



Lanyard MPERS Device Model LC140 FCC SAR Test Report

FCC ID: ZQR-LC140

80-H1151-5 Rev. A

December 16, 2011

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Revision history

Revision	Date	Description
A	16 December 2011	Initial release



December 16, 2011

Lanyard MPERS Device Model LC140 FCC SAR Test Report
80-H1151-5 Rev. A



5775 Morehouse Dr.
San Diego CA 92121

Overview

Test Report Reference:	80-H1151-5 Rev. A
Responsible Engineer:	John Forrester
Signature:	
Test Engineer:	Mark Ortlieb
Signature:	
Date(s) of Testing:	19 August 2011 1 September 2011 12 September 2011 13 September 2011 4 November 2011 5 November 2011
Date of Report issue:	16 December 2011
Test Laboratory:	QUALCOMM Incorporated 5775 Morehouse Dr. San Diego CA 92121 (General Telephone) 1 858 587 1121
Model Tested:	MPERS (Mobile Personal Emergency Response System) Lanyard device, Model LC140
Test Specification Standard(s):	<i>FCC CFR47 Part 2.1093: Radiofrequency radiation exposure evaluation: portable devices</i> <i>FCC/OET Bulletin 65, including Supplement C, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields</i> <i>FCC "SAR Measurement Procedures for 3G Devices" (October 2007)</i> <i>FCC "Mobile and Portable Device – RF Exposure Procedures and Equipment Authorization Policies" (KDB 447498)</i> <i>ANSI/IEEE P1528/D1.2 Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques</i>
Results:	The DUT complies with the above-mentioned test specifications.

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1. Test summary

1.1 Introduction

A MPERS (Mobile Personal Emergency Response System) Lanyard device, model LC140, was tested for SAR compliance with respect to FCC Part 2.1093 RF exposure limits. This test report is intended to document performance of the EUT with respect to established SAR measurement procedures and is intended to demonstrate compliance with RF exposure limits.

1.2 Equipment Usage

The MPERS LC140 is designed to be worn as a pendant around the user's neck and is operated by the user pressing a call button and holding the device towards the user's face during an emergency situation. The MPERS LC140 is not intended to be held to the ear as it only incorporates a far field speaker.

The device is only capable of making a voice phone call to a pre-configured emergency hotline number. Alternate phone numbers cannot be programmed into the device nor can it receive phone calls from anyone other than the call center.

During normal operation, the MPERS device also self-initiates short data burst transmissions (< 6 seconds) every 30 minutes to a monitoring service that provides information on the user's location and physical activity. Due to the low duty cycle, RF exposure evaluation was not conducted for data transmission. SAR exclusion for this normal operation mode is detailed in Section 10.

The MPERS device has only a single WWAN transmitter with a single transmit antenna, and only supports CDMA 1x 850 (Band Class 0) MHz and 1900 MHz (Band Class 1) bands. There are no collocated transmitters, receive diversity antennas, or any other external connections other than for battery charging.

1.3 Compliance Standards

- **FCC OET 65** Supplement C *Evaluation Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields*
- **FCC KDB 447498** *Mobile and Portable Device – RF Exposure Procedures and Equipment Authorization Policies*
- **FCC KDB 941225** *SAR Measurement Procedures for 3G Devices – CDMA 2000/EV-DO – WCDMA/HSDPA/HSPA*
- **FCC KDB 450824** *SAR Probe Calibration and System Verification Considerations for Measurements at 150 MHz – 3 GHz*
- **FCC Part 2.1093** *Radiofrequency radiation exposure evaluation: portable devices*
- **IEEE 1528** *Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communication Devices: Measurement Techniques*

1.4 Maximum Measured SAR results (Worst Case Results)

Table 1-1 Worst-case measured 1 g SAR (Head and Body)

Test position	Band	Channel	1 g SAR (mW/g)	1 g Limit (Head & Body)
Rear of device toward neck portion of phantom, 1.5 cm separation (DUT worn on wrist)	850 (BC0)	383	1.53 mW/g	1.6 mW/g
Rear of device toward neck portion of phantom, 1.5 cm separation (DUT worn on wrist)	1900 (BC1)	25	0.778 mW/g	1.6 mW/g

Table 1-2 Worst-case measured 10 g SAR (Hand)

Test position	Band	Channel	10 g SAR (mW/g)	10 g Limit (Hand)
Rear of device toward flat phantom, 0 cm separation	850 (BC0)	383	0.893 mW/g	4.0 mW/g
Rear of device toward flat phantom, 0 cm separation	1900 (BC1)	600	1.61 mW/g	4.0 mW/g

Table 1-3 Overall Measurement Uncertainty

Combined Standard Uncertainty	10.0%
Extended Standard Uncertainty (k=2)	20.1%

1.5 SAR Limits

Table 1-3 gives 1 gram SAR limits for general public for the frequency range of 10 MHz to 10 GHz as called out in FCC CFR 47 Part 2.1093.

Table 1-4 1 Gram SAR Limits

Localized SAR (head and trunk)	1.6 mW/g (1 g)
Hands, Wrists, Feet and Ankles	4.0 mW/g (10 g)

1.6 Simultaneous Transmission

The MPERS LC140 device contains only a single transmitter, therefore simultaneous transmission consideration does not apply.

2. EUT Description

2.1 General

Table 2-1 EUT Information

EUT Model	LC140
FCC ID	ZQR-LC140
EUT Serial Number	4
EUT description	Lanyard mobile wireless personal emergency service (MPERS) device with WWAN transmit capability.
WWAN Technologies	CDMA 2000 1x
Unlicensed Technologies	None
TX Frequencies	CDMA 1x Band Class 0: 824.2 – 848.8 MHz CDMA 1x Band Class 1: 1850.2 – 1909.8 MHz
Nominal Factory Transmit Power (dBm)	Band Class 0: 24dBm Band Class 1: 24dBm
Duty Cycle(s)	CDMA: 100%
WWAN Antenna Type	PIFA
WLAN Antenna	None

3. Conducted Transmit Power

Conducted transmit power was tested in accordance with FCC 3G procedures and 3GPP2 standards. The test procedure for configuring the EUT to transmit at maximum output power for CDMA 1x is provided in Section 9.3 . All testing was conducted with the test call in RC3, S055 configuration.

Table 3-1 WWAN Measured Average Transmit Power (dBm)

		US 835 MHz (BC0)			US 1900 MHz (BC1)		
Mode	Service Option	1013	383	777	25	600	1175
CDMA 1x	RC1 SO2	24.3	24.0	23.9	24.0	24.0	24.3
CDMA 1x	RC1, S055	24.4	24.1	23.7	24.0	24.0	24.3
CDMA 1x	RC2, SO9	24.4	24.1	23.7	23.9	24.1	24.2
CDMA 1x	RC2, S055	24.4	24.1	23.7	23.9	24.0	24.3
CDMA 1x	RC3, S055	24.4	24.1	23.7	24.1	24.2	24.3
CDMA 1x	RC3, S032	24.4	24.1	23.7	23.8	23.8	24.2

4. SAR Test Program

4.1 Test Positions

The MPERS LC140 is intended to be worn around the user's neck as a pendant, and operated by the user during a voice call by holding the module device in the hand and speaking into the front face of the module. Therefore SAR was measured for the device in the position shown in Figure 4-1.

SAR was measured from the rear of the device as shown in Figure 4-2 to determine compliance for body-worn positions. Measurements for body-worn positions were made at a compliance distance in order to satisfy test condition requirements as provided by the FCC through direct KDB inquiry.

Finally, SAR was measured from the rear of the device as shown in Figure 4-3 to determine compliance for hand-held positions.

Figure 4-1 Front of device toward SAM phantom, 1.0 cm separation

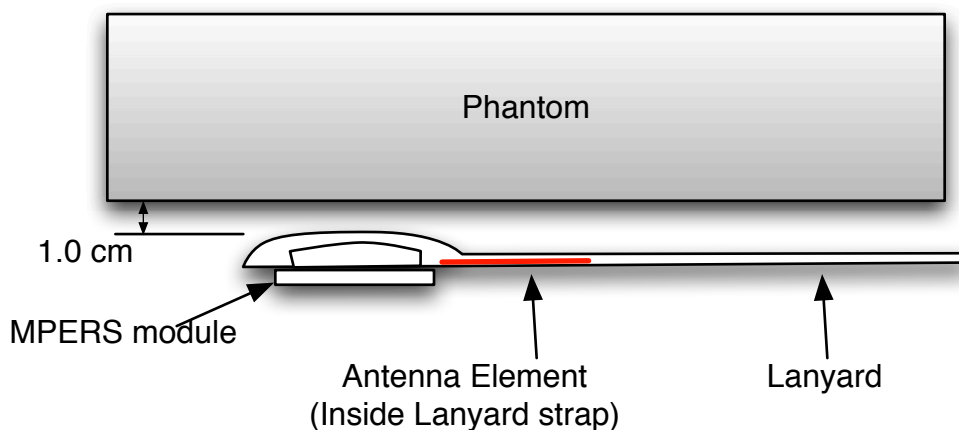


Figure 4-2 Rear of device toward to SAM phantom (1.5 cm separation)

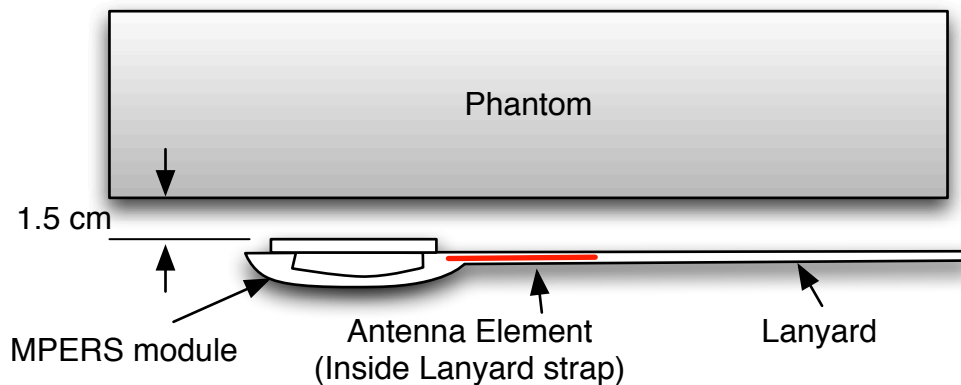
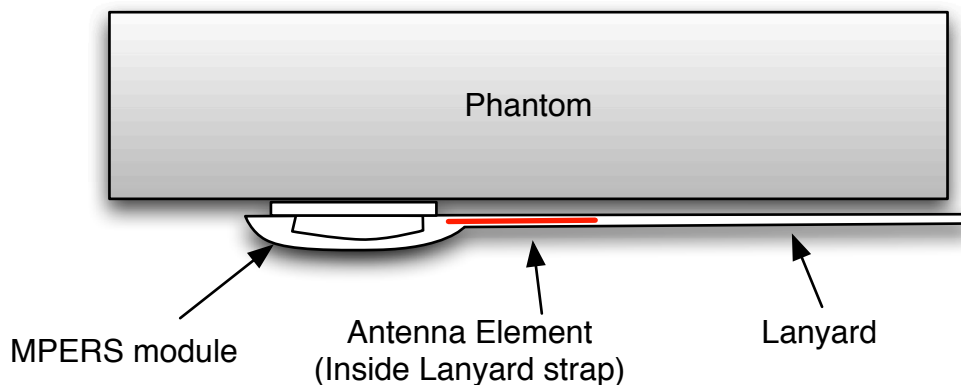


Figure 4-3 Rear of device toward to SAM phantom (0 cm separation)



4.2 Test Channels

Table 4-1 Test Channels

Technology	Band	Channel	Frequency
CDMA 1x	Band Class 0 (835)	1013	824.7
		383	836.49
		777	848.97
	Band Class 1 (1900)	25	1851.25
		600	1880
		1175	1908.75

4.3 Dielectric Tissue Simulating Liquids

Since the user is intended to hold the MPERS LC140 device toward the face, Head TSL was used for SAR measurements performed per Figure 4-1. For SAR measurements performed per Figure 4-2 and Figure 4-3, Body TSL was used. Liquid properties are described in Section 5.5 .

5. SAR Test Facility

5.1 General

Test Location	QUALCOMM Incorporated 5775 Morehouse Dr. San Diego CA 92121
Temperature Range	15-35 °C (23°C actual)
Humidity Range	25-75% (38% actual)
Pressure	860-1060 mbar (1015 mB)

All Qualcomm dosimetry equipment is operated within a shielded screen room manufactured by Lindgren RF Enclosures to provide isolation from external EM fields. The E-field probes of the DASY5 system are capable of detecting signals as low as $5\mu\text{W/g}$ in the liquid dielectric, and so external fields are minimized by the screen room, leaving the phone as the dominant radiation source. The floor of the screen room is reflective, so the phantom bench is placed on two ferrite panels measuring 2 ft^2 each, in order to minimize reflected energy that would otherwise re-enter the phantom and combine constructively or destructively with the desired results.

5.2 Dosimetry System

The dosimetry equipment consists of a complete state-of-the-art DASY5 dosimetry system manufactured and calibrated by Schmid & Partner Engineering AG of Zurich, Switzerland. The DASY5 system consists of a six axis robot, a robot controller, a teach pendant, automation software on a 3.16 GHz Intel Core®2 Duo CPU E8500 computer, data acquisition system, isotropic E-field probe, device positioning holder, and validation kit.

Figure 5-1 DASY5 system: Robot Arm, Controller box, Device Positioning Holder



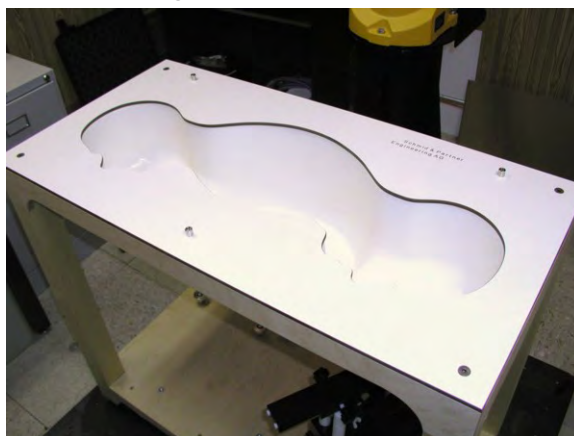
5.3 E-field probe

Manufactured by Schmid & Partner, Model ET3DV6. Calibrated by the manufacturer in head tissue simulating liquid at frequencies ranging from 835 MHz to 1.95 GHz. Dynamic range is said by the manufacturer to be 5 $\mu\text{W/gm}$ to approx. 100 mW/g. The probe contains 3 small dipoles positioned symmetrically on a triangular core to provide for isotropic detection of the field. Each dipole contains a diode at the feed point that converts the RF signal to DC, which is conducted down a high impedance line to the data acquisition system.

5.4 Phantom

The phantom is the Standard Anthropomorphic Model (“SAM”) phantom supplied by Schmid & Partner AG, and is designed for compliance to the guidelines provided in standard IEEE P1528. It consists of a left and right side head for simulating phone usage on both sides of the head, as well as a flat area for simulating phone usage against the body. The phantom is constructed of fiberglass with 2 mm $\pm 0.1\text{mm}$ shell thickness. The DASY5 system uses a homogeneous tissue phantom based on studies concerning energy absorption of the human head, and the different absorption rates between adults and children. These studies indicated that a homogeneous phantom should overestimate SAR by no more than 15% for 10 g averages and should not underestimate SAR.

Figure 5-2 SAM Phantom



5.5 Liquid Dielectric

The tissue simulating liquid filling the phantom is mixed by Qualcomm staff per manufacturer instructions and regulatory standards. There are separate formulas for the various applicable frequencies. Before the test, the permittivity and conductivity were measured with an automated Hewlett-Packard 85070B dielectric probe in conjunction with a HP 8752C network analyzer to monitor permittivity change due to evaporation and settling of ingredients. The electromagnetic parameters of the liquid were maintained as shown in Table 5-1. The target values were obtained from the FCC OET 65 Supplement C.

