SAR EVALUATION REPORT

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

Date of Testing:
01/12/15 - 01/22/15
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Document Serial No.:
0Y1501120062-R2.ZNF

FCC ID: **ZNFH950**

APPLICANT: **LG ELECTRONICS MOBILECOMM U.S.A., INC.**

DUT Type: Portable Handset
Application Type: Certification
FCC Rule Part(s): CFR §2.1093
Model(s): LG-H950, LGH950, H950

Equipment Class	Band & Mode	Tx Frequency	SAR		
			1 gm Head (W/kg)	1 gm Body-Worn (W/kg)	1 gm Hotspot (W/kg)
PCE	GSM/GPRS/EDGE 850	824.20 - 848.80 MHz	0.46	0.63	0.66
PCE	GSM/GPRS/EDGE 1900	1850.20 - 1909.80 MHz	0.53	0.37	0.37
PCE	UMTS 850	826.40 - 846.60 MHz	0.33	0.44	0.49
PCE	UMTS 1900	1852.4 - 1907.6 MHz	0.81	0.40	0.56
PCE	LTE Band 12	699.7 - 715.3 MHz	0.19	0.46	0.46
PCE	LTE Band 5 (Cell)	824.7 - 848.3 MHz	0.36	0.47	0.47
PCE	LTE Band 4 (AWS)	1710.7 - 1754.3 MHz	0.65	0.68	0.68
PCE	LTE Band 2 (PCS)	1850.7 - 1909.3 MHz	0.86	0.43	0.59
PCE	LTE Band 7	2502.5 - 2567.5 MHz	0.71	0.55	0.79
DTS	2.4 GHz WLAN	2412 - 2462 MHz	0.59	0.12	0.16
NII	5.8 GHz WLAN	5745 - 5825 MHz	0.23	< 0.1	<0.1
NII	5.2 GHz WLAN	5180 - 5240 MHz	0.30	< 0.1	
NII	5.3 GHz WLAN	5260 - 5320 MHz	0.31	< 0.1	
NII	5.5 GHz WLAN	5500 - 5720 MHz	0.21	< 0.1	
DSS/DTS	Bluetooth	2402 - 2480 MHz	N/A		
Simultaneous SAR per KDB 690783 D01v01r03:			1.10	0.89	0.94

Note: This revised Test Report (S/N: 0Y1501120062-R2.ZNF) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in Section 1.9 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

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

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1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 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 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
2.4 GHz WLAN	Data	2412 - 2462 MHz
5.8 GHz WLAN	Data	5745 - 5825 MHz
5.2 GHz WLAN	Data	5180 - 5240 MHz
5.3 GHz WLAN	Data	5260 - 5320 MHz
5.5 GHz WLAN	Data	5500 - 5720 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz

1.2 Nominal and Maximum Output Power Specifications

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

Mode / Band		Voice (dBm)	Burst Average GMSK (dBm)		Burst Average 8-PSK (dBm)	
		1 TX Slot	*1 TX Slots*	*2 TX Slots*	*1 TX Slots*	*2 TX Slots*
GSM/GPRS/EDGE 850	Maximum	**33.2**	**33.2**	**31.7**	**27.7**	**26.7**
	Nominal	**32.7**	**32.7**	**31.2**	**27.2**	**26.2**
GSM/GPRS/EDGE 1900	Maximum	**30.2**	**30.2**	**28.7**	**26.7**	**25.7**
	Nominal	**29.7**	**29.7**	**28.2**	**26.2**	**25.2**

Mode / Band		Modulated Average (dBm)		
		3GPP WCDMA Rel. 99	*3GPP HSDPA Rel. 5*	*3GPP HSUPA Rel. 6*
UMTS Band 5 (850 MHz)	Maximum	**23.7**	**23.7**	**23.7**
	Nominal	**23.2**	**23.2**	**23.2**
UMTS Band 2 (1900 MHz)	Maximum	**23.7**	**23.7**	**23.7**
	Nominal	**23.2**	**23.2**	**23.2**

Mode / Band		Modulated Average (dBm)
LTE Band 12	Maximum	**24.7**
	Nominal	**24.2**
LTE Band 17	Maximum	**24.7**
	Nominal	**24.2**
LTE Band 5 (Cell)	Maximum	**24.2**
	Nominal	**23.7**
LTE Band 4 (AWS)	Maximum	**24.2**
	Nominal	**23.7**
LTE Band 2 (PCS)	Maximum	**24.2**
	Nominal	**23.7**
LTE Band 7	Maximum	**23.7**
	Nominal	**23.2**

Mode / Band		Modulated Average (dBm)
IEEE 802.11b (2.4 GHz)	Maximum	**15.0**
	Nominal	**14.0**
IEEE 802.11g (2.4 GHz)	Maximum	**13.0**
	Nominal	**12.0**
IEEE 802.11n (2.4 GHz)	Maximum	**11.0**
	Nominal	**10.0**
IEEE 802.11ac (2.4 GHz)	Maximum	**11.0**
	Nominal	**10.0**
IEEE 802.11a (5 GHz)	Maximum	**13.0**
	Nominal	**12.0**
IEEE 802.11n (5 GHz 20 MHz)	Maximum	**13.0**
	Nominal	**12.0**
IEEE 802.11n (5 GHz 40 MHz)	Maximum	**12.0**
	Nominal	**11.0**
IEEE 802.11ac (5 GHz 20 MHz)	Maximum	**13.0**
	Nominal	**12.0**
IEEE 802.11ac (5 GHz 40 MHz)	Maximum	**12.0**
	Nominal	**11.0**
IEEE 802.11ac (5 GHz 80 MHz)	Maximum	**12.0**
	Nominal	**11.0**
Bluetooth (1Mbps)	Maximum	**10.0**
	Nominal	**9.0**
Bluetooth (2Mbps)	Maximum	**7.0**
	Nominal	**6.0**
Bluetooth (3Mbps)	Maximum	**7.0**
	Nominal	**6.0**
Bluetooth LE	Maximum	**6.0**
	Nominal	**5.0**

1.3 DUT Antenna Locations

A diagram showing the location of the device antennas can be found in Appendix F. Exact antenna dimensions and separation distances are shown in the Technical Descriptions in the FCC filing. The overall dimensions of this device are > 9 x 5 cm. The overall diagonal dimension of the device is <160 mm and the diagonal display is <150 mm.

Table 1-1
Mobile Hotspot Sides for SAR Testing

Mobile Hotspot Sides for SAR Testing						
Mode	Back	Front	Top	Bottom	Right	Left
GPRS 850	Yes	Yes	No	Yes	Yes	No
GPRS 1900	Yes	Yes	No	Yes	No	Yes
UMTS 850	Yes	Yes	No	Yes	Yes	No
UMTS 1900	Yes	Yes	No	Yes	No	Yes
LTE Band 12	Yes	Yes	No	Yes	Yes	No
LTE Band 5 (Cell)	Yes	Yes	No	Yes	Yes	No
LTE Band 4 (AWS)	Yes	Yes	No	Yes	No	Yes
LTE Band 2 (PCS)	Yes	Yes	No	Yes	No	Yes
LTE Band 7	Yes	Yes	No	Yes	No	Yes
2.4 GHz WLAN	Yes	Yes	Yes	No	No	Yes
5.8 GHz WLAN	Yes	Yes	Yes	No	No	Yes

Note: Particular DUT edges were not required to be evaluated for Wireless Router SAR if the edges were greater than 2.5 cm from the transmitting antenna according to FCC KDB Publication 941225 D06v01 guidance, page 2. The distances between the transmit antennas and the edges of the device are included in the filing. When wireless router mode is enabled, 5.2-5.7 GHz WLAN operations are disabled.

1.4 Near Field Communications (NFC) Antenna

This DUT has NFC operations. The NFC antenna is integrated into the device. The NFC antenna location diagram can be found in appendix F. The NFC antenna is integrated into the device; therefore all SAR tests were performed with the NFC antenna.

1.5 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D05v01, transmitters are considered to be transmitting simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. Possible transmission paths for the DUT are shown in Figure 1-1 and are color-coded to indicate communication modes which share the same path. Modes which share the same transmission path cannot transmit simultaneously with one another.

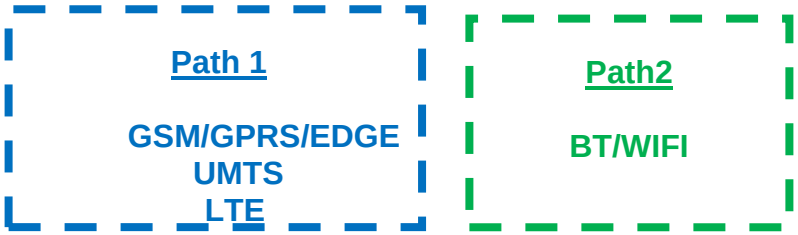

Figure 1-1
Simultaneous Transmission Paths

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

Table 1-2
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router
1	GSM voice + 2.4 GHz WI-FI	Yes	Yes	N/A
2	GSM voice + 5 GHz WI-FI	Yes	Yes	N/A
3	GSM voice + 2.4 GHz Bluetooth	N/A	Yes	N/A
4	UMTS + 2.4 GHz WI-FI	Yes	Yes	Yes
5	UMTS + 5 GHz WI-FI	Yes	Yes	Yes
6	UMTS + 2.4 GHz Bluetooth	N/A	Yes	N/A
7	LTE + 2.4 GHz WI-FI	Yes	Yes	Yes
8	LTE + 5 GHz WI-FI	Yes	Yes	Yes
9	LTE + 2.4 GHz Bluetooth	N/A	Yes	N/A
10	GPRS/EDGE + 2.4 GHz WI-FI	Yes*	Yes*	Yes
11	GPRS/EDGE + 5 GHz WI-FI	Yes*	Yes*	Yes
12	GPRS/EDGE + 2.4 GHz Bluetooth	N/A	Yes*	N/A

1. 2.4 GHz WLAN, 5 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. (*) = for VOIP applications possibly used by the end-user
4. When the user utilizes multiple services in UMTS 3G mode it uses multi-Radio Access Bearer or multi-RAB. The power control is based on a physical control channel (Dedicated Physical Control Channel [DPCCH]) and power control will be adjusted to meet the needs of both services. Therefore, the UMTS+WLAN scenario also represents the UMTS Voice/DATA + WLAN Hotspot scenario.
5. Per the manufacturer, WIFI Direct is expected to be used in conjunction with a held-to-ear or body-worn accessory voice call. Simultaneous transmission scenarios involving WIFI direct are specified above.
6. 5 GHz Wireless Router is only supported for the 5.8 GHz Band by S/W, therefore 5.2-5.7 GHz Bands were not evaluated for wireless router conditions.
7. 2.4 GHz WIFI supports Hotspot and WIFI-Direct(GO/GC).
8. 5.8 GHz WIFI supports Hotspot and WIFI-Direct(GO/GC).
9. This device supports VoLTE.

1.6 SAR Test Exclusions Applied

(A) WIFI/BT

Since Wireless Router operations are not allowed by the chipset firmware using 5.2-5.7 GHz WIFI, only 2.4 GHz and 5.8 GHz WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v01.

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

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

Based on the maximum conducted power of Bluetooth (rounded to the nearest mW) and the antenna to user separation distance, body-worn Bluetooth SAR was not required; [(10/10)* √2.480] = 1.6< 3.0. Per KDB Publication 447498 D01v05, the maximum power of the channel was rounded to the nearest mW before calculation.

This device supports 20 MHz and 40 MHz Bandwidths for IEEE 802.11n for 5 GHz WIFI only. IEEE 802.11n was not evaluated for SAR since the average output power of 20 MHz and 40 MHz bandwidths was not more than 0.25 dB higher than the average output power of IEEE 802.11a.

This device supports IEEE 802.11ac with the following features:

a) Up to 80 MHz Bandwidth only
b) No aggregate channel configurations
c) 1 Tx antenna output
d) 256 QAM is supported
e) New 5 GHz channels 138, 142, and 144 are supported

(B) Licensed Transmitter(s)

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

This device is only capable of QPSK HSUPA in the uplink. Therefore, no additional SAR tests are required beyond that described for devices with HSUPA in KDB 941225 D01v02.

This Device additionally supports LTE B17. LTE Band 12 and LTE Band 17 share the same transmission path. LTE Band 17 was not evaluated for SAR since the supported frequency range falls within the LTE Band 12 supported frequency range and the Band 17 target power was less than or equal to the Band 12 target power.

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 D05v02.

This device supports inter-band LTE Carrier Aggregation (CA) in the downlink only. All uplink communications are identical to Release 8 specifications. Per FCC Guidance, LTE CA SAR was not needed for testing since the data sent by uplink on uplink physical channels does not change between Rel 8 and Rel 10.

1.7 SAR Test Positioning Based on Form Factor

Due to the embowed design of the device, Body SAR was configured per FCC Guidance. For Back side, the device was tested at a distance of 8 mm at the center of the device. For Front side, the device was tested at a distance of 8 mm from the outer ends of the device. The remaining surface or edges within 25 mm of a Tx antenna were tested at a distance of 10 mm.

1.8 Power Reduction for SAR

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

1.9 Guidance Applied

- IEEE 1528-2003
- FCC KDB Publication 941225 D01v03, D05v02r03, D06v01r01 (2G/3G/4G and Hotspot)
- FCC KDB Publication 248227 D01v01r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v05r02 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r03, D02v01r01 (SAR Measurements up to 6 GHz)
- April 2013 TCB Workshop Notes (IEEE 802.11ac)
- October 2013 TCB Workshop Notes (GPRS Testing Considerations)

1.10 Device Serial Numbers

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

	Head Serial Number	Body-Worn Serial Number	Hotspot Serial Number
GSM/GPRS/EDGE 850	1501-3	1501-3	1501-3
GSM/GPRS/EDGE 1900	1501-3	1501-3	1501-3
UMTS 850	1501-3	1501-3	1501-3
UMTS 1900	1501-3	1501-3	1501-3
LTE Band 12	1501-2	1501-2	1501-2
LTE Band 5 (Cell)	1501-2	1501-2	1501-2
LTE Band 4 (AWS)	1501-2	1501-2	1501-2
LTE Band 2 (PCS)	1501-2	1501-2	1501-2
LTE Band 7	1501-2	1501-23	1501-23
2.4 GHz WLAN	1301-2	1301-2	1301-2
5 GHz WLAN	1301-2	1301-2	1301-2

2 LTE INFORMATION

LTE Information					
FCC ID	**ZNFH950**				
Form Factor	Portable Handset				
Frequency Range of each LTE transmission band	LTE Band 12 (699.7 - 715.3 MHz)				
	LTE Band 17 (706.5 - 713.5 MHz)				
	LTE Band 5 (Cell) (824.7 - 848.3 MHz)				
	LTE Band 4 (AWS) (1710.7 - 1754.3 MHz)				
	LTE Band 2 (PCS) (1850.7 - 1909.3 MHz)				
	LTE Band 7 (2502.5 - 2567.5 MHz)				
Channel Bandwidths	LTE Band 12: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
	LTE Band 17: 5 MHz, 10 MHz				
	LTE Band 5 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
	LTE Band 4 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 2 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 7: 5 MHz, 10 MHz, 15 MHz, 20 MHz				
Channel Numbers and Frequencies (MHz)	Low		Mid	High	
LTE Band 12: 1.4 MHz	699.7 (23017)		707.5 (23095)	715.3 (23173)	
LTE Band 12: 3 MHz	700.5 (23025)		707.5 (23095)	714.5 (23165)	
LTE Band 12: 5 MHz	701.5 (23035)		707.5 (23095)	713.5 (23155)	
LTE Band 12: 10 MHz	704 (23060)		707.5 (23095)	711 (23130)	
LTE Band 17: 5 MHz	706.5 (23755)		710 (23790)	713.5 (23825)	
LTE Band 17: 10 MHz	709 (23780)		710 (23790)	711 (23800)	
LTE Band 5 (Cell): 1.4 MHz	824.7 (20407)		836.5 (20525)	848.3 (20643)	
LTE Band 5 (Cell): 3 MHz	825.5 (20415)		836.5 (20525)	847.5 (20635)	
LTE Band 5 (Cell): 5 MHz	826.5 (20425)		836.5 (20525)	846.5 (20625)	
LTE Band 5 (Cell): 10 MHz	829 (20450)		836.5 (20525)	844 (20600)	
LTE Band 4 (AWS): 1.4 MHz	1710.7 (19957)		1732.5 (20175)	1754.3 (20393)	
LTE Band 4 (AWS): 3 MHz	1711.5 (19965)		1732.5 (20175)	1753.5 (20385)	
LTE Band 4 (AWS): 5 MHz	1712.5 (19975)		1732.5 (20175)	1752.5 (20375)	
LTE Band 4 (AWS): 10 MHz	1715 (20000)		1732.5 (20175)	1750 (20350)	
LTE Band 4 (AWS): 15 MHz	1717.5 (20025)		1732.5 (20175)	1747.5 (20325)	
LTE Band 4 (AWS): 20 MHz	1720 (20050)		1732.5 (20175)	1745 (20300)	
LTE Band 2 (PCS): 1.4 MHz	1850.7 (18607)		1880 (18900)	1909.3 (19193)	
LTE Band 2 (PCS): 3 MHz	1851.5 (18615)		1880 (18900)	1908.5 (19185)	
LTE Band 2 (PCS): 5 MHz	1852.5 (18625)		1880 (18900)	1907.5 (19175)	
LTE Band 2 (PCS): 10 MHz	1855 (18650)		1880 (18900)	1905 (19150)	
LTE Band 2 (PCS): 15 MHz	1857.5 (18675)		1880 (18900)	1902.5 (19125)	
LTE Band 2 (PCS): 20 MHz	1860 (18700)		1880 (18900)	1900 (19100)	
LTE Band 7: 5 MHz	2502.5 (20775)		2535 (21100)	2567.5 (21425)	
LTE Band 7: 10 MHz	2505 (20800)		2535 (21100)	2565 (21400)	
LTE Band 7: 15 MHz	2507.5 (20825)		2535 (21100)	2562.5 (21375)	
LTE Band 7: 20 MHz	2510 (20850)		2535 (21100)	2560 (21350)	
UE Category	4				
Modulations Supported in UL	QPSK, 16QAM				
LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.3~6.2.5? (manufacturer attestation to be provided)	YES				
A-MPR (Additional MPR) disabled for SAR Testing?	YES				
LTE Carrier Aggregation Possible Combinations	LTE B4 (PCC) + LTE B17 (SCC)	LTE B2 (PCC) + LTE B17 (SCC)	LTE B17 (PCC) + LTE B2 (SCC)	LTE B2 (PCC) + LTE B29 (SCC)	LTE B4 (PCC) + LTE B29 (SCC)
	5MHz (B4)+5MHz (B17)	5MHz (B2)+5MHz (B17)	5MHz (B17)+5MHz (B2)	5MHz (B2)+5MHz (B29)	5MHz (B4)+5MHz (B29)
	5MHz (B4)+10MHz (B17)	5MHz (B2)+10MHz (B17)	5MHz (B17)+10MHz (B2)	5MHz (B2)+10MHz (B29)	5MHz (B4)+10MHz (B29)
	10MHz (B4)+5MHz (B17)	10MHz (B2)+5MHz (B17)	10MHz (B17)+5MHz (B2)	10MHz (B2)+5MHz (B29)	10MHz (B4)+5MHz (B29)
	10MHz (B4)+10MHz (B17)	10MHz (B2)+10MHz (B17)	10MHz (B17)+10MHz (B2)	10MHz (B2)+10MHz (B29)	10MHz (B4)+10MHz (B29)
LTE Carrier Aggregation Additional Information	This device does not support full CA features on 3GPP Release 10. It supports a maximum of 2 carriers in the downlink with a total maximum bandwidth of 10 MHz of the spectrum. All uplink communications are identical to the Release 8 Specifications. Uplink communications are done on the PCC. Due to carrier capability, only the combinations listed above are supported. The following LTE Release 10 Features are not supported: Relay, HetNet, Enhanced MIMO, eICI, WIFI Offloading, MDH, eMBMA, Cross-Carrier Scheduling, Enhanced SC-FDMA.				

3 INTRODUCTION

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

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

3.1 SAR Definition

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

Equation 3-1
SAR Mathematical Equation

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

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

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

where:

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

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

4 DOSIMETRIC ASSESSMENT

4.1 Measurement Procedure

The evaluation was performed using the following procedure compliant to FCC KDB Publication 865664 D01v01 and IEEE 1528-2013:

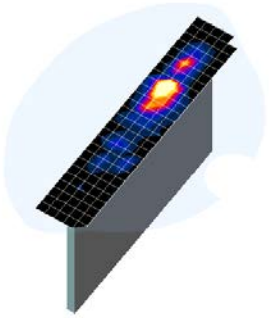

Figure 4-1
Sample SAR Area Scan

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head and body interface and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01 (See Table 4-1) and IEEE 1528-2013.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01 (See Table 4-1) and IEEE 1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):

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

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

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

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

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

*Also compliant to IEEE 1528-2013 Table 6

5 DEFINITION OF REFERENCE POINTS

5.1 EAR REFERENCE POINT

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

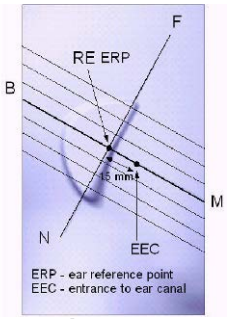

Figure 5-1
Close-Up Side view of ERP

5.2 HANDSET REFERENCE POINTS

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

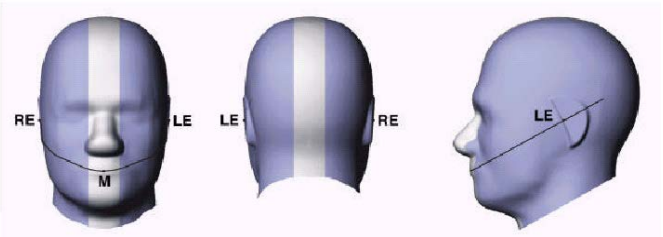

Figure 5-2
Front, back and side view of SAM Twin Phantom

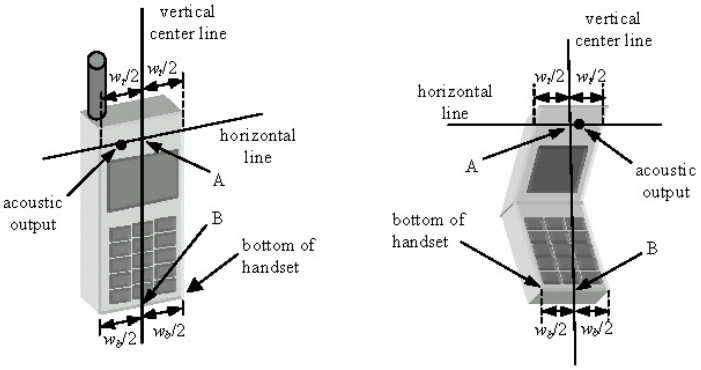

Figure 5-3
Handset Vertical Center & Horizontal Line Reference Points

6 TEST CONFIGURATION POSITIONS FOR HANDSETS

6.1 Device Holder

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

6.2 Positioning for Cheek

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

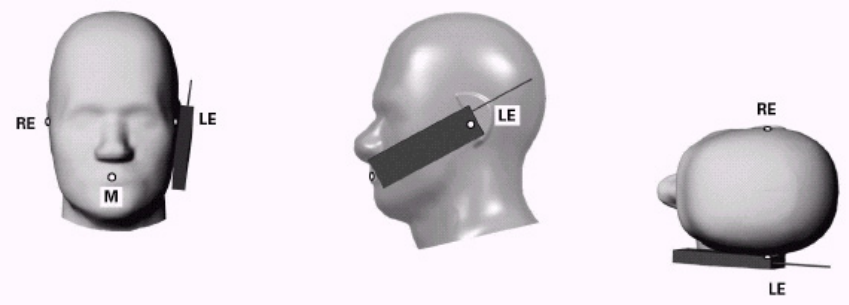

Figure 6-1 Front, Side and Top View of Cheek Position

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

6.3 Positioning for Ear / 15º Tilt

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

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

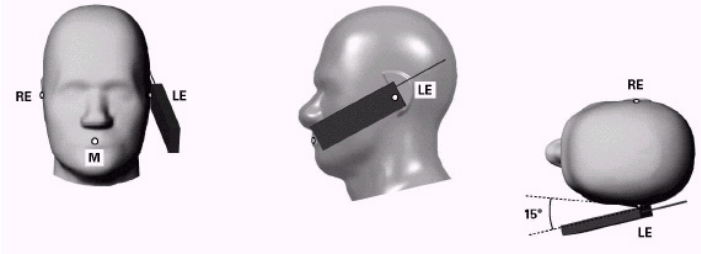

Figure 6-2 Front, Side and Top View of Ear/15º Tilt Position

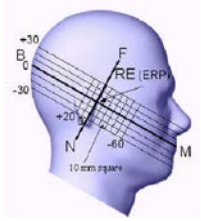

Figure 6-3
Side view w/ relevant markings

6.4 SAR Evaluations near the Mouth/Jaw Regions of the SAM Phantom

Antennas located near the bottom of a phone may require SAR measurements around the mouth and jaw regions of the SAM head phantom. This typically applies to clam-shell style phones that are generally longer in the unfolded normal use positions or to certain older style long rectangular phones. Per IEEE 1528-2013, a rotated SAM phantom is necessary to allow probe access to such regions. Both SAM heads of the TwinSAM-Chin20 are rotated 20 degrees around the NF line. Each head can be removed from the table for emptying and cleaning.

Under these circumstances, the following procedures apply, adopted from the FCC guidance on SAR handsets document FCC KDB Publication 648474 D04_v01. The SAR required in these regions of SAM should be measured using a flat phantom. The phone should be positioned with a separation distance of 4 mm between the ear reference point (ERP) and the outer surface of the flat phantom shell. While maintaining this distance at the ERP location, the low (bottom) edge of the phone should be lowered from the phantom to establish the same separation distance between the peak SAR location identified by the truncated partial SAR distribution measured with the SAM phantom. The distance from the peak SAR location to the phone is determined by the straight line passing perpendicularly through the phantom surface. When it is not feasible to maintain 4 mm separation at the ERP while also establishing the required separation at the peak SAR location, the top edge of the phone will be allowed to touch the phantom with a separation < 4 mm at the ERP. The phone should not be tilted to the left or right while placed in this inclined position to the flat phantom.

6.5 Body-Worn Accessory Configurations

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 6-4). Per FCC KDB Publication 648474 D04v01, Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB Publication 447498 D01v05 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

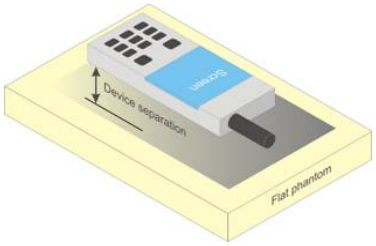

Figure 6-4
Sample Body-Worn Diagram

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are tested with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

Body-worn accessories may not always be supplied or available as options for some devices intended to be authorized for body-worn use. In this case, a test configuration with a separation distance between the back of the device and the flat phantom is used. Test position spacing was documented. Transmitters that are designed to operate in front of a person's face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom in head fluid. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessories, including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

6.6 Extremity Exposure Configurations

Devices that are designed or intended for use on extremities or mainly operated in extremity only exposure conditions; i.e., hands, wrists, feet and ankles, may require extremity SAR evaluation. When the device also operates in close proximity to the user's body, SAR compliance for the body is also required. The 1-g body and 10-g extremity SAR Exclusion Thresholds found in KDB Publication 44798 D01v05 should be applied to determine SAR test requirements.

Per KDB Publication 447498 D01v05, Cell phones (handsets) are not normally designed to be used on extremities or operated in extremity only exposure conditions. The maximum output power levels of handsets generally do not require extremity SAR testing to show compliance. Therefore, extremity SAR was not evaluated for this device.

6.7 Wireless Router Configurations

Some battery-operated handsets have the capability to transmit and receive user data through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 v01 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10 mm from the front, back and edges of the device containing transmitting antennas within 2.5 cm of their edges, determined from general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the WIFI transmitter according to FCC KDB Publication 447498 D01v05 publication procedures. The "Portable Hotspot" feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

7 RF EXPOSURE LIMITS

7.1 Uncontrolled Environment

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

7.2 Controlled Environment

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

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

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

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

8 FCC MEASUREMENT PROCEDURES

Power measurements were performed using a base station simulator under digital average power.

8.1 Measured and Reported SAR

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

8.2 Procedures Used to Establish RF Signal for SAR

The following procedures are according to FCC KDB Publication 941225 D01 "SAR Measurement Procedures for 3G Devices" v02, October 2007.

The device was 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 were 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 was 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 deviated by more than 5%, the SAR test and drift measurements were repeated.

8.3 SAR Measurement Conditions for UMTS

8.3.1 Output Power Verification

Maximum output power is measured on the High, Middle and Low channels for each applicable transmission band according to the general descriptions in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR with TPC (transmit power control) set to all "1s".

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 (release 5), using the appropriate RMC with TPC (transmit power control) set to all "1s" or applying the required inner loop power control procedures to maintain maximum output power while HSUPA is active. Results for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HS-DPCCH etc) are tabulated in this test report. All configurations that are not supported by the DUT or cannot be measured due to technical or equipment limitations are identified.

8.3.2 Head SAR Measurements for Handsets

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.

8.3.3 Body SAR Measurements

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits all "1s".

8.3.4 SAR Measurements for Handsets with Rel 5 HSDPA

Body SAR for HSDPA is not required for handsets with HSDPA capabilities when the maximum average output power of each RF channel with HSDPA active is less than 0.25 dB higher than that measured without HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2 kbps RMC is ≤ 75% of the SAR limit. Otherwise, SAR is measured for HSDPA, using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, using the highest body SAR configuration measured in 12.2 kbps RMC without HSDPA, on the maximum output channel with the body exposure configuration that resulted in the highest SAR in 12.2 kbps RMC mode for that RF channel.

The H-set used in FRC for HSDPA should be configured according to the UE category of a test device. The number of HS-DSCH/HSPDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the applicable H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the FRC for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 2 ms to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors of βc=9 and βd=15, and power offset parameters of ΔACK= ΔNACK =5 and ΔCQI=2 is used. The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the FRC.

Sub-Test	β_c	β_d	β_d *(SF)*	β_c/β_d	β_{HS} *(Note1, Note 2)*	CM (dB) *(Note 3)*	MPR (dB) *(Note 3)*
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 *(Note 4)*	15/15 *(Note 4)*	64	12/15 *(Note 4)*	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 8 ⇔ $A_{hs} = \beta_{hs}/\beta_c$ = 30/15 ⇔ β_{hs}= 30/15 *β_c.

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and Δ_{NACK} = 8 (A_{hs} = 30/15) with β_{hs} = 30/15 * β_c, and Δ_{CQI} = 7 (A_{hs} = 24/15) with β_{hs} = 24/15 * β_c.

Note 3: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Figure 8-1
Table C.10.1.4 of TS 234.121-1

8.3.5 SAR Measurements for Handsets with Rel 6 HSUPA

Body SAR for HSUPA is not required when the maximum average output of each RF channel with HSUPA/HSDPA active is less than 0.25 dB higher than as measured without HSUPA/HSDPA using 12.2 kbps RMC and maximum SAR for 12.2 kbps RMC is ≤ 75 % of the SAR limit. Otherwise SAR is measured on the maximum output channel for the body exposure configuration produced highest SAR in 12.2 kbps RMC for that RF channel, using the additional procedures under "Release 6 HSPA data devices"

Head SAR for VOIP operations under HSPA is not required when maximum average output of each RF channel with HSPA is less than 0.25 dB higher than as measured using 12.2 kbps RMC. Otherwise SAR is measured using same HSPA configuration as used for body SAR.

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs}[1]	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM[2] (dB)	MPR (dB)	AG[4] Index	E-TFCI
1	11/15[3]	15/15[3]	64	11/15[3]	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1}: 47/15 β_{ed2}: 47/15	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15[4]	15/15[4]	64	15/15[4]	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$.
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.
Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 14/15 and β_d = 15/15.
Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g.
Note 6: β_{ed} can not be set directly; it is set by Absolute Grant Value.

8.4 SAR Measurement Conditions for LTE

LTE modes were tested according to FCC KDB 941225 D05v02 publication. Please see notes after the tabulated SAR data for required test configurations. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The R&S CMW500 was used for LTE output power measurements and SAR testing. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

8.4.1 Spectrum Plots for RB Configurations

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

8.4.2 MPR

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

8.4.3 A-MPR

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

8.4.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05v02r01:

a. Per Section 5.2.1, SAR is required for QPSK 1 RB Allocation for the largest bandwidth
   i. The required channel and offset combination with the highest maximum output power is required for SAR.
   ii. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required. Otherwise, SAR is required for the remaining required test channels using the RB offset configuration with highest output power for that channel.

iii. When the reported SAR for a required test channel is > 1.45 W/kg, SAR is required for all RB offset configurations for that channel.

b. Per Section 5.2.2, SAR is required for 50% RB allocation using the largest bandwidth following the same procedures outlined in Section 5.2.1.
c. Per Section 5.2.3, QPSK SAR is not required for the 100% allocation when the highest maximum output power for the 100% allocation is less than the highest maximum output power of the 1 RB and 50% RB allocations and the reported SAR for the 1 RB and 50% RB allocations is < 0.8 W/kg.
d. Per Section 5.2.4 and 5.3, SAR tests for higher order modulations and lower bandwidths configurations are not required when the conducted power of the required test configurations determined by Sections 5.2.1 through 5.2.3 is less than or equal to ½ dB higher than the equivalent configuration using QPSK modulation and when the QPSK SAR for those configurations is <1.45 W/kg.

8.4.5 Carrier Aggregation

LTE Carrier Aggregation (CA) measurements were made in accordance to 3GPP TS 36.521-1 V10.4.0 (2012-12). The RRC connection is only handled by one cell, the Primary component carrier (PCC) for downlink and uplink communications. After making a data connection to the PCC, the UE device adds the Secondary component carrier (SCC) on the downlink only. All uplink communications and acknowledgements remain identical to release 8 specifications on the PCC. Additional output powers were measured using two carriers in the downlink for the release 8 configurations with the highest output power among all channels, RB configurations and bandwidths for each uplink band. Per FCC Guidance, no SAR measurements were required.

8.5 SAR Testing with 802.11 Transmitters

Normal network operating configurations are not suitable for measuring the SAR of 802.11 a/b/g/n/ac transmitters. 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 D01v01r02 for more details.

8.5.1 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. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be used for all measurements.

8.5.2 Frequency Channel Configurations [24]

For 2.4 GHz, the highest average RF output power channel between the low, mid and high channel at the lowest data rate was selected for SAR evaluation in 802.11b mode. 802.11g/n modes and higher data rates for 802.11b were additionally evaluated for SAR if the output power of the respective mode was 0.25 dB or higher than the powers of the SAR configurations tested in the 802.11b mode.

For 5 GHz, the highest average RF output power channel across the default test channels at the lowest data rate was selected for SAR evaluation in 802.11a. When the adjacent channels are higher in power then the default channels, these “required channels” were considered instead of the default channels for SAR testing. 802.11n modes and higher data rates for 802.11a/n were evaluated only if the respective mode was higher than 0.25 dB or more than the 802.11a mode. 802.11ac SAR was evaluated for highest 802.11a configuration in each 5 GHz band and each exposure condition. 802.11ac modes were additionally evaluated for SAR if the output power for the respective mode was more than 0.25 dB higher than powers of 802.11a modes.

If the maximum extrapolated peak SAR of the zoom scan for the highest output channel was less than 1.6 W/kg and if the 1g averaged SAR was less than 0.8 W/kg, SAR testing was not required for the other test channels in the band.

9 RF CONDUCTED POWERS

9.1 GSM Conducted Powers

		Maximum Burst-Averaged Output Power				
		Voice	GPRS/EDGE Data (GMSK)		EDGE Data (8-PSK)	
Band	Channel	GSM [dBm] CS (1 Slot)	GPRS [dBm] 1 Tx Slot	GPRS [dBm] 2 Tx Slot	EDGE [dBm] 1 Tx Slot	EDGE [dBm] 2 Tx Slot
GSM 850	128	33.17	33.16	**31.63**	27.69	26.67
	190	33.04	33.04	**31.21**	27.65	26.54
	251	33.18	33.15	**31.29**	27.64	26.70
GSM 1900	512	30.01	30.03	**28.27**	26.54	25.67
	661	29.82	29.89	**28.61**	26.53	25.44
	810	30.15	30.18	**28.54**	26.50	25.35
		Calculated Maximum Frame-Averaged Output Power				
		Voice	GPRS/EDGE Data (GMSK)		EDGE Data (8-PSK)	
Band	Channel	GSM [dBm] CS (1 Slot)	GPRS [dBm] 1 Tx Slot	GPRS [dBm] 2 Tx Slot	EDGE [dBm] 1 Tx Slot	EDGE [dBm] 2 Tx Slot
GSM 850	128	24.14	24.13	**25.61**	18.66	20.65
	190	24.01	24.01	**25.19**	18.62	20.52
	251	24.15	24.12	**25.27**	18.61	20.68
GSM 1900	512	20.98	21.00	**22.25**	17.51	19.65
	661	20.79	20.86	**22.59**	17.50	19.42
	810	21.12	21.15	**22.52**	17.47	19.33
GSM 850	Frame Avg.Targets:	23.67	23.67	**25.18**	18.17	20.18
GSM 1900		20.67	20.67	**22.18**	17.17	19.18

Note:

1. Both burst-averaged and calculated frame-averaged powers are included. Frame-averaged power was calculated from the measured burst-averaged power by converting the slot powers into linear units and calculating the energy over 8 timeslots.
2. The source-based frame-averaged output power was evaluated for all GPRS/EDGE slot configurations. The configuration with the highest target frame averaged output power was evaluated. When the maximum frame-averaged powers are equivalent across two or more slots (within 0.25 dB), the configuration with the most number of time slots was tested.
3. GPRS/EDGE (GMSK) output powers were measured with coding scheme setting of 1 (CS1) on the base station simulator. CS1 was configured to measure GPRS output power measurements and SAR to ensure GMSK modulation in the signal. Our Investigation has shown that CS1 - CS4 settings do not have any impact on the output levels or modulation in the GPRS modes.
4. EDGE (8-PSK) output powers were measured with MCS7 on the base station simulator. MCS7 coding scheme was used to measure the output powers for EDGE since investigation has shown that choosing MCS7 coding scheme will ensure 8-PSK modulation. It has been shown that MCS levels that produce 8PSK modulation do not have an impact on output power.

GSM Class: B
GPRS Multislot class: 10 (Max 2 Tx uplink slots)
EDGE Multislot class: 10 (Max 2 Tx uplink slots)
DTM Multislot Class: N/A

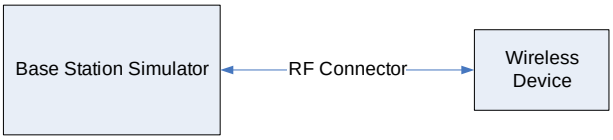

Figure 9-1
Power Measurement Setup

9.2 UMTS Conducted Powers

3GPP Release Version	Mode	3GPP 34.121 Subtest	Cellular Band [dBm]			PCS Band [dBm]			3GPP MPR [dB]
			4132	4183	4233	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	23.65	23.52	23.63	23.63	23.66	23.70	-
99		12.2 kbps AMR	23.58	23.50	23.57	23.63	23.44	23.61	-
6	HSDPA	Subtest 1	23.54	23.50	23.64	22.93	23.14	23.21	0
6		Subtest 2	23.67	23.58	23.70	22.90	23.17	23.15	0
6		Subtest 3	23.07	23.05	23.15	22.39	22.67	22.68	0.5
6		Subtest 4	23.12	23.02	23.14	22.42	22.63	22.68	0.5
6	HSUPA	Subtest 1	22.21	22.41	22.58	21.84	21.75	22.08	0
6		Subtest 2	21.59	21.06	21.28	20.55	20.44	20.83	2
6		Subtest 3	21.88	22.05	22.15	21.67	21.59	21.94	1
6		Subtest 4	21.44	21.32	21.14	20.38	20.52	20.61	2
6		Subtest 5	22.15	22.30	22.48	21.80	21.85	21.91	0

UMTS SAR was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01v02. HSPA SAR was not required since the average output power of the HSPA subtests was not more than 0.25 dB higher than the RMC level and SAR was less than 1.2 W/kg.

This device does not support DC-HSDPA.

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

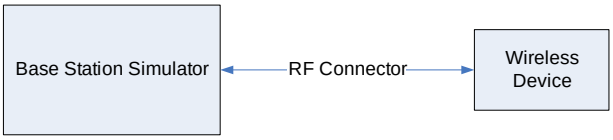

Figure 9-2
Power Measurement Setup

9.3 LTE Conducted Powers

9.3.1 LTE Band 12

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	707.5	23095	10	QPSK	1	0	**24.64**	0	0
	707.5	23095	10	QPSK	1	25	24.60	0	0
	707.5	23095	10	QPSK	1	49	24.59	0	0
	707.5	23095	10	QPSK	25	0	23.21	0-1	1
	707.5	23095	10	QPSK	25	12	**23.25**	0-1	1
	707.5	23095	10	QPSK	25	25	23.21	0-1	1
	707.5	23095	10	QPSK	50	0	23.20	0-1	1
	707.5	23095	10	16QAM	1	0	23.61	0-1	1
	707.5	23095	10	16QAM	1	25	23.55	0-1	1
	707.5	23095	10	16QAM	1	49	23.56	0-1	1
	707.5	23095	10	16QAM	25	0	22.20	0-2	2
	707.5	23095	10	16QAM	25	12	22.22	0-2	2
	707.5	23095	10	16QAM	25	25	22.28	0-2	2
	707.5	23095	10	16QAM	50	0	22.24	0-2	2

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

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	701.5	23035	5	QPSK	1	0	24.58	0	0
	701.5	23035	5	QPSK	1	12	24.40	0	0
	701.5	23035	5	QPSK	1	24	24.49	0	0
	701.5	23035	5	QPSK	12	0	23.31	0-1	1
	701.5	23035	5	QPSK	12	6	23.28	0-1	1
	701.5	23035	5	QPSK	12	13	23.20	0-1	1
	701.5	23035	5	QPSK	25	0	23.28	0-1	1
	701.5	23035	5	16-QAM	1	0	23.55	0-1	1
	701.5	23035	5	16-QAM	1	12	23.45	0-1	1
	701.5	23035	5	16-QAM	1	24	23.53	0-1	1
	701.5	23035	5	16-QAM	12	0	22.28	0-2	2
	701.5	23035	5	16-QAM	12	6	22.21	0-2	2
	701.5	23035	5	16-QAM	12	13	22.29	0-2	2
	701.5	23035	5	16-QAM	25	0	22.31	0-2	2
Mid	707.5	23095	5	QPSK	1	0	24.50	0	0
	707.5	23095	5	QPSK	1	12	24.40	0	0
	707.5	23095	5	QPSK	1	24	24.38	0	0
	707.5	23095	5	QPSK	12	0	23.22	0-1	1
	707.5	23095	5	QPSK	12	6	23.29	0-1	1
	707.5	23095	5	QPSK	12	13	23.38	0-1	1
	707.5	23095	5	QPSK	25	0	23.30	0-1	1
	707.5	23095	5	16-QAM	1	0	23.40	0-1	1
	707.5	23095	5	16-QAM	1	12	23.48	0-1	1
	707.5	23095	5	16-QAM	1	24	23.37	0-1	1
	707.5	23095	5	16-QAM	12	0	22.20	0-2	2
	707.5	23095	5	16-QAM	12	6	22.47	0-2	2
	707.5	23095	5	16-QAM	12	13	22.21	0-2	2
	707.5	23095	5	16-QAM	25	0	22.23	0-2	2
High	713.5	23155	5	QPSK	1	0	24.63	0	0
	713.5	23155	5	QPSK	1	12	24.54	0	0
	713.5	23155	5	QPSK	1	24	24.58	0	0
	713.5	23155	5	QPSK	12	0	23.31	0-1	1
	713.5	23155	5	QPSK	12	6	23.38	0-1	1
	713.5	23155	5	QPSK	12	13	23.30	0-1	1
	713.5	23155	5	QPSK	25	0	23.24	0-1	1
	713.5	23155	5	16-QAM	1	0	23.55	0-1	1
	713.5	23155	5	16-QAM	1	12	23.49	0-1	1
	713.5	23155	5	16-QAM	1	24	23.58	0-1	1
	713.5	23155	5	16-QAM	12	0	22.21	0-2	2
	713.5	23155	5	16-QAM	12	6	22.28	0-2	2
	713.5	23155	5	16-QAM	12	13	22.22	0-2	2
	713.5	23155	5	16-QAM	25	0	22.27	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	700.5	23025	3	QPSK	1	0	23.86	0	0
	700.5	23025	3	QPSK	1	7	23.77	0	0
	700.5	23025	3	QPSK	1	14	24.10	0	0
	700.5	23025	3	QPSK	8	0	22.99	0-1	1
	700.5	23025	3	QPSK	8	4	22.96	0-1	1
	700.5	23025	3	QPSK	8	7	23.07	0-1	1
	700.5	23025	3	QPSK	15	0	23.04	0-1	1
	700.5	23025	3	16-QAM	1	0	22.81	0-1	1
	700.5	23025	3	16-QAM	1	7	23.04	0-1	1
	700.5	23025	3	16-QAM	1	14	23.06	0-1	1
	700.5	23025	3	16-QAM	8	0	22.27	0-2	2
	700.5	23025	3	16-QAM	8	4	22.16	0-2	2
	700.5	23025	3	16-QAM	8	7	22.25	0-2	2
	700.5	23025	3	16-QAM	15	0	22.30	0-2	2
Mid	707.5	23095	3	QPSK	1	0	24.70	0	0
	707.5	23095	3	QPSK	1	7	24.69	0	0
	707.5	23095	3	QPSK	1	14	24.32	0	0
	707.5	23095	3	QPSK	8	0	23.64	0-1	1
	707.5	23095	3	QPSK	8	4	23.49	0-1	1
	707.5	23095	3	QPSK	8	7	23.57	0-1	1
	707.5	23095	3	QPSK	15	0	23.64	0-1	1
	707.5	23095	3	16-QAM	1	0	23.41	0-1	1
	707.5	23095	3	16-QAM	1	7	23.66	0-1	1
	707.5	23095	3	16-QAM	1	14	23.25	0-1	1
	707.5	23095	3	16-QAM	8	0	22.70	0-2	2
	707.5	23095	3	16-QAM	8	4	22.62	0-2	2
	707.5	23095	3	16-QAM	8	7	22.47	0-2	2
	707.5	23095	3	16-QAM	15	0	22.60	0-2	2
High	714.5	23165	3	QPSK	1	0	23.96	0	0
	714.5	23165	3	QPSK	1	7	24.54	0	0
	714.5	23165	3	QPSK	1	14	24.33	0	0
	714.5	23165	3	QPSK	8	0	23.18	0-1	1
	714.5	23165	3	QPSK	8	4	23.27	0-1	1
	714.5	23165	3	QPSK	8	7	23.23	0-1	1
	714.5	23165	3	QPSK	15	0	23.24	0-1	1
	714.5	23165	3	16-QAM	1	0	22.72	0-1	1
	714.5	23165	3	16-QAM	1	7	22.82	0-1	1
	714.5	23165	3	16-QAM	1	14	22.70	0-1	1
	714.5	23165	3	16-QAM	8	0	22.08	0-2	2
	714.5	23165	3	16-QAM	8	4	22.15	0-2	2
	714.5	23165	3	16-QAM	8	7	22.10	0-2	2
	714.5	23165	3	16-QAM	15	0	22.15	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	699.7	23017	1.4	QPSK	1	0	23.70	0	0
	699.7	23017	1.4	QPSK	1	2	23.71	0	0
	699.7	23017	1.4	QPSK	1	5	23.70	0	0
	699.7	23017	1.4	QPSK	3	0	23.75	0	0
	699.7	23017	1.4	QPSK	3	2	23.76	0	0
	699.7	23017	1.4	QPSK	3	3	23.70	0	0
	699.7	23017	1.4	QPSK	6	0	22.93	0-1	1
	699.7	23017	1.4	16-QAM	1	0	23.16	0-1	1
	699.7	23017	1.4	16-QAM	1	2	23.17	0-1	1
	699.7	23017	1.4	16-QAM	1	5	23.00	0-1	1
	699.7	23017	1.4	16-QAM	3	0	23.25	0-1	1
	699.7	23017	1.4	16-QAM	3	2	23.16	0-1	1
	699.7	23017	1.4	16-QAM	3	3	23.02	0-1	1
	699.7	23017	1.4	16-QAM	6	0	22.00	0-2	2
Mid	707.5	23095	1.4	QPSK	1	0	23.78	0	0
	707.5	23095	1.4	QPSK	1	2	23.80	0	0
	707.5	23095	1.4	QPSK	1	5	23.71	0	0
	707.5	23095	1.4	QPSK	3	0	23.72	0	0
	707.5	23095	1.4	QPSK	3	2	23.74	0	0
	707.5	23095	1.4	QPSK	3	3	23.72	0	0
	707.5	23095	1.4	QPSK	6	0	23.28	0-1	1
	707.5	23095	1.4	16-QAM	1	0	23.45	0-1	1
	707.5	23095	1.4	16-QAM	1	2	23.48	0-1	1
	707.5	23095	1.4	16-QAM	1	5	23.11	0-1	1
	707.5	23095	1.4	16-QAM	3	0	23.56	0-1	1
	707.5	23095	1.4	16-QAM	3	2	23.51	0-1	1
	707.5	23095	1.4	16-QAM	3	3	23.48	0-1	1
	707.5	23095	1.4	16-QAM	6	0	22.35	0-2	2
High	715.3	23173	1.4	QPSK	1	0	24.12	0	0
	715.3	23173	1.4	QPSK	1	2	24.17	0	0
	715.3	23173	1.4	QPSK	1	5	24.00	0	0
	715.3	23173	1.4	QPSK	3	0	24.01	0	0
	715.3	23173	1.4	QPSK	3	2	24.04	0	0
	715.3	23173	1.4	QPSK	3	3	23.88	0	0
	715.3	23173	1.4	QPSK	6	0	23.55	0-1	1
	715.3	23173	1.4	16-QAM	1	0	23.70	0-1	1
	715.3	23173	1.4	16-QAM	1	2	23.61	0-1	1
	715.3	23173	1.4	16-QAM	1	5	23.28	0-1	1
	715.3	23173	1.4	16-QAM	3	0	23.64	0-1	1
	715.3	23173	1.4	16-QAM	3	2	23.70	0-1	1
	715.3	23173	1.4	16-QAM	3	3	23.44	0-1	1
	715.3	23173	1.4	16-QAM	6	0	22.68	0-2	2

9.3.2 LTE Band 5 (Cell)

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	836.5	20525	10	QPSK	1	0	23.81	0	0
	836.5	20525	10	QPSK	1	25	23.84	0	0
	836.5	20525	10	QPSK	1	49	**24.00**	0	0
	836.5	20525	10	QPSK	25	0	22.84	0-1	1
	836.5	20525	10	QPSK	25	12	22.95	0-1	1
	836.5	20525	10	QPSK	25	25	**22.97**	0-1	1
	836.5	20525	10	QPSK	50	0	22.89	0-1	1
	836.5	20525	10	16QAM	1	0	23.13	0-1	1
	836.5	20525	10	16QAM	1	25	23.14	0-1	1
	836.5	20525	10	16QAM	1	49	23.18	0-1	1
	836.5	20525	10	16QAM	25	0	21.98	0-2	2
	836.5	20525	10	16QAM	25	12	22.11	0-2	2
	836.5	20525	10	16QAM	25	25	22.06	0-2	2
	836.5	20525	10	16QAM	50	0	21.91	0-2	2

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

Table 9-6
LTE Band 5 (Cell) Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	826.5	20425	5	QPSK	1	0	23.85	0	0
	826.5	20425	5	QPSK	1	12	23.84	0	0
	826.5	20425	5	QPSK	1	24	23.98	0	0
	826.5	20425	5	QPSK	12	0	22.92	0-1	1
	826.5	20425	5	QPSK	12	6	23.00	0-1	1
	826.5	20425	5	QPSK	12	13	22.98	0-1	1
	826.5	20425	5	QPSK	25	0	22.89	0-1	1
	826.5	20425	5	16-QAM	1	0	23.19	0-1	1
	826.5	20425	5	16-QAM	1	12	23.10	0-1	1
	826.5	20425	5	16-QAM	1	24	23.20	0-1	1
	826.5	20425	5	16-QAM	12	0	22.06	0-2	2
	826.5	20425	5	16-QAM	12	6	22.07	0-2	2
	826.5	20425	5	16-QAM	12	13	22.11	0-2	2
	826.5	20425	5	16-QAM	25	0	21.93	0-2	2
Mid	836.5	20525	5	QPSK	1	0	23.87	0	0
	836.5	20525	5	QPSK	1	12	23.89	0	0
	836.5	20525	5	QPSK	1	24	24.08	0	0
	836.5	20525	5	QPSK	12	0	22.81	0-1	1
	836.5	20525	5	QPSK	12	6	23.00	0-1	1
	836.5	20525	5	QPSK	12	13	23.00	0-1	1
	836.5	20525	5	QPSK	25	0	22.97	0-1	1
	836.5	20525	5	16-QAM	1	0	23.09	0-1	1
	836.5	20525	5	16-QAM	1	12	23.19	0-1	1
	836.5	20525	5	16-QAM	1	24	23.13	0-1	1
	836.5	20525	5	16-QAM	12	0	22.02	0-2	2
	836.5	20525	5	16-QAM	12	6	22.11	0-2	2
	836.5	20525	5	16-QAM	12	13	22.09	0-2	2
	836.5	20525	5	16-QAM	25	0	21.93	0-2	2
High	846.5	20625	5	QPSK	1	0	23.78	0	0
	846.5	20625	5	QPSK	1	12	23.90	0	0
	846.5	20625	5	QPSK	1	24	23.95	0	0
	846.5	20625	5	QPSK	12	0	22.89	0-1	1
	846.5	20625	5	QPSK	12	6	22.91	0-1	1
	846.5	20625	5	QPSK	12	13	23.05	0-1	1
	846.5	20625	5	QPSK	25	0	22.85	0-1	1
	846.5	20625	5	16-QAM	1	0	23.14	0-1	1
	846.5	20625	5	16-QAM	1	12	23.13	0-1	1
	846.5	20625	5	16-QAM	1	24	23.20	0-1	1
	846.5	20625	5	16-QAM	12	0	22.06	0-2	2
	846.5	20625	5	16-QAM	12	6	22.16	0-2	2
	846.5	20625	5	16-QAM	12	13	22.07	0-2	2
	846.5	20625	5	16-QAM	25	0	21.86	0-2	2

Table 9-7
LTE Band 5 (Cell) Conducted Powers - 3 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	825.5	20415	3	QPSK	1	0	24.10	0	0
	825.5	20415	3	QPSK	1	7	24.12	0	0
	825.5	20415	3	QPSK	1	14	24.03	0	0
	825.5	20415	3	QPSK	8	0	23.15	0-1	1
	825.5	20415	3	QPSK	8	4	23.08	0-1	1
	825.5	20415	3	QPSK	8	7	23.08	0-1	1
	825.5	20415	3	QPSK	15	0	23.07	0-1	1
	825.5	20415	3	16-QAM	1	0	22.95	0-1	1
	825.5	20415	3	16-QAM	1	7	22.96	0-1	1
	825.5	20415	3	16-QAM	1	14	22.77	0-1	1
	825.5	20415	3	16-QAM	8	0	22.11	0-2	2
	825.5	20415	3	16-QAM	8	4	22.06	0-2	2
	825.5	20415	3	16-QAM	8	7	22.00	0-2	2
	825.5	20415	3	16-QAM	15	0	22.12	0-2	2
Mid	836.5	20525	3	QPSK	1	0	23.97	0	0
	836.5	20525	3	QPSK	1	7	24.17	0	0
	836.5	20525	3	QPSK	1	14	24.15	0	0
	836.5	20525	3	QPSK	8	0	23.11	0-1	1
	836.5	20525	3	QPSK	8	4	23.19	0-1	1
	836.5	20525	3	QPSK	8	7	23.20	0-1	1
	836.5	20525	3	QPSK	15	0	23.18	0-1	1
	836.5	20525	3	16-QAM	1	0	23.08	0-1	1
	836.5	20525	3	16-QAM	1	7	23.20	0-1	1
	836.5	20525	3	16-QAM	1	14	23.14	0-1	1
	836.5	20525	3	16-QAM	8	0	22.19	0-2	2
	836.5	20525	3	16-QAM	8	4	22.17	0-2	2
	836.5	20525	3	16-QAM	8	7	22.20	0-2	2
	836.5	20525	3	16-QAM	15	0	22.18	0-2	2
High	847.5	20635	3	QPSK	1	0	23.74	0	0
	847.5	20635	3	QPSK	1	7	24.07	0	0
	847.5	20635	3	QPSK	1	14	24.14	0	0
	847.5	20635	3	QPSK	8	0	22.93	0-1	1
	847.5	20635	3	QPSK	8	4	23.07	0-1	1
	847.5	20635	3	QPSK	8	7	23.20	0-1	1
	847.5	20635	3	QPSK	15	0	23.11	0-1	1
	847.5	20635	3	16-QAM	1	0	22.57	0-1	1
	847.5	20635	3	16-QAM	1	7	23.04	0-1	1
	847.5	20635	3	16-QAM	1	14	23.04	0-1	1
	847.5	20635	3	16-QAM	8	0	22.00	0-2	2
	847.5	20635	3	16-QAM	8	4	22.20	0-2	2
	847.5	20635	3	16-QAM	8	7	22.19	0-2	2
	847.5	20635	3	16-QAM	15	0	22.16	0-2	2

Table 9-8
LTE Band 5 (Cell) Conducted Powers – 1.4 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	824.7	20407	1.4	QPSK	1	0	23.63	0	0
	824.7	20407	1.4	QPSK	1	2	23.78	0	0
	824.7	20407	1.4	QPSK	1	5	23.68	0	0
	824.7	20407	1.4	QPSK	3	0	23.64	0	0
	824.7	20407	1.4	QPSK	3	2	23.68	0	0
	824.7	20407	1.4	QPSK	3	3	23.65	0	0
	824.7	20407	1.4	QPSK	6	0	22.86	0-1	1
	824.7	20407	1.4	16-QAM	1	0	22.65	0-1	1
	824.7	20407	1.4	16-QAM	1	2	22.71	0-1	1
	824.7	20407	1.4	16-QAM	1	5	22.63	0-1	1
	824.7	20407	1.4	16-QAM	3	0	22.74	0-1	1
	824.7	20407	1.4	16-QAM	3	2	22.83	0-1	1
	824.7	20407	1.4	16-QAM	3	3	22.78	0-1	1
	824.7	20407	1.4	16-QAM	6	0	22.00	0-2	2
Mid	836.5	20525	1.4	QPSK	1	0	23.59	0	0
	836.5	20525	1.4	QPSK	1	2	23.70	0	0
	836.5	20525	1.4	QPSK	1	5	23.69	0	0
	836.5	20525	1.4	QPSK	3	0	23.58	0	0
	836.5	20525	1.4	QPSK	3	2	23.77	0	0
	836.5	20525	1.4	QPSK	3	3	23.76	0	0
	836.5	20525	1.4	QPSK	6	0	23.00	0-1	1
	836.5	20525	1.4	16-QAM	1	0	22.84	0-1	1
	836.5	20525	1.4	16-QAM	1	2	23.02	0-1	1
	836.5	20525	1.4	16-QAM	1	5	23.05	0-1	1
	836.5	20525	1.4	16-QAM	3	0	22.93	0-1	1
	836.5	20525	1.4	16-QAM	3	2	23.13	0-1	1
	836.5	20525	1.4	16-QAM	3	3	23.10	0-1	1
	836.5	20525	1.4	16-QAM	6	0	22.00	0-2	2
High	848.3	20643	1.4	QPSK	1	0	23.97	0	0
	848.3	20643	1.4	QPSK	1	2	24.04	0	0
	848.3	20643	1.4	QPSK	1	5	23.92	0	0
	848.3	20643	1.4	QPSK	3	0	23.95	0	0
	848.3	20643	1.4	QPSK	3	2	23.93	0	0
	848.3	20643	1.4	QPSK	3	3	23.85	0	0
	848.3	20643	1.4	QPSK	6	0	23.15	0-1	1
	848.3	20643	1.4	16-QAM	1	0	23.04	0-1	1
	848.3	20643	1.4	16-QAM	1	2	23.15	0-1	1
	848.3	20643	1.4	16-QAM	1	5	23.03	0-1	1
	848.3	20643	1.4	16-QAM	3	0	23.17	0-1	1
	848.3	20643	1.4	16-QAM	3	2	23.19	0-1	1
	848.3	20643	1.4	16-QAM	3	3	23.13	0-1	1
	848.3	20643	1.4	16-QAM	6	0	22.20	0-2	2

