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CNAS L0310



## FCC SAR Compliance Test Report

**Product Name:** HUAWEI MateBook

**Model:** MACHR-W29, MACHR-W19

**Report No.:** SYBH(Z-SAR)20190123011002-2

**FCC ID:** QISMACHR-WX9

|      | APPROVED<br>(Lab Manager) | PREPARED<br>(Test Engineer) |
|------|---------------------------|-----------------------------|
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| DATE | 2019-03-06                | 2019-03-06                  |

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2. The laboratory has passed the accreditation by The American Association for Laboratory Accreditation (A2LA). The accreditation number is 2174.01 & 2174.02 & 2174.03
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※ ※ Modified History ※ ※

| REV.    | DESCRIPTION                 | ISSUED DATE | REMARK     |
|---------|-----------------------------|-------------|------------|
| Rev.1.0 | Initial Test Report Release | 2019-03-06  | Lin Jiekai |
|         |                             |             |            |
|         |                             |             |            |
|         |                             |             |            |
|         |                             |             |            |

## 1 General Information

### 1.1 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing are below Table 1.

| Band                                                                                                                               | Max Reported SAR(W/kg) |
|------------------------------------------------------------------------------------------------------------------------------------|------------------------|
|                                                                                                                                    | 1-g Body (0mm) *       |
| WiFi 2.4G                                                                                                                          | 0.76                   |
| WiFi 5G                                                                                                                            | 0.64                   |
| BT                                                                                                                                 | 0.11                   |
| The highest reported SAR for Body and Simultaneous transmission exposure conditions are 0.76 W/kg and 1.51 W/kg per KDB690783 D01. |                        |

Table 1: Summary of test result

Note:

1)\* For body operation, this device has been tested at a minimum of 0mm from the body per FCC KDB616217.

The device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits according to the FCC rule §2.1093, the ANSI C95.1:1992/IEEE C95.1:1991, the NCRP Report Number 86 for uncontrolled environment, and had been tested in accordance with the measurement methods and procedures specified in IEEE Std 1528-2013.

## 1.2 RF exposure limits

| Human Exposure                                         | Uncontrolled Environment<br>General Population | Controlled Environment<br>Occupational |
|--------------------------------------------------------|------------------------------------------------|----------------------------------------|
| <b>Spatial Peak SAR*</b><br>(Brain/Body/Arms/Legs)     | <b>1.60 W/kg</b>                               | 8.00 W/kg                              |
| <b>Spatial Average SAR**</b><br>(Whole Body)           | 0.08 W/kg                                      | 0.40 W/kg                              |
| <b>Spatial Peak SAR***</b><br>(Hands/Feet/Ankle/Wrist) | 4.00 W/kg                                      | 20.00 W/kg                             |

Table 2: RF exposure limits

The limit applied in this test report is shown in **bold** letters

### Notes:

- \* The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
- \*\* The Spatial Average value of the SAR averaged over the whole body.
- \*\*\* The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

**Uncontrolled Environments** are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

**Controlled Environments** are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation

### 1.3 EUT Description

| Device Information:              |                                                                                                                                                                                                                |           |           |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------|
| Product Name:                    | HUAWEI MateBook                                                                                                                                                                                                |           |           |
| Model:                           | MACHR-W29, MACHR-W19                                                                                                                                                                                           |           |           |
| FCC ID :                         | QISMACHR-WX9                                                                                                                                                                                                   |           |           |
| SN:                              | 1#: XMYBB18C21000036(MACHR-W29)<br>2#: 96GBB18C24000060(MACHR-W29)<br>3#: XMYBB18C21000061(MACHR-W29)<br>4#: XMYBB18C21000034(MACHR-W29)<br>5#: 8DLBB18C24000066(MACHR-W19)<br>6#: 99HBB18C24000052(MACHR-W19) |           |           |
| Device Type :                    | Portable device                                                                                                                                                                                                |           |           |
| Device Phase:                    | Identical Prototype                                                                                                                                                                                            |           |           |
| Exposure Category:               | Uncontrolled environment / general population                                                                                                                                                                  |           |           |
| Hardware Version :               | SP2MACHRW19M                                                                                                                                                                                                   |           |           |
| Software Version :               | 1.5.0.7(C001)                                                                                                                                                                                                  |           |           |
| Antenna Type :                   | Internal antenna                                                                                                                                                                                               |           |           |
| Device Operating Configurations: |                                                                                                                                                                                                                |           |           |
| Supporting Mode(s)               | WiFi 2.4G/5G, BT                                                                                                                                                                                               |           |           |
| Test Modulation                  | WiFi(DSSS/OFDM),BT(GFSK)                                                                                                                                                                                       |           |           |
| Operating Frequency Range(s)     | Band                                                                                                                                                                                                           | Tx (MHz)  | Rx (MHz)  |
|                                  | WiFi 2.4G                                                                                                                                                                                                      | 2412-2462 | 2412-2462 |
|                                  | WiFi 5G                                                                                                                                                                                                        | 5150-5250 | 5150-5250 |
|                                  |                                                                                                                                                                                                                | 5250-5350 | 5250-5350 |
|                                  |                                                                                                                                                                                                                | 5470-5725 | 5470-5725 |
|                                  |                                                                                                                                                                                                                | 5725-5850 | 5725-5850 |
| BT                               | 2402-2480                                                                                                                                                                                                      | 2402-2480 |           |
| Test Channels (low-mid-high):    | 802.11b/g/n 20M:1-2-6-10-11(WiFi 2.4G)                                                                                                                                                                         |           |           |
|                                  | 802.11n 40M:3-4-6-8-9(WiFi 2.4G)                                                                                                                                                                               |           |           |
|                                  | 802.11a/n/ac 20M:<br>36-40-44-48-52-56-60-64-100-104-108-112-116-120-124-128-132-136-140-149-153-157-161-165 (WiFi 5G)                                                                                         |           |           |
|                                  | 802.11n/ac 40M:<br>38-46-54-62-102-110-118-126-134-151-159 (WiFi 5G)                                                                                                                                           |           |           |
|                                  | 802.11ac 80M: 42-58-106-122-155 (WiFi 5G)                                                                                                                                                                      |           |           |
|                                  | 802.11ac 160M: 50-114 (WiFi 5G)                                                                                                                                                                                |           |           |
|                                  | 0-19-39-78(BT)                                                                                                                                                                                                 |           |           |

Table 3: Device information and operating configuration

Note: For WiFi 5G, the device does not support channel 144(20M), channel 142(40M) and channel 138(80M).

### 1.3.1 General Description

MACHR-W29/MACHR-W19 is a notebook computer, Which supports 2.4G Wi-Fi, 5G Wi-Fi, and Bluetooth wireless frequency bands. It provides power and fingerprint key switch, one USB type A , two USB type C, and a earphone interfaces.

#### Battery information:

| Name                   | Manufacturer/trademark                                                    | Description                                                                                           |
|------------------------|---------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| Rechargeable<br>Li-ion | Huawei Technologies Co., Ltd.<br>(Dynapack International Technology Corp) | Model : HB4593R1ECW<br>Rated capacity: 7410mAh<br>Rated Voltage: 7.6V<br>Limited Charge Voltage: 8.7V |
|                        | Huawei Technologies Co., Ltd.<br>(Sunwoda Electronic Co., Ltd)            |                                                                                                       |



### Difference description:

The difference between MACHR-W29, and MACHR-W19 is show in the following table:

| Model            | MACHR-W29<br>(with GPU version)         | MACHR-W29<br>(without GPU version)      | MACHR-W19<br>(with GPU version)         | MACHR-W19<br>(without GPU version)      |
|------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|
| PCB layout       | The same                                | The same                                | The same                                | The same                                |
| Main board       | The same                                | Delete GPU chip and related components  | The same                                | Delete GPU chip and related components  |
| Frequency bands  | The same, support WiFi 2.4G&5G, BT 2.4G | The same, support WiFi 2.4G&5G, BT 2.4G | The same, support WiFi 2.4G&5G, BT 2.4G | The same, support WiFi 2.4G&5G, BT 2.4G |
| BT/ WiFi antenna | The same                                | The same                                | The same                                | The same                                |
| Appearance       | The same                                | The same                                | The same                                | The same                                |
| Dimension        | The same                                | The same                                | The same                                | The same                                |
| CPU              | Whiskey lake-U i7, Support max 4.6GHz   | Whiskey lake-U i7, Support max 4.6GHz   | Whiskey lake-U i5, Support max 3.9GHz   | Whiskey lake-U i5, Support max 3.9GHz   |
| GPU              | Support                                 | Not support                             | Support                                 | Not support                             |
| Memory           | 16/8G                                   | 16/8G                                   | 8G                                      | 8G                                      |
| SSD              | 512G/1T                                 | 512G/1T                                 | 256G/512G                               | 256G/512G                               |
| Rear camera      | Not support                             | Not support                             | Not support                             | Not support                             |
| Front camera     | The same                                | The same                                | The same                                | The same                                |
| Adapter          | The same                                | The same                                | The same                                | The same                                |
| Battery          | The same                                | The same                                | The same                                | The same                                |
| Accessories      | The same                                | The same                                | The same                                | The same                                |

According to the difference description above:

- 1) Full SAR test is performed on MACHR-W29 (with GPU version).
- 2) MACHR-W29 (without GPU version) shares the same test data of MACHR-W29 (with GPU version) for each same frequency band.
- 3) MACHR-W19 (with GPU version) is tested at the SAR worst case of MACHR-W29 for each same frequency band.
- 4) MACHR-W19 (without GPU version) shares the same test data of MACHR-W19 (with GPU version) for each same frequency band.

#### 1.4 Test specification(s)

|                                  |                                                                                                                                                                             |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ANSI C95.1:1992 /IEEE C95.1:1991 | Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.                                                                    |
| IEEE Std 1528-2013               | Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques |
| KDB 447498 D01                   | General RF Exposure Guidance v06                                                                                                                                            |
| KDB 248227 D01                   | SAR Guidance for IEEE 802.11 Wi-Fi SAR v02r02                                                                                                                               |
| KDB 865664 D01                   | SAR measurement 100 MHz to 6 GHz v01r04                                                                                                                                     |
| KDB 865664 D02                   | RF Exposure Reporting v01r02                                                                                                                                                |
| KDB 690783 D01                   | SAR Listings on Grants v01r03                                                                                                                                               |
| KDB 616217 D04                   | SAR for laptop and tablets v01r02                                                                                                                                           |

#### 1.5 Testing laboratory

|                        |                                                                                                                                                                       |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Site              | Reliability Laboratory of Huawei Technologies Co., Ltd.                                                                                                               |
| Test Location          | NO.2 New City Avenue Songshan Lake Sci. & Tech. Industry Park, Dongguan, Guangdong, P.R.C                                                                             |
| Telephone              | +86 769 23830808                                                                                                                                                      |
| Fax                    | +86 769 23837628                                                                                                                                                      |
| State of accreditation | The Test laboratory (area of testing) is accredited according to ISO/IEC 17025.<br>CNAS Registration number: L0310<br>A2LA TESTING CERT # 2174.01 & 2174.02 & 2174.03 |

#### 1.6 Applicant and Manufacturer

|              |                                                                                                                             |
|--------------|-----------------------------------------------------------------------------------------------------------------------------|
| Company Name | HUAWEI TECHNOLOGIES CO., LTD                                                                                                |
| Address      | Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C |

#### 1.7 Application details

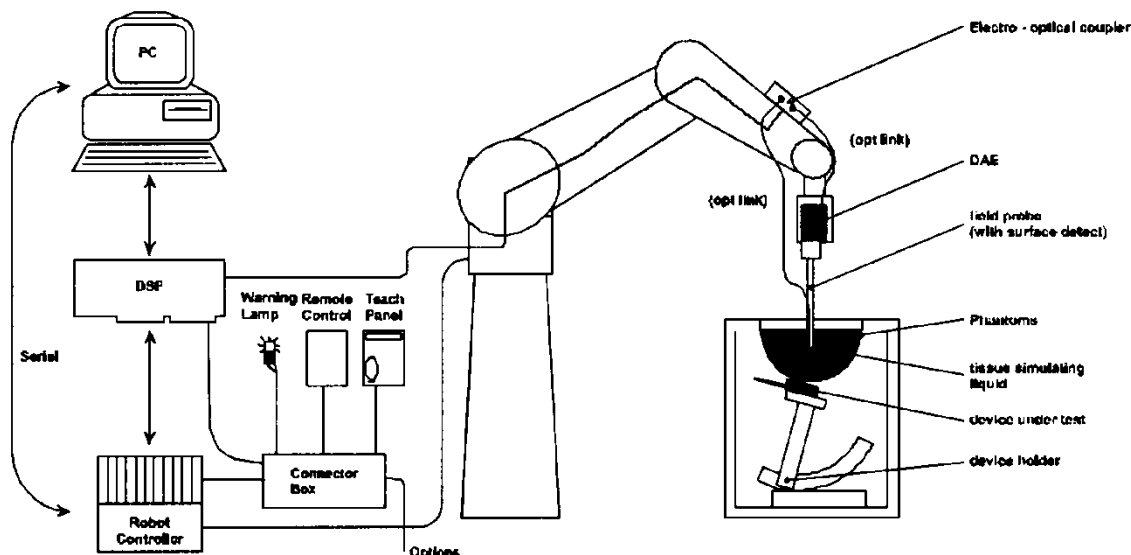
|                    |            |
|--------------------|------------|
| Start Date of test | 2019-02-27 |
| End Date of test   | 2019-03-02 |

#### 1.8 Ambient Condition

|                     |             |
|---------------------|-------------|
| Ambient temperature | 18°C – 25°C |
| Relative Humidity   | 30% – 70%   |

## 2 SAR Measurement System

### 2.1 SAR Measurement Set-up



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

- A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronic (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.
- A unit to operate the optical surface detector which is connected to the EOC.
- The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY measurement server.
- The DASY measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows 7.
- DASY software and SEMCAD data evaluation software.
- Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
- The generic twin phantom enabling the testing of left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- System check dipoles allowing to validate the proper functioning of the system.

## 2.2 Test environment

The DASY measurement system is placed at the head end of a room with dimensions: 5 x 2.5 x 3 m<sup>3</sup>, the SAM phantom is placed in a distance of 75 cm from the side walls and 1.1m from the rear wall. Above the test system a 1.5 x 1.5 m<sup>2</sup> array of pyramid absorbers is installed to reduce reflections from the ceiling.

Picture 1 of the photo documentation shows a complete view of the test environment.

The system allows the measurement of SAR values larger than 0.005 mW/g.

## 2.3 Data Acquisition Electronics description

The data acquisition electronics (DAE) consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converted and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information, as well as an optical uplink for commands and the clock.

The mechanical probe mounting device includes two different sensor systems for frontal and sideways Probe contacts. They are used for mechanical surface detection and probe collision detection.

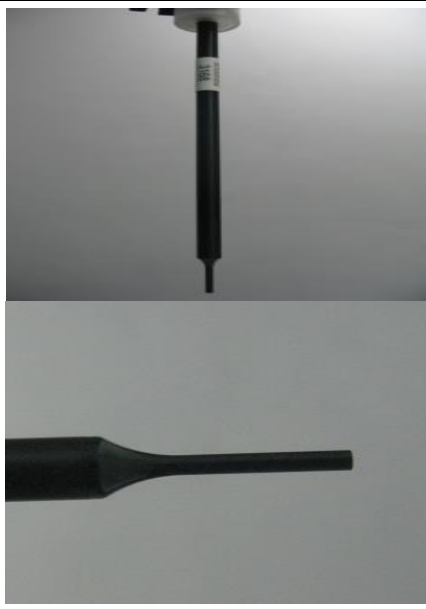
DAE

|                       |                          |                                                                                      |
|-----------------------|--------------------------|--------------------------------------------------------------------------------------|
| Input Impedance       | 200MOhm                  |  |
| The Inputs            | symmetrical and floating |                                                                                      |
| Common mode rejection | above 80 dB              |                                                                                      |

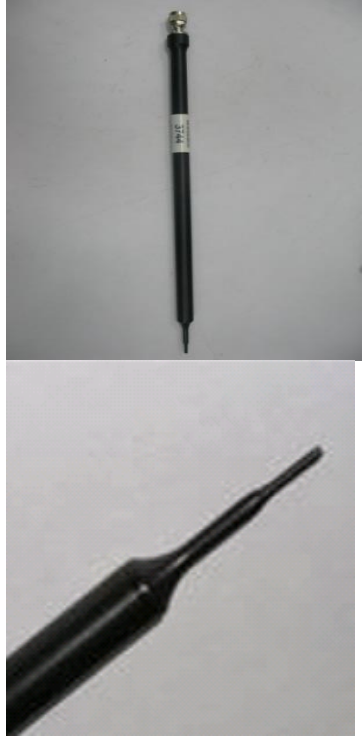
## 2.4 Probe description

These probes are specially designed and calibrated for use in liquids with high permittivities. They should not be used in air, since the spherical isotropy in air is poor ( $\pm 2$  dB). The dosimetric probes have special calibrations in various liquids at different frequencies.

### Isotropic E-Field Probe ES3DV3 for Dosimetric Measurements

|               |                                                                                                                                                                                    |                                                                                      |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Construction  | Symmetrical design with triangular core<br>Interleaved sensors<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., DGBE) |  |
| Calibration   | ISO/IEC 17025 calibration service available.                                                                                                                                       |                                                                                      |
| Frequency     | 10 MHz to 4 GHz; Linearity: $\pm 0.2$ dB (30 MHz to 4 GHz)                                                                                                                         |                                                                                      |
| Directivity   | $\pm 0.2$ dB in HSL (rotation around probe axis)<br>$\pm 0.3$ dB in tissue material (rotation normal to probe axis)                                                                |                                                                                      |
| Dynamic range | 5 $\mu$ W/g to > 100 mW/g; Linearity: $\pm 0.2$ dB                                                                                                                                 |                                                                                      |
| Dimensions    | Overall length: 337 mm (Tip: 20 mm)<br>Tip diameter: 3.9 mm (Body: 12 mm)<br>Distance from probe tip to dipole centers: 2.0 mm                                                     |                                                                                      |
| Application   | General dosimetry up to 4 GHz<br>Dosimetry in strong gradient fields<br>Compliance tests of mobile phones                                                                          |                                                                                      |

### Isotropic E-Field Probe EX3DV4 for Dosimetric Measurements

|               |                                                                                                                                                                                                              |                                                                                       |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Construction  | Symmetrical design with triangular core<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., DGBE)                                                  |  |
| Calibration   | ISO/IEC 17025 calibration service available.                                                                                                                                                                 |                                                                                       |
| Frequency     | 10 MHz to >6 GHz; Linearity: $\pm 0.2$ dB (30 MHz to 6 GHz)                                                                                                                                                  |                                                                                       |
| Directivity   | $\pm 0.3$ dB in HSL (rotation around probe axis)<br>$\pm 0.5$ dB in tissue material (rotation normal to probe axis)                                                                                          |                                                                                       |
| Dynamic range | 10 $\mu$ W/g to > 100 mW/g;<br>Linearity: $\pm 0.2$ dB (noise: typically < 1 $\mu$ W/g)                                                                                                                      |                                                                                       |
| Dimensions    | Overall length: 337 mm (Tip: 20 mm)<br>Tip diameter: 2.5 mm (Body: 12 mm)<br>Typical distance from probe tip to dipole centers: 1 mm                                                                         |                                                                                       |
| Application   | High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields).<br>Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30% |                                                                                       |

## 2.5 Phantom description

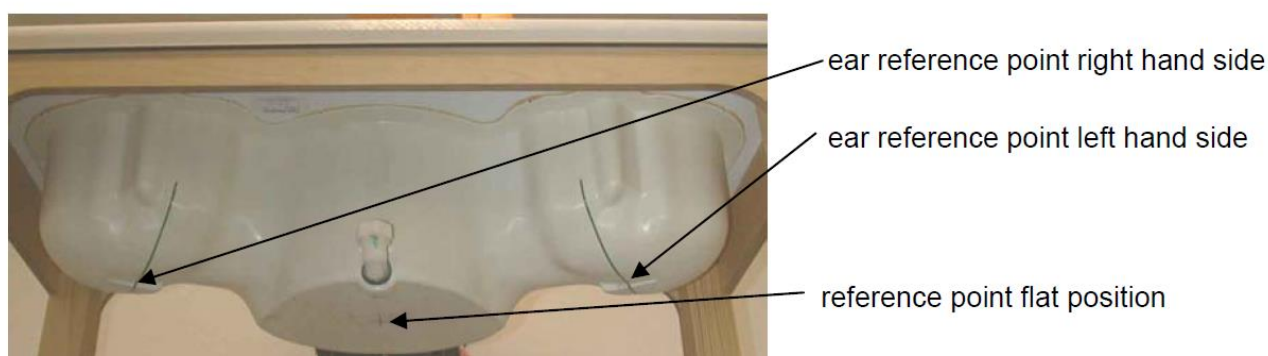
### SAM Twin Phantom

|                   |                                                        |                                                                                     |
|-------------------|--------------------------------------------------------|-------------------------------------------------------------------------------------|
| Shell Thickness   | 2mm±0.2mm;The ear region:6.0±0.2mm                     |  |
| Filling Volume    | Approximately 25 liters                                |                                                                                     |
| Dimensions        | Length:1000mm; Width:500mm;<br>Height: adjustable feet |                                                                                     |
| Measurement Areas | Left hand<br>Right hand<br>Flat phantom                |                                                                                     |

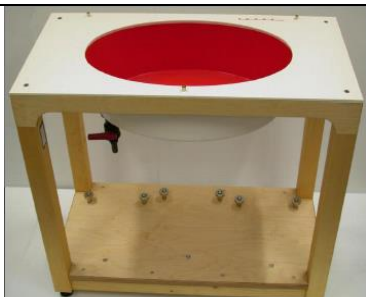
The bottom plate contains three pairs of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections.

A white cover is provided to cover the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. Free space scans of devices on top of this phantom cover are possible. Three reference marks are provided on the phantom counter. These reference marks are used to teach the absolute phantom position relative to the robot.

The following figure shows the definition of reference point:



### ELI Phantom

|                   |                                     |                                                                                       |
|-------------------|-------------------------------------|---------------------------------------------------------------------------------------|
| Shell Thickness   | 2mm±0.2mm                           |  |
| Filling Volume    | Approximately 30 liters             |                                                                                       |
| Dimensions        | Major axis:600mm; Minor axis:400mm; |                                                                                       |
| Measurement Areas | Flat phantom                        |                                                                                       |

The ELI4 phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30MHz to 6GHz. ELI4 is fully compatible with the latest draft of the standard IEC 62209-2 and all known tissue simulating liquids.

