



**FCC OET BULLETIN 65 SUPPLEMENT C 01-01  
IEEE Std 1528-2003, IEEE Std 1528a-2005**

**SAR EVALUATION REPORT**

*For*  
**Braille Pad**

**Model: RC001  
FCC ID: U48-RC002B**

**Report Number: 12U14401-1  
Issue Date: 8/2/2012**

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**NVLAP LAB CODE 200065-0**

Revision History

| <u>Rev.</u> | <u>Issue Date</u> | <u>Revisions</u> | <u>Revised By</u> |
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| --          | 8/2/2012          | Initial Issue    | --                |

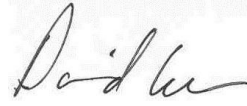
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## 1. Attestation of Test Results

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                          |                                                            |              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------------------------------------------------|--------------|
| Applicant                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | LEVELSTAR                                |                                                            |              |
| DUT description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Braille Pad                              |                                                            |              |
| Model                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | RC001                                    |                                                            |              |
| Test device is                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | An identical prototype                   |                                                            |              |
| Device category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Portable                                 |                                                            |              |
| Exposure category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | General Population/Uncontrolled Exposure |                                                            |              |
| Date tested                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6/15/2012 – 8/1/2012                     |                                                            |              |
| FCC Rule Parts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Freq. Range                              | Highest 1-g SAR                                            | Limit        |
| 22                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 824-849 MHz                              | Head (Touch flat): 0.395 W/kg<br>Body (Rear): 0.614 W/kg   | 1.6 W/kg     |
| 24                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1850-1910 MHz                            | Head (Touch flat): 0.431 W/kg<br>Body (Edge 3): 0.794 W/kg |              |
| 15.247                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2412-2462 MHz                            | Head (Right Touch): 0.286<br>Body (Rear): 0.065 W/kg       |              |
| Applicable Standards                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                          |                                                            | Test Results |
| FCC OET Bulletin 65 Supplement C 01-01, IEEE Std 1528-2003, IEEE Std 1528a-2005                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                          |                                                            | Pass         |
| <p>UL CCS tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.</p> <p><b>Note:</b> The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.</p> <p>Approved &amp; Released For UL CCS By: </p> <p>Tested By: </p> |                                          |                                                            |              |
| Dave Weaver<br>Staff Engineer<br>UL CCS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                          | David Lee<br>SAR Engineer<br>UL CCS                        |              |

## 2. Test Methodology

The tests documented in this report were performed in accordance with FCC OET Bulletin 65 Supplement C Edition 01-01, IEEE STD 1528-2003, IEEE STD 1528a-2005 and the following KDB Procedures:

- 648474 D01 SAR Handsets Multi Xmitter and Ant, v01r05
- 248227 D01 SAR meas for 802 11abg v01r02
- 941225 D01 SAR test for 3G devices v02
- 941225 D03 SAR Test Reduction GSM GPRS EDGE v01

## 3. Facilities and Accreditation

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

## 4. Calibration and Uncertainty

### 4.1. Measuring Instrument Calibration

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards.

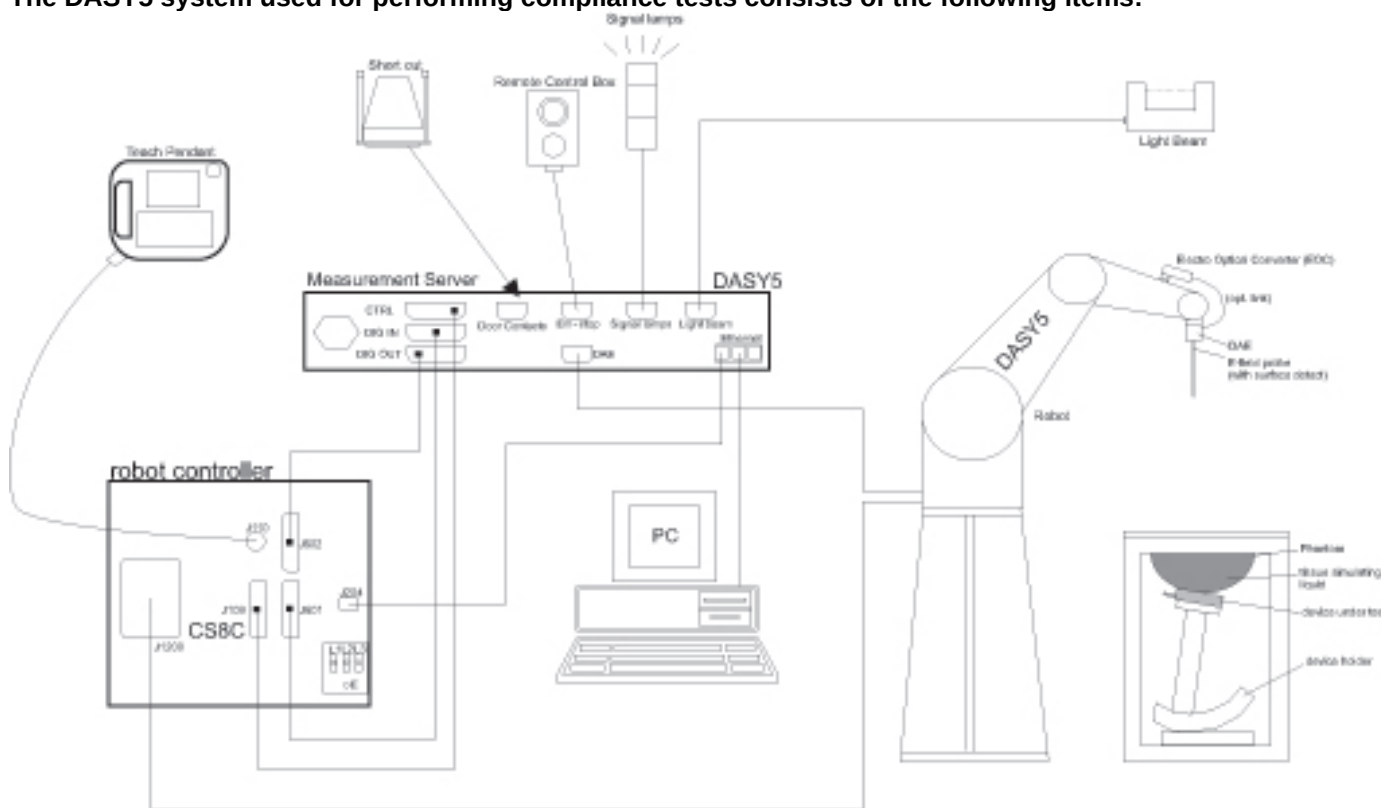
| Name of Equipment            | Manufacturer | Type/Model        | Serial No. | Cal. Due date |    |      |
|------------------------------|--------------|-------------------|------------|---------------|----|------|
|                              |              |                   |            | MM            | DD | Year |
| Dielectronic Probe kit       | HP           | 85070C            | N/A        | N/A           |    |      |
| Base Station Simulator       | R & S        | CMU 200           | 120111     | 5             | 25 | 2013 |
| ESA Series Network Analyzer  | Agilent      | E5071B            | MY42100131 | 2             | 11 | 2013 |
| Synthesized Signal Generator | HP           | 8665B             | 3744A01084 | 5             | 3  | 2013 |
| E-Field Probe                | SPEAG        | EX3DV4            | 3749       | 1             | 27 | 2013 |
| Thermometer                  | ERTCO        | 639-1S            | 8350       | 7             | 30 | 2013 |
| Data Acquisition Electronics | SPEAG        | DAE3              | 427        | 1             | 17 | 2013 |
| System Validation Dipole     | SPEAG        | D835V2            | 4d002      | 3             | 6  | 2013 |
| System Validation Dipole     | SPEAG        | D1900V2           | 5d043      | 11            | 10 | 2012 |
| System Validation Dipole     | SPEAG        | D2450V2           | 748        | 2             | 7  | 2013 |
| Power Meter                  | HP           | 438A              | 2822A05684 | 10            | 7  | 2013 |
| Power Sensor                 | HP           | 8481A             | 2702A66876 | 8             | 1  | 2013 |
| Amplifier                    | MITEQ        | 4D00400600-50-30P | 1620606    | N/A           |    |      |
| Directional coupler          | Werlatone    | C8060-102         | 2141       | N/A           |    |      |

## 4.2. Measurement Uncertainty

| Measurement uncertainty for 300 MHz to 3 GHz averaged over 1 gram |          |              |         |             |          |
|-------------------------------------------------------------------|----------|--------------|---------|-------------|----------|
| Component                                                         | Error, % | Distribution | Divisor | Sensitivity | U (X), % |
| <b>Measurement System</b>                                         |          |              |         |             |          |
| Probe Calibration (k=1)                                           | 6.00     | Normal       | 1       | 1           | 6.00     |
| Axial Isotropy                                                    | 1.15     | Rectangular  | 1.732   | 0.7071      | 0.47     |
| Hemispherical Isotropy                                            | 2.30     | Rectangular  | 1.732   | 0.7071      | 0.94     |
| Boundary Effect                                                   | 0.90     | Rectangular  | 1.732   | 1           | 0.52     |
| Probe Linearity                                                   | 3.45     | Rectangular  | 1.732   | 1           | 1.99     |
| System Detection Limits                                           | 1.00     | Rectangular  | 1.732   | 1           | 0.58     |
| Readout Electronics                                               | 0.30     | Normal       | 1       | 1           | 0.30     |
| Response Time                                                     | 0.80     | Rectangular  | 1.732   | 1           | 0.46     |
| Integration Time                                                  | 2.60     | Rectangular  | 1.732   | 1           | 1.50     |
| RF Ambient Conditions - Noise                                     | 3.00     | Rectangular  | 1.732   | 1           | 1.73     |
| RF Ambient Conditions - Reflections                               | 3.00     | Rectangular  | 1.732   | 1           | 1.73     |
| Probe Positioner Mechanical Tolerance                             | 0.40     | Rectangular  | 1.732   | 1           | 0.23     |
| Probe Positioning with respect to Phantom                         | 2.90     | Rectangular  | 1.732   | 1           | 1.67     |
| Extrapolation, Interpolation and Integration                      | 1.00     | Rectangular  | 1.732   | 1           | 0.58     |
| <b>Test Sample Related</b>                                        |          |              |         |             |          |
| Test Sample Positioning                                           | 2.90     | Normal       | 1       | 1           | 2.90     |
| Device Holder Uncertainty                                         | 3.60     | Normal       | 1       | 1           | 3.60     |
| Output Power Variation - SAR Drift                                | 5.00     | Rectangular  | 1.732   | 1           | 2.89     |
| <b>Phantom and Tissue Parameters</b>                              |          |              |         |             |          |
| Phantom Uncertainty (shape and thickness)                         | 4.00     | Rectangular  | 1.732   | 1           | 2.31     |
| Liquid Conductivity - deviation from target                       | 5.00     | Rectangular  | 1.732   | 0.64        | 1.85     |
| Liquid Conductivity - measurement                                 | -4.50    | Normal       | 1       | 0.64        | -2.88    |
| Liquid Permittivity - deviation from target                       | 5.00     | Rectangular  | 1.732   | 0.6         | 1.73     |
| Liquid Permittivity - measurement uncertainty                     | -3.47    | Normal       | 1       | 0.6         | -2.08    |
| Combined Standard Uncertainty Uc(y) =                             |          |              |         |             | 10.37    |
| Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =  |          |              |         | 20.74 %     |          |
| Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =  |          |              |         | 1.64 dB     |          |

## 5. Measurement System Description and Setup

The DASY5 system used for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

## 6. SAR Measurement Procedures

### 6.1. Normal SAR Measurement Procedure

#### Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

#### Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528-2003, IEEE Standard 1528a-2005 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

#### Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures  $\geq 7 \times 7 \times 9$  (above 4.5 GHz) or  $5 \times 5 \times 7$  (below 3 GHz) points within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

#### Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

#### Step 5: Z-Scan (FCC only)

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation the extrapolated distance should not be larger than the step size in Z-direction.

## 6.2. Volume Scan Procedures

### Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

### Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528-2003, IEEE 1528a-2005 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

### Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures  $\geq 7 \times 7 \times 9$  (above 4.5 GHz) or  $5 \times 5 \times 7$  (below 3 GHz) points within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

### Step 4: Volume Scan

Volume Scans are used to assess peak SAR and averaged SAR measurements in largely extended 3-dimensional volumes within any phantom. This measurement does not need any previous area scan. The grid can be anchored to a user specific point or to the current probe location.

### Step 5: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

## 7. Device Under Test

|                             |                                                                                                                                    |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Braille Pad<br>Model: RC001 |                                                                                                                                    |
| Normal operation            | <ul style="list-style-type: none"> <li>- Held to head,</li> <li>- Body (Rear and Edge 3) with 0 mm separation distance.</li> </ul> |
| Accessory                   | 1. Headset                                                                                                                         |

### 7.1. Air Interfaces and Frequency Ranges

|                     |                                                                                                                                                                                                                                                                                              |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Air Interfaces      | <ul style="list-style-type: none"> <li>- GSM, GPRS and EGPRS (EGPRS is Rx only)</li> <li>- UMTS (WCDMA) Rel 99, HSDPA (Rel 5, CAT 5), (HSUPA is not supported)</li> <li>- 802.11b/g/n with HT20</li> <li>- Bluetooth Ver. 2.1 +EDR</li> </ul>                                                |
| Tx Frequency Ranges | <ul style="list-style-type: none"> <li>- GSM850: 824 - 849 MHz</li> <li>- GSM1900: 1850 - 1910 MHz</li> <li>- W-CDMA (UMTS) Band V: 824 - 849 MHz</li> <li>- W-CDMA (UMTS) Band II: 1850 - 1910 MHz</li> <li>- 802.11b/g/n: 2412 - 2462 MHz</li> <li>- Bluetooth: 2402 - 2480 MHz</li> </ul> |

### 7.2. Simultaneous Transmission

| No. | Conditions           |
|-----|----------------------|
| 1   | GSM850 Voice + BT    |
| 2   | GSM1900 Voice + BT   |
| 3   | GSM850 GPRS + BT     |
| 4   | GSM1900 GPRS + BT    |
| 5   | W-CDMA Band V+ BT    |
| 6   | W-CDMA Band II+ BT   |
| 7   | GSM850 Voice + WIFI  |
| 8   | GSM1900 Voice + WIFI |
| 9   | GSM850 GPRS + WIFI   |
| 10  | GSM1900 GPRS + WIFI  |
| 11  | W-CDMA Band V+ WIFI  |
| 12  | W-CDMA Band II+ WIFI |

#### Notes:

1. WiFi 2.4 GHz and BT cannot transmit simultaneously

## 8. Summary of Test Configurations

Refer to section 17 for antenna location and separation distance

### 8.1. Head Exposure Condition for WWAN

| Test Configurations | SAR Required | Note                                                                                                                                      |
|---------------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Left Touch          | Yes          | EUT size and antenna location prevented testing on the head phantom. Testing was performed using the flat phantom according to KDB 648474 |
| Left Tilt (15°)     | Yes          |                                                                                                                                           |
| Right Touch         | Yes          |                                                                                                                                           |
| Right Tilt (15°)    | Yes          |                                                                                                                                           |

### 8.2. Head Exposure Condition for Wi-Fi

| Test Configurations | SAR Required | Note |
|---------------------|--------------|------|
| Left Touch          | Yes          |      |
| Left Tilt (15°)     | Yes          |      |
| Right Touch         | Yes          |      |
| Right Tilt (15°)    | Yes          |      |

### 8.3. Body Exposure Conditions for WWAN

| Test Configurations | Antenna-to-edge/surface | SAR Required | Note           |
|---------------------|-------------------------|--------------|----------------|
| Rear                | 20 mm                   | Yes          |                |
| Rear w/ Headset     | 20 mm                   | Yes          |                |
| Front               | 4 mm                    | No           | Not normal use |
| Edge 1              | 51 mm                   | No           | Not normal use |
| Edge 2              | 143 mm                  | No           | Not normal use |
| Edge 3              | 7 mm                    | Yes          |                |
| Edge 4              | 6 mm                    | No           | Not normal use |

### 8.4. Body Exposure Conditions for Wi-Fi

| Test Configurations | Antenna-to-edge/surface | SAR Required | Note                                         |
|---------------------|-------------------------|--------------|----------------------------------------------|
| Rear                | 20 mm                   | Yes          |                                              |
| Rear w/ Headset     | 20 mm                   | Yes          |                                              |
| Front               | 4 mm                    | No           | Not normal use                               |
| Edge 1              | 11 mm                   | No           | Not normal use                               |
| Edge 2              | 146 mm                  | No           | Not normal use                               |
| Edge 3              | 79 mm                   | No           | Antenna to user distance greater than 2.5 cm |
| Edge 4              | 7 mm                    | No           | Not normal use                               |

## 8.1. Head SAR

### Justification for using body phantom for measuring head SAR

Due to the size of the EUT and the position of the WWAN antenna it was impossible to get meaningful data for head SAR.

The following procedure was applied (KDB 648474 section on SAR Tests in Mouth and Jaw Regions of the SAM Phantom):

- EUT was positioned with its bottom edge positioned from the flat phantom with the same distance provided by the cheek touching position using SAM.
- The ear reference point (ERP, as defined for SAM) of the device should be positioned  $\frac{1}{2}$  cm from the flat phantom shell.
- The lower half of the EUT is secured in the test device holder at a fixed distance below the flat phantom determined by the minimum separation along the lower edge of the EUT in the cheek touching position using SAM.

The EUT protruded too far from the SAM to allow measurement from its bottom edge. The separation distance from the antenna to the phantom was used as a reference. This resulted in the antenna being closer to the phantom when the EUT was mounted on the left. Therefore the left head distance was used as the most conservative.

See section 18 Setup Photos for details on device positioning and photographs showing how separation distances are determined.

The following head SAR plot is provided to show the difficulties associated with using the SAM for measuring head SAR with this EUT.

