



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

**(Class II Permissive Change)**

**SAR EVALUATION REPORT**

*For*  
**Intel Centrino Advanced-N 6235  
(Tested inside of Panasonic Tablet PC FZ-G1)**

**Model: WL12A  
FCC ID: ACJ9TGWL12A**

**Report Number: 12J14673-1F  
Issue Date: 3/1/2013**

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**NVLAP LAB CODE 200065-0**

### Revision History

| <u>Rev.</u> | <u>Issue Date</u> | <u>Revisions</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <u>Revised By</u> |
|-------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| --          | 1/29/2013         | Initial Issue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | --                |
| A           | 1/31/2013         | Section 1.1 – corrected 2.4GHz result from 1.17 to 1.19                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
| B           | 2/14/2013         | <ul style="list-style-type: none"> <li>- Section 8 – Revised table for determination of required test configurations.</li> <li>- Section 11 and 12 – Added liquid and system check information required to support additional testing.</li> <li>- Section 13 – Additional testing results for Bluetooth and Wi-Fi 5 GHz bands at Edge 4</li> <li>- Section 15 – Amended simultaneous transmission tables to account for the Edge 4 test position.</li> <li>- Section 19 – Added Edge 4 test setup photo.</li> <li>- Updated contents in the appendixes.</li> </ul>                                                                                                                                                                                                                                                                                                               | Ray Su            |
| C           | 2/18/2013         | Added and replaced edge test results with values measured during retest, and updated all related plots and supporting information accordingly.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Ray Su            |
| D           | 2/21/2013         | Purged previous rear side test results obtained from testing under the SAM phantom and replaced with values measured under the ELI phantom. All associated plots, supporting documents and other analyses have been updated accordingly.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Ray Su            |
| E           | 2/26/2013         | <ul style="list-style-type: none"> <li>- Section 7.2 – Modified table for consistent usage of terms.</li> <li>- Section 8 – Split tables to distinguish between test exclusion considerations for above and below 50 mm.</li> <li>- Section 9 – Added column to tables in order to identify the surfaces and edges requiring SAR evaluation.</li> <li>- Section 13 – Inserted new content to Section 13.2, which is now used for documenting the estimated SAR values wherever standalone SAR test exclusion applies.</li> </ul>                                                                                                                                                                                                                                                                                                                                                 | Ray Su            |
| F           | 3/1/2013          | <ul style="list-style-type: none"> <li>- Removed information and language inconsistent or no longer required by current KDBs in various sections. This includes statement on Z-Scans and the uncertainty budget.</li> <li>- Section 7 – Revised duty factor with newly measured values.</li> <li>- Section 8 – Replaced original tables with simplified versions.</li> <li>- Section 11 and 12 – New liquid and system check information in support for additional testing performed.</li> <li>- Section 13 – Added new test results, and inserted/relocated tables originally from Section 8 and 14 for SAR test exclusion and estimated SAR values, respectively.</li> <li>- Section 14 – Revised tables to allow for more comprehensive simultaneous transmission analysis, and updated values in accordance with changes that have taken place in other sections.</li> </ul> | Ray Su            |

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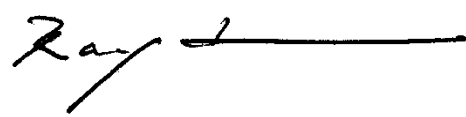
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## 1. Attestation of Test Results

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                |                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Applicant                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Panasonic Corporation of North America                                         |                                                                                      |
| DUT description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Intel Centrino Advanced-N 6235<br>(Tested inside of Panasonic Tablet PC FZ-G1) |                                                                                      |
| Model                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | WL12A                                                                          |                                                                                      |
| Test device is                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | An identical prototype                                                         |                                                                                      |
| Device category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Portable                                                                       |                                                                                      |
| Exposure category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | General Population/Uncontrolled Exposure                                       |                                                                                      |
| Date tested                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1/4/2013 – 2/28/2013                                                           |                                                                                      |
| Applicable Standards                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                | Test Results                                                                         |
| Published RF exposure KDB procedures, TCB workshop updates and OET Bulletin 65 Supplement C, IEEE Std 1528-2003 and IEEE Std 1528a-2005                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                | Pass                                                                                 |
| <p>UL CCS tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.</p> <p><b>Note:</b> The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.</p> |                                                                                |                                                                                      |
| Approved & Released For UL CCS By:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                | Tested By:                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                |  |
| Dave Weaver<br>Program Manager<br>UL CCS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                | Ray Su<br>SAR Engineer<br>UL CCS                                                     |

## 1.1. Summary of Highest 1-g SAR Results

Worst Case SAR data for each Frequency Band

| RF Exposure Rule                    | Freq. Range   | Highest Reported SAR                                                           | Limit       |
|-------------------------------------|---------------|--------------------------------------------------------------------------------|-------------|
| 15.247 (Wi-Fi)                      | 2412-2462 MHz | Body: 1.09 W/kg (Edge 4)                                                       | 1.6<br>W/kg |
| 15.407                              | 5150-5250 MHz | Body: 0.797 W/kg (Edge 3)                                                      |             |
|                                     | 5250-5350 MHz | Body: 1.19 W/kg (Edge 3)                                                       |             |
|                                     | 5500-5700 MHz | Body: 1.1 W/kg (Edge 3)                                                        |             |
| 15.247                              | 5725-5850 MHz | Body: 0.754 W/kg (Edge 3)                                                      |             |
| Simultaneous Transmission Condition |               | 1.31 W/kg (refer to Section 14.3.)<br>(The highest across exposure conditions) |             |

### LEGEND:

- Rear = Back
- Edge 1 = Top Edge
- Edge 2 = Right Edge
- Edge 3 = Bottom Edge
- Edge 4 = Left Edge

## 2. Test Methodology

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

- 865664 D01 SAR Measurement 100 MHz to 6 GHz v01
- 865664 D02 SAR Reporting v01
- 447498 D01 General RF Exposure Guidance v05
- 248227 D01 SAR Meas for 802 11abg v01r02

## 3. Facilities and Accreditation

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

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

## 4. Calibration and Uncertainty

### 4.1. Measuring Instrument Calibration

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

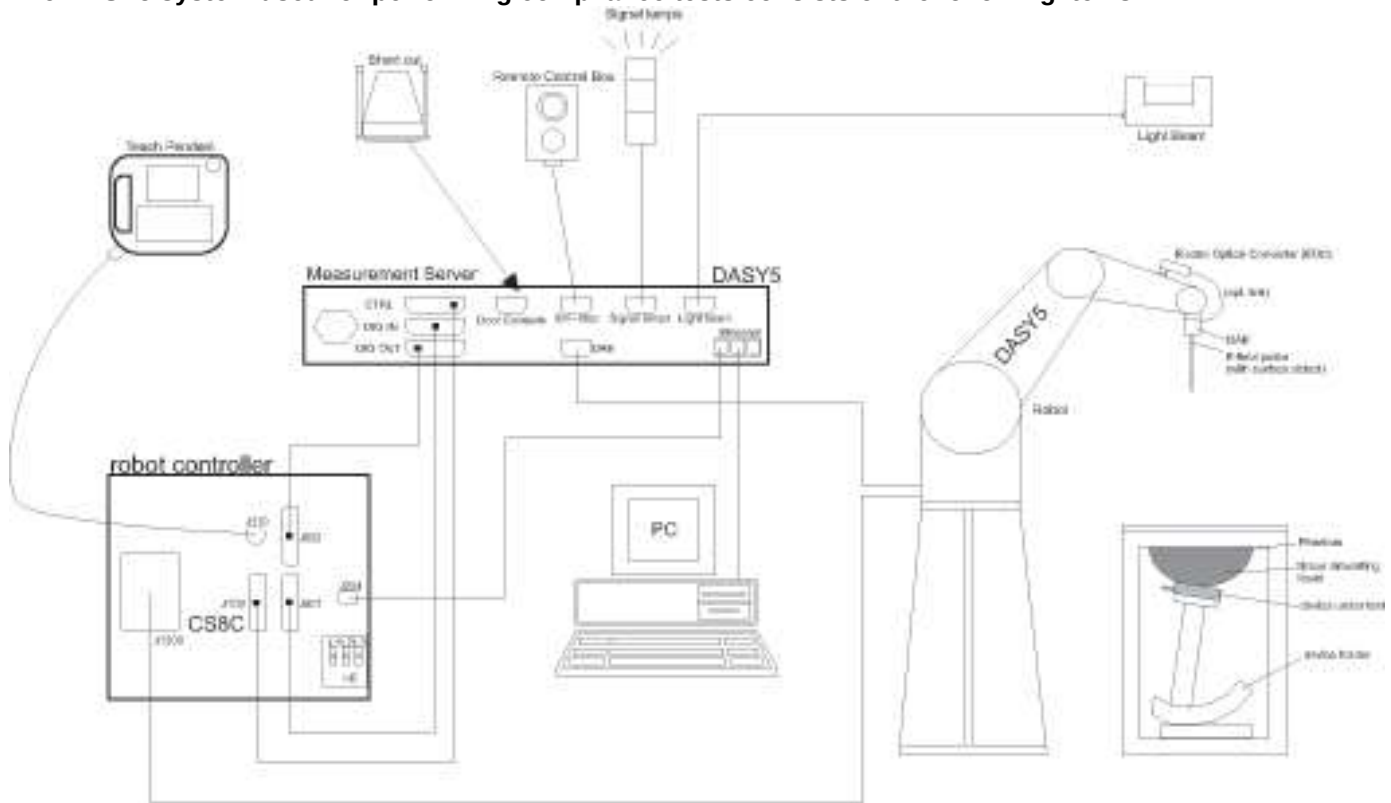
| Name of Equipment            | Manufacturer | Type/Model        | Serial No. | Cal. Due date |    |      |
|------------------------------|--------------|-------------------|------------|---------------|----|------|
|                              |              |                   |            | MM            | DD | Year |
| S-Parameter Network Analyzer | Agilent      | 8753ES            | MY40001647 | 6             | 27 | 2013 |
| Dielectronic Probe kit       | SPEAG        | SM DAK 040 CA     | 1082       | 9             | 18 | 2013 |
| Dielectronic Probe kit       | HP           | 85070E            | 594        | N/A           |    |      |
| Synthesized Signal Generator | HP           | 8665B             | 3438A00633 | 2             | 22 | 2013 |
| Power Meter                  | HP           | 438A              | 3513U04320 | 9             | 17 | 2013 |
| Power Sensor A               | HP           | 8481A             | 2237A31744 | 8             | 17 | 2013 |
| Power Sensor B               | HP           | 8481A             | 3318A95392 | 8             | 17 | 2013 |
| Amplifier                    | MITEQ        | 4D00400600-50-30P | 1622052    | N/A           |    |      |
| Directional coupler          | Werlatone    | C8060-102         | 2149       | N/A           |    |      |
| Synthesized Signal Generator | HP           | 8665B             | 3744A01084 | 5             | 3  | 2013 |
| Power Meter                  | HP           | 438A              | 2822A05684 | 10            | 7  | 2013 |
| Power Sensor A               | HP           | 8481A             | 2702A66876 | 8             | 1  | 2013 |
| Power Sensor B               | HP           | 8482A             | 2349A08568 | 4             | 14 | 2013 |
| Amplifier                    | MITEQ        | 4D00400600-50-30P | 1620606    | N/A           |    |      |
| Directional coupler          | Werlatone    | C8060-102         | 2141       | N/A           |    |      |
| Thermometer                  | ERTCO        | 639-1S            | 8350       | 7             | 30 | 2013 |
| E-Field Probe                | SPEAG        | EX3DV4            | 3686       | 2             | 16 | 2013 |
| E-Field Probe                | SPEAG        | EX3DV4            | 3885       | 10            | 9  | 2013 |
| E-Field Probe                | SPEAG        | EX3DV4            | 3773       | 3             | 14 | 2013 |
| E-Field Probe                | SPEAG        | EX3DV4            | 3751       | 11            | 15 | 2013 |
| Data Acquisition Electronics | SPEAG        | DAE4              | 1239       | 6             | 6  | 2013 |
| Data Acquisition Electronics | SPEAG        | DAE4              | 1352       | 10            | 8  | 2013 |
| Data Acquisition Electronics | SPEAG        | DAE4              | 1259       | 2             | 13 | 2013 |
| System Validation Dipole     | SPEAG        | D2450V2           | 706        | 4             | 11 | 2013 |
| System Validation Dipole     | SPEAG        | D2450V2           | 899        | 10            | 5  | 2013 |
| System Validation Dipole     | SPEAG        | D5GHzV2           | 1003       | 9             | 18 | 2013 |
| System Validation Dipole     | SPEAG        | D5GHzV2           | 1138       | 10            | 9  | 2013 |
| Power Meter                  | R & S        | NRP               | 100673     | 5             | 5  | 2013 |
| Power Sensor                 | R & S        | NRP - Z23         | 100168     | 5             | 5  | 2013 |
| Power Meter                  | Agilent      | N1912A            | MY52310061 | 7             | 5  | 2013 |
| Power Sensor Ch A            | Agilent      | N1921A            | MY52260009 | 7             | 5  | 2013 |
| Power Sensor Ch B            | Agilent      | N1921A            | MY52270022 | 7             | 21 | 2013 |
| Power Meter                  | Agilent      | N1912A            | MY50001018 | 8             | 10 | 2013 |

## 4.2. Measurement Uncertainty

Per KDB 865664, when no measured SAR values exceed 1.5 W/kg, measurement uncertainty analysis does not need to be provided in the test report.

## 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 v01

|                                                                                                        | $\leq 3$ 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 v01 (Draft)

|                                                                                                                                                                                                                                                                                                             |                                           |                                                                                             | $\leq 3$ 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.

## **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

|                                                                                                |                                                                                                                                                                                                    |
|------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Intel Centrino Advanced-N 6235<br>(Tested inside of Panasonic Tablet PC FZ-G1)<br>Model: WL12A |                                                                                                                                                                                                    |
| Operating Configuration(s)                                                                     | <ul style="list-style-type: none"><li>Tablet Mode</li></ul>                                                                                                                                        |
| Exposure Condition(s)                                                                          | <ul style="list-style-type: none"><li>The device is used in close proximity to the body. Specific details of the required test positions are provided in Section 8 "Exposure Conditions"</li></ul> |
| Accessory                                                                                      | <ul style="list-style-type: none"><li>None</li></ul>                                                                                                                                               |

### 7.1. Band and Air Interfaces

|                    |                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tx Frequency Bands | <ul style="list-style-type: none"><li>802.11a/b/g/n: 2412 - 2462 MHz, b / g / HT20 / HT40<br/>5150 - 5250 MHz, a / HT20 / HT40<br/>5250 - 5350 MHz, a / HT20 / HT40<br/>5500 - 5700 MHz, a / HT20 / HT40<br/>5725 - 5850 MHz, a / HT20 / HT40</li><li>Bluetooth: 2402 - 2480 MHz</li></ul>                                                                |
| Modulation         | <ul style="list-style-type: none"><li>802.11a/b/g/n : BPSK, QPSK, CCK, 16-QAM and 64-QAM</li><li>Bluetooth 4.0+LE: GFSK, DQPSK, 8-DPSK</li></ul>                                                                                                                                                                                                          |
| Duty Cycle         | <ul style="list-style-type: none"><li>802.11b: 98.9%</li><li>802.11g: 97.7%</li><li>802.11a: 98.3%</li><li>802.11n: Not assessed</li></ul> <p><b>Note:</b> Given the close proximity of the measured duty factors to 100%, scaling to compensate for duty factor was found to have no impact on the measured SAR results and therefore not performed.</p> |

## 7.2. Simultaneous Transmission

| Usage Scenario | Modes                                  | Mode of Operation     | BAND        | 802.11b/g/n WLAN Main | 802.11b/g/n WLAN Aux | 802.11a/n WLAN Main | 802.11a/n WLAN Aux | BT 2.4 GHz |
|----------------|----------------------------------------|-----------------------|-------------|-----------------------|----------------------|---------------------|--------------------|------------|
| Body SAR       | 2.4GHz WLAN SISO + BT (WLAN 1 Tx)      | 802.11b/g/n WLAN Main | 2.4 GHz     | YES                   | No                   | No                  | No                 | YES        |
|                |                                        | 802.11b/g/n WLAN Aux  | 2.4 GHz     | No                    | YES                  | No                  | No                 | No         |
|                | 5 GHz Bands WLAN SISO + BT (WLAN 1 Tx) | 802.11a/n WLAN Main   | 5 GHz Bands | No                    | No                   | YES                 | No                 | YES        |
|                |                                        | 802.11a/n WLAN Aux    | 5 GHz Bands | No                    | No                   | No                  | YES                | No         |
|                | 2.4GHz WLAN MIMO (WLAN 2 Tx)           | 802.11n WLAN Main     | 2.4 GHz     | YES                   | YES                  | No                  | No                 | No         |
|                |                                        | 802.11n WLAN Aux      | 2.4 GHz     | YES                   | YES                  | No                  | No                 | No         |
|                | 5 GHz Bands WLAN MIMO (WLAN 2 Tx)      | 802.11n WLAN Main     | 5 GHz Bands | No                    | No                   | YES                 | YES                | No         |
|                |                                        | 802.11n WLAN Aux      | 5 GHz Bands | No                    | No                   | YES                 | YES                | No         |

### Notes:

1. Bluetooth transmits using the WLAN Aux Antenna
2. Bluetooth can transmit simultaneously with the WLAN Main Antenna, in either of the WLAN bands.
3. Bluetooth cannot transmit simultaneously with the WLAN Aux Antenna, in either of the WLAN bands; this also precludes the transmission of Bluetooth when WLAN is in MIMO mode.
4. With a maximum output power of **4.47 mW** (6.5 dBm), Bluetooth qualifies for Standalone SAR test exclusion based on the formula for Standalone SAR test exclusion considerations outlined in KDB 447498 D01 . For the exact value that this formula yields, please refer to **Section 15 “Simultaneous Transmission SAR Analysis”** of this report.