The phantom shell material is resistant to all ingredients used in the tissue-equivalent liquid recipes. The shell of the phantom including ear spacers is constructed from low permittivity and low loss material, with a relative permittivity  $2 \leq \epsilon_r \leq 5$  at  $\leq 3$  GHz,  $3 \leq \epsilon_r \leq 4$  at  $> 3$  GHz and a loss tangent  $\leq 0.05$ .



## Modular Triple Flat Phantom

|                                                                                                                                                                                                                                                               |                                                                                 |                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Shell Thickness<br>(bottom plate)                                                                                                                                                                                                                             | 2mm±0.2mm                                                                       |  |
| Filling Volume (Module)                                                                                                                                                                                                                                       | approx. 8.1 liters<br>(filling height: 155 mm)                                  |                                                                                     |
| Dimensions                                                                                                                                                                                                                                                    | Length: 292 mm<br>Width: 178 mm<br>Height: 178 mm<br>Useable area: 280 × 175 mm |                                                                                     |
| Measurement Areas                                                                                                                                                                                                                                             | Flat phantom                                                                    |                                                                                     |
| The Modular Flat Phantom consists of three identical modules that can be installed and removed separately without emptying the liquid. It is used for compliance testing of small wireless devices in body-worn configurations according to IEC 62209-2, etc. |                                                                                 |                                                                                     |

## 2.6 Device holder description

The DASY device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65°. The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. This device holder is used for standard mobile phones or PDA's only. If necessary an additional support of polystyrene material is used.



The DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity  $\epsilon = 3$  and loss tangent  $\sigma = 0.02$ . The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

The device holder permits the device to be positioned with a tolerance of  $\pm 1^\circ$  in the tilt angle.

Larger DUT's (e.g. notebooks) cannot be tested using this device holder. Instead a support of bigger polystyrene cubes and thin polystyrene plates is used to position the DUT in all relevant positions to find and measure spots with maximum SAR values.

Therefore those devices are normally only tested at the flat part of the SAM.

## 2.7 Test Equipment List

This table gives a complete overview of the SAR measurement equipment.

Devices used during the test described are marked ☒

|                                     | Manufacturer  | Device                               | Type     | Serial number | Date of last calibration | Valid period* |
|-------------------------------------|---------------|--------------------------------------|----------|---------------|--------------------------|---------------|
| <input checked="" type="checkbox"/> | SPEAG         | Dosimetric E-Field Probe             | EX3DV4   | 7505          | 2018-06-12               | One year      |
| <input checked="" type="checkbox"/> | SPEAG         | Dosimetric E-Field Probe             | EX3DV4   | 3736          | 2018-04-27               | One year      |
| <input checked="" type="checkbox"/> | SPEAG         | 2450 MHz Dipole                      | D2450V2  | 860           | 2018-11-17               | Three years   |
| <input checked="" type="checkbox"/> | SPEAG         | 5GHz Dipole                          | D5GHzV2  | 1155          | 2018-06-08               | Three years   |
| <input checked="" type="checkbox"/> | SPEAG         | Data acquisition electronics         | DAE4     | 1492          | 2018-11-14               | One year      |
| <input checked="" type="checkbox"/> | SPEAG         | Data acquisition electronics         | DAE4     | 851           | 2018-07-18               | One year      |
| <input checked="" type="checkbox"/> | SPEAG         | Software                             | DASY52   | N/A           | NCR                      | NCR           |
| <input checked="" type="checkbox"/> | SPEAG         | Flat Phantom                         | ELI      | 1038          | NCR                      | NCR           |
| <input checked="" type="checkbox"/> | SPEAG         | Flat Phantom                         | ELI      | 2090          | NCR                      | NCR           |
| <input checked="" type="checkbox"/> | R & S         | Universal Radio Communication Tester | CMW 500  | 165424        | 2018-07-07               | One year      |
| <input checked="" type="checkbox"/> | Agilent       | Network Analyser                     | E5071C   | MY46107368    | 2018-10-15               | One year      |
| <input checked="" type="checkbox"/> | Agilent       | Dielectric Probe Kit                 | 85070E   | 2484          | NCR                      | NCR           |
| <input checked="" type="checkbox"/> | Agilent       | Signal Generator                     | N5181A   | MY50145341    | 2018-12-18               | One year      |
| <input checked="" type="checkbox"/> | MINI-CIRCUITS | Amplifier                            | ZHL-42W  | QA1402001     | NCR                      | NCR           |
| <input checked="" type="checkbox"/> | MINI-CIRCUITS | Amplifier                            | ZVE-8G+  | 188163        | NCR                      | NCR           |
| <input checked="" type="checkbox"/> | Agilent       | Dual Directional Coupler             | 772D     | MY52180173    | 2018-12-13               | One year      |
| <input checked="" type="checkbox"/> | AR            | Directional Coupler                  | DC7144M1 | 311190        | 2018-05-29               | One year      |
| <input checked="" type="checkbox"/> | Agilent       | Power Meter                          | E4417A   | MY54100027    | 2018-03-24               | One year      |
| <input checked="" type="checkbox"/> | Keysight      | Power Meter Sensor                   | E9321A   | MY57150002    | 2018-03-15               | One year      |
| <input checked="" type="checkbox"/> | R & S         | Power Meter                          | NRP      | 100740        | 2018-07-17               | One year      |
| <input checked="" type="checkbox"/> | R & S         | Power Meter Sensor                   | NRP-Z11  | 106288        | 2018-07-17               | One year      |

Note:

1) Per KDB865664 D01 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.

- There is no physical damage on the dipole;
- System check with specific dipole is within 10% of calibrated value;
- The most recent return-loss result, measured at least annually, deviates by no more than 20% from the previous measurement.
- 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) Network analyzer probe calibration against air, distilled water and a shorting block performed before measuring liquid parameters.

3) \*All the equipment are within the valid period when the tests are performed.



## 3 SAR Measurement Procedure

### 3.1 Scanning procedure

The DASY installation includes predefined files with recommended procedures for measurements and system check. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

- The “reference” and “drift” measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the DUT’s output power and should vary max. +/- 5 %.
- For power drift measurement, DASY software supports that the reference position can be either the selected section’s grid reference point or a user point. If the E-field of power reference measurement in the default grid reference point is very small, the test lab may set the reference position to the user point near the hotspot location to avoid large measurement uncertainty.
- The “surface check” measurement tests the optical surface detection system of the DASY system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above  $\pm 0.1\text{mm}$ ). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within  $\pm 30^\circ$ .)
- The “area scan” measures the SAR above the DUT or verification dipole on a parallel plane to the surface. It is used to locate the approximate location of the peak SAR with 2D spline interpolation. The robot performs a stepped movement along one grid axis while the local electrical field strength is measured by the probe. The probe is touching the surface of the SAM during acquisition of measurement values. The standard scan uses large grid spacing for faster measurement. Standard grid spacing for head measurements is 15 mm in x- and y- dimension ( $\leq 2\text{GHz}$ ), 12 mm in x- and y- dimension (2-4 GHz) and 10mm in x- and y- dimension (4-6GHz). If a finer resolution is needed, the grid spacing can be reduced. Grid spacing and orientation have no influence on the SAR result. For special applications where the standard scan method does not find the peak SAR within the grid, e.g. mobile phones with flip cover, the grid can be adapted in orientation. Results of this coarse scan are shown in Appendix B.
- A “zoom scan” measures the field in a volume around the 2D peak SAR value acquired in the previous “coarse” scan. This is a fine grid with maximum scan spatial resolution:  $\Delta x_{\text{zoom}}, \Delta y_{\text{zoom}} \leq 2\text{GHz} - \leq 8\text{mm}$ , 2-4GHz -  $\leq 5\text{ mm}$  and 4-6 GHz- $\leq 4\text{mm}$ ;  $\Delta z_{\text{zoom}} \leq 3\text{GHz} - \leq 5\text{ mm}$ , 3-4 GHz-  $\leq 4\text{mm}$  and 4-6GHz- $\leq 2\text{mm}$  where the robot additionally moves the probe along the z-axis away from the bottom of the Phantom. DASY is also able to perform repeated zoom scans if more than 1 peak is found during area scan. In this document, the evaluated peak 1g and 10g averaged SAR values are shown in the 2D-graphics in Appendix B. Test results relevant for the specified standard (see chapter 1.4.) are shown in table form in chapter 7.2.
- A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 2 mm steps. This measurement shows the continuity of the liquid and can - depending in the field strength – also show the liquid depth. A z-axis scan of the measurement with maximum SAR value is shown in Appendix B.

The following table summarizes the area scan and zoom scan resolutions per FCC KDB865664 D01:

| Frequency | Maximum Area Scan resolution<br>( $\Delta x_{\text{area}}, \Delta y_{\text{area}}$ ) | Maximum Zoom Scan spatial resolution<br>( $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$ ) | Maximum Zoom Scan spatial resolution |                               |                                     | Minimum zoom scan volume<br>(x,y,z) |
|-----------|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|--------------------------------------|-------------------------------|-------------------------------------|-------------------------------------|
|           |                                                                                      |                                                                                              | Uniform Grid                         | Graded Grad                   |                                     |                                     |
|           |                                                                                      |                                                                                              | $\Delta z_{\text{Zoom}}(n)$          | $\Delta z_{\text{Zoom}}(1)^*$ | $\Delta z_{\text{Zoom}}(n>1)^*$     |                                     |
| ≤2GHz     | ≤15mm                                                                                | ≤8mm                                                                                         | ≤5mm                                 | ≤4mm                          | ≤1.5* $\Delta z_{\text{Zoom}}(n-1)$ | ≥30mm                               |
| 2-3GHz    | ≤12mm                                                                                | ≤5mm                                                                                         | ≤5mm                                 | ≤4mm                          | ≤1.5* $\Delta z_{\text{Zoom}}(n-1)$ | ≥30mm                               |
| 3-4GHz    | ≤12mm                                                                                | ≤5mm                                                                                         | ≤4mm                                 | ≤3mm                          | ≤1.5* $\Delta z_{\text{Zoom}}(n-1)$ | ≥28mm                               |
| 4-5GHz    | ≤10mm                                                                                | ≤4mm                                                                                         | ≤3mm                                 | ≤2.5mm                        | ≤1.5* $\Delta z_{\text{Zoom}}(n-1)$ | ≥25mm                               |
| 5-6GHz    | ≤10mm                                                                                | ≤4mm                                                                                         | ≤2mm                                 | ≤2mm                          | ≤1.5* $\Delta z_{\text{Zoom}}(n-1)$ | ≥22mm                               |

### 3.2 Spatial Peak SAR Evaluation

The spatial peak SAR - value for 1 and 10 g is evaluated after the Cube measurements have been done. The basis of the evaluation are the SAR values measured at the points of the fine cube grid consisting of 5 x 5 x 7 points (with 8mm horizontal resolution) or 7 x 7 x 7 points (with 5mm horizontal resolution) or 8 x 8 x 7 points (with 4mm horizontal resolution). The algorithm that finds the maximal averaged volume is separated into three different stages.

- The data between the dipole center of the probe and the surface of the phantom are extrapolated. This data cannot be measured since the center of the dipole is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is about 1 mm (see probe calibration sheet). The extrapolated data from a cube measurement can be visualized by selecting 'Graph Evaluated'.
- The maximum interpolated value is searched with a straight-forward algorithm. Around this maximum the SAR - values averaged over the spatial volumes (1g or 10 g) are computed using the 3d-spline interpolation algorithm. If the volume cannot be evaluated (i.e., if a part of the grid was cut off by the boundary of the measurement area) the evaluation will be started on the corners of the bottom plane of the cube.
- All neighboring volumes are evaluated until no neighboring volume with a higher average value is found.

#### Extrapolation

The extrapolation is based on a least square algorithm [W. Gander, Computermathematik, p.168-180]. Through the points in the first 3 cm along the z-axis, polynomials of order four are calculated. These polynomials are then used to evaluate the points between the surface and the probe tip. The points, calculated from the surface, have a distance of 1 mm from each other.

#### Interpolation

The interpolation of the points is done with a 3d-Spline. The 3d-Spline is composed of three one-dimensional splines with the "Not a knot"-condition [W. Gander, Computermathematik, p.141-150] (x, y and z -direction) [Numerical Recipes in C, Second Edition, p.123ff].

#### Volume Averaging

At First the size of the cube is calculated. Then the volume is integrated with the trapezoidal algorithm. 8000 points (20x20x20) are interpolated to calculate the average.

#### Advanced Extrapolation

DASY uses the advanced extrapolation option which is able to compensate boundary effects on E-field probes.

### 3.3 Data Storage and Evaluation

#### Data Storage

The DASY software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension "DAE". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

#### Data Evaluation by SEMCAD

The SEMCAD software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

|                    |                           |                                                                         |
|--------------------|---------------------------|-------------------------------------------------------------------------|
| Probe parameters:  | - Sensitivity             | Norm <sub>i</sub> , a <sub>i0</sub> , a <sub>i1</sub> , a <sub>i2</sub> |
|                    | - Conversion factor       | ConvF <sub>i</sub>                                                      |
|                    | - Diode compression point | Dcp <sub>i</sub>                                                        |
| Device parameters: | - Frequency               | f                                                                       |
|                    | - Crest factor            | cf                                                                      |
| Media parameters:  | - Conductivity            | σ                                                                       |
|                    | - Density                 | ρ                                                                       |

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics.

If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot cf/dcp_i$$

|      |                  |                                                   |                  |
|------|------------------|---------------------------------------------------|------------------|
| with | V <sub>i</sub>   | = compensated signal of channel i                 | (i = x, y, z)    |
|      | U <sub>i</sub>   | = input signal of channel i                       | (i = x, y, z)    |
|      | cf               | = crest factor of exciting field (DASY parameter) |                  |
|      | dcp <sub>i</sub> | = diode compression point                         | (DASY parameter) |

From the compensated input signals the primary field data for each channel can be evaluated:

$$\begin{aligned} \text{E-field probes:} \quad E_i &= (V_i / \text{Norm}_i \cdot \text{ConvF})^{1/2} \\ \text{H-field probes:} \quad H_i &= (V_i)^{1/2} \cdot (a_{i0} + a_{i1}f + a_{i2}f^2)/f \end{aligned}$$

with  $V_i$  = compensated signal of channel i (i = x, y, z)  
 $\text{Norm}_i$  = sensor sensitivity of channel i (i = x, y, z)  
 [mV/ (V/m)<sup>2</sup>] for E-field Probes  
 $\text{ConvF}$  = sensitivity enhancement in solution  
 $a_{ij}$  = sensor sensitivity factors for H-field probes  
 $f$  = carrier frequency [GHz]  
 $E_i$  = electric field strength of channel i in V/m  
 $H_i$  = magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{\text{tot}} = (E_x^2 + E_y^2 + E_z^2)^{1/2}$$

The primary field data are used to calculate the derived field units.

$$\text{SAR} = (E_{\text{tot}}^2 \cdot \sigma) / (\rho \cdot 1000)$$

with  $\text{SAR}$  = local specific absorption rate in mW/g  
 $E_{\text{tot}}$  = total field strength in V/m  
 $\sigma$  = conductivity in [mho/m] or [Siemens/m]  
 $\rho$  = equivalent tissue density in g/cm<sup>3</sup>

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

$$P_{\text{pwe}} = E_{\text{tot}}^2 / 3770 \quad \text{or} \quad P_{\text{pwe}} = H_{\text{tot}}^2 \cdot 37.7$$

with  $P_{\text{pwe}}$  = equivalent power density of a plane wave in mW/cm<sup>2</sup>  
 $E_{\text{tot}}$  = total electric field strength in V/m  
 $H_{\text{tot}}$  = total magnetic field strength in A/m

## 4 System Verification Procedure

### 4.1 Tissue Verification

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine if the dielectric parameters are within the tolerances of the specified target values. The measured conductivity and relative permittivity should be within  $\pm 5\%$  of the target values.

The following materials are used for producing the tissue-equivalent materials.

| Ingredients (% of weight) | Body Tissue |      |       |       |      |        |
|---------------------------|-------------|------|-------|-------|------|--------|
| Frequency Band (MHz)      | 750         | 835  | 1750  | 1900  | 2450 | 2600   |
| Water                     | 50.3        | 52.4 | 69.91 | 69.91 | 73.2 | 64.493 |
| Salt (NaCl)               | 1.60        | 1.40 | 0.13  | 0.13  | 0.04 | 0.024  |
| Sugar                     | 47.0        | 45.0 | 0.0   | 0.0   | 0.0  | 0.0    |
| HEC                       | 0.0         | 1.0  | 0.0   | 0.0   | 0.0  | 0.0    |
| Bactericide               | 0.0         | 0.1  | 0.0   | 0.0   | 0.0  | 0.0    |
| Triton X-100              | 0.0         | 0.0  | 0.0   | 0.0   | 0.0  | 0.0    |
| DGBE                      | 0.0         | 0.0  | 29.96 | 29.96 | 26.7 | 32.252 |

Table 4: Tissue Dielectric Properties

Salt: 99+% Pure Sodium Chloride; Sugar: 98+% Pure Sucrose; Water: De-ionized,  $16\text{M}\Omega$ + resistivity

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

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

#### ☒ Simulating Body Liquid (MBBL600-6000MHz), Manufactured by SPEAG:

| Ingredients                     | (% by weight) |
|---------------------------------|---------------|
| Water                           | 60-80%        |
| Esters, Emulsifiers, Inhibitors | 20-40%        |
| Sodium salt                     | 0-1.5%        |

| Tissue Type  | Target Frequency | Target Tissue |                     | Measured Tissue |                     | Deviation (Within +/-5% ) |                | Test Date  |
|--------------|------------------|---------------|---------------------|-----------------|---------------------|---------------------------|----------------|------------|
|              |                  | Permit-tivity | Conduc-tivity [S/m] | Permit-tivity   | Conduc-tivity [S/m] | $\Delta\epsilon_r$        | $\Delta\sigma$ |            |
| 2450MHz Body | 2410             | 52.8          | 1.91                | 53.09           | 1.965               | 0.55%                     | 2.88%          | 2019-02-27 |
|              | 2435             | 52.7          | 1.94                | 53.04           | 1.988               | 0.65%                     | 2.47%          |            |
|              | 2450             | 52.7          | 1.95                | 53.02           | 2.003               | 0.61%                     | 2.72%          |            |
|              | 2460             | 52.7          | 1.96                | 53.02           | 2.012               | 0.61%                     | 2.65%          |            |
| 2450MHz Body | 2410             | 52.8          | 1.91                | 50.38           | 1.915               | -4.58%                    | 0.26%          | 2019-03-02 |
|              | 2435             | 52.7          | 1.94                | 50.34           | 1.941               | -4.48%                    | 0.05%          |            |
|              | 2450             | 52.7          | 1.95                | 50.33           | 1.954               | -4.50%                    | 0.21%          |            |
|              | 2460             | 52.7          | 1.96                | 50.32           | 1.963               | -4.52%                    | 0.15%          |            |
| 5GHz Body    | 5250             | 48.9          | 5.36                | 49.80           | 5.257               | 1.84%                     | -1.92%         | 2019-02-28 |
|              | 5600             | 48.5          | 5.77                | 49.49           | 5.682               | 2.04%                     | -1.53%         |            |
|              | 5750             | 48.3          | 5.94                | 49.26           | 5.967               | 1.99%                     | 0.45%          |            |

Table 5: Measured Tissue Parameter

Note:

- 1) The dielectric parameters of the tissue-equivalent liquid should be measured under similar ambient conditions and within 2 °C of the conditions expected during the SAR evaluation to satisfy protocol requirements.
- 2) KDB865664 was ensured to be applied for probe calibration frequencies greater than or equal to 50MHz of the EUT frequencies.
- 3) The above measured tissue parameters were used in the DASY software to perform interpolation via the DASY software to determine actual dielectric parameters at the test frequencies. The SAR test plots may slightly differ from the table above since the DASY rounds to three significant digits.

## 4.2 System Check

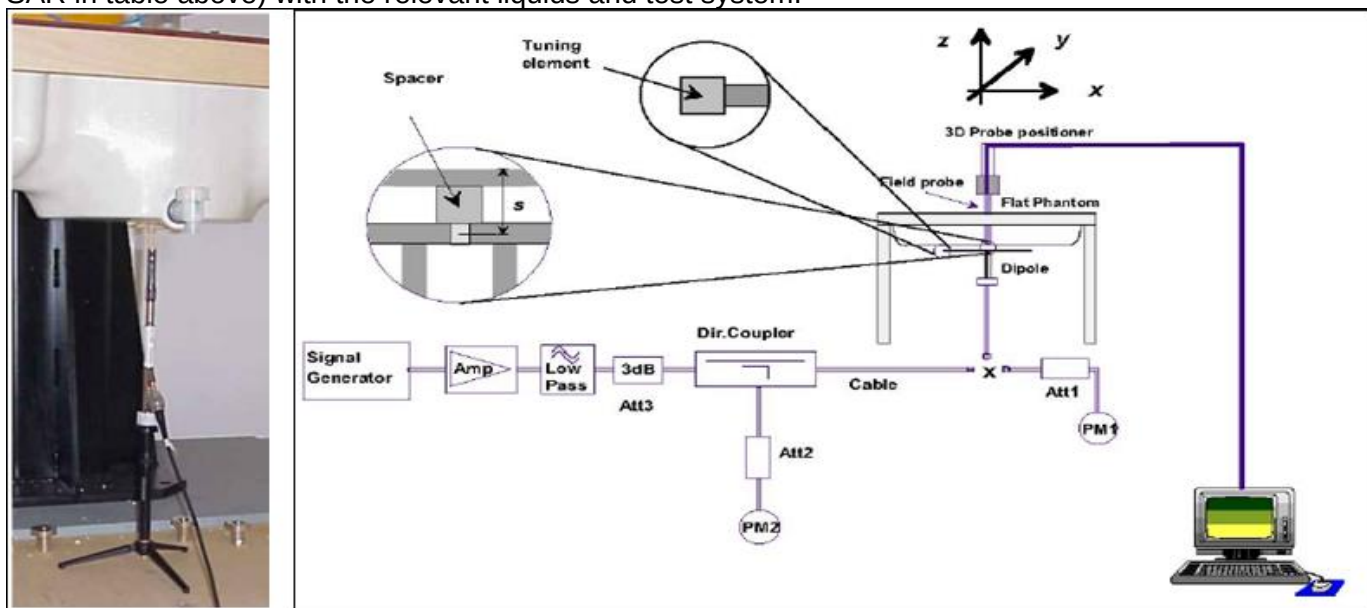
The system check is performed for verifying the accuracy of the complete measurement system and performance of the software. The system check is performed with tissue equivalent material according to IEEE 1528 (described above). The following table shows system check results for all frequency bands and tissue liquids used during the tests (Graphic Plot(s) see Appendix A).

| Dipole Information | System Check | Target SAR<br>(Normalized to 1W) |                | Measured SAR<br>(Normalized to 1W) |                | Deviation<br>(Within +/-10% ) |               | Test Date |
|--------------------|--------------|----------------------------------|----------------|------------------------------------|----------------|-------------------------------|---------------|-----------|
| SN                 |              | 1-g<br>(mW/g)                    | 10-g<br>(mW/g) | 1-g<br>(mW/g)                      | 10-g<br>(mW/g) | $\Delta$ 1-g                  | $\Delta$ 10-g |           |
| 860                | 2450MHz Body | 51.60                            | 24.20          | 47.60                              | 23.96          | -7.75%                        | -0.99%        | 2019-2-27 |
| 860                | 2450MHz Body | 51.60                            | 24.20          | 49.60                              | 23.56          | -3.88%                        | -2.64%        | 2019-3-2  |
| 1155               | 5250MHz Body | 74.70                            | 20.90          | 76.30                              | 21.90          | 2.14%                         | 4.78%         | 2019-2-28 |
| 1155               | 5600MHz Body | 79.60                            | 22.10          | 81.90                              | 23.40          | 2.89%                         | 5.88%         | 2019-2-28 |
| 1155               | 5750MHz Body | 73.30                            | 20.40          | 74.50                              | 21.20          | 1.64%                         | 3.92%         | 2019-2-28 |

Table 6: System Check Results

### 4.3 System check Procedure

The system check is performed by using a system check dipole which is positioned parallel to the planar part of the SAM phantom at the reference point. The distance of the dipole to the SAM phantom is determined by a plexiglass spacer. The dipole is connected to the signal source consisting of signal generator and amplifier via a directional coupler, N-connector cable and adaption to SAM. It is fed with a power of 250 mW (below 3GHz) or 100mW (3-6GHz). To adjust this power, a power meter is used. The power sensor is connected to the cable before the system check to measure the power at this point and do adjustments at the signal generator. At the outputs of the directional coupler both return loss as well as forward power are controlled during the system check to make sure that emitted power at the dipole is kept constant. This can also be checked by the power drift measurement after the test (result on plot). System check results have to be equal or near the values determined during dipole calibration (target SAR in table above) with the relevant liquids and test system.