## GSM 1900

Frequency: 1880 MHz; Duty Cycle: 1:8.00018; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.403$  mho/m;  $\epsilon_r = 40.413$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1239; Calibrated: 6/6/2012
- Probe: EX3DV4 - SN3751; ConvF(7.33, 7.33, 7.33); Calibrated: 12/19/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM; Type: QD000P40CD; Serial: 1632

**LHS/Touch\_GSMK\_ch 661/Area Scan (11x12x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (measured) = 0.129 mW/g

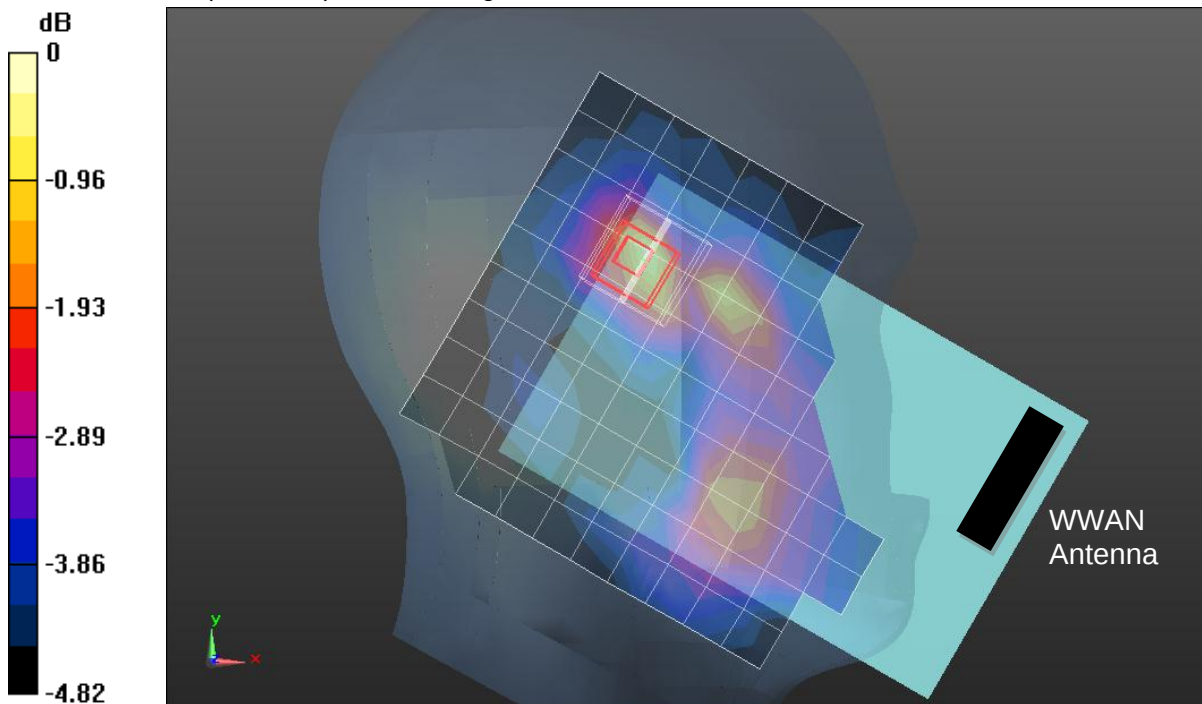
**LHS/Touch\_GSMK\_ch 661/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 9.806 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 0.1820

**SAR(1 g) = 0.118 mW/g; SAR(10 g) = 0.081 mW/g**

Maximum value of SAR (measured) = 0.138 mW/g



0 dB = 0.140mW/g = -17.08 dB mW/g

## 9. RF Output Power Measurement

### 9.1. GSM850

Target power

GMSK: 32.0 dBm. Tune-up Tolerance: -1 dB / +1 dB

8PSK: 27.0 dBm. Tune-up Tolerance: -1 dB / +1 dB

#### GMSK (Voice) Mode

| Band | Ch No. | Freq. (MHz) | Avg burst Pwr (dBm) |
|------|--------|-------------|---------------------|
| 850  | 128    | 824.2       | 32.9                |
|      | 190    | 836.6       | 32.9                |
|      | 251    | 848.8       | 32.7                |

#### GMSK (GPRS) Mode - Coding Scheme: CS1

| Band | Ch No. | Freq. (MHz) | Avg burst Pwr (dBm) |               |         |               | Avg burst Pwr (dBm) |               |         |               |
|------|--------|-------------|---------------------|---------------|---------|---------------|---------------------|---------------|---------|---------------|
|      |        |             | 1 slot              | Frame Avg Pwr | 2 slots | Frame Avg Pwr | 3 slots             | Frame Avg Pwr | 4 slots | Frame Avg Pwr |
| 850  | 128    | 824.2       | 32.7                | 23.7          | 32.3    | 26.3          | 32.2                | 27.9          | 32.1    | 29.1          |
|      | 190    | 836.6       | 32.8                | 23.8          | 32.4    | 26.4          | 32.7                | 28.4          | 32.7    | 29.7          |
|      | 251    | 848.8       | 32.7                | 23.7          | 32.4    | 26.4          | 32.4                | 28.1          | 32.2    | 29.2          |

#### EGPRS (8PSK) - Coding Scheme: MCS5

| Band | Ch No. | Freq (MHz) | Avg burst Pwr (dBm) |               |         |               | Avg burst Pwr (dBm) |               |         |               |
|------|--------|------------|---------------------|---------------|---------|---------------|---------------------|---------------|---------|---------------|
|      |        |            | 1 slot              | Frame Avg Pwr | 2 slots | Frame Avg Pwr | 3 slots             | Frame Avg Pwr | 4 slots | Frame Avg Pwr |
| 850  | 128    | 824.2      | 27.6                | 18.6          | 27.5    | 21.5          | 27.3                | 23.0          | 27.0    | 24.0          |
|      | 190    | 836.6      | 27.6                | 18.6          | 27.5    | 21.5          | 27.1                | 22.8          | 27.0    | 24.0          |
|      | 251    | 848.8      | 27.4                | 18.4          | 27.3    | 21.3          | 27.1                | 22.8          | 26.8    | 23.8          |

#### Notes:

The worst-case configuration and mode for SAR testing is determined to be as follows:

- Head: GMSK Voice Mode
- Body: GMSK (GPRS) mode with 4 time slots, based on the output power measurements above
- SAR is not required for EGPRS (8PSK) Mode because its output power is less than that of GPRS Mode

## 9.2. GSM1900

Target Power

GMSK: 29.0 dBm. Tune-up Tolerance: -1 dB / +1 dB

8PSK: 26.0 dBm. Tune-up Tolerance: -1 dB / +1 dB

### GMSK (Voice) Mode

| Band | Ch No. | Freq. (MHz) | Avg burst Pwr (dBm) |
|------|--------|-------------|---------------------|
| 1900 | 512    | 1850.2      | 29.5                |
|      | 661    | 1880        | 30.0                |
|      | 810    | 1909.8      | 30.3                |

### GMSK (GPRS) Mode - Coding Scheme: CS1

| Band | Ch No. | Freq. (MHz) | Avg burst Pwr (dBm) |               |         |               | Avg burst Pwr (dBm) |               |         |               |
|------|--------|-------------|---------------------|---------------|---------|---------------|---------------------|---------------|---------|---------------|
|      |        |             | 1 slot              | Frame Avg Pwr | 2 slots | Frame Avg Pwr | 3 slots             | Frame Avg Pwr | 4 slots | Frame Avg Pwr |
| 1900 | 512    | 1850.2      | 28.7                | 19.7          | 28.8    | 22.8          | 28.8                | 24.5          | 29.4    | 26.4          |
|      | 661    | 1880        | 28.8                | 19.8          | 29.3    | 23.3          | 29.2                | 24.9          | 29.7    | 26.7          |
|      | 810    | 1909.8      | 29.0                | 20.0          | 29.7    | 23.7          | 29.5                | 25.2          | 29.4    | 26.4          |

### EGPRS (8PSK) - Coding Scheme: MCS5

| Band | Ch No. | f (MHz) | Avg burst Pwr (dBm) |               |         |               | Avg burst Pwr (dBm) |               |         |               |
|------|--------|---------|---------------------|---------------|---------|---------------|---------------------|---------------|---------|---------------|
|      |        |         | 1 slot              | Frame Avg Pwr | 2 slots | Frame Avg Pwr | 3 slots             | Frame Avg Pwr | 4 slots | Frame Avg Pwr |
| 1900 | 512    | 1850.2  | 25.5                | 16.5          | 26.0    | 20.0          | 25.9                | 21.6          | 25.9    | 22.9          |
|      | 661    | 1880.0  | 25.8                | 16.8          | 26.3    | 20.3          | 26.2                | 21.9          | 26.2    | 23.2          |
|      | 810    | 1909.8  | 26.1                | 17.1          | 26.6    | 20.6          | 26.5                | 22.2          | 26.4    | 23.4          |

### Notes:

The worst-case configuration and mode for SAR testing is determined to be as follows:

- Head: GMSK Voice Mode
- Body: GMSK (GPRS) mode with 4 time slots, based on the output power measurements above
- SAR is not required for EGPRS (8PSK) Mode because its output power is less than that of GPRS Mode

### 9.3. W-CDMA (UMTS) Band V

Target Power: 22.0 dBm

Tune-up Tolerance: -1 dB / +2 dB

#### Release 99 (RMC, 12.2kbps)

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 specification. The DUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7).

| Mode                   | Subtest                 | Rel99        |
|------------------------|-------------------------|--------------|
| WCDMA General Settings | Loopback Mode           | Test Mode 1  |
|                        | Rel99 RMC               | 12.2kbps RMC |
|                        | Power Control Algorithm | Algorithm2   |
|                        | $\beta_c/\beta_d$       | 8/15         |

#### Output power table

| Band         | Ch No. | Freq. (MHz) | Measured Avg. Power (dBm) |
|--------------|--------|-------------|---------------------------|
| 850 (Band V) | 4132   | 826.4       | 21.05                     |
|              | 4183   | 836.6       | 21.13                     |
|              | 4233   | 846.6       | 21.08                     |

### **HSPA (HSDPA & HSUPA)**

The following 5 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

|                               | Mode                                 | HSPA                                                                                                                                         | HSPA  | HSPA                                                  | HSPA  | HSPA                                                                                                                                         |
|-------------------------------|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------------------------------------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------------|
|                               | Subtest                              | 1                                                                                                                                            | 2     | 3                                                     | 4     | 5                                                                                                                                            |
| W-CDMA<br>General<br>Settings | Loopback Mode                        | Test Mode 1                                                                                                                                  |       |                                                       |       |                                                                                                                                              |
|                               | Rel99 RMC                            | 12.2kbps RMC                                                                                                                                 |       |                                                       |       |                                                                                                                                              |
|                               | HSDPA FRC                            | H-Set1                                                                                                                                       |       |                                                       |       |                                                                                                                                              |
|                               | HSUPA Test                           | HSUPA Loopback                                                                                                                               |       |                                                       |       |                                                                                                                                              |
|                               | Power Control Algorithm              | Algorithm2                                                                                                                                   |       |                                                       |       |                                                                                                                                              |
|                               | $\beta_c$                            | 11/15                                                                                                                                        | 6/15  | 15/15                                                 | 2/15  | 15/15                                                                                                                                        |
|                               | $\beta_d$                            | 15/15                                                                                                                                        | 15/15 | 9/15                                                  | 15/15 | 15/15                                                                                                                                        |
|                               | $\beta_{ec}$                         | 209/225                                                                                                                                      | 12/15 | 30/15                                                 | 2/15  | 24/15                                                                                                                                        |
|                               | $\beta_c/\beta_d$                    | 11/15                                                                                                                                        | 6/15  | 15/9                                                  | 2/15  | 15/15                                                                                                                                        |
|                               | $\beta_{hs}$                         | 22/15                                                                                                                                        | 12/15 | 30/15                                                 | 4/15  | 30/15                                                                                                                                        |
|                               | $\beta_{ed}$                         | 1309/225                                                                                                                                     | 94/75 | 47/15<br>47/15                                        | 56/75 | 134/15                                                                                                                                       |
|                               | CM (dB)                              | 1.0                                                                                                                                          | 3.0   | 2.0                                                   | 3.0   | 1.0                                                                                                                                          |
|                               | MPR (dB)                             | 0                                                                                                                                            | 2     | 1                                                     | 2     | 0                                                                                                                                            |
| HSDPA<br>Specific<br>Settings | DACK                                 | 8                                                                                                                                            |       |                                                       |       |                                                                                                                                              |
|                               | DNAK                                 | 8                                                                                                                                            |       |                                                       |       |                                                                                                                                              |
|                               | DCQI                                 | 8                                                                                                                                            |       |                                                       |       |                                                                                                                                              |
|                               | Ack-Nack repetition factor           | 3                                                                                                                                            |       |                                                       |       |                                                                                                                                              |
|                               | CQI Feedback (Table 5.2B.4)          | 4ms                                                                                                                                          |       |                                                       |       |                                                                                                                                              |
|                               | CQI Repetition Factor (Table 5.2B.4) | 2                                                                                                                                            |       |                                                       |       |                                                                                                                                              |
|                               | Ahs = $\beta_{hs}/\beta_c$           | 30/15                                                                                                                                        |       |                                                       |       |                                                                                                                                              |
| HSUPA<br>Specific<br>Settings | D E-DPCCH                            | 6                                                                                                                                            | 8     | 8                                                     | 5     | 7                                                                                                                                            |
|                               | DHARQ                                | 0                                                                                                                                            | 0     | 0                                                     | 0     | 0                                                                                                                                            |
|                               | AG Index                             | 20                                                                                                                                           | 12    | 15                                                    | 17    | 21                                                                                                                                           |
|                               | ETFCI (from 34.121 Table C.11.1.3)   | 75                                                                                                                                           | 67    | 92                                                    | 71    | 81                                                                                                                                           |
|                               | Associated Max UL Data Rate kbps     | 242.1                                                                                                                                        | 174.9 | 482.8                                                 | 205.8 | 308.9                                                                                                                                        |
|                               | Reference E_TFCIs                    | E-TFCI 11<br>E-TFCI PO 4<br>E-TFCI 67<br>E-TFCI PO 18<br>E-TFCI 71<br>E-TFCI PO 23<br>E-TFCI 75<br>E-TFCI PO 26<br>E-TFCI 81<br>E-TFCI PO 27 |       | E-TFCI 11<br>E-TFCI PO 4<br>E-TFCI 92<br>E-TFCI PO 18 |       | E-TFCI 11<br>E-TFCI PO 4<br>E-TFCI 67<br>E-TFCI PO 18<br>E-TFCI 71<br>E-TFCI PO 23<br>E-TFCI 75<br>E-TFCI PO 26<br>E-TFCI 81<br>E-TFCI PO 27 |
|                               |                                      |                                                                                                                                              |       |                                                       |       |                                                                                                                                              |
|                               |                                      |                                                                                                                                              |       |                                                       |       |                                                                                                                                              |
|                               |                                      |                                                                                                                                              |       |                                                       |       |                                                                                                                                              |
|                               |                                      |                                                                                                                                              |       |                                                       |       |                                                                                                                                              |

**Output power table**

| Band                 | Mode      | UL Ch No. | Freq. (MHz) | Target MPR | Avg Pwr (dBm) |
|----------------------|-----------|-----------|-------------|------------|---------------|
| W-CDMA (UMTS) Band V | Subtest 1 | 4132      | 826.4       | 0          | 19.11         |
|                      |           | 4183      | 836.6       | 0          | 19.25         |
|                      |           | 4233      | 846.6       | 0          | 19.11         |
|                      | Subtest 2 | 4132      | 826.4       | 2          | 19.21         |
|                      |           | 4183      | 836.6       | 2          | 19.47         |
|                      |           | 4233      | 846.6       | 2          | 19.12         |
|                      | Subtest 3 | 4132      | 826.4       | 1          | 19.25         |
|                      |           | 4183      | 836.6       | 1          | 19.57         |
|                      |           | 4233      | 846.6       | 1          | 19.02         |
|                      | Subtest 4 | 4132      | 826.4       | 1          | 19.15         |
|                      |           | 4183      | 836.6       | 1          | 19.35         |
|                      |           | 4233      | 846.6       | 1          | 19.02         |
|                      | Subtest 5 | 4132      | 826.4       | 0          | 19.12         |
|                      |           | 4183      | 836.6       | 0          | 19.54         |
|                      |           | 4233      | 846.6       | 0          | 19.03         |

**Note(s):**

KDB 941225 D01 – Body SAR is not required for handsets with HSPA capabilities when the maximum average output of each RF channel with HSUPA/HSDPA active is less than ¼ dB higher than that measured without HSUPA/HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2kbps RMC is ≤ 75% of the SAR limit.

