MOTOROLA

Portable Cellular Phone SAR Test Report

Tests Requested By:	Motorola Mobility, Inc. 600 N. US Highway 45 Libertyville, IL 60048
Test Report #:	24971-1F
Date of Report:	Apr-23-2012
Date of Test:	Mar-28-2012 to Apr-19-2012
FCC ID #:	IHDT56NH3
Generic Name:	M0CD9
Test Laboratory:	Motorola Mobility, Inc. - ADR Test Services Laboratory No.1 Wang Jing East Road, Chaoyang District Beijing, P. R. China, 100102
Report Author:	HaiLiang Tang 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)

2404

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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Revision History

Revision Version	Date	Notes
Rev. 0	23-Apr-2012	Initial report release

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.

Transmit Band	Head SAR (1 g $^{W}/_{kg}$)	Body SAR (1 g $^{W}/_{kg}$)	Mobile Hotspot SAR (1 g $^{W}/_{kg}$)
GSM 850	**0.68**	**0.62**	**0.43**
GSM 1900	**0.26**	**0.24**	**0.69**
WCDMA 850	**0.51**	**0.5**	**0.42**
WCDMA 1900	**0.37**	**0.35**	**0.62**
Wi-Fi 2.45 GHz	**0.28**	**0.01**	**0.1**

2. Description of the Device Under Test

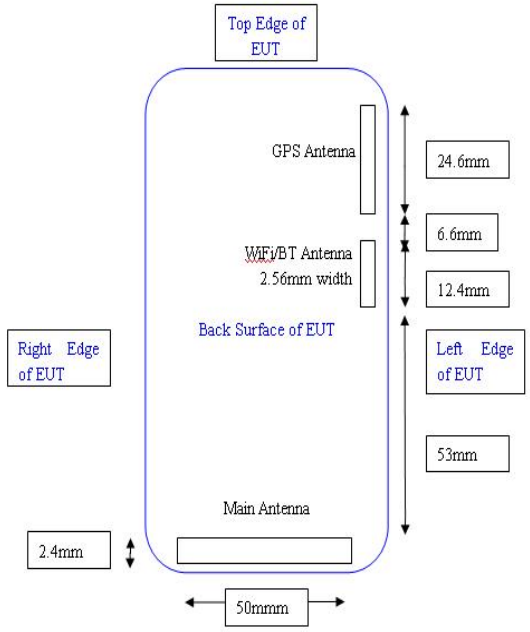
2.1 Antenna description

Main (850/1900 MHz) Antenna

Type	Internal	
Location	Bottom of Transceiver	
Dimensions	Width	2.40 mm
	Length	50.00 mm

Bluetooth/Wi-Fi 2 GHz Antenna

Type	Internal	
Location	Right-Side Rear of Transceiver	
Dimensions	Width	2.56 mm
	Length	12.40 mm



2.2 Device Signaling[1]

Serial Number(s) (Functional Use)	352206050003182 (GSM/WCDMA Band V/Wi-Fi 2.4 GHz head/body/SAR testing) 352205050010585 (WCDMA Band II head/body SAR testing, GSM/WCDMA mobile hotspot SAR testing) 351915050001308 (Wi-Fi 2.4 GHz conducted power measurements)
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)
GSM 850	GMSK	33.5 dBm	1:8	824.2 - 848.8 MHz
GSM 1900	GMSK	30.5 dBm	1:8	1850.2 - 1909.8 MHz
WCDMA 850	QPSK	24.0 dBm	1:1	826.4 - 846.6 MHz
WCDMA 1900	QPSK	24.0 dBm	1:1	1852.4 - 1907.6 MHz
Wi-Fi 802.11b/g/n	BPSK	19.26 dBm	1:1	2412.0 - 2462.0 MHz
Bluetooth	GFSK	9.78 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)
	Class B (DTM not supported)

Mode(s) of Operation	GPRS/EDGE 850				GPRS/EDGE 1900			
Modulation	GMSK				GMSK			
Maximum Output Power Setting (dBm)	33.5	30.5	28.5	**27.5**	30.5	27.5	25.5	24.5
Time Average Output Power Setting (dBm)	24.5	24.5	24.3	**24.5**	21.5	21.5	21.3	21.5
Duty Cycle	1:8	2:8	3:8	**4:8**	1:8	2:8	3:8	4:8
Transmitting Frequency Range(s)	824.2 - 848.8 MHz				1850.2 - 1909.8 MHz			

Mode(s) of Operation	EDGE 850				EDGE 1900			
Modulation	8PSK				8PSK			
Maximum Output Power Setting (dBm)	28.1	25.2	23	**22.2**	27.2	24.2	22.2	21.2
Time Average Output Power Setting (dBm)	19.1	19.2	18.8	**19.2**	18.2	18.2	18	18.2
Duty Cycle	1:8	2:8	3:8	**4:8**	1:8	2:8	3:8	4:8
Transmitting Frequency Range(s)	824.2 - 848.8 MHz				1850.2 - 1909.8 MHz			

[1] **Bolded** entries indicate data mode configurations of highest time-average power output per band and data mode type, and thus we utilized for SAR testing in this report.

