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SAR EVALUATION REPORT

Applicant Name:
LG Electronics USA
1000 Sylvan Avenue
Englewood Cliffs, NJ 07632
United States

Date of Testing:
11/16/15 – 12/07/15
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Document Serial No.:
0Y1511161958-R1.ZNF

FCC ID: **ZNFK330**

APPLICANT: **LG ELECTRONICS USA**

DUT Type: Portable Handset
Application Type: Certification
FCC Rule Part(s): CFR §2.1093
Model(s): LG-K330, LGK330, K330, LG-MS330, LGMS330, MS330, LGL51AL

Equipment Class	Band & Mode	Tx Frequency	SAR		
			1 gm Head (W/kg)	1 gm Body-Worn (W/kg)	1 gm Hotspot (W/kg)
PCE	GSM/GPRS/EDGE 850	824.20 - 848.80 MHz	0.49	0.51	0.51
PCE	UMTS 850	826.40 - 846.60 MHz	0.35	0.40	0.40
PCE	UMTS 1750	1712.4 - 1752.5 MHz	0.47	1.03	1.03
PCE	GSM/GPRS/EDGE 1900	1850.20 - 1909.80 MHz	0.38	0.45	0.45
PCE	UMTS 1900	1852.4 - 1907.6 MHz	0.50	0.62	0.62
PCE	LTE Band 12	699.7 - 715.3 MHz	0.34	0.57	0.57
PCE	LTE Band 5 (Cell)	824.7 - 848.3 MHz	0.36	0.47	0.47
PCE	LTE Band 4 (AWS)	1710.7 - 1754.3 MHz	0.51	1.03	1.03
PCE	LTE Band 2 (PCS)	1850.7 - 1909.3 MHz	0.52	0.58	0.61
DTS	2.4 GHz WLAN	2412 - 2462 MHz	0.97	0.14	0.14
DSS/DTS	Bluetooth	2402 - 2480 MHz	N/A		
Simultaneous SAR per KDB 690783 D01v01r03:			1.49	1.31	1.17

Note: This revised Test Report (S/N: 0Y1511161958-R1.ZNF) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

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

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

Randy Ortanez
President

ACCREDITED
TESTING CERT#2041.01

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
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.5 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 17	Voice/Data	706.5 - 713.5 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
Bluetooth	Data	2402 - 2480 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 D01v05r02.

Mode / Band		Voice (dBm)	Burst Average GMSK (dBm)				Burst Average 8-PSK (dBm)			
		1 TX Slot	*1 TX Slots*	*2 TX Slots*	*3 TX Slots*	*4 TX Slots*	*1 TX Slots*	*2 TX Slots*	*3 TX Slots*	*4 TX Slots*
GSM/GPRS/EDGE 850	Maximum	**33.7**	**33.7**	**31.7**	**29.7**	**28.2**	**27.7**	**26.7**	**24.7**	**23.7**
	Nominal	**33.2**	**33.2**	**31.2**	**29.2**	**27.7**	**27.2**	**26.2**	**24.2**	**23.2**
GSM/GPRS/EDGE 1900	Maximum	**30.2**	**30.2**	**28.2**	**27.2**	**25.7**	**26.7**	**25.7**	**23.7**	**22.7**
	Nominal	**29.7**	**29.7**	**27.7**	**26.7**	**25.2**	**26.2**	**25.2**	**23.2**	**22.2**

Mode / Band		Modulated Average (dBm)			
		3GPP WCDMA	*3GPP HSDPA*	*3GPP HSUPA*	*3GPP DC-HSDPA*
UMTS Band 5 (850 MHz)	Maximum	**23.7**	**23.7**	**23.7**	**23.7**
	Nominal	**23.2**	**23.2**	**23.2**	**23.2**
UMTS Band 4 (1750 MHz)	Maximum	**24.2**	**24.2**	**24.2**	**24.2**
	Nominal	**23.7**	**23.7**	**23.7**	**23.7**
UMTS Band 2 (1900 MHz)	Maximum	**23.4**	**23.4**	**23.4**	**23.4**
	Nominal	**22.9**	**22.9**	**22.9**	**22.9**

Mode / Band		Modulated Average (dBm)
LTE Band 12	Maximum	**24.2**
	Nominal	**23.7**
LTE Band 17	Maximum	**24.2**
	Nominal	**23.7**
LTE Band 5 (Cell)	Maximum	**23.7**
	Nominal	**23.2**
LTE Band 4 (AWS)	Maximum	**24.2**
	Nominal	**23.7**
LTE Band 2 (PCS)	Maximum	**23.4**
	Nominal	**22.9**

Mode / Band		Modulated Average (dBm)				
		ch. 1	ch. 2	ch. 3 - 9	ch. 10	ch. 11
IEEE 802.11b (2.4 GHz)	Maximum	**18.0**				
	Nominal	**17.0**				
IEEE 802.11g (2.4 GHz)	Maximum	**14.0**	**15.0**	**17.5**	**15.0**	**14.0**
	Nominal	**13.0**	**14.0**	**16.5**	**14.0**	**13.0**
IEEE 802.11n (2.4 GHz)	Maximum	**13.0**	**14.0**	**17.0**	**14.0**	**13.0**
	Nominal	**12.0**	**13.0**	**16.0**	**13.0**	**12.0**

Mode / Band		Modulated Average (dBm)
Bluetooth	Maximum	**11.0**
	Nominal	**7.0**
Bluetooth LE	Maximum	**3.0**
	Nominal	**-1.0**

1.3 DUT Antenna Locations

The overall dimensions of this device are > 9 x 5 cm. The overall diagonal dimension of the device is ≤160 mm and the diagonal display is ≤150 mm. A diagram showing the location of the device antennas can be found in Appendix F.

Table 1-1
Device Edges/Sides for SAR Testing

Mode	Back	Front	Top	Bottom	Right	Left
GPRS 850	Yes	Yes	No	Yes	Yes	Yes
UMTS 850	Yes	Yes	No	Yes	Yes	Yes
UMTS 1750	Yes	Yes	No	Yes	No	Yes
GPRS 1900	Yes	Yes	No	Yes	No	Yes
UMTS 1900	Yes	Yes	No	Yes	No	Yes
LTE Band 12	Yes	Yes	No	Yes	Yes	Yes
LTE Band 5 (Cell)	Yes	Yes	No	Yes	Yes	Yes
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

Note: Particular DUT edges were not required to be evaluated for wireless router SAR if the edges were greater than 2.5 cm from the transmitting antenna according to FCC KDB Publication 941225 D06v02 guidance, page 2. The distances between the transmit antennas and the edges of the device are included in the filing.

1.4 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D01v05r02, 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 D01v05r02 3) procedures.

Table 1-2
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Notes
1	GSM voice + 2.4 GHz WI-FI	Yes	Yes	N/A	
2	GSM voice + 2.4 GHz Bluetooth	N/A	Yes	N/A	
3	UMTS + 2.4 GHz WI-FI	Yes	Yes	Yes	
4	UMTS + 2.4 GHz Bluetooth	N/A	Yes	N/A	
5	LTE + 2.4 GHz WI-FI	Yes	Yes	Yes	
6	LTE + 2.4 GHz Bluetooth	N/A	Yes	N/A	
7	GPRS/EDGE + 2.4 GHz WI-FI	Yes*	Yes*	Yes	*-Pre-installed VOIP applications are considered.
8	GPRS/EDGE + 2.4 GHz Bluetooth	N/A	Yes*	N/A	*-Pre-installed VOIP applications are considered.

1. 2.4 GHz WLAN and 2.4 GHz Bluetooth share the same antenna path and cannot transmit simultaneously.
2. All licensed modes share the same antenna path and cannot transmit simultaneously.
3. When the user utilizes multiple services in UMTS 3G mode it uses multi-Radio Access Bearer or multi-RAB. The power control is based on a physical control channel (Dedicated Physical Control Channel [DPCCH]) and power control will be adjusted to meet the needs of both services. Therefore, the UMTS+WLAN scenario also represents the UMTS Voice/DATA + WLAN 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. Therefore, there are no simultaneous transmission scenarios involving WIFI direct beyond that listed in the above table.
5. This device supports VoLTE.

1.5 Miscellaneous SAR Test Considerations

(A) WIFI/BT

Per FCC KDB 447498 D01v05r02, 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; [(13/10)* √2.480] = 2.0< 3.0. Per KDB Publication 447498 D01v05r02, the maximum power of the channel was rounded to the nearest mW before calculation.

(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 D01v03.

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 D05v02r03.

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

1.6 Power Reduction for SAR

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

1.7 Guidance Applied

- IEEE 1528-2013
- FCC KDB Publication 941225 D01v03, D05v02r03, D06v02 (2G/3G/4G and Hotspot)
- FCC KDB Publication 248227 D01v02r01 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v05r02 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r04, D02v01r01 (SAR Measurements up to 6 GHz)
- October 2013 TCB Workshop Notes (GPRS Testing Considerations)

1.8 Device Serial Numbers

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

	Head Serial Number	Body-Worn Serial Number	Hotspot Serial Number
GSM/GPRS/EDGE 850	02138	02138	02138
UMTS 850	02138	02138	02138
UMTS 1750	02138	02146	02146
GSM/GPRS/EDGE 1900	02146	02138	02138
UMTS 1900	02146	02138	02138
LTE Band 12	02146	02146	02146
LTE Band 5 (Cell)	02138	02146	02146
LTE Band 4 (AWS)	02138	02146	02146
LTE Band 2 (PCS)	02146	02138	02138
2.4 GHz WLAN	05163	05163	05163

2 LTE INFORMATION

LTE Information			
FCC ID	**ZNFK330**		
Form Factor	Portable Handset		
Frequency Range of each LTE transmission band	LTE Band 12 (699.7 - 715.3 MHz)		
	LTE Band 17 (706.5 - 713.5 MHz)		
	LTE Band 5 (Cell) (824.7 - 848.3 MHz)		
	LTE Band 4 (AWS) (1710.7 - 1754.3 MHz)		
	LTE Band 2 (PCS) (1850.7 - 1909.3 MHz)		
Channel Bandwidths	LTE Band 12: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz		
	LTE Band 17: 5 MHz, 10 MHz		
	LTE Band 5 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz		
	LTE Band 4 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz		
	LTE Band 2 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz		
Channel Numbers and Frequencies (MHz)	Low	Mid	High
LTE Band 12: 1.4 MHz	699.7 (23017)	707.5 (23095)	715.3 (23173)
LTE Band 12: 3 MHz	700.5 (23025)	707.5 (23095)	714.5 (23165)
LTE Band 12: 5 MHz	701.5 (23035)	707.5 (23095)	713.5 (23155)
LTE Band 12: 10 MHz	704 (23060)	707.5 (23095)	711 (23130)
LTE Band 17: 5 MHz	706.5 (23755)	710 (23790)	713.5 (23825)
LTE Band 17: 10 MHz	709 (23780)	710 (23790)	711 (23800)
LTE Band 5 (Cell): 1.4 MHz	824.7 (20407)	836.5 (20525)	848.3 (20643)
LTE Band 5 (Cell): 3 MHz	825.5 (20415)	836.5 (20525)	847.5 (20635)
LTE Band 5 (Cell): 5 MHz	826.5 (20425)	836.5 (20525)	846.5 (20625)
LTE Band 5 (Cell): 10 MHz	829 (20450)	836.5 (20525)	844 (20600)
LTE Band 4 (AWS): 1.4 MHz	1710.7 (19957)	1732.5 (20175)	1754.3 (20393)
LTE Band 4 (AWS): 3 MHz	1711.5 (19965)	1732.5 (20175)	1753.5 (20385)
LTE Band 4 (AWS): 5 MHz	1712.5 (19975)	1732.5 (20175)	1752.5 (20375)
LTE Band 4 (AWS): 10 MHz	1715 (20000)	1732.5 (20175)	1750 (20350)
LTE Band 4 (AWS): 15 MHz	1717.5 (20025)	1732.5 (20175)	1747.5 (20325)
LTE Band 4 (AWS): 20 MHz	1720 (20050)	1732.5 (20175)	1745 (20300)
LTE Band 2 (PCS): 1.4 MHz	1850.7 (18607)	1880 (18900)	1909.3 (19193)
LTE Band 2 (PCS): 3 MHz	1851.5 (18615)	1880 (18900)	1908.5 (19185)
LTE Band 2 (PCS): 5 MHz	1852.5 (18625)	1880 (18900)	1907.5 (19175)
LTE Band 2 (PCS): 10 MHz	1855 (18650)	1880 (18900)	1905 (19150)
LTE Band 2 (PCS): 15 MHz	1857.5 (18675)	1880 (18900)	1902.5 (19125)
LTE Band 2 (PCS): 20 MHz	1860 (18700)	1880 (18900)	1900 (19100)
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 Release 10 Additional Information	This device does not support full LTE Release 10 operations in the US. All uplink communications are identical to the Release 8 Specifications. The following LTE Release 10 Features are not supported: Carrier Aggregation, Relay, HetNet, Enhanced MIMO, eICI, WIFI Offloading, MDH, eMBMA, Cross-Carrier Scheduling, Enhanced SC-FDMA.		

3 INTRODUCTION

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

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

3.1 SAR Definition

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

Equation 3-1
SAR Mathematical Equation

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

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

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

where:

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

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

4 DOSIMETRIC ASSESSMENT

4.1 Measurement Procedure

The evaluation was performed using the following procedure compliant to FCC KDB Publication 865664 D01v01r04 and IEEE 1528-2013:

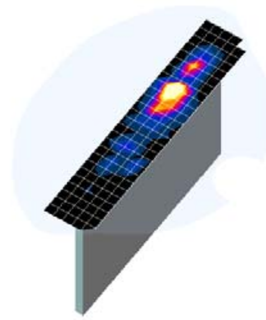


Figure 4-1
Sample SAR Area Scan

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 D01v01r04 (See Table 4-1) and IEEE 1528-2013.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01r04 (See Table 4-1) and IEEE 1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):
   a. SAR values at the inner surface of the phantom are extrapolated from the measured values along the line away from the surface with spacing no greater than that in Table 4-1. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).
   b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the "Not a knot" condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.
   c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.

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

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

*Also compliant to IEEE 1528-2013 Table 6

5 DEFINITION OF REFERENCE POINTS

5.1 EAR REFERENCE POINT

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

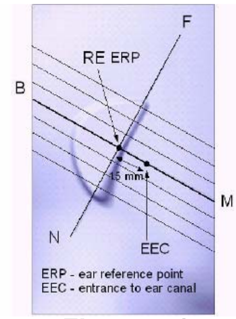


Figure 5-1
Close-Up Side view of ERP

5.2 HANDSET REFERENCE POINTS

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

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

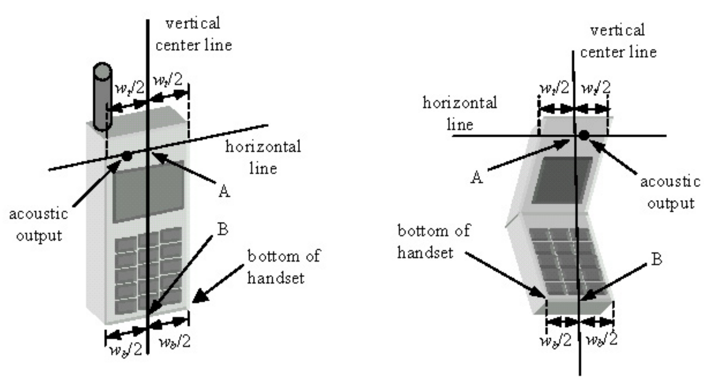


Figure 5-3
Handset Vertical Center & Horizontal Line Reference Points

6 TEST CONFIGURATION POSITIONS FOR HANDSETS

6.1 Device Holder

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

6.2 Positioning for Cheek

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

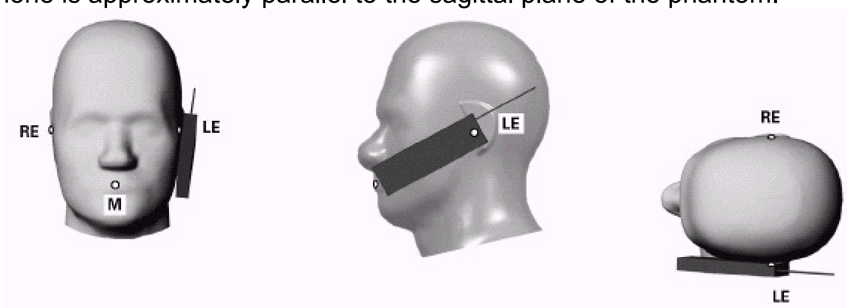


Figure 6-1 Front, Side and Top View of Cheek Position

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

6.3 Positioning for Ear / 15º Tilt

With the test device aligned in the "Cheek Position":

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

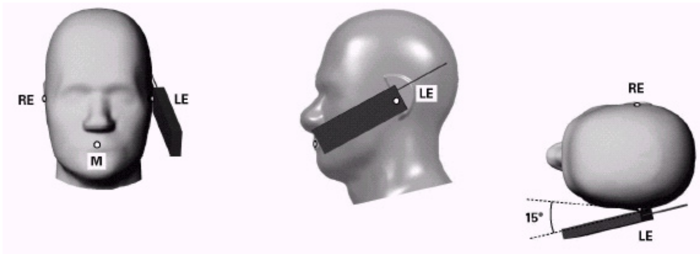


Figure 6-2 Front, Side and Top View of Ear/15º Tilt Position

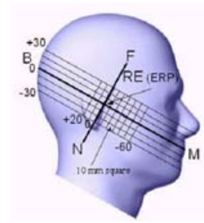


Figure 6-3
Side view w/ relevant markings

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

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

Under these circumstances, the following procedures apply, adopted from the FCC guidance on SAR handsets document FCC KDB Publication 648474 D04v01r02. The SAR required in these regions of SAM should be measured using a flat phantom. The phone should be positioned with a separation distance of 4 mm between the ear reference point (ERP) and the outer surface of the flat phantom shell. While maintaining this distance at the ERP location, the low (bottom) edge of the phone should be lowered from the phantom to establish the same separation distance between the peak SAR location identified by the truncated partial SAR distribution measured with the SAM phantom. The distance from the peak SAR location to the phone is determined by the straight line passing perpendicularly through the phantom surface. When it is not feasible to maintain 4 mm separation at the ERP while also establishing the required separation at the peak SAR location, the top edge of the phone will be allowed to touch the phantom with a separation < 4 mm at the ERP. The phone should not be tilted to the left or right while placed in this inclined position to the flat phantom.

6.5 Body-Worn Accessory Configurations

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 6-4). Per FCC KDB Publication 648474 D04v01r02, 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 D01v05r02 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

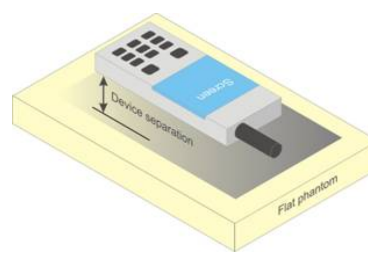


Figure 6-4
Sample Body-Worn Diagram

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

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

6.6 Extremity Exposure Configurations

Devices that are designed or intended for use on extremities or mainly operated in extremity only exposure conditions; i.e., hands, wrists, feet and ankles, may require extremity SAR evaluation. When the device also operates in close proximity to the user's body, SAR compliance for the body is also required. The 1-g body and 10-g extremity SAR Exclusion Thresholds found in KDB Publication 447498 D01v05r02 should be applied to determine SAR test requirements.

Per KDB Publication 447498 D01v05r02, Cell phones (handsets) are not normally designed to be used on extremities or operated in extremity only exposure conditions. The maximum output power levels of handsets generally do not require extremity SAR testing to show compliance. Therefore, extremity SAR was not evaluated for this device.

6.7 Wireless Router Configurations

Some battery-operated handsets have the capability to transmit and receive user data through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06v02 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 D01v05r02 procedures. The "Portable Hotspot" feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

7 RF EXPOSURE LIMITS

7.1 Uncontrolled Environment

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

7.2 Controlled Environment

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

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

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

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

8 FCC MEASUREMENT PROCEDURES

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

8.1 Measured and Reported SAR

Per FCC KDB Publication 447498 D01v05r02, when SAR is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance. For simultaneous transmission, the measured aggregate SAR must be scaled according to the sum of the differences between the maximum tune-up tolerance and actual power used to test each transmitter. When SAR is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as *reported* SAR. The highest *reported* SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r03.

8.2 3G SAR Test Reduction Procedure

In FCC KDB Publication 941225 D01v03, certain transmission modes within a frequency band and wireless mode evaluated for SAR are defined as primary modes. The equivalent modes considered for SAR test reduction are denoted as secondary modes. When the maximum output power including tune-up tolerance specified for production units in a secondary mode is ≤ 0.25 dB higher than the primary mode or when the highest reported SAR of the primary mode, scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode, is ≤ 1.2 W/kg, SAR measurements are not required for the secondary mode. These criteria are referred to as the 3G SAR test reduction procedure. When the 3G SAR test reduction procedure is not satisfied, SAR measurements are additionally required for the secondary mode.

8.3 Procedures Used to Establish RF Signal for SAR

The following procedures are according to FCC KDB Publication 941225 D01v03 "3G SAR Measurement Procedures."

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

8.4 SAR Measurement Conditions for UMTS

8.4.1 Output Power Verification

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

8.4.2 Head SAR Measurements

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

8.4.3 Body SAR Measurements

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

8.4.4 SAR Measurements with Rel 5 HSDPA

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

8.4.5 SAR Measurements with Rel 6 HSUPA

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

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

8.4.6 SAR Measurement Conditions for DC-HSDPA

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

8.5 SAR Measurement Conditions for LTE

LTE modes are tested according to FCC KDB 941225 D05v02r03 publication. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The R&S CMW500 or Anritsu MT8820C simulators are used for LTE output power measurements and SAR testing. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

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 D05v02r03:

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 4.2.2, SAR is required for 50% RB allocation using the largest bandwidth following the same procedures outlined in Section 4.2.1.
c. Per Section 4.2.3, 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 4.2.4 and 4.3, 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 4.2.1 through 4.2.3 is less than or equal to ½ dB higher than the equivalent configuration using QPSK modulation and when the QPSK SAR for those configurations is <1.45 W/kg.

8.6 SAR Testing with 802.11 Transmitters

The normal network operating configurations of 802.11 transmitters are not suitable for SAR measurements. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure the results are consistent and reliable. See KDB Publication 248227 D01v02r01 for more details.

8.6.1 General Device Setup

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

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

8.6.2 Initial Test Position Procedure

For exposure conditions with multiple test positions, such as handset operating next to the ear, devices with hotspot mode or UMPC mini-tablet, procedures for initial test position can be applied. Using the transmission mode determined by the DSSS procedure or initial test configuration, area scans are measured for all positions in an exposure condition. The test position with the highest extrapolated (peak) SAR is used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg, no additional testing for the remaining test positions is required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.

8.6.3 2.4 GHz SAR Test Requirements

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

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

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

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

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	33.45	33.45	31.40	**29.20**	27.90	27.55	26.35	24.50	23.20
	190	33.55	33.55	31.30	**29.40**	27.90	27.55	26.40	24.50	23.35
	251	33.10	33.10	30.90	**29.20**	27.50	27.35	26.25	24.30	23.20
GSM 1900	512	30.00	29.90	28.10	**27.10**	25.45	26.35	25.30	23.70	22.65
	661	30.05	29.05	27.95	**26.85**	25.40	26.35	25.30	23.65	22.55
	810	30.15	30.05	28.20	**27.00**	25.50	26.30	25.20	23.65	22.50

		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	24.42	24.42	25.38	**24.94**	24.89	18.52	20.33	20.24	20.19
	190	24.52	24.52	25.28	**25.14**	24.89	18.52	20.38	20.24	20.34
	251	24.07	24.07	24.88	**24.94**	24.49	18.32	20.23	20.04	20.19
GSM 1900	512	20.97	20.87	22.08	**22.84**	22.44	17.32	19.28	19.44	19.64
	661	21.02	20.02	21.93	**22.59**	22.39	17.32	19.28	19.39	19.54
	810	21.12	21.02	22.18	**22.74**	22.49	17.27	19.18	19.39	19.49
GSM 850	Frame Avg.Targets:	24.17	24.17	25.18	**24.94**	24.69	18.17	20.18	19.94	20.19
GSM 1900		20.67	20.67	21.68	**22.44**	22.19	17.17	19.18	18.94	19.19

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. GPRS/EDGE (GMSK) output powers were measured with coding scheme setting of 1 (CS1) on the base station simulator. CS1 was configured to measure GPRS output power measurements and SAR to ensure GMSK modulation in the signal. Our Investigation has shown that CS1 - CS4 settings do not have any impact on the output levels or modulation in the GPRS modes.
3. EDGE (8-PSK) output powers were measured with MCS7 on the base station simulator. MCS7 coding scheme was used to measure the output powers for EDGE since investigation has shown that choosing MCS7 coding scheme will ensure 8-PSK modulation. It has been shown that MCS levels that produce 8PSK modulation do not have an impact on output power.

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

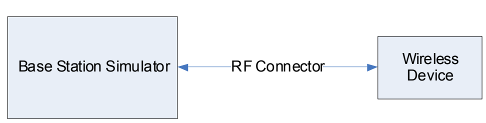


Figure 9-1
Power Measurement Setup

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	23.60	23.55	23.50	24.00	24.15	24.05	23.15	23.25	23.30	-
99		12.2 kbps AMR	23.60	23.55	23.50	24.05	24.10	24.00	23.20	23.20	23.25	-
6	HSDPA	Subtest 1	23.60	23.59	23.67	24.15	24.19	24.20	23.30	23.34	23.36	0
6		Subtest 2	23.62	23.60	23.58	24.14	24.19	24.20	23.37	23.39	23.40	0
6		Subtest 3	23.14	23.16	23.10	23.69	23.70	23.70	22.85	22.90	22.90	0.5
6		Subtest 4	23.20	23.17	23.10	23.70	23.70	23.69	22.85	22.86	22.89	0.5
6	HSUPA	Subtest 1	23.23	22.65	23.00	23.56	23.61	23.92	22.89	22.16	22.76	0
6		Subtest 2	21.93	21.83	21.98	21.85	22.46	21.94	21.26	21.34	21.71	2
6		Subtest 3	22.36	22.15	22.50	22.62	23.02	23.07	21.98	22.23	22.17	1
6		Subtest 4	21.95	21.98	22.20	22.33	22.71	22.91	21.53	21.67	21.56	2
6		Subtest 5	23.66	23.68	23.59	24.15	24.20	24.19	23.18	23.30	23.31	0
8	DC-HSDPA	Subtest 1	23.70	23.69	23.60	23.67	23.86	24.08	23.35	23.37	23.40	0
8		Subtest 2	23.70	23.70	23.66	23.64	23.82	24.00	23.26	23.32	23.40	0
8		Subtest 3	23.20	23.20	23.19	23.27	23.36	23.59	22.82	22.77	22.90	0.5
8		Subtest 4	23.20	23.18	23.20	23.22	23.28	23.56	22.65	22.81	22.90	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

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

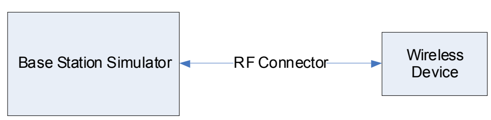


Figure 9-2
Power Measurement Setup

9.3 LTE Conducted Powers

9.3.1 LTE Band 12

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	707.5	23095	10	QPSK	1	0	23.97	0	0
	707.5	23095	10	QPSK	1	25	**24.15**	0	0
	707.5	23095	10	QPSK	1	49	23.81	0	0
	707.5	23095	10	QPSK	25	0	**22.84**	0-1	1
	707.5	23095	10	QPSK	25	12	22.79	0-1	1
	707.5	23095	10	QPSK	25	25	22.69	0-1	1
	707.5	23095	10	QPSK	50	0	22.73	0-1	1
	707.5	23095	10	16QAM	1	0	22.77	0-1	1
	707.5	23095	10	16QAM	1	25	23.10	0-1	1
	707.5	23095	10	16QAM	1	49	22.70	0-1	1
	707.5	23095	10	16QAM	25	0	21.87	0-2	2
	707.5	23095	10	16QAM	25	12	21.91	0-2	2
	707.5	23095	10	16QAM	25	25	21.90	0-2	2
	707.5	23095	10	16QAM	50	0	21.86	0-2	2

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

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	701.5	23035	5	QPSK	1	0	24.03	0	0
	701.5	23035	5	QPSK	1	12	24.11	0	0
	701.5	23035	5	QPSK	1	24	24.15	0	0
	701.5	23035	5	QPSK	12	0	22.68	0-1	1
	701.5	23035	5	QPSK	12	6	22.69	0-1	1
	701.5	23035	5	QPSK	12	13	22.81	0-1	1
	701.5	23035	5	QPSK	25	0	22.78	0-1	1
	701.5	23035	5	16-QAM	1	0	23.10	0-1	1
	701.5	23035	5	16-QAM	1	12	23.19	0-1	1
	701.5	23035	5	16-QAM	1	24	23.06	0-1	1
	701.5	23035	5	16-QAM	12	0	21.64	0-2	2
	701.5	23035	5	16-QAM	12	6	21.74	0-2	2
	701.5	23035	5	16-QAM	12	13	21.77	0-2	2
	701.5	23035	5	16-QAM	25	0	22.06	0-2	2
Mid	707.5	23095	5	QPSK	1	0	23.94	0	0
	707.5	23095	5	QPSK	1	12	24.07	0	0
	707.5	23095	5	QPSK	1	24	23.76	0	0
	707.5	23095	5	QPSK	12	0	22.83	0-1	1
	707.5	23095	5	QPSK	12	6	22.77	0-1	1
	707.5	23095	5	QPSK	12	13	22.76	0-1	1
	707.5	23095	5	QPSK	25	0	22.78	0-1	1
	707.5	23095	5	16-QAM	1	0	22.84	0-1	1
	707.5	23095	5	16-QAM	1	12	23.08	0-1	1
	707.5	23095	5	16-QAM	1	24	22.86	0-1	1
	707.5	23095	5	16-QAM	12	0	21.78	0-2	2
	707.5	23095	5	16-QAM	12	6	21.64	0-2	2
	707.5	23095	5	16-QAM	12	13	21.62	0-2	2
	707.5	23095	5	16-QAM	25	0	21.70	0-2	2
High	713.5	23155	5	QPSK	1	0	23.70	0	0
	713.5	23155	5	QPSK	1	12	23.95	0	0
	713.5	23155	5	QPSK	1	24	23.38	0	0
	713.5	23155	5	QPSK	12	0	22.83	0-1	1
	713.5	23155	5	QPSK	12	6	22.78	0-1	1
	713.5	23155	5	QPSK	12	13	22.61	0-1	1
	713.5	23155	5	QPSK	25	0	22.80	0-1	1
	713.5	23155	5	16-QAM	1	0	22.78	0-1	1
	713.5	23155	5	16-QAM	1	12	22.80	0-1	1
	713.5	23155	5	16-QAM	1	24	22.41	0-1	1
	713.5	23155	5	16-QAM	12	0	21.90	0-2	2
	713.5	23155	5	16-QAM	12	6	21.76	0-2	2
	713.5	23155	5	16-QAM	12	13	21.80	0-2	2
	713.5	23155	5	16-QAM	25	0	21.91	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	700.5	23025	3	QPSK	1	0	23.97	0	0
	700.5	23025	3	QPSK	1	7	23.92	0	0
	700.5	23025	3	QPSK	1	14	23.77	0	0
	700.5	23025	3	QPSK	8	0	22.83	0-1	1
	700.5	23025	3	QPSK	8	4	22.84	0-1	1
	700.5	23025	3	QPSK	8	7	22.73	0-1	1
	700.5	23025	3	QPSK	15	0	22.80	0-1	1
	700.5	23025	3	16-QAM	1	0	23.17	0-1	1
	700.5	23025	3	16-QAM	1	7	23.15	0-1	1
	700.5	23025	3	16-QAM	1	14	23.04	0-1	1
	700.5	23025	3	16-QAM	8	0	21.68	0-2	2
	700.5	23025	3	16-QAM	8	4	21.88	0-2	2
	700.5	23025	3	16-QAM	8	7	21.87	0-2	2
	700.5	23025	3	16-QAM	15	0	22.01	0-2	2
Mid	707.5	23095	3	QPSK	1	0	23.75	0	0
	707.5	23095	3	QPSK	1	7	23.91	0	0
	707.5	23095	3	QPSK	1	14	23.97	0	0
	707.5	23095	3	QPSK	8	0	22.81	0-1	1
	707.5	23095	3	QPSK	8	4	22.81	0-1	1
	707.5	23095	3	QPSK	8	7	22.79	0-1	1
	707.5	23095	3	QPSK	15	0	22.76	0-1	1
	707.5	23095	3	16-QAM	1	0	23.11	0-1	1
	707.5	23095	3	16-QAM	1	7	23.10	0-1	1
	707.5	23095	3	16-QAM	1	14	23.02	0-1	1
	707.5	23095	3	16-QAM	8	0	22.04	0-2	2
	707.5	23095	3	16-QAM	8	4	21.76	0-2	2
	707.5	23095	3	16-QAM	8	7	21.70	0-2	2
	707.5	23095	3	16-QAM	15	0	21.60	0-2	2
High	714.5	23165	3	QPSK	1	0	23.80	0	0
	714.5	23165	3	QPSK	1	7	23.75	0	0
	714.5	23165	3	QPSK	1	14	23.42	0	0
	714.5	23165	3	QPSK	8	0	22.64	0-1	1
	714.5	23165	3	QPSK	8	4	22.63	0-1	1
	714.5	23165	3	QPSK	8	7	22.49	0-1	1
	714.5	23165	3	QPSK	15	0	22.63	0-1	1
	714.5	23165	3	16-QAM	1	0	22.75	0-1	1
	714.5	23165	3	16-QAM	1	7	22.78	0-1	1
	714.5	23165	3	16-QAM	1	14	22.56	0-1	1
	714.5	23165	3	16-QAM	8	0	21.78	0-2	2
	714.5	23165	3	16-QAM	8	4	21.68	0-2	2
	714.5	23165	3	16-QAM	8	7	21.54	0-2	2
	714.5	23165	3	16-QAM	15	0	21.60	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	699.7	23017	1.4	QPSK	1	0	23.89	0	0
	699.7	23017	1.4	QPSK	1	2	24.15	0	0
	699.7	23017	1.4	QPSK	1	5	24.14	0	0
	699.7	23017	1.4	QPSK	3	0	23.92	0	0
	699.7	23017	1.4	QPSK	3	2	23.90	0	0
	699.7	23017	1.4	QPSK	3	3	23.91	0	0
	699.7	23017	1.4	QPSK	6	0	23.00	0-1	1
	699.7	23017	1.4	16-QAM	1	0	23.14	0-1	1
	699.7	23017	1.4	16-QAM	1	2	23.13	0-1	1
	699.7	23017	1.4	16-QAM	1	5	23.20	0-1	1
	699.7	23017	1.4	16-QAM	3	0	22.68	0-1	1
	699.7	23017	1.4	16-QAM	3	2	22.65	0-1	1
	699.7	23017	1.4	16-QAM	3	3	22.58	0-1	1
	699.7	23017	1.4	16-QAM	6	0	22.07	0-2	2
Mid	707.5	23095	1.4	QPSK	1	0	23.97	0	0
	707.5	23095	1.4	QPSK	1	2	24.00	0	0
	707.5	23095	1.4	QPSK	1	5	24.01	0	0
	707.5	23095	1.4	QPSK	3	0	23.84	0	0
	707.5	23095	1.4	QPSK	3	2	23.90	0	0
	707.5	23095	1.4	QPSK	3	3	23.86	0	0
	707.5	23095	1.4	QPSK	6	0	22.93	0-1	1
	707.5	23095	1.4	16-QAM	1	0	22.92	0-1	1
	707.5	23095	1.4	16-QAM	1	2	23.05	0-1	1
	707.5	23095	1.4	16-QAM	1	5	23.08	0-1	1
	707.5	23095	1.4	16-QAM	3	0	22.63	0-1	1
	707.5	23095	1.4	16-QAM	3	2	22.59	0-1	1
	707.5	23095	1.4	16-QAM	3	3	22.54	0-1	1
	707.5	23095	1.4	16-QAM	6	0	21.89	0-2	2
High	715.3	23173	1.4	QPSK	1	0	23.68	0	0
	715.3	23173	1.4	QPSK	1	2	23.65	0	0
	715.3	23173	1.4	QPSK	1	5	23.68	0	0
	715.3	23173	1.4	QPSK	3	0	23.46	0	0
	715.3	23173	1.4	QPSK	3	2	23.51	0	0
	715.3	23173	1.4	QPSK	3	3	23.43	0	0
	715.3	23173	1.4	QPSK	6	0	22.41	0-1	1
	715.3	23173	1.4	16-QAM	1	0	22.30	0-1	1
	715.3	23173	1.4	16-QAM	1	2	22.30	0-1	1
	715.3	23173	1.4	16-QAM	1	5	22.44	0-1	1
	715.3	23173	1.4	16-QAM	3	0	22.45	0-1	1
	715.3	23173	1.4	16-QAM	3	2	22.40	0-1	1
	715.3	23173	1.4	16-QAM	3	3	22.32	0-1	1
	715.3	23173	1.4	16-QAM	6	0	21.54	0-2	2

9.3.2 LTE Band 5 (Cell)

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	836.5	20525	10	QPSK	1	0	**23.48**	0	0
	836.5	20525	10	QPSK	1	25	23.43	0	0
	836.5	20525	10	QPSK	1	49	23.37	0	0
	836.5	20525	10	QPSK	25	0	22.52	0-1	1
	836.5	20525	10	QPSK	25	12	**22.62**	0-1	1
	836.5	20525	10	QPSK	25	25	22.53	0-1	1
	836.5	20525	10	QPSK	50	0	22.51	0-1	1
	836.5	20525	10	16QAM	1	0	22.28	0-1	1
	836.5	20525	10	16QAM	1	25	22.31	0-1	1
	836.5	20525	10	16QAM	1	49	22.47	0-1	1
	836.5	20525	10	16QAM	25	0	21.49	0-2	2
	836.5	20525	10	16QAM	25	12	21.49	0-2	2
	836.5	20525	10	16QAM	25	25	21.42	0-2	2
	836.5	20525	10	16QAM	50	0	21.42	0-2	2