9.3.3 LTE Band 4 (AWS)

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	1732.5	20175	20	QPSK	1	0	**23.99**	0	0
	1732.5	20175	20	QPSK	1	50	23.98	0	0
	1732.5	20175	20	QPSK	1	99	23.81	0	0
	1732.5	20175	20	QPSK	50	0	22.89	0-1	1
	1732.5	20175	20	QPSK	50	25	**22.95**	0-1	1
	1732.5	20175	20	QPSK	50	50	22.85	0-1	1
	1732.5	20175	20	QPSK	100	0	22.89	0-1	1
	1732.5	20175	20	16QAM	1	0	22.97	0-1	1
	1732.5	20175	20	16QAM	1	50	23.01	0-1	1
	1732.5	20175	20	16QAM	1	99	23.04	0-1	1
	1732.5	20175	20	16QAM	50	0	21.72	0-2	2
	1732.5	20175	20	16QAM	50	25	21.79	0-2	2
	1732.5	20175	20	16QAM	50	50	21.80	0-2	2
	1732.5	20175	20	16QAM	100	0	21.79	0-2	2

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

Table 9-10
LTE Band 4 (AWS) Conducted Powers - 15 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1717.5	20025	15	QPSK	1	0	23.80	0	0
	1717.5	20025	15	QPSK	1	36	23.88	0	0
	1717.5	20025	15	QPSK	1	74	23.78	0	0
	1717.5	20025	15	QPSK	36	0	22.75	0-1	1
	1717.5	20025	15	QPSK	36	18	22.71	0-1	1
	1717.5	20025	15	QPSK	36	37	22.80	0-1	1
	1717.5	20025	15	QPSK	75	0	22.89	0-1	1
	1717.5	20025	15	16QAM	1	0	22.91	0-1	1
	1717.5	20025	15	16QAM	1	36	22.99	0-1	1
	1717.5	20025	15	16QAM	1	74	22.98	0-1	1
	1717.5	20025	15	16QAM	36	0	21.89	0-2	2
	1717.5	20025	15	16QAM	36	18	21.87	0-2	2
	1717.5	20025	15	16QAM	36	37	21.88	0-2	2
	1717.5	20025	15	16QAM	75	0	21.78	0-2	2
Mid	1732.5	20175	15	QPSK	1	0	23.90	0	0
	1732.5	20175	15	QPSK	1	36	23.86	0	0
	1732.5	20175	15	QPSK	1	74	23.88	0	0
	1732.5	20175	15	QPSK	36	0	22.91	0-1	1
	1732.5	20175	15	QPSK	36	18	22.97	0-1	1
	1732.5	20175	15	QPSK	36	37	23.04	0-1	1
	1732.5	20175	15	QPSK	75	0	23.00	0-1	1
	1732.5	20175	15	16QAM	1	0	22.80	0-1	1
	1732.5	20175	15	16QAM	1	36	22.70	0-1	1
	1732.5	20175	15	16QAM	1	74	22.89	0-1	1
	1732.5	20175	15	16QAM	36	0	21.76	0-2	2
	1732.5	20175	15	16QAM	36	18	21.86	0-2	2
	1732.5	20175	15	16QAM	36	37	21.75	0-2	2
	1732.5	20175	15	16QAM	75	0	21.76	0-2	2
High	1747.5	20325	15	QPSK	1	0	23.85	0	0
	1747.5	20325	15	QPSK	1	36	23.88	0	0
	1747.5	20325	15	QPSK	1	74	23.75	0	0
	1747.5	20325	15	QPSK	36	0	22.70	0-1	1
	1747.5	20325	15	QPSK	36	18	22.74	0-1	1
	1747.5	20325	15	QPSK	36	37	22.71	0-1	1
	1747.5	20325	15	QPSK	75	0	22.84	0-1	1
	1747.5	20325	15	16QAM	1	0	22.88	0-1	1
	1747.5	20325	15	16QAM	1	36	22.86	0-1	1
	1747.5	20325	15	16QAM	1	74	22.79	0-1	1
	1747.5	20325	15	16QAM	36	0	21.89	0-2	2
	1747.5	20325	15	16QAM	36	18	21.90	0-2	2
	1747.5	20325	15	16QAM	36	37	22.00	0-2	2
	1747.5	20325	15	16QAM	75	0	21.87	0-2	2

Table 9-11
LTE Band 4 (AWS) Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1715	20000	10	QPSK	1	0	23.77	0	0
	1715	20000	10	QPSK	1	25	23.89	0	0
	1715	20000	10	QPSK	1	49	23.77	0	0
	1715	20000	10	QPSK	25	0	22.95	0-1	1
	1715	20000	10	QPSK	25	12	22.76	0-1	1
	1715	20000	10	QPSK	25	25	22.75	0-1	1
	1715	20000	10	QPSK	50	0	22.70	0-1	1
	1715	20000	10	16QAM	1	0	22.79	0-1	1
	1715	20000	10	16QAM	1	25	22.78	0-1	1
	1715	20000	10	16QAM	1	49	22.83	0-1	1
	1715	20000	10	16QAM	25	0	21.88	0-2	2
	1715	20000	10	16QAM	25	12	21.75	0-2	2
	1715	20000	10	16QAM	25	25	21.79	0-2	2
	1715	20000	10	16QAM	50	0	21.76	0-2	2
Mid	1732.5	20175	10	QPSK	1	0	23.90	0	0
	1732.5	20175	10	QPSK	1	25	23.78	0	0
	1732.5	20175	10	QPSK	1	49	23.87	0	0
	1732.5	20175	10	QPSK	25	0	22.77	0-1	1
	1732.5	20175	10	QPSK	25	12	22.76	0-1	1
	1732.5	20175	10	QPSK	25	25	22.79	0-1	1
	1732.5	20175	10	QPSK	50	0	22.76	0-1	1
	1732.5	20175	10	16QAM	1	0	22.89	0-1	1
	1732.5	20175	10	16QAM	1	25	22.92	0-1	1
	1732.5	20175	10	16QAM	1	49	22.91	0-1	1
	1732.5	20175	10	16QAM	25	0	21.78	0-2	2
	1732.5	20175	10	16QAM	25	12	21.87	0-2	2
	1732.5	20175	10	16QAM	25	25	21.88	0-2	2
	1732.5	20175	10	16QAM	50	0	21.85	0-2	2
High	1750	20350	10	QPSK	1	0	23.79	0	0
	1750	20350	10	QPSK	1	25	23.80	0	0
	1750	20350	10	QPSK	1	49	23.81	0	0
	1750	20350	10	QPSK	25	0	22.76	0-1	1
	1750	20350	10	QPSK	25	12	22.91	0-1	1
	1750	20350	10	QPSK	25	25	22.86	0-1	1
	1750	20350	10	QPSK	50	0	22.85	0-1	1
	1750	20350	10	16QAM	1	0	22.90	0-1	1
	1750	20350	10	16QAM	1	25	22.97	0-1	1
	1750	20350	10	16QAM	1	49	22.81	0-1	1
	1750	20350	10	16QAM	25	0	21.85	0-2	2
	1750	20350	10	16QAM	25	12	21.80	0-2	2
	1750	20350	10	16QAM	25	25	21.78	0-2	2
	1750	20350	10	16QAM	50	0	21.79	0-2	2

Table 9-12
LTE Band 4 (AWS) Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1712.5	19975	5	QPSK	1	0	23.87	0	0
	1712.5	19975	5	QPSK	1	12	23.85	0	0
	1712.5	19975	5	QPSK	1	24	23.91	0	0
	1712.5	19975	5	QPSK	12	0	22.85	0-1	1
	1712.5	19975	5	QPSK	12	6	22.77	0-1	1
	1712.5	19975	5	QPSK	12	13	22.71	0-1	1
	1712.5	19975	5	QPSK	25	0	22.70	0-1	1
	1712.5	19975	5	16-QAM	1	0	22.89	0-1	1
	1712.5	19975	5	16-QAM	1	12	22.85	0-1	1
	1712.5	19975	5	16-QAM	1	24	22.90	0-1	1
	1712.5	19975	5	16-QAM	12	0	21.78	0-2	2
	1712.5	19975	5	16-QAM	12	6	21.89	0-2	2
	1712.5	19975	5	16-QAM	12	13	21.85	0-2	2
	1712.5	19975	5	16-QAM	25	0	21.79	0-2	2
Mid	1732.5	20175	5	QPSK	1	0	23.89	0	0
	1732.5	20175	5	QPSK	1	12	23.95	0	0
	1732.5	20175	5	QPSK	1	24	23.79	0	0
	1732.5	20175	5	QPSK	12	0	22.76	0-1	1
	1732.5	20175	5	QPSK	12	6	22.89	0-1	1
	1732.5	20175	5	QPSK	12	13	22.80	0-1	1
	1732.5	20175	5	QPSK	25	0	22.90	0-1	1
	1732.5	20175	5	16-QAM	1	0	23.05	0-1	1
	1732.5	20175	5	16-QAM	1	12	23.00	0-1	1
	1732.5	20175	5	16-QAM	1	24	22.99	0-1	1
	1732.5	20175	5	16-QAM	12	0	21.89	0-2	2
	1732.5	20175	5	16-QAM	12	6	21.79	0-2	2
	1732.5	20175	5	16-QAM	12	13	21.86	0-2	2
	1732.5	20175	5	16-QAM	25	0	21.84	0-2	2
High	1752.5	20375	5	QPSK	1	0	23.80	0	0
	1752.5	20375	5	QPSK	1	12	23.89	0	0
	1752.5	20375	5	QPSK	1	24	23.99	0	0
	1752.5	20375	5	QPSK	12	0	22.85	0-1	1
	1752.5	20375	5	QPSK	12	6	22.87	0-1	1
	1752.5	20375	5	QPSK	12	13	22.83	0-1	1
	1752.5	20375	5	QPSK	25	0	22.80	0-1	1
	1752.5	20375	5	16-QAM	1	0	22.94	0-1	1
	1752.5	20375	5	16-QAM	1	12	22.91	0-1	1
	1752.5	20375	5	16-QAM	1	24	22.84	0-1	1
	1752.5	20375	5	16-QAM	12	0	21.89	0-2	2
	1752.5	20375	5	16-QAM	12	6	21.75	0-2	2
	1752.5	20375	5	16-QAM	12	13	21.89	0-2	2
	1752.5	20375	5	16-QAM	25	0	21.86	0-2	2

Table 9-13
LTE Band 4 (AWS) Conducted Powers - 3 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1711.5	19965	3	QPSK	1	0	23.87	0	0
	1711.5	19965	3	QPSK	1	7	23.90	0	0
	1711.5	19965	3	QPSK	1	14	23.92	0	0
	1711.5	19965	3	QPSK	8	0	22.83	0-1	1
	1711.5	19965	3	QPSK	8	4	22.79	0-1	1
	1711.5	19965	3	QPSK	8	7	22.82	0-1	1
	1711.5	19965	3	QPSK	15	0	22.78	0-1	1
	1711.5	19965	3	16-QAM	1	0	22.77	0-1	1
	1711.5	19965	3	16-QAM	1	7	22.84	0-1	1
	1711.5	19965	3	16-QAM	1	14	22.79	0-1	1
	1711.5	19965	3	16-QAM	8	0	21.76	0-2	2
	1711.5	19965	3	16-QAM	8	4	21.74	0-2	2
	1711.5	19965	3	16-QAM	8	7	21.73	0-2	2
	1711.5	19965	3	16-QAM	15	0	21.75	0-2	2
Mid	1732.5	20175	3	QPSK	1	0	23.74	0	0
	1732.5	20175	3	QPSK	1	7	23.88	0	0
	1732.5	20175	3	QPSK	1	14	23.77	0	0
	1732.5	20175	3	QPSK	8	0	22.70	0-1	1
	1732.5	20175	3	QPSK	8	4	22.72	0-1	1
	1732.5	20175	3	QPSK	8	7	22.83	0-1	1
	1732.5	20175	3	QPSK	15	0	22.76	0-1	1
	1732.5	20175	3	16-QAM	1	0	22.70	0-1	1
	1732.5	20175	3	16-QAM	1	7	22.90	0-1	1
	1732.5	20175	3	16-QAM	1	14	22.85	0-1	1
	1732.5	20175	3	16-QAM	8	0	21.71	0-2	2
	1732.5	20175	3	16-QAM	8	4	21.70	0-2	2
	1732.5	20175	3	16-QAM	8	7	21.72	0-2	2
	1732.5	20175	3	16-QAM	15	0	21.71	0-2	2
High	1753.5	20385	3	QPSK	1	0	23.75	0	0
	1753.5	20385	3	QPSK	1	7	23.96	0	0
	1753.5	20385	3	QPSK	1	14	23.98	0	0
	1753.5	20385	3	QPSK	8	0	22.70	0-1	1
	1753.5	20385	3	QPSK	8	4	22.78	0-1	1
	1753.5	20385	3	QPSK	8	7	23.04	0-1	1
	1753.5	20385	3	QPSK	15	0	22.83	0-1	1
	1753.5	20385	3	16-QAM	1	0	22.70	0-1	1
	1753.5	20385	3	16-QAM	1	7	22.86	0-1	1
	1753.5	20385	3	16-QAM	1	14	22.94	0-1	1
	1753.5	20385	3	16-QAM	8	0	21.83	0-2	2
	1753.5	20385	3	16-QAM	8	4	21.93	0-2	2
	1753.5	20385	3	16-QAM	8	7	22.18	0-2	2
	1753.5	20385	3	16-QAM	15	0	21.81	0-2	2

Table 9-14
LTE Band 4 (AWS) Conducted Powers – 1.4 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1710.7	19957	1.4	QPSK	1	0	23.39	0	0
	1710.7	19957	1.4	QPSK	1	2	23.42	0	0
	1710.7	19957	1.4	QPSK	1	5	23.40	0	0
	1710.7	19957	1.4	QPSK	3	0	23.25	0	0
	1710.7	19957	1.4	QPSK	3	2	23.30	0	0
	1710.7	19957	1.4	QPSK	3	3	23.35	0	0
	1710.7	19957	1.4	QPSK	6	0	22.21	0-1	1
	1710.7	19957	1.4	16-QAM	1	0	22.20	0-1	1
	1710.7	19957	1.4	16-QAM	1	2	22.21	0-1	1
	1710.7	19957	1.4	16-QAM	1	5	22.23	0-1	1
	1710.7	19957	1.4	16-QAM	3	0	22.20	0-1	1
	1710.7	19957	1.4	16-QAM	3	2	22.22	0-1	1
	1710.7	19957	1.4	16-QAM	3	3	22.20	0-1	1
	1710.7	19957	1.4	16-QAM	6	0	21.28	0-2	2
Mid	1732.5	20175	1.4	QPSK	1	0	23.44	0	0
	1732.5	20175	1.4	QPSK	1	2	23.50	0	0
	1732.5	20175	1.4	QPSK	1	5	23.45	0	0
	1732.5	20175	1.4	QPSK	3	0	23.47	0	0
	1732.5	20175	1.4	QPSK	3	2	23.52	0	0
	1732.5	20175	1.4	QPSK	3	3	23.49	0	0
	1732.5	20175	1.4	QPSK	6	0	22.31	0-1	1
	1732.5	20175	1.4	16-QAM	1	0	22.26	0-1	1
	1732.5	20175	1.4	16-QAM	1	2	22.22	0-1	1
	1732.5	20175	1.4	16-QAM	1	5	22.21	0-1	1
	1732.5	20175	1.4	16-QAM	3	0	22.22	0-1	1
	1732.5	20175	1.4	16-QAM	3	2	22.25	0-1	1
	1732.5	20175	1.4	16-QAM	3	3	22.23	0-1	1
	1732.5	20175	1.4	16-QAM	6	0	21.32	0-2	2
High	1754.3	20393	1.4	QPSK	1	0	23.32	0	0
	1754.3	20393	1.4	QPSK	1	2	23.41	0	0
	1754.3	20393	1.4	QPSK	1	5	23.47	0	0
	1754.3	20393	1.4	QPSK	3	0	23.36	0	0
	1754.3	20393	1.4	QPSK	3	2	23.47	0	0
	1754.3	20393	1.4	QPSK	3	3	23.41	0	0
	1754.3	20393	1.4	QPSK	6	0	22.30	0-1	1
	1754.3	20393	1.4	16-QAM	1	0	22.24	0-1	1
	1754.3	20393	1.4	16-QAM	1	2	22.22	0-1	1
	1754.3	20393	1.4	16-QAM	1	5	22.23	0-1	1
	1754.3	20393	1.4	16-QAM	3	0	22.20	0-1	1
	1754.3	20393	1.4	16-QAM	3	2	22.21	0-1	1
	1754.3	20393	1.4	16-QAM	3	3	22.20	0-1	1
	1754.3	20393	1.4	16-QAM	6	0	21.27	0-2	2

9.3.4 LTE Band 2 (PCS)

Table 9-15
LTE Band 2 (PCS) Conducted Powers - 20 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1860	18700	20	QPSK	1	0	23.90	0	0
	1860	18700	20	QPSK	1	50	24.03	0	0
	1860	18700	20	QPSK	1	99	23.89	0	0
	1860	18700	20	QPSK	50	0	22.92	0-1	1
	1860	18700	20	QPSK	50	25	22.81	0-1	1
	1860	18700	20	QPSK	50	50	22.75	0-1	1
	1860	18700	20	QPSK	100	0	22.77	0-1	1
	1860	18700	20	16QAM	1	0	22.85	0-1	1
	1860	18700	20	16QAM	1	50	22.83	0-1	1
	1860	18700	20	16QAM	1	99	22.79	0-1	1
	1860	18700	20	16QAM	50	0	21.91	0-2	2
	1860	18700	20	16QAM	50	25	21.95	0-2	2
	1860	18700	20	16QAM	50	50	21.76	0-2	2
	1860	18700	20	16QAM	100	0	21.80	0-2	2
Mid	1880.0	18900	20	QPSK	1	0	23.88	0	0
	1880.0	18900	20	QPSK	1	50	23.83	0	0
	1880.0	18900	20	QPSK	1	99	23.91	0	0
	1880.0	18900	20	QPSK	50	0	22.91	0-1	1
	1880.0	18900	20	QPSK	50	25	22.86	0-1	1
	1880.0	18900	20	QPSK	50	50	22.79	0-1	1
	1880.0	18900	20	QPSK	100	0	22.74	0-1	1
	1880.0	18900	20	16QAM	1	0	22.70	0-1	1
	1880.0	18900	20	16QAM	1	50	22.79	0-1	1
	1880.0	18900	20	16QAM	1	99	22.85	0-1	1
	1880.0	18900	20	16QAM	50	0	21.77	0-2	2
	1880.0	18900	20	16QAM	50	25	21.89	0-2	2
	1880.0	18900	20	16QAM	50	50	21.88	0-2	2
	1880.0	18900	20	16QAM	100	0	21.70	0-2	2
High	1900	19100	20	QPSK	1	0	**24.11**	0	0
	1900	19100	20	QPSK	1	50	24.05	0	0
	1900	19100	20	QPSK	1	99	23.94	0	0
	1900	19100	20	QPSK	50	0	**22.97**	0-1	1
	1900	19100	20	QPSK	50	25	22.83	0-1	1
	1900	19100	20	QPSK	50	50	22.77	0-1	1
	1900	19100	20	QPSK	100	0	22.76	0-1	1
	1900	19100	20	16QAM	1	0	22.87	0-1	1
	1900	19100	20	16QAM	1	50	22.85	0-1	1
	1900	19100	20	16QAM	1	99	22.85	0-1	1
	1900	19100	20	16QAM	50	0	21.97	0-2	2
	1900	19100	20	16QAM	50	25	21.78	0-2	2
	1900	19100	20	16QAM	50	50	21.83	0-2	2
	1900	19100	20	16QAM	100	0	21.80	0-2	2

Table 9-16
LTE Band 2 (PCS) Conducted Powers - 15 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1857.5	18675	15	QPSK	1	0	23.93	0	0
	1857.5	18675	15	QPSK	1	36	23.98	0	0
	1857.5	18675	15	QPSK	1	74	23.90	0	0
	1857.5	18675	15	QPSK	36	0	22.83	0-1	1
	1857.5	18675	15	QPSK	36	18	22.83	0-1	1
	1857.5	18675	15	QPSK	36	37	22.81	0-1	1
	1857.5	18675	15	QPSK	75	0	22.86	0-1	1
	1857.5	18675	15	16QAM	1	0	22.79	0-1	1
	1857.5	18675	15	16QAM	1	36	22.85	0-1	1
	1857.5	18675	15	16QAM	1	74	22.89	0-1	1
	1857.5	18675	15	16QAM	36	0	21.82	0-2	2
	1857.5	18675	15	16QAM	36	18	22.02	0-2	2
	1857.5	18675	15	16QAM	36	37	21.81	0-2	2
	1857.5	18675	15	16QAM	75	0	21.78	0-2	2
Mid	1880.0	18900	15	QPSK	1	0	23.81	0	0
	1880.0	18900	15	QPSK	1	36	23.83	0	0
	1880.0	18900	15	QPSK	1	74	23.90	0	0
	1880.0	18900	15	QPSK	36	0	22.95	0-1	1
	1880.0	18900	15	QPSK	36	18	22.80	0-1	1
	1880.0	18900	15	QPSK	36	37	22.78	0-1	1
	1880.0	18900	15	QPSK	75	0	22.82	0-1	1
	1880.0	18900	15	16QAM	1	0	22.77	0-1	1
	1880.0	18900	15	16QAM	1	36	22.83	0-1	1
	1880.0	18900	15	16QAM	1	74	22.85	0-1	1
	1880.0	18900	15	16QAM	36	0	21.80	0-2	2
	1880.0	18900	15	16QAM	36	18	21.84	0-2	2
	1880.0	18900	15	16QAM	36	37	21.89	0-2	2
	1880.0	18900	15	16QAM	75	0	21.81	0-2	2
High	1902.5	19125	15	QPSK	1	0	24.03	0	0
	1902.5	19125	15	QPSK	1	36	24.13	0	0
	1902.5	19125	15	QPSK	1	74	23.84	0	0
	1902.5	19125	15	QPSK	36	0	23.03	0-1	1
	1902.5	19125	15	QPSK	36	18	22.91	0-1	1
	1902.5	19125	15	QPSK	36	37	22.80	0-1	1
	1902.5	19125	15	QPSK	75	0	22.79	0-1	1
	1902.5	19125	15	16QAM	1	0	22.88	0-1	1
	1902.5	19125	15	16QAM	1	36	22.86	0-1	1
	1902.5	19125	15	16QAM	1	74	22.80	0-1	1
	1902.5	19125	15	16QAM	36	0	21.90	0-2	2
	1902.5	19125	15	16QAM	36	18	21.80	0-2	2
	1902.5	19125	15	16QAM	36	37	21.92	0-2	2
	1902.5	19125	15	16QAM	75	0	21.76	0-2	2

Table 9-17
LTE Band 2 (PCS) Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1855	18650	10	QPSK	1	0	23.99	0	0
	1855	18650	10	QPSK	1	25	24.09	0	0
	1855	18650	10	QPSK	1	49	23.82	0	0
	1855	18650	10	QPSK	25	0	22.87	0-1	1
	1855	18650	10	QPSK	25	12	22.80	0-1	1
	1855	18650	10	QPSK	25	25	22.75	0-1	1
	1855	18650	10	QPSK	50	0	22.77	0-1	1
	1855	18650	10	16QAM	1	0	22.80	0-1	1
	1855	18650	10	16QAM	1	25	22.88	0-1	1
	1855	18650	10	16QAM	1	49	22.84	0-1	1
	1855	18650	10	16QAM	25	0	21.83	0-2	2
	1855	18650	10	16QAM	25	12	22.00	0-2	2
	1855	18650	10	16QAM	25	25	21.74	0-2	2
	1855	18650	10	16QAM	50	0	21.75	0-2	2
Mid	1880.0	18900	10	QPSK	1	0	23.81	0	0
	1880.0	18900	10	QPSK	1	25	23.84	0	0
	1880.0	18900	10	QPSK	1	49	23.92	0	0
	1880.0	18900	10	QPSK	25	0	22.86	0-1	1
	1880.0	18900	10	QPSK	25	12	22.89	0-1	1
	1880.0	18900	10	QPSK	25	25	22.78	0-1	1
	1880.0	18900	10	QPSK	50	0	22.78	0-1	1
	1880.0	18900	10	16QAM	1	0	22.76	0-1	1
	1880.0	18900	10	16QAM	1	25	22.81	0-1	1
	1880.0	18900	10	16QAM	1	49	22.85	0-1	1
	1880.0	18900	10	16QAM	25	0	21.81	0-2	2
	1880.0	18900	10	16QAM	25	12	21.95	0-2	2
	1880.0	18900	10	16QAM	25	25	21.85	0-2	2
	1880.0	18900	10	16QAM	50	0	21.79	0-2	2
High	1905	19150	10	QPSK	1	0	24.03	0	0
	1905	19150	10	QPSK	1	25	24.05	0	0
	1905	19150	10	QPSK	1	49	23.87	0	0
	1905	19150	10	QPSK	25	0	22.99	0-1	1
	1905	19150	10	QPSK	25	12	22.81	0-1	1
	1905	19150	10	QPSK	25	25	22.83	0-1	1
	1905	19150	10	QPSK	50	0	22.74	0-1	1
	1905	19150	10	16QAM	1	0	22.83	0-1	1
	1905	19150	10	16QAM	1	25	22.88	0-1	1
	1905	19150	10	16QAM	1	49	22.79	0-1	1
	1905	19150	10	16QAM	25	0	21.88	0-2	2
	1905	19150	10	16QAM	25	12	21.80	0-2	2
	1905	19150	10	16QAM	25	25	21.81	0-2	2
	1905	19150	10	16QAM	50	0	21.90	0-2	2

Table 9-18
LTE Band 2 (PCS) Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1852.5	18625	5	QPSK	1	0	23.91	0	0
	1852.5	18625	5	QPSK	1	12	24.10	0	0
	1852.5	18625	5	QPSK	1	24	23.96	0	0
	1852.5	18625	5	QPSK	12	0	23.01	0-1	1
	1852.5	18625	5	QPSK	12	6	22.84	0-1	1
	1852.5	18625	5	QPSK	12	13	22.74	0-1	1
	1852.5	18625	5	QPSK	25	0	22.81	0-1	1
	1852.5	18625	5	16-QAM	1	0	22.82	0-1	1
	1852.5	18625	5	16-QAM	1	12	22.88	0-1	1
	1852.5	18625	5	16-QAM	1	24	22.78	0-1	1
	1852.5	18625	5	16-QAM	12	0	21.97	0-2	2
	1852.5	18625	5	16-QAM	12	6	22.00	0-2	2
	1852.5	18625	5	16-QAM	12	13	21.81	0-2	2
	1852.5	18625	5	16-QAM	25	0	21.87	0-2	2
Mid	1880.0	18900	5	QPSK	1	0	23.87	0	0
	1880.0	18900	5	QPSK	1	12	23.76	0	0
	1880.0	18900	5	QPSK	1	24	23.95	0	0
	1880.0	18900	5	QPSK	12	0	22.81	0-1	1
	1880.0	18900	5	QPSK	12	6	22.92	0-1	1
	1880.0	18900	5	QPSK	12	13	22.71	0-1	1
	1880.0	18900	5	QPSK	25	0	22.82	0-1	1
	1880.0	18900	5	16-QAM	1	0	22.77	0-1	1
	1880.0	18900	5	16-QAM	1	12	22.75	0-1	1
	1880.0	18900	5	16-QAM	1	24	22.83	0-1	1
	1880.0	18900	5	16-QAM	12	0	21.76	0-2	2
	1880.0	18900	5	16-QAM	12	6	21.83	0-2	2
	1880.0	18900	5	16-QAM	12	13	21.98	0-2	2
	1880.0	18900	5	16-QAM	25	0	21.79	0-2	2
High	1907.5	19175	5	QPSK	1	0	24.19	0	0
	1907.5	19175	5	QPSK	1	12	24.08	0	0
	1907.5	19175	5	QPSK	1	24	23.98	0	0
	1907.5	19175	5	QPSK	12	0	23.07	0-1	1
	1907.5	19175	5	QPSK	12	6	22.88	0-1	1
	1907.5	19175	5	QPSK	12	13	22.81	0-1	1
	1907.5	19175	5	QPSK	25	0	22.81	0-1	1
	1907.5	19175	5	16-QAM	1	0	22.88	0-1	1
	1907.5	19175	5	16-QAM	1	12	22.82	0-1	1
	1907.5	19175	5	16-QAM	1	24	22.82	0-1	1
	1907.5	19175	5	16-QAM	12	0	21.93	0-2	2
	1907.5	19175	5	16-QAM	12	6	21.76	0-2	2
	1907.5	19175	5	16-QAM	12	13	21.76	0-2	2
	1907.5	19175	5	16-QAM	25	0	21.87	0-2	2

Table 9-19
LTE Band 2 (PCS) Conducted Powers - 3 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1851.5	18615	3	QPSK	1	0	24.16	0	0
	1851.5	18615	3	QPSK	1	7	24.14	0	0
	1851.5	18615	3	QPSK	1	14	23.88	0	0
	1851.5	18615	3	QPSK	8	0	23.15	0-1	1
	1851.5	18615	3	QPSK	8	4	23.09	0-1	1
	1851.5	18615	3	QPSK	8	7	22.97	0-1	1
	1851.5	18615	3	QPSK	15	0	23.08	0-1	1
	1851.5	18615	3	16-QAM	1	0	22.91	0-1	1
	1851.5	18615	3	16-QAM	1	7	22.81	0-1	1
	1851.5	18615	3	16-QAM	1	14	22.76	0-1	1
	1851.5	18615	3	16-QAM	8	0	22.09	0-2	2
	1851.5	18615	3	16-QAM	8	4	22.04	0-2	2
	1851.5	18615	3	16-QAM	8	7	22.01	0-2	2
	1851.5	18615	3	16-QAM	15	0	22.16	0-2	2
Mid	1880.0	18900	3	QPSK	1	0	23.82	0	0
	1880.0	18900	3	QPSK	1	7	24.05	0	0
	1880.0	18900	3	QPSK	1	14	23.83	0	0
	1880.0	18900	3	QPSK	8	0	23.09	0-1	1
	1880.0	18900	3	QPSK	8	4	23.11	0-1	1
	1880.0	18900	3	QPSK	8	7	23.06	0-1	1
	1880.0	18900	3	QPSK	15	0	23.07	0-1	1
	1880.0	18900	3	16-QAM	1	0	22.78	0-1	1
	1880.0	18900	3	16-QAM	1	7	23.08	0-1	1
	1880.0	18900	3	16-QAM	1	14	22.88	0-1	1
	1880.0	18900	3	16-QAM	8	0	22.20	0-2	2
	1880.0	18900	3	16-QAM	8	4	22.19	0-2	2
	1880.0	18900	3	16-QAM	8	7	22.18	0-2	2
	1880.0	18900	3	16-QAM	15	0	22.20	0-2	2
High	1908.5	19185	3	QPSK	1	0	23.66	0	0
	1908.5	19185	3	QPSK	1	7	23.58	0	0
	1908.5	19185	3	QPSK	1	14	23.63	0	0
	1908.5	19185	3	QPSK	8	0	22.56	0-1	1
	1908.5	19185	3	QPSK	8	4	22.50	0-1	1
	1908.5	19185	3	QPSK	8	7	22.52	0-1	1
	1908.5	19185	3	QPSK	15	0	22.52	0-1	1
	1908.5	19185	3	16-QAM	1	0	22.50	0-1	1
	1908.5	19185	3	16-QAM	1	7	22.51	0-1	1
	1908.5	19185	3	16-QAM	1	14	22.50	0-1	1
	1908.5	19185	3	16-QAM	8	0	21.62	0-2	2
	1908.5	19185	3	16-QAM	8	4	21.56	0-2	2
	1908.5	19185	3	16-QAM	8	7	21.55	0-2	2
	1908.5	19185	3	16-QAM	15	0	21.50	0-2	2

Table 9-20
LTE Band 2 (PCS) Conducted Powers – 1.4 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1850.7	18607	1.4	QPSK	1	0	23.84	0	0
	1850.7	18607	1.4	QPSK	1	2	23.90	0	0
	1850.7	18607	1.4	QPSK	1	5	23.94	0	0
	1850.7	18607	1.4	QPSK	3	0	23.86	0	0
	1850.7	18607	1.4	QPSK	3	2	23.86	0	0
	1850.7	18607	1.4	QPSK	3	3	23.83	0	0
	1850.7	18607	1.4	QPSK	6	0	22.97	0-1	1
	1850.7	18607	1.4	16-QAM	1	0	22.32	0-1	1
	1850.7	18607	1.4	16-QAM	1	2	22.33	0-1	1
	1850.7	18607	1.4	16-QAM	1	5	22.37	0-1	1
	1850.7	18607	1.4	16-QAM	3	0	22.41	0-1	1
	1850.7	18607	1.4	16-QAM	3	2	22.44	0-1	1
	1850.7	18607	1.4	16-QAM	3	3	22.43	0-1	1
	1850.7	18607	1.4	16-QAM	6	0	22.00	0-2	2
Mid	1880.0	18900	1.4	QPSK	1	0	23.87	0	0
	1880.0	18900	1.4	QPSK	1	2	23.89	0	0
	1880.0	18900	1.4	QPSK	1	5	23.82	0	0
	1880.0	18900	1.4	QPSK	3	0	23.83	0	0
	1880.0	18900	1.4	QPSK	3	2	23.81	0	0
	1880.0	18900	1.4	QPSK	3	3	23.76	0	0
	1880.0	18900	1.4	QPSK	6	0	22.74	0-1	1
	1880.0	18900	1.4	16-QAM	1	0	22.32	0-1	1
	1880.0	18900	1.4	16-QAM	1	2	22.34	0-1	1
	1880.0	18900	1.4	16-QAM	1	5	22.30	0-1	1
	1880.0	18900	1.4	16-QAM	3	0	22.34	0-1	1
	1880.0	18900	1.4	16-QAM	3	2	22.37	0-1	1
	1880.0	18900	1.4	16-QAM	3	3	22.32	0-1	1
	1880.0	18900	1.4	16-QAM	6	0	21.88	0-2	2
High	1909.3	19193	1.4	QPSK	1	0	23.24	0	0
	1909.3	19193	1.4	QPSK	1	2	23.26	0	0
	1909.3	19193	1.4	QPSK	1	5	23.46	0	0
	1909.3	19193	1.4	QPSK	3	0	23.32	0	0
	1909.3	19193	1.4	QPSK	3	2	23.30	0	0
	1909.3	19193	1.4	QPSK	3	3	23.46	0	0
	1909.3	19193	1.4	QPSK	6	0	22.31	0-1	1
	1909.3	19193	1.4	16-QAM	1	0	22.20	0-1	1
	1909.3	19193	1.4	16-QAM	1	2	22.23	0-1	1
	1909.3	19193	1.4	16-QAM	1	5	22.21	0-1	1
	1909.3	19193	1.4	16-QAM	3	0	22.23	0-1	1
	1909.3	19193	1.4	16-QAM	3	2	22.22	0-1	1
	1909.3	19193	1.4	16-QAM	3	3	22.24	0-1	1
	1909.3	19193	1.4	16-QAM	6	0	21.26	0-2	2

9.3.5 LTE Band 7

Table 9-21
LTE Band 7 Conducted Powers - 20 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	2510	20850	20	QPSK	1	0	23.49	0	0
	2510	20850	20	QPSK	1	50	23.54	0	0
	2510	20850	20	QPSK	1	99	23.41	0	0
	2510	20850	20	QPSK	50	0	22.45	0-1	1
	2510	20850	20	QPSK	50	25	22.33	0-1	1
	2510	20850	20	QPSK	50	50	22.42	0-1	1
	2510	20850	20	QPSK	100	0	22.29	0-1	1
	2510	20850	20	16QAM	1	0	22.21	0-1	1
	2510	20850	20	16QAM	1	50	22.20	0-1	1
	2510	20850	20	16QAM	1	99	22.23	0-1	1
	2510	20850	20	16QAM	50	0	21.36	0-2	2
	2510	20850	20	16QAM	50	25	21.42	0-2	2
	2510	20850	20	16QAM	50	50	21.35	0-2	2
	2510	20850	20	16QAM	100	0	21.30	0-2	2
Mid	2535.0	21100	20	QPSK	1	0	23.35	0	0
	2535.0	21100	20	QPSK	1	50	**23.62**	0	0
	2535.0	21100	20	QPSK	1	99	23.54	0	0
	2535.0	21100	20	QPSK	50	0	**22.53**	0-1	1
	2535.0	21100	20	QPSK	50	25	22.33	0-1	1
	2535.0	21100	20	QPSK	50	50	22.42	0-1	1
	2535.0	21100	20	QPSK	100	0	22.31	0-1	1
	2535.0	21100	20	16QAM	1	0	22.55	0-1	1
	2535.0	21100	20	16QAM	1	50	22.59	0-1	1
	2535.0	21100	20	16QAM	1	99	22.60	0-1	1
	2535.0	21100	20	16QAM	50	0	21.48	0-2	2
	2535.0	21100	20	16QAM	50	25	21.30	0-2	2
	2535.0	21100	20	16QAM	50	50	21.33	0-2	2
	2535.0	21100	20	16QAM	100	0	21.33	0-2	2
High	2560	21350	20	QPSK	1	0	23.60	0	0
	2560	21350	20	QPSK	1	50	23.46	0	0
	2560	21350	20	QPSK	1	99	23.30	0	0
	2560	21350	20	QPSK	50	0	22.27	0-1	1
	2560	21350	20	QPSK	50	25	22.31	0-1	1
	2560	21350	20	QPSK	50	50	22.33	0-1	1
	2560	21350	20	QPSK	100	0	22.30	0-1	1
	2560	21350	20	16QAM	1	0	22.49	0-1	1
	2560	21350	20	16QAM	1	50	22.40	0-1	1
	2560	21350	20	16QAM	1	99	22.35	0-1	1
	2560	21350	20	16QAM	50	0	21.45	0-2	2
	2560	21350	20	16QAM	50	25	21.40	0-2	2
	2560	21350	20	16QAM	50	50	21.33	0-2	2
	2560	21350	20	16QAM	100	0	21.39	0-2	2

Table 9-22
LTE Band 7 Conducted Powers - 15 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	2507.5	20825	15	QPSK	1	0	23.49	0	0
	2507.5	20825	15	QPSK	1	36	23.51	0	0
	2507.5	20825	15	QPSK	1	74	23.36	0	0
	2507.5	20825	15	QPSK	36	0	22.52	0-1	1
	2507.5	20825	15	QPSK	36	18	22.34	0-1	1
	2507.5	20825	15	QPSK	36	37	22.42	0-1	1
	2507.5	20825	15	QPSK	75	0	22.32	0-1	1
	2507.5	20825	15	16QAM	1	0	22.20	0-1	1
	2507.5	20825	15	16QAM	1	36	22.23	0-1	1
	2507.5	20825	15	16QAM	1	74	22.22	0-1	1
	2507.5	20825	15	16QAM	36	0	21.45	0-2	2
	2507.5	20825	15	16QAM	36	18	21.38	0-2	2
	2507.5	20825	15	16QAM	36	37	21.45	0-2	2
	2507.5	20825	15	16QAM	75	0	21.36	0-2	2
Mid	2535.0	21100	15	QPSK	1	0	23.45	0	0
	2535.0	21100	15	QPSK	1	36	23.68	0	0
	2535.0	21100	15	QPSK	1	74	23.60	0	0
	2535.0	21100	15	QPSK	36	0	22.59	0-1	1
	2535.0	21100	15	QPSK	36	18	22.40	0-1	1
	2535.0	21100	15	QPSK	36	37	22.38	0-1	1
	2535.0	21100	15	QPSK	75	0	22.41	0-1	1
	2535.0	21100	15	16QAM	1	0	22.57	0-1	1
	2535.0	21100	15	16QAM	1	36	22.67	0-1	1
	2535.0	21100	15	16QAM	1	74	22.67	0-1	1
	2535.0	21100	15	16QAM	36	0	21.53	0-2	2
	2535.0	21100	15	16QAM	36	18	21.32	0-2	2
	2535.0	21100	15	16QAM	36	37	21.30	0-2	2
	2535.0	21100	15	16QAM	75	0	21.36	0-2	2
High	2562.5	21375	15	QPSK	1	0	23.68	0	0
	2562.5	21375	15	QPSK	1	36	23.56	0	0
	2562.5	21375	15	QPSK	1	74	23.25	0	0
	2562.5	21375	15	QPSK	36	0	22.36	0-1	1
	2562.5	21375	15	QPSK	36	18	22.32	0-1	1
	2562.5	21375	15	QPSK	36	37	22.28	0-1	1
	2562.5	21375	15	QPSK	75	0	22.28	0-1	1
	2562.5	21375	15	16QAM	1	0	22.51	0-1	1
	2562.5	21375	15	16QAM	1	36	22.43	0-1	1
	2562.5	21375	15	16QAM	1	74	22.39	0-1	1
	2562.5	21375	15	16QAM	36	0	21.49	0-2	2
	2562.5	21375	15	16QAM	36	18	21.47	0-2	2
	2562.5	21375	15	16QAM	36	37	21.41	0-2	2
	2562.5	21375	15	16QAM	75	0	21.42	0-2	2

Table 9-23
LTE Band 7 Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	2505	20800	10	QPSK	1	0	23.49	0	0
	2505	20800	10	QPSK	1	25	23.60	0	0
	2505	20800	10	QPSK	1	49	23.51	0	0
	2505	20800	10	QPSK	25	0	22.52	0-1	1
	2505	20800	10	QPSK	25	12	22.28	0-1	1
	2505	20800	10	QPSK	25	25	22.39	0-1	1
	2505	20800	10	QPSK	50	0	22.36	0-1	1
	2505	20800	10	16QAM	1	0	22.31	0-1	1
	2505	20800	10	16QAM	1	25	22.23	0-1	1
	2505	20800	10	16QAM	1	49	22.24	0-1	1
	2505	20800	10	16QAM	25	0	21.39	0-2	2
	2505	20800	10	16QAM	25	12	21.52	0-2	2
	2505	20800	10	16QAM	25	25	21.40	0-2	2
	2505	20800	10	16QAM	50	0	21.37	0-2	2
Mid	2535.0	21100	10	QPSK	1	0	23.34	0	0
	2535.0	21100	10	QPSK	1	25	23.70	0	0
	2535.0	21100	10	QPSK	1	49	23.59	0	0
	2535.0	21100	10	QPSK	25	0	22.51	0-1	1
	2535.0	21100	10	QPSK	25	12	22.34	0-1	1
	2535.0	21100	10	QPSK	25	25	22.40	0-1	1
	2535.0	21100	10	QPSK	50	0	22.31	0-1	1
	2535.0	21100	10	16QAM	1	0	22.53	0-1	1
	2535.0	21100	10	16QAM	1	25	22.60	0-1	1
	2535.0	21100	10	16QAM	1	49	22.58	0-1	1
	2535.0	21100	10	16QAM	25	0	21.54	0-2	2
	2535.0	21100	10	16QAM	25	12	21.27	0-2	2
	2535.0	21100	10	16QAM	25	25	21.37	0-2	2
	2535.0	21100	10	16QAM	50	0	21.37	0-2	2
High	2565	21400	10	QPSK	1	0	23.64	0	0
	2565	21400	10	QPSK	1	25	23.44	0	0
	2565	21400	10	QPSK	1	49	23.31	0	0
	2565	21400	10	QPSK	25	0	22.31	0-1	1
	2565	21400	10	QPSK	25	12	22.32	0-1	1
	2565	21400	10	QPSK	25	25	22.35	0-1	1
	2565	21400	10	QPSK	50	0	22.29	0-1	1
	2565	21400	10	16QAM	1	0	22.58	0-1	1
	2565	21400	10	16QAM	1	25	22.42	0-1	1
	2565	21400	10	16QAM	1	49	22.42	0-1	1
	2565	21400	10	16QAM	25	0	21.43	0-2	2
	2565	21400	10	16QAM	25	12	21.44	0-2	2
	2565	21400	10	16QAM	25	25	21.31	0-2	2
	2565	21400	10	16QAM	50	0	21.41	0-2	2

Table 9-24
LTE Band 7 Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	2502.5	20775	5	QPSK	1	0	23.47	0	0
	2502.5	20775	5	QPSK	1	12	23.49	0	0
	2502.5	20775	5	QPSK	1	24	23.46	0	0
	2502.5	20775	5	QPSK	12	0	22.52	0-1	1
	2502.5	20775	5	QPSK	12	6	22.36	0-1	1
	2502.5	20775	5	QPSK	12	13	22.42	0-1	1
	2502.5	20775	5	QPSK	25	0	22.35	0-1	1
	2502.5	20775	5	16-QAM	1	0	22.31	0-1	1
	2502.5	20775	5	16-QAM	1	12	22.30	0-1	1
	2502.5	20775	5	16-QAM	1	24	22.29	0-1	1
	2502.5	20775	5	16-QAM	12	0	21.45	0-2	2
	2502.5	20775	5	16-QAM	12	6	21.38	0-2	2
	2502.5	20775	5	16-QAM	12	13	21.40	0-2	2
	2502.5	20775	5	16-QAM	25	0	21.33	0-2	2
Mid	2535.0	21100	5	QPSK	1	0	23.36	0	0
	2535.0	21100	5	QPSK	1	12	23.70	0	0
	2535.0	21100	5	QPSK	1	24	23.58	0	0
	2535.0	21100	5	QPSK	12	0	22.49	0-1	1
	2535.0	21100	5	QPSK	12	6	22.28	0-1	1
	2535.0	21100	5	QPSK	12	13	22.46	0-1	1
	2535.0	21100	5	QPSK	25	0	22.40	0-1	1
	2535.0	21100	5	16-QAM	1	0	22.57	0-1	1
	2535.0	21100	5	16-QAM	1	12	22.61	0-1	1
	2535.0	21100	5	16-QAM	1	24	22.59	0-1	1
	2535.0	21100	5	16-QAM	12	0	21.57	0-2	2
	2535.0	21100	5	16-QAM	12	6	21.30	0-2	2
	2535.0	21100	5	16-QAM	12	13	21.33	0-2	2
	2535.0	21100	5	16-QAM	25	0	21.28	0-2	2
High	2567.5	21425	5	QPSK	1	0	23.64	0	0
	2567.5	21425	5	QPSK	1	12	23.46	0	0
	2567.5	21425	5	QPSK	1	24	23.28	0	0
	2567.5	21425	5	QPSK	12	0	22.32	0-1	1
	2567.5	21425	5	QPSK	12	6	22.34	0-1	1
	2567.5	21425	5	QPSK	12	13	22.32	0-1	1
	2567.5	21425	5	QPSK	25	0	22.29	0-1	1
	2567.5	21425	5	16-QAM	1	0	22.50	0-1	1
	2567.5	21425	5	16-QAM	1	12	22.48	0-1	1
	2567.5	21425	5	16-QAM	1	24	22.35	0-1	1
	2567.5	21425	5	16-QAM	12	0	21.55	0-2	2
	2567.5	21425	5	16-QAM	12	6	21.38	0-2	2
	2567.5	21425	5	16-QAM	12	13	21.42	0-2	2
	2567.5	21425	5	16-QAM	25	0	21.48	0-2	2

9.3.6 LTE Carrier Aggregation Conducted Powers

Table 9-25
LTE Carrier Aggregation Conducted Powers – Band 4 (PCC) 5 MHz BW + Band 17 (SCC) 10 MHz BW

Band 4 (PCC) 5 MHz BW + Band 17 (SCC) 10 MHz BW				
1752.5 MHz / ch.20375 + 740 MHz / ch. 5790	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel. 8 Tx.Power (dBm)
	1	24	23.98	23.99

Table 9-26
LTE Carrier Aggregation Conducted Powers – Band 2 (PCC) 5 MHz BW + Band 17 (SCC) 10 MHz BW

Band 2 (PCC) 5 MHz BW + Band 17 (SCC) 10 MHz BW				
1907.5 MHz / ch.19175 + 740 MHz / ch. 5790	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel. 8 Tx.Power (dBm)
	1	0	24.13	24.19

Table 9-27
LTE Carrier Aggregation Conducted Powers – Band 17 (PCC) 10 MHz BW + Band 2 (SCC) 10 MHz BW

Band 17 (PCC) 10 MHz BW + Band 2 (SCC) 10 MHz BW				
710 MHz / ch.23790 + 1960 MHz / ch. 900	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel. 8 Tx.Power (dBm)
	1	0	24.61	24.64

Table 9-28
LTE Carrier Aggregation Conducted Powers – Band 2 (PCC) 5 MHz BW + Band 29 (SCC) 10 MHz BW

Band 2 (PCC) 5 MHz BW + Band 29 (SCC) 10 MHz BW				
1907.5 MHz / ch.19175 + 722.5 / ch. 9715	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel. 8 Tx.Power (dBm)
	1	0	24.04	24.19

Table 9-29
LTE Carrier Aggregation Conducted Powers – Band 4 (PCC) 5 MHz BW + Band 29 (SCC) 10 MHz BW

Band 4 (PCC) 5 MHz BW + Band 29 (SCC) 10 MHz BW				
1752.5 MHz / ch.20375 + 722.5 MHz / ch. 9715	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel. 8 Tx.Power (dBm)
	1	24	23.99	23.99

Notes:
1. The device does not support all Rel. 10 Carrier Aggregation features due to modem chipset limitation.
2. The device only supports LTE downlink Carrier Aggregation. Uplink Carrier Aggregation is not supported. Power measurements were performed with two DL carriers for the Release 8 configuration that had the highest output power (across all bandwidths, channels and RB Configurations) for each band
3. This device only supports inter-band CA with 2 carriers (B4+B17, B2+B17, B17+B2, B2+B29, B4+B29) with a maximum of 10 MHz of spectrum for LTE Band 2/4/17/29.
4. All control and acknowledge data is sent on uplink channels that operate identical to release 8 specifications.

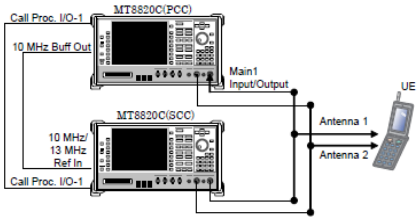

Figure 9-2
Power Measurement Setup

9.4 WLAN Conducted Powers

Table 9-25
IEEE 802.11b Average RF Power

Mode	Freq [MHz]	Channel	802.11b Conducted Power [dBm]			
			Data Rate [Mbps]			
			1	2	5.5	11
802.11b	2412	1*	13.96	14.23	14.04	14.02
802.11b	2437	6*	**14.24**	14.46	14.32	14.25
802.11b	2462	11*	14.13	14.42	14.20	14.13

Table 9-26
IEEE 802.11g Average RF Power

Mode	Freq [MHz]	Channel	802.11g Conducted Power [dBm]							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
802.11g	2412	1	11.90	11.82	11.70	11.81	11.77	11.89	11.75	11.91
802.11g	2437	6	12.05	11.99	11.78	11.96	11.88	12.03	11.83	12.05
802.11g	2462	11	11.96	11.83	11.82	11.89	11.81	11.91	11.81	11.95

Table 9-27
IEEE 802.11n Average RF Power

Mode	Freq [MHz]	Channel	802.11n (2.4GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			6.5	13	19.5	26	39	52	58.5	65
802.11n	2412	1	10.57	10.55	10.42	10.45	10.57	10.72	10.56	10.70
802.11n	2437	6	10.77	10.77	10.68	10.66	10.82	10.91	10.74	10.92
802.11n	2462	11	10.55	10.45	10.38	10.48	10.52	10.70	10.51	10.68

Table 9-28
IEEE 802.11a Average RF Power

Mode	Freq [MHz]	Channel	802.11a Conducted Power [dBm]							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
802.11a	5180	36*	**12.53**	12.47	12.68	12.62	12.57	12.51	12.61	12.53
802.11a	5200	40	12.45	12.39	12.53	12.56	12.53	12.44	12.49	12.40
802.11a	5220	44	12.31	12.23	12.52	12.32	12.30	12.24	12.38	12.28
802.11a	5240	48*	12.36	12.30	12.57	12.46	12.45	12.28	12.47	12.32
802.11a	5260	52*	12.38	12.53	12.61	12.56	12.60	12.45	12.51	12.68
802.11a	5280	56	12.47	12.65	12.73	12.62	12.63	12.53	12.56	12.72
802.11a	5300	60	12.81	12.98	12.99	12.92	12.96	12.82	12.97	12.90
802.11a	5320	64*	**12.83**	12.90	12.98	12.98	12.93	12.95	12.99	12.92
802.11a	5500	100	12.70	12.78	12.75	12.73	12.71	12.74	12.79	12.66
802.11a	5520	104*	12.40	12.46	12.39	12.38	12.33	12.41	12.45	12.32
802.11a	5540	108	12.27	12.41	12.37	12.38	12.29	12.34	12.29	12.28
802.11a	5560	112	12.43	12.48	12.42	12.44	12.47	12.47	12.51	12.33
802.11a	5580	116*	12.66	12.74	12.74	12.66	12.76	12.74	12.71	12.63
802.11a	5600	120	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5620	124	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5640	128	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5660	132	12.48	12.52	12.50	12.53	12.52	12.50	12.50	12.45
802.11a	5680	136*	12.59	12.68	12.66	12.62	12.64	12.64	12.64	12.49
802.11a	5700	140	**12.94**	12.94	12.99	12.93	12.99	12.94	12.95	12.92
802.11a	5720	144	12.81	12.80	12.90	12.82	12.90	12.79	12.86	12.82
802.11a	5745	149*	12.50	12.35	12.28	12.52	12.35	12.32	12.36	12.43
802.11a	5765	153	**12.77**	12.66	12.50	12.83	12.54	12.66	12.64	12.73
802.11a	5785	157*	12.45	12.33	12.26	12.45	12.22	12.22	12.23	12.37
802.11a	5805	161	12.65	12.45	12.40	12.60	12.48	12.48	12.48	12.63
802.11a	5825	165*	12.58	12.45	12.29	12.64	12.48	12.33	12.49	12.55

Per FCC KDB Publication 443999 and RSS-210 A9.2(3), transmission on channels which overlap the 5600-5650 MHz is prohibited as a client. This device does not transmit any beacons or initiate any transmissions in 5.3 and 5.5 GHz Band.

(*) – indicates default channels per KDB Publication 248227 D01v01r02. When the adjacent channels are higher in power then the default channels, these “required channels” are considered for SAR testing instead of the default channels.

Table 9-29
IEEE 802.11n Average RF Power – 20 MHz Bandwidth

Mode	Freq [MHz]	Channel	20MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			6.5	13	19.5	26	39	52	58.5	65
802.11n	5180	36	12.41	12.34	12.38	12.32	12.31	12.37	12.39	12.42
802.11n	5200	40	12.32	12.31	12.32	12.27	12.25	12.23	12.29	12.30
802.11n	5220	44	12.21	12.06	12.15	12.10	12.09	12.20	12.15	12.23
802.11n	5240	48	12.26	12.15	12.19	12.14	12.09	12.25	12.18	12.26
802.11n	5260	52	12.41	12.45	12.44	12.46	12.38	12.34	12.44	12.42
802.11n	5280	56	12.32	12.36	12.37	12.44	12.27	12.18	12.37	12.33
802.11n	5300	60	12.33	12.31	12.30	12.39	12.40	12.23	12.41	12.40
802.11n	5320	64	12.16	12.21	12.16	12.19	12.13	12.11	12.19	12.21
802.11n	5500	100	12.31	12.33	12.23	12.20	12.26	12.24	12.19	12.24
802.11n	5520	104	12.21	12.28	12.14	12.10	12.21	12.21	12.06	12.11
802.11n	5540	108	12.23	12.30	12.23	12.05	12.18	12.14	12.11	12.22
802.11n	5560	112	12.13	12.22	12.04	12.08	12.06	12.08	12.02	12.00
802.11n	5580	116	12.15	12.23	12.05	12.04	12.05	12.08	11.98	12.08
802.11n	5600	120	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5620	124	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5640	128	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5660	132	12.05	12.04	11.95	11.93	12.00	11.89	11.94	12.00
802.11n	5680	136	12.07	12.16	12.03	11.89	12.04	12.02	11.93	11.92
802.11n	5700	140	12.02	11.98	11.90	11.93	11.99	11.90	11.85	11.98
802.11n	5720	144	11.99	12.00	12.10	12.02	12.10	11.99	12.06	12.02
802.11n	5745	149	12.62	12.71	12.69	12.71	12.69	12.54	12.57	12.58
802.11n	5765	153	12.65	12.81	12.69	12.72	12.72	12.50	12.57	12.63
802.11n	5785	157	12.73	12.82	12.76	12.81	12.79	12.56	12.61	12.71
802.11n	5805	161	12.83	12.93	12.95	12.95	12.85	12.80	12.75	12.75
802.11n	5825	165	12.76	12.87	12.88	12.94	12.77	12.69	12.77	12.73

Table 9-30
IEEE 802.11n Average RF Power – 40 MHz Bandwidth

Mode	Freq [MHz]	Channel	40MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			13.5	27	40.5	54	81	108	121.5	135
802.11n	5190	38	11.34	11.21	11.25	11.16	11.17	11.21	11.24	11.22
802.11n	5230	46	11.13	11.04	11.10	11.01	11.01	11.04	11.03	11.06
802.11n	5270	54	11.19	11.02	11.06	11.09	11.12	11.10	11.14	11.22
802.11n	5310	62	11.02	11.01	11.09	11.16	11.13	11.19	11.01	11.05
802.11n	5510	102	11.03	11.05	11.02	11.03	11.12	11.09	11.04	11.05
802.11n	5550	110	11.07	11.13	11.10	11.10	11.17	11.09	11.16	11.14
802.11n	5590	118	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5630	126	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5670	134	11.01	11.01	11.03	11.07	11.08	11.08	11.04	11.07
802.11n	5710	142	11.02	11.01	11.01	11.05	11.06	11.06	11.02	11.05
802.11n	5755	151	11.32	11.34	11.31	11.50	11.41	11.35	11.16	11.34
802.11n	5795	159	11.38	11.41	11.40	11.52	11.44	11.37	11.26	11.41

Table 9-31
IEEE 802.11ac Average RF Power – 80 MHz Bandwidth

Mode	Freq [MHz]	Channel	80MHz BW 802.11ac (5GHz) Conducted Power [dBm]									
			Data Rate [Mbps]									
			29.3	58.5	87.8	117	175.5	234	263.3	292.5	351	390
802.11ac	5210	42	**11.58**	11.61	11.53	11.65	11.66	11.65	11.67	11.69	11.72	11.62
802.11ac	5290	58	**11.72**	11.67	11.63	11.76	11.69	11.66	11.64	11.67	11.78	11.69
802.11ac	5530	106	**11.10**	11.03	11.01	11.03	11.12	11.03	11.09	11.05	11.15	11.13
802.11ac	5690	138	11.08	11.01	11.03	11.01	11.10	11.04	11.10	11.06	11.12	11.11
802.11ac	5775	155	**11.11**	11.03	11.07	11.07	11.07	11.05	11.11	11.14	11.13	11.16

Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v01r02 and October 2012/April 2013 FCC/TCB Meeting Notes:

- For 2.4 GHz operations, highest average RF output power channel for the lowest data rate for IEEE 802.11b were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11g/n) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11b mode.
- For 5 GHz operations, highest average RF output power channel for the lowest data rate for IEEE 802.11a were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11n 20 MHz and 40 MHz) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11a mode.
- Full SAR tests for all IEEE 802.11ac configurations were not required because the average output power was not more than 0.25 dB higher than IEEE 802.11a mode. IEEE 802.11ac was evaluated for the highest IEEE 802.11a position in each 5 GHz band and exposure condition.
- When the maximum extrapolated peak SAR of the zoom scan for the maximum output channel is <1.6 W/kg and the reported 1g averaged SAR is <0.8 W/kg, SAR testing on other channels is not required. Otherwise, the other default (or corresponding required) test channels were additionally tested using the lowest data rate.
- The bolded data rate and channel above were tested for SAR.