## 8. Exposure Conditions

Refer to Section 18 “Antenna Dimensions and Separation Distances” for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

### 8.1. Test Configurations for the Main Antenna, SISO and MIMO Modes

| Test Configurations | Antenna-to-edge/surface | SAR Required | Note                                                      |
|---------------------|-------------------------|--------------|-----------------------------------------------------------|
| Rear                | 13mm                    | Yes          |                                                           |
| Front               | -                       | No           | SAR is not required as this is not a typical use scenario |
| Edge 1              | 32mm                    | Yes          |                                                           |
| Edge 2              | 265.5mm                 | No           | Refer to section 13 for SAR exclusion justification       |
| Edge 3              | 139mm                   | No           | Refer to section 13 for SAR exclusion justification       |
| Edge 4              | 5mm                     | Yes          |                                                           |

### 8.2. Test Configurations for the Auxiliary Antenna, SISO and MIMO Modes

| Test Configurations | Antenna-to-edge/surface | SAR Required | Note                                                      |
|---------------------|-------------------------|--------------|-----------------------------------------------------------|
| Rear                | 13mm                    | Yes          |                                                           |
| Front               | -                       | No           | SAR is not required as this is not a typical use scenario |
| Edge 1              | 184.5mm                 | Yes          | Refer to section 13 for SAR exclusion justification       |
| Edge 2              | 228.3mm                 | Yes          | Refer to section 13 for SAR exclusion justification       |
| Edge 3              | 5mm                     | No           |                                                           |
| Edge 4              | 23.7mm                  | No           |                                                           |

#### LEGEND:

- Rear = Back
- Edge 1 = Top Edge
- Edge 2 = Right Edge
- Edge 3 = Bottom Edge
- Edge 4 = Left Edge

#### Note(s):

The antenna to edge/surface distances are with the bumpers removed according to KDB enquiry response.

## 9. Summary of Required Test Modes

### 9.1. Wi-Fi 2.4 GHz Band

| Mode         | Number of Transmitters | Ch. # | Freq. (MHz) | Maximum Target Power from Original Approval (dBm) |      | Maximum Target Power for Host Approval (dBm) |      | SAR Test (Yes/No) | Surfaces/ Edges requiring SAR evaluation |
|--------------|------------------------|-------|-------------|---------------------------------------------------|------|----------------------------------------------|------|-------------------|------------------------------------------|
|              |                        |       |             | Main                                              | Aux  | Main                                         | Aux  |                   |                                          |
| 802.11b      | 1 Tx                   | 1     | 2412        | 16.8                                              |      | 12.0                                         |      | Yes               | Bottom, Edge 1, Edge 4                   |
|              |                        | 6     | 2437        | 16.8                                              |      | 14.5                                         |      |                   |                                          |
|              |                        | 11    | 2462        | 16.8                                              |      | 11.5                                         |      |                   |                                          |
|              |                        | 1     | 2412        |                                                   | 16.6 |                                              | 12.0 | Yes               | Bottom, Edge 3, Edge 4                   |
|              |                        | 6     | 2437        |                                                   | 15.0 |                                              | 15.0 |                   |                                          |
|              |                        | 11    | 2462        |                                                   | 16.0 |                                              | 11.5 |                   |                                          |
| 802.11g      | 1 Tx                   | 1     | 2412        | 14.1                                              |      | 12.0                                         |      | Yes               | Bottom, Edge 1, Edge 4                   |
|              |                        | 6     | 2437        | 16.6                                              |      | 14.5                                         |      |                   |                                          |
|              |                        | 11    | 2462        | 14.0                                              |      | 11.5                                         |      |                   |                                          |
|              |                        | 1     | 2412        |                                                   | 13.9 |                                              | 12.0 | Yes               | Bottom, Edge 3, Edge 4                   |
|              |                        | 6     | 2437        |                                                   | 16.7 |                                              | 15.5 |                   |                                          |
|              |                        | 11    | 2462        |                                                   | 13.5 |                                              | 11.5 |                   |                                          |
| 802.11n HT20 | 1 Tx                   | 1     | 2412        | 13.1                                              |      | 12.0                                         |      | No                | N/A                                      |
|              |                        | 6     | 2437        | 16.5                                              |      | 14.5                                         |      |                   |                                          |
|              |                        | 11    | 2462        | 12.5                                              |      | 11.5                                         |      |                   |                                          |
|              |                        | 1     | 2412        |                                                   | 12.5 |                                              | 11.5 | No                | N/A                                      |
|              |                        | 6     | 2437        |                                                   | 16.6 |                                              | 15.0 |                   |                                          |
|              |                        | 11    | 2462        |                                                   | 12.4 |                                              | 11.5 |                   |                                          |
| 802.11n HT20 | 2 Tx                   | 1     | 2412        | 11.6                                              | 11.6 | 11.5                                         | 11.5 | Yes               | Covered by testing in 802.11b/g          |
|              |                        | 6     | 2437        | 13.3                                              | 13.0 | 12.5                                         | 12.5 |                   |                                          |
|              |                        | 11    | 2462        | 11.1                                              | 10.4 | 10.5                                         | 10.4 |                   |                                          |
| 802.11n HT40 | 1 Tx                   | 3     | 2422        | 10.6                                              |      | 10.6                                         |      | No                | N/A                                      |
|              |                        | 6     | 2437        | 13.6                                              |      | 13.6                                         |      |                   |                                          |
|              |                        | 9     | 2450        | 10.1                                              |      | 10.1                                         |      |                   |                                          |
|              |                        | 3     | 2422        |                                                   | 9.2  |                                              | 9.2  | No                | N/A                                      |
|              |                        | 6     | 2437        |                                                   | 12.7 |                                              | 12.7 |                   |                                          |
|              |                        | 9     | 2450        |                                                   | 10.1 |                                              | 10.1 |                   |                                          |
| 802.11n HT40 | 2 Tx                   | 3     | 2422        | 7.3                                               | 7.0  | 7.3                                          | 7.0  | No                | N/A                                      |
|              |                        | 6     | 2437        | 12.3                                              | 12.3 | 12.3                                         | 12.3 |                   |                                          |
|              |                        | 9     | 2450        | 6.5                                               | 6.7  | 6.5                                          | 6.7  |                   |                                          |

#### Note(s):

- Per KDB 248227, SAR is not required for 802.HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a/b channels.

## 9.2. Wi-Fi 5.2 GHz Band

| Mode         | Number of Transmitters | Ch. # | Freq. (MHz) | Maximum Target Power from Original Approval (dBm) |      | Maximum Target Power for Host Approval (dBm) |      | SAR Test (Yes/No) | Surfaces/ Edges requiring SAR evaluation |
|--------------|------------------------|-------|-------------|---------------------------------------------------|------|----------------------------------------------|------|-------------------|------------------------------------------|
|              |                        |       |             | Main                                              | Aux  | Main                                         | Aux  |                   |                                          |
| 802.11a      | 1 Tx                   | 36    | 5180        | 16.2                                              |      | 13.0                                         |      | Yes               | Bottom, Edge 1, Edge 4                   |
|              |                        | 40    | 5200        | 16.2                                              |      | 15.0                                         |      |                   |                                          |
|              |                        | 44    | 5220        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 48    | 5240        | 15.9                                              |      | 15.0                                         |      |                   |                                          |
|              |                        | 36    | 5180        |                                                   | 15.9 |                                              | 13.0 | Yes               | Bottom, Edge 3, Edge 4                   |
|              |                        | 40    | 5200        |                                                   | 15.8 |                                              | 15.0 |                   |                                          |
|              |                        | 44    | 5220        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 48    | 5240        |                                                   | 15.7 |                                              | 15.0 |                   |                                          |
| 802.11n HT20 | 1 Tx                   | 36    | 5180        | 15.9                                              |      | 13.0                                         |      | No                | N/A                                      |
|              |                        | 40    | 5200        | 16.5                                              |      | 15.0                                         |      |                   |                                          |
|              |                        | 44    | 5220        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 48    | 5240        | 16.4                                              |      | 15.0                                         |      |                   |                                          |
|              |                        | 36    | 5180        |                                                   | 16.0 |                                              | 14.0 | No                | N/A                                      |
|              |                        | 40    | 5200        |                                                   | 16.0 |                                              | 15.0 |                   |                                          |
|              |                        | 44    | 5220        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 48    | 5240        |                                                   | 15.9 |                                              | 15.0 |                   |                                          |
| 802.11n HT20 | 2 Tx                   | 36    | 5180        | 13.3                                              | 13.3 | 12.0                                         | 12.0 | Yes               | Coverd by testing in 802.11a             |
|              |                        | 40    | 5200        | 12.2                                              | 13.2 | 12.0                                         | 12.0 |                   |                                          |
|              |                        | 48    | 5240        | 13.0                                              | 12.9 | 12.0                                         | 12.0 |                   |                                          |
| 802.11n HT40 | 1 Tx                   | 38    | 5190        | 12.8                                              |      | 12.8                                         |      | No                | N/A                                      |
|              |                        | 46    | 5230        | 16.4                                              |      | 14.5                                         |      | No                | N/A                                      |
|              |                        | 38    | 5190        |                                                   | 12.7 |                                              | 12.7 |                   |                                          |
|              |                        | 46    | 5230        |                                                   | 15.8 |                                              | 14.5 |                   |                                          |
| 802.11n HT40 | 2 Tx                   | 38    | 5190        | 10.0                                              | 10.8 | 10.0                                         | 10.8 | No                | N/A                                      |
|              |                        | 46    | 5230        | 13.4                                              | 13.3 | 12.0                                         | 12.0 |                   |                                          |

### Note(s):

- Per KDB 248227, SAR is not required for 802.HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a/b channels.

### 9.3. Wi-Fi 5.3 GHz Band

| Mode         | Number of Transmitters | Ch. # | Freq. (MHz) | Maximum Target Power from Original Approval (dBm) |      | Maximum Target Power for Host Approval (dBm) |      | SAR Test (Yes/No) | Surfaces/ Edges requiring SAR evaluation |
|--------------|------------------------|-------|-------------|---------------------------------------------------|------|----------------------------------------------|------|-------------------|------------------------------------------|
|              |                        |       |             | Main                                              | Aux  | Main                                         | Aux  |                   |                                          |
| 802.11a      | 1 Tx                   | 52    | 5260        | 15.9                                              |      | 15.0                                         |      | Yes               | Bottom, Edge 1, Edge 4                   |
|              |                        | 56    | 5280        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 60    | 5300        | 16.3                                              |      | 15.0                                         |      |                   |                                          |
|              |                        | 64    | 5320        | 16.4                                              |      | 14.5                                         |      |                   |                                          |
|              |                        | 52    | 5260        |                                                   | 15.3 |                                              | 15.0 | Yes               | Bottom, Edge 3, Edge 4                   |
|              |                        | 56    | 5280        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 60    | 5300        |                                                   | 15.4 |                                              | 15.0 |                   |                                          |
|              |                        | 64    | 5320        |                                                   | 15.9 |                                              | 14.5 |                   |                                          |
| 802.11n HT20 | 1 Tx                   | 52    | 5260        | 16.1                                              |      | 15.0                                         |      | No                | N/A                                      |
|              |                        | 60    | 5300        | 16.6                                              |      | 15.0                                         |      |                   |                                          |
|              |                        | 64    | 5320        | 16.6                                              |      | 14.5                                         |      |                   |                                          |
|              |                        | 52    | 5260        |                                                   | 15.4 |                                              | 15.0 | No                | N/A                                      |
|              |                        | 60    | 5300        |                                                   | 15.3 |                                              | 15.0 |                   |                                          |
|              |                        | 64    | 5320        |                                                   | 15.7 |                                              | 14.5 |                   |                                          |
| 802.11n HT20 | 2 Tx                   | 52    | 5260        | 12.7                                              | 12.5 | 12.0                                         | 12.0 | Yes               | Covered by testing in 802.11a            |
|              |                        | 60    | 5300        | 13.2                                              | 12.6 | 12.0                                         | 12.0 |                   |                                          |
|              |                        | 64    | 5320        | 12.9                                              | 13.1 | 12.0                                         | 12.0 |                   |                                          |
| 802.11n HT40 | 1 Tx                   | 54    | 5270        | 16.0                                              |      | 15.0                                         |      | No                | N/A                                      |
|              |                        | 62    | 5310        | 11.5                                              |      | 11.5                                         |      |                   |                                          |
|              |                        | 54    | 5270        |                                                   | 15.2 |                                              | 15.0 | No                | N/A                                      |
|              |                        | 62    | 5310        |                                                   | 12.4 |                                              | 12.4 |                   |                                          |
| 802.11n HT40 | 2 Tx                   | 54    | 5270        | 12.6                                              | 12.5 | 12.0                                         | 12.0 | No                | N/A                                      |
|              |                        | 62    | 5310        | 12.4                                              | 12.3 | 12.4                                         | 12.3 |                   |                                          |

#### Note(s):

- Per KDB 248227, SAR is not required for 802.HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a/b channels.

## 9.4. Wi-Fi 5.5 GHz Band

| Mode         | Number of Transmitters | Ch. # | Freq. (MHz) | Maximum Target Power from Original Approval (dBm) |      | Maximum Target Power for Host Approval (dBm) |      | SAR Test (Yes/No) | Surfaces/ Edges requiring SAR evaluation |
|--------------|------------------------|-------|-------------|---------------------------------------------------|------|----------------------------------------------|------|-------------------|------------------------------------------|
|              |                        |       |             | Main                                              | Aux  | Main                                         | Aux  |                   |                                          |
| 802.11a      | 1 Tx                   | 100   | 5500        | 16.4                                              |      | 15.0                                         |      | Yes               | Bottom, Edge 1, Edge 4                   |
|              |                        | 104   | 5520        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 108   | 5540        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 112   | 5560        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 116   | 5580        | 16.5                                              |      | 15.0                                         |      |                   |                                          |
|              |                        | 120   | 5600        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 124   | 5620        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 128   | 5640        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 132   | 5660        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 136   | 5680        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 140   | 5700        | 16.5                                              |      | 15.0                                         |      |                   |                                          |
|              |                        | 100   | 5500        |                                                   | 15.6 |                                              | 15.0 | Yes               | Bottom, Edge 3, Edge 4                   |
|              |                        | 104   | 5520        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 108   | 5540        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 112   | 5560        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 116   | 5580        |                                                   | 15.7 |                                              | 15.0 |                   |                                          |
|              |                        | 120   | 5600        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 124   | 5620        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 128   | 5640        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 132   | 5660        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 136   | 5680        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 140   | 5700        |                                                   | 15.5 |                                              | 15.0 |                   |                                          |
| 802.11n HT20 | 1 Tx                   | 100   | 5500        | 16.4                                              |      | 15.0                                         |      | No                | N/A                                      |
|              |                        | 116   | 5580        | 16.4                                              |      | 15.0                                         |      |                   |                                          |
|              |                        | 140   | 5700        | 16.3                                              |      | 15.0                                         |      |                   |                                          |
|              |                        | 100   | 5500        |                                                   | 15.6 |                                              | 15.0 | No                | N/A                                      |
|              |                        | 116   | 5580        |                                                   | 15.7 |                                              | 15.0 |                   |                                          |
|              |                        | 140   | 5700        |                                                   | 15.5 |                                              | 15.0 |                   |                                          |
| 802.11n HT20 | 2 Tx                   | 100   | 5500        | 12.7                                              | 13.2 | 12.5                                         | 12.5 | Yes               | Covered by testing in 802.11a            |
|              |                        | 120   | 5600        | 12.7                                              | 13.2 | 12.5                                         | 12.5 |                   |                                          |
|              |                        | 140   | 5700        | 12.4                                              | 12.4 | 12.4                                         | 12.4 |                   |                                          |
| 802.11n HT40 | 1 Tx                   | 102   | 5510        | 15.5                                              |      | 13.5                                         |      | No                | N/A                                      |
|              |                        | 110   | 5550        | 16.5                                              |      | 15.0                                         |      |                   |                                          |
|              |                        | 134   | 5670        | 16.4                                              |      | 15.0                                         |      |                   |                                          |
|              |                        | 102   | 5510        |                                                   | 14.8 |                                              | 13.5 | No                | N/A                                      |
|              |                        | 110   | 5550        |                                                   | 15.8 |                                              | 15.0 |                   |                                          |
|              |                        | 134   | 5670        |                                                   | 15.6 |                                              | 15.0 |                   |                                          |
| 802.11n HT40 | 2 Tx                   | 102   | 5510        | 13.1                                              | 13.0 | 11.5                                         | 11.5 | No                | N/A                                      |
|              |                        | 110   | 5550        | 13.1                                              | 13.2 | 12.5                                         | 12.5 |                   |                                          |
|              |                        | 134   | 5670        | 12.6                                              | 12.8 | 12.5                                         | 12.5 |                   |                                          |

### Note(s):

- Per KDB 248227, SAR is not required for 802.HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a/b channels.

