



MOTOROLA

Portable Cellular Phone SAR Test Report

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

Test Report #: 24814-1F Rev. C
Date of Report: Oct-19-2011, revised Nov-23-2011
Date of Test: Aug-23-2011 to Sep-28-2011 and Oct 17- 19, 2011
FCC ID #: IHDP56ME4
Generic Name: M0C2E

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

Accreditation:



2404

| | |
|--|---|
| <u>Tests:</u> | <u>Procedures:</u> |
| Electromagnetic Specific Absorption Rate | IEC 62209-1 |
| | RSS-102 |
| | IEEE 1528 - 2003 |
| | FCC OET Bulletin 65 (<i>including Supplement C</i>) |
| | Australian Communications Authority Radio |
| | Communications (Electromagnetic Radiation – |
| | Human Exposure) Standard 2003 |
| | CENELEC EN 50360 |
| | ARIB Std. T-56 (2002) |

On the following products or types of products:

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

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

Table of Contents

1. Introduction3

2. Description of the Device Under Test4

 2.1 Antenna description.....4

 2.2 Device Signaling.....5

 2.2.1 Power limit reduction scenes6

 2.3 Device Conducted Power Measurements6

 2.3.1 GSM modes6

 2.3.2 WCDMA modes7

 2.3.3 Wi-Fi 802.11 modes8

3. Test Equipment Used9

 3.1 Dosimetric System9

 3.2 Additional Equipment.....9

4. Electrical parameters of the tissue simulating liquid10

5. System Accuracy Verifications.....12

6. Test Results14

 6.1 Head Adjacent Test Results14

 6.2 Body Worn Test Results.....17

 6.3 Lapdock Accessory Test Results.....19

 6.4 Mobile Hotspot Test Results.....21

 6.5 Description and Evaluation of Simultaneous Transmitters.....25

References28

Appendix 1: SAR distribution comparisons for System Accuracy Verifications

Appendix 2: SAR distribution plots for Head Adjacent Test Results

Appendix 3: SAR distribution plots for Body Worn Test Results

Appendix 4: SAR distribution plots for Lapdock Accessory Test Results

Appendix 5: SAR distribution plots for Mobile Hotspot Test Results

Appendix 6: Measurement Uncertainty Budget

Appendix 7: Probe Calibration Certificate

Appendix 8: Dipole Characterization Certificate

Revision History

| Revision Version | Date | Notes |
|------------------|-------------|---|
| Rev. 0 | Oct-19-2011 | Initial report release. |
| Rev. A | Nov-02-2011 | Corrections based to respond to TCB inquiries. |
| Rev. B | Nov-07-2011 | Corrected Typos |
| Rev. C | Nov-23-2011 | Removal of 5 GHz test data per FCC inquiry, Added references to external report for 5 GHz Corrected Typos per TCB inquiry |

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 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 | 0.37 | 0.34 | 0.58 |
| GSM 1900 | 0.19 | 0.14 | 0.67 |
| WCDMA 850 | 0.40 | 0.48 | 0.77 |
| WCDMA 1900 | 0.42 | 0.13 | 1.11 |
| Wi-Fi 2.45 GHz | 0.16 | 0.02 | 0.36 |

SAR test results for the 5 GHz transmit bands are provided in report [*IHDP56ME4 FCC 5GHz SAR Report.pdf*](#) included within the Exhibit 11 documents.

2. Description of the Device Under Test

2.1 Antenna description

GSM/WCDMA (800/1900 MHz) Antenna

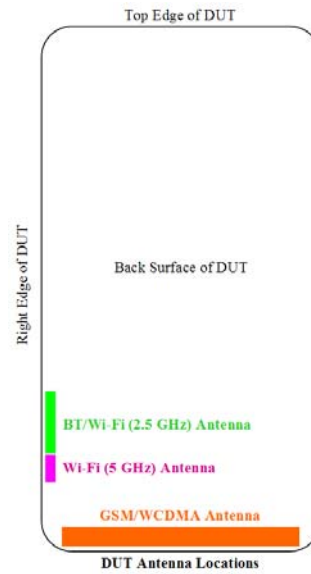
| | | |
|-------------------|----------------------------|---------|
| Type | Internal | |
| Location | Bottom Rear of Transceiver | |
| Dimensions | Width | 1.3 mm |
| | Length | 53.5 mm |

Bluetooth/Wi-Fi (2.5 GHz) Antenna

| | | |
|-------------------|--------------------------------|---------|
| Type | Internal | |
| Location | Right-Edge Rear of Transceiver | |
| Dimensions | Width | 0.5 mm |
| | Length | 16.2 mm |

Wi-Fi (5 GHz) Antenna

| | | |
|-------------------|--------------------------------|--------|
| Type | Internal | |
| Location | Right-Edge Rear of Transceiver | |
| Dimensions | Width | 0.5 mm |
| | Length | 3.9 mm |



2.2 Device Signaling¹

| | |
|---|--|
| Serial Number(s) (Functional Use) | LS3A280035 (GSM/WCDMA conducted power measurements, GSM/WCDMA head/body/mobile hotspot SAR testing) TA22300PPO (2.45 GHz SAR testing) LS3A2K0003 (Wi-Fi 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 | 31.0 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 | 18.33 dBm | 1:1 | 2412.0 - 2462.0 MHz |
| Wi-Fi 802.11a/n | BPSK | 11.41 dBm | 1:1 | 5180.0 - 5240.0 MHz, 5260.0 - 5320.0 MHz, 5500.0 - 5700.0 MHz, 5745.0 - 5825.0 MHz |
| Bluetooth | GFSK | 9.57 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 | | | |
|--|-------------------|------|-------------|------|---------------------|------|-------------|------|
| | GMSK | | | | GMSK | | | |
| Maximum Output Power Setting (dBm) | 33.5 | 30.5 | 28.8 | 27.5 | 31.0 | 28.0 | 26.5 | 25.0 |
| Time Average Output Power Setting (dBm) | 24.5 | 24.5 | 24.6 | 24.5 | 22.0 | 22.0 | 22.3 | 22.0 |
| 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 | | | |
|--|-------------------|------|-------------|------|---------------------|------|-------------|------|
| | 8PSK | | | | 8PSK | | | |
| Maximum Output Power Setting (dBm) | 28.6 | 25.6 | 23.9 | 22.6 | 27.8 | 24.8 | 23.1 | 21.8 |
| Time Average Output Power Setting (dBm) | 19.6 | 19.6 | 19.7 | 19.6 | 18.8 | 18.8 | 18.9 | 18.8 |
| 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 were utilized for SAR testing in this report.

2.2.1 Power limit reduction schemes

For specified modes of operation, the DUT utilizes reduced maximum power limits to maintain compliance to SAR exposure limits. Complete descriptions of the following functionalities are provided in the Operational Description contained within Exhibit 12. The implementations to trigger the reductions in power require the device to be radiating, which prevents conducted power measurements of these functionalities without modification of the DUT.

