



# RF EXPOSURE EVALUATION REPORT

**Product Name:** IP Phone  
**Trade Mark:** GRANDSTREAM  
**Model No:** GRP2616  
**HVIN:** GRP2616V2  
**Report Number:** 200829026RFC-5  
**Test Standards:** FCC 47 CFR Part 1 Subpart I  
RSS-102 Issue 5  
**FCC ID:** YZZGRP2616V2  
**IC:** 11964A-GRP2616V2  
**Test Result:** PASS  
**Date of Issue:** November 16, 2020

Prepared for:

**Grandstream Networks, Inc.**  
**126 Brookline Ave., 3rd Floor Boston, MA 02215, USA**

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UTTR-RF-RSS102-V1.0

## Version

| Version No. | Date              | Description |
|-------------|-------------------|-------------|
| V1.0        | November 16, 2020 | Original    |



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## 1. GENERAL INFORMATION

### 1.1 CLIENT INFORMATION

|                                 |                                                     |
|---------------------------------|-----------------------------------------------------|
| <b>Applicant:</b>               | Grandstream Networks, Inc.                          |
| <b>Address of Applicant:</b>    | 126 Brookline Ave., 3rd Floor Boston, MA 02215, USA |
| <b>Manufacturer:</b>            | Grandstream Networks, Inc.                          |
| <b>Address of Manufacturer:</b> | 126 Brookline Ave., 3rd Floor Boston, MA 02215, USA |

### 1.2 EUT INFORMATION

|                               |                    |                        |                   |
|-------------------------------|--------------------|------------------------|-------------------|
| <b>Product Name:</b>          | IP Phone           |                        |                   |
| <b>Model No:</b>              | GRP2616            |                        |                   |
| <b>HVIN:</b>                  | GRP2616V2          |                        |                   |
| <b>Trade Mark:</b>            | GRANDSTREAM        |                        |                   |
| <b>DUT Stage:</b>             | Production Unit    |                        |                   |
| <b>EUT Supports Function:</b> | 2.4 GHz ISM Band:  | IEEE 802.11b/g/n       |                   |
|                               |                    | Bluetooth V4.2         |                   |
|                               | 5 GHz U-NII Bands: | 5 150 MHz to 5 250 MHz | IEEE 802.11a/n/ac |
|                               |                    | 5 250 MHz to 5 350 MHz | IEEE 802.11a/n/ac |
|                               |                    | 5 470 MHz to 5 725 MHz | IEEE 802.11a/n/ac |
|                               |                    | 5 725 MHz to 5 850 MHz | IEEE 802.11a/n/ac |
| <b>Sample Received Date:</b>  | September 3, 2020  |                        |                   |

### 1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

| For BT_LE                  |                        |
|----------------------------|------------------------|
| <b>Frequency Band:</b>     | 2400 MHz to 2483.5 MHz |
| <b>Frequency Range:</b>    | 2402 MHz to 2480 MHz   |
| <b>Bluetooth Version:</b>  | Bluetooth LE           |
| <b>Type of Modulation:</b> | GFSK                   |
| <b>Number of Channels:</b> | 40                     |
| <b>Channel Separation:</b> | 2 MHz                  |
| <b>Antenna Type:</b>       | Dipole Antenna         |
| <b>Antenna Gain:</b>       | 3.5 dBi                |
| <b>Maximum Peak Power:</b> | 3.6 dBm                |

| For BT_EDR                   |                                         |
|------------------------------|-----------------------------------------|
| <b>Frequency Band:</b>       | 2400 MHz to 2483.5 MHz                  |
| <b>Frequency Range:</b>      | 2402 MHz to 2480 MHz                    |
| <b>Bluetooth Version:</b>    | Bluetooth BR + EDR                      |
| <b>Modulation Technique:</b> | Frequency Hopping Spread Spectrum(FHSS) |
| <b>Type of Modulation:</b>   | GFSK, $\pi/4$ DQPSK, 8DPSK              |
| <b>Number of Channels:</b>   | 79                                      |
| <b>Channel Separation:</b>   | 1 MHz                                   |
| <b>Antenna Type:</b>         | Dipole Antenna                          |
| <b>Antenna Gain:</b>         | 3.5 dBi                                 |
| <b>Maximum Peak Power:</b>   | 8.439 dBm                               |

