Portable Cellular Phone SAR Test Report

Tests Requested By:	Motorola Mobility, Inc. 600 N. US Highway 45 Libertyville, IL 60048
Test Report #:	24980-1F Rev. A
Date of Report:	Jun 13, 2012
Date of Test:	April 24, 2012 – May 17, 2012
FCC ID #:	IHDT56NQ2
Generic Name:	M0D00
Test Laboratory:	Motorola Mobility, Inc. - ADR Test Services Laboratory 600 N. US Highway 45 Libertyville, IL 60048
Report Author:	Ketal Patel 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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2. Description of the Device Under Test

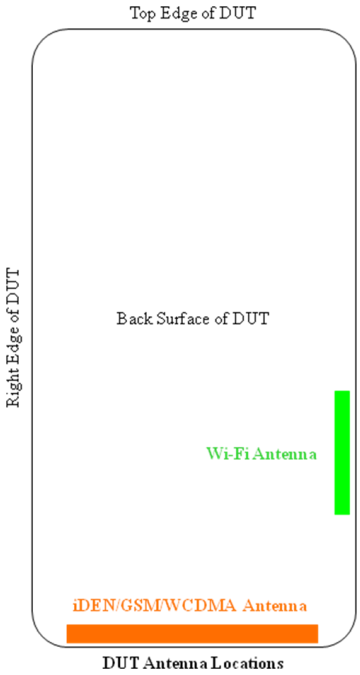
2.1 Antenna description

iDEN/GSM/WCDMA (800/1700/1900 MHz) Antenna

Type	Internal	
Location	Bottom of Transceiver	
Dimensions	Width	9.75 mm
	Length	51.27 mm

Bluetooth/Wi-Fi 2 GHz Antenna

Type	Internal	
Location	Left-Side Rear of Transceiver	
Dimensions	Width	4.77 mm
	Length	29.22 mm



2.2 Device Signaling[1]

Serial Number(s) (Functional Use)	364PNG06MN (iDEN/GSM.WCDMA conducted power measurements, iDEN/GSM/WCDMA/Wi-Fi 2.4 GHz SAR testing) 364PNG0513 (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)
iDEN 800 (Interconnect / Dispatch)	M16-QAM	28.06 dBm	2:6 / 1:6	806.0125 - 824.9875 MHz
iDEN 800 (Packet Data)	M64-QAM, M16-QAM, QPSK	28.06 dBm	81:120	806.0125 - 824.9875 MHz
GSM 1800	GMSK	30.5 dBm	1:8	1710.2 - 1784.8 MHz
GSM 1900	GMSK	30.5 dBm	1:8	1850.2 - 1909.8 MHz
WCDMA 1700	QPSK	24.0 dBm	1:1	1712.4 – 1752.6 MHz
WCDMA 1900	QPSK	24.0 dBm	1:1	1852.4 - 1907.6 MHz
WCDMA 2100	QPSK	24.0 dBm	1:1	1922.4 - 1977.6 MHz
Wi-Fi 802.11b/g/n	BPSK	19.24 dBm	1:1	2412.0 - 2462.0 MHz
Bluetooth	GFSK	8.9 dBm	1:1	2402.0 – 2480.0 MHz

GSM Data Functionality	GPRS/EDGE Class 12 (4 uplink timeslots; 4 downlink timeslots; 5 total timeslots per frame)
	Class B (DTM not supported)

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

[1] **Bolded** entries indicate data mode configurations of highest time-average power output per band and data mode type, and thus wee 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. Tables of the reduced limits used for testing are given below. A complete description of this functionality is provided in the "Operational Description" contained within Exhibit 12. Additionally, use of a wired or wireless headset does not impact power reduction functionality. 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 1700	WCDMA 1900
Channel Ranges	1312 - 1513	9262 - 9538
Maximum Output Power Setting (dBm)	24.0	24.0
Reduced Maximum Output Power Setting (dBm)	21.0	21.0

Mode(s) of Operation	GPRS/EDGE 1900				EDGE 1900			
Modulation	GMSK				8PSK			
Duty Cycle	1:8	2:8	3:8	**4:8**	1:8	**2:8**	3:8	4:8
Maximum Output Power Setting (dBm)	30.5	27.5	25.7	**24.5**	27.0	**27.0**	25.0	23.0
Time Average Output Power Setting (dBm)	21.5	21.5	21.4	**21.5**	18.0	**21.0**	20.7	20.0
Reduced Maximum Output Power Setting (dBm)	27.5	24.5	22.7	**21.5**	24.0	**24.0**	22.0	20.0
Reduced Time Average Output Power Setting (dBm)	18.5	18.5	18.4	**18.5**	15.0	**18.0**	17.7	17.0