## 5 SAR measurement variability and uncertainty

### 5.1 SAR measurement variability

Per KDB865664 D01 SAR measurement 100 MHz to 6 GHz, SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. The additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

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

The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.

The detailed repeated measurement results are shown in Section 7.2.

### 5.2 SAR measurement uncertainty

Per KDB865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is  $< 1.5$  W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. The equivalent ratio (1.5/1.6) is applied to extremity and occupational exposure conditions.

## 6 SAR Test Configuration

### 6.1 Test Positions Configuration

Per FCC KDB616217D04, The required minimum test separation distance for incorporating transmitters and antennas into laptop, notebook and netbook computer displays is determined with the display screen opened at an angle of 90° to the keyboard compartment. If a computer has other operating configurations that require a different or more conservative display to keyboard angle for normal use, a KDB inquiry should be submitted to determine the test requirements. When antennas are incorporated in the keyboard 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. However, when edge testing is necessary, the similar concerns for simultaneous transmission on adjacent or multiple edges described for laptop also apply.

For this device, the transmit antennas are located at the keyboard section. Body operating configurations are tested with the device bottom side positioned against a flat phantom with test separation distance of 0mm in a normal use configuration.

## 6.2 WiFi Test Configuration

For WiFi SAR testing, a communication link is set up with the testing software for WiFi mode test. During the test, at the each test frequency channel, the EUT is operated at the RF continuous emission mode. Per KDB248227 D01, a minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

### 6.2.1 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.

### 6.2.2 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 KDB248227 D01). 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.

### 6.2.3 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  $\leq 1.2$  W/kg, SAR is not required for that subsequent test configuration.

#### 6.2.4 WiFi 2.4G 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 KDB248227 D01) 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 KDB248227 D01). 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 a/g/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.

### 6.2.5 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.

### 6.2.6 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, the channels at 5.60 – 5.65 GHz in U-NII-2C band must be disabled with acceptable mechanisms and documented in the equipment certification to avoid SAR requirements.<sup>10</sup> TDWR restriction does not apply under the new rules; 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.<sup>11</sup> 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.

### **6.2.7 OFDM Transmission Mode SAR Test Channel Selection Requirements**

For 2.4 GHz and 5 GHz bands, When the same maximum output power was specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration with the largest channel bandwidth, lowest order modulation and lowest data rate. When the maximum output power of a channel is the same for equivalent OFDM configurations (for example 802.11a, 802.11n and 802.11ac, or 802.11g and 802.11n, with the same channel bandwidth, modulation, and data rate, etc), the lower order 802.11 mode (i.e., 802.11a is chosen over 802.11n then 802.11ac, or 802.11g is chosen over 802.11n) is used for SAR measurement. When the maximum output power are the same for multiple test channel, either according to the default or additional power measurement requirement, SAR is measured using the channel closest to the middle of the frequency band or aggregated band. When there are multiple channels with the same maximum output power, SAR is measured using the higher number channel.

### **6.2.8 MIMO SAR Considerations**

Per KDB248227 D01, simultaneous transmission provisions in KDB Publication 447498 should be used to determine simultaneous transmission SAR test exclusion for WiFi MIMO. If the sum of 1-g SAR single transmission SAR measurement is  $<1.6\text{W/kg}$ , no additional SAR measurements for MIMO are required. Alternatively, SAR for MIMO can be measured with all antennas transmitting simultaneously at the specified maximum output power of MIMO operation.

## 6.3 Power Reduction Specification

This device uses the following power reduction features to reduce the transmit power and ensure SAR compliance. These power reduction features are implemented using a single fixed level of reduction through static table look-up for some wireless operating modes or frequency bands and triggered by a single event or operation. The published RF exposure KDB procedures are applicable to the specific implementation and applied for testing. So PAG is not required for these features.

This device uses the mobile country code (MCC) detection mechanism to indicate whether the users in CE countries, FCC countries in WiFi bands. The selection between different power levels is based on the country code detection mechanism. It can determine the countries where users are and set the relevant power level for WiFi antennas accordingly.

| Antenna              | MCC OF CE COUNTRY<br>(CE standard) | MCC OF FCC COUNTRY<br>(FCC standard) |
|----------------------|------------------------------------|--------------------------------------|
| WiFi 2.4G (Main Ant) | Power Level A1                     | Power Level B1                       |
| WiFi 5G (Aux Ant)    | Power Level A2                     | Power Level B2                       |
| WiFi 2.4G (Main Ant) | Power Level A3                     | Power Level B3                       |
| WiFi 5G (Aux Ant)    | Power Level A4                     | Power Level B4                       |

### 6.3.1 Power Level Specification of WiFi Antenna

The following tables summarize the key WiFi power level information and WiFi conducted power validation results of MCC detection mechanism with signaling mode:

| Mode                             | Channel        | Max Power Level (dBm) |                    |
|----------------------------------|----------------|-----------------------|--------------------|
|                                  |                | WiFi Antenna          |                    |
|                                  |                | MCC OF CE COUNTRY     | MCC OF FCC COUNTRY |
| WiFi 2.4G<br>802.11b             | 1CH            | 16.0                  | 16.0               |
|                                  | 11CH           | 16.0                  | 15.0               |
|                                  | other channels | 16.0                  | 17.0               |
| WiFi 2.4G<br>802.11g             | 1CH            | 16.0                  | 16.0               |
|                                  | 11CH           | 16.0                  | 15.0               |
|                                  | other channels | 16.0                  | 17.0               |
| WiFi 2.4G<br>802.11n 20M<br>SISO | 1CH            | 16.0                  | 16.0               |
|                                  | 11CH           | 16.0                  | 15.0               |
|                                  | other channels | 16.0                  | 17.0               |
| WiFi 2.4G<br>802.11n 40M<br>SISO | 3CH,9CH        | 16.0                  | 13.0               |
|                                  | other channels | 16.0                  | 15.0               |
| WiFi 2.4G<br>802.11n 20M<br>MIMO | 1CH            | 13.0                  | 13.0               |
|                                  | 11CH           | 13.0                  | 12.0               |
|                                  | other channels | 13.0                  | 14.0               |
| WiFi 2.4G<br>802.11n 40M<br>MIMO | 3CH,9CH        | 13.0                  | 10.0               |
|                                  | other channels | 13.0                  | 12.0               |



| Mode                            | Channel        | Max Power Level (dBm) |      |                    |      |
|---------------------------------|----------------|-----------------------|------|--------------------|------|
|                                 |                | WiFi Antenna          |      |                    |      |
|                                 |                | MCC OF CE COUNTRY     |      | MCC OF FCC COUNTRY |      |
|                                 |                | MAIN                  | AUX  | MAIN               | AUX  |
| WiFi 5G<br>802.11a              | 149-165CH      | 10.5                  | 11.0 | 10.5               | 11.0 |
|                                 | other channels | 16.5                  | 16.5 | 10.5               | 11.0 |
| WiFi 5G<br>802.11n 20M<br>SISO  | 149-165CH      | 10.5                  | 11.0 | 10.5               | 11.0 |
|                                 | other channels | 16.5                  | 16.5 | 10.5               | 11.0 |
| WiFi 5G<br>802.11n 40M<br>SISO  | 151-159CH      | 10.5                  | 11.0 | 10.5               | 11.0 |
|                                 | other channels | 14.5                  | 15.5 | 10.5               | 11.0 |
| WiFi 5G<br>802.11n 20M<br>MIMO  | 149-165CH      | 8.0                   | 8.0  | 8.0                | 8.0  |
|                                 | other channels | 13.5                  | 13.5 | 8.0                | 8.0  |
| WiFi 5G<br>802.11n 40M<br>MIMO  | 151-159CH      | 8.0                   | 8.0  | 8.0                | 8.0  |
|                                 | other channels | 12.0                  | 12.0 | 8.0                | 8.0  |
| WiFi 5G<br>802.11ac 20M<br>SISO | 149-165CH      | 10.5                  | 11.0 | 10.5               | 11.0 |
|                                 | other channels | 16.5                  | 16.5 | 10.5               | 11.0 |
| WiFi 5G<br>802.11ac 40M<br>SISO | 151-159CH      | 10.5                  | 11.0 | 10.5               | 11.0 |
|                                 | other channels | 14.5                  | 15.5 | 10.5               | 11.0 |
| WiFi 5G<br>802.11ac 80M<br>SISO | 155CH          | 10.5                  | 11.0 | 10.5               | 11.0 |
|                                 | other channels | 14.5                  | 15.5 | 10.5               | 11.0 |
| 802.11ac 160M<br>SISO           | 50CH,114CH     | 14.5                  | 15.5 | 10.5               | 11.0 |
| WiFi 5G<br>802.11ac 20M<br>MIMO | 149-165CH      | 8.0                   | 8.0  | 8.0                | 8.0  |
|                                 | other channels | 13.5                  | 13.5 | 8.0                | 8.0  |
| WiFi 5G<br>802.11ac 40M<br>MIMO | 151-159CH      | 8.0                   | 8.0  | 8.0                | 8.0  |
|                                 | other channels | 12.0                  | 12.0 | 8.0                | 8.0  |
| WiFi 5G<br>802.11ac 80M<br>MIMO | 155CH          | 8.0                   | 8.0  | 8.0                | 8.0  |
|                                 | other channels | 12.0                  | 12.0 | 8.0                | 8.0  |
| 802.11ac 160M<br>MIMO           | 50CH,114CH     | 12.0                  | 12.0 | 8.0                | 8.0  |

Note:

- 1)For FCC SAR test, WiFi SAR test should be evaluated at the power level of FCC mobile country code for each exposure conditions.
- 2)The detailed full power and reduced conducted power measurement results are provided in section 7.1 of this report



## 7 SAR Measurement Results

### 7.1 Conducted power measurements

For the measurements, Radio Communication Tester was used.

#### 7.1.1 Conducted power of WiFi 2.4G

| Mode             | Ant  | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up Max. | Average Power (dBm) | SAR Test (Yes/No) |
|------------------|------|---------|-----------------|------------------|--------------|---------------------|-------------------|
| 802.11b          | Main | 1       | 2412            | 1Mbps            | 16.00        | 14.69               | No                |
|                  |      | 2       | 2417            |                  | 17.00        | <b>15.71</b>        | Yes               |
|                  |      | 6       | 2437            |                  | 17.00        | <b>15.75</b>        | Yes               |
|                  |      | 10      | 2457            |                  | 17.00        | <b>15.87</b>        | Yes               |
|                  |      | 11      | 2462            |                  | 15.00        | 14.01               | No                |
|                  | Aux  | 1       | 2412            | 1Mbps            | 16.00        | 14.41               | No                |
|                  |      | 2       | 2417            |                  | 17.00        | <b>15.50</b>        | Yes               |
|                  |      | 6       | 2437            |                  | 17.00        | <b>15.52</b>        | Yes               |
|                  |      | 10      | 2457            |                  | 17.00        | <b>15.60</b>        | Yes               |
|                  |      | 11      | 2462            |                  | 15.00        | 13.68               | No                |
| 802.11g          | Main | 1       | 2412            | 6Mbps            | 16.00        | 14.80               | No                |
|                  |      | 2       | 2417            |                  | 17.00        | 15.69               | No                |
|                  |      | 6       | 2437            |                  | 17.00        | 15.75               | No                |
|                  |      | 10      | 2457            |                  | 17.00        | 15.79               | No                |
|                  |      | 11      | 2462            |                  | 15.00        | 13.92               | No                |
|                  | Aux  | 1       | 2412            | 6Mbps            | 16.00        | 14.54               | No                |
|                  |      | 2       | 2417            |                  | 17.00        | 15.42               | No                |
|                  |      | 6       | 2437            |                  | 17.00        | 15.43               | No                |
|                  |      | 10      | 2457            |                  | 17.00        | 15.52               | No                |
|                  |      | 11      | 2462            |                  | 15.00        | 13.70               | No                |
| 802.11n SISO 20M | Main | 1       | 2412            | MCS0             | 16.00        | 14.72               | No                |
|                  |      | 2       | 2417            |                  | 17.00        | 15.55               | No                |
|                  |      | 6       | 2437            |                  | 17.00        | 15.65               | No                |
|                  |      | 10      | 2457            |                  | 17.00        | 15.69               | No                |
|                  |      | 11      | 2462            |                  | 15.00        | 13.79               | No                |
|                  | Aux  | 1       | 2412            | MCS0             | 16.00        | 14.35               | No                |
|                  |      | 2       | 2417            |                  | 17.00        | 15.31               | No                |
|                  |      | 6       | 2437            |                  | 17.00        | 15.32               | No                |
|                  |      | 10      | 2457            |                  | 17.00        | 15.41               | No                |
|                  |      | 11      | 2462            |                  | 15.00        | 13.63               | No                |
| 802.11n SISO 40M | Main | 3       | 2422            | MCS0             | 13.00        | 11.78               | No                |
|                  |      | 4       | 2427            |                  | 15.00        | 13.52               | No                |
|                  |      | 6       | 2437            |                  | 15.00        | 13.72               | No                |
|                  |      | 8       | 2437            |                  | 15.00        | 13.61               | No                |
|                  |      | 9       | 2452            |                  | 13.00        | 11.82               | No                |
|                  | Aux  | 3       | 2422            | MCS0             | 13.00        | 11.47               | No                |
|                  |      | 4       | 2427            |                  | 15.00        | 13.25               | No                |
|                  |      | 6       | 2437            |                  | 15.00        | 13.35               | No                |
|                  |      | 8       | 2437            |                  | 15.00        | 13.33               | No                |
|                  |      | 9       | 2452            |                  | 13.00        | 11.33               | No                |

| Mode                   | Ant  | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up Max. | Average Power (dBm) | SAR Test (Yes/No) |
|------------------------|------|---------|-----------------|------------------|--------------|---------------------|-------------------|
| 802.11n<br>MIMO<br>20M | Main | 1       | 2412            | MCS8             | 13.00        | 11.75               | No                |
|                        |      | 2       | 2417            |                  | 14.00        | 12.66               | No                |
|                        |      | 6       | 2437            |                  | 14.00        | 12.82               | No                |
|                        |      | 10      | 2457            |                  | 14.00        | 12.85               | No                |
|                        |      | 11      | 2462            |                  | 12.00        | 10.94               | No                |
|                        | Aux  | 1       | 2412            | MCS8             | 13.00        | 11.39               | No                |
|                        |      | 2       | 2417            |                  | 14.00        | 12.25               | No                |
|                        |      | 6       | 2437            |                  | 14.00        | 12.28               | No                |
|                        |      | 10      | 2457            |                  | 14.00        | 12.46               | No                |
|                        |      | 11      | 2462            |                  | 12.00        | 10.49               | No                |
|                        | Sum  | 1       | 2412            | MCS8             | 16.00        | 14.58               | No                |
|                        |      | 2       | 2417            |                  | 17.00        | <b>15.47</b>        | Yes               |
|                        |      | 6       | 2437            |                  | 17.00        | <b>15.57</b>        | Yes               |
|                        |      | 10      | 2457            |                  | 17.00        | <b>15.67</b>        | Yes               |
|                        |      | 11      | 2462            |                  | 15.00        | 13.73               | No                |
| 802.11n<br>MIMO<br>40M | Main | 3       | 2422            | MCS8             | 10.00        | 8.89                | No                |
|                        |      | 4       | 2427            |                  | 12.00        | 10.68               | No                |
|                        |      | 6       | 2437            |                  | 12.00        | 10.92               | No                |
|                        |      | 8       | 2437            |                  | 12.00        | 10.72               | No                |
|                        |      | 9       | 2452            |                  | 10.00        | 8.93                | No                |
|                        | Aux  | 3       | 2422            | MCS8             | 10.00        | 8.54                | No                |
|                        |      | 4       | 2427            |                  | 12.00        | 10.11               | No                |
|                        |      | 6       | 2437            |                  | 12.00        | 10.31               | No                |
|                        |      | 8       | 2437            |                  | 12.00        | 10.25               | No                |
|                        |      | 9       | 2452            |                  | 10.00        | 8.47                | No                |
|                        | Sum  | 3       | 2422            | MCS8             | 13.00        | 11.73               | No                |
|                        |      | 4       | 2427            |                  | 15.00        | 13.41               | No                |
|                        |      | 6       | 2437            |                  | 15.00        | 13.64               | No                |
|                        |      | 8       | 2437            |                  | 15.00        | 13.50               | No                |
|                        |      | 9       | 2452            |                  | 13.00        | 11.72               | No                |

Table 7: Conducted power measurement results of WiFi 2.4G(MCC of FCC countries)

Note:

1) The bolded mode was selected for SAR testing.

| Mode             | Ant  | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
|------------------|------|---------|-----------------|------------------|---------|---------------------|-------------------|
| 802.11b          | Main | 1       | 2412            | 1Mbps            | 16.00   | 14.89               | No                |
|                  |      | 2       | 2417            |                  | 16.00   | 14.88               | No                |
|                  |      | 6       | 2437            |                  | 16.00   | 14.90               | No                |
|                  |      | 10      | 2457            |                  | 16.00   | 14.93               | No                |
|                  |      | 11      | 2462            |                  | 16.00   | 14.69               | No                |
|                  | Aux  | 1       | 2412            | 1Mbps            | 16.00   | 14.64               | No                |
|                  |      | 2       | 2417            |                  | 16.00   | 14.66               | No                |
|                  |      | 6       | 2437            |                  | 16.00   | 14.72               | No                |
|                  |      | 10      | 2457            |                  | 16.00   | 14.74               | No                |
|                  |      | 11      | 2462            |                  | 16.00   | 14.58               | No                |
| 802.11g          | Main | 1       | 2412            | 6Mbps            | 16.00   | 14.71               | No                |
|                  |      | 2       | 2417            |                  | 16.00   | 14.80               | No                |
|                  |      | 6       | 2437            |                  | 16.00   | 14.91               | No                |
|                  |      | 10      | 2457            |                  | 16.00   | 14.87               | No                |
|                  |      | 11      | 2462            |                  | 16.00   | 14.95               | No                |
|                  | Aux  | 1       | 2412            | 6Mbps            | 16.00   | 14.47               | No                |
|                  |      | 2       | 2417            |                  | 16.00   | 14.52               | No                |
|                  |      | 6       | 2437            |                  | 16.00   | 14.63               | No                |
|                  |      | 10      | 2457            |                  | 16.00   | 14.57               | No                |
|                  |      | 11      | 2462            |                  | 16.00   | 14.74               | No                |
| 802.11n SISO 20M | Main | 1       | 2412            | MCS0             | 16.00   | 14.68               | No                |
|                  |      | 2       | 2417            |                  | 16.00   | 14.73               | No                |
|                  |      | 6       | 2437            |                  | 16.00   | 14.80               | No                |
|                  |      | 10      | 2457            |                  | 16.00   | 14.64               | No                |
|                  |      | 11      | 2462            |                  | 16.00   | 14.79               | No                |
|                  | Aux  | 1       | 2412            | MCS0             | 16.00   | 14.47               | No                |
|                  |      | 2       | 2417            |                  | 16.00   | 14.54               | No                |
|                  |      | 6       | 2437            |                  | 16.00   | 14.63               | No                |
|                  |      | 10      | 2457            |                  | 16.00   | 14.45               | No                |
|                  |      | 11      | 2462            |                  | 16.00   | 14.53               | No                |
| 802.11n SISO 40M | Main | 3       | 2422            | MCS0             | 16.00   | 14.67               | No                |
|                  |      | 4       | 2427            |                  | 16.00   | 14.55               | No                |
|                  |      | 6       | 2437            |                  | 16.00   | 14.32               | No                |
|                  |      | 8       | 2437            |                  | 16.00   | 14.43               | No                |
|                  |      | 9       | 2452            |                  | 16.00   | 14.65               | No                |
|                  | Aux  | 3       | 2422            | MCS0             | 16.00   | 14.41               | No                |
|                  |      | 4       | 2427            |                  | 16.00   | 14.33               | No                |
|                  |      | 6       | 2437            |                  | 16.00   | 14.49               | No                |
|                  |      | 8       | 2437            |                  | 16.00   | 14.39               | No                |
|                  |      | 9       | 2452            |                  | 16.00   | 14.57               | No                |
| Mode             | Ant  | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
| 802.11n MIMO 20M | Main | 1       | 2412            | MCS8             | 13.00   | 11.86               | No                |
|                  |      | 2       | 2417            |                  | 13.00   | 11.84               | No                |
|                  |      | 6       | 2437            |                  | 13.00   | 11.88               | No                |
|                  |      | 10      | 2457            |                  | 13.00   | 11.90               | No                |
|                  |      | 11      | 2462            |                  | 13.00   | 11.65               | No                |
|                  | Aux  | 1       | 2412            | MCS8             | 13.00   | 11.50               | No                |
|                  |      | 2       | 2417            |                  | 13.00   | 11.54               | No                |
|                  |      | 6       | 2437            |                  | 13.00   | 11.69               | No                |
|                  |      | 10      | 2457            |                  | 13.00   | 11.78               | No                |
|                  |      | 11      | 2462            |                  | 13.00   | 11.41               | No                |

|                        |      |    |      |      |       |       |    |
|------------------------|------|----|------|------|-------|-------|----|
|                        | Sum  | 1  | 2412 | MCS8 | 16.00 | 14.69 | No |
|                        |      | 2  | 2417 |      | 16.00 | 14.70 | No |
|                        |      | 6  | 2437 |      | 16.00 | 14.80 | No |
|                        |      | 10 | 2457 |      | 16.00 | 14.85 | No |
|                        |      | 11 | 2462 |      | 16.00 | 14.54 | No |
| 802.11n<br>MIMO<br>40M | Main | 3  | 2422 | MCS8 | 13.00 | 11.65 | No |
|                        |      | 4  | 2427 |      | 13.00 | 11.73 | No |
|                        |      | 6  | 2437 |      | 13.00 | 11.68 | No |
|                        |      | 8  | 2437 |      | 13.00 | 11.59 | No |
|                        |      | 9  | 2452 |      | 13.00 | 11.80 | No |
|                        | Aux  | 3  | 2422 | MCS8 | 13.00 | 11.42 | No |
|                        |      | 4  | 2427 |      | 13.00 | 11.61 | No |
|                        |      | 6  | 2437 |      | 13.00 | 11.52 | No |
|                        |      | 8  | 2437 |      | 13.00 | 11.48 | No |
|                        |      | 9  | 2452 |      | 13.00 | 11.72 | No |
|                        | Sum  | 3  | 2422 | MCS8 | 16.00 | 14.55 | No |
|                        |      | 4  | 2427 |      | 16.00 | 14.68 | No |
|                        |      | 6  | 2437 |      | 16.00 | 14.61 | No |
|                        |      | 8  | 2437 |      | 16.00 | 14.55 | No |
|                        |      | 9  | 2452 |      | 16.00 | 14.77 | No |