## 9.4. W-CDMA (UMTS) Band II

Target Power: 22.0 dBm

Tune-up Tolerance: -1 dB / +2 dB

### Release 99 (RMC, 12.2kbps)

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 specification. The DUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7).

| Mode                   | Subtest                 | Rel99        |
|------------------------|-------------------------|--------------|
| WCDMA General Settings | Loopback Mode           | Test Mode 1  |
|                        | Rel99 RMC               | 12.2kbps RMC |
|                        | Power Control Algorithm | Algorithm2   |
|                        | $\beta_c/\beta_d$       | 8/15         |

### Output power table

| Band           | Ch No. | Freq. (MHz) | Measured Avg. Power (dBm) |
|----------------|--------|-------------|---------------------------|
| 1900 (Band II) | 9262   | 1852.4      | 22.1                      |
|                | 9400   | 1880.0      | 22.0                      |
|                | 9538   | 1907.6      | 22.4                      |

### **HSPA (HSDPA & HSUPA)**

The following 5 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

|                               | Mode                                 | HSPA                                                                                                                                         | HSPA  | HSPA                                                  | HSPA  | HSPA                                                                                                                                         |
|-------------------------------|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------------------------------------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------------|
|                               | Subtest                              | 1                                                                                                                                            | 2     | 3                                                     | 4     | 5                                                                                                                                            |
| W-CDMA<br>General<br>Settings | Loopback Mode                        | Test Mode 1                                                                                                                                  |       |                                                       |       |                                                                                                                                              |
|                               | Rel99 RMC                            | 12.2kbps RMC                                                                                                                                 |       |                                                       |       |                                                                                                                                              |
|                               | HSDPA FRC                            | H-Set1                                                                                                                                       |       |                                                       |       |                                                                                                                                              |
|                               | HSUPA Test                           | HSUPA Loopback                                                                                                                               |       |                                                       |       |                                                                                                                                              |
|                               | Power Control Algorithm              | Algorithm2                                                                                                                                   |       |                                                       |       |                                                                                                                                              |
|                               | $\beta_c$                            | 11/15                                                                                                                                        | 6/15  | 15/15                                                 | 2/15  | 15/15                                                                                                                                        |
|                               | $\beta_d$                            | 15/15                                                                                                                                        | 15/15 | 9/15                                                  | 15/15 | 15/15                                                                                                                                        |
|                               | $\beta_{ec}$                         | 209/225                                                                                                                                      | 12/15 | 30/15                                                 | 2/15  | 24/15                                                                                                                                        |
|                               | $\beta_c/\beta_d$                    | 11/15                                                                                                                                        | 6/15  | 15/9                                                  | 2/15  | 15/15                                                                                                                                        |
|                               | $\beta_{hs}$                         | 22/15                                                                                                                                        | 12/15 | 30/15                                                 | 4/15  | 30/15                                                                                                                                        |
|                               | $\beta_{ed}$                         | 1309/225                                                                                                                                     | 94/75 | 47/15<br>47/15                                        | 56/75 | 134/15                                                                                                                                       |
|                               | CM (dB)                              | 1.0                                                                                                                                          | 3.0   | 2.0                                                   | 3.0   | 1.0                                                                                                                                          |
|                               | MPR (dB)                             | 0                                                                                                                                            | 2     | 1                                                     | 2     | 0                                                                                                                                            |
| HSDPA<br>Specific<br>Settings | DACK                                 | 8                                                                                                                                            |       |                                                       |       |                                                                                                                                              |
|                               | DNAK                                 | 8                                                                                                                                            |       |                                                       |       |                                                                                                                                              |
|                               | DCQI                                 | 8                                                                                                                                            |       |                                                       |       |                                                                                                                                              |
|                               | Ack-Nack repetition factor           | 3                                                                                                                                            |       |                                                       |       |                                                                                                                                              |
|                               | CQI Feedback (Table 5.2B.4)          | 4ms                                                                                                                                          |       |                                                       |       |                                                                                                                                              |
|                               | CQI Repetition Factor (Table 5.2B.4) | 2                                                                                                                                            |       |                                                       |       |                                                                                                                                              |
|                               | Ahs = $\beta_{hs}/\beta_c$           | 30/15                                                                                                                                        |       |                                                       |       |                                                                                                                                              |
| HSUPA<br>Specific<br>Settings | D E-DPCCH                            | 6                                                                                                                                            | 8     | 8                                                     | 5     | 7                                                                                                                                            |
|                               | DHARQ                                | 0                                                                                                                                            | 0     | 0                                                     | 0     | 0                                                                                                                                            |
|                               | AG Index                             | 20                                                                                                                                           | 12    | 15                                                    | 17    | 21                                                                                                                                           |
|                               | ETFCI (from 34.121 Table C.11.1.3)   | 75                                                                                                                                           | 67    | 92                                                    | 71    | 81                                                                                                                                           |
|                               | Associated Max UL Data Rate kbps     | 242.1                                                                                                                                        | 174.9 | 482.8                                                 | 205.8 | 308.9                                                                                                                                        |
|                               | Reference E_TFCIs                    | E-TFCI 11<br>E-TFCI PO 4<br>E-TFCI 67<br>E-TFCI PO 18<br>E-TFCI 71<br>E-TFCI PO 23<br>E-TFCI 75<br>E-TFCI PO 26<br>E-TFCI 81<br>E-TFCI PO 27 |       | E-TFCI 11<br>E-TFCI PO 4<br>E-TFCI 92<br>E-TFCI PO 18 |       | E-TFCI 11<br>E-TFCI PO 4<br>E-TFCI 67<br>E-TFCI PO 18<br>E-TFCI 71<br>E-TFCI PO 23<br>E-TFCI 75<br>E-TFCI PO 26<br>E-TFCI 81<br>E-TFCI PO 27 |
|                               |                                      |                                                                                                                                              |       |                                                       |       |                                                                                                                                              |
|                               |                                      |                                                                                                                                              |       |                                                       |       |                                                                                                                                              |
|                               |                                      |                                                                                                                                              |       |                                                       |       |                                                                                                                                              |
|                               |                                      |                                                                                                                                              |       |                                                       |       |                                                                                                                                              |

**Output power table**

| Band                  | Mode      | UL Ch No. | Freq. (MHz) | Target MPR | Avg Pwr (dBm) |
|-----------------------|-----------|-----------|-------------|------------|---------------|
| W-CDMA (UMTS) Band II | Subtest 1 | 9262      | 1852.4      | 0          | 20.63         |
|                       |           | 9400      | 1880.0      | 0          | 20.57         |
|                       |           | 9538      | 1907.6      | 0          | 20.87         |
|                       | Subtest 2 | 9262      | 1852.4      | 2          | 20.50         |
|                       |           | 9400      | 1880.0      | 2          | 20.62         |
|                       |           | 9538      | 1907.6      | 2          | 20.66         |
|                       | Subtest 3 | 9262      | 1852.4      | 1          | 20.55         |
|                       |           | 9400      | 1880.0      | 1          | 20.62         |
|                       |           | 9538      | 1907.6      | 1          | 20.95         |
|                       | Subtest 4 | 9262      | 1852.4      | 1          | 20.45         |
|                       |           | 9400      | 1880.0      | 1          | 20.50         |
|                       |           | 9538      | 1907.6      | 1          | 20.63         |
|                       | Subtest 5 | 9262      | 1852.4      | 0          | 20.53         |
|                       |           | 9400      | 1880.0      | 0          | 20.39         |
|                       |           | 9538      | 1907.6      | 0          | 20.93         |

**Note(s):**

KDB 941225 D01 – Body SAR is not required for handsets with HSPA capabilities when the maximum average output of each RF channel with HSUPA/HSDPA active is less than ¼ dB higher than that measured without HSUPA/HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2kbps RMC is ≤ 75% of the SAR limit.

## 9.5. Wi-Fi (802.11bgn)

Required Test Channels per KDB 248227 D01

| Mode      | Band    | GHz   | Channel         | "Default Test Channels" |         |
|-----------|---------|-------|-----------------|-------------------------|---------|
|           |         |       |                 | 802.11b                 | 802.11g |
| 802.11b/g | 2.4 GHz | 2.412 | 1 <sup>#</sup>  | √                       | ▽       |
|           |         | 2.437 | 6               | √                       | ▽       |
|           |         | 2.462 | 11 <sup>#</sup> | √                       | ▽       |

Notes:

√ = "default test channels"

▽ = possible 802.11g channels with maximum average output  $\frac{1}{4}$  dB  $\geq$  the "default test channels"

<sup>#</sup> = when output power is reduced for channel 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested.

### Output power table

| Band (MHz) | Mode           | Ch # | Freq. (MHz) | Target Power (dBm) | Avg Pwr (dBm) |
|------------|----------------|------|-------------|--------------------|---------------|
| 2.4        | 802.11b        | 1    | 2412        | 15                 | 14.1          |
|            |                | 6    | 2437        | 15                 | 14.2          |
|            |                | 11   | 2462        | 15                 | 14.2          |
|            | 802.11g        | 1    | 2412        | 15                 | 14.3          |
|            |                | 6    | 2437        | 15                 | 14.3          |
|            |                | 11   | 2462        | 15                 | 14.1          |
|            | 802.11n (HT20) | 1    | 2412        | 15                 | 14.2          |
|            |                | 6    | 2437        | 15                 | 14.1          |
|            |                | 11   | 2462        | 15                 | 13.9          |
|            | 802.11n (HT40) | 3    | 2422        | 10                 | 9.9           |
|            |                | 6    | 2437        | 10                 | 10.0          |
|            |                | 9    | 2452        | 10                 | 9.8           |

### Note(s):

- SAR is not required for 802.11g/n channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a/b channels. As per KDB 248227

## 9.6. Bluetooth

Version 2.1+EDR, Power class: 1 (100 mW/20 dBm)

| Mode | Channel # | Freq. (MHz) | Conducted Avg Power |      |
|------|-----------|-------------|---------------------|------|
|      |           |             | (dBm)               | (mW) |
| GFSK | 1         | 2402        | 7.95                | 6.24 |
|      | 40        | 2441        | 7.71                | 5.90 |
|      | 79        | 2480        | 7.35                | 5.43 |

### Note(s):

According to KDB 648474, Table 2, Unlicensed transmitters

When there is simultaneous transmission, Stand-alone SAR not required due to

- ☒ Output  $\leq 2 \cdot P_{\text{Ref}}$  (13.8dBm / 24 mW) and antenna is  $\geq 5.0$  cm from other antennas
- ☐ Output  $\leq P_{\text{Ref}}$  (10.79dBm / 12 mW) and antenna is  $\geq 2.5$  cm from other antennas
- ☐ Output  $\leq P_{\text{Ref}}$  (10.79dBm / 12 mW) and antenna is  $< 2.5$  cm from other antennas

## 10. Tissue Dielectric Properties

IEEE Std 1528-2003, IEEE Std 1528a-2005 Table 2

| Target Frequency (MHz) | Head         |                |
|------------------------|--------------|----------------|
|                        | $\epsilon_r$ | $\sigma$ (S/m) |
| 300                    | 45.3         | 0.87           |
| 450                    | 43.5         | 0.87           |
| 835                    | 41.5         | 0.90           |
| 900                    | 41.5         | 0.97           |
| 1450                   | 40.5         | 1.20           |
| 1800 – 2000            | 40.0         | 1.40           |
| 2450                   | 39.2         | 1.80           |
| 2600                   | 39.0         | 1.96           |
| 3000                   | 38.5         | 2.40           |

FCC OET Bulletin 65 Supplement C 01-01

| Target Frequency (MHz) | Head         |                | Body         |                |
|------------------------|--------------|----------------|--------------|----------------|
|                        | $\epsilon_r$ | $\sigma$ (S/m) | $\epsilon_r$ | $\sigma$ (S/m) |
| 150                    | 52.3         | 0.76           | 61.9         | 0.80           |
| 300                    | 45.3         | 0.87           | 58.2         | 0.92           |
| 450                    | 43.5         | 0.87           | 56.7         | 0.94           |
| 835                    | 41.5         | 0.90           | 55.2         | 0.97           |
| 900                    | 41.5         | 0.97           | 55.0         | 1.05           |
| 915                    | 41.5         | 0.98           | 55.0         | 1.06           |
| 1450                   | 40.5         | 1.20           | 54.0         | 1.30           |
| 1610                   | 40.3         | 1.29           | 53.8         | 1.40           |
| 1800 – 2000            | 40.0         | 1.40           | 53.3         | 1.52           |
| 2450                   | 39.2         | 1.80           | 52.7         | 1.95           |
| 3000                   | 38.5         | 2.40           | 52.0         | 2.73           |
| 5000                   | 36.2         | 4.45           | 49.3         | 5.07           |
| 5100                   | 36.1         | 4.55           | 49.1         | 5.18           |
| 5200                   | 36.0         | 4.66           | 49.0         | 5.30           |
| 5300                   | 35.9         | 4.76           | 48.9         | 5.42           |
| 5400                   | 35.8         | 4.86           | 48.7         | 5.53           |
| 5500                   | 35.6         | 4.96           | 48.6         | 5.65           |
| 5600                   | 35.5         | 5.07           | 48.5         | 5.77           |
| 5700                   | 35.4         | 5.17           | 48.3         | 5.88           |
| 5800                   | 35.3         | 5.27           | 48.2         | 6.00           |

## 10.1. Composition of Ingredients for the Tissue Material Used in the SAR Tests

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

| Ingredients<br>(% by weight) | Frequency (MHz) |       |       |      |       |       |       |      |      |      |
|------------------------------|-----------------|-------|-------|------|-------|-------|-------|------|------|------|
|                              | 450             |       | 835   |      | 915   |       | 1900  |      | 2450 |      |
| Tissue Type                  | Head            | Body  | Head  | Body | Head  | Body  | Head  | Body | Head | Body |
| Water                        | 38.56           | 51.16 | 41.45 | 52.4 | 41.05 | 56.0  | 54.9  | 40.4 | 62.7 | 73.2 |
| Salt (NaCl)                  | 3.95            | 1.49  | 1.45  | 1.4  | 1.35  | 0.76  | 0.18  | 0.5  | 0.5  | 0.04 |
| Sugar                        | 56.32           | 46.78 | 56.0  | 45.0 | 56.5  | 41.76 | 0.0   | 58.0 | 0.0  | 0.0  |
| HEC                          | 0.98            | 0.52  | 1.0   | 1.0  | 1.0   | 1.21  | 0.0   | 1.0  | 0.0  | 0.0  |
| Bactericide                  | 0.19            | 0.05  | 0.1   | 0.1  | 0.1   | 0.27  | 0.0   | 0.1  | 0.0  | 0.0  |
| Triton X-100                 | 0.0             | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0  | 36.8 | 0.0  |
| DGBE                         | 0.0             | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 44.92 | 0.0  | 0.0  | 26.7 |
| Dielectric Constant          | 43.42           | 58.0  | 42.54 | 56.1 | 42.0  | 56.8  | 39.9  | 54.0 | 39.8 | 52.5 |
| Conductivity (S/m)           | 0.85            | 0.83  | 0.91  | 0.95 | 1.0   | 1.07  | 1.42  | 1.45 | 1.88 | 1.78 |

Salt: 99+% Pure Sodium Chloride

Sugar: 98+% Pure Sucrose

Water: De-ionized, 16 MΩ+ resistivity

HEC: Hydroxyethyl Cellulose

DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]

Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

## 10.2. Tissue Dielectric Parameter Check Results

Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

| Date       | Freq. (MHz) | Liquid Parameters |         |                                         | Measured | Target | Delta (%) | Limit ±(%) |
|------------|-------------|-------------------|---------|-----------------------------------------|----------|--------|-----------|------------|
| 06/15/2012 | Body 2450   | e'                | 51.7172 | Relative Permittivity ( $\epsilon_r$ ): | 51.72    | 52.70  | -1.86     | 5          |
|            |             | e''               | 14.7504 | Conductivity ( $\sigma$ ):              | 2.01     | 1.95   | 3.05      | 5          |
|            | Body 2410   | e'                | 51.8606 | Relative Permittivity ( $\epsilon_r$ ): | 51.86    | 52.76  | -1.70     | 5          |
|            |             | e''               | 14.5588 | Conductivity ( $\sigma$ ):              | 1.95     | 1.91   | 2.28      | 5          |
|            | Body 2435   | e'                | 51.7562 | Relative Permittivity ( $\epsilon_r$ ): | 51.76    | 52.73  | -1.84     | 5          |
|            |             | e''               | 14.6772 | Conductivity ( $\sigma$ ):              | 1.99     | 1.93   | 2.91      | 5          |
|            | Body 2475   | e'                | 51.6713 | Relative Permittivity ( $\epsilon_r$ ): | 51.67    | 52.67  | -1.89     | 5          |
|            |             | e''               | 14.8581 | Conductivity ( $\sigma$ ):              | 2.04     | 1.99   | 3.00      | 5          |
| 06/19/2012 | Body 835    | e'                | 54.2309 | Relative Permittivity ( $\epsilon_r$ ): | 54.23    | 55.20  | -1.76     | 5          |
|            |             | e''               | 21.3660 | Conductivity ( $\sigma$ ):              | 0.99     | 0.97   | 2.27      | 5          |
|            | Body 820    | e'                | 54.3739 | Relative Permittivity ( $\epsilon_r$ ): | 54.37    | 55.28  | -1.63     | 5          |
|            |             | e''               | 21.4326 | Conductivity ( $\sigma$ ):              | 0.98     | 0.97   | 0.90      | 5          |
|            | Body 850    | e'                | 54.0859 | Relative Permittivity ( $\epsilon_r$ ): | 54.09    | 55.16  | -1.94     | 5          |
|            |             | e''               | 21.2874 | Conductivity ( $\sigma$ ):              | 1.01     | 0.99   | 1.92      | 5          |
| 06/21/2012 | Body 835    | e'                | 53.3866 | Relative Permittivity ( $\epsilon_r$ ): | 53.39    | 55.20  | -3.29     | 5          |
|            |             | e''               | 21.0264 | Conductivity ( $\sigma$ ):              | 0.98     | 0.97   | 0.64      | 5          |
|            | Body 820    | e'                | 53.5366 | Relative Permittivity ( $\epsilon_r$ ): | 53.54    | 55.28  | -3.15     | 5          |
|            |             | e''               | 21.0933 | Conductivity ( $\sigma$ ):              | 0.96     | 0.97   | -0.69     | 5          |
|            | Body 850    | e'                | 53.2406 | Relative Permittivity ( $\epsilon_r$ ): | 53.24    | 55.16  | -3.47     | 5          |
|            |             | e''               | 20.9705 | Conductivity ( $\sigma$ ):              | 0.99     | 0.99   | 0.40      | 5          |
| 06/22/2012 | Head 835    | e'                | 42.2087 | Relative Permittivity ( $\epsilon_r$ ): | 42.21    | 41.50  | 1.71      | 5          |
|            |             | e''               | 18.9557 | Conductivity ( $\sigma$ ):              | 0.88     | 0.90   | -2.21     | 5          |
|            | Head 820    | e'                | 42.4128 | Relative Permittivity ( $\epsilon_r$ ): | 42.41    | 41.60  | 1.95      | 5          |
|            |             | e''               | 18.9904 | Conductivity ( $\sigma$ ):              | 0.87     | 0.90   | -3.63     | 5          |
|            | Head 850    | e'                | 42.0210 | Relative Permittivity ( $\epsilon_r$ ): | 42.02    | 41.50  | 1.26      | 5          |
|            |             | e''               | 18.9274 | Conductivity ( $\sigma$ ):              | 0.89     | 0.92   | -2.23     | 5          |
| 06/24/2012 | Head 1900   | e'                | 40.3270 | Relative Permittivity ( $\epsilon_r$ ): | 40.33    | 40.00  | 0.82      | 5          |
|            |             | e''               | 13.4688 | Conductivity ( $\sigma$ ):              | 1.42     | 1.40   | 1.64      | 5          |
|            | Head 1850   | e'                | 40.5511 | Relative Permittivity ( $\epsilon_r$ ): | 40.55    | 40.00  | 1.38      | 5          |
|            |             | e''               | 13.3175 | Conductivity ( $\sigma$ ):              | 1.37     | 1.40   | -2.15     | 5          |
|            | Head 1880   | e'                | 40.4134 | Relative Permittivity ( $\epsilon_r$ ): | 40.41    | 40.00  | 1.03      | 5          |
|            |             | e''               | 13.4100 | Conductivity ( $\sigma$ ):              | 1.40     | 1.40   | 0.13      | 5          |
|            | Head 1910   | e'                | 40.2808 | Relative Permittivity ( $\epsilon_r$ ): | 40.28    | 40.00  | 0.70      | 5          |
|            |             | e''               | 13.4972 | Conductivity ( $\sigma$ ):              | 1.43     | 1.40   | 2.39      | 5          |
| 06/24/2012 | Body 1900   | e'                | 53.7369 | Relative Permittivity ( $\epsilon_r$ ): | 53.74    | 53.30  | 0.82      | 5          |
|            |             | e''               | 14.2832 | Conductivity ( $\sigma$ ):              | 1.51     | 1.52   | -0.73     | 5          |
|            | Body 1850   | e'                | 53.9255 | Relative Permittivity ( $\epsilon_r$ ): | 53.93    | 53.30  | 1.17      | 5          |
|            |             | e''               | 14.1123 | Conductivity ( $\sigma$ ):              | 1.45     | 1.52   | -4.50     | 5          |
|            | Body 1880   | e'                | 53.8084 | Relative Permittivity ( $\epsilon_r$ ): | 53.81    | 53.30  | 0.95      | 5          |
|            |             | e''               | 14.2184 | Conductivity ( $\sigma$ ):              | 1.49     | 1.52   | -2.22     | 5          |
|            | Body 1910   | e'                | 53.6983 | Relative Permittivity ( $\epsilon_r$ ): | 53.70    | 53.30  | 0.75      | 5          |
|            |             | e''               | 14.3172 | Conductivity ( $\sigma$ ):              | 1.52     | 1.52   | 0.03      | 5          |