Lab temperature is controlled to ensure stable liquid temperatures do not vary more than $\pm 2^\circ\text{C}$.

Table 5-1 Tissue Dielectric Properties at Time of Testing

Test Date	TSL	Frequency (MHz)	Permittivity (ϵ_r)				Conductivity (σ)			
			Measured Values	Target Values	Deviation (%)	Limit	Measured Values	Target Values	Deviation (%)	Limit
8/19/2011	Body	836.51	54.427	55.2	-1.4%	±5%	0.953	0.97	-1.7%	±5%
9/1/2011	Head	836.51	41.132	41.5	-0.89%	±5%	0.884	0.90	-1.78%	±5%
9/12/2011	Body	1880	51.998	53.3	-2.4%	±5%	1.506	1.52	-0.92%	±5%
9/13/2011	Head	1880	38.25	40.0	-4.38%	±5%	1.426	1.40	1.86%	±5%
11/4/2011	Body	824.7	55.297	55.2	0.18%	±5%	0.937	0.97	-3.40%	±5%
11/5/2011	Body	1851.25	51.832	53.3	-2.75%	±5%	1.458	1.52	-4.08%	±5%

25 L of each of the tissue simulating liquids were prepared using the following proportions of ingredients (percent by weight):

Head TSL:

835 MHz Head Tissue Simulating Liquid

Water – 51.07%
Cellulose – 0.23%
Sugar – 47.31%
Preventol – 0.24%
Salt – 1.15%

1900 MHz Head Tissue Simulating Liquid

Water – 55.3 %
Glycol Monobutyl Ether – 44.5%
Salt – 0.31%

Muscle TSL:

835 Mhz Body Tissue Simulating Liquid

Water – 50.8%
Salt – 9.94%
Preventol – 0.01%
Sugar – 48%

1900 Mhz Body Tissue Simulating Liquid

Water – 70.2%
Glycol Monobutyl Ether – 29.4%
Salt – 0.4%

6. System Specifications and Calibration

6.1 General System Specifications

Figure 6-1 shows a diagram of the Schmid & Partner DASY5 system.

**Figure 6-1 Diagram of DASY5 System,
from S&P Applications Notes System Description and Setup**

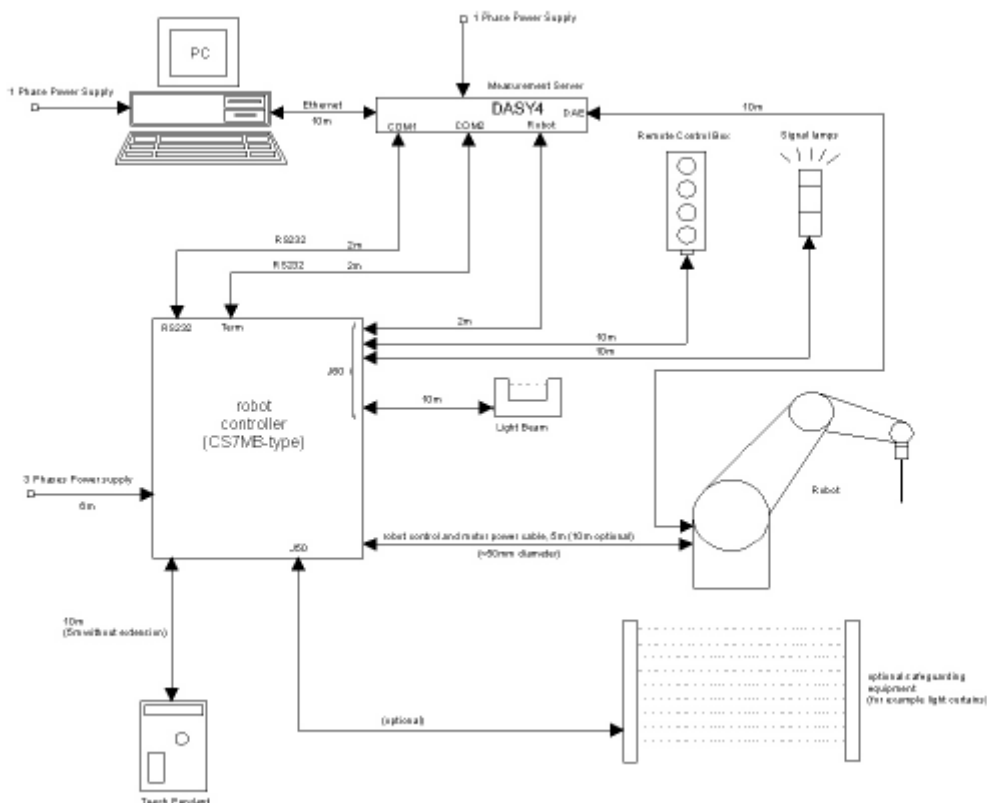


Table 6-1 Data Acquisition

Processor	Intel Core®2 Duo CPU E8500 GHz
Operating System	Microsoft® Windows® XP
Software	DASY5 V52.6.1.408, Schmid & Partners Eng. AG, Switzerland SEMCAD X V 14.4.2 Build 57
Surface Detection	Mechanical

Table 6-2 E-Field Probe

Offset tip to sensor center	2.7 mm
Offset surface to probe tip	1.8 ± 0.2
Frequency	30 MHz to 3.0 GHz
Dynamic Range	5µW/g to 100 mW/g
Isotropy	±0.15 dB (in brain liquid)

Table 6-3 Phantom

Dielectric	835 MHz band: homogeneous water/sugar/salt/ cellulose liquid 1900 MHz band: Homogeneous water/glycol/salt liquid
Shell	2 mm ± 0.2 mm polyester fiber glass
Ear	Integral model per SAM phantom specification

6.2 Calibration Table

Table 6-4 Calibration

Equipment Mfr & Type	Serial number	Last Calibrated	Next Calibration
Schmid & Partner Engineering AG Dosimetric E-field Probe, ET3DV5	1733	16 February 2011	16 February 2012
Schmid & Partner Engineering AG dipole validation kit, D835V2	466	19 October 2010*	19 October 2012
Schmid & Partner Engineering AG dipole validation kit, D1900V2	5d096	21 October 2010*	21 October 2012
Schmid & Partner Engineering AG Data Acquisition Electronics, DAE3 V1	400	8 February 2011	8 February 2012
Gigatronics 8541C RF Power Meter	K81354	17 May 2011	17 May 2012
Gigatronics 80401A Power Sensor	G000517	20 January 2011	20 January 2012
Hewlett-Packard 8720E Network Analyzer	K100454	20 April 2011	20 April 2012
Hewlett-Packard 85070M Dielectric Probe System	N/A	N/A	N/A

*Some testing in this report was performed beyond the 1-year calibration date, therefore extended calibration analysis was done as described in FCC KDB 50824 D02. See Section 6.3 .

6.3 Extended calibration information

Sections 6.3.1 and 6.3.2 provide supporting documentation regarding use of test equipment that was used under the extended calibration guidelines of FCC KDB 50824 D02.

6.3.1 D835V2, Serial number 466

Validation dipole D835V2, S/N 466, has not been damaged in any way since its calibration on 19 October 2010.

No system check SAR measurements have deviated by more than $\pm 10\%$ from what is given in the manufacturer's calibration documentation (system check information with deviation in this report is provided in Section 13.)

Subsequent to the testing that was performed in November (beyond calibration due date), the dipole was sent to the manufacturer, Schmid & Partner AG, for calibration. Return loss and input impedance measurements in the new calibration certificate (2 December 2011) were compared to those in the previous calibration certificate and found to be within expected tolerances. Both 2010 and 2011 calibration certificates are included in Section 15. Table 6-5 and Table 6-6 give specific data and deviation values for D835V2.

Table 6-5 Return Loss Information for D835V2 (S/N 466)

Tissue Simulating Liquid	19 October 2010 calibration	2 December 2011 calibration	Difference (%)	Limit
Head TSL	-28.1 dB	-26.6 dB	5.3%	20%
Body TSL	-25.1 dB	-23.2 dB	7.6%	20%

Table 6-6 Impedance Information for D835V2 (S/N 466)

Tissue Simulating Liquid	19 October 2010 calibration	2 December 2011 calibration	Difference (Ω)	Difference Limit
Head TSL	Real: 51.9 Ω	Real: 53.2 Ω	Real: +1.3 Ω	5 Ω
	Imaginary: j3.5 Ω	Imaginary: j3.6 Ω	Imaginary: +0.1 Ω	
Body TSL	Real: 48.1 Ω	Real: 47.8 Ω	Real: -0.3 Ω	5 Ω
	Imaginary: j5.2 Ω	Imaginary: j6.4 Ω	Imaginary: +1.2 Ω	

6.3.2 D1900V2, Serial number 5d096

Validation dipole D1900V2, S/N 5d096, has not been damaged in any way since its calibration on 21 October 2010.

No system check SAR measurements have deviated by more than $\pm 10\%$ from what is given in the manufacturer's calibration documentation (system check information with deviation in this report is provided in Section 13.)

Subsequent to the testing that was performed in November (beyond calibration due date), the dipole was sent to the manufacturer, Schmid & Partner AG, for calibration. Return loss and input impedance measurements in the new calibration certificate (6 December 2011) were compared to those in the previous calibration certificate and found to be within expected tolerances. Both 2010 and 2011 calibration certificates are included in Section 15. Table 6-7 and Table 6-8 give specific data and deviation values for D1900V2.

Table 6-7 Return Loss Information for D1900V2 (SN 5d096)

Tissue Simulating Liquid	21 October 2010 calibration	6 December 2011 calibration	Difference (%)	Limit
Head TSL	-25.4 dB	-25.0 dB	-1.5%	20%
Body TSL	-23.6 dB	-23.8 dB	-0.8%	

Table 6-8 Impedance Information for D1900V2 (SN 5d096)

Tissue Simulating Liquid	21 October 2010 calibration	6 December 2011 calibration	Difference (Ω)	Difference Limit
Head TSL	Real: 53.3 Ω	Real: 53.0 Ω	Real: -0.3 Ω	5.0 Ω
	Imaginary: j5.0 Ω	Imaginary: j5.0 Ω	Imaginary: +0.0 Ω	
Body TSL	Real: 47.1 Ω	Real: 47.4 Ω	Real: +0.3 Ω	
	Imaginary: j5.7 Ω	Imaginary: j5.8 Ω	Imaginary: +0.1 Ω	

7. SAR Measurement Procedure

7.1 DUT Configuration

The DUT was configured into the desired transmit configuration per the procedures defined in section 9.

7.2 Power Verification

Prior to beginning SAR testing, conducted power was measured on the MPERS device to verify functionality and the WWAN maximum transmit power values using the procedures defined in section 9. The results of the conducted power measurements are in section 3.

7.3 Test Configurations

7.3.1 DUT Position

The DUT was positioned as described in Section 4. SAR Test Program.

7.4 Scan procedure

The scan routine is set up as follows:

- Power reference measurement
- Area scan
- Power Drift measurement
- 60 second delay
- Power reference measurement
- 7x7x7 cube (zoom) scan
- Power Drift measurement
- Robot movement to maximum location
- Z-axis scan

8. Measurement Uncertainty

The possible errors included in this measurement arise from device positioning uncertainty, device manufacturing uncertainty, liquid dielectric permittivity uncertainty, liquid dielectric conductivity uncertainty, and uncertainty due to disturbance of the fields by the probe.

Table 8-1 Measurement Uncertainty

	Uncertainty value (\pm %)	Prob. DIST	Div.	(ci) 1g	(ci) 10g	Std. Unc. (1g) (\pm %)	Std. Unc. (10g)	(vi) v _{eff}
Measurement System								
Probe Calibration	4.8	N	1	1	1	4.8	4.8	∞
Axial Isotropy	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
Hemispherical Isotropy	9.6	R	$\sqrt{3}$	0.7	0.7	3.9	3.9	∞
Boundary Effects	1	R	$\sqrt{3}$	1	1	0.6	0.6	∞
Linearity	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
System Detection Limits	1	R	$\sqrt{3}$	1	1	0.6	0.6	∞
Readout Electronics	1	N	1	1	1	1.0	1.0	∞
Response Time	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
Integration Time	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
RF Ambient Conditions	3	R	$\sqrt{3}$	1	1	1.7	1.7	∞
Probe Positioner	0.4	R	$\sqrt{3}$	1	1	0.2	0.2	∞
Probe Positioning	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	∞
Max. SAR Eval.	1	R	$\sqrt{3}$	1	1	0.6	0.6	∞
Test Sample Related								
Device Positioning	2.9	N	1	1	1	2.9	2.9	145
Device Holder	3.6	N	1	1	1	3.6	3.6	5
Power Drift	5	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom and Setup								
Phantom Uncertainty	4	R	$\sqrt{3}$	1	1	2.3	2.3	∞
Liquid Conductivity (target)	5	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (meas.)	2.5	N	1	0.64	0.43	1.6	1.1	∞
Liquid Permittivity (target)	5	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (meas.)	2.5	N	1	0.6	0.49	1.5	1.2	∞
Combined Std. Uncertainty						10.3 %	10.0 %	330
Expanded STD Uncertainty						20.6 %	20.1 %	

9. EUT Configuration Procedure

9.1 WWAN Transmission Setup

9.1.1 EUT Test Frequencies (WWAN)

Table 9-1 Test Frequencies

	850 MHz						1900 MHz					
	Low		Mid		High		Low		Mid		High	
	Ch	Freq	Ch	Freq	Ch	Freq	Ch	Freq	Ch	Freq	Ch	Freq
CDMA	1013	824.7	384	836.52	777	848.31	25	1851.25	600	1880	1175	1908.75

9.1.2 Call Box Simulator Information

Table 9-2 Communications Test Box Information

Make	Agilent	
Model	8960	
Cal Date	15 September 2010 (early September testing) 18 October 2011 (November testing)	
Serial Number	GB44052409	
SW Revision	GSM TA E1968A-101 GPRS TA E1968A-102 EGPRS TA E1968A-103 WCDMA E1963A HSDPA TEST MODES E1963A-403 HSuPA TEST MODES E1963A-413 cdma 2000 TA E1962B 1xEV-DO TA E1966A 1xEV-DO FTM TA E1976A 1xEV-DO Release A E1966A-102 1xEV-DO RelA FTM E1976A-102 Fast Switch Test App E1987A	

9.2 Duty Cycle

Duty cycle for all CDMA 1x calls was 100%.

9.3 Call set-up For CDMA2000 1x

Use CDMA2000 Rev 6 protocol in the call box.

- 1) Test for Reverse/Forward TCH RC1, Reverse/Forward TCH RC2, and RC3 Reverse FCH and demodulation of RC 3, 4 or 5.
 - a. Set up a call using Fundamental Channel Test Mode 1 (RC1, SO 2) with 9600 bps data rate only.
 - b. As per C.S0011 or TIA/EIA-98-F Table 4.4.5.2-1, set the test parameters as shown in Table 9-3.
 - c. Send continuously '0' power control bits to the EUT.
 - d. Measure the output power at EUT's antenna connector as recorded on the power meter with values corrected for cables losses.
 - e. Repeat step b through d for Fundamental Channel Test Mode:
 - i. RC1, SO55
 - ii. RC3, SO55
 - iii. RC2, SO55
 - iv. RC3, SO55
- 2) Test for RC 3 Reverse FCH, RC3 Reverse SCH0 and demodulation of RC 3, 4 or 5.
 - a. Set up a call using Supplemental Channel Test Mode 3 (RC 3, SO 32) with 9600 bps Fundamental Channel and 9600 bps SCH0 data rate.
 - b. As per C.S0011 or TIA/EIA-98-F Table 4.4.5.2-2, set the test parameters as shown in Table 9-4.
 - c. Send alternating '0' and '1' power control bits to the EUT.
 - d. Determine the active channel configuration. If the desired channel configuration is not the active channel configuration, increase \hat{I}_{or} by 1 dB and repeat the verification. Repeat this step until the desired channel configuration becomes active.
 - e. Measure the output power at the EUT's antenna connector.
 - f. Decrease \hat{I}_{or} by 0.5 dB.
 - g. Determine the active channel configuration. If the active channel configuration is the desired channel configuration, measure the output power at the EUT's antenna connector.
 - h. Repeat step f and g until the output power no longer increases or the desired channel configuration is no longer active. Record the highest output power achieved with the desired channel configuration active.
 - i. Repeat step a through h ten times and average the result.
- 3) Test for RC3 Reverse FCH, RC 3 DCCH and demodulation of RC3, 4 or 5.
 - a. Use the same procedure as described in 2).

