



## **SAR EVALUATION REPORT**

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

**For  
IEEE 802.11 2X2 MIMO a/b/g/n/ac Wireless LAN +  
Bluetooth + NFC NGFF Module**

**FCC ID: TLZ-CM389NF  
Model Name: AW-CM389NF**

**Report Number: 4788808986.2-SAR-2**

**Issue Date: January 30, 2019**

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**Revision History**

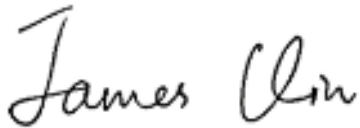
| Rev. | Date             | Revisions                                                                                                                                                                                                                                                                                                                      | Revised By |
|------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| V1.0 | January 14, 2019 | Initial Issue                                                                                                                                                                                                                                                                                                                  | \          |
| V2.0 | January 30, 2019 | Report revised based in Reviewer's comments:<br>1. Sec. 6: Added module dimension information.<br>2. Sec. 9: Updated the diagram.<br>3. Sec. 8: Added the Wi-Fi duty cycle reference report NO.<br>4. Sec. 11: Deleted the SAR result of rear screen surface.<br>5. Updated the power table and corresponding SAR result table | James Qin  |

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**1. Attestation of Test Results**

| Applicant Name                                                                                                                                 | AzureWave Technologies, Inc.                                                                                                              |                                                              |       |
|------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|-------|
| Address                                                                                                                                        | 8 F., No. 94, Baozhong Rd., Xindian, Taipei, Taiwan 231                                                                                   |                                                              |       |
| EUT Name                                                                                                                                       | IEEE 802.11 2X2 MIMO a/b/g/n/ac Wireless LAN + Bluetooth + NFC NGFF Module                                                                |                                                              |       |
| Model Name                                                                                                                                     | AW-CM389NF                                                                                                                                |                                                              |       |
| Sample Status                                                                                                                                  | Normal                                                                                                                                    |                                                              |       |
| Brand Name                                                                                                                                     | AzureWave                                                                                                                                 |                                                              |       |
| Host Equipment                                                                                                                                 | Notebook Computer                                                                                                                         |                                                              |       |
| Brand Name                                                                                                                                     | Lenovo                                                                                                                                    |                                                              |       |
| Host Model                                                                                                                                     | Lenovo 300e Chromebook 2nd Gen MTK, 81QC                                                                                                  |                                                              |       |
| Sample Received Date                                                                                                                           | December 23, 2018                                                                                                                         |                                                              |       |
| Date of Tested                                                                                                                                 | January 2, 2019 to January 30, 2019                                                                                                       |                                                              |       |
| Applicable Standards                                                                                                                           | FCC 47 CFR § 2.1093<br>IEEE Std. 1528-2013<br>KDB publication                                                                             |                                                              |       |
| <b>SAR Limits (W/Kg)</b>                                                                                                                       |                                                                                                                                           |                                                              |       |
| Exposure Category                                                                                                                              | Peak spatial-average(1g of tissue)                                                                                                        | Extremities (hands, wrists, ankles, etc.)<br>(10g of tissue) |       |
| General population /<br>Uncontrolled exposure                                                                                                  | 1.6                                                                                                                                       | 4                                                            |       |
| <b>The Highest Reported SAR (W/kg)</b>                                                                                                         |                                                                                                                                           |                                                              |       |
| RF Exposure Conditions                                                                                                                         | Equipment Class                                                                                                                           |                                                              |       |
|                                                                                                                                                | DTS                                                                                                                                       | U-NII                                                        | DSS   |
| Body (1-g)                                                                                                                                     | 0.129                                                                                                                                     | 1.055                                                        | 0.148 |
| Simultaneous Transmission (1-g)                                                                                                                | 1.569                                                                                                                                     |                                                              |       |
| Test Results                                                                                                                                   | Pass                                                                                                                                      |                                                              |       |
| Prepared By:<br><br>James Qin<br>Engineer Project Associate | Approved By:<br><br>Stephen Guo<br>Laboratory Manager |                                                              |       |

## 2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with IEEE Std. 1528-2013, the following FCC Published RF exposure KDB procedures:

- 248227 D01 802.11 Wi-Fi SAR
- 447498 D01 General RF Exposure Guidance
- 690783 D01 SAR Listings on Grants
- 865664 D01 SAR measurement 100 MHz to 6 GHz
- 865664 D02 RF Exposure Reporting
- 616217 D04 SAR for laptop and tablets

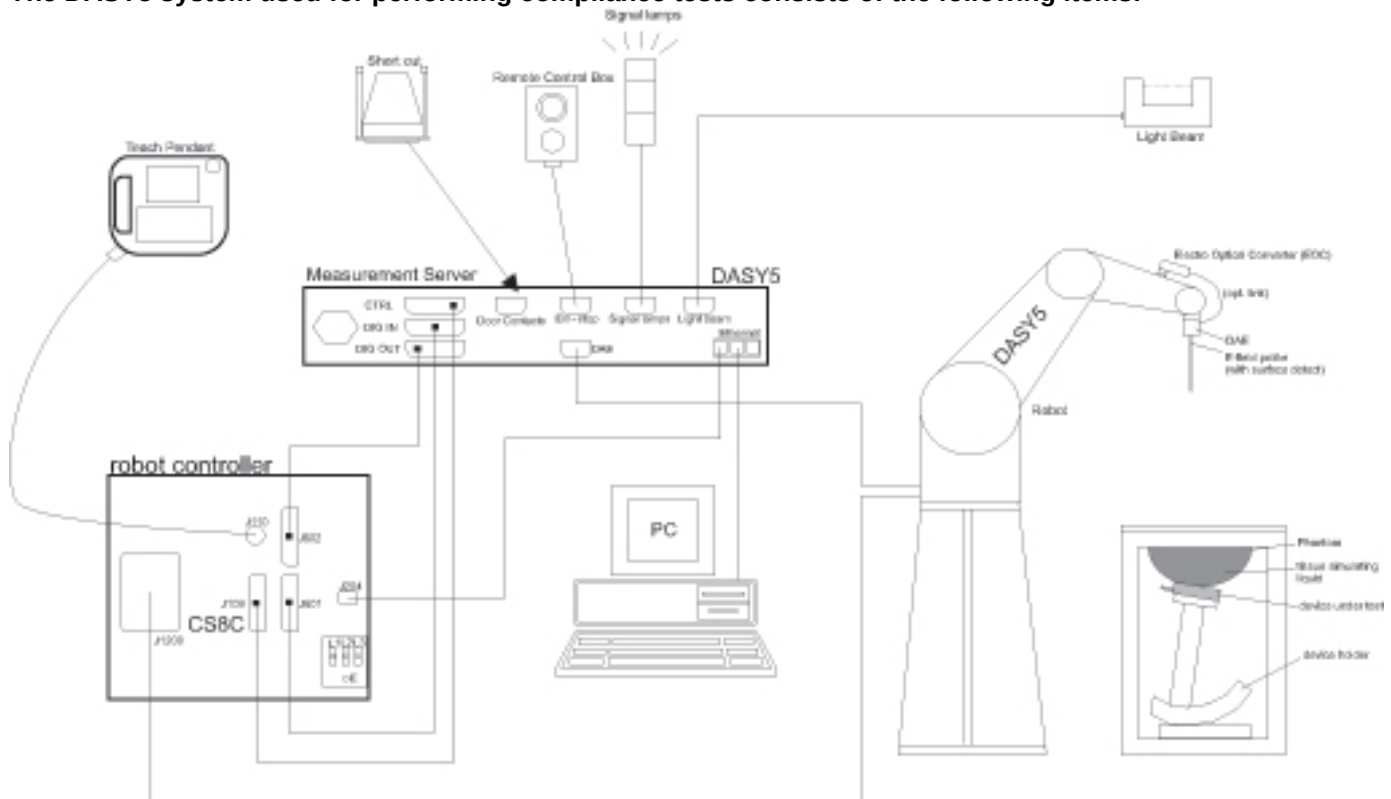
### 3. Facilities and Accreditation

|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Location             | UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Address                   | Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Accreditation Certificate | <p><b>A2LA (Certificate No.: 4102.01)</b></p> <p>UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch has been assessed and proved to be in compliance with A2LA.</p> <p><b>FCC (FCC Recognized No.: CN1187)</b></p> <p>UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules</p> <p><b>IC(Company No.: 21320)</b></p> <p>UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch has been registered and fully described in a report filed with Industry Canada. The Company Number is 21320.</p> <p><b>VCCI (Registration No.: G-20019, R-20004, C-20012 and T-20011)</b></p> <p>UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch has been assessed and proved to be in compliance with VCCI, the Membership No. is 3793.</p> <p>Facility Name:<br/>Chamber D, the VCCI registration No. is G-20019 and R-20004<br/>Shielding Room B , the VCCI registration No. is C-20012 and T-20011</p> |
| Description               | All measurement facilities use to collect the measurement data are located at Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

## 4. SAR Measurement System & Test Equipment

### 4.1. SAR Measurement System

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



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running Win7 and the DASY52 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

## 4.2. SAR Scan Procedures

### Step 1: Power Reference Measurement

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

### Step 2: Area Scan

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

Area Scan Parameters extracted from KDB 865664 D01 v01r04 SAR Measurement 100 MHz to 6 GHz

|                                                                                                        | $\leq 3$ GHz                                                                                                                                                                                                                                                           | $> 3$ GHz                                              |
|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface | $5 \pm 1$ mm                                                                                                                                                                                                                                                           | $\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm     |
| Maximum probe angle from probe axis to phantom surface normal at the measurement location              | $30^\circ \pm 1^\circ$                                                                                                                                                                                                                                                 | $20^\circ \pm 1^\circ$                                 |
| Maximum area scan spatial resolution: $\Delta x_{\text{Area}}, \Delta y_{\text{Area}}$                 | $\leq 2$ 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 v01r04 SAR Measurement 100 MHz to 6 GHz

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

**Step 4: Power drift measurement**

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

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

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

### 4.3. Test Equipment

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

|                                     | Name of equipment             | Manufacturer         | Type/Model             | Serial No. | Cal. Due Date     |
|-------------------------------------|-------------------------------|----------------------|------------------------|------------|-------------------|
| <input checked="" type="checkbox"/> | ENA Network Analyzer          | Keysight             | E5080A                 | MY55100583 | December 10, 2019 |
| <input checked="" type="checkbox"/> | Dielectric Assessment Kit     | SPEAG                | SM DAK 040 SA          | 1155       | NCR               |
| <input checked="" type="checkbox"/> | DC power supply               | Keysight             | E36103A                | MY55350020 | December 10, 2019 |
| <input checked="" type="checkbox"/> | Signal Generator              | Rohde & Schwarz      | SME06                  | 837633\001 | December 10, 2019 |
| <input checked="" type="checkbox"/> | BI-Directional Coupler        | WERLATONE            | C8060-102              | 3423       | December 10, 2019 |
| <input checked="" type="checkbox"/> | Peak and Average Power Sensor | Keysight             | E9323A                 | MY55440013 | December 10, 2019 |
| <input checked="" type="checkbox"/> | Peak and Average Power Sensor | Keysight             | E9323A                 | MY55420006 | December 10, 2019 |
| <input checked="" type="checkbox"/> | Dual Channel PK Power Meter   | Keysight             | N1912A                 | MY55416024 | December 10, 2019 |
| <input checked="" type="checkbox"/> | Amplifier                     | CORAD TECHNOLOGY LTD | AMF-4D-00400600-50-30P | 1983561    | NCR               |
| <input type="checkbox"/>            | Base Station Simulator        | Rohde & Schwarz      | CMW500                 | 155523     | December 10, 2019 |
| <input checked="" type="checkbox"/> | Dosimetric E-Field Probe      | SPEAG                | EX3DV4                 | 7383       | December 19, 2019 |
| <input checked="" type="checkbox"/> | Data Acquisition Electronic   | SPEAG                | DAE3                   | 427        | December 11, 2019 |
| <input type="checkbox"/>            | Dipole Kit 750 MHz            | SPEAG                | D750V3                 | 1153       | December 6, 2021  |
| <input type="checkbox"/>            | Dipole Kit 835 MHz            | SPEAG                | D835V2                 | 4d206      | December 5, 2021  |
| <input type="checkbox"/>            | Dipole Kit 900 MHz            | SPEAG                | D900V2                 | 1d190      | December 5, 2021  |
| <input type="checkbox"/>            | Dipole Kit 1800 MHz           | SPEAG                | D1800V2                | 2d212      | December 6, 2021  |
| <input type="checkbox"/>            | Dipole Kit 1900 MHz           | SPEAG                | D1900V2                | 5d212      | December 7, 2021  |
| <input type="checkbox"/>            | Dipole Kit 2300 MHz           | SPEAG                | D2300V2                | 1065       | December 4, 2021  |
| <input checked="" type="checkbox"/> | Dipole Kit 2450 MHz           | SPEAG                | D2450V2                | 977        | December 4, 2021  |
| <input type="checkbox"/>            | Dipole Kit 2600 MHz           | SPEAG                | D2600V2                | 1117       | December 7, 2021  |
| <input checked="" type="checkbox"/> | Dipole Kit 5 GHz              | SPEAG                | D5GHzV2                | 1231       | December 14, 2021 |
| <input checked="" type="checkbox"/> | Software                      | SPEAG                | DASY52                 | N/A        | NCR               |
| <input checked="" type="checkbox"/> | Twin Phantom                  | SPEAG                | SAM V5.0               | 1805       | NCR               |
| <input type="checkbox"/>            | ELI Phantom                   | SPEAG                | ELI V5.0               | 1235       | NCR               |
| <input checked="" type="checkbox"/> | Thermometer                   | Control Company      | 4242                   | 150709653  | December 6, 2019  |
| <input checked="" type="checkbox"/> | Hygrometer                    | \                    | GX-138                 | \          | September 5, 2019 |

## Note:

- 1) As per KDB865664D01 requirements for dipole calibration, the test laboratory has adopted three-year extended calibration interval. Each measured dipole is expected to evaluate with the following criteria at least on annual interval in Appendix C.
  - a) There is no physical damage on the dipole;
  - b) System check with specific dipole is within 10% of calibrated value;
  - c) The most recent return-loss result, measured at least annually, deviates by no more than 20% from the previous measurement.
  - d) The most recent measurement of the real or imaginary parts of the impedance, measured at least annually is within 5Ω from the previous measurement.
- 2) Dielectric assessment kit is calibrated against air, distilled water and a shorting block performed before measuring liquid parameters.
- 3) NCR is short for “No Calibration Requirement”.

