

# TEST REPORT

Report No.: SHE19110012-02HE

Date: 2019-11-19

Page 1 of 20

**Applicant** : Toast, Inc.  
**Address of Applicant** : 401 Park Drive, Suite 801, Boston, MA 02215, USA

**Product Name** : Data Processing machine  
**Model No.** : TT200/TK200  
**Sample No.** : E19110012-02#01  
**FCC ID** : 2AMNG-TT200  
**ISED Number** : 23177-TT200

**Standards** : FCC CFR47 Part 15, Subpart C  
RSS-Gen (Issue 5, March 2019)  
RSS-247 (Issue 2, February 2017)

**Date of Receipt** : 2019-11-12  
**Date of Test** : 2019-11-12 ~ 2019-11-18  
**Date of Issue** : 2019-11-19

**Remark:**

*This report details the results of the testing carried out on one sample, the results contained in this report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.*

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(Jennifer Zhou)

Reviewed by: Adrian Shi  
(Adrian Shi)

Approved by: Guoyou Chi  
(Authorized signatory: Guoyou Chi)

# TEST REPORT

Report No.: SHE19110012-02HE

Date: 2019-11-19

Page 2 of 20

| Revision Record |            |           |            |
|-----------------|------------|-----------|------------|
| Version         | Date       | Revisions | Revised By |
| 1.0             | 2019-11-19 | Original  | --         |
|                 |            |           |            |
|                 |            |           |            |
|                 |            |           |            |

# TEST REPORT

Report No.: SHE19110012-02HE

Date: 2019-11-19

Page 3 of 20

## Contents

|          |                                                    |          |
|----------|----------------------------------------------------|----------|
| <b>1</b> | <b>GENERAL INFORMATION .....</b>                   | <b>4</b> |
| 1.1      | TESTING LABORATORY .....                           | 4        |
| 1.2      | DETAILS OF APPLICATION .....                       | 4        |
| 1.3      | DETAILS OF EUT .....                               | 4        |
| 1.4      | TEST METHODOLOGY.....                              | 5        |
| <b>2</b> | <b>TEST CONDITION .....</b>                        | <b>6</b> |
| 2.1      | ENVIRONMENTAL CONDITIONS .....                     | 6        |
| 2.2      | EQUIPMENT LIST .....                               | 6        |
| 2.3      | MEASUREMENT UNCERTAINTY.....                       | 6        |
| <b>3</b> | <b>TEST SET-UP AND OPERATION MODES .....</b>       | <b>7</b> |
| 3.1      | DETAILS OF TEST MODE .....                         | 7        |
| 3.2      | SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT .....  | 7        |
| 3.3      | SUPPORT SOFTWARE.....                              | 7        |
| 3.4      | TEST SETUP DIAGRAM .....                           | 8        |
| <b>4</b> | <b>TEST RESULTS .....</b>                          | <b>9</b> |
| 4.1      | TRANSMITTER REQUIREMENT & TEST SUITES .....        | 9        |
| 4.1.1    | <i>Spurious Emission</i> .....                     | 9        |
| 4.1.2    | <i>Band Edge (Restricted-band band-edge)</i> ..... | 10       |

# TEST REPORT

Report No.: SHE19110012-02HE

Date: 2019-11-19

Page 4 of 20

## 1 General Information

### 1.1 Testing Laboratory

|              |                                                       |
|--------------|-------------------------------------------------------|
| Company Name | ICAS Testing Technology Services (Shanghai) Co., Ltd. |
| Address      | 155 Pingbei Rd, Minhang District, Shanghai, China     |
| Telephone    | 0086 21-51682999                                      |
| Fax          | 0086 21-54711112                                      |
| Homepage     | www.icasiso.com                                       |

### 1.2 Details of Application

|                |                                                  |
|----------------|--------------------------------------------------|
| Company Name   | Toast, Inc.                                      |
| Address        | 401 Park Drive, Suite 801, Boston, MA 02215, USA |
| Contact Person | Mr James H Barber                                |
| Telephone      | (562) 546-2272                                   |
| Email          | jbarber@toasttab.com                             |

### 1.3 Details of EUT

|                           |                              |
|---------------------------|------------------------------|
| Product Name              | Data Processing machine      |
| Brand Name                | Toast                        |
| Model No.                 | TT200/TK200                  |
| FCC ID                    | 2AMNG-TT200                  |
| ISED Number               | 23177-TT200                  |
| Mode of Operation         | Bluetooth BR/EDR             |
| Frequency Range           | 2400MHz ~ 2483.5MHz          |
| Number of Channels        | 79 (at intervals of 1 MHz)   |
| Modulation Type           | GFSK, $\pi/4$ -DQPSK, 8-DPSK |
| Antenna Type              | PIFA Antenna                 |
| Antenna Gain              | 1.92 dBi                     |
| Extreme Temperature Range | 0°C ~ +55°C                  |
| Test Voltage              | AC 24V                       |

#### Note(s):

1. This test report is for approval of PCB and speaker change based on the original test report No. I19D00071-SRD01.
2. The details product change please refer to the document 'Product Change Description'.
3. Only additional test required in the product change list in this report.
4. The model TK200 is the same as TT200 except the attached base support, detail please refer to clause 5.1. So only tested model was TT200.

# TEST REPORT

Report No.: SHE19110012-02HE

Date: 2019-11-19

Page 5 of 20

## 1.4 Test Methodology

|                                                |                                                                                                                              |
|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| 47 CFR Part 15, Subpart C<br>(10-1-16 Edition) | Miscellaneous Wireless Communications Services                                                                               |
| FCC PUBLIC NOTICE DA 00-705<br>(Mar.30, 2000)  | Filling and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems                                             |
| RSS-Gen<br>(Issue 5, March 2019)               | General Requirements for Compliance of Radio Apparatus                                                                       |
| RSS-247<br>(Issue 2, February 2017)            | Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices |
| ANSI C63.10-2013                               | American National Standard for Testing Unlicensed Wireless Devices                                                           |

### Note(s):

All test items were verified and recorded according to the standards and without any addition/deviation/exclusion during the test.

