UNDP-1 Lenovo® Thinkpad® X200T FCC SAR Report

80-VK276-3 Rev. A

June 24, 2008

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June 19, 2008

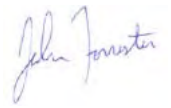
UNDP-1 Lenovo® Thinkpad® X200T FCC SAR Report
80-VK276-3 Rev. A

Revision history

Revision	Date	Description
A	June 2008	Initial release

5775 Morehouse Dr.
San Diego CA 92121

Overview

Test Report Reference:	80-VK276-3 Rev. A
Responsible Engineer:	John Forrester
Signature:	
Test Engineer:	Mark Ortlieb
Signature:	
Date of issue:	24 June 2008
Test Laboratory:	QUALCOMM Incorporated 5775 Morehouse Dr. San Diego CA 92121 (General Telephone) 1 858 587 1121
Model Tested:	UNDP-1 with Lenovo ThinkPad X200 Tablet
Test Specification Standard(s):	*FCC CFR47 Part 2.1093: Radiofrequency radiation exposure evaluation: portable devices* *FCC/OET Bulletin 65, including Supplement C, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields* *FCC "SAR Measurement Procedures for 3G Devices" (October 2007)* *FCC "SAR Evaluation Considerations for Laptop Computers with Antennas Built-in on Display Screens" (December 2007)* *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*
Results:	The UNDP-1 embedded in a Lenovo® ThinkPad® X200 Tablet (Model: X200T) complies with the requirements of the aforementioned standards and is in compliance with the FCC Part 2.1093 RF exposure limit.

Contents

Figures

Tables

1. Test summary

1.1 Equipment tested

A UNDP-1 WWAN mPCIe card embedded in a Lenovo ThinkPad X200T Series notebook computer was tested for SAR compliance with FCC regulations.

X200T computer also has embedded Bluetooth and WLAN capabilities that were not tested as part of this test report. The WLAN is categorized as a mobile device due to the separation distance between the antenna and the user and also does not transmit simultaneously with the WWAN module. Bluetooth does transmit simultaneously with the WWAN module but was not evaluated as the transmit power is less then 60/f.

1.2 Maximum (Worst Case Results)

Tables 1-1 and 1-2 give maximum SAR results for head and body-worn positions respectively.

Table 1-1 Maximum SAR

Band	Mode	Channel	1 g SAR	Result
Cell	GPRS 2 UL	High	0.373 mW/g	Pass
PCS	EV-DO	High	0.561 mW/g	Pass

1.3 Measurement Uncertainty

Table 1-2 Measurement Uncertainty

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

1.4 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 1-3 1 Gram SAR Limits

Localized SAR (head and trunk)	1.6 mW/g

2. EUT Description

2.1 General

Table 2-1 WWAN Module Information

WWAN Module Model	UNDP-1
WWAN Module FCC ID	J9CUNDP-1L
WWAN Module Description	UNDP-1 is a PCI Express Mini Card with WWAN connectivity for the WCDMA/HSPA, GSM/GPRS/EDGE and CDMA2000 1x/1x-EVDO protocols, plus GPS position location.
Host(s) Tested:	ThinkPad X200 Tablet (Model: X200T)
WWAN Technologies	GSM/GPRS/EDGE CDMA 1x Rel0 CDMA EV-DO RevA WCDMA/HSPA
Equipment Categories	GPRS Category 10 EDGE Category 10 HSDPA Category 8 (Release 6) HSUPA Category 5 (Release 6)
TX Frequencies	GSM/GPRS/EDGE: 824.2 – 848.8 MHz GSM/GPRS/EDGE: 1850.2 – 1909.8 MHz CDMA 1x/EV-DO: 824.7 – 848.31 MHz CDMA 1x/EV-DO: 1851.25 – 1908.75 MHz WCDMA/HSPA: 826.4 – 846.6 MHz WCDMA/HSPA: 1852.4 – 1907.5 MHz Bands Not used in the United States: GSM/GPRS/EDGE: 880.2 – 914.8 MHz GSM/GPRS/EDGE: 1710.2 – 1784.8 MHz WCDMA/HSPA: 1922.6 – 1977.4 MHz
Duty Cycle(s)	CDMA/WCMDA: 100% GPRS 1 uplink slot: 12.5% GPRS 2 uplink slots: 25%
Power Supply	3.3Vdc supplied by host notebook computer

Table 2-2 Host Notebook Information

Host Notebook Model	ThinkPad X200 Tablet (Model: X200T)
WLAN FCC ID	N/A
Bluetooth FCC ID	N/A
UWB FCC IC	N/A
WWAN Antenna(s)	ACON P/N: 25.90673.001 Wistron NeWeb P/N: 25.90667.001
BT Antenna(s)	N/A
WLAN Antenna(s)	N/A
Minimum WWAN to user separation distance (cm)	1.2 (Secondary Portrait) 3.05 (Tablet mode) 23.8 (Notebook mode)
WLAN to user separation distance (cm)	N/A
Bluetooth to user separation distance (cm)	N/A
WWAN to WLAN antenna separation distance (cm)	N/A
WWAN to Bluetooth antenna separation distance (cm)	6.5

Table 2-3 Simultaneous Transmission Information

	WLAN	Bluetooth
WWAN	No	Yes
WLAN	N/A	Yes

3. Conducted Transmit Power Results

Conducted transmit power was tested in accordance with FCC 3G procedures, 3GPP and 3GPP2 standards. The test procedure for configuring the EUT to transmit at maximum output power is in section 11.

All transmit power results are based on an average detector. The rationale and calculations determining the SAR configurations tested per the FCC procedure are detailed in section 4. .

Table 3-1 GPRS Maximum Transmit Power

	GSM850 Channel			GSM1900 Channel		
Mode	**128**	**190**	**251**	**512**	**661**	**810**
GPRS 2UL	26.12	26.16	26.23	23.19	23.01	22.97

Table 3-2 CDMA 1x/EV-DO Maximum Transmit Power

REV	CDMA BCO (850MHz)			CDMA BC1 (1900MHz)		
RC/TAP	**Low**	**Mid**	**High**	**Low**	**Mid**	**High**
RC3 (SO55)	24.53	24.56	24.62	24.58	24.44	24.73
RTAP rate = 153.6kbps	24.24	24.23	24.51	**24.42**	**24.14**	**24.49**
RETAP - payload size = 4096	24.48	24.5	24.46	24.47	24.35	24.6

Table 3-3 WCDMA/HSPA Maximum Transmit Power Results

		Band V Channel			Band II Channel		
Mode	**3GPP Subtest**	**Low**	**Mid**	**High**	**Low**	**Mid**	**High**
Rel99	R99	24.11	24.06	24.14	24.21	24.08	24.15
Rel6 HSDPA	1	23.48	23.61	23.60	24.33	24.18	24.13
	2	23.12	23.18	23.10	23.85	23.88	23.75
	3	23.07	23.12	23.06	23.92	24.02	23.88
	4	22.67	22.77	22.64	23.55	23.54	23.46
Rel6 HSUPA	1	23.89	23.72	23.68	23.58	23.84	23.26
	2	22.58	22.65	22.43	22.49	22.54	22.53
	3	22.08	22.19	22.04	22.45	22.54	22.61
	4	21.63	21.68	21.65	22.58	22.63	22.58
	5	23.16	23.55	22.75	24.18	24.32	24.18

4. SAR Test Matrix

Table 4-1 describes the SAR configurations tested for the EUT and host notebook described in this report per the FCC procedure "SAR Evaluation Considerations for Laptop Computers with Antennas Built-in on Display Screens" released in December of 2007.

The configurations tested are based on the calculations in Table 4-3 that are based on evaluation requirements summarized in Table 2 of the FCC procedure. The conducted powers used in the separation distance calculations is summarized in Table 4-2, which represents the highest transmit power test results from the data in section 3. . Per the FCC 3G Measurement procedures, modes have been omitted from Table 4-2 for the following reasons.

- Per FCC 3G 1x procedures, all modes have been eliminated that are less than 0.25dB greater than 1x RC3 (SO55)
- Per the FCC 3G procedures EV-DO Rev A has been omitted since the maximum transmit power results are less then the 1x RC3 and EV-DO Rel 0 test results.
- Per the FCC 3G procedures, HSDPA and HSUPA have been omitted since the maximum transmit power results are less then the R99 test results.

All SAR configurations are based on calculations for an individual transmitter or antenna. Simultaneous transmitter considerations have not been completed for these reasons:

- WWAN does not transmit simultaneously with WLAN
- Bluetooth Power is $<60/f_{(GHz)}$

Table 4-1 SAR Testing Completed per FCC Laptop Procedures

Mode	Band	Channels	Rational
GPRS 2UL	850 MHz	Low/mid/high	T Test highest low/mid/high channels since the antenna-to-user separation distance provided by host notebook computer is less then the calculated antenna-to-user distance per Table 2 of FCC procedure.
EV-DO R0	1900 MHz	Low/mid/high	Test highest low/mid/high channels since the antenna-to-user separation distance provided by host notebook computer is less then the calculated antenna-to-user distance per Table 2 of FCC procedure. Note: Only EV-DO R0 is tested since the other modes are equal or less transmit power.

Table 4-2 Maximum Transmit Power Summary (dBm)

	Cell			PCS		
Mode	Low	Mid	High	Low	Mid	High
1EV-DO R0	24.24	24.23	24.51	**24.42**	**24.14**	**24.49**
GPRS 2UL	**26.12**	**26.16**	**26.23**	23.19	23.01	22.97

Table 4-3 SAR Evaluation Requirements per FCC laptop procedure (Individual transmitter requirements)

Technology	Freq (MHz)	Maximum Average Conducted Power (dBm)	Maximum Average Conducted Power (mW)	$60/F_{(GHz)}$ (mW)	1/2*n (cm) per FCC Procedure	Minimum antenna-user dist (cm)	NB1 Antenna-User Distance (cm)	SAR Test Requirement per RF Conditions and Test Reduction Procedure	SAR Measured
1x RC3	824	24.5	283.8	72.8	1	6	3.05	Full SAR test	No
1x RC3	836	24.6	285.8	71.8	1	6	3.05	Full SAR test	No
1x RC3	849	24.6	289.7	70.7	2	7	3.05	Full SAR test	No
EV_DO R0	824	24.2	265.5	72.8	1	6	3.05	Full SAR test	No
EV_DO R0	836	24.2	264.9	71.8	1	6	3.05	Full SAR test	No
EV_DO R0	849	24.5	282.5	70.7	1	6	3.05	Full SAR test	No
R99	824	24.1	257.6	72.8	1	6	3.05	Full SAR test	No
R99	836	24.1	254.7	71.8	1	6	3.05	Full SAR test	No
R99	849	24.1	259.4	70.7	1	6	3.05	Full SAR test	No
GPRS 2UL	824	26.1	409.3	72.8	2	7	3.05	Full SAR test	Yes
GPRS 2UL	836	26.2	413.0	71.8	2	7	3.05	Full SAR test	Yes
GPRS 2UL	849	26.2	419.8	70.7	2	7	3.05	Full SAR test	Yes
1x RC3	1850	24.6	287.1	32.4	4	9	3.05	Full SAR test	No
1x RC3	1880	24.4	278.0	31.9	4	9	3.05	Full SAR test	No
1x RC3	1910	24.7	297.2	31.4	4	9	3.05	Full SAR test	No
EV_DO R0	1850	24.4	276.7	32.4	4	9	3.05	Full SAR test	Yes
EV_DO R0	1880	24.1	259.4	31.9	4	9	3.05	Full SAR test	Yes
EV_DO R0	1910	24.5	281.2	31.4	4	9	3.05	Full SAR test	Yes
R99	1850	24.2	263.6	32.4	4	9	3.05	Full SAR test	No
R99	1880	24.1	255.9	31.9	4	9	3.05	Full SAR test	No
R99	1910	24.2	260.0	31.4	4	9	3.05	Full SAR test	No
GPRS 2UL	1850	23.2	208.4	32.4	3	8	3.05	Full SAR test	No
GPRS 2UL	1880	23.0	200.0	31.9	3	8	3.05	Full SAR test	No
GPRS 2UL	1910	23.0	198.2	31.4	3	8	3.05	Full SAR test	No

5. SAR Test Facility

5.1 General

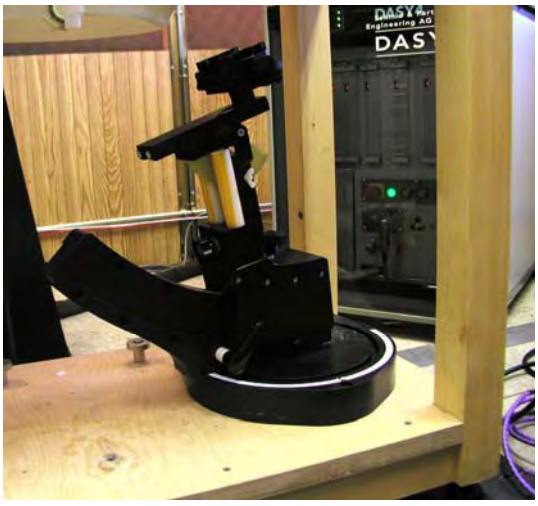
Test Location	QUALCOMM Incorporated 5775 Morehouse Dr. San Diego CA 92121
Temperature Range	15-35 °C (23°C actual)
Humidity Range	25-75% (37% actual)
Pressure	860-1060 mbar (1015 mB)

All of Qualcomm's 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 DASY4 system are capable of detecting signals as low as 5µW/g in the liquid dielectric, and so external fields are minimized by the screen room, leaving the phone as the dominate radiation source. The floor of the screen room is reflective, so the phantom bench is placed on four 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 DASY4 dosimetry system manufactured and calibrated by Schmid & Partner Engineering AG of Zurich, Switzerland. The DASY4 system consists of a six axis robot, a robot controller, a teach pendant, automation software on a 2.4 GHz Intel Pentium4 computer, data acquisition system, isotropic E-field probe, device positioning holder, and validation kit.
Figure 3-1 shows the robot arm, controller box and device positioning holder.

Figure 5-1 DASY4 system: Robot Arm, Controller box, Device Positioning Holder



5.3 E-field probe

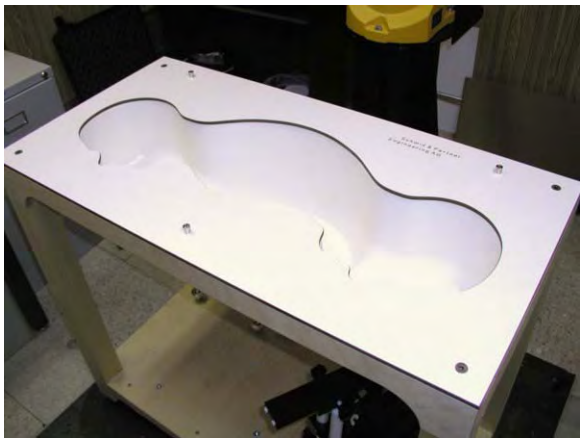
Manufactured by Schmid & Partner, Model ET3DV6. Calibrated by the manufacturer in head tissue simulating liquid at frequencies ranging from 835 MHz to 1.95 GHz. Dynamic range is said by the manufacturer to be 5

µW/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 ±0.1mm shell thickness. The DASY4 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 3-2 shows the SAM phantom.

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 H-P 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 Tables 3-1. The target values were obtained from the FCC OET Bulletin 65 Supplement C.

Table 5-1 Tissue Dielectric Properties at Time of Testing

			Permittivity (ε_r)				Conductivity (σ)			
	Frequency (MHz)	Section	Measured Values	Target Values	Deviation (%)	Limit	Measured Values	Target Values	Deviation (%)	Limit
06/17/08	835	Body	55.7	55.20	+0.9%	5%	0.94	0.97	-3.1%	5%
06/18/08	1900	Body	52.0	53.30	-2.4%	5%	1.53	1.52	+0.7%	5%

*Scaled to 30 dBm and normalization to tissue parameters per SAR sensitivities as provided by Schmid & Partner AG.

25 L of each of the tissue simulating liquids were prepared using the following proportions of ingredients:

Body Liquids:
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. SAR System Specifications and Calibration

6.1 System Specifications

Figure 6-1 shows a diagram of the Schmid & Partner DASY4 system.

Figure 6-1 Diagram of DASY4 System, from S&P Applications Notes System Description and Setup

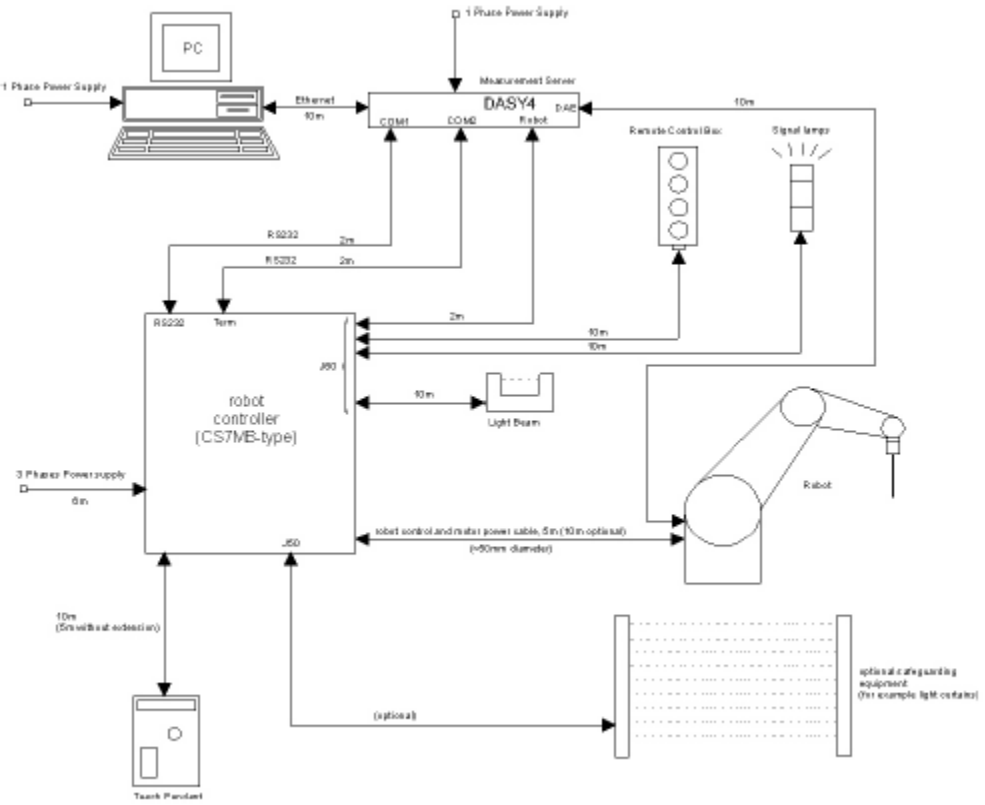


Table 6-1 Data Acquisition Information

Processor	Intel® Pentium® 4, 2.40 GHz
Operating System	Microsoft® Windows® XP
Software	DASY4 V4.7 Build 55, Schmid & Partners Eng. AG, Switzerland SEMCAD V1.8 Build 176
Surface Detection	Optical and Mechanical

Table 6-2 E-Field Probe Information

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 Information

Dielectric	Cellular band: Homogeneous sugar/salt/cellulose liquid PCS 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 6-4 SAR System Calibration Information

Equipment Mfr & Type	Serial number	Last Calibrated	Next Calibration
Schmid & Partner Engineering AG Dosimetric E-field Probe, ET3DV5	1733	9/4/2007	9/4/2008
Schmid & Partner Engineering AG dipole validation kit, D1900V2	5d019	11/28/2007	11/28/2008
Schmid & Partner Engineering AG dipole validation kit, D835V2	466	11/24/2007	11/24/2008
Schmid & Partner Engineering AG Data Acquisition Electronics, DAE3 V1	400	3/5/2008	3/5/2009
Gigatronics 8541C RF Power Meter	K82228	9/21/07	9/21/08
Hewlett-Packard 8714C Vector Network Analyzer	US38171129	5/2/2007	6/30/2008
Hewlett-Packard 85070M Dielectric Probe System	N/A	N/A	N/A
835 MHz Body Tissue Simulating Liquid	N/A	August 2006	N/A
1900 MHz Body Tissue Simulating Liquid	N/A	August 2006	N/A

7. SAR Measurement Procedure

7.1 EUT Configuration

The EUT was configured into the desired transmit configuration per the procedures defined in section 11.

7.2 Power Verification

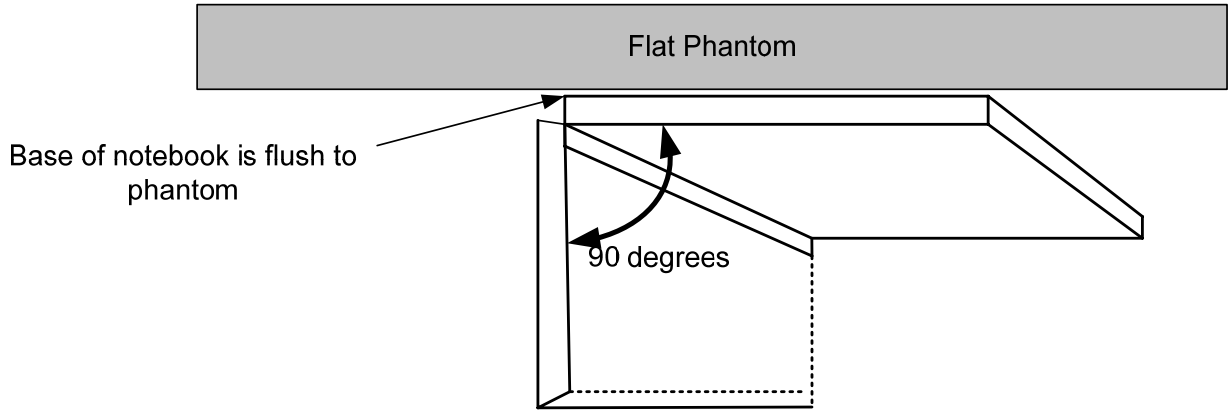
Prior to beginning SAR testing, conducted power was measured on the UNDP-1 module embedded in the host computer to verify functionality and the WWAN maximum transmit power values using the procedures defined in section 11. The results of the conducted power measurements are found in section 3.

