



## Test Report

**Date** : 2019-06-14

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**No.** : HMD19060037

**Applicant** : BioIntelliSense, Inc.  
570 El Camino Real #200, Redwood City, CA94063, United States

**Supplier / Manufacturer** : BioIntelliSense, Inc.  
570 El Camino Real #200, Redwood City, CA94063, United States

**Description of Sample(s)** : Submitted sample(s) said to be  
Product: BioSticker  
Brand Name: N/A  
Model No.: BIOST0208  
FCC ID: 2ASE7-BIOST0208

**Date Samples Received** : 2019-06-10

**Date Tested** : 2019-06-12 to 2019-06-14

**Investigation Requested** : Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2017 and ANSI C63.10:2013 for FCC Certification.

**Conclusions** : The submitted product COMPLIED with the requirements of Federal Communications Commission [FCC] Rules and Regulations Part 15. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report.

**Remarks** : Bluetooth DTS (GFSK)

  
CHEUNG Chi, Kenneth  
Authorized Signatory



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### **1.0 General Details**

#### **1.1 Test Laboratory**

The Hong Kong Standards and Testing Centre Ltd.  
EMC Laboratory  
10 Dai Wang Street, Taipo Industrial Estate, New Territories, Hong Kong  
Telephone: 852 2666 1888  
Fax: 852 2664 4353

#### **1.2 Equipment Under Test [EUT]**

##### **Description of Sample(s)**

|               |                                                                                        |
|---------------|----------------------------------------------------------------------------------------|
| Product:      | BioSticker                                                                             |
| Manufacturer: | BioIntelliSense, Inc.<br>570 El Camino Real #200, Redwood City, CA94063, United States |
| Brand Name:   | N/A                                                                                    |
| Model Number: | BIOST0208                                                                              |
| Rating:       | 3.0Vd.c. Battery                                                                       |

#### **1.2.1 Description of EUT Operation**

The Equipment Under Test (EUT) is a BioSticker. The transmission signal is digital modulated with channel frequency range 2402-2480MHz. The R.F. signal was modulated by IC; the type of modulation used was digital transmission Modulation.

#### **1.3 Date of Order**

2019-06-10

#### **1.4 Submitted Sample(s):**

1 Sample

#### **1.5 Test Duration**

2019-06-12 to 2019-06-14

#### **1.6 Country of Origin**

China

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### 1.7 RF Module Details

Module Model Number: DA14681  
Module FCC ID: N/A  
Module Transmission Type: Bluetooth V4.2 BLE  
Modulation: GFSK  
Data Rates: 1Mbps  
Frequency Range: 2400-2483.5MHz  
Carrier Frequencies: 2402MHz – 2480MHz

Module Specification (specification provided by manufacturer)

### 1.8 Antenna Details

Antenna Type: Monopole antenna  
Antenna Gain: 0dBi

### 1.9 Channel List

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 0       | 2402            | 20      | 2442            |
| 1       | 2404            | 21      | 2444            |
| 2       | 2406            | 22      | 2446            |
| 3       | 2408            | 23      | 2448            |
| 4       | 2410            | 24      | 2450            |
| 5       | 2412            | 25      | 2452            |
| 6       | 2414            | 26      | 2454            |
| 7       | 2416            | 27      | 2456            |
| 8       | 2418            | 28      | 2458            |
| 9       | 2420            | 29      | 2460            |
| 10      | 2422            | 30      | 2462            |
| 11      | 2424            | 31      | 2464            |
| 12      | 2426            | 32      | 2466            |
| 13      | 2428            | 33      | 2468            |
| 14      | 2430            | 34      | 2470            |
| 15      | 2432            | 35      | 2472            |
| 16      | 2434            | 36      | 2474            |
| 17      | 2436            | 37      | 2476            |
| 18      | 2438            | 38      | 2478            |
| 19      | 2440            | 39      | 2480            |

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### 2.0 Technical Details

#### **2.1 Investigations Requested**

Perform Electromagnetic Interference measurements in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2017 Regulations and ANSI C63.10:2013 for FCC Certification.  
According FCC KDB 558074 DTS Measurement Guidance, Duty cycle  $\geq 98\%$ .  
The device was realized by test software.