Table 8: Test results conducted power measurement WiFi 2.4G(MCC of CE countries)

## 7.1.2 Conducted power of WiFi 5G

| Mode    | Antenna | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
|---------|---------|---------|-----------------|------------------|---------|---------------------|-------------------|
| 802.11a | Main    | CH 36   | 5180            | 6Mbps            | 10.50   | 9.20                | No                |
|         |         | CH 40   | 5200            |                  | 10.50   | 9.15                | No                |
|         |         | CH 44   | 5220            |                  | 10.50   | 9.22                | No                |
|         |         | CH 48   | 5240            |                  | 10.50   | 9.05                | No                |
|         |         | CH 52   | 5260            |                  | 10.50   | 9.10                | No                |
|         |         | CH 56   | 5280            |                  | 10.50   | 9.15                | No                |
|         |         | CH 60   | 5300            |                  | 10.50   | 9.07                | No                |
|         |         | CH 64   | 5320            |                  | 10.50   | 9.03                | No                |
|         |         | CH 100  | 5500            |                  | 10.50   | 8.75                | No                |
|         |         | CH 104  | 5520            |                  | 10.50   | 8.85                | No                |
|         |         | CH 108  | 5540            |                  | 10.50   | 8.99                | No                |
|         |         | CH 112  | 5560            |                  | 10.50   | 9.00                | No                |
|         |         | CH 116  | 5580            |                  | 10.50   | 8.91                | No                |
|         |         | CH 120  | 5600            |                  | 10.50   | 9.05                | No                |
|         |         | CH 124  | 5620            |                  | 10.50   | 9.13                | No                |
|         |         | CH 128  | 5640            |                  | 10.50   | 9.18                | No                |
|         |         | CH 132  | 5660            |                  | 10.50   | 9.05                | No                |
|         |         | CH 136  | 5680            |                  | 10.50   | 9.21                | No                |
|         |         | CH 140  | 5700            |                  | 10.50   | 8.98                | No                |
|         |         | CH 149  | 5745            |                  | 10.50   | 9.14                | No                |
|         |         | CH 153  | 5765            |                  | 10.50   | 9.20                | No                |
|         |         | CH 157  | 5785            |                  | 10.50   | 9.06                | No                |
|         |         | CH 161  | 5805            |                  | 10.50   | 9.18                | No                |
|         |         | CH 165  | 5825            |                  | 10.50   | 9.05                | No                |
|         | Aux     | CH 36   | 5180            | 6Mbps            | 11.00   | 9.98                | No                |
|         |         | CH 40   | 5200            |                  | 11.00   | 10.30               | No                |
|         |         | CH 44   | 5220            |                  | 11.00   | 10.09               | No                |
|         |         | CH 48   | 5240            |                  | 11.00   | 10.18               | No                |
|         |         | CH 52   | 5260            |                  | 11.00   | 10.19               | No                |
|         |         | CH 56   | 5280            |                  | 11.00   | 10.38               | No                |
|         |         | CH 60   | 5300            |                  | 11.00   | 10.10               | No                |
|         |         | CH 64   | 5320            |                  | 11.00   | 9.79                | No                |
|         |         | CH 100  | 5500            |                  | 11.00   | 9.77                | No                |
|         |         | CH 104  | 5520            |                  | 11.00   | 9.92                | No                |
|         |         | CH 108  | 5540            |                  | 11.00   | 9.69                | No                |
|         |         | CH 112  | 5560            |                  | 11.00   | 9.85                | No                |
|         |         | CH 116  | 5580            |                  | 11.00   | 9.59                | No                |
|         |         | CH 120  | 5600            |                  | 11.00   | 9.91                | No                |
|         |         | CH 124  | 5620            |                  | 11.00   | 10.17               | No                |
|         |         | CH 128  | 5640            |                  | 11.00   | 9.81                | No                |
|         |         | CH 132  | 5660            |                  | 11.00   | 9.86                | No                |
|         |         | CH 136  | 5680            |                  | 11.00   | 10.02               | No                |
|         |         | CH 140  | 5700            |                  | 11.00   | 10.16               | No                |
|         |         | CH 149  | 5745            |                  | 11.00   | 10.07               | No                |
|         |         | CH 153  | 5765            |                  | 11.00   | 10.19               | No                |
|         |         | CH 157  | 5785            |                  | 11.00   | 10.30               | No                |
|         |         | CH 161  | 5805            |                  | 11.00   | 10.25               | No                |
|         |         | CH 165  | 5825            |                  | 11.00   | 10.27               | No                |

| Mode                             | Antenna | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
|----------------------------------|---------|---------|-----------------|------------------|---------|---------------------|-------------------|
| 802.11n<br>SISO<br>20M<br>(5GHz) | Main    | CH 36   | 5180            | MCS0             | 10.50   | 9.20                | No                |
|                                  |         | CH 40   | 5200            |                  | 10.50   | 9.00                | No                |
|                                  |         | CH 44   | 5220            |                  | 10.50   | 9.12                | No                |
|                                  |         | CH 48   | 5240            |                  | 10.50   | 9.07                | No                |
|                                  |         | CH 52   | 5260            |                  | 10.50   | 9.19                | No                |
|                                  |         | CH 56   | 5280            |                  | 10.50   | 9.06                | No                |
|                                  |         | CH 60   | 5300            |                  | 10.50   | 8.90                | No                |
|                                  |         | CH 64   | 5320            |                  | 10.50   | 8.92                | No                |
|                                  |         | CH 100  | 5500            |                  | 10.50   | 8.77                | No                |
|                                  |         | CH 104  | 5520            |                  | 10.50   | 8.71                | No                |
|                                  |         | CH 108  | 5540            |                  | 10.50   | 8.87                | No                |
|                                  |         | CH 112  | 5560            |                  | 10.50   | 8.82                | No                |
|                                  |         | CH 116  | 5580            |                  | 10.50   | 8.84                | No                |
|                                  |         | CH 120  | 5600            |                  | 10.50   | 8.98                | No                |
|                                  |         | CH 124  | 5620            |                  | 10.50   | 9.06                | No                |
|                                  |         | CH 128  | 5640            |                  | 10.50   | 9.08                | No                |
|                                  |         | CH 132  | 5660            |                  | 10.50   | 8.95                | No                |
|                                  |         | CH 136  | 5680            |                  | 10.50   | 9.10                | No                |
|                                  |         | CH 140  | 5700            |                  | 10.50   | 8.91                | No                |
|                                  |         | CH 149  | 5745            |                  | 10.50   | 8.98                | No                |
|                                  |         | CH 153  | 5765            |                  | 10.50   | 9.14                | No                |
|                                  |         | CH 157  | 5785            |                  | 10.50   | 8.97                | No                |
|                                  |         | CH 161  | 5805            |                  | 10.50   | 9.09                | No                |
|                                  |         | CH 165  | 5825            |                  | 10.50   | 8.97                | No                |
|                                  | Aux     | CH 36   | 5180            | MCS0             | 11.00   | 10.12               | No                |
|                                  |         | CH 40   | 5200            |                  | 11.00   | 10.20               | No                |
|                                  |         | CH 44   | 5220            |                  | 11.00   | 9.90                | No                |
|                                  |         | CH 48   | 5240            |                  | 11.00   | 10.10               | No                |
|                                  |         | CH 52   | 5260            |                  | 11.00   | 9.99                | No                |
|                                  |         | CH 56   | 5280            |                  | 11.00   | 10.21               | No                |
|                                  |         | CH 60   | 5300            |                  | 11.00   | 10.07               | No                |
|                                  |         | CH 64   | 5320            |                  | 11.00   | 9.59                | No                |
|                                  |         | CH 100  | 5500            |                  | 11.00   | 9.43                | No                |
|                                  |         | CH 104  | 5520            |                  | 11.00   | 9.56                | No                |
|                                  |         | CH 108  | 5540            |                  | 11.00   | 9.50                | No                |
|                                  |         | CH 112  | 5560            |                  | 11.00   | 9.55                | No                |
|                                  |         | CH 116  | 5580            |                  | 11.00   | 9.64                | No                |
|                                  |         | CH 120  | 5600            |                  | 11.00   | 9.74                | No                |
|                                  |         | CH 124  | 5620            |                  | 11.00   | 9.98                | No                |
|                                  |         | CH 128  | 5640            |                  | 11.00   | 9.85                | No                |
|                                  |         | CH 132  | 5660            |                  | 11.00   | 10.01               | No                |
|                                  |         | CH 136  | 5680            |                  | 11.00   | 10.02               | No                |
|                                  |         | CH 140  | 5700            |                  | 11.00   | 10.12               | No                |
|                                  |         | CH 149  | 5745            |                  | 11.00   | 9.94                | No                |
|                                  |         | CH 153  | 5765            |                  | 11.00   | 10.23               | No                |
|                                  |         | CH 157  | 5785            |                  | 11.00   | 10.35               | No                |
|                                  |         | CH 161  | 5805            |                  | 11.00   | 10.13               | No                |
|                                  |         | CH 165  | 5825            |                  | 11.00   | 10.17               | No                |

| Mode                              | Antenna | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
|-----------------------------------|---------|---------|-----------------|------------------|---------|---------------------|-------------------|
| 802.11n<br>SISO<br>40M<br>(5GHz)  | Main    | CH 38   | 5190            | MCS0             | 10.50   | 9.18                | No                |
|                                   |         | CH 46   | 5230            |                  | 10.50   | 9.08                | No                |
|                                   |         | CH 54   | 5270            |                  | 10.50   | 9.05                | No                |
|                                   |         | CH 62   | 5310            |                  | 10.50   | 8.93                | No                |
|                                   |         | CH 102  | 5510            |                  | 10.50   | 8.80                | No                |
|                                   |         | CH 110  | 5550            |                  | 10.50   | 8.87                | No                |
|                                   |         | CH 118  | 5590            |                  | 10.50   | 9.02                | No                |
|                                   |         | CH 126  | 5630            |                  | 10.50   | 9.19                | No                |
|                                   |         | CH 134  | 5670            |                  | 10.50   | 9.17                | No                |
|                                   |         | CH 151  | 5755            |                  | 10.50   | 9.24                | No                |
|                                   |         | CH 159  | 5795            |                  | 10.50   | 9.11                | No                |
|                                   | Aux     | CH 38   | 5190            | MCS0             | 11.00   | 10.33               | No                |
|                                   |         | CH 46   | 5230            |                  | 11.00   | 9.96                | No                |
|                                   |         | CH 54   | 5270            |                  | 11.00   | 10.21               | No                |
|                                   |         | CH 62   | 5310            |                  | 11.00   | 9.78                | No                |
|                                   |         | CH 102  | 5510            |                  | 11.00   | 9.56                | No                |
|                                   |         | CH 110  | 5550            |                  | 11.00   | 9.54                | No                |
|                                   |         | CH 118  | 5590            |                  | 11.00   | 9.64                | No                |
|                                   |         | CH 126  | 5630            |                  | 11.00   | 9.87                | No                |
|                                   |         | CH 134  | 5670            |                  | 11.00   | 9.95                | No                |
|                                   |         | CH 151  | 5755            |                  | 11.00   | 10.00               | No                |
|                                   |         | CH 159  | 5795            |                  | 11.00   | 10.11               | No                |
| Mode                              | Antenna | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
| 802.11ac<br>SISO<br>20M<br>(5GHz) | Main    | CH 36   | 5180            | MCS0             | 10.50   | 9.22                | No                |
|                                   |         | CH 40   | 5200            |                  | 10.50   | 9.26                | No                |
|                                   |         | CH 44   | 5220            |                  | 10.50   | 9.31                | No                |
|                                   |         | CH 48   | 5240            |                  | 10.50   | 9.11                | No                |
|                                   |         | CH 52   | 5260            |                  | 10.50   | 9.26                | No                |
|                                   |         | CH 56   | 5280            |                  | 10.50   | 9.22                | No                |
|                                   |         | CH 60   | 5300            |                  | 10.50   | 9.15                | No                |
|                                   |         | CH 64   | 5320            |                  | 10.50   | 9.13                | No                |
|                                   |         | CH 100  | 5500            |                  | 10.50   | 8.84                | No                |
|                                   |         | CH 104  | 5520            |                  | 10.50   | 8.91                | No                |
|                                   |         | CH 108  | 5540            |                  | 10.50   | 9.02                | No                |
|                                   |         | CH 112  | 5560            |                  | 10.50   | 9.09                | No                |
|                                   |         | CH 116  | 5580            |                  | 10.50   | 9.10                | No                |
|                                   |         | CH 120  | 5600            |                  | 10.50   | 9.21                | No                |
|                                   |         | CH 124  | 5620            |                  | 10.50   | 9.15                | No                |
|                                   |         | CH 128  | 5640            |                  | 10.50   | 9.18                | No                |
|                                   |         | CH 132  | 5660            |                  | 10.50   | 9.15                | No                |
|                                   |         | CH 136  | 5680            |                  | 10.50   | 9.28                | No                |
|                                   |         | CH 140  | 5700            |                  | 10.50   | 9.12                | No                |
|                                   |         | CH 149  | 5745            |                  | 10.50   | 9.22                | No                |
|                                   |         | CH 153  | 5765            |                  | 10.50   | 9.35                | No                |
|                                   |         | CH 157  | 5785            |                  | 10.50   | 9.17                | No                |
|                                   |         | CH 161  | 5805            |                  | 10.50   | 9.28                | No                |
|                                   |         | CH 165  | 5825            |                  | 10.50   | 9.16                | No                |
|                                   | Aux     | CH 36   | 5180            | MCS0             | 11.00   | 10.09               | No                |
|                                   |         | CH 40   | 5200            |                  | 11.00   | 10.22               | No                |
|                                   |         | CH 44   | 5220            |                  | 11.00   | 9.89                | No                |
|                                   |         | CH 48   | 5240            |                  | 11.00   | 10.10               | No                |

|                                   |         | CH 52   | 5260            |                  | 11.00   | 9.97                | No                |
|-----------------------------------|---------|---------|-----------------|------------------|---------|---------------------|-------------------|
|                                   |         | CH 56   | 5280            |                  | 11.00   | 10.19               | No                |
|                                   |         | CH 60   | 5300            |                  | 11.00   | 10.07               | No                |
|                                   |         | CH 64   | 5320            |                  | 11.00   | 9.60                | No                |
|                                   |         | CH 100  | 5500            |                  | 11.00   | 9.44                | No                |
|                                   |         | CH 104  | 5520            |                  | 11.00   | 9.58                | No                |
|                                   |         | CH 108  | 5540            |                  | 11.00   | 9.50                | No                |
|                                   |         | CH 112  | 5560            |                  | 11.00   | 9.54                | No                |
|                                   |         | CH 116  | 5580            |                  | 11.00   | 9.63                | No                |
|                                   |         | CH 120  | 5600            |                  | 11.00   | 9.76                | No                |
|                                   |         | CH 124  | 5620            |                  | 11.00   | 10.04               | No                |
|                                   |         | CH 128  | 5640            |                  | 11.00   | 9.84                | No                |
|                                   |         | CH 132  | 5660            |                  | 11.00   | 9.86                | No                |
|                                   |         | CH 136  | 5680            |                  | 11.00   | 10.01               | No                |
|                                   |         | CH 140  | 5700            |                  | 11.00   | 10.16               | No                |
|                                   |         | CH 149  | 5745            |                  | 11.00   | 9.87                | No                |
|                                   |         | CH 153  | 5765            |                  | 11.00   | 10.20               | No                |
|                                   |         | CH 157  | 5785            |                  | 11.00   | 10.19               | No                |
|                                   |         | CH 161  | 5805            |                  | 11.00   | 10.10               | No                |
|                                   |         | CH 165  | 5825            |                  | 11.00   | 10.30               | No                |
| Mode                              | Antenna | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
| 802.11ac<br>SISO<br>40M<br>(5GHz) | Main    | CH 38   | 5190            | MCS0             | 10.50   | 9.32                | No                |
|                                   |         | CH 46   | 5230            |                  | 10.50   | 9.22                | No                |
|                                   |         | CH 54   | 5270            |                  | 10.50   | 9.18                | No                |
|                                   |         | CH 62   | 5310            |                  | 10.50   | 9.00                | No                |
|                                   |         | CH 102  | 5510            |                  | 10.50   | 8.97                | No                |
|                                   |         | CH 110  | 5550            |                  | 10.50   | 9.02                | No                |
|                                   |         | CH 118  | 5590            |                  | 10.50   | 9.02                | No                |
|                                   |         | CH 126  | 5630            |                  | 10.50   | 9.15                | No                |
|                                   |         | CH 134  | 5670            |                  | 10.50   | 9.18                | No                |
|                                   |         | CH 151  | 5755            |                  | 10.50   | 9.23                | No                |
|                                   |         | CH 159  | 5795            |                  | 10.50   | 9.19                | No                |
|                                   | Aux     | CH 38   | 5190            | MCS0             | 11.00   | 10.18               | No                |
|                                   |         | CH 46   | 5230            |                  | 11.00   | 10.06               | No                |
|                                   |         | CH 54   | 5270            |                  | 11.00   | 10.14               | No                |
|                                   |         | CH 62   | 5310            |                  | 11.00   | 9.76                | No                |
|                                   |         | CH 102  | 5510            |                  | 11.00   | 9.74                | No                |
|                                   |         | CH 110  | 5550            |                  | 11.00   | 9.68                | No                |
|                                   |         | CH 118  | 5590            |                  | 11.00   | 9.78                | No                |
|                                   |         | CH 126  | 5630            |                  | 11.00   | 10.10               | No                |
|                                   |         | CH 134  | 5670            |                  | 11.00   | 10.08               | No                |
|                                   |         | CH 151  | 5755            |                  | 11.00   | 10.10               | No                |
|                                   |         | CH 159  | 5795            |                  | 11.00   | 10.28               | No                |



| Mode                      | Antenna | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
|---------------------------|---------|---------|-----------------|------------------|---------|---------------------|-------------------|
| 802.11ac SISO 80M (5GHz)  | Main    | CH 42   | 5210            | MCS0             | 10.50   | 9.02                | No                |
|                           |         | CH 58   | 5290            |                  | 10.50   | <b>8.97</b>         | Yes               |
|                           |         | CH 106  | 5530            |                  | 10.50   | 8.74                | No                |
|                           |         | CH 122  | 5610            |                  | 10.50   | 8.98                | No                |
|                           |         | CH 155  | 5775            |                  | 10.50   | <b>9.35</b>         | Yes               |
|                           | Aux     | CH 42   | 5210            | MCS0             | 11.00   | 9.93                | No                |
|                           |         | CH 58   | 5290            |                  | 11.00   | <b>9.88</b>         | Yes               |
|                           |         | CH 106  | 5530            |                  | 11.00   | 9.39                | No                |
|                           |         | CH 122  | 5610            |                  | 11.00   | 9.77                | No                |
|                           |         | CH 155  | 5775            |                  | 11.00   | <b>10.04</b>        | Yes               |
| Mode                      | Antenna | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
| 802.11ac SISO 160M (5GHz) | Main    | CH 50   | 5250            | MCS0             | 10.50   | 8.80                | No                |
|                           |         | CH 114  | 5570            |                  | 10.50   | <b>8.75</b>         | Yes               |
|                           | Aux     | CH 50   | 5250            | MCS0             | 11.00   | 9.79                | No                |
|                           |         | CH 114  | 5570            |                  | 11.00   | <b>9.25</b>         | Yes               |
| Mode                      | Antenna | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
| 802.11n MIMO 20M (5GHz)   | Main    | CH 36   | 5180            | MCS8             | 8.00    | 7.12                | No                |
|                           |         | CH 40   | 5200            |                  | 8.00    | 7.05                | No                |
|                           |         | CH 44   | 5220            |                  | 8.00    | 7.12                | No                |
|                           |         | CH 48   | 5240            |                  | 8.00    | 7.05                | No                |
|                           |         | CH 52   | 5260            |                  | 8.00    | 7.22                | No                |
|                           |         | CH 56   | 5280            |                  | 8.00    | 7.02                | No                |
|                           |         | CH 60   | 5300            |                  | 8.00    | 7.11                | No                |
|                           |         | CH 64   | 5320            |                  | 8.00    | 7.01                | No                |
|                           |         | CH 100  | 5500            |                  | 8.00    | 6.98                | No                |
|                           |         | CH 104  | 5520            |                  | 8.00    | 6.94                | No                |
|                           |         | CH 108  | 5540            |                  | 8.00    | 7.02                | No                |
|                           |         | CH 112  | 5560            |                  | 8.00    | 7.10                | No                |
|                           |         | CH 116  | 5580            |                  | 8.00    | 7.04                | No                |
|                           |         | CH 120  | 5600            |                  | 8.00    | 6.88                | No                |
|                           |         | CH 124  | 5620            |                  | 8.00    | 7.24                | No                |
|                           |         | CH 128  | 5640            |                  | 8.00    | 7.18                | No                |
|                           |         | CH 132  | 5660            |                  | 8.00    | 6.99                | No                |
|                           |         | CH 136  | 5680            |                  | 8.00    | 7.00                | No                |
|                           |         | CH 140  | 5700            |                  | 8.00    | 7.06                | No                |
|                           |         | CH 149  | 5745            |                  | 8.00    | 7.05                | No                |
|                           |         | CH 153  | 5765            |                  | 8.00    | 7.20                | No                |
|                           |         | CH 157  | 5785            |                  | 8.00    | 7.06                | No                |
|                           |         | CH 161  | 5805            |                  | 8.00    | 7.14                | No                |
|                           |         | CH 165  | 5825            |                  | 8.00    | 7.18                | No                |
|                           | Aux     | CH 36   | 5180            | MCS8             | 8.00    | 7.02                | No                |
|                           |         | CH 40   | 5200            |                  | 8.00    | 6.98                | No                |
|                           |         | CH 44   | 5220            |                  | 8.00    | 7.05                | No                |
|                           |         | CH 48   | 5240            |                  | 8.00    | 7.11                | No                |
|                           |         | CH 52   | 5260            |                  | 8.00    | 7.10                | No                |
|                           |         | CH 56   | 5280            |                  | 8.00    | 7.06                | No                |
|                           |         | CH 60   | 5300            |                  | 8.00    | 7.08                | No                |
|                           |         | CH 64   | 5320            |                  | 8.00    | 6.99                | No                |
|                           |         | CH 100  | 5500            |                  | 8.00    | 6.94                | No                |
|                           |         | CH 104  | 5520            |                  | 8.00    | 7.02                | No                |