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	28.09	28.08	28.1
	815.5125	28.07	28.05	28.06
	824.9875	28.11	28.19	28.22

2.3.2 GSM modes

Band	Channel	Conducted power (dBm) for GSM modes[2] (Burst Average Power)								
		GSM *CS Voice* **(1 Slot)**	**GPRS** *PS Data* **(1 Slot)**	**GPRS** *PS Data* **(2 Slots)**	**GPRS** *PS Data* **(3 Slots)**	**GPRS** *PS Data* **(4 Slots)**	**EDGE** *PS Data* **(1 Slot)**	**EDGE** *PS Data* **(2 Slots)**	**EDGE** *PS Data* **(3 Slots)**	**EDGE** *PS Data* **(4 Slots)**
GSM 1900	512	30.31	30.33	27.39	25.70	24.59	27.06	27.05	24.85	22.90
	661	30.35	30.38	27.30	25.69	24.42	27.01	27.01	24.92	22.89
	810	30.62	30.70	27.37	25.79	24.50	27.04	26.96	24.80	22.80

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 1900	512	21.31	21.33	21.39	21.40	21.59	18.06	21.05	20.55	19.90
	661	21.35	21.38	21.30	21.39	21.42	18.01	21.01	20.62	19.89
	810	21.62	21.70	21.37	21.49	21.50	18.04	20.96	20.50	19.80

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

2.3.3 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 1700	1312	24.12	24.11	24.19	23.99	23.99	23.9	24.09	23.97	23.93	23.88	23.9
	1413	24.11	24.09	24.09	24.03	24.08	24.04	23.96	24.06	24.04	24.04	24.05
	1513	24.04	24.01	24.04	23.97	24.03	23.97	24.02	23.89	23.98	23.96	24.03
WCDMA 1900	9262	23.93	23.96	23.98	23.95	23.96	23.91	24.01	23.95	23.99	23.89	24.02
	9400	23.91	23.88	23.88	23.89	23.88	23.92	23.93	23.92	23.92	23.88	23.92
	9538	23.88	23.86	23.88	23.97	23.87	23.95	23.89	23.95	23.88	23.93	23.91

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.

2.3.4 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	**19.07**	19.15	18.84	18.92
	6	**19.14**	19.13	18.81	18.93
	11	**19.22**	19.24	18.95	19.04

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	18.17	18.10	17.77	17.74	15.47	15.41	13.85	13.85
	6	18.40	18.32	17.94	17.88	15.80	15.65	14.11	13.95
	11	18.29	18.24	17.84	17.78	15.61	15.56	13.86	13.82

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	17.01	17.51	17.49	15.54	15.49	13.66	13.77	12.79
	6	17.19	17.66	17.67	15.79	15.56	13.96	14.00	13.13
	11	16.97	17.54	17.63	15.64	15.61	13.91	13.91	12.92

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	17.07	17.55	17.52	15.33	15.31	13.63	13.73	12.73
	6	17.03	17.63	17.56	15.68	15.72	13.96	13.90	13.08
	11	16.95	17.51	17.55	15.51	15.48	13.84	13.78	12.86

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	376	Aug-31-2011	Aug-31-2012
E-Field Probe ES3DV3	3124	Aug-23-2011	Aug-23-2012
DASY4™ DAE V1	1310	Jan-11-2012	Jan-11-2013
E-Field Probe ES3DV3	3284	Jan-10-2012	Jan-10-2013
S.A.M. Phantom used for 800 MHz	TP-1156		
S.A.M. Phantom used for 1800/1900/2450 MHz	TP-1319		
Dipole Validation Kit, DV835V2	4D128	Jan-11-2012	Jan-11-2013
Dipole Validation Kit, DV1800V2	2D191	Jan-05-2012	Jan-05-2013
Dipole Validation Kit, DV1800V2	259TR	Oct-20-2011	Oct-20-2013
Dipole Validation Kit, DV2450V2	863	Mar-17-2011	Mar-17-2013