#### **2.2 Test Standards and Results Summary Tables**

| EMISSION<br>Results Summary    |                        |                   |                     |                                     |                          |                                     |
|--------------------------------|------------------------|-------------------|---------------------|-------------------------------------|--------------------------|-------------------------------------|
| Test Condition                 | Test Requirement       | Test Method       | Class /<br>Severity | Test Result                         |                          |                                     |
|                                |                        |                   |                     | Pass                                | Failed                   | N/A                                 |
| Maximum Peak Output Power      | FCC 47CFR 15.247(b)(3) | ANSI C63.10: 2013 | N/A                 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| Radiated Spurious Emissions    | FCC 47CFR 15.209       | ANSI C63.10: 2013 | N/A                 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| AC Mains Conducted Emissions   | FCC 47CFR 15.207       | ANSI C63.10: 2013 | N/A                 | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Power Spectral Density         | FCC 47CFR 15.247(e)    | ANSI C63.10: 2013 | N/A                 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| 6dB Bandwidth                  | FCC 47CFR 15.247(a)(2) | ANSI C63.10: 2013 | N/A                 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| Band Edge Emissions (Radiated) | FCC 47CFR 15.247(d)    | ANSI C63.10: 2013 | N/A                 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| Antenna requirement            | FCC 47CFR 15.203       | N/A               | N/A                 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |

Note: N/A - Not Applicable

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### 3.0 Test Results

#### **3.1 Emission**

##### **3.1.1 Maximum Peak Output Power**

|                    |                        |
|--------------------|------------------------|
| Test Requirement:  | FCC 47CFR 15.247(b)(3) |
| Test Method:       | ANSI C63.10: 2013      |
| Test Date:         | 2019-06-12             |
| Mode of Operation: | Bluetooth DTS Tx mode  |

Ambient Temperature: 25°C

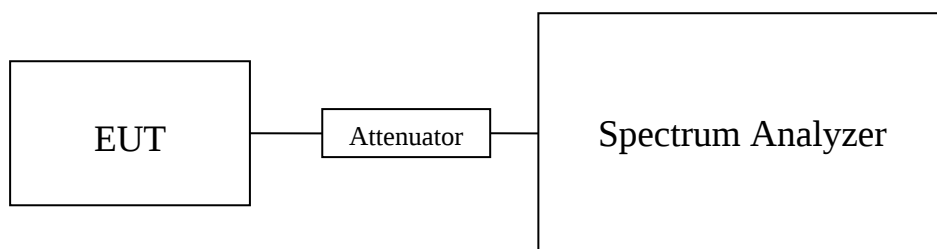
Relative Humidity: 51%

Atmospheric Pressure: 101 kPa

#### **Test Method:**

The RF output of the EUT was connected to the spectrum analyzer. All the attenuation or cable loss will be added to the measured maximum output power. The results are recorded in Watt.

#### **Test Setup:**



Note: a temporary antenna connector was soldered to the RF output.

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### Limits for Peak Output Power of Fundamental & Harmonics Emissions [FCC 47CFR 15.247]:

For Digital Transmission systems in 2400-2483.5 MHz Band: 1 Watt (30dBm)

| Results of BT DTS Tx Mode (2402MHz to 2480MHz) : Pass (TX Unit) (GFSK) |                |                      |                  |               |                |
|------------------------------------------------------------------------|----------------|----------------------|------------------|---------------|----------------|
| Channel                                                                | Frequency(MHz) | Conducted power(dBm) | Antenna Gain(dB) | E.I.R.P.(dBm) | E.I.R.P (Watt) |
| 0                                                                      | 2402           | -4.47                | 0                | -4.47         | 0.000357       |
| 19                                                                     | 2440           | -4.42                | 0                | -4.42         | 0.000361       |
| 39                                                                     | 2480           | -4.28                | 0                | -4.28         | 0.000373       |

