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SAR EVALUATION REPORT

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

Date of Testing:
02/23/15 - 03/02/15
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Document Serial No.:
0Y1502190491.ZNF

FCC ID:	**ZNFH631**
APPLICANT:	**LG ELECTRONICS MOBILECOMM U.S.A., INC.**

DUT Type:	Portable Handset
Application Type:	Class II Permissive Change
FCC Rule Part(s):	CFR §2.1093
Model(s):	H631, LGH631, LG-H631, MS631, LGMS631, LG-MS631
Permissive Change(s):	See FCC change document
Date of Original Certification:	03/04/2015

Equipment Class	Band & Mode	Tx Frequency	SAR			
			1 gm Head (W/kg)	1 gm Body-Worn (W/kg)	1 gm Hotspot (W/kg)	10 gm Extremity (W/kg)
PCE	GSM/GPRS/EDGE 850	824.20 - 848.80 MHz	0.25	0.38	0.41	
PCE	GSM/GPRS/EDGE 1900	1850.20 - 1909.80 MHz	0.18	0.35	0.36	
PCE	UMTS 850	826.40 - 846.60 MHz	0.39	0.62	0.69	
PCE	UMTS 1750	1712.4 - 1752.5 MHz	0.65	1.10	1.10	
PCE	UMTS 1900	1852.4 - 1907.6 MHz	0.49	0.71	0.77	
PCE	LTE Band 12	699.7 - 715.3 MHz	0.24	0.51	0.51	
PCE	LTE Band 4 (AWS)	1710.7 - 1754.3 MHz	0.60	1.01	1.01	
PCE	LTE Band 2 (PCS)	1850.7 - 1909.3 MHz	0.49	0.62	0.66	
DTS	2.4 GHz WLAN	2412 - 2462 MHz	0.50	0.19	0.19	
NII	5.2 GHz WLAN	5180 - 5240 MHz	0.63	0.22		0.68
NII	5.3 GHz WLAN	5260 - 5320 MHz	0.72	0.24		0.68
NII	5.5 GHz WLAN	5500 - 5700 MHz	0.74	0.27		0.64
NII	5.8 GHz WLAN	5745 - 5825 MHz	0.71	0.30	0.30	
DSS/DTS	Bluetooth	2402 - 2480 MHz	N/A			
Simultaneous SAR per KDB 690783 D01v01r03:			1.39	1.40	1.40	0.68

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 1750	Voice/Data	1712.4 - 1752.5 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
5.2 GHz WLAN	Voice/Data	5180 - 5240 MHz
5.3 GHz WLAN	Voice/Data	5260 - 5320 MHz
5.5 GHz WLAN	Voice/Data	5500 - 5700 MHz
5.8 GHz WLAN	Voice/Data	5745 - 5825 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 Slot*	*2 TX Slots*	*3 TX Slots*	*4 TX Slots*	*1 TX Slot*	*2 TX Slots*	*3 TX Slots*	*4 TX Slots*
GSM/GPRS/EDGE 850	Maximum	**32.7**	**32.7**	**29.7**	**27.7**	**26.7**	**26.7**	**26.7**	**24.7**	**23.7**
	Nominal	**32.2**	**32.2**	**29.2**	**27.2**	**26.2**	**26.2**	**26.2**	**24.2**	**23.2**
GSM/GPRS/EDGE 1900	Maximum	**30.7**	**30.7**	**27.7**	**26.7**	**24.7**	**25.7**	**25.7**	**24.7**	**23.7**
	Nominal	**30.2**	**30.2**	**27.2**	**26.2**	**24.2**	**25.2**	**25.2**	**24.2**	**23.2**

Mode / Band		Modulated Average (dBm)			
		3GPP WCDMA Rel. 99	*3GPP HSDPA Rel. 5*	*3GPP HSUPA Rel. 6*	*3GPP DC-HSDPA Rel. 8*
UMTS Band 5 (850 MHz)	Maximum	**24.7**	**24.7**	**24.7**	**24.7**
	Nominal	**24.2**	**24.2**	**24.2**	**24.2**
UMTS Band 4 (1750 MHz)	Maximum	**24.7**	**24.7**	**24.7**	**24.7**
	Nominal	**24.2**	**24.2**	**24.2**	**24.2**
UMTS Band 2 (1900 MHz)	Maximum	**24.7**	**24.7**	**24.7**	**24.7**
	Nominal	**24.2**	**24.2**	**24.2**	**24.2**

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Mode / Band		Modulated Average (dBm)
LTE Band 12	Maximum	**24.7**
	Nominal	**24.2**
LTE Band 4 (AWS)	Maximum	**24.7**
	Nominal	**24.2**
LTE Band 2 (PCS)	Maximum	**24.7**
	Nominal	**24.2**

Mode / Band		Modulated Average (dBm)
IEEE 802.11b (2.4 GHz)	Maximum	**17.0**
	Nominal	**16.0**
IEEE 802.11g (2.4 GHz)	Maximum	**15.0**
	Nominal	**14.0**
IEEE 802.11n (2.4 GHz)	Maximum	**15.0**
	Nominal	**14.0**
IEEE 802.11a (5 GHz)	Maximum	**16.0**
	Nominal	**15.0**
IEEE 802.11n (5 GHz)	Maximum	**16.0**
	Nominal	**15.0**
Bluetooth	Maximum	**9.0**
	Nominal	**8.0**
Bluetooth LE	Maximum	**1.0**
	Nominal	**0.0**

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. Since the diagonal dimension of this device is > 160 mm and <200 mm, it is considered a “phablet.”.

Table 1-1
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 1750	Yes	Yes	No	Yes	No	Yes
UMTS 1900	Yes	Yes	No	Yes	No	Yes
LTE Band 12	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
2.4 GHz WLAN	Yes	Yes	Yes	No	Yes	No
5 GHz WLAN	Yes	Yes	Yes	No	Yes	No

Note: Particular DUT edges were not required to be evaluated for Wireless Router SAR or Extremity SAR if the edges were greater than 2.5 cm from the transmitting antenna according to FCC KDB Publication 941225 D06 guidance, page 2 and FCC KDB 648474 D04v01r01. The distances between the transmit antennas and the edges of the device are included in the filing.

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1.4 Near Field Communications (NFC) Antenna

This DUT has NFC operations. The NFC antenna is integrated into the battery cover. All SAR tests were performed with the battery cover with NFC antenna already incorporated. A diagram showing the location of the NFC antenna can be found in Appendix F.

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	Extremity	Notes
1	GSM voice + 2.4 GHz WI-FI	Yes	Yes	N/A	Yes	
2	GSM voice + 5 GHz WI-FI	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz Bluetooth	N/A	Yes	N/A	Yes	
4	UMTS + 2.4 GHz WI-FI	Yes	Yes	Yes	Yes	
5	UMTS + 5 GHz WI-FI	Yes	Yes	Yes	Yes	
6	UMTS + 2.4 GHz Bluetooth	N/A	Yes	N/A	Yes	
7	LTE + 2.4 GHz WI-FI	Yes	Yes	Yes	Yes	
8	LTE + 5 GHz WI-FI	Yes	Yes	Yes	Yes	
9	LTE + 2.4 GHz Bluetooth	N/A	Yes	N/A	Yes	
10	GPRS/EDGE + 2.4 GHz WI-FI	Yes*	Yes*	Yes	Yes	*-Pre-installed VOIP applications are considered.
11	GPRS/EDGE + 5 GHz WI-FI	Yes*	Yes*	Yes	Yes	*-Pre-installed VOIP applications are considered.
12	GPRS/EDGE + 2.4 GHz Bluetooth	N/A	Yes*	N/A	Yes	*-Pre-installed VOIP applications are considered.

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. 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.
4. 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 in the above table.
5. 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.
6. VoLTE is supported.
7. VoWIFI is supported.

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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 D06.

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; [(8/10)* √2.480] = 1.3 < 3.0. Per KDB Publication 447498 D01v05, the maximum power of the channel was rounded to the nearest mW before calculation.

Per FCC KDB 447498 D01v05, the 10g SAR exclusion threshold for distances <50mm is defined by the following equation:

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

Based on the maximum conducted power of Bluetooth (rounded to the nearest mW) and the antenna to user separation distance, extremity Bluetooth SAR was not required; [(8/5)* √2.480] = 2.5 < 7.5. 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.

Per FCC KDB Publication 648474 D04v01r01, this device is considered a "phablet" since the diagonal dimension is greater than 160mm and less than 200mm. Extremity SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg. Because wireless router operations are not supported for 5.2 – 5.7 GHz WLAN, extremity SAR tests were performed. Extremity SAR was not evaluated for 2.4 GHz and 5.8 GHz WLAN operations since wireless router 1g SAR was < 1.2 W/kg.

(B) Licensed Transmitter(s)

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

This device is only capable of QPSK HSUPA in the uplink. Therefore, no additional SAR tests are required beyond that described for devices with HSUPA in KDB 941225 D01.

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 D05.

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Per FCC KDB Publication 648474 D04v01r01, this device is considered a "phablet" since the diagonal dimension is greater than 160mm and less than 200mm. Therefore, extremity SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg. Extremity SAR was not evaluated for licensed technologies since wireless router 1g SAR was < 1.2 W/kg for these modes.

1.7 Power Reduction for SAR

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

1.8 Quick Cover

This DUT may be used with a standard battery cover or with an optional quick cover which features an extension to wrap around and protect the front side of the device. Per FCC KDB Publication 648474 D03, SAR was measured using the standard battery cover and then repeated with the quick cover for the configuration with the highest measured SAR for each wireless technology, frequency band, operating mode, and exposure condition. Additional head and extremity tests using the quick cover were performed with the cover extension both open and closed. Additional body-worn and hotspot tests were performed with the cover extension closed because operations near the body with the cover extension open are not expected. Since reported SAR did not exceed 1.2 W/kg, additional testing with the quick cover was not required.

1.9 Guidance Applied

- IEEE 1528-2003
- FCC KDB Publication 941225 D01, D05, D06 (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)
- FCC KDB Publication 648474 D03-D04 (Phablet Procedures, Cover Accessories)
- 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	Extremity Serial Number
GSM/GPRS/EDGE 850	358387060001731	358387060001731	358387060001731	-
GSM/GPRS/EDGE 1900	358387060001731	358387060001731	358387060001731	-
UMTS 850	358387060001731	358387060001731	358387060001731	-
UMTS 1750	358387060001731	358387060001731	358387060001731	-
UMTS 1900	358387060001731	358387060001731	358387060001731	-
LTE Band 12	358387060001723	358387060001723	358387060001723	-
LTE Band 4 (AWS)	358387060001723	358387060001723	358387060001723	-
LTE Band 2 (PCS)	358387060001723	358387060001723	358387060001723	-
2.4 GHz WLAN	358387060001772	358387060001772	358387060001772	-
5 GHz WLAN	358387060001749	358387060001749	358387060001749	358387060001749

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2 LTE INFORMATION

LTE Information			
FCC ID	**ZNFH631**		
Form Factor	Portable Handset		
Frequency Range of each LTE transmission band	LTE Band 12 (699.7 - 715.3 MHz)		
	LTE Band 4 (AWS) (1710.7 - 1754.3 MHz)		
	LTE Band 2 (PCS) (1850.7 - 1909.3 MHz)		
Channel Bandwidths	LTE Band 12: 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		
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 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)
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 Additional Information	This device does not support full LTE Release 10 Features such as: Carrier Aggregation, Relay, HetNet, Enhanced MIMO, eICI, WIFI Offloading, MDH, eMBMA, Cross-Carrier Scheduling, Enhanced SC-FDMA.		

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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]

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4 DOSIMETRIC ASSESSMENT

4.1 Measurement Procedure

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

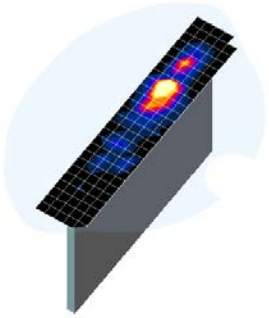

Figure 4-1
Sample SAR Area Scan

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

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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].

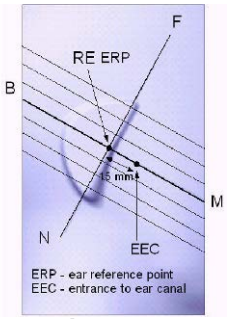

Figure 5-1
Close-Up Side view of ERP

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.

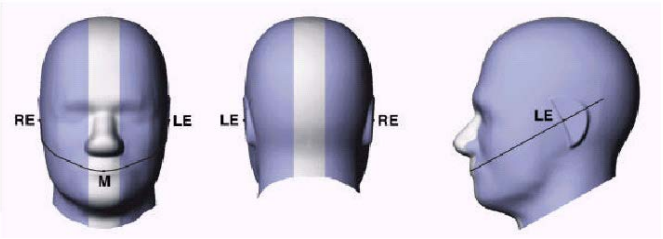

Figure 5-2
Front, back and side view of SAM Twin Phantom

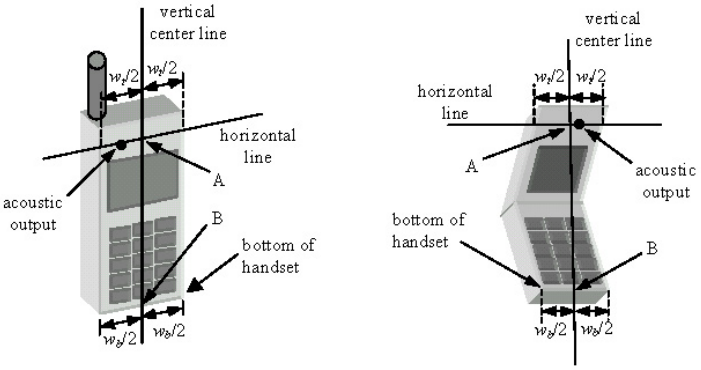

Figure 5-3
Handset Vertical Center & Horizontal Line Reference Points

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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.

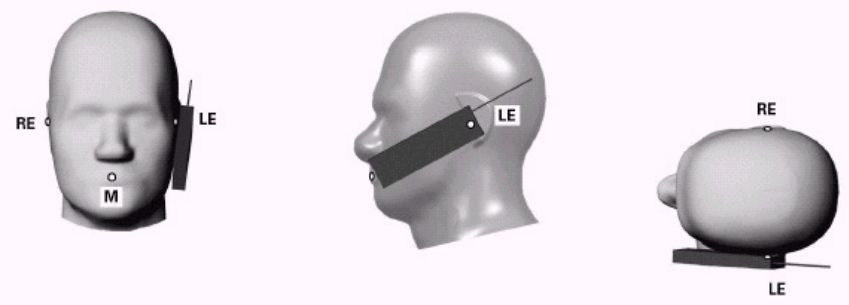

Figure 6-1 Front, Side and Top View of Cheek Position

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).

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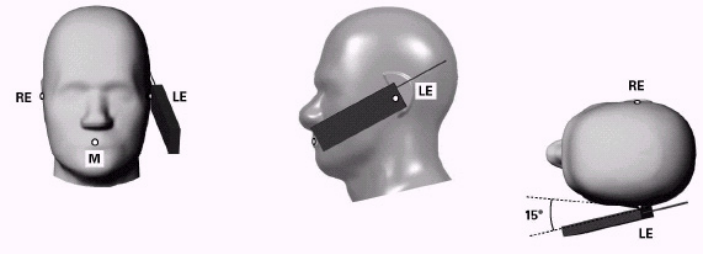

Figure 6-2 Front, Side and Top View of Ear/15º Tilt Position

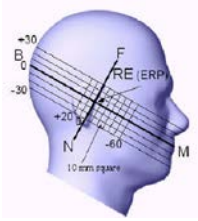

Figure 6-3
Side view w/ relevant markings

6.4 Body-Worn Accessory Configurations

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 6-4). Per FCC KDB Publication 648474 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.

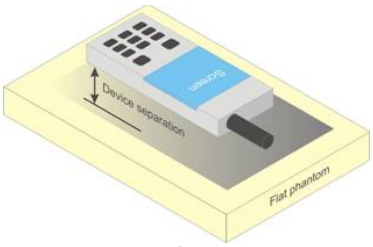

Figure 6-4
Sample Body-Worn Diagram

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.

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6.5 Extremity Exposure Configurations

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

For smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC minitablets that support voice calls next to the ear, the phablets procedures outlined in KDB Publication 648474 D04 v01r01DR04 should be applied to evaluate SAR compliance. A device marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance. In addition to the normally required head and body-worn accessory SAR test procedures required for handsets, the UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna <=25 mm from that surface or edge, in direct contact with the phantom, for 10-g SAR. The UMPC mini-tablet 1-g SAR at 5 mm is not required. When hotspot mode applies, 10-g SAR is required only for the surfaces and edges with hotspot mode 1-g SAR > 1.2 W/kg.

6.6 Wireless Router Configurations

Some battery-operated handsets have the capability to transmit and receive user data through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 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.

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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.

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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 3G SAR Test Reduction Procedure

In FCC KDB Publication 941225 D01, certain transmission modes within a frequency band and wireless mode evaluated for SAR are defined as primary modes. The equivalent modes considered for SAR test reduction are denoted as secondary modes. When the maximum output power including tuneup tolerance specified for production units in a secondary mode is ≤ 0.25 dB higher than the primary mode or when the highest reported SAR of the primary mode, scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode, is ≤ 1.2 W/kg, SAR measurements are not required for the secondary mode. These criteria are referred to as the 3G SAR test reduction procedure. When the 3G SAR test reduction procedure is not satisfied, SAR measurements are additionally required for the secondary mode.

8.3 Procedures Used to Establish RF Signal for SAR

The following procedures are according to FCC KDB Publication 941225 D01 “SAR Measurement Procedures for 3G Devices”, October 2014.

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.

8.4 SAR Measurement Conditions for UMTS

8.4.1 Output Power Verification

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

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8.4.2 Head SAR Measurements

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

8.4.3 Body SAR Measurements

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

8.4.4 SAR Measurements with Rel 5 HSDPA

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

8.4.5 SAR Measurements with Rel 6 HSUPA

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

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

8.4.6 SAR Measurement Conditions for DC-HSDPA

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

8.5 SAR Measurement Conditions for LTE

LTE modes were tested according to FCC KDB 941225 D05 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).

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8.5.1 Spectrum Plots for RB Configurations

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

8.5.2 MPR

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

8.5.3 A-MPR

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

8.5.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05:

a. Per Section 4.2.1, 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.

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8.6 SAR Testing with 802.11 Transmitters

Normal network operating configurations are not suitable for measuring the SAR of 802.11 a/b/g/n 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.

8.6.1 General Device Setup

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

8.6.2 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.

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.

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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	GPRS [dBm] 3 Tx Slot	GPRS [dBm] 4 Tx Slot	EDGE [dBm] 1 Tx Slot	EDGE [dBm] 2 Tx Slot	EDGE [dBm] 3 Tx Slot	EDGE [dBm] 4 Tx Slot
GSM 850	128	32.63	32.63	29.68	27.58	**26.60**	26.68	26.70	24.56	23.53
	190	32.70	32.70	29.70	27.68	**26.69**	26.70	26.70	24.67	23.61
	251	32.68	32.67	29.58	27.52	**26.51**	26.62	26.57	24.48	23.45
GSM 1900	512	30.70	30.70	27.46	**26.35**	24.24	24.40	25.22	24.56	23.34
	661	30.61	30.56	27.34	**26.43**	24.27	25.35	25.23	24.35	23.27
	810	30.68	30.67	27.44	**26.39**	24.31	25.33	25.21	24.42	23.29

		Calculated Maximum Frame-Averaged Output Power								
		Voice	GPRS/EDGE Data (GMSK)				EDGE Data (8-PSK)			
Band	Channel	GSM [dBm] CS (1 Slot)	GPRS [dBm] 1 Tx Slot	GPRS [dBm] 2 Tx Slot	GPRS [dBm] 3 Tx Slot	GPRS [dBm] 4 Tx Slot	EDGE [dBm] 1 Tx Slot	EDGE [dBm] 2 Tx Slot	EDGE [dBm] 3 Tx Slot	EDGE [dBm] 4 Tx Slot
GSM 850	128	23.60	23.60	23.66	23.32	**23.59**	17.65	20.68	20.30	20.52
	190	23.67	23.67	23.68	23.42	**23.68**	17.67	20.68	20.41	20.60
	251	23.65	23.64	23.56	23.26	**23.50**	17.59	20.55	20.22	20.44
GSM 1900	512	21.67	21.67	21.44	**22.09**	21.23	15.37	19.20	20.30	20.33
	661	21.58	21.53	21.32	**22.17**	21.26	16.32	19.21	20.09	20.26
	810	21.65	21.64	21.42	**22.13**	21.30	16.30	19.19	20.16	20.28
GSM 850	Frame Avg.Targets:	23.17	23.17	23.18	22.94	**23.19**	17.17	20.18	19.94	20.19
GSM 1900		21.17	21.17	21.18	**21.94**	21.19	16.17	19.18	19.94	20.19

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. Per October 2013 TCB Workshop Notes, the source-based frame-averaged output power was evaluated for all GPRS/EDGE slot configurations. The configuration with the highest target frame averaged output power was evaluated for SAR. When the maximum frame-averaged powers are equivalent across two or more slots (within 0.25 dB), the configuration with the most number of time slots was tested.
3. 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: 12 (Max 4 Tx uplink slots)
EDGE Multislot class: 12 (Max 4 Tx uplink slots)
DTM Multislot Class: N/A

Figure 9-1
Power Measurement Setup

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9.2 UMTS Conducted Powers

3GPP Release Version	Mode	3GPP 34.121 Subtest	Cellular Band [dBm]			AWS Band [dBm]			PCS Band [dBm]			3GPP MPR [dB]
			4132	4183	4233	1312	1412	1862	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	24.13	24.19	24.20	24.39	24.53	24.42	24.16	24.07	24.13	-
99		12.2 kbps AMR	24.12	24.12	24.15	24.33	24.31	24.37	24.12	24.05	24.10	-
6	HSDPA	Subtest 1	24.29	24.18	24.14	24.18	24.12	24.13	24.25	24.09	24.14	0
6		Subtest 2	24.19	24.19	24.17	24.17	24.14	24.19	24.25	24.22	24.22	0
6		Subtest 3	23.91	23.78	23.74	23.72	23.70	23.63	23.82	23.70	23.61	0.5
6		Subtest 4	23.77	23.70	23.74	23.72	23.69	23.70	23.72	23.61	23.67	0.5
6	HSUPA	Subtest 1	23.02	22.74	22.95	22.98	22.85	23.13	22.75	22.70	22.86	0
6		Subtest 2	22.30	22.35	22.22	22.21	22.28	22.34	22.35	22.25	22.30	2
6		Subtest 3	23.14	22.71	23.10	23.17	22.93	22.98	22.64	22.74	23.12	1
6		Subtest 4	23.24	23.04	23.26	22.31	22.82	22.38	22.77	22.90	23.23	2
6		Subtest 5	24.22	24.23	24.14	24.21	24.12	24.09	24.10	24.02	24.00	0
8	DC-HSDPA	Subtest 1	24.34	24.27	24.15	24.63	24.62	24.51	24.02	24.16	24.07	0
8		Subtest 2	24.37	23.79	24.15	24.15	24.58	24.49	24.24	24.29	24.32	0
8		Subtest 3	23.95	23.88	23.75	24.06	24.17	23.90	23.89	23.80	23.79	0.5
8		Subtest 4	23.94	23.88	23.76	24.04	24.00	23.89	23.87	23.87	23.88	0.5

DC-HSDPA considerations

- 3GPP Specification 34.121-1 Release 8 Ver 8.10.0 was used for DC-HSDPA guidance
- H-Set 12 (QPSK) was confirmed to be used during DC-HSDPA measurements
- The DUT supports UE category 24 for HSDPA

Figure 9-2
Power Measurement Setup

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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	**24.39**	0	0
	707.5	23095	10	QPSK	1	25	24.33	0	0
	707.5	23095	10	QPSK	1	49	24.31	0	0
	707.5	23095	10	QPSK	25	0	23.27	0-1	1
	707.5	23095	10	QPSK	25	12	**23.29**	0-1	1
	707.5	23095	10	QPSK	25	25	23.28	0-1	1
	707.5	23095	10	QPSK	50	0	23.22	0-1	1
	707.5	23095	10	16QAM	1	0	23.31	0-1	1
	707.5	23095	10	16QAM	1	25	23.27	0-1	1
	707.5	23095	10	16QAM	1	49	23.29	0-1	1
	707.5	23095	10	16QAM	25	0	22.48	0-2	2
	707.5	23095	10	16QAM	25	12	22.45	0-2	2
	707.5	23095	10	16QAM	25	25	22.51	0-2	2
	707.5	23095	10	16QAM	50	0	22.50	0-2	2

Note: LTE Band 12 at 10 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

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Table 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	24.21	0	0
	701.5	23035	5	QPSK	1	12	24.35	0	0
	701.5	23035	5	QPSK	1	24	24.33	0	0
	701.5	23035	5	QPSK	12	0	23.40	0-1	1
	701.5	23035	5	QPSK	12	6	23.23	0-1	1
	701.5	23035	5	QPSK	12	13	23.29	0-1	1
	701.5	23035	5	QPSK	25	0	23.31	0-1	1
	701.5	23035	5	16-QAM	1	0	23.39	0-1	1
	701.5	23035	5	16-QAM	1	12	23.39	0-1	1
	701.5	23035	5	16-QAM	1	24	23.35	0-1	1
	701.5	23035	5	16-QAM	12	0	22.25	0-2	2
	701.5	23035	5	16-QAM	12	6	22.20	0-2	2
	701.5	23035	5	16-QAM	12	13	22.26	0-2	2
	701.5	23035	5	16-QAM	25	0	22.24	0-2	2
Mid	707.5	23095	5	QPSK	1	0	24.30	0	0
	707.5	23095	5	QPSK	1	12	24.25	0	0
	707.5	23095	5	QPSK	1	24	24.28	0	0
	707.5	23095	5	QPSK	12	0	23.26	0-1	1
	707.5	23095	5	QPSK	12	6	23.24	0-1	1
	707.5	23095	5	QPSK	12	13	23.25	0-1	1
	707.5	23095	5	QPSK	25	0	23.22	0-1	1
	707.5	23095	5	16-QAM	1	0	23.35	0-1	1
	707.5	23095	5	16-QAM	1	12	23.31	0-1	1
	707.5	23095	5	16-QAM	1	24	23.30	0-1	1
	707.5	23095	5	16-QAM	12	0	22.21	0-2	2
	707.5	23095	5	16-QAM	12	6	22.25	0-2	2
	707.5	23095	5	16-QAM	12	13	22.29	0-2	2
	707.5	23095	5	16-QAM	25	0	22.24	0-2	2
High	713.5	23155	5	QPSK	1	0	24.36	0	0
	713.5	23155	5	QPSK	1	12	24.33	0	0
	713.5	23155	5	QPSK	1	24	24.31	0	0
	713.5	23155	5	QPSK	12	0	23.29	0-1	1
	713.5	23155	5	QPSK	12	6	23.25	0-1	1
	713.5	23155	5	QPSK	12	13	23.26	0-1	1
	713.5	23155	5	QPSK	25	0	23.29	0-1	1
	713.5	23155	5	16-QAM	1	0	23.38	0-1	1
	713.5	23155	5	16-QAM	1	12	23.35	0-1	1
	713.5	23155	5	16-QAM	1	24	23.31	0-1	1
	713.5	23155	5	16-QAM	12	0	22.26	0-2	2
	713.5	23155	5	16-QAM	12	6	22.26	0-2	2
	713.5	23155	5	16-QAM	12	13	22.28	0-2	2
	713.5	23155	5	16-QAM	25	0	22.20	0-2	2

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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	24.20	0	0
	700.5	23025	3	QPSK	1	7	24.25	0	0
	700.5	23025	3	QPSK	1	14	24.25	0	0
	700.5	23025	3	QPSK	8	0	23.38	0-1	1
	700.5	23025	3	QPSK	8	4	23.34	0-1	1
	700.5	23025	3	QPSK	8	7	23.33	0-1	1
	700.5	23025	3	QPSK	15	0	23.40	0-1	1
	700.5	23025	3	16-QAM	1	0	23.41	0-1	1
	700.5	23025	3	16-QAM	1	7	23.42	0-1	1
	700.5	23025	3	16-QAM	1	14	23.26	0-1	1
	700.5	23025	3	16-QAM	8	0	22.29	0-2	2
	700.5	23025	3	16-QAM	8	4	22.24	0-2	2
	700.5	23025	3	16-QAM	8	7	22.28	0-2	2
	700.5	23025	3	16-QAM	15	0	22.30	0-2	2
Mid	707.5	23095	3	QPSK	1	0	24.26	0	0
	707.5	23095	3	QPSK	1	7	24.31	0	0
	707.5	23095	3	QPSK	1	14	24.35	0	0
	707.5	23095	3	QPSK	8	0	23.26	0-1	1
	707.5	23095	3	QPSK	8	4	23.29	0-1	1
	707.5	23095	3	QPSK	8	7	23.25	0-1	1
	707.5	23095	3	QPSK	15	0	23.44	0-1	1
	707.5	23095	3	16-QAM	1	0	23.41	0-1	1
	707.5	23095	3	16-QAM	1	7	23.40	0-1	1
	707.5	23095	3	16-QAM	1	14	23.31	0-1	1
	707.5	23095	3	16-QAM	8	0	22.26	0-2	2
	707.5	23095	3	16-QAM	8	4	22.29	0-2	2
	707.5	23095	3	16-QAM	8	7	22.30	0-2	2
	707.5	23095	3	16-QAM	15	0	22.30	0-2	2
High	714.5	23165	3	QPSK	1	0	24.29	0	0
	714.5	23165	3	QPSK	1	7	24.35	0	0
	714.5	23165	3	QPSK	1	14	24.33	0	0
	714.5	23165	3	QPSK	8	0	23.31	0-1	1
	714.5	23165	3	QPSK	8	4	23.39	0-1	1
	714.5	23165	3	QPSK	8	7	23.40	0-1	1
	714.5	23165	3	QPSK	15	0	23.20	0-1	1
	714.5	23165	3	16-QAM	1	0	23.21	0-1	1
	714.5	23165	3	16-QAM	1	7	23.25	0-1	1
	714.5	23165	3	16-QAM	1	14	23.21	0-1	1
	714.5	23165	3	16-QAM	8	0	22.37	0-2	2
	714.5	23165	3	16-QAM	8	4	22.34	0-2	2
	714.5	23165	3	16-QAM	8	7	22.30	0-2	2
	714.5	23165	3	16-QAM	15	0	22.36	0-2	2

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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	24.21	0	0
	699.7	23017	1.4	QPSK	1	2	24.23	0	0
	699.7	23017	1.4	QPSK	1	5	24.25	0	0
	699.7	23017	1.4	QPSK	3	0	24.25	0	0
	699.7	23017	1.4	QPSK	3	2	24.26	0	0
	699.7	23017	1.4	QPSK	3	3	24.31	0	0
	699.7	23017	1.4	QPSK	6	0	23.35	0-1	1
	699.7	23017	1.4	16-QAM	1	0	23.34	0-1	1
	699.7	23017	1.4	16-QAM	1	2	23.21	0-1	1
	699.7	23017	1.4	16-QAM	1	5	23.29	0-1	1
	699.7	23017	1.4	16-QAM	3	0	23.22	0-1	1
	699.7	23017	1.4	16-QAM	3	2	23.26	0-1	1
	699.7	23017	1.4	16-QAM	3	3	23.24	0-1	1
	699.7	23017	1.4	16-QAM	6	0	22.25	0-2	2
Mid	707.5	23095	1.4	QPSK	1	0	24.40	0	0
	707.5	23095	1.4	QPSK	1	2	24.31	0	0
	707.5	23095	1.4	QPSK	1	5	24.35	0	0
	707.5	23095	1.4	QPSK	3	0	24.34	0	0
	707.5	23095	1.4	QPSK	3	2	24.34	0	0
	707.5	23095	1.4	QPSK	3	3	24.28	0	0
	707.5	23095	1.4	QPSK	6	0	23.20	0-1	1
	707.5	23095	1.4	16-QAM	1	0	23.26	0-1	1
	707.5	23095	1.4	16-QAM	1	2	23.25	0-1	1
	707.5	23095	1.4	16-QAM	1	5	23.22	0-1	1
	707.5	23095	1.4	16-QAM	3	0	23.29	0-1	1
	707.5	23095	1.4	16-QAM	3	2	23.34	0-1	1
	707.5	23095	1.4	16-QAM	3	3	23.25	0-1	1
	707.5	23095	1.4	16-QAM	6	0	22.30	0-2	2
High	715.3	23173	1.4	QPSK	1	0	24.32	0	0
	715.3	23173	1.4	QPSK	1	2	24.31	0	0
	715.3	23173	1.4	QPSK	1	5	24.31	0	0
	715.3	23173	1.4	QPSK	3	0	24.40	0	0
	715.3	23173	1.4	QPSK	3	2	24.41	0	0
	715.3	23173	1.4	QPSK	3	3	24.31	0	0
	715.3	23173	1.4	QPSK	6	0	23.34	0-1	1
	715.3	23173	1.4	16-QAM	1	0	23.31	0-1	1
	715.3	23173	1.4	16-QAM	1	2	23.35	0-1	1
	715.3	23173	1.4	16-QAM	1	5	23.26	0-1	1
	715.3	23173	1.4	16-QAM	3	0	23.20	0-1	1
	715.3	23173	1.4	16-QAM	3	2	23.25	0-1	1
	715.3	23173	1.4	16-QAM	3	3	23.22	0-1	1
	715.3	23173	1.4	16-QAM	6	0	22.38	0-2	2

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9.3.2 LTE Band 4 (AWS)

Table 9-5
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	**24.56**	0	0
	1732.5	20175	20	QPSK	1	50	24.29	0	0
	1732.5	20175	20	QPSK	1	99	24.48	0	0
	1732.5	20175	20	QPSK	50	0	**23.30**	0-1	1
	1732.5	20175	20	QPSK	50	25	23.23	0-1	1
	1732.5	20175	20	QPSK	50	50	23.27	0-1	1
	1732.5	20175	20	QPSK	100	0	23.22	0-1	1
	1732.5	20175	20	16QAM	1	0	23.21	0-1	1
	1732.5	20175	20	16QAM	1	50	23.28	0-1	1
	1732.5	20175	20	16QAM	1	99	23.29	0-1	1
	1732.5	20175	20	16QAM	50	0	22.23	0-2	2
	1732.5	20175	20	16QAM	50	25	22.25	0-2	2
	1732.5	20175	20	16QAM	50	50	22.24	0-2	2
	1732.5	20175	20	16QAM	100	0	22.25	0-2	2

Note: LTE Band 4 (AWS) at 20 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

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Table 9-6
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	24.26	0	0
	1717.5	20025	15	QPSK	1	36	24.23	0	0
	1717.5	20025	15	QPSK	1	74	24.35	0	0
	1717.5	20025	15	QPSK	36	0	23.26	0-1	1
	1717.5	20025	15	QPSK	36	18	23.22	0-1	1
	1717.5	20025	15	QPSK	36	37	23.20	0-1	1
	1717.5	20025	15	QPSK	75	0	23.35	0-1	1
	1717.5	20025	15	16QAM	1	0	23.34	0-1	1
	1717.5	20025	15	16QAM	1	36	23.28	0-1	1
	1717.5	20025	15	16QAM	1	74	23.29	0-1	1
	1717.5	20025	15	16QAM	36	0	22.28	0-2	2
	1717.5	20025	15	16QAM	36	18	22.25	0-2	2
	1717.5	20025	15	16QAM	36	37	22.29	0-2	2
	1717.5	20025	15	16QAM	75	0	22.26	0-2	2
Mid	1732.5	20175	15	QPSK	1	0	24.40	0	0
	1732.5	20175	15	QPSK	1	36	24.41	0	0
	1732.5	20175	15	QPSK	1	74	24.28	0	0
	1732.5	20175	15	QPSK	36	0	23.31	0-1	1
	1732.5	20175	15	QPSK	36	18	23.35	0-1	1
	1732.5	20175	15	QPSK	36	37	23.26	0-1	1
	1732.5	20175	15	QPSK	75	0	23.31	0-1	1
	1732.5	20175	15	16QAM	1	0	23.30	0-1	1
	1732.5	20175	15	16QAM	1	36	23.34	0-1	1
	1732.5	20175	15	16QAM	1	74	23.29	0-1	1
	1732.5	20175	15	16QAM	36	0	22.25	0-2	2
	1732.5	20175	15	16QAM	36	18	22.26	0-2	2
	1732.5	20175	15	16QAM	36	37	22.28	0-2	2
	1732.5	20175	15	16QAM	75	0	22.23	0-2	2
High	1747.5	20325	15	QPSK	1	0	24.40	0	0
	1747.5	20325	15	QPSK	1	36	24.31	0	0
	1747.5	20325	15	QPSK	1	74	24.33	0	0
	1747.5	20325	15	QPSK	36	0	23.32	0-1	1
	1747.5	20325	15	QPSK	36	18	23.34	0-1	1
	1747.5	20325	15	QPSK	36	37	23.21	0-1	1
	1747.5	20325	15	QPSK	75	0	23.26	0-1	1
	1747.5	20325	15	16QAM	1	0	23.40	0-1	1
	1747.5	20325	15	16QAM	1	36	23.42	0-1	1
	1747.5	20325	15	16QAM	1	74	23.35	0-1	1
	1747.5	20325	15	16QAM	36	0	22.31	0-2	2
	1747.5	20325	15	16QAM	36	18	22.26	0-2	2
	1747.5	20325	15	16QAM	36	37	22.24	0-2	2
	1747.5	20325	15	16QAM	75	0	22.25	0-2	2

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Table 9-7
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	24.25	0	0
	1715	20000	10	QPSK	1	25	24.29	0	0
	1715	20000	10	QPSK	1	49	24.20	0	0
	1715	20000	10	QPSK	25	0	23.21	0-1	1
	1715	20000	10	QPSK	25	12	23.29	0-1	1
	1715	20000	10	QPSK	25	25	23.36	0-1	1
	1715	20000	10	QPSK	50	0	23.30	0-1	1
	1715	20000	10	16QAM	1	0	23.35	0-1	1
	1715	20000	10	16QAM	1	25	23.41	0-1	1
	1715	20000	10	16QAM	1	49	23.25	0-1	1
	1715	20000	10	16QAM	25	0	22.20	0-2	2
	1715	20000	10	16QAM	25	12	22.21	0-2	2
	1715	20000	10	16QAM	25	25	22.45	0-2	2
	1715	20000	10	16QAM	50	0	22.44	0-2	2
Mid	1732.5	20175	10	QPSK	1	0	24.25	0	0
	1732.5	20175	10	QPSK	1	25	24.26	0	0
	1732.5	20175	10	QPSK	1	49	24.45	0	0
	1732.5	20175	10	QPSK	25	0	23.29	0-1	1
	1732.5	20175	10	QPSK	25	12	23.28	0-1	1
	1732.5	20175	10	QPSK	25	25	23.36	0-1	1
	1732.5	20175	10	QPSK	50	0	23.26	0-1	1
	1732.5	20175	10	16QAM	1	0	23.25	0-1	1
	1732.5	20175	10	16QAM	1	25	23.31	0-1	1
	1732.5	20175	10	16QAM	1	49	23.39	0-1	1
	1732.5	20175	10	16QAM	25	0	22.34	0-2	2
	1732.5	20175	10	16QAM	25	12	22.29	0-2	2
	1732.5	20175	10	16QAM	25	25	22.37	0-2	2
	1732.5	20175	10	16QAM	50	0	22.26	0-2	2
High	1750	20350	10	QPSK	1	0	24.24	0	0
	1750	20350	10	QPSK	1	25	24.37	0	0
	1750	20350	10	QPSK	1	49	24.51	0	0
	1750	20350	10	QPSK	25	0	23.53	0-1	1
	1750	20350	10	QPSK	25	12	23.38	0-1	1
	1750	20350	10	QPSK	25	25	23.21	0-1	1
	1750	20350	10	QPSK	50	0	23.34	0-1	1
	1750	20350	10	16QAM	1	0	23.20	0-1	1
	1750	20350	10	16QAM	1	25	23.25	0-1	1
	1750	20350	10	16QAM	1	49	23.26	0-1	1
	1750	20350	10	16QAM	25	0	22.26	0-2	2
	1750	20350	10	16QAM	25	12	22.41	0-2	2
	1750	20350	10	16QAM	25	25	22.26	0-2	2
	1750	20350	10	16QAM	50	0	22.31	0-2	2

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Table 9-8
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	24.29	0	0
	1712.5	19975	5	QPSK	1	12	24.26	0	0
	1712.5	19975	5	QPSK	1	24	24.28	0	0
	1712.5	19975	5	QPSK	12	0	23.35	0-1	1
	1712.5	19975	5	QPSK	12	6	23.36	0-1	1
	1712.5	19975	5	QPSK	12	13	23.40	0-1	1
	1712.5	19975	5	QPSK	25	0	23.21	0-1	1
	1712.5	19975	5	16-QAM	1	0	23.26	0-1	1
	1712.5	19975	5	16-QAM	1	12	23.28	0-1	1
	1712.5	19975	5	16-QAM	1	24	23.29	0-1	1
	1712.5	19975	5	16-QAM	12	0	22.34	0-2	2
	1712.5	19975	5	16-QAM	12	6	22.21	0-2	2
	1712.5	19975	5	16-QAM	12	13	22.29	0-2	2
	1712.5	19975	5	16-QAM	25	0	22.35	0-2	2
Mid	1732.5	20175	5	QPSK	1	0	24.70	0	0
	1732.5	20175	5	QPSK	1	12	24.41	0	0
	1732.5	20175	5	QPSK	1	24	24.34	0	0
	1732.5	20175	5	QPSK	12	0	23.46	0-1	1
	1732.5	20175	5	QPSK	12	6	23.43	0-1	1
	1732.5	20175	5	QPSK	12	13	23.42	0-1	1
	1732.5	20175	5	QPSK	25	0	23.35	0-1	1
	1732.5	20175	5	16-QAM	1	0	23.26	0-1	1
	1732.5	20175	5	16-QAM	1	12	23.32	0-1	1
	1732.5	20175	5	16-QAM	1	24	23.22	0-1	1
	1732.5	20175	5	16-QAM	12	0	22.27	0-2	2
	1732.5	20175	5	16-QAM	12	6	22.37	0-2	2
	1732.5	20175	5	16-QAM	12	13	22.33	0-2	2
	1732.5	20175	5	16-QAM	25	0	22.26	0-2	2
High	1752.5	20375	5	QPSK	1	0	24.47	0	0
	1752.5	20375	5	QPSK	1	12	24.34	0	0
	1752.5	20375	5	QPSK	1	24	24.45	0	0
	1752.5	20375	5	QPSK	12	0	23.29	0-1	1
	1752.5	20375	5	QPSK	12	6	23.24	0-1	1
	1752.5	20375	5	QPSK	12	13	23.49	0-1	1
	1752.5	20375	5	QPSK	25	0	23.21	0-1	1
	1752.5	20375	5	16-QAM	1	0	23.24	0-1	1
	1752.5	20375	5	16-QAM	1	12	23.35	0-1	1
	1752.5	20375	5	16-QAM	1	24	23.49	0-1	1
	1752.5	20375	5	16-QAM	12	0	22.20	0-2	2
	1752.5	20375	5	16-QAM	12	6	22.21	0-2	2
	1752.5	20375	5	16-QAM	12	13	22.45	0-2	2
	1752.5	20375	5	16-QAM	25	0	22.35	0-2	2

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Table 9-9
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	24.59	0	0
	1711.5	19965	3	QPSK	1	7	24.20	0	0
	1711.5	19965	3	QPSK	1	14	24.43	0	0
	1711.5	19965	3	QPSK	8	0	23.26	0-1	1
	1711.5	19965	3	QPSK	8	4	23.25	0-1	1
	1711.5	19965	3	QPSK	8	7	23.29	0-1	1
	1711.5	19965	3	QPSK	15	0	23.20	0-1	1
	1711.5	19965	3	16-QAM	1	0	23.30	0-1	1
	1711.5	19965	3	16-QAM	1	7	23.24	0-1	1
	1711.5	19965	3	16-QAM	1	14	23.25	0-1	1
	1711.5	19965	3	16-QAM	8	0	22.23	0-2	2
	1711.5	19965	3	16-QAM	8	4	22.21	0-2	2
	1711.5	19965	3	16-QAM	8	7	22.37	0-2	2
	1711.5	19965	3	16-QAM	15	0	22.31	0-2	2
Mid	1732.5	20175	3	QPSK	1	0	24.59	0	0
	1732.5	20175	3	QPSK	1	7	24.32	0	0
	1732.5	20175	3	QPSK	1	14	24.32	0	0
	1732.5	20175	3	QPSK	8	0	23.52	0-1	1
	1732.5	20175	3	QPSK	8	4	23.45	0-1	1
	1732.5	20175	3	QPSK	8	7	23.29	0-1	1
	1732.5	20175	3	QPSK	15	0	23.35	0-1	1
	1732.5	20175	3	16-QAM	1	0	23.22	0-1	1
	1732.5	20175	3	16-QAM	1	7	23.23	0-1	1
	1732.5	20175	3	16-QAM	1	14	23.52	0-1	1
	1732.5	20175	3	16-QAM	8	0	22.46	0-2	2
	1732.5	20175	3	16-QAM	8	4	22.30	0-2	2
	1732.5	20175	3	16-QAM	8	7	22.27	0-2	2
	1732.5	20175	3	16-QAM	15	0	22.24	0-2	2
High	1753.5	20385	3	QPSK	1	0	24.64	0	0
	1753.5	20385	3	QPSK	1	7	24.23	0	0
	1753.5	20385	3	QPSK	1	14	24.27	0	0
	1753.5	20385	3	QPSK	8	0	23.29	0-1	1
	1753.5	20385	3	QPSK	8	4	23.45	0-1	1
	1753.5	20385	3	QPSK	8	7	23.25	0-1	1
	1753.5	20385	3	QPSK	15	0	23.23	0-1	1
	1753.5	20385	3	16-QAM	1	0	23.31	0-1	1
	1753.5	20385	3	16-QAM	1	7	23.37	0-1	1
	1753.5	20385	3	16-QAM	1	14	23.22	0-1	1
	1753.5	20385	3	16-QAM	8	0	22.28	0-2	2
	1753.5	20385	3	16-QAM	8	4	22.29	0-2	2
	1753.5	20385	3	16-QAM	8	7	22.21	0-2	2
	1753.5	20385	3	16-QAM	15	0	22.32	0-2	2

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Table 9-10
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	24.26	0	0
	1710.7	19957	1.4	QPSK	1	2	24.25	0	0
	1710.7	19957	1.4	QPSK	1	5	24.23	0	0
	1710.7	19957	1.4	QPSK	3	0	24.35	0	0
	1710.7	19957	1.4	QPSK	3	2	24.31	0	0
	1710.7	19957	1.4	QPSK	3	3	24.26	0	0
	1710.7	19957	1.4	QPSK	6	0	23.29	0-1	1
	1710.7	19957	1.4	16-QAM	1	0	23.24	0-1	1
	1710.7	19957	1.4	16-QAM	1	2	23.28	0-1	1
	1710.7	19957	1.4	16-QAM	1	5	23.21	0-1	1
	1710.7	19957	1.4	16-QAM	3	0	23.24	0-1	1
	1710.7	19957	1.4	16-QAM	3	2	23.22	0-1	1
	1710.7	19957	1.4	16-QAM	3	3	23.36	0-1	1
	1710.7	19957	1.4	16-QAM	6	0	22.31	0-2	2
Mid	1732.5	20175	1.4	QPSK	1	0	24.29	0	0
	1732.5	20175	1.4	QPSK	1	2	24.40	0	0
	1732.5	20175	1.4	QPSK	1	5	24.41	0	0
	1732.5	20175	1.4	QPSK	3	0	24.26	0	0
	1732.5	20175	1.4	QPSK	3	2	24.25	0	0
	1732.5	20175	1.4	QPSK	3	3	24.41	0	0
	1732.5	20175	1.4	QPSK	6	0	23.36	0-1	1
	1732.5	20175	1.4	16-QAM	1	0	23.24	0-1	1
	1732.5	20175	1.4	16-QAM	1	2	23.38	0-1	1
	1732.5	20175	1.4	16-QAM	1	5	23.39	0-1	1
	1732.5	20175	1.4	16-QAM	3	0	23.24	0-1	1
	1732.5	20175	1.4	16-QAM	3	2	23.25	0-1	1
	1732.5	20175	1.4	16-QAM	3	3	23.21	0-1	1
	1732.5	20175	1.4	16-QAM	6	0	22.25	0-2	2
High	1754.3	20393	1.4	QPSK	1	0	24.25	0	0
	1754.3	20393	1.4	QPSK	1	2	24.46	0	0
	1754.3	20393	1.4	QPSK	1	5	24.41	0	0
	1754.3	20393	1.4	QPSK	3	0	24.32	0	0
	1754.3	20393	1.4	QPSK	3	2	24.21	0	0
	1754.3	20393	1.4	QPSK	3	3	24.36	0	0
	1754.3	20393	1.4	QPSK	6	0	23.23	0-1	1
	1754.3	20393	1.4	16-QAM	1	0	23.39	0-1	1
	1754.3	20393	1.4	16-QAM	1	2	23.24	0-1	1
	1754.3	20393	1.4	16-QAM	1	5	23.42	0-1	1
	1754.3	20393	1.4	16-QAM	3	0	23.26	0-1	1
	1754.3	20393	1.4	16-QAM	3	2	23.34	0-1	1
	1754.3	20393	1.4	16-QAM	3	3	23.25	0-1	1
	1754.3	20393	1.4	16-QAM	6	0	22.29	0-2	2

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9.3.3 LTE Band 2 (PCS)

Table 9-11
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	24.24	0	0
	1860	18700	20	QPSK	1	50	24.20	0	0
	1860	18700	20	QPSK	1	99	24.23	0	0
	1860	18700	20	QPSK	50	0	23.30	0-1	1
	1860	18700	20	QPSK	50	25	23.21	0-1	1
	1860	18700	20	QPSK	50	50	23.25	0-1	1
	1860	18700	20	QPSK	100	0	23.20	0-1	1
	1860	18700	20	16QAM	1	0	23.25	0-1	1
	1860	18700	20	16QAM	1	50	23.22	0-1	1
	1860	18700	20	16QAM	1	99	23.24	0-1	1
	1860	18700	20	16QAM	50	0	22.30	0-2	2
	1860	18700	20	16QAM	50	25	22.29	0-2	2
	1860	18700	20	16QAM	50	50	22.25	0-2	2
	1860	18700	20	16QAM	100	0	22.27	0-2	2
Mid	1880.0	18900	20	QPSK	1	0	**24.42**	0	0
	1880.0	18900	20	QPSK	1	50	24.27	0	0
	1880.0	18900	20	QPSK	1	99	24.28	0	0
	1880.0	18900	20	QPSK	50	0	**23.31**	0-1	1
	1880.0	18900	20	QPSK	50	25	23.22	0-1	1
	1880.0	18900	20	QPSK	50	50	23.20	0-1	1
	1880.0	18900	20	QPSK	100	0	23.21	0-1	1
	1880.0	18900	20	16QAM	1	0	23.28	0-1	1
	1880.0	18900	20	16QAM	1	50	23.21	0-1	1
	1880.0	18900	20	16QAM	1	99	23.20	0-1	1
	1880.0	18900	20	16QAM	50	0	22.28	0-2	2
	1880.0	18900	20	16QAM	50	25	22.39	0-2	2
	1880.0	18900	20	16QAM	50	50	22.36	0-2	2
	1880.0	18900	20	16QAM	100	0	22.21	0-2	2
High	1900	19100	20	QPSK	1	0	24.22	0	0
	1900	19100	20	QPSK	1	50	24.28	0	0
	1900	19100	20	QPSK	1	99	24.22	0	0
	1900	19100	20	QPSK	50	0	23.29	0-1	1
	1900	19100	20	QPSK	50	25	23.21	0-1	1
	1900	19100	20	QPSK	50	50	23.23	0-1	1
	1900	19100	20	QPSK	100	0	23.24	0-1	1
	1900	19100	20	16QAM	1	0	23.27	0-1	1
	1900	19100	20	16QAM	1	50	23.34	0-1	1
	1900	19100	20	16QAM	1	99	23.31	0-1	1
	1900	19100	20	16QAM	50	0	22.28	0-2	2
	1900	19100	20	16QAM	50	25	22.31	0-2	2
	1900	19100	20	16QAM	50	50	22.37	0-2	2
	1900	19100	20	16QAM	100	0	22.34	0-2	2