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	WCDMA 850	WCDMA 1900
Channel Ranges	4132 - 4233	9262 - 9538
Maximum Output Power Setting (dBm)	24.0	24.0
Reduced Maximum Output Power Setting (dBm)	21.0	16.5

Mode(s) of Operation	GPRS/EDGE 850				GPRS/EDGE 1900			
Modulation	GMSK				GMSK			
Duty Cycle	1:8	2:8	3:8	4:8	1:8	2:8	3:8	4:8
Maximum Output Power Setting (dBm)	33.5	30.5	28.5	**27.5**	30.5	27.5	25.5	**24.5**
Time Average Output Power Setting (dBm)	24.5	24.5	24.3	**24.5**	21.5	21.5	21.3	**21.5**
Reduced Maximum Output Power Setting (dBm)	30.5	27.5	25.5	**24.5**	27.5	24.5	22.5	**21.5**
Reduced Time Average Output Power Setting (dBm)	21.5	21.5	21.3	**21.5**	18.5	18.5	18.3	**18.5**

Mode(s) of Operation	EDGE 850				EDGE 1900			
Modulation	8PSK				8PSK			
Duty Cycle	1:8	2:8	3:8	4:8	1:8	2:8	3:8	4:8
Maximum Output Power Setting (dBm)	28.1	25.2	23	22.2	27.2	24.2	22.2	21.2
Time Average Output Power Setting (dBm)	19.1	19.2	18.8	19.2	18.2	18.2	18	18.2
Reduced Maximum Output Power Setting (dBm)	25.1	22.2	20	19.2	24.2	21.2	19.2	18.2
Reduced Time Average Output Power Setting (dBm)	16.1	16.2	15.8	16.2	15.2	15.2	15	15.2

2.3 Device Conducted Power Measurements

2.3.1 GSM modes

Band	Channel	Conducted power (dBm) for GSM modes[2] (Burst Average Power)								
		GSM *CS Voice* (1 Slot)	**GPRS** *PS Data* (1 Slot)	**EDGE** *PS Data* (1 Slot)	**GPRS** *PS Data* (2 Slots)	**EDGE** *PS Data* (2 Slots)	**GPRS** *PS Data* (3 Slots)	**EDGE** *PS Data* (3 Slots)	**GPRS** *PS Data* (4 Slots)	**EDGE** *PS Data* (4 Slots)
GSM 850	128	33.55	33.34	28.36	30.68	24.99	28.44	23.31	27.32	22.06
	190	33.65	33.63	28.11	30.41	25.00	28.32	22.78	27.37	21.97
	251	33.49	33.59	28.20	30.72	25.03	28.34	22.85	27.52	21.85
GSM 1900	512	30.42	30.41	27.40	27.69	24.17	25.57	21.84	24.65	21.21
	661	30.37	30.49	27.44	27.71	24.05	25.63	21.87	24.29	20.93
	810	30.30	30.35	27.31	27.45	24.01	25.65	21.86	24.47	20.90

Band	Channel	Conducted power (dBm) for GSM modes[2] (Source-Based Time-Averaged Power)								
		GSM *CS Voice* (1 Slot)	**GPRS** *PS Data* (1 Slot)	**EDGE** *PS Data* (1 Slot)	**GPRS** *PS Data* (2 Slots)	**EDGE** *PS Data* (2 Slots)	**GPRS** *PS Data* (3 Slots)	**EDGE** *PS Data* (3 Slots)	**GPRS** *PS Data* (4 Slots)	**EDGE** *PS Data* (4 Slots)
GSM 850	128	24.55	24.34	19.36	24.68	18.99	24.18	19.05	24.32	19.06
	190	24.65	24.63	19.11	24.41	19.00	24.06	18.52	24.37	18.97
	251	24.49	24.59	19.20	24.72	19.03	24.08	18.59	24.52	18.85
GSM 1900	512	21.42	21.41	18.40	21.69	18.17	21.31	17.58	21.65	18.21
	661	21.37	21.49	18.44	21.71	18.05	21.37	17.61	21.29	17.93
	810	21.30	21.35	18.31	21.45	18.01	21.39	17.60	21.47	17.90

[2] *CS Voice* denotes circuit-switched transmission for voice calling, and *PS Data* denotes packet-switched transmission for data sessions.

2.3.2 WCDMA modes

Per the "SAR Measurement Procedures for 3G Devices" released in October, 2007, 12.2 kbps RMC, 12.2 kbps AMR, HS-DPCCH Sub-test 1-4, and E-DCH Sub-test 1-5 modes were considered. The conducted power measurements (per section 5.2 of 3GPP TS 34.121) for each mode are shown in the table below.

Band	Channel	Conducted power (dBm) for WCDMA modes		Conducted Power (dBm) for WCDMA – HSDPA (Rel 5) Modes				Conducted Power (dBm) for WCDMA – HSPA (HSUPA/HSDPA-Rel 6) Modes				
		RMC	AMR	Subtest 1	Subtest 2	Subtest 3	Subtest 4	Subtest 1	Subtest 2	Subtest 3	Subtest 4	Subtest 5
WCDMA 850	4132	23.97	23.95	24.15	24.1	24.14	24.14	24.14	24.1	24.14	24.15	24.17
	4180	24.03	24.03	24.13	24.18	24.18	24.17	24.14	24.15	24.15	24.15	24.22
	4233	23.9	23.93	24.03	24.09	24.12	24.11	24.07	24.06	24.08	24.03	24.09
WCDMA 1900	9262	24.05	23.87	24.13	24.12	24.12	24.15	24.04	24.07	24.07	24.07	24.13
	9400	23.91	23.76	23.92	23.97	23.96	23.96	23.83	23.85	23.86	23.84	23.89
	9538	23.81	23.75	23.86	23.86	23.88	23.91	23.79	23.8	23.81	23.82	23.85

Maximum Power Reduction (MPR)

According to 3GPP 25.101 sub-clause 6.2.2, the maximum output power is allowed to be reduced by following the table.

