



## **SAR EVALUATION REPORT**

**FCC 47 CFR § 2.1093  
IEEE Std 1528-2013**

*For*  
**GSM/WCDMA Tablet + Bluetooth & WLAN 2.4GHz b/g/n**

**FCC ID: A3LSMT561Y  
Model Name: SM-T561Y**

**Report Number: 15K20294-S1  
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**TL-637**

### Revision History

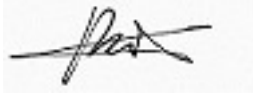
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## Table of Contents

|            |                                                                  |           |
|------------|------------------------------------------------------------------|-----------|
| <b>1.</b>  | <b>Attestation of Test Results .....</b>                         | <b>5</b>  |
| <b>2.</b>  | <b>Test Specification, Methods and Procedures.....</b>           | <b>6</b>  |
| <b>3.</b>  | <b>Facilities and Accreditation .....</b>                        | <b>6</b>  |
| <b>4.</b>  | <b>SAR Measurement System &amp; Test Equipment .....</b>         | <b>7</b>  |
| 4.1.       | SAR Measurement System.....                                      | 7         |
| 4.2.       | SAR Scan Procedures.....                                         | 8         |
| 4.3.       | Test Equipment.....                                              | 10        |
| <b>5.</b>  | <b>Measurement Uncertainty.....</b>                              | <b>10</b> |
| <b>6.</b>  | <b>Device Under Test (DUT) Information .....</b>                 | <b>11</b> |
| 6.1.       | DUT Description .....                                            | 11        |
| 6.2.       | Wireless Technologies.....                                       | 11        |
| 6.3.       | Nominal and Maximum Output Power.....                            | 12        |
| 6.4.       | Power Reduction by Proximity Sensing .....                       | 13        |
| 6.4.1.     | Proximity Sensor Triggering Distance (KDB 616217 §6.2).....      | 13        |
| 6.4.2.     | Proximity Sensor Triggering Distance Measurement Results.....    | 14        |
| 6.4.3.     | Proximity Sensor Coverage (KDB 616217 §6.3) .....                | 17        |
| 6.4.4.     | Resulting test positions for SAR measurements .....              | 17        |
| <b>7.</b>  | <b>RF Exposure Conditions (Test Configurations).....</b>         | <b>18</b> |
| 7.1.       | Standalone SAR Test Exclusion Considerations.....                | 18        |
| 7.2.       | Required Test Configurations .....                               | 19        |
| <b>8.</b>  | <b>Dielectric Property Measurements &amp; System Check .....</b> | <b>20</b> |
| 8.1.       | Dielectric Property Measurements .....                           | 20        |
| 8.2.       | System Check.....                                                | 22        |
| <b>9.</b>  | <b>Conducted Output Power Measurements.....</b>                  | <b>25</b> |
| 9.1.       | GSM .....                                                        | 25        |
| 9.2.       | W-CDMA .....                                                     | 26        |
| 9.3.       | Wi-Fi 2.4GHz .....                                               | 29        |
| 9.4.       | Bluetooth .....                                                  | 29        |
| <b>10.</b> | <b>Measured and Reported (Scaled) SAR Results.....</b>           | <b>30</b> |
| 10.1.      | GSM850.....                                                      | 31        |
| 10.2.      | GSM1900.....                                                     | 31        |
| 10.3.      | W-CDMA Band V .....                                              | 31        |

|                   |                                                     |           |
|-------------------|-----------------------------------------------------|-----------|
| 10.4.             | Wi-Fi (DTS Band) .....                              | 32        |
| 10.5.             | Bluetooth .....                                     | 32        |
| <b>11.</b>        | <b>SAR Measurement Variability .....</b>            | <b>33</b> |
| <b>12.</b>        | <b>Simultaneous Transmission SAR Analysis .....</b> | <b>34</b> |
| 12.1.             | Sum of the SAR for GSM850 & Wi-Fi & BT .....        | 36        |
| 12.2.             | Sum of the SAR for GSM1900 & Wi-Fi & BT .....       | 36        |
| 12.3.             | Sum of the SAR for W-CDMA Band V & Wi-Fi & BT ..... | 37        |
| <b>Appendixes</b> | <b>.....</b>                                        | <b>38</b> |
| A_15K20294        | SAR Photos & Ant. Locations .....                   | 38        |
| B_15K20294        | SAR Highest Test Plots .....                        | 38        |
| C_15K20294        | SAR System Check Plots .....                        | 38        |
| D_15K20294        | SAR Tissue Ingredients .....                        | 38        |
| E_15K20294        | SAR Probe Cal. Certificates .....                   | 38        |
| F_15K20294        | SAR Dipole Cal. Certificates .....                  | 38        |

## 1. Attestation of Test Results

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                   |                                                                                      |                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-----------------|
| Applicant Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | SAMSUNG ELECTRONICS.,LTD.                                                         |                                                                                      |                 |
| FCC ID                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | A3LSMT561Y                                                                        |                                                                                      |                 |
| Model Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | SM-T561Y                                                                          |                                                                                      |                 |
| Applicable Standards                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | FCC 47 CFR § 2.1093<br>Published RF exposure KDB procedures<br>IEEE Std 1528-2013 |                                                                                      |                 |
| <b>SAR Limits (W/Kg)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                   |                                                                                      |                 |
| Exposure Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Peak spatial-average(1g of tissue)                                                |                                                                                      |                 |
| General population /<br>Uncontrolled exposure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1.6                                                                               |                                                                                      |                 |
| <b>The Highest Reported SAR (W/kg)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                   |                                                                                      |                 |
| <b>RF Exposure Conditions</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Equipment Class</b>                                                            |                                                                                      |                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Licensed</b>                                                                   | <b>DTS</b>                                                                           | <b>DSS (BT)</b> |
| Standalone                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0.852                                                                             | 1.072                                                                                | 0.037           |
| Simultaneous TX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1.554                                                                             |                                                                                      |                 |
| Date Tested                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 3/10/2015 to 4/27/2015                                                            |                                                                                      |                 |
| Test Results                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Pass                                                                              |                                                                                      |                 |
| <p>UL Korea, Ltd. 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 Korea, Ltd. 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 Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. 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 IAS, any agency of the Federal Government, or any agency of any government.</p> |                                                                                   |                                                                                      |                 |
| Approved & Released By:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                   | Prepared By:                                                                         |                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                   |  |                 |
| JiHo Choi<br>Operations Manager<br>UL Korea, Ltd Suwon Laboratory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   | Justin Park<br>Engineer<br>UL Korea, Ltd Suwon Laboratory                            |                 |

## 2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE STD 1528-2013, the following FCC Published RF exposure [KDB](#) procedures:

- o 248227 D01 SAR meas for 802.11 v02
- o 447498 D01 General RF Exposure Guidance v05r02
- o 616217 D04 SAR for laptop and tablets v01r01
- o 690783 D01 SAR Listings on Grants v01r03
- o 865664 D01 SAR measurement 100 MHz to 6 GHz v01r03
- o 865664 D02 RF Exposure Reporting v01r01
- o 941225 D01 3G SAR Procedures v03
- o 941225 D06 Hotspot Mode v02

## 3. Facilities and Accreditation

The test sites and measurement facilities used to collect data are located at

|            |
|------------|
| Suwon      |
| SAR 1 Room |
| SAR 2 Room |
| SAR 3 Room |

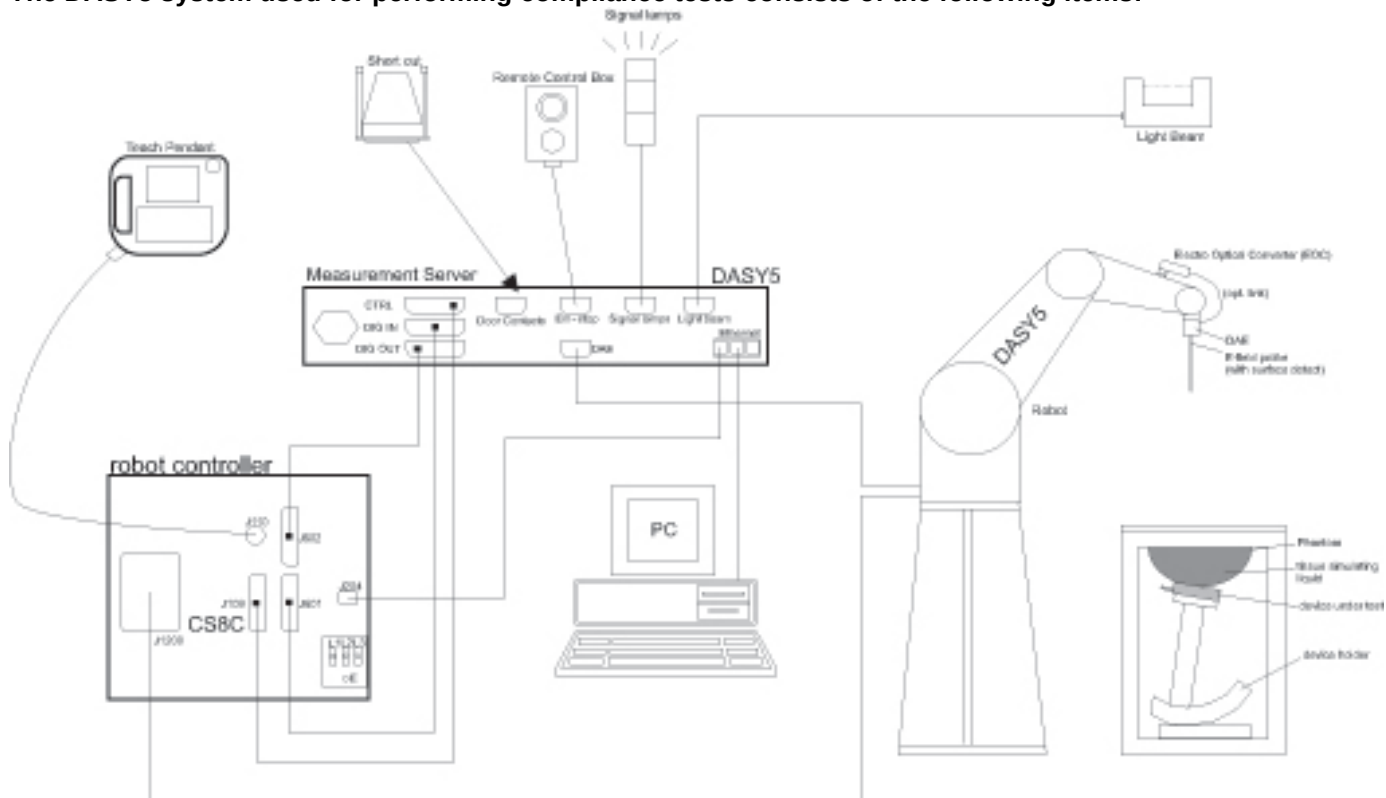
UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637.

The full scope of accreditation can be viewed at <http://www.iasonline.org/PDF/TL/TL-637.pdf>.

## 4. SAR Measurement System & Test Equipment

### 4.1. SAR Measurement System

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.

## 4.2. SAR 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 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.

Area Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

|                                                                                                        | $\leq 3$ GHz                                                                                                                                                                                                                                                           | $> 3$ GHz                                              |
|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface | $5 \pm 1$ mm                                                                                                                                                                                                                                                           | $\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm     |
| Maximum probe angle from probe axis to phantom surface normal at the measurement location              | $30^\circ \pm 1^\circ$                                                                                                                                                                                                                                                 | $20^\circ \pm 1^\circ$                                 |
| Maximum area scan spatial resolution: $\Delta x_{Area}$ , $\Delta y_{Area}$                            | $\leq 2$ GHz: $\leq 15$ mm<br>$2 - 3$ GHz: $\leq 12$ mm                                                                                                                                                                                                                | $3 - 4$ GHz: $\leq 12$ mm<br>$4 - 6$ GHz: $\leq 10$ mm |
|                                                                                                        | When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device. |                                                        |



### 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 points (refer to table below) 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.

Zoom Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

|                                                                                                                                                                                                                                                                                                             |                                           |                                                                                             | $\leq 3$ GHz                                         | $> 3$ GHz                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------------|
| Maximum zoom scan spatial resolution: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$                                                                                                                                                                                                                      |                                           |                                                                                             | $\leq 2$ GHz: $\leq 8$ mm<br>2 – 3 GHz: $\leq 5$ mm* | 3 – 4 GHz: $\leq 5$ mm*<br>4 – 6 GHz: $\leq 4$ mm*                            |
| Maximum zoom scan spatial resolution, normal to phantom surface                                                                                                                                                                                                                                             | uniform grid: $\Delta z_{\text{Zoom}}(n)$ |                                                                                             | $\leq 5$ mm                                          | 3 – 4 GHz: $\leq 4$ mm<br>4 – 5 GHz: $\leq 3$ mm<br>5 – 6 GHz: $\leq 2$ mm    |
|                                                                                                                                                                                                                                                                                                             | graded grid                               | $\Delta z_{\text{Zoom}}(1)$ : between 1 <sup>st</sup> two points closest to phantom surface | $\leq 4$ mm                                          | 3 – 4 GHz: $\leq 3$ mm<br>4 – 5 GHz: $\leq 2.5$ mm<br>5 – 6 GHz: $\leq 2$ mm  |
|                                                                                                                                                                                                                                                                                                             |                                           | $\Delta z_{\text{Zoom}}(n>1)$ : between subsequent points                                   | $\leq 1.5 \cdot \Delta z_{\text{Zoom}}(n-1)$         |                                                                               |
| Minimum zoom scan volume                                                                                                                                                                                                                                                                                    | x, y, z                                   |                                                                                             | $\geq 30$ mm                                         | 3 – 4 GHz: $\geq 28$ mm<br>4 – 5 GHz: $\geq 25$ mm<br>5 – 6 GHz: $\geq 22$ mm |
| Note: $\delta$ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.                                                                                                                                                           |                                           |                                                                                             |                                                      |                                                                               |
| * When zoom scan is required and the <i>reported</i> SAR from the area scan based <i>1-g SAR estimation</i> procedures of KDB 447498 is $\leq 1.4$ W/kg, $\leq 8$ mm, $\leq 7$ mm and $\leq 5$ mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz. |                                           |                                                                                             |                                                      |                                                                               |

### 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.

### 4.3. Test Equipment

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.