Calculated measurement uncertainty : 30MHz to 1GHz 1.7dB  
1GHz to 26GHz 1.7dB

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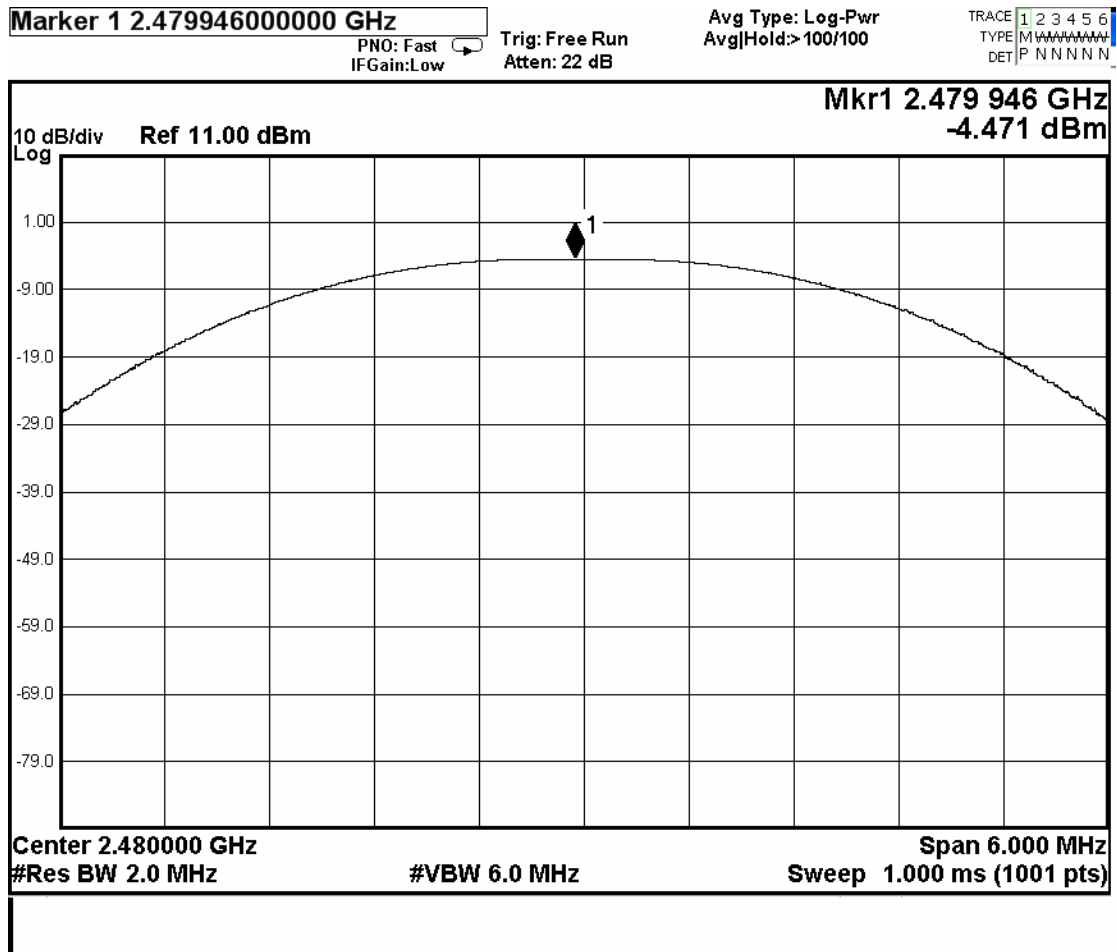
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Test plot of Maximum Peak Conducted Output Power :

Bluetooth Communication mode (BT DTS-GFSK, 2402MHz)