Table 6.1A: UE maximum output power with HS-DPCCH and E-DCH

UE transmit channel configuration	CM (dB)	MPR (dB)
For all combinations of; DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH	$0 \leq CM \leq 3.5$	MAX (CM-1, 0)
Note 1: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.		

The device supports MPR to solve linearity issues (ACLR or SEM) due to the higher peak-to-average ratios (PAR) of the HSUPA signal. This prevents saturating the full range of the TX DAC inside of device and provides a reduced power output to the RF transceiver chip according to the Cubic Metric (a function of the combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH).

When E-DPDCH channels are present, the beta gains on those channels are reduced first to try to get the power under the allowed limit. If the beta gains are lowered as far as possible, then a hard limiting is applied at the maximum allowed level.

The SW currently recalculates the cubic metric every time the beta gains on the E-DPDCH are reduced. The cubic metric will likely get lower each time this is done. However, there is no reported reduction of maximum output power in the HSUPA mode since the device also provides a mechanism to compensate for the power back-off by increasing the gain of TX_AGC in the transceiver (PA) device.

The end effect is that the DUT output power is identical to the case where there is no MPR in the device.

2.3.3 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 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	**17.15**	17.3	18.34	18.53
	6	**17.52**	17.64	18.72	18.87
	11	**17.91**	17.97	19.2	19.26

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	17.77	17.67	17.18	17.37	15.81	15.79	14.52	14.55
	6	18.48	18.54	18.11	17.88	16.65	16.41	15	15.25
	11	18.76	18.78	18.4	18.42	16.86	16.87	15.46	15.49

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	16.54	17.18	17.22	16.03	15.97	14.73	14.61	13.73
	6	17.2	17.73	17.78	16.55	16.6	15.29	15.39	14.49
	11	17.57	18.11	18.12	16.81	16.75	15.46	15.38	14.55

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	16.38	16.89	17.12	15.97	15.9	14.51	14.54	13.72
	6	16.93	17.81	17.72	16.82	16.56	15.26	15.18	14.42
	11	17.47	17.99	18.13	16.83	16.74	15.32	15.33	14.4

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 ±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	437	Feb-9-2012	Feb-9-2013
E-Field Probe ES3DV3	3178	Jan-11-2012	Jan-11-2013
S.A.M. Phantom used for 800/900 MHz	TP-1407		
S.A.M. Phantom used for 1800/1900/2450 MHz	TP-1160		
Dipole Validation Kit, DV835V2	421TR	Apr-04-2011	Apr-04-2013
Dipole Validation Kit, DV1800V2	2d128	Apr-06-2011	Apr-06-2013
Dipole Validation Kit, DV2450V2	788	Jul-12-2011	Jul-12-2012

3.2 Additional Equipment

Description	Serial Number	Cal Date	Cal Due Date
Power Meter E4419B	GB43310686	Feb-23-2012	Feb-23-2013
Power Meter 437B	3125U09525	Feb-23-2012	Feb-23-2013
Power Sensor #1 - E9301A	MY41495336	Feb-23-2012	Feb-23-2013
Power Sensor #2 - E9301A	MY41497905	Feb-23-2012	Feb-23-2013
Signal Generator HP8648C	3847U02385	Feb-21-2012	Feb-21-2013
Network Analyzer E5071B	MY42301800	Jan-28-2012	Jan-28-2013
Dielectric Probe Kit HP85070E	MY44300245		

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].

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 Er 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		
			ε_r	σ (S/m)	Temp (°C)
835	Head	**Measured,** Mar-29-2012	41.8	0.92	21.5
		Measured, Mar-30-2012	41.9	0.92	21.2
		Recommended Limits	41.78 ±5%	0.896 ±5%	18-25
	Body	**Measured,** Mar-31-2012	53.5	0.97	21.5
		Measured, Apr-19-2012	53.1	0.96	21.8
		Recommended Limits	55.4 ±5%	0.966 ±5%	18-25
1880	Head	**Measured,** Mar-28-2012	38.3	1.45	21.7
		Measured, Mar-30-2012	38	1.47	21.6
		Measured, Apr-01-2012	38.3	1.46	21.6
		Recommended Limits	40.0 ±5%	1.40 ±5%	18-25
	Body	**Measured,** Mar-31-2012	51	1.56	21.7
		Measured, Apr-2-2012	51	1.59	21.9
		Measured, Apr-17-2012	51.2	1.59	20.5
		Measured, Apr-18-2012	51.1	1.59	20.5
		Recommended Limits	53.3 ±5%	1.52 ±5%	18-25
2450	Head	**Measured,** Apr-9-2012	39.4	1.83	21.9
		Recommended Limits	39.2 ±10%	1.80 ±5%	18-25
	Body	**Measured,** Apr-12-2012	50.7	1.94	22
		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,** Mar-29-2012	9.8	41.8	0.92	22.2	21.5
	Measured, Mar-30-2012	9.75	41.9	0.92	22.2	21.2
	Recommended Limits	9.57	41.5 ±5%	0.90 ±5%	18-25	18-25
1800	**Measured,** Mar-28-2012	36.25	38.7	1.36	22	21.3
	Measured, Mar-30-2012	37.5	38.3	1.38	21.7	21.6
	Measured, Apr-01-2012	36.75	38.7	1.39	22	21.5
	Recommended Limits	37.8	40.0 ±5%	1.40 ±5%	18-25	18-25
2450	**Measured,** Apr-9-2012	53	39.4	1.83	21.7	21.5
	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	3178	835	5.65	5 of 11
		1810	4.88	5 of 11
		2450	4.29	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,** Mar-31-2012	9.4	53.5	0.97	21.7	21.3
	Measured, Apr-19-2012	9.35	53.1	0.96	21.7	21.8
	Recommended Limits	9.77	55.2 ±5%	0.97 ±5%	18-25	18-25
1800	**Measured,** Mar-31-2012	36.6	51.3	1.48	21.7	21.3
	Measured, Apr-2-2012	35.95	51.4	1.5	21.7	21.8
	Measured, Apr-17-2012	36.15	51.5	1.5	21.7	20.7
	Measured, Apr-18-2012	35.4	51.4	1.5	21.7	20.7
	Recommended Limits	37.9	53.3 ±5%	1.52 ±5%	18-25	18-25
2450	**Measured,** Apr-12-2012	52.5	50.7	1.94	22.1	21.1
	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	3178	835	5.70	6 of 11
		1810	4.72	6 of 11
		2450	4.13	6 of 11