#### Dielectric Property Measurements

| Name of Equipment      | Manufacturer | Type/Model    | Serial No.    | Cal. Due Date |
|------------------------|--------------|---------------|---------------|---------------|
| Network Analyzer       | Agilent      | E5071C        | MY46522054    | 9-23-2015     |
| Dielectronic Probe kit | SPEAG        | DAK-3.5       | 1196          | 8-5-2015      |
| Dielectronic Probe kit | SPEAG        | DAK-3.5 Short | SM DAK 200 BA | N/A           |
| Thermometer            | LKM          | DTM3000       | 3424          | 11-13-2015    |

#### System Check

| Name of Equipment                    | Manufacturer | Type/Model            | Serial No. | Cal. Due Date |
|--------------------------------------|--------------|-----------------------|------------|---------------|
| MXG Analog Signal Generator          | Agilent      | N5181A                | MY50145882 | 9-23-2015     |
| Power Sensor                         | Agilent      | U2000A                | MY54260010 | 9-23-2015     |
| Power Sensor                         | Agilent      | U2000A                | MY54260007 | 9-23-2015     |
| Power Amplifier                      | EXODUS       | 1410025-AMP2027-10003 | 10003      | 11-7-2015     |
| Directional Coupler                  | Agilent      | 772D                  | MY52180193 | 9-22-2015     |
| Directional Coupler                  | Agilent      | 778D                  | MY52180432 | 9-22-2015     |
| Low Pass Filter                      | MICROLAB     | LA-15N                | 03943      | 11-4-2015     |
| Low Pass Filter                      | FILTRON      | L14012FL              | 1410003S   | 11-4-2015     |
| Low Pass Filter                      | MICROLAB     | LA-60N                | 03942      | 11-5-2015     |
| Attenuator                           | Agilent      | 8491B/003             | MY39269292 | 9-22-2015     |
| Attenuator                           | Agilent      | 8491B/010             | MY39269315 | 9-22-2015     |
| Attenuator                           | Agilent      | 8491B/020             | MY39269298 | 9-22-2015     |
| E-Field Probe (SAR 1)                | SPEAG        | EX3DV4                | 7330       | 2-12-2015     |
| E-Field Probe (SAR 2)                | SPEAG        | EX3DV4                | 7313       | 8-27-2015     |
| E-Field Probe (SAR 3)                | SPEAG        | EX3DV4                | 7314       | 8-27-2015     |
| Data Acquisition Electronics (SAR 1) | SPEAG        | DAE4                  | 1468       | 1-12-2016     |
| Data Acquisition Electronics (SAR 2) | SPEAG        | DAE4                  | 1447       | 8-25-2015     |
| Data Acquisition Electronics (SAR 3) | SPEAG        | DAE4                  | 1446       | 8-27-2015     |
| System Validation Dipole             | SPEAG        | D835V2                | 4d174      | 8-13-2015     |
| System Validation Dipole             | SPEAG        | D1900V2               | 5d190      | 8-12-2015     |
| System Validation Dipole             | SPEAG        | D1900V2               | 5d199      | 2-6-2016      |
| System Validation Dipole             | SPEAG        | D2450V2               | 939        | 8-11-2015     |
| Thermometer (SAR 1)                  | Lutron       | MHB-382SD             | AH.53049   | 11-18-2015    |
| Thermometer (SAR 2)                  | Lutron       | MHB-382SD             | AH.50215   | 11-18-2015    |
| Thermometer (SAR 3)                  | Lutron       | MHB-382SD             | AH.50213   | 11-18-2015    |

#### Others

| Name of Equipment      | Manufacturer | Type/Model | Serial No.  | Cal. Due Date |
|------------------------|--------------|------------|-------------|---------------|
| Base Station Simulator | R & S        | CMW500     | 150313      | 8-13-2015     |
| Base Station Simulator | R & S        | CMW500     | 150314      | 8-13-2015     |
| Bluetooth Tester       | TESCOM       | TC-3000C   | 3000C000546 | 11-17-2015    |

### 5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

## 6. Device Under Test (DUT) Information

### 6.1. DUT Description

|                           |                                                                                                                                                                                                                                              |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Device Dimension          | Overall (Length x Width): 242 mm x 150 mm<br>Overall Diagonal: 276 mm<br>Display Diagonal: 243.5 mm                                                                                                                                          |
| Back Cover                | <input checked="" type="checkbox"/> The rechargeable battery is not user accessible.                                                                                                                                                         |
| Battery Options           | <input checked="" type="checkbox"/> The rechargeable battery is not user accessible.                                                                                                                                                         |
| Wireless Router (Hotspot) | Wi-Fi Hotspot mode permits the device to share its cellular data connection with other Wi-Fi-enabled devices.<br><input checked="" type="checkbox"/> Mobile Hotspot (Wi-Fi 2.4 GHz)<br><input type="checkbox"/> Mobile Hotspot (Wi-Fi 5 GHz) |
| Wi-Fi Direct              | Wi-Fi Direct enabled devices transfer data directly between each other<br><input checked="" type="checkbox"/> Wi-Fi Direct (Wi-Fi 2.4 GHz)<br><input type="checkbox"/> Wi-Fi Direct (Wi-Fi 5 GHz)                                            |

### 6.2. Wireless Technologies

| Wireless technologies | Frequency bands | Operating mode                                                                                                         |                                                                                                                                                                                                                            | Duty Cycle used for SAR testing                                                           |
|-----------------------|-----------------|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| GSM                   | 850<br>1900     | Voice (GMSK)<br>GPRS (GMSK)                                                                                            | GPRS Multi-Slot Class:<br><input type="checkbox"/> Class 8 - One Up<br><input type="checkbox"/> Class 10 - Two Up<br><input checked="" type="checkbox"/> Class 12 - Four Up<br><input type="checkbox"/> Class 33 - Four Up | GSM Voice: 12.5%<br>GPRS: 1 Slot: 12.5%<br>2 Slots: 25%<br>3 Slots: 37.5%<br>4 Slots: 50% |
|                       |                 | Does this device support DTM (Dual Transfer Mode)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |                                                                                                                                                                                                                            |                                                                                           |
| W-CDMA (UMTS)         | Band V          | UMTS Rel. 99 (Voice & Data)<br>HSDPA (Rel. 7)<br>HSUPA (Rel. 6)<br>HSPA+ (Rel. 7)                                      |                                                                                                                                                                                                                            | 100%                                                                                      |
| Wi-Fi                 | 2.4 GHz         | 802.11b<br>802.11g<br>802.11n (HT20)                                                                                   |                                                                                                                                                                                                                            | 100%                                                                                      |
|                       |                 | Does this device support Band gap channel? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No         |                                                                                                                                                                                                                            |                                                                                           |
| Bluetooth             | 2.4 GHz         | Version 4.0 LE                                                                                                         |                                                                                                                                                                                                                            | N/A                                                                                       |

### 6.3. Nominal and Maximum Output Power

KDB 447498 sec.4.1.(3) at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit

| Upper limit (dB): -1.5 ~ 0.5 |              | Max. RF Output Power (dBm) |                              | Reduce RF Output Power (dBm) |                              |
|------------------------------|--------------|----------------------------|------------------------------|------------------------------|------------------------------|
| RF Air interface             | Mode         | Target                     | Max. tune-up tolerance limit | Target                       | Max. tune-up tolerance limit |
| GSM850                       | Voice        | 32.5                       | <b>33.0</b>                  | 27.0                         | <b>27.5</b>                  |
|                              | GPRS 1 slot  | 32.5                       | <b>33.0</b>                  | 27.0                         | <b>27.5</b>                  |
|                              | GPRS 2 slots | 31.0                       | <b>31.5</b>                  | 25.0                         | <b>25.5</b>                  |
|                              | GPRS 3 slots | 29.0                       | <b>29.5</b>                  | 23.0                         | <b>23.5</b>                  |
|                              | GPRS 4 slots | 27.0                       | <b>27.5</b>                  | 21.0                         | <b>21.5</b>                  |
| GSM1900                      | Voice        | 29.0                       | <b>29.5</b>                  | 22.0                         | <b>22.5</b>                  |
|                              | GPRS 1 slot  | 29.0                       | <b>29.5</b>                  | 22.0                         | <b>22.5</b>                  |
|                              | GPRS 2 slots | 26.5                       | <b>27.0</b>                  | 20.0                         | <b>20.5</b>                  |
|                              | GPRS 3 slots | 24.5                       | <b>25.0</b>                  | 18.0                         | <b>18.5</b>                  |
|                              | GPRS 4 slots | 23.0                       | <b>23.5</b>                  | 17.0                         | <b>17.5</b>                  |
| W-CDMA Band V                | R99          | 23.0                       | <b>23.5</b>                  | 19.0                         | <b>19.5</b>                  |
|                              | HSDPA        | 22.5                       | <b>23.0</b>                  | 18.5                         | <b>19.0</b>                  |
|                              | HSUPA        | 21.5                       | <b>22.0</b>                  | 17.5                         | <b>18.0</b>                  |

| Upper limit (dB): -1.5 ~ 0.5 |              | Max. RF Output Power (dBm) |                              | Reduce RF Output Power (dBm) |                              |
|------------------------------|--------------|----------------------------|------------------------------|------------------------------|------------------------------|
| RF Air interface             | Mode         | Target                     | Max. tune-up tolerance limit | Target                       | Max. tune-up tolerance limit |
| WiFi 2.4 GHz                 | 802.11b      | 15.5                       | <b>16.0</b>                  | N/A                          |                              |
|                              | 802.11g      | 14.0                       | <b>14.5</b>                  | N/A                          |                              |
|                              | 802.11n HT20 | 13.0                       | <b>13.5</b>                  | N/A                          |                              |
| Bluetooth                    |              | 9.5                        | <b>10.0</b>                  | N/A                          |                              |
| Bluetooth LE                 |              | 8.0                        | <b>8.5</b>                   | N/A                          |                              |

## 6.4. Power Reduction by Proximity Sensing

Due to the operating configurations and exposure conditions required by tablets, proximity sensors are used in this device to reduce the maximum output power in specific wireless and operating modes to ensure SAR compliance. This device uses a capacitive proximity sensor that is same metallic component as the transmitting antenna to facilitate triggering in typical user interactivity with the device.

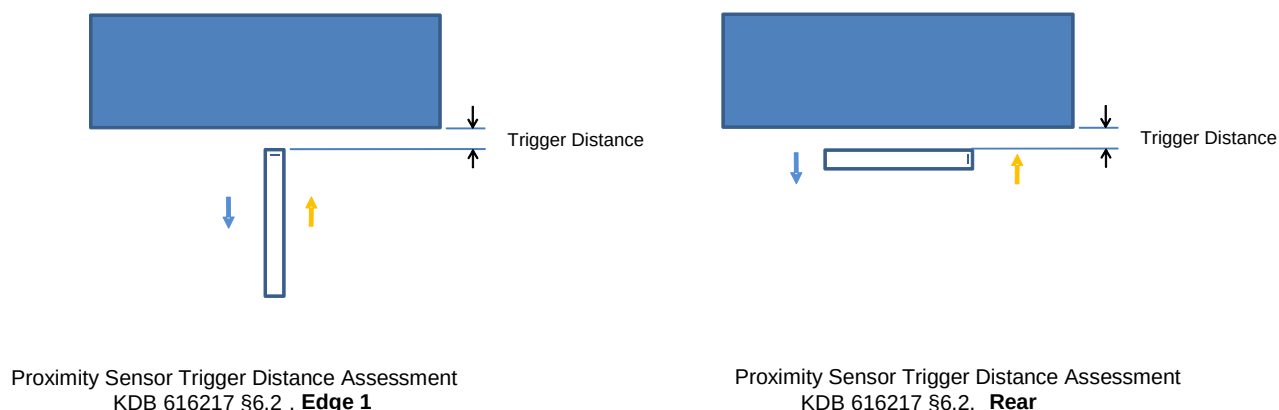
### 6.4.1. Proximity Sensor Triggering Distance (KDB 616217 §6.2)

Rear of the DUT was placed directly below the flat phantom. The DUT was moved toward the phantom in accordance with the steps outlined in KDB 616217 §6.2 to determine the trigger distance for enabling power reduction. The DUT was moved away from the phantom to determine the trigger distance for resuming full power.

The measurement was then repeated for the surface of Rear.

The DUT featured a visual indicator on its display that showed the status of the proximity sensor (Triggered or not triggered). This was used to determine the status of the sensor during the proximity sensor assessment as monitoring the output power directly was not practical without affecting the measurement.

It was confirmed separately that the output power was altered according to the proximity sensor status indication. This was achieved by observing the proximity sensor status at the same time as monitoring the conducted power. Section 9 contains both the full and reduced conducted power measurements.



