



UNDP-1 Hewlett-Packard HSTNN-W47C SAR Test Report

80-VH688-8 Rev. A

May 6, 2008

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QUALCOMM Incorporated
5775 Morehouse Drive
San Diego, CA 92121-1714
U.S.A.

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UNDP-1 Hewlett-Packard HSTNN-W47C SAR Test Report
80-VH688-8 Rev. A

Revision history

Revision	Date	Description
A	May 2008	Initial release



5775 Morehouse Dr.
San Diego CA 92121

Overview

Test Report Reference:	80-VH688-8 Rev. A
Responsible Engineer:	John Forrester
Signature:	
Test Engineer:	Mark Ortlieb
Signature:	
Date of issue:	6 May 2008
Test Laboratory:	QUALCOMM Incorporated 5775 Morehouse Dr. San Diego CA 92121 (General Telephone) 1 858 587 1121
Model Tested:	UNDP-1 with Hewlett-Packard HSTNN-47C Tablet Computer
Test Specification Standard(s):	<i>FCC CFR47 Part 2.1093: Radiofrequency radiation exposure evaluation: portable devices</i> <i>FCC/OET Bulletin 65, including Supplement C, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields</i> <i>FCC "SAR Measurement Procedures for 3G Devices" (October 2007)</i> <i>FCC "SAR Evaluation Considerations for Laptop Computers with Antennas Built-in on Display Screens" (December 2007)</i> <i>ANSI/IEEE P1528/D1.2 Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques</i>
Results:	The UNDP-1 embedded in Hewlett-Packard host notebook HSTNN-47C complies with the requirements of the aforementioned standards and is in compliance with the FCC Part 2.1093 RF exposure limit.

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1. Test summary

1.1 Equipment tested

A UNDP-1 WWAN mPCIe card embedded in a HP model HSTNN-W47C tablet was tested for SAR compliance with FCC regulations.

The HSTNN-W47C notebook computer also has embedded Bluetooth and WLAN capabilities that were not tested as part of this test report. When used as a conventional notebook, the WWAN and WLAN antennas provide greater than 20cm of separation distance to the end user and is thus classified as a mobile device per FCC definitions. When operated in “Table” mode, the platform is categorized as a portable device and requires SAR evaluation of WWAN and WLAN. A separate test report addresses WLAN RF safety and simultaneous transmit conditions for WLAN and WWAN transmitters.

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	Mid	1.45 mW/g	Pass
PCS	EV-DO	Low	0.59 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-1H
WWAN Module Serial Number	QCT712142468
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:	HP model HSTNN-W47C
Host(s) Serial Number:	2CE8080PHL
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/WCMA: 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	HP model HSTNN-W47C
WLAN FCC ID(s)	N/A
Bluetooth FCC ID(s)	N/A
UWB FCC IC	N/A
WWAN Antenna(s)	The WWAN transmitter uses a Planner Inverted F antenna manufactured by Amphenol. P/N WT0544-12-000-R
BT Antenna(s)	N/A
WLAN Antenna(s)	N/A
WWAN to user separation distance (cm)	2.1
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)	N/A

Table 2-3 Simultaneous Transmission Information

	WLAN	Bluetooth
WWAN	Yes	Yes
WLAN	Yes	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 section 11.

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

Table 3-1 GPRS Maximum Transmit Power (dBm)

Mode	GSM850 Channel			GSM1900 Channel		
	128	190	251	512	661	810
GPRS 2UL	25.3	25.0	25.2	36.0	36.2	37.4

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

REV	CDMA BCO (850MHz)			CDMA BC1 (1900MHz)		
RC/TAP	Low	Mid	High	Low	Mid	High
RC3 (SO55)	24.4	24.7	24.7	24.9	24.5	24.7
RTAP rate = 153.6kbps	24.5	24.8	24.8	24.7	24.6	24.7
RETAP - payload size = 4096	24.6	24.8	24.7	24.7	24.6	24.7

Table 3-3 WCDMA/HSMA Maximum Transmit Power Results (dBm)

Mode	3GPP Subtest	Band V Channel			Band II Channel		
		Low	Mid	High	Low	Mid	High
Rel99	R99	24.55	24.45	24.48	24.45	24.1	24.14
Rel6 HSDPA	1	24.4	24.32	24.34	24.2	24.06	23.99
	2	24.45	24.34	24.43	24.4	24.04	24.07
	3	24.7	24.67	24.63	24.7	24.46	24.36
	4	24.29	24.14	24.31	24.04	24	23.94
Rel6 HSUPA	1	24.18	24.24	24.12	23.68	24.07	23.7
	2	20.4	20.4	20.4	22.75	23.8	22.55
	3	23.3	23.3	23.4	23.4	23.8	24.0
	4	22.9	21.8	22.6	22.6	22.4	22.1
	5	23.3	23.4	23.6	23.9	23.7	23.8

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 are addressed in a separate SAR report. Bluetooth power is $<60/f_{\text{GHz}}$ and therefore not tested.

Table 4-1 SAR Testing Completed per FCC Laptop Procedures

Mode	Band	Channels	Rationale
GPRS 2UL	850 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.
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)

Mode	Cell			PCS		
	Low	Mid	High	Low	Mid	High
1x RC3 (SO55)	24.4	24.7	24.7	24.9	24.5	24.7
EV-DO R0	24.5	24.8	24.8	24.7	24.6	24.7
EV-DO RA	24.6	24.8	24.7	24.7	24.6	24.7
R99	24.55	24.45	24.48	24.45	24.1	24.14
GPRS 2UL	25.3	25.0	25.2	22.8	22.9	22.4

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	24.4	275.4	72.8	1	6	1.5	Full SAR test	No
1x RC3	836	24.7	295.1	71.8	2	7	1.5	Full SAR test	No
1x RC3	849	24.7	295.1	70.7	2	7	1.5	Full SAR test	No
EV_DO R0	824	24.5	281.8	72.8	1	6	1.5	Full SAR test	No
EV_DO R0	836	24.8	302.0	71.8	2	7	1.5	Full SAR test	No
EV_DO R0	849	24.8	302.0	70.7	2	7	1.5	Full SAR test	No
R99	824	24.6	285.1	72.8	1	6	1.5	Full SAR test	No
R99	836	24.5	278.6	71.8	1	6	1.5	Full SAR test	No
R99	849	24.5	280.5	70.7	1	6	1.5	Full SAR test	No
GPRS 2UL	824	25.3	341.1	72.8	2	7	1.5	Full SAR test	Yes
GPRS 2UL	836	25.0	315.5	71.8	2	7	1.5	Full SAR test	Yes
GPRS 2UL	849	25.2	331.8	70.7	2	7	1.5	Full SAR test	Yes
1x RC3	1850	24.9	309.0	32.4	4	9	1.5	Full SAR test	No
1x RC3	1880	24.5	281.8	31.9	4	9	1.5	Full SAR test	No
1x RC3	1910	24.7	295.1	31.4	4	9	1.5	Full SAR test	No
EV_DO R0	1850	24.7	295.1	32.4	4	9	1.5	Full SAR test	Yes
EV_DO R0	1880	24.6	288.4	31.9	4	9	1.5	Full SAR test	Yes
EV_DO R0	1910	24.7	295.1	31.4	4	9	1.5	Full SAR test	Yes
R99	1850	24.5	278.6	32.4	4	9	1.5	Full SAR test	No
R99	1880	24.1	257.0	31.9	4	9	1.5	Full SAR test	No
R99	1910	24.1	259.4	31.4	4	9	1.5	Full SAR test	No
GPRS 2UL	1850	23.9	246.3	32.4	3	8	1.5	Full SAR test	No
GPRS 2UL	1880	24.1	259.1	31.9	4	9	1.5	Full SAR test	No
GPRS 2UL	1910	25.4	347.2	31.4	5	10	1.5	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% (38% 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 $5\mu\text{W/g}$ 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

$\mu\text{W/gm}$ to approx. 100 mW/g . The probe contains 3 small dipoles positioned symmetrically on a triangular core to provide for isotropic detection of the field. Each dipole contains a diode at the feed point that converts the RF signal to DC, which is conducted down a high impedance line to the data acquisition system.

5.4 Phantom

The phantom is the Standard Anthropomorphic Model (“SAM”) phantom supplied by Schmid & Partner AG, and is designed for compliance to the guidelines provided in standard IEEE P1528. It consists of a left and right side head for simulating phone usage on both sides of the head, as well as a flat area for simulating phone usage against the body. The phantom is constructed of fiberglass with $2 \text{ mm} \pm 0.1 \text{ mm}$ 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 web page for Tissue Dielectric Properties at <http://www.fcc.gov/fcc-bin/dielec.sh>.

Table 5-1 Tissue Dielectric Properties at Time of Testing

			Permittivity (ϵ_r)				Conductivity (σ)			
			Measured Values	Target Values	Deviation (%)	Limit	Measured Values	Target Values	Deviation (%)	Limit
Frequency (MHz)	Section									
3/27/2008	1900	Body	51.0	53.3	-4.30%	5%	1.52	1.52	0.00%	5%
4/1/2008	1900	Body	51.1	53.3	-4.10%	5%	1.55	1.52	+2.00%	5%
4/3/2008	1900	Body	52.3	53.3	-1.87%	5%	1.55	1.52	+2.00%	5%
4/14/2008	835	Body	54.1	55.2	-1.9%	5%	0.98	0.97	1.03%	5%

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

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

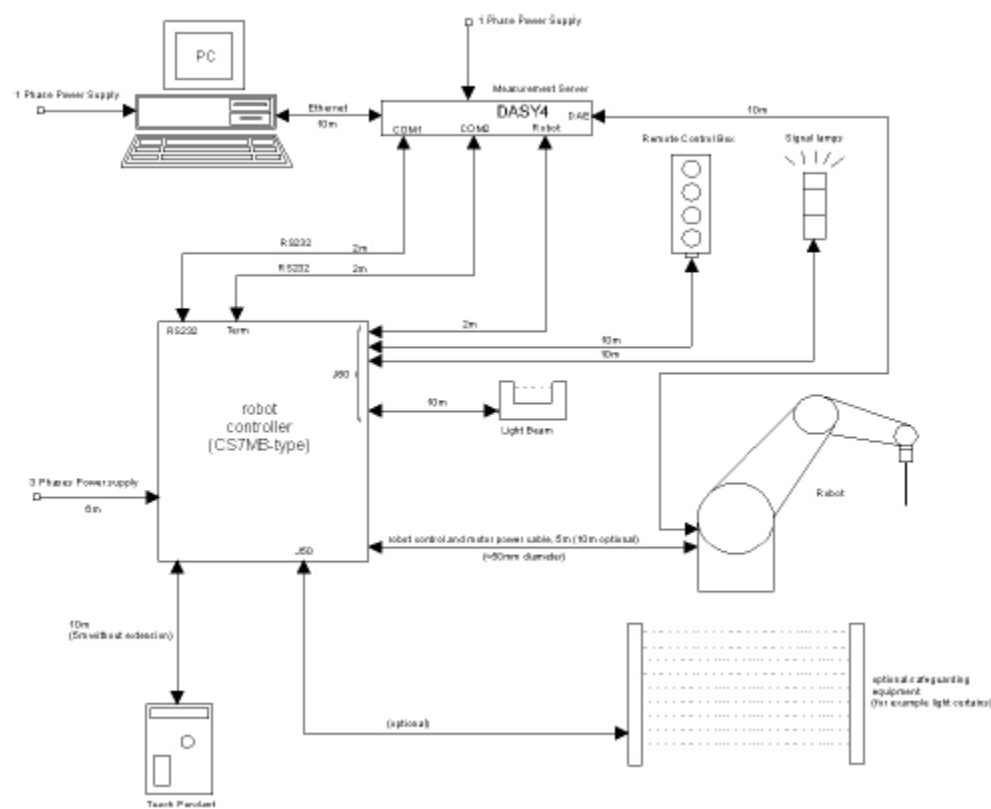


Table 6-1 Data Acquisition Information

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	5 μ W/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 $\pm$ 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	09/04/2007	09/04/2008
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	03/05/2008	03/05/2009
Gigatronics 8541C RF Power Meter	K82228	9/21/07	9/21/08
Hewlett-Packard 8714C Vector Network Analyzer	US38171129	5/2/2007	5/2/2008
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

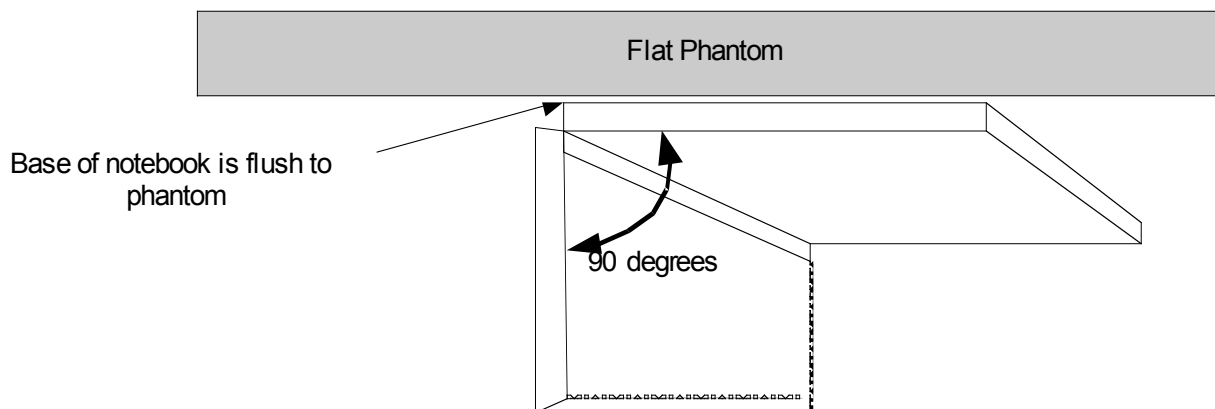
Prior to beginning SAR testing, conducted power was measured on the UNDP-1 module embedded in the host computer to verify functionally and the WWAN maximum transmit power values using the procedures defined in section 11. The results of the conducted power measurements are found in section 3.