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

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	826.5	20425	5	QPSK	1	0	23.36	0	0
	826.5	20425	5	QPSK	1	12	23.40	0	0
	826.5	20425	5	QPSK	1	24	23.37	0	0
	826.5	20425	5	QPSK	12	0	22.59	0-1	1
	826.5	20425	5	QPSK	12	6	22.50	0-1	1
	826.5	20425	5	QPSK	12	13	22.53	0-1	1
	826.5	20425	5	QPSK	25	0	22.58	0-1	1
	826.5	20425	5	16-QAM	1	0	22.47	0-1	1
	826.5	20425	5	16-QAM	1	12	22.60	0-1	1
	826.5	20425	5	16-QAM	1	24	22.61	0-1	1
	826.5	20425	5	16-QAM	12	0	21.38	0-2	2
	826.5	20425	5	16-QAM	12	6	21.41	0-2	2
	826.5	20425	5	16-QAM	12	13	21.34	0-2	2
	826.5	20425	5	16-QAM	25	0	21.66	0-2	2
Mid	836.5	20525	5	QPSK	1	0	23.08	0	0
	836.5	20525	5	QPSK	1	12	23.30	0	0
	836.5	20525	5	QPSK	1	24	23.12	0	0
	836.5	20525	5	QPSK	12	0	22.47	0-1	1
	836.5	20525	5	QPSK	12	6	22.53	0-1	1
	836.5	20525	5	QPSK	12	13	22.54	0-1	1
	836.5	20525	5	QPSK	25	0	22.51	0-1	1
	836.5	20525	5	16-QAM	1	0	22.19	0-1	1
	836.5	20525	5	16-QAM	1	12	22.15	0-1	1
	836.5	20525	5	16-QAM	1	24	22.26	0-1	1
	836.5	20525	5	16-QAM	12	0	21.16	0-2	2
	836.5	20525	5	16-QAM	12	6	21.22	0-2	2
	836.5	20525	5	16-QAM	12	13	21.23	0-2	2
	836.5	20525	5	16-QAM	25	0	21.45	0-2	2
High	846.5	20625	5	QPSK	1	0	23.16	0	0
	846.5	20625	5	QPSK	1	12	23.32	0	0
	846.5	20625	5	QPSK	1	24	23.25	0	0
	846.5	20625	5	QPSK	12	0	22.35	0-1	1
	846.5	20625	5	QPSK	12	6	22.43	0-1	1
	846.5	20625	5	QPSK	12	13	22.43	0-1	1
	846.5	20625	5	QPSK	25	0	22.34	0-1	1
	846.5	20625	5	16-QAM	1	0	22.12	0-1	1
	846.5	20625	5	16-QAM	1	12	21.82	0-1	1
	846.5	20625	5	16-QAM	1	24	22.20	0-1	1
	846.5	20625	5	16-QAM	12	0	21.46	0-2	2
	846.5	20625	5	16-QAM	12	6	21.42	0-2	2
	846.5	20625	5	16-QAM	12	13	21.42	0-2	2
	846.5	20625	5	16-QAM	25	0	21.25	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	825.5	20415	3	QPSK	1	0	23.56	0	0
	825.5	20415	3	QPSK	1	7	23.67	0	0
	825.5	20415	3	QPSK	1	14	23.16	0	0
	825.5	20415	3	QPSK	8	0	22.42	0-1	1
	825.5	20415	3	QPSK	8	4	22.41	0-1	1
	825.5	20415	3	QPSK	8	7	22.41	0-1	1
	825.5	20415	3	QPSK	15	0	22.43	0-1	1
	825.5	20415	3	16-QAM	1	0	22.41	0-1	1
	825.5	20415	3	16-QAM	1	7	22.40	0-1	1
	825.5	20415	3	16-QAM	1	14	22.45	0-1	1
	825.5	20415	3	16-QAM	8	0	21.53	0-2	2
	825.5	20415	3	16-QAM	8	4	21.63	0-2	2
	825.5	20415	3	16-QAM	8	7	21.21	0-2	2
	825.5	20415	3	16-QAM	15	0	21.40	0-2	2
Mid	836.5	20525	3	QPSK	1	0	23.39	0	0
	836.5	20525	3	QPSK	1	7	23.54	0	0
	836.5	20525	3	QPSK	1	14	23.43	0	0
	836.5	20525	3	QPSK	8	0	22.47	0-1	1
	836.5	20525	3	QPSK	8	4	22.47	0-1	1
	836.5	20525	3	QPSK	8	7	22.50	0-1	1
	836.5	20525	3	QPSK	15	0	22.48	0-1	1
	836.5	20525	3	16-QAM	1	0	22.47	0-1	1
	836.5	20525	3	16-QAM	1	7	22.67	0-1	1
	836.5	20525	3	16-QAM	1	14	22.54	0-1	1
	836.5	20525	3	16-QAM	8	0	21.58	0-2	2
	836.5	20525	3	16-QAM	8	4	21.60	0-2	2
	836.5	20525	3	16-QAM	8	7	21.47	0-2	2
	836.5	20525	3	16-QAM	15	0	21.47	0-2	2
High	847.5	20635	3	QPSK	1	0	23.39	0	0
	847.5	20635	3	QPSK	1	7	23.40	0	0
	847.5	20635	3	QPSK	1	14	23.44	0	0
	847.5	20635	3	QPSK	8	0	22.41	0-1	1
	847.5	20635	3	QPSK	8	4	22.42	0-1	1
	847.5	20635	3	QPSK	8	7	22.46	0-1	1
	847.5	20635	3	QPSK	15	0	22.50	0-1	1
	847.5	20635	3	16-QAM	1	0	21.96	0-1	1
	847.5	20635	3	16-QAM	1	7	21.94	0-1	1
	847.5	20635	3	16-QAM	1	14	22.08	0-1	1
	847.5	20635	3	16-QAM	8	0	21.44	0-2	2
	847.5	20635	3	16-QAM	8	4	21.55	0-2	2
	847.5	20635	3	16-QAM	8	7	21.57	0-2	2
	847.5	20635	3	16-QAM	15	0	21.37	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	824.7	20407	1.4	QPSK	1	0	23.48	0	0
	824.7	20407	1.4	QPSK	1	2	23.54	0	0
	824.7	20407	1.4	QPSK	1	5	23.45	0	0
	824.7	20407	1.4	QPSK	3	0	23.45	0	0
	824.7	20407	1.4	QPSK	3	2	23.45	0	0
	824.7	20407	1.4	QPSK	3	3	23.39	0	0
	824.7	20407	1.4	QPSK	6	0	22.48	0-1	1
	824.7	20407	1.4	16-QAM	1	0	22.30	0-1	1
	824.7	20407	1.4	16-QAM	1	2	22.28	0-1	1
	824.7	20407	1.4	16-QAM	1	5	22.03	0-1	1
	824.7	20407	1.4	16-QAM	3	0	22.37	0-1	1
	824.7	20407	1.4	16-QAM	3	2	22.37	0-1	1
	824.7	20407	1.4	16-QAM	3	3	22.29	0-1	1
	824.7	20407	1.4	16-QAM	6	0	21.53	0-2	2
Mid	836.5	20525	1.4	QPSK	1	0	23.52	0	0
	836.5	20525	1.4	QPSK	1	2	23.61	0	0
	836.5	20525	1.4	QPSK	1	5	23.48	0	0
	836.5	20525	1.4	QPSK	3	0	23.46	0	0
	836.5	20525	1.4	QPSK	3	2	23.46	0	0
	836.5	20525	1.4	QPSK	3	3	23.42	0	0
	836.5	20525	1.4	QPSK	6	0	22.51	0-1	1
	836.5	20525	1.4	16-QAM	1	0	22.59	0-1	1
	836.5	20525	1.4	16-QAM	1	2	22.66	0-1	1
	836.5	20525	1.4	16-QAM	1	5	22.70	0-1	1
	836.5	20525	1.4	16-QAM	3	0	22.59	0-1	1
	836.5	20525	1.4	16-QAM	3	2	22.57	0-1	1
	836.5	20525	1.4	16-QAM	3	3	22.49	0-1	1
	836.5	20525	1.4	16-QAM	6	0	21.48	0-2	2
High	848.3	20643	1.4	QPSK	1	0	23.40	0	0
	848.3	20643	1.4	QPSK	1	2	23.35	0	0
	848.3	20643	1.4	QPSK	1	5	23.32	0	0
	848.3	20643	1.4	QPSK	3	0	23.43	0	0
	848.3	20643	1.4	QPSK	3	2	23.38	0	0
	848.3	20643	1.4	QPSK	3	3	23.39	0	0
	848.3	20643	1.4	QPSK	6	0	22.42	0-1	1
	848.3	20643	1.4	16-QAM	1	0	22.44	0-1	1
	848.3	20643	1.4	16-QAM	1	2	22.59	0-1	1
	848.3	20643	1.4	16-QAM	1	5	22.55	0-1	1
	848.3	20643	1.4	16-QAM	3	0	22.64	0-1	1
	848.3	20643	1.4	16-QAM	3	2	22.44	0-1	1
	848.3	20643	1.4	16-QAM	3	3	22.38	0-1	1
	848.3	20643	1.4	16-QAM	6	0	21.58	0-2	2

9.3.3 LTE Band 4 (AWS)

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	1732.5	20175	20	QPSK	1	0	24.12	0	0
	1732.5	20175	20	QPSK	1	50	**24.16**	0	0
	1732.5	20175	20	QPSK	1	99	23.66	0	0
	1732.5	20175	20	QPSK	50	0	22.91	0-1	1
	1732.5	20175	20	QPSK	50	25	**22.94**	0-1	1
	1732.5	20175	20	QPSK	50	50	22.89	0-1	1
	1732.5	20175	20	QPSK	100	0	22.86	0-1	1
	1732.5	20175	20	16QAM	1	0	22.62	0-1	1
	1732.5	20175	20	16QAM	1	50	22.92	0-1	1
	1732.5	20175	20	16QAM	1	99	22.67	0-1	1
	1732.5	20175	20	16QAM	50	0	21.78	0-2	2
	1732.5	20175	20	16QAM	50	25	21.76	0-2	2
	1732.5	20175	20	16QAM	50	50	21.89	0-2	2
	1732.5	20175	20	16QAM	100	0	21.78	0-2	2

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

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1717.5	20025	15	QPSK	1	0	24.17	0	0
	1717.5	20025	15	QPSK	1	36	23.87	0	0
	1717.5	20025	15	QPSK	1	74	23.76	0	0
	1717.5	20025	15	QPSK	36	0	22.93	0-1	1
	1717.5	20025	15	QPSK	36	18	22.85	0-1	1
	1717.5	20025	15	QPSK	36	37	22.78	0-1	1
	1717.5	20025	15	QPSK	75	0	22.82	0-1	1
	1717.5	20025	15	16QAM	1	0	22.91	0-1	1
	1717.5	20025	15	16QAM	1	36	22.33	0-1	1
	1717.5	20025	15	16QAM	1	74	22.57	0-1	1
	1717.5	20025	15	16QAM	36	0	21.84	0-2	2
	1717.5	20025	15	16QAM	36	18	21.77	0-2	2
	1717.5	20025	15	16QAM	36	37	21.71	0-2	2
	1717.5	20025	15	16QAM	75	0	21.64	0-2	2
Mid	1732.5	20175	15	QPSK	1	0	23.99	0	0
	1732.5	20175	15	QPSK	1	36	23.80	0	0
	1732.5	20175	15	QPSK	1	74	24.13	0	0
	1732.5	20175	15	QPSK	36	0	22.88	0-1	1
	1732.5	20175	15	QPSK	36	18	22.84	0-1	1
	1732.5	20175	15	QPSK	36	37	22.83	0-1	1
	1732.5	20175	15	QPSK	75	0	22.88	0-1	1
	1732.5	20175	15	16QAM	1	0	22.82	0-1	1
	1732.5	20175	15	16QAM	1	36	22.74	0-1	1
	1732.5	20175	15	16QAM	1	74	22.85	0-1	1
	1732.5	20175	15	16QAM	36	0	21.73	0-2	2
	1732.5	20175	15	16QAM	36	18	21.75	0-2	2
	1732.5	20175	15	16QAM	36	37	21.76	0-2	2
	1732.5	20175	15	16QAM	75	0	21.74	0-2	2
High	1747.5	20325	15	QPSK	1	0	24.02	0	0
	1747.5	20325	15	QPSK	1	36	23.70	0	0
	1747.5	20325	15	QPSK	1	74	23.63	0	0
	1747.5	20325	15	QPSK	36	0	23.03	0-1	1
	1747.5	20325	15	QPSK	36	18	22.83	0-1	1
	1747.5	20325	15	QPSK	36	37	22.70	0-1	1
	1747.5	20325	15	QPSK	75	0	22.79	0-1	1
	1747.5	20325	15	16QAM	1	0	22.57	0-1	1
	1747.5	20325	15	16QAM	1	36	22.46	0-1	1
	1747.5	20325	15	16QAM	1	74	22.37	0-1	1
	1747.5	20325	15	16QAM	36	0	21.94	0-2	2
	1747.5	20325	15	16QAM	36	18	21.82	0-2	2
	1747.5	20325	15	16QAM	36	37	21.68	0-2	2
	1747.5	20325	15	16QAM	75	0	21.77	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1715	20000	10	QPSK	1	0	23.85	0	0
	1715	20000	10	QPSK	1	25	24.12	0	0
	1715	20000	10	QPSK	1	49	23.63	0	0
	1715	20000	10	QPSK	25	0	23.03	0-1	1
	1715	20000	10	QPSK	25	12	22.97	0-1	1
	1715	20000	10	QPSK	25	25	22.95	0-1	1
	1715	20000	10	QPSK	50	0	23.00	0-1	1
	1715	20000	10	16QAM	1	0	22.88	0-1	1
	1715	20000	10	16QAM	1	25	22.86	0-1	1
	1715	20000	10	16QAM	1	49	22.33	0-1	1
	1715	20000	10	16QAM	25	0	21.91	0-2	2
	1715	20000	10	16QAM	25	12	21.88	0-2	2
	1715	20000	10	16QAM	25	25	21.72	0-2	2
	1715	20000	10	16QAM	50	0	21.80	0-2	2
Mid	1732.5	20175	10	QPSK	1	0	24.02	0	0
	1732.5	20175	10	QPSK	1	25	24.00	0	0
	1732.5	20175	10	QPSK	1	49	23.85	0	0
	1732.5	20175	10	QPSK	25	0	22.88	0-1	1
	1732.5	20175	10	QPSK	25	12	22.95	0-1	1
	1732.5	20175	10	QPSK	25	25	22.91	0-1	1
	1732.5	20175	10	QPSK	50	0	22.91	0-1	1
	1732.5	20175	10	16QAM	1	0	23.08	0-1	1
	1732.5	20175	10	16QAM	1	25	22.82	0-1	1
	1732.5	20175	10	16QAM	1	49	22.95	0-1	1
	1732.5	20175	10	16QAM	25	0	21.88	0-2	2
	1732.5	20175	10	16QAM	25	12	21.94	0-2	2
	1732.5	20175	10	16QAM	25	25	21.93	0-2	2
	1732.5	20175	10	16QAM	50	0	21.89	0-2	2
High	1750	20350	10	QPSK	1	0	24.10	0	0
	1750	20350	10	QPSK	1	25	24.00	0	0
	1750	20350	10	QPSK	1	49	23.72	0	0
	1750	20350	10	QPSK	25	0	22.87	0-1	1
	1750	20350	10	QPSK	25	12	22.81	0-1	1
	1750	20350	10	QPSK	25	25	22.66	0-1	1
	1750	20350	10	QPSK	50	0	22.76	0-1	1
	1750	20350	10	16QAM	1	0	23.10	0-1	1
	1750	20350	10	16QAM	1	25	22.62	0-1	1
	1750	20350	10	16QAM	1	49	22.70	0-1	1
	1750	20350	10	16QAM	25	0	22.01	0-2	2
	1750	20350	10	16QAM	25	12	21.92	0-2	2
	1750	20350	10	16QAM	25	25	21.88	0-2	2
	1750	20350	10	16QAM	50	0	21.78	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1712.5	19975	5	QPSK	1	0	24.06	0	0
	1712.5	19975	5	QPSK	1	12	24.08	0	0
	1712.5	19975	5	QPSK	1	24	23.96	0	0
	1712.5	19975	5	QPSK	12	0	22.75	0-1	1
	1712.5	19975	5	QPSK	12	6	22.77	0-1	1
	1712.5	19975	5	QPSK	12	13	22.86	0-1	1
	1712.5	19975	5	QPSK	25	0	22.84	0-1	1
	1712.5	19975	5	16-QAM	1	0	22.32	0-1	1
	1712.5	19975	5	16-QAM	1	12	22.71	0-1	1
	1712.5	19975	5	16-QAM	1	24	22.24	0-1	1
	1712.5	19975	5	16-QAM	12	0	21.77	0-2	2
	1712.5	19975	5	16-QAM	12	6	21.79	0-2	2
	1712.5	19975	5	16-QAM	12	13	21.81	0-2	2
	1712.5	19975	5	16-QAM	25	0	21.93	0-2	2
Mid	1732.5	20175	5	QPSK	1	0	23.80	0	0
	1732.5	20175	5	QPSK	1	12	23.82	0	0
	1732.5	20175	5	QPSK	1	24	23.64	0	0
	1732.5	20175	5	QPSK	12	0	22.90	0-1	1
	1732.5	20175	5	QPSK	12	6	22.81	0-1	1
	1732.5	20175	5	QPSK	12	13	22.91	0-1	1
	1732.5	20175	5	QPSK	25	0	22.90	0-1	1
	1732.5	20175	5	16-QAM	1	0	22.74	0-1	1
	1732.5	20175	5	16-QAM	1	12	22.98	0-1	1
	1732.5	20175	5	16-QAM	1	24	22.75	0-1	1
	1732.5	20175	5	16-QAM	12	0	21.61	0-2	2
	1732.5	20175	5	16-QAM	12	6	21.71	0-2	2
	1732.5	20175	5	16-QAM	12	13	21.89	0-2	2
	1732.5	20175	5	16-QAM	25	0	21.83	0-2	2
High	1752.5	20375	5	QPSK	1	0	23.66	0	0
	1752.5	20375	5	QPSK	1	12	23.94	0	0
	1752.5	20375	5	QPSK	1	24	23.90	0	0
	1752.5	20375	5	QPSK	12	0	22.68	0-1	1
	1752.5	20375	5	QPSK	12	6	22.70	0-1	1
	1752.5	20375	5	QPSK	12	13	22.64	0-1	1
	1752.5	20375	5	QPSK	25	0	22.67	0-1	1
	1752.5	20375	5	16-QAM	1	0	22.65	0-1	1
	1752.5	20375	5	16-QAM	1	12	22.45	0-1	1
	1752.5	20375	5	16-QAM	1	24	22.51	0-1	1
	1752.5	20375	5	16-QAM	12	0	21.67	0-2	2
	1752.5	20375	5	16-QAM	12	6	21.66	0-2	2
	1752.5	20375	5	16-QAM	12	13	21.61	0-2	2
	1752.5	20375	5	16-QAM	25	0	21.75	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1711.5	19965	3	QPSK	1	0	23.90	0	0
	1711.5	19965	3	QPSK	1	7	23.97	0	0
	1711.5	19965	3	QPSK	1	14	23.96	0	0
	1711.5	19965	3	QPSK	8	0	22.88	0-1	1
	1711.5	19965	3	QPSK	8	4	22.90	0-1	1
	1711.5	19965	3	QPSK	8	7	22.85	0-1	1
	1711.5	19965	3	QPSK	15	0	22.90	0-1	1
	1711.5	19965	3	16-QAM	1	0	22.77	0-1	1
	1711.5	19965	3	16-QAM	1	7	22.76	0-1	1
	1711.5	19965	3	16-QAM	1	14	22.73	0-1	1
	1711.5	19965	3	16-QAM	8	0	21.68	0-2	2
	1711.5	19965	3	16-QAM	8	4	21.63	0-2	2
	1711.5	19965	3	16-QAM	8	7	21.59	0-2	2
	1711.5	19965	3	16-QAM	15	0	22.10	0-2	2
Mid	1732.5	20175	3	QPSK	1	0	23.90	0	0
	1732.5	20175	3	QPSK	1	7	23.88	0	0
	1732.5	20175	3	QPSK	1	14	23.84	0	0
	1732.5	20175	3	QPSK	8	0	22.96	0-1	1
	1732.5	20175	3	QPSK	8	4	22.90	0-1	1
	1732.5	20175	3	QPSK	8	7	22.96	0-1	1
	1732.5	20175	3	QPSK	15	0	22.84	0-1	1
	1732.5	20175	3	16-QAM	1	0	22.79	0-1	1
	1732.5	20175	3	16-QAM	1	7	22.75	0-1	1
	1732.5	20175	3	16-QAM	1	14	22.81	0-1	1
	1732.5	20175	3	16-QAM	8	0	22.02	0-2	2
	1732.5	20175	3	16-QAM	8	4	22.07	0-2	2
	1732.5	20175	3	16-QAM	8	7	21.92	0-2	2
	1732.5	20175	3	16-QAM	15	0	21.62	0-2	2
High	1753.5	20385	3	QPSK	1	0	23.76	0	0
	1753.5	20385	3	QPSK	1	7	23.70	0	0
	1753.5	20385	3	QPSK	1	14	23.78	0	0
	1753.5	20385	3	QPSK	8	0	22.61	0-1	1
	1753.5	20385	3	QPSK	8	4	22.53	0-1	1
	1753.5	20385	3	QPSK	8	7	22.56	0-1	1
	1753.5	20385	3	QPSK	15	0	22.63	0-1	1
	1753.5	20385	3	16-QAM	1	0	22.27	0-1	1
	1753.5	20385	3	16-QAM	1	7	22.41	0-1	1
	1753.5	20385	3	16-QAM	1	14	22.22	0-1	1
	1753.5	20385	3	16-QAM	8	0	21.48	0-2	2
	1753.5	20385	3	16-QAM	8	4	21.61	0-2	2
	1753.5	20385	3	16-QAM	8	7	21.56	0-2	2
	1753.5	20385	3	16-QAM	15	0	21.65	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1710.7	19957	1.4	QPSK	1	0	24.07	0	0
	1710.7	19957	1.4	QPSK	1	2	23.98	0	0
	1710.7	19957	1.4	QPSK	1	5	24.00	0	0
	1710.7	19957	1.4	QPSK	3	0	23.85	0	0
	1710.7	19957	1.4	QPSK	3	2	23.91	0	0
	1710.7	19957	1.4	QPSK	3	3	23.93	0	0
	1710.7	19957	1.4	QPSK	6	0	22.79	0-1	1
	1710.7	19957	1.4	16-QAM	1	0	23.07	0-1	1
	1710.7	19957	1.4	16-QAM	1	2	23.14	0-1	1
	1710.7	19957	1.4	16-QAM	1	5	23.11	0-1	1
	1710.7	19957	1.4	16-QAM	3	0	22.96	0-1	1
	1710.7	19957	1.4	16-QAM	3	2	22.94	0-1	1
	1710.7	19957	1.4	16-QAM	3	3	22.96	0-1	1
	1710.7	19957	1.4	16-QAM	6	0	21.94	0-2	2
Mid	1732.5	20175	1.4	QPSK	1	0	23.91	0	0
	1732.5	20175	1.4	QPSK	1	2	23.94	0	0
	1732.5	20175	1.4	QPSK	1	5	23.87	0	0
	1732.5	20175	1.4	QPSK	3	0	23.96	0	0
	1732.5	20175	1.4	QPSK	3	2	23.99	0	0
	1732.5	20175	1.4	QPSK	3	3	23.97	0	0
	1732.5	20175	1.4	QPSK	6	0	22.84	0-1	1
	1732.5	20175	1.4	16-QAM	1	0	22.89	0-1	1
	1732.5	20175	1.4	16-QAM	1	2	22.99	0-1	1
	1732.5	20175	1.4	16-QAM	1	5	23.14	0-1	1
	1732.5	20175	1.4	16-QAM	3	0	23.03	0-1	1
	1732.5	20175	1.4	16-QAM	3	2	23.07	0-1	1
	1732.5	20175	1.4	16-QAM	3	3	22.97	0-1	1
	1732.5	20175	1.4	16-QAM	6	0	22.08	0-2	2
High	1754.3	20393	1.4	QPSK	1	0	23.75	0	0
	1754.3	20393	1.4	QPSK	1	2	23.89	0	0
	1754.3	20393	1.4	QPSK	1	5	23.60	0	0
	1754.3	20393	1.4	QPSK	3	0	23.61	0	0
	1754.3	20393	1.4	QPSK	3	2	23.83	0	0
	1754.3	20393	1.4	QPSK	3	3	23.62	0	0
	1754.3	20393	1.4	QPSK	6	0	22.60	0-1	1
	1754.3	20393	1.4	16-QAM	1	0	22.70	0-1	1
	1754.3	20393	1.4	16-QAM	1	2	23.08	0-1	1
	1754.3	20393	1.4	16-QAM	1	5	23.05	0-1	1
	1754.3	20393	1.4	16-QAM	3	0	22.33	0-1	1
	1754.3	20393	1.4	16-QAM	3	2	22.47	0-1	1
	1754.3	20393	1.4	16-QAM	3	3	22.56	0-1	1
	1754.3	20393	1.4	16-QAM	6	0	21.55	0-2	2

9.3.4 LTE Band 2 (PCS)

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1860	18700	20	QPSK	1	0	23.25	0	0
	1860	18700	20	QPSK	1	50	23.18	0	0
	1860	18700	20	QPSK	1	99	22.92	0	0
	1860	18700	20	QPSK	50	0	22.17	0-1	1
	1860	18700	20	QPSK	50	25	22.15	0-1	1
	1860	18700	20	QPSK	50	50	22.14	0-1	1
	1860	18700	20	QPSK	100	0	22.05	0-1	1
	1860	18700	20	16QAM	1	0	21.80	0-1	1
	1860	18700	20	16QAM	1	50	21.81	0-1	1
	1860	18700	20	16QAM	1	99	21.70	0-1	1
	1860	18700	20	16QAM	50	0	21.26	0-2	2
	1860	18700	20	16QAM	50	25	21.27	0-2	2
	1860	18700	20	16QAM	50	50	21.23	0-2	2
	1860	18700	20	16QAM	100	0	21.05	0-2	2
Mid	1880.0	18900	20	QPSK	1	0	23.20	0	0
	1880.0	18900	20	QPSK	1	50	**23.30**	0	0
	1880.0	18900	20	QPSK	1	99	22.87	0	0
	1880.0	18900	20	QPSK	50	0	**22.26**	0-1	1
	1880.0	18900	20	QPSK	50	25	22.18	0-1	1
	1880.0	18900	20	QPSK	50	50	22.15	0-1	1
	1880.0	18900	20	QPSK	100	0	22.15	0-1	1
	1880.0	18900	20	16QAM	1	0	22.13	0-1	1
	1880.0	18900	20	16QAM	1	50	22.21	0-1	1
	1880.0	18900	20	16QAM	1	99	21.89	0-1	1
	1880.0	18900	20	16QAM	50	0	21.27	0-2	2
	1880.0	18900	20	16QAM	50	25	21.31	0-2	2
	1880.0	18900	20	16QAM	50	50	21.28	0-2	2
	1880.0	18900	20	16QAM	100	0	21.27	0-2	2
High	1900	19100	20	QPSK	1	0	23.30	0	0
	1900	19100	20	QPSK	1	50	23.24	0	0
	1900	19100	20	QPSK	1	99	22.82	0	0
	1900	19100	20	QPSK	50	0	22.24	0-1	1
	1900	19100	20	QPSK	50	25	22.23	0-1	1
	1900	19100	20	QPSK	50	50	22.06	0-1	1
	1900	19100	20	QPSK	100	0	22.13	0-1	1
	1900	19100	20	16QAM	1	0	21.88	0-1	1
	1900	19100	20	16QAM	1	50	21.73	0-1	1
	1900	19100	20	16QAM	1	99	21.72	0-1	1
	1900	19100	20	16QAM	50	0	21.36	0-2	2
	1900	19100	20	16QAM	50	25	21.26	0-2	2
	1900	19100	20	16QAM	50	50	21.16	0-2	2
	1900	19100	20	16QAM	100	0	21.28	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1857.5	18675	15	QPSK	1	0	23.30	0	0
	1857.5	18675	15	QPSK	1	36	23.18	0	0
	1857.5	18675	15	QPSK	1	74	23.21	0	0
	1857.5	18675	15	QPSK	36	0	22.10	0-1	1
	1857.5	18675	15	QPSK	36	18	22.14	0-1	1
	1857.5	18675	15	QPSK	36	37	22.21	0-1	1
	1857.5	18675	15	QPSK	75	0	22.17	0-1	1
	1857.5	18675	15	16QAM	1	0	21.86	0-1	1
	1857.5	18675	15	16QAM	1	36	21.75	0-1	1
	1857.5	18675	15	16QAM	1	74	21.79	0-1	1
	1857.5	18675	15	16QAM	36	0	21.11	0-2	2
	1857.5	18675	15	16QAM	36	18	21.15	0-2	2
	1857.5	18675	15	16QAM	36	37	21.23	0-2	2
	1857.5	18675	15	16QAM	75	0	21.16	0-2	2
Mid	1880.0	18900	15	QPSK	1	0	23.30	0	0
	1880.0	18900	15	QPSK	1	36	23.13	0	0
	1880.0	18900	15	QPSK	1	74	23.03	0	0
	1880.0	18900	15	QPSK	36	0	22.28	0-1	1
	1880.0	18900	15	QPSK	36	18	22.16	0-1	1
	1880.0	18900	15	QPSK	36	37	22.11	0-1	1
	1880.0	18900	15	QPSK	75	0	22.18	0-1	1
	1880.0	18900	15	16QAM	1	0	22.08	0-1	1
	1880.0	18900	15	16QAM	1	36	22.11	0-1	1
	1880.0	18900	15	16QAM	1	74	22.11	0-1	1
	1880.0	18900	15	16QAM	36	0	21.26	0-2	2
	1880.0	18900	15	16QAM	36	18	21.15	0-2	2
	1880.0	18900	15	16QAM	36	37	21.10	0-2	2
	1880.0	18900	15	16QAM	75	0	21.29	0-2	2
High	1902.5	19125	15	QPSK	1	0	23.25	0	0
	1902.5	19125	15	QPSK	1	36	23.02	0	0
	1902.5	19125	15	QPSK	1	74	22.96	0	0
	1902.5	19125	15	QPSK	36	0	22.10	0-1	1
	1902.5	19125	15	QPSK	36	18	22.10	0-1	1
	1902.5	19125	15	QPSK	36	37	22.12	0-1	1
	1902.5	19125	15	QPSK	75	0	22.09	0-1	1
	1902.5	19125	15	16QAM	1	0	21.95	0-1	1
	1902.5	19125	15	16QAM	1	36	21.77	0-1	1
	1902.5	19125	15	16QAM	1	74	21.95	0-1	1
	1902.5	19125	15	16QAM	36	0	21.30	0-2	2
	1902.5	19125	15	16QAM	36	18	21.30	0-2	2
	1902.5	19125	15	16QAM	36	37	21.24	0-2	2
	1902.5	19125	15	16QAM	75	0	21.34	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1855	18650	10	QPSK	1	0	23.20	0	0
	1855	18650	10	QPSK	1	25	23.32	0	0
	1855	18650	10	QPSK	1	49	23.21	0	0
	1855	18650	10	QPSK	25	0	22.03	0-1	1
	1855	18650	10	QPSK	25	12	22.18	0-1	1
	1855	18650	10	QPSK	25	25	22.10	0-1	1
	1855	18650	10	QPSK	50	0	22.20	0-1	1
	1855	18650	10	16QAM	1	0	21.73	0-1	1
	1855	18650	10	16QAM	1	25	21.75	0-1	1
	1855	18650	10	16QAM	1	49	21.80	0-1	1
	1855	18650	10	16QAM	25	0	21.05	0-2	2
	1855	18650	10	16QAM	25	12	21.22	0-2	2
	1855	18650	10	16QAM	25	25	21.22	0-2	2
	1855	18650	10	16QAM	50	0	21.15	0-2	2
Mid	1880.0	18900	10	QPSK	1	0	23.31	0	0
	1880.0	18900	10	QPSK	1	25	23.28	0	0
	1880.0	18900	10	QPSK	1	49	23.00	0	0
	1880.0	18900	10	QPSK	25	0	22.23	0-1	1
	1880.0	18900	10	QPSK	25	12	22.30	0-1	1
	1880.0	18900	10	QPSK	25	25	22.12	0-1	1
	1880.0	18900	10	QPSK	50	0	22.18	0-1	1
	1880.0	18900	10	16QAM	1	0	22.22	0-1	1
	1880.0	18900	10	16QAM	1	25	22.02	0-1	1
	1880.0	18900	10	16QAM	1	49	22.02	0-1	1
	1880.0	18900	10	16QAM	25	0	21.37	0-2	2
	1880.0	18900	10	16QAM	25	12	21.37	0-2	2
	1880.0	18900	10	16QAM	25	25	21.22	0-2	2
	1880.0	18900	10	16QAM	50	0	21.19	0-2	2
High	1905	19150	10	QPSK	1	0	23.31	0	0
	1905	19150	10	QPSK	1	25	23.12	0	0
	1905	19150	10	QPSK	1	49	22.94	0	0
	1905	19150	10	QPSK	25	0	22.09	0-1	1
	1905	19150	10	QPSK	25	12	21.92	0-1	1
	1905	19150	10	QPSK	25	25	21.93	0-1	1
	1905	19150	10	QPSK	50	0	22.09	0-1	1
	1905	19150	10	16QAM	1	0	22.03	0-1	1
	1905	19150	10	16QAM	1	25	21.77	0-1	1
	1905	19150	10	16QAM	1	49	21.50	0-1	1
	1905	19150	10	16QAM	25	0	21.22	0-2	2
	1905	19150	10	16QAM	25	12	21.37	0-2	2
	1905	19150	10	16QAM	25	25	21.18	0-2	2
	1905	19150	10	16QAM	50	0	21.25	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1852.5	18625	5	QPSK	1	0	23.32	0	0
	1852.5	18625	5	QPSK	1	12	23.02	0	0
	1852.5	18625	5	QPSK	1	24	22.86	0	0
	1852.5	18625	5	QPSK	12	0	22.00	0-1	1
	1852.5	18625	5	QPSK	12	6	21.97	0-1	1
	1852.5	18625	5	QPSK	12	13	22.02	0-1	1
	1852.5	18625	5	QPSK	25	0	22.03	0-1	1
	1852.5	18625	5	16-QAM	1	0	21.57	0-1	1
	1852.5	18625	5	16-QAM	1	12	21.70	0-1	1
	1852.5	18625	5	16-QAM	1	24	21.48	0-1	1
	1852.5	18625	5	16-QAM	12	0	21.02	0-2	2
	1852.5	18625	5	16-QAM	12	6	21.00	0-2	2
	1852.5	18625	5	16-QAM	12	13	20.93	0-2	2
	1852.5	18625	5	16-QAM	25	0	21.16	0-2	2
Mid	1880.0	18900	5	QPSK	1	0	23.12	0	0
	1880.0	18900	5	QPSK	1	12	23.32	0	0
	1880.0	18900	5	QPSK	1	24	23.36	0	0
	1880.0	18900	5	QPSK	12	0	22.13	0-1	1
	1880.0	18900	5	QPSK	12	6	22.24	0-1	1
	1880.0	18900	5	QPSK	12	13	22.08	0-1	1
	1880.0	18900	5	QPSK	25	0	22.22	0-1	1
	1880.0	18900	5	16-QAM	1	0	22.07	0-1	1
	1880.0	18900	5	16-QAM	1	12	22.18	0-1	1
	1880.0	18900	5	16-QAM	1	24	21.89	0-1	1
	1880.0	18900	5	16-QAM	12	0	21.09	0-2	2
	1880.0	18900	5	16-QAM	12	6	21.09	0-2	2
	1880.0	18900	5	16-QAM	12	13	21.04	0-2	2
	1880.0	18900	5	16-QAM	25	0	21.31	0-2	2
High	1907.5	19175	5	QPSK	1	0	23.06	0	0
	1907.5	19175	5	QPSK	1	12	23.35	0	0
	1907.5	19175	5	QPSK	1	24	23.08	0	0
	1907.5	19175	5	QPSK	12	0	22.03	0-1	1
	1907.5	19175	5	QPSK	12	6	21.98	0-1	1
	1907.5	19175	5	QPSK	12	13	21.83	0-1	1
	1907.5	19175	5	QPSK	25	0	22.02	0-1	1
	1907.5	19175	5	16-QAM	1	0	21.82	0-1	1
	1907.5	19175	5	16-QAM	1	12	21.63	0-1	1
	1907.5	19175	5	16-QAM	1	24	21.53	0-1	1
	1907.5	19175	5	16-QAM	12	0	21.19	0-2	2
	1907.5	19175	5	16-QAM	12	6	21.07	0-2	2
	1907.5	19175	5	16-QAM	12	13	21.11	0-2	2
	1907.5	19175	5	16-QAM	25	0	21.31	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1851.5	18615	3	QPSK	1	0	23.23	0	0
	1851.5	18615	3	QPSK	1	7	22.95	0	0
	1851.5	18615	3	QPSK	1	14	23.10	0	0
	1851.5	18615	3	QPSK	8	0	21.95	0-1	1
	1851.5	18615	3	QPSK	8	4	21.98	0-1	1
	1851.5	18615	3	QPSK	8	7	22.00	0-1	1
	1851.5	18615	3	QPSK	15	0	21.92	0-1	1
	1851.5	18615	3	16-QAM	1	0	21.59	0-1	1
	1851.5	18615	3	16-QAM	1	7	21.53	0-1	1
	1851.5	18615	3	16-QAM	1	14	21.58	0-1	1
	1851.5	18615	3	16-QAM	8	0	20.75	0-2	2
	1851.5	18615	3	16-QAM	8	4	20.68	0-2	2
	1851.5	18615	3	16-QAM	8	7	21.12	0-2	2
	1851.5	18615	3	16-QAM	15	0	21.07	0-2	2
Mid	1880.0	18900	3	QPSK	1	0	23.03	0	0
	1880.0	18900	3	QPSK	1	7	23.11	0	0
	1880.0	18900	3	QPSK	1	14	22.81	0	0
	1880.0	18900	3	QPSK	8	0	22.14	0-1	1
	1880.0	18900	3	QPSK	8	4	22.10	0-1	1
	1880.0	18900	3	QPSK	8	7	22.10	0-1	1
	1880.0	18900	3	QPSK	15	0	22.12	0-1	1
	1880.0	18900	3	16-QAM	1	0	21.95	0-1	1
	1880.0	18900	3	16-QAM	1	7	21.98	0-1	1
	1880.0	18900	3	16-QAM	1	14	21.88	0-1	1
	1880.0	18900	3	16-QAM	8	0	21.00	0-2	2
	1880.0	18900	3	16-QAM	8	4	21.19	0-2	2
	1880.0	18900	3	16-QAM	8	7	21.19	0-2	2
	1880.0	18900	3	16-QAM	15	0	20.91	0-2	2
High	1908.5	19185	3	QPSK	1	0	23.20	0	0
	1908.5	19185	3	QPSK	1	7	22.93	0	0
	1908.5	19185	3	QPSK	1	14	22.93	0	0
	1908.5	19185	3	QPSK	8	0	22.02	0-1	1
	1908.5	19185	3	QPSK	8	4	21.93	0-1	1
	1908.5	19185	3	QPSK	8	7	21.82	0-1	1
	1908.5	19185	3	QPSK	15	0	21.93	0-1	1
	1908.5	19185	3	16-QAM	1	0	21.87	0-1	1
	1908.5	19185	3	16-QAM	1	7	21.54	0-1	1
	1908.5	19185	3	16-QAM	1	14	21.53	0-1	1
	1908.5	19185	3	16-QAM	8	0	21.16	0-2	2
	1908.5	19185	3	16-QAM	8	4	21.15	0-2	2
	1908.5	19185	3	16-QAM	8	7	21.16	0-2	2
	1908.5	19185	3	16-QAM	15	0	21.24	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1850.7	18607	1.4	QPSK	1	0	23.00	0	0
	1850.7	18607	1.4	QPSK	1	2	23.24	0	0
	1850.7	18607	1.4	QPSK	1	5	23.21	0	0
	1850.7	18607	1.4	QPSK	3	0	22.98	0	0
	1850.7	18607	1.4	QPSK	3	2	22.92	0	0
	1850.7	18607	1.4	QPSK	3	3	22.88	0	0
	1850.7	18607	1.4	QPSK	6	0	21.87	0-1	1
	1850.7	18607	1.4	16-QAM	1	0	22.26	0-1	1
	1850.7	18607	1.4	16-QAM	1	2	22.14	0-1	1
	1850.7	18607	1.4	16-QAM	1	5	22.01	0-1	1
	1850.7	18607	1.4	16-QAM	3	0	21.90	0-1	1
	1850.7	18607	1.4	16-QAM	3	2	21.94	0-1	1
	1850.7	18607	1.4	16-QAM	3	3	21.90	0-1	1
	1850.7	18607	1.4	16-QAM	6	0	21.13	0-2	2
Mid	1880.0	18900	1.4	QPSK	1	0	23.30	0	0
	1880.0	18900	1.4	QPSK	1	2	23.05	0	0
	1880.0	18900	1.4	QPSK	1	5	23.11	0	0
	1880.0	18900	1.4	QPSK	3	0	23.03	0	0
	1880.0	18900	1.4	QPSK	3	2	23.13	0	0
	1880.0	18900	1.4	QPSK	3	3	23.08	0	0
	1880.0	18900	1.4	QPSK	6	0	21.98	0-1	1
	1880.0	18900	1.4	16-QAM	1	0	21.89	0-1	1
	1880.0	18900	1.4	16-QAM	1	2	22.19	0-1	1
	1880.0	18900	1.4	16-QAM	1	5	22.01	0-1	1
	1880.0	18900	1.4	16-QAM	3	0	21.77	0-1	1
	1880.0	18900	1.4	16-QAM	3	2	21.90	0-1	1
	1880.0	18900	1.4	16-QAM	3	3	21.98	0-1	1
	1880.0	18900	1.4	16-QAM	6	0	21.40	0-2	2
High	1909.3	19193	1.4	QPSK	1	0	23.10	0	0
	1909.3	19193	1.4	QPSK	1	2	23.20	0	0
	1909.3	19193	1.4	QPSK	1	5	23.04	0	0
	1909.3	19193	1.4	QPSK	3	0	22.88	0	0
	1909.3	19193	1.4	QPSK	3	2	23.01	0	0
	1909.3	19193	1.4	QPSK	3	3	22.92	0	0
	1909.3	19193	1.4	QPSK	6	0	21.94	0-1	1
	1909.3	19193	1.4	16-QAM	1	0	22.02	0-1	1
	1909.3	19193	1.4	16-QAM	1	2	22.27	0-1	1
	1909.3	19193	1.4	16-QAM	1	5	21.95	0-1	1
	1909.3	19193	1.4	16-QAM	3	0	21.75	0-1	1
	1909.3	19193	1.4	16-QAM	3	2	21.71	0-1	1
	1909.3	19193	1.4	16-QAM	3	3	21.63	0-1	1
	1909.3	19193	1.4	16-QAM	6	0	21.25	0-2	2