|  |     |        |      |      |       |       |    |
|--|-----|--------|------|------|-------|-------|----|
|  |     | CH 108 | 5540 |      | 8.00  | 7.01  | No |
|  |     | CH 112 | 5560 |      | 8.00  | 7.00  | No |
|  |     | CH 116 | 5580 |      | 8.00  | 6.97  | No |
|  |     | CH 120 | 5600 |      | 8.00  | 7.11  | No |
|  |     | CH 124 | 5620 |      | 8.00  | 7.09  | No |
|  |     | CH 128 | 5640 |      | 8.00  | 7.10  | No |
|  |     | CH 132 | 5660 |      | 8.00  | 7.13  | No |
|  |     | CH 136 | 5680 |      | 8.00  | 7.05  | No |
|  |     | CH 140 | 5700 |      | 8.00  | 6.98  | No |
|  |     | CH 149 | 5745 |      | 8.00  | 7.11  | No |
|  |     | CH 153 | 5765 |      | 8.00  | 7.08  | No |
|  |     | CH 157 | 5785 |      | 8.00  | 7.14  | No |
|  |     | CH 161 | 5805 |      | 8.00  | 7.20  | No |
|  |     | CH 165 | 5825 |      | 8.00  | 7.18  | No |
|  | Sum | CH 36  | 5180 | MCS8 | 11.00 | 10.08 | No |
|  |     | CH 40  | 5200 |      | 11.00 | 10.03 | No |
|  |     | CH 44  | 5220 |      | 11.00 | 10.10 | No |
|  |     | CH 48  | 5240 |      | 11.00 | 10.09 | No |
|  |     | CH 52  | 5260 |      | 11.00 | 10.17 | No |
|  |     | CH 56  | 5280 |      | 11.00 | 10.05 | No |
|  |     | CH 60  | 5300 |      | 11.00 | 10.11 | No |
|  |     | CH 64  | 5320 |      | 11.00 | 10.01 | No |
|  |     | CH 100 | 5500 |      | 11.00 | 9.97  | No |
|  |     | CH 104 | 5520 |      | 11.00 | 9.99  | No |
|  |     | CH 108 | 5540 |      | 11.00 | 10.03 | No |
|  |     | CH 112 | 5560 |      | 11.00 | 10.06 | No |
|  |     | CH 116 | 5580 |      | 11.00 | 10.02 | No |
|  |     | CH 120 | 5600 |      | 11.00 | 10.01 | No |
|  |     | CH 124 | 5620 |      | 11.00 | 10.18 | No |
|  |     | CH 128 | 5640 |      | 11.00 | 10.15 | No |
|  |     | CH 132 | 5660 |      | 11.00 | 10.07 | No |
|  |     | CH 136 | 5680 |      | 11.00 | 10.04 | No |
|  |     | CH 140 | 5700 |      | 11.00 | 10.03 | No |
|  |     | CH 149 | 5745 |      | 11.00 | 10.09 | No |
|  |     | CH 153 | 5765 |      | 11.00 | 10.15 | No |
|  |     | CH 157 | 5785 |      | 11.00 | 10.11 | No |
|  |     | CH 161 | 5805 |      | 11.00 | 10.18 | No |
|  |     | CH 165 | 5825 |      | 11.00 | 10.19 | No |

| Mode                              | Antenna | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
|-----------------------------------|---------|---------|-----------------|------------------|---------|---------------------|-------------------|
| 802.11n<br>MIMO<br>40M<br>(5GHz)  | Main    | CH 38   | 5190            | MCS8             | 8.00    | 7.11                | No                |
|                                   |         | CH 46   | 5230            |                  | 8.00    | 6.98                | No                |
|                                   |         | CH 54   | 5270            |                  | 8.00    | 6.95                | No                |
|                                   |         | CH 62   | 5310            |                  | 8.00    | 7.02                | No                |
|                                   |         | CH 102  | 5510            |                  | 8.00    | 6.95                | No                |
|                                   |         | CH 110  | 5550            |                  | 8.00    | 7.10                | No                |
|                                   |         | CH 118  | 5590            |                  | 8.00    | 7.05                | No                |
|                                   |         | CH 126  | 5630            |                  | 8.00    | 7.01                | No                |
|                                   |         | CH 134  | 5670            |                  | 8.00    | 7.00                | No                |
|                                   |         | CH 151  | 5755            |                  | 8.00    | 6.99                | No                |
|                                   |         | CH 159  | 5795            |                  | 8.00    | 6.94                | No                |
|                                   | Aux     | CH 38   | 5190            | MCS8             | 8.00    | 7.05                | No                |
|                                   |         | CH 46   | 5230            |                  | 8.00    | 7.01                | No                |
|                                   |         | CH 54   | 5270            |                  | 8.00    | 6.92                | No                |
|                                   |         | CH 62   | 5310            |                  | 8.00    | 6.90                | No                |
|                                   |         | CH 102  | 5510            |                  | 8.00    | 7.11                | No                |
|                                   |         | CH 110  | 5550            |                  | 8.00    | 7.08                | No                |
|                                   |         | CH 118  | 5590            |                  | 8.00    | 7.02                | No                |
|                                   |         | CH 126  | 5630            |                  | 8.00    | 6.99                | No                |
|                                   |         | CH 134  | 5670            |                  | 8.00    | 7.01                | No                |
|                                   |         | CH 151  | 5755            |                  | 8.00    | 7.10                | No                |
|                                   |         | CH 159  | 5795            |                  | 8.00    | 7.12                | No                |
|                                   | Sum     | CH 38   | 5190            | MCS8             | 11.00   | 10.09               | No                |
|                                   |         | CH 46   | 5230            |                  | 11.00   | 10.01               | No                |
|                                   |         | CH 54   | 5270            |                  | 11.00   | 9.95                | No                |
|                                   |         | CH 62   | 5310            |                  | 11.00   | 9.97                | No                |
|                                   |         | CH 102  | 5510            |                  | 11.00   | 10.04               | No                |
|                                   |         | CH 110  | 5550            |                  | 11.00   | 10.10               | No                |
|                                   |         | CH 118  | 5590            |                  | 11.00   | 10.05               | No                |
|                                   |         | CH 126  | 5630            |                  | 11.00   | 10.01               | No                |
|                                   |         | CH 134  | 5670            |                  | 11.00   | 10.02               | No                |
|                                   |         | CH 151  | 5755            |                  | 11.00   | 10.06               | No                |
|                                   |         | CH 159  | 5795            |                  | 11.00   | 10.04               | No                |
| Mode                              | Antenna | Channel | Frequency(MHz)  | Data Rate (Mbps) | Tune-up | Average Power(dBm)  | SAR Test(Yes/No)  |
| 802.11ac<br>MIMO<br>20M<br>(5GHz) | Main    | CH 36   | 5180            | MCS0             | 8.00    | 7.09                | No                |
|                                   |         | CH 40   | 5200            |                  | 8.00    | 7.02                | No                |
|                                   |         | CH 44   | 5220            |                  | 8.00    | 7.09                | No                |
|                                   |         | CH 48   | 5240            |                  | 8.00    | 7.02                | No                |
|                                   |         | CH 52   | 5260            |                  | 8.00    | 7.19                | No                |
|                                   |         | CH 56   | 5280            |                  | 8.00    | 6.99                | No                |
|                                   |         | CH 60   | 5300            |                  | 8.00    | 7.08                | No                |
|                                   |         | CH 64   | 5320            |                  | 8.00    | 6.98                | No                |
|                                   |         | CH 100  | 5500            |                  | 8.00    | 6.95                | No                |
|                                   |         | CH 104  | 5520            |                  | 8.00    | 6.91                | No                |
|                                   |         | CH 108  | 5540            |                  | 8.00    | 6.99                | No                |
|                                   |         | CH 112  | 5560            |                  | 8.00    | 7.07                | No                |
|                                   |         | CH 116  | 5580            |                  | 8.00    | 7.01                | No                |
|                                   |         | CH 120  | 5600            |                  | 8.00    | 6.85                | No                |
|                                   |         | CH 124  | 5620            |                  | 8.00    | 7.21                | No                |
|                                   |         | CH 128  | 5640            |                  | 8.00    | 7.15                | No                |
|                                   |         | CH 132  | 5660            |                  | 8.00    | 6.96                | No                |

|  |     |        |      |      |       |       |    |
|--|-----|--------|------|------|-------|-------|----|
|  |     | CH 136 | 5680 |      | 8.00  | 6.97  | No |
|  |     | CH 140 | 5700 |      | 8.00  | 7.03  | No |
|  |     | CH 149 | 5745 |      | 8.00  | 7.02  | No |
|  |     | CH 153 | 5765 |      | 8.00  | 7.17  | No |
|  |     | CH 157 | 5785 |      | 8.00  | 7.03  | No |
|  |     | CH 161 | 5805 |      | 8.00  | 7.11  | No |
|  |     | CH 165 | 5825 |      | 8.00  | 7.15  | No |
|  | Aux | CH 36  | 5180 | MCS0 | 8.00  | 6.99  | No |
|  |     | CH 40  | 5200 |      | 8.00  | 6.95  | No |
|  |     | CH 44  | 5220 |      | 8.00  | 7.02  | No |
|  |     | CH 48  | 5240 |      | 8.00  | 7.08  | No |
|  |     | CH 52  | 5260 |      | 8.00  | 7.07  | No |
|  |     | CH 56  | 5280 |      | 8.00  | 7.03  | No |
|  |     | CH 60  | 5300 |      | 8.00  | 7.05  | No |
|  |     | CH 64  | 5320 |      | 8.00  | 6.96  | No |
|  |     | CH 100 | 5500 |      | 8.00  | 6.91  | No |
|  |     | CH 104 | 5520 |      | 8.00  | 6.99  | No |
|  |     | CH 108 | 5540 |      | 8.00  | 6.98  | No |
|  |     | CH 112 | 5560 |      | 8.00  | 6.97  | No |
|  |     | CH 116 | 5580 |      | 8.00  | 6.94  | No |
|  |     | CH 120 | 5600 |      | 8.00  | 7.08  | No |
|  |     | CH 124 | 5620 |      | 8.00  | 7.06  | No |
|  |     | CH 128 | 5640 |      | 8.00  | 7.07  | No |
|  |     | CH 132 | 5660 |      | 8.00  | 7.10  | No |
|  |     | CH 136 | 5680 |      | 8.00  | 7.02  | No |
|  |     | CH 140 | 5700 |      | 8.00  | 6.95  | No |
|  |     | CH 149 | 5745 |      | 8.00  | 7.08  | No |
|  |     | CH 153 | 5765 |      | 8.00  | 7.05  | No |
|  |     | CH 157 | 5785 |      | 8.00  | 7.11  | No |
|  |     | CH 161 | 5805 |      | 8.00  | 7.17  | No |
|  |     | CH 165 | 5825 |      | 8.00  | 7.15  | No |
|  | Sum | CH 36  | 5180 | MCS0 | 11.00 | 10.05 | No |
|  |     | CH 40  | 5200 |      | 11.00 | 10.00 | No |
|  |     | CH 44  | 5220 |      | 11.00 | 10.07 | No |
|  |     | CH 48  | 5240 |      | 11.00 | 10.06 | No |
|  |     | CH 52  | 5260 |      | 11.00 | 10.14 | No |
|  |     | CH 56  | 5280 |      | 11.00 | 10.02 | No |
|  |     | CH 60  | 5300 |      | 11.00 | 10.08 | No |
|  |     | CH 64  | 5320 |      | 11.00 | 9.98  | No |
|  |     | CH 100 | 5500 |      | 11.00 | 9.94  | No |
|  |     | CH 104 | 5520 |      | 11.00 | 9.96  | No |
|  |     | CH 108 | 5540 |      | 11.00 | 10.00 | No |
|  |     | CH 112 | 5560 |      | 11.00 | 10.03 | No |
|  |     | CH 116 | 5580 |      | 11.00 | 9.99  | No |
|  |     | CH 120 | 5600 |      | 11.00 | 9.98  | No |
|  |     | CH 124 | 5620 |      | 11.00 | 10.15 | No |
|  |     | CH 128 | 5640 |      | 11.00 | 10.12 | No |
|  |     | CH 132 | 5660 |      | 11.00 | 10.04 | No |
|  |     | CH 136 | 5680 |      | 11.00 | 10.01 | No |
|  |     | CH 140 | 5700 |      | 11.00 | 10.00 | No |
|  |     | CH 149 | 5745 |      | 11.00 | 10.06 | No |
|  |     | CH 153 | 5765 |      | 11.00 | 10.12 | No |
|  |     | CH 157 | 5785 |      | 11.00 | 10.08 | No |
|  |     | CH 161 | 5805 |      | 11.00 | 10.15 | No |
|  |     | CH 165 | 5825 |      | 11.00 | 10.16 | No |

| Mode                     | Antenna | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
|--------------------------|---------|---------|-----------------|------------------|---------|---------------------|-------------------|
| 802.11ac MIMO 40M (5GHz) | Main    | CH 38   | 5190            | MCS0             | 8.00    | 7.13                | No                |
|                          |         | CH 46   | 5230            |                  | 8.00    | 7.00                | No                |
|                          |         | CH 54   | 5270            |                  | 8.00    | 6.97                | No                |
|                          |         | CH 62   | 5310            |                  | 8.00    | 7.04                | No                |
|                          |         | CH 102  | 5510            |                  | 8.00    | 6.97                | No                |
|                          |         | CH 110  | 5550            |                  | 8.00    | 7.12                | No                |
|                          |         | CH 118  | 5590            |                  | 8.00    | 7.07                | No                |
|                          |         | CH 126  | 5630            |                  | 8.00    | 7.03                | No                |
|                          |         | CH 134  | 5670            |                  | 8.00    | 7.02                | No                |
|                          |         | CH 151  | 5755            |                  | 8.00    | 7.01                | No                |
|                          |         | CH 159  | 5795            |                  | 8.00    | 6.96                | No                |
|                          | Aux     | CH 38   | 5190            | MCS0             | 8.00    | 7.07                | No                |
|                          |         | CH 46   | 5230            |                  | 8.00    | 7.03                | No                |
|                          |         | CH 54   | 5270            |                  | 8.00    | 6.94                | No                |
|                          |         | CH 62   | 5310            |                  | 8.00    | 6.92                | No                |
|                          |         | CH 102  | 5510            |                  | 8.00    | 7.13                | No                |
|                          |         | CH 110  | 5550            |                  | 8.00    | 7.10                | No                |
|                          |         | CH 118  | 5590            |                  | 8.00    | 7.04                | No                |
|                          |         | CH 126  | 5630            |                  | 8.00    | 7.01                | No                |
|                          |         | CH 134  | 5670            |                  | 8.00    | 7.03                | No                |
|                          |         | CH 151  | 5755            |                  | 8.00    | 7.12                | No                |
|                          |         | CH 159  | 5795            |                  | 8.00    | 7.14                | No                |
|                          | Sum     | CH 38   | 5190            | MCS0             | 11.00   | 10.11               | No                |
|                          |         | CH 46   | 5230            |                  | 11.00   | 10.03               | No                |
|                          |         | CH 54   | 5270            |                  | 11.00   | 9.97                | No                |
|                          |         | CH 62   | 5310            |                  | 11.00   | 9.99                | No                |
|                          |         | CH 102  | 5510            |                  | 11.00   | 10.06               | No                |
|                          |         | CH 110  | 5550            |                  | 11.00   | 10.12               | No                |
|                          |         | CH 118  | 5590            |                  | 11.00   | 10.07               | No                |
|                          |         | CH 126  | 5630            |                  | 11.00   | 10.03               | No                |
|                          |         | CH 134  | 5670            |                  | 11.00   | 10.04               | No                |
|                          |         | CH 151  | 5755            |                  | 11.00   | 10.08               | No                |
|                          |         | CH 159  | 5795            |                  | 11.00   | 10.06               | No                |
| Mode                     | Antenna | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
| 802.11ac MIMO 80M (5GHz) | Main    | CH 42   | 5210            | MCS0             | 8.00    | 6.95                | No                |
|                          |         | CH 58   | 5290            |                  | 8.00    | 7.01                | No                |
|                          |         | CH 106  | 5530            |                  | 8.00    | 6.94                | No                |
|                          |         | CH 122  | 5610            |                  | 8.00    | 6.88                | No                |
|                          |         | CH 155  | 5775            |                  | 8.00    | 7.05                | No                |
|                          | Aux     | CH 42   | 5210            | MCS0             | 8.00    | 7.12                | No                |
|                          |         | CH 58   | 5290            |                  | 8.00    | 7.04                | No                |
|                          |         | CH 106  | 5530            |                  | 8.00    | 7.10                | No                |
|                          |         | CH 122  | 5610            |                  | 8.00    | 7.18                | No                |
|                          |         | CH 155  | 5775            |                  | 8.00    | 7.22                | No                |
|                          | Sum     | CH 42   | 5210            | MCS0             | 11.00   | 10.05               | No                |
|                          |         | CH 58   | 5290            |                  | 11.00   | <b>10.04</b>        | Yes               |
|                          |         | CH 106  | 5530            |                  | 11.00   | 10.03               | No                |
|                          |         | CH 122  | 5610            |                  | 11.00   | 10.04               | No                |
|                          |         | CH 155  | 5775            |                  | 11.00   | <b>10.15</b>        | Yes               |

| Mode                              | Antenna | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
|-----------------------------------|---------|---------|-----------------|------------------|---------|---------------------|-------------------|
| 802.11ac<br>MIMO<br>160<br>(5GHz) | Main    | CH 50   | 5250            | MCS0             | 8.00    | 7.03                | No                |
|                                   |         | CH 114  | 5570            |                  | 8.00    | 7.14                | No                |
|                                   | Aux     | CH 50   | 5250            | MCS0             | 8.00    | 6.99                | No                |
|                                   |         | CH 114  | 5570            |                  | 8.00    | 7.05                | No                |
|                                   | Sum     | CH 50   | 5250            | MCS0             | 11.00   | 10.02               | No                |
|                                   |         | CH 114  | 5570            |                  | 11.00   | <b>10.11</b>        | Yes               |

Table 9: Conducted power measurement results of WiFi 5G(MCC of FCC countries)

Note:

1) The bolded mode was selected for SAR testing.