7.3 Test Configurations

7.3.1 Laptop Position

The host computer was not tested in the Lap-held position as shown in Figure 7-1 as the WWAN antenna is >20cm from the end user.

Figure 7-1 Lap-held position drawing



7.3.2 Tablet Position

Table 7-2 Phantom to Notebook Surface Contact Designations

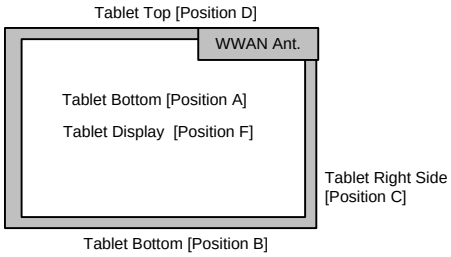


Table 7-3 Display Orientation Configurations

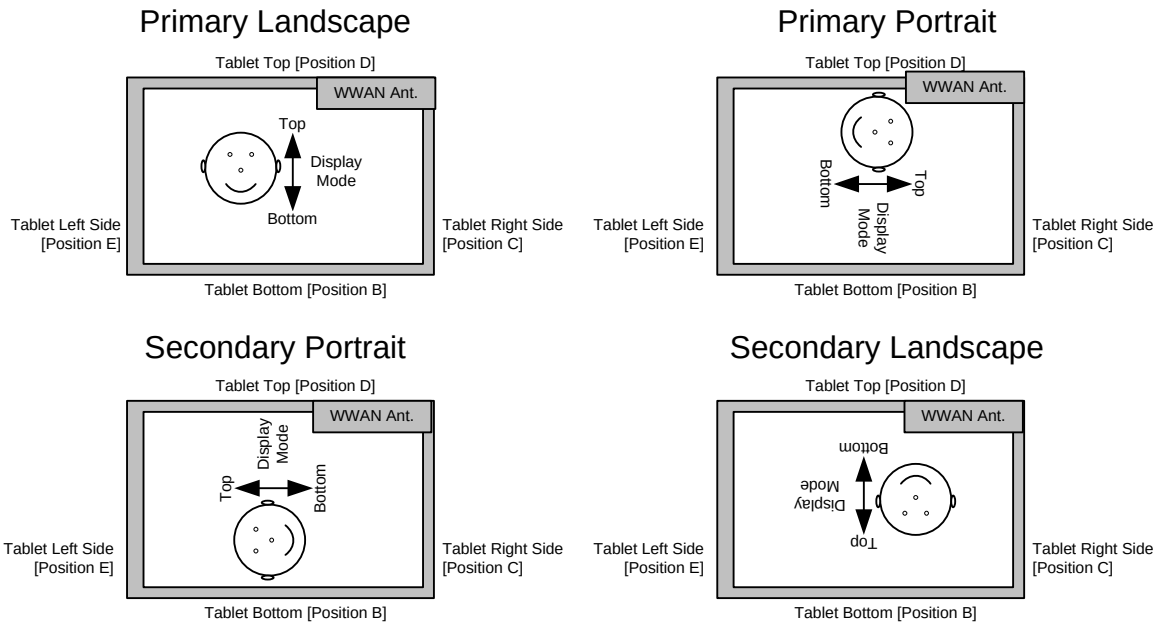


Table 7-4 Proposed SAR test positions

SAR Test Position (Surface Flush to Phantom)	Tablet Usage Mode	WWAN Antenna Angle	Description
A	Tablet	Fixed	**Tested**
B	Primary Landscape	Fixed	Not tested. WWAN antenna to user separation >20cm
C	Secondary Portrait	Fixed	Disabled via Software
D	Secondary Landscape	Fixed	Disabled via Software
E	Primary Portrait	Fixed	Not tested. WWAN antenna to user separation >20cm
F	Display Flush	Fixed	Not applicable

7.4 Scan procedure

The scan routine is set up as follows:
- Power verification measurement
- Area scan
- 7x7x7 cube (zoom) scan
- 15 cm Z-scan located at measured maximum
- Power verification re-test (Drift)

Both 1 g and 10 g measurements are handled with the same scan process.

8. Validation Data

8.1 General Validation Procedure

Validation scans were performed prior to testing of each different medium used. Prior to installing a body medium, a validation scan is performed using a corresponding head medium. A validation dipole antenna was selected that roughly matched the center frequency of the band being tested. 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 of 250 mW (20 dBm). Measured data is scaled to 30 dBm and tissue parameters normalized to correspond with values provided by manufacturer's calibration data. Validation SAR has a tolerance of ±10%.

If testing of a particular frequency band took more than one day, a new validation scan was done prior to commencing with testing for the subsequent day.

8.2 Validation Data

Table 9-1 shows validation data for the respective days of the test program.

Table 8-1 SAR Validation Data UNDP-1 Test Program

				1 g SAR (mW/g)			
Date	**Frequency (MHz)**	**Permittivity (ε_r)**	**Conductivity (σ)**	**Measured (20dBm)**	**Scaled and normalized***	**Target**	**Difference (%)**
06/17/2008	835	55.7	0.95	0.914	9.3	9.27	+0.4%
06/18/2008	1900	52.0	1.52	3.85	38.28	37.2	-2.9%
06/23/2008	1900	52.5	1.60	4.02	38.89	37.2	+4.6%
06/23/2008	835	0.964	56.3	0.901	9.15	9.27	-1.3%

Validation plots are in Section 13.

9. Test Result Summary

9.1 Numerical Data

Table 9-1 shows the 1 g SAR test data for the 2 frequency bands tested.

Table 9-1 Measured SAR Results

Mode	Position	Band	Channel	Freq	Drift (dB)	Measured 1g SAR (mW/g)
GPRS 2UL	Tablet	Cell	128	824.2	+0.095	0.0979
GPRS 2UL	Tablet	Cell	190	836.6	+0.006	0.164
GPRS 2UL	Tablet	Cell	251	848.8	-0.069	0.298
CDMA DO R0 153k	Tablet	PCS	25	1851.25	+ 0.175	0.129
CDMA DO R0 153k	Tablet	PCS	600	1880	-0.037	0.192
CDMA DO R0 153k	Tablet	PCS	1175	1908.75	-0.091	0.268
GPRS 2UL	SP	Cell	128	824.2	+0.028	0.126
GPRS 2UL	SP	Cell	190	836.6	+0.17	0.209
GPRS 2UL	SP	Cell	251	848.8	-0.127	0.373
CDMA DO R0 153k	SP	PCS	25	1851.25	+0.002	0.342
CDMA DO R0 153k	SP	PCS	600	1880	+0.027	0.393
CDMA DO R0 153k	SP	PCS	1175	1908.75	-0.02	0.561

10. 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 10-1 Measurement Uncertainty

	Uncertainty value (± %)	Prob. DIST	Div.	(ci) 1g	(ci) 10g	Std. Unc. (1g) (± %)	Std. Unc. (10g)	(vi) veff
Measurement System								
Probe Calibration	4.8	N	1	1	1	4.8	4.8	∞
Axial Isotropy	4.7	R	√3	0.7	0.7	1.9	1.9	∞
Hemispherical Isotropy	9.6	R	√3	0.7	0.7	3.9	3.9	∞
Boundary Effects	1	R	√3	1	1	0.6	0.6	∞
Linearity	4.7	R	√3	1	1	2.7	2.7	∞
System Detection Limits	1	R	√3	1	1	0.6	0.6	∞
Readout Electronics	1	N	1	1	1	1.0	1.0	∞
Response Time	0.8	R	√3	1	1	0.5	0.5	∞
Integration Time	2.6	R	√3	1	1	1.5	1.5	∞
RF Ambient Conditions	3	R	√3	1	1	1.7	1.7	∞
Probe Positioner	0.4	R	√3	1	1	0.2	0.2	∞
Probe Positioning	2.9	R	√3	1	1	1.7	1.7	∞
Max. SAR Eval.	1	R	√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	√3	1	1	2.9	2.9	∞
Phantom and Setup								
Phantom Uncertainty	4	R	√3	1	1	2.3	2.3	∞
Liquid Conductivity (target)	5	R	√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	√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 %**	

11. EUT Configuration Procedure

11.1 EUT Test Frequencies

Table 11-1 Test Frequencies

	850 MHz						1900 MHz					
	Low		Mid		High		Low		Mid		High	
	Ch	Freq	Ch	Freq	Ch	Freq	Ch	Freq	Ch	Freq	Ch	Freq
GSM	128	824.2	190	836.6	251	848.8	512	1850.2	661	1880	810	1909.8
CDMA	1013	824.7	384	836.52	777	848.31	25	1851.25	600	1880	1175	1908.75
WCDMA	UL: 4132 DL: 4357	826.4	UL: 4182 DL: 4407	836.4	UL: 4233 DL: 4458	846.6	UL: 9262 DL: 9847	1852.4	UL: 9400 DL: 9800	1880	UL: 9538 DL: 9763	1907.6

11.2 Call Box Simulator Information

Table 11-2 Communications Test Box Information

Make	Agilent	
Model	8960	
Cal Date	6/17/2007	
Serial Number	GB44052409	
SW Revision	GSM TA GPRS TA EGPRS TA WCDMA HSDPA TEST MODES HSuPA TEST MODES cdma 2000 TA 1xEV-DO TA 1xEV-DO FTM TA 1xEV-DO Release A 1xEV-DO RelA FTM	E1968A-101 E1968A-102 E1968A-103 E1963A E1963A-403 E1963A-413 E1962B E1966A E1976A E1966A-102 E1976A-102

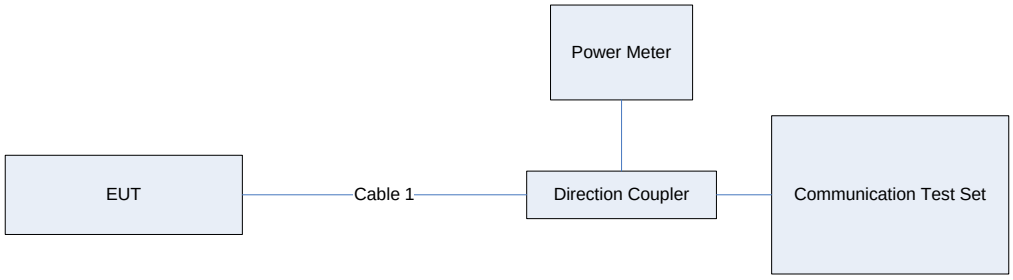
11.3 RF Power Measurement Procedure

11.3.1 Test Setup

Connect the transmitter output to communications test set as shown in Figure 11-1 and configure the EUT to operate at maximum power in a call per procedures defined in sections 11.4 . Measure the conducted transmit power at the frequencies defined in 11.1 .

Power measurements are completed using a power meter configured to measure average power. The cable loss must be measured for the specific frequencies under test and added as a correction factor for all the tests.

Figure 11-1 RF Output Power Test Setup



11.4 Base Station Emulator Settings and Test Procedures

11.4.1 For CDMA2000 1x/EVDO

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 11-3.
    c. Send continuously ‘0’ power control bits to the UNDP-1.
    d. Measure the output power at UNDP-1 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. RC2, SO9
        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 11-4.
    c. Send alternating ‘0’ and ‘1’ power control bit to the UNDP-1

d. Determine the active channel configuration. If the desired channel configuration is not the active channel configuration, increase Îor by 1 dB and repeat the verification. Repeat this step until the desired channel configuration becomes active.
e. Measure the output power at the UNDP-1 antenna connector.
f. Decrease Îor 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 UNDP-1 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 11-3 Parameters for Max. Power with a single traffic code channel, SR1

Parameter	Units	Value
$\hat{I}_{or}$	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 11-4 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

1xEV-DO

1) Use 1xEV-DO Rel 0 protocol in the call box.

a. RTAP

- Select Test Application Protocol to RTAP
- Set RTAP Rate to 9.6 kbps
- Generator Info -> Termination Parameters -> Max Forward Packet Duration -> 16 Slots
- Set Îor to -60 dBm/1.23 MHz
- Send continuously ‘0’ power control bits
- Measure the power at UNDP-1 antenna connector
- Repeat above steps for RTAP Rate = 19.2 kbps, 38.4 kbps, 76.8 kbps and 153.6 kbps respectively

2) Use 1xEV-DO Rev A protocol in the call box.

   a. RETAP

   - Select Test Application Protocol to RETAP
   - F-Traffic Format -> 4 (1024, 2, 128) Canonical (307.2k, QPSK)
   - Set R-Data Pkt Size to 128
   - Protocol Subtype Config -> Release A Physical Layer Subtype -> Subtype 2
     ->PL Subtype 2 Access Channel MAC Subtype -> Default (Subtype 0)
   - Generator Info -> Termination Parameters -> Max Forward Packet Duration -> 16 Slots
     ->ACK R-Data After -> Subpacket 0 (All ACK)
   - Set Îor to -60 dBm/1.23 MHz
   - Send continuously '0' power control bits
   - Measure the power at UNDP-1 antenna connector
   - Repeat above steps for R-Data Pkt Size = 256, 512, 768, 1024, 1536, 2048, 3072, 4096, 6144, 8192, 12288 respectively.
   - Repeat above steps for R-Data Pkt Size = 256, 512, 768, 1024, 1536, 2048, 3072, 4096, 6144, 8192, 12288 respectively.

11.4.2 For WCDMA/HSDPA/HSUPA

Configure the call box to support all WCDMA tests in respect to the 3GPP 34.121 (listed in Table 11-5).

Rel99

1) Set a Test Mode 1 loop back with a 12.2kbps Reference Measurement Channel (RMC)
2) Set and send continuously Up power control commands to the UNDP-1

HSDPA Rel 6

1) Establish a Test Mode 1 look back with both 1 12.2kbps RMC channel and a H-Set1 Fixed Reference Channel (FRC). With the 8820 this is accomplished by setting the signal Channel Coding to "Fixed Reference Channel" and configuring for HSET-1 QKSP.
2) Set beta values and HSDPA settings for HSDPA Sebtest1 according to Table 11-5
3) Send continuously Up power control commands to the UNDP-1
4) Measure the power at the UNDP-1 antenna connector using the power meter with modulated average detector
5) Repeat the measurement for the HSDPA Subtest2, 3 and 4 as given in Table 11-5

HSUPA Rel 6

1) Use UL RMC 12.2kbps and FRC H-Set1 QPSK, Test Mode 1 loop back. With the 8820 this is accomplished by setting the signal Channel Coding to "E-DCH Test Channel" and configuring the equipment category to Cat6_10ms.
2) Set the Absolute Grant for HSUPA Subtest1 according to Table 11-5
3) Set the UNDP power to be at least 5dB lower than the Maximum output power
4) Send power control bits to give one TPC_cmd = +1 command to the UNDP. If UNDP doesn't send any E-DPCH data with decreased E-TFCI within 500ms, then repeat this process until the decreased E-TFCI is reported.
5) Confirm that the E-TFCI transmitted by the UNDP is equal to the target E-TFCI in Table 11-5. If the E-TFCI transmitted by the UNDP is not equal to the target E-TFCI, then send power control bits to give one TPC_cmd = -1 command to the UE. If UE sends any E-DPCH data with decreased E-TFCI within 500 ms,

send new power control bits to give one TPC_cmd = -1 command to the UE. Then confirm that the E-TFCI transmitted by the UE is equal to the target E-TFCI in Table 11-5. If the E-TFCI transmitted by the UE is not equal to the target E-TFCI, then fail the UE

6) Repeat the measurement for the HSUPA Subtest2, 3, 4 and 5 as given in Table 11-5

Table 11-5 3GPP Rel99/HSPA Subtest Settings

	Mode	**Rel99**	**Rel6 HSDPA**	**Rel6 HSDPA**	**Rel6 HSDPA**	**Rel6 HSDPA**	**Rel6 HSUPA**	**Rel6 HSUPA**	**Rel6 HSUPA**	**Rel6 HSUPA**	**Rel6 HSUPA**
	Subtest	**-**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**5**
WCDMA General Settings	Loopback Mode	Test Mode 1	Test Mode 1				Test Mode 1				
	Rel99 RMC	12.2kbps RMC	12.2kbps RMC				12.2kbps RMC				
	HSDPA FRC	Not Applicable	H-Set1				H-Set1				
	HSUPA Test	Not Applicable	Not Applicable				HSUPA Loopback				
	Power Control Algorithm	Algorithm2	Algorithm2				Algorithm2				
	βc	Not Applicable	2/15	12/15	15/15	15/15	11/15	6/15	15/15	2/15	15/15
	βd	Not Applicable	15/15	15/15	8/15	4/15	15/15	15/15	9/15	15/15	15/15
	βec	Not Applicable	-	-	-	-	209/225	12/15	30/15	2/15	24/15
	βc/βd	8/15	2/15	12/15	15/8	15/4	11/15	6/15	15/9	2/15	15/15
	βhs	Not Applicable	4/15	24/15	30/15	30/15	22/15	12/15	30/15	4/15	30/15
	βed	Not Applicable	Not Applicable				1309/225	94/75	47/15 47/15	56/75	134/15
HSDPA Specific Settings	DACK	Not Applicable	8				8				
	DNAK	Not Applicable	8				8				
	DCQI	Not Applicable	8				8				
	Ack-Nack repetition factor	Not Applicable	3				3				
	CQI Feedback (Table 5.2B.4)	Not Applicable	4ms				4ms				
	CQI Repetition Factor (Table 5.2B.4)	Not Applicable	2				2				
	Ahs = βhs/βc	Not Applicable	30/15				30/15				
HSUPA Specific Settings	D E-DPCCH	Not Applicable	Not Applicable				6	8	8	5	7
	DHARQ	Not Applicable	Not Applicable				0	0	0	0	0
	AG Index	Not Applicable	Not Applicable				20	12	15	17	21
	ETFCI (from 34.121 Table C.11.1.3)	Not Applicable	Not Applicable				75	67	92	71	81
	Associated Max UL Data Rate kbps	Not Applicable	Not Applicable				242.1	174.9	482.8	205.8	308.9
	Reference E_TFCIs	Not Applicable	Not Applicable				E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27		E-TFCI 11 E-TFCI PO 4 E-TFCI 92 E-TFCI PO 18	E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27	

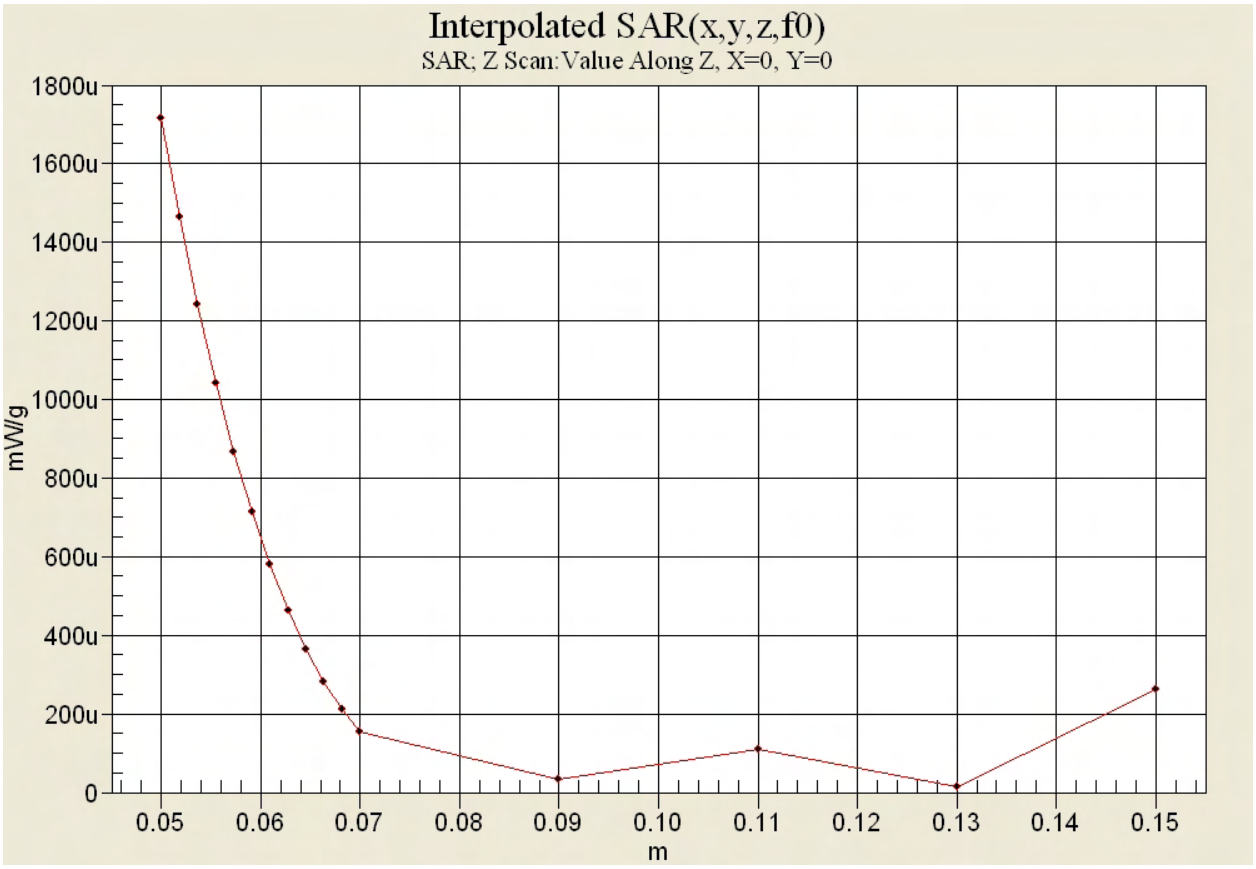
11.4.3 For GSM/GPRS/EGDE

- Configure the call box to support GPRS test.
- Configure for desired number of uplink transmit lots.
- Set MS_TX level to 0 (850 MHz) or 2 (1900MHz) to configure EUT to transmit at maximum output power.