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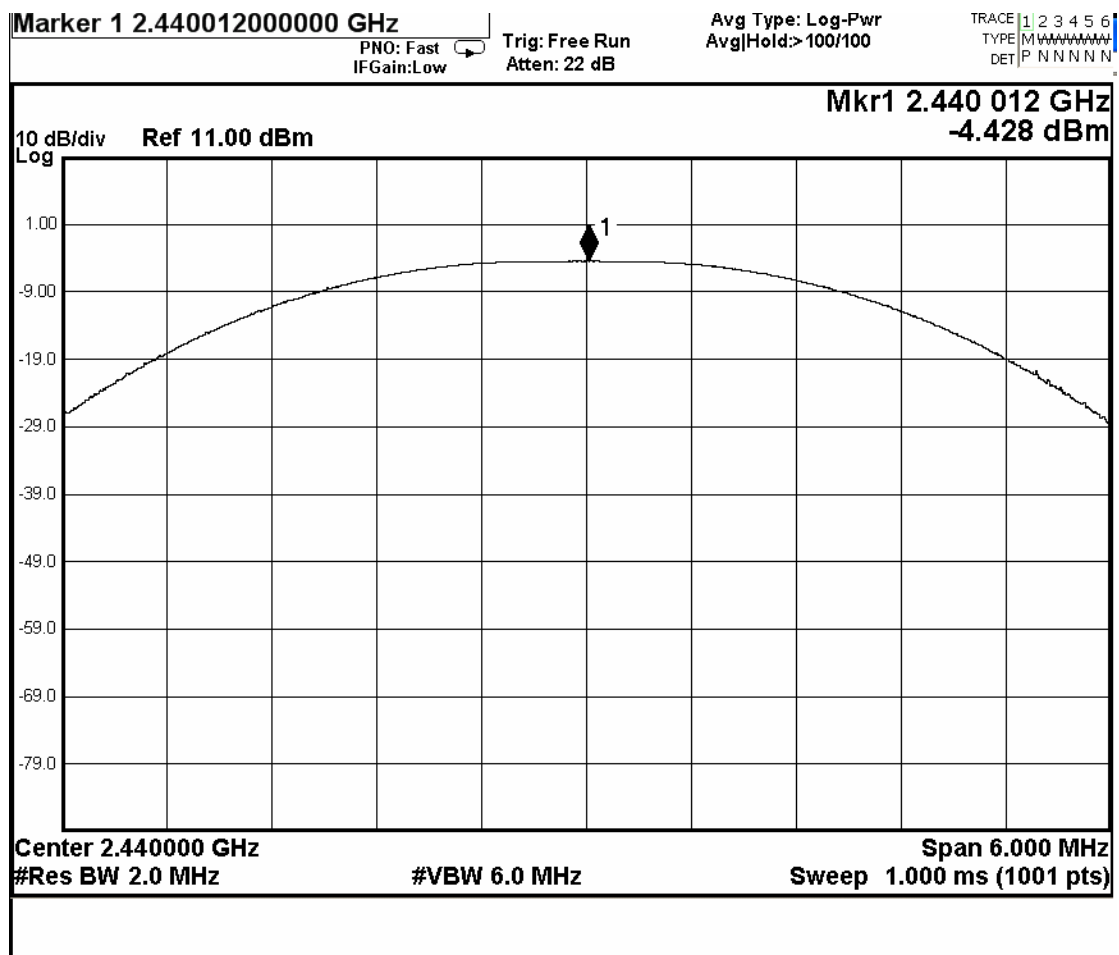


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Bluetooth Communication mode (BT DTS-GFSK, 2440MHz)



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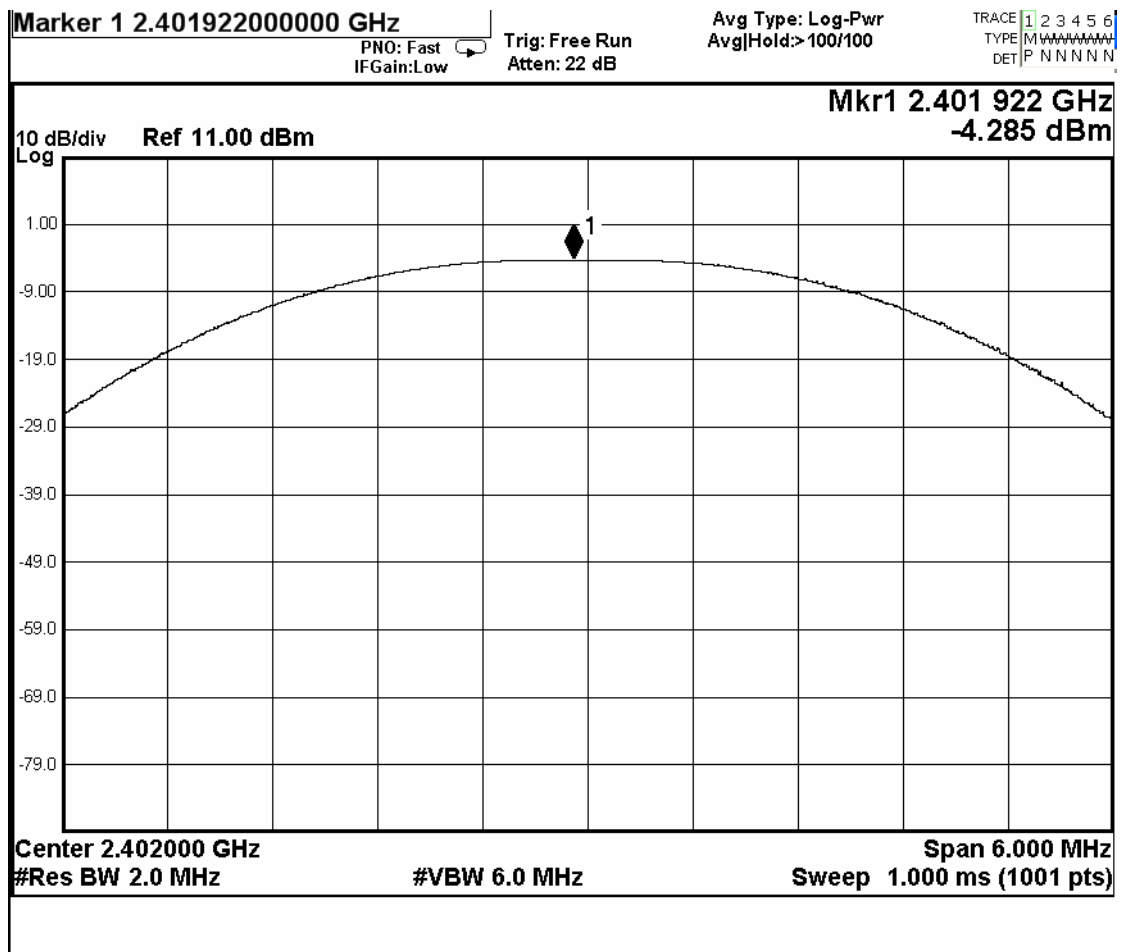
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Bluetooth Communication mode (BT DTS-GFSK, 2480MHz)



