



**FCC 47 CFR Parts 1 & 2  
Published RF Exposure KDB Procedures  
IEEE Standard 1528-2013**

**SAR EVALUATION REPORT**

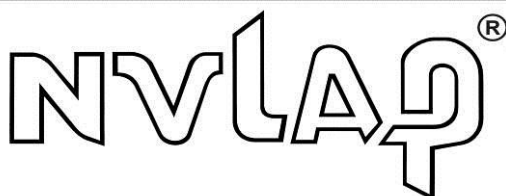
*For*  
**GSM/WCDM Tablet + Bluetooth, DTS/UNII a/b/g/n/ac & ANT+**

**Model: SM-T805C  
FCC ID: A3LSMT805C**

**Report Number: 14U17722-S7A  
Issue Date: 6/10/2014**

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**NVLAP LAB CODE 200065-0**

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| --          | 6/2/2014          | Initial Issue                                 | --                |
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## 1. Attestation of Test Results

|                                 |                                                                                                                |            |            |            |
|---------------------------------|----------------------------------------------------------------------------------------------------------------|------------|------------|------------|
| Applicant                       | Samsung Electronics Co., Ltd.                                                                                  |            |            |            |
| DUT description                 | GSM/WCDM Tablet + Bluetooth, DTS/UNII a/b/g/n/ac & ANT+                                                        |            |            |            |
| Model                           | SM-T805C                                                                                                       |            |            |            |
| Test device is                  | An identical prototype                                                                                         |            |            |            |
| Device category                 | Portable                                                                                                       |            |            |            |
| Exposure category               | General Population/Uncontrolled Exposure                                                                       |            |            |            |
| Date tested                     | 5/15/2014 – 5/28/2014                                                                                          |            |            |            |
| The highest reported SAR values | RF exposure condition                                                                                          | Licensed   | DTS        | UNII       |
|                                 | Stand-Alone                                                                                                    | 1.107 W/kg | 0.710 W/kg | 0.628 W/kg |
|                                 | Simultaneous Transmission                                                                                      | 1.583 W/kg |            | 1.531 W/kg |
| Applicable Standards            | FCC 47 CFR Parts 1 & 2<br>Published RF Exposure KDB Procedures, and TCB workshop updates<br>IEEE Std 1528-2013 |            |            |            |
| Test Results                    | Pass                                                                                                           |            |            |            |

UL Verification Services Inc. 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 Verification Services Inc. 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.

**Note:** 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 Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.

Approved & Released By:

Prepared By:




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## 2. Test Methodology

The tests documented in this report were performed in accordance with FCC 47 CFR Parts 1 & 2, IEEE STD 1528-2013, the following FCC Published RF exposure KDB procedures, and TCB workshop updates:

- 447498 D01 General RF Exposure Guidance v05r02
- 616217 D04 SAR for Laptop and Tablets v01r01
- 941225 D01 SAR test for 3G devices v02
- 941225 D02 HSPA and 1x Advanced v02r02
- 941225 D03 SAR Test Reduction GSM GPRS EDGE v01
- 941225 D04 SAR for GSM E GPRS Dual Xfer Mode v01
- 248227 D01 SAR Meas for 802 11abg v01r02
- 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03
- 865664 D02 SAR Reporting v01r01
- 690783 D01 SAR Listings on Grants v01r02

## 3. Facilities and Accreditation

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

| 47173 Benicia Street | 47266 Benicia Street |
|----------------------|----------------------|
| SAR Lab A            | SAR Lab 1            |
| SAR Lab B            | SAR Lab 2            |
| SAR Lab C            | SAR Lab 3            |
| SAR Lab D            | SAR Lab 4            |
| SAR Lab E            |                      |
| SAR Lab F            |                      |
| SAR Lab G            |                      |
| SAR Lab H            |                      |

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

## 4. Calibration and Uncertainty

### 4.1. Measuring Instrument Calibration

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

#### Tissue Dielectric Properties

| Name of Equipment      | Manufacturer    | Type/Model    | Serial No.    | Cal. Due Date |
|------------------------|-----------------|---------------|---------------|---------------|
| ENA Network Analyzer   | Agilent         | E5071B        | MY42100131    | 2/24/2015     |
| Dielectronic Probe kit | SPEAG           | DAK-3.5       | 1082          | 9/10/2014     |
| Dielectronic Probe kit | SPEAG           | DAK-3.5 Short | SM DAK 200 BA | N/A           |
| Thermometer            | Control Company | 4242          | 122529162     | 9/19/2014     |

#### System Performance Check

| Name of Equipment            | Manufacturer | Type/Model             | Serial No. | Cal. Due Date |
|------------------------------|--------------|------------------------|------------|---------------|
| Synthesized Signal Generator | Agilent      | 8665B                  | 3438A0063  | 6/13/2014     |
| Power Meter                  | HP           | 438A                   | 2822A05684 | 10/10/2014    |
| Power Sensor                 | Agilent      | 8481A                  | 2237A31744 | 10/2/2014     |
| Power Sensor                 | Agilent      | 8481A                  | 2349A36506 | 9/30/2014     |
| Amplifier                    | MITEQ        | AMF-4D-00400600-50-30P | 1795093    | N/A           |
| Directional coupler          | Werlatone    | C8060-102              | 2711       | N/A           |
| DC Power Supply              | AMETEK       | XHR60-18               | 1308A01935 | N/A           |
| Thermometer                  | EXTECH       | 445703                 | T35480662  | 3/28/2015     |
| E-Field Probe                | SPEAG        | EX3DV4                 | 3871       | 12/11/2014    |
| E-Field Probe                | SPEAG        | EX3DV3                 | 3531       | 11/21/2014    |
| Data Acquisition Electronics | SPEAG        | DAE3                   | 427        | 1/21/2015     |
| Data Acquisition Electronics | SPEAG        | DAE4                   | 1359       | 2/17/2015     |
| System Validation Dipole     | SPEAG        | D835V2                 | 4d002      | 11/15/2014    |
| System Validation Dipole     | SPEAG        | D1900V2                | 5d163      | 9/17/2014     |
| System Validation Dipole     | SPEAG        | D2450V2                | 899        | 9/10/2014     |
| System Validation Dipole     | SPEAG        | D5GHzV2                | 1138       | 11/19/2014    |

#### Others

| Name of Equipment      | Manufacturer | Type/Model | Serial No. | Cal. Due Date |
|------------------------|--------------|------------|------------|---------------|
| Base Station Simulator | R & S        | CMW500     | 132910-cp  | 4/25/2015     |
| Base Station Simulator | R & S        | CMW500     | 132911-tu  | 2/27/2015     |
| Power Meter            | Agilent      | N1912A     | MY50001015 | 6/29/2014     |
| Power Sensor           | Agilent      | N1921A     | MY52020011 | 5/6/2015      |
| Power Sensor           | Agilent      | N1921A     | MY52200012 | 9/25/2014     |

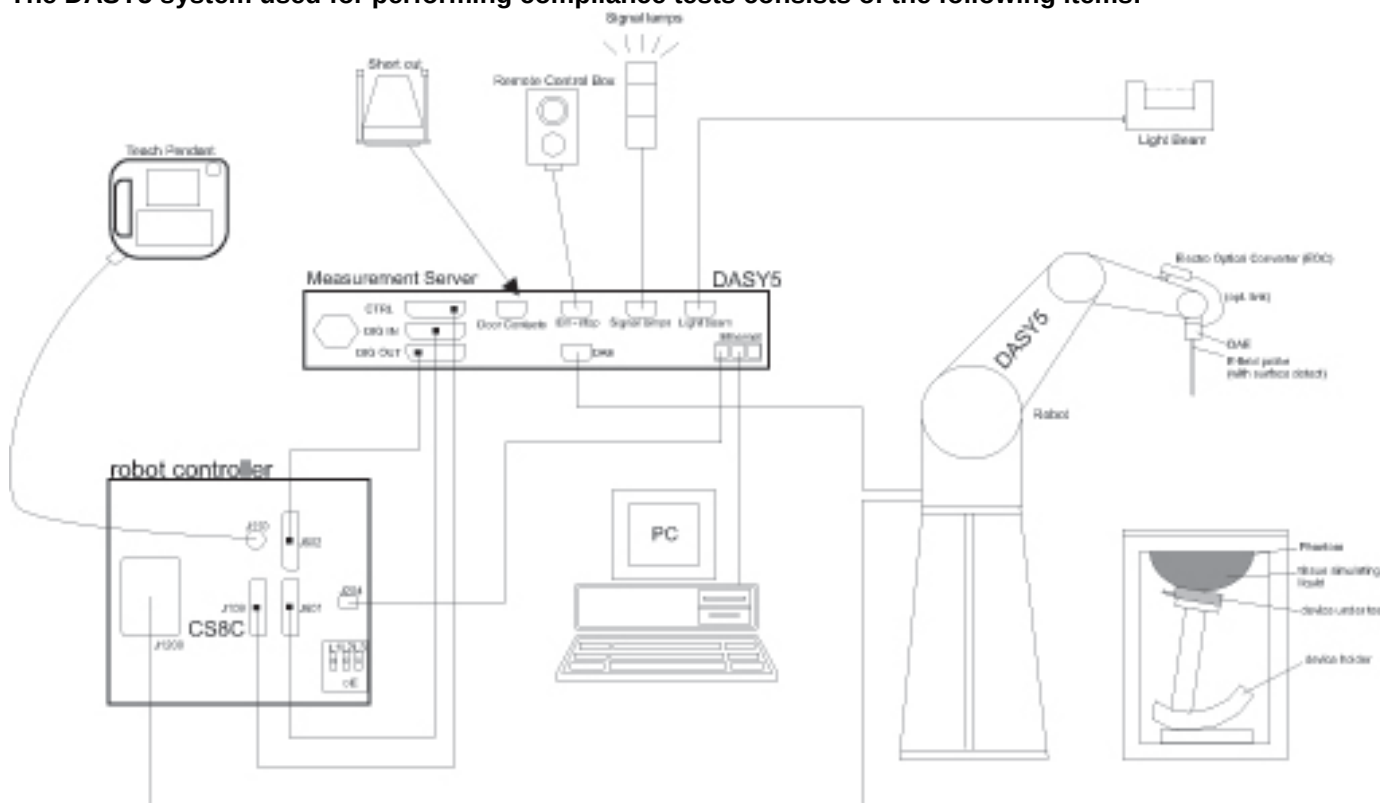
### 4.2. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03 Section 2.8.1., 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 1528-2003 is not required in SAR reports submitted for equipment approval.



## 5. Measurement System Description and Setup

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



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

## 6. SAR Measurement Procedure

### 6.1. Normal SAR Measurement Procedure

#### Step 1: Power Reference Measurement

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

#### Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528 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 v01r03

|                                                                                                        | $\leq 3$ 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: $\Delta x_{\text{Area}}, \Delta y_{\text{Area}}$                 | $\leq 2$ 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 v01r03

|                                                                                                                                                                                                                                                                                                             |                                           |                                                                                             | $\leq 3$ 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 <u>reported</u> 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.

## **6.2. Volume Scan Procedures**

### **Step 1: Repeat Step 1-4 in Section 6.1**

#### **Step 2: Volume Scan**

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

#### **Step 3: Power drift measurement**

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

## 7. Device Under Test

### 7.1. General Information

|                            |                                                                                                                                                                                                                                          |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating Configuration(s) | Stand-alone                                                                                                                                                                                                                              |
| Mobile Hotspot             | WiFi Hotspot mode permits the device to share its cellular data connection with other WiFi-enabled devices.<br><input checked="" type="checkbox"/> Mobile Hotspot (WiFi 2.4 GHz)<br><input type="checkbox"/> Mobile Hotspot (WiFi 5 GHz) |
| WiFi Direct                | Wi-Fi Direct enabled devices transfer data directly between each other<br><input checked="" type="checkbox"/> WiFi Direct (WiFi 2.4 GHz)<br><input type="checkbox"/> WiFi Direct (WiFi 5 GHz)                                            |
| RF Exposure Condition(s)   | Stand-alone                                                                                                                                                                                                                              |
| Device dimension           | Overall (Length x Width): 247.3 mm x 177.3 mm<br>Overall Diagonal: 303.12mm<br>Display Diagonal: 267.2mm                                                                                                                                 |
| Back Cover                 | <input checked="" type="checkbox"/> Normal Battery Cover<br><input type="checkbox"/> Wireless Charger Battery Cover<br><input type="checkbox"/> Normal Battery Cover with NFC                                                            |
| Accessory                  | <input checked="" type="checkbox"/> Headset                                                                                                                                                                                              |
| Battery Options            | <input checked="" type="checkbox"/> Standard – Lithium-ion battery, Rating 4.35 Vdc, 30.02 Wh<br><input type="checkbox"/> Extended (large capacity)                                                                                      |

## 7.2. Wireless Technologies

|                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wireless Technology and Frequency Bands | GSM: 850 / 1900<br>W-CDMA Band: V / II<br>WiFi: 2.4 / 5 GHz<br>Bluetooth: 2.4 GHz.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Mode                                    | GSM <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Voice (GMSK)</li> <li><input checked="" type="checkbox"/> GPRS (GMSK)</li> <li><input checked="" type="checkbox"/> EGPRS (8PSK)</li> </ul> W-CDMA <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> UMTS Rel. 99</li> <li><input checked="" type="checkbox"/> HSDPA (Rel. 5)</li> <li><input checked="" type="checkbox"/> HSUPA (Rel. 7)</li> </ul> WiFi 2.4GHz (802.11b/g/n) <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> 802.11b</li> <li><input checked="" type="checkbox"/> 802.11g</li> <li><input checked="" type="checkbox"/> 802.11n (20MHz)</li> </ul> Wi-Fi 5GHz <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> 802.11a</li> <li><input checked="" type="checkbox"/> 802.11n (HT20)</li> <li><input checked="" type="checkbox"/> 802.11n (HT40)</li> <li><input checked="" type="checkbox"/> 802.11ac (80MHz)</li> </ul> Bluetooth Ver. 4.0 (LE) |
| Duty Cycle                              | GSM GPRS 1 Slot: 12.5%; 2 Slots: 25%, 3 Slots: 37.5%, 4 Slots: 50%<br>W-CDMA: 100%<br>WiFi 802.11a/b/g/n: 100%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| GPRS Multi-Slot Class                   | <input type="checkbox"/> Class 8 - One Up<br><input type="checkbox"/> Class 10 - Two Up<br><input checked="" type="checkbox"/> Class 12 - Four Up                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| DTM (Dual Transfer Mode)                | <input type="checkbox"/> Supported                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| VoIP (GPRS)                             | <input checked="" type="checkbox"/> Supported                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| SV-LTE & SV-DO                          | <input type="checkbox"/> Supported                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

### 7.3. RF Output Power Tolerance

| RF Air Interface | Mode         |           | Full Power (dBm)      |              |                      | With Power Reduction  |              |                      |
|------------------|--------------|-----------|-----------------------|--------------|----------------------|-----------------------|--------------|----------------------|
|                  |              |           | Lower Limit           | Target Power | Upper Limit          | Lower Limit           | Target Power | Upper Limit          |
|                  |              |           | Tolerance (dB) : -1.5 |              | Tolerance (dB) : 0.5 | Tolerance (dB) : -1.5 |              | Tolerance (dB) : 0.5 |
| GSM 850          | GPRS         | 1 Slot    | 31.5                  | 33.0         | 33.5                 | 24.5                  | 26.0         | 26.5                 |
|                  |              | 2 Slots   | 29.0                  | 30.5         | 31.0                 | 22.5                  | 24.0         | 24.5                 |
|                  |              | 3 Slots   | 27.0                  | 28.5         | 29.0                 | 20.5                  | 22.0         | 22.5                 |
|                  |              | 4 Slots   | 25.0                  | 26.5         | 27.0                 | 19.0                  | 20.5         | 21.0                 |
|                  | EGPRS        | 1 Slot    | 25.5                  | 27.0         | 27.5                 | 19.0                  | 20.5         | 21.0                 |
|                  |              | 2 Slots   | 25.5                  | 27.0         | 27.5                 | 18.5                  | 20.0         | 20.5                 |
|                  |              | 3 Slots   | 24.0                  | 25.5         | 26.0                 | 16.0                  | 17.5         | 18.0                 |
|                  |              | 4 Slots   | 23.0                  | 24.5         | 25.0                 | 15.5                  | 17.0         | 17.5                 |
| GSM 1900         | GPRS         | 1 Slot    | 26.5                  | 28.0         | 28.5                 | 19.5                  | 21.0         | 21.5                 |
|                  |              | 2 Slots   | 25.5                  | 27.0         | 27.5                 | 18.0                  | 19.5         | 20.0                 |
|                  |              | 3 Slots   | 24.0                  | 25.5         | 26.0                 | 15.0                  | 16.5         | 17.0                 |
|                  |              | 4 Slots   | 22.5                  | 24.0         | 24.5                 | 13.5                  | 15.0         | 15.5                 |
|                  | EGPRS        | 1 Slot    | 24.5                  | 26.0         | 26.5                 | 15.5                  | 17.0         | 17.5                 |
|                  |              | 2 Slots   | 24.0                  | 25.5         | 26.0                 | 15.0                  | 16.5         | 17.0                 |
|                  |              | 3 Slots   | 22.5                  | 24.0         | 24.5                 | 12.0                  | 13.5         | 14.0                 |
|                  |              | 4 Slots   | 21.5                  | 23.0         | 23.5                 | 12.0                  | 13.5         | 14.0                 |
| W-CDMA Band V    | Rel. 99      | RMC       | 21.0                  | 22.5         | 23.0                 | 16.0                  | 17.5         | 18.0                 |
|                  |              | Subtest 1 | 21.0                  | 22.5         | 23.0                 | 16.0                  | 17.5         | 18.0                 |
|                  | HSDPA Rel. 6 | Subtest 2 | 21.0                  | 22.5         | 23.0                 | 16.0                  | 17.5         | 18.0                 |
|                  |              | Subtest 3 | 20.5                  | 22.0         | 22.5                 | 15.5                  | 17.0         | 17.5                 |
|                  |              | Subtest 4 | 20.5                  | 22.0         | 22.5                 | 15.5                  | 17.0         | 17.5                 |
|                  | HSUPA Rel. 7 | Subtest 1 | 21.0                  | 22.5         | 23.0                 | 15.0                  | 16.5         | 17.0                 |
|                  |              | Subtest 2 | 19.0                  | 20.5         | 21.0                 | 13.0                  | 14.5         | 15.0                 |
|                  |              | Subtest 3 | 20.0                  | 21.5         | 22.0                 | 14.0                  | 15.5         | 16.0                 |
|                  |              | Subtest 4 | 19.0                  | 20.5         | 21.0                 | 13.0                  | 14.5         | 15.0                 |
|                  |              | Subtest 5 | 21.0                  | 22.5         | 23.0                 | 15.0                  | 16.5         | 17.0                 |
|                  |              | Subtest 6 | 21.0                  | 22.5         | 23.0                 | 15.0                  | 16.5         | 17.0                 |
| W-CDMA Band II   | Rel. 99      | RMC       | 19.2                  | 20.7         | 21.2                 | 10.0                  | 11.5         | 12.0                 |
|                  |              | Subtest 1 | 19.2                  | 20.7         | 21.2                 | 10.0                  | 11.5         | 12.0                 |
|                  | HSDPA Rel. 6 | Subtest 2 | 19.2                  | 20.7         | 21.2                 | 10.0                  | 11.5         | 12.0                 |
|                  |              | Subtest 3 | 18.7                  | 20.2         | 20.7                 | 9.5                   | 11.0         | 11.5                 |
|                  |              | Subtest 4 | 18.7                  | 20.2         | 20.7                 | 9.5                   | 11.0         | 11.5                 |
|                  | HSUPA Rel. 7 | Subtest 1 | 19.2                  | 20.7         | 21.2                 | 10.0                  | 11.5         | 12.0                 |
|                  |              | Subtest 2 | 17.2                  | 18.7         | 19.2                 | 8.0                   | 9.5          | 10.0                 |
|                  |              | Subtest 3 | 18.2                  | 19.7         | 20.2                 | 9.0                   | 10.5         | 11.0                 |
|                  |              | Subtest 4 | 17.2                  | 18.7         | 19.2                 | 8.0                   | 9.5          | 10.0                 |
|                  |              | Subtest 5 | 19.2                  | 20.7         | 21.2                 | 10.0                  | 11.5         | 12.0                 |
|                  |              | Subtest 6 | 19.2                  | 20.7         | 21.2                 | 10.0                  | 11.5         | 12.0                 |
| Wi-Fi 2.4 GHz    | 802.11b      | 20MHz     | 13.5                  | 15.0         | 15.5                 |                       |              |                      |
|                  | 802.11g      | 20MHz     | 10.5                  | 12.0         | 12.5                 |                       |              |                      |
|                  | 802.11n      | HT20      | 10.5                  | 12.0         | 12.5                 |                       |              |                      |
| Wi-Fi 5 GHz      | 802.11a      | 802.11a   | 7.5                   | 9.0          | 9.5                  |                       |              |                      |
|                  | 802.11n      | HT20      | 7.5                   | 9.0          | 9.5                  |                       |              |                      |
|                  |              | HT40      | 7.5                   | 9.0          | 9.5                  |                       |              |                      |
|                  | 802.11ac     | VHT80     | 7.5                   | 9.0          | 9.5                  |                       |              |                      |
| Bluetooth        | 802.15.1     | V3.0      | 6.5                   | 8.0          | 8.5                  |                       |              |                      |
|                  |              | V4.0 LE   | 4.5                   | 6.0          | 6.5                  |                       |              |                      |

## 7.4. Simultaneous Transmission Condition

| RF Exposure Condition                                                                                                                                                                                                                                                                                                                                | Capable Transmit Configurations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Stand-alone                                                                                                                                                                                                                                                                                                                                          | <b>Wi-Fi and BT</b> <ol style="list-style-type: none"><li>2.4GHz (Wi-Fi 2) + BT (Wi-Fi 1)</li><li>5GHz (Wi-Fi 2) + BT (Wi-Fi 1)</li><li>2.4GHz (Wi-Fi 1) + 2.4GHz (Wi-Fi 2)</li><li>5GHz (Wi-Fi 1) + 5GHz (Wi-Fi 2)</li></ol> <b>WWAN, Wi-Fi and BT</b> <ol style="list-style-type: none"><li>WWAN + BT (Wi-Fi 1)</li><li>WWAN + 2.4GHz (Wi-Fi 1)</li><li>WWAN + 2.4GHz (Wi-Fi 2)</li><li>WWAN + 5GHz (Wi-Fi 1)</li><li>WWAN + 5GHz (Wi-Fi 2)</li><li>WWAN + 2.4GHz (Wi-Fi 2) + BT (Wi-Fi 1)</li><li>WWAN + 5GHz (Wi-Fi 2) + BT (Wi-Fi 1)</li><li>WWAN + 2.4GHz (Wi-Fi 1) + 2.4GHz (Wi-Fi 2)</li><li>WWAN + 5GHz (Wi-Fi 1) + 5GHz (Wi-Fi 2)</li></ol> |
| <p>Notes:</p> <p>Refer to Appendix for antenna locations</p> <p>Bluetooth cannot transmit simultaneously with Wi-Fi on Wi-Fi Antenna 1</p> <p>Wi-Fi MIMO:</p> <ul style="list-style-type: none"><li>- It is not possible between 2.4 GHz and 5 GHz.</li><li>- It is supported in all Wi-Fi bands and is possible during WWAN transmission.</li></ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |



## 7.5. Power Reduction by Proximity Sensing

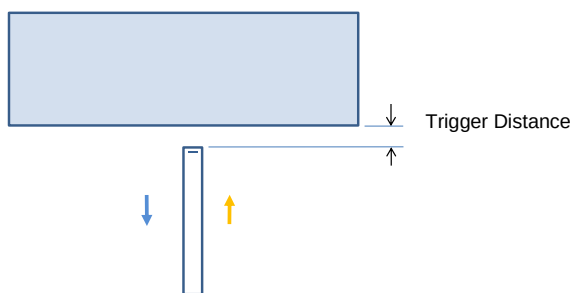
### 7.5.1. Proximity Sensor Triggering Distance (KDB 616217 §6.2)

Edge 1 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.

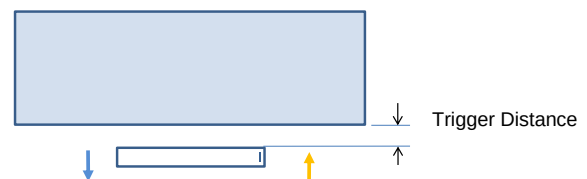
The measurement was then repeated for the Rear surface.

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.