The DUT utilizes reduced limits for the maximum WCDMA 1900 band transmit power on the high channel range when the mobile hotspot functionality is enabled. A table of the reduced limits used for testing is given below.

| Mode(s) of Operation | WCDMA 1900 | | |
|--|------------|-----------|-----------|
| Test Channel | 9262 | 9400 | 9538 |
| Channel Ranges | 9262-9367 | 9368-9455 | 9456-9538 |
| Maximum Output Power Setting (dBm) | 24.0 | 24.0 | 24.0 |
| Reduced Maximum Output Power Setting (dBm) | 24.0 | 24.0 | 22.0 |
| Duty Cycle | 1:1 | 1:1 | 1:1 |

2.3 Device Conducted Power Measurements

2.3.1 GSM modes

| Band | Channel | Conducted power (dBm) for GSM modes ² | | | | | | | | |
|-------------|---------|---|-----------------------------|------------------------------|---|------------------------------|-----------------------------|------------------------------|------------------------------|------------------------------|
| | | GSM CS Voice (1 Slot) | GPRS PS Data (1 Slot) | GPRS PS Data (2 Slots) | GPRS PS Data (3 Slots) ³ | 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 850 | 128 | 33.41 | 33.54 | 30.55 | 28.79 | 27.70 | 28.56 | 25.57 | 23.65 | 22.49 |
| | 190 | 33.41 | 33.55 | 30.47 | 28.77 | 27.57 | 28.40 | 25.71 | 23.64 | 22.56 |
| | 251 | 33.30 | 33.45 | 30.44 | 28.77 | 27.52 | 28.55 | 25.62 | 23.78 | 22.69 |
| GSM 1900 | 512 | 31.16 | 31.04 | 28.19 | 26.61 | 25.08 | 27.66 | 24.60 | 22.96 | 21.62 |
| | 661 | 31.20 | 31.06 | 28.02 | 26.30 | 24.92 | 27.72 | 24.60 | 22.87 | 21.62 |
| | 810 | 31.00 | 31.07 | 28.14 | 26.57 | 25.04 | 27.87 | 24.88 | 23.11 | 22.01 |

| Band | Channel | Time Averaged Conducted power (dBm) for GSM modes | | | | | | | | |
|------|---------|--|------------------------------|------------------------------|------------------------------|------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| | | GMSK CS Voice (1 Slot) | GMSK PS Data (1 Slots) | GMSK PS Data (2 Slots) | GMSK PS Data (3 Slots) | GMSK PS Data (4 Slots) | 8-PSK PS Data (1 Slots) | 8-PSK PS Data (2 Slots) | 8-PSK PS Data (3 Slots) | 8-PSK PS Data (4 Slots) |
| 850 | 128 | 24.54 | 24.55 | 24.49 | 24.70 | 19.56 | 19.57 | 19.35 | 19.49 | 24.54 |
| | 190 | 24.55 | 24.47 | 24.47 | 24.57 | 19.40 | 19.71 | 19.34 | 19.56 | 24.55 |
| | 251 | 24.45 | 24.44 | 24.47 | 24.52 | 19.55 | 19.62 | 19.48 | 19.69 | 24.45 |
| 1900 | 512 | 22.04 | 22.19 | 22.31 | 22.08 | 18.66 | 18.60 | 18.66 | 18.62 | 22.04 |
| | 661 | 22.06 | 22.02 | 22.00 | 21.92 | 18.72 | 18.60 | 18.57 | 18.62 | 22.06 |
| | 810 | 22.07 | 22.14 | 22.27 | 22.04 | 18.87 | 18.88 | 18.81 | 19.01 | 22.07 |

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

³ **Bolded** entries indicate data mode configurations of highest time-average power output per band and data mode type, and thus were utilized for SAR testing in this report.

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 | 23.87 | 23.87 | 23.96 | 23.97 | 23.98 | 23.96 | 23.93 | 23.93 | 23.94 | 23.94 | 23.97 |
| | 4180 | 23.83 | 23.88 | 23.88 | 23.98 | 23.93 | 24.01 | 23.92 | 23.96 | 23.91 | 23.95 | 23.94 |
| | 4233 | 23.90 | 24.02 | 24.01 | 24.02 | 23.97 | 24.06 | 23.95 | 24.01 | 23.98 | 24.00 | 23.97 |
| WCDMA 1900 | 9262 | 24.10 | 24.05 | 24.05 | 23.94 | 24.12 | 24.00 | 24.16 | 24.01 | 24.14 | 24.01 | 24.10 |
| | 9400 | 23.87 | 23.66 | 23.84 | 23.83 | 23.81 | 23.78 | 23.81 | 23.78 | 23.81 | 23.77 | 23.83 |
| | 9538 | 23.83 | 23.88 | 23.79 | 23.89 | 23.82 | 23.92 | 23.79 | 23.92 | 23.81 | 23.87 | 23.82 |

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 $\beta_c/\beta_d = 12/15$, $\beta_{ns}/\beta_c = 24/15$. 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.

Justification for reduced test configurations for WiFi channels per KDB pub 248227 and April FCC/TCB Meeting Notes:

- For 2.4 GHz, highest average RF output power channel for the lowest data rate were selected for SAR evaluation. 802.11g & n modes were not investigated since the average output powers were not greater than 0.25 dB than that of the corresponding channel in the lowest data rate IEEE 802.11b.

SAR test results for the 5 GHz transmit bands are provided in report [IHDP56ME4 FCC 5GHz SAR Report.pdf](#) included within the Exhibit 11 documents.

| Mode | Freq [MHz] | Channel | Conducted Power [dBm] | | | |
|---------|---------------|---------|-----------------------|-------|-------|-------|
| | | | Data Rate [Mbps] | | | |
| | | | 1 | 2 | 5.5 | 11 |
| 802.11b | 2412 | 1 | 17.66 | 17.59 | 17.52 | 17.53 |
| 802.11b | 2437 | 6 | 17.89 | 17.94 | 17.91 | 17.84 |
| 802.11b | 2462 | 11 | 18.33 | 18.24 | 18.22 | 18.18 |

| Mode | Freq [MHz] | Channel | Conducted Power [dBm] | | | | | | | |
|---------|---------------|---------|-----------------------|-------|-------|-------|-------|-------|-------|-------|
| | | | Data Rate [Mbps] | | | | | | | |
| | | | 6 | 9 | 12 | 18 | 24 | 36 | 48 | 54 |
| 802.11g | 2412 | 1 | 16.89 | 16.81 | 16.32 | 16.35 | 14.51 | 14.53 | 13.12 | 13.07 |
| 802.11g | 2437 | 6 | 17.42 | 17.49 | 16.96 | 16.95 | 15.03 | 15.11 | 13.63 | 13.73 |
| 802.11g | 2462 | 11 | 16.25 | 16.26 | 16.25 | 16.32 | 15.30 | 15.30 | 13.94 | 13.95 |

| Mode | Freq [MHz] | Channel | Conducted Power [dBm] | | | | | | | |
|---------|---------------|---------|--|-------|-------|-------|-------|-------|-------|-------|
| | | | Data Rate [Mbps] 800 ns Guard Interval | | | | | | | |
| | | | 6.5 | 13 | 20 | 26 | 39 | 52 | 58 | 65 |
| 802.11n | 2412 | 1 | 15.85 | 16.34 | 16.27 | 14.57 | 14.60 | 13.10 | 13.04 | 12.28 |
| 802.11n | 2437 | 6 | 16.29 | 16.73 | 16.77 | 15.18 | 15.13 | 13.57 | 13.64 | 12.80 |
| 802.11n | 2462 | 11 | 16.08 | 16.12 | 16.15 | 15.26 | 15.25 | 13.85 | 13.79 | 12.97 |

| Mode | Freq [MHz] | Channel | Conducted Power [dBm] | | | | | | | |
|---------|---------------|---------|--|-------|-------|-------|-------|-------|-------|-------|
| | | | Data Rate [Mbps] 400 ns Guard Interval | | | | | | | |
| | | | 7.2 | 14.4 | 22 | 29 | 43 | 58 | 65 | 72 |
| 802.11n | 2412 | 1 | 15.78 | 16.28 | 16.33 | 14.49 | 14.54 | 13.08 | 13.12 | 12.26 |
| 802.11n | 2437 | 6 | 16.43 | 16.70 | 16.79 | 15.11 | 15.09 | 13.67 | 13.56 | 12.70 |
| 802.11n | 2462 | 11 | 16.15 | 16.08 | 16.08 | 15.34 | 15.33 | 13.80 | 13.86 | 12.99 |