| For 2.4 GHz ISM Band of Wi-Fi |                                                                                                                                                |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Frequency Band:               | 2400 MHz to 2483.5 MHz                                                                                                                         |
| Frequency Range:              | 2412 MHz to 2462 MHz                                                                                                                           |
| Support Standards:            | IEEE 802.11b, IEEE 802.11g, IEEE 802.11n-HT20                                                                                                  |
| Type of Modulation:           | IEEE 802.11b: DSSS(CCK, DQPSK, DBPSK)<br>IEEE 802.11g: OFDM(64-QAM, 16-QAM, QPSK, BPSK)<br>IEEE 802.11n-HT20: OFDM(64-QAM, 16-QAM, QPSK, BPSK) |
| Data Rate:                    | IEEE 802.11b: Up to 11 Mbps<br>IEEE 802.11g: Up to 54 Mbps<br>IEEE 802.11n-HT20: Up to MCS7                                                    |
| Number of Channels:           | IEEE 802.11b: 11<br>IEEE 802.11g: 11<br>IEEE 802.11n-HT20: 11                                                                                  |
| Channel Separation:           | 5 MHz                                                                                                                                          |
| Antenna Type:                 | Dipole Antenna                                                                                                                                 |
| Antenna Gain:                 | 3.5 dBi                                                                                                                                        |
| Maximum EIRP (dBm):           | IEEE 802.11b: 22.40 dBm<br>IEEE 802.11g: 27.67 dBm<br>IEEE 802.11n-HT20: 27.32 dBm                                                             |
| Maximum Peak Power:           | IEEE 802.11b: 18.90 dBm<br>IEEE 802.11g: 24.17 dBm<br>IEEE 802.11n-HT20: 23.82 dBm                                                             |

| For 5 GHz U-NII Bands of Wi-Fi |                                                                                                 |
|--------------------------------|-------------------------------------------------------------------------------------------------|
| Frequency Bands:               | 5150 MHz to 5250 MHz (U-NII-1)                                                                  |
|                                | 5250 MHz to 5350 MHz (U-NII-2A)                                                                 |
|                                | 5470 MHz to 5725 MHz (U-NII-2C)                                                                 |
|                                | 5 725 MHz to 5 850 MHz (U-NII-3)                                                                |
| Frequency Ranges:              | 5180 MHz to 5240 MHz                                                                            |
|                                | 5260 MHz to 5320 MHz                                                                            |
|                                | 5500 MHz to 5700 MHz                                                                            |
|                                | 5 745 MHz to 5 825 MHz                                                                          |
| Support Standards:             | IEEE 802.11a/n/ac                                                                               |
| TPC Function:                  | Not Support                                                                                     |
| DFS Operational mode:          | Slave without radar Interference detection function                                             |
| Type of Modulation:            | IEEE 802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK)                                                    |
|                                | IEEE 802.11n: OFDM(64QAM, 16QAM, QPSK, BPSK)                                                    |
|                                | IEEE 802.11ac: OFDM(256QAM, 64QAM, 16QAM, QPSK, BPSK)                                           |
| Channel Spacing:               | IEEE 802.11a/n-HT20/ac-VHT20: 20 MHz                                                            |
|                                | IEEE 802.11n-HT40/ac-VHT40: 40 MHz                                                              |
|                                | IEEE 802.11ac-VHT80: 80 MHz                                                                     |
| Data Rate:                     | IEEE 802.11a: Up to 54 Mbps                                                                     |
|                                | IEEE 802.11n-HT20: Up to MCS15                                                                  |
|                                | IEEE 802.11n-HT40: Up to MCS15                                                                  |
|                                | IEEE 802.11ac-VHT20: Up to MCS8                                                                 |
|                                | IEEE 802.11ac-VHT40: Up to MCS9                                                                 |
| Number of Channels:            | IEEE 802.11ac-VHT80: Up to MCS9                                                                 |
|                                | 5150 MHz to 5250 MHz:<br>4 for IEEE 802.11a/n-HT20/ac-VHT20<br>2 for IEEE 802.11n-HT40/ac-VHT40 |