| Date      | Freq. (MHz) | Liquid Parameters |         |                                         | Measured | Target | Delta (%) | Limit ±(%) |
|-----------|-------------|-------------------|---------|-----------------------------------------|----------|--------|-----------|------------|
| 6/25/2012 | Head 2450   | e'                | 39.1827 | Relative Permittivity ( $\epsilon_r$ ): | 39.18    | 39.20  | -0.04     | 5          |
|           |             | e"                | 13.7452 | Conductivity ( $\sigma$ ):              | 1.87     | 1.80   | 4.03      | 5          |
|           | Head 2410   | e'                | 39.3034 | Relative Permittivity ( $\epsilon_r$ ): | 39.30    | 39.28  | 0.06      | 5          |
|           |             | e"                | 13.6374 | Conductivity ( $\sigma$ ):              | 1.83     | 1.76   | 3.81      | 5          |
|           | Head 2435   | e'                | 39.2374 | Relative Permittivity ( $\epsilon_r$ ): | 39.24    | 39.24  | 0.01      | 5          |
|           |             | e"                | 13.7115 | Conductivity ( $\sigma$ ):              | 1.86     | 1.78   | 4.15      | 5          |
|           | Head 2475   | e'                | 39.0521 | Relative Permittivity ( $\epsilon_r$ ): | 39.05    | 39.17  | -0.30     | 5          |
|           |             | e"                | 13.8145 | Conductivity ( $\sigma$ ):              | 1.90     | 1.83   | 4.06      | 5          |
| 6/26/2012 | Head 835    | e'                | 41.7712 | Relative Permittivity ( $\epsilon_r$ ): | 41.77    | 41.50  | 0.65      | 5          |
|           |             | e"                | 18.9069 | Conductivity ( $\sigma$ ):              | 0.88     | 0.90   | -2.46     | 5          |
|           | Head 820    | e'                | 41.9617 | Relative Permittivity ( $\epsilon_r$ ): | 41.96    | 41.60  | 0.86      | 5          |
|           |             | e"                | 18.9495 | Conductivity ( $\sigma$ ):              | 0.86     | 0.90   | -3.84     | 5          |
|           | Head 850    | e'                | 41.5877 | Relative Permittivity ( $\epsilon_r$ ): | 41.59    | 41.50  | 0.21      | 5          |
|           |             | e"                | 18.8769 | Conductivity ( $\sigma$ ):              | 0.89     | 0.92   | -2.49     | 5          |
| 7/8/2012  | Body 835    | e'                | 53.4220 | Relative Permittivity ( $\epsilon_r$ ): | 53.42    | 55.20  | -3.22     | 5          |
|           |             | e"                | 21.4210 | Conductivity ( $\sigma$ ):              | 0.99     | 0.97   | 2.53      | 5          |
|           | Body 820    | e'                | 53.7651 | Relative Permittivity ( $\epsilon_r$ ): | 53.77    | 55.28  | -2.73     | 5          |
|           |             | e"                | 21.4807 | Conductivity ( $\sigma$ ):              | 0.98     | 0.97   | 1.13      | 5          |
|           | Body 830    | e'                | 53.5086 | Relative Permittivity ( $\epsilon_r$ ): | 53.51    | 55.24  | -3.13     | 5          |
|           |             | e"                | 21.5346 | Conductivity ( $\sigma$ ):              | 0.99     | 0.97   | 2.54      | 5          |
|           | Body 850    | e'                | 53.4272 | Relative Permittivity ( $\epsilon_r$ ): | 53.43    | 55.16  | -3.14     | 5          |
|           |             | e"                | 21.4908 | Conductivity ( $\sigma$ ):              | 1.02     | 0.99   | 2.89      | 5          |
| 7/8/2012  | Head 835    | e'                | 41.5745 | Relative Permittivity ( $\epsilon_r$ ): | 41.57    | 41.50  | 0.18      | 5          |
|           |             | e"                | 19.0387 | Conductivity ( $\sigma$ ):              | 0.88     | 0.90   | -1.78     | 5          |
|           | Head 820    | e'                | 41.8995 | Relative Permittivity ( $\epsilon_r$ ): | 41.90    | 41.60  | 0.71      | 5          |
|           |             | e"                | 19.1107 | Conductivity ( $\sigma$ ):              | 0.87     | 0.90   | -3.02     | 5          |
|           | Head 850    | e'                | 41.4925 | Relative Permittivity ( $\epsilon_r$ ): | 41.49    | 41.50  | -0.02     | 5          |
|           |             | e"                | 19.1177 | Conductivity ( $\sigma$ ):              | 0.90     | 0.92   | -1.25     | 5          |
| 7/8/2012  | Body 1900   | e'                | 53.1222 | Relative Permittivity ( $\epsilon_r$ ): | 53.12    | 53.30  | -0.33     | 5          |
|           |             | e"                | 14.5716 | Conductivity ( $\sigma$ ):              | 1.54     | 1.52   | 1.28      | 5          |
|           | Body 1850   | e'                | 53.2586 | Relative Permittivity ( $\epsilon_r$ ): | 53.26    | 53.30  | -0.08     | 5          |
|           |             | e"                | 14.4880 | Conductivity ( $\sigma$ ):              | 1.49     | 1.52   | -1.95     | 5          |
|           | Body 1880   | e'                | 53.1709 | Relative Permittivity ( $\epsilon_r$ ): | 53.17    | 53.30  | -0.24     | 5          |
|           |             | e"                | 14.6267 | Conductivity ( $\sigma$ ):              | 1.53     | 1.52   | 0.59      | 5          |
|           | Body 1910   | e'                | 53.0988 | Relative Permittivity ( $\epsilon_r$ ): | 53.10    | 53.30  | -0.38     | 5          |
|           |             | e"                | 14.6867 | Conductivity ( $\sigma$ ):              | 1.56     | 1.52   | 2.62      | 5          |

## 11. System Performance Check

The system performance check is performed prior to any usage of the system in order to verify SAR system measurement accuracy. The system performance check verifies that the system operates within its specifications of  $\pm 10\%$ .

### 11.1. System Performance Check Measurement Conditions

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness:  $2.0 \pm 0.2$  mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.  
For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.
- Distance between probe sensors and phantom surface was set to 3 mm.  
For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was 100 mW.
- The results are normalized to 1 W input power.

### 11.2. Reference SAR Values for System Performance Check

The reference SAR values can be obtained from the calibration certificate of system validation dipoles

| System Dipole | Serial No. | Cal. Date | Freq. (MHz) | SAR Measured (mW/g) |       |       |
|---------------|------------|-----------|-------------|---------------------|-------|-------|
|               |            |           |             | 1g/10g              | Head  | Body  |
| D835V2        | 4d117      | 4/10/12   | 835         | 1g                  | 9.4   | 9.84  |
|               |            |           |             | 10g                 | 6.16  | 6.48  |
| D1900V2       | 5d140      | 4/12/12   | 1900        | 1g                  | 39.08 | 40.0  |
|               |            |           |             | 10g                 | 20.56 | 21.28 |
| D2450V2       | 748        | 2/7/12    | 2450        | 1g                  | 53.6  | 50.8  |
|               |            |           |             | 10g                 | 24.8  | 23.64 |

### 11.3. System Performance Check Results

| Date Tested | System Dipole |            | T.S. Liquid | SAR Measured (Normalized to 1 W) |       | Target (Ref. Value) | Delta (%) | Tolerance (%) |
|-------------|---------------|------------|-------------|----------------------------------|-------|---------------------|-----------|---------------|
|             | Type          | Serial No. |             |                                  |       |                     |           |               |
| 6/15/2012   | D2450V2       | 748        | Body        | 1g                               | 51.50 | 50.8                | 1.38      | ±10           |
|             |               |            |             | 10g                              | 24.00 | 23.64               | 1.52      |               |
| 6/20/2012   | D835V2        | 4d117      | Body        | 1g                               | 10.40 | 9.84                | 5.69      | ±10           |
|             |               |            |             | 10g                              | 6.84  | 6.48                | 5.56      |               |
| 6/21/2012   | D835V2        | 4d117      | Body        | 1g                               | 9.74  | 9.84                | -1.02     | ±10           |
|             |               |            |             | 10g                              | 6.40  | 6.48                | -1.23     |               |
| 6/22/2012   | D835V2        | 4d117      | Body        | 1g                               | 10.00 | 9.84                | 1.63      | ±10           |
|             |               |            |             | 10g                              | 6.61  | 6.48                | 2.01      |               |
| 6/22/2012   | D835V2        | 4d117      | Head        | 1g                               | 9.42  | 9.40                | 0.21      | ±10           |
|             |               |            |             | 10g                              | 6.18  | 6.16                | 0.32      |               |
| 6/24/2012   | D1900V2       | 5d140      | Head        | 1g                               | 36.40 | 39.08               | -6.86     | ±10           |
|             |               |            |             | 10g                              | 19.00 | 20.56               | -7.59     |               |
| 6/24/2012   | D1900V2       | 5d140      | Body        | 1g                               | 38.60 | 40.00               | -3.50     | ±10           |
|             |               |            |             | 10g                              | 20.03 | 21.28               | -5.87     |               |
| 6/25/2012   | D2450V2       | 748        | Head        | 1g                               | 56.4  | 53.6                | 5.22      | ±10           |
|             |               |            |             | 10g                              | 25.7  | 24.8                | 3.63      |               |
| 6/26/2012   | D835V2        | 4d117      | Head        | 1g                               | 9.45  | 9.4                 | 0.53      | ±10           |
|             |               |            |             | 10g                              | 6.21  | 6.16                | 0.81      |               |
| 7/8/2012    | D835V2        | 4d117      | Body        | 1g                               | 10.40 | 9.84                | 5.69      | ±10           |
|             |               |            |             | 10g                              | 6.84  | 6.48                | 5.56      |               |
| 7/8/2012    | D835V2        | 4d117      | Head        | 1g                               | 9.35  | 9.4                 | -0.53     | ±10           |
|             |               |            |             | 10g                              | 6.17  | 6.16                | 0.16      |               |
| 7/8/2012    | D1900V2       | 5d140      | Body        | 1g                               | 38.90 | 40.00               | -2.75     | ±10           |
|             |               |            |             | 10g                              | 20.30 | 21.28               | -4.61     |               |

## 12. SAR Test Results

### 12.1. GSM850

#### 12.1.1. Head SAR

| Test Position | Mode         | Ch #. | Freq. (MHz) | Avg Pwr (dBm) | SAR (mW/g)   |              | Note |
|---------------|--------------|-------|-------------|---------------|--------------|--------------|------|
|               |              |       |             |               | 1-g          | 10-g         |      |
| Left Touch    | GMSK (Voice) | 128   | 824.20      | 32.9          |              |              | 1    |
|               |              | 190   | 836.60      | 32.9          | 0.253        | 0.152        |      |
|               |              | 251   | 848.80      | 32.7          |              |              | 1    |
| Touch Flat    | GMSK (Voice) | 128   | 824.20      | 32.9          |              |              | 1    |
|               |              | 190   | 836.60      | 32.9          | <b>0.272</b> | <b>0.197</b> |      |
|               |              | 251   | 848.80      | 32.7          |              |              | 1    |

#### 12.1.2. Body SAR

| Test Position | Mode         | Dist. (mm) | Ch #. | Freq. (MHz) | Avg Pwr (dBm) | SAR (mW/g)   |              | Note |
|---------------|--------------|------------|-------|-------------|---------------|--------------|--------------|------|
|               |              |            |       |             |               | 1-g          | 10-g         |      |
| Rear          | GPRS 4 slots | 0          | 128   | 824.20      | 33.0          |              |              | 1    |
|               |              |            | 190   | 836.60      | 32.9          | 0.611        | 0.398        |      |
|               |              |            | 190   | 836.60      | 32.9          | <b>0.614</b> | <b>0.406</b> | 2    |
|               |              |            | 251   | 848.80      | 32.6          |              |              | 1    |
| Edge 3        | GPRS 4 slots | 0          | 128   | 824.20      | 33.0          |              |              | 1    |
|               |              |            | 190   | 836.60      | 32.9          | 0.366        | 0.228        |      |
|               |              |            | 251   | 848.80      | 32.6          |              |              | 1    |

#### Note(s):

1. SAR test was performed in the middle channel only as the measured level was < 50% of the SAR limit as stated in FCC "Public Notice DA 02-1438" by the SCC-34/SC-2. Testing in the low and high channel is optional.
2. With headset attached.
3. SAR is not required because the distance from the tested antenna to this edge is greater than 2.5 cm.

## 12.2. GSM1900

### 12.2.1. Head SAR

| Test Position | Mode         | Ch #. | Freq. (MHz) | Avg Pwr (dBm) | SAR (mW/g)   |              | Note |
|---------------|--------------|-------|-------------|---------------|--------------|--------------|------|
|               |              |       |             |               | 1-g          | 10-g         |      |
| Left Touch    | GMSK (Voice) | 512   | 1850.2      | 29.5          |              |              | 1    |
|               |              | 661   | 1880.0      | 30.0          | 0.118        | 0.081        |      |
|               |              | 810   | 1909.8      | 30.3          |              |              | 1    |
| Touch Flat    | GMSK (Voice) | 512   | 1850.2      | 29.5          |              |              | 1    |
|               |              | 661   | 1880.0      | 30.0          | <b>0.241</b> | <b>0.134</b> |      |
|               |              | 810   | 1909.8      | 30.3          |              |              | 1    |

### 12.2.2. Body SAR

| Test Position | Mode         | Dist. (mm) | Ch #. | Freq. (MHz) | Avg Pwr (dBm) | SAR (mW/g)   |              | Note |
|---------------|--------------|------------|-------|-------------|---------------|--------------|--------------|------|
|               |              |            |       |             |               | 1-g          | 10-g         |      |
| Rear          | GPRS 4 slots | 0          | 512   | 1850.2      | 29.4          |              |              | 1    |
|               |              |            | 661   | 1880.0      | 29.7          | 0.661        | 0.374        |      |
|               |              |            | 810   | 1909.8      | 29.4          |              |              | 1    |
|               |              |            | 661   | 1880.0      | 29.7          | 0.404        | 0.279        | 2    |
| Edge 3        | GPRS 4 slots | 0          | 512   | 1850.2      | 29.4          |              |              | 1    |
|               |              |            | 661   | 1880.0      | 29.7          | <b>0.794</b> | <b>0.463</b> |      |
|               |              |            | 810   | 1909.8      | 29.4          |              |              | 1    |

#### Note(s):

1. SAR test was performed in the middle channel only as the measured level was < 50% of the SAR limit as stated in FCC "Public Notice DA 02-1438" by the SCC-34/SC-2. Testing in the low and high channel is optional.
2. With headset attached.
3. SAR is not required because the distance from the tested antenna to this edge is greater than 2.5 cm.

## 12.3. WCDMA (UMTS) Band V

### Test mode reduction considerations

Body SAR is not required for handsets with HSPA capabilities when the maximum average output of each RF channel with HSUPA/HSDPA active is less than ¼ dB higher than that measured without HSUPA/HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2kbps RMC is ≤ 75% of the SAR limit as per KDB 941225 D01

#### 12.3.1. Head SAR

| Test Position | Mode                | Ch #. | Freq. (MHz) | Avg Pwr (dBm) | SAR (mW/g)   |              | Note |
|---------------|---------------------|-------|-------------|---------------|--------------|--------------|------|
|               |                     |       |             |               | 1-g          | 10-g         |      |
| Left Touch    | Rel 99 RMC 12.2kbps | 4132  | 826.4       | 21.05         |              |              | 1    |
|               |                     | 4183  | 836.6       | 21.13         | 0.140        | 0.108        |      |
|               |                     | 4233  | 846.6       | 21.08         |              |              | 1    |
| Touch Flat    | Rel 99 RMC 12.2kbps | 4132  | 826.4       | 21.05         |              |              | 1    |
|               |                     | 4183  | 836.6       | 21.13         | <b>0.395</b> | <b>0.249</b> |      |
|               |                     | 4233  | 846.6       | 21.08         |              |              | 1    |

#### 12.3.2. Body SAR

| Test Position | Mode                | Dist. (mm) | Ch #. | Freq. (MHz) | Avg Pwr (dBm) | SAR (mW/g)   |              | Note |
|---------------|---------------------|------------|-------|-------------|---------------|--------------|--------------|------|
|               |                     |            |       |             |               | 1-g          | 10-g         |      |
| Rear          | Rel 99 RMC 12.2Kbps | 0          | 4132  | 826.4       | 21.05         |              |              | 1    |
|               |                     |            | 4183  | 836.6       | 21.13         | 0.095        | 0.058        |      |
|               |                     |            | 4233  | 846.6       | 21.08         |              |              | 1    |
| Edge 3        | Rel 99 RMC 12.2Kbps | 0          | 4132  | 826.4       | 21.05         |              |              | 1    |
|               |                     |            | 4183  | 836.6       | 21.13         | 0.106        | 0.086        |      |
|               |                     |            | 4183  | 836.6       | 21.13         | <b>0.107</b> | <b>0.073</b> | 2    |
|               |                     |            | 4233  | 846.6       | 21.08         |              |              | 1    |

#### Note(s):

- SAR test was performed in the middle channel only as the measured level was < 50% of the SAR limit as stated in FCC "Public Notice DA 02-1438" by the SCC-34/SC-2. Testing in the low and high channel is optional.
- With headset attached.
- SAR is not required because the distance from the tested antenna to this edge is greater than 2.5 cm.