9.4 WLAN Conducted Powers

Table 9-21
2.4 GHz Average RF Power

Freq [MHz]	Channel	2.4GHz Conducted Power [dBm]	
		IEEE Transmission Mode	
		802.11b	802.11g
2412	1	17.48	13.89
2417	2	N/A	14.91
2422	3	N/A	16.01
2437	6	**17.49**	16.49
2452	9	N/A	15.97
2457	10	N/A	14.76
2462	11	17.02	13.71

Justification for test configurations for WLAN per KDB Publication 248227 D01v02r01:

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

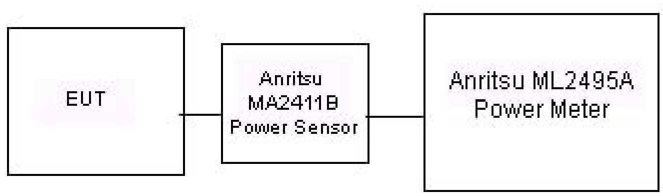


Figure 9-3
Power Measurement Setup

10 SYSTEM VERIFICATION

10.1 Tissue Verification

Table 10-1
Measured Tissue Properties

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (C˚)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ε	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ε	% dev σ	% dev ε
11/19/2015	750H	21.8	700	0.880	44.105	0.889	42.201	-1.01%	4.51%
			710	0.889	43.986	0.890	42.149	-0.11%	4.36%
			740	0.916	43.588	0.893	41.994	2.58%	3.80%
			755	0.930	43.391	0.894	41.916	4.03%	3.52%
11/17/2015	835H	21.5	820	0.904	42.178	0.899	41.578	0.56%	1.44%
			835	0.918	41.991	0.900	41.500	2.00%	1.18%
			850	0.933	41.786	0.916	41.500	1.86%	0.69%
11/18/2015	1750H	22.0	1710	1.329	38.871	1.348	40.142	-1.41%	-3.17%
			1750	1.369	38.667	1.371	40.079	-0.15%	-3.52%
			1790	1.409	38.476	1.394	40.016	1.08%	-3.85%
11/18/2015	1900H	22.0	1850	1.375	39.156	1.400	40.000	-1.79%	-2.11%
			1880	1.405	39.037	1.400	40.000	0.36%	-2.41%
			1910	1.435	38.879	1.400	40.000	2.50%	-2.80%
12/7/2015	2450H	23.8	2400	1.748	40.153	1.756	39.289	-0.46%	2.20%
			2450	1.797	39.963	1.800	39.200	-0.17%	1.95%
			2500	1.851	39.716	1.855	39.136	-0.22%	1.48%
11/19/2015	750B	22.3	700	0.920	55.274	0.959	55.726	-4.07%	-0.81%
			710	0.930	55.166	0.960	55.687	-3.12%	-0.94%
			740	0.959	54.819	0.963	55.570	-0.42%	-1.35%
			755	0.973	54.655	0.964	55.512	0.93%	-1.54%
11/16/2015	835B	21.5	820	0.970	54.118	0.969	55.258	0.10%	-2.06%
			835	0.984	53.916	0.970	55.200	1.44%	-2.33%
			850	0.999	53.828	0.988	55.154	1.11%	-2.40%
11/16/2015	1750B	21.8	1710	1.439	51.557	1.463	53.537	-1.64%	-3.70%
			1750	1.482	51.357	1.488	53.432	-0.40%	-3.88%
			1790	1.524	51.237	1.514	53.326	0.66%	-3.92%
11/18/2015	1750B	21.9	1710	1.437	51.584	1.463	53.537	-1.78%	-3.65%
			1750	1.480	51.382	1.488	53.432	-0.54%	-3.84%
			1790	1.524	51.232	1.514	53.326	0.66%	-3.93%
11/16/2015	1900B	22.1	1850	1.504	51.619	1.520	53.300	-1.05%	-3.15%
			1880	1.536	51.550	1.520	53.300	1.05%	-3.28%
			1910	1.573	51.465	1.520	53.300	3.49%	-3.44%
12/7/2015	2450B	21.6	2400	1.905	50.985	1.902	52.767	0.16%	-3.38%
			2450	1.987	50.916	1.950	52.700	1.90%	-3.39%
			2500	2.044	50.751	2.021	52.636	1.14%	-3.58%

The above measured tissue parameters were used in the DASY software. The DASY software was used to perform interpolation to determine the dielectric parameters at the SAR test device frequencies (per KDB Publication 865664 D01v01r04 and IEEE 1528-2013 6.6.1.2). The tissue parameters listed in the SAR test plots may slightly differ from the table above due to significant digit rounding in the software.

10.2 Test System Verification

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

Table 10-2
System Verification Results

System Verification TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Dipole SN	Probe SN	Measured SAR_{1g} (W/kg)	1 W Target SAR_{1g} (W/kg)	1 W Normalized SAR_{1g} (W/kg)	$Deviation_{1g}$ (%)
K	750	HEAD	11/19/2015	23.2	21.8	0.200	1054	3022	1.740	8.280	8.700	5.07%
E	850	HEAD	11/17/2015	22.7	21.1	0.200	4d119	3351	1.770	9.380	8.850	-5.65%
D	1750	HEAD	11/18/2015	21.3	21.5	0.100	1051	3209	3.830	36.200	38.300	5.80%
J	1900	HEAD	11/18/2015	21.2	22.0	0.100	5d141	3319	3.720	39.900	37.200	-6.77%
H	2450	HEAD	12/07/2015	23.1	23.0	0.100	719	3263	5.630	54.200	56.300	3.87%
G	750	BODY	11/19/2015	20.7	21.5	0.200	1054	3318	1.830	8.530	9.150	7.27%
K	850	BODY	11/16/2015	23.0	21.7	0.200	4d119	3022	1.840	9.200	9.200	0.00%
J	1750	BODY	11/16/2015	22.5	21.8	0.100	1051	3319	3.660	37.100	36.600	-1.35%
G	1750	BODY	11/18/2015	20.2	21.8	0.100	1051	3318	3.860	37.100	38.600	4.04%
K	1900	BODY	11/16/2015	23.0	22.1	0.100	5d141	3022	4.240	40.000	42.400	6.00%
J	2450	BODY	12/07/2015	22.5	22.0	0.100	719	3319	5.070	51.900	50.700	-2.31%

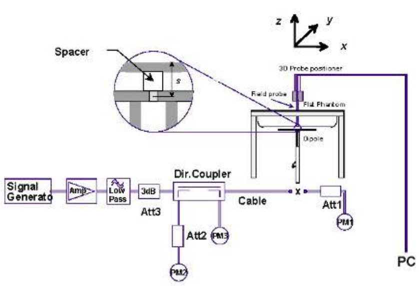


Figure 10-1
System Verification Setup Diagram

Figure 10-2
System Verification Setup Photo

11 SAR DATA SUMMARY

11.1 Standalone Head SAR Data

Table 11-1
GSM 850 Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	# of Time Slots	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GSM 850	GSM	33.7	33.55	-0.06	Right	Cheek	02138	1	1:8.3	0.443	1.035	0.459	
836.60	190	GSM 850	GSM	33.7	33.55	0.03	Right	Tilt	02138	1	1:8.3	0.217	1.035	0.225	
836.60	190	GSM 850	GSM	33.7	33.55	0.04	Left	Cheek	02138	1	1:8.3	0.367	1.035	0.380	
836.60	190	GSM 850	GSM	33.7	33.55	-0.08	Left	Tilt	02138	1	1:8.3	0.197	1.035	0.204	
836.60	190	GSM 850	GPRS	29.7	29.40	0.08	Right	Cheek	02138	3	1:2.76	0.452	1.072	0.485	A1
836.60	190	GSM 850	GPRS	29.7	29.40	0.03	Right	Tilt	02138	3	1:2.76	0.236	1.072	0.253	
836.60	190	GSM 850	GPRS	29.7	29.40	-0.03	Left	Cheek	02138	3	1:2.76	0.386	1.072	0.414	
836.60	190	GSM 850	GPRS	29.7	29.40	0.04	Left	Tilt	02138	3	1:2.76	0.212	1.072	0.227	
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
UMTS 850 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.60	4183	UMTS 850	RMC	23.7	23.55	0.01	Right	Cheek	02138	1:1	0.340	1.035	0.352	A2
836.60	4183	UMTS 850	RMC	23.7	23.55	-0.01	Right	Tilt	02138	1:1	0.169	1.035	0.175	
836.60	4183	UMTS 850	RMC	23.7	23.55	-0.12	Left	Cheek	02138	1:1	0.304	1.035	0.315	
836.60	4183	UMTS 850	RMC	23.7	23.55	0.04	Left	Tilt	02138	1:1	0.159	1.035	0.165	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Head 1.6 W/kg (mW/g) averaged over 1 gram						

Table 11-3
UMTS 1750 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1732.40	1412	UMTS 1750	RMC	24.2	24.15	-0.07	Right	Cheek	02138	1:1	0.357	1.012	0.361	
1732.40	1412	UMTS 1750	RMC	24.2	24.15	0.04	Right	Tilt	02138	1:1	0.259	1.012	0.262	
1732.40	1412	UMTS 1750	RMC	24.2	24.15	0.14	Left	Cheek	02138	1:1	0.462	1.012	0.468	A3
1732.40	1412	UMTS 1750	RMC	24.2	24.15	0.13	Left	Tilt	02138	1:1	0.312	1.012	0.316	
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
GSM 1900 Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	# of Time Slots	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
1880.00	661	GSM 1900	GSM	30.2	30.05	-0.07	Right	Cheek	02146	1	1:8.3	0.247	1.035	0.256	
1880.00	661	GSM 1900	GSM	30.2	30.05	0.00	Right	Tilt	02146	1	1:8.3	0.106	1.035	0.110	
1880.00	661	GSM 1900	GSM	30.2	30.05	-0.12	Left	Cheek	02146	1	1:8.3	0.309	1.035	0.320	
1880.00	661	GSM 1900	GSM	30.2	30.05	-0.04	Left	Tilt	02146	1	1:8.3	0.161	1.035	0.167	
1880.00	661	GSM 1900	GPRS	27.2	26.85	-0.10	Right	Cheek	02146	3	1:2.76	0.293	1.084	0.318	
1880.00	661	GSM 1900	GPRS	27.2	26.85	0.03	Right	Tilt	02146	3	1:2.76	0.152	1.084	0.165	
1880.00	661	GSM 1900	GPRS	27.2	26.85	0.09	Left	Cheek	02146	3	1:2.76	0.347	1.084	0.376	A4
1880.00	661	GSM 1900	GPRS	27.2	26.85	-0.09	Left	Tilt	02146	3	1:2.76	0.201	1.084	0.218	
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	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1880.00	9400	UMTS 1900	RMC	23.4	23.25	-0.06	Right	Cheek	02146	1:1	0.388	1.035	0.402	
1880.00	9400	UMTS 1900	RMC	23.4	23.25	0.00	Right	Tilt	02146	1:1	0.194	1.035	0.201	
1880.00	9400	UMTS 1900	RMC	23.4	23.25	0.03	Left	Cheek	02146	1:1	0.478	1.035	0.495	A5
1880.00	9400	UMTS 1900	RMC	23.4	23.25	-0.06	Left	Tilt	02146	1:1	0.270	1.035	0.279	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							**Head 1.6 W/kg (mW/g)** averaged over 1 gram							

Table 11-6
LTE Band 12 Head SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
707.50	23095	Mid	LTE Band 12	10	24.2	24.15	-0.06	0	Right	Cheek	QPSK	1	25	02146	1:1	0.334	1.012	0.338	A6
707.50	23095	Mid	LTE Band 12	10	23.2	22.84	0.07	1	Right	Cheek	QPSK	25	0	02146	1:1	0.252	1.086	0.274	
707.50	23095	Mid	LTE Band 12	10	24.2	24.15	-0.02	0	Right	Tilt	QPSK	1	25	02146	1:1	0.183	1.012	0.185	
707.50	23095	Mid	LTE Band 12	10	23.2	22.84	-0.15	1	Right	Tilt	QPSK	25	0	02146	1:1	0.138	1.086	0.150	
707.50	23095	Mid	LTE Band 12	10	24.2	24.15	-0.09	0	Left	Cheek	QPSK	1	25	02146	1:1	0.321	1.012	0.325	
707.50	23095	Mid	LTE Band 12	10	23.2	22.84	0.05	1	Left	Cheek	QPSK	25	0	02146	1:1	0.239	1.086	0.260	
707.50	23095	Mid	LTE Band 12	10	24.2	24.15	0.04	0	Left	Tilt	QPSK	1	25	02146	1:1	0.193	1.012	0.195	
707.50	23095	Mid	LTE Band 12	10	23.2	22.84	-0.02	1	Left	Tilt	QPSK	25	0	02146	1:1	0.139	1.086	0.151	
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 5 (Cell) Head SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.7	23.48	-0.12	0	Right	Cheek	QPSK	1	0	02138	1:1	0.339	1.052	0.357	A7
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.7	22.62	0.03	1	Right	Cheek	QPSK	25	12	02138	1:1	0.273	1.019	0.278	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.7	23.48	0.03	0	Right	Tilt	QPSK	1	0	02138	1:1	0.163	1.052	0.171	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.7	22.62	-0.01	1	Right	Tilt	QPSK	25	12	02138	1:1	0.136	1.019	0.139	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.7	23.48	0.09	0	Left	Cheek	QPSK	1	0	02138	1:1	0.325	1.052	0.342	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.7	22.62	-0.05	1	Left	Cheek	QPSK	25	12	02138	1:1	0.236	1.019	0.240	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.7	23.48	-0.14	0	Left	Tilt	QPSK	1	0	02138	1:1	0.172	1.052	0.181	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.7	22.62	0.04	1	Left	Tilt	QPSK	25	12	02138	1:1	0.130	1.019	0.132	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-8
LTE Band 4 (AWS) Head SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.2	24.16	-0.16	0	Right	Cheek	QPSK	1	50	02138	1:1	0.347	1.009	0.350	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	22.94	-0.14	1	Right	Cheek	QPSK	50	25	02138	1:1	0.290	1.062	0.308	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.2	24.16	-0.19	0	Right	Tilt	QPSK	1	50	02138	1:1	0.253	1.009	0.255	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	22.94	0.04	1	Right	Tilt	QPSK	50	25	02138	1:1	0.206	1.062	0.219	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.2	24.16	-0.08	0	Left	Cheek	QPSK	1	50	02138	1:1	0.501	1.009	0.506	A8
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	22.94	0.02	1	Left	Cheek	QPSK	50	25	02138	1:1	0.376	1.062	0.399	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.2	24.16	-0.01	0	Left	Tilt	QPSK	1	50	02138	1:1	0.313	1.009	0.316	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	22.94	0.08	1	Left	Tilt	QPSK	50	25	02138	1:1	0.235	1.062	0.250	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-9
LTE Band 2 (PCS) Head SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	23.4	23.30	-0.07	0	Right	Cheek	QPSK	1	50	02146	1:1	0.459	1.023	0.470	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	22.4	22.26	0.13	1	Right	Cheek	QPSK	50	0	02146	1:1	0.325	1.033	0.336	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	23.4	23.30	0.00	0	Right	Tilt	QPSK	1	50	02146	1:1	0.211	1.023	0.216	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	22.4	22.26	0.03	1	Right	Tilt	QPSK	50	0	02146	1:1	0.153	1.033	0.158	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	23.4	23.30	0.01	0	Left	Cheek	QPSK	1	50	02146	1:1	0.507	1.023	**0.519**	A9
1880.00	18900	Mid	LTE Band 2 (PCS)	20	22.4	22.26	0.07	1	Left	Cheek	QPSK	50	0	02146	1:1	0.427	1.033	0.441	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	23.4	23.30	0.02	0	Left	Tilt	QPSK	1	50	02146	1:1	0.294	1.023	0.301	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	22.4	22.26	0.01	1	Left	Tilt	QPSK	50	0	02146	1:1	0.222	1.033	0.229	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-10
DTS Head SAR

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Data Rate (Mbps)	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.												W/kg	(W/kg)			(W/kg)	
2437	6	802.11b	DSSS	22	18.0	17.49	-	Right	Cheek	05163	1	99.1	0.402	-	1.125	1.009	-	
2437	6	802.11b	DSSS	22	18.0	17.49	-	Right	Tilt	05163	1	99.1	0.212	-	1.125	1.009	-	
2412	1	802.11b	DSSS	22	18.0	17.48	0.02	Left	Cheek	05163	1	99.1	0.798	0.849	1.127	1.009	0.966	A10
2437	6	802.11b	DSSS	22	18.0	17.49	0.17	Left	Cheek	05163	1	99.1	0.816	0.816	1.125	1.009	0.926	
2437	6	802.11b	DSSS	22	18.0	17.49	0.00	Left	Tilt	05163	1	99.1	0.471	0.485	1.125	1.009	0.551	
2412	1	802.11b	DSSS	22	18.0	17.48	0.08	Left	Cheek	05163	1	99.1	0.735	0.716	1.127	1.009	0.814	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Head 1.6 W/kg (mW/g) averaged over 1 gram										

Note: Variability data is highlighted blue in the table above.

11.2 Standalone Body-Worn SAR Data

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

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of Time Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GSM 850	GSM	33.7	33.55	0.16	10 mm	02138	1	1:8.3	back	0.472	1.035	0.489	
836.60	190	GSM 850	GPRS	29.7	29.40	-0.02	10 mm	02138	3	1:2.76	back	0.473	1.072	0.507	A11
836.60	4183	UMTS 850	RMC	23.7	23.55	-0.03	10 mm	02138	N/A	1:1	back	0.389	1.035	0.403	A12
1712.40	1312	UMTS 1750	RMC	24.2	24.00	-0.09	10 mm	02146	N/A	1:1	back	0.851	1.047	0.891	
1732.40	1412	UMTS 1750	RMC	24.2	24.15	0.13	10 mm	02146	N/A	1:1	back	0.936	1.012	0.947	
1752.50	1862	UMTS 1750	RMC	24.2	24.05	-0.13	10 mm	02146	N/A	1:1	back	0.997	1.035	1.032	A13
1880.00	661	GSM 1900	GSM	30.2	30.05	0.03	10 mm	02138	1	1:8.3	back	0.372	1.035	0.385	
1880.00	661	GSM 1900	GPRS	27.2	26.85	0.05	10 mm	02138	3	1:2.76	back	0.416	1.084	0.451	A14
1880.00	9400	UMTS 1900	RMC	23.4	23.25	0.02	10 mm	02138	N/A	1:1	back	0.596	1.035	0.617	A15
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 11-12
LTE Body-Worn SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
707.50	23095	Mid	LTE Band 12	10	24.2	24.15	0.03	0	02146	QPSK	1	25	10 mm	back	1:1	0.565	1.012	0.572	A16
707.50	23095	Mid	LTE Band 12	10	23.2	22.84	0.01	1	02146	QPSK	25	0	10 mm	back	1:1	0.412	1.086	0.447	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.7	23.48	0.10	0	02146	QPSK	1	0	10 mm	back	1:1	0.442	1.052	0.465	A17
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.7	22.62	-0.04	1	02146	QPSK	25	12	10 mm	back	1:1	0.318	1.019	0.324	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.2	24.16	-0.18	0	02146	QPSK	1	50	10 mm	back	1:1	1.020	1.009	1.029	A18
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	22.94	-0.09	1	02146	QPSK	50	25	10 mm	back	1:1	0.792	1.062	0.841	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	22.86	0.00	1	02146	QPSK	100	0	10 mm	back	1:1	0.778	1.081	0.841	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.2	24.16	-0.02	0	02146	QPSK	1	50	10 mm	back	1:1	1.020	1.009	1.029	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	23.4	23.30	0.03	0	02138	QPSK	1	50	10 mm	back	1:1	0.570	1.023	0.583	A19
1880.00	18900	Mid	LTE Band 2 (PCS)	20	22.4	22.26	0.05	1	02138	QPSK	50	0	10 mm	back	1:1	0.493	1.033	0.509	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Body 1.6 W/kg (mW/g) averaged over 1 gram										

Note: Variability data is highlighted blue in the table above.

Table 11-13
DTS Body-Worn SAR

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.												W/kg	(W/kg)			(W/kg)	
2437	6	802.11b	DSSS	22	18.0	17.49	-0.05	10 mm	05163	1	back	99.1	0.158	0.125	1.125	1.009	0.142	A21
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram										

11.3 Standalone Wireless Router SAR Data

Table 11-14
GPRS/UMTS Hotspot SAR Data

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of GPRS Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GSM 850	GPRS	29.7	29.40	-0.02	10 mm	02138	3	1:2.76	back	0.473	1.072	0.507	A11
836.60	190	GSM 850	GPRS	29.7	29.40	-0.08	10 mm	02138	3	1:2.76	front	0.428	1.072	0.459	
836.60	190	GSM 850	GPRS	29.7	29.40	-0.01	10 mm	02138	3	1:2.76	bottom	0.250	1.072	0.268	
836.60	190	GSM 850	GPRS	29.7	29.40	0.02	10 mm	02138	3	1:2.76	right	0.394	1.072	0.422	
836.60	190	GSM 850	GPRS	29.7	29.40	-0.07	10 mm	02138	3	1:2.76	left	0.278	1.072	0.298	
836.60	4183	UMTS 850	RMC	23.7	23.55	-0.03	10 mm	02138	N/A	1:1	back	0.389	1.035	0.403	A12
836.60	4183	UMTS 850	RMC	23.7	23.55	-0.01	10 mm	02138	N/A	1:1	front	0.340	1.035	0.352	
836.60	4183	UMTS 850	RMC	23.7	23.55	-0.04	10 mm	02138	N/A	1:1	bottom	0.239	1.035	0.247	
836.60	4183	UMTS 850	RMC	23.7	23.55	0.01	10 mm	02138	N/A	1:1	right	0.300	1.035	0.311	
836.60	4183	UMTS 850	RMC	23.7	23.55	-0.06	10 mm	02138	N/A	1:1	left	0.209	1.035	0.216	
1712.40	1312	UMTS 1750	RMC	24.2	24.00	-0.09	10 mm	02146	N/A	1:1	back	0.851	1.047	0.891	
1732.40	1412	UMTS 1750	RMC	24.2	24.15	0.13	10 mm	02146	N/A	1:1	back	0.936	1.012	0.947	
1752.50	1862	UMTS 1750	RMC	24.2	24.05	-0.13	10 mm	02146	N/A	1:1	back	0.997	1.035	1.032	A13
1712.40	1312	UMTS 1750	RMC	24.2	24.00	0.00	10 mm	02146	N/A	1:1	front	0.718	1.047	0.752	
1732.40	1412	UMTS 1750	RMC	24.2	24.15	0.00	10 mm	02146	N/A	1:1	front	0.795	1.012	0.805	
1752.50	1862	UMTS 1750	RMC	24.2	24.05	0.14	10 mm	02146	N/A	1:1	front	0.825	1.035	0.854	
1732.40	1412	UMTS 1750	RMC	24.2	24.15	-0.03	10 mm	02146	N/A	1:1	bottom	0.327	1.012	0.331	
1732.40	1412	UMTS 1750	RMC	24.2	24.15	0.03	10 mm	02146	N/A	1:1	left	0.245	1.012	0.248	
1880.00	661	GSM 1900	GPRS	27.2	26.85	0.05	10 mm	02138	3	1:2.76	back	0.416	1.084	0.451	A14
1880.00	661	GSM 1900	GPRS	27.2	26.85	0.00	10 mm	02138	3	1:2.76	front	0.379	1.084	0.411	
1880.00	661	GSM 1900	GPRS	27.2	26.85	-0.05	10 mm	02138	3	1:2.76	bottom	0.246	1.084	0.267	
1880.00	661	GSM 1900	GPRS	27.2	26.85	-0.04	10 mm	02138	3	1:2.76	left	0.285	1.084	0.309	
1880.00	9400	UMTS 1900	RMC	23.4	23.25	0.02	10 mm	02138	N/A	1:1	back	0.596	1.035	0.617	A15
1880.00	9400	UMTS 1900	RMC	23.4	23.25	-0.08	10 mm	02138	N/A	1:1	front	0.593	1.035	0.614	
1880.00	9400	UMTS 1900	RMC	23.4	23.25	-0.15	10 mm	02138	N/A	1:1	bottom	0.409	1.035	0.423	
1880.00	9400	UMTS 1900	RMC	23.4	23.25	0.06	10 mm	02138	N/A	1:1	left	0.430	1.035	0.445	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram								

Table 11-15
LTE Band 12 Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
707.50	23095	Mid	LTE Band 12	10	24.2	24.15	0.03	0	02146	QPSK	1	25	10 mm	back	1:1	0.565	1.012	0.572	A16
707.50	23095	Mid	LTE Band 12	10	23.2	22.84	0.01	1	02146	QPSK	25	0	10 mm	back	1:1	0.412	1.086	0.447	
707.50	23095	Mid	LTE Band 12	10	24.2	24.15	-0.04	0	02146	QPSK	1	25	10 mm	front	1:1	0.374	1.012	0.378	
707.50	23095	Mid	LTE Band 12	10	23.2	22.84	0.02	1	02146	QPSK	25	0	10 mm	front	1:1	0.268	1.086	0.291	
707.50	23095	Mid	LTE Band 12	10	24.2	24.15	-0.21	0	02146	QPSK	1	25	10 mm	bottom	1:1	0.144	1.012	0.146	
707.50	23095	Mid	LTE Band 12	10	23.2	22.84	-0.09	1	02146	QPSK	25	0	10 mm	bottom	1:1	0.102	1.086	0.111	
707.50	23095	Mid	LTE Band 12	10	24.2	24.15	0.09	0	02146	QPSK	1	25	10 mm	right	1:1	0.287	1.012	0.290	
707.50	23095	Mid	LTE Band 12	10	23.2	22.84	0.12	1	02146	QPSK	25	0	10 mm	right	1:1	0.208	1.086	0.226	
707.50	23095	Mid	LTE Band 12	10	24.2	24.15	-0.04	0	02146	QPSK	1	25	10 mm	left	1:1	0.165	1.012	0.167	
707.50	23095	Mid	LTE Band 12	10	23.2	22.84	0.00	1	02146	QPSK	25	0	10 mm	left	1:1	0.128	1.086	0.139	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Body 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-16
LTE Band 5 (Cell) Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.7	23.48	0.10	0	02146	QPSK	1	0	10 mm	back	1:1	0.442	1.052	0.465	A17
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.7	22.62	-0.04	1	02146	QPSK	25	12	10 mm	back	1:1	0.318	1.019	0.324	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.7	23.48	0.13	0	02146	QPSK	1	0	10 mm	front	1:1	0.407	1.052	0.428	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.7	22.62	0.01	1	02146	QPSK	25	12	10 mm	front	1:1	0.286	1.019	0.291	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.7	23.48	0.07	0	02146	QPSK	1	0	10 mm	bottom	1:1	0.245	1.052	0.258	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.7	22.62	0.00	1	02146	QPSK	25	12	10 mm	bottom	1:1	0.182	1.019	0.185	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.7	23.48	-0.07	0	02146	QPSK	1	0	10 mm	right	1:1	0.321	1.052	0.338	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.7	22.62	0.04	1	02146	QPSK	25	12	10 mm	right	1:1	0.226	1.019	0.230	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.7	23.48	-0.08	0	02146	QPSK	1	0	10 mm	left	1:1	0.247	1.052	0.260	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.7	22.62	0.04	1	02146	QPSK	25	12	10 mm	left	1:1	0.170	1.019	0.173	
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 11-17
LTE Band 4 (AWS) Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.2	24.16	-0.18	0	02146	QPSK	1	50	10 mm	back	1:1	1.020	1.009	1.029	A18
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	22.94	-0.09	1	02146	QPSK	50	25	10 mm	back	1:1	0.792	1.062	0.841	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	22.86	0.00	1	02146	QPSK	100	0	10 mm	back	1:1	0.778	1.081	0.841	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.2	24.16	0.19	0	02146	QPSK	1	50	10 mm	front	1:1	0.894	1.009	0.902	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	22.94	0.07	1	02146	QPSK	50	25	10 mm	front	1:1	0.670	1.062	0.712	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	22.86	0.04	1	02146	QPSK	100	0	10 mm	front	1:1	0.676	1.081	0.731	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.2	24.16	-0.08	0	02146	QPSK	1	50	10 mm	bottom	1:1	0.393	1.009	0.397	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	22.94	-0.03	1	02146	QPSK	50	25	10 mm	bottom	1:1	0.294	1.062	0.312	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.2	24.16	0.02	0	02146	QPSK	1	50	10 mm	left	1:1	0.243	1.009	0.245	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	22.94	0.01	1	02146	QPSK	50	25	10 mm	left	1:1	0.186	1.062	0.198	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.2	24.16	-0.02	0	02146	QPSK	1	50	10 mm	back	1:1	1.020	1.009	1.029	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Body 1.6 W/kg (mW/g) averaged over 1 gram									

Note: Variability data is highlighted blue in the table above.

Table 11-18
LTE Band 2 (PCS) Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	23.4	23.30	0.03	0	02138	QPSK	1	50	10 mm	back	1:1	0.570	1.023	0.583	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	22.4	22.26	0.05	1	02138	QPSK	50	0	10 mm	back	1:1	0.493	1.033	0.509	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	23.4	23.30	0.03	0	02138	QPSK	1	50	10 mm	front	1:1	0.592	1.023	0.606	A20
1880.00	18900	Mid	LTE Band 2 (PCS)	20	22.4	22.26	-0.06	1	02138	QPSK	50	0	10 mm	front	1:1	0.476	1.033	0.492	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	23.4	23.30	0.05	0	02138	QPSK	1	50	10 mm	bottom	1:1	0.424	1.023	0.434	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	22.4	22.26	-0.13	1	02138	QPSK	50	0	10 mm	bottom	1:1	0.334	1.033	0.345	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	23.4	23.30	-0.21	0	02138	QPSK	1	50	10 mm	left	1:1	0.566	1.023	0.579	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	22.4	22.26	-0.05	1	02138	QPSK	50	0	10 mm	left	1:1	0.478	1.033	0.494	
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	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.												W/kg	(W/kg)			(W/kg)	
2437	6	802.11b	DSSS	22	18.0	17.49	-0.05	10 mm	05163	1	back	99.1	0.158	0.125	1.125	1.009	0.142	A21
2437	6	802.11b	DSSS	22	18.0	17.49	-	10 mm	05163	1	front	99.1	0.132	-	1.125	1.009	-	
2437	6	802.11b	DSSS	22	18.0	17.49	-	10 mm	05163	1	top	99.1	0.047	-	1.125	1.009	-	
2437	6	802.11b	DSSS	22	18.0	17.49	-	10 mm	05163	1	right	99.1	0.074	-	1.125	1.009	-	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Body 1.6 W/kg (mW/g) averaged over 1 gram									

11.4 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013 and FCC KDB Publication 447498 D01v05r02.
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 D01v05r02.
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 D04v01r02, 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 D01v01r04, variability SAR tests were performed when the measured SAR results for a frequency band were ≥ 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 D06v02, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with WIFI) was not activated (See Section 6.7 for more details).

GSM Test Notes:

1. Body-Worn accessory testing is typically associated with voice operations. Therefore, GSM voice was evaluated for body-worn SAR.
2. Justification for reduced test configurations per KDB Publication 941225 D01v03 and October 2013 TCB Workshop Notes: The source-based frame-averaged output power was evaluated for all GPRS/EDGE slot configurations. The configuration with the highest target frame averaged output power was evaluated for hotspot SAR. When the maximum frame-averaged powers are equivalent across two or more slots (within 0.25 dB), the configuration with the most number of time slots was tested.
3. Per FCC KDB Publication 447498 D01v05r02, 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.
4. GPRS was additionally evaluated for head and body-worn exposure conditions to address possible VoIP scenarios.

UMTS Notes:

1. UMTS mode in was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01v03. AMR and HSPA SAR was not required per the 3G Test Reduction Procedure in KDB Publication 941225 D01v03.
2. Per FCC KDB Publication 447498 D01v05r02, 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 D05v02r03. The general test procedures used for testing can be found in Section 8.5.4.
2. MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.
3. A-MPR was disabled for all SAR tests by setting NS=01 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

WLAN Notes:

1. For held-to-ear and hotspot operations, the initial test position procedures were applied. The test position with the highest extrapolated peak SAR will be used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg, no additional testing for the remaining test positions was required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.
2. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r01 for 2.4 GHz WIFI operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4 GHz 802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR. See Section 8.6.3 for more information. When the maximum reported 1g averaged SAR is ≤0.8 W/kg, SAR testing on additional channels was not required. Otherwise, SAR for the next highest output power channel was required until the reported SAR result was ≤ 1.20 W/kg or all test channels were measured.
3. The device was configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools. The reported SAR was scaled to the 100% transmission duty factor to determine compliance. Procedures used to measure the duty factor are identical to that in the associated EMC test reports.

12 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

12.1 Introduction

The following procedures adopted from FCC KDB Publication 447498 D01v05r02 are applicable to devices with built-in unlicensed transmitters such as 802.11 and Bluetooth devices which may simultaneously transmit with the licensed transmitter.

12.2 Simultaneous Transmission Procedures

This device contains transmitters that may operate simultaneously. Therefore simultaneous transmission analysis is required. Per FCC KDB 447498 D01v05r02 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. The different test positions in an exposure condition may be considered collectively to determine SAR test exclusion according to the sum of 1-g or 10-g SAR.

When standalone SAR is not required to be measured, per FCC KDB 447498 D01v05r02 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	11.00	10	0.273

Note: Held-to ear configurations are not applicable to Bluetooth operations and therefore were not considered for simultaneous transmission. Per KDB Publication 447498 D01v05r02, the maximum power of the channel was rounded to the nearest mW before calculation.

12.3 Head SAR Simultaneous Transmission Analysis

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

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	GSM/GPRS 850	0.485	0.966	1.451
	UMTS 850	0.352	0.966	1.318
	UMTS 1750	0.468	0.966	1.434
	GSM/GPRS 1900	0.376	0.966	1.342
	UMTS 1900	0.495	0.966	1.461
	LTE Band 12	0.338	0.966	1.304
	LTE Band 5 (Cell)	0.357	0.966	1.323
	LTE Band 4 (AWS)	0.506	0.966	1.472
	LTE Band 2 (PCS)	0.519	0.966	**1.485**

12.4 Body-Worn Simultaneous Transmission Analysis

Table 12-3
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body-Worn at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body-Worn	GSM/GPRS 850	0.507	0.142	0.649
	UMTS 850	0.403	0.142	0.545
	UMTS 1750	1.032	0.142	**1.174**
	GSM/GPRS 1900	0.451	0.142	0.593
	UMTS 1900	0.617	0.142	0.759
	LTE Band 12	0.572	0.142	0.714
	LTE Band 5 (Cell)	0.465	0.142	0.607
	LTE Band 4 (AWS)	1.029	0.142	1.171
	LTE Band 2 (PCS)	0.583	0.142	0.725

Table 12-4
Simultaneous Transmission Scenario with Bluetooth (Body-Worn at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body-Worn	GSM/GPRS 850	0.507	0.273	0.780
	UMTS 850	0.403	0.273	0.676
	UMTS 1750	1.032	0.273	**1.305**
	GSM/GPRS 1900	0.451	0.273	0.724
	UMTS 1900	0.617	0.273	0.890
	LTE Band 12	0.572	0.273	0.845
	LTE Band 5 (Cell)	0.465	0.273	0.738
	LTE Band 4 (AWS)	1.029	0.273	1.302
	LTE Band 2 (PCS)	0.583	0.273	0.856

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

12.5 Hotspot SAR Simultaneous Transmission Analysis

Table 12-5
Simultaneous Transmission Scenario (2.4 GHz Hotspot at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Hotspot SAR	GPRS 850	0.507	0.142	0.649
	UMTS 850	0.403	0.142	0.545
	UMTS 1750	1.032	0.142	**1.174**
	GPRS 1900	0.451	0.142	0.593
	UMTS 1900	0.617	0.142	0.759
	LTE Band 12	0.572	0.142	0.714
	LTE Band 5 (Cell)	0.465	0.142	0.607
	LTE Band 4 (AWS)	1.029	0.142	1.171
	LTE Band 2 (PCS)	0.606	0.142	0.748

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 D01v05r02 and IEEE 1528-2013 Section 6.3.4.1.2.