6. Test Results

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™ 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 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 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:

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

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	3178	835	5.65	5 of 11
		1810	4.88	5 of 11
		2450	4.29	5 of 11

Left Head Cheek Position																
f (MHz)	Mode	Battery/ Accessory	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)	Corrected (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Corrected (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	GSM 850, CS Voice	SNN5899A	128												
			190	21.5	-0.041	33.65		0.478		0.48	0.639		0.65		
			251												
	WCDMA 850, 12.2 kbps RMC		4132												
			4180	20.5	0.029	24.03		0.352		0.35	0.472		0.47		
			4233												
1880	GSM 1900, CS Voice		512												
			661	**20.7**	**-0.035**	**30.37**		**0.155**		**0.16**	**0.26**		**0.26**	**5x5x7**	**A**
			810												
	WCDMA 1900, 12.2 kbps RMC		9262												
			9400	**21.2**	**0.252**	**24**		**0.222**		**0.22**	**0.373**		**0.37**	**5x5x7**	**A**
			9538												
2450	802.11b, 1 Mbps		1	21	0.192	17.15		0.122		0.12	0.267		0.27		
			6	20.8	0.176	17.52		0.115		0.12	0.253		0.25		
			11	**21.4**	**0.362**	**17.91**		**0.127**		**0.13**	**0.283**		**0.28**	**5x5x7**	**A**
	802.11b, 5.5 Mbps		1	20.6	0.2	18.34		0.104		0.1	0.228		0.23		
			6	20.6	0.03	18.72		0.102		0.1	0.222		0.22		
			11	20.6	0.183	19.2		0.118		0.12	0.263		0.26		
	802.11b, 11 Mbps		1	20.4	0.14	18.53		0.095		0.09	0.208		0.21		
			6	20.4	-0.008	18.87		0.091		0.09	0.204		0.2		
			11	20.4	-0.081	19.26		0.1		0.1	0.222		0.23		
	802.11g, 6 Mbps		1	20.4	0.036	17.77		0.102		0.1	0.224		0.22		
			6	20.4	-0.026	18.48		0.085		0.09	0.187		0.19		
			11	21	0.481	18.76		0.101		0.1	0.225		0.23		
	802.11g, 9 Mbps		1	21	0.14	17.67		0.099		0.1	0.215		0.22		
			6	21	0.217	18.54		0.111		0.11	0.244		0.24		
			11	21	0.231	18.78		0.108		0.11	0.24		0.24		
	802.11g, 12 Mbps		6	20.6	0.26	18.11		0.095		0.1	0.209		0.21		
			11	20.6	0.147	18.4		0.102		0.1	0.228		0.23		
	802.11g, 18 Mbps		6	20.4	0.111	17.88		0.089		0.09	0.195		0.2		
			11	20.4	0.35	18.42		0.098		0.1	0.216		0.22		
	802.11n, 14.4 Mbps (400ns GI)		6	20.4	0.275	17.8		0.046		0.05	0.098		0.1		
	802.11n, 19.5 Mbps (800ns GI)		6	20.4	0.262	17.78		0.041		0.04	0.085		0.09		

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	Temp (°C)	Drift (dB)	DUT Power		10 g SAR value			1 g SAR value			Test Plot	
						Measured (dBm)	Power Reduction (dB)	Measured (W/kg)	Corrected (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Corrected (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	GSM 850, CS Voice	SNN5899A	128												
			190	**20.5**	**-0.057**	**33.65**		**0.499**		**0.51**	**0.674**		**0.68**	**5x5x7**	**A**
			251												
	GPRS 850, PS Data 4 Upslots		190	21.3	-0.088	27.37		0.489		0.5	0.656		0.67		
	WCDMA 850, 12.2 kbps RMC		4132												
			4180	**20.5**	**-0.019**	24.03		**0.373**		**0.37**	**0.505**		**0.51**	**5x5x7**	**A**
			4233												
1880	GSM 1900, CS Voice		512												
			661	20.4	0.113	30.37		0.143		0.14	0.236		0.24		
			810												
	WCDMA 1900, 12.2 kbps RMC		9262												
			9400	21.2	0.013	24		0.195		0.2	0.319		0.32		
			9538												
2450	802.11b, 1 Mbps		1												
			6												
			11	21	0.089	17.91		0.109		0.11	0.206		0.21		