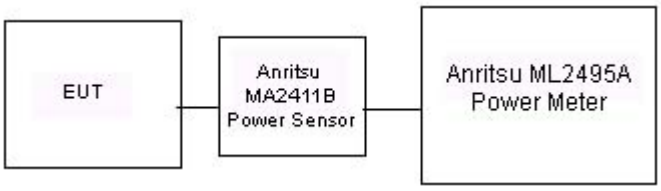

Figure 9-3
Power Measurement Setup for Bandwidths < 50 MHz

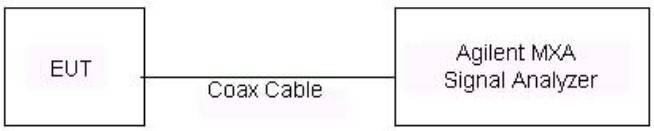

Figure 9-4
Power Measurement Setup for Bandwidths > 50 MHz

10 SYSTEM VERIFICATION

10.1 Tissue Verification

Table 10-1
Measured Tissue Properties

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (C°)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ε	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ε	%dev σ	%dev ε
1/19/2015	750H	19.5	695	0.849	41.688	0.889	42.227	-4.50%	-1.28%
			710	0.863	41.471	0.890	42.149	-3.03%	-1.61%
			725	0.875	41.262	0.891	42.071	-1.80%	-1.92%
			740	0.890	40.993	0.893	41.994	-0.34%	-2.38%
			755	0.902	40.754	0.894	41.916	0.89%	-2.77%
1/16/2015	835H	23.3	820	0.883	40.963	0.899	41.578	-1.78%	-1.48%
			835	0.897	40.801	0.900	41.500	-0.33%	-1.68%
			850	0.911	40.621	0.916	41.500	-0.55%	-2.12%
1/16/2015	1750H	22.7	1710	1.299	38.638	1.348	40.142	-3.64%	-3.75%
			1750	1.340	38.482	1.371	40.079	-2.26%	-3.98%
			1790	1.382	38.312	1.394	40.016	-0.86%	-4.26%
1/13/2015	1900H	22.6	1850	1.391	40.515	1.400	40.000	-0.64%	1.29%
			1880	1.424	40.437	1.400	40.000	1.71%	1.09%
			1910	1.455	40.300	1.400	40.000	3.93%	0.75%
1/13/2015	2450H	24.2	2401	1.803	40.860	1.756	39.287	2.68%	4.00%
			2450	1.855	40.623	1.800	39.200	3.06%	3.63%
			2499	1.919	40.425	1.853	39.138	3.56%	3.29%
1/20/2015	2600H	23.0	2500	1.904	40.275	1.855	39.136	2.64%	2.91%
			2550	1.964	40.082	1.909	39.073	2.88%	2.58%
			2600	2.021	39.884	1.964	39.009	2.90%	2.24%
1/22/2015	5200H-5800H	20.1	5180	4.432	35.745	4.635	36.009	-4.38%	-0.73%
			5200	4.449	35.741	4.655	35.986	-4.43%	-0.68%
			5220	4.468	35.684	4.676	35.963	-4.45%	-0.78%
			5280	4.530	35.583	4.737	35.894	-4.37%	-0.87%
			5300	4.549	35.571	4.758	35.871	-4.39%	-0.84%
			5320	4.575	35.543	4.778	35.849	-4.25%	-0.85%
			5500	4.748	35.287	4.963	35.643	-4.33%	-1.00%
			5520	4.772	35.275	4.983	35.620	-4.23%	-0.97%
			5540	4.785	35.258	5.004	35.597	-4.38%	-0.95%
			5600	4.849	35.184	5.065	35.529	-4.26%	-0.97%
			5700	4.951	35.020	5.168	35.414	-4.20%	-1.11%
			5765	5.026	34.989	5.234	35.340	-3.97%	-0.99%
			5785	5.039	34.914	5.255	35.317	-4.11%	-1.14%
			5800	5.054	34.890	5.270	35.300	-4.10%	-1.16%
1/15/2015	750B	21.9	695	0.914	54.813	0.959	55.745	-4.69%	-1.67%
			710	0.928	54.655	0.960	55.687	-3.33%	-1.85%
			725	0.941	54.488	0.961	55.629	-2.08%	-2.05%
			740	0.956	54.338	0.963	55.570	-0.73%	-2.22%
			755	0.970	54.194	0.964	55.512	0.62%	-2.37%
1/15/2015	835B	22.0	820	0.989	53.432	0.969	55.258	2.06%	-3.30%
			835	1.004	53.289	0.970	55.200	3.51%	-3.46%
			850	1.018	53.128	0.988	55.154	3.04%	-3.67%
1/15/2015	1750B	21.9	1710	1.437	50.944	1.463	53.537	-1.78%	-4.84%
			1750	1.480	50.821	1.488	53.432	-0.54%	-4.89%
			1790	1.525	50.671	1.514	53.326	0.73%	-4.98%
1/12/2015	1900B	23.1	1850	1.504	52.096	1.520	53.300	-1.05%	-2.26%
			1880	1.535	51.997	1.520	53.300	0.99%	-2.44%
			1910	1.568	51.885	1.520	53.300	3.16%	-2.65%
1/13/2015	2450B	24.2	2401	1.944	50.801	1.903	52.765	2.15%	-3.72%
			2450	2.004	50.587	1.950	52.700	2.77%	-4.01%
			2499	2.075	50.411	2.019	52.638	2.77%	-4.23%
1/19/2015	2600B	22.8	2500	2.094	50.848	2.021	52.636	3.61%	-3.40%
			2550	2.168	50.583	2.092	52.573	3.63%	-3.79%
			2600	2.237	50.388	2.163	52.509	3.42%	-4.04%
1/13/2015	5200B-5800B	23.1	5180	5.429	47.349	5.276	49.041	2.90%	-3.45%
			5200	5.461	47.307	5.299	49.014	3.06%	-3.48%
			5220	5.474	47.263	5.323	48.987	2.84%	-3.52%
			5280	5.558	47.179	5.393	48.906	3.06%	-3.53%
			5300	5.589	47.162	5.416	48.879	3.19%	-3.51%
			5320	5.608	47.117	5.439	48.851	3.11%	-3.55%
			5500	5.847	46.781	5.650	48.607	3.49%	-3.76%
			5520	5.879	46.779	5.673	48.580	3.63%	-3.71%
			5540	5.898	46.751	5.696	48.553	3.55%	-3.71%
			5600	5.996	46.661	5.766	48.471	3.99%	-3.73%
			5700	6.121	46.456	5.883	48.336	4.05%	-3.89%
			5765	6.203	46.336	5.959	48.248	4.09%	-3.96%
			5785	6.241	46.288	5.982	48.220	4.33%	-4.01%
			5800	6.263	46.274	6.000	48.200	4.38%	-4.00%

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

10.2 Test System Verification

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

Table 10-2
System Verification Results

System Verification TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Dipole SN	Probe SN	Measured SAR_{1g} (W/kg)	1 W Target SAR_{1g} (W/kg)	1 W Normalized SAR_{1g} (W/kg)	$Deviation_{1g}$ (%)
K	750	HEAD	01/19/2015	23.1	21.4	0.100	1054	3288	0.784	8.330	7.840	-5.88%
J	835	HEAD	01/16/2015	23.4	23.3	0.100	4d133	3022	0.915	9.200	9.150	-0.54%
I	1750	HEAD	01/16/2015	23.3	22.7	0.100	1008	3209	3.370	36.900	33.700	-8.67%
G	1900	HEAD	01/13/2015	23.9	23.0	0.100	5d149	3258	4.250	40.200	42.500	5.72%
B	2450	HEAD	01/13/2015	22.7	22.6	0.100	882	3334	5.050	52.000	50.500	-2.88%
I	2600	HEAD	01/20/2015	21.9	23.0	0.100	1071	3209	5.360	57.500	53.600	-6.78%
H	5200	HEAD	01/22/2015	23.9	21.5	0.100	1120	3920	7.540	79.100	75.400	-4.68%
H	5300	HEAD	01/22/2015	23.9	21.5	0.100	1120	3920	8.030	83.400	80.300	-3.72%
H	5500	HEAD	01/22/2015	23.9	21.6	0.100	1120	3920	8.190	84.900	81.900	-3.53%
H	5600	HEAD	01/22/2015	24.0	21.8	0.100	1120	3920	7.910	82.200	79.100	-3.77%
H	5800	HEAD	01/22/2015	23.9	21.6	0.100	1120	3920	7.800	79.100	78.000	-1.39%
I	750	BODY	01/15/2015	23.1	21.9	0.100	1054	3209	0.891	8.640	8.910	3.12%
K	835	BODY	01/15/2015	23.3	22.0	0.100	4d133	3288	0.966	9.350	9.660	3.32%
D	1750	BODY	01/15/2015	23.4	22.3	0.100	1008	3263	3.950	37.600	39.500	5.05%
J	1900	BODY	01/12/2015	20.6	21.2	0.100	5d141	3022	3.980	40.600	39.800	-1.97%
B	2450	BODY	01/13/2015	22.7	22.4	0.100	882	3334	5.010	49.500	50.100	1.21%
I	2600	BODY	01/19/2015	24.0	22.8	0.100	1071	3209	6.070	56.900	60.700	6.68%
H	5200	BODY	01/13/2015	24.7	22.5	0.100	1191	3920	7.140	77.800	71.400	-8.23%
H	5300	BODY	01/13/2015	24.8	22.5	0.100	1191	3920	7.360	79.900	73.600	-7.88%
H	5500	BODY	01/13/2015	24.8	22.5	0.100	1191	3920	7.500	83.100	75.000	-9.75%
H	5600	BODY	01/13/2015	24.8	22.5	0.100	1191	3920	7.740	84.100	77.400	-7.97%
H	5800	BODY	01/13/2015	24.8	22.5	0.100	1191	3920	7.040	78.000	70.400	-9.74%

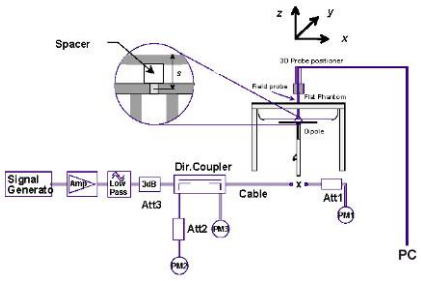

Figure 10-1
System Verification Setup Diagram

Figure 10-2
System Verification Setup Photo

11 SAR DATA SUMMARY

11.1 Standalone Head SAR Data

Table 11-1
GSM 850 Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	# of Time Slots	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GSM 850	GSM	33.2	33.04	0.04	Right	Cheek	1501-3	1	1:8.3	0.321	1.038	0.333	
836.60	190	GSM 850	GSM	33.2	33.04	0.04	Right	Tilt	1501-3	1	1:8.3	0.162	1.038	0.168	
836.60	190	GSM 850	GSM	33.2	33.04	-0.05	Left	Cheek	1501-3	1	1:8.3	0.286	1.038	0.297	
836.60	190	GSM 850	GSM	33.2	33.04	-0.03	Left	Tilt	1501-3	1	1:8.3	0.139	1.038	0.144	
836.60	190	GSM 850	GPRS	31.7	31.21	0.08	Right	Cheek	1501-3	2	1:4.15	0.411	1.119	0.460	A1
836.60	190	GSM 850	GPRS	31.7	31.21	-0.11	Right	Tilt	1501-3	2	1:4.15	0.222	1.119	0.248	
836.60	190	GSM 850	GPRS	31.7	31.21	-0.05	Left	Cheek	1501-3	2	1:4.15	0.387	1.119	0.433	
836.60	190	GSM 850	GPRS	31.7	31.21	0.01	Left	Tilt	1501-3	2	1:4.15	0.180	1.119	0.201	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram								

Table 11-2
GSM 1900 Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	# of Time Slots	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
1880.00	661	GSM 1900	GSM	30.2	29.82	-0.06	Right	Cheek	1501-3	1	1:8.3	0.136	1.091	0.148	
1880.00	661	GSM 1900	GSM	30.2	29.82	0.03	Right	Tilt	1501-3	1	1:8.3	0.152	1.091	0.166	
1880.00	661	GSM 1900	GSM	30.2	29.82	0.04	Left	Cheek	1501-3	1	1:8.3	0.371	1.091	0.405	
1880.00	661	GSM 1900	GSM	30.2	29.82	0.08	Left	Tilt	1501-3	1	1:8.3	0.131	1.091	0.143	
1880.00	661	GSM 1900	GPRS	28.7	28.61	-0.05	Right	Cheek	1501-3	2	1:4.15	0.211	1.021	0.215	
1880.00	661	GSM 1900	GPRS	28.7	28.61	-0.01	Right	Tilt	1501-3	2	1:4.15	0.220	1.021	0.225	
1880.00	661	GSM 1900	GPRS	28.7	28.61	0.11	Left	Cheek	1501-3	2	1:4.15	0.518	1.021	0.529	A2
1880.00	661	GSM 1900	GPRS	28.7	28.61	0.16	Left	Tilt	1501-3	2	1:4.15	0.172	1.021	0.176	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram								

Table 11-3
UMTS 850 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.60	4183	UMTS 850	RMC	23.7	23.52	-0.04	Right	Cheek	1501-3	1:1	0.318	1.042	0.331	A3
836.60	4183	UMTS 850	RMC	23.7	23.52	0.08	Right	Tilt	1501-3	1:1	0.166	1.042	0.173	
836.60	4183	UMTS 850	RMC	23.7	23.52	0.03	Left	Cheek	1501-3	1:1	0.302	1.042	0.315	
836.60	4183	UMTS 850	RMC	23.7	23.52	0.00	Left	Tilt	1501-3	1:1	0.162	1.042	0.169	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-4
UMTS 1900 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1880.00	9400	UMTS 1900	RMC	23.7	23.66	-0.04	Right	Cheek	1501-3	1:1	0.318	1.009	0.321	
1880.00	9400	UMTS 1900	RMC	23.7	23.66	0.12	Right	Tilt	1501-3	1:1	0.323	1.009	0.326	
1852.40	9262	UMTS 1900	RMC	23.7	23.63	-0.05	Left	Cheek	1501-3	1:1	0.723	1.016	0.735	
1880.00	9400	UMTS 1900	RMC	23.7	23.66	-0.01	Left	Cheek	1501-3	1:1	0.804	1.009	0.811	A4
1907.60	9538	UMTS 1900	RMC	23.7	23.70	-0.03	Left	Cheek	1501-3	1:1	0.719	1.000	0.719	
1880.00	9400	UMTS 1900	RMC	23.7	23.66	0.05	Left	Tilt	1501-3	1:1	0.296	1.009	0.299	
1880.00	9400	UMTS 1900	RMC	23.7	23.66	-0.05	Left	Cheek	1501-3	1:1	0.799	1.009	0.806	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Head 1.6 W/kg (mW/g) averaged over 1 gram						

Note: Blue entry indicates variability measurements.

Table 11-5
LTE Band 12 Head SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
707.50	23095	Mid	LTE Band 12	10	24.7	24.64	0.09	0	Right	Cheek	QPSK	1	0	1501-2	1:1	0.191	1.014	0.194	A5
707.50	23095	Mid	LTE Band 12	10	23.7	23.25	0.11	1	Right	Cheek	QPSK	25	12	1501-2	1:1	0.141	1.109	0.156	
707.50	23095	Mid	LTE Band 12	10	24.7	24.64	0.03	0	Right	Tilt	QPSK	1	0	1501-2	1:1	0.096	1.014	0.097	
707.50	23095	Mid	LTE Band 12	10	23.7	23.25	0.05	1	Right	Tilt	QPSK	25	12	1501-2	1:1	0.066	1.109	0.073	
707.50	23095	Mid	LTE Band 12	10	24.7	24.64	-0.05	0	Left	Cheek	QPSK	1	0	1501-2	1:1	0.130	1.014	0.132	
707.50	23095	Mid	LTE Band 12	10	23.7	23.25	0.12	1	Left	Cheek	QPSK	25	12	1501-2	1:1	0.083	1.109	0.092	
707.50	23095	Mid	LTE Band 12	10	24.7	24.64	0.08	0	Left	Tilt	QPSK	1	0	1501-2	1:1	0.074	1.014	0.075	
707.50	23095	Mid	LTE Band 12	10	23.7	23.25	0.18	1	Left	Tilt	QPSK	25	12	1501-2	1:1	0.042	1.109	0.047	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-6
LTE Band 5 (Cell) Head SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.2	24.00	-0.04	0	Right	Cheek	QPSK	1	49	1501-2	1:1	0.346	1.047	0.362	A6
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.2	22.97	-0.02	1	Right	Cheek	QPSK	25	25	1501-2	1:1	0.258	1.054	0.272	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.2	24.00	0.02	0	Right	Tilt	QPSK	1	49	1501-2	1:1	0.175	1.047	0.183	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.2	22.97	0.02	1	Right	Tilt	QPSK	25	25	1501-2	1:1	0.144	1.054	0.152	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.2	24.00	-0.03	0	Left	Cheek	QPSK	1	49	1501-2	1:1	0.309	1.047	0.324	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.2	22.97	0.01	1	Left	Cheek	QPSK	25	25	1501-2	1:1	0.252	1.054	0.266	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.2	24.00	-0.11	0	Left	Tilt	QPSK	1	49	1501-2	1:1	0.163	1.047	0.171	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.2	22.97	-0.07	1	Left	Tilt	QPSK	25	25	1501-2	1:1	0.134	1.054	0.141	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-7
LTE Band 4 (AWS) Head SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #
MHz	Ch.																			
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.2	23.99	0.07	0	Right	Cheek	QPSK	1	0	1501-2	1:1	0.220	1.050	0.231	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	22.95	-0.03	1	Right	Cheek	QPSK	50	25	1501-2	1:1	0.265	1.059	0.281	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.2	23.99	-0.03	0	Right	Tilt	QPSK	1	0	1501-2	1:1	0.259	1.050	0.272	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	22.95	0.03	1	Right	Tilt	QPSK	50	25	1501-2	1:1	0.273	1.059	0.289	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.2	23.99	0.04	0	Left	Cheek	QPSK	1	0	1501-2	1:1	0.588	1.050	0.617	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	22.95	0.00	1	Left	Cheek	QPSK	50	25	1501-2	1:1	0.616	1.059	0.652	A7
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.2	23.99	0.01	0	Left	Tilt	QPSK	1	0	1501-2	1:1	0.229	1.050	0.240	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	22.95	0.00	1	Left	Tilt	QPSK	50	25	1501-2	1:1	0.236	1.059	0.250	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population											Head 1.6 W/kg (mW/g) averaged over 1 gram									

Table 11-8
LTE Band 2 (PCS) Head SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #
MHz	Ch.																			
1900.00	19100	High	LTE Band 2 (PCS)	20	24.2	24.11	0.05	0	Right	Cheek	QPSK	1	0	1501-2	1:1	0.432	1.021	0.441	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.2	22.97	0.18	1	Right	Cheek	QPSK	50	0	1501-2	1:1	0.288	1.054	0.304	
1900.00	19100	High	LTE Band 2 (PCS)	20	24.2	24.11	0.02	0	Right	Tilt	QPSK	1	0	1501-2	1:1	0.461	1.021	0.471	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.2	22.97	-0.05	1	Right	Tilt	QPSK	50	0	1501-2	1:1	0.334	1.054	0.352	
1900.00	19100	High	LTE Band 2 (PCS)	20	24.2	24.11	-0.04	0	Left	Cheek	QPSK	1	0	1501-2	1:1	0.773	1.021	0.789	
1860.00	18700	Low	LTE Band 2 (PCS)	20	23.2	22.92	-0.01	1	Left	Cheek	QPSK	50	0	1501-2	1:1	0.594	1.067	0.634	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	23.2	22.91	-0.03	1	Left	Cheek	QPSK	50	0	1501-2	1:1	0.801	1.069	**0.856**	A8
1900.00	19100	High	LTE Band 2 (PCS)	20	23.2	22.97	0.05	1	Left	Cheek	QPSK	50	0	1501-2	1:1	0.768	1.054	0.809	
1860.00	18700	Low	LTE Band 2 (PCS)	20	23.2	22.77	-0.01	1	Left	Cheek	QPSK	100	0	1501-2	1:1	0.551	1.104	0.608	
1900.00	19100	High	LTE Band 2 (PCS)	20	24.2	24.11	0.18	0	Left	Tilt	QPSK	1	0	1501-2	1:1	0.321	1.021	0.328	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.2	22.97	0.01	1	Left	Tilt	QPSK	50	0	1501-2	1:1	0.264	1.054	0.278	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population											Head 1.6 W/kg (mW/g) averaged over 1 gram									

Table 11-9
LTE Band 7 Head SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #
MHz	Ch.																			
2535.00	21100	Mid	LTE Band 7	20	23.7	23.62	0.01	0	Right	Cheek	QPSK	1	50	1501-2	1:1	0.333	1.019	0.339	
2535.00	21100	Mid	LTE Band 7	20	22.7	22.53	0.03	1	Right	Cheek	QPSK	50	0	1501-2	1:1	0.217	1.040	0.226	
2535.00	21100	Mid	LTE Band 7	20	23.7	23.62	0.01	0	Right	Tilt	QPSK	1	50	1501-2	1:1	0.297	1.019	0.303	
2535.00	21100	Mid	LTE Band 7	20	22.7	22.53	-0.04	1	Right	Tilt	QPSK	50	0	1501-2	1:1	0.190	1.040	0.198	
2535.00	21100	Mid	LTE Band 7	20	23.7	23.62	-0.01	0	Left	Cheek	QPSK	1	50	1501-2	1:1	0.693	1.019	0.706	A9
2535.00	21100	Mid	LTE Band 7	20	22.7	22.53	-0.07	1	Left	Cheek	QPSK	50	0	1501-2	1:1	0.468	1.040	0.487	
2535.00	21100	Mid	LTE Band 7	20	23.7	23.62	0.01	0	Left	Tilt	QPSK	1	50	1501-2	1:1	0.230	1.019	0.234	
2535.00	21100	Mid	LTE Band 7	20	22.7	22.53	0.01	1	Left	Tilt	QPSK	50	0	1501-2	1:1	0.152	1.040	0.158	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population											Head 1.6 W/kg (mW/g) averaged over 1 gram									

Table 11-10
DTS Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Data Rate (Mbps)	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
2437	6	IEEE 802.11b	DSSS	15.0	14.24	0.15	Right	Cheek	1301-2	1	1:1	0.498	1.191	**0.593**	A10
2437	6	IEEE 802.11b	DSSS	15.0	14.24	-0.19	Right	Tilt	1301-2	1	1:1	0.464	1.191	0.553	
2437	6	IEEE 802.11b	DSSS	15.0	14.24	0.05	Left	Cheek	1301-2	1	1:1	0.207	1.191	0.247	
2437	6	IEEE 802.11b	DSSS	15.0	14.24	0.17	Left	Tilt	1301-2	1	1:1	0.208	1.191	0.248	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**							**Head** **1.6 W/kg (mW/g)** averaged over 1 gram								

Table 11-11
NII Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Data Rate (Mbps)	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
5180	36	IEEE 802.11a	OFDM	13.0	12.53	-0.01	Right	Cheek	1301-2	6	1:1	0.268	1.114	0.299	
5210	42	IEEE 802.11ac	OFDM	12.0	11.58	0.04	Right	Cheek	1301-2	29.3	1:1	0.225	1.102	0.248	
5180	36	IEEE 802.11a	OFDM	13.0	12.53	0.15	Right	Tilt	1301-2	6	1:1	0.174	1.114	0.194	
5180	36	IEEE 802.11a	OFDM	13.0	12.53	0.18	Left	Cheek	1301-2	6	1:1	0.087	1.114	0.097	
5180	36	IEEE 802.11a	OFDM	13.0	12.53	0.09	Left	Tilt	1301-2	6	1:1	0.058	1.114	0.065	
5320	64	IEEE 802.11a	OFDM	13.0	12.83	0.04	Right	Cheek	1301-2	6	1:1	0.301	1.040	**0.313**	A11
5290	58	IEEE 802.11ac	OFDM	12.0	11.72	0.03	Right	Cheek	1301-2	29.3	1:1	0.188	1.067	0.201	
5320	64	IEEE 802.11a	OFDM	13.0	12.83	0.18	Right	Tilt	1301-2	6	1:1	0.216	1.040	0.225	
5320	64	IEEE 802.11a	OFDM	13.0	12.83	0.04	Left	Cheek	1301-2	6	1:1	0.113	1.040	0.118	
5320	64	IEEE 802.11a	OFDM	13.0	12.83	0.06	Left	Tilt	1301-2	6	1:1	0.073	1.040	0.076	
5700	140	IEEE 802.11a	OFDM	13.0	12.94	0.01	Right	Cheek	1301-2	6	1:1	0.211	1.014	0.214	
5530	106	IEEE 802.11ac	OFDM	12.0	11.10	0.15	Right	Cheek	1301-2	29.3	1:1	0.163	1.230	0.200	
5700	140	IEEE 802.11a	OFDM	13.0	12.94	0.14	Right	Tilt	1301-2	6	1:1	0.166	1.014	0.168	
5700	140	IEEE 802.11a	OFDM	13.0	12.94	0.11	Left	Cheek	1301-2	6	1:1	0.132	1.014	0.134	
5700	140	IEEE 802.11a	OFDM	13.0	12.94	0.05	Left	Tilt	1301-2	6	1:1	0.098	1.014	0.099	
5765	153	IEEE 802.11a	OFDM	13.0	12.77	0.19	Right	Cheek	1301-2	6	1:1	0.213	1.054	0.225	
5775	155	IEEE 802.11ac	OFDM	12.0	11.11	0.03	Right	Cheek	1301-2	29.3	1:1	0.133	1.227	0.163	
5765	153	IEEE 802.11a	OFDM	13.0	12.77	0.06	Right	Tilt	1301-2	6	1:1	0.161	1.054	0.170	
5765	153	IEEE 802.11a	OFDM	13.0	12.77	0.04	Left	Cheek	1301-2	6	1:1	0.133	1.054	0.140	
5765	153	IEEE 802.11a	OFDM	13.0	12.77	0.09	Left	Tilt	1301-2	6	1:1	0.098	1.054	0.103	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**							**Head** **1.6 W/kg (mW/g)** averaged over 1 gram								

11.2 Standalone Body-Worn SAR Data

Table 11-12
GSM/UMTS Body-Worn SAR Data

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of Time Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GSM 850	GSM	33.2	33.04	0.04	8 mm	1501-3	1	1:8.3	back	0.455	1.038	0.472	
836.60	190	GSM 850	GPRS	31.7	31.21	-0.08	8 mm	1501-3	2	1:4.15	back	0.566	1.119	0.633	A12
1880.00	661	GSM 1900	GSM	30.2	29.82	0.04	8 mm	1501-3	1	1:8.3	back	0.253	1.091	0.276	
1880.00	661	GSM 1900	GPRS	28.7	28.61	0.01	8 mm	1501-3	2	1:4.15	back	0.362	1.021	0.370	A14
836.60	4183	UMTS 850	RMC	23.7	23.52	0.02	8 mm	1501-3	N/A	1:1	back	0.426	1.042	0.444	A15
1880.00	9400	UMTS 1900	RMC	23.7	23.66	-0.05	8 mm	1501-3	N/A	1:1	back	0.398	1.009	0.402	A17
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-13
LTE Body-Worn SAR

MEASUREMENT RESULTS																		
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
707.50	23095	Mid	LTE Band 12	10	24.7	24.64	-0.04	0	1501-2	QPSK	1	0	8 mm	back	1:1	0.451	1.014	0.457	A19
707.50	23095	Mid	LTE Band 12	10	23.7	23.25	0.07	1	1501-2	QPSK	25	12	8 mm	back	1:1	0.294	1.109	0.326	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.2	24.00	0.11	0	1501-2	QPSK	1	49	8 mm	back	1:1	0.445	1.047	0.466	A20
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.2	22.97	0.04	1	1501-2	QPSK	25	25	8 mm	back	1:1	0.357	1.054	0.376	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.2	23.99	-0.01	0	1501-2	QPSK	1	0	8 mm	back	1:1	0.641	1.050	0.673	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	22.95	-0.02	1	1501-2	QPSK	50	25	8 mm	back	1:1	0.646	1.059	0.684	A21
1900.00	19100	High	LTE Band 2 (PCS)	20	24.2	24.11	0.05	0	1501-2	QPSK	1	0	8 mm	back	1:1	0.418	1.021	0.427	A22
1900.00	19100	High	LTE Band 2 (PCS)	20	23.2	22.97	0.00	1	1501-2	QPSK	50	0	8 mm	back	1:1	0.401	1.054	0.423	
2535.00	21100	Mid	LTE Band 7	20	23.7	23.62	0.02	0	1501-23	QPSK	1	50	8 mm	back	1:1	0.541	1.019	0.551	A24
2535.00	21100	Mid	LTE Band 7	20	22.7	22.53	0.01	1	1501-23	QPSK	50	0	8 mm	back	1:1	0.393	1.040	0.409	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Body 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-14
DTS Body-Worn SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
2437	6	IEEE 802.11b	DSSS	15.0	14.24	0.01	8 mm	1301-2	1	back	1:1	0.101	1.191	0.120	A26
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-15
NII Body-Worn SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
5180	36	IEEE 802.11a	OFDM	13.0	12.53	0.15	8 mm	1301-2	6	back	1:1	0.068	1.114	0.076	
5210	42	IEEE 802.11ac	OFDM	12.0	11.58	-0.12	8 mm	1301-2	29.3	back	1:1	0.043	1.102	0.047	
5320	64	IEEE 802.11a	OFDM	13.0	12.83	0.08	8 mm	1301-2	6	back	1:1	0.072	1.040	0.075	A29
5290	58	IEEE 802.11ac	OFDM	12.0	11.72	0.10	8 mm	1301-2	29.3	back	1:1	0.040	1.067	0.043	
5700	140	IEEE 802.11a	OFDM	13.0	12.94	0.06	8 mm	1301-2	6	back	1:1	0.064	1.014	0.065	
5530	106	IEEE 802.11ac	OFDM	12.0	11.10	0.19	8 mm	1301-2	29.3	back	1:1	0.050	1.230	0.062	
5765	153	IEEE 802.11a	OFDM	13.0	12.77	0.09	8 mm	1301-2	6	back	1:1	0.064	1.054	0.067	
5775	155	IEEE 802.11ac	OFDM	12.0	11.11	0.08	8 mm	1301-2	29.3	back	1:1	0.055	1.227	0.067	

ANSI / IEEE C95.1 1992 - SAFETY LIMIT	Body
Spatial Peak	1.6 W/kg (mW/g)
Uncontrolled Exposure/General Population	averaged over 1 gram

11.3 Standalone Wireless Router SAR Data

Table 11-16
GPRS/UMTS Hotspot SAR Data

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of GPRS Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GSM 850	GPRS	31.7	31.21	-0.08	8 mm	1501-3	2	1:4.15	back	0.566	1.119	0.633	
836.60	190	GSM 850	GPRS	31.7	31.21	-0.02	8 mm	1501-3	2	1:4.15	front	0.593	1.119	0.664	A12
836.60	190	GSM 850	GPRS	31.7	31.21	0.06	10 mm	1501-3	2	1:4.15	bottom	0.324	1.119	0.363	
836.60	190	GSM 850	GPRS	31.7	31.21	0.01	10 mm	1501-3	2	1:4.15	right	0.500	1.119	0.560	
1880.00	661	GSM 1900	GPRS	28.7	28.61	0.01	8 mm	1501-3	2	1:4.15	back	0.362	1.021	0.370	A14
1880.00	661	GSM 1900	GPRS	28.7	28.61	-0.02	8 mm	1501-3	2	1:4.15	front	0.342	1.021	0.349	
1880.00	661	GSM 1900	GPRS	28.7	28.61	-0.05	10 mm	1501-3	2	1:4.15	bottom	0.142	1.021	0.145	
1880.00	661	GSM 1900	GPRS	28.7	28.61	-0.02	10 mm	1501-3	2	1:4.15	left	0.337	1.021	0.344	
836.60	4183	UMTS 850	RMC	23.7	23.52	0.02	8 mm	1501-3	N/A	1:1	back	0.426	1.042	0.444	
836.60	4183	UMTS 850	RMC	23.7	23.52	0.01	8 mm	1501-3	N/A	1:1	front	0.471	1.042	0.491	A16
836.60	4183	UMTS 850	RMC	23.7	23.52	0.09	10 mm	1501-3	N/A	1:1	bottom	0.257	1.042	0.268	
836.60	4183	UMTS 850	RMC	23.7	23.52	0.00	10 mm	1501-3	N/A	1:1	right	0.363	1.042	0.378	
1880.00	9400	UMTS 1900	RMC	23.7	23.66	-0.05	8 mm	1501-3	N/A	1:1	back	0.398	1.009	0.402	
1880.00	9400	UMTS 1900	RMC	23.7	23.66	0.08	8 mm	1501-3	N/A	1:1	front	0.385	1.009	0.388	
1880.00	9400	UMTS 1900	RMC	23.7	23.66	-0.01	10 mm	1501-3	N/A	1:1	bottom	0.228	1.009	0.230	
1880.00	9400	UMTS 1900	RMC	23.7	23.66	-0.04	10 mm	1501-3	N/A	1:1	left	0.550	1.009	0.555	A18

ANSI / IEEE C95.1 1992 - SAFETY LIMIT	Body
Spatial Peak	1.6 W/kg (mW/g)
Uncontrolled Exposure/General Population	averaged over 1 gram

Table 11-17
LTE Band 12 Hotspot SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #
MHz	Ch.																			
707.50	23095	Mid	LTE Band 12	10	24.7	24.64	-0.04	0	1501-2	QPSK	1	0	8 mm	back	1:1	0.451	1.014	0.457	A19
707.50	23095	Mid	LTE Band 12	10	23.7	23.25	0.07	1	1501-2	QPSK	25	12	8 mm	back	1:1	0.294	1.109	0.326	
707.50	23095	Mid	LTE Band 12	10	24.7	24.64	-0.03	0	1501-2	QPSK	1	0	8 mm	front	1:1	0.444	1.014	0.450	
707.50	23095	Mid	LTE Band 12	10	23.7	23.25	-0.16	1	1501-2	QPSK	25	12	8 mm	front	1:1	0.303	1.109	0.336	
707.50	23095	Mid	LTE Band 12	10	24.7	24.64	0.02	0	1501-2	QPSK	1	0	10 mm	bottom	1:1	0.137	1.014	0.139	
707.50	23095	Mid	LTE Band 12	10	23.7	23.25	0.02	1	1501-2	QPSK	25	12	10 mm	bottom	1:1	0.096	1.109	0.106	
707.50	23095	Mid	LTE Band 12	10	24.7	24.64	-0.06	0	1501-2	QPSK	1	0	10 mm	right	1:1	0.451	1.014	0.457	
707.50	23095	Mid	LTE Band 12	10	23.7	23.25	-0.07	1	1501-2	QPSK	25	12	10 mm	right	1:1	0.271	1.109	0.301	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Body 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-18
LTE Band 5 (Cell) Hotspot SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #
MHz	Ch.																			
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.2	24.00	0.11	0	1501-2	QPSK	1	49	8 mm	back	1:1	0.445	1.047	0.466	A20
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.2	22.97	0.04	1	1501-2	QPSK	25	25	8 mm	back	1:1	0.357	1.054	0.376	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.2	24.00	0.02	0	1501-2	QPSK	1	49	8 mm	front	1:1	0.414	1.047	0.433	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.2	22.97	0.07	1	1501-2	QPSK	25	25	8 mm	front	1:1	0.331	1.054	0.349	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.2	24.00	-0.20	0	1501-2	QPSK	1	49	10 mm	bottom	1:1	0.253	1.047	0.265	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.2	22.97	0.04	1	1501-2	QPSK	25	25	10 mm	bottom	1:1	0.195	1.054	0.206	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.2	24.00	0.18	0	1501-2	QPSK	1	49	10 mm	right	1:1	0.375	1.047	0.393	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.2	22.97	-0.08	1	1501-2	QPSK	25	25	10 mm	right	1:1	0.310	1.054	0.327	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Body 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-19
LTE Band 4 (AWS) Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #
MHz	Ch.																		
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.2	23.99	-0.01	0	1501-2	QPSK	1	0	8 mm	back	1:1	0.641	1.050	0.673	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	22.95	-0.02	1	1501-2	QPSK	50	25	8 mm	back	1:1	0.646	1.059	0.684	A21
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.2	23.99	-0.06	0	1501-2	QPSK	1	0	8 mm	front	1:1	0.601	1.050	0.631	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	22.95	-0.15	1	1501-2	QPSK	50	25	8 mm	front	1:1	0.625	1.059	0.662	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.2	23.99	-0.02	0	1501-2	QPSK	1	0	10 mm	bottom	1:1	0.190	1.050	0.200	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	22.95	-0.04	1	1501-2	QPSK	50	25	10 mm	bottom	1:1	0.194	1.059	0.205	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.2	23.99	0.00	0	1501-2	QPSK	1	0	10 mm	left	1:1	0.412	1.050	0.433	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	22.95	-0.05	1	1501-2	QPSK	50	25	10 mm	left	1:1	0.445	1.059	0.471	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Body 1.6 W/kg (mW/g) averaged over 1 gram						

Table 11-20
LTE Band 2 (PCS) Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #
MHz	Ch.																		
1900.00	19100	High	LTE Band 2 (PCS)	20	24.2	24.11	0.05	0	1501-2	QPSK	1	0	8 mm	back	1:1	0.418	1.021	0.427	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.2	22.97	0.00	1	1501-2	QPSK	50	0	8 mm	back	1:1	0.401	1.054	0.423	
1900.00	19100	High	LTE Band 2 (PCS)	20	24.2	24.11	-0.02	0	1501-2	QPSK	1	0	8 mm	front	1:1	0.426	1.021	0.435	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.2	22.97	0.06	1	1501-2	QPSK	50	0	8 mm	front	1:1	0.407	1.054	0.429	
1900.00	19100	High	LTE Band 2 (PCS)	20	24.2	24.11	0.03	0	1501-2	QPSK	1	0	10 mm	bottom	1:1	0.227	1.021	0.232	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.2	22.97	0.01	1	1501-2	QPSK	50	0	10 mm	bottom	1:1	0.228	1.054	0.240	
1900.00	19100	High	LTE Band 2 (PCS)	20	24.2	24.11	-0.05	0	1501-2	QPSK	1	0	10 mm	left	1:1	0.581	1.021	0.593	A23
1900.00	19100	High	LTE Band 2 (PCS)	20	23.2	22.97	0.07	1	1501-2	QPSK	50	0	10 mm	left	1:1	0.550	1.054	0.580	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population														Body 1.6 W/kg (mW/g) averaged over 1 gram					

Table 11-21
LTE Band 7 Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #
MHz	Ch.																		
2535.00	21100	Mid	LTE Band 7	20	23.7	23.62	0.02	0	1501-23	QPSK	1	50	8 mm	back	1:1	0.541	1.019	0.551	
2535.00	21100	Mid	LTE Band 7	20	22.7	22.53	0.01	1	1501-23	QPSK	50	0	8 mm	back	1:1	0.393	1.040	0.409	
2535.00	21100	Mid	LTE Band 7	20	23.7	23.62	0.00	0	1501-23	QPSK	1	50	8 mm	front	1:1	0.773	1.019	**0.788**	A25
2535.00	21100	Mid	LTE Band 7	20	22.7	22.53	0.00	1	1501-23	QPSK	50	0	8 mm	front	1:1	0.557	1.040	0.579	
2535.00	21100	Mid	LTE Band 7	20	23.7	23.62	-0.03	0	1501-23	QPSK	1	50	10 mm	bottom	1:1	0.417	1.019	0.425	
2535.00	21100	Mid	LTE Band 7	20	22.7	22.53	0.00	1	1501-23	QPSK	50	0	10 mm	bottom	1:1	0.285	1.040	0.296	
2535.00	21100	Mid	LTE Band 7	20	23.7	23.62	0.00	0	1501-23	QPSK	1	50	10 mm	left	1:1	0.480	1.019	0.489	
2535.00	21100	Mid	LTE Band 7	20	22.7	22.53	-0.02	1	1501-23	QPSK	50	0	10 mm	left	1:1	0.321	1.040	0.334	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population														Body 1.6 W/kg (mW/g) averaged over 1 gram					

Table 11-22
WLAN Hotspot SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #
MHz	Ch.														
2437	6	IEEE 802.11b	DSSS	15.0	14.24	0.01	8 mm	1301-2	1	back	1:1	0.101	1.191	0.120	
2437	6	IEEE 802.11b	DSSS	15.0	14.24	-0.10	8 mm	1301-2	1	front	1:1	0.130	1.191	**0.155**	A27
2437	6	IEEE 802.11b	DSSS	15.0	14.24	0.11	10 mm	1301-2	1	top	1:1	0.072	1.191	0.086	
2437	6	IEEE 802.11b	DSSS	15.0	14.24	0.17	10 mm	1301-2	1	left	1:1	0.043	1.191	0.051	
5765	153	IEEE 802.11a	OFDM	13.0	12.77	0.09	8 mm	1301-2	6	back	1:1	0.064	1.054	0.067	
5765	153	IEEE 802.11a	OFDM	13.0	12.77	0.04	8 mm	1301-2	6	front	1:1	0.042	1.054	0.044	
5765	153	IEEE 802.11a	OFDM	13.0	12.77	0.01	10 mm	1301-2	6	top	1:1	0.055	1.054	0.058	
5765	153	IEEE 802.11a	OFDM	13.0	12.77	0.01	10 mm	1301-2	6	left	1:1	0.086	1.054	**0.091**	A28
5775	155	IEEE 802.11ac	OFDM	12.0	11.11	0.09	10 mm	1301-2	29.3	left	1:1	0.053	1.227	0.065	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Body 1.6 W/kg (mW/g) averaged over 1 gram					

11.4 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2003, and FCC KDB Publication 447498 D01v05.
2. Batteries are fully charged at the beginning of the SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v05.
6. Due to the embowed design of the device, Body SAR was configured per FCC Guidance. See section 1.7 for more information.
7. Per FCC KDB 865664 D01 v01, variability SAR tests were performed when the measured SAR results for a frequency band were greater than 0.8 W/kg. Repeated SAR measurements are highlighted in the tables above for clarity. Please see Section 13 for variability analysis.
8. Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 10 mm was considered because the manufacturer has determined that there will be body-worn accessories available in the marketplace for users to support this separation distance.
9. During SAR Testing for the Wireless Router conditions per FCC KDB Publication 941225 D06v01, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with WIFI) was not activated (See Section 6.7 for more details).

GSM Test Notes:

1. GSM voice and GPRS was evaluated for body-worn SAR.
2. Justification for reduced test configurations per KDB Publication 941225 D03v01 and October 2013 TCB Workshop Notes: The source-based frame-averaged output power was evaluated for all GPRS/EDGE slot configurations. The configuration with the highest target frame averaged output power was evaluated. When the maximum frame-averaged powers are equivalent across two or more slots (within 0.25 dB), the configuration with the most number of time slots was tested.
3. Per FCC KDB Publication 447498 D01v05, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s). When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel was used.

UMTS Notes:

1. UMTS mode in was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01v02. HSPA SAR was not required since the average output power of the HSPA subtests was not more than 0.25 dB higher than the RMC level and SAR was less than 1.2 W/kg.
2. Per FCC KDB Publication 447498 D01v05, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg 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 D05v02r01. The general test procedures used for testing can be found in Section 8.4.4.
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 Guidance, LTE CA SAR was not needed for testing since the data sent by uplink on the uplink physical channels does not change between Rel. 8 and Rel. 10.

WLAN Notes:

1. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v01r02 and October 2012 FCC/TCB Meeting Notes for 2.4 GHz WIFI operations: Highest average RF output power channel for the lowest data rate was selected for SAR evaluation in 802.11b. Other IEEE 802.11 modes (including 802.11g/n) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11b mode.
2. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v01r02 and October 2012 FCC/TCB Meeting Notes for 5 GHz WIFI operations: Highest average RF output power channel for the lowest data rate was selected for SAR evaluation in 802.11a. Other IEEE 802.11 modes (including 802.11n 20 MHz and 40 MHz bandwidths) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11a mode.
3. Per April 2013 TCB Workshop notes, full SAR tests for all IEEE 802.11ac configurations were not required because the average output power was not more than 0.25 dB higher than IEEE 802.11a mode. IEEE 802.11ac was evaluated for the highest IEEE 802.11a position in each 5 GHz band and exposure condition.
4. When wireless router mode is enabled, 5.2-5.7 GHz WLAN operations are disabled.
5. WIFI transmission was verified using an uncalibrated spectrum analyzer.
6. When the maximum extrapolated peak SAR of the zoom scan for the maximum output channel is <1.6 W/kg and the reported 1g averaged SAR is <0.8 W/kg, SAR testing on other default channels was not required.

12 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

12.1 Introduction

The following procedures adopted from FCC KDB Publication 447498 D01v05 are applicable to handsets with built-in unlicensed transmitters such as 802.11a/b/g/n/ac and Bluetooth devices which may simultaneously transmit with the licensed transmitter.

12.2 Simultaneous Transmission Procedures

This device contains transmitters that may operate simultaneously. Therefore simultaneous transmission analysis is required. Per FCC KDB 447498 D01v05 IV.C.1.iii and IEEE 1528-2013 Section 6.3.4.1.2, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the simultaneous transmitting antennas in a specific a physical test configuration is ≤1.6 W/kg. When standalone SAR is not required to be measured, per FCC KDB 447498 D01v05 4.3.2 2), the following equation must be used to estimate the standalone 1g SAR for simultaneous transmission assessment involving that transmitter.

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

Table 12-1
Estimated SAR

Mode	Frequency	Maximum Allowed Power	Separation Distance (Body)	Estimated SAR (Body)
	[MHz]	[dBm]	[mm]	[W/kg]
Bluetooth	2480	10.00	10	0.210

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

12.3 Head SAR Simultaneous Transmission Analysis

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

Simult Tx	Configuration	GSM 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.333	0.593	**0.926**
	Right Tilt	0.168	0.553	0.721
	Left Cheek	0.297	0.247	0.544
	Left Tilt	0.144	0.248	0.392

Simult Tx	Configuration	GPRS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.460	0.593	**1.053**
	Right Tilt	0.248	0.553	0.801
	Left Cheek	0.433	0.247	0.680
	Left Tilt	0.201	0.248	0.449

Simult Tx	Configuration	GSM 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.148	0.593	**0.741**
	Right Tilt	0.166	0.553	0.719
	Left Cheek	0.405	0.247	0.652
	Left Tilt	0.143	0.248	0.391

Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.215	0.593	**0.808**
	Right Tilt	0.225	0.553	0.778
	Left Cheek	0.529	0.247	0.776
	Left Tilt	0.176	0.248	0.424

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.331	0.593	**0.924**
	Right Tilt	0.173	0.553	0.726
	Left Cheek	0.315	0.247	0.562
	Left Tilt	0.169	0.248	0.417

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.321	0.593	0.914
	Right Tilt	0.326	0.553	0.879
	Left Cheek	0.811	0.247	**1.058**
	Left Tilt	0.299	0.248	0.547

Simult Tx	Configuration	LTE Band 12 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.194	0.593	**0.787**
	Right Tilt	0.097	0.553	0.650
	Left Cheek	0.132	0.247	0.379
	Left Tilt	0.075	0.248	0.323

Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.362	0.593	**0.955**
	Right Tilt	0.183	0.553	0.736
	Left Cheek	0.324	0.247	0.571
	Left Tilt	0.171	0.248	0.419

Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.281	0.593	0.874
	Right Tilt	0.289	0.553	0.842
	Left Cheek	0.652	0.247	**0.899**
	Left Tilt	0.250	0.248	0.498

Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.441	0.593	1.034
	Right Tilt	0.471	0.553	1.024
	Left Cheek	0.856	0.247	**1.103**
	Left Tilt	0.328	0.248	0.576

Simult Tx	Configuration	LTE Band 7 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.339	0.593	0.932
	Right Tilt	0.303	0.553	0.856
	Left Cheek	0.706	0.247	**0.953**
	Left Tilt	0.234	0.248	0.482

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

Simult Tx	Configuration	GSM 850 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 850 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.333	0.313	**0.646**	Head SAR	Right Cheek	0.460	0.313	**0.773**
	Right Tilt	0.168	0.225	0.393		Right Tilt	0.248	0.225	0.473
	Left Cheek	0.297	0.140	0.437		Left Cheek	0.433	0.140	0.573
	Left Tilt	0.144	0.103	0.247		Left Tilt	0.201	0.103	0.304
Simult Tx	Configuration	GSM 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.148	0.313	0.461	Head SAR	Right Cheek	0.215	0.313	0.528
	Right Tilt	0.166	0.225	0.391		Right Tilt	0.225	0.225	0.450
	Left Cheek	0.405	0.140	**0.545**		Left Cheek	0.529	0.140	**0.669**
	Left Tilt	0.143	0.103	0.246		Left Tilt	0.176	0.103	0.279
Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.331	0.313	**0.644**	Head SAR	Right Cheek	0.321	0.313	0.634
	Right Tilt	0.173	0.225	0.398		Right Tilt	0.326	0.225	0.551
	Left Cheek	0.315	0.140	0.455		Left Cheek	0.811	0.140	**0.951**
	Left Tilt	0.169	0.103	0.272		Left Tilt	0.299	0.103	0.402
Simult Tx	Configuration	LTE Band 12 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.194	0.313	**0.507**	Head SAR	Right Cheek	0.362	0.313	**0.675**
	Right Tilt	0.097	0.225	0.322		Right Tilt	0.183	0.225	0.408
	Left Cheek	0.132	0.140	0.272		Left Cheek	0.324	0.140	0.464
	Left Tilt	0.075	0.103	0.178		Left Tilt	0.171	0.103	0.274
Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.281	0.313	0.594	Head SAR	Right Cheek	0.441	0.313	0.754
	Right Tilt	0.289	0.225	0.514		Right Tilt	0.471	0.225	0.696
	Left Cheek	0.652	0.140	**0.792**		Left Cheek	0.856	0.140	**0.996**
	Left Tilt	0.250	0.103	0.353		Left Tilt	0.328	0.103	0.431

Simult Tx	Configuration	LTE Band 7 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.339	0.313	0.652
	Right Tilt	0.303	0.225	0.528
	Left Cheek	0.706	0.140	**0.846**
	Left Tilt	0.234	0.103	0.337

The worst case 5 GHz WIFI reported SAR for each head configuration was considered for simultaneous SAR exclusion via summation of standalone SAR, regardless of whether the WIFI channel has WIFI Hotspot capability, for simplicity to determine compliance. Please note that the actual simultaneous transmission SAR will not exceed the summed levels indicated.

12.4 Body-Worn Simultaneous Transmission Analysis

Table 12-4
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body-Worn at 0.8 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	0.472	0.120	0.592
Back Side	GPRS 850	0.633	0.120	0.753
Back Side	GSM 1900	0.276	0.120	0.396
Back Side	GPRS 1900	0.370	0.120	0.490
Back Side	UMTS 850	0.444	0.120	0.564
Back Side	UMTS 1900	0.402	0.120	0.522
Back Side	LTE Band 12	0.457	0.120	0.577
Back Side	LTE Band 5 (Cell)	0.466	0.120	0.586
Back Side	LTE Band 4 (AWS)	0.684	0.120	**0.804**
Back Side	LTE Band 2 (PCS)	0.427	0.120	0.547
Back Side	LTE Band 7	0.551	0.120	0.671

Table 12-5
Simultaneous Transmission Scenario with 5 GHz WLAN (Body-Worn at 0.8 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	0.472	0.076	0.548
Back Side	GPRS 850	0.633	0.076	0.709
Back Side	GSM 1900	0.276	0.076	0.352
Back Side	GPRS 1900	0.370	0.076	0.446
Back Side	UMTS 850	0.444	0.076	0.520
Back Side	UMTS 1900	0.402	0.076	0.478
Back Side	LTE Band 12	0.457	0.076	0.533
Back Side	LTE Band 5 (Cell)	0.466	0.076	0.542
Back Side	LTE Band 4 (AWS)	0.684	0.076	**0.760**
Back Side	LTE Band 2 (PCS)	0.427	0.076	0.503
Back Side	LTE Band 7	0.551	0.076	0.627

The worst case 5 GHz WIFI reported SAR for each body-worn configuration was considered for simultaneous SAR exclusion via summation of standalone SAR, regardless of whether the WIFI channel has WIFI Hotspot capability, for simplicity to determine compliance. Please note that the actual simultaneous transmission SAR will not exceed the summed levels indicated.

Table 12-6
Simultaneous Transmission Scenario with Bluetooth (Body-Worn at 0.8 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	0.472	0.210	0.682
Back Side	GPRS 850	0.633	0.210	0.843
Back Side	GSM 1900	0.276	0.210	0.486
Back Side	GPRS 1900	0.370	0.210	0.580
Back Side	UMTS 850	0.444	0.210	0.654
Back Side	UMTS 1900	0.402	0.210	0.612
Back Side	LTE Band 12	0.457	0.210	0.667
Back Side	LTE Band 5 (Cell)	0.466	0.210	0.676
Back Side	LTE Band 4 (AWS)	0.684	0.210	**0.894**
Back Side	LTE Band 2 (PCS)	0.427	0.210	0.637
Back Side	LTE Band 7	0.551	0.210	0.761

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

12.5 Hotspot SAR Simultaneous Transmission Analysis

Per FCC KDB Publication 941225 D06v01, the devices edges with antennas more than 2.5 cm from edge are not required to be evaluated for SAR ("-").

Table 12-7
Simultaneous Transmission Scenario (2.4 GHz Hotspot)

Simult Tx	Configuration	GPRS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.633	0.120	0.753
	Front	0.664	0.155	**0.819**
	Top	-	0.086	0.086
	Bottom	0.363	-	0.363
	Right	0.560	-	0.560
	Left	-	0.051	0.051

Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.370	0.120	0.490
	Front	0.349	0.155	**0.504**
	Top	-	0.086	0.086
	Bottom	0.145	-	0.145
	Right	-	-	0.000
	Left	0.344	0.051	0.395

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.444	0.120	0.564
	Front	0.491	0.155	**0.646**
	Top	-	0.086	0.086
	Bottom	0.268	-	0.268
	Right	0.378	-	0.378
	Left	-	0.051	0.051

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.402	0.120	0.522
	Front	0.388	0.155	0.543
	Top	-	0.086	0.086
	Bottom	0.230	-	0.230
	Right	-	-	0.000
	Left	0.555	0.051	**0.606**

Simult Tx	Configuration	LTE Band 12 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.457	0.120	0.577
	Front	0.450	0.155	**0.605**
	Top	-	0.086	0.086
	Bottom	0.139	-	0.139
	Right	0.457	-	0.457
	Left	-	0.051	0.051

Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.466	0.120	0.586
	Front	0.433	0.155	**0.588**
	Top	-	0.086	0.086
	Bottom	0.265	-	0.265
	Right	0.393	-	0.393
	Left	-	0.051	0.051

Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.684	0.120	0.804
	Front	0.662	0.155	**0.817**
	Top	-	0.086	0.086
	Bottom	0.205	-	0.205
	Right	-	-	0.000
	Left	0.471	0.051	0.522

Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.427	0.120	0.547
	Front	0.435	0.155	0.590
	Top	-	0.086	0.086
	Bottom	0.240	-	0.240
	Right	-	-	0.000
	Left	0.593	0.051	**0.644**

Simult Tx	Configuration	LTE Band 7 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.551	0.120	0.671
	Front	0.788	0.155	**0.943**
	Top	-	0.086	0.086
	Bottom	0.425	-	0.425
	Right	-	-	0.000
	Left	0.489	0.051	0.540

Table 12-8
Simultaneous Transmission Scenario (5 GHz Hotspot)

Simult Tx	Configuration	GPRS 850 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.633	0.067	0.700
	Front	0.664	0.044	**0.708**
	Top	-	0.058	0.058
	Bottom	0.363	-	0.363
	Right	0.560	-	0.560
	Left	-	0.091	0.091

Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.370	0.067	**0.437**
	Front	0.349	0.044	0.393
	Top	-	0.058	0.058
	Bottom	0.145	-	0.145
	Right	-	-	0.000
	Left	0.344	0.091	0.435

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.444	0.067	0.511
	Front	0.491	0.044	**0.535**
	Top	-	0.058	0.058
	Bottom	0.268	-	0.268
	Right	0.378	-	0.378
	Left	-	0.091	0.091

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.402	0.067	0.469
	Front	0.388	0.044	0.432
	Top	-	0.058	0.058
	Bottom	0.230	-	0.230
	Right	-	-	0.000
	Left	0.555	0.091	**0.646**

Simult Tx	Configuration	LTE Band 12 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.457	0.067	**0.524**
	Front	0.450	0.044	0.494
	Top	-	0.058	0.058
	Bottom	0.139	-	0.139
	Right	0.457	-	0.457
	Left	-	0.091	0.091

Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.466	0.067	**0.533**
	Front	0.433	0.044	0.477
	Top	-	0.058	0.058
	Bottom	0.265	-	0.265
	Right	0.393	-	0.393
	Left	-	0.091	0.091

Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.684	0.067	**0.751**
	Front	0.662	0.044	0.706
	Top	-	0.058	0.058
	Bottom	0.205	-	0.205
	Right	-	-	0.000
	Left	0.471	0.091	0.562

Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.427	0.067	0.494
	Front	0.435	0.044	0.479
	Top	-	0.058	0.058
	Bottom	0.240	-	0.240
	Right	-	-	0.000
	Left	0.593	0.091	**0.684**

Simult Tx	Configuration	LTE Band 7 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.551	0.067	0.618
	Front	0.788	0.044	**0.832**
	Top	-	0.058	0.058
	Bottom	0.425	-	0.425
	Right	-	-	0.000
	Left	0.489	0.091	0.580

12.6 Simultaneous Transmission Conclusion

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

13 SAR MEASUREMENT VARIABILITY

13.1 Measurement Variability

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

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

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

Table 13-1
Head SAR Measurement Variability Results

HEAD VARIABILITY RESULTS														
Band	FREQUENCY		Mode/Band	Service	Side	Test Position	Measured SAR (1g)	1st Repeated SAR (1g)	Ratio	2nd Repeated SAR (1g)	Ratio	3rd Repeated SAR (1g)	Ratio
	MHz	Ch.					(W/kg)	(W/kg)		(W/kg)		(W/kg)	
1900	1880.00	9400	UMTS 1900	RMC	Left	Cheek	0.804	0.799	1.01	N/A	N/A	N/A	N/A
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population					Head 1.6 W/kg (mW/g) averaged over 1 gram								

13.2 Measurement Uncertainty

The measured SAR was <1.5 W/kg for all frequency bands. Therefore, per KDB Publication 865664 D01v01, the extended measurement uncertainty analysis per IEEE 1528-2003 was not required.