13 SAR MEASUREMENT VARIABILITY

13.1 Measurement Variability

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

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

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

Table 13-1
Head SAR Measurement Variability Results

HEAD VARIABILITY RESULTS														
Band	FREQUENCY		Mode/Band	Service	Side	Test Position	Data Rate (Mbps)	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)	
2450	2412.00	1	802.11b, 22 MHz Bandwidth	DSSS	Left	Cheek	1	0.849	0.716	1.19	N/A	N/A	N/A	N/A
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population					Head 1.6 W/kg (mW/g) averaged over 1 gram									

Table 13-2
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	1732.50	20175	LTE Band 4 (AWS), 20 MHz Bandwidth	QPSK, 1 RB, 50 RB Offset	back	10 mm	1.020	1.020	1.00	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 D01v01r04, the extended measurement uncertainty analysis per IEEE 1528-2013 was not required.

14 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/12/2015	Annual	5/12/2016	1070
SPEAG	ES3DV2	SAR Probe	8/26/2015	Annual	8/26/2016	3022
SPEAG	ES3DV3	SAR Probe	6/22/2015	Annual	6/22/2016	3351
SPEAG	ES3DV3	SAR Probe	3/19/2015	Annual	3/19/2016	3209
SPEAG	ES3DV3	SAR Probe	3/19/2015	Annual	3/19/2016	3319
SPEAG	ES3DV3	SAR Probe	5/20/2015	Annual	5/20/2016	3263
SPEAG	ES3DV3	SAR Probe	1/23/2015	Annual	1/23/2016	3318
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/18/2015	Annual	2/18/2016	665
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/24/2015	Annual	8/24/2016	1322
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/20/2015	Annual	4/20/2016	1407
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/13/2015	Annual	3/13/2016	1368
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/17/2015	Annual	6/17/2016	859
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/14/2015	Annual	1/14/2016	1272
SPEAG	D750V3	750 MHz Dipole	3/11/2015	Annual	3/11/2016	1054
SPEAG	D835V2	835 MHz SAR Dipole	4/13/2015	Annual	4/13/2016	4d119
SPEAG	D1750V2	1750 MHz SAR Dipole	4/15/2015	Annual	4/15/2016	1051
SPEAG	D1900V2	1900 MHz SAR Dipole	4/14/2015	Annual	4/14/2016	5d141
SPEAG	D2450V2	2450 MHz SAR Dipole	8/20/2015	Annual	8/20/2016	719
Agilent	8594A	(9kHz-2.9GHz) Spectrum Analyzer	N/A	N/A	N/A	3051A00187
Agilent	N5182A	MXG Vector Signal Generator	3/16/2015	Annual	3/16/2016	MY47420651
Agilent	8648D	(9kHz-4GHz) Signal Generator	3/15/2015	Annual	3/15/2016	3629U00687
Agilent	8753E	(30kHz-6GHz) Network Analyzer	12/30/2014	Annual	12/30/2015	JP38020182
Agilent	8753ES	S-Parameter Network Analyzer	1/20/2015	Annual	1/20/2016	US39170122
Agilent	8753ES	Network Analyzer	3/20/2015	Annual	3/20/2016	MY40001472
Agilent	E4438C	ESG Vector Signal Generator	3/15/2015	Annual	3/15/2016	MY45091346
Agilent	E4432B	ESG-D Series Signal Generator	3/16/2015	Annual	3/16/2016	US40053896
Agilent	E8257D	(250kHz-20GHz) Signal Generator	3/15/2015	Annual	3/15/2016	MY45470194
Agilent	E4438C	ESG Vector Signal Generator	4/1/2014	Biennial	4/1/2016	MY47270002
Agilent	E5515C	Wireless Communications Test Set	6/18/2015	Biennial	6/18/2017	GB41450275
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433975
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433976
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433978
Anritsu	ML2438A	Power Meter	3/13/2015	Annual	3/13/2016	1190013
Anritsu	MA2481A	Power Sensor	3/10/2015	Annual	3/10/2016	5605
Anritsu	MA24106A	USB Power Sensor	5/29/2015	Annual	5/29/2016	1248508
Anritsu	MT8820C	Radio Communication Analyzer	7/24/2015	Annual	7/24/2016	6200901190
Anritsu	MA2481A	Power Sensor	3/10/2015	Annual	3/10/2016	5821
Anritsu	MA2481A	Power Sensor	3/10/2015	Annual	3/10/2016	2400
Anritsu	MA2481A	Power Sensor	3/11/2015	Annual	3/11/2016	5318
Anritsu	MA24106A	USB Power Sensor	5/29/2015	Annual	5/29/2016	1231538
Anritsu	MA24106A	USB Power Sensor	5/29/2015	Annual	5/29/2016	1244524
Anritsu	MA2411B	Pulse Power Sensor	8/3/2015	Annual	8/3/2016	1126066
Anritsu	ML2495A	Power Meter	10/16/2015	Biennial	10/16/2017	1039008
Anritsu	ML2496A	Power Meter	3/13/2015	Annual	3/13/2016	1306009
Anritsu	MT8820C	Radio Communication Analyzer	6/12/2015	Annual	6/12/2016	6201240328
Anritsu	MA24106A	USB Power Sensor	3/11/2015	Annual	3/11/2016	1344557
Anritsu	MA24106A	USB Power Sensor	3/2/2015	Annual	3/2/2016	1349503
Anritsu	MA2411B	Pulse Power Sensor	3/13/2015	Annual	3/13/2016	1207470
Anritsu	ML2496A	Power Meter	3/13/2015	Annual	3/13/2016	1351001
COMTech	AR85729-5	Solid State Amplifier	CBT	N/A	CBT	M1S5A00-009
Control Company	4040	Digital Thermometer	3/18/2015	Biennial	3/18/2017	150194979
Control Company	4353	Long Stem Thermometer	1/22/2015	Biennial	1/22/2017	150053042
Control Company	4040	Digital Thermometer	3/18/2015	Biennial	3/18/2017	150195001
Control Company	4353	Long Stem Thermometer	3/5/2015	Biennial	3/5/2017	150149534
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
MiniCircuits	SLP-2400+	Low Pass Filter	CBT	N/A	CBT	R8979500903
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-1200+	Low Pass Filter DC to 1000 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
Mitutoyo	CD-6"CSX	Digital Caliper	5/8/2014	Biennial	5/8/2016	13264162
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Rohde & Schwarz	CMW500	Radio Communication Tester	5/15/2015	Annual	5/15/2016	112347
Rohde & Schwarz	CMW500	Radio Communication Tester	9/8/2015	Annual	9/8/2016	109366
Rohde & Schwarz	CMU200	Base Station Simulator	3/23/2015	Annual	3/23/2016	836371/0079
Rohde & Schwarz	CMU200	Base Station Simulator	6/3/2015	Annual	6/3/2016	109892
Seekonk	NC-100	Torque Wrench	3/18/2014	Biennial	3/18/2016	N/A
Seekonk	NC-100	Torque Wrench	3/18/2014	Biennial	3/18/2016	N/A
SPEAG	DAKS_VNA R140	VNA for Portable DAK	8/16/2015	Annual	8/16/2016	80513

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

15 MEASUREMENT UNCERTAINTIES

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

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]

17 REFERENCES

[1] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation, Aug. 1996.

[2] ANSI/IEEE C95.1-2005, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, 2006.

[3] ANSI/IEEE C95.1-1992, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, Sept. 1992.

[4] ANSI/IEEE C95.3-2002, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave, New York: IEEE, December 2002.

[5] IEEE Standards Coordinating Committee 39 –Standards Coordinating Committee 34 – IEEE Std. 1528-2013, Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head Due to Wireless Communications Devices: Measurement Techniques.

[6] NCRP, National Council on Radiation Protection and Measurements, Biological Effects and Exposure Criteria for RadioFrequency Electromagnetic Fields, NCRP Report No. 86, 1986. Reprinted Feb. 1995.

[7] T. Schmid, O. Egger, N. Kuster, Automated E-field scanning system for dosimetric assessments, IEEE Transaction on Microwave Theory and Techniques, vol. 44, Jan. 1996, pp. 105-113.

[8] K. Pokovic, T. Schmid, N. Kuster, Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies, ICECOM97, Oct. 1997, pp. 1 -124.

[9] K. Pokovic, T. Schmid, and N. Kuster, E-field Probe with improved isotropy in brain simulating liquids, Proceedings of the ELMAR, Zadar, Croatia, June 23-25, 1996, pp. 172-175.

[10] Schmid & Partner Engineering AG, Application Note: Data Storage and Evaluation, June 1998, p2.

[11] V. Hombach, K. Meier, M. Burkhardt, E. Kuhn, N. Kuster, The Dependence of EM Energy Absorption upon Human Modeling at 900 MHz, IEEE Transaction on Microwave Theory and Techniques, vol. 44 no. 10, Oct. 1996, pp. 1865-1873.

[12] N. Kuster and Q. Balzano, Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300MHz, IEEE Transaction on Vehicular Technology, vol. 41, no. 1, Feb. 1992, pp. 17-23.

[13] G. Hartsgrove, A. Kraszewski, A. Surowiec, Simulated Biological Materials for Electromagnetic Radiation Absorption Studies, University of Ottawa, Bioelectromagnetics, Canada: 1987, pp. 29-36.

[14] Q. Balzano, O. Garay, T. Manning Jr., Electromagnetic Energy Exposure of Simulated Users of Portable Cellular Telephones, IEEE Transactions on Vehicular Technology, vol. 44, no.3, Aug. 1995.

[15] W. Gander, Computermathematick, Birkhaeuser, Basel, 1992.

[16] W.H. Press, S.A. Teukolsky, W.T. Vetterling, and B.P. Flannery, Numerical Recipes in C, The Art of Scientific Computing, Second edition, Cambridge University Press, 1992.

[17] N. Kuster, R. Kastle, T. Schmid, Dosimetric evaluation of mobile communications equipment with known precision, IEEE Transaction on Communications, vol. E80-B, no. 5, May 1997, pp. 645-652.

[18] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), Human Exposure to Electromagnetic Fields High-frequency: 10kHz-300GHz, Jan. 1995.

[19] Prof. Dr. Niels Kuster, ETH, Eidgenössische Technische Hoschschule Zürich, Dosimetric Evaluation of the Cellular Phone.

[20] IEC 62209-1, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 1: Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz), Feb. 2005.

[21] Industry Canada RSS-102 Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) Issue 4, March 2010.

[22] Health Canada Safety Code 6 Limits of Human Exposure to Radio Frequency Electromagnetic Fields in the Frequency Range from 3 kHz – 300 GHz, 2009

[23] FCC SAR Test Procedures for 2G-3G Devices, Mobile Hotspot and UMPC Devices KDB Publications 941225, D01-D07

[24] SAR Measurement Guidance for IEEE 802.11 Transmitters, KDB Publication 248227 D01v02r01

[25] FCC SAR Considerations for Handsets with Multiple Transmitters and Antennas, KDB Publications 648474 D03-D04

[26] FCC SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers, FCC KDB Publication 616217 D04

[27] FCC SAR Measurement and Reporting Requirements for 100MHz – 6 GHz, KDB Publications 865664 D01-D02

[28] FCC General RF Exposure Guidance and SAR Procedures for Dongles, KDB Publication 447498, D01-D02

[29] Anexo à Resolução No. 533, de 10 de Septembro de 2009.

[30] IEC 62209-2, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz), Mar. 2010.

APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFK330; Type: Portable Handset; Serial: 02138

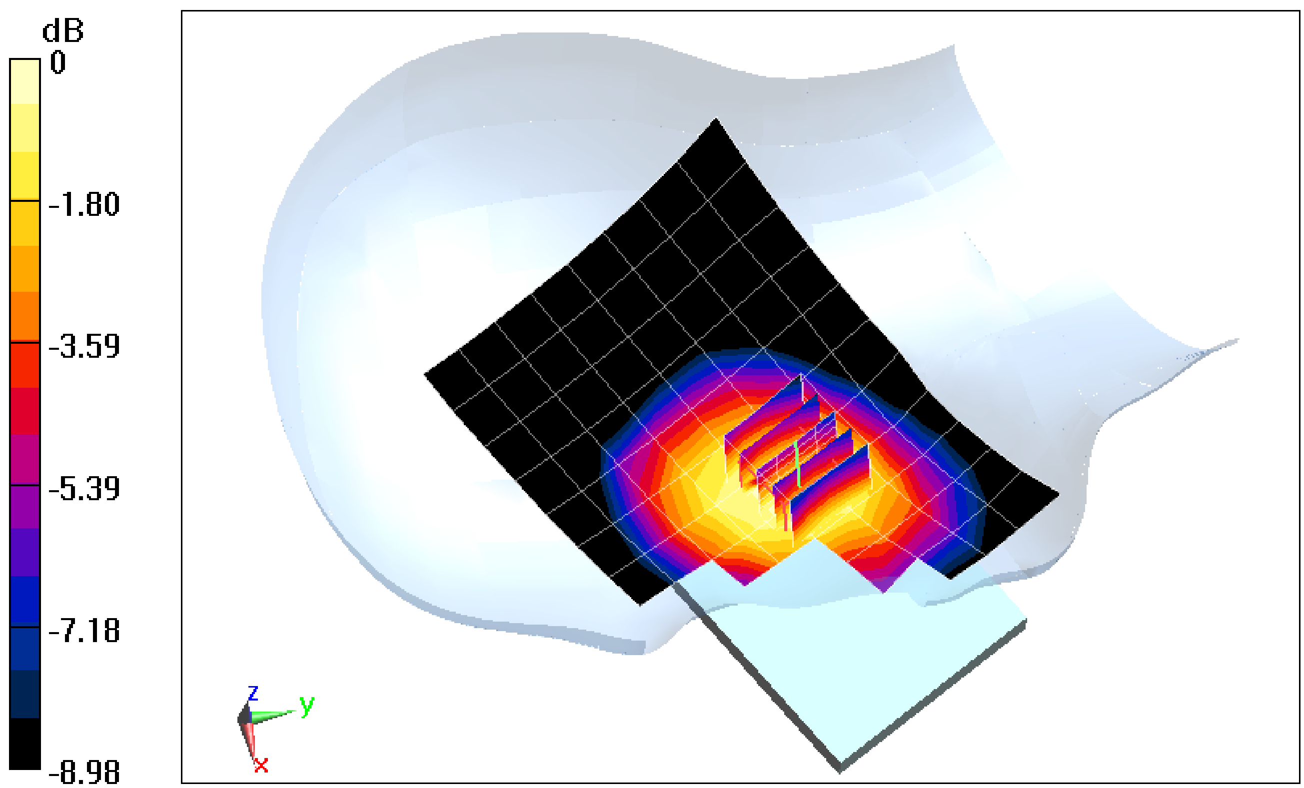
Communication System: UID 0, GSM GPRS; 3 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:2.76
Medium: 835 Head, Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.92 S/m; ε_r = 41.969; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 11-17-2015; Ambient Temp: 22.7°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3351; ConvF(6.17, 6.17, 6.17); Calibrated: 6/22/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/24/2015
Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: GPRS 850, Right Head, Cheek, Mid.ch, 3 Tx slots

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.19 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 1.54 W/kg
SAR(1 g) = 0.452 W/kg



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFK330; Type: Portable Handset; Serial: 02138

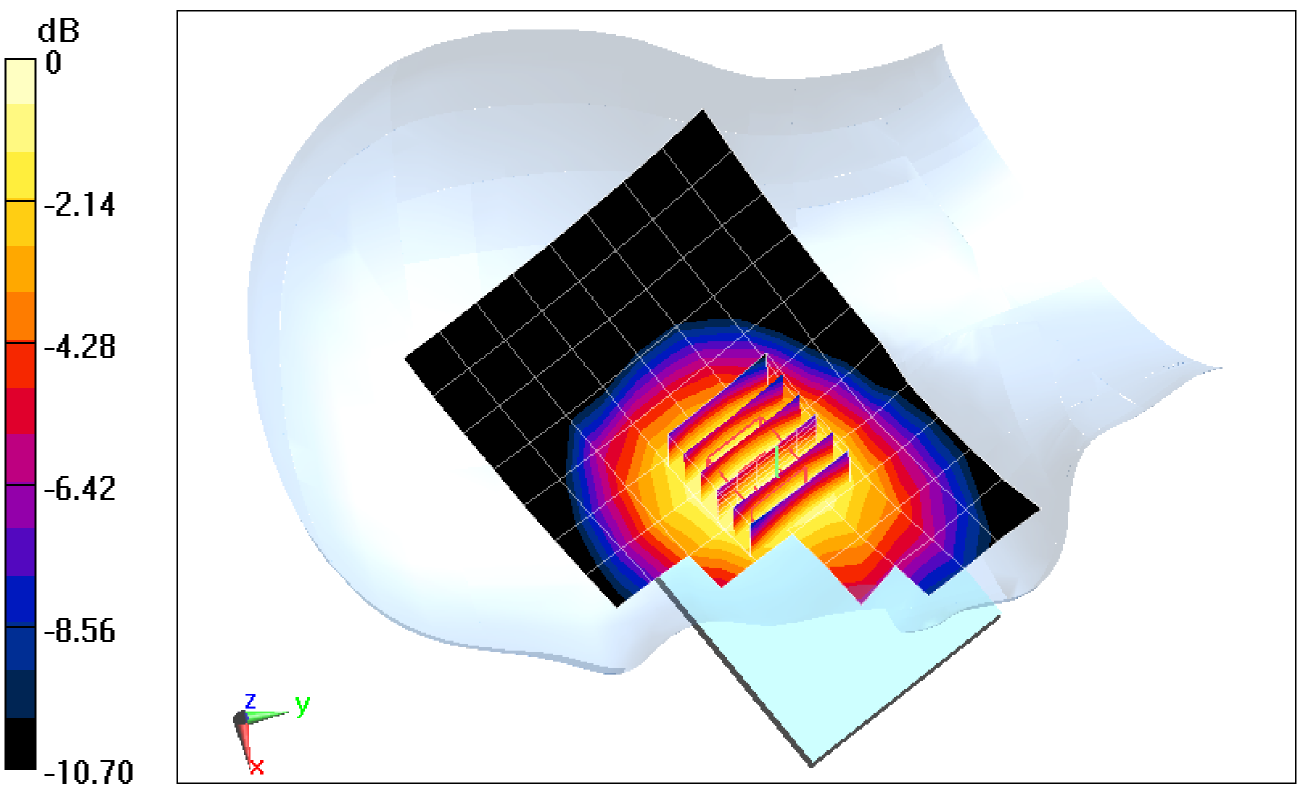
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Head, Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.92 S/m; ε_r = 41.969; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 11-17-2015; Ambient Temp: 22.7°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3351; ConvF(6.17, 6.17, 6.17); Calibrated: 6/22/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/24/2015
Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.64 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.420 W/kg
SAR(1 g) = 0.340 W/kg



0 dB = 0.372 W/kg = -4.29 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFK330; Type: Portable Handset; Serial: 02138

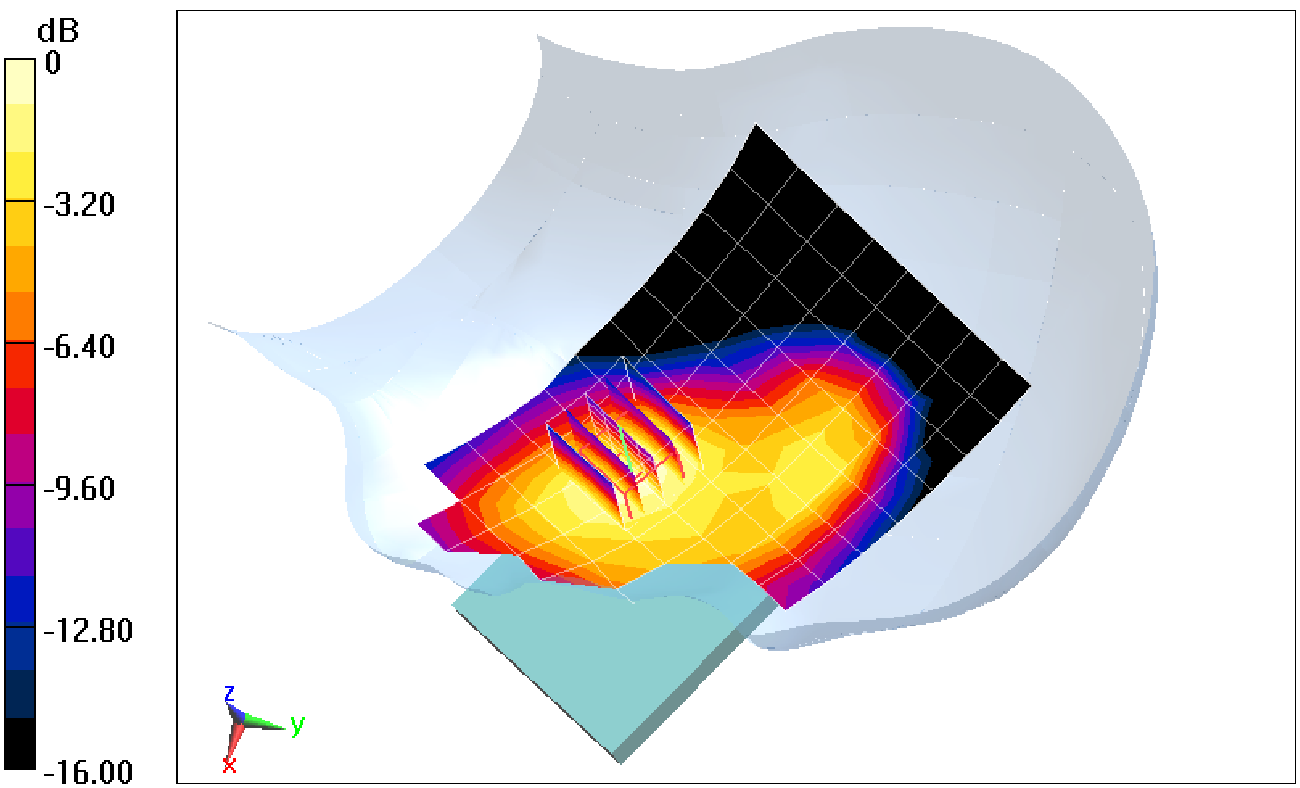
Communication System: UID 0, UMTS; Frequency: 1732.4 MHz; Duty Cycle: 1:1
Medium: 1750 Head, Medium parameters used (interpolated):
f = 1732.4 MHz; σ = 1.351 S/m; ε_r = 38.757; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 11-18-2015; Ambient Temp: 21.3°C; Tissue Temp: 21.5°C

Probe: ES3DV3 - SN3209; ConvF(5.23, 5.23, 5.23); Calibrated: 3/19/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/20/2015
Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.74 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 0.723 W/kg
SAR(1 g) = 0.462 W/kg



0 dB = 0.551 W/kg = -2.59 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFK330; Type: Portable Handset; Serial: 02146

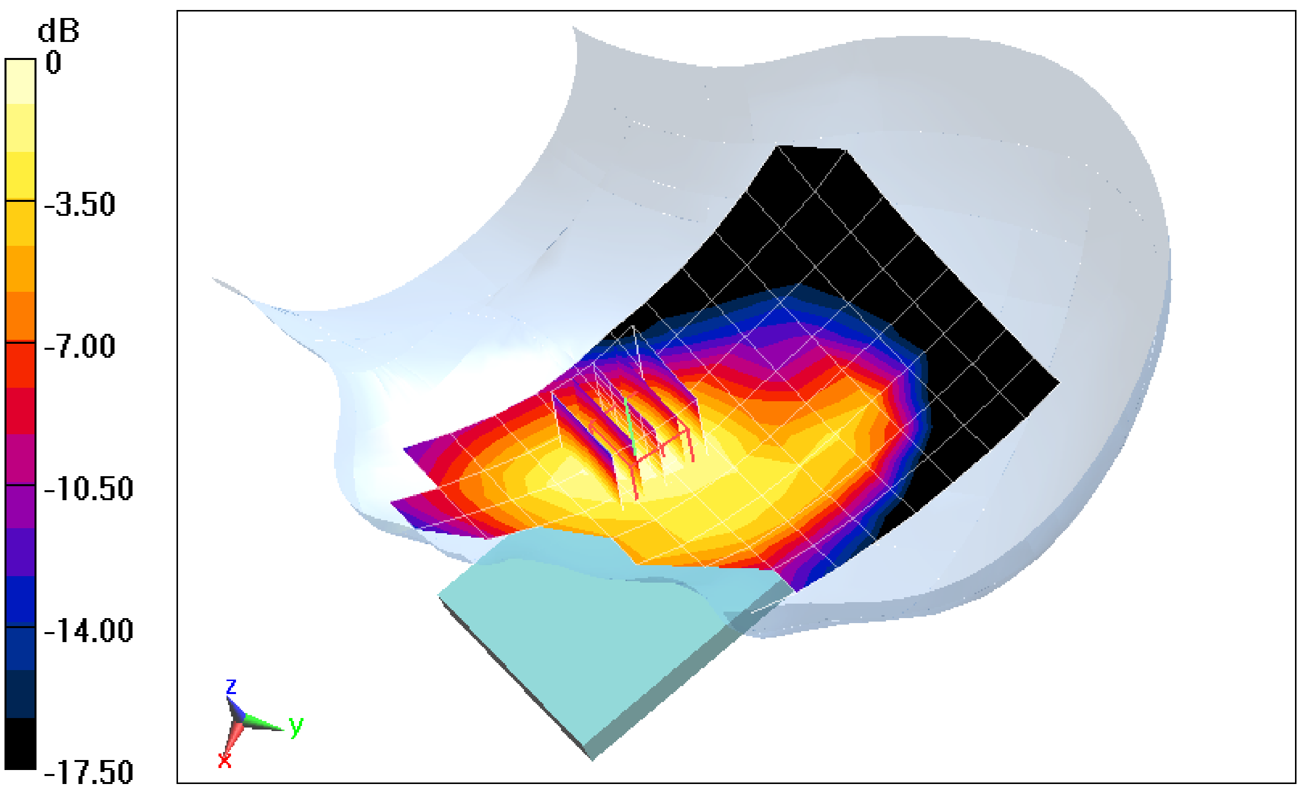
Communication System: UID 0, GSM GPRS; 3 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:2.76
Medium: 1900 Head, Medium parameters used:
f = 1880 MHz; σ = 1.405 S/m; ε_r = 39.037; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 11-18-2015; Ambient Temp: 21.2°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3319; ConvF(5.1, 5.1, 5.1); Calibrated: 3/19/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 3/13/2015
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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.62 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 0.529 W/kg
SAR(1 g) = 0.347 W/kg



0 dB = 0.413 W/kg = -3.84 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFK330; Type: Portable Handset; Serial: 02146

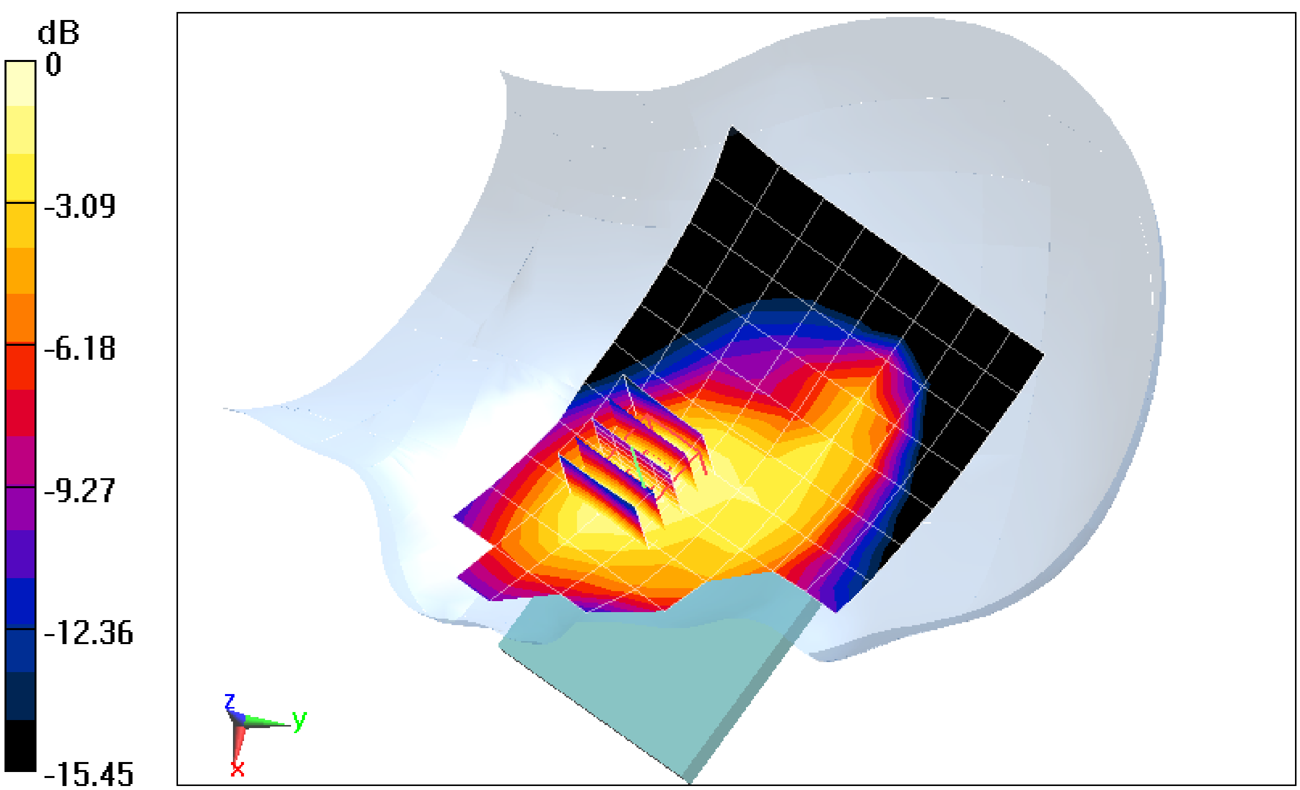
Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Head, Medium parameters used:
f = 1880 MHz; σ = 1.405 S/m; ε_r = 39.037; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 11-18-2015; Ambient Temp: 21.2°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3319; ConvF(5.1, 5.1, 5.1); Calibrated: 3/19/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 3/13/2015
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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.27 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.723 W/kg
SAR(1 g) = 0.478 W/kg



0 dB = 0.556 W/kg = -2.55 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFK330; Type: Portable Handset; Serial: 02146

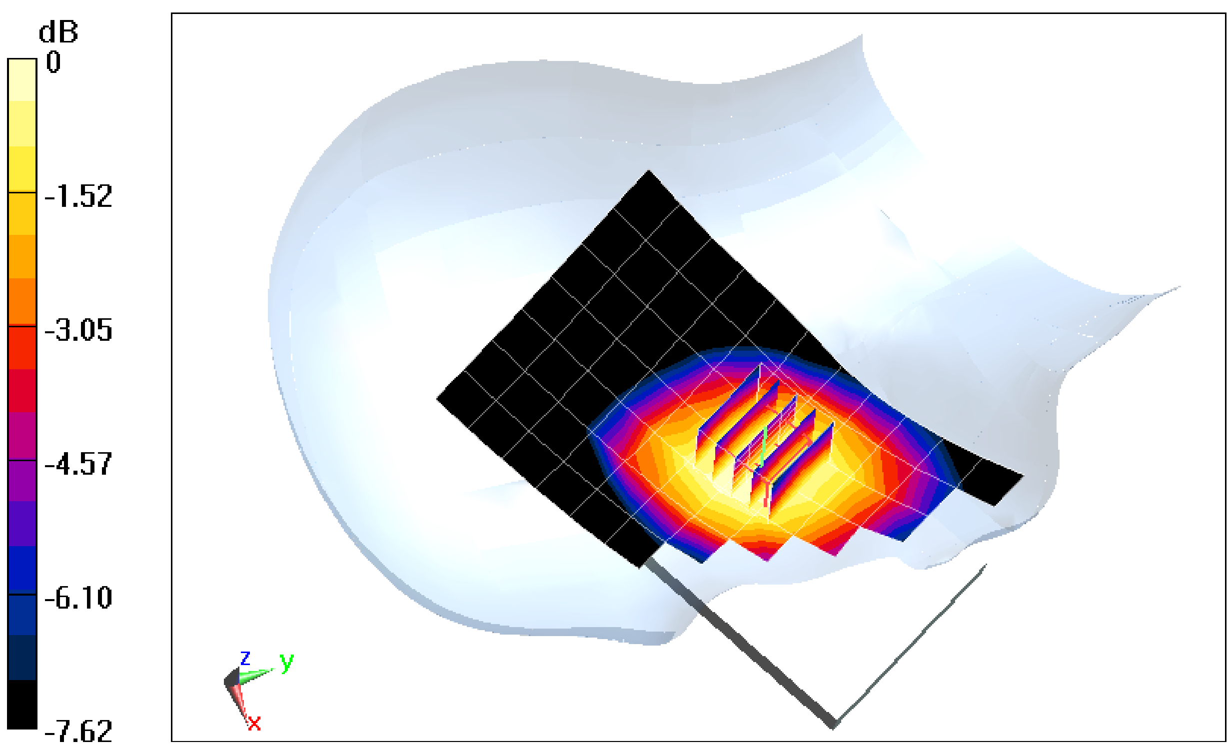
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: 750 Head, Medium parameters used (interpolated):
f = 707.5 MHz; σ = 0.887 S/m; ε_r = 44.016; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 11-19-2015; Ambient Temp: 23.2°C; Tissue Temp: 21.8°C

Probe: ES3DV2 - SN3022; ConvF(6.33, 6.33, 6.33); Calibrated: 8/26/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/18/2015
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1797
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 12, Right Head, Cheek, Mid.ch,
10 MHz Bandwidth, QPSK, 1 RB, 25 RB Offset

Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.07 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.401 W/kg
SAR(1 g) = 0.334 W/kg



0 dB = 0.361 W/kg = -4.42 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFK330; Type: Portable Handset; Serial: 02138

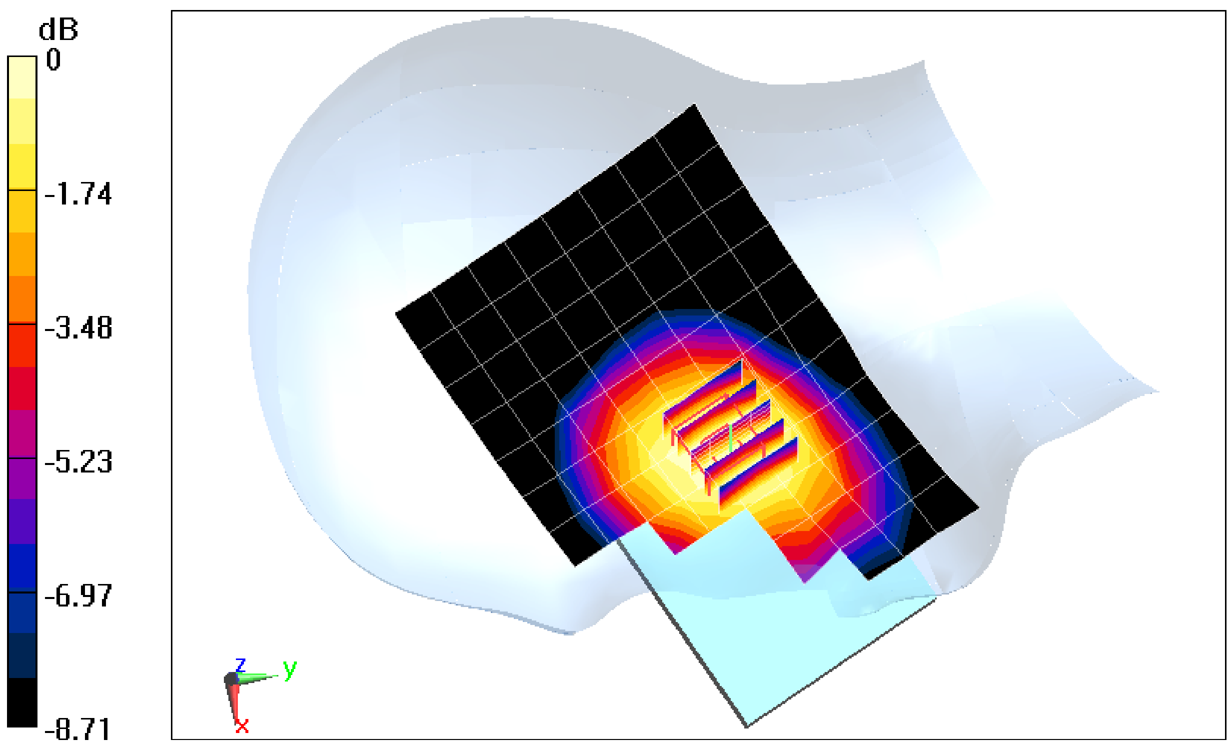
Communication System: UID 0, LTE Band 5 (Cell.); Frequency: 836.5 MHz; Duty Cycle: 1:1
Medium: 835 Head, Medium parameters used (interpolated):
f = 836.5 MHz; σ = 0.919 S/m; ε_r = 41.971; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 11-17-2015; Ambient Temp: 22.7°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3351; ConvF(6.17, 6.17, 6.17); Calibrated: 6/22/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/24/2015
Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 5 (Cell.), Right Head, Cheek, Mid.ch,
10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.12 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 0.415 W/kg
SAR(1 g) = 0.339 W/kg



0 dB = 0.365 W/kg = -4.38 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFK330; Type: Portable Handset; Serial: 02138