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Table 9-12
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	24.45	0	0
	1857.5	18675	15	QPSK	1	36	24.27	0	0
	1857.5	18675	15	QPSK	1	74	24.23	0	0
	1857.5	18675	15	QPSK	36	0	23.27	0-1	1
	1857.5	18675	15	QPSK	36	18	23.32	0-1	1
	1857.5	18675	15	QPSK	36	37	23.40	0-1	1
	1857.5	18675	15	QPSK	75	0	23.39	0-1	1
	1857.5	18675	15	16QAM	1	0	23.20	0-1	1
	1857.5	18675	15	16QAM	1	36	23.28	0-1	1
	1857.5	18675	15	16QAM	1	74	23.49	0-1	1
	1857.5	18675	15	16QAM	36	0	22.27	0-2	2
	1857.5	18675	15	16QAM	36	18	22.23	0-2	2
	1857.5	18675	15	16QAM	36	37	22.35	0-2	2
	1857.5	18675	15	16QAM	75	0	22.30	0-2	2
Mid	1880.0	18900	15	QPSK	1	0	24.58	0	0
	1880.0	18900	15	QPSK	1	36	24.46	0	0
	1880.0	18900	15	QPSK	1	74	24.47	0	0
	1880.0	18900	15	QPSK	36	0	23.34	0-1	1
	1880.0	18900	15	QPSK	36	18	23.40	0-1	1
	1880.0	18900	15	QPSK	36	37	23.38	0-1	1
	1880.0	18900	15	QPSK	75	0	23.31	0-1	1
	1880.0	18900	15	16QAM	1	0	23.26	0-1	1
	1880.0	18900	15	16QAM	1	36	23.36	0-1	1
	1880.0	18900	15	16QAM	1	74	23.41	0-1	1
	1880.0	18900	15	16QAM	36	0	22.30	0-2	2
	1880.0	18900	15	16QAM	36	18	22.50	0-2	2
	1880.0	18900	15	16QAM	36	37	22.31	0-2	2
	1880.0	18900	15	16QAM	75	0	22.27	0-2	2
High	1902.5	19125	15	QPSK	1	0	24.26	0	0
	1902.5	19125	15	QPSK	1	36	24.33	0	0
	1902.5	19125	15	QPSK	1	74	24.37	0	0
	1902.5	19125	15	QPSK	36	0	23.48	0-1	1
	1902.5	19125	15	QPSK	36	18	23.31	0-1	1
	1902.5	19125	15	QPSK	36	37	23.45	0-1	1
	1902.5	19125	15	QPSK	75	0	23.36	0-1	1
	1902.5	19125	15	16QAM	1	0	23.43	0-1	1
	1902.5	19125	15	16QAM	1	36	23.50	0-1	1
	1902.5	19125	15	16QAM	1	74	23.31	0-1	1
	1902.5	19125	15	16QAM	36	0	22.20	0-2	2
	1902.5	19125	15	16QAM	36	18	22.55	0-2	2
	1902.5	19125	15	16QAM	36	37	22.33	0-2	2
	1902.5	19125	15	16QAM	75	0	22.57	0-2	2

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Table 9-13
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	24.46	0	0
	1855	18650	10	QPSK	1	25	24.23	0	0
	1855	18650	10	QPSK	1	49	24.35	0	0
	1855	18650	10	QPSK	25	0	23.44	0-1	1
	1855	18650	10	QPSK	25	12	23.27	0-1	1
	1855	18650	10	QPSK	25	25	23.25	0-1	1
	1855	18650	10	QPSK	50	0	23.22	0-1	1
	1855	18650	10	16QAM	1	0	23.49	0-1	1
	1855	18650	10	16QAM	1	25	23.25	0-1	1
	1855	18650	10	16QAM	1	49	23.40	0-1	1
	1855	18650	10	16QAM	25	0	22.46	0-2	2
	1855	18650	10	16QAM	25	12	22.44	0-2	2
	1855	18650	10	16QAM	25	25	22.47	0-2	2
	1855	18650	10	16QAM	50	0	22.44	0-2	2
Mid	1880.0	18900	10	QPSK	1	0	24.61	0	0
	1880.0	18900	10	QPSK	1	25	24.40	0	0
	1880.0	18900	10	QPSK	1	49	24.33	0	0
	1880.0	18900	10	QPSK	25	0	23.37	0-1	1
	1880.0	18900	10	QPSK	25	12	23.44	0-1	1
	1880.0	18900	10	QPSK	25	25	23.33	0-1	1
	1880.0	18900	10	QPSK	50	0	23.22	0-1	1
	1880.0	18900	10	16QAM	1	0	23.32	0-1	1
	1880.0	18900	10	16QAM	1	25	23.33	0-1	1
	1880.0	18900	10	16QAM	1	49	23.28	0-1	1
	1880.0	18900	10	16QAM	25	0	22.21	0-2	2
	1880.0	18900	10	16QAM	25	12	22.35	0-2	2
	1880.0	18900	10	16QAM	25	25	22.33	0-2	2
	1880.0	18900	10	16QAM	50	0	22.39	0-2	2
High	1905	19150	10	QPSK	1	0	24.41	0	0
	1905	19150	10	QPSK	1	25	24.32	0	0
	1905	19150	10	QPSK	1	49	24.35	0	0
	1905	19150	10	QPSK	25	0	23.26	0-1	1
	1905	19150	10	QPSK	25	12	23.34	0-1	1
	1905	19150	10	QPSK	25	25	23.31	0-1	1
	1905	19150	10	QPSK	50	0	23.38	0-1	1
	1905	19150	10	16QAM	1	0	23.27	0-1	1
	1905	19150	10	16QAM	1	25	23.32	0-1	1
	1905	19150	10	16QAM	1	49	23.49	0-1	1
	1905	19150	10	16QAM	25	0	22.46	0-2	2
	1905	19150	10	16QAM	25	12	22.50	0-2	2
	1905	19150	10	16QAM	25	25	22.55	0-2	2
	1905	19150	10	16QAM	50	0	22.51	0-2	2

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Table 9-14
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	24.31	0	0
	1852.5	18625	5	QPSK	1	12	24.34	0	0
	1852.5	18625	5	QPSK	1	24	24.38	0	0
	1852.5	18625	5	QPSK	12	0	23.43	0-1	1
	1852.5	18625	5	QPSK	12	6	23.30	0-1	1
	1852.5	18625	5	QPSK	12	13	23.45	0-1	1
	1852.5	18625	5	QPSK	25	0	23.23	0-1	1
	1852.5	18625	5	16-QAM	1	0	23.46	0-1	1
	1852.5	18625	5	16-QAM	1	12	23.34	0-1	1
	1852.5	18625	5	16-QAM	1	24	23.23	0-1	1
	1852.5	18625	5	16-QAM	12	0	22.31	0-2	2
	1852.5	18625	5	16-QAM	12	6	22.35	0-2	2
	1852.5	18625	5	16-QAM	12	13	22.43	0-2	2
	1852.5	18625	5	16-QAM	25	0	22.32	0-2	2
Mid	1880.0	18900	5	QPSK	1	0	24.58	0	0
	1880.0	18900	5	QPSK	1	12	24.41	0	0
	1880.0	18900	5	QPSK	1	24	24.33	0	0
	1880.0	18900	5	QPSK	12	0	23.25	0-1	1
	1880.0	18900	5	QPSK	12	6	23.36	0-1	1
	1880.0	18900	5	QPSK	12	13	23.41	0-1	1
	1880.0	18900	5	QPSK	25	0	23.43	0-1	1
	1880.0	18900	5	16-QAM	1	0	23.46	0-1	1
	1880.0	18900	5	16-QAM	1	12	23.37	0-1	1
	1880.0	18900	5	16-QAM	1	24	23.35	0-1	1
	1880.0	18900	5	16-QAM	12	0	22.51	0-2	2
	1880.0	18900	5	16-QAM	12	6	22.53	0-2	2
	1880.0	18900	5	16-QAM	12	13	22.36	0-2	2
	1880.0	18900	5	16-QAM	25	0	22.46	0-2	2
High	1907.5	19175	5	QPSK	1	0	24.33	0	0
	1907.5	19175	5	QPSK	1	12	24.52	0	0
	1907.5	19175	5	QPSK	1	24	24.20	0	0
	1907.5	19175	5	QPSK	12	0	23.52	0-1	1
	1907.5	19175	5	QPSK	12	6	23.21	0-1	1
	1907.5	19175	5	QPSK	12	13	23.35	0-1	1
	1907.5	19175	5	QPSK	25	0	23.28	0-1	1
	1907.5	19175	5	16-QAM	1	0	23.40	0-1	1
	1907.5	19175	5	16-QAM	1	12	23.29	0-1	1
	1907.5	19175	5	16-QAM	1	24	23.26	0-1	1
	1907.5	19175	5	16-QAM	12	0	22.26	0-2	2
	1907.5	19175	5	16-QAM	12	6	22.52	0-2	2
	1907.5	19175	5	16-QAM	12	13	22.52	0-2	2
	1907.5	19175	5	16-QAM	25	0	22.29	0-2	2

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Table 9-15
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	24.44	0	0
	1851.5	18615	3	QPSK	1	7	24.41	0	0
	1851.5	18615	3	QPSK	1	14	24.33	0	0
	1851.5	18615	3	QPSK	8	0	23.53	0-1	1
	1851.5	18615	3	QPSK	8	4	23.26	0-1	1
	1851.5	18615	3	QPSK	8	7	23.23	0-1	1
	1851.5	18615	3	QPSK	15	0	23.23	0-1	1
	1851.5	18615	3	16-QAM	1	0	23.36	0-1	1
	1851.5	18615	3	16-QAM	1	7	23.27	0-1	1
	1851.5	18615	3	16-QAM	1	14	23.20	0-1	1
	1851.5	18615	3	16-QAM	8	0	22.41	0-2	2
	1851.5	18615	3	16-QAM	8	4	22.26	0-2	2
	1851.5	18615	3	16-QAM	8	7	22.27	0-2	2
	1851.5	18615	3	16-QAM	15	0	22.26	0-2	2
Mid	1880.0	18900	3	QPSK	1	0	24.51	0	0
	1880.0	18900	3	QPSK	1	7	24.37	0	0
	1880.0	18900	3	QPSK	1	14	24.53	0	0
	1880.0	18900	3	QPSK	8	0	23.39	0-1	1
	1880.0	18900	3	QPSK	8	4	23.26	0-1	1
	1880.0	18900	3	QPSK	8	7	23.26	0-1	1
	1880.0	18900	3	QPSK	15	0	23.23	0-1	1
	1880.0	18900	3	16-QAM	1	0	23.27	0-1	1
	1880.0	18900	3	16-QAM	1	7	23.45	0-1	1
	1880.0	18900	3	16-QAM	1	14	23.23	0-1	1
	1880.0	18900	3	16-QAM	8	0	22.46	0-2	2
	1880.0	18900	3	16-QAM	8	4	22.50	0-2	2
	1880.0	18900	3	16-QAM	8	7	22.48	0-2	2
	1880.0	18900	3	16-QAM	15	0	22.32	0-2	2
High	1908.5	19185	3	QPSK	1	0	24.27	0	0
	1908.5	19185	3	QPSK	1	7	24.28	0	0
	1908.5	19185	3	QPSK	1	14	24.38	0	0
	1908.5	19185	3	QPSK	8	0	23.24	0-1	1
	1908.5	19185	3	QPSK	8	4	23.24	0-1	1
	1908.5	19185	3	QPSK	8	7	23.43	0-1	1
	1908.5	19185	3	QPSK	15	0	23.25	0-1	1
	1908.5	19185	3	16-QAM	1	0	23.35	0-1	1
	1908.5	19185	3	16-QAM	1	7	23.32	0-1	1
	1908.5	19185	3	16-QAM	1	14	23.37	0-1	1
	1908.5	19185	3	16-QAM	8	0	22.48	0-2	2
	1908.5	19185	3	16-QAM	8	4	22.48	0-2	2
	1908.5	19185	3	16-QAM	8	7	22.53	0-2	2
	1908.5	19185	3	16-QAM	15	0	22.27	0-2	2

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Table 9-16
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	24.26	0	0
	1850.7	18607	1.4	QPSK	1	2	24.43	0	0
	1850.7	18607	1.4	QPSK	1	5	24.36	0	0
	1850.7	18607	1.4	QPSK	3	0	24.36	0	0
	1850.7	18607	1.4	QPSK	3	2	24.32	0	0
	1850.7	18607	1.4	QPSK	3	3	24.23	0	0
	1850.7	18607	1.4	QPSK	6	0	23.36	0-1	1
	1850.7	18607	1.4	16-QAM	1	0	23.31	0-1	1
	1850.7	18607	1.4	16-QAM	1	2	23.35	0-1	1
	1850.7	18607	1.4	16-QAM	1	5	23.33	0-1	1
	1850.7	18607	1.4	16-QAM	3	0	23.22	0-1	1
	1850.7	18607	1.4	16-QAM	3	2	23.40	0-1	1
	1850.7	18607	1.4	16-QAM	3	3	23.21	0-1	1
	1850.7	18607	1.4	16-QAM	6	0	22.29	0-2	2
Mid	1880.0	18900	1.4	QPSK	1	0	24.26	0	0
	1880.0	18900	1.4	QPSK	1	2	24.29	0	0
	1880.0	18900	1.4	QPSK	1	5	24.38	0	0
	1880.0	18900	1.4	QPSK	3	0	24.46	0	0
	1880.0	18900	1.4	QPSK	3	2	24.25	0	0
	1880.0	18900	1.4	QPSK	3	3	24.30	0	0
	1880.0	18900	1.4	QPSK	6	0	23.36	0-1	1
	1880.0	18900	1.4	16-QAM	1	0	23.39	0-1	1
	1880.0	18900	1.4	16-QAM	1	2	23.35	0-1	1
	1880.0	18900	1.4	16-QAM	1	5	23.33	0-1	1
	1880.0	18900	1.4	16-QAM	3	0	23.24	0-1	1
	1880.0	18900	1.4	16-QAM	3	2	23.22	0-1	1
	1880.0	18900	1.4	16-QAM	3	3	23.26	0-1	1
	1880.0	18900	1.4	16-QAM	6	0	22.44	0-2	2
High	1909.3	19193	1.4	QPSK	1	0	24.42	0	0
	1909.3	19193	1.4	QPSK	1	2	24.32	0	0
	1909.3	19193	1.4	QPSK	1	5	24.33	0	0
	1909.3	19193	1.4	QPSK	3	0	24.35	0	0
	1909.3	19193	1.4	QPSK	3	2	24.31	0	0
	1909.3	19193	1.4	QPSK	3	3	24.25	0	0
	1909.3	19193	1.4	QPSK	6	0	23.22	0-1	1
	1909.3	19193	1.4	16-QAM	1	0	23.29	0-1	1
	1909.3	19193	1.4	16-QAM	1	2	23.25	0-1	1
	1909.3	19193	1.4	16-QAM	1	5	23.41	0-1	1
	1909.3	19193	1.4	16-QAM	3	0	23.36	0-1	1
	1909.3	19193	1.4	16-QAM	3	2	23.29	0-1	1
	1909.3	19193	1.4	16-QAM	3	3	23.35	0-1	1
	1909.3	19193	1.4	16-QAM	6	0	22.21	0-2	2

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9.4 WLAN Conducted Powers

Table 9-17
IEEE 802.11b Average RF Power

Mode	Freq [MHz]	Channel	802.11b (2.4 GHz) Conducted Power [dBm]			
			Data Rate [Mbps]			
			1	2	5.5	11
802.11b	2412	1*	16.66	16.60	16.56	16.50
802.11b	2437	6*	16.75	16.54	16.65	16.56
802.11b	2462	11*	**16.78**	16.75	16.69	16.68

Table 9-18
IEEE 802.11g Average RF Power

Mode	Freq [MHz]	Channel	802.11g (2.4 GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
802.11g	2412	1	14.98	14.82	14.94	14.93	14.99	14.86	14.87	14.83
802.11g	2437	6	14.96	14.93	14.85	14.92	14.93	14.99	14.93	14.77
802.11g	2462	11	14.92	14.87	14.74	14.76	14.60	14.79	14.73	14.77

Table 9-19
IEEE 802.11n Average RF Power

Mode	Freq [MHz]	Channel	802.11n (2.4 GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			6.5	13	20	26	39	52	58	65
802.11n	2412	1	14.56	14.64	14.72	14.42	14.46	14.51	14.61	14.53
802.11n	2437	6	14.72	14.73	14.58	14.54	14.52	14.39	14.48	14.51
802.11n	2462	11	14.75	14.90	14.80	14.71	14.77	14.65	14.67	14.69

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Table 9-20
IEEE 802.11a Average RF Power

Mode	Freq [MHz]	Channel	802.11a (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
802.11a	5180	36*	**15.19**	15.08	15.12	15.11	15.07	15.04	14.99	15.08
802.11a	5200	40	15.04	15.08	15.11	15.09	15.00	15.14	14.97	14.97
802.11a	5220	44	15.02	14.96	14.91	14.86	14.78	15.00	14.99	14.96
802.11a	5240	48*	14.94	15.02	14.92	14.89	14.92	14.86	14.78	14.78
802.11a	5260	52*	**14.83**	14.78	14.75	14.80	14.74	14.79	14.89	14.79
802.11a	5280	56	14.67	14.76	14.72	14.82	14.81	14.66	14.60	14.68
802.11a	5300	60	14.71	14.71	14.69	14.72	14.71	14.81	14.86	14.64
802.11a	5320	64*	14.79	14.75	14.75	14.71	14.73	14.68	14.60	14.59
802.11a	5500	100	14.93	14.92	14.91	14.88	14.75	14.84	14.90	15.02
802.11a	5520	104*	**14.99**	14.84	14.82	14.83	14.93	14.89	14.91	14.90
802.11a	5540	108	14.78	14.78	14.83	14.84	14.78	14.78	14.77	14.80
802.11a	5560	112	14.74	14.65	14.66	14.67	14.69	14.73	14.63	14.75
802.11a	5580	116*	14.69	14.80	14.66	14.79	14.71	14.71	14.81	14.67
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	14.65	14.56	14.73	14.64	14.71	14.49	14.46	14.55
802.11a	5680	136*	14.62	14.65	14.65	14.67	14.46	14.53	14.52	14.48
802.11a	5700	140	14.62	14.53	14.57	14.69	14.62	14.60	14.50	14.59
802.11a	5745	149*	14.65	14.59	14.57	14.54	14.40	14.49	14.44	14.51
802.11a	5765	153	**14.99**	15.02	15.06	15.11	14.91	14.89	14.89	14.84
802.11a	5785	157*	14.89	14.90	14.94	14.94	15.06	14.81	14.92	14.83
802.11a	5805	161	14.89	14.87	14.80	14.81	14.84	14.84	14.88	14.92
802.11a	5825	165*	14.85	14.85	14.81	14.83	14.73	14.75	14.80	14.71

(*) – 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.

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Table 9-21
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	15.04	14.99	15.11	15.05	14.98	15.02	15.00	15.05
802.11n	5200	40	14.99	15.00	15.06	14.95	14.97	14.82	14.75	14.88
802.11n	5220	44	14.93	14.91	14.99	14.86	14.86	14.85	14.89	14.95
802.11n	5240	48	14.94	14.71	14.82	14.76	14.72	14.75	14.72	14.69
802.11n	5260	52	14.77	14.79	14.74	14.72	14.71	14.77	14.75	14.73
802.11n	5280	56	14.70	14.66	14.63	14.56	14.63	14.61	14.67	14.51
802.11n	5300	60	14.69	14.65	14.62	14.56	14.51	14.56	14.66	14.58
802.11n	5320	64	14.49	14.59	14.59	14.60	14.65	14.61	14.65	14.67
802.11n	5500	100	14.88	14.81	14.74	14.72	14.92	14.89	14.81	14.85
802.11n	5520	104	14.67	14.70	14.70	14.62	14.80	14.80	14.79	14.81
802.11n	5540	108	14.62	14.62	14.73	14.64	14.51	14.59	14.72	14.68
802.11n	5560	112	14.61	14.75	14.73	14.62	14.42	14.55	14.44	14.58
802.11n	5580	116	14.63	14.66	14.64	14.63	14.58	14.66	14.58	14.55
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	14.58	14.54	14.49	14.45	14.52	14.47	14.52	14.56
802.11n	5680	136	14.29	14.45	14.32	14.28	14.41	14.43	14.37	14.48
802.11n	5700	140	14.45	14.53	14.56	14.56	14.56	14.44	14.43	14.51
802.11n	5745	149	14.42	14.33	14.29	14.49	14.49	14.41	14.45	14.35
802.11n	5765	153	14.85	14.73	14.83	14.86	14.76	14.79	14.86	14.85
802.11n	5785	157	14.90	14.81	14.79	14.78	14.78	14.75	14.79	14.79
802.11n	5805	161	14.71	14.73	14.73	14.78	14.76	14.70	14.61	14.58
802.11n	5825	165	14.75	14.57	14.55	14.55	14.61	14.65	14.68	14.57

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Table 9-22
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	14.73	14.63	14.75	14.73	14.82	14.83	14.70	14.82
802.11n	5230	46	14.44	14.69	14.50	14.64	14.48	14.38	14.53	14.54
802.11n	5270	54	14.56	14.50	14.61	14.31	14.42	14.45	14.37	14.38
802.11n	5310	62	14.36	14.43	14.53	14.47	14.55	14.28	14.32	14.34
802.11n	5510	102	14.55	14.60	14.67	14.55	14.63	14.62	14.55	14.52
802.11n	5550	110	14.34	14.43	14.42	14.45	14.49	14.45	14.51	14.33
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	14.20	14.26	14.39	14.34	14.15	14.15	14.24	14.20
802.11n	5755	151	14.11	14.10	14.09	14.21	14.16	14.12	14.11	14.08
802.11n	5795	159	14.14	14.21	14.16	14.21	14.16	14.06	14.15	14.16

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) 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.
- 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.

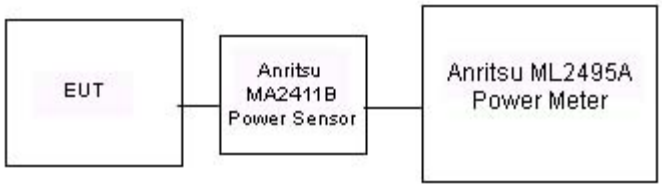

Figure 9-3
Power Measurement Setup

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10 SYSTEM VERIFICATION

10.1 Tissue Verification

Table 10-1
Measured Head Tissue Properties

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (C°)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ε	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ε	%dev σ	%dev ε
03/02/2015	750H	21.3	695	0.871	42.638	0.889	42.227	-2.02%	0.97%
			710	0.885	42.417	0.890	42.149	-0.56%	0.64%
			725	0.899	42.226	0.891	42.071	0.90%	0.37%
			740	0.912	42.010	0.893	41.994	2.13%	0.04%
			755	0.927	41.837	0.894	41.916	3.69%	-0.19%
02/27/2015	835H	21.2	820	0.876	40.435	0.899	41.578	-2.56%	-2.75%
			835	0.890	40.230	0.900	41.500	-1.11%	-3.06%
			850	0.904	40.019	0.916	41.500	-1.31%	-3.57%
02/24/2015	1750H	22.2	1710	1.304	39.426	1.348	40.142	-3.26%	-1.78%
			1750	1.346	39.258	1.371	40.079	-1.82%	-2.05%
			1790	1.386	39.051	1.394	40.016	-0.57%	-2.41%
03/02/2015	1900H	21.8	1850	1.356	39.093	1.400	40.000	-3.14%	-2.27%
			1880	1.387	38.958	1.400	40.000	-0.93%	-2.61%
			1910	1.417	38.808	1.400	40.000	1.21%	-2.98%
02/26/2015	2450H	23.5	2401	1.826	39.383	1.756	39.287	3.99%	0.24%
			2450	1.885	39.202	1.800	39.200	4.72%	0.01%
			2499	1.944	39.015	1.853	39.138	4.91%	-0.31%
03/02/2015	5200H-5800H	21.1	5180	4.558	36.154	4.635	36.009	-1.66%	0.40%
			5200	4.591	36.146	4.655	35.986	-1.37%	0.44%
			5220	4.624	36.014	4.676	35.963	-1.11%	0.14%
			5260	4.643	36.006	4.717	35.917	-1.57%	0.25%
			5300	4.696	35.997	4.758	35.871	-1.30%	0.35%
			5320	4.704	35.874	4.778	35.849	-1.55%	0.07%
			5500	4.911	35.654	4.963	35.643	-1.05%	0.03%
			5520	4.903	35.594	4.983	35.620	-1.61%	-0.07%
			5560	4.932	35.512	5.024	35.574	-1.83%	-0.17%
			5600	5.001	35.487	5.065	35.529	-1.26%	-0.12%
			5660	5.035	35.408	5.127	35.460	-1.79%	-0.15%
			5765	5.144	35.294	5.234	35.340	-1.72%	-0.13%
			5785	5.187	35.302	5.255	35.317	-1.29%	-0.04%
			5800	5.190	35.261	5.270	35.300	-1.52%	-0.11%
			5805	5.191	35.273	5.275	35.294	-1.59%	-0.06%

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Table 10-2
Measured Body Tissue Properties

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (C°)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ε	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ε	%dev σ	%dev ε
03/02/2015	750B	21.9	695	0.924	54.793	0.959	55.745	-3.65%	-1.71%
			710	0.937	54.608	0.960	55.687	-2.40%	-1.94%
			725	0.955	54.552	0.961	55.629	-0.62%	-1.94%
			740	0.973	54.413	0.963	55.570	1.04%	-2.08%
			755	0.988	54.302	0.964	55.512	2.49%	-2.18%
02/25/2015	835B	21.9	820	0.935	54.339	0.969	55.258	-3.51%	-1.66%
			835	0.950	54.182	0.970	55.200	-2.06%	-1.84%
			850	0.965	54.062	0.988	55.154	-2.33%	-1.98%
02/25/2015	1750B	22.4	1710	1.423	51.191	1.463	53.537	-2.73%	-4.38%
			1750	1.464	51.093	1.488	53.432	-1.61%	-4.38%
			1790	1.508	50.870	1.514	53.326	-0.40%	-4.61%
02/28/2015	1900B	22.9	1850	1.490	51.438	1.520	53.300	-1.97%	-3.49%
			1880	1.524	51.322	1.520	53.300	0.26%	-3.71%
			1910	1.559	51.213	1.520	53.300	2.57%	-3.92%
02/25/2015	2450B	24.5	2401	1.854	50.372	1.903	52.765	-2.57%	-4.54%
			2450	1.916	50.214	1.950	52.700	-1.74%	-4.72%
			2499	1.979	50.049	2.019	52.638	-1.98%	-4.92%
02/23/2015	5200B-5800B	23.0	5180	5.246	47.347	5.276	49.041	-0.57%	-3.45%
			5200	5.284	47.301	5.299	49.014	-0.28%	-3.49%
			5260	5.360	47.103	5.369	48.933	-0.17%	-3.74%
			5300	5.425	47.010	5.416	48.879	0.17%	-3.82%
			5500	5.729	46.574	5.650	48.607	1.40%	-4.18%
			5520	5.753	46.566	5.673	48.580	1.41%	-4.15%
			5765	6.116	45.965	5.959	48.248	2.63%	-4.73%
			5800	6.168	45.889	6.000	48.200	2.80%	-4.79%

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.

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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 10-3
System Verification Results – 1g

System Verification TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Dipole SN	Probe SN	Measured SAR_{1g} (W/kg)	1 W Target SAR_{1g} (W/kg)	1 W Normalized SAR_{1g} (W/kg)	$Deviation_{1g}$ (%)
C	750	HEAD	03/02/2015	22.6	21.3	0.100	1003	3333	0.824	8.090	8.240	1.85%
J	835	HEAD	02/27/2015	23.3	21.2	0.100	4d133	3022	0.908	9.200	9.080	-1.30%
J	1750	HEAD	02/24/2015	23.4	22.2	0.100	1008	3022	3.640	36.900	36.400	-1.36%
J	1900	HEAD	03/02/2015	23.4	21.8	0.100	5d149	3022	3.870	40.200	38.700	-3.73%
A	2450	HEAD	02/26/2015	24.5	23.5	0.100	797	3331	5.340	52.100	53.400	2.50%
H	5200	HEAD	03/02/2015	24.1	21.1	0.050	1057	3920	3.950	81.500	79.000	-3.07%
H	5300	HEAD	03/02/2015	24.2	21.0	0.050	1057	3920	4.130	84.700	82.600	-2.48%
H	5500	HEAD	03/02/2015	24.0	21.2	0.050	1057	3920	3.850	84.300	77.000	-8.66%
H	5600	HEAD	03/02/2015	24.2	21.1	0.050	1057	3920	4.060	83.800	81.200	-3.10%
H	5800	HEAD	03/02/2015	24.1	21.0	0.050	1057	3920	3.890	81.100	77.800	-4.07%
B	750	BODY	03/02/2015	23.2	21.9	0.100	1003	3334	0.872	8.460	8.720	3.07%
C	835	BODY	02/25/2015	22.4	21.9	0.100	4d132	3333	0.977	9.140	9.770	6.89%
J	1750	BODY	02/25/2015	23.8	22.4	0.100	1008	3022	3.540	37.600	35.400	-5.85%
G	1900	BODY	02/28/2015	23.4	22.9	0.100	5d149	3213	4.130	40.400	41.300	2.23%
A	2450	BODY	02/25/2015	23.1	24.5	0.100	797	3331	5.340	50.400	53.400	5.95%
A	5200	BODY	02/23/2015	21.7	23.0	0.050	1191	3949	4.060	77.800	81.200	4.37%
A	5300	BODY	02/23/2015	21.6	23.1	0.050	1191	3949	4.240	79.900	84.800	6.13%
A	5500	BODY	02/23/2015	21.5	23.2	0.050	1191	3949	4.360	83.100	87.200	4.93%
A	5800	BODY	02/23/2015	21.7	23.1	0.050	1191	3949	3.900	78.000	78.000	0.00%

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Table 10-4
System Verification Results – 10g

System Verification TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Dipole SN	Probe SN	Measured SAR_{10g} (W/kg)	1 W Target SAR_{10g} (W/kg)	1 W Normalized SAR_{10g} (W/kg)	$Deviation_{10g}$ (%)
A	5200	BODY	02/23/2015	21.7	23.0	0.050	1191	3949	1.130	21.600	22.600	4.63%
A	5300	BODY	02/23/2015	21.6	23.1	0.050	1191	3949	1.170	22.300	23.400	4.93%
A	5500	BODY	02/23/2015	21.5	23.2	0.050	1191	3949	1.200	23.000	24.000	4.35%

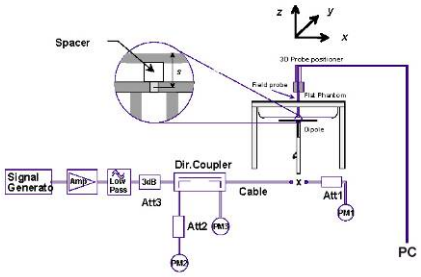

Figure 10-1
System Verification Setup Diagram

Figure 10-2
System Verification Setup Photo

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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	Cover Type	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	32.7	32.70	-0.13	Right	Cheek	Standard	358387060001731	1	1:8.3	0.250	1.000	0.250	A1
836.60	190	GSM 850	GSM	32.7	32.70	-0.12	Right	Cheek	Quick Cover (Open)	358387060001731	1	1:8.3	0.190	1.000	0.190	
836.60	190	GSM 850	GSM	32.7	32.70	0.00	Right	Cheek	Quick Cover (Closed)	358387060001731	1	1:8.3	0.164	1.000	0.164	
836.60	190	GSM 850	GSM	32.7	32.70	0.01	Right	Tilt	Standard	358387060001731	1	1:8.3	0.152	1.000	0.152	
836.60	190	GSM 850	GSM	32.7	32.70	-0.05	Left	Cheek	Standard	358387060001731	1	1:8.3	0.201	1.000	0.201	
836.60	190	GSM 850	GSM	32.7	32.70	0.13	Left	Tilt	Standard	358387060001731	1	1:8.3	0.135	1.000	0.135	
836.60	190	GSM 850	GPRS	26.7	26.69	-0.02	Right	Cheek	Standard	358387060001731	4	1:2.076	0.233	1.002	0.233	
836.60	190	GSM 850	GPRS	26.7	26.69	-0.04	Right	Cheek	Quick Cover (Open)	358387060001731	4	1:2.076	0.177	1.002	0.177	
836.60	190	GSM 850	GPRS	26.7	26.69	0.08	Right	Cheek	Quick Cover (Closed)	358387060001731	4	1:2.076	0.157	1.002	0.157	
836.60	190	GSM 850	GPRS	26.7	26.69	0.19	Right	Tilt	Standard	358387060001731	4	1:2.076	0.165	1.002	0.165	
836.60	190	GSM 850	GPRS	26.7	26.69	0.00	Left	Cheek	Standard	358387060001731	4	1:2.076	0.208	1.002	0.208	
836.60	190	GSM 850	GPRS	26.7	26.69	0.15	Left	Tilt	Standard	358387060001731	4	1:2.076	0.150	1.002	0.150	
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	Cover Type	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	30.7	30.61	0.06	Right	Cheek	Standard	358387060001731	1	1:8.3	0.090	1.021	0.092	
1880.00	661	GSM 1900	GSM	30.7	30.61	0.16	Right	Tilt	Standard	358387060001731	1	1:8.3	0.072	1.021	0.074	
1880.00	661	GSM 1900	GSM	30.7	30.61	0.04	Left	Cheek	Standard	358387060001731	1	1:8.3	0.159	1.021	0.162	
1880.00	661	GSM 1900	GSM	30.7	30.61	0.13	Left	Cheek	Quick Cover (Open)	358387060001731	1	1:8.3	0.142	1.021	0.145	
1880.00	661	GSM 1900	GSM	30.7	30.61	0.15	Left	Cheek	Quick Cover (Closed)	358387060001731	1	1:8.3	0.149	1.021	0.152	
1880.00	661	GSM 1900	GSM	30.7	30.61	0.05	Left	Tilt	Standard	358387060001731	1	1:8.3	0.101	1.021	0.103	
1880.00	661	GSM 1900	GPRS	26.7	26.43	-0.07	Right	Cheek	Standard	358387060001731	3	1:2.76	0.090	1.064	0.096	
1880.00	661	GSM 1900	GPRS	26.7	26.43	0.17	Right	Tilt	Standard	358387060001731	3	1:2.76	0.062	1.064	0.066	
1880.00	661	GSM 1900	GPRS	26.7	26.43	-0.05	Left	Cheek	Standard	358387060001731	3	1:2.76	0.161	1.064	0.171	
1880.00	661	GSM 1900	GPRS	26.7	26.43	-0.08	Left	Cheek	Quick Cover (Open)	358387060001731	3	1:2.76	0.153	1.064	0.163	
1880.00	661	GSM 1900	GPRS	26.7	26.43	-0.04	Left	Cheek	Quick Cover (Closed)	358387060001731	3	1:2.76	0.170	1.064	0.181	A2
1880.00	661	GSM 1900	GPRS	26.7	26.43	0.14	Left	Tilt	Standard	358387060001731	3	1:2.76	0.089	1.064	0.095	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram									

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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	Cover Type	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	24.7	24.19	0.04	Right	Cheek	Standard	358387060001731	1:1	0.348	1.125	0.392	A3
836.60	4183	UMTS 850	RMC	24.7	24.19	0.10	Right	Cheek	Quick Cover (Open)	358387060001731	1:1	0.330	1.125	0.371	
836.60	4183	UMTS 850	RMC	24.7	24.19	0.09	Right	Cheek	Quick Cover (Closed)	358387060001731	1:1	0.281	1.125	0.316	
836.60	4183	UMTS 850	RMC	24.7	24.19	0.00	Right	Tilt	Standard	358387060001731	1:1	0.219	1.125	0.246	
836.60	4183	UMTS 850	RMC	24.7	24.19	0.02	Left	Cheek	Standard	358387060001731	1:1	0.284	1.125	0.320	
836.60	4183	UMTS 850	RMC	24.7	24.19	-0.07	Left	Tilt	Standard	358387060001731	1:1	0.203	1.125	0.228	
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 1750 Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Cover Type	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
1732.40	1412	UMTS 1750	RMC	24.7	24.53	0.01	Right	Cheek	Standard	358387060001731	1:1	0.437	1.040	0.454	
1732.40	1412	UMTS 1750	RMC	24.7	24.53	0.02	Right	Tilt	Standard	358387060001731	1:1	0.370	1.040	0.385	
1732.40	1412	UMTS 1750	RMC	24.7	24.53	0.08	Left	Cheek	Standard	358387060001731	1:1	0.572	1.040	0.595	
1732.40	1412	UMTS 1750	RMC	24.7	24.53	0.16	Left	Cheek	Quick Cover (Open)	358387060001731	1:1	0.626	1.040	**0.651**	A4
1732.40	1412	UMTS 1750	RMC	24.7	24.53	0.14	Left	Cheek	Quick Cover (Closed)	358387060001731	1:1	0.544	1.040	0.566	
1732.40	1412	UMTS 1750	RMC	24.7	24.53	-0.11	Left	Tilt	Standard	358387060001731	1:1	0.428	1.040	0.445	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram								

Table 11-5
UMTS 1900 Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Cover Type	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	24.7	24.07	-0.01	Right	Cheek	Standard	358387060001731	1:1	0.195	1.156	0.225	
1880.00	9400	UMTS 1900	RMC	24.7	24.07	0.08	Right	Tilt	Standard	358387060001731	1:1	0.164	1.156	0.190	
1880.00	9400	UMTS 1900	RMC	24.7	24.07	-0.15	Left	Cheek	Standard	358387060001731	1:1	0.346	1.156	0.400	
1880.00	9400	UMTS 1900	RMC	24.7	24.07	0.14	Left	Cheek	Quick Cover (Open)	358387060001731	1:1	0.424	1.156	0.490	A5
1880.00	9400	UMTS 1900	RMC	24.7	24.07	-0.09	Left	Cheek	Quick Cover (Closed)	358387060001731	1:1	0.378	1.156	0.437	
1880.00	9400	UMTS 1900	RMC	24.7	24.07	0.02	Left	Tilt	Standard	358387060001731	1:1	0.216	1.156	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								

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Table 11-6
LTE Band 12 Head SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Cover Type	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	Standard	24.7	24.39	0.00	0	Right	Cheek	QPSK	1	0	358387060001723	1:1	0.221	1.074	0.237	A6
707.50	23095	Mid	LTE Band 12	10	Quick Cover (Open)	24.7	24.39	-0.12	0	Right	Cheek	QPSK	1	0	358387060001723	1:1	0.207	1.074	0.222	
707.50	23095	Mid	LTE Band 12	10	Quick Cover (Closed)	24.7	24.39	0.01	0	Right	Cheek	QPSK	1	0	358387060001723	1:1	0.201	1.074	0.216	
707.50	23095	Mid	LTE Band 12	10	Standard	23.7	23.29	-0.04	1	Right	Cheek	QPSK	25	12	358387060001723	1:1	0.169	1.099	0.186	
707.50	23095	Mid	LTE Band 12	10	Standard	24.7	24.39	0.14	0	Right	Tilt	QPSK	1	0	358387060001723	1:1	0.124	1.074	0.133	
707.50	23095	Mid	LTE Band 12	10	Standard	23.7	23.29	0.15	1	Right	Tilt	QPSK	25	12	358387060001723	1:1	0.096	1.099	0.106	
707.50	23095	Mid	LTE Band 12	10	Standard	24.7	24.39	0.06	0	Left	Cheek	QPSK	1	0	358387060001723	1:1	0.202	1.074	0.217	
707.50	23095	Mid	LTE Band 12	10	Standard	23.7	23.29	-0.06	1	Left	Cheek	QPSK	25	12	358387060001723	1:1	0.156	1.099	0.171	
707.50	23095	Mid	LTE Band 12	10	Standard	24.7	24.39	-0.08	0	Left	Tilt	QPSK	1	0	358387060001723	1:1	0.105	1.074	0.113	
707.50	23095	Mid	LTE Band 12	10	Standard	23.7	23.29	0.07	1	Left	Tilt	QPSK	25	12	358387060001723	1:1	0.083	1.099	0.091	
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]	Cover Type	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)	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	24.7	24.56	0.10	0	Right	Cheek	QPSK	1	0	358387060001723	1:1	0.369	1.033	0.381	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.7	23.30	-0.18	1	Right	Cheek	QPSK	50	0	358387060001723	1:1	0.257	1.096	0.282	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	24.7	24.56	0.20	0	Right	Tilt	QPSK	1	0	358387060001723	1:1	0.326	1.033	0.337	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.7	23.30	-0.04	1	Right	Tilt	QPSK	50	0	358387060001723	1:1	0.261	1.096	0.286	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	24.7	24.56	0.00	0	Left	Cheek	QPSK	1	0	358387060001723	1:1	0.571	1.033	0.590	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Quick Cover (Open)	24.7	24.56	0.09	0	Left	Cheek	QPSK	1	0	358387060001723	1:1	0.555	1.033	0.573	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Quick Cover (Closed)	24.7	24.56	0.07	0	Left	Cheek	QPSK	1	0	358387060001723	1:1	0.577	1.033	0.596	A7
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.7	23.30	0.02	1	Left	Cheek	QPSK	50	0	358387060001723	1:1	0.392	1.096	0.430	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	24.7	24.56	0.18	0	Left	Tilt	QPSK	1	0	358387060001723	1:1	0.318	1.033	0.328	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.7	23.30	-0.05	1	Left	Tilt	QPSK	50	0	358387060001723	1:1	0.271	1.096	0.297	
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]	Cover Type	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)	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	24.7	24.42	0.16	0	Right	Cheek	QPSK	1	0	358387060001723	1:1	0.181	1.067	0.193	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	23.7	23.31	-0.04	1	Right	Cheek	QPSK	50	0	358387060001723	1:1	0.140	1.094	0.153	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	24.7	24.42	0.10	0	Right	Tilt	QPSK	1	0	358387060001723	1:1	0.152	1.067	0.162	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	23.7	23.31	-0.04	1	Right	Tilt	QPSK	50	0	358387060001723	1:1	0.113	1.094	0.124	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	24.7	24.42	0.16	0	Left	Cheek	QPSK	1	0	358387060001723	1:1	0.339	1.067	0.362	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Quick Cover (Open)	24.7	24.42	0.13	0	Left	Cheek	QPSK	1	0	358387060001723	1:1	0.459	1.067	0.490	A8
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Quick Cover (Closed)	24.7	24.42	0.12	0	Left	Cheek	QPSK	1	0	358387060001723	1:1	0.372	1.067	0.397	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	23.7	23.31	0.05	1	Left	Cheek	QPSK	50	0	358387060001723	1:1	0.246	1.094	0.269	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	24.7	24.42	0.20	0	Left	Tilt	QPSK	1	0	358387060001723	1:1	0.221	1.067	0.236	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	23.7	23.31	-0.04	1	Left	Tilt	QPSK	50	0	358387060001723	1:1	0.157	1.094	0.172	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population															Head 1.6 W/kg (mW/g) averaged over 1 gram					

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Table 11-9
DTS Head SAR

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Cover Type	Device Serial Number	Data Rate (Mbps)	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
2462	11	IEEE 802.11b	DSSS	17.0	16.78	0.12	Right	Cheek	Standard	358387060001772	1	1:1	0.142	1.052	0.149	
2462	11	IEEE 802.11b	DSSS	17.0	16.78	-0.05	Right	Tilt	Standard	358387060001772	1	1:1	0.111	1.052	0.117	
2462	11	IEEE 802.11b	DSSS	17.0	16.78	0.09	Left	Cheek	Standard	358387060001772	1	1:1	0.479	1.052	**0.504**	A9
2462	11	IEEE 802.11b	DSSS	17.0	16.78	0.11	Left	Cheek	Quick Cover (Open)	358387060001772	1	1:1	0.380	1.052	0.400	
2462	11	IEEE 802.11b	DSSS	17.0	16.78	0.05	Left	Cheek	Quick Cover (Closed)	358387060001772	1	1:1	0.291	1.052	0.306	
2462	11	IEEE 802.11b	DSSS	17.0	16.78	0.06	Left	Tilt	Standard	358387060001772	1	1:1	0.386	1.052	0.406	
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
NII Head SAR

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Cover Type	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	16.0	15.19	0.05	Right	Cheek	Standard	358387060001749	6	1:1	0.285	1.205	0.343	
5180	36	IEEE 802.11a	OFDM	16.0	15.19	0.19	Right	Tilt	Standard	358387060001749	6	1:1	0.216	1.205	0.260	
5180	36	IEEE 802.11a	OFDM	16.0	15.19	0.07	Left	Cheek	Standard	358387060001749	6	1:1	0.512	1.205	0.617	
5220	44	IEEE 802.11a	OFDM	16.0	15.02	0.08	Left	Cheek	Standard	358387060001749	6	1:1	0.503	1.253	0.630	
5180	36	IEEE 802.11a	OFDM	16.0	15.19	0.14	Left	Tilt	Standard	358387060001749	6	1:1	0.297	1.205	0.358	
5260	52	IEEE 802.11a	OFDM	16.0	14.83	0.18	Right	Cheek	Standard	358387060001749	6	1:1	0.279	1.309	0.365	
5260	52	IEEE 802.11a	OFDM	16.0	14.83	0.13	Right	Tilt	Standard	358387060001749	6	1:1	0.198	1.309	0.259	
5260	52	IEEE 802.11a	OFDM	16.0	14.83	0.05	Left	Cheek	Standard	358387060001749	6	1:1	0.549	1.309	0.719	
5320	64	IEEE 802.11a	OFDM	16.0	14.79	0.10	Left	Cheek	Standard	358387060001749	6	1:1	0.548	1.321	0.724	
5260	52	IEEE 802.11a	OFDM	16.0	14.83	0.17	Left	Tilt	Standard	358387060001749	6	1:1	0.279	1.309	0.365	
5520	104	IEEE 802.11a	OFDM	16.0	14.99	0.03	Right	Cheek	Standard	358387060001749	6	1:1	0.204	1.262	0.257	
5520	104	IEEE 802.11a	OFDM	16.0	14.99	-0.18	Right	Tilt	Standard	358387060001749	6	1:1	0.155	1.262	0.196	
5520	104	IEEE 802.11a	OFDM	16.0	14.99	0.13	Left	Cheek	Standard	358387060001749	6	1:1	0.576	1.262	0.727	A10
5520	104	IEEE 802.11a	OFDM	16.0	14.99	0.00	Left	Cheek	Quick Cover (Open)	358387060001749	6	1:1	0.496	1.262	0.626	
5520	104	IEEE 802.11a	OFDM	16.0	14.99	0.20	Left	Cheek	Quick Cover (Closed)	358387060001749	6	1:1	0.355	1.262	0.448	
5560	112	IEEE 802.11a	OFDM	16.0	14.74	0.14	Left	Cheek	Standard	358387060001749	6	1:1	0.542	1.337	0.725	
5660	132	IEEE 802.11a	OFDM	16.0	14.65	0.05	Left	Cheek	Standard	358387060001749	6	1:1	0.544	1.365	**0.743**	
5520	104	IEEE 802.11a	OFDM	16.0	14.99	0.03	Left	Tilt	Standard	358387060001749	6	1:1	0.295	1.262	0.372	
5765	153	IEEE 802.11a	OFDM	16.0	14.99	0.16	Right	Cheek	Standard	358387060001749	6	1:1	0.231	1.262	0.292	
5765	153	IEEE 802.11a	OFDM	16.0	14.99	-0.04	Right	Tilt	Standard	358387060001749	6	1:1	0.183	1.262	0.231	
5765	153	IEEE 802.11a	OFDM	16.0	14.99	-0.14	Left	Cheek	Standard	358387060001749	6	1:1	0.562	1.262	0.709	
5785	157	IEEE 802.11a	OFDM	16.0	14.89	-0.01	Left	Cheek	Standard	358387060001749	6	1:1	0.546	1.291	0.705	
5805	161	IEEE 802.11a	OFDM	16.0	14.89	0.04	Left	Cheek	Standard	358387060001749	6	1:1	0.517	1.291	0.667	
5765	153	IEEE 802.11a	OFDM	16.0	14.99	0.17	Left	Tilt	Standard	358387060001749	6	1:1	0.281	1.262	0.355	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram									

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11.2 Standalone Body-Worn SAR Data

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

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Cover Type	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	32.7	32.70	0.12	10 mm	Standard	358387060001731	1	1:8.3	back	0.354	1.000	0.354	
836.60	190	GSM 850	GSM	32.7	32.70	-0.02	10 mm	Quick Cover (Closed)	358387060001731	1	1:8.3	back	0.375	1.000	0.375	A11
836.60	190	GSM 850	GPRS	26.7	26.69	0.06	10 mm	Standard	358387060001731	4	1:2.076	back	0.349	1.002	0.350	
836.60	190	GSM 850	GPRS	26.7	26.69	0.11	10 mm	Quick Cover (Closed)	358387060001731	4	1:2.076	back	0.289	1.002	0.290	
1880.00	661	GSM 1900	GSM	30.7	30.61	-0.09	10 mm	Standard	358387060001731	1	1:8.3	back	0.342	1.021	0.349	A13
1880.00	661	GSM 1900	GSM	30.7	30.61	-0.01	10 mm	Quick Cover (Closed)	358387060001731	1	1:8.3	back	0.263	1.021	0.269	
1880.00	661	GSM 1900	GPRS	26.7	26.43	-0.07	10 mm	Standard	358387060001731	3	1:2.76	back	0.313	1.064	0.333	
1880.00	661	GSM 1900	GPRS	26.7	26.43	-0.05	10 mm	Quick Cover (Closed)	358387060001731	3	1:2.76	back	0.249	1.064	0.265	
836.60	4183	UMTS 850	RMC	24.7	24.19	-0.02	10 mm	Standard	358387060001731	N/A	1:1	back	0.549	1.125	0.618	A15
836.60	4183	UMTS 850	RMC	24.7	24.19	0.00	10 mm	Quick Cover (Closed)	358387060001731	N/A	1:1	back	0.433	1.125	0.487	
1712.40	1312	UMTS 1750	RMC	24.7	24.39	0.03	10 mm	Standard	358387060001731	N/A	1:1	back	1.000	1.074	1.074	
1732.40	1412	UMTS 1750	RMC	24.7	24.53	-0.06	10 mm	Standard	358387060001731	N/A	1:1	back	1.040	1.040	1.082	
1752.50	1862	UMTS 1750	RMC	24.7	24.42	0.00	10 mm	Standard	358387060001731	N/A	1:1	back	0.988	1.067	1.054	
1732.40	1412	UMTS 1750	RMC	24.7	24.53	0.06	10 mm	Quick Cover (Closed)	358387060001731	N/A	1:1	back	0.971	1.040	1.010	
1732.40	1412	UMTS 1750	RMC	24.7	24.53	0.09	10 mm	Standard	358387060001731	N/A	1:1	back	1.060	1.040	1.102	A17
1880.00	9400	UMTS 1900	RMC	24.7	24.07	-0.01	10 mm	Standard	358387060001731	N/A	1:1	back	0.618	1.156	0.714	A18
1880.00	9400	UMTS 1900	RMC	24.7	24.07	-0.01	10 mm	Quick Cover (Closed)	358387060001731	N/A	1:1	back	0.582	1.156	0.673	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram								

Blue entry represents variability measurement.