## 9.5. Wi-Fi 5.8 GHz Band

| Mode         | Number of Transmitters | Ch. # | Freq. (MHz) | Maximum Target Power from Original Approval (dBm) |      | Maximum Target Power for Host Approval (dBm) |      | SAR Test (Yes/No) | Surfaces/ Edges requiring SAR evaluation |
|--------------|------------------------|-------|-------------|---------------------------------------------------|------|----------------------------------------------|------|-------------------|------------------------------------------|
|              |                        |       |             | Main                                              | Aux  | Main                                         | Aux  |                   |                                          |
| 802.11a      | 1 Tx                   | 149   | 5745        | 16.5                                              |      | 15.0                                         |      | Yes               | Bottom, Edge 1, Edge 4                   |
|              |                        | 153   | 5765        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 157   | 5785        | 16.5                                              |      | 15.0                                         |      |                   |                                          |
|              |                        | 161   | 5805        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 165   | 5825        | 16.5                                              |      | 15.0                                         |      |                   |                                          |
|              |                        | 149   | 5745        |                                                   | 16.7 |                                              | 15.0 | Yes               | Bottom, Edge 3, Edge 4                   |
|              |                        | 153   | 5765        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 157   | 5785        |                                                   | 16.7 |                                              | 15.0 |                   |                                          |
|              |                        | 161   | 5805        |                                                   |      |                                              |      |                   |                                          |
|              |                        | 165   | 5825        |                                                   | 16.6 |                                              | 14.5 |                   |                                          |
| 802.11n HT20 | 1 Tx                   | 149   | 5745        | 16.6                                              |      | 15.0                                         |      | No                | N/A                                      |
|              |                        | 157   | 5785        | 16.6                                              |      | 15.0                                         |      |                   |                                          |
|              |                        | 165   | 5825        | 16.5                                              |      | 15.0                                         |      |                   |                                          |
|              |                        | 149   | 5745        |                                                   | 16.7 |                                              | 15.0 | No                | N/A                                      |
|              |                        | 157   | 5785        |                                                   | 16.6 |                                              | 15.0 |                   |                                          |
|              |                        | 165   | 5825        |                                                   | 16.6 |                                              | 15.0 |                   |                                          |
| 802.11n HT20 | 2 Tx                   | 149   | 5745        | 13.6                                              | 13.5 | 12.0                                         | 12.0 | Yes               | Covered by testing in 802.11a            |
|              |                        | 157   | 5785        | 13.5                                              | 13.4 | 12.0                                         | 12.0 |                   |                                          |
|              |                        | 165   | 5825        | 13.3                                              | 13.7 | 12.0                                         | 12.0 |                   |                                          |
| 802.11n HT40 | 1 Tx                   | 151   | 5755        | 16.5                                              |      | 15.0                                         |      | No                | N/A                                      |
|              |                        | 159   | 5795        | 16.5                                              |      | 15.0                                         |      | No                | N/A                                      |
|              |                        | 151   | 5755        |                                                   | 16.6 |                                              | 15.0 |                   |                                          |
|              |                        | 159   | 5795        |                                                   | 16.6 |                                              | 15.0 |                   |                                          |
| 802.11n HT40 | 2 Tx                   | 151   | 5755        | 13.5                                              | 13.5 | 12.0                                         | 12.0 | No                | N/A                                      |
|              |                        | 159   | 5795        | 13.5                                              | 13.5 | 12.0                                         | 12.0 |                   |                                          |

### Note(s):

- Per KDB 248227, SAR is not required for 802.HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a/b channels.

## 10. RF Output Power Measurement

### Required Test Channels per KDB 248227 D01

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

▽ = 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.

## 10.1. Wi-Fi 2.4 GHz Band

Tune-up Tolerance: -1.0 dB / +0 dB

| Mode         | Number of Transmitters | Ch # | Freq. (MHz) | Target Avg Pwr (dBm) |      | Measured Avg Pwr (dBm) |      |
|--------------|------------------------|------|-------------|----------------------|------|------------------------|------|
|              |                        |      |             | Main                 | Aux  | Main                   | Aux  |
| 802.11b      | 1 Tx                   | 1    | 2412        | 12.0                 |      | 11.7                   |      |
|              |                        | 6    | 2437        | 14.5                 |      | 14.5                   |      |
|              |                        | 11   | 2462        | 11.5                 |      | 11.3                   |      |
|              |                        | 1    | 2412        |                      | 12.0 |                        | 11.7 |
|              |                        | 6    | 2437        |                      | 15.0 |                        | 15.0 |
|              |                        | 11   | 2462        |                      | 11.5 |                        | 11.5 |
| 802.11g      | 1 Tx                   | 1    | 2412        | 12.0                 |      | 11.8                   |      |
|              |                        | 6    | 2437        | 14.5                 |      | 14.2                   |      |
|              |                        | 11   | 2462        | 11.5                 |      | 11.5                   |      |
|              |                        | 1    | 2412        |                      | 12.0 |                        | 11.7 |
|              |                        | 6    | 2437        |                      | 15.5 |                        | 15.1 |
|              |                        | 11   | 2462        |                      | 11.5 |                        | 11.3 |
| 802.11n HT20 | 2 Tx                   | 1    | 2412        | 11.5                 | 11.5 | 11.3                   | 11.5 |
|              |                        | 6    | 2437        | 12.5                 | 12.5 | 12.2                   | 12.4 |
|              |                        | 11   | 2462        | 10.5                 | 10.4 | 10.4                   | 10.3 |

### 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.
- Cells highlighted in blue under the "Measured Avg Pwr" columns denote:
  - In cases where there are variations between the power of channels within a band, the highest output power channels within the band for the transmit antenna and diversity mode, and are consequently the channels initially selected for SAR evaluation.
  - In cases where there are no variations between the power of channels within a band, the default Required Test Channels as listed in KDB 248227 D01.

## 10.2. Wi-Fi 5.2 GHz Band

Tune-up Tolerance: -1.0 dB / +0 dB

| Mode         | Number of Transmitters | Ch # | Freq. (MHz) | Target Avg Pwr (dBm) |      | Measured Avg Pwr (dBm) |      |
|--------------|------------------------|------|-------------|----------------------|------|------------------------|------|
|              |                        |      |             | Main                 | Aux  | Main                   | Aux  |
| 802.11a      | 1 Tx                   | 36   | 5180        | 13.0                 |      | 12.9                   |      |
|              |                        | 40   | 5200        | 15.0                 |      | 15.0                   |      |
|              |                        | 44   | 5220        |                      |      | 15.0                   |      |
|              |                        | 48   | 5240        | 15.0                 |      | 14.9                   |      |
|              |                        | 36   | 5180        |                      | 13.0 |                        | 12.7 |
|              |                        | 40   | 5200        |                      | 15.0 |                        | 14.8 |
|              |                        | 44   | 5220        |                      |      |                        | 14.7 |
|              |                        | 48   | 5240        |                      | 15.0 |                        | 14.8 |
| 802.11n HT20 | 2 Tx                   | 36   | 5180        | 12.0                 | 12.0 | 11.6                   | 11.7 |
|              |                        | 40   | 5200        | 12.0                 | 12.0 | 11.8                   | 11.7 |
|              |                        | 48   | 5240        | 12.0                 | 12.0 | 11.8                   | 11.7 |

## 10.3. Wi-Fi 5.3 GHz Band

Tune-up Tolerance: -1.0 dB / +0 dB

| Mode         | Number of Transmitters | Ch # | Freq. (MHz) | Target Avg Pwr (dBm) |      | Measured Avg Pwr (dBm) |      |
|--------------|------------------------|------|-------------|----------------------|------|------------------------|------|
|              |                        |      |             | Main                 | Aux  | Main                   | Aux  |
| 802.11a      | 1 Tx                   | 52   | 5260        | 15.0                 |      | 15.0                   |      |
|              |                        | 56   | 5280        |                      |      | 15.0                   |      |
|              |                        | 60   | 5300        | 15.0                 |      | 15.0                   |      |
|              |                        | 64   | 5320        | 14.5                 |      | 14.5                   |      |
|              |                        | 52   | 5260        |                      | 15.0 |                        | 14.8 |
|              |                        | 56   | 5280        |                      |      |                        | 14.9 |
|              |                        | 60   | 5300        |                      | 15.0 |                        | 14.8 |
|              |                        | 64   | 5320        |                      | 14.5 |                        | 14.3 |
| 802.11n HT20 | 2 Tx                   | 52   | 5260        | 12.0                 | 12.0 | 11.7                   | 11.5 |
|              |                        | 60   | 5300        | 12.0                 | 12.0 | 11.6                   | 11.7 |
|              |                        | 64   | 5320        | 12.0                 | 12.0 | 11.7                   | 11.8 |

### Note(s):

- Per KDB 248227 D01, 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.
- Cells highlighted in blue under the "Measured Avg Pwr" columns denote:
  - In cases where there are variations between the power of channels within a band, the highest output power channels within the band for the transmit antenna and diversity mode, and are consequently the channels initially selected for SAR evaluation.
  - In cases where there are no variations between the power of channels within a band, the default Required Test Channels as listed in KDB 248227 D01.

## 10.4. Wi-Fi 5.5 GHz Band

Tune-up Tolerance: -1.0 dB / +0 dB

| Mode         | Number of Transmitters | Ch # | Freq. (MHz) | Target Avg Pwr (dBm) |      | Measured Avg Pwr (dBm) |      |
|--------------|------------------------|------|-------------|----------------------|------|------------------------|------|
|              |                        |      |             | Main                 | Aux  | Main                   | Aux  |
| 802.11a      | 1 Tx                   | 100  | 5500        | 15.0                 |      | 14.9                   |      |
|              |                        | 104  | 5520        |                      |      | 14.9                   |      |
|              |                        | 108  | 5540        |                      |      | 14.8                   |      |
|              |                        | 112  | 5560        |                      |      | 14.6                   |      |
|              |                        | 116  | 5580        | 15.0                 |      | 14.8                   |      |
|              |                        | 120  | 5600        |                      |      | 14.6                   |      |
|              |                        | 124  | 5620        |                      |      | 14.8                   |      |
|              |                        | 128  | 5640        |                      |      | 15.0                   |      |
|              |                        | 132  | 5660        |                      |      | 15.0                   |      |
|              |                        | 136  | 5680        |                      |      | 14.9                   |      |
|              |                        | 140  | 5700        | 15.0                 |      | 14.8                   |      |
|              |                        | 100  | 5500        |                      | 15.0 |                        | 14.9 |
|              |                        | 104  | 5520        |                      |      |                        | 14.6 |
|              |                        | 108  | 5540        |                      |      |                        | 14.6 |
|              |                        | 112  | 5560        |                      |      |                        | 15.0 |
|              |                        | 116  | 5580        |                      | 15.0 |                        | 14.7 |
|              |                        | 120  | 5600        |                      |      |                        | 14.9 |
|              |                        | 124  | 5620        |                      |      |                        | 14.8 |
|              |                        | 128  | 5640        |                      |      |                        | 15.0 |
|              |                        | 132  | 5660        |                      |      |                        | 14.7 |
|              |                        | 136  | 5680        |                      |      |                        | 14.9 |
|              |                        | 140  | 5700        |                      | 15.0 |                        | 15.0 |
| 802.11n HT20 | 2 Tx                   | 100  | 5500        | 12.5                 | 12.5 | 12.4                   | 11.7 |
|              |                        | 120  | 5600        | 12.5                 | 12.5 | 11.9                   | 11.8 |
|              |                        | 140  | 5700        | 12.4                 | 12.4 | 12.0                   | 12.3 |

### Note(s):

- Per KDB 248227 D01, 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.
- Cells highlighted in blue under the "Measured Avg Pwr" columns denote:
  - In cases where there are variations between the power of channels within a band, the highest output power channels within the band for the transmit antenna and diversity mode, and are consequently the channels initially selected for SAR evaluation.
  - In cases where there are no variations between the power of channels within a band, the default Required Test Channels as listed in KDB 248227 D01.

## 10.5. Wi-Fi 5.8 GHz Band

Tune-up Tolerance: -1.0 dB / +0 dB

| Mode         | Number of Transmitters | Ch # | Freq. (MHz) | Target Avg Pwr (dBm) |      | Measured Avg Pwr (dBm) |      |
|--------------|------------------------|------|-------------|----------------------|------|------------------------|------|
|              |                        |      |             | Main                 | Aux  | Main                   | Aux  |
| 802.11a      | 1 Tx                   | 149  | 5745        | 15.0                 |      | 14.9                   |      |
|              |                        | 153  | 5765        |                      |      | 14.8                   |      |
|              |                        | 157  | 5785        | 15.0                 |      | 14.9                   |      |
|              |                        | 161  | 5805        |                      |      | 14.9                   |      |
|              |                        | 165  | 5825        | 15.0                 |      | 15.0                   |      |
|              |                        | 149  | 5745        |                      | 15.0 |                        | 15.0 |
|              |                        | 153  | 5765        |                      |      |                        | 14.9 |
|              |                        | 157  | 5785        |                      | 15.0 |                        | 14.9 |
|              |                        | 161  | 5805        |                      |      |                        | 14.4 |
|              |                        | 165  | 5825        |                      | 14.5 |                        | 14.5 |
| 802.11n HT20 | 2 Tx                   | 149  | 5745        | 12.0                 | 12.0 | 12.0                   | 11.6 |
|              |                        | 157  | 5785        | 12.0                 | 12.0 | 11.9                   | 11.7 |
|              |                        | 165  | 5825        | 12.0                 | 12.0 | 11.9                   | 11.3 |

### Note(s):

- Per KDB 248227 D01, 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.
- Cells highlighted in blue under the "Measured Avg Pwr" columns denote:
  - In cases where there are variations between the power of channels within a band, the highest output power channels within the band for the transmit antenna and diversity mode, and are consequently the channels initially selected for SAR evaluation.
  - In cases where there are no variations between the power of channels within a band, the default Required Test Channels as listed in KDB 248227 D01.

## 11. Tissue Dielectric Properties

IEEE Std 1528-2003 Table 2

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

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| 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           |

## 11.1. 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

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

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

## 11.2. 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.

| Date      | Freq. (MHz) |     | Liquid Parameters |                                         | Measured | Target | Delta (%)    | Limit $\pm$ (%) |
|-----------|-------------|-----|-------------------|-----------------------------------------|----------|--------|--------------|-----------------|
| 1/3/2012  | Body 5180   | e'  | 47.0900           | Relative Permittivity ( $\epsilon_r$ ): | 47.09    | 49.05  | -3.99        | 10              |
|           |             | e'' | 18.4800           | Conductivity ( $\sigma$ ):              | 5.32     | 5.27   | 0.97         | 5               |
|           | Body 5200   | e'  | 47.1300           | Relative Permittivity ( $\epsilon_r$ ): | 47.13    | 49.02  | -3.85        | 10              |
|           |             | e'' | 18.5400           | Conductivity ( $\sigma$ ):              | 5.36     | 5.29   | 1.24         | 5               |
|           | Body 5600   | e'  | 46.5400           | Relative Permittivity ( $\epsilon_r$ ): | 46.54    | 48.48  | -4.00        | 10              |
|           |             | e'' | 18.8400           | Conductivity ( $\sigma$ ):              | 5.87     | 5.76   | 1.83         | 5               |
|           | Body 5800   | e'  | 46.3500           | Relative Permittivity ( $\epsilon_r$ ): | 46.35    | 48.20  | -3.84        | 10              |
|           |             | e'' | 19.1100           | Conductivity ( $\sigma$ ):              | 6.16     | 6.00   | 2.72         | 5               |
|           | Body 5825   | e'  | 46.2600           | Relative Permittivity ( $\epsilon_r$ ): | 46.26    | 48.20  | -4.02        | 10              |
|           |             | e'' | 19.0900           | Conductivity ( $\sigma$ ):              | 6.18     | 6.00   | 3.05         | 5               |
| 1/7/2013  | Body 5180   | e'  | 47.3200           | Relative Permittivity ( $\epsilon_r$ ): | 47.32    | 49.05  | -3.52        | 10              |
|           |             | e'' | 18.6000           | Conductivity ( $\sigma$ ):              | 5.36     | 5.27   | 1.63         | 5               |
|           | Body 5200   | e'  | 47.2600           | Relative Permittivity ( $\epsilon_r$ ): | 47.26    | 49.02  | -3.59        | 10              |
|           |             | e'' | 18.6300           | Conductivity ( $\sigma$ ):              | 5.39     | 5.29   | 1.74         | 5               |
|           | Body 5600   | e'  | 46.6200           | Relative Permittivity ( $\epsilon_r$ ): | 46.62    | 48.48  | -3.83        | 10              |
|           |             | e'' | 18.9700           | Conductivity ( $\sigma$ ):              | 5.91     | 5.76   | 2.53         | 5               |
|           | Body 5800   | e'  | 46.3100           | Relative Permittivity ( $\epsilon_r$ ): | 46.31    | 48.20  | -3.92        | 10              |
|           |             | e'' | 19.1400           | Conductivity ( $\sigma$ ):              | 6.17     | 6.00   | 2.88         | 5               |
|           | Body 5825   | e'  | 46.2500           | Relative Permittivity ( $\epsilon_r$ ): | 46.25    | 48.20  | <b>-4.05</b> | 10              |
|           |             | e'' | 19.1900           | Conductivity ( $\sigma$ ):              | 6.22     | 6.00   | 3.59         | 5               |
| 1/11/2013 | Body 2450   | e'  | 51.4200           | Relative Permittivity ( $\epsilon_r$ ): | 51.42    | 52.70  | -2.43        | 5               |
|           |             | e'' | 14.1100           | Conductivity ( $\sigma$ ):              | 1.92     | 1.95   | -1.43        | 5               |
|           | Body 2410   | e'  | 51.5200           | Relative Permittivity ( $\epsilon_r$ ): | 51.52    | 52.76  | -2.35        | 5               |
|           |             | e'' | 13.9400           | Conductivity ( $\sigma$ ):              | 1.87     | 1.91   | -2.07        | 5               |
|           | Body 2475   | e'  | 51.3900           | Relative Permittivity ( $\epsilon_r$ ): | 51.39    | 52.67  | -2.43        | 5               |
|           |             | e'' | 14.3300           | Conductivity ( $\sigma$ ):              | 1.97     | 1.99   | -0.66        | 5               |
| 1/14/2013 | Body 2450   | e'  | 52.2300           | Relative Permittivity ( $\epsilon_r$ ): | 52.23    | 52.70  | -0.89        | 5               |
|           |             | e'' | 14.5500           | Conductivity ( $\sigma$ ):              | 1.98     | 1.95   | 1.65         | 5               |
|           | Body 2410   | e'  | 52.4000           | Relative Permittivity ( $\epsilon_r$ ): | 52.40    | 52.76  | -0.68        | 5               |
|           |             | e'' | 14.4600           | Conductivity ( $\sigma$ ):              | 1.94     | 1.91   | 1.58         | 5               |
|           | Body 2475   | e'  | 52.1600           | Relative Permittivity ( $\epsilon_r$ ): | 52.16    | 52.67  | -0.97        | 5               |
|           |             | e'' | 14.7300           | Conductivity ( $\sigma$ ):              | 2.03     | 1.99   | 2.11         | 5               |