14 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Gigatronics	80701A	(0.05-18GHz) Power Sensor	10/30/2014	Annual	10/30/2015	1833460
Agilent	E8257D	(250kHz-20GHz) Signal Generator	4/15/2014	Annual	4/15/2015	MY45470194
Agilent	8753E	(30kHz-6GHz) Network Analyzer	12/30/2014	Annual	12/30/2015	JP38020182
Agilent	8594A	(9kHz-2.9GHz) Spectrum Analyzer	N/A	N/A	N/A	3051A00187
Agilent	8648D	(9kHz-4GHz) Signal Generator	4/15/2014	Annual	4/15/2015	3629U00687
SPEAG	D1765V2	1765 MHz SAR Dipole	5/7/2014	Annual	5/7/2015	1008
SPEAG	D1900V2	1900 MHz SAR Dipole	4/9/2014	Annual	4/9/2015	5d141
SPEAG	D1900V2	1900 MHz SAR Dipole	7/23/2014	Annual	7/23/2015	5d149
SPEAG	D2450V2	2450 MHz SAR Dipole	2/24/2014	Annual	2/24/2015	882
SPEAG	D2600V2	2600 MHz SAR Dipole	10/20/2014	Annual	10/20/2015	1071
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A
SPEAG	D5GHzV2	5 GHz SAR Dipole	2/26/2014	Annual	2/26/2015	1120
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
SPEAG	D750V3	750 MHz Dipole	3/17/2014	Annual	3/17/2015	1054
SPEAG	D835V2	835 MHz SAR Dipole	7/24/2014	Annual	7/24/2015	4d133
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433978
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Rohde & Schwarz	CMU200	Base Station Simulator	4/24/2014	Annual	4/24/2015	836371/0079
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/26/2014	Annual	2/26/2015	665
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/17/2014	Annual	3/17/2015	1334
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/11/2014	Annual	4/11/2015	1368
SPEAG	DAE4	Dasy Data Acquisition Electronics	5/14/2014	Annual	5/14/2015	859
SPEAG	DAE4	Dasy Data Acquisition Electronics	9/18/2014	Annual	9/18/2015	1364
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/12/2014	Annual	8/12/2015	1322
SPEAG	DAE4	Dasy Data Acquisition Electronics	12/12/2014	Annual	12/12/2015	1415
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/6/2014	Annual	5/6/2015	1070
Mitutoyo	CD-6"CSX	Digital Caliper	5/8/2014	Biennial	5/8/2016	13264162
Fisher Scientific	15-077-960	Digital Thermometer	12/4/2013	Biennial	12/4/2015	130764551
Agilent	E4438C	ESG Vector Signal Generator	4/25/2014	Annual	4/25/2015	MY42082385
Control Company	61220-416	Long-Stem Thermometer	4/29/2014	Biennial	4/29/2016	111331323
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
MiniCircuits	SLP-2400+	Low Pass Filter	CBT	N/A	CBT	R8979500903
Mini-Circuits	NLP-1200+	Low Pass Filter DC to 1000 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Agilent	N9020A	MXA Signal Analyzer	10/27/2014	Annual	10/27/2015	US46470561
Agilent	N5182A	MXG Vector Signal Generator	4/15/2014	Annual	4/15/2015	MY47420800
Agilent	N5182A	MXG Vector Signal Generator	4/15/2014	Annual	4/15/2015	MY47420651
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
Anritsu	ML2495A	Power Meter	10/31/2013	Biennial	10/31/2015	941001
Anritsu	ML2495A	Power Meter	10/31/2013	Biennial	10/31/2015	1039008
Anritsu	ML2469A	Power Meter	3/14/2014	Annual	3/14/2015	1306009
Anritsu	MA2411B	Pulse Power Sensor	11/17/2014	Annual	11/17/2015	1207364
Anritsu	MA2411B	Pulse Power Sensor	11/17/2014	Annual	11/17/2015	1126066
Anritsu	MT8820C	Radio Communication Analyzer	11/18/2014	Annual	11/18/2015	6201300731
Tektronix	RSA6114A	Real Time Spectrum Analyzer	4/16/2014	Annual	4/16/2015	B010177
SPEAG	D5GHzV2	SAR Dipole	9/25/2014	Annual	9/25/2015	1191
SPEAG	ES3DV3	SAR Probe	2/25/2014	Annual	2/25/2015	3258
SPEAG	ES3DV3	SAR Probe	3/19/2014	Annual	3/19/2015	3209
SPEAG	EX3DV4	SAR Probe	12/12/2014	Annual	12/12/2015	3920
SPEAG	ES3DV3	SAR Probe	5/15/2014	Annual	5/15/2015	3263
SPEAG	ES3DV2	SAR Probe	8/19/2014	Annual	8/19/2015	3022
SPEAG	ES3DV3	SAR Probe	9/24/2014	Annual	9/24/2015	3288
SPEAG	ES3DV3	SAR Probe	12/16/2014	Annual	12/16/2015	3334
COMTECH	AR85729-5/5759B	Solid State Amplifier	CBT	N/A	CBT	M3W1A00-1002
COMTech	AR85729-5	Solid State Amplifier	CBT	N/A	CBT	M1S5A00-009
Agilent	8753ES	S-Parameter Network Analyzer	5/22/2014	Annual	5/22/2015	US39170118
Fisher Scientific	S97611	Thermometer	4/12/2013	Biennial	4/12/2015	130219303
Seekonk	NC-100	Torque Wrench	3/18/2014	Biennial	3/18/2016	22313
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	3/18/2014	Biennial	3/18/2016	N/A
Gigatronics	8651A	Universal Power Meter	10/30/2014	Annual	10/30/2015	8650319
Anritsu	MA24106A	USB Power Sensor	5/15/2014	Annual	5/15/2015	1244524
Anritsu	MA24106A	USB Power Sensor	5/15/2014	Annual	5/15/2015	1244512
Control Company	36934-158	Wall-Mounted Thermometer	4/29/2014	Biennial	4/29/2016	122014488
Agilent	E5515C	Wireless Communications Test Set	11/20/2014	Biennial	11/20/2016	GB43163447
Rohde & Schwarz	CMW500	Radio Communication Tester	10/3/2014	Annual	10/3/2015	100976
Rohde & Schwarz	CMW500	Radio Communication Tester	9/4/2014	Annual	9/4/2015	109366

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

15 MEASUREMENT UNCERTAINTIES

Applicable for frequencies less than 3000 MHz.

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

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

Applicable for frequencies up to 6 GHz.

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

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

16 CONCLUSION

16.1 Measurement Conclusion

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

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

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APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFH950; Type: Portable Handset; Serial: 1501-3

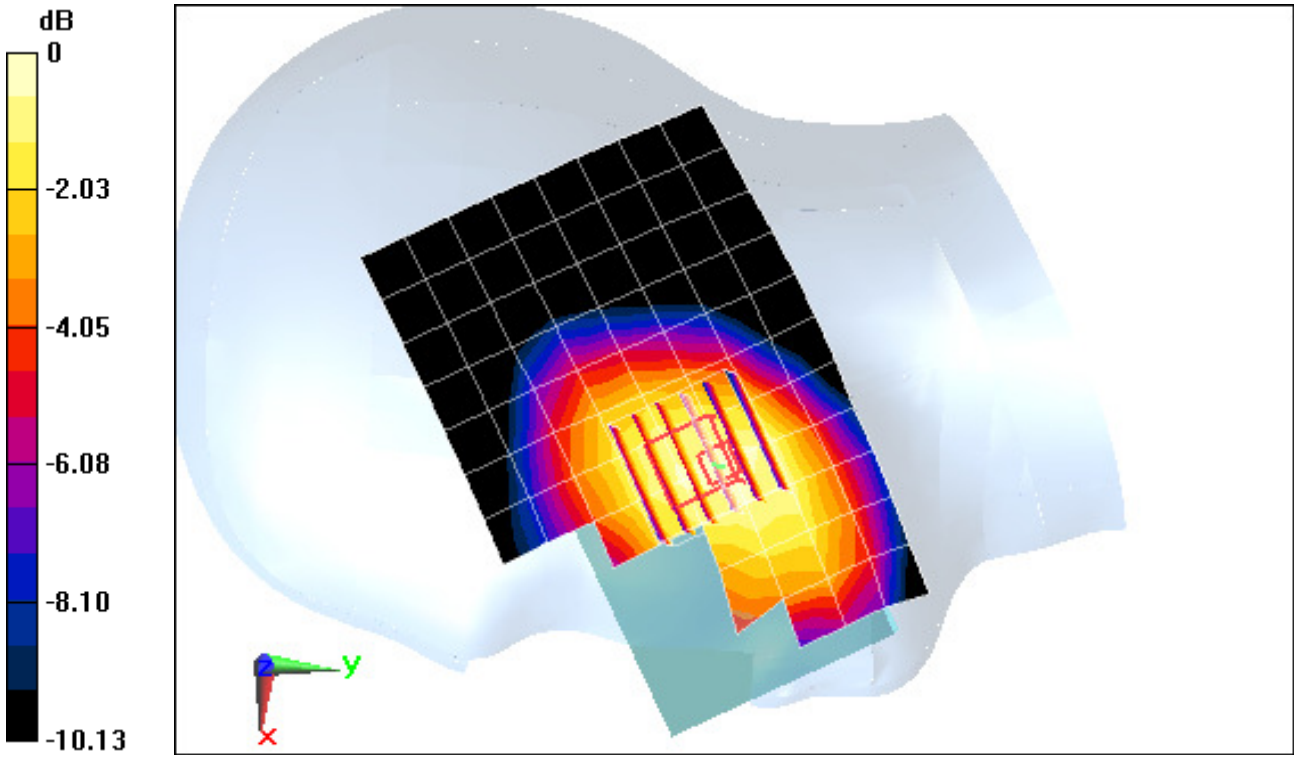
Communication System: UID 0, GSM GPRS; 2 Tx slots; Frequency: 836.6 MHz;Duty Cycle: 1:4.15
Medium: 835 Head Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.898 S/m; ε_r = 40.782; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 01-16-2015; Ambient Temp: 23.4°C; Tissue Temp: 23.3°C

Probe: ES3DV2 - SN3022; ConvF(6.18, 6.18, 6.18); Calibrated: 8/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/12/2014
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Mode: GPRS 850, Right Head, Cheek, Mid.ch, 2 Tx slots

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.60 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 0.523 W/kg
SAR(1 g) = 0.411 W/kg



0 dB = 0.453 W/kg = -3.44 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFH950; Type: Portable Handset; Serial: 1501-3

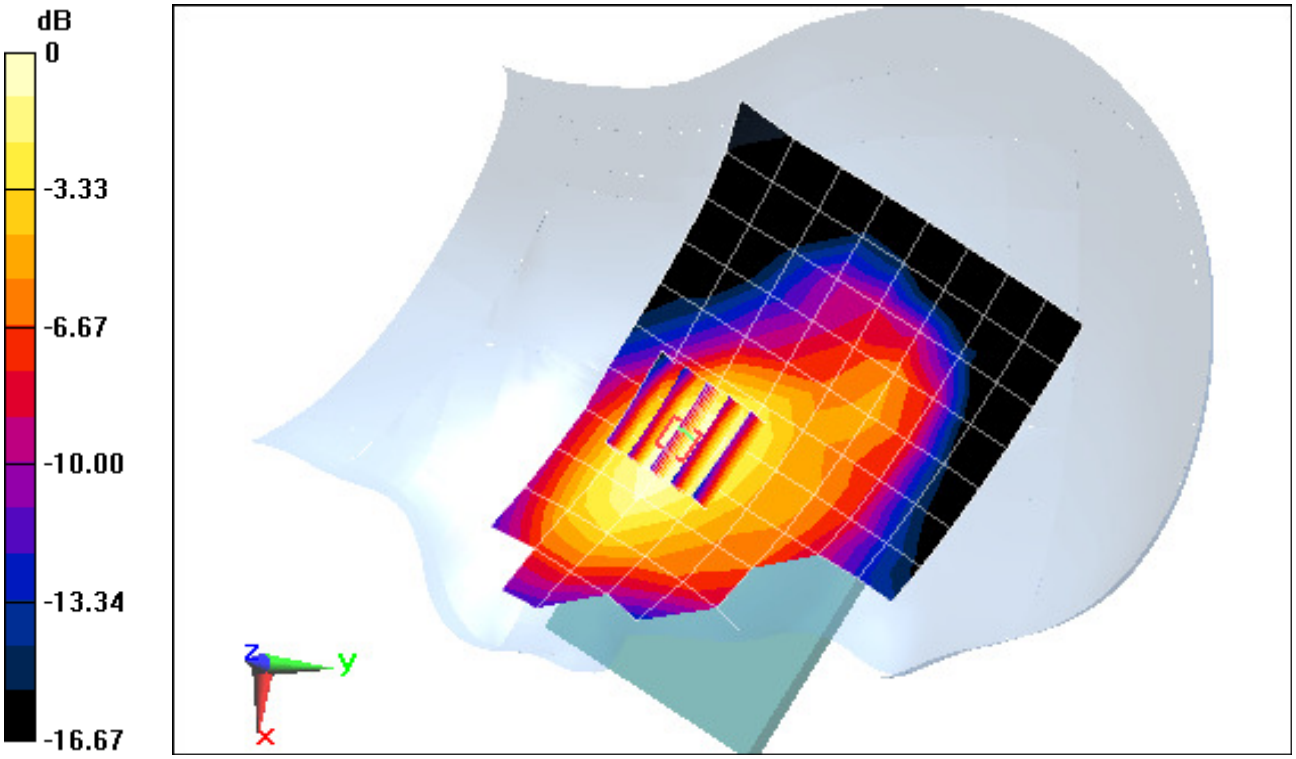
Communication System: UID 0, GSM GPRS; 2 Tx slots; Frequency: 1880 MHz;Duty Cycle: 1:4.15
Medium: 1900 Head Medium parameters used:
f = 1880 MHz; σ = 1.424 S/m; ε_r = 40.437; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 01-13-2015; Ambient Temp: 23.9°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3258; ConvF(5.04, 5.04, 5.04); Calibrated: 2/25/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/26/2014
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.72 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 0.798 W/kg
SAR(1 g) = 0.518 W/kg



0 dB = 0.591 W/kg = -2.28 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFH950; Type: Portable Handset; Serial: 1501-3

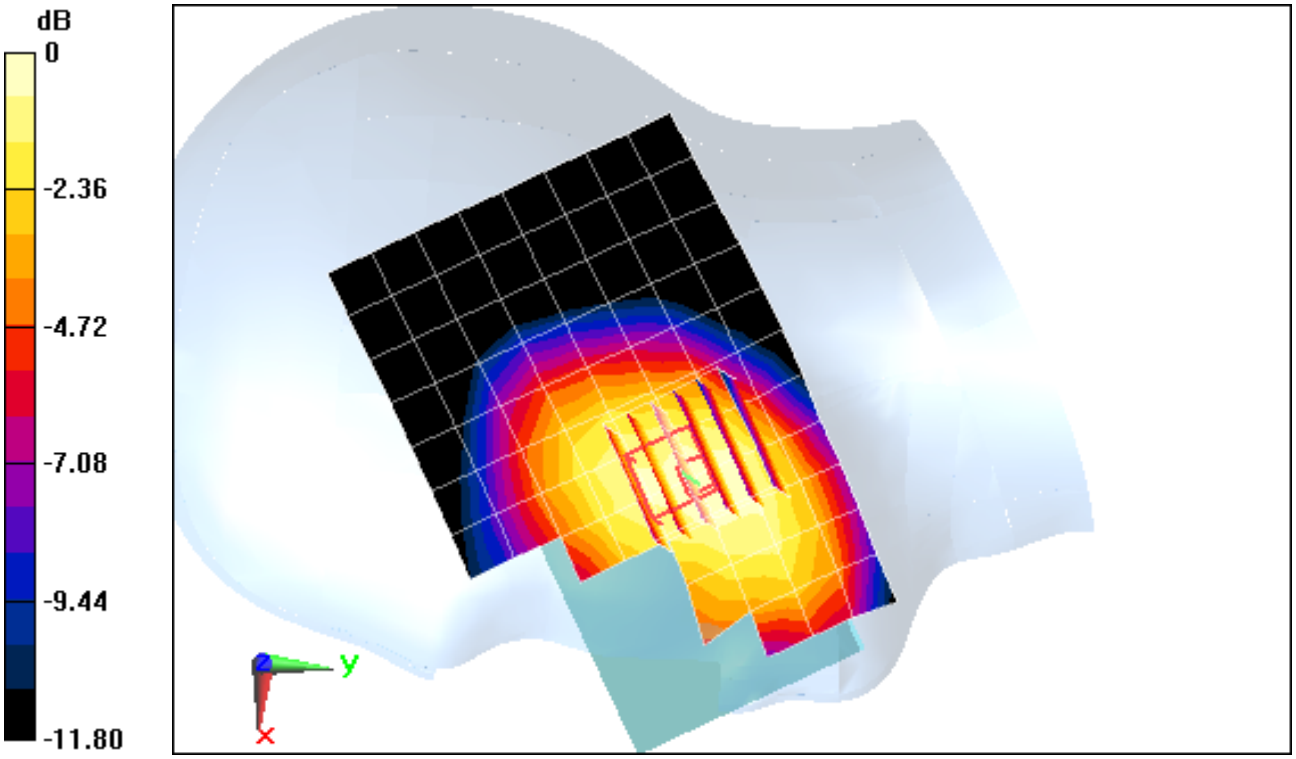
Communication System: UID 0, UMTS; Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium: 835 Head Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.898 S/m; ε_r = 40.782; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 01-16-2015; Ambient Temp: 23.4°C; Tissue Temp: 23.3°C

Probe: ES3DV2 - SN3022; ConvF(6.18, 6.18, 6.18); Calibrated: 8/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/12/2014
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.53 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.409 W/kg
SAR(1 g) = 0.318 W/kg



0 dB = 0.348 W/kg = -4.58 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFH950; Type: Portable Handset; Serial: 1501-3

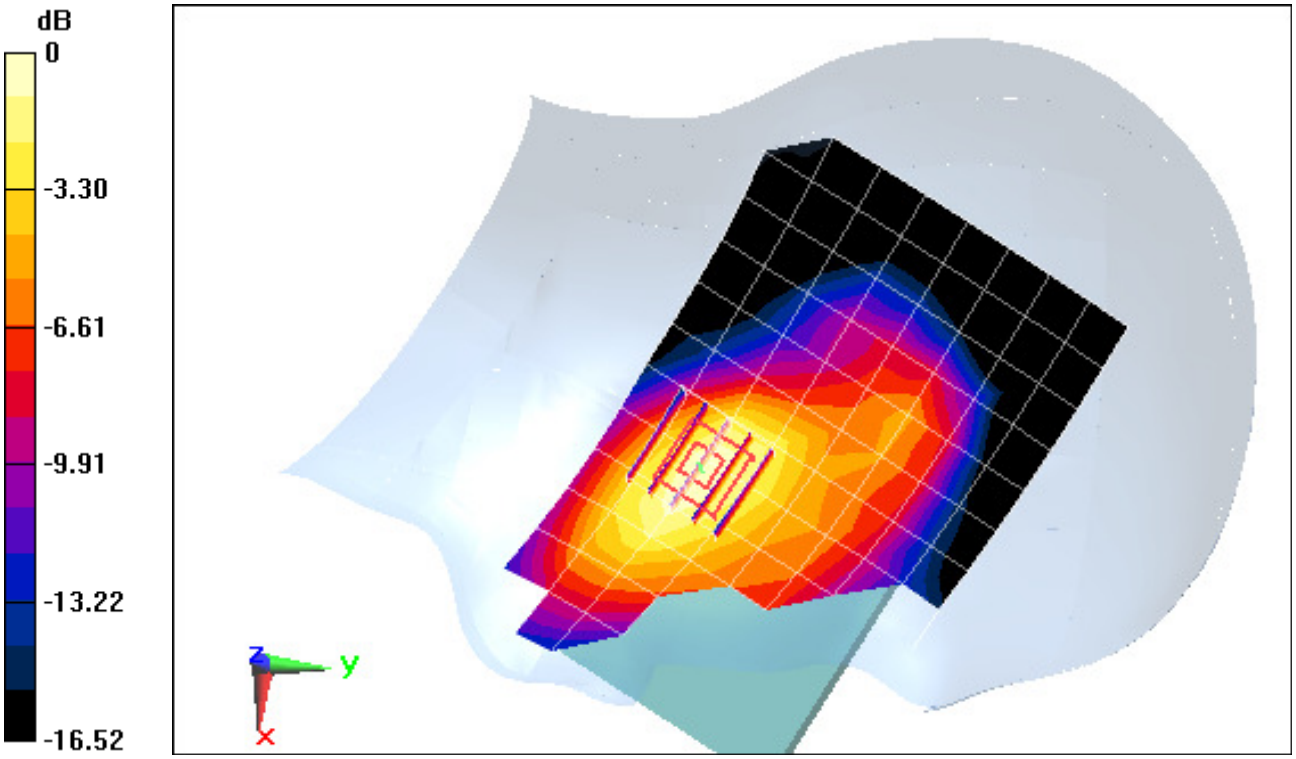
Communication System: UID 0, UMTS; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used:
f = 1880 MHz; σ = 1.424 S/m; ε_r = 40.437; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 01-13-2015; Ambient Temp: 23.9°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3258; ConvF(5.04, 5.04, 5.04); Calibrated: 2/25/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/26/2014
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.87 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.23 W/kg
SAR(1 g) = 0.804 W/kg



0 dB = 0.933 W/kg = -0.30 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFH950; Type: Portable Handset; Serial: 1501-2

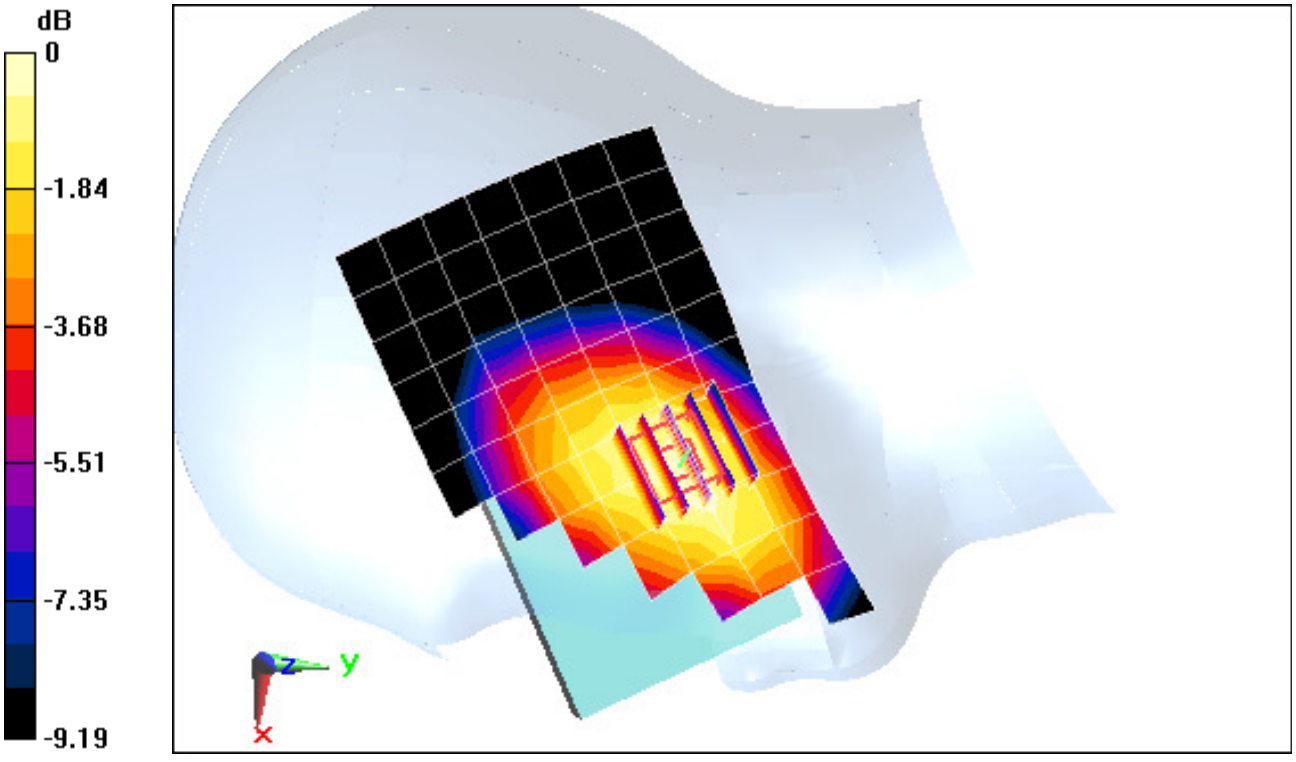
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz;Duty Cycle: 1:1
Medium: 750 Head Medium parameters used (interpolated):
f = 707.5 MHz; σ = 0.861 S/m; ε_r = 41.507; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 01-19-2015; Ambient Temp: 23.1°C; Tissue Temp: 21.4°C

Probe: ES3DV3 - SN3288; ConvF(6.81, 6.81, 6.81); Calibrated: 9/24/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1364; Calibrated: 9/18/2014
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1797
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

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

Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.03 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 0.250 W/kg
SAR(1 g) = 0.191 W/kg



0 dB = 0.211 W/kg = -6.76 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFH950; Type: Portable Handset; Serial: 1501-2

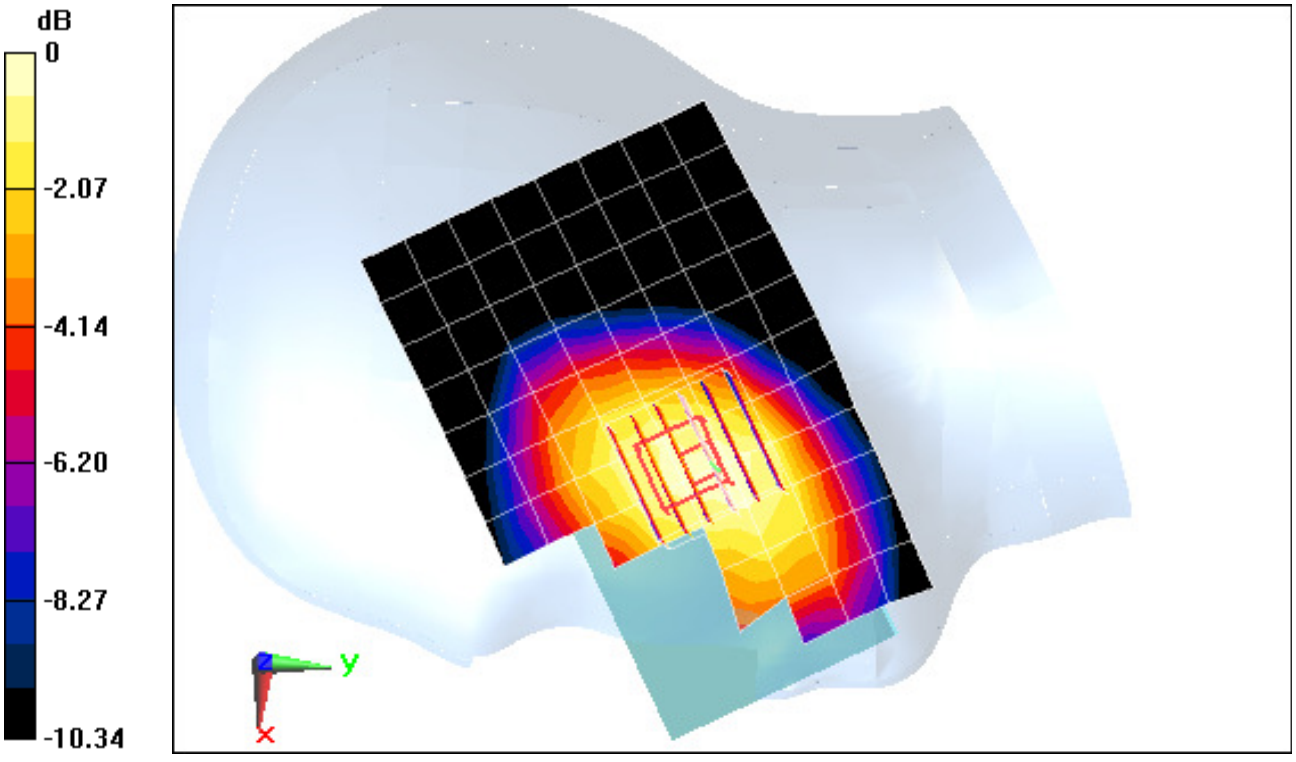
Communication System: UID 0, LTE Band 5 (Cell.); Frequency: 836.5 MHz;Duty Cycle: 1:1
Medium: 835 Head Medium parameters used (interpolated):
f = 836.5 MHz; σ = 0.898 S/m; ε_r = 40.783; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 01-16-2015; Ambient Temp: 23.4°C; Tissue Temp: 23.3°C

Probe: ES3DV2 - SN3022; ConvF(6.18, 6.18, 6.18); Calibrated: 8/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/12/2014
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 5 (Cell.), Right Head, Cheek, Mid.ch,
10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.09 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.444 W/kg
SAR(1 g) = 0.346 W/kg



0 dB = 0.379 W/kg = -4.21 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFH950; Type: Portable Handset; Serial: 1501-2

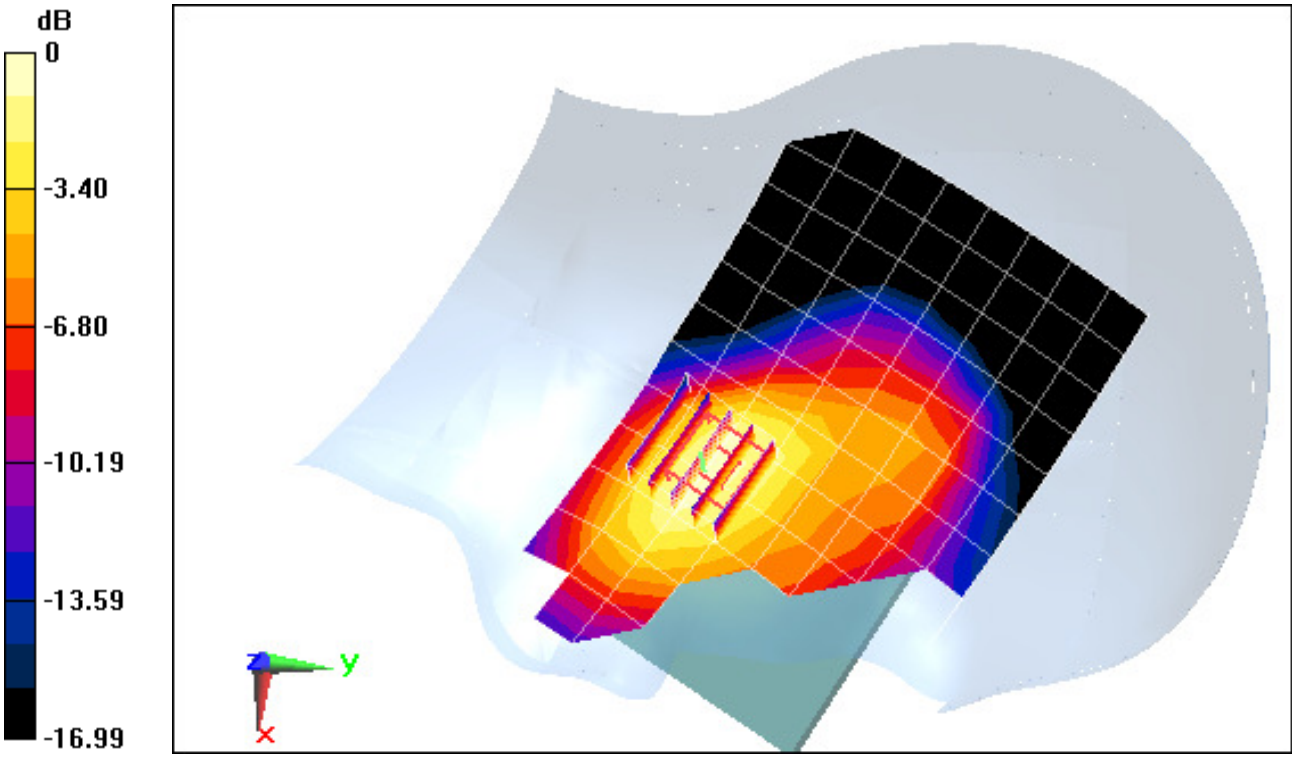
Communication System: UID 0, LTE Band 4; Frequency: 1732.5 MHz;Duty Cycle: 1:1
Medium: 1750 Head Medium parameters used (interpolated):
f = 1732.5 MHz; σ = 1.322 S/m; ε_r = 38.55; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 01-16-2015; Ambient Temp: 23.3°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3209; ConvF(5.24, 5.24, 5.24); Calibrated: 3/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/17/2014
Phantom: SAM Right; Type: SAM; Serial: 1757
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 4 (AWS), Left Head, Cheek, Mid.ch,
20 MHz Bandwidth, QPSK, 50 RB, 25 RB Offset

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.92 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 0.936 W/kg
SAR(1 g) = 0.616 W/kg



0 dB = 0.716 W/kg = -1.45 dBW/kg

DUT: ZNFH950; Type: Portable Handset; Serial: 1501-2

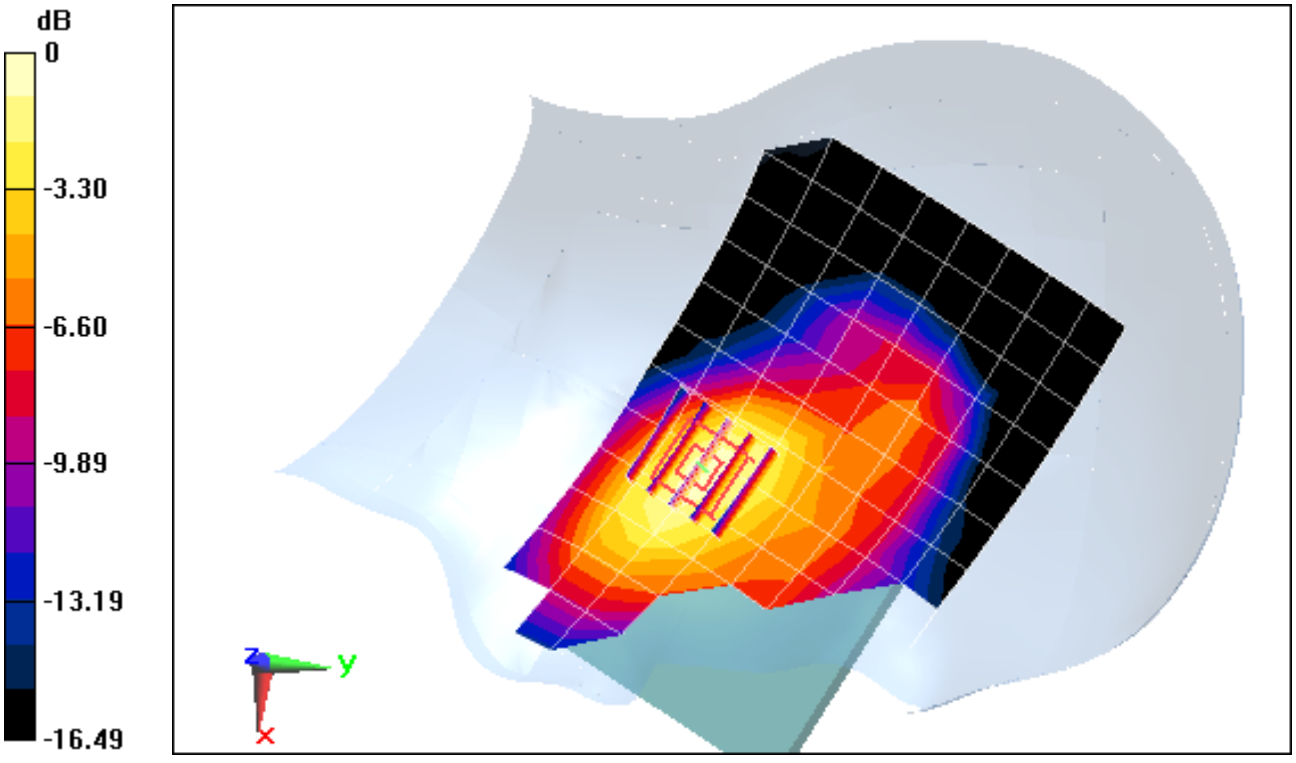
Communication System: UID 0, LTE Band 2 (PCS); Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used:
f = 1880 MHz; σ = 1.424 S/m; ε_r = 40.437; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 01-13-2015; Ambient Temp: 23.9°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3258; ConvF(5.04, 5.04, 5.04); Calibrated: 2/25/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/26/2014
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 2 (PCS), Left Head, Cheek, Mid.ch, QPSK,
20 MHz Bandwidth, 50 RB, 0 RB Offset

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.85 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.24 W/kg
SAR(1 g) = 0.801 W/kg



0 dB = 0.924 W/kg = -0.34 dBW/kg

DUT: ZNFH950; Type: Portable Handset; Serial: 1501-2

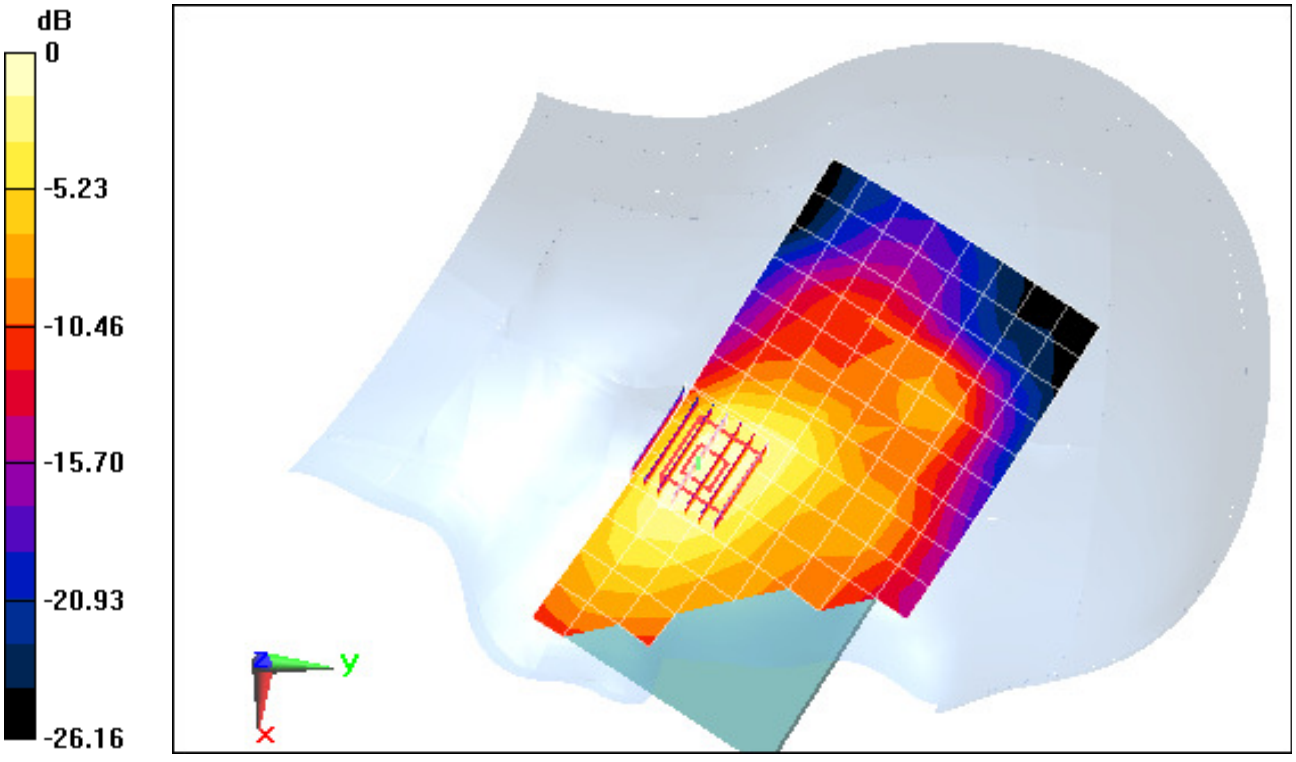
Communication System: UID 0, LTE Band 7; Frequency: 2535 MHz;Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used (interpolated):
f = 2535 MHz; σ = 1.946 S/m; ε_r = 40.14; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 01-20-2015; Ambient Temp: 21.9°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3209; ConvF(4.38, 4.38, 4.38); Calibrated: 3/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/17/2014
Phantom: SAM Right; Type: SAM; Serial: 1757
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 7, Left Head, Cheek, Mid.ch, QPSK,
20 MHz Bandwidth, 1 RB, 50 RB Offset

Area Scan (9x17x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 21.97 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.30 W/kg
SAR(1 g) = 0.693 W/kg



0 dB = 0.870 W/kg = -0.60 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFH950; Type: Portable Handset; Serial: 1301-2

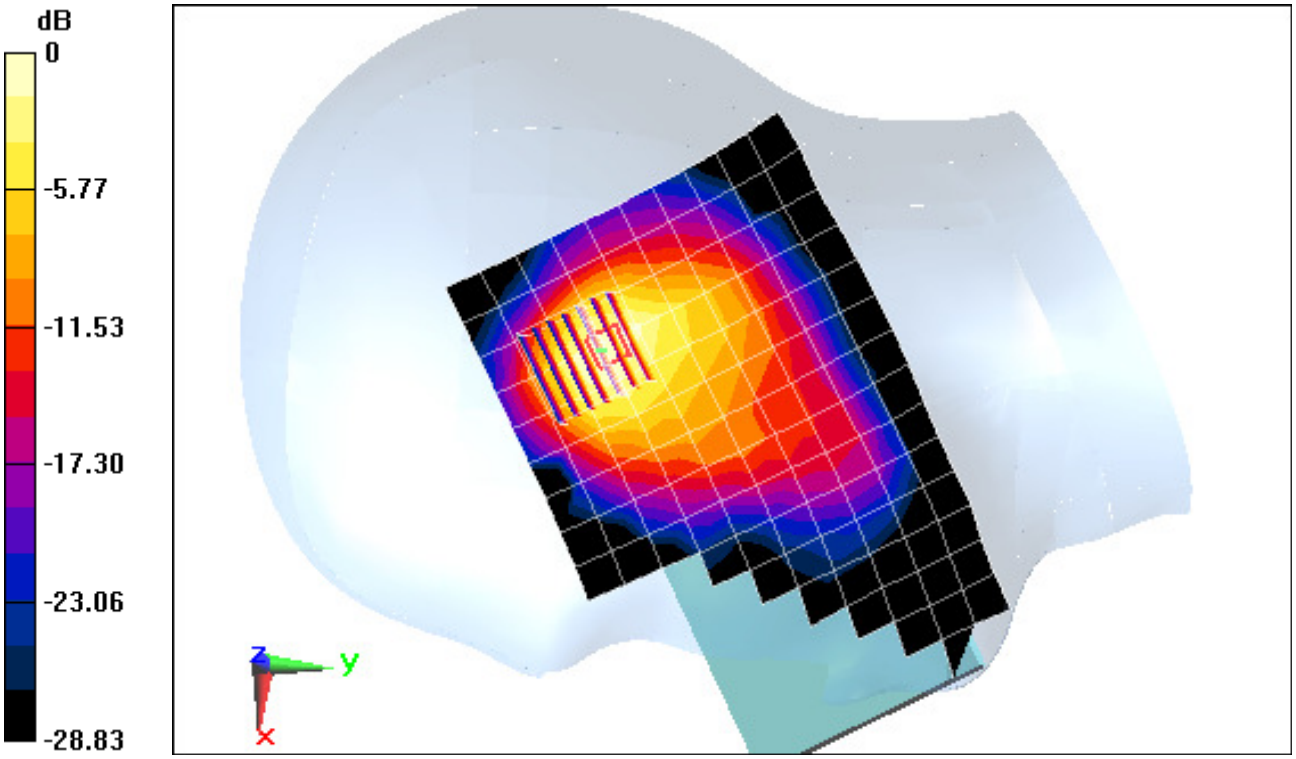
Communication System: UID 0, IEEE 802.11b; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used (interpolated):
f = 2437 MHz; σ = 1.841 S/m; ε_r = 40.686; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 01-13-2015; Ambient Temp: 22.7°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3334; ConvF(4.51, 4.51, 4.51); Calibrated: 12/16/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 12/12/2014
Phantom: Sub Twin Sam v5.0; Type: QD000P40CD; Serial: TP:1626
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Mode: IEEE 802.11b, Right Head, Cheek, Ch 06, 1 Mbps

Area Scan (11x18x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 17.61 V/m; Power Drift = 0.15 dB
Peak SAR (extrapolated) = 1.14 W/kg
SAR(1 g) = 0.498 W/kg



0 dB = 0.652 W/kg = -1.86 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFH950; Type: Portable Handset; Serial: 1301-2

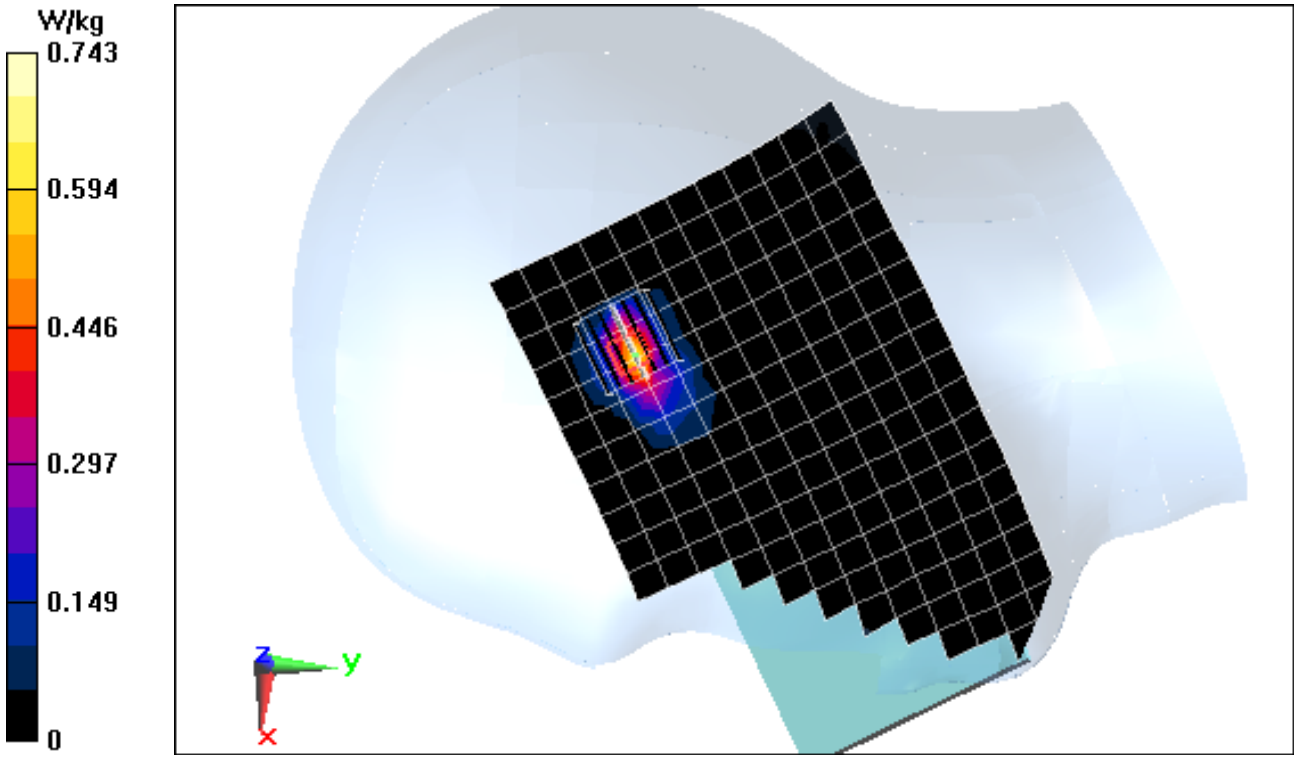
Communication System: UID 0, IEEE 802.11a; Frequency: 5320 MHz;Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
f = 5320 MHz; σ = 4.575 S/m; ε_r = 35.543; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 01-22-2015; Ambient Temp: 23.9°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN3920; ConvF(4.69, 4.69, 4.69); Calibrated: 12/12/2014;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 4/11/2014
Phantom: SAM with CRP v5.0; Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Mode: IEEE 802.11a, 5.3 GHz, Right Head, Cheek, Ch 64, 6 Mbps

Area Scan (13x22x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio = 1.4
Reference Value = 8.824 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 1.29 W/kg
SAR(1 g) = 0.301 W/kg



DUT: ZNFH950; Type: Portable Handset; Serial: 1501-3

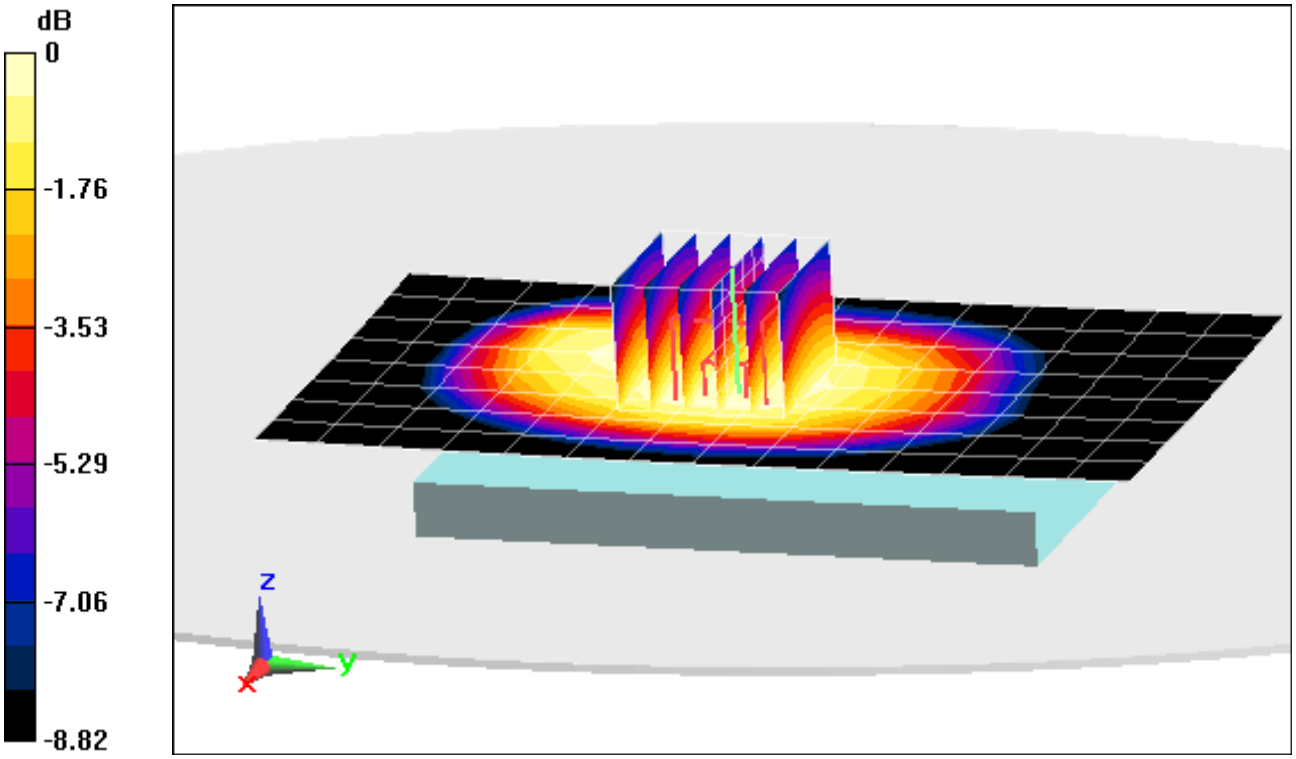
Communication System: UID 0, GSM GPRS; 2 Tx slots; Frequency: 836.6 MHz;Duty Cycle: 1:4.15
Medium: 835 Body Medium parameters used (interpolated):
f = 836.6 MHz; σ = 1.005 S/m; ε_r = 53.272; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 0.8 cm

Test Date: 01-15-2015; Ambient Temp: 23.3°C; Tissue Temp: 22.0°C

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

Mode: GPRS 850, Body SAR, Back side, Mid.ch, 2 Tx Slots

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.52 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 0.716 W/kg
SAR(1 g) = 0.566 W/kg



0 dB = 0.619 W/kg = -2.08 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFH950; Type: Portable Handset; Serial: 1501-3

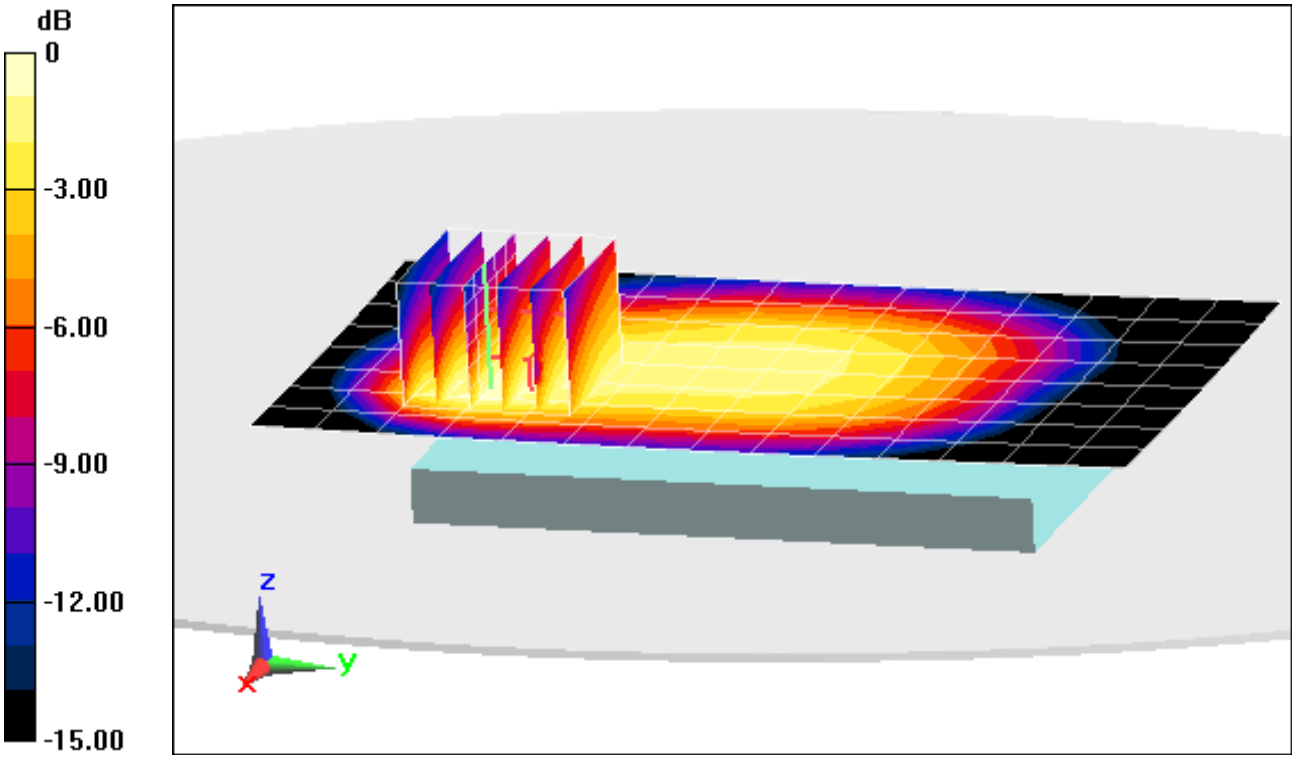
Communication System: UID 0, GSM GPRS; 2 Tx slots; Frequency: 836.6 MHz;Duty Cycle: 1:4.15
Medium: 835 Body Medium parameters used (interpolated):
f = 836.6 MHz; σ = 1.005 S/m; ε_r = 53.272; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 0.8 cm

Test Date: 01-15-2015; Ambient Temp: 23.3°C; Tissue Temp: 22.0°C

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

Mode: GPRS 850, Body SAR, Front side, Mid.ch, 2 Tx Slots

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.74 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.898 W/kg
SAR(1 g) = 0.593 W/kg



0 dB = 0.683 W/kg = -1.66 dBW/kg

DUT: ZNFH950; Type: Portable Handset; Serial: 1501-3

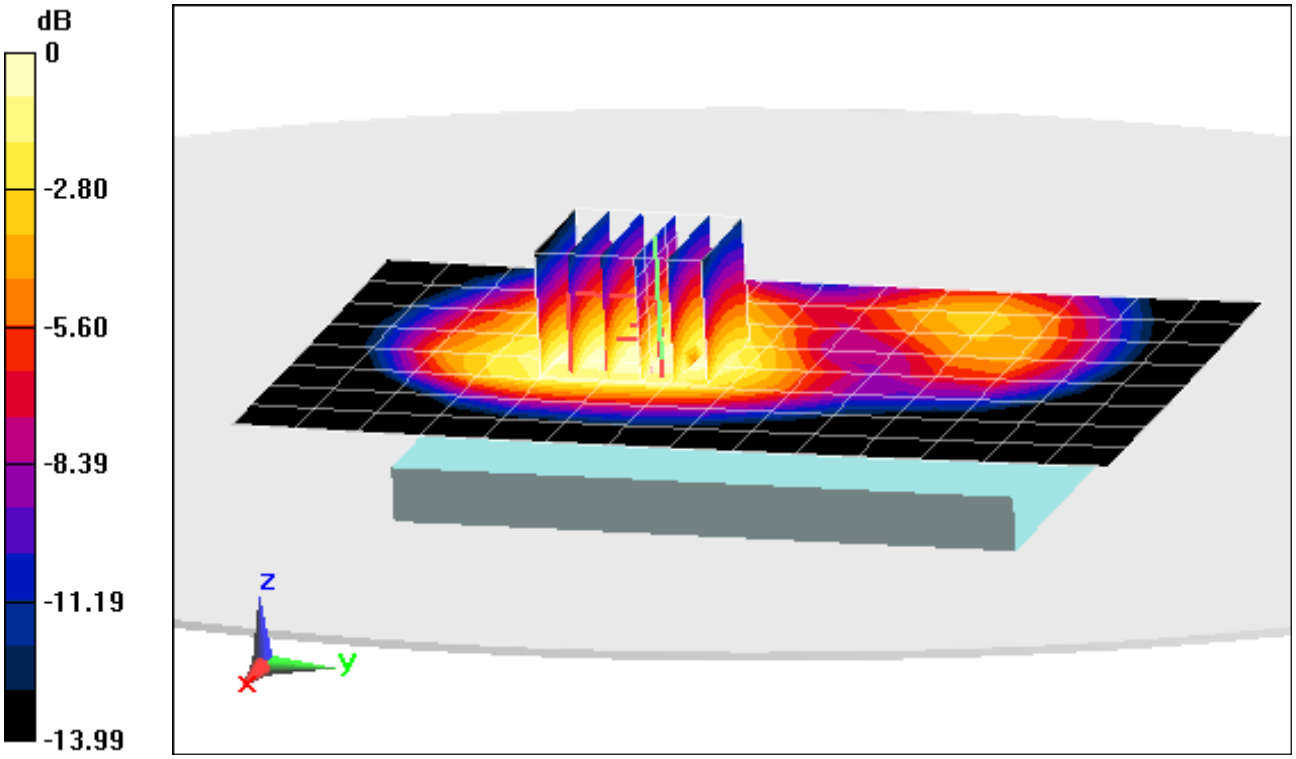
Communication System: UID 0, GSM GPRS; 2 Tx slots; Frequency: 1880 MHz;Duty Cycle: 1:4.15
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.535 S/m; ε_r = 51.997; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 0.8 cm