3. Test Equipment Used

3.1 Dosimetric System

The Motorola Mobility ADR Test Services Laboratory utilizes a Dosimetric Assessment System (Dasy4™ v4.7) manufactured by Schmid & Partner Engineering AG (SPEAG™), of Zurich Switzerland. All the SAR measurements are taken within a shielded enclosure. The overall 10 g RSS uncertainty of the measurement system is $\pm 10.8\%$ (K=1) with an expanded uncertainty of $\pm 21.6\%$ (K=2). The overall 1 g RSS uncertainty of the measurement system is $\pm 11.1\%$ (K=1) with an expanded uncertainty of $\pm 22.2\%$ (K=2). The measurement uncertainty budget is given in Appendix 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 | 434 | Jan-13-2011 | Jan-13-2012 |
| E-Field Probe ES3DV3 | 3115 | Jan-12-2011 | Jan-12-2012 |
| DASY4™ DAE V1 | 699 | Sep-20-2010 | Sep-20-2011 |
| DASY4™ DAE V1 | 702 | Apr-14-2011 | Apr-14-2012 |
| E-Field Probe ES3DV3 | 3184 | Mar-11-2011 | Mar-11-2012 |
| DASY4™ DAE V1 | 440 | Nov-11-2010 | Nov-11-2011 |
| S.A.M. Phantom used for 800/1900 MHz | TP-1136 | | |
| S.A.M. Phantom used for 800 MHz | TP-1235 | | |
| S.A.M. Phantom used for 1800/1900/2450 MHz | TP-1131 | | |
| S.A.M. Phantom used for 2450 MHz | TP-1319 | | |
| Dipole Validation Kit, DV835V2 | 422TR | Mar-18-2011 | Mar-18-2012 |
| Dipole Validation Kit, DV835V2 | 436TR | Mar-18-2011 | Mar-18-2012 |
| Dipole Validation Kit, DV1800V2 | 250TR | Mar-17-2011 | Mar-17-2012 |
| Dipole Validation Kit, DV1800V2 | 259TR | Mar-17-2011 | Mar-17-2012 |
| Dipole Validation Kit, DV1800V2 | 271TR | Mar-08-2011 | Mar-08-2012 |
| Dipole Validation Kit, DV2450V2 | 863 | Mar-17-2011 | Mar-17-2012 |

3.2 Additional Equipment

| Description | Serial Number | Cal Date | Cal Due Date |
|-------------------------------|---------------|-------------|--------------|
| Signal Generator HP8648C | 3847A04982 | Nov-18-2009 | Nov-18-2011 |
| Power Meter E4419B | GB39510900 | Mar-28-2011 | Mar-28-2013 |
| Power Sensor #1 - E9301A | US39211007 | Aug-16-2011 | Aug-16-2012 |
| Power Sensor #2 - E9301A | US39211008 | Aug-16-2011 | Aug-16-2012 |
| Signal Generator HP8648C | 3847A04632 | Aug-13-2011 | Aug-13-2013 |
| Power Meter E4419B | GB39511087 | Dec-22-2009 | Dec-22-2011 |
| Power Sensor #1 - E9301A | US39211006 | Oct-25-2010 | Oct-25-2011 |
| Power Sensor #2 - E9301A | US39210934 | Oct-25-2010 | Oct-25-2011 |
| Signal Generator HP8648C | 3847A04843 | Mar-28-2011 | Mar-28-2013 |
| Power Meter E4419B | GB39511084 | Mar-28-2011 | Mar-28-2013 |
| Power Sensor #1 - E9301A | US39210929 | Mar-31-2011 | Mar-31-2012 |
| Power Sensor #2 - E9301A | US39210930 | Mar-31-2011 | Mar-31-2012 |
| Network Analyzer HP8753ES | US39171846 | May-19-2011 | May-19-2012 |
| Dielectric Probe Kit HP85070C | US99360070 | | |

4. Electrical parameters of the tissue simulating liquid

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

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

| f (MHz) | Tissue type | Limits / Measured | Dielectric Parameters | | |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------|
| | | | ϵ_r | σ (S/m) | Temp (°C) |
| 835 | Head | Measured, Aug-23-2011 | 40.6 | 0.91 | 18.4 |
| | | Measured, Sep-07-2011 | 41.9 | 0.91 | 20.7 |
| | | Recommended Limits | 41.5 \pm 5% | 0.90 \pm 5% | 18-25 |
| | Body | Measured, Aug-28-2011 | 54.1 | 0.97 | 19.2 |
| | | Measured, Sep-09-2011 | 53.8 | 0.98 | 20.7 |
| | | Measured, Sep-17-2011 | 55.3 | 0.97 | 20.2 |
| | | Measured, Sep-19-2011 | 55.7 | 0.99 | 20.3 |
| | | Measured, Sep-29-2011 | 55.3 | 0.98 | 20.1 |
| | | Recommended Limits | 55.2 \pm 5% | 0.97 \pm 5% | 18-25 |
| | | 1880 | Head | Measured, Aug-23-2011 | 39.9 |
| Measured, Aug-24-2011 | 39.5 | | | 1.47 | 19.1 |
| Measured, Sep-03-2011 | 38.0 | | | 1.46 | 19.0 |
| Recommended Limits | 40.0 \pm 5% | | | 1.40 \pm 5% | 18-25 |
| Body | Measured, Aug-25-2011 | | 51.0 | 1.57 | 19.2 |
| | Measured, Aug-27-2011 | | 50.7 | 1.59 | 19.3 |
| | Measured, Sep-03-2011 | | 50.7 | 1.57 | 19.2 |
| | Measured, Sep-18-2011 | | 50.9 | 1.59 | 19.8 |
| | Measured, Sep-19-2011 | | 51.4 | 1.59 | 20.1 |
| | Recommended Limits | | 53.3 \pm 5% | 1.52 \pm 5% | 18-25 |
| 2450 | Head | Measured, Oct-19-2011 | 38.2 | 1.86 | 20.1 |
| | | Recommended Limits | 39.2 \pm 5% | 1.80 \pm 5% | 18-25 |
| | Body | Measured, Sep-19-2011 | 52.0 | 1.96 | 20.3 |
| | | Measured, Oct-17-2011 | 50.7 | 1.94 | 20.3 |
| | | Measured, Oct-18-2011 | 50.8 | 1.94 | 20.5 |
| | | Recommended Limits | 52.7 \pm 5% | 1.95 \pm 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 $\pm 10\%$ from the target SAR indicated in Appendix 7. These frequencies are within $\pm 10\%$ 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 $15.0 \text{ cm} \pm 0.5 \text{ cm}$. For frequencies above 3 GHz, the simulated tissue depth was verified to be $10 \text{ cm} \pm 0.5 \text{ cm}$. Z-axis scans showing the SAR penetration are also included in Appendix 1. All system accuracy verifications were performed within 24 hours of SAR testing. The same phantoms, simulated tissue and test equipment were used for these verifications and the SAR testing.