**Tissue Dielectric Parameter Check Results (continued)**

| Date      | Freq. (MHz) | Liquid Parameters |                                         |                                         | Measured | Target | Delta (%) | Limit ±(%) |
|-----------|-------------|-------------------|-----------------------------------------|-----------------------------------------|----------|--------|-----------|------------|
| 1/15/2013 | Body 5180   | e'                | 47.7300                                 | Relative Permittivity ( $\epsilon_r$ ): | 47.73    | 49.05  | -2.68     | 10         |
|           |             | e"                | 18.1200                                 | Conductivity ( $\sigma$ ):              | 5.22     | 5.27   | -0.99     | 5          |
|           | Body 5200   | e'                | 47.6900                                 | Relative Permittivity ( $\epsilon_r$ ): | 47.69    | 49.02  | -2.71     | 10         |
|           |             | e"                | 18.1400                                 | Conductivity ( $\sigma$ ):              | 5.24     | 5.29   | -0.94     | 5          |
|           | Body 5600   | e'                | 47.0600                                 | Relative Permittivity ( $\epsilon_r$ ): | 47.06    | 48.48  | -2.92     | 10         |
|           |             | e"                | 18.5400                                 | Conductivity ( $\sigma$ ):              | 5.77     | 5.76   | 0.21      | 5          |
|           | Body 5800   | e'                | 46.7400                                 | Relative Permittivity ( $\epsilon_r$ ): | 46.74    | 48.20  | -3.03     | 10         |
|           |             | e"                | 18.7800                                 | Conductivity ( $\sigma$ ):              | 6.06     | 6.00   | 0.94      | 5          |
|           | Body 5825   | e'                | 46.7100                                 | Relative Permittivity ( $\epsilon_r$ ): | 46.71    | 48.20  | -3.09     | 10         |
|           |             | e"                | 18.8000                                 | Conductivity ( $\sigma$ ):              | 6.09     | 6.00   | 1.48      | 5          |
| 1/16/2013 | Body 2450   | e'                | 50.7000                                 | Relative Permittivity ( $\epsilon_r$ ): | 50.70    | 52.70  | -3.80     | 5          |
|           |             | e"                | 14.4700                                 | Conductivity ( $\sigma$ ):              | 1.97     | 1.95   | 1.09      | 5          |
|           | Body 2410   | e'                | 50.8000                                 | Relative Permittivity ( $\epsilon_r$ ): | 50.80    | 52.76  | -3.71     | 5          |
|           |             | e"                | 14.3100                                 | Conductivity ( $\sigma$ ):              | 1.92     | 1.91   | 0.53      | 5          |
|           | Body 2475   | e'                | 50.6000                                 | Relative Permittivity ( $\epsilon_r$ ): | 50.60    | 52.67  | -3.93     | 5          |
|           |             | e"                | 14.4800                                 | Conductivity ( $\sigma$ ):              | 1.99     | 1.99   | 0.38      | 5          |
| 1/23/2013 | Body 2450   | e'                | 53.0900                                 | Relative Permittivity ( $\epsilon_r$ ): | 53.09    | 52.70  | 0.74      | 5          |
|           |             | e"                | 14.3800                                 | Conductivity ( $\sigma$ ):              | 1.96     | 1.95   | 0.46      | 5          |
|           | Body 2410   | e'                | 53.2200                                 | Relative Permittivity ( $\epsilon_r$ ): | 53.22    | 52.76  | 0.87      | 5          |
|           |             | e"                | 14.2900                                 | Conductivity ( $\sigma$ ):              | 1.91     | 1.91   | 0.39      | 5          |
|           | Body 2475   | e'                | 52.9900                                 | Relative Permittivity ( $\epsilon_r$ ): | 52.99    | 52.67  | 0.61      | 5          |
|           |             | e"                | 14.3900                                 | Conductivity ( $\sigma$ ):              | 1.98     | 1.99   | -0.24     | 5          |
| 2/13/2013 | Body 5180   | e'                | 49.4600                                 | Relative Permittivity ( $\epsilon_r$ ): | 49.46    | 49.05  | 0.84      | 10         |
|           |             | e"                | 17.5100                                 | Conductivity ( $\sigma$ ):              | 5.04     | 5.27   | -4.33     | 5          |
|           | Body 5200   | e'                | 49.4100                                 | Relative Permittivity ( $\epsilon_r$ ): | 49.41    | 49.02  | 0.80      | 10         |
|           |             | e"                | 17.5100                                 | Conductivity ( $\sigma$ ):              | 5.06     | 5.29   | -4.38     | 5          |
|           | Body 5600   | e'                | 48.8800                                 | Relative Permittivity ( $\epsilon_r$ ): | 48.88    | 48.48  | 0.83      | 10         |
|           |             | e"                | 17.8500                                 | Conductivity ( $\sigma$ ):              | 5.56     | 5.76   | -3.52     | 5          |
|           | Body 5800   | e'                | 48.6500                                 | Relative Permittivity ( $\epsilon_r$ ): | 48.65    | 48.20  | 0.93      | 10         |
|           |             | e"                | 18.0400                                 | Conductivity ( $\sigma$ ):              | 5.82     | 6.00   | -3.04     | 5          |
| Body 5825 | e'          | 48.6200           | Relative Permittivity ( $\epsilon_r$ ): | 48.62                                   | 48.20    | 0.87   | 10        |            |
|           | e"          | 18.0400           | Conductivity ( $\sigma$ ):              | 5.84                                    | 6.00     | -2.62  | 5         |            |
| 2/14/2013 | Body 2450   | e'                | 50.5000                                 | Relative Permittivity ( $\epsilon_r$ ): | 50.50    | 52.70  | -4.17     | 5          |
|           |             | e"                | 14.4600                                 | Conductivity ( $\sigma$ ):              | 1.97     | 1.95   | 1.02      | 5          |
|           | Body 2410   | e'                | 50.6500                                 | Relative Permittivity ( $\epsilon_r$ ): | 50.65    | 52.76  | -4.00     | 5          |
|           |             | e"                | 14.3200                                 | Conductivity ( $\sigma$ ):              | 1.92     | 1.91   | 0.60      | 5          |
|           | Body 2475   | e'                | 50.4400                                 | Relative Permittivity ( $\epsilon_r$ ): | 50.44    | 52.67  | -4.23     | 5          |
|           |             | e"                | 14.5400                                 | Conductivity ( $\sigma$ ):              | 2.00     | 1.99   | 0.80      | 5          |
| 2/19/2013 | Body 5180   | e'                | 48.2600                                 | Relative Permittivity ( $\epsilon_r$ ): | 48.26    | 49.05  | -1.60     | 10         |
|           |             | e"                | 18.5300                                 | Conductivity ( $\sigma$ ):              | 5.34     | 5.27   | 1.25      | 5          |
|           | Body 5200   | e'                | 48.2200                                 | Relative Permittivity ( $\epsilon_r$ ): | 48.22    | 49.02  | -1.63     | 10         |
|           |             | e"                | 18.5500                                 | Conductivity ( $\sigma$ ):              | 5.36     | 5.29   | 1.30      | 5          |
|           | Body 5600   | e'                | 47.6000                                 | Relative Permittivity ( $\epsilon_r$ ): | 47.60    | 48.48  | -1.81     | 10         |
|           |             | e"                | 19.0000                                 | Conductivity ( $\sigma$ ):              | 5.92     | 5.76   | 2.69      | 5          |
|           | Body 5800   | e'                | 47.2000                                 | Relative Permittivity ( $\epsilon_r$ ): | 47.20    | 48.20  | -2.07     | 10         |
|           |             | e"                | 19.2000                                 | Conductivity ( $\sigma$ ):              | 6.19     | 6.00   | 3.20      | 5          |
| Body 5825 | e'          | 47.1800           | Relative Permittivity ( $\epsilon_r$ ): | 47.18                                   | 48.20    | -2.12  | 10        |            |
|           | e"          | 19.2200           | Conductivity ( $\sigma$ ):              | 6.23                                    | 6.00     | 3.75   | 5         |            |

**Tissue Dielectric Parameter Check Results (continued)**

| Date      | Freq. (MHz) | Liquid Parameters |         |                                         | Measured | Target | Delta (%) | Limit ±(%) |
|-----------|-------------|-------------------|---------|-----------------------------------------|----------|--------|-----------|------------|
| 2/28/2013 | Body 2450   | e'                | 51.1300 | Relative Permittivity ( $\epsilon_r$ ): | 51.13    | 52.70  | -2.98     | 5          |
|           |             | e''               | 14.0200 | Conductivity ( $\sigma$ ):              | 1.91     | 1.95   | -2.06     | 5          |
|           | Body 2410   | e'                | 51.2500 | Relative Permittivity ( $\epsilon_r$ ): | 51.25    | 52.76  | -2.86     | 5          |
|           |             | e''               | 13.8600 | Conductivity ( $\sigma$ ):              | 1.86     | 1.91   | -2.63     | 5          |
|           | Body 2475   | e'                | 51.0300 | Relative Permittivity ( $\epsilon_r$ ): | 51.03    | 52.67  | -3.11     | 5          |
|           |             | e''               | 14.1100 | Conductivity ( $\sigma$ ):              | 1.94     | 1.99   | -2.18     | 5          |

## 12. 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.

### 12.1. 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  $\pm 0.5$  cm for SAR measurements  $\leq 3$  GHz and  $\geq 10.0$  cm  $\pm 0.5$  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.

### 12.2. 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 |
| D2450V2       | 706        | 4/11/2012 | 2450        | 1g                       | 51.2 | 49.6 |
|               |            |           |             | 10g                      | 23.9 | 23.4 |
| D2450V2       | 899        | 10/5/12   | 2450        | 1g                       | 53.6 | 51.7 |
|               |            |           |             | 10g                      | 25.0 | 24.3 |
| D5GHV2        | 1003       | 9/18/2012 | 5.2GHz      | 1g                       | 76.5 | 74.8 |
|               |            |           |             | 10g                      | 21.9 | 20.9 |
|               |            |           | 5.6GHz      | 1g                       | 82.8 | 79.0 |
|               |            |           |             | 10g                      | 23.6 | 22.0 |
|               |            |           | 5.8GHz      | 1g                       | 76.9 | 77.0 |
|               |            |           |             | 10g                      | 22.0 | 21.4 |
| D5GHV2        | 1138       | 10/9/2012 | 5.2GHz      | 1g                       | 79.5 | 73.2 |
|               |            |           |             | 10g                      | 22.8 | 20.4 |
|               |            |           | 5.5 GHz     | 1g                       | 83.6 | 77.9 |
|               |            |           |             | 10g                      | 23.8 | 21.7 |
|               |            |           | 5.8GHz      | 1g                       | 78.7 | 72.8 |
|               |            |           |             | 10g                      | 22.4 | 20.1 |

## 12.3. 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.

| Date Tested | System Dipole      |          | T.S.<br>Liquid |     | Measured Results |              |                     | Target<br>(Ref.<br>Value) | Delta<br>±10 % | Est./Zoom<br>Ratio<br>±3 % |
|-------------|--------------------|----------|----------------|-----|------------------|--------------|---------------------|---------------------------|----------------|----------------------------|
|             | Type               | Serial # |                |     | Area<br>Scan     | Zoom<br>Scan | Normalize<br>to 1 W |                           |                |                            |
| 1/3/2013    | D5GHzV2<br>5.2 GHz | 1138     | Body           | 1g  | 7.02             | 7.70         | 77.0                | 73.2                      | 5.19           | -9.69                      |
|             |                    |          |                | 10g | 2.01             | 2.18         | 21.8                | 20.4                      | 6.86           |                            |
| 1/3/2013    | D5GHzV2<br>5.6 GHz | 1138     | Body           | 1g  | 7.73             | 8.34         | 83.4                | 77.9                      | 7.06           | -7.89                      |
|             |                    |          |                | 10g | 2.10             | 2.31         | 23.1                | 21.7                      | 6.45           |                            |
| 1/3/2013    | D5GHzV2<br>5.8 GHz | 1138     | Body           | 1g  | 7.07             | 7.89         | 78.9                | 72.8                      | 8.38           | -11.60                     |
|             |                    |          |                | 10g | 1.97             | 2.20         | 22.0                | 20.1                      | 9.45           |                            |
| 1/7/2013    | D5GHzV2<br>5.2 GHz | 1138     | Body           | 1g  | 6.87             | 7.44         | 74.4                | 73.2                      | 1.64           | -8.30                      |
|             |                    |          |                | 10g | 1.93             | 2.11         | 21.1                | 20.4                      | 3.43           |                            |
| 1/7/2013    | D5GHzV2<br>5.6 GHz | 1138     | Body           | 1g  | 7.19             | 7.87         | 78.7                | 77.9                      | 1.03           | -9.46                      |
|             |                    |          |                | 10g | 2.00             | 2.18         | 21.8                | 21.7                      | 0.46           |                            |
| 1/7/2013    | D5GHzV2<br>5.8 GHz | 1138     | Body           | 1g  | 6.31             | 7.09         | 70.9                | 72.8                      | -2.61          | -12.36                     |
|             |                    |          |                | 10g | 1.76             | 1.96         | 19.6                | 20.1                      | -2.49          |                            |
| 1/11/2013   | D2450V2            | 706      | Body           | 1g  | 5.11             | 5.05         | 50.5                | 49.6                      | 1.81           | 1.17                       |
|             |                    |          |                | 10g | 2.21             | 2.28         | 22.8                | 23.4                      | -2.56          |                            |
| 1/14/2013   | D2450V2            | 706      | Body           | 1g  | 5.17             | 5.18         | 51.8                | 49.6                      | 4.44           | -0.19                      |
|             |                    |          |                | 10g | 2.22             | 2.39         | 23.9                | 23.4                      | 2.14           |                            |
| 1/15/2013   | D5GHzV2<br>5.2 GHz | 1003     | Body           | 1g  | 7.30             | 7.81         | 78.1                | 74.8                      | 4.41           | -6.99                      |
|             |                    |          |                | 10g | 1.99             | 2.19         | 21.9                | 20.9                      | 4.78           |                            |
| 1/15/2013   | D5GHzV2<br>5.6 GHz | 1003     | Body           | 1g  | 6.54             | 7.54         | 75.4                | 79.0                      | -4.56          | -15.29                     |
|             |                    |          |                | 10g | 1.80             | 2.07         | 20.7                | 22.0                      | -5.91          |                            |
| 1/15/2013   | D5GHzV2<br>5.8 GHz | 1003     | Body           | 1g  | 6.04             | 7.04         | 70.4                | 77.0                      | -8.57          | -16.56                     |
|             |                    |          |                | 10g | 1.66             | 1.98         | 19.8                | 21.4                      | -7.48          |                            |
| 1/15/2013   | D5GHzV2<br>5.2 GHz | 1003     | Body           | 1g  | 7.22             | 7.56         | 75.6                | 74.8                      | 1.07           | -4.71                      |
|             |                    |          |                | 10g | 1.98             | 2.14         | 21.4                | 20.9                      | 2.39           |                            |
| 1/15/2013   | D5GHzV2<br>5.6 GHz | 1003     | Body           | 1g  | 8.58             | 8.06         | 80.6                | 79.0                      | 2.03           | 6.06                       |
|             |                    |          |                | 10g | 2.30             | 2.24         | 22.4                | 22.0                      | 1.82           |                            |
| 1/15/2013   | D5GHzV2<br>5.8 GHz | 1003     | Body           | 1g  | 8.44             | 7.52         | 75.2                | 77.0                      | -2.34          | 10.90                      |
|             |                    |          |                | 10g | 2.27             | 2.09         | 20.9                | 21.4                      | -2.34          |                            |
| 1/16/2013   | D2450V2            | 706      | Body           | 1g  | 5.09             | 5.08         | 50.8                | 49.6                      | 2.42           | 0.20                       |
|             |                    |          |                | 10g | 2.20             | 2.36         | 23.6                | 23.4                      | 0.85           |                            |
| 1/24/2013   | D2450V2            | 706      | Body           | 1g  | 4.99             | 5.07         | 50.7                | 49.6                      | 2.22           | -1.60                      |
|             |                    |          |                | 10g | 2.13             | 2.34         | 23.4                | 23.4                      | 0.00           |                            |
| 2/13/2013   | D5GHzV2<br>5.2 GHz | 1138     | Body           | 1g  | 7.23             | 7.61         | 76.1                | 73.2                      | 3.96           | -5.26                      |
|             |                    |          |                | 10g | 1.98             | 2.15         | 21.5                | 20.4                      | 5.39           |                            |
| 2/13/2013   | D5GHzV2<br>5.6 GHz | 1138     | Body           | 1g  | 7.74             | 7.97         | 79.7                | 77.9                      | 2.31           | -2.97                      |
|             |                    |          |                | 10g | 2.07             | 2.21         | 22.1                | 21.7                      | 1.84           |                            |
| 2/13/2013   | D5GHzV2<br>5.8 GHz | 1138     | Body           | 1g  | 6.77             | 7.09         | 70.9                | 72.8                      | -2.61          | -4.73                      |
|             |                    |          |                | 10g | 1.82             | 1.97         | 19.7                | 20.1                      | -1.99          |                            |
| 2/14/2013   | D2450V2            | 899      | Body           | 1g  | 5.35             | 5.38         | 53.8                | 51.7                      | 4.06           | -0.56                      |
|             |                    |          |                | 10g | 2.31             | 2.48         | 24.8                | 24.3                      | 2.06           |                            |
| 2/20/2013   | D2450V2            | 899      | Body           | 1g  | 5.19             | 5.24         | 52.4                | 51.7                      | 1.35           | -0.96                      |
|             |                    |          |                | 10g | 2.26             | 2.43         | 24.3                | 24.3                      | 0.00           |                            |