## 12.4. WCDMA (UMTS) Band II

### Test mode reduction considerations

Body SAR is not required for handsets with HSPA capabilities when the maximum average output of each RF channel with HSUPA/HSDPA active is less than ¼ dB higher than that measured without HSUPA/HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2kbps RMC is ≤ 75% of the SAR limit as per KDB 941225 D01

#### 12.4.1. Head SAR

| Test Position | Mode                | Ch #. | Freq. (MHz) | Avg Pwr (dBm) | SAR (mW/g)   |              | Note |
|---------------|---------------------|-------|-------------|---------------|--------------|--------------|------|
|               |                     |       |             |               | 1-g          | 10-g         |      |
| Left Touch    | Rel 99 RMC 12.2kbps | 9262  | 1852.4      | 22.1          |              |              | 1    |
|               |                     | 9400  | 1880.0      | 22.0          | 0.177        | 0.122        | 4    |
|               |                     | 9538  | 1907.6      | 22.4          |              |              | 1    |
| Touch Flat    | Rel 99 RMC 12.2kbps | 9262  | 1852.4      | 22.1          |              |              | 1    |
|               |                     | 9400  | 1880.0      | 22.0          | <b>0.431</b> | <b>0.243</b> |      |
|               |                     | 9538  | 1907.6      | 22.4          |              |              | 1    |

#### 12.4.2. Body SAR

| Test Position | Mode                | Dist. (mm) | Ch #. | Freq. (MHz) | Avg Pwr (dBm) | SAR (mW/g)   |              | Note |
|---------------|---------------------|------------|-------|-------------|---------------|--------------|--------------|------|
|               |                     |            |       |             |               | 1-g          | 10-g         |      |
| Rear          | Rel 99 RMC 12.2Kbps | 0          | 9262  | 1852.4      | 22.1          |              |              | 1    |
|               |                     |            | 9400  | 1880.0      | 22.0          | <b>0.469</b> | <b>0.274</b> |      |
|               |                     |            | 9400  | 1880.0      | 22.0          | 0.461        | 0.265        | 2    |
|               |                     |            | 9538  | 1907.6      | 22.4          |              |              | 1    |
| Edge 3        | Rel 99 RMC 12.2Kbps | 0          | 9262  | 1852.4      | 22.1          |              |              | 1    |
|               |                     |            | 9400  | 1880.0      | 22.0          | 0.294        | 0.158        |      |
|               |                     |            | 9538  | 1907.6      | 22.4          |              |              | 1    |

#### Note(s):

- SAR test was performed in the middle channel only as the measured level was < 50% of the SAR limit as stated in FCC "Public Notice DA 02-1438" by the SCC-34/SC-2. Testing in the low and high channel is optional.
- With headset attached.
- SAR is not required because the distance from the tested antenna to this edge is greater than 2.5 cm.
- A second Z Scan

## 12.5. Wi-Fi (2.4 GHz Band)

### 12.5.1. Head SAR

| Test Position | Mode    | Dist. (mm) | Ch #. | Freq. (MHz) | Avg Pwr (dBm) | SAR (mW/g)   |              | Note |
|---------------|---------|------------|-------|-------------|---------------|--------------|--------------|------|
|               |         |            |       |             |               | 1-g          | 10-g         |      |
| LHS Touch     | 802.11b | 0          | 1     | 2412        | 14.12         |              |              | 1    |
|               |         |            | 6     | 2437        | 14.20         | 0.210        | 0.178        |      |
|               |         |            | 11    | 2462        | 14.18         |              |              | 1    |
| LHS Tilt      | 802.11b | 0          | 1     | 2412        | 14.12         |              |              | 1    |
|               |         |            | 6     | 2437        | 14.20         | 0.171        | 0.114        |      |
|               |         |            | 11    | 2462        | 14.18         |              |              | 1    |
| RHS Touch     | 802.11b | 0          | 1     | 2412        | 14.12         |              |              | 1    |
|               |         |            | 6     | 2437        | 14.20         | <b>0.286</b> | <b>0.191</b> |      |
|               |         |            | 11    | 2462        | 14.18         |              |              | 1    |
| RHS Tilt      | 802.11b | 0          | 1     | 2412        | 14.12         |              |              | 1    |
|               |         |            | 6     | 2437        | 14.20         | 0.284        | 0.158        |      |
|               |         |            | 11    | 2462        | 14.18         |              |              | 1    |

#### Note(s):

- Testing was performed on the channel with the highest output power only as the SAR was  $\leq 0.8$  W/kg with the operating frequency band having a range of  $< 100$  MHz. Per KDB 447498 1) e) i)

### 12.5.2. Body SAR

| Test Position | Mode    | Dist. (mm) | Ch #. | Freq. (MHz) | Avg Pwr (dBm) | SAR (mW/g)   |       | Note |
|---------------|---------|------------|-------|-------------|---------------|--------------|-------|------|
|               |         |            |       |             |               | 1-g          | 10-g  |      |
| Rear          | 802.11b | 0          | 1     | 2412        | 14.12         |              |       | 1    |
|               |         |            | 6     | 2437        | 14.20         | <b>0.065</b> | 0.036 |      |
|               |         |            | 11    | 2462        | 14.18         |              |       | 1    |

#### Note(s):

- Testing was performed on the channel with the highest output power only as the SAR was  $\leq 0.8$  W/kg with the operating frequency band having a range of  $< 100$  MHz. Per KDB 447498 1) e) i)

### 13. Summary of Highest SAR Values

Results for highest SAR values for each frequency band and mode

| Technology/Band      | Test configuration |                  | Mode                    | Highest 1g SAR (W/kg) |
|----------------------|--------------------|------------------|-------------------------|-----------------------|
| GSM850               | Head               | Touch Flat       | GMSK (Voice)            | 0.272                 |
|                      | Body               | Rear             | GPRS (4 slots)          | 0.614                 |
| GSM1900              | Head               | Touch Flat       | GMSK (Voice)            | 0.241                 |
|                      | Body               | Edge 3           | GPRS (4 slots)          | 0.794                 |
| WCDMA (UMTS) band V  | Head               | Touch Flat       | Rel.99 (RMC, 12.2 kbps) | 0.395                 |
|                      | Body               | Edge 3 w/Headset | Rel.99 (RMC, 12.2 kbps) | 0.107                 |
| WCDMA (UMTS) band II | Head               | Touch Flat       | Rel.99 (RMC, 12.2 kbps) | 0.431                 |
|                      | Body               | Rear             | Rel.99 (RMC, 12.2 kbps) | 0.469                 |
| WiFi 2.4 GHz         | Head               | Right Touch      | 802.11b                 | 0.286                 |
| WiFi 2.4 GHz         | Body               | Rear             | 802.11b                 | 0.065                 |

### 13.1. Scaled SAR Values to the Maximum tune-up Tolerances

The following measured results were scaled to the maximum tune-up tolerance, according to the output power of the channel tested for the highest measured results in each frequency band.

| Test Configuration |             | Mode                  | Ch #. | Freq. (MHz) | Power (dBm)        |          | SAR (W/kg) |        |
|--------------------|-------------|-----------------------|-------|-------------|--------------------|----------|------------|--------|
|                    |             |                       |       |             | Max. tune-up limit | Measured | Measured   | Scaled |
| Head               | Touch Flat  | GSM850                | 190   | 836.60      | 33.0               | 32.90    | 0.272      | 0.278  |
| Body               | Rear        | GSM850 (GPRS 4 slot)  | 190   | 836.60      | 33.0               | 32.90    | 0.614      | 0.628  |
| Head               | Touch Flat  | GSM1900               | 661   | 1880.00     | 30.0               | 30.00    | 0.241      | 0.241  |
| Body               | Rear        | GSM1900 (GPRS 4 slot) | 661   | 1880.00     | 30.0               | 30.00    | 0.794      | 0.794  |
| Head               | Touch Flat  | W-CDMA BAND V         | 4183  | 836.60      | 24.0               | 21.13    | 0.395      | 0.765  |
| Body               | Edge 3      | W-CDMA BAND V         | 4183  | 836.60      | 24.0               | 21.13    | 0.107      | 0.207  |
| Head               | Touch Flat  | W-CDMA BAND II        | 9400  | 1880.00     | 24.0               | 22.00    | 0.431      | 0.683  |
| Body               | Rear        | W-CDMA BAND II        | 9400  | 1880.00     | 24.0               | 22.00    | 0.469      | 0.743  |
| Body               | Right Touch | 802.11b               | 6     | 2437.00     | 15.0               | 14.20    | 0.286      | 0.344  |
| Body               | Rear        | 802.11b               | 6     | 2437.00     | 15.0               | 14.20    | 0.065      | 0.078  |

## 13.2. SAR Plots (from Summary of Highest SAR Values)

Test Laboratory: UL CCS SAR Lab C

Date: 7/8/2012

### GSM850

Frequency: 836.6 MHz; Duty Cycle: 1:8.00018; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C  
Medium parameters used (interpolated):  $f = 836.6$  MHz;  $\sigma = 0.887$  mho/m;  $\epsilon_r = 41.608$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1239; Calibrated: 6/6/2012
- Probe: EX3DV4 - SN3751; ConvF(8.35, 8.35, 8.35); Calibrated: 12/19/2011;
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM; Type: QD000P40CD; Serial: 1632

**Head Flat/GMSK Voice/1slot\_Touch Flat\_ch 190/Area Scan (11x16x1):** Measurement grid:  
dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.308 mW/g

**Head Flat/GMSK Voice/1slot\_Touch Flat\_ch 190/Zoom Scan (5x5x7)/Cube 0:**

Measurement grid: dx=8mm, dy=8mm, dz=5mm

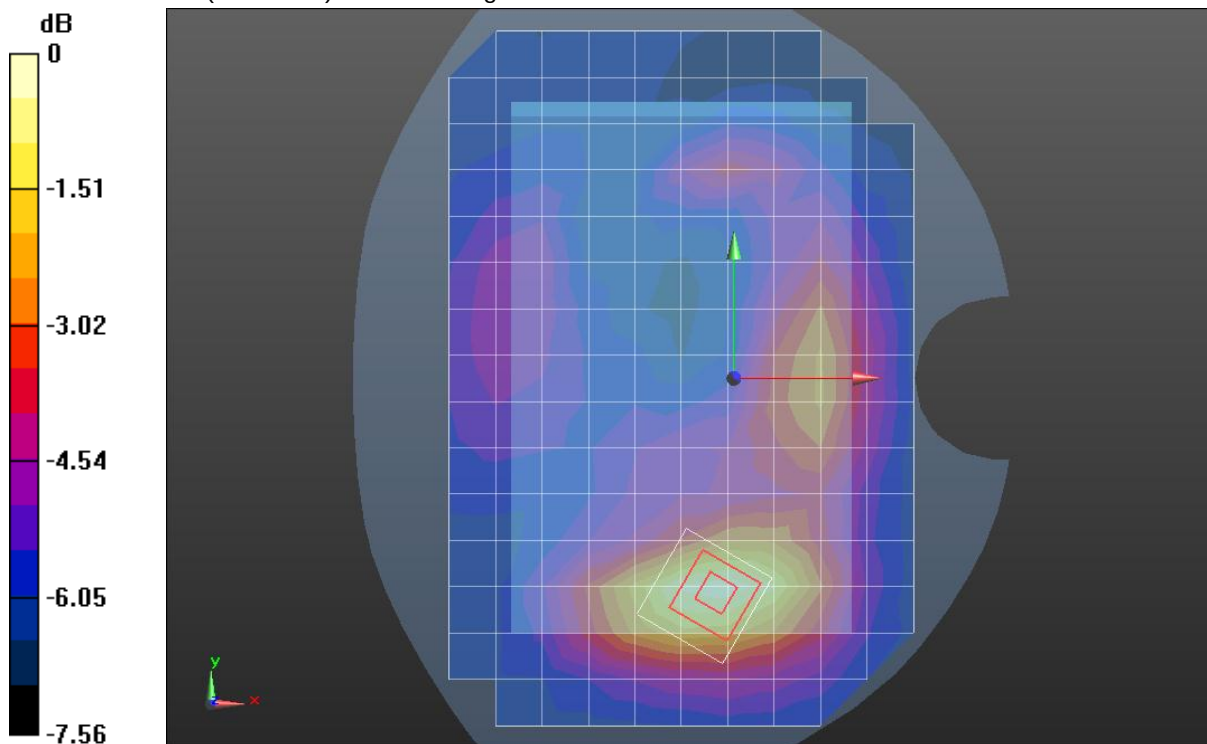
Reference Value = 19.050 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.385 mW/g

**SAR(1 g) = 0.272 mW/g; SAR(10 g) = 0.197 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.317 mW/g



0 dB = 0.317 mW/g = -9.98 dB mW/g

## GSM850

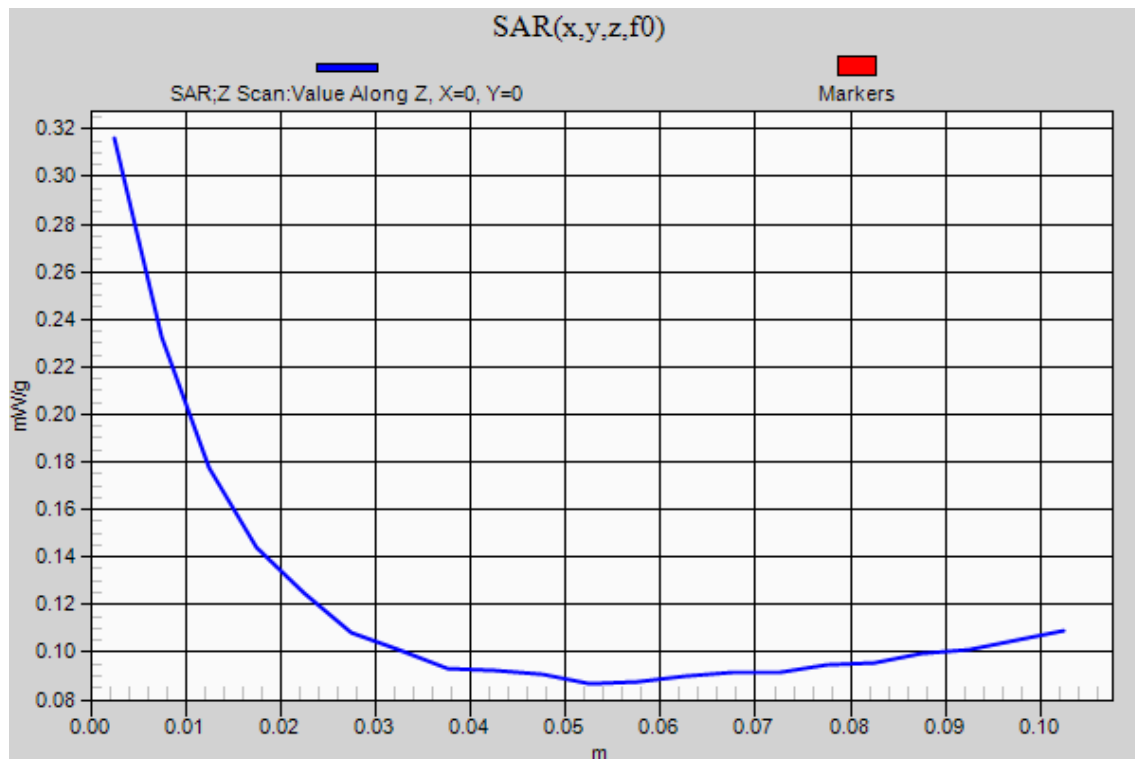
Frequency: 836.6 MHz; Duty Cycle: 1:8.00018

**Head Flat/GMSK Voice/1slot\_Touch Flat\_ch 190/Z Scan (1x1x21):** Measurement grid:

dx=20mm, dy=20mm, dz=5mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.316 mW/g



## GSM850

Frequency: 836.6 MHz; Duty Cycle: 1:1.99986; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C  
Medium parameters used (interpolated):  $f = 836.6$  MHz;  $\sigma = 0.999$  mho/m;  $\epsilon_r = 53.418$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1239; Calibrated: 6/6/2012
- Probe: EX3DV4 - SN3751; ConvF(8.64, 8.64, 8.64); Calibrated: 12/19/2011;
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (A); Type: QDOVA001BB; Serial: 1120

**Rear/GPRS\_Ch 190 4 slot w/Headset/Area Scan (12x16x1):** Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.702 mW/g

**Rear/GPRS\_Ch 190 4 slot w/Headset/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

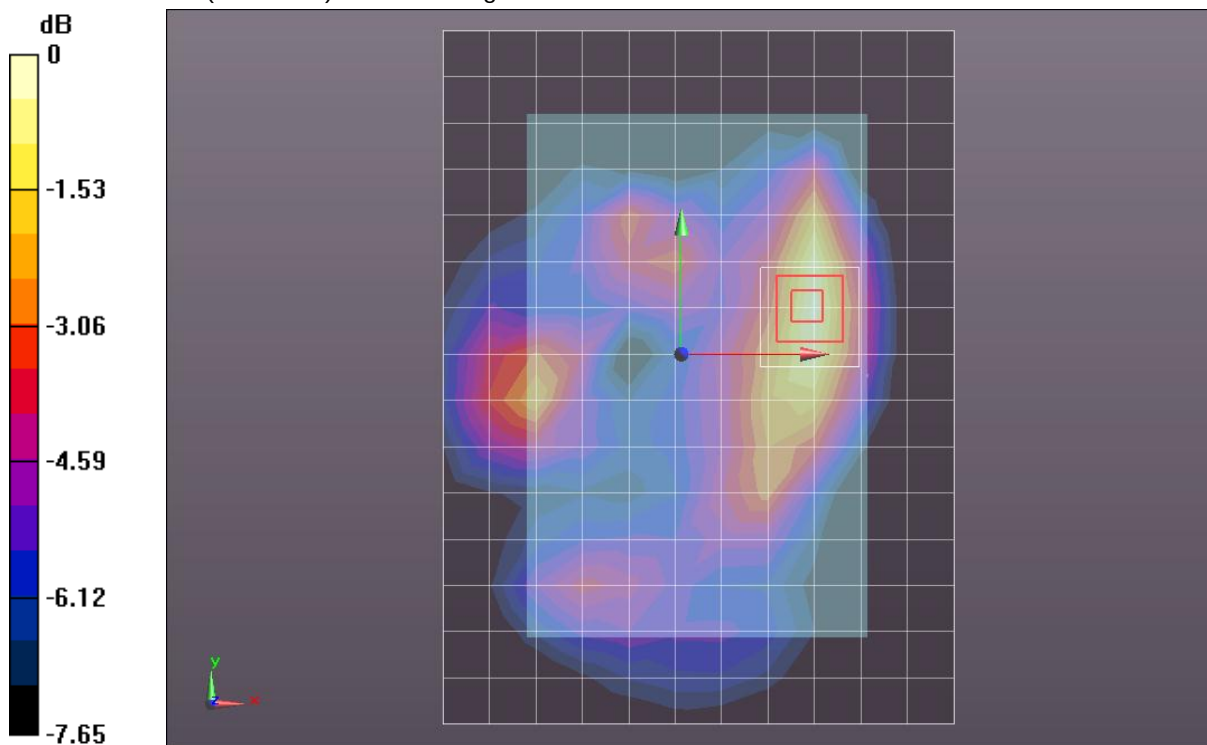
Reference Value = 27.446 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 0.955 mW/g