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|                                              |                                                                                                                               |                |                 |                 |                |
|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------|-----------------|----------------|
|                                              | 1 for IEEE 802.11acVHT80                                                                                                      |                |                 |                 |                |
|                                              | 5250 MHz to 5350 MHz:<br>4 for IEEE 802.11a/n-HT20/ac-VHT20<br>2 for IEEE 802.11n-HT40)/ac-VHT40<br>1 for IEEE 802.11acVHT80  |                |                 |                 |                |
|                                              | 5470 MHz to 5725 MHz:<br>11 for IEEE 802.11a/n-HT20/ac-VHT20<br>5 for IEEE 802.11n-HT40/ac-VHT40<br>2 for IEEE 802.11ac-VHT80 |                |                 |                 |                |
|                                              | 5725 MHz to 5850 MHz:<br>5 for IEEE 802.11a/n-HT20/ac-VHT20<br>2 for IEEE 802.11n-HT40/ac-VHT40<br>1 for IEEE 802.11ac-VHT80  |                |                 |                 |                |
| <b>Antenna Type:</b>                         | Dipole Antenna                                                                                                                |                |                 |                 |                |
| <b>Antenna Gain:</b>                         | 5150 MHz to 5250 MHz: 4.0 dBi                                                                                                 |                |                 |                 |                |
|                                              | 5250 MHz to 5350 MHz: 4.0 dBi                                                                                                 |                |                 |                 |                |
|                                              | 5470 MHz to 5725 MHz: 4.0 dBi                                                                                                 |                |                 |                 |                |
|                                              | 5725 MHz to 5850 MHz: 4.0 dBi                                                                                                 |                |                 |                 |                |
| <b>Maximum EIRP (dBm):</b>                   | <b>Chain 0</b>                                                                                                                |                | <b>U-NII-1</b>  |                 |                |
|                                              | IEEE 802.11a:                                                                                                                 |                | 19.74           |                 |                |
|                                              | IEEE 802.11n-HT20:                                                                                                            |                | 19.31           |                 |                |
|                                              | IEEE 802.11n-HT40:                                                                                                            |                | 15.91           |                 |                |
|                                              | IEEE 802.11ac-VHT20:                                                                                                          |                | 19.35           |                 |                |
|                                              | IEEE 802.11ac-VHT40:                                                                                                          |                | 14.24           |                 |                |
|                                              | IEEE 802.11ac-VHT80:                                                                                                          |                | 13.66           |                 |                |
| <b>Maximum conducted output power (dBm):</b> |                                                                                                                               | <b>U-NII-1</b> | <b>U-NII-2A</b> | <b>U-NII-2C</b> | <b>U-NII-3</b> |
|                                              | IEEE 802.11a:                                                                                                                 | 15.74          | 15.57           | 13.71           | 16.31          |
|                                              | IEEE 802.11n-HT20:                                                                                                            | 15.31          | 15.23           | 14.30           | 16.05          |
|                                              | IEEE 802.11n-HT40:                                                                                                            | 11.91          | 11.85           | 10.87           | 12.99          |
|                                              | IEEE 802.11ac-VHT20                                                                                                           | 15.35          | 15.21           | 14.27           | 15.05          |
|                                              | IEEE 802.11ac-VHT40                                                                                                           | 10.24          | 10.15           | 9.36            | 13.08          |
|                                              | IEEE 802.11ac-VHT80:                                                                                                          | 9.66           | 9.71            | 11.06           | 15.31          |

## 1.4 OTHER INFORMATION

| Test channels for BT_LE |                      |                       |                  |                   |
|-------------------------|----------------------|-----------------------|------------------|-------------------|
| Type of Modulation      | Tx/Rx Frequency      | Test RF Channel Lists |                  |                   |
| GFSK                    | 2402 MHz to 2480 MHz | <b>Lowest(L)</b>      | <b>Middle(M)</b> | <b>Highest(H)</b> |
|                         |                      | Channel 0             | Channel 19       | Channel 39        |
|                         |                      | 2402 MHz              | 2440 MHz         | 2480 MHz          |

| Test channels for BT_EDR         |                      |                       |                  |                   |
|----------------------------------|----------------------|-----------------------|------------------|-------------------|
| Mode                             | Tx/Rx Frequency      | Test RF Channel Lists |                  |                   |
| GFSK<br>(DH1, DH3, DH5)          | 2402 MHz to 2480 MHz | <b>Lowest(L)</b>      | <b>Middle(M)</b> | <b>Highest(H)</b> |
|                                  |                      | Channel 0             | Channel 39       | Channel 78        |
|                                  |                      | 2402 MHz              | 2441 MHz         | 2480 MHz          |
| $\pi/4$ DQPSK<br>(DH1, DH3, DH5) | 2402 MHz to 2480 MHz | Channel 0             | Channel 39       | Channel 78        |
|                                  |                      | 2402 MHz              | 2441 MHz         | 2480 MHz          |

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|                          |                      |           |            |            |
|--------------------------|----------------------|-----------|------------|------------|
| 8DPSK<br>(DH1, DH3, DH5) | 2402 MHz to 2480 MHz | Channel 0 | Channel 39 | Channel 78 |
|                          |                      | 2402 MHz  | 2441 MHz   | 2480 MHz   |

| Test channels for 2.4 GHz ISM Band of Wi-Fi |                      |                       |           |            |
|---------------------------------------------|----------------------|-----------------------|-----------|------------|
| Mode                                        | Tx/Rx Frequency      | Test RF Channel Lists |           |            |
|                                             |                      | Lowest(L)             | Middle(M) | Highest(H) |
| IEEE 802.11b                                | 2412 MHz to 2462 MHz | Channel 1             | Channel 6 | Channel 11 |
|                                             |                      | 2412 MHz              | 2437 MHz  | 2462 MHz   |
| IEEE 802.11g                                | 2412 MHz to 2462 MHz | Channel 1             | Channel 6 | Channel 11 |
|                                             |                      | 2412 MHz              | 2437 MHz  | 2462 MHz   |
| IEEE 802.11n-HT20                           | 2412 MHz to 2462 MHz | Channel 1             | Channel 6 | Channel 11 |
|                                             |                      | 2412 MHz              | 2437 MHz  | 2462 MHz   |