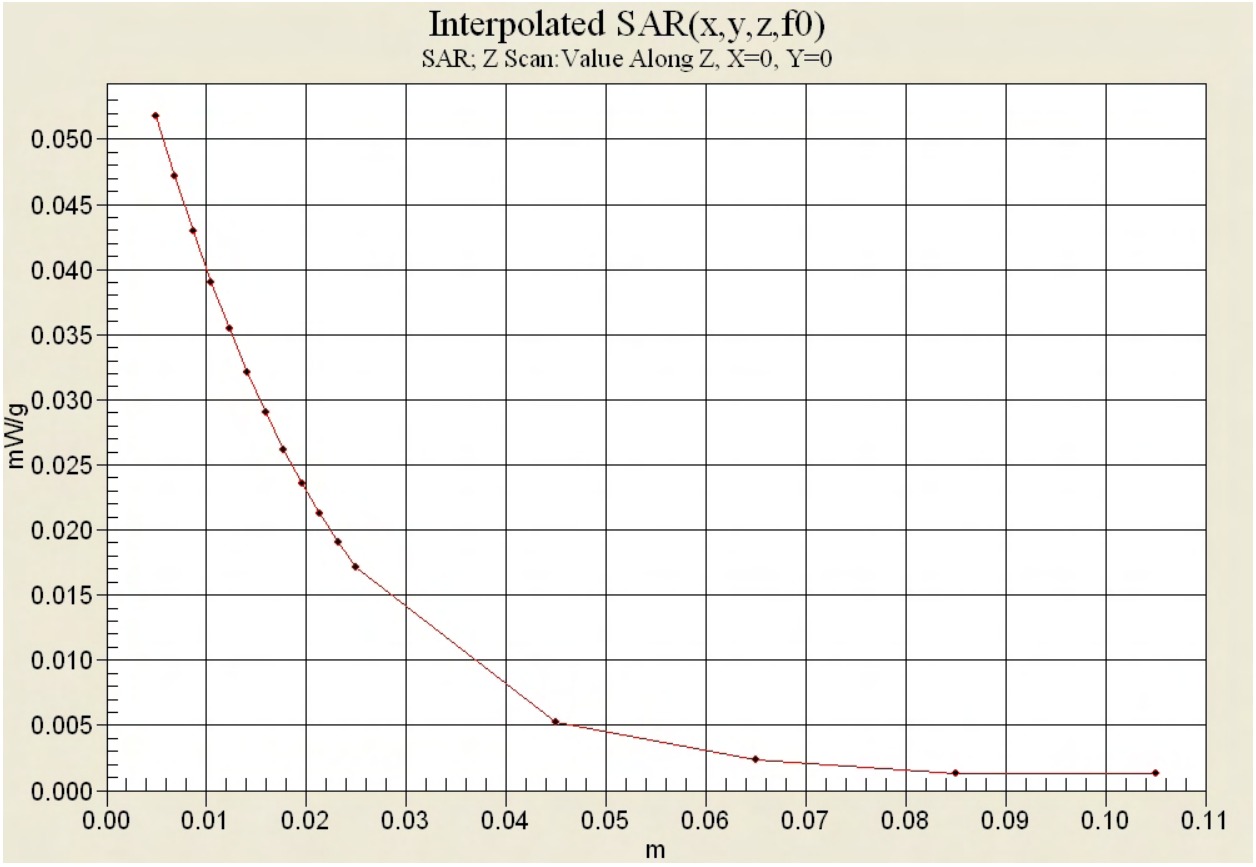
13. Validation Plots

The following pages show validation plots for the respective days of the test program.

13.1 PCS band Z-Scan Plot



13.2 Cell band Z-Scan Plot



13.3 Validation Plots

Date/Time: 6/18/2008 9:37:25 AM

Test Laboratory: QUALCOMM Incorporated

20080618_Val1900_20dBm_muscle

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d019

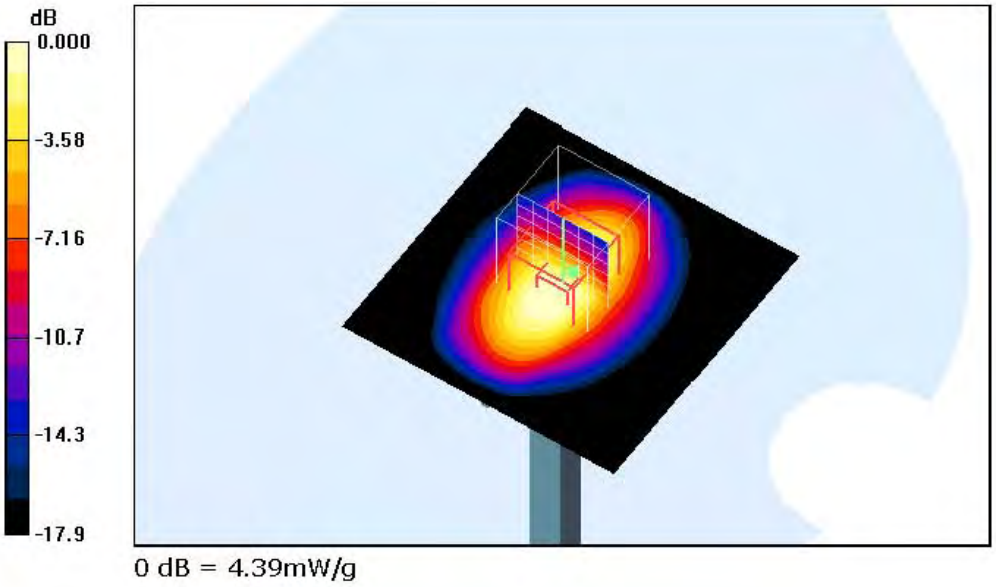
Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: MSL1800 Medium parameters used (interpolated): f = 1900 MHz; σ = 1.52 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1733; ConvF(4.71, 4.71, 4.71); Calibrated: 9/4/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 3/5/2008
- Phantom: SAM with CRP; Type: SAM;
- Measurement SW: DASY4, V4.7 Build 55;

d=10mm, Pin=20 dBm/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 4.68 mW/g

d=10mm, Pin=20 dBm/Zoom Scan (7x7x7) (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.8 V/m; Power Drift = -0.029 dB
Peak SAR (extrapolated) = 6.55 W/kg
SAR(1 g) = 3.85 mW/g; SAR(10 g) = 2.05 mW/g
Maximum value of SAR (measured) = 4.39 mW/g



Date/Time: 6/17/2008 3:33:13 PM

Test Laboratory: QUALCOMM Incorporated

20080617_Val835_20dBm_muscle

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:465

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: MSL835 Medium parameters used (interpolated): f = 835 MHz; σ = 0.95 mho/m; ε_r = 55.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

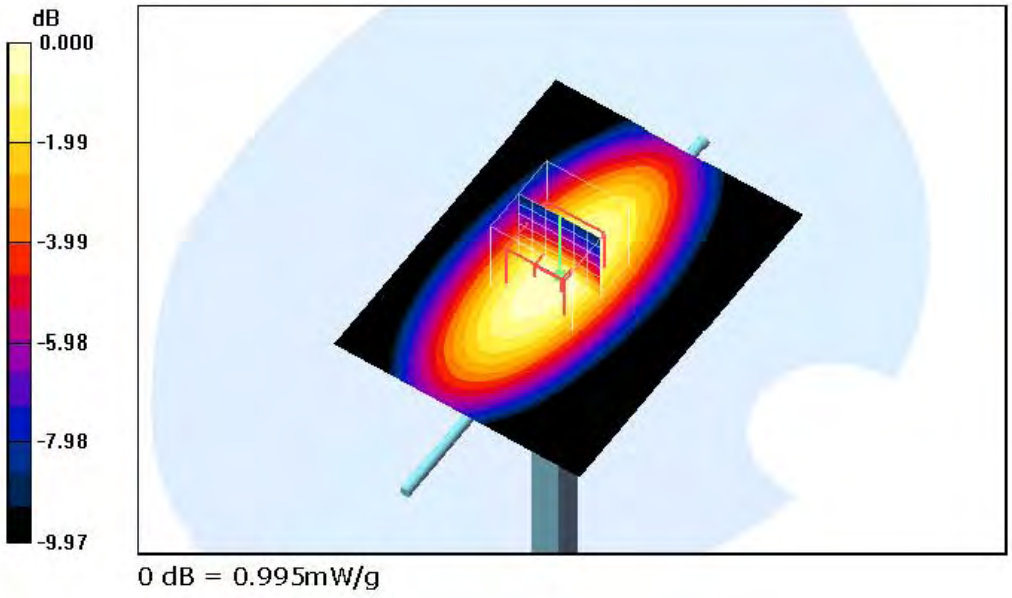
- Probe: ET3DV6 - SN1733; ConvF(6.57, 6.57, 6.57); Calibrated: 9/4/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 3/5/2008
- Phantom: SAM with CRP; Type: SAM;
- Measurement SW: DASY4, V4.7 Build 55;

d=15mm, Pin=20 dBm/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.000 mW/g

d=15mm, Pin=20 dBm/Zoom Scan (7x7x7) (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 33.8 V/m; Power Drift = -0.023 dB
Peak SAR (extrapolated) = 1.27 W/kg
SAR(1 g) = 0.914 mW/g; SAR(10 g) = 0.609 mW/g
Maximum value of SAR (measured) = 0.995 mW/g



0 dB = 0.995mW/g

Date/Time: 6/23/2008 9:48:47 AM

Test Laboratory: QUALCOMM Incorporated

20080623_Val1900_20dBm_muscle

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d019

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: MSL1800 Medium parameters used (interpolated): f = 1900 MHz; σ = 1.6 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

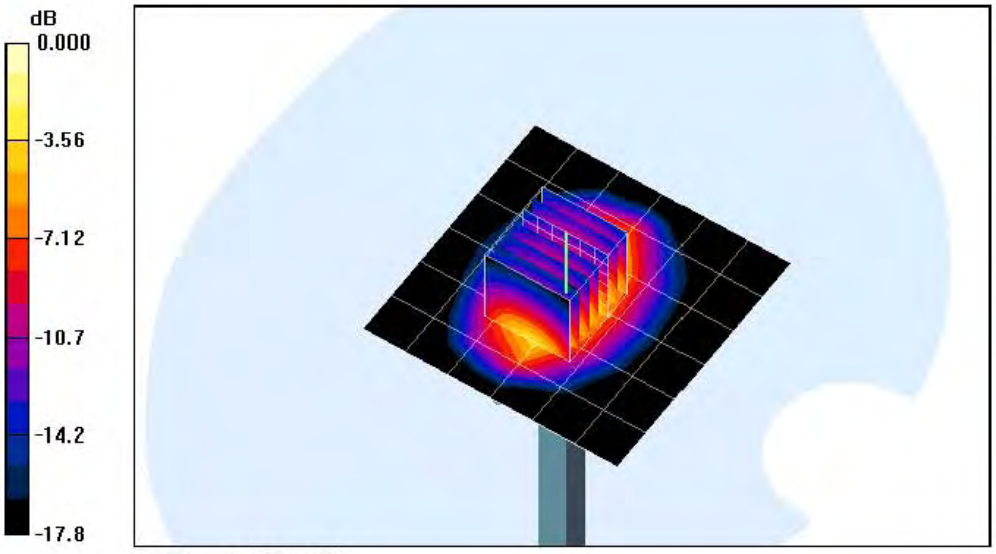
- Probe: ET3DV6 - SN1733; ConvF(4.71, 4.71, 4.71); Calibrated: 9/4/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 3/5/2008
- Phantom: SAM with CRP; Type: SAM;
- Measurement SW: DASY4, V4.7 Build 55;

d=10mm, Pin=20 dBm/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 4.36 mW/g

d=10mm, Pin=20 dBm/Zoom Scan (7x7x7) (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.7 V/m; Power Drift = -0.088 dB
Peak SAR (extrapolated) = 6.75 W/kg
SAR(1 g) = 4.02 mW/g; SAR(10 g) = 2.14 mW/g
Maximum value of SAR (measured) = 4.56 mW/g



0 dB = 4.56mW/g

Date/Time: 6/23/2008 12:40:14 PM

Test Laboratory: QUALCOMM Incorporated

20080623_Val835_20dBm_muscle

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:465

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: MSL835 Medium parameters used (interpolated): f = 835 MHz; σ = 0.964 mho/m; ε_r = 56.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

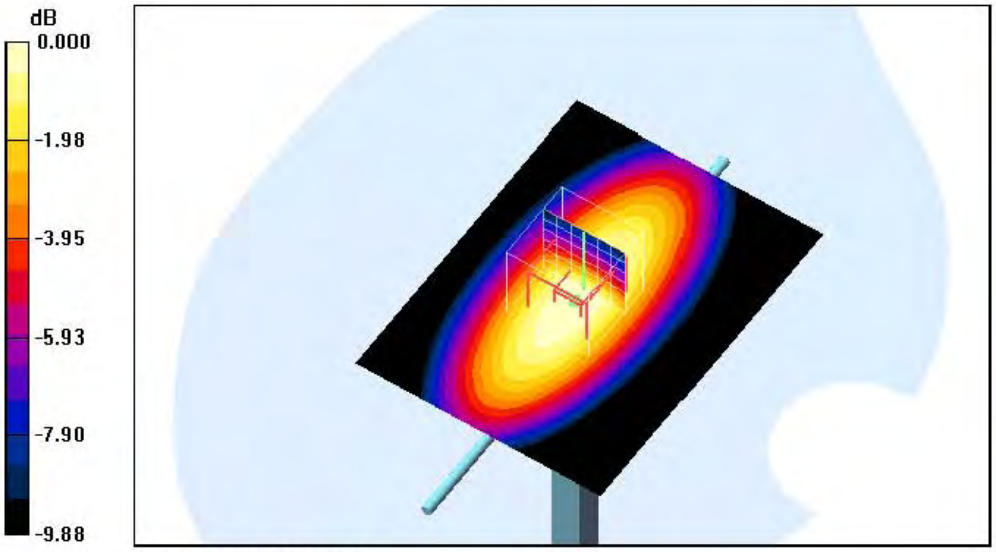
- Probe: ET3DV6 - SN1733; ConvF(6.57, 6.57, 6.57); Calibrated: 9/4/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 3/5/2008
- Phantom: SAM with CRP; Type: SAM;
- Measurement SW: DASY4, V4.7 Build 55;

d=15mm, Pin=20 dBm/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.983 mW/g

d=15mm, Pin=20 dBm/Zoom Scan (7x7x7) (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 33.0 V/m; Power Drift = 0.041 dB
Peak SAR (extrapolated) = 1.25 W/kg
SAR(1 g) = 0.901 mW/g; SAR(10 g) = 0.601 mW/g
Maximum value of SAR (measured) = 0.976 mW/g



0 dB = 0.976mW/g

14. SAR Results Plots

14.1 PCS band

Date/Time: 6/18/2008 12:38:25 PM

Test Laboratory: QUALCOMM Incorporated

20080618_X200T_DO-PCS

DUT: X200T; Type: Laptop; Serial: LV-001CK

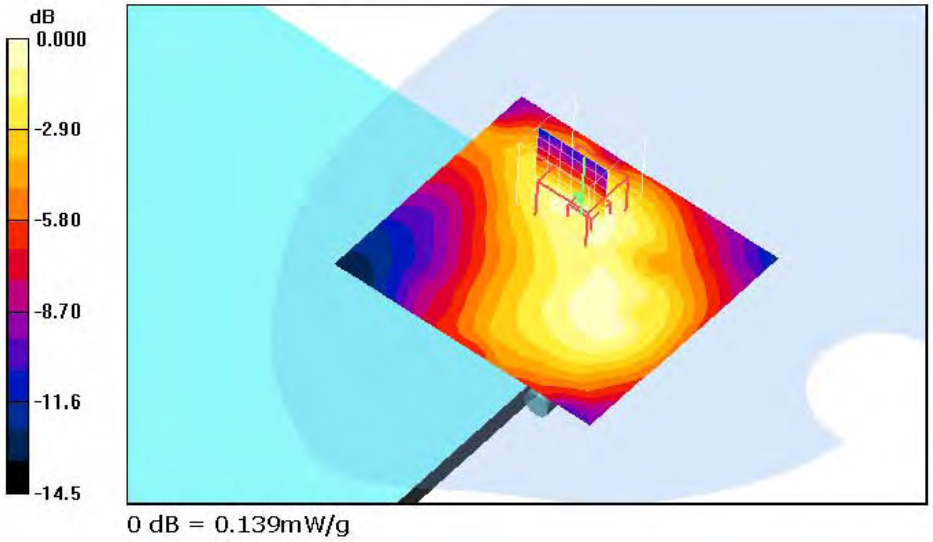
Communication System: CDMA 1xEVDO - PCS; Frequency: 1851.25 MHz;Duty Cycle: 1:1
Medium: MSL1800 Medium parameters used: f = 1851.25 MHz; σ = 1.47 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1733; ConvF(4.71, 4.71, 4.71); Calibrated: 9/4/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 3/5/2008
- Phantom: SAM with CRP; Type: SAM;
- Measurement SW: DASY4, V4.7 Build 55;

Laptop - Tablet Position - Low /Area Scan (111x101x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.131 mW/g

Laptop - Tablet Position - Low /Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.77 V/m; Power Drift = 0.175 dB
Peak SAR (extrapolated) = 0.282 W/kg
SAR(1 g) = 0.129 mW/g; SAR(10 g) = 0.082 mW/g
Maximum value of SAR (measured) = 0.139 mW/g



Date/Time: 6/18/2008 10:44:55 AM

Test Laboratory: QUALCOMM Incorporated

20080618_X200T_DO-PCS

DUT: X200T; Type: Laptop; Serial: LV-001CK

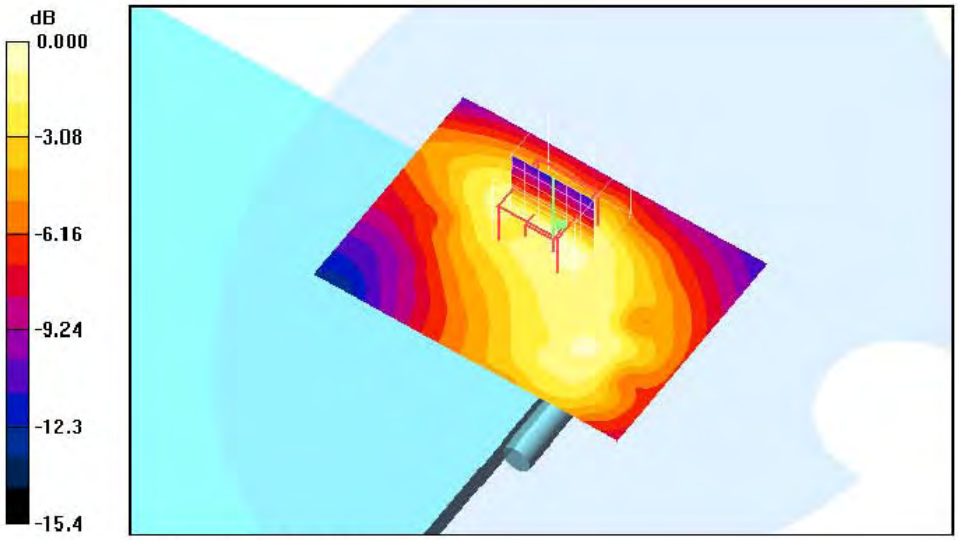
Communication System: CDMA 1xEVDO - PCS; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: MSL1800 Medium parameters used: f = 1880 MHz; σ = 1.5 mho/m; ε_r = 52.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1733; ConvF(4.71, 4.71, 4.71); Calibrated: 9/4/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 3/5/2008
- Phantom: SAM with CRP; Type: SAM;
- Measurement SW: DASY4, V4.7 Build 55;

Laptop - Tablet Position - Middle/Area Scan (111x81x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.193 mW/g

Laptop - Tablet Position - Middle/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.60 V/m; Power Drift = -0.037 dB
Peak SAR (extrapolated) = 0.285 W/kg
SAR(1 g) = 0.192 mW/g; SAR(10 g) = 0.119 mW/g
Maximum value of SAR (measured) = 0.216 mW/g