| System Accuracy Verification Measurements for Head SAR Measurements | | | | | | | |
|---|-----------------------|-----------------------------|-------------------------------|-----------------------|----------------|-------------------|------------------|
| f (MHz) | Description | Measured SAR (W/kg), 1 gram | Normalized SAR (W/kg), 1 gram | Dielectric Parameters | | Ambient Temp (°C) | Tissue Temp (°C) |
| | | | | ϵ_r | σ (S/m) | | |
| 835 | Measured, Aug-23-2011 | 2.00 | 10.00 | 40.6 | 0.91 | 20.8 | 18.4 |
| | Recommended Limits | 2.42 | 9.73 | 41.5 $\pm 5\%$ | 0.90 $\pm 5\%$ | 18-25 | 18-25 |
| | Measured, Sep-07-2011 | 1.95 | 9.75 | 41.9 | 0.91 | 21.1 | 20.5 |
| | Recommended Limits | 2.32 | 9.33 | 41.5 $\pm 5\%$ | 0.90 $\pm 5\%$ | 18-25 | 18-25 |
| 1800 | Measured, Aug-23-2011 | 7.69 | 38.45 | 40.3 | 1.38 | 20.4 | 18.2 |
| | Measured, Aug-24-2011 | 7.77 | 38.85 | 39.9 | 1.38 | 21.0 | 19.3 |
| | Measured, Sep-02-2011 | 7.95 | 39.75 | 38.4 | 1.37 | 20.8 | 19.0 |
| | Recommended Limits | 9.47 | 38.6 | 40.0 $\pm 5\%$ | 1.40 $\pm 5\%$ | 18-25 | 18-25 |
| 2450 | Measured, Oct-19-2011 | 11.3 | 56.5 | 38.2 | 1.86 | 21.5 | 20.5 |
| | Recommended Limits | 13.3 | 54.2 | 39.2 $\pm 5\%$ | 1.80 $\pm 5\%$ | 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 | 3115 | 835 | 5.87 | 5 of 11 |
| | | 2450 | 4.39 | 5 of 11 |
| E-Field Probe ES3DV3 | 3184 | 835 | 6.11 | 5 of 11 |
| | | 1810 | 5.11 | 5 of 11 |

| System Accuracy Verification Measurements for Body SAR Measurements | | | | | | | |
|---|-----------------------|-----------------------------|-------------------------------|-----------------------|----------------|-------------------|------------------|
| f (MHz) | Description | Measured SAR (W/kg), 1 gram | Normalized SAR (W/kg), 1 gram | Dielectric Parameters | | Ambient Temp (°C) | Tissue Temp (°C) |
| | | | | ϵ_r | σ (S/m) | | |
| 835 | Measured, Aug-28-2011 | 2.01 | 10.05 | 54.1 | 0.97 | 21.0 | 19.2 |
| | Recommended Limits | 2.56 | 10.1 | 55.2 ±5% | 0.97 ±5% | 18-25 | 18-25 |
| | Measured, Sep-09-2011 | 1.90 | 9.50 | 53.8 | 0.98 | 21.2 | 19.7 |
| | Measured, Sep-17-2011 | 1.86 | 9.30 | 55.3 | 0.97 | 21.1 | 20.2 |
| | Measured, Sep-19-2011 | 1.99 | 9.95 | 55.7 | 0.99 | 21.1 | 20.0 |
| | Measured, Sep-29-2011 | 1.99 | 9.95 | 55.3 | 0.98 | 21.4 | 20.2 |
| | Recommended Limits | 2.49 | 9.77 | 55.2 ±5% | 0.97 ±5% | 18-25 | 18-25 |
| 1800 | Measured, Aug-25-2011 | 8.23 | 41.15 | 51.7 | 1.50 | 21.2 | 18.5 |
| | Recommended Limits | 9.25 | 37.9 | 53.3 ±5% | 1.52 ±5% | 18-25 | 18-25 |
| | Measured, Aug-27-2011 | 7.87 | 39.35 | 51.0 | 1.49 | 21.0 | 19.3 |
| | Measured, Sep-03-2011 | 7.92 | 39.60 | 51.1 | 1.48 | 21.3 | 19.2 |
| | Recommended Limits | 9.15 | 37.5 | 53.3 ±5% | 1.52 ±5% | 18-25 | 18-25 |
| | Measured, Sep-18-2011 | 7.50 | 37.50 | 51.2 | 1.49 | 21.1 | 19.6 |
| | Measured, Sep-19-2011 | 8.08 | 40.40 | 51.7 | 1.49 | 21.3 | 19.6 |
| | Recommended Limits | 9.08 | 37.2 | 53.3 ±5% | 1.52 ±5% | 18-25 | 18-25 |
| | Measured, Sep-28-2011 | 7.85 | 39.25 | 51.6 | 1.48 | 21.3 | 20.9 |
| | Recommended Limits | 9.41 | 38.5 | 53.3 ±5% | 1.52 ±5% | 18-25 | 18-25 |
| 2450 | Measured, Sep-19-2011 | 11.5 | 57.5 | 52.0 | 1.96 | 21.1 | 20.2 |
| | Measured, Oct-17-2011 | 11.4 | 57.0 | 50.7 | 1.94 | 21.4 | 20.8 |
| | Measured, Oct-18-2011 | 11.1 | 55.5 | 50.8 | 1.94 | 21.5 | 20.5 |
| | Recommended Limits | 13.2 | 52.8 | 52.7 ±5% | 1.95 ±5% | 18-25 | 18-25 |

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

| Description | Serial Number | f (MHz) | Conversion Factor | Cal Cert pg # |
|----------------------|---------------|---------|-------------------|---------------|
| E-Field Probe ES3DV3 | 3115 | 835 | 5.88 | 6 of 11 |
| | | 1810 | 4.61 | 6 of 11 |
| | | 2450 | 4.12 | 6 of 11 |
| E-Field Probe ES3DV3 | 3184 | 835 | 6.10 | 6 of 11 |
| | | 1810 | 4.90 | 6 of 11 |

6. Test Results

For GSM and 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 5. 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 SNN5899A - 1800 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 [6]. Also shown are the temperature of the simulated tissue after the test, the measured drift, the measured conducted output power levels, power reduction amount (when applicable), the measured SAR corrected for probe calibration (when applicable), and the extrapolated SAR. The exact method of extrapolation is:

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

The SAR reported at the end of the measurement process by the DASY4™ measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process. This is the most conservative SAR because it corresponds to the average output power at the beginning of the SAR test. This extrapolation has been done because when the DUT is operating properly it may exhibit a slump in radiated power and SAR over time. This is verified by measuring the SAR drift after the test.

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

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

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

| Description | Serial Number | f (MHz) | Conversion Factor | Cal Cert pg # |
|----------------------|---------------|---------|-------------------|---------------|
| E-Field Probe ES3DV3 | 3115 | 835 | 5.87 | 5 of 11 |
| | | 2450 | 4.39 | 5 of 11 |
| E-Field Probe ES3DV3 | 3184 | 835 | 6.11 | 5 of 11 |
| | | 1810 | 5.11 | 5 of 11 |

Head SAR test results for the 5 GHz transmit bands are provided in report [IHDP56ME4 FCC 5GHz SAR Report.pdf](#) included within the Exhibit 11 documents.

| 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 | 18.2 | -0.127 | 33.41 | X | 0.25 | X | 0.26 | 0.331 | X | 0.34 | | |
| | | | 190 | | | | | | | | | | | | |
| | | | 251 | | | | | | | | | | | | |
| | WCDMA 850, 12.2 kbps RMC | SNN5899A | 4132 | 19.8 | -0.206 | 23.83 | X | 0.269 | X | 0.28 | 0.349 | X | 0.37 | | |
| | | | 4233 | | | | | | | | | | | | |
| 1880 | GSM 1900, CS Voice | SNN5899A | 512 | 19.6 | 0.032 | 31.20 | X | 0.051 | X | 0.05 | 0.085 | X | 0.09 | | |
| | | | 661 | | | | | | | | | | | | |
| | | | 810 | | | | | | | | | | | | |
| | WCDMA 1900, 12.2 kbps RMC | SNN5899A | 9262 | 18.0 | 0.011 | 23.87 | X | 0.102 | X | 0.10 | 0.167 | X | 0.17 | | |
| | | | 9400 | | | | | | | | | | | | |
| 2450 | 802.11b, 1 Mbps | SNN5899A | 1 | 20.7 | -0.226 | 18.33 | X | 0.0373 | X | 0.04 | 0.0686 | X | 0.07 | | |
| | | | 6 | | | | | | | | | | | | |
| | | | 11 | | | | | | | | | | | | |