| Test channels for 5 GHz U-NII Bands of Wi-Fi             |                      |                       |             |             |
|----------------------------------------------------------|----------------------|-----------------------|-------------|-------------|
| Mode                                                     | Tx/Rx Frequency      | Test RF Channel Lists |             |             |
|                                                          |                      | Lowest(L)             | Middle(M)   | Highest(H)  |
| IEEE 802.11a<br>IEEE 802.11n-HT20<br>IEEE 802.11ac-VHT20 | 5150 MHz to 5250 MHz | Channel 36            | Channel 44  | Channel 48  |
|                                                          |                      | 5180 MHz              | 5220 MHz    | 5240 MHz    |
|                                                          | 5250 MHz to 5350 MHz | Channel 52            | Channel 60  | Channel 64  |
|                                                          |                      | 5260 MHz              | 5300 MHz    | 5320 MHz    |
|                                                          | 5470 MHz to 5725 MHz | Channel 100           | Channel 116 | Channel 140 |
|                                                          |                      | 5500 MHz              | 5580 MHz    | 5700 MHz    |
|                                                          | 5725 MHz to 5850 MHz | Channel 149           | Channel 157 | Channel 165 |
|                                                          |                      | 5745 MHz              | 5785 MHz    | 5825 MHz    |
| IEEE 802.11n-HT40<br>IEEE 802.11ac-VHT40                 | 5150 MHz to 5250 MHz | Channel 38            | --          | Channel 46  |
|                                                          |                      | 5190 MHz              | --          | 5230 MHz    |
|                                                          | 5250 MHz to 5350 MHz | Channel 54            | --          | Channel 62  |
|                                                          |                      | 5270 MHz              | --          | 5310 MHz    |
|                                                          | 5470 MHz to 5725 MHz | Channel 102           | Channel 110 | Channel 134 |
|                                                          |                      | 5510 MHz              | 5550 MHz    | 5670 MHz    |
|                                                          | 5725 MHz to 5850 MHz | Channel 151           | --          | Channel 159 |
|                                                          |                      | 5755 MHz              | --          | 5795 MHz    |
| IEEE 802.11ac-VHT80                                      | 5150 MHz to 5250 MHz | --                    | Channel 42  | --          |
|                                                          |                      | --                    | 5210 MHz    | --          |
|                                                          | 5250 MHz to 5350 MHz | --                    | Channel 58  | --          |
|                                                          |                      | --                    | 5290 MHz    | --          |
|                                                          | 5470 MHz to 5725 MHz | Channel 106           | --          | --          |
|                                                          |                      | 5530 MHz              | --          | --          |
|                                                          | 5725 MHz to 5850 MHz | --                    | Channel 155 | --          |
|                                                          |                      | --                    | 5775 MHz    | --          |

## 1.5 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product, according to the specifications of the manufacturers. It must comply with the requirements of the following standards:

**FCC 47 CFR Part 1 Subpart I**  
**RSS-102 Issue 5**

All test items have been performed and recorded as per the above standards

## 1.6 DEVIATION FROM STANDARDS

None.

## 1.7 ABNORMALITIES FROM STANDARD CONDITIONS

None.

## 1.8 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

## 2. EQUIPMENT LIST

Please refer to the RF test report.

## 3. MPE EVALUATION

### 3.1 REFERENCE DOCUMENTS FOR EVALUATION

| No. | Identity                                        | Document Title                                                                                 |
|-----|-------------------------------------------------|------------------------------------------------------------------------------------------------|
| 1   | FCC 47 CFR Part 1 Subpart I                     | PROCEDURES IMPLEMENTING THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969                          |
| 2   | RSS-102 Issue 5                                 | Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) |
| 3   | KDB 447498 D01 General RF Exposure Guidance v06 | RF EXPOSURE PROCEDURES AND EQUIPMENT AUTHORIZATION POLICIES FOR MOBILE AND PORTABLE DEVICES    |

### 3.2 MPE COMPLIANCE REQUIREMENT

#### 3.2.1 Limits

##### 3.2.1.1 FCC 47 CFR Part 1 Subpart I

According to §1.1307(b)(1), system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

#### Limits for Occupational / Controlled Exposure

| Frequency range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/cm <sup>2</sup> ) | Averaging Times   E   <sup>2</sup> ,   H   <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|-----------------------------------------|------------------------------------------------------------------------|
| 0.3-3.0               | 614                               | 1.63                              | (100)*                                  | 6                                                                      |
| 3.0-30                | 1842/f                            | 4.89/f                            | (900/f)*                                | 6                                                                      |
| 30-300                | 61.4                              | 0.163                             | 1.0                                     | 6                                                                      |
| 300-1500              | /                                 | /                                 | F/300                                   | 6                                                                      |
| 1500-100000           | /                                 | /                                 | 5                                       | 6                                                                      |