## 5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is  $< 1.5$  W/kg and the measured 10-g SAR within a frequency band is  $< 3.75$  W/kg. The expanded SAR measurement uncertainty must be  $\leq 30\%$ , for a confidence interval of  $k = 2$ . If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std. 1528-2013 is not required in SAR reports submitted for equipment approval.

## 6. Device Under Test (DUT) Information

### 6.1. DUT Description

|                                                                        |                                                                                                                                                                                                                               |
|------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The DUT is a wireless module with IEEE 802.11a/b/g/n/ac, and BT radio. |                                                                                                                                                                                                                               |
| DUT dimension                                                          | Overall (Length x Width x Height): 16mm x 11mm x 1.5mm                                                                                                                                                                        |
| Host information                                                       | Overall (Length x Width x Height): 290 mm x 204mm x 20.35<br>Note:<br>The host supports tablet use conditions, there are two different pair of antenna assembled into the host, one is SKU-3 (NDX), another is SKU-4 (INPAQ). |

### 6.2. Wireless Technology

| Wireless technology | Frequency band |
|---------------------|----------------|
| Wi-Fi               | 2.4 GHz        |
| Wi-Fi               | 5 GHz          |
| BT                  | 2.4 GHz        |

## 7. SAR Test Configuration

As per KDB 616217 D04, when antennas are incorporated in the screen section of a laptop computer, SAR is required for the bottom surface of the keyboard. Provided tablet use conditions are not supported by the laptop computer, SAR tests for bystander exposure from the edges of the keyboard and display screen of laptop computers are generally not required.

### 7.1. Wi-Fi Test Configuration

For Wi-Fi SAR testing, a communication link is set up with the testing software for Wi-Fi mode test. During the test, at the each test frequency channel, the EUT is operated at the RF continuous emission mode. The test procedures in KDB 248227D01 are applied.

#### 7.1.1. Initial Test Position Procedure

For exposure condition with multiple test position, such as handsets operating next to the ear, devices with hotspot mode or UMPC mini-tablet, procedures for initial test position can be applied. Using the transmission mode determined by the DSSS procedure or initial test configuration, area scans are measured for all position in an exposure condition. The test position with the highest extrapolated (peak) SAR is used as the initial test position. When reported SAR for the initial test position is  $\leq 0.4\text{W/kg}$ , no additional testing for the remaining test position is required. Otherwise, SAR is evaluated at the subsequent highest peak SAR position until the reported SAR result is  $\leq 0.8\text{W/kg}$  or all test position are measured. For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is  $> 0.8\text{W/kg}$ , SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is  $\leq 1.2\text{W/kg}$  or all required channels are tested.

#### 7.1.2. Initial Test Configuration Procedure

An initial test configuration is determined for OFDM transmission modes according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band. SAR is measured using the highest measured maximum output power channel. For configurations with the same specified or measured maximum output power, additional transmission mode and test channel selection procedures are required (see section 5.3.2 of KDB 248227D01). SAR test reduction of subsequent highest output test channels is based on the reported SAR of the initial test configuration.

For next to the ear, hotspot mode and UMC mini-tablet exposure configurations where multiple test positions are required, the initial test position procedure is applied to minimize the number of test positions required for SAR measurement using the initial test configuration transmission mode. For fixed exposure conditions that do not have multiple SAR test positions, SAR is measured in the transmission mode determined by the initial test configuration. When the reported SAR of the initial test configuration is  $> 0.8\text{W/kg}$ , SAR measurement is required for the subsequent next highest measured output power channel(s) in the initial test configuration until the reported SAR is  $\leq 1.2\text{W/kg}$  or all required channels are tested.

#### 7.1.3. Sub Test Configuration Procedure

SAR measurement requirements for the remaining 802.11 transmission mode configurations that have not been tested in the initial test configuration are determined separately for each standalone and aggregated frequency band, in each exposure condition, according to the maximum output power specified for production units.

When the highest reported SAR for the initial test configuration, according to the initial test position or fixed exposure position requirements, is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is  $\leq 1.2\text{W/kg}$ , SAR is not required for that subsequent test configuration.

#### 7.1.4. 2.4GHz Wi-Fi SAR Test Procedures

Separate SAR procedures are applied to DSSS and OFDM configurations in the 2.4 GHz band to simplify DSSS test requirements. For 802.11b DSSS SAR measurements, DSSS SAR procedure applies to fixed exposure test position and initial test position procedure applies to multiple exposure test positions.

##### A) 802.11b DSSS SAR Test Requirements

SAR is measured for 2.4 GHz 802.11b DSSS using either a fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:

- 1) When the reported SAR of the highest measured maximum output power channel (section 3.1 of KDB 248227D01) for the exposure configuration is  $\leq 0.8$  W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
- 2) When the reported SAR is  $> 0.8$  W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is  $> 1.2$  W/kg, SAR is required for the third channel; i.e., all channels require testing.

##### B) 2.4GHz 802.11g/n OFDM SAR Test Exclusion Requirements

When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, the measurement and test reduction procedures for OFDM are applied (section 5.3 of KDB 248227D01). SAR is not required for the following 2.4 GHz OFDM conditions.

- 1) When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.
- 2) When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg.

##### C) SAR Test Requirements for OFDM configurations

When SAR measurement is required for 802.11 g/n OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. In applying the initial test configuration and subsequent test configuration procedures, the 802.11 transmission configuration with the highest specified maximum output power and the channel within a test configuration with the highest measured maximum output power should be clearly distinguished to apply the procedures.

### 7.1.5. 5GHz Wi-Fi SAR Test Procedures

#### A) U-NII-1 and U-NII-2A Bands

For devices that operate in only one of the U-NII-1 and U-NII-2A bands, the normally required SAR procedures for OFDM configurations are applied. For devices that operate in both U-NII bands using the same transmitter and antenna(s), SAR test reduction is determined according to the following:

- 1) When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is  $\leq 1.2$  W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, both bands are tested independently for SAR.
- 2) When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is  $\leq 1.2$  W/kg, SAR is not required for the band with lower maximum output power in that test configuration; otherwise, both bands are tested independently for SAR.
- 3) The two U-NII bands may be aggregated to support a 160 MHz channel on channel number 50. Without additional testing, the maximum output power for this is limited to the lower of the maximum output power certified for the two bands. When SAR measurement is required for at least one of the bands and the highest reported SAR adjusted by the ratio of specified maximum output power of aggregated to standalone band is  $> 1.2$  W/kg, SAR is required for the 160 MHz channel. This procedure does not apply to an aggregated band with maximum output higher than the standalone band(s); the aggregated band must be tested independently for SAR. SAR is not required when the 160 MHz channel is operating at a reduced maximum power and also qualifies for SAR test exclusion.

#### B) U-NII-2C and U-NII-3 Bands

The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. When Terminal Doppler Weather Radar (TDWR) restriction applies, all channels that operate at 5.60 – 5.65 GHz must be included to apply the SAR test reduction and measurement procedures.

When the same transmitter and antenna(s) are used for U-NII-2C band and U-NII-3 band or 5.8 GHz band of §15.247, the bands may be aggregated to enable additional channels with 20, 40 or 80 MHz bandwidth to span across the band gap, as illustrated in Appendix B. The maximum output power for the additional band gap channels is limited to the lower of those certified for the bands. Unless band gap channels are permanently disabled, they must be considered for SAR testing. The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. To maintain SAR measurement accuracy and to facilitate test reduction, the channels in U-NII-2C band above 5.65 GHz may be grouped with the 5.8 GHz channels in U-NII-3 or §15.247 band to enable two SAR probe calibration frequency points to cover the bands, including the band gap channels. When band gap channels are supported and the bands are not aggregated for SAR testing, band gap channels must be considered independently in each band according to the normally required OFDM SAR measurement and probe calibration frequency points requirements.

**C) OFDM Transmission Mode SAR Test Configuration and Channel Selection Requirements**

The initial test configuration for 5 GHz OFDM transmission modes is determined by the 802.11 configuration with the highest maximum output power specified for production units, including tune-up tolerance, in each standalone and aggregated frequency band. SAR for the initial test configuration is measured using the highest maximum output power channel determined by the default power measurement procedures. When multiple configurations in a frequency band have the same specified maximum output power, the initial test configuration is determined according to the following steps applied sequentially.

- 1) The largest channel bandwidth configuration is selected among the multiple configurations with the same specified maximum output power.
- 2) If multiple configurations have the same specified maximum output power and largest channel bandwidth, the lowest order modulation among the largest channel bandwidth configurations is selected.
- 3) If multiple configurations have the same specified maximum output power, largest channel bandwidth and lowest order modulation, the lowest data rate configuration among these configurations is selected. When multiple transmission modes (802.11a/g/n/ac) have the same specified maximum output power, largest channel bandwidth, lowest order modulation and lowest data rate, the lowest order 802.11 mode is selected; i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is chosen over 802.11n.

After an initial test configuration is determined, if multiple test channels have the same measured maximum output power, the channel chosen for SAR measurement is determined according to the following. These channel selection procedures apply to both the initial test configuration and subsequent test configuration(s), with respect to the default power measurement procedures or additional power measurements required for further SAR test reduction. The same procedures also apply to subsequent highest output power channel(s) selection.

- 1) The channel closest to mid-band frequency is selected for SAR measurement.
- 2) For channels with equal separation from mid-band frequency; for example, high and low channels

**D) SAR Test Requirements for OFDM configurations**

When SAR measurement is required for 802.11 a/n/ac OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. When the same transmitter and antenna(s) are used for U-NII-1 and U-NII-2A bands, additional SAR test reduction applies. When band gap channels between U-NII-2C band and 5.8 GHz U-NII-3 or §15.247 band are supported, the highest maximum output power transmission mode configuration and maximum output power channel across the bands must be used to determine SAR test reduction, according to the initial test configuration and subsequent test configuration requirements. In applying the initial test configuration and subsequent test configuration procedures, the 802.11 transmission configuration with the highest specified maximum output power and the channel within a test configuration with the highest measured maximum output power should be clearly distinguished to apply the procedures.