# TEST REPORT

Report No.: SHE19110012-02HE

Date: 2019-11-19

Page 6 of 20

## 2 Test Condition

### 2.1 Environmental conditions

|                            |          |
|----------------------------|----------|
| Temperature (°C)           | 18-25    |
| Humidity (%RH)             | 40-65    |
| Barometric Pressure (mbar) | 960-1060 |

### 2.2 Equipment List

| Name of Equipment                   | Manufacturer    | Model        | Serial No. | Cal. Due Date |
|-------------------------------------|-----------------|--------------|------------|---------------|
| Spectrum Analyzer                   | Keysight        | N9020B       | MY59260184 | 2020-07-28    |
| Spectrum Analyzer                   | Rohde & Schwarz | FSV40N       | 101450     | 2020-06-24    |
| EMI Test Receiver                   | Rohde & Schwarz | ESPI3        | 100173     | 2020-06-19    |
| EMI Test Receiver                   | Rohde & Schwarz | ESR 7        | 101911     | 2020-06-19    |
| V-network                           | SCHWARZBECK     | NSLK 8127    | 8127-902   | 2020-02-20    |
| Wideband Radio Communication Tester | Rohde & Schwarz | CMW 500      | 100687     | 2020-08-22    |
| Broadband Antenna                   | SCHWARZBECK     | VULB9163     | 9163-1037  | 2020-06-06    |
| Horn Antenna-18G                    | SCHWARZBECK     | BBHA9120D    | 9120D-1775 | 2020-06-06    |
| Loop Antenna                        | SCHWARZBECK     | FMZB 1513    | N/A        | 2021-03-19    |
| Horn Antenna-40G                    | YINGLIAN        | LB-180400-KF | N/A        | 2020-07-26    |
| EMC chamber 9*6*6 (L*W*H)           | CHANGNING       | 966          | N/A        | 2020-06-26    |
| Shielded Enclosure 8*5*4 (L*W*H)    | CHANGNING       | 854          | N/A        | 2020-08-28    |
| Test Software                       | BL              | BL410_E      | N/A        | N/A           |

### 2.3 Measurement Uncertainty

| Parameter                       | Frequency      | Uncertainty |
|---------------------------------|----------------|-------------|
| Antenna Port Conducted Emission | < 1GHz         | ± 1.5 dB    |
|                                 | > 1GHz         | ± 1.5 dB    |
| Radiated Emission               | 30 MHz – 1 GHz | ± 3 dB      |
|                                 | > 1GHz         | ± 3 dB      |

# TEST REPORT

Report No.: SHE19110012-02HE

Date: 2019-11-19

Page 7 of 20

## 3 Test Set-up and Operation Modes

### 3.1 Details of Test Mode

Using test software was control EUT work in continuous transmitter and receiver mode. Select test channel as below:

| Channel                   | Frequency |
|---------------------------|-----------|
| The lowest channel(CH0)   | 2402MHz   |
| The middle channel(CH39)  | 2441MHz   |
| The Highest channel(CH78) | 2480MHz   |

The basic operation modes are:

- A. On
  - 1. BR/EDR mode
    - a. Transmitting
      - i. Low Channel
      - ii. Middle Channel
      - iii. High Channel
      - iv. Hopping mode
    - b. Receiving
  - 2. Normal working with Bluetooth on
- B. Standby
- C. Off

### 3.2 Special Accessories and Auxiliary Equipment

| Description | Manufacturer | Model No. | Serial No. |
|-------------|--------------|-----------|------------|
| Laptop      | Lenovo       | TP00083A  | N/A        |
|             |              |           |            |

### 3.3 Support Software

| Description | Manufacturer | Software Name |
|-------------|--------------|---------------|
| Software    | /            | RF Test Tool  |
|             |              |               |

# TEST REPORT

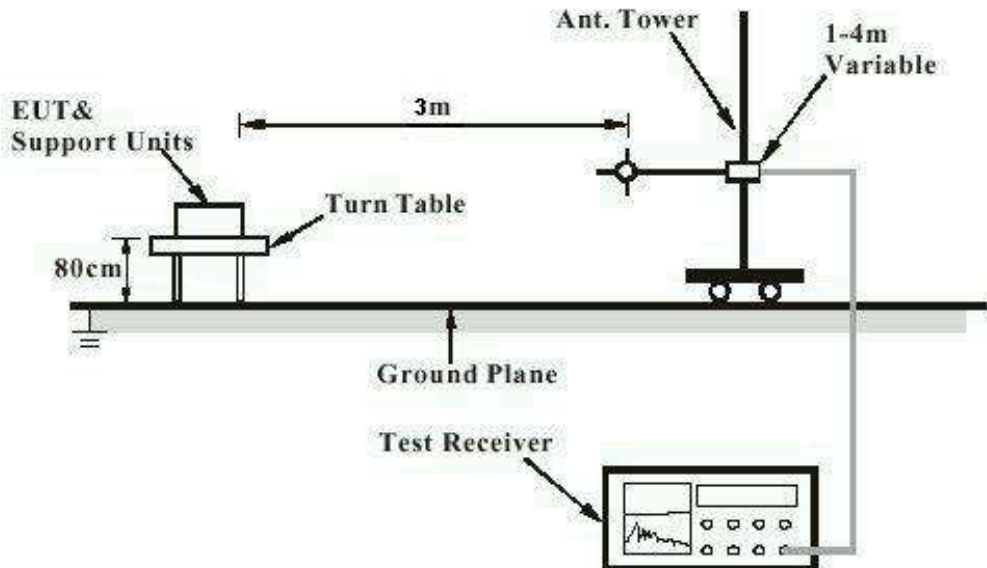
Report No.: SHE19110012-02HE

Date: 2019-11-19

Page 8 of 20

## 3.4 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1GHz are done with a table height of 1.5m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

# TEST REPORT

Report No.: SHE19110012-02HE

Date: 2019-11-19

Page 9 of 20

## 4 Test Results

### 4.1 Transmitter Requirement & Test Suites

#### 4.1.1 Spurious Emission

RESULT:

PASS

|                   |                                                     |
|-------------------|-----------------------------------------------------|
| Test standard     | : FCC Part 15.247(d), 15.205, 15.209<br>RSS-247 5.5 |
| Requirement       | : ANSI C63.10-2013                                  |
| Kind of test site | : 3m Semi-Anechoic Chamber                          |

#### Test setup

|                     |                   |
|---------------------|-------------------|
| Test Channel        | : Low/Middle/High |
| Operation Mode      | : A               |
| Ambient temperature | : 25°C            |
| Relative humidity   | : 52%             |

#### Notes:

1. Test plots please refer to the annex document "EXHIBIT A of SHE19110012-02HE".
2. For 9 kHz ~ 30 MHz, the amplitude of spurious emissions that are attenuated by more than 20dB below the permissible. The value has no need to be reported.
3. The spurious above 18GHz is noise only and 20dB below the limit. The value has no need to be reported.
4. The EUT is working in the Normal link mode below 1 GHz.