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### 3.1.2 Radiated Emissions

|                    |                                               |
|--------------------|-----------------------------------------------|
| Test Requirement:  | FCC 47CFR 15.209                              |
| Test Method:       | ANSI C63.10:2013                              |
| Test Date:         | 2019-06-12 to 2019-06-14                      |
| Mode of Operation: | Tx mode / Bluetooth Communication mode (GFSK) |

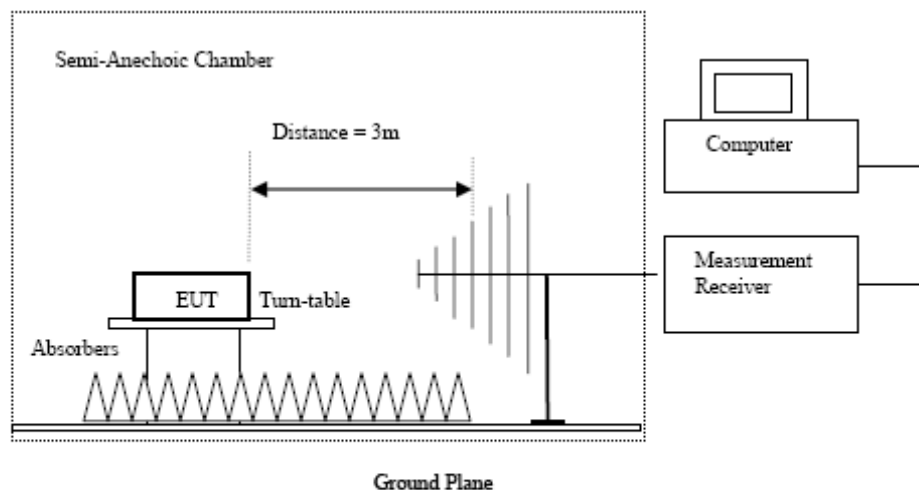
Ambient Temperature: 25°C      Relative Humidity: 50%      Atmospheric Pressure: 101 kPa

#### Test Method:

For emission measurements at or below 1 GHz, the sample was placed 0.8m above the ground plane of semi-anechoic Chamber\*. For emission measurements above 1 GHz, the sample was placed 1.5m above the ground plane of semi-anechoic Chamber\*. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

\* Semi-Anechoic chamber located on the G/F of The Hong Kong Standards and Testing Centre Ltd. with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 607756.

#### Test Setup:



- Absorbers placed on top of the ground plane are for measurements above 1000MHz only.
- Measurements between 30MHz to 1000MHz made with Bi-log antennas, above 1000MHz horn antennas are used, 9kHz to 30MHz loop antennas are used.