Test Date: 01-12-2015; Ambient Temp: 20.6°C; Tissue Temp: 21.2°C

Probe: ES3DV2 - SN3022; ConvF(4.49, 4.49, 4.49); Calibrated: 8/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/12/2014
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Mode: GPRS 1900, Body SAR, Back side, Mid.ch, 2 Tx Slots

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.25 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.532 W/kg
SAR(1 g) = 0.362 W/kg



0 dB = 0.422 W/kg = -3.75 dBW/kg

DUT: ZNFH950; Type: Portable Handset; Serial: 1501-3

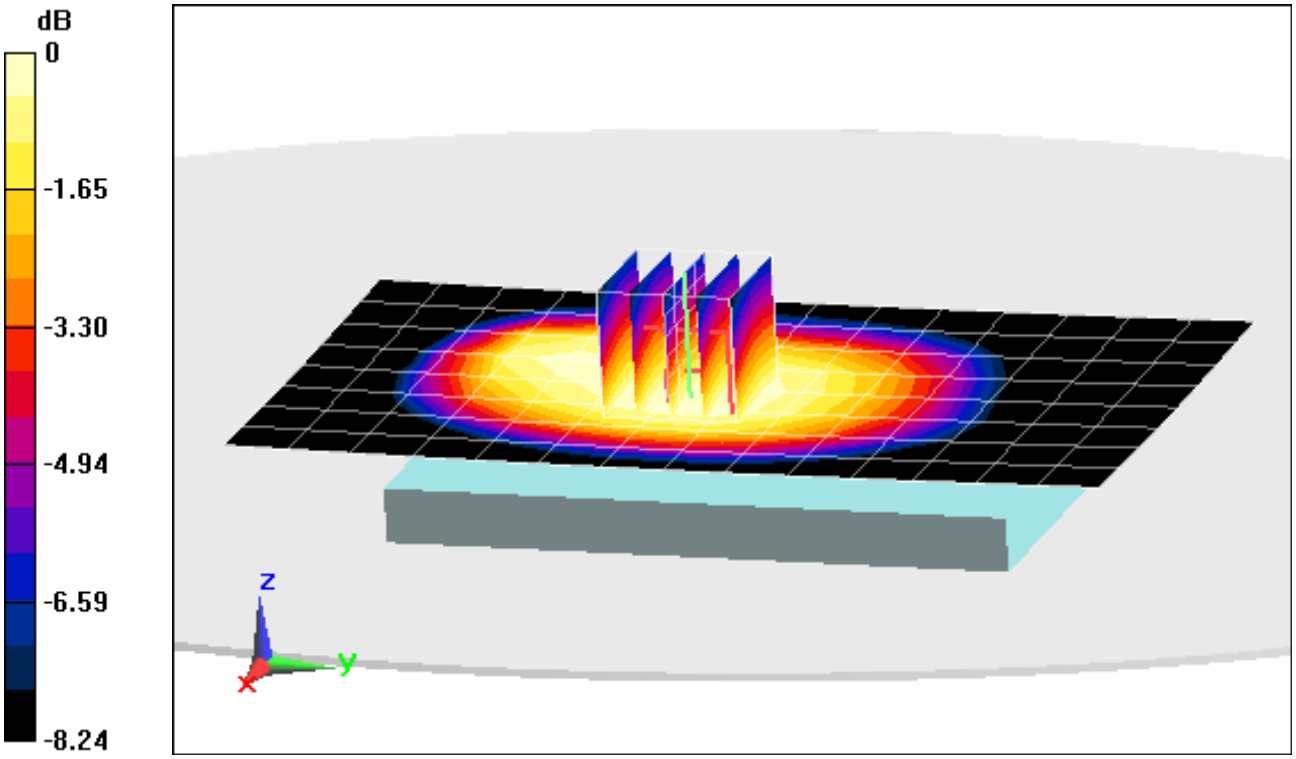
Communication System: UID 0, UMTS; Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 836.6 MHz; σ = 1.005 S/m; ε_r = 53.272; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 0.8 cm

Test Date: 01-15-2015; Ambient Temp: 23.3°C; Tissue Temp: 22.0°C

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

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.66 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.536 W/kg
SAR(1 g) = 0.426 W/kg



0 dB = 0.467 W/kg = -3.31 dBW/kg

DUT: ZNFH950; Type: Portable Handset; Serial: 1501-3

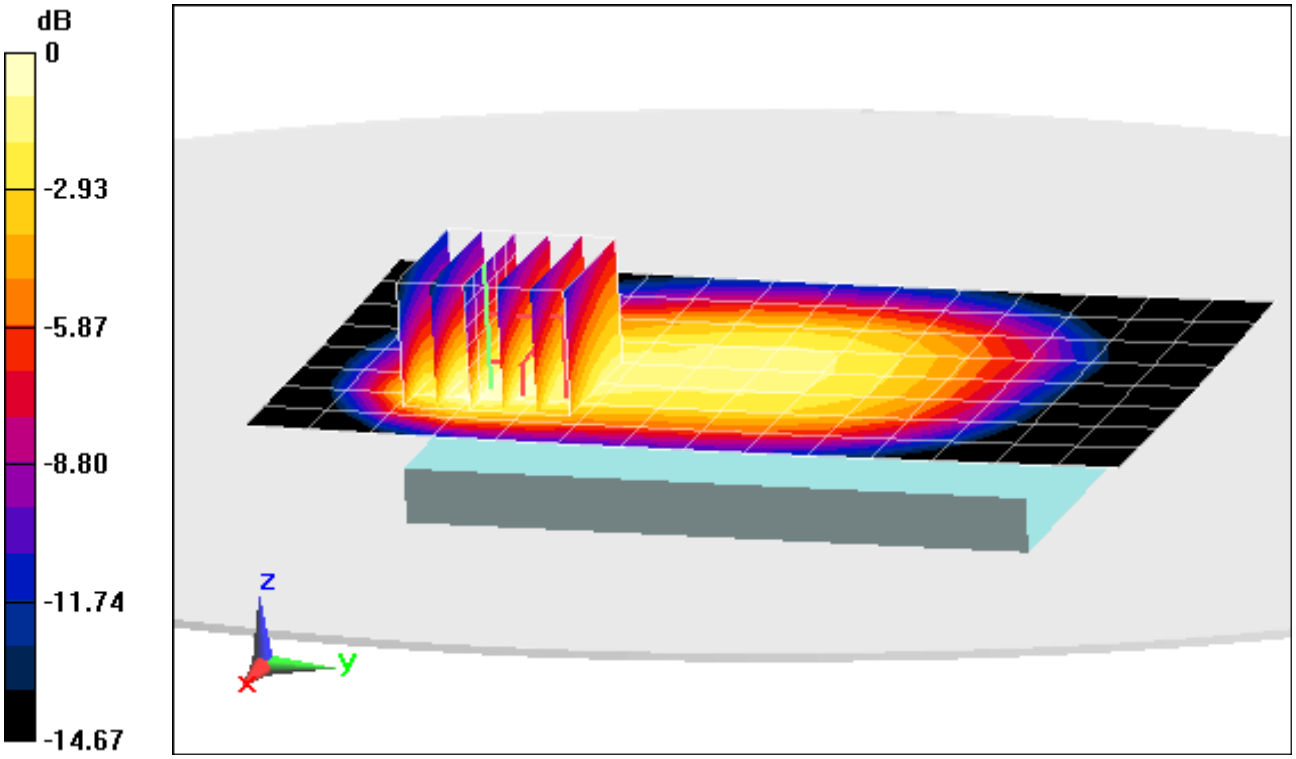
Communication System: UID 0, UMTS; Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 836.6 MHz; σ = 1.005 S/m; ε_r = 53.272; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 0.8 cm

Test Date: 01-15-2015; Ambient Temp: 23.3°C; Tissue Temp: 22.0°C

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

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.84 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.720 W/kg
SAR(1 g) = 0.471 W/kg



0 dB = 0.545 W/kg = -2.64 dBW/kg

DUT: ZNFH950; Type: Portable Handset; Serial: 1501-3

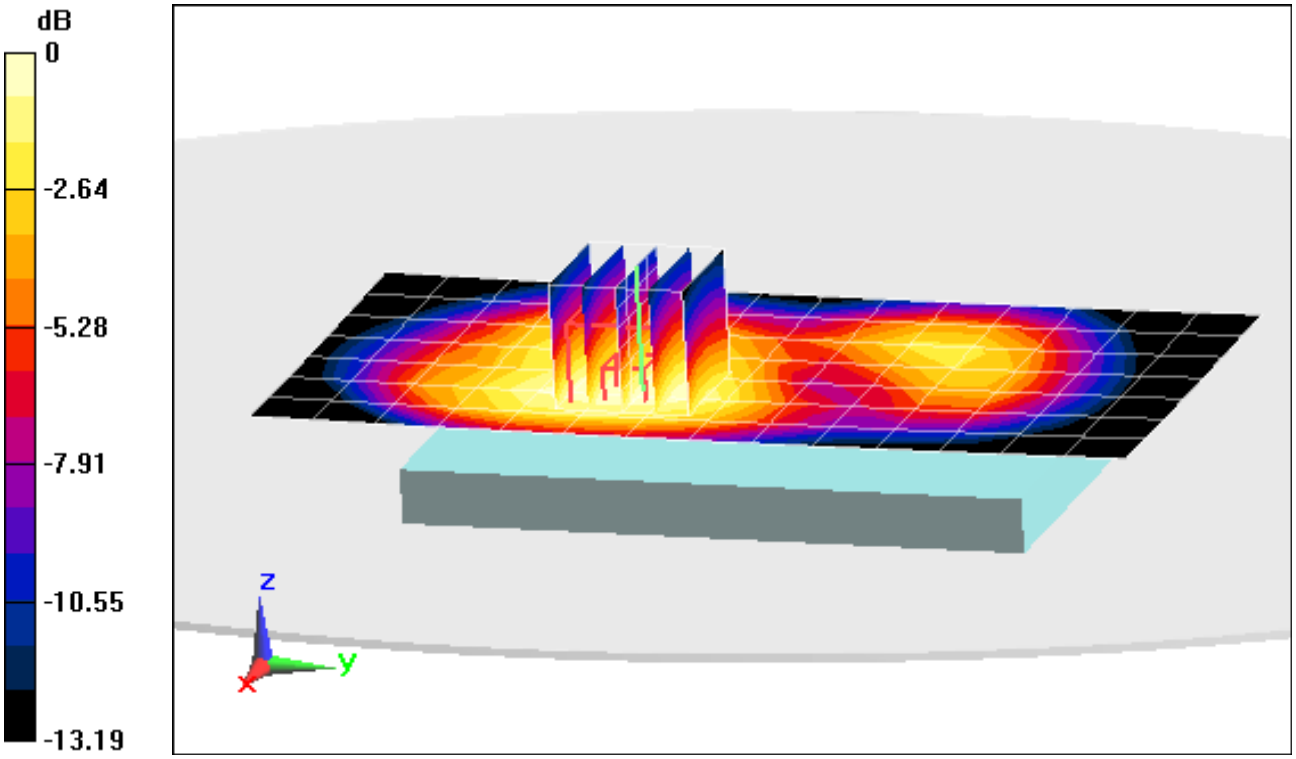
Communication System: UID 0, UMTS; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.535 S/m; ε_r = 51.997; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 0.8 cm

Test Date: 01-12-2015; Ambient Temp: 20.6°C; Tissue Temp: 21.2°C

Probe: ES3DV2 - SN3022; ConvF(4.49, 4.49, 4.49); Calibrated: 8/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/12/2014
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

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

Area Scan (8x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.91 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 0.579 W/kg
SAR(1 g) = 0.398 W/kg



0 dB = 0.458 W/kg = -3.39 dBW/kg

DUT: ZNFH950; Type: Portable Handset; Serial: 1501-3

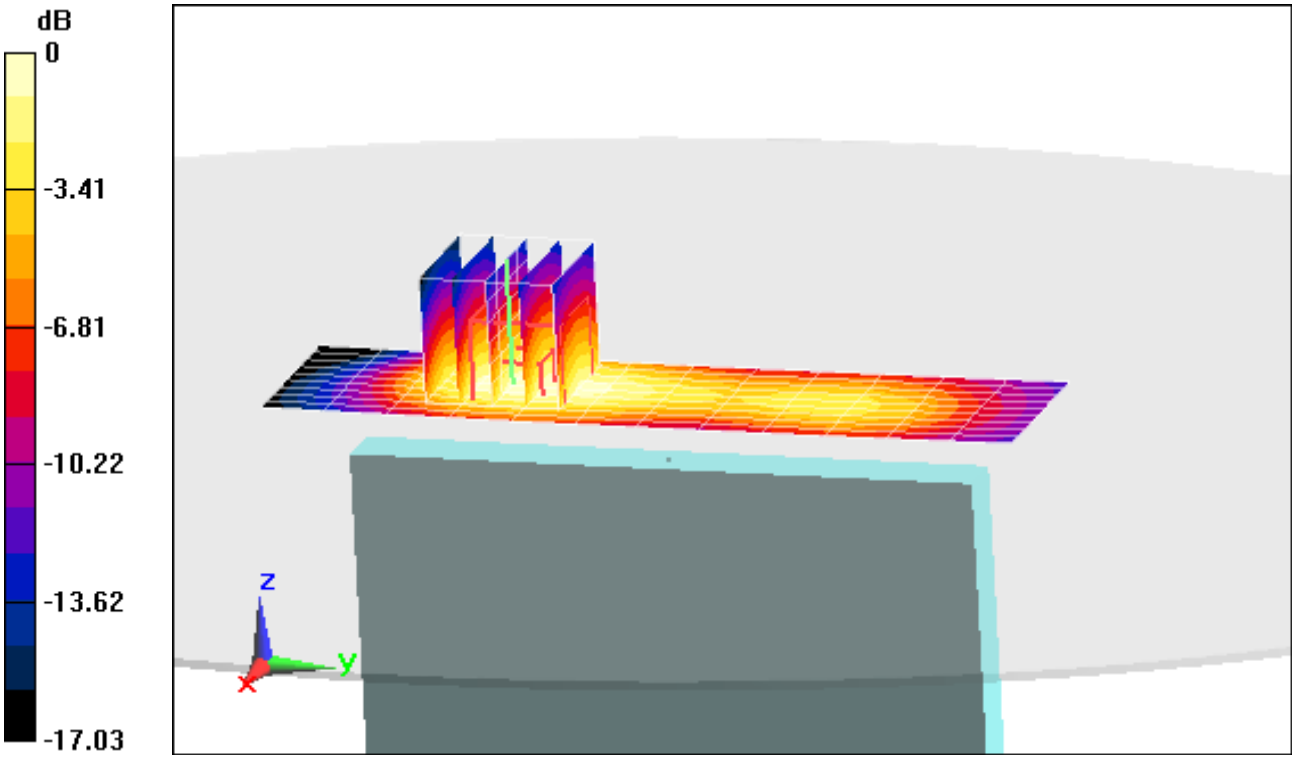
Communication System: UID 0, UMTS; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.535 S/m; ε_r = 51.997; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 01-12-2015; Ambient Temp: 20.6°C; Tissue Temp: 21.2°C

Probe: ES3DV2 - SN3022; ConvF(4.49, 4.49, 4.49); Calibrated: 8/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/12/2014
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Mode: UMTS 1900, Body SAR, Left Edge, Mid.ch

Area Scan (10x13x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.24 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.872 W/kg
SAR(1 g) = 0.550 W/kg



0 dB = 0.655 W/kg = -1.84 dBW/kg

DUT: ZNFH950; Type: Portable Handset; Serial: 1501-2

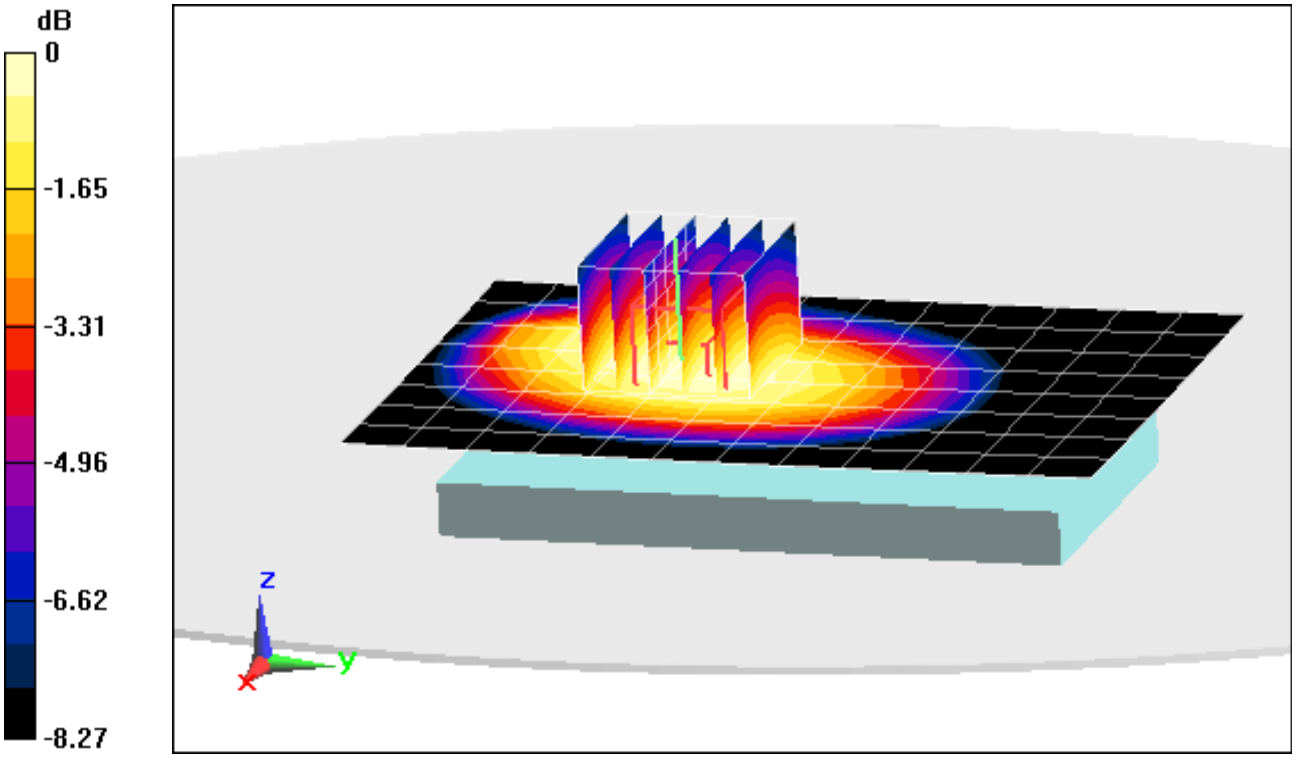
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz;Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 707.5 MHz; σ = 0.926 S/m; ε_r = 54.69; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 0.8 cm

Test Date: 01-15-2015; Ambient Temp: 23.1°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3209; ConvF(6.16, 6.16, 6.16); Calibrated: 3/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/17/2014
Phantom: ELI Front; Type: QDOVA002AA; Serial: TP:1202
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

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

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.69 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.563 W/kg
SAR(1 g) = 0.451 W/kg



0 dB = 0.492 W/kg = -3.08 dBW/kg

DUT: ZNFH950; Type: Portable Handset; Serial: 1501-2

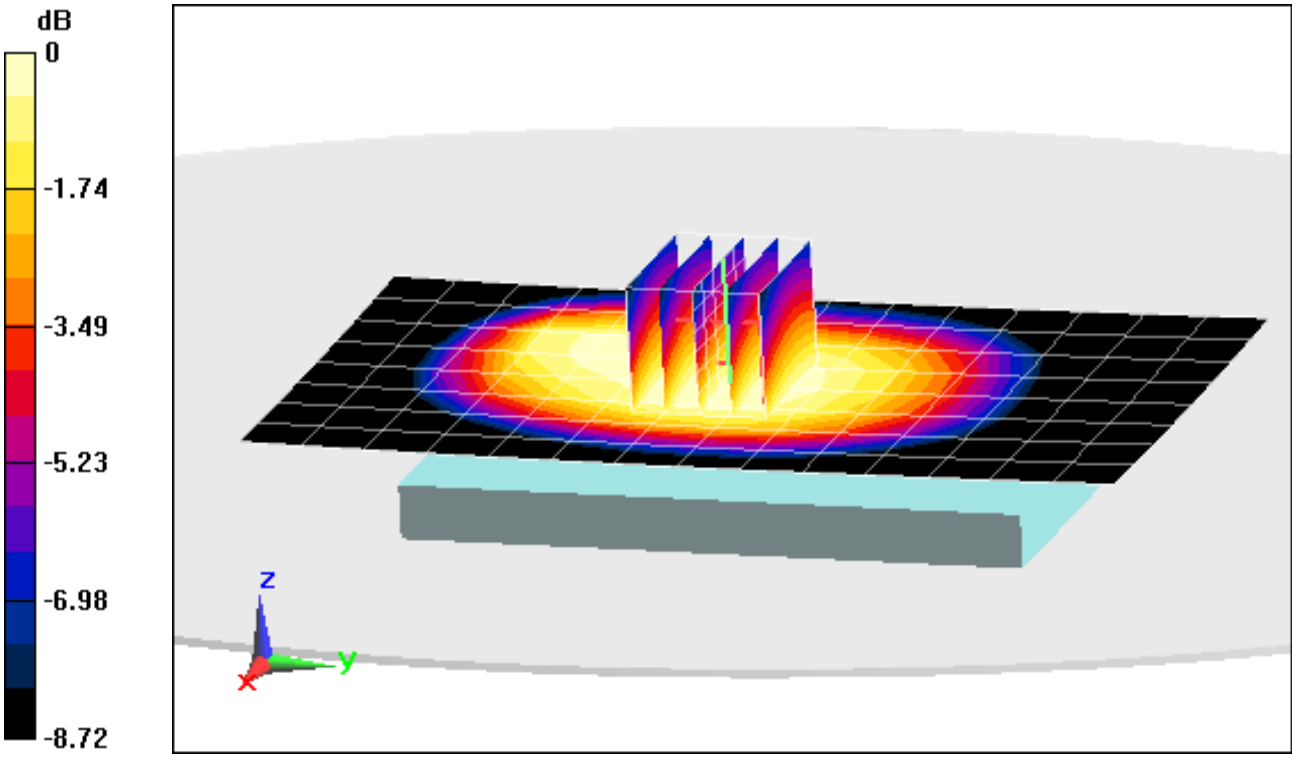
Communication System: UID 0, LTE Band 5; Frequency: 836.5 MHz;Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 836.5 MHz; σ = 1.005 S/m; ε_r = 53.273; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 0.8 cm

Test Date: 01-15-2015; Ambient Temp: 23.3°C; Tissue Temp: 22.0°C

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

Mode: LTE Band 5 (Cell.), Body SAR, Back side, Mid.ch,
10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.71 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 0.558 W/kg
SAR(1 g) = 0.445 W/kg



0 dB = 0.486 W/kg = -3.13 dBW/kg

DUT: ZNFH950; Type: Portable Handset; Serial: 1501-2

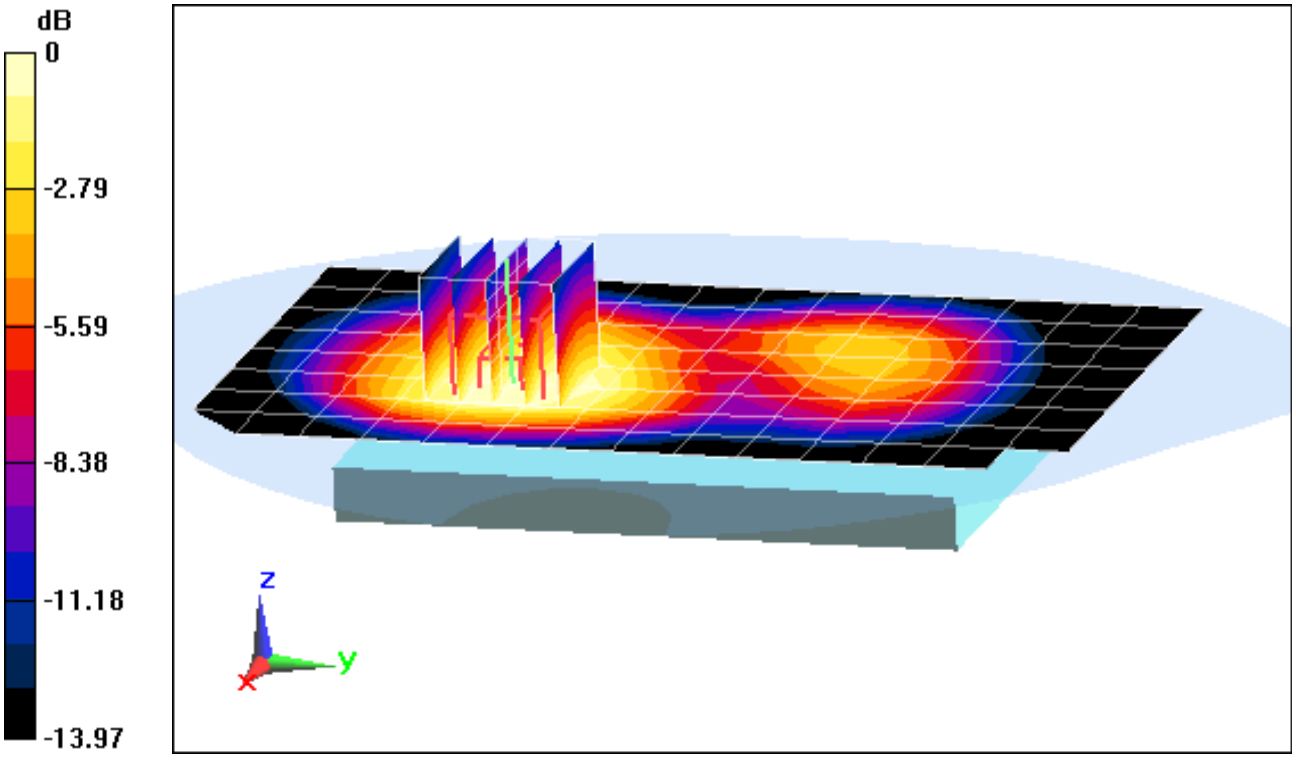
Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz;Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
f = 1732.5 MHz; σ = 1.461 S/m; ε_r = 50.875; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 0.8 cm

Test Date: 01-15-2015; Ambient Temp: 23.4°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3263; ConvF(4.98, 4.98, 4.98); Calibrated: 5/15/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/14/2014
Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 4 (AWS), Body SAR, Back side, Mid.ch,
20 MHz Bandwidth, QPSK, 50 RB, 25 RB Offset

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.29 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.946 W/kg
SAR(1 g) = 0.646 W/kg



0 dB = 0.742 W/kg = -1.30 dBW/kg

DUT: ZNFH950; Type: Portable Handset; Serial: 1501-2

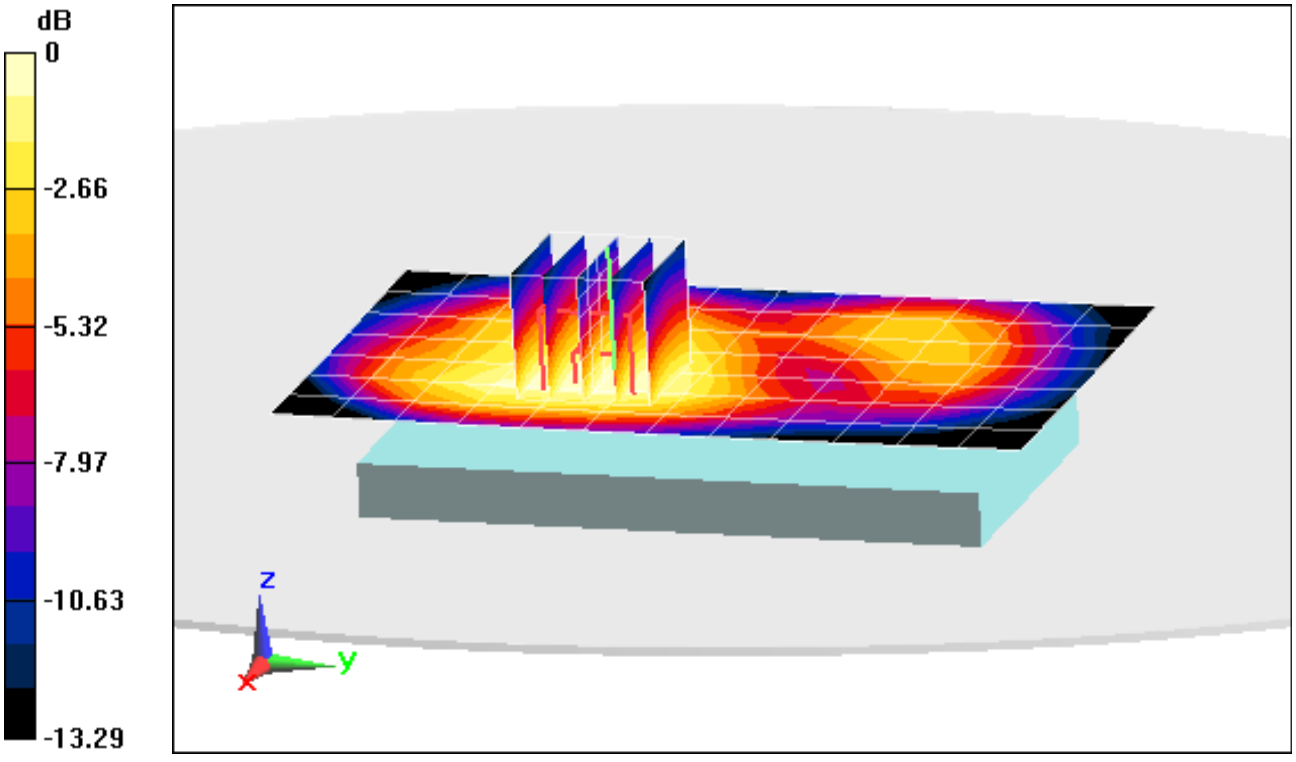
Communication System: UID 0, LTE Band 2 (PCS); Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.557 S/m; ε_r = 51.922; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 0.8 cm

Test Date: 01-12-2015; Ambient Temp: 20.6°C; Tissue Temp: 21.2°C

Probe: ES3DV2 - SN3022; ConvF(4.49, 4.49, 4.49); Calibrated: 8/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/12/2014
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

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

Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 17.30 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.606 W/kg
SAR(1 g) = 0.418 W/kg



0 dB = 0.482 W/kg = -3.17 dBW/kg

DUT: ZNFH950; Type: Portable Handset; Serial: 1501-2

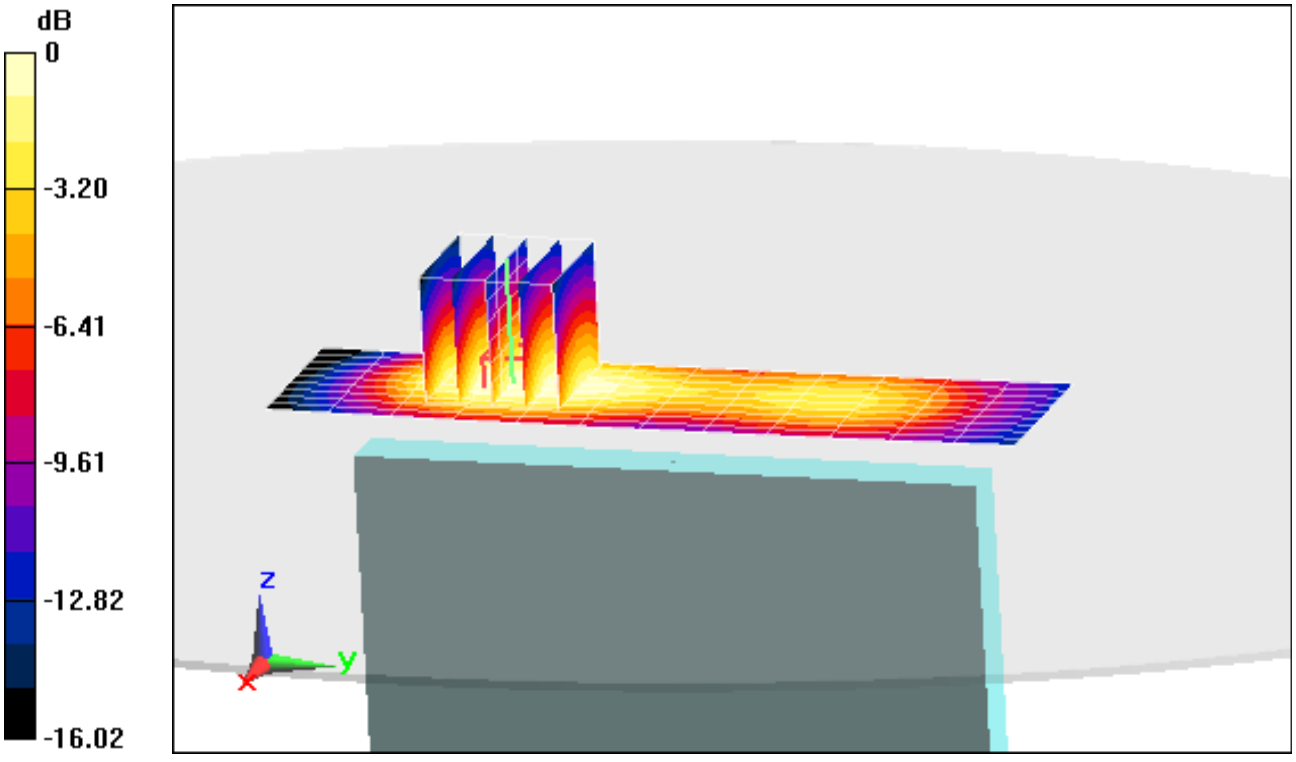
Communication System: UID 0, LTE Band 2 (PCS); Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.557 S/m; ε_r = 51.922; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 01-12-2015; Ambient Temp: 20.6°C; Tissue Temp: 21.2°C

Probe: ES3DV2 - SN3022; ConvF(4.49, 4.49, 4.49); Calibrated: 8/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/12/2014
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

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

Area Scan (10x13x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.13 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 0.920 W/kg
SAR(1 g) = 0.581 W/kg



0 dB = 0.695 W/kg = -1.58 dBW/kg

DUT: ZNFH950; Type: Portable Handset; Serial: 1501-23

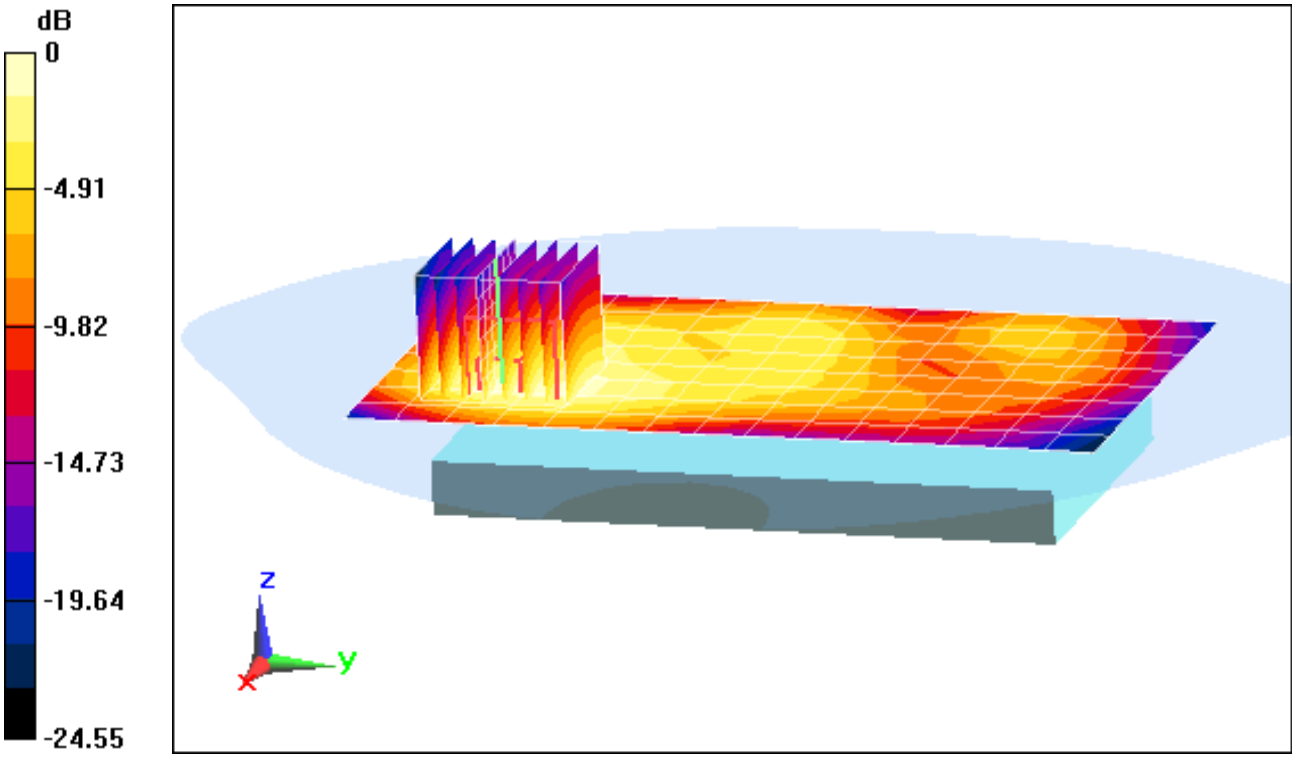
Communication System: UID 0, LTE Band 7; Frequency: 2535 MHz;Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
f = 2535 MHz; σ = 2.146 S/m; ε_r = 50.663; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 0.8 cm

Test Date: 01-19-2015; Ambient Temp: 24.0°C; Tissue Temp: 22.8°C

Probe: ES3DV3 - SN3209; ConvF(4.04, 4.04, 4.04); Calibrated: 3/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/17/2014
Phantom: SAM left; Type: QD000P40CD; Serial: TP:1715
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 7, Body SAR, Back side, Mid.ch,
20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset

Area Scan (9x16x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 15.78 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.10 W/kg
SAR(1 g) = 0.541 W/kg



0 dB = 0.679 W/kg = -1.68 dBW/kg

DUT: ZNFH950; Type: Portable Handset; Serial: 1501-23

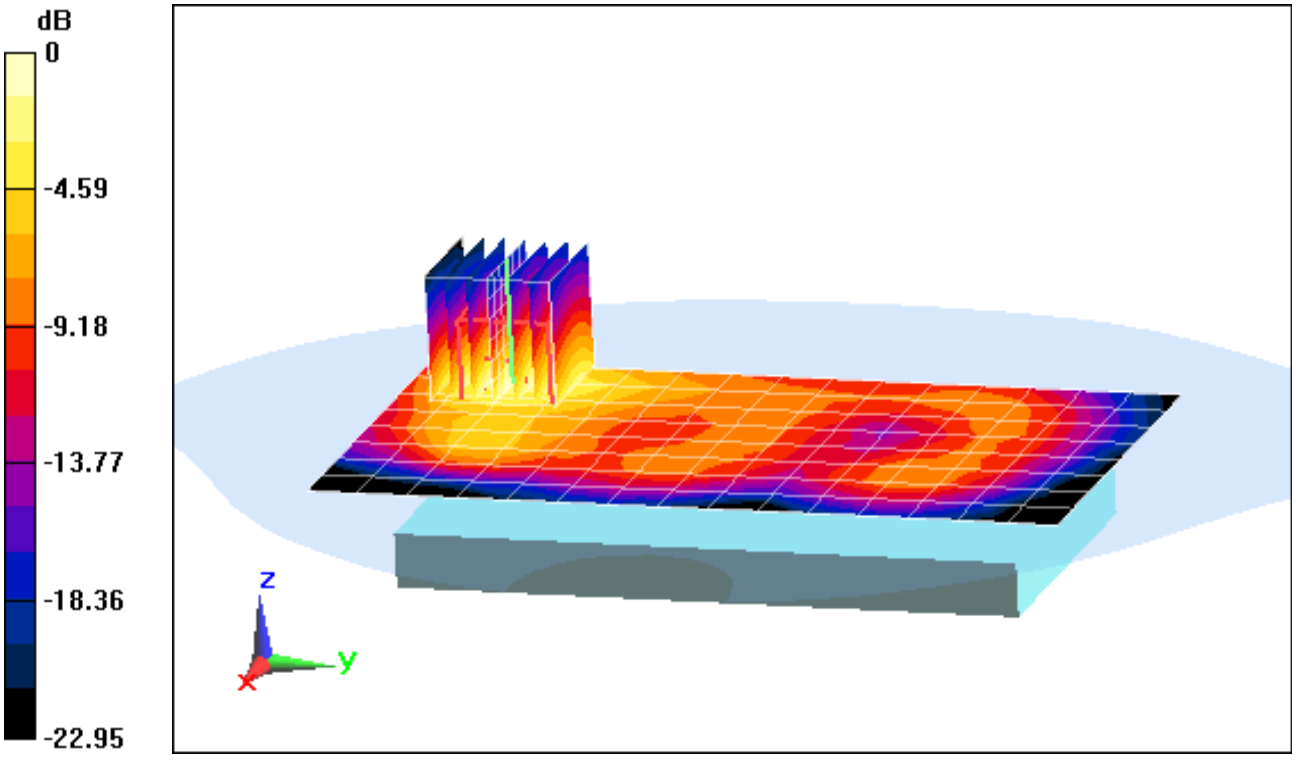
Communication System: UID 0, LTE Band 7; Frequency: 2535 MHz;Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
f = 2535 MHz; σ = 2.146 S/m; ε_r = 50.663; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 0.8 cm

Test Date: 01-19-2015; Ambient Temp: 24.0°C; Tissue Temp: 22.8°C

Probe: ES3DV3 - SN3209; ConvF(4.04, 4.04, 4.04); Calibrated: 3/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/17/2014
Phantom: SAM left; Type: QD000P40CD; Serial: TP:1715
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 7, Body SAR, Front side, Mid.ch,
20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset

Area Scan (9x16x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 20.04 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.71 W/kg
SAR(1 g) = 0.773 W/kg



0 dB = 0.993 W/kg = -0.03 dBW/kg

DUT: ZNFH950; Type: Portable Handset; Serial: 1301-2

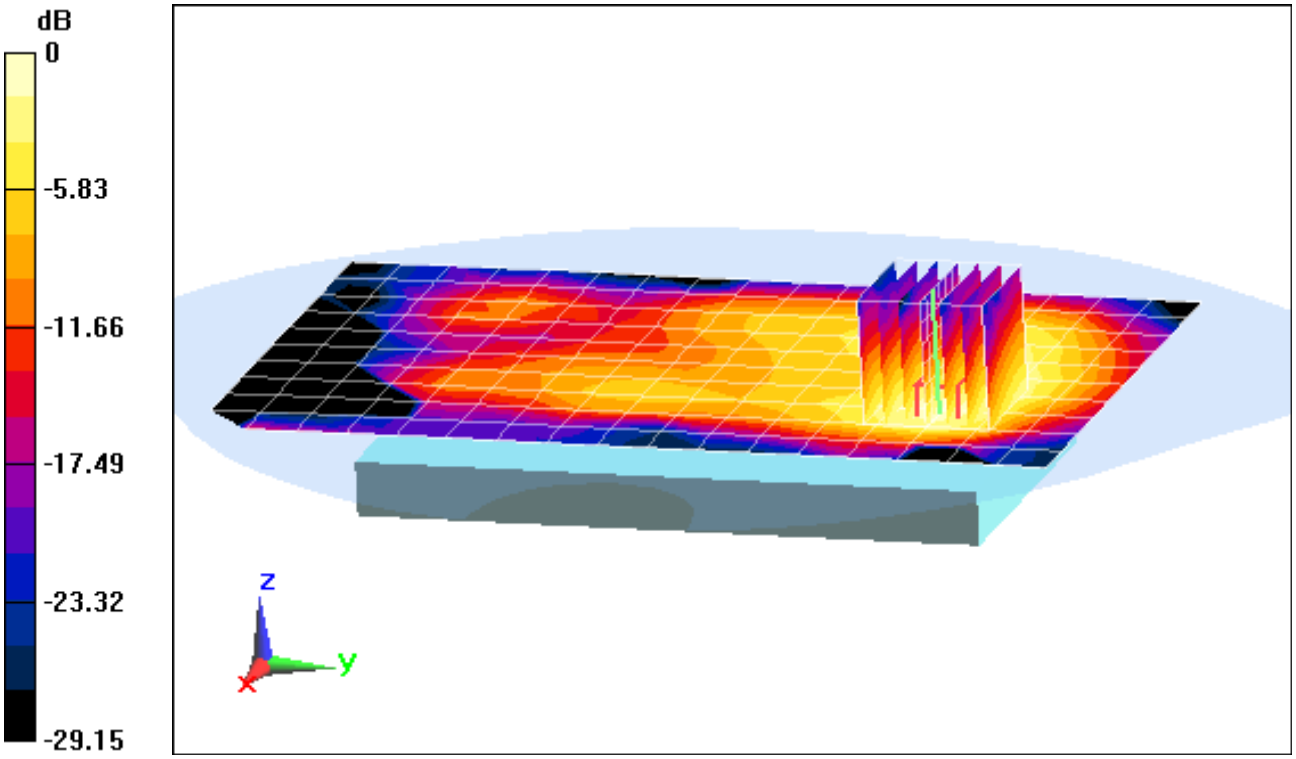
Communication System: UID 0, IEEE 802.11b; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
f = 2437 MHz; σ = 1.988 S/m; ε_r = 50.644; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 0.8 cm

Test Date: 01-13-2015; Ambient Temp: 22.7°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3334; ConvF(4.28, 4.28, 4.28); Calibrated: 12/16/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 12/12/2014
Phantom: Main Twin Sam; Type: QD000P40CC; Serial: TP: 1375
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Mode: IEEE 802.11b, Body SAR, Ch 06, 1 Mbps, Back Side

Area Scan (11x18x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.585 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.238 W/kg
SAR(1 g) = 0.101 W/kg



0 dB = 0.131 W/kg = -8.83 dBW/kg

DUT: ZNFH950; Type: Portable Handset; Serial: 1301-2

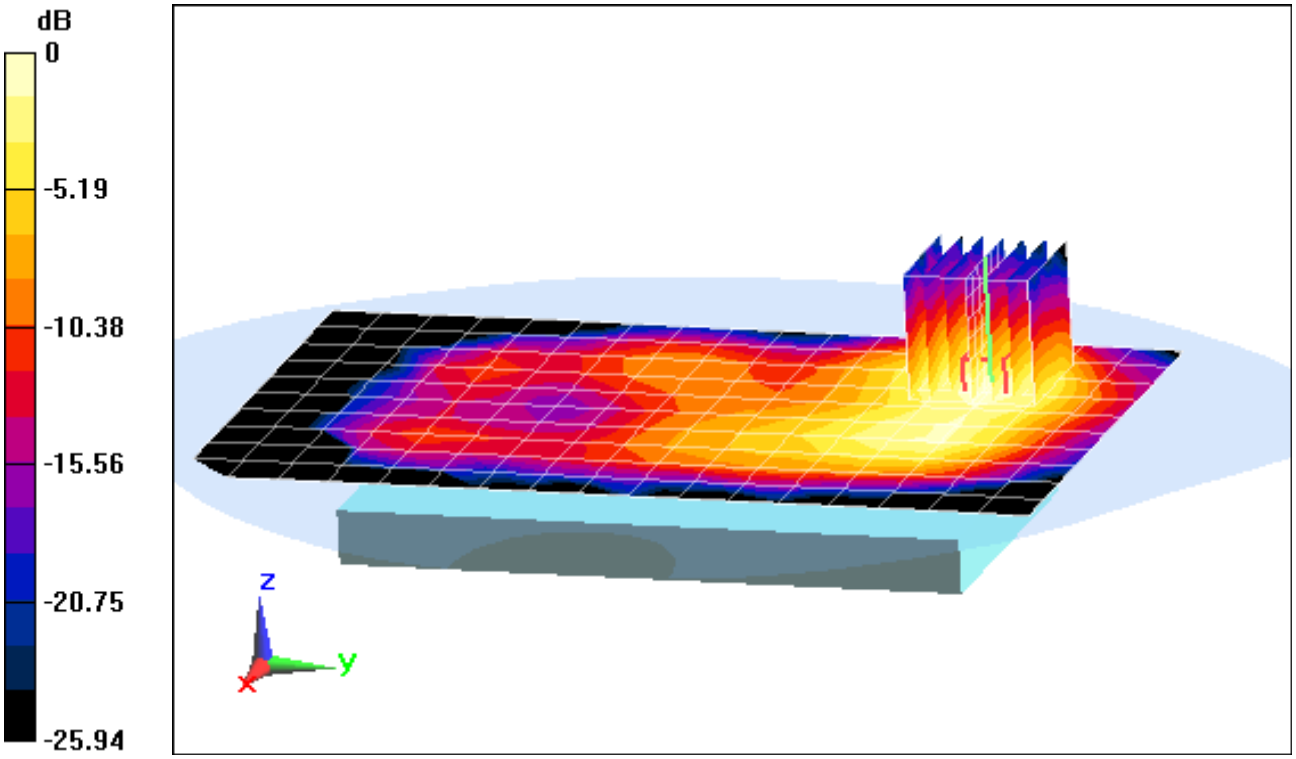
Communication System: UID 0, IEEE 802.11b; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
f = 2437 MHz; σ = 1.988 S/m; ε_r = 50.644; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 0.8 cm

Test Date: 01-13-2015; Ambient Temp: 22.7°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3334; ConvF(4.28, 4.28, 4.28); Calibrated: 12/16/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 12/12/2014
Phantom: Main Twin Sam; Type: QD000P40CC; Serial: TP: 1375
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Mode: IEEE 802.11b, Body SAR, Ch 06, 1 Mbps, Front Side

Area Scan (11x18x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.284 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 0.269 W/kg
SAR(1 g) = 0.130 W/kg



0 dB = 0.163 W/kg = -7.88 dBW/kg

DUT: ZNFH950; Type: Portable Handset; Serial: 1301-2

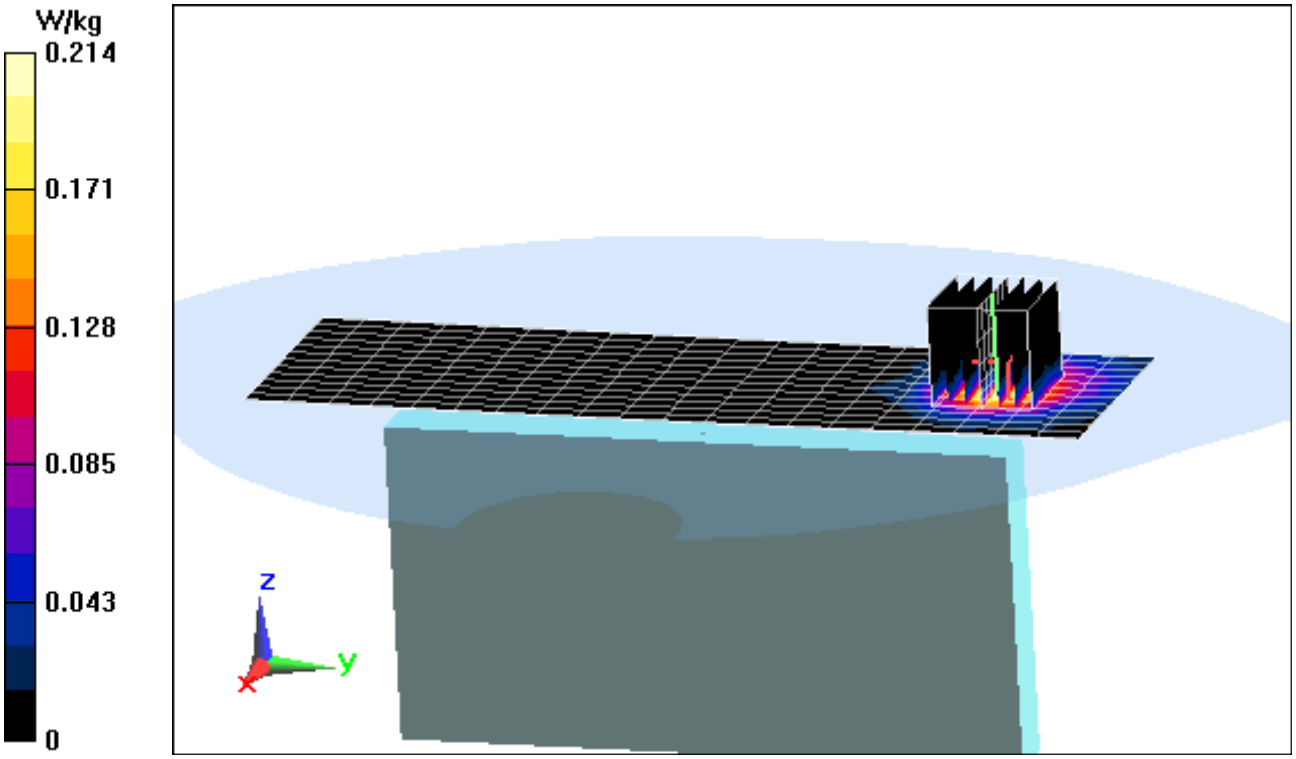
Communication System: UID 0, 802.11a 5.2-5.8 GHz Band; Frequency: 5765 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5765 MHz; σ = 6.203 S/m; ε_r = 46.336; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 01-13-2015; Ambient Temp: 24.8°C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN3920; ConvF(3.93, 3.93, 3.93); Calibrated: 12/12/2014;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 4/11/2014
Phantom: SAM; Type: QD000P40CD; Serial: TP:1758
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Mode: IEEE 802.11a, 5.8 GHz, Body SAR, Ch 153, 6 Mbps, Left Edge

Area Scan (13x21x1): Measurement grid: dx=5mm, dy=10mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio = 1.4
Reference Value = 3.928 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.356 W/kg
SAR(1 g) = 0.086 W/kg



DUT: ZNFH950; Type: Portable Handset; Serial: 1301-2

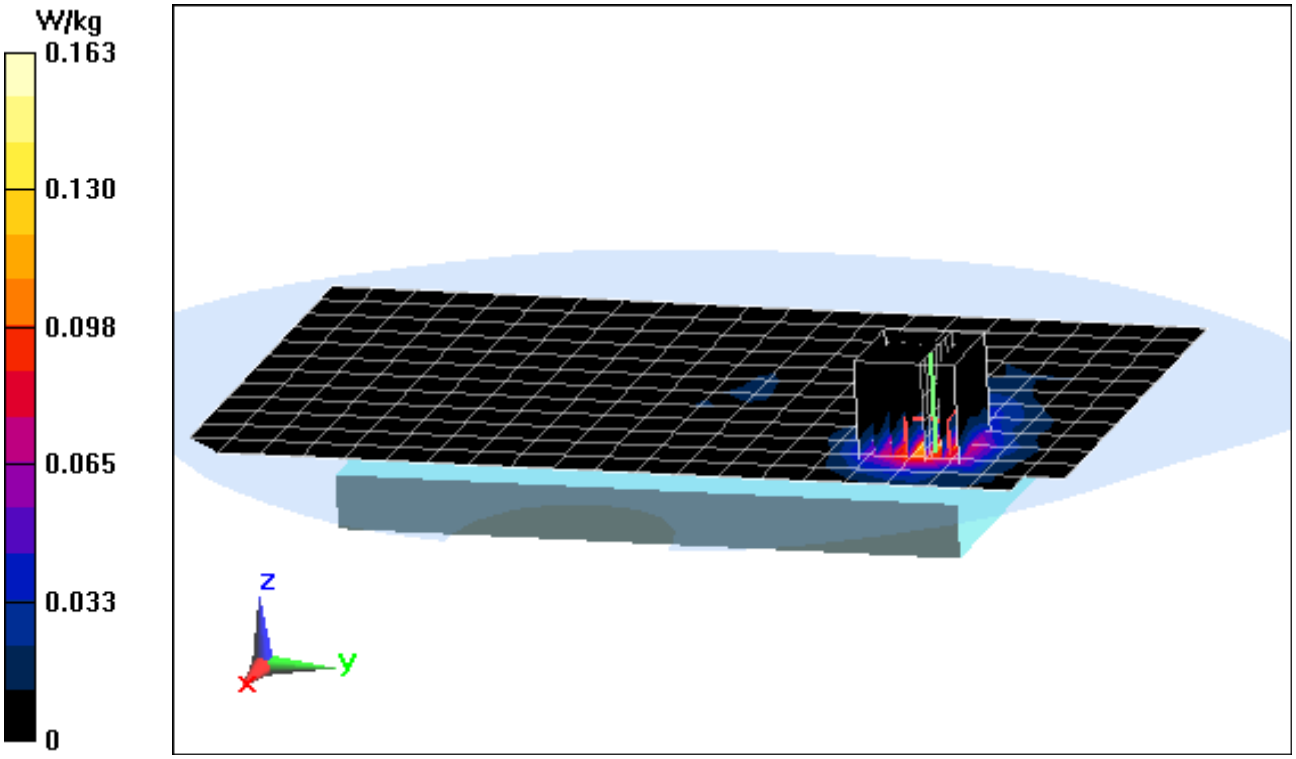
Communication System: UID 0, 802.11a 5.2-5.8 GHz Band; Frequency: 5320 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5320 MHz; σ = 5.608 S/m; ε_r = 47.117; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 0.8 cm

Test Date: 01-13-2015; Ambient Temp: 24.8°C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN3920; ConvF(4.16, 4.16, 4.16); Calibrated: 12/12/2014;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 4/11/2014
Phantom: SAM; Type: QD000P40CD; Serial: TP:1758
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Mode: IEEE 802.11a, 5.3 GHz, Body SAR, Ch 64, 6 Mbps, Back Side

Area Scan (13x22x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio = 1.4
Reference Value = 3.746 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 0.286 W/kg
SAR(1 g) = 0.072 W/kg



APPENDIX B: SYSTEM VERIFICATION

PCTEST ENGINEERING LABORATORY, INC.