| Mode         | Antenna | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
|--------------|---------|---------|-----------------|------------------|---------|---------------------|-------------------|
| 802.11a SISO | Main    | CH 36   | 5180            | 6Mbps            | 16.50   | 15.28               | No                |
|              |         | CH 40   | 5200            |                  | 16.50   | 15.33               | No                |
|              |         | CH 44   | 5220            |                  | 16.50   | 15.41               | No                |
|              |         | CH 48   | 5240            |                  | 16.50   | 15.27               | No                |
|              |         | CH 52   | 5260            |                  | 16.50   | 15.22               | No                |
|              |         | CH 56   | 5280            |                  | 16.50   | 15.23               | No                |
|              |         | CH 60   | 5300            |                  | 16.50   | 15.19               | No                |
|              |         | CH 64   | 5320            |                  | 16.50   | 15.10               | No                |
|              |         | CH 100  | 5500            |                  | 16.50   | 14.91               | No                |
|              |         | CH 104  | 5520            |                  | 16.50   | 14.98               | No                |
|              |         | CH 108  | 5540            |                  | 16.50   | 15.24               | No                |
|              |         | CH 112  | 5560            |                  | 16.50   | 15.31               | No                |
|              |         | CH 116  | 5580            |                  | 16.50   | 15.05               | No                |
|              |         | CH 120  | 5600            |                  | 16.50   | 15.26               | No                |
|              |         | CH 124  | 5620            |                  | 16.50   | 15.45               | No                |
|              |         | CH 128  | 5640            |                  | 16.50   | 14.95               | No                |
|              |         | CH 132  | 5660            |                  | 16.50   | 14.87               | No                |
|              |         | CH 136  | 5680            |                  | 16.50   | 15.07               | No                |
|              |         | CH 140  | 5700            |                  | 16.50   | 15.28               | No                |
|              |         | CH 149  | 5745            |                  | 10.50   | 9.43                | No                |
|              |         | CH 153  | 5765            |                  | 10.50   | 9.33                | No                |
|              |         | CH 157  | 5785            |                  | 10.50   | 9.28                | No                |
|              |         | CH 161  | 5805            |                  | 10.50   | 9.40                | No                |
|              |         | CH 165  | 5825            |                  | 10.50   | 9.31                | No                |
|              | Aux     | CH 36   | 5180            | 6Mbps            | 16.50   | 15.40               | No                |
|              |         | CH 40   | 5200            |                  | 16.50   | 15.47               | No                |
|              |         | CH 44   | 5220            |                  | 16.50   | 15.31               | No                |
|              |         | CH 48   | 5240            |                  | 16.50   | 15.05               | No                |
|              |         | CH 52   | 5260            |                  | 16.50   | 15.27               | No                |
|              |         | CH 56   | 5280            |                  | 16.50   | 14.99               | No                |
|              |         | CH 60   | 5300            |                  | 16.50   | 15.10               | No                |
|              |         | CH 64   | 5320            |                  | 16.50   | 14.92               | No                |
|              |         | CH 100  | 5500            |                  | 16.50   | 15.02               | No                |
|              |         | CH 104  | 5520            |                  | 16.50   | 15.23               | No                |
|              |         | CH 108  | 5540            |                  | 16.50   | 15.49               | No                |
|              |         | CH 112  | 5560            |                  | 16.50   | 15.31               | No                |
|              |         | CH 116  | 5580            |                  | 16.50   | 15.22               | No                |
|              |         | CH 120  | 5600            |                  | 16.50   | 15.44               | No                |
|              |         | CH 124  | 5620            |                  | 16.50   | 15.36               | No                |
|              |         | CH 128  | 5640            |                  | 16.50   | 14.89               | No                |
|              |         | CH 132  | 5660            |                  | 16.50   | 15.11               | No                |
|              |         | CH 136  | 5680            |                  | 16.50   | 15.34               | No                |
|              |         | CH 140  | 5700            |                  | 16.50   | 15.77               | No                |
|              |         | CH 149  | 5745            |                  | 11.00   | 10.23               | No                |
|              |         | CH 153  | 5765            |                  | 11.00   | 10.19               | No                |
|              |         | CH 157  | 5785            |                  | 11.00   | 10.33               | No                |
|              |         | CH 161  | 5805            |                  | 11.00   | 10.40               | No                |
|              |         | CH 165  | 5825            |                  | 11.00   | 10.25               | No                |

| Mode                             | Antenna | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
|----------------------------------|---------|---------|-----------------|------------------|---------|---------------------|-------------------|
| 802.11n<br>SISO<br>20M<br>(5GHz) | Main    | CH 36   | 5180            | MCS0             | 16.50   | 15.15               | No                |
|                                  |         | CH 40   | 5200            |                  | 16.50   | 15.23               | No                |
|                                  |         | CH 44   | 5220            |                  | 16.50   | 15.09               | No                |
|                                  |         | CH 48   | 5240            |                  | 16.50   | 14.99               | No                |
|                                  |         | CH 52   | 5260            |                  | 16.50   | 15.11               | No                |
|                                  |         | CH 56   | 5280            |                  | 16.50   | 15.08               | No                |
|                                  |         | CH 60   | 5300            |                  | 16.50   | 15.31               | No                |
|                                  |         | CH 64   | 5320            |                  | 16.50   | 14.96               | No                |
|                                  |         | CH 100  | 5500            |                  | 16.50   | 14.80               | No                |
|                                  |         | CH 104  | 5520            |                  | 16.50   | 15.25               | No                |
|                                  |         | CH 108  | 5540            |                  | 16.50   | 15.19               | No                |
|                                  |         | CH 112  | 5560            |                  | 16.50   | 15.07               | No                |
|                                  |         | CH 116  | 5580            |                  | 16.50   | 14.87               | No                |
|                                  |         | CH 120  | 5600            |                  | 16.50   | 15.26               | No                |
|                                  |         | CH 124  | 5620            |                  | 16.50   | 15.16               | No                |
|                                  |         | CH 128  | 5640            |                  | 16.50   | 15.31               | No                |
|                                  |         | CH 132  | 5660            |                  | 16.50   | 15.02               | No                |
|                                  |         | CH 136  | 5680            |                  | 16.50   | 15.31               | No                |
|                                  |         | CH 140  | 5700            |                  | 16.50   | 15.09               | No                |
|                                  |         | CH 149  | 5745            |                  | 10.50   | 9.40                | No                |
|                                  |         | CH 153  | 5765            |                  | 10.50   | 9.37                | No                |
|                                  |         | CH 157  | 5785            |                  | 10.50   | 9.30                | No                |
|                                  |         | CH 161  | 5805            |                  | 10.50   | 9.25                | No                |
|                                  |         | CH 165  | 5825            |                  | 10.50   | 9.32                | No                |
|                                  | Aux     | CH 36   | 5180            | MCS0             | 16.50   | 15.41               | No                |
|                                  |         | CH 40   | 5200            |                  | 16.50   | 15.37               | No                |
|                                  |         | CH 44   | 5220            |                  | 16.50   | 15.22               | No                |
|                                  |         | CH 48   | 5240            |                  | 16.50   | 15.19               | No                |
|                                  |         | CH 52   | 5260            |                  | 16.50   | 15.28               | No                |
|                                  |         | CH 56   | 5280            |                  | 16.50   | 14.92               | No                |
|                                  |         | CH 60   | 5300            |                  | 16.50   | 15.33               | No                |
|                                  |         | CH 64   | 5320            |                  | 16.50   | 14.88               | No                |
|                                  |         | CH 100  | 5500            |                  | 16.50   | 14.98               | No                |
|                                  |         | CH 104  | 5520            |                  | 16.50   | 15.50               | No                |
|                                  |         | CH 108  | 5540            |                  | 16.50   | 15.49               | No                |
|                                  |         | CH 112  | 5560            |                  | 16.50   | 15.24               | No                |
|                                  |         | CH 116  | 5580            |                  | 16.50   | 15.34               | No                |
|                                  |         | CH 120  | 5600            |                  | 16.50   | 15.48               | No                |
|                                  |         | CH 124  | 5620            |                  | 16.50   | 14.92               | No                |
|                                  |         | CH 128  | 5640            |                  | 16.50   | 14.85               | No                |
|                                  |         | CH 132  | 5660            |                  | 16.50   | 15.40               | No                |
|                                  |         | CH 136  | 5680            |                  | 16.50   | 15.52               | No                |
|                                  |         | CH 140  | 5700            |                  | 16.50   | 15.88               | No                |
|                                  |         | CH 149  | 5745            |                  | 11.00   | 10.15               | No                |
|                                  |         | CH 153  | 5765            |                  | 11.00   | 10.27               | No                |
|                                  |         | CH 157  | 5785            |                  | 11.00   | 10.25               | No                |
|                                  |         | CH 161  | 5805            |                  | 11.00   | 10.15               | No                |
|                                  |         | CH 165  | 5825            |                  | 11.00   | 10.16               | No                |



| Mode                              | Antenna | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
|-----------------------------------|---------|---------|-----------------|------------------|---------|---------------------|-------------------|
| 802.11n<br>SISO<br>40M<br>(5GHz)  | Main    | CH 38   | 5190            | MCS0             | 14.50   | 13.45               | No                |
|                                   |         | CH 46   | 5230            |                  | 14.50   | 13.30               | No                |
|                                   |         | CH 54   | 5270            |                  | 14.50   | 13.25               | No                |
|                                   |         | CH 62   | 5310            |                  | 14.50   | 13.11               | No                |
|                                   |         | CH 102  | 5510            |                  | 14.50   | 13.09               | No                |
|                                   |         | CH 110  | 5550            |                  | 14.50   | 13.12               | No                |
|                                   |         | CH 118  | 5590            |                  | 14.50   | 13.34               | No                |
|                                   |         | CH 126  | 5630            |                  | 14.50   | 13.20               | No                |
|                                   |         | CH 134  | 5670            |                  | 14.50   | 13.38               | No                |
|                                   |         | CH 151  | 5755            |                  | 10.50   | 9.23                | No                |
|                                   |         | CH 159  | 5795            |                  | 10.50   | 9.17                | No                |
|                                   | Aux     | CH 38   | 5190            | MCS0             | 15.50   | 14.84               | No                |
|                                   |         | CH 46   | 5230            |                  | 15.50   | 14.77               | No                |
|                                   |         | CH 54   | 5270            |                  | 15.50   | 14.63               | No                |
|                                   |         | CH 62   | 5310            |                  | 15.50   | 14.36               | No                |
|                                   |         | CH 102  | 5510            |                  | 15.50   | 14.31               | No                |
|                                   |         | CH 110  | 5550            |                  | 15.50   | 14.48               | No                |
|                                   |         | CH 118  | 5590            |                  | 15.50   | 14.53               | No                |
|                                   |         | CH 126  | 5630            |                  | 15.50   | 14.69               | No                |
|                                   |         | CH 134  | 5670            |                  | 15.50   | 14.83               | No                |
|                                   |         | CH 151  | 5755            |                  | 11.00   | 10.11               | No                |
|                                   |         | CH 159  | 5795            |                  | 11.00   | 10.27               | No                |
| Mode                              | Antenna | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
| 802.11ac<br>SISO<br>20M<br>(5GHz) | Main    | CH 36   | 5180            | MCS0             | 16.50   | 15.26               | No                |
|                                   |         | CH 40   | 5200            |                  | 16.50   | 15.13               | No                |
|                                   |         | CH 44   | 5220            |                  | 16.50   | 15.20               | No                |
|                                   |         | CH 48   | 5240            |                  | 16.50   | 15.35               | No                |
|                                   |         | CH 52   | 5260            |                  | 16.50   | 15.24               | No                |
|                                   |         | CH 56   | 5280            |                  | 16.50   | 15.37               | No                |
|                                   |         | CH 60   | 5300            |                  | 16.50   | 15.19               | No                |
|                                   |         | CH 64   | 5320            |                  | 16.50   | 15.07               | No                |
|                                   |         | CH 100  | 5500            |                  | 16.50   | 14.88               | No                |
|                                   |         | CH 104  | 5520            |                  | 16.50   | 14.92               | No                |
|                                   |         | CH 108  | 5540            |                  | 16.50   | 15.05               | No                |
|                                   |         | CH 112  | 5560            |                  | 16.50   | 15.10               | No                |
|                                   |         | CH 116  | 5580            |                  | 16.50   | 15.34               | No                |
|                                   |         | CH 120  | 5600            |                  | 16.50   | 15.29               | No                |
|                                   |         | CH 124  | 5620            |                  | 16.50   | 15.09               | No                |
|                                   |         | CH 128  | 5640            |                  | 16.50   | 15.40               | No                |
|                                   |         | CH 132  | 5660            |                  | 16.50   | 15.36               | No                |
|                                   |         | CH 136  | 5680            |                  | 16.50   | 15.22               | No                |
|                                   |         | CH 140  | 5700            |                  | 16.50   | 15.25               | No                |
|                                   |         | CH 149  | 5745            |                  | 10.50   | 9.39                | No                |
|                                   |         | CH 153  | 5765            |                  | 10.50   | 9.27                | No                |
|                                   |         | CH 157  | 5785            |                  | 10.50   | 9.33                | No                |
|                                   |         | CH 161  | 5805            |                  | 10.50   | 9.31                | No                |
|                                   |         | CH 165  | 5825            |                  | 10.50   | 9.36                | No                |
|                                   | Aux     | CH 36   | 5180            | MCS0             | 16.50   | 15.61               | No                |
|                                   |         | CH 40   | 5200            |                  | 16.50   | 15.57               | No                |
|                                   |         | CH 44   | 5220            |                  | 16.50   | 15.39               | No                |
|                                   |         | CH 48   | 5240            |                  | 16.50   | 15.44               | No                |

|                                   |         | CH 52   | 5260            |                  | 16.50   | 15.45               | No                |
|-----------------------------------|---------|---------|-----------------|------------------|---------|---------------------|-------------------|
|                                   |         | CH 56   | 5280            |                  | 16.50   | 15.50               | No                |
|                                   |         | CH 60   | 5300            |                  | 16.50   | 15.12               | No                |
|                                   |         | CH 64   | 5320            |                  | 16.50   | 15.08               | No                |
|                                   |         | CH 100  | 5500            |                  | 16.50   | 15.22               | No                |
|                                   |         | CH 104  | 5520            |                  | 16.50   | 15.09               | No                |
|                                   |         | CH 108  | 5540            |                  | 16.50   | 15.56               | No                |
|                                   |         | CH 112  | 5560            |                  | 16.50   | 15.43               | No                |
|                                   |         | CH 116  | 5580            |                  | 16.50   | 15.37               | No                |
|                                   |         | CH 120  | 5600            |                  | 16.50   | 15.67               | No                |
|                                   |         | CH 124  | 5620            |                  | 16.50   | 15.55               | No                |
|                                   |         | CH 128  | 5640            |                  | 16.50   | 15.43               | No                |
|                                   |         | CH 132  | 5660            |                  | 16.50   | 15.69               | No                |
|                                   |         | CH 136  | 5680            |                  | 16.50   | 15.76               | No                |
|                                   |         | CH 140  | 5700            |                  | 16.50   | 15.70               | No                |
|                                   |         | CH 149  | 5745            |                  | 11.00   | 10.07               | No                |
|                                   |         | CH 153  | 5765            |                  | 11.00   | 10.34               | No                |
|                                   |         | CH 157  | 5785            |                  | 11.00   | 10.50               | No                |
|                                   |         | CH 161  | 5805            |                  | 11.00   | 10.19               | No                |
|                                   |         | CH 165  | 5825            |                  | 11.00   | 10.28               | No                |
| Mode                              | Antenna | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
| 802.11ac<br>SISO<br>40M<br>(5GHz) | Main    | CH 38   | 5190            | MCS0             | 14.50   | 13.43               | No                |
|                                   |         | CH 46   | 5230            |                  | 14.50   | 13.37               | No                |
|                                   |         | CH 54   | 5270            |                  | 14.50   | 13.18               | No                |
|                                   |         | CH 62   | 5310            |                  | 14.50   | 13.09               | No                |
|                                   |         | CH 102  | 5510            |                  | 14.50   | 13.10               | No                |
|                                   |         | CH 110  | 5550            |                  | 14.50   | 13.21               | No                |
|                                   |         | CH 118  | 5590            |                  | 14.50   | 13.25               | No                |
|                                   |         | CH 126  | 5630            |                  | 14.50   | 13.29               | No                |
|                                   |         | CH 134  | 5670            |                  | 14.50   | 13.45               | No                |
|                                   |         | CH 151  | 5755            |                  | 10.50   | 9.22                | No                |
|                                   | Aux     | CH 159  | 5795            | MCS0             | 10.50   | 9.16                | No                |
|                                   |         | CH 38   | 5190            |                  | 15.50   | 14.80               | No                |
|                                   |         | CH 46   | 5230            |                  | 15.50   | 14.77               | No                |
|                                   |         | CH 54   | 5270            |                  | 15.50   | 14.62               | No                |
|                                   |         | CH 62   | 5310            |                  | 15.50   | 14.33               | No                |
|                                   |         | CH 102  | 5510            |                  | 15.50   | 14.36               | No                |
|                                   |         | CH 110  | 5550            |                  | 15.50   | 14.23               | No                |
|                                   |         | CH 118  | 5590            |                  | 15.50   | 14.50               | No                |
|                                   |         | CH 126  | 5630            |                  | 15.50   | 14.38               | No                |
|                                   |         | CH 134  | 5670            |                  | 15.50   | 14.34               | No                |
|                                   |         | CH 151  | 5755            |                  | 11.00   | 10.33               | No                |
|                                   |         | CH 159  | 5795            |                  | 11.00   | 10.25               | No                |

| Mode                               | Antenna | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
|------------------------------------|---------|---------|-----------------|------------------|---------|---------------------|-------------------|
| 802.11ac<br>SISO<br>80M<br>(5GHz)  | Main    | CH 42   | 5210            | MCS0             | 14.50   | 13.23               | No                |
|                                    |         | CH 58   | 5290            |                  | 14.50   | 13.09               | No                |
|                                    |         | CH 106  | 5530            |                  | 14.50   | 12.93               | No                |
|                                    |         | CH 122  | 5610            |                  | 14.50   | 13.23               | No                |
|                                    |         | CH 155  | 5775            |                  | 10.50   | 9.18                | No                |
|                                    | Aux     | CH 42   | 5210            | MCS0             | 15.50   | 14.47               | No                |
|                                    |         | CH 58   | 5290            |                  | 15.50   | 14.37               | No                |
|                                    |         | CH 106  | 5530            |                  | 15.50   | 14.07               | No                |
|                                    |         | CH 122  | 5610            |                  | 15.50   | 14.41               | No                |
|                                    |         | CH 155  | 5775            |                  | 11.00   | 10.06               | No                |
| Mode                               | Antenna | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
| 802.11ac<br>SISO<br>160M<br>(5GHz) | Main    | CH 50   | 5250            | MCS0             | 14.50   | 12.84               | No                |
|                                    |         | CH 114  | 5570            |                  | 14.50   | 12.88               | No                |
|                                    | Aux     | CH 50   | 5250            | MCS0             | 15.50   | 13.10               | No                |
|                                    |         | CH 114  | 5570            |                  | 15.50   | 12.89               | No                |
| Mode                               | Antenna | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
| 802.11n<br>MIMO<br>20M<br>(5GHz)   | Main    | CH 36   | 5180            | MCS8             | 13.50   | 11.95               | No                |
|                                    |         | CH 40   | 5200            |                  | 13.50   | 11.87               | No                |
|                                    |         | CH 44   | 5220            |                  | 13.50   | 11.84               | No                |
|                                    |         | CH 48   | 5240            |                  | 13.50   | 11.90               | No                |
|                                    |         | CH 52   | 5260            |                  | 13.50   | 11.94               | No                |
|                                    |         | CH 56   | 5280            |                  | 13.50   | 11.79               | No                |
|                                    |         | CH 60   | 5300            |                  | 13.50   | 11.83               | No                |
|                                    |         | CH 64   | 5320            |                  | 13.50   | 11.80               | No                |
|                                    |         | CH 100  | 5500            |                  | 13.50   | 11.62               | No                |
|                                    |         | CH 104  | 5520            |                  | 13.50   | 11.74               | No                |
|                                    |         | CH 108  | 5540            |                  | 13.50   | 11.68               | No                |
|                                    |         | CH 112  | 5560            |                  | 13.50   | 11.80               | No                |
|                                    |         | CH 116  | 5580            |                  | 13.50   | 11.66               | No                |
|                                    |         | CH 120  | 5600            |                  | 13.50   | 11.96               | No                |
|                                    |         | CH 124  | 5620            |                  | 13.50   | 11.91               | No                |
|                                    |         | CH 128  | 5640            |                  | 13.50   | 11.87               | No                |
|                                    |         | CH 132  | 5660            |                  | 13.50   | 11.79               | No                |
|                                    |         | CH 136  | 5680            |                  | 13.50   | 11.84               | No                |
|                                    |         | CH 140  | 5700            |                  | 13.50   | 11.88               | No                |
|                                    |         | CH 149  | 5745            |                  | 8.00    | 6.63                | No                |
|                                    |         | CH 153  | 5765            |                  | 8.00    | 6.55                | No                |
|                                    |         | CH 157  | 5785            |                  | 8.00    | 6.56                | No                |
|                                    |         | CH 161  | 5805            |                  | 8.00    | 6.60                | No                |
|                                    |         | CH 165  | 5825            |                  | 8.00    | 6.61                | No                |
|                                    | Aux     | CH 36   | 5180            | MCS8             | 13.50   | 12.84               | No                |
|                                    |         | CH 40   | 5200            |                  | 13.50   | 12.85               | No                |
|                                    |         | CH 44   | 5220            |                  | 13.50   | 12.73               | No                |
|                                    |         | CH 48   | 5240            |                  | 13.50   | 12.88               | No                |
|                                    |         | CH 52   | 5260            |                  | 13.50   | 12.67               | No                |
|                                    |         | CH 56   | 5280            |                  | 13.50   | 12.74               | No                |
|                                    |         | CH 60   | 5300            |                  | 13.50   | 12.25               | No                |
|                                    |         | CH 64   | 5320            |                  | 13.50   | 12.13               | No                |
|                                    |         | CH 100  | 5500            |                  | 13.50   | 12.18               | No                |
|                                    |         | CH 104  | 5520            |                  | 13.50   | 12.21               | No                |

|                                  |         | CH 108  | 5540            |                  | 13.50   | 12.19               | No                |
|----------------------------------|---------|---------|-----------------|------------------|---------|---------------------|-------------------|
|                                  |         | CH 112  | 5560            |                  | 13.50   | 12.22               | No                |
|                                  |         | CH 116  | 5580            |                  | 13.50   | 12.53               | No                |
|                                  |         | CH 120  | 5600            |                  | 13.50   | 12.48               | No                |
|                                  |         | CH 124  | 5620            |                  | 13.50   | 12.61               | No                |
|                                  |         | CH 128  | 5640            |                  | 13.50   | 12.58               | No                |
|                                  |         | CH 132  | 5660            |                  | 13.50   | 12.74               | No                |
|                                  |         | CH 136  | 5680            |                  | 13.50   | 12.69               | No                |
|                                  |         | CH 140  | 5700            |                  | 13.50   | 12.88               | No                |
|                                  |         | CH 149  | 5745            |                  | 8.00    | 6.80                | No                |
|                                  |         | CH 153  | 5765            |                  | 8.00    | 7.09                | No                |
|                                  |         | CH 157  | 5785            |                  | 8.00    | 7.12                | No                |
|                                  |         | CH 161  | 5805            |                  | 8.00    | 6.84                | No                |
|                                  |         | CH 165  | 5825            |                  | 8.00    | 7.11                | No                |
|                                  | Sum     | CH 36   | 5180            | MCS8             | 16.50   | 15.43               | No                |
|                                  |         | CH 40   | 5200            |                  | 16.50   | 15.40               | No                |
|                                  |         | CH 44   | 5220            |                  | 16.50   | 15.32               | No                |
|                                  |         | CH 48   | 5240            |                  | 16.50   | 15.43               | No                |
|                                  |         | CH 52   | 5260            |                  | 16.50   | 15.33               | No                |
|                                  |         | CH 56   | 5280            |                  | 16.50   | 15.30               | No                |
|                                  |         | CH 60   | 5300            |                  | 16.50   | 15.06               | No                |
|                                  |         | CH 64   | 5320            |                  | 16.50   | 14.98               | No                |
|                                  |         | CH 100  | 5500            |                  | 16.50   | 14.92               | No                |
|                                  |         | CH 104  | 5520            |                  | 16.50   | 14.99               | No                |
|                                  |         | CH 108  | 5540            |                  | 16.50   | 14.95               | No                |
|                                  |         | CH 112  | 5560            |                  | 16.50   | 15.03               | No                |
|                                  |         | CH 116  | 5580            |                  | 16.50   | 15.13               | No                |
|                                  |         | CH 120  | 5600            |                  | 16.50   | 15.24               | No                |
|                                  |         | CH 124  | 5620            |                  | 16.50   | 15.28               | No                |
|                                  |         | CH 128  | 5640            |                  | 16.50   | 15.25               | No                |
|                                  |         | CH 132  | 5660            |                  | 16.50   | 15.30               | No                |
|                                  |         | CH 136  | 5680            |                  | 16.50   | 15.30               | No                |
|                                  |         | CH 140  | 5700            |                  | 16.50   | 15.42               | No                |
|                                  |         | CH 149  | 5745            |                  | 11.00   | 9.73                | No                |
|                                  |         | CH 153  | 5765            |                  | 11.00   | 9.84                | No                |
|                                  |         | CH 157  | 5785            |                  | 11.00   | 9.86                | No                |
|                                  |         | CH 161  | 5805            |                  | 11.00   | 9.73                | No                |
|                                  |         | CH 165  | 5825            |                  | 11.00   | 9.88                | No                |
| Mode                             | Antenna | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
| 802.11n<br>MIMO<br>40M<br>(5GHz) | Main    | CH 38   | 5190            | MCS8             | 12.00   | 10.52               | No                |
|                                  |         | CH 46   | 5230            |                  | 12.00   | 10.49               | No                |
|                                  |         | CH 54   | 5270            |                  | 12.00   | 10.33               | No                |
|                                  |         | CH 62   | 5310            |                  | 12.00   | 10.25               | No                |
|                                  |         | CH 102  | 5510            |                  | 12.00   | 10.11               | No                |
|                                  |         | CH 110  | 5550            |                  | 12.00   | 10.24               | No                |
|                                  |         | CH 118  | 5590            |                  | 12.00   | 10.20               | No                |
|                                  |         | CH 126  | 5630            |                  | 12.00   | 10.27               | No                |
|                                  |         | CH 134  | 5670            |                  | 12.00   | 10.31               | No                |
|                                  |         | CH 151  | 5755            |                  | 8.00    | 6.40                | No                |
|                                  |         | CH 159  | 5795            |                  | 8.00    | 6.34                | No                |
|                                  | Aux     | CH 38   | 5190            | MCS8             | 12.00   | 11.23               | No                |
|                                  |         | CH 46   | 5230            |                  | 12.00   | 11.17               | No                |
|                                  |         | CH 54   | 5270            |                  | 12.00   | 11.13               | No                |
|                                  |         | CH 62   | 5310            |                  | 12.00   | 10.77               | No                |
|                                  |         | CH 102  | 5510            |                  | 12.00   | 10.56               | No                |