## 8. Conducted Output Power Measurement

General note:

- 1) As per KDB 447498 sec.4.1.d) at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit.
- 2) NM is short for "Not Measured"

### 8.1. Power measurement result of 2.4GHz Wi-Fi.

| Mode         | Channel | Frequency (MHz) | Data Rate | Average Power of Main ANT (dBm) | Average Power of Aux ANT (dBm) | SUM   | SAR Test |
|--------------|---------|-----------------|-----------|---------------------------------|--------------------------------|-------|----------|
| 802.11b      | 1       | 2412            | 1Mbps     | 12.45                           | 12.46                          | 15.47 | Required |
|              | 6       | 2437            |           | 12.39                           | 12.35                          | 15.38 |          |
|              | 11      | 2462            |           | 10.26                           | 10.39                          | 13.34 |          |
| 802.11g      | 1       | 2412            | 6Mbps     | NM                              | NM                             | NM    | Excluded |
|              | 6       | 2437            |           | NM                              | NM                             | NM    |          |
|              | 11      | 2462            |           | NM                              | NM                             | NM    |          |
| 802.11n-HT20 | 1       | 2412            | MCS0      | NM                              | NM                             | NM    | Excluded |
|              | 6       | 2437            |           | NM                              | NM                             | NM    |          |
|              | 11      | 2462            |           | NM                              | NM                             | NM    |          |
| 802.11n-HT40 | 3       | 2422            | MCS0      | NM                              | NM                             | NM    | Excluded |
|              | 6       | 2437            |           | NM                              | NM                             | NM    |          |
|              | 9       | 2452            |           | NM                              | NM                             | NM    |          |

### 8.2. Power measurement result of 5GHz Wi-Fi (U-NII-1).

| Mode           | Channel | Frequency (MHz) | Data Rate | Average Power of Main ANT (dBm) | Average Power of Aux ANT (dBm) | SUM | SAR Test |
|----------------|---------|-----------------|-----------|---------------------------------|--------------------------------|-----|----------|
| 802.11a        | 36      | 5180            | 6Mbps     | NM                              | NM                             | NM  | Excluded |
|                | 40      | 5200            |           | NM                              | NM                             | NM  |          |
|                | 44      | 5220            |           | NM                              | NM                             | NM  |          |
|                | 48      | 5240            |           | NM                              | NM                             | NM  |          |
| 802.11n-HT20   | 36      | 5180            | MCS0      | NM                              | NM                             | NM  | Excluded |
|                | 40      | 5200            |           | NM                              | NM                             | NM  |          |
|                | 44      | 5220            |           | NM                              | NM                             | NM  |          |
|                | 48      | 5240            |           | NM                              | NM                             | NM  |          |
| 802.11n-HT40   | 38      | 5190            | MCS0      | NM                              | NM                             | NM  | Excluded |
|                | 46      | 5230            |           | NM                              | NM                             | NM  |          |
| 802.11ac-VHT20 | 36      | 5180            | MCS0      | NM                              | NM                             | NM  | Excluded |
|                | 40      | 5200            |           | NM                              | NM                             | NM  |          |
|                | 44      | 5220            |           | NM                              | NM                             | NM  |          |
|                | 48      | 5240            |           | NM                              | NM                             | NM  |          |
| 802.11ac-VHT40 | 38      | 5190            | MCS0      | NM                              | NM                             | NM  | Excluded |
|                | 46      | 5230            |           | NM                              | NM                             | NM  |          |
| 802.11ac-VHT80 | 42      | 5210            | MCS0      | NM                              | NM                             | NM  | Excluded |

**8.3. Power measurement result of 5GHz Wi-Fi (U-NII-2A).**

| Mode           | Channel | Frequency (MHz) | Data Rate | Average Power of Main ANT (dBm) | Average Power of Aux ANT (dBm) | SUM   | SAR Test |
|----------------|---------|-----------------|-----------|---------------------------------|--------------------------------|-------|----------|
| 802.11a        | 52      | 5260            | 6Mbps     | 12.73                           | 12.84                          | 15.80 | Required |
|                | 56      | 5280            |           | 13.00                           | 12.95                          | 15.99 |          |
|                | 60      | 5300            |           | 12.86                           | 12.68                          | 15.78 |          |
|                | 64      | 5320            |           | 12.68                           | 12.61                          | 15.66 |          |
| 802.11n-HT20   | 52      | 5260            | MCS0      | NM                              | NM                             | NM    | Excluded |
|                | 56      | 5280            |           | NM                              | NM                             | NM    |          |
|                | 60      | 5300            |           | NM                              | NM                             | NM    |          |
|                | 64      | 5320            |           | NM                              | NM                             | NM    |          |
| 802.11n-HT40   | 54      | 5270            | MCS0      | NM                              | NM                             | NM    | Excluded |
|                | 62      | 5310            |           | NM                              | NM                             | NM    |          |
| 802.11ac-VHT20 | 52      | 5260            | MCS0      | NM                              | NM                             | NM    | Excluded |
|                | 56      | 5280            |           | NM                              | NM                             | NM    |          |
|                | 60      | 5300            |           | NM                              | NM                             | NM    |          |
|                | 64      | 5320            |           | NM                              | NM                             | NM    |          |
| 802.11ac-VHT40 | 54      | 5270            | MCS0      | NM                              | NM                             | NM    | Excluded |
|                | 62      | 5310            |           | NM                              | NM                             | NM    |          |
| 802.11ac-VHT80 | 58      | 5290            | MCS0      | NM                              | NM                             | NM    | Excluded |

**8.4. Power measurement result of 5GHz Wi-Fi (U-NII-2C).**

| Mode           | Channel | Frequency (MHz) | Data Rate | Average Power of Main ANT (dBm) | Average Power of Aux ANT (dBm) | SUM   | SAR Test |
|----------------|---------|-----------------|-----------|---------------------------------|--------------------------------|-------|----------|
| 802.11a        | 100     | 5500            | 6Mbps     | 12.58                           | 12.41                          | 15.51 | Required |
|                | 104     | 5520            |           | 12.37                           | 12.56                          | 15.48 |          |
|                | 108     | 5540            |           | 12.47                           | 12.68                          | 15.59 |          |
|                | 112     | 5560            |           | 12.49                           | 12.76                          | 15.64 |          |
|                | 116     | 5580            |           | 12.65                           | 12.88                          | 15.78 |          |
|                | 120     | 5600            |           | 12.41                           | 12.69                          | 15.56 |          |
|                | 124     | 5620            |           | 12.47                           | 12.81                          | 15.65 |          |
|                | 128     | 5640            |           | 12.77                           | 12.91                          | 15.85 |          |
|                | 132     | 5660            |           | 12.68                           | 12.93                          | 15.82 |          |
|                | 136     | 5680            |           | 12.98                           | 12.99                          | 16.00 |          |
|                | 140     | 5700            |           | 12.81                           | 12.98                          | 15.91 |          |
| 802.11n-HT20   | 100     | 5500            | MCS0      | NM                              | NM                             | NM    | Excluded |
|                | 104     | 5520            |           | NM                              | NM                             | NM    |          |
|                | 108     | 5540            |           | NM                              | NM                             | NM    |          |
|                | 112     | 5560            |           | NM                              | NM                             | NM    |          |
|                | 116     | 5580            |           | NM                              | NM                             | NM    |          |
|                | 120     | 5600            |           | NM                              | NM                             | NM    |          |
|                | 124     | 5620            |           | NM                              | NM                             | NM    |          |
|                | 128     | 5640            |           | NM                              | NM                             | NM    |          |
|                | 132     | 5660            |           | NM                              | NM                             | NM    |          |
|                | 136     | 5680            |           | NM                              | NM                             | NM    |          |
|                | 140     | 5700            |           | NM                              | NM                             | NM    |          |
| 802.11n-HT40   | 102     | 5510            | MCS0      | NM                              | NM                             | NM    | Excluded |
|                | 110     | 5550            |           | NM                              | NM                             | NM    |          |
|                | 118     | 5590            |           | NM                              | NM                             | NM    |          |
|                | 126     | 5630            |           | NM                              | NM                             | NM    |          |
|                | 134     | 5670            |           | NM                              | NM                             | NM    |          |
| 802.11ac-VHT20 | 100     | 5500            | MCS0      | NM                              | NM                             | NM    | Excluded |
|                | 104     | 5520            |           | NM                              | NM                             | NM    |          |
|                | 108     | 5540            |           | NM                              | NM                             | NM    |          |
|                | 112     | 5560            |           | NM                              | NM                             | NM    |          |
|                | 116     | 5580            |           | NM                              | NM                             | NM    |          |
|                | 120     | 5600            |           | NM                              | NM                             | NM    |          |
|                | 124     | 5620            |           | NM                              | NM                             | NM    |          |
|                | 128     | 5640            |           | NM                              | NM                             | NM    |          |
|                | 132     | 5660            |           | NM                              | NM                             | NM    |          |
|                | 136     | 5680            |           | NM                              | NM                             | NM    |          |
|                | 140     | 5700            |           | NM                              | NM                             | NM    |          |
| 802.11ac-VHT40 | 102     | 5510            | MCS0      | NM                              | NM                             | NM    | Excluded |
|                | 110     | 5550            |           | NM                              | NM                             | NM    |          |
|                | 118     | 5590            |           | NM                              | NM                             | NM    |          |
|                | 126     | 5630            |           | NM                              | NM                             | NM    |          |
|                | 134     | 5670            |           | NM                              | NM                             | NM    |          |
| 802.11ac-VHT80 | 106     | 5530            | MCS0      | NM                              | NM                             | NM    | Excluded |
|                | 122     | 5610            |           | NM                              | NM                             | NM    |          |

|  |     |      |  |    |    |    |  |
|--|-----|------|--|----|----|----|--|
|  | 138 | 5690 |  | NM | NM | NM |  |
|--|-----|------|--|----|----|----|--|

### 8.5. Power measurement result of 5GHz Wi-Fi (U-NII-3) for Main ANT.

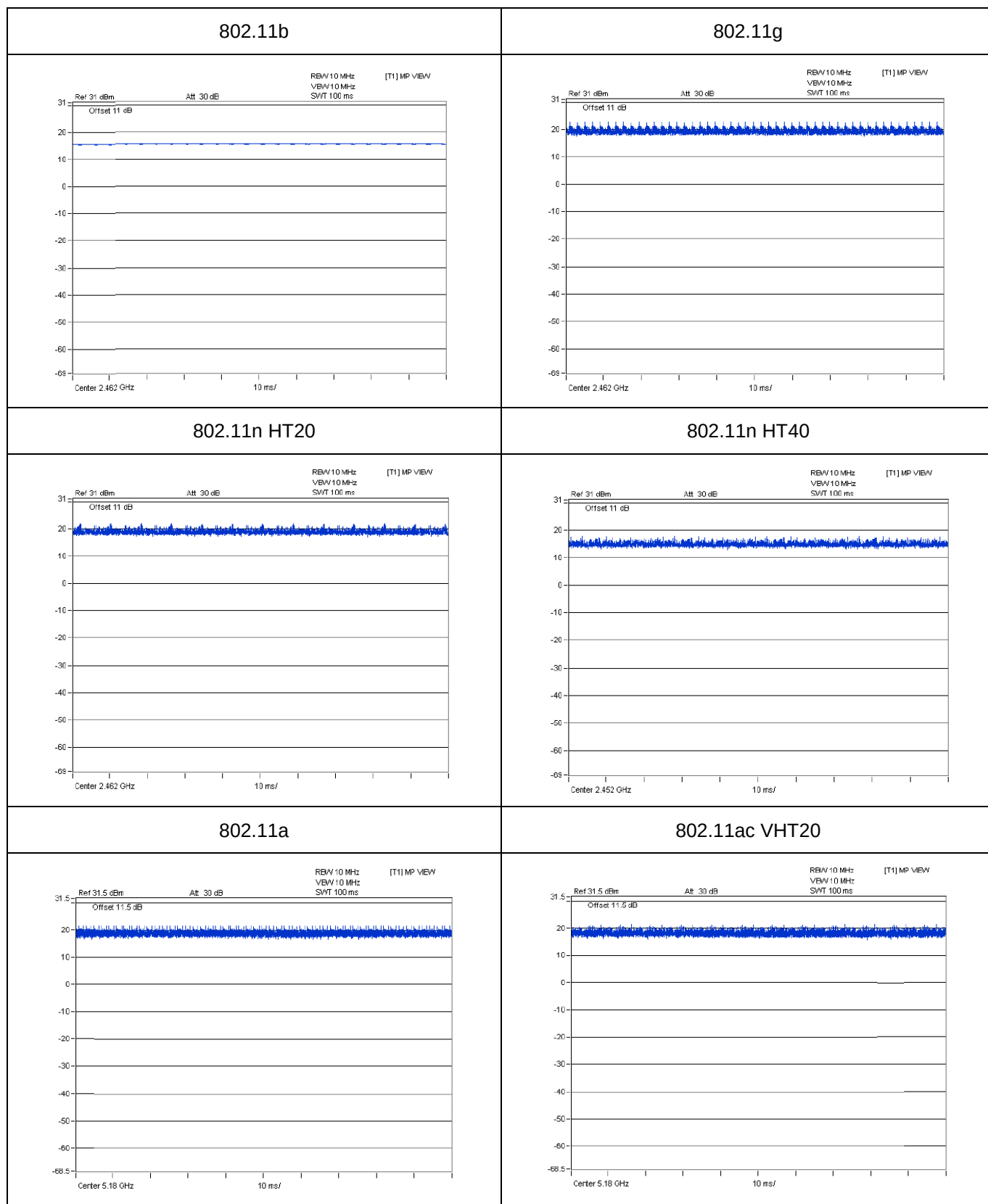
| Mode           | Channel | Frequency (MHz) | Data Rate | Average Power of Main ANT (dBm) | Average Power of Aux ANT (dBm) | SUM   | SAR Test |
|----------------|---------|-----------------|-----------|---------------------------------|--------------------------------|-------|----------|
| 802.11a        | 149     | 5745            | 6Mbps     | 14.36                           | 14.39                          | 17.39 | Required |
|                | 153     | 5765            |           | 14.45                           | 14.41                          | 17.44 |          |
|                | 157     | 5785            |           | 14.48                           | 14.29                          | 17.40 |          |
|                | 161     | 5805            |           | 14.47                           | 14.21                          | 17.35 |          |
|                | 165     | 5825            |           | 14.42                           | 13.85                          | 17.15 |          |
| 802.11n-HT20   | 149     | 5745            | MCS0      | NM                              | NM                             | NM    | Excluded |
|                | 153     | 5765            |           | NM                              | NM                             | NM    |          |
|                | 157     | 5785            |           | NM                              | NM                             | NM    |          |
|                | 161     | 5805            |           | NM                              | NM                             | NM    |          |
|                | 165     | 5825            |           | NM                              | NM                             | NM    |          |
| 802.11n-HT40   | 151     | 5755            | MCS0      | NM                              | NM                             | NM    | Excluded |
|                | 159     | 5795            |           | NM                              | NM                             | NM    |          |
| 802.11ac-VHT20 | 149     | 5745            | MCS0      | NM                              | NM                             | NM    | Excluded |
|                | 153     | 5765            |           | NM                              | NM                             | NM    |          |
|                | 157     | 5785            |           | NM                              | NM                             | NM    |          |
|                | 161     | 5805            |           | NM                              | NM                             | NM    |          |
|                | 165     | 5825            |           | NM                              | NM                             | NM    |          |
| 802.11ac-VHT40 | 151     | 5755            | MCS0      | NM                              | NM                             | NM    | Excluded |
|                | 159     | 5795            |           | NM                              | NM                             | NM    |          |
| 802.11ac-VHT80 | 155     | 5775            | MCS0      | NM                              | NM                             | NM    | Excluded |