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**Limits for General Population / Uncontrolled Exposure**

| Frequency range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/cm <sup>2</sup> ) | Averaging Times   E   <sup>2</sup> ,   H   <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|-----------------------------------------|------------------------------------------------------------------------|
| 0.3-1.34              | 614                               | 1.63                              | (100)*                                  | 30                                                                     |
| 1.34-30               | 824/f                             | 2.19/f                            | (180/f)*                                | 30                                                                     |
| 30-300                | 27.5                              | 0.073                             | 0.2                                     | 30                                                                     |
| 300-1500              | /                                 | /                                 | F/1500                                  | 30                                                                     |
| 1500-100000           | /                                 | /                                 | <b>1</b>                                | 30                                                                     |

**Note:** f = frequency in MHz: \* = Plane-wave equivalents power density.

**3.2.1.2 RSS-102 Issue 5**

According to RSS-102 Issue 5, system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

According to RSS-102 Issue 5, system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz<sup>6</sup> and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $4.49/f^{0.5}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $1.31 \times 10^{-2} f^{0.6834}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

**3.2.2 Test Procedure**

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

**3.3 MPE CALCULATION METHOD****FCC 47 CFR Part 1 Subpart I**

$$S = PG/4\pi R^2 = EIRP/4\pi R^2$$

S = power density (in appropriate units, e.g., mW/cm<sup>2</sup>)

P = power input to the antenna (in appropriate units, e.g., mW)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor is normally numeric gain.

R = distance to the center of radiation of the antenna (in appropriate units, e.g., cm)

**3.4 MPE CALCULATION RESULTS**

**Note:** For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

### 3.4.1 For WLAN

For Wi-Fi function, operating at 2412MHz to 2462 MHz for IEEE802.11b/g/n and operating at 5150 MHz to 5250 MHz for IEEE802.11a/n/ac and operating at 5250 MHz to 5350 MHz for IEEE802.11a/n/ac and operating at 5470 MHz to 5725 MHz for IEEE802.11a/n/ac and operating at 5725 MHz to 5850 MHz for IEEE802.11a/n/ac.

#### 3.4.1.1 Antenna Type:

Chain 0: Dipole Antenna

#### 3.4.1.2 Antenna Gain:

Chain 0: 2412MHz to 2462 MHz: 3.5 dBi  
5150 MHz to 5250 MHz: 4.0 dBi  
5250 MHz to 5350 MHz: 4.0 dBi  
5470 MHz to 5725 MHz: 4.0 dBi  
5725 MHz to 5850 MHz: 4.0 dBi

#### 3.4.1.3 Results for FCC 47 CFR Part 1 Subpart I

| Operating Mode                           | Freq. | Declared maximum conducted average output power | Max. positive tolerance according manufacturer | Antenna Gain | Calculated maximum EIRP | Declared maximum EIRP | MPE Limit             | MPE Value |
|------------------------------------------|-------|-------------------------------------------------|------------------------------------------------|--------------|-------------------------|-----------------------|-----------------------|-----------|
|                                          | (MHz) | (dBm)                                           |                                                | (dBi)        | (dBm)                   | (mW)                  | (mw/cm <sup>2</sup> ) |           |
| IEEE 802.11b                             | 2412  | 18                                              | 1                                              | 3.5          | 22.5                    | 177.8279              | 1                     | 0.0354    |
|                                          | 2437  | 18                                              | 1                                              | 3.5          | 22.5                    | 177.8279              | 1                     | 0.0354    |
|                                          | 2462  | 18                                              | 1                                              | 3.5          | 22.5                    | 177.8279              | 1                     | 0.0354    |
| IEEE 802.11g                             | 2412  | 24                                              | 1                                              | 3.5          | 28.5                    | 707.9458              | 1                     | 0.1408    |
|                                          | 2437  | 24                                              | 1                                              | 3.5          | 28.5                    | 707.9458              | 1                     | 0.1408    |
|                                          | 2462  | 24                                              | 1                                              | 3.5          | 28.5                    | 707.9458              | 1                     | 0.1408    |
| IEEE 802.11n-HT20                        | 2412  | 23                                              | 1                                              | 3.5          | 27.5                    | 562.3413              | 1                     | 0.1119    |
|                                          | 2437  | 23                                              | 1                                              | 3.5          | 27.5                    | 562.3413              | 1                     | 0.1119    |
|                                          | 2462  | 23                                              | 1                                              | 3.5          | 27.5                    | 562.3413              | 1                     | 0.1119    |
| IEEE 802.11a                             | 5180  | 16                                              | 1                                              | 4            | 21                      | 125.8925              | 1                     | 0.0250    |
|                                          | 5220  | 16                                              | 1                                              | 4            | 21                      | 125.8925              | 1                     | 0.0250    |
|                                          | 5240  | 16                                              | 1                                              | 4            | 21                      | 125.8925              | 1                     | 0.0250    |
|                                          | 5260  | 16                                              | 1                                              | 4            | 21                      | 125.8925              | 1                     | 0.0250    |
|                                          | 5300  | 16                                              | 1                                              | 4            | 21                      | 125.8925              | 1                     | 0.0250    |
|                                          | 5320  | 16                                              | 1                                              | 4            | 21                      | 125.8925              | 1                     | 0.0250    |
|                                          | 5500  | 14                                              | 1                                              | 4            | 19                      | 79.4328               | 1                     | 0.0158    |
|                                          | 5580  | 14                                              | 1                                              | 4            | 19                      | 79.4328               | 1                     | 0.0158    |
|                                          | 5700  | 14                                              | 1                                              | 4            | 19                      | 79.4328               | 1                     | 0.0158    |
|                                          | 5745  | 15                                              | 1.5                                            | 4            | 20.5                    | 112.2018              | 1                     | 0.0223    |
|                                          | 5785  | 15                                              | 1.5                                            | 4            | 20.5                    | 112.2018              | 1                     | 0.0223    |
|                                          | 5805  | 15                                              | 1.5                                            | 4            | 20.5                    | 112.2018              | 1                     | 0.0223    |
| IEEE 802.11n-HT20<br>IEEE 802.11ac-VHT20 | 5180  | 16                                              | 1                                              | 4            | 21                      | 125.8925              | 1                     | 0.0250    |
|                                          | 5220  | 16                                              | 1                                              | 4            | 21                      | 125.8925              | 1                     | 0.0250    |
|                                          | 5240  | 16                                              | 1                                              | 4            | 21                      | 125.8925              | 1                     | 0.0250    |
|                                          | 5260  | 16                                              | 1                                              | 4            | 21                      | 125.8925              | 1                     | 0.0250    |
|                                          | 5300  | 16                                              | 1                                              | 4            | 21                      | 125.8925              | 1                     | 0.0250    |
|                                          | 5320  | 16                                              | 1                                              | 4            | 21                      | 125.8925              | 1                     | 0.0250    |
|                                          | 5500  | 14                                              | 1                                              | 4            | 19                      | 79.4328               | 1                     | 0.0158    |