**System Performance Check Results continued**

| Date Tested | System Dipole      |          | T.S.<br>Liquid |     | Measured Results |              |                     | Target<br>(Ref.<br>Value) | Delta<br>±10 % | Est./Zoom<br>Ratio<br>±3 % |
|-------------|--------------------|----------|----------------|-----|------------------|--------------|---------------------|---------------------------|----------------|----------------------------|
|             | Type               | Serial # |                |     | Area<br>Scan     | Zoom<br>Scan | Normalize<br>to 1 W |                           |                |                            |
| 2/19/2013   | D5GHzV2<br>5.2 GHz | 1003     | Body           | 1g  | 6.69             | 7.02         | 70.2                | 74.8                      | -6.15          | -4.93                      |
|             |                    |          |                | 10g | 1.82             | 1.98         | 19.8                | 20.9                      | -5.26          |                            |
| 2/19/2013   | D5GHzV2<br>5.6 GHz | 1003     | Body           | 1g  | 7.33             | 7.80         | 78.0                | 79.0                      | -1.27          | -6.41                      |
|             |                    |          |                | 10g | 1.95             | 2.15         | 21.5                | 22.0                      | -2.27          |                            |
| 2/19/2013   | D5GHzV2<br>5.8 GHz | 1003     | Body           | 1g  | 6.72             | 7.31         | 73.1                | 77.0                      | -5.06          | -8.78                      |
|             |                    |          |                | 10g | 1.81             | 2.03         | 20.3                | 21.4                      | -5.14          |                            |
| 2/28/2013   | D2450V2            | 706      | Body           | 1g  | 5.27             | 5.33         | 53.3                | 49.6                      | 7.46           | -1.14                      |
|             |                    |          |                | 10g | 2.29             | 2.46         | 24.6                | 23.4                      | 5.13           |                            |

## 13. SAR Test Results

### 13.1. Standalone SAR Test Exclusion Considerations

Standalone SAR test exclusion was based upon the following criteria:

1. If the antenna to DUT adjacent edge or bottom separation distance is < 50mm a distance of 5mm is used to determine SAR exclusion and estimated SAR value
2. If the antenna to DUT adjacent edge or bottom separation distance is >50mm the actual antenna to user separation distance is used to determine SAR exclusion and estimated SAR value
3. As the SISO (1 Tx) mode powers are higher than the MIMO (2Tx) powers separate testing of the MIMO (2 Tx) SAR was considered unnecessary. The reported stand-alone values for 1Tx mode are used to cover simultaneous conditions.
4. Despite its qualifications for test exclusion on all surfaces and edges, SAR measurement was performed for Bluetooth at Edge 4 because the estimated value at this edge was deemed overly conservative

#### 13.1.1. SAR exclusion calculations for Wi-Fi SISO (1 Tx) and Bluetooth for antenna <50mm from the user

| Antenna                        | Tx        | Frequency<br>(MHz) | Output power <sup>Note 2, 4</sup> |    | Separation distances (mm) <sup>Note 1 and 4</sup> |        |        |        |        |       | Calculated Threshold Value |         |         |         |        |       |
|--------------------------------|-----------|--------------------|-----------------------------------|----|---------------------------------------------------|--------|--------|--------|--------|-------|----------------------------|---------|---------|---------|--------|-------|
|                                |           |                    | dBm                               | mW | Bottom                                            | Edge 1 | Edge 2 | Edge 3 | Edge 4 | Front | Bottom                     | Edge 1  | Edge 2  | Edge 3  | Edge 4 | Front |
| WiFi - Main Antenna            |           |                    |                                   |    |                                                   |        |        |        |        |       |                            |         |         |         |        |       |
| WLAN Main                      | WiFi      | 2412               | 14.50                             | 28 | 5                                                 | 5      | 265.5  | 139    | 5      |       | 8.7                        | 8.7     | > 50 mm | > 50 mm | 8.7    | N/A   |
| WLAN Main                      | WiFi      | 5180               | 15.00                             | 32 | 5                                                 | 5      | 265.5  | 139    | 5      |       | 14.6                       | 14.6    | > 50 mm | > 50 mm | 14.6   | N/A   |
| WLAN Main                      | WiFi      | 5260               | 15.00                             | 32 | 5                                                 | 5      | 265.5  | 139    | 5      |       | 14.7                       | 14.7    | > 50 mm | > 50 mm | 14.7   | N/A   |
| WLAN Main                      | WiFi      | 5500               | 15.00                             | 32 | 5                                                 | 5      | 265.5  | 139    | 5      |       | 15.0                       | 15.0    | > 50 mm | > 50 mm | 15.0   | N/A   |
| WLAN Main                      | WiFi      | 5745               | 15.00                             | 32 | 5                                                 | 5      | 265.5  | 139    | 5      |       | 15.3                       | 15.3    | > 50 mm | > 50 mm | 15.3   | N/A   |
| Bluetooth / WiFi - Aux Antenna |           |                    |                                   |    |                                                   |        |        |        |        |       |                            |         |         |         |        |       |
| WLAN Aux                       | WiFi      | 2412               | 15.50                             | 35 | 5                                                 | 184.5  | 228.3  | 5      | 5      |       | 10.9                       | > 50 mm | > 50 mm | 10.9    | 10.9   | N/A   |
| WLAN Aux                       | WiFi      | 5180               | 15.00                             | 32 | 5                                                 | 184.5  | 228.3  | 5      | 5      |       | 14.6                       | > 50 mm | > 50 mm | 14.6    | 14.6   | N/A   |
| WLAN Aux                       | WiFi      | 5260               | 15.00                             | 32 | 5                                                 | 184.5  | 228.3  | 5      | 5      |       | 14.7                       | > 50 mm | > 50 mm | 14.7    | 14.7   | N/A   |
| WLAN Aux                       | WiFi      | 5500               | 15.00                             | 32 | 5                                                 | 184.5  | 228.3  | 5      | 5      |       | 15.0                       | > 50 mm | > 50 mm | 15.0    | 15.0   | N/A   |
| WLAN Aux                       | WiFi      | 5745               | 15.00                             | 32 | 5                                                 | 184.5  | 228.3  | 5      | 5      |       | 15.3                       | > 50 mm | > 50 mm | 15.3    | 15.3   | N/A   |
| WLAN Aux                       | Bluetooth | 2402               | 6.50                              | 4  | 5                                                 | 184.5  | 228.3  | 5      | 5      |       | 0.2                        | > 50 mm | > 50 mm | 0.2     | 0.2    | N/A   |

#### Note(s):

1. According to KDB 447498, if the calculated threshold value is >3 then SAR testing is required.
2. SAR exclusion was not assessed for 2 Tx (MIMO) as the higher 1 Tx (SISO) SAR values were used for simultaneous transmission analysis.

### 13.1.2. SAR exclusion calculations for Wi-Fi SISO (1 Tx) and Bluetooth for antenna >50mm from the user

| Antenna                        | Tx        | Frequency<br>(MHz) | Output power |    | Separation distances (mm) |        |        |        |        |       | Power Threshold (mW) |         |        |         |         |       |
|--------------------------------|-----------|--------------------|--------------|----|---------------------------|--------|--------|--------|--------|-------|----------------------|---------|--------|---------|---------|-------|
|                                |           |                    | dBm          | mW | Bottom                    | Edge 1 | Edge 2 | Edge 3 | Edge 4 | Front | Bottom               | Edge 1  | Edge 2 | Edge 3  | Edge 4  | Front |
| WiFi - Main Antenna            |           |                    |              |    |                           |        |        |        |        |       |                      |         |        |         |         |       |
| WLAN Main                      | WiFi      | 2412               | 14.50        | 28 | 5                         | 5      | 265.5  | 139    | 5      |       | < 50 mm              | < 50 mm | 2252   | 987     | < 50 mm | N/A   |
| WLAN Main                      | WiFi      | 5180               | 15.00        | 32 | 5                         | 5      | 265.5  | 139    | 5      |       | < 50 mm              | < 50 mm | 2221   | 956     | < 50 mm | N/A   |
| WLAN Main                      | WiFi      | 5260               | 15.00        | 32 | 5                         | 5      | 265.5  | 139    | 5      |       | < 50 mm              | < 50 mm | 2220   | 955     | < 50 mm | N/A   |
| WLAN Main                      | WiFi      | 5500               | 15.00        | 32 | 5                         | 5      | 265.5  | 139    | 5      |       | < 50 mm              | < 50 mm | 2219   | 954     | < 50 mm | N/A   |
| WLAN Main                      | WiFi      | 5745               | 15.00        | 32 | 5                         | 5      | 265.5  | 139    | 5      |       | < 50 mm              | < 50 mm | 2218   | 953     | < 50 mm | N/A   |
| Bluetooth / WiFi - Aux Antenna |           |                    |              |    |                           |        |        |        |        |       |                      |         |        |         |         |       |
| WLAN Aux                       | WiFi      | 2412               | 15.50        | 35 | 5                         | 184.5  | 228.3  | 5      | 5      |       | < 50 mm              | 1442    | 1880   | < 50 mm | < 50 mm | N/A   |
| WLAN Aux                       | WiFi      | 5180               | 15.00        | 32 | 5                         | 184.5  | 228.3  | 5      | 5      |       | < 50 mm              | 1411    | 1849   | < 50 mm | < 50 mm | N/A   |
| WLAN Aux                       | WiFi      | 5260               | 15.00        | 32 | 5                         | 184.5  | 228.3  | 5      | 5      |       | < 50 mm              | 1410    | 1848   | < 50 mm | < 50 mm | N/A   |
| WLAN Aux                       | WiFi      | 5500               | 15.00        | 32 | 5                         | 184.5  | 228.3  | 5      | 5      |       | < 50 mm              | 1409    | 1847   | < 50 mm | < 50 mm | N/A   |
| WLAN Aux                       | WiFi      | 5745               | 15.00        | 32 | 5                         | 184.5  | 228.3  | 5      | 5      |       | < 50 mm              | 1408    | 1846   | < 50 mm | < 50 mm | N/A   |
| WLAN Aux                       | Bluetooth | 2402               | 6.50         | 4  | 5                         | 184.5  | 228.3  | 5      | 5      |       | < 50 mm              | 1442    | 1880   | < 50 mm | < 50 mm | N/A   |

#### Note(s):

1. According to KDB 447498, if the calculated Power threshold is less than the output power then SAR testing is required.
2. SAR exclusion was not assessed for 2 Tx (MIMO) as the higher 1 Tx (SISO) SAR values were used for simultaneous transmission analysis

#### Conclusion:

- As the calculated Power Threshold is greater than the DUT output power for Edge2 and 3 for the main antenna and for Edge 1 and 2 for the aux antenna SAR testing is not required for these configurations

## 13.2. Estimated SAR for Simultaneous Transmission SAR Analysis

### Considerations for using estimated SAR values:

1. If the antenna to DUT adjacent edge or bottom separation distance is < 50mm a distance of 5mm is used to determine SAR estimated SAR value.
2. If the antenna to DUT adjacent edge or bottom separation distance is >50mm the actual antenna to user separation distance is used to determine SAR estimated SAR value.
3. Output power is the maximum rated power (including tune-up or manufacturing tolerances) and includes source-based averaging.
4. If the antenna separation distance is > 50mm then the estimated SAR value is the lesser of the estimated value at 50mm or 0.4 W/Kg.
5. Formulas round separation distance to nearest mm and power to nearest mW before calculating estimated SAR

### 13.2.1. Estimated SAR for Wi-Fi 1 Tx (SISO)

| Antenna                               | Tx        | Frequency (MHz) | Output power <sup>Note 2, 4</sup> |    | Separation distances (mm) <sup>Note 1 and 4</sup> |        |        |        |        |       | Estimated SAR Value <sup>Note 3 and 4</sup> |         |        |         |         |       |
|---------------------------------------|-----------|-----------------|-----------------------------------|----|---------------------------------------------------|--------|--------|--------|--------|-------|---------------------------------------------|---------|--------|---------|---------|-------|
|                                       |           |                 | dBm                               | mW | Bottom                                            | Edge 1 | Edge 2 | Edge 3 | Edge 4 | Front | Bottom                                      | Edge 1  | Edge 2 | Edge 3  | Edge 4  | Front |
| WLAN Main                             | WiFi      | 2412            | 14.50                             | 28 | 5                                                 | 5      | 265.5  | 139    | 5      |       | Measure                                     | Measure | 0.116  | 0.116   | Measure | N/A   |
| WLAN Main                             | WiFi      | 5180            | 15.00                             | 32 | 5                                                 | 5      | 265.5  | 139    | 5      |       | Measure                                     | Measure | 0.194  | 0.194   | Measure | N/A   |
| WLAN Main                             | WiFi      | 5260            | 15.00                             | 32 | 5                                                 | 5      | 265.5  | 139    | 5      |       | Measure                                     | Measure | 0.196  | 0.196   | Measure | N/A   |
| WLAN Main                             | WiFi      | 5500            | 15.00                             | 32 | 5                                                 | 5      | 265.5  | 139    | 5      |       | Measure                                     | Measure | 0.200  | 0.200   | Measure | N/A   |
| WLAN Main                             | WiFi      | 5745            | 15.00                             | 32 | 5                                                 | 5      | 265.5  | 139    | 5      |       | Measure                                     | Measure | 0.205  | 0.205   | Measure | N/A   |
| <b>Bluetooth / WiFi - Aux Antenna</b> |           |                 |                                   |    |                                                   |        |        |        |        |       |                                             |         |        |         |         |       |
| WLAN Aux                              | WiFi      | 2412            | 15.50                             | 35 | 5                                                 | 184.5  | 228.3  | 5      | 5      |       | Measure                                     | 0.145   | 0.145  | Measure | Measure | N/A   |
| WLAN Aux                              | WiFi      | 5180            | 15.00                             | 32 | 5                                                 | 184.5  | 228.3  | 5      | 5      |       | Measure                                     | 0.194   | 0.194  | Measure | Measure | N/A   |
| WLAN Aux                              | WiFi      | 5260            | 15.00                             | 32 | 5                                                 | 184.5  | 228.3  | 5      | 5      |       | Measure                                     | 0.196   | 0.196  | Measure | Measure | N/A   |
| WLAN Aux                              | WiFi      | 5500            | 15.00                             | 32 | 5                                                 | 184.5  | 228.3  | 5      | 5      |       | Measure                                     | 0.200   | 0.200  | Measure | Measure | N/A   |
| WLAN Aux                              | WiFi      | 5745            | 15.00                             | 32 | 5                                                 | 184.5  | 228.3  | 5      | 5      |       | Measure                                     | 0.205   | 0.205  | Measure | Measure | N/A   |
| WLAN Aux                              | Bluetooth | 2402            | 6.50                              | 4  | 5                                                 | 184.5  | 228.3  | 5      | 5      |       | 0.165                                       | 0.017   | 0.017  | 0.165   | 0.165   | N/A   |

### Notes:

1. Estimated SAR for 2 Tx (MIMO) was not assessed as the higher 1 Tx (SISO) SAR values were used for simultaneous transmission analysis.
2. Situations that comprised only estimated values (i.e. edge 2) are not reported as they are inherently compliant. The maximum SAR value based on two estimated values would be 0.8 W/Kg, well below the highest stand-alone SAR value for Edges 3 and 4 and therefore not the most conservative exposure condition for simultaneous transmission analysis
3. As Simultaneous Transmission SAR of the DUT was compliant under the higher power conditions of Wi-Fi 1 Tx, it was judged that such analyses would be unnecessary for Wi-Fi 2 Tx (MIMO), given the substantially lower MIMO power levels and considerable separation distance between WLAN Main and the WLAN Auxiliary antennas.
4. Wherever appropriate, Wi-Fi 1 Tx (SISO) SAR values were used to represent those of Wi-Fi 2 Tx (MIMO); if compliance can be shown with the more conservative Wi-Fi 1 Tx values, then there is no need to perform separate assessment for Wi-Fi 2 Tx.