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 | 18.2 | -0.100 | 33.41 | X | 0.255 | X | 0.26 | 0.357 | X | 0.37 | 5x5x7 | A45 |
| | | | 190 | | | | | | | | | | | | |
| | | | 251 | | | | | | | | | | | | |
| | WCDMA 850, 12.2 kbps RMC | SNN5899A | 4132 | 19.8 | 0.117 | 23.83 | X | 0.288 | X | 0.29 | 0.400 | X | 0.40 | 5x5x7 | A46 |
| | | | 4233 | | | | | | | | | | | | |
| 1880 | GSM 1900, CS Voice | SNN5899A | 512 | 20.2 | 0.098 | 31.20 | X | 0.109 | X | 0.11 | 0.187 | X | 0.19 | 5x5x7 | A47 |
| | | | 661 | | | | | | | | | | | | |
| | | | 810 | | | | | | | | | | | | |
| | WCDMA 1900, 12.2 kbps RMC | SNN5899A | 9262 | 18.1 | 0.162 | 23.87 | X | 0.241 | X | 0.24 | 0.417 | X | 0.42 | 5x5x7 | A48 |
| | | | 9400 | | | | | | | | | | | | |
| 2450 | 802.11b, 1 Mbps | SNN5899A | 1 | 20.7 | -0.194 | 17.66 | X | 0.078 | X | 0.08 | 0.151 | X | 0.16 | 5x5x7 | A49 |
| | | | 6 | | | | | | | | | | | | |
| | | | 11 | | | | | | | | | | | | |

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 | 18.2 | -0.051 | 33.41 | | 0.168 | | 0.17 | 0.223 | | 0.23 | 5x5x7 | A50 |
| | | | 251 | | | | | | | | | | | | |
| | WCDMA 850, 12.2 kbps RMC | SNN5899A | 4132 | | | | | | | | | | | | |
| | | | 4180 | 19.9 | 0.106 | 19.9 | | 0.176 | | 0.18 | 0.229 | | 0.23 | | |
| 1880 | GSM 1900, CS Voice | SNN5899A | 512 | | | | | | | | | | | | |
| | | | 661 | 19.6 | -0.016 | 31.20 | | 0.026 | | 0.03 | 0.046 | | 0.05 | 5x5x7 | A51 |
| | | | 810 | | | | | | | | | | | | |
| | WCDMA 1900, 12.2 kbps RMC | SNN5899A | 9262 | | | | | | | | | | | | |
| | | | 9400 | 18.0 | 0.124 | 23.87 | | 0.057 | | 0.06 | 0.099 | | 0.10 | 5x5x7 | A52 |
| 2450 | 802.11b, 1 Mbps | SNN5899A | 1 | | | | | | | | | | | | |
| | | | 6 | | | | | | | | | | | | |
| | | | 11 | 20.2 | 0.081 | 18.33 | | 0.022 | | 0.02 | 0.0426 | | 0.04 | 5x5x7 | A53 |

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 | 18.2 | 0.017 | 33.41 | | 0.162 | | 0.16 | 0.213 | | 0.21 | | |
| | | | 251 | | | | | | | | | | | | |
| | WCDMA 850, 12.2 kbps RMC | SNN5899A | 4132 | | | | | | | | | | | | |
| | | | 4180 | 20.2 | 0.100 | 23.83 | | 0.199 | | 0.20 | 0.259 | | 0.26 | 5x5x7 | A54 |
| 1880 | GSM 1900, CS Voice | SNN5899A | 512 | | | | | | | | | | | | |
| | | | 661 | 20.1 | -0.408 | 31.20 | | 0.023 | | 0.03 | 0.040 | | 0.04 | | |
| | | | 810 | | | | | | | | | | | | |
| | WCDMA 1900, 12.2 kbps RMC | SNN5899A | 9262 | | | | | | | | | | | | |
| | | | 9400 | 18.0 | 0.121 | 23.87 | | 0.053 | | 0.05 | 0.090 | | 0.09 | | |
| 2450 | 802.11b, 1 Mbps | SNN5899A | 1 | | | | | | | | | | | | |
| | | | 6 | | | | | | | | | | | | |
| | | | 11 | 20.2 | 0.0225 | 18.33 | | 0.0144 | | 0.01 | 0.0264 | | 0.03 | | |

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 and 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, the measured conducted output power levels, power reduction amount (when applicable), the measured SAR corrected for probe calibration (when applicable), and the extrapolated SAR. The exact method of extrapolation is:

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

The SAR reported at the end of the measurement process by the DASY4™ measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process. This is the most conservative SAR because it corresponds to the average output power at the beginning of the SAR test. This extrapolation has been done because when the DUT is operating properly it may exhibit a slump in radiated power and SAR over time. This is verified by measuring the SAR drift after the test.

The test conditions that produced the highest SAR values in each band are indicated as bold numbers in the following tables and are included in Appendix 3. All other test conditions measured lower SAR values than those included in Appendix 3.

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

The simulated tissue depth was verified to be 15.0 cm ± 0.5 cm 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 for the data modes.

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 | 3115 | 835 | 5.88 | 6 of 11 |
| | | 2450 | 4.12 | 6 of 11 |
| E-Field Probe ES3DV3 | 3184 | 1810 | 4.90 | 6 of 11 |

Body-Worn SAR test results for the 5 GHz transmit bands are provided in report [IHDP56ME4 FCC 5GHz SAR Report.pdf](#) included within the Exhibit 11 documents.

| 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 | 18.1 | -0.121 | 33.41 | | 0.127 | | 0.13 | 0.168 | | 0.17 | | |
| | | | 251 | | | | | | | | | | | | |
| | GPRS 850, PS Data 3 Uplots | SNN5899A | 190 | 20.0 | 0.106 | 28.77 | | 0.254 | | 0.25 | 0.336 | | 0.34 | 5x5x7 | A56 |
| | EDGE 850, PS Data 3 Uplots | SNN5899A | 190 | 20.0 | 0.085 | 23.64 | | 0.086 | | 0.09 | 0.113 | | 0.11 | | |
| | WCDMA 850, 12.2 kbps RMC | SNN5899A | 4132 | | | | | | | | | | | | |
| | | | 4180 | 20.2 | -0.056 | 23.83 | | 0.352 | | 0.36 | 0.470 | | 0.48 | 5x5x7 | A57 |
| | | | 4233 | | | | | | | | | | | | |
| 1880 | GSM 1900, CS Voice | SNN5899A | 512 | | | | | | | | | | | | |
| | | | 661 | 19.0 | -0.073 | 31.20 | | 0.047 | | 0.05 | 0.075 | | 0.08 | | |
| | | | 810 | | | | | | | | | | | | |
| | WCDMA 1900, 12.2 kbps RMC | SNN5899A | 9262 | | | | | | | | | | | | |
| | | | | 9400 | 19.0 | 0.066 | 23.87 | | 0.066 | | 0.07 | 0.108 | | 0.11 | |
| | | | 9538 | | | | | | | | | | | | |
| 2450 | 802.11b, 1 Mbps | SNN5899A | 1 | | | | | | | | | | | | |
| | | | 6 | | | | | | | | | | | | |
| | | | 11 | 20.8 | 0.0401 | 18.33 | | 0.0142 | | 0.01 | 0.0243 | | 0.02 | | |