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| Operating Mode                           | Freq. | Declared maximum conducted average output power | Max. positive tolerance according manufacturer | Antenna Gain | Calculated maximum EIRP | Declared maximum EIRP | MPE Limit             | MPE Value |
|------------------------------------------|-------|-------------------------------------------------|------------------------------------------------|--------------|-------------------------|-----------------------|-----------------------|-----------|
|                                          | (MHz) | (dBm)                                           |                                                | (dBi)        | (dBm)                   | (mW)                  | (mw/cm <sup>2</sup> ) |           |
|                                          | 5580  | 14                                              | 1                                              | 4            | 19                      | 79.4328               | 1                     | 0.0158    |
|                                          | 5700  | 14                                              | 1                                              | 4            | 19                      | 79.4328               | 1                     | 0.0158    |
|                                          | 5745  | 15                                              | 1.5                                            | 4            | 20.5                    | 112.2018              | 1                     | 0.0223    |
|                                          | 5785  | 15                                              | 1.5                                            | 4            | 20.5                    | 112.2018              | 1                     | 0.0223    |
|                                          | 5805  | 15                                              | 1.5                                            | 4            | 20.5                    | 112.2018              | 1                     | 0.0223    |
| IEEE 802.11n-HT40<br>IEEE 802.11ac-VHT40 | 5190  | 11                                              | 1                                              | 4            | 16                      | 39.8107               | 1                     | 0.0079    |
|                                          | 5230  | 11                                              | 1                                              | 4            | 16                      | 39.8107               | 1                     | 0.0079    |
|                                          | 5270  | 11                                              | 1                                              | 4            | 16                      | 39.8107               | 1                     | 0.0079    |
|                                          | 5310  | 11                                              | 1                                              | 4            | 16                      | 39.8107               | 1                     | 0.0079    |
|                                          | 5510  | 10                                              | 1.5                                            | 4            | 15.5                    | 35.4813               | 1                     | 0.0071    |
|                                          | 5550  | 10                                              | 1.5                                            | 4            | 15.5                    | 35.4813               | 1                     | 0.0071    |
|                                          | 5670  | 10                                              | 1.5                                            | 4            | 15.5                    | 35.4813               | 1                     | 0.0071    |
|                                          | 5755  | 13                                              | 1                                              | 4            | 18                      | 63.0957               | 1                     | 0.0126    |
|                                          | 5795  | 13                                              | 1                                              | 4            | 18                      | 63.0957               | 1                     | 0.0126    |
| IEEE 802.11ac-VHT80                      | 5210  | 10                                              | 1                                              | 4            | 15                      | 31.6228               | 1                     | 0.0063    |
|                                          | 5290  | 10                                              | 1                                              | 4            | 15                      | 31.6228               | 1                     | 0.0063    |
|                                          | 5530  | 11                                              | 1                                              | 4            | 16                      | 39.8107               | 1                     | 0.0079    |
|                                          | 5775  | 15                                              | 1                                              | 4            | 20                      | 100.0000              | 1                     | 0.0199    |