#### LEGEND

- Direction of DUT travel for determination of power reduction triggering point
- Direction of DUT travel for determination of full power resumption triggering point

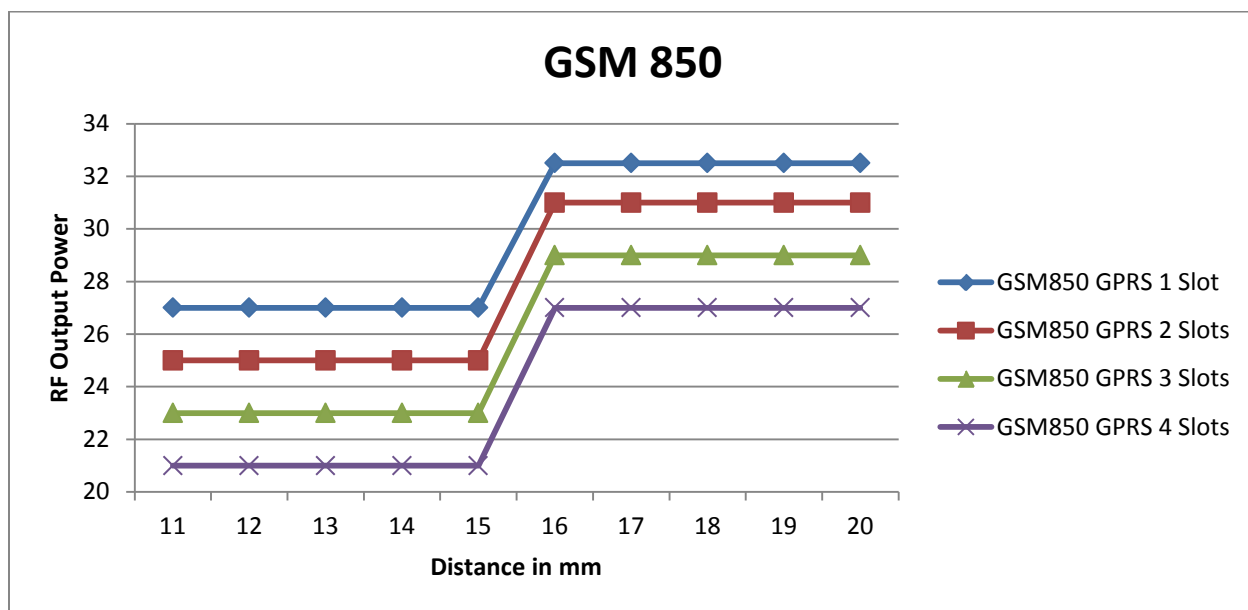
#### Summary of Trigger Distances for WWAN

| Tissue<br>simulating<br>liquid | Trigger distance - Edge 1   |                        | Trigger distance - Rear     |                        |
|--------------------------------|-----------------------------|------------------------|-----------------------------|------------------------|
|                                | Moving<br>toward<br>phantom | Moving from<br>phantom | Moving<br>toward<br>phantom | Moving from<br>phantom |
| 850 muscle                     | 12mm                        | 12mm                   | 15mm                        | 15mm                   |
| 1900 muscle                    | 12mm                        | 12mm                   | 15mm                        | 15mm                   |