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 | 18.0 | -0.092 | 33.41 | | 0.101 | | 0.10 | 0.134 | | 0.14 | | |
| | | | 251 | | | | | | | | | | | | |
| | WCDMA 850, 12.2 kbps RMC | SNN5899A | 4132 | | | | | | | | | | | | |
| | | | | 4180 | 20.2 | -0.052 | 23.83 | | 0.299 | | 0.30 | 0.399 | | 0.40 | |
| | | | 4233 | | | | | | | | | | | | |
| 1880 | GSM 1900, CS Voice | SNN5899A | 512 | | | | | | | | | | | | |
| | | | 661 | 19.0 | -0.115 | 31.20 | | 0.086 | | 0.09 | 0.140 | | 0.14 | 5x5x7 | A58 |
| | | | 810 | | | | | | | | | | | | |
| | GPRS 1900, PS Data 3 Uplots | SNN5899A | 661 | 20.2 | -0.157 | 26.30 | | 0.052 | | 0.05 | 0.084 | | 0.09 | | |
| | EDGE 1900, PS Data 3 Uplots | SNN5899A | 661 | 20.2 | 0.070 | 22.87 | | 0.026 | | 0.03 | 0.043 | | 0.04 | | |
| | WCDMA 1900, 12.2 kbps RMC | SNN5899A | 9262 | | | | | | | | | | | | |
| | | | 9400 | 19.0 | 0.049 | 23.87 | | 0.082 | | 0.08 | 0.132 | | 0.13 | 5x5x7 | A59 |
| | | | 9538 | | | | | | | | | | | | |
| 2450 | 802.11b, 1 Mbps | SNN5899A | 1 | 20.8 | 0.0015 | 17.66 | | 0.0144 | | 0.01 | 0.0246 | | 0.02 | 5x5x7 | A60 |
| | | | 6 | 20.8 | 0.127 | 17.89 | | 0.0124 | | 0.01 | 0.0217 | | 0.02 | | |
| | | | 11 | 20.8 | -0.823 | 18.33 | | 0.0142 | | 0.01 | 0.0244 | | 0.02 | | |

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

6.3 Lapdock Accessory Test Results

The DUT supports the use of the Motorola Lapdock™. The SAR results above were utilized to determine the channel that results in the highest measured SAR value when in proximity of the user's body. SAR testing was performed with the DUT placed into the Lapdock™ and the Lapdock™ placed for testing per FCC KDB 616217. For GSM and 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 Motorola Lapdock supports the use of data modes within the phone for a data connection to the Internet. While the phone is attached to the Lapdock, the phone is still able to make an receive calls. These calls can be simultaneous to the data transmission, if the technology in the phone supports this (eg: WiFi and GSM). An evaluation of the simultaneous transmitter SAR is provided in section 6.5. The 5 GHz WiFi modes (802.11a/n) do not operate in with Lapdock.

The SAR results shown in table 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, the measured conducted output power levels, power reduction amount (when applicable), the measured SAR corrected for probe calibration (when applicable), and the extrapolated SAR. The exact method of extrapolation is:

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

The SAR reported at the end of the measurement process by the DASY4™ measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process. This is the most conservative SAR because it corresponds to the average output power at the beginning of the SAR test. This extrapolation has been done because when the DUT is operating properly it may exhibit a slump in radiated power and SAR over time. This is verified by measuring the SAR drift after the test.

The 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.

The SAR measurements were performed using the flat section of the SAM phantoms listed in section 3.1. The simulated tissue depth was verified to be 15.0 cm ± 0.5 cm. The DUT and Lapdock™ were placed using a Laptop Extension Kit available from SPEAG™ that facilitates the testing of larger devices according to IEC 62209-2 (e.g., laptops, cameras, etc.). The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin-SAM Phantoms.

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

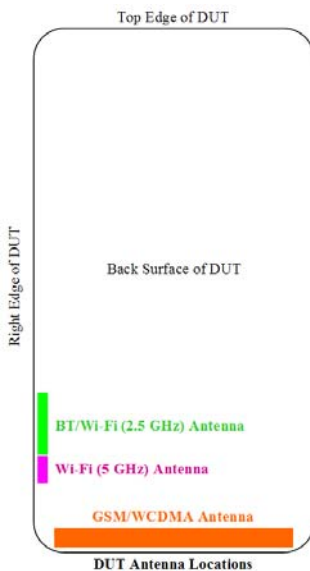
| Description | Serial Number | f (MHz) | Conversion Factor | Cal Cert pg # |
|----------------------|---------------|---------|-------------------|---------------|
| E-Field Probe ES3DV3 | 3115 | 835 | 5.88 | 6 of 11 |
| | | 1810 | 4.61 | 6 of 11 |
| | | 2450 | 4.12 | 6 of 11 |

| Lapdock against Body, Bottom Surface of Lapdock 0 mm from Phantom, Screen opened 90 degrees | | | | | | | | | | | | | | | | |
|--|--------------------------------|-----------------------|---------|--------------|---------------|-------------------|----------------------------|--------------------|---------------------|------------------------|--------------------|---------------------|------------------------|-----------|-----------|--|
| 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 | GPRS 850, PS Data 3 Uplots | SNN5899A | 128 | | | | | | | | | | | | | |
| | | | 190 | 20.0 | 0.007 | 28.77 | | 0.144 | | 0.14 | 0.216 | | 0.22 | 5x5x7 | A62 | |
| | | | 251 | | | | | | | | | | | | | |
| | GSM 850, CS Voice | SNN5899A | 128 | | | | | | | | | | | | | |
| | | | 190 | 20.7 | -0.145 | 33.41 | | 0.101 | | 0.01 | 0.189 | | 0.20 | | | |
| | | | 251 | | | | | | | | | | | | | |
| | WCDMA 850, 12.2 kbps RMC | SNN5899A | 4132 | | | | | | | | | | | | | |
| | | | 4180 | 20.0 | -0.170 | 23.83 | | 0.210 | | 0.22 | 0.315 | | 0.33 | 5x5x7 | A63 | |
| | | | 4233 | | | | | | | | | | | | | |
| 1880 | GPRS 1900, PS Data 3 Uplots | SNN5899A | 512 | | | | | | | | | | | | | |
| | | | 661 | 20.0 | 0.013 | 26.30 | | 0.036 | | 0.04 | 0.064 | | 0.06 | 5x5x7 | A64 | |
| | | | 810 | | | | | | | | | | | | | |
| | GSM 1900, CS Voice | SNN5899A | 512 | | | | | | | | | | | | | |
| | | | 661 | 20.0 | 20.0 | 31.20 | | 0.0314 | | 0.03 | 0.0541 | | 0.05 | | | |
| | | | 810 | | | | | | | | | | | | | |
| WCDMA 1900, 12.2 kbps RMC | SNN5899A | 9262 | | | | | | | | | | | | | | |
| | | 9400 | 20.0 | -0.148 | 23.87 | | 0.094 | | 0.10 | 0.166 | | 0.17 | 5x5x7 | A65 | | |
| | | | 9538 | | | | | | | | | | | | | |
| 2450 | 802.11b, 1 Mbps | SNN5899A | 1 | | | | | | | | | | | | | |
| | | | 6 | | | | | | | | | | | | | |
| | | | 11 | 20.2 | -0.135 | 18.33 | | 0.00513 | | 0.01 | 0.00891 | | 0.01 | 5x5x7 | A66 | |

Table 7: SAR measurement results at the highest possible output power, measured 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 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 less than 2.5 cm from the edge.



| Mobile Hotspot Edges/Surfaces for SAR testing | | | | | | |
|---|-----|--------|------|-------|-------|------|
| Mode | Top | Bottom | Left | Right | Front | Back |
| GSM/WCDMA | NO | YES | YES | YES | YES | YES |
| Wi-Fi | NO | YES | NO | YES | YES | YES |

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 temperature of the simulated tissue after the test, the measured drift, the measured conducted output power levels, power reduction amount (when applicable), the measured SAR corrected for probe calibration (when applicable), 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 mobile Hotspot functionality will only operate using the 2.45 GHz WiFi modes and the cellular modes. The firmware does not support the use of the 5 GHz WiFi modes as part of the mobile Hotspot.