3.2 Additional Equipment

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

4. Electrical parameters of the tissue simulating liquid

Prior to conducting SAR measurements, the relative permittivity, ε_r, and the conductivity, σ, of the tissue simulating liquids were measured with a HP85070 Dielectric Probe Kit These values, along with the temperature of the simulated tissue are shown in the table below. The recommended limits for permittivity and conductivity are also shown. A mass density of $\rho = 1\ ^{g}/_{cm^3}$ 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)
815	**Head**	**Measured,** Apr-24-2012	40.9	0.9	18.6
		Recommended Limits	41.78 ±5%	0.896 ±5%	18-25
	Body	**Measured,** Apr-26-2012	54.6	0.97	19.2
		Recommended Limits	55.4 ±5%	0.966 ±5%	18-25
1730	**Head**	**Measured, Apr**-27-2012	40.0	1.4	18.4
		Measured, May-17-2012	39.8	1.41	18.7
		Recommended Limits	40.1 ±5%	1.36 ±5%	18-25
	Body	**Measured, Apr**-27-2012	52.4	1.51	18.7
		Measured, May-12-2012	52.8	1.5	19.3
		Recommended Limits	53.5 ±5%	1.48 ±5%	18-25
1880	**Head**	**Measured, Apr**-24-2012	38.3	1.45	18.7
		Measured, Apr-25-2012	38.3	1.45	18.7
		Measured, May-17-2012	38.1	1.46	18.7
		Recommended Limits	40.0 ±5%	1.40 ±5%	18-25
	Body	**Measured, Apr**-26-2012	51.8	1.59	18.8
		Measured, Apr-27-2012	51.5	1.59	18.7
		Measured, May-10-2012	52.2	1.58	18.7
		Measured, May-15-2012	51.6	1.59	19.0
		Recommended Limits	53.3 ±5%	1.52 ±5%	18-25
2450	**Head**	**Measured,** May-12-2012	38.5	1.87	19.8
		Recommended Limits	39.2 ±10%	1.80 ±5%	18-25
	Body	**Measured,** May-08-2012	50.8	2.02	18.9
		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,** Apr-24-2012	10.05	40.7	0.92	21.7	18.6
	Recommended Limits	9.45	41.5 ±5%	0.90 ±5%	18-25	18-25
1800	**Measured, Apr**-24-2012	38.15	38.8	1.36	20.8	18.7
	Measured, Apr-27-2012	37.7	38.5	1.38	21.1	18.4
	Measured, May-17-2012	37.7	38.5	1.38	21.1	18.7
	Recommended Limits	38.6	40.0 ±5%	1.40 ±5%	18-25	18-25
2450	**Measured,** May-11-2012	56.0	38.5	1.87	21.1	19.8
	Recommended Limits	54.2	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	3124	835	6.08	5 of 11
		1810	5.03	5 of 11
		2450	4.4	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,** Apr-25-2012	10.15	54.4	0.99	20.8	19.2
	Recommended Limits	9.45	55.2 ±5%	0.97 ±5%	18-25	18-25
1800	**Measured, Apr**-26-2012	38.45	52.1	1.49	20.8	18.8
	Measured, Apr-27-2012	39.2	51.8	1.49	21.5	18.7
	Measured, May-12-201	38.25	52.7	1.47	20.8	19.3
	Measured, May-14-2012	38.1	52.1	1.49	20.7	19.0
	Recommended Limits	37.5	53.3 ±5%	1.52 ±5%	18-25	18-25
	Measured, May-09-2012	35.85	52.3	1.5	20.6	18.7
	Recommended Limits	37.8	53.3 ±5%	1.52 ±5%	18-25	18-25
2450	**Measured,** May-08-2012	57.5	50.8	2.02	21.6	18.9
	Recommended Limits	52.8	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	3124	835	6.04	6 of 11
		1810	4.69	6 of 11
		2450	4.21	6 of 11
	3284	1810	5.28	6 of 11

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. For GSM/WCDMA 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™ 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 SNN5879A - 1880 mAH battery

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:

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

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	3124	835	6.08	5 of 11
		1810	5.03	5 of 11
		2450	4.4	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*	SNN5879A	806.0125									
			815.5125	18.8	0.06	28.07	0.076	0.08	0.099	0.10		
			824.9875									
	iDEN 800 *Packet Data 81:120*		806.0125									
			815.5125	19.1	0.01	28.06	.097	0.10	0.125	0.13		
			824.9875									
1730	WCDMA 1700, 12.2 kbps RMC		1312									
			1413	**18.1**	**-0.03**	**24.11**	**0.334**	**0.34**	**0.548**	**0.55**	**5x5x7**	**A29**
			1513									
1880	GSM 1900, CS Voice		512									
			661	**18.9**	**-0.15**	**30.35**	**0.149**	**0.15**	**0.245**	**0.25**	**5x5x7**	**A30**
			810									
	GPRS 1900, PS Data (4 Upslots)		661	19.0	0.24	24.42	0.118	0.12	0.192	0.19		
	EDGE 1900, PS Data (2 Upslots)		661	19.0	-0.34	27.01	0.117	0.13	0.193	0.21		
	WCDMA 1900, 12.2 kbps RMC		9262									
			9400	**18.6**	**-0.18**	**23.91**	**0.307**	**0.32**	**0.509**	**0.53**	**5x5x7**	**A31**
			9538									
2450	802.11b, 1 Mbps data rate		Chan. 1	**20.3**	**-0.3**	**19.07**	**0.186**	**0.20**	**0.387**	**0.41**	**5x5x7**	A32
			Chan. 6	18.2	0.02	19.14	0.15	0.15	0.32	0.32		
			Chan. 11	20.7	-0.16	19.22	0.13	0.13	0.276	0.29		

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*	SNN5879A	806.0125									
			815.5125	**18.5**	**0.07**	**28.07**	**0.279**	**0.28**	**0.374**	**0.37**	**5x5x7**	**A33**
			824.9875									
	iDEN 800 *Packet Data 81:120*		806.0125									
			815.5125	18.7	-0.02	28.06	0.109	0.11	0.142	0.11		
			824.9875									
1730	WCDMA 1700, 12.2 kbps RMC		1312									
			1413	18.1	-0.01	24.11	0.34	0.34	0.527	0.53		
			1513									
1880	GSM 1900, CS Voice		512									
			661	18.9	-0.1	30.35	0.082	0.08	0.129	0.13		
			810									
	WCDMA 1900, 12.2 kbps RMC		9262									
			9400	18.7	-0.1	23.91	0.207	0.21	0.329	0.34		
			9538									
2450	802.11b, 1 Mbps data rate		Chan. 1									
			Chan. 6									
			Chan. 11	20.5	0.15	19.22	0.056	0.06	0.102	0.10		

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*	SNN5879A	806.0125									
			815.5125	18.7	-0.08	28.07	0.064	0.06	0.081	0.08		
			824.9875									
815	iDEN 800 *Packet Data 81:120*		806.0125									
			815.5125	18.9	-0.02	28.06	0.078	0.08	0.104	0.10		
			824.9875									
1730	WCDMA 1700, 12.2 kbps RMC		1312									
			1413	**18.1**	**-0.01**	**24.11**	**0.188**	**0.19**	**0.292**	**0.29**	**5x5x7**	**A34**
			1513									
1880	GSM 1900, CS Voice		512									
			661	**18.9**	**0.15**	**30.35**	**0.063**	**0.06**	**0.102**	**0.10**	**5x5x7**	**A35**
			810									
	WCDMA 1900, 12.2 kbps RMC		9262									
			9400	18.6	0.11	23.91	0.131	0.13	0.215	0.22		
			9538									
2450	802.11b, 1 Mbps data rate		Chan. 1	**20.3**	**0.25**	**19.07**	**0.038**	**0.04**	**0.073**	**0.07**	**5x5x7**	**A36**
			Chan. 6	18.2	0.14	19.14	0.031	0.03	0.061	0.06		
			Chan. 11	20.6	0.19	19.22	0.029	0.03	0.056	0.06		

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*	SNN5879A	806.0125									
			815.5125	**18.3**	**-0.05**	**28.07**	**0.179**	**0.18**	**0.259**	**0.26**	**5x5x7**	**A37**
			824.9875									
815	iDEN 800 *Packet Data 81:120*		806.0125									
			815.5125	18.4	0.1	28.06	0.069	0.07	0.087	0.09		
			824.9875									
1730	WCDMA 1700, 12.2 kbps RMC		1312									
			1413	18.1	0.05	24.11	0.16	0.16	0.269	0.27		
			1513									
1880	GSM 1900, CS Voice		512									
			661	18.8	-0.08	30.35	0.057	0.06	0.10	0.10		
			810									
	WCDMA 1900, 12.2 kbps RMC		9262									
			9400	**18.7**	**0.09**	**23.91**	**0.137**	**0.14**	**0.238**	**0.24**	**5x5x7**	**A38**
			9538									
2450	802.11b, 1 Mbps data rate		Chan. 1									
			Chan. 6									
			Chan. 11	20.5	-0.25	19.22	0.028	0.03	0.54	0.06		