0 dB = 0.216mW/g

Date/Time: 6/18/2008 10:20:06 AM

Test Laboratory: QUALCOMM Incorporated

20080618_X200T_DO-PCS

DUT: X200T; Type: Laptop; Serial: LV-001CK

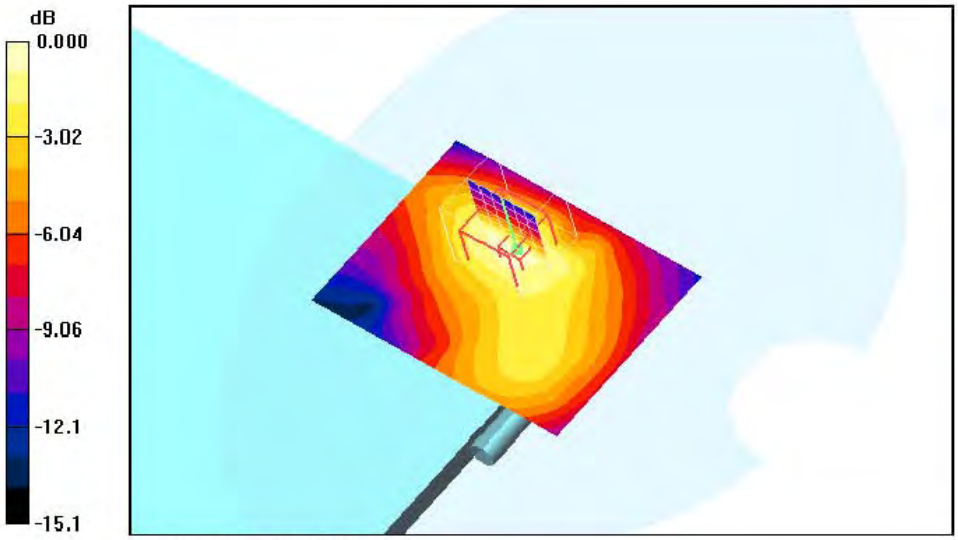
Communication System: CDMA 1xEVDO - PCS; Frequency: 1908.75 MHz;Duty Cycle: 1:1
Medium: MSL1800 Medium parameters used: f = 1908.75 MHz; σ = 1.53 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1733; ConvF(4.71, 4.71, 4.71); Calibrated: 9/4/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 3/5/2008
- Phantom: SAM with CRP; Type: SAM;
- Measurement SW: DASY4, V4.7 Build 55;

Laptop - Tablet Position - High/Area Scan (111x81x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.291 mW/g

Laptop - Tablet Position - High/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.1 V/m; Power Drift = -0.091 dB
Peak SAR (extrapolated) = 0.403 W/kg
SAR(1 g) = 0.265 mW/g; SAR(10 g) = 0.164 mW/g
Maximum value of SAR (measured) = 0.311 mW/g



0 dB = 0.311mW/g

Date/Time: 6/23/2008 11:41:33 AM

Test Laboratory: QUALCOMM Incorporated

20080623_X200T_DO-PCS-Secondary-Portrait

DUT: X200T; Type: Laptop; Serial: LV-001CK

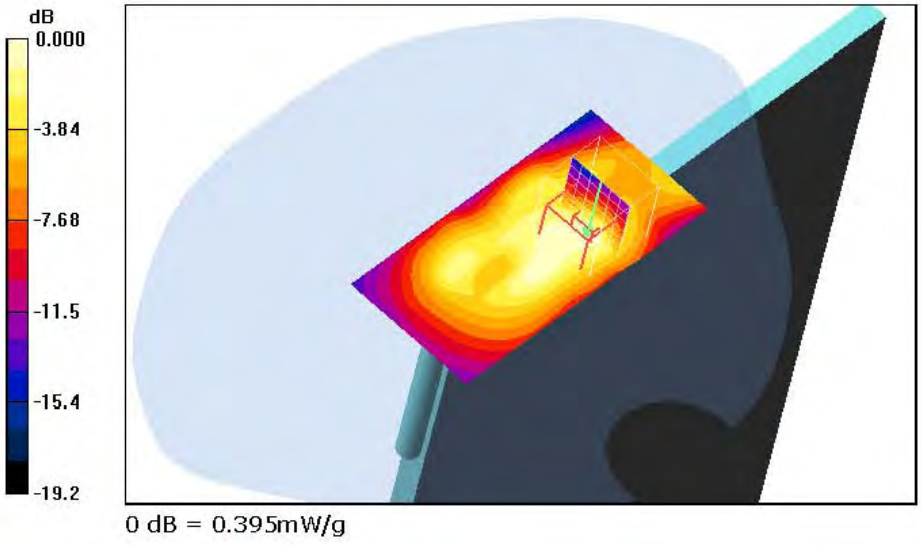
Communication System: CDMA 1xEVDO - PCS; Frequency: 1851.25 MHz;Duty Cycle: 1:1
Medium: MSL1800 Medium parameters used: f = 1851.25 MHz; σ = 1.56 mho/m; ε_r = 52.6; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1733; ConvF(4.71, 4.71, 4.71); Calibrated: 9/4/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 3/5/2008
- Phantom: SAM with CRP; Type: SAM;
- Measurement SW: DASY4, V4.7 Build 55;

Laptop - Tablet Position - Low/Area Scan (61x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.404 mW/g

Laptop - Tablet Position - Low/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.4 V/m; Power Drift = 0.002 dB
Peak SAR (extrapolated) = 0.757 W/kg
SAR(1 g) = 0.342 mW/g; SAR(10 g) = 0.191 mW/g
Maximum value of SAR (measured) = 0.395 mW/g



0 dB = 0.395mW/g

Date/Time: 6/23/2008 10:53:10 AM

Test Laboratory: QUALCOMM Incorporated

20080623_X200T_DO-PCS-Secondary-Portrait

DUT: X200T; Type: Laptop; Serial: LV-001CK

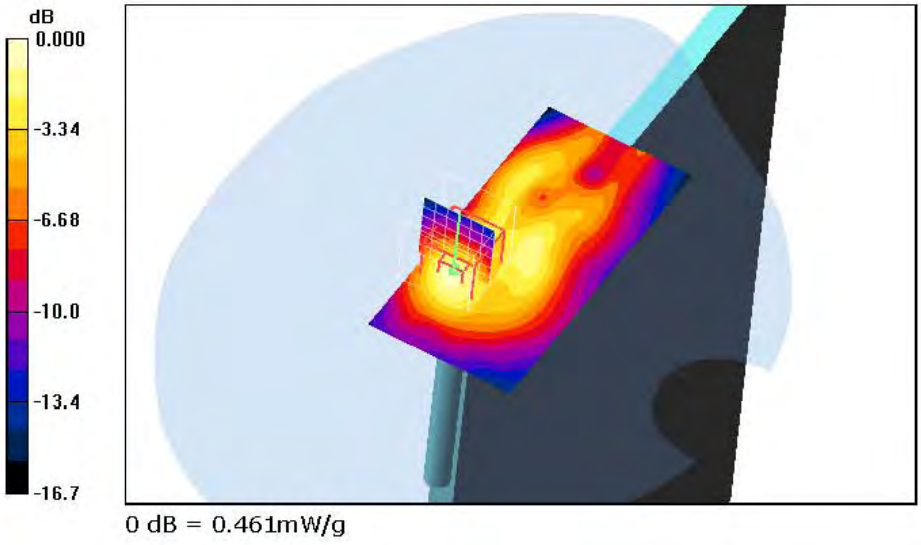
Communication System: CDMA 1xEVDO - PCS; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: MSL1800 Medium parameters used: f = 1880 MHz; σ = 1.59 mho/m; ε_r = 52.6; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1733; ConvF(4.71, 4.71, 4.71); Calibrated: 9/4/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 3/5/2008
- Phantom: SAM with CRP; Type: SAM;
- Measurement SW: DASY4, V4.7 Build 55;

Laptop - Tablet Position - Middle/Area Scan (61x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.429 mW/g

Laptop - Tablet Position - Middle/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 11.4 V/m; Power Drift = 0.027 dB
Peak SAR (extrapolated) = 0.901 W/kg
SAR(1 g) = 0.393 mW/g; SAR(10 g) = 0.205 mW/g
Maximum value of SAR (measured) = 0.461 mW/g



0 dB = 0.461mW/g

Date/Time: 6/23/2008 11:19:14 AM

Test Laboratory: QUALCOMM Incorporated

20080623_X200T_DO-PCS-Secondary-Portrait

DUT: X200T; Type: Laptop; Serial: LV-001CK

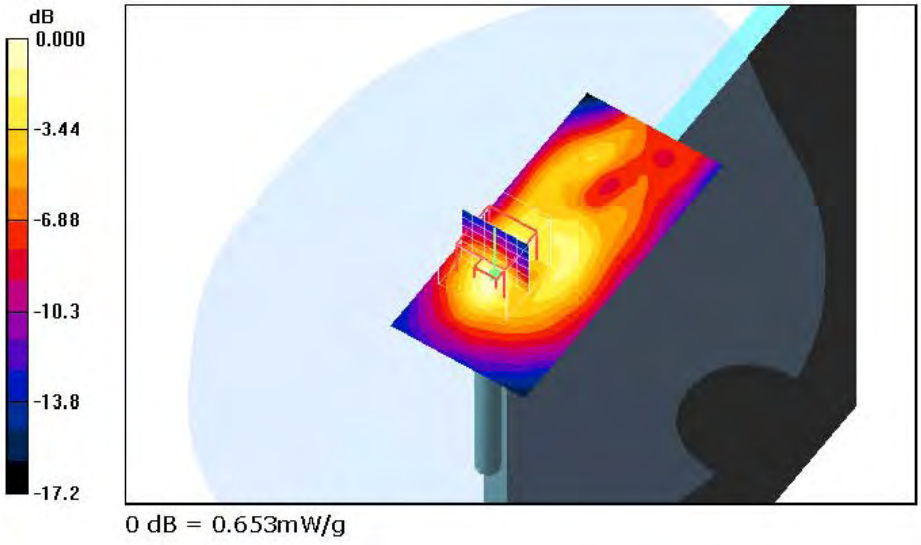
Communication System: CDMA 1xEVDO - PCS; Frequency: 1908.75 MHz;Duty Cycle: 1:1
Medium: MSL1800 Medium parameters used: f = 1908.75 MHz; σ = 1.62 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1733; ConvF(4.71, 4.71, 4.71); Calibrated: 9/4/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 3/5/2008
- Phantom: SAM with CRP; Type: SAM;
- Measurement SW: DASY4, V4.7 Build 55;

Laptop - Tablet Position - High/Area Scan (61x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.613 mW/g

Laptop - Tablet Position - High/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.9 V/m; Power Drift = -0.020 dB
Peak SAR (extrapolated) = 0.996 W/kg
SAR(1 g) = 0.561 mW/g; SAR(10 g) = 0.287 mW/g
Maximum value of SAR (measured) = 0.653 mW/g



0 dB = 0.653mW/g

14.2 Cell band

Date/Time: 6/17/2008 4:47:55 PM

Test Laboratory: QUALCOMM Incorporated

20080617_X200T_GSM850-2UL

DUT: X200T; Type: Laptop; Serial: LV-001CK

Communication System: US GSM-GPRS850-2UL; Frequency: 824.2 MHz;Duty Cycle: 1:4.3
Medium: MSL835 Medium parameters used (extrapolated): f = 824.2 MHz; σ = 0.94 mho/m; ε_r = 55.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

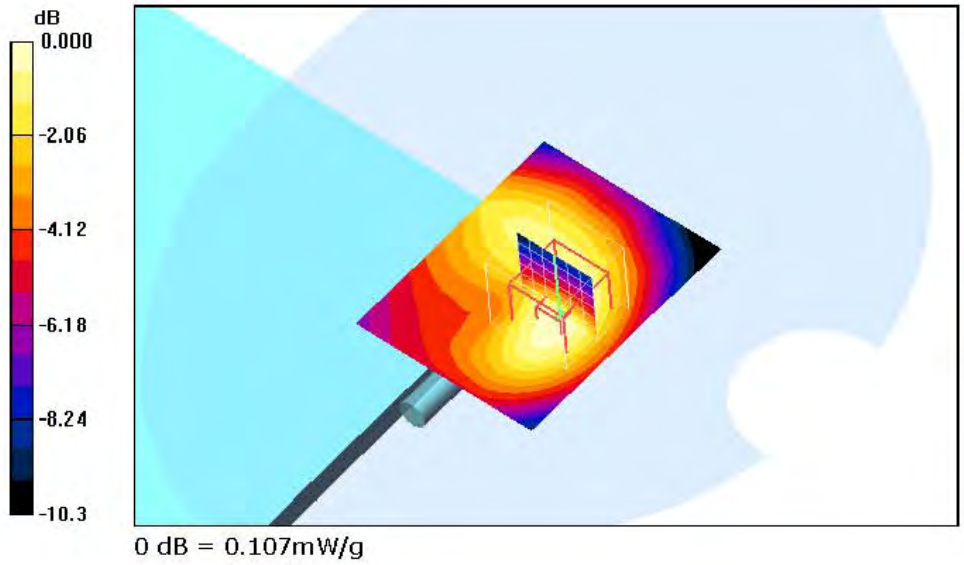
- Probe: ET3DV6 - SN1733; ConvF(6.57, 6.57, 6.57); Calibrated: 9/4/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 3/5/2008
- Phantom: SAM with CRP; Type: SAM;
- Measurement SW: DASY4, V4.7 Build 55;

Laptop - Tablet Position - Low/Area Scan (71x91x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.106 mW/g

Laptop - Tablet Position - Low/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.48 V/m; Power Drift = 0.095 dB
Peak SAR (extrapolated) = 0.135 W/kg
SAR(1 g) = 0.098 mW/g; SAR(10 g) = 0.064 mW/g
Maximum value of SAR (measured) = 0.107 mW/g



0 dB = 0.107mW/g

Date/Time: 6/17/2008 4:22:18 PM

Test Laboratory: QUALCOMM Incorporated

20080617_X200T_GSM850-2UL

DUT: X200T; Type: Laptop; Serial: LV-001CK

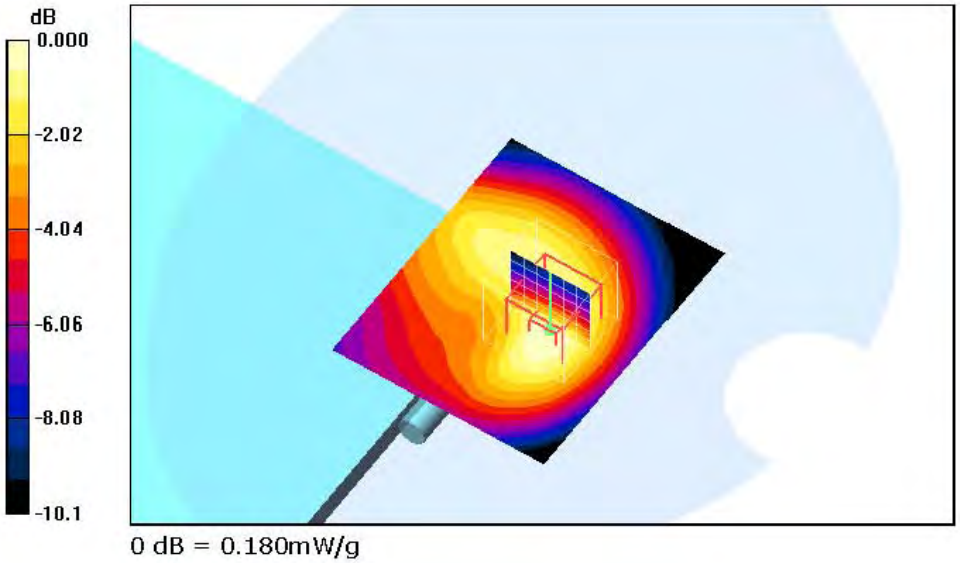
Communication System: US GSM-GPRS850-2UL; Frequency: 836.6 MHz;Duty Cycle: 1:4.3
Medium: MSL835 Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.951 mho/m; ε_r = 55.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1733; ConvF(6.57, 6.57, 6.57); Calibrated: 9/4/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 3/5/2008
- Phantom: SAM with CRP; Type: SAM;
- Measurement SW: DASY4, V4.7 Build 55;

Laptop - Tablet Position - Middle/Area Scan (81x101x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.181 mW/g

Laptop - Tablet Position - Middle/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.4 V/m; Power Drift = 0.006 dB
Peak SAR (extrapolated) = 0.233 W/kg
SAR(1 g) = 0.164 mW/g; SAR(10 g) = 0.107 mW/g
Maximum value of SAR (measured) = 0.180 mW/g



0 dB = 0.180mW/g

Date/Time: 6/17/2008 5:10:43 PM

Test Laboratory: QUALCOMM Incorporated

20080617_X200T_GSM850-2UL

DUT: X200T; Type: Laptop; Serial: LV-001CK

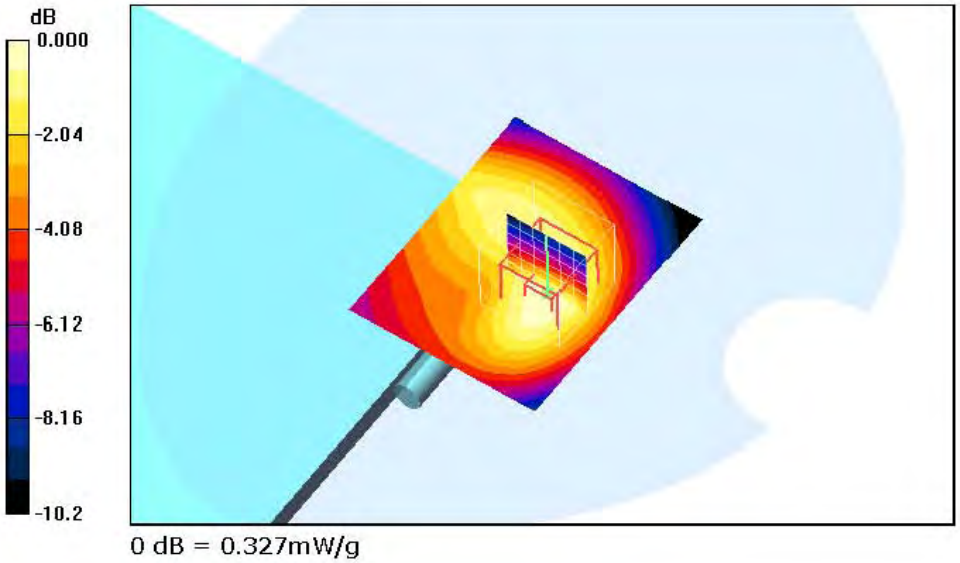
Communication System: US GSM-GPRS850-2UL; Frequency: 848.8 MHz;Duty Cycle: 1:4.3
Medium: MSL835 Medium parameters used (extrapolated): f = 848.8 MHz; σ = 0.963 mho/m; ε_r = 55.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1733; ConvF(6.57, 6.57, 6.57); Calibrated: 9/4/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 3/5/2008
- Phantom: SAM with CRP; Type: SAM;
- Measurement SW: DASY4, V4.7 Build 55;

Laptop - Tablet Position - High/Area Scan (71x91x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.327 mW/g

Laptop - Tablet Position - High/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 16.7 V/m; Power Drift = -0.069 dB
Peak SAR (extrapolated) = 0.408 W/kg
SAR(1 g) = 0.298 mW/g; SAR(10 g) = 0.197 mW/g
Maximum value of SAR (measured) = 0.327 mW/g



0 dB = 0.327mW/g

Date/Time: 6/23/2008 2:26:51 PM

Test Laboratory: QUALCOMM Incorporated

20080623_X200T_GSM850-2UL-Secondary-Portrait

DUT: X200T; Type: Laptop; Serial: LV-001CK

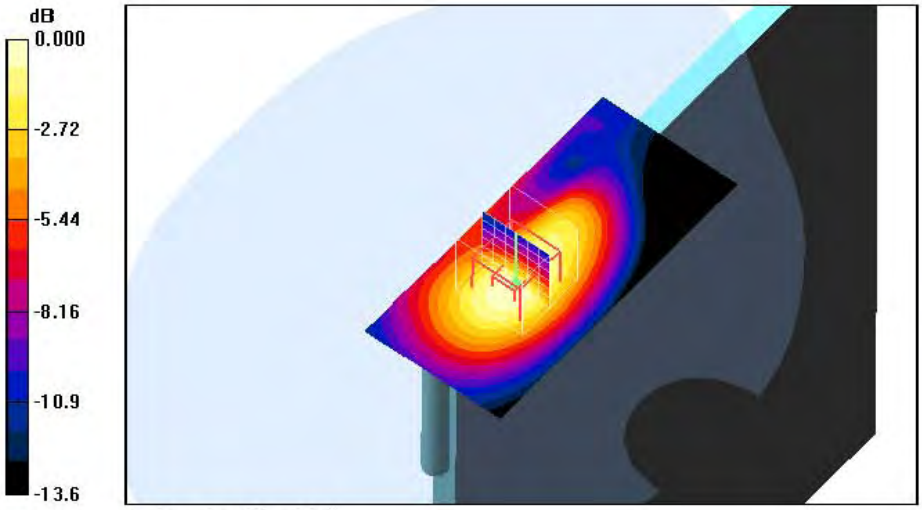
Communication System: US GSM-GPRS850-2UL; Frequency: 824.2 MHz;Duty Cycle: 1:4.3
Medium: MSL835 Medium parameters used: f = 824.2 MHz; σ = 0.954 mho/m; ε_r = 56.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1733; ConvF(6.57, 6.57, 6.57); Calibrated: 9/4/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 3/5/2008
- Phantom: SAM with CRP; Type: SAM;
- Measurement SW: DASY4, V4.7 Build 55;

Laptop - Tablet Position - Low/Area Scan (61x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.142 mW/g

Laptop - Tablet Position - Low/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.63 V/m; Power Drift = 0.028 dB
Peak SAR (extrapolated) = 0.201 W/kg
SAR(1 g) = 0.126 mW/g; SAR(10 g) = 0.074 mW/g
Maximum value of SAR (measured) = 0.140 mW/g