Table 11-12
LTE Body-Worn SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Cover Type	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.																(W/kg)		(W/kg)	
707.50	23095	Mid	LTE Band 12	10	Standard	24.7	24.39	0.01	0	358387060001723	QPSK	1	0	10 mm	back	1:1	0.475	1.074	0.510	A20
707.50	23095	Mid	LTE Band 12	10	Quick Cover (Closed)	24.7	24.39	-0.16	0	358387060001723	QPSK	1	0	10 mm	back	1:1	0.436	1.074	0.468	
707.50	23095	Mid	LTE Band 12	10	Standard	23.7	23.29	0.01	1	358387060001723	QPSK	25	12	10 mm	back	1:1	0.361	1.099	0.397	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	24.7	24.56	0.12	0	358387060001723	QPSK	1	0	10 mm	back	1:1	0.982	1.033	1.014	A21
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Quick Cover (Closed)	24.7	24.56	-0.02	0	358387060001723	QPSK	1	0	10 mm	back	1:1	0.946	1.033	0.977	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.7	23.30	0.06	1	358387060001723	QPSK	50	0	10 mm	back	1:1	0.728	1.096	0.798	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.7	23.22	0.03	1	358387060001723	QPSK	100	0	10 mm	back	1:1	0.711	1.117	0.794	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	24.7	24.42	0.12	0	358387060001723	QPSK	1	0	10 mm	back	1:1	0.584	1.067	0.623	A22
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Quick Cover (Closed)	24.7	24.42	-0.20	0	358387060001723	QPSK	1	0	10 mm	back	1:1	0.560	1.067	0.598	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	23.7	23.31	-0.03	1	358387060001723	QPSK	50	0	10 mm	back	1:1	0.449	1.094	0.491	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Body 1.6 W/kg (mW/g) averaged over 1 gram										

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Table 11-13
DTS Body-Worn SAR

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Cover Type	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #
MHz	Ch.															
2462	11	IEEE 802.11b	DSSS	17.0	16.78	0.04	10 mm	Standard	358387060001772	1	back	1:1	0.177	1.052	0.186	
2462	11	IEEE 802.11b	DSSS	17.0	16.78	0.08	10 mm	Quick Cover (Closed)	358387060001772	1	back	1:1	0.181	1.052	**0.190**	A24
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
NII Body-Worn SAR

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Cover Type	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #
MHz	Ch.															
5180	36	IEEE 802.11a	OFDM	16.0	15.19	-0.04	10 mm	Standard	358387060001749	6	back	1:1	0.184	1.205	0.222	
5260	52	IEEE 802.11a	OFDM	16.0	14.83	0.12	10 mm	Standard	358387060001749	6	back	1:1	0.185	1.309	0.242	
5520	104	IEEE 802.11a	OFDM	16.0	14.99	0.18	10 mm	Standard	358387060001749	6	back	1:1	0.217	1.262	0.274	
5765	153	IEEE 802.11a	OFDM	16.0	14.99	0.07	10 mm	Standard	358387060001749	6	back	1:1	0.233	1.262	0.294	
5765	153	IEEE 802.11a	OFDM	16.0	14.99	0.19	10 mm	Quick Cover (Closed)	358387060001749	6	back	1:1	0.238	1.262	**0.300**	A25
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**								**Body** **1.6 W/kg (mW/g)** averaged over 1 gram								

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11.3 Standalone Wireless Router SAR Data

Table 11-15
GPRS/UMTS Hotspot SAR Data

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Cover Type	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	26.7	26.69	0.06	10 mm	Standard	358387060001731	4	1:2.076	back	0.349	1.002	0.350	
836.60	190	GSM 850	GPRS	26.7	26.69	0.02	10 mm	Standard	358387060001731	4	1:2.076	front	0.274	1.002	0.275	
836.60	190	GSM 850	GPRS	26.7	26.69	-0.05	10 mm	Standard	358387060001731	4	1:2.076	bottom	0.231	1.002	0.231	
836.60	190	GSM 850	GPRS	26.7	26.69	0.01	10 mm	Standard	358387060001731	4	1:2.076	right	0.413	1.002	0.414	A12
836.60	190	GSM 850	GPRS	26.7	26.69	-0.02	10 mm	Quick Cover (Closed)	358387060001731	4	1:2.076	right	0.308	1.002	0.309	
1880.00	661	GSM 1900	GPRS	26.7	26.43	-0.07	10 mm	Standard	358387060001731	3	1:2.76	back	0.313	1.064	0.333	
1880.00	661	GSM 1900	GPRS	26.7	26.43	-0.01	10 mm	Standard	358387060001731	3	1:2.76	front	0.339	1.064	0.361	A14
1880.00	661	GSM 1900	GPRS	26.7	26.43	-0.04	10 mm	Quick Cover (Closed)	358387060001731	3	1:2.76	front	0.255	1.064	0.271	
1880.00	661	GSM 1900	GPRS	26.7	26.43	-0.17	10 mm	Standard	358387060001731	3	1:2.76	bottom	0.256	1.064	0.272	
1880.00	661	GSM 1900	GPRS	26.7	26.43	0.17	10 mm	Standard	358387060001731	3	1:2.76	left	0.211	1.064	0.225	
836.60	4183	UMTS 850	RMC	24.7	24.19	-0.02	10 mm	Standard	358387060001731	N/A	1:1	back	0.549	1.125	0.618	
836.60	4183	UMTS 850	RMC	24.7	24.19	-0.04	10 mm	Standard	358387060001731	N/A	1:1	front	0.400	1.125	0.450	
836.60	4183	UMTS 850	RMC	24.7	24.19	0.00	10 mm	Standard	358387060001731	N/A	1:1	bottom	0.328	1.125	0.369	
836.60	4183	UMTS 850	RMC	24.7	24.19	-0.01	10 mm	Standard	358387060001731	N/A	1:1	right	0.616	1.125	0.693	A16
836.60	4183	UMTS 850	RMC	24.7	24.19	0.08	10 mm	Quick Cover (Closed)	358387060001731	N/A	1:1	right	0.550	1.125	0.619	
1712.40	1312	UMTS 1750	RMC	24.7	24.39	0.03	10 mm	Standard	358387060001731	N/A	1:1	back	1.000	1.074	1.074	
1732.40	1412	UMTS 1750	RMC	24.7	24.53	-0.06	10 mm	Standard	358387060001731	N/A	1:1	back	1.040	1.040	1.082	
1752.50	1862	UMTS 1750	RMC	24.7	24.42	0.00	10 mm	Standard	358387060001731	N/A	1:1	back	0.988	1.067	1.054	
1732.40	1412	UMTS 1750	RMC	24.7	24.53	0.06	10 mm	Quick Cover (Closed)	358387060001731	N/A	1:1	back	0.971	1.040	1.010	
1712.40	1312	UMTS 1750	RMC	24.7	24.39	-0.06	10 mm	Standard	358387060001731	N/A	1:1	front	0.787	1.074	0.845	
1732.40	1412	UMTS 1750	RMC	24.7	24.53	0.02	10 mm	Standard	358387060001731	N/A	1:1	front	0.857	1.040	0.891	
1752.50	1862	UMTS 1750	RMC	24.7	24.42	0.00	10 mm	Standard	358387060001731	N/A	1:1	front	0.835	1.067	0.891	
1732.40	1412	UMTS 1750	RMC	24.7	24.53	0.05	10 mm	Standard	358387060001731	N/A	1:1	bottom	0.419	1.040	0.436	
1732.40	1412	UMTS 1750	RMC	24.7	24.53	0.05	10 mm	Standard	358387060001731	N/A	1:1	left	0.632	1.040	0.657	
1732.40	1412	UMTS 1750	RMC	24.7	24.53	0.09	10 mm	Standard	358387060001731	N/A	1:1	back	1.060	1.040	**1.102**	A17
1880.00	9400	UMTS 1900	RMC	24.7	24.07	-0.01	10 mm	Standard	358387060001731	N/A	1:1	back	0.618	1.156	0.714	
1880.00	9400	UMTS 1900	RMC	24.7	24.07	0.01	10 mm	Standard	358387060001731	N/A	1:1	front	0.665	1.156	0.769	A19
1880.00	9400	UMTS 1900	RMC	24.7	24.07	-0.02	10 mm	Quick Cover (Closed)	358387060001731	N/A	1:1	front	0.606	1.156	0.701	
1880.00	9400	UMTS 1900	RMC	24.7	24.07	-0.06	10 mm	Standard	358387060001731	N/A	1:1	bottom	0.570	1.156	0.659	
1880.00	9400	UMTS 1900	RMC	24.7	24.07	-0.03	10 mm	Standard	358387060001731	N/A	1:1	left	0.431	1.156	0.498	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram								

Blue entry represents variability measurement.

Table 11-16
LTE Band 12 Hotspot SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Cover Type	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.																(W/kg)		(W/kg)	
707.50	23095	Mid	LTE Band 12	10	Standard	24.7	24.39	0.01	0	358387060001723	QPSK	1	0	10 mm	back	1:1	0.475	1.074	0.510	A20
707.50	23095	Mid	LTE Band 12	10	Quick Cover (Closed)	24.7	24.39	-0.16	0	358387060001723	QPSK	1	0	10 mm	back	1:1	0.436	1.074	0.468	
707.50	23095	Mid	LTE Band 12	10	Standard	23.7	23.29	0.01	1	358387060001723	QPSK	25	12	10 mm	back	1:1	0.361	1.099	0.397	
707.50	23095	Mid	LTE Band 12	10	Standard	24.7	24.39	0.13	0	358387060001723	QPSK	1	0	10 mm	front	1:1	0.325	1.074	0.349	
707.50	23095	Mid	LTE Band 12	10	Standard	23.7	23.29	0.01	1	358387060001723	QPSK	25	12	10 mm	front	1:1	0.237	1.099	0.260	
707.50	23095	Mid	LTE Band 12	10	Standard	24.7	24.39	0.03	0	358387060001723	QPSK	1	0	10 mm	bottom	1:1	0.139	1.074	0.149	
707.50	23095	Mid	LTE Band 12	10	Standard	23.7	23.29	0.01	1	358387060001723	QPSK	25	12	10 mm	bottom	1:1	0.099	1.099	0.109	
707.50	23095	Mid	LTE Band 12	10	Standard	24.7	24.39	-0.17	0	358387060001723	QPSK	1	0	10 mm	right	1:1	0.463	1.074	0.497	
707.50	23095	Mid	LTE Band 12	10	Standard	23.7	23.29	0.01	1	358387060001723	QPSK	25	12	10 mm	right	1:1	0.328	1.099	0.360	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Body 1.6 W/kg (mW/g) averaged over 1 gram										

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Table 11-17
LTE Band 4 (AWS) Hotspot SAR

MEASUREMENT RESULTS																					
FREQUENCY			Mode	Bandwidth [MHz]	Cover Type	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.																(W/kg)		(W/kg)	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	24.7	24.56	0.12	0	358387060001723	QPSK	1	0	10 mm	back	1:1	0.982	1.033	1.014	A21
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Quick Cover (Closed)	24.7	24.56	-0.02	0	358387060001723	QPSK	1	0	10 mm	back	1:1	0.946	1.033	0.977	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.7	23.30	0.06	1	358387060001723	QPSK	50	0	10 mm	back	1:1	0.728	1.096	0.798	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.7	23.22	0.03	1	358387060001723	QPSK	100	0	10 mm	back	1:1	0.711	1.117	0.794	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	24.7	24.56	0.13	0	358387060001723	QPSK	1	0	10 mm	front	1:1	0.790	1.033	0.816	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.7	23.30	0.02	1	358387060001723	QPSK	50	0	10 mm	front	1:1	0.624	1.096	0.684	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.7	23.22	0.01	1	358387060001723	QPSK	100	0	10 mm	front	1:1	0.620	1.117	0.693	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	24.7	24.56	0.16	0	358387060001723	QPSK	1	0	10 mm	bottom	1:1	0.391	1.033	0.404	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.7	23.30	-0.05	1	358387060001723	QPSK	50	0	10 mm	bottom	1:1	0.282	1.096	0.309	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	24.7	24.56	-0.17	0	358387060001723	QPSK	1	0	10 mm	left	1:1	0.456	1.033	0.471	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.7	23.30	-0.06	1	358387060001723	QPSK	50	0	10 mm	left	1:1	0.336	1.096	0.368	
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 2 (PCS) Hotspot SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Cover Type	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.																(W/kg)		(W/kg)	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	24.7	24.42	0.12	0	358387060001723	QPSK	1	0	10 mm	back	1:1	0.584	1.067	0.623	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	23.7	23.31	-0.03	1	358387060001723	QPSK	50	0	10 mm	back	1:1	0.449	1.094	0.491	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	24.7	24.42	-0.07	0	358387060001723	QPSK	1	0	10 mm	front	1:1	0.622	1.067	0.664	A23
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Quick Cover (Closed)	24.7	24.42	0.06	0	358387060001723	QPSK	1	0	10 mm	front	1:1	0.545	1.067	0.582	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	23.7	23.31	-0.03	1	358387060001723	QPSK	50	0	10 mm	front	1:1	0.467	1.094	0.511	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	24.7	24.42	0.17	0	358387060001723	QPSK	1	0	10 mm	bottom	1:1	0.458	1.067	0.489	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	23.7	23.31	0.03	1	358387060001723	QPSK	50	0	10 mm	bottom	1:1	0.358	1.094	0.392	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	24.7	24.42	-0.01	0	358387060001723	QPSK	1	0	10 mm	left	1:1	0.397	1.067	0.424	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	23.7	23.31	-0.09	1	358387060001723	QPSK	50	0	10 mm	left	1:1	0.296	1.094	0.324	
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
WLAN Hotspot SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Cover Type	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
2462	11	IEEE 802.11b	DSSS	17.0	16.78	0.04	10 mm	Standard	358387060001772	1	back	1:1	0.177	1.052	0.186	
2462	11	IEEE 802.11b	DSSS	17.0	16.78	0.08	10 mm	Quick Cover (Closed)	358387060001772	1	back	1:1	0.181	1.052	**0.190**	A24
2462	11	IEEE 802.11b	DSSS	17.0	16.78	0.17	10 mm	Standard	358387060001772	1	front	1:1	0.068	1.052	0.072	
2462	11	IEEE 802.11b	DSSS	17.0	16.78	0.09	10 mm	Standard	358387060001772	1	top	1:1	0.075	1.052	0.079	
2462	11	IEEE 802.11b	DSSS	17.0	16.78	-0.02	10 mm	Standard	358387060001772	1	right	1:1	0.072	1.052	0.076	
5765	153	IEEE 802.11a	OFDM	16.0	14.99	0.07	10 mm	Standard	358387060001749	6	back	1:1	0.233	1.262	0.294	
5765	153	IEEE 802.11a	OFDM	16.0	14.99	0.19	10 mm	Quick Cover (Closed)	358387060001749	6	back	1:1	0.238	1.262	**0.300**	A25
5765	153	IEEE 802.11a	OFDM	16.0	14.99	0.11	10 mm	Standard	358387060001749	6	front	1:1	0.124	1.262	0.156	
5765	153	IEEE 802.11a	OFDM	16.0	14.99	0.13	10 mm	Standard	358387060001749	6	top	1:1	0.146	1.262	0.184	
5765	153	IEEE 802.11a	OFDM	16.0	14.99	-0.04	10 mm	Standard	358387060001749	6	right	1:1	0.219	1.262	0.276	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Body 1.6 W/kg (mW/g) averaged over 1 gram			

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11.4 Standalone Hand SAR Data

Table 11-20
WLAN Hand SAR

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Cover Type	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (10g)	Scaling Factor	Scaled SAR (10g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
5180	36	IEEE 802.11a	OFDM	16.0	15.19	-0.01	0 mm	Standard	358387060001749	6	back	1:1	0.497	1.205	0.599	
5180	36	IEEE 802.11a	OFDM	16.0	15.19	0.03	0 mm	Standard	358387060001749	6	front	1:1	0.300	1.205	0.362	
5180	36	IEEE 802.11a	OFDM	16.0	15.19	-0.02	0 mm	Standard	358387060001749	6	top	1:1	0.229	1.205	0.276	
5180	36	IEEE 802.11a	OFDM	16.0	15.19	-0.02	0 mm	Standard	358387060001749	6	right	1:1	0.563	1.205	0.678	A26
5180	36	IEEE 802.11a	OFDM	16.0	15.19	0.00	0 mm	Quick Cover (Closed)	358387060001749	6	right	1:1	0.394	1.205	0.475	
5180	36	IEEE 802.11a	OFDM	16.0	15.19	0.11	0 mm	Quick Cover (Open)	358387060001749	6	right	1:1	0.392	1.205	0.472	
5260	52	IEEE 802.11a	OFDM	16.0	14.83	-0.03	0 mm	Standard	358387060001749	6	back	1:1	0.400	1.309	0.524	
5260	52	IEEE 802.11a	OFDM	16.0	14.83	0.13	0 mm	Standard	358387060001749	6	front	1:1	0.313	1.309	0.410	
5260	52	IEEE 802.11a	OFDM	16.0	14.83	0.01	0 mm	Standard	358387060001749	6	top	1:1	0.242	1.309	0.317	
5260	52	IEEE 802.11a	OFDM	16.0	14.83	-0.02	0 mm	Standard	358387060001749	6	right	1:1	0.521	1.309	**0.682**	
5520	104	IEEE 802.11a	OFDM	16.0	14.99	0.16	0 mm	Standard	358387060001749	6	back	1:1	0.504	1.262	0.636	
5520	104	IEEE 802.11a	OFDM	16.0	14.99	0.14	0 mm	Standard	358387060001749	6	front	1:1	0.312	1.262	0.394	
5520	104	IEEE 802.11a	OFDM	16.0	14.99	0.13	0 mm	Standard	358387060001749	6	top	1:1	0.179	1.262	0.226	
5520	104	IEEE 802.11a	OFDM	16.0	14.99	-0.01	0 mm	Standard	358387060001749	6	right	1:1	0.457	1.262	0.577	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Hand 4.0 W/kg (mW/g) averaged over 10 grams							

11.5 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. 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.
7. Per FCC KDB Publication 648474 D04v01, body-worn SAR was evaluated without a headset connected to the device. Since the standalone reported body-worn SAR was ≤ 1.2 W/kg, no additional body-worn SAR evaluations using a headset cable were required.
8. 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.
9. During SAR Testing for the Wireless Router conditions per FCC KDB Publication 941225 D06, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with WIFI) was not activated (See Section 6.7 for more details).
10. Per FCC KDB Publication 648474 D04v01r01, this device is considered a "phablet" since the diagonal dimension is > 160 mm and < 200 mm. Therefore, hand SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg.

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11. Per FCC KDB Publication 648474 D03, SAR was measured using the standard battery cover and then repeated with the quick cover for the configuration with the highest measured SAR for each wireless technology, frequency band, operating mode, and exposure condition. Since reported SAR did not exceed 1.2 W/kg, additional testing with the quick cover was not required.
12. Head and extremity tests using the quick cover were performed with the cover extension both open and closed. Body-worn and hotspot tests were performed with the cover extension closed because operations near the body with the cover extension open are not expected.

GSM Test Notes:

1. Body-Worn accessory testing is typically associated with voice operations. Therefore, GSM voice was evaluated for body-worn SAR. GPRS was additionally evaluated for head and body-worn voice calls to cover VoIP.
2. Justification for reduced test configurations per KDB Publication 941225 and October 2013 TCB Workshop Notes: The source-based frame-averaged output power was evaluated for all GPRS/EDGE slot configurations. The configuration with the highest target frame averaged output power was evaluated for SAR. When the maximum frame-averaged powers are equivalent across two or more slots (within 0.25 dB), the configuration with the most number of time slots was tested.
3. Per FCC KDB Publication 447498 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 D01. 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 D05. 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).

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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) 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. When Hotspot is enabled, 5.2 – 5.7 GHz bands are disabled. Therefore no 5.2 – 5.7 GHz WIFI Wireless Router SAR Data was required.
4. WIFI transmission was verified using an uncalibrated spectrum analyzer.
5. When the maximum extrapolated peak SAR of the zoom scan for the maximum output channel for 1g SAR is > 1.6 W/kg or the reported 1g averaged SAR is > 0.8 W/kg, SAR testing on other default channels was required. Since the reported 10g averaged SAR is < 2.0 W/kg, extremity SAR testing on other default channels was not required.

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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 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	9.00	10	0.168

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.

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

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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)	Simult Tx	Configuration	GPRS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.250	0.149	0.399	Head SAR	Right Cheek	0.233	0.149	0.382
	Right Tilt	0.152	0.117	0.269		Right Tilt	0.165	0.117	0.282
	Left Cheek	0.201	0.504	**0.705**		Left Cheek	0.208	0.504	**0.712**
	Left Tilt	0.135	0.406	0.541		Left Tilt	0.150	0.406	0.556
Simult Tx	Configuration	GSM 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.092	0.149	0.241	Head SAR	Right Cheek	0.096	0.149	0.245
	Right Tilt	0.074	0.117	0.191		Right Tilt	0.066	0.117	0.183
	Left Cheek	0.162	0.504	**0.666**		Left Cheek	0.181	0.504	**0.685**
	Left Tilt	0.103	0.406	0.509		Left Tilt	0.095	0.406	0.501
Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1750 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.392	0.149	0.541	Head SAR	Right Cheek	0.454	0.149	0.603
	Right Tilt	0.246	0.117	0.363		Right Tilt	0.385	0.117	0.502
	Left Cheek	0.320	0.504	**0.824**		Left Cheek	0.651	0.504	**1.155**
	Left Tilt	0.228	0.406	0.634		Left Tilt	0.445	0.406	0.851
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 12 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.225	0.149	0.374	Head SAR	Right Cheek	0.237	0.149	0.386
	Right Tilt	0.190	0.117	0.307		Right Tilt	0.133	0.117	0.250
	Left Cheek	0.490	0.504	**0.994**		Left Cheek	0.217	0.504	**0.721**
	Left Tilt	0.250	0.406	0.656		Left Tilt	0.113	0.406	0.519
Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	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	0.381	0.149	0.530	Head SAR	Right Cheek	0.193	0.149	0.342
	Right Tilt	0.337	0.117	0.454		Right Tilt	0.162	0.117	0.279
	Left Cheek	0.596	0.504	**1.100**		Left Cheek	0.490	0.504	**0.994**
	Left Tilt	0.328	0.406	0.734		Left Tilt	0.236	0.406	0.642

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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	0.250	0.365	0.615	Head SAR	Right Cheek	0.233	0.365	0.598
	Right Tilt	0.152	0.260	0.412		Right Tilt	0.165	0.260	0.425
	Left Cheek	0.201	0.743	**0.944**		Left Cheek	0.208	0.743	**0.951**
	Left Tilt	0.135	0.372	0.507		Left Tilt	0.150	0.372	0.522
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	0.092	0.365	0.457	Head SAR	Right Cheek	0.096	0.365	0.461
	Right Tilt	0.074	0.260	0.334		Right Tilt	0.066	0.260	0.326
	Left Cheek	0.162	0.743	**0.905**		Left Cheek	0.181	0.743	**0.924**
	Left Tilt	0.103	0.372	0.475		Left Tilt	0.095	0.372	0.467
Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1750 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.392	0.365	0.757	Head SAR	Right Cheek	0.454	0.365	0.819
	Right Tilt	0.246	0.260	0.506		Right Tilt	0.385	0.260	0.645
	Left Cheek	0.320	0.743	**1.063**		Left Cheek	0.651	0.743	**1.394**
	Left Tilt	0.228	0.372	0.600		Left Tilt	0.445	0.372	0.817
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 12 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.225	0.365	0.590	Head SAR	Right Cheek	0.237	0.365	0.602
	Right Tilt	0.190	0.260	0.450		Right Tilt	0.133	0.260	0.393
	Left Cheek	0.490	0.743	**1.233**		Left Cheek	0.217	0.743	**0.960**
	Left Tilt	0.250	0.372	0.622		Left Tilt	0.113	0.372	0.485
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	0.381	0.365	0.746	Head SAR	Right Cheek	0.193	0.365	0.558
	Right Tilt	0.337	0.260	0.597		Right Tilt	0.162	0.260	0.422
	Left Cheek	0.596	0.743	**1.339**		Left Cheek	0.490	0.743	**1.233**
	Left Tilt	0.328	0.372	0.700		Left Tilt	0.236	0.372	0.608

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.

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12.4 Body-Worn Simultaneous Transmission Analysis

Table 12-4
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body-Worn at 1.0 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	0.375	0.190	0.565
Back Side	GPRS 850	0.350	0.190	0.540
Back Side	GSM 1900	0.349	0.190	0.539
Back Side	GPRS 1900	0.333	0.190	0.523
Back Side	UMTS 850	0.618	0.190	0.808
Back Side	UMTS 1750	1.102	0.190	1.292
Back Side	UMTS 1900	0.714	0.190	0.904
Back Side	LTE Band 12	0.510	0.190	0.700
Back Side	LTE Band 4 (AWS)	1.014	0.190	1.204
Back Side	LTE Band 2 (PCS)	0.623	0.190	0.813

Table 12-5
Simultaneous Transmission Scenario with 5 GHz WLAN (Body-Worn at 1.0 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	0.375	0.300	0.675
Back Side	GPRS 850	0.350	0.300	0.650
Back Side	GSM 1900	0.349	0.300	0.649
Back Side	GPRS 1900	0.333	0.300	0.633
Back Side	UMTS 850	0.618	0.300	0.918
Back Side	UMTS 1750	1.102	0.300	**1.402**
Back Side	UMTS 1900	0.714	0.300	1.014
Back Side	LTE Band 12	0.510	0.300	0.810
Back Side	LTE Band 4 (AWS)	1.014	0.300	1.314
Back Side	LTE Band 2 (PCS)	0.623	0.300	0.923

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 1.0 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	0.375	0.168	0.543
Back Side	GPRS 850	0.350	0.168	0.518
Back Side	GSM 1900	0.349	0.168	0.517
Back Side	GPRS 1900	0.333	0.168	0.501
Back Side	UMTS 850	0.618	0.168	0.786
Back Side	UMTS 1750	1.102	0.168	1.270
Back Side	UMTS 1900	0.714	0.168	0.882
Back Side	LTE Band 12	0.510	0.168	0.678
Back Side	LTE Band 4 (AWS)	1.014	0.168	1.182
Back Side	LTE Band 2 (PCS)	0.623	0.168	0.791

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.

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12.5 Hotspot SAR Simultaneous Transmission Analysis

Per FCC KDB Publication 941225 D06, 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 with 2.4 GHz WLAN (Hotspot at 1.0 cm)

Simult Tx	Configuration	GPRS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.350	0.190	**0.540**	Body SAR	Back	0.333	0.190	**0.523**
	Front	0.275	0.072	0.347		Front	0.361	0.072	0.433
	Top	-	0.079	0.079		Top	-	0.079	0.079
	Bottom	0.231	-	0.231		Bottom	0.272	-	0.272
	Right	0.414	0.076	0.490		Right	-	0.076	0.076
	Left	-	-	0.000		Left	0.225	-	0.225
Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1750 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.618	0.190	**0.808**	Body SAR	Back	1.102	0.190	**1.292**
	Front	0.450	0.072	0.522		Front	0.891	0.072	0.963
	Top	-	0.079	0.079		Top	-	0.079	0.079
	Bottom	0.369	-	0.369		Bottom	0.436	-	0.436
	Right	0.693	0.076	0.769		Right	-	0.076	0.076
	Left	-	-	0.000		Left	0.657	-	0.657
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 12 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.714	0.190	**0.904**	Body SAR	Back	0.510	0.190	**0.700**
	Front	0.769	0.072	0.841		Front	0.349	0.072	0.421
	Top	-	0.079	0.079		Top	-	0.079	0.079
	Bottom	0.659	-	0.659		Bottom	0.149	-	0.149
	Right	-	0.076	0.076		Right	0.497	0.076	0.573
	Left	0.498	-	0.498		Left	-	-	0.000
Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	1.014	0.190	**1.204**	Body SAR	Back	0.623	0.190	**0.813**
	Front	0.816	0.072	0.888		Front	0.664	0.072	0.736
	Top	-	0.079	0.079		Top	-	0.079	0.079
	Bottom	0.404	-	0.404		Bottom	0.489	-	0.489
	Right	-	0.076	0.076		Right	-	0.076	0.076
	Left	0.471	-	0.471		Left	0.424	-	0.424

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

Simult Tx	Configuration	GPRS 850 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)
Body SAR	Back	0.350	0.300	0.650	Body SAR	Back	0.333	0.300	**0.633**
	Front	0.275	0.156	0.431		Front	0.361	0.156	0.517
	Top	-	0.184	0.184		Top	-	0.184	0.184
	Bottom	0.231	-	0.231		Bottom	0.272	-	0.272
	Right	0.414	0.276	**0.690**		Right	-	0.276	0.276
	Left	-	-	0.000		Left	0.225	-	0.225
Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1750 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.618	0.300	0.918	Body SAR	Back	1.102	0.300	**1.402**
	Front	0.450	0.156	0.606		Front	0.891	0.156	1.047
	Top	-	0.184	0.184		Top	-	0.184	0.184
	Bottom	0.369	-	0.369		Bottom	0.436	-	0.436
	Right	0.693	0.276	**0.969**		Right	-	0.276	0.276
	Left	-	-	0.000		Left	0.657	-	0.657
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 12 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.714	0.300	**1.014**	Body SAR	Back	0.510	0.300	**0.810**
	Front	0.769	0.156	0.925		Front	0.349	0.156	0.505
	Top	-	0.184	0.184		Top	-	0.184	0.184
	Bottom	0.659	-	0.659		Bottom	0.149	-	0.149
	Right	-	0.276	0.276		Right	0.497	0.276	0.773
	Left	0.498	-	0.498		Left	-	-	0.000
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)
Body SAR	Back	1.014	0.300	**1.314**	Body SAR	Back	0.623	0.300	**0.923**
	Front	0.816	0.156	0.972		Front	0.664	0.156	0.820
	Top	-	0.184	0.184		Top	-	0.184	0.184
	Bottom	0.404	-	0.404		Bottom	0.489	-	0.489
	Right	-	0.276	0.276		Right	-	0.276	0.276
	Left	0.471	-	0.471		Left	0.424	-	0.424

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.

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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
Body SAR Measurement Variability Results

BODY VARIABILITY RESULTS													
Band	FREQUENCY		Mode	Service	Side	Spacing	Measured SAR (1g)	1st Repeated SAR (1g)	Ratio	2nd Repeated SAR (1g)	Ratio	3rd Repeated SAR (1g)	Ratio
	MHz	Ch.					(W/kg)	(W/kg)		(W/kg)		(W/kg)	
1750	1732.40	1412	UMTS 1750	RMC	back	10 mm	1.040	1.060	1.02	N/A	N/A	N/A	N/A
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram						

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.

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14 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
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	D750V3	750 MHz Dipole	1/16/2015	Annual	1/16/2016	1003
SPEAG	D835V2	835 MHz SAR Dipole	7/24/2014	Annual	7/24/2015	4d133
SPEAG	D1765V2	1765 MHz SAR Dipole	5/7/2014	Annual	5/7/2015	1008
SPEAG	D1900V2	1900 MHz SAR Dipole	7/23/2014	Annual	7/23/2015	5d149
SPEAG	D2450V2	2450 MHz SAR Dipole	1/15/2015	Annual	1/15/2016	797
SPEAG	D5GHzV2	5 GHz SAR Dipole	1/21/2015	Annual	1/21/2016	1057
SPEAG	D835V2	835 MHz SAR Dipole	1/16/2015	Annual	1/16/2016	4d132
SPEAG	D5GHzV2	SAR Dipole	9/25/2014	Annual	9/25/2015	1191
SPEAG	ES3DV2	SAR Probe	8/19/2014	Annual	8/19/2015	3022
SPEAG	ES3DV3	SAR Probe	8/20/2014	Annual	8/20/2015	3331
SPEAG	ES3DV3	SAR Probe	10/24/2014	Annual	10/24/2015	3333
SPEAG	EX3DV4	SAR Probe	12/12/2014	Annual	12/12/2015	3920
SPEAG	ES3DV3	SAR Probe	12/16/2014	Annual	12/16/2015	3334
SPEAG	ES3DV3	SAR Probe	1/20/2015	Annual	1/20/2016	3213
SPEAG	EX3DV4	SAR Probe	8/21/2014	Annual	8/21/2015	3949
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/11/2014	Annual	4/11/2015	1368
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/12/2014	Annual	8/12/2015	1322
SPEAG	DAE4	Dasy Data Acquisition Electronics	10/23/2014	Annual	10/23/2015	1408
SPEAG	DAE4	Dasy Data Acquisition Electronics	10/31/2014	Annual	10/31/2015	1333
SPEAG	DAE4	Dasy Data Acquisition Electronics	12/12/2014	Annual	12/12/2015	1415
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/19/2015	Annual	1/19/2016	1407
Rohde & Schwarz	CMU200	Base Station Simulator	4/24/2014	Annual	4/24/2015	836371/0079
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
Fisher Scientific	15-077-960	Digital Thermometer	12/4/2013	Biennial	12/4/2015	130764558
Control Company	4052	Long Stem Thermometer	9/27/2013	Biennial	9/27/2015	130567447
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	MA2411B	Pulse Power Sensor	3/25/2014	Annual	3/25/2015	1207470
Anritsu	MA2411B	Pulse Power Sensor	11/13/2014	Annual	11/13/2015	1339018
Anritsu	MT8820C	Radio Communication Analyzer	5/6/2014	Annual	5/6/2015	6201144419
Anritsu	MT8820C	Radio Communication Analyzer	8/28/2014	Annual	8/28/2015	6201240328
Rohde & Schwarz	CMW500	Radio Communication Tester	10/3/2014	Annual	10/3/2015	100976
Rohde & Schwarz	CMW500	Radio Communication Tester	10/4/2013	Biennial	10/4/2015	103962
Tektronix	RSA6114A	Real Time Spectrum Analyzer	4/16/2014	Annual	4/16/2015	B010177
Agilent	8753ES	S-Parameter Network Analyzer	1/20/2015	Annual	1/20/2016	US39170122
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	3/18/2014	Biennial	3/18/2016	N/A
Anritsu	MA24106A	USB Power Sensor	5/14/2014	Annual	5/14/2015	1231538
Anritsu	MA24106A	USB Power Sensor	5/14/2014	Annual	5/14/2015	1231535
VWR	36934-158	Wall-Mounted Thermometer	8/8/2013	Biennial	8/8/2015	130477877
Agilent	E5515C	Wireless Communications Test Set	11/20/2014	Biennial	11/20/2016	GB43163447
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433972
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A
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

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.

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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

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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

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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

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PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001731

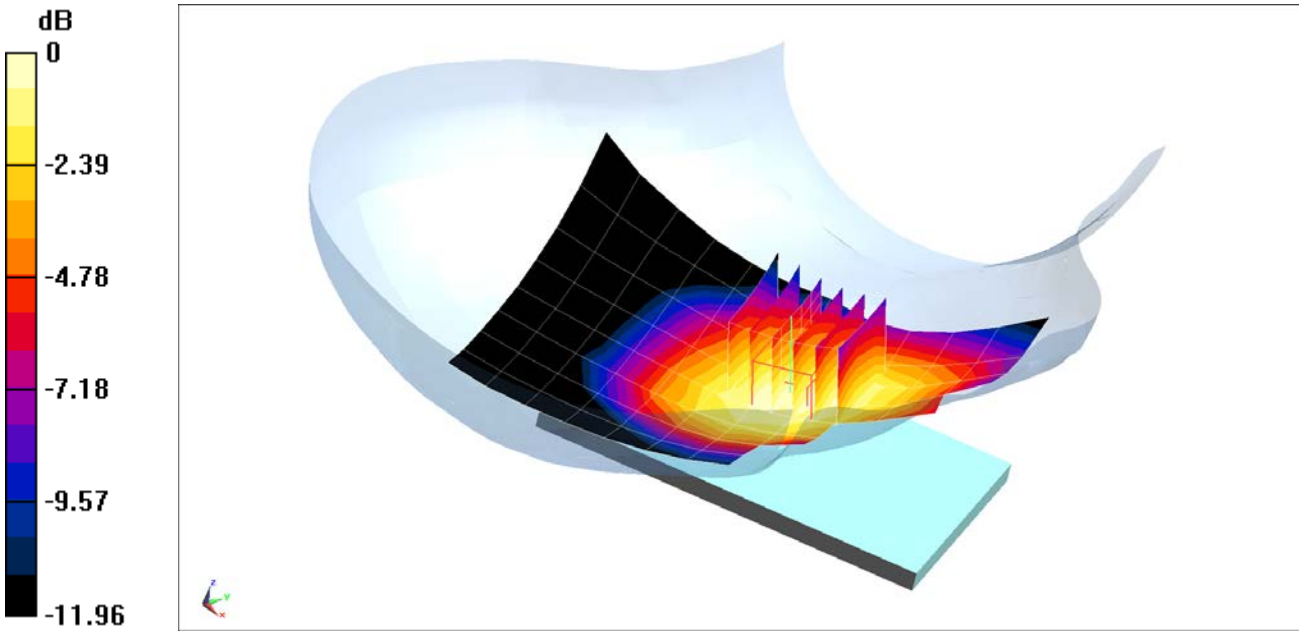
Communication System: UID 0, GSM; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium: 835 Head Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.891 S/m; ε_r = 40.207; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 02-27-2015; Ambient Temp: 23.3°C; Tissue Temp: 21.2°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: GSM 850, Right Head, Cheek, Mid.ch, Standard Cover

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 17.32 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 0.314 W/kg
SAR (1 g) = 0.250 W/kg



0 dB = 0.272 W/kg = -5.65 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001731

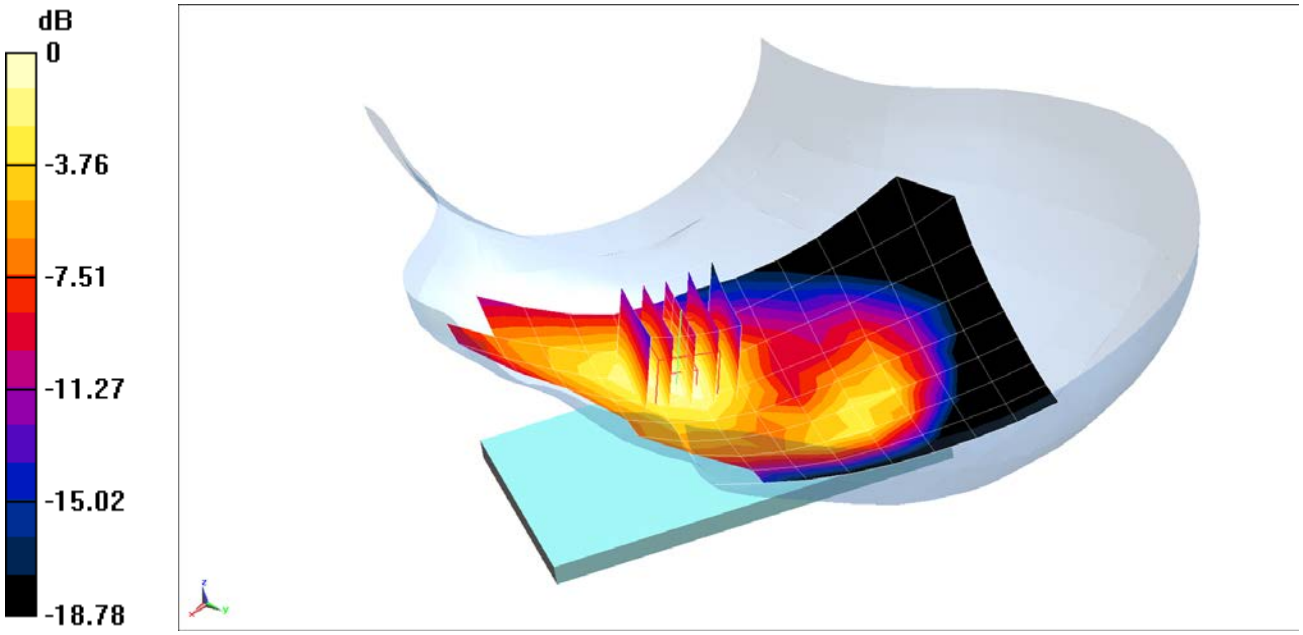
Communication System: UID 0, GSM1900 GPRS; Frequency: 1880 MHz; Duty Cycle: 1:2.76
Medium: 1900 Head Medium parameters used:
f = 1880 MHz; σ = 1.387 S/m; ε_r = 38.958; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 03-02-2015; Ambient Temp: 23.4°C; Tissue Temp: 21.8°C

Probe: ES3DV2 - SN3022; ConvF(4.85, 4.85, 4.85); 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 1900, Left Head, Cheek, Mid.ch, 3 Tx slots, Quick Cover Closed

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.50 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.257 W/kg
SAR (1 g) = 0.170 W/kg



0 dB = 0.197 W/kg = -7.06 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001731

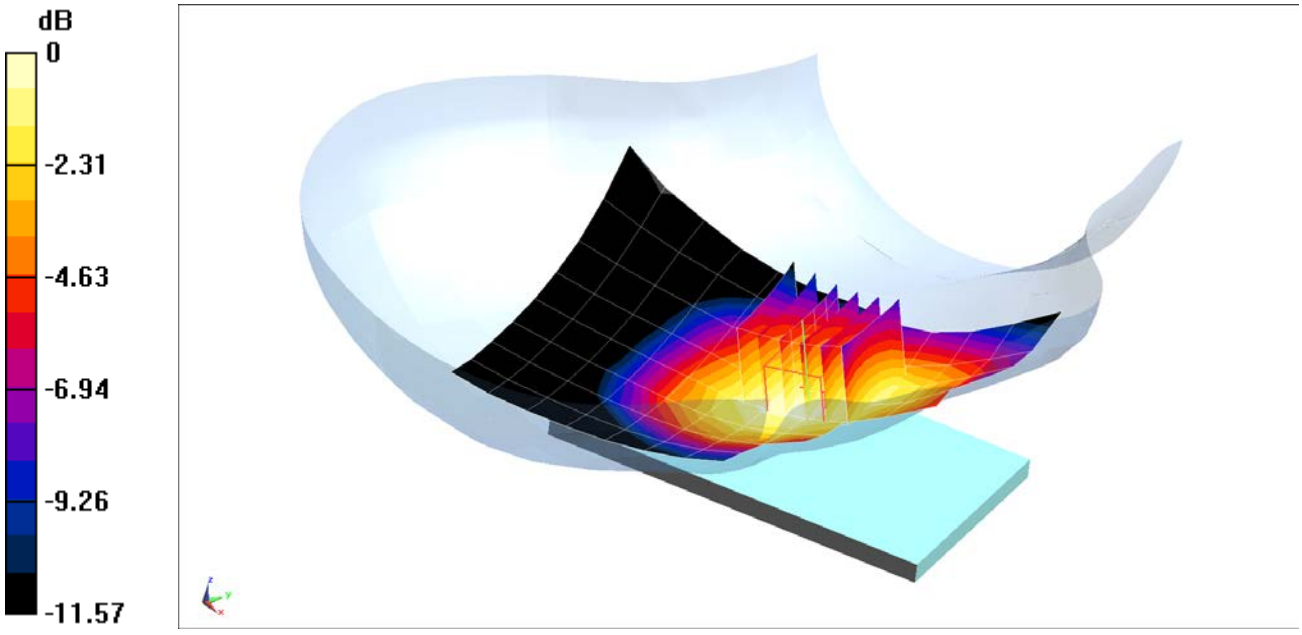
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.891 S/m; ε_r = 40.207; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 02-27-2015; Ambient Temp: 23.3°C; Tissue Temp: 21.2°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, Standard Cover

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.49 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.441 W/kg
SAR (1 g) = 0.348 W/kg



0 dB = 0.377 W/kg = -4.24 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001731

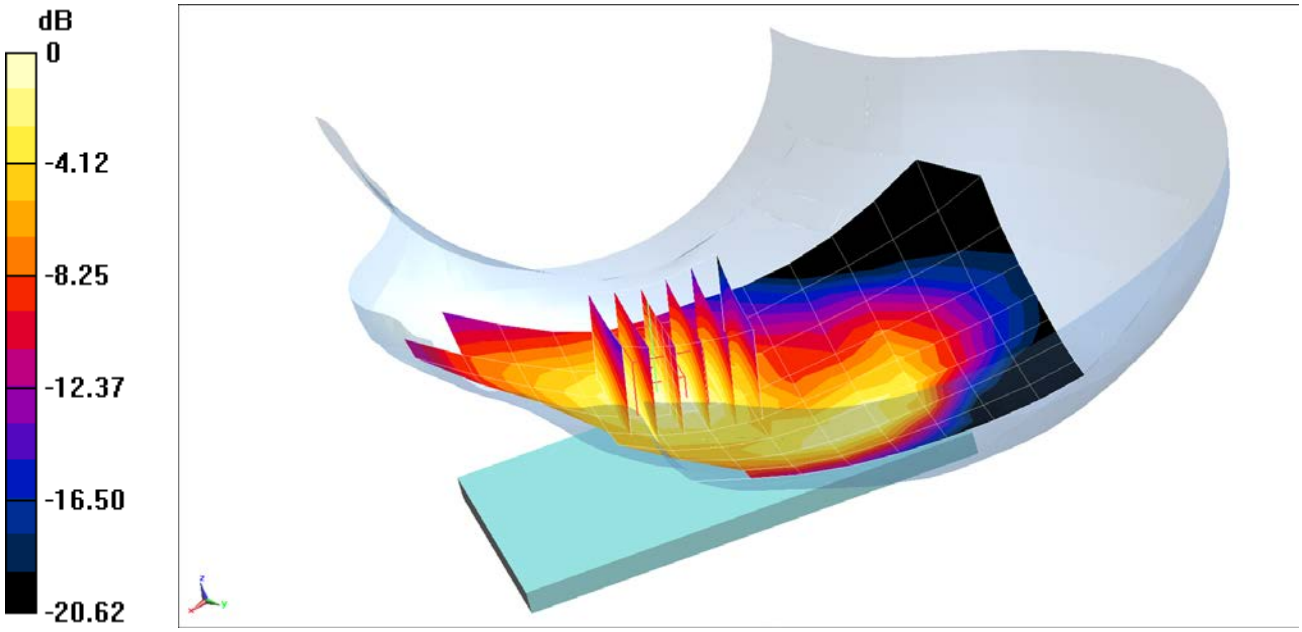
Communication System: UID 0, UMTS; Frequency: 1732.4 MHz; Duty Cycle: 1:1
Medium: 1750 Head Medium parameters used (interpolated):
f = 1732.4 MHz; σ = 1.328 S/m; ε_r = 39.332; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 02-24-2015; Ambient Temp: 23.4°C; Tissue Temp: 22.2°C

Probe: ES3DV2 - SN3022; ConvF(5.04, 5.04, 5.04); 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: AWS UMTS, Left Head, Cheek, Mid.ch, Quick Cover Open

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 = 0.16 dB
Peak SAR (extrapolated) = 0.943 W/kg
SAR (1 g) = 0.626 W/kg



0 dB = 0.735 W/kg = -1.34 dBW/kg

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001731

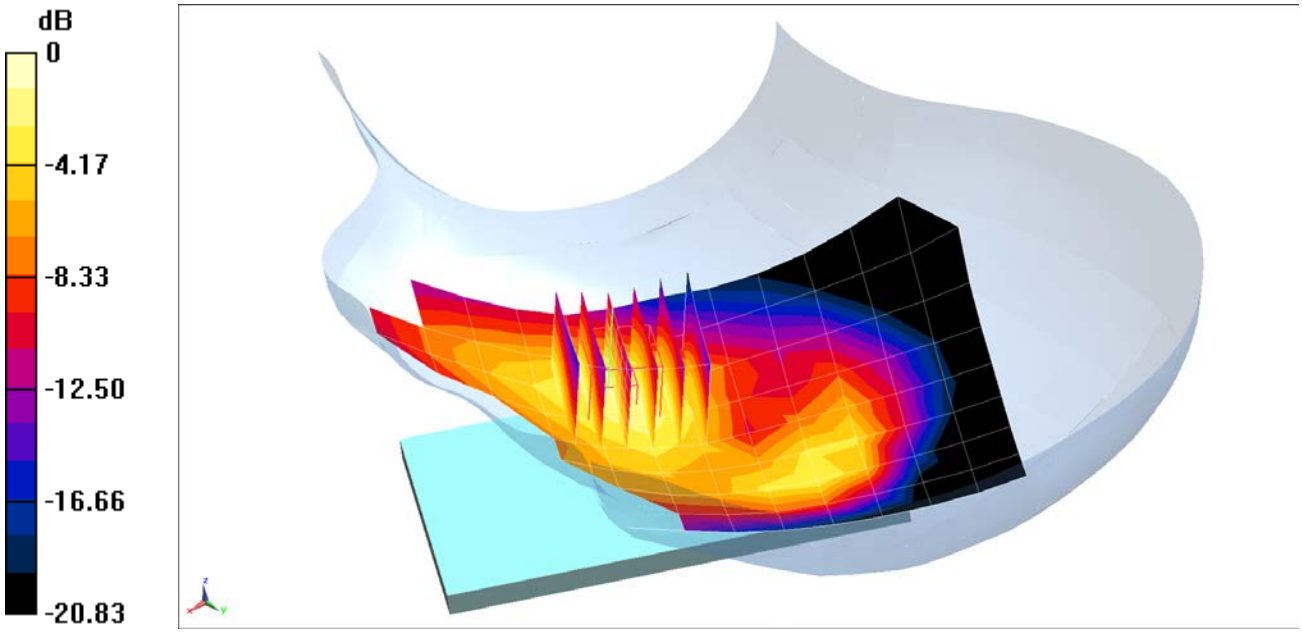
Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used:
f = 1880 MHz; σ = 1.387 S/m; ε_r = 38.958; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 03-02-2015; Ambient Temp: 23.4°C; Tissue Temp: 21.8°C

Probe: ES3DV2 - SN3022; ConvF(4.85, 4.85, 4.85); 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 1900, Left Head, Cheek, Mid.ch, Quick Cover Open

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.86 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 0.657 W/kg
SAR (1 g) = 0.424 W/kg



0 dB = 0.501 W/kg = -3.00 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001723