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	3124	835	6.08	5 of 11
		2450	4.4	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***	SNN5879A	806.0125									
			815.5125	**18.5**	**-0.06**	**28.05**	**0.125**	**0.13**	**0.167**	**0.17**	**5x5x7**	**A40**
			824.9875									
1730	**WCDMA 1700, 12.2 kbps RMC**		1312									
			1413	**18.6**	**0**	**24.11**	**0.177**	**0.18**	**0.273**	**0.27**	**5x5x7**	**A41**
			1513									
1880	**GPRS 1900, PS Data (4 Upslots)**		661	**18.5**	**-0.17**	**24.42**	**0.066**	**0.07**	**0.104**	**0.11**	**5x5x7**	**A42**
	EDGE 1900, PS Data (2 Upslots)		661	17.7	-0.1	27.01	0.058	0.06	0.101	0.10		
	WCDMA 1900, 12.2 kbps RMC		9262									
			9400	**18.5**	**0.02**	**23.91**	**0.154**	**0.15**	**0.244**	**0.24**	**5x5x7**	**A43**
			9538									
2450	**802.11b, 1 Mbps data rate**		Chan. 1	**20.1**	**-0.08**	**19.07**	**0.026**	**0.03**	**0.048**	**0.05**	**5x5x7**	**A44**
			Chan. 6	18.2	-0.06	19.14	0.017	0.02	0.032	0.03		
			Chan. 11	20.2	0.05	19.22	0.022	0.02	0.041	0.04		

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 7 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:

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

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 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 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	3124	835	6.04	6 of 11
		1810	4.69	6 of 11
		2450	4.21	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*	SNN5879A	806.0125									
			815.5125	19.0	0.01	28.07	0.097	0.10	0.127	0.13		
			824.9875									
	iDEN 800 *Packet Data 81:120*		806.0125									
			815.5125	18.8	-0.14	28.06	0.099	0.10	0.137	0.14		
			824.9875									
1730	WCDMA 1700, 12.2 kbps RMC		1312									
			1413	18.1	-0.05	24.11	0.161	0.16	0.243	0.25		
			1513									
1880	GSM 1900, CS Voice		512									
			661	18.0	-0.82	30.35	0.054	0.06	0.085	0.10		
			810									
	GPRS 1900, PS Data (4 Upslots)		661	**18.5**	**0.24**	**24.42**	**0.071**	**0.07**	**0.11**	**0.11**	**5x5x7**	**A46**
	EDGE 1900, PS Data (2 Upslots)		661	18.2	0.35	27.01	0.053	0.05	0.084	0.08		
	WCDMA 1900, 12.2 kbps RMC		9262									
			9400	18.0	-0.03	23.91	0.132	0.13	0.0204	0.21		
			9538									
2450	802.11b, 1 Mbps data rate		Chan. 1									
			Chan. 6									
			Chan. 11	20.0	0.15	19.22	0.019	0.02	0.035	0.04		

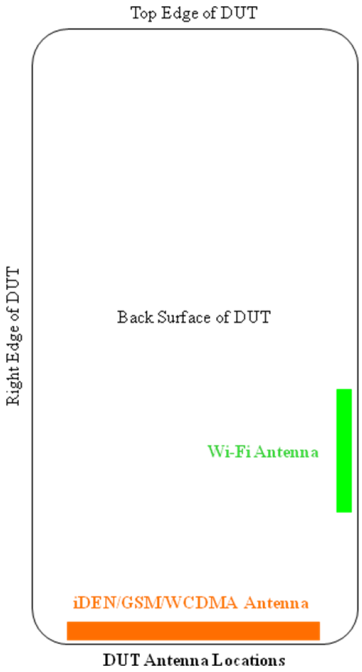
Table 6: SAR measurement results at the highest possible output power, measured in a body-worn position against the ICNIRP and ANSI SAR Limit.