0 dB = 0.140mW/g

Date/Time: 6/23/2008 3:32:05 PM

Test Laboratory: QUALCOMM Incorporated

20080623_X200T_GSM850-2UL-Secondary-Portrait

DUT: X200T; Type: Laptop; Serial: LV-001CK

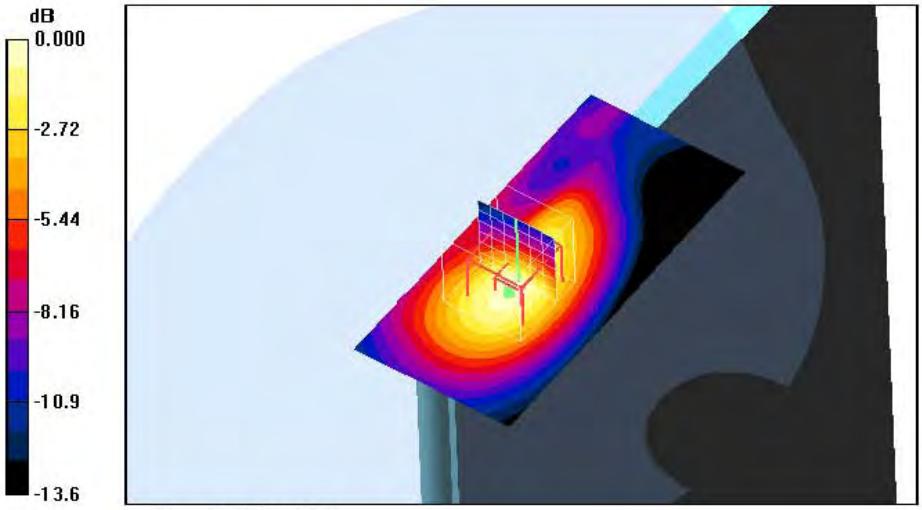
Communication System: US GSM-GPRS850-2UL; Frequency: 836.6 MHz;Duty Cycle: 1:4.3
Medium: MSL835 Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.966 mho/m; ε_r = 56.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1733; ConvF(6.57, 6.57, 6.57); Calibrated: 9/4/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 3/5/2008
- Phantom: SAM with CRP; Type: SAM;
- Measurement SW: DASY4, V4.7 Build 55;

Laptop - Tablet Position - Middle/Area Scan (61x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.215 mW/g

Laptop - Tablet Position - Middle/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 11.7 V/m; Power Drift = 0.170 dB
Peak SAR (extrapolated) = 0.328 W/kg
SAR(1 g) = 0.209 mW/g; SAR(10 g) = 0.125 mW/g
Maximum value of SAR (measured) = 0.233 mW/g



0 dB = 0.233mW/g

Date/Time: 6/23/2008 4:25:00 PM

Test Laboratory: QUALCOMM Incorporated

20080623_X200T_GSM850-2UL-Secondary-Portrait

DUT: X200T; Type: Laptop; Serial: LV-001CK

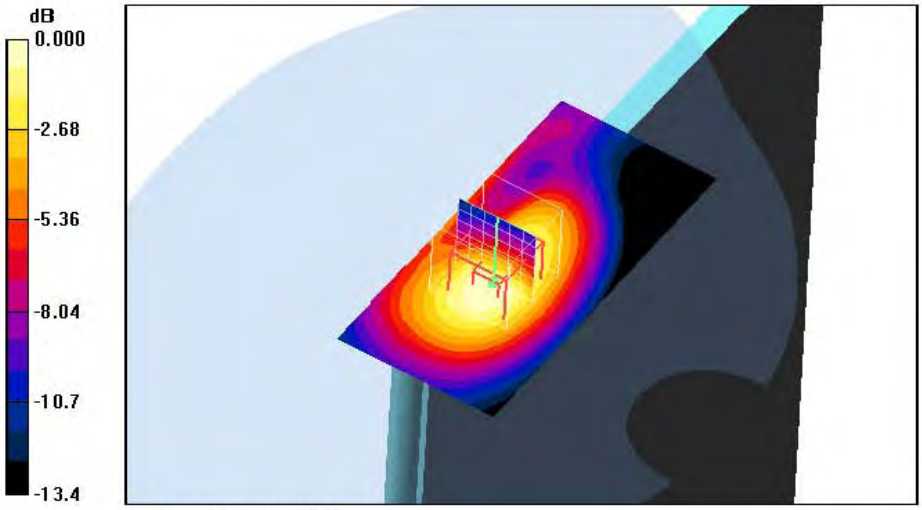
Communication System: US GSM-GPRS850-2UL; Frequency: 848.8 MHz;Duty Cycle: 1:4.3
Medium: MSL835 Medium parameters used: f = 848.8 MHz; σ = 0.974 mho/m; ε_r = 56; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1733; ConvF(6.57, 6.57, 6.57); Calibrated: 9/4/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn400; Calibrated: 3/5/2008
- Phantom: SAM with CRP; Type: SAM;
- Measurement SW: DASY4, V4.7 Build 55;

Laptop - Tablet Position - High/Area Scan (61x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.412 mW/g

Laptop - Tablet Position - High/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 16.9 V/m; Power Drift = -0.127 dB
Peak SAR (extrapolated) = 0.593 W/kg
SAR(1 g) = 0.373 mW/g; SAR(10 g) = 0.225 mW/g
Maximum value of SAR (measured) = 0.408 mW/g



0 dB = 0.408mW/g

15. SAR System Calibration Data

The following pages show calibration certification data for the Schmid & Partner AG DASY4 SAR system.

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_Nov07

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 466
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	November 12, 2007
Condition of the calibrated item	In Tolerance

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	04-Oct-07 (METAS, No. 217-00736)	Oct-08
Power sensor HP 8481A	US37292783	04-Oct-07 (METAS, No. 217-00736)	Oct-08
Reference 20 dB Attenuator	SN: 5086 (20g)	07-Aug-07 (METAS, No 217-00718)	Aug-08
Reference 10 dB Attenuator	SN: 5047.2 (10r)	07-Aug-07 (METAS, No 217-00718)	Aug-08
Reference Probe ET3DV6 (HF)	SN 1507	26-Oct-07 (SPEAG, No. ET3-1507_Oct07)	Oct-08
DAE4	SN 601	30-Jan-07 (SPEAG, No. DAE4-601_Jan07)	Jan-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-07)	In house check: Oct-09
RF generator R&S SMT-06	100005	04-Aug-99 (SPEAG, in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Oct-07)	In house check: Oct-08

	Name	Function	Signature
Calibrated by:	Mike Meili	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: November 14, 2007

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "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
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) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY4	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.4 ± 6 %	0.88 mho/m ± 6 %
Head TSL temperature during test	(21.9 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.34 mW / g
SAR normalized	normalized to 1W	9.36 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**9.34 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.53 mW / g
SAR normalized	normalized to 1W	6.12 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**6.09 mW / g ± 16.5 % (k=2)**

[1] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.9 ± 6 %	1.00 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.37 mW / g
SAR normalized	normalized to 1W	9.48 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**9.27 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.56 mW / g
SAR normalized	normalized to 1W	6.24 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**6.15 mW / g ± 16.5 % (k=2)**

[2] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.1 Ω - 5.1 jΩ
Return Loss	- 25.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.5 Ω - 6.6 jΩ
Return Loss	- 22.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.384 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	August 27, 2002

DASY4 Validation Report for Head TSL

Date/Time: 07.11.2007 12:23:00

Test Laboratory: SPEAG, Zurich, Switzerland

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

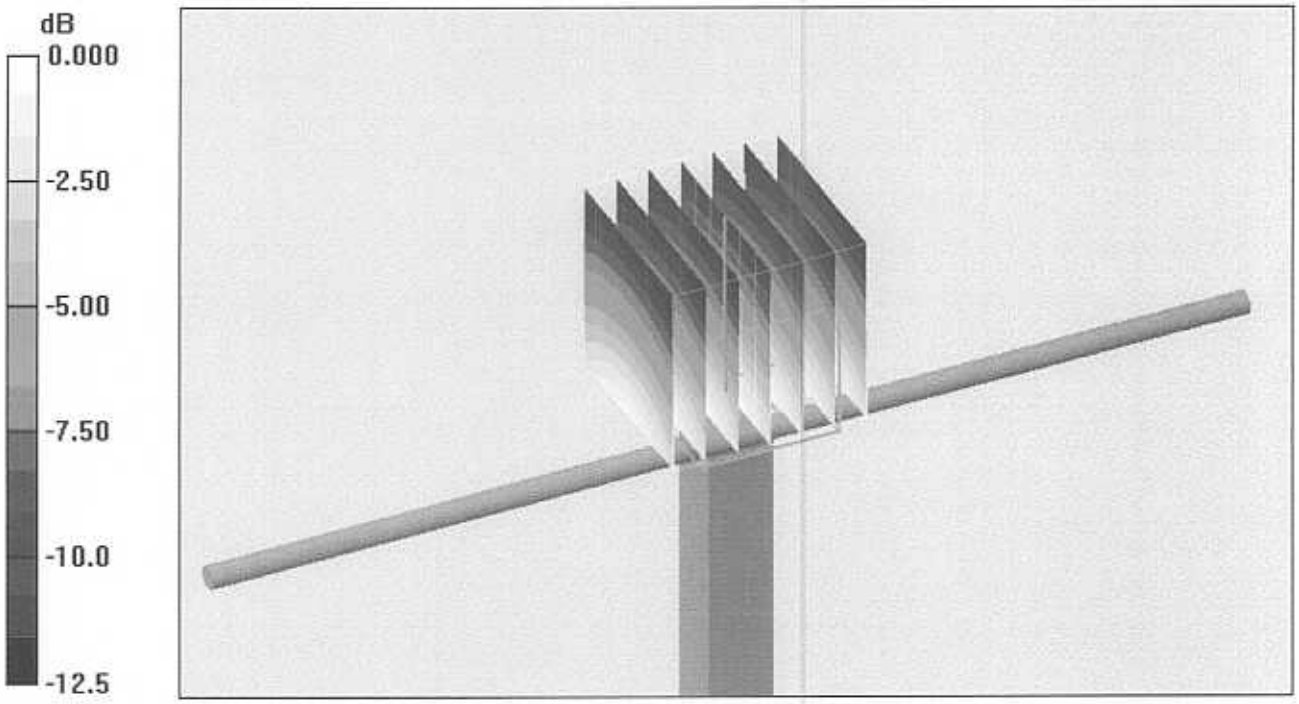
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL 900 MHz;
Medium parameters used: f = 835 MHz; σ = 0.88 mho/m; ε_r = 40.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(6.01, 6.01, 6.01); Calibrated: 26.10.2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

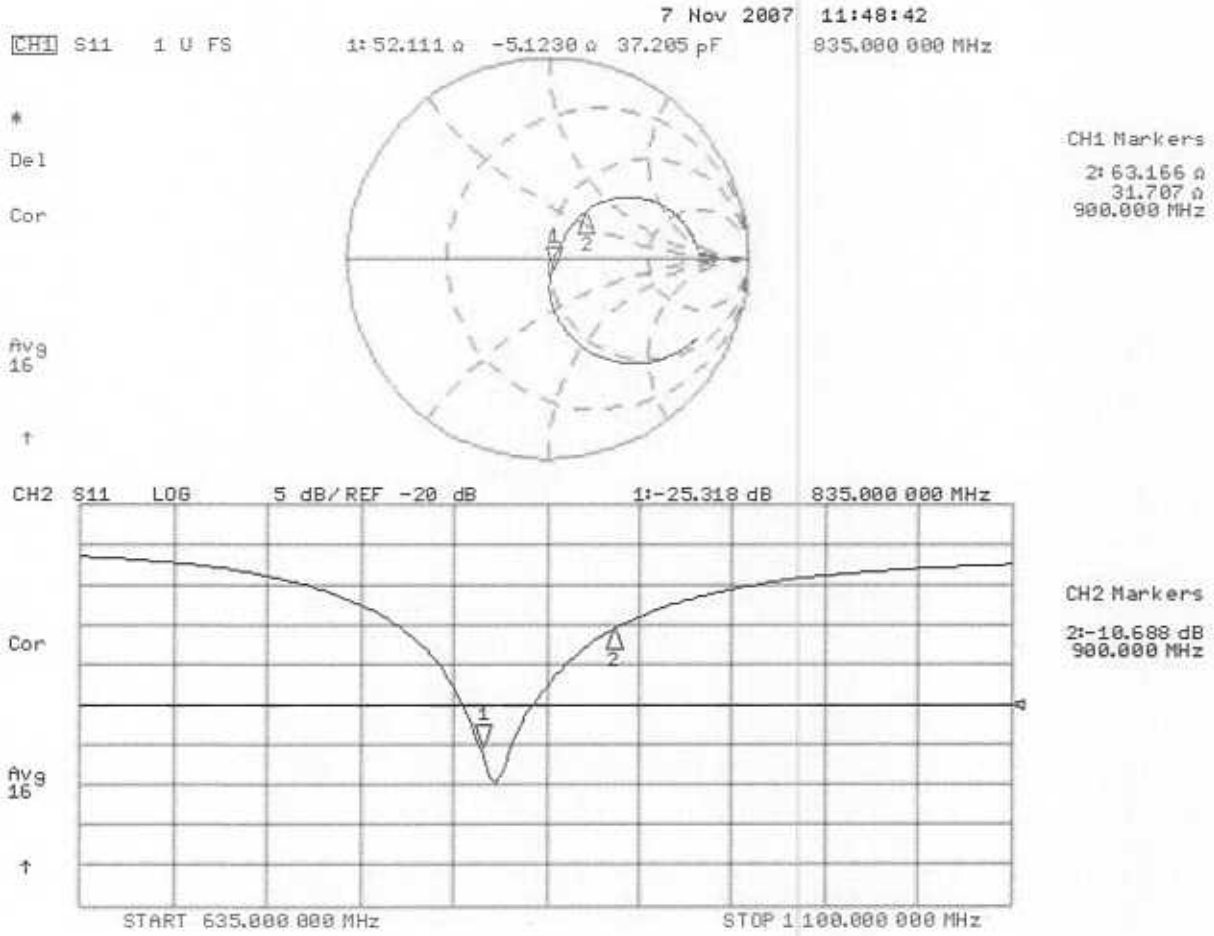
Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.5 V/m; Power Drift = 0.024 dB
Peak SAR (extrapolated) = 3.44 W/kg
SAR(1 g) = 2.34 mW/g; SAR(10 g) = 1.53 mW/g
Maximum value of SAR (measured) = 2.51 mW/g



0 dB = 2.51mW/g

Impedance Measurement Plot for Head TSL



DASY4 Validation Report for Body TSL

Date/Time: 12.11.2007 12:06:39

Test Laboratory: SPEAG, Zurich, Switzerland

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

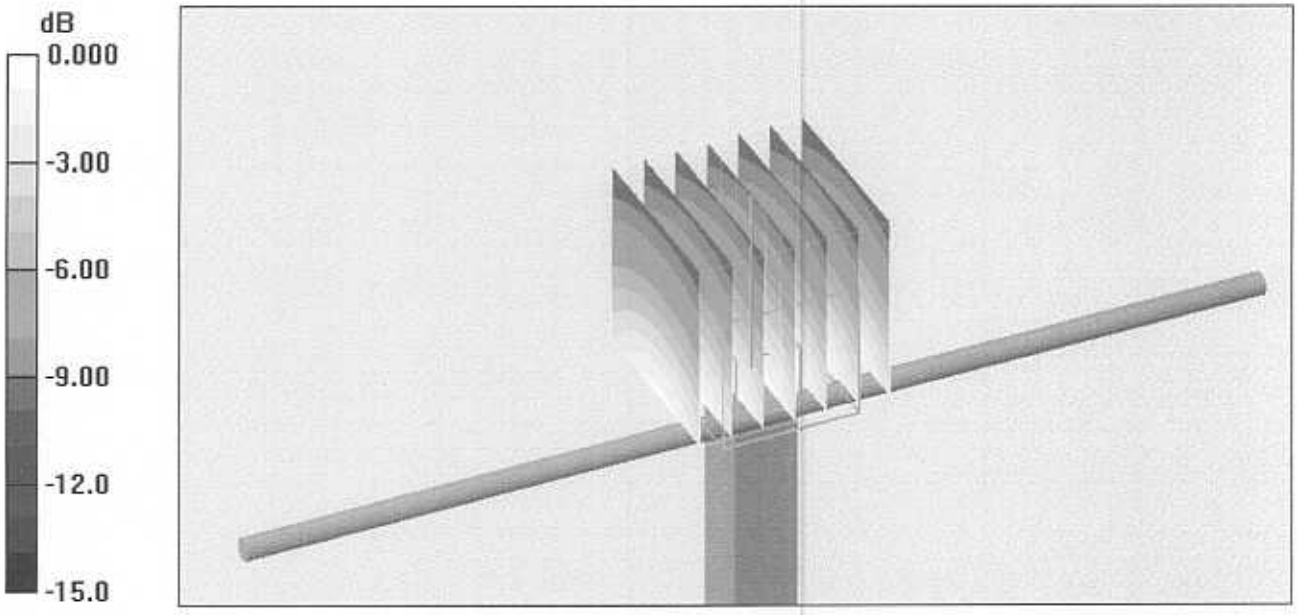
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: MSL900;
Medium parameters used: f = 835 MHz; σ = 1 mho/m; ε_r = 54.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(5.83, 5.83, 5.83); Calibrated: 26.10.2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; ;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

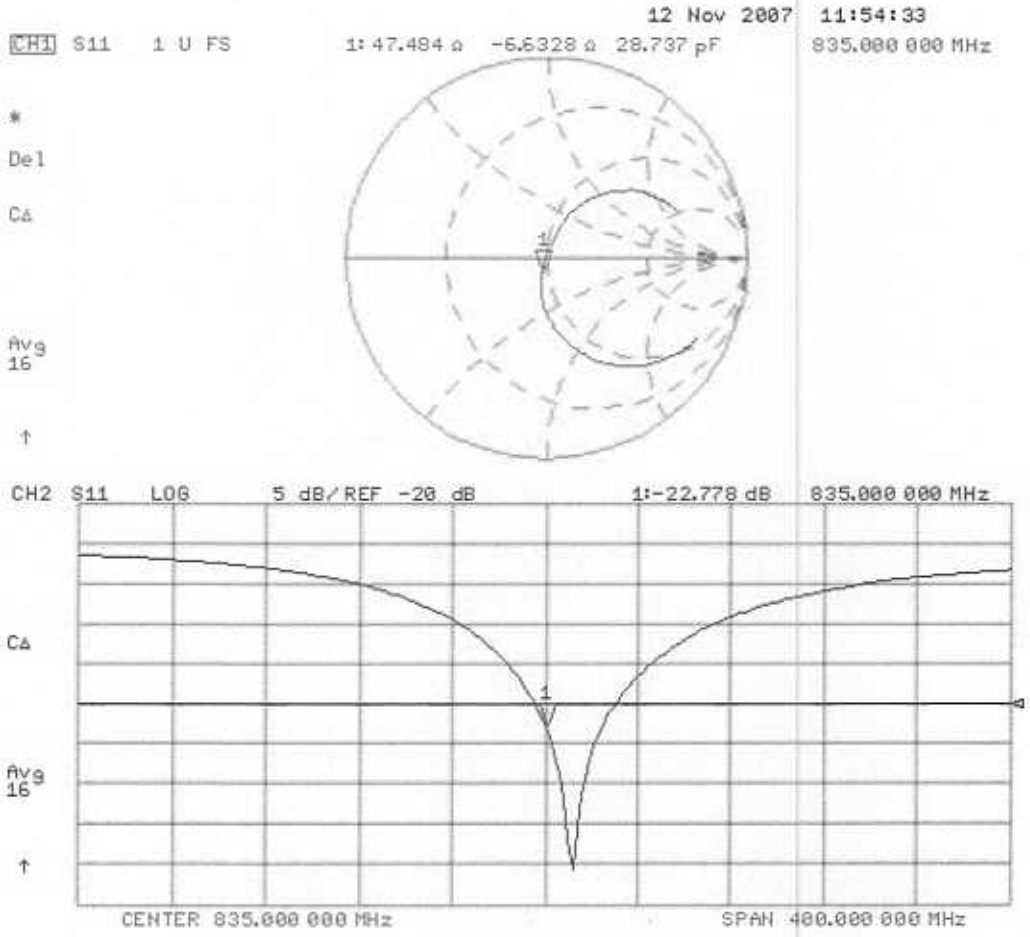
Pin = 250mW, d = 15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.1 V/m; Power Drift = -0.015 dB
Peak SAR (extrapolated) = 3.41 W/kg
SAR(1 g) = 2.37 mW/g; SAR(10 g) = 1.56 mW/g
Maximum value of SAR (measured) = 2.56 mW/g



0 dB = 2.56mW/g

Impedance Measurement Plot for Body TSL



QUALCOMM®

5775 Morehouse Drive, San Diego, CA 92121-2779

Report # 14352:1190361639

Certificate of Calibration

Manufacturer: GIGATRONICS **Model #:** 8542C

Asset #: K82228 **Serial Number:** 1834430

Description: POWER METER

QUALCOMM Incorporated hereby certifies that...

the above described instrument met or exceeded all published specifications at the time of calibration specified below; and has been calibrated using standards whose accuracies are traceable to the National Institute of Standards and Technology (NIST) within the limitations of the Institute's calibration services, or have been derived from accepted values or physical constants, or have been derived by ratio or self calibration techniques. The collective uncertainty of the measurement standards have not exceeded 4:1 test accuracy ratio for each characteristic calibrated, unless otherwise noted. All calibration activities performed are in compliance with MIL-STD-45662A, ANSI/NCSL Z540-1-1994, ISO-9001-1994, and ISO 10012-1:1992. This report and its results refer only to the item(s) calibrated and are not to be reproduced, except in full, without the written approval of the Qualcomm Incorporated Calibration Laboratory.