**SAR(1 g) = 0.614 mW/g; SAR(10 g) = 0.406 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.747 mW/g



0 dB = 0.747 mW/g = -2.53 dB mW/g

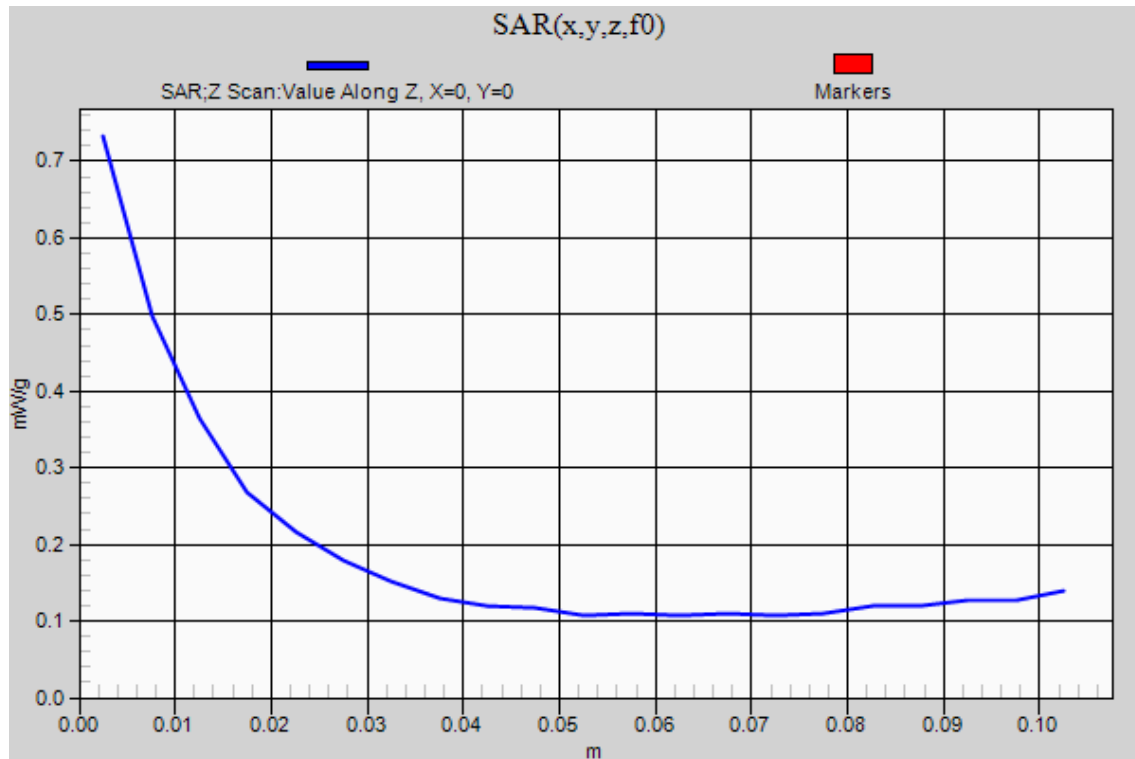
## GSM850

Frequency: 836.6 MHz; Duty Cycle: 1:1.99986

**Rear/GPRS\_Ch 190 4 slot w/Headset/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.733 mW/g



## GSM 1900

Frequency: 1880 MHz; Duty Cycle: 1:8.00018; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.403$  mho/m;  $\epsilon_r = 40.413$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1239; Calibrated: 6/6/2012
- Probe: EX3DV4 - SN3751; ConvF(7.33, 7.33, 7.33); Calibrated: 12/19/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM; Type: QD000P40CD; Serial: 1632

**Head Flat/Touch\_GMSK\_ch 661/Area Scan (11x16x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (measured) = 0.298 mW/g

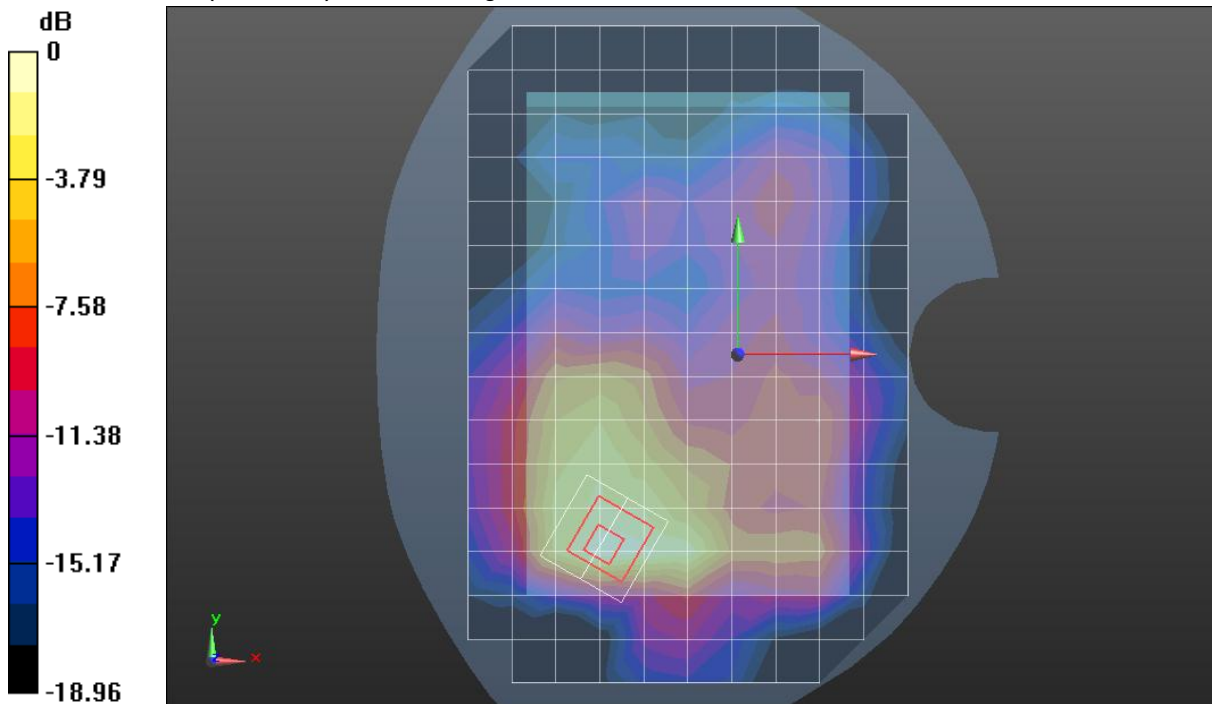
**Head Flat/Touch\_GMSK\_ch 661/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 14.728 V/m; Power Drift = 0.0079 dB

Peak SAR (extrapolated) = 0.3980

**SAR(1 g) = 0.241 mW/g; SAR(10 g) = 0.134 mW/g**

Maximum value of SAR (measured) = 0.297 mW/g



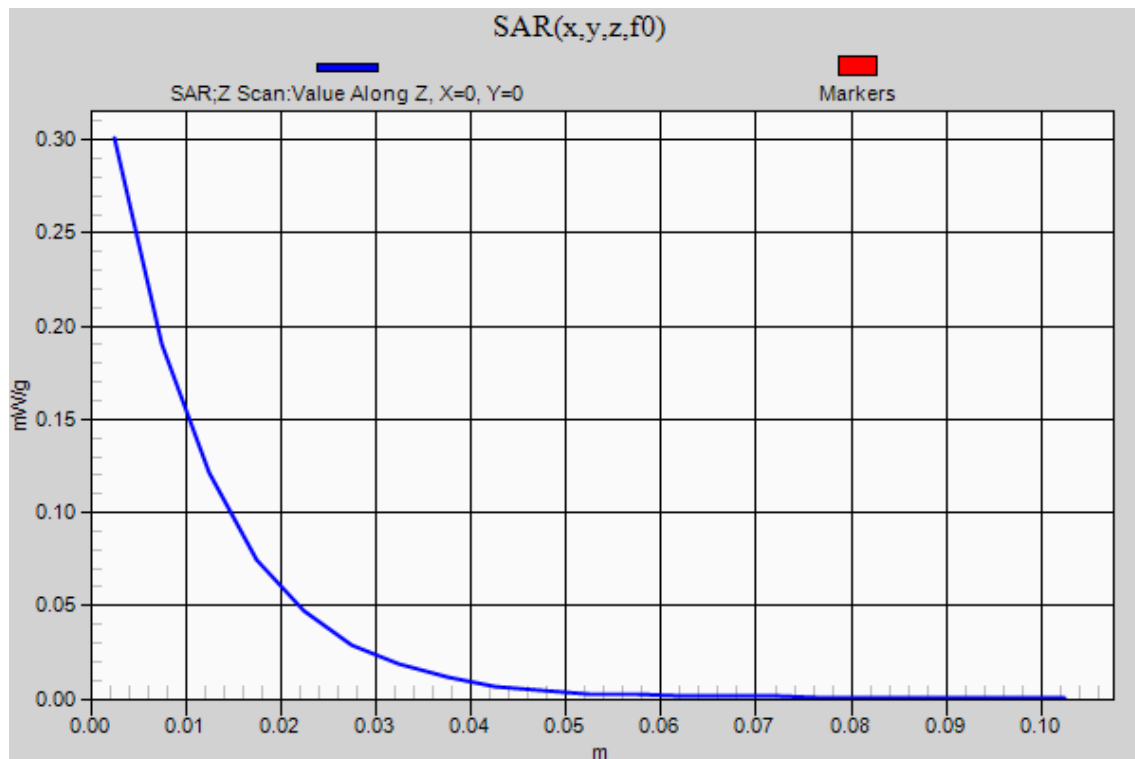
0 dB = 0.300mW/g = -10.46 dB mW/g

Test Laboratory: UL CCS SAR Lab C Date: 6/25/2012

## GSM 1900

Frequency: 1880 MHz; Duty Cycle: 1:8.00018

**Head/Touch/Flat\_GMSK Voice 1 slot\_ch 661/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm  
Maximum value of SAR (measured) = 0.301 mW/g



## GSM 1900

Frequency: 1880 MHz; Duty Cycle: 1:1.99986; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.53$  mho/m;  $\epsilon_r = 53.171$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1239; Calibrated: 6/6/2012
- Probe: EX3DV4 - SN3751; ConvF(6.83, 6.83, 6.83); Calibrated: 12/19/2011;
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (A); Type: QDOVA001BB; Serial: 1117

**Body/Edge 3\_GPRS 4 slots\_ch 661/Area Scan (7x16x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (measured) = 0.837 mW/g

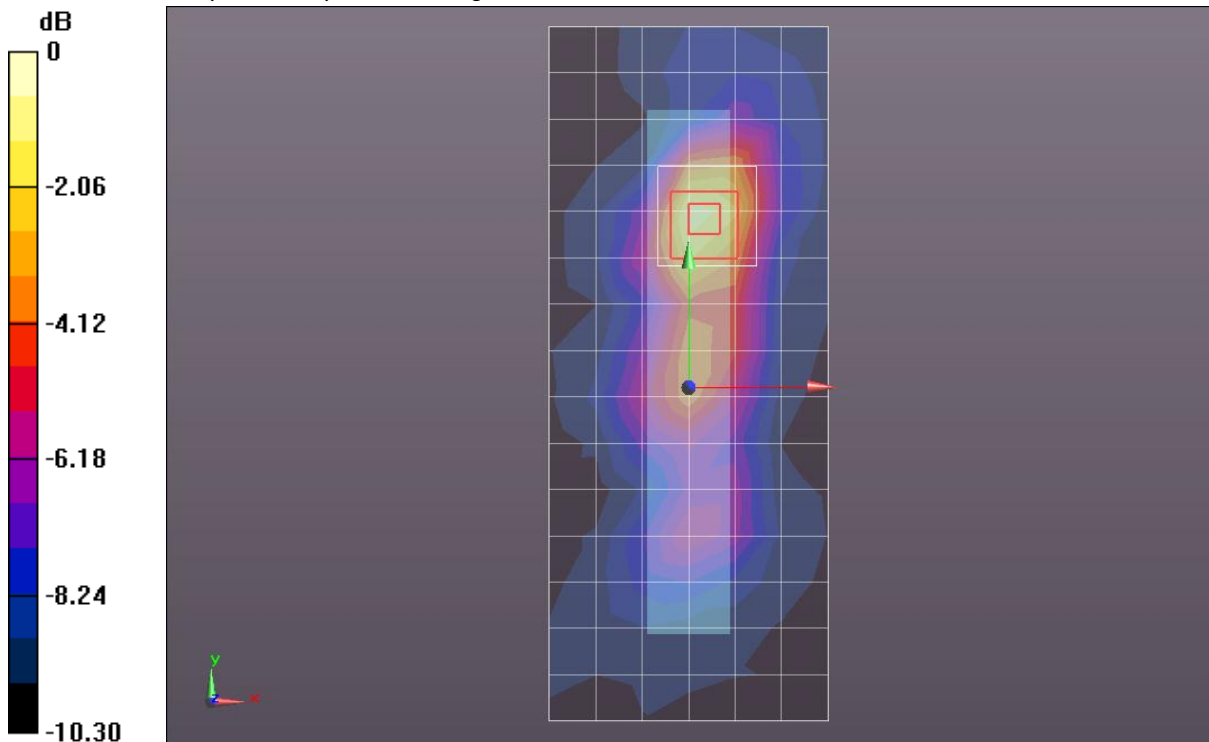
**Body/Edge 3\_GPRS 4 slots\_ch 661/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 23.503 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 1.352 mW/g

**SAR(1 g) = 0.794 mW/g; SAR(10 g) = 0.463 mW/g**

Maximum value of SAR (measured) = 1.01 mW/g



0 dB = 1.01 mW/g = 0.09 dB mW/g

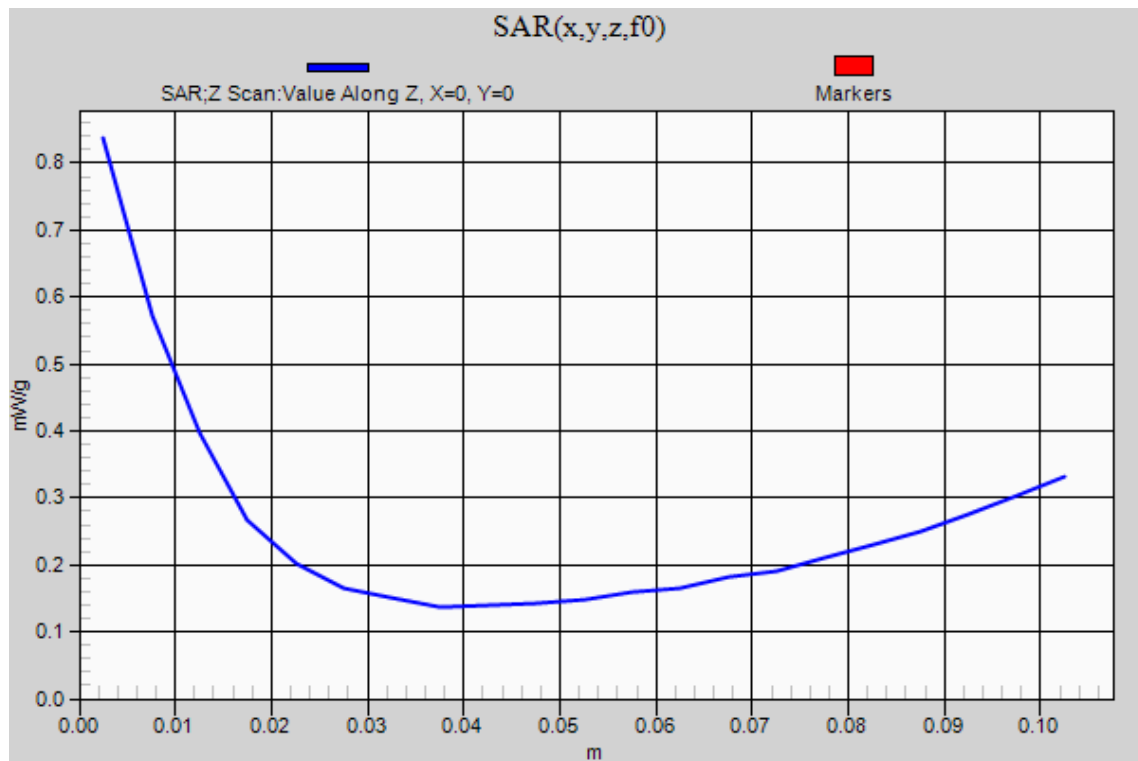
Test Laboratory: UL CCS SAR Lab B Date: 7/8/2012

## GSM 1900

Frequency: 1880 MHz; Duty Cycle: 1:1.99986

**Body/Edge 3\_GPRS 4 slots\_ch 661/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 0.837 mW/g



## W-CDMA Band V

Frequency: 836.6 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C  
Medium parameters used (interpolated):  $f = 836.6$  MHz;  $\sigma = 0.88$  mho/m;  $\epsilon_r = 41.752$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1239; Calibrated: 6/6/2012
- Probe: EX3DV4 - SN3751; ConvF(8.35, 8.35, 8.35); Calibrated: 12/19/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (B); Type: QDOVA001BB; Serial: 1121