## 6.4.2. Proximity Sensor Triggering Distance Measurement Results

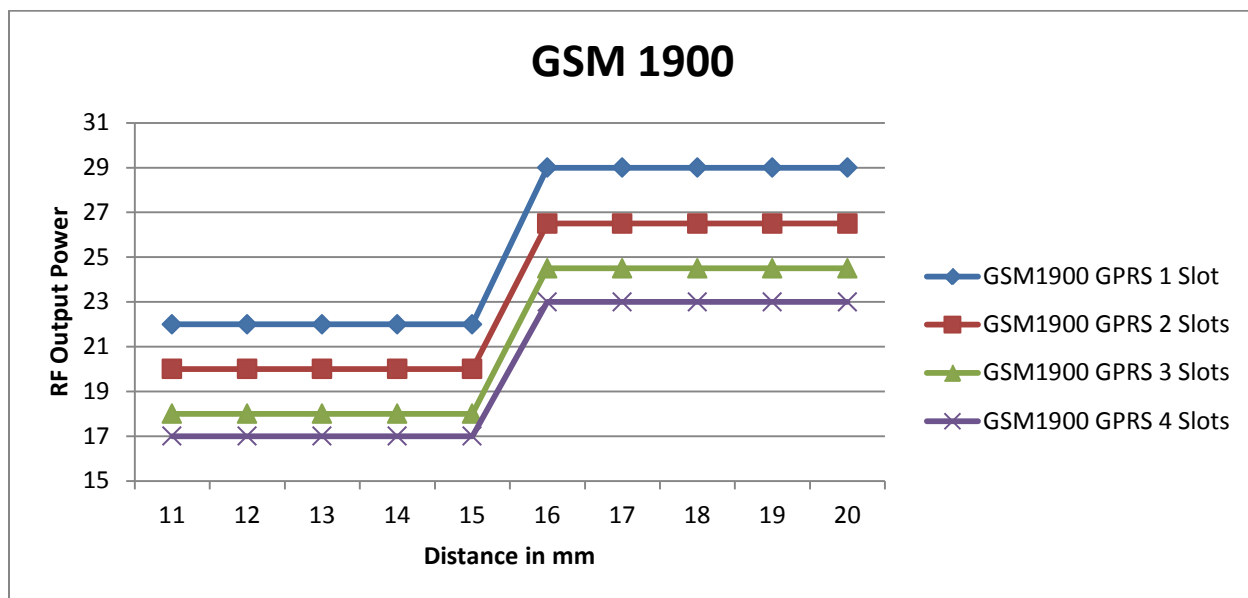
### GSM850

Rear, DUT Moving Toward (Trigger) and Away (Release) from the Phantom



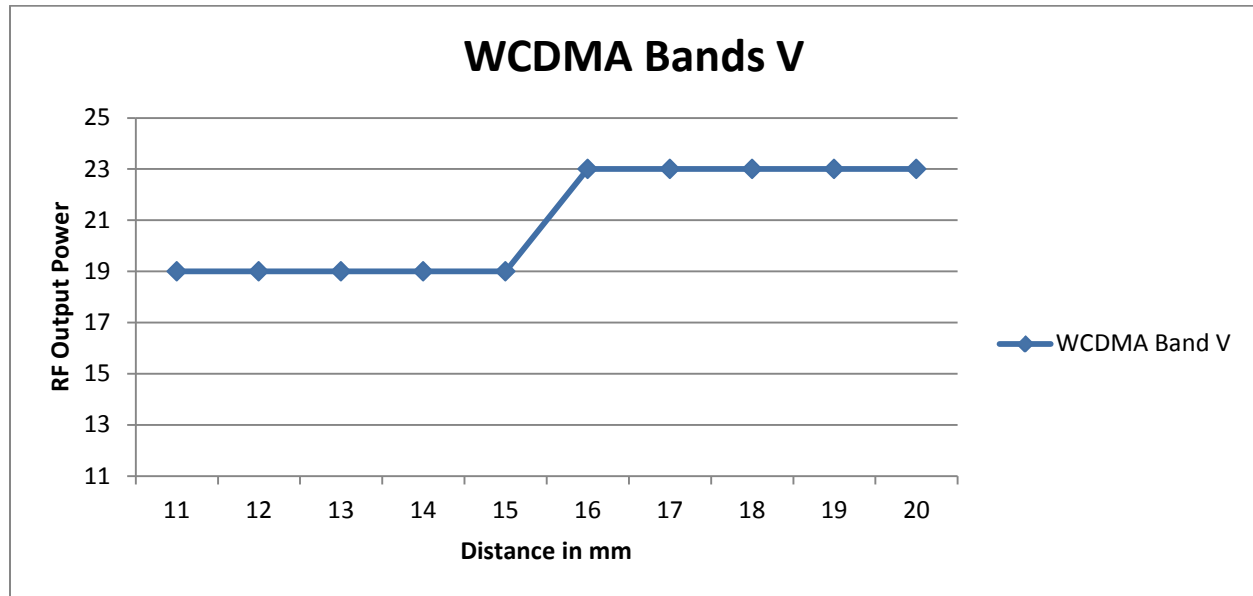
### GSM1900

Rear, DUT Moving Toward (Trigger) and Away (Release) from the Phantom



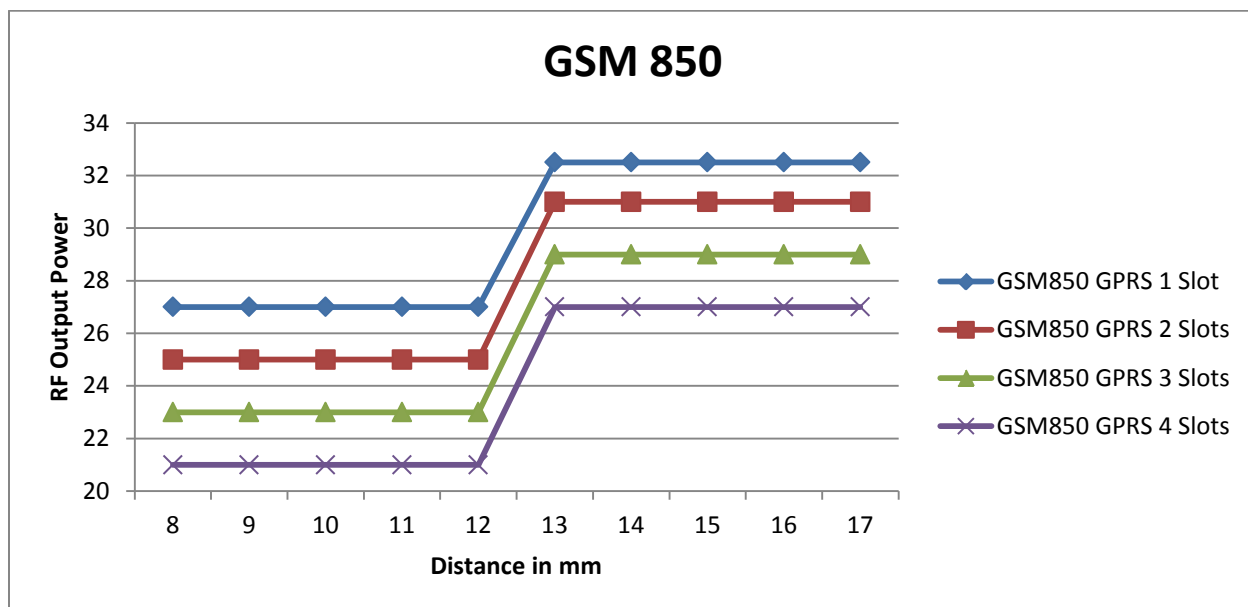
### WCDMA Band V

Rear, DUT Moving Toward (Trigger) and Away (Release) from the Phantom



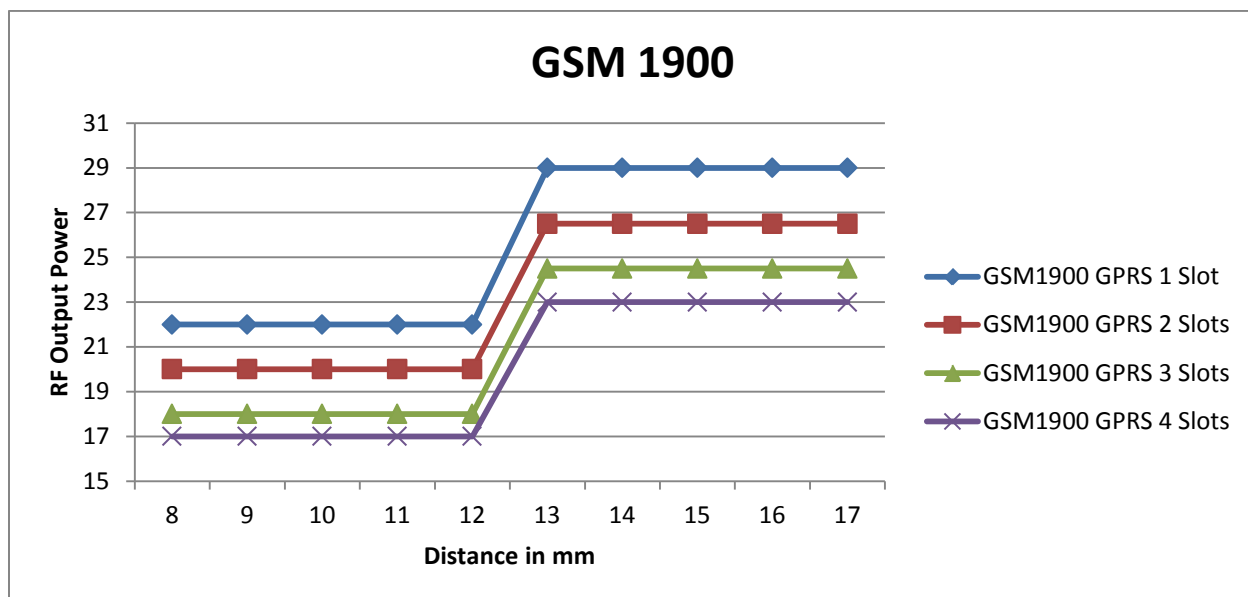
### GSM850

Edge 1, DUT Moving Toward (Trigger) and Away (Release) from the Phantom



### GSM1900

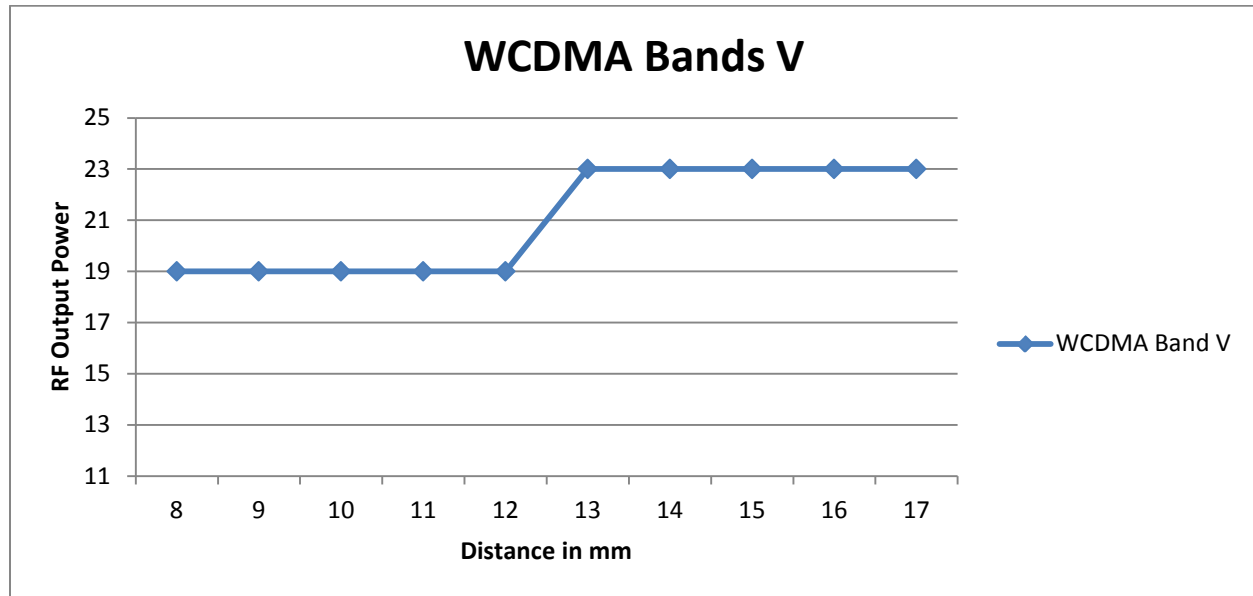
Edge 1, DUT Moving Toward (Trigger) and Away (Release) from the Phantom





### W-CDMA Band V

Edge 1, DUT Moving Toward (Trigger) and Away (Release) from the Phantom



#### 6.4.3. Proximity Sensor Coverage (KDB 616217 §6.3)

As there is no spatial offset between the antenna and the proximity sensor element, proximity sensor coverage did not need to be assessed.

#### 6.4.4. Resulting test positions for SAR measurements

| Wireless technologies | Position | §6.2 Triggering Distance | §6.3 Coverage | Worst case distance for SAR |
|-----------------------|----------|--------------------------|---------------|-----------------------------|
| WWAN                  | Rear     | 15 mm                    | N/A           | 14 mm                       |
|                       | Edge 1   | 12 mm                    | N/A           | 11 mm                       |

## 7. RF Exposure Conditions (Test Configurations)

Refer to “SAR Photos and Ant locations” Appendix for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

### 7.1. Standalone SAR Test Exclusion Considerations

Since the *Dedicated Host Approach* is applied, the standalone SAR test exclusion procedure in KDB 447498 § 4.3.1 is applied in conjunction with KDB 616217 § 4.3 to determine the minimum test separation distance:

- o When the separation distance from the antenna to an adjacent edge is  $\leq 5$  mm, a distance of 5 mm is applied to determine SAR test exclusion.
- o When the separation distance from the antenna to an adjacent edge is  $> 5$  mm, the actual antenna-to-edge separation distance is applied to determine SAR test exclusion.

### SAR Test Exclusion Calculations for WWAN

#### Antennas < 50mm to adjacent edges

| Antenna                             | Tx Interface | Frequency (MHz) | Output Power |     | Separation Distances (mm) |        |        |        |        |       | Calculated Threshold Value |                   |         |         |                   |       |
|-------------------------------------|--------------|-----------------|--------------|-----|---------------------------|--------|--------|--------|--------|-------|----------------------------|-------------------|---------|---------|-------------------|-------|
|                                     |              |                 | dBm          | mW  | Rear                      | Edge 1 | Edge 2 | Edge 3 | Edge 4 | Front | Rear                       | Edge 1            | Edge 2  | Edge 3  | Edge 4            | Front |
| Full Power, Proximity Sensor Off    |              |                 |              |     |                           |        |        |        |        |       |                            |                   |         |         |                   |       |
| Cellular                            | GPRS 2 Slots | 848.8           | 31.50        | 353 | 1.4                       | 3.5    | 102    | 227    | 12     |       | 65<br>-MEASURE-            | 65<br>-MEASURE-   | > 50 mm | > 50 mm | 27.1<br>-MEASURE- |       |
| Cellular                            | GPRS 2 Slots | 1909.8          | 27.00        | 125 | 1.4                       | 3.5    | 102    | 227    | 12     |       | 34.5<br>-MEASURE-          | 34.5<br>-MEASURE- | > 50 mm | > 50 mm | 14.4<br>-MEASURE- |       |
| Cellular                            | W-CDMA 5     | 846.6           | 23.50        | 224 | 1.4                       | 3.5    | 102    | 227    | 12     |       | 41.2<br>-MEASURE-          | 41.2<br>-MEASURE- | > 50 mm | > 50 mm | 17.2<br>-MEASURE- |       |
| Power Back-off, Proximity Sensor On |              |                 |              |     |                           |        |        |        |        |       |                            |                   |         |         |                   |       |
| Cellular                            | GPRS 2 Slots | 848.8           | 25.50        | 89  | 1.4                       | 3.5    | 102    | 227    | 12     |       | 16.4<br>-MEASURE-          | 16.4<br>-MEASURE- | > 50 mm | > 50 mm | 6.8<br>-MEASURE-  |       |
| Cellular                            | GPRS 2 Slots | 1909.8          | 20.50        | 28  | 1.4                       | 3.5    | 102    | 227    | 12     |       | 7.7<br>-MEASURE-           | 7.7<br>-MEASURE-  | > 50 mm | > 50 mm | 3.2<br>-MEASURE-  |       |
| Cellular                            | W-CDMA 5     | 846.6           | 19.50        | 89  | 1.4                       | 3.5    | 102    | 227    | 12     |       | 16.4<br>-MEASURE-          | 16.4<br>-MEASURE- | > 50 mm | > 50 mm | 6.8<br>-MEASURE-  |       |

#### Note(s):

1. According to KDB 447498, if the calculated threshold value is  $>3$  then SAR testing is required.

#### Antennas > 50mm to adjacent edges

| Antenna                             | Tx Interface | Frequency (MHz) | Output Power |     | Separation Distances (mm) |        |        |        |        |       | Calculated Threshold Value |         |                      |                       |         |       |
|-------------------------------------|--------------|-----------------|--------------|-----|---------------------------|--------|--------|--------|--------|-------|----------------------------|---------|----------------------|-----------------------|---------|-------|
|                                     |              |                 | dBm          | mW  | Rear                      | Edge 1 | Edge 2 | Edge 3 | Edge 4 | Front | Rear                       | Edge 1  | Edge 2               | Edge 3                | Edge 4  | Front |
| Full Power, Proximity Sensor Off    |              |                 |              |     |                           |        |        |        |        |       |                            |         |                      |                       |         |       |
| Cellular                            | GPRS 2 Slots | 848.8           | 31.50        | 353 | 1.4                       | 3.5    | 102    | 227    | 12     |       | < 50 mm                    | < 50 mm | 457.1 mW<br>-EXEMPT- | 1164.4 mW<br>-EXEMPT- | < 50 mm |       |
| Cellular                            | GPRS 2 Slots | 1909.8          | 27.00        | 125 | 1.4                       | 3.5    | 102    | 227    | 12     |       | < 50 mm                    | < 50 mm | 628.5 mW<br>-EXEMPT- | 1878.5 mW<br>-EXEMPT- | < 50 mm |       |
| Cellular                            | W-CDMA 5     | 846.6           | 23.50        | 224 | 1.4                       | 3.5    | 102    | 227    | 12     |       | < 50 mm                    | < 50 mm | 456.5 mW<br>-EXEMPT- | 1162 mW<br>-EXEMPT-   | < 50 mm |       |
| Power Back-off, Proximity Sensor On |              |                 |              |     |                           |        |        |        |        |       |                            |         |                      |                       |         |       |
| Cellular                            | GPRS 2 Slots | 848.8           | 25.50        | 89  | 1.4                       | 3.5    | 102    | 227    | 12     |       | < 50 mm                    | < 50 mm | 457.1 mW<br>-EXEMPT- | 1164.4 mW<br>-EXEMPT- | < 50 mm |       |
| Cellular                            | GPRS 2 Slots | 1909.8          | 20.50        | 28  | 1.4                       | 3.5    | 102    | 227    | 12     |       | < 50 mm                    | < 50 mm | 628.5 mW<br>-EXEMPT- | 1878.5 mW<br>-EXEMPT- | < 50 mm |       |
| Cellular                            | W-CDMA 5     | 846.6           | 19.50        | 89  | 1.4                       | 3.5    | 102    | 227    | 12     |       | < 50 mm                    | < 50 mm | 456.5 mW<br>-EXEMPT- | 1162 mW<br>-EXEMPT-   | < 50 mm |       |

#### Note(s):

1. According to KDB 447498, if the calculated Power threshold is less than the output power then SAR testing is required.

## SAR Test Exclusion Calculations for WLAN

Antennas < 50mm to adjacent edges

| Tx Interface                     | Frequency (MHz) | Output Power |    | Separation Distances (mm) |        |        |        |        |       | Calculated Threshold Value |                 |                   |         |         |       |
|----------------------------------|-----------------|--------------|----|---------------------------|--------|--------|--------|--------|-------|----------------------------|-----------------|-------------------|---------|---------|-------|
|                                  |                 | dBm          | mW | Rear                      | Edge 1 | Edge 2 | Edge 3 | Edge 4 | Front | Rear                       | Edge 1          | Edge 2            | Edge 3  | Edge 4  | Front |
| Full Power, Proximity Sensor Off |                 |              |    |                           |        |        |        |        |       |                            |                 |                   |         |         |       |
| Wi-Fi 2.4 GHz                    | 2462            | 16.00        | 40 | 1.4                       | 44     | 6      | 179.5  | 140.5  |       | 12.6<br>-MEASURE-          | 1.4<br>-EXEMPT- | 10.5<br>-MEASURE- | > 50 mm | > 50 mm |       |
| Bluetooth                        | 2480            | 10.00        | 10 | 1.4                       | 44     | 6      | 179.5  | 140.5  |       | 3.1<br>-MEASURE-           | 0.4<br>-EXEMPT- | 2.6<br>-EXEMPT-   | > 50 mm | > 50 mm |       |

### Note(s):

- According to KDB 447498, if the calculated threshold value is >3 then SAR testing is required.

Antennas > 50mm to adjacent edges

| Tx Interface                     | Frequency (MHz) | Output Power |    | Separation Distances (mm) |        |        |        |        |       | Calculated Threshold Value |         |         |                       |                       |       |
|----------------------------------|-----------------|--------------|----|---------------------------|--------|--------|--------|--------|-------|----------------------------|---------|---------|-----------------------|-----------------------|-------|
|                                  |                 | dBm          | mW | Rear                      | Edge 1 | Edge 2 | Edge 3 | Edge 4 | Front | Rear                       | Edge 1  | Edge 2  | Edge 3                | Edge 4                | Front |
| Full Power, Proximity Sensor Off |                 |              |    |                           |        |        |        |        |       |                            |         |         |                       |                       |       |
| Wi-Fi 2.4 GHz                    | 2462            | 16.00        | 40 | 1.4                       | 44     | 6      | 179.5  | 140.5  |       | < 50 mm                    | < 50 mm | < 50 mm | 1390.6 mW<br>-EXEMPT- | 1000.6 mW<br>-EXEMPT- |       |
| Bluetooth                        | 2480            | 10.00        | 10 | 1.4                       | 44     | 6      | 179.5  | 140.5  |       | < 50 mm                    | < 50 mm | < 50 mm | 1390.3 mW<br>-EXEMPT- | 1000.3 mW<br>-EXEMPT- |       |

### Note(s):

- According to KDB 447498, if the calculated Power threshold is less than the output power then SAR testing is required.

## 7.2. Required Test Configurations

The table below identifies the standalone test configurations required for this device according to the findings in Section 7.1:

| Test Configurations               | Rear | Edge 1     | Edge 2        | Edge 3        | Edge 4      |
|-----------------------------------|------|------------|---------------|---------------|-------------|
|                                   |      | (Top Edge) | (Right Edge ) | (Bottom Edge) | (Left Edge) |
| GSM850 Full Power                 | Yes  | Yes        | No            | No            | Yes         |
| GSM850 w / Power Reduction        | Yes  | Yes        | No            | No            | Yes         |
| GSM1900 Full Power                | Yes  | Yes        | No            | No            | Yes         |
| GSM1900 w / Power Reduction       | Yes  | Yes        | No            | No            | Yes         |
| W-CDMA Band 5 Full Power          | Yes  | Yes        | No            | No            | Yes         |
| W-CDMA Band 5 w / Power Reduction | Yes  | Yes        | No            | No            | Yes         |
| Wi-Fi 2.4 GHz Full Power          | Yes  | No         | Yes           | No            | No          |
| Bluetooth                         | Yes  | No         | No            | No            | No          |

### Note(s):

- Yes = Testing is required.
- No = Testing is not required.