#### 3.4.1.1 Results for RSS-102 Issue 5

| Operating Mode    | Freq. | Declared maximum conducted average output power | Max. positive tolerance according manufacturer | Antenna Gain | Calculated maximum EIRP | Declared maximum EIRP | Declare Limit |
|-------------------|-------|-------------------------------------------------|------------------------------------------------|--------------|-------------------------|-----------------------|---------------|
|                   | (MHz) | (dBm)                                           |                                                | (dBi)        | (dBm)                   | (W)                   | (W)           |
| IEEE 802.11b      | 2412  | 18                                              | 1                                              | 3.5          | 22.5                    | 0.1778                | 2.6840        |
|                   | 2437  | 18                                              | 1                                              | 3.5          | 22.5                    | 0.1778                | 2.7030        |
|                   | 2462  | 18                                              | 1                                              | 3.5          | 22.5                    | 0.1778                | 2.7219        |
| IEEE 802.11g      | 2412  | 24                                              | 1                                              | 3.5          | 28.5                    | 0.7079                | 2.6840        |
|                   | 2437  | 24                                              | 1                                              | 3.5          | 28.5                    | 0.7079                | 2.7030        |
|                   | 2462  | 24                                              | 1                                              | 3.5          | 28.5                    | 0.7079                | 2.7219        |
| IEEE 802.11n-HT20 | 2412  | 23                                              | 1                                              | 3.5          | 27.5                    | 0.5623                | 2.6840        |
|                   | 2437  | 23                                              | 1                                              | 3.5          | 27.5                    | 0.5623                | 2.7030        |
|                   | 2462  | 23                                              | 1                                              | 3.5          | 27.5                    | 0.5623                | 2.7219        |
| IEEE 802.11a      | 5180  | 16                                              | 1                                              | 4            | 21                      | 0.1259                | 4.5253        |
|                   | 5220  | 16                                              | 1                                              | 4            | 21                      | 0.1259                | 4.5491        |
|                   | 5240  | 16                                              | 1                                              | 4            | 21                      | 0.1259                | 4.5610        |
|                   | 5260  | 16                                              | 1                                              | 4            | 21                      | 0.1259                | 4.5729        |
|                   | 5300  | 16                                              | 1                                              | 4            | 21                      | 0.1259                | 4.5966        |
|                   | 5320  | 16                                              | 1                                              | 4            | 21                      | 0.1259                | 4.6085        |
|                   | 5500  | 14                                              | 1                                              | 4            | 19                      | 0.0794                | 4.7145        |
|                   | 5580  | 14                                              | 1                                              | 4            | 19                      | 0.0794                | 4.7613        |
|                   | 5700  | 14                                              | 1                                              | 4            | 19                      | 0.0794                | 4.8310        |
|                   | 5745  | 15                                              | 1.5                                            | 4            | 20.5                    | 0.1122                | 4.8570        |
|                   | 5785  | 15                                              | 1.5                                            | 4            | 20.5                    | 0.1122                | 4.8801        |
|                   | 5805  | 15                                              | 1.5                                            | 4            | 20.5                    | 0.1122                | 4.8916        |
| IEEE 802.11n-HT20 | 5180  | 16                                              | 1                                              | 4            | 21                      | 0.1259                | 4.5253        |