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### Limits for Radiated Emissions FCC 47 CFR 15.247 Class B1:

| Frequency Range | Quasi-Peak Limits |
|-----------------|-------------------|
| [MHz]           | [μV/m]            |
| 0.009-0.490     | 2400/F (kHz)      |
| 0.490-1.705     | 24000/F (kHz)     |
| 1.705-30        | 30                |
| 30-88           | 100               |
| 88-216          | 150               |
| 216-960         | 200               |
| Above 960       | 500               |

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

### Result of Tx mode (2402.0 MHz) (GFSK) (9kHz – 30MHz): Pass

| Field Strength of Spurious Emissions<br>Peak Value          |                |                   |                |                |       |                  |
|-------------------------------------------------------------|----------------|-------------------|----------------|----------------|-------|------------------|
| Frequency                                                   | Measured Level | Correction Factor | Field Strength | Field Strength | Limit | E-Field Polarity |
| MHz                                                         | dBμV           | dB/m              | dBμV/m         | μV/m           | μV/m  |                  |
| Emissions detected are more than 20 dB below the FCC Limits |                |                   |                |                |       |                  |

### Result of Tx mode (2402.0 MHz) (GFSK) (Above 1GHz): Pass

| Field Strength of Spurious Emissions<br>Peak Value |                    |                   |                |           |        |                  |
|----------------------------------------------------|--------------------|-------------------|----------------|-----------|--------|------------------|
| Frequency                                          | Measured Level @3m | Correction Factor | Field Strength | Limit @3m | Margin | E-Field Polarity |
| MHz                                                | dBμV               | dB/m              | dBμV/m         | dBμV/m    | dB     |                  |
| 4804.0                                             | 14.4               | 41.5              | 55.9           | 74.0      | 18.1   | Vertical         |
| 4804.0                                             | 13.9               | 42.4              | 56.3           | 74.0      | 17.7   | Horizontal       |
| 7206.0                                             | 9.9                | 45.1              | 55.0           | 74.0      | 19.0   | Vertical         |
| 7206.0                                             | 8.5                | 46.2              | 54.7           | 74.0      | 19.3   | Horizontal       |
| 9612.0                                             | 7.2                | 48.0              | 55.2           | 74.0      | 18.8   | Vertical         |
| 9612.0                                             | 6.2                | 48.8              | 55.0           | 74.0      | 19.0   | Horizontal       |
| 12010.0                                            | 3.9                | 51.8              | 55.7           | 74.0      | 18.3   | Vertical         |
| 12010.0                                            | 3.5                | 52.4              | 55.9           | 74.0      | 18.2   | Horizontal       |

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| Field Strength of Spurious Emissions<br>Average Value |                               |                              |                             |                        |              |                     |
|-------------------------------------------------------|-------------------------------|------------------------------|-----------------------------|------------------------|--------------|---------------------|
| Frequency<br>MHz                                      | Measured<br>Level @3m<br>dBμV | Correction<br>Factor<br>dB/m | Field<br>Strength<br>dBμV/m | Limit<br>@3m<br>dBμV/m | Margin<br>dB | E-Field<br>Polarity |
| 4804.0                                                | -2.2                          | 41.5                         | 39.4                        | 54.0                   | 14.7         | Vertical            |
| 4804.0                                                | -2.2                          | 42.4                         | 40.2                        | 54.0                   | 13.8         | Horizontal          |
| 7206.0                                                | -6.3                          | 45.1                         | 38.8                        | 54.0                   | 15.2         | Vertical            |
| 7206.0                                                | -7.5                          | 46.2                         | 38.8                        | 54.0                   | 15.3         | Horizontal          |
| 9608.0                                                | -8.8                          | 48.0                         | 39.2                        | 54.0                   | 14.8         | Vertical            |
| 9608.0                                                | -9.6                          | 48.8                         | 39.2                        | 54.0                   | 14.8         | Horizontal          |
| 12010.0                                               | -11.3                         | 51.8                         | 40.5                        | 54.0                   | 13.5         | Vertical            |
| 12010.0                                               | -12.7                         | 52.4                         | 39.69                       | 54.0                   | 14.3         | Horizontal          |