Proximity Sensor Trigger Distance Assessment  
KDB 616217 §6.2, **Edge 1**



Proximity Sensor Trigger Distance Assessment  
KDB 616217 §6.2, **Rear**

#### 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

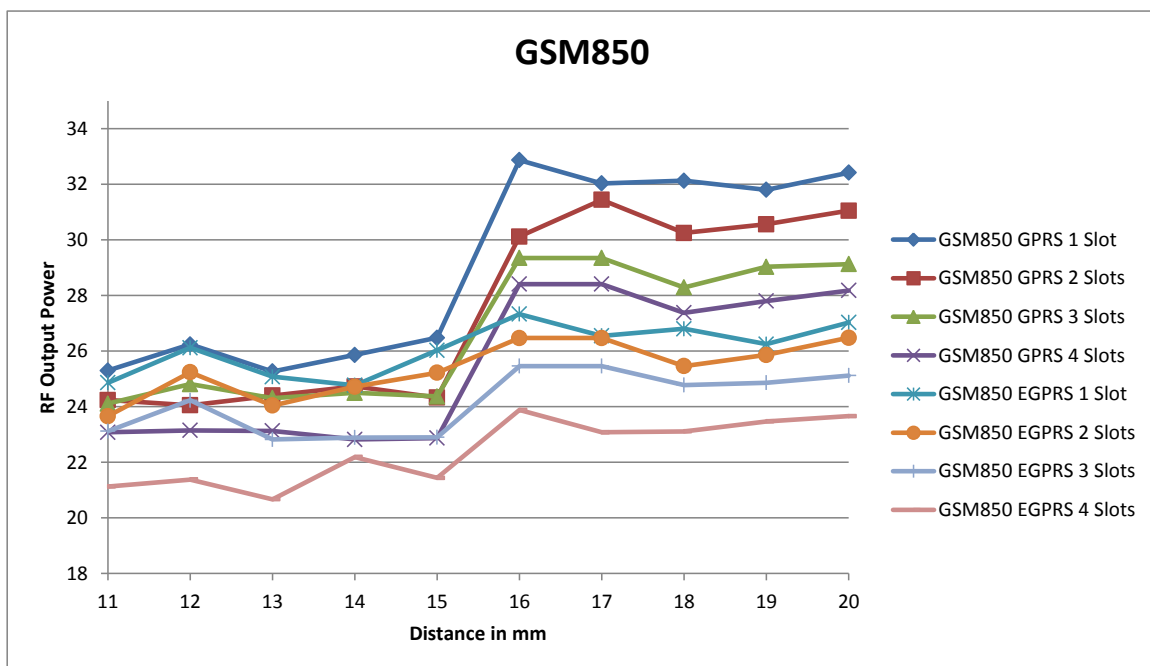
| Tissue<br>simulating<br>liquid | Trigger distance - Edge 1   |                        | Trigger distance - Rear     |                        |
|--------------------------------|-----------------------------|------------------------|-----------------------------|------------------------|
|         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

## 7.5.2. Proximity Sensor Triggering Distance Measurement Results

### GSM850

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

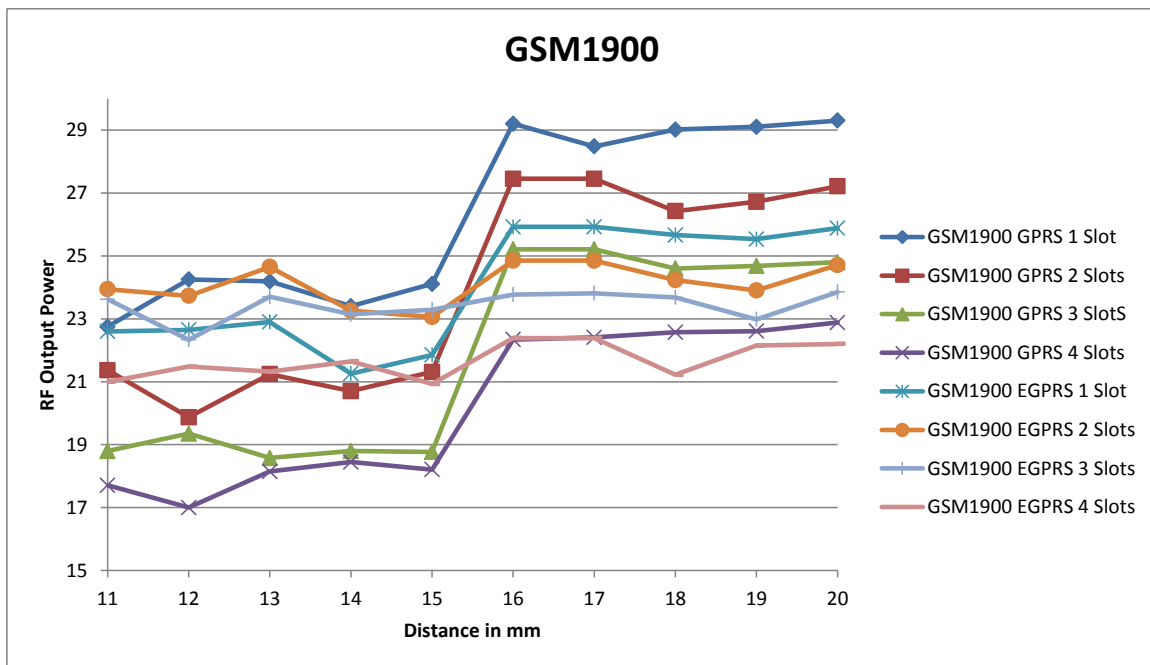
| Distance to DUT vs. Output Power in dBm |       |       |       |       |       |       |       |       |       |       |
|-----------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Distance                                | 20    | 19    | 18    | 17    | 16    | 15    | 14    | 13    | 12    | 11    |
| GSM850 GPRS 1 Slot                      | 32.42 | 31.8  | 32.13 | 32.03 | 32.87 | 26.48 | 25.86 | 25.27 | 26.24 | 25.3  |
| GSM850 GPRS 2 Slots                     | 31.05 | 30.56 | 30.25 | 31.44 | 30.12 | 24.33 | 24.73 | 24.4  | 24.05 | 24.24 |
| GSM850 GPRS 3 Slots                     | 29.13 | 29.03 | 28.29 | 29.35 | 29.35 | 24.37 | 24.5  | 24.31 | 24.81 | 24.11 |
| GSM850 GPRS 4 Slots                     | 28.18 | 27.8  | 27.38 | 28.41 | 28.41 | 22.87 | 22.82 | 23.13 | 23.15 | 23.08 |
| GSM850 EGPRS 1 Slot                     | 27.03 | 26.25 | 26.8  | 26.55 | 27.33 | 26.03 | 24.77 | 25.08 | 26.12 | 24.86 |
| GSM850 EGPRS 2 Slots                    | 26.48 | 25.86 | 25.46 | 26.47 | 26.47 | 25.22 | 24.72 | 24.04 | 25.24 | 23.66 |
| GSM850 EGPRS 3 Slots                    | 25.12 | 24.86 | 24.78 | 25.46 | 25.46 | 22.9  | 22.89 | 22.82 | 24.23 | 23.12 |
| GSM850 EGPRS 4 Slots                    | 23.66 | 23.47 | 23.11 | 23.08 | 23.88 | 21.44 | 22.19 | 20.67 | 21.38 | 21.13 |



### GSM1900

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

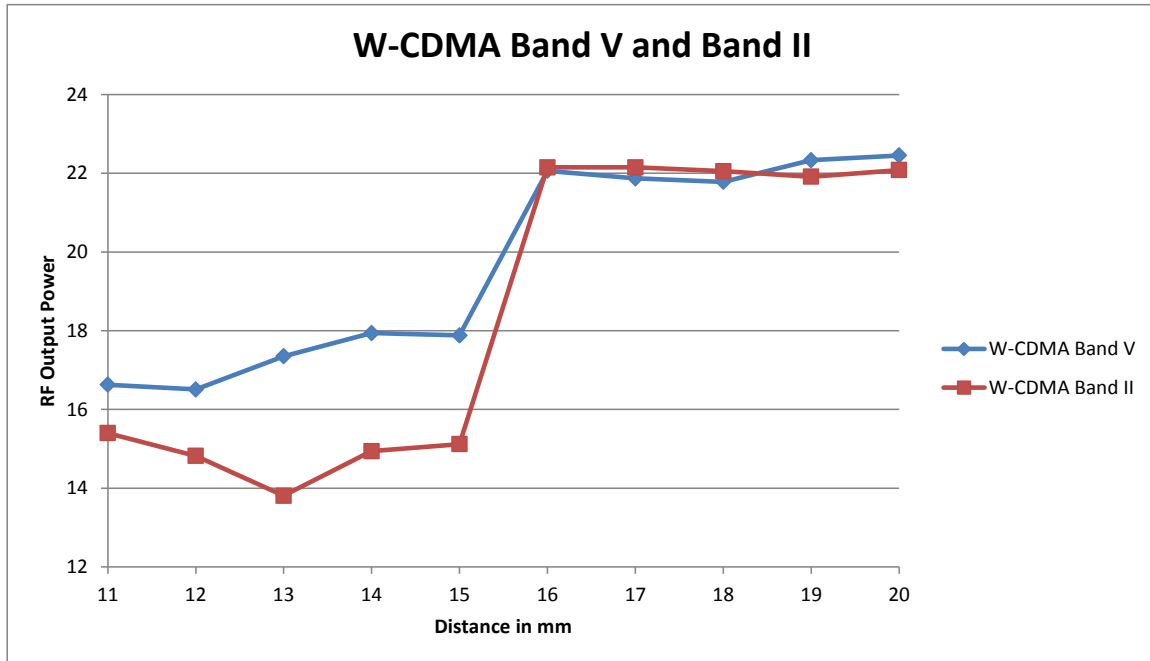
| Distance to DUT vs. Output Power in dBm |       |       |       |       |       |       |       |       |       |       |
|-----------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Distance                                | 20    | 19    | 18    | 17    | 16    | 15    | 14    | 13    | 12    | 11    |
| GSM1900 GPRS 1 Slot                     | 29.3  | 29.1  | 29.01 | 28.48 | 29.2  | 24.11 | 23.4  | 24.19 | 24.25 | 22.75 |
| GSM1900 GPRS 2 Slots                    | 27.21 | 26.72 | 26.42 | 27.45 | 27.45 | 21.31 | 20.7  | 21.24 | 19.87 | 21.37 |
| GSM1900 GPRS 3 Slots                    | 24.8  | 24.68 | 24.6  | 25.21 | 25.21 | 18.77 | 18.8  | 18.58 | 19.35 | 18.8  |
| GSM1900 GPRS 4 Slots                    | 22.88 | 22.61 | 22.57 | 22.41 | 22.34 | 18.21 | 18.45 | 18.15 | 17    | 17.71 |
| GSM1900 EGPRS 1 Slot                    | 25.88 | 25.53 | 25.66 | 25.92 | 25.92 | 21.85 | 21.26 | 22.9  | 22.65 | 22.6  |
| GSM1900 EGPRS 2 Slots                   | 24.71 | 23.9  | 24.23 | 24.85 | 24.85 | 23.06 | 23.26 | 24.65 | 23.73 | 23.94 |
| GSM1900 EGPRS 3 Slots                   | 23.85 | 22.98 | 23.68 | 23.81 | 23.77 | 23.29 | 23.14 | 23.7  | 22.33 | 23.62 |
| GSM1900 EGPRS 4 Slots                   | 22.2  | 22.15 | 21.22 | 22.39 | 22.39 | 20.93 | 21.65 | 21.32 | 21.48 | 21    |



### W-CDMA Band V and Band II

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

| Distance to DUT vs. Output Power in dBm |       |       |       |       |       |       |       |       |       |       |
|-----------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Distance                                | 20    | 19    | 18    | 17    | 16    | 15    | 14    | 13    | 12    | 11    |
| W-CDMA Band V                           | 22.45 | 22.33 | 21.78 | 21.87 | 22.06 | 17.88 | 17.94 | 17.35 | 16.51 | 16.63 |
| W-CDMA Band II                          | 22.08 | 21.91 | 22.05 | 22.15 | 22.15 | 15.12 | 14.94 | 13.81 | 14.82 | 15.4  |



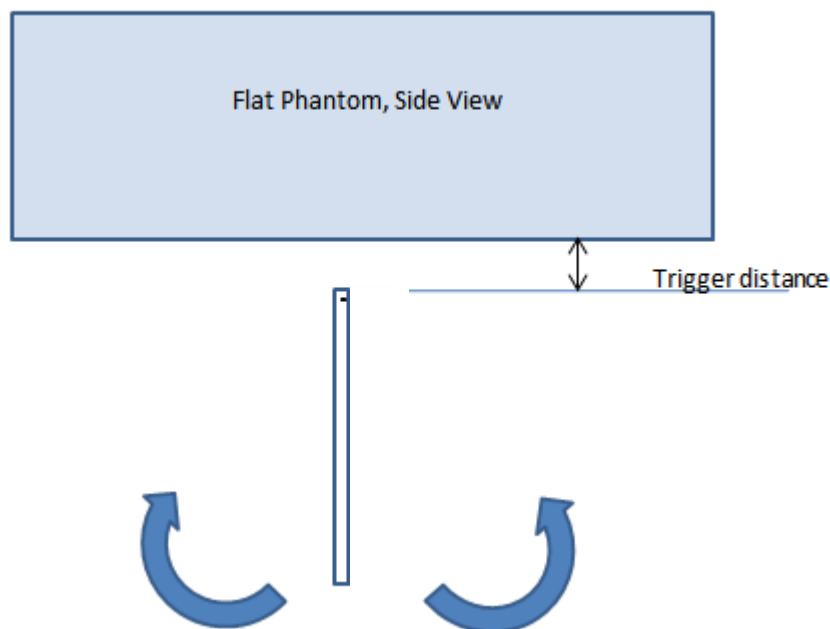
### 7.5.3. Proximity Sensor Coverage (KDB 616217 §6.3)

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

### 7.5.4. Proximity Sensor Tilt Angle Assessment (KDB 616217 §6.4)

The DUT was positioned directly below the flat phantom at the minimum measured trigger distance with Edge 1 parallel to the base of the flat phantom for each band.

The EUT was rotated about Edge 1 for angles up to  $\pm 45^\circ$ . If the output power increased during the rotation the DUT was moved 1mm toward the phantom and the rotation repeated. This procedure was repeated until the power remained reduced for all angles up to  $\pm 45^\circ$ .



Proximity sensor tilt angle assessment (Edge 4) KDB 616217 §6.4

### Summary of Tablet Tilt Angle Influence to Proximity Sensor Triggering

| Band (MHz) | Minimum trigger distance measured according to KDB 616217 §6.2 | Minimum distance at which power reduction was maintained over $\pm 45^\circ$ | Power reduction status |      |      |      |      |    |     |     |     |     |     |
|------------|----------------------------------------------------------------|------------------------------------------------------------------------------|------------------------|------|------|------|------|----|-----|-----|-----|-----|-----|
|            |                                                                |                                                                              | -45°                   | -40° | -30° | -20° | -10° | 0° | 10° | 20° | 30° | 40° | 45° |
| 850        | 15 mm                                                          | 15 mm                                                                        | On                     | On   | On   | On   | On   | On | On  | On  | On  | On  | On  |
| 1900       | 15 mm                                                          | 15 mm                                                                        | On                     | On   | On   | On   | On   | On | On  | On  | On  | On  | On  |

The minimum trigger distance measured for any of the steps required in KDB 616217 §6.2, §6.3 and §6.4 was 15 mm. Full Power SAR measurements for the Rear and Edge 1 were performed at 14mm separation distance from the phantom.

## 8. RF Exposure Conditions

Refer to the Appendix “Antenna Locations and Separation Distances” for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

The EUT implements the power reduction scheme for SAR compliance, for specific device configuration and orientations, as described below. The complete description of the implementation and functionality is provided in the “Operational Description of Power Reduction” exhibit.

### 8.1. 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:

- 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.
- 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. A sensor triggering of 14 mm is included for both Rear and Edge 1 |              |                 |              |     |                           |        |        |        |        |       |                            |                   |                   |         |         |       |
| Cellular                                                                                            | GPRS 2 Slots | 848.8           | 31.00        | 315 | 5                         | 8.4    | 15     | 168    | 173    |       | 58<br>-MEASURE-            | 36.3<br>-MEASURE- | 19.3<br>-MEASURE- | > 50 mm | > 50 mm |       |
| Cellular                                                                                            | GPRS 3 Slots | 1909.8          | 26.00        | 149 | 5                         | 8.4    | 15     | 168    | 173    |       | 41.2<br>-MEASURE-          | 25.7<br>-MEASURE- | 13.7<br>-MEASURE- | > 50 mm | > 50 mm |       |
| Cellular                                                                                            | W-CDMA V     | 846.6           | 23.00        | 200 | 5                         | 8.4    | 15     | 168    | 173    |       | 36.8<br>-MEASURE-          | 23<br>-MEASURE-   | 12.3<br>-MEASURE- | > 50 mm | > 50 mm |       |
| Cellular                                                                                            | W-CDMA II    | 1907.6          | 21.20        | 132 | 5                         | 8.4    | 15     | 168    | 173    |       | 36.5<br>-MEASURE-          | 22.8<br>-MEASURE- | 12.2<br>-MEASURE- | > 50 mm | > 50 mm |       |
| Power Back-off, Grip Sensor On                                                                      |              |                 |              |     |                           |        |        |        |        |       |                            |                   |                   |         |         |       |
| Cellular                                                                                            | GPRS 2 Slots | 848.8           | 24.50        | 70  | 5                         | 8.4    | 15     | 168    | 173    |       | 12.9<br>-MEASURE-          | 8.1<br>-MEASURE-  | 4.3<br>-MEASURE-  | > 50 mm | > 50 mm |       |
| Cellular                                                                                            | GPRS 2 Slots | 1909.8          | 20.00        | 25  | 5                         | 8.4    | 15     | 168    | 173    |       | 6.9<br>-MEASURE-           | 4.3<br>-MEASURE-  | 2.3<br>-EXEMPT-   | > 50 mm | > 50 mm |       |
| Cellular                                                                                            | W-CDMA V     | 846.6           | 18.00        | 63  | 5                         | 8.4    | 15     | 168    | 173    |       | 11.6<br>-MEASURE-          | 7.2<br>-MEASURE-  | 3.9<br>-MEASURE-  | > 50 mm | > 50 mm |       |
| Cellular                                                                                            | W-CDMA II    | 1907.6          | 12.00        | 16  | 5                         | 8.4    | 15     | 168    | 173    |       | 4.4<br>-MEASURE-           | 2.8<br>-EXEMPT-   | 1.5<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

| 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. A sensor triggering of 14 mm is included for both Rear and Edge 1 |              |                 |              |     |                           |        |        |        |        |       |                            |         |         |                       |                       |       |
| Cellular                                                                                            | GPRS 2 Slots | 848.8           | 31.00        | 315 | 5                         | 8.4    | 15     | 168    | 173    |       | < 50 mm                    | < 50 mm | < 50 mm | 830.5 mW<br>-EXEMPT-  | 858.8 mW<br>-EXEMPT-  |       |
| Cellular                                                                                            | GPRS 3 Slots | 1909.8          | 26.00        | 149 | 5                         | 8.4    | 15     | 168    | 173    |       | < 50 mm                    | < 50 mm | < 50 mm | 1288.5 mW<br>-EXEMPT- | 1338.5 mW<br>-EXEMPT- |       |
| Cellular                                                                                            | W-CDMA V     | 846.6           | 23.00        | 200 | 5                         | 8.4    | 15     | 168    | 173    |       | < 50 mm                    | < 50 mm | < 50 mm | 829 mW<br>-EXEMPT-    | 857.2 mW<br>-EXEMPT-  |       |
| Cellular                                                                                            | W-CDMA II    | 1907.6          | 21.20        | 132 | 5                         | 8.4    | 15     | 168    | 173    |       | < 50 mm                    | < 50 mm | < 50 mm | 1288.6 mW<br>-EXEMPT- | 1338.6 mW<br>-EXEMPT- |       |
| Power Back-off, Grip Sensor On                                                                      |              |                 |              |     |                           |        |        |        |        |       |                            |         |         |                       |                       |       |
| Cellular                                                                                            | GPRS 2 Slots | 848.8           | 24.50        | 70  | 5                         | 8.4    | 15     | 168    | 173    |       | < 50 mm                    | < 50 mm | < 50 mm | 830.5 mW<br>-EXEMPT-  | 858.8 mW<br>-EXEMPT-  |       |
| Cellular                                                                                            | GPRS 2 Slots | 1909.8          | 20.00        | 25  | 5                         | 8.4    | 15     | 168    | 173    |       | < 50 mm                    | < 50 mm | < 50 mm | 1288.5 mW<br>-EXEMPT- | 1338.5 mW<br>-EXEMPT- |       |
| Cellular                                                                                            | W-CDMA V     | 846.6           | 18.00        | 63  | 5                         | 8.4    | 15     | 168    | 173    |       | < 50 mm                    | < 50 mm | < 50 mm | 829 mW<br>-EXEMPT-    | 857.2 mW<br>-EXEMPT-  |       |
| Cellular                                                                                            | W-CDMA II    | 1907.6          | 12.00        | 16  | 5                         | 8.4    | 15     | 168    | 173    |       | < 50 mm                    | < 50 mm | < 50 mm | 1288.6 mW<br>-EXEMPT- | 1338.6 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.

## SAR Test Exclusion Calculations for WLAN

### Antennas < 50mm to adjacent edges

#### SISO

| 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 |
| Wi-Fi Main Antenna |                 |              |    |                           |        |        |        |        |       |                            |                  |         |         |                 |       |
| Wi-Fi 2.4 GHz      | 2462            | 15.50        | 35 | 5                         | 8.4    | 185    | 170    | 45     |       | 11<br>-MEASURE-            | 6.9<br>-MEASURE- | > 50 mm | > 50 mm | 1.2<br>-EXEMPT- |       |
| Wi-Fi 5.2 GHz      | 5240            | 9.50         | 9  | 5                         | 8.4    | 185    | 170    | 45     |       | 4.1<br>-MEASURE-           | 2.6<br>-EXEMPT-  | > 50 mm | > 50 mm | 0.5<br>-EXEMPT- |       |
| Wi-Fi 5.3 GHz      | 5320            | 9.50         | 9  | 5                         | 8.4    | 185    | 170    | 45     |       | 4.2<br>-MEASURE-           | 2.6<br>-EXEMPT-  | > 50 mm | > 50 mm | 0.5<br>-EXEMPT- |       |
| Wi-Fi 5.5 GHz      | 5700            | 9.50         | 9  | 5                         | 8.4    | 185    | 170    | 45     |       | 4.3<br>-MEASURE-           | 2.7<br>-EXEMPT-  | > 50 mm | > 50 mm | 0.5<br>-EXEMPT- |       |
| Wi-Fi 5.8 GHz      | 5825            | 9.50         | 9  | 5                         | 8.4    | 185    | 170    | 45     |       | 4.3<br>-MEASURE-           | 2.7<br>-EXEMPT-  | > 50 mm | > 50 mm | 0.5<br>-EXEMPT- |       |
| Bluetooth          | 2480            | 8.50         | 7  | 5                         | 8.4    | 185    | 170    | 45     |       | 2.2<br>-EXEMPT-            | 1.4<br>-EXEMPT-  | > 50 mm | > 50 mm | 0.2<br>-EXEMPT- |       |
| Wi-Fi Aux Antenna  |                 |              |    |                           |        |        |        |        |       |                            |                  |         |         |                 |       |
| Wi-Fi 2.4 GHz      | 2462            | 15.50        | 35 | 5                         | 8.4    | 162    | 170    | 67.8   |       | 11<br>-MEASURE-            | 6.9<br>-MEASURE- | > 50 mm | > 50 mm | > 50 mm         |       |
| Wi-Fi 5.2 GHz      | 5240            | 9.50         | 9  | 5                         | 8.4    | 162    | 170    | 67.8   |       | 4.1<br>-MEASURE-           | 2.6<br>-EXEMPT-  | > 50 mm | > 50 mm | > 50 mm         |       |
| Wi-Fi 5.3 GHz      | 5320            | 9.50         | 9  | 5                         | 8.4    | 162    | 170    | 67.8   |       | 4.2<br>-MEASURE-           | 2.6<br>-EXEMPT-  | > 50 mm | > 50 mm | > 50 mm         |       |
| Wi-Fi 5.5 GHz      | 5700            | 9.50         | 9  | 5                         | 8.4    | 162    | 170    | 67.8   |       | 4.3<br>-MEASURE-           | 2.7<br>-EXEMPT-  | > 50 mm | > 50 mm | > 50 mm         |       |
| Wi-Fi 5.8 GHz      | 5825            | 9.50         | 9  | 5                         | 8.4    | 162    | 170    | 67.8   |       | 4.3<br>-MEASURE-           | 2.7<br>-EXEMPT-  | > 50 mm | > 50 mm | > 50 mm         |       |

