



# MOTOROLA

## Portable Cellular Phone SAR Test Report

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

**Test Report #:** 24975-1F  
**Date of Report:** June 11, 2012  
**Date of Test:** Apr 4, 2012 – Jul 3, 2012  
**FCC ID #:** IHDT56NH5  
**Generic Name:** M0D6B

**Test Laboratory:** Motorola Mobility, Inc. - ADR Test Services Laboratory  
600 N. US Highway 45  
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This laboratory is accredited to ISO/IEC 17025-2005 to perform the following tests:

**Accreditation:**



2404

<u>Tests:</u>	<u>Procedures:</u>
Electromagnetic Specific Absorption Rate	IEC 62209-1
	RSS-102
	IEEE 1528 - 2003
	FCC OET Bulletin 65 ( <i>including Supplement C</i> )
	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

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:

**Statement of Compliance:**

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.

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### Revision History

Revision Version	Date	Notes
Rev. 0	11-Jun-2012	Initial report release
Rev. A	3-Jul-2012	Updated per FCC inquiry Jun-29

## 1. Introduction

The Motorola Mobility ADR Test Services 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].

For ANSI / IEEE C95.1 (1 g), the final stand-alone SAR readings for this phone are given in the table below. These measurements were performed using a DASY4™ v4.7 or DASY52™ system manufactured by Schmid & Partner Engineering AG (SPEAG), of Zurich Switzerland.

<b>Transmit Band</b>	<b>Head SAR (1 g<sup>W</sup>/kg)</b>	<b>Body SAR (1 g<sup>W</sup>/kg)</b>	<b>Mobile Hotspot SAR (1 g<sup>W</sup>/kg)</b>
<b>CDMA 800</b>	<b>0.75</b>	<b>0.65</b>	<b>1.34</b>
<b>CDMA 1900</b>	<b>0.83</b>	<b>0.44</b>	<b>1.44</b>
<b>Wi-Fi 2.45 GHz</b>	<b>0.56</b>	<b>0.06</b>	<b>0.16</b>

## 2. Description of the Device Under Test

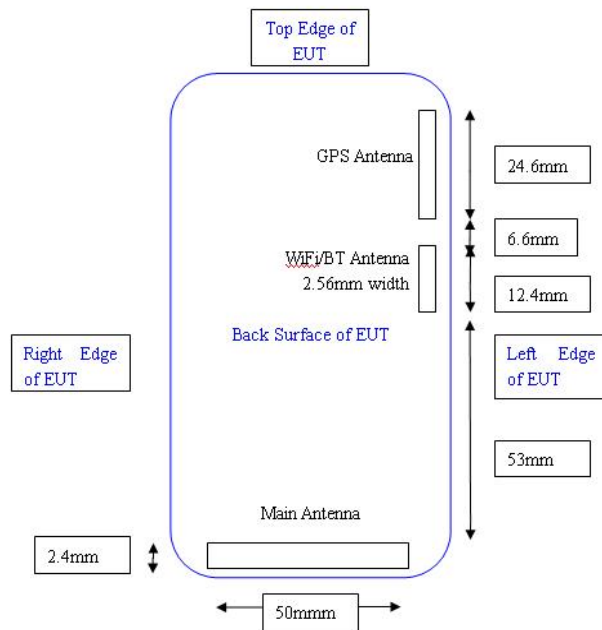
### 2.1 Antenna description

Main (850/1900 MHz) Antenna

<b>Type</b>	Internal	
<b>Location</b>	Bottom of Transceiver	
<b>Dimensions</b>	Width	2.40 mm
	Length	50.00 mm

Bluetooth/Wi-Fi 2.4 GHz Antenna

<b>Type</b>	Internal	
<b>Location</b>	Right-Side Rear of Transceiver	
<b>Dimensions</b>	Width	2.56 mm
	Length	12.40 mm



## 2.2 Device Signaling<sup>1</sup>

<b>Serial Number(s) (Functional Use)</b>	351633050007783, 352513050003959 (CDMA conducted power measurements, CDMA SAR testing) A000002CB81DB4 (Wi-Fi 2.4 GHz conducted power measurements) 352513050007521 (Wi-Fi 2.4 GHz SAR testing)
<b>Production Unit or Identical Prototype (47 CFR §2.908)</b>	Identical Prototype
<b>Device Category</b>	Portable (Mobile Station Class B)
<b>RF Exposure Limits</b>	General Population / Uncontrolled

Mode(s) of Operation	Modulation Mode(s)	Maximum Output Power Setting	Duty Cycle	Transmitting Frequency Range(s)
CDMA 800	QPSK	25.0 dBm	1:1	824.70 - 848.31 MHz
CDMA 1900	QPSK	25.0 dBm	1:1	1851.20 - 1908.75 MHz
Wi-Fi 802.11b/g/n	BPSK	18.86 dBm	1:1	2412.0 - 2462.0 MHz
Bluetooth	GFSK	9.78 dBm	1:1	2402.0 – 2480.0 MHz

### 2.2.1 Power limit reduction for Mobile Hotspot functionality

The DUT utilizes reduced limits for the maximum transmit power when the mobile hotspot functionality is enabled. A table 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 12. 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.

Mode(s) of Operation	CDMA 800		
<b>Test Channel</b>	25	600	1175
<b>Maximum Output Power Setting (dBm)</b>	25.0	25.0	25.0
<b>Reduced Maximum Output Power Setting (dBm)</b>	25.0	25.0	25.0

Mode(s) of Operation	CDMA 1900		
<b>Test Channel</b>	25	600	1175
<b>Maximum Output Power Setting (dBm)</b>	25.0	25.0	25.0
<b>Reduced Maximum Output Power Setting (dBm)</b>	21.5	21.5	21.5

## 2.3 Device Conducted Power Measurements

### 2.3.1 CDMA modes

Per the “SAR Measurement Procedures for 3G Devices” released in October, 2007, RC1, RC3 and RC3 (FCH + SCH) CDMA modes, EVDO Rev O, EVDO Rev A were considered. The conducted power measurements (per steps 3, 4 & 10 of section 4.4.5.2 of 3GPP2 C.5.011 / TIA -98-E) for each mode are shown in the table below.

Conducted power (dBm) for CDMA modes						
	Channel	RC1		RC3		RC3 (FCH + SCH)
		SO2	SO55	SO2	SO55	
CDMA 800	1013	25.03	25.06	25.05	25.01	Per Motorola designs, the maximum power, when in a mode that allows supplemental channels, will always be less than the RC3/RC1 maximum conducted power limit.
	384	25.06	25.04	25.07	25.02	
	777	25.01	24.98	24.94	25	
CDMA 1900	25	25.1	25.13	25.2	25	
	600	24.99	25.1	24.99	24.93	
	1175	25.02	25.01	24.93	24.89	

Conducted power (dBm) for EVDO modes					
	Channel	TDSO SO32		EVDO Rev O	EVDO Rev A
		+FCH-SCH	+SCH	RTAP 153.6K	Subtest 2 RETAP
CDMA 800	1013	25.07	25.06	25.15	25.12
	384	25.09	25.09	25.19	25.13
	777	25.04	25.04	25.07	25.09
CDMA 1900	25	25.06	25.1	25.09	25.12
	600	24.96	24.98	25.05	25.11
	1175	24.88	24.81	24.98	25.08

### 2.3.2 Wi-Fi 802.11 modes

Per “SAR Measurement Procedures for 802.11 a/b/g Transmitters” (FCC KDB 248227), power measurements were performed for 802.11 operational modes. The average conducted power measurements for each mode are shown in the tables below. SAR testing for 802.11 was performed with the transmitter set to the lowest data rate on the default test channels **highlighted in bold** in the tables below.

Band	Channel	Average Conducted Power (dBm) for 802.11b Mode Data Rates			
		1 Mbps	2 Mbps	5.5 Mbps	11 Mbps
Wi-Fi 2450 MHz	1	<b>18.16</b>	18.17	18.09	18.14
	6	<b>18.55</b>	18.46	18.49	18.56
	11	<b>18.85</b>	18.86	18.79	18.80

Band	Channel	Average Conducted Power (dBm) for 802.11g Mode Data Rates							
		6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps	54 Mbps
Wi-Fi 2450 MHz	1	16.01	15.87	15.94	15.92	14.77	14.78	13.2	13.29
	6	17.82	17.88	17.85	17.81	15.32	15.41	13.77	13.74
	11	16.63	16.59	16.69	16.63	15.51	15.47	14.03	14.04

Band	Channel	Average Conducted Power (dBm) for 802.11n Mode Data Rates (20 MHz Channel, 400 ns Guard Interval)							
		7.2 Mbps	14.4 Mbps	21.6 Mbps	28.8 Mbps	43.3 Mbps	57.7 Mbps	65 Mbps	72.2 Mbps
Wi-Fi 2450 MHz	1	14.73	14.84	14.83	14.88	14.85	13.27	13.31	13.3
	6	16.82	17.45	17.39	15.43	15.42	13.65	13.7	13.68
	11	15.48	15.52	15.57	15.6	15.48	13.95	13.92	13.9

Band	Channel	Average Conducted Power (dBm) for 802.11n Mode Data Rates (20 MHz Channel, 800 ns Guard Interval)							
		6.5 Mbps	13 Mbps	19.5 Mbps	26 Mbps	39 Mbps	52 Mbps	58.5 Mbps	65 Mbps
Wi-Fi 2450 MHz	1	14.74	14.89	14.78	14.81	14.75	13.3	13.29	13.34
	6	16.76	17.43	17.38	15.41	15.38	13.71	13.65	13.67
	11	15.49	15.56	15.54	15.57	15.55	14.01	13.9	13.89

### 3. Test Equipment Used

#### 3.1 Dosimetric System

The Motorola Mobility ADR Test Services Laboratory utilizes a Dosimetric Assessment System (DASY4™ v4.7 or DASY52™) 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). The measurement uncertainty budget is given in Appendix 5. 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	1313	Jan-20-2012	Jan-20-2013
E-Field Probe ES3DV3	3180	Jan-11-2012	Jan-11-2013
DASY4™ DAE V1	699	Sep-22-2011	Sep-22-2012
E-Field Probe ES3DV3	3115	Jan-11-2012	Jan-11-2013
S.A.M. Phantom used for 800/900 MHz	TP-1154		
S.A.M. Phantom used for 1800/1900/2450 MHz	TP-1684		
Dipole Validation Kit, DV835V2	425TR	Jul-08-2011	Jul-08-2012
Dipole Validation Kit, DV1800V2	2d129	Jul 22, 2011	Jul 22, 2012
Dipole Validation Kit, DV2450V2	863	Mar-17-2012	Mar-17-2013

#### 3.2 Additional Equipment

Description	Serial Number	Cal Date	Cal Due Date
Power Meter E4419B	MY45101158	Mar-16-2012	Mar-16-2013
Power Meter 437B	3110A05196	Mar-16-2012	Mar-16-2013
Power Sensor - 8481A	MY41096757	Mar-16-2012	Mar-16-2013
Power Meter E4419B	MY45101158	Mar-16-2012	Mar-16-2013
Power Sensor #1 - E9301A	MY41497903	Mar-16-2012	Mar-16-2013
Power Sensor #2 - E9301A	US39211011	Mar-16-2012	Mar-16-2013
Amplifier - Mini Circuits ZHL42	101705		
3dB Fixed Attenuator 8491A	MY39263202	Feb-23-2012	Feb-23-2013
10dB Fixed Attenuator 8491A	MY39263155	Feb-23-2012	Feb-23-2013
Dual Directional Coupler 778D	18369	Mar-16-2012	Mar-16-2013
Power Supply HP6632B	MY43002619	Mar-19-2012	Mar-19-2013
Signal Generator HP8648C	3847A04633	Mar-14-2012	Mar-14-2013
Network Analyzer E5071B	MY42301800	Jan-28-2012	Jan-28-2013
Dielectric Probe Kit DAK-3.5	1028		

#### 4. Electrical parameters of the tissue simulating liquid

Prior to conducting SAR measurements, the relative permittivity,  $\epsilon_r$ , and the conductivity,  $\sigma$ , of the tissue simulating liquids were measured with a SPEAG DAK-3.5 Dielectric Assessment 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 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  $\epsilon_r$  and higher than the target Sigma values to minimize SAR underestimations". The 1900 MHz simulated tissues listed below meet this criteria.

f (MHz)	Tissue type	Limits / Measured	Dielectric Parameters		
			$\epsilon_r$	$\sigma$ (S/m)	Temp (°C)
835	Head	Measured, Apr-02-2012	40.6	0.89	20.5
		Measured, Apr-04-2012	42.6	0.93	20.6
		Measured, Apr-05-2012	41.9	0.92	20.5
		<b>Recommended Limits</b>	41.5 ±5%	0.90 ±5%	18-25
	Body	Measured, Apr-12-2012	56.2	1.00	19.8
		Measured, Apr-16-2012	55.6	0.99	19.8
		Measured, Apr-19-2012	55.2	0.98	19.7
		Measured, Jun-04-2012	54.2	1.00	19.7
		Measured, Jun-08-2012	53.4	1.00	20.1
		<b>Recommended Limits</b>	55.2 ±5%	0.97 ±5%	18-25
1880	Head	Measured, Apr-06-2012	38.1	1.46	21.0
		Measured, Apr-09-2012	38.1	1.46	21.4
		Measured, Apr-27-2012	38.4	1.46	20.5
		<b>Recommended Limits</b>	40.0 ±5%	1.40 ±5%	18-25
	Body	Measured, Apr-10-2012	50.8	1.59	20.0
		Measured, Apr-17-2012	51.2	1.58	19.9
		Measured, Apr-18-2012	50.8	1.59	20.0
		Measured, Jun-05-2012	51.3	1.58	20.2
		Measured, Jun-07-2012	51.9	1.55	20.2
		Measured, Jul-03-2012	50.7	1.57	20.0
<b>Recommended Limits</b>	53.3 ±5%	1.52 ±5%	18-25		
2450	Head	Measured, Jun-01-2012	40.2	1.83	21.2
		<b>Recommended Limits</b>	39.2 ±5%	1.80 ±5%	18-25
	Body	Measured, Jun-01-2012	52	1.89	20
		<b>Recommended Limits</b>	52.7 ±5%	1.95 ±5%	18-25

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

<b>Ingredient</b>	<b>782 / 835 / 900 MHz Head</b>	<b>782 / 835 / 900 MHz Body</b>	<b>1800 MHz / 1900 MHz Head</b>	<b>1800 MHz / 1900 MHz Body</b>	<b>2450 MHz Head</b>	<b>2450 MHz Body</b>
Sugar	57	44.9	--	--	--	--
DGBE	--	--	47	30.8	--	30
Diacetin	--	--	--	--	51	--
Water	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. System Accuracy Verifications

A system accuracy verification of the DASY4™ or DASY5™ was performed using the measurement equipment listed in Section 3.1. The daily system accuracy verification occurs within the flat section of the SAM phantom.

A SAR measurement was performed to verify the measured SAR was within ±10% from the target SAR indicated in Appendix 7. These frequencies are within ±10% of the compliance test mid-band frequency as required in [1] and [5]. The test was conducted on the same days as the measurement of the DUT. Recommended limits for permittivity and conductivity, specified in [5], are shown in the table below. The obtained results from the system accuracy verification are also displayed in the table below. SAR values are normalized to 1 W forward power delivered to the dipole. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values. The distributions of SAR compare well with those of the reference measurements (see Appendix 1). For frequencies below 3 GHz, the simulated tissue depth was verified to be 15.0 cm ± 0.5 cm. Z-axis scans showing the SAR penetration are also included in Appendix 1.

System Accuracy Verification Measurements for Head SAR Measurements						
f (MHz)	Description	SAR (W/kg), 1 gram	Dielectric Parameters		Ambient Temp (°C)	Tissue Temp (°C)
			ε <sub>r</sub>	σ (S/m)		
835	Measured, Apr-02-2012	9.45	40.6	0.89	22.6	21.0
	Measured, Apr-04-2012	9.90	42.6	0.93	22.1	20.8
	Measured, Apr-05-2012	9.85	41.9	0.92	22.1	20.6
	Recommended Limits	9.13	41.5 ±5%	0.90 ±5%	18-25	18-25
1800	Measured, Apr-05-2012	37.0	38.4	1.37	21.7	21.5
	Measured, Apr-09-2012	37.2	38.4	1.38	21.6	21.5
	Measured, Apr-27-2012	37.1	38.7	1.38	21.9	21.5
	Recommended Limits	38.5	40.0 ±5%	1.40 ±5%	18-25	18-25
2450	Measured, Jun-01-2012	54	37.7	1.89	21.1	21.8
	Recommended Limits	54.2	39.2 ±5%	1.80 ±5%	18-25	18-25

The following probe conversion factors were used on the E-Field probe(s) used with the system accuracy verification measurements for head SAR measurements:

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ES3DV3	3180	835	6.07	5 of 11
		1810	5.20	5 of 11
E-Field Probe ES3DV3	3115	2450	4.35	5 of 11

System Accuracy Verification Measurements for Body SAR Measurements						
f (MHz)	Description	SAR (W/kg), 1 gram	Dielectric Parameters		Ambient Temp (°C)	Tissue Temp (°C)
			$\epsilon_r$	$\sigma$ (S/m)		
835	Measured, Apr-12-2012	9.90	56.2	1.00	21.6	20.5
	Measured, Apr-16-2012	9.70	55.6	0.99	22.2	20.2
	Measured, Apr-19-2012	9.75	55.6	0.99	21.7	19.8
	Measured, Jun-04-2012	9.85	54.2	1.00	21.3	19.7
	Recommended Limits	9.35	55.2 ±5%	0.97 ±5%	18-25	18-25
1800	Measured, Apr-10-2012	36.0	51.0	1.49	22.1	20.6
	Measured, Apr-16-2012	35.2	51.4	1.48	22.2	21.5
	Measured, Apr-17-2012	35.9	51.0	1.50	22.2	20.5
	Measured, Jun-05-2012	36.25	51.7	1.48	21.2	20.2
	Measured, Jul-03-2012	35.25	51.1	1.48	21.0	20.2
	Recommended Limits	38.8	53.3 ±5%	1.52 ±5%	18-25	18-25
2450	Measured, Jun-01-2012	54.5	50.5	1.95	20.8	18.9
	Recommended Limits	51.2	52.7 ±5%	1.95 ±5%	18-25	18-25

The following probe conversion factors were used on the E-Field probe(s) used with the system accuracy verification measurements for body SAR measurements:

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ES3DV3	3180	835	5.97	6 of 11
		1810	5.09	6 of 11
E-Field Probe ES3DV3	3115	2450	4.12	6 of 11

## **6. Test Results**

For CDMA modes, the test sample was operated using an actual transmission through a base station simulator. Wi-Fi testing was conducted using manufacturer test mode software, per guidance given in FCC KDB 248227. The base station simulator or test software was set up for the proper channels, transmitter power levels and transmit modes of operation.

The phone was tested in the configurations stipulated in [1], [4] and [5]. The phone was positioned into these configurations using the device holder supplied with the DASY4™ or DASY5™ 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 Appendices 2 through 4. Please refer to the DASY4™ or DASY5™ manual for additional information on SAR scanning procedures and algorithms used.

The DUT covered by this report has an integrated battery (p/n SNN5899A – 1780mAH) that is not intended for removal by the end user.

This battery was used to do all of the SAR testing. The phone was placed in the SAR measurement system with a fully charged battery.

## 6.1 Head Adjacent Test Results

The SAR results shown in tables 1 through 5 are maximum SAR values averaged over 1 gram of phantom tissue, to demonstrate compliance to [3] and also over 10 grams of phantom tissue, to demonstrate compliance to the [6]. Also shown are the temperature of the simulated tissue after the test, the measured drift and the extrapolated SAR. The exact method of extrapolation is:

$$\text{Extrapolated SAR} = (\text{Measured or Corrected SAR}) * 10^{(-\text{drift}/10)}$$

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 left head and right head SAR contour distributions are similar. Because of this similarity, the cheek/touch and 15° tilt test conditions with the highest SAR values in each band are indicated as bold numbers in the following tables and are included in Appendix 2. All other test conditions measured lower SAR values than those included in Appendix 2.

The SAR measurements were performed using the SAM phantoms listed in section 3.1. Since the same phantoms and simulated tissue were used for the system accuracy verification and the device SAR measurements, the Z-axis scans included in Appendix 1 are applicable for verification of simulated tissue depth.

The following probe conversion factors were used on the E-Field probe(s) used for head-adjacent measurements:

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ES3DV3	3180	835	6.07	5 of 11
		1810	5.20	5 of 11
E-Field Probe ES3DV3	3115	2450	4.35	5 of 11

**Left Head Cheek Position**

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	DUT Power	10 g SAR value		1 g SAR value		Test Plot	Plot Page
					Measured (dBm)	Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)		
835	CDMA 800, RC3 SO55	1013			25.05						
		384	20.5	-0.330	25.07	0.457	0.49	0.614	0.66		
		777			24.94						
1880	CDMA 1900, RC3 SO55	25			25.20						
		600	20.5	0.180	24.99	0.274	0.27	0.440	0.44		
		1175			24.93						
2450	802.11b, 1 Mbps	1	21.2	-0.07	18.16	0.228	0.23	0.512	0.52		
		6	21.2	-0.05	18.55	0.201	0.2	0.467	0.47		
		11	21.5	0.06	18.85	0.245	0.25	0.562	0.56	5x5x7	A-39

**Table 1: SAR measurement results at the highest possible output power, measured in a head cheek position against the ICNIRP and ANSI SAR Limit.**

**Right Head Cheek Position**

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	DUT Power	10 g SAR value		1 g SAR value		Test Plot	Plot Page
					Measured (dBm)	Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)		
835	CDMA 800, RC3 SO55	1013			25.05						
		384	20.6	-0.290	25.07	0.518	0.55	0.700	0.75	5x5x7	A-37
		777			24.94						
1880	CDMA 1900, RC3 SO55	25	21.0	0.001	25.20	0.506	0.51	0.832	0.83	5x5x7	A-38
		600	20.5	-0.097	24.99	0.479	0.49	0.808	0.83		
		1175	21.0	-0.091	24.93	0.258	0.26	0.431	0.44		
2450	802.11b, 1 Mbps	1			17.15						
		6			17.52						
		11	21.5	-0.04	17.91	0.226	0.23	0.452	0.46		

**Table 2: SAR measurement results at the highest possible output power, measured in a head cheek position against the ICNIRP and ANSI SAR Limit.**

**Left Head 15° Tilt Position**

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	DUT Power	10 g SAR value		1 g SAR value		Test Plot	Plot Page
					Measured (dBm)	Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)		
835	CDMA 800, RC3 SO55	1013			25.05						
		384	20.5	0.027	25.07	0.288	0.29	0.372	0.37		
		777			24.94						
1880	CDMA 1900, RC3 SO55	25			25.20						
		600	20.5	-0.091	24.99	0.202	0.21	0.330	0.34		
		1175			24.93						
2450	802.11b, 1 Mbps	1			17.15						
		6			17.52						
		11	21.5	0.02	17.91	0.055	0.06	0.111	0.11		

**Table 3: SAR measurement results at the highest possible output power, measured in a head tilt position against the ICNIRP and ANSI SAR Limit.**

**Right Head 15° Tilt Position**

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	DUT Power	10 g SAR value		1 g SAR value		Test Plot	Plot Page
					Measured (dBm)	Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	
835	CDMA 800, RC3 SO55	1013			25.05						
		384	20.5	-0.024	25.07	0.312	0.31	0.407	0.41	5x5x7	A-40
		777			24.94						
1880	CDMA 1900, RC3 SO55	25			25.20						
		600	20.5	0.130	24.99	0.200	0.20	0.346	0.35	5x5x7	A-41
		1175			24.93						
2450	802.11b, 1 Mbps	1			17.15						
		6			17.52						
		11	21.5	-0.13	17.91	0.086	0.09	0.164	0.17	5x5x7	A-42

**Table 4: SAR measurement results at the highest possible output power, measured in a head tilt position against the ICNIRP and ANSI SAR Limit.**

## 6.2 Body Worn Test Results

The SAR results shown in tables 6 through 8 are maximum SAR values averaged over 1 gram of phantom tissue, to demonstrate compliance to [3] and also over 10 grams of phantom tissue, to demonstrate compliance to [6]. Also shown are the temperature of the simulated tissue after the test, the measured drift and the extrapolated SAR. The exact method of extrapolation is:

$$\text{Extrapolated SAR} = (\text{Measured or Corrected SAR}) * 10^{(-\text{drift}/10)}$$

The SAR reported at the end of the measurement process by the DASY4™ or DASY5™ 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 test conditions that produced the highest SAR values in each band are indicated as bold numbers in the following tables and are included in Appendix 3. All other test conditions measured lower SAR values than those included in Appendix 3.

A SPEAG™ MFP V5.1 C Triple Modular Phantom was used for the body-worn tests. The triple modular phantom consists of three identical modules that can be installed and removed separately without emptying the liquid. Each module of the triple phantom is constructed of glass-fiber reinforced vinylester (VG-GF) with a thickness at the bottom of 2.0 mm. It measures 29.2 cm(long) by 17.8 cm(wide) by 17.8 cm(tall). Alternately, a “flat” phantom was used for the body-worn tests. This “flat” phantom is made out of 1” thick natural High Density Polyethylene with a thickness at the bottom of 2.0 mm. It measures 52.7 cm(long) by 26.7 cm(wide) by 21.2 cm(tall). The simulated tissue depth was verified to be 15.0 cm ± 0.5 cm. The same device holder described in section 6 was used for positioning the phone.

The simulated tissue depth was verified to be 15.0 cm ± 0.5 cm for frequencies less than 3 GHz, or 10.0 cm ± 0.5 cm for frequencies greater than 3 GHz. The same device holder described in section 6 was used for positioning the phone. Functional accessories were divided into two categories, the ones with metal components and the ones with non-metal components. For non-metallic component accessories, testing was performed on the accessory that displayed the closest proximity to the flat phantom. Each metallic component accessory, if any, was checked for uniqueness of metal component so that each is tested with the device. If multiple accessories shared an identical metal component, only the accessory that dictates the closest spacing to the body was tested. The cellular phone was tested with a headset connected to the device for all body-worn SAR measurements.

There are no body-worn accessories available for this phone at the time of testing thus the device was tested per the Supplement C testing guidelines for devices that do not have body-worn accessories. A separation distance of 25 mm between the device and the flat phantom was used for testing body-worn SAR. The chosen separation distance of 25 mm is utilized in order to support any case or holder accessories offered or to be offered by Motorola for this product. The device was tested with the front and back of the device facing the phantom. Both sides of the device were tested for Body SAR for the purpose of including the SAR evaluation for body-worn accessories that support the device with the front side facing the user.

The cellular phone was also tested in data mode operations. For these tests, a separation distance of 25 mm between the device and the flat phantom was used. The device was tested in the worst-case SAR position and channel configuration from the voice-mode body-worn testing.

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

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ES3DV3	3180	835	5.97	6 of 11
		1810	5.09	6 of 11
E-Field Probe ES3DV3	3115	2450	4.12	6 of 11

**Body-Worn, Front of Phone 25 mm from Phantom**

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	DUT Power	10 g SAR value		1 g SAR value		Test Plot	Grid	Plot Page
						Measured (dBm)	Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)			
835	CDMA 800, RC3 SO55	1013			25.05							
		384	19.5	-0.110	25.07	0.470	0.48	0.624	0.64			
		777			24.94							
1880	CDMA 1900, RC3 SO55	25			25.20							
		600	20.0	-0.017	24.99	0.193	0.19	0.315	0.32			
		1175			24.93							
2450	802.11b, 1 Mbps	1			17.15							
		6			17.52							
		11	18.6	0	17.91	0.013	0.01	0.023	0.02			

**Table 6: SAR measurement results at the highest possible output power, measured in a body-worn position against the ICNIRP and ANSI SAR Limit.**

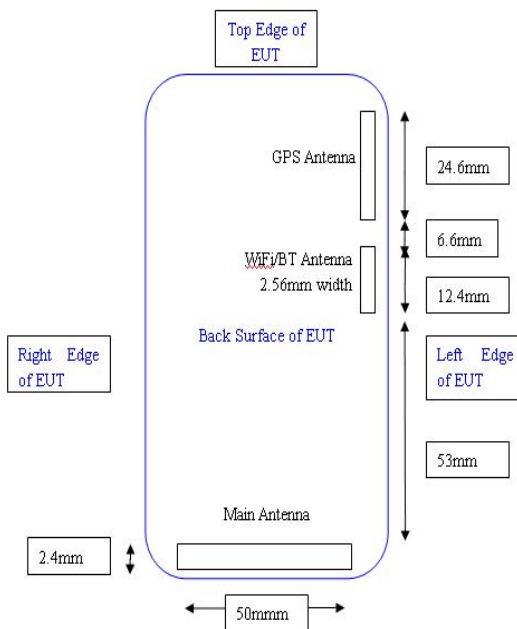
**Body-Worn, Back of Phone 25 mm from Phantom**

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	DUT Power	10 g SAR value		1 g SAR value		Test Plot	Grid	Plot Page
						Measured (dBm)	Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)			
835	CDMA 800, RC3 SO55	1013			25.05							
		384	19.5	-0.130	25.07	0.476	0.49	0.635	0.65	5x5x7	A-44	
		777			24.94							
1880	CDMA 1900, RC3 SO55	25			25.20							
		600	20.0	-0.029	24.99	0.269	0.27	0.440	0.44	5x5x7	A-45	
		1175			24.93							
2450	802.11b, 1 Mbps	1	20.2	-0.17	17.15	0.023	0.02	0.061	0.06	5x5x7	A-45	
		6	18.5	0.22	17.52	0.021	0.02	0.037	0.04			
		11	18.6	0.1	17.91	0.018	0.02	0.032	0.03			

**Table 7: SAR measurement results at the highest possible output power, measured in a body-worn position against the ICNIRP and ANSI SAR Limit.**

### 6.4 Mobile Hotspot Test Results

The DUT is capable of functioning as a Wi-Fi to Cellular mobile hotspot. Additional SAR testing was performed according to the interim test guidelines provided at the October 2010 TCB Workshop. Testing was performed with a separation of 1 cm between the DUT and the “flat” phantom. The DUT was positioned for SAR tests with the front and back surfaces facing the phantom, and also with the edges facing the phantom in which the transmitting antenna is < 2.5 cm from the edge.



Mobile Hotspot Surfaces for SAR testing						
Mode	Front	Back	Left	Right	Top	Bottom
CDMA	Yes	Yes	Yes	Yes	No	Yes
Wi-Fi	Yes	Yes	Yes	No	No	No

The SAR results shown in tables 9 through 13 are maximum SAR values averaged over 1 gram of phantom tissue, to demonstrate compliance to [3] and also over 10 grams of phantom tissue, to demonstrate compliance to [6]. Also shown are the temperature of the simulated tissue after the test, the measured drift and the extrapolated SAR. The exact method of extrapolation is:

$$Extrapolated\ SAR = (Measured\ or\ Corrected\ SAR) * 10^{(-drift/10)}$$

The SAR reported at the end of the measurement process by the DASY4™ or DASY5™ 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 DUT utilizes a reduced limit for the maximum transmit power when the mobile hotspot functionality is enabled, as described above in 2.2.1. A complete description of this functionality is provided in the “Operational Description” contained within Exhibit 12.

The test conditions that produced the highest SAR values in each band are indicated as bold numbers in the following tables and are included in Appendix 4. All other test conditions measured lower SAR values than those included in Appendix 4.

A SPEAG™ MFP V5.1 C Triple Modular Phantom was used for the body-worn tests. The triple modular phantom consists of three identical modules that can be installed and removed separately without emptying the liquid. Each module of the triple phantom is constructed of glass-fiber reinforced vinylester (VG-GF) with a thickness at the bottom of 2.0 mm. It measures 29.2 cm(long) by 17.8 cm(wide) by 17.8 cm(tall). Alternately, a “flat” phantom was used for the body-worn tests. This “flat” phantom is made out of 1” thick natural High Density Polyethylene with a thickness at the bottom of 2.0 mm. It measures 52.7 cm(long) by 26.7 cm(wide) by 21.2 cm(tall). The simulated tissue depth was verified to be 15.0 cm ± 0.5 cm. The same device holder described in section 6 was used for positioning the phone.

The simulated tissue depth was verified to be 15.0 cm ± 0.5 cm for frequencies below 3 GHz, or 10.0 cm ± 0.5 cm for frequencies greater than 3 GHz. The same device holder described in section 6 was used for positioning the phone.

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	3180	835	5.97	6 of 11
		1810	5.09	6 of 11
E-Field Probe ES3DV3	3115	2450	4.12	6 of 11

**Mobile Hotspot, Front of Phone 10 mm from Phantom**

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	DUT Power		10 g SAR value		1 g SAR value		Test Plot	
					Measured (dBm)	Power Reduction (dB)	Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	CDMA 800, RC3 SO55	1013	20	0.03	25.05	0	0.668	0.67	0.867	0.87		
		384	20	-0.11	25.07	0	0.913	0.94	1.19	1.22		
		777	19	-0.008	24.94	0	0.992	0.99	1.3	1.3		
1880	CDMA 1900, RC3 SO55	25	19.7	0.012	25.20	-3.5	0.456	0.46	0.852	0.85		
		600	18.8	-0.018	24.99	-3.5	0.515	0.52	0.972	0.98		
		1175	19.8	-0.085	24.93	-3.5	0.52	0.53	0.986	1.01		
2450	802.11b, 1 Mbps	1			17.15	0.0						
		6			17.52	0.0						
		11	20.3	0.01	17.91	0.0	0.058	0.06	0.112	0.11		

**Table 9: SAR measurement results at the highest possible output power, measured against the ICNIRP and ANSI SAR Limit.**

**Mobile Hotspot, Back of Phone 10 mm from Phantom**

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	DUT Power		10 g SAR value		1 g SAR value		Test Plot	
					Measured (dBm)	Power Reduction (dB)	Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	CDMA 800, RC3 SO55	1013	19.7	0.029	25.05	0	0.772	0.77	1.01	1.01		
		384	19.7	0.07	25.07	0	0.995	1	1.31	1.31		
		777	19.7	0.026	24.94	0	1.01	1.01	1.34	1.34	5x5x7	A-47
1880	CDMA 1900, RC3 SO55	25	19.7	-0.09	25.20	-3.5	0.49	0.5	0.909	0.93		
		600	19.6	-0.17	24.99	-3.5	0.547	0.57	1.03	1.07		
		1175	19.5	-0.33	24.93	-3.5	0.559	0.6	1.07	1.15		
2450	802.11b, 1 Mbps	1			17.15	0.0						
		6			17.52	0.0						
		11	20.3	-0.02	17.91	0.0	0.068	0.07	0.13	0.13		

**Table 10: SAR measurement results at the highest possible output power, measured against the ICNIRP and ANSI SAR Limit.**

**Mobile Hotspot, Left Edge of Phone 10 mm from Phantom**

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	DUT Power		10 g SAR value		1 g SAR value		Test Plot	
					Measured (dBm)	Power Reduction (dB)	Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	CDMA 800, RC3 SO55	1013			25.05	0						
		384	19.4	0.038	25.07	0	0.523	0.52	0.754	0.75		
		777			24.94	0						
1880	CDMA 1900, RC3 SO55	25			25.20	-3.5						
		600	19	0.017	24.99	-3.5	0.046	0.05	0.068	0.07		
		1175			24.93	-3.5						
2450	802.11b, 1 Mbps	1			17.15	0.0						
		6			17.52	0.0						
		11	20.3	0.02	17.91	0.0	0.083	0.08	0.159	0.16	5x5x7	A-50

**Table 11: SAR measurement results at the highest possible output power, measured against the ICNIRP and ANSI SAR Limit.**

**Mobile Hotspot, Bottom Edge of Phone 10 mm from Phantom**

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	DUT Power		10 g SAR value		1 g SAR value		Test Plot	
					Measured (dBm)	Power Reduction (dB)	Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	CDMA 800, RC3 SO55	1013			25.05	0						
		384	19.5	0.068	25.07	0	0.052	0.05	0.087	0.09		
		777			24.94	0						
1880	CDMA 1900, RC3 SO55	25	19.1	0.009	25.20	-3.5	0.677	0.68	1.31	1.31		
		600	20	-0.024	24.99	-3.5	0.733	0.74	1.42	1.43		
		1175	19.1	-0.015	24.93	-3.5	0.75	0.75	1.44	1.44	5x5x7	A-49

**Table 12: SAR measurement results at the highest possible output power, measured against the ICNIRP and ANSI SAR Limit.**

**Mobile Hotspot, Right Edge of Phone 10 mm from Phantom**

f (MHz)	Mode	Channel	Temp (°C)	Drift (dB)	DUT Power		10 g SAR value		1 g SAR value		Test Plot	
					Measured (dBm)	Power Reduction (dB)	Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	CDMA 800, RC3 SO55	1013	19.5	0.004	25.05	0	0.42	0.42	0.611	0.61		
		384	19.5	0.091	25.07	0	0.558	0.56	0.813	0.81		
		777	19.4	0.033	24.94	0	0.593	0.59	0.861	0.86		
1880	CDMA 1900, RC3 SO55	25			25.20	-3.5						
		600	19	-0.031	24.99	-3.5	0.095	0.1	0.16	0.16		
		1175			24.93	-3.5						

**Table 13: SAR measurement results at the highest possible output power, measured against the ICNIRP and ANSI SAR Limit.**

### 6.5 Description and Evaluation of Simultaneous Transmitters

Per "SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas" (FCC KDB 648474), the necessity of stand-alone and simultaneous SAR testing was evaluated for the licensed and unlicensed transmitters of the device under test.

By device design the CDMA transmitters may operate simultaneously with either the Wi-Fi 802.11 transmitter or the Bluetooth transmitter. The separation distance between the Wi-Fi 802.11/Bluetooth antenna and the main antenna is 5.3 cm. Pictorial representation of the antenna locations and separation distances are given in Exhibit 7d.

The Bluetooth transmitter of the device under test can be excluded from stand-alone and simultaneous SAR evaluation, per the highlighted requirements from FCC KDB 648474, as follows:

1. The highest output conducted power measured for Bluetooth on the device under test is 9.51 mW [ $\leq 24 \text{ mW}$ ]
2. The separation distance between the Bluetooth antenna and the main antenna is 5.3 cm [ $\geq 5.0 \text{ cm}$ ]

For the transmitters requiring stand-alone SAR testing (CDMA and Wi-Fi 802.11), the KDB guidelines direct that if the sum of the 1 g SAR measured for the simultaneously transmitting antennas is less than the SAR limit, SAR measurement for simultaneous transmission is not required. Further, if the SAR-to-peak-location separation ratio for two simultaneously transmitting antennas is less than 0.3 then SAR measurement for simultaneous transmission is likewise not required.

Evaluations for Simultaneous SAR (Head, Body, Mobile Hotspot)					
Position	Transmitter Stand-Alone 1 g SAR Values (W/kg)			1 g SAR Summations (W/kg)	
	CDMA 800	CDMA 1900	Wi-Fi 2450 GHz	CDMA 800+ Wi-Fi	CDMA 1900+ Wi-Fi
Left Head Cheek	0.66	0.44	0.56	1.22	1
Right Head Cheek	0.75	0.96	0.46	1.21	1.42
Left Head 15° Tilt	0.37	0.34	0.11	0.48	0.45
Right Head 15° Tilt	0.41	0.35	0.17	0.58	0.52
Body Worn, Front of Phone 25 from Phantom	0.64	0.32	0.02	0.66	0.34
Body Worn, Back of Phone 25 from Phantom	0.65	0.44	0.06	0.71	0.5
Mobile Hotspot, Front of Phone 10mm from Phantom	1.3	1.01	0.11	1.41	1.12
Mobile Hotspot, Back of Phone 10mm from Phantom	1.34	1.15	0.13	1.47	1.28
Mobile Hotspot, Left Edge of Phone 10mm from Phantom	0.75	0.07	0.16	0.91	0.23

As no summation of transmitter SAR values results in a value greater than the compliance limit, no measurements for simultaneous SAR are required.

## 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)”