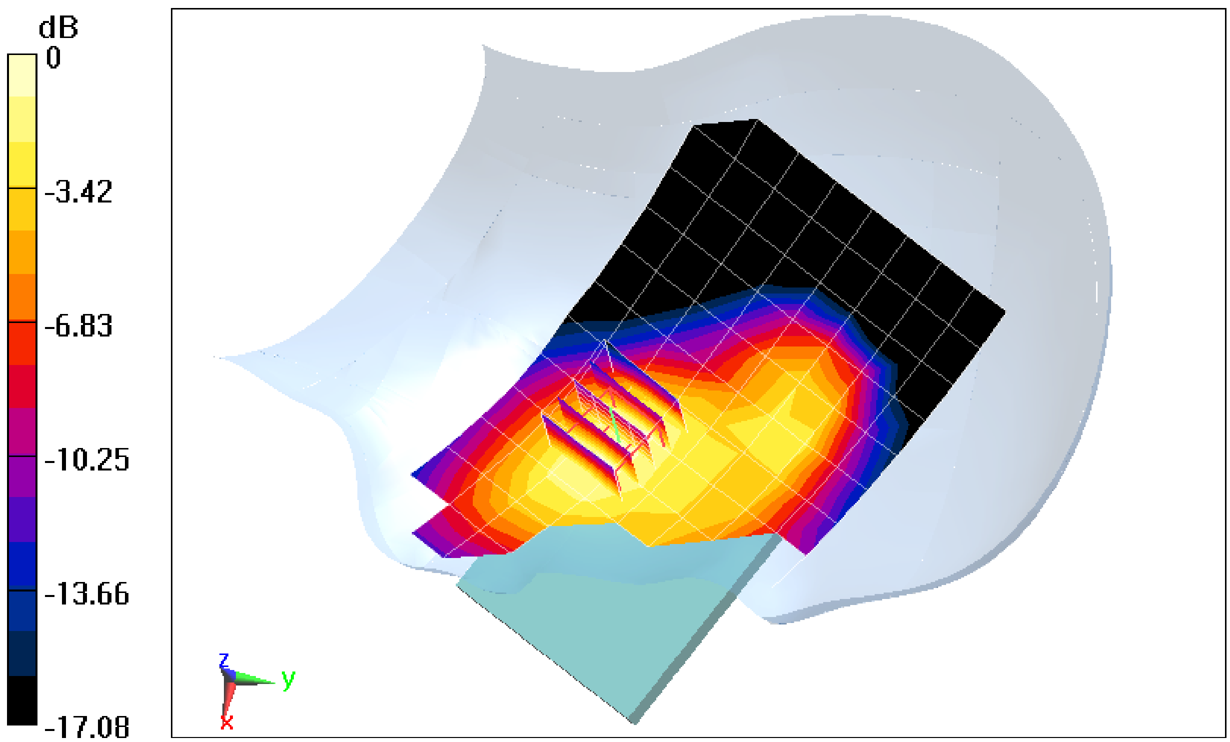
Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: 1750 Head, Medium parameters used (interpolated):
f = 1732.5 MHz; σ = 1.352 S/m; ε_r = 38.756; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 11-18-2015; Ambient Temp: 21.3°C; Tissue Temp: 21.5°C

Probe: ES3DV3 - SN3209; ConvF(5.23, 5.23, 5.23); Calibrated: 3/19/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/20/2015
Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 4 (AWS), Left Head, Cheek, Mid.ch,
20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.16 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 0.781 W/kg
SAR(1 g) = 0.501 W/kg



0 dB = 0.597 W/kg = -2.24 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFK330; Type: Portable Handset; Serial: 02146

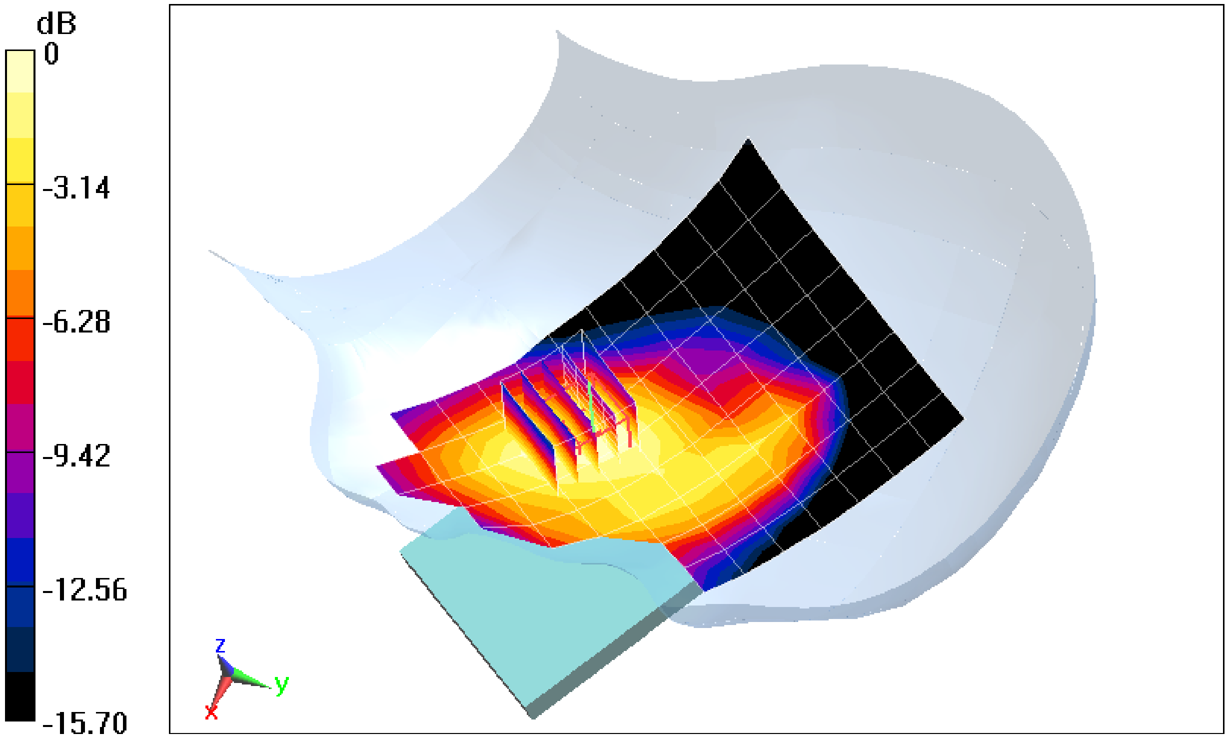
Communication System: UID 0, LTE Band 2 (PCS); Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Head, Medium parameters used:
f = 1880 MHz; σ = 1.405 S/m; ε_r = 39.037; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 11-18-2015; Ambient Temp: 21.2°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3319; ConvF(5.1, 5.1, 5.1); Calibrated: 3/19/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 3/13/2015
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, 50 RB Offset

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.03 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.776 W/kg
SAR(1 g) = 0.507 W/kg



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFK330; Type: Portable Handset; Serial: 05163

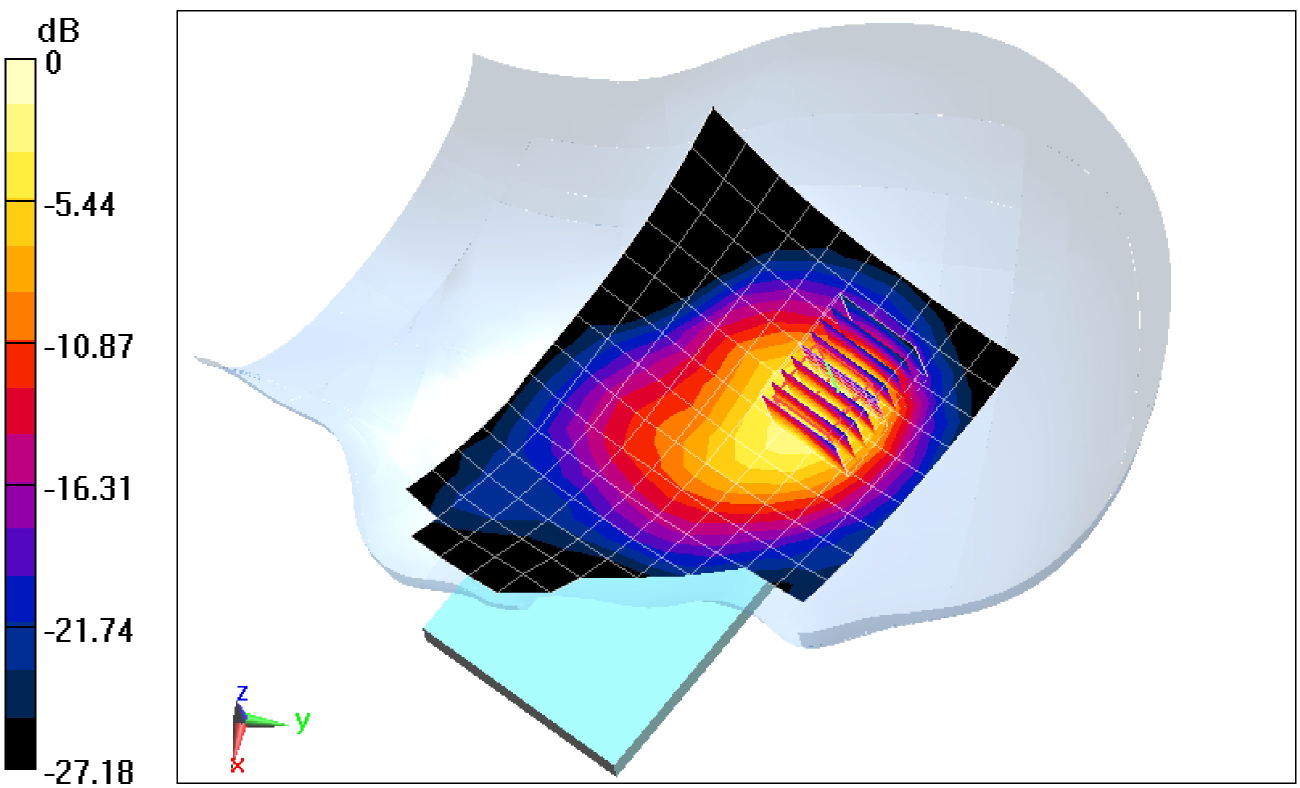
Communication System: UID 0, IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium: 2450 Head, Medium parameters used (interpolated):
f = 2412 MHz; σ = 1.76 S/m; ε_r = 40.107; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 12-07-2015; Ambient Temp: 23.1°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3263; ConvF(4.4, 4.4, 4.4); Calibrated: 5/20/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 6/17/2015
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: IEEE 802.11b, 22 MHz Bandwidth, Left Head, Cheek, Ch 01, 1 Mbps

Area Scan (11x18x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x9x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 21.76 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.84 W/kg
SAR(1 g) = 0.849 W/kg



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFK330; Type: Portable Handset; Serial: 02138

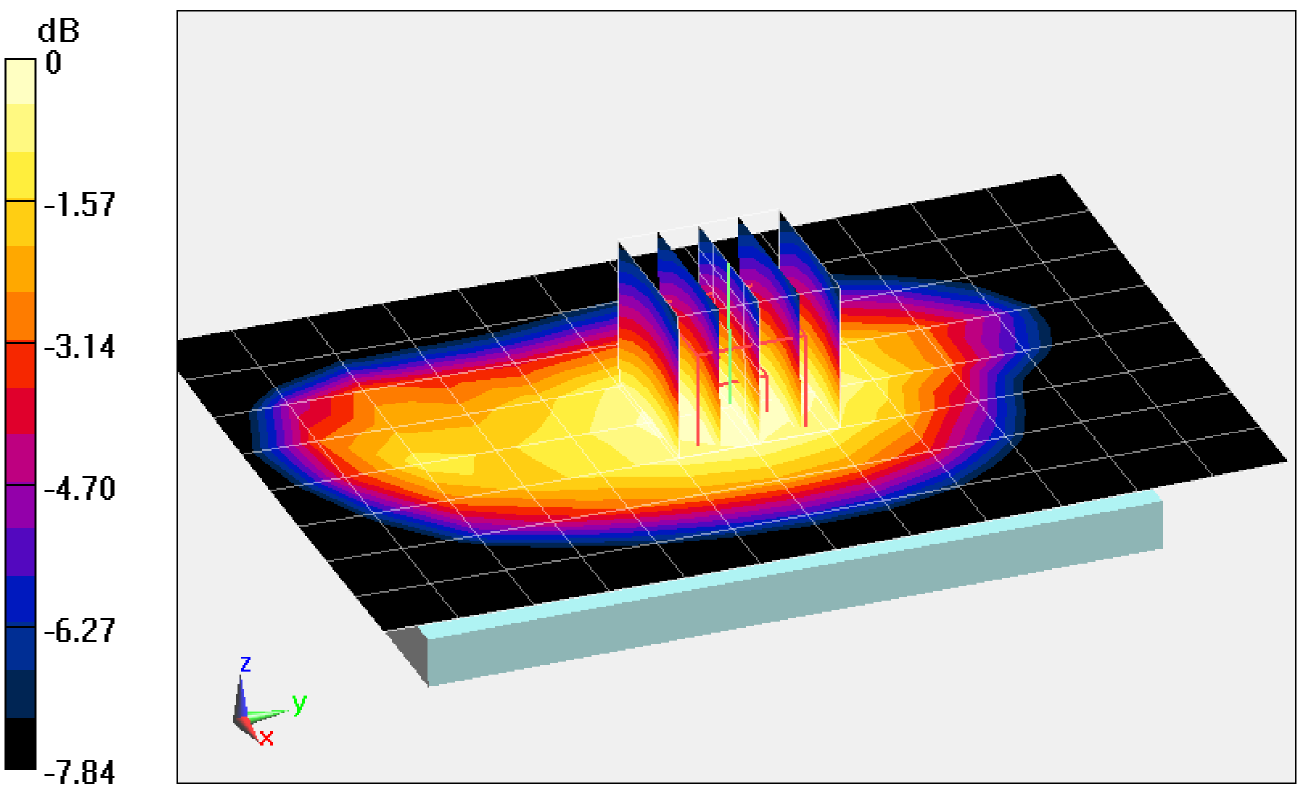
Communication System: UID 0, GSM GPRS; 3 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:2.76
Medium: 835 Body, Medium parameters used (interpolated):
f = 836.6 MHz; $\sigma = 0.986$ S/m; $\varepsilon_r = 53.907$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-16-2015; Ambient Temp: 23.0°C; Tissue Temp: 21.7°C

Probe: ES3DV2 - SN3022; ConvF(6.13, 6.13, 6.13); Calibrated: 8/26/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/18/2015
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1229
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: GPRS 850, Body SAR, Back side, Mid.ch, 3 Tx Slots

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.65 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.576 W/kg
SAR(1 g) = 0.473 W/kg



0 dB = 0.517 W/kg = -2.87 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFK330; Type: Portable Handset; Serial: 02138

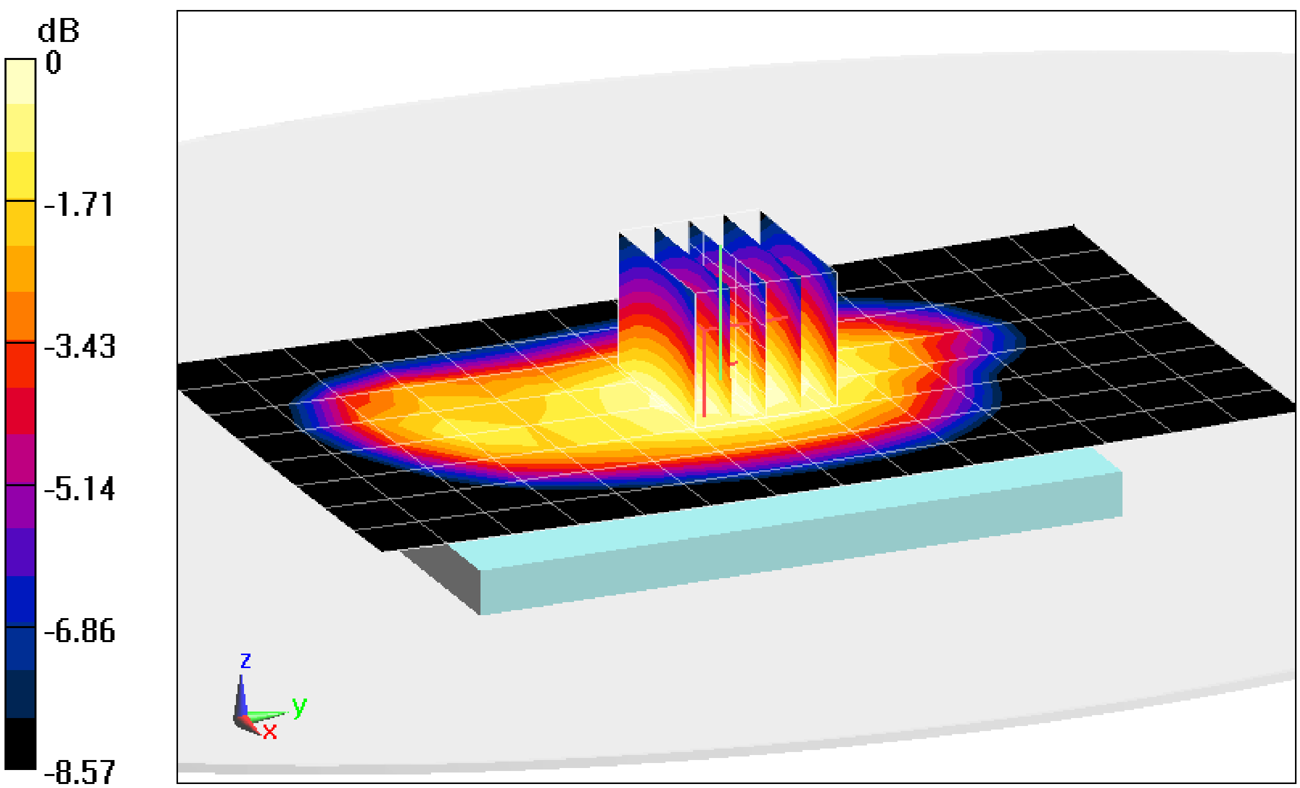
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Body, Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.986 S/m; ε_r = 53.907; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-16-2015; Ambient Temp: 23.0°C; Tissue Temp: 21.7°C

Probe: ES3DV2 - SN3022; ConvF(6.13, 6.13, 6.13); Calibrated: 8/26/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/18/2015
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1229
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.55 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.481 W/kg
SAR(1 g) = 0.389 W/kg



0 dB = 0.424 W/kg = -3.73 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFK330; Type: Portable Handset; Serial: 02146

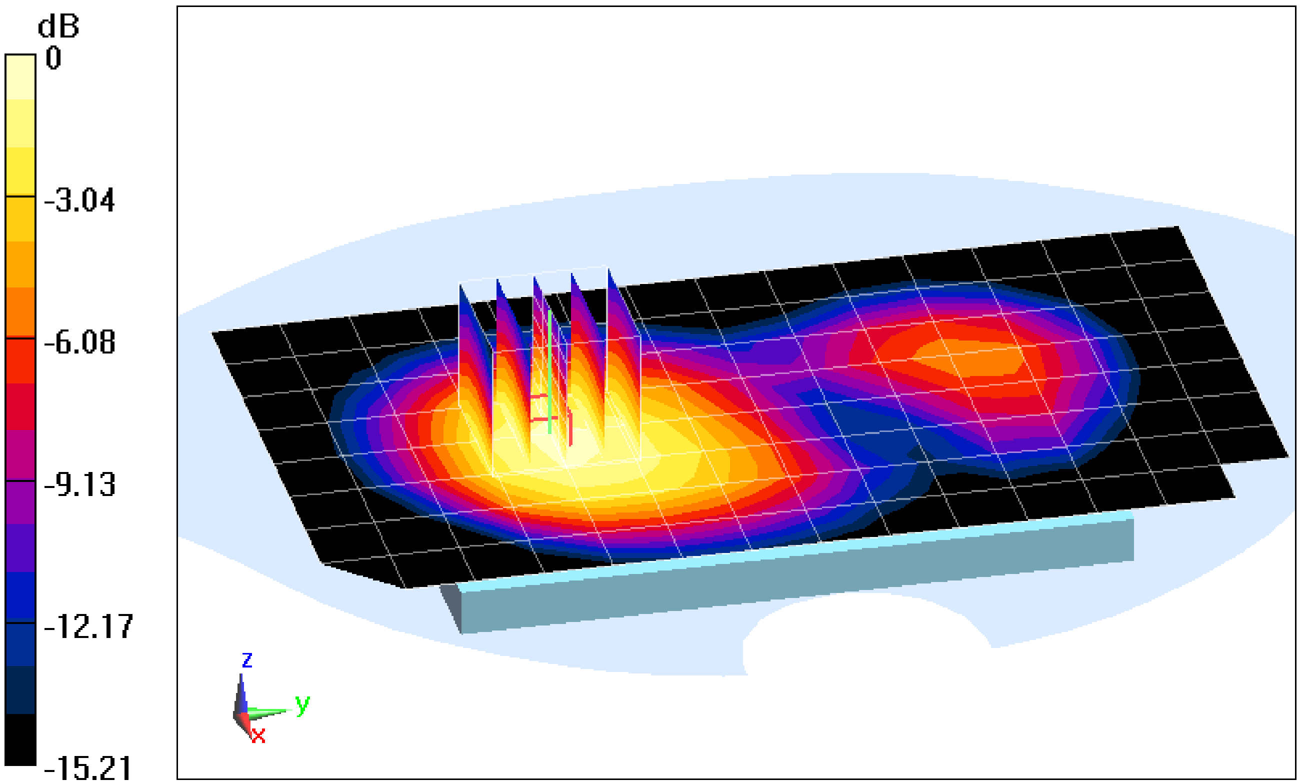
Communication System: UID 0, UMTS; Frequency: 1752.5 MHz; Duty Cycle: 1:1
Medium: 1750 Body, Medium parameters used (interpolated):
f = 1752.5 MHz; σ = 1.485 S/m; ε_r = 51.349; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-16-2015; Ambient Temp: 22.5°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3319; ConvF(4.83, 4.83, 4.83); Calibrated: 3/19/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 3/13/2015
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 1750, Body SAR, Back side, High.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.86 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 1.48 W/kg
SAR(1 g) = 0.997 W/kg



0 dB = 1.16 W/kg = 0.64 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFK330; Type: Portable Handset; Serial: 02138

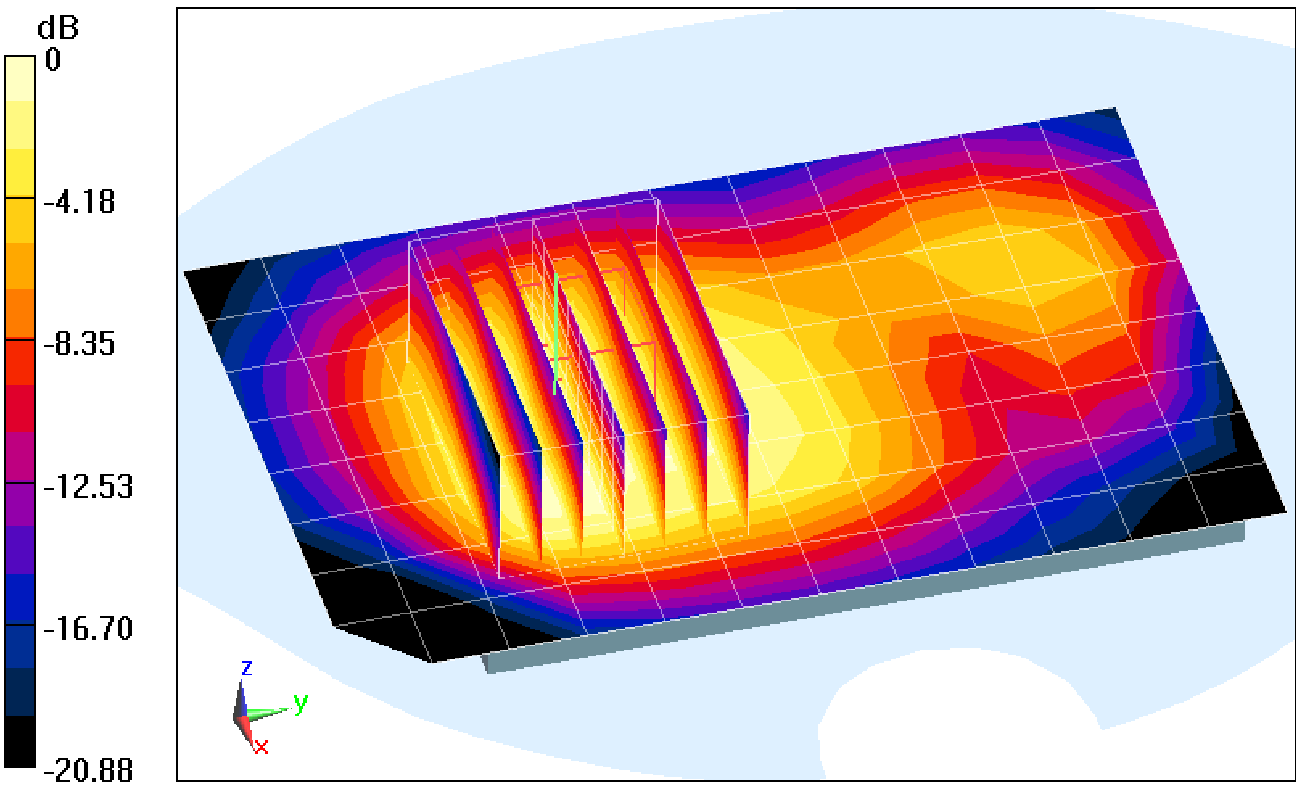
Communication System: UID 0, GSM GPRS; 3 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:2.76
Medium: 1900 Body, Medium parameters used:
$f = 1880$ MHz; $\sigma = 1.536$ S/m; $\varepsilon_r = 51.55$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-16-2015; Ambient Temp: 23.0°C; Tissue Temp: 22.1°C

Probe: ES3DV2 - SN3022; ConvF(4.56, 4.56, 4.56); Calibrated: 8/26/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/18/2015
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1797
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: GPRS 1900, Body SAR, Back side, Mid.ch, 3 Tx Slots

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (9x7x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.93 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.652 W/kg
SAR(1 g) = 0.416 W/kg



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFK330; Type: Portable Handset; Serial: 02138

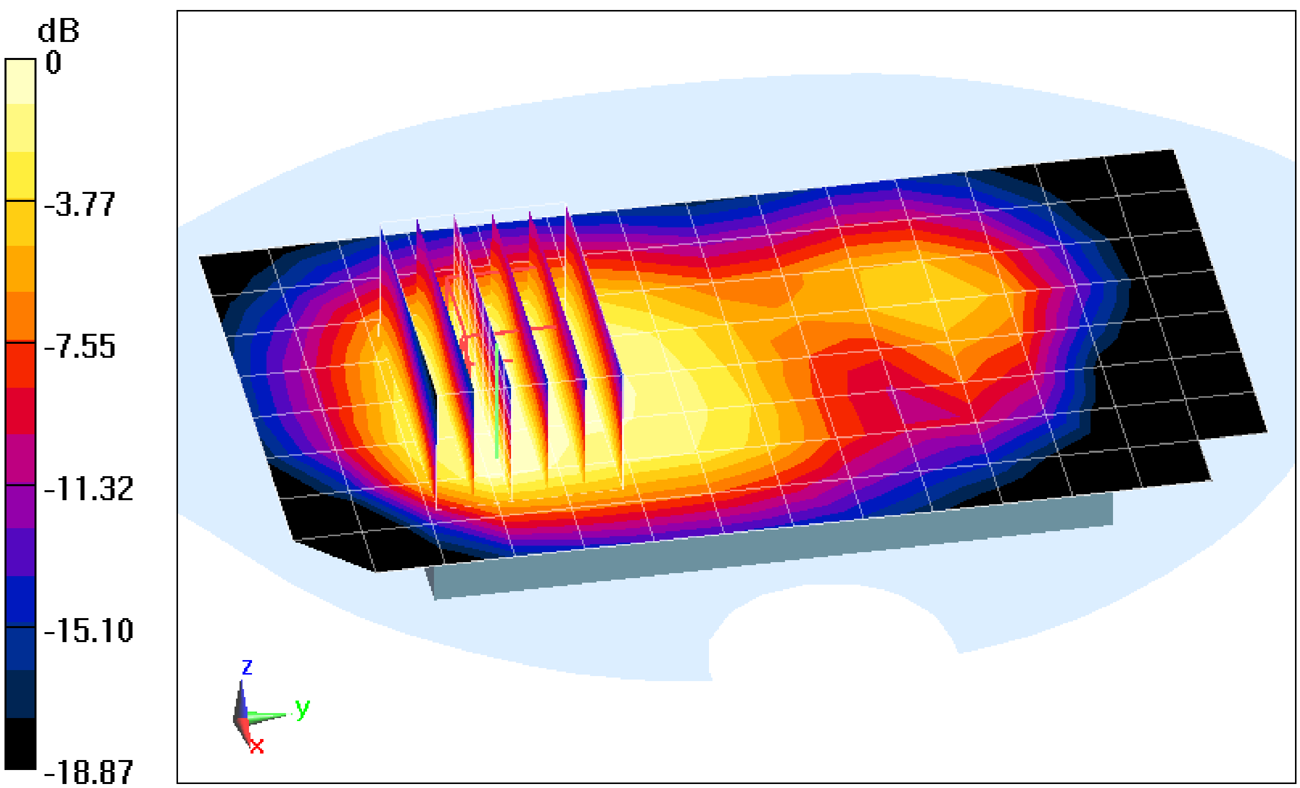
Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Body, Medium parameters used:
f = 1880 MHz; σ = 1.536 S/m; ε_r = 51.55; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 11-16-2015; Ambient Temp: 23.0°C; Tissue Temp: 22.1°C

Probe: ES3DV2 - SN3022; ConvF(4.56, 4.56, 4.56); Calibrated: 8/26/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/18/2015
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1797
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (9x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.13 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.02 W/kg
SAR(1 g) = 0.596 W/kg



0 dB = 0.681 W/kg = -1.67 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFK330; Type: Portable Handset; Serial: 02146

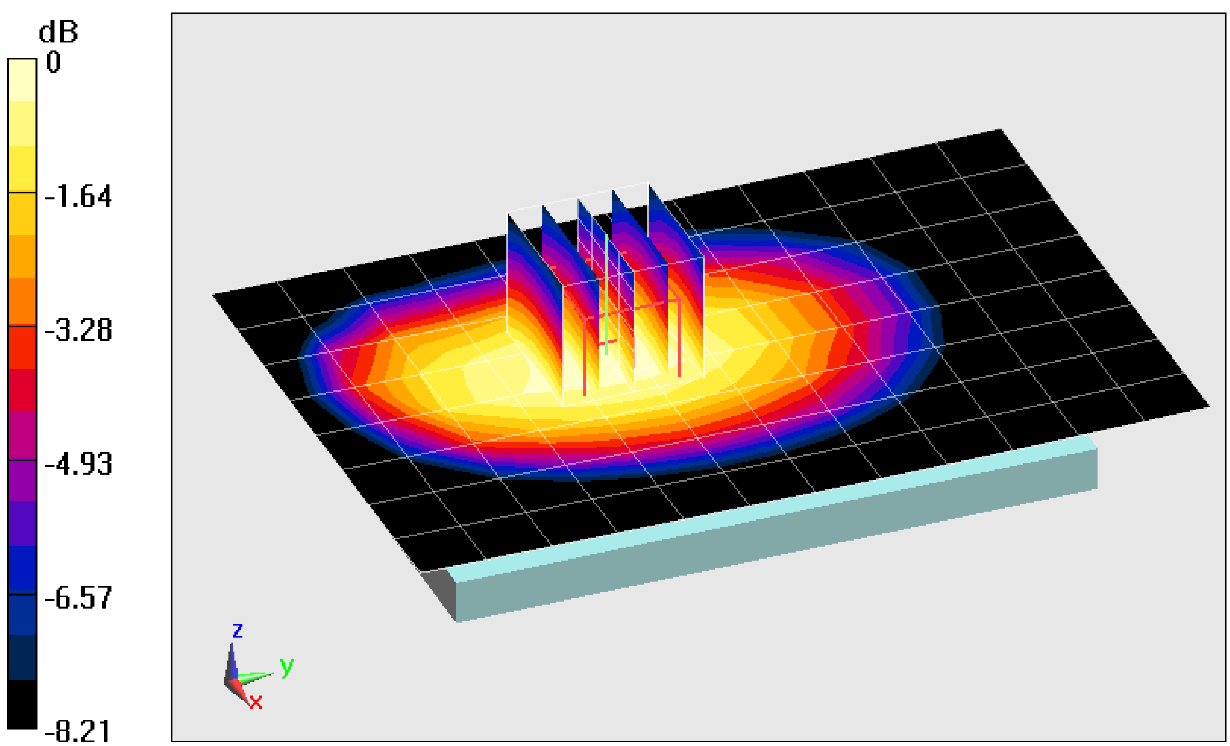
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: 750 Body, Medium parameters used (interpolated):
f = 707.5 MHz; σ = 0.927 S/m; ε_r = 55.193; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-19-2015; Ambient Temp: 20.7°C; Tissue Temp: 21.5°C

Probe: ES3DV3 - SN3318; ConvF(6.22, 6.22, 6.22); Calibrated: 1/23/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 1/14/2015
Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2027
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, 25 RB Offset

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.79 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.712 W/kg
SAR(1 g) = 0.565 W/kg



0 dB = 0.622 W/kg = -2.06 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFK330; Type: Portable Handset; Serial: 02146

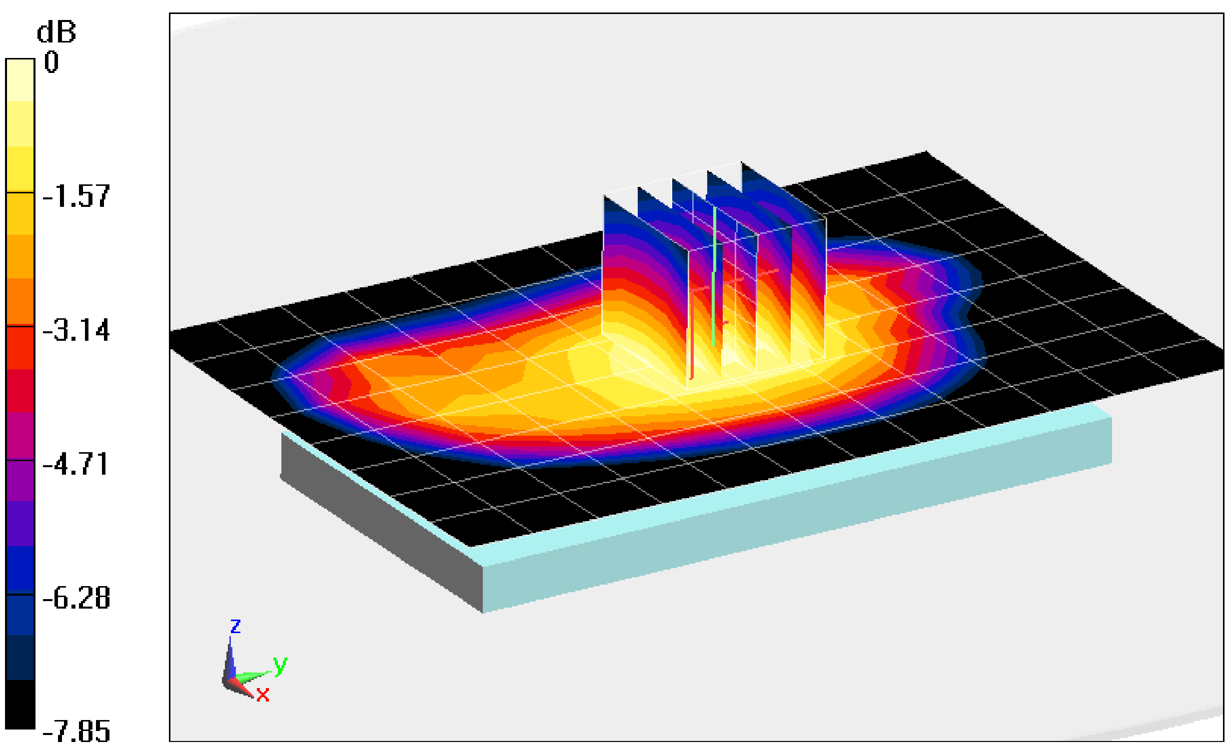
Communication System: UID 0, LTE Band 5; Frequency: 836.5 MHz; Duty Cycle: 1:1
Medium: 835 Body, Medium parameters used (interpolated):
f = 836.5 MHz; σ = 0.985 S/m; ε_r = 53.907; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-16-2015; Ambient Temp: 23.0°C; Tissue Temp: 21.7°C

Probe: ES3DV2 - SN3022; ConvF(6.13, 6.13, 6.13); Calibrated: 8/26/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/18/2015
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1229
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 5 (Cell.), Body SAR, Back side, Mid.ch,
10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.04 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 0.546 W/kg
SAR(1 g) = 0.442 W/kg



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFK330; Type: Portable Handset; Serial: 02146

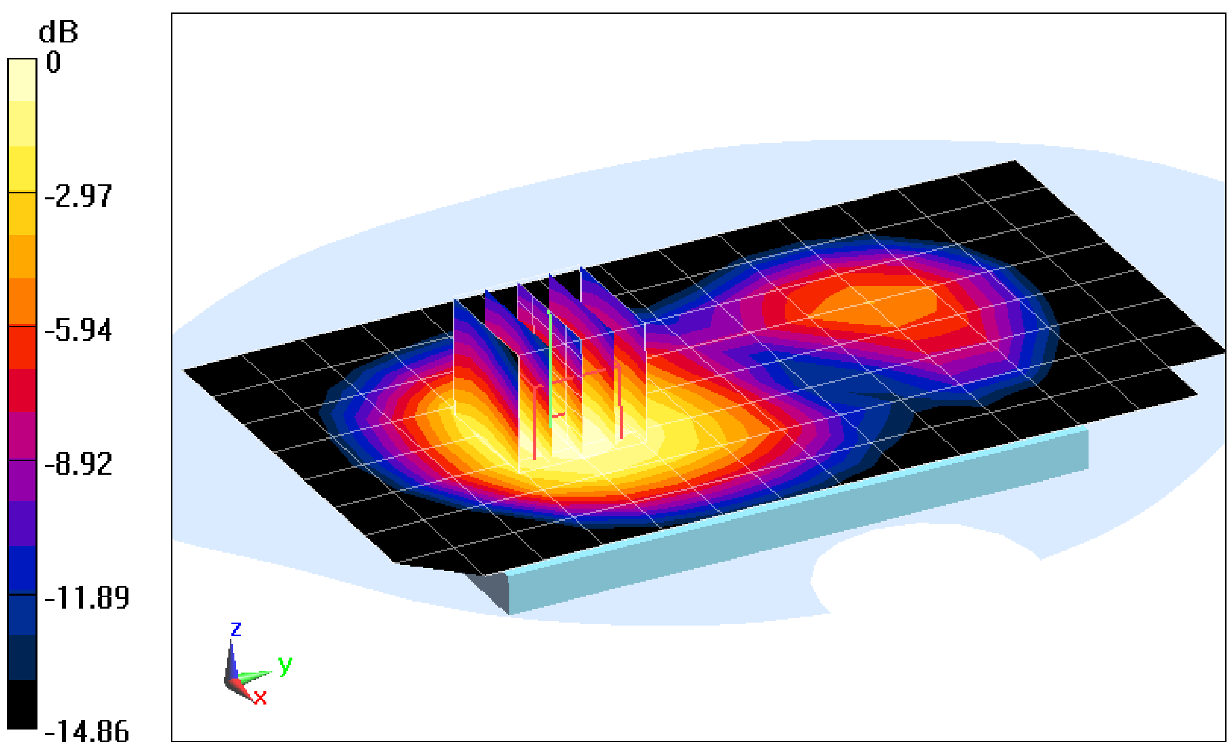
Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: 1750 Body, Medium parameters used (interpolated):
f = 1732.5 MHz; σ = 1.463 S/m; ε_r = 51.445; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-16-2015; Ambient Temp: 22.5°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3319; ConvF(4.83, 4.83, 4.83); Calibrated: 3/19/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 3/13/2015
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), Body SAR, Back side, Mid.ch,
20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset**