#### MIMO

| 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 |
| Wi-Fi Main Antenna |                 |              |    |                           |        |        |        |        |       |                            |                  |         |         |                 |       |
| Wi-Fi 2.4 GHz      | 2462            | 15.50        | 35 | 5                         | 8.4    | 185    | 170    | 45     |       | 11<br>-MEASURE-            | 6.9<br>-MEASURE- | > 50 mm | > 50 mm | 1.2<br>-EXEMPT- |       |
| Wi-Fi 5.2 GHz      | 5240            | 9.50         | 9  | 5                         | 8.4    | 185    | 170    | 45     |       | 4.1<br>-MEASURE-           | 2.6<br>-EXEMPT-  | > 50 mm | > 50 mm | 0.5<br>-EXEMPT- |       |
| Wi-Fi 5.3 GHz      | 5320            | 9.50         | 9  | 5                         | 8.4    | 185    | 170    | 45     |       | 4.2<br>-MEASURE-           | 2.6<br>-EXEMPT-  | > 50 mm | > 50 mm | 0.5<br>-EXEMPT- |       |
| Wi-Fi 5.5 GHz      | 5700            | 9.50         | 9  | 5                         | 8.4    | 185    | 170    | 45     |       | 4.3<br>-MEASURE-           | 2.7<br>-EXEMPT-  | > 50 mm | > 50 mm | 0.5<br>-EXEMPT- |       |
| Wi-Fi 5.8 GHz      | 5825            | 9.50         | 9  | 5                         | 8.4    | 185    | 170    | 45     |       | 4.3<br>-MEASURE-           | 2.7<br>-EXEMPT-  | > 50 mm | > 50 mm | 0.5<br>-EXEMPT- |       |
| Wi-Fi Aux Antenna  |                 |              |    |                           |        |        |        |        |       |                            |                  |         |         |                 |       |
| Wi-Fi 2.4 GHz      | 2462            | 15.50        | 35 | 5                         | 8.4    | 162    | 170    | 67.8   |       | 11<br>-MEASURE-            | 6.9<br>-MEASURE- | > 50 mm | > 50 mm | > 50 mm         |       |
| Wi-Fi 5.2 GHz      | 5240            | 9.50         | 9  | 5                         | 8.4    | 162    | 170    | 67.8   |       | 4.1<br>-MEASURE-           | 2.6<br>-EXEMPT-  | > 50 mm | > 50 mm | > 50 mm         |       |
| Wi-Fi 5.3 GHz      | 5320            | 9.50         | 9  | 5                         | 8.4    | 162    | 170    | 67.8   |       | 4.2<br>-MEASURE-           | 2.6<br>-EXEMPT-  | > 50 mm | > 50 mm | > 50 mm         |       |
| Wi-Fi 5.5 GHz      | 5700            | 9.50         | 9  | 5                         | 8.4    | 162    | 170    | 67.8   |       | 4.3<br>-MEASURE-           | 2.7<br>-EXEMPT-  | > 50 mm | > 50 mm | > 50 mm         |       |
| Wi-Fi 5.8 GHz      | 5825            | 9.50         | 9  | 5                         | 8.4    | 162    | 170    | 67.8   |       | 4.3<br>-MEASURE-           | 2.7<br>-EXEMPT-  | > 50 mm | > 50 mm | > 50 mm         |       |

#### Note(s):

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

## Antennas > 50mm to adjacent edges

### SISO

| 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 |
| Wi-Fi Main Antenna (Wi-Fi 1) |                 |              |    |                           |        |        |        |        |       |                            |         |                       |                       |                      |       |
| Wi-Fi 2.4 GHz                | 2462            | 15.50        | 35 | 5                         | 8.4    | 185    | 170    | 45     |       | < 50 mm                    | < 50 mm | 1445.6 mW<br>-EXEMPT- | 1295.6 mW<br>-EXEMPT- | < 50 mm              |       |
| Wi-Fi 5.2 GHz                | 5240            | 9.50         | 9  | 5                         | 8.4    | 185    | 170    | 45     |       | < 50 mm                    | < 50 mm | 1415.5 mW<br>-EXEMPT- | 1265.5 mW<br>-EXEMPT- | < 50 mm              |       |
| Wi-Fi 5.3 GHz                | 5320            | 9.50         | 9  | 5                         | 8.4    | 185    | 170    | 45     |       | < 50 mm                    | < 50 mm | 1415 mW<br>-EXEMPT-   | 1265 mW<br>-EXEMPT-   | < 50 mm              |       |
| Wi-Fi 5.5 GHz                | 5700            | 9.50         | 9  | 5                         | 8.4    | 185    | 170    | 45     |       | < 50 mm                    | < 50 mm | 1412.8 mW<br>-EXEMPT- | 1262.8 mW<br>-EXEMPT- | < 50 mm              |       |
| Wi-Fi 5.8 GHz                | 5825            | 9.50         | 9  | 5                         | 8.4    | 185    | 170    | 45     |       | < 50 mm                    | < 50 mm | 1412.2 mW<br>-EXEMPT- | 1262.2 mW<br>-EXEMPT- | < 50 mm              |       |
| Bluetooth                    | 2480            | 8.50         | 7  | 5                         | 8.4    | 185    | 170    | 45     |       | < 50 mm                    | < 50 mm | 1445.3 mW<br>-EXEMPT- | 1295.3 mW<br>-EXEMPT- | < 50 mm              |       |
| Wi-Fi Aux Antenna (Wi-Fi 2)  |                 |              |    |                           |        |        |        |        |       |                            |         |                       |                       |                      |       |
| Wi-Fi 2.4 GHz                | 2462            | 15.50        | 56 | 5                         | 8.4    | 162    | 170    | 67.8   |       | < 50 mm                    | < 50 mm | 1215.6 mW<br>-EXEMPT- | 1295.6 mW<br>-EXEMPT- | 273.6 mW<br>-EXEMPT- |       |
| Wi-Fi 5.2 GHz                | 5230            | 9.50         | 22 | 5                         | 8.4    | 162    | 170    | 67.8   |       | < 50 mm                    | < 50 mm | 1185.6 mW<br>-EXEMPT- | 1265.6 mW<br>-EXEMPT- | 243.6 mW<br>-EXEMPT- |       |
| Wi-Fi 5.3 GHz                | 5300            | 9.50         | 22 | 5                         | 8.4    | 162    | 170    | 67.8   |       | < 50 mm                    | < 50 mm | 1185.2 mW<br>-EXEMPT- | 1265.2 mW<br>-EXEMPT- | 243.2 mW<br>-EXEMPT- |       |
| Wi-Fi 5.5 GHz                | 5680            | 9.50         | 22 | 5                         | 8.4    | 162    | 170    | 67.8   |       | < 50 mm                    | < 50 mm | 1182.9 mW<br>-EXEMPT- | 1262.9 mW<br>-EXEMPT- | 240.9 mW<br>-EXEMPT- |       |
| Wi-Fi 5.8 GHz                | 5825            | 9.50         | 22 | 5                         | 8.4    | 162    | 170    | 67.8   |       | < 50 mm                    | < 50 mm | 1182.2 mW<br>-EXEMPT- | 1262.2 mW<br>-EXEMPT- | 240.2 mW<br>-EXEMPT- |       |

### MIMO

| 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 |
| Wi-Fi Main Antenna (Wi-Fi 1) |                 |              |    |                           |        |        |        |        |       |                            |         |                       |                       |                      |       |
| Wi-Fi 2.4 GHz                | 2462            | 15.50        | 56 | 5                         | 8.4    | 185    | 170    | 45     |       | < 50 mm                    | < 50 mm | 1445.6 mW<br>-EXEMPT- | 1295.6 mW<br>-EXEMPT- | < 50 mm              |       |
| Wi-Fi 5.2 GHz                | 5240            | 9.50         | 22 | 5                         | 8.4    | 185    | 170    | 45     |       | < 50 mm                    | < 50 mm | 1415.5 mW<br>-EXEMPT- | 1265.5 mW<br>-EXEMPT- | < 50 mm              |       |
| Wi-Fi 5.3 GHz                | 5320            | 9.50         | 22 | 5                         | 8.4    | 185    | 170    | 45     |       | < 50 mm                    | < 50 mm | 1415 mW<br>-EXEMPT-   | 1265 mW<br>-EXEMPT-   | < 50 mm              |       |
| Wi-Fi 5.5 GHz                | 5700            | 9.50         | 22 | 5                         | 8.4    | 185    | 170    | 45     |       | < 50 mm                    | < 50 mm | 1412.8 mW<br>-EXEMPT- | 1262.8 mW<br>-EXEMPT- | < 50 mm              |       |
| Wi-Fi 5.8 GHz                | 5825            | 9.50         | 22 | 5                         | 8.4    | 185    | 170    | 45     |       | < 50 mm                    | < 50 mm | 1412.2 mW<br>-EXEMPT- | 1262.2 mW<br>-EXEMPT- | < 50 mm              |       |
| Wi-Fi Aux Antenna (Wi-Fi 2)  |                 |              |    |                           |        |        |        |        |       |                            |         |                       |                       |                      |       |
| Wi-Fi 2.4 GHz                | 2462            | 15.50        | 56 | 5                         | 8.4    | 162    | 170    | 67.8   |       | < 50 mm                    | < 50 mm | 1215.6 mW<br>-EXEMPT- | 1295.6 mW<br>-EXEMPT- | 273.6 mW<br>-EXEMPT- |       |
| Wi-Fi 5.2 GHz                | 5240            | 9.50         | 22 | 5                         | 8.4    | 162    | 170    | 67.8   |       | < 50 mm                    | < 50 mm | 1185.5 mW<br>-EXEMPT- | 1265.5 mW<br>-EXEMPT- | 243.5 mW<br>-EXEMPT- |       |
| Wi-Fi 5.3 GHz                | 5320            | 9.50         | 22 | 5                         | 8.4    | 162    | 170    | 67.8   |       | < 50 mm                    | < 50 mm | 1185 mW<br>-EXEMPT-   | 1265 mW<br>-EXEMPT-   | 243 mW<br>-EXEMPT-   |       |
| Wi-Fi 5.5 GHz                | 5700            | 9.50         | 22 | 5                         | 8.4    | 162    | 170    | 67.8   |       | < 50 mm                    | < 50 mm | 1182.8 mW<br>-EXEMPT- | 1262.8 mW<br>-EXEMPT- | 240.8 mW<br>-EXEMPT- |       |
| Wi-Fi 5.8 GHz                | 5825            | 9.50         | 22 | 5                         | 8.4    | 162    | 170    | 67.8   |       | < 50 mm                    | < 50 mm | 1182.2 mW<br>-EXEMPT- | 1262.2 mW<br>-EXEMPT- | 240.2 mW<br>-EXEMPT- |       |

### Note(s):

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



## 8.2.Required Test Configurations

The table below identifies the standalone WWAN and WLAN test configurations required for this device according to the findings in Section 8.1:

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

### Note(s):

1. Yes = Testing is required.
2. No = Testing is not required.

## 9. RF Output Power Measurement

### 9.1. GSM

| 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            | 23.6            | 25.9              | 16.9            |
|      |              |               |            | 190    | 836.6       | 32.6            | 23.6            | 26.0              | 17.0            |
|      |              |               |            | 251    | 848.8       | 32.9            | 23.9            | 25.9              | 16.9            |
|      | GPRS (GMSK)  | CS1           | 1          | 128    | 824.2       | 32.6            | 23.6            | 25.9              | 16.9            |
|      |              |               |            | 190    | 836.6       | 32.6            | 23.6            | 26.0              | 17.0            |
|      |              |               |            | 251    | 848.8       | 32.9            | 23.9            | 25.9              | 16.9            |
|      |              |               | 2          | 128    | 824.2       | 30.9            | 24.9            | 24.3              | 18.3            |
|      |              |               |            | 190    | 836.6       | 31.0            | 25.0            | 24.4              | 18.4            |
|      |              |               |            | 251    | 848.8       | 31.0            | 25.0            | 24.3              | 18.3            |
|      |              |               | 3          | 128    | 824.2       | 28.5            | 24.2            | 22.0              | 17.7            |
|      |              |               |            | 190    | 836.6       | 28.6            | 24.3            | 22.1              | 17.8            |
|      |              |               |            | 251    | 848.8       | 28.8            | 24.5            | 22.1              | 17.8            |
|      |              |               | 4          | 128    | 824.2       | 26.8            | 23.8            | 20.8              | 17.8            |
|      |              |               |            | 190    | 836.6       | 26.9            | 23.9            | 20.8              | 17.8            |
|      |              |               |            | 251    | 848.8       | 27.0            | 24.0            | 20.9              | 17.9            |
|      | EGPRS (8PSK) | MCS5          | 1          | 128    | 824.2       | 27.2            | 18.2            | 19.9              | 10.9            |
|      |              |               |            | 190    | 836.6       | 27.2            | 18.2            | 20.0              | 11.0            |
|      |              |               |            | 251    | 848.8       | 27.3            | 18.3            | 20.0              | 11.0            |
|      |              |               | 2          | 128    | 824.2       | 27.0            | 21.0            | 19.8              | 13.8            |
|      |              |               |            | 190    | 836.6       | 27.1            | 21.1            | 19.9              | 13.9            |
|      |              |               |            | 251    | 848.8       | 27.1            | 21.1            | 19.9              | 13.9            |
|      |              |               | 3          | 128    | 824.2       | 25.5            | 21.2            | 17.3              | 13.0            |
|      |              |               |            | 190    | 836.6       | 25.6            | 21.3            | 17.5              | 13.2            |
|      |              |               |            | 251    | 848.8       | 25.6            | 21.3            | 17.5              | 13.2            |
|      |              |               | 4          | 128    | 824.2       | 24.3            | 21.3            | 17.3              | 14.3            |
|      |              |               |            | 190    | 836.6       | 24.5            | 21.5            | 17.4              | 14.4            |
|      |              |               |            | 251    | 848.8       | 24.5            | 21.5            | 17.4              | 14.4            |

#### Notes:

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

- GMSK (GPRS) mode with 3 time slots for when Power Reduction is disabled, based on the output/frame power measurements above
- GMSK (GPRS) mode with 3 time slots for when Power Reduction is enabled, based on the output/frame power measurements above
- SAR is required for EGPRS (8PSK) mode because its output/frame power is greater than that of GPRS Mode

| 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      | 28.2            | 19.2            | 20.7              | 11.7            |
|      |              |               |            | 661    | 1880.0      | 28.3            | 19.3            | 20.7              | 11.7            |
|      |              |               |            | 810    | 1909.8      | 28.3            | 19.3            | 20.8              | 11.8            |
|      | GPRS (GMSK)  | CS1           | 1          | 512    | 1850.2      | 28.2            | 19.2            | 20.7              | 11.7            |
|      |              |               |            | 661    | 1880.0      | 28.3            | 19.3            | 20.7              | 11.7            |
|      |              |               |            | 810    | 1909.8      | 28.3            | 19.3            | 20.8              | 11.8            |
|      |              |               | 2          | 512    | 1850.2      | 27.2            | 21.2            | 19.5              | 13.5            |
|      |              |               |            | 661    | 1880.0      | 27.3            | 21.3            | 19.4              | 13.4            |
|      |              |               |            | 810    | 1909.8      | 27.2            | 21.2            | 19.4              | 13.4            |
|      |              |               | 3          | 512    | 1850.2      | 25.9            | 21.6            | 16.5              | 12.2            |
|      |              |               |            | 661    | 1880.0      | 25.7            | 21.4            | 16.5              | 12.2            |
|      |              |               |            | 810    | 1909.8      | 25.6            | 21.3            | 16.5              | 12.2            |
|      |              |               | 4          | 512    | 1850.2      | 24.2            | 21.2            | 14.9              | 11.9            |
|      |              |               |            | 661    | 1880.0      | 24.3            | 21.3            | 15.0              | 12.0            |
|      |              |               |            | 810    | 1909.8      | 24.2            | 21.2            | 15.0              | 12.0            |
|      | EGPRS (8PSK) | MCS5          | 1          | 512    | 1850.2      | 26.1            | 17.1            | 16.8              | 7.8             |
|      |              |               |            | 661    | 1880.0      | 26.0            | 17.0            | 16.9              | 7.9             |
|      |              |               |            | 810    | 1909.8      | 25.8            | 16.8            | 16.9              | 7.9             |
|      |              |               | 2          | 512    | 1850.2      | 26.0            | 20.0            | 16.8              | 10.8            |
|      |              |               |            | 661    | 1880.0      | 25.8            | 19.8            | 16.9              | 10.9            |
|      |              |               |            | 810    | 1909.8      | 25.6            | 19.6            | 16.8              | 10.8            |
|      |              |               | 3          | 512    | 1850.2      | 24.4            | 20.1            | 13.1              | 8.8             |
|      |              |               |            | 661    | 1880.0      | 24.2            | 19.9            | 13.0              | 8.7             |
|      |              |               |            | 810    | 1909.8      | 24.1            | 19.8            | 13.0              | 8.7             |
|      |              |               | 4          | 512    | 1850.2      | 23.2            | 20.2            | 13.4              | 10.4            |
|      |              |               |            | 661    | 1880.0      | 23.1            | 20.1            | 13.5              | 10.5            |
|      |              |               |            | 810    | 1909.8      | 22.9            | 19.9            | 13.5              | 10.5            |

#### Notes:

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

- GMSK (GPRS) mode with 3 time slots for when Power Reduction is disabled, based on the output/frame power measurements above
- GMSK (GPRS) mode with 2 time slots for when Power Reduction is enabled, based on the output/frame power measurements above
- SAR is required for EGPRS (8PSK) mode because its output/frame power is greater than that of GPRS Mode

## 9.2. W-CDMA

### Release 99

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 | Algorithm 2  |
|                        | $\beta_c/\beta_d$       | 8/15         |

### Measured Results

| Band           | Mode                    | UL Ch No. | Freq. (MHz) | Max. Power (dBm) | PWR Back-off (dBm) |
|----------------|-------------------------|-----------|-------------|------------------|--------------------|
| W-CDMA Band V  | Rel 99 (RMC, 12.2 kbps) | 4132      | 826.4       | 22.5             | 17.7               |
|                |                         | 4183      | 836.6       | 22.4             | 17.7               |
|                |                         | 4233      | 846.6       | 22.6             | 17.7               |
| W-CDMA Band II | Rel 99 (RMC, 12.2 kbps) | 9262      | 1852.4      | 21.1             | 11.9               |
|                |                         | 9400      | 1880.0      | 21.2             | 11.6               |
|                |                         | 9538      | 1907.6      | 21.2             | 11.9               |

### HSDPA

The following 4 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121-1. 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         | 12/15 | 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 | $D_{ACK}$                            | 8            |       |       |       |
|                         | $D_{NAK}$                            | 8            |       |       |       |
|                         | DCQI                                 | 8            |       |       |       |
|                         | Ack-Nack repetition factor           | 3            |       |       |       |
|                         | CQI Feedback (Table 5.2B.4)          | 4ms          |       |       |       |
|                         | CQI Repetition Factor (Table 5.2B.4) | 2            |       |       |       |
|                         | $A_{hs}=\beta_{hs}/\beta_c$          | 30/15        |       |       |       |

**Measured Results**

| Band           | Mode      | UL Ch No. | Freq. (MHz) | Max. Power (dBm) | PWR Back-off (dBm) |
|----------------|-----------|-----------|-------------|------------------|--------------------|
| W-CDMA Band V  | Subtest 1 | 4132      | 826.4       | 21.8             | 16.6               |
|                |           | 4183      | 836.6       | 21.7             | 16.7               |
|                |           | 4233      | 846.6       | 21.7             | 16.7               |
|                | Subtest 2 | 4132      | 826.4       | 21.9             | 16.7               |
|                |           | 4183      | 836.6       | 21.7             | 16.7               |
|                |           | 4233      | 846.6       | 21.6             | 16.8               |
|                | Subtest 3 | 4132      | 826.4       | 21.3             | 16.2               |
|                |           | 4183      | 836.6       | 21.2             | 16.1               |
|                |           | 4233      | 846.6       | 21.1             | 16.3               |
|                | Subtest 4 | 4132      | 826.4       | 21.3             | 16.2               |
|                |           | 4183      | 836.6       | 21.2             | 16.2               |
|                |           | 4233      | 846.6       | 21.1             | 16.2               |
| W-CDMA Band II | Subtest 1 | 9262      | 1852.4      | 21.1             | 10.8               |
|                |           | 9400      | 1880.0      | 21.0             | 10.5               |
|                |           | 9538      | 1907.6      | 21.2             | 10.9               |
|                | Subtest 2 | 9262      | 1852.4      | 21.0             | 10.3               |
|                |           | 9400      | 1880.0      | 21.2             | 10.5               |
|                |           | 9538      | 1907.6      | 21.0             | 10.8               |
|                | Subtest 3 | 9262      | 1852.4      | 20.2             | 10.3               |
|                |           | 9400      | 1880.0      | 20.2             | 10.0               |
|                |           | 9538      | 1907.6      | 20.7             | 10.3               |
|                | Subtest 4 | 9262      | 1852.4      | 20.7             | 10.3               |
|                |           | 9400      | 1880.0      | 20.2             | 9.9                |
|                |           | 9538      | 1907.6      | 20.7             | 10.2               |

Maximum output power levels that are possible for all subtests reported.

### HSPA (HSDPA & HSUPA)

The following 5 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                                 | HSPA         |       |                |       |             |
|-------------------------|--------------------------------------|--------------|-------|----------------|-------|-------------|
|                         | Subtest                              | 1            | 2     | 3              | 4     | 5           |
| WCDMA General Settings  | Loopback Mode                        | Test Mode 1  |       |                |       |             |
|                         | Rel99 RMC                            | 12.2kbps 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        | 11/15 | 15/9           | 2/15  | 15/0        |
|                         | $\beta_{hs}$                         | 22/15        | 12/15 | 30/15          | 4/15  | 5/15        |
|                         | $\beta_{ed}$                         | 1309/225     | 94/75 | 47/15<br>47/15 | 56/75 | 47/15       |
|                         | CM (dB)                              | 1            | 3     | 2              | 3     | 1           |
|                         | MPR (dB)                             | 0            | 2     | 1              | 2     | 0           |
| HSDPA Specific Settings | DACK                                 | 8            |       |                |       | 0           |
|                         | DNAK                                 | 8            |       |                |       | 0           |
|                         | DCQI                                 | 8            |       |                |       | 0           |
|                         | Ack-Nack repetition factor           | 3            |       |                |       |             |
|                         | CQI Feedback (Table 5.2B.4)          | 4ms          |       |                |       |             |
|                         | CQI Repetition Factor (Table 5.2B.4) | 2            |       |                |       |             |
|                         | $A_{hs} = \beta_{hs}/\beta_c$        | 30/15        |       |                |       |             |
| HSUPA Specific Settings | E-DPDCCH                             | 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 Channelisation Codes         | 2xSF2        |       |                |       | SF4         |

### Measured Results

| Band           | Mode      | UL Ch No. | Freq. (MHz) | Max. Power (dBm) | Power Back-off (dBm) |
|----------------|-----------|-----------|-------------|------------------|----------------------|
| W-CDMA Band V  | Subtest 1 | 4132      | 826.4       | 21.5             | 16.2                 |
|                |           | 4183      | 836.6       | 21.4             | 16.1                 |
|                |           | 4233      | 846.6       | 21.6             | 16.1                 |
|                | Subtest 2 | 4132      | 826.4       | 20.6             | 15.0                 |
|                |           | 4183      | 836.6       | 20.5             | 15.0                 |
|                |           | 4233      | 846.6       | 20.0             | 15.0                 |
|                | Subtest 3 | 4132      | 826.4       | 20.5             | 15.3                 |
|                |           | 4183      | 836.6       | 20.7             | 15.1                 |
|                |           | 4233      | 846.6       | 20.5             | 15.3                 |
|                | Subtest 4 | 4132      | 826.4       | 20.5             | 15.0                 |
|                |           | 4183      | 836.6       | 21.0             | 15.0                 |
|                |           | 4233      | 846.6       | 20.4             | 15.0                 |
|                | Subtest 5 | 4132      | 826.4       | 21.9             | 16.4                 |
|                |           | 4183      | 836.6       | 21.7             | 16.3                 |
|                |           | 4233      | 846.6       | 21.6             | 16.3                 |
| W-CDMA Band II | Subtest 1 | 9262      | 1852.4      | 21.2             | 11.2                 |
|                |           | 9400      | 1880.0      | 21.0             | 10.7                 |
|                |           | 9538      | 1907.6      | 21.0             | 10.4                 |
|                | Subtest 2 | 9262      | 1852.4      | 19.2             | 9.7                  |
|                |           | 9400      | 1880.0      | 19.2             | 9.1                  |
|                |           | 9538      | 1907.6      | 19.0             | 9.1                  |
|                | Subtest 3 | 9262      | 1852.4      | 20.2             | 10.8                 |
|                |           | 9400      | 1880.0      | 20.0             | 9.7                  |
|                |           | 9538      | 1907.6      | 20.1             | 9.5                  |
|                | Subtest 4 | 9262      | 1852.4      | 19.2             | 9.9                  |
|                |           | 9400      | 1880.0      | 19.2             | 9.6                  |
|                |           | 9538      | 1907.6      | 19.2             | 9.4                  |
|                | Subtest 5 | 9262      | 1852.4      | 21.1             | 11.7                 |
|                |           | 9400      | 1880.0      | 21.0             | 10.8                 |
|                |           | 9538      | 1907.6      | 21.2             | 10.6                 |

### 9.3. WiFi (2.4 GHz Band)

Required Test Channels per KDB 248227 D01

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

**Notes:**  
√ = "default test channels"  
▽ = possible 802.11g channels with maximum average output ¼ dB ≥ the "default test channels"  
<sup>#</sup> = when output power is reduced for channel 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested.