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	Temp (°C)	Drift (dB)	DUT Power		10 g SAR value			1 g SAR value			Test Plot	
						Measured (dBm)	Power Reduction (dB)	Measured (W/kg)	Corrected (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Corrected (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	GSM 850, CS Voice	SNN5899A	128												
			190	**21.5**	**0.037**	**33.65**		**0.322**		**0.32**	**0.421**		**0.42**	**5x5x7**	**A**
			251												
	WCDMA 850, 12.2 kbps RMC		4132												
			4180	**20.5**	**-0.077**	**24.03**		**0.221**		**0.22**	**0.287**		**0.29**	**5x5x7**	**A**
			4233												
1880	GSM 1900, CS Voice		512												
			661	21	0.013	30.37		0.075		0.08	0.117		0.12		
			810												
	WCDMA 1900, 12.2 kbps RMC		9262												
			9400	21.2	0.031	24		0.123		0.12	0.192		0.19		
			9538												
2450	802.11b, 1 Mbps		1												
			6												
			11	21.2	0.096	17.91		0.036		0.04	0.071		0.07		

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	Temp (°C)	Drift (dB)	DUT Power		10 g SAR value			1 g SAR value			Test Plot	
						Measured (dBm)	Power Reduction (dB)	Measured (W/kg)	Corrected (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Corrected (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	GSM 850, CS Voice	SNN5899A	128												
			190	20.5	-0.059	33.65		0.288		0.29	0.378		0.38		
			251												
	WCDMA 850, 12.2 kbps RMC		4132												
			4180	20.5	-0.024	24.03		0.217		0.22	0.283		0.28		
			4233												
1880	GSM 1900, CS Voice		512												
			661	**20.2**	**0.003**	**30.37**		**0.087**		**0.09**	**0.153**		**0.15**	**5x5x7**	**A**
			810												
	WCDMA 1900, 12.2 kbps RMC		9262												
			9400	**21.2**	**0.112**	**24**		**0.132**		**0.13**	**0.23**		**0.23**	**5x5x7**	**A**
			9538												
2450	802.11b, 1 Mbps		1												
			6												
			11	**21**	**0.006**	**17.91**		**0.052**		**0.05**	**0.096**		**0.1**	**5x5x7**	**A**

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 5 through 6 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™ 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 "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	3178	835	5.70	6 of 11
		1810	4.72	6 of 11
		2450	4.13	6 of 11

Body-Worn, Front of Phone 25 mm from Phantom																
f (MHz)	Mode	Battery/ Accessory	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)	Corrected (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Corrected (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	GSM 850, CS Voice	SNN5899A	128												
			190	**21.2**	**-0.081**	**33.65**		**0.461**		**0.47**	**0.61**		**0.62**	**5x5x7**	**A**
			251												
	GPRS 850, PS Data 4 Upslots		190	21	-0.167	27.37		0.381		0.4	0.503		0.52		
	WCDMA 850, 12.2 kbps RMC		4132												
			4180	**21.2**	**0.069**	**24.03**		**0.375**		**0.38**	**0.498**		**0.5**	**5x5x7**	**A**
			4233												
1880	GSM 1900, CS Voice		512												
			661	20.5	0.021	30.37		0.13		0.13	0.21		0.21		
			810												
	WCDMA 1900, 12.2 kbps RMC		9262												
			9400	21.7	-0.036	24		0.149		0.15	0.238		0.24		
			9538												
2450	802.11b, 1 Mbps		1												
			6												
			11	20.5	0.382	17.91		0		0	0.001		0		

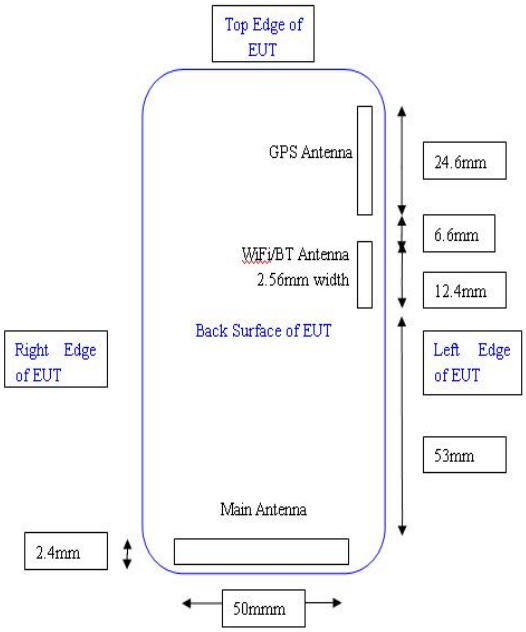
Table 5: SAR measurement results at the highest possible output power, measured in a body-worn position against the ICNIRP and ANSI SAR Limit.