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.96 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 1.50 W/kg
SAR(1 g) = 1.02 W/kg



0 dB = 1.17 W/kg = 0.68 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFK330; Type: Portable Handset; Serial: 02138

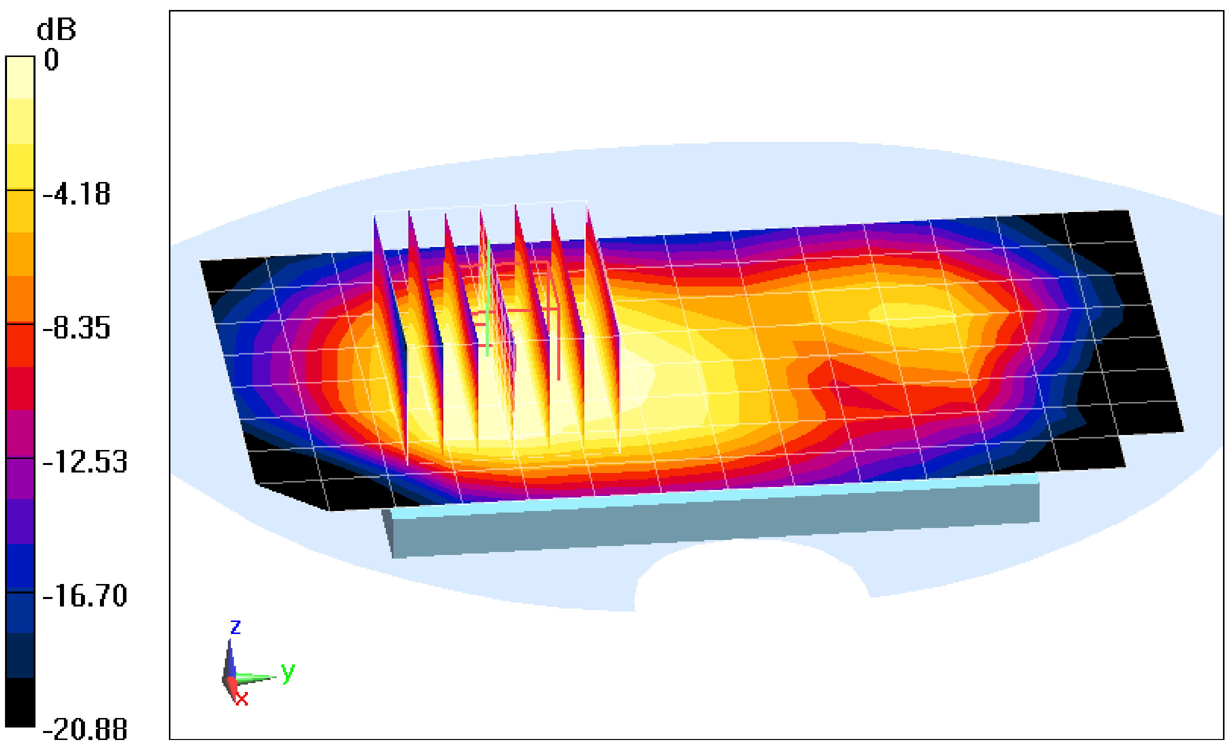
Communication System: UID 0, LTE Band 2 (PCS); Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Body, Medium parameters used:
f = 1880 MHz; σ = 1.536 S/m; ε_r = 51.55; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-16-2015; Ambient Temp: 23.0°C; Tissue Temp: 22.1°C

Probe: ES3DV2 - SN3022; ConvF(4.56, 4.56, 4.56); Calibrated: 8/26/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/18/2015
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1797
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 2 (PCS), Body SAR, Back side, Mid.ch,
20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (9x7x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.23 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.898 W/kg
SAR(1 g) = 0.570 W/kg



0 dB = 0.658 W/kg = -1.82 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFK330; Type: Portable Handset; Serial: 02138

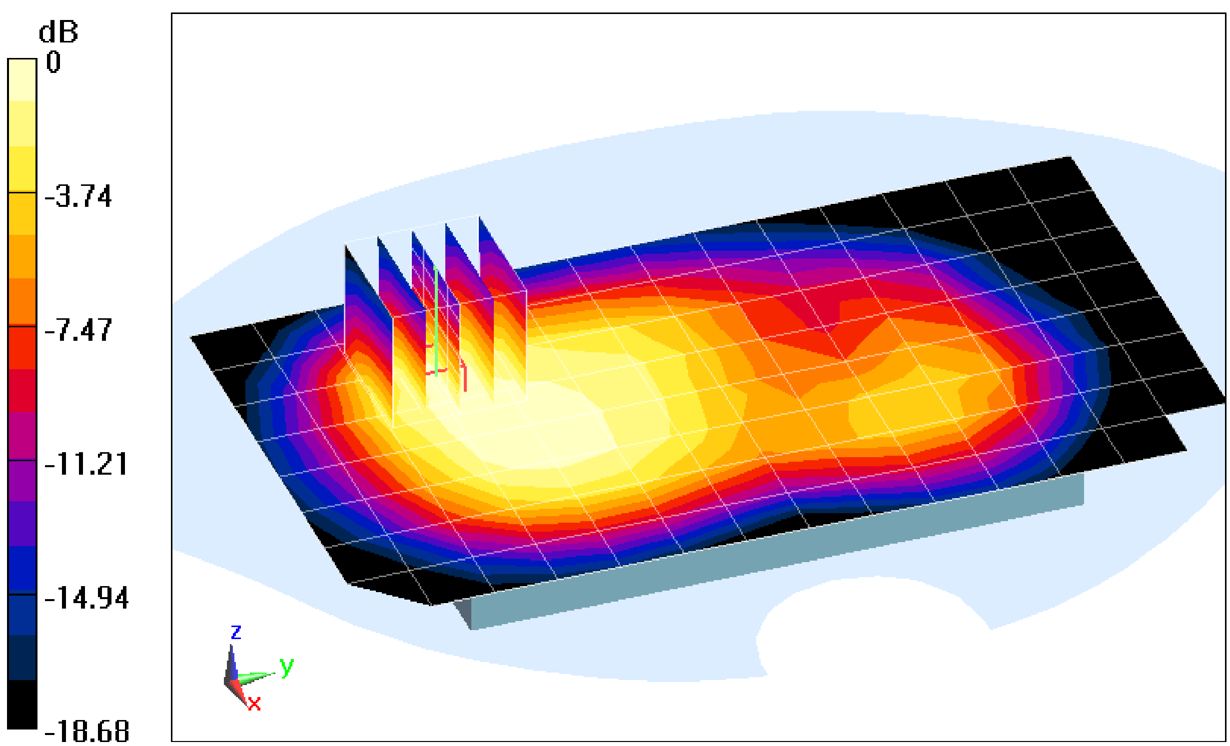
Communication System: UID 0, LTE Band 2 (PCS); Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Body, Medium parameters used:
f = 1880 MHz; σ = 1.536 S/m; ε_r = 51.55; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-16-2015; Ambient Temp: 23.0°C; Tissue Temp: 22.1°C

Probe: ES3DV2 - SN3022; ConvF(4.56, 4.56, 4.56); Calibrated: 8/26/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/18/2015
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1797
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 2 (PCS), Body SAR, Front side, Mid.ch, 20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.95 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 1.03 W/kg
SAR(1 g) = 0.592 W/kg



0 dB = 0.719 W/kg = -1.43 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFK330; Type: Portable Handset; Serial: 05163

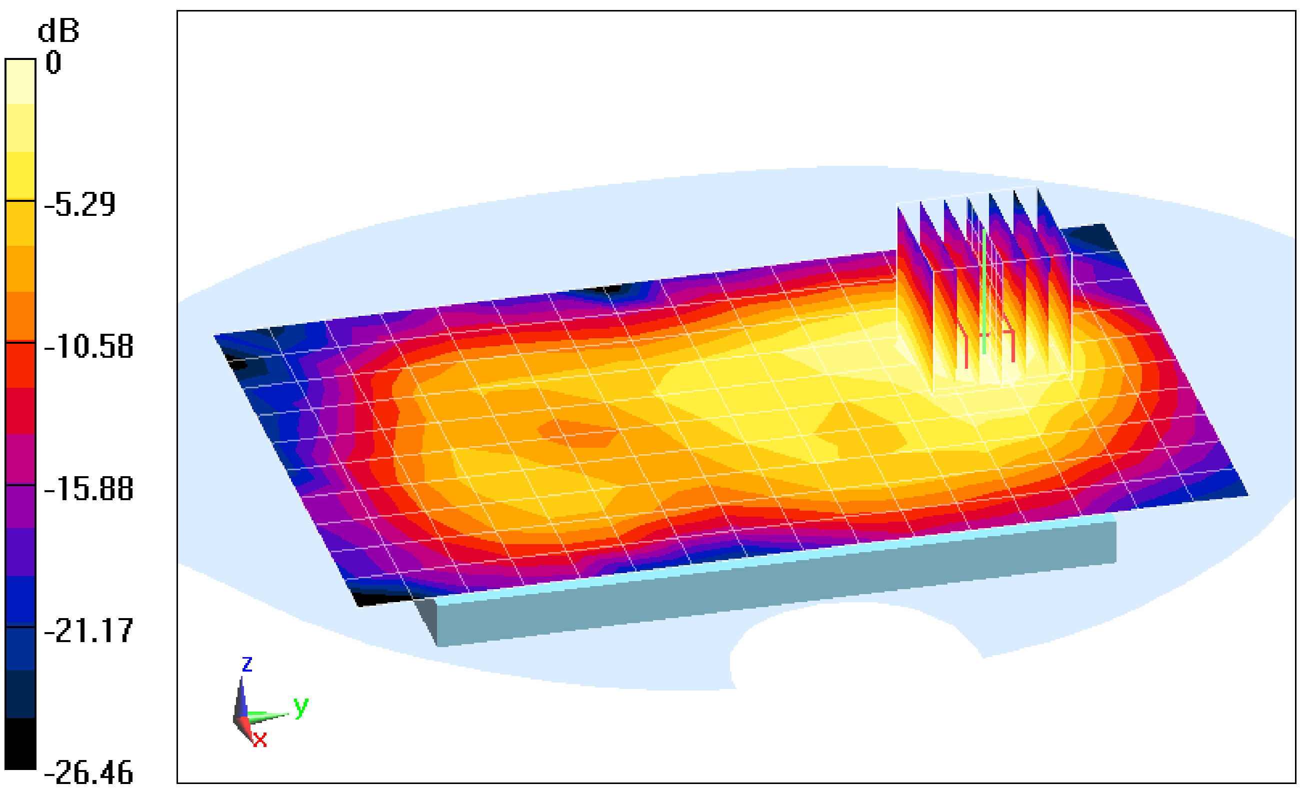
Communication System: UID 0, IEEE 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1
Medium: 2450 Body, Medium parameters used (interpolated):
f = 2437 MHz; σ = 1.966 S/m; ε_r = 50.934; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-07-2015; Ambient Temp: 22.5°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3319; ConvF(4.11, 4.11, 4.11); Calibrated: 3/19/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 3/13/2015
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: IEEE 802.11b, 22 MHz Bandwidth, Body SAR, Ch 06, 1 Mbps, Back Side

Area Scan (11x17x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.435 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 0.262 W/kg
SAR(1 g) = 0.125 W/kg



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

APPENDIX B: SYSTEM VERIFICATION

PCTEST ENGINEERING LABORATORY, INC.

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

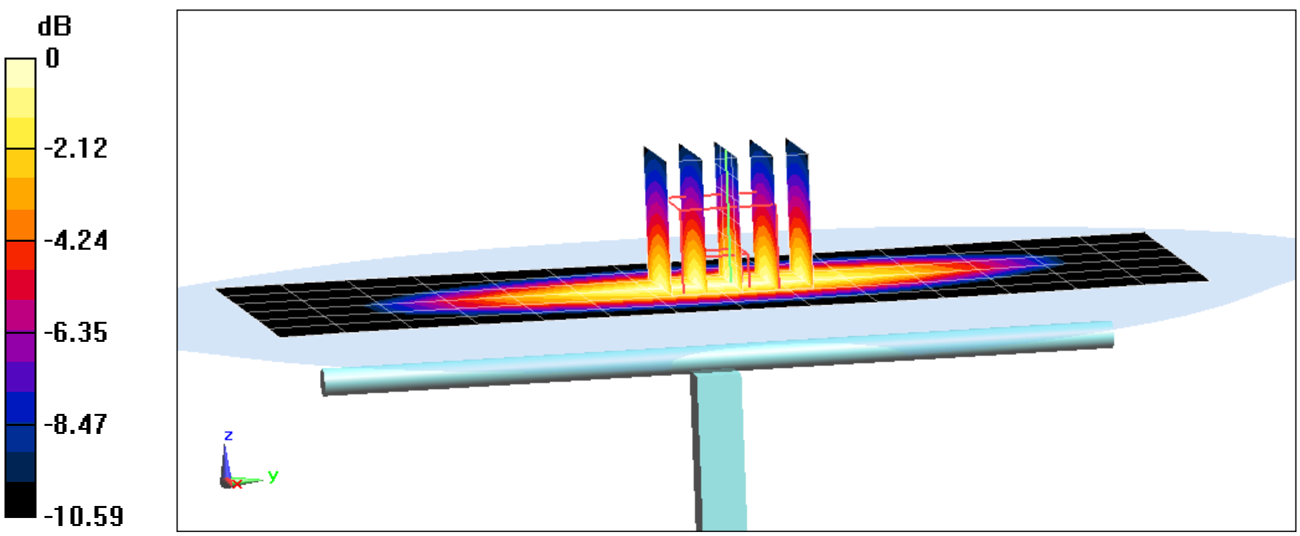
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 750 Head Medium parameters used (interpolated):
f = 750 MHz; σ = 0.925 S/m; ε_r = 43.457; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 11-19-2015; Ambient Temp: 23.2°C; Tissue Temp: 21.8°C

Probe: ES3DV2 - SN3022; ConvF(6.33, 6.33, 6.33); Calibrated: 8/26/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/18/2015
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1797
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

750 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.59 W/kg
SAR(1 g) = 1.74 W/kg
Deviation(1 g) = 5.07%



0 dB = 2.03 W/kg = 3.07 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d119

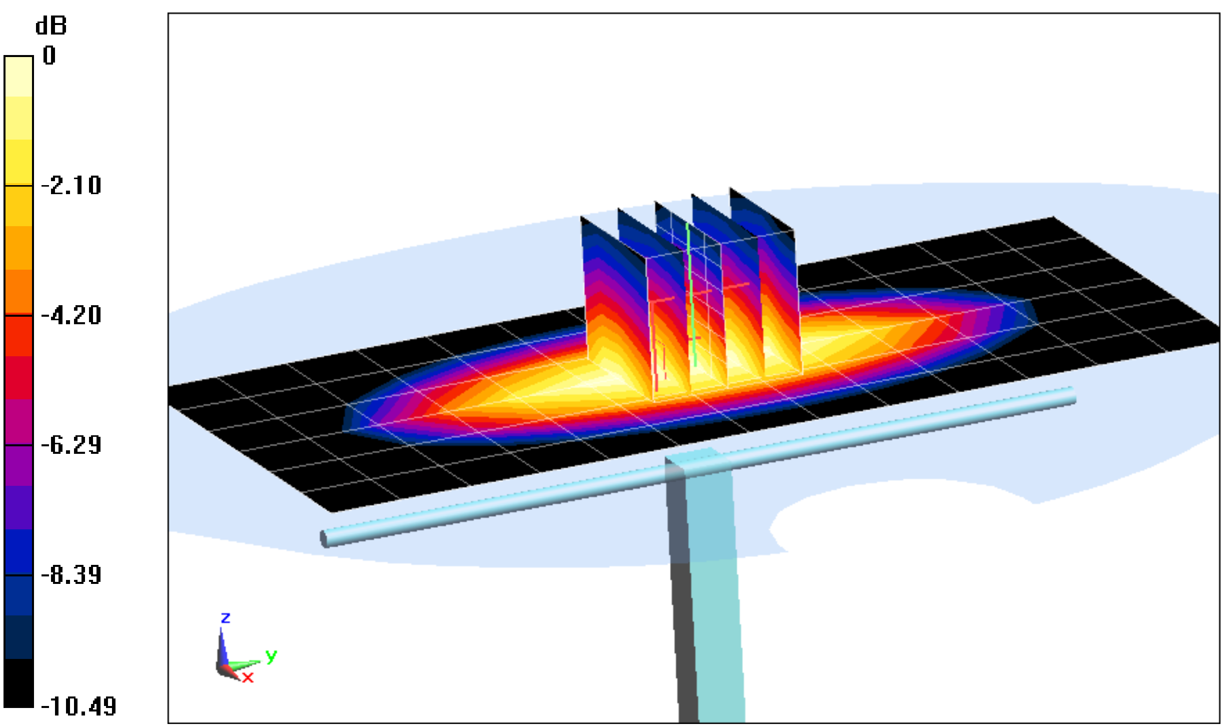
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used:
f = 835 MHz; $\sigma = 0.918$ S/m; $\varepsilon_r = 41.991$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 11-17-2015; Ambient Temp: 22.7°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3351; ConvF(6.17, 6.17, 6.17); Calibrated: 6/22/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/24/2015
Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

835 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.62 W/kg
SAR(1 g) = 1.77 W/kg
Deviation(1 g) = -5.65%



0 dB = 2.04 W/kg = 3.10 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1051

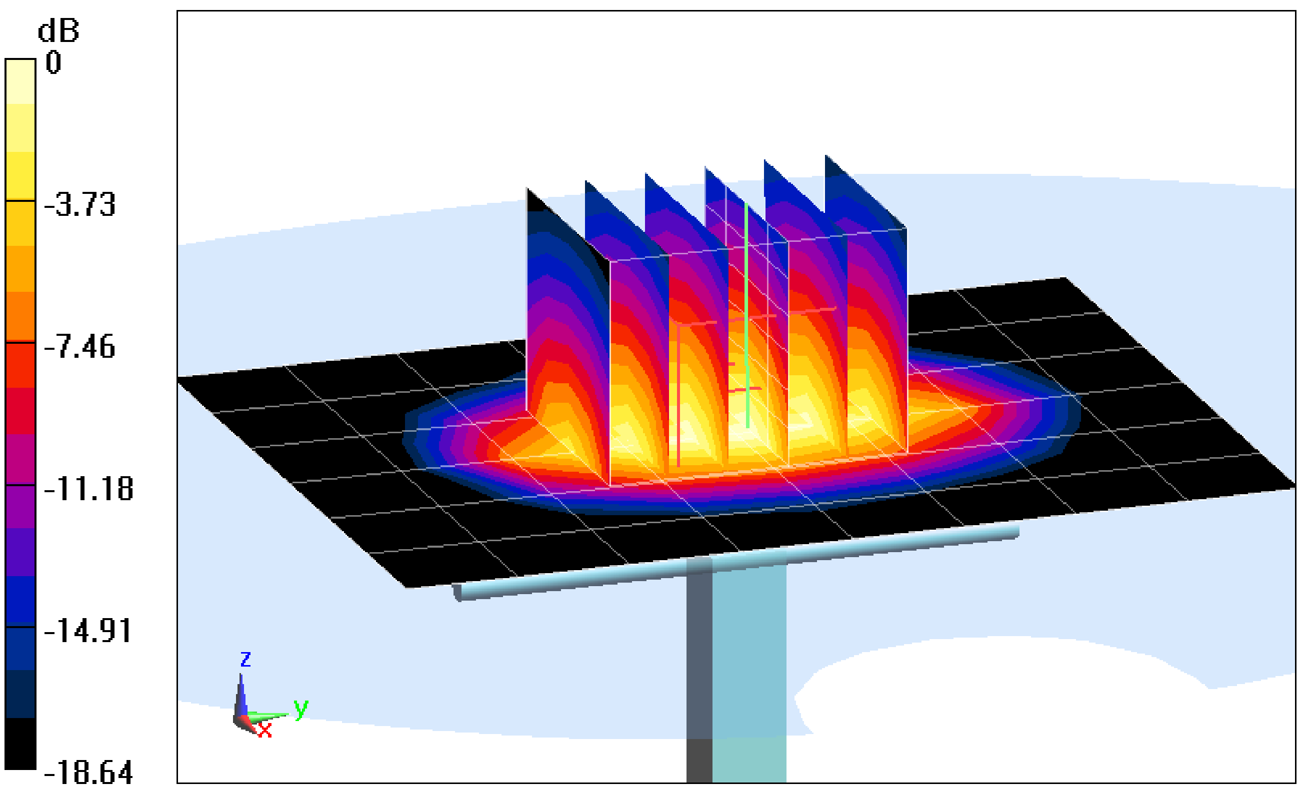
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Head, Medium parameters used:
f = 1750 MHz; σ = 1.369 S/m; ε_r = 38.667; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-18-2015; Ambient Temp: 21.3°C; Tissue Temp: 21.5°C

Probe: ES3DV3 - SN3209; ConvF(5.23, 5.23, 5.23); Calibrated: 3/19/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/20/2015
Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

1750 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 7.03 W/kg
SAR(1 g) = 3.83 W/kg
Deviation(1 g) = 5.80%



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

PCTEST ENGINEERING LABORATORY, INC.

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

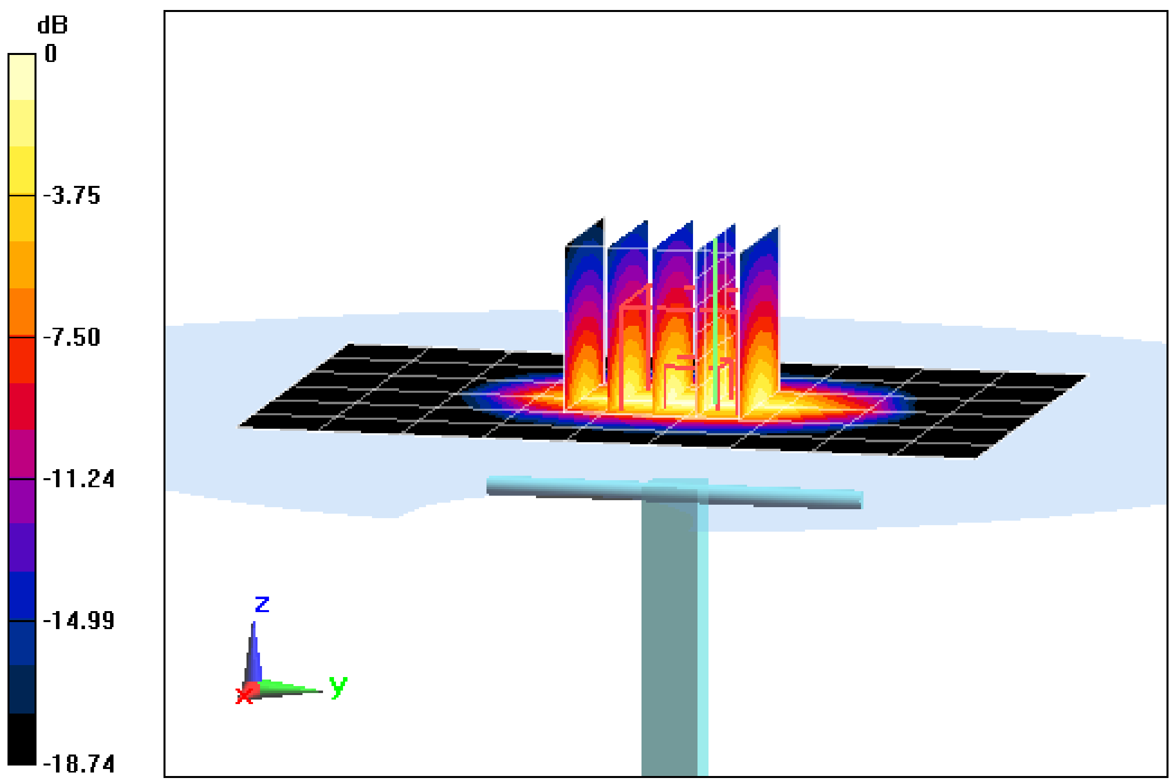
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Head, Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.425 S/m; ε_r = 38.932; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-18-2015; Ambient Temp: 21.2°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3319; ConvF(5.1, 5.1, 5.1); Calibrated: 3/19/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 3/13/2015
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 at 20.0 dBm (100 mW)

Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 6.72 W/kg
SAR(1 g) = 3.72 W/kg
Deviation = -6.77%



0 dB = 4.64 W/kg = 6.67 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

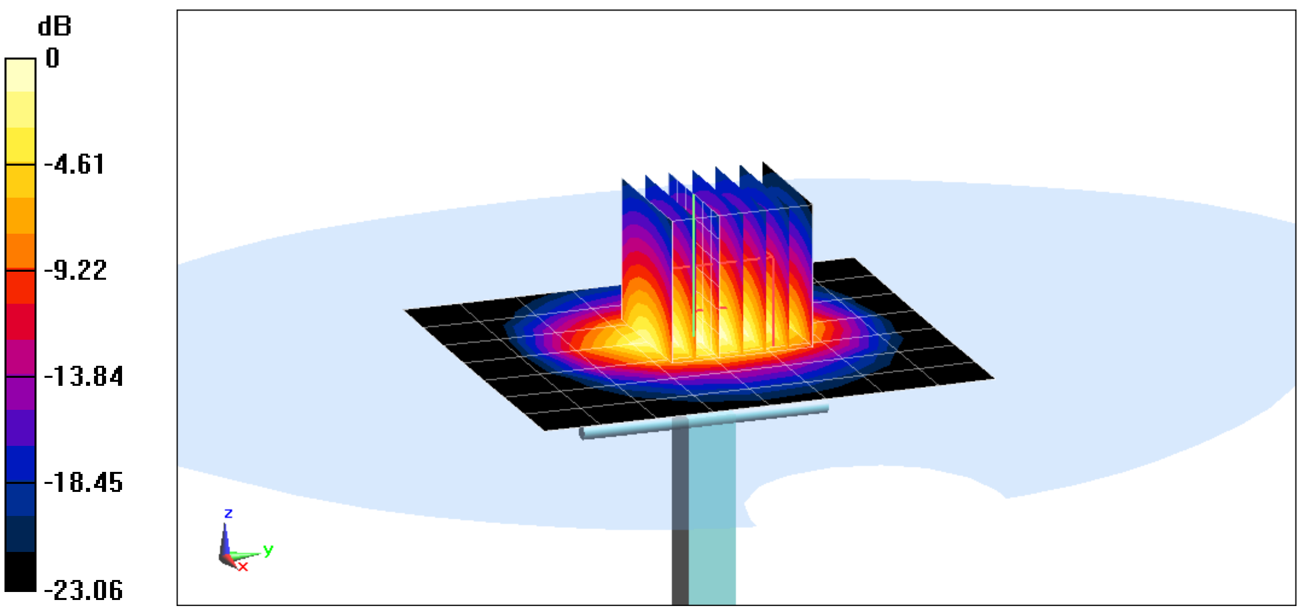
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used:
f = 2450 MHz; σ = 1.797 S/m; ε_r = 39.963; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-07-2015; Ambient Temp: 23.1°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3263; ConvF(4.4, 4.4, 4.4); Calibrated: 5/20/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 6/17/2015
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

2450 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 11.6 W/kg
SAR(1 g) = 5.63 W/kg
Deviation(1 g) = 3.87%



0 dB = 7.34 W/kg = 8.66 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

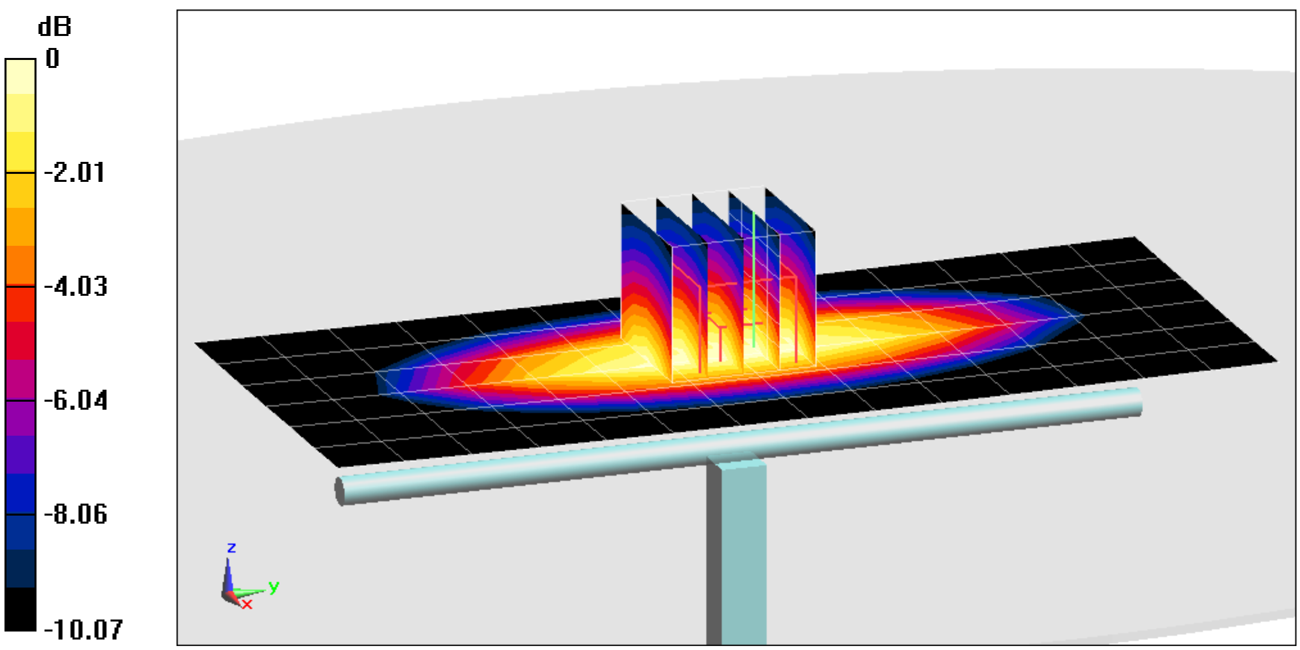
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 750 MHz; σ = 0.968 S/m; ε_r = 54.71; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 11-19-2015; Ambient Temp: 20.7°C; Tissue Temp: 21.5°C

Probe: ES3DV3 - SN3318; ConvF(6.22, 6.22, 6.22); Calibrated: 1/23/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 1/14/2015
Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2027
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

750 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.65 W/kg
SAR(1 g) = 1.83 W/kg
Deviation(1 g) = 7.27%



0 dB = 2.12 W/kg = 3.26 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d119

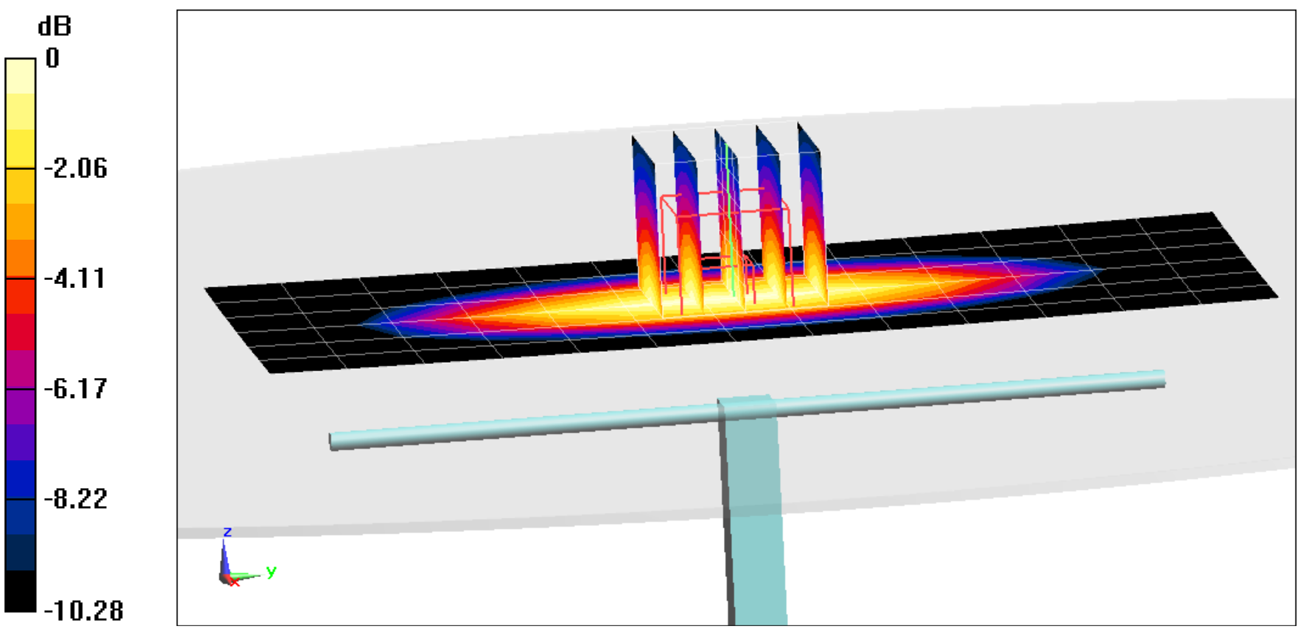
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used:
f = 835 MHz; $\sigma = 0.984$ S/m; $\varepsilon_r = 53.916$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 11-16-2015; Ambient Temp: 23.0°C; Tissue Temp: 21.7°C

Probe: ES3DV2 - SN3022; ConvF(6.13, 6.13, 6.13); Calibrated: 8/26/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/18/2015
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1229
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

835 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.66 W/kg
SAR(1 g) = 1.84 W/kg
Deviation(1 g) = 0.00%



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1051

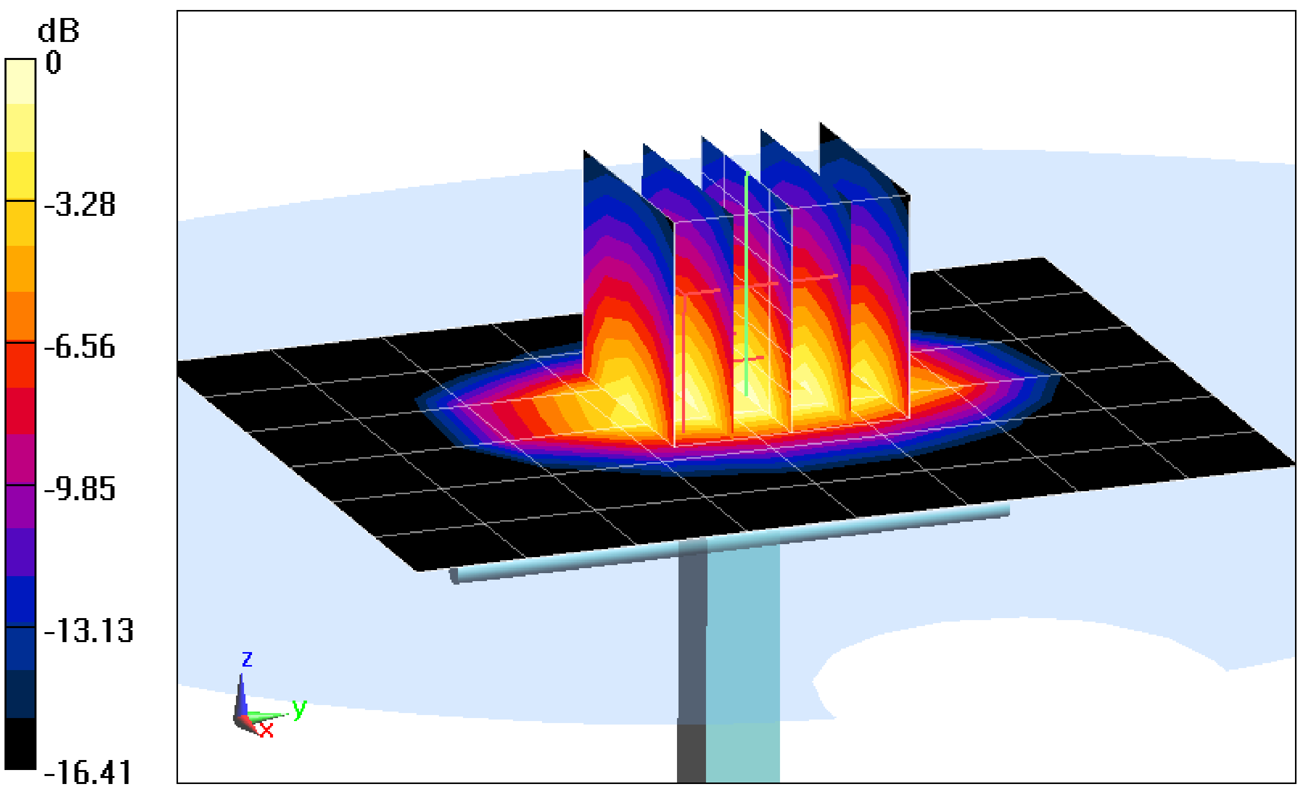
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Body, Medium parameters used:
f = 1750 MHz; σ = 1.482 S/m; ε_r = 51.357; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-16-2015; Ambient Temp: 22.5°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3319; ConvF(4.83, 4.83, 4.83); Calibrated: 3/19/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 3/13/2015
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 at 20.0 dBm (100 mW)

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 6.25 W/kg
SAR(1 g) = 3.66 W/kg
Deviation(1 g) = -1.35%



0 dB = 4.56 W/kg = 6.59 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1051

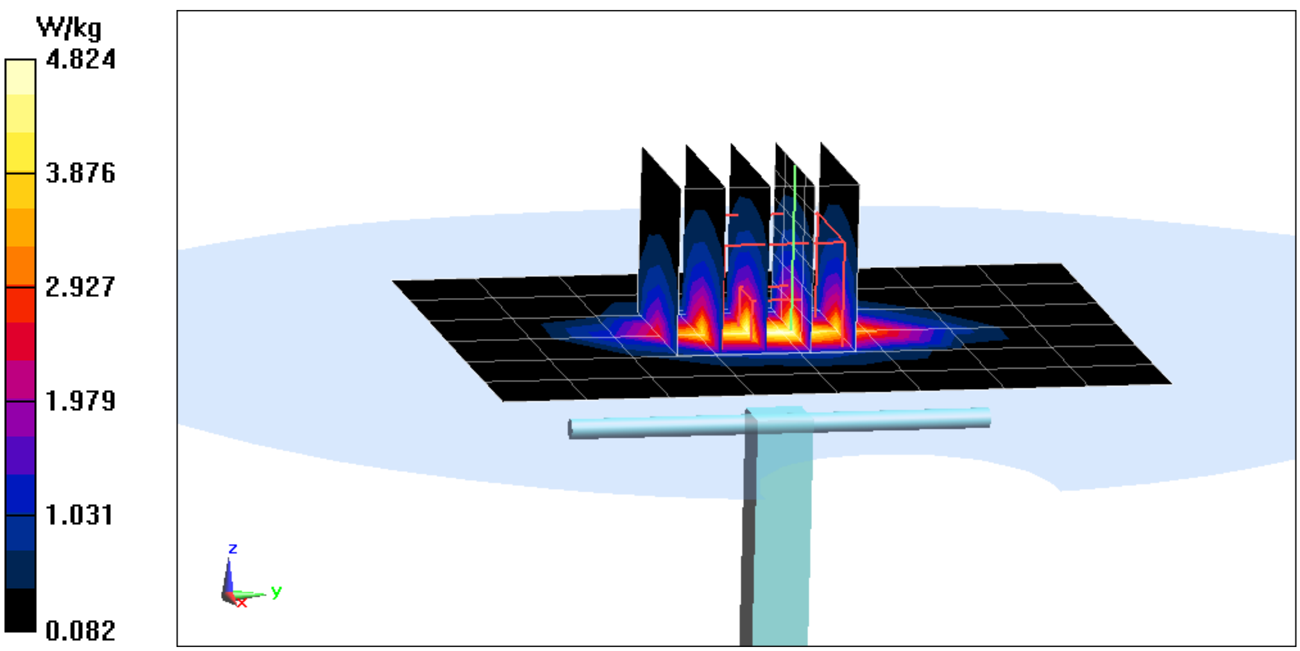
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used:
f = 1750 MHz; σ = 1.48 S/m; ε_r = 51.382; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-18-2015; Ambient Temp: 20.2°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3318; ConvF(4.95, 4.95, 4.95); Calibrated: 1/23/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 1/14/2015
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

1750 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 6.86 W/kg
SAR(1 g) = 3.86 W/kg
Deviation(1 g) = 4.04%



PCTEST ENGINEERING LABORATORY, INC.