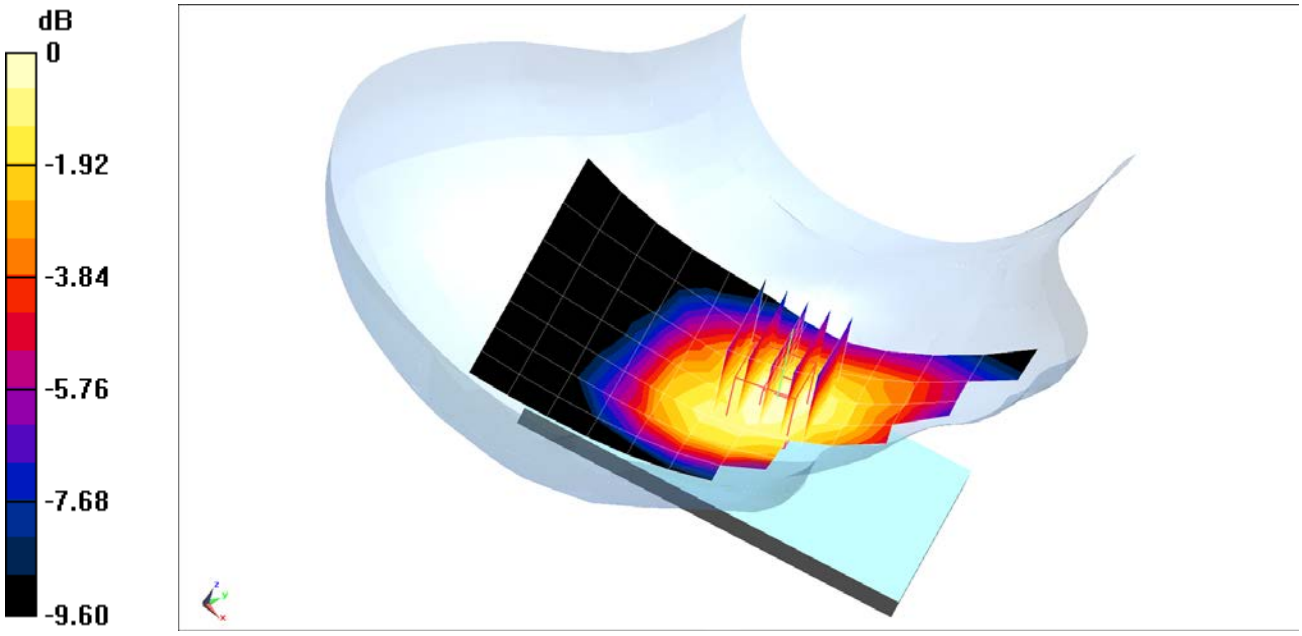
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: 750 Head Medium parameters used (interpolated):
$f = 707.5$ MHz; $\sigma = 0.883$ S/m; $\varepsilon_r = 42.454$; $\rho = 1000$ kg/m^3
Phantom section: Right Section

Test Date: 03-02-2015; Ambient Temp: 22.6°C; Tissue Temp: 21.3°C

Probe: ES3DV3 - SN3333; ConvF(6.55, 6.55, 6.55); Calibrated: 10/24/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1408; Calibrated: 10/23/2014
Phantom: Main TWIN SAM; Type: QD000P40CC; Serial: TP-1406
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, Standard Cover

Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.50 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 0.274 W/kg
SAR (1 g) = 0.221 W/kg



0 dB = 0.245 W/kg = -6.11 dBW/kg

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001723

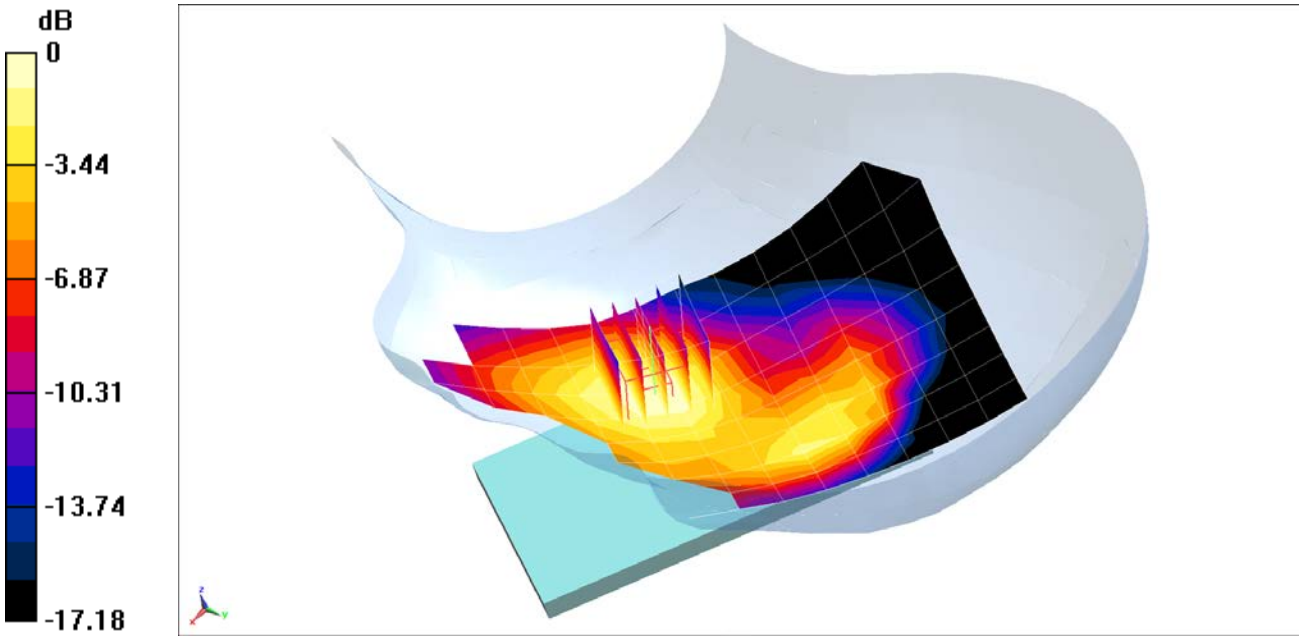
Communication System: UID 0, LTE RF Band 4; Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: 1750 Head Medium parameters used (interpolated):
$f = 1732.5$ MHz; $\sigma = 1.328$ S/m; $\varepsilon_r = 39.332$; $\rho = 1000$ kg/m^3
Phantom section: Left Section

Test Date: 02-24-2015; Ambient Temp: 23.4°C; Tissue Temp: 22.2°C

Probe: ES3DV2 - SN3022; ConvF(5.04, 5.04, 5.04); 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 4 (AWS), Left Head, Cheek, Mid.ch, 20 MHz Bandwidth QPSK, 1 RB, 0 RB Offset, Quick Cover Closed

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.94 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 0.844 W/kg
SAR (1 g) = 0.577 W/kg



0 dB = 0.676 W/kg = -1.70 dBW/kg

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001723

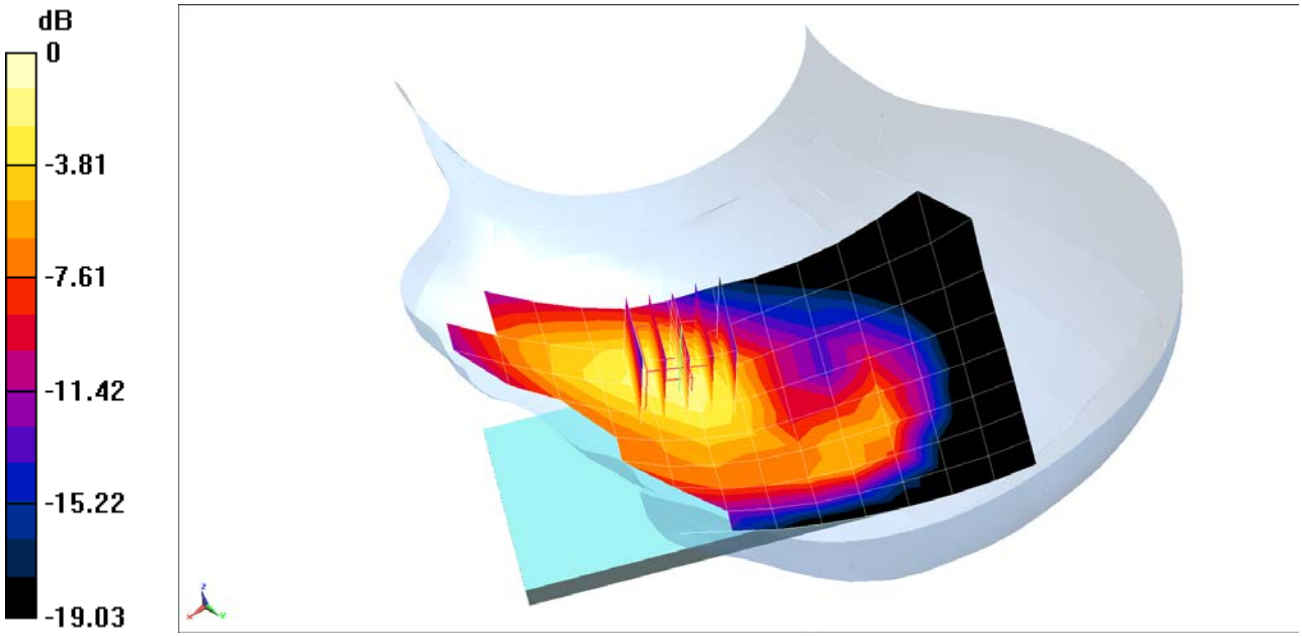
Communication System: UID 0, LTE Band 2; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used:
f = 1880 MHz; σ = 1.387 S/m; ε_r = 38.958; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 03-02-2015; Ambient Temp: 23.4°C; Tissue Temp: 21.8°C

Probe: ES3DV2 - SN3022; ConvF(4.85, 4.85, 4.85); 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 2 (PCS), Left Head, Cheek, Mid.ch, 20 MHz Bandwidth QPSK, 1 RB, 0 RB Offset, Quick Cover Open

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.68 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 0.700 W/kg
SAR (1 g) = 0.459 W/kg



0 dB = 0.519 W/kg = -2.85 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001772

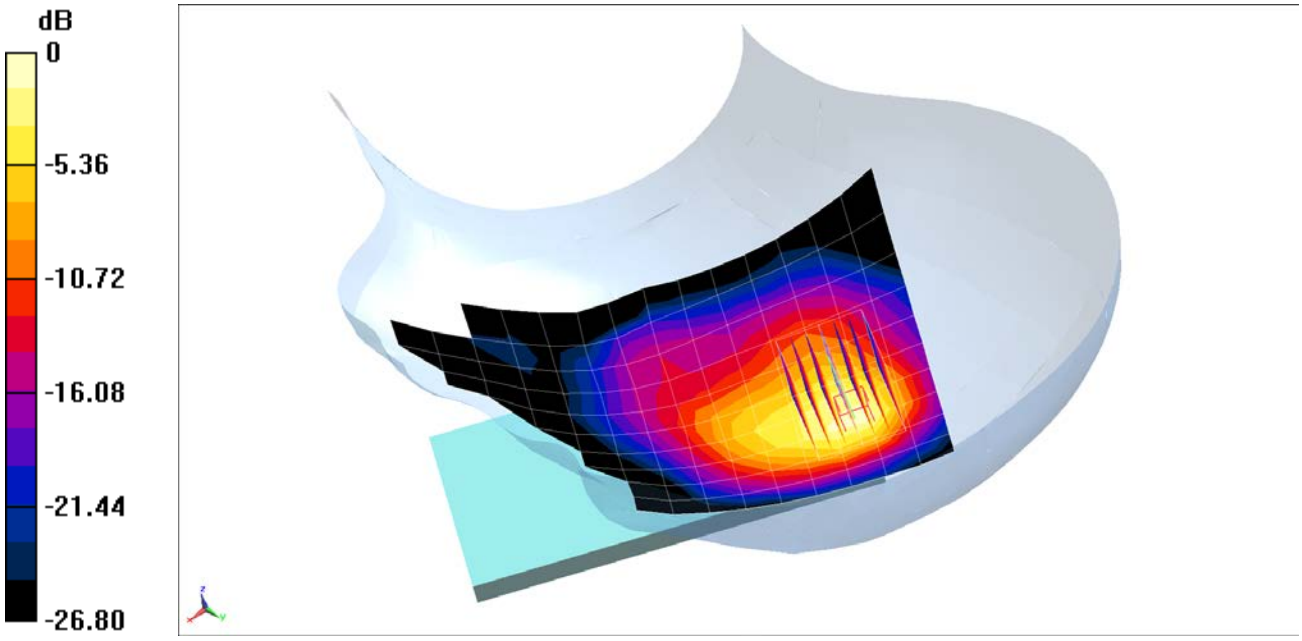
Communication System: UID 0, IEEE 802.11b; Frequency: 2462 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used (interpolated):
$f = 2462$ MHz; $\sigma = 1.899$ S/m; $\varepsilon_r = 39.156$; $\rho = 1000$ kg/m^3
Phantom section: Left Section

Test Date: 02-26-2015; Ambient Temp: 24.5°C; Tissue Temp: 23.5°C

Probe: ES3DV3 - SN3331; ConvF(4.48, 4.48, 4.48); Calibrated: 8/20/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 10/31/2014
Phantom: SAM Main; Type: QD000P40CC; Serial: TP 1114
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: IEEE 802.11b, Left Head, Cheek, Ch 11, 1 Mbps, Standard Cover

Area Scan (11x16x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 16.23 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 1.14 W/kg
SAR (1 g) = 0.479 W/kg



0 dB = 0.638 W/kg = -1.95 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001749

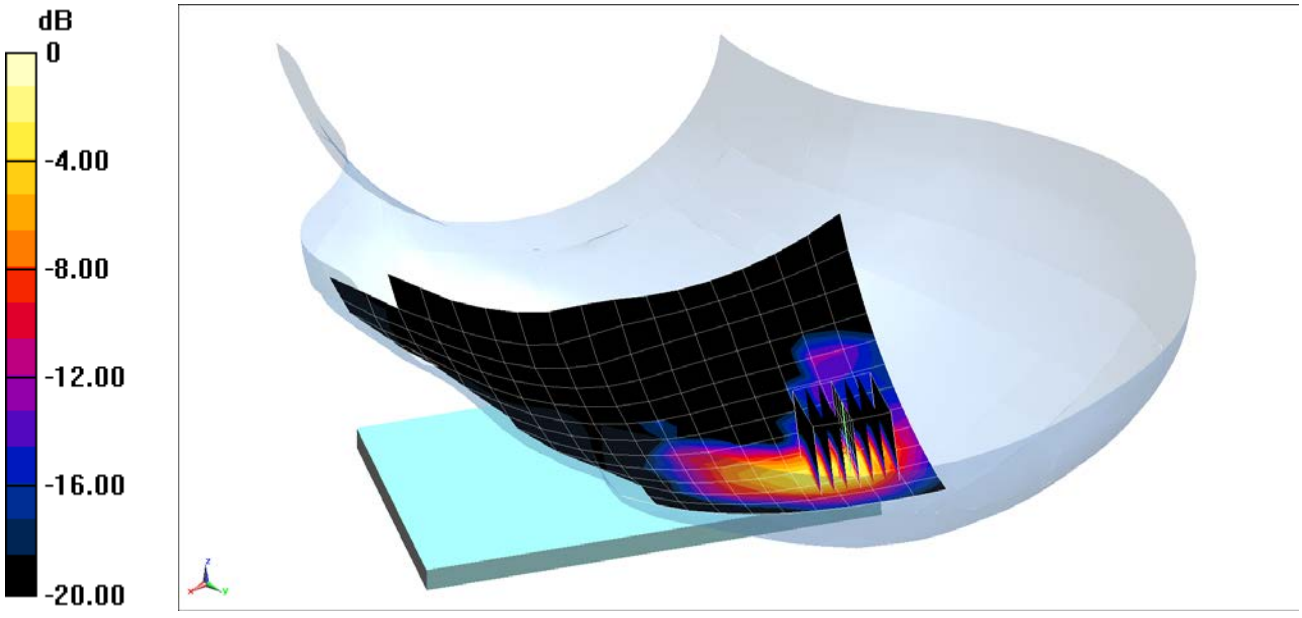
Communication System: UID 0, IEEE 802.11a; Frequency: 5520 MHz; Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
f = 5520 MHz; σ = 4.903 S/m; ε_r = 35.594; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 03-02-2015; Ambient Temp: 24.0°C; Tissue Temp: 21.2°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 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, 5.5 GHz, Left Head, Cheek, Ch 104, 6 Mbps, Standard Cover

Area Scan (13x19x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio = 1.4
Reference Value = 11.49 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 2.48 W/kg
SAR (1 g) = 0.576 W/kg



0 dB = 1.39 W/kg = 1.43 dBW/kg

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001731

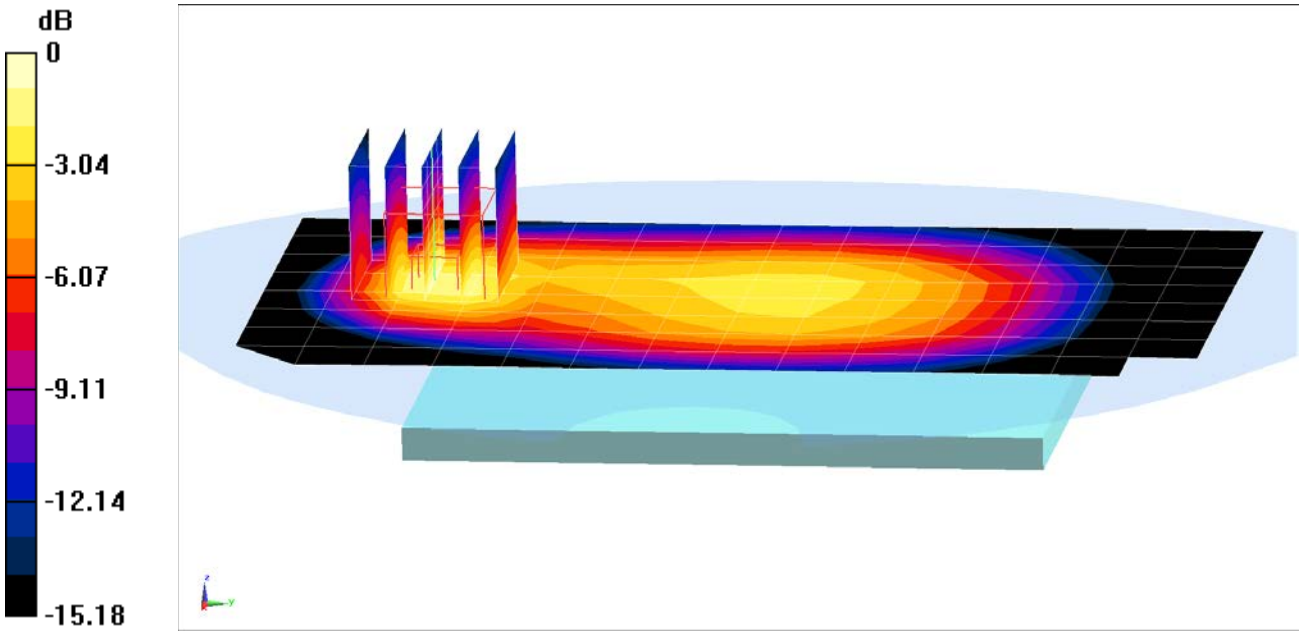
Communication System: UID 0, GSM; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium: 835 Body Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.952 S/m; ε_r = 54.169; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-25-2015; Ambient Temp: 22.4°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3333; ConvF(6.12, 6.12, 6.12); Calibrated: 10/24/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1408; Calibrated: 10/23/2014
Phantom: Sub TWIN SAM; Type: QD000P40CC; Serial: TP-1357
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.29 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.674 W/kg
SAR (1 g) = 0.375 W/kg



0 dB = 0.476 W/kg = -3.22 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001731

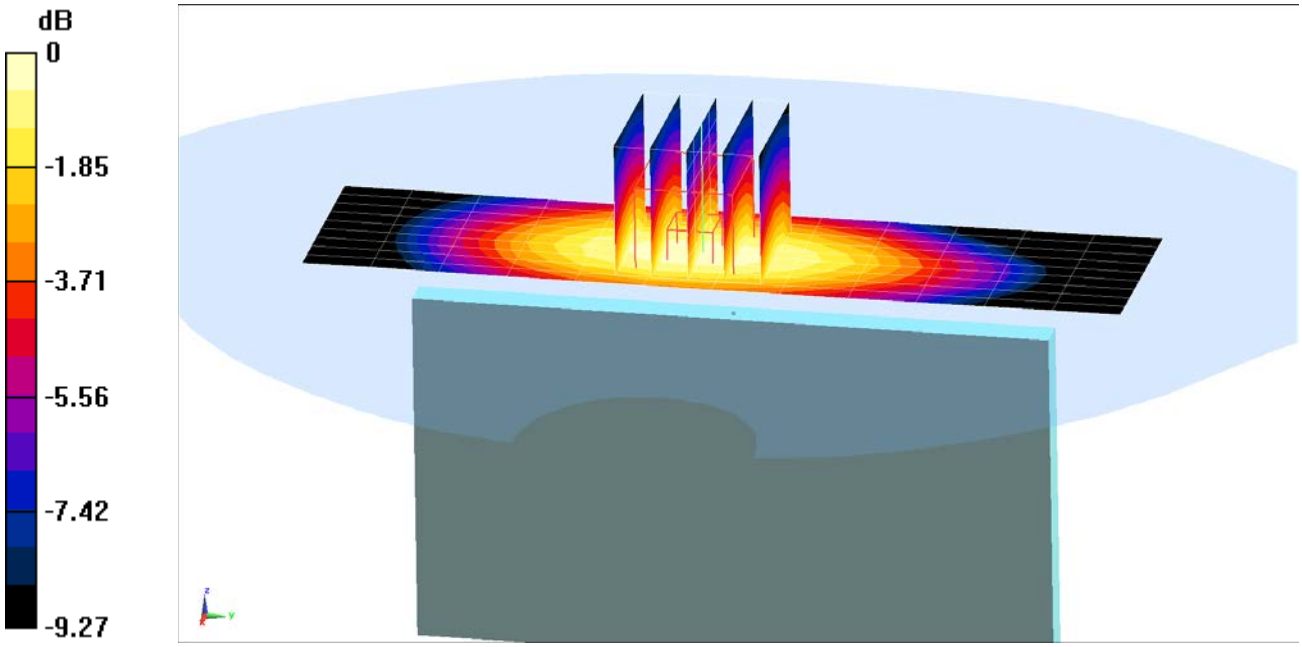
Communication System: UID 0, GSM850 GPRS; Frequency: 836.6 MHz; Duty Cycle: 1:2.076
Medium: 835 Body Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.952 S/m; ε_r = 54.169; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-25-2015; Ambient Temp: 22.4°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3333; ConvF(6.12, 6.12, 6.12); Calibrated: 10/24/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1408; Calibrated: 10/23/2014
Phantom: Sub TWIN SAM; Type: QD000P40CC; Serial: TP-1357
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: GPRS 850, Body SAR, Right Edge, Mid.ch, 4 Tx Slots, Standard Cover

Area Scan (10x13x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.38 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.578 W/kg
SAR (1 g) = 0.413 W/kg



0 dB = 0.473 W/kg = -3.25 dBW/kg

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001731

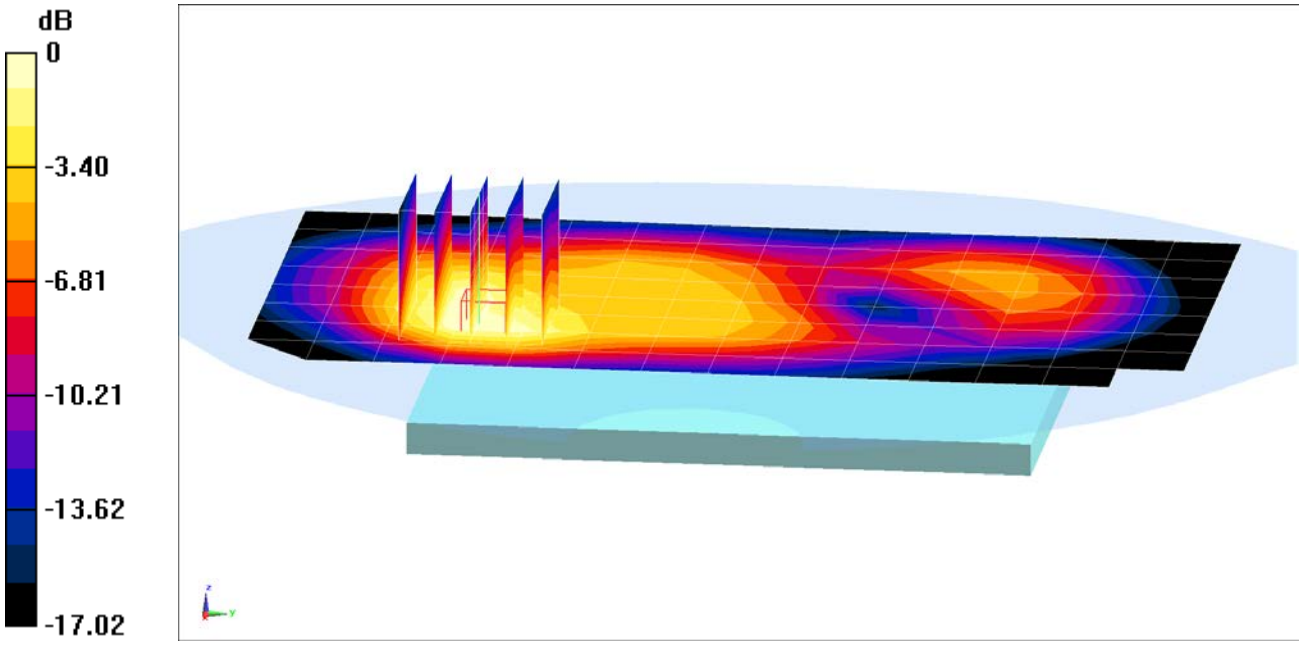
Communication System: UID 0, GSM; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.524 S/m; ε_r = 51.322; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-28-2015; Ambient Temp: 23.4°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3213; ConvF(4.72, 4.72, 4.72); Calibrated: 1/20/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 1/19/2015
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.24 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 0.591 W/kg
SAR (1 g) = 0.342 W/kg



0 dB = 0.410 W/kg = -3.87 dBW/kg

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001731

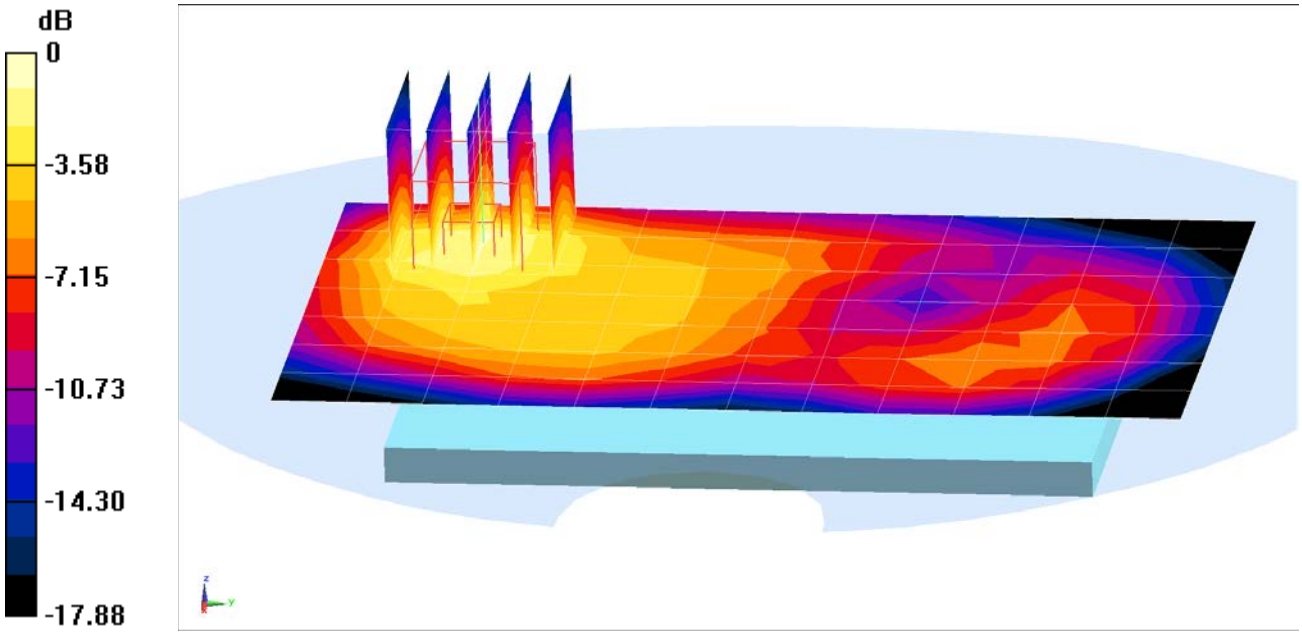
Communication System: UID 0, GSM GPRS; Frequency: 1880 MHz; Duty Cycle: 1:2.76
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.524 S/m; ε_r = 51.322; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-28-2015; Ambient Temp: 23.4°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3213; ConvF(4.72, 4.72, 4.72); Calibrated: 1/20/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 1/19/2015
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: GPRS 1900, Body SAR, Front side, Mid.ch, 3 Tx Slots, Standard Cover

Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.75 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.595 W/kg
SAR (1 g) = 0.339 W/kg



0 dB = 0.411 W/kg = -3.86 dBW/kg

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001731

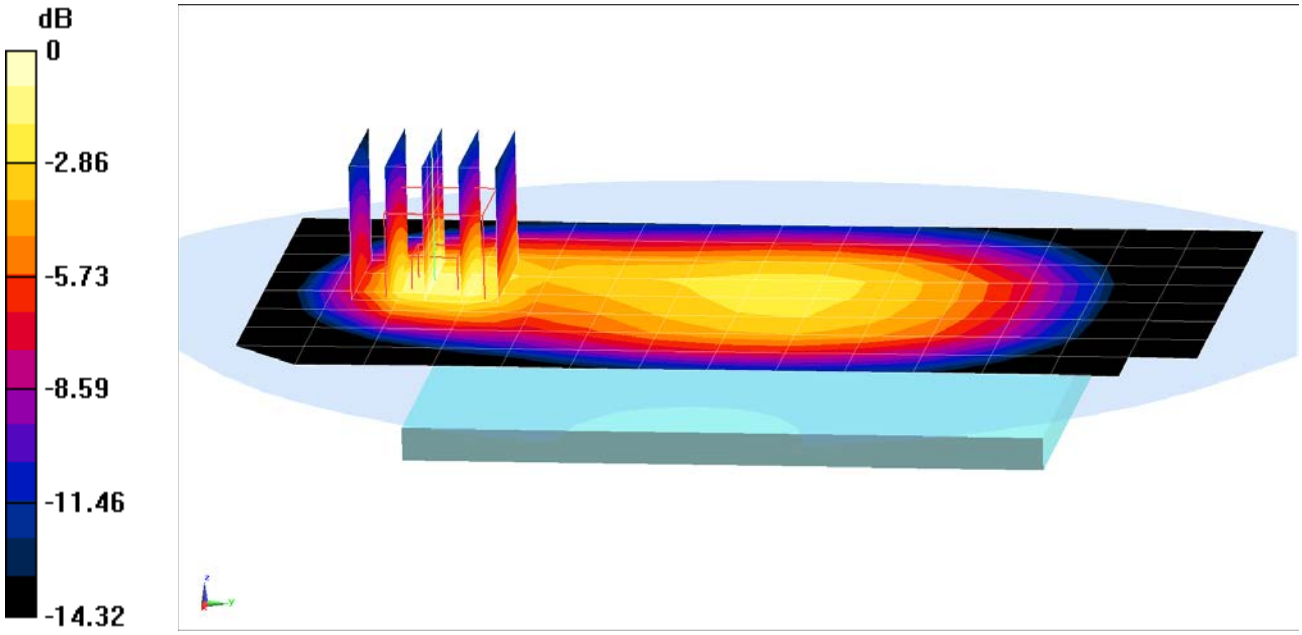
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
$f = 836.6$ MHz; $\sigma = 0.952$ S/m; $\varepsilon_r = 54.169$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-25-2015; Ambient Temp: 22.4°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3333; ConvF(6.12, 6.12, 6.12); Calibrated: 10/24/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1408; Calibrated: 10/23/2014
Phantom: Sub TWIN SAM; Type: QD000P40CC; Serial: TP-1357
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.12 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.951 W/kg
SAR (1 g) = 0.549 W/kg



0 dB = 0.686 W/kg = -1.64 dBW/kg

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001731

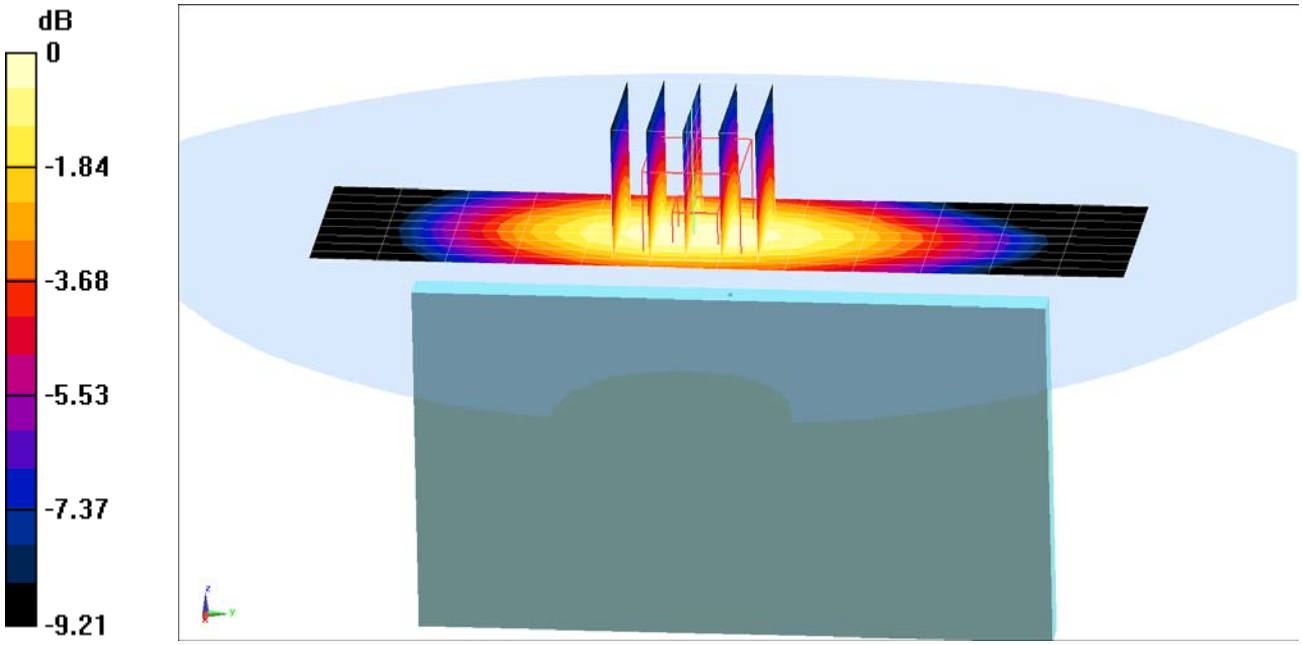
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.952 S/m; ε_r = 54.169; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-25-2015; Ambient Temp: 22.4°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3333; ConvF(6.12, 6.12, 6.12); Calibrated: 10/24/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1408; Calibrated: 10/23/2014
Phantom: Sub TWIN SAM; Type: QD000P40CC; Serial: TP-1357
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: UMTS 850, Body SAR, Right Edge, Mid.ch, Standard Cover

Area Scan (10x13x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 26.46 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.862 W/kg
SAR (1 g) = 0.616 W/kg



0 dB = 0.708 W/kg = -1.50 dBW/kg

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001731

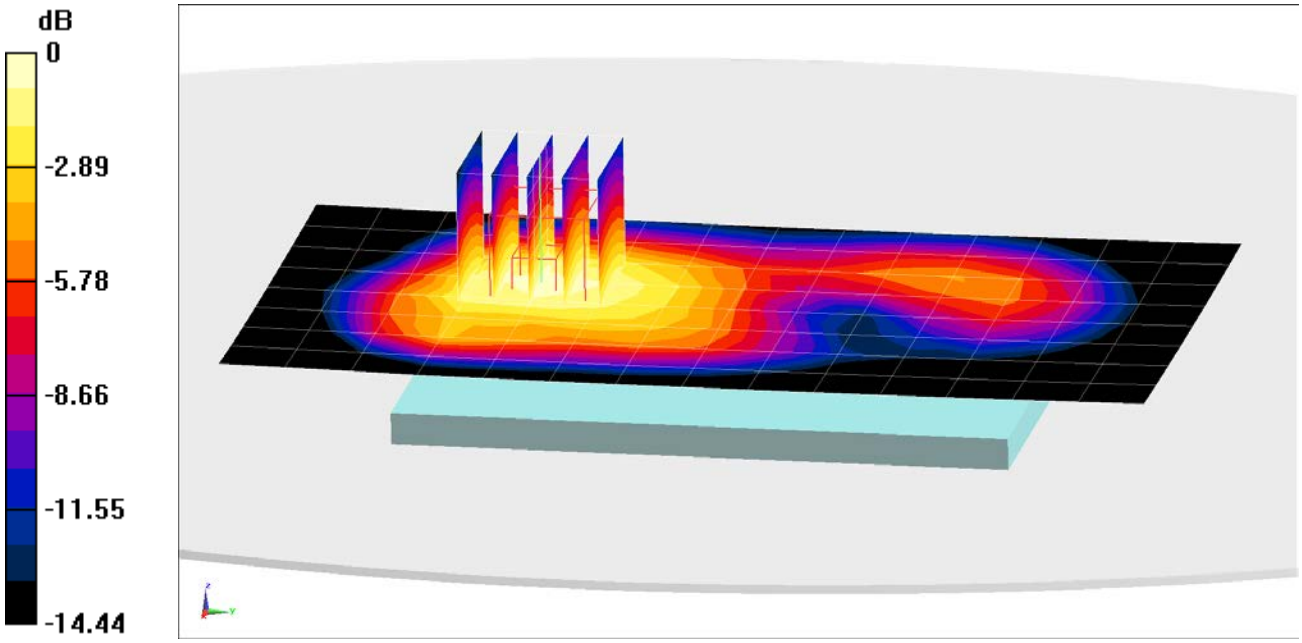
Communication System: UID 0, UMTS; Frequency: 1732.4 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
f = 1732.4 MHz; σ = 1.446 S/m; ε_r = 51.136; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-25-2015; Ambient Temp: 23.8°C; Tissue Temp: 22.4°C

Probe: ES3DV2 - SN3022; ConvF(4.7, 4.7, 4.7); 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: AWS UMTS, Body SAR, Back side, Mid.ch, Standard Cover

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.12 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 1.57 W/kg
SAR (1 g) = 1.06 W/kg



0 dB = 1.23 W/kg = 0.90 dBW/kg

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001731

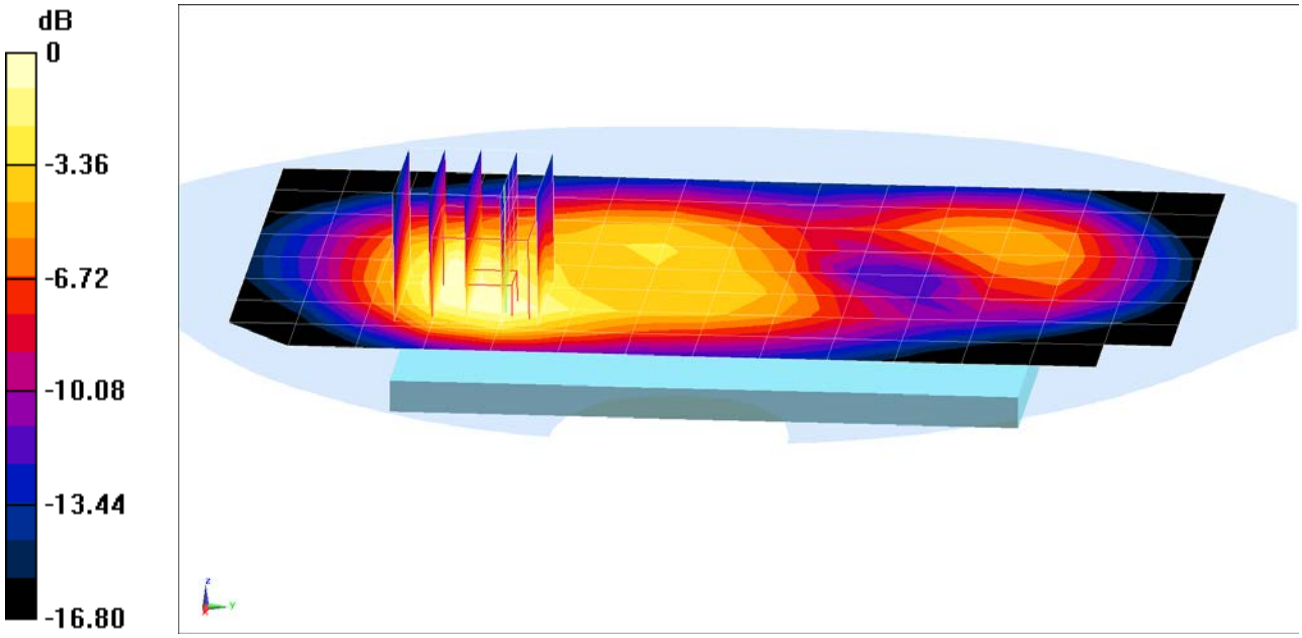
Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.524 S/m; ε_r = 51.322; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-28-2015; Ambient Temp: 23.4°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3213; ConvF(4.72, 4.72, 4.72); Calibrated: 1/20/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 1/19/2015
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.35 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.07 W/kg
SAR (1 g) = 0.618 W/kg



0 dB = 0.718 W/kg = -1.44 dBW/kg

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001731

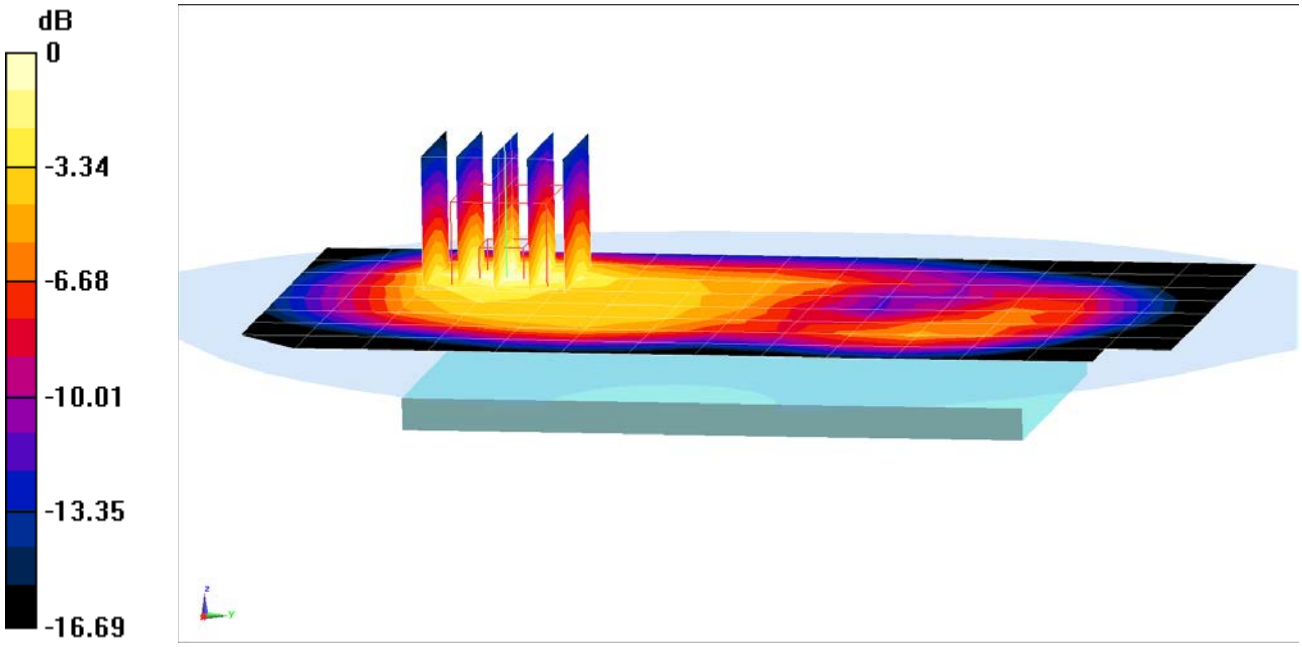
Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.524 S/m; ε_r = 51.322; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-28-2015; Ambient Temp: 23.4°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3213; ConvF(4.72, 4.72, 4.72); Calibrated: 1/20/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 1/19/2015
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.26 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.15 W/kg
SAR (1 g) = 0.665 W/kg



0 dB = 0.785 W/kg = -1.05 dBW/kg

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001723

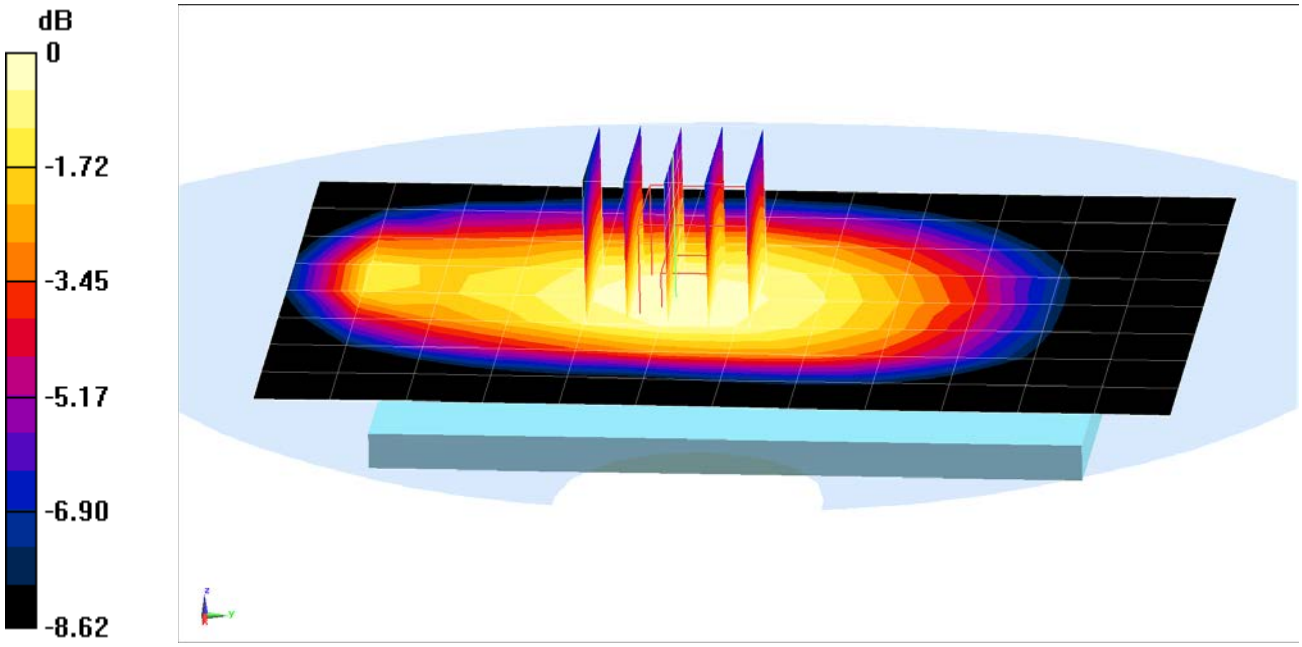
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 707.5 MHz; σ = 0.935 S/m; ε_r = 54.639; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-02-2015; Ambient Temp: 23.2°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3334; ConvF(6.09, 6.09, 6.09); 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: LTE Band 12, Body SAR, Back side, Mid.ch, 10 MHz Bandwidth QPSK, 1 RB, 0 RB Offset, Standard Cover

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.84 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.590 W/kg
SAR (1 g) = 0.475 W/kg



0 dB = 0.522 W/kg = -2.82 dBW/kg

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001723

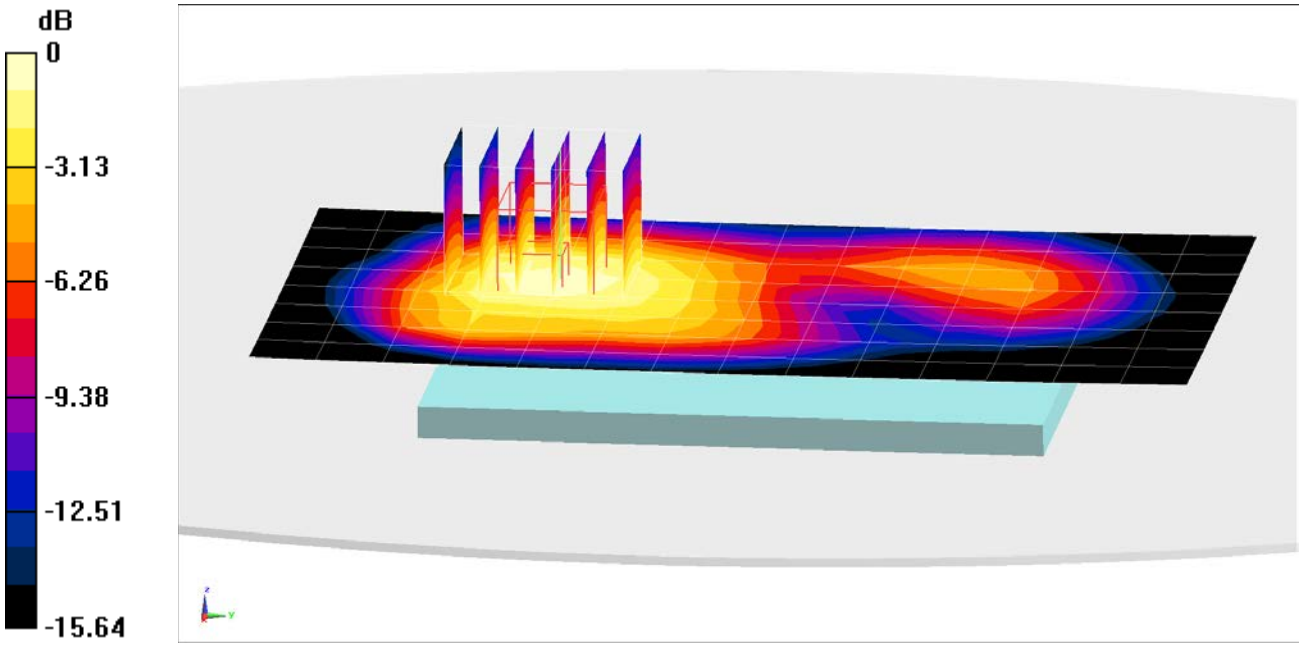
Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
$f = 1732.5$ MHz; $\sigma = 1.446$ S/m; $\varepsilon_r = 51.136$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-23-2015; Ambient Temp: 23.8°C; Tissue Temp: 22.4°C

Probe: ES3DV2 - SN3022; ConvF(4.7, 4.7, 4.7); 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 4 (AWS), Body SAR, Back side, Mid.ch, 20 MHz Bandwidth QPSK, 1 RB, 0 RB Offset, Standard Cover

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 26.36 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 1.48 W/kg
SAR (1 g) = 0.982 W/kg