#### Measured Results

| Band (GHz) | Mode           | Mode   | No. of Transmitters | Ch # | Freq. (MHz) | Avg Pwr (dBm) |         | SAR Test (Yes/No) |
|------------|----------------|--------|---------------------|------|-------------|---------------|---------|-------------------|
|            |                |        |                     |      |             | Wi-Fi 1       | Wi-Fi 2 |                   |
| 2.4        | 802.11b        | 1 Mbps | 1 Tx                | 1    | 2412        | 15.5          | 15.3    | Yes               |
|            |                |        |                     | 6    | 2437        | 15.5          | 15.3    |                   |
|            |                |        |                     | 11   | 2462        | 15.5          | 14.8    |                   |
|            |                |        | 2 Tx                | 1    | 2412        | 14.6          | 15.1    | Yes               |
|            |                |        |                     | 6    | 2437        | 15.1          | 15.0    |                   |
|            |                |        |                     | 11   | 2462        | 14.6          | 14.7    |                   |
|            | 802.11g        | 6 Mbps | 1 Tx                | 1    | 2412        | 12.5          | 12.2    | No                |
|            |                |        |                     | 6    | 2437        | 12.2          | 12.0    |                   |
|            |                |        |                     | 11   | 2462        | 12.5          | 11.9    |                   |
|            |                |        | 2 Tx                | 1    | 2412        | 11.8          | 12.2    | No                |
|            |                |        |                     | 6    | 2437        | 12.3          | 12.0    |                   |
|            |                |        |                     | 11   | 2462        | 11.6          | 11.7    |                   |
|            | 802.11n (HT20) | MCS0   | 1 Tx                | 1    | 2412        | 11.8          | 12.4    | No                |
|            |                |        |                     | 6    | 2437        | 12.5          | 12.4    |                   |
|            |                |        |                     | 11   | 2462        | 12.0          | 12.3    |                   |
|            |                |        | 2 Tx                | 1    | 2412        | 11.7          | 12.4    | No                |
|            |                |        |                     | 6    | 2437        | 12.4          | 12.4    |                   |
|            |                |        |                     | 11   | 2462        | 12.1          | 12.3    |                   |

#### Note(s):

Per KDB 248227 D01, SAR is not required for 802.11g/HT20 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels.

#### Power measurements to determine worst-case data rates

| Mode    | Ch # | Freq. (MHz) | Data Rate | Avg Pwr |        | SAR test (Yes/No) |
|---------|------|-------------|-----------|---------|--------|-------------------|
|         |      |             |           | WiFi 1  | WiFi 2 |                   |
| 802.11b | 6    | 2437        | 1 Mbps    | 15.5    | 15.3   | Yes               |
|         |      |             | 2 Mbps    | 15.5    | 15.3   | No                |
|         |      |             | 5.5 Mbps  | 15.5    | 15.3   | No                |
|         |      |             | 11 Mbps   | 15.5    | 15.3   | No                |



## 9.4. WiFi (5 GHz Bands)

### Required Test Channels per KDB 248227 D01

| Mode    |                  | Band    | GHz   | Channel | "Default Test Channels" |   |
|---------|------------------|---------|-------|---------|-------------------------|---|
|         |                  |         |       |         | 802.11a                 |   |
| 802.11a | UNII<br>(15.407) | 5.2 GHz | 5.180 | 36      | √                       |   |
|         |                  |         | 5.200 | 40      |                         | * |
|         |                  |         | 2.220 | 44      |                         | * |
|         |                  |         | 5.240 | 48      | √                       |   |
|         |                  | 5.3 GHz | 5.260 | 52      | √                       |   |
|         |                  |         | 5.280 | 56      |                         | * |
|         |                  |         | 5.300 | 60      |                         | * |
|         |                  |         | 5.320 | 64      | √                       |   |
|         |                  | 5.5 GHz | 5.500 | 100     |                         |   |
|         |                  |         | 5.520 | 104     | √                       |   |
|         |                  |         | 5.540 | 108     |                         | * |
|         |                  |         | 5.560 | 112     |                         | * |
|         |                  |         | 5.580 | 116     | √                       |   |
|         |                  |         | 5.600 | 120     |                         | * |
|         |                  |         | 5.620 | 124     | √                       |   |
|         |                  |         | 5.640 | 128     |                         | * |
|         |                  |         | 5.660 | 132     |                         | * |
|         |                  |         | 5.680 | 136     | √                       |   |
|         |                  |         | 5.700 | 140     |                         | * |
|         | DTS<br>(15.247)  | 5.8 GHz | 5.745 | 149     | √                       |   |
|         |                  |         | 5.765 | 153     |                         | * |
|         |                  |         | 5.785 | 157     | √                       |   |
|         |                  |         | 5.805 | 161     |                         | * |
|         |                  |         | 5.825 | 165     | √                       |   |

√ = "default test channels"

\* = possible 802.11a channels with maximum average output > the "default test channels"

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

**WiFi 5 GHz Bands Measured Results**

| Band (GHz) | Mode             | Mode   | No. of Transmitters | Ch # | Freq. (MHz) | Avg Pwr (dBm) |         | SAR Test (Yes/No) |
|------------|------------------|--------|---------------------|------|-------------|---------------|---------|-------------------|
|            |                  |        |                     |      |             | Wi-Fi 1       | Wi-Fi 2 |                   |
| 5.2 (UNII) | 802.11a          | 6 Mbps | 1 Tx                | 36   | 5180        | 8.9           | 9.0     | Yes               |
|            |                  |        |                     | 40   | 5200        | 8.8           | 8.9     |                   |
|            |                  |        |                     | 44   | 5220        | 8.9           | 9.0     |                   |
|            |                  |        |                     | 48   | 5240        | 8.7           | 9.0     |                   |
|            |                  |        | 2 Tx                | 36   | 5180        | 9.0           | 9.1     | Yes               |
|            |                  |        |                     | 40   | 5200        | 9.0           | 9.1     |                   |
|            |                  |        |                     | 44   | 5220        | 8.8           | 9.0     |                   |
|            |                  |        |                     | 48   | 5240        | 8.8           | 9.0     |                   |
|            | 802.11n (HT20)   | MCS0   | 1 Tx                | 36   | 5180        | 9.0           | 8.9     | No                |
|            |                  |        |                     | 40   | 5200        | 8.8           | 8.9     |                   |
|            |                  |        |                     | 44   | 5220        | 8.7           | 8.8     |                   |
|            |                  |        |                     | 48   | 5240        | 8.7           | 8.8     |                   |
|            |                  |        | 2 Tx                | 36   | 5180        | 8.8           | 8.8     | No                |
|            |                  |        |                     | 40   | 5200        | 8.8           | 9.0     |                   |
|            | 802.11n (HT40)   | MCS0   | 1 Tx                | 38   | 5190        | 9.2           | 9.2     | No                |
|            |                  |        |                     | 46   | 5230        | 9.1           | 9.3     |                   |
|            |                  |        | 2 Tx                | 38   | 5190        | 9.2           | 9.3     | No                |
|            |                  |        |                     | 46   | 5230        | 9.2           | 9.4     |                   |
|            | 802.11ac (VHT80) | MCS0   | 1 Tx                | 42   | 5210        | 8.8           | 8.9     | Yes               |
|            |                  |        | 2 Tx                | 42   | 5210        | 8.8           | 8.8     | Yes               |
| 5.3 (UNII) | 802.11a          | 6 Mbps | 1 Tx                | 52   | 5260        | 9.3           | 9.2     | Yes               |
|            |                  |        |                     | 56   | 5280        | 9.0           | 8.7     |                   |
|            |                  |        |                     | 60   | 5300        | 9.1           | 8.7     |                   |
|            |                  |        |                     | 64   | 5320        | 9.2           | 9.0     |                   |
|            |                  |        | 2 Tx                | 52   | 5260        | 8.9           | 8.9     | Yes               |
|            |                  |        |                     | 56   | 5280        | 8.7           | 8.9     |                   |
|            |                  |        |                     | 60   | 5300        | 8.8           | 9.0     |                   |
|            |                  |        |                     | 64   | 5320        | 9.0           | 8.9     |                   |
|            | 802.11n (HT20)   | MCS0   | 1 Tx                | 52   | 5260        | 8.8           | 8.7     | No                |
|            |                  |        |                     | 56   | 5280        | 8.9           | 8.7     |                   |
|            |                  |        |                     | 60   | 5300        | 8.7           | 8.7     |                   |
|            |                  |        |                     | 64   | 5320        | 8.8           | 8.8     |                   |
|            |                  |        | 2 Tx                | 52   | 5260        | 8.8           | 8.8     | No                |
|            |                  |        |                     | 56   | 5280        | 8.8           | 8.8     |                   |
|            | 802.11n (HT40)   | MCS0   | 1 Tx                | 54   | 5270        | 9.3           | 9.1     | No                |
|            |                  |        |                     | 62   | 5310        | 9.2           | 9.2     |                   |
|            |                  |        | 2 Tx                | 54   | 5270        | 9.1           | 9.1     | No                |
|            |                  |        |                     | 62   | 5310        | 9.2           | 9.2     |                   |
|            | 802.11ac (VHT80) | MCS0   | 1 Tx                | 58   | 5290        | 9.0           | 9.0     | Yes               |
|            |                  |        | 2 Tx                | 58   | 5290        | 9.0           | 9.0     | Yes               |

**Wi-Fi 5 GHz Bands Measured Results continued**

| Band (GHz) | Mode             | Mode   | No. of Transmitters | Ch # | Freq. (MHz) | Avg Pwr (dBm) |         | SAR Test (Yes/No) |
|------------|------------------|--------|---------------------|------|-------------|---------------|---------|-------------------|
|            |                  |        |                     |      |             | Wi-Fi 1       | Wi-Fi 2 |                   |
| 5.5 (UNII) | 802.11a          | 6 Mbps | 1 Tx                | 100  | 5500        | 9.0           | 9.1     | Yes               |
|            |                  |        |                     | 104  | 5520        | 9.4           | 9.3     |                   |
|            |                  |        |                     | 108  | 5540        | 9.2           | 9.3     |                   |
|            |                  |        |                     | 112  | 5560        | 9.4           | 9.3     |                   |
|            |                  |        |                     | 116  | 5580        | 9.2           | 9.3     |                   |
|            |                  |        |                     | 120  | 5600        | 9.2           | 9.4     |                   |
|            |                  |        |                     | 124  | 5620        | 9.2           | 9.3     |                   |
|            |                  |        |                     | 128  | 5640        | 9.0           | 9.3     |                   |
|            |                  |        |                     | 132  | 5660        | 8.9           | 9.3     |                   |
|            |                  |        |                     | 136  | 5680        | 9.0           | 9.2     |                   |
|            |                  |        |                     | 140  | 5700        | 9.0           | 9.3     |                   |
|            |                  |        | 2 Tx                | 100  | 5500        | 9.2           | 9.2     | Yes               |
|            |                  |        |                     | 104  | 5520        | 9.2           | 9.2     |                   |
|            |                  |        |                     | 108  | 5540        | 9.2           | 9.1     |                   |
|            |                  |        |                     | 112  | 5560        | 9.2           | 9.2     |                   |
|            |                  |        |                     | 116  | 5580        | 9.1           | 9.2     |                   |
|            |                  |        |                     | 120  | 5600        | 9.1           | 9.3     |                   |
|            |                  |        |                     | 124  | 5620        | 9.2           | 9.1     |                   |
|            |                  |        |                     | 128  | 5640        | 9.0           | 9.1     |                   |
|            |                  |        |                     | 132  | 5660        | 9.1           | 9.2     |                   |
|            |                  |        |                     | 136  | 5680        | 9.2           | 9.3     |                   |
|            |                  |        |                     | 140  | 5700        | 9.0           | 9.3     |                   |
|            | 802.11n (HT20)   | MCS0   | 1 Tx                | 100  | 5500        | 9.1           | 9.3     | No                |
|            |                  |        |                     | 104  | 5520        | 9.1           | 9.3     |                   |
|            |                  |        |                     | 108  | 5540        | 9.2           | 9.3     |                   |
|            |                  |        |                     | 112  | 5560        | 9.1           | 9.2     |                   |
|            |                  |        |                     | 116  | 5580        | 9.0           | 9.2     |                   |
|            |                  |        |                     | 120  | 5600        | 9.0           | 9.1     |                   |
|            |                  |        |                     | 124  | 5620        | 9.0           | 9.2     |                   |
|            |                  |        |                     | 128  | 5640        | 9.0           | 9.1     |                   |
|            |                  |        |                     | 132  | 5660        | 8.9           | 9.2     |                   |
|            |                  |        |                     | 136  | 5680        | 9.0           | 9.3     |                   |
|            |                  |        |                     | 140  | 5700        | 8.9           | 9.1     |                   |
|            |                  |        | 2 Tx                | 100  | 5500        | 9.1           | 9.3     | No                |
|            |                  |        |                     | 104  | 5520        | 9.1           | 9.3     |                   |
|            |                  |        |                     | 108  | 5540        | 9.2           | 9.3     |                   |
|            |                  |        |                     | 112  | 5560        | 9.2           | 9.3     |                   |
|            |                  |        |                     | 116  | 5580        | 8.9           | 9.2     |                   |
|            |                  |        |                     | 120  | 5600        | 9.0           | 9.3     |                   |
|            |                  |        |                     | 124  | 5620        | 8.9           | 9.2     |                   |
|            |                  |        |                     | 128  | 5640        | 8.9           | 9.2     |                   |
|            | 802.11n (HT40)   | MCS0   | 1 Tx                | 102  | 5510        | 9.2           | 9.2     | No                |
|            |                  |        |                     | 110  | 5550        | 9.1           | 9.3     |                   |
|            |                  |        |                     | 134  | 5670        | 9.2           | 9.2     |                   |
|            |                  |        | 2 Tx                | 102  | 5510        | 9.1           | 9.2     | No                |
|            |                  |        |                     | 110  | 5550        | 9.1           | 9.2     |                   |
|            |                  |        |                     | 134  | 5670        | 9.2           | 9.2     |                   |
|            | 802.11ac (VHT80) | MCS0   | 1 Tx                | 106  | 5530        | 8.9           | 9.0     | Yes               |
|            |                  |        |                     | 138  | 5690        | 8.7           | 8.8     |                   |
|            |                  |        | 2 Tx                | 106  | 5530        | 8.9           | 9.1     | Yes               |
|            |                  |        |                     | 138  | 5690        | 8.9           | 9.2     |                   |

| Band (GHz) | Mode             | Mode   | No. of Transmitters | Ch # | Freq. (MHz) | Avg Pwr (dBm) |         | SAR Test (Yes/No) |
|------------|------------------|--------|---------------------|------|-------------|---------------|---------|-------------------|
|            |                  |        |                     |      |             | Wi-Fi 1       | Wi-Fi 2 |                   |
| 5.8 (DTS)  | 802.11a          | 6 Mbps | 1 Tx                | 149  | 5745        | 8.8           | 9.0     | Yes               |
|            |                  |        |                     | 153  | 5765        | 8.6           | 8.9     |                   |
|            |                  |        |                     | 157  | 5785        | 8.6           | 8.8     |                   |
|            |                  |        |                     | 161  | 5805        | 8.7           | 8.9     |                   |
|            |                  |        |                     | 165  | 5825        | 8.8           | 9.0     |                   |
|            |                  |        | 2 Tx                | 149  | 5745        | 8.7           | 9.1     | Yes               |
|            |                  |        |                     | 153  | 5765        | 8.6           | 8.9     |                   |
|            |                  |        |                     | 157  | 5785        | 8.4           | 8.8     |                   |
|            |                  |        |                     | 161  | 5805        | 8.7           | 9.1     |                   |
|            |                  |        |                     | 165  | 5825        | 8.6           | 9.0     |                   |
|            | 802.11n (HT20)   | MCS0   | 1 Tx                | 149  | 5745        | 8.9           | 9.0     | No                |
|            |                  |        |                     | 153  | 5765        | 8.9           | 9.0     |                   |
|            |                  |        |                     | 157  | 5785        | 8.6           | 8.9     |                   |
|            |                  |        |                     | 161  | 5805        | 8.6           | 8.9     |                   |
|            |                  |        |                     | 165  | 5825        | 8.7           | 8.7     |                   |
|            |                  |        | 2 Tx                | 149  | 5745        | 8.4           | 8.8     | No                |
|            |                  |        |                     | 153  | 5765        | 8.4           | 8.9     |                   |
|            |                  |        |                     | 157  | 5785        | 8.5           | 8.9     |                   |
|            |                  |        |                     | 161  | 5805        | 8.6           | 9.0     |                   |
|            |                  |        |                     | 165  | 5825        | 8.6           | 9.0     |                   |
|            | 802.11n (HT40)   | MCS0   | 1 Tx                | 151  | 5755        | 8.9           | 9.0     | No                |
|            |                  |        |                     | 159  | 5795        | 8.9           | 9.1     |                   |
|            |                  |        | 2 Tx                | 151  | 5755        | 8.8           | 9.1     | No                |
|            |                  |        |                     | 159  | 5795        | 8.8           | 9.1     |                   |
|            | 802.11ac (80MHz) | MCS0   | 1 Tx                | 155  | 5775        | 8.8           | 9.0     | Yes               |
|            |                  |        | 2 Tx                | 155  | 5775        | 9.0           | 8.9     | Yes               |

**Note(s):**

Per KDB 248227, SAR is not required for 802.11n HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a channels.

**Power measurements to determine worst-case data rates**

| Band           | Mode    | Ch # | Freq. (MHz) | Data Rate | Avg Pwr (dBm) |        | SAR test (Yes/No) |
|----------------|---------|------|-------------|-----------|---------------|--------|-------------------|
|                |         |      |             |           | WiFi 1        | WiFi 2 |                   |
| 5.2 GHz (UNII) | 802.11a | 36   | 5180        | 6 Mbps    | 8.9           | 9.0    | Yes               |
|                |         |      |             | 9 Mbps    | 8.9           | 9.0    | No                |
|                |         |      |             | 12 Mbps   | 8.9           | 9.0    | No                |
|                |         |      |             | 18 Mbps   | 8.9           | 9.0    | No                |
|                |         |      |             | 24 Mbps   | 8.9           | 9.0    | No                |
|                |         |      |             | 36 Mbps   | 8.9           | 9.0    | No                |
|                |         |      |             | 48 Mbps   | 8.9           | 9.0    | No                |
|                |         |      |             | 54 Mbps   | 8.9           | 9.0    | No                |
| 5.3 GHz (UNII) | 802.11a | 52   | 5260        | 6 Mbps    | 9.3           | 9.2    | Yes               |
|                |         |      |             | 9 Mbps    | 9.2           | 9.2    | No                |
|                |         |      |             | 12 Mbps   | 9.3           | 9.1    | No                |
|                |         |      |             | 18 Mbps   | 9.2           | 9.2    | No                |
|                |         |      |             | 24 Mbps   | 9.2           | 9.1    | No                |
|                |         |      |             | 36 Mbps   | 9.2           | 9.0    | No                |
|                |         |      |             | 48 Mbps   | 9.2           | 9.0    | No                |
|                |         |      |             | 54 Mbps   | 9.2           | 9.0    | No                |
| 5.5 GHz (UNII) | 802.11a | 104  | 5520        | 6 Mbps    | 9.4           | 9.3    | Yes               |
|                |         |      |             | 9 Mbps    | 9.3           | 9.2    | No                |
|                |         |      |             | 12 Mbps   | 9.1           | 9.2    | No                |
|                |         |      |             | 18 Mbps   | 9.1           | 9.3    | No                |
|                |         |      |             | 24 Mbps   | 9.3           | 9.3    | No                |
|                |         |      |             | 36 Mbps   | 9.2           | 9.3    | No                |
|                |         |      |             | 48 Mbps   | 9.4           | 9.3    | No                |
|                |         |      |             | 54 Mbps   | 9.3           | 9.3    | No                |
| 5.8 GHz (DTS)  | 802.11a | 149  | 5745        | 6 Mbps    | 8.8           | 9.0    | Yes               |
|                |         |      |             | 9 Mbps    | 8.8           | 9.0    | No                |
|                |         |      |             | 12 Mbps   | 8.8           | 9.0    | No                |
|                |         |      |             | 18 Mbps   | 8.8           | 9.0    | No                |
|                |         |      |             | 24 Mbps   | 8.8           | 9.0    | No                |
|                |         |      |             | 36 Mbps   | 8.8           | 9.0    | No                |
|                |         |      |             | 48 Mbps   | 8.8           | 9.0    | No                |
|                |         |      |             | 54 Mbps   | 8.8           | 9.0    | No                |

**9.5. Bluetooth**

| Band (GHz) | Mode               | Ch # | Freq. (MHz) | Conducted Avg Power |      |
|------------|--------------------|------|-------------|---------------------|------|
|            |                    |      |             | (dBm)               | (mW) |
| 2.4        | V3.0 + EDR, GFSK   | 0    | 2402        | 6.4                 | 4.37 |
|            |                    | 39   | 2441        | 8.3                 | 6.76 |
|            |                    | 78   | 2480        | 8.0                 | 6.31 |
|            | V3.0 + EDR, 8-DPSK | 0    | 2402        | 3.4                 | 2.19 |
|            |                    | 39   | 2441        | 5.5                 | 3.55 |
|            |                    | 78   | 2480        | 4.5                 | 2.82 |
|            | V4.0 LE, GFSK      | 0    | 2402        | 4.2                 | 2.63 |
|            |                    | 19   | 2440        | 6.2                 | 4.17 |
|            |                    | 39   | 2480        | 5.5                 | 3.55 |

## 10. Tissue Dielectric Properties

### IEEE Standard 1528-2013

| Target Frequency (MHz) | Head         |                |
|------------------------|--------------|----------------|
|                        | $\epsilon_r$ | $\sigma$ (S/m) |
| 300                    | 45.3         | 0.87           |
| 450                    | 43.5         | 0.87           |
| 750                    | 41.9         | 0.89           |
| 835                    | 41.5         | 0.90           |
| 900                    | 41.5         | 0.97           |
| 1450                   | 40.5         | 1.20           |
| 1500                   | 40.4         | 1.23           |
| 1640                   | 40.2         | 1.31           |
| 1750                   | 40.1         | 1.37           |
| 1800                   | 40.0         | 1.40           |
| 1900                   | 40.0         | 1.40           |
| 2000                   | 40.0         | 1.40           |
| 2100                   | 39.8         | 1.49           |
| 2300                   | 39.5         | 1.67           |
| 2450                   | 39.2         | 1.80           |
| 2600                   | 39.0         | 1.96           |
| 3000                   | 38.5         | 2.40           |
| 3500                   | 37.9         | 2.91           |
| 4000                   | 37.4         | 3.43           |
| 4500                   | 36.8         | 3.94           |
| 5000                   | 36.2         | 4.45           |
| 5200                   | 36.0         | 4.66           |
| 5400                   | 35.8         | 4.86           |
| 5600                   | 35.5         | 5.07           |
| 5800                   | 35.3         | 5.27           |
| 600                    | 35.1         | 5.48           |

NOTE—For convenience, permittivity and conductivity values at some frequencies that are not part of the original data from Drossos et al. [B60] or the extension to 5800 MHz are provided (i.e., the values shown in italics). These values were linearly interpolated between the values in this table that are immediately above and below these values, except the values at 6000 MHz that were linearly extrapolated from the values at 3000 MHz and 5800 MHz.

### FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03

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

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

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

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

Salt: 99+% Pure Sodium Chloride

Sugar: 98+% Pure Sucrose

Water: De-ionized, 16 MΩ+ resistivity

HEC: Hydroxyethyl Cellulose

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

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

### MSL/HSL750 (Body and Head liquids for 700 – 800 MHz)

| Item                                               | Head Tissue Simulation Liquids HSL750<br>Muscle (body) Tissue Simulation Liquids MSL750                                                           |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Type No                                            | SL AAH 075                                                                                                                                        |
| Manufacturer                                       | SPEAG                                                                                                                                             |
| The item is composed of the following ingredients: |                                                                                                                                                   |
| H <sub>2</sub> O                                   | Water, 35 – 58%                                                                                                                                   |
| Sucrose                                            | Sugar, white, refined, 40-60%                                                                                                                     |
| NaCl                                               | Sodium Chloride, 0-6%                                                                                                                             |
| Hydroxyethyl-cellulose                             | Medium Viscosity (CAS# 9004-62-0), <0.3%                                                                                                          |
| Preventol-D7                                       | Preservative: aqueous preparation, (CAS# 55965-84-9), containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyl-3(2H)-isothiazolone, 0.1-0.7% |

### MSL/HSL1750 (Body and Head liquids for 1700 – 1800 MHz)

| Item                                                | Head Tissue Simulation Liquids HSL1750<br>Muscle (body) Tissue Simulation Liquids MSL1750 |
|-----------------------------------------------------|-------------------------------------------------------------------------------------------|
| Type No                                             | SL AAM 175                                                                                |
| Manufacturer                                        | SPEAG                                                                                     |
| -The item is composed of the following ingredients: |                                                                                           |
| H <sub>2</sub> O                                    | Water, 52 – 75%                                                                           |
| C8H18O3                                             | Diethylene glycol monobutyl ether (DGBE), 25-48%                                          |
| NaCl                                                | Sodium Chloride, <1.0%                                                                    |

### Simulating Liquids for 5 GHz, Manufactured by SPEAG

| Ingredients        | (% by weight) |
|--------------------|---------------|
| Water              | 78            |
| Mineral oil        | 11            |
| Emulsifiers        | 9             |
| Additives and Salt | 2             |

## 10.2. Tissue Dielectric Parameter Check Results

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.