CALIBRATION INFORMATION

Cal Date	09/21/2007	**Interval**	12	**Cal Temp**	22
Cal Due	09/21/2008	**Data**	YES	**Humidity**	53
Tech	Troy Howard	**Pass**	YES	**Seals OK**	YES

Condition Received IN TOLERANCE

Condition Returned MEETS MFR'S SPECS

Physical Condition of Equipment GOOD

Out of Tolerance Conditions/Limitation

Cal Procedure Gigatronics 8540C Series Power Meters **Revision** QUAL- 031125 REV 1.1

STANDARDS USED FOR CALIBRATION

Asset Number	MFG	Model	Description	Cal Date	Due Date
X03045	AGILENT TECHNOLOGIES	34401A	MULTIMETER	05/10/07	11/09/07
X11013	AGILENT TECHNOLOGIES	3335A	SYNTHESIZER/LEVEL GENERATOR	07/26/07	07/25/08
X21296	GIGATRONICS	80301A	POWER SENSOR	10/24/06	10/24/07
K65267	AGILENT TECHNOLOGIES	432A	POWER METER	11/22/06	11/22/07
X10665	AGILENT TECHNOLOGIES	478A	THERMISTOR MOUNT	11/08/06	11/08/07

Signed: _____ **Date:** 09/21/2007

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 Federal Office of Metrology and Accreditation
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: ET3-1733_Sep07

CALIBRATION CERTIFICATE

Object	ET3DV6 - SN:1733
Calibration procedure(s)	QA CAL-01.v6 and QA CAL-12.v5 Calibration procedure for dosimetric E-field probes
Calibration date:	September 4, 2007
Condition of the calibrated item	In Tolerance

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41495277	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41498087	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Reference 3 dB Attenuator	SN: S5054 (3c)	8-Aug-07 (METAS, No. 217-00719)	Aug-08
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-07 (METAS, No. 217-00671)	Mar-08
Reference 30 dB Attenuator	SN: S5129 (30b)	8-Aug-07 (METAS, No. 217-00720)	Aug-08
Reference Probe ES3DV2	SN: 3013	4-Jan-07 (SPEAG, No. ES3-3013_Jan07)	Jan-08
DAE4	SN: 654	20-Apr-07 (SPEAG, No. DAE4-654_Apr07)	Apr-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-06)	In house check: Oct-07

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Niels Kuster	Quality Manager	

Issued: September 4, 2007

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

Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
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:

a) 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
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 $\vartheta = 0$ ($f \leq 900$ 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 effect 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 (no uncertainty required). DCP does not depend on frequency nor media.
- *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 *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.

Probe ET3DV6

SN:1733

Manufactured:	September 27, 2002
Last calibrated:	September 22, 2006
Recalibrated:	September 4, 2007

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1733

Sensitivity in Free Space[A] Diode Compression[B]

NormX	**1.52** ± 10.1%	$\mu V/(V/m)^2$	DCP X	**95** mV
NormY	**1.50** ± 10.1%	$\mu V/(V/m)^2$	DCP Y	**92** mV
NormZ	**1.63** ± 10.1%	$\mu V/(V/m)^2$	DCP Z	**92** mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL **900 MHz** **Typical SAR gradient: 5 % per mm**

Sensor Center to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	5.7	3.0
SAR_{be} [%]	With Correction Algorithm	0.3	0.1

TSL **1750 MHz** **Typical SAR gradient: 10 % per mm**

Sensor Center to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	11.7	8.0
SAR_{be} [%]	With Correction Algorithm	0.6	0.2

Sensor Offset

Probe Tip to Sensor Center	**2.7** mm

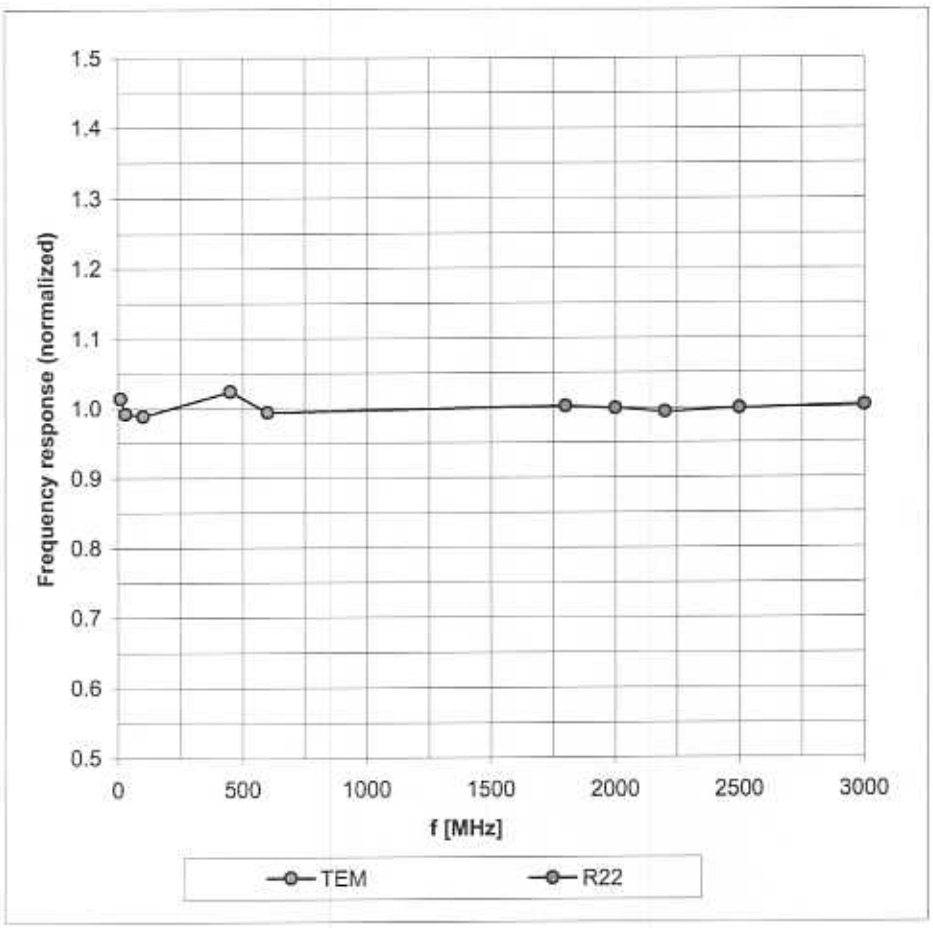
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Page 8).

[B] Numerical linearization parameter: uncertainty not required.

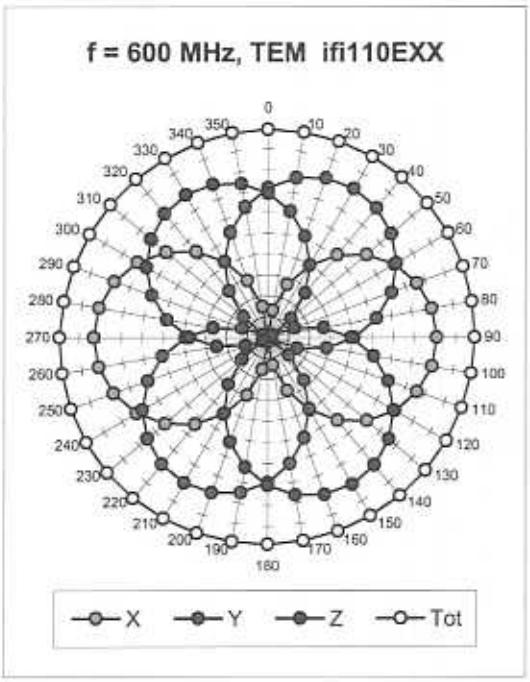
Frequency Response of E-Field

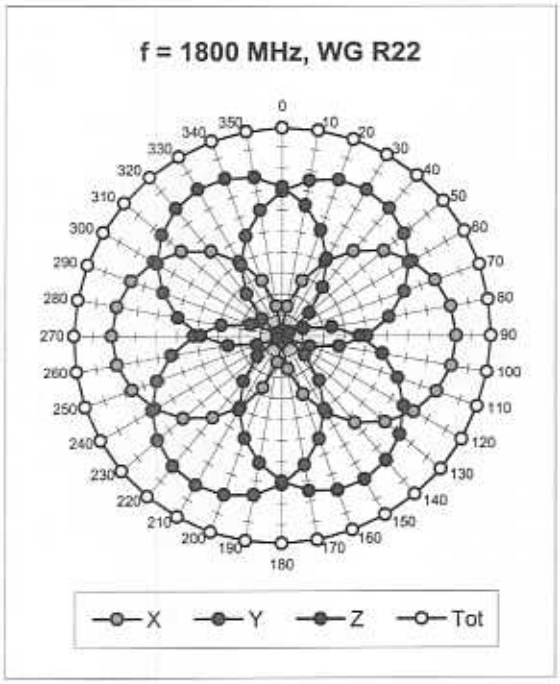
(TEM-Cell:ifi110 EXX, Waveguide: R22)

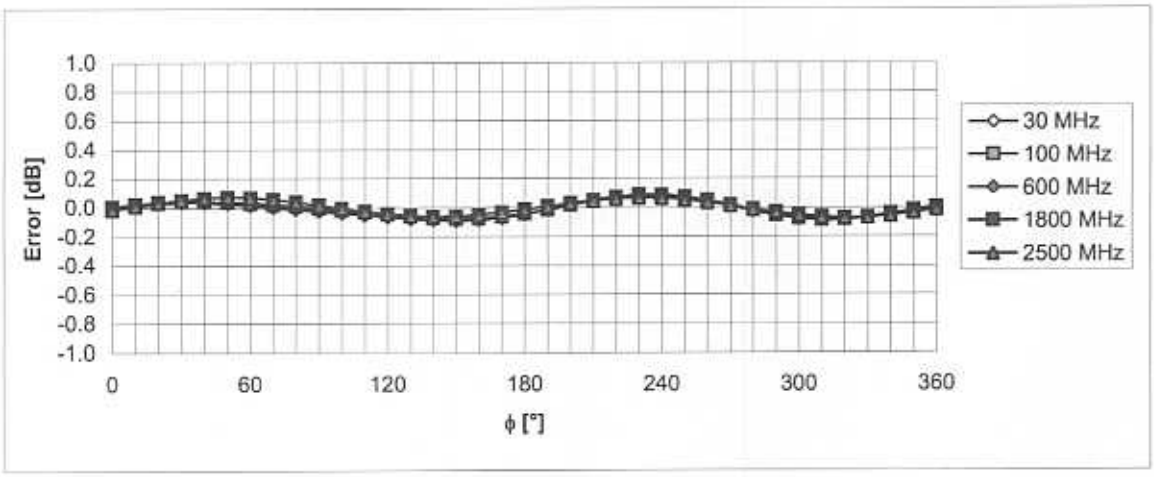


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°



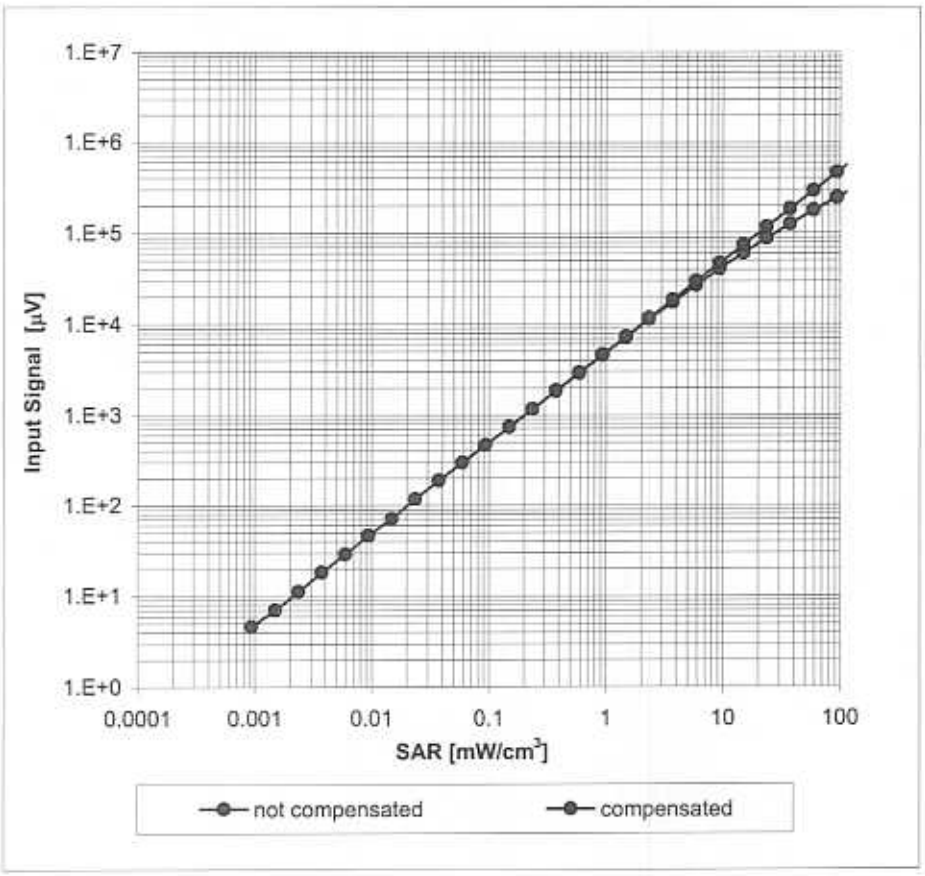


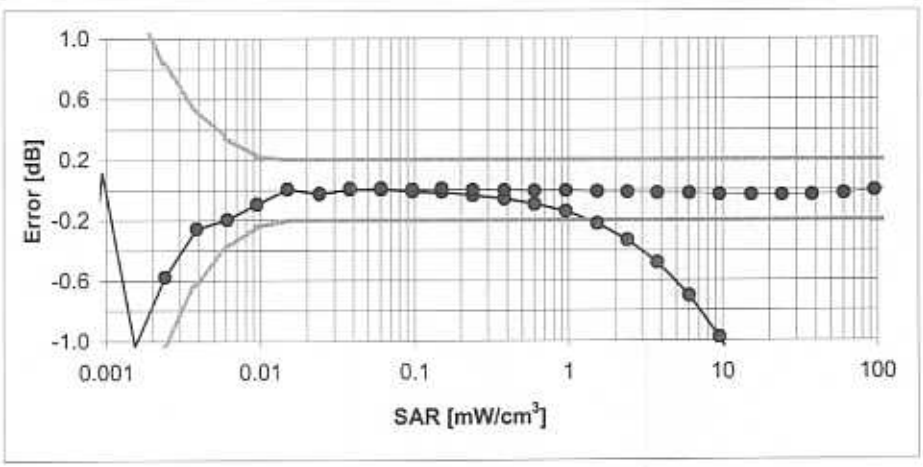


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

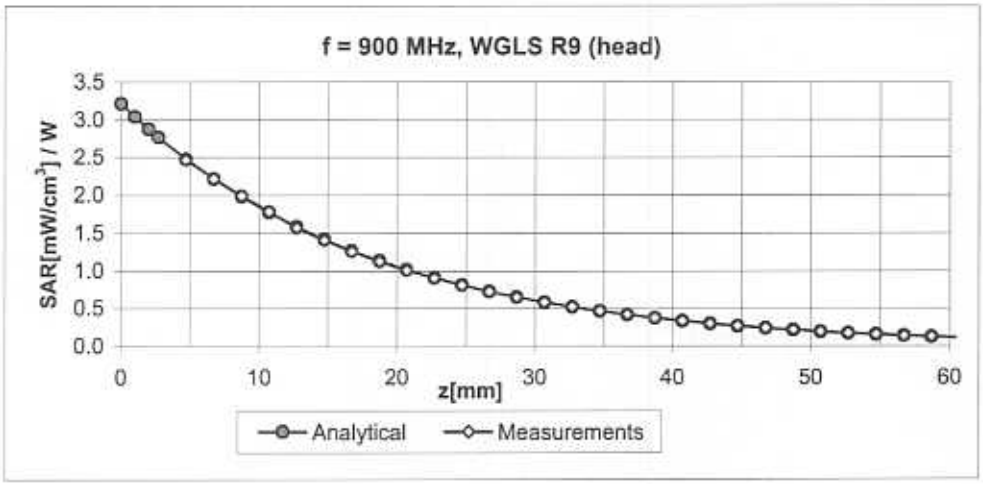
(Waveguide R22, f = 1800 MHz)





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

Conversion Factor Assessment

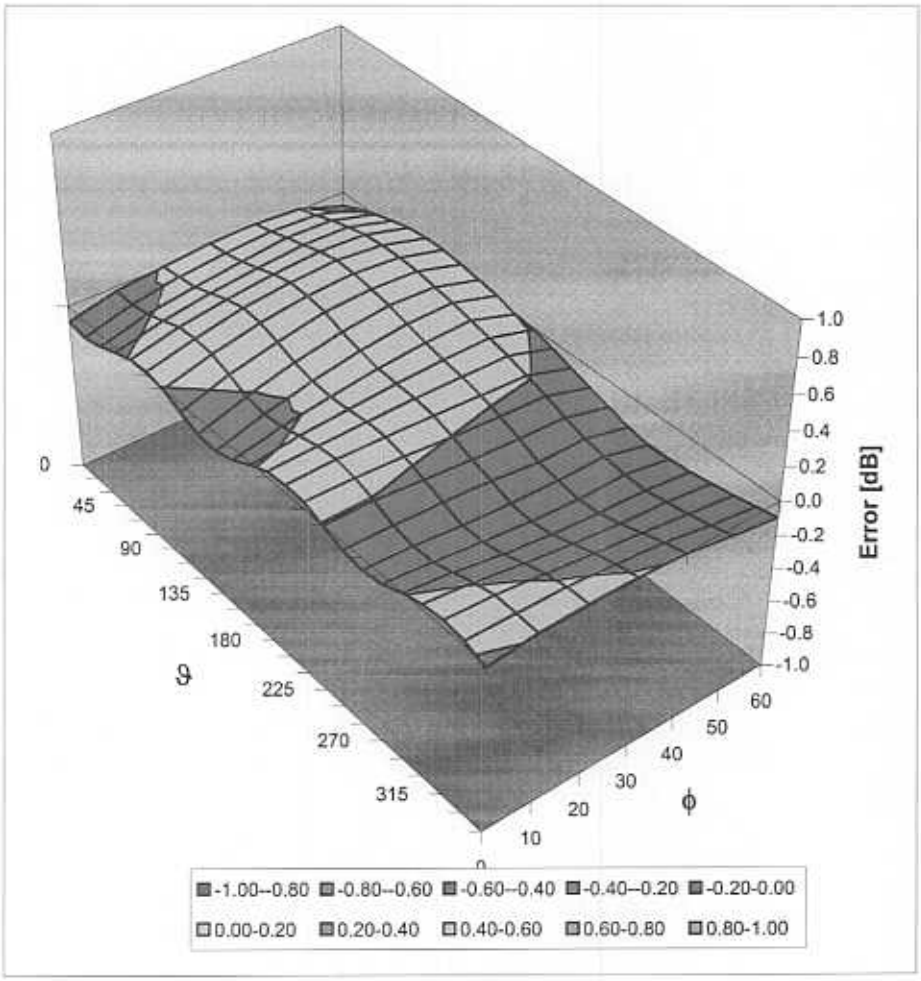


f [MHz]	Validity [MHz][C]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
450	± 50 / ± 100	Head	43.5 ± 5%	0.87 ± 5%	0.36	1.83	7.34 ± 13.3% (k=2)
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	0.24	2.89	6.89 ± 11.0% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.29	2.89	6.72 ± 11.0% (k=2)
1640	± 50 / ± 100	Head	40.3 ± 5%	1.29 ± 5%	0.54	2.59	5.83 ± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.64	2.36	5.42 ± 11.0% (k=2)
1900	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.55	2.77	5.24 ± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.55	2.75	5.06 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.62	2.11	4.56 ± 11.8% (k=2)
450	± 50 / ± 100	Body	56.7 ± 5%	0.94 ± 5%	0.33	2.65	7.68 ± 13.3% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.35	2.89	6.57 ± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.37	2.89	6.29 ± 11.0% (k=2)
1640	± 50 / ± 100	Body	53.8 ± 5%	1.40 ± 5%	0.50	2.84	5.27 ± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.4 ± 5%	1.49 ± 5%	0.55	2.76	4.95 ± 11.0% (k=2)
1900	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.67	2.43	4.71 ± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.73	2.29	4.58 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.65	2.17	3.93 ± 11.8% (k=2)

[C] The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

Agilent Technologies

AGILENT TECHNOLOGIES
INTERNAL ASSESSMENT
PROGRAM : EMG
E102/1995

U.S. EPSG Service Centers
Irvine Branch
17811 Sky Park Circle BLDG9 SuiteFG
Irvine, CA 92614 (321) 235-2149

Certificate of Calibration

Agilent Calibration

Certificate Number: 1-651985653-1

Manufacturer: Hewlett-Packard Co.
Model Number: 8714C
Serial Number: US38171129
Customer:
Qualcomm Inc
6455 Lusk Blvd

SAN DIEGO CA 92121 United States

Description: RF NETWORK ANALYZER, 3 GHZ
Options Installed:
Customer Asset No: k82012
Location of Calibration:
U.S. EPSG Service Centers
Irvine Branch
17811 Sky Park Circle BLDG9 SuiteFG
Irvine, CA 92614 (321) 235-2149

Procedure: STE-50112873-A.05.00
Date of Calibration: 2 May 2007
Temperature: 23 +/- 5 °C

Customer PO Number Credit Card - F. Cisnero
Humidity: 20-80% RH

This certifies that the above product was calibrated in compliance with a quality system registered to ISO 9001:2000 using applicable Agilent Technologies procedures.

As Received Conditions:

Initial testing found the equipment to be **IN-SPECIFICATION** at the points tested.

As Shipped Conditions:

At the completion of the calibration, measured values were **IN-SPECIFICATION** at the points tested.

Remarks or Special Requirements:

Our calibration procedures are designed to provide measurement uncertainty of less than or equal to one quarter of the specification of the unit under test, where possible, with a coverage factor of 2.

The test limits stated in the report correspond to the published specifications of the equipment, at the points tested.

This certificate is composed of 2 pages containing a summary of calibration information.

Based on the recommended calibration interval, the next calibration is due on 2 May 2008.