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

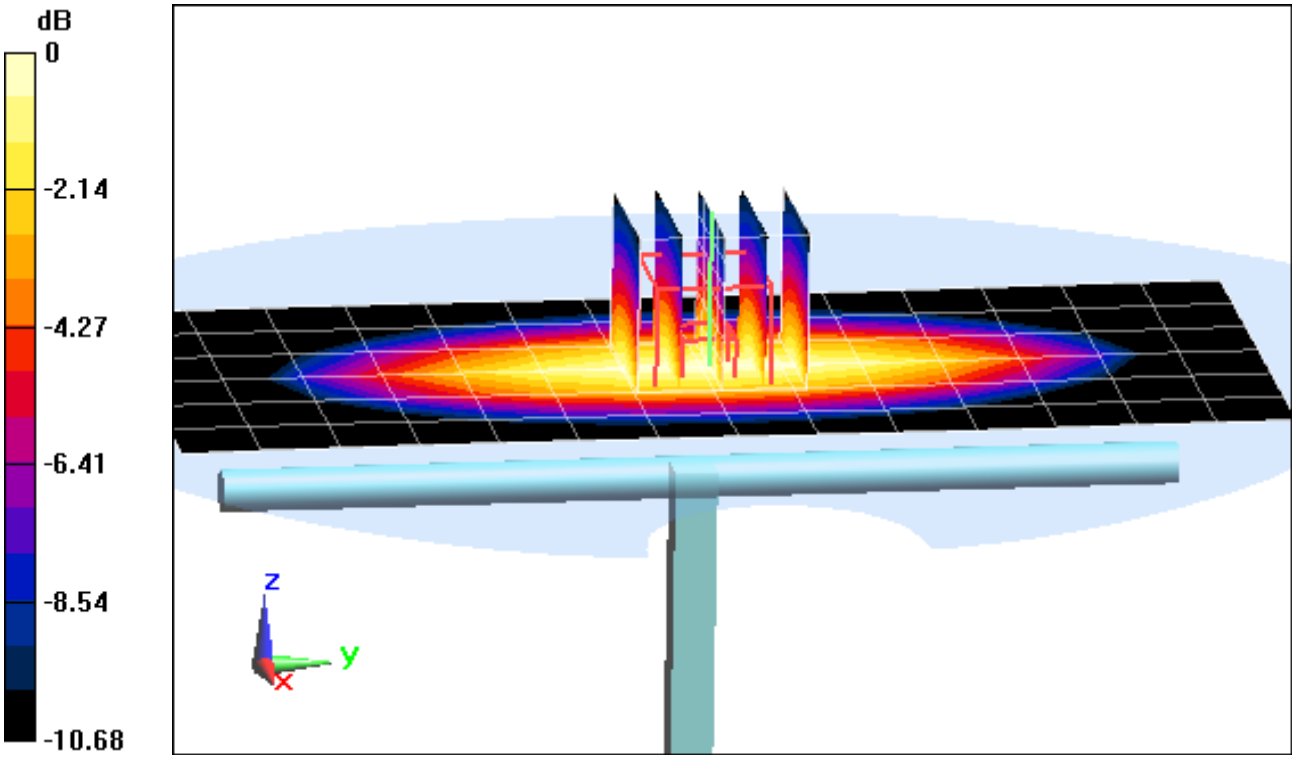
Communication System: UID 0, CW; Frequency: 750 MHz;Duty Cycle: 1:1
Medium: 750 Head Medium parameters used (interpolated):
f = 750 MHz; σ = 0.898 S/m; ε_r = 40.834; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.5 cm

Test Date: 01-19-2015; Ambient Temp: 23.1°C; Tissue Temp: 21.4°C

Probe: ES3DV3 - SN3288; ConvF(6.81, 6.81, 6.81); Calibrated: 9/24/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1364; Calibrated: 9/18/2014
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1797
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

750 MHz System Verification

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 1.18 W/kg
SAR(1 g) = 0.784 W/kg
Deviation = -5.88%%



0 dB = 0.921 W/kg = -0.36 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

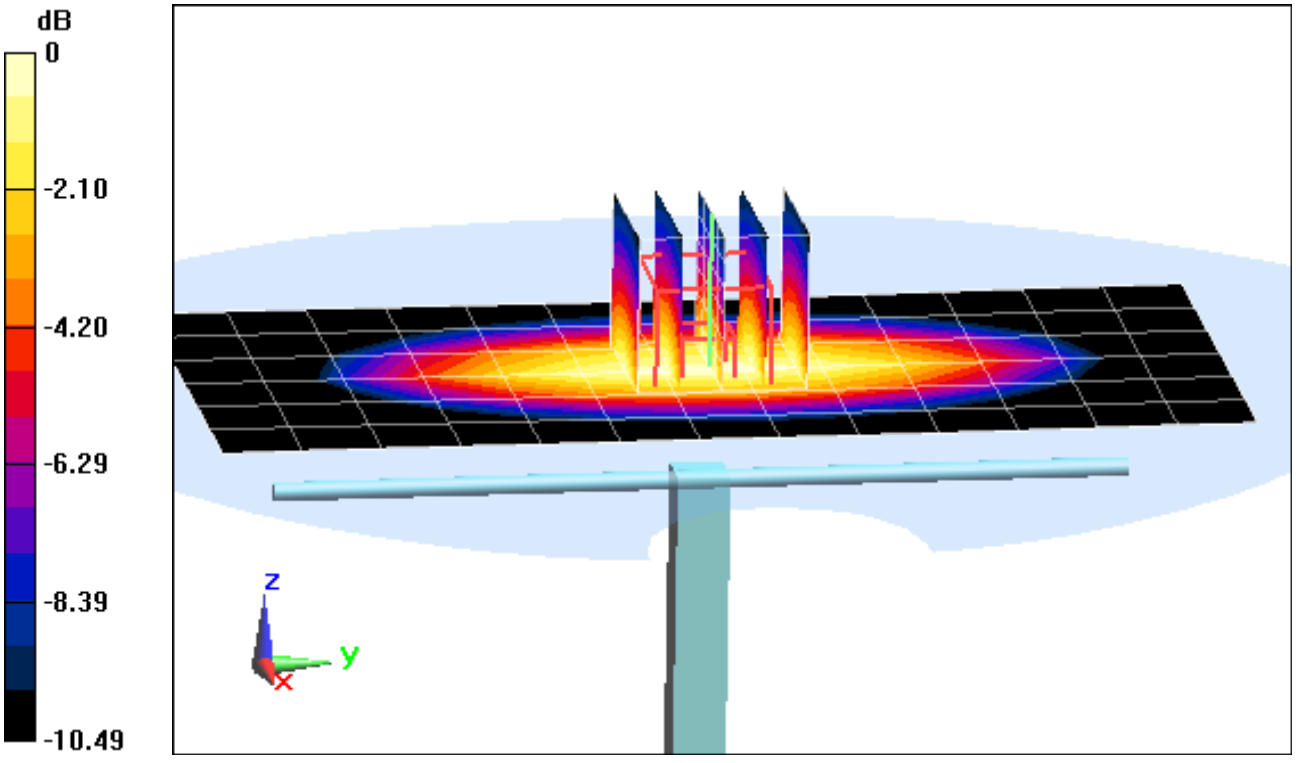
Communication System: UID 0, CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: 835 Head Medium parameters used:
f = 835 MHz; σ = 0.897 S/m; ε_r = 40.801; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.5 cm

Test Date: 01-16-2015; Ambient Temp: 23.4°C; Tissue Temp: 23.3°C

Probe: ES3DV2 - SN3022; ConvF(6.18, 6.18, 6.18); Calibrated: 8/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/12/2014
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

835 MHz System Verification

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 1.34 W/kg
SAR(1 g) = 0.915 W/kg
Deviation = -0.54%



0 dB = 1.07 W/kg = 0.29 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1750 MHz; Type: D1765V2; Serial: 1008

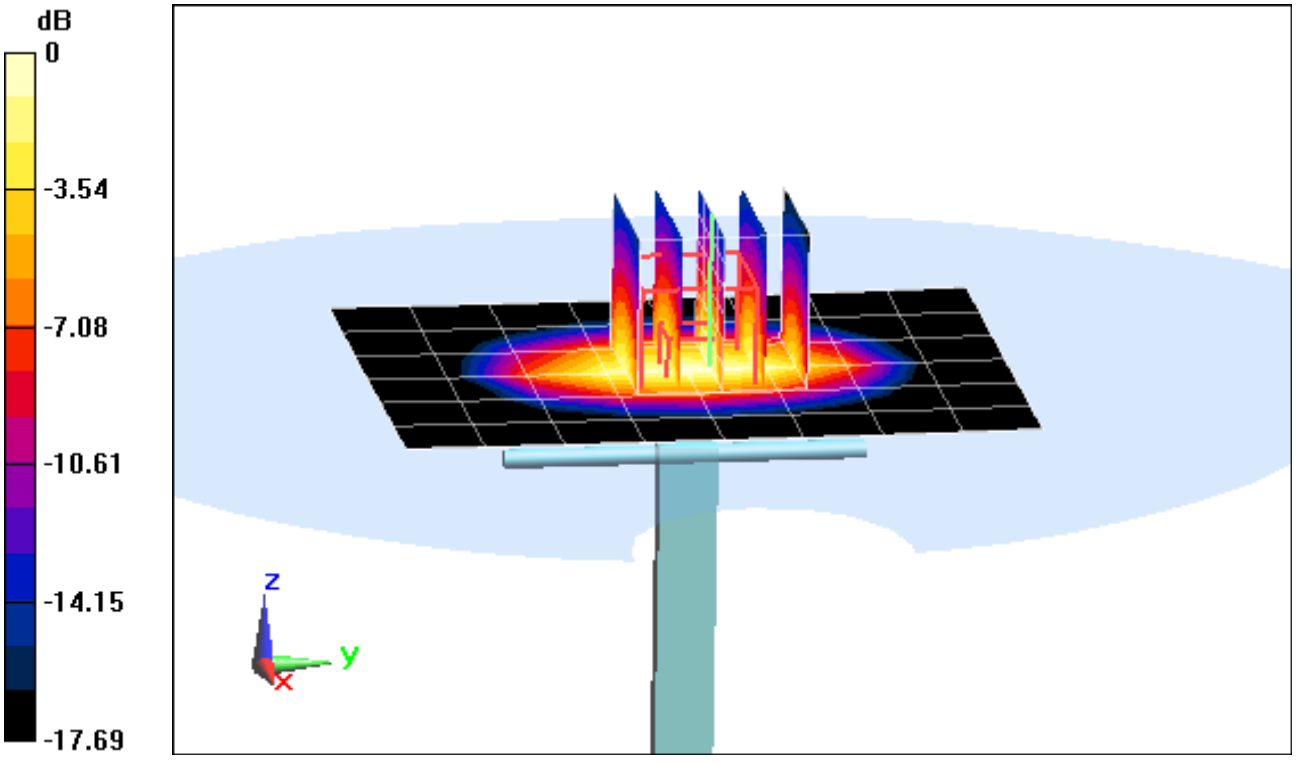
Communication System: UID 0, CW; Frequency: 1750 MHz;Duty Cycle: 1:1
Medium: 1750 Head Medium parameters used:
f = 1750 MHz; σ = 1.34 S/m; ε_r = 38.482; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 01-16-2015; Ambient Temp: 23.3°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3209; ConvF(5.24, 5.24, 5.24); Calibrated: 3/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/17/2014
Phantom: SAM Right; Type: SAM; Serial: 1757
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

1750 MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 6.13 W/kg
SAR(1 g) = 3.37 W/kg
Deviation = -8.67%



0 dB = 4.13 W/kg = 6.16 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

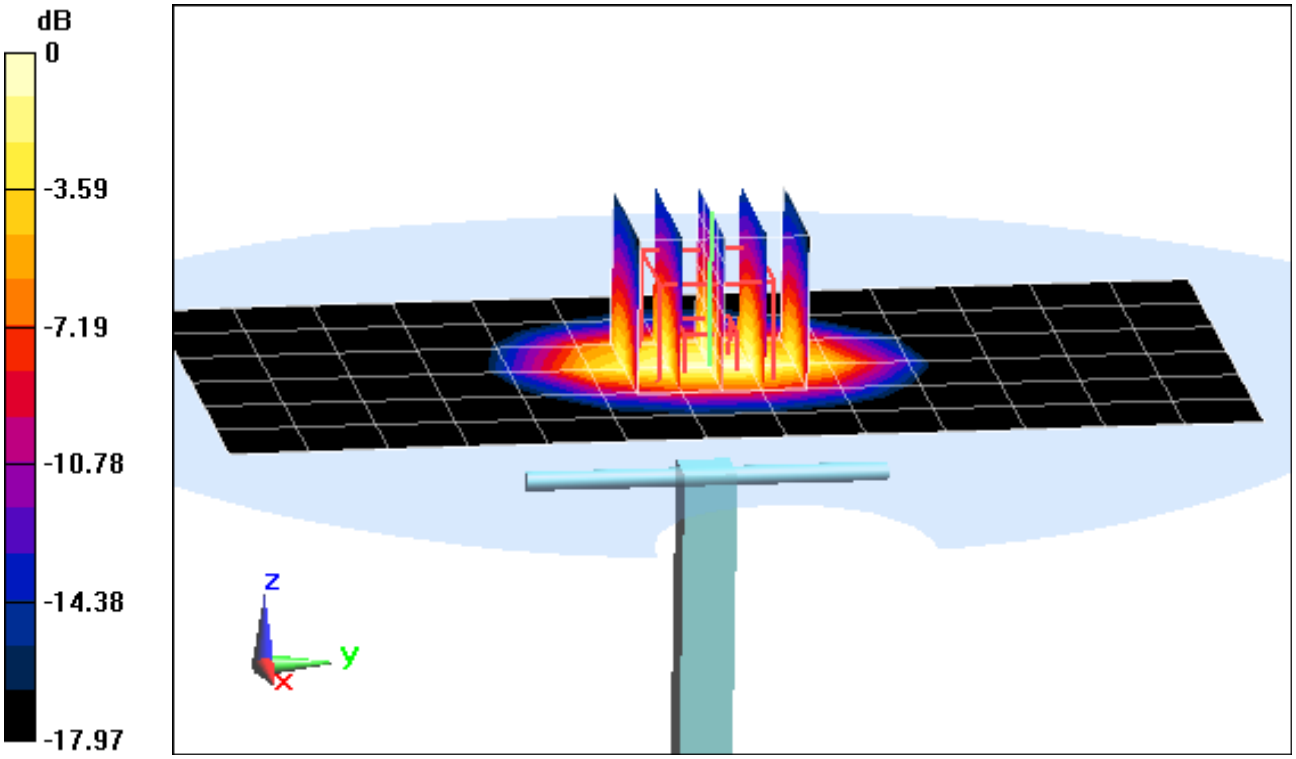
Communication System: UID 0, CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.445 S/m; ε_r = 40.346; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 01-13-2015; Ambient Temp: 23.9°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3258; ConvF(5.04, 5.04, 5.04); Calibrated: 2/25/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/26/2014
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

1900 MHz System Verification

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 7.78 W/kg
SAR(1 g) = 4.25 W/kg
Deviation = 5.72%



0 dB = 5.14 W/kg = 7.11 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 882

Communication System: UID 0, CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used:
f = 2450 MHz; σ = 1.855 S/m; ε_r = 40.623; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

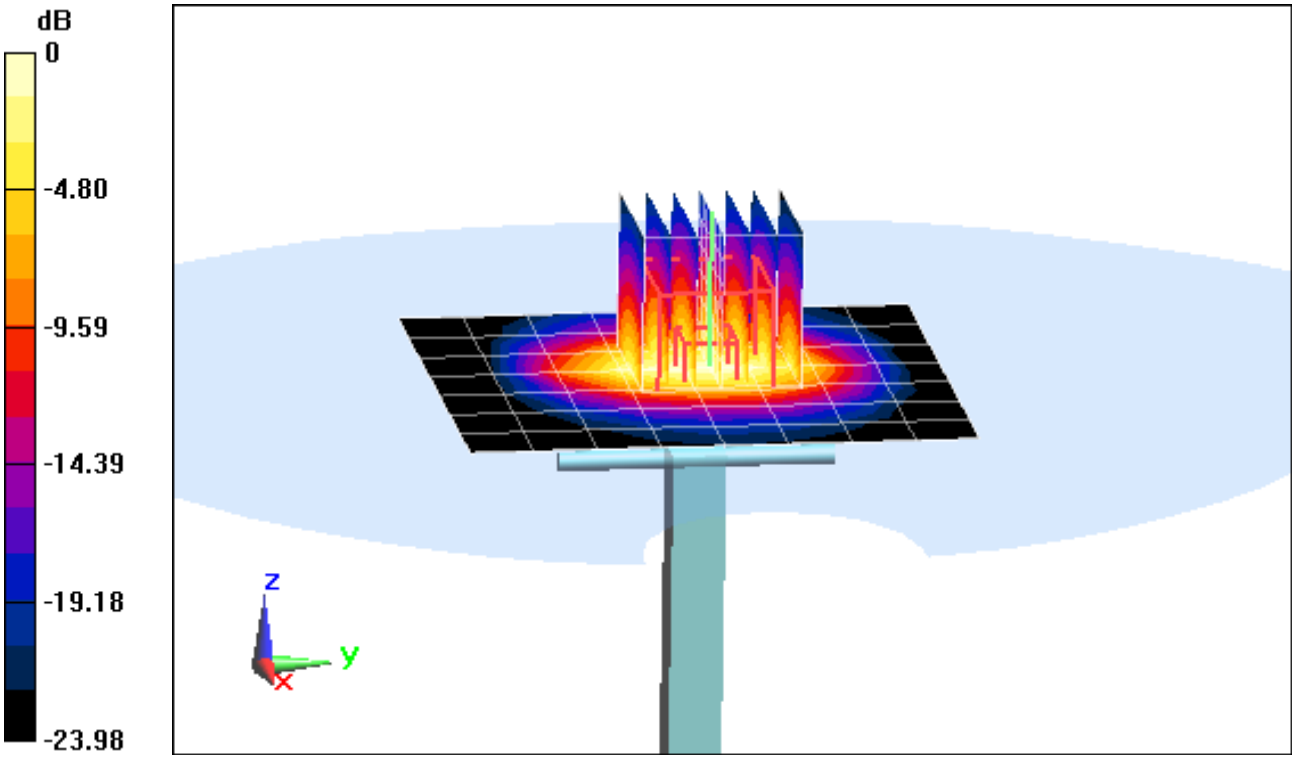
Test Date: 01-13-2015; Ambient Temp: 22.7°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3334; ConvF(4.51, 4.51, 4.51); Calibrated: 12/16/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 12/12/2014
Phantom: Sub Twin Sam v5.0; Type: QD000P40CD; Serial: TP:1626
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

2450 MHz System Verification

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

SAR(1 g) = 5.05 W/kg
Deviation = -2.88%



0 dB = 6.27 W/kg = 7.97 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1071

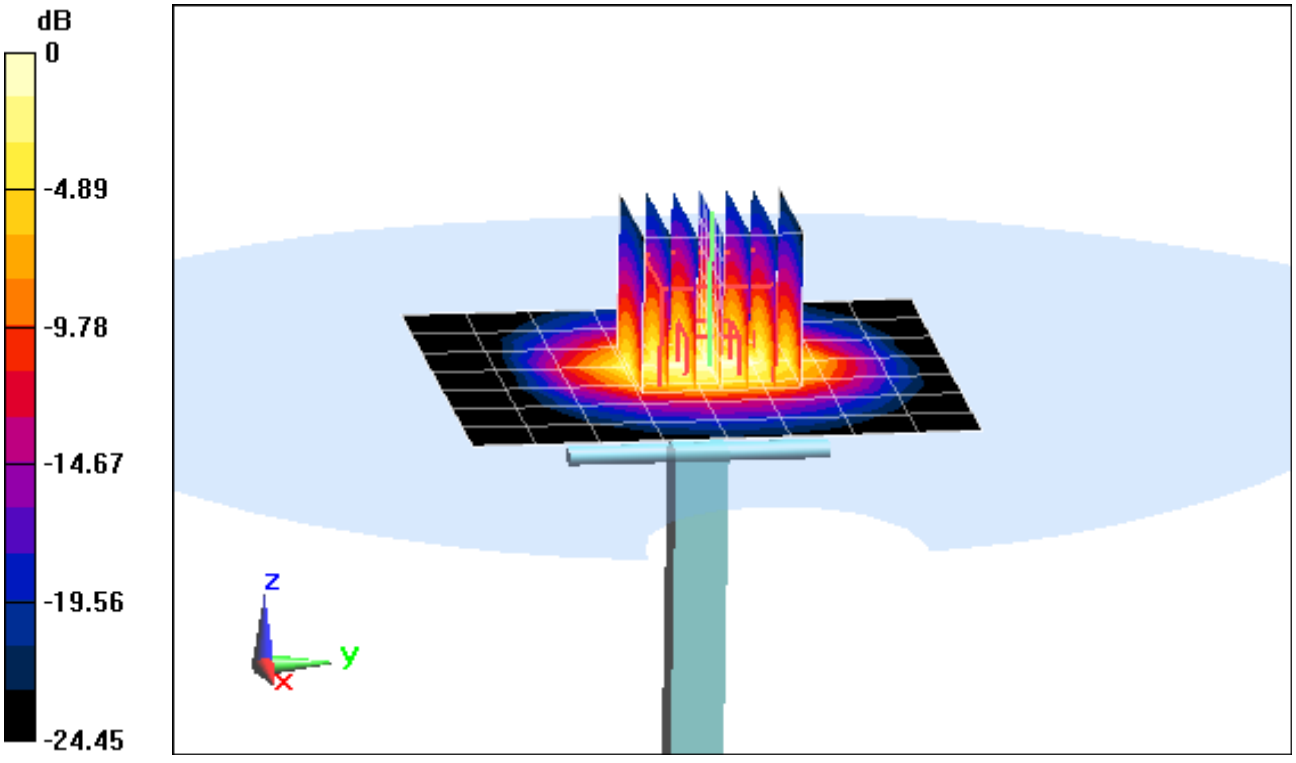
Communication System: UID 0, CW; Frequency: 2600 MHz;Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used:
f = 2600 MHz; σ = 2.021 S/m; ε_r = 39.884; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 01-20-2015; Ambient Temp: 21.9°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3209; ConvF(4.38, 4.38, 4.38); Calibrated: 3/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/17/2014
Phantom: SAM Right; Type: SAM; Serial: 1757
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

2600 MHz System Verification

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 12.0 W/kg
SAR(1 g) = 5.36 W/kg
Deviation = -6.78%



0 dB = 7.19 W/kg = 8.57 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5200 MHz; Type: D5GHzV2; Serial: 1120

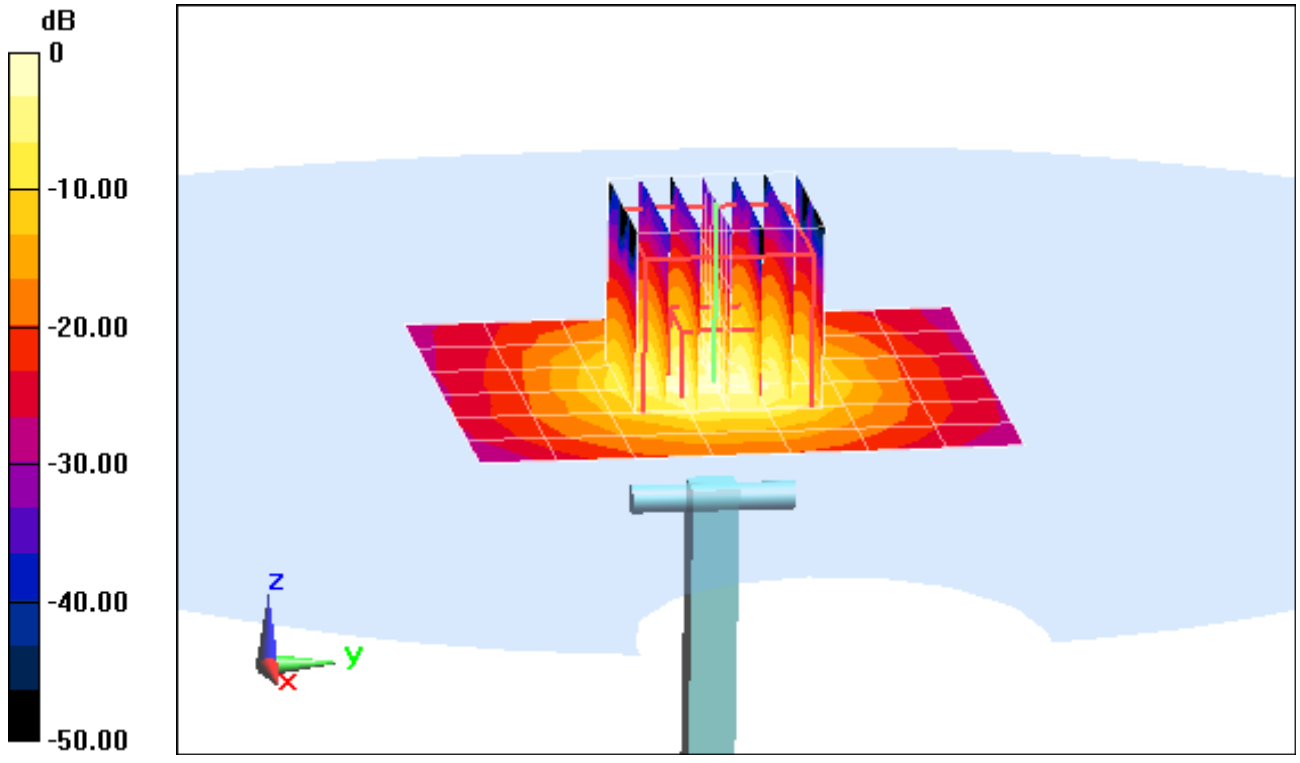
Communication System: UID 0, CW; Frequency: 5200 MHz;Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
f = 5200 MHz; σ = 4.449 S/m; ε_r = 35.741; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 01-22-2015; Ambient Temp: 23.9°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN3920; ConvF(4.87, 4.87, 4.87); Calibrated: 12/12/2014;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 4/11/2014
Phantom: SAM, Left; Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

5200 MHz System Verification

Area Scan (7x8x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio = 1.4
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 30.0 W/kg
SAR(1 g) = 7.54 W/kg
Deviation = -4.68%



0 dB = 19.0 W/kg = 12.79 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5300 MHz; Type: D5GHzV2; Serial: 1120

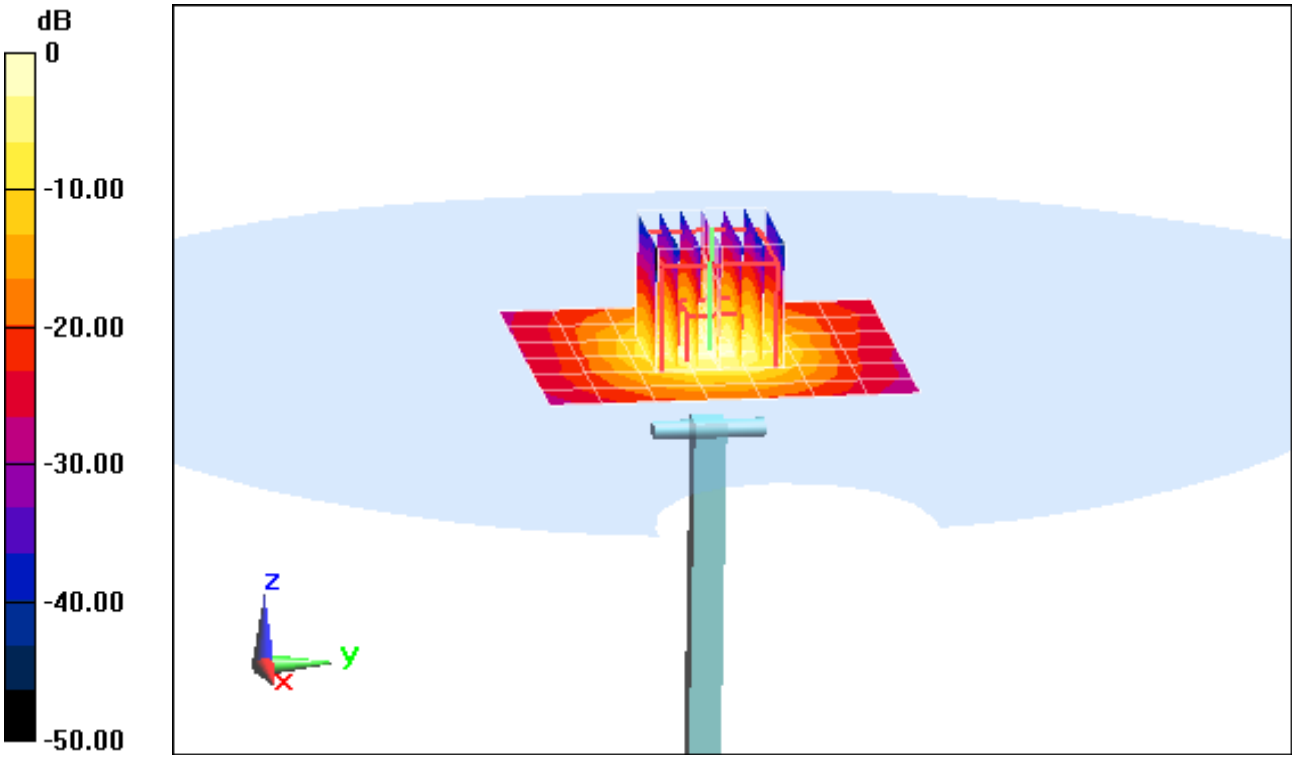
Communication System: UID 0, CW; Frequency: 5300 MHz;Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
f = 5300 MHz; σ = 4.549 S/m; ε_r = 35.571; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 01-22-2015; Ambient Temp: 23.9°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN3920; ConvF(4.69, 4.69, 4.69); Calibrated: 12/12/2014;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 4/11/2014
Phantom: SAM, Left; Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

5300 MHz System Verification

Area Scan (7x8x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio = 1.4
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 32.4 W/kg
SAR(1 g) = 8.03 W/kg
Deviation = -3.72%



0 dB = 20.2 W/kg = 13.05 dBW/kg

DUT: Dipole 5500 MHz; Type: D5GHzV2; Serial: 1120

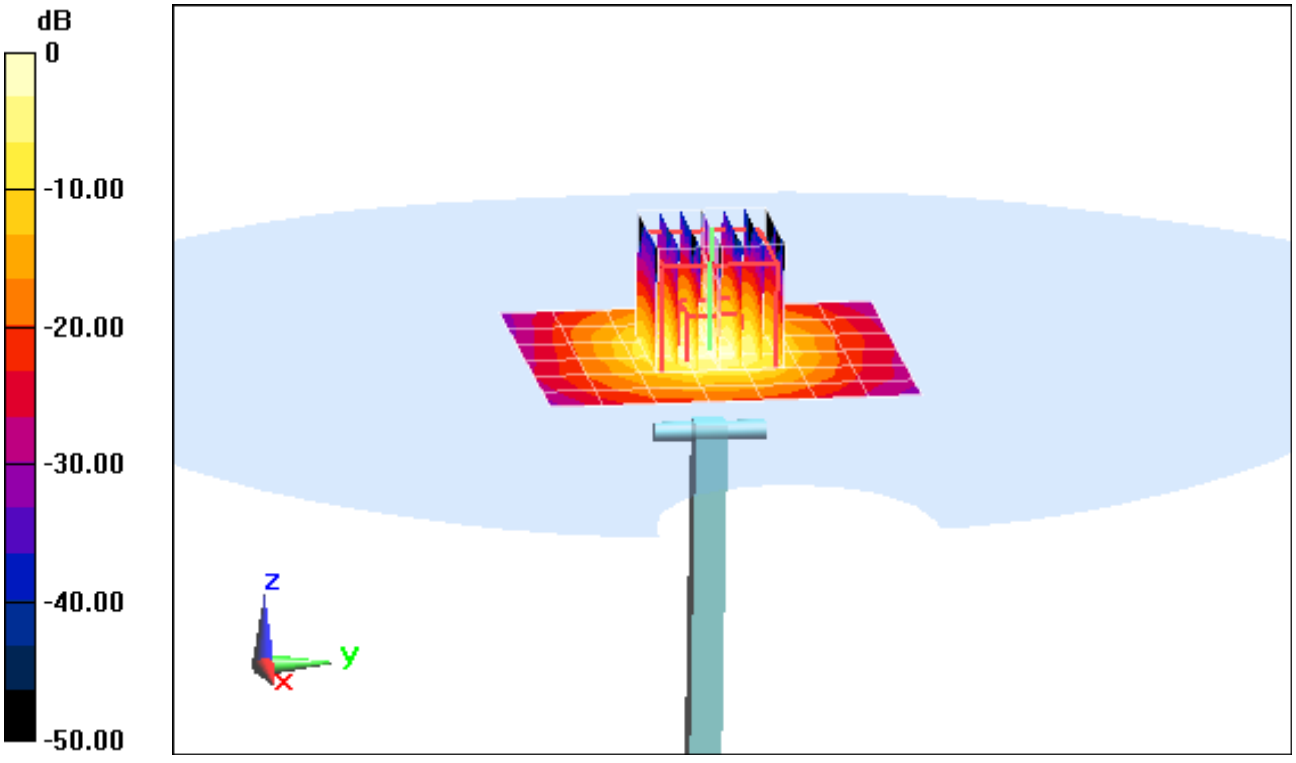
Communication System: UID 0, CW; Frequency: 5500 MHz;Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
f = 5500 MHz; σ = 4.748 S/m; ε_r = 35.287; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 01-22-2015; Ambient Temp: 23.9°C; Tissue Temp: 21.6°C

Probe: EX3DV4 - SN3920; ConvF(4.44, 4.44, 4.44); Calibrated: 12/12/2014;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 4/11/2014
Phantom: SAM, Left; Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

5500 MHz System Verification

Area Scan (7x8x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio = 1.4
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 33.1 W/kg
SAR(1 g) = 8.19 W/kg
Deviation = -3.53%



0 dB = 21.0 W/kg = 13.22 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5600 MHz; Type: D5GHzV2; Serial: 1120

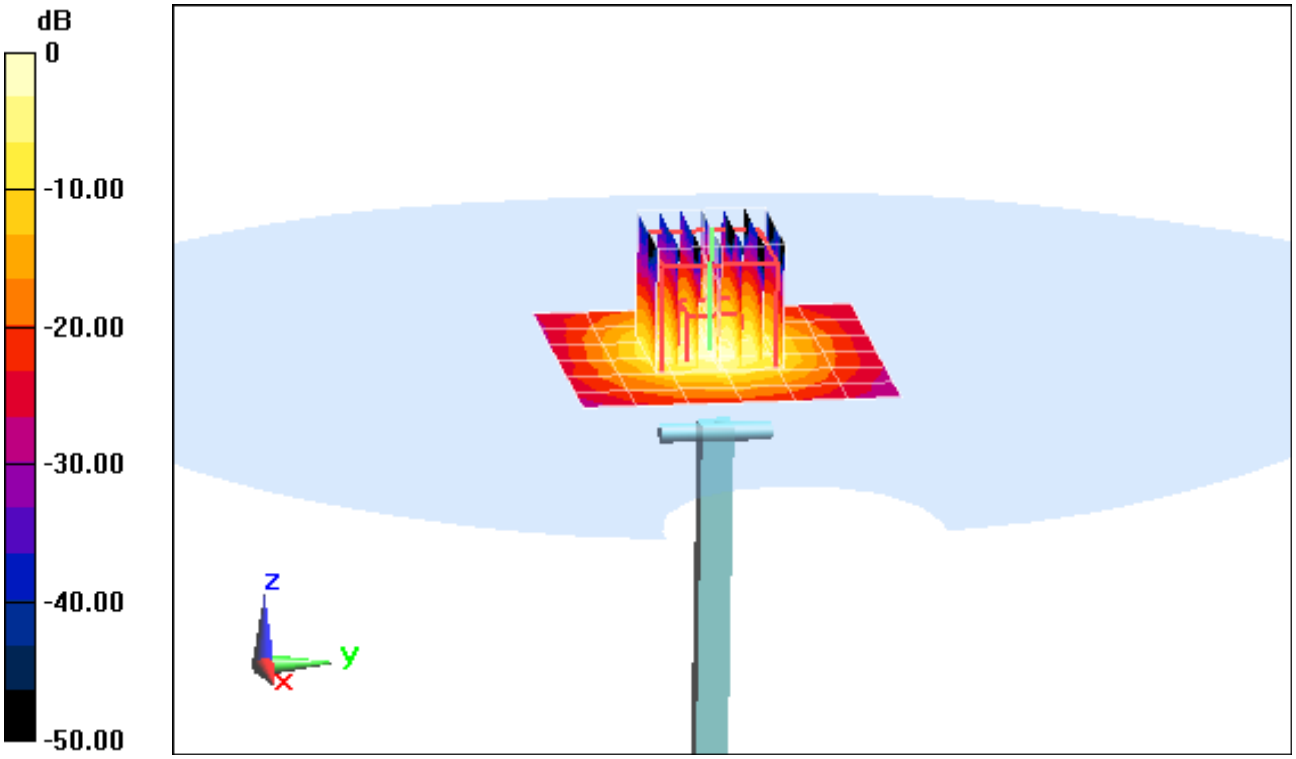
Communication System: UID 0, CW; Frequency: 5600 MHz;Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
f = 5600 MHz; σ = 4.849 S/m; ε_r = 35.184; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 01-22-2015; Ambient Temp: 24.0°C; Tissue Temp: 21.8°C

Probe: EX3DV4 - SN3920; ConvF(4.35, 4.35, 4.35); Calibrated: 12/12/2014;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 4/11/2014
Phantom: SAM, Left; Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

5600 MHz System Verification

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio = 1.4
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 33.0 W/kg
SAR(1 g) = 7.91 W/kg
Deviation = -3.77%



0 dB = 20.2 W/kg = 13.05 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5800 MHz; Type: D5GHzV2; Serial: 1120

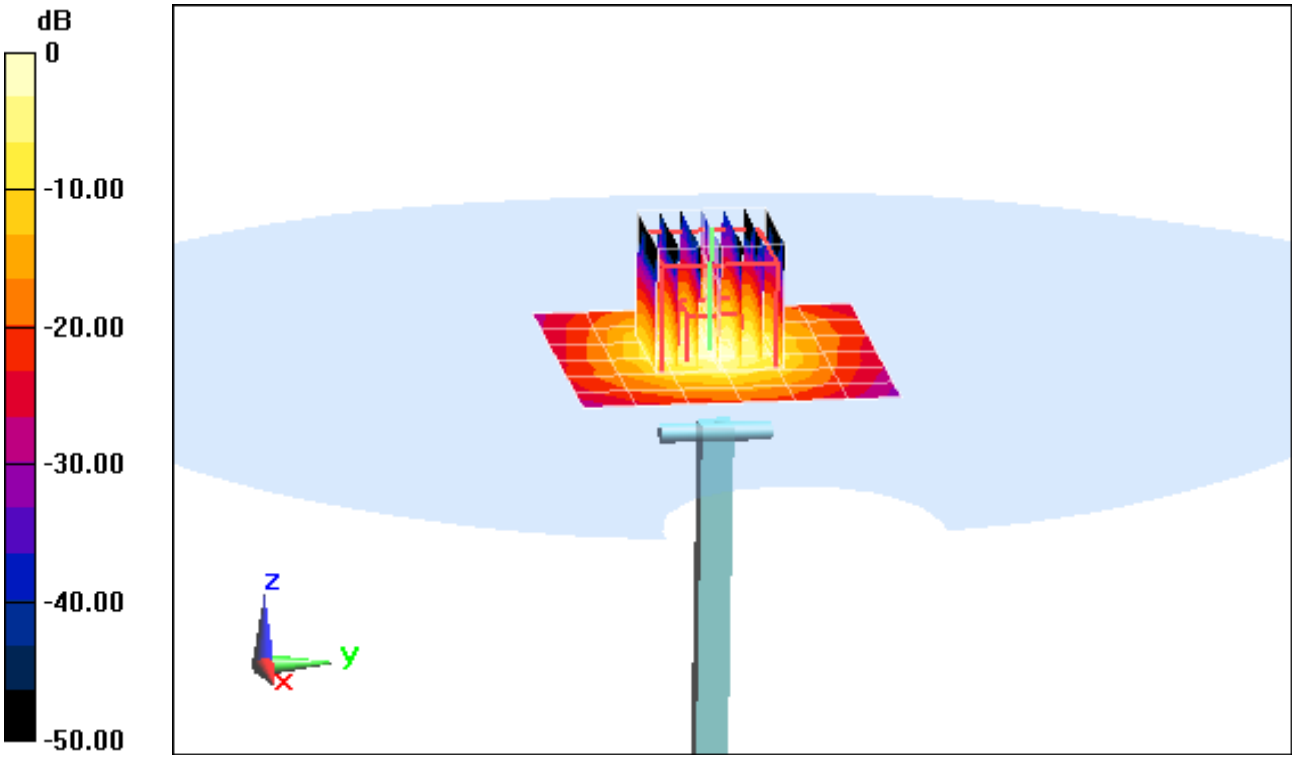
Communication System: UID 0, CW; Frequency: 5800 MHz;Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
f = 5800 MHz; σ = 5.054 S/m; ε_r = 34.89; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 01-22-2015; Ambient Temp: 23.9°C; Tissue Temp: 21.6°C

Probe: EX3DV4 - SN3920; ConvF(4.27, 4.27, 4.27); Calibrated: 12/12/2014;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 4/11/2014
Phantom: SAM, Left; Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

5800 MHz System Verification

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio = 1.4
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 34.3 W/kg
SAR(1 g) = 7.80 W/kg
Deviation = -1.39%



0 dB = 20.4 W/kg = 13.10 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

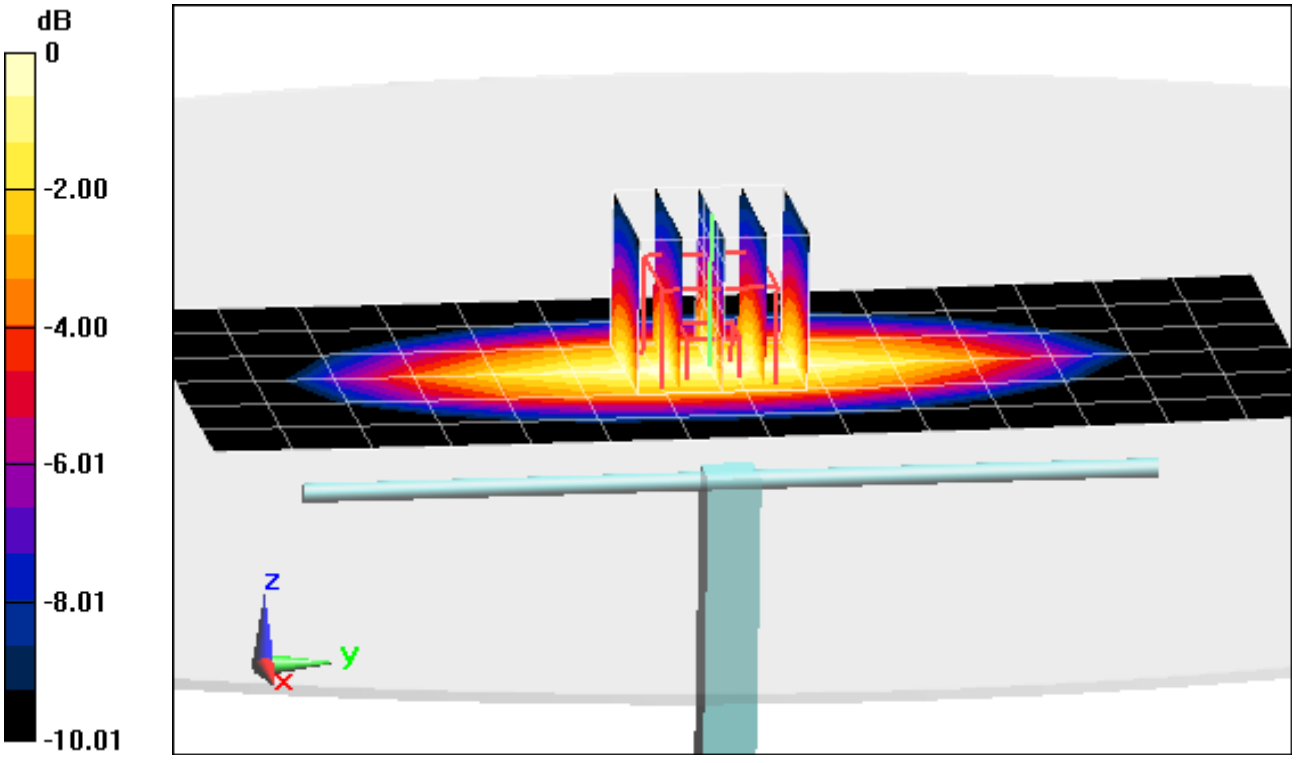
Communication System: UID 0, CW; Frequency: 750 MHz;Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 750 MHz; σ = 0.965 S/m; ε_r = 54.242; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.5 cm

Test Date: 01-15-2015; Ambient Temp: 23.1°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3209; ConvF(6.16, 6.16, 6.16); Calibrated: 3/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/17/2014
Phantom: ELI Front; Type: QDOVA002AA; Serial: TP:1202
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

750 MHz System Verification

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 1.29 W/kg
SAR(1 g) = 0.891 W/kg
Deviation = 3.12%



0 dB = 1.04 W/kg = 0.17 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

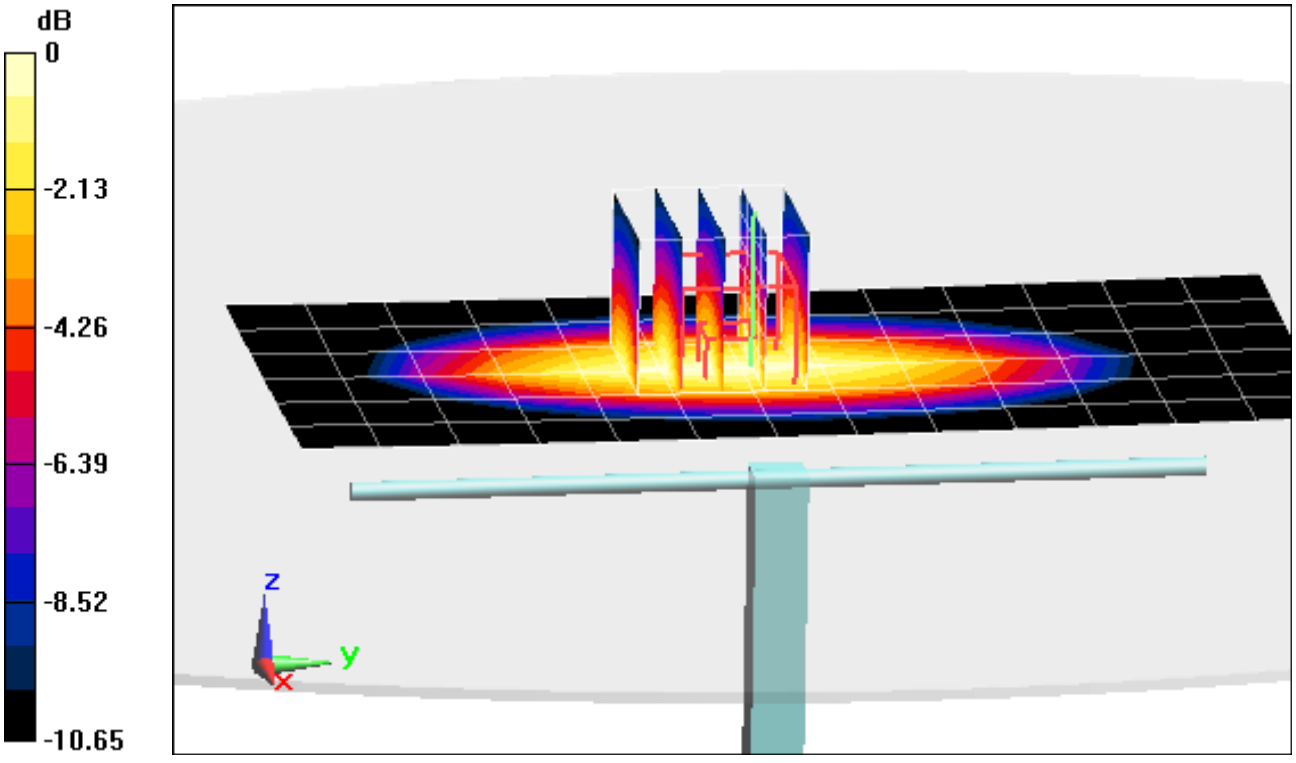
Communication System: UID 0, CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: 835 Body Medium parameters used:
f = 835 MHz; σ = 1.004 S/m; ε_r = 53.289; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.5 cm

Test Date: 01-15-2015; Ambient Temp: 23.3°C; Tissue Temp: 22.0°C

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

835 MHz System Verification

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 1.43 W/kg
SAR(1 g) = 0.966 W/kg
Deviation = 3.32%



0 dB = 1.12 W/kg = 0.49 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1750 MHz; Type: D1765V2; Serial: 1008

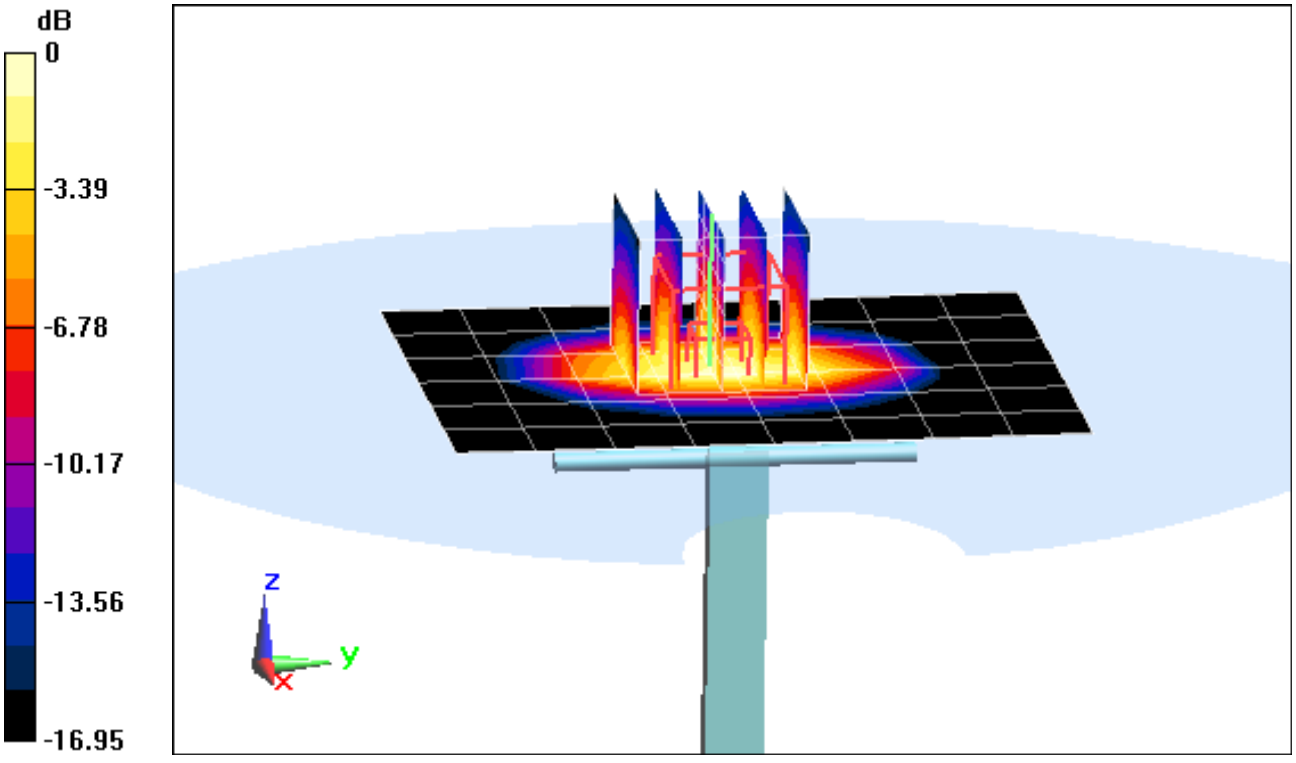
Communication System: UID 0, CW; Frequency: 1750 MHz;Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used:
f = 1750 MHz; σ = 1.48 S/m; ε_r = 50.821; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 01-15-2015; Ambient Temp: 23.4°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3263; ConvF(4.98, 4.98, 4.98); Calibrated: 5/15/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/14/2014
Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

1750 MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 6.95 W/kg
SAR(1 g) = 3.95 W/kg
Deviation = 5.05%



0 dB = 4.97 W/kg = 6.96 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

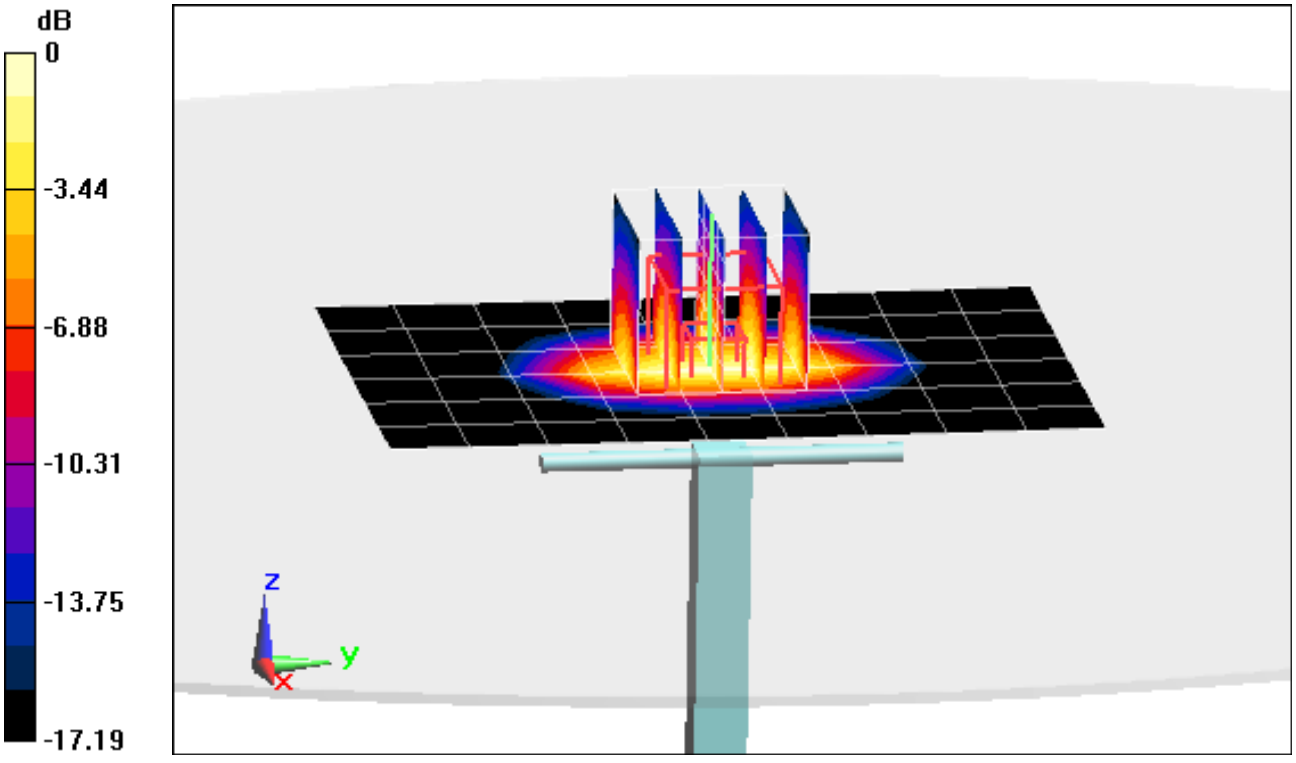
Communication System: UID 0, CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.557 S/m; ε_r = 51.922; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 01-12-2015; Ambient Temp: 20.6°C; Tissue Temp: 21.2°C

Probe: ES3DV2 - SN3022; ConvF(4.49, 4.49, 4.49); Calibrated: 8/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/12/2014
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

1900 MHz System Verification

Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 6.96 W/kg
SAR(1 g) = 3.98 W/kg
Deviation = -1.97%



0 dB = 5.03 W/kg = 7.02 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 882

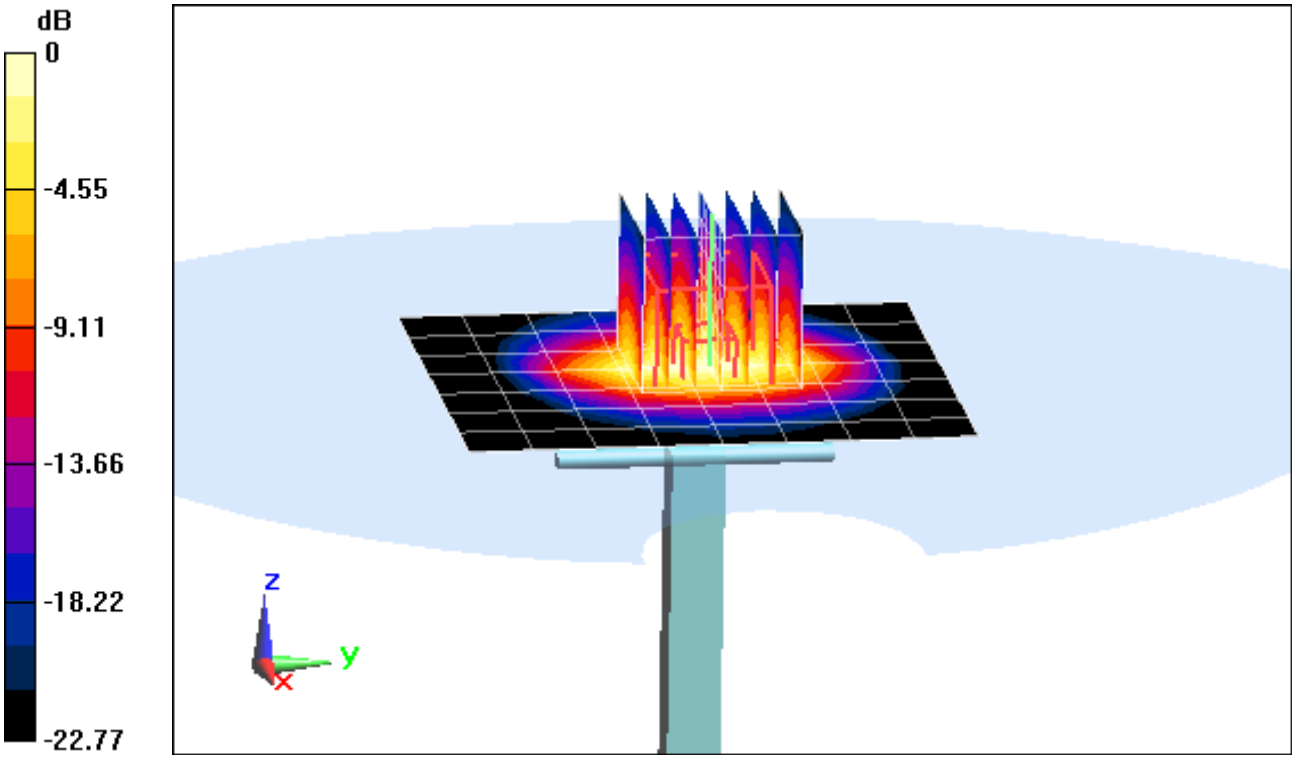
Communication System: UID 0, CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used:
f = 2450 MHz; σ = 2.004 S/m; ε_r = 50.587; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 01-13-2015; Ambient Temp: 22.7°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3334; ConvF(4.28, 4.28, 4.28); Calibrated: 12/16/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 12/12/2014
Phantom: Main Twin Sam; Type: QD000P40CC; Serial: TP: 1375
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