# TEST REPORT

Report No.: SHE19110012-02HE

Date: 2019-11-19

Page 10 of 20

## 4.1.2 Band Edge (Restricted-band band-edge)

RESULT:

**PASS**

|                   |                                                     |
|-------------------|-----------------------------------------------------|
| Test standard     | : FCC Part 15.247(d), 15.205, 15.209<br>RSS-247 5.5 |
| Requirement       | : ANSI C63.10-2013                                  |
| Kind of test site | : 3m Semi-Anechoic Chamber                          |

### Test setup

|                     |                   |
|---------------------|-------------------|
| Test Channel        | : Low/Middle/High |
| Operation Mode      | : A.1             |
| Ambient temperature | : 25°C            |
| Relative humidity   | : 52%             |

For details refer to following test plot.

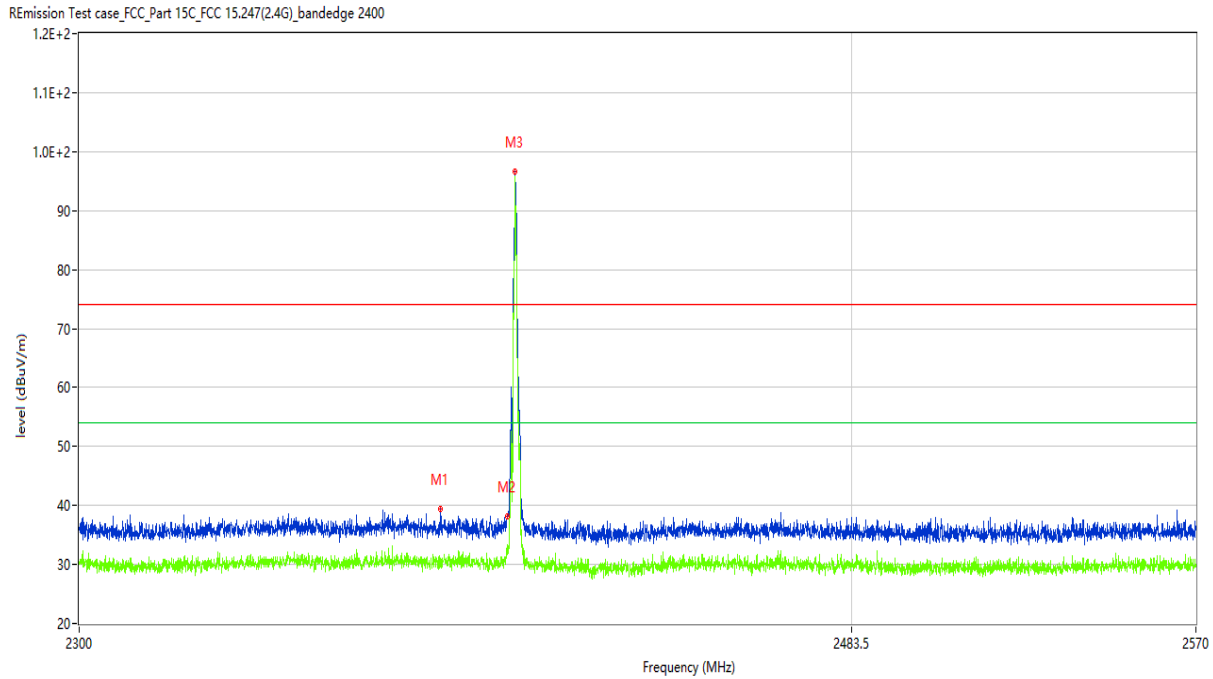
# TEST REPORT

Report No.: SHE19110012-02HE

Date: 2019-11-19

Page 11 of 20

**Figure 1: Band Edge (Restricted-band band-edge), 2402MHz, GFSK**  
Horizontal



| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (Degree) | Height (cm) | Antenna    | Verdict |
|-----|-----------------|------------------|-------------|----------------|-----------------|----------|----------------|-------------|------------|---------|
| 1   | 2384.151        | 39.43            | -3.79       | 74.0           | -34.57          | Peak     | 65.20          | 100         | Horizontal | Pass    |
| 1** | 2384.151        | 31.03            | -3.79       | 54.0           | -22.97          | AV       | 65.20          | 100         | Horizontal | Pass    |
| 2   | 2400.000        | 38.17            | -4.18       | 74.0           | -35.83          | Peak     | 1.20           | 100         | H          | Pass    |
| 2** | 2400.000        | 32.01            | -4.18       | 54.0           | -21.99          | AV       | 1.20           | 100         | H          | Pass    |
| 3   | 2401.765        | 96.53            | -4.17       | 74.0           | 22.53           | Peak     | 0.00           | 100         | Horizontal | N/A     |
| 3** | 2401.765        | 95.86            | -4.17       | 54.0           | 41.86           | AV       | 0.00           | 100         | Horizontal | N/A     |