Print Date: 2 May 2007

Rick Whitcomb Americas Delivery Mgr.

ver:E.00.00

Agilent Technologies

AGILENT TECHNOLOGIES
INTERNAL ASSESSMENT
PROGRAM : BMG
E102/1995

U.S. EPSG Service Centers
Irvine Branch
17811 Sky Park Circle BLDG9 SuiteFG
Irvine, CA 92614 (321) 235-2149

Certificate of Calibration

Agilent Calibration

Certificate Number: 1-651985653-1

Traceability Information:

Technician ID Number: 78478

Traceability is to national standards administered by the U.S. NIST, NRC Canada, Euromet members (NPL, PTB, BNM, etc,) or other recognized standards laboratories.

Some measurements are traceable to natural physical constants, consensus standards or ratio type measurements.

Supporting documentation relative to traceability is available for review by appointment.

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

Calibration Equipment Used:

Model Number:	Model Description:	Trace Number:	Cal Due Date:	Certificate Number:
11667A	DC-18 GHz power splitter, Type N, 50 ohm	11667A14796	22 Sep 2007	1-619263631-1
33250A	FUNCTION/ARB WAVEFORM GENERATO	33250A13225	13 Feb 2008	1-543080812-7
5351B	CW Microwave Frequency Counter	5351B00856	30 Jul 2008	1-424334491-1
8482A	Power sensor, 100 kHz to 4.2 GHz	8482A04503	13 Sep 2007	1-463139233-1
8491A	Coaxial Attenuator, dc-12.4GHz, Type N	8491A7652	13 Sep 2007	1-463215653-1
8491B	Coaxial Attenuator, dc-18 GHz, Type N	8491B21841	30 Jun 2007	1-87061156-1
8491B	Coaxial Attenuator, dc-18 GHz, Type N	8491B21925	30 Jul 2009	1-436507338-1
8491B	Coaxial Attenuator, dc-18 GHz, Type N	8491B24908	30 Sep 2007	1-102116647-1
8496G	0-110dB Prog. Step Attenuator, 0-4GHz	8496G14573	10 Jan 2008	1-519424863-1
85032B	50-ohm Type N cal. kit for 8752A/C	85032B00590	2 Jun 2007	1-304431023-1
8563E	9 kHz - 26.5 GHz MW spectrum analyzer	8563E11516	22 Jun 2007	1-306141118-5
E4419B	Dual channel EPM series power meter	E4419B11188	4 Oct 2007	1-469421033-1

Measurement Report

AGILENT TECHNOLOGIES
17811 SkyPark Cir
Irvine, CA 92614
CSC Address Line 3

Report Number: 1-651985653-1
Manufacturer: Hewlett-Packard Co.
(Agilent Technologies)
Model Number: 8714C (HP8714C)
Options Installed: none
Firmware Version:

Customer: QUALCOMM INC

Cust. Unit No.: K82012
Serial Number: US38171129

Test Date: 2 May 2007
Temperature: 23.0+/-5 DEG C

Tested By: 78478
Humidity: 20 to 80% RH

Test Program Name: HP871X Part No. 5011-2873
Test Program Version: A.05.00
Test Executive: STE/9000 C.07.21C (MENDOR B.06.09ZD)

Specification Limits:

Unless indicated otherwise, the units for minimum and/or maximum specification limits are the same as the units stated for the measured value.

Calibration Standards Used

Model No.	Serial No.	Trace No.	Cal Due Date
AGT33250A	MY40013225	33250A13225	13 Feb 2008
HP11667A	14796	11667A14796	22 Sep 2007
HP5351B	3032A00856	5351B00856	30 Jul 2008
HP8482A	1925A04503	8482A04503	13 Sep 2007
HP8491A	7652	8491A7652	13 Sep 2007
HP8491B	21841	8491B21841	30 Jun 2007
HP8491B	21925	8491B21925	30 Jul 2009
HP8491B	2708A24908	8491B24908	30 Sep 2007
HP8496G	3247A14573	8496G14573	10 Jan 2008
HP85032B	2541A00590	85032B00590	02 Jun 2007
HP8563E	3943A11516	8563E11516	22 Jun 2007
HPE4419B	GB39511188	E4419B11188	04 Oct 2007

Report Number: 1-651985653-1
Model Number: HP8714C
Serial Number: US38171129

Test Date: 2 May 2007

Cust. Unit No.: K82012

PERFORMANCE TEST RESULTS SUMMARY

Test Name	Status
INITIAL SETUP	DONE
FREQUENCY ACCURACY	PASSED
GAIN COMPRESSION	PASSED
NOISE FLOOR	PASSED
DYNAMIC ACCURACY	PASSED
POWER FLATNESS	PASSED
ABSOLUTE ACCURACY	PASSED
BROADBAND FREQUENCY RESPONSE	PASSED
DIRECTIVITY	PASSED
HARMONICS	PASSED

Report Number: 1-651985653-1
Model Number: HP8714C
Serial Number: US38171129

Test Date: 2 May 2007

Cust. Unit No.: K82012

FREQUENCY ACCURACY

PASSED

TEST CONDITIONS	MINIMUM	MEASURED	MAXIMUM
Frequency Error at			
10.000000 MHz	-0.050	-0.006 kHz	0.050
50.000000 MHz	-0.250	-0.031 kHz	0.250
123.456789 MHz	-0.617	-0.077 kHz	0.617
500.000000 MHz	-2.500	0.000 kHz	2.500
1000.000000 MHz	-5.000	0.000 kHz	5.000
1300.000000 MHz	-6.500	0.000 kHz	6.500
1905.000000 MHz	-9.525	0.000 kHz	9.525
1915.000000 MHz	-9.575	0.000 kHz	9.575
2500.000000 MHz	-12.500	0.000 kHz	12.500
2850.000000 MHz	-14.250	0.000 kHz	14.250

GAIN COMPRESSION

PASSED

TEST CONDITIONS	MEASURED	MAXIMUM
0.3 MHz	0.000 dB	0.367
1.0 MHz	0.000 dB	0.367
10.0 MHz	0.000 dB	0.367
100.0 MHz	0.000 dB	0.367
500.0 MHz	0.000 dB	0.367
1000.0 MHz	0.000 dB	0.367
2000.0 MHz	0.000 dB	0.367
3000.0 MHz	0.000 dB	0.367

NOISE FLOOR

PASSED

TEST CONDITIONS	MEASURED	MAXIMUM
Narrowband Detector Mode Fine BW, Spur Avoid ON 300 kHz - 5 MHz	-109.0 dBm	-50.0

continued...

Report Number: 1-651985653-1
Model Number: HP8714C
Serial Number: US38171129

Test Date: 2 May 2007

Cust. Unit No.: K82012

NOISE FLOOR

TEST CONDITIONS	MEASURED	MAXIMUM
5 MHz - 3000 MHz	-99.0 dBm	-90.0
Broadband Detector Mode Narrow BW, Spur Avoid OFF 300 kHz - 3000 MHz	-52.9 dBm	-50.0

DYNAMIC ACCURACY

PASSED

TEST CONDITIONS	MINIMUM	MEASURED	MAXIMUM
Nominal Input Level			
-10 dBm	-0.233	0.029 dB	0.233
-20 dBm	-0.100	0.004 dB	0.100
-30 dBm	-0.100	0.007 dB	0.100
-40 dBm	-0.100	0.008 dB	0.100
-50 dBm	-0.100	0.012 dB	0.100
-60 dBm	-0.100	0.009 dB	0.100
-70 dBm	-0.100	0.004 dB	0.100
-80 dBm	-0.400	0.010 dB	0.400
-90 dBm	-0.700	-0.174 dB	0.700
-100 dBm	-1.000	0.228 dB	1.000

POWER FLATNESS

PASSED

TEST CONDITIONS	MEASURED	MAXIMUM
Nominal Power Level		
10.00 dBm	0.58 dB	2.00
Maximum: +10.30 dBm, found at:	2884.6 MHz	
Minimum: +9.77 dBm, found at:	.3 MHz	
0.00 dBm	0.40 dB	2.00
Maximum: +.24 dBm, found at:	2884.6 MHz	

continued...

Report Number: 1-651985653-1
Model Number: HP8714C
Serial Number: US38171129

Test Date: 2 May 2007

Cust. Unit No.: K82012

POWER FLATNESS

TEST CONDITIONS		MEASURED	MAXIMUM
Minimum:	-.16 dBm, found at:	.3 MHz	
-5.00 dBm		0.24 dB	2.00
Maximum:	-4.85 dBm, found at:	2884.6 MHz	
Minimum:	-5.09 dBm, found at:	.3 MHz	

ABSOLUTE ACCURACY

PASSED

TEST CONDITIONS	MINIMUM	MEASURED	MAXIMUM
+16.0 dBm	-0.55	0.26 dB	0.55
+10.0 dBm	-0.50	0.20 dB	0.50
+5.0 dBm	-0.50	0.25 dB	0.50
0.0 dBm	-0.50	0.22 dB	0.50
-5.0 dBm	-0.50	0.13 dB	0.50
-10.0 dBm	-0.50	0.15 dB	0.50
-15.0 dBm	-0.50	0.38 dB	0.50
-20.0 dBm	-0.50	0.39 dB	0.50
-25.0 dBm	-0.50	0.34 dB	0.50
-30.0 dBm	-0.50	0.35 dB	0.50
-35.0 dBm	-0.75	0.13 dB	0.75
-40.0 dBm	-1.00	0.15 dB	1.00
-45.0 dBm	-1.50	0.35 dB	1.50
-50.0 dBm	-2.00	0.06 dB	2.00
-55.0 dBm	-7.00	1.22 dB	7.00

BROADBAND FREQUENCY RESPONSE

PASSED

TEST CONDITIONS	MEASURED	MAXIMUM
Nominal Input Level -6 dBm	0.70 dB	2.00

Measurement Report

Report Number: 1-651985653-1
Model Number: HP8714C
Serial Number: US38171129

Test Date: 2 May 2007

Cust. Unit No.: K82012

DIRECTIVITY

PASSED

TEST CONDITIONS	MEASURED	MAXIMUM
Directivity	-45.3 dB	-30.0
Source Match	-24.7 dB	-20.0
Input Match	-20.9 dB	-18.0

HARMONICS

PASSED

TEST CONDITIONS	MEASURED	MAXIMUM
+7 dBm Source Level		
2nd Harm. measured at		
0.3 MHz	-41.3 dBc	-20.0
1.0 MHz	-45.2 dBc	-30.0
3.0 MHz	-42.0 dBc	-30.0
10.0 MHz	-51.8 dBc	-30.0
30.0 MHz	-51.7 dBc	-30.0
100.0 MHz	-61.7 dBc	-30.0
200.0 MHz	-43.2 dBc	-30.0
300.0 MHz	-41.0 dBc	-30.0
400.0 MHz	-36.8 dBc	-30.0
500.0 MHz	-34.8 dBc	-30.0
600.0 MHz	-35.7 dBc	-30.0
700.0 MHz	-38.0 dBc	-30.0
800.0 MHz	-38.2 dBc	-30.0
900.0 MHz	-38.8 dBc	-30.0
1000.0 MHz	-40.7 dBc	-30.0
1100.0 MHz	-43.7 dBc	-30.0
1200.0 MHz	-56.7 dBc	-30.0
1440.0 MHz	-37.8 dBc	-30.0

Agilent Technologies

Agilent Service Request Number:
1-651985593

Agilent Service Order Number:
1-651985653

Customer Service Information

Qualcomm Inc
6455 Lusk Blvd
SAN DIEGO CA 92121
United States

Customer Contact:
Fito Cisneros

Telephone:
(858) 651-0348

Receive Date:
24/APR/2007

Schedule Date:
01/MAY/2007

Shipped Date:

Product Number:
AGILENT 8714C

Product Serial Number:
US38171129

Product Description:
RF Network analyzer

Purchase Order Number:
K82012

Problem Description:
Agilent Calibration /

Cal Interval: 12 Months /
Installed Options: /
Special Requirements:K82012

Services Provided:
Calibration complete unit met MFG spec

Accessories

Parts Used

Qty	Part Number	Description

Agilent Technologies

AGILENT TECHNOLOGIES
INTERNAL ASSESSMENT
PROGRAM : AQ-SSU-12/95

EMG Support Operation
10090 Foothills Blvd.
Roseville, CA. 95747
(800) 829-4444

Certificate of Calibration

Agilent Inclusive Calibration PLUS

Certificate Number: 1-287259662-1

Manufacturer:	Hewlett-Packard Co.	**Description:**	RF Network Analyzer, 3 GHz
Model Number:	8714C	**Options Installed:**	
Serial Number:	US38171129	**Customer Asset Numb**	K82012
Customer:		**Location of Calibration:**	
Qualcomm Inc 6455 Lusk Blvd SAN DIEGO CA 92121 United States		EMG Support Operation 10090 Foothills Blvd. Roseville, CA. 95747 (800) 829-4444	
Procedure:	STE-50112873-A.04.00		
Date of Calibration:	13 Apr 2006	**Customer PO Number**	Credit Card
Temperature:	18-28 °C	**Humidity:**	20-80% RH

This certifies that the above product was calibrated in compliance with a quality system registered to ISO 9001:2000 using applicable Agilent Technologies procedures.

As Received Conditions:

Initial testing found the equipment to be **IN-SPECIFICATION** at the points tested.

As Shipped Conditions:

At the completion of the calibration, measured values were **IN-SPECIFICATION** at the points tested.

Remarks or Special Requirements:

Our calibration procedures are designed to provide measurement uncertainty of less than or equal to one quarter of the specification of the unit under test, where possible, with a coverage factor of 2.

The test limits stated in the report correspond to the published specifications of the equipment, at the points tested.

This certificate is composed of 2 pages containing a summary of calibration information.

Based on the recommended calibration interval, the next calibration is due on 13 Apr 2007.

Print Date: 13 Apr 2006

Larry Goins Calibration District Mgr.

Agilent Technologies

AGILENT TECHNOLOGIES
INTERNAL ASSESSMENT
PROGRAM : AQ-SSU-12/95

EMG Support Operation
10090 Foothills Blvd.
Roseville, CA. 95747
(800) 829-4444

Certificate of Calibration

Agilent Inclusive Calibration PLUS

Certificate Number: 1-287259662-1

Traceability Information:

Technician ID Number: 88880

Traceability is to national standards administered by the U.S. NIST, NRC Canada, Euromet members (NPL, PTB, BNM, etc,) or other recognized standards laboratories.

Some measurements are traceable to natural physical constants, consensus standards or ratio type measurements.

Supporting documentation relative to traceability is available for review by appointment.

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

Calibration Equipment Used:

Model Number:	Model Description:	Trace Number:	Cal Due Date:	Certificate Number:
11667A	DC-18 GHz power splitter, Type N, 50 ohm	11667A23842	12 Oct 2007	1-228745016-1
438A	Dual-channel power meter with GPIB	438A06600	12 Aug 2006	1-169481804-1
8116A	PULSE/FUNCTION GENERATOR	8116A02166	6 Oct 2007	1-284199219-1
8482A	Power sensor, 100 kHz to 4.2 GHz	8482A01646	8 Nov 2006	1-240072081-1
8491B	COAXIAL ATTENUATOR	8491B22418	21 Feb 2009	1-265849051-1
8491B	COAXIAL ATTENUATOR	8491B23996	21 Feb 2009	1-265848768-1
8491B	COAXIAL ATTENUATOR	8491B24024	21 Feb 2009	1-265876274-1
8491B	COAXIAL ATTENUATOR	8491B30482	21 Feb 2009	1-265876417-1
85032B	50-ohm Type N cal. kit for 8752A/C	85032B10850	5 Jun 2006	1-82252990-1
8563E	9 kHz - 26.5 GHz MW spectrum analyzer	8563E07558	24 Jan 2007	1-143935910-1

Agilent Technologies Inc
A03
10090 Foothills Blvd
ROSEVILLE CA 95747
United States

Agilent Technologies

Agilent Service Request Number:
1-287259432

Agilent Service Order Number:
1-287259662

Customer Service Information

Qualcomm Inc
6455 Lusk Blvd
SAN DIEGO CA 92121
United States

Customer Contact:
Derick Myler

Telephone:
(858) 651-2535

Receive Date:
12/APR/2006

Schedule Date:
19/APR/2006

Shipped Date:

Product Number:
AGILENT 8714C

Product Serial Number:
US38171129

Product Description:
RF Network analyzer

Purchase Order Number:
BBP K82012

Problem Description:
Agilent cal. 12 month cal interval.

Services Provided:
Cleaned and calibrated to manufacturer's specifications. Calibration certificate and data provided.

Accessories

2 HANDLES

Parts Used

Qty	Part Number	Description

Measurement Report

Report Number: 1-287259662-1 **Test Date:** 13 Apr 2006
Model Number: HP8714C
Serial Number: US38171129

PERFORMANCE TEST RESULTS SUMMARY

Test Name	Status
INITIAL SETUP	DONE
FREQUENCY ACCURACY	PASSED
GAIN COMPRESSION	PASSED
NOISE FLOOR	PASSED
DYNAMIC ACCURACY	PASSED
POWER FLATNESS	PASSED
ABSOLUTE ACCURACY	PASSED
BROADBAND FREQUENCY RESPONSE	PASSED
DIRECTIVITY	PASSED
HARMONICS	PASSED

Measurement Report

Report Number: 1-287259662-1 **Test Date:** 13 Apr 2006
Model Number: HP8714C
Serial Number: US38171129

HARMONICS **PASSED**

TEST CONDITIONS	MEASURED	MAXIMUM
+7 dBm Source Level		
2nd Harm. measured at		
0.3 MHz	-40.5 dBc	-20.0
1.0 MHz	-42.7 dBc	-30.0
3.0 MHz	-46.0 dBc	-30.0
10.0 MHz	-47.7 dBc	-30.0
30.0 MHz	-52.2 dBc	-30.0
100.0 MHz	-56.2 dBc	-30.0
200.0 MHz	-43.8 dBc	-30.0
300.0 MHz	-41.5 dBc	-30.0
400.0 MHz	-36.7 dBc	-30.0
500.0 MHz	-34.8 dBc	-30.0
600.0 MHz	-34.7 dBc	-30.0
700.0 MHz	-35.3 dBc	-30.0
800.0 MHz	-36.5 dBc	-30.0
900.0 MHz	-36.7 dBc	-30.0
1000.0 MHz	-39.5 dBc	-30.0
1100.0 MHz	-42.7 dBc	-30.0
1200.0 MHz	-60.7 dBc	-30.0
1440.0 MHz	-36.0 dBc	-30.0

Measurement Report

Report Number: 1-287259662-1 **Test Date:** 13 Apr 2006
Model Number: HP8714C
Serial Number: US38171129

NOISE FLOOR

TEST CONDITIONS	MEASURED	MAXIMUM
300 kHz - 3000 MHz	-52.6 dBm	-50.0

DYNAMIC ACCURACY

PASSED

TEST CONDITIONS	MINIMUM	MEASURED	MAXIMUM
Nominal Input Level			
-10 dBm	-0.233	0.026 dB	0.233
-20 dBm	-0.100	0.001 dB	0.100
-30 dBm	-0.100	-0.003 dB	0.100
-40 dBm	-0.100	-0.002 dB	0.100
-50 dBm	-0.100	0.010 dB	0.100
-60 dBm	-0.100	0.006 dB	0.100
-70 dBm	-0.100	0.005 dB	0.100
-80 dBm	-0.400	-0.015 dB	0.400
-90 dBm	-0.700	0.022 dB	0.700
-100 dBm	-1.000	0.127 dB	1.000

POWER FLATNESS

PASSED

TEST CONDITIONS		MEASURED	MAXIMUM
Nominal Power Level			
10.00 dBm		0.45 dB	2.00
Maximum:	+10.30 dBm, found at:	2884.6 MHz	
Minimum:	+9.84 dBm, found at:	.3 MHz	
0.00 dBm		0.28 dB	2.00
Maximum:	+.21 dBm, found at:	2884.6 MHz	
Minimum:	-.07 dBm, found at:	.3 MHz	
-5.00 dBm		0.16 dB	2.00
Maximum:	-4.89 dBm, found at:	2884.6 MHz	
Minimum:	-5.05 dBm, found at:	1269.4 MHz	

Measurement Report

AGILENT TECHNOLOGIES
TMO Support Operation
10090 Foothills Blvd.
Roseville, CA. 95747

Report Number: 1-287259662-1
Customer: QUALCOMM INC
Manufacturer: Hewlett-Packard Co.
(Agilent Technologies)
Model Number: 8714C (HP8714C)
Serial Number: US38171129
Options Installed: none
Firmware Version:

Test Date: 13 Apr 2006
Tested By: 9700081
Temperature: 23±5 °C
Humidity: 20 to 80% RH

Test Program Name: HP871X Part No. 5011-2873
Test Program Version: A.04.00
Test Executive: STE/9000 C.07.09C (MENDOR B.06.09I)

Specification Limits:

Unless indicated otherwise, the units for minimum and/or maximum specification limits are the same as the units stated for the measured value.