Table 9-3 Parameters for Max. Power with a single traffic code channel, SR1

Parameter	Units	Value
I_{or}	dBm/1.23 MHz	-104
$\frac{\text{Pilot } E_c}{I_{or}}$	dB	-7
$\frac{\text{Traffic } E_c}{I_{or}}$	dB	-7.4

Table 9-4 Parameters for Max. Power with multiple traffic code channel, SR1

Parameter	Units	Value
$\frac{\text{Pilot } E_c}{I_{or}}$	dB	-7
$\frac{\text{Traffic } E_c}{I_{or}}$	dB	-7.4

10. Low Duty Cycle RF Exposure Evaluation

This section provides numerical calculations justifying SAR measurement exclusion based on average power $<60/f$ (f =frequency in GHz) for MPERS low duty cycle data transmissions.

The device transmits a burst of data approximately 6 seconds long every 30 minutes.

The calculations below are based on the nominal transmit power setting of 24 dBm for the LC140 device. The measured conducted power reported in this test report is higher/lower due to device tolerances and measurement uncertainty. Given the adjusted average power for defined duty cycle is much lower than the $60/f$ power, the transmit power tolerance does not impact the conclusion.

Table 10-1 Duty Cycle Calculation

Maximum Transmission Time within Duty Cycle Period (sec)	Duty Cycle Period		Duty Cycle
	Min	Sec	
6	30	1800	0.33%

Table 10-2 SAR Exclusion Calculation

a. Mode	Frequency (MHz)	Duty Cycle	Nominal Average Conducted TX Power (dBm)		Adjusted Transmit Power		60/f Power		Result
			dBm	mW	dBm	mW	dBm	mW	
CDMA 850 MHz	824	0.33%	24	251	-0.8	0.8	18.6	72.8	SAR measurement exclusion (Adjusted Avg Pwr<60/f)
10.1.1.1 CDMA 1900 MHz	1850	0.33%	24	251	-0.8	0.8	15.1	32.4	SAR measurement exclusion (Adjusted Avg Pwr<60/f)

11. Numerical SAR Data

11.1 Numerical Data

Table 11-1 1-g SAR Test Data for MPERS LC140 (Head and Body SAR)

Position	TSL	Band	Ch	1 g Limit (mW/g)	1 g SAR (mW/g)
Front of device toward phantom, 1.0 cm separation	Head	CDMA 1x, 850 (BC0)	1013	1.6 mW/g (1 g)	0.735
			383		0.895
			777		0.588
Rear of device toward flat phantom, 1.5 cm separation	Body		1013		1.51
			383		1.53
			777		1.04
Front of device toward phantom, 1.0 cm separation	Head	CDMA 1x, 1900 (BC1)	600 ⁽¹⁾		0.661
Rear of device toward flat phantom, 1.5 cm separation	Body		25		0.778
			600		0.585
			1175	0.391	
			Rear of device toward flat phantom, 1.0 cm separation	25	1.58

(1) As permitted by KDB 447498, only the middle channel was measured since the measured data was more than 3.0 dB below the SAR limit.

Table 11-2 10-g SAR Test Data for MPERS LC140 (Hand/Wrist SAR)

Position	TSL	Band	Ch	10 g Limit (mW/g)	10 g SAR (mW/g)
Rear of device toward flat phantom, 0 cm separation	Body	CDMA 1x, 850 (BC0)	383 ⁽¹⁾	4.0 mW/g (10 g)	0.893
Rear of device toward flat phantom, 0 cm separation		CDMA 1x, 1900 (BC1)	600 ⁽¹⁾		1.61

13. System Performance Check

13.1 General System Check Procedure

System performance check scans were performed at the beginning of testing of each test program day. A dipole antenna was selected that roughly matched the center frequency of the bands being tested (835 MHz and 1900 MHz). A CW sine wave with a matching frequency is then applied to the antenna from a signal generator through an amplifier for a power level shown in Table 13-1. Measured SAR is then scaled to 30 dBm for comparison to the dipole manufacturer's scaled SAR at 30 dBm. System performance check SAR has a tolerance of $\pm 10\%$.

13.2 System Performance Check Data

Table 13-1 shows system check data.

Table 13-1 1-g SAR System Check Data MPERS Test Program

Date	TSL	Frequency (MHz)	1 g SAR (mW/g)		Target	Difference (%)	Tolerance (%)
			Measured	Scaled to 30 dBm			
9/1/2011	Head	835	0.928	9.28	9.64	-3.73%	$\pm 10\%$
9/13/2011	Head	1900	4.0	40.0	40.0	+0.00%	$\pm 10\%$
11/4/2011	Body	835	0.939	9.39	10.10	-7.03%	$\pm 10\%$
11/5/2011	Body	1900	4.06	40.6	40.4	+0.50%	$\pm 10\%$

Table 13-2 10-g SAR System Check Data MPERS Test Program

Date	TSL	Frequency (MHz)	10 g SAR (mW/g)		Target	Difference (%)	Tolerance (%)
			Measured	Scaled to 30 dBm			
8/19/2011	Body	835	0.643	6.43	6.64	-3.2%	$\pm 10\%$
9/12/2011	Body	1900	2.13	21.3	21.4	-0.5%	$\pm 10\%$

Date/Time: 9/1/2011 8:06:43 AM, Date/Time: 9/1/2011 8:13:32 AM

Test Laboratory: QUALCOMM Incorporated

20110901_Val835_Head_20dBm

DUT: Dipole 835 MHz D835V2; Type: D835V2; Serial: D835V2 - SN:466

Communication System: CW; Communication System Band: D835 (835.0 MHz); Frequency: 835 MHz; Communication System
PAR: 0 dB

Medium parameters used (interpolated): $f = 835$ MHz; $\sigma = 0.87$ mho/m; $\epsilon_r = 40.36$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ET3DV6 - SN1733; ConvF(6.56, 6.56, 6.56); Calibrated: 2/16/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 2/8/2011
- Phantom: SAM with CRP; Type: SAM; Phantom Serial: 209
- Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

Configuration/d=15mm, Pin=20dBm, dist=4.0mm (ET-Probe)/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 1.009 mW/g

Configuration/d=15mm, Pin=20dBm, dist=4.0mm (ET-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

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

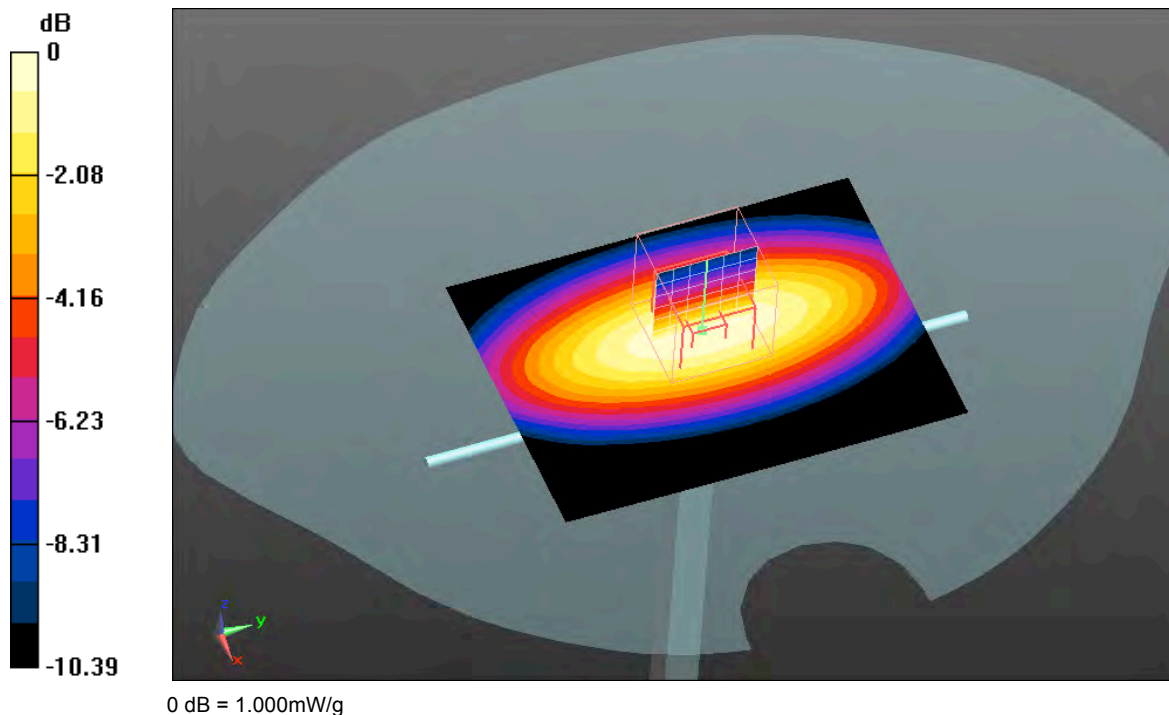
Reference Value = 35.328 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 1.358 W/kg

SAR(1 g) = 0.928 mW/g; SAR(10 g) = 0.609 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 1.004 mW/g



Date/Time: 9/13/2011 8:24:50 AM, Date/Time: 9/13/2011 8:31:37 AM

Test Laboratory: QUALCOMM Incorporated

20110913_Val1900_Head_20dBm

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d096

Communication System: CW; Communication System Band: D1900 (1900 MHz); Frequency: 1900 MHz; Communication System
PAR: 0 dB

Medium parameters used (interpolated): $f = 1900$ MHz; $\sigma = 1.445$ mho/m; $\epsilon_r = 38.15$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ET3DV6 - SN1733; ConvF(5.2, 5.2, 5.2); Calibrated: 2/16/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 2/8/2011
- Phantom: SAM with CRP; Type: SAM; Phantom Serial: 209
- Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

Configuration/d=15mm, Pin=20dBm, dist=4.0mm (ET-Probe)/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 4.889 mW/g

Configuration/d=15mm, Pin=20dBm, dist=4.0mm (ET-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

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

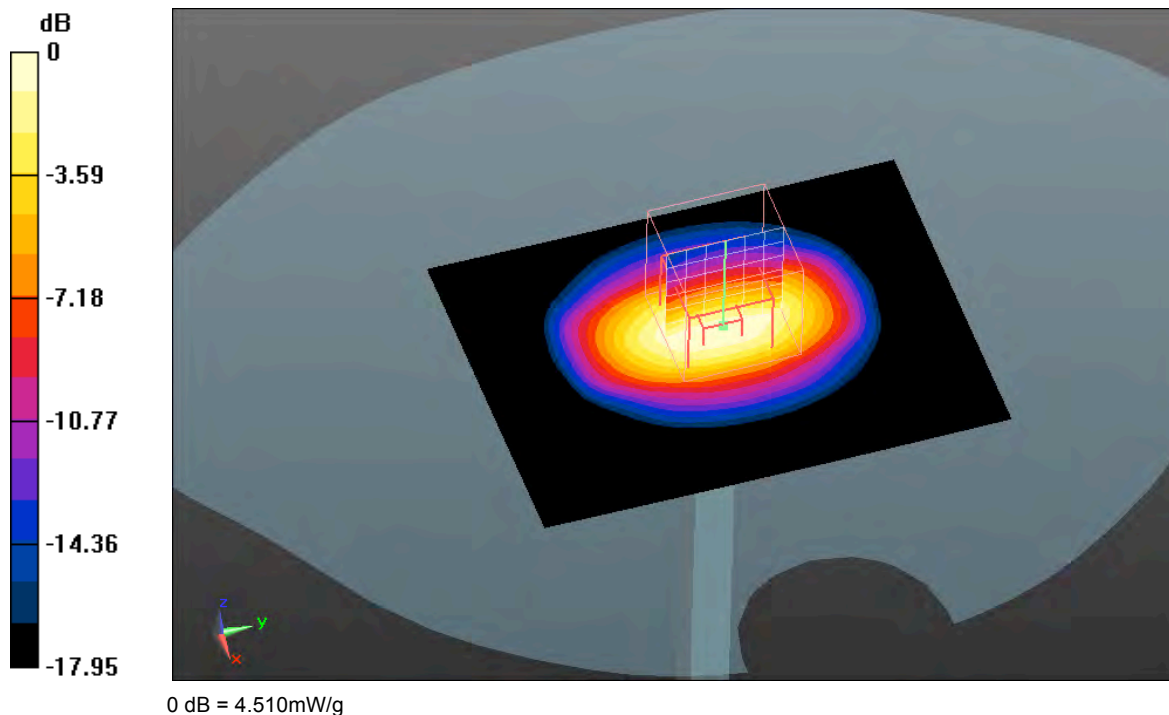
Reference Value = 59.170 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 7.102 W/kg

SAR(1 g) = 4 mW/g; SAR(10 g) = 2.09 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 4.512 mW/g



Date/Time: 11/4/2011 5:23:15 PM, Date/Time: 11/4/2011 5:30:02 PM

Test Laboratory: QUALCOMM Incorporated

20111104_Val835_Body_20dBm

DUT: Dipole 835 MHz D835V2; Type: D835V2; Serial: D835V2 - SN:466

Communication System: CW; Communication System Band: D835 (835.0 MHz); Frequency: 835 MHz; Communication System
PAR: 0 dB

Medium parameters used (interpolated): $f = 835$ MHz; $\sigma = 0.951$ mho/m; $\epsilon_r = 55.223$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ET3DV6 - SN1733; ConvF(6.45, 6.45, 6.45); Calibrated: 2/16/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 2/8/2011
- Phantom: SAM with CRP; Type: SAM; Phantom Serial: 209
- Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

Configuration/d=15mm, Pin=20dBm, dist=4.0mm (ET-Probe)/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 1.035 mW/g

Configuration/d=15mm, Pin=20dBm, dist=4.0mm (ET-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