### SAR Lab 1

|           | Freq. (MHz) | Liquid Parameters |                                         |                                         | Measured | Target | Delta (%) | Limit ±(%) |
|-----------|-------------|-------------------|-----------------------------------------|-----------------------------------------|----------|--------|-----------|------------|
| 5/23/2014 | Body 5180   | e'                | 48.3800                                 | Relative Permittivity ( $\epsilon_r$ ): | 48.38    | 49.05  | -1.36     | 5          |
|           |             | e"                | 18.3400                                 | Conductivity ( $\sigma$ ):              | 5.28     | 5.27   | 0.21      | 5          |
|           | Body 5200   | e'                | 48.3500                                 | Relative Permittivity ( $\epsilon_r$ ): | 48.35    | 49.02  | -1.37     | 5          |
|           |             | e"                | 18.3800                                 | Conductivity ( $\sigma$ ):              | 5.31     | 5.29   | 0.37      | 5          |
|           | Body 5600   | e'                | 47.6900                                 | Relative Permittivity ( $\epsilon_r$ ): | 47.69    | 48.48  | -1.62     | 5          |
|           |             | e"                | 18.7300                                 | Conductivity ( $\sigma$ ):              | 5.83     | 5.76   | 1.23      | 5          |
|           | Body 5800   | e'                | 47.3800                                 | Relative Permittivity ( $\epsilon_r$ ): | 47.38    | 48.20  | -1.70     | 5          |
|           |             | e"                | 18.9500                                 | Conductivity ( $\sigma$ ):              | 6.11     | 6.00   | 1.86      | 5          |
| Body 5825 | e'          | 47.3600           | Relative Permittivity ( $\epsilon_r$ ): | 47.36                                   | 48.20    | -1.74  | 5         |            |
|           | e"          | 18.9700           | Conductivity ( $\sigma$ ):              | 6.14                                    | 6.00     | 2.40   | 5         |            |
| 5/23/2014 | Body 2450   | e'                | 52.4300                                 | Relative Permittivity ( $\epsilon_r$ ): | 52.43    | 52.70  | -0.51     | 5          |
|           |             | e"                | 14.5400                                 | Conductivity ( $\sigma$ ):              | 1.98     | 1.95   | 1.58      | 5          |
|           | Body 2410   | e'                | 52.5300                                 | Relative Permittivity ( $\epsilon_r$ ): | 52.53    | 52.76  | -0.43     | 5          |
|           |             | e"                | 14.4500                                 | Conductivity ( $\sigma$ ):              | 1.94     | 1.91   | 1.51      | 5          |
|           | Body 2475   | e'                | 52.3500                                 | Relative Permittivity ( $\epsilon_r$ ): | 52.35    | 52.67  | -0.60     | 5          |
|           |             | e"                | 14.5900                                 | Conductivity ( $\sigma$ ):              | 2.01     | 1.99   | 1.14      | 5          |
| 5/27/2014 | Body 2450   | e'                | 50.7551                                 | Relative Permittivity ( $\epsilon_r$ ): | 50.76    | 52.70  | -3.69     | 5          |
|           |             | e"                | 14.8319                                 | Conductivity ( $\sigma$ ):              | 2.02     | 1.95   | 3.62      | 5          |
|           | Body 2410   | e'                | 50.8605                                 | Relative Permittivity ( $\epsilon_r$ ): | 50.86    | 52.76  | -3.60     | 5          |
|           |             | e"                | 14.7404                                 | Conductivity ( $\sigma$ ):              | 1.98     | 1.91   | 3.55      | 5          |
|           | Body 2475   | e'                | 50.7032                                 | Relative Permittivity ( $\epsilon_r$ ): | 50.70    | 52.67  | -3.73     | 5          |
|           |             | e"                | 14.8875                                 | Conductivity ( $\sigma$ ):              | 2.05     | 1.99   | 3.21      | 5          |



**SAR LAB 2**

|           | Freq. (MHz) |     | Liquid Parameters |                                         | Measured | Target | Delta (%) | Limit ±(%) |
|-----------|-------------|-----|-------------------|-----------------------------------------|----------|--------|-----------|------------|
| 5/12/2014 | Body 835    | e'  | 53.5000           | Relative Permittivity ( $\epsilon_r$ ): | 53.50    | 55.20  | -3.08     | 5          |
|           |             | e'' | 21.8800           | Conductivity ( $\sigma$ ):              | 1.02     | 0.97   | 4.73      | 5          |
|           | Body 820    | e'  | 53.6600           | Relative Permittivity ( $\epsilon_r$ ): | 53.66    | 55.28  | -2.93     | 5          |
|           |             | e'' | 21.9600           | Conductivity ( $\sigma$ ):              | 1.00     | 0.97   | 3.39      | 5          |
|           | Body 850    | e'  | 53.3500           | Relative Permittivity ( $\epsilon_r$ ): | 53.35    | 55.16  | -3.28     | 5          |
|           |             | e'' | 21.8100           | Conductivity ( $\sigma$ ):              | 1.03     | 0.99   | 4.42      | 5          |
| 5/15/2014 | Body 1900   | e'  | 51.3100           | Relative Permittivity ( $\epsilon_r$ ): | 51.31    | 53.30  | -3.73     | 5          |
|           |             | e'' | 14.3700           | Conductivity ( $\sigma$ ):              | 1.52     | 1.52   | -0.12     | 5          |
|           | Body 1850   | e'  | 51.4900           | Relative Permittivity ( $\epsilon_r$ ): | 51.49    | 53.30  | -3.40     | 5          |
|           |             | e'' | 14.2900           | Conductivity ( $\sigma$ ):              | 1.47     | 1.52   | -3.29     | 5          |
|           | Body 1910   | e'  | 51.2800           | Relative Permittivity ( $\epsilon_r$ ): | 51.28    | 53.30  | -3.79     | 5          |
|           |             | e'' | 14.3800           | Conductivity ( $\sigma$ ):              | 1.53     | 1.52   | 0.47      | 5          |
| 5/19/2014 | Body 1900   | e'  | 51.2900           | Relative Permittivity ( $\epsilon_r$ ): | 51.29    | 53.30  | -3.77     | 5          |
|           |             | e'' | 14.3300           | Conductivity ( $\sigma$ ):              | 1.51     | 1.52   | -0.40     | 5          |
|           | Body 1850   | e'  | 51.4700           | Relative Permittivity ( $\epsilon_r$ ): | 51.47    | 53.30  | -3.43     | 5          |
|           |             | e'' | 14.1900           | Conductivity ( $\sigma$ ):              | 1.46     | 1.52   | -3.97     | 5          |
|           | Body 1910   | e'  | 51.2600           | Relative Permittivity ( $\epsilon_r$ ): | 51.26    | 53.30  | -3.83     | 5          |
|           |             | e'' | 14.3500           | Conductivity ( $\sigma$ ):              | 1.52     | 1.52   | 0.26      | 5          |
| 5/19/2014 | Body 835    | e'  | 55.3200           | Relative Permittivity ( $\epsilon_r$ ): | 55.32    | 55.20  | 0.22      | 5          |
|           |             | e'' | 21.9000           | Conductivity ( $\sigma$ ):              | 1.02     | 0.97   | 4.82      | 5          |
|           | Body 820    | e'  | 55.3700           | Relative Permittivity ( $\epsilon_r$ ): | 55.37    | 55.28  | 0.17      | 5          |
|           |             | e'' | 21.9600           | Conductivity ( $\sigma$ ):              | 1.00     | 0.97   | 3.39      | 5          |
|           | Body 850    | e'  | 55.1900           | Relative Permittivity ( $\epsilon_r$ ): | 55.19    | 55.16  | 0.06      | 5          |
|           |             | e'' | 21.8700           | Conductivity ( $\sigma$ ):              | 1.03     | 0.99   | 4.71      | 5          |
| 5/20/2014 | Body 5180   | e'  | 47.6600           | Relative Permittivity ( $\epsilon_r$ ): | 47.66    | 49.05  | -2.83     | 5          |
|           |             | e'' | 18.1800           | Conductivity ( $\sigma$ ):              | 5.24     | 5.27   | -0.67     | 5          |
|           | Body 5200   | e'  | 47.4800           | Relative Permittivity ( $\epsilon_r$ ): | 47.48    | 49.02  | -3.14     | 5          |
|           |             | e'' | 18.3500           | Conductivity ( $\sigma$ ):              | 5.31     | 5.29   | 0.21      | 5          |
|           | Body 5600   | e'  | 46.7800           | Relative Permittivity ( $\epsilon_r$ ): | 46.78    | 48.48  | -3.50     | 5          |
|           |             | e'' | 18.7100           | Conductivity ( $\sigma$ ):              | 5.83     | 5.76   | 1.13      | 5          |
|           | Body 5800   | e'  | 46.5200           | Relative Permittivity ( $\epsilon_r$ ): | 46.52    | 48.20  | -3.49     | 5          |
|           |             | e'' | 19.0300           | Conductivity ( $\sigma$ ):              | 6.14     | 6.00   | 2.29      | 5          |
|           | Body 5825   | e'  | 46.4900           | Relative Permittivity ( $\epsilon_r$ ): | 46.49    | 48.20  | -3.55     | 5          |
|           |             | e'' | 19.0200           | Conductivity ( $\sigma$ ):              | 6.16     | 6.00   | 2.67      | 5          |
| 5/22/2014 | Body 1900   | e'  | 51.3800           | Relative Permittivity ( $\epsilon_r$ ): | 51.38    | 53.30  | -3.60     | 5          |
|           |             | e'' | 14.1900           | Conductivity ( $\sigma$ ):              | 1.50     | 1.52   | -1.37     | 5          |
|           | Body 1850   | e'  | 51.5600           | Relative Permittivity ( $\epsilon_r$ ): | 51.56    | 53.30  | -3.26     | 5          |
|           |             | e'' | 14.0700           | Conductivity ( $\sigma$ ):              | 1.45     | 1.52   | -4.78     | 5          |
|           | Body 1910   | e'  | 51.3400           | Relative Permittivity ( $\epsilon_r$ ): | 51.34    | 53.30  | -3.68     | 5          |
|           |             | e'' | 14.2200           | Conductivity ( $\sigma$ ):              | 1.51     | 1.52   | -0.65     | 5          |
| 5/23/2014 | Body 835    | e'  | 53.1700           | Relative Permittivity ( $\epsilon_r$ ): | 53.17    | 55.20  | -3.68     | 5          |
|           |             | e'' | 21.8100           | Conductivity ( $\sigma$ ):              | 1.01     | 0.97   | 4.39      | 5          |
|           | Body 820    | e'  | 53.4800           | Relative Permittivity ( $\epsilon_r$ ): | 53.48    | 55.28  | -3.25     | 5          |
|           |             | e'' | 21.9100           | Conductivity ( $\sigma$ ):              | 1.00     | 0.97   | 3.15      | 5          |
|           | Body 850    | e'  | 53.0800           | Relative Permittivity ( $\epsilon_r$ ): | 53.08    | 55.16  | -3.77     | 5          |
|           |             | e'' | 21.7500           | Conductivity ( $\sigma$ ):              | 1.03     | 0.99   | 4.14      | 5          |

## 11. System Performance 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 remeasured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

### 11.1. System Performance Check Measurement Conditions

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0  $\pm$  0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The 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.

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

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

| System Dipole | Serial No. | Cal. Date  | Freq. (MHz) | Target SAR Values (mW/g) |      |      |
|---------------|------------|------------|-------------|--------------------------|------|------|
|               |            |            |             | 1g/10g                   | Head | Body |
| D835V2        | 4d002      | 11/15/2013 | 835         | 1g                       | 9.49 | 9.43 |
|               |            |            |             | 10g                      | 6.18 | 6.21 |
| D1900V2       | 5d163      | 9/17/2013  | 1900        | 1g                       | 40.9 | 40.1 |
|               |            |            |             | 10g                      | 21.2 | 21.2 |
| D2450V2       | 899        | 9/10/2013  | 2450        | 1g                       | 51.3 | 49.7 |
|               |            |            |             | 10g                      | 23.9 | 23.3 |
| D5GHzV2       | 1138       | 11/19/2013 | 5200        | 1g                       | 78.5 | 72.9 |
|               |            |            |             | 10g                      | 22.5 | 20.4 |
|               |            |            | 5600        | 1g                       | 82.7 | 78.3 |
|               |            |            |             | 10g                      | 23.5 | 21.7 |
|               |            |            | 5800        | 1g                       | 78.3 | 72.8 |
|               |            |            |             | 10g                      | 22.4 | 20.1 |

### 11.3. System Performance 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 Lab 1

| Date Tested | System Dipole  |          | T.S. Liquid |     | Measured Results |           |                  | Target (Ref. Value) | Delta ±10 % | Est./Zoom Ratio | Plot No. |
|-------------|----------------|----------|-------------|-----|------------------|-----------|------------------|---------------------|-------------|-----------------|----------|
|             | Type           | Serial # |             |     | Area Scan        | Zoom Scan | Normalize to 1 W |                     |             |                 |          |
| 5/23/2014   | D5GHzV2 5.2GHz | 1138     | Body        | 1g  | 6.72             | 7.43      | 74.30            | 72.90               | 1.92        | -10.57          |          |
|             |                |          |             | 10g | 1.89             | 2.08      | 20.80            | 20.40               | 1.96        |                 |          |
| 5/23/2014   | D5GHzV2 5.6GHz | 1138     | Body        | 1g  | 7.64             | 8.36      | 83.60            | 78.30               | 6.77        | -9.42           | 1, 2     |
|             |                |          |             | 10g | 2.08             | 2.31      | 23.10            | 21.70               | 6.45        |                 |          |
| 5/23/2014   | D5GHzV2 5.8GHz | 1138     | Body        | 1g  | 6.53             | 7.14      | 71.40            | 72.80               | -1.92       | -9.34           |          |
|             |                |          |             | 10g | 1.79             | 1.96      | 19.60            | 20.10               | -2.49       |                 |          |
| 5/23/2014   | 2.4GHz         | 899      | Body        | 1g  | 5.06             | 5.16      | 51.60            | 49.70               | 3.82        | -1.98           |          |
|             |                |          |             | 10g | 2.20             | 2.40      | 24.00            | 23.30               | 3.00        |                 |          |
| 5/28/2014   | 2.4GHz         | 899      | Body        | 1g  | 5.42             | 5.32      | 53.20            | 49.7                | 7.04        | 1.85            | 3,4      |
|             |                |          |             | 10g | 2.35             | 2.47      | 24.70            | 23.3                | 6.01        |                 |          |

#### SAR Lab 2

| Date Tested | System Dipole     |          | T.S. Liquid | Measured Results |           |                  | Target (Ref. Value) | Delta ±10 % | Est./Zoom Ratio | Plot No. |      |
|-------------|-------------------|----------|-------------|------------------|-----------|------------------|---------------------|-------------|-----------------|----------|------|
|             | Type              | Serial # |             | Area Scan        | Zoom Scan | Normalize to 1 W |                     |             |                 |          |      |
| 5/12/2014   | D835V2            | 4d002    | Body        | 1g               | 1.03      | 1.01             | 10.10               | 9.43        | 7.10            | 1.94     |      |
|             |                   |          |             | 10g              | 0.69      | 0.67             | 6.72                | 6.21        | 8.21            |          |      |
| 5/15/2014   | D1900V2           | 5d163    | Body        | 1g               | 4.09      | 4.02             | 40.20               | 40.10       | 0.25            | 1.71     |      |
|             |                   |          |             | 10g              | 2.07      | 2.11             | 21.10               | 21.20       | -0.47           |          |      |
| 5/19/2014   | D1900V2           | 5d163    | Body        | 1g               | 3.94      | 3.87             | 38.70               | 40.10       | -3.49           | 1.78     |      |
|             |                   |          |             | 10g              | 2.00      | 2.03             | 20.30               | 21.20       | -4.25           |          |      |
| 5/19/2014   | D835V2            | 4d002    | Body        | 1g               | 1.05      | 1.03             | 10.30               | 9.43        | 9.23            | 1.90     | 5,6  |
|             |                   |          |             | 10g              | 0.70      | 0.68             | 6.82                | 6.21        | 9.82            |          |      |
| 5/20/2014   | D5GHzV2<br>5.2GHz | 1138     | Body        | 1g               | 6.31      | 6.77             | 67.70               | 72.9        | -7.13           | -7.29    |      |
|             |                   |          |             | 10g              | 1.80      | 1.94             | 19.40               | 20.4        | -4.90           |          |      |
| 5/20/2014   | D5GHzV2<br>5.6GHz | 1138     | Body        | 1g               | 6.72      | 7.36             | 73.60               | 78.3        | -6.00           | -9.52    |      |
|             |                   |          |             | 10g              | 1.93      | 2.08             | 20.80               | 21.7        | -4.15           |          |      |
| 5/20/2014   | D5GHzV2<br>5.8GHz | 1138     | Body        | 1g               | 5.97      | 6.57             | 65.70               | 72.8        | -9.75           | -10.05   | 7,8  |
|             |                   |          |             | 10g              | 1.72      | 1.87             | 18.70               | 20.1        | -6.97           |          |      |
| 5/22/2014   | D1900V2           | 5d163    | Body        | 1g               | 3.89      | 3.82             | 38.20               | 40.10       | -4.74           | 1.80     | 9,10 |
|             |                   |          |             | 10g              | 1.99      | 2.01             | 20.10               | 21.20       | -5.19           |          |      |
| 5/23/2014   | D835V2            | 4d002    | Body        | 1g               | 1.04      | 1.02             | 10.20               | 9.4         | 8.17            | 1.92     |      |
|             |                   |          |             | 10g              | 0.70      | 0.68             | 6.75                | 6.2         | 8.70            |          |      |

## 12. SAR Test Results

SAR Test Reduction criteria are as follows:

### **KDB 447498 D01 General RF Exposure Guidance v05r02:**

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 648474 Section 2.3:**

With headset attached, when the reported SAR for body-worn accessory, measured without a headset connected to the handset, is  $> 1.2$  W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

### **KDB 941225 D01 SAR test for 3G devices v02 (pg.12):**

Body SAR is also measured for HSPA when the maximum average output of each RF channel with HSPA active is at least  $\frac{1}{4}$  dB higher than that measured without HSPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is above 75% of the SAR limit. Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 with power control algorithm 2.

### **KDB 248227 D01 SAR Measurements Procedures for 802.11 a/b/g Transmitters v01r02 (pg.6):**

When the extrapolated maximum peak SAR for the maximum output channel is  $\leq 1.6$  W/kg and the 1-g averaged SAR is  $\leq 0.8$  W/kg, testing of other channels in the "default test channels" or "required test channels" configuration is optional.

### **April 2013 TCB Workshop Updates:**

Apply usual 802.11 test exclusion considerations, but include 802.11ac SAR for highest 802.11a configuration in each frequency band and each exposure condition.

## 12.1. 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 | OFF          | 14         | Rear          | 190   | 836.6       | 31.0          | 31.0  | 0.536          | <b>0.536</b> | 1        |
|              |              |            | Edge 1        | 190   | 836.6       | 31.0          | 31.0  | 0.162          | 0.162        |          |
|              |              | 0          | Edge 2        | 190   | 836.6       | 31.0          | 31.0  | 0.470          | 0.470        |          |
| GPRS 2 slots | ON           | 0          | Rear          | 190   | 836.6       | 24.5          | 24.4  | 0.554          | <b>0.567</b> | 2        |
|              |              |            | Edge 1        | 190   | 836.6       | 24.5          | 24.4  | 0.213          | 0.218        |          |
|              |              |            | Edge 2        | 190   | 836.6       | 24.5          | 24.4  | 0.125          | 0.128        |          |

## 12.2. 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 3 slots | OFF          | 14         | Rear          | 512   | 1850.2      | 26.0          | 25.9  | 0.932          | 0.954        |          |
|              |              |            |               | 661   | 1880.0      | 26.0          | 25.7  | 0.960          | 1.029        |          |
|              |              |            |               | 810   | 1909.8      | 26.0          | 25.6  | 1.010          | <b>1.107</b> | 3        |
|              |              |            | Edge 1        | 512   | 1850.2      | 26.0          | 25.9  | 0.743          | 0.760        |          |
|              |              |            |               | 661   | 1880.0      | 26.0          | 25.7  | 0.711          | 0.762        |          |
|              |              |            |               | 810   | 1909.8      | 26.0          | 25.6  | 0.707          | 0.775        |          |
|              |              | 0          | Edge 2        | 661   | 1880.0      | 26.0          | 25.7  | 0.072          | 0.077        |          |
| GPRS 2 slots | ON           | 0          | Rear          | 661   | 1880.0      | 20.0          | 19.4  | 0.658          | 0.755        | 4        |
|              |              |            | Edge 1        | 661   | 1880.0      | 20.0          | 19.4  | 0.531          | 0.610        |          |

## 12.3. 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 12.2 kbps | OFF          | 14         | Rear          | 4183  | 836.6       | 23.0          | 22.4  | 0.343          | <b>0.394</b> | 5        |
|                      |              |            | Edge 1        | 4183  | 836.6       | 23.0          | 22.4  | 0.095          | 0.109        |          |
|                      |              | 0          | Edge 2        | 4183  | 836.6       | 23.0          | 22.4  | 0.300          | 0.344        |          |
| Rel 99 RMC 12.2 kbps | ON           | 0          | Rear          | 4183  | 836.6       | 18.0          | 17.7  | 0.521          | <b>0.558</b> | 6        |
|                      |              |            | Edge 1        | 4183  | 836.6       | 18.0          | 17.7  | 0.196          | 0.210        |          |
|                      |              |            | Edge 2        | 4183  | 836.6       | 18.0          | 17.7  | 0.080          | 0.086        |          |

## 12.4. W-CDMA Band II

| 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 12.2 kbps | OFF          | 14         | Rear          | 9262  | 1852.4      | 21.2          | 21.1  | 0.944          | 0.966        |          |
|                      |              |            |               | 9400  | 1880.0      | 21.2          | 21.2  | 0.985          | 0.985        |          |
|                      |              |            |               | 9538  | 1907.6      | 21.2          | 21.2  | 1.010          | <b>1.010</b> | 7        |
|                      |              |            | Edge 1        | 9262  | 1852.4      | 21.2          | 21.1  | 0.851          | 0.871        |          |
|                      |              |            |               | 9400  | 1880.0      | 21.2          | 21.2  | 0.816          | 0.816        |          |
|                      |              |            |               | 9538  | 1907.6      | 21.2          | 21.2  | 0.810          | 0.810        |          |
|                      |              | 0          | Edge 2        | 9400  | 1880.0      | 21.2          | 21.2  | 0.076          | 0.076        |          |
| Rel 99 RMC 12.2 kbps | ON           | 0          | Rear          | 9400  | 1880.0      | 12.0          | 11.6  | 0.352          | <b>0.386</b> | 8        |

## 12.5. Wi-Fi DTS Band

| Test Position | Dist. (mm) | Mode    |           | Antenna | Ch #. | Freq. (MHz) | Power (dBm)   |       |               |       | 1-g SAR (W/kg) |        |         |        | Plot No. |
|---------------|------------|---------|-----------|---------|-------|-------------|---------------|-------|---------------|-------|----------------|--------|---------|--------|----------|
|               |            |         |           |         |       |             | Tune-up limit | Meas. | Tune-up limit | Meas. | Meas.          | Scaled | Meas.   | Scaled |          |
|               |            |         |           |         |       |             | Wi-Fi 1       |       | Wi-Fi 2       |       | Wi-Fi 1        |        | Wi-Fi 2 |        |          |
| Rear          | 0          | 802.11b | 2.4 (DTS) | 1 TX    | 6     | 2437        | 15.5          | 15.5  |               |       | 0.503          | 0.503  |         |        |          |
|               |            |         |           | 1 TX    | 6     | 2437        |               |       | 15.5          | 15.3  |                |        | 0.656   | 0.687  |          |
|               |            |         |           | 2 TX    | 6     | 2437        | 15.5          | 15.1  | 15.5          | 15.0  | 0.625          | 0.685  | 0.633   | 0.710  | 9        |
| Edge 1        | 0          | 802.11b | 2.4 (DTS) | 1 TX    | 6     | 2437        | 15.5          | 15.5  |               |       | 0.310          | 0.310  |         |        |          |
|               |            |         |           | 1 TX    | 6     | 2437        |               |       | 15.5          | 15.3  |                |        | 0.242   | 0.253  |          |
|               |            |         |           | 2 TX    | 6     | 2437        | 15.5          | 15.1  | 15.5          | 15.0  | 0.313          | 0.343  | 0.169   | 0.190  |          |
| Rear          | 0          | 802.11a | 5.8 (DTS) | 1 TX    | 149   | 5745        | 9.5           | 8.8   |               |       | 0.453          | 0.532  |         |        |          |
|               |            |         |           | 1 TX    | 149   | 5745        |               |       | 9.5           | 9.0   |                |        | 0.428   | 0.480  |          |
|               |            |         |           | 2 TX    | 149   | 5745        | 9.5           | 8.7   | 9.5           | 9.1   | 0.459          | 0.552  | 0.477   | 0.523  | 10       |

### 12.5.1. Wi-Fi DTS Additional Testing

| Test Position | Dist. (mm) | Mode     |           | Antenna | Ch #. | Freq. (MHz) | Power (dBm)   |       |               |       | 1-g SAR (W/kg) |        |         |        | Plot No. |
|---------------|------------|----------|-----------|---------|-------|-------------|---------------|-------|---------------|-------|----------------|--------|---------|--------|----------|
|               |            |          |           |         |       |             | Tune-up limit | Meas. | Tune-up limit | Meas. | Meas.          | Scaled | Meas.   | Scaled |          |
|               |            |          |           |         |       |             | Wi-Fi 1       |       | Wi-Fi 2       |       | Wi-Fi 1        |        | Wi-Fi 2 |        |          |
| Rear          | 0          | 802.11ac | 5.8 (DTS) | 1 TX    | 149   | 5745        | 9.5           | 8.8   |               |       | 0.296          | 0.348  |         |        |          |
|               |            |          |           | 1 TX    | 149   | 5745        |               |       | 9.5           | 9.0   |                |        | 0.311   | 0.349  |          |
|               |            |          |           | 2 TX    | 149   | 5745        | 9.5           | 9.0   | 9.5           | 8.9   | 0.365          | 0.410  | 0.392   | 0.450  |          |