# TEST REPORT

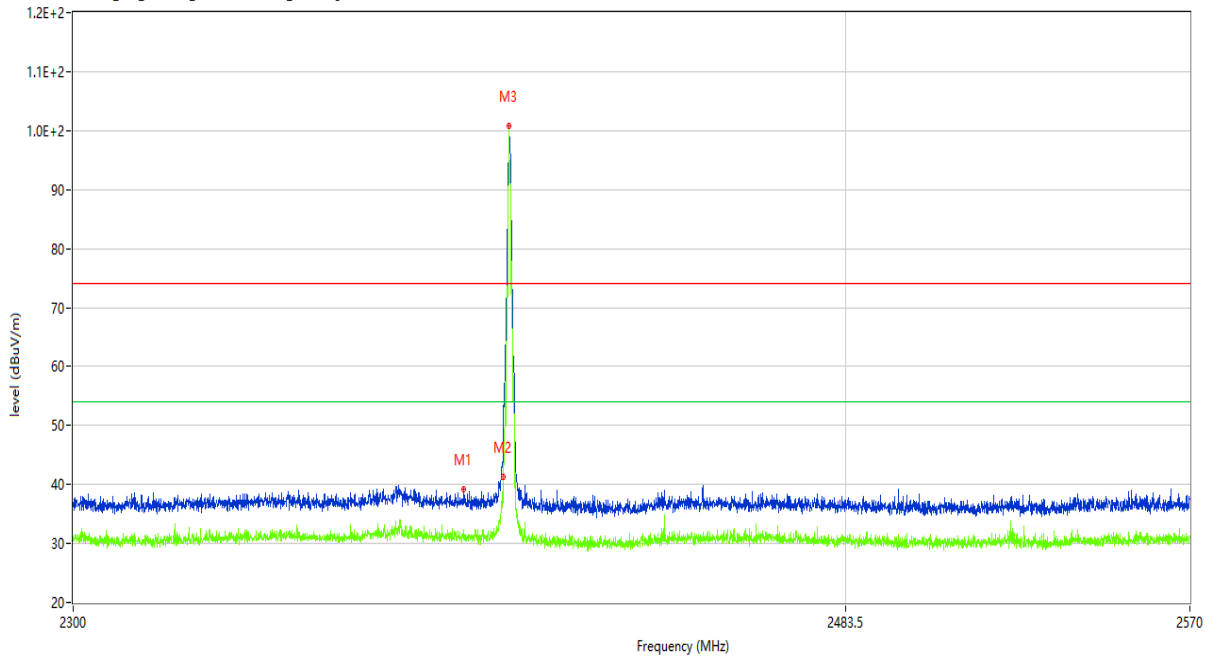
Report No.: SHE19110012-02HE

Date: 2019-11-19

Page 12 of 20

## Vertical

REmission Test case\_FCC\_Part 15C\_FCC 15.247(2.4G)\_bandedge 2400



| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (Degree) | Height (cm) | Antenna  | Verdict |
|-----|-----------------|------------------|-------------|----------------|-----------------|----------|----------------|-------------|----------|---------|
| 1   | 2391.102        | 39.12            | -3.81       | 74.0           | -34.88          | Peak     | 125.80         | 100         | Vertical | Pass    |
| 1** | 2391.102        | 32.30            | -3.81       | 54.0           | -21.70          | AV       | 125.80         | 100         | Vertical | Pass    |
| 2   | 2400.000        | 41.53            | -4.18       | 74.0           | -32.47          | Peak     | 137.90         | 100         | V        | Pass    |
| 2** | 2400.000        | 35.70            | -4.18       | 54.0           | -18.30          | AV       | 137.90         | 100         | V        | Pass    |
| 3   | 2401.765        | 100.88           | -4.17       | 74.0           | 26.88           | Peak     | 10.40          | 100         | Vertical | N/A     |
| 3** | 2401.765        | 100.11           | -4.17       | 54.0           | 46.11           | AV       | 10.40          | 100         | Vertical | N/A     |

# TEST REPORT

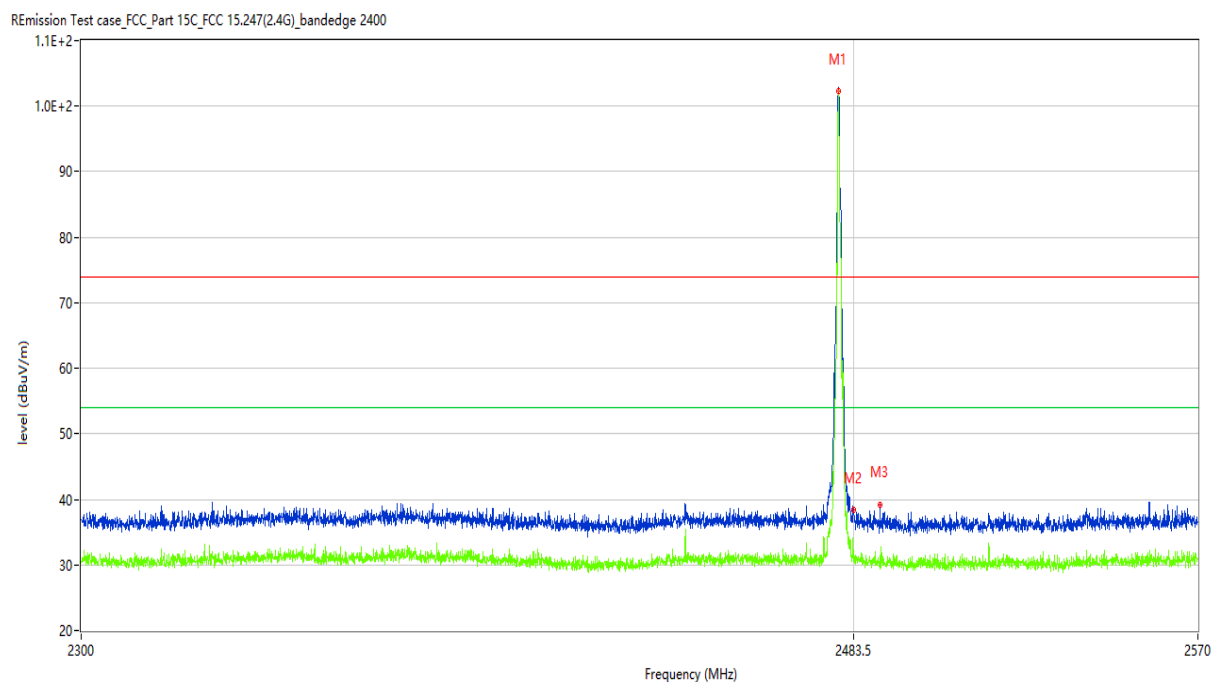
Report No.: SHE19110012-02HE

Date: 2019-11-19

Page 13 of 20

**Figure 2: Band Edge (Restricted-band band-edge), 2480MHz, GFSK**

Horizontal



| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (Degree) | Height (cm) | Antenna    | Verdict |
|-----|-----------------|------------------|-------------|----------------|-----------------|----------|----------------|-------------|------------|---------|
| 1   | 2479.775        | 102.83           | -3.76       | 74.0           | 28.83           | Peak     | 111.00         | 100         | Horizontal | N/A     |
| 1** | 2479.775        | 102.22           | -3.76       | 54.0           | 48.22           | AV       | 111.00         | 100         | Horizontal | N/A     |
| 2   | 2483.500        | 38.35            | -3.87       | 74.0           | -35.65          | Peak     | 125.39         | 100         | H          | Pass    |
| 2** | 2483.500        | 30.76            | -3.87       | 54.0           | -23.24          | AV       | 125.39         | 100         | H          | Pass    |
| 3   | 2490.032        | 39.24            | -4.08       | 74.0           | -34.76          | Peak     | 85.30          | 100         | Horizontal | Pass    |
| 3** | 2490.032        | 31.19            | -4.08       | 54.0           | -22.81          | AV       | 85.30          | 100         | Horizontal | Pass    |