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

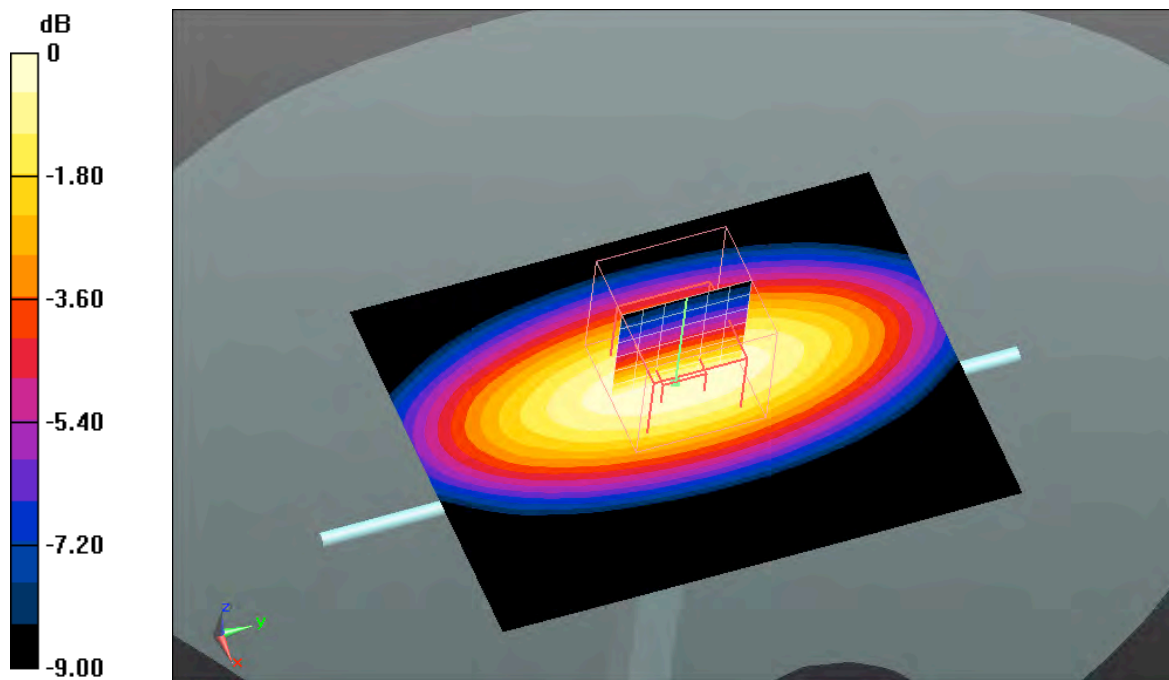
Reference Value = 34.614 V/m; Power Drift = -0.20 dB

Peak SAR (extrapolated) = 1.310 W/kg

SAR(1 g) = 0.939 mW/g; SAR(10 g) = 0.628 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 1.018 mW/g



0 dB = 1.020mW/g

Date/Time: 11/5/2011 4:27:47 PM, Date/Time: 11/5/2011 4:34:31 PM

Test Laboratory: QUALCOMM Incorporated

20111105_Val1900_Body_20dBm

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d096

Communication System: CW; Communication System Band: D1900 (1900 MHz); Frequency: 1900 MHz; Communication System
PAR: 0 dB

Medium parameters used (interpolated): $f = 1900$ MHz; $\sigma = 1.518$ mho/m; $\epsilon_r = 51.712$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ET3DV6 - SN1733; ConvF(4.61, 4.61, 4.61); Calibrated: 2/16/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 2/8/2011
- Phantom: SAM with CRP; Type: SAM; Phantom Serial: 209
- Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

Configuration/d=15mm, Pin=20dBm, dist=4.0mm (ET-Probe)/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 5.187 mW/g

Configuration/d=15mm, Pin=20dBm, dist=4.0mm (ET-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

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

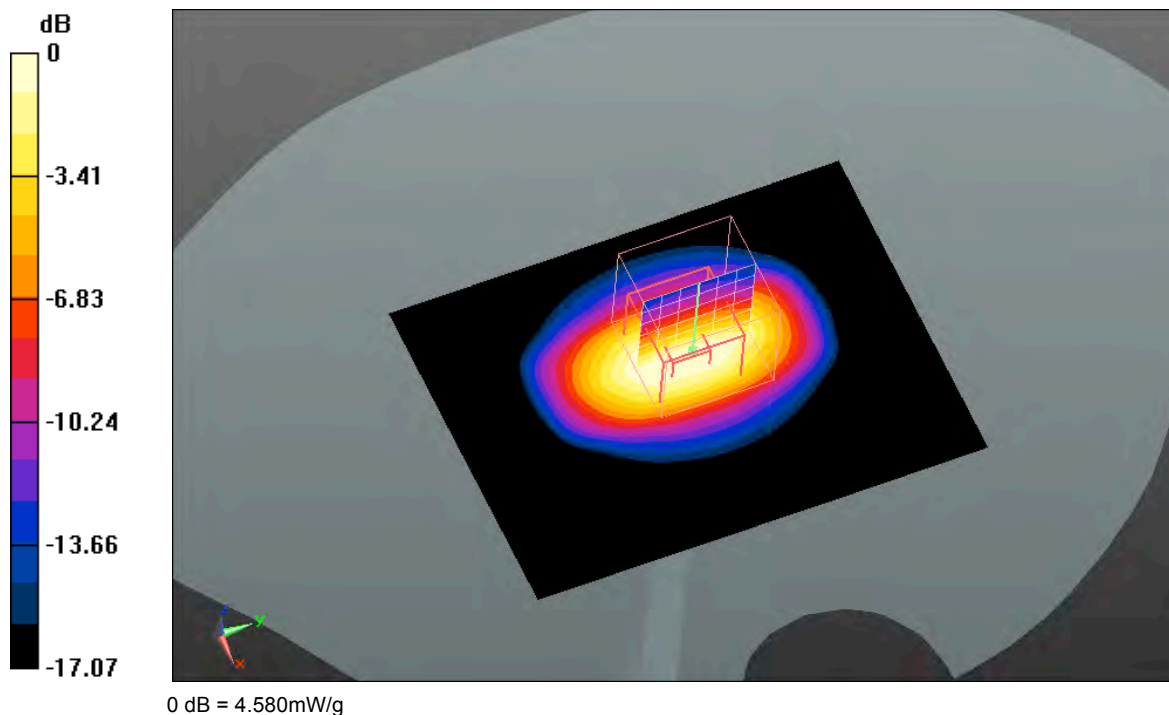
Reference Value = 58.095 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 6.695 W/kg

SAR(1 g) = 4.06 mW/g; SAR(10 g) = 2.17 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 4.585 mW/g



Date/Time: 8/19/2011 12:37:21 PM, Date/Time: 8/19/2011 12:44:09 PM

Test Laboratory: QUALCOMM Incorporated

20110819_Val835_Muscle_20dBm

DUT: Dipole 835 MHz D835V2; Type: D835V2; Serial: D835V2 - SN:466

Communication System: CW; Communication System Band: D835 (835.0 MHz); Frequency: 835 MHz; Communication System
PAR: 0 dB

Medium parameters used (interpolated): $f = 835$ MHz; $\sigma = 0.946$ mho/m; $\epsilon_r = 54.863$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ET3DV6 - SN1733; ConvF(6.45, 6.45, 6.45); Calibrated: 2/16/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 2/8/2011
- Phantom: SAM with CRP; Type: SAM; Phantom Serial: 209
- Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

Configuration/d=15mm, Pin=20dBm, dist=4.0mm (ET-Probe)/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (interpolated) = 1.043 mW/g

Configuration/d=15mm, Pin=20dBm, dist=4.0mm (ET-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

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

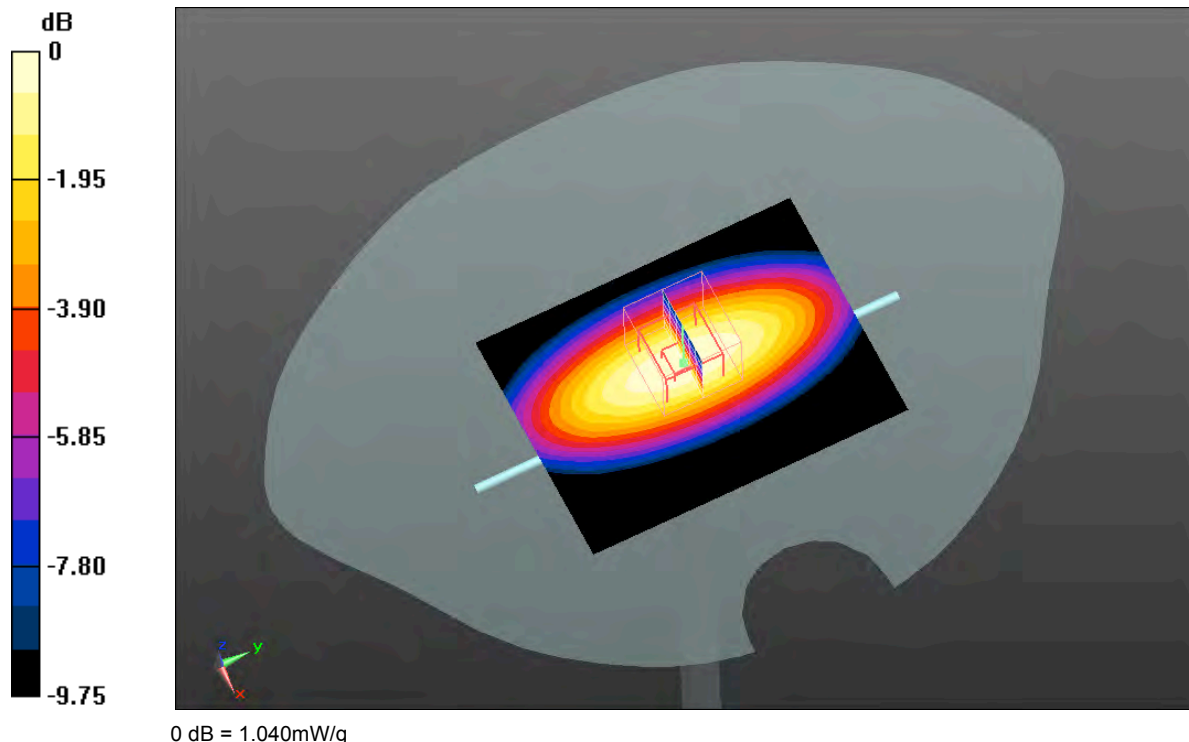
Reference Value = 34.800 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 1.337 W/kg

SAR(1 g) = 0.960 mW/g; SAR(10 g) = 0.643 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 1.040 mW/g



Date/Time: 9/12/2011 11:14:31 AM, Date/Time: 9/12/2011 11:21:17 AM

Test Laboratory: QUALCOMM Incorporated

20110912_Val1900_Muscle_20dBm

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d096

Communication System: CW; Communication System Band: D1900 (1900.0 MHz); Frequency: 1900 MHz; Communication System
PAR: 0 dB

Medium parameters used (interpolated): $f = 1900$ MHz; $\sigma = 1.53$ mho/m; $\epsilon_r = 51.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ET3DV6 - SN1733; ConvF(4.61, 4.61, 4.61); Calibrated: 2/16/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 2/8/2011
- Phantom: SAM with CRP; Type: SAM; Phantom Serial: 209
- Measurement SW: DASYS2, V52.6 Build 1; Postprocessing SW: SEMCAD X, V14.2 Build 4 Version 14.2.4 (1957) (Deployment Build)

Configuration/d=15mm, Pin=19.86dBm, dist=4.0mm (ET-Probe) 2/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 4.86 mW/g

Configuration/d=15mm, Pin=19.86dBm, dist=4.0mm (ET-Probe) 2/Zoom Scan (7x7x7) (7x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

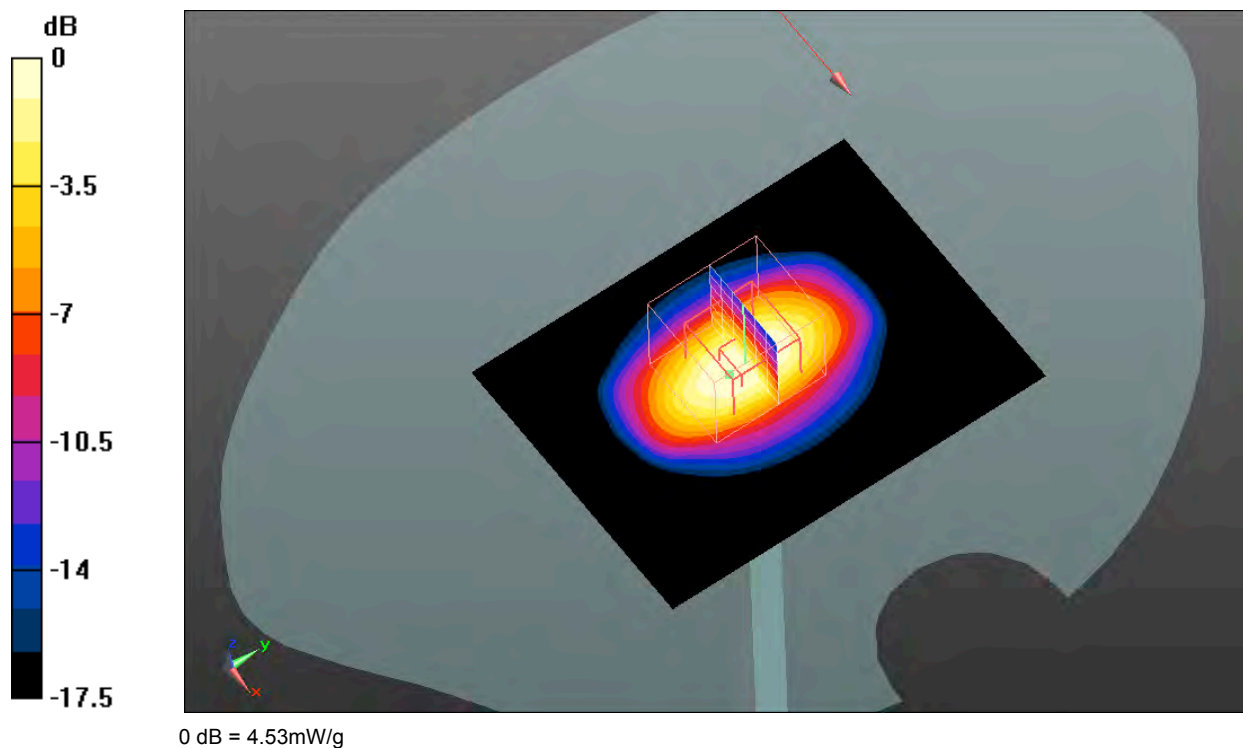
Reference Value = 58.4 V/m; Power Drift = 0.0074 dB

Peak SAR (extrapolated) = 6.57 W/kg

SAR(1 g) = 3.97 mW/g; SAR(10 g) = 2.13 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 4.53 mW/g



14. SAR Plots

14.1 Band Class 0 Plots

14.1.1 Front of EUT toward phantom, 1.0 cm separation

Date/Time: 9/1/2011 2:46:27 PM, Date/Time: 9/1/2011 2:55:34 PM

Test Laboratory: QUALCOMM Incorporated

20110901_MPERS_#1_Lanyard_CDMA_BC0-front

DUT: MPERS Lanyard; Type: module phone; Serial: 4

Communication System: CDMA835; Communication System Band: CDMA CELL; Frequency: 836.49 MHz; Communication System
PAR: 0 dB

Medium parameters used: $f = 836.505$ MHz; $\sigma = 0.884$ mho/m; $\epsilon_r = 41.132$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ET3DV6 - SN1733; ConvF(6.56, 6.56, 6.56); Calibrated: 2/16/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 2/8/2011
- Phantom: SAM with CRP; Type: SAM; Phantom Serial: 209
- Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

Configuration/MPERS Lanyard, Front of device toward phantom, 1.0 cm separation, Middle/Area Scan (101x61x1):

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.913 mW/g

Configuration/MPERS Lanyard, Front of device toward phantom, 1.0 cm separation, Middle/Zoom Scan (7x7x7)/Cube 0:

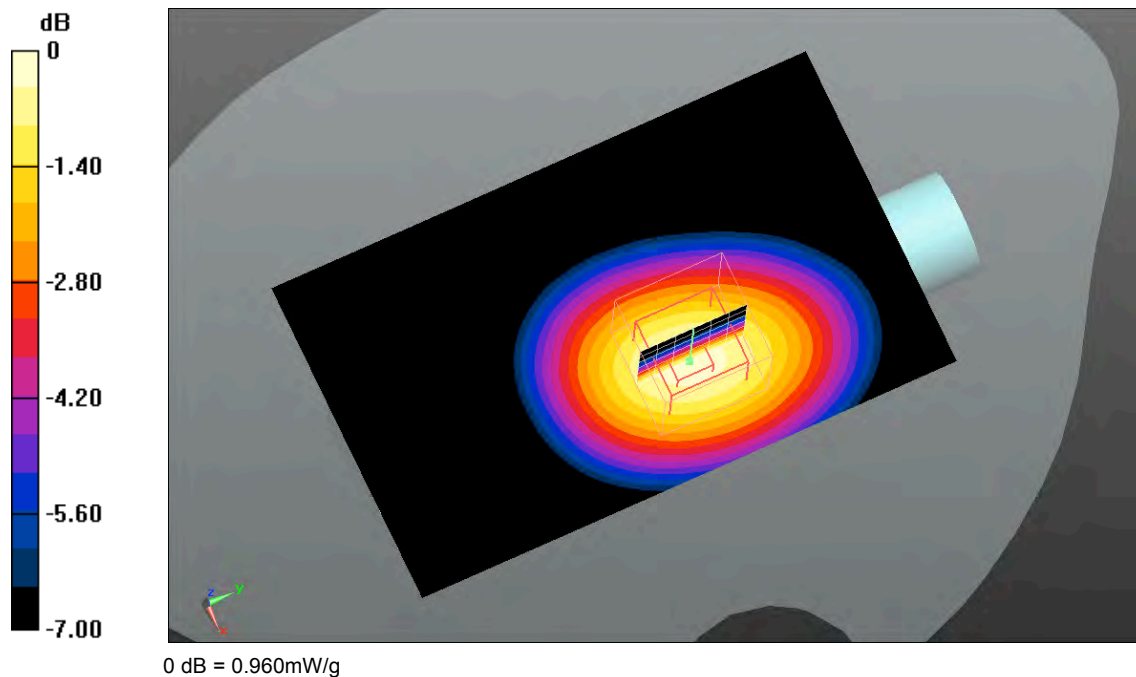
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 28.005 V/m; Power Drift = 0.24 dB

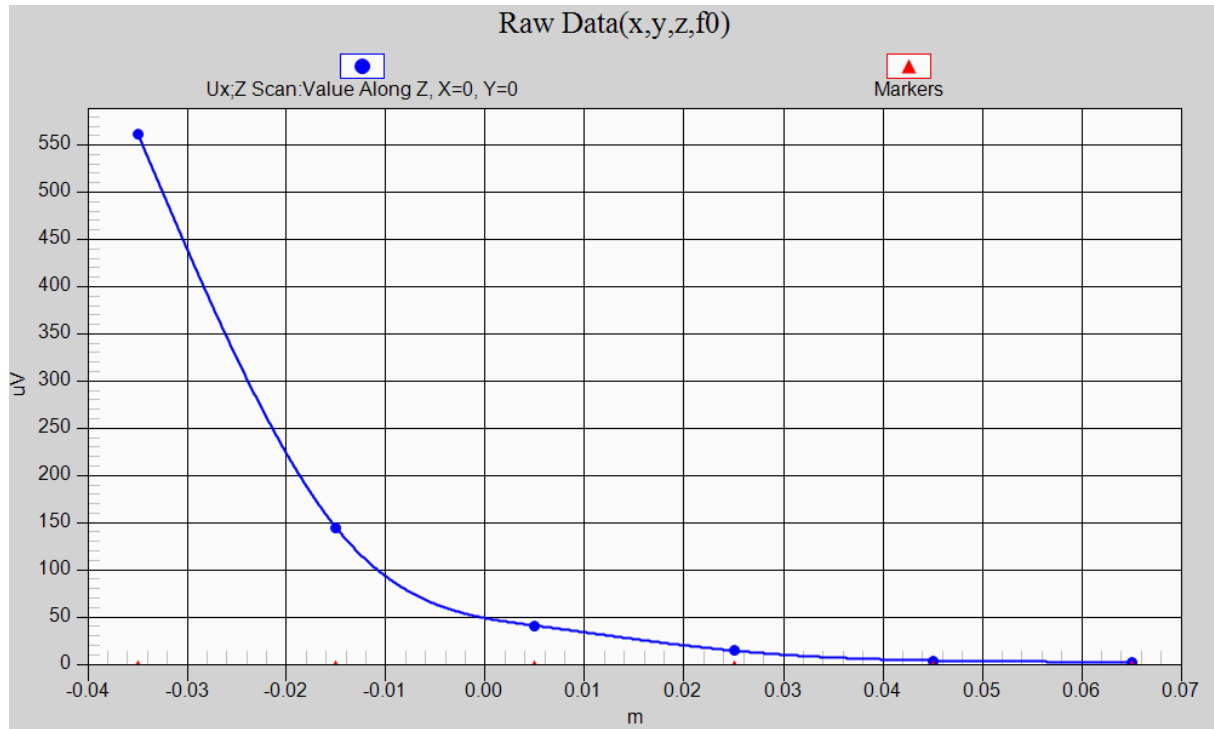
Peak SAR (extrapolated) = 1.243 W/kg

SAR(1 g) = 0.895 mW/g; SAR(10 g) = 0.610 mW/g

Maximum value of SAR (measured) = 0.960 mW/g



14.1.2 Z-axis plot



14.1.3 Rear of EUT toward phantom, 1.5 cm separation

Date/Time: 11/5/2011 9:12:54 AM, Date/Time: 11/5/2011 9:19:39 AM

Test Laboratory: QUALCOMM Incorporated

20111104_MPERS_Lanyard_CDMA_BC0-rear

DUT: MPERS Lanyard; Type: module phone; Serial: 4

Communication System: CDMA835; Communication System Band: CDMA CELL; Frequency: 824.7 MHz; Communication System

PAR: 0 dB

Medium parameters used: $f = 824.7$ MHz; $\sigma = 0.937$ mho/m; $\epsilon_r = 55.297$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ET3DV6 - SN1733; ConvF(6.45, 6.45, 6.45); Calibrated: 2/16/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 2/8/2011
- Phantom: SAM with CRP; Type: SAM; Phantom Serial: 209
- Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

Configuration/MPERS Belt clip, Rear of device toward phantom, 1.5 cm separation, Low 2/Area Scan (81x61x1):

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.656 mW/g

Configuration/MPERS Belt clip, Rear of device toward phantom, 1.5 cm separation, Low 2/Zoom Scan (7x7x7)/Cube 0:

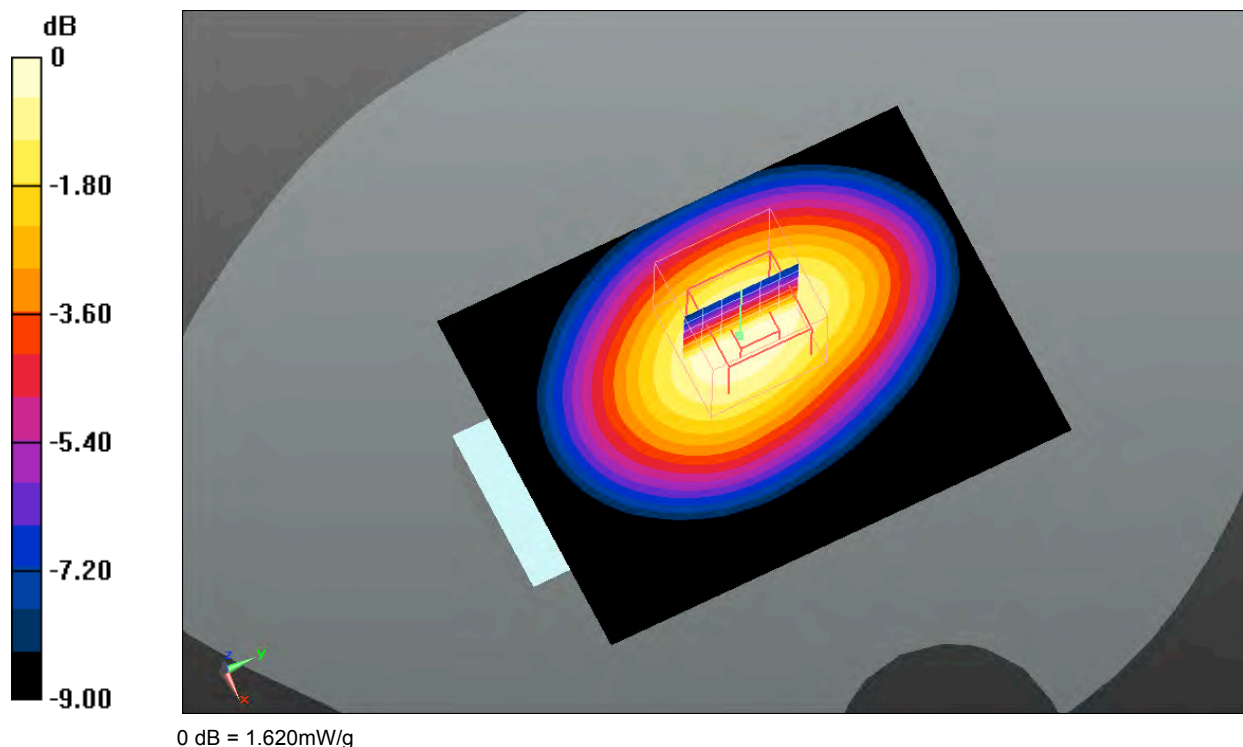
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 39.536 V/m; Power Drift = 0.20 dB

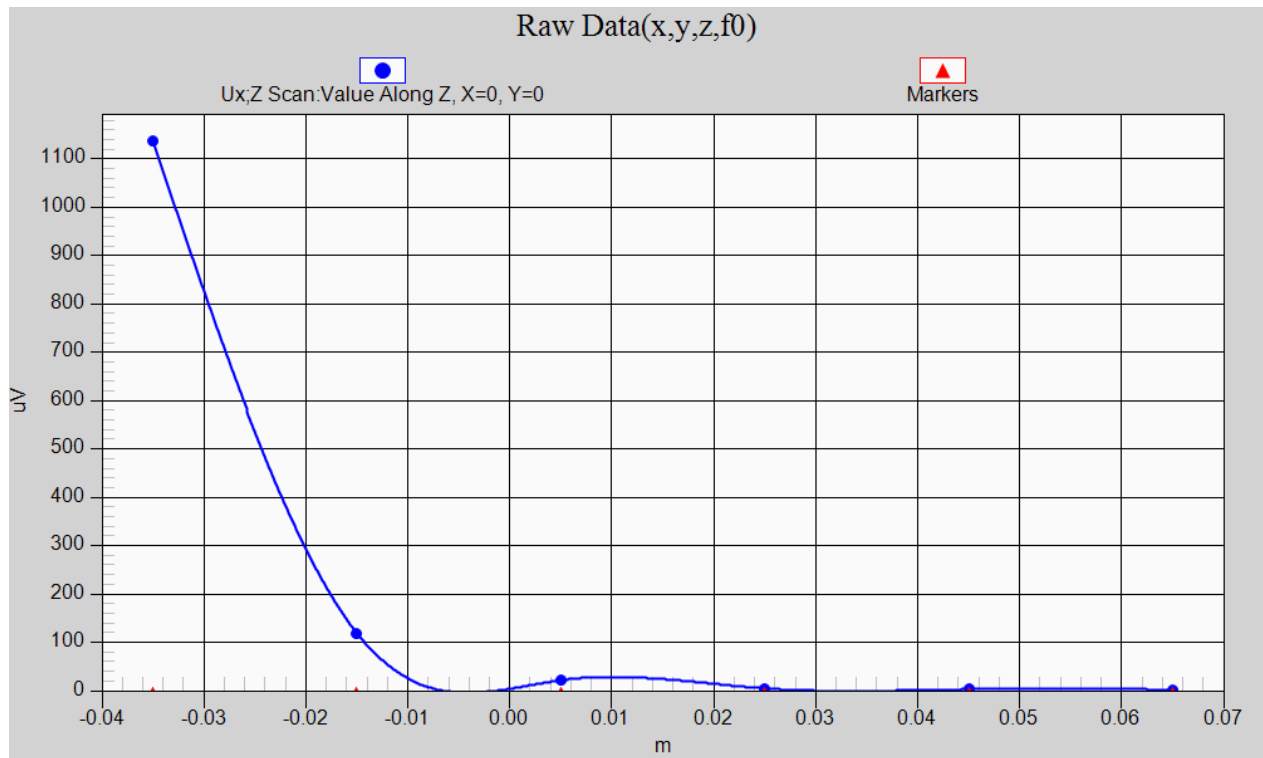
Peak SAR (extrapolated) = 1.967 W/kg

SAR(1 g) = 1.51 mW/g; SAR(10 g) = 1.06 mW/g

Maximum value of SAR (measured) = 1.619 mW/g



14.1.4 Z-axis plot



14.2 Band Class 1 Plots

14.2.1 Front of EUT toward phantom, 1.0 cm separation, head SAR (1 g SAR)

Date/Time: 9/13/2011 9:29:43 AM, Date/Time: 9/13/2011 9:38:49 AM

Test Laboratory: QUALCOMM Incorporated

20110913_MPERS_#1_Lanyard_CDMA_BC1-front

DUT: MPERS Lanyard; Type: module phone; Serial: 4

Communication System: CDMA PCS; Communication System Band: CDMA PCS; Frequency: 1880 MHz; Communication System

PAR: 0 dB

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.426$ mho/m; $\epsilon_r = 38.25$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ET3DV6 - SN1733; ConvF(5.2, 5.2, 5.2); Calibrated: 2/16/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 2/8/2011
- Phantom: SAM with CRP; Type: SAM; Phantom Serial: 209
- Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

Configuration/MPERS Lanyard, PTT mode, Front of device toward phantom, 1.0 cm separation, Middle/Area Scan
(101x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.616 mW/g

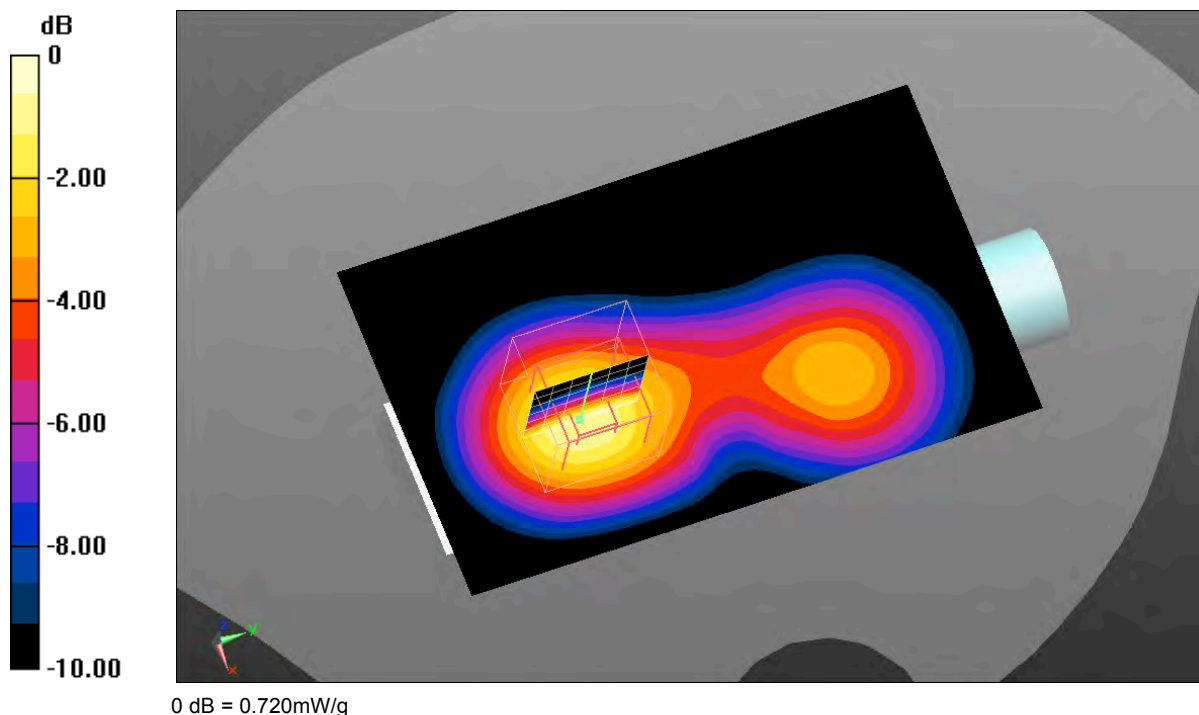
Configuration/MPERS Lanyard, PTT mode, Front of device toward phantom, 1.0 cm separation, Middle/Zoom Scan
(7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 15.435 V/m; Power Drift = 0.26 dB