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 Surface designations

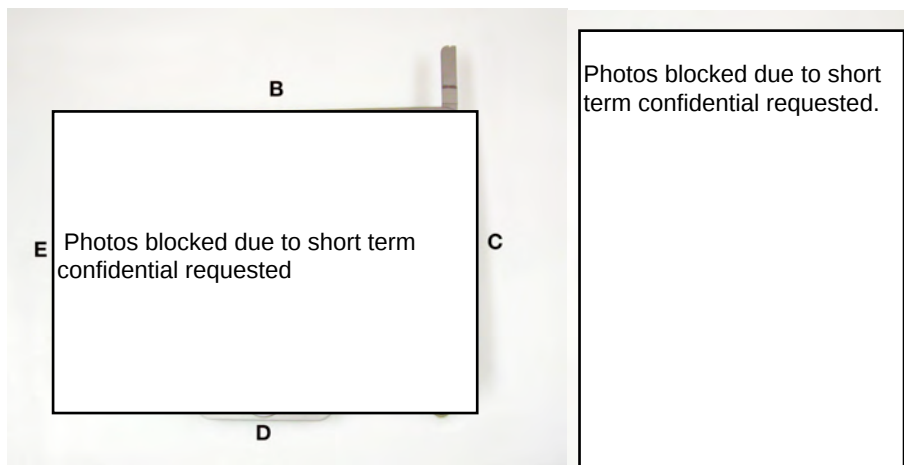


Table 7-3 Proposed SAR test positions

Surface oriented toward phantom (dist=0mm)	Main WWAN antenna					
	90° orientation		180° orientation		Stowed	
	Lap held position	Tablet mode	Lap held position	Tablet mode	Lap held position	Tablet mode
A	No	No	No	No	No	No
B	No	No	No	No	No	No
C	No	No	No	No	No	No
D	No	No	No	No	No	No
E	No	No	No	No	No	No
F	No	Yes	No	Yes	No	Yes

In tablet mode, the display is only displayed properly when surface D or E is flush with the phantom. In these configurations, the WWAN antenna is >20cm from the phantom and therefore SAR was not tested.

The tablet configuration where surface F is flush with the phantom is applicable and was tested for all antenna positions.

7.4 Scan procedure

The scan routine is set up as follows:

- Power verification measurement
- Area scan
- 7x7x7 cube (zoom) scan
- 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 $\pm 10\%$.

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 (Body TSL)

Date	Frequency (MHz)	Permittivity (ϵ_r)	Conductivity (σ)	1 g SAR (mW/g)		
				Measured *	Target	Difference (%)
3/27/2008	1900	51.1	1.51	38.6	37.2	+3.8%
4/1/2008	1900	51.1	1.55	38.8	37.2	+3.8%
4/3/2008	1900	51.3	1.55	38.2	37.2	+2.6%
4/14/2008	835	54.1	0.98	8.93	9.27	-3.7%

*Measured data after scaling to 30 dBm and normalization to tissue parameters. See Validation plots in section 13 for raw data.

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	Band	Channel	Freq	Antenna Position	Drift (dB)	Measured 1g SAR (mW/g)
GPRS 2UL	850 MHz	128	824.2	90°	-0.014	1.37
GPRS 2UL	850 MHz	190	836.6	90°	-0.029	1.41
GPRS 2UL	850 MHz	251	848.8	90°	-0.002	1.31
GPRS 2UL	850 MHz	128	824.2	180°	-0.050	1.33
GPRS 2UL	850 MHz	190	836.6	180°	-0.034	1.45
GPRS 2UL	850 MHz	251	848.8	180°	-0.009	1.44
GPRS 2UL	850 MHz	190	836.6	stowed	0.445	0.002
EVDO r0	1900 MHz	25	1851.25	90°	0.028	0.48
EVDO r0	1900 MHz	600	1880	90°	0.169	0.31
EVDO r0	1900 MHz	1175	1908.75	90°	-0.025	0.27
EVDO r0	1900 MHz	25	1851.25	180°	0.090	0.59
EVDO r0	1900 MHz	600	1880	180°	-0.032	0.45
EVDO r0	1900 MHz	1175	1908.75	180°	0.046	0.44
EVDO r0	1900 MHz	25	1851.25	stowed	0.072	0.02

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

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	E1968A-101
	GPRS TA	E1968A-102
	EGPRS TA	E1968A-103
	WCDMA	E1963A
	HSDPA TEST MODES	E1963A-403
	HSuPA TEST MODES	E1963A-413
	cdma 2000 TA	E1962B
	1xEV-DO TA	E1966A
	1xEV-DO FTM TA	E1976A
	1xEV-DO Release A	E1966A-102
	1xEV-DO RelA FTM	E1976A-102

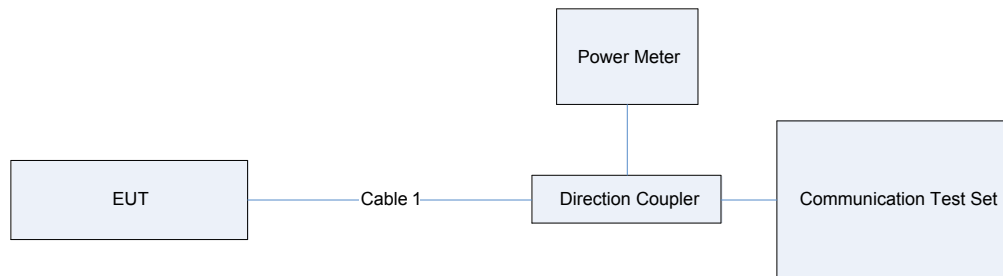
11.3 RF Power Measurement Procedure

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 $\hat{I}_{or}$ by 1 dB and repeat the verification. Repeat this step until the desired channel configuration becomes active.
 - e. Measure the output power at the UNDP-1 antenna connector.
 - f. Decrease $\hat{I}_{or}$ by 0.5 dB.
 - g. Determine the active channel configuration. If the active channel configuration is the desired channel configuration, measure the output power at the 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 $\hat{I}_{or}$ 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 $\hat{I}_{or}$ 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 loop 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 Subtest	Rel99	Rel6 HSDPA	Rel6 HSDPA	Rel6 HSDPA	Rel6 HSDPA	Rel6 HSUPA	Rel6 HSUPA	Rel6 HSUPA	Rel6 HSUPA	Rel6 HSUPA
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				
	β_c	Not Applicable	2/15	12/15	15/15	15/15	11/15	6/15	15/15	2/15	15/15
	β_d	Not Applicable	15/15	15/15	8/15	4/15	15/15	15/15	9/15	15/15	15/15
	β_{ec}	Not Applicable	-	-	-	-	209/225	12/15	30/15	2/15	24/15
	β_c/β_d	8/15	2/15	12/15	15/8	15/4	11/15	6/15	15/9	2/15	15/15
	β_{hs}	Not Applicable	4/15	24/15	30/15	30/15	22/15	12/15	30/15	4/15	30/15
β_{ed}	Not Applicable	Not Applicable				1309/225	94/75	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 = β_{hs}/β_c	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 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		
		Not Applicable	Not Applicable								

11.4.3 For GSM/GPRS/EGDE

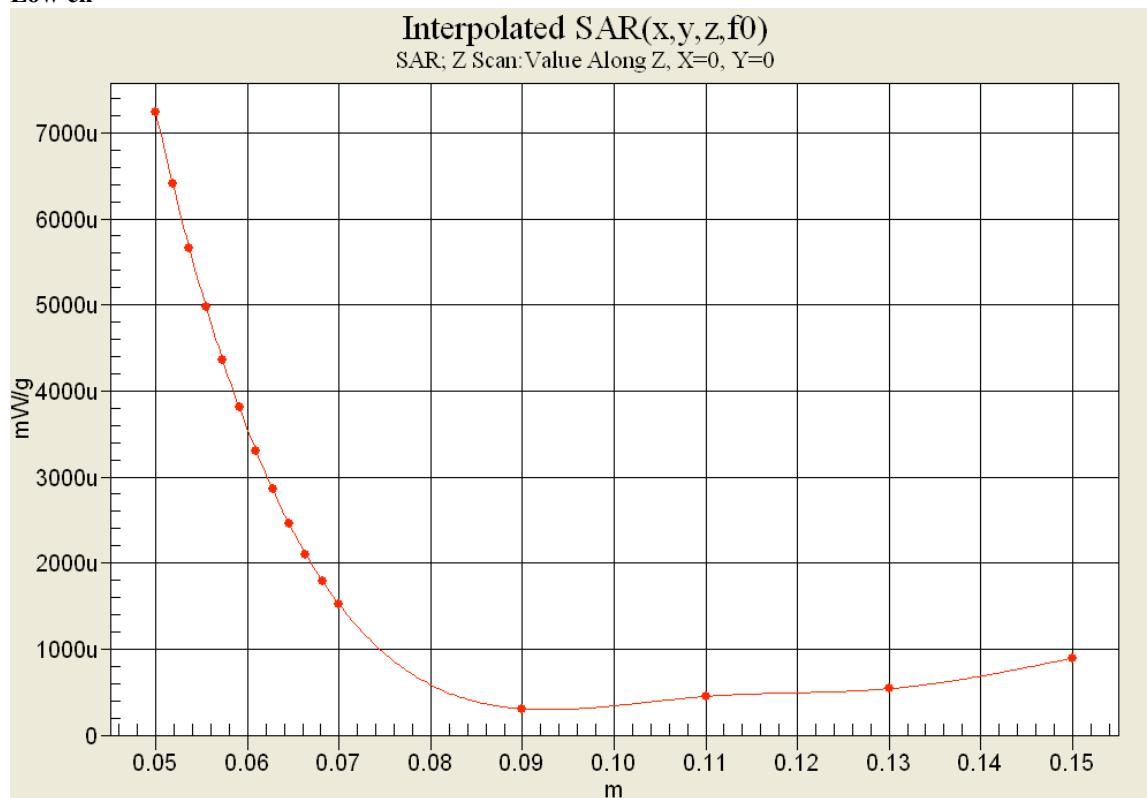
- Configure the call box to support GPRS test.
- Configure for desired number of uplink transmit lots.
- Set MS_TX level to 0 (850 MHz) or 2 (1900MHz) to configure EUT to transmit at maximum output power.

13. Validation Plots

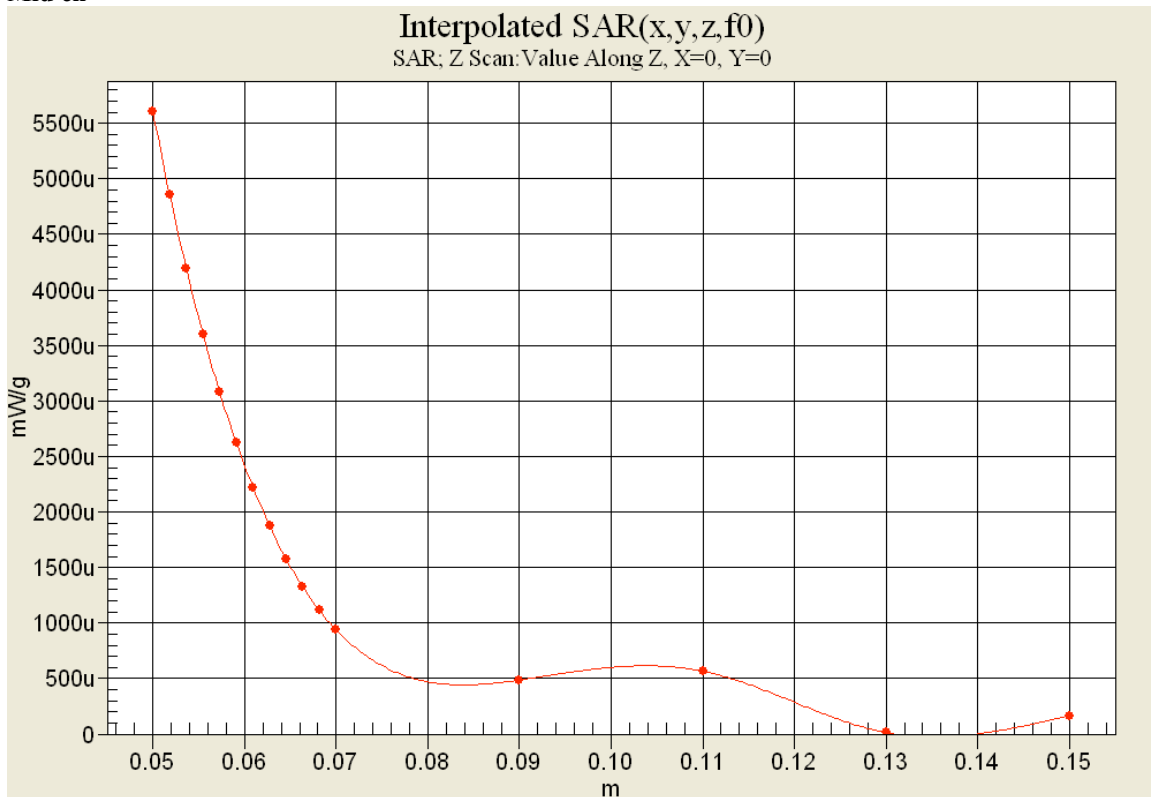
The following pages show validation plots for the respective days of the test program.