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

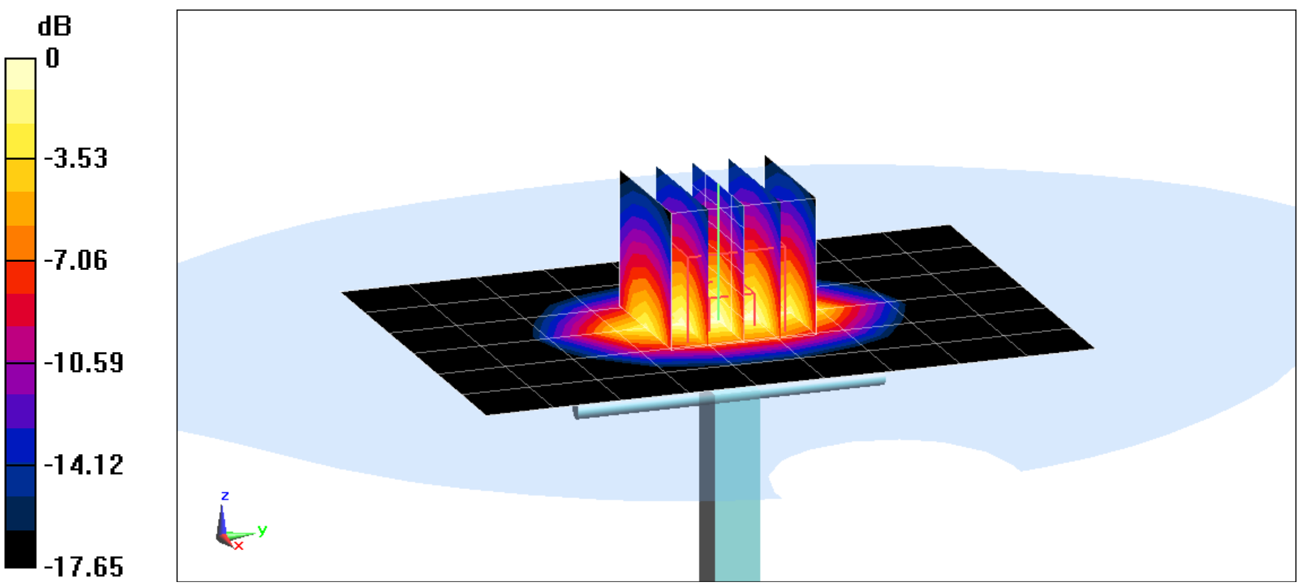
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
$f = 1900$ MHz; $\sigma = 1.561$ S/m; $\varepsilon_r = 51.493$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-16-2015; Ambient Temp: 23.0°C; Tissue Temp: 22.1°C

Probe: ES3DV2 - SN3022; ConvF(4.56, 4.56, 4.56); Calibrated: 8/26/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/18/2015
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1797
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

1900 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 7.60 W/kg
SAR(1 g) = 4.24 W/kg
Deviation(1 g) = 6.00%



0 dB = 5.38 W/kg = 7.31 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

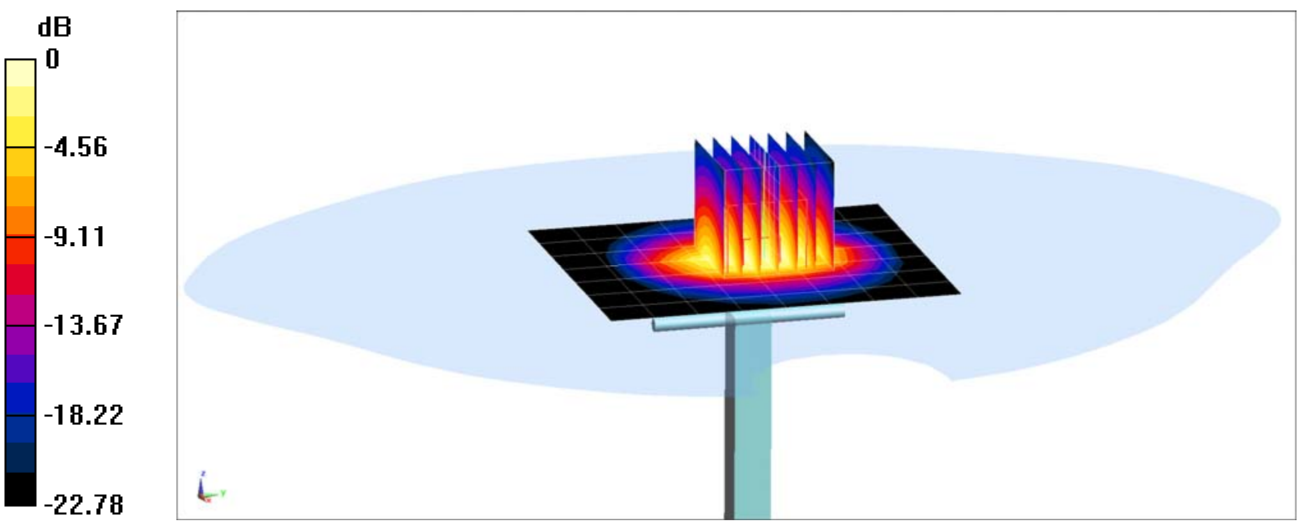
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used:
f = 2450 MHz; σ = 1.987 S/m; ε_r = 50.916; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-07-2015; Ambient Temp: 22.5°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3319; ConvF(4.11, 4.11, 4.11); Calibrated: 3/19/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 3/13/2015
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)

2450 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 10.8 W/kg
SAR(1 g) = 5.07 W/kg
Deviation(1 g) = -2.31%



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

APPENDIX C: PROBE CALIBRATION

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

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

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

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **ES3-3022_Aug15**

CALIBRATION CERTIFICATE

Object: ES3DV2 - SN:3022

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

Calibration date: August 26, 2015

BN ✓ 9/3/2015

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 E4419B	GB41293874	01-Apr-15 (No. 217-02128)	Mar-16
Power sensor E4412A	MY41498087	01-Apr-15 (No. 217-02128)	Mar-16
Reference 3 dB Attenuator	SN: S5054 (3c)	01-Apr-15 (No. 217-02129)	Mar-16
Reference 20 dB Attenuator	SN: S5277 (20x)	01-Apr-15 (No. 217-02132)	Mar-16
Reference 30 dB Attenuator	SN: S5129 (30b)	01-Apr-15 (No. 217-02133)	Mar-16
Reference Probe ES3DV2	SN: 3013	30-Dec-14 (No. ES3-3013_Dec14)	Dec-15
DAE4	SN: 660	14-Jan-15 (No. DAE4-660_Jan15)	Jan-16
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:	Michael Weber	Laboratory Technician	M.Weber
Approved by:	Katja Pokovic	Technical Manager	[signature]

Issued: August 27, 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
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
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
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

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 26, 2015

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 (μV/(V/m)²)[A]	1.00	1.03	0.95	± 10.1 %
DCP (mV)[B]	99.9	99.7	100.9	

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	179.6	±3.3 %
		Y	0.0	0.0	1.0		183.9	
		Z	0.0	0.0	1.0		179.0	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	3.60	65.9	14.2	10.00	43.5	±2.2 %
		Y	2.84	63.5	13.0		43.3	
		Z	2.76	63.7	12.7		41.7	
10011-CAB	UMTS-FDD (WCDMA)	X	3.32	67.0	18.7	2.91	144.4	±0.7 %
		Y	3.24	66.3	18.0		147.3	
		Z	3.19	66.3	18.0		143.5	
10012-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	3.15	69.9	19.5	1.87	146.1	±0.7 %
		Y	2.88	67.7	18.0		147.9	
		Z	2.78	67.4	17.8		145.6	
10013-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	11.40	71.3	23.8	9.46	144.9	±3.3 %
		Y	11.15	70.5	23.1		146.9	
		Z	10.95	70.5	23.3		140.3	
10021-DAB	GSM-FDD (TDMA, GMSK)	X	20.66	99.8	29.2	9.39	132.6	±2.2 %
		Y	14.36	93.3	26.6		145.3	
		Z	17.17	97.2	27.8		145.4	
10023-DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	17.22	96.5	28.2	9.57	125.4	±1.9 %
		Y	11.06	88.6	25.0		136.0	
		Z	8.71	84.6	23.4		130.7	
10024-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	31.05	99.5	25.9	6.56	135.2	±2.2 %
		Y	25.28	97.4	25.0		132.5	
		Z	21.58	95.7	24.5		144.4	
10027-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	42.88	99.9	24.0	4.80	129.5	±1.9 %
		Y	40.80	99.6	23.7		124.9	
		Z	38.42	99.7	23.7		137.8	
10028-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	44.48	100.0	23.2	3.55	138.2	±1.9 %
		Y	44.03	99.7	22.8		133.0	
		Z	41.36	99.8	22.8		147.5	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	16.08	99.5	23.3	1.16	127.5	±1.4 %
		Y	79.69	99.6	19.3		146.2	
		Z	45.81	99.9	20.4		138.2	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.43	67.4	19.8	5.67	138.7	±1.4 %
		Y	6.27	66.8	19.2		134.9	
		Z	6.16	66.6	19.2		127.6	

10103-CAB	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	10.13	75.0	25.9	9.29	129.4	±3.3 %
		Y	9.46	73.0	24.5		131.8	
		Z	9.52	74.0	25.4		137.0	
10108-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.27	66.9	19.7	5.80	137.0	±1.7 %
		Y	6.24	66.7	19.3		140.0	
		Z	6.06	66.3	19.2		127.1	
10117-CAB	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.16	68.7	21.3	8.07	127.7	±2.2 %
		Y	9.99	68.2	20.9		131.5	
		Z	10.22	69.1	21.4		141.6	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	9.34	73.4	25.2	9.28	125.0	±3.3 %
		Y	8.92	72.2	24.3		127.2	
		Z	8.95	73.1	25.1		131.9	
10154-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	5.95	66.4	19.4	5.75	134.4	±1.4 %
		Y	5.92	66.2	19.1		137.0	
		Z	5.98	66.7	19.5		146.8	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.39	66.9	19.6	5.82	139.9	±1.7 %
		Y	6.35	66.7	19.3		141.9	
		Z	6.15	66.2	19.2		128.4	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	4.96	66.6	19.8	5.73	137.3	±1.4 %
		Y	4.85	66.1	19.3		139.8	
		Z	4.85	66.6	19.7		146.7	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	8.75	78.7	28.3	9.21	138.9	±3.0 %
		Y	7.69	75.1	26.1		140.1	
		Z	7.80	76.6	27.2		144.0	
10175-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	4.88	66.2	19.6	5.72	132.0	±1.4 %
		Y	4.77	65.8	19.1		132.6	
		Z	4.83	66.5	19.6		146.0	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	4.91	66.3	19.7	5.72	131.7	±1.4 %
		Y	4.82	66.0	19.2		138.4	
		Z	4.86	66.7	19.7		145.7	
10196-CAB	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	10.04	69.1	21.7	8.10	140.9	±2.2 %
		Y	9.62	67.9	20.8		125.2	
		Z	9.74	68.6	21.3		133.3	
10225-CAB	UMTS-FDD (HSPA+)	X	7.01	67.1	19.6	5.97	143.7	±1.4 %
		Y	6.78	66.2	19.0		129.3	
		Z	6.80	66.7	19.3		136.5	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	8.55	78.0	27.9	9.21	134.6	±3.0 %
		Y	7.79	75.6	26.3		141.6	
		Z	7.89	76.9	27.4		145.2	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	9.30	74.8	26.1	9.24	134.8	±3.3 %
		Y	8.65	72.5	24.5		136.4	
		Z	8.33	72.3	24.8		126.6	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	10.20	76.2	26.8	9.30	144.8	±3.3 %
		Y	9.41	73.7	25.1		145.9	
		Z	9.18	73.9	25.6		138.6	

10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.45	66.7	18.9	3.96	147.0	±0.9 %
		Y	4.21	65.5	17.9		126.5	
		Z	4.36	66.5	18.5		148.0	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.57	66.3	18.5	3.46	134.3	±0.7 %
		Y	3.48	65.6	17.8		136.8	
		Z	3.51	66.2	18.3		136.4	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.53	66.4	18.6	3.39	135.8	±0.7 %
		Y	3.45	65.8	17.9		140.4	
		Z	3.50	66.5	18.5		137.0	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.18	66.5	19.5	5.81	129.4	±1.4 %
		Y	6.15	66.3	19.1		133.6	
		Z	6.13	66.5	19.3		131.2	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.77	67.2	19.9	6.06	134.8	±1.7 %
		Y	6.81	67.3	19.7		144.8	
		Z	6.68	67.1	19.7		136.7	
10400-AAC	IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)	X	10.30	69.4	22.0	8.37	142.0	±2.5 %
		Y	9.90	68.2	21.1		126.8	
		Z	10.15	69.3	21.9		142.6	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.72	68.1	18.9	3.76	147.8	±0.7 %
		Y	4.56	67.5	18.2		133.6	
		Z	4.61	68.2	18.7		147.4	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.57	67.8	18.8	3.77	144.3	±0.7 %
		Y	4.43	67.3	18.1		131.3	
		Z	4.57	68.3	18.8		145.0	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	2.64	67.9	18.7	1.54	142.1	±0.5 %
		Y	2.36	65.4	16.8		130.3	
		Z	2.50	66.7	17.7		145.0	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	10.04	69.0	21.7	8.23	138.8	±2.2 %
		Y	9.71	68.0	20.9		125.6	
		Z	9.94	69.0	21.6		140.4	

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 Norm X,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: 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)	Unc (k=2)
750	41.9	0.89	6.33	6.33	6.33	0.46	1.43	± 12.0 %
835	41.5	0.90	6.11	6.11	6.11	0.24	2.08	± 12.0 %
1750	40.1	1.37	5.08	5.08	5.08	0.45	1.47	± 12.0 %
1900	40.0	1.40	4.93	4.93	4.93	0.59	1.25	± 12.0 %
2300	39.5	1.67	4.63	4.63	4.63	0.55	1.39	± 12.0 %
2450	39.2	1.80	4.30	4.30	4.30	0.51	1.47	± 12.0 %
2600	39.0	1.96	4.12	4.12	4.12	0.57	1.46	± 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.

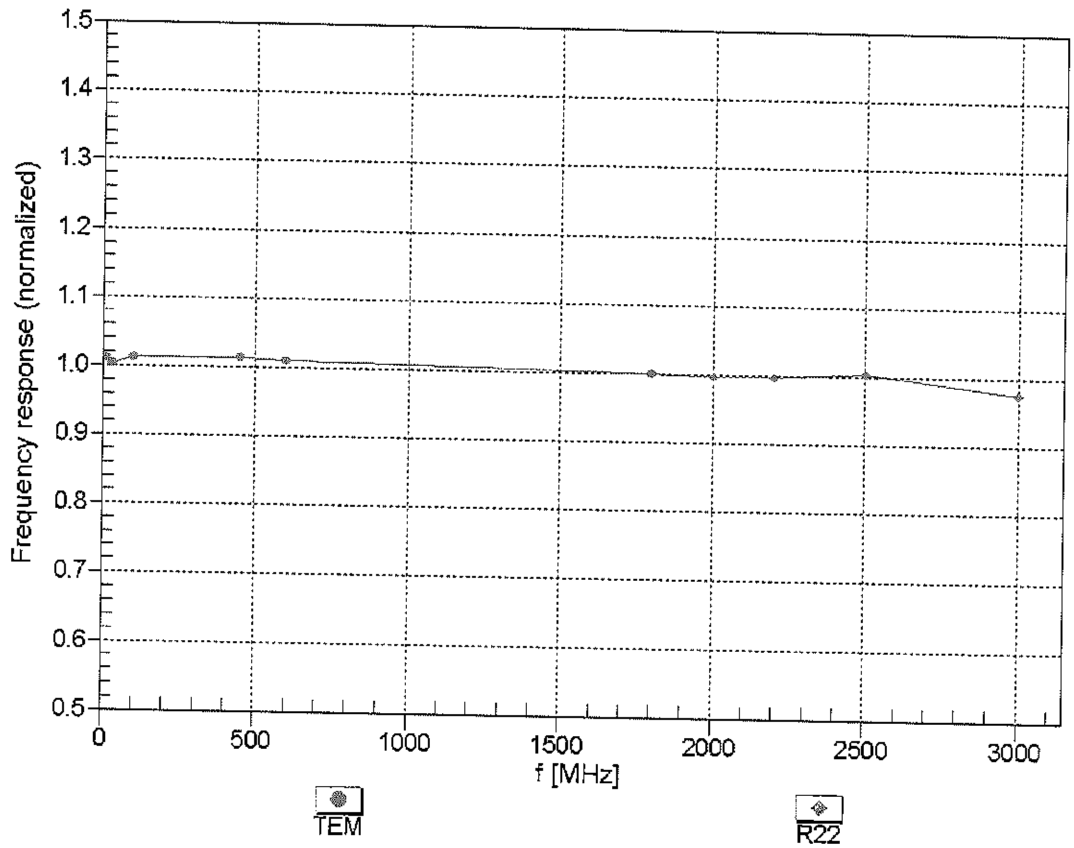
DASY/EASY - Parameters of Probe: ES3DV2 - SN:3022

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)	Unc (k=2)
750	55.5	0.96	6.16	6.16	6.16	0.50	1.34	± 12.0 %
835	55.2	0.97	6.13	6.13	6.13	0.25	2.16	± 12.0 %
1750	53.4	1.49	4.79	4.79	4.79	0.61	1.33	± 12.0 %
1900	53.3	1.52	4.56	4.56	4.56	0.31	2.02	± 12.0 %
2300	52.9	1.81	4.32	4.32	4.32	0.79	1.19	± 12.0 %
2450	52.7	1.95	4.08	4.08	4.08	0.80	1.12	± 12.0 %
2600	52.5	2.16	3.96	3.96	3.96	0.80	1.10	± 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.

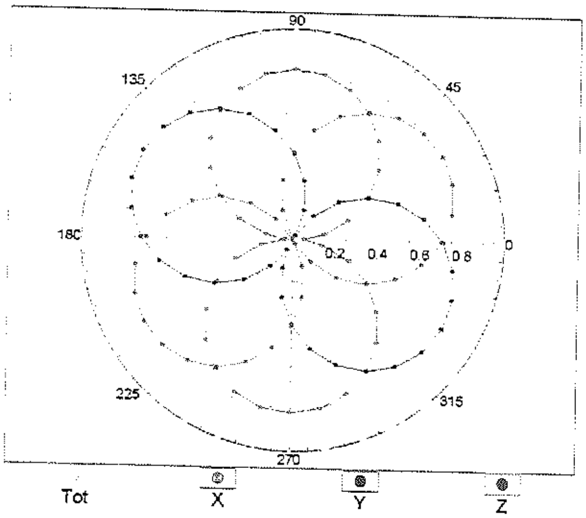
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



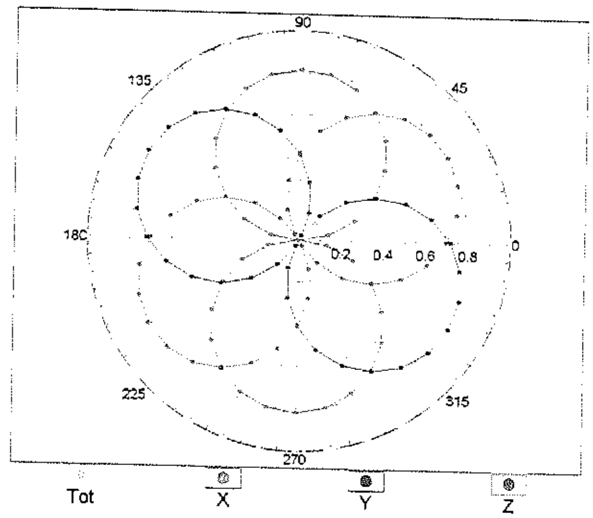
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

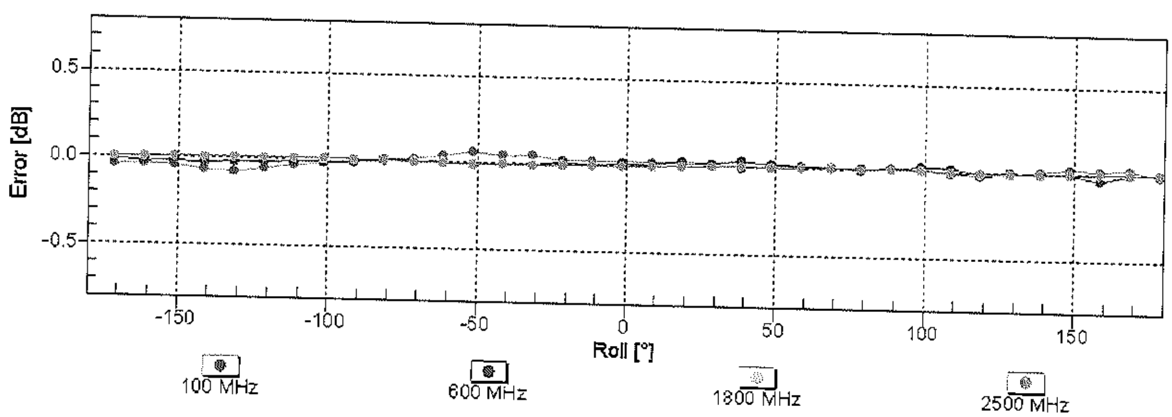
Receiving Pattern (ϕ), $\vartheta = 0°$

f=600 MHz,TEM



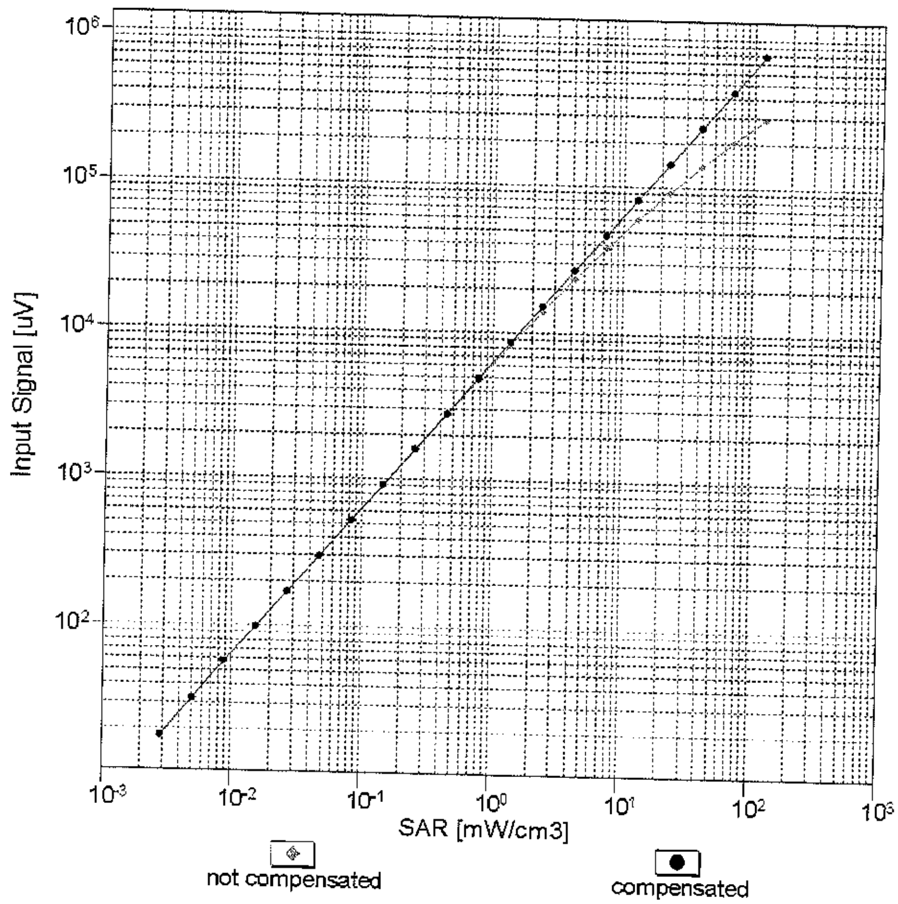
f=1800 MHz,R22

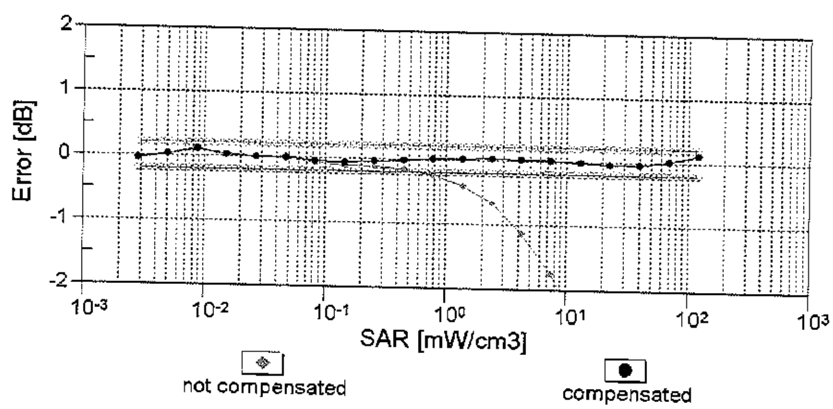




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

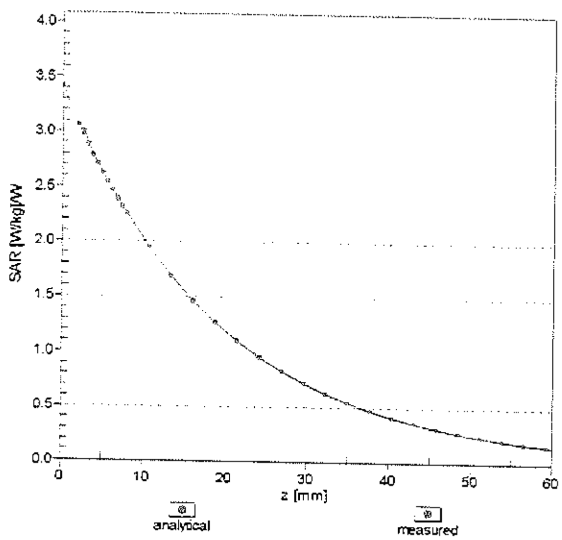
Dynamic Range f(SAR_{head})
(TEM cell , f_{eval}= 1900 MHz)

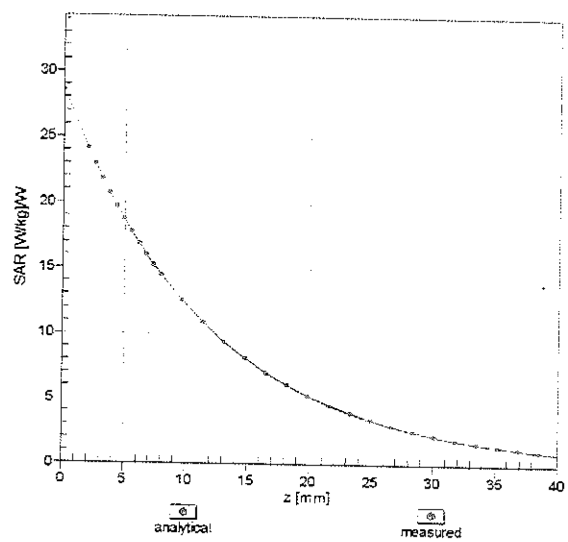




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

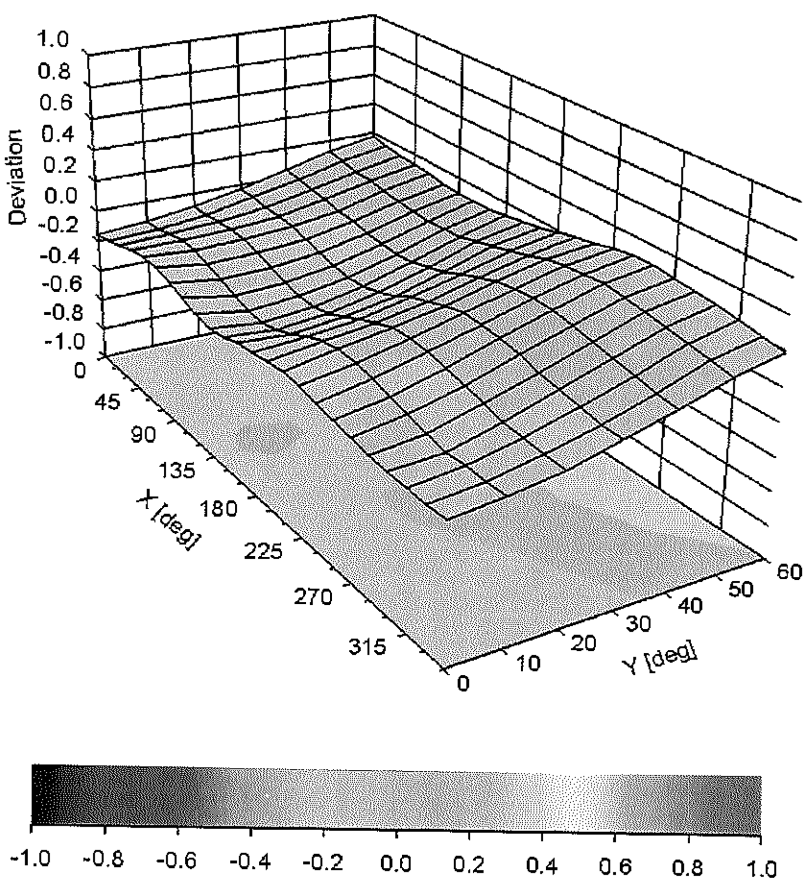
Conversion Factor Assessment





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 (°)	98.5
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
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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: ES3-3351_Jun15

CALIBRATION CERTIFICATE

Object: ES3DV3 - SN:3351

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

BN ✓ 06/25/15

Calibration date: June 22, 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 E4419B	GB41293874	01-Apr-15 (No. 217-02128)	Mar-16
Power sensor E4412A	MY41498087	01-Apr-15 (No. 217-02128)	Mar-16
Reference 3 dB Attenuator	SN: S5054 (3c)	01-Apr-15 (No. 217-02129)	Mar-16
Reference 20 dB Attenuator	SN: S5277 (20x)	01-Apr-15 (No. 217-02132)	Mar-16
Reference 30 dB Attenuator	SN: S5129 (30b)	01-Apr-15 (No. 217-02133)	Mar-16
Reference Probe ES3DV2	SN: 3013	30-Dec-14 (No. ES3-3013_Dec14)	Dec-15
DAE4	SN: 660	14-Jan-15 (No. DAE4-660_Jan15)	Jan-16
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	Leif Klysner
Approved by:	Katja Pokovic	Technical Manager	Katja Pokovic

Issued: June 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

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Accreditation No.: **SCS 0108**

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 ES3DV3

SN:3351

Manufactured: May 22, 2012
Calibrated: June 22, 2015

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3351

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (µV/(V/m)^2)[A]	0.99	1.17	1.19	± 10.1 %
DCP (mV)[B]	113.6	105.2	104.5	

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	188.8	±3.8 %
		Y	0.0	0.0	1.0		196.2	
		Z	0.0	0.0	1.0		151.3	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	2.73	65.7	12.7	10.00	35.9	±1.2 %
		Y	1.18	58.1	9.8		37.4	
		Z	2.44	61.9	12.5		42.0	
10011-CAB	UMTS-FDD (WCDMA)	X	3.43	68.2	18.9	2.91	148.5	±0.5 %
		Y	3.14	66.5	18.1		114.3	
		Z	3.26	66.5	18.1		119.3	
10012-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	3.13	70.5	19.4	1.87	149.0	±0.5 %
		Y	2.46	65.9	17.0		115.2	
		Z	3.02	68.7	18.5		120.9	
10013-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	10.59	69.9	22.6	9.46	139.1	±2.5 %
		Y	10.11	68.9	22.4		103.4	
		Z	10.74	69.4	22.4		114.3	
10021-DAB	GSM-FDD (TDMA, GMSK)	X	4.33	75.1	18.5	9.39	125.5	±1.4 %
		Y	5.13	77.6	20.0		144.5	
		Z	17.70	96.1	27.5		123.5	
10023-DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	4.56	75.8	18.9	9.57	147.7	±2.2 %
		Y	5.75	78.8	20.2		140.4	
		Z	18.60	97.9	28.5		117.3	
10024-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	3.42	71.8	15.3	6.56	119.6	±1.4 %
		Y	14.95	90.8	22.0		132.7	
		Z	29.34	98.9	25.6		106.6	
10027-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	28.96	99.9	23.5	4.80	135.7	±1.9 %
		Y	55.26	99.9	21.9		107.5	
		Z	35.15	99.9	24.6		120.0	
10028-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	36.32	96.2	20.3	3.55	147.5	±1.9 %
		Y	73.22	99.9	20.7		117.0	
		Z	52.78	99.6	22.4		128.3	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	31.23	99.5	20.1	1.16	122.8	±1.4 %
		Y	0.74	62.4	7.0		135.2	
		Z	56.68	99.6	20.2		141.5	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.01	66.4	18.9	5.67	112.7	±1.2 %
		Y	6.14	66.9	19.3		124.6	
		Z	6.37	67.2	19.4		129.3	

10103-CAB	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	8.50	71.4	23.6	9.29	137.9	±2.7 %
		Y	8.12	70.6	23.6		105.2	
		Z	9.68	73.4	24.7		118.6	
10108-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	5.88	66.0	18.8	5.80	111.2	±1.2 %
		Y	5.99	66.5	19.2		122.8	
		Z	6.28	66.9	19.4		128.7	
10117-CAB	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.19	69.3	21.2	8.07	149.1	±2.2 %
		Y	9.73	68.2	20.9		111.5	
		Z	9.97	68.3	20.8		117.7	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	8.07	71.0	23.5	9.28	132.7	±2.5 %
		Y	8.82	74.2	25.9		147.0	
		Z	9.11	72.5	24.4		115.3	
10154-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	5.55	65.4	18.6	5.75	107.9	±0.9 %
		Y	5.67	66.0	19.0		120.3	
		Z	5.96	66.3	19.1		126.2	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	5.96	65.9	18.7	5.82	111.9	±1.2 %
		Y	6.12	66.6	19.3		125.0	
		Z	6.38	66.8	19.3		131.2	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	4.68	66.6	19.4	5.73	130.7	±0.9 %
		Y	4.81	67.2	20.0		144.7	
		Z	4.74	65.5	18.9		109.9	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	6.59	73.2	25.1	9.21	143.9	±2.5 %
		Y	6.42	72.7	25.3		113.3	
		Z	7.92	75.5	26.2		127.2	
10175-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	4.68	66.5	19.4	5.72	128.6	±0.9 %
		Y	4.80	67.2	20.0		144.2	
		Z	4.73	65.5	18.9		109.1	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	4.71	66.7	19.5	5.72	128.9	±1.2 %
		Y	4.78	67.1	19.9		143.9	
		Z	5.12	67.3	19.9		149.9	
10196-CAB	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.72	68.8	21.1	8.10	138.3	±1.9 %
		Y	9.32	67.9	20.9		105.9	
		Z	9.58	67.8	20.6		111.2	
10225-CAB	UMTS-FDD (HSPA+)	X	6.60	66.5	18.9	5.97	117.6	±1.2 %
		Y	6.69	66.9	19.3		132.0	
		Z	7.08	67.2	19.5		139.9	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	6.57	73.1	25.0	9.21	144.5	±2.2 %
		Y	6.59	73.6	25.8		114.3	
		Z	8.03	76.0	26.4		127.7	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	7.44	70.0	23.2	9.24	122.9	±2.5 %
		Y	8.16	73.3	25.5		138.8	
		Z	8.43	71.6	24.1		108.3	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	8.01	70.7	23.4	9.30	130.5	±2.7 %
		Y	8.86	74.4	26.1		146.7	
		Z	9.12	72.6	24.5		114.0	

10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.49	67.5	18.8	3.96	146.9	±0.7 %
		Y	4.13	65.9	18.1		117.5	
		Z	4.36	66.2	18.2		121.1	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.66	67.7	18.9	3.46	133.9	±0.5 %
		Y	3.37	66.1	18.1		109.3	
		Z	3.54	66.0	18.0		112.1	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.55	67.5	18.7	3.39	136.7	±0.7 %
		Y	3.35	66.4	18.2		110.1	
		Z	3.44	65.7	17.9		112.9	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	5.86	65.9	18.8	5.81	109.3	±1.2 %
		Y	6.00	66.5	19.3		122.6	
		Z	6.23	66.7	19.3		126.8	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.42	66.5	19.1	6.06	114.1	±1.2 %
		Y	6.60	67.2	19.7		127.9	
		Z	6.85	67.4	19.7		132.6	
10400-AAC	IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)	X	10.03	69.2	21.5	8.37	141.2	±1.9 %
		Y	9.51	68.0	21.1		106.9	
		Z	9.90	68.2	21.1		114.0	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	5.00	70.6	19.6	3.76	146.5	±0.5 %
		Y	4.32	67.9	18.3		115.0	
		Z	4.63	67.5	18.3		121.9	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.99	71.0	19.8	3.77	143.8	±0.5 %
		Y	4.37	68.5	18.7		113.5	
		Z	4.56	67.5	18.2		120.2	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	3.07	71.2	19.9	1.54	145.7	±0.5 %
		Y	2.43	66.6	17.4		116.6	
		Z	2.59	67.1	17.8		124.3	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	9.84	69.0	21.3	8.23	139.6	±1.9 %
		Y	9.37	67.9	21.0		106.5	
		Z	9.84	68.4	21.1		117.4	