# TEST REPORT

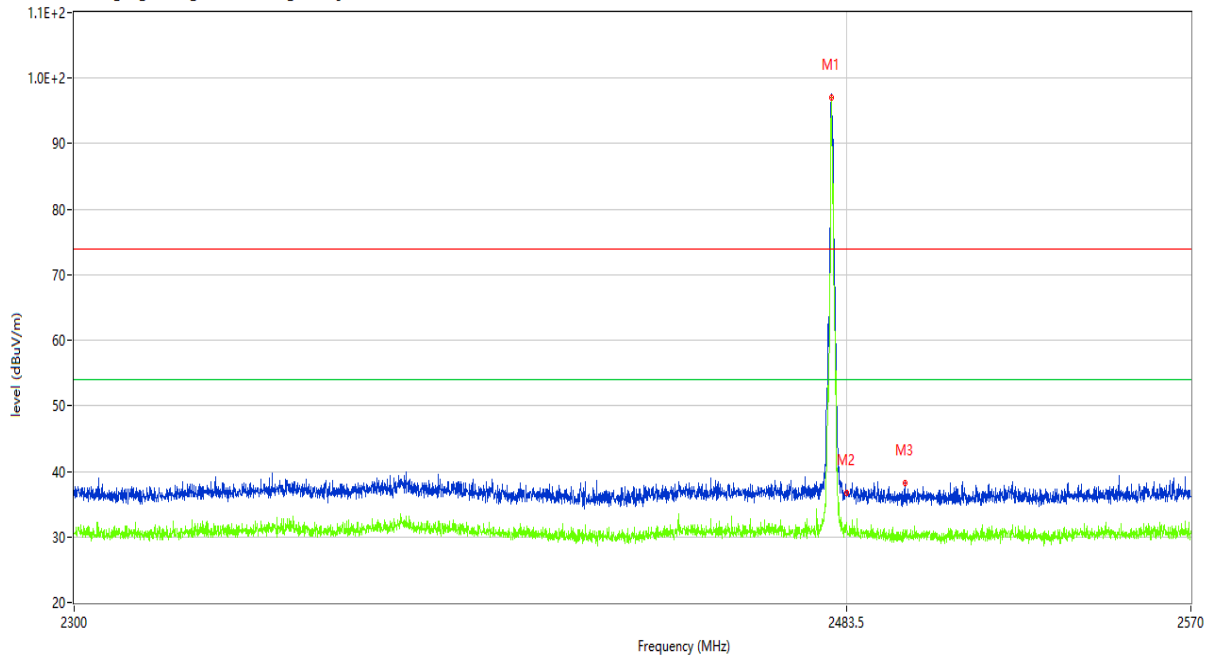
Report No.: SHE19110012-02HE

Date: 2019-11-19

Page 14 of 20

## Vertical

REmission Test case\_FCC\_Part 15C\_FCC 15.247(2.4G)\_bandedge 2400



| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (Degree) | Height (cm) | Antenna  | Verdict |
|-----|-----------------|------------------|-------------|----------------|-----------------|----------|----------------|-------------|----------|---------|
| 1   | 2479.775        | 97.59            | -3.76       | 74.0           | 23.59           | Peak     | 144.10         | 100         | Vertical | N/A     |
| 1** | 2479.775        | 96.99            | -3.76       | 54.0           | 42.99           | AV       | 144.10         | 100         | Vertical | N/A     |
| 2   | 2483.500        | 36.60            | -3.87       | 74.0           | -37.40          | Peak     | 142.05         | 100         | V        | Pass    |
| 2** | 2483.500        | 31.52            | -3.87       | 54.0           | -22.48          | AV       | 142.05         | 100         | V        | Pass    |
| 3   | 2497.928        | 38.31            | -4.36       | 74.0           | -35.69          | Peak     | 45.80          | 100         | Vertical | Pass    |
| 3** | 2497.928        | 31.10            | -4.36       | 54.0           | -22.90          | AV       | 45.80          | 100         | Vertical | Pass    |