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*	SNN5879A	806.0125									
			815.5125	19.0	-0.11	28.07	0.111	0.11	0.148	0.15		
			824.9875									
	iDEN 800 *Packet Data 81:120*		806.0125									
			815.5125	**18.6**	**-0.12**	**28.06**	**0.111**	**0.11**	**0.151**	**0.16**	**5x5x7**	**A47**
			824.9875									
1730	WCDMA 1700, 12.2 kbps RMC		1312									
			1413	**18.1**	**0.0**	**24.11**	**0.216**	**0.22**	**0.334**	**0.33**	**5x5x7**	**A48**
			1513									
1880	GSM 1900, CS Voice		512									
			661	17.9	0.042	30.35	0.06	0.06	0.094	0.09		
			810									
	WCDMA 1900, 12.2 kbps RMC		9262									
			9400	**18.0**	**-0.01**	**23.91**	**0.15**	**0.15**	**0.235**	**0.24**	**5x5x7**	**A49**
			9538									
2450	802.11b, 1 Mbps data rate		Chan. 1	20.0	-0.16	19.07	0.047	0.05	0.085	0.09		
			Chan. 6	**18.1**	**0.05**	**19.14**	**0.056**	**0.06**	**0.102**	**0.10**	**5x5x7**	**A50**
			Chan. 11	20.0	-0.05	19.22	0.040	0.04	0.073	0.07		

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
GSM/ WCDMA	YES	YES	YES	YES	NO	YES
Wi-Fi	YES	YES	YES	NO	NO	NO

The SAR results shown in tables 8 through 12 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 temperatures of the simulated tissue after the test, the measured drift and the extrapolated SAR. The exact method of extrapolation is:

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

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 2.2.1. 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 5. All other test conditions measured lower SAR values than those included in Appendix 5.

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	3124	835	6.04	6 of 11
		1810	4.69	6 of 11
		2450	4.21	6 of 11
	3284	1810	5.28	6 of 11

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
1730	WCDMA 1700, 12.2 kbps RMC	SNN5875A	1312	18.6	0.13	21.0	-3	0.15		0.15	0.929		0.93		
			1413	**19**	**-0.11**	**21.0**	**-3**	**0.578**		**0.59**	**1.06**		**1.09**	**5x5x7**	**A52**
			1513	19	0.01	21.0	-3	0.509		0.51	0.274		0.27		
1880	GPRS 1900, PS Data (4 Upslots)	SNN5875A	512												
			661	**19.3**	**-0.07**	**24.42**		**0.423**		**0.43**	**0.776**		**0.79**	**5x5x7**	**A53**
			810												
	WCDMA 1900, 12.2 kbps RMC	SNN5875A	9262												
			9400	**20.1**	**0.02**	**21.0**	**-3**	**0.429**		**0.43**	**0.781**		**0.78**	**5x5x7**	**A54**
			9538												

Table 8: 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	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
1730	WCDMA 1700, 12.2 kbps RMC	SNN5875A	1312												
			1413	19	0.11	21.0	-3	0.042		0.04	0.0773		0.08		
			1513												
1880	GPRS 1900, PS Data (4 Upslots)	SNN5875A	512												
			661	20.2	0.1	24.42		0.068		0.07	0.123		0.12		
			810												
	WCDMA 1900, 12.2 kbps RMC	SNN5875A	9262												
			9400	20.1	-0.05	21.0	-3	0.079		0.08	0.147		0.15		
			9538												
2450	802.11b, 1 Mbps	SNN5875A	1												
			6												
			11	**18.1**	**0.09**	**19.22**		**0.255**		**0.26**	**0.557**		**0.56**	**5x5x7**	**A55**

Table 9: 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, 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 [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
1730	WCDMA 1700, 12.2 kbps RMC	SNN5875A	1312												
			1413	19.0	-0.01	21.0	-3	0.035		0.03	0.059		0.06		
			1513												
1880	GPRS 1900, PS Data (4 Upslots)	SNN5875A	512												
			661	20.2	-0.06	24.42		0.046		0.05	0.078		0.08		
			810												
	WCDMA 1900, 12.2 kbps RMC	SNN5875A	9262												
			9400	20.1	-0.05	21.0	-3	0.051		0.05	0.086		0.09		
			9538												