|                                   |         | CH 110  | 5550           |                  | 12.00   | 10.49              | No               |
|-----------------------------------|---------|---------|----------------|------------------|---------|--------------------|------------------|
|                                   |         | CH 118  | 5590           |                  | 12.00   | 10.74              | No               |
|                                   |         | CH 126  | 5630           |                  | 12.00   | 10.84              | No               |
|                                   |         | CH 134  | 5670           |                  | 12.00   | 11.03              | No               |
|                                   |         | CH 151  | 5755           |                  | 8.00    | 7.14               | No               |
|                                   |         | CH 159  | 5795           |                  | 8.00    | 7.26               | No               |
|                                   | Sum     | CH 38   | 5190           | MCS8             | 15.00   | 13.90              | No               |
|                                   |         | CH 46   | 5230           |                  | 15.00   | 13.85              | No               |
|                                   |         | CH 54   | 5270           |                  | 15.00   | 13.76              | No               |
|                                   |         | CH 62   | 5310           |                  | 15.00   | 13.53              | No               |
|                                   |         | CH 102  | 5510           |                  | 15.00   | 13.35              | No               |
|                                   |         | CH 110  | 5550           |                  | 15.00   | 13.38              | No               |
|                                   |         | CH 118  | 5590           |                  | 15.00   | 13.49              | No               |
|                                   |         | CH 126  | 5630           |                  | 15.00   | 13.57              | No               |
|                                   |         | CH 134  | 5670           |                  | 15.00   | 13.70              | No               |
|                                   |         | CH 151  | 5755           |                  | 11.00   | 9.80               | No               |
|                                   |         | CH 159  | 5795           |                  | 11.00   | 9.83               | No               |
| Mode                              | Antenna | Channel | Frequency(MHz) | Data Rate (Mbps) | Tune-up | Average Power(dBm) | SAR Test(Yes/No) |
| 802.11ac<br>MIMO<br>20M<br>(5GHz) | Main    | CH 36   | 5180           | MCS0             | 13.50   | 12.22              | No               |
|                                   |         | CH 40   | 5200           |                  | 13.50   | 12.19              | No               |
|                                   |         | CH 44   | 5220           |                  | 13.50   | 12.31              | No               |
|                                   |         | CH 48   | 5240           |                  | 13.50   | 12.11              | No               |
|                                   |         | CH 52   | 5260           |                  | 13.50   | 12.08              | No               |
|                                   |         | CH 56   | 5280           |                  | 13.50   | 12.03              | No               |
|                                   |         | CH 60   | 5300           |                  | 13.50   | 11.95              | No               |
|                                   |         | CH 64   | 5320           |                  | 13.50   | 11.93              | No               |
|                                   |         | CH 100  | 5500           |                  | 13.50   | 11.75              | No               |
|                                   |         | CH 104  | 5520           |                  | 13.50   | 11.80              | No               |
|                                   |         | CH 108  | 5540           |                  | 13.50   | 11.69              | No               |
|                                   |         | CH 112  | 5560           |                  | 13.50   | 11.84              | No               |
|                                   |         | CH 116  | 5580           |                  | 13.50   | 12.08              | No               |
|                                   |         | CH 120  | 5600           |                  | 13.50   | 12.18              | No               |
|                                   |         | CH 124  | 5620           |                  | 13.50   | 12.21              | No               |
|                                   |         | CH 128  | 5640           |                  | 13.50   | 11.99              | No               |
|                                   |         | CH 132  | 5660           |                  | 13.50   | 11.84              | No               |
|                                   |         | CH 136  | 5680           |                  | 13.50   | 12.05              | No               |
|                                   |         | CH 140  | 5700           |                  | 13.50   | 12.14              | No               |
|                                   |         | CH 149  | 5745           |                  | 8.00    | 6.69               | No               |
|                                   |         | CH 153  | 5765           |                  | 8.00    | 6.81               | No               |
|                                   |         | CH 157  | 5785           |                  | 8.00    | 6.66               | No               |
|                                   |         | CH 161  | 5805           |                  | 8.00    | 6.67               | No               |
|                                   |         | CH 165  | 5825           |                  | 8.00    | 6.58               | No               |
|                                   | Aux     | CH 36   | 5180           | MCS0             | 13.50   | 12.81              | No               |
|                                   |         | CH 40   | 5200           |                  | 13.50   | 12.76              | No               |
|                                   |         | CH 44   | 5220           |                  | 13.50   | 12.88              | No               |
|                                   |         | CH 48   | 5240           |                  | 13.50   | 12.61              | No               |
|                                   |         | CH 52   | 5260           |                  | 13.50   | 12.70              | No               |
|                                   |         | CH 56   | 5280           |                  | 13.50   | 12.72              | No               |
|                                   |         | CH 60   | 5300           |                  | 13.50   | 12.35              | No               |
|                                   |         | CH 64   | 5320           |                  | 13.50   | 12.21              | No               |
|                                   |         | CH 100  | 5500           |                  | 13.50   | 12.19              | No               |
|                                   |         | CH 104  | 5520           |                  | 13.50   | 12.07              | No               |
|                                   |         | CH 108  | 5540           |                  | 13.50   | 12.33              | No               |
|                                   |         | CH 112  | 5560           |                  | 13.50   | 12.42              | No               |
|                                   |         | CH 116  | 5580           |                  | 13.50   | 12.57              | No               |

|                                   |         | CH 120  | 5600            |                  | 13.50   | 12.53               | No                |
|-----------------------------------|---------|---------|-----------------|------------------|---------|---------------------|-------------------|
|                                   |         | CH 124  | 5620            |                  | 13.50   | 12.67               | No                |
|                                   |         | CH 128  | 5640            |                  | 13.50   | 12.51               | No                |
|                                   |         | CH 132  | 5660            |                  | 13.50   | 12.88               | No                |
|                                   |         | CH 136  | 5680            |                  | 13.50   | 12.74               | No                |
|                                   |         | CH 140  | 5700            |                  | 13.50   | 12.93               | No                |
|                                   |         | CH 149  | 5745            |                  | 8.00    | 7.32                | No                |
|                                   |         | CH 153  | 5765            |                  | 8.00    | 7.41                | No                |
|                                   |         | CH 157  | 5785            |                  | 8.00    | 7.58                | No                |
|                                   |         | CH 161  | 5805            |                  | 8.00    | 7.60                | No                |
|                                   |         | CH 165  | 5825            |                  | 8.00    | 7.55                | No                |
|                                   | Sum     | CH 36   | 5180            | MCS0             | 16.50   | 15.54               | No                |
|                                   |         | CH 40   | 5200            |                  | 16.50   | 15.49               | No                |
|                                   |         | CH 44   | 5220            |                  | 16.50   | 15.61               | No                |
|                                   |         | CH 48   | 5240            |                  | 16.50   | 15.38               | No                |
|                                   |         | CH 52   | 5260            |                  | 16.50   | 15.41               | No                |
|                                   |         | CH 56   | 5280            |                  | 16.50   | 15.40               | No                |
|                                   |         | CH 60   | 5300            |                  | 16.50   | 15.16               | No                |
|                                   |         | CH 64   | 5320            |                  | 16.50   | 15.08               | No                |
|                                   |         | CH 100  | 5500            |                  | 16.50   | 14.99               | No                |
|                                   |         | CH 104  | 5520            |                  | 16.50   | 14.95               | No                |
|                                   |         | CH 108  | 5540            |                  | 16.50   | 15.03               | No                |
|                                   |         | CH 112  | 5560            |                  | 16.50   | 15.15               | No                |
|                                   |         | CH 116  | 5580            |                  | 16.50   | 15.34               | No                |
|                                   |         | CH 120  | 5600            |                  | 16.50   | 15.37               | No                |
|                                   |         | CH 124  | 5620            |                  | 16.50   | 15.46               | No                |
|                                   |         | CH 128  | 5640            |                  | 16.50   | 15.27               | No                |
|                                   |         | CH 132  | 5660            |                  | 16.50   | 15.40               | No                |
|                                   |         | CH 136  | 5680            |                  | 16.50   | 15.42               | No                |
|                                   |         | CH 140  | 5700            |                  | 16.50   | 15.56               | No                |
|                                   |         | CH 149  | 5745            |                  | 11.00   | 10.03               | No                |
|                                   |         | CH 153  | 5765            |                  | 11.00   | 10.13               | No                |
|                                   |         | CH 157  | 5785            |                  | 11.00   | 10.15               | No                |
|                                   |         | CH 161  | 5805            |                  | 11.00   | 10.17               | No                |
|                                   |         | CH 165  | 5825            |                  | 11.00   | 10.10               | No                |
| Mode                              | Antenna | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
| 802.11ac<br>MIMO<br>40M<br>(5GHz) | Main    | CH 38   | 5190            | MCS0             | 12.00   | 10.75               | No                |
|                                   |         | CH 46   | 5230            |                  | 12.00   | 10.81               | No                |
|                                   |         | CH 54   | 5270            |                  | 12.00   | 10.50               | No                |
|                                   |         | CH 62   | 5310            |                  | 12.00   | 10.33               | No                |
|                                   |         | CH 102  | 5510            |                  | 12.00   | 10.29               | No                |
|                                   |         | CH 110  | 5550            |                  | 12.00   | 10.33               | No                |
|                                   |         | CH 118  | 5590            |                  | 12.00   | 10.48               | No                |
|                                   |         | CH 126  | 5630            |                  | 12.00   | 10.43               | No                |
|                                   |         | CH 134  | 5670            |                  | 12.00   | 10.58               | No                |
|                                   |         | CH 151  | 5755            |                  | 8.00    | 6.66                | No                |
|                                   |         | CH 159  | 5795            |                  | 8.00    | 6.58                | No                |
|                                   | Aux     | CH 38   | 5190            | MCS0             | 12.00   | 11.45               | No                |
|                                   |         | CH 46   | 5230            |                  | 12.00   | 11.37               | No                |
|                                   |         | CH 54   | 5270            |                  | 12.00   | 11.42               | No                |
|                                   |         | CH 62   | 5310            |                  | 12.00   | 11.05               | No                |
|                                   |         | CH 102  | 5510            |                  | 12.00   | 10.87               | No                |
|                                   |         | CH 110  | 5550            |                  | 12.00   | 10.94               | No                |
|                                   |         | CH 118  | 5590            |                  | 12.00   | 10.92               | No                |
|                                   |         | CH 126  | 5630            |                  | 12.00   | 11.25               | No                |

|                                   |         | CH 134  | 5670            |                  | 12.00   | 11.30               | No                |
|-----------------------------------|---------|---------|-----------------|------------------|---------|---------------------|-------------------|
|                                   |         | CH 151  | 5755            |                  | 8.00    | 7.41                | No                |
|                                   |         | CH 159  | 5795            |                  | 8.00    | 7.54                | No                |
|                                   | Sum     | CH 38   | 5190            | MCS0             | 15.00   | 14.12               | No                |
|                                   |         | CH 46   | 5230            |                  | 15.00   | 14.11               | No                |
|                                   |         | CH 54   | 5270            |                  | 15.00   | 13.99               | No                |
|                                   |         | CH 62   | 5310            |                  | 15.00   | 13.72               | No                |
|                                   |         | CH 102  | 5510            |                  | 15.00   | 13.60               | No                |
|                                   |         | CH 110  | 5550            |                  | 15.00   | 13.66               | No                |
|                                   |         | CH 118  | 5590            |                  | 15.00   | 13.72               | No                |
|                                   |         | CH 126  | 5630            |                  | 15.00   | 13.87               | No                |
|                                   |         | CH 134  | 5670            |                  | 15.00   | 13.97               | No                |
|                                   |         | CH 151  | 5755            |                  | 11.00   | 10.06               | No                |
|                                   |         | CH 159  | 5795            |                  | 11.00   | 10.10               | No                |
| Mode                              | Antenna | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
| 802.11ac<br>MIMO<br>80M<br>(5GHz) | Main    | CH 42   | 5210            | MCS0             | 12.00   | 9.94                | No                |
|                                   |         | CH 58   | 5290            |                  | 12.00   | 9.79                | No                |
|                                   |         | CH 106  | 5530            |                  | 12.00   | 9.81                | No                |
|                                   |         | CH 122  | 5610            |                  | 12.00   | 10.05               | No                |
|                                   |         | CH 155  | 5775            |                  | 8.00    | 6.12                | No                |
|                                   | Aux     | CH 42   | 5210            | MCS0             | 12.00   | 10.33               | No                |
|                                   |         | CH 58   | 5290            |                  | 12.00   | 10.36               | No                |
|                                   |         | CH 106  | 5530            |                  | 12.00   | 9.92                | No                |
|                                   |         | CH 122  | 5610            |                  | 12.00   | 10.09               | No                |
|                                   |         | CH 155  | 5775            |                  | 8.00    | 6.55                | No                |
|                                   | Sum     | CH 42   | 5210            | MCS0             | 15.00   | <b>13.15</b>        | No                |
|                                   |         | CH 58   | 5290            |                  | 15.00   | <b>13.09</b>        | No                |
|                                   |         | CH 106  | 5530            |                  | 15.00   | 12.88               | No                |
|                                   |         | CH 122  | 5610            |                  | 15.00   | 13.08               | No                |
|                                   |         | CH 155  | 5775            |                  | 11.00   | <b>9.35</b>         | No                |
| Mode                              | Antenna | Channel | Frequency (MHz) | Data Rate (Mbps) | Tune-up | Average Power (dBm) | SAR Test (Yes/No) |
| 802.11ac<br>MIMO<br>160<br>(5GHz) | Main    | CH 50   | 5250            | MCS0             | 12.00   | 9.61                | No                |
|                                   |         | CH 114  | 5570            |                  | 12.00   | 9.57                | No                |
|                                   | Aux     | CH 50   | 5250            | MCS0             | 12.00   | 10.08               | No                |
|                                   |         | CH 114  | 5570            |                  | 12.00   | 9.74                | No                |
|                                   | Sum     | CH 50   | 5250            | MCS0             | 15.00   | 12.86               | No                |
|                                   |         | CH 114  | 5570            |                  | 15.00   | <b>12.67</b>        | No                |

Table 10: Test results conducted power measurement WiFi 5G(MCC of CE countries)

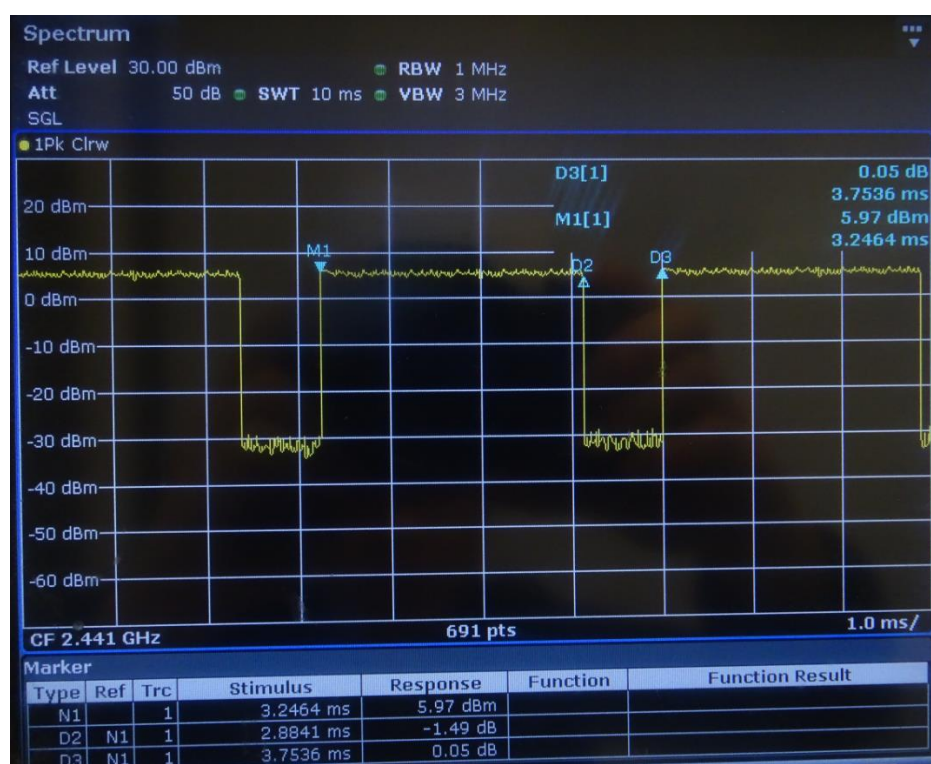
### 7.1.3 Conducted power of BT

| BT   | Tune-up Max. | Average Conducted Power (dBm) |              |              |
|------|--------------|-------------------------------|--------------|--------------|
|      |              | 0CH                           | 39CH         | 78CH         |
| DH5  | 10.70        | <b>9.48</b>                   | <b>10.25</b> | <b>10.50</b> |
| 2DH5 | 6.70         | 6.24                          | 6.18         | 5.97         |
| 3DH5 | 6.70         | 6.22                          | 6.16         | 5.93         |
| BT   | Tune-up Max. | Average Conducted Power (dBm) |              |              |
|      |              | 0CH                           | 19CH         | 39CH         |
| BLE  | 6.50         | 4.68                          | 4.48         | 4.20         |

Table 11: Test results conducted power measurement BT

Note: The conducted power of BT is measured with RMS detector.

Figure: Bluetooth Transmission Plot



So the bluetooth duty cycle is calculated as below:

$$\text{Duty Cycle} = \text{pulse width} \times 100\% = \frac{2.88\text{ms}}{3.75\text{ms}} \times 100\% = 77\%$$



## 7.2 SAR measurement Results

### General Notes:

- 1) Per KDB 447498 D01, all SAR measurement results are scaled to the maximum tune-up tolerance limit to demonstrate SAR compliance.
- 2) Per KDB 447498 D01, 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:
  - $\leq 0.8\text{W/kg}$  for 1-g or  $2.0\text{W/kg}$  for 10-g respectively, when the transmission band is  $\leq 100\text{MHz}$ .
  - $\leq 0.6\text{ W/kg}$  or  $1.5\text{ W/kg}$ , for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz.
  - $\leq 0.4\text{ W/kg}$  or  $1.0\text{ W/kg}$ , for 1-g or 10-g respectively, when the transmission band is  $\geq 200\text{ MHz}$ .When the maximum output power variation across the required test channels is  $> \frac{1}{2}\text{ dB}$ , instead of the middle channel, the highest output power channel must be used.
- 3) Per KDB 865664 D01, for each frequency band, repeated SAR measurement is required only when the measured SAR is  $\geq 0.8\text{W/kg}$ ; if the deviation among the repeated measurement is  $\leq 20\%$ , and the measured SAR  $< 1.45\text{W/kg}$ , only one repeated measurement is required.
- 4) Per KDB 865664 D02, SAR plot is only required for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination; Plots are also required when the measured SAR is  $> 1.5\text{ W/kg}$ , or  $> 7.0\text{ W/kg}$  for occupational exposure. The published RF exposure KDB procedures may require additional plots; for example, to support SAR to peak location separation ratio test exclusion and/or volume scan post-processing (Refer to appendix B for details).

### WiFi Notes:

Per KDB 248227 D01:

- 1) 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..
- 2) When the DSSS *reported* SAR of the highest measured maximum output power channel for the exposure configuration is  $\leq 0.8\text{ W/kg}$ , no further SAR testing is required for 802.11b DSSS in that exposure configuration.
- 3) 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  $\leq 1.2\text{ W/kg}$ , SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations
- 4) The highest SAR measured for the initial test position or initial test configuration should be used to determine SAR test exclusion according to the sum of 1-g SAR and SAR peak to location ratio provisions in KDB 447498. In addition, a test lab may also choose to perform standalone SAR measurements for test positions and 802.11 configurations that are not required by the initial test position or initial test configuration procedures and apply the results to determine simultaneous transmission SAR test exclusion, according to sum of 1-g and SAR peak to location ratio requirements to reduce the number of simultaneous transmission SAR measurements.
- 5) For WIFI 2.4G MIMO, SAR is measured with all antennas transmitting simultaneously at the specified maximum output power of MIMO operation.

6) For WIFI 5G MIMO, SAR is measured with all antennas transmitting simultaneously at the specified maximum output power of MIMO operation.