# TEST REPORT

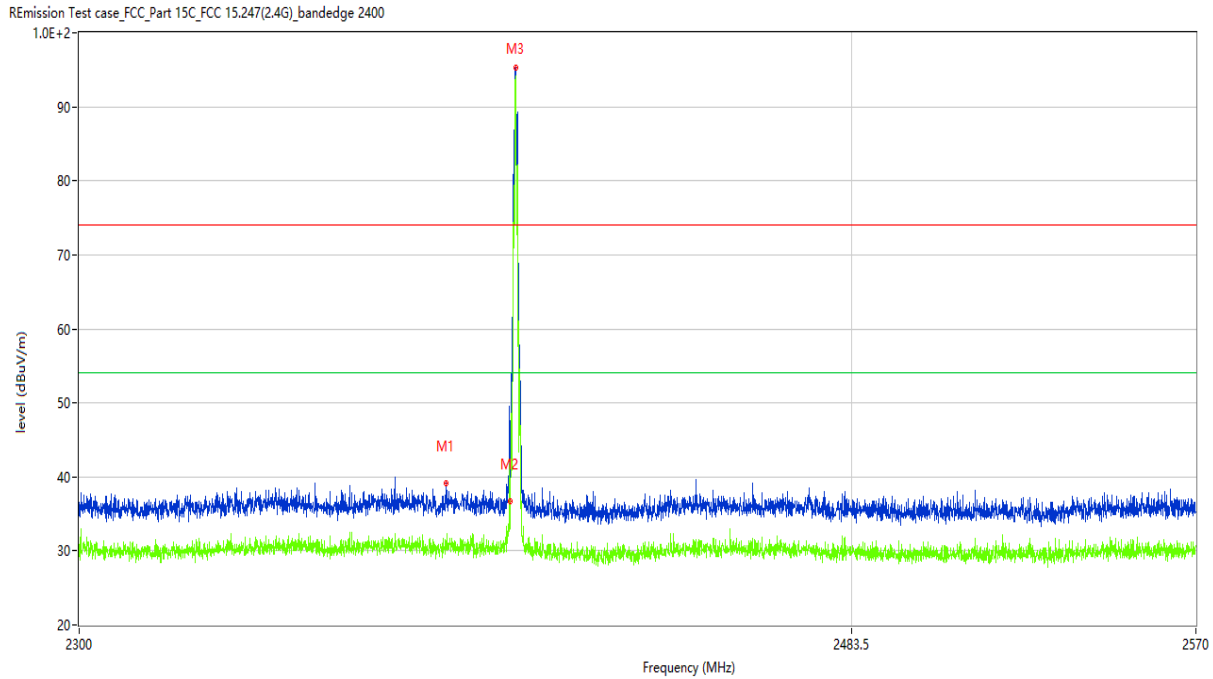
Report No.: SHE19110012-02HE

Date: 2019-11-19

Page 15 of 20

**Figure 3: Band Edge (Restricted-band band-edge), 2402MHz, 8-DPSK**

Horizontal



| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (Degree) | Height (cm) | Antenna    | Verdict |
|-----|-----------------|------------------|-------------|----------------|-----------------|----------|----------------|-------------|------------|---------|
| 1   | 2385.366        | 39.13            | -3.78       | 74.0           | -34.87          | Peak     | 358.70         | 100         | Horizontal | Pass    |
| 1** | 2385.366        | 31.33            | -3.78       | 54.0           | -22.67          | AV       | 358.70         | 100         | Horizontal | Pass    |
| 2   | 2400.000        | 36.73            | -4.18       | 74.0           | -37.27          | Peak     | 294.93         | 100         | H          | Pass    |
| 2** | 2400.000        | 31.27            | -4.18       | 54.0           | -22.73          | AV       | 294.93         | 100         | H          | Pass    |
| 3   | 2401.967        | 95.37            | -4.17       | 74.0           | 21.37           | Peak     | 281.00         | 100         | Horizontal | N/A     |
| 3** | 2401.967        | 94.21            | -4.17       | 54.0           | 40.21           | AV       | 281.00         | 100         | Horizontal | N/A     |

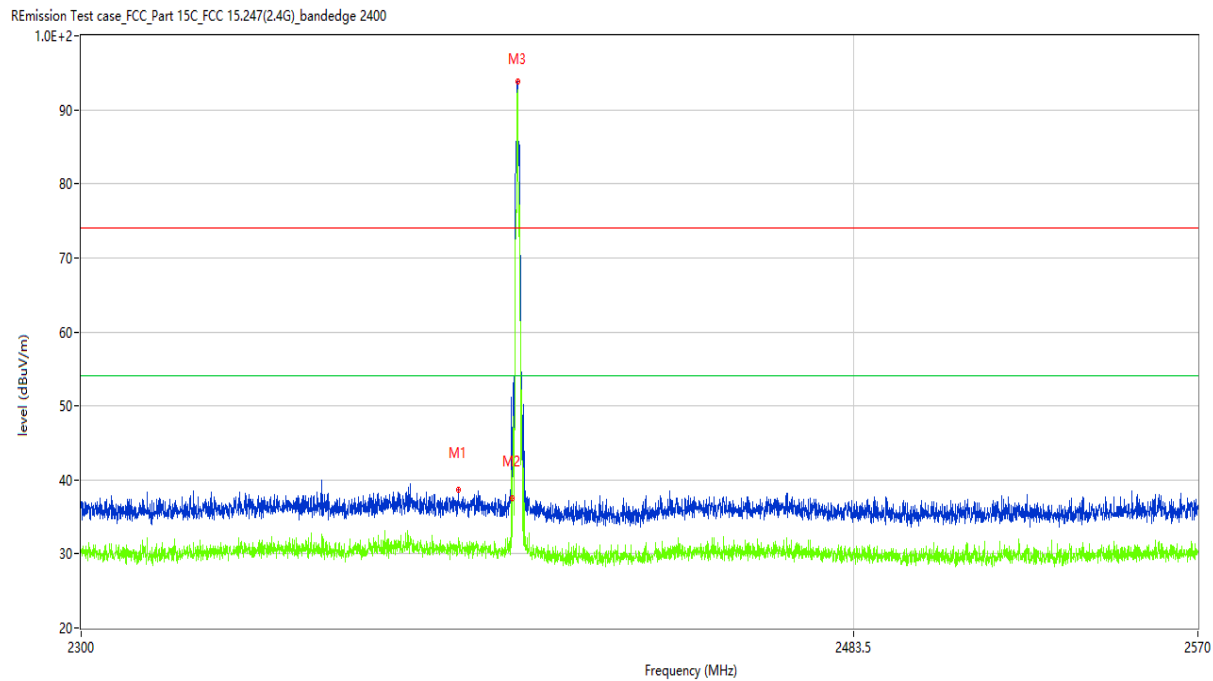
# TEST REPORT

Report No.: SHE19110012-02HE

Date: 2019-11-19

Page 16 of 20

## Vertical



| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (Degree) | Height (cm) | Antenna  | Verdict |
|-----|-----------------|------------------|-------------|----------------|-----------------|----------|----------------|-------------|----------|---------|
| 1   | 2387.796        | 38.72            | -3.77       | 74.0           | -35.28          | Peak     | 3.50           | 100         | Vertical | Pass    |
| 1** | 2387.796        | 31.82            | -3.77       | 54.0           | -22.18          | AV       | 3.50           | 100         | Vertical | Pass    |
| 2   | 2400.000        | 37.57            | -4.18       | 74.0           | -36.43          | Peak     | 85.95          | 100         | V        | Pass    |
| 2** | 2400.000        | 30.90            | -4.18       | 54.0           | -23.10          | AV       | 85.95          | 100         | V        | Pass    |
| 3   | 2401.967        | 93.84            | -4.17       | 74.0           | 19.84           | Peak     | 10.10          | 100         | Vertical | N/A     |
| 3** | 2401.967        | 92.67            | -4.17       | 54.0           | 38.67           | AV       | 10.10          | 100         | Vertical | N/A     |