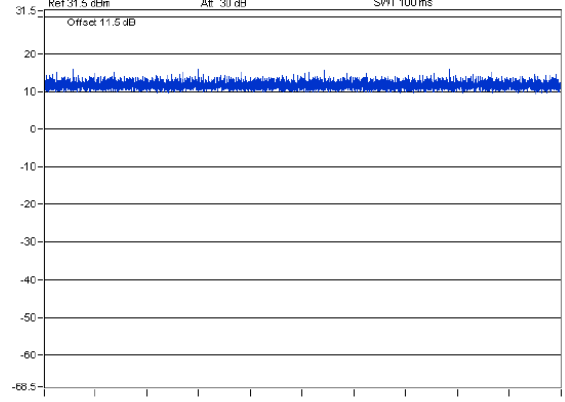
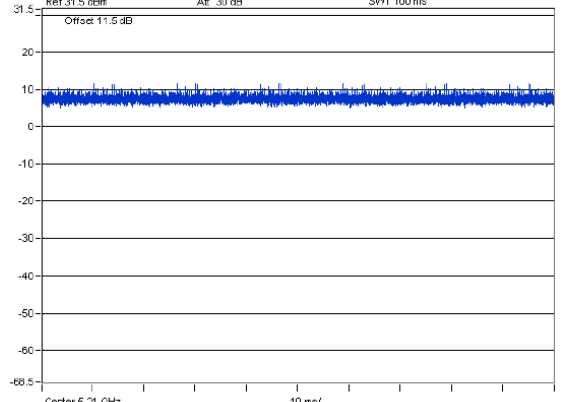
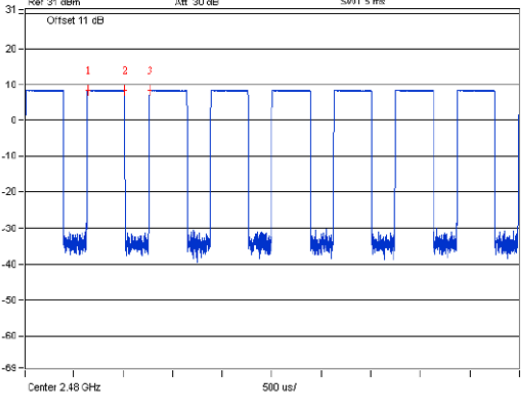
**8.6. Power measurement result BT**

| Band | Mode | Antenna | Average Conducted Power (dBm) |      |      | Tune-up |
|------|------|---------|-------------------------------|------|------|---------|
|      |      |         | 0CH                           | 39CH | 78CH |         |
| 2.4G | DH5  | Aux     | 9.13                          | 8.91 | 8.65 | 10.0    |
|      | 3DH5 | Aux     | 5.89                          | 5.91 | 5.95 | 6.0     |

| Band | Mode | Antenna | Average Conducted Power (dBm) |      |      | Tune-up |
|------|------|---------|-------------------------------|------|------|---------|
|      |      |         | 0CH                           | 19CH | 39CH |         |
| 2.4G | BLE  | Aux     | 8.65                          | 8.73 | 8.59 | 9       |

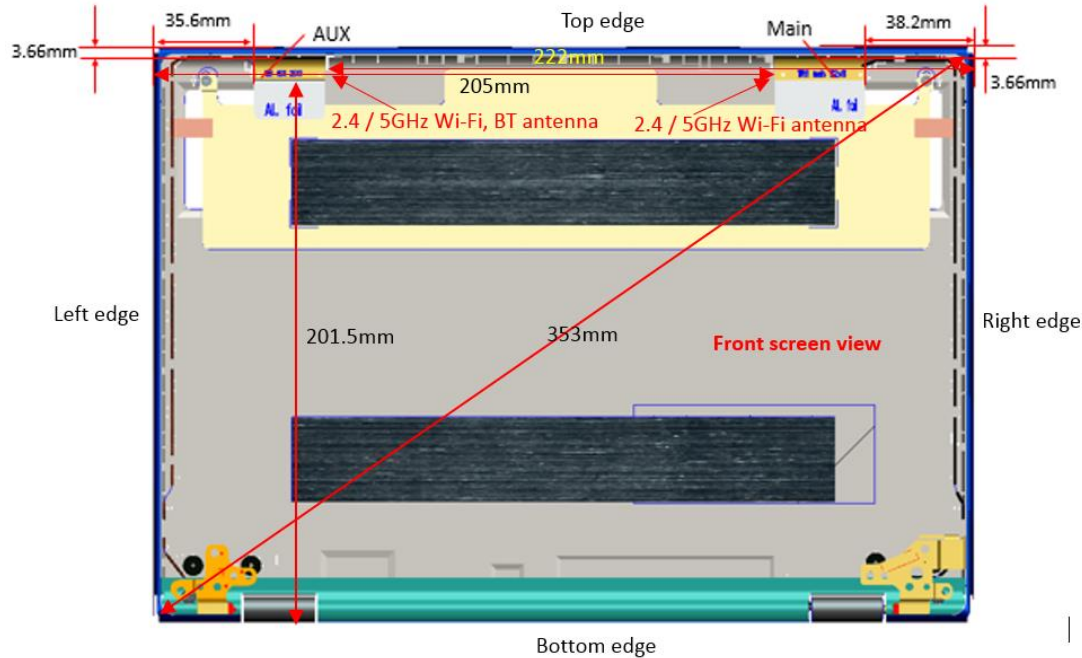
## 8.7. Duty cycle measurement plots



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div>802.11ac VHT40</div> <div><div><div>Ref: 31.5 dBm</div><div>Att: 30 dB</div><div>RBW: 10 MHz</div><div>VBW: 10 MHz</div><div>SWT: 100 ms</div></div><div>[T1] MP VIEW</div><div></div></div>                                                                                                                                                                                                                                        | <div>802.11ac VHT80</div> <div><div><div>Ref: 31.5 dBm</div><div>Att: 30 dB</div><div>RBW: 10 MHz</div><div>VBW: 10 MHz</div><div>SWT: 100 ms</div></div><div>[T1] MP VIEW</div><div></div></div> |
| <div>BT</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <div>N/A</div>                                                                                                                                                                                                                                                                      |
| <div>Duty cycle = 0.3775 ms/0.625 ms = 0.604</div> <div><div><div>Ref: 31 dBm</div><div>Att: 30 dB</div><div>RBW: 10 MHz</div><div>VBW: 10 MHz</div><div>SWT: 5 ms</div></div><div>[T1] MP VIEW</div><div></div></div> <div><div>Marker 1 [T1]</div><div>6.43 dBm</div><div>620.750000 us</div><div>Delta 2 [T1]</div><div>0.04 dB</div><div>377.500000 us</div><div>Delta 3 [T1]</div><div>0.00 dB</div><div>625.000000 us</div></div> | <div>N/A</div>                                                                                                                                                                                                                                                                      |

## 9. RF Exposure Conditions

Refer to the diagram inside the device which attached below for the specific details of the antenna-to-edges distances. The product supports notebook mode, stand mode, tent mode and tablet mode, SAR evaluation for tablet mode covers the other three mode.



Per FCC KDB 447498D01:

1. The 1-g SAR and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances  $\leq 50$  mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$  for 1-g SAR and  $\leq 7.5$  for product specific 10-g SAR, where:

- $f(\text{GHz})$  is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm is applied to determine SAR test exclusion.

2. The SAR exclusion threshold for distances  $> 50$  mm is defined by the following equation, as illustrated in KDB 447498 D01 Appendix B:

a) at 100 MHz to 1500 MHz

[Power allowed at numeric threshold for 50 mm in step 1) + (test separation distance - 50 mm) · (f(MHz)/150)] mW

b) at  $> 1500$  MHz and  $\leq 6$  GHz

[Power allowed at numeric Threshold at 50 mm in step 1) + (test separation distance - 50 mm) · 10] mW

3. The test separation distances required for a device to demonstrate SAR or MPE compliance must be sufficiently conservative to support the operational separation distances required by the device and its antennas and radiating structures. For devices such as tablets and transmitters embedded in keyboard sections of laptop computers that are typically used in close proximity to users, the test separation distance is determined by the smallest distance between the outer surface of the device and the user. For larger devices, as the antenna operational separation distance increases to where the SAR characteristics of the device and its antennas are not directly influenced by the user, such as antennas along the top and upper side edges of laptop computer displays or opposite and adjacent edges of tablets, the test separation distance is normally determined by the closest separation between the antenna and the user.

## 9.1. SAR evaluation exclusion analysis for Bluetooth

For 2.4GHz Wi-Fi SISO mode 1-g SAR (aux antenna to outer surface separation distance  $\leq 50\text{mm}$ )

| Position               | Frequency (MHz) | Power (dBm) | Power (mW) | Separation Distance (mm) | Calculation Result | Threshold | SAR Test |
|------------------------|-----------------|-------------|------------|--------------------------|--------------------|-----------|----------|
| Front keyboard surface | 2480            | 10.00       | 10.00      | 5.00                     | 3.1                | 3.0       | Required |
| Top edge               | 2480            | 10.00       | 10.00      | 5.00                     | 3.1                | 3.0       | Required |
| Left edge              | 2480            | 10.00       | 10.00      | 35.60                    | 0.4                | 3.0       | Excluded |

For 2.4GHz Wi-Fi SISO mode 1-g SAR (aux antenna to outer surface separation distance  $> 50\text{mm}$ )

| Position       | Frequency (MHz) | Power (dBm) | Power (mW) | Power allowed at 50mm | Separation Distance (mm) | Calculation Result (mW) | SAR Test |
|----------------|-----------------|-------------|------------|-----------------------|--------------------------|-------------------------|----------|
| Bottom surface | 2480            | 10.00       | 10.00      | 95.25                 | 201.5                    | 1610.25                 | Excluded |
| Right edge     | 2480            | 10.00       | 10.00      | 95.25                 | 222.00                   | 1815.25                 | Excluded |

## 9.2. SAR evaluation exclusion analysis for 2.4GHz Wi-Fi

For 2.4GHz Wi-Fi SISO mode 1-g SAR (main antenna to outer surface separation distance  $\leq 50\text{mm}$ )

| Position               | Frequency (MHz) | Power (dBm) | Power (mW) | Separation Distance (mm) | Calculation Result | Threshold | SAR Test |
|------------------------|-----------------|-------------|------------|--------------------------|--------------------|-----------|----------|
| Front keyboard surface | 2462            | 12.50       | 17.78      | 5.00                     | 5.6                | 3.0       | Required |
| Top edge               | 2462            | 12.50       | 17.78      | 5.00                     | 5.6                | 3.0       | Required |
| Right edge             | 2462            | 12.50       | 17.78      | 38.20                    | 0.7                | 3.0       | Excluded |