Calibration Standards Used

Model No.	Serial No.	Trace No.	Cal Due Date
HP11667A	23842	11667A23842	12 Oct 2007
HP438A	3513U06600	438A06600	12 Aug 2006
HP8116A	2124G02166	8116A02166	06 Oct 2007
HP8482A	1551A01646	8482A01646	08 Nov 2006
HP8491B	22418	8491B22418	21 Feb 2009
HP8491B	23996	8491B23996	21 Feb 2009
HP8491B	24024	8491B24024	21 Feb 2009
HP8491B	30482	8491B30482	21 Feb 2009
HP8496G	3247A14624	8496G14624	12 Dec 2007
HP85032B	3217A10850	85032B10850	05 Jun 2006
HP8563E	3728A07558	8563E07558	24 Jan 2007

Measurement Report

Report Number: 1-287259662-1
Model Number: HP8714C
Serial Number: US38171129
Test Date: 13 Apr 2006

ABSOLUTE ACCURACY

PASSED

TEST CONDITIONS	MINIMUM	MEASURED	MAXIMUM
+16.0 dBm	-0.55	0.17 dB	0.55
+10.0 dBm	-0.50	0.11 dB	0.50
+5.0 dBm	-0.50	0.15 dB	0.50
0.0 dBm	-0.50	0.14 dB	0.50
-5.0 dBm	-0.50	0.07 dB	0.50
-10.0 dBm	-0.50	0.10 dB	0.50
-15.0 dBm	-0.50	0.29 dB	0.50
-20.0 dBm	-0.50	0.30 dB	0.50
-25.0 dBm	-0.50	0.28 dB	0.50
-30.0 dBm	-0.50	0.30 dB	0.50
-35.0 dBm	-0.75	0.34 dB	0.75
-40.0 dBm	-1.00	0.36 dB	1.00
-45.0 dBm	-1.50	0.34 dB	1.50
-50.0 dBm	-2.00	0.43 dB	2.00
-55.0 dBm	-7.00	3.40 dB	7.00

BROADBAND FREQUENCY RESPONSE

PASSED

TEST CONDITIONS	MEASURED	MAXIMUM
Nominal Input Level -6 dBm	1.01 dB	2.00

DIRECTIVITY

PASSED

TEST CONDITIONS	MEASURED	MAXIMUM
Directivity	-47.9 dB	-30.0
Source Match	-44.1 dB	-20.0
Input Match	-21.4 dB	-18.0

Measurement Report

Report Number: 1-287259662-1 **Test Date:** 13 Apr 2006
Model Number: HP8714C
Serial Number: US38171129

FREQUENCY ACCURACY

PASSED

TEST CONDITIONS	MINIMUM	MEASURED	MAXIMUM
Frequency Error at			
10.000000 MHz	-0.050	-0.006 kHz	0.050
50.000000 MHz	-0.250	-0.028 kHz	0.250
123.456789 MHz	-0.617	-0.069 kHz	0.617
500.000000 MHz	-2.500	-0.280 kHz	2.500
1000.000000 MHz	-5.000	-0.560 kHz	5.000
1300.000000 MHz	-6.500	-0.727 kHz	6.500
1905.000000 MHz	-9.525	-1.066 kHz	9.525
1915.000000 MHz	-9.575	-1.071 kHz	9.575
2500.000000 MHz	-12.500	-1.398 kHz	12.500
2850.000000 MHz	-14.250	-1.595 kHz	14.250

GAIN COMPRESSION

PASSED

TEST CONDITIONS	MEASURED	MAXIMUM
0.3 MHz	0.156 dB	0.367
1.0 MHz	0.000 dB	0.367
10.0 MHz	0.000 dB	0.367
100.0 MHz	0.000 dB	0.367
500.0 MHz	0.000 dB	0.367
1000.0 MHz	0.000 dB	0.367
2000.0 MHz	0.000 dB	0.367
3000.0 MHz	0.000 dB	0.367

NOISE FLOOR

PASSED

TEST CONDITIONS	MEASURED	MAXIMUM
Narrowband Detector Mode		
Fine BW, Spur Avoid ON		
300 kHz - 5 MHz	-107.3 dBm	-50.0
5 MHz - 3000 MHz	-97.5 dBm	-90.0
Broadband Detector Mode		
Narrow BW, Spur Avoid OFF		

continued...

QUALCOMM®

5775 Morehouse Drive, San Diego, CA, 92121-2779

Report # K82012:QC-128547142

Certificate of Calibration

Manufacturer:	AGILENT TECHNOLOGIES	**Model #:**	8714C
Asset #:	K82012	**Serial Number:**	US38171129
Description:	NETWORK ANALYZER		

QUALCOMM Incorporated hereby certifies that...

the above described instrument met or exceeded all published specifications at the time of calibration specified below; and has been calibrated using standards whose accuracies are traceable to the National Institute of Standards and Technology (NIST) within the limitations of the Institute's calibration services, or have been derived from accepted values or physical constants, or have been derived by ratio or self calibration techniques. The collective uncertainty of the measurement standards have not exceeded 4:1 test accuracy ratio for each characteristic calibrated, unless otherwise noted. All calibration activities performed are in compliance with MIL-STD-45662A, ANSI/NCSL Z540-1-1994, ISO-9001-1994, and ISO 10012-1:1992. This report and its results refer only to the item(s) calibrated and are not to be reproduced, except in full, without the written approval of the Qualcomm Incorporated Calibration Laboratory.

CALIBRATION INFORMATION

Cal Date	01/27/2004	**Interval**	12	**Cal Temp**	22
Cal Due	01/27/2005	**Data**	NO	**Humidity**	50
Tech	KHANH VU	**Pass**	YES	**Seals OK**	YES

Condition Received IN TOLERANCE

Condition Returmed MEETS MFR'S SPECS

Physical Condition of Equipment GOOD

Out of Tolerance Conditions/Limitation

USE HP'S AUTOMATION P/T

Cal Procedure MANUFACTURER **Revisioin** NA

STANDARDS USED FOR CALIBRATION

Asset Number	MFG	Model	Description	Cal Date	Due Date
X12044	AGILENT TECHNOLOGIES	11582A	ATTENUATOR SET	11/07/03	11/06/04
K23161	AGILENT TECHNOLOGIES	437B	POWER METER	10/01/03	10/01/04
X04201	AGILENT TECHNOLOGIES	8482A	POWER SENSOR	10/01/03	10/01/04
K69726	AGILENT TECHNOLOGIES	8561E	SPECTRUM ANALYZER	11/06/03	11/05/04
X21430	AGILENT TECHNOLOGIES	11636A	POWER DIVIDER	04/23/03	04/22/04
K42597	AGILENT TECHNOLOGIES	8116A	PULSE/FUNCTION GENERATOR	11/12/03	11/12/04
K73978	AGILENT TECHNOLOGIES	5351B	FREQUENCY COUNTER	10/03/03	10/03/04
X03748	AGILENT TECHNOLOGIES	8496G	COAXIAL STEP ATTENUATOR	10/13/03	10/13/04
K65475	AGILENT TECHNOLOGIES	85032B	CALIBRATION KIT	10/06/03	10/05/04
K76196	AGILENT TECHNOLOGIES	11713A	ATTENUATOR/SWITCH DRIVER		

Signed: Kathleen Abreu **Date:** 01/27/2004

COPY

X1970/

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: **DAE3-400_Mar08**

CALIBRATION CERTIFICATE

Object	DAE3 - SD 000 D03 AA - SN: 400
Calibration procedure(s)	QA CAL-06.v12 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	March 5, 2008
Condition of the calibrated item	In Tolerance

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Fluke Process Calibrator Type 702	SN: 6295803	04-Oct-07 (Elcal AG, No: 6467)	Oct-08
Keithley Multimeter Type 2001	SN: 0810278	03-Oct-07 (Elcal AG, No: 6465)	Oct-08
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Calibrator Box V1.1	SE UMS 006 AB 1004	25-Jun-07 (SPEAG, in house check)	In house check Jun-08

	Name	Function	Signature
Calibrated by:	Dominique Steffen	Technician	
Approved by:	Fin Bomholt	R&D Director	

Issued: March 5, 2008

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

Glossary

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement*: Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range:	1LSB =	6.1µV ,	full range =	-100...+300 mV
Low Range:	1LSB =	61nV ,	full range =	-1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.689 ± 0.1% (k=2)	405.159 ± 0.1% (k=2)	403.680 ± 0.1% (k=2)
Low Range	3.96738 ± 0.7% (k=2)	3.96885 ± 0.7% (k=2)	3.91978 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	347 ° ± 1 °

Appendix

1. DC Voltage Linearity

High Range		Input (μV)	Reading (μV)	Error (%)
Channel X	+ Input	200000	199999.6	0.00
Channel X	+ Input	20000	20006.05	0.03
Channel X	- Input	20000	-20001.79	0.01
Channel Y	+ Input	200000	199999.8	0.00
Channel Y	+ Input	20000	20006.87	0.03
Channel Y	- Input	20000	-19998.83	-0.01
Channel Z	+ Input	200000	200000	0.00
Channel Z	+ Input	20000	20004.03	0.02
Channel Z	- Input	20000	-20004.39	0.02

Low Range		Input (μV)	Reading (μV)	Error (%)
Channel X	+ Input	2000	2000	0.00
Channel X	+ Input	200	199.82	-0.09
Channel X	- Input	200	-199.40	-0.30
Channel Y	+ Input	2000	2000	0.00
Channel Y	+ Input	200	199.99	0.00
Channel Y	- Input	200	-200.53	0.27
Channel Z	+ Input	2000	1999.9	0.00
Channel Z	+ Input	200	198.94	-0.53
Channel Z	- Input	200	-200.89	0.44

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	-5.64	-7.20
	- 200	9.15	7.89
Channel Y	200	-8.45	-8.44
	- 200	7.61	7.76
Channel Z	200	20.82	20.67
	- 200	-20.24	-23.02

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	3.30	-0.21
Channel Y	200	1.14	-	4.22
Channel Z	200	-0.34	1.22	-

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	15653	15677
Channel Y	15956	15909
Channel Z	16453	16956

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	0.55	-1.14	1.75	0.57
Channel Y	-1.31	-3.09	0.00	0.54
Channel Z	-1.26	-2.81	0.25	0.52

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance

	Zeroing (MOhm)	Measuring (MOhm)
Channel X	0.2001	197.2
Channel Y	0.2002	198.6
Channel Z	0.1999	198.7

8. Low Battery Alarm Voltage (verified during pre test)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (verified during pre test)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.0	+6	+14
Supply (- Vcc)	-0.01	-8	-9

Schmid & Partner Engineering AG

s p e a g

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IMPORTANT NOTICE

USAGE OF THE DAE 3

The DAE unit is a delicate, high precision instrument and requires careful treatment by the user. There are no serviceable parts inside the DAE. Special attention shall be given to the following points:

Battery Exchange: The battery cover of the DAE3 unit is connected to a fragile 3-pin battery connector. Customer is responsible to apply outmost caution not to bend or damage the connector when changing batteries.

Shipping of the DAE: Before shipping the DAE to SPEAG for calibration Customer shall remove the batteries and pack the DAE in an antistatic bag. The packaging shall protect the DAE from impacts during transportation. The package shall be marked to indicate that a fragile instrument is inside.

E-Stop Failures: Touch detection may be malfunctioning due to broken magnets in the E-stop. Rough handling of the E-stop may lead to damage of these magnets. Touch and collision errors are often caused by dust and dirt accumulated in the E-stop. To prevent E-stop failure, Customer shall always mount the probe to the DAE carefully and keep the DAE unit in a non-dusty environment if not used for measurements.

Repair: Minor repairs are performed at no extra cost during the annual calibration. However, SPEAG reserves the right to charge for any repair especially if rough unprofessional handling caused the defect.

Important Note:
Warranty and calibration is void if the DAE unit is disassembled partly or fully by the Customer.

Important Note:
Never attempt to grease or oil the E-stop assembly. Cleaning and readjusting of the E-stop assembly is allowed by certified SPEAG personnel only and is part of the annual calibration procedure.

Schmid & Partner Engineering

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 108

Client Qualcomm USA

Certificate No: D1900V2-5d019_Nov07

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d019
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	November 13, 2007
Condition of the calibrated item	In Tolerance

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	04-Oct-07 (METAS, No. 217-00736)	Oct-08
Power sensor HP 8481A	US37292783	04-Oct-07 (METAS, No. 217-00736)	Oct-08
Reference 20 dB Attenuator	SN: 5086 (20g)	07-Aug-07 (METAS, No 217-00718)	Aug-08
Reference 10 dB Attenuator	SN: 5047.2 (10r)	07-Aug-07 (METAS, No 217-00718)	Aug-08
Reference Probe ET3DV6 (HF)	SN: 1507	26-Oct-07 (SPEAG, No. ET3-1507_Oct07)	Oct-08
DAE4	SN 601	30-Jan-07 (SPEAG, No. DAE4-601_Jan07)	Jan-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-07)	In house check: Oct-08
RF generator R&S SMT-06	100005	4-Aug-99 (SPEAG, in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Oct-07)	In house check: Oct-08

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

Issued: November 15, 2007

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

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

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "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
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) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY4	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.8 ± 6 %	1.45 mho/m ± 6 %
Head TSL temperature during test	(21.4 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	condition	
SAR measured	250 mW input power	9.86 mW / g
SAR normalized	normalized to 1W	39.4 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**38.1 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.15 mW / g
SAR normalized	normalized to 1W	20.6 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**20.2 mW / g ± 16.5 % (k=2)**

[1] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.7 ± 6 %	1.54 mho/m ± 6 %
Body TSL temperature during test	(21.0 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.32 mW / g
SAR normalized	normalized to 1W	37.3 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**37.2 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	4.99 mW / g
SAR normalized	normalized to 1W	20.0 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**20.0 mW / g ± 16.5 % (k=2)**

[2] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.0 Ω + 2.3 jΩ
Return Loss	- 28.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.6 Ω + 3.0 jΩ
Return Loss	- 29.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.197 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	June 04, 2002

DASY4 Validation Report for Head TSL

Date/Time: 05.11.2007 14:23:55

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d019

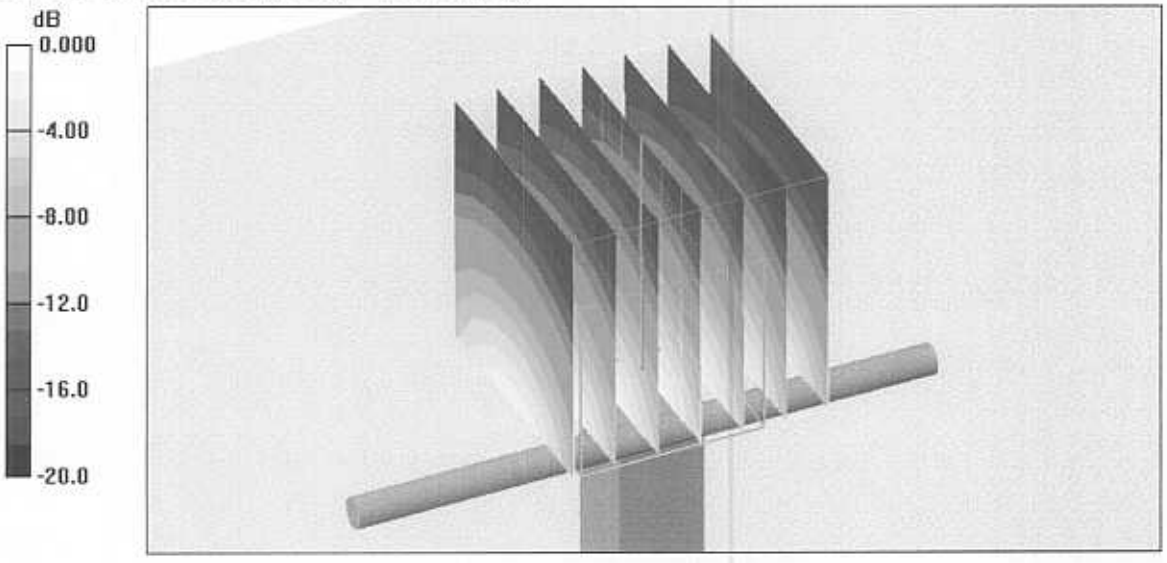
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL U10 BB;
Medium parameters used: f = 1900 MHz; σ = 1.45 mho/m; ε_r = 38.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.86, 4.86, 4.86); Calibrated: 26.10.2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

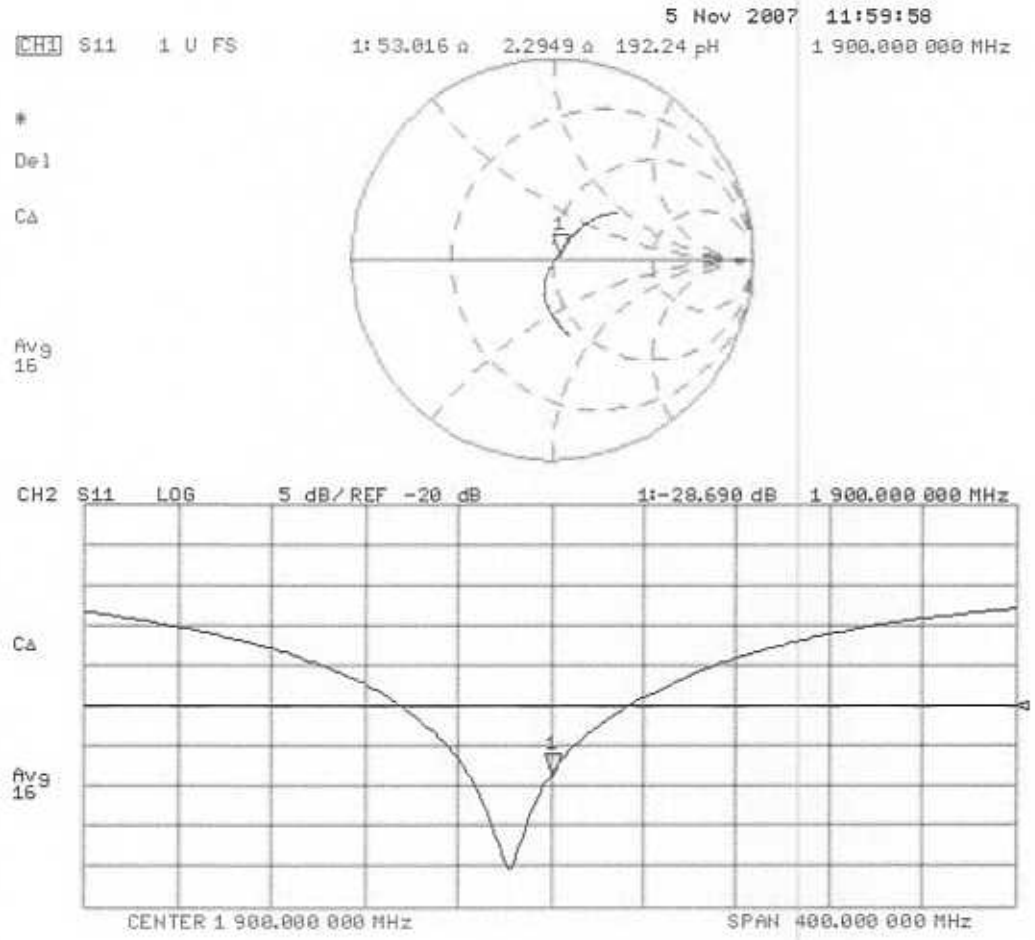
Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 93.1 V/m; Power Drift = 0.036 dB
Peak SAR (extrapolated) = 17.4 W/kg
SAR(1 g) = 9.86 mW/g; SAR(10 g) = 5.15 mW/g
Maximum value of SAR (measured) = 11.1 mW/g



0 dB = 11.1mW/g

Impedance Measurement Plot for Head TSL



DASY4 Validation Report for Body TSL

Date/Time: 13.11.2007 14:09:19

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d019

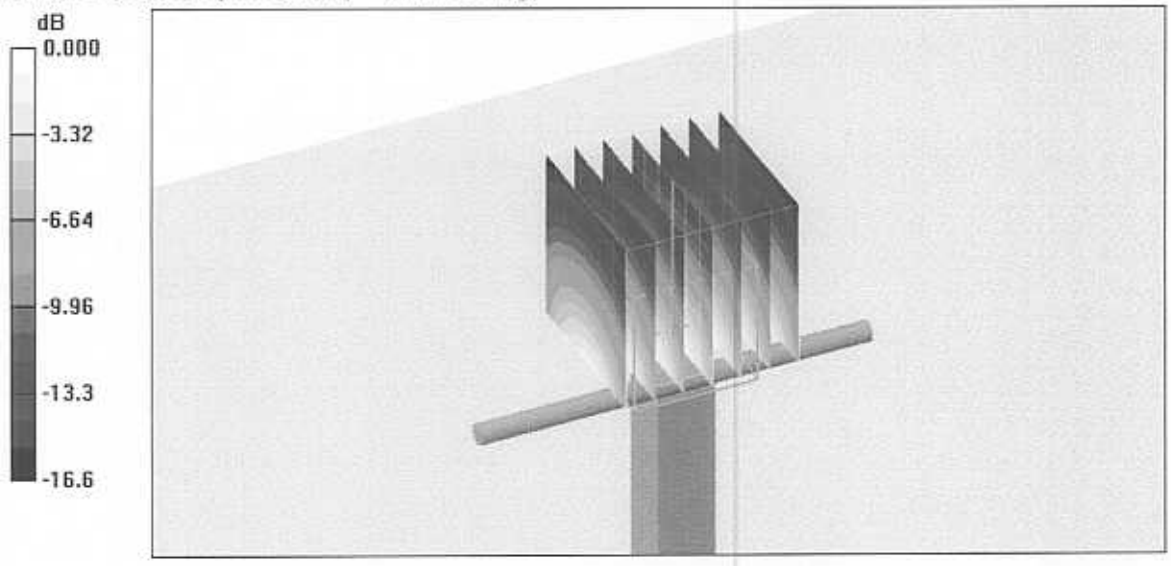
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: MSL U10 BB;
Medium parameters used: f = 1900 MHz; σ = 1.54 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.48, 4.48, 4.48); Calibrated: 26.10.2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.5 V/m; Power Drift = -0.006 dB
Peak SAR (extrapolated) = 15.9 W/kg
SAR(1 g) = 9.32 mW/g; SAR(10 g) = 4.99 mW/g
Maximum value of SAR (measured) = 10.6 mW/g



0 dB = 10.6mW/g

Impedance Measurement Plot for Body TSL