**BT Notes:**

The reported SAR for BT is scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

## 7.2.1 SAR measurement Results of WiFi 2.4G

| Test Position of Body                               | Dist. | Test Channel /Freq.(MHz) | Test Mode    | Area Scan 1-g SAR (W/kg) | Measured SAR(W/kg) |       | Power Drift (dB) | Actual duty cycle | Scaled 1-g SAR (W/kg) | Conducted Power (dBm) | Tune-up Power (dBm) | Reported 1-g SAR (W/kg) | Accessory Information | SAR Plot. |
|-----------------------------------------------------|-------|--------------------------|--------------|--------------------------|--------------------|-------|------------------|-------------------|-----------------------|-----------------------|---------------------|-------------------------|-----------------------|-----------|
|                                                     |       |                          |              |                          | 1-g                | 10-g  |                  |                   |                       |                       |                     |                         |                       |           |
| Main Antenna                                        |       |                          |              |                          |                    |       |                  |                   |                       |                       |                     |                         |                       |           |
| MACHR-W29 SAR test data                             |       |                          |              |                          |                    |       |                  |                   |                       |                       |                     |                         |                       |           |
| Bottom Side                                         | 0mm   | 10/2457                  | 802.11b      | 0.416                    | 0.501              | 0.197 | 0.13             | 98%               | 0.511                 | 15.87                 | 17.00               | 0.663                   | Battery 1#            | /         |
| Bottom Side                                         | 0mm   | 10/2457                  | 802.11b      | 0.435                    | 0.553              | 0.219 | 0.00             | 98%               | 0.564                 | 15.87                 | 17.00               | 0.732                   | Battery 2#            | /         |
| Bottom Side                                         | 0mm   | 2/2417                   | 802.11b      | 0.391                    | 0.495              | 0.197 | 0.12             | 98%               | 0.505                 | 15.71                 | 17.00               | 0.680                   | Battery 2#            | /         |
| Bottom Side                                         | 0mm   | 6/2437                   | 802.11b      | 0.410                    | 0.559              | 0.219 | 0.15             | 98%               | 0.570                 | 15.75                 | 17.00               | 0.761                   | Battery 2#            | Yes       |
| MACHR-W19 tested at the SAR worse case of MACHR-W29 |       |                          |              |                          |                    |       |                  |                   |                       |                       |                     |                         |                       |           |
| Bottom Side                                         | 0mm   | 6/2437                   | 802.11b      | 0.415                    | 0.461              | 0.184 | 0.00             | 98%               | 0.470                 | 15.75                 | 17.00               | 0.627                   | Battery 2#            | /         |
| Aux Antenna                                         |       |                          |              |                          |                    |       |                  |                   |                       |                       |                     |                         |                       |           |
| MACHR-W29 SAR test data                             |       |                          |              |                          |                    |       |                  |                   |                       |                       |                     |                         |                       |           |
| Bottom Side                                         | 0mm   | 10/2457                  | 802.11b      | 0.351                    | 0.493              | 0.202 | -0.10            | 98%               | 0.503                 | 15.60                 | 17.00               | 0.694                   | Battery 1#            | /         |
| Bottom Side                                         | 0mm   | 10/2457                  | 802.11b      | 0.289                    | 0.484              | 0.196 | -0.07            | 98%               | 0.494                 | 15.60                 | 17.00               | 0.682                   | Battery 2#            | /         |
| Bottom Side                                         | 0mm   | 2/2417                   | 802.11b      | 0.342                    | 0.496              | 0.201 | 0.12             | 98%               | 0.506                 | 15.50                 | 17.00               | 0.715                   | Battery 1#            | Yes       |
| Bottom Side                                         | 0mm   | 6/2437                   | 802.11b      | 0.306                    | 0.414              | 0.173 | -0.05            | 98%               | 0.422                 | 15.52                 | 17.00               | 0.594                   | Battery 1#            | /         |
| MACHR-W19 tested at the SAR worse case of MACHR-W29 |       |                          |              |                          |                    |       |                  |                   |                       |                       |                     |                         |                       |           |
| Bottom Side                                         | 0mm   | 2/2417                   | 802.11b      | 0.374                    | 0.491              | 0.195 | 0.13             | 98%               | 0.501                 | 15.50                 | 17.00               | 0.708                   | Battery 1#            | /         |
| MIMO Mode                                           |       |                          |              |                          |                    |       |                  |                   |                       |                       |                     |                         |                       |           |
| MACHR-W29 SAR test data                             |       |                          |              |                          |                    |       |                  |                   |                       |                       |                     |                         |                       |           |
| Bottom Side                                         | 0mm   | 10/2457                  | 802.11n(20M) | 0.137                    | 0.166              | 0.067 | 0.14             | 98%               | 0.169                 | 15.67                 | 17.00               | 0.230                   | Battery 1#            | /         |
| Bottom Side                                         | 0mm   | 10/2457                  | 802.11n(20M) | 0.200                    | 0.279              | 0.111 | -0.05            | 98%               | 0.285                 | 15.67                 | 17.00               | 0.387                   | Battery 2#            | Yes       |
| Bottom Side                                         | 0mm   | 2/2417                   | 802.11n(20M) | 0.170                    | 0.227              | 0.090 | 0.12             | 98%               | 0.232                 | 15.47                 | 17.00               | 0.329                   | Battery 2#            | /         |
| Bottom Side                                         | 0mm   | 6/2437                   | 802.11n(20M) | 0.199                    | 0.235              | 0.091 | -0.15            | 98%               | 0.240                 | 15.57                 | 17.00               | 0.333                   | Battery 2#            | /         |
| MACHR-W19 tested at the SAR worse case of MACHR-W29 |       |                          |              |                          |                    |       |                  |                   |                       |                       |                     |                         |                       |           |
| Bottom Side                                         | 0mm   | 10/2457                  | 802.11n(20M) | 0.200                    | 0.241              | 0.096 | 0.17             | 98%               | 0.246                 | 15.67                 | 17.00               | 0.334                   | Battery 2#            | /         |

Table 12: Body SAR test results of WiFi 2.4G

Note:

- 1) Per KDB248227D01, for Body SAR test of WiFi 2.4G SISO(MAIN or AUX), SAR is measured for 2.4 GHz 802.11b DSSS using the initial test position procedure. The highest reported SAR for DSSS is adjusted by the ratio of OFDM 802.11g/n to DSSS specified maximum output power and the adjusted SAR is < 1.2 W/kg, so SAR for 802.11g/n is not required.
- 2) Per KDB248227D01, for Body SAR test of WiFi 2.4G MIMO, SAR is measured for 2.4 GHz 802.11n 20M using the initial test position procedure. The highest reported SAR for 802.11n 20M is adjusted by the ratio of 802.11n 40M to 802.11n 20M specified maximum output power and the adjusted SAR is < 1.2 W/kg, so SAR for 802.11n 40M is not required.

## 7.2.2 SAR measurement Results of WiFi 5G

| Test Position<br>of Body                            | Dist. | Test Channel<br>/Freq.(MHz) | Test Mode      | Area Scan<br>1-g SAR<br>(W/kg) | Measured SAR(W/kg) |       | Power Drift<br>(dB) | Actual<br>duty<br>cycle | Scaled<br>1-g SAR<br>(W/kg) | Conducted<br>Power<br>(dBm) | Tune-up<br>Power<br>(dBm) | Reported<br>1-g SAR<br>(W/kg) | Accessory<br>Information | SAR<br>Plot |
|-----------------------------------------------------|-------|-----------------------------|----------------|--------------------------------|--------------------|-------|---------------------|-------------------------|-----------------------------|-----------------------------|---------------------------|-------------------------------|--------------------------|-------------|
|                                                     |       |                             |                |                                | 1-g                | 10-g  |                     |                         |                             |                             |                           |                               |                          |             |
| Main Antenna                                        |       |                             |                |                                |                    |       |                     |                         |                             |                             |                           |                               |                          |             |
| MACHR-W29 SAR test data                             |       |                             |                |                                |                    |       |                     |                         |                             |                             |                           |                               |                          |             |
| Test data of U-NII-2A band                          |       |                             |                |                                |                    |       |                     |                         |                             |                             |                           |                               |                          |             |
| Bottom Side                                         | 0mm   | 58/5290                     | 802.11ac(80M)  | 0.230                          | 0.254              | 0.084 | 0.02                | 90%                     | 0.282                       | 8.97                        | 10.50                     | 0.401                         | Battery 1#               | /           |
| Bottom Side                                         | 0mm   | 58/5290                     | 802.11ac(80M)  | 0.221                          | 0.226              | 0.073 | -0.04               | 90%                     | 0.251                       | 8.97                        | 10.50                     | 0.357                         | Battery 2#               | /           |
| Test data of U-NII-2C band                          |       |                             |                |                                |                    |       |                     |                         |                             |                             |                           |                               |                          |             |
| Bottom Side                                         | 0mm   | 114/5570                    | 802.11ac(160M) | 0.321                          | 0.353              | 0.115 | -0.03               | 90%                     | 0.392                       | 8.75                        | 10.50                     | 0.587                         | Battery 1#               | /           |
| Bottom Side                                         | 0mm   | 114/5570                    | 802.11ac(160M) | 0.326                          | 0.382              | 0.125 | 0.07                | 90%                     | 0.424                       | 8.75                        | 10.50                     | 0.635                         | Battery 2#               | /           |
| Test data of U-NII-3 band                           |       |                             |                |                                |                    |       |                     |                         |                             |                             |                           |                               |                          |             |
| Bottom Side                                         | 0mm   | 155/5775                    | 802.11ac(80M)  | 0.374                          | 0.402              | 0.132 | -0.15               | 90%                     | 0.447                       | 9.35                        | 10.50                     | 0.582                         | Battery 1#               | /           |
| Bottom Side                                         | 0mm   | 155/5775                    | 802.11ac(80M)  | 0.392                          | 0.442              | 0.144 | 0.03                | 90%                     | 0.491                       | 9.35                        | 10.50                     | 0.640                         | Battery 2#               | Yes         |
| MACHR-W19 tested at the SAR worse case of MACHR-W29 |       |                             |                |                                |                    |       |                     |                         |                             |                             |                           |                               |                          |             |
| Bottom Side                                         | 0mm   | 155/5775                    | 802.11ac(80M)  | 0.325                          | 0.276              | 0.073 | -0.18               | 90%                     | 0.307                       | 9.35                        | 10.50                     | 0.400                         | Battery 2#               | /           |
| Aux Antenna                                         |       |                             |                |                                |                    |       |                     |                         |                             |                             |                           |                               |                          |             |
| MACHR-W29 SAR test data                             |       |                             |                |                                |                    |       |                     |                         |                             |                             |                           |                               |                          |             |
| Test data of U-NII-2A band                          |       |                             |                |                                |                    |       |                     |                         |                             |                             |                           |                               |                          |             |
| Bottom Side                                         | 0mm   | 58/5290                     | 802.11ac(80M)  | 0.242                          | 0.266              | 0.093 | 0.07                | 90%                     | 0.296                       | 9.88                        | 11.00                     | 0.383                         | Battery 1#               | /           |
| Bottom Side                                         | 0mm   | 58/5290                     | 802.11ac(80M)  | 0.217                          | 0.226              | 0.079 | -0.06               | 90%                     | 0.251                       | 9.88                        | 11.00                     | 0.325                         | Battery 2#               | /           |
| Test data of U-NII-2C band                          |       |                             |                |                                |                    |       |                     |                         |                             |                             |                           |                               |                          |             |
| Bottom Side                                         | 0mm   | 114/5570                    | 802.11ac(160M) | 0.335                          | 0.364              | 0.123 | -0.08               | 90%                     | 0.404                       | 9.25                        | 11.00                     | 0.605                         | Battery 1#               | Yes         |
| Bottom Side                                         | 0mm   | 114/5570                    | 802.11ac(160M) | 0.289                          | 0.302              | 0.102 | -0.10               | 90%                     | 0.336                       | 9.25                        | 11.00                     | 0.502                         | Battery 2#               | /           |
| Test data of U-NII-3 band                           |       |                             |                |                                |                    |       |                     |                         |                             |                             |                           |                               |                          |             |
| Bottom Side                                         | 0mm   | 155/5775                    | 802.11ac(80M)  | 0.276                          | 0.328              | 0.111 | -0.11               | 90%                     | 0.364                       | 10.04                       | 11.00                     | 0.455                         | Battery 1#               | /           |
| Bottom Side                                         | 0mm   | 155/5775                    | 802.11ac(80M)  | 0.273                          | 0.298              | 0.099 | 0.00                | 90%                     | 0.331                       | 10.04                       | 11.00                     | 0.413                         | Battery 2#               | /           |
| MACHR-W19 tested at the SAR worse case of MACHR-W29 |       |                             |                |                                |                    |       |                     |                         |                             |                             |                           |                               |                          |             |
| Bottom Side                                         | 0mm   | 114/5570                    | 802.11ac(160M) | 0.259                          | 0.282              | 0.096 | 0.18                | 90%                     | 0.313                       | 9.25                        | 11.00                     | 0.469                         | Battery 1#               | /           |
| MIMO Mode                                           |       |                             |                |                                |                    |       |                     |                         |                             |                             |                           |                               |                          |             |
| MACHR-W29 SAR test data                             |       |                             |                |                                |                    |       |                     |                         |                             |                             |                           |                               |                          |             |
| Test data of U-NII-2A band                          |       |                             |                |                                |                    |       |                     |                         |                             |                             |                           |                               |                          |             |
| Bottom Side                                         | 0mm   | 58/5290                     | 802.11ac(80M)  | 0.110                          | 0.113              | 0.037 | -0.13               | 90%                     | 0.126                       | 10.04                       | 11.00                     | 0.157                         | Battery 1#               | /           |
| Bottom Side                                         | 0mm   | 58/5290                     | 802.11ac(80M)  | 0.145                          | 0.174              | 0.058 | -0.10               | 90%                     | 0.193                       | 10.04                       | 11.00                     | 0.241                         | Battery 2#               | /           |
| Test data of U-NII-2C band                          |       |                             |                |                                |                    |       |                     |                         |                             |                             |                           |                               |                          |             |
| Bottom Side                                         | 0mm   | 114/5570                    | 802.11ac(160M) | 0.184                          | 0.208              | 0.067 | 0.00                | 90%                     | 0.231                       | 10.11                       | 11.00                     | 0.284                         | Battery 1#               | /           |
| Bottom Side                                         | 0mm   | 114/5570                    | 802.11ac(160M) | 0.166                          | 0.162              | 0.050 | -0.13               | 90%                     | 0.180                       | 10.11                       | 11.00                     | 0.221                         | Battery 2#               | /           |
| Test data of U-NII-3 band                           |       |                             |                |                                |                    |       |                     |                         |                             |                             |                           |                               |                          |             |
| Bottom Side                                         | 0mm   | 155/5775                    | 802.11ac(80M)  | 0.247                          | 0.250              | 0.078 | 0.00                | 90%                     | 0.278                       | 10.15                       | 11.00                     | 0.338                         | Battery 1#               | Yes         |
| Bottom Side                                         | 0mm   | 155/5775                    | 802.11ac(80M)  | 0.191                          | 0.209              | 0.065 | -0.14               | 90%                     | 0.232                       | 10.15                       | 11.00                     | 0.282                         | Battery 2#               | /           |
| MACHR-W19 tested at the SAR worse case of MACHR-W29 |       |                             |                |                                |                    |       |                     |                         |                             |                             |                           |                               |                          |             |
| Bottom Side                                         | 0mm   | 155/5775                    | 802.11ac(80M)  | 0.189                          | 0.201              | 0.063 | 0.00                | 90%                     | 0.223                       | 10.15                       | 11.00                     | 0.272                         | Battery 1#               | /           |

Table 13: Body SAR test results of WiFi 5G

Note:

1)Per KDB248227D01, for Body SAR test of WiFi 5G U-NII-2A band, SAR is measured for 5GHz 802.11ac 80M using the initial test position procedure. The highest reported SAR is adjusted by the ratio of 802.11ac 80M to other WiFi 5G mode specified maximum output power and the adjusted SAR is  $< 1.2$  W/kg, so SAR for other WiFi 5G mode is not required.

2)Per KDB248227D01, for Body SAR test of WiFi 5G U-NII-2C band, SAR is measured for 5GHz 802.11ac 160M using the initial test position procedure. The highest reported SAR is adjusted by the ratio of 802.11ac 160M to other WiFi 5G mode specified maximum output power and the adjusted SAR is  $< 1.2$  W/kg, so SAR for other WiFi 5G mode is not required.

3)Per KDB248227D01, for Body SAR test of WiFi 5G U-NII-3 band, SAR is measured for 5GHz 802.11ac 80M using the initial test position procedure. The highest reported SAR is adjusted by the ratio of 802.11ac 80M to other WiFi 5G mode specified maximum output power and the adjusted SAR is  $< 1.2$  W/kg, so SAR for other WiFi 5G mode is not required.

4) 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. As 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).

### 7.2.3 SAR measurement Results of BT

| Test Position of Body                               | Test Channel /Freq.(MHz) | Test Mode | Measured SAR(W/kg) |       | Power Drift (dB) | Actual duty cycle | Cal duty cycle | Scaled 1-g SAR (W/kg) | Conducted Power (dBm) | Tune-up Power (dBm) | Reported 1-g SAR (W/kg) | Accessory Information | SAR Plot. |
|-----------------------------------------------------|--------------------------|-----------|--------------------|-------|------------------|-------------------|----------------|-----------------------|-----------------------|---------------------|-------------------------|-----------------------|-----------|
|                                                     |                          |           | 1-g                | 10-g  |                  |                   |                |                       |                       |                     |                         |                       |           |
| MACHR-W29 SAR test data                             |                          |           |                    |       |                  |                   |                |                       |                       |                     |                         |                       |           |
| Bottom Side                                         | 39/2441                  | DH5       | 0.052              | 0.020 | 0.14             | 77%               | 100%           | 0.068                 | 10.25                 | 10.70               | 0.075                   | Battery 1#            | /         |
| Bottom Side                                         | 39/2441                  | DH5       | 0.055              | 0.021 | -0.14            | 77%               | 100%           | 0.071                 | 10.25                 | 10.70               | 0.079                   | Battery 2#            | /         |
| Bottom Side                                         | 0/2402                   | DH5       | 0.057              | 0.022 | -0.17            | 77%               | 100%           | 0.074                 | 9.48                  | 10.70               | 0.098                   | Battery 2#            | /         |
| Bottom Side                                         | 78/2480                  | DH5       | 0.050              | 0.019 | -0.14            | 77%               | 100%           | 0.065                 | 10.50                 | 10.70               | 0.068                   | Battery 2#            | /         |
| MACHR-W19 tested at the SAR worse case of MACHR-W29 |                          |           |                    |       |                  |                   |                |                       |                       |                     |                         |                       |           |
| Bottom Side                                         | 0/2402                   | DH5       | 0.064              | 0.025 | -0.10            | 77%               | 100%           | 0.083                 | 9.48                  | 10.70               | 0.110                   | Battery 2#            | Yes       |

Table 14: Body SAR test results of BT

### 7.3 Multiple Transmitter Evaluation

The following tables list information which is relevant for the decision if a simultaneous transmit evaluation is necessary according to FCC KDB 447498 D01 General RF Exposure Guidance.

The detailed location of the Tx antennas inside the device refers to Appendix E.

#### 7.3.1 Simultaneous Transmission Possibilities

The Simultaneous Transmission Possibilities of this device are as below:

| No. | Simultaneous Tx Combination | Body |
|-----|-----------------------------|------|
| 1   | wifi 5G Main+BT             | Yes  |
| 2   | wifi 5G Aux+BT              | Yes  |
| 3   | wifi 5G MIMO+BT             | Yes  |
| 4   | wifi 2.4G Main+BT           | Yes  |
| 5   | wifi 5G Main+2.4G Main      | Yes  |
| 6   | wifi 5G Main+2.4G Aux       | Yes  |
| 7   | wifi 5G Aux+2.4G Main       | Yes  |
| 8   | wifi 5G Aux+2.4G Aux        | Yes  |
| 9   | wifi 5G Aux+2.4G Main+ BT   | Yes  |
| 10  | wifi 5G Main+2.4G Main+ BT  | Yes  |

Table 15: Simultaneous Transmission Possibilities

Note:

- 1) WiFi 2.4G Aux and Bluetooth can't transmit simultaneously, because they share the same antenna.
- 2) Wi-Fi 2.4G has two TX antennas. Wi-Fi 2.4G 802.11n support 2\*2 MIMO function.
- 3) Wi-Fi 5G has two TX antennas. Wi-Fi 5G 802.11 n/ac support 2\*2 MIMO function.

### 7.3.2 SAR Summation Scenario

| Test Position             | WiFi Max <sub>SAR</sub> (W/kg) |                  |                   |                 |                |                 | BT Max <sub>SAR</sub><br>(W/kg) | Σ1-g SAR<br>(W/kg) |       |       |       |       |       |       |       |              |       |
|---------------------------|--------------------------------|------------------|-------------------|-----------------|----------------|-----------------|---------------------------------|--------------------|-------|-------|-------|-------|-------|-------|-------|--------------|-------|
|                           | WiFi 2.4G<br>MAIN              | WiFi 2.4G<br>AUX | WiFi 2.4G<br>MIMO | WiFi 5G<br>MAIN | WiFi 5G<br>AUX | WiFi 5G<br>MIMO |                                 |                    |       |       |       |       |       |       |       |              |       |
|                           | 1                              | 2                | 3                 | 4               | 5              | 6               |                                 | 1+4                | 1+5   | 1+7   | 2+4   | 2+5   | 4+7   | 5+7   | 6+7   | 1+4+7        | 1+5+7 |
| Body 0mm<br>(Bottom Side) | 0.761                          | 0.715            | 0.387             | 0.640           | 0.605          | 0.338           | 0.110                           | 1.401              | 1.366 | 0.871 | 1.355 | 1.320 | 0.750 | 0.715 | 0.448 | <b>1.511</b> | 1.476 |

Table 16: SAR Simultaneous Tx Combination

### 7.3.3 Simultaneous Transmission Conclusion

The above numeral summed SAR results is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit and therefore simultaneous transmission SAR with Volume Scans is not required per KDB 447498 D01.



**Appendix A. System Check Plots**

(Please See Appendix No.: SYBH(Z-SAR)20190123011002-2A, total: 10 pages)

**Appendix B. SAR Measurement Plots**

(Please See Appendix No.: SYBH(Z-SAR)20190123011002-2B, total: 8 pages)

**Appendix C. Calibration Certificate**

(Please See Appendix No.: SYBH(Z-SAR)20190123011002-2C, total: 86 pages)

**Appendix D. Photo documentation**

(Please See Appendix No.: SYBH(Z-SAR)20190123011002-2D, total: 4 pages)

**Appendix E. Antenna Location**

(Please See Appendix No.: SYBH(Z-SAR)20190123011002-2E, total: 1 page)

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**End**