# TEST REPORT

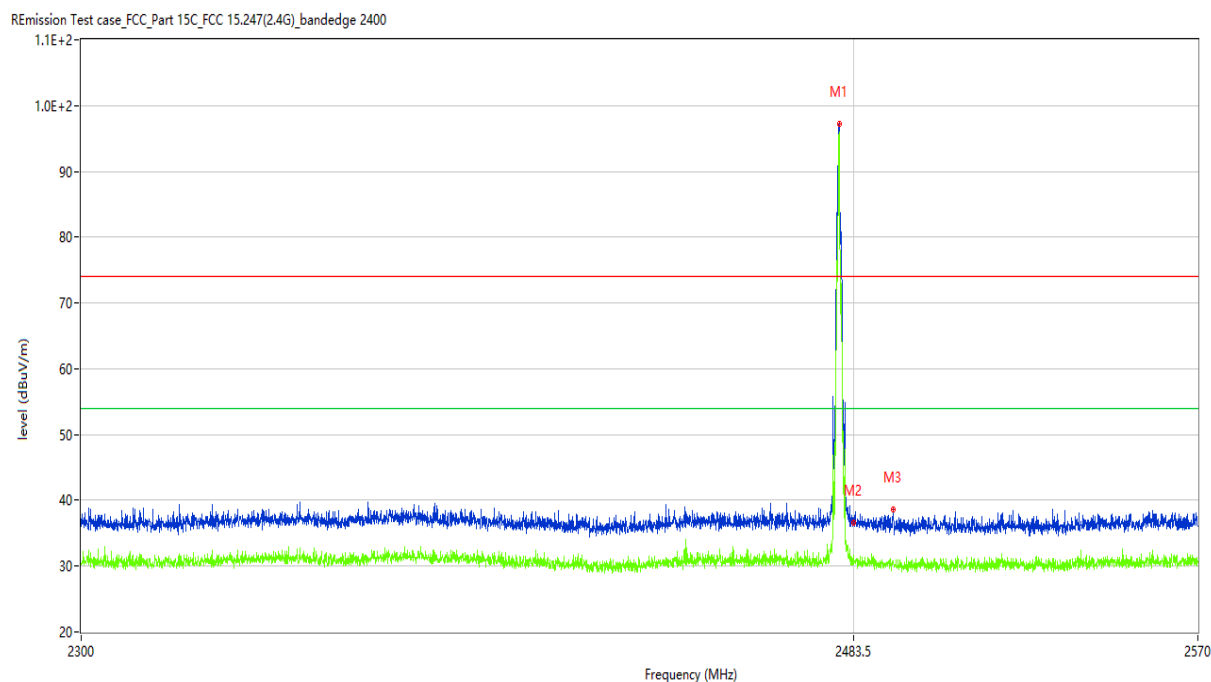
Report No.: SHE19110012-02HE

Date: 2019-11-19

Page 17 of 20

**Figure 4: Band Edge (Restricted-band band-edge), 2480MHz, 8-DPSK**

Horizontal



| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (Degree) | Height (cm) | Antenna    | Verdict |
|-----|-----------------|------------------|-------------|----------------|-----------------|----------|----------------|-------------|------------|---------|
| 1   | 2479.978        | 97.18            | -3.76       | 74.0           | 23.18           | Peak     | 119.50         | 100         | Horizontal | N/A     |
| 1** | 2479.978        | 95.91            | -3.76       | 54.0           | 41.91           | AV       | 119.50         | 100         | Horizontal | N/A     |
| 2   | 2483.500        | 36.75            | -3.87       | 74.0           | -37.25          | Peak     | 135.67         | 100         | H          | Pass    |
| 2** | 2483.500        | 30.52            | -3.87       | 54.0           | -23.48          | AV       | 135.67         | 100         | H          | Pass    |
| 3   | 2493.339        | 38.53            | -4.20       | 74.0           | -35.47          | Peak     | 199.20         | 100         | Horizontal | Pass    |
| 3** | 2493.339        | 30.47            | -4.20       | 54.0           | -23.53          | AV       | 199.20         | 100         | Horizontal | Pass    |

# TEST REPORT

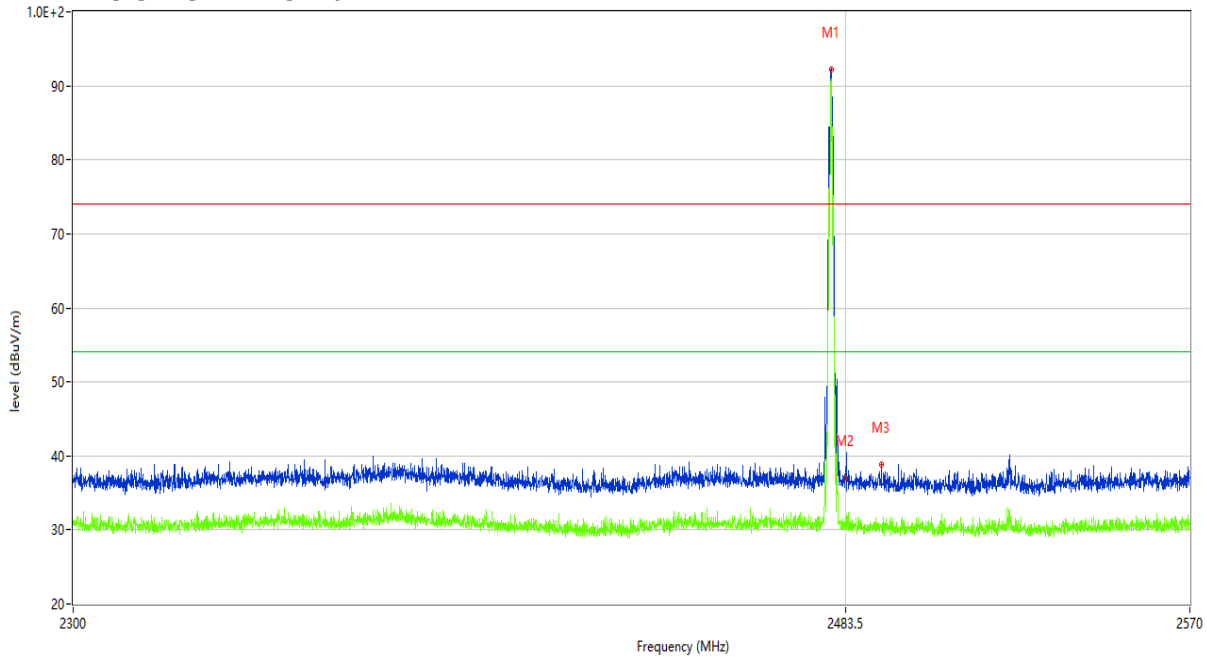
Report No.: SHE19110012-02HE

Date: 2019-11-19

Page 18 of 20

## Vertical

REmission Test case\_FCC\_Part 15C\_FCC 15.247(2.4G)\_bandedge 2400



| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (Degree) | Height (cm) | Antenna  | Verdict |
|-----|-----------------|------------------|-------------|----------------|-----------------|----------|----------------|-------------|----------|---------|
| 1   | 2479.978        | 92.24            | -3.76       | 74.0           | 18.24           | Peak     | 136.30         | 100         | Vertical | N/A     |
| 1** | 2479.978        | 90.98            | -3.76       | 54.0           | 36.98           | AV       | 136.30         | 100         | Vertical | N/A     |
| 2   | 2483.500        | 37.06            | -3.87       | 74.0           | -36.94          | Peak     | 264.20         | 100         | V        | Pass    |
| 2** | 2483.500        | 30.87            | -3.87       | 54.0           | -23.13          | AV       | 264.20         | 100         | V        | Pass    |
| 3   | 2492.394        | 38.77            | -4.16       | 74.0           | -35.23          | Peak     | 127.40         | 100         | Vertical | Pass    |
| 3** | 2492.394        | 30.49            | -4.16       | 54.0           | -23.51          | AV       | 127.40         | 100         | Vertical | Pass    |