## 8. Dielectric Property Measurements & System Check

### 8.1. Dielectric Property Measurements

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within  $\pm 2^\circ\text{C}$  of the temperature when the tissue parameters are characterized.

The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.

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

#### Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

| 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           |

#### IEEE Std 1528-2013

Refer to Table 3 within the IEEE Std 1528-2013

## Dielectric Property Measurements Results:

### SAR 1 Room

| Date       | Freq. (MHz) | Liquid Parameters |         |                            | Measured | Target | Delta (%) | Limit ±(%) |
|------------|-------------|-------------------|---------|----------------------------|----------|--------|-----------|------------|
| 04-15-2015 | Body 2450   | e'                | 50.7500 | Relative Permittivity (ε): | 50.75    | 52.70  | -3.70     | 5          |
|            |             | e"                | 14.5300 | Conductivity (σ):          | 1.98     | 1.95   | 1.51      | 5          |
|            | Body 2410   | e'                | 50.8900 | Relative Permittivity (ε): | 50.89    | 52.76  | -3.54     | 5          |
|            |             | e"                | 14.3800 | Conductivity (σ):          | 1.93     | 1.91   | 1.02      | 5          |
|            | Body 2475   | e'                | 50.6600 | Relative Permittivity (ε): | 50.66    | 52.67  | -3.81     | 5          |
|            |             | e"                | 14.6400 | Conductivity (σ):          | 2.01     | 1.99   | 1.49      | 5          |

### SAR 2 Room

| Date      | Freq. (MHz) | Liquid Parameters |         |                            | Measured | Target | Delta (%) | Limit ±(%) |
|-----------|-------------|-------------------|---------|----------------------------|----------|--------|-----------|------------|
| 3-9-2015  | Body 835    | e'                | 53.1000 | Relative Permittivity (ε): | 53.10    | 55.20  | -3.80     | 5          |
|           |             | e''               | 21.2400 | Conductivity (σ):          | 0.99     | 0.97   | 1.66      | 5          |
|           | Body 820    | e'                | 53.1900 | Relative Permittivity (ε): | 53.19    | 55.28  | -3.78     | 5          |
|           |             | e''               | 21.2800 | Conductivity (σ):          | 0.97     | 0.97   | 0.18      | 5          |
|           | Body 850    | e'                | 52.9600 | Relative Permittivity (ε): | 52.96    | 55.16  | -3.98     | 5          |
|           |             | e''               | 21.2200 | Conductivity (σ):          | 1.00     | 0.99   | 1.60      | 5          |
| 3-24-2015 | Body 835    | e'                | 53.3700 | Relative Permittivity (ε): | 53.37    | 55.20  | -3.32     | 5          |
|           |             | e''               | 21.6100 | Conductivity (σ):          | 1.00     | 0.97   | 3.44      | 5          |
|           | Body 820    | e'                | 53.5200 | Relative Permittivity (ε): | 53.52    | 55.28  | -3.18     | 5          |
|           |             | e''               | 21.6800 | Conductivity (σ):          | 0.99     | 0.97   | 2.07      | 5          |
|           | Body 850    | e'                | 53.2300 | Relative Permittivity (ε): | 53.23    | 55.16  | -3.49     | 5          |
|           |             | e''               | 21.5400 | Conductivity (σ):          | 1.02     | 0.99   | 3.13      | 5          |
| 4-27-2015 | Body 2450   | e'                | 51.7600 | Relative Permittivity (ε): | 51.76    | 52.70  | -1.78     | 5          |
|           |             | e''               | 14.3400 | Conductivity (σ):          | 1.95     | 1.95   | 0.18      | 5          |
|           | Body 2410   | e'                | 51.9200 | Relative Permittivity (ε): | 51.92    | 52.76  | -1.59     | 5          |
|           |             | e''               | 14.1800 | Conductivity (σ):          | 1.90     | 1.91   | -0.38     | 5          |
|           | Body 2475   | e'                | 51.6800 | Relative Permittivity (ε): | 51.68    | 52.67  | -1.88     | 5          |
|           |             | e''               | 14.4400 | Conductivity (σ):          | 1.99     | 1.99   | 0.10      | 5          |

### SAR 3 Room

| Date      | Freq. (MHz) | Liquid Parameters |         |                                         | Measured | Target | Delta (%) | Limit ±(%) |
|-----------|-------------|-------------------|---------|-----------------------------------------|----------|--------|-----------|------------|
| 3-9-2015  | Body 1900   | e'                | 51.2000 | Relative Permittivity ( $\epsilon_r$ ): | 51.20    | 53.30  | -3.94     | 5          |
|           |             | e''               | 14.8100 | Conductivity ( $\sigma$ ):              | 1.56     | 1.52   | 2.94      | 5          |
|           | Body 1850   | e'                | 51.3700 | Relative Permittivity ( $\epsilon_r$ ): | 51.37    | 53.30  | -3.62     | 5          |
|           |             | e''               | 14.8200 | Conductivity ( $\sigma$ ):              | 1.52     | 1.52   | 0.29      | 5          |
|           | Body 1910   | e'                | 51.1800 | Relative Permittivity ( $\epsilon_r$ ): | 51.18    | 53.30  | -3.98     | 5          |
|           |             | e''               | 14.8100 | Conductivity ( $\sigma$ ):              | 1.57     | 1.52   | 3.48      | 5          |
| 4-20-2015 | Body 1900   | e'                | 53.2400 | Relative Permittivity ( $\epsilon_r$ ): | 53.24    | 53.30  | -0.11     | 5          |
|           |             | e''               | 14.9700 | Conductivity ( $\sigma$ ):              | 1.58     | 1.52   | 4.05      | 5          |
|           | Body 1850   | e'                | 53.4100 | Relative Permittivity ( $\epsilon_r$ ): | 53.41    | 53.30  | 0.21      | 5          |
|           |             | e''               | 14.9500 | Conductivity ( $\sigma$ ):              | 1.54     | 1.52   | 1.17      | 5          |
|           | Body 1910   | e'                | 53.2300 | Relative Permittivity ( $\epsilon_r$ ): | 53.23    | 53.30  | -0.13     | 5          |
|           |             | e''               | 14.9800 | Conductivity ( $\sigma$ ):              | 1.59     | 1.52   | 4.66      | 5          |

## 8.2. System Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are re-measured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

### 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 depth of tissue-equivalent liquid in a phantom must be  $\geq$  15.0 cm for SAR measurements  $\leq$  3 GHz and  $\geq$  10.0 cm for measurements  $>$  3 GHz.
- 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.

### Reference Target SAR Values

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

| System Dipole | Serial No. | Cal. Date | Freq. (MHz) | Target SAR Values (W/kg) |      |      |
|---------------|------------|-----------|-------------|--------------------------|------|------|
|               |            |           |             | 1g/10g                   | Head | Body |
| D835V2        | 4d174      | 8-12-2014 | 835         | 1g                       | 9.32 | 9.62 |
|               |            |           |             | 10g                      | 6.09 | 6.37 |
| D1900V2       | 5d190      | 8-12-2014 | 1900        | 1g                       | 40.2 | 40.4 |
|               |            |           |             | 10g                      | 21.0 | 21.3 |
| D1900V2       | 5d199      | 2-6-2015  | 1900        | 1g                       | 41   | 40.6 |
|               |            |           |             | 10g                      | 21.4 | 21.6 |
| D2450V2       | 939        | 8-11-2014 | 2450        | 1g                       | 52.1 | 51.4 |
|               |            |           |             | 10g                      | 24.2 | 24   |

## System Check Results

The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within 10% of the manufacturer calibrated dipole SAR target.

### SAR 1 Room

| Date Tested | System Dipole |          | T.S. Liquid |     | Measured Results    |                  | Target (Ref. Value) | Delta ±10 % | Plot No. |
|-------------|---------------|----------|-------------|-----|---------------------|------------------|---------------------|-------------|----------|
|             | Type          | Serial # |             |     | Zoom Scan to 100 mW | Normalize to 1 W |                     |             |          |
| 4-15-2015   | D2450V2       | 939      | Body        | 1g  | 5.28                | 52.80            | 51.40               | 2.72        | 1        |
|             |               |          |             | 10g | 2.40                | 24.00            | 24.00               | 0.00        |          |

### SAR 2 Room

| Date Tested | System Dipole |          | T.S. Liquid |     | Measured Results    |                  | Target (Ref. Value) | Delta ±10 % | Plot No. |
|-------------|---------------|----------|-------------|-----|---------------------|------------------|---------------------|-------------|----------|
|             | Type          | Serial # |             |     | Zoom Scan to 100 mW | Normalize to 1 W |                     |             |          |
| 3-9-2015    | D835V2        | 4d174    | Body        | 1g  | 0.96                | 9.57             | 9.62                | -0.52       |          |
|             |               |          |             | 10g | 0.63                | 6.30             | 6.37                | -1.10       |          |
| 3-24-2015   | D835V2        | 4d174    | Body        | 1g  | 0.98                | 9.82             | 9.62                | 2.08        | 2        |
|             |               |          |             | 10g | 0.65                | 6.45             | 6.37                | 1.26        |          |
| 4-27-2015   | D2450V2       | 939      | Body        | 1g  | 5.57                | 55.70            | 51.40               | 8.37        |          |
|             |               |          |             | 10g | 2.59                | 25.90            | 24.00               | 7.92        |          |

### SAR 3 Room

| Date Tested | System Dipole |          | T.S. Liquid |     | Measured Results    |                  | Target (Ref. Value) | Delta ±10 % | Plot No. |
|-------------|---------------|----------|-------------|-----|---------------------|------------------|---------------------|-------------|----------|
|             | Type          | Serial # |             |     | Zoom Scan to 100 mW | Normalize to 1 W |                     |             |          |
| 3-9-2015    | D1900V2       | 5d190    | Body        | 1g  | 3.96                | 39.60            | 40.40               | -1.98       |          |
|             |               |          |             | 10g | 2.03                | 20.30            | 21.30               | -4.69       |          |
| 4-20-2015   | D1900V2       | 5d199    | Body        | 1g  | 4.21                | 42.10            | 40.6                | 3.69        | 3        |
|             |               |          |             | 10g | 2.16                | 21.60            | 21.60               | 0.00        |          |



## 9. Conducted Output Power Measurements

### 9.1. GSM

#### GSM850 Measured Results

| Band | Mode        | Coding Scheme | Time Slots | Ch No. | Freq. (MHz) | Max. Power      |                 | with Pwr Back-off |                 |
|------|-------------|---------------|------------|--------|-------------|-----------------|-----------------|-------------------|-----------------|
|      |             |               |            |        |             | Burst Pwr (dBm) | Frame Pwr (dBm) | Burst Pwr (dBm)   | Frame Pwr (dBm) |
| 850  | GSM (Voice) | CS1           | 1          | 128    | 824.2       | 32.6            | 23.5            | 26.9              | 17.9            |
|      |             |               |            | 190    | 836.6       | 32.5            | 23.4            | 27.0              | 18.0            |
|      |             |               |            | 251    | 848.8       | 32.5            | 23.5            | 27.1              | 18.1            |
|      | GPRS (GMSK) | CS1           | 1          | 128    | 824.2       | 32.6            | 23.6            | 26.9              | 17.9            |
|      |             |               |            | 190    | 836.6       | 32.5            | 23.5            | 27.0              | 18.0            |
|      |             |               |            | 251    | 848.8       | 32.5            | 23.5            | 27.1              | 18.1            |
|      |             |               | 2          | 128    | 824.2       | 31.0            | 25.0            | 24.9              | 18.9            |
|      |             |               |            | 190    | 836.6       | 31.0            | 25.0            | 25.0              | 19.0            |
|      |             |               |            | 251    | 848.8       | 31.1            | 25.1            | 25.1              | 19.1            |
|      |             |               | 3          | 128    | 824.2       | 28.9            | 24.7            | 23.0              | 18.7            |
|      |             |               |            | 190    | 836.6       | 29.0            | 24.8            | 23.1              | 18.8            |
|      |             |               |            | 251    | 848.8       | 29.1            | 24.8            | 23.2              | 18.9            |
|      |             |               | 4          | 128    | 824.2       | 26.9            | 23.9            | 20.9              | 17.9            |
|      |             |               |            | 190    | 836.6       | 27.0            | 24.0            | 21.1              | 18.1            |
|      |             |               |            | 251    | 848.8       | 27.1            | 24.1            | 21.2              | 18.2            |

EGPRS(8PSK) is Rx only

#### Notes:

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

- Standalone: GMSK (GPRS) mode with 2 time slots for Max power and 2 time slots for Reduced power, based on the output power measurements above