Table 10: 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 [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
1730	WCDMA 1700, 12.2 kbps RMC	SNN5875A	1312												
			1413	19.0	-0.05	21.0	-3	0.24		0.24	0.375		0.38		
			1513												
1880	GPRS 1900, PS Data (4 Upslots)	SNN5875A	512												
			661	20.2	0.17	24.42		0.245		0.25	0.436		0.44		
			810												
	WCDMA 1900, 12.2 kbps RMC	SNN5875A	9262												
			9400	20.1	0.03	21.0	-3	0.258		0.26	0.424		0.42		
			9538												
2450	802.11b, 1 Mbps	SNN5875A	1												
			6												
			11	18.1	-0.04	19.22		0.075		0.08	0.154		0.16		

Table 11: 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	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
1730	WCDMA 1700, 12.2 kbps RMC	SNN5875A	1312												
			1413	19	0.1	21.0	-3	0.436		0.44	0.732		0.73		
			1513												
1880	GPRS 1900, PS Data (4 Upslots)	SNN5875A	512												
			661	20.2	-0.03	24.42		0.367		0.37	0.609		0.61		
			810												
	WCDMA 1900, 12.2 kbps RMC	SNN5875A	9262												
			9400	20.1	0.04	21.0	-3	0.341		0.34	0.562		0.56		
			9538												
2450	802.11b, 1 Mbps	SNN5875A	1												
			6												
			11	18.0	0.08	19.22		0.248		0.25	0.538		0.54		

Table 12: 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 iDEN, GSM, and WCDMA 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 2.118 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. 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 8.9 mW [< 12 mW]
2. The separation distance between the Bluetooth antenna and the main antenna is 2.118 cm [<5.0 cm]
3. The highest 1-g Body-Worn SAR values for primary transmitters are: [<1.2 $^{W}/_{kg}$]
   iDEN 800 (0.16 $^{W}/_{kg}$); GSM 1900 (0.11 $^{W}/_{kg}$); WCDMA 1700 (0.33 $^{W}/_{kg}$); WCDMA 1900 (0.24 $^{W}/_{kg}$); Wi-Fi 2450 (0.1 $^{W}/_{kg}$)

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

Description of Simultaneous Transmit Capabilities				
Transmitter Combinations		Scenario Supported?	Supported for Mobile Hotspot?	Notes
#1	iDEN (Interconnect/Dispatch) + iDEN (Packet Data)	No	No	DUT system architecture does not support simultaneous voice and data during an iDEN session on the cellular network
#2	iDEN (Interconnect/Dispatch) + GSM (PS Data)	Yes	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.
#3	iDEN (Interconnect/Dispatch) + WCDMA (Data)	Yes	No	
#4	GSM (CS Voice) + iDEN (Packet Data)	Yes	No	
#5	GSM (CS Voice) + GSM (PS Data)	No	No	
#6	GSM (CS Voice) + WCDMA (Data)	No	No	
#7	WCDMA (Voice) + iDEN (Packet Data)	Yes	No	
#8	WCDMA (Voice) + GSM (PS Data)	No	No	
#9	iDEN (Packet Data) + GSM (PS Data)	No	No	
#10	iDEN (Packet Data) + WCDMA (Data)	No	No	
#11	GSM (PS Data) + WCDMA (Data)	No	No	
#12	iDEN (Interconnect/Dispatch) + GSM (CS Voice)	Yes	No	
#13	iDEN (Interconnect/Dispatch) + WCDMA (Voice)	Yes	No	
#14	GSM (CS Voice) + WCDMA (Voice)	No	No	
#15	WCDMA (Voice) + WCDMA (Data)	Yes	Yes	Inherent support in the WCDMA transmission scheme
#16	iDEN (Interconnect/Dispatch) + Wi-Fi	Yes	No	Supported for voice plus background data.
#17	GSM (CS Voice) + Wi-Fi	Yes	No	
#18	WCDMA (Voice) + Wi-Fi	Yes	No	
#19	iDEN (Packet Data) + Wi-Fi	No	No	DUT system architecture supports only one data (except in Mobile Hotspot) session at a time. WCDMA operates at reduced power during mobile hotspot operation, See Section 2.1.2
#10	GSM (PS Data) + Wi-Fi	No	Yes	
#21	WCDMA (Data) + Wi-Fi	No	Yes	
#22	iDEN (Interconnect/Dispatch) + GSM (CS Voice) + Wi-Fi	Yes	No	
#23	iDEN (Interconnect/Dispatch) + WCDMA (Voice)+ Wi-Fi	Yes	No	