# TEST REPORT

Report No.: SHE19110012-02HE

Date: 2019-11-19

Page 19 of 20

**Figure 5: Band Edge (Restricted-band band-edge), Hopping Mode, GFSK**  
Horizontal



| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (Degree) | Height (cm) | Antenna    | Verdict |
|-----|-----------------|------------------|-------------|----------------|-----------------|----------|----------------|-------------|------------|---------|
| 1   | 2390.000        | 37.15            | -3.76       | 74.0           | -36.85          | Peak     | 145.09         | 100         | H          | Pass    |
| 1** | 2390.000        | 30.95            | -3.76       | 54.0           | -23.05          | AV       | 145.09         | 100         | H          | Pass    |
| 2   | 2400.000        | 36.57            | -4.18       | 74.0           | -37.43          | Peak     | 184.95         | 100         | H          | Pass    |
| 2** | 2400.000        | 31.13            | -4.18       | 54.0           | -22.87          | AV       | 184.95         | 100         | H          | Pass    |
| 3   | 2483.500        | 35.75            | -3.87       | 74.0           | -38.25          | Peak     | 171.22         | 100         | H          | Pass    |
| 3** | 2483.500        | 29.63            | -3.87       | 54.0           | -24.37          | AV       | 171.22         | 100         | H          | Pass    |
| 4   | 2486.403        | 38.26            | -3.96       | 74.0           | -35.74          | Peak     | 0.60           | 100         | Horizontal | Pass    |
| 4** | 2486.403        | 30.41            | -3.96       | 54.0           | -23.59          | AV       | 0.60           | 100         | Horizontal | Pass    |

# TEST REPORT

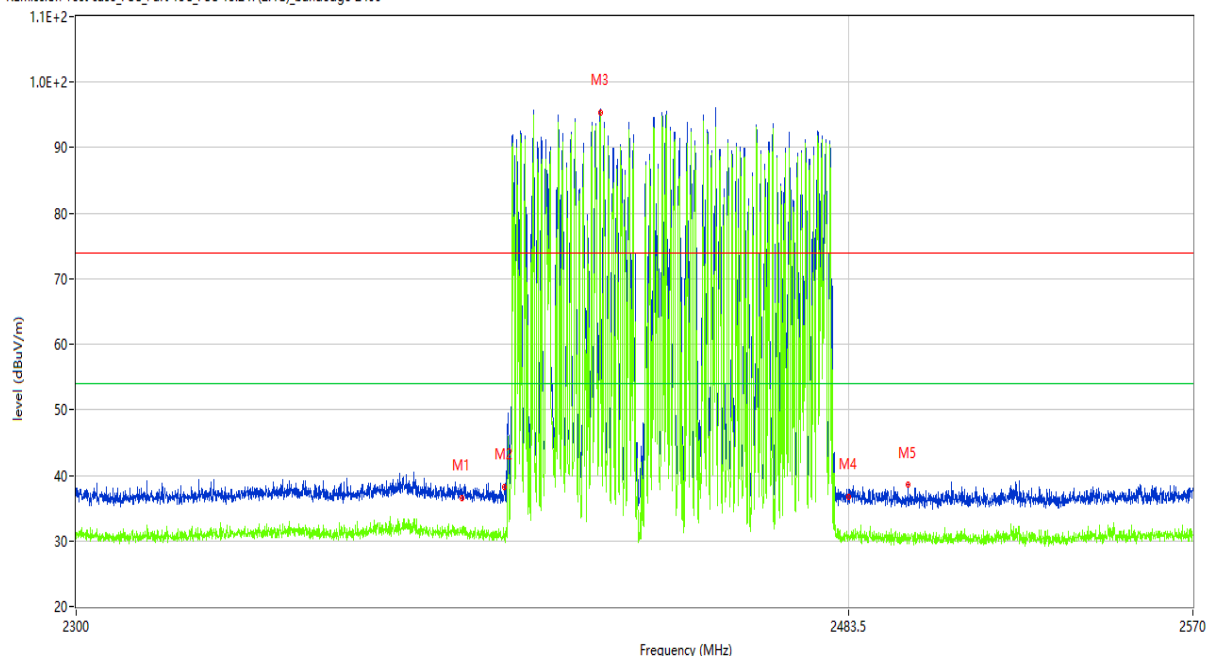
Report No.: SHE19110012-02HE

Date: 2019-11-19

Page 20 of 20

## Vertical

REmission Test case\_FCC\_Part 15C\_FCC 15.247(2.4G)\_bandedge 2400



| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (Degree) | Height (cm) | Antenna  | Verdict |
|-----|-----------------|------------------|-------------|----------------|-----------------|----------|----------------|-------------|----------|---------|
| 1   | 2390.000        | 36.74            | -3.76       | 74.0           | -37.26          | Peak     | 355.24         | 100         | V        | Pass    |
| 1** | 2390.000        | 31.80            | -3.76       | 54.0           | -22.20          | AV       | 355.24         | 100         | V        | Pass    |
| 2   | 2400.000        | 38.21            | -4.18       | 74.0           | -35.79          | Peak     | 159.66         | 100         | V        | Pass    |
| 2** | 2400.000        | 30.97            | -4.18       | 54.0           | -23.03          | AV       | 159.66         | 100         | V        | Pass    |
| 3   | 2422.954        | 96.00            | -4.30       | 74.0           | 22.00           | Peak     | 267.60         | 100         | Vertical | N/A     |
| 3** | 2422.954        | 95.43            | -4.30       | 54.0           | 41.43           | AV       | 267.60         | 100         | Vertical | N/A     |
| 4   | 2483.500        | 36.96            | -3.87       | 74.0           | -37.04          | Peak     | 182.16         | 100         | V        | Pass    |
| 4** | 2483.500        | 30.82            | -3.87       | 54.0           | -23.18          | AV       | 182.16         | 100         | V        | Pass    |
| 5   | 2498.265        | 38.53            | -4.37       | 74.0           | -35.47          | Peak     | 0.70           | 100         | Vertical | Pass    |
| 5** | 2498.265        | 31.10            | -4.37       | 54.0           | -22.90          | AV       | 0.70           | 100         | Vertical | Pass    |

Note:

Only shows the worst case results on hopping mode.

\*\*\*End of the report\*\*\*