13.1 PCS band Z-Scan Plots

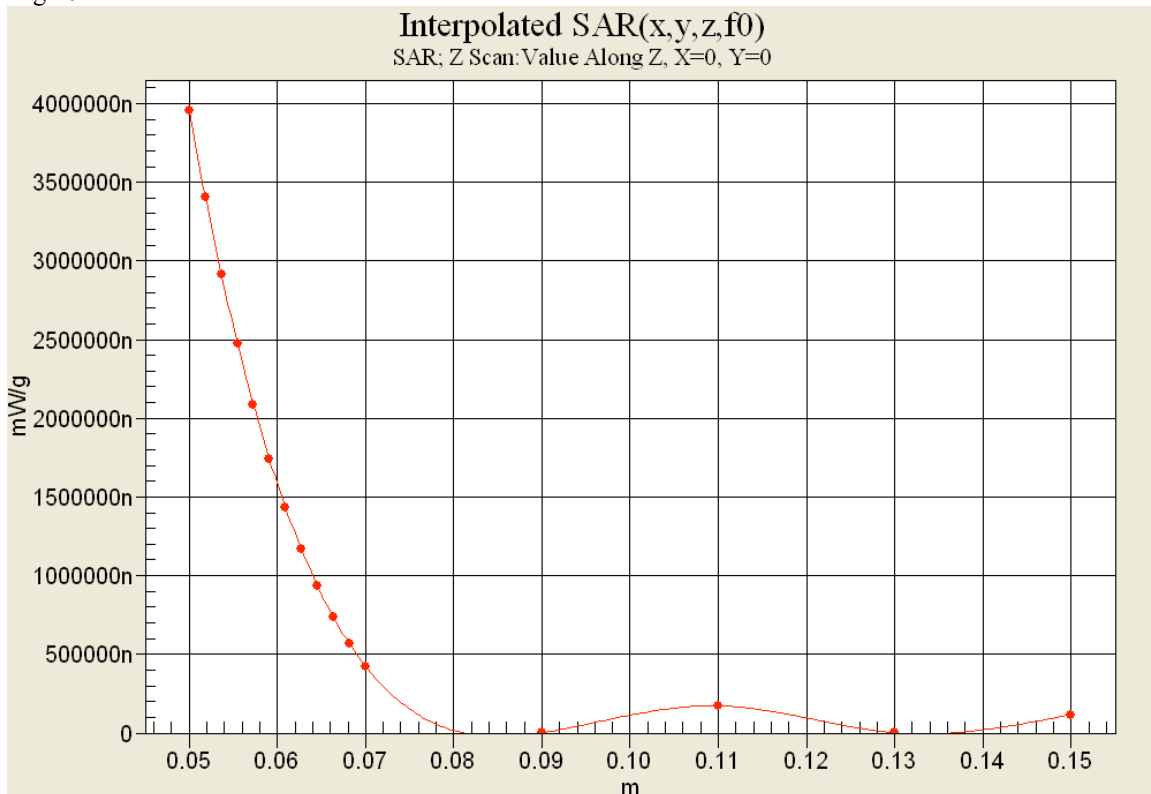
Low ch



Mid ch

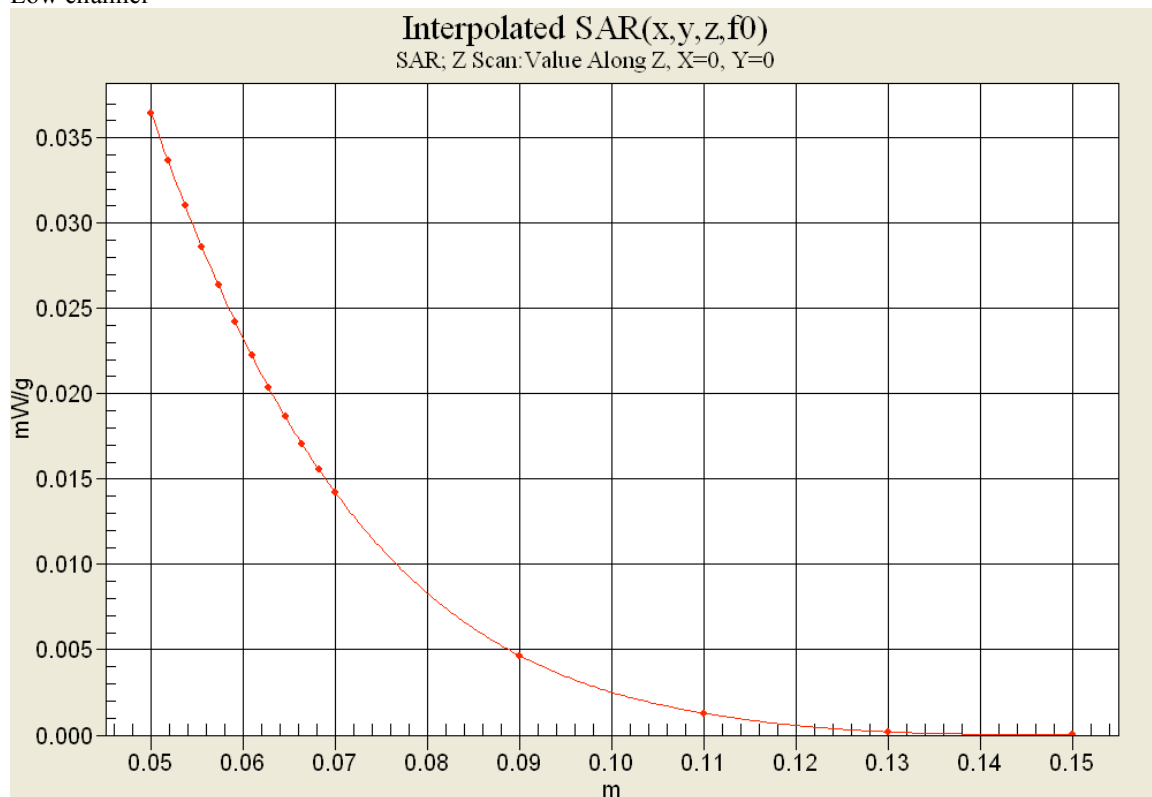


High ch

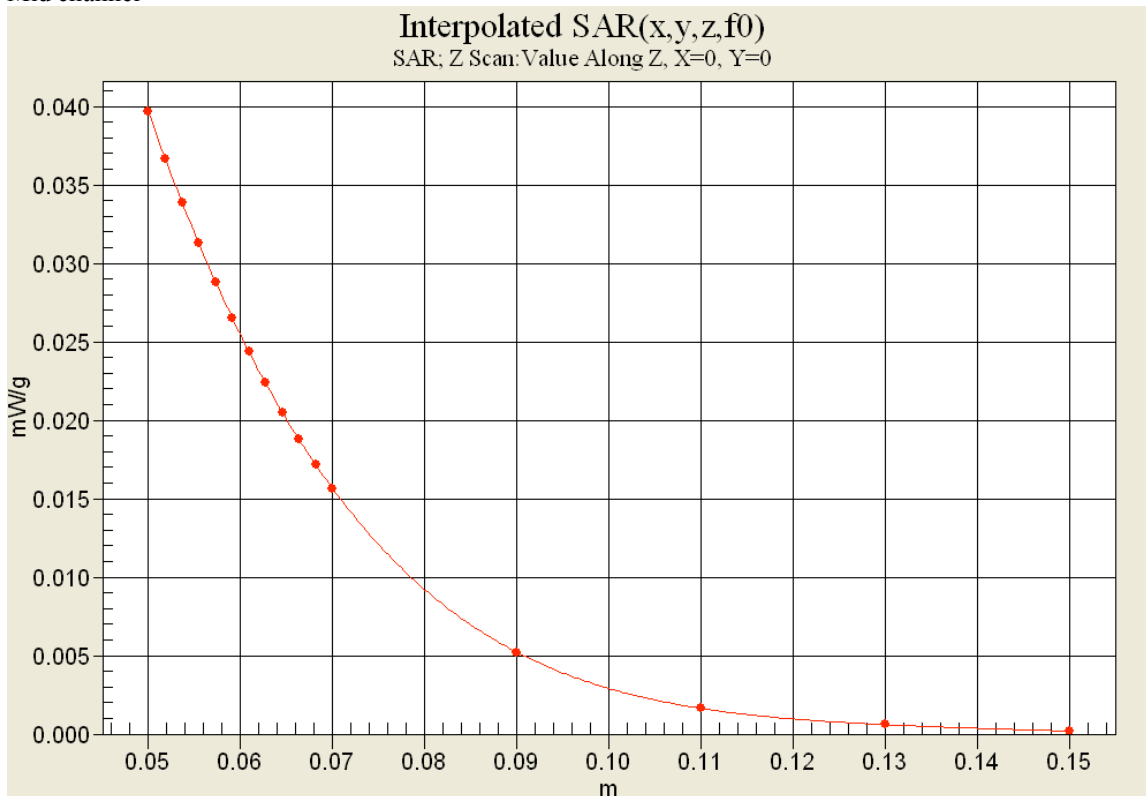


13.2 Cell band Z-Scan Plots

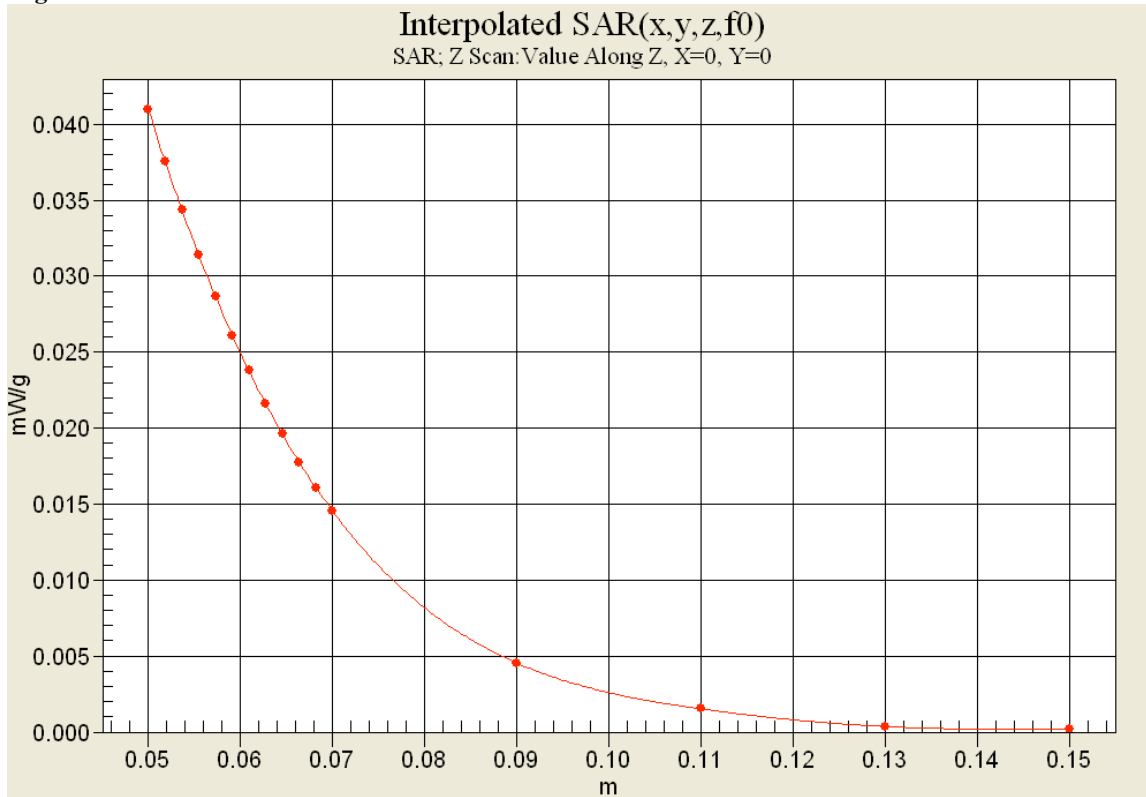
Low channel



Mid channel



High channel



13.3 Validation Plots

The following pages show validation plots for the days tested.

Date/Time: 3/27/2008 9:45:23 AM

Test Laboratory: QUALCOMM Incorporated

20080327_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; $\sigma = 1.52$ mho/m;
 $\epsilon_r = 51$; $\rho = 1000$ kg/m³

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

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (interpolated) = 4.71 mW/g

d=10mm, Pin=20 dBm/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm,
dy=5mm, dz=5mm

Reference Value = 55.5 V/m; Power Drift = -0.036 dB

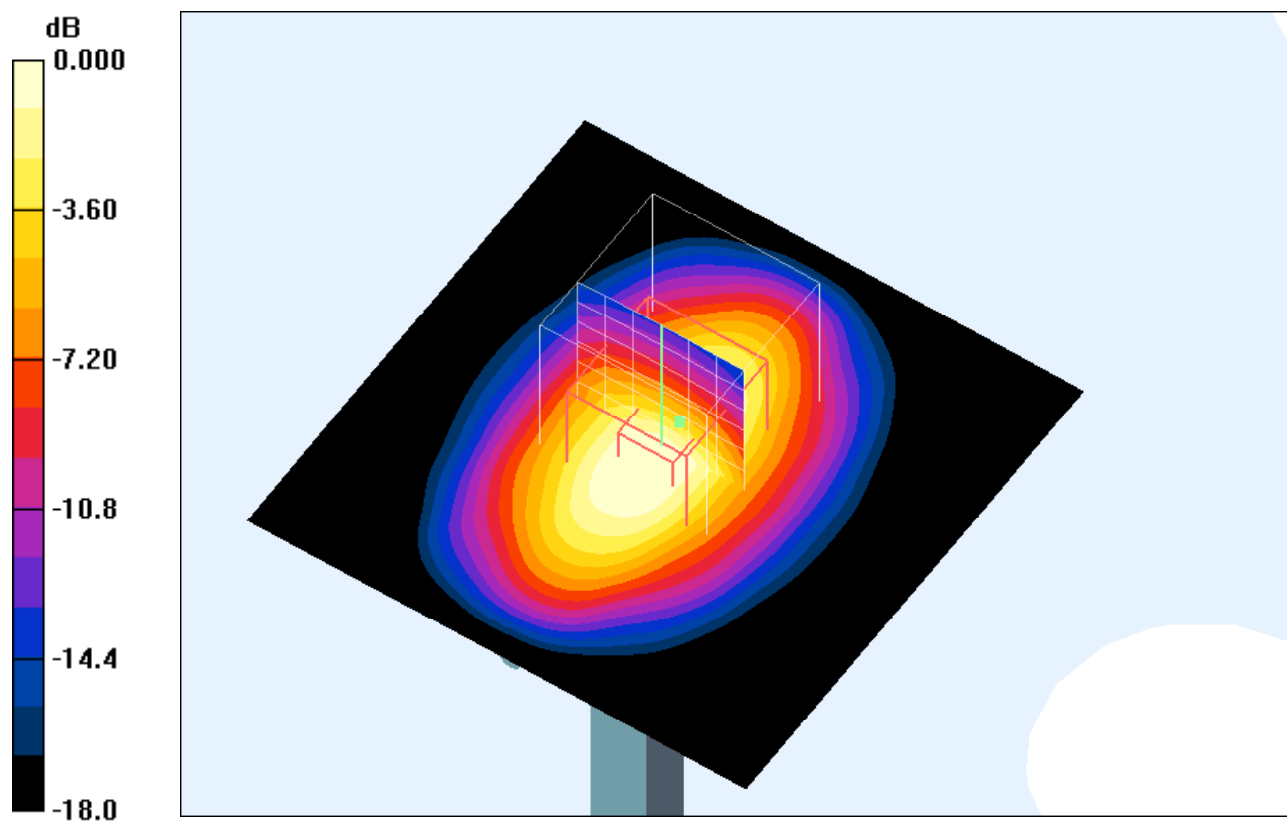
Peak SAR (extrapolated) = 6.66 W/kg

SAR(1 g) = 3.94 mW/g; SAR(10 g) = 2.11 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 4.51 mW/g

0 dB = 4.51mW/g



Date/Time: 4/1/2008 1:24:35 PM

Test Laboratory: QUALCOMM Incorporated

20080401_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; $\sigma = 1.55$ mho/m;

$\epsilon_r = 51.1$; $\rho = 1000$ kg/m³

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

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (interpolated) = 4.88 mW/g

d=10mm, Pin=20 dBm/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.5 V/m; Power Drift = -0.017 dB