0 dB = 1.14 W/kg = 0.57 dBW/kg

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001723

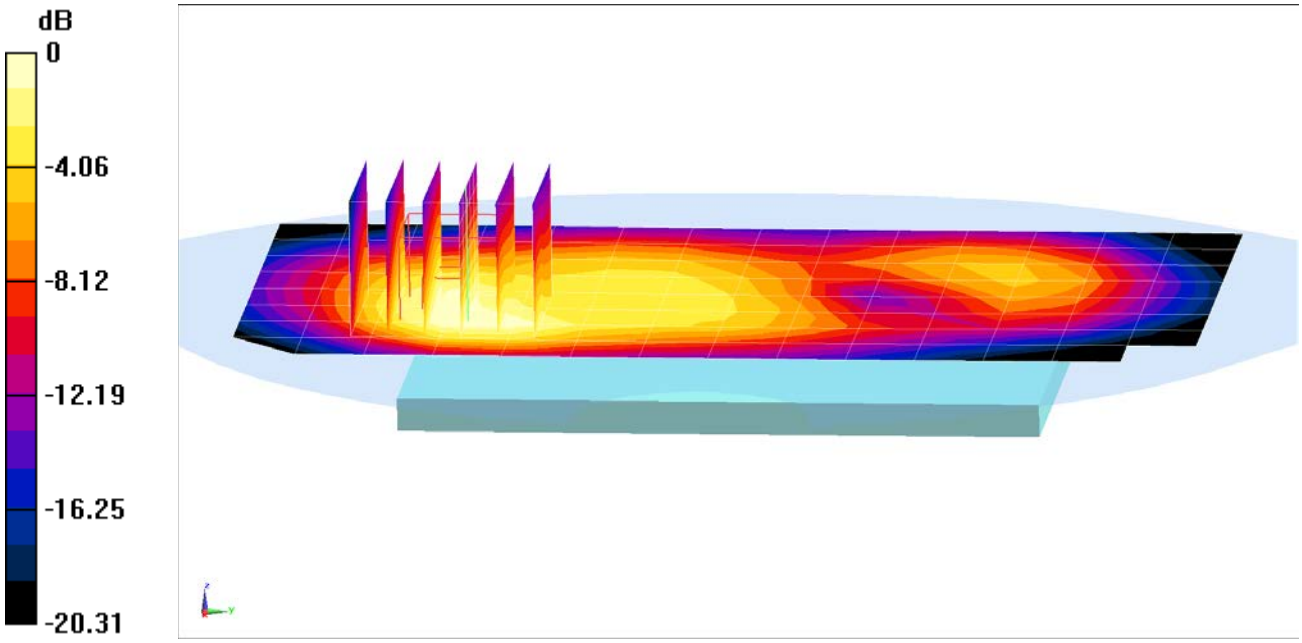
Communication System: UID 0, LTE Band 2 (PCS); Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.524 S/m; ε_r = 51.322; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-28-2015; Ambient Temp: 23.4°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3213; ConvF(4.72, 4.72, 4.72); Calibrated: 1/20/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 1/19/2015
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), Body SAR, Back side, Mid.ch, 20 MHz Bandwidth QPSK, 1 RB, 0 RB Offset, Standard Cover

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.47 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 0.989 W/kg
SAR (1 g) = 0.584 W/kg



0 dB = 0.710 W/kg = -1.49 dBW/kg

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001723

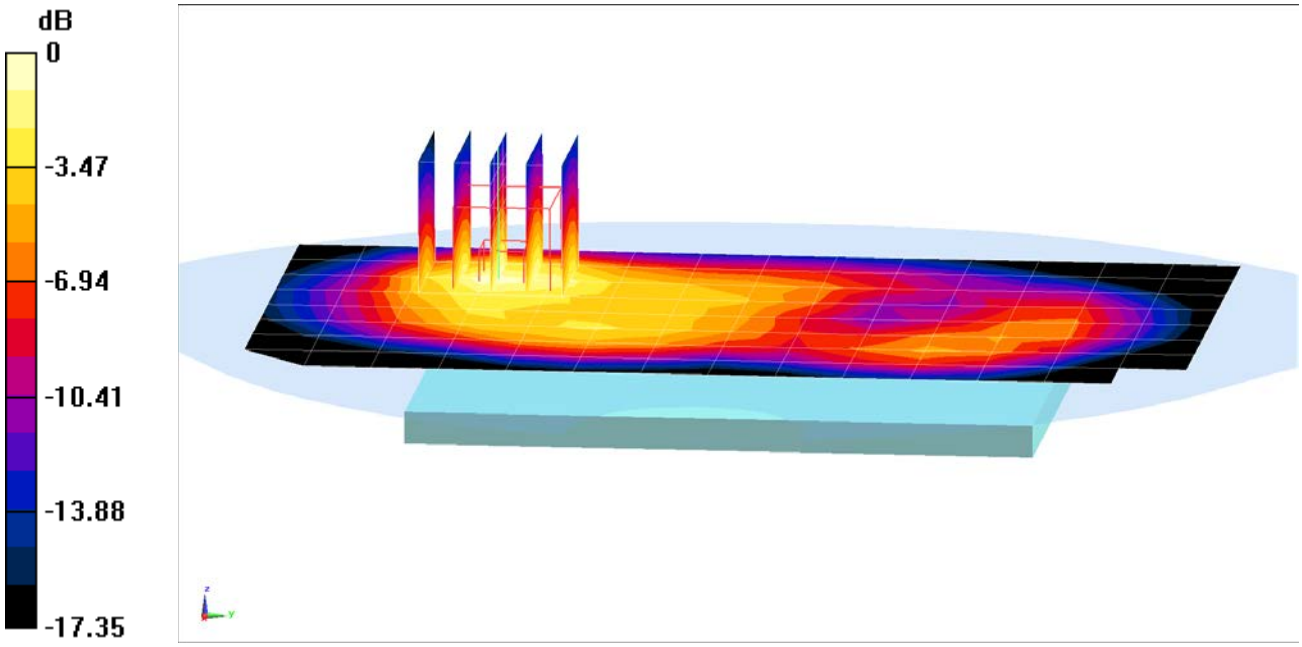
Communication System: UID 0, LTE Band 2 (PCS); Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.524 S/m; ε_r = 51.322; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-28-2015; Ambient Temp: 23.4°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3213; ConvF(4.72, 4.72, 4.72); Calibrated: 1/20/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 1/19/2015
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), Body SAR, Front side, Mid.ch, 20 MHz Bandwidth QPSK, 1 RB, 0 RB Offset, Standard Cover

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.62 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 1.07 W/kg
SAR (1 g) = 0.622 W/kg



0 dB = 0.765 W/kg = -1.16 dBW/kg

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001772

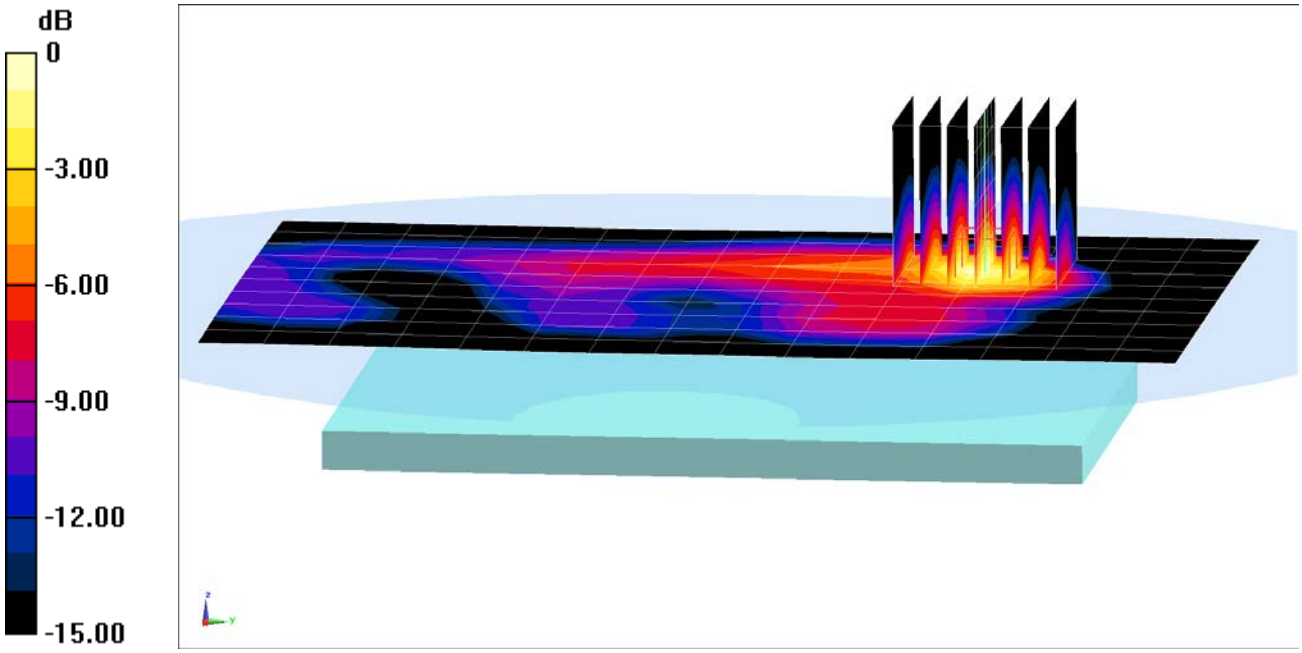
Communication System: UID 0, IEEE 802.11b; Frequency: 2462 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
f = 2462 MHz; σ = 1.931 S/m; ε_r = 50.174; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-25-2015; Ambient Temp: 23.1°C; Tissue Temp: 24.5°C

Probe: ES3DV3 - SN3331; ConvF(4.29, 4.29, 4.29); Calibrated: 8/20/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 10/31/2014
Phantom: SAM Main ; Type: QD000P40CC; Serial: TP 1114
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: IEEE 802.11b, Body SAR, Ch 11, 1 Mbps, Back Side, Quick Cover Closed

Area Scan (11x16x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.22 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 0.426 W/kg
SAR (1 g) = 0.181 W/kg



0 dB = 0.245 W/kg = -6.11 dBW/kg

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001749

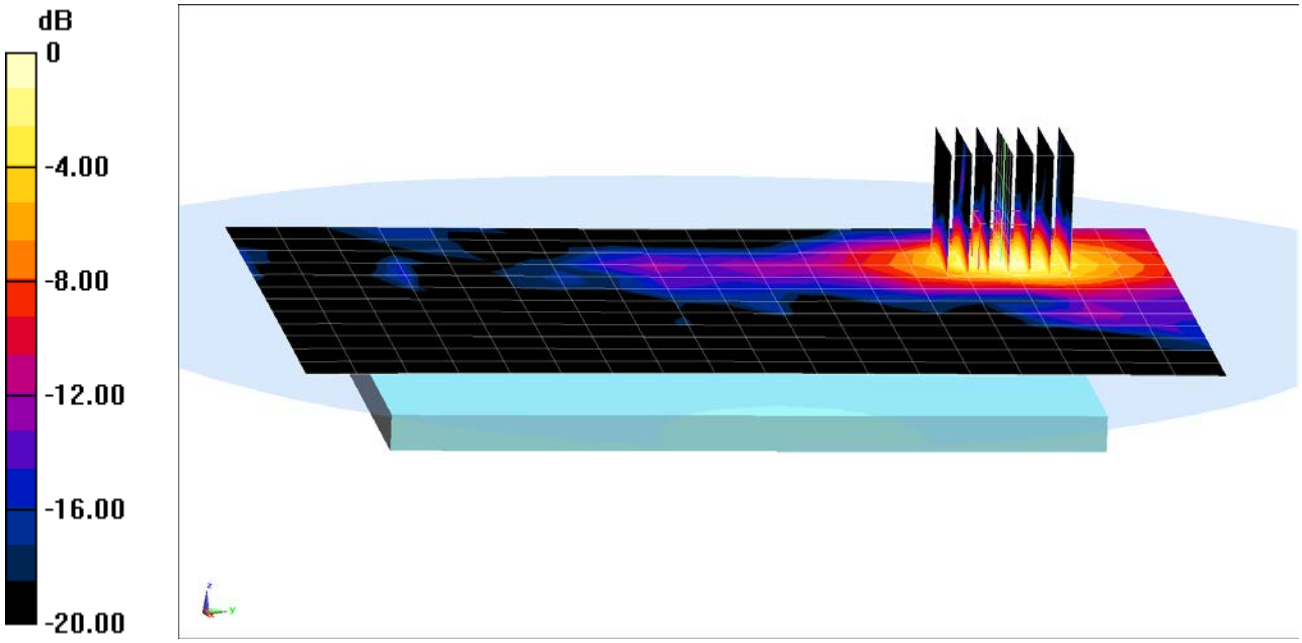
Communication System: UID 0, IEEE 802.11a; Frequency: 5765 MHz; Duty Cycle: 1:1
Medium: 5GHz Body Medium parameters used:
f = 5765 MHz; σ = 6.116 S/m; ε_r = 45.965; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-23-2015; Ambient Temp: 21.7°C; Tissue Temp: 23.1°C

Probe: EX3DV4 - SN3949; ConvF(4.27, 4.27, 4.27); Calibrated: 8/21/2014;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 10/31/2014
Phantom: SAM Sub; Type: QD000P40CC; Serial: TP:1357
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, Back Side, Quick Cover Closed

Area Scan (13x19x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio = 1.4
Reference Value = 6.161 V/m; Power Drift = 0.19 dB
Peak SAR (extrapolated) = 1.08 W/kg
SAR (1 g) = 0.238 W/kg



0 dB = 0.592 W/kg = -2.28 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFH631; Type: Portable Handset; Serial: 358387060001749

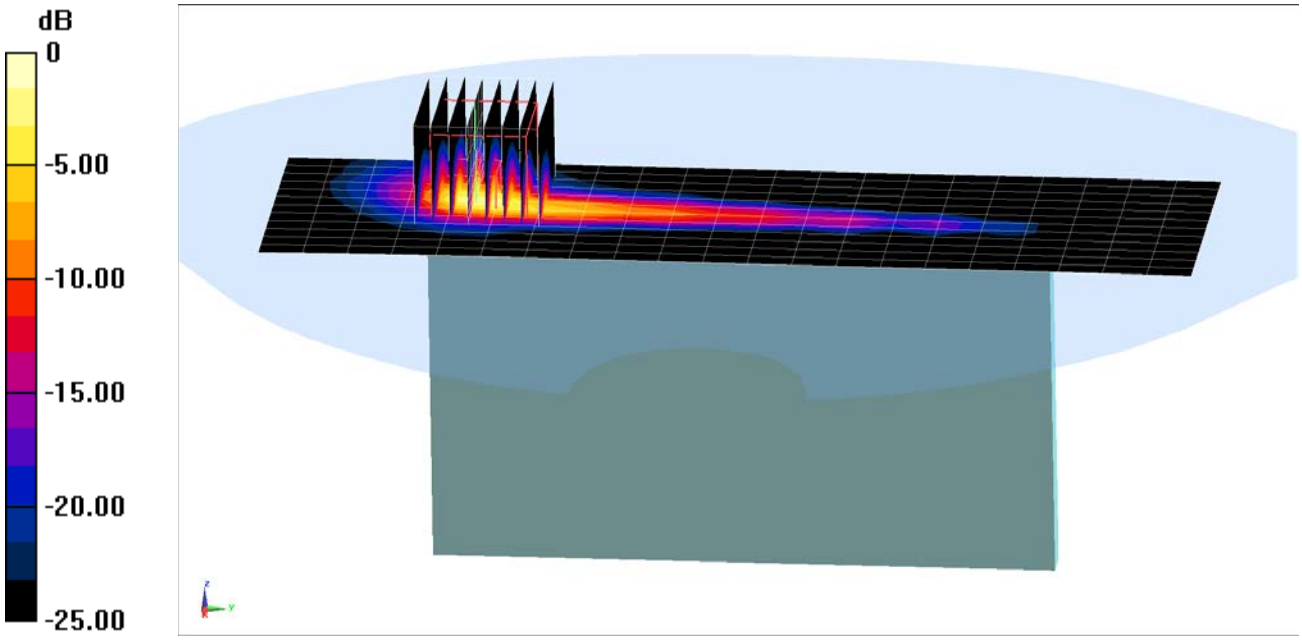
Communication System: UID 0, IEEE 802.11a; Frequency: 5180 MHz; Duty Cycle: 1:1
Medium: 5GHz Body Medium parameters used:
f = 5180 MHz; σ = 5.246 S/m; ε_r = 47.347; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 02-23-2015; Ambient Temp: 21.7°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN3949; ConvF(4.68, 4.68, 4.68); Calibrated: 8/21/2014;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 10/31/2014
Phantom: SAM Sub; Type: QD000P40CC; Serial: TP:1357
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: IEEE 802.11a, 5.2 GHz, Hand SAR, Ch 36, 6 Mbps, Right Edge, Standard Cover

Area Scan (13x22x1): Measurement grid: dx=5mm, dy=10mm
Zoom Scan (9x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio = 1.4
Reference Value = 20.56 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 10.9 W/kg
SAR (10 g) = 0.563 W/kg



0 dB = 6.33 W/kg = 8.01 dBW/kg

APPENDIX B: SYSTEM VERIFICATION

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PCTEST ENGINEERING LABORATORY, INC.

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

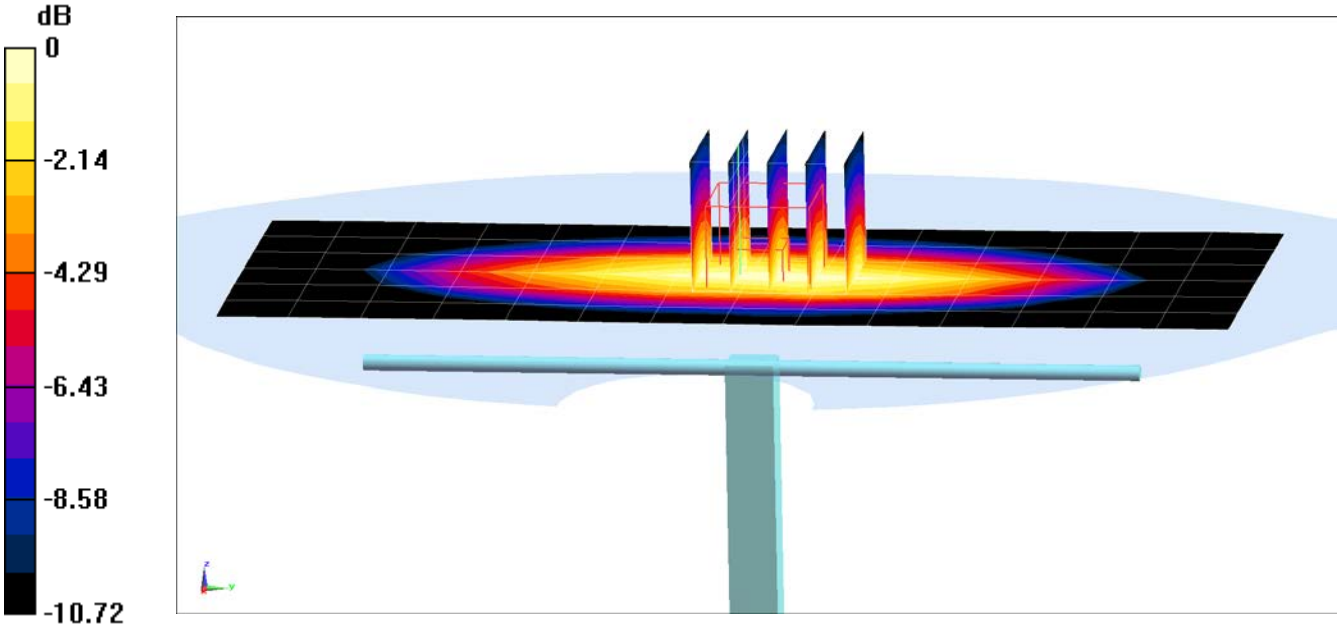
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 750 Head Medium parameters used (interpolated):
$f = 750$ MHz; $\sigma = 0.922$ S/m; $\varepsilon_r = 41.895$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 03-02-2015; Ambient Temp: 22.6°C; Tissue Temp: 21.3°C

Probe: ES3DV3 - SN3333; ConvF(6.55, 6.55, 6.55); Calibrated: 10/24/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1408; Calibrated: 10/23/2014
Phantom: Main TWIN SAM; Type: QD000P40CC; Serial: TP-1406
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) = 1.23 W/kg
SAR (1 g) = 0.824 W/kg
Deviation = 1.85%



0 dB = 0.962 W/kg = -0.17 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

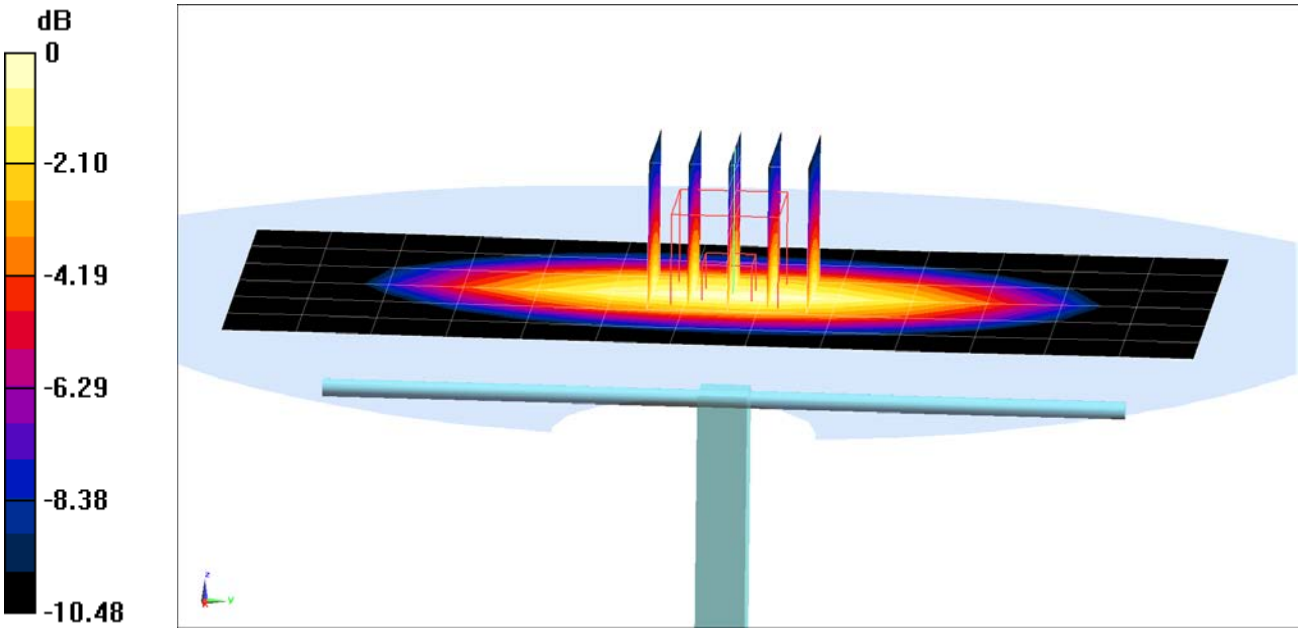
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used:
f = 835 MHz; σ = 0.89 S/m; ε_r = 40.23; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 02-27-2015; Ambient Temp: 23.3°C; Tissue Temp: 21.2°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) = 1.33 W/kg
SAR (1 g) = 0.908 W/kg
Deviation = -1.30%



0 dB = 1.06 W/kg = 0.25 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

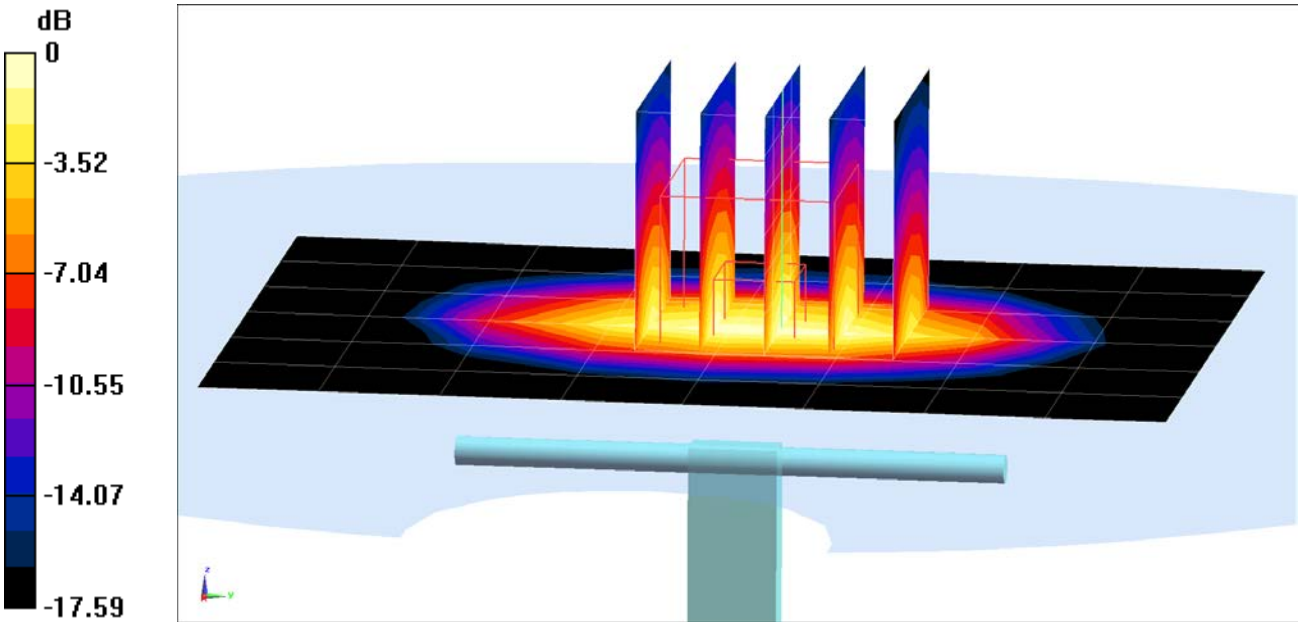
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Head Medium parameters used:
f = 1750 MHz; σ = 1.346 S/m; ε_r = 39.258; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-24-2015; Ambient Temp: 23.4°C; Tissue Temp: 22.2°C

Probe: ES3DV2 - SN3022; ConvF(5.04, 5.04, 5.04); 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)

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) = 6.50 W/kg
SAR (1 g) = 3.64 W/kg
Deviation = -1.36%



0 dB = 4.57 W/kg = 6.60 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

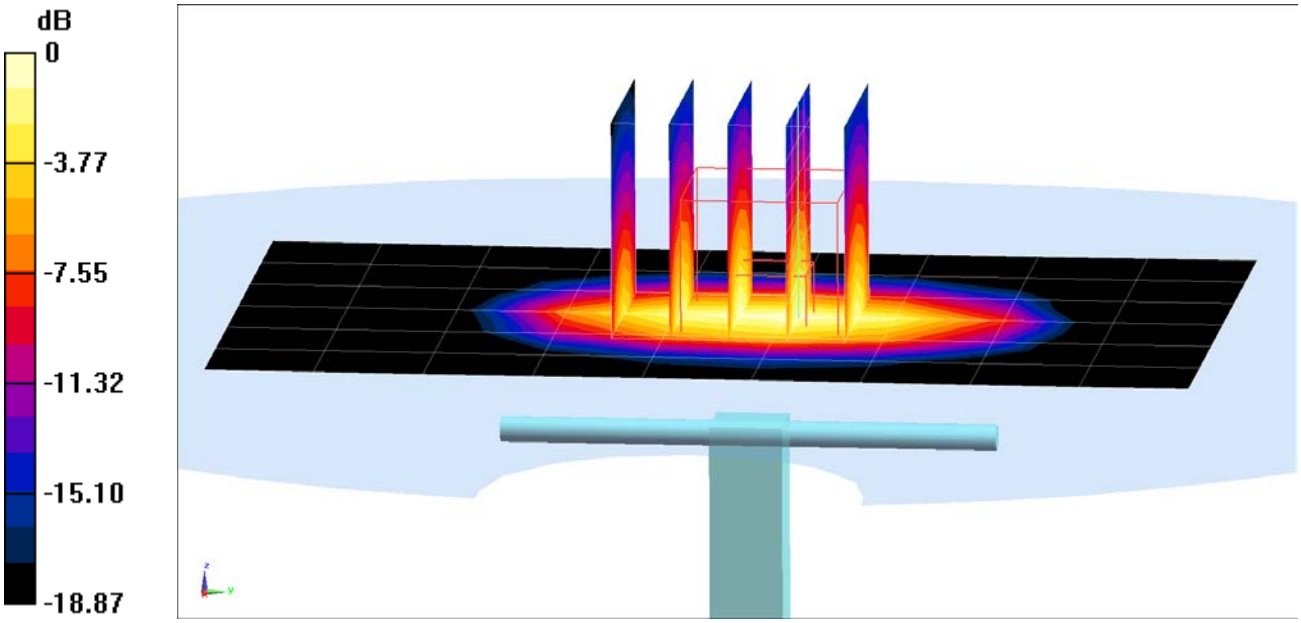
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.407 S/m; ε_r = 38.858; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-02-2015; Ambient Temp: 23.4°C; Tissue Temp: 21.8°C

Probe: ES3DV2 - SN3022; ConvF(4.85, 4.85, 4.85); 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)

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) = 7.01 W/kg
SAR (1 g) = 3.87 W/kg
Deviation = -3.73%



0 dB = 4.83 W/kg = 6.84 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 797

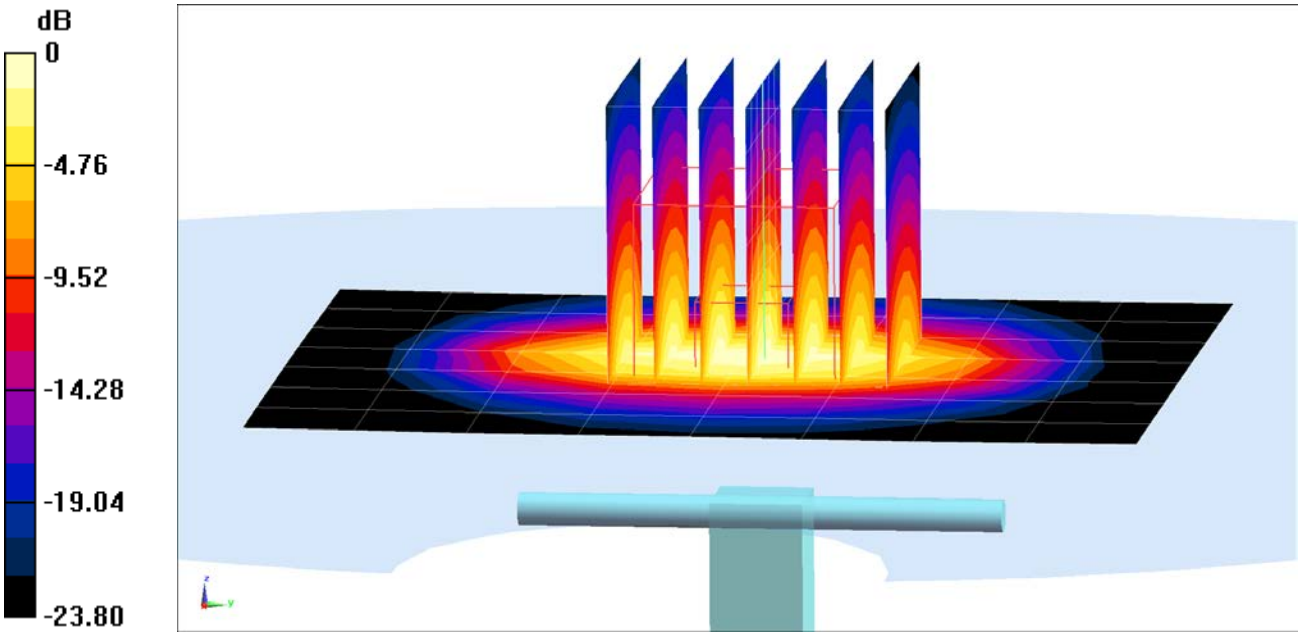
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used:
f = 2450 MHz; σ = 1.885 S/m; ε_r = 39.202; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-26-2015; Ambient Temp: 24.5°C; Tissue Temp: 23.5°C

Probe: ES3DV3 - SN3331; ConvF(4.48, 4.48, 4.48); Calibrated: 8/20/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 10/31/2014
Phantom: SAM Main; Type: QD000P40CC; Serial: TP 1114
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) = 11.6 W/kg
SAR (1 g) = 5.34 W/kg
Deviation = 2.50%



0 dB = 7.05 W/kg = 8.48 dBW/kg

DUT: Dipole 5200 MHz; Type: D5GHzV2; Serial: 1057

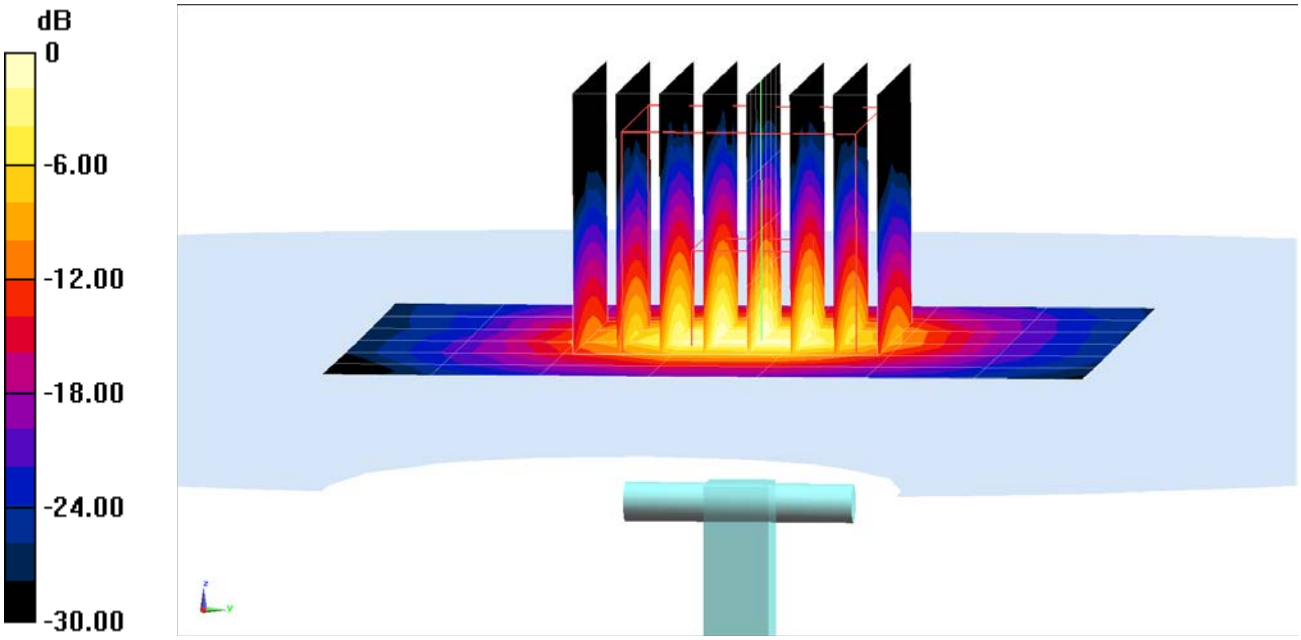
Communication System: UID 0, CW; Frequency: 5200 MHz; Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
f = 5200 MHz; σ = 4.591 S/m; ε_r = 36.146; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-02-2015; Ambient Temp: 24.1°C; Tissue Temp: 21.1°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 with CRP v5.0; 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 (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio = 1.4
Input Power = 17 dBm (50 mW)
Peak SAR (extrapolated) = 15.9 W/kg
SAR (1 g) = 3.95 W/kg
Deviation = -3.07%



0 dB = 9.26 W/kg = 9.67 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5300 MHz; Type: D5GHzV2; Serial: 1057

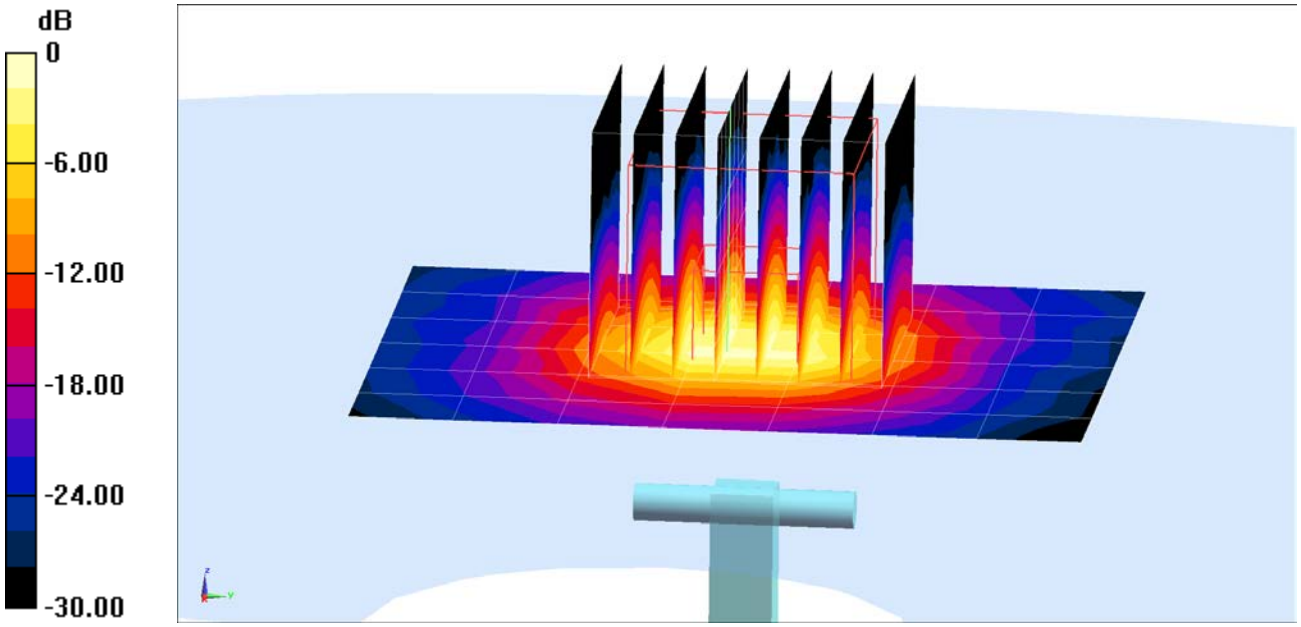
Communication System: UID 0, CW; Frequency: 5300 MHz; Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
f = 5300 MHz; σ = 4.696 S/m; ε_r = 35.997; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-02-2015; Ambient Temp: 24.2°C; Tissue Temp: 21.0°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)

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 = 17 dBm (50 mW)
Peak SAR (extrapolated) = 17.0 W/kg
SAR (1 g) = 4.13 W/kg
Deviation = -2.48%



0 dB = 9.72 W/kg = 9.88 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5500 MHz; Type: D5GHzV2; Serial: 1057

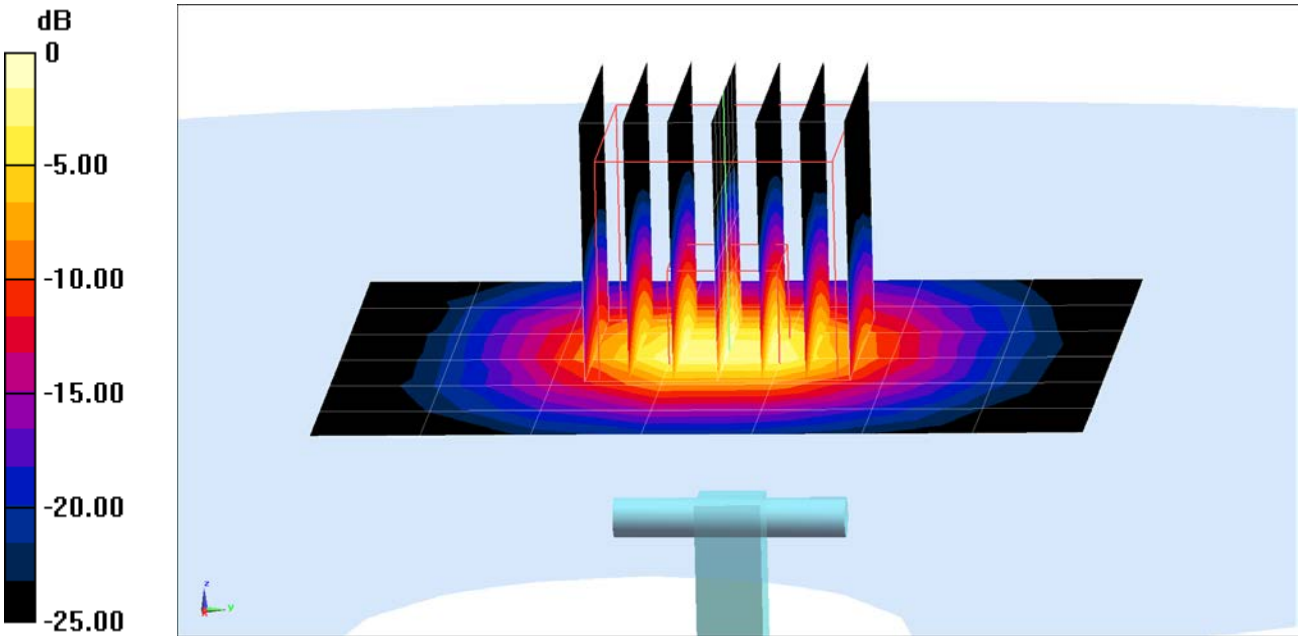
Communication System: UID 0, CW; Frequency: 5500 MHz; Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
f = 5500 MHz; σ = 4.911 S/m; ε_r = 35.654; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-02-2015; Ambient Temp: 24.0°C; Tissue Temp: 21.2°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 with CRP v5.0; 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 = 17 dBm (50 mW)
Peak SAR (extrapolated) = 16.0 W/kg
SAR (1 g) = 3.85 W/kg
Deviation = -8.66%



0 dB = 9.94 W/kg = 9.97 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5600 MHz; Type: D5GHzV2; Serial: 1057

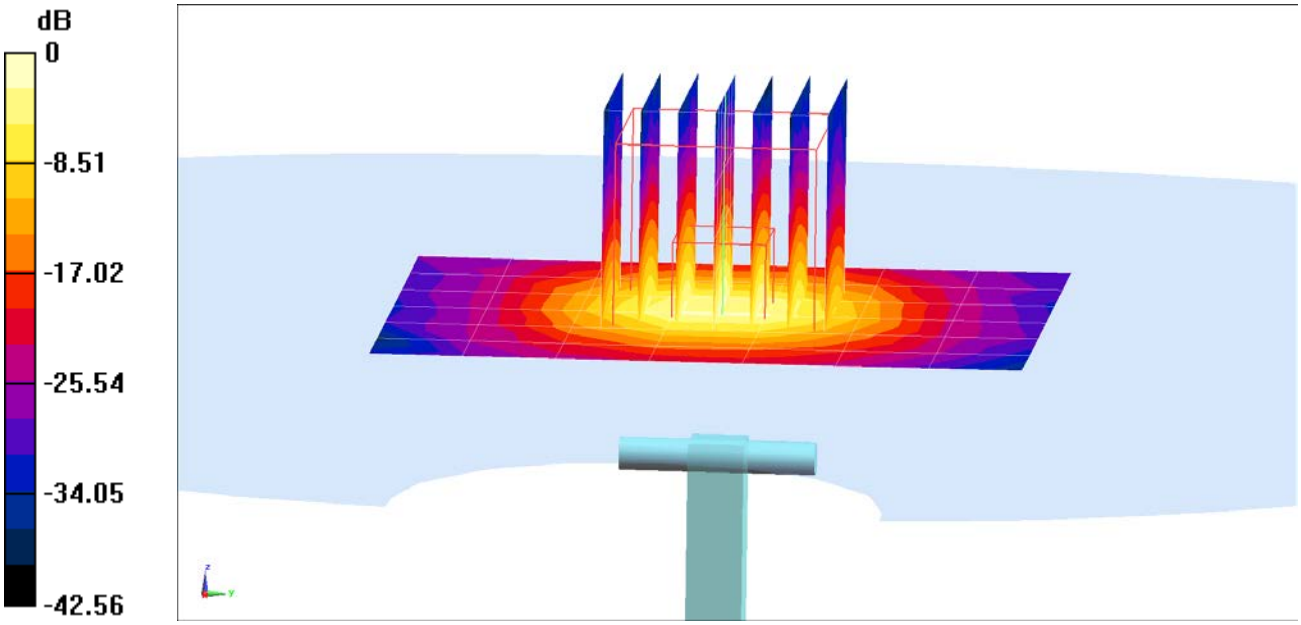
Communication System: UID 0, CW; Frequency: 5600 MHz; Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
f = 5600 MHz; σ = 5.001 S/m; ε_r = 35.487; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-02-2015; Ambient Temp: 24.2°C; Tissue Temp: 21.1°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 with CRP v5.0; 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 (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 = 17 dBm (50 mW)
Peak SAR (extrapolated) = 17.1 W/kg
SAR (1 g) = 4.06 W/kg
Deviation = -3.10%



0 dB = 10.5 W/kg = 10.21 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5800 MHz; Type: D5GHzV2; Serial: 1057

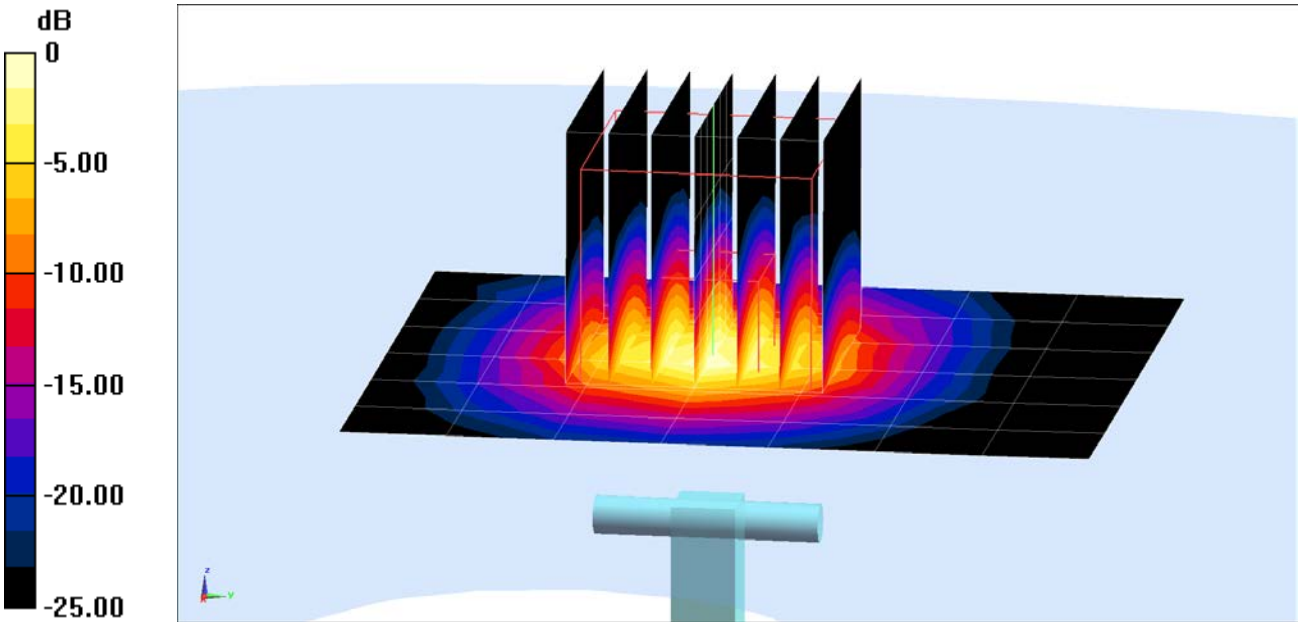
Communication System: UID 0, CW; Frequency: 5800 MHz; Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
f = 5800 MHz; σ = 5.19 S/m; ε_r = 35.261; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-02-2015; Ambient Temp: 24.1°C; Tissue Temp: 21.0°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 with CRP v5.0; 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 (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 = 17 dBm (50 mW)
Peak SAR (extrapolated) = 17.4 W/kg
SAR (1 g) = 3.89 W/kg
Deviation = -4.07%



0 dB = 10.4 W/kg = 10.17 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

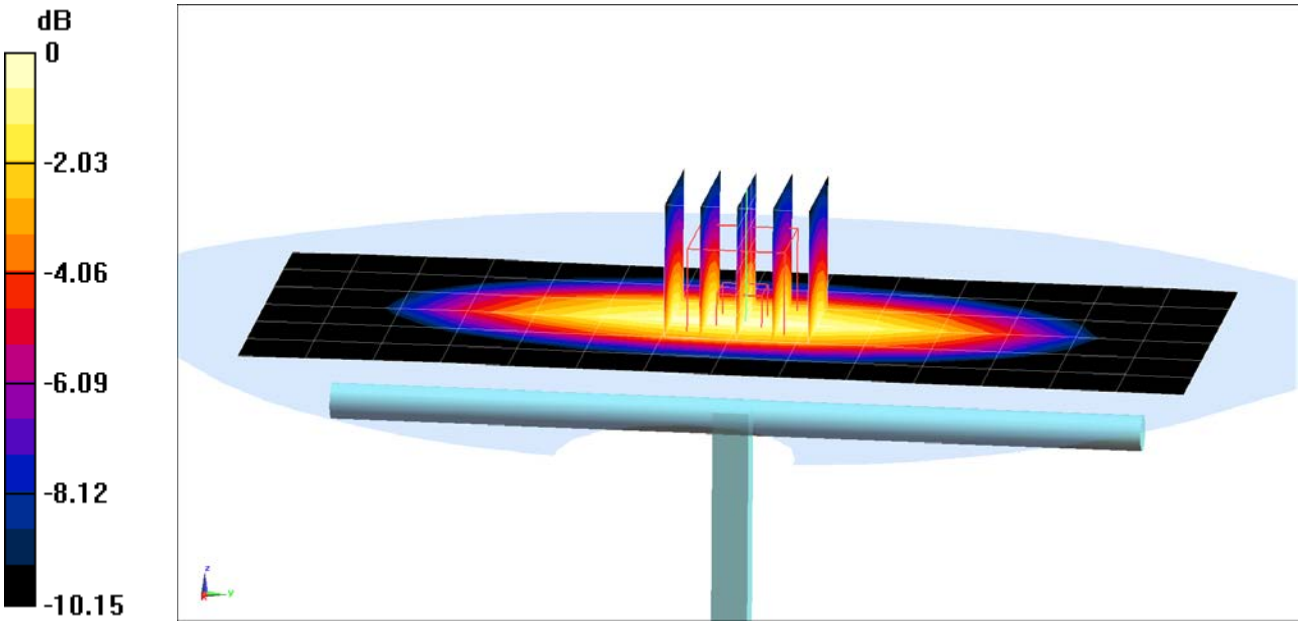
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
$f = 750$ MHz; $\sigma = 0.983$ S/m; $\varepsilon_r = 54.339$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 03-02-2015; Ambient Temp: 23.2°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3334; ConvF(6.09, 6.09, 6.09); 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)

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) = 1.27 W/kg
SAR (1 g) = 0.872 W/kg
Deviation = 3.07%



0 dB = 1.01 W/kg = 0.04 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d132