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| Operating Mode                           | Freq. | Declared maximum conducted average output power | Max. positive tolerance according manufacturer | Antenna Gain | Calculated maximum EIRP | Declared maximum EIRP | Declare Limit |
|------------------------------------------|-------|-------------------------------------------------|------------------------------------------------|--------------|-------------------------|-----------------------|---------------|
|                                          | (MHz) | (dBm)                                           |                                                | (dBi)        | (dBm)                   | (W)                   | (W)           |
| IEEE 802.11ac-VHT20                      | 5220  | 16                                              | 1                                              | 4            | 21                      | 0.1259                | 4.5491        |
|                                          | 5240  | 16                                              | 1                                              | 4            | 21                      | 0.1259                | 4.5610        |
|                                          | 5260  | 16                                              | 1                                              | 4            | 21                      | 0.1259                | 4.5729        |
|                                          | 5300  | 16                                              | 1                                              | 4            | 21                      | 0.1259                | 4.5966        |
|                                          | 5320  | 16                                              | 1                                              | 4            | 21                      | 0.1259                | 4.6085        |
|                                          | 5500  | 14                                              | 1                                              | 4            | 19                      | 0.0794                | 4.7145        |
|                                          | 5580  | 14                                              | 1                                              | 4            | 19                      | 0.0794                | 4.7613        |
|                                          | 5700  | 14                                              | 1                                              | 4            | 19                      | 0.0794                | 4.8310        |
|                                          | 5745  | 15                                              | 1.5                                            | 4            | 20.5                    | 0.1122                | 4.8570        |
|                                          | 5785  | 15                                              | 1.5                                            | 4            | 20.5                    | 0.1122                | 4.8801        |
|                                          | 5805  | 15                                              | 1.5                                            | 4            | 20.5                    | 0.1122                | 4.8916        |
| IEEE 802.11n-HT40<br>IEEE 802.11ac-VHT40 | 5190  | 11                                              | 1                                              | 4            | 16                      | 0.0398                | 4.5312        |
|                                          | 5230  | 11                                              | 1                                              | 4            | 16                      | 0.0398                | 4.5551        |
|                                          | 5270  | 11                                              | 1                                              | 4            | 16                      | 0.0398                | 4.5789        |
|                                          | 5310  | 11                                              | 1                                              | 4            | 16                      | 0.0398                | 4.6026        |
|                                          | 5510  | 10                                              | 1.5                                            | 4            | 15.5                    | 0.0355                | 4.7204        |
|                                          | 5550  | 10                                              | 1.5                                            | 4            | 15.5                    | 0.0355                | 4.7437        |
|                                          | 5670  | 10                                              | 1.5                                            | 4            | 15.5                    | 0.0355                | 4.8136        |
|                                          | 5755  | 13                                              | 1                                              | 4            | 18                      | 0.0631                | 4.8628        |
|                                          | 5795  | 13                                              | 1                                              | 4            | 18                      | 0.0631                | 4.8859        |
| IEEE 802.11ac-VHT80                      | 5210  | 10                                              | 1                                              | 4            | 15                      | 0.0316                | 4.5432        |
|                                          | 5290  | 10                                              | 1                                              | 4            | 15                      | 0.0316                | 4.5907        |
|                                          | 5530  | 11                                              | 1                                              | 4            | 16                      | 0.0398                | 4.7321        |
|                                          | 5775  | 15                                              | 1                                              | 4            | 20                      | 0.1000                | 4.8743        |

### 3.4.2 For BT

For BT\_LE function, operating at 2402MHz to 2480 MHz for GFSK and

For BT\_EDR function, operating at 2402MHz to 2480 MHz for GFSK,  $\pi/4$  DQPSK, 8DPSK

#### 3.4.2.1 Antenna Type:

Chain 0: Dipole Antenna

#### 3.4.2.2 Antenna Gain:

Chain 0: 2402MHz to 2480 MHz: 3.5 dBi

#### 3.4.2.3 Results for FCC 47 CFR Part 1 Subpart I

| Operating Mode | Freq.     | Declared maximum conducted output power | Max. positive tolerance according manufacturer | Antenna Gain | Calculated maximum EIRP | Declared maximum EIRP | MPE Limit             | MPE Value |
|----------------|-----------|-----------------------------------------|------------------------------------------------|--------------|-------------------------|-----------------------|-----------------------|-----------|
|                | (MHz)     | (dBm)                                   | (dBm)                                          | (dBm)        | (dBm)                   | (mW)                  | (mW/cm <sup>2</sup> ) |           |
| LE             | 2402-2480 | 3                                       | 1                                              | 3.5          | 7.5                     | 5.6234                | 1                     | 0.0011    |
| EDR            | 2402-2480 | 7                                       | 2                                              | 3.5          | 12.5                    | 17.7828               | 1                     | 0.0035    |

#### 3.4.2.4 Results for RSS-102 Issue 5

| Operating Mode | Freq.     | Declared maximum conducted output power | Max. positive tolerance according manufacturer | Antenna Gain | Calculated maximum EIRP | Declared maximum EIRP | Limit  |
|----------------|-----------|-----------------------------------------|------------------------------------------------|--------------|-------------------------|-----------------------|--------|
|                | (MHz)     | (dBm)                                   | (dBm)                                          | (dBm)        | (dBm)                   | (W)                   | (W)    |
| LE             | 2402-2480 | 3                                       | 1                                              | 3.5          | 7.5                     | 0.0056                | 2.6764 |
| EDR            | 2402-2480 | 7                                       | 2                                              | 3.5          | 12.5                    | 0.0178                | 2.6764 |

**3.4.3 Simultaneous Multi-band Transmission MPE Analysis****3.4.4.1 List of Mode for Simultaneous Multi-band Transmission**

| No. | Configurations | Support/Not Support |
|-----|----------------|---------------------|
| 1   | 2.4G_WLAN + BT | Not Support         |
| 2   | 5G_WLAN + BT   | Not Support         |

**APPENDIX 1 PHOTOS OF TEST SETUP**

N/A

**APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS**

Refer to Appendix 2 for EUT external and internal Photos.

\*\*\* End of Report \*\*\*

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