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 mobile hotspot 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 mobile hotspot 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 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 mobile hotspot measurements:

| Description | Serial Number | f (MHz) | Conversion Factor | Cal Cert pg # |
|----------------------|---------------|---------|-------------------|---------------|
| E-Field Probe ES3DV3 | 3115 | 1810 | 4.61 | 6 of 11 |
| | | 2450 | 4.12 | 6 of 11 |
| E-Field Probe ES3DV3 | 3184 | 835 | 6.10 | 6 of 11 |
| | | 1810 | 4.90 | 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 (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 | GPRS 850, PS Data 3 Uplots | SNN5899A | 128 | | | | | | | | | | | | |
| | | | 190 | 20.1 | -0.12 | 28.77 | | 0.0178 | | 0.02 | 0.0288 | | 0.03 | 5x5x7 | A68 |
| | | | 251 | | | | | | | | | | | | |
| | WCDMA 850, 12.2 kbps RMC | SNN5899A | 4132 | | | | | | | | | | | | |
| | | | 4180 | 20.2 | 0.141 | 23.83 | | 0.024 | | 0.02 | 0.039 | | 0.04 | 5x5x7 | A69 |
| | | | 4233 | | | | | | | | | | | | |
| 1880 | GPRS 1900, PS Data 3 Uplots | SNN5899A | 512 | | | | | | | | | | | | |
| | | | 661 | 19.0 | 0.0428 | 26.30 | | 0.283 | | 0.28 | 0.575 | | 0.58 | 5x5x7 | A70 |
| | | | 810 | | | | | | | | | | | | |
| | WCDMA 1900, 12.2 kbps RMC | SNN5899A | 9262 | 20.1 | 0.0421 | 24.10 | | 0.424 | | 0.42 | 0.843 | | 0.84 | | |
| | | | 9400 | 20.1 | 0.0161 | 23.87 | | 0.58 | | 0.58 | 1.16 | | 1.16 | 5x5x7 | A71 |
| | | | 9538 | 20.2 | 0.0848 | 23.83 | 2.0 | 0.501 | | 0.50 | 0.977 | | 0.98 | | |
| 2450 | 802.11b, 1 Mbps | SNN5899A | 1 | | | | | | | | | | | | |
| | | | 6 | | | | | | | | | | | | |
| | | | 11 | 20.5 | -0.0294 | 18.33 | | 0.0102 | | 0.01 | 0.018 | | 0.02 | 5x5x7 | A72 |

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 (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 | GPRS 850, PS Data 3 Uplots | SNN5899A | 128 | | | | | | | | | | | | | |
| | | | 190 | 20.1 | -0.0914 | 28.77 | | 0.23 | | 0.23 | 0.329 | | 0.34 | 5x5x7 | A73 | |
| | | | 251 | | | | | | | | | | | | | |
| | WCDMA 850, 12.2 kbps RMC | SNN5899A | 4132 | | | | | | | | | | | | | |
| | | | 4180 | 20.3 | -0.030 | 23.83 | | 0.418 | | 0.42 | 0.603 | | 0.61 | 5x5x7 | A74 | |
| | | | 4233 | | | | | | | | | | | | | |
| 1880 | GPRS 1900, PS Data 3 Uplots | SNN5899A | 512 | | | | | | | | | | | | | |
| | | | 661 | 19.0 | -0.004 | 26.30 | | 0.0092 | | 0.01 | 0.0161 | | 0.02 | 5x5x7 | A75 | |
| | | | 810 | | | | | | | | | | | | | |
| | WCDMA 1900, 12.2 kbps RMC | SNN5899A | 9262 | | | | | | | | | | | | | |
| | | | 9400 | 20.2 | -0.094 | 23.87 | | 0.0197 | | 0.02 | 0.0332 | | 0.03 | 5x5x7 | A76 | |
| | | | 9538 | | | | | | | | | | | | | |

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

| Mobile Hotspot, Right Edge of Phone 10 mm from Phantom | | | | | | | | | | | | | | | | |
|--|-----------------------------|-------------------|---------|-----------|------------|----------------|----------------------|-----------------|------------------|---------------------|-----------------|------------------|---------------------|-----------|-----------|--|
| f (MHz) | Mode | 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 | GPRS 850, PS Data 3 Uplots | SNN5899A | 128 | | | | | | | | | | | | | |
| | | | 190 | 20.1 | -0.0493 | 28.77 | | 0.192 | | 0.19 | 0.274 | | 0.28 | 5x5x7 | A77 | |
| | | | 251 | | | | | | | | | | | | | |
| | WCDMA 850, 12.2 kbps RMC | SNN5899A | 4132 | | | | | | | | | | | | | |
| | | | 4180 | 19.0 | 0.012 | 23.83 | | 0.227 | | 0.23 | 0.326 | | 0.33 | 5x5x7 | A78 | |
| | | | 4233 | | | | | | | | | | | | | |
| 1880 | GPRS 1900, PS Data 3 Uplots | SNN5899A | 512 | | | | | | | | | | | | | |
| | | | 661 | 19.0 | -0.060 | 26.30 | | 0.0455 | | 0.05 | 0.0763 | | 0.08 | 5x5x7 | A79 | |
| | | | 810 | | | | | | | | | | | | | |
| | WCDMA 1900, 12.2 kbps RMC | SNN5899A | 9262 | | | | | | | | | | | | | |
| | | | 9400 | 20.2 | 0.12 | 23.87 | | 0.103 | | 0.10 | 0.171 | | 0.17 | 5x5x7 | A80 | |
| | | | 9538 | | | | | | | | | | | | | |
| 2450 | 802.11b, 1 Mbps | SNN5899A | 1 | 20.5 | 0.0654 | 17.66 | | 0.169 | | 0.17 | 0.361 | | 0.36 | 5x5x7 | A81 | |
| | | | 6 | 20.5 | -0.0473 | 17.89 | | 0.152 | | 0.15 | 0.332 | | 0.34 | | | |
| | | | 11 | 20.5 | -0.0835 | 18.33 | | 0.141 | | 0.14 | 0.309 | | 0.31 | | | |