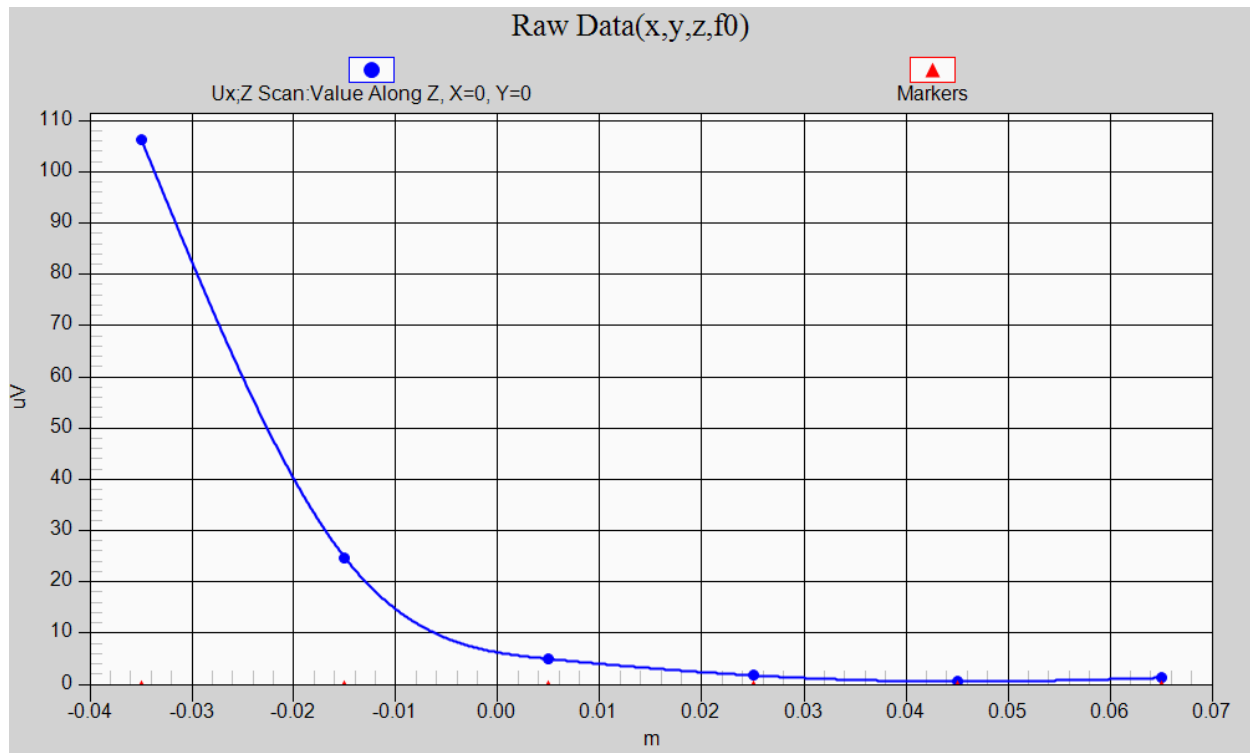
Peak SAR (extrapolated) = 1.025 W/kg

SAR(1 g) = 0.661 mW/g; SAR(10 g) = 0.396 mW/g

Maximum value of SAR (measured) = 0.718 mW/g



14.2.2 Z-axis plot



14.2.3 Rear of device toward phantom, 1.5 cm separation, body SAR (1 g SAR)

Date/Time: 11/6/2011 2:04:02 PM, Date/Time: 11/6/2011 2:17:41 PM, Date/Time: 11/6/2011 2:30:40 PM

Test Laboratory: QUALCOMM Incorporated

20111105_MPERS_Lanyard_CDMA_BC1-rear

DUT: MPERS Lanyard; Type: module phone; Serial: 4

Communication System: CDMA PCS; Communication System Band: CDMA PCS; Frequency: 1880 MHz; Communication System

PAR: 0 dB

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.496$ mho/m; $\epsilon_r = 51.763$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ET3DV6 - SN1733; ConvF(4.61, 4.61, 4.61); Calibrated: 2/16/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 2/8/2011
- Phantom: SAM with CRP; Type: SAM; Phantom Serial: 209
- Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

Configuration/MPERS Belt clip, Rear of device toward phantom, 1.5 cm separation, Middle/Area Scan (91x61x1):

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.695 mW/g

Configuration/MPERS Belt clip, Rear of device toward phantom, 1.5 cm separation, Middle/Zoom Scan (7x7x7)/Cube 0:

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

Reference Value = 13.761 V/m; Power Drift = -0.20 dB

Peak SAR (extrapolated) = 0.870 W/kg

SAR(1 g) = 0.585 mW/g; SAR(10 g) = 0.357 mW/g

Maximum value of SAR (measured) = 0.631 mW/g

Configuration/MPERS Belt clip, Rear of device toward phantom, 1.5 cm separation, Middle/Zoom Scan (7x7x7)/Cube 1:

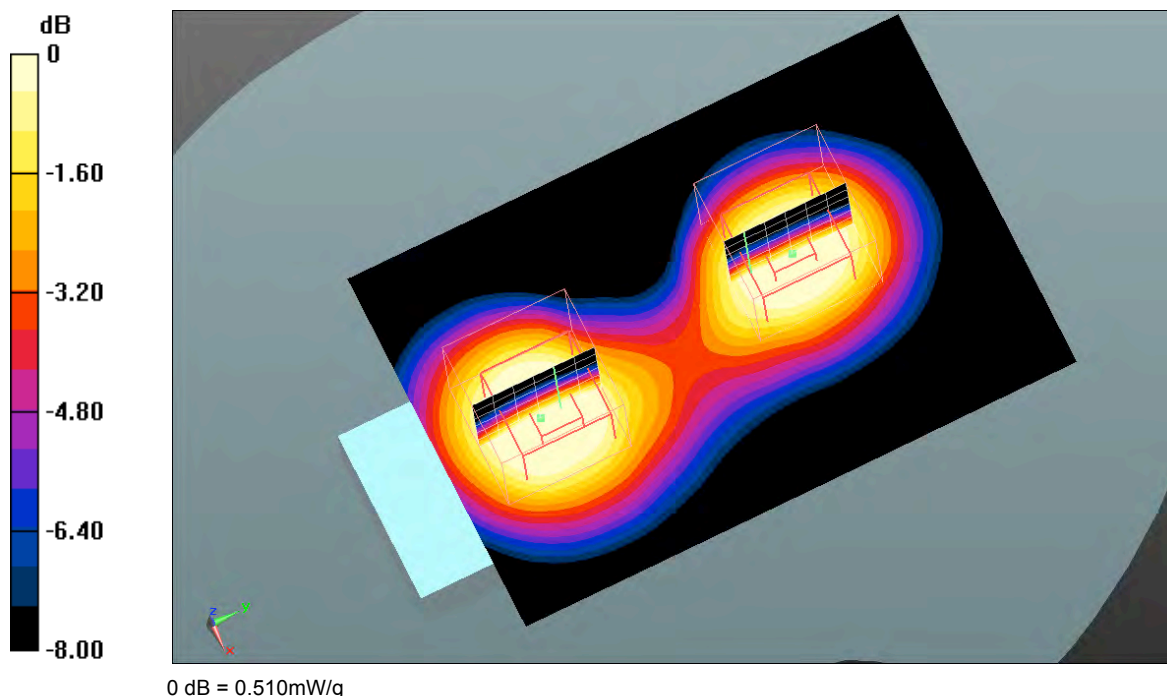
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 13.761 V/m; Power Drift = -0.20 dB

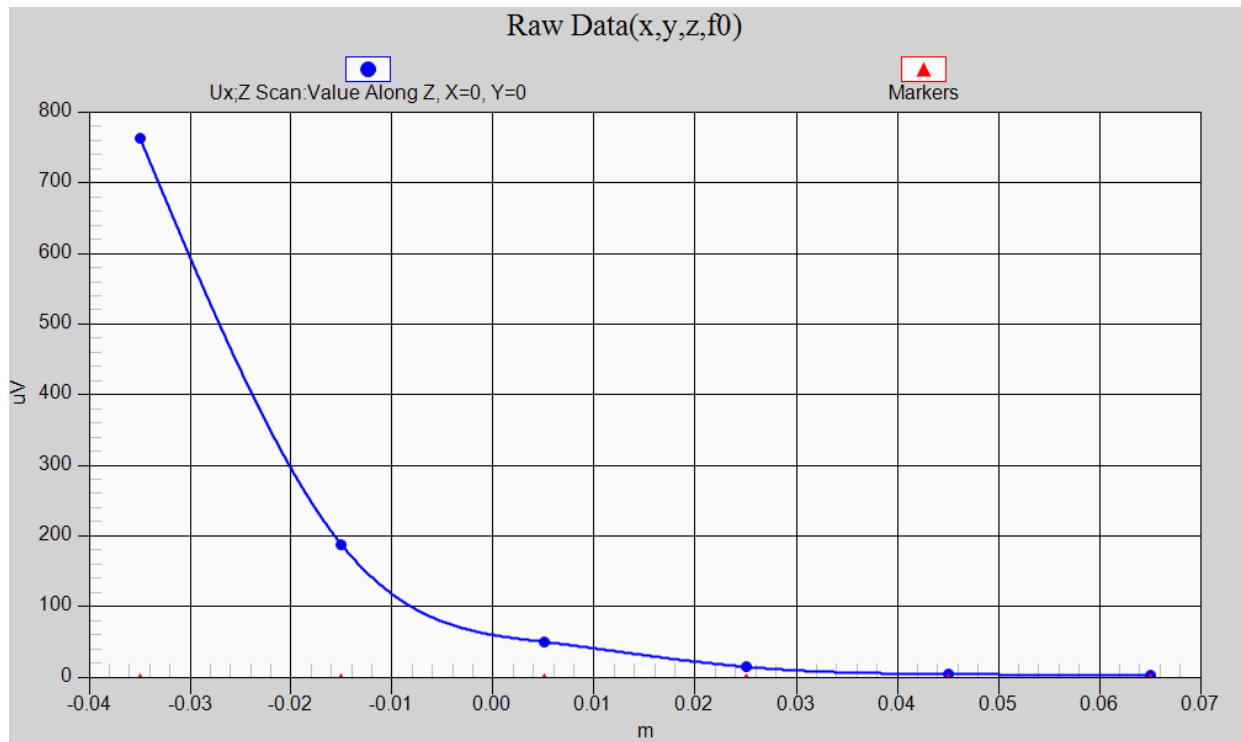
Peak SAR (extrapolated) = 0.692 W/kg

SAR(1 g) = 0.447 mW/g; SAR(10 g) = 0.275 mW/g

Maximum value of SAR (measured) = 0.513 mW/g



14.2.4 Z-axis plot



14.2.5 Rear of EUT toward phantom, 1.0 cm separation, body SAR (1 g SAR)

Date/Time: 11/7/2011 8:01:19 AM, Date/Time: 11/7/2011 8:08:05 AM

Test Laboratory: QUALCOMM Incorporated

20111105_MPERS_Lanyard_CDMA_BC1-rear

DUT: MPERS Lanyard; Type: module phone; Serial: 4

Communication System: CDMA PCS; Communication System Band: CDMA PCS; Frequency: 1851.25 MHz; Communication System PAR: 0 dB

Medium parameters used: $f = 1851.25$ MHz; $\sigma = 1.458$ mho/m; $\epsilon_r = 51.832$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ET3DV6 - SN1733; ConvF(4.61, 4.61, 4.61); Calibrated: 2/16/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 2/8/2011
- Phantom: SAM with CRP; Type: SAM; Phantom Serial: 209
- Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

Configuration/MPERS Belt clip, Rear of device toward phantom, 1.0 cm separation, Low/Area Scan (81x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.021 mW/g

Configuration/MPERS Belt clip, Rear of device toward phantom, 1.0 cm separation, Low/Zoom Scan (7x7x7)/Cube 0:

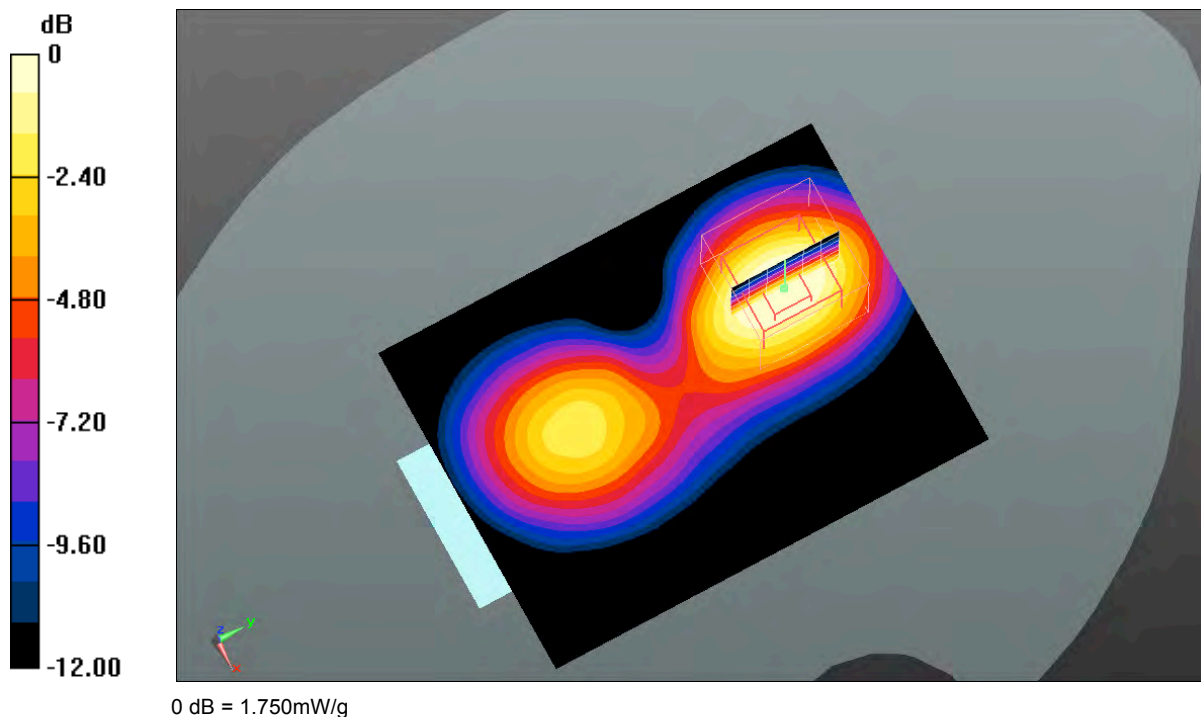
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 19.614 V/m; Power Drift = -0.18 dB

Peak SAR (extrapolated) = 2.438 W/kg

SAR(1 g) = 1.58 mW/g; SAR(10 g) = 0.897 mW/g

Maximum value of SAR (measured) = 1.752 mW/g



14.2.6 Rear of EUT toward phantom, 0 cm separation, hand/wrist SAR (10 g SAR)

Date/Time: 8/19/2011 2:33:51 PM, Date/Time: 8/19/2011 2:40:17 PM

Test Laboratory: QUALCOMM Incorporated

20110819_MPERS_#1_Lanyard_CDMA_BC0-rear

DUT: MPERS Lanyard; Type: module phone; Serial: 4

Communication System: CDMA835; Communication System Band: CDMA CELL; Frequency: 836.49 MHz; Communication System PAR: 0 dB