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:3351

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	6.43	6.43	6.43	0.31	1.96	± 12.0 %
835	41.5	0.90	6.17	6.17	6.17	0.21	2.59	± 12.0 %
1750	40.1	1.37	5.24	5.24	5.24	0.55	1.35	± 12.0 %
1900	40.0	1.40	5.07	5.07	5.07	0.54	1.42	± 12.0 %
2300	39.5	1.67	4.74	4.74	4.74	0.69	1.31	± 12.0 %
2450	39.2	1.80	4.46	4.46	4.46	0.80	1.26	± 12.0 %
2600	39.0	1.96	4.35	4.35	4.35	0.80	1.26	± 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:3351

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	6.21	6.21	6.21	0.29	1.98	± 12.0 %
835	55.2	0.97	6.11	6.11	6.11	0.77	1.20	± 12.0 %
1750	53.4	1.49	4.88	4.88	4.88	0.68	1.30	± 12.0 %
1900	53.3	1.52	4.68	4.68	4.68	0.61	1.46	± 12.0 %
2300	52.9	1.81	4.47	4.47	4.47	0.80	1.16	± 12.0 %
2450	52.7	1.95	4.30	4.30	4.30	0.80	1.16	± 12.0 %
2600	52.5	2.16	4.16	4.16	4.16	0.80	1.20	± 12.0 %

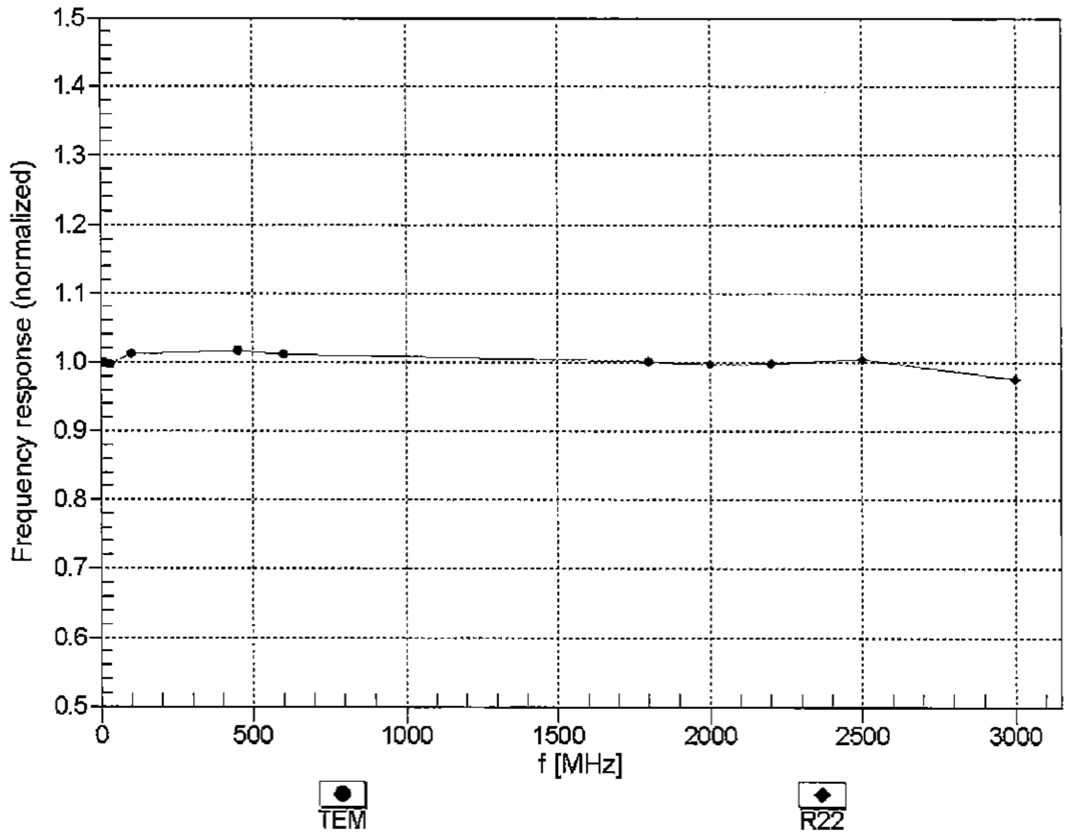
[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz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

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

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

Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)

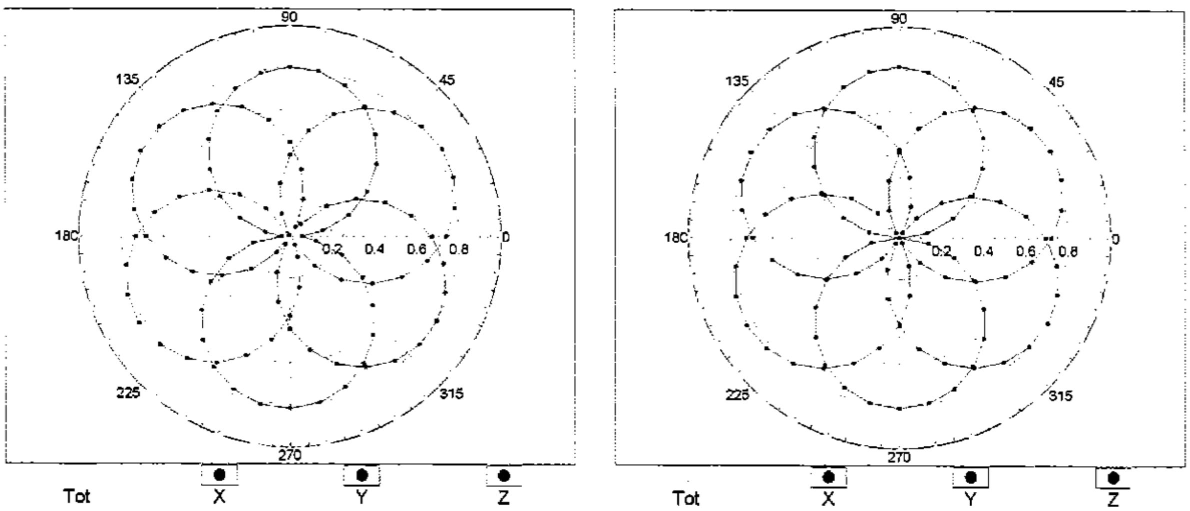


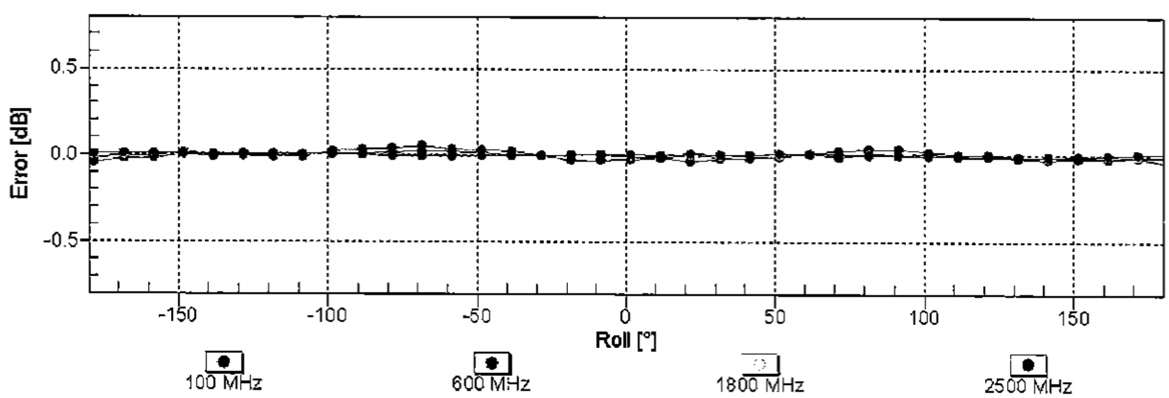
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM

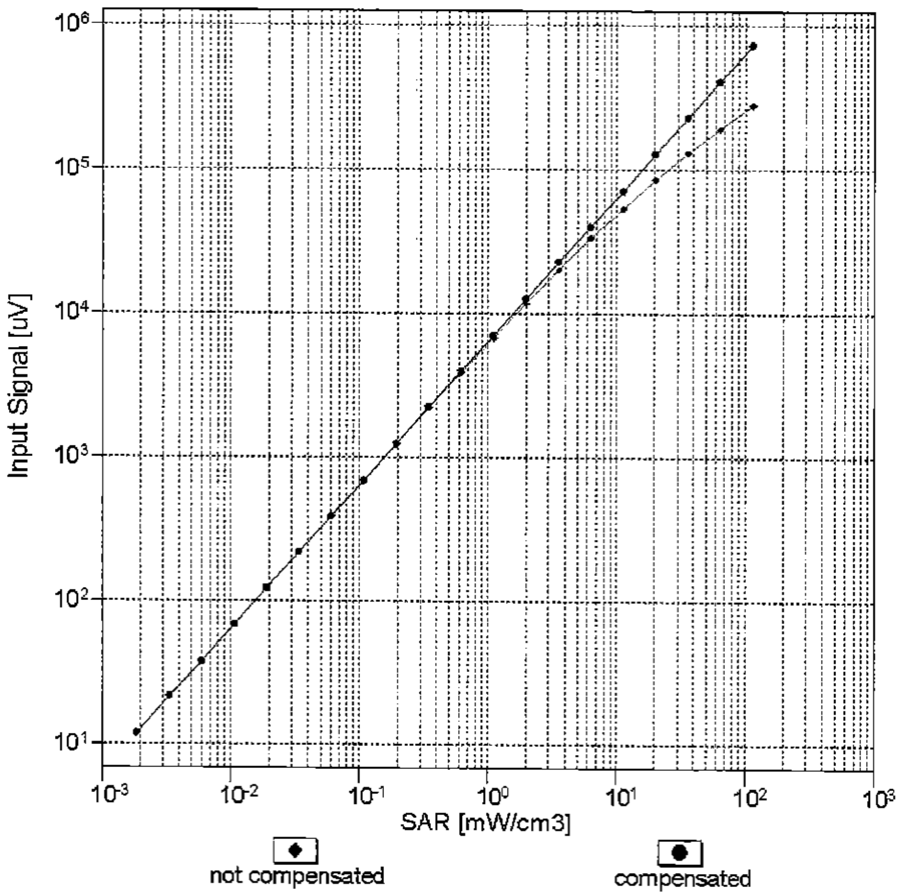
f=1800 MHz,R22

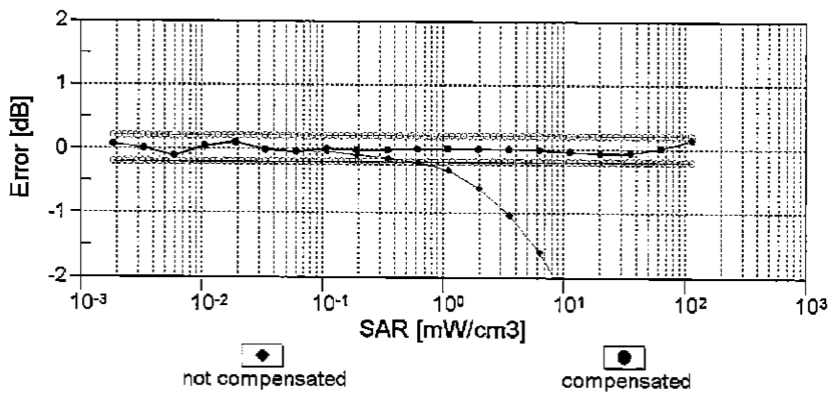




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

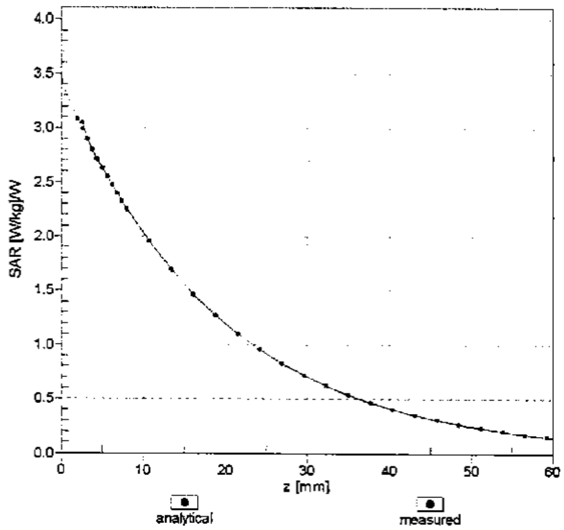




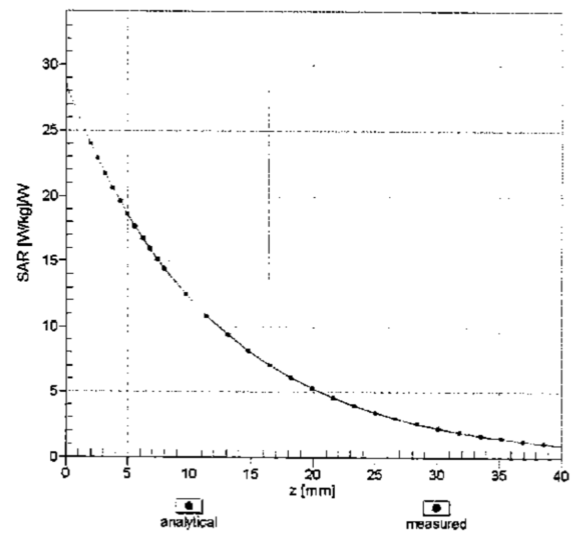
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

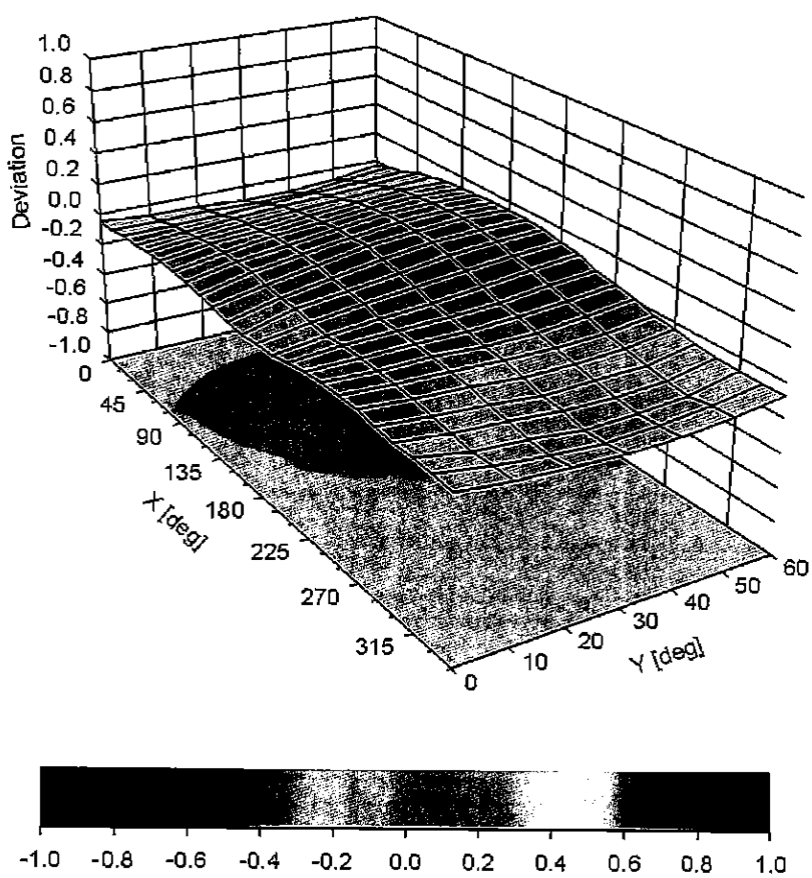


f = 1900 MHz,WGLS R22 (H_convF)



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:3351

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	21.5
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
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: **ES3-3209_Mar15**

CALIBRATION CERTIFICATE

Object	ES3DV3 - SN:3209
Calibration procedure(s)	QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	March 19, 2015

BN ✓
3/26

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-14 (No. ES3-3013_Dec14)	Dec-15
DAE4	SN: 660	14-Jan-15 (No. DAE4-660_Jan15)	Jan-16
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:	Israe Elnaouq	Laboratory Technician	Israe Elnaouq
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 19, 2015

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

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 ES3DV3

SN:3209

Manufactured: October 14, 2008
Calibrated: March 19, 2015

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3209

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (µV/(V/m)^2)[A]	1.35	1.33	1.14	± 10.1 %
DCP (mV)[B]	102.0	100.9	103.3	

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	214.5	±3.5 %
		Y	0.0	0.0	1.0		192.6	
		Z	0.0	0.0	1.0		199.1	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	2.61	65.1	12.2	10.00	42.3	±1.7 %
		Y	1.39	57.8	8.9		42.7	
		Z	4.57	70.3	14.0		38.3	
10011-CAB	UMTS-FDD (WCDMA)	X	3.12	66.3	18.1	2.91	130.3	±0.7 %
		Y	3.08	65.6	17.5		132.2	
		Z	3.32	67.7	19.0		137.6	
10012-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	2.54	66.8	17.8	1.87	131.1	±0.7 %
		Y	2.67	67.1	17.7		131.6	
		Z	2.85	69.2	19.1		138.0	
10013-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	10.78	70.5	23.4	9.46	146.9	±2.7 %
		Y	10.39	69.2	22.5		123.5	
		Z	10.50	69.9	23.1		128.4	
10021-DAB	GSM-FDD (TDMA, GMSK)	X	3.65	74.2	17.7	9.39	130.0	±1.9 %
		Y	6.62	83.5	22.0		149.4	
		Z	4.25	76.8	19.2		136.2	
10023-DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	3.95	75.3	18.4	9.57	138.8	±2.5 %
		Y	4.99	78.2	19.8		143.3	
		Z	4.11	75.8	18.9		129.3	
10024-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	6.44	80.3	17.7	6.56	135.0	±1.7 %
		Y	3.76	73.7	16.0		144.2	
		Z	11.61	88.5	20.7		148.0	
10027-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	43.77	99.9	21.8	4.80	131.8	±1.7 %
		Y	13.95	87.5	19.0		142.7	
		Z	39.96	99.9	22.1		145.6	
10028-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	62.88	99.8	20.4	3.55	144.5	±2.2 %
		Y	2.45	70.4	12.9		130.3	
		Z	80.83	99.9	19.9		135.1	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	0.32	58.4	4.3	1.16	144.1	±1.9 %
		Y	16.25	79.9	12.1		129.5	
		Z	95.90	91.1	14.4		134.6	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.32	67.4	19.8	5.67	138.3	±1.4 %
		Y	6.35	67.3	19.5		144.4	
		Z	6.20	67.1	19.6		127.7	

10103-CAB	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	8.72	73.1	25.3	9.29	138.6	±2.7 %
		Y	8.88	72.9	24.9		147.9	
		Z	8.48	72.3	24.9		127.4	
10108-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.14	66.9	19.6	5.80	136.2	±1.7 %
		Y	6.20	66.8	19.4		142.8	
		Z	6.10	66.8	19.6		126.2	
10117-CAB	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.05	68.9	21.4	8.07	126.8	±2.2 %
		Y	9.98	68.5	21.1		132.4	
		Z	10.23	69.4	21.7		140.4	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	8.16	72.2	25.0	9.28	133.6	±2.7 %
		Y	8.33	72.0	24.5		142.6	
		Z	8.40	73.1	25.6		147.5	
10154-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	5.83	66.5	19.4	5.75	133.1	±1.4 %
		Y	5.89	66.3	19.2		139.3	
		Z	6.00	67.2	19.9		146.5	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.26	66.9	19.6	5.82	138.8	±1.7 %
		Y	6.34	67.0	19.5		145.1	
		Z	6.22	66.9	19.7		128.8	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	4.77	66.7	19.8	5.73	135.9	±1.4 %
		Y	4.89	66.6	19.5		141.8	
		Z	4.85	66.8	19.9		128.3	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	6.77	75.0	26.9	9.21	144.2	±2.5 %
		Y	6.56	72.6	25.2		131.1	
		Z	6.68	74.0	26.4		137.1	
10175-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	4.80	66.9	19.9	5.72	135.2	±1.4 %
		Y	4.87	66.5	19.5		140.6	
		Z	5.03	67.7	20.4		149.4	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	4.77	66.7	19.8	5.72	134.7	±1.2 %
		Y	4.88	66.5	19.5		140.6	
		Z	4.84	66.8	19.9		127.8	
10196-CAB	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.97	69.5	21.9	8.10	145.2	±2.2 %
		Y	9.60	68.2	21.0		125.1	
		Z	9.80	69.1	21.7		133.9	
10225-CAB	UMTS-FDD (HSPA+)	X	6.95	67.5	19.8	5.97	147.3	±1.4 %
		Y	6.73	66.4	19.1		128.7	
		Z	6.89	67.4	19.8		137.2	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	6.85	75.4	27.2	9.21	146.0	±2.5 %
		Y	6.54	72.5	25.1		131.6	
		Z	6.76	74.4	26.6		138.2	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	7.58	71.3	24.6	9.24	126.6	±2.5 %
		Y	7.73	71.1	24.2		133.3	
		Z	7.82	72.4	25.3		139.0	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	8.18	72.2	25.1	9.30	133.6	±2.7 %
		Y	8.35	72.0	24.6		141.1	
		Z	8.42	73.2	25.6		147.0	

10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.22	66.1	18.4	3.96	128.8	±0.9 %
		Y	4.24	65.9	18.1		133.8	
		Z	4.39	67.1	19.0		141.7	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.51	66.7	18.6	3.46	140.9	±0.7 %
		Y	3.52	66.2	18.1		143.4	
		Z	3.58	67.2	19.0		131.7	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.45	66.7	18.5	3.39	142.0	±0.7 %
		Y	3.50	66.4	18.2		146.9	
		Z	3.61	67.8	19.3		132.2	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.15	66.9	19.6	5.81	136.3	±1.4 %
		Y	6.20	66.8	19.4		140.3	
		Z	6.11	66.8	19.6		126.6	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.80	67.8	20.1	6.06	143.2	±1.7 %
		Y	6.80	67.5	19.9		147.4	
		Z	6.71	67.6	20.1		131.9	
10400-AAB	IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)	X	10.31	70.0	22.4	8.37	147.9	±3.0 %
		Y	9.88	68.5	21.3		127.2	
		Z	10.13	69.5	22.1		135.8	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.60	68.6	18.9	3.76	128.2	±0.5 %
		Y	4.58	67.9	18.4		134.2	
		Z	4.86	69.6	19.5		142.6	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.57	68.9	19.1	3.77	149.7	±0.5 %
		Y	4.51	68.0	18.5		132.3	
		Z	4.78	69.6	19.5		140.3	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	2.47	67.0	17.9	1.54	128.1	±0.7 %
		Y	2.46	66.4	17.4		132.5	
		Z	2.72	69.1	19.2		140.6	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	10.12	69.7	22.1	8.23	146.8	±2.7 %
		Y	9.66	68.2	21.1		125.0	
		Z	9.91	69.2	21.8		134.3	

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 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:3209

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	6.34	6.34	6.34	0.29	2.02	± 12.0 %
835	41.5	0.90	6.04	6.04	6.04	0.23	2.57	± 12.0 %
1750	40.1	1.37	5.23	5.23	5.23	0.80	1.08	± 12.0 %
1900	40.0	1.40	5.05	5.05	5.05	0.10	2.40	± 12.0 %
2300	39.5	1.67	4.76	4.76	4.76	0.70	1.27	± 12.0 %
2450	39.2	1.80	4.53	4.53	4.53	0.80	1.22	± 12.0 %
2600	39.0	1.96	4.36	4.36	4.36	0.75	1.31	± 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.

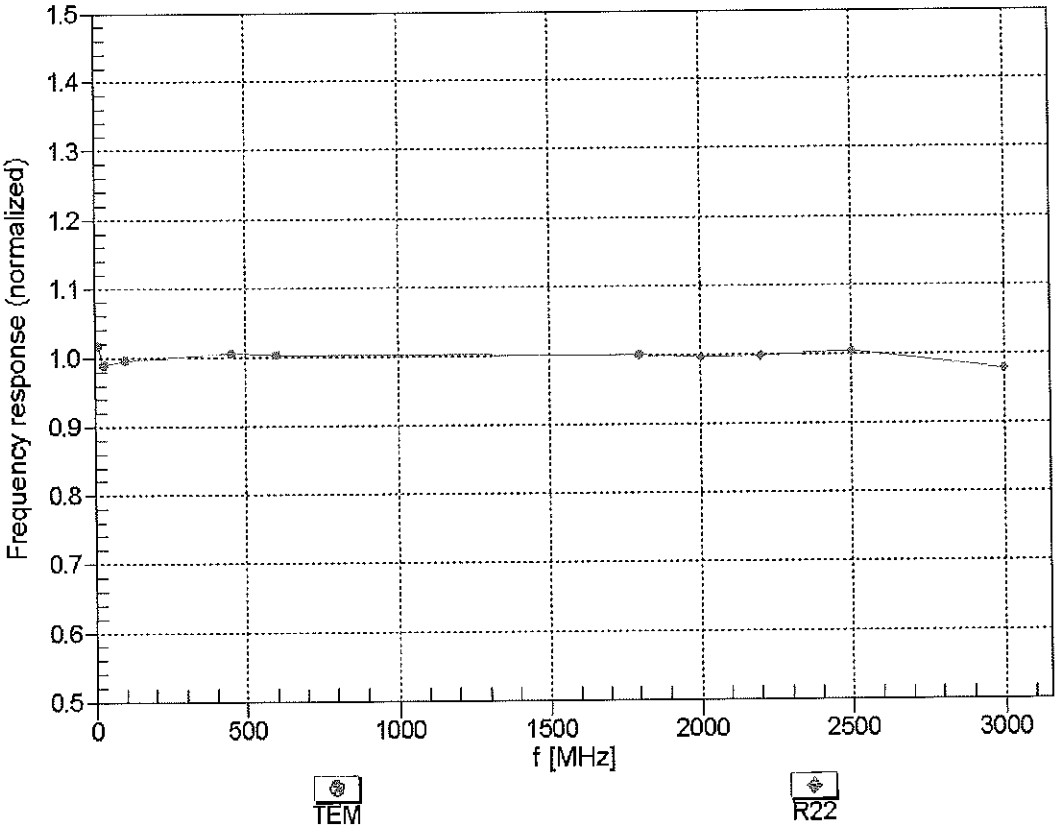
DASY/EASY - Parameters of Probe: ES3DV3 - SN:3209

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	6.12	6.12	6.12	0.34	1.81	± 12.0 %
835	55.2	0.97	6.07	6.07	6.07	0.37	1.79	± 12.0 %
1750	53.4	1.49	4.86	4.86	4.86	0.67	1.43	± 12.0 %
1900	53.3	1.52	4.57	4.57	4.57	0.57	1.53	± 12.0 %
2300	52.9	1.81	4.28	4.28	4.28	0.80	1.19	± 12.0 %
2450	52.7	1.95	4.12	4.12	4.12	0.72	1.15	± 12.0 %
2600	52.5	2.16	3.92	3.92	3.92	0.80	1.10	± 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.

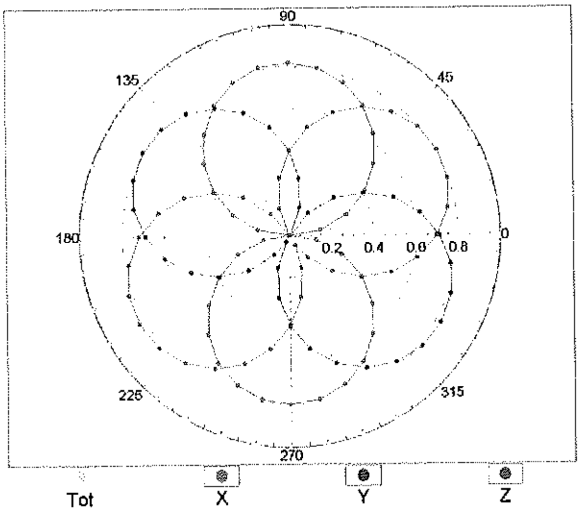
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



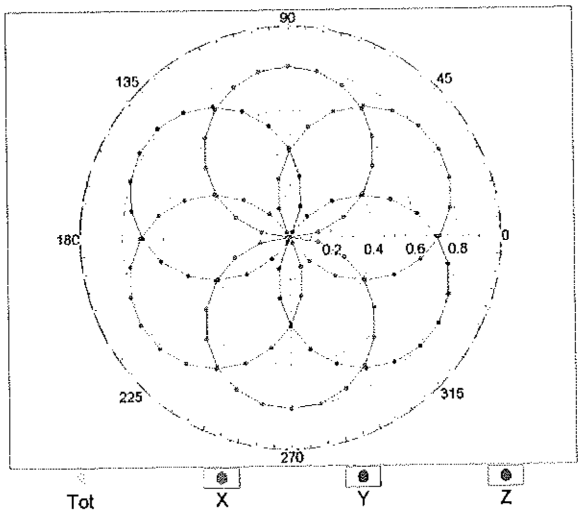
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

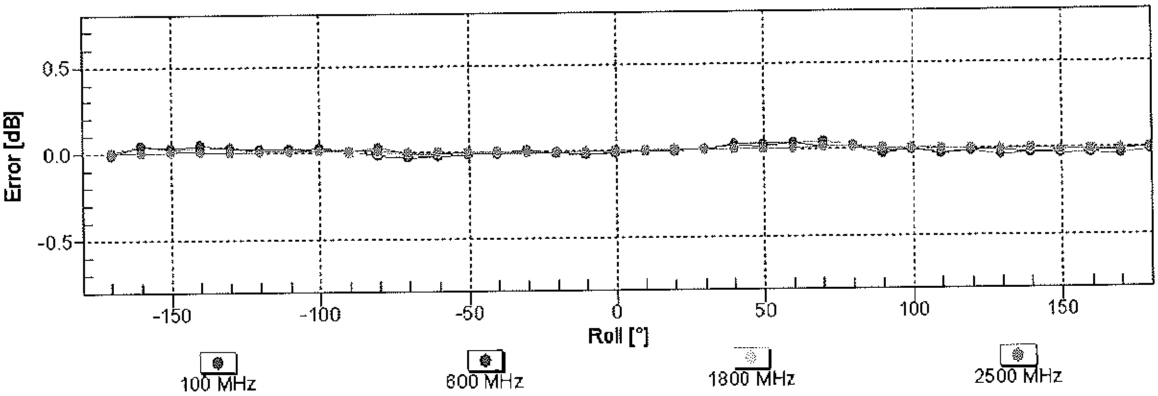
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22

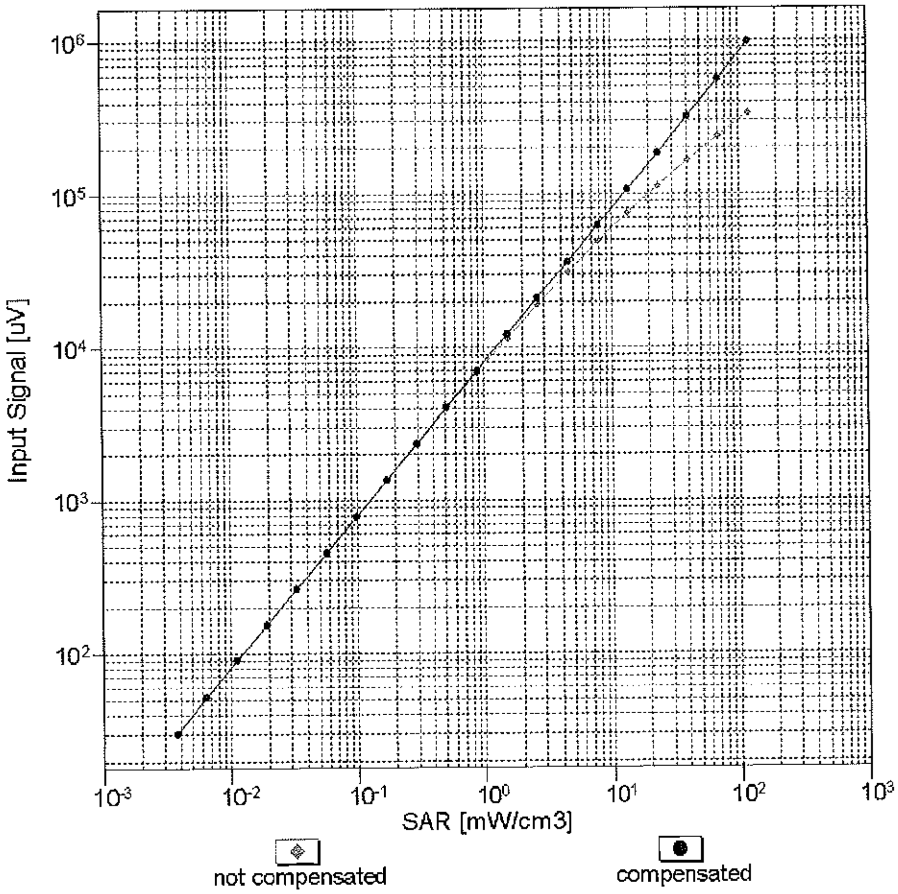


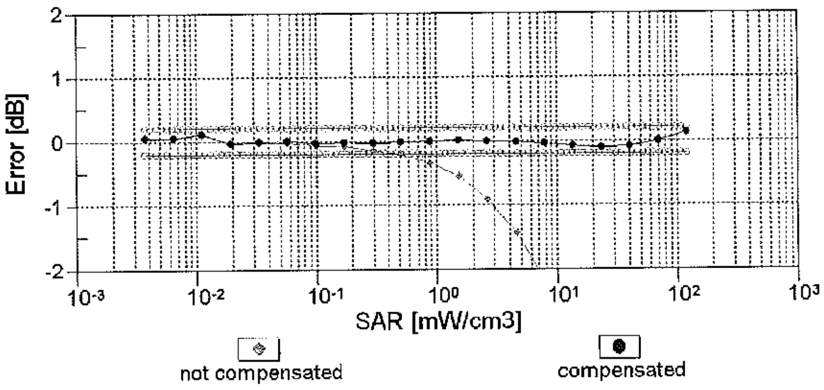


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

(TEM cell , f_{eval}= 1900 MHz)

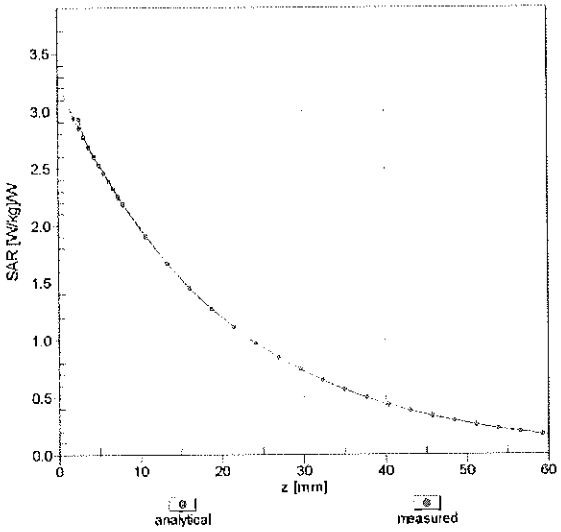




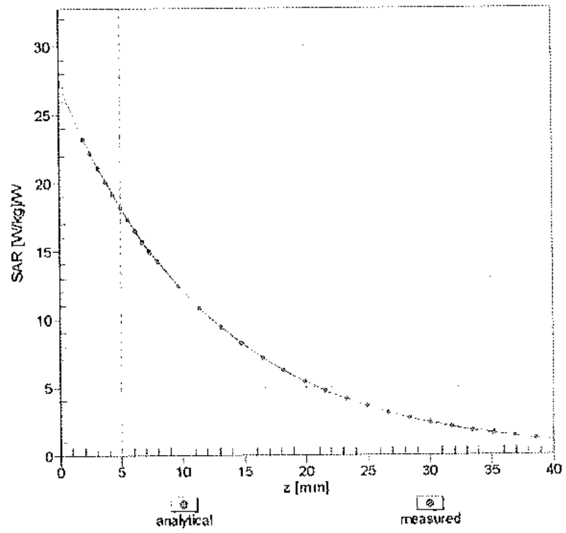
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

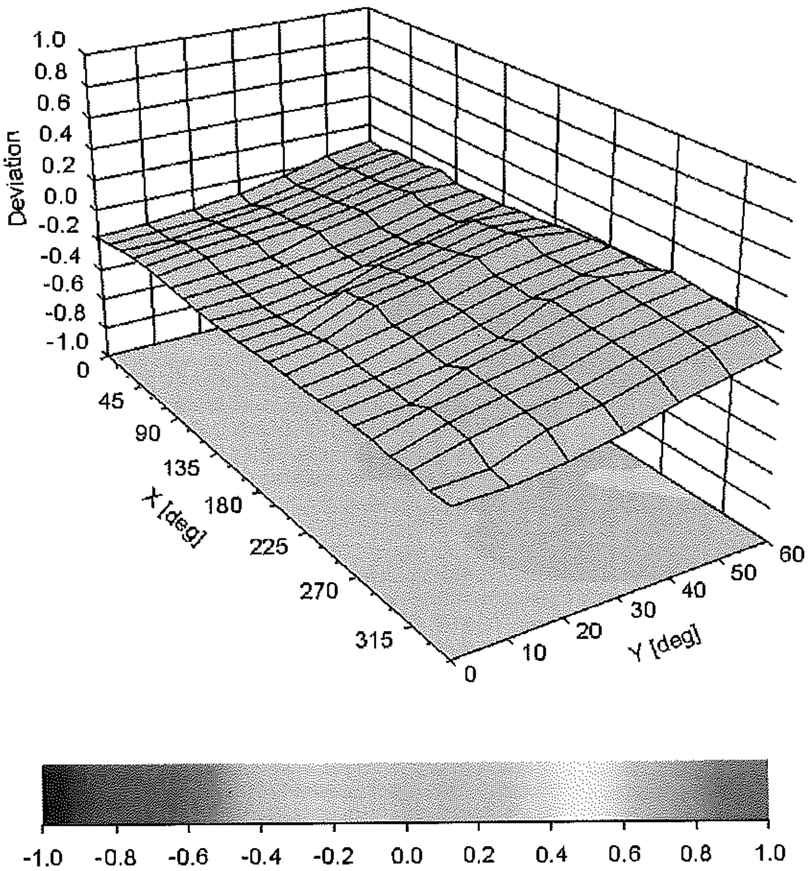


f = 1900 MHz,WGLS R22 (H_convF)



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:3209

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-40.3
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