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

| Mobile Hotspot, Front Surface 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 (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 | GPRS 850, PS Data 3 Uplots | SNN5899A | 128 | | | | | | | | | | | | |
| | | | 190 | 20.1 | -0.0156 | 28.77 | | 0.405 | | 0.41 | 0.518 | | 0.52 | 5x5x7 | A82 |
| | | | 251 | | | | | | | | | | | | |
| | WCDMA 850, 12.2 kbps RMC | SNN5899A | 4132 | | | | | | | | | | | | |
| | | | 4180 | 19.0 | 0.025 | 23.83 | | 0.535 | | 0.54 | 0.695 | | 0.70 | 5x5x7 | A83 |
| 1880 | GPRS 1900, PS Data 3 Uplots | SNN5899A | 512 | | | | | | | | | | | | |
| | | | 661 | 19.0 | -0.287 | 26.30 | | 0.293 | | 0.31 | 0.592 | | 0.63 | 5x5x7 | A84 |
| | | | 810 | | | | | | | | | | | | |
| | WCDMA 1900, 12.2 kbps RMC | SNN5899A | 9262 | 19.6 | 0.0466 | 24.10 | | 0.448 | | 0.45 | 0.856 | | 0.86 | | |
| | | | 9400 | 19.6 | 0.0567 | 23.87 | | 0.578 | | 0.58 | 1.11 | | 1.11 | 5x5x7 | A85 |
| 2450 | 802.11b, 1 Mbps | SNN5899A | 1 | | | | | | | | | | | | |
| | | | 6 | | | | | | | | | | | | |
| | | | 11 | 20.5 | -0.155 | 18.33 | | 0.0642 | | 0.07 | 0.131 | | 0.14 | 5x5x7 | A86 |

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

| Mobile Hotspot, Back Surface 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 (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 | GPRS 850, PS Data 3 Uplots | SNN5899A | 128 | | | | | | | | | | | | |
| | | | 190 | 20.1 | -0.0348 | 28.77 | | 0.439 | | 0.44 | 0.567 | | 0.57 | 5x5x7 | A87 |
| | | | 251 | | | | | | | | | | | | |
| | WCDMA 850, 12.2 kbps RMC | SNN5899A | 4132 | | | | | | | | | | | | |
| | | | 4180 | 19.0 | -0.120 | 23.83 | | 0.563 | | 0.56 | 0.752 | | 0.77 | 5x5x7 | A88 |
| 1880 | GPRS 1900, PS Data 3 Uplots | SNN5899A | 512 | | | | | | | | | | | | |
| | | | 661 | 19.0 | 0.303 | 26.30 | | 0.25 | | 0.25 | 0.493 | | 0.49 | 5x5x7 | A89 |
| | | | 810 | | | | | | | | | | | | |
| | WCDMA 1900, 12.2 kbps RMC | SNN5899A | 9262 | 20.5 | 0.000 | 24.10 | | 0.371 | | 0.37 | 0.679 | | 0.68 | | |
| | | | 9400 | 19.6 | 0.17 | 23.87 | | 0.584 | | 0.58 | 1.11 | | 1.11 | 5x5x7 | A90 |
| 2450 | 802.11b, 1 Mbps | SNN5899A | 1 | | | | | | | | | | | | |
| | | | 6 | | | | | | | | | | | | |
| | | | 11 | 20.5 | 0.0583 | 18.33 | | 0.0604 | | 0.06 | 0.12 | | 0.12 | 5x5x7 | A91 |

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 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 1.76 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 **bolded** requirements from FCC KDB 648474, as follows. Note that Bluetooth mode is not intended for use in configurations against the head or during mobile hotspot operation, and this evaluation considers only the body-worn configuration.

1. The highest output conducted power measured for Bluetooth on the device under test is 9.06 mW [**≤ 12 mW**]
2. The separation distance between the Bluetooth antenna and the CDMA antenna is 2.34 cm [**< 2.5 cm**]
3. The highest 1-g Body-Worn SAR values for the other transmitters are:
GSM 850 (0.34 W/kg); GSM 1900 (0.14 W/kg); WCDMA 850 (0.48 W/kg); WCDMA 1900 (0.13 W/kg) [**< 1.2 W/kg**]

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.

| 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.

SAR test results for the 5 GHz transmit bands are provided in report [IHDP56ME4 FCC 5GHz SAR Report.pdf](#) included within the Exhibit 11 documents. Evaluations for the simultaneous SAR summations including data from that report 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 | #7 | #7 | #8 | #8 |
| Band Position | GSM 850 | GSM 1900 | WCDMA 850 | WCDMA 1900 | Wi-Fi 2450 | Wi-Fi 5 GHz | GSM 850 + Wi-Fi 2450 | GSM 1900 + Wi-Fi 2450 | WCDMA 850 + Wi-Fi 2450 | WCDMA 1900 + Wi-Fi 2450 | GSM 850 + Wi-Fi 5 GHz | GSM 1900 + Wi-Fi 5 GHz | WCDMA 850 + Wi-Fi 5 GHz | WCDMA 1900 + Wi-Fi 5 GHz |
| | Left Head Cheek | 0.34 | 0.09 | 0.37 | 0.17 | 0.07 | 0.035 | 0.41 | 0.16 | 0.44 | 0.24 | 0.38 | 0.13 | 0.41 |
| Left Head 15° Tilt | 0.23 | 0.05 | 0.23 | 0.10 | 0.04 | 0.011 | 0.27 | 0.09 | 0.27 | 0.14 | 0.24 | 0.06 | 0.24 | 0.11 |
| Right Head Cheek | 0.37 | 0.19 | 0.40 | 0.42 | 0.16 | 0.054 | 0.53 | 0.35 | 0.56 | 0.58 | 0.42 | 0.24 | 0.45 | 0.47 |
| Right Head 15° Tilt | 0.21 | 0.04 | 0.26 | 0.09 | 0.03 | 0.028 | 0.24 | 0.07 | 0.29 | 0.12 | 0.24 | 0.07 | 0.29 | 0.12 |
| Body Worn, Front of Phone 25 mm from Phantom | 0.17 | 0.08 | 0.48 | 0.11 | 0.02 | 0.027 | 0.19 | 0.10 | 0.50 | 0.13 | 0.20 | 0.11 | 0.51 | 0.14 |
| Body Worn, Back of Phone 25 mm from Phantom | 0.14 | 0.14 | 0.40 | 0.13 | 0.02 | 0.031 | 0.16 | 0.16 | 0.42 | 0.15 | 0.17 | 0.17 | 0.43 | 0.16 |

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 | 0.58 | 0.04 | 1.16 | 0.02 | 0.05 | 0.60 | 0.06 |
| Right Edge of DUT 10 mm from Phantom | | 0.28 | 0.08 | 0.33 | 0.17 | 0.36 | 0.64 | 0.44 | 0.69 | 0.53 |
| Left Edge of DUT 10 mm from Phantom | | 0.34 | 0.02 | 0.61 | 0.03 | 0.00 | 0.34 | 0.02 | 0.61 | 0.03 |
| Front Surface of DUT 10 mm from Phantom | | 0.58 | 0.67 | 0.70 | 1.11 | 0.14 | 0.72 | 0.81 | 0.84 | 1.25 |
| Back Surface of DUT 10 mm from Phantom | | 0.64 | 0.49 | 0.77 | 1.11 | 0.12 | 0.76 | 0.61 | 0.89 | 1.23 |

The following LapDock position SAR summations for simultaneous evaluation are provided to demonstrate a data link (over WiFi) with a simultaneous voice call (over GSM, WCDMA), and additionally evaluations for mobile hotspot connections (WiFi connected to one of the cellular data modes).

| Evaluations for Simultaneous SAR, LapDock Position | | | |
|---|-------------------|---------------------------------|----------------------------------|
| Transmit Mode | SAR (W/Kg) | 2.45 GHz WiFi SAR (W/Kg) | 1 g SAR Summations (W/kg) |
| GSM 850 | 0.20 | 0.01 | 0.21 |
| GPRS 850 | 0.22 | 0.01 | 0.22 |
| WCDMA 850 | 0.33 | 0.01 | 0.34 |
| GSM 1900 | 0.05 | 0.01 | 0.06 |
| GPRS 1900 | 0.06 | 0.01 | 0.07 |
| WCDMA 1900 | 0.17 | 0.01 | 0.18 |

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)”