



MOTOROLA

Supplemental Portable Cellular Phone SAR Test Report

Tests Requested By: Motorola Mobility, Inc.
600 N. US Highway 45
Libertyville, IL 60048

Test Report #: 24980-1F Rev. 0
Date of Report: May 17, 2012
Date of Test: May 10, 2012 – May 15, 2012
FCC ID #: IHDT56NQ2
Generic Name: M0D00

Test Laboratory: Motorola Mobility, Inc. - Product Safety & Compliance Laboratory
600 N. US Highway 45
Libertyville, IL 60048

Report Author: Ketal Patel
RF Engineer *Ketal Patel*

This laboratory is accredited to ISO/IEC 17025-2005 to perform the following tests:

Accreditation:



2404

Tests:
Electromagnetic Specific Absorption Rate

Procedures:
IEC 62209-1
RSS-102
IEEE 1528 - 2003
FCC OET Bulletin 65 (including Supplement C)
Australian Communications Authority Radio
Communications (Electromagnetic Radiation – Human
Exposure) Standard 2003
CENELEC EN 50360
ARIB Std. T-56 (2002)

On the following products or types of products:

Wireless Communications Devices (Examples): Two Way Radios; Portable Phones (including Cellular, Licensed Non-Broadcast and PCS); Low Frequency Readers; and Pagers

Statement of Compliance:

Motorola declares under its sole responsibility that the portable cellular telephone model to which this declaration relates, is in conformity with the appropriate General Population/Uncontrolled RF exposure standards, recommendations and guidelines (FCC 47 CFR §2.1093) as well as with CENELEC en50360:2001 and ANSI / IEEE C95.1. It also declares that the product was tested in accordance with IEEE 1528 / CENELEC EN62209-1 (2006), as well as other appropriate measurement standards, guidelines and recommended practices. Any deviations from these standards, guidelines and recommended practices are noted below:

Motorola's ISO 17025 accreditation scope does not currently include SAR testing in the 5 GHz band. Therefore, SAR testing performed in this band was performed outside of our ISO 17025 accreditation. The general procedures and guidelines provided within; FCC KDB 248227 D01, FCC KDB 648474 D01, FCC KDB 865664 D01 and IEC 62209-2 were utilized for testing.

©Motorola, Inc. 2012

This test report shall not be reproduced except in full, without written approval of the laboratory. The results and statements contained herein relate only to the items tested. The names of individuals involved may be mentioned only in connection with the statements or results from this report. Motorola encourages all feedback, both positive and negative, on this test report.

Table of Contents

1. Introduction	3
2. Description of the Device Under Test	3
3. Test Equipment Used	4
3.1 Dosimetric System	4
3.2 Additional Equipment	<i>Error! Bookmark not defined.</i>
4. Electrical parameters of the tissue simulating liquid	5
5. Test Results	6
References	7
Appendix 1: SAR distribution plots for Mobile Hotspot Configuration	

Revision History

Revision Version	Date	Notes
Rev. 0	17-May-2012	Initial report release

1. Introduction

The Motorola Mobility Product Safety & Compliance Laboratory has performed measurements of the maximum potential exposure to the user of the portable cellular phone covered by this test report. The Specific Absorption Rate (SAR) of this product was measured. The portable cellular phone was tested in accordance with [1], [4] and [5]. The SAR values measured for the portable cellular phone are below the maximum recommended levels of 1.6 W/kg in a 1 g average set in [3] and 2.0 W/kg in a 10 g average set in [2].

Per direction of the FCC, the following SAR test data is being provided to demonstrate the device's effective utilization of power reduction conditions specified in Exhibit 12 - Operational Description. The values in the table in Section 6.0 are provided solely for purposes of confirming compliant power reduction operation and do not represent maximum SAR values of the product. For maximum reported SAR compliance values, refer to the Exhibit 11 SAR test report.

2. Description of the Device Under Test

Serial Number(s)		364PNG06MN		
Production Unit or Identical Prototype (47 CFR §2.908)		Identical Prototype		
Device Category		Portable		
Mode(s) of Operation	Modulation Mode(s)	Maximum Output Power Setting	Duty Cycle	Transmitting Frequency Range(s)
iDEN 800 (Interconnect / Dispatch)	M16-QAM	28.06 dBm	2:6 / 1:6	806.0125 - 824.9875 MHz
iDEN 800 (Packet Data)	M64-QAM, M16-QAM, QPSK	28.06 dBm	81:120	806.0125 - 824.9875 MHz
GSM 1900	GMSK	30.5 dBm	1:8	1850.2 - 1909.8 MHz
WCDMA 1700	QPSK	24.0 dBm	1:1	1712.4 - 1752.6 MHz
WCDMA 1900	QPSK	24.0 dBm	1:1	1852.4 - 1907.6 MHz
Wi-Fi 802.11b/g/n	BPSK	19.24 dBm	1:1	2412.0 - 2462.0 MHz
Bluetooth	GFSK	8.9 dBm	1:1	2402.0 - 2480.0 MHz

GSM Data Functionality	GPRS/EDGE Class 12 (4 uplink timeslots; 4 downlink timeslots; 5 total timeslots per frame). GPRS not supported for Mobile Hotspot via firmware.
	Class B (DTM not supported)

The DUT utilizes a set of reduced limits for the maximum transmit when the mobile hotspot functionality is enabled. Tables of the reduced limits used for testing are given below. A complete description of this functionality is provided in the "Operational Description" contained within Exhibit 12A. The implementation to trigger the reduction in power requires the device to be radiating, which prevents conducted power measurements of this functionality without modification to the unit. The power reductions levels are verified by means of the SAR measurements provided in the Supplemental SAR report.

Mode(s) of Operation	GPRS/EDGE 1900				EDGE 1900			
	GMSK				8PSK			
Maximum Output Power Setting (dBm)	30.5	27.5	25.7	24.5	27.0	27.0	25.0	23.0
Time Average Output Power Setting (dBm)	21.5	21.5	21.4	21.5	18.0	21.0	20.7	20.0
Duty Cycle	1:8	2:8	3:8	4:8	1:8	2:8	3:8	4:8
Transmitting Frequency Range(s)	1850.2 - 1909.8 MHz				1850.2 - 1909.8 MHz			

3. Test Equipment Used

3.1 Dosimetric System

The Motorola Mobile Devices Business Product Safety & Compliance Laboratory utilizes a Dosimetric Assessment System (Dasy4™ v4.7) manufactured by Schmid & Partner Engineering AG (SPEAG™), of Zurich Switzerland. All the SAR measurements are taken within a shielded enclosure. The overall 10 g RSS uncertainty of the measurement system is $\pm 10.8\%$ (K=1) with an expanded uncertainty of $\pm 21.6\%$ (K=2). The overall 1 g RSS uncertainty of the measurement system is $\pm 11.1\%$ (K=1) with an expanded uncertainty of $\pm 22.2\%$ (K=2). Per IEEE 1528, this uncertainty budget is applicable to the SAR range of 0.4 W/kg to 10 W/kg.

The list of calibrated equipment used for the measurements is shown in the following table.

Description	Serial Number	Cal Date	Cal Due Date
DASY4™ DAE V1	376	Aug-31-2011	Aug-31-2012
E-Field Probe ES3DV3	3124	Aug-23-2011	Aug-23-2012
DASY4™ DAE V1	1310	Jan-11-2012	Jan-11-2013
E-Field Probe ES3DV3	3284	Jan-10-2012	Jan-10-2013
S.A.M. Phantom used for 800 MHz	TP-1156		
S.A.M. Phantom used for 1800/1900/2450 MHz	TP-1319		
Dipole Validation Kit, DV835V2	4D128	Jan-11-2012	Jan-11-2013
Dipole Validation Kit, DV1800V2	2D191	Jan-05-2012	Jan-05-2013
Dipole Validation Kit, DV1800V2	259TR	Mar-17-2011	Mar-17-2013
Dipole Validation Kit, DV2450V2	863	Mar-17-2011	Mar-17-2013

3.2 Additional Equipment

Description	Serial Number	Cal Date	Cal Due Date
Signal Generator HP8648C	3847A04810	Sep-26-2011	Sep-26-2013
Power Meter E4419B	GB39511090	Aug-12-2011	Aug-12-2013
Power Sensor #1 - E9301A	US39210918	Nov-16-2011	Nov-16-2012
Power Sensor #2 - E9301A	US39210917	Nov-16-2011	Nov-16-2012
Signal Generator HP8648C	3847M01245	Aug-23-2011	Aug-23-2013
Power Meter E4419B	GB39511084	Mar-28-2011	Mar-28-2013
Power Sensor #1 - E9301A	US39210931	Jan-19-2012	Jan-19-2013
Power Sensor #2 - E9301A	US39210932	Jan-19-2012	Jan-19-2013
Signal Generator HP8648C	3847A04632	Aug-13-2011	Aug-13-2013
Power Meter E4419B	GB39511085	Nov-04-2011	Nov-04-2013
Power Sensor #1 - E9301A	US39210915	Sep-09-2011	Sep-09-2012
Power Sensor #2 - E9301A	US39210916	Sep-09-2011	Sep-09-2012
Network Analyzer HP8753ES	US39172529	Sep-12-2011	Sep-12-2012
Network Analyzer E5071C	MY6212851	May-10-2012	May-10-2013
Dielectric Probe Kit DAK-3.5	1030		

4. Electrical parameters of the tissue simulating liquid

Prior to conducting SAR measurements, the relative permittivity, ϵ_r , and the conductivity, σ , of the tissue simulating liquids were measured with a HP85070 Dielectric Probe Kit. These values, along with the temperature of the simulated tissue are shown in the table below. The recommended limits for permittivity and conductivity are also shown. A mass density of $\rho = 1 \text{ g/cm}^3$ was entered into the system in all the cases. It can be seen that the measured parameters are within tolerance of the recommended limits specified in [1] and [5].

E-field probes calibrated at 1810 MHz were used for "1900 MHz" band (1850 MHz - 1910 MHz) SAR measurements. FCC KDB pub. 450824 provides additional requirements on page 3 of 6 for SAR testing that is performed with probe calibration points that are more than 50 MHz removed from the measured bands. The KDB requires; "(2) When nominal tissue dielectric parameters are specified in the probe calibration data, the tissue dielectric parameters measured for routine measurements should be less than the target ϵ_r and higher than the target Sigma values to minimize SAR underestimations". The 1900 MHz simulated tissues listed below meet these criteria.

f (MHz)	Tissue type	Limits / Measured	Dielectric Parameters		
			ϵ_r	σ (S/m)	Temp (°C)
1730	Body	Measured, May-12-2012	52.8	1.5	19.3
		Recommended Limits	53.5 ±5%	1.48 ±5%	18-25
1880	Body	Measured, May-10-2012	52.2	1.58	18.7
		Measured, May-15-2012	51.6	1.59	19.0
		Recommended Limits	53.3 ±5%	1.52 ±5%	18-25

The list of ingredients and the percent composition used for the simulated tissues are indicated in the table below.

Ingredient	835 MHz / 900 MHz Head	835 MHz / 900 MHz Body	1800 MHz / 1900 MHz Head	1800 MHz / 1900 MHz Body	2450 MHz Head	2450 MHz Body
Sugar	57	44.9	--	--	--	--
DGBE	--	--	47	30.8	--	30
Diacetin	--	--	--	--	51	--
9Water	40.45	53.06	52.62	68.8	48.75	70
Salt	1.45	0.94	0.38	0.4	0.15	--
HEC	1	1	--	--	--	--
Bact.	0.1	0.1	--	--	0.1	--

5. Test Results

The test sample was operated using an actual transmission through a base station simulator. The base station simulator was set up for the proper channels, transmitter power levels and transmit modes of operation.

The phone was tested in configurations specified by the FCC for this device in order to demonstrate the effective utilization of power reduction conditions specified in Exhibit 12. Testing was performed with a separation of 1 cm between the DUT and the “flat” phantom. The phone was positioned into these configurations using the device holder supplied with the DASY4™ SAR measurement system. The default settings for the “coarse” and “cube” scans were chosen and used for measurements. The grid spacing of the coarse scan was set to 15 mm or less as shown in the SAR plots included in Appendix 1. Please refer to the DASY4™ manual for additional information on SAR scanning procedures and algorithms used.

The SAR results shown in the table below are maximum SAR values averaged over 1 gram of phantom tissue. Also shown is the extrapolated SAR to account for drift. The exact method of extrapolation is $\text{Extrapolated SAR} = \text{Measured SAR} * 10^{-(\text{drift}/10)}$. The SAR reported at the end of the measurement process by the DASY4™ measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process. This is the most conservative SAR because it corresponds to the average output power at the beginning of the SAR test. This extrapolation has been done because when the DUT is operating properly it may exhibit a slump in radiated power and SAR over time. This is verified by measuring the SAR drift after the test.

The Cellular Phone model covered by this report has the following battery options:
 Model SNN5879A - 1880 mAH battery

A “flat” phantom was for the body-worn tests. This “flat” phantom is made out of 1” thick natural High Density Polyethylene with a thickness at the bottom equal to 2.0 mm. It measures 52.7 cm(long) x 26.7 cm(wide) x 21.2 cm(tall). The simulated tissue depth was verified to be 15.0 cm ± 0.5 cm for frequencies below 3 GHz.

The following probe conversion factors were used on the E-Field probe(s) used for the body-worn mobile hotspot measurements:

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ES3DV3	3124	835	6.04	6 of 11
		1810	4.69	6 of 11
		2450	4.21	6 of 11
	3284	1810	5.28	6 of 11

Per direction of the FCC, the following SAR test data is being provided to demonstrate the device's effective utilization of power reduction conditions specified in Exhibit 12 - Operational Description. The values in the table are provided solely for purposes of confirming compliant power reduction operation and do not represent maximum SAR values of the product. For maximum reported SAR compliance values, refer to the Exhibit 11 SAR test report.

Mobile Hotspot, Phone 10 mm from Phantom									
F (MHz)	Mode	Test Configuration	Channel	1 g SAR value w/o Pwr Reduction		1 g SAR value w/ Pwr Reduction		Pwr Reduction Specification (dB)	Measured Pwr Reduction (dB)
				Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)		
1730	WCDMA 1700, 12.2 kbps RMC	Bottom Edge of Device 10mm from Phantom	1312						
			1413	2.26	2.26	1.06	1.09	3	3.18
			1513						
1880	WCDMA 1900, 12.2 kbps RMC		9262						
			9400	1.55	1.56	0.78	0.78	3	3.01
			9538						

References

- [1] CENELEC, en62209-1:2006 “Human Exposure to Radio Frequency Fields From Hand - Held and Body - Mounted Wireless Communication Devices – Human Models, Instrumentation, and Procedures”
- [2] CENELEC, en50360:2001 “Product standard to demonstrate the compliance of mobile phones with the basic restrictions related to human exposure to electromagnetic fields (300 MHz – 3 GHz)”.
- [3] ANSI / IEEE, C95.1 1992 Edition “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”
- [4] FCC OET Bulletin 65 Supplement C 01-01
- [5] IEEE 1528 2003 Edition “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”
- [6] ICNIRP Guidelines “Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz)”

Appendix 1

SAR distribution plots for Mobile Hotspot Configuration

Test Laboratory: Motorola Mobility - WCDMA 1700 Mobile Hotspot, with Cutback

Serial: 364PNG06MN; FCC ID: INDT56NQ2

Procedure Notes: Pwr Step: ALWAYS UP Battery Model #: BF6X SNN5879A Test Configuration: MOBILE HOTSPOT, BOTTOM EDGE OF PHONE 10MM FROM PHANTOM

Communication System: _WCDMA; Frequency: 1732 MHz; Communication System Channel Number: 1413; Duty Cycle: 1:1

Medium: 1730 Glycol Body; Medium parameters used: $f = 1730$ MHz; $\sigma = 1.5$ mho/m; $\epsilon_r = 52.8$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3124; ConvF(4.69, 4.69, 4.69); Calibrated: 8/23/2011;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 8/31/2011
- Phantom: R#-1, Triple Flat Phantom 5.1C (Rev.4); Type: QD 000 P51 CA; Serial: n/a;
- ; SEMCAD X Version 14.6.5 (6469)

Flat Phone Template/Area Scan - Normal Body (15mm) (131x71x1):

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

Maximum value of SAR (interpolated) = 1.19 mW/g

Triple Flat Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:

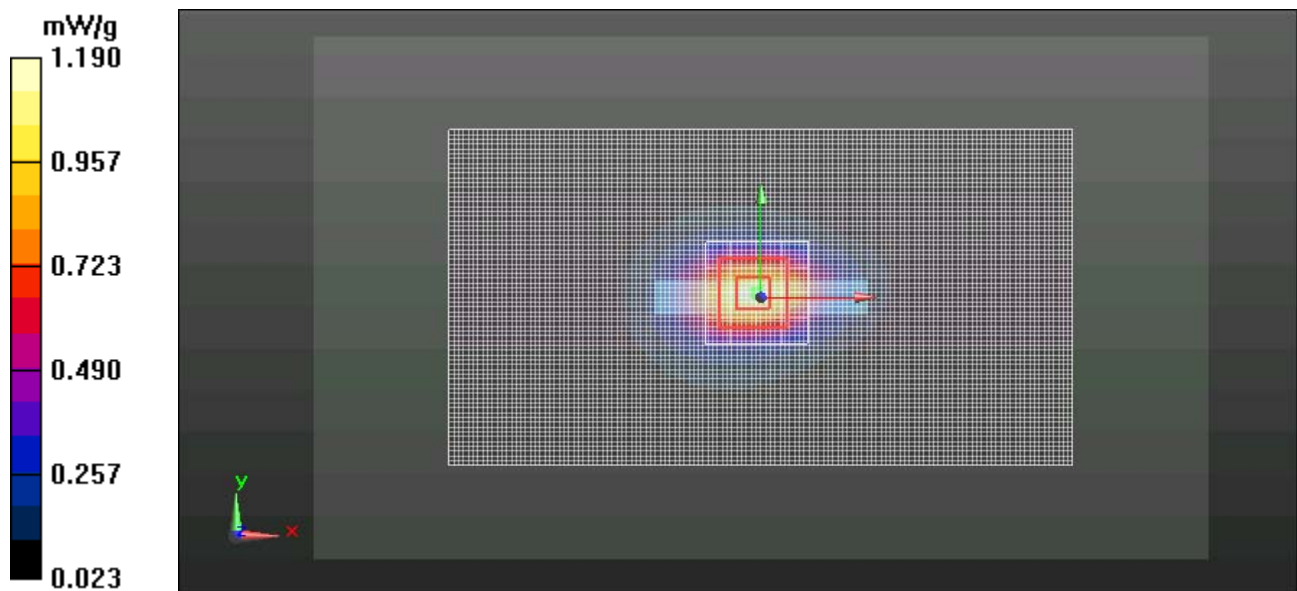
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 25.052 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 1.773 mW/g

SAR(1 g) = 1.06 mW/g; SAR(10 g) = 0.578 mW/g

Maximum value of SAR (measured) = 1.19 mW/g



Test Laboratory: Motorola Mobility - WCDMA 1700 Mobile Hotspot, No Cutback

Serial: 364PNG06MN; FCC ID: IHDT56NQ2

Procedure Notes: Pwr Step: ALWAYS UP Battery Model #:BF6X SNN5879A Test Configuration: BOTTOM EDGE OF PHONE 10MM FROM PHANTOM

Communication System: _WCDMA; Frequency: 1732 MHz; Communication System Channel Number: 1413; Duty Cycle: 1:1

Medium: 1730 Glycol Body; Medium parameters used: $f = 1730$ MHz; $\sigma = 1.5$ mho/m; $\epsilon_r = 52.8$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3124; ConvF(4.69, 4.69, 4.69); Calibrated: 8/23/2011;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 8/31/2011
- Phantom: R#-1, Triple Flat Phantom 5.1C (Rev.4); Type: QD 000 P51 CA; Serial: n/a;
- ; SEMCAD X Version 14.6.5 (6469)

Triple Flat Phone Template/Area Scan - Normal Body (15mm) (131x71x1):

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

Maximum value of SAR (interpolated) = 2.53 mW/g

Triple Flat Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:

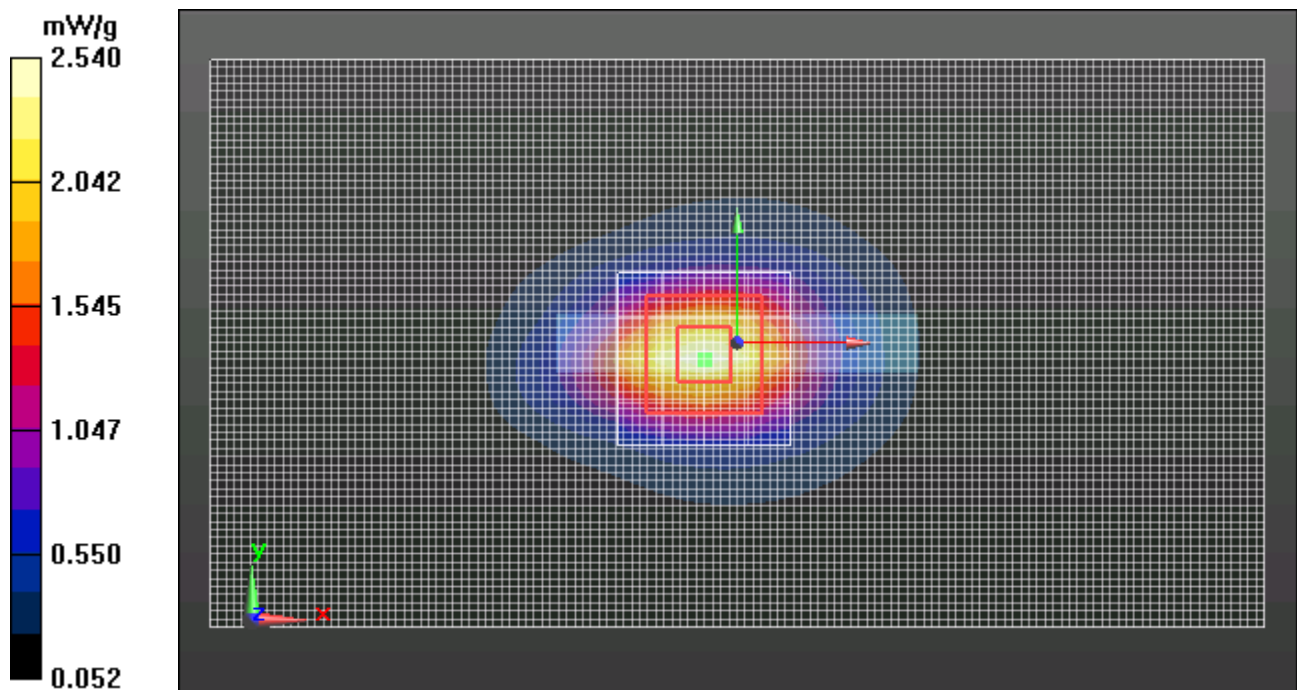
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 38.865 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 3.810 mW/g

SAR(1 g) = 2.26 mW/g; SAR(10 g) = 1.23 mW/g

Maximum value of SAR (measured) = 2.54 mW/g



Test Laboratory: Motorola Mobility - WCDMA 1900 Mobile Hotspot, with Cutback

Serial: 364PNG06MN; FCC ID: IHDT56NQ2

Procedure Notes: Pwr Step: ALL UP BITS Battery Model #: BF6X SNN5879A Test configuration: MOBILE HOTSPOT, BOTTOM EDGE OF PHONE 10MM FROM PHANTOM

Communication System: _WCDMA; Frequency: 1880 MHz; Communication System Channel Number: 9400; Duty Cycle: 1:1

Medium: Regular Glycol Body 1750/1880; Medium parameters used: $f = 1880$ MHz; $\sigma = 1.58$ mho/m; $\epsilon_r = 52.2$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3284; ConvF(5.28, 5.28, 5.28); Calibrated: 1/10/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1310; Calibrated: 1/11/2012
- Phantom: R#4, Triple Flat Phantom 5.1C (Rev.4); Type: QD 000 P51 CA; Serial: n/a;
- ; SEMCAD X Version 14.6.5 (6469)

Triple Flat Phone Template/Area Scan - Normal Body (15mm) (131x71x1):

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

Maximum value of SAR (interpolated) = 0.891 mW/g

Triple Flat Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:

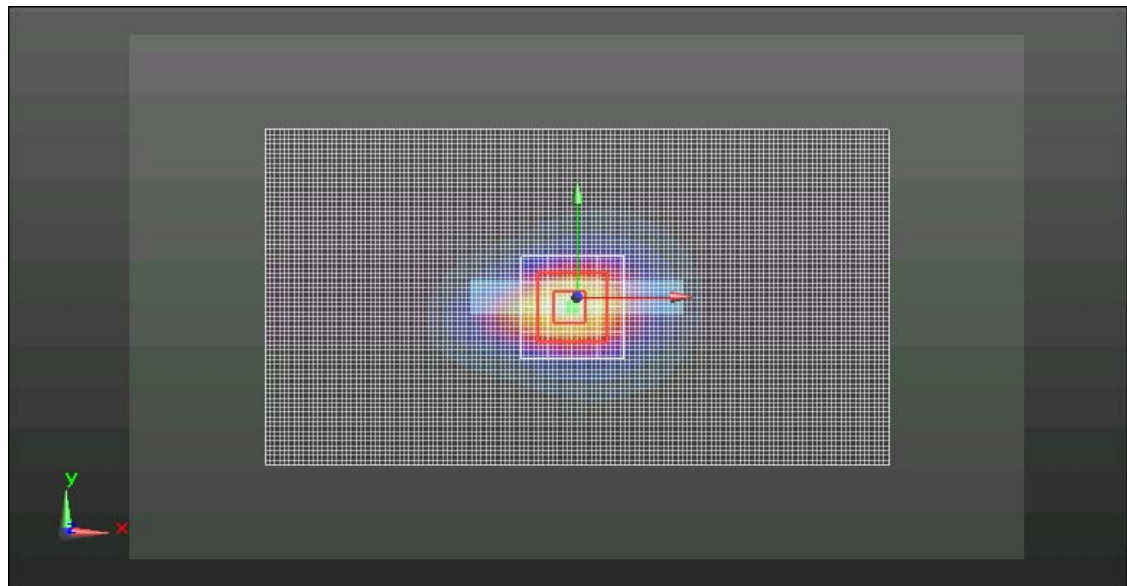
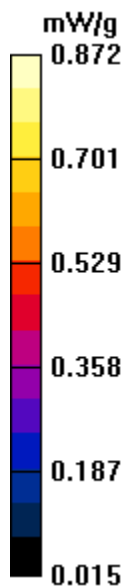
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 20.732 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 1.322 mW/g

SAR(1 g) = 0.781 mW/g; SAR(10 g) = 0.429 mW/g

Maximum value of SAR (measured) = 0.872 mW/g



Test Laboratory: Motorola Mobility - WCDMA 1900 Mobile Hotspot, No Cutback

Serial: 364PNG06MN; FCC ID: IHDT56NQ2

Procedure Notes: Pwr Step: ALL UP BITS Battery Model #: BF6X SNN5879A Test Configuration: BOTTOM EDGE OF PHONE 10MM FROM PHANTOM

Communication System: _WCDMA; Frequency: 1880 MHz; Communication System Channel Number: 9400; Duty Cycle: 1:1

Medium: Regular Glycol Body 1750/1880; Medium parameters used: $f = 1880$ MHz; $\sigma = 1.58$ mho/m; $\epsilon_r = 52.2$; $\rho = 1000$ kg/m³

DASY4 Configuration:

- Probe: ES3DV3 - SN3284; ConvF(5.28, 5.28, 5.28); Calibrated: 1/10/2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1310; Calibrated: 1/11/2012
- Phantom: R#4, Triple Flat Phantom 5.1C (Rev.4); Type: QD 000 P51 CA; Serial: n/a;
- ; SEMCAD X Version 14.6.5 (6469)

Triple Flat Phone Template/Area Scan - Normal Body (15mm) (131x71x1):

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

Maximum value of SAR (interpolated) = 1.73 mW/g

Triple Flat Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:

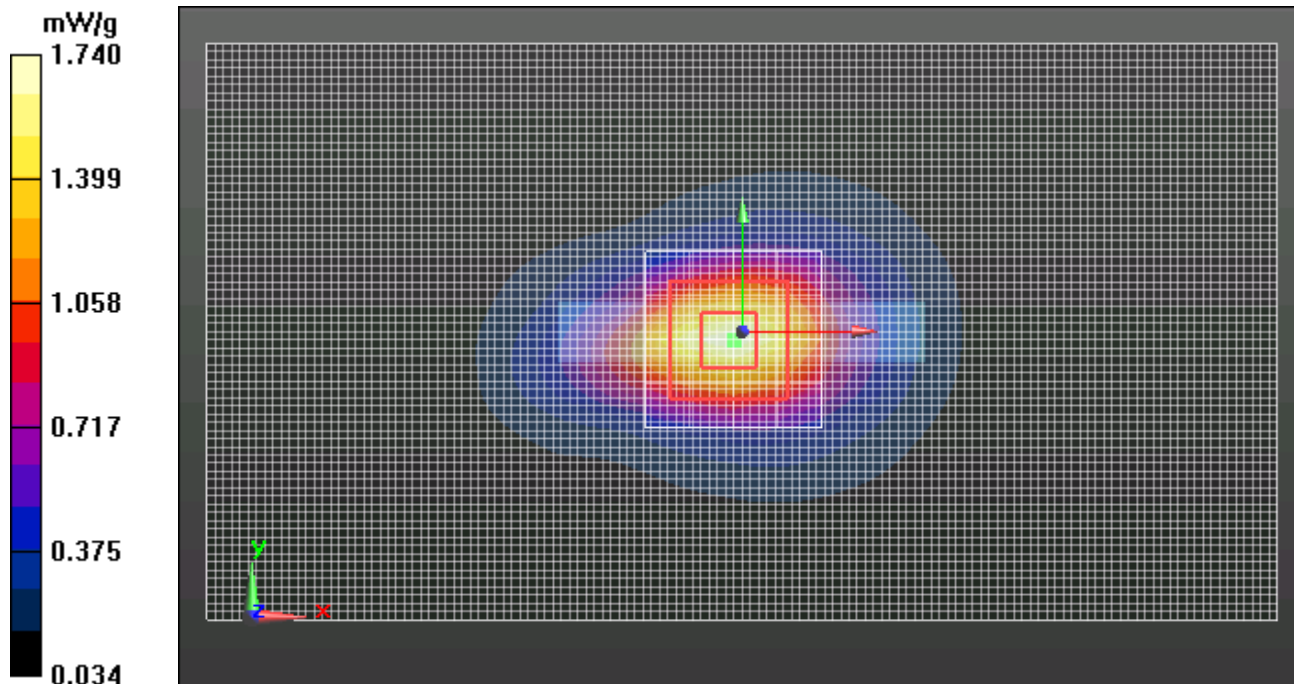
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 30.489 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 2.610 mW/g

SAR(1 g) = 1.55 mW/g; SAR(10 g) = 0.851 mW/g

Maximum value of SAR (measured) = 1.74 mW/g



END OF REPORT