## 12.6. Wi-Fi UNII Band

| Test Position | Dist. (mm) | Mode    |            | Antenna | Ch #. | Freq. (MHz) | Power (dBm)   |       |               |       | 1-g SAR (W/kg) |        |         |        | Plot No. |
|---------------|------------|---------|------------|---------|-------|-------------|---------------|-------|---------------|-------|----------------|--------|---------|--------|----------|
|               |            |         |            |         |       |             | Tune-up limit | Meas. | Tune-up limit | Meas. | Meas.          | Scaled | Meas.   | Scaled |          |
|               |            |         |            |         |       |             | Wi-Fi 1       |       | Wi-Fi 2       |       | Wi-Fi 1        |        | Wi-Fi 2 |        |          |
| Rear          | 0          | 802.11a | 5.2 (UNII) | 1 TX    | 36    | 5180        | 9.5           | 8.9   |               |       | 0.224          | 0.257  |         |        |          |
|               |            |         |            | 1 TX    | 36    | 5180        |               |       | 9.5           | 9.0   |                |        | 0.382   | 0.429  |          |
|               |            |         |            | 2 TX    | 36    | 5180        | 9.5           | 9.0   | 9.5           | 9.1   | 0.238          | 0.267  | 0.446   | 0.489  | 11       |
|               |            |         | 5.3 (UNII) | 1 TX    | 52    | 5260        | 9.5           | 9.3   |               |       | 0.243          | 0.254  |         |        |          |
|               |            |         |            | 1 TX    | 52    | 5260        |               |       | 9.5           | 9.2   |                |        | 0.410   | 0.439  |          |
|               |            |         |            | 2 TX    | 64    | 5320        | 9.5           | 9.0   | 9.5           | 9.0   | 0.346          | 0.388  | 0.560   | 0.628  | 12       |
|               |            |         | 5.5 (UNII) | 1 TX    | 104   | 5520        | 9.5           | 9.4   |               |       | 0.509          | 0.521  |         |        |          |
|               |            |         |            | 1 TX    | 104   | 5520        |               |       | 9.5           | 9.3   |                |        | 0.403   | 0.422  |          |
|               |            |         |            | 2 TX    | 136   | 5680        | 9.5           | 9.2   | 9.5           | 9.3   | 0.577          | 0.618  | 0.493   | 0.516  | 13       |

### 12.6.1. Wi-Fi UNII Additional Testing

| Test Position | Dist. (mm) | Mode     |            | Antenna | Ch #. | Freq. (MHz) | Power (dBm)   |       |               |       | 1-g SAR (W/kg) |        |         |        | Plot No. |
|---------------|------------|----------|------------|---------|-------|-------------|---------------|-------|---------------|-------|----------------|--------|---------|--------|----------|
|               |            |          |            |         |       |             | Tune-up limit | Meas. | Tune-up limit | Meas. | Meas.          | Scaled | Meas.   | Scaled |          |
|               |            |          |            |         |       |             | Wi-Fi 1       |       | Wi-Fi 2       |       | Wi-Fi 1        |        | Wi-Fi 2 |        |          |
| Rear          | 0          | 802.11ac | 5.2 (UNII) | 1 TX    | 36    | 5180        | 9.5           | 8.8   |               |       | 0.164          | 0.193  |         |        |          |
|               |            |          |            | 1 TX    | 36    | 5180        |               |       | 9.5           | 8.9   |                |        | 0.313   | 0.359  |          |
|               |            |          |            | 2 TX    | 36    | 5180        | 9.5           | 8.8   | 9.5           | 8.8   | 0.140          | 0.164  | 0.284   | 0.334  |          |
|               |            |          | 5.3 (UNII) | 1 TX    | 52    | 5260        | 9.5           | 9.0   |               |       | 0.185          | 0.208  |         |        |          |
|               |            |          |            | 1 TX    | 52    | 5260        |               |       | 9.5           | 9.0   |                |        | 0.313   | 0.351  |          |
|               |            |          |            | 2 TX    | 64    | 5320        | 9.5           | 9.0   | 9.5           | 9.0   | 0.212          | 0.238  | 0.327   | 0.367  |          |
|               |            |          | 5.5 (UNII) | 1 TX    | 106   | 5530        | 9.5           | 8.9   |               |       | 0.375          | 0.431  |         |        |          |
|               |            |          |            | 1 TX    | 106   | 5530        |               |       | 9.5           | 9.0   |                |        | 0.261   | 0.293  |          |
|               |            |          |            | 2 TX    | 138   | 5690        | 9.5           | 8.9   | 9.5           | 9.2   | 0.365          | 0.419  | 0.392   | 0.420  |          |

## 12.7. Bluetooth

| Antenna | Dist.<br>(mm) | Test Position | Mode      |     | Ch #. | Freq.<br>(MHz) | Power (dBm)      |       | 1-g SAR (W/kg) |              | Plot<br>No. |
|---------|---------------|---------------|-----------|-----|-------|----------------|------------------|-------|----------------|--------------|-------------|
|         |               |               |           |     |       |                | Tune-up<br>limit | Meas. | Meas.          | Scaled       |             |
| 1       | 0             | Rear          | Bluetooth | 2.4 | 39    | 2441           | 8.5              | 8.3   | 0.314          | <b>0.329</b> | 14          |

### 13. SAR Measurement Variability

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz v01r03. 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.

#### 13.1. The Highest Measured SAR Configuration in Each Frequency Band

| Frequency Band (MHz) | Air Interface      | Stand-alone (W/kg) | Repeated SAR (Yes/No) |
|----------------------|--------------------|--------------------|-----------------------|
| 850                  | GSM 850            | 0.554              | No                    |
|                      | W-CDMA Band V      | 0.521              | No                    |
| 1900                 | GSM 1900           | 1.010              | Yes                   |
|                      | W-CDMA Band II     | 1.010              | Yes                   |
| 2400                 | Wi-Fi 802.11b/g/n  | 0.633              | No                    |
|                      | Bluetooth          | 0.314              | No                    |
| 5200                 | Wi-Fi 802.11a/n/ac | 0.446              | No                    |
| 5300                 | Wi-Fi 802.11a/n/ac | 0.560              | No                    |
| 5500                 | Wi-Fi 802.11a/n/ac | 0.567              | No                    |
| 5800                 | Wi-Fi 802.11a/n/ac | 0.552              | No                    |

#### 13.2. Repeated Measurement Results

| Frequency band | Test Position | Mode         | Pwr Back-off | Dist. (mm) | Ch #. | Freq. (MHz) | Meas. SAR (W/kg) |          | Largest to Smallest SAR Ratio | Note |
|----------------|---------------|--------------|--------------|------------|-------|-------------|------------------|----------|-------------------------------|------|
|                |               |              |              |            |       |             | Original         | Repeated |                               |      |
| 1900           | Rear          | GPRS 3 Slots | OFF          | 14         | 810   | 1909.8      | 1.010            | 1.010    | 1.00                          | 1    |
|                |               | Rel. 99 RMC  | OFF          | 14         | 9538  | 1907.6      | 1.010            | 1.010    | 1.00                          | 1    |

#### Note(s):

1. 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.



## 14. Simultaneous Transmission SAR Analysis

### 14.1. 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
- Test positions Edge 3 and Edge 4 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.

#### 14.1.1. 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. A sensor triggering of 14 mm is included for both Rear and Edge 1 |              |                 |              |     |                           |        |        |        |        |       |                                |           |           |        |        |       |
| Cellular                                                                                            | GPRS 2 Slots | 848.8           | 31.00        | 315 | 5                         | 8.4    | 15     | 168    | 173    |       | -MEASURE-                      | -MEASURE- | -MEASURE- | 0.400  | 0.400  |       |
| Cellular                                                                                            | GPRS 3 Slots | 1909.8          | 26.00        | 149 | 5                         | 8.4    | 15     | 168    | 173    |       | -MEASURE-                      | -MEASURE- | -MEASURE- | 0.400  | 0.400  |       |
| Cellular                                                                                            | W-CDMA V     | 846.6           | 23.00        | 200 | 5                         | 8.4    | 15     | 168    | 173    |       | -MEASURE-                      | -MEASURE- | -MEASURE- | 0.400  | 0.400  |       |
| Cellular                                                                                            | W-CDMA II    | 1907.6          | 21.20        | 132 | 5                         | 8.4    | 15     | 168    | 173    |       | -MEASURE-                      | -MEASURE- | -MEASURE- | 0.400  | 0.400  |       |
| Power Back-off, Grip Sensor On                                                                      |              |                 |              |     |                           |        |        |        |        |       |                                |           |           |        |        |       |
| Cellular                                                                                            | GPRS 2 Slots | 848.8           | 24.50        | 70  | 5                         | 8.4    | 15     | 168    | 173    |       | -MEASURE-                      | -MEASURE- | -MEASURE- | 0.400  | 0.400  |       |
| Cellular                                                                                            | GPRS 2 Slots | 1909.8          | 20.00        | 25  | 5                         | 8.4    | 15     | 168    | 173    |       | -MEASURE-                      | -MEASURE- | 0.307     | 0.400  | 0.400  |       |
| Cellular                                                                                            | W-CDMA V     | 846.6           | 18.00        | 63  | 5                         | 8.4    | 15     | 168    | 173    |       | -MEASURE-                      | -MEASURE- | -MEASURE- | 0.400  | 0.400  |       |
| Cellular                                                                                            | W-CDMA II    | 1907.6          | 12.00        | 16  | 5                         | 8.4    | 15     | 168    | 173    |       | -MEASURE-                      | 0.368     | 0.196     | 0.400  | 0.400  |       |

#### 14.1.2. Estimated SAR for WLAN

##### SISO

| 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 Main Antenna (Wi-Fi 1) |                 |              |    |                           |        |        |        |        |       |                                |           |        |        |        |       |
| Wi-Fi 2.4 GHz                | 2462            | 15.50        | 35 | 5                         | 8.4    | 185    | 170    | 45     |       | -MEASURE-                      | -MEASURE- | 0.400  | 0.400  | 0.163  |       |
| Wi-Fi 5.2 GHz                | 5240            | 9.50         | 9  | 5                         | 8.4    | 185    | 170    | 45     |       | -MEASURE-                      | 0.343     | 0.400  | 0.400  | 0.061  |       |
| Wi-Fi 5.3 GHz                | 5320            | 9.50         | 9  | 5                         | 8.4    | 185    | 170    | 45     |       | -MEASURE-                      | 0.346     | 0.400  | 0.400  | 0.062  |       |
| Wi-Fi 5.5 GHz                | 5700            | 9.50         | 9  | 5                         | 8.4    | 185    | 170    | 45     |       | -MEASURE-                      | 0.358     | 0.400  | 0.400  | 0.064  |       |
| Wi-Fi 5.8 GHz                | 5825            | 9.50         | 9  | 5                         | 8.4    | 185    | 170    | 45     |       | -MEASURE-                      | 0.362     | 0.400  | 0.400  | 0.064  |       |
| Bluetooth                    | 2480            | 8.50         | 7  | 5                         | 8.4    | 185    | 170    | 45     |       | 0.294                          | 0.184     | 0.400  | 0.400  | 0.033  |       |
| Wi-Fi Aux Antenna (Wi-Fi 2)  |                 |              |    |                           |        |        |        |        |       |                                |           |        |        |        |       |
| Wi-Fi 2.4 GHz                | 2462            | 15.50        | 35 | 5                         | 8.4    | 162    | 170    | 67.8   |       | -MEASURE-                      | -MEASURE- | 0.400  | 0.400  | 0.400  |       |
| Wi-Fi 5.2 GHz                | 5240            | 9.50         | 9  | 5                         | 8.4    | 162    | 170    | 67.8   |       | -MEASURE-                      | 0.343     | 0.400  | 0.400  | 0.400  |       |
| Wi-Fi 5.3 GHz                | 5320            | 9.50         | 9  | 5                         | 8.4    | 162    | 170    | 67.8   |       | -MEASURE-                      | 0.346     | 0.400  | 0.400  | 0.400  |       |
| Wi-Fi 5.5 GHz                | 5700            | 9.50         | 9  | 5                         | 8.4    | 162    | 170    | 67.8   |       | -MEASURE-                      | 0.358     | 0.400  | 0.400  | 0.400  |       |
| Wi-Fi 5.8 GHz                | 5825            | 9.50         | 9  | 5                         | 8.4    | 162    | 170    | 67.8   |       | -MEASURE-                      | 0.362     | 0.400  | 0.400  | 0.400  |       |

##### MIMO

| 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 Main Antenna (Wi-Fi 1) |                 |              |    |                           |        |        |        |        |       |                                |           |        |        |        |       |  |
| Wi-Fi 2.4 GHz                | 2462            | 15.50        | 35 | 5                         | 8.4    | 185    | 170    | 45     |       | -MEASURE-                      | -MEASURE- | 0.400  | 0.400  | 0.163  |       |  |
| Wi-Fi 5.2 GHz                | 5240            | 9.50         | 9  | 5                         | 8.4    | 185    | 170    | 45     |       | -MEASURE-                      | 0.343     | 0.400  | 0.400  | 0.061  |       |  |
| Wi-Fi 5.3 GHz                | 5320            | 9.50         | 9  | 5                         | 8.4    | 185    | 170    | 45     |       | -MEASURE-                      | 0.346     | 0.400  | 0.400  | 0.062  |       |  |
| Wi-Fi 5.5 GHz                | 5700            | 9.50         | 9  | 5                         | 8.4    | 185    | 170    | 45     |       | -MEASURE-                      | 0.358     | 0.400  | 0.400  | 0.064  |       |  |
| Wi-Fi 5.8 GHz                | 5825            | 9.50         | 9  | 5                         | 8.4    | 185    | 170    | 45     |       | -MEASURE-                      | 0.362     | 0.400  | 0.400  | 0.064  |       |  |
| Wi-Fi Aux Antenna (Wi-Fi 2)  |                 |              |    |                           |        |        |        |        |       |                                |           |        |        |        |       |  |
| Wi-Fi 2.4 GHz                | 2462            | 15.50        | 35 | 5                         | 8.4    | 162    | 170    | 67.8   |       | -MEASURE-                      | -MEASURE- | 0.400  | 0.400  | 0.400  |       |  |
| Wi-Fi 5.2 GHz                | 5240            | 9.50         | 9  | 5                         | 8.4    | 162    | 170    | 67.8   |       | -MEASURE-                      | 0.343     | 0.400  | 0.400  | 0.400  |       |  |
| Wi-Fi 5.3 GHz                | 5320            | 9.50         | 9  | 5                         | 8.4    | 162    | 170    | 67.8   |       | -MEASURE-                      | 0.346     | 0.400  | 0.400  | 0.400  |       |  |
| Wi-Fi 5.5 GHz                | 5700            | 9.50         | 9  | 5                         | 8.4    | 162    | 170    | 67.8   |       | -MEASURE-                      | 0.358     | 0.400  | 0.400  | 0.400  |       |  |
| Wi-Fi 5.8 GHz                | 5825            | 9.50         | 9  | 5                         | 8.4    | 162    | 170    | 67.8   |       | -MEASURE-                      | 0.362     | 0.400  | 0.400  | 0.400  |       |  |

## 14.2. Sum of the SAR for GSM850, Wi-Fi, and BT

| Simultaneous Transmission Scenario |                          | Standalone SAR Values |                  |                   |                  |                   |                      |                       |                   | Σ 1-g SAR (mW/g) | SPLSR (Yes/ No) |
|------------------------------------|--------------------------|-----------------------|------------------|-------------------|------------------|-------------------|----------------------|-----------------------|-------------------|------------------|-----------------|
| Position                           | Combination              | GSM850                | Wi-Fi 1 DTS Band | Wi-Fi 1 UNII Band | Wi-Fi 2 DTS Band | Wi-Fi 2 UNII Band | Wi-Fi 1 + 2 DTS Band | Wi-Fi 1 + 2 UNII Band | Wi-Fi 1 Bluetooth |                  |                 |
| Rear                               | WWAN + Wi-Fi 1           | 0.567                 | 0.503            |                   |                  |                   |                      |                       |                   | 1.070            | No              |
|                                    | WWAN + Wi-Fi 2           | 0.567                 |                  | 0.521             |                  |                   |                      |                       |                   | 1.088            | No              |
|                                    | WWAN + Wi-Fi 2 + BT      | 0.567                 |                  |                   | 0.687            |                   |                      |                       | 0.329             | 1.583            | No              |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 | 0.567                 |                  |                   |                  | 0.439             |                      |                       | 0.329             | 1.335            | No              |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 | 0.567                 |                  |                   |                  |                   | 0.710                |                       |                   | 1.277            | No              |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 | 0.567                 |                  |                   |                  |                   |                      | 0.628                 |                   | 1.195            | No              |
| Edge 1                             | WWAN + Wi-Fi 1           | 0.218                 | 0.310            |                   |                  |                   |                      |                       |                   | 0.528            | No              |
|                                    | WWAN + Wi-Fi 2           | 0.218                 |                  | 0.362             |                  |                   |                      |                       |                   | 0.580            | No              |
|                                    | WWAN + Wi-Fi 2 + BT      | 0.218                 |                  |                   | 0.253            |                   |                      |                       | 0.289             | 0.760            | No              |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 | 0.218                 |                  |                   |                  | 0.362             |                      |                       | 0.289             | 0.869            | No              |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 | 0.218                 |                  |                   |                  |                   | 0.343                |                       |                   | 0.561            | No              |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 | 0.218                 |                  |                   |                  |                   |                      | 0.362                 |                   | 0.580            | No              |
| Edge 2                             | WWAN + Wi-Fi 1           | 0.470                 | 0.400            |                   |                  |                   |                      |                       |                   | 0.870            | No              |
|                                    | WWAN + Wi-Fi 2           | 0.470                 |                  | 0.400             |                  |                   |                      |                       |                   | 0.870            | No              |
|                                    | WWAN + Wi-Fi 2 + BT      | 0.470                 |                  |                   | 0.400            |                   |                      |                       | 0.400             | 1.270            | No              |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 | 0.470                 |                  |                   |                  | 0.400             |                      |                       | 0.400             | 1.270            | No              |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 | 0.470                 |                  |                   |                  |                   | 0.400                |                       |                   | 0.870            | No              |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 | 0.470                 |                  |                   |                  |                   |                      | 0.400                 |                   | 0.870            | No              |

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

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

### Conclusion:

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

### 14.3. Sum of the SAR for GSM1900, Wi-Fi, and BT

| Simultaneous Transmission Scenario |                          | Standalone SAR Values |                  |                   |                  |                   |                      |                       |                   | Σ 1-g SAR (mW/g) | SPLSR (Yes/ No) |
|------------------------------------|--------------------------|-----------------------|------------------|-------------------|------------------|-------------------|----------------------|-----------------------|-------------------|------------------|-----------------|
| Position                           | Combination              | GSM1900               | Wi-Fi 1 DTS Band | Wi-Fi 1 UNII Band | Wi-Fi 2 DTS Band | Wi-Fi 2 UNII Band | Wi-Fi 1 + 2 DTS Band | Wi-Fi 1 + 2 UNII Band | Wi-Fi 1 Bluetooth |                  |                 |
| Rear                               | WWAN + Wi-Fi 1           | 1.107                 | 0.503            |                   |                  |                   |                      |                       |                   | 1.610            | Yes             |
|                                    | WWAN + Wi-Fi 1           | 1.107                 |                  | 0.521             |                  |                   |                      |                       |                   | 1.628            | Yes             |
|                                    | WWAN + Wi-Fi 2 + BT      | 1.107                 |                  |                   | 0.687            |                   |                      |                       | 0.329             | 2.123            | Yes             |
|                                    | WWAN + Wi-Fi 2 + BT      | 1.107                 |                  |                   |                  | 0.439             |                      |                       | 0.329             | 1.875            | Yes             |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 | 1.107                 |                  |                   |                  |                   | 0.710                |                       |                   | 1.817            | Yes             |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 | 1.107                 |                  |                   |                  |                   |                      | 0.628                 |                   | 1.735            | Yes             |
| Edge 1                             | WWAN + Wi-Fi 1           | 0.775                 | 0.310            |                   |                  |                   |                      |                       |                   | 1.085            | No              |
|                                    | WWAN + Wi-Fi 1           | 0.775                 |                  | 0.362             |                  |                   |                      |                       |                   | 1.137            | No              |
|                                    | WWAN + Wi-Fi 2 + BT      | 0.775                 |                  |                   | 0.253            |                   |                      |                       | 0.289             | 1.317            | No              |
|                                    | WWAN + Wi-Fi 2 + BT      | 0.775                 |                  |                   |                  | 0.362             |                      |                       | 0.289             | 1.426            | No              |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 | 0.775                 |                  |                   |                  |                   | 0.343                |                       |                   | 1.118            | No              |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 | 0.775                 |                  |                   |                  |                   |                      | 0.362                 |                   | 1.137            | No              |
| Edge 2                             | WWAN + Wi-Fi 1           | 0.077                 | 0.400            |                   |                  |                   |                      |                       |                   | 0.477            | No              |
|                                    | WWAN + Wi-Fi 1           | 0.077                 |                  | 0.400             |                  |                   |                      |                       |                   | 0.477            | No              |
|                                    | WWAN + Wi-Fi 2 + BT      | 0.077                 |                  |                   | 0.400            |                   |                      |                       | 0.400             | 0.877            | No              |
|                                    | WWAN + Wi-Fi 2 + BT      | 0.077                 |                  |                   |                  | 0.400             |                      |                       | 0.400             | 0.877            | No              |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 | 0.077                 |                  |                   |                  |                   | 0.400                |                       |                   | 0.477            | No              |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 | 0.077                 |                  |                   |                  |                   |                      | 0.400                 |                   | 0.477            | No              |

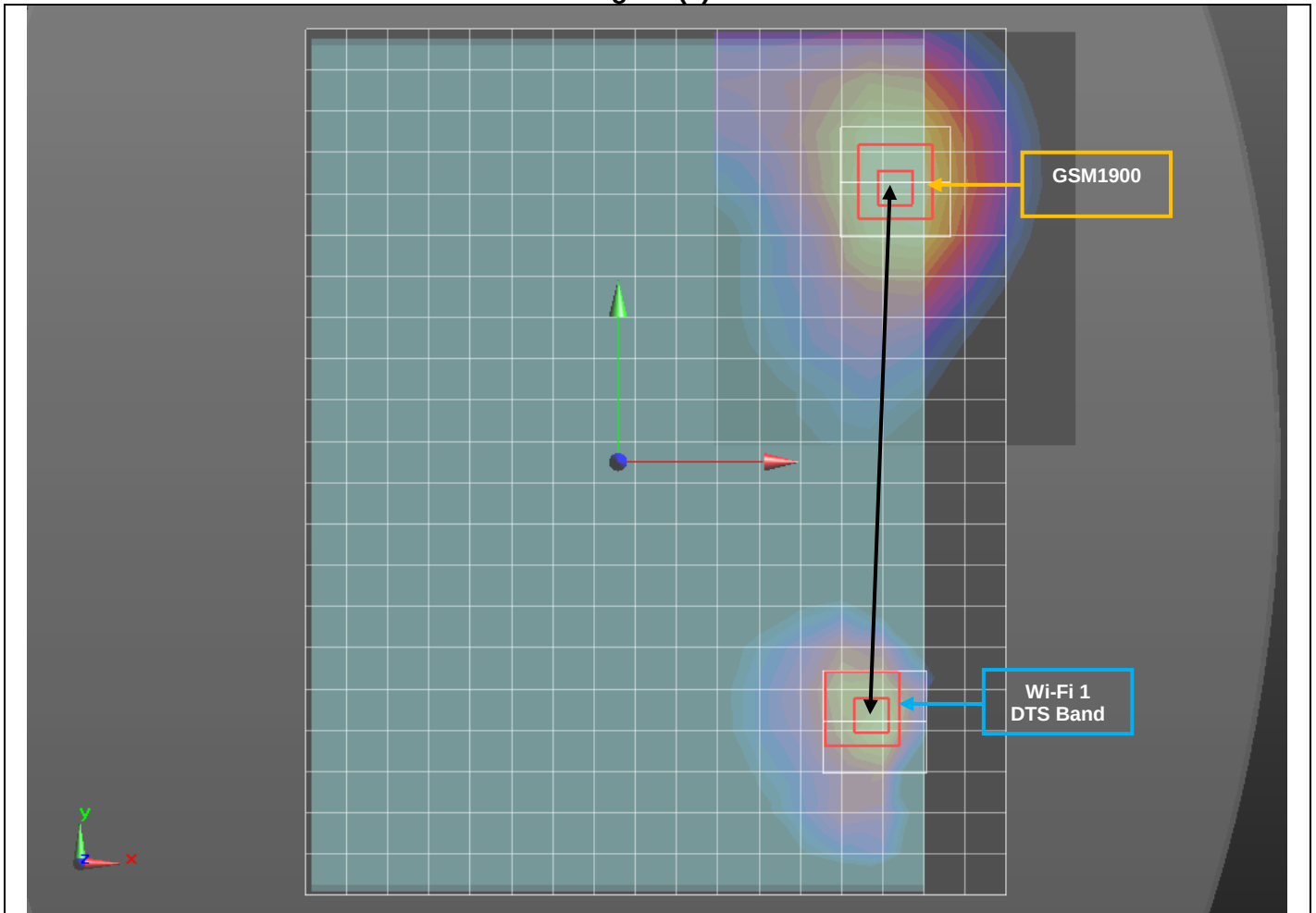
### SAR to Peak Location Separation Ratio (SPLSR)

| Simultaneous Transmission Scenario |                          | Standalone SAR Values |                  |                   |                  |                   |                      |                       |           | Σ 1-g SAR (mW/g) | Calculated distance (mm) | SPLSR (≤ 0.04) | Volume Scan (Yes/ No) | Figure |
|------------------------------------|--------------------------|-----------------------|------------------|-------------------|------------------|-------------------|----------------------|-----------------------|-----------|------------------|--------------------------|----------------|-----------------------|--------|
| Position                           | Combination              | GSM1900               | Wi-Fi 1 DTS Band | Wi-Fi 1 UNII Band | Wi-Fi 2 DTS Band | Wi-Fi 2 UNII Band | Wi-Fi 1 + 2 DTS Band | Wi-Fi 1 + 2 UNII Band | Bluetooth |                  |                          |                |                       |        |
| Rear                               | WWAN + Wi-Fi 1           | 1.107                 | 0.503            |                   |                  |                   |                      |                       |           | 1.610            | 157.2                    | 0.013          | No                    | 1      |
|                                    |                          | 1.107                 |                  | 0.521             |                  |                   |                      |                       |           | 1.628            | 150.8                    | 0.014          | No                    | 2      |
|                                    | WWAN + Wi-Fi 2 + BT      | 1.107                 |                  |                   | 0.687            |                   |                      |                       | 0.329     | 2.123            |                          |                |                       | 3      |
|                                    |                          | 1.107                 |                  |                   | 0.687            |                   |                      |                       |           | 1.794            | 123.6                    | 0.019          | No                    |        |
|                                    |                          | 1.107                 |                  |                   |                  |                   |                      |                       | 0.329     | 1.436            | 156.0                    | 0.011          | No                    |        |
|                                    |                          |                       |                  |                   | 0.687            |                   |                      |                       | 0.329     | 1.016            | 32.4                     | 0.032          | No                    | 4      |
|                                    |                          | 1.107                 |                  |                   |                  | 0.439             |                      |                       | 0.329     | 1.875            |                          |                |                       |        |
|                                    |                          | 1.107                 |                  |                   |                  | 0.439             |                      |                       |           | 1.546            | 127.5                    | 0.015          | No                    |        |
|                                    |                          | 1.107                 |                  |                   |                  |                   |                      |                       | 0.329     | 1.436            | 156.0                    | 0.011          | No                    |        |
|                                    |                          |                       |                  |                   | 0.439            |                   |                      |                       | 0.329     | 0.768            | 28.6                     | 0.024          | No                    |        |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 | 1.107                 |                  |                   |                  |                   | 0.710                |                       |           | 1.817            | 127.2                    | 0.019          | No                    | 5      |
|                                    |                          | 1.107                 |                  |                   |                  |                   |                      | 0.628                 |           | 1.735            | 123.5                    | 0.019          | No                    | 6      |