**Head/Touch Flat/R99\_ch 4183/Area Scan (11x16x1):** Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.479 mW/g

**Head/Touch Flat/R99\_ch 4183/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

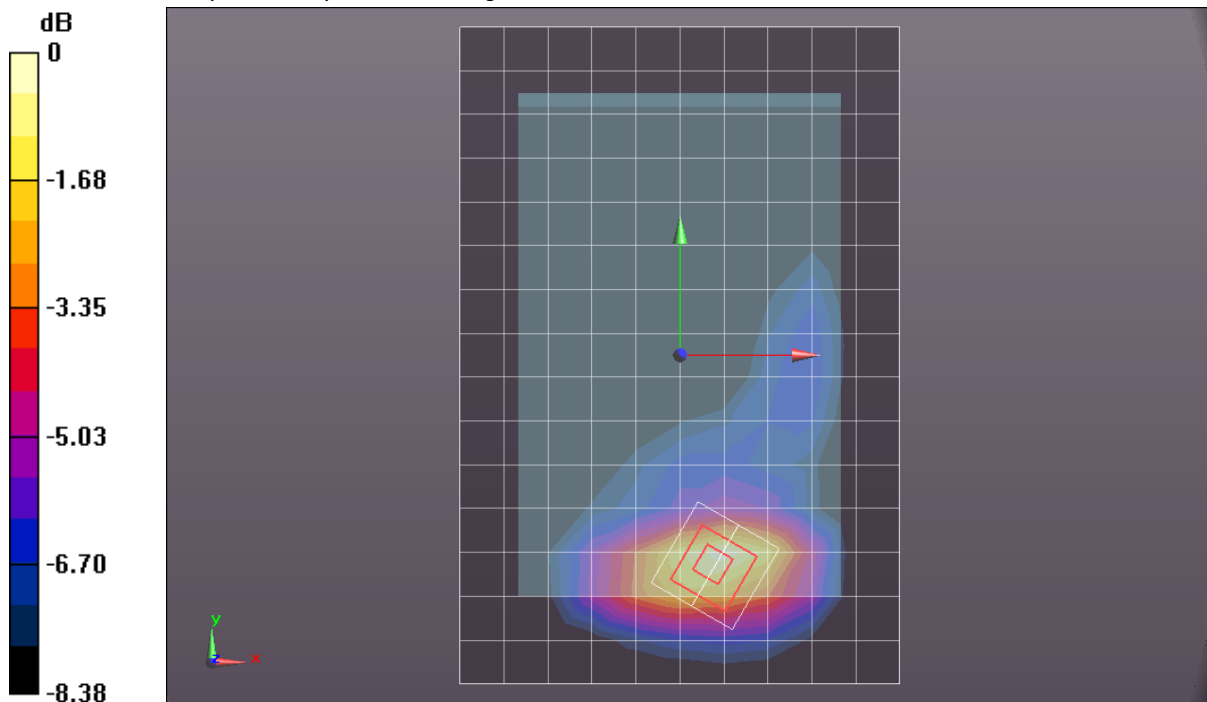
Reference Value = 23.574 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 0.6530

**SAR(1 g) = 0.395 mW/g; SAR(10 g) = 0.249 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.498 mW/g



0 dB = 0.500mW/g = -6.02 dB mW/g

Test Laboratory: UL CCS SAR Lab C

Date: 6/26/2012

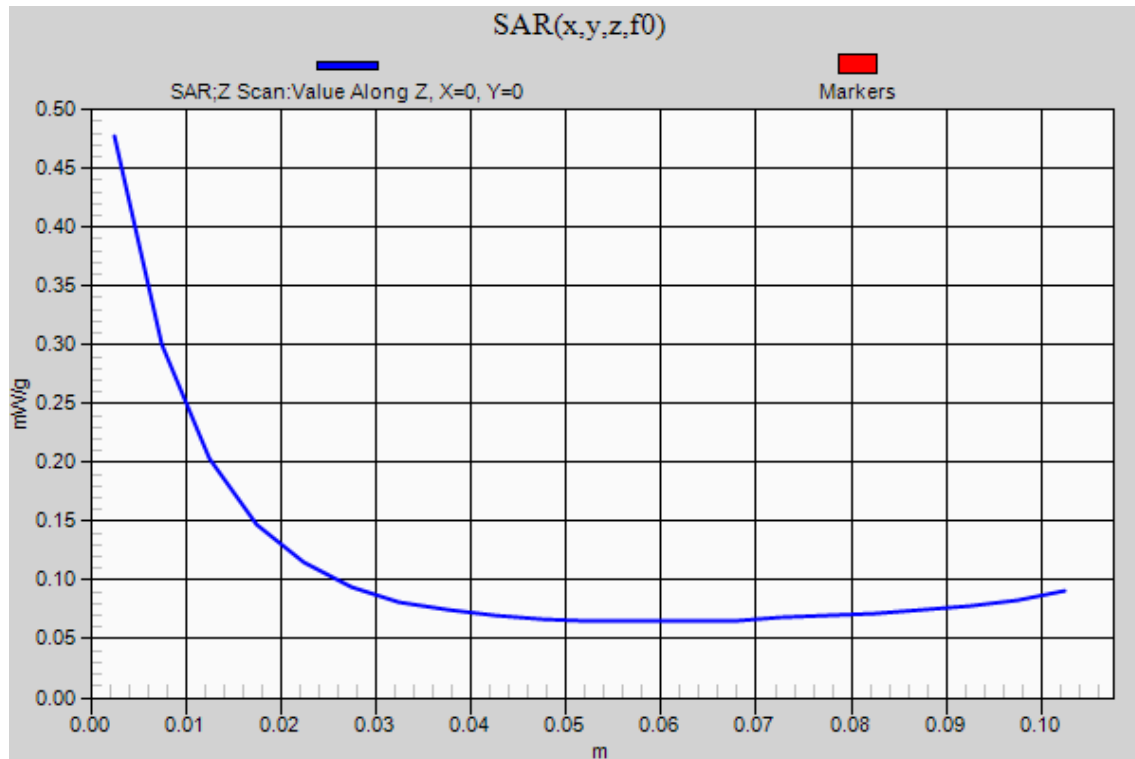
## W-CDMA Band V

Frequency: 836.6 MHz; Duty Cycle: 1:1

**Head Flat/Touch Flat\_ch 4183/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.477 mW/g



## W-CDMA Band V Body

Frequency: 836.6 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C

Medium parameters used (interpolated):  $f = 836.6$  MHz;  $\sigma = 0.988$  mho/m;  $\epsilon_r = 53.91$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1239; Calibrated: 6/6/2012
- Probe: EX3DV4 - SN3751; ConvF(8.64, 8.64, 8.64); Calibrated: 12/19/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (B); Type: QDOVA001BB; Serial: 1121

**Edge 3/ Rel 99 RMC w/Hset\_Ch 4183/Area Scan (7x12x1):** Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.100 mW/g

**Edge 3/ Rel 99 RMC w/Hset\_Ch 4183/Zoom Scan 2 (5x5x7)/Cube 1:** Measurement grid:

dx=8mm, dy=8mm, dz=5mm

Reference Value = 10.042 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.1270

**SAR(1 g) = 0.089 mW/g; SAR(10 g) = 0.072 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.097 mW/g

**Edge 3/ Rel 99 RMC w/Hset\_Ch 4183/Zoom Scan 2 (5x5x7)/Cube 0:** Measurement grid:

dx=8mm, dy=8mm, dz=5mm

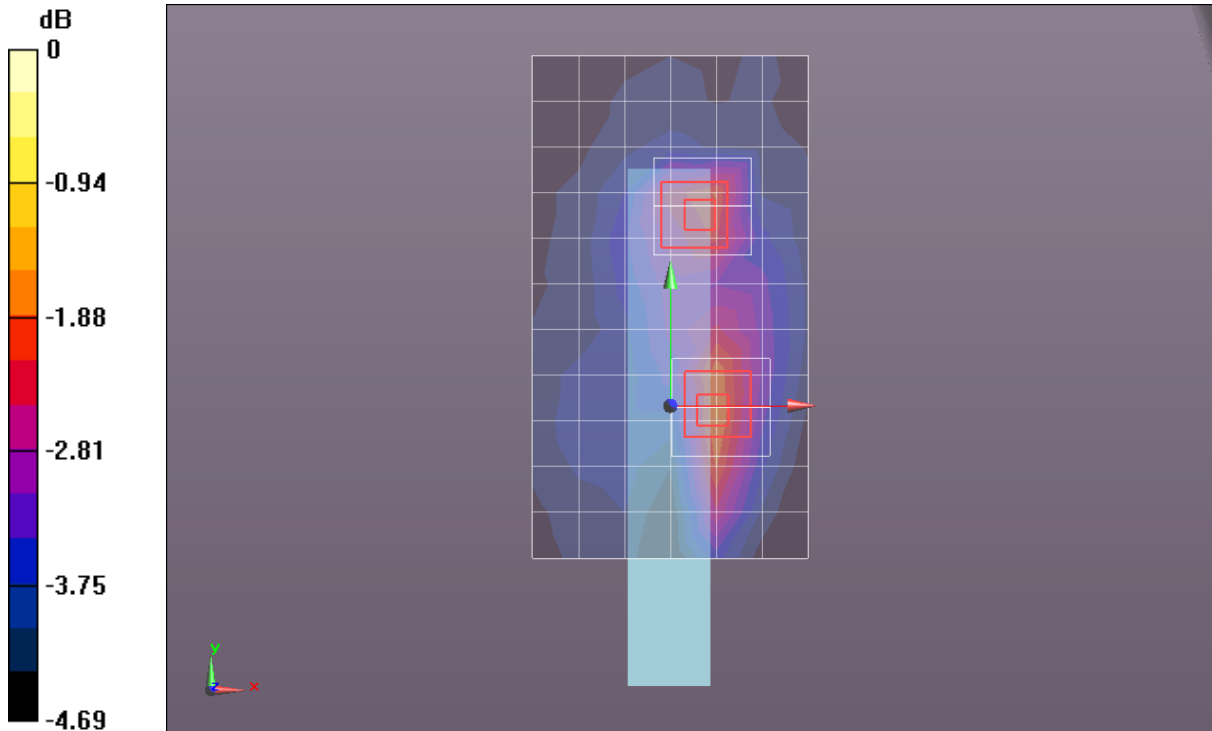
Reference Value = 10.042 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.2490

**SAR(1 g) = 0.107 mW/g; SAR(10 g) = 0.073 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.143 mW/g



0 dB = 0.140mW/g = -17.08 dB mW/g

Test Laboratory: UL CCS SAR Lab C

Date: 6/22/2012

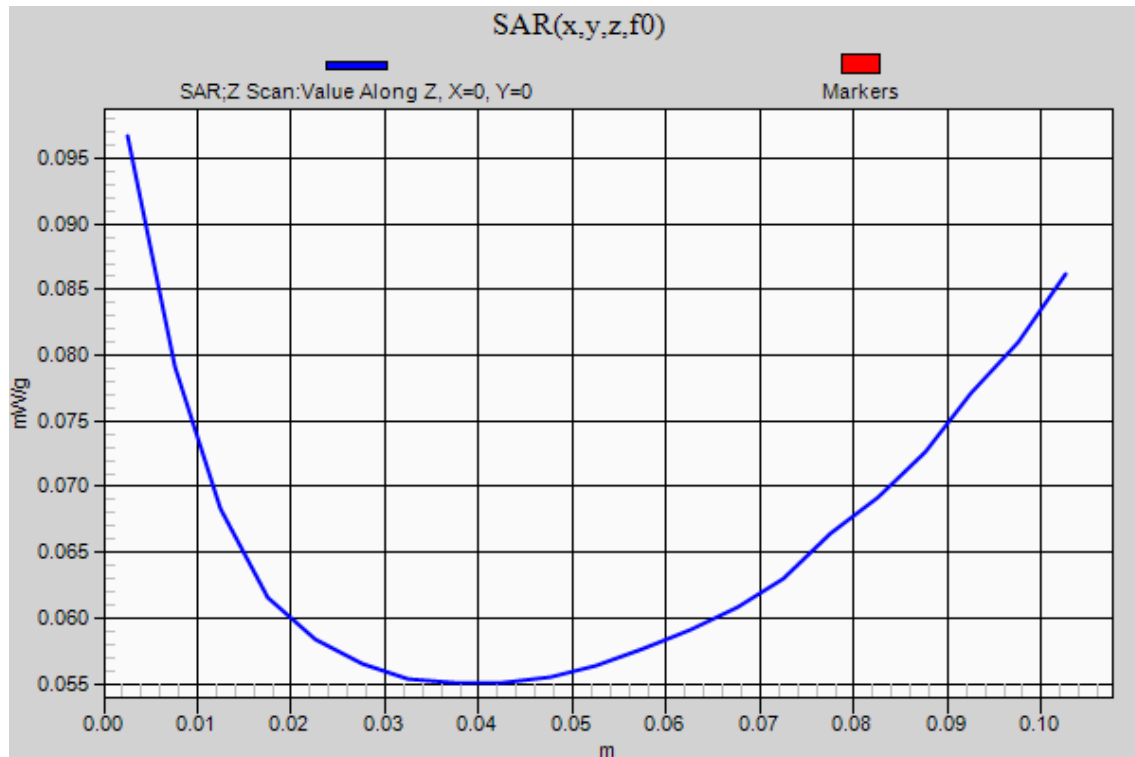
## W-CDMA Band V Body

Frequency: 836.6 MHz; Duty Cycle: 1:1

**Edge 3/ Rel 99 RMC w/Hset\_Ch 4183/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.097 mW/g



## UMTS Band II

Frequency: 1880 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.403$  mho/m;  $\epsilon_r = 40.413$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1239; Calibrated: 6/6/2012
- Probe: EX3DV4 - SN3751; ConvF(7.33, 7.33, 7.33); Calibrated: 12/19/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM; Type: QD000P40CD; Serial: 1632

**Head Flat/Touch\_UMTS R99\_ch 9400/Area Scan (11x16x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.540 mW/g

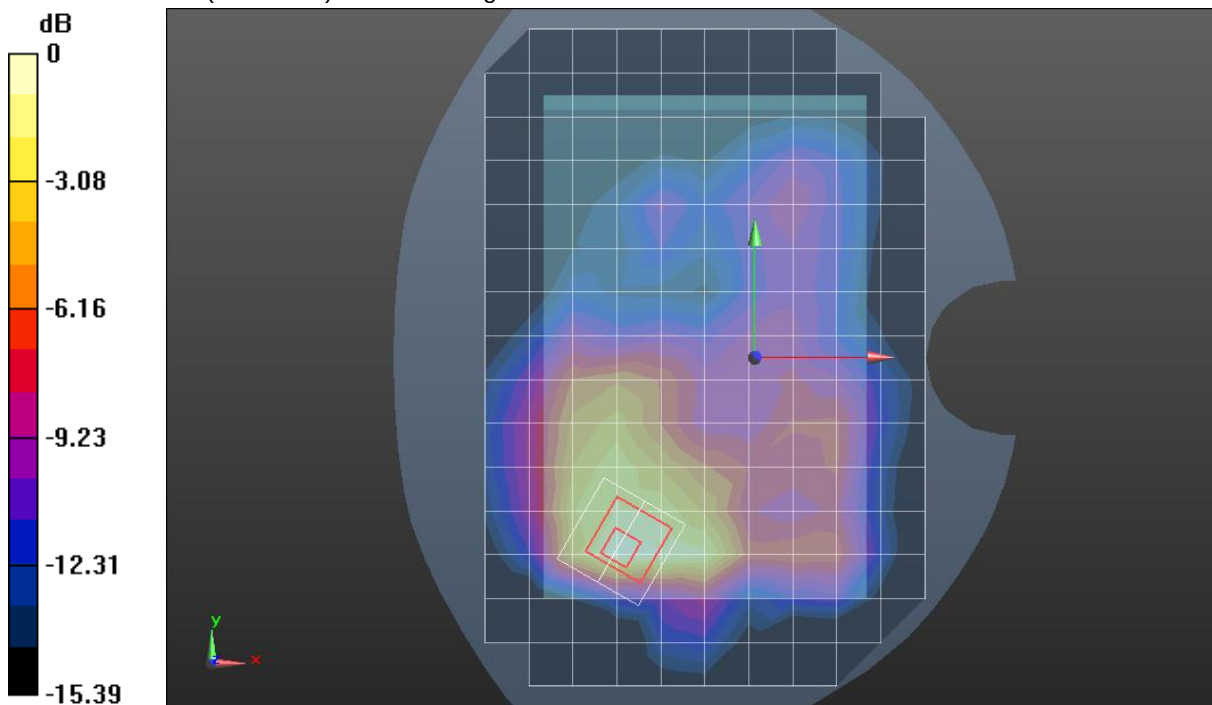
**Head Flat/Touch\_UMTS R99\_ch 9400/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 19.655 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.7000

**SAR(1 g) = 0.431 mW/g; SAR(10 g) = 0.243 mW/g**

Maximum value of SAR (measured) = 0.537 mW/g



0 dB = 0.540mW/g = -5.35 dB mW/g

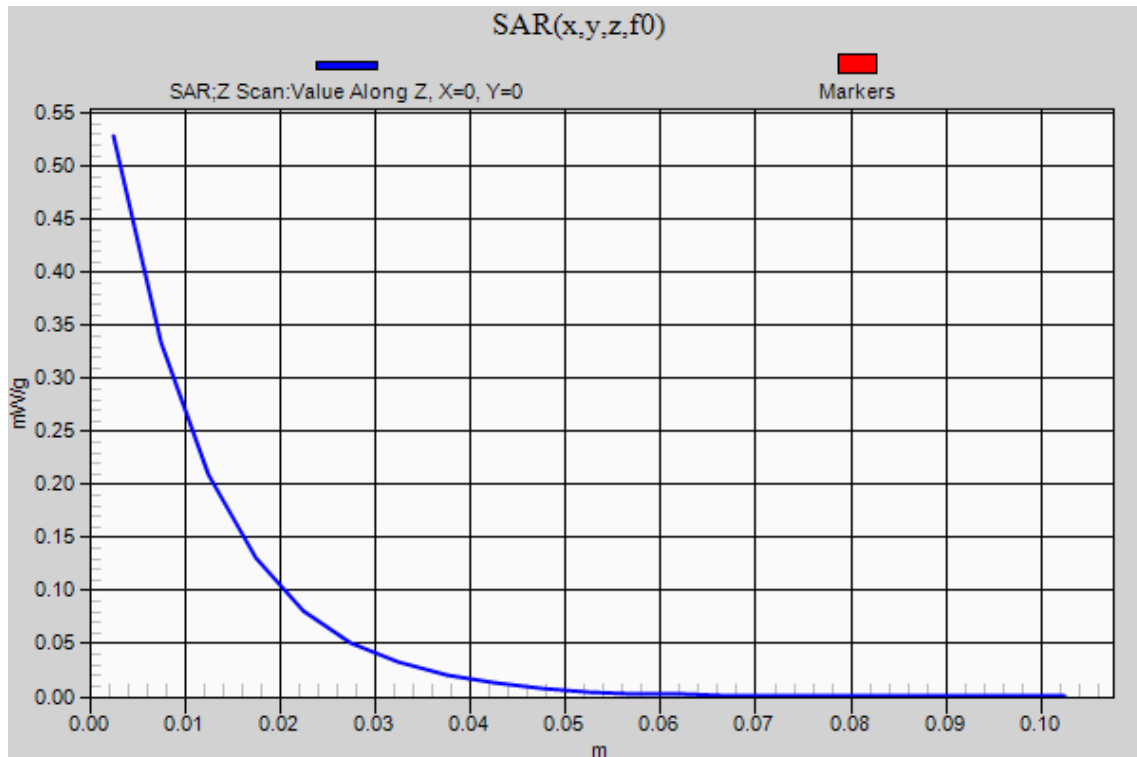
Test Laboratory: UL CCS SAR Lab C Date: 6/25/2012