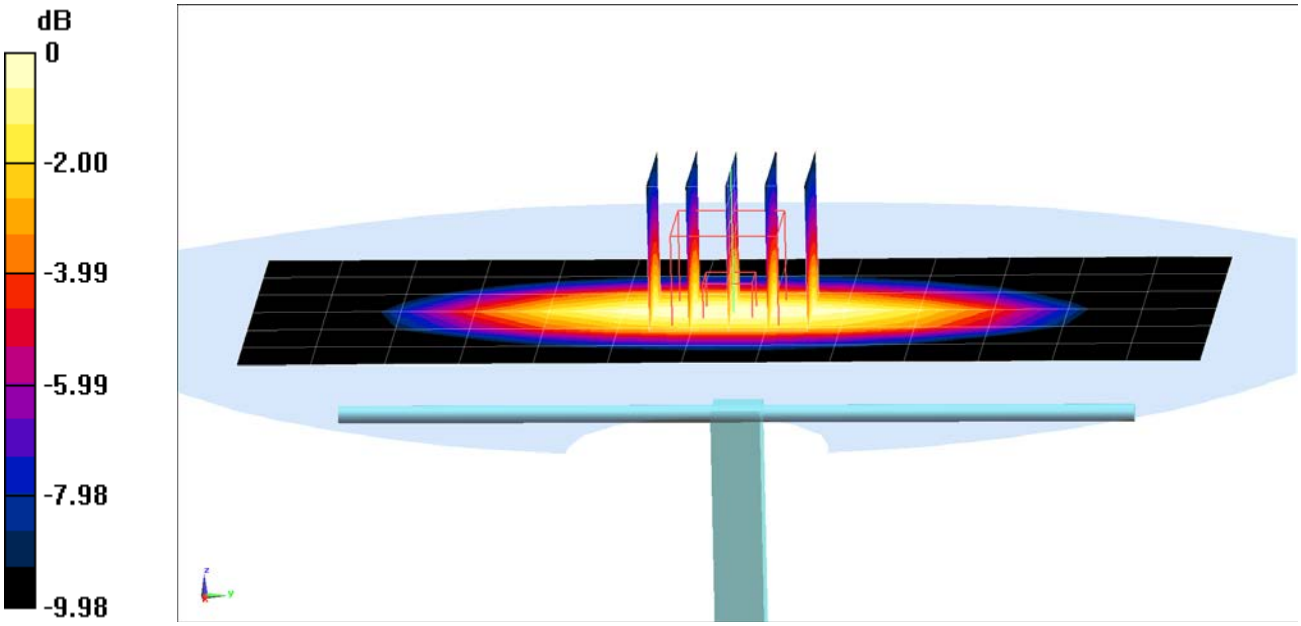
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used:
f = 835 MHz; σ = 0.95 S/m; ε_r = 54.182; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 02-25-2015; Ambient Temp: 22.4°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3333; ConvF(6.12, 6.12, 6.12); Calibrated: 10/24/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1408; Calibrated: 10/23/2014
Phantom: Sub TWIN SAM; Type: QD000P40CC; Serial: TP-1357
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) = 1.41 W/kg
SAR (1 g) = 0.977 W/kg
Deviation = 6.89%



0 dB = 1.13 W/kg = 0.53 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

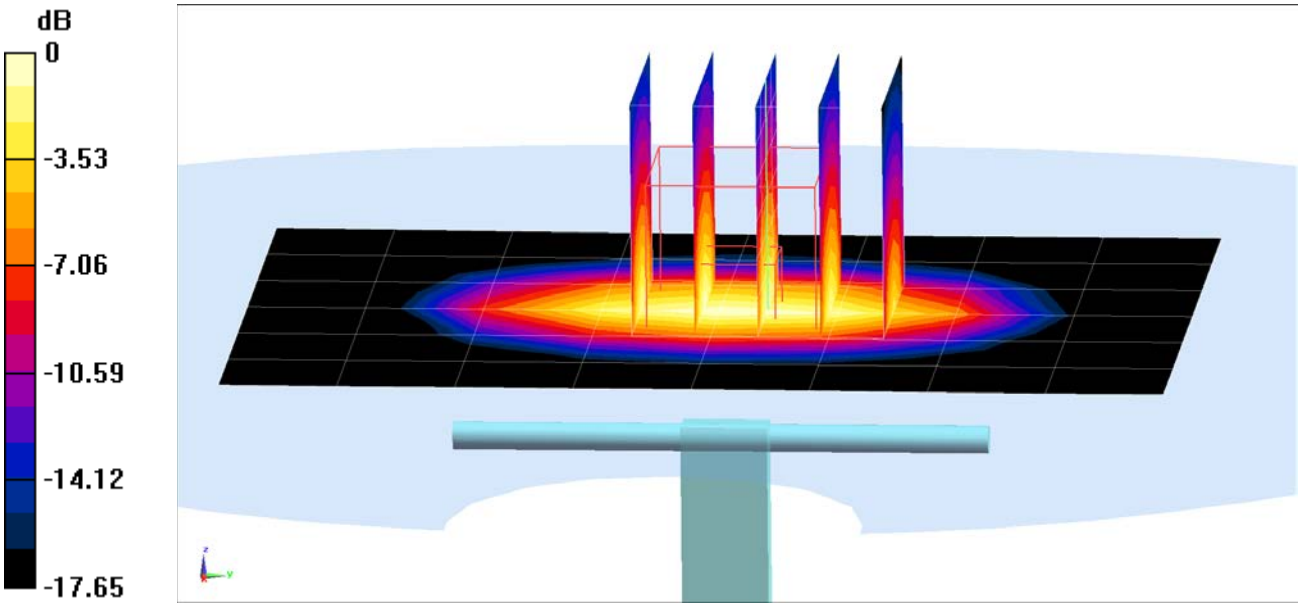
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used:
f = 1750 MHz; σ = 1.464 S/m; ε_r = 51.093; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-25-2015; Ambient Temp: 23.8°C; Tissue Temp: 22.4°C

Probe: ES3DV2 - SN3022; ConvF(4.7, 4.7, 4.7); 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)

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) = 6.39 W/kg
SAR (1 g) = 3.54 W/kg
Deviation = -5.85%



0 dB = 4.31 W/kg = 6.34 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

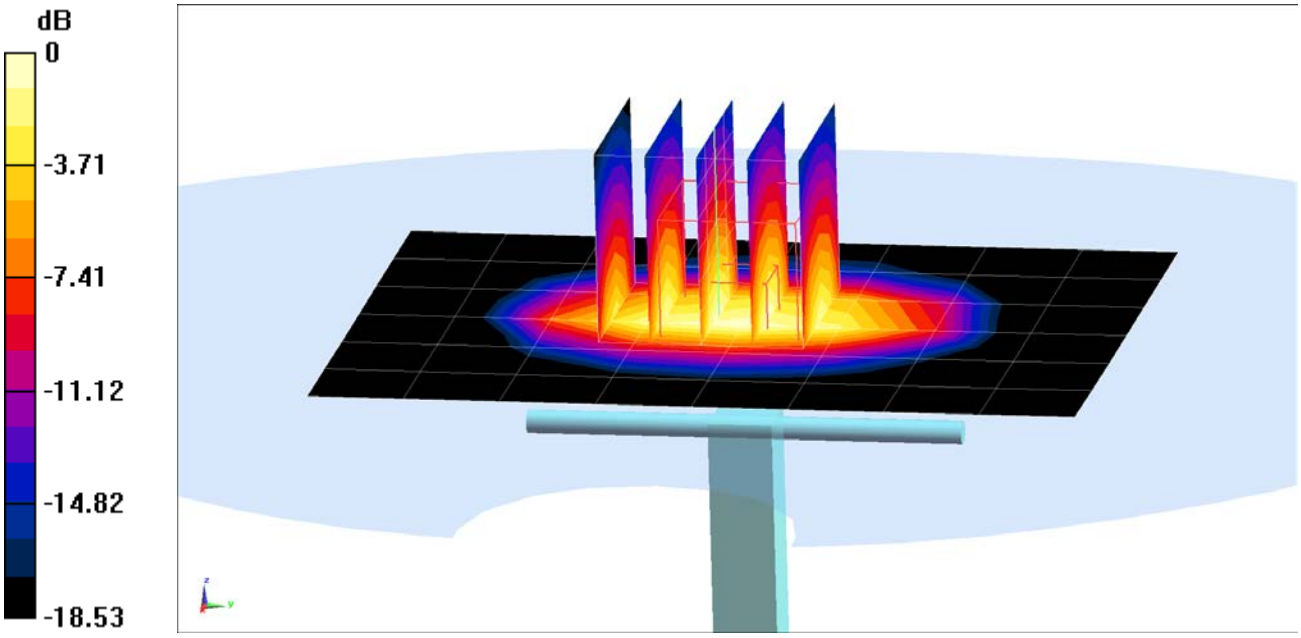
Communication System: UID 10000, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.547 S/m; ε_r = 51.249; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-28-2015; Ambient Temp: 23.4°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3213; ConvF(4.72, 4.72, 4.72); Calibrated: 1/20/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 1/19/2015
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 (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) = 7.44 W/kg
SAR (1 g) = 4.13 W/kg
Deviation = 2.23%



0 dB = 5.13 W/kg = 7.10 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 797

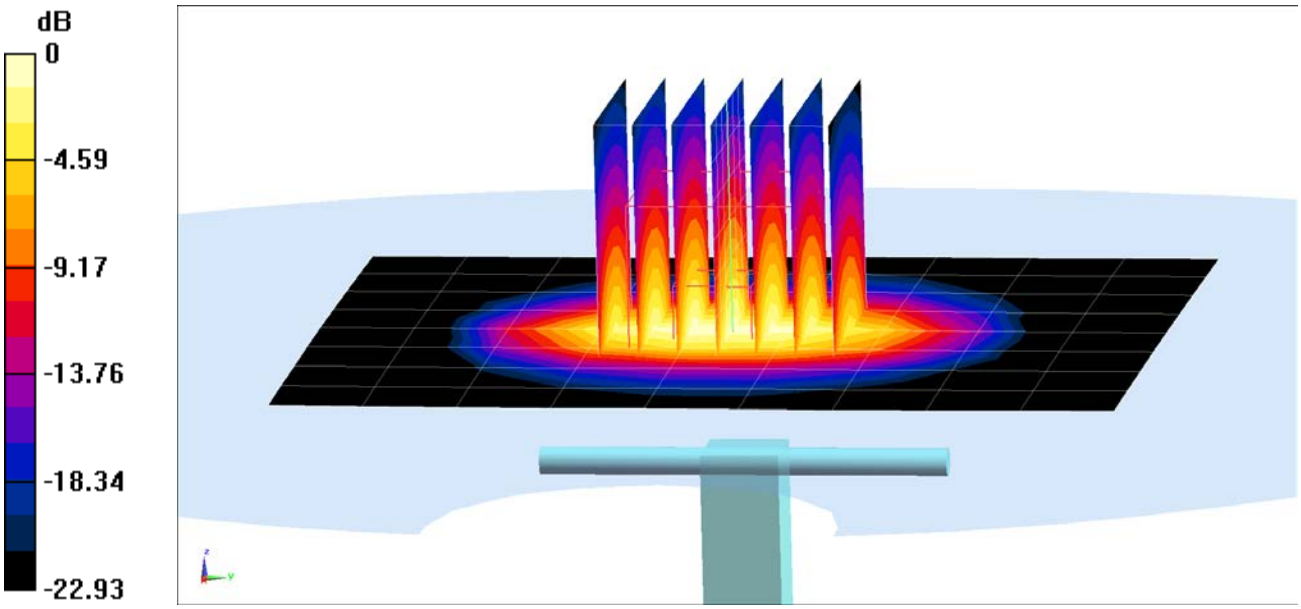
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used:
f = 2450 MHz; σ = 1.916 S/m; ε_r = 50.214; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-25-2015; Ambient Temp: 23.1°C; Tissue Temp: 24.5°C

Probe: ES3DV3 - SN3331; ConvF(4.29, 4.29, 4.29); Calibrated: 8/20/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 10/31/2014
Phantom: SAM Main; Type: QD000P40CC; Serial: TP 1114
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

2450 MHz System Verification

Area Scan (9x10x1): 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) = 12.2 W/kg
SAR (1 g) = 5.34 W/kg
Deviation = 5.95%



0 dB = 7.09 W/kg = 8.51 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

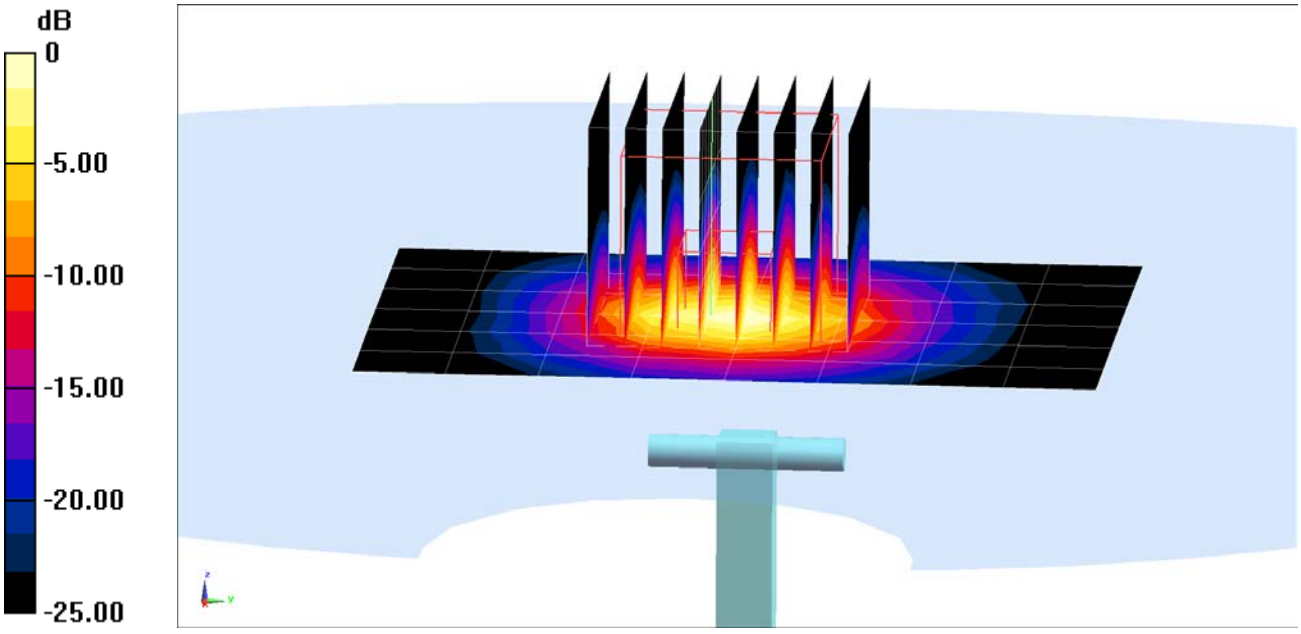
Communication System: UID 0, CW; Frequency: 5200 MHz; Duty Cycle: 1:1
Medium: 5GHz Body Medium parameters used:
f = 5200 MHz; σ = 5.284 S/m; ε_r = 47.301; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-23-2015; Ambient Temp: 21.7°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN3949; ConvF(4.68, 4.68, 4.68); Calibrated: 8/21/2014;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 10/31/2014
Phantom: SAM Sub; Type: QD000P40CC; Serial: TP:1357
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

5200 MHz System Verification

Area Scan (7x9x1): 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 = 17 dBm (50 mW)
Peak SAR (extrapolated) = 16.8 W/kg
SAR (1 g) = 4.06 W/kg; SAR (10 g) = 1.13 W/kg
Deviation (1 g) = 4.37%; Deviation (10 g) = 4.63%



0 dB = 9.54 W/kg = 9.80 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

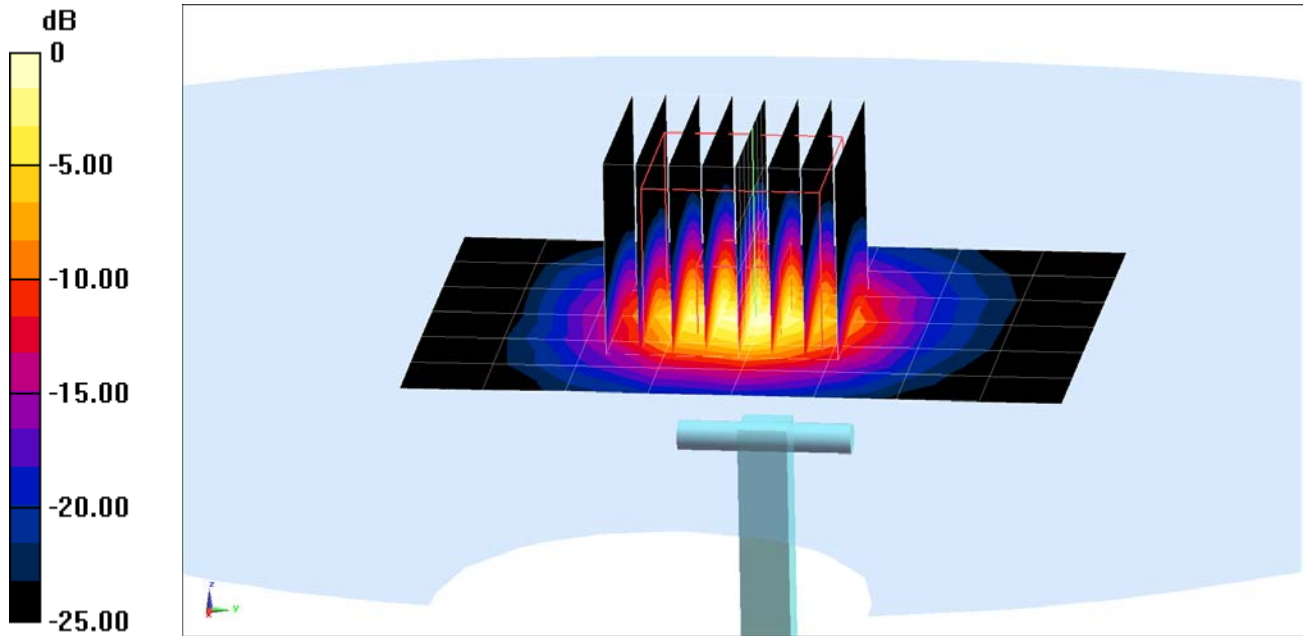
Communication System: UID 0, CW; Frequency: 5300 MHz; Duty Cycle: 1:1
Medium: 5GHz Body Medium parameters used:
f = 5300 MHz; σ = 5.425 S/m; ε_r = 47.01; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-23-2015; Ambient Temp: 21.6°C; Tissue Temp: 23.1°C

Probe: EX3DV4 - SN3949; ConvF(4.47, 4.47, 4.47); Calibrated: 8/21/2014;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 10/31/2014
Phantom: SAM Sub; Type: QD000P40CC; Serial: TP:1357
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

5300 MHz System Verification

Area Scan (7x9x1): 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 = 17 dBm (50 mW)
Peak SAR (extrapolated) = 18.1 W/kg
SAR (1 g) = 4.24 W/kg; SAR (10 g) = 1.17 W/kg
Deviation (1 g) = 6.13%; Deviation (10 g) = 4.93%



0 dB = 10.4 W/kg = 10.17 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

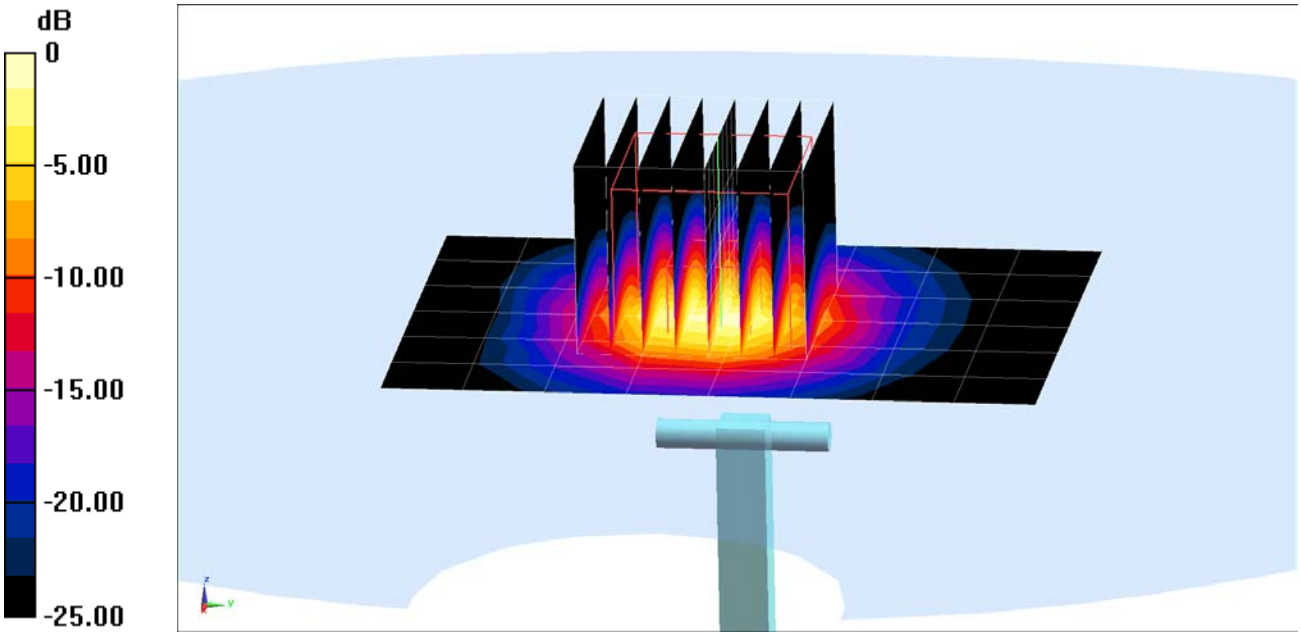
Communication System: UID 0, CW; Frequency: 5500 MHz; Duty Cycle: 1:1
Medium: 5GHz Body Medium parameters used:
f = 5500 MHz; σ = 5.729 S/m; ε_r = 46.574; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-23-2015; Ambient Temp: 21.5°C; Tissue Temp: 23.2°C

Probe: EX3DV4 - SN3949; ConvF(4.16, 4.16, 4.16); Calibrated: 8/21/2014;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 10/31/2014
Phantom: SAM Sub; Type: QD000P40CC; Serial: TP:1357
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

5500 MHz System Verification

Area Scan (7x9x1): 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 = 17 dBm (50 mW)
Peak SAR (extrapolated) = 18.8 W/kg
SAR (1 g) = 4.36 W/kg; SAR (10 g) = 1.2 W/kg
Deviation (1 g) = 4.93%; Deviation (10 g) = 4.35%



0 dB = 10.5 W/kg = 10.21 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

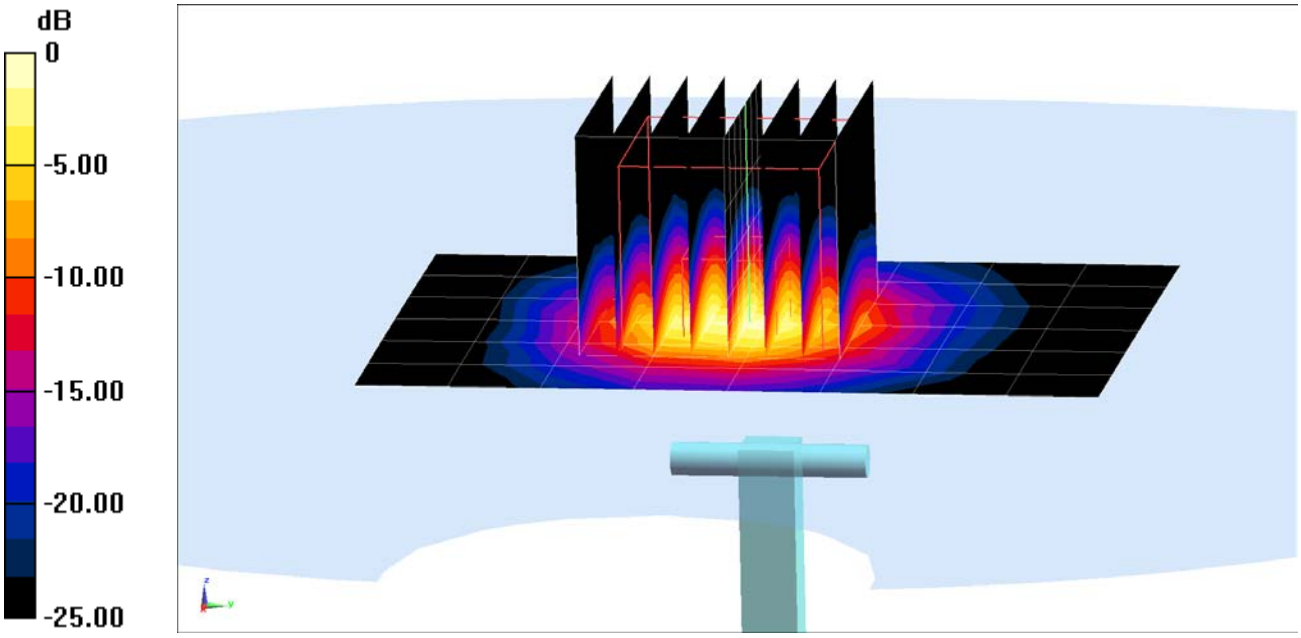
Communication System: UID 0, CW; Frequency: 5800 MHz; Duty Cycle: 1:1
Medium: 5GHz Body Medium parameters used:
f = 5800 MHz; σ = 6.168 S/m; ε_r = 45.889; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-23-2015; Ambient Temp: 21.7°C; Tissue Temp: 23.1°C

Probe: EX3DV4 - SN3949; ConvF(4.27, 4.27, 4.27); Calibrated: 8/21/2014;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 10/31/2014
Phantom: SAM Sub; Type: QD000P40CC; Serial: TP:1357
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

5800 MHz System Verification

Area Scan (7x9x1): 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 = 17 dBm (50 mW)
Peak SAR (extrapolated) = 18.6 W/kg
SAR (1 g) = 3.9 W/kg
Deviation = 0.00%



0 dB = 9.83 W/kg = 9.93 dBW/kg

APPENDIX C: PROBE CALIBRATION

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

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

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

Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D750V3-1003_Jan15

CALIBRATION CERTIFICATE

Object	D750V3 - SN: 1003
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	January 16, 2015

CC 2/3/15

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-14 (No. ES3-3205_Dec14)	Dec-15
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: January 19, 2015

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

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

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

Accredited by the Swiss Accreditation Service (SAS)
Accreditation No.: SCS 0108
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "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	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.7 ± 6 %	0.91 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	2.06 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.09 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.32 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	56.0 ± 6 %	0.99 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.16 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**8.46 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.42 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**5.58 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.7 Ω - 1.4 jΩ
Return Loss	- 28.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.3 Ω - 3.8 jΩ
Return Loss	- 27.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.043 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	January 21, 2009

DASY5 Validation Report for Head TSL

Date: 16.01.2015

Test Laboratory: SPEAG, Zurich, Switzerland

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

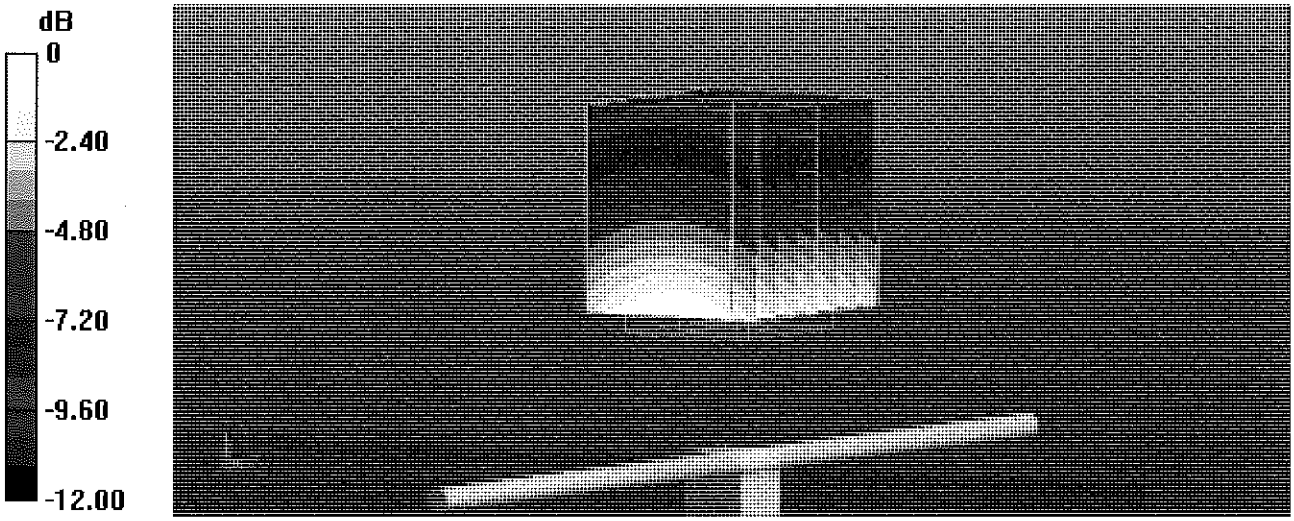
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.91 S/m; ε_r = 41.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.44, 6.44, 6.44); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

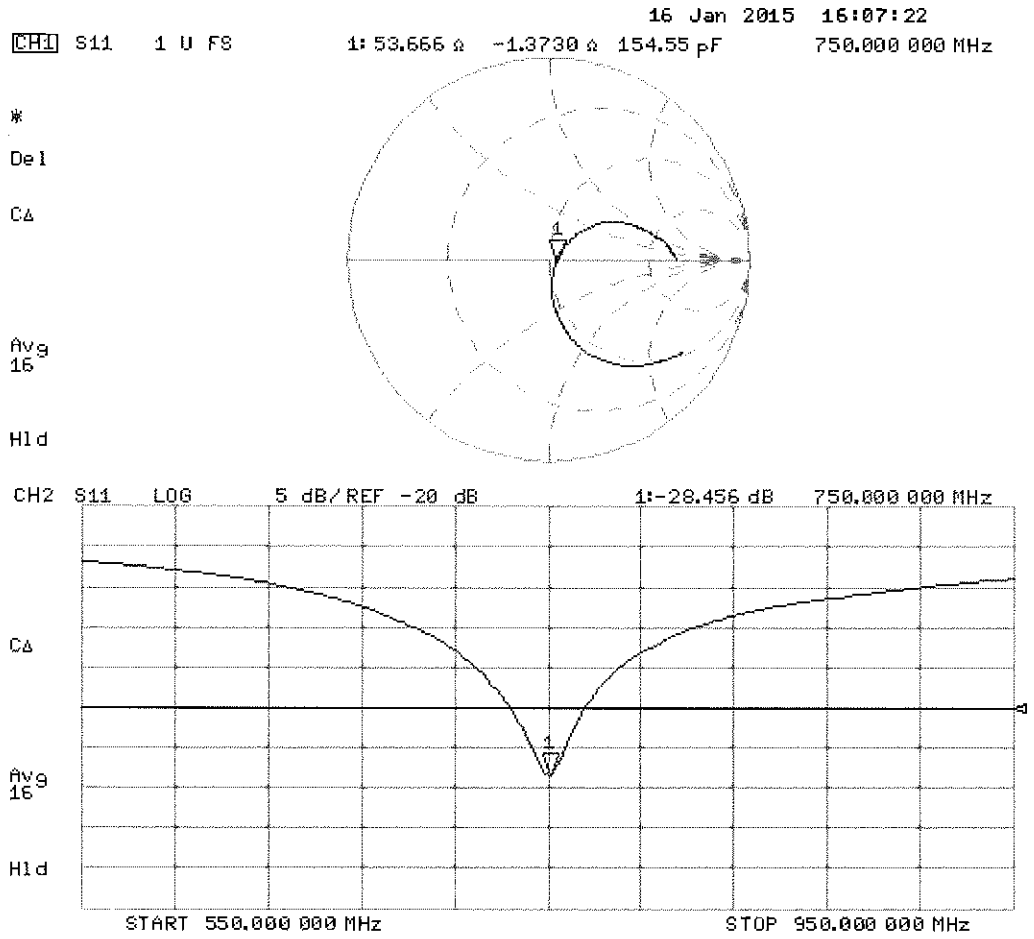
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.08 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.05 W/kg
SAR(1 g) = 2.06 W/kg; SAR(10 g) = 1.35 W/kg
Maximum value of SAR (measured) = 2.41 W/kg



0 dB = 2.41 W/kg = 3.82 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 16.01.2015

Test Laboratory: SPEAG, Zurich, Switzerland

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

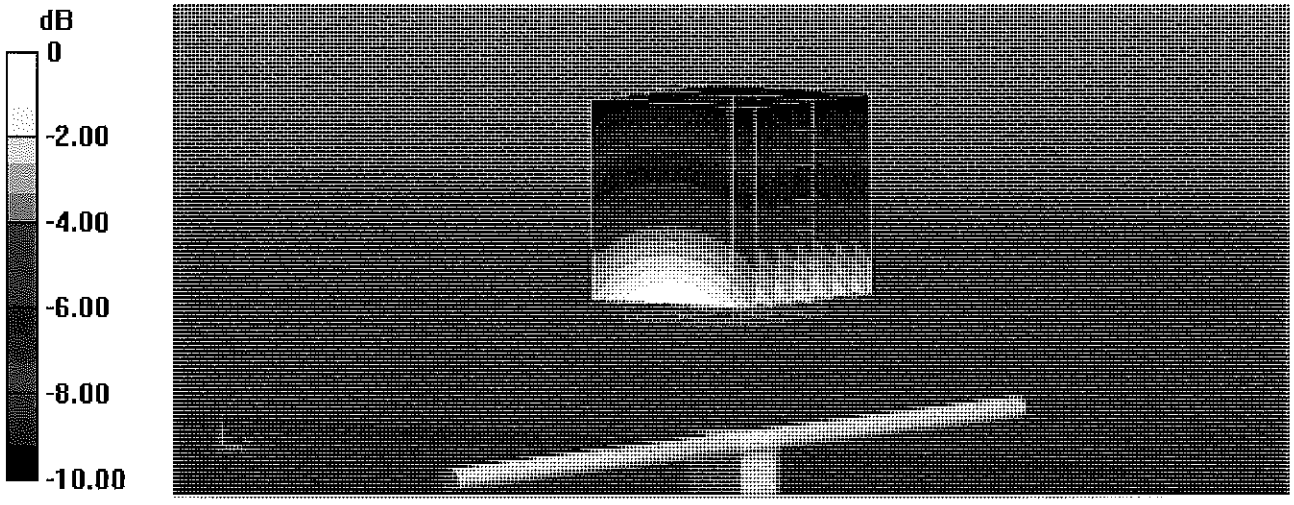
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.99 S/m; ε_r = 56; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.21, 6.21, 6.21); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

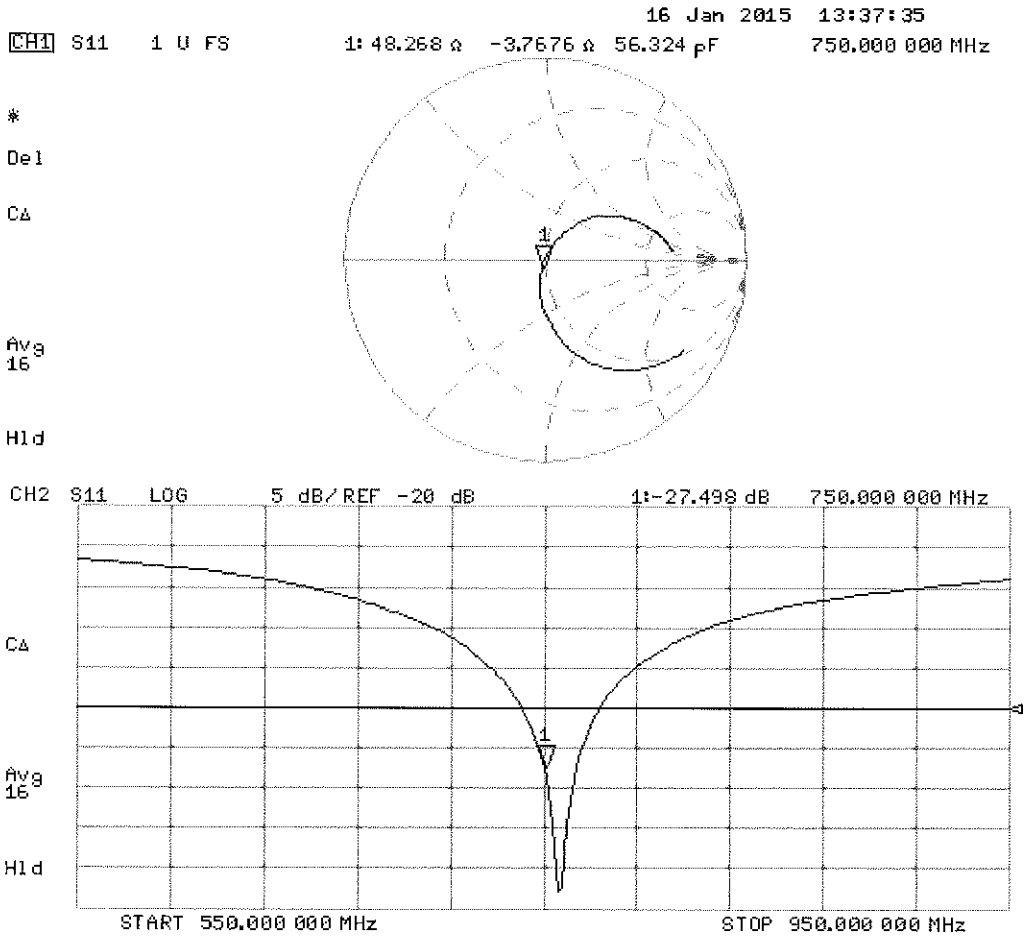
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.21 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 3.16 W/kg
SAR(1 g) = 2.16 W/kg; SAR(10 g) = 1.42 W/kg
Maximum value of SAR (measured) = 2.52 W/kg



0 dB = 2.52 W/kg = 4.01 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

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Accreditation No.: **SCS 108**

Accredited by the Swiss Accreditation Service (SAS)
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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) 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

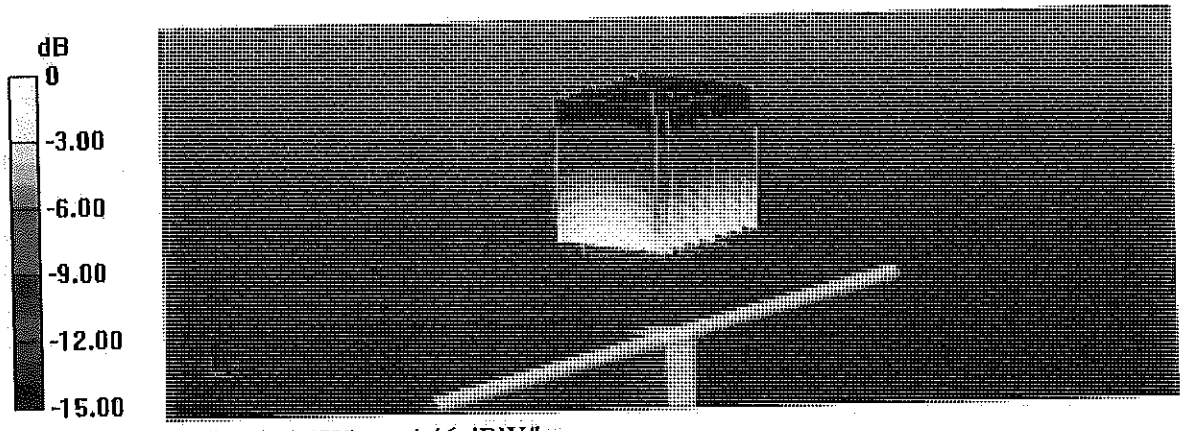
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.94 S/m; ε_r = 41.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

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)

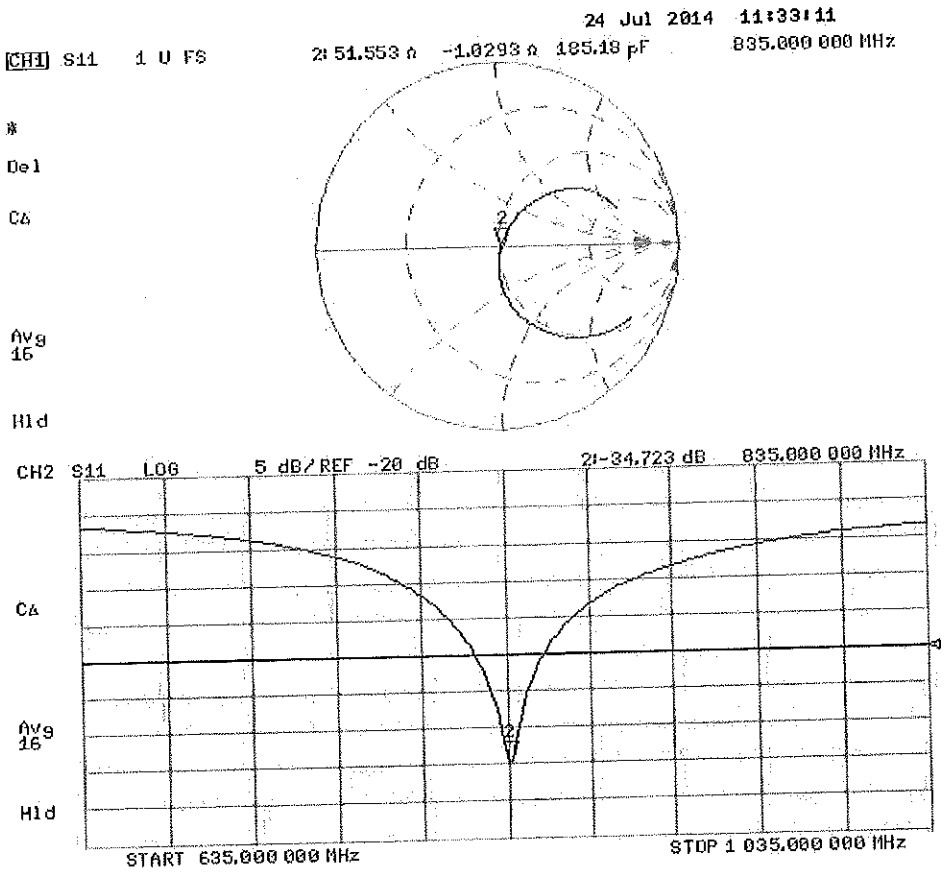
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

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

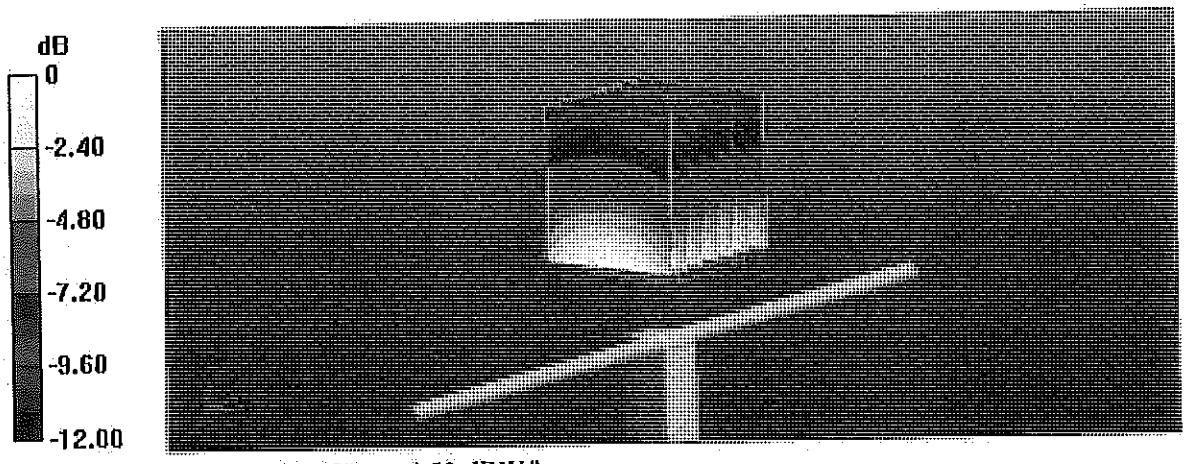
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 1.02 S/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

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)

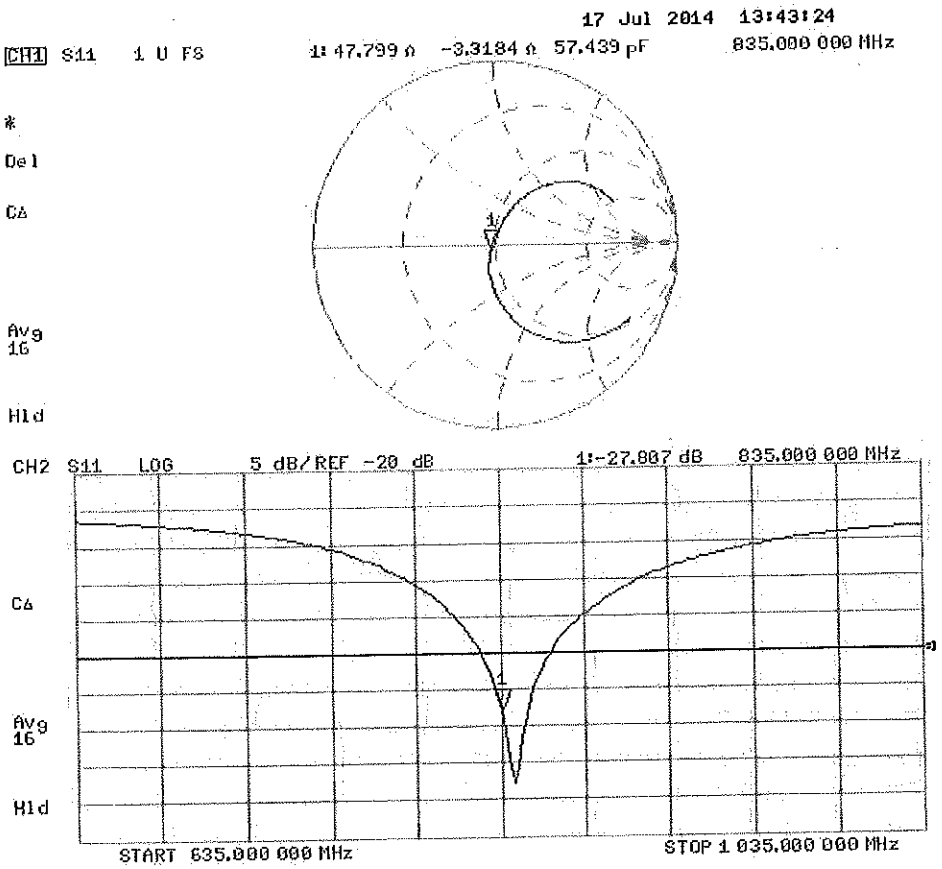
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

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



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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

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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) 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

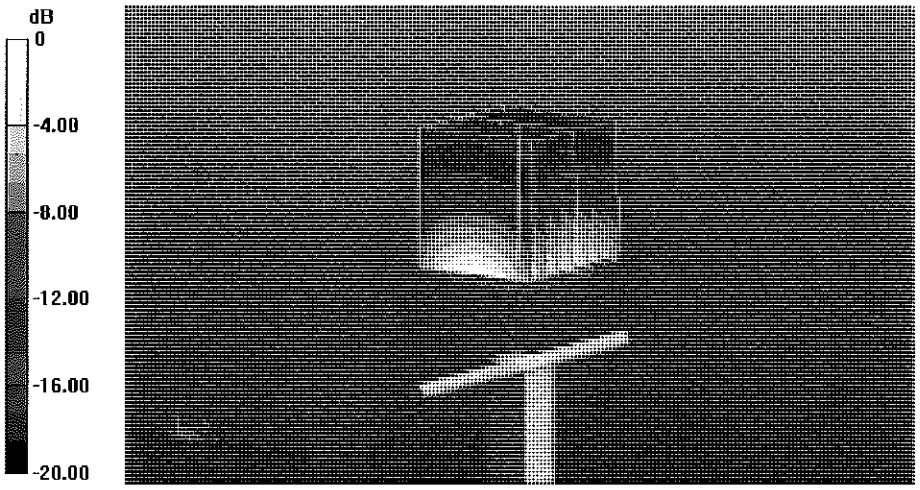
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.36 S/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

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)

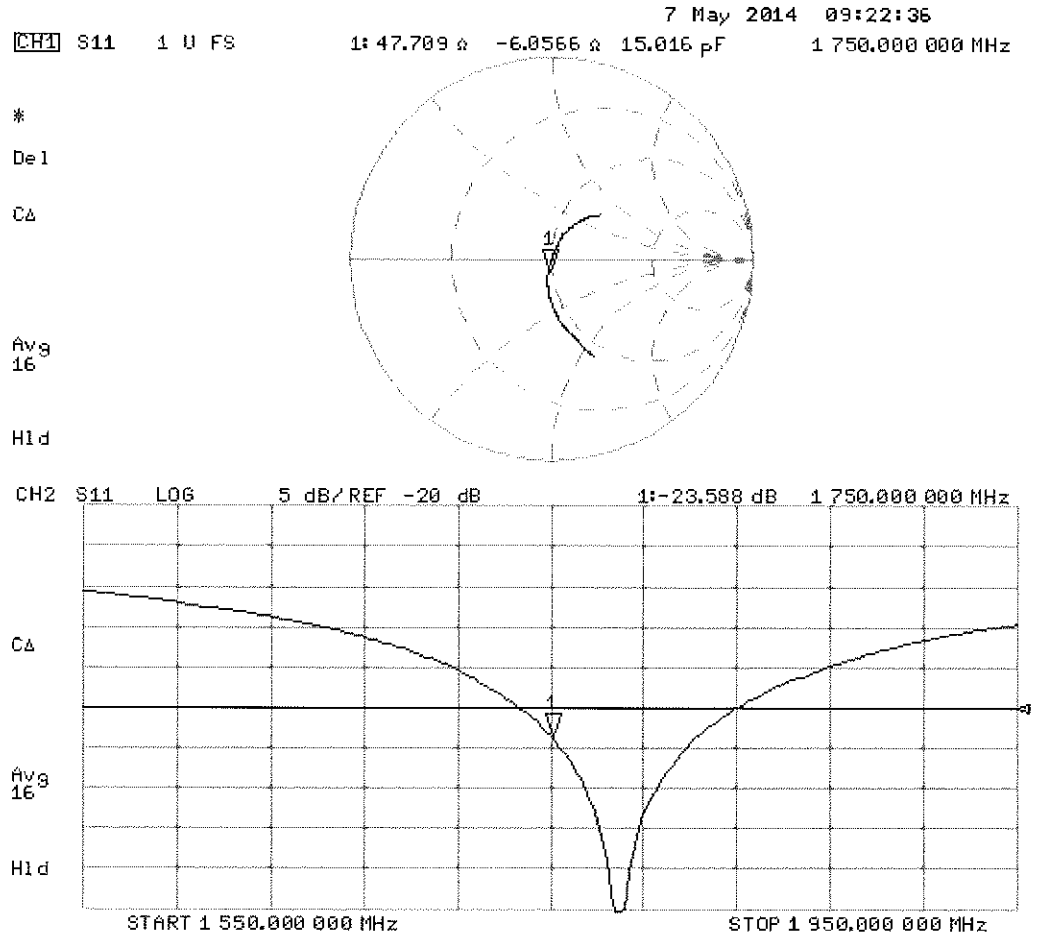
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

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

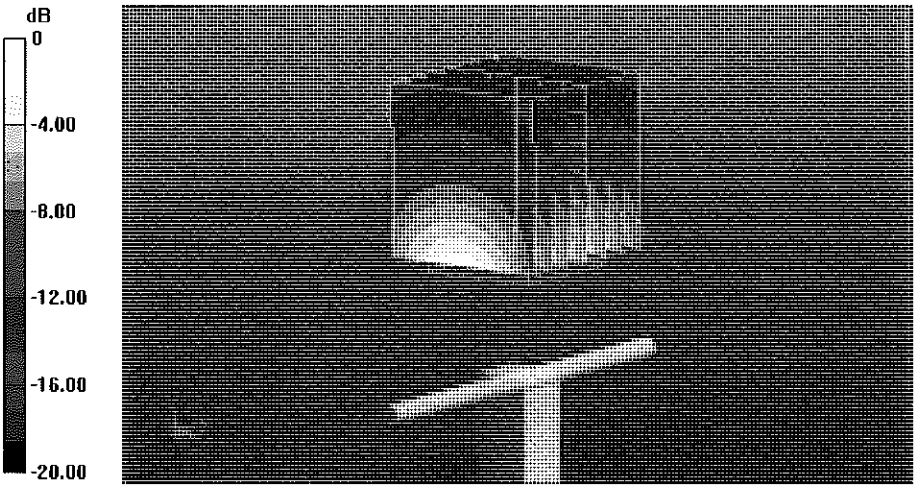
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.48 S/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

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)