Body-Worn, Back of Phone 25 mm from Phantom																
f (MHz)	Mode	Battery/ Accessory	Channel	Temp (°C)	Drift (dB)	DUT Power		10 g SAR value			1 g SAR value			Test Plot	
						Measured (dBm)	Power Reduction (dB)	Measured (W/kg)	Corrected (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Corrected (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	GSM 850, CS Voice	SNN5899A	128												
			190	21	-0.002	33.65		0.378		0.38	0.499		0.5		
			251												
	WCDMA 850, 12.2 kbps RMC		4132												
			4180	21.2	0.014	24.03		0.31		0.31	0.409		0.41		
			4233												
1880	GSM 1900, CS Voice		512												
			661	**20.5**	**0.002**	**30.37**		**0.151**		**0.15**	**0.244**		**0.24**	**5x5x7**	**A**
			810												
	GPRS 1900, PS Data 4 Upslots		661	20.2	-0.098	24.29		0.141		0.14	0.226		0.23		
	WCDMA 1900, 12.2 kbps RMC		9262												
			9400	**21.4**	**0.032**	**24**		**0.218**		**0.22**	**0.351**		**0.35**	**5x5x7**	**A**
			9538												
2450	802.11b, 1 Mbps		1	20.5	0.143	17.15		0		0	0.004		0		
			6	20.2	0.095	17.52		0		0	0.001		0		
			11	**20.5**	**-0.452**	**17.91**		**0.003**		**0**	**0.009**		**0.01**	**5x5x7**	**A**
	802.11b, 5.5 Mbps		1	20.8	0.099	18.34		0		0	0.002		0		
			6	20.8	0.065	18.72		0		0	0.001		0		
			11	20.5	0.096	19.2		0		0	0		0		
	802.11b, 11 Mbps		1	20.3	0.733	18.53		0.002		0	0.006		0.01		
			6	20.3	0.299	18.87		0		0	0		0		
			11	20.3	-0.069	19.26		0.001		0	0.004		0		
	802.11g, 6 Mbps		1	20.2	0.937	17.77		0		0	0.001		0		
			6	20.2	0.022	18.48		0		0	0.001		0		
			11	20	0.274	18.76		0		0	0.002		0		
	802.11g, 9 Mbps		1	20.9	0.119	17.67		0.003		0	0.012		0.01		
			6	20.5	0.071	18.54		0		0	0.002		0		
			11	20.9	0.986	18.78		0.005		0	0.014		0.01		
	802.11g, 12 Mbps		6	20	0.297	18.11		0.001		0	0.007		0.01		
			11	20	-0.242	18.4		0		0	0.001		0		
	802.11g, 18 Mbps		6	20	0.318	17.88		0		0	0.002		0		
			11	20	-0.322	18.42		0.001		0	0.006		0.01		
	802.11n, 14.4 Mbps (400ns GI)		6	20	-0.547	17.8		0		0	0		0		
	802.11n, 19.5 Mbps (800ns GI)		6	20	0.424	17.78		0		0	0.001		0		

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

6.3 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 per FCC KDB 941225 D06. 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
GSM	Yes	Yes	Yes	Yes	No	Yes
WCDMA	Yes	Yes	Yes	Yes	No	Yes
Wi-Fi	Yes	Yes	Yes	No	No	No

The SAR results shown in tables 7 through 11 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™ 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 2.2.2. 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 "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	3178	835	5.70	6 of 11
		1810	4.72	6 of 11
		2450	4.13	6 of 11

Mobile Hotspot, Bottom Edge of Phone 10 mm from Phantom																
f (MHz)	Mode	Battery/ Accessory	Channel	Temp (°C)	Drift (dB)	DUT Power		10 g SAR value			1 g SAR value			Test Plot	
						Measured or Limit [3] (dBm)	Reduction Target (dB)	Measured (W/kg)	Corrected (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Corrected (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	GPRS 850, PS Data (4 Upslots)	SNN5899A	128												
			190	21.6	-0.293	24.5	-3	0.018		0.02	0.03		0.03		
			251												
	WCDMA 850, 12.2 kbps RMC		4132												
			4180	21.3	-0.126	21	-3	0.017		0.02	0.03		0.03		
			4233												
1880	GPRS 1900, PS Data (4 Upslots)		512												
			661	**20.2**	**-0.084**	**21.5**	**-3**	**0.34**		**0.35**	**0.673**		**0.69**	**5x5x7**	**A**
			810												
	WCDMA 1900, 12.2 kbps RMC		9262												
			9400	**20.5**	**-0.045**	**16.5**	**-7.5**	**0.307**		**0.31**	**0.611**		**0.62**	**5x5x7**	**A**
			9538												

Table 7: SAR measurement results at the highest possible output power, measured against the ICNIRP and ANSI SAR Limit.

[3] For tests with power limit reductions employed, measured conducted power is not available by device design. Per FCC direction, measured power is replaced with the reduced maximum power limit for the device mode under test.