For 2.4GHz Wi-Fi SISO mode 1-g SAR (main antenna to outer surface separation distance  $> 50\text{mm}$ )

| Position       | Frequency (MHz) | Power (dBm) | Power (mW) | Power allowed at 50mm | Separation Distance (mm) | Calculation Result (mW) | SAR Test |
|----------------|-----------------|-------------|------------|-----------------------|--------------------------|-------------------------|----------|
| Bottom surface | 2462            | 12.50       | 17.78      | 95.60                 | 201.5                    | 1610.60                 | Excluded |
| Left edge      | 2462            | 12.50       | 17.78      | 95.60                 | 205.00                   | 1645.60                 | Excluded |

For 2.4GHz Wi-Fi SISO mode 1-g SAR (aux antenna to outer surface separation distance  $\leq 50\text{mm}$ )

| Position               | Frequency (MHz) | Power (dBm) | Power (mW) | Separation Distance (mm) | Calculation Result | Threshold | SAR Test |
|------------------------|-----------------|-------------|------------|--------------------------|--------------------|-----------|----------|
| Front keyboard surface | 2462            | 12.50       | 17.78      | 5.00                     | 5.6                | 3.0       | Required |
| Top edge               | 2462            | 12.50       | 17.78      | 5.00                     | 5.6                | 3.0       | Required |
| Left edge              | 2462            | 12.50       | 17.78      | 35.60                    | 0.8                | 3.0       | Excluded |

For 2.4GHz Wi-Fi SISO mode 1-g SAR (aux antenna to outer surface separation distance  $> 50\text{mm}$ )

| Position       | Frequency (MHz) | Power (dBm) | Power (mW) | Power allowed at 50mm | Separation Distance (mm) | Calculation Result (mW) | SAR Test |
|----------------|-----------------|-------------|------------|-----------------------|--------------------------|-------------------------|----------|
| Bottom surface | 2462            | 12.50       | 17.78      | 95.60                 | 201.5                    | 1610.60                 | Excluded |
| Right edge     | 2462            | 12.50       | 17.78      | 95.60                 | 222.00                   | 1815.60                 | Excluded |

**9.3. SAR evaluation exclusion analysis for 5GHz Wi-Fi**For 5GHz Wi-Fi SISO mode 1-g SAR (main antenna to outer surface separation distance  $\leq 50\text{mm}$ )

| Position               | Frequency (MHz) | Power (dBm) | Power (mW) | Separation Distance (mm) | Calculation Result | Threshold | SAR Test |
|------------------------|-----------------|-------------|------------|--------------------------|--------------------|-----------|----------|
| Front keyboard surface | 5825            | 14.50       | 28.18      | 5.00                     | 13.6               | 3.0       | Required |
| Top edge               | 5825            | 14.50       | 28.18      | 5.00                     | 13.6               | 3.0       | Required |
| Right edge             | 5825            | 14.50       | 28.18      | 38.20                    | 1.8                | 3.0       | Excluded |

For 5GHz Wi-Fi SISO mode 1-g SAR (main antenna to outer surface separation distance  $> 50\text{mm}$ )

| Position       | Frequency (MHz) | Power (dBm) | Power (mW) | Power allowed at 50mm | Separation Distance (mm) | Calculation Result (mW) | SAR Test |
|----------------|-----------------|-------------|------------|-----------------------|--------------------------|-------------------------|----------|
| Bottom surface | 5825            | 14.50       | 28.18      | 62.15                 | 201.5                    | 1577.15                 | Excluded |
| Left edge      | 5825            | 14.50       | 28.18      | 62.15                 | 205.00                   | 1612.15                 | Excluded |

For 5GHz Wi-Fi SISO mode 1-g SAR (aux antenna to outer surface separation distance  $\leq 50\text{mm}$ )

| Position               | Frequency (MHz) | Power (dBm) | Power (mW) | Separation Distance (mm) | Calculation Result | Threshold | SAR Test |
|------------------------|-----------------|-------------|------------|--------------------------|--------------------|-----------|----------|
| Front keyboard surface | 5825            | 14.50       | 28.18      | 5.00                     | 13.6               | 3.0       | Required |
| Top edge               | 5825            | 14.50       | 28.18      | 5.00                     | 13.6               | 3.0       | Required |
| Left edge              | 5825            | 14.50       | 28.18      | 35.60                    | 1.9                | 3.0       | Excluded |

For 5GHz Wi-Fi SISO mode 1-g SAR (aux antenna to outer surface separation distance  $> 50\text{mm}$ )

| Position       | Frequency (MHz) | Power (dBm) | Power (mW) | Power allowed at 50mm | Separation Distance (mm) | Calculation Result (mW) | SAR Test |
|----------------|-----------------|-------------|------------|-----------------------|--------------------------|-------------------------|----------|
| Bottom surface | 5825            | 14.50       | 28.18      | 62.15                 | 201.5                    | 1577.15                 | Excluded |
| Right edge     | 5825            | 14.50       | 28.18      | 62.15                 | 222.00                   | 1782.15                 | Excluded |

## 10. Dielectric Property Measurements & System Check

### 10.1. System Validation

| Frequency | Date              | Probe S/N | Probe type | Probe cal. Point |      | Perm.        | Cond.            | CW Validation |                 |                | Mode Validation |             |      |
|-----------|-------------------|-----------|------------|------------------|------|--------------|------------------|---------------|-----------------|----------------|-----------------|-------------|------|
|           |                   |           |            |                  |      | ( $\sigma$ ) | ( $\epsilon_r$ ) | Sensitivity   | Probe Linearity | Probe Isotropy | Mode Type       | Duty Factor | PAR  |
| 2450      | December 25, 2018 | 7383      | EX3DV4     | 2450             | Body | 51.94        | 2.02             | Pass          | Pass            | Pass           | OFDM            | N/A         | Pass |
| 5250      | December 25, 2018 | 7383      | EX3DV4     | 5250             | Body | 48.34        | 5.42             | Pass          | Pass            | Pass           | OFDM            | N/A         | Pass |
| 5600      | December 25, 2018 | 7383      | EX3DV4     | 5600             | Body | 47.57        | 5.94             | Pass          | Pass            | Pass           | OFDM            | N/A         | Pass |
| 5750      | December 25, 2018 | 7383      | EX3DV4     | 5750             | Body | 47.30        | 6.00             | Pass          | Pass            | Pass           | OFDM            | N/A         | Pass |

### 10.2. Dielectric Property Measurements

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

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

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

#### Tissue Dielectric Parameters

FCC KDB 865664 D01 v01r04 SAR Measurement 100 MHz to 6 GHz

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

IEEE Std 1528-2013

Refer to Table 3 within the IEEE Std 1528-2013

**Dielectric Property Measurements Results:**

| Liquid    | Freq. | Liquid Parameters |      |                |      | Deviation (%)  |       | Limit (%) | Temp. (°C) | Test Date        |
|-----------|-------|-------------------|------|----------------|------|----------------|-------|-----------|------------|------------------|
|           |       | Measured          |      | Target         |      | ϵ <sub>r</sub> | σ     |           |            |                  |
|           |       | ϵ <sub>r</sub>    | σ    | ϵ <sub>r</sub> | σ    |                |       |           |            |                  |
| Body 2450 | 2400  | 51.56             | 1.92 | 52.77          | 1.90 | -2.29          | 0.92  | ±5        | 20.7       | January 2, 2019  |
|           | 2450  | 51.46             | 1.96 | 52.70          | 1.95 | -2.35          | 0.72  |           |            |                  |
|           | 2540  | 51.15             | 2.07 | 52.59          | 2.08 | -2.74          | -0.48 |           |            |                  |
| Body 2450 | 2400  | 51.61             | 1.90 | 52.77          | 1.90 | -2.20          | -0.21 | ±5        | 22.4       | January 29, 2019 |
|           | 2450  | 51.77             | 1.95 | 52.70          | 1.95 | -1.76          | 0.15  |           |            |                  |
|           | 2540  | 51.34             | 2.07 | 52.59          | 2.08 | -2.38          | -0.58 |           |            |                  |
| Body 5250 | 5160  | 48.69             | 5.18 | 49.07          | 5.25 | -0.77          | -1.26 | ±5        | 21.3       | January 30, 2019 |
|           | 5250  | 48.56             | 5.28 | 48.95          | 5.36 | -0.80          | -1.51 |           |            |                  |
|           | 5340  | 48.38             | 5.39 | 48.96          | 5.46 | -1.18          | -1.30 |           |            |                  |
| Body 5600 | 5500  | 48.21             | 5.76 | 48.61          | 5.65 | -0.82          | 1.88  | ±5        | 21.9       | January 30, 2019 |
|           | 5600  | 48.08             | 5.88 | 48.47          | 5.77 | -0.80          | 1.96  |           |            |                  |
|           | 5700  | 47.89             | 6.02 | 48.34          | 5.88 | -0.93          | 2.41  |           |            |                  |
| Body 5750 | 5660  | 47.19             | 5.93 | 48.39          | 5.84 | -2.48          | 1.54  | ±5        | 21.8       | January 5, 2019  |
|           | 5750  | 47.08             | 6.07 | 48.27          | 5.94 | -2.47          | 2.21  |           |            |                  |
|           | 5840  | 46.86             | 6.25 | 48.16          | 6.03 | -2.70          | 3.67  |           |            |                  |

### 10.3. System Check

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

#### System Performance Check Measurement Conditions:

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness:  $2.0 \pm 0.2$  mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be  $\geq 15.0$  cm for SAR measurements  $\leq 3$  GHz and  $\geq 10.0$  cm for measurements  $> 3$  GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm (above 1GHz) and 15mm (below 1GHz) from dipole center to the simulating liquid surface.
- For area scan, standard grid spacing for head measurements is 15 mm in x- and y- dimension( $\leq 2$ GHz), 12 mm in x- and y-dimension(2-4 GHz) and 10mm in x- and y- dimension(4-6GHz).
- For zoom scan,  $\Delta x_{\text{zoom}}, \Delta y_{\text{zoom}} \leq 2$ GHz -  $\leq 8$ mm, 2-4GHz -  $\leq 5$  mm and 4-6 GHz- $\leq 4$ mm;  $\Delta z_{\text{zoom}} \leq 3$ GHz -  $\leq 5$  mm, 3-4 GHz-  $\leq 4$ mm and 4-6GHz- $\leq 2$ mm.
- Distance between probe sensors and phantom surface was set to 3 mm except for 5 GHz band. For 5GHz band, Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was set to 100 mW or 250 mW depend on the certificate of the dipoles.
- The results are normalized to 1 W input power.

**System Check Results**

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

| T.S. Liquid |      | Measured Results    |                           | Target<br>(Ref. value) | Deviation<br>(%) | Limit<br>(%) | Temp.<br>(°C) | Test Date        |
|-------------|------|---------------------|---------------------------|------------------------|------------------|--------------|---------------|------------------|
|             |      | Zoom Scan<br>(W/Kg) | Normalize to<br>1W (W/Kg) |                        |                  |              |               |                  |
| Body 2450   | 1-g  | 12.400              | 49.60                     | 51.60                  | -3.88            | ±10          | 20.7          | January 2, 2019  |
|             | 10-g | 5.590               | 22.36                     | 24.10                  | -7.22            |              |               |                  |
| Body 2450   | 1-g  | 12.300              | 49.20                     | 51.60                  | -4.65            | ±10          | 22.4          | January 29, 2019 |
|             | 10-g | 5.640               | 22.56                     | 24.10                  | -6.39            |              |               |                  |
| Body 5250   | 1-g  | 7.470               | 74.70                     | 74.20                  | 0.67             | ±10          | 21.3          | January 30, 2019 |
|             | 10-g | 2.070               | 20.70                     | 21.10                  | -1.90            |              |               |                  |
| Body 5600   | 1-g  | 7.570               | 75.70                     | 77.50                  | -2.32            | ±10          | 21.9          | January 30, 2019 |
|             | 10-g | 2.070               | 20.70                     | 22.10                  | -6.33            |              |               |                  |
| Body 5750   | 1-g  | 7.150               | 71.50                     | 74.90                  | -4.54            | ±10          | 21.8          | January 5, 2019  |
|             | 10-g | 1.960               | 19.60                     | 21.10                  | -7.11            |              |               |                  |

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

As per KDB 447498 sec.4.1.e), When SAR or MPE is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as reported.

### Scaled SAR calculation formula:

Scaled SAR = Tune-up in mW / Conducted power in mW \* Duty cycle (if available) \* SAR value

### SAR Test Reduction criteria are as follows:

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

A) Per KDB447498 D01 v06, all SAR measurement results are scaled to the maximum tune-up tolerance limit to demonstrate SAR compliance.