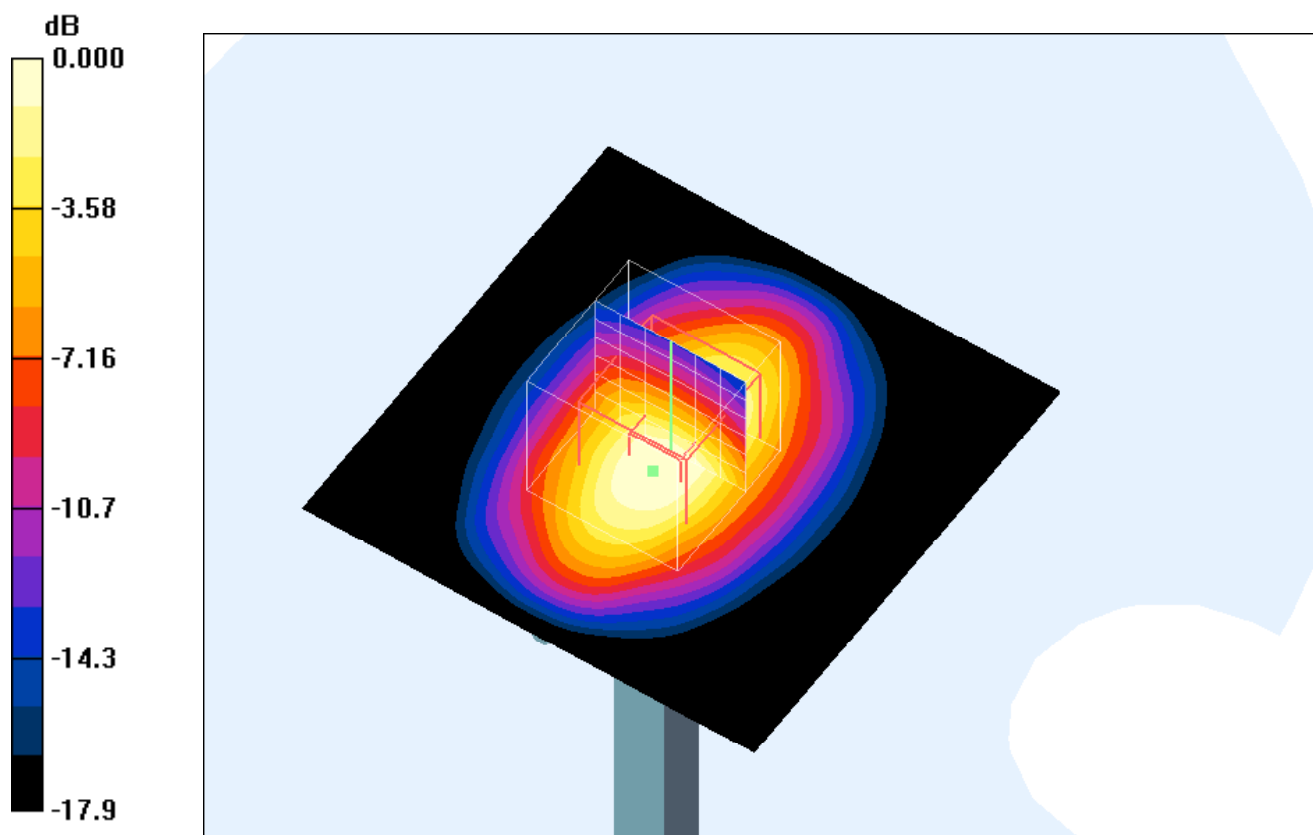
Peak SAR (extrapolated) = 6.78 W/kg

SAR(1 g) = 4.02 mW/g; SAR(10 g) = 2.14 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 4.57 mW/g

0 dB = 4.57mW/g



Date/Time: 4/3/2008 9:29:11 AM

Test Laboratory: QUALCOMM Incorporated

20080402_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; $\sigma = 1.55$ mho/m;

$\epsilon_r = 51.3$; $\rho = 1000$ kg/m³

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

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (interpolated) = 5.08 mW/g

d=10mm, Pin=20 dBm/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.8 V/m; Power Drift = -0.033 dB

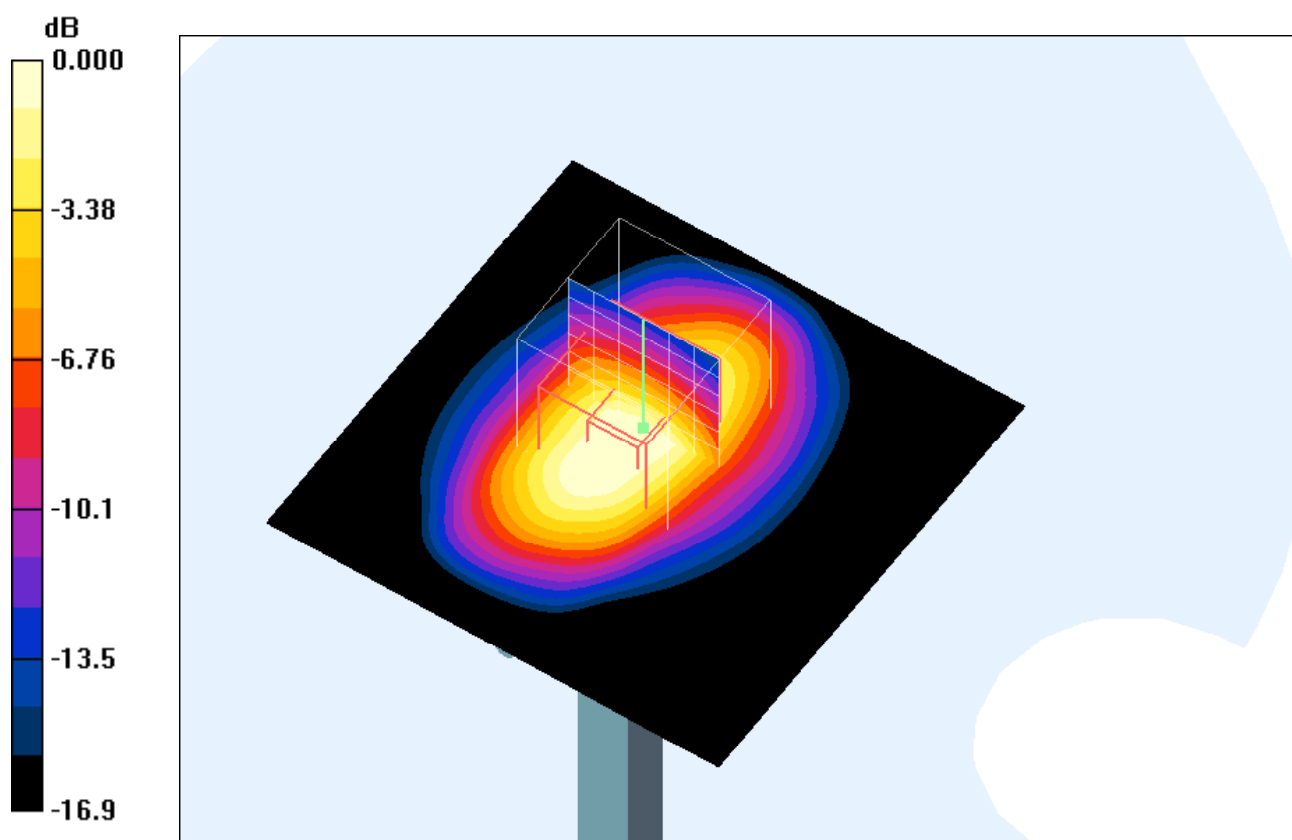
Peak SAR (extrapolated) = 6.59 W/kg

SAR(1 g) = 3.95 mW/g; SAR(10 g) = 2.12 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 4.46 mW/g

0 dB = 4.46mW/g



Date/Time: 4/14/2008 2:27:12 PM

Test Laboratory: QUALCOMM Incorporated

20080414_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; $\sigma = 0.975$ mho/m; $\epsilon_r = 54.1$; $\rho = 1000$ kg/m³

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

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (interpolated) = 0.990 mW/g

d=15mm, Pin=20dBm/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 33.5 V/m; Power Drift = -0.112 dB

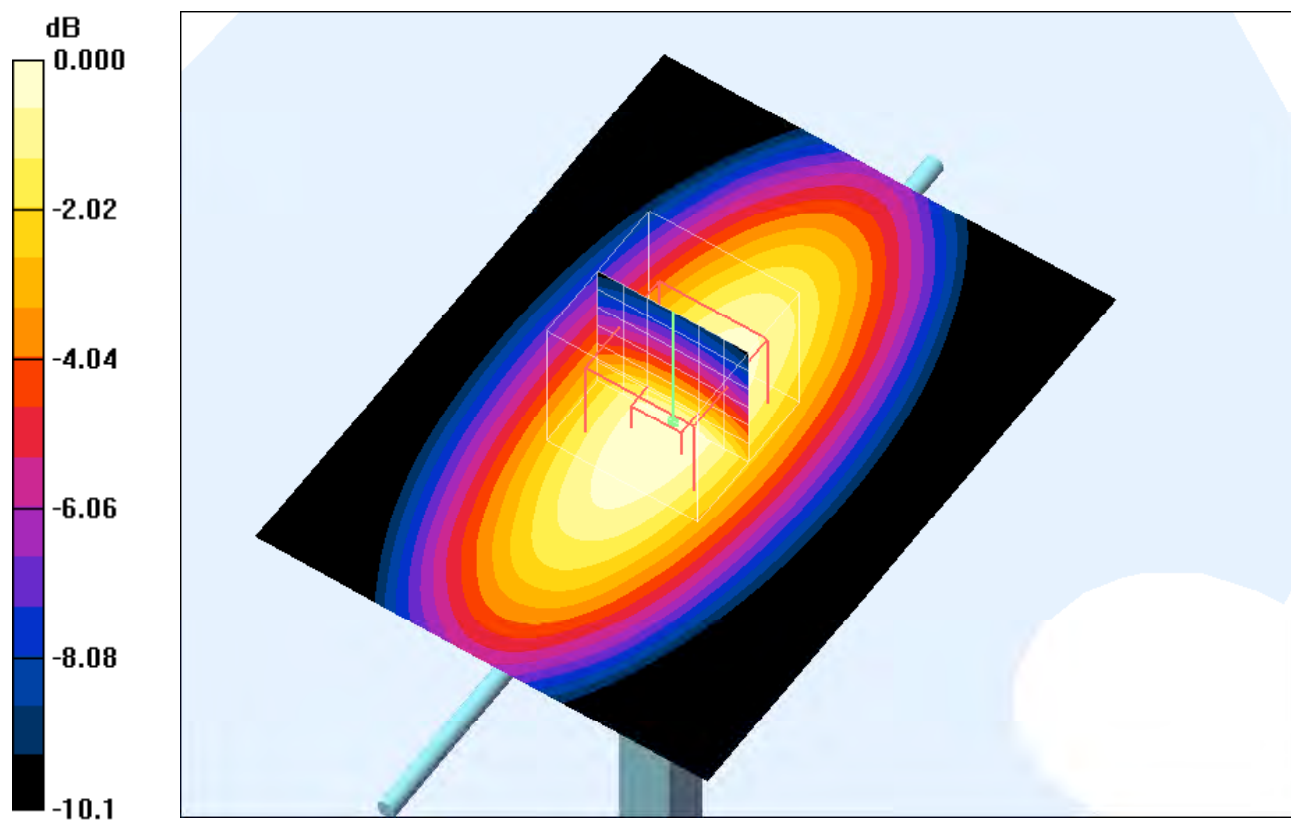
Peak SAR (extrapolated) = 1.28 W/kg

SAR(1 g) = 0.907 mW/g; SAR(10 g) = 0.599 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.988 mW/g

0 dB = 0.988/g



14. SAR Results Plots

The following pages show reports with data and plots for both EV-DO r0 and GPRS modes.

14.1 EV-DO r0 (PCS band)

Date/Time: 3/27/2008 4:47:39 PM

Test Laboratory: QUALCOMM Incorporated

20080327_UNDP-1_DO-PCS-surfaceF-antenna90

DUT: HSTNN-W47C; Type: Laptop; Serial: 2CE8080PHL

Communication System: CDMA 1x PCS; Frequency: 1851.25 MHz; Duty Cycle: 1:1

Medium: MSL1800 Medium parameters used (interpolated): $f = 1851.25$ MHz; $\sigma = 1.48$

mho/m; $\epsilon_r = 51.2$; $\rho = 1000$ kg/m³

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;

Tablet PC, Antenna at 90deg. – Low/Area Scan (161x181x1): Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (interpolated) = 0.527 mW/g

Tablet PC, Antenna at 90deg. – Low/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 13.4 V/m; Power Drift = 0.028 dB

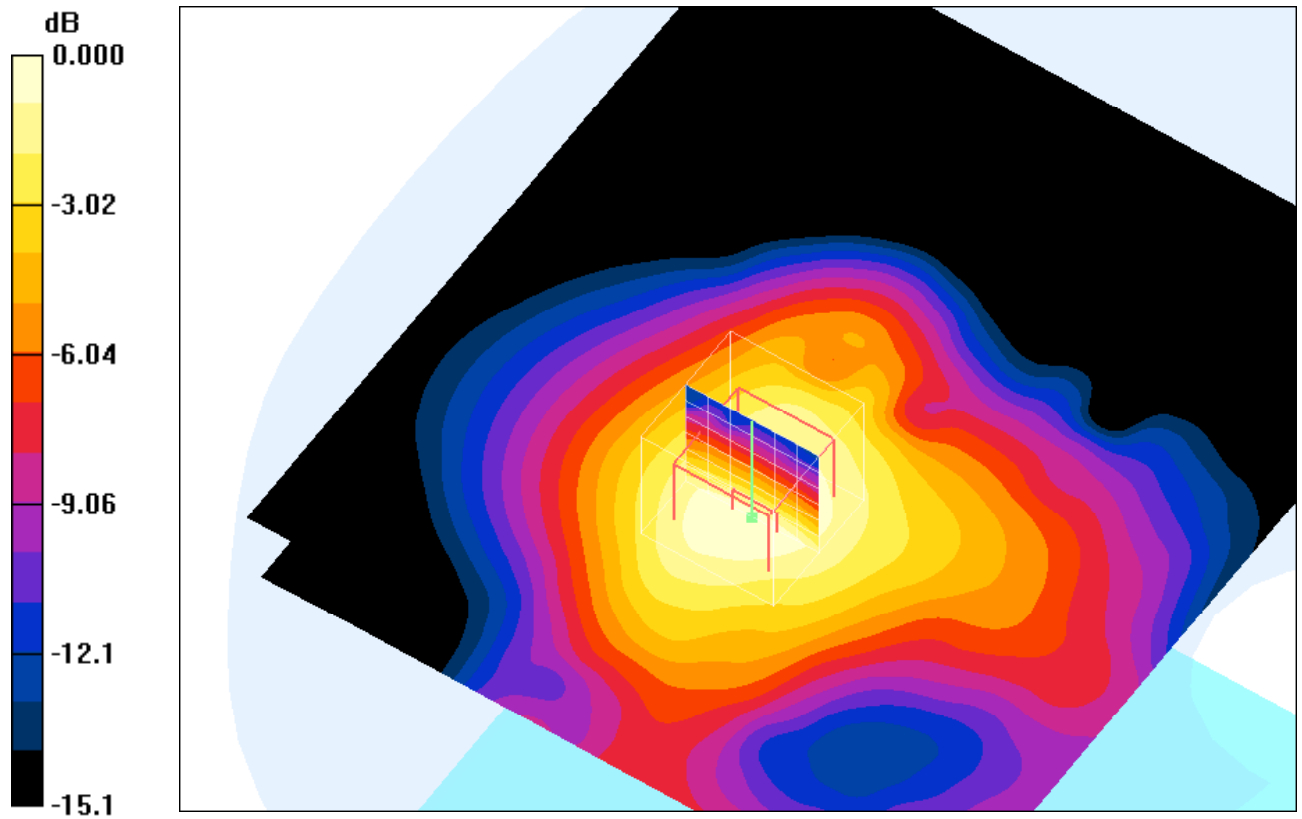
Peak SAR (extrapolated) = 0.717 W/kg

SAR(1 g) = 0.481 mW/g; SAR(10 g) = 0.301 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.534 mW/g