Mobile Hotspot, Left Edge of Phone 10 mm from Phantom																
f (MHz)	Mode	Battery/ Accessory	Channel	Temp (°C)	Drift (dB)	DUT Power		10 g SAR value			1 g SAR value			Test Plot	
						Measured or Limit [4] (dBm)	Reduction Target (dB)	Measured (W/kg)	Corrected (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Corrected (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	GPRS 850, PS Data (4 Upslots)	SNN5899A	128												
			190	21.6	-0.034	24.5	-3	0.149		0.15	0.213		0.21		
			251												
	WCDMA 850, 12.2 kbps RMC		4132												
			4180	21.3	-0.033	21	-3	0.213		0.21	0.303		0.31		
			4233												
1880	GPRS 1900, PS Data (4 Upslots)		512												
			661	20.2	0.085	21.5	-3	0.014		0.01	0.025		0.02		
			810												
	WCDMA 1900, 12.2 kbps RMC		9262												
			9400	20.4	0.169	16.5	-7.5	0.017		0.02	0.028		0.03		
			9538												
2450	802.11b, 1 Mbps		1	20.7	0.109	17.15		0.057		0.06	0.104		0.1		
			6	20.7	-0.008	17.52		0.053		0.05	0.098		0.1		
			11	20.5	-0.053	17.91		0.045		0.05	0.085		0.09		
	802.11b, 5.5 Mbps		1	20.4	0.098	18.34		0.054		0.05	0.098		0.1		
			6	20.4	0.097	18.72		0.05		0.05	0.098		0.1		
			11	20.4	0.095	19.2		0.052		0.05	0.095		0.09		
	802.11b, 11 Mbps		1	20	0.137	18.53		0.053		0.05	0.099		0.01		
			6	20	0.036	18.87		0.041		0.04	0.077		0.08		
			11	20.5	-0.02	19.26		0.043		0.04	0.082		0.08		
	802.11g, 6 Mbps		1	20	0.154	17.77		0.043		0.04	0.083		0.08		
			6	20	0.091	18.48		0.044		0.04	0.081		0.08		
			11	20	0.055	18.76		0.034		0.03	0.067		0.07		
	802.11g, 9 Mbps		1	20	0	17.67		0.047		0.05	0.086		0.09		
			6	20	0.214	18.54		0.04		0.04	0.071		0.07		
			11	20	0.164	18.78		0.036		0.04	0.069		0.07		
	802.11g, 12 Mbps		6	20.3	0.114	18.11		0.033		0.03	0.061		0.06		
			11	20.3	0.04	18.4		0.032		0.03	0.063		0.06		
	802.11g, 18 Mbps		6	20	0.089	17.88		0.032		0.03	0.063		0.06		
			11	20	0.096	18.42		0.03		0.03	0.06		0.06		
	802.11n, 14.4 Mbps (400ns GI)		6	20	-0.13	17.8		0.011		0.01	0.032		0.03		
	802.11n, 19.5 Mbps (800ns GI)		6	20	0.358	17.78		0.012		0.01	0.033		0.03		

Table 8: SAR measurement results at the highest possible output power, measured against the ICNIRP and ANSI SAR Limit.

[4] For tests with power limit reductions employed, measured conducted power is not available by device design. Per FCC direction, measured power is replaced with the reduced maximum power limit for the device mode under test.

Mobile Hotspot, Right Edge of Phone 10 mm from Phantom																
f (MHz)	Mode	Battery/ Accessory	Channel	Temp (°C)	Drift (dB)	DUT Power		10 g SAR value			1 g SAR value			Test Plot	
						Measured or Limit [5] (dBm)	Reduction Target (dB)	Measured (W/kg)	Corrected (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Corrected (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	GPRS 850, PS Data (4 Upslots)	SNN5899A	128												
			190	21.6	-0.047	24.5	-3	0.161		0.16	0.231		0.23		
			251												
	WCDMA 850, 12.2 kbps RMC		4132												
			4180	21.3	0.001	21	-3	0.21		0.21	0.299		0.3		
			4233												
1880	GPRS 1900, PS Data (4 Upslots)		512												
			661	20.2	-0.11	21.5	-3	0.036		0.04	0.059		0.06		
			810												
	WCDMA 1900, 12.2 kbps RMC		9262												
			9400	20.5	-0.104	16.5	-7.5	0.034		0.04	0.057		0.06		
			9538												

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

Mobile Hotspot, Front of Phone 10 mm from Phantom																
f (MHz)	Mode	Battery/ Accessory	Channel	Temp (°C)	Drift (dB)	DUT Power		10 g SAR value			1 g SAR value			Test Plot	
						Measured or Limit [6] (dBm)	Reduction Target (dB)	Measured (W/kg)	Corrected (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Corrected (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	GPRS 850, PS Data (4 Upslots)	SNN5899A	128												
			190	**21.6**	**-0.035**	**24.5**	**-3**	**0.326**		**0.33**	**0.426**		**0.43**	**5x5x7**	**A**
			251												
	WCDMA 850, 12.2 kbps RMC		4132												
			4180	21	-0.174	21	-3	0.287		0.3	0.374		0.39		
			4233												
1880	GPRS 1900, PS Data (4 Upslots)		512												
			661	20.1	0.026	21.5	-3	0.169		0.17	0.321		0.32		
			810												
	WCDMA 1900, 12.2 kbps RMC		9262												
			9400	20.4	-0.003	16.5	-7.5	0.107		0.11	0.195		0.2		
			9538												
2450	802.11b, 1 Mbps		1												
			6												
			11	20.5	0.212	17.91		0.018		0.02	0.039		0.04		

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

[5] For tests with power limit reductions employed, measured conducted power is not available by device design. Per FCC direction, measured power is replaced with the reduced maximum power limit for the device mode under test.

[6] For tests with power limit reductions employed, measured conducted power is not available by device design. Per FCC direction, measured power is replaced with the reduced maximum power limit for the device mode under test.

Mobile Hotspot, Back of Phone 10 mm from Phantom																
f (MHz)	Mode	Battery/ Accessory	Channel	Temp (°C)	Drift (dB)	DUT Power		10 g SAR value			1 g SAR value			Test Plot	
						Measured or Limit [7] (dBm)	Reduction Target (dB)	Measured (W/kg)	Corrected (W/kg)	Extrapolated (W/kg)	Measured (W/kg)	Corrected (W/kg)	Extrapolated (W/kg)	Grid	Plot Page
835	GPRS 850, PS Data (4 Upslots)	SNN5899A	128												
			190	21.6	-0.064	24.5	-3	0.316		0.32	0.415		0.42		
			251												
	WCDMA 850, 12.2 kbps RMC		4132												
			4180	**21**	**0.062**	**21**	**-3**	**0.322**		**0.32**	**0.423**		**0.42**	**5x5x7**	**A**
			4233												
1880	GPRS 1900, PS Data (4 Upslots)		512												
			661	20.1	-0.028	21.5	-3	0.184		0.19	0.342		0.34		
			810												
	WCDMA 1900, 12.2 kbps RMC		9262												
			9400	20.2	0.021	16.5	-7.5	0.121		0.12	0.218		0.22		
			9538												
2450	802.11b, 1 Mbps		1												
			6												
			11	**20.5**	**0.283**	**17.91**		**0.024**		**0.02**	**0.044**		**0.04**	**5x5x7**	**A**

Table 11: SAR measurement results at the highest possible output power, measured 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 GSM/WCDMA transmitter 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. Note that Bluetooth mode is not intended for use in configurations against the head, and this evaluation considers only the body-worn configurations.