**Result of Tx mode (2440.0 MHz) (GFSK) (9kHz – 30MHz): Pass**

| Field Strength of Spurious Emissions<br>Peak Value                 |                           |                              |                             |                           |               |                     |
|--------------------------------------------------------------------|---------------------------|------------------------------|-----------------------------|---------------------------|---------------|---------------------|
| Frequency<br>MHz                                                   | Measured<br>Level<br>dBuV | Correction<br>Factor<br>dB/m | Field<br>Strength<br>dBuV/m | Field<br>Strength<br>uV/m | Limit<br>uV/m | E-Field<br>Polarity |
| <b>Emissions detected are more than 20 dB below the FCC Limits</b> |                           |                              |                             |                           |               |                     |

**Result of Tx mode (2440.0 MHz) (GFSK) (Above 1GHz): Pass**

| Field Strength of Spurious Emissions<br>Peak Value |                               |                              |                             |                        |              |                     |
|----------------------------------------------------|-------------------------------|------------------------------|-----------------------------|------------------------|--------------|---------------------|
| Frequency<br>MHz                                   | Measured<br>Level @3m<br>dBμV | Correction<br>Factor<br>dB/m | Field<br>Strength<br>dBμV/m | Limit<br>@3m<br>dBμV/m | Margin<br>dB | E-Field<br>Polarity |
| 4880.0                                             | 14.4                          | 41.6                         | 56.0                        | 74.0                   | 18.0         | Vertical            |
| 4880.0                                             | 12.7                          | 42.5                         | 55.2                        | 74.0                   | 18.8         | Horizontal          |
| 7320.0                                             | 2.0                           | 53.2                         | 55.2                        | 74.0                   | 18.8         | Vertical            |
| 7320.0                                             | 8.8                           | 46.3                         | 55.1                        | 74.0                   | 18.9         | Horizontal          |
| 9760.0                                             | 7.3                           | 48.1                         | 55.4                        | 74.0                   | 18.7         | Vertical            |
| 9760.0                                             | 6.5                           | 48.9                         | 55.4                        | 74.0                   | 18.6         | Horizontal          |
| 12200.0                                            | 3.7                           | 51.6                         | 55.3                        | 74.0                   | 18.7         | Vertical            |
| 12200.0                                            | 3.5                           | 52.5                         | 56.0                        | 74.0                   | 18.0         | Horizontal          |

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| Field Strength of Spurious Emissions<br>Average Value |                               |                              |                             |                        |              |                     |
|-------------------------------------------------------|-------------------------------|------------------------------|-----------------------------|------------------------|--------------|---------------------|
| Frequency<br>MHz                                      | Measured<br>Level @3m<br>dBμV | Correction<br>Factor<br>dB/m | Field<br>Strength<br>dBμV/m | Limit<br>@3m<br>dBμV/m | Margin<br>dB | E-Field<br>Polarity |
| 4880.0                                                | -2.7                          | 41.6                         | 38.9                        | 54.0                   | 15.1         | Vertical            |
| 4880.0                                                | -3.7                          | 42.5                         | 38.8                        | 54.0                   | 15.2         | Horizontal          |
| 7320.0                                                | -6.3                          | 45.2                         | 38.9                        | 54.0                   | 15.1         | Vertical            |
| 7320.0                                                | -7.5                          | 46.3                         | 38.8                        | 54.0                   | 15.2         | Horizontal          |
| 9760.0                                                | -8.9                          | 48.1                         | 39.2                        | 54.0                   | 14.8         | Vertical            |
| 9760.0                                                | -10.3                         | 48.9                         | 38.6                        | 54.0                   | 15.4         | Horizontal          |
| 12200.0                                               | -12.2                         | 51.6                         | 39.4                        | 54.0                   | 14.6         | Vertical            |
| 12200.0                                               | -13.0                         | 52.5                         | 39.5                        | 54.0                   | 14.5         | Horizontal          |

**Result of Tx mode (2480.0 MHz) (GFSK) (9kHz – 30MHz): Pass**

| Field Strength of Spurious Emissions<br>Peak Value          |                           |                              |                             |                           |               |                     |
|-------------------------------------------------------------|---------------------------|------------------------------|-----------------------------|---------------------------|---------------|---------------------|
| Frequency<br>MHz                                            | Measured<br>Level<br>dBuV | Correction<br>Factor<br>dB/m | Field<br>Strength<br>dBuV/m | Field<br>Strength<br>uV/m | Limit<br>uV/m | E-Field<br>Polarity |
| Emissions detected are more than 20 dB below the FCC Limits |                           |                              |                             |                           |               |                     |