0 dB = 0.534 mW/g



Date/Time: 3/27/2008 4:00:43 PM

Test Laboratory: QUALCOMM Incorporated

20080327_UNDP-1_DO-PCS-surfaceF-antenna90

DUT: HSTNN-W47C; Type: Laptop; Serial: 2CE8080PHL

Communication System: CDMA 1x PCS; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: MSL1800 Medium parameters used: $f = 1880$ MHz; $\sigma = 1.51$ mho/m; $\epsilon_r = 51.1$;
 $\rho = 1000$ kg/m³

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;

Tablet PC, Antenna at 90deg. – Middle/Area Scan (161x181x1): Measurement grid:

dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.344 mW/g

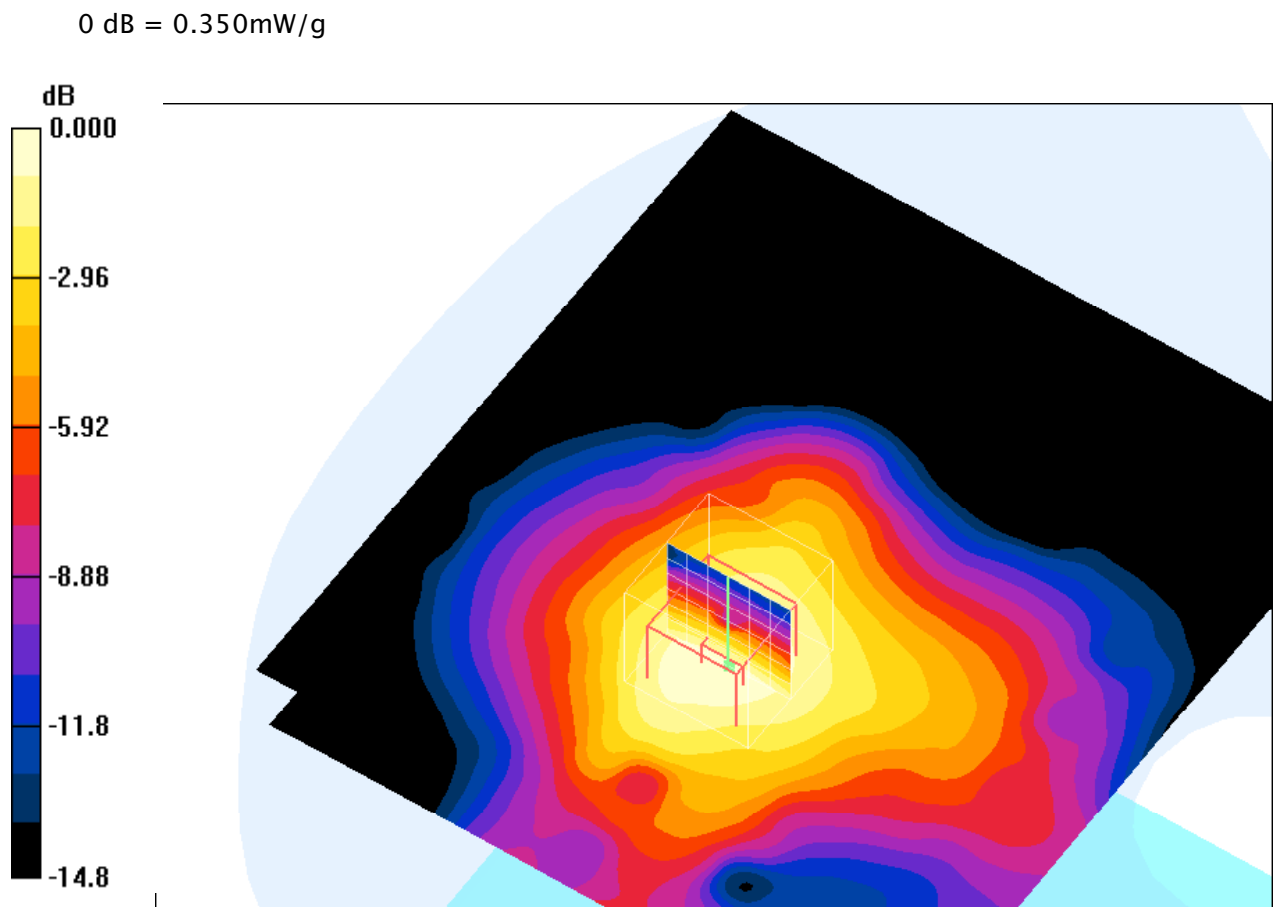
Tablet PC, Antenna at 90deg. – Middle/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 10.4 V/m; Power Drift = 0.169 dB

Peak SAR (extrapolated) = 0.575 W/kg

SAR(1 g) = 0.308 mW/g; SAR(10 g) = 0.197 mW/g

Maximum value of SAR (measured) = 0.350 mW/g



Date/Time: 3/27/2008 5:31:50 PM

Test Laboratory: QUALCOMM Incorporated

20080327_UNDP-1_DO-PCS-surfaceF-antenna90

DUT: HSTNN-W47C; Type: Laptop; Serial: 2CE8080PHL

Communication System: CDMA 1x PCS; Frequency: 1908.75 MHz; Duty Cycle: 1:1
Medium: MSL1800 Medium parameters used (interpolated): $f = 1908.75$ MHz; $\sigma = 1.53$ mho/m; $\epsilon_r = 51$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY4 Configuration:

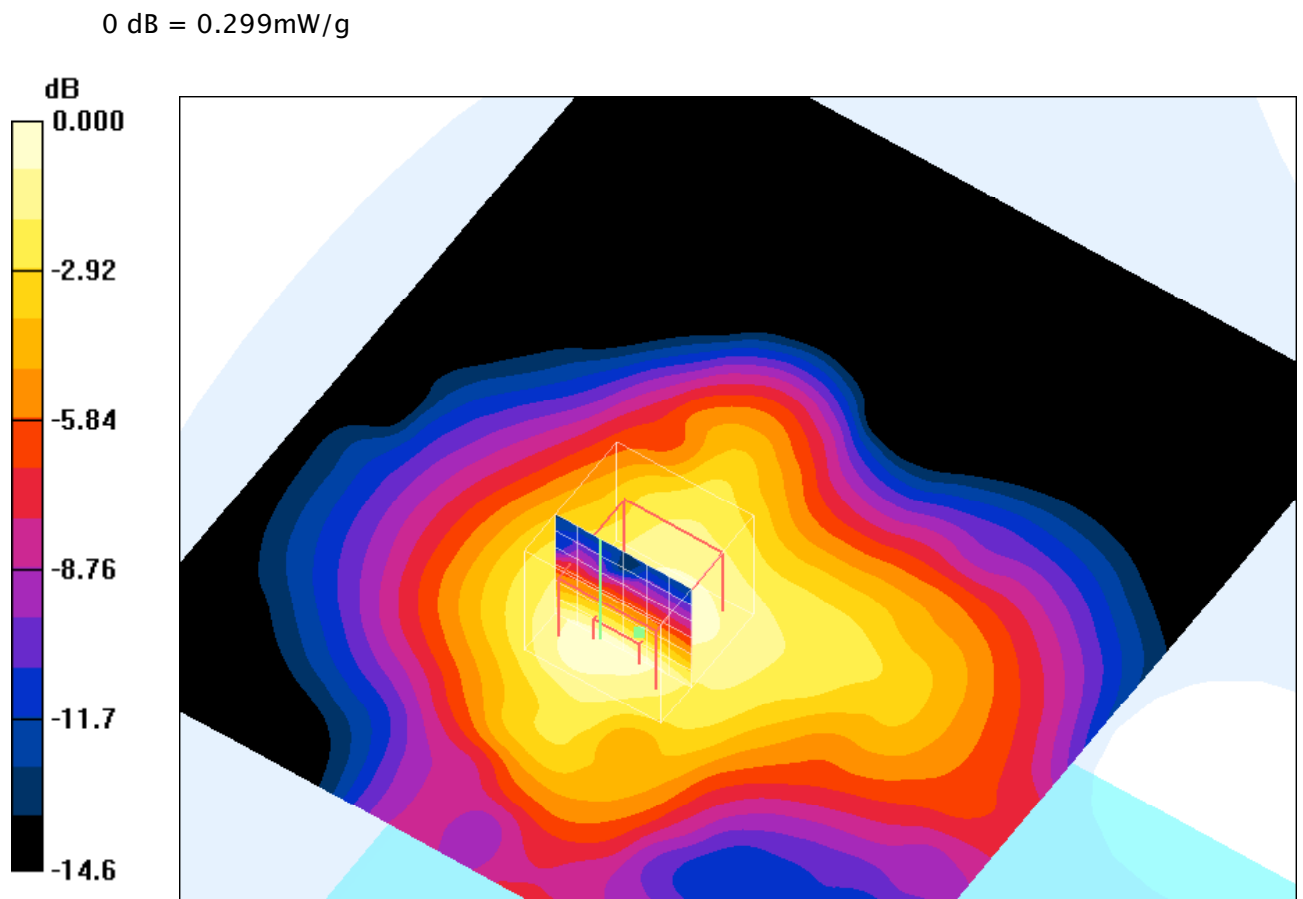
- * Probe: ET3DV6 – SN1733; ConvF(4.71, 4.71, 4.71); Calibrated: 9/4/2007
- * Sensor-Surface: 4mm (Mechanical Surface Detection)
- * Electronics: DAE3 Sn400; Calibrated: 3/5/2008
- * Phantom: SAM with CRP; Type: SAM;
- * Measurement SW: DASY4, V4.7 Build 55;

Tablet PC, Antenna at 90deg. – High/Area Scan (161x181x1): Measurement grid:
dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.297 mW/g

Tablet PC, Antenna at 90deg. – High/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement
grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.68 V/m; Power Drift = -0.025 dB
Peak SAR (extrapolated) = 0.606 W/kg
SAR(1 g) = 0.272 mW/g; SAR(10 g) = 0.167 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.299 mW/g



Date/Time: 4/3/2008 10:10:48 AM

Test Laboratory: QUALCOMM Incorporated

20080402_UNDP-1_DO-PCS-surfaceF-ant180

DUT: HSTNN-W47C; Type: Laptop; Serial: 2CE8080PHL

Communication System: CDMA 1xEVDO - PCS; Frequency: 1851.25 MHz; Duty Cycle: 1:1
Medium: MSL1800 Medium parameters used: $f = 1851.25$ MHz; $\sigma = 1.47$ mho/m; $\epsilon_r = 51.6$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

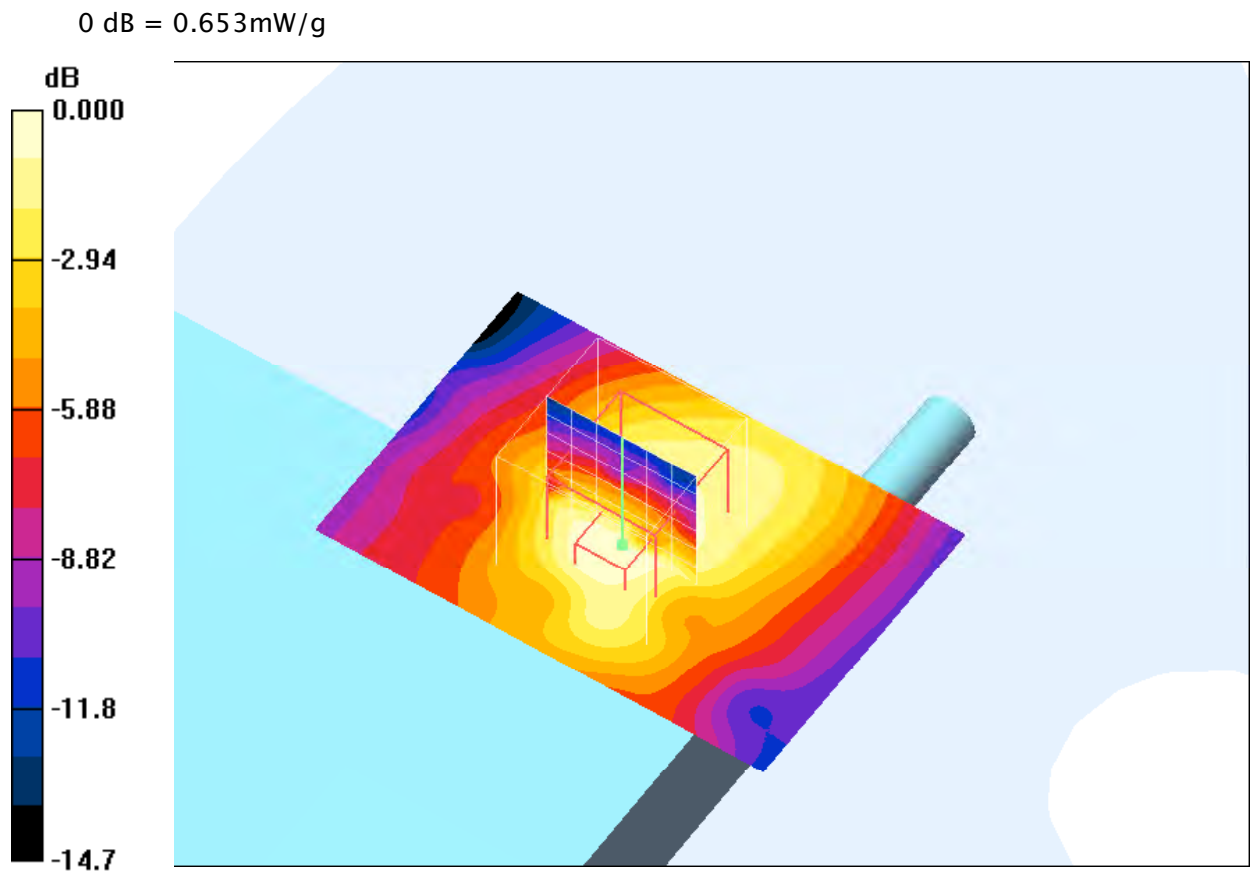
DASY4 Configuration:

- * 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;

Tablet PC, Antenna 180deg. - Low/Area Scan (91x61x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.674 mW/g

Tablet PC, Antenna 180deg. - Low/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:
dx=5mm, dy=5mm, dz=5mm
Reference Value = 20.4 V/m; Power Drift = 0.090 dB
Peak SAR (extrapolated) = 1.69 W/kg
SAR(1 g) = 0.590 mW/g; SAR(10 g) = 0.366 mW/g

Maximum value of SAR (measured) = 0.653 mW/g



Date/Time: 4/3/2008 10:32:29 AM

Test Laboratory: QUALCOMM Incorporated

20080402_UNDP-1_DO-PCS-surfaceF-ant180

DUT: HSTNN-W47C; Type: Laptop; Serial: 2CE8080PHL

Communication System: CDMA 1xEVDO - PCS; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: MSL1800 Medium parameters used: $f = 1880$ MHz; $\sigma = 1.5$ mho/m; $\epsilon_r = 51.4$; $\rho = 1000$ kg/m³
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;

Tablet PC, Antenna 180deg. - Middle/Area Scan (91x61x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.497 mW/g

Tablet PC, Antenna 180deg. - Middle/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 17.6 V/m; Power Drift = -0.032 dB

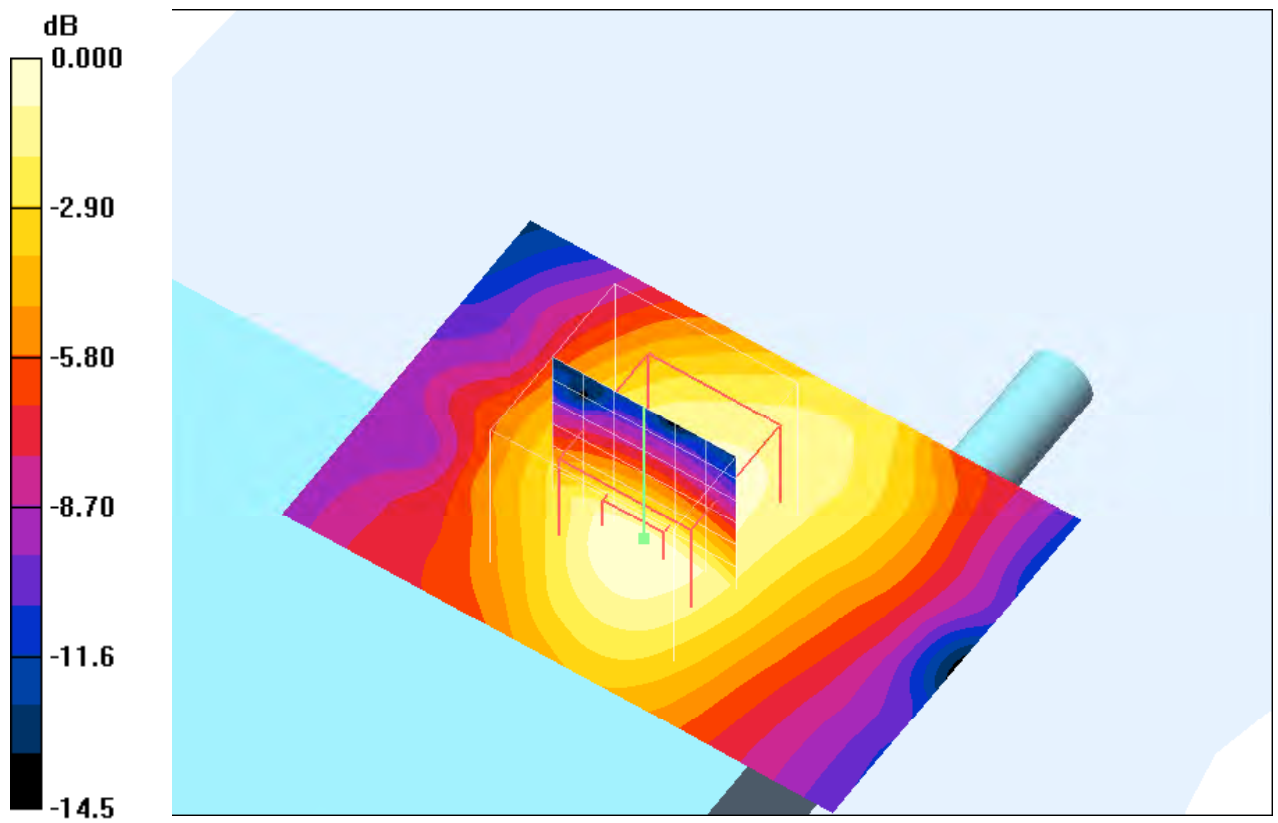
Peak SAR (extrapolated) = 0.853 W/kg

SAR(1 g) = 0.449 mW/g; SAR(10 g) = 0.275 mW/g

Warning: Maximum averaged SAR over 10 g is located on the boundary of the measurement cube. This cube might not incorporate the absolute averaged SAR. Please consider a refinement of the Area Scan measurement.

Maximum value of SAR (measured) = 0.486 mW/g

0 dB = 0.486mW/g



Date/Time: 4/3/2008 10:57:51 AM

Test Laboratory: QUALCOMM Incorporated

20080402_UNDP-1_DO-PCS-surfaceF-ant180

DUT: HSTNN-W47C; Type: Laptop; Serial: 2CE8080PHL

Communication System: CDMA 1xEVDO - PCS; Frequency: 1908.75 MHz; Duty Cycle: 1:1
Medium: MSL1800 Medium parameters used: $f = 1908.75$ MHz; $\sigma = 1.57$ mho/m; $\epsilon_r = 51.2$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

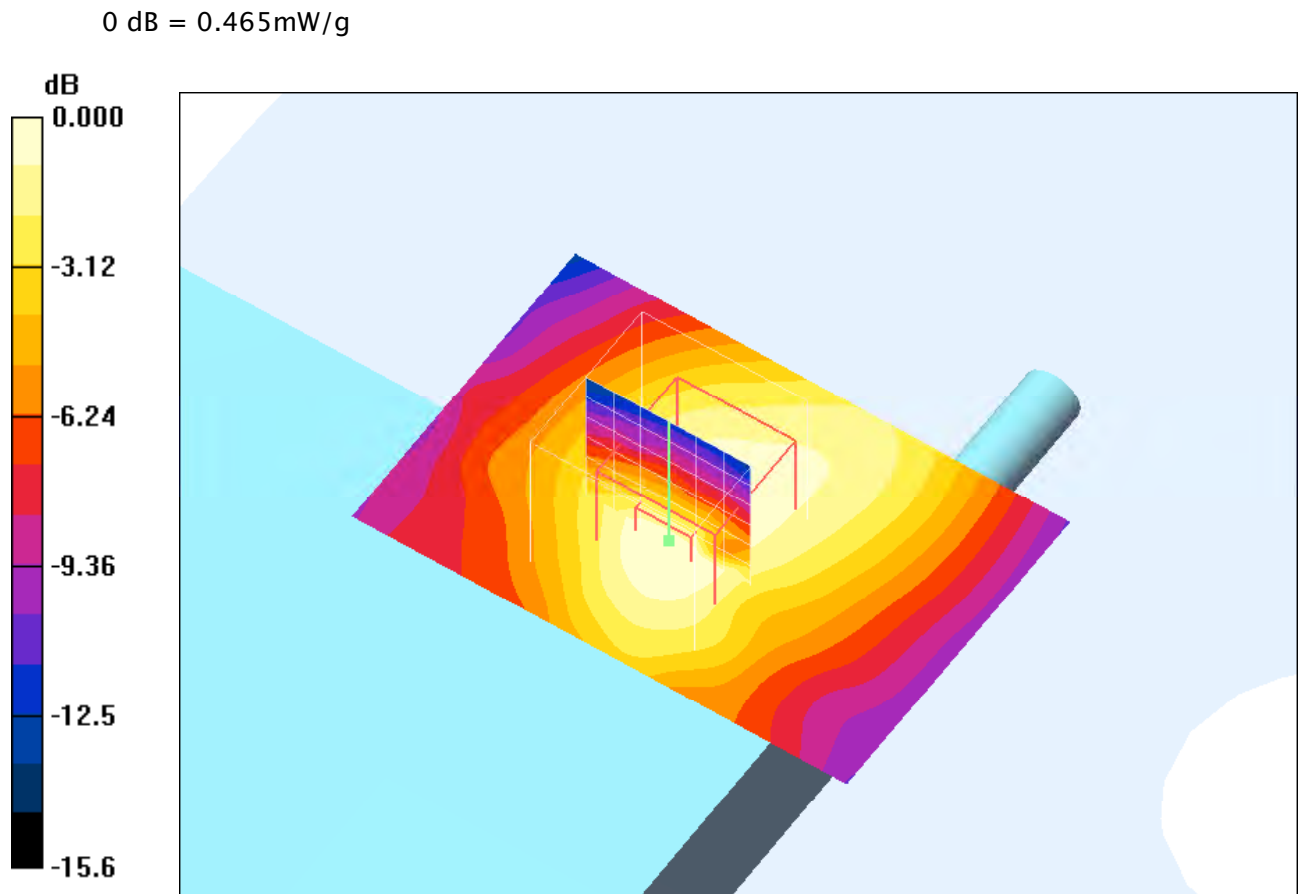
DASY4 Configuration:

- * 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;

Tablet PC, Antenna 180deg. - High/Area Scan (91x61x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.486 mW/g

Tablet PC, Antenna 180deg. - High/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 16.9 V/m; Power Drift = 0.046 dB
Peak SAR (extrapolated) = 1.02 W/kg
SAR(1 g) = 0.443 mW/g; SAR(10 g) = 0.265 mW/g

Maximum value of SAR (measured) = 0.465 mW/g



Date/Time: 4/2/2008 10:06:38 AM

Test Laboratory: QUALCOMM Incorporated

20080401_UNDP-1_DO-PCS-surfaceF-ant_stowed

DUT: HSTNN-W47C; Type: Laptop; Serial: 2CE8080PHL

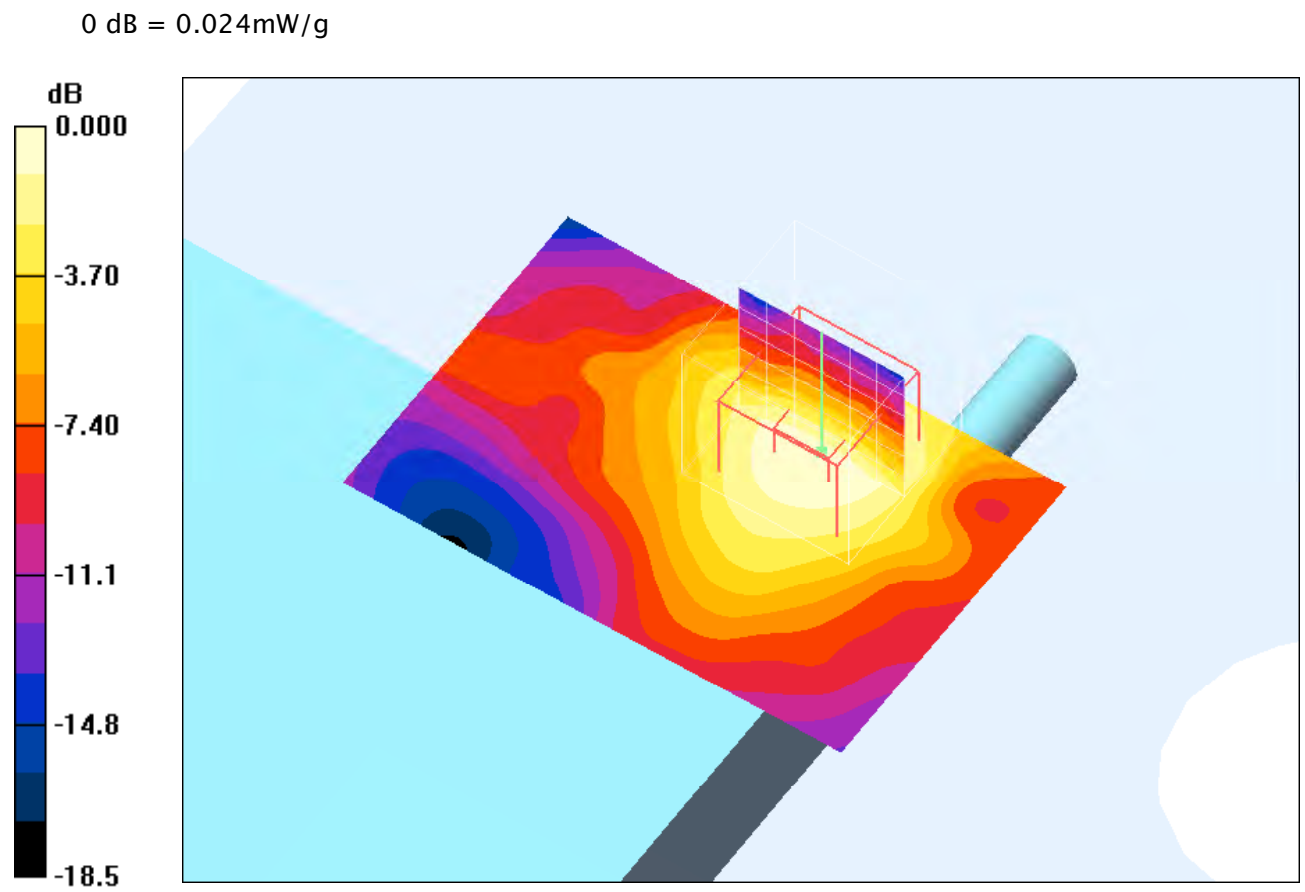
Communication System: CDMA 1xEVDO - PCS; Frequency: 1851.25 MHz; Duty Cycle: 1:1
Medium: MSL1800 Medium parameters used: $f = 1851.25$ MHz; $\sigma = 1.46$ mho/m; $\epsilon_r = 51.3$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

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;

Tablet PC, Antenna stowed - Low/Area Scan (91x61x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.024 mW/g

Tablet PC, Antenna stowed - Low/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:
dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.98 V/m; Power Drift = 0.072 dB
Peak SAR (extrapolated) = 0.038 W/kg
SAR(1 g) = 0.021 mW/g; SAR(10 g) = 0.012 mW/g
Maximum value of SAR (measured) = 0.024 mW/g



14.2 GPRS-2UL (Cell band)

Date/Time: 4/14/2008 3:37:45 PM

Test Laboratory: QUALCOMM Incorporated

20080414_UNDP-1_GPRS2UL-surfaceF-ant90

DUT: HSTNN-W47C; Type: Laptop; Serial: 2CE8080PHL

Communication System: US GSM-GPRS850-2UL; Frequency: 824.2 MHz; Duty Cycle: 1:4.3

Medium: MSL850 Medium parameters used (extrapolated): $f = 824.2$ MHz; $\sigma = 0.959$

mho/m; $\epsilon_r = 54.2$; $\rho = 1000$ kg/m³

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;

Tablet PC, Antenna 90deg – Low/Area Scan (101x61x1): Measurement grid: dx=10mm, dy=10mm

Info: Extrapolated medium parameters used for SAR evaluation.

Maximum value of SAR (interpolated) = 1.49 mW/g

Tablet PC, Antenna 90deg – Low/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 35.5 V/m; Power Drift = -0.014 dB

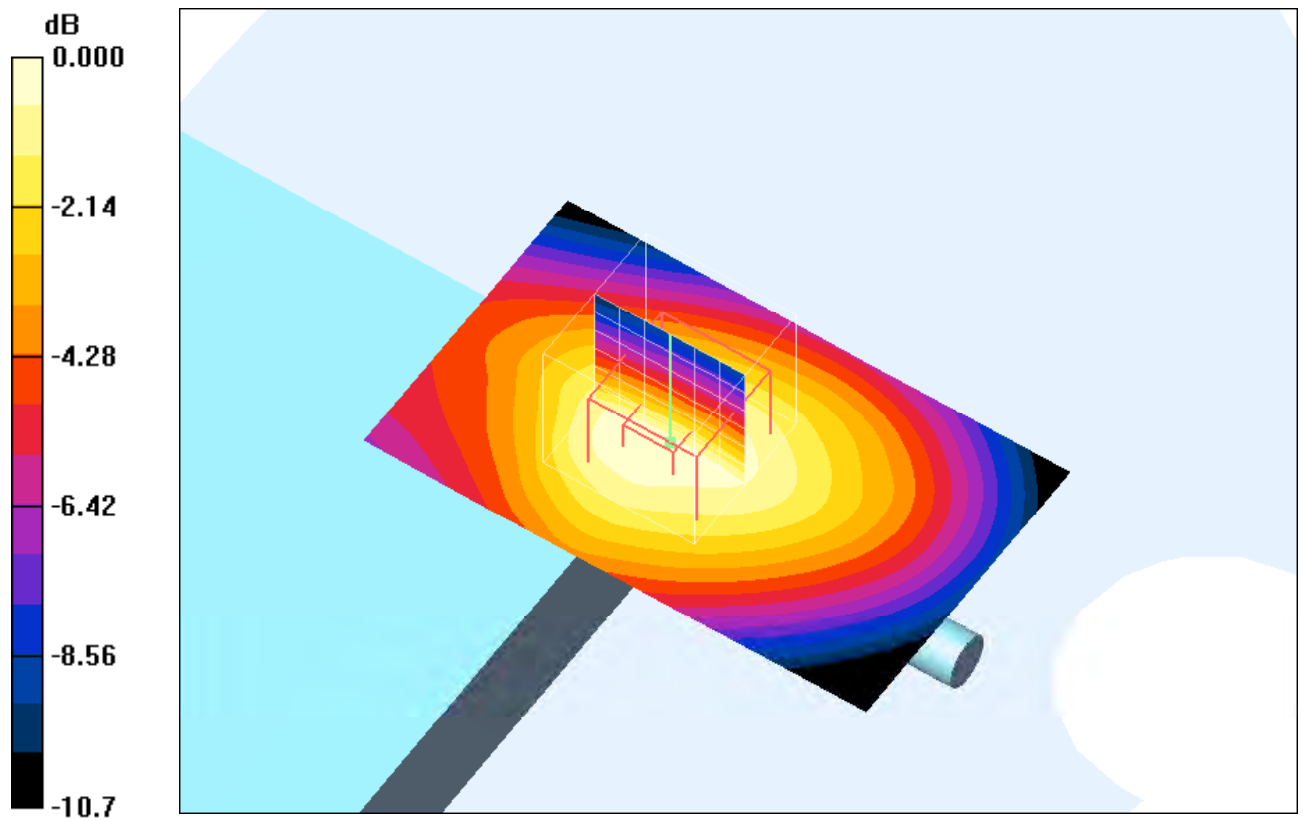
Peak SAR (extrapolated) = 2.01 W/kg

SAR(1 g) = 1.37 mW/g; SAR(10 g) = 0.914 mW/g

Info: Extrapolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 1.48 mW/g

0 dB = 1.48mW/g



Date/Time: 4/14/2008 3:05:52 PM

Test Laboratory: QUALCOMM Incorporated

20080414_UNDP-1_GPRS2UL-surfaceF-ant90

DUT: HSTNN-W47C; Type: Laptop; Serial: 2CE8080PHL

Communication System: US GSM-GPRS850-2UL; Frequency: 836.6 MHz; Duty Cycle: 1:4.3

Medium: MSL850 Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.975$

mho/m; $\epsilon_r = 54$; $\rho = 1000$ kg/m³

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;

Tablet PC, Antenna 90deg – Middle/Area Scan (101x61x1): Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (interpolated) = 1.53 mW/g

Tablet PC, Antenna 90deg – Middle/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

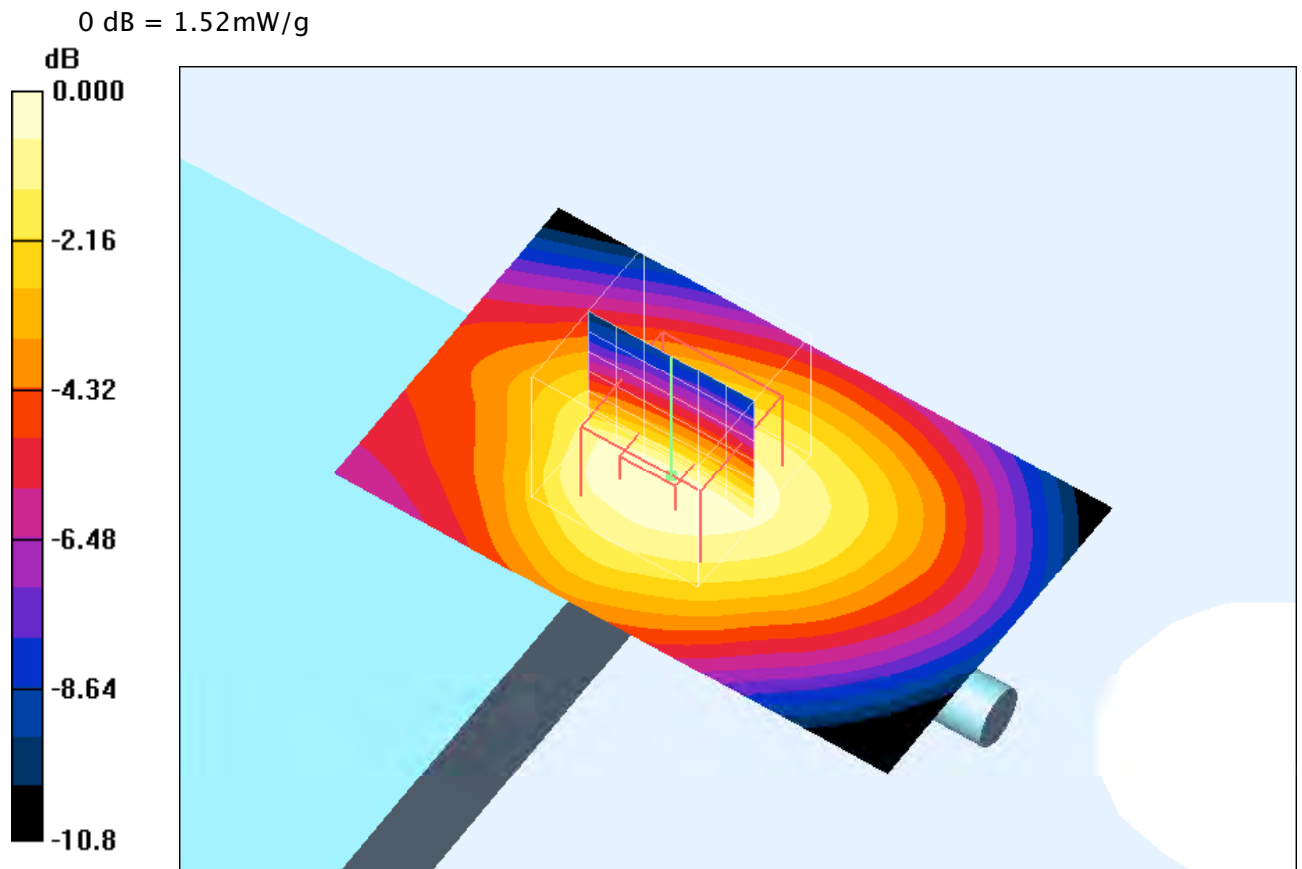
Reference Value = 35.7 V/m; Power Drift = -0.029 dB

Peak SAR (extrapolated) = 2.07 W/kg

SAR(1 g) = 1.41 mW/g; SAR(10 g) = 0.942 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 1.52 mW/g



Date/Time: 4/14/2008 4:09:21 PM

Test Laboratory: QUALCOMM Incorporated

20080414_UNDP-1_GPRS2UL-surfaceF-ant90

DUT: HSTNN-W47C; Type: Laptop; Serial: 2CE8080PHL

Communication System: US GSM-GPRS850-2UL; Frequency: 848.8 MHz; Duty Cycle: 1:4.3

Medium: MSL850 Medium parameters used (extrapolated): $f = 848.8$ MHz; $\sigma = 0.988$

mho/m; $\epsilon_r = 53.9$; $\rho = 1000$ kg/m³

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;

Tablet PC, Antenna 90deg – High/Area Scan (101x61x1): Measurement grid: dx=10mm, dy=10mm

Info: Extrapolated medium parameters used for SAR evaluation.

Maximum value of SAR (interpolated) = 1.43 mW/g

Tablet PC, Antenna 90deg – High/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

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

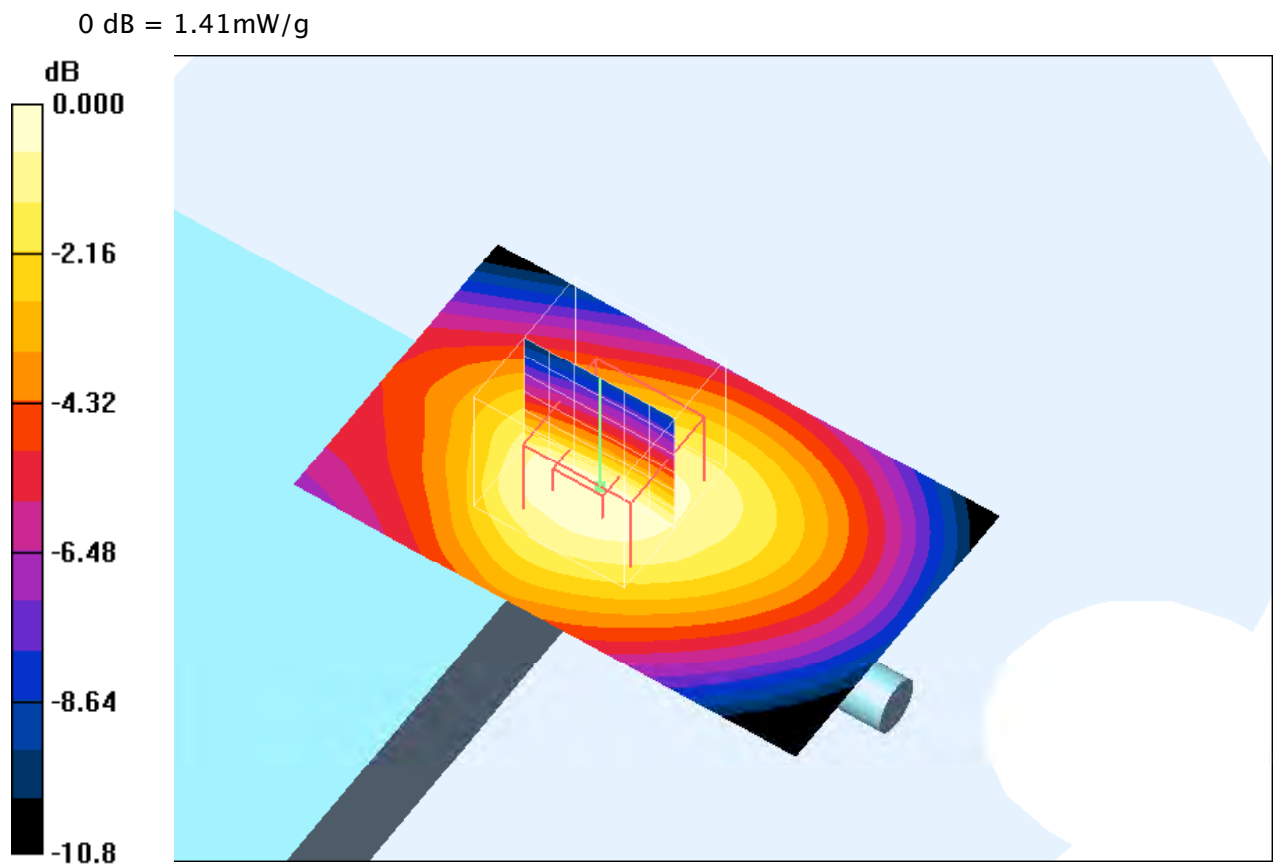
Reference Value = 34.3 V/m; Power Drift = -0.002 dB

Peak SAR (extrapolated) = 1.86 W/kg

SAR(1 g) = 1.31 mW/g; SAR(10 g) = 0.877 mW/g

Info: Extrapolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 1.41 mW/g



Date/Time: 4/15/2008 9:56:24 AM

Test Laboratory: QUALCOMM Incorporated

20080414_UNDP-1_GPRS2UL-surfaceF-ant180

DUT: HSTNN-W47C; Type: Laptop; Serial: 2CE8080PHL

Communication System: US GSM-GPRS850-2UL; Frequency: 824.2 MHz; Duty Cycle: 1:4.3

Medium: MSL850 Medium parameters used (extrapolated): $f = 824.2$ MHz; $\sigma = 0.959$

mho/m; $\epsilon_r = 54.2$; $\rho = 1000$ kg/m³

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;

Tablet PC, Antenna 180deg – Low/Area Scan (101x61x1): Measurement grid: dx=10mm, dy=10mm

Info: Extrapolated medium parameters used for SAR evaluation.

Maximum value of SAR (interpolated) = 1.44 mW/g

Tablet PC, Antenna 180deg – Low/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

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

Reference Value = 39.3 V/m; Power Drift = -0.050 dB

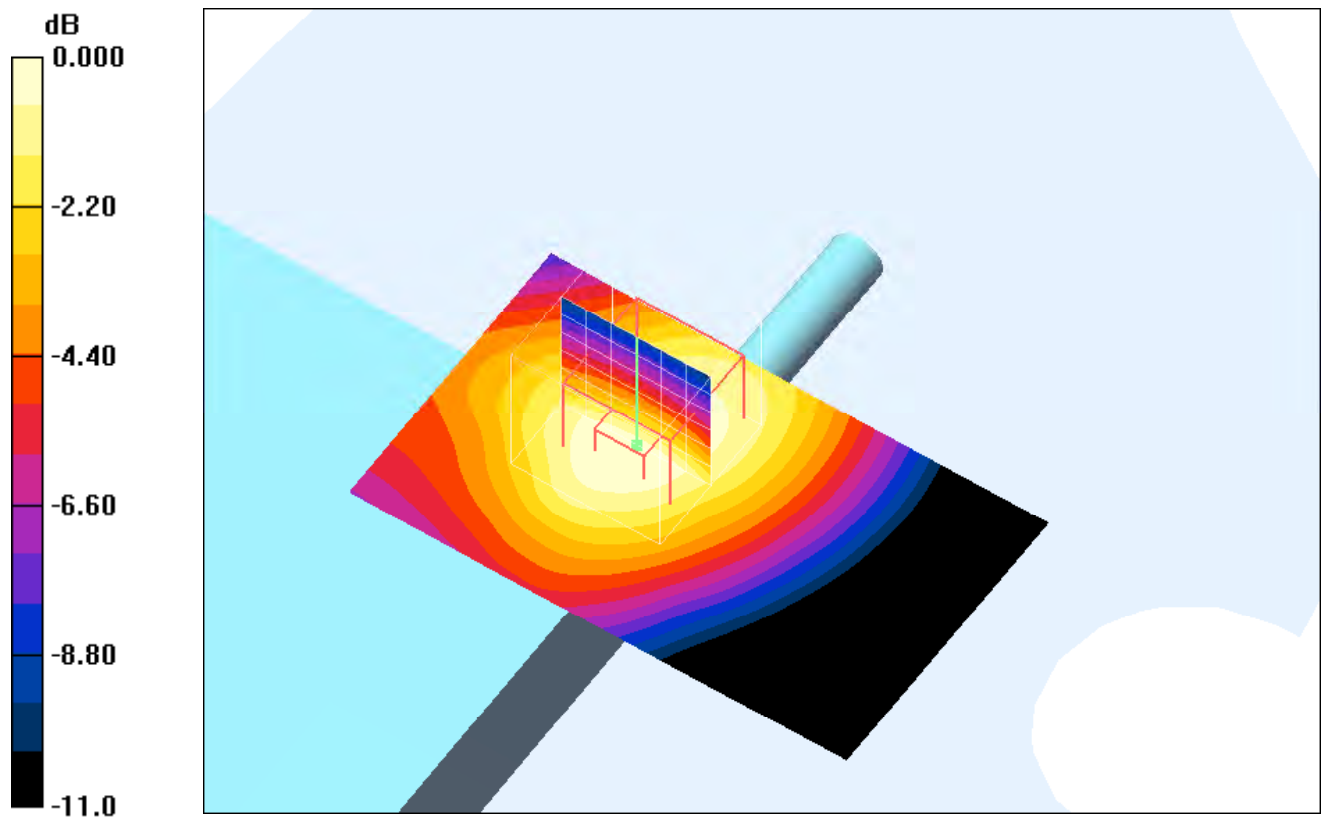
Peak SAR (extrapolated) = 1.95 W/kg

SAR(1 g) = 1.33 mW/g; SAR(10 g) = 0.890 mW/g

Info: Extrapolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 1.43 mW/g

0 dB = 1.43mW/g



Date/Time: 4/15/2008 10:18:04 AM

Test Laboratory: QUALCOMM Incorporated

20080414_UNDP-1_GPRS2UL-surfaceF-ant180

DUT: HSTNN-W47C; Type: Laptop; Serial: 2CE8080PHL

Communication System: US GSM-GPRS850-2UL; Frequency: 836.6 MHz; Duty Cycle: 1:4.3

Medium: MSL850 Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.975$

mho/m; $\epsilon_r = 54$; $\rho = 1000$ kg/m³

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;

Tablet PC, Antenna 180deg – Middle/Area Scan (101x61x1): Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (interpolated) = 1.59 mW/g

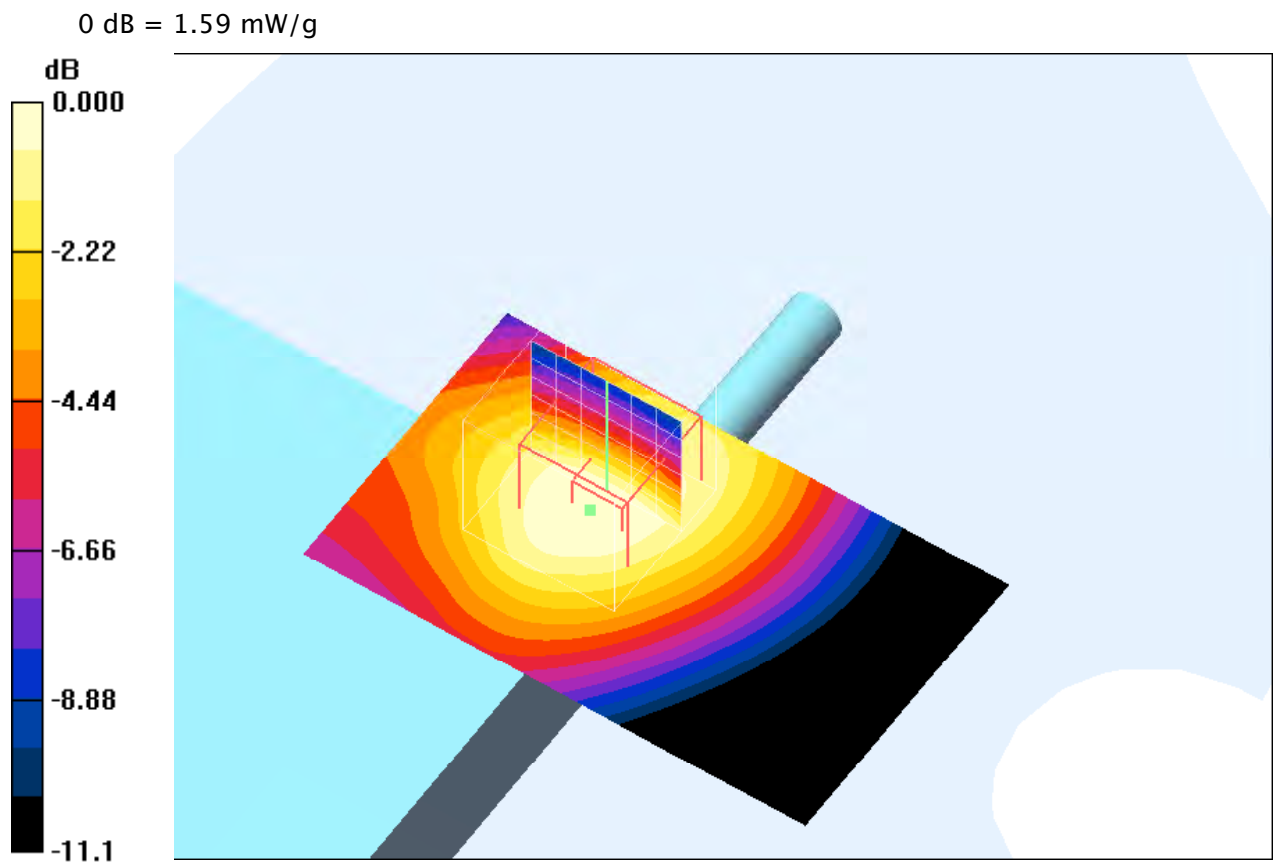
Tablet PC, Antenna 180deg – Middle/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 41.4 V/m; Power Drift = -0.034 dB

Peak SAR (extrapolated) = 2.08 W/kg

SAR(1 g) = 1.45 mW/g; SAR(10 g) = 0.987 mW/g

Maximum value of SAR (measured) = 1.59 mW/g



Date/Time: 4/15/2008 9:27:34 AM

Test Laboratory: QUALCOMM Incorporated

20080414_UNDP-1_GPRS2UL-surfaceF-ant180

DUT: HSTNN-W47C; Type: Laptop; Serial: 2CE8080PHL

Communication System: US GSM-GPRS850-2UL; Frequency: 848.8 MHz; Duty Cycle: 1:4.3

Medium: MSL850 Medium parameters used (extrapolated): $f = 848.8$ MHz; $\sigma = 0.988$

mho/m; $\epsilon_r = 53.9$; $\rho = 1000$ kg/m³

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;

Tablet PC, Antenna 180deg – High/Area Scan (101x61x1): Measurement grid: dx=10mm, dy=10mm

Info: Extrapolated medium parameters used for SAR evaluation.

Maximum value of SAR (interpolated) = 1.57 mW/g

Tablet PC, Antenna 180deg – High/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

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

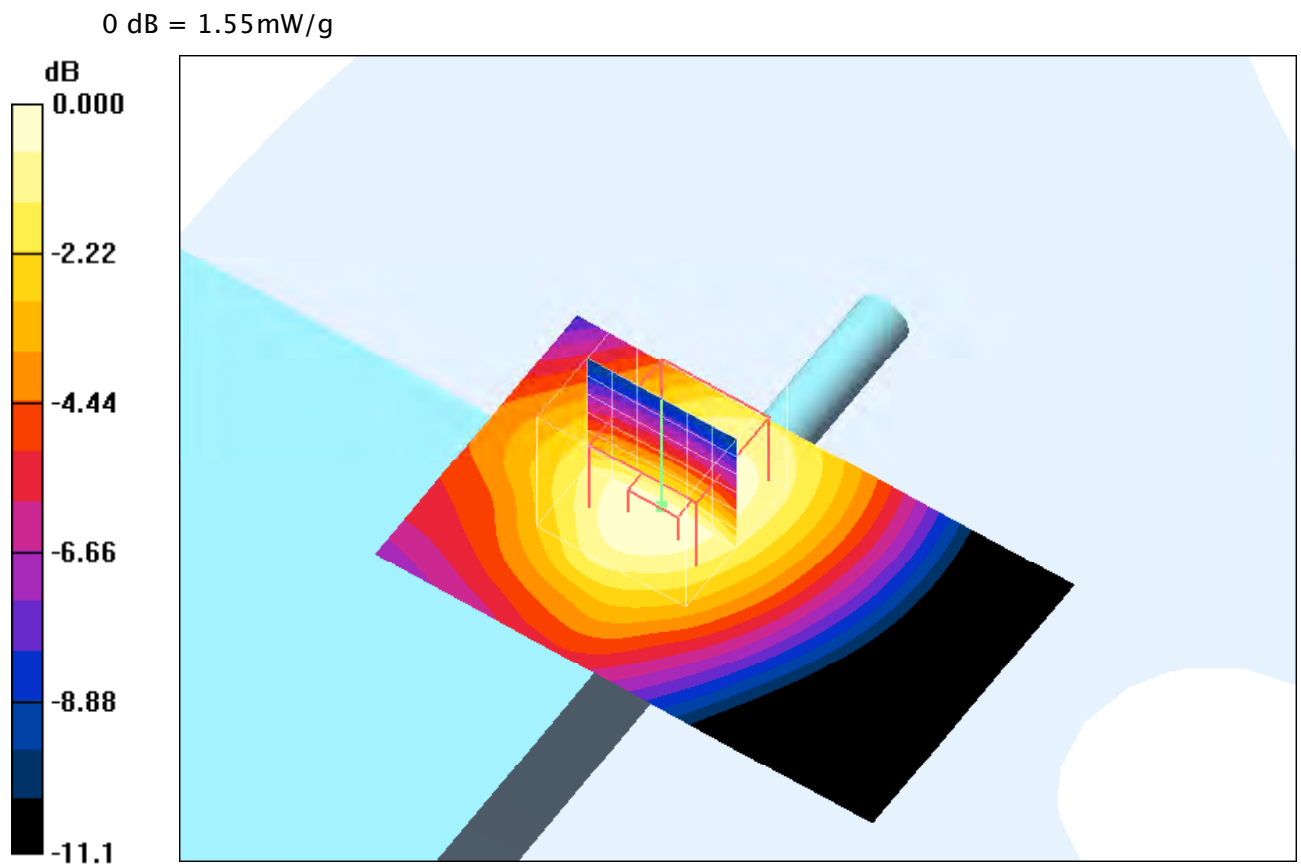
Reference Value = 40.6 V/m; Power Drift = -0.009 dB

Peak SAR (extrapolated) = 2.09 W/kg

SAR(1 g) = 1.44 mW/g; SAR(10 g) = 0.965 mW/g

Info: Extrapolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 1.55 mW/g



Date/Time: 4/15/2008 12:04:57 PM

Test Laboratory: QUALCOMM Incorporated

20080414_UNDP-1_GPRS2UL-surfaceF-ant_stowed

DUT: HSTNN-W47C; Type: Laptop; Serial: 2CE8080PHL

Communication System: US GSM-GPRS850-2UL; Frequency: 836.6 MHz; Duty Cycle: 1:4.3

Medium: MSL850 Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.975$

mho/m; $\epsilon_r = 54$; $\rho = 1000$ kg/m³

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;

Tablet PC, Antenna stowed – Middle/Area Scan (101x61x1): Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (interpolated) = 0.003 mW/g

Tablet PC, Antenna stowed – Middle/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 1.20 V/m; Power Drift = 0.445 dB

Peak SAR (extrapolated) = 0.004 W/kg

SAR(1 g) = 0.00244 mW/g; SAR(10 g) = 0.00144 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.003 mW/g