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 [≤ 24 mW]
2. The separation distance between the Bluetooth antenna and the main antenna is 5.3 cm [≥ 5.0 cm]

The Wi-Fi and the Bluetooth cannot transmit simultaneously, so there is no co-location test requirement for Wi-Fi and Bluetooth. GSM supports voice and data transmission, though not simultaneously. WCDMA supports voice and data transmission simultaneously.

[7] For tests with power limit reductions employed, measured conducted power is not available by device design. Per FCC direction, measured power is replaced with the reduced maximum power limit for the device mode under test.

Description of Simultaneous Transmit Capabilities				
Transmitter Combinations		Scenario Supported?	Supported for Mobile Hotspot?	Notes
#1	GSM (CS Voice) + GSM (PS Data)	No	No	DUT system architecture does not support simultaneous voice and data (except on WCDMA), multiple voice channels, or multiple data channels during a single session on the cellular network.
#2	WCDMA (Voice) + WCDMA (Data)	Yes	Yes	
#3	GSM (CS Voice) + WCDMA (Data)	No	No	
#4	WCDMA (Voice) + GSM (PS Data)	No	No	
#5	GSM (PS Data) + WCDMA (Data)	No	No	
#6	GSM (CS Voice) + WCDMA (Voice)	No	No	
#7	GSM (CS Voice) + Wi-Fi	Yes	No	Supported for voice plus background data.
#8	WCDMA (Voice) + Wi-Fi	Yes	No	
#9	GSM (PS Data) + Wi-Fi	Yes	Yes	Supported for mobile hotspot operation.
#10	WCDMA (Data) + Wi-Fi	Yes	Yes	

For the transmitters requiring stand-alone SAR testing (GSM, WCDMA, 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, body, and mobile hotspot simultaneous SAR summations for the worst-case SAR transmitter configurations are presented in the tables below.

The following SAR summations for simultaneous evaluation are provided to demonstrate a GSM or WCDMA voice link with a simultaneous data link on Wi-Fi.

Evaluations for Simultaneous SAR, Head and Body positions									
	Transmitter Stand-Alone 1 g SAR Values (W/kg)					1 g SAR Summations (W/kg)			
Transmitter Combination						#7	#7	#8	#8
Band / Position	GSM 850	GSM 1900	WCDMA 850	WCDMA 1900	Wi-Fi 2450	GSM 850 + Wi-Fi 2450	GSM 1900 + Wi-Fi 2450	WCDMA 850 + Wi-Fi 2450	WCDMA 1900 + Wi-Fi 2450
Left Head Cheek	0.65	0.26	0.47	0.37	0.28	0.93	0.54	0.75	0.65
Left Head 15° Tilt	0.42	0.12	0.29	0.19	0.07	0.49	0.19	0.36	0.26
Right Head Cheek	0.68	0.24	0.51	0.32	0.21	0.89	0.45	0.72	0.53
Right Head 15° Tilt	0.38	0.15	0.28	0.23	0.1	0.48	0.25	0.38	0.33
Body Worn, Front of Phone 25 mm from Phantom	0.62	0.21	0.5	0.24	0	0.62	0.21	0.5	0.24
Body Worn, Back of Phone 25 mm from Phantom	0.5	0.24	0.41	0.35	0.01	0.51	0.25	0.42	0.36

The following Mobile Hotspot (10 mm separation) position SAR summations for simultaneous evaluation are provided to demonstrate a data link (over GSM or WCDMA) with a simultaneous data link on Wi-Fi (to client devices).

Evaluations for Simultaneous SAR, Mobile Hotspot (10 mm separation) positions Mobile Hotspot functionality enabled									
	Transmitter Stand-Alone 1 g SAR Values (W/kg)					1 g SAR Summations (W/kg)			
Transmitter Combination						#9	#9	#10	#10
Band / Position	GSM 850	GSM 1900	WCDMA 850	WCDMA 1900	Wi-Fi 2450	GSM 850 +Wi-Fi 2450	GSM 1900 + Wi-Fi 2450	WCDMA 850 +Wi-Fi 2450	WCDMA 1900 +Wi-Fi 2450
Bottom Edge of DUT 10 mm from Phantom	0.03	0.69	0.03	0.62		0.03	0.69	0.03	0.62
Left Edge of DUT 10 mm from Phantom	0.21	0.02	0.31	0.03	0.1	0.31	0.12	0.41	0.13
Right Edge of DUT 10 mm from Phantom	0.23	0.06	0.3	0.06		0.23	0.06	0.3	0.06
Front Surface of DUT 10 mm from Phantom	0.43	0.32	0.39	0.2	0.04	0.47	0.36	0.43	0.24
Back Surface of DUT 10 mm from Phantom	0.42	0.34	0.42	0.22	0.04	0.46	0.38	0.46	0.26

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)”