#### GSM1900 Measured Results

| Band | Mode        | Coding Scheme | Time Slots | Ch No. | Freq. (MHz) | Max. Power      |                 | with Pwr Back-off |                 |
|------|-------------|---------------|------------|--------|-------------|-----------------|-----------------|-------------------|-----------------|
|      |             |               |            |        |             | Burst Pwr (dBm) | Frame Pwr (dBm) | Burst Pwr (dBm)   | Frame Pwr (dBm) |
| 1900 | GSM (Voice) | CS1           | 1          | 512    | 1850.2      | 29.1            | 20.0            | 22.1              | 13.1            |
|      |             |               |            | 661    | 1880.0      | 29.3            | 20.3            | 22.2              | 13.1            |
|      |             |               |            | 810    | 1909.8      | 29.1            | 20.1            | 22.1              | 13.0            |
|      | GPRS (GMSK) | CS1           | 1          | 512    | 1850.2      | 29.1            | 20.0            | 22.1              | 13.1            |
|      |             |               |            | 661    | 1880.0      | 29.3            | 20.3            | 22.1              | 13.1            |
|      |             |               |            | 810    | 1909.8      | 29.1            | 20.1            | 22.1              | 13.0            |
|      |             |               | 2          | 512    | 1850.2      | 26.8            | 20.7            | 20.1              | 14.1            |
|      |             |               |            | 661    | 1880.0      | 26.8            | 20.8            | 20.2              | 14.2            |
|      |             |               |            | 810    | 1909.8      | 26.7            | 20.7            | 20.1              | 14.1            |
|      |             |               | 3          | 512    | 1850.2      | 24.2            | 19.9            | 18.1              | 13.8            |
|      |             |               |            | 661    | 1880.0      | 24.2            | 20.0            | 18.1              | 13.9            |
|      |             |               |            | 810    | 1909.8      | 24.2            | 19.9            | 18.0              | 13.7            |
|      |             |               | 4          | 512    | 1850.2      | 22.3            | 19.2            | 17.1              | 14.1            |
|      |             |               |            | 661    | 1880.0      | 22.3            | 19.3            | 17.1              | 14.1            |
|      |             |               |            | 810    | 1909.8      | 22.2            | 19.2            | 17.1              | 14.0            |

EGPRS(8PSK) is Rx only

#### Notes:

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

- Standalone: GMSK (GPRS) mode with 2 time slots for Max power and 2 time slots for Reduced power, based on the output power measurements above

## 9.2. W-CDMA

### Release 99 Setup Procedures used to establish the test signals

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 2  |
|                        | Rel99 RMC               | 12.2kbps RMC |
|                        | Power Control Algorithm | Algorithm2   |
|                        | $\beta_c/\beta_d$       | 8/15         |

### HSDPA Setup Procedures used to establish the test signals

The following 4 Sub-tests were completed according to Release 7 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

|                         | Mode                                   | HSDPA        | HSDPA | HSDPA | HSDPA |
|-------------------------|----------------------------------------|--------------|-------|-------|-------|
|                         | Subtest                                | 1            | 2     | 3     | 4     |
| W-CDMA General Settings | Loopback Mode                          | Test Mode 1  |       |       |       |
|                         | Rel99 RMC                              | 12.2kbps RMC |       |       |       |
|                         | HSDPA FRC                              | H-Set 1      |       |       |       |
|                         | Power Control Algorithm                | Algorithm 2  |       |       |       |
|                         | $\beta_c$                              | 2/15         | 11/15 | 15/15 | 15/15 |
|                         | $\beta_d$                              | 15/15        | 15/15 | 8/15  | 4/15  |
|                         | Bd (SF)                                | 64           |       |       |       |
|                         | $\beta_c/\beta_d$                      | 2/15         | 11/15 | 15/8  | 15/4  |
|                         | $\beta_{hs}$                           | 4/15         | 24/15 | 30/15 | 30/15 |
|                         | MPR (dB)                               | 0            | 0     | 0.5   | 0.5   |
| HSDPA Specific Settings | D <sub>ACK</sub>                       | 8            |       |       |       |
|                         | D <sub>NAK</sub>                       | 8            |       |       |       |
|                         | DCQI                                   | 8            |       |       |       |
|                         | Ack-Nack repetition factor             | 3            |       |       |       |
|                         | CQI Feedback (Table 5.2B.4)            | 4ms          |       |       |       |
|                         | CQI Repetition Factor (Table 5.2B.4)   | 2            |       |       |       |
|                         | A <sub>hs</sub> = $\beta_{hs}/\beta_c$ | 30/15        |       |       |       |

### **HSPA (HSDPA & HSUPA) Setup Procedures used to establish the test signals**

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          |       |       |       |             |
|-------------------------------|--------------------------------------|---------------|-------|-------|-------|-------------|
|                               | Subtest                              | 1             | 2     | 3     | 4     | 5           |
| WCDMA<br>General<br>Settings  | Loopback Mode                        | Test Mode 1   |       |       |       |             |
|                               | Rel99 RMC                            | 12.2 kbps RMC |       |       |       |             |
|                               | HSDPA FRC                            | H-Set 1       |       |       |       |             |
|                               | HSUPA Test                           | HSPA          |       |       |       |             |
|                               | Power Control Algorithm              | Algorithm 2   |       |       |       | Algorithm 1 |
|                               | $\beta_c$                            | 11/15         | 6/15  | 15/15 | 2/15  | 15/15       |
|                               | $\beta_d$                            | 15/15         | 15/15 | 9/15  | 15/15 | 0           |
|                               | $\beta_{ec}$                         | 209/225       | 12/15 | 30/15 | 2/15  | 5/15        |
|                               | $\beta_c/\beta_d$                    | 11/15         | 6/15  | 15/9  | 2/15  | 15/1        |
|                               | $\beta_{hs}$                         | 22/15         | 12/15 | 30/15 | 4/15  | 5/15        |
|                               | $\beta_{ed}$                         | 1309/225      | 94/75 | 47/15 | 56/75 | 47/15       |
| HSDPA<br>Specific<br>Settings | CM (dB)                              | 1             | 3     | 2     | 3     | 1           |
|                               | MPR (dB)                             | 0             | 2     | 1     | 2     | 0           |
|                               | DACK                                 | 8             |       |       |       | 0           |
|                               | DNAK                                 | 8             |       |       |       | 0           |
|                               | DCQI                                 | 8             |       |       |       | 0           |
|                               | Ack-Nack repetition factor           | 3             |       |       |       |             |
|                               | CQI Feedback (Table 5.2B.4)          | 4ms           |       |       |       |             |
| HSUPA<br>Specific<br>Settings | CQI Repetition Factor (Table 5.2B.4) | 2             |       |       |       |             |
|                               | $A_{hs} = \beta_{hs}/\beta_c$        | 30/15         |       |       |       |             |
|                               | E-DPDCH                              | 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                    | 5             | 5     | 2     | 5     | 1           |
|                               | Reference E-TFCI                     | 11            | 11    | 11    | 11    | 67          |
|                               | Reference E-TFCI PO                  | 4             | 4     | 4     | 4     | 18          |
|                               | Reference E-TFCI                     | 67            | 67    | 92    | 67    | 67          |
|                               | Reference E-TFCI PO                  | 18            | 18    | 18    | 18    | 18          |
|                               | Reference E-TFCI                     | 71            | 71    | 71    | 71    | 71          |
|                               | Reference E-TFCI PO                  | 23            | 23    | 23    | 23    | 23          |
|                               | Reference E-TFCI                     | 75            | 75    | 75    | 75    | 75          |
|                               | Reference E-TFCI PO                  | 26            | 26    | 26    | 26    | 26          |
|                               | Reference E-TFCI                     | 81            | 81    | 81    | 81    | 81          |
|                               | Reference E-TFCI PO                  | 27            | 27    | 27    | 27    | 27          |
|                               | Maximum Channelization Codes         | 2xSF2         |       |       |       | SF4         |

### **HSPA+**

Since 16QAM is not used for uplink, the uplink Category and release is same as HSUPA, i.e., Rel. 7 Therefore, the RF conducted power is not measured.

**WCDMA Band V Measured Results**

| Band          | Mode   |                | UL Ch No. | Freq. (MHz) | MPR (dB) | Avg Pwr (dBm) |              |
|---------------|--------|----------------|-----------|-------------|----------|---------------|--------------|
|               |        |                |           |             |          | Max           | Pwr Back-off |
| W-CDMA Band V | Rel 99 | RMC, 12.2 kbps | 4132      | 826.4       | N/A      | 23.0          | 19.0         |
|               |        |                | 4183      | 836.6       | N/A      | 22.9          | 19.3         |
|               |        |                | 4233      | 846.6       | N/A      | 22.6          | 19.4         |
|               | HSDPA  | Subtest 1      | 4132      | 826.4       | 0        | 21.6          | 18.0         |
|               |        |                | 4183      | 836.6       | 0        | 21.7          | 18.2         |
|               |        |                | 4233      | 846.6       | 0        | 21.7          | 18.4         |
|               |        | Subtest 2      | 4132      | 826.4       | 0        | 21.6          | 18.1         |
|               |        |                | 4183      | 836.6       | 0        | 21.7          | 18.3         |
|               |        |                | 4233      | 846.6       | 0        | 21.7          | 18.3         |
|               |        | Subtest 3      | 4132      | 826.4       | 0.5      | 21.7          | 18.1         |
|               |        |                | 4183      | 836.6       | 0.5      | 21.8          | 18.3         |
|               |        |                | 4233      | 846.6       | 0.5      | 21.8          | 18.4         |
|               |        | Subtest 4      | 4132      | 826.4       | 0.5      | 21.6          | 18.1         |
|               |        |                | 4183      | 836.6       | 0.5      | 21.7          | 18.3         |
|               |        |                | 4233      | 846.6       | 0.5      | 21.7          | 18.3         |
|               | HSUPA  | Subtest 1      | 4132      | 826.4       | 0        | 20.8          | 17.5         |
|               |        |                | 4183      | 836.6       | 0        | 20.9          | 17.7         |
|               |        |                | 4233      | 846.6       | 0        | 20.9          | 17.8         |
|               |        | Subtest 2      | 4132      | 826.4       | 2        | 18.9          | 17.5         |
|               |        |                | 4183      | 836.6       | 2        | 19.1          | 17.3         |
|               |        |                | 4233      | 846.6       | 2        | 19.0          | 17.4         |
|               |        | Subtest 3      | 4132      | 826.4       | 1        | 20.1          | 17.7         |
|               |        |                | 4183      | 836.6       | 1        | 20.3          | 17.2         |
|               |        |                | 4233      | 846.6       | 1        | 20.2          | 17.9         |
|               |        | Subtest 4      | 4132      | 826.4       | 2        | 19.7          | 17.5         |
|               |        |                | 4183      | 836.6       | 2        | 19.8          | 17.5         |
|               |        |                | 4233      | 846.6       | 2        | 19.7          | 17.7         |
|               |        | Subtest 5      | 4132      | 826.4       | 0        | 21.4          | 17.1         |
|               |        |                | 4183      | 836.6       | 0        | 21.5          | 17.7         |
|               |        |                | 4233      | 846.6       | 0        | 21.5          | 17.8         |

### 9.3. Wi-Fi 2.4GHz

| Band (GHz) | Mode           | Data Rate | Ch # | Freq. (MHz) | Avg Pwr (dBm) | Max Output Power (dBm) | SAR Test (Yes/No) | Note(s) |
|------------|----------------|-----------|------|-------------|---------------|------------------------|-------------------|---------|
| 2.4        | 802.11b        | 1 Mbps    | 1    | 2412        | 15.5          | 16.0                   | Yes               |         |
|            |                |           | 6    | 2437        | 15.5          |                        |                   |         |
|            |                |           | 11   | 2462        | 15.6          |                        |                   |         |
|            | 802.11g        | 6 Mbps    | 1    | 2412        | Not Required  | 14.5                   | No                | 1       |
|            |                |           | 6    | 2437        |               |                        |                   |         |
|            |                |           | 11   | 2462        |               |                        |                   |         |
|            | 802.11n (HT20) | 6.5 Mbps  | 1    | 2412        |               | 13.5                   | No                | 1       |
|            |                |           | 6    | 2437        |               |                        |                   |         |
|            |                |           | 11   | 2462        |               |                        |                   |         |

#### Note(s):

- Output Power and SAR is not required for 802.11g/n HT20 channels when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg.

### 9.4. Bluetooth

| Band (GHz) | Mode                      | Ch # | Freq. (MHz) | Avg Pwr (dBm) | Avg Pwr (mW) |
|------------|---------------------------|------|-------------|---------------|--------------|
| 2.4        | V3.0 + BDR, GFSK          | 0    | 2402        | 9.1           | 8.09         |
|            |                           | 39   | 2441        | 8.6           | 7.29         |
|            |                           | 78   | 2480        | 8.9           | 7.77         |
|            | V3.0 + EDR, $\pi/4$ DQPSK | 0    | 2402        | 5.2           | 3.33         |
|            |                           | 39   | 2441        | 4.6           | 2.91         |
|            |                           | 78   | 2480        | 4.8           | 3.03         |
|            | V3.0 + EDR, 8-DPSK        | 0    | 2402        | 5.4           | 3.45         |
|            |                           | 39   | 2441        | 4.7           | 2.98         |
|            |                           | 78   | 2480        | 4.9           | 3.10         |
|            | V4.0 LE, GFSK             | 0    | 2402        | 7.8           | 6.07         |
|            |                           | 19   | 2440        | 7.9           | 6.13         |
|            |                           | 39   | 2480        | 7.8           | 6.07         |

## 10. Measured and Reported (Scaled) SAR Results

SAR Test Reduction criteria are as follows:

### KDB 447498 D01 General RF Exposure Guidance:

Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

- $\leq 0.8$  W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is  $\leq 100$  MHz
- $\leq 0.6$  W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
- $\leq 0.4$  W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is  $\geq 200$  MHz

### KDB 941225 D01 SAR test for 3G devices:

When the maximum output power and tune-up tolerance specified for production units in a secondary mode is  $\leq \frac{1}{4}$  dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is  $\leq 1.2$  W/kg, SAR measurement is not required for the secondary mode

### KDB 248227 D01 SAR meas for 802.11 v02:

SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the initial test position(s) by applying the DSSS or OFDM SAR measurement procedures in the required wireless mode test configuration(s). The initial test position(s) is measured using the highest measured maximum output power channel in the required wireless mode test configuration(s). When the reported SAR for the initial test position is:

- $\leq 0.4$  W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.
- $> 0.4$  W/kg, SAR is repeated using the same wireless mode test configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the reported SAR is  $\leq 0.8$  W/kg or all required test positions are tested.
  - o For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.
  - o When it is unclear, all equivalent conditions must be tested.
- For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is  $> 0.8$  W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is  $\leq 1.2$  W/kg or all required test channels are considered.
  - o The additional power measurements required for this step should be limited to those necessary for identifying subsequent highest output power channels to apply the test reduction.
- When the specified maximum output power is the same for both UNII 1 and UNII 2A, begin SAR measurements in UNII 2A with the channel with the highest measured output power. If the reported SAR for UNII 2A is  $\leq 1.2$  W/kg, SAR is not required for UNII 1; otherwise treat the remaining bands separately and test them independently for SAR.
- When the specified maximum output power is different between UNII 1 and UNII 2A, begin SAR with the band that has the higher specified maximum output. If the highest reported SAR for the band with the highest specified power is  $\leq 1.2$  W/kg, testing for the band with the lower specified output power is not required; otherwise test the remaining bands independently for SAR.