### 13.3. Bluetooth

Although Bluetooth testing satisfies the SAR exclusion criteria it was tested for edge 4 because the estimated SAR value was considered overly conservative.

| Test Position | Mode   | Dist. (mm) | Ch #. | Freq. (MHz) | Power (dBm)   |       | 1-g SAR (W/kg) |        | Plot No. | Note |
|---------------|--------|------------|-------|-------------|---------------|-------|----------------|--------|----------|------|
|               |        |            |       |             | Tune-up limit | Meas. | Meas.          | Scaled |          |      |
| Edge 4        | 802.15 | 0          | 39    | 2441        | 6.5           | 6.5   | 0.0089         | 0.0089 | 1        | 1    |

#### Note(s):

1. According to KDB 447498, 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.
2. Although testing was not required due to the estimated SAR being less than 0.4 it was performed to support simultaneous transmission analysis of co-located antennas in associated products.

## 13.4. Wi-Fi 2.4 GHz Band

### Main Antenna

| Test Position | Mode    | Dist. (mm) | Ch #. | Freq. (MHz) | Power (dBm)   |       | 1-g SAR (W/kg) |              | Plot No. | Note |
|---------------|---------|------------|-------|-------------|---------------|-------|----------------|--------------|----------|------|
|               |         |            |       |             | Tune-up limit | Meas. | Meas.          | Scaled       |          |      |
| Rear          | 802.11b | 0          | 1     | 2412        | 12.00         | 11.7  |                |              |          | 1    |
|               |         |            | 6     | 2437        | 14.50         | 14.5  | 0.186          | 0.186        | 1        |      |
|               |         |            | 11    | 2462        | 11.50         | 11.3  |                |              |          | 1    |
|               | 802.11g | 0          | 1     | 2412        | 12.00         | 11.8  |                |              |          | 1    |
|               |         |            | 6     | 2437        | 14.50         | 14.2  | 0.183          | 0.196        | 2        |      |
|               |         |            | 11    | 2462        | 11.50         | 11.5  |                |              |          | 1    |
| Edge 1        | 802.11b | 0          | 1     | 2412        | 12.00         | 11.7  |                |              |          | 1    |
|               |         |            | 6     | 2437        | 14.50         | 14.5  | 0.081          | 0.081        | 3        |      |
|               |         |            | 11    | 2462        | 11.50         | 11.3  |                |              |          | 1    |
|               | 802.11g | 0          | 1     | 2412        | 12.00         | 11.8  |                |              |          | 1    |
|               |         |            | 6     | 2437        | 14.50         | 14.2  | 0.078          | 0.084        | 4        |      |
|               |         |            | 11    | 2462        | 11.50         | 11.5  |                |              |          | 1    |
| Edge 4        | 802.11b | 0          | 1     | 2412        | 12.00         | 11.7  | 0.598          | 0.641        | 5        |      |
|               |         |            | 6     | 2437        | 14.50         | 14.5  | <b>1.080</b>   | 1.080        | 6        |      |
|               |         |            | 11    | 2462        | 11.50         | 11.3  | 0.461          | 0.483        | 7        |      |
|               | 802.11g | 0          | 1     | 2412        | 12.00         | 11.8  | 0.585          | 0.613        | 8        |      |
|               |         |            | 6     | 2437        | 14.50         | 14.2  | 1.020          | <b>1.093</b> | 9        |      |
|               |         |            | 11    | 2462        | 11.50         | 11.5  | 0.479          | 0.479        | 10       |      |

#### Note(s):

- According to KDB 447498, 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.

## Wi-Fi 2.4 GHz Band continued

### Auxiliary Antenna

| Test Position | Mode    | Dist. (mm) | Ch #. | Freq. (MHz) | Power (dBm)   |       | 1-g SAR (W/kg) |        | Plot No. | Note |
|---------------|---------|------------|-------|-------------|---------------|-------|----------------|--------|----------|------|
|               |         |            |       |             | Tune-up limit | Meas. | Meas.          | Scaled |          |      |
| Rear          | 802.11b | 0          | 1     | 2412        | 12.00         | 11.7  |                |        |          | 1    |
|               |         |            | 6     | 2437        | 15.00         | 15.0  | 0.040          | 0.040  | 11       |      |
|               |         |            | 11    | 2462        | 11.50         | 11.5  |                |        |          | 1    |
|               | 802.11g | 0          | 1     | 2412        | 12.00         | 11.7  |                |        |          | 1    |
|               |         |            | 6     | 2437        | 15.50         | 15.1  | 0.057          | 0.062  | 12       |      |
|               |         |            | 11    | 2462        | 11.50         | 11.3  |                |        |          | 1    |
| Edge 3        | 802.11b | 0          | 1     | 2412        | 12.00         | 11.7  |                |        |          | 1    |
|               |         |            | 6     | 2437        | 15.00         | 15.0  | 0.280          | 0.280  | 13       |      |
|               |         |            | 11    | 2462        | 11.50         | 11.5  |                |        |          | 1    |
|               | 802.11g | 0          | 1     | 2412        | 12.00         | 11.7  |                |        |          | 1    |
|               |         |            | 6     | 2437        | 15.50         | 15.1  | 0.381          | 0.418  | 14       |      |
|               |         |            | 11    | 2462        | 11.50         | 11.3  |                |        |          | 1    |
| Edge 4        | 802.11b | 0          | 1     | 2412        | 12.00         | 11.7  |                |        |          | 1    |
|               |         |            | 6     | 2437        | 15.00         | 15.0  | 0.086          | 0.086  | 15       |      |
|               |         |            | 11    | 2462        | 11.50         | 11.5  |                |        |          | 1    |
|               | 802.11g | 0          | 1     | 2412        | 12.00         | 11.7  |                |        |          | 1    |
|               |         |            | 6     | 2437        | 15.50         | 15.1  | 0.115          | 0.126  | 16       |      |
|               |         |            | 11    | 2462        | 11.50         | 11.3  |                |        |          | 1    |

#### Note(s):

- According to KDB 447498, 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.

## 13.5. Wi-Fi 5.2 GHz Band

### Main Antenna

| Test Position | Mode    | Dist. (mm) | Ch #. | Freq. (MHz) | Power (dBm)   |       | 1-g SAR (W/kg) |              | Plot No. | Note |
|---------------|---------|------------|-------|-------------|---------------|-------|----------------|--------------|----------|------|
|               |         |            |       |             | Tune-up limit | Meas. | Meas.          | Scaled       |          |      |
| Rear          | 802.11a | 0          | 40    | 5200        | 15.00         | 15.0  | 0.136          | 0.136        | 1        |      |
|               |         |            | 44    | 5220        | 15.00         | 15.0  | 0.123          | 0.123        | 2        |      |
| Edge 1        | 802.11a | 0          | 40    | 5200        | 15.00         | 15.0  | 0.058          | 0.058        | 3        |      |
|               |         |            | 44    | 5220        | 15.00         | 15.0  | 0.061          | 0.061        | 4        |      |
| Edge 4        | 802.11a | 0          | 40    | 5200        | 15.00         | 15.0  | 0.674          | 0.674        | 5        |      |
|               |         |            | 44    | 5220        | 15.00         | 15.0  | <b>0.797</b>   | <b>0.797</b> | 6        |      |

### Auxiliary Antenna

| Test Position | Mode    | Dist. (mm) | Ch #. | Freq. (MHz) | Power (dBm)   |       | 1-g SAR (W/kg) |        | Plot No. | Note |
|---------------|---------|------------|-------|-------------|---------------|-------|----------------|--------|----------|------|
|               |         |            |       |             | Tune-up limit | Meas. | Meas.          | Scaled |          |      |
| Rear          | 802.11a | 0          | 40    | 5200        | 15.00         | 14.8  | 0.108          | 0.113  | 7        |      |
|               |         |            | 48    | 5240        | 15.00         | 14.8  | 0.142          | 0.149  | 8        |      |
| Edge 3        | 802.11a | 0          | 40    | 5200        | 15.00         | 14.8  | 0.360          | 0.377  | 9        |      |
|               |         |            | 48    | 5240        | 15.00         | 14.8  | 0.520          | 0.545  | 10       |      |
| Edge 4        | 802.11a | 0          | 40    | 5200        | 15.00         | 14.8  | 0.039          | 0.041  | 11       |      |
|               |         |            | 48    | 5240        | 15.00         | 14.8  | 0.054          | 0.057  | 12       |      |

**Note(s):**

## 13.6. Wi-Fi 5.3 GHz Band

### Main Antenna

| Test Position | Mode    | Dist. (mm) | Ch #. | Freq. (MHz) | Power (dBm)   |       | 1-g SAR (W/kg) |              | Plot No. | Note |
|---------------|---------|------------|-------|-------------|---------------|-------|----------------|--------------|----------|------|
|               |         |            |       |             | Tune-up limit | Meas. | Meas.          | Scaled       |          |      |
| Rear          | 802.11a | 0          | 52    | 5260        | 15.00         | 15.0  | 0.206          | 0.206        | 13       |      |
|               |         |            | 60    | 5300        | 15.00         | 15.0  | 0.201          | 0.201        | 14       |      |
| Edge 1        | 802.11a | 0          | 52    | 5260        | 15.00         | 15.0  | 0.107          | 0.107        | 15       |      |
|               |         |            | 60    | 5300        | 15.00         | 15.0  | 0.138          | 0.138        | 16       |      |
| Edge 4        | 802.11a | 0          | 52    | 5260        | 15.00         | 15.0  | 1.010          | 1.010        | 17       |      |
|               |         |            | 60    | 5300        | 15.00         | 15.0  | <b>1.190</b>   | <b>1.190</b> | 18       |      |

### Auxiliary Antenna

| Test Position | Mode    | Dist. (mm) | Ch #. | Freq. (MHz) | Power (dBm)   |       | 1-g SAR (W/kg) |        | Plot No. | Note |
|---------------|---------|------------|-------|-------------|---------------|-------|----------------|--------|----------|------|
|               |         |            |       |             | Tune-up limit | Meas. | Meas.          | Scaled |          |      |
| Rear          | 802.11a | 0          | 56    | 5280        | 15.00         | 14.9  | 0.220          | 0.225  | 19       |      |
|               |         |            | 60    | 5300        | 15.00         | 14.8  | 0.243          | 0.254  | 20       |      |
| Edge 3        | 802.11a | 0          | 56    | 5280        | 15.00         | 14.9  | 0.821          | 0.840  | 21       |      |
|               |         |            | 60    | 5300        | 15.00         | 14.8  | 0.896          | 0.938  | 22       |      |
| Edge 4        | 802.11a | 0          | 56    | 5280        | 15.00         | 14.9  | 0.099          | 0.101  | 23       |      |
|               |         |            | 60    | 5300        | 15.00         | 14.8  | 0.118          | 0.124  | 24       |      |

**Note(s):**

## 13.7. Wi-Fi 5.5 GHz Band

### Main Antenna

| Test Position | Mode    | Dist. (mm) | Ch #. | Freq. (MHz) | Power (dBm)   |       | 1-g SAR (W/kg) |              | Plot No. | Note |
|---------------|---------|------------|-------|-------------|---------------|-------|----------------|--------------|----------|------|
|               |         |            |       |             | Tune-up limit | Meas. | Meas.          | Scaled       |          |      |
| Rear          | 802.11a | 0          | 104   | 5520        | 15.00         | 14.9  | 0.134          | 0.137        | 25       |      |
|               |         |            | 116   | 5580        | 15.00         | 14.8  | 0.210          | 0.220        | 26       |      |
|               |         |            | 124   | 5620        | 15.00         | 14.8  | 0.159          | 0.166        | 27       |      |
|               |         |            | 132   | 5660        | 15.00         | 15.0  | 0.118          | 0.118        | 28       |      |
| Edge 1        | 802.11a | 0          | 104   | 5520        | 15.00         | 14.9  | 0.080          | 0.082        | 29       |      |
|               |         |            | 116   | 5580        | 15.00         | 14.8  | 0.059          | 0.062        | 30       |      |
|               |         |            | 124   | 5620        | 15.00         | 14.8  | 0.038          | 0.040        | 31       |      |
|               |         |            | 132   | 5660        | 15.00         | 15.0  | 0.007          | 0.007        | 32       |      |
| Edge 4        | 802.11a | 0          | 104   | 5520        | 15.00         | 14.9  | 0.648          | 0.663        | 33       |      |
|               |         |            | 116   | 5580        | 15.00         | 14.8  | <b>1.050</b>   | <b>1.099</b> | 34       |      |
|               |         |            | 124   | 5620        | 15.00         | 14.8  | 0.805          | 0.843        | 35       |      |
|               |         |            | 132   | 5660        | 15.00         | 15.0  | 0.543          | 0.543        | 36       |      |

### Auxiliary Antenna

| Test Position | Mode    | Dist. (mm) | Ch #. | Freq. (MHz) | Power (dBm)   |       | 1-g SAR (W/kg) |        | Plot No. | Note |
|---------------|---------|------------|-------|-------------|---------------|-------|----------------|--------|----------|------|
|               |         |            |       |             | Tune-up limit | Meas. | Meas.          | Scaled |          |      |
| Rear          | 802.11a | 0          | 100   | 5500        | 15.00         | 14.9  | 0.137          | 0.140  | 37       |      |
|               |         |            | 112   | 5560        | 15.00         | 15.0  | 0.229          | 0.229  | 38       |      |
|               |         |            | 128   | 5640        | 15.00         | 15.0  | 0.116          | 0.116  | 39       |      |
|               |         |            | 140   | 5700        | 15.00         | 15.0  | 0.087          | 0.087  | 40       |      |
| Edge 3        | 802.11a | 0          | 100   | 5500        | 15.00         | 14.9  | 0.565          | 0.578  | 41       |      |
|               |         |            | 112   | 5560        | 15.00         | 15.0  | 1.030          | 1.030  | 42       |      |
|               |         |            | 128   | 5640        | 15.00         | 15.0  | 0.533          | 0.533  | 43       |      |
|               |         |            | 140   | 5700        | 15.00         | 15.0  | 0.376          | 0.376  | 44       |      |
| Edge 4        | 802.11a | 0          | 100   | 5500        | 15.00         | 14.9  | 0.052          | 0.053  | 45       |      |
|               |         |            | 112   | 5560        | 15.00         | 15.0  | 0.094          | 0.094  | 46       |      |
|               |         |            | 128   | 5640        | 15.00         | 15.0  | 0.034          | 0.034  | 47       |      |
|               |         |            | 140   | 5700        | 15.00         | 15.0  | 0.027          | 0.027  | 48       |      |

**Note(s):**

## 13.8. Wi-Fi 5.8 GHz Band

### Main Antenna

| Test Position | Mode    | Dist. (mm) | Ch #. | Freq. (MHz) | Power (dBm)   |       | 1-g SAR (W/kg) |        | Plot No. | Note |
|---------------|---------|------------|-------|-------------|---------------|-------|----------------|--------|----------|------|
|               |         |            |       |             | Tune-up limit | Meas. | Meas.          | Scaled |          |      |
| Rear          | 802.11a | 0          | 149   | 5745        | 15.00         | 14.9  | 0.081          | 0.083  | 49       |      |
|               |         |            | 157   | 5785        | 15.00         | 14.9  | 0.084          | 0.086  | 50       |      |
|               |         |            | 165   | 5825        | 15.00         | 15.0  | 0.090          | 0.090  | 51       |      |
| Edge 1        | 802.11a | 0          | 149   | 5745        | 15.00         | 14.9  | 0.025          | 0.026  | 52       |      |
|               |         |            | 157   | 5785        | 15.00         | 14.9  | 0.037          | 0.038  | 53       |      |
|               |         |            | 165   | 5825        | 15.00         | 15.0  | 0.021          | 0.021  | 54       |      |
| Edge 4        | 802.11a | 0          | 149   | 5745        | 15.00         | 14.9  | 0.324          | 0.332  | 55       |      |
|               |         |            | 157   | 5785        | 15.00         | 14.9  | 0.354          | 0.362  | 56       |      |
|               |         |            | 165   | 5825        | 15.00         | 15.0  | 0.414          | 0.414  | 57       |      |