2450 MHz System Verification

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 11.4 W/kg
SAR(1 g) = 5.01 W/kg
Deviation = 1.21%



0 dB = 6.62 W/kg = 8.21 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1071

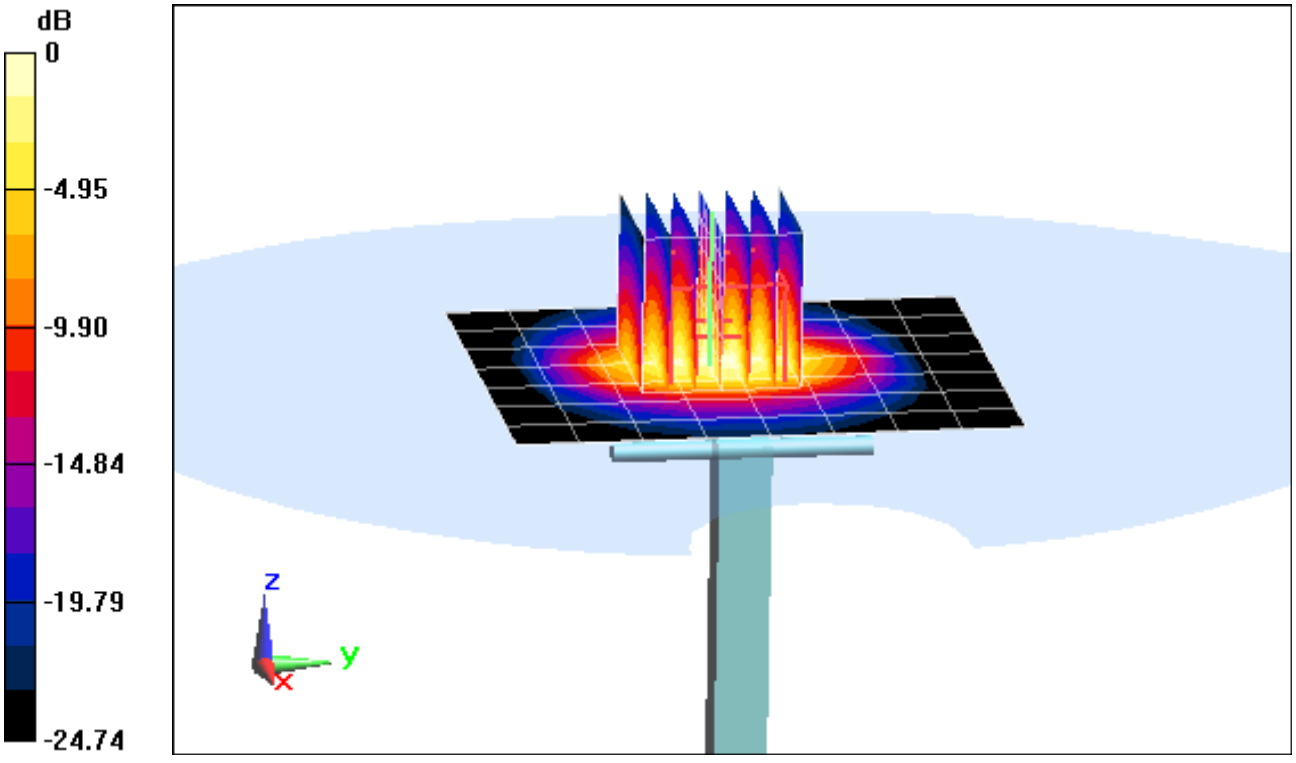
Communication System: UID 0, CW; Frequency: 2600 MHz;Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used:
f = 2600 MHz; σ = 2.237 S/m; ε_r = 50.388; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 01-19-2015; Ambient Temp: 24.0°C; Tissue Temp: 22.8°C

Probe: ES3DV3 - SN3209; ConvF(4.04, 4.04, 4.04); Calibrated: 3/19/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/17/2014
Phantom: SAM left; Type: QD000P40CD; Serial: TP:1715
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

2600 MHz System Verification

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 14.2 W/kg
SAR(1 g) = 6.07 W/kg
Deviation = 6.68%



0 dB = 7.98 W/kg = 9.02 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5200 MHz; Type: D5GHzV2; Serial: 1191

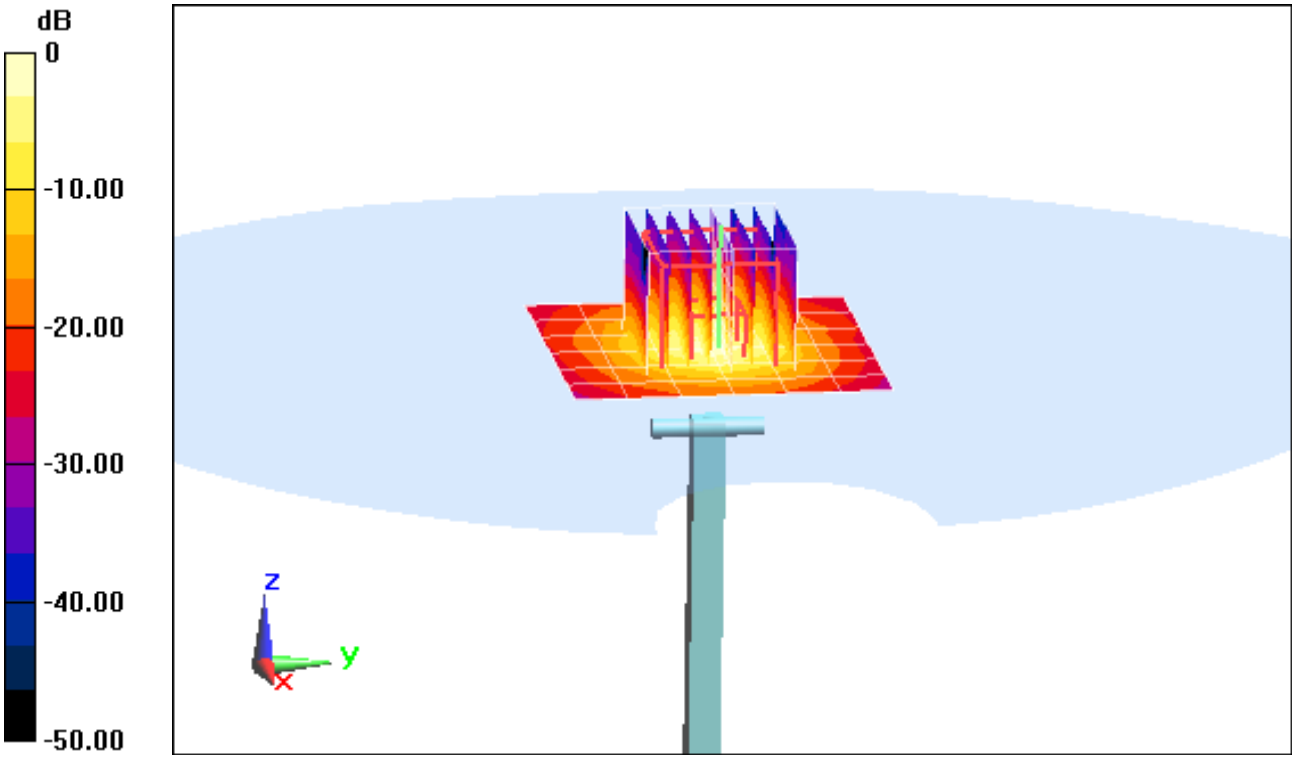
Communication System: UID 0, CW; Frequency: 5200 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5200 MHz; σ = 5.461 S/m; ε_r = 47.307; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 01-13-2015; Ambient Temp: 24.7°C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN3920; ConvF(4.33, 4.33, 4.33); Calibrated: 12/12/2014;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 4/11/2014
Phantom: SAM; Type: QD000P40CD; Serial: TP:1758
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

5200 MHz System Verification

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio = 1.4
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 28.5 W/kg
SAR(1 g) = 7.14 W/kg
Deviation = -8.23%



0 dB = 16.9 W/kg = 12.28 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5300 MHz; Type: D5GHzV2; Serial: 1191

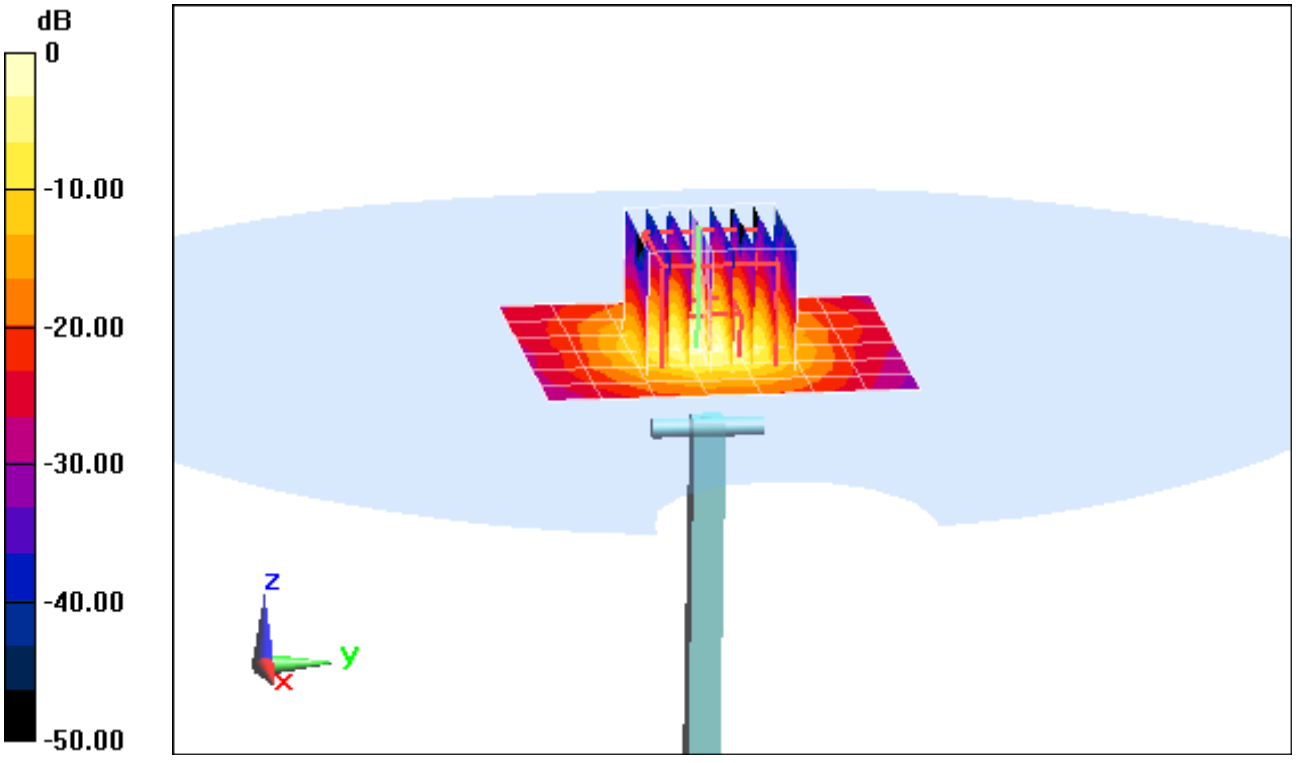
Communication System: UID 0, CW; Frequency: 5300 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5300 MHz; σ = 5.589 S/m; ε_r = 47.162; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 01-13-2015; Ambient Temp: 24.8°C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN3920; ConvF(4.16, 4.16, 4.16); Calibrated: 12/12/2014;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 4/11/2014
Phantom: SAM; Type: QD000P40CD; Serial: TP:1758
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

5300 MHz System Verification

Area Scan (7x8x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio = 1.4
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 30.1 W/kg
SAR(1 g) = 7.36 W/kg
Deviation = -7.88%



0 dB = 17.4 W/kg = 12.41 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5500 MHz; Type: D5GHzV2; Serial: 1191

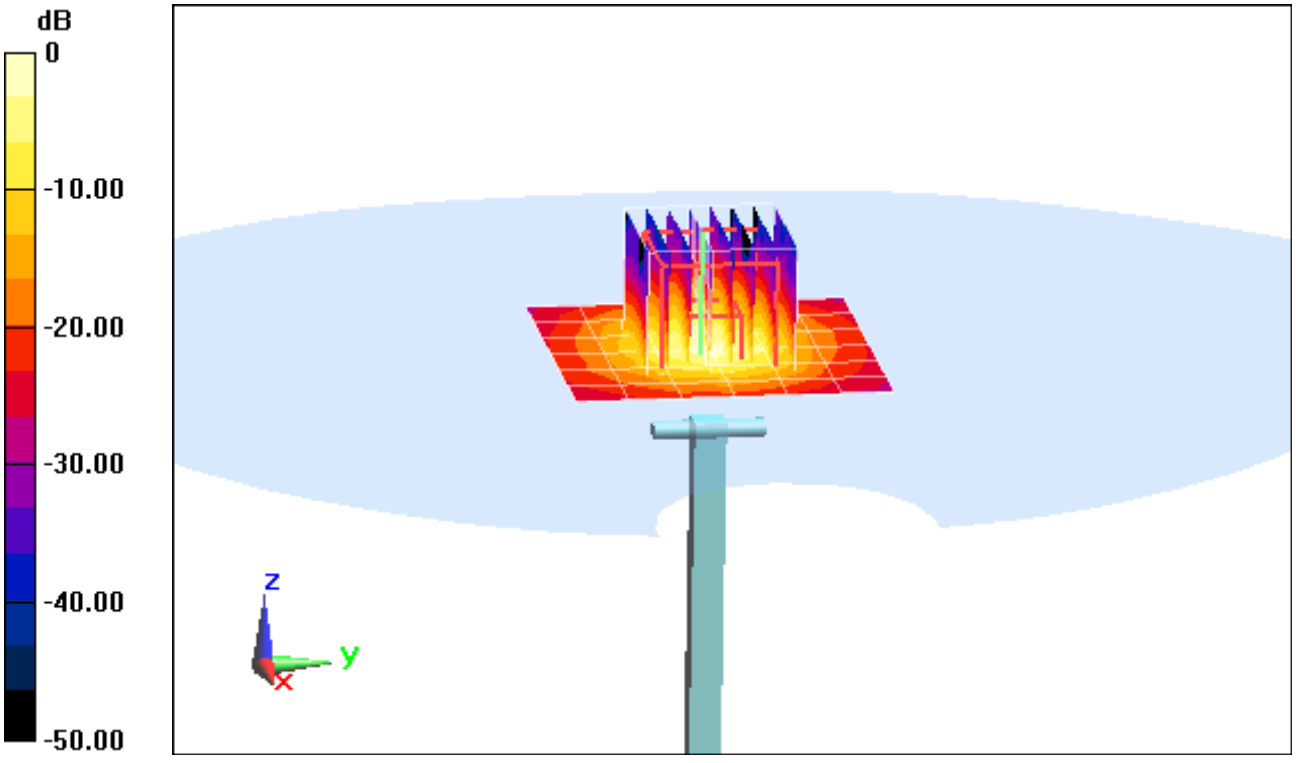
Communication System: UID 0, CW; Frequency: 5500 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5500 MHz; σ = 5.847 S/m; ε_r = 46.781; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 01-13-2015; Ambient Temp: 24.8°C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN3920; ConvF(3.79, 3.79, 3.79); Calibrated: 12/12/2014;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 4/11/2014
Phantom: SAM; Type: QD000P40CD; Serial: TP:1758
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

5500 MHz System Verification

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio = 1.4
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 31.3 W/kg
SAR(1 g) = 7.50 W/kg
Deviation = -9.75%



0 dB = 18.1 W/kg = 12.58 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5600 MHz; Type: D5GHzV2; Serial: 1191

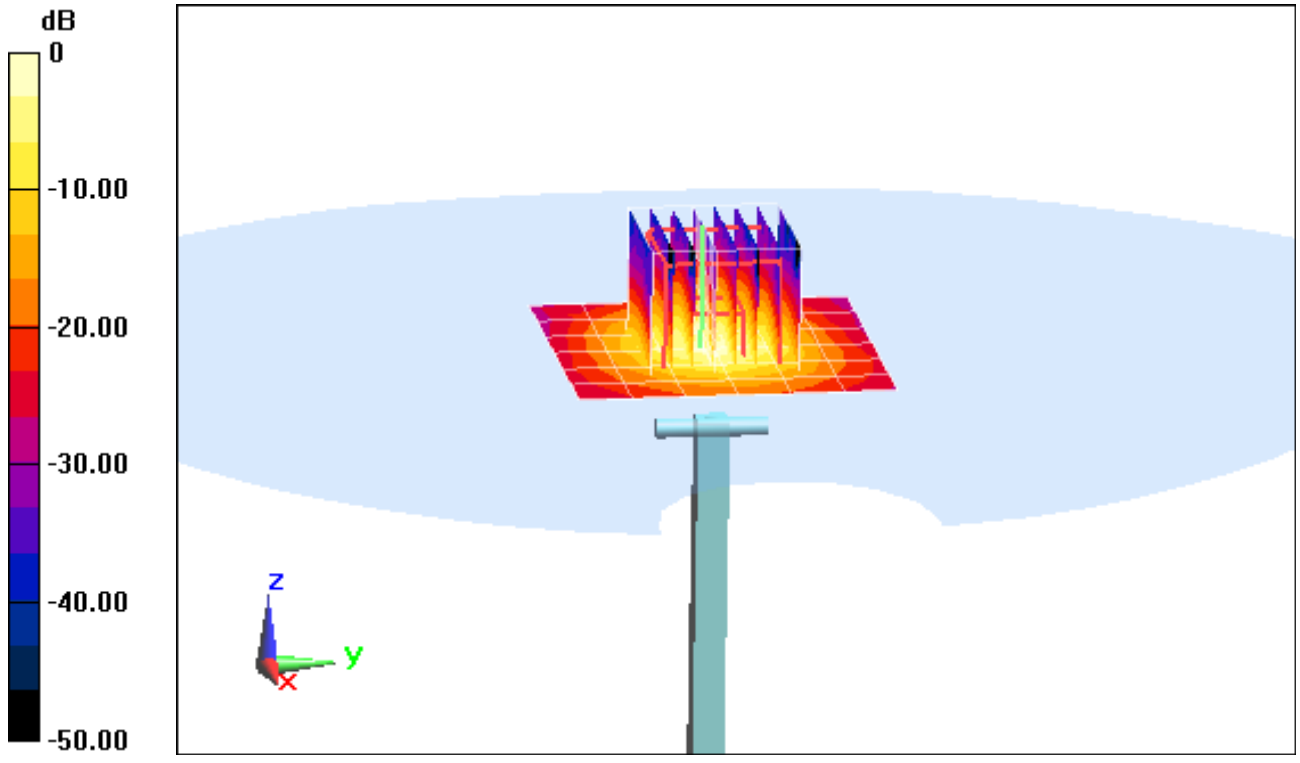
Communication System: UID 0, CW; Frequency: 5600 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5600 MHz; σ = 5.996 S/m; ε_r = 46.661; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 01-13-2015; Ambient Temp: 24.8°C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN3920; ConvF(3.66, 3.66, 3.66); Calibrated: 12/12/2014;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 4/11/2014
Phantom: SAM; Type: QD000P40CD; Serial: TP:1758
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

5600 MHz System Verification

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio = 1.4
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 32.9 W/kg
SAR(1 g) = 7.74 W/kg
Deviation = -7.97%



0 dB = 18.7 W/kg = 12.72 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5800 MHz; Type: D5GHzV2; Serial: 1191

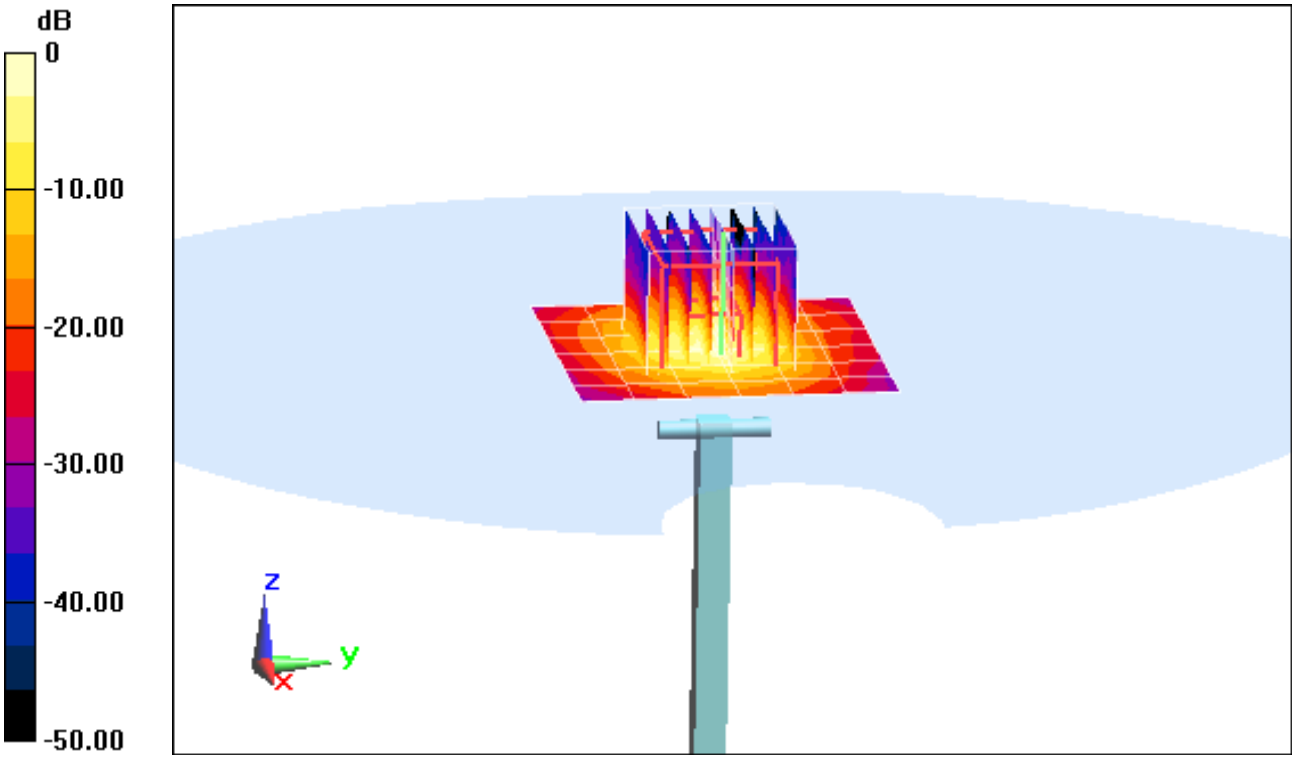
Communication System: UID 0, CW; Frequency: 5800 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5800 MHz; σ = 6.263 S/m; ε_r = 46.274; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 01-13-2015; Ambient Temp: 24.8°C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN3920; ConvF(3.93, 3.93, 3.93); Calibrated: 12/12/2014;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 4/11/2014
Phantom: SAM; Type: QD000P40CD; Serial: TP:1758
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

5800 MHz System Verification

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio = 1.4
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 31.7 W/kg
SAR(1 g) = 7.04 W/kg
Deviation = -9.74%



0 dB = 17.5 W/kg = 12.43 dBW/kg

APPENDIX C: PROBE CALIBRATION

Calibration Laboratory of
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Accreditation No.: SCS 108

Client **PC Test**

Certificate No: D750V3-1054_Mar14

CALIBRATION CERTIFICATE

Object D750V3 - SN: 1054

CCJ 3/28/14

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

Calibration date: March 17, 2014

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 17, 2014

PCTH 80680

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Accreditation No.: SCS 108

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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) 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	V52.8.7
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	40.6 ± 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	2.15 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.33 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.39 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	55.2 ± 6 %	1.00 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	2.23 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**8.64 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.46 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**5.69 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	55.1 Ω + 0.7 jΩ
Return Loss	- 26.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.5 Ω - 2.8 jΩ
Return Loss	- 29.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.035 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	November 08, 2011

DASY5 Validation Report for Head TSL

Date: 17.03.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

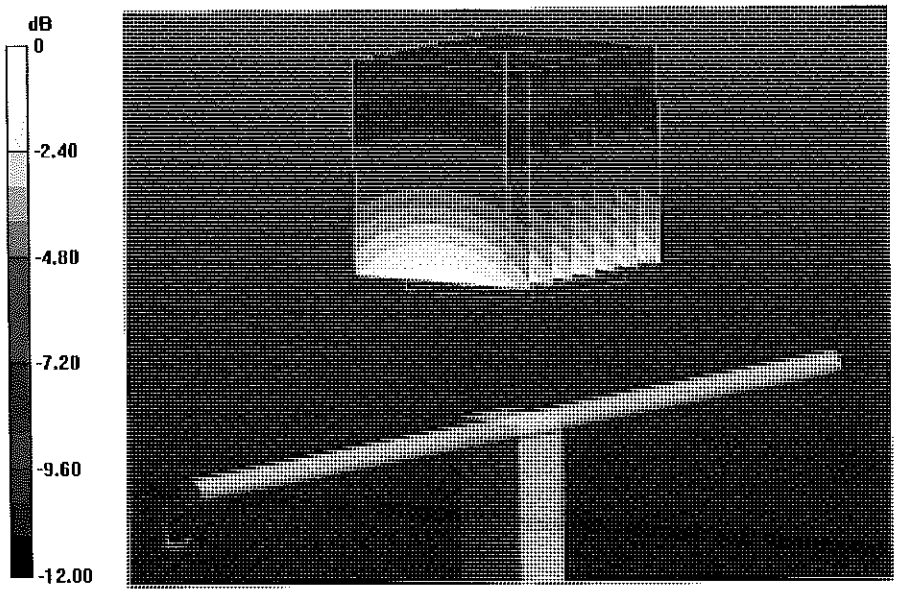
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.92 S/m; ε_r = 40.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.37, 6.37, 6.37); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

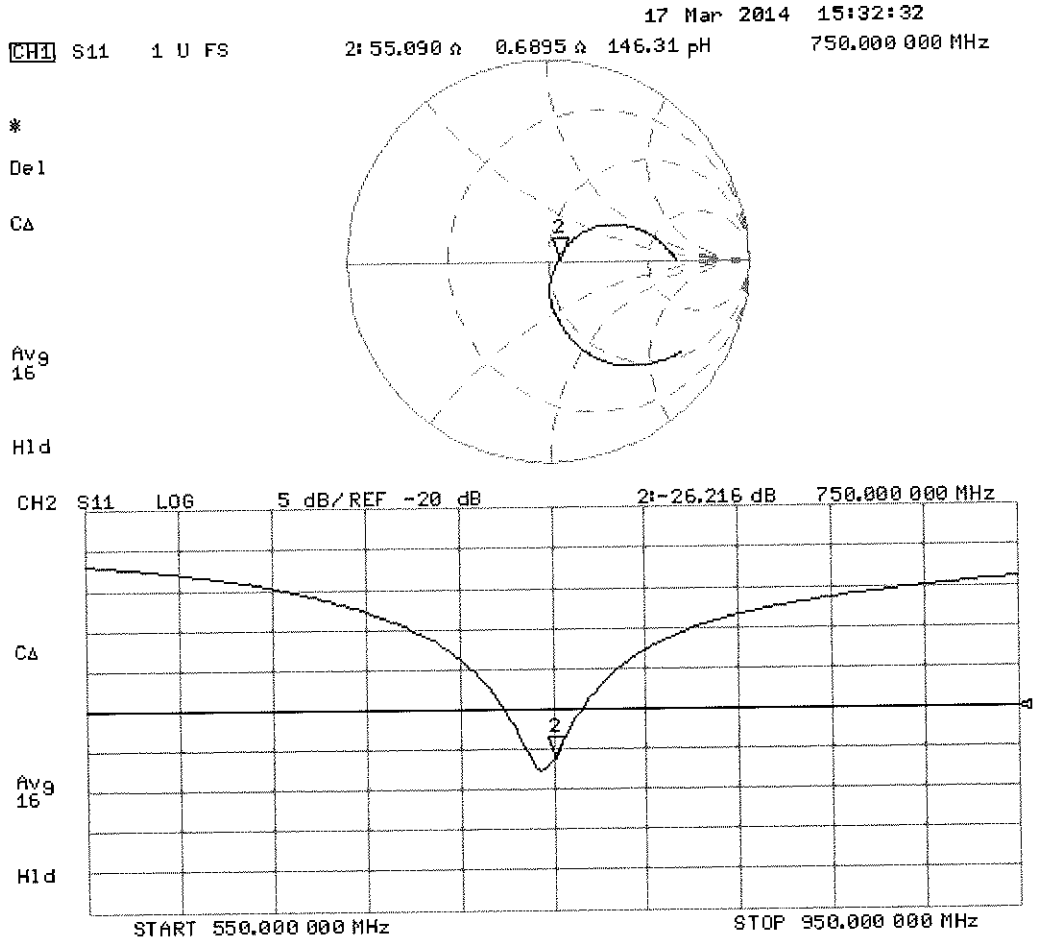
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.851 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 3.25 W/kg
SAR(1 g) = 2.15 W/kg; SAR(10 g) = 1.39 W/kg
Maximum value of SAR (measured) = 2.51 W/kg



0 dB = 2.51 W/kg = 4.00 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 14.03.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

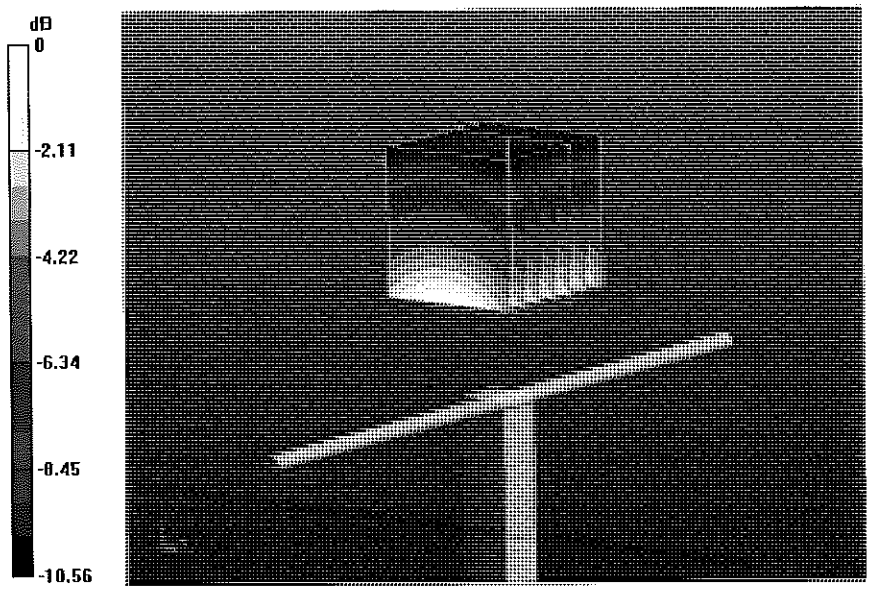
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 1 S/m; ε_r = 55.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.13, 6.13, 6.13); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

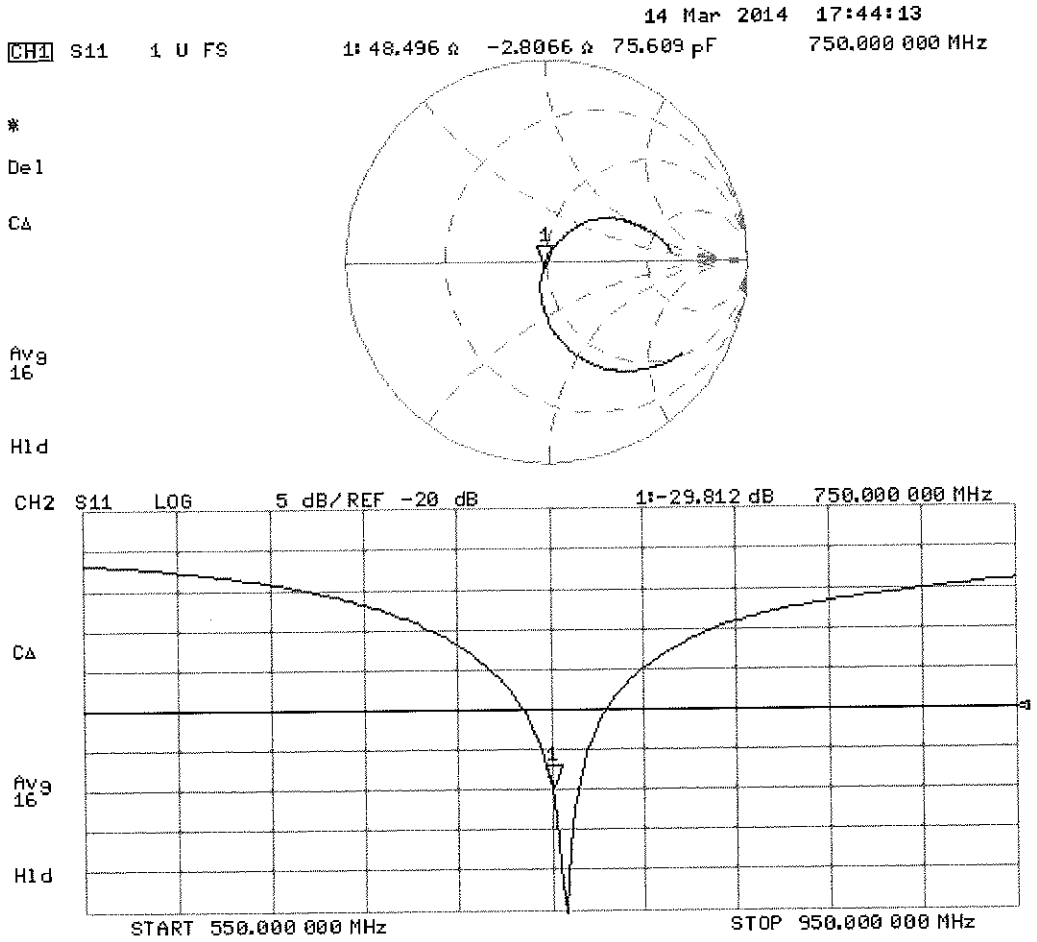
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.788 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.27 W/kg
SAR(1 g) = 2.23 W/kg; SAR(10 g) = 1.46 W/kg
Maximum value of SAR (measured) = 2.59 W/kg



0 dB = 2.59 W/kg = 4.13 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D835V2-4d133_Jul14**

CALIBRATION CERTIFICATE

Object D835V2 - SN: 4d133

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

CC 8/6/14

Calibration date: July 24, 2014

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	30-Apr-14 (No. DAE4-601_Apr14)	Apr-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (In house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (In house check Oct-13)	In house check: Oct-14

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

Issued: July 24, 2014

Calibration Laboratory of
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Accreditation No.: **SCS 108**

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

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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) 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	V52.8.8
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	41.1 ± 6 %	0.94 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	2.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.20 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.53 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.96 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	53.8 ± 6 %	1.02 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	2.44 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.35 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.59 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.15 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.6 Ω - 1.0 jΩ
Return Loss	- 34.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.8 Ω - 3.3 jΩ
Return Loss	- 27.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.395 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 22, 2011

DASY5 Validation Report for Head TSL

Date: 24.07.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

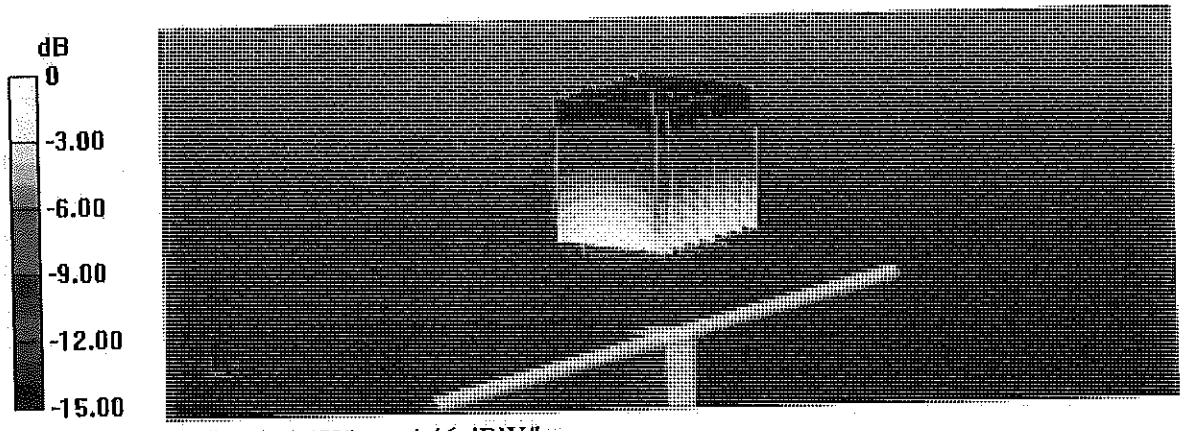
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.94 S/m; ε_r = 41.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.22, 6.22, 6.22); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

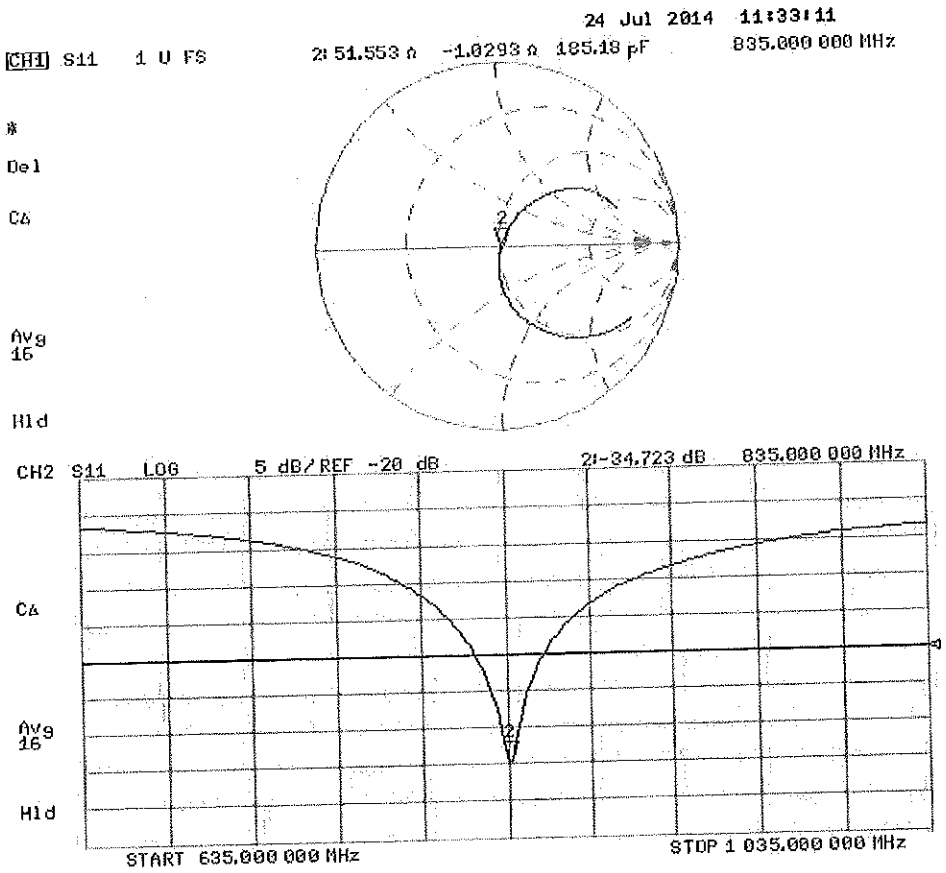
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.07 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 3.58 W/kg
SAR(1 g) = 2.38 W/kg; SAR(10 g) = 1.53 W/kg
Maximum value of SAR (measured) = 2.79 W/kg



0 dB = 2.79 W/kg = 4.46 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 17.07.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

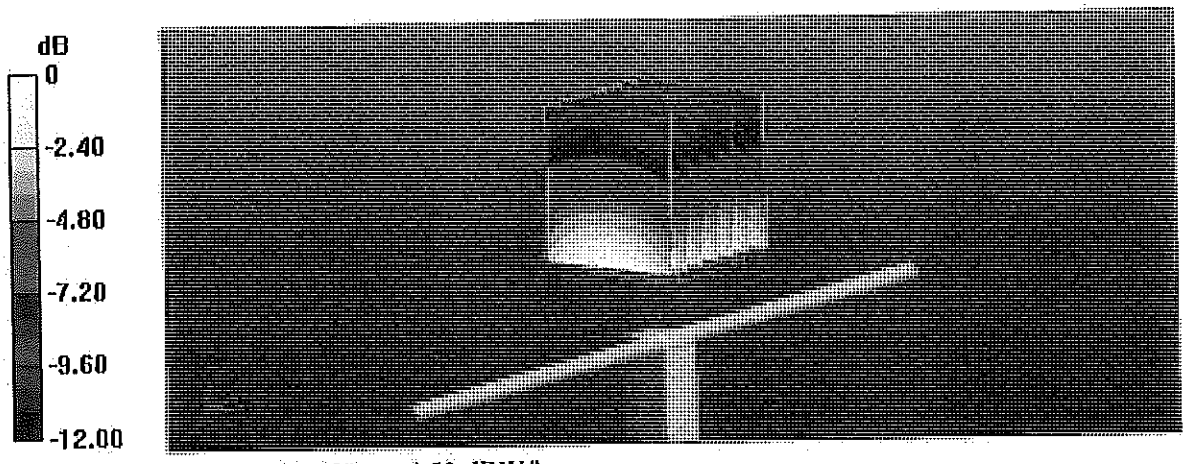
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 1.02 S/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.09, 6.09, 6.09); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

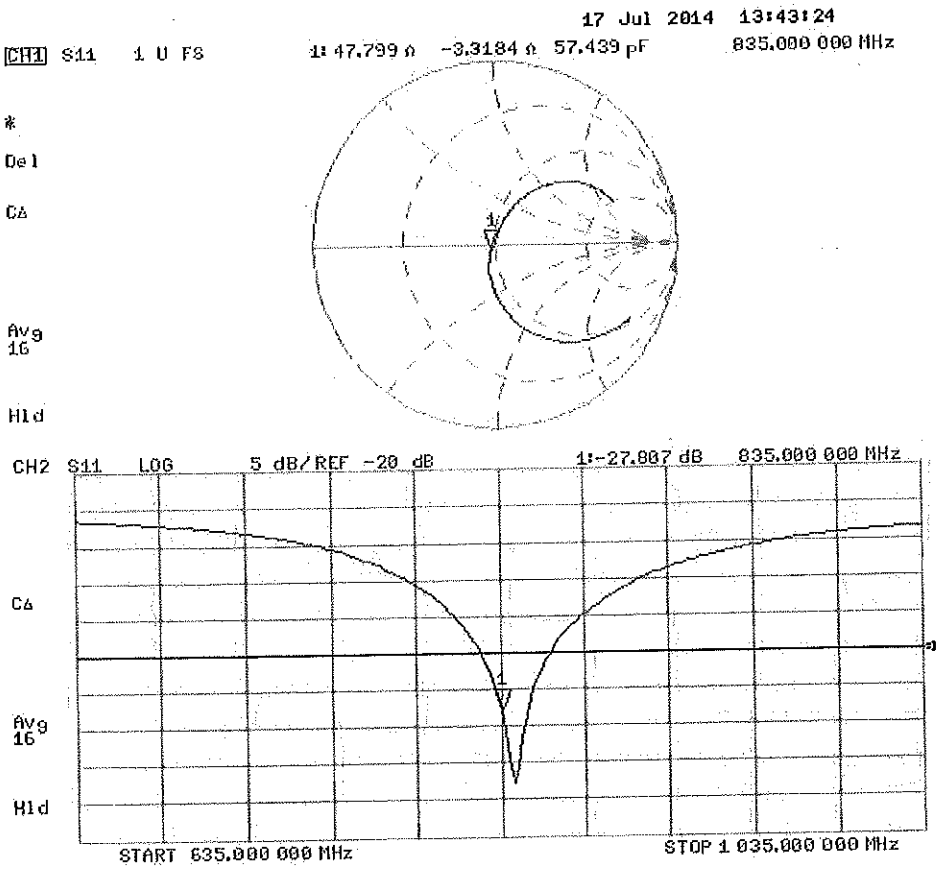
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.61 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.59 W/kg
SAR(1 g) = 2.44 W/kg; SAR(10 g) = 1.59 W/kg
Maximum value of SAR (measured) = 2.84 W/kg



0 dB = 2.84 W/kg = 4.53 dBW/kg

Impedance 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)
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Accreditation No.: SCS 108

Client **PC Test**

Certificate No: D1765V2-1008_May14

CALIBRATION CERTIFICATE

Object D1765V2 - SN: 1008

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

CCV
6R/H

Calibration date: May 07, 2014

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	30-Apr-14 (No. DAE4-601_Apr14)	Apr-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

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

Issued: May 12, 2014

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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) 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	V52.8.8
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	39.0 ± 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	9.23 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**36.9 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.87 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.5 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	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.2 ± 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	9.41 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**37.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.02 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.1 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	47.7 Ω - 6.1 jΩ
Return Loss	- 23.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	43.7 Ω - 6.4 jΩ
Return Loss	- 20.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.211 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	October 06, 2005

DASY5 Validation Report for Head TSL

Date: 07.05.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1765 MHz; Type: D1765V2; Serial: D1765V2 - SN: 1008

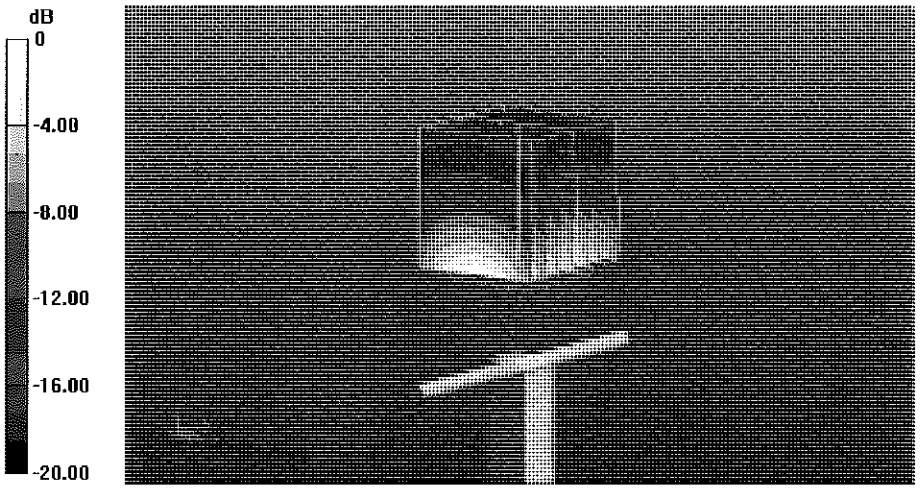
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.36 S/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.23, 5.23, 5.23); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

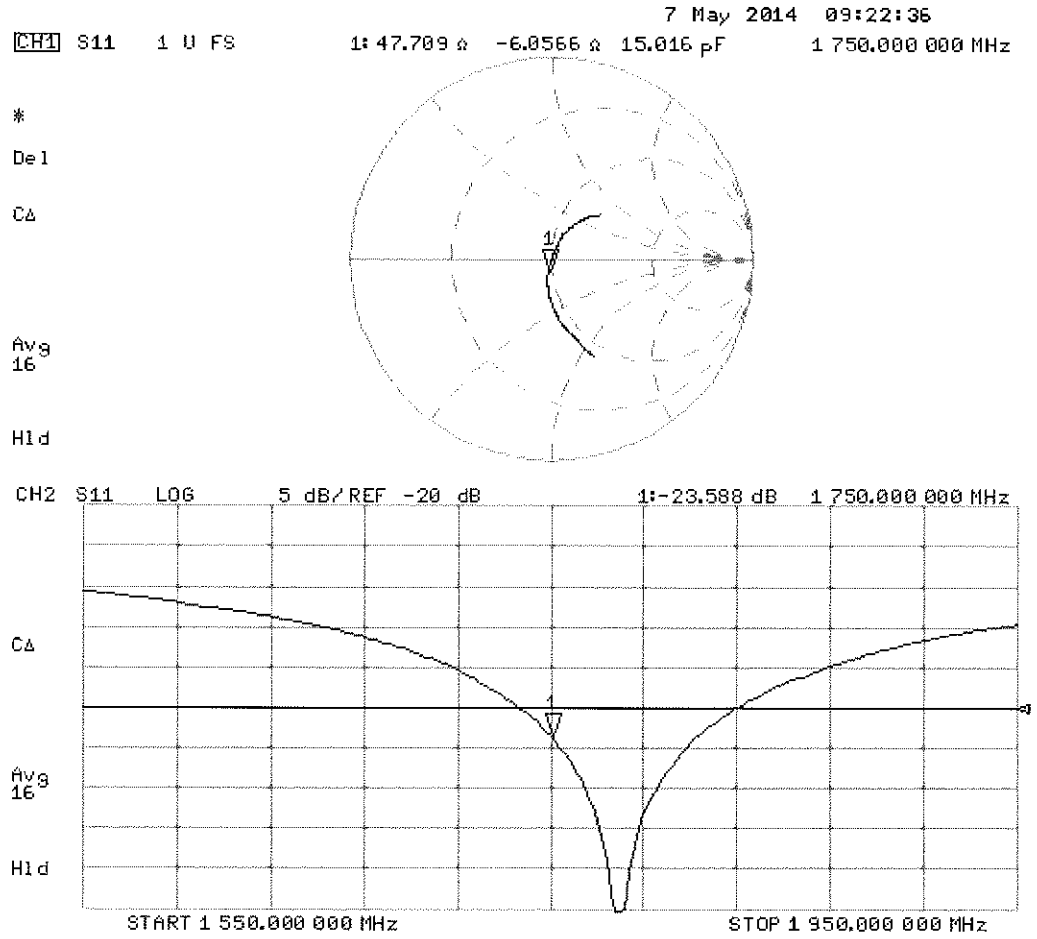
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.06 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 16.7 W/kg
SAR(1 g) = 9.23 W/kg; SAR(10 g) = 4.87 W/kg
Maximum value of SAR (measured) = 11.7 W/kg



0 dB = 11.7 W/kg = 10.68 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 07.05.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1765 MHz; Type: D1765V2; Serial: D1765V2 - SN: 1008

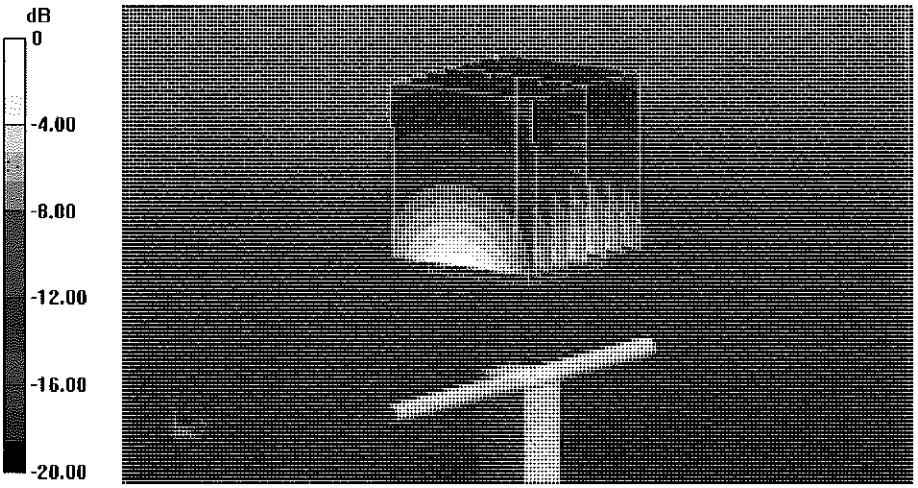
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.48 S/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.89, 4.89, 4.89); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

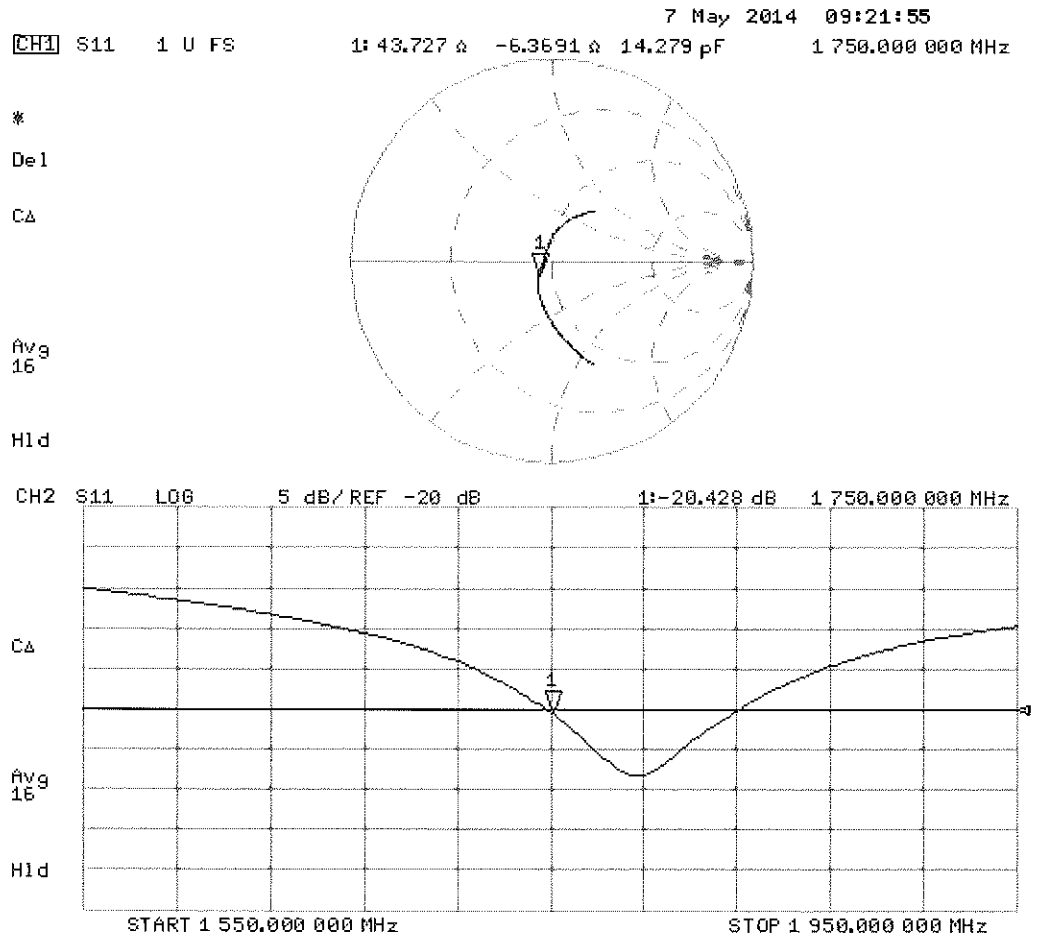
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 93.01 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 16.3 W/kg
SAR(1 g) = 9.41 W/kg; SAR(10 g) = 5.02 W/kg
Maximum value of SAR (measured) = 11.8 W/kg



0 dB = 11.8 W/kg = 10.72 dBW/kg

Impedance Measurement Plot for Body TSL



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

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

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

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D1900V2-5d149_Jul14**

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d149
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	July 23, 2014

CC 11/5/14

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 EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	30-Apr-14 (No. DAE4-601_Apr14)	Apr-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

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

Issued: July 23, 2014

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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) 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	V52.8.8
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	39.5 ± 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	10.0 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**40.2 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.24 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.0 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	52.5 ± 6 %	1.51 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	10.1 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**40.4 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.33 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.3 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.6 Ω + 5.5 jΩ
Return Loss	- 24.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.8 Ω + 6.1 jΩ
Return Loss	- 24.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.197 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 11, 2011

DASY5 Validation Report for Head TSL

Date: 23.07.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

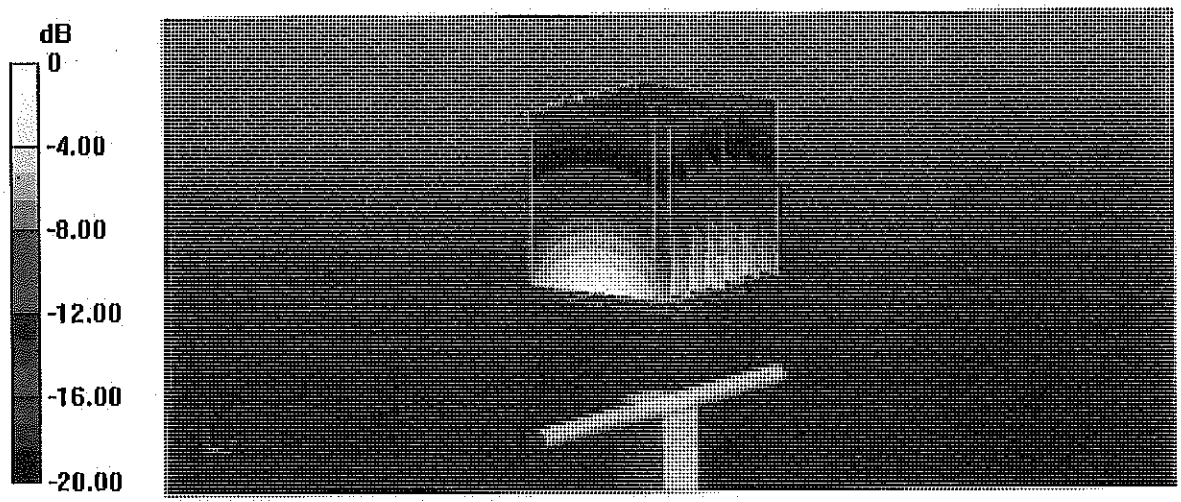
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.38 S/m; ε_r = 39.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.06, 5.06, 5.06); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

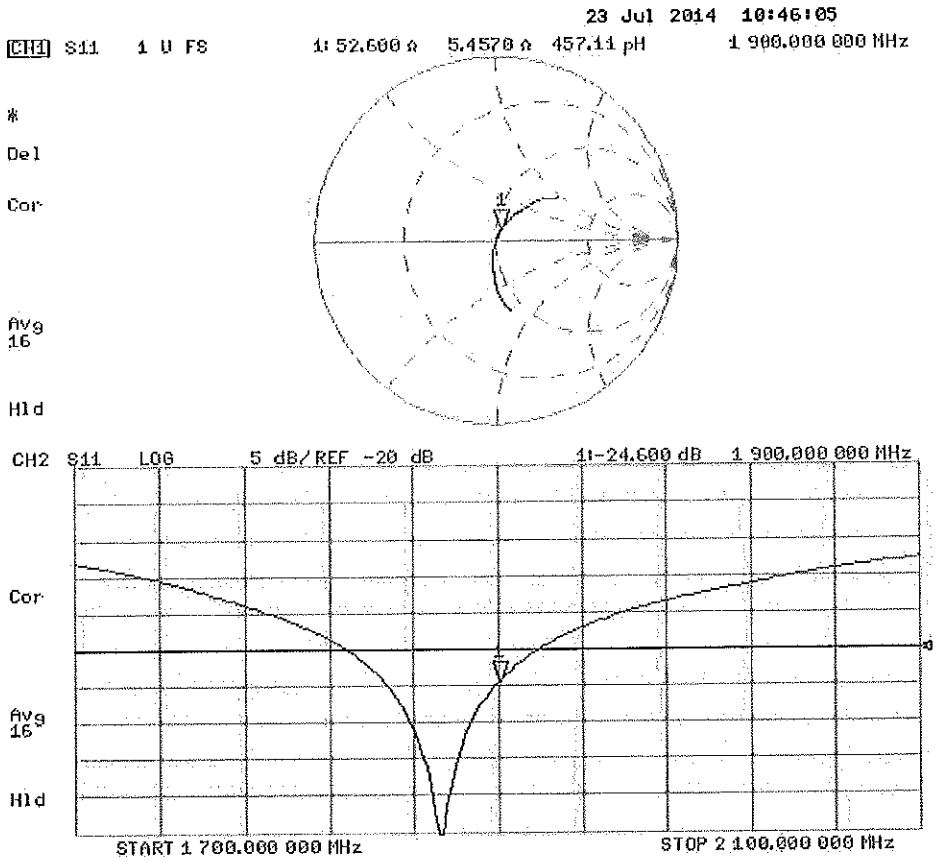
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 98.92 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 18.4 W/kg
SAR(1 g) = 10 W/kg; SAR(10 g) = 5.24 W/kg
Maximum value of SAR (measured) = 12.8 W/kg