To determine the initial test position, Area Scans were performed to determine the position with the *Maximum Value of SAR (measured)*. The position that produced the highest *Maximum Value of SAR* is considered the worst case position; thus used as the initial test position.

## 10.1. GSM850

| Mode         | Pwr Back-off | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | Power (dBm)   |       | 1-g SAR (W/kg) |        | Plot No. |
|--------------|--------------|------------|---------------|-------|-------------|---------------|-------|----------------|--------|----------|
|              |              |            |               |       |             | Tune-up limit | Meas. | Meas.          | Scaled |          |
| GPRS 2 Slots | ON           | 0          | Rear          | 190   | 836.6       | 25.5          | 25.0  | 0.549          | 0.612  | 1        |
|              |              |            | Edge 1        | 190   | 836.6       | 25.5          | 25.0  | 0.266          | 0.296  |          |
|              |              |            | Edge 4        | 190   | 836.6       | 25.5          | 25.0  | 0.066          | 0.073  |          |
| GPRS 2 Slots | OFF          | 14         | Rear          | 190   | 836.6       | 31.5          | 31.0  | 0.331          | 0.368  |          |
|              |              | 11         | Edge 1        | 190   | 836.6       | 31.5          | 31.0  | 0.200          | 0.222  |          |
|              |              | 0          | Edge 4        | 190   | 836.6       | 31.5          | 31.0  | 0.293          | 0.326  |          |

## 10.2. GSM1900

| Mode         | Pwr Back-off | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | Power (dBm)   |       | 1-g SAR (W/kg) |        | Plot No. |
|--------------|--------------|------------|---------------|-------|-------------|---------------|-------|----------------|--------|----------|
|              |              |            |               |       |             | Tune-up limit | Meas. | Meas.          | Scaled |          |
| GPRS 2 Slots | ON           | 0          | Rear          | 661   | 1880.0      | 20.5          | 20.2  | 0.447          | 0.482  |          |
|              |              |            | Edge 1        | 661   | 1880.0      | 20.5          | 20.2  | 0.448          | 0.483  |          |
|              |              |            | Edge 4        | 661   | 1880.0      | 20.5          | 20.2  | 0.185          | 0.199  |          |
| GPRS 2 Slots | OFF          | 14         | Rear          | 661   | 1880.0      | 27.0          | 26.8  | 0.281          | 0.291  |          |
|              |              | 11         | Edge 1        | 661   | 1880.0      | 27.0          | 26.8  | 0.377          | 0.390  |          |
|              |              | 0          | Edge 4        | 512   | 1850.2      | 27.0          | 26.8  | 0.789          | 0.834  |          |
|              |              |            |               | 661   | 1880.0      | 27.0          | 26.8  | 0.821          | 0.850  |          |
|              |              |            |               | 810   | 1909.8      | 27.0          | 26.7  | 0.802          | 0.852  | 2        |

## 10.3. W-CDMA Band V

| Mode       | Pwr Back-off | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | Power (dBm)   |       | 1-g SAR (W/kg) |        | Plot No. |
|------------|--------------|------------|---------------|-------|-------------|---------------|-------|----------------|--------|----------|
|            |              |            |               |       |             | Tune-up limit | Meas. | Meas.          | Scaled |          |
| Rel 99 RMC | ON           | 0          | Rear          | 4183  | 836.6       | 19.5          | 19.3  | 0.650          | 0.678  | 3        |
|            |              |            | Edge 1        | 4183  | 836.6       | 19.5          | 19.3  | 0.288          | 0.300  |          |
|            |              |            | Edge 4        | 4183  | 836.6       | 19.5          | 19.3  | 0.094          | 0.098  |          |
| Rel 99 RMC | OFF          | 14         | Rear          | 4183  | 836.6       | 23.5          | 22.9  | 0.230          | 0.265  |          |
|            |              | 11         | Edge 1        | 4183  | 836.6       | 23.5          | 22.9  | 0.151          | 0.174  |          |
|            |              | 0          | Edge 4        | 4183  | 836.6       | 23.5          | 22.9  | 0.217          | 0.250  |          |

## 10.4. Wi-Fi (DTS Band)

| Frequency Band | Mode              | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | Area Scan Max. SAR (W/kg) | Power (dBm)   |       | 1-g SAR (W/kg) |        | Notes | Plot No. |
|----------------|-------------------|------------|---------------|-------|-------------|---------------------------|---------------|-------|----------------|--------|-------|----------|
|                |                   |            |               |       |             |                           | Tune-up limit | Meas. | Meas.          | Scaled |       |          |
| 2.4GHz         | 802.11b<br>1 Mbps | 0          | Rear          | 1     | 2412.0      | 1.750                     | 16.0          | 15.5  | 0.955          | 1.072  | 3     | 4        |
|                |                   |            |               | 6     | 2437.0      | 1.440                     | 16.0          | 15.5  | 0.779          | 0.878  |       |          |
|                |                   |            |               | 11    | 2462.0      | 0.980                     | 16.0          | 15.6  | 0.622          | 0.680  |       |          |
|                |                   |            | Edge 2        | 1     | 2412.0      | 0.176                     | 16.0          | 15.4  | 0.163          | 0.187  | 1     |          |

### Note(s):

1. Highest reported SAR is  $\leq 0.4$  W/kg. Therefore, further SAR measurements within this exposure condition are not required.
2. Highest reported SAR is  $> 0.4$  W/kg. Due to the highest reported SAR for this test position, other test positions in Head exposure condition were evaluated until a SAR  $\leq 0.8$  W/kg was reported.
3. Testing for a second channel was required because the reported SAR for this test position was  $> 0.8$  W/kg.
4. Additional testing required in order satisfying FCC simultaneous transmission limit criteria.

## 10.5. Bluetooth

| Frequency Band | Mode | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | Power (dBm)   |       | 1-g SAR (W/kg) |        | Plot No. |
|----------------|------|------------|---------------|-------|-------------|---------------|-------|----------------|--------|----------|
|                |      |            |               |       |             | Tune-up limit | Meas. | Meas.          | Scaled |          |
| 2.4 GHz        | GFSK | 0          | Rear          | 39    | 2441.0      | 10.0          | 8.6   | 0.037          | 0.051  | 5        |



## 11. SAR Measurement Variability

In accordance with published RF Exposure KDB 865664 D01 SAR measurement 100 MHz to 6 GHz. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

- 1) Repeated measurement is not required when the original highest measured SAR is  $< 0.80$  W/kg; steps 2) through 4) do not apply.
- 2) When the original highest measured SAR is  $\geq 0.80$  W/kg, repeat that measurement once.
- 3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is  $> 1.20$  or when the original or repeated measurement is  $\geq 1.45$  W/kg (~ 10% from the 1-g SAR limit).
- 4) Perform a third repeated measurement only if the original, first or second repeated measurement is  $\geq 1.5$  W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is  $> 1.20$ .

| Frequency Band (MHz) | Air Interface     | RF Exposure Conditions | Test Position | Repeated SAR (Yes/No) | Highest Measured SAR (W/kg) | Repeated Measured SAR (W/kg) | Largest to Smallest SAR Ratio |
|----------------------|-------------------|------------------------|---------------|-----------------------|-----------------------------|------------------------------|-------------------------------|
| 850                  | GSM 850           | Standalone             | Rear          | No                    | 0.549                       | N/A                          | N/A                           |
|                      | WCDMA Band V      | Standalone             | Rear          | No                    | 0.65                        | N/A                          | N/A                           |
| 1900                 | GSM 1900          | Standalone             | Edge 4        | Yes                   | 0.821                       | 0.826                        | 1.01                          |
| 2400                 | Wi-Fi 802.11b/g/n | Standalone             | Rear          | Yes                   | 0.955                       | 0.974                        | 1.02                          |
|                      | Bluetooth         | Standalone             | Rear          | No                    | 0.037                       | N/A                          | N/A                           |

### Note(s):

Second Repeated Measurement is not required since the ratio of the largest to smallest SAR for the original and first repeated measurement is not  $> 1.20$ .

## 12. Simultaneous Transmission SAR Analysis

KDB 447498 D01 General RF Exposure Guidance introduces a new formula for calculating the SAR to Peak Location Ratio (SPLSR) between pairs of simultaneously transmitting antennas:

$$SPLSR = (SAR_1 + SAR_2)^{1.5} / Ri$$

Where:

**SAR<sub>1</sub>** is the highest measured or estimated SAR for the first of a pair of simultaneous transmitting antennas, in a specific test operating mode and exposure condition

**SAR<sub>2</sub>** is the highest measured or estimated SAR for the second of a pair of simultaneous transmitting antennas, in the same test operating mode and exposure condition as the first

**Ri** is the separation distance between the pair of simultaneous transmitting antennas. When the SAR is measured, for both antennas in the pair, it is determined by the actual x, y and z coordinates in the 1-g SAR for each SAR peak location, based on the extrapolated and interpolated result in the zoom scan measurement, using the formula of  $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$

In order for a pair of simultaneous transmitting antennas with the sum of 1-g SAR > 1.6 W/kg to qualify for exemption from Simultaneous Transmission SAR measurements, it has to satisfy the condition of:

$$(SAR_1 + SAR_2)^{1.5} / Ri < 0.04$$

### Simultaneous Transmission Condition

| RF Exposure Condition                                                                                                                                                                                                                                     | Item | Capable Transmit Configurations |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------------------------|
| Standalone                                                                                                                                                                                                                                                | 1    | GSM(GPRS/EDGE) + Wi-Fi 2.4GHz   |
|                                                                                                                                                                                                                                                           | 2    | GSM(GPRS/EDGE) + BT             |
|                                                                                                                                                                                                                                                           | 3    | W-CDMA + Wi-Fi 2.4GHz           |
|                                                                                                                                                                                                                                                           | 4    | W-CDMA + BT                     |
| Notes:                                                                                                                                                                                                                                                    |      |                                 |
| <ol style="list-style-type: none"> <li>Only DTS supports Hotspot.</li> <li>GPRS/EDGE, W-CDMA support Hotspot.</li> <li>VoIP is supported in GPRS/EDGE, W-CDMA</li> <li>Wi-Fi 2.4GHz Radio cannot transmit simultaneously with Bluetooth Radio.</li> </ol> |      |                                 |

## Estimated SAR for Simultaneous Transmission SAR Analysis

### Considerations for SAR estimation

- When standalone SAR test exclusion applies, standalone SAR must also be estimated to determine simultaneous transmission SAR test exclusion.
- Dedicated Host Approach criteria for SAR test exclusion is likewise applied to SAR estimation, with certain distinctions between test exclusion and SAR estimation:
  - When the separation distance from the antenna to an adjacent edge is  $\leq 5$  mm, a distance of 5 mm is applied for SAR estimation; this is the same between test exclusion and SAR estimation calculations.
  - When the separation distance from the antenna to an adjacent edge is  $> 5$  mm but  $\leq 50$  mm, the actual antenna-to-edge separation distance is applied for SAR estimation.
  - When the minimum test separation distance is  $> 50$  mm, the estimated SAR value is 0.4 W/kg
- Please refer to Estimated SAR Tables to see which test positions are inherently compliant as they consist of only estimated SAR values for all applicable transmitters and consequently will always have sum of SAR values  $< 1.2$  W/kg. Simultaneous transmission SAR analysis was therefore not performed for these test positions.