Medium parameters used: $f = 836.505$ MHz; $\sigma = 0.953$ mho/m; $\epsilon_r = 54.427$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ET3DV6 - SN1733; ConvF(6.45, 6.45, 6.45); Calibrated: 2/16/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 2/8/2011
- Phantom: SAM with CRP; Type: SAM; Phantom Serial: 209
- Measurement SW: DASYS2, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

Configuration/MPERS Lanyard TP1, Rear of device toward phantom, 0 cm separation, Middle/Area Scan (81x61x1):

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.525 mW/g

Configuration/MPERS Lanyard TP1, Rear of device toward phantom, 0 cm separation, Middle/Zoom Scan (7x7x7)/Cube 0:

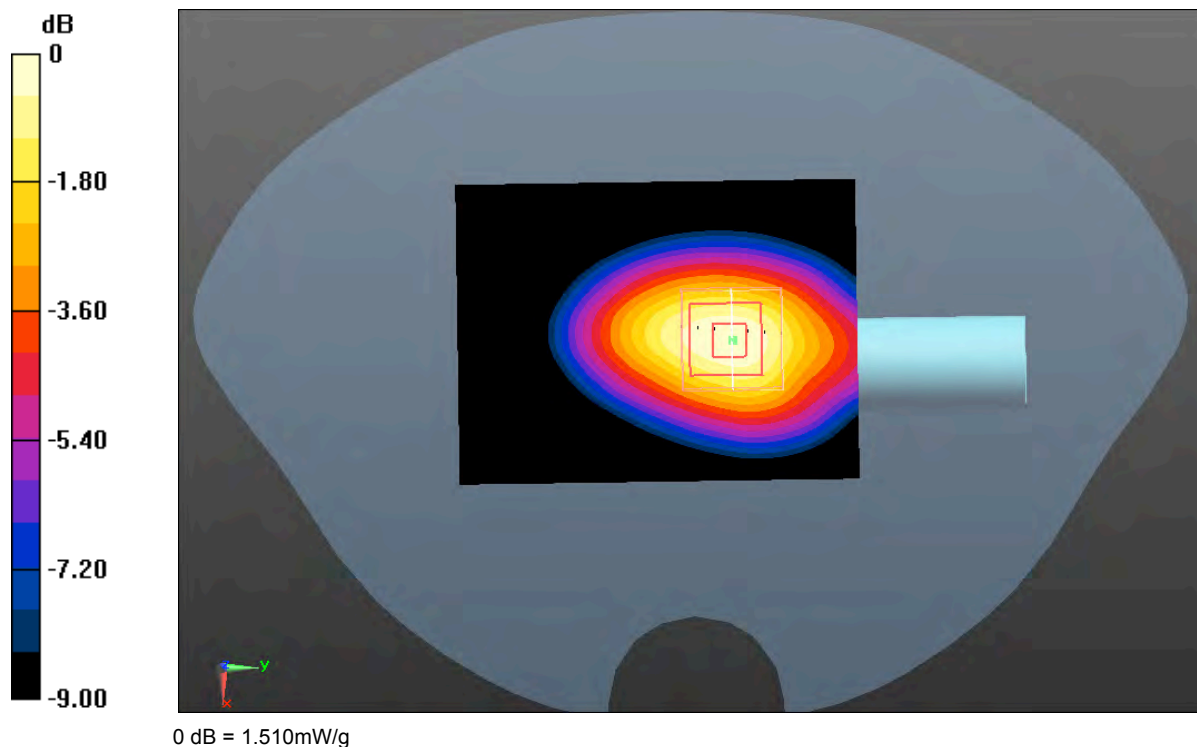
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 36.331 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 2.133 W/kg

SAR(1 g) = 1.4 mW/g; SAR(10 g) = 0.893 mW/g

Maximum value of SAR (measured) = 1.512 mW/g



Date/Time: 9/12/2011 7:36:15 PM, Date/Time: 9/12/2011 8:00:57 PM

Test Laboratory: QUALCOMM Incorporated

20110912_MPERS_#1_Lanyard_CDMA_BC1-rear1

DUT: MPERS Lanyard; Type: module phone; Serial: 4

Communication System: CDMA PCS; Communication System Band: CDMA PCS; Frequency: 1880 MHz; Communication System
PAR: 0 dB

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.506$ mho/m; $\epsilon_r = 51.998$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ET3DV6 - SN1733; ConvF(4.61, 4.61, 4.61); Calibrated: 2/16/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 2/8/2011
- Phantom: SAM with CRP; Type: SAM; Phantom Serial: 209
- Measurement SW: DASY52, Version 52.6 (1); SEMCAD X Version 14.4.2 (2595)

Configuration/MPERS Lanyard TP1, Rear of device toward phantom, 0 cm separation, Middle/Area Scan (101x61x1):

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 5.192 mW/g

Configuration/MPERS Lanyard TP1, Rear of device toward phantom, 0 cm separation, Middle/Zoom Scan (7x7x7)/Cube 0:

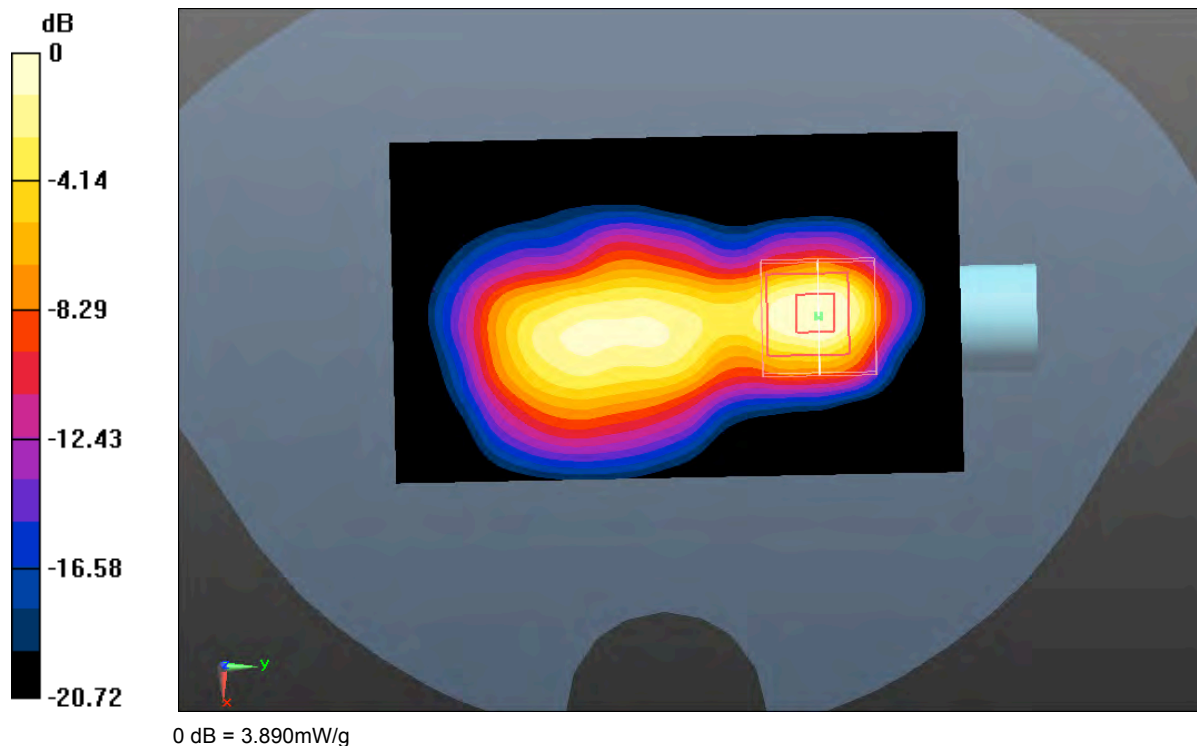
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 44.966 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 6.449 W/kg

SAR(1 g) = 3.34 mW/g; SAR(10 g) = 1.61 mW/g

Maximum value of SAR (measured) = 3.894 mW/g



15. Calibration Data

The following pages show calibration certification data for the Schmid & Partner AG DASY5 SAR system. Also included are Schmid & Partner's calibration lab accreditation certificates for ISO 17025.

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



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

Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

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

Client **Qualcomm USA**

Certificate No: **ET3-1733_Feb11**

CALIBRATION CERTIFICATE

Object **ET3DV6 - SN:1733**

Calibration procedure(s) **QA CAL-01.v7, QA CAL-12.v6, QA CAL-23.v4, QA CAL-25.v3**
Calibration procedure for dosimetric E-field probes

Calibration date: **February 16, 2011**

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 $(22 \pm 3)^\circ\text{C}$ 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-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	01-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	01-Apr-10 (No. 217-01136)	Apr-11
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-10 (No. 217-01159)	Mar-11
Reference 20 dB Attenuator	SN: S5086 (20b)	30-Mar-10 (No. 217-01161)	Mar-11
Reference 30 dB Attenuator	SN: S5129 (30b)	30-Mar-10 (No. 217-01160)	Mar-11
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	23-Apr-10 (No. DAE4-654_Apr10)	Apr-11
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Marcel Fehr	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	
Issued: February 17, 2011			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			

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



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

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

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	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., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- 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:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E^2 -field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z}** = NORM_{x,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
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}** are numerical linearization parameters in dB assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media.
- VR**: VR is the validity range of the calibration related to the average diode voltage or DAE voltage in mV.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ 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 NORM_{x,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.

ET3DV6 – SN:1733

February 16, 2011

Probe ET3DV6

SN:1733

Manufactured: September 27, 2002
Calibrated: February 16, 2011

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

ET3DV6- SN:1733

February 16, 2011

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1733

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$) ^A	1.55	1.56	1.61	± 10.1 %
DCP (mV) ^B	99.8	96.3	98.3	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc ^E (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	130.3	±2.5 %
			Y	0.00	0.00	1.00	131.1	
			Z	0.00	0.00	1.00	130.1	
10154	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	7.40	X	6.96	66.1	20.0	108.9	±3.0 %
			Y	7.19	67.0	20.8	110.9	
			Z	7.05	66.4	20.3	109.3	
10155	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)	8.10	X	8.09	67.4	21.1	114.3	±3.8 %
			Y	8.32	68.3	21.9	116.3	
			Z	8.11	67.5	21.2	115.2	
10175	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	6.50	X	5.55	66.5	20.0	134.0	±2.2 %
			Y	5.61	67.0	20.6	135.1	
			Z	5.53	66.5	20.1	134.0	
10176	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	7.20	X	6.24	67.6	20.9	133.0	±3.3 %
			Y	6.33	68.3	21.7	134.8	
			Z	6.25	67.8	21.2	133.3	
10011	UMTS-FDD (WCDMA)	3.20	X	3.36	65.7	17.8	141.0	±0.7 %
			Y	3.37	65.8	18.1	142.6	
			Z	3.36	66.0	18.2	140.4	
10012	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	1.90	X	2.73	67.0	17.7	143.8	±0.7 %
			Y	2.55	65.8	17.5	145.4	
			Z	2.65	67.1	18.2	143.0	
10013	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	9.50	X	11.19	71.0	23.6	139.8	±5.2 %
			Y	11.52	72.0	24.2	140.8	
			Z	11.12	70.8	23.7	139.2	
10023	GPRS-FDD (TDMA, GMSK, TN 0)	9.20	X	6.15	78.3	19.4	136.8	±1.7 %
			Y	5.95	81.9	21.3	129.0	
			Z	4.50	75.8	18.4	126.5	
10024	GPRS-FDD (TDMA, GMSK, TN 0-1)	6.19	X	9.83	82.6	18.5	123.3	±1.4 %
			Y	24.60	97.3	23.2	117.4	
			Z	7.46	81.3	18.1	117.8	
10039	CDMA2000 (1xRTT, RC1)	4.60	X	4.67	66.3	18.7	139.7	±1.2 %
			Y	4.69	66.3	19.0	142.6	
			Z	4.67	66.3	18.8	140.0	

ET3DV6– SN:1733

February 16, 2011

Modulation Calibration Parameters (cont.)

10081	CDMA2000 (1xRTT, RC3)	4.00	X	3.84	65.4	18.1	136.0	±0.9 %
			Y	3.91	65.8	18.5	139.2	
			Z	3.87	65.8	18.4	137.6	
10103	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	5.75	X	7.18	71.9	21.7	149.7	±1.9 %
			Y	6.10	68.7	20.5	106.4	
			Z	5.96	68.1	19.9	104.5	
10104	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	6.40	X	6.84	67.5	19.9	111.7	±2.7 %
			Y	6.93	68.1	20.6	114.1	
			Z	6.83	67.6	20.1	112.9	
10108	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	5.75	X	5.83	65.4	18.6	109.2	±1.7 %
			Y	6.07	66.3	19.4	113.2	
			Z	5.97	66.0	19.1	111.0	
10109	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	6.40	X	6.90	66.3	19.4	116.0	±2.5 %
			Y	7.08	67.0	20.0	119.6	
			Z	6.93	66.5	19.6	117.8	
10080	CDMA2000 (1xEV-DO, 153.6 kbps)	4.40	X	4.42	66.3	18.8	142.2	±0.9 %
			Y	4.40	66.2	18.9	143.8	
			Z	4.48	66.7	19.2	141.9	

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 5 and 6).

^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.

ET3DV6– SN:1733

February 16, 2011

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1733

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	Depth (mm)	Unct. (k=2)
450	43.5	0.87	7.31	7.31	7.31	0.18	2.13	± 13.4 %
750	41.9	0.89	6.89	6.89	6.89	0.70	1.73	± 12.0 %
835	41.5	0.90	6.56	6.56	6.56	0.61	1.88	± 12.0 %
900	41.5	0.97	6.43	6.43	6.43	0.55	2.05	± 12.0 %
1640	40.3	1.29	5.78	5.78	5.78	0.52	2.44	± 12.0 %
1750	40.1	1.37	5.46	5.46	5.46	0.54	2.31	± 12.0 %
1900	40.0	1.40	5.20	5.20	5.20	0.51	2.38	± 12.0 %
1950	40.0	1.40	5.04	5.04	5.04	0.51	2.36	± 12.0 %
2450	39.2	1.80	4.46	4.46	4.46	0.78	1.66	± 12.0 %

^C Frequency validity 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.

^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.