### Auxiliary Antenna

| Test Position | Mode    | Dist. (mm) | Ch #. | Freq. (MHz) | Power (dBm)   |       | 1-g SAR (W/kg) |              | Plot No. | Note |
|---------------|---------|------------|-------|-------------|---------------|-------|----------------|--------------|----------|------|
|               |         |            |       |             | Tune-up limit | Meas. | Meas.          | Scaled       |          |      |
| Rear          | 802.11a | 0          | 149   | 5745        | 15.00         | 15.0  | 0.123          | 0.123        | 58       |      |
|               |         |            | 157   | 5785        | 15.00         | 14.9  | 0.145          | 0.148        | 59       |      |
|               |         |            | 165   | 5825        | 14.50         | 14.5  | 0.116          | 0.116        | 60       |      |
| Edge 3        | 802.11a | 0          | 149   | 5745        | 15.00         | 15.0  | 0.578          | 0.578        | 61       |      |
|               |         |            | 157   | 5785        | 15.00         | 14.9  | <b>0.737</b>   | <b>0.754</b> | 62       |      |
|               |         |            | 165   | 5825        | 14.50         | 14.5  | 0.551          | 0.551        | 63       |      |
| Edge 4        | 802.11a | 0          | 149   | 5745        | 15.00         | 15.0  | 0.040          | 0.040        | 64       |      |
|               |         |            | 157   | 5785        | 15.00         | 14.9  | 0.042          | 0.043        | 65       |      |
|               |         |            | 165   | 5825        | 14.50         | 14.5  | 0.043          | 0.043        | 66       |      |

**Note(s):**

### 13.9. Summary of Highest SAR Values

Results for the highest measured SAR values in each frequency band and mode

| Technology/<br>Band | Test configuration  |          |          | Mode          | Dist.<br>(mm) | Freq.<br>(Mhz) | Power<br>(dBm) | 1g SAR<br>(W/kg) |
|---------------------|---------------------|----------|----------|---------------|---------------|----------------|----------------|------------------|
|                     | Transmit<br>Antenna | Exposure | Position |               |               |                |                |                  |
| Wi-Fi<br>2.4 GHz    | Main                | Body     | Edge 4   | 802.11b 1Mbps | 0             | 2437           | 14.5           | 1.08             |
| Wi-Fi<br>5.2 GHz    | Main                | Body     | Edge 4   | 802.11a 6Mbps | 0             | 5220           | 15.0           | 0.795            |
| Wi-Fi<br>5.3 GHz    | Auxiliary           | Body     | Edge 3   | 802.11a 6Mbps | 0             | 5300           | 14.8           | 1.14             |
| Wi-Fi<br>5.5 GHz    | Auxiliary           | Body     | Edge 3   | 802.11a 6Mbps | 0             | 5560           | 15.0           | 1.05             |
| Wi-Fi<br>5.8 GHz    | Auxiliary           | Body     | Edge 3   | 802.11a 6Mbps | 0             | 5785           | 14.9           | 0.737            |

### 13.10. SAR Measurement Variability and Uncertainty

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz v01. 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.

| Wireless Technologies | Test Configuration |          |          | Mode           | Dist. (mm) | Ch #. | Freq. (MHz) | Meas. SAR (W/kg) |          | Largest to Smallest SAR Ratio | Plot No. |
|-----------------------|--------------------|----------|----------|----------------|------------|-------|-------------|------------------|----------|-------------------------------|----------|
|                       | Transmit Antenna   | Exposure | Position |                |            |       |             | Original         | Repeated |                               |          |
| Wi-Fi 2.4 GHz         | Main               | Body     | Edge 3   | 802.11b 1 Mbps | 0          | 6     | 2437        | 1.08             | 1.06     | 1.02                          | 1        |
| Wi-Fi 5.2 GHz         | Main               | Body     | Edge 4   | 802.11a 6 Mbps | 0          | 44    | 5220        | 0.797            | 0.795    | 1.00                          | 2        |
| Wi-Fi 5.3 GHz         | Main               | Body     | Edge 4   | 802.11a 6 Mbps | 0          | 60    | 5300        | 1.19             | 1.14     | 1.04                          | 3        |
| Wi-Fi 5.5 GHz         | Main               | Body     | Edge 4   | 802.11a 6 Mbps | 0          | 112   | 5560        | 1.05             | 1.00     | 1.05                          | 4        |
| Wi-Fi 5.8 GHz         | Auxiliary          | Body     | Edge 4   | 802.11a 6 Mbps | 0          | 157   | 5785        | 0.737            | 0.723    | 1.02                          | 5        |

#### Note(s):

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

## 13.11. SAR Plots (from Summary of Highest Measured SAR Values)

Test Laboratory: UL CCS SAR Lab F Date: 2/16/2013

### Wi-Fi 2.4 GHz

Frequency: 2437 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C

Medium parameters used (interpolated):  $f = 2437$  MHz;  $\sigma = 1.956$  mho/m;  $\epsilon_r = 50.566$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY5 Configuration:

- Area Scan Setting: Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1352; Calibrated: 10/8/2012
- Probe: EX3DV4 - SN3885; ConvF(6.8, 6.8, 6.8); Calibrated: 10/9/2012;
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (B); Type: QDOVA001BB; Serial: 1118

**Main Ant., Edge 4/802.11b Ch 6/Area Scan (8x9x1):** Measurement grid: dx=12mm, dy=12mm

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

Maximum value of SAR (measured) = 1.58 W/kg

**Main Ant., Edge 4/802.11b Ch 6/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

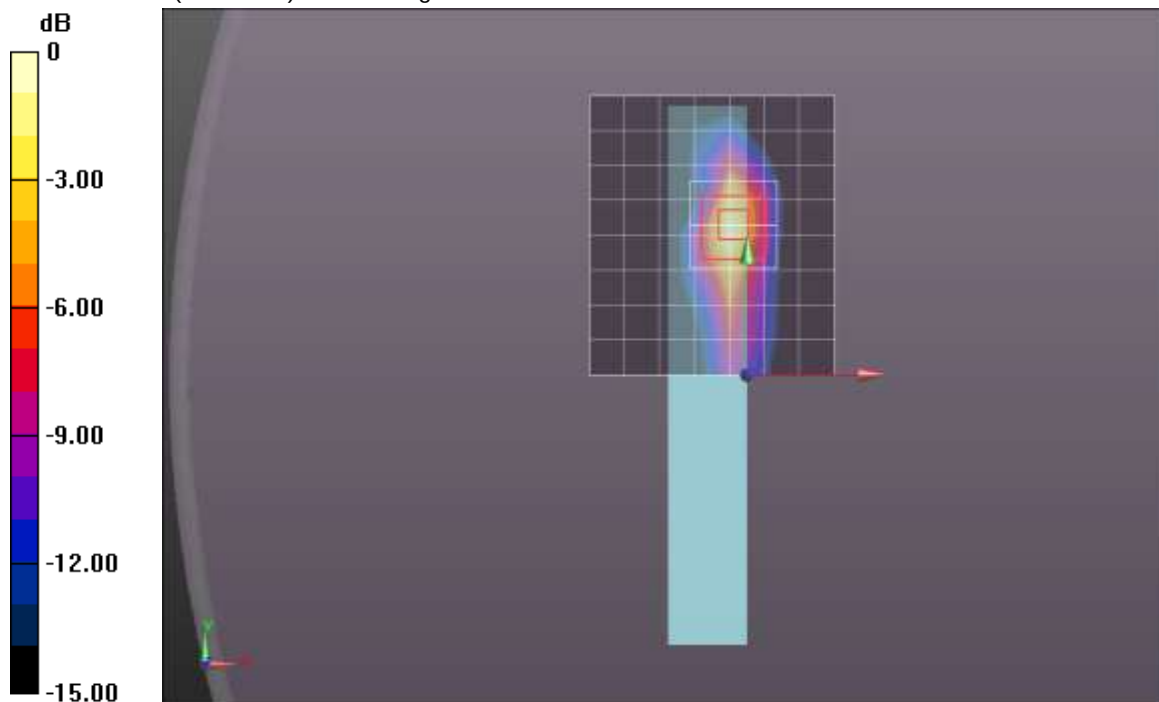
Reference Value = 28.412 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 2.67 W/kg

**SAR(1 g) = 1.08 W/kg; SAR(10 g) = 0.420 W/kg**

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

Maximum value of SAR (measured) = 1.72 W/kg



## Wi-Fi 5 GHz

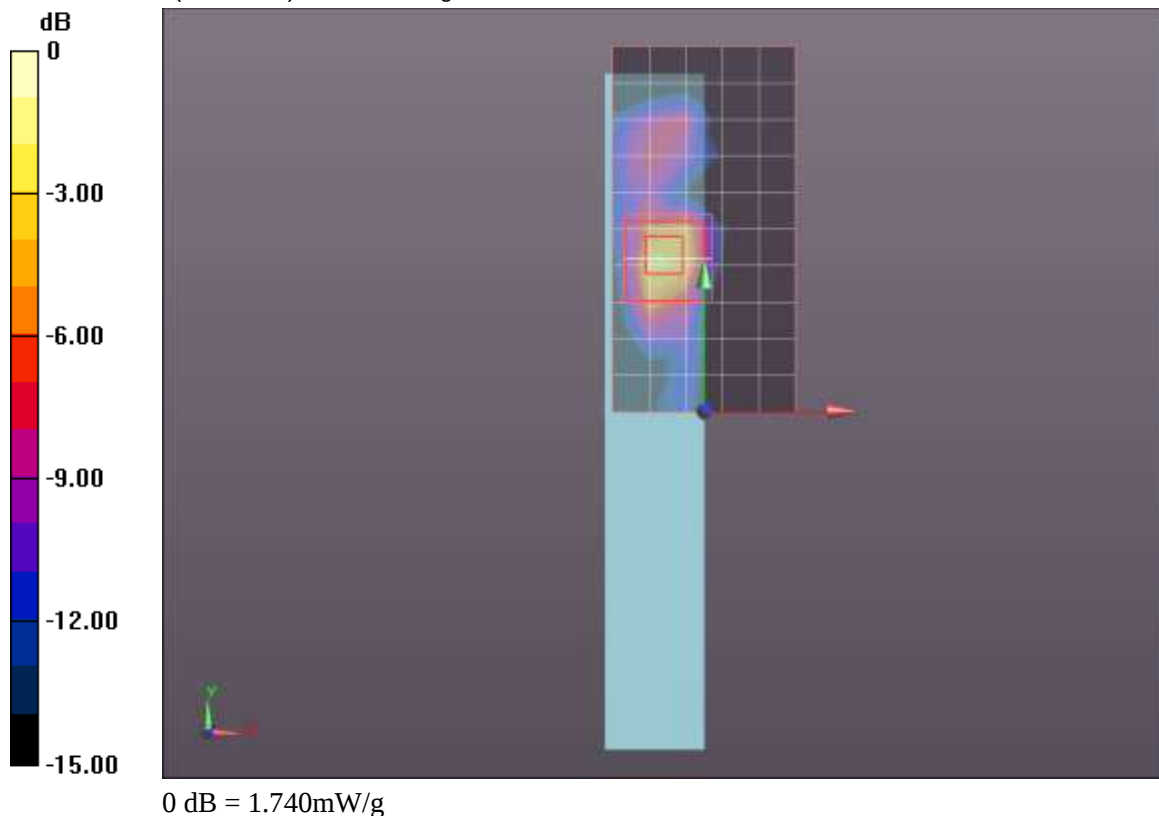
Frequency: 5220 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C  
Medium parameters used:  $f = 5220$  MHz;  $\sigma = 5.448$  mho/m;  $\epsilon_r = 47.026$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY5 Configuration:

- Area Scan Setting: Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Averaged Fast SAR: Polynomial fit
- Electronics: DAE4 Sn1239; Calibrated: 6/6/2012
- Probe: EX3DV4 - SN3773; ConvF(4.15, 4.15, 4.15); Calibrated: 3/14/2012
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (A); Type: QDOVA001BB; Serial: 1117

**Main Ant., Edge 4 Under ELI/802.11a Ch 44/Area Scan (6x11x1):** Measurement grid: dx=10mm, dy=10mm  
Maximum value of SAR (measured) = 0.995 mW/g

**Main Ant., Edge 4 Under ELI/802.11a Ch 44/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm  
Reference Value = 14.145 V/m; Power Drift = -0.11 dB  
Peak SAR (extrapolated) = 3.524 W/kg  
**SAR(1 g) = 0.797 mW/g; SAR(10 g) = 0.204 mW/g**  
Maximum value of SAR (measured) = 1.744 mW/g



## Wi-Fi 5 GHz

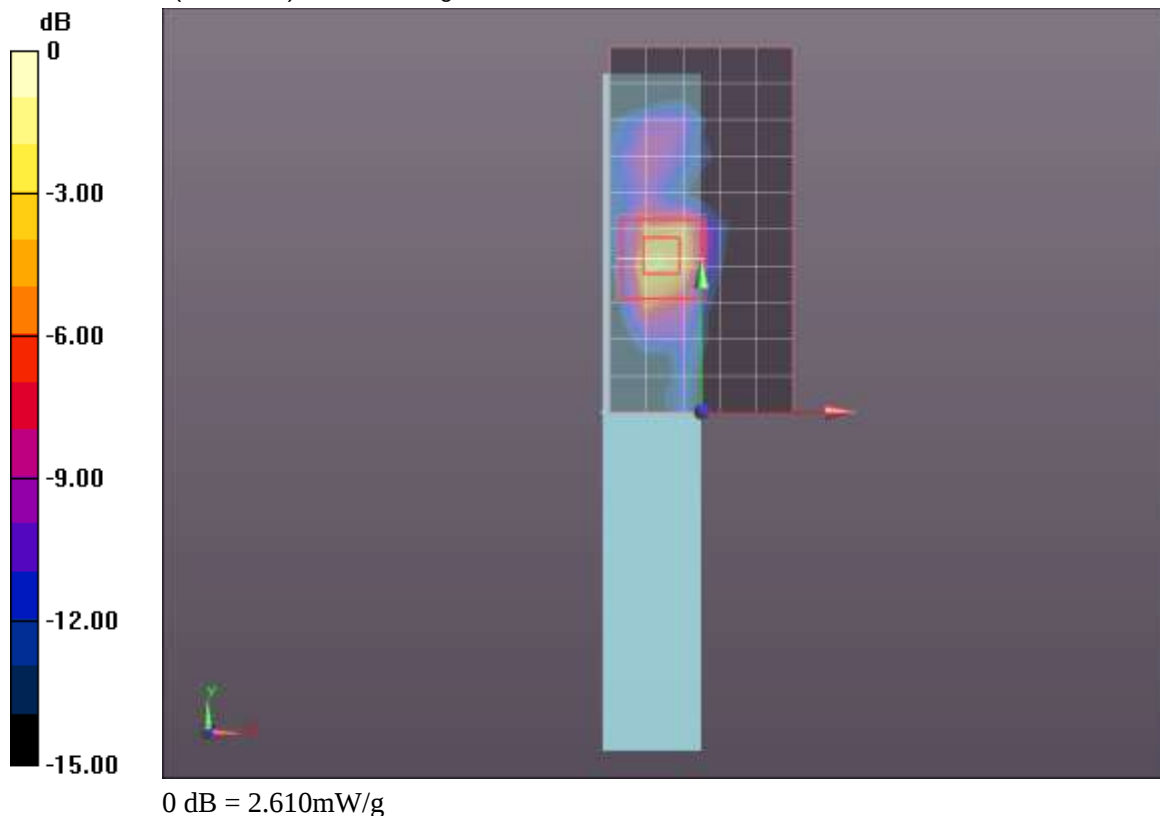
Frequency: 5300 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C  
Medium parameters used:  $f = 5300$  MHz;  $\sigma = 5.537$  mho/m;  $\epsilon_r = 46.928$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY5 Configuration:

- Area Scan Setting: Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Averaged Fast SAR: Polynomial fit
- Electronics: DAE4 Sn1239; Calibrated: 6/6/2012
- Probe: EX3DV4 - SN3773; ConvF(3.83, 3.83, 3.83); Calibrated: 3/14/2012
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (A); Type: QDOVA001BB; Serial: 1117

**Main Ant., Edge 4 Under ELI/802.11a Ch 60/Area Scan (6x11x1):** Measurement grid: dx=10mm, dy=10mm  
Maximum value of SAR (measured) = 1.546 mW/g