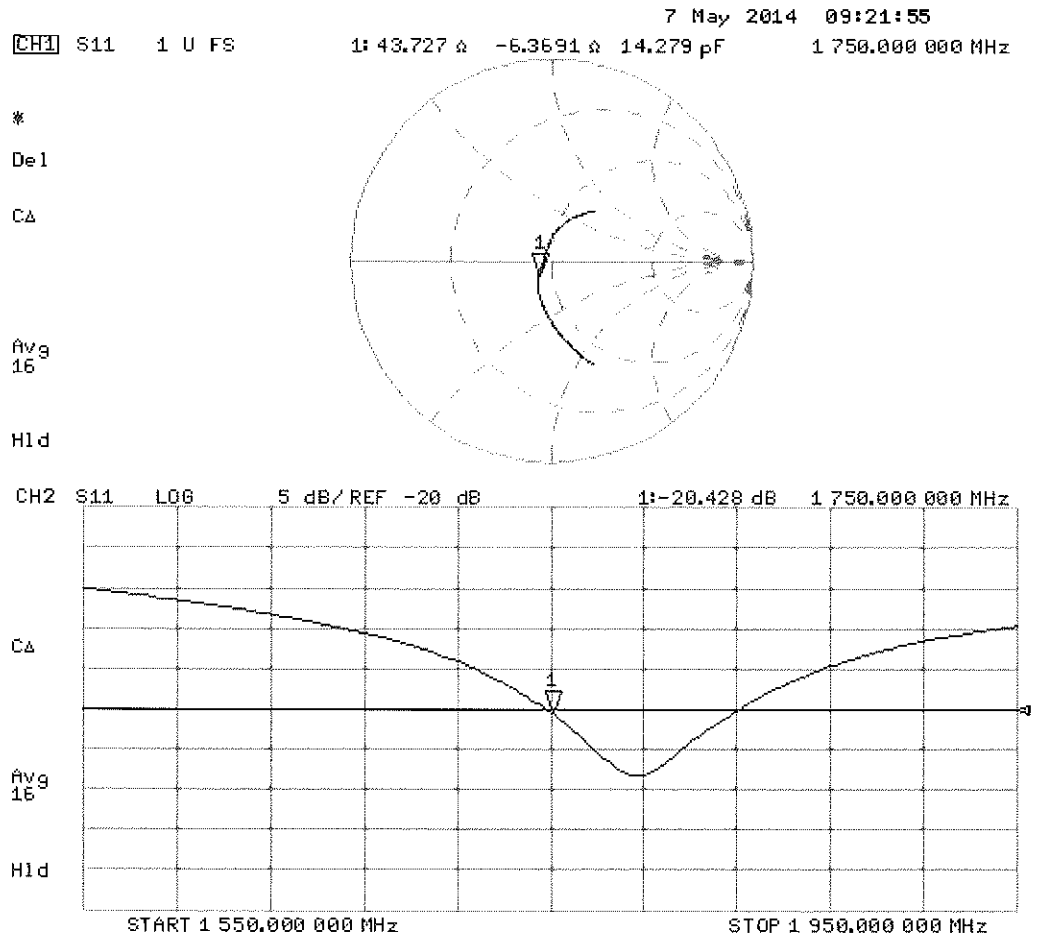
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

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



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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

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

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

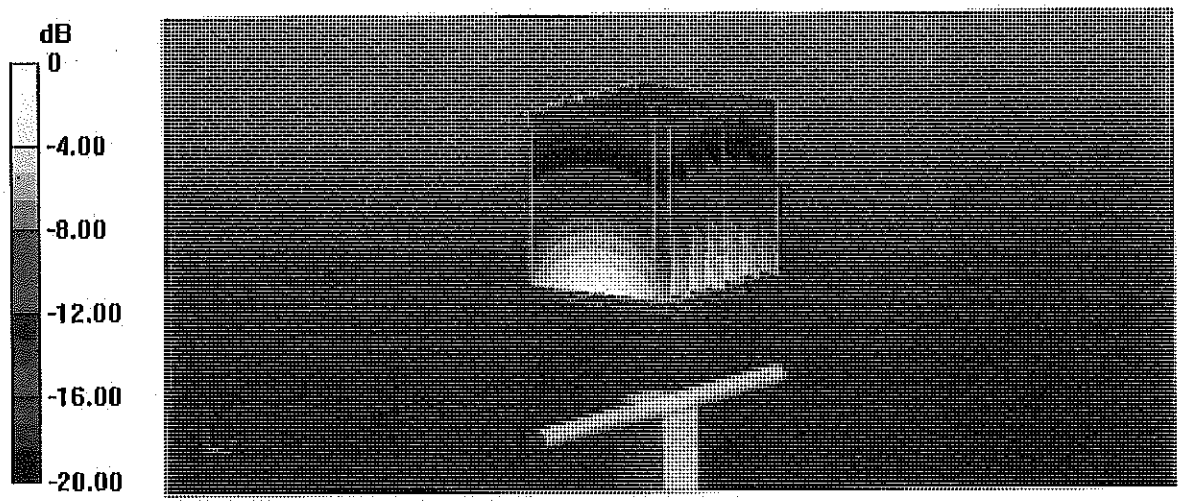
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.38 S/m; ε_r = 39.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

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)

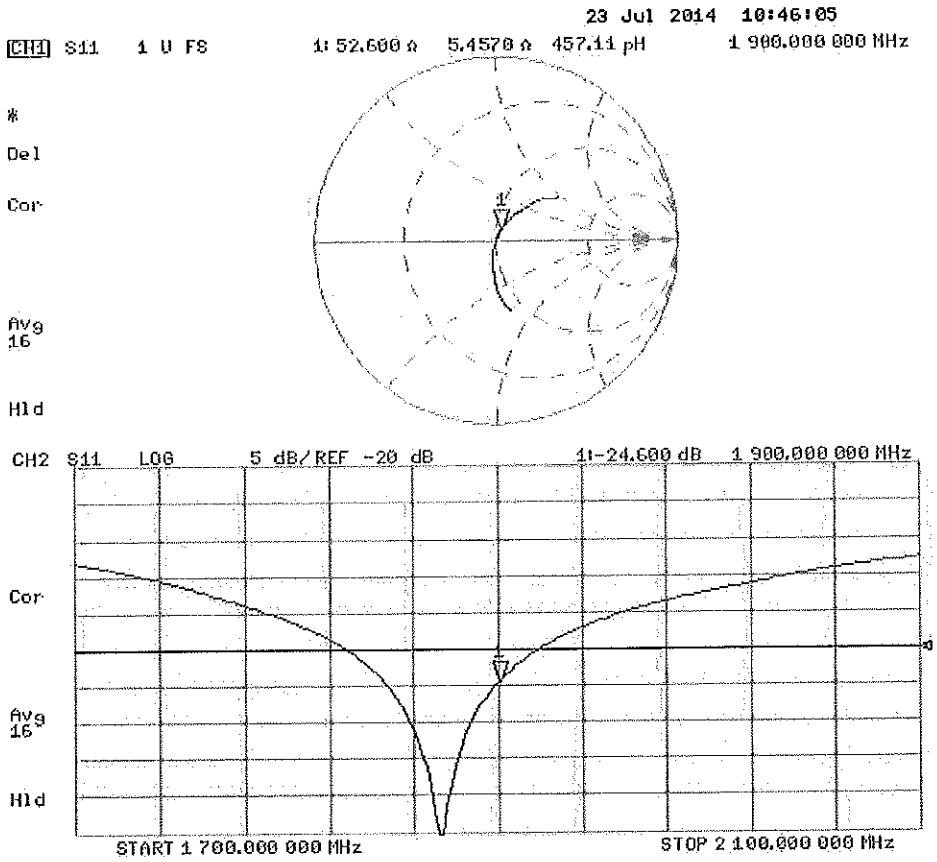
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

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

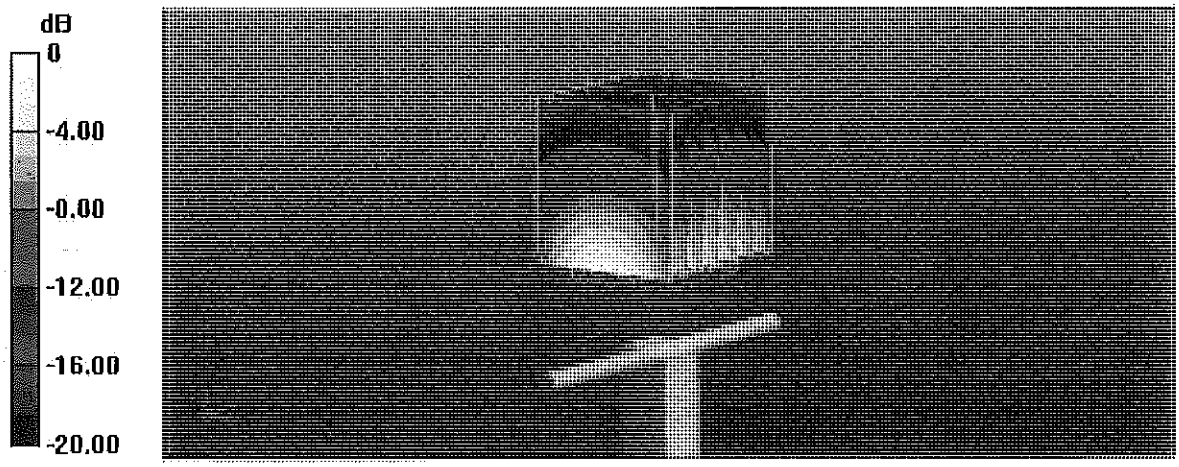
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.51 S/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

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)

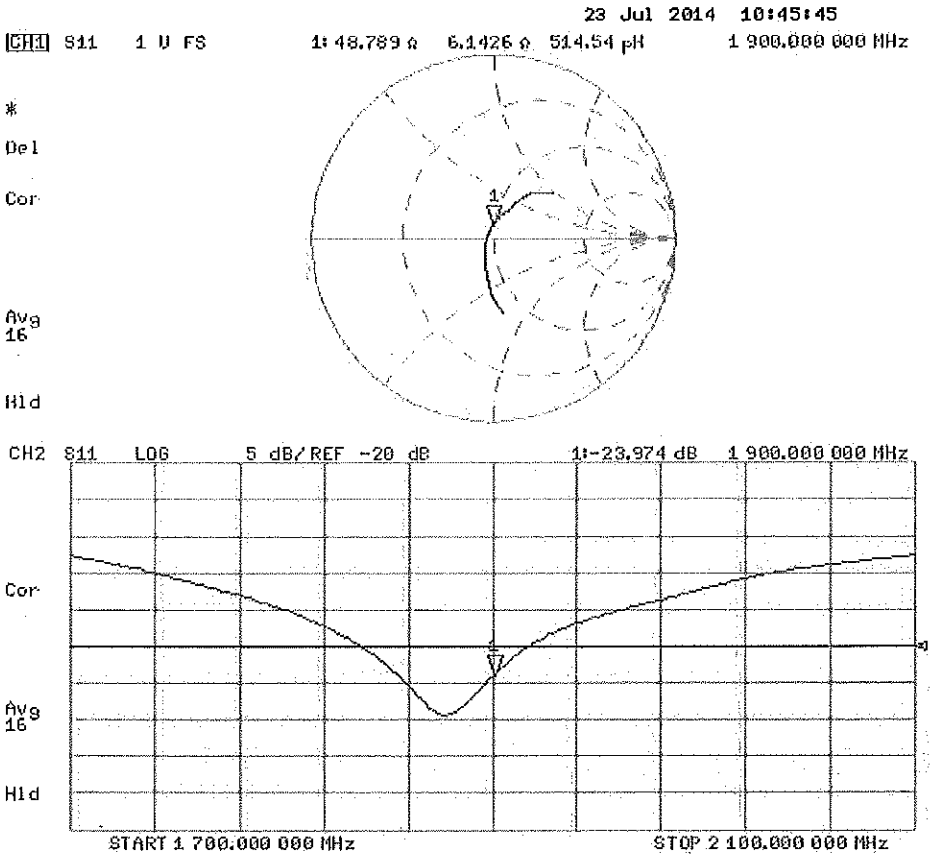
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

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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Accreditation No.: SCS 0108

Client PC Test

Certificate No: D2450V2-797_Jan15

CALIBRATION CERTIFICATE

Object: D2450V2 - SN: 797

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

CC 2/3/15

Calibration date: January 15, 2015

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter 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-14 (No. ES3-3205_Dec14)	Dec-15
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:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 16, 2015

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Accreditation No.: SCS 0108

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "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	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	39.3 ± 6 %	1.88 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	**52.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.15 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.3 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.6 ± 6 %	2.03 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	12.9 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**50.4 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.90 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.3 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.1 Ω + 4.0 jΩ
Return Loss	- 25.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.4 Ω + 4.7 jΩ
Return Loss	- 26.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.151 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	January 24, 2006

DASY5 Validation Report for Head TSL

Date: 15.01.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 797

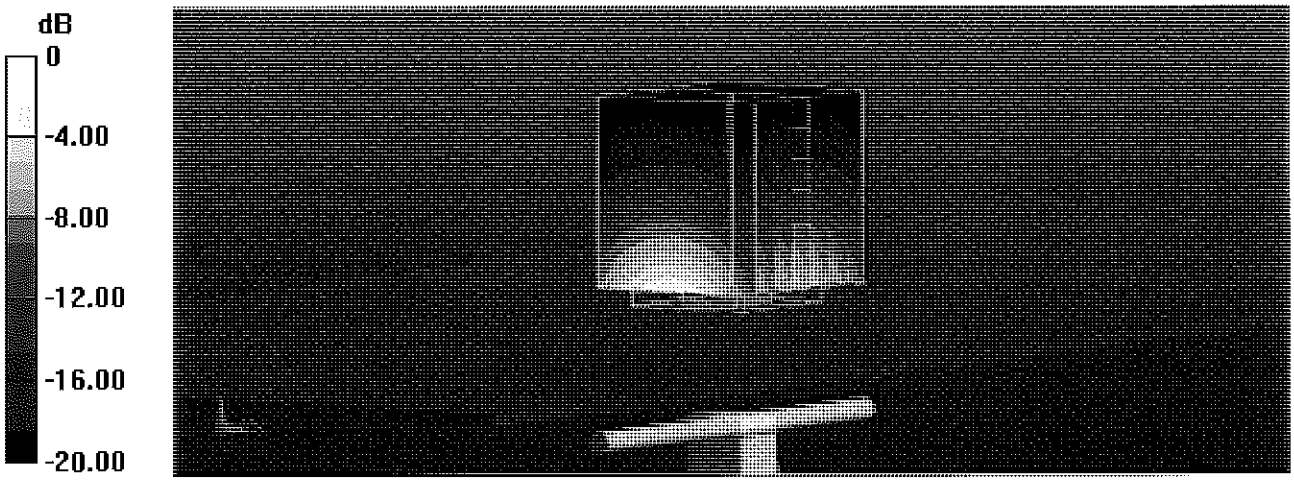
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.88 S/m; ε_r = 39.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.54, 4.54, 4.54); Calibrated: 30.12.2014;
- 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)

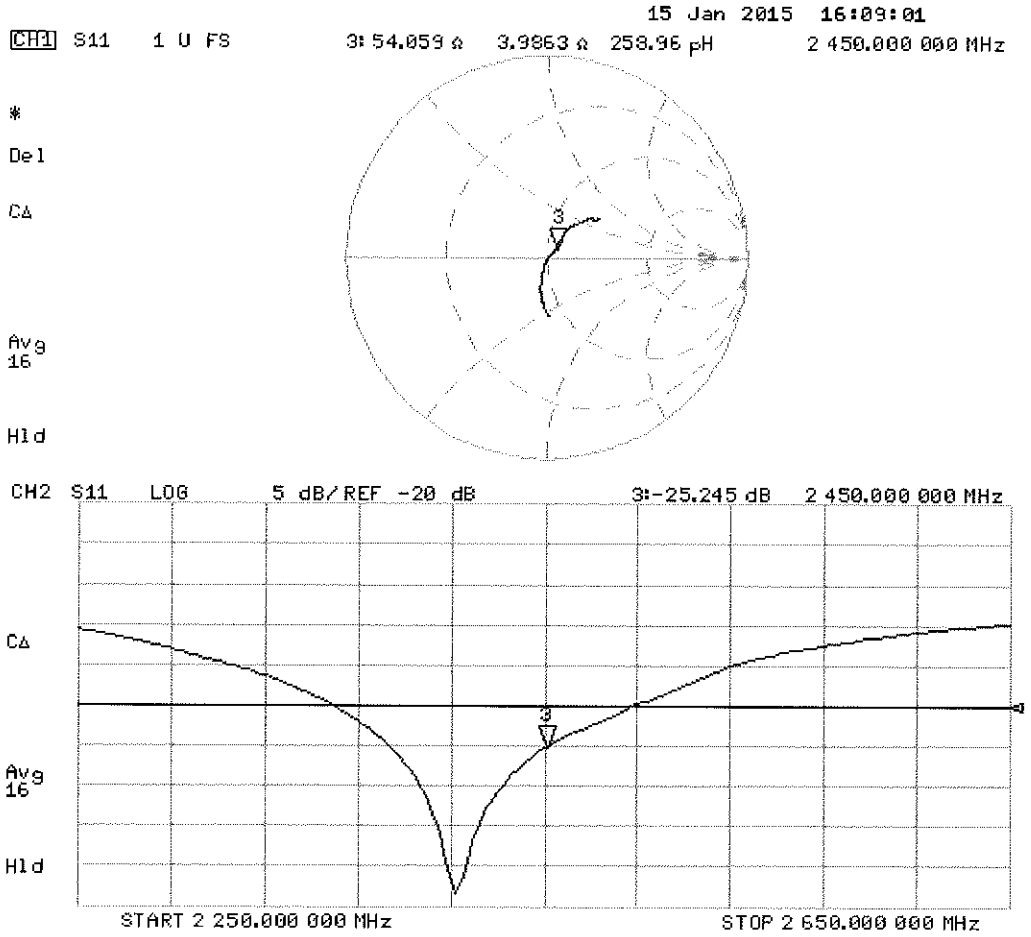
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 99.77 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 27.7 W/kg
SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.15 W/kg
Maximum value of SAR (measured) = 17.5 W/kg



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

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 15.01.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 797

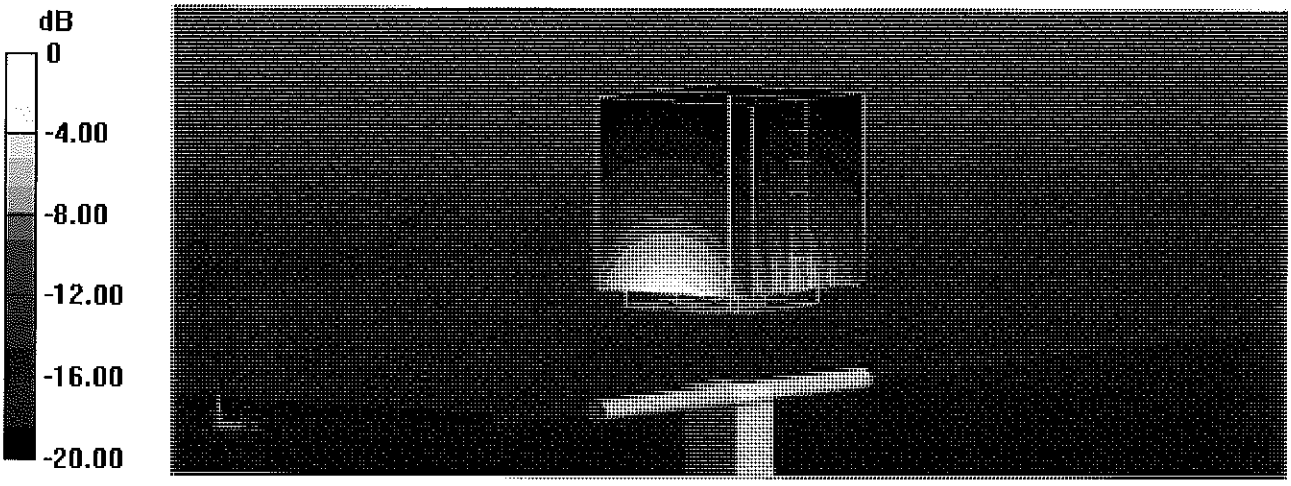
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.03 S/m; ε_r = 51.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.32, 4.32, 4.32); Calibrated: 30.12.2014;
- 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)

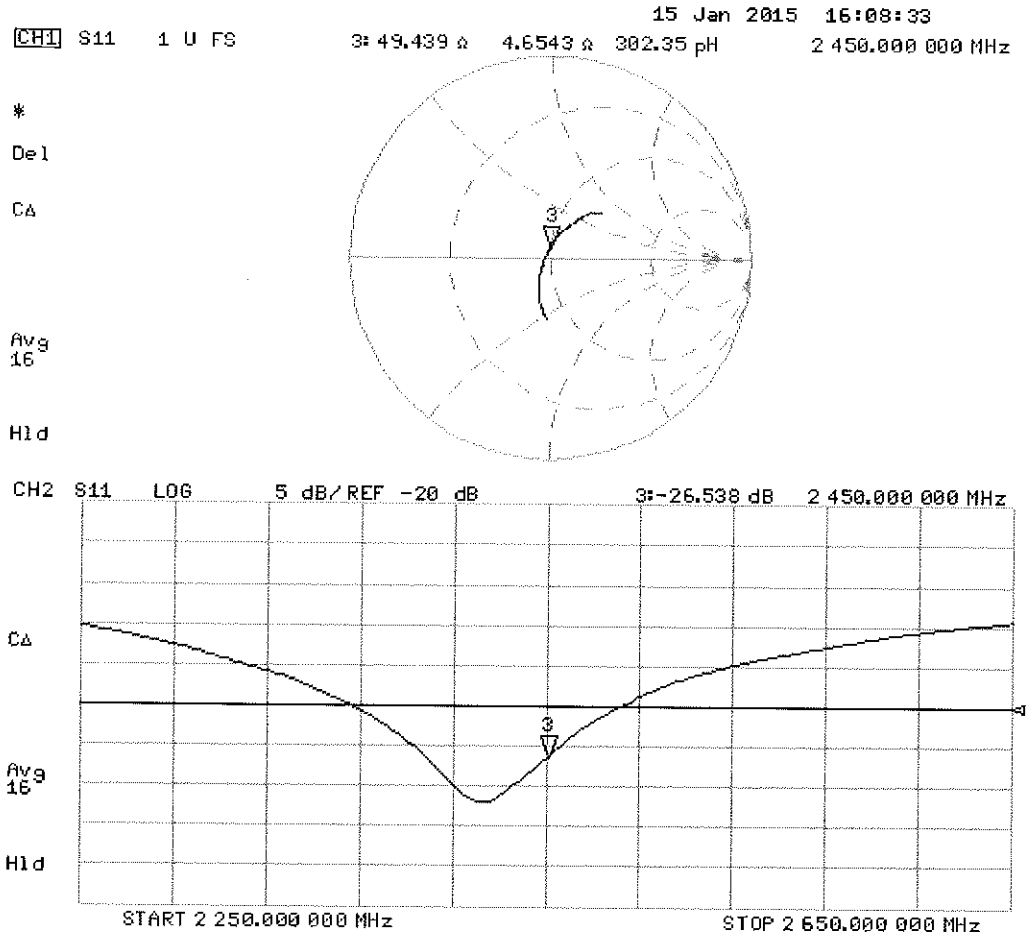
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.11 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 27.4 W/kg
SAR(1 g) = 12.9 W/kg; SAR(10 g) = 5.9 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 Body TSL



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Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D5GHzV2-1057_Jan15

CALIBRATION CERTIFICATE

Object D5GHzV2 - SN:1057

Calibration procedure(s) QA CAL-22.v2
Calibration procedure for dipole validation kits between 3-6 GHz

CC 2/3/15

Calibration date: January 21, 2015

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter 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 EX3DV4	SN: 3503	30-Dec-14 (No. EX3-3503_Dec14)	Dec-15
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: January 22, 2015

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

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

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

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

Accreditation No.: SCS 0108

Glossary:

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

Calibration is Performed According to the Following Standards:

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	36.3 ± 6 %	4.56 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	8.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**81.5 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.31 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	36.1 ± 6 %	4.66 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	8.47 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**84.7 W / kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.41 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.1 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	35.9 ± 6 %	4.86 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	8.43 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**84.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.8 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.6 ± 6 %	4.97 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	8.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**83.8 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.7 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	35.4 ± 6 %	5.18 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	8.11 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	2.29 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.9 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	49.4 ± 6 %	5.42 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	7.37 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**73.9 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.05 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.6 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	49.2 ± 6 %	5.55 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	7.41 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**74.2 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.08 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.9 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	48.9 ± 6 %	5.82 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	7.90 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	2.19 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	48.7 ± 6 %	5.96 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.75 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**77.7 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.5 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	48.4 ± 6 %	6.25 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	7.49 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**75.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.06 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.6 W/kg ± 19.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS0108)

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	49.0 Ω - 9.4 jΩ
Return Loss	- 20.4 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	48.3 Ω - 4.2 jΩ
Return Loss	- 26.8 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	49.2 Ω - 5.0 jΩ
Return Loss	- 25.9 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	54.4 Ω - 4.8 jΩ
Return Loss	- 24.1 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	51.8 Ω - 2.6 jΩ
Return Loss	- 30.1 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	48.2 Ω - 8.4 jΩ
Return Loss	- 21.2 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	48.6 Ω - 3.6 jΩ
Return Loss	- 28.2 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	49.4 Ω - 4.1 jΩ
Return Loss	- 27.6 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	55.1 Ω - 4.0 jΩ
Return Loss	- 24.2 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	51.6 Ω - 1.6 jΩ
Return Loss	- 33.0 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	November 27, 2006

DASY5 Validation Report for Head TSL

Date: 21.01.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN:1057

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 = 4.56 S/m; ε_r = 36.3; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 4.66 S/m; ε_r = 36.1; ρ = 1000 kg/m^3 , Medium parameters used: f = 5500 MHz; σ = 4.86 S/m; ε_r = 35.9; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 4.97 S/m; ε_r = 35.6; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 5.18 S/m; ε_r = 35.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.51, 5.51, 5.51); Calibrated: 30.12.2014, ConvF(5.21, 5.21, 5.21); Calibrated: 30.12.2014, ConvF(5.12, 5.12, 5.12); Calibrated: 30.12.2014, ConvF(4.92, 4.92, 4.92); Calibrated: 30.12.2014, ConvF(4.9, 4.9, 4.9); Calibrated: 30.12.2014;
- 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)

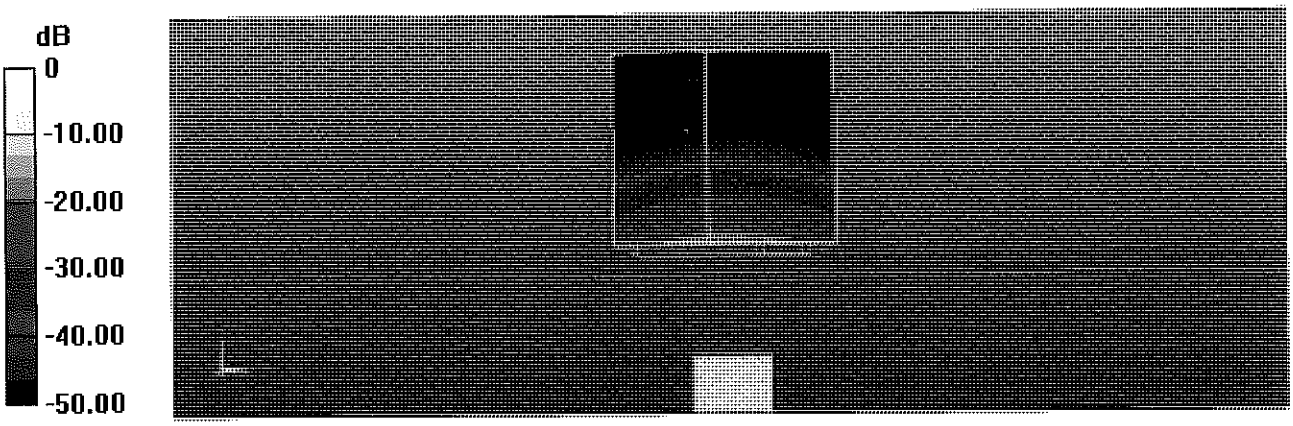
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.51 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 29.8 W/kg
SAR(1 g) = 8.14 W/kg; SAR(10 g) = 2.31 W/kg
Maximum value of SAR (measured) = 19.3 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 = 65.30 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 32.1 W/kg
SAR(1 g) = 8.47 W/kg; SAR(10 g) = 2.41 W/kg
Maximum value of SAR (measured) = 20.4 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 = 64.33 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 33.5 W/kg
SAR(1 g) = 8.43 W/kg; SAR(10 g) = 2.38 W/kg
Maximum value of SAR (measured) = 20.6 W/kg

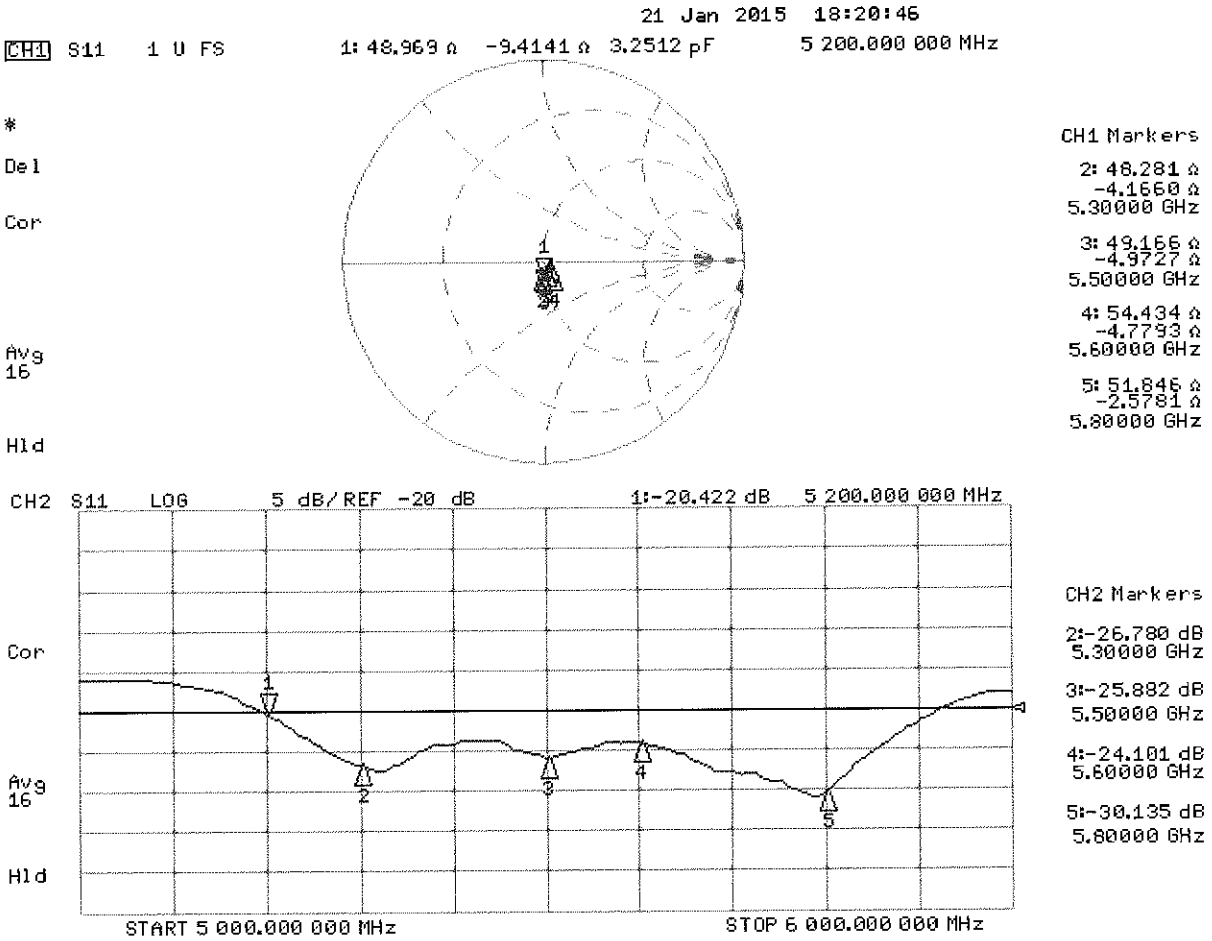
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.47 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 33.5 W/kg
SAR(1 g) = 8.38 W/kg; SAR(10 g) = 2.37 W/kg
Maximum value of SAR (measured) = 20.2 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 = 62.34 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 33.8 W/kg
SAR(1 g) = 8.11 W/kg; SAR(10 g) = 2.29 W/kg
Maximum value of SAR (measured) = 19.8 W/kg



0 dB = 19.3 W/kg = 12.86 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 20.01.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN:1057

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 = 5.42 S/m; ε_r = 49.4; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 5.55 S/m; ε_r = 49.2; ρ = 1000 kg/m^3 , Medium parameters used: f = 5500 MHz; σ = 5.82 S/m; ε_r = 48.9; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 5.96 S/m; ε_r = 48.7; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 6.25 S/m; ε_r = 48.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.95, 4.95, 4.95); Calibrated: 30.12.2014, ConvF(4.78, 4.78, 4.78); Calibrated: 30.12.2014, ConvF(4.45, 4.45, 4.45); Calibrated: 30.12.2014, ConvF(4.35, 4.35, 4.35); Calibrated: 30.12.2014, ConvF(4.32, 4.32, 4.32); Calibrated: 30.12.2014;
- 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)

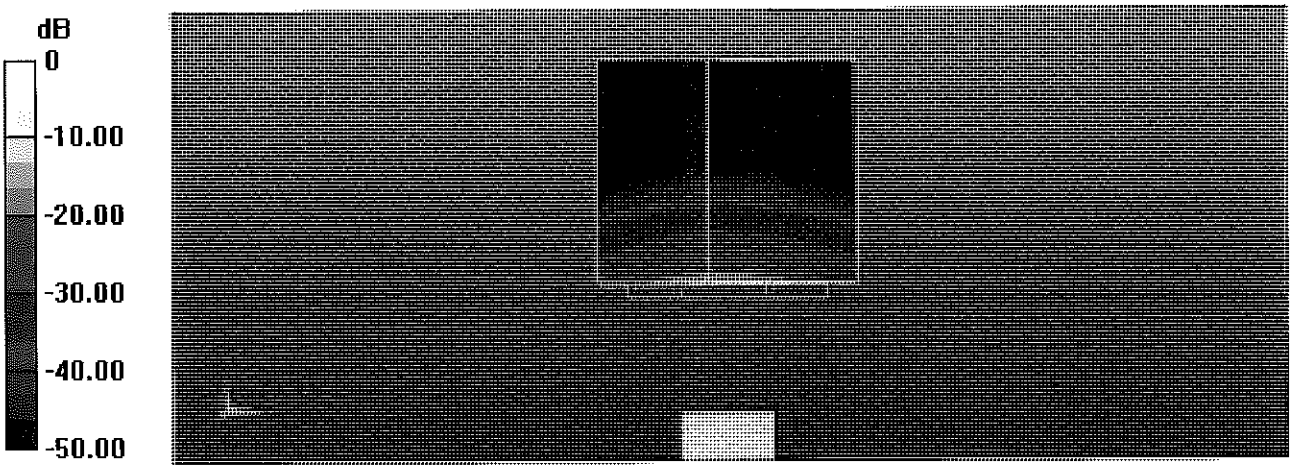
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.76 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 28.9 W/kg
SAR(1 g) = 7.37 W/kg; SAR(10 g) = 2.05 W/kg
Maximum value of SAR (measured) = 17.4 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 = 58.35 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 29.8 W/kg
SAR(1 g) = 7.41 W/kg; SAR(10 g) = 2.08 W/kg
Maximum value of SAR (measured) = 17.6 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 = 59.04 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 33.7 W/kg
SAR(1 g) = 7.9 W/kg; SAR(10 g) = 2.19 W/kg
Maximum value of SAR (measured) = 19.2 W/kg

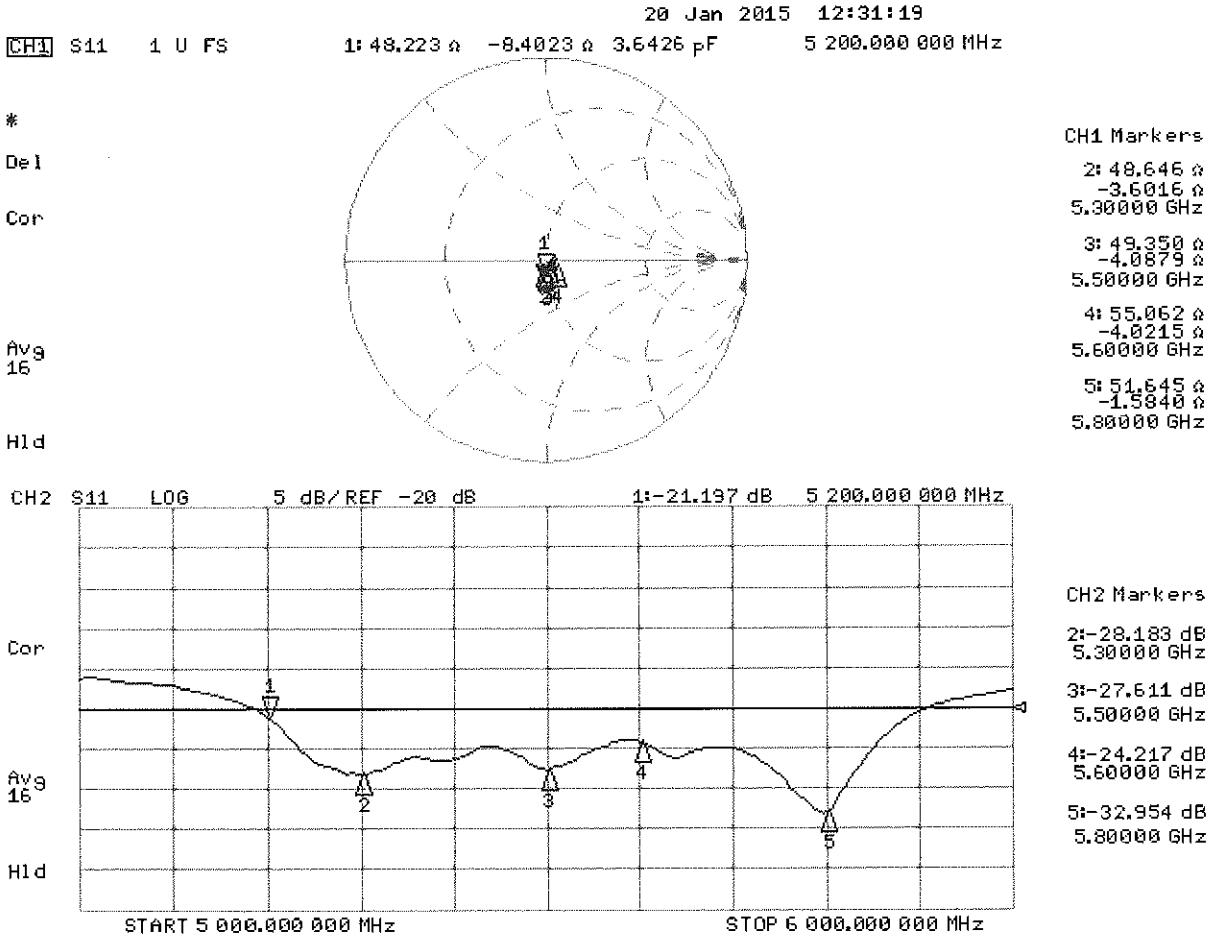
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 57.74 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 34.1 W/kg
SAR(1 g) = 7.75 W/kg; SAR(10 g) = 2.14 W/kg
Maximum value of SAR (measured) = 19.1 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 = 55.86 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 34.7 W/kg
SAR(1 g) = 7.49 W/kg; SAR(10 g) = 2.06 W/kg
Maximum value of SAR (measured) = 18.6 W/kg



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

Impedance Measurement Plot for Body TSL



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

S Schweizerischer Kalibrierdienst
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S Swiss Calibration Service

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

Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D835V2-4d132_Jan15

CALIBRATION CERTIFICATE

Object D835V2 - SN: 4d132

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

CC 2/3/15

Calibration date: January 16, 2015

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter 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-14 (No. ES3-3205_Dec14)	Dec-15
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: January 19, 2015

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

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Accredited by the Swiss Accreditation Service (SAS) **Accreditation No.: SCS 0108**
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Glossary:

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

Calibration is Performed According to the Following Standards:

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	41.5 ± 6 %	0.93 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	2.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.25 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.54 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.04 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	55.8 ± 6 %	1.01 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	2.35 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.14 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.53 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**5.98 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.8 Ω - 2.3 jΩ
Return Loss	- 30.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.5 Ω - 4.3 jΩ
Return Loss	- 25.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.385 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: 16.01.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d132

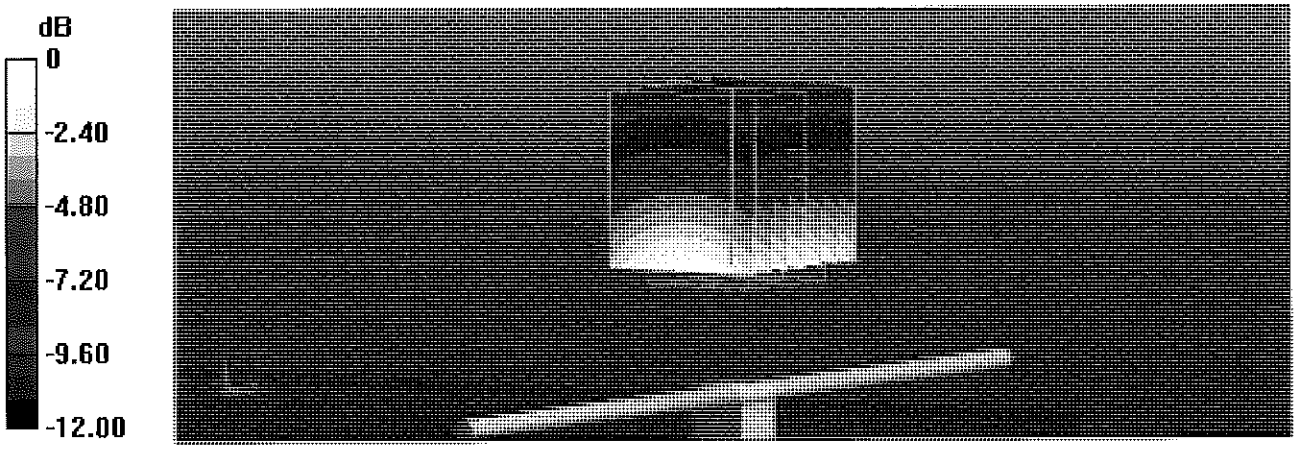
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.93 S/m; ε_r = 41.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.2, 6.2, 6.2); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

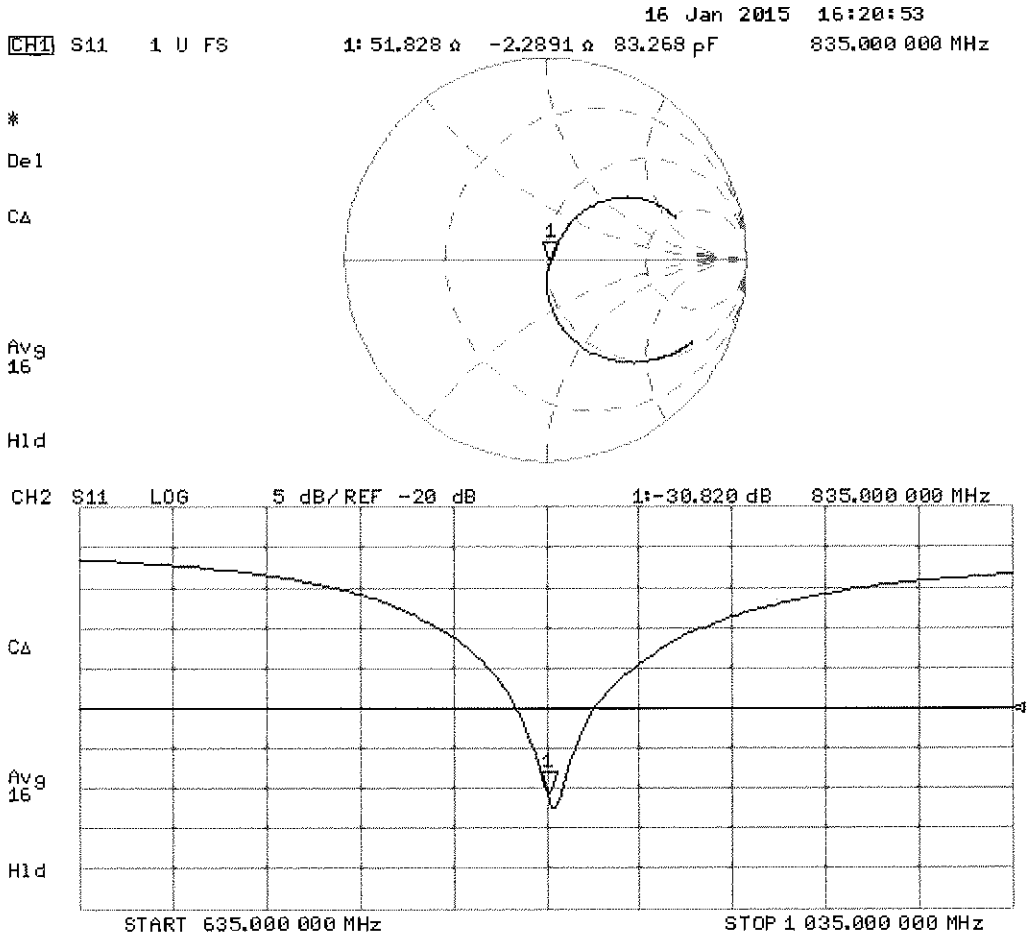
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.27 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 3.51 W/kg
SAR(1 g) = 2.37 W/kg; SAR(10 g) = 1.54 W/kg
Maximum value of SAR (measured) = 2.77 W/kg



0 dB = 2.77 W/kg = 4.42 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 16.01.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d132

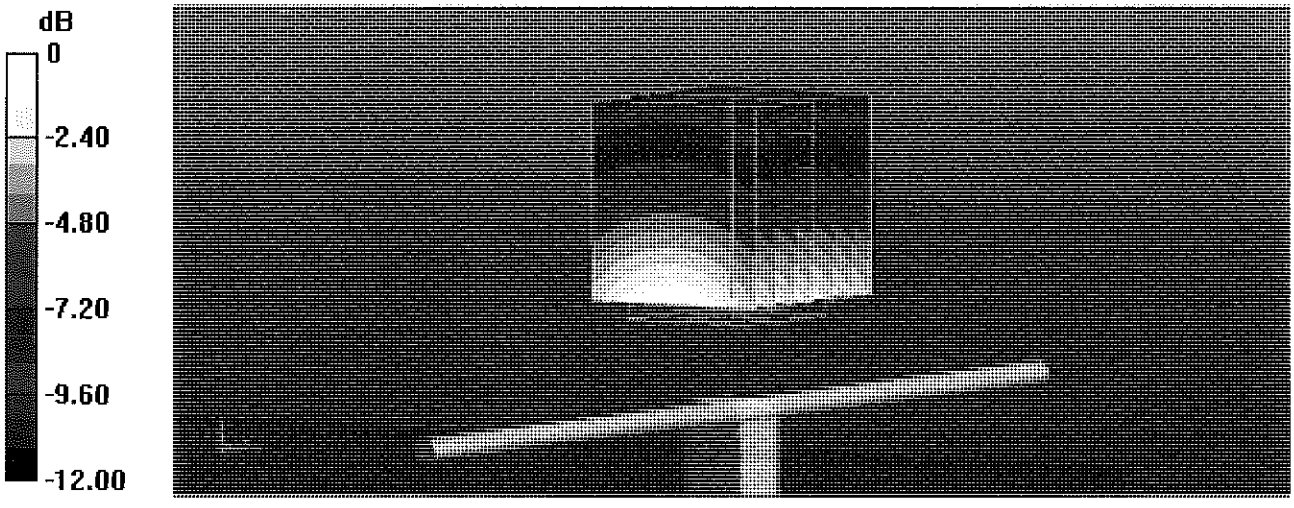
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 1.01 S/m; ε_r = 55.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.17, 6.17, 6.17); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

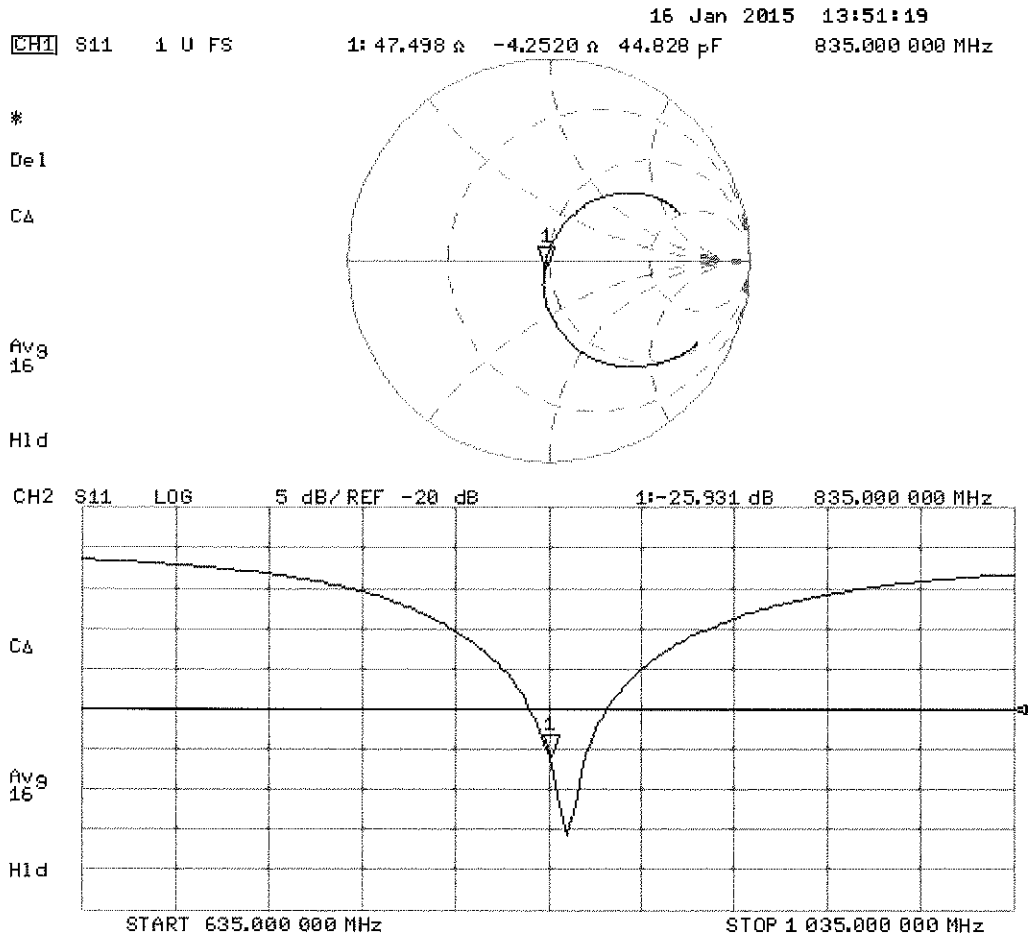
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.27 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.47 W/kg
SAR(1 g) = 2.35 W/kg; SAR(10 g) = 1.53 W/kg
Maximum value of SAR (measured) = 2.75 W/kg