## UMTS Band II

Frequency: 1880 MHz; Duty Cycle: 1:1

**Head Flat/Touch\_UMTS R99\_ch 9400/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 0.528 mW/g



## UMTS Band II

Frequency: 1880 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.534$  mho/m;  $\epsilon_r = 54.363$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1239; Calibrated: 6/6/2012
- Probe: EX3DV4 - SN3751; ConvF(6.83, 6.83, 6.83); Calibrated: 12/19/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (A); Type: QDOVA001BB; Serial: 1120

**Body/Rear\_R99 RMC\_ch 9400/Area Scan (11x16x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (measured) = 0.520 mW/g

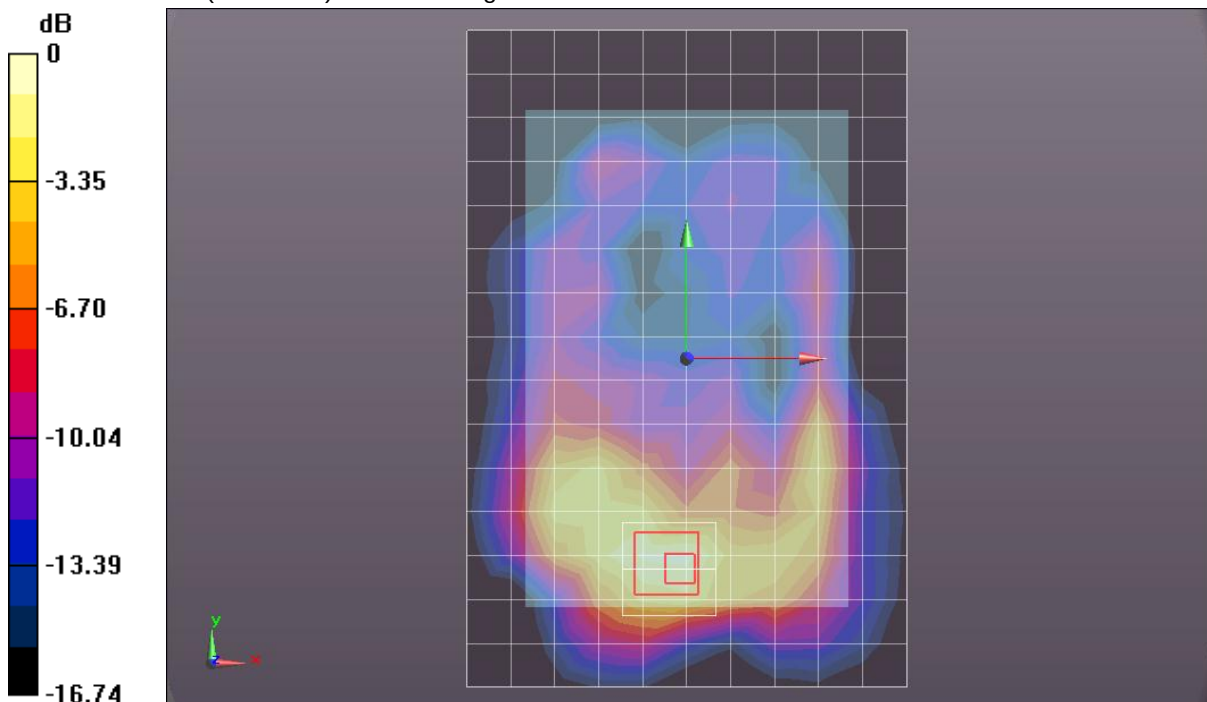
**Body/Rear\_R99 RMC\_ch 9400/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 18.492 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 0.7740

**SAR(1 g) = 0.469 mW/g; SAR(10 g) = 0.274 mW/g**

Maximum value of SAR (measured) = 0.599 mW/g



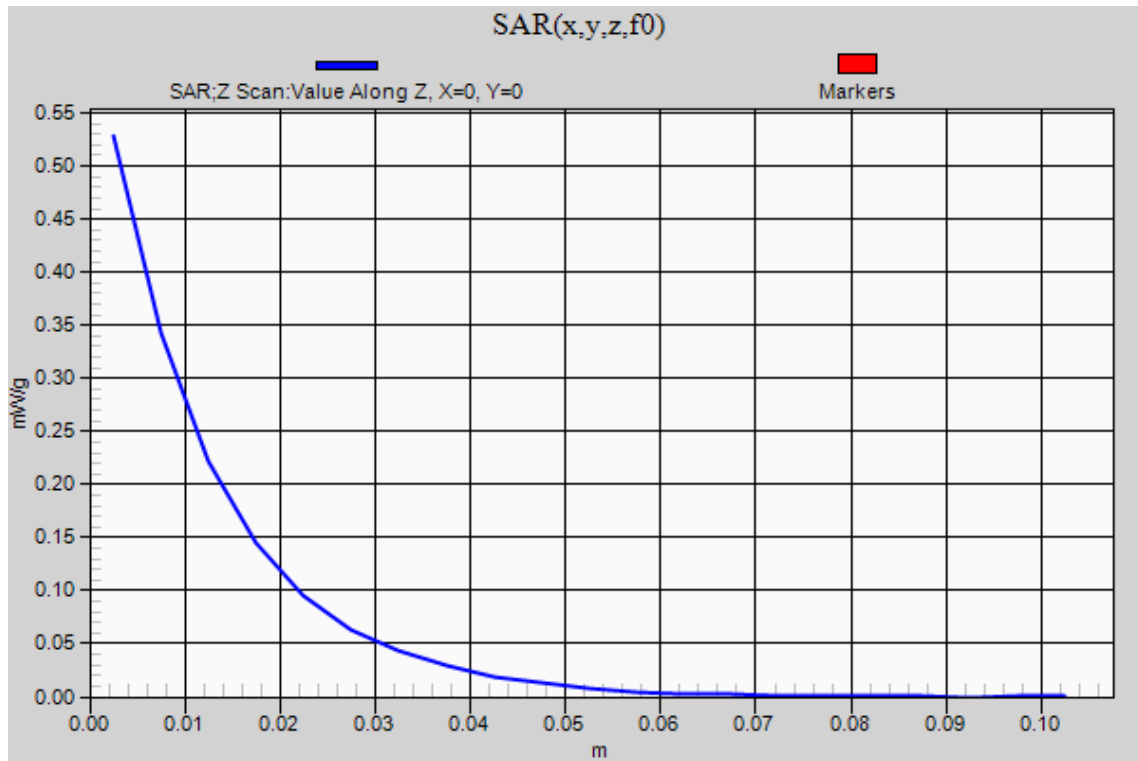
0 dB = 0.600mW/g = -4.44 dB mW/g

## UMTS Band II

Frequency: 1880 MHz; Duty Cycle: 1:1

**Body/Rear\_R99 RMC\_ch 9400/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 0.528 mW/g



Test Laboratory: UL CCS SAR Lab C

Date: 6/26/2012

## WiFi\_2.4GHz Band

Frequency: 2437 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C  
Medium parameters used (interpolated):  $f = 2437$  MHz;  $\sigma = 1.86$  mho/m;  $\epsilon_r = 39.232$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1239; Calibrated: 6/6/2012
- Probe: EX3DV4 - SN3751; ConvF(6.53, 6.53, 6.53); Calibrated: 12/19/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM; Type: QD000P40CD; Serial: 1632

**RHS/Touch\_ch 6/Area Scan (11x12x1):** Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.277 mW/g

**RHS/Touch\_ch 6/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

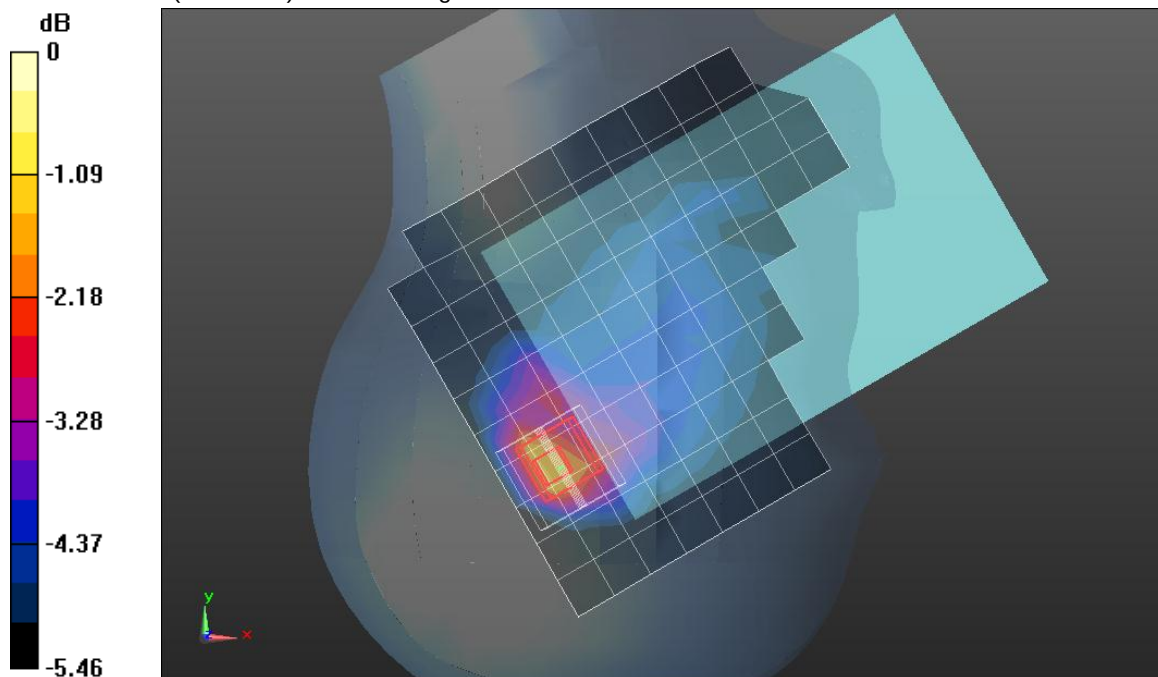
Reference Value = 12.188 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.5310

**SAR(1 g) = 0.286 mW/g; SAR(10 g) = 0.191 mW/g**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.377 mW/g



Test Laboratory: UL CCS SAR Lab C

Date: 6/26/2012

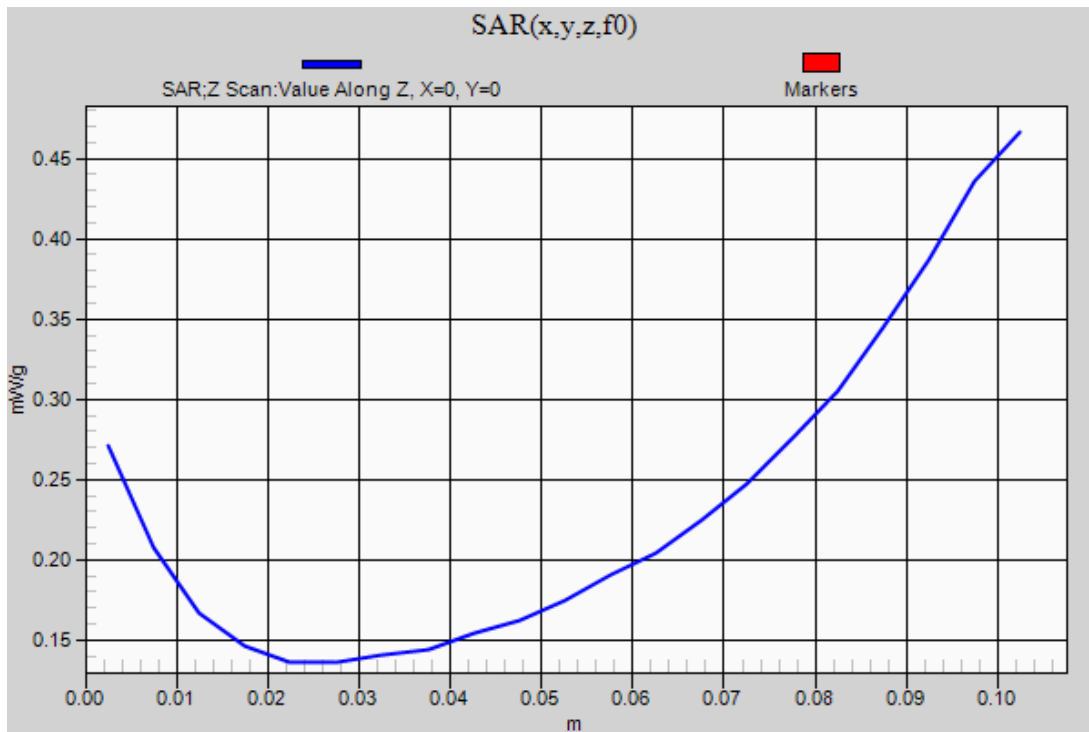
## WiFi\_2.4GHz Band

Frequency: 2437 MHz; Duty Cycle: 1:1

**RHS/Touch\_ch 6/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.466 mW/g



## 14. Simultaneous Transmission SAR Analysis

Stand-alone SAR evaluation is not required as the Bluetooth output power is  $\leq 2 \cdot P_{\text{Ref}}$  (13.8dBm / 24 mW) and the antenna separation is  $\geq 5$  cm. Therefore, simultaneous transmission SAR evaluation is not required between Bluetooth and any other transmitters.

### 14.1. Head Exposure Conditions

#### 14.1.1. Sum of the SAR for GSM, W-CDMA, & WiFi

##### Sum of the SAR with Measured Values

| Test Position | Voice   |          |               |                | Data         | $\Sigma$ 1-g SAR (mW/g) |
|---------------|---------|----------|---------------|----------------|--------------|-------------------------|
|               | GSM 850 | GSM 1900 | W-CDMA Band V | W-CDMA Band II | WiFi 2.4 GHz |                         |
| Touch Flat    | 0.272   |          |               |                | 0.286        | 0.558                   |
|               |         | 0.241    |               |                | 0.286        | 0.527                   |
|               |         |          | 0.395         |                | 0.286        | 0.681                   |
|               |         |          |               | 0.431          | 0.286        | <b>0.717</b>            |

##### Sum of the SAR with Scaled Values for the Worst-case Configuration

| Test Position | Voice   |          |               |                | Data         | $\Sigma$ 1-g SAR (mW/g) |
|---------------|---------|----------|---------------|----------------|--------------|-------------------------|
|               | GSM 850 | GSM 1900 | W-CDMA Band V | W-CDMA Band II | WiFi 2.4 GHz |                         |
| Touch Flat    | 0.278   |          |               |                | 0.344        | 0.622                   |
|               |         | 0.241    |               |                | 0.344        | 0.585                   |
|               |         |          | 0.765         |                | 0.344        | 1.109                   |
|               |         |          |               | 0.683          | 0.344        | <b>1.027</b>            |

#### SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

#### Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the sum of the 1-g SAR is < 1.6 W/kg.

## 14.2. Body Exposure Conditions

### 14.2.1. Sum of the SAR for GSM, W-CDMA, & WiFi

#### Sum of the SAR with Measured Values

| Test Position | Voice   |          |               |                | Data         | $\Sigma$ 1-g SAR (mW/g) |
|---------------|---------|----------|---------------|----------------|--------------|-------------------------|
|               | GSM 850 | GSM 1900 | W-CDMA Band V | W-CDMA Band II | WiFi 2.4 GHz |                         |
| Rear          | 0.614   |          |               |                | 0.065        | 0.679                   |
|               |         | 0.661    |               |                | 0.065        | 0.726                   |
|               |         |          | 0.095         |                | 0.065        | 0.160                   |
|               |         |          |               | 0.469          | 0.065        | 0.534                   |
| Edge 3        | 0.336   |          |               |                | 0            | 0.336                   |
|               |         | 0.794    |               |                | 0            | <b>0.794</b>            |
|               |         |          | 0.107         |                | 0            | 0.107                   |
|               |         |          |               | 0.294          | 0            | 0.294                   |

#### Sum of the SAR with Scaled Values for the Worst-case Configuration

| Test Position | Voice   |          |               |                | Data         | $\Sigma$ 1-g SAR (mW/g) |
|---------------|---------|----------|---------------|----------------|--------------|-------------------------|
|               | GSM 850 | GSM 1900 | W-CDMA Band V | W-CDMA Band II | WiFi 2.4 GHz |                         |
| Rear          | 0.628   |          |               |                | 0.078        | 0.706                   |
|               |         | 0.708    |               |                | 0.078        | 0.786                   |
|               |         |          | 0.184         |                | 0.078        | 0.262                   |
|               |         |          |               | 0.743          | 0.078        | <b>0.821</b>            |

#### SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

#### Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the sum of the 1-g SAR is < 1.6 W/kg.

## **15. Appendixes**

**Refer to separated files for the following appendixes.**

- 15.1. System Performance Check Plots**
- 15.2. SAR Test Plots for GSM850**
- 15.3. SAR Test Plots for GSM1900**
- 15.4. SAR Test Plots for WCDMA (UMTS) Band V**
- 15.5. SAR Test Plots for WCDMA (UMTS) Band II**
- 15.6. SAR Test Plots for WiFi 2.4 GHz**
- 15.7. Calibration Certificate for E-Field Probe EX3DV4 - SN 3686**
- 15.8. Calibration Certificate for E-Field Probe EX3DV4 - SN 3751**
- 15.9. Calibration Certificate for D835V2 - SN 4d117**
- 15.10. Calibration Certificate for D1900V2 - SN 5d140**
- 15.11. Calibration Certificate for D2450V2 - SN 748**