**Main Ant., Edge 4 Under ELI/802.11a Ch 60/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm  
Reference Value = 17.663 V/m; Power Drift = -0.16 dB  
Peak SAR (extrapolated) = 5.209 W/kg  
**SAR(1 g) = 1.19 mW/g; SAR(10 g) = 0.310 mW/g**  
Maximum value of SAR (measured) = 2.608 mW/g



## Wi-Fi 5 GHz

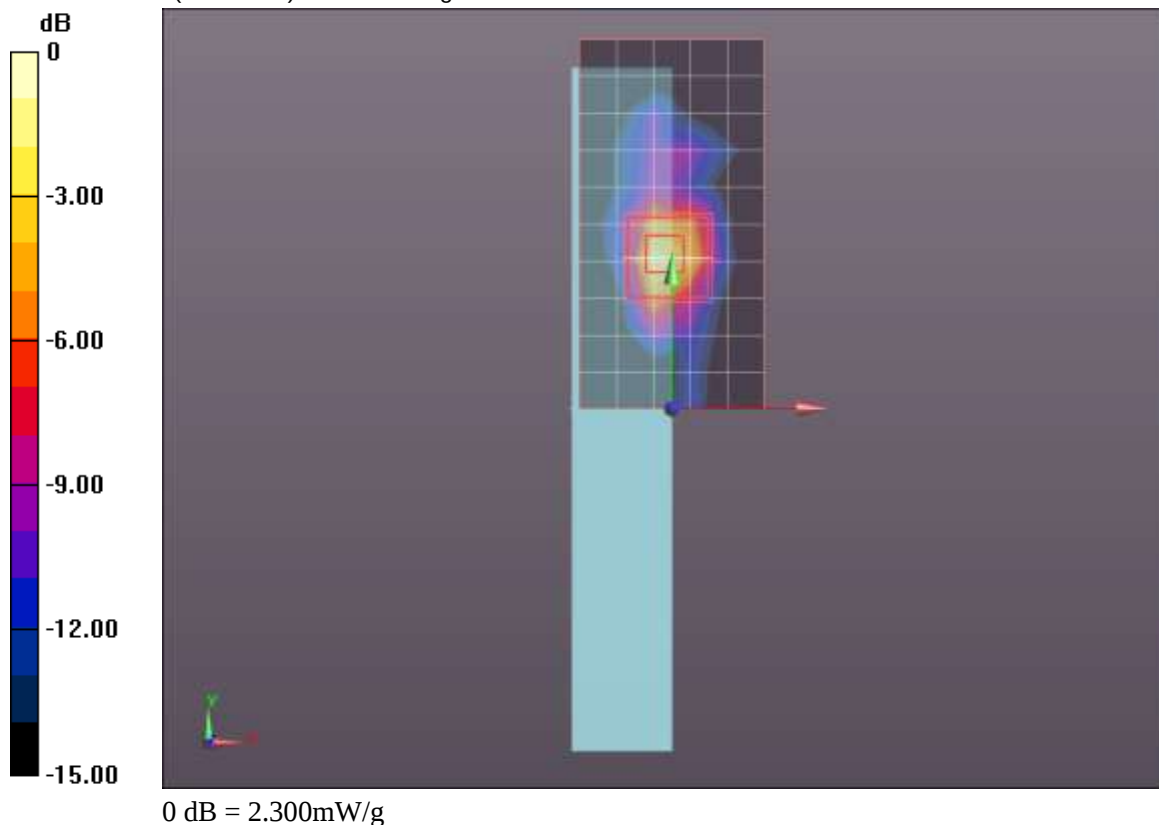
Frequency: 5580 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C  
Medium parameters used:  $f = 5580$  MHz;  $\sigma = 5.913$  mho/m;  $\epsilon_r = 46.405$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY5 Configuration:

- Area Scan Setting: Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Averaged Fast SAR: Polynomial fit
- Electronics: DAE4 Sn1239; Calibrated: 6/6/2012
- Probe: EX3DV4 - SN3773; ConvF(3.46, 3.46, 3.46); Calibrated: 3/14/2012
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (A); Type: QDOVA001BB; Serial: 1117

**Main Ant., Edge 4 Under ELI/802.11a Ch 116/Area Scan (6x11x1):** Measurement grid: dx=10mm, dy=10mm  
Maximum value of SAR (measured) = 1.831 mW/g

**Main Ant., Edge 4 Under ELI/802.11a Ch 116/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm  
Reference Value = 17.201 V/m; Power Drift = -0.17 dB  
Peak SAR (extrapolated) = 4.683 W/kg  
**SAR(1 g) = 1.05 mW/g; SAR(10 g) = 0.276 mW/g**  
Maximum value of SAR (measured) = 2.305 mW/g



## Wi-Fi 5 GHz

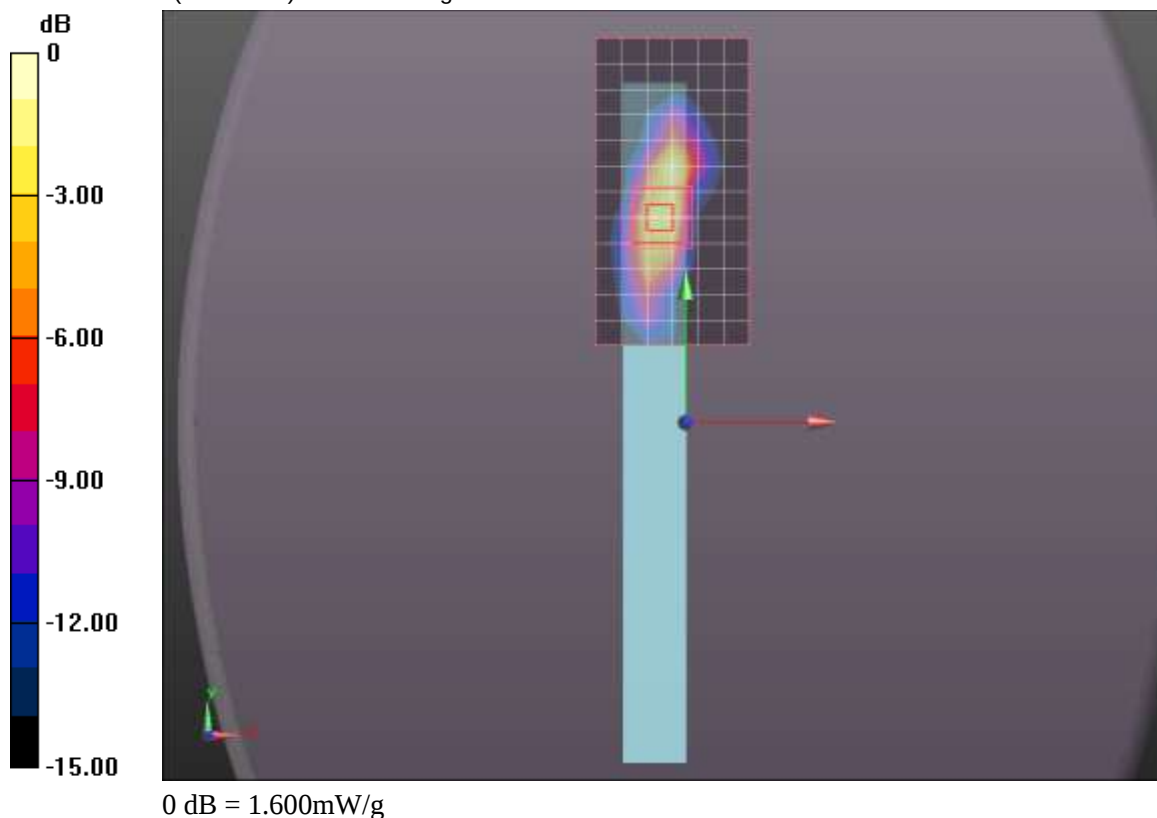
Frequency: 5785 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C  
Medium parameters used:  $f = 5785$  MHz;  $\sigma = 6.174$  mho/m;  $\epsilon_r = 46.102$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY5 Configuration:

- Area Scan Setting: Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Averaged Fast SAR: Polynomial fit
- Electronics: DAE4 Sn1239; Calibrated: 6/6/2012
- Probe: EX3DV4 - SN3773; ConvF(3.57, 3.57, 3.57); Calibrated: 3/14/2012
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (A); Type: QDOVA001BB; Serial: 1117

**Aux Ant., Edge 3 Under ELI/802.11a Ch 157/Area Scan (7x13x1):** Measurement grid: dx=10mm, dy=10mm  
Maximum value of SAR (measured) = 1.160 mW/g

**Aux Ant., Edge 3 Under ELI/802.11a Ch 157/Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm  
Reference Value = 14.028 V/m; Power Drift = 0.03 dB  
Peak SAR (extrapolated) = 3.344 W/kg  
**SAR(1 g) = 0.737 mW/g; SAR(10 g) = 0.215 mW/g**  
Maximum value of SAR (measured) = 1.603 mW/g



## 14. Simultaneous Transmission SAR Analysis

### 14.1. Sum of the SAR for Wi-Fi 2.4 GHz Band & Bluetooth

| Test Position      | Data               | Data              | Data      | $\Sigma$ 1-g SAR (mW/g) |
|--------------------|--------------------|-------------------|-----------|-------------------------|
|                    | Wi-Fi 2.4 GHz Main | Wi-Fi 2.4 GHz Aux | Bluetooth |                         |
| Rear, Wi-Fi 1 Tx   | 0.196              |                   | 0.165     | 0.361                   |
| Rear, Wi-Fi 2 Tx   | 0.196              | 0.062             |           | 0.258                   |
| Edge 1, Wi-Fi 1 Tx | 0.084              |                   | 0.017     | 0.101                   |
| Edge 1, Wi-Fi 2 Tx | 0.084              | 0.133             |           | 0.217                   |
| Edge 3, Wi-Fi 1 Tx | 0.116              |                   | 0.165     | 0.281                   |
| Edge 3, Wi-Fi 2 Tx | 0.116              | 0.418             |           | 0.534                   |
| Edge 4, Wi-Fi 1 Tx | 1.093              |                   | 0.0089    | 1.102                   |
| Edge 4, Wi-Fi 2 Tx | 1.093              | 0.126             |           | <b>1.219</b>            |

#### Note(s):

1. Bluetooth and Wi-Fi aux cannot simultaneously transmit
2. As there were only estimated values for edge 2 it was not assessed as it is inherently compliant
3. Values shaded green are estimated SAR

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

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

#### Conclusion:

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

## 14.2. Sum of the SAR for Wi-Fi 5.2 GHz Band & Bluetooth

| Test Position      | Data               | Data              | Data      | $\Sigma$ 1-g SAR (mW/g) |
|--------------------|--------------------|-------------------|-----------|-------------------------|
|                    | Wi-Fi 5.2 GHz Main | Wi-Fi 5.2 GHz Aux | Bluetooth |                         |
| Rear, Wi-Fi 1 Tx   | 0.136              |                   | 0.165     | 0.301                   |
| Rear, Wi-Fi 2 Tx   | 0.136              | 0.149             |           | 0.285                   |
| Edge 1, Wi-Fi 2 Tx | 0.061              |                   | 0.017     | 0.078                   |
| Edge 1, Wi-Fi 2 Tx | 0.061              | 0.194             |           | 0.255                   |
| Edge 3, Wi-Fi 2 Tx | 0.194              |                   | 0.165     | 0.359                   |
| Edge 3, Wi-Fi 2 Tx | 0.194              | 0.545             |           | 0.739                   |
| Edge 4, Wi-Fi 1 Tx | 0.797              |                   | 0.0089    | 0.806                   |
| Edge 4, Wi-Fi 2 Tx | 0.797              | 0.057             |           | <b>0.854</b>            |

### Note(s):

1. Bluetooth and Wi-Fi aux cannot simultaneously transmit
2. As there were only estimated values for edge 2 it was not assessed as it is inherently compliant
3. Values shaded green are estimated SAR

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

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

### Conclusion:

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

### 14.3. Sum of the SAR for Wi-Fi 5.3 GHz Band & Bluetooth

| Test Position      | Data               | Data              | Data      | $\Sigma$ 1-g SAR (mW/g) |
|--------------------|--------------------|-------------------|-----------|-------------------------|
|                    | Wi-Fi 5.3 GHz Main | Wi-Fi 5.3 GHz Aux | Bluetooth |                         |
| Rear, Wi-Fi 1 Tx   | 0.206              |                   | 0.165     | 0.371                   |
| Rear, Wi-Fi 2 Tx   | 0.206              | 0.254             |           | 0.460                   |
| Edge 1, Wi-Fi 1 Tx | 0.138              |                   | 0.017     | 0.155                   |
| Edge 1, Wi-Fi 2 Tx | 0.138              | 0.196             |           | 0.334                   |
| Edge 3, Wi-Fi 1 Tx | 0.196              |                   | 0.165     | 0.361                   |
| Edge 3, Wi-Fi 2 Tx | 0.196              | 0.938             |           | 1.134                   |
| Edge 4, Wi-Fi 1 Tx | 1.19               |                   | 0.0089    | 1.199                   |
| Edge 4, Wi-Fi 2 Tx | 1.19               | 0.124             |           | <b>1.314</b>            |

#### Note(s):

1. Bluetooth and Wi-Fi aux cannot simultaneously transmit
2. As there were only estimated values for edge 2 it was not assessed as it is inherently compliant
3. Values shaded green are estimated SAR

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

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

#### Conclusion:

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

#### 14.4. Sum of the SAR for Wi-Fi 5.5 GHz Bands & Bluetooth

| Test Position      | Data               | Data              | Data      | $\Sigma$ 1-g SAR (mW/g) |
|--------------------|--------------------|-------------------|-----------|-------------------------|
|                    | Wi-Fi 5.5 GHz Main | Wi-Fi 5.5 GHz Aux | Bluetooth |                         |
| Rear, Wi-Fi 1 Tx   | 0.220              |                   | 0.165     | 0.385                   |
| Rear, Wi-Fi 2 Tx   | 0.220              | 0.229             |           | 0.449                   |
| Edge 1, Wi-Fi 1 Tx | 0.082              |                   | 0.017     | 0.099                   |
| Edge 1, Wi-Fi 2 Tx | 0.082              | 0.200             |           | 0.282                   |
| Edge 3, Wi-Fi 1 Tx | 0.200              |                   | 0.165     | 0.365                   |
| Edge 3, Wi-Fi 2 Tx | 0.200              | 1.030             |           | <b>1.230</b>            |
| Edge 4, Wi-Fi 1 Tx | 1.099              |                   | 0.0089    | 1.108                   |
| Edge 4, Wi-Fi 2 Tx | 1.099              | 0.094             |           | 1.193                   |

#### Note(s):

1. Bluetooth and Wi-Fi aux cannot simultaneously transmit
2. As there were only estimated values for edge 2 it was not assessed as it is inherently compliant
3. Values shaded green are estimated SAR

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

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

#### Conclusion:

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

#### 14.5. Sum of the SAR for Wi-Fi 5.8 GHz Band & Bluetooth

| Test Position      | Data               | Data              | Data      | $\Sigma$ 1-g SAR (mW/g) |
|--------------------|--------------------|-------------------|-----------|-------------------------|
|                    | Wi-Fi 5.8 GHz Main | Wi-Fi 5.8 GHz Aux | Bluetooth |                         |
| Rear, Wi-Fi 1 Tx   | 0.090              |                   | 0.165     | 0.255                   |
| Rear, Wi-Fi 2 Tx   | 0.090              | 0.148             |           | 0.238                   |
| Edge 1, Wi-Fi 1 Tx | 0.038              |                   | 0.017     | 0.055                   |
| Edge 1, Wi-Fi 2 Tx | 0.038              | 0.205             |           | 0.243                   |
| Edge 3, Wi-Fi 1 Tx | 0.205              |                   | 0.165     | 0.370                   |
| Edge 3, Wi-Fi 2 Tx | 0.205              | 0.754             |           | 0.959                   |
| Edge 4, Wi-Fi 1 Tx | 0.414              |                   | 0.0089    | 0.423                   |
| Edge 4, Wi-Fi 2 Tx | 0.414              | 0.043             |           | 0.457                   |

#### Note(s):

1. Bluetooth and Wi-Fi aux cannot simultaneously transmit
2. As there were only estimated values for edge 2 it was not assessed as it is inherently compliant
3. Values shaded green are estimated SAR

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

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

#### Conclusion:

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

## **15. Appendixes**

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

- 15.1. System Performance Check Plots**
- 15.2. SAR Test Plots for Bluetooth**
- 15.3. SAR Test Plots for Wi-Fi 2.4 GHz Band**
- 15.4. SAR Test Plots for Wi-Fi 5 GHz Bands**
- 15.5. SAR Test Plots for Repeated Test**
- 15.6. Calibration Certificate for E-Field Probe EX3DV4 - SN 3686**
- 15.7. Calibration Certificate for E-Field Probe EX3DV4 - SN 3751**
- 15.8. Calibration Certificate for E-Field Probe EX3DV4 - SN 3773**
- 15.9. Calibration Certificate for E-Field Probe EX3DV4 - SN 3885**
- 15.10. Calibration Certificate for D2450V2 - SN 706**
- 15.11. Calibration Certificate for D2450V2 - SN 899**
- 15.12. Calibration Certificate for D5GHzV2 - SN 1003**
- 15.13. Calibration Certificate for D5GHzV2 - SN 1138**