0 dB = 12.8 W/kg = 11.07 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 23.07.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

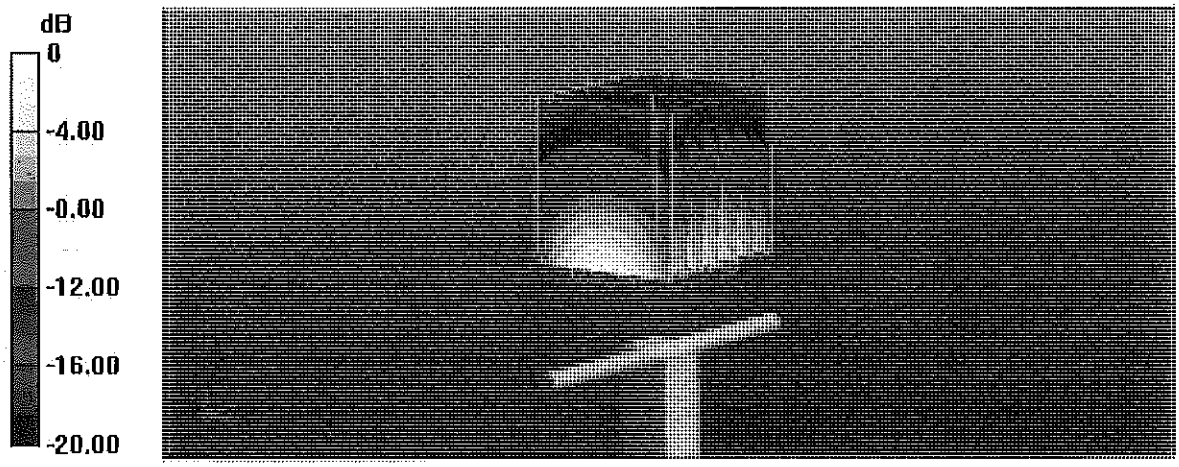
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.51 S/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.76, 4.76, 4.76); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

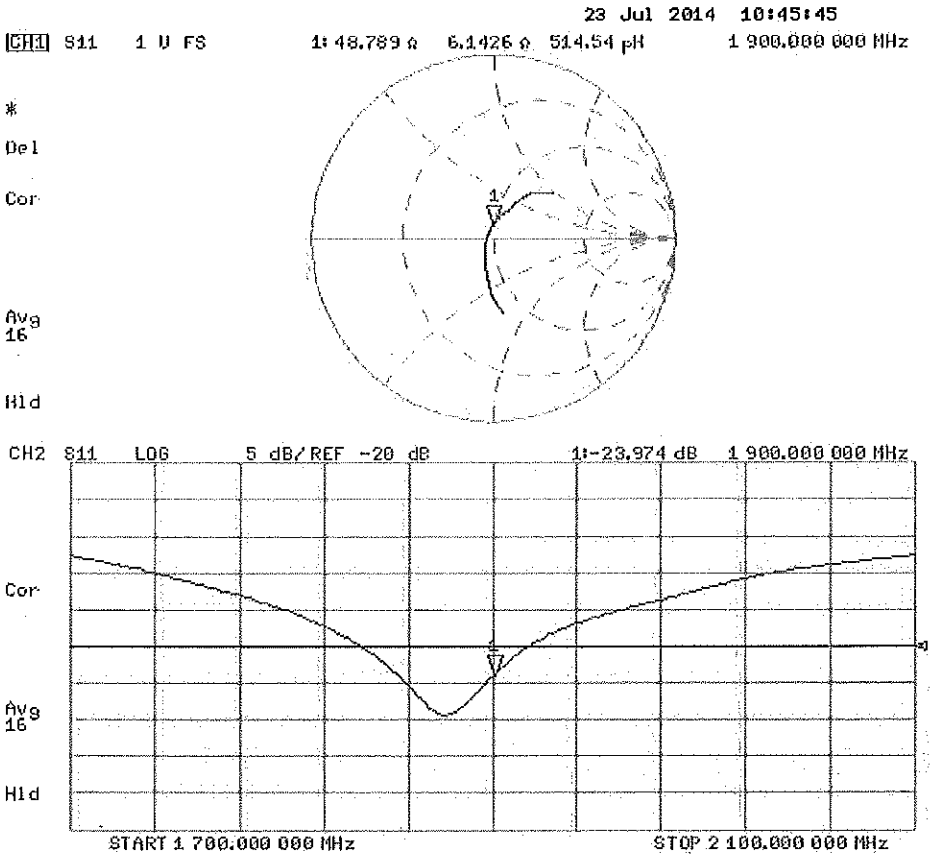
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.83 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 17.6 W/kg
SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.33 W/kg
Maximum value of SAR (measured) = 12.8 W/kg



0 dB = 12.8 W/kg = 11.07 dBW/kg

Impedance Measurement Plot for Body TSL



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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 108

Client PC Test

Certificate No: D2450V2-882_Feb14

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 882
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	February 24, 2014

CCV 3/6/14

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 EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 25, 2014

PCTH 80826

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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) 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	V52.8.7
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	38.1 ± 6 %	1.86 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.3 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.0 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.12 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.2 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	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	50.7 ± 6 %	2.02 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	12.7 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**49.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.87 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.1 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.5 Ω - 0.9 jΩ
Return Loss	- 29.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.1 Ω + 1.5 jΩ
Return Loss	- 36.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.159 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	October 06, 2011

DASY5 Validation Report for Head TSL

Date: 24.02.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 882

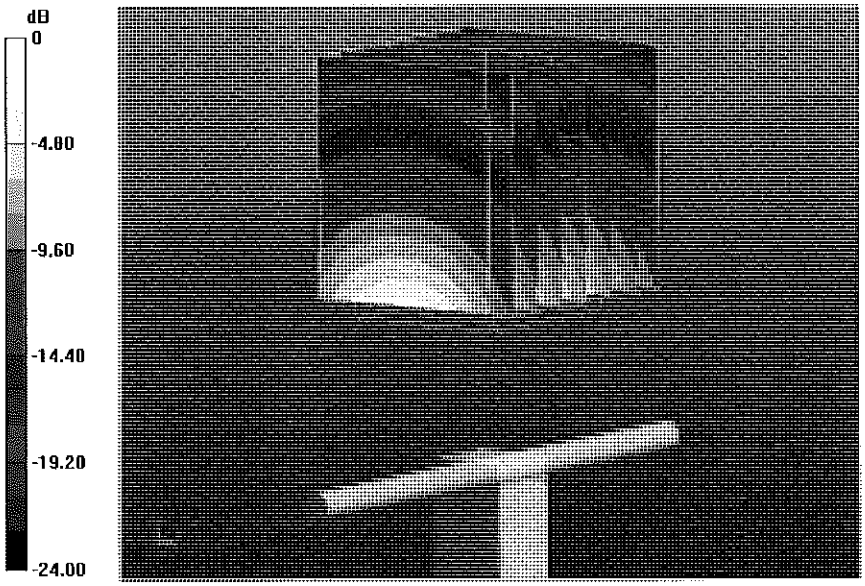
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.86 S/m; ε_r = 38.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

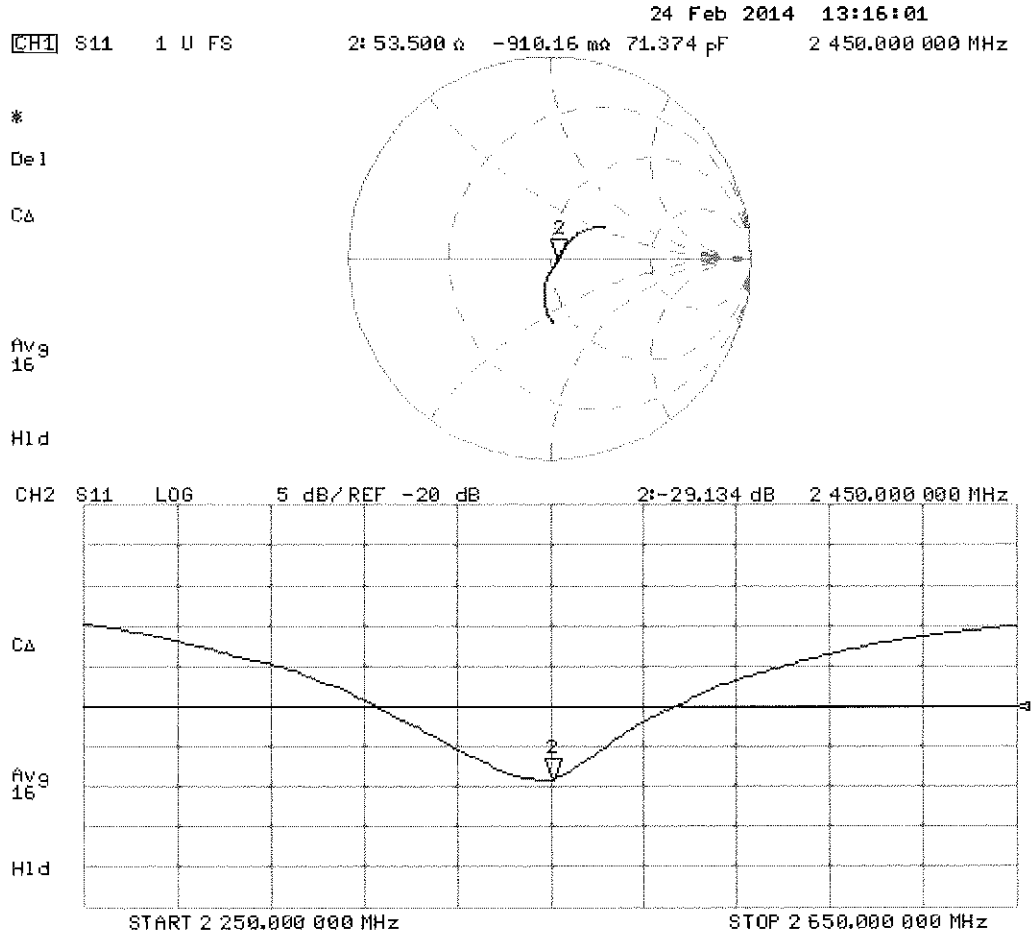
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 99.531 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 27.8 W/kg
SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.12 W/kg
Maximum value of SAR (measured) = 17.0 W/kg



0 dB = 17.0 W/kg = 12.30 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 24.02.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 882

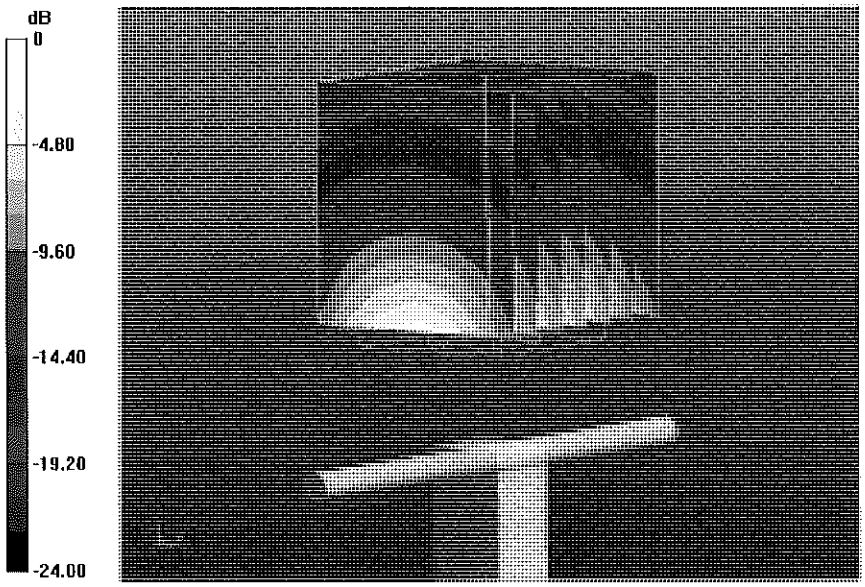
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.02 S/m; ε_r = 50.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.35, 4.35, 4.35); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

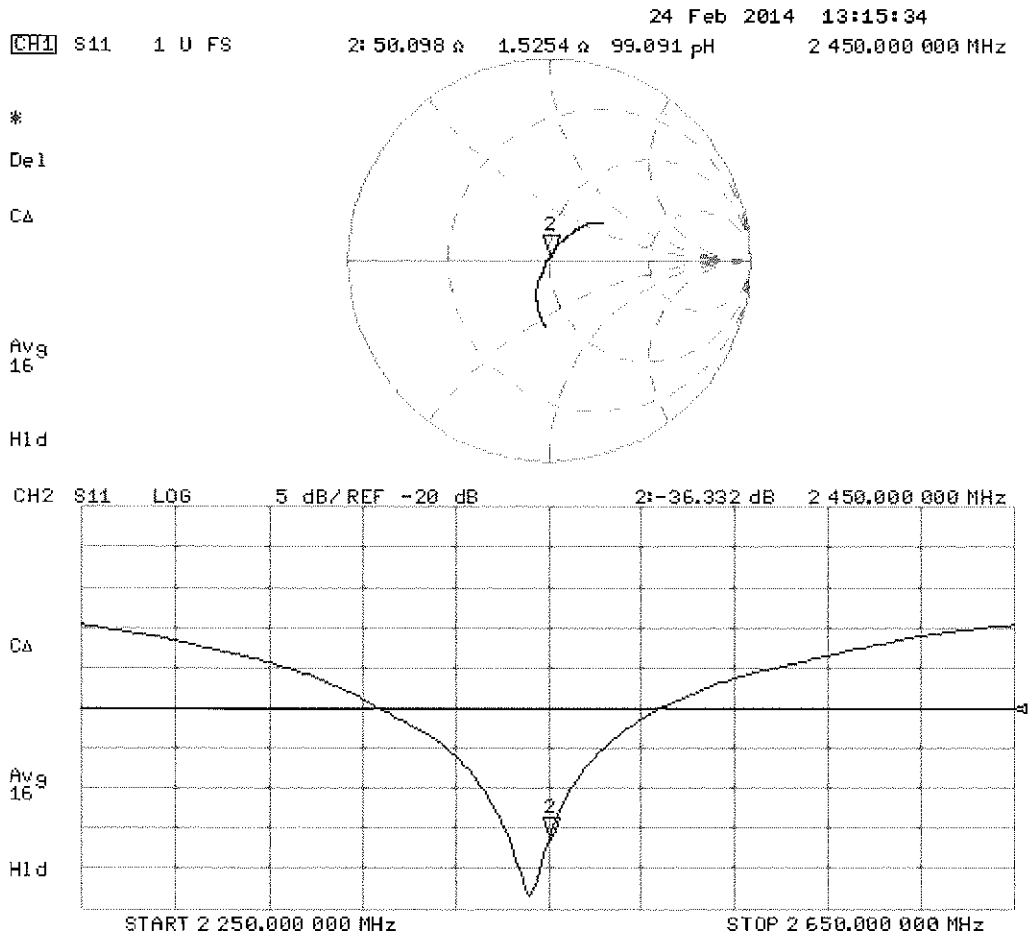
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scau (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.329 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 26.8 W/kg
SAR(1 g) = 12.7 W/kg; SAR(10 g) = 5.87 W/kg
Maximum value of SAR (measured) = 16.9 W/kg



0 dB = 16.9 W/kg = 12.28 dBW/kg

Impedance Measurement Plot for Body TSL



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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 108**

Client **PC Test**

Certificate No: **D2600V2-1071_Oct14**

CALIBRATION CERTIFICATE

Object	D2600V2 - SN: 1071
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	October 20, 2014

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: October 20, 2014

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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) 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	V52.8.8
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	37.8 ± 6 %	2.03 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	14.7 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**57.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.57 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**25.9 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	50.8 ± 6 %	2.22 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	14.5 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**56.9 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.43 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**25.4 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.7 Ω - 5.2 jΩ
Return Loss	- 25.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.9 Ω - 4.2 jΩ
Return Loss	- 24.2 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	July 17, 2013

DASY5 Validation Report for Head TSL

Date: 20.10.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1071

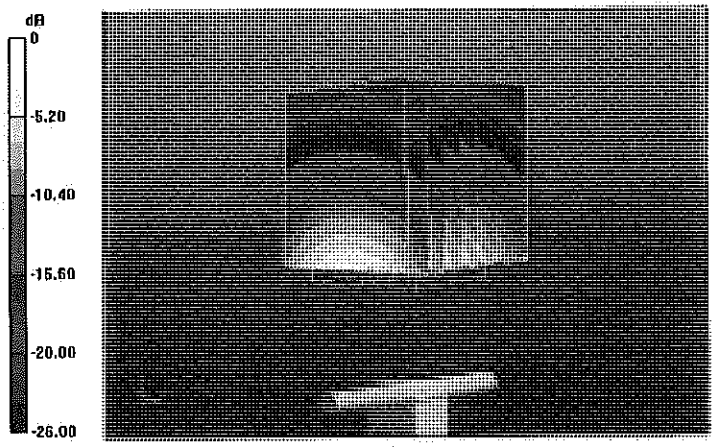
Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 2.03 S/m; ε_r = 37.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.46, 4.46, 4.46); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

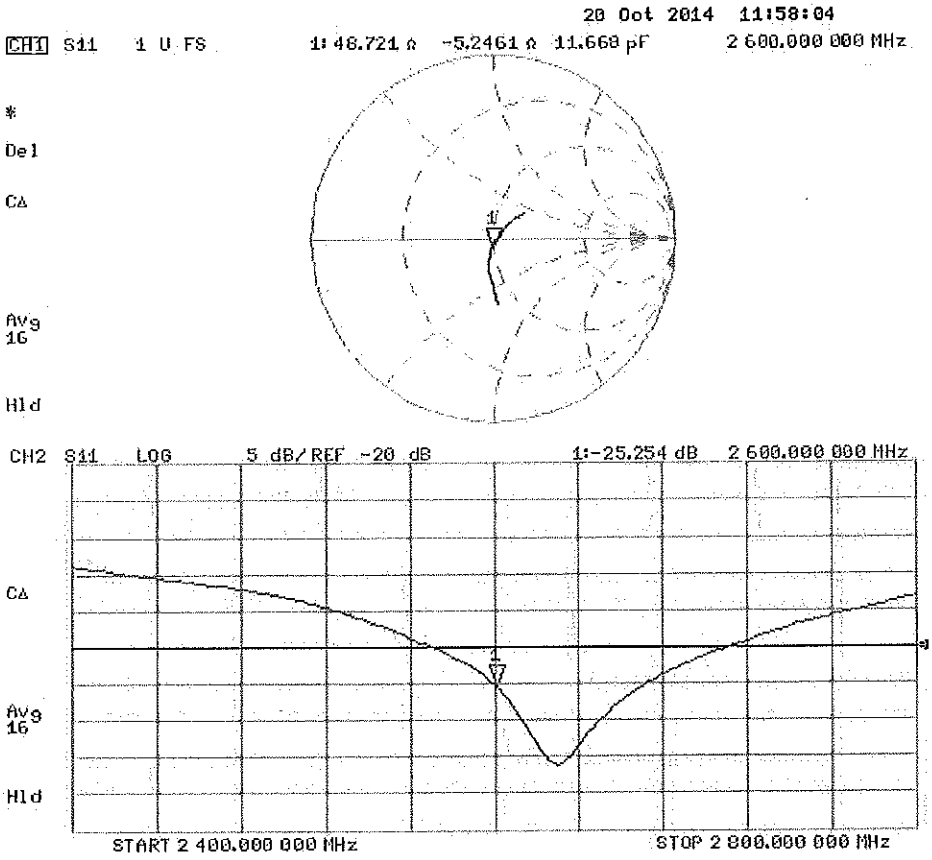
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 103.3 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 31.0 W/kg
SAR(1 g) = 14.7 W/kg; SAR(10 g) = 6.57 W/kg
Maximum value of SAR (measured) = 19.7 W/kg



0 dB = 19.7 W/kg = 12.94 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 20.10.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1071

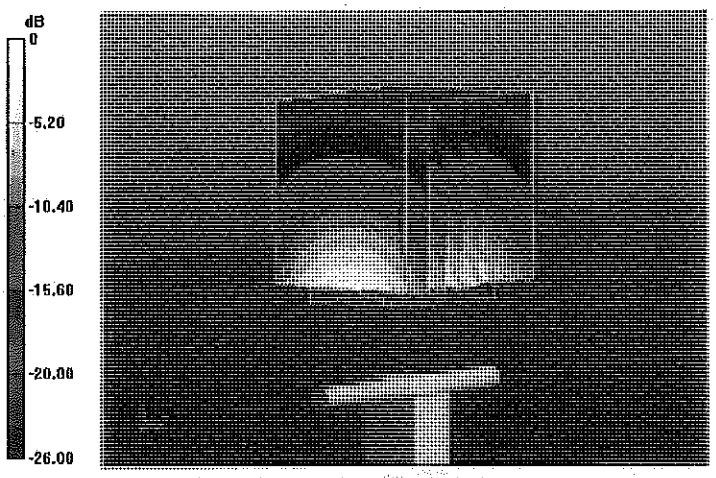
Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 2.22 S/m; ε_r = 50.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.24, 4.24, 4.24); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

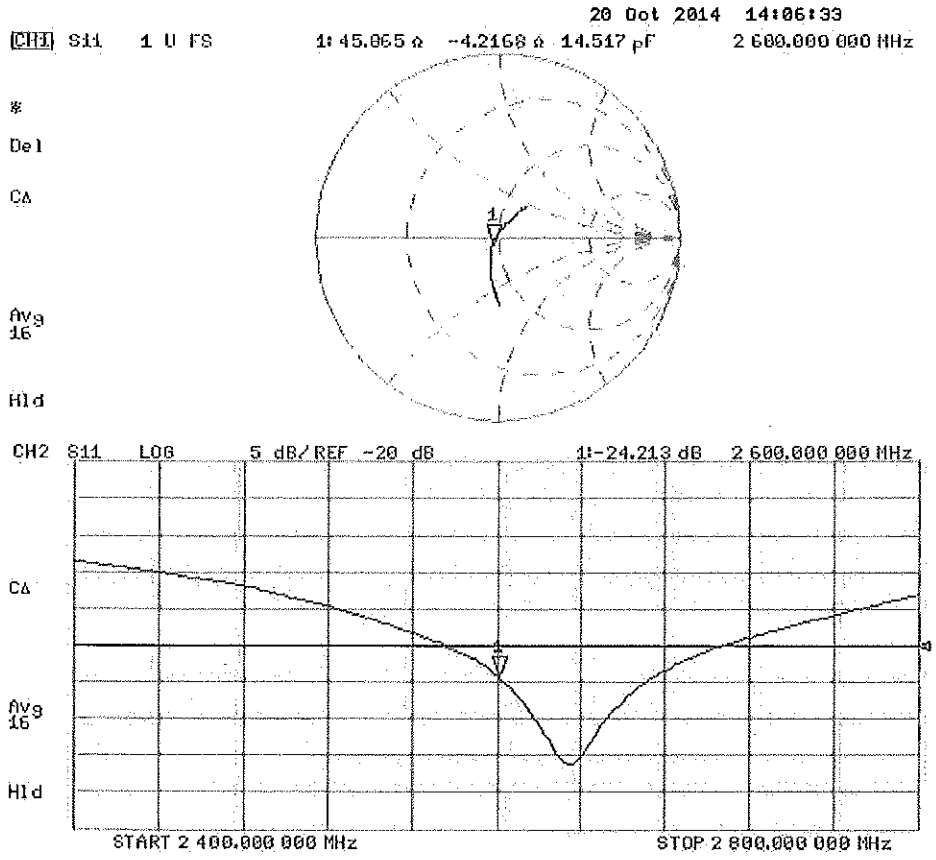
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97.02 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 31.0 W/kg
SAR(1 g) = 14.5 W/kg; SAR(10 g) = 6.43 W/kg
Maximum value of SAR (measured) = 19.3 W/kg



0 dB = 19.3 W/kg = 12.86 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 108

Client PC Test

Certificate No: D5GHzV2-1120_Feb14

CALIBRATION CERTIFICATE

CCV 3/6/14

Object	D5GHzV2 - SN: 1120
Calibration procedure(s)	QA CAL-22.v2 Calibration procedure for dipole validation kits between 3-6 GHz
Calibration date:	February 26, 2014

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe EX3DV4	SN: 3503	30-Dec-13 (No. EX3-3503_Dec13)	Dec-14
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

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

Issued: February 27, 2014

PCT# 80834

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

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Accreditation No.: SCS 108
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Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010
b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"
c) 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

Additional Documentation:

d) 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	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz ± 1 MHz 5300 MHz ± 1 MHz 5500 MHz ± 1 MHz 5600 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.1 ± 6 %	4.52 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.87 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**79.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.24 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.5 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.9 ± 6 %	4.63 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.30 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**83.4 W / kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.8 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.7 ± 6 %	4.84 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.45 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**84.9 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.1 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.6 ± 6 %	4.95 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.18 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**82.2 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.5 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.3 ± 6 %	5.16 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.87 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**79.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.23 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.4 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.8 ± 6 %	5.40 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.43 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**74.0 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.08 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.7 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.42 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.6 ± 6 %	5.53 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5300 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.62 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**75.8 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.3 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.65 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.3 ± 6 %	5.80 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.96 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**79.2 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.21 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**22.0 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.1 ± 6 %	5.94 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.98 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**79.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.21 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**22.0 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.8 ± 6 %	6.21 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.47 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**74.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.07 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.6 W/kg ± 19.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	54.0 Ω - 5.6 jΩ
Return Loss	- 23.6 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	51.1 Ω + 1.6 jΩ
Return Loss	- 34.6 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	51.1 Ω - 2.3 jΩ
Return Loss	- 31.9 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	58.4 Ω - 0.2 jΩ
Return Loss	- 22.2 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	52.9 Ω + 2.8 jΩ
Return Loss	- 28.2 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	52.3 Ω - 5.9 jΩ
Return Loss	- 24.2 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	51.1 Ω + 1.2 jΩ
Return Loss	- 35.8 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	50.5 Ω - 2.6 jΩ
Return Loss	- 31.6 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	59.5 Ω - 2.9 jΩ
Return Loss	- 20.9 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	54.2 Ω + 1.1 jΩ
Return Loss	- 27.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.206 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 08, 2011

DASY5 Validation Report for Head TSL

Date: 26.02.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1120

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 4.52 S/m; ε_r = 37.1; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5300 MHz; σ = 4.63 S/m; ε_r = 36.9; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5500 MHz; σ = 4.84 S/m; ε_r = 36.7; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5600 MHz; σ = 4.95 S/m; ε_r = 36.6; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5800 MHz; σ = 5.16 S/m; ε_r = 36.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.52, 5.52, 5.52); Calibrated: 30.12.2013, ConvF(5.2, 5.2, 5.2); Calibrated: 30.12.2013, ConvF(5.01, 5.01, 5.01); Calibrated: 30.12.2013, ConvF(4.86, 4.86, 4.86); Calibrated: 30.12.2013, ConvF(4.91, 4.91, 4.91); Calibrated: 30.12.2013;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

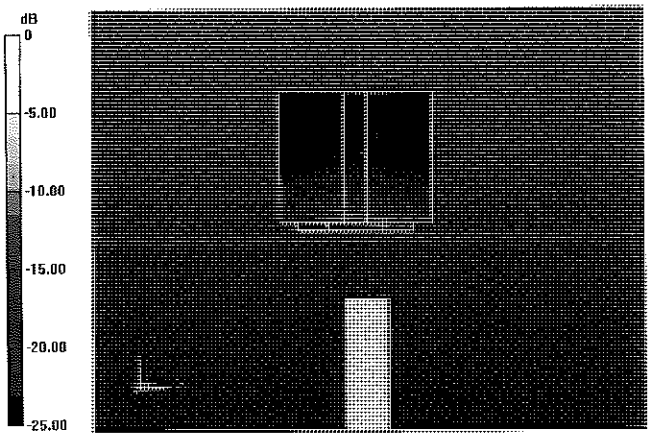
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 62.794 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 28.6 W/kg
SAR(1 g) = 7.87 W/kg; SAR(10 g) = 2.24 W/kg
Maximum value of SAR (measured) = 18.0 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.390 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 31.5 W/kg
SAR(1 g) = 8.3 W/kg; SAR(10 g) = 2.37 W/kg
Maximum value of SAR (measured) = 19.2 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.321 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 33.6 W/kg
SAR(1 g) = 8.45 W/kg; SAR(10 g) = 2.4 W/kg
Maximum value of SAR (measured) = 20.0 W/kg

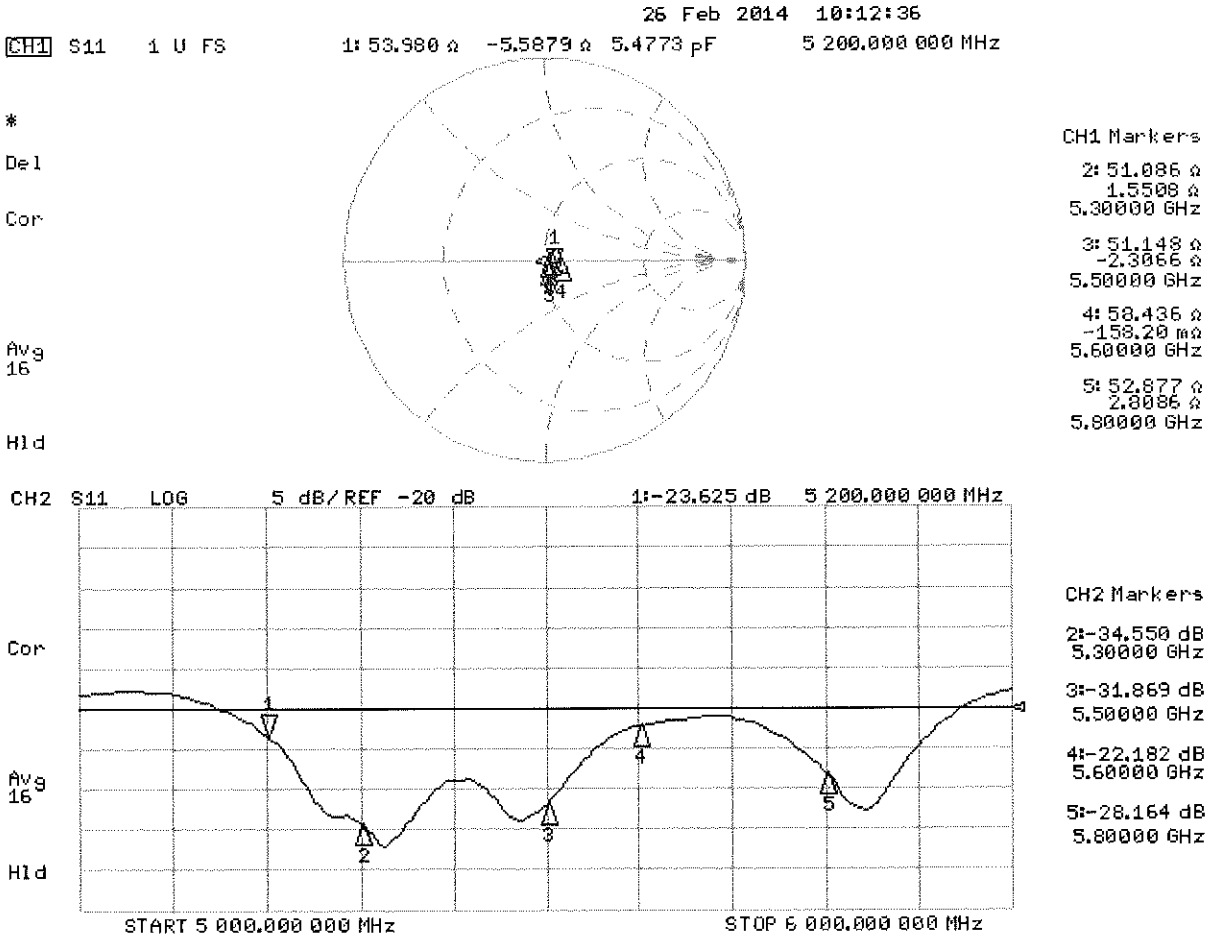
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 62.007 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 32.7 W/kg
SAR(1 g) = 8.18 W/kg; SAR(10 g) = 2.33 W/kg
Maximum value of SAR (measured) = 19.4 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 59.638 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 33.0 W/kg
SAR(1 g) = 7.87 W/kg; SAR(10 g) = 2.23 W/kg
Maximum value of SAR (measured) = 19.0 W/kg



0 dB = 19.0 W/kg = 12.79 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 25.02.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1120

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 5.4 S/m; ε_r = 47.8; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5300 MHz; σ = 5.53 S/m; ε_r = 47.6; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5500 MHz; σ = 5.8 S/m; ε_r = 47.3; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5600 MHz; σ = 5.94 S/m; ε_r = 47.1; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5800 MHz; σ = 6.21 S/m; ε_r = 46.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.01, 5.01, 5.01); Calibrated: 30.12.2013, ConvF(4.76, 4.76, 4.76); Calibrated: 30.12.2013, ConvF(4.52, 4.52, 4.52); Calibrated: 30.12.2013, ConvF(4.3, 4.3, 4.3); Calibrated: 30.12.2013, ConvF(4.47, 4.47, 4.47); Calibrated: 30.12.2013;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

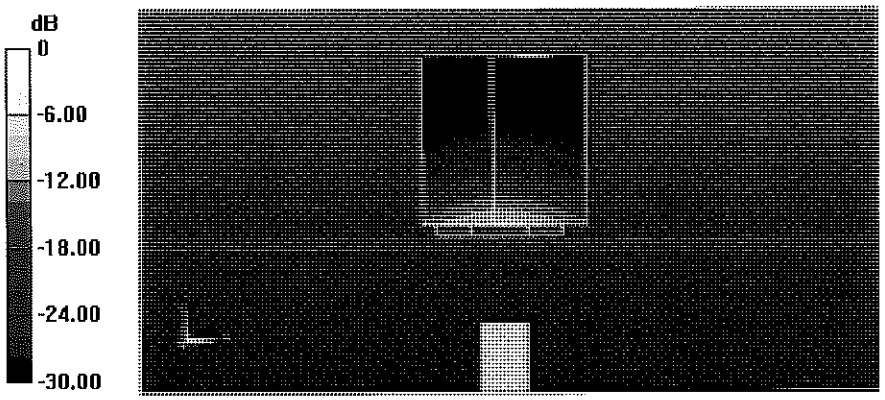
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 59.562 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 29.5 W/kg
SAR(1 g) = 7.43 W/kg; SAR(10 g) = 2.08 W/kg
Maximum value of SAR (measured) = 17.7 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.903 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 31.1 W/kg
SAR(1 g) = 7.62 W/kg; SAR(10 g) = 2.14 W/kg
Maximum value of SAR (measured) = 18.4 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 59.015 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 34.5 W/kg
SAR(1 g) = 7.96 W/kg; SAR(10 g) = 2.21 W/kg
Maximum value of SAR (measured) = 19.5 W/kg

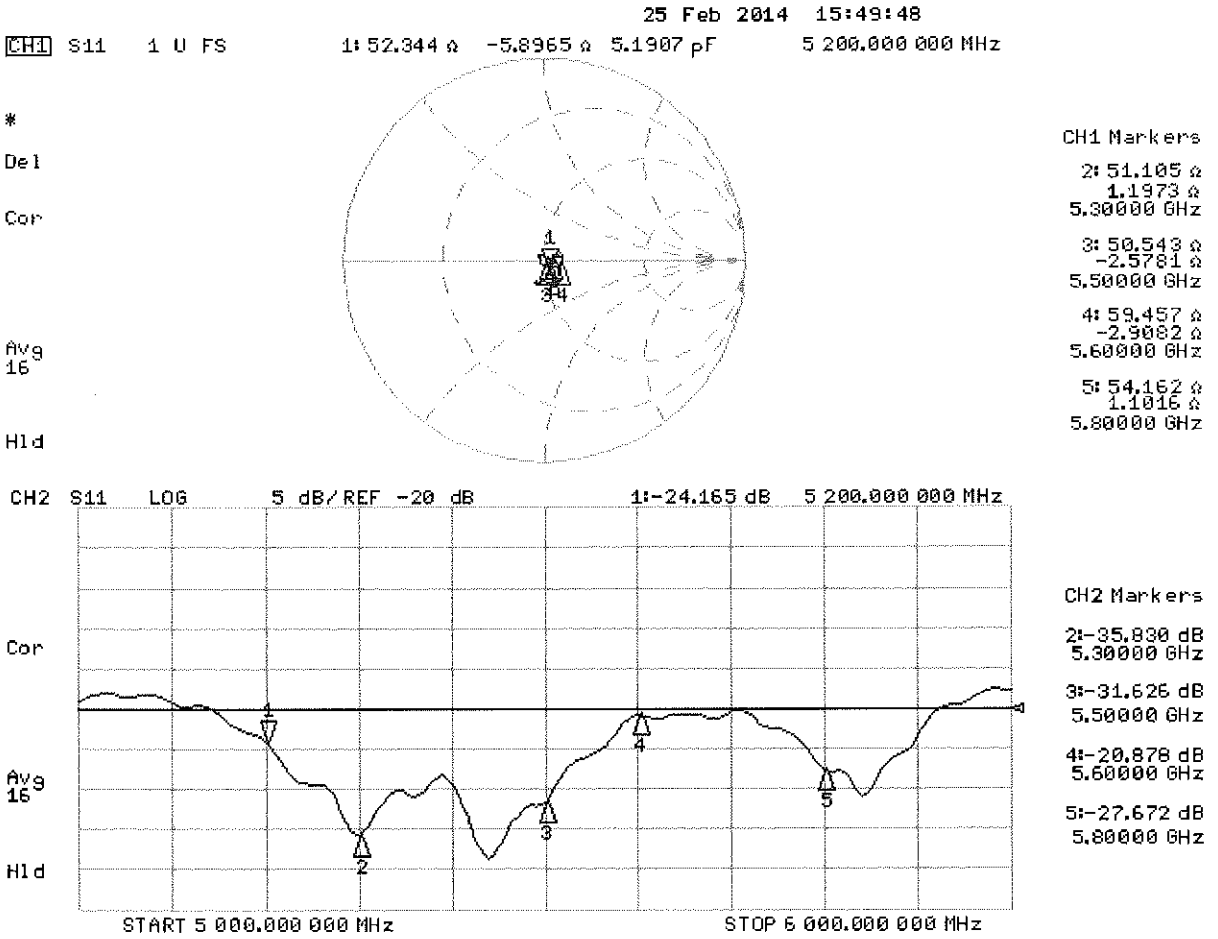
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.626 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 35.6 W/kg
SAR(1 g) = 7.98 W/kg; SAR(10 g) = 2.21 W/kg
Maximum value of SAR (measured) = 19.8 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 55.428 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 34.9 W/kg
SAR(1 g) = 7.47 W/kg; SAR(10 g) = 2.07 W/kg
Maximum value of SAR (measured) = 18.8 W/kg



0 dB = 18.8 W/kg = 12.74 dBW/kg

Impedance Measurement Plot for Body TSL



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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 108**

Client **PC Test**

Certificate No: **D1900V2-5d141_Apr14**

CALIBRATION CERTIFICATE

Object D1900V2 - SN: 5d141

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

Calibration date: April 09, 2014

✓ Kok 5/7/14

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 EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 801	25-Apr-13 (No. DAE4-801_Apr13)	Apr-14

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

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

Issued: April 9, 2014

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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) 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	V52.8.7
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	39.1 ± 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	9.91 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**40.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.17 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**20.8 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	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.4 ± 6 %	1.52 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	10.2 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**40.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.41 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.6 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.8 Ω + 5.5 jΩ
Return Loss	- 24.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.8 Ω + 6.3 jΩ
Return Loss	- 23.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 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 11, 2011

DASY5 Validation Report for Head TSL

Date: 09.04.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

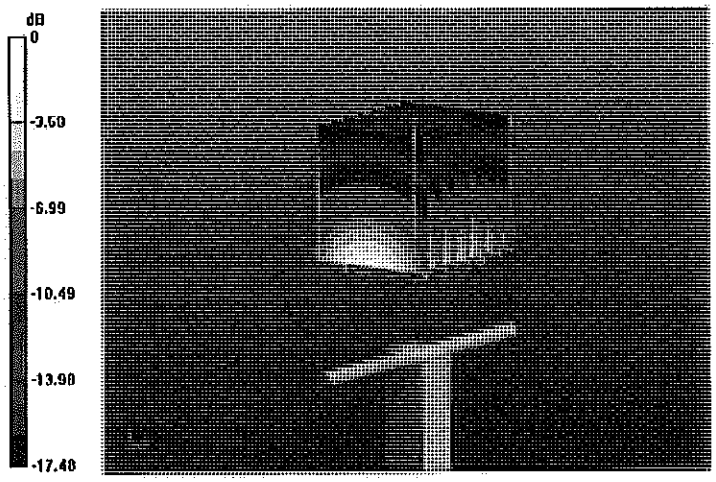
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.36 S/m; ε_r = 39.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.06, 5.06, 5.06); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

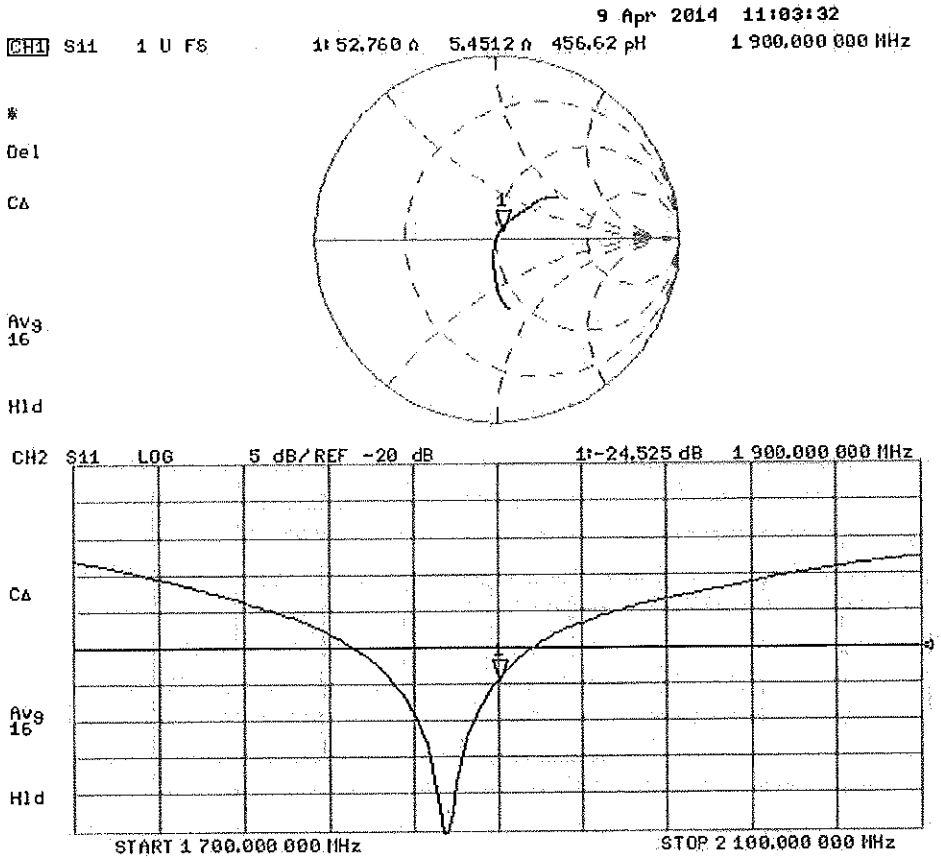
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 99.080 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 18.2 W/kg
SAR(1 g) = 9.91 W/kg; SAR(10 g) = 5.17 W/kg
Maximum value of SAR (measured) = 12.5 W/kg



0 dB = 12.5 W/kg = 10.97 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 09.04.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

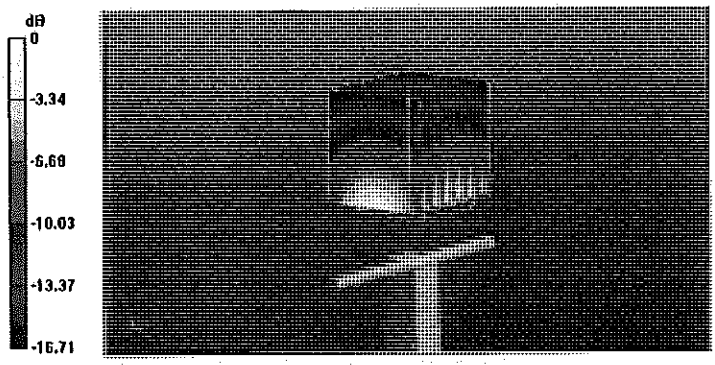
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.52 S/m; ε_r = 52.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.76, 4.76, 4.76); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom; Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

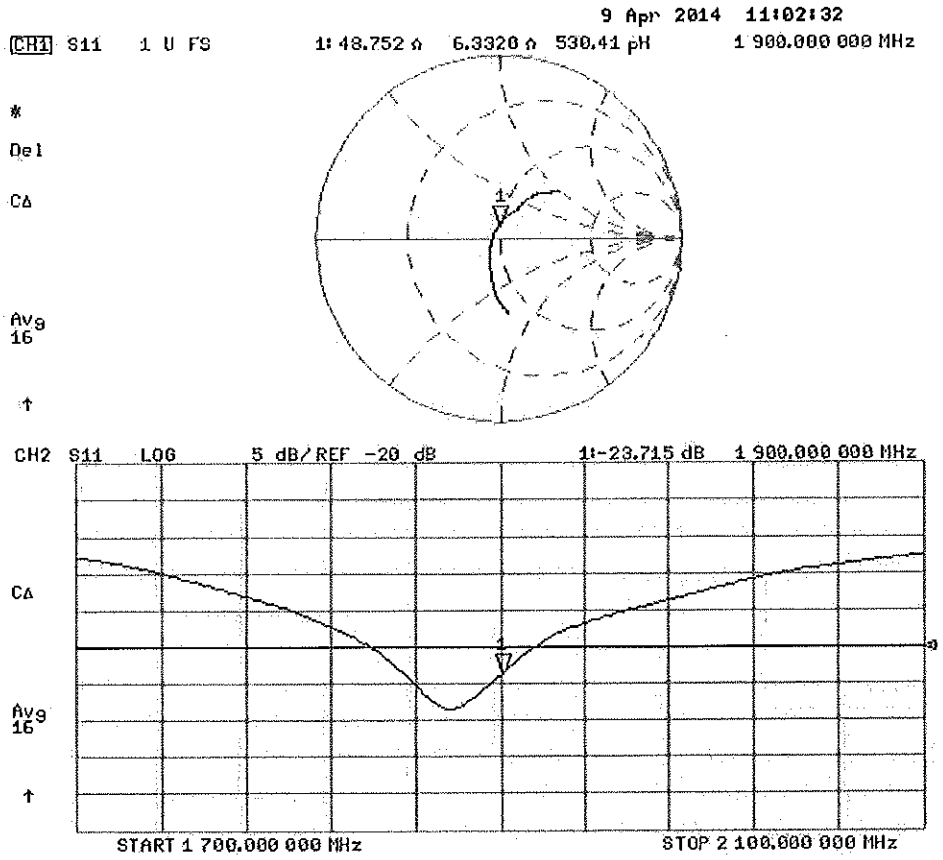
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.820 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 17.9 W/kg
SAR(1 g) = 10.2 W/kg; SAR(10 g) = 5.41 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 108**

Client **PC Test**

Certificate No: **D5GHzV2-1191_Sep14**

CALIBRATION CERTIFICATE

Object D5GHzV2 - SN:1191

Calibration procedure(s) QA CAL-22.v2
Calibration procedure for dipole validation kits between 3-6 GHz

CC
WIWM

Calibration date: September 25, 2014

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe EX3DV4	SN: 3503	30-Dec-13 (No. EX3-3503_Dec13)	Dec-14
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

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

Issued: September 25, 2014

Asset # 81751

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) IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010
b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"
c) 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

Additional Documentation:

d) 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	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz ± 1 MHz 5300 MHz ± 1 MHz 5500 MHz ± 1 MHz 5600 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.9 ± 6 %	4.54 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.17 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**81.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.1 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.8 ± 6 %	4.64 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.64 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**85.8 W / kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.47 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.5 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.5 ± 6 %	4.83 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.93 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**88.6 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.54 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**25.2 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.4 ± 6 %	4.93 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.76 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**86.9 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.49 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.7 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.1 ± 6 %	5.14 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.30 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**82.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.3 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.1 ± 6 %	5.40 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.84 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**77.8 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.18 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.6 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.42 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.9 ± 6 %	5.53 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5300 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.05 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**79.9 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.25 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**22.3 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.65 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.6 ± 6 %	5.79 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.37 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**83.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.32 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.0 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.4 ± 6 %	5.93 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.48 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**84.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.35 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.3 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.1 ± 6 %	6.21 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.86 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**78.0 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.17 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.5 W/kg ± 19.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS108)

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	51.8 Ω - 9.9 jΩ
Return Loss	- 20.1 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	54.5 Ω - 1.5 jΩ
Return Loss	- 26.8 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	49.6 Ω - 2.0 jΩ
Return Loss	- 33.9 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	56.5 Ω - 4.4 jΩ
Return Loss	- 22.7 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	56.6 Ω + 4.4 jΩ
Return Loss	- 22.6 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	51.9 Ω - 8.1 jΩ
Return Loss	- 21.8 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	54.5 Ω + 0.1 jΩ
Return Loss	- 27.3 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	50.2 Ω - 0.6 jΩ
Return Loss	- 43.8 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	57.5 Ω - 3.2 jΩ
Return Loss	- 22.4 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	57.2 Ω + 5.2 jΩ
Return Loss	- 21.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.202 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 01, 2014

DASY5 Validation Report for Head TSL

Date: 25.09.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN:1191

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 4.54 S/m; ε_r = 34.9; ρ = 1000 kg/m^3
Medium parameters used: f = 5300 MHz; σ = 4.64 S/m; ε_r = 34.8; ρ = 1000 kg/m^3
Medium parameters used: f = 5500 MHz; σ = 4.83 S/m; ε_r = 34.5; ρ = 1000 kg/m^3
Medium parameters used: f = 5600 MHz; σ = 4.93 S/m; ε_r = 34.4; ρ = 1000 kg/m^3
Medium parameters used: f = 5800 MHz; σ = 5.14 S/m; ε_r = 34.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.52, 5.52, 5.52); Calibrated: 30.12.2013, ConvF(5.2, 5.2, 5.2); Calibrated: 30.12.2013, ConvF(5.01, 5.01, 5.01); Calibrated: 30.12.2013, ConvF(4.86, 4.86, 4.86); Calibrated: 30.12.2013, ConvF(4.91, 4.91, 4.91); Calibrated: 30.12.2013;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

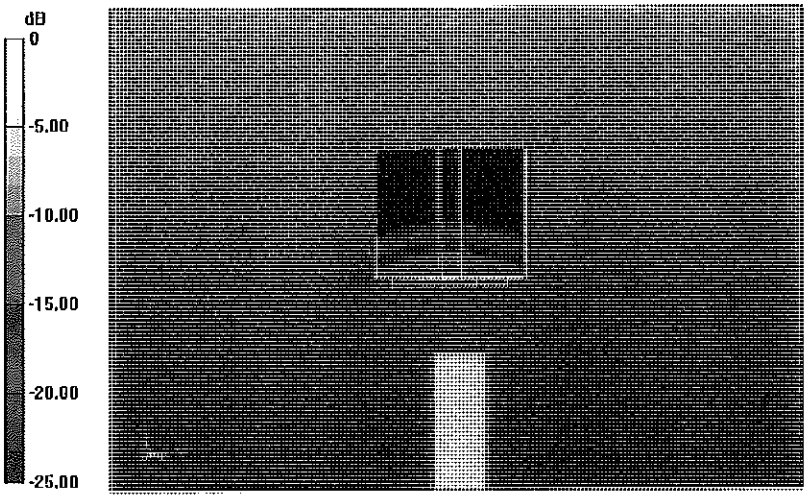
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.20 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 30.0 W/kg
SAR(1 g) = 8.17 W/kg; SAR(10 g) = 2.33 W/kg
Maximum value of SAR (measured) = 18.5 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.90 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 32.7 W/kg
SAR(1 g) = 8.64 W/kg; SAR(10 g) = 2.47 W/kg
Maximum value of SAR (measured) = 19.8 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.91 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 35.3 W/kg
SAR(1 g) = 8.93 W/kg; SAR(10 g) = 2.54 W/kg
Maximum value of SAR (measured) = 20.9 W/kg

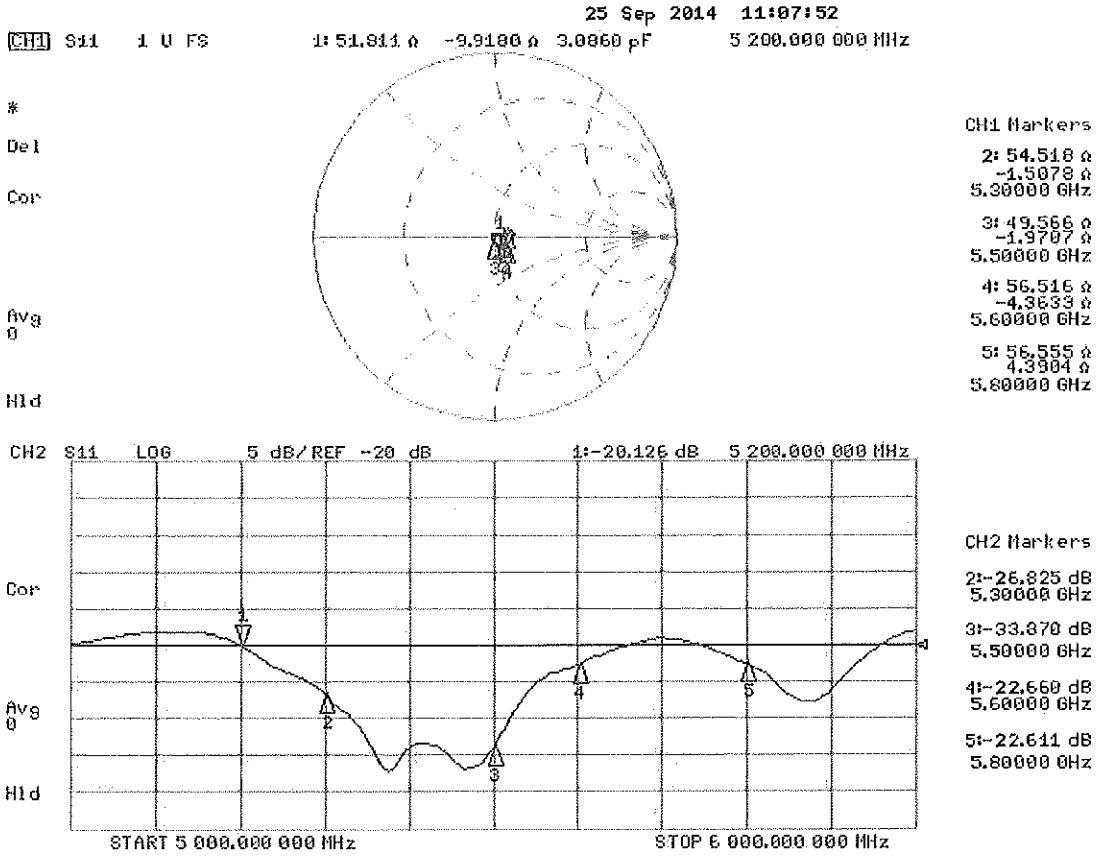
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.29 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 34.8 W/kg
SAR(1 g) = 8.76 W/kg; SAR(10 g) = 2.49 W/kg
Maximum value of SAR (measured) = 20.7 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 62.74 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 34.4 W/kg
SAR(1 g) = 8.3 W/kg; SAR(10 g) = 2.35 W/kg



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

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 24.09.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN:1191

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 5.4 S/m; ε_r = 47.1; ρ = 1000 kg/m^3
Medium parameters used: f = 5300 MHz; σ = 5.53 S/m; ε_r = 46.9; ρ = 1000 kg/m^3
Medium parameters used: f = 5500 MHz; σ = 5.79 S/m; ε_r = 46.6; ρ = 1000 kg/m^3
Medium parameters used: f = 5600 MHz; σ = 5.93 S/m; ε_r = 46.4; ρ = 1000 kg/m^3
Medium parameters used: f = 5800 MHz; σ = 6.21 S/m; ε_r = 46.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.01, 5.01, 5.01); Calibrated: 30.12.2013, ConvF(4.76, 4.76, 4.76); Calibrated: 30.12.2013, ConvF(4.52, 4.52, 4.52); Calibrated: 30.12.2013, ConvF(4.3, 4.3, 4.3); Calibrated: 30.12.2013, ConvF(4.47, 4.47, 4.47); Calibrated: 30.12.2013;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

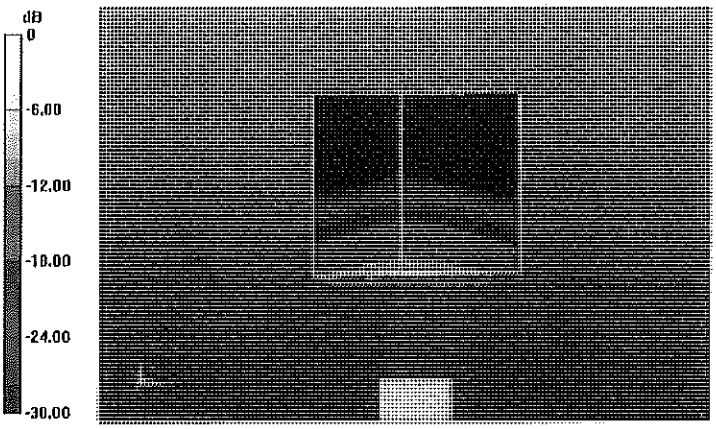
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 60.46 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 30.7 W/kg
SAR(1 g) = 7.84 W/kg; SAR(10 g) = 2.18 W/kg
Maximum value of SAR (measured) = 18.5 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 60.42 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 32.1 W/kg
SAR(1 g) = 8.05 W/kg; SAR(10 g) = 2.25 W/kg
Maximum value of SAR (measured) = 19.1 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 60.44 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 35.8 W/kg
SAR(1 g) = 8.37 W/kg; SAR(10 g) = 2.32 W/kg
Maximum value of SAR (measured) = 20.4 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 60.44 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 37.0 W/kg
SAR(1 g) = 8.48 W/kg; SAR(10 g) = 2.35 W/kg
Maximum value of SAR (measured) = 20.9 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 56.69 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 36.4 W/kg
SAR(1 g) = 7.86 W/kg; SAR(10 g) = 2.17 W/kg
Maximum value of SAR (measured) = 19.7 W/kg



0 dB = 19.7 W/kg = 12.94 dBW/kg

Impedance Measurement Plot for Body TSL