### Conclusion:

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

**Figure (1)**



| Mode                        | Peak SAR          | X      | Y       | Z      |
|-----------------------------|-------------------|--------|---------|--------|
|                             | mW/g              | m      | m       | m      |
| GSM1900                     | 1.3               | 0.0805 | 0.0815  | -0.181 |
| Wi-Fi 1 DTS Band            | 0.813             | 0.0746 | -0.0756 | -0.181 |
| d: Calculated distance (mm) | WWAN to Wi-Fi DTS | 157.2  |         |        |

The Peak Location Separation Distance is computed by using the formula below:

$$\text{SQRT}((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)$$

Figure (2)

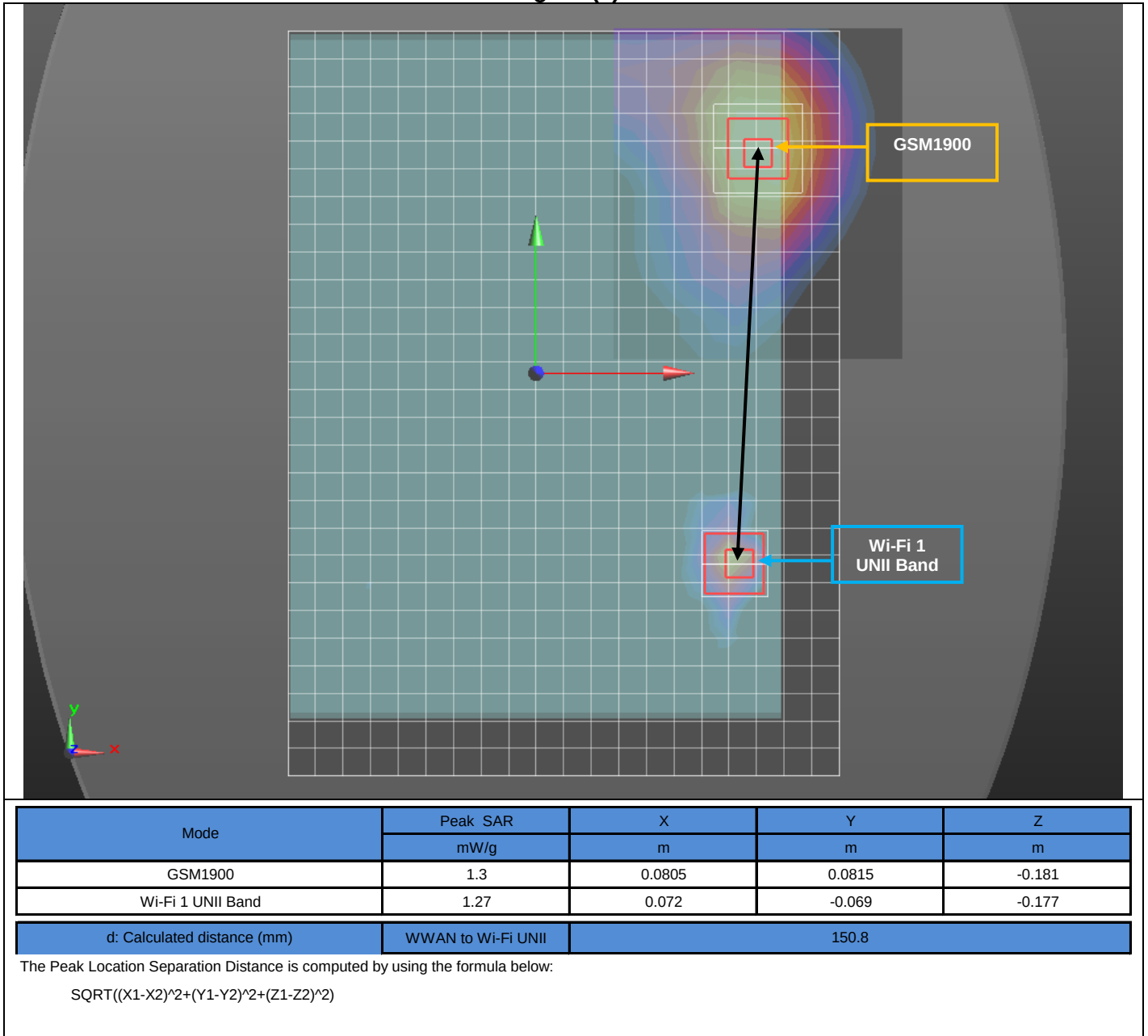
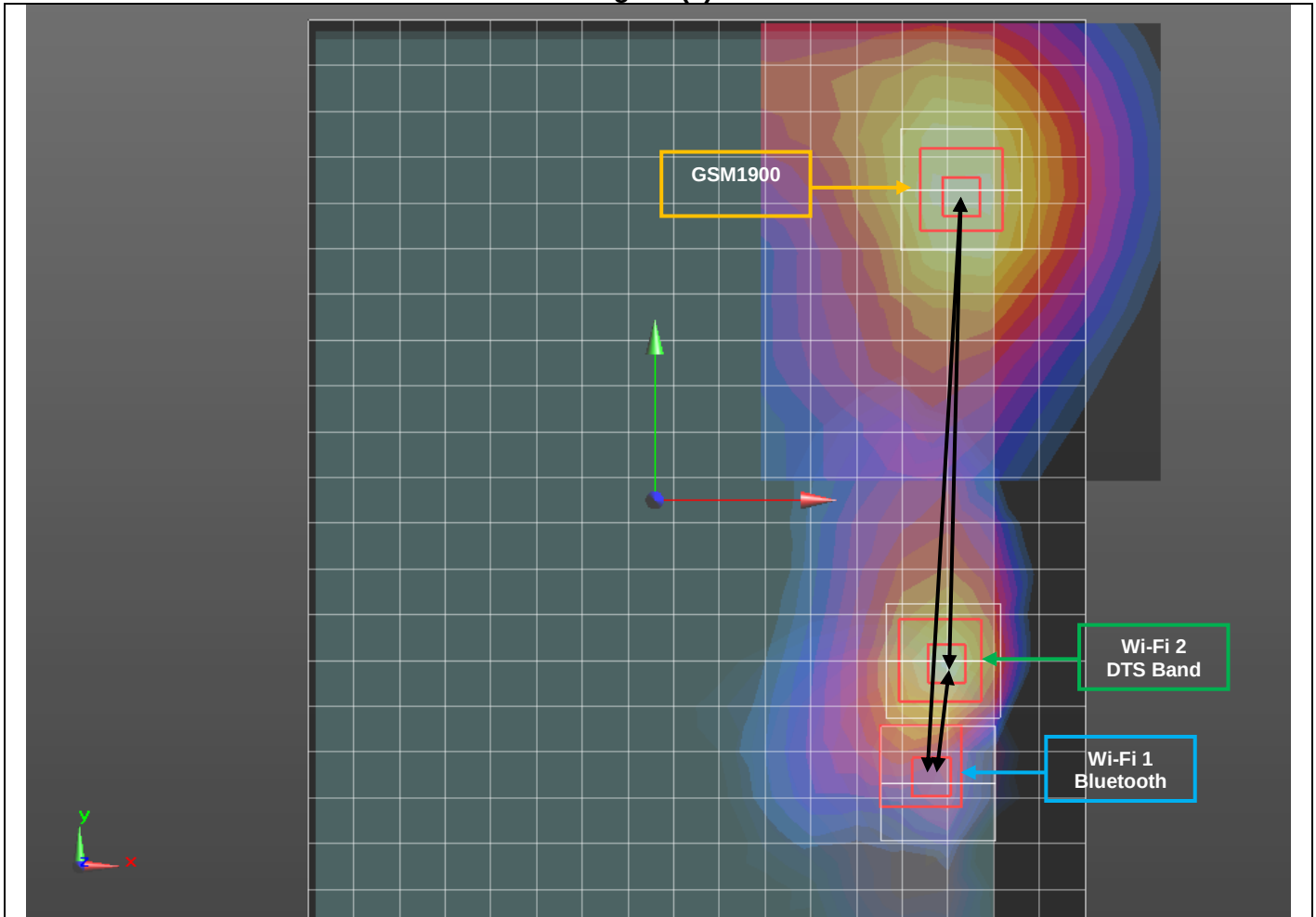


Figure (3)

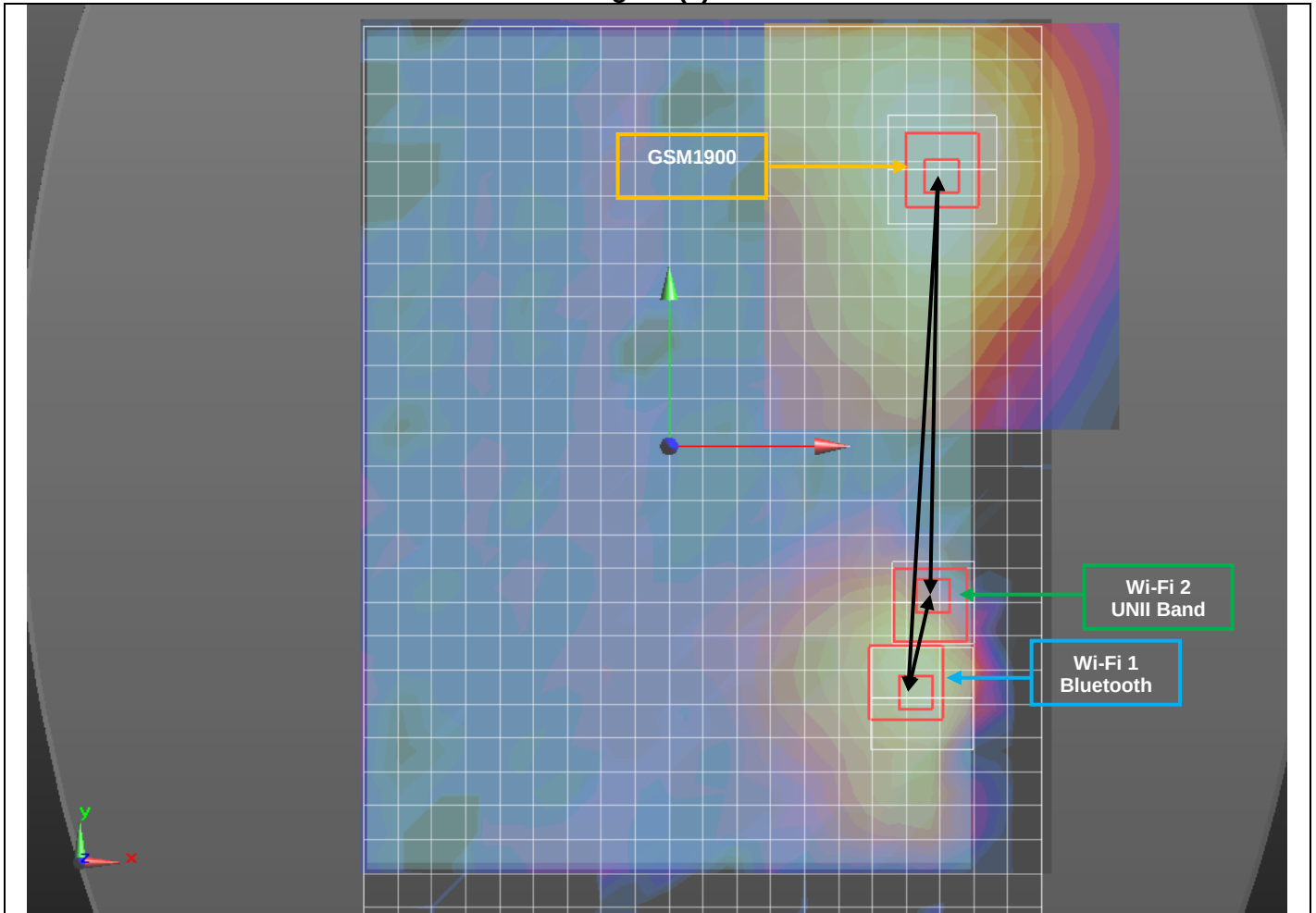


| Mode                        | Peak SAR               | X      | Y       | Z      |
|-----------------------------|------------------------|--------|---------|--------|
|                             | mW/g                   | m      | m       | m      |
| GSM1900                     | 1.3                    | 0.0805 | 0.0815  | -0.181 |
| Wi-Fi 2 DTS Band            | 1.11                   | 0.0758 | -0.042  | -0.181 |
| Wi-Fi 1 Bluetooth           | 0.498                  | 0.0746 | -0.0744 | -0.18  |
| d: Calculated distance (mm) | WWAN to Wi-Fi DTS      | 123.6  |         |        |
|                             | WWAN to Bluetooth      | 156.0  |         |        |
|                             | Wi-Fi DTS to Bluetooth | 32.4   |         |        |

The Peak Location Separation Distance is computed by using the formula below:

$$\text{SQRT}((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)$$

Figure (4)



| Mode                        | Peak SAR                | X      | Y       | Z      |
|-----------------------------|-------------------------|--------|---------|--------|
|                             | mW/g                    | m      | m       | m      |
| GSM1900                     | 1.3                     | 0.0805 | 0.0815  | -0.181 |
| Wi-Fi 2 UNII Band           | 0.961                   | 0.078  | -0.046  | -0.18  |
| Wi-Fi 1 Bluetooth           | 0.498                   | 0.0746 | -0.0744 | -0.18  |
| d: Calculated distance (mm) | WWAN to Wi-Fi UNII      | 127.5  |         |        |
|                             | WWAN to Bluetooth       | 156.0  |         |        |
|                             | Wi-Fi UNII to Bluetooth | 28.6   |         |        |

The Peak Location Separation Distance is computed by using the formula below:

$$\text{SQRT}((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)$$

Figure (5)

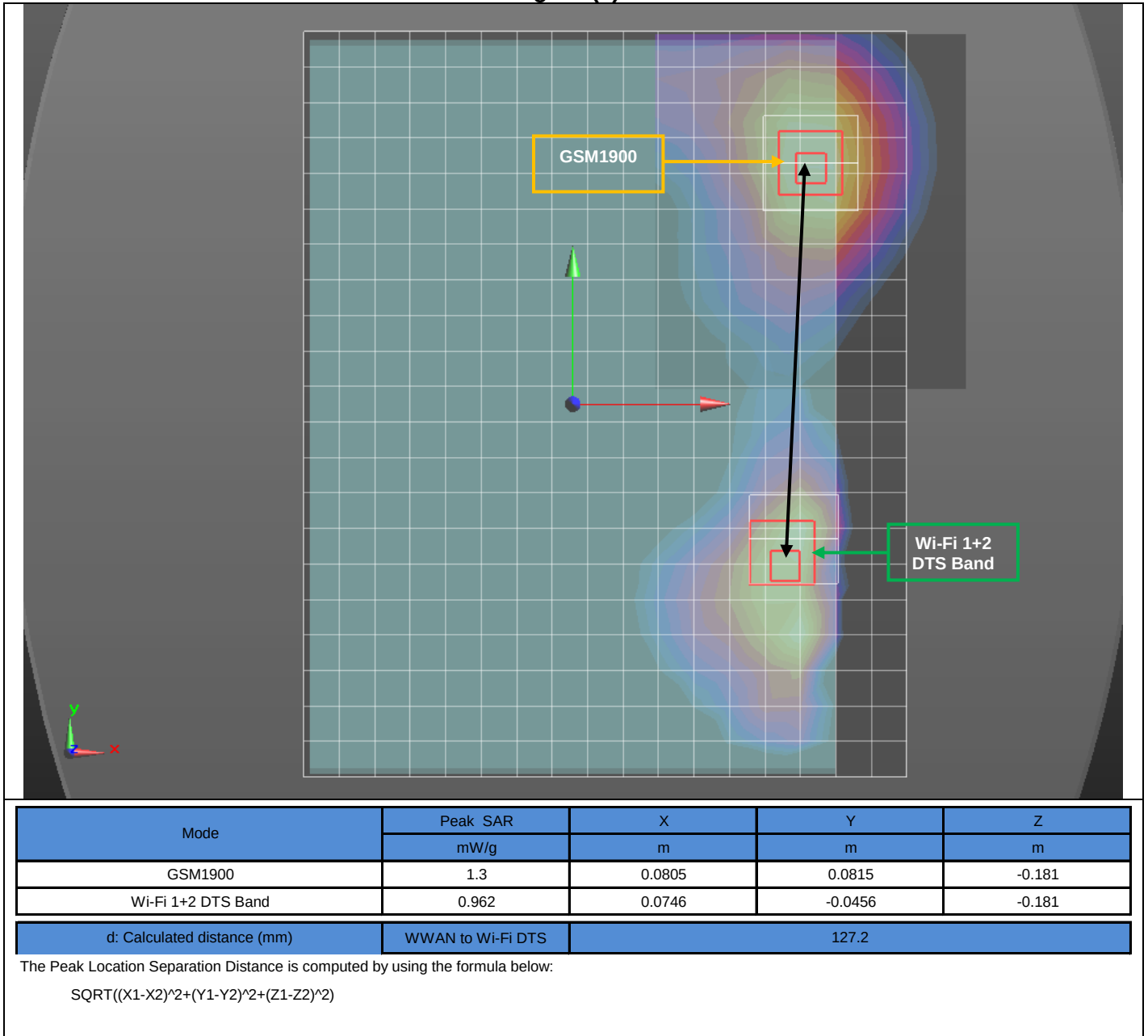
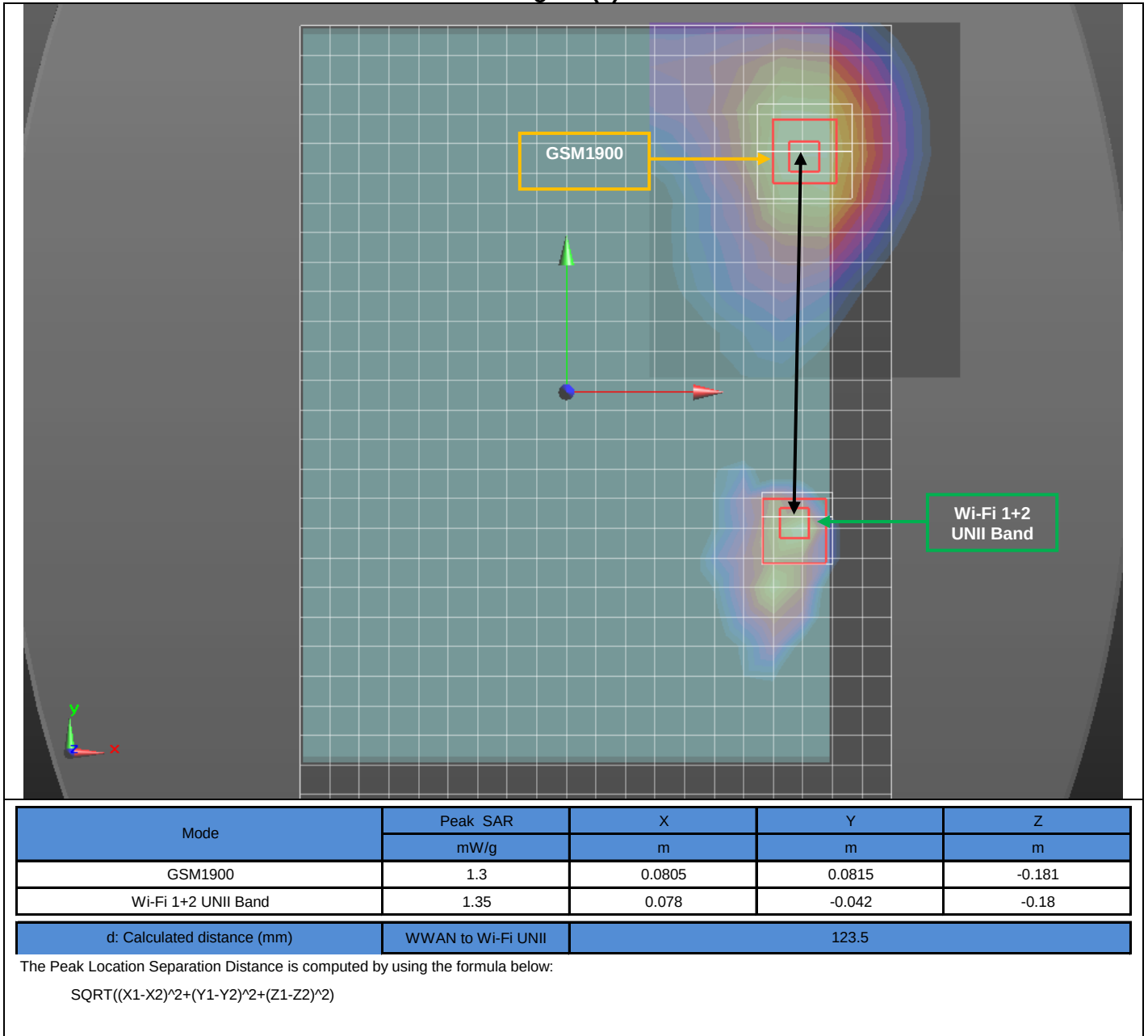




Figure (6)