For the transmitters requiring stand-alone SAR testing (iDEN, 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 iDEN, GSM or WCDMA voice link with a simultaneous voice link on iDEN and/or 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)									
Band / Position	GSM 1900	WCDMA 1700	WCDMA 1900	iDEN 800	Wi-Fi 2450	GSM 1900 + iDEN 800	WCDMA 1700 + iDEN 800	WCDMA 1900 + iDEN 800	GSM 1900 + Wi-Fi 2450	WCDMA 1700 + Wi-Fi 2450	WCDMA 1900 + Wi-Fi 2450	iDEN 800 + Wi-Fi 2450	GSM 1900 + iDEN 800 + Wi-Fi 2450	WCDMA 1700 + iDEN 800 + Wi-Fi 2450	WCDMA 1900 + iDEN 800 + Wi-Fi 2450
Left Head Cheek	0.25	0.55	0.53	0.10	0.41	0.35	0.65	0.63	0.66	0.96	0.94	0.51	0.76	1.06	1.04
Left Head 15° Tilt	0.10	0.29	0.22	0.08	0.07	0.18	0.37	0.30	0.17	0.36	0.29	0.15	0.25	0.44	0.37
Right Head Cheek	0.13	0.53	0.34	0.37	0.10	0.50	0.90	0.71	0.23	0.63	0.44	0.47	0.60	1.00	0.81
Right Head 15° Tilt	0.10	0.27	0.24	0.26	0.06	0.36	0.53	0.50	0.16	0.33	0.30	0.32	0.42	0.59	0.56
Push-To-Talk, Front of Phone 25 mm from Phantom	0.11	0.27	0.24	0.17	0.05	0.28	0.44	0.41	0.16	0.32	0.29	0.22	0.33	0.49	0.46
Body Worn, Front of Phone 25 mm from Phantom	0.11	0.25	0.21	0.13	0.04	0.24	0.38	0.34	0.15	0.29	0.25	0.18	0.28	0.42	0.38
Body Worn, Back of Phone 25 mm from Phantom	0.09	0.33	0.24	0.15	0.10	0.24	0.48	0.39	0.19	0.43	0.34	0.26	0.34	0.58	0.49

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

	Transmitter Stand-Alone 1 g SAR Values (W/kg)				1 g SAR Summations (W/kg)		
Band / Position	GSM 1900	WCDMA 1700	WCDMA 1900	iDEN 800	GSM 1900 + iDEN 800	WCDMA 1700 + iDEN 800	WCDMA 1900 + iDEN 800
Left Head Cheek	0.25	0.55	0.53	0.13	0.38	0.68	0.66
Left Head 15° Tilt	0.10	0.29	0.22	0.10	0.2	0.39	0.32
Right Head Cheek	0.13	0.53	0.34	0.14	0.27	0.67	0.48
Right Head 15° Tilt	0.10	0.27	0.24	0.09	0.19	0.36	0.33
Body Worn, Front of Phone 25 mm from Phantom	0.11	0.25	0.21	0.14	0.25	0.39	0.35
Body Worn, Back of Phone 25 mm from Phantom	0.09	0.33	0.24	0.16	0.25	0.49	0.40

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)							
	Transmitter Stand-Alone 1 g SAR Values (W/kg)				1 g SAR Summations (W/kg)		
Band / Position	GSM 1900	WCDMA 1700	WCDMA 1900	Wi-Fi 2450	GSM 1900 + Wi-Fi 2450	WCDMA 1700 + Wi-Fi 2450	WCDMA 1900 + Wi-Fi 2450
Bottom Edge of DUT 10 mm from Phantom	0.79	1.09	0.78	0	0.79	1.09	0.78
Left Surface of DUT 10 mm from Phantom	0.12	0.08	0.15	0.56	0.68	0.64	0.71
Right Edge of DUT 10 mm from Phantom	0.08	0.06	0.09	0	0.08	0.06	0.09
Front Surface of DUT 10 mm from Phantom	0.44	0.38	0.42	0.16	0.6	0.54	0.58
Back Surface of DUT 10 mm from Phantom	0.61	0.73	0.56	0.54	1.15	1.27	1.1

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)"