### Estimated SAR for WWAN

| Antenna                             | Tx Interface | Frequency (MHz) | Output Power |     | Separation Distances (mm) |        |        |        |        |       | Estimated 1-g SAR Value (W/kg) |            |        |        |            |       |
|-------------------------------------|--------------|-----------------|--------------|-----|---------------------------|--------|--------|--------|--------|-------|--------------------------------|------------|--------|--------|------------|-------|
|                                     |              |                 | dBm          | mW  | Rear                      | Edge 1 | Edge 2 | Edge 3 | Edge 4 | Front | Rear                           | Edge 1     | Edge 2 | Edge 3 | Edge 4     | Front |
| Full Power, Proximity Sensor Off    |              |                 |              |     |                           |        |        |        |        |       |                                |            |        |        |            |       |
| Cellular                            | GPRS 2 Slots | 848.8           | 31.50        | 353 | 1.4                       | 3.5    | 102    | 227    | 12     |       | -MEA-SURE-                     | -MEA-SURE- | 0.400  | 0.400  | -MEA-SURE- |       |
| Cellular                            | GPRS 2 Slots | 1909.8          | 27.00        | 125 | 1.4                       | 3.5    | 102    | 227    | 12     |       | -MEA-SURE-                     | -MEA-SURE- | 0.400  | 0.400  | -MEA-SURE- |       |
| Cellular                            | W-CDMA 5     | 846.6           | 23.50        | 100 | 1.4                       | 3.5    | 102    | 227    | 12     |       | -MEA-SURE-                     | -MEA-SURE- | 0.400  | 0.400  | -MEA-SURE- |       |
| Power Back-off, Proximity Sensor On |              |                 |              |     |                           |        |        |        |        |       |                                |            |        |        |            |       |
| Cellular                            | GPRS 2 Slots | 848.8           | 25.50        | 89  | 1.4                       | 3.5    | 102    | 227    | 12     |       | -MEA-SURE-                     | -MEA-SURE- | 0.400  | 0.400  | -MEA-SURE- |       |
| Cellular                            | GPRS 2 Slots | 1909.8          | 20.50        | 28  | 1.4                       | 3.5    | 102    | 227    | 12     |       | -MEA-SURE-                     | -MEA-SURE- | 0.400  | 0.400  | -MEA-SURE- |       |
| Cellular                            | W-CDMA 5     | 846.6           | 19.50        | 89  | 1.4                       | 3.5    | 102    | 227    | 12     |       | -MEA-SURE-                     | -MEA-SURE- | 0.400  | 0.400  | -MEA-SURE- |       |

### Estimated SAR for WLAN

| Tx Interface  | Frequency (MHz) | Output Power |    | Separation Distances (mm) |        |        |        |        |       | Estimated 1-g SAR Value (W/kg) |        |           |        |        |       |
|---------------|-----------------|--------------|----|---------------------------|--------|--------|--------|--------|-------|--------------------------------|--------|-----------|--------|--------|-------|
|               |                 | dBm          | mW | Rear                      | Edge 1 | Edge 2 | Edge 3 | Edge 4 | Front | Rear                           | Edge 1 | Edge 2    | Edge 3 | Edge 4 | Front |
| Wi-Fi 2.4 GHz | 2462            | 16.00        | 40 | 1.4                       | 44     | 6      | 179.5  | 140.5  |       | -MEASURE-                      | 0.190  | -MEASURE- | 0.400  | 0.400  |       |
| Bluetooth     | 2480            | 10.00        | 10 | 1.4                       | 44     | 6      | 179.5  | 140.5  |       | -MEASURE-                      | 0.048  | 0.350     | 0.400  | 0.400  |       |

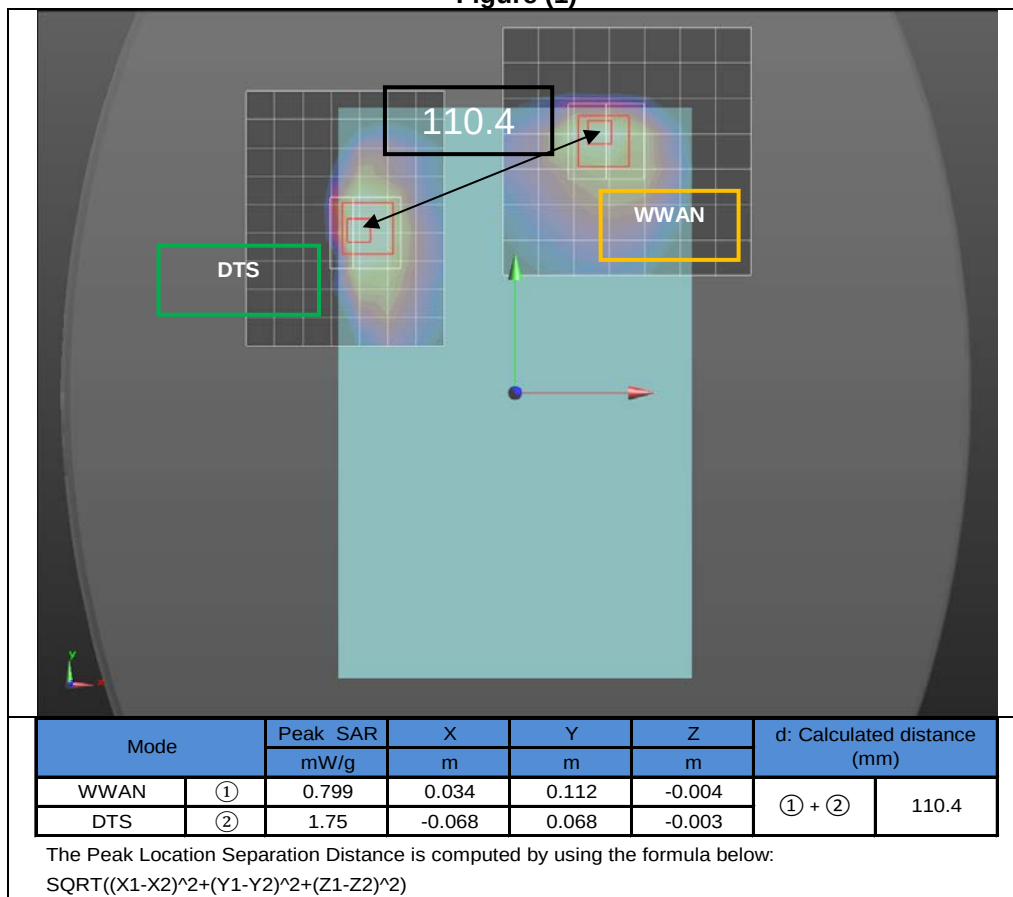
## 12.1. Sum of the SAR for GSM850 & Wi-Fi & BT

| RF Exposure conditions | Test Position | ①<br>WWAN | ②<br>DTS | ③<br>BT | ① + ②<br>WWAN + DTS |                 | ① + ③<br>WWAN + BT |                 |
|------------------------|---------------|-----------|----------|---------|---------------------|-----------------|--------------------|-----------------|
|                        |               |           |          |         | Σ 1-g SAR (mW/g)    | SPLSR (Yes/ No) | Σ 1-g SAR (mW/g)   | SPLSR (Yes/ No) |
| Body                   | Rear          | 0.612     | 1.072    | 0.051   | 1.684               | Yes             | 0.663              | No              |
|                        | Edge 1        | 0.296     | 0.190    | 0.048   | 0.486               | No              | 0.344              | No              |
|                        | Edge 2        | 0.400     | 0.187    | 0.350   | 0.587               | No              | 0.750              | No              |
|                        | Edge 3        | 0.400     | 0.400    | 0.400   | 0.800               | No              | 0.800              | No              |
|                        | Edge 4        | 0.326     | 0.400    | 0.400   | 0.726               | No              | 0.726              | No              |

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

| Test Position | Worst-case combination |          | Σ 1-g SAR (mW/g) |       | Calculated distance (mm) | SPLSR (≤ 0.04) | Volume Scan (Yes/ No) | Figure |
|---------------|------------------------|----------|------------------|-------|--------------------------|----------------|-----------------------|--------|
|               | ①<br>WWAN              | ②<br>DTS |                  |       |                          |                |                       |        |
| Rear          | 0.612                  | 1.072    | ① + ②            | 1.684 | 110.4                    | 0.020          | No                    | 1      |

Figure (1)



## 12.2. Sum of the SAR for GSM1900 & Wi-Fi & BT

| RF Exposure conditions | Test Position | ①<br>WWAN | ②<br>DTS | ③<br>BT | ① + ②<br>WWAN + DTS |                 | ① + ③<br>WWAN + BT |                 |
|------------------------|---------------|-----------|----------|---------|---------------------|-----------------|--------------------|-----------------|
|                        |               |           |          |         | Σ 1-g SAR (mW/g)    | SPLSR (Yes/ No) | Σ 1-g SAR (mW/g)   | SPLSR (Yes/ No) |
| Body                   | Rear          | 0.482     | 1.072    | 0.051   | 1.554               | No              | 0.533              | No              |
|                        | Edge 1        | 0.483     | 0.190    | 0.048   | 0.673               | No              | 0.531              | No              |
|                        | Edge 2        | 0.400     | 0.187    | 0.350   | 0.587               | No              | 0.750              | No              |
|                        | Edge 3        | 0.400     | 0.400    | 0.400   | 0.800               | No              | 0.800              | No              |
|                        | Edge 4        | 0.852     | 0.400    | 0.400   | 1.252               | No              | 1.252              | No              |

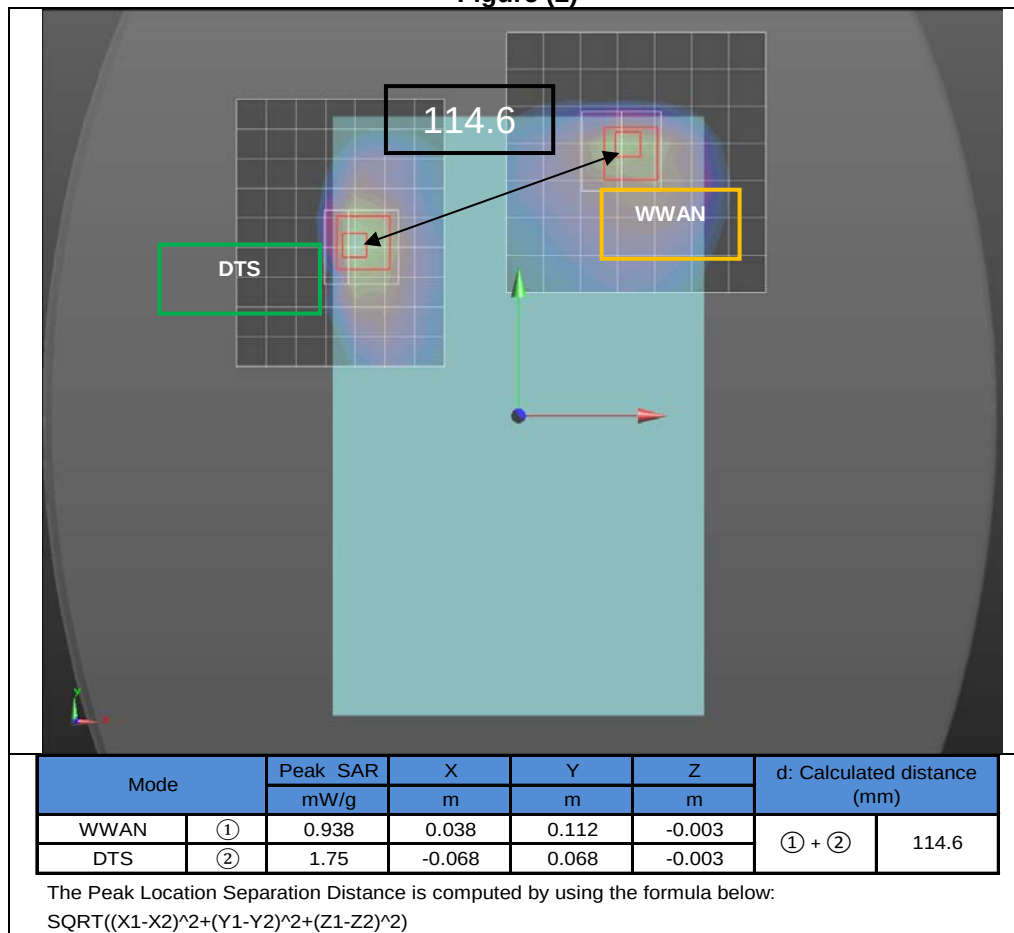
### 12.3. Sum of the SAR for W-CDMA Band V & Wi-Fi & BT

| RF Exposure conditions | Test Position | ① WWAN | ② DTS | ③ BT  | ① + ②<br>WWAN + DTS |                 | ① + ③<br>WWAN + BT |                 |
|------------------------|---------------|--------|-------|-------|---------------------|-----------------|--------------------|-----------------|
|                        |               |        |       |       | Σ 1-g SAR (mW/g)    | SPLSR (Yes/ No) | Σ 1-g SAR (mW/g)   | SPLSR (Yes/ No) |
| Body                   | Rear          | 0.678  | 1.072 | 0.051 | 1.750               | Yes             | 0.729              | No              |
|                        | Edge 1        | 0.300  | 0.190 | 0.048 | 0.490               | No              | 0.348              | No              |
|                        | Edge 2        | 0.400  | 0.187 | 0.350 | 0.587               | No              | 0.750              | No              |
|                        | Edge 3        | 0.400  | 0.400 | 0.400 | 0.800               | No              | 0.800              | No              |
|                        | Edge 4        | 0.250  | 0.400 | 0.400 | 0.650               | No              | 0.650              | No              |

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

| Test Position | Worst-case combination |       | Σ 1-g SAR (mW/g) |       | Calculated distance (mm) | SPLSR (≤ 0.04) | Volume Scan (Yes/ No) | Figure |
|---------------|------------------------|-------|------------------|-------|--------------------------|----------------|-----------------------|--------|
|               | ① WWAN                 | ② DTS |                  |       |                          |                |                       |        |
| Rear          | 0.678                  | 1.072 | ① + ②            | 1.750 | 114.6                    | 0.020          | No                    | 2      |

Figure (2)



#### Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the either sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

## **Appendixes**

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

**A\_15K20294 SAR Photos & Ant. Locations**

**B\_15K20294 SAR Highest Test Plots**

**C\_15K20294 SAR System Check Plots**

**D\_15K20294 SAR Tissue Ingredients**

**E\_15K20294 SAR Probe Cal. Certificates**

**F\_15K20294 SAR Dipole Cal. Certificates**

**END OF REPORT**