#### 14.4. Sum of the SAR for W-CDMA Band V, Wi-Fi, and BT

| Simultaneous Transmission Scenario |                          | Standalone SAR Values |                  |                   |                  |                   |                      |                       |                   | Σ 1-g SAR (mW/g) | SPLSR (Yes/ No) |
|------------------------------------|--------------------------|-----------------------|------------------|-------------------|------------------|-------------------|----------------------|-----------------------|-------------------|------------------|-----------------|
| Position                           | Combination              | W-CDMA Band V         | Wi-Fi 1 DTS Band | Wi-Fi 1 UNII Band | Wi-Fi 2 DTS Band | Wi-Fi 2 UNII Band | Wi-Fi 1 + 2 DTS Band | Wi-Fi 1 + 2 UNII Band | Wi-Fi 1 Bluetooth |                  |                 |
| Rear                               | WWAN + Wi-Fi 1           | 0.558                 | 0.503            |                   |                  |                   |                      |                       |                   | 1.061            | No              |
|                                    |                          | 0.558                 |                  | 0.521             |                  |                   |                      |                       |                   | 1.079            | No              |
|                                    | WWAN + Wi-Fi 2 + BT      | 0.558                 |                  |                   | 0.687            |                   |                      |                       | 0.329             | 1.574            | No              |
|                                    |                          | 0.558                 |                  |                   |                  | 0.439             |                      |                       | 0.329             | 1.326            | No              |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 | 0.558                 |                  |                   |                  |                   | 0.710                |                       |                   | 1.268            | No              |
|                                    |                          | 0.558                 |                  |                   |                  |                   |                      | 0.628                 |                   | 1.186            | No              |
| Edge 1                             | WWAN + Wi-Fi 1           | 0.210                 | 0.310            |                   |                  |                   |                      |                       |                   | 0.520            | No              |
|                                    |                          | 0.210                 |                  | 0.362             |                  |                   |                      |                       |                   | 0.572            | No              |
|                                    | WWAN + Wi-Fi 2 + BT      | 0.210                 |                  |                   | 0.253            |                   |                      |                       | 0.289             | 0.752            | No              |
|                                    |                          | 0.210                 |                  |                   |                  | 0.362             |                      |                       | 0.289             | 0.861            | No              |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 | 0.210                 |                  |                   |                  |                   | 0.343                |                       |                   | 0.553            | No              |
|                                    |                          | 0.210                 |                  |                   |                  |                   |                      | 0.362                 |                   | 0.572            | No              |
| Edge 2                             | WWAN + Wi-Fi 1           | 0.344                 | 0.400            |                   |                  |                   |                      |                       |                   | 0.744            | No              |
|                                    |                          | 0.344                 |                  | 0.400             |                  |                   |                      |                       |                   | 0.744            | No              |
|                                    | WWAN + Wi-Fi 2 + BT      | 0.344                 |                  |                   | 0.400            |                   |                      |                       | 0.400             | 1.144            | No              |
|                                    |                          | 0.344                 |                  |                   |                  | 0.400             |                      |                       | 0.400             | 1.144            | No              |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 | 0.344                 |                  |                   |                  |                   | 0.400                |                       |                   | 0.744            | No              |
|                                    |                          | 0.344                 |                  |                   |                  |                   |                      | 0.400                 |                   | 0.744            | No              |

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

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

#### Conclusion:

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

## 14.5. Sum of the SAR for W-CDMA Band II, Wi-Fi, and BT

| Simultaneous Transmission Scenario |                          | Standalone SAR Values |                  |                   |                  |                   |                      |                       |                   | Σ 1-g SAR (mW/g) | SPLSR (Yes/ No) |
|------------------------------------|--------------------------|-----------------------|------------------|-------------------|------------------|-------------------|----------------------|-----------------------|-------------------|------------------|-----------------|
| Position                           | Combination              | W-CDMA Band II        | Wi-Fi 1 DTS Band | Wi-Fi 1 UNII Band | Wi-Fi 2 DTS Band | Wi-Fi 2 UNII Band | Wi-Fi 1 + 2 DTS Band | Wi-Fi 1 + 2 UNII Band | Wi-Fi 1 Bluetooth |                  |                 |
| Rear                               | WWAN + Wi-Fi 1           | 1.010                 | 0.503            |                   |                  |                   |                      |                       |                   | 1.513            | No              |
|                                    | WWAN + Wi-Fi 2 + BT      | 1.010                 |                  | 0.521             |                  |                   |                      |                       |                   | 1.531            | No              |
|                                    | WWAN + Wi-Fi 2 + BT      | 1.010                 |                  |                   | 0.687            |                   |                      |                       | 0.329             | 2.026            | Yes             |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 | 1.010                 |                  |                   |                  | 0.439             |                      |                       | 0.329             | 1.778            | Yes             |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 | 1.010                 |                  |                   |                  |                   | 0.710                |                       |                   | 1.720            | Yes             |
| Edge 1                             | WWAN + Wi-Fi 1           | 0.871                 | 0.310            |                   |                  |                   |                      |                       |                   | 1.181            | No              |
|                                    | WWAN + Wi-Fi 2 + BT      | 0.871                 |                  | 0.362             |                  |                   |                      |                       |                   | 1.233            | No              |
|                                    | WWAN + Wi-Fi 2 + BT      | 0.871                 |                  |                   | 0.253            |                   |                      |                       | 0.289             | 1.413            | No              |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 | 0.871                 |                  |                   |                  | 0.362             |                      |                       | 0.289             | 1.522            | No              |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 | 0.871                 |                  |                   |                  |                   | 0.343                |                       |                   | 1.214            | No              |
| Edge 2                             | WWAN + Wi-Fi 1           | 0.076                 | 0.400            |                   |                  |                   |                      |                       |                   | 0.476            | No              |
|                                    | WWAN + Wi-Fi 2 + BT      | 0.076                 |                  | 0.400             |                  |                   |                      |                       |                   | 0.476            | No              |
|                                    | WWAN + Wi-Fi 2 + BT      | 0.076                 |                  |                   | 0.400            |                   |                      |                       | 0.400             | 0.876            | No              |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 | 0.076                 |                  |                   |                  | 0.400             |                      |                       | 0.400             | 0.876            | No              |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 | 0.076                 |                  |                   |                  |                   | 0.400                |                       |                   | 0.476            | No              |

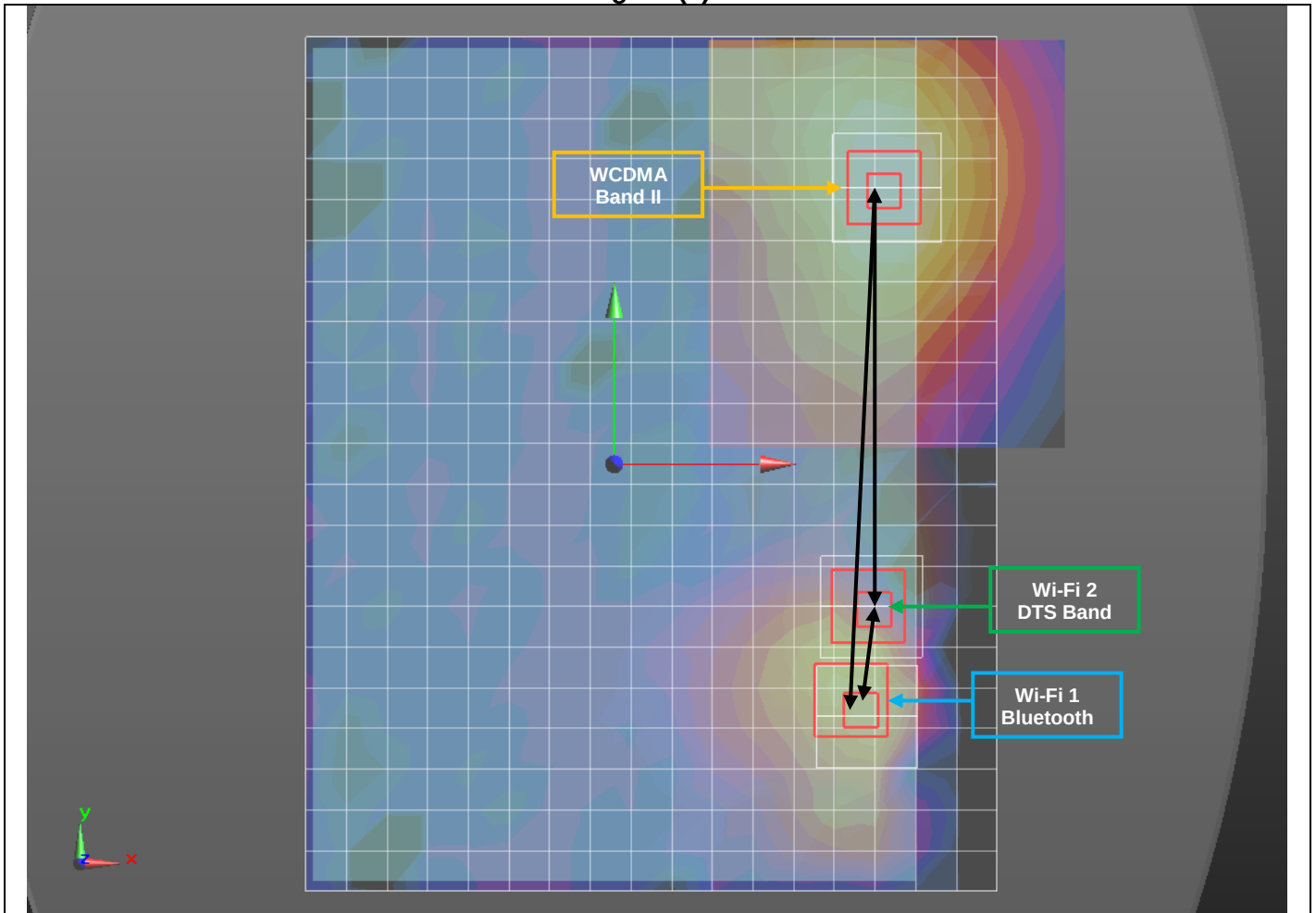
### SAR to Peak Location Separation Ratio (SPLSR)

| Simultaneous Transmission Scenario |                          | Standalone SAR Values |                  |                   |                  |                   |                      |                       |           | Σ 1-g SAR (mW/g) | Calculated distance (mm) | SPLSR (≤ 0.04) | Volume Scan (Yes/ No) | Figure |
|------------------------------------|--------------------------|-----------------------|------------------|-------------------|------------------|-------------------|----------------------|-----------------------|-----------|------------------|--------------------------|----------------|-----------------------|--------|
| Position                           | Combination              | GSM1900               | Wi-Fi 1 DTS Band | Wi-Fi 1 UNII Band | Wi-Fi 2 DTS Band | Wi-Fi 2 UNII Band | Wi-Fi 1 + 2 DTS Band | Wi-Fi 1 + 2 UNII Band | Bluetooth |                  |                          |                |                       |        |
| Rear                               | WWAN + Wi-Fi 2 + BT      | 1.010                 |                  |                   | 0.687            |                   |                      |                       | 0.329     | 2.026            |                          |                |                       | 7      |
|                                    |                          | 1.010                 |                  |                   | 0.687            |                   |                      |                       |           | 1.697            | 123.6                    | 0.018          | No                    |        |
|                                    |                          | 1.010                 |                  |                   |                  |                   |                      |                       | 0.329     | 1.339            | 156.0                    | 0.010          | No                    |        |
|                                    |                          |                       |                  |                   | 0.687            |                   |                      |                       | 0.329     | 1.016            | 32.4                     | 0.032          | No                    |        |
|                                    |                          | 1.010                 |                  |                   |                  | 0.439             |                      |                       | 0.329     | 1.778            |                          |                |                       | 8      |
|                                    |                          | 1.010                 |                  |                   |                  | 0.439             |                      |                       |           | 1.449            | 127.5                    | 0.014          | No                    |        |
|                                    |                          | 1.010                 |                  |                   |                  |                   |                      |                       | 0.329     | 1.339            | 156.0                    | 0.010          | No                    |        |
|                                    | WWAN + Wi-Fi 1 + Wi-Fi 2 |                       |                  |                   |                  | 0.439             |                      |                       | 0.329     | 0.768            | 28.6                     | 0.024          | No                    | 9      |
|                                    |                          | 1.010                 |                  |                   |                  |                   | 0.710                |                       |           | 1.720            | 127.2                    | 0.018          | No                    |        |
|                                    |                          | 1.010                 |                  |                   |                  |                   |                      | 0.628                 |           | 1.638            | 123.5                    | 0.017          | No                    | 10     |

### Conclusion:

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

Figure (7)

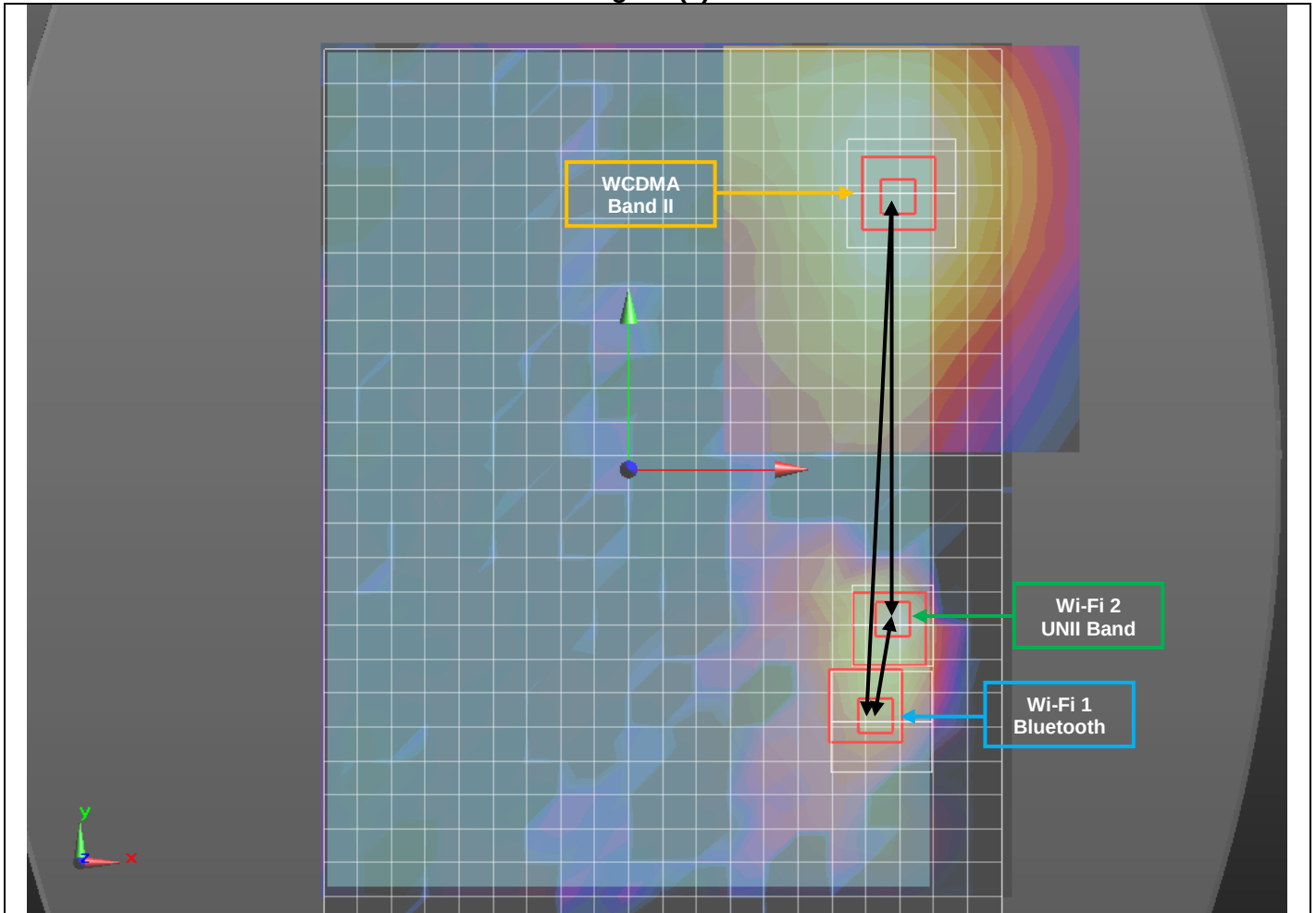


| Mode                        | Peak SAR               | X      | Y       | Z      |
|-----------------------------|------------------------|--------|---------|--------|
|                             | mW/g                   | m      | m       | m      |
| WCDMA Band II               | 1.29                   | 0.0805 | 0.0815  | -0.181 |
| Wi-Fi 2 DTS Band            | 1.11                   | 0.0758 | -0.042  | -0.181 |
| Wi-Fi 1 Bluetooth           | 0.498                  | 0.0746 | -0.0744 | -0.18  |
| d: Calculated distance (mm) | WWAN to Wi-Fi DTS      | 123.6  |         |        |
|                             | WWAN to Bluetooth      | 156.0  |         |        |
|                             | Wi-Fi DTS to Bluetooth | 32.4   |         |        |

The Peak Location Separation Distance is computed by using the formula below:

$$\text{SQRT}((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)$$

Figure (8)

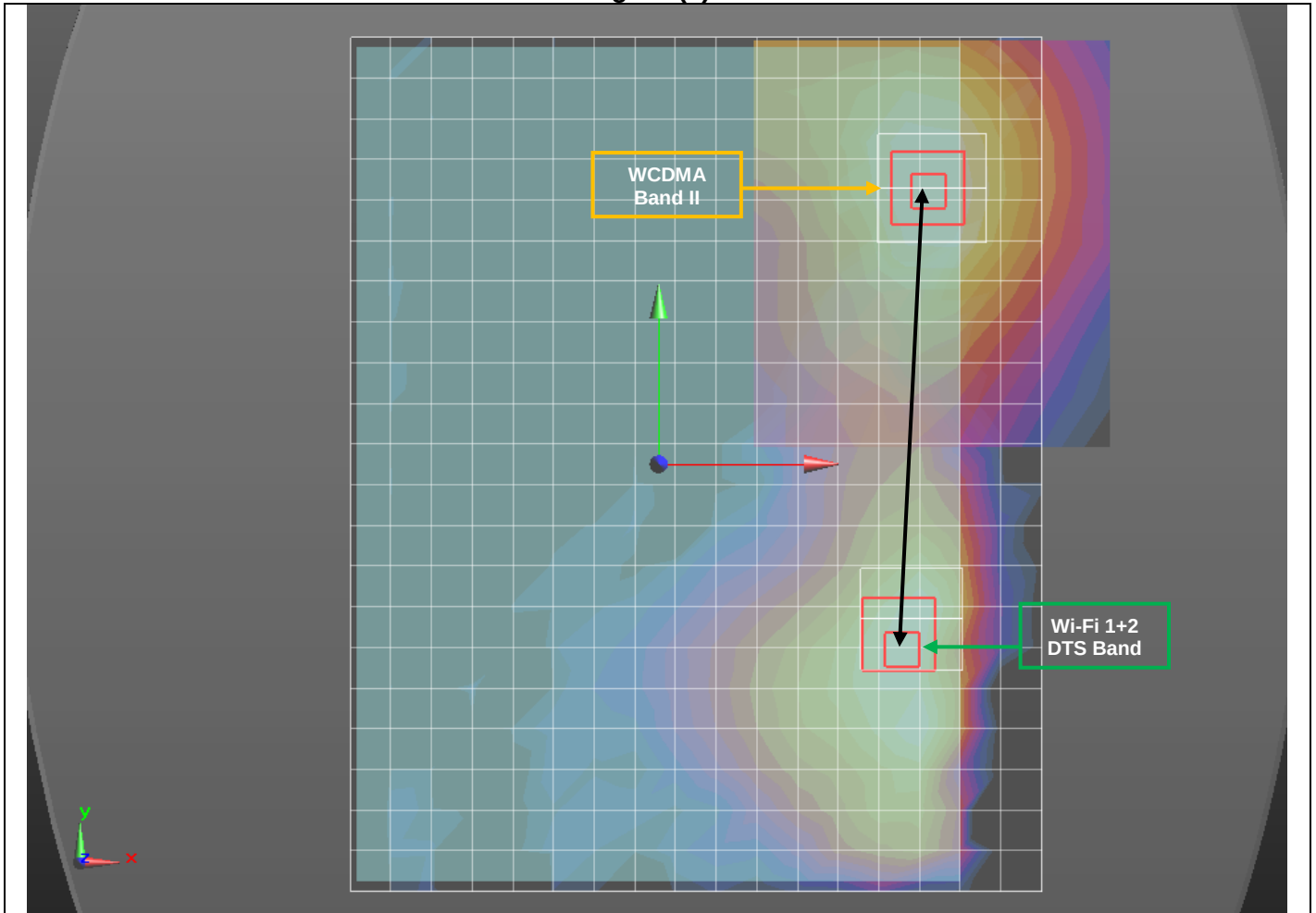


| Mode                        | Peak SAR                | X      | Y       | Z      |
|-----------------------------|-------------------------|--------|---------|--------|
|                             | mW/g                    | m      | m       | m      |
| WCDMA Band II               | 1.29                    | 0.0805 | 0.0815  | -0.181 |
| Wi-Fi 2 UNII Band           | 0.961                   | 0.078  | -0.046  | -0.18  |
| Wi-Fi 1 Bluetooth           | 0.498                   | 0.0746 | -0.0744 | -0.18  |
| d: Calculated distance (mm) | WWAN to Wi-Fi UNII      | 127.5  |         |        |
|                             | WWAN to Bluetooth       | 156.0  |         |        |
|                             | Wi-Fi UNII to Bluetooth | 28.6   |         |        |

The Peak Location Separation Distance is computed by using the formula below:

$$\text{SQRT}((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)$$

Figure (9)

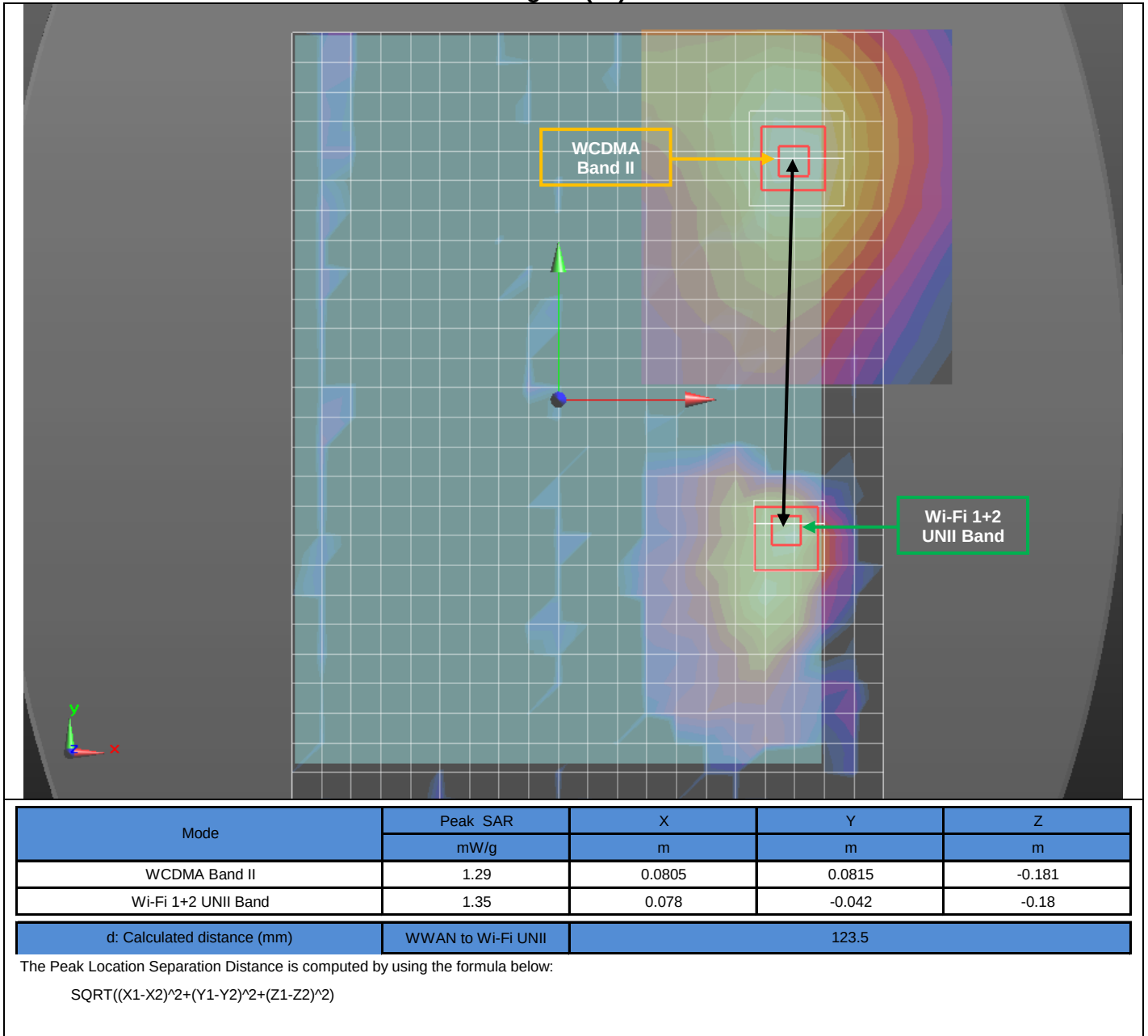


| Mode                        | Peak SAR          | X      | Y       | Z      |
|-----------------------------|-------------------|--------|---------|--------|
|                             | mW/g              | m      | m       | m      |
| WCDMA Band II               | 1.29              | 0.0805 | 0.0815  | -0.181 |
| Wi-Fi 1+2 DTS Band          | 0.962             | 0.0746 | -0.0456 | -0.181 |
| d: Calculated distance (mm) | WWAN to Wi-Fi DTS | 127.2  |         |        |

The Peak Location Separation Distance is computed by using the formula below:

$$\text{SQRT}((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)$$

Figure (10)



## **15. Appendixes**

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

- 15.1. Photos and Antenna Locations**
- 15.2. System Performance Check Plots**
- 15.3. Highest SAR Test Plots**
- 15.4. Calibration Certificate for E-Field Probe EX3DV3 - SN 3871**
- 15.5. Calibration Certificate for E-Field Probe EX3DV3 - SN 3531**
- 15.6. Calibration Certificate for D835V2 - SN 4d002**
- 15.7. Calibration Certificate for D1900V2- SN 5d163**
- 15.8. Calibration Certificate for D2450V2 - SN 899**
- 15.9. Calibration Certificate for D5GHzV2 - SN 1138**

**END OF REPORT**