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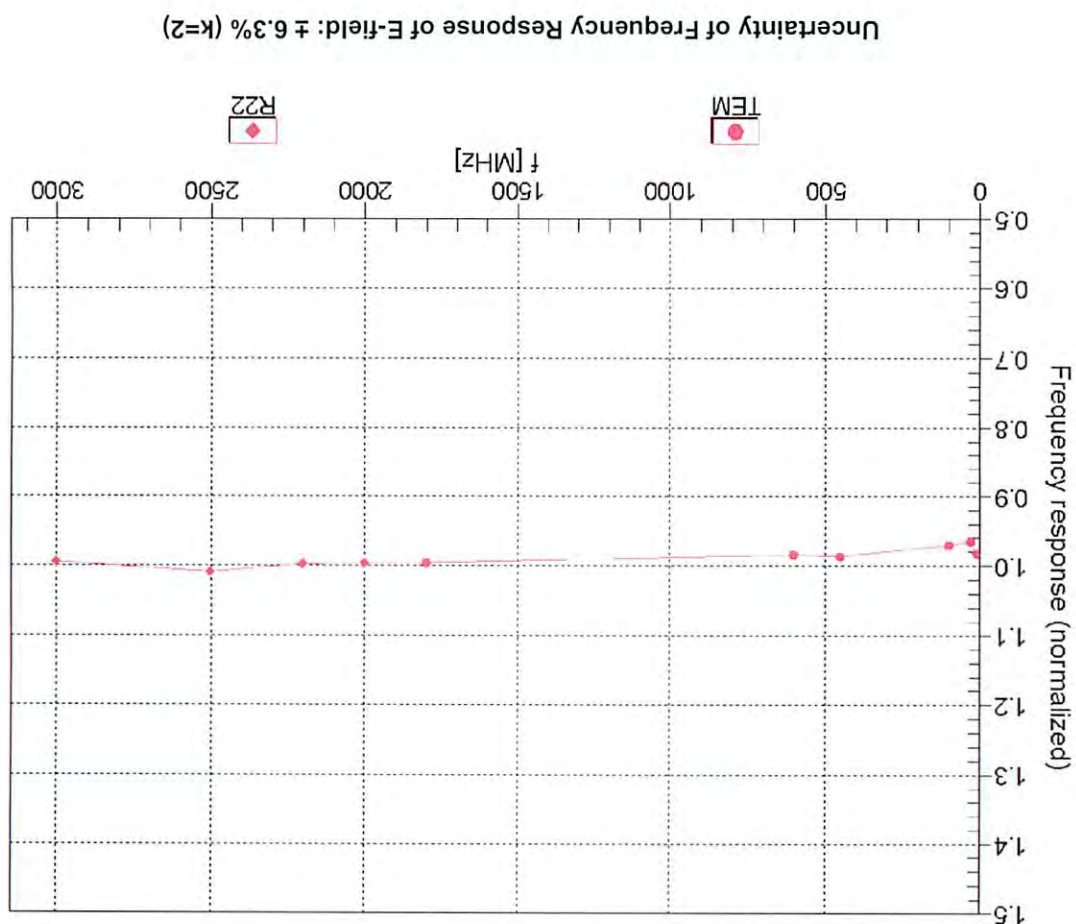
DASY/EASY - Parameters of Probe: ET3DV6- SN:1733

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	Depth (mm)	Unct. (k=2)
450	56.7	0.94	7.65	7.65	7.65	0.13	2.16	± 13.4 %
750	55.5	0.96	6.55	6.55	6.55	0.78	1.73	± 12.0 %
835	55.2	0.97	6.45	6.45	6.45	0.72	1.83	± 12.0 %
900	55.0	1.05	6.34	6.34	6.34	0.66	1.90	± 12.0 %
1640	53.8	1.40	5.23	5.23	5.23	0.57	2.72	± 12.0 %
1750	53.4	1.49	4.78	4.78	4.78	0.53	2.86	± 12.0 %
1900	53.3	1.52	4.61	4.61	4.61	0.55	2.79	± 12.0 %
1950	53.3	1.52	4.67	4.67	4.67	0.59	2.58	± 12.0 %
2450	52.7	1.95	4.05	4.05	4.05	0.88	1.36	± 12.0 %

^C Frequency validity 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.

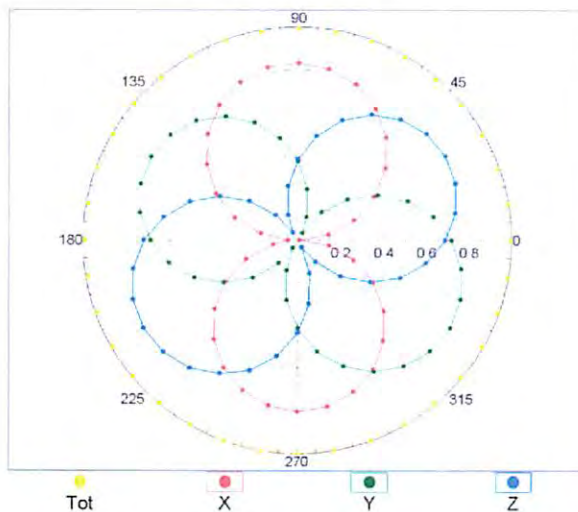
^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty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



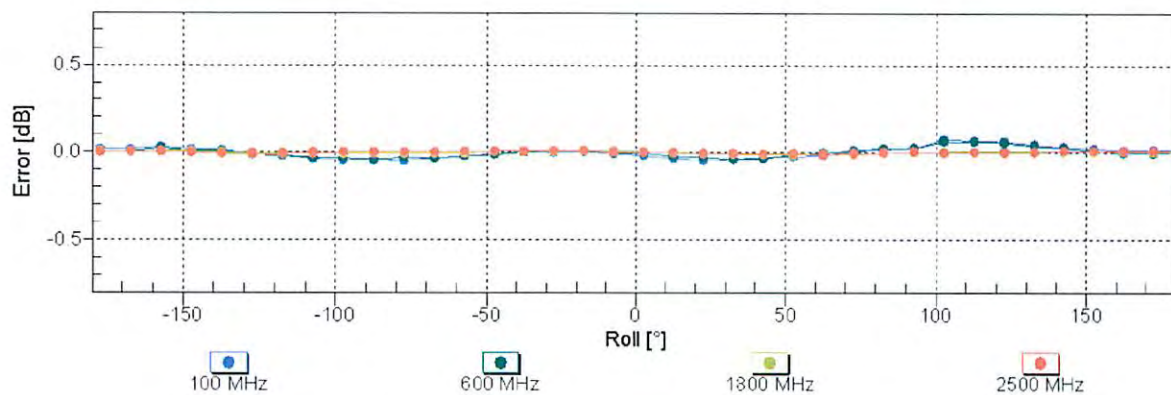
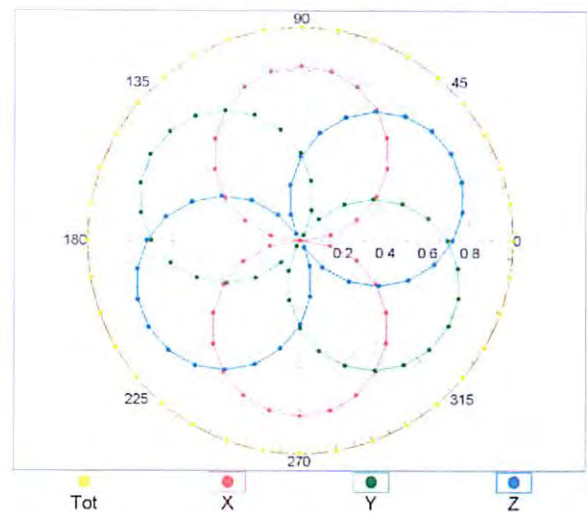
Frequency Response of E-Field
 (TEM-Cell: if1110 EXX, Waveguide: R22)

Receiving Pattern (ϕ), $\theta = 0^\circ$

f=600 MHz, TEM



f=1800 MHz, R22

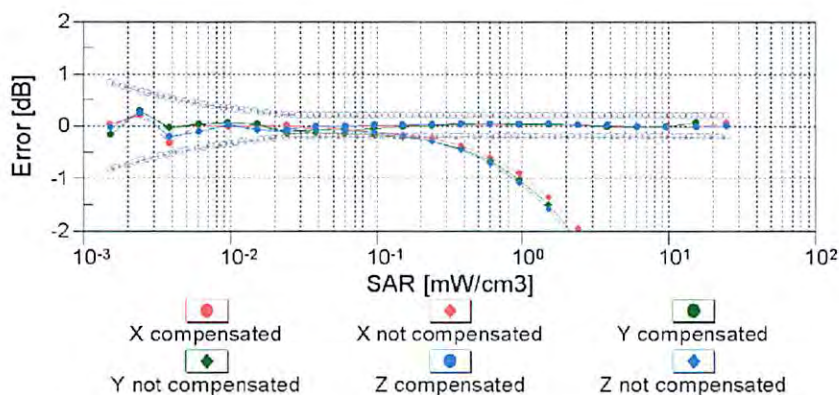
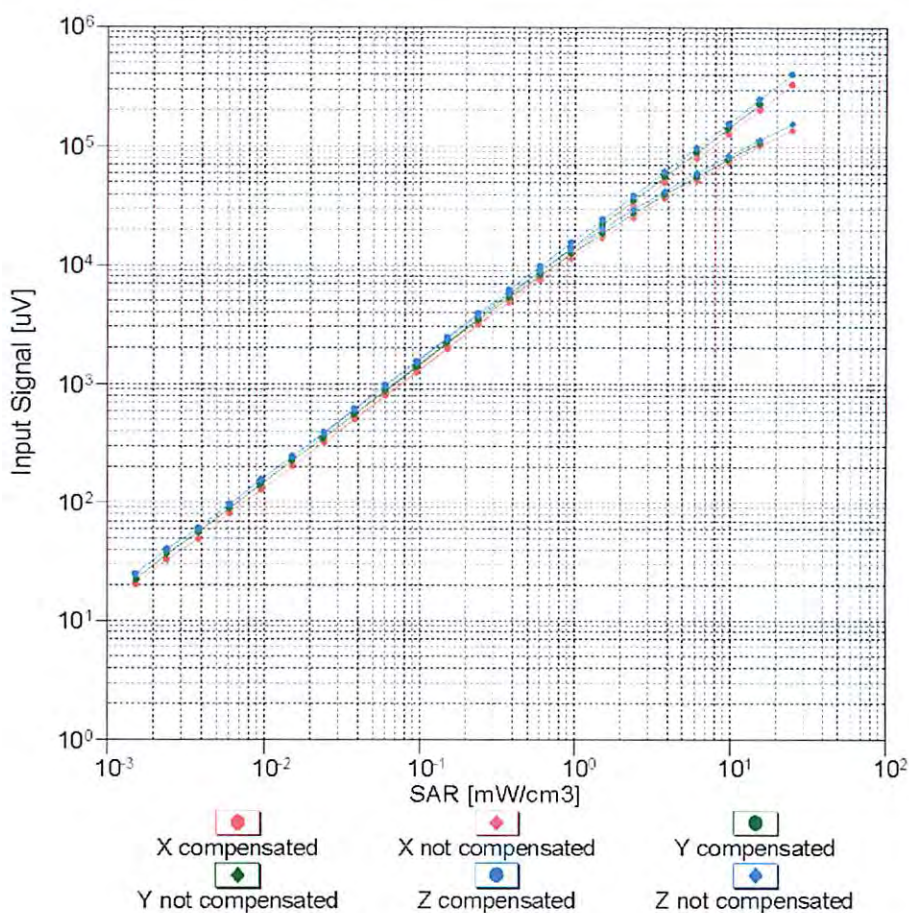


Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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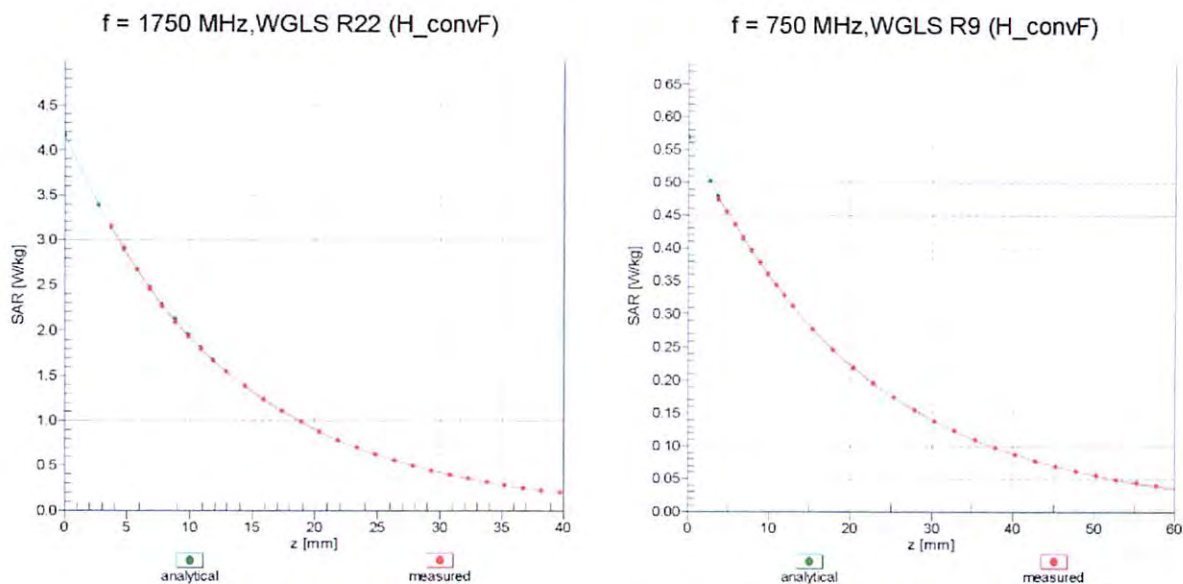
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Dynamic Range f(SAR_{head}) (TEM cell , f = 900 MHz)



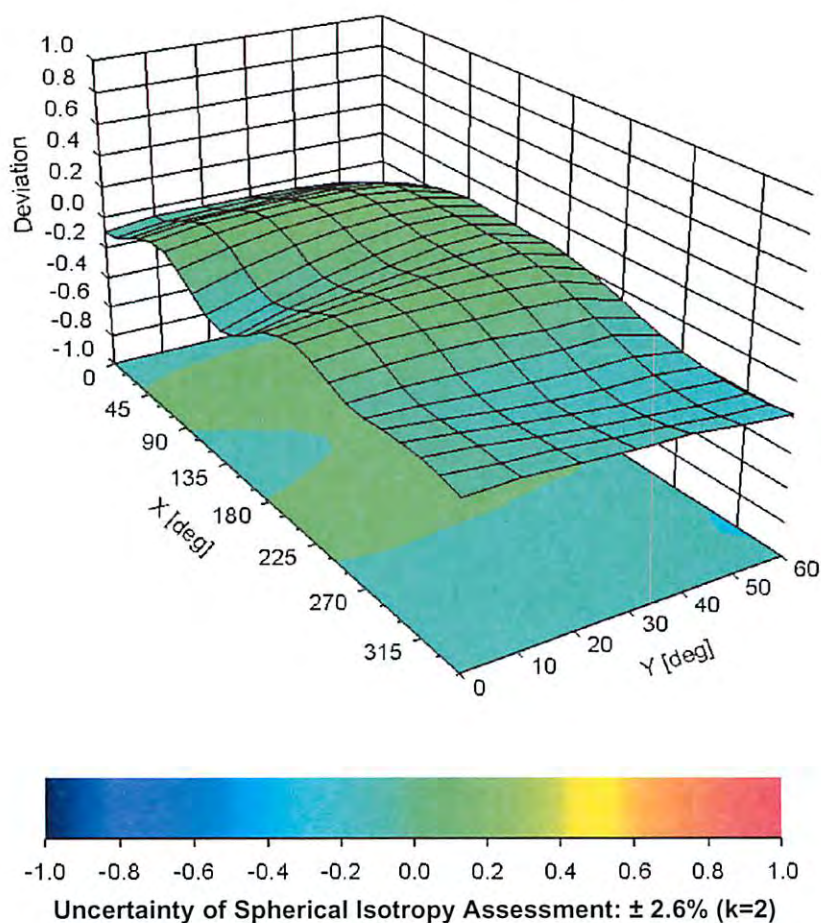
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



Deviation from Isotropy in Air

Error (ϕ , θ), $f = 900 \text{ MHz}$



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DASY/EASY - Parameters of Probe: ET3DV6 - SN:1733

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	enabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	6.8 mm
Probe Tip to Sensor X Calibration Point	2.7 mm
Probe Tip to Sensor Y Calibration Point	2.7 mm
Probe Tip to Sensor Z Calibration Point	2.7 mm
Recommended Measurement Distance from Surface	4 mm

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



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

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

Accreditation No.: **SCS 108**

Client **Qualcomm USA**

Certificate No: **D835V2-466_Oct10**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 466**

Calibration procedure(s) **QA CAL-05.v7**
Calibration procedure for dipole validation kits

Calibration date: **October 19, 2010**

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 $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390S85 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Dimce Iliev	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: October 19, 2010

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