0 dB = 2.75 W/kg = 4.39 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

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

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)

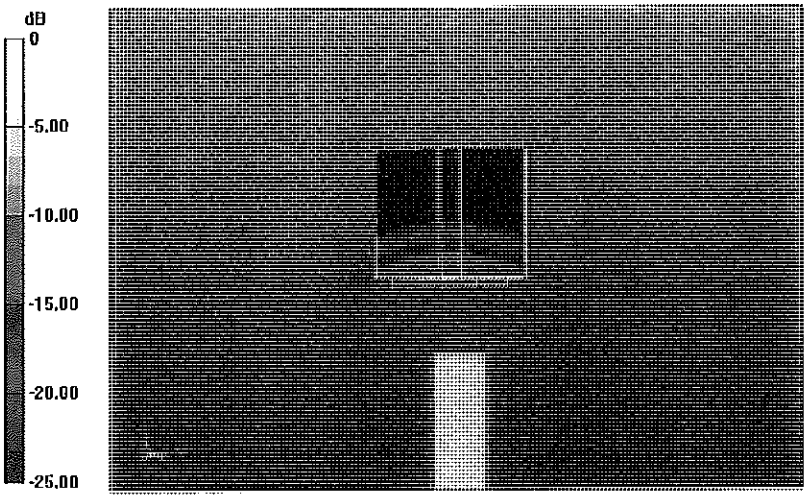
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.20 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 30.0 W/kg
SAR(1 g) = 8.17 W/kg; SAR(10 g) = 2.33 W/kg
Maximum value of SAR (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

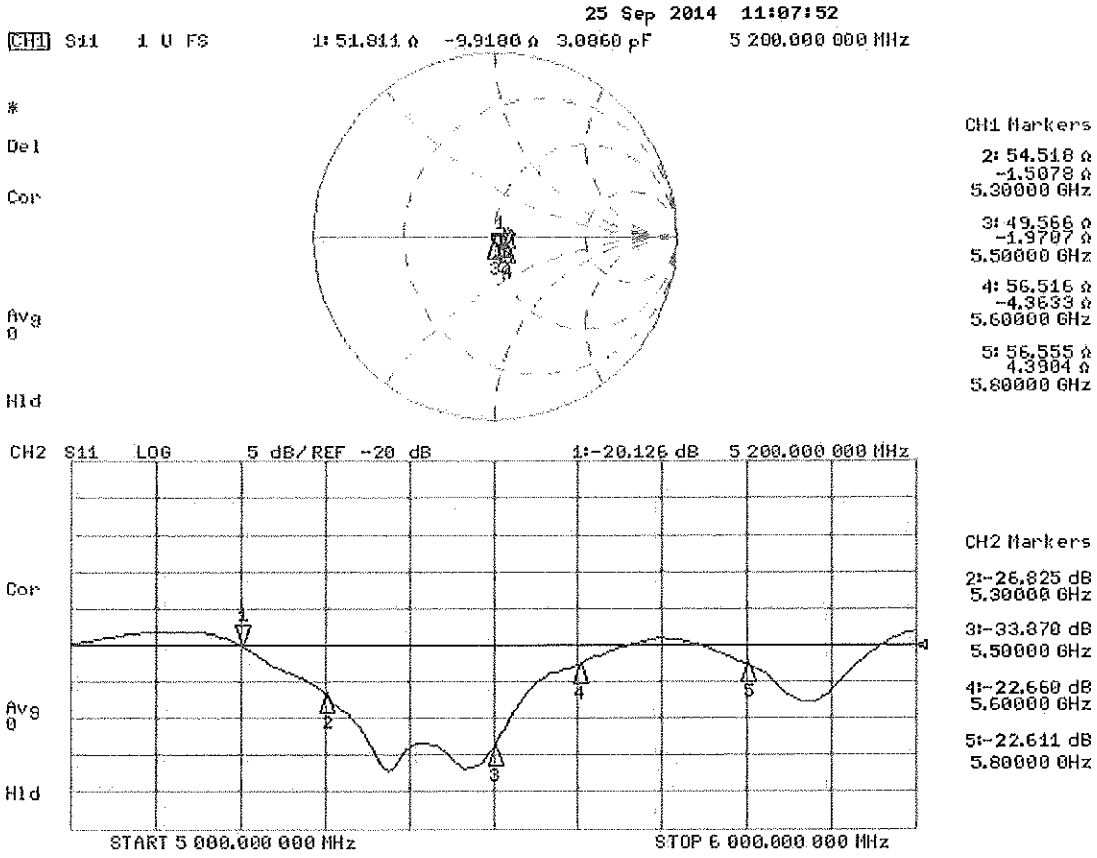
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.29 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 34.8 W/kg
SAR(1 g) = 8.76 W/kg; SAR(10 g) = 2.49 W/kg
Maximum value of SAR (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)

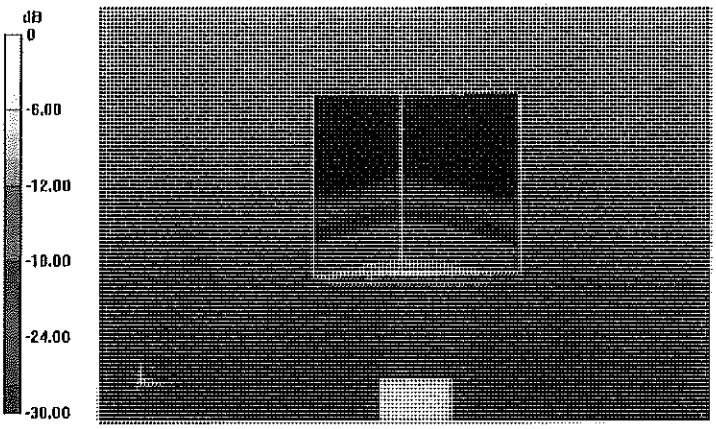
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 60.46 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 30.7 W/kg
SAR(1 g) = 7.84 W/kg; SAR(10 g) = 2.18 W/kg
Maximum value of SAR (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

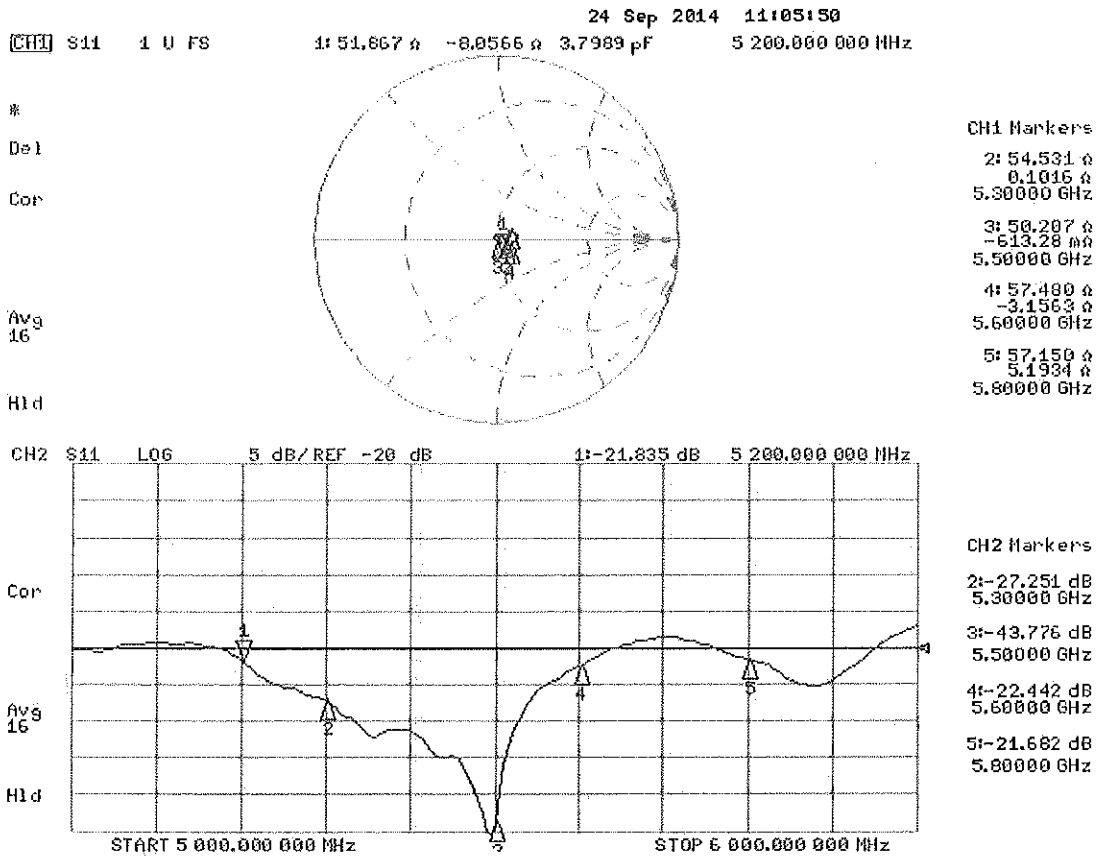
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 60.44 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 37.0 W/kg
SAR(1 g) = 8.48 W/kg; SAR(10 g) = 2.35 W/kg
Maximum value of SAR (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



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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: **ES3-3333_Oct14**

CALIBRATION CERTIFICATE

Object ES3DV3 - SN:3333

Calibration procedure(s) QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

CC 10/31/14

Calibration date: October 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 E4419B	GB41293874	03-Apr-14 (No. 217-01911)	Apr-15
Power sensor E4412A	MY41498087	03-Apr-14 (No. 217-01911)	Apr-15
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-14 (No. 217-01915)	Apr-15
Reference 20 dB Attenuator	SN: S5277 (20x)	03-Apr-14 (No. 217-01919)	Apr-15
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-14 (No. 217-01920)	Apr-15
Reference Probe ES3DV2	SN: 3013	30-Dec-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: October 24, 2014

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

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

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Accredited by the Swiss Accreditation Service (SAS) Accreditation No.: **SCS 108**
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Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to proba axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wiraless 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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe ES3DV3

SN:3333

Manufactured: January 24, 2012
Calibrated: October 24, 2014

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3333

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.08	0.90	0.88	± 10.1 %
DCP (mV)[B]	102.7	107.7	106.3	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	190.7	±2.5 %
		Y	0.0	0.0	1.0		183.3	
		Z	0.0	0.0	1.0		197.9	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	3.17	61.7	12.2	10.00	42.4	±1.9 %
		Y	3.16	63.7	12.4		38.0	
		Z	1.84	59.2	10.5		39.9	
10011-CAB	UMTS-FDD (WCDMA)	X	3.22	65.9	17.6	2.91	128.5	±0.5 %
		Y	3.60	69.3	19.8		146.7	
		Z	3.51	68.1	18.8		133.7	
10012-CAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	3.14	68.6	18.2	1.87	132.6	±0.7 %
		Y	3.64	73.3	21.1		127.5	
		Z	3.50	71.4	19.6		136.4	
10013-CAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	11.56	70.8	23.0	9.46	135.8	±3.5 %
		Y	10.93	70.2	23.0		122.3	
		Z	10.93	70.0	22.6		132.8	
10021-DAB	GSM-FDD (TDMA, GMSK)	X	24.60	96.9	27.6	9.39	147.6	±1.9 %
		Y	19.44	94.3	26.1		148.6	
		Z	9.58	82.7	21.9		138.2	
10023-DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	20.09	93.0	26.4	9.57	141.7	±2.7 %
		Y	24.86	99.0	27.9		143.5	
		Z	11.74	86.4	23.4		134.4	
10024-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	23.76	91.2	23.1	6.56	147.8	±2.6 %
		Y	37.10	99.8	25.3		149.9	
		Z	16.01	88.1	21.6		128.0	
10027-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	36.24	94.5	22.6	4.80	128.6	±2.5 %
		Y	47.57	99.9	23.7		133.5	
		Z	44.37	99.7	23.6		140.1	
10028-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	65.86	99.7	22.7	3.55	133.1	±2.7 %
		Y	55.92	100.0	22.6		142.0	
		Z	59.41	100.0	22.2		125.1	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	85.87	100.0	20.1	1.16	138.3	±2.2 %
		Y	14.41	99.2	23.3		130.5	
		Z	85.82	99.8	19.3		135.9	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.49	67.4	19.4	5.67	144.6	±1.7 %
		Y	6.49	68.0	20.1		139.9	
		Z	6.54	67.9	19.7		147.3	

10103-CAB	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	10.81	74.7	24.9	9.29	122.0	±3.0 %
		Y	10.50	75.9	26.1		131.6	
		Z	9.76	73.5	24.5		138.6	
10108-CAB	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.43	67.2	19.4	5.80	143.3	±1.7 %
		Y	6.37	67.7	20.0		138.0	
		Z	6.43	67.5	19.7		146.7	
10117-CAA	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.19	68.6	20.9	8.07	136.2	±2.5 %
		Y	10.15	68.9	21.4		128.3	
		Z	10.12	68.7	21.0		137.9	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	11.48	77.0	26.1	9.28	147.5	±3.3 %
		Y	9.81	74.9	25.8		125.7	
		Z	9.22	72.8	24.3		133.2	
10154-CAB	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.10	66.5	19.1	5.75	140.0	±1.7 %
		Y	6.04	67.1	19.8		134.8	
		Z	6.12	67.1	19.5		143.2	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.57	67.2	19.4	5.82	146.3	±1.7 %
		Y	6.47	67.6	20.0		139.6	
		Z	6.56	67.6	19.7		148.5	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	5.16	66.7	19.4	5.73	145.8	±1.4 %
		Y	5.02	67.5	20.2		137.5	
		Z	5.07	67.2	19.7		147.1	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	10.07	79.2	27.3	9.21	136.5	±3.0 %
		Y	9.70	81.5	29.3		142.5	
		Z	7.63	74.3	25.3		125.0	
10175-CAB	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	5.13	66.6	19.3	5.72	145.9	±1.4 %
		Y	5.01	67.4	20.1		137.5	
		Z	5.04	67.1	19.7		146.3	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	5.14	66.6	19.3	5.72	145.7	±1.4 %
		Y	5.03	67.5	20.3		137.4	
		Z	5.06	67.2	19.7		146.6	
10196-CAA	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.88	68.3	20.8	8.10	130.9	±2.5 %
		Y	10.13	69.6	21.8		149.0	
		Z	9.77	68.4	20.9		131.6	
10225-CAB	UMTS-FDD (HSPA+)	X	6.98	66.5	19.0	5.97	132.9	±1.7 %
		Y	7.14	67.8	20.0		149.7	
		Z	7.02	67.2	19.4		134.3	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	10.13	79.4	27.4	9.21	137.5	±3.0 %
		Y	9.73	81.6	29.3		143.3	
		Z	7.59	74.1	25.1		125.6	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	10.80	76.4	25.9	9.24	140.0	±3.3 %
		Y	10.19	77.2	27.1		147.2	
		Z	8.55	71.8	23.9		124.9	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	11.59	77.3	26.3	9.30	148.4	±3.5 %
		Y	9.87	75.1	25.9		126.0	
		Z	9.21	72.7	24.2		133.6	

10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.40	66.1	18.1	3.96	134.1	±0.7 %
		Y	4.48	67.4	19.2		129.7	
		Z	4.54	67.2	18.7		137.4	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.59	65.7	17.7	3.46	127.5	±0.7 %
		Y	3.85	68.4	19.7		143.4	
		Z	3.78	67.6	18.8		129.7	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.56	65.9	17.8	3.39	127.9	±0.7 %
		Y	3.81	68.6	19.8		144.2	
		Z	3.71	67.5	18.8		130.7	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.44	67.1	19.4	5.81	143.0	±1.7 %
		Y	6.37	67.6	20.0		137.9	
		Z	6.43	67.5	19.7		146.5	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	7.02	67.8	19.8	6.06	148.7	±1.9 %
		Y	6.96	68.2	20.4		143.6	
		Z	6.72	67.1	19.5		126.9	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.73	67.0	17.9	3.76	140.2	±0.7 %
		Y	4.96	69.4	19.5		130.7	
		Z	5.05	69.3	19.1		140.9	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.70	67.2	18.1	3.77	138.1	±0.7 %
		Y	4.85	69.5	19.6		129.6	
		Z	5.14	70.1	19.5		139.3	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	2.47	66.1	17.1	1.54	133.2	±0.7 %
		Y	3.15	72.2	20.9		127.9	
		Z	3.32	72.0	20.1		137.2	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	9.99	68.4	21.0	8.23	131.6	±2.5 %
		Y	9.84	68.6	21.4		123.3	
		Z	9.89	68.6	21.1		133.4	

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

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 7 and 8).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3333

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	6.55	6.55	6.55	0.34	1.74	± 12.0 %
835	41.5	0.90	6.33	6.33	6.33	0.44	1.48	± 12.0 %
1750	40.1	1.37	5.26	5.26	5.26	0.73	1.21	± 12.0 %
1900	40.0	1.40	5.11	5.11	5.11	0.66	1.32	± 12.0 %
2450	39.2	1.80	4.53	4.53	4.53	0.62	1.40	± 12.0 %
2600	39.0	1.96	4.40	4.40	4.40	0.68	1.38	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3333

Calibration Parameter Determined in Body Tissue Simulating Media

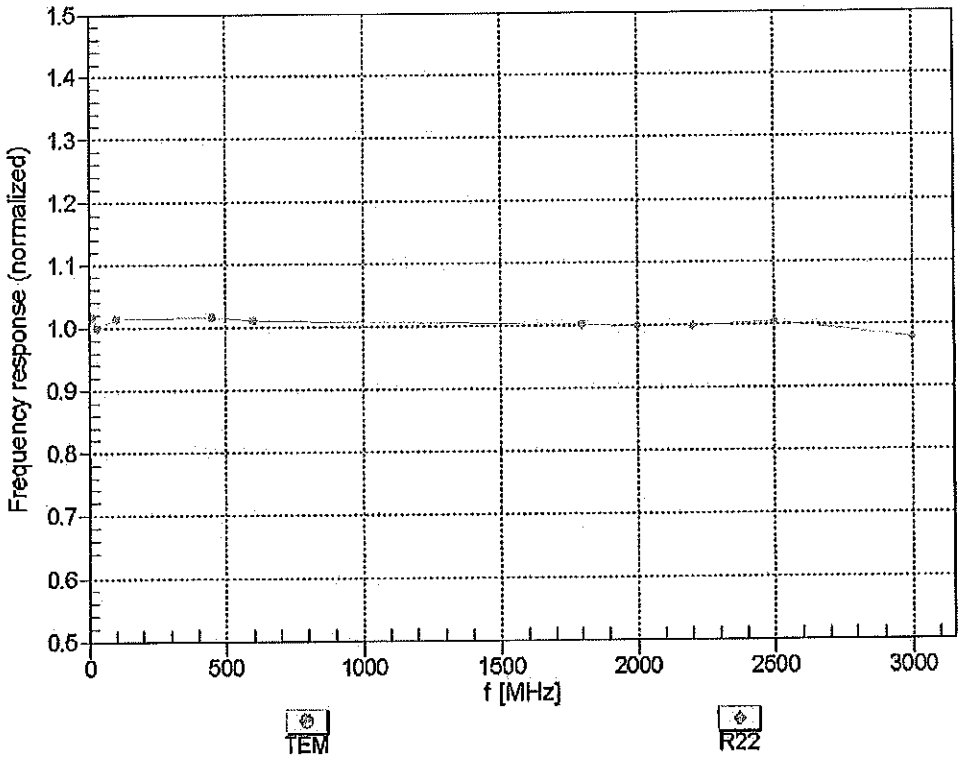
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	55.5	0.96	6.14	6.14	6.14	0.35	1.76	± 12.0 %
835	55.2	0.97	6.12	6.12	6.12	0.57	1.37	± 12.0 %
1750	53.4	1.49	4.89	4.89	4.89	0.80	1.24	± 12.0 %
1900	53.3	1.52	4.67	4.67	4.67	0.75	1.29	± 12.0 %
2450	52.7	1.95	4.26	4.26	4.26	0.80	1.01	± 12.0 %
2600	52.5	2.16	4.13	4.13	4.13	0.80	0.99	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

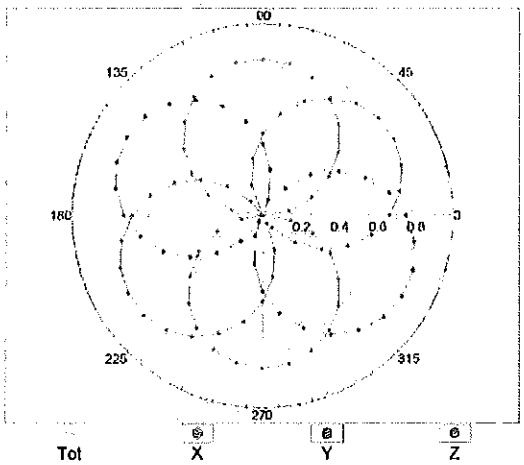
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



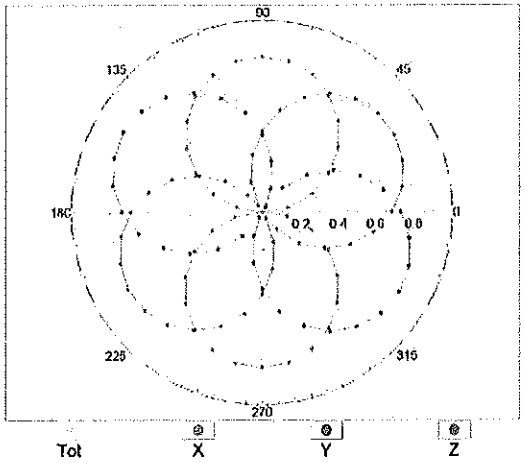
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

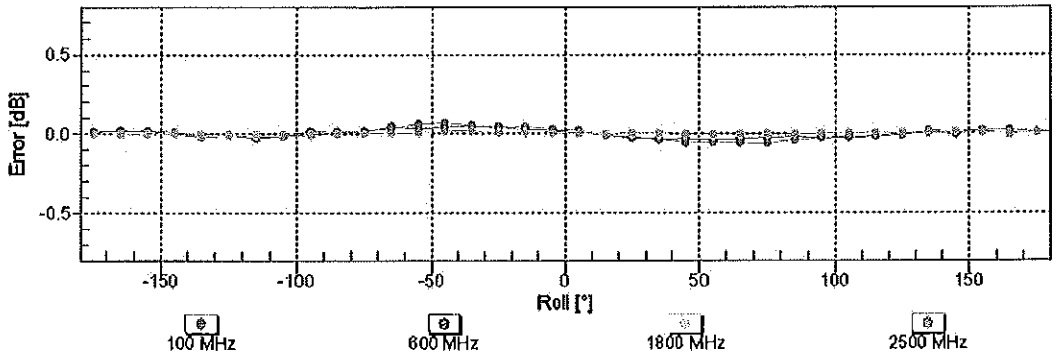
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



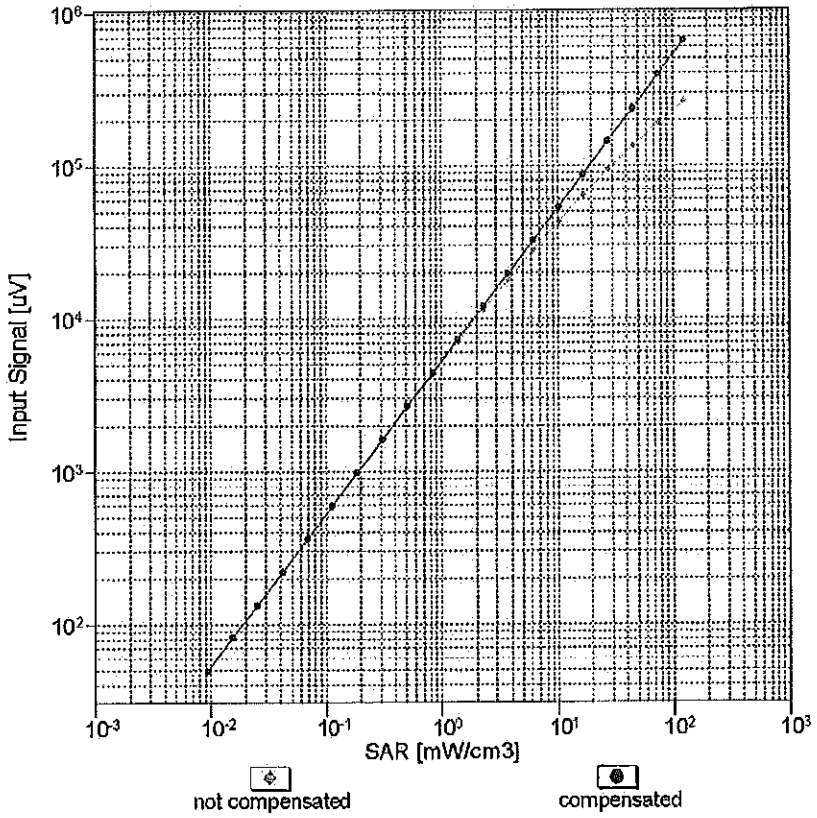
f=1800 MHz,R22

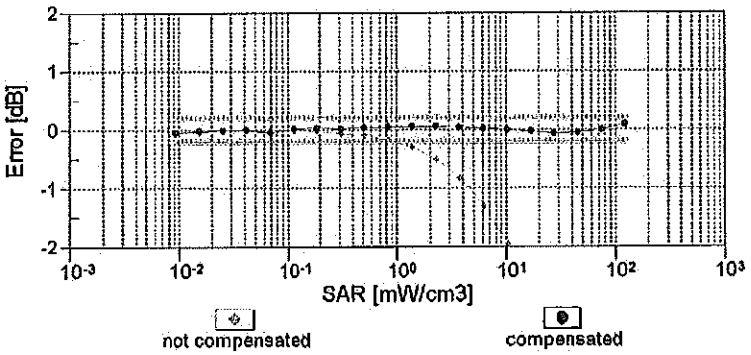




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR$_{head}$)
(TEM cell , f_{eval}= 1900 MHz)

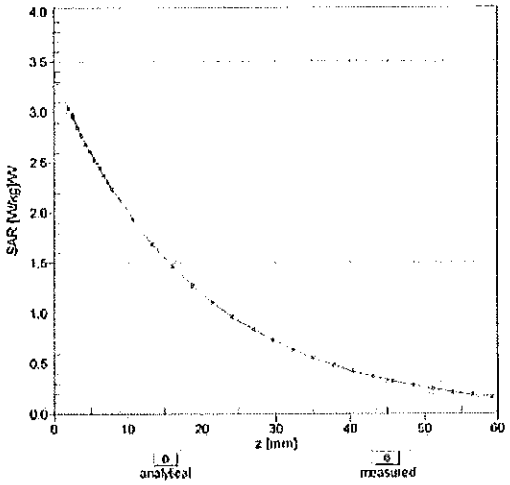




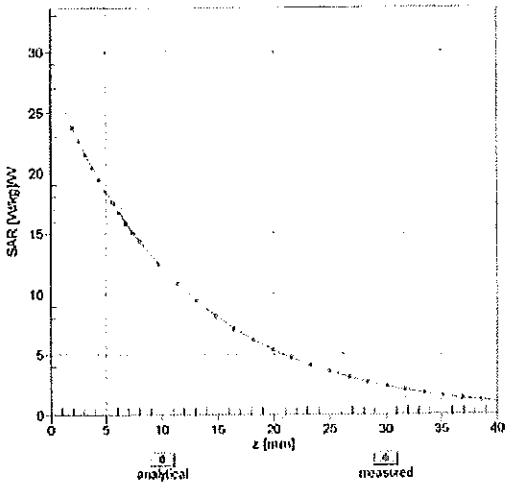
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

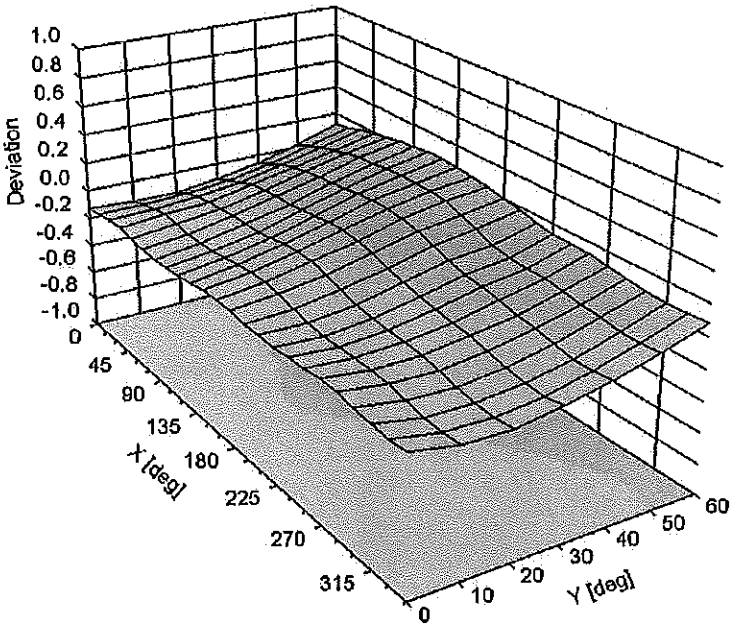


f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3333

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-34.9
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

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: **ES3-3022_Aug14/2**

CALIBRATION CERTIFICATE (Replacement of No: ES3-3022_Aug14)

Object	ES3DV2 - SN:3022
Calibration procedure(s)	QA CAL-01.v9, QA CAL-12.v9, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	August 19, 2014

CC

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	03-Apr-14 (No. 217-01911)	Apr-15
Power sensor E4412A	MY41498087	03-Apr-14 (No. 217-01911)	Apr-15
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-14 (No. 217-01915)	Apr-15
Reference 20 dB Attenuator	SN: S5277 (20x)	03-Apr-14 (No. 217-01919)	Apr-15
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-14 (No. 217-01920)	Apr-15
Reference Probe ES3DV2	SN: 3013	30-Dec-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

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

Issued: November 3, 2014

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

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

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

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe ES3DV2

SN:3022

Manufactured: April 15, 2003
Calibrated: August 19, 2014

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: ES3DV2 - SN:3022

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.00	1.04	0.96	± 10.1 %
DCP (mV)[B]	103.0	96.3	101.6	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	181.8	±2.7 %
		Y	0.0	0.0	1.0		183.0	
		Z	0.0	0.0	1.0		192.3	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	2.51	63.1	12.7	10.00	42.6	±1.9 %
		Y	2.62	63.1	12.9		42.7	
		Z	3.12	65.7	13.6		40.4	
10011-CAB	UMTS-FDD (WCDMA)	X	3.33	67.8	19.2	2.91	145.9	±0.9 %
		Y	3.13	64.9	16.9		147.4	
		Z	3.20	66.4	18.2		139.6	
10012-CAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	3.05	70.1	19.8	1.87	147.2	±0.9 %
		Y	2.62	65.1	16.2		147.4	
		Z	2.85	68.2	18.4		141.7	
10013-CAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	11.10	70.9	23.6	9.46	143.9	±3.0 %
		Y	11.04	70.2	22.9		144.2	
		Z	10.77	70.2	23.1		134.7	
10021-DAB	GSM-FDD (TDMA, GMSK)	X	19.66	99.7	28.6	9.39	126.0	±1.9 %
		Y	11.04	89.6	25.5		138.9	
		Z	10.45	88.8	24.9		137.5	
10023-DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	20.19	99.6	28.5	9.57	142.0	±2.5 %
		Y	10.53	88.4	25.0		145.5	
		Z	15.52	96.5	27.8		147.6	
10024-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	31.93	99.6	25.2	6.56	149.5	±1.9 %
		Y	12.70	87.9	22.2		148.0	
		Z	27.00	99.8	25.7		135.3	
10027-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	38.32	99.8	23.8	4.80	148.1	±2.2 %
		Y	9.80	83.2	19.3		138.8	
		Z	31.96	99.9	24.2		128.9	
10028-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	40.03	99.5	22.8	3.55	130.5	±2.2 %
		Y	40.27	99.6	23.0		148.1	
		Z	43.09	99.7	22.5		140.1	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	38.93	99.4	20.4	1.16	146.7	±1.9 %
		Y	32.83	92.5	17.9		139.2	
		Z	31.94	99.5	20.8		133.1	
10039-CAB	CDMA2000 (1xRTT, RC1)	X	4.66	66.8	19.3	4.57	144.5	±1.2 %
		Y	4.56	65.3	17.9		137.2	
		Z	4.52	66.1	18.7		131.7	

10081-CAB	CDMA2000 (1xRTT, RC3)	X	3.82	66.0	18.7	3.97	140.3	±0.9 %
		Y	3.77	64.5	17.3		133.6	
		Z	3.79	65.7	18.4		128.2	
10098-CAB	UMTS-FDD (HSUPA, Subtest 2)	X	4.40	66.2	18.5	3.98	130.9	±1.2 %
		Y	4.39	65.0	17.4		131.1	
		Z	4.47	66.3	18.4		140.0	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.30	67.3	19.8	5.67	137.4	±1.7 %
		Y	6.25	66.3	18.9		135.9	
		Z	6.36	67.4	19.7		147.5	
10108-CAB	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.14	66.8	19.6	5.80	134.6	±1.7 %
		Y	6.17	66.1	18.9		133.9	
		Z	6.24	67.0	19.7		144.5	
10110-CAB	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	5.82	66.3	19.4	5.75	131.2	±1.7 %
		Y	5.82	65.4	18.6		130.3	
		Z	5.91	66.5	19.4		140.4	
10114-CAA	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	X	10.00	68.5	21.2	8.10	124.3	±2.5 %
		Y	9.89	67.9	20.6		124.0	
		Z	10.05	68.6	21.2		133.2	
10117-CAA	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.01	68.6	21.2	8.07	125.8	±2.5 %
		Y	9.91	67.9	20.7		125.8	
		Z	10.09	68.8	21.3		134.7	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	9.69	75.5	26.4	9.28	144.7	±3.3 %
		Y	9.09	72.7	24.6		143.2	
		Z	8.54	72.0	24.5		124.8	
10154-CAB	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	5.82	66.2	19.4	5.75	131.3	±1.9 %
		Y	6.06	66.3	19.1		149.2	
		Z	5.91	66.5	19.4		140.7	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.27	66.9	19.7	5.82	136.5	±1.4 %
		Y	6.19	65.8	18.7		128.4	
		Z	6.33	67.0	19.6		145.4	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	4.81	66.4	19.7	5.73	134.8	±1.7 %
		Y	4.92	66.1	19.1		149.9	
		Z	4.78	66.4	19.6		141.2	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	7.83	76.6	27.2	9.21	131.4	±3.5 %
		Y	7.54	74.5	25.8		147.8	
		Z	7.71	76.7	27.4		145.3	
10175-CAB	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	4.90	66.9	20.0	5.72	147.6	±1.4 %
		Y	4.90	66.0	19.1		148.0	
		Z	4.78	66.4	19.6		141.6	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	4.90	66.9	20.0	5.72	148.1	±1.4 %
		Y	4.89	65.9	19.0		146.9	
		Z	4.80	66.5	19.7		142.1	
10193-CAA	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	X	9.80	68.7	21.4	8.09	135.1	±2.7 %
		Y	9.78	68.2	20.9		135.5	
		Z	9.70	68.5	21.2		130.2	

10196-CAA	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.79	68.7	21.4	8.10	136.4	±2.7 %
		Y	9.81	68.3	20.9		138.0	
		Z	9.72	68.6	21.3		132.8	
10219-CAA	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	X	9.68	68.6	21.3	8.03	136.0	±2.7 %
		Y	9.74	68.3	21.0		137.4	
		Z	9.62	68.5	21.2		132.6	
10222-CAA	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	X	10.20	69.1	21.5	8.06	143.4	±2.6 %
		Y	9.91	68.0	20.7		125.8	
		Z	10.27	69.4	21.6		148.4	
10225-CAB	UMTS-FDD (HSPA+)	X	6.87	66.9	19.6	5.97	139.5	±1.9 %
		Y	7.04	66.9	19.3		149.3	
		Z	6.89	67.0	19.5		143.5	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	7.66	75.9	26.9	9.21	126.1	±3.0 %
		Y	7.17	73.1	25.1		132.1	
		Z	7.18	74.6	26.3		128.0	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	8.58	73.1	25.3	9.24	127.6	±3.3 %
		Y	8.22	71.0	23.7		126.9	
		Z	8.83	74.3	26.0		149.8	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	9.69	75.5	26.5	9.30	143.8	±3.3 %
		Y	8.88	72.0	24.2		135.2	
		Z	8.83	72.9	25.1		131.3	
10274-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	X	5.87	67.0	19.2	4.87	141.2	±1.4 %
		Y	5.77	65.8	18.1		136.0	
		Z	5.71	66.3	18.6		132.7	
10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.44	67.2	19.2	3.96	147.3	±0.9 %
		Y	4.29	65.3	17.6		139.2	
		Z	4.31	66.3	18.5		139.6	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.60	67.1	19.1	3.46	137.8	±0.7 %
		Y	3.44	64.8	17.2		129.6	
		Z	3.48	66.2	18.4		130.5	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.50	66.9	18.9	3.39	139.5	±0.7 %
		Y	3.38	64.8	17.2		132.0	
		Z	3.48	66.5	18.5		133.1	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.12	66.7	19.6	5.81	133.3	±1.9 %
		Y	6.35	66.7	19.3		149.3	
		Z	6.17	66.8	19.5		132.7	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.72	67.4	20.0	6.06	138.7	±1.7 %
		Y	6.63	66.3	19.1		131.4	
		Z	6.72	67.3	19.9		138.7	
10315-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	X	2.90	69.9	19.8	1.71	146.4	±0.5 %
		Y	2.54	65.2	16.5		139.3	
		Z	2.75	68.1	18.5		146.4	
10316-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc duty cycle)	X	10.12	69.3	21.9	8.36	142.9	±3.0 %
		Y	10.01	68.5	21.3		135.2	
		Z	10.11	69.3	21.9		141.7	

10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.59	68.2	19.0	3.76	126.7	±0.7 %
		Y	4.59	67.2	18.0		142.4	
		Z	4.64	68.5	19.0		143.0	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.64	68.8	19.3	3.77	147.1	±0.9 %
		Y	4.47	67.1	17.9		139.6	
		Z	4.54	68.4	18.9		147.2	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	2.66	69.0	19.4	1.54	145.8	±0.5 %
		Y	2.40	64.8	16.2		140.0	
		Z	2.62	67.8	18.4		147.2	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	9.97	69.1	21.7	8.23	142.0	±3.0 %
		Y	10.08	68.9	21.4		145.8	
		Z	10.01	69.2	21.8		143.3	

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

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 8 and 9).
[D] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: ES3DV2 - SN:3022

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	6.39	6.39	6.39	0.20	2.24	± 12.0 %
835	41.5	0.90	6.18	6.18	6.18	0.23	1.98	± 12.0 %
1750	40.1	1.37	5.04	5.04	5.04	0.51	1.35	± 12.0 %
1900	40.0	1.40	4.85	4.85	4.85	0.38	1.66	± 12.0 %
2450	39.2	1.80	4.31	4.31	4.31	0.66	1.28	± 12.0 %
2600	39.0	1.96	4.13	4.13	4.13	0.76	1.28	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

DASY/EASY - Parameters of Probe: ES3DV2 - SN:3022

Calibration Parameter Determined in Body Tissue Simulating Media

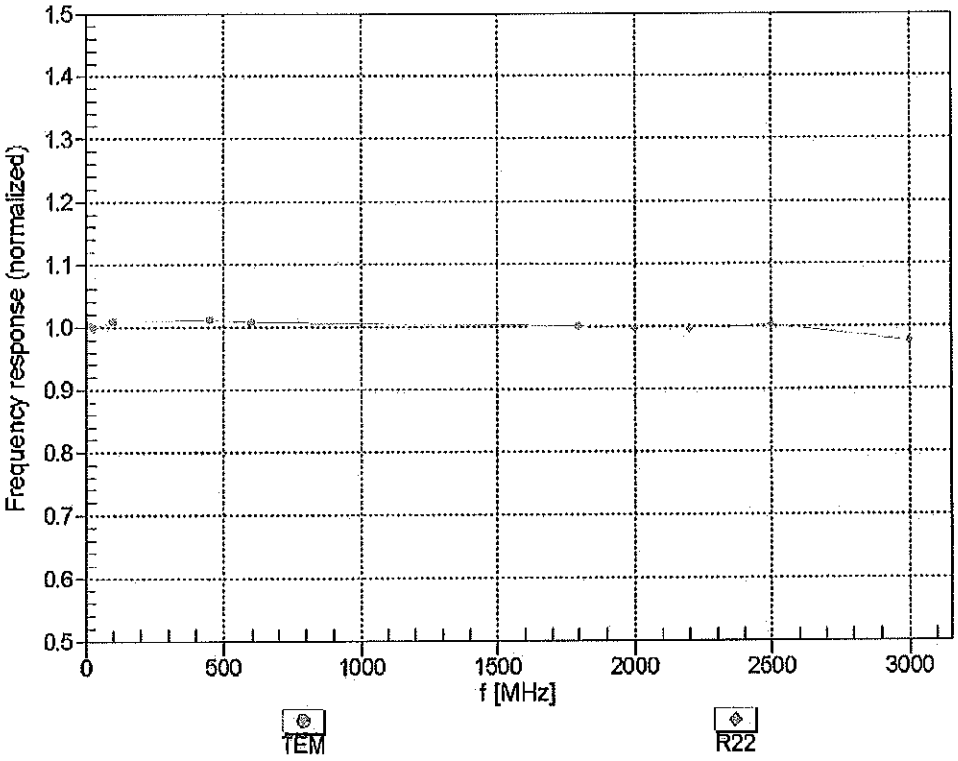
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
450	56.7	0.94	6.78	6.78	6.78	0.12	1.30	± 13.3 %
600	56.1	0.95	6.72	6.72	6.72	0.05	1.20	± 13.3 %
750	55.5	0.96	6.02	6.02	6.02	0.23	2.05	± 12.0 %
835	55.2	0.97	5.98	5.98	5.98	0.29	1.85	± 12.0 %
1750	53.4	1.49	4.70	4.70	4.70	0.66	1.25	± 12.0 %
1900	53.3	1.52	4.49	4.49	4.49	0.33	2.02	± 12.0 %
2450	52.7	1.95	4.05	4.05	4.05	0.80	1.01	± 12.0 %
2600	52.5	2.16	3.94	3.94	3.94	0.68	1.03	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

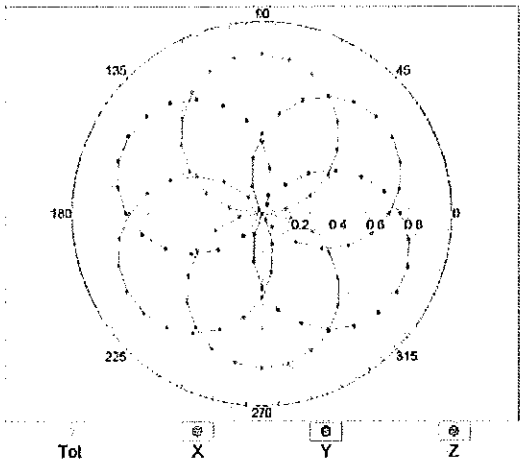
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



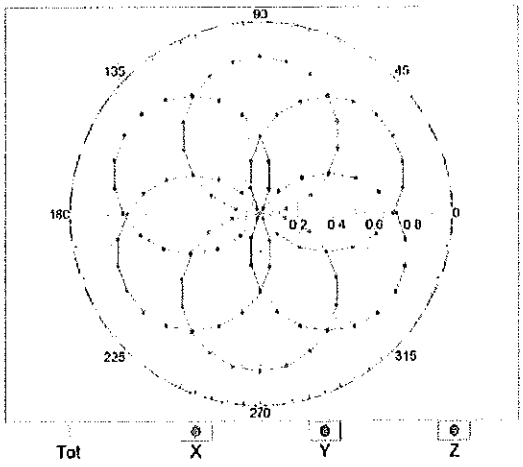
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

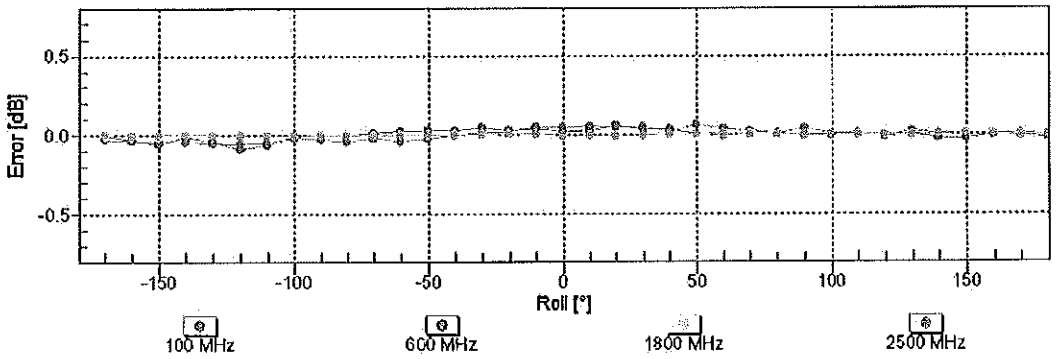
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



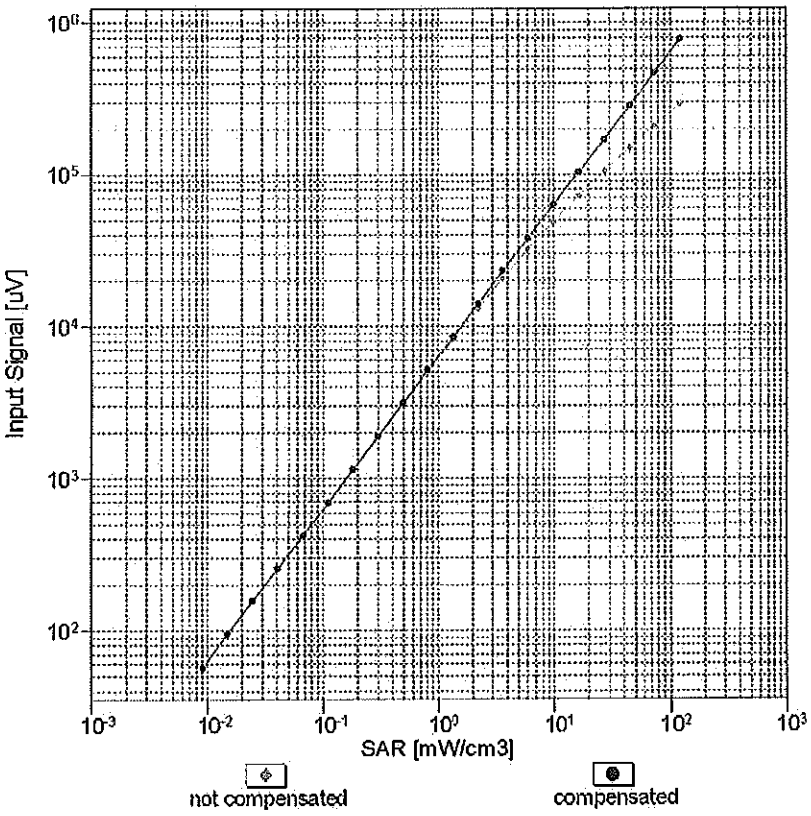
f=1800 MHz,R22

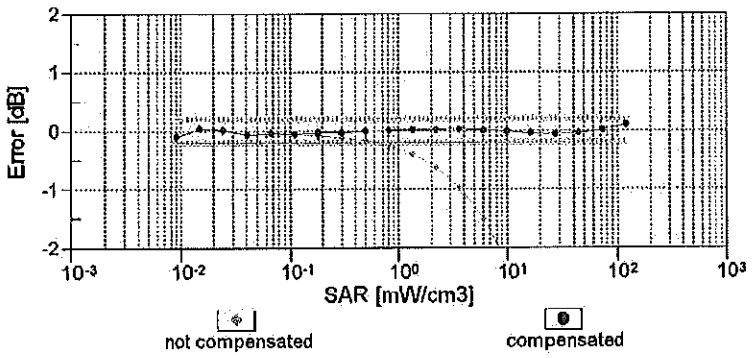




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})
(TEM cell , f_{eval}= 1900 MHz)

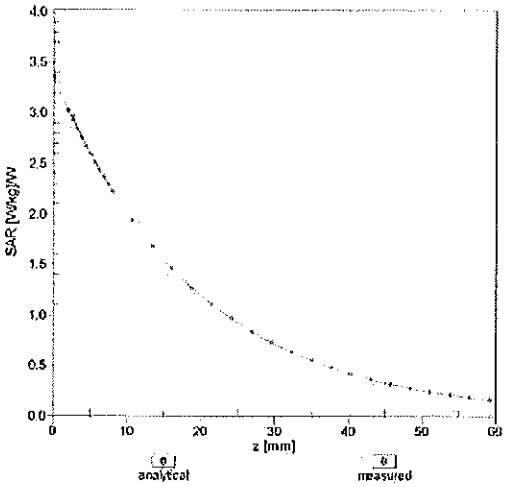




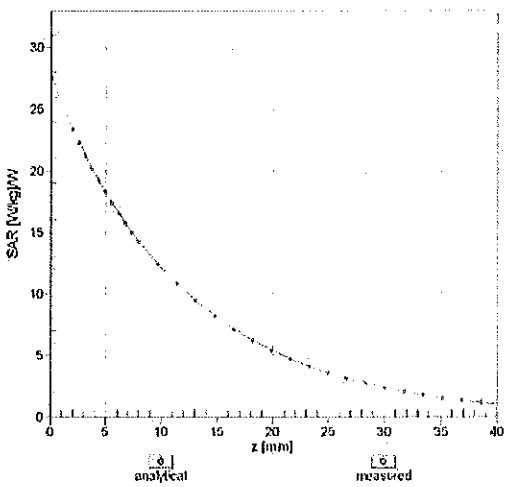
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

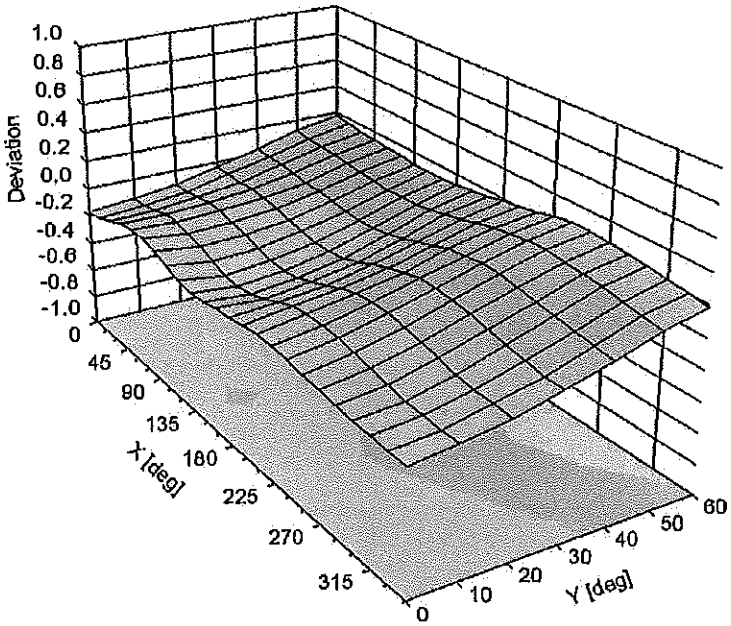


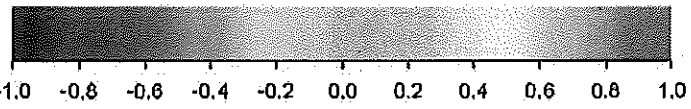
f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

DASY/EASY - Parameters of Probe: ES3DV2 - SN:3022

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-80.3
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm