MOTOROLA

Portable Cellular Phone SAR Test Report

Tests Requested By:	Motorola Mobility, Inc. 600 N. US Highway 45 Libertyville, IL 60048
Test Report #:	24591-1
Date of Report:	Jul-26-2011
Date of Test:	Jul-02-2011 to Jul-05-2011
FCC ID #:	IHDP56MH1
Generic Name:	N/A
Test Laboratory:	Motorola Mobility, Inc. - ADR Test Services Laboratory 600 N. US Highway 45 Libertyville, IL 60048
Report Author:	Thomas Knipple Senior RF Engineer

Accreditation:

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

Tests:	Procedures:
Electromagnetic Specific Absorption Rate	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)

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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.

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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 ICNIRP (10 g), the final SAR reading for this phone is 0.60 W/kg for head-adjacent use, 0.11 W/kg for dispatch/push-to-talk use, and 0.43 W/kg for body-worn use. 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 system manufactured by Schmid & Partner Engineering AG (SPEAG), of Zurich Switzerland.

Transmit Band	Head SAR (1 g $^{W}/_{kg}$)	Dispatch/ Push-to-Talk SAR (1 g $^{W}/_{kg}$)	Body-Worn SAR (1 g $^{W}/_{kg}$)
iDEN 800	**0.64**	**0.13**	**0.50**
iDEN 900	**0.83**	**0.15**	**0.59**
Wi-Fi 2450	**0.40**	**0.06**	**0.04**

2. Description of the Device Under Test

2.1 Antenna description

Main iDEN Antenna

Type	Internal	
Location	Bottom of Transceiver	
Dimensions	Width	5.00 mm
	Length	44.07 mm

Bluetooth/Wi-Fi 2 GHz Antenna

Type	Internal	
Location	Bottom-Right Side of Transceiver	
Dimensions	Width	2.0 mm
	Length	21.0 mm

2.2 Device Signaling

Serial Number(s) (Functional Use)	364VML0DGQ (iDEN conducted power measurements, iDEN SAR testing) (Wi-Fi 2.4 GHz conducted power measurements, Wi-Fi 2.4 GHz SAR testing)
Production Unit or Identical Prototype (47 CFR §2..908)	Identical Prototype
Device Category	Portable (Mobile Station Class B)
RF Exposure Limits	General Population / Uncontrolled

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
iDEN 900 (Interconnect / Dispatch)	M16-QAM	28.06 dBm	2:6 / 1:6	896.01875 - 901.98125 MHz
iDEN 900 (Packet Data)	M64-QAM, M16-QAM, QPSK	28.06 dBm	81:120	896.01875 - 901.98125 MHz
Wi-Fi 802.11b/g/n	BPSK	19.0 dBm	1:1	2412.0 - 2462.5 MHz
Bluetooth	GFSK	9 dBm	1:1	2402.0 - 2483.5 MHz

The Device Under Test (DUT) is a digital multi-service data-capable device that employs time division multiplexing (TDMA) with duty cycles of 16.67% (Dispatch), 16.67% or 33.00% (Interconnect or Circuit Data), and up to 67.50% (Packet Data) operation. Possible modulation formats are QPSK, M16-QAM, or M64-QAM.

All voice modes employ M16-QAM modulation and are interleaved as 1:6 (for Dispatch or Interconnect) or 1:3 (Interconnect only). Split 1:3 Interconnect is operated at 16.67% duty cycle, but because there will be two pulses in each 90 ms frame, the overall interleave is 2:6.

Data transmissions employ QPSK, M16-QAM, or M64-QAM modulations and have a maximum duty cycle of 67.50% (Packet Data). Packet Data operation is possible with and without connection to an external data device (via data cable or Bluetooth link).

All iDEN modes (Interconnect, Dispatch, and Data) are available in both the 800 and 900 MHz SMR bands.

2.3 Device Conducted Power Measurements

2.3.1 iDEN modes

Conducted power for iDEN modes (dBm)				
Band	**Frequency (MHz)**	**Interconnect**	**Interconnect/ Dispatch**	**Packet Data**
		2:6	**1:6**	**81:120**
iDEN 800	806.0125	27.95	28.01	27.95
	815.5125	27.97	27.94	27.86
	824.9875	27.94	28.02	27.86
iDEN 900	896.01875	27.94	27.94	27.95
	898.99375	28.00	28.07	28.01
	901.98125	28.12	27.93	27.90

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. The head, push-to-talk, and body positions that resulted in the highest SAR values were further tested on the additional channels and higher data rates **highlighted in pink** 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	**18.35**	18.28	18.14	18.07
	6	**17.92**	17.85	18.11	17.91
	11	**19.26**	18.91	19.12	18.91

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	15.57	15.64	14.42	12.83	13.73	12.89	13.43	13.02
	6	14.86	15.21	13.90	12.35	13.17	12.32	12.91	12.57
	11	16.09	16.50	15.21	13.64	14.67	13.43	14.07	13.94

3. Test Equipment Used

3.1 Dosimetric System

The Motorola Mobility ADR Test Services 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 ±10.8% (K=1) with an expanded uncertainty of ±21.6% (K=2). The overall 1 g RSS uncertainty of the measurement system is ±11.1% (K=1) with an expanded uncertainty of ±22.2% (K=2). The measurement uncertainty budget is given in Appendix 6. 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	702	Apr-14-2011	Apr-14-2012
E-Field Probe ES3DV3	3183	Jul-14-2010	Jul-14-2011
S.A.M. Phantom used for 800/900 MHz	TP-1319		
S.A.M. Phantom used for 800/900 MHz	TP-1156		
Dipole Validation Kit, DV835V2	434TR	Mar-09-2011	Mar-09-2012
Dipole Validation Kit, DV2450V2	740	Mar-17-2011	Mar-17-2012

3.2 Additional Equipment

Description	Serial Number	Cal Date	Cal Due Date
Signal Generator HP8648C	3847A04982	Nov-18-2009	Nov-18-2011
Power Meter E4419B	GB39510900	Mar-28-2011	Mar-28-2013
Power Sensor #1 - E9301A	US39210918	Oct-25-2010	Oct-25-2011
Power Sensor #2 - E9301A	US39210917	Oct-25-2010	Oct-25-2011
Network Analyzer HP8753ES	US39171846	May-19-2011	May-19-2012
Dielectric Probe Kit HP85070C	US99360070		

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 $\rho = 1\ ^{g}/_{cm^3}$ 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].

f (MHz)	Tissue type	Limits / Measured	Dielectric Parameters		
			ε_r	σ (S/m)	Temp (°C)
815	Head	**Measured,** Jul-24-2011	42.9	0.91	19.7
		Recommended Limits	41.6 ±5%	0.898 ±5%	18-25
	Body	**Measured,** Jul-03-2011	53.9	0.97	19.6
		Recommended Limits	55.3 ±5%	0.968 ±5%	18-25
898	Head	**Measured,** Jul-02-2011	41.2	0.98	19.6
		Measured, Jul-03-2011	40.5	0.97	19.7
		Recommended Limits	41.5 ±5%	0.97 ±5%	18-25
	Body	**Measured,** Jul-03-2011	53.0	1.06	19.6
		Recommended Limits	55.0 ±5%	1.05 ±5%	18-25
2450	Head	**Measured,** Jul-04-2011	35.4	1.79	19.3
		Recommended Limits	39.2 ±10%	1.80 ±5%	18-25
	Body	**Measured,** Jul-05-2011	48.8	2.04	19.2
		Recommended Limits	52.7 ±10%	1.95 ±5%	18-25

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

Ingredient	782 / 835 / 900 MHz Head	782 / 835 / 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	--
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™ 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_r	σ (S/m)		
835	**Measured,** Jul-02-2011	9.85	42.0	0.92	20.7	19.0
	Measured, Jul-03-2011	9.95	42.6	0.93	20.8	19.9
	Recommended Limits	9.69	41.5 ±5%	0.90 ±5%	18-25	18-25
2450	**Measured,** Jul-04-2011	53.0	35.4	1.79	20.8	19.3
	Recommended Limits	53.8	39.2 ±10%	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	3183	835	6.11	5 of 11
		2450	4.49	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)
			ε_r	σ (S/m)		
835	**Measured,** Jul-03-2011	10.05	53.8	1.00	20.8	19.7
	Recommended Limits	10.0	55.2 ±5%	0.97 ±5%	18-25	18-25
2450	**Measured,** Jul-05-2011	54.5	48.8	2.04	21.0	19.1
	Recommended Limits	51.3	52.7 ±10%	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	3183	835	6.15	6 of 11
		2450	4.36	6 of 11

6. Test Results

The DUT is capable of iDEN operation in a test mode that allows control of the transmitter without the need to place actual phone calls. This guarantees that the unit does not change its transmitter power, and that the resultant measured field values will not be affected by external connections. Wi-Fi testing was conducted using manufacturer test mode software, per guidance given in FCC KDB 248227. The 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™ 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™ manual for additional information on SAR scanning procedures and algorithms used.

The Cellular Phone model covered by this report has the following battery options:

Model SNN5843A - 1420 mAH battery
Model SNN5891A - 1560 mAH battery

The battery model SNN5843A was used to do most of the SAR testing. The phone was placed in the SAR measurement system with a fully charged battery. The configurations that resulted in the highest SAR values were tested using the other battery listed above.

6.1 Head Adjacent Test Results

The SAR results shown in tables 1 through 4 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 Extrapolated SAR = Measured SAR * $10^{(-drift/10)}$. 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	3183	835	6.11	5 of 11
		2450	4.49	5 of 11

Left Head Cheek Position												
f (MHz)	Mode	Battery/ Accessory	Channel or Freq. (MHz)	Temp (°C)	Drift (dB)	DUT Power	10 g SAR value		1 g SAR value		Test Plot	
						Measured (dBm)	Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
815	iDEN 800 *Interconnect 2:6*	SNN5843A	806.0125									
			815.5125	18.7	-0.325	27.97	0.422	0.45	0.572	0.62		
			824.9875									
		SNN5891A	815.5125	**19.9**	**-0.324**	**27.97**	**0.440**	**0.47**	**0.594**	**0.64**	**5x5x7**	**A15**
898	iDEN 900 *Interconnect 2:6*	SNN5843A	896.01875									
			898.99375	18.8	-0.143	28.00	0.482	0.50	0.658	0.68		
			901.98125									
		SNN5891A	898.99375	**19.8**	**-0.222**	**28.00**	**0.574**	**0.60**	**0.787**	**0.83**	**5x5x7**	**A16**
2450	802.11b, 1 Mbps data rate	SNN5843A	Chan. 1	19.4	0.010	18.35	0.163	0.16	0.354	0.35		
			Chan. 6	19.5	0.277	17.92	0.172	0.17	0.372	0.37		
			Chan. 11	19.2	0.046	19.26	0.123	0.12	0.285	0.29		
		SNN5891A	Chan. 6	**19.5**	**0.049**	**17.92**	**0.177**	**0.18**	**0.403**	**0.40**	**5x5x7**	**A17**

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	Battery/ Accessory	Channel or Freq. (MHz)	Temp (°C)	Drift (dB)	DUT Power	10 g SAR value		1 g SAR value		Test Plot	
						Measured (dBm)	Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
815	iDEN 800 *Interconnect 2:6*	SNN5843A	806.0125									
			815.5125	18.7	-0.084	27.97	0.330	0.34	0.455	0.46		
			824.9875									
898	iDEN 900 *Interconnect 2:6*	SNN5843A	896.01875									
			898.99375	18.8	-0.186	28.00	0.456	0.48	0.616	0.64		
			901.98125									
2450	802.11b, 1 Mbps data rate	SNN5843A	Chan. 1									
			Chan. 6									
			Chan. 11	19.3	-0.013	19.26	0.072	0.07	0.139	0.14		

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	Battery/ Accessory	Channel or Freq. (MHz)	Temp (°C)	Drift (dB)	DUT Power	10 g SAR value		1 g SAR value		Test Plot	
						Measured (dBm)	Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
815	iDEN 800 *Interconnect 2:6*	SNN5843A	806.0125									
			815.5125	18.7	-0.148	27.97	0.210	0.22	0.274	0.28		
			824.9875									
		SNN5891A	815.5125	**19.9**	**-0.183**	**27.97**	**0.225**	**0.23**	**0.297**	**0.31**	**5x5x7**	**A18**
898	iDEN 900 *Interconnect 2:6*	SNN5843A	896.01875									
			898.99375	18.8	-0.009	28.00	0.242	0.24	0.323	0.32		
			901.98125									
2450	802.11b, 1 Mbps data rate	SNN5843A	Chan. 1									
			Chan. 6									
			Chan. 11	19.2	0.135	19.26	0.008	0.01	0.016	0.02		

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	Battery/ Accessory	Channel or Freq. (MHz)	Temp (°C)	Drift (dB)	DUT Power	10 g SAR value		1 g SAR value		Test Plot	
						Measured (dBm)	Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
815	iDEN 800 *Interconnect 2:6*	SNN5843A	806.0125									
			815.5125	18.7	0.020	27.97	0.188	0.19	0.244	0.24		
			824.9875									
898	iDEN 900 *Interconnect 2:6*	SNN5843A	896.01875									
			898.99375	18.8	-0.144	28.00	0.242	0.25	0.322	0.33		
			901.98125									
		SNN5891A	898.99375	**19.8**	**-0.249**	**28.00**	**0.293**	**0.31**	**0.390**	**0.41**	**5x5x7**	**A19**
2450	802.11b, 1 Mbps data rate	SNN5843A	Chan. 1	19.3	0.029	18.35	0.019	0.02	0.033	0.03		
			Chan. 6	19.3	-0.241	17.92	0.020	0.02	0.035	0.04		
			Chan. 11	19.2	0.055	19.26	0.012	0.01	0.023	0.02		
		SNN5891A	Chan. 6	**19.6**	**-0.148**	**19.26**	**0.020**	**0.02**	**0.038**	**0.04**	**5x5x7**	**A20**

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 Dispatch/Push-to-Talk Test Results

The SAR results shown in table 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 measured conducted output powers, 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 SAR * $10^{(-drift/10)}$. 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.

A full data set output of one test condition per band with the highest SAR values from the DASY™ measurement system is included as Appendix 3. The test conditions included are indicated as bold numbers in the following tables. All other test conditions measured lower SAR values than those included.

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 to be 15.0 cm ± 0.5 cm.

For the purposes of these tests the DUT is commanded to the proper channel, transmitter power level and transmit mode of operation. The DUT was then placed in the SAR measurement system with a fully charged battery. The DUT was placed with the front of the device positioned at 2.5 cm from the flat portion of the SAM phantom, as per Supplement C 01-01.

The following probe conversion factors were used on the E-Field probe(s) used for the Dispatch/Push-To-Talk measurements:

Description	Serial Number	f (MHz)	Conversion Factor	Cal Cert pg #
E-Field Probe ES3DV3	3183	835	6.11	5 of 11
		2450	4.49	5 of 11

Dispatch/Push-To-Talk, Front of Phone 25 mm from Phantom												
f (MHz)	Mode	Battery/ Accessory	Channel or Freq. (MHz)	Temp (°C)	Drift (dB)	DUT Power	10 g SAR value		1 g SAR value		Test Plot	
						Measured (dBm)	Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
815	iDEN 800 *Dispatch 1:6*	SNN5843A	806.0125									
			815.5125	19.8	-0.001	27.94	0.094	0.09	0.128	0.13		
			824.9875									
		SNN5891A	815.5125	**19.9**	**-0.130**	**27.94**	**0.096**	**0.10**	**0.130**	**0.13**	**5x5x7**	**A22**
898	iDEN 900 *Dispatch 1:6*	SNN5843A	896.01875									
			898.99375	**18.8**	**-0.075**	**28.07**	**0.104**	**0.11**	**0.147**	**0.15**	**5x5x7**	**A23**
			901.98125									
		SNN5891A	898.99375	19.9	-0.048	28.07	0.102	0.13	0.137	0.14		
2450	802.11b, 1 Mbps data rate	SNN5843A	Chan. 1	**19.5**	**0.129**	**18.35**	**0.035**	**0.04**	**0.062**	**0.06**	**5x5x7**	**A24**
			Chan. 6	19.5	-0.142	17.92	0.031	0.03	0.054	0.06		
			Chan. 11	19.5	0.171	19.26	0.019	0.02	0.034	0.03		
		SNN5891A	Chan. 1	19.5	0.025	19.26	0.034	0.03	0.059	0.06		

Table 5: SAR measurement results at the highest possible output power, measured in a Push-to-Talk position against the ICNIRP and ANSI SAR Limit.

6.3 Body Worn Test Results

The SAR results shown in tables 6 through 9 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 SAR * $10^{(-drift/10)}$. 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 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 "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 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	3183	835	6.15	6 of 11
		2450	4.36	6 of 11

Body-Worn, Front of Phone 25 mm from Phantom												
f (MHz)	Mode	Battery/ Accessory	Channel or Freq. (MHz)	Temp (°C)	Drift (dB)	DUT Power	10 g SAR value		1 g SAR value		Test Plot	
						Measured (dBm)	Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
815	iDEN 800 *Interconnect 2:6*	SNN5843A	806.0125									
			815.5125	19.6	-0.033	27.97	0.111	0.11	0.150	0.15		
			824.9875									
	iDEN 800 *Packet Data 81:120*	SNN5843A	806.0125									
			815.5125	19.8	-0.176	27.86	0.299	0.31	0.392	0.41		
			824.9875									
898	iDEN 900 *Interconnect 2:6*	SNN5843A	896.01875									
			898.99375	19.8	-0.045	28.00	0.132	0.13	0.178	0.18		
			901.98125									
	iDEN 900 *Packet Data 81:120*	SNN5843A	896.01875									
			898.99375	**19.8**	**-0.254**	**28.01**	**0.402**	**0.43**	**0.554**	**0.59**	**5x5x7**	**A27**
			901.98125									
		SNN5891A	898.99375	19.5	0.059	28.01	0.113	0.11	0.16	0.16		
2450	802.11b, 1 Mbps data rate	SNN5843A	Chan. 1	**19.4**	**0.100**	**18.35**	**0.023**	**0.02**	**0.041**	**0.04**	**5x5x7**	**A28**
			Chan. 6	19.4	-0.177	17.92	0.021	0.02	0.036	0.04		
			Chan. 11	19.4	-0.204	19.26	0.011	0.01	0.020	0.02		
		SNN5891A	Chan. 1	19.4	-0.033	19.26	0.019	0.02	0.033	0.03		

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	Battery/ Accessory	Channel or Freq. (MHz)	Temp (°C)	Drift (dB)	DUT Power	10 g SAR value		1 g SAR value		Test Plot	
						Measured (dBm)	Measured (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
815	iDEN 800 *Interconnect 2:6*	SNN5843A	806.0125									
			815.5125	19.6	-0.148	27.97	0.122	0.13	0.163	0.17		
			824.9875									
	iDEN 800 *Packet Data 81:120*	SNN5843A	806.0125									
			815.5125	19.6	-0.228	27.86	0.316	0.33	0.423	0.45		
			824.9875									
		SNN5891A	815.5125	**19.8**	**-0.293**	**27.86**	**0.353**	**0.38**	**0.472**	**0.50**	**5x5x7**	**A26**
898	iDEN 900 *Interconnect 2:6*	SNN5843A	896.01875									
			898.99375	19.8	-0.148	28.00	0.133	0.14	0.183	0.19		
			901.98125									
	iDEN 900 *Packet Data 81:120*	SNN5843A	896.01875									
			898.99375	19.8	-0.087	28.01	0.386	0.39	0.523	0.53		
			901.98125									
2450	802.11b, 1 Mbps data rate	SNN5843A	Chan. 1									
			Chan. 6									
			Chan. 11	19.4	-0.142	19.26	0.010	0.01	0.019	0.02		

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 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 DUT supports the following simultaneous transmision combinations:

Description of Simultaneous Transmit Capabilities			
Transmitter Combinations		Scenario Supported?	Notes
#1	iDEN (Interconnect/Dispatch) + iDEN (Packet Data)	No	DUT system architecture does not support simultaneous voice and data during an iDEN session on the cellular network
#2	iDEN (Interconnect/Dispatch) + Wi-Fi	Yes	Supported for voice plus background data
#3	iDEN (Packet Data) + Wi-Fi	No	DUT system architecture supports only one data session at a time
#4	iDEN + Bluetooth	Yes	No testing required for Bluetooth per notes below
#5	Wi-Fi + Bluetooth	No	

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. Note that Bluetooth mode is not intended for use in configurations against the head, and this evaluation considers only the body-worn configurations:

1. The highest output conducted power measured for Bluetooth on the device under test is 9.33 mW [< 12 mW]
2. The separation distance between the Bluetooth antenna and the main antenna is 2.07 cm [< 2.5 cm]
3. The highest 1-g Body-Worn SAR values for primary transmitters are: [< 1.2 $^{W}/_{kg}$]
   iDEN 800 (0.17 $^{W}/_{kg}$); iDEN 900 (0.19 $^{W}/_{kg}$)

For the transmitters requiring stand-alone SAR testing (iDEN 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 of the head, push-to-talk, and body simultaneous SAR summations for the worst-case SAR transmitter combinations are presented in the tables below.

Evaluations for Simultaneous SAR							
Cellular Mode	**Wi-Fi Mode**	**Configuration**	**Cellular Mode 1 g SAR Value (W/kg)**	**Wi-Fi Mode 1 g SAR Value (W/kg)**	**Summation 1 g SAR Value (W/kg)**	**SAR-to-peak-location Separation Ratio**	***Simultaneous Measurements Required?***
iDEN 800, Interconnect 2:6	Wi-Fi 2450 802.11b, 1 Mbps	Left Cheek with Battery SNN5891A	0.64	0.40	1.04		No
iDEN 900, Interconnect 2:6	Wi-Fi 2450 802.11b, 1 Mbps	Left Cheek with Battery SNN5891A	0.83	0.40	1.23		No
iDEN 800, Dispatch 1:6	Wi-Fi 2450 802.11b, 1 Mbps	Push-to-Talk with Battery SNN5891A	0.13	0.06	0.19		No
iDEN 900, Dispatch 1:6	Wi-Fi 2450 802.11b, 1 Mbps	Push-to-Talk with Battery SNN5843A	0.15	0.06	0.21		No
iDEN 800, Interconnect 2:6	Wi-Fi 2450 802.11b, 1 Mbps	Body-Worn, Front of Phone 25 mm from Phantom with Battery SNN5843A	0.15	0.04	0.19		No
iDEN 900, Interconnect 2:6	Wi-Fi 2450 802.11b, 1 Mbps	Body-Worn, Front of Phone 25 mm from Phantom with Battery SNN5843A	0.18	0.04	0.22		No

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)”