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

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

#### Per KDB865664 D01 v01r04:

For each frequency band, repeated SAR measurement is required only when the measured SAR is  $\geq 0.8$ W/Kg; if the deviation among the repeated measurement is  $\leq 20\%$ , and the measured SAR  $< 1.45$ W/Kg, only one repeated measurement is required.

**11.1. SAR Test Results of Bluetooth with SKU-3 antenna platform**

| Test Position          | Test Mode | Channel/<br>Frequency | Power (dBm) |       | SAR Value          | Power Drift | Duty Factor (%) | Scaled (W/Kg) |
|------------------------|-----------|-----------------------|-------------|-------|--------------------|-------------|-----------------|---------------|
|                        |           |                       | Tune-up     | Meas. | 1-g<br>(Zoom Scan) |             |                 |               |
| Top edge               | DH5       | 0/2402                | 10.00       | 9.13  | 0.065              | -0.13       | 60.40           | 0.132         |
| Front keyboard surface | DH5       | 0/2402                | 10.00       | 9.13  | 0.027              | -0.06       | 60.40           | 0.055         |

**11.2. SAR Test Results of Bluetooth with SKU-4 antenna platform**

| Test Position          | Test Mode | Channel/<br>Frequency | Power (dBm) |       | SAR Value          | Power Drift | Duty Factor (%) | Scaled (W/Kg) |
|------------------------|-----------|-----------------------|-------------|-------|--------------------|-------------|-----------------|---------------|
|                        |           |                       | Tune-up     | Meas. | 1-g<br>(Zoom Scan) |             |                 |               |
| Top edge               | DH5       | 0/2402                | 10.00       | 9.13  | 0.073              | -0.11       | 60.40           | 0.148         |
| Front keyboard surface | DH5       | 0/2402                | 10.00       | 9.13  | 0.007              | 0.18        | 60.40           | 0.015         |

**11.3. SAR Test Results of 2.4GHz Wi-Fi with SKU-3 antenna platform**

| Test Position             | Test Mode | Channel/<br>Frequency | Power (dBm) |       | SAR Value             | Power<br>Drift | Duty<br>Factor<br>(%) | Scaled<br>(W/Kg) |
|---------------------------|-----------|-----------------------|-------------|-------|-----------------------|----------------|-----------------------|------------------|
|                           |           |                       | Tune-up     | Meas. | 1-g<br>(Zoom<br>Scan) |                |                       |                  |
| SISO-Main antenna         |           |                       |             |       |                       |                |                       |                  |
| Top edge                  | 802.11b   | 1/2414                | 12.50       | 12.45 | 0.113                 | 0.05           | 100.00                | 0.114            |
| Front keyboard<br>surface | 802.11b   | 1/2412                | 12.50       | 12.45 | 0.015                 | -0.05          | 100.00                | 0.015            |
| SISO-Aux antenna          |           |                       |             |       |                       |                |                       |                  |
| Top edge                  | 802.11b   | 1/2414                | 12.50       | 12.46 | 0.121                 | 0.17           | 100.00                | 0.122            |
| Front keyboard<br>surface | 802.11b   | 1/2412                | 12.50       | 12.46 | 0.082                 | 0.18           | 100.00                | 0.083            |

OFDM mode SAR evaluation exclusion analysis for 1-g SAR for main antenna.

| Mode         | Tune-up<br>(dBm) | Tune-up<br>(mW) | Highest<br>Reported<br>SAR<br>(W/Kg) | Adjusted<br>SAR<br>(W/Kg) | SAR Test |
|--------------|------------------|-----------------|--------------------------------------|---------------------------|----------|
| 802.11b      | 12.5             | 17.78           | 0.114                                | \                         | \        |
| 802.11g      | 16               | 39.81           | \                                    | 0.255                     | Excluded |
| 802.11n HT20 | 16               | 39.81           | \                                    | 0.255                     | Excluded |
| 802.11n HT40 | 12.5             | 17.78           | \                                    | 0.114                     | Excluded |

Note:

- 1) The highest reported SAR of DSSS adjusted by the ratio of OFDM 802.11g/n to DSSS specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg, so SAR evaluation for 802.11g/n is not required.

OFDM mode SAR evaluation exclusion analysis for 1-g SAR for aux antenna.

| Mode         | Tune-up<br>(dBm) | Tune-up<br>(mW) | Highest<br>Reported<br>SAR<br>(W/Kg) | Adjusted<br>SAR<br>(W/Kg) | SAR Test |
|--------------|------------------|-----------------|--------------------------------------|---------------------------|----------|
| 802.11b      | 12.5             | 17.78           | 0.122                                | \                         | \        |
| 802.11g      | 16               | 39.81           | \                                    | 0.273                     | Excluded |
| 802.11n HT20 | 16               | 39.81           | \                                    | 0.273                     | Excluded |
| 802.11n HT40 | 12.5             | 17.78           | \                                    | 0.122                     | Excluded |

Note:

- 1) The highest reported SAR of DSSS adjusted by the ratio of OFDM 802.11g/n to DSSS specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg, so SAR evaluation for 802.11g/n is not required.
- 2) The highest SUM SAR value of corresponding position is regard as the MIMO SAR value. For SKU-3 antenna platform, the MIMO SAR value is 0.236 W/kg.

**11.4. SAR Test Results of 2.4GHz Wi-Fi with SKU-4 antenna platform**

| Test Position             | Test Mode | Channel/<br>Frequency | Power (dBm) |       | SAR Value             | Power<br>Drift | Duty<br>Factor<br>(%) | Scaled<br>(W/Kg) |
|---------------------------|-----------|-----------------------|-------------|-------|-----------------------|----------------|-----------------------|------------------|
|                           |           |                       | Tune-up     | Meas. | 1-g<br>(Zoom<br>Scan) |                |                       |                  |
| SISO-Main antenna         |           |                       |             |       |                       |                |                       |                  |
| Top edge                  | 802.11b   | 1/2414                | 12.50       | 12.45 | 0.115                 | 0.13           | 100.00                | 0.116            |
| Front keyboard<br>surface | 802.11b   | 1/2415                | 12.50       | 12.45 | 0.020                 | -0.15          | 100.00                | 0.020            |
| SISO-Aux antenna          |           |                       |             |       |                       |                |                       |                  |
| Top edge                  | 802.11b   | 1/2414                | 12.50       | 12.46 | 0.128                 | 0.12           | 100.00                | 0.129            |
| Front keyboard<br>surface | 802.11b   | 1/2415                | 12.50       | 12.46 | 0.024                 | -0.14          | 100.00                | 0.024            |

OFDM mode SAR evaluation exclusion analysis for 1-g SAR for main antenna.

| Mode         | Tune-up<br>(dBm) | Tune-up<br>(mW) | Highest<br>Reported<br>SAR<br>(W/Kg) | Adjusted<br>SAR<br>(W/Kg) | SAR Test |
|--------------|------------------|-----------------|--------------------------------------|---------------------------|----------|
| 802.11b      | 12.5             | 17.78           | 0.116                                | \                         | \        |
| 802.11g      | 16               | 39.81           | \                                    | 0.260                     | Excluded |
| 802.11n HT20 | 16               | 39.81           | \                                    | 0.260                     | Excluded |
| 802.11n HT40 | 12.5             | 17.78           | \                                    | 0.116                     | Excluded |

Note:

- 1) The highest reported SAR of DSSS adjusted by the ratio of OFDM 802.11g/n to DSSS specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg, so SAR evaluation for 802.11g/n is not required.

OFDM mode SAR evaluation exclusion analysis for 1-g SAR for aux antenna.

| Mode         | Tune-up<br>(dBm) | Tune-up<br>(mW) | Highest<br>Reported<br>SAR<br>(W/Kg) | Adjusted<br>SAR<br>(W/Kg) | SAR Test |
|--------------|------------------|-----------------|--------------------------------------|---------------------------|----------|
| 802.11b      | 12.5             | 17.78           | 0.129                                | \                         | \        |
| 802.11g      | 16               | 39.81           | \                                    | 0.289                     | Excluded |
| 802.11n HT20 | 16               | 39.81           | \                                    | 0.289                     | Excluded |
| 802.11n HT40 | 12.5             | 17.78           | \                                    | 0.129                     | Excluded |

Note:

- 1) The highest reported SAR of DSSS adjusted by the ratio of OFDM 802.11g/n to DSSS specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg, so SAR evaluation for 802.11g/n is not required.
- 2) The highest SUM SAR value of corresponding position is regard as the MIMO SAR value. For SKU-4 antenna platform, the MIMO SAR value is 0.245 W/kg.

**11.5. SAR Test Results of 5GHz Wi-Fi with SKU-3 antenna platform**

| Test Position          | Test Mode | Channel/<br>Frequency | Power (dBm) |       | SAR Value       | Power Drift | Duty Factor (%) | Scaled (W/Kg) |
|------------------------|-----------|-----------------------|-------------|-------|-----------------|-------------|-----------------|---------------|
|                        |           |                       | Tune-up     | Meas. | 1-g (Zoom Scan) |             |                 |               |
| SISO                   |           |                       |             |       |                 |             |                 |               |
| U-NII-2A_Main antenna  |           |                       |             |       |                 |             |                 |               |
| Top edge               | 802.11a   | 56/5280               | 13.0        | 13.00 | 0.634           | 0.18        | 100.00          | 0.634         |
| Front keyboard surface | 802.11a   | 56/5280               | 13.0        | 13.00 | 0.017           | 0.11        | 100.00          | 0.017         |
| U-NII-2C_Main antenna  |           |                       |             |       |                 |             |                 |               |
| Top edge               | 802.11a   | 136/5680              | 13.0        | 12.98 | 0.648           | -0.14       | 100.00          | 0.651         |
| Top edge               | 802.11a   | 136/5680              | 13.0        | 12.98 | 0.020           | -0.16       | 100.00          | 0.020         |
| U-NII-3_Main antenna   |           |                       |             |       |                 |             |                 |               |
| Top edge               | 802.11a   | 157/5785              | 14.5        | 14.48 | 0.769           | -0.19       | 100.00          | 0.773         |
| Front keyboard surface | 802.11a   | 157/5785              | 14.5        | 14.48 | 0.029           | 0.09        | 100.00          | 0.029         |
| U-NII-2A_Aux antenna   |           |                       |             |       |                 |             |                 |               |
| Top edge               | 802.11a   | 56/5280               | 13.0        | 12.95 | 0.516           | 0.16        | 100.00          | 0.522         |
| Front keyboard surface | 802.11a   | 56/5280               | 13.0        | 12.95 | 0.109           | -0.15       | 100.00          | 0.110         |
| U-NII-2C_Aux antenna   |           |                       |             |       |                 |             |                 |               |
| Top edge               | 802.11a   | 136/5680              | 13.0        | 12.99 | 0.749           | -0.12       | 100.00          | 0.751         |
| Top edge               | 802.11a   | 136/5680              | 13.0        | 12.99 | 0.099           | -0.14       | 100.00          | 0.099         |
| U-NII-3_Aux antenna    |           |                       |             |       |                 |             |                 |               |
| Top edge               | 802.11a   | 153/5765              | 14.5        | 14.41 | 0.780           | -0.18       | 100.00          | 0.796         |
| Front keyboard surface | 802.11a   | 153/5765              | 14.5        | 14.41 | 0.160           | -0.05       | 100.00          | 0.163         |

Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for main antenna (U-NII-2A).

| Mode         | Tune-up<br>(dBm) | Tune-up<br>(mW) | Highest<br>Reported<br>SAR<br>(W/Kg) | Adjusted<br>SAR<br>(W/Kg) | SAR Test |
|--------------|------------------|-----------------|--------------------------------------|---------------------------|----------|
| 802.11a      | 13               | 19.95           | 0.634                                | \                         | \        |
| 802.11n 20M  | 13               | 19.95           | \                                    | 0.634                     | Excluded |
| 802.11n 40M  | 11.5             | 14.13           | \                                    | 0.449                     | Excluded |
| 802.11ac 20M | 13               | 19.95           | \                                    | 0.634                     | Excluded |
| 802.11ac 40M | 11.5             | 14.13           | \                                    | 0.449                     | Excluded |
| 802.11ac 80M | 8                | 6.31            | \                                    | 0.200                     | Excluded |

Note:

- 1) The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg, SAR test for the other 802.11 modes are not required.

Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for main antenna (U-NII-2C).

| Mode         | Tune-up (dBm) | Tune-up (mW) | Highest Reported SAR (W/Kg) | Adjusted SAR (W/Kg) | SAR Test |
|--------------|---------------|--------------|-----------------------------|---------------------|----------|
| 802.11a      | 13            | 19.95        | 0.650                       | \                   | \        |
| 802.11n 20M  | 12            | 15.85        | \                           | 0.516               | Excluded |
| 802.11n 40M  | 9.5           | 8.91         | \                           | 0.290               | Excluded |
| 802.11ac 20M | 12            | 15.85        | \                           | 0.516               | Excluded |
| 802.11ac 40M | 9.5           | 8.91         | \                           | 0.290               | Excluded |
| 802.11ac 80M | 7             | 5.01         | \                           | 0.163               | Excluded |

Note:

- 1) The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg, SAR test for the other 802.11 modes are not required.

Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for main antenna (U-NII-3).

| Mode         | Tune-up (dBm) | Tune-up (mW) | Highest Reported SAR (W/Kg) | Adjusted SAR (W/Kg) | SAR Test |
|--------------|---------------|--------------|-----------------------------|---------------------|----------|
| 802.11a      | 14.5          | 28.18        | 0.773                       | \                   | \        |
| 802.11n 20M  | 14.5          | 28.18        | \                           | 0.773               | Excluded |
| 802.11n 40M  | 14            | 25.12        | \                           | 0.689               | Excluded |
| 802.11ac 20M | 14.5          | 28.18        | \                           | 0.773               | Excluded |
| 802.11ac 40M | 14            | 25.12        | \                           | 0.689               | Excluded |
| 802.11ac 80M | 12            | 15.85        | \                           | 0.435               | Excluded |

Note:

- 1) The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg, SAR test for the other 802.11 modes are not required.

## Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for aux antenna (U-NII-2A).

| Mode         | Tune-up (dBm) | Tune-up (mW) | Highest Reported SAR (W/Kg) | Adjusted SAR (W/Kg) | SAR Test |
|--------------|---------------|--------------|-----------------------------|---------------------|----------|
| 802.11a      | 13            | 19.95        | 0.522                       | \                   | \        |
| 802.11n 20M  | 13            | 19.95        | \                           | 0.522               | Excluded |
| 802.11n 40M  | 11.5          | 14.13        | \                           | 0.370               | Excluded |
| 802.11ac 20M | 13            | 19.95        | \                           | 0.522               | Excluded |
| 802.11ac 40M | 11.5          | 14.13        | \                           | 0.370               | Excluded |
| 802.11ac 80M | 8             | 6.31         | \                           | 0.165               | Excluded |

Note:

- 1) The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg, SAR test for the other 802.11 modes are not required.

## Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for aux antenna (U-NII-2C).

| Mode         | Tune-up (dBm) | Tune-up (mW) | Highest Reported SAR (W/Kg) | Adjusted SAR (W/Kg) | SAR Test |
|--------------|---------------|--------------|-----------------------------|---------------------|----------|
| 802.11a      | 13            | 19.95        | 0.751                       | \                   | \        |
| 802.11n 20M  | 12            | 15.85        | \                           | 0.597               | Excluded |
| 802.11n 40M  | 9.5           | 8.91         | \                           | 0.335               | Excluded |
| 802.11ac 20M | 12            | 15.85        | \                           | 0.597               | Excluded |
| 802.11ac 40M | 9.5           | 8.91         | \                           | 0.335               | Excluded |
| 802.11ac 80M | 7             | 5.01         | \                           | 0.189               | Excluded |

Note:

- 1) The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg, SAR test for the other 802.11 modes are not required.

Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for aux antenna (U-NII-3).

| Mode         | Tune-up (dBm) | Tune-up (mW) | Highest Reported SAR (W/Kg) | Adjusted SAR (W/Kg) | SAR Test |
|--------------|---------------|--------------|-----------------------------|---------------------|----------|
| 802.11a      | 14.5          | 28.18        | 0.796                       | \                   | \        |
| 802.11n 20M  | 14.5          | 28.18        | \                           | 0.796               | Excluded |
| 802.11n 40M  | 14            | 25.12        | \                           | 0.709               | Excluded |
| 802.11ac 20M | 14.5          | 28.18        | \                           | 0.796               | Excluded |
| 802.11ac 40M | 14            | 25.12        | \                           | 0.709               | Excluded |
| 802.11ac 80M | 12            | 15.85        | \                           | 0.448               | Excluded |

Note:

- 1) The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg, SAR test for the other 802.11 modes are not required.
- 2) The highest SUM SAR value of corresponding position is regard as the MIMO SAR value. For SKU-3 antenna platform, the MIMO SAR value is 1.569 W/kg.

**11.6. SAR Test Results of 5GHz Wi-Fi with SKU-4 antenna platform**

| Test Position          | Test Mode | Channel/<br>Frequency | Power (dBm) |       | SAR Value       | Power Drift | Duty Factor (%) | Scaled (W/Kg) |
|------------------------|-----------|-----------------------|-------------|-------|-----------------|-------------|-----------------|---------------|
|                        |           |                       | Tune-up     | Meas. | 1-g (Zoom Scan) |             |                 |               |
| SISO                   |           |                       |             |       |                 |             |                 |               |
| U-NII-2A_ Main antenna |           |                       |             |       |                 |             |                 |               |
| Top edge               | 802.11a   | 56/5280               | 13.0        | 13.00 | 0.594           | 0.00        | 100.00          | 0.594         |
| Front keyboard surface | 802.11a   | 56/5280               | 13.0        | 13.00 | 0.020           | 0.16        | 100.00          | 0.020         |
| U-NII-2C_ Main antenna |           |                       |             |       |                 |             |                 |               |
| Top edge               | 802.11a   | 136/5680              | 13.0        | 12.98 | 0.760           | 0.04        | 100.00          | 0.764         |
| Front keyboard surface | 802.11a   | 136/5680              | 13.0        | 12.98 | 0.031           | 0.00        | 100.00          | 0.031         |
| U-NII-3_ Main antenna  |           |                       |             |       |                 |             |                 |               |
| Top edge               | 802.11a   | 157/5785              | 14.5        | 14.48 | 1.030           | -0.06       | 100.00          | 1.035         |
| Top edge               | 802.11a   | 161/5805              | 14.5        | 14.47 | 0.922           | -0.17       | 100.00          | 0.928         |
| Front keyboard surface | 802.11a   | 157/5785              | 14.5        | 14.48 | 0.038           | 0.15        | 100.00          | 0.039         |
| Top edge-repeated      | 802.11a   | 157/5785              | 14.5        | 14.48 | 1.050           | -0.11       | 100.00          | 1.055         |
| U-NII-2A_ Aux antenna  |           |                       |             |       |                 |             |                 |               |
| Top edge               | 802.11a   | 56/5280               | 13.0        | 12.95 | 0.850           | -0.14       | 100.00          | 0.860         |
| Top edge               | 802.11a   | 52/5260               | 13.0        | 12.84 | 0.880           | 0.11        | 100.00          | 0.913         |
| Front keyboard surface | 802.11a   | 56/5280               | 13.0        | 12.95 | 0.021           | -0.16       | 100.00          | 0.021         |
| Top edge-repeated      | 802.11a   | 52/5260               | 13.0        | 12.84 | 0.890           | -0.10       | 100.00          | 0.923         |
| U-NII-2C_ Aux antenna  |           |                       |             |       |                 |             |                 |               |
| Top edge               | 802.11a   | 136/5680              | 13.0        | 12.99 | 0.552           | -0.16       | 100.00          | 0.553         |
| Front keyboard surface | 802.11a   | 136/5680              | 13.0        | 12.99 | 0.022           | 0.02        | 100.00          | 0.022         |
| U-NII-3_ Aux antenna   |           |                       |             |       |                 |             |                 |               |
| Top edge               | 802.11a   | 153/5765              | 14.5        | 14.41 | 0.898           | 0.15        | 100.00          | 0.917         |
| Top edge               | 802.11a   | 149/5745              | 14.5        | 14.39 | 0.996           | 0.18        | 100.00          | 1.022         |
| Front keyboard surface | 802.11a   | 153/5765              | 14.5        | 14.41 | 0.068           | 0.05        | 100.00          | 0.069         |
| Top edge-repeated      | 802.11a   | 149/5745              | 14.5        | 14.39 | 0.990           | 0.13        | 100.00          | 1.015         |

## Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for main antenna (U-NII-2A).

| Mode         | Tune-up (dBm) | Tune-up (mW) | Highest Reported SAR (W/Kg) | Adjusted SAR (W/Kg) | SAR Test |
|--------------|---------------|--------------|-----------------------------|---------------------|----------|
| 802.11a      | 13            | 19.95        | 0.594                       | \                   | \        |
| 802.11n 20M  | 13            | 19.95        | \                           | 0.594               | Excluded |
| 802.11n 40M  | 11.5          | 14.13        | \                           | 0.421               | Excluded |
| 802.11ac 20M | 13            | 19.95        | \                           | 0.594               | Excluded |
| 802.11ac 40M | 11.5          | 14.13        | \                           | 0.421               | Excluded |
| 802.11ac 80M | 8             | 6.31         | \                           | 0.188               | Excluded |

Note:

- 1) The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg, SAR test for the other 802.11 modes are not required.

## Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for main antenna (U-NII-2C).

| Mode         | Tune-up (dBm) | Tune-up (mW) | Highest Reported SAR (W/Kg) | Adjusted SAR (W/Kg) | SAR Test |
|--------------|---------------|--------------|-----------------------------|---------------------|----------|
| 802.11a      | 13            | 19.95        | 0.764                       | \                   | \        |
| 802.11n 20M  | 12            | 15.85        | \                           | 0.607               | Excluded |
| 802.11n 40M  | 9.5           | 8.91         | \                           | 0.341               | Excluded |
| 802.11ac 20M | 12            | 15.85        | \                           | 0.607               | Excluded |
| 802.11ac 40M | 9.5           | 8.91         | \                           | 0.341               | Excluded |
| 802.11ac 80M | 7             | 5.01         | \                           | 0.192               | Excluded |

Note:

- 1) The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg, SAR test for the other 802.11 modes are not required.

## Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for main antenna (U-NII-3).

| Mode         | Tune-up (dBm) | Tune-up (mW) | Highest Reported SAR (W/Kg) | Adjusted SAR (W/Kg) | SAR Test |
|--------------|---------------|--------------|-----------------------------|---------------------|----------|
| 802.11a      | 14.5          | 28.18        | 1.055                       | \                   | \        |
| 802.11n 20M  | 14.5          | 28.18        | \                           | 1.055               | Excluded |
| 802.11n 40M  | 14            | 25.12        | \                           | 0.940               | Excluded |
| 802.11ac 20M | 14.5          | 28.18        | \                           | 1.055               | Excluded |
| 802.11ac 40M | 14            | 25.12        | \                           | 0.940               | Excluded |
| 802.11ac 80M | 12            | 15.85        | \                           | 0.593               | Excluded |

Note:

- 1) The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg, SAR test for the other 802.11 modes are not required.

## Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for aux antenna (U-NII-2A).

| Mode         | Tune-up (dBm) | Tune-up (mW) | Highest Reported SAR (W/Kg) | Adjusted SAR (W/Kg) | SAR Test |
|--------------|---------------|--------------|-----------------------------|---------------------|----------|
| 802.11a      | 13            | 19.95        | 0.923                       | \                   | \        |
| 802.11n 20M  | 13            | 19.95        | \                           | 0.923               | Excluded |
| 802.11n 40M  | 11.5          | 14.13        | \                           | 0.653               | Excluded |
| 802.11ac 20M | 13            | 19.95        | \                           | 0.923               | Excluded |
| 802.11ac 40M | 11.5          | 14.13        | \                           | 0.653               | Excluded |
| 802.11ac 80M | 8             | 6.31         | \                           | 0.292               | Excluded |

Note:

- 1) The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg, SAR test for the other 802.11 modes are not required.

## Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for aux antenna (U-NII-2C).

| Mode         | Tune-up (dBm) | Tune-up (mW) | Highest Reported SAR (W/Kg) | Adjusted SAR (W/Kg) | SAR Test |
|--------------|---------------|--------------|-----------------------------|---------------------|----------|
| 802.11a      | 13            | 19.95        | 0.553                       | \                   | \        |
| 802.11n 20M  | 12            | 15.85        | \                           | 0.439               | Excluded |
| 802.11n 40M  | 9.5           | 8.91         | \                           | 0.247               | Excluded |
| 802.11ac 20M | 12            | 15.85        | \                           | 0.439               | Excluded |
| 802.11ac 40M | 9.5           | 8.91         | \                           | 0.247               | Excluded |
| 802.11ac 80M | 7             | 5.01         | \                           | 0.139               | Excluded |

Note:

- 1) The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg, SAR test for the other 802.11 modes are not required.

## Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for aux antenna (U-NII-3).

| Mode         | Tune-up (dBm) | Tune-up (mW) | Highest Reported SAR (W/Kg) | Adjusted SAR (W/Kg) | SAR Test |
|--------------|---------------|--------------|-----------------------------|---------------------|----------|
| 802.11a      | 14.5          | 28.18        | 1.022                       | \                   | \        |
| 802.11n 20M  | 14.5          | 28.18        | \                           | 1.022               | Excluded |
| 802.11n 40M  | 14            | 25.12        | \                           | 0.911               | Excluded |
| 802.11ac 20M | 14.5          | 28.18        | \                           | 1.022               | Excluded |
| 802.11ac 40M | 14            | 25.12        | \                           | 0.911               | Excluded |
| 802.11ac 80M | 12            | 15.85        | \                           | 0.575               | Excluded |

Note:

- 1) The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg, SAR test for the other 802.11 modes are not required.
- 2) The highest SUM SAR value of corresponding position is regard as the MIMO SAR value. For SKU-4 antenna platform, the MIMO SAR value is 2.077 W/kg. It is  $> 1.6$  W/kg, so SPLSR analysis is required.

## 12. Simultaneous Transmission SAR Analysis

Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmitting antenna.

The main antenna supports 2.4GHz Wi-Fi, 5GHz Wi-Fi, the aux antenna supports 2.4GHz Wi-Fi, 5GHz Wi-Fi and BT, when in MIMO mode, the BT technology is dismissed.

Coexistence mode

| Combination | Mode                                             |
|-------------|--------------------------------------------------|
| 1           | 2.4GHz Wi-Fi (main ANT) + BT (aux ANT)           |
| 2           | 5GHz Wi-Fi (main ANT) + BT (aux ANT)             |
| 3           | 2.4GHz Wi-Fi (main ANT) + 2.4GHz Wi-Fi (aux ANT) |
| 4           | 5GHz Wi-Fi (main ANT) + 5GHz Wi-Fi (aux ANT)     |

**12.1. Simultaneous Transmission calculation for SKU-3 antenna platform**

For Combination NO.1

| Test Position | 2.4GHz Wi-Fi<br>(main ANT)<br>1-g SAR (W/Kg) | BT<br>(aux ANT)<br>1-g SAR (W/Kg) | SUM<br>1-g SAR (W/Kg) | SPLSR    |
|---------------|----------------------------------------------|-----------------------------------|-----------------------|----------|
| Top edge      | 0.114                                        | 0.132                             | 0.246                 | Excluded |

Note:

- 1) Because the maximum SUM 1-g SAR  $\leq 1.6$  W/Kg, so the SPLSR analysis is not required.

For Combination NO.2

| Test Position | 5GHz Wi-Fi<br>(main ANT)<br>1-g SAR (W/Kg) | BT<br>(aux ANT)<br>1-g SAR (W/Kg) | SUM<br>1-g SAR (W/Kg) | SPLSR    |
|---------------|--------------------------------------------|-----------------------------------|-----------------------|----------|
| Top edge      | 0.773                                      | 0.132                             | 0.905                 | Excluded |

Note:

- 1) Because the maximum SUM 1-g SAR  $\leq 1.6$  W/Kg, so the SPLSR analysis is not required.

For Combination NO.3

| Test Position | 2.4GHz Wi-Fi<br>(main ANT)<br>1-g SAR (W/Kg) | 2.4GHz Wi-Fi<br>(aux ANT)<br>1-g SAR (W/Kg) | SUM<br>1-g SAR (W/Kg) | SPLSR    |
|---------------|----------------------------------------------|---------------------------------------------|-----------------------|----------|
| Top edge      | 0.114                                        | 0.122                                       | 0.236                 | Excluded |

Note:

- 1) Because the maximum SUM 1-g SAR  $\leq 1.6$  W/Kg, so the SPLSR analysis is not required.

For Combination NO.4 (U-NII-2A)

| Test Position | 5GHz Wi-Fi<br>(main ANT)<br>1-g SAR (W/Kg) | 5GHz Wi-Fi<br>(aux ANT)<br>1-g SAR (W/Kg) | SUM<br>1-g SAR (W/Kg) | SPLSR    |
|---------------|--------------------------------------------|-------------------------------------------|-----------------------|----------|
| Top edge      | 0.634                                      | 0.522                                     | 1.156                 | Excluded |

Note:

- 1) Because the maximum SUM 1-g SAR  $\leq 1.6$  W/Kg, so the SPLSR analysis is not required.

## For Combination NO.4 (U-NII-2C)

| Test Position | 5GHz Wi-Fi<br>(main ANT)<br>1-g SAR (W/Kg) | 5GHz Wi-Fi<br>(aux ANT)<br>1-g SAR (W/Kg) | SUM<br>1-g SAR (W/Kg) | SPLSR    |
|---------------|--------------------------------------------|-------------------------------------------|-----------------------|----------|
| Top edge      | 0.651                                      | 0.751                                     | 1.402                 | Excluded |

Note:

- 1) Because the maximum SUM 1-g SAR  $\leq 1.6$  W/Kg, so the SPLSR analysis is not required.

## For Combination NO.4 (U-NII-3)

| Test Position | 5GHz Wi-Fi<br>(main ANT)<br>1-g SAR (W/Kg) | 5GHz Wi-Fi<br>(aux ANT)<br>1-g SAR (W/Kg) | SUM<br>1-g SAR (W/Kg) | SPLSR    |
|---------------|--------------------------------------------|-------------------------------------------|-----------------------|----------|
| Top edge      | 0.773                                      | 0.796                                     | 1.569                 | Excluded |

Note:

- 1) Because the maximum SUM 1-g SAR  $\leq 1.6$  W/Kg, so the SPLSR analysis is not required.

**12.2. Simultaneous Transmission calculation for SKU-4 antenna platform**

For Combination NO.1

| Test Position | 2.4GHz Wi-Fi<br>(main ANT)<br>1-g SAR (W/Kg) | BT<br>(aux ANT)<br>1-g SAR (W/Kg) | SUM<br>1-g SAR (W/Kg) | SPLSR    |
|---------------|----------------------------------------------|-----------------------------------|-----------------------|----------|
| Top edge      | 0.116                                        | 0.148                             | 0.264                 | Excluded |

Note:

- 1) Because the maximum SUM 1-g SAR  $\leq 1.6$  W/Kg, so the SPLSR analysis is not required.

For Combination NO.2

| Test Position | 5GHz Wi-Fi<br>(main ANT)<br>1-g SAR (W/Kg) | BT<br>(aux ANT)<br>1-g SAR (W/Kg) | SUM<br>1-g SAR (W/Kg) | SPLSR    |
|---------------|--------------------------------------------|-----------------------------------|-----------------------|----------|
| Top edge      | 1.055                                      | 0.148                             | 1.203                 | Excluded |

Note:

- 1) Because the maximum SUM 1-g SAR  $\leq 1.6$  W/Kg, so the SPLSR analysis is not required.

For Combination NO.3

| Test Position | 2.4GHz Wi-Fi<br>(main ANT)<br>1-g SAR (W/Kg) | 2.4GHz Wi-Fi<br>(aux ANT)<br>1-g SAR (W/Kg) | SUM<br>1-g SAR (W/Kg) | SPLSR    |
|---------------|----------------------------------------------|---------------------------------------------|-----------------------|----------|
| Top edge      | 0.116                                        | 0.129                                       | 0.245                 | Excluded |

Note:

- 1) Because the maximum SUM 1-g SAR  $\leq 1.6$  W/Kg, so the SPLSR analysis is not required.

For Combination NO.4 (U-NII-2A)

| Test Position | 5GHz Wi-Fi<br>(main ANT)<br>1-g SAR (W/Kg) | 5GHz Wi-Fi<br>(aux ANT)<br>1-g SAR (W/Kg) | SUM<br>1-g SAR (W/Kg) | SPLSR    |
|---------------|--------------------------------------------|-------------------------------------------|-----------------------|----------|
| Top edge      | 0.594                                      | 0.923                                     | 1.517                 | Excluded |

Note:

- 1) Because the maximum SUM 1-g SAR  $\leq 1.6$  W/Kg, so the SPLSR analysis is not required.

## For Combination NO.4 (U-NII-2C)

| Test Position | 5GHz Wi-Fi<br>(main ANT)<br>1-g SAR (W/Kg) | 5GHz Wi-Fi<br>(aux ANT)<br>1-g SAR (W/Kg) | SUM<br>1-g SAR (W/Kg) | SPLSR    |
|---------------|--------------------------------------------|-------------------------------------------|-----------------------|----------|
| Top edge      | 0.764                                      | 0.553                                     | 1.417                 | Excluded |

Note:

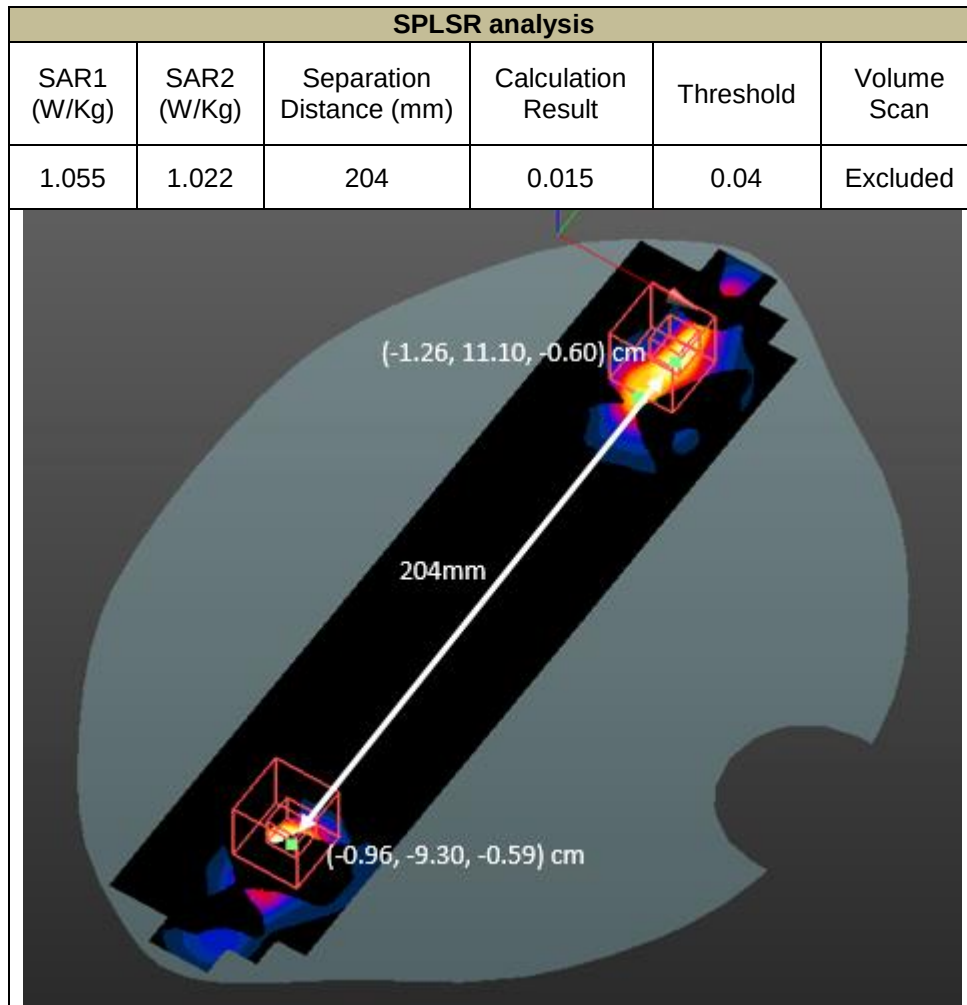
- 1) Because the maximum SUM 1-g SAR  $\leq$  1.6 W/Kg, so the SPLSR analysis is not required.

## For Combination NO.4 (U-NII-3)

| Test Position | 5GHz Wi-Fi<br>(main ANT)<br>1-g SAR (W/Kg) | 5GHz Wi-Fi<br>(aux ANT)<br>1-g SAR (W/Kg) | SUM<br>1-g SAR (W/Kg) | SPLSR    |
|---------------|--------------------------------------------|-------------------------------------------|-----------------------|----------|
| Top edge      | 1.055                                      | 1.022                                     | 2.077                 | Required |

Note:

- 1) Because the maximum SUM 1-g SAR  $>$  1.6 W/Kg, so the SPLSR analysis is required.



Note:

- 1) Because the calculation result is  $\leq 0.04$  W/Kg, so the volume scan is not required.

## **Appendixes**

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

**4788808986.2-SAR-2\_App A Photo**

**4788808986.2-SAR-2\_App B System Check Plots**

**4788808986.2-SAR-2\_App C Highest Test Plots**

**4788808986.2-SAR-2\_App D Cal. Certificates**

-----End of Report-----