**Result of Tx mode (2480.0 MHz) (GFSK) (Above 1GHz): Pass**

| Field Strength of Spurious Emissions<br>Peak Value |                               |                              |                             |                        |              |                     |
|----------------------------------------------------|-------------------------------|------------------------------|-----------------------------|------------------------|--------------|---------------------|
| Frequency<br>MHz                                   | Measured<br>Level @3m<br>dBμV | Correction<br>Factor<br>dB/m | Field<br>Strength<br>dBμV/m | Limit<br>@3m<br>dBμV/m | Margin<br>dB | E-Field<br>Polarity |
| 4960.0                                             | 14.6                          | 41.4                         | 56.0                        | 74.0                   | 18.1         | Vertical            |
| 4960.0                                             | 12.6                          | 42.7                         | 55.3                        | 74.0                   | 18.7         | Horizontal          |
| 7440.0                                             | 9.3                           | 45.6                         | 54.9                        | 74.0                   | 19.1         | Vertical            |
| 7440.0                                             | 8.6                           | 46.5                         | 55.1                        | 74.0                   | 18.9         | Horizontal          |
| 9920.0                                             | 6.6                           | 48.6                         | 55.2                        | 74.0                   | 18.8         | Vertical            |
| 9920.0                                             | 5.61                          | 49.7                         | 55.3                        | 74.0                   | 18.7         | Horizontal          |
| 12400.0                                            | 4.4                           | 51.7                         | 56.1                        | 74.0                   | 18.0         | Vertical            |
| 12400.0                                            | 3.2                           | 52.7                         | 55.9                        | 74.0                   | 18.2         | Horizontal          |

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| Field Strength of Spurious Emissions<br>Average Value |                                     |                              |                                   |                              |              |                     |
|-------------------------------------------------------|-------------------------------------|------------------------------|-----------------------------------|------------------------------|--------------|---------------------|
| Frequency<br>MHz                                      | Measured<br>Level @3m<br>dB $\mu$ V | Correction<br>Factor<br>dB/m | Field<br>Strength<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>dB | E-Field<br>Polarity |
| 4960.0                                                | -2.8                                | 41.4                         | 38.6                              | 54.0                         | 15.4         | Vertical            |
| 4960.0                                                | -3.8                                | 42.7                         | 38.9                              | 54.0                         | 15.1         | Horizontal          |
| 7440.0                                                | -6.8                                | 45.6                         | 38.8                              | 54.0                         | 15.2         | Vertical            |
| 7440.0                                                | -7.5                                | 46.5                         | 39.1                              | 54.0                         | 15.0         | Horizontal          |
| 9920.0                                                | -9.6                                | 48.6                         | 39.0                              | 54.0                         | 15.0         | Vertical            |
| 9920.0                                                | -10.3                               | 49.7                         | 39.4                              | 54.0                         | 14.6         | Horizontal          |
| 12400.0                                               | -11.4                               | 51.7                         | 40.3                              | 54.0                         | 13.7         | Vertical            |
| 12400.0                                               | -13.2                               | 52.7                         | 39.5                              | 54.0                         | 14.5         | Horizontal          |

**Remarks:**

No additional spurious emissions found between lowest internal used/generated frequency and 30 MHz

\* Denotes restricted band of operation.

Measurements were made using a peak detector. Any emission less than 1000MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 and the limits of FCC Rules Part 15 Section 15.209 were applied.

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement (9kHz-30MHz): 2.0dB  
uncertainty (30MHz -1GHz): 4.9dB  
(1GHz -6GHz): 4.02dB  
(6GHz -26.5GHz): 4.03dB

Emissions in the vertical and horizontal polarizations have been investigated and the worst-case test results are recorded in this report.

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### **Radiated Emissions Measurement:**

#### **Limit :**

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 5.205(c)).

### **Result: RF Radiated Emissions (Lowest)-GFSK**

| Field Strength of Band-edge Compliance<br>Peak Value |                                     |                              |                                   |                              |              |                     |
|------------------------------------------------------|-------------------------------------|------------------------------|-----------------------------------|------------------------------|--------------|---------------------|
| Frequency<br>MHz                                     | Measured<br>Level @3m<br>dB $\mu$ V | Correction<br>Factor<br>dB/m | Field<br>Strength<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>dB | E-Field<br>Polarity |
| 2390.0                                               | 8.2                                 | 36.8                         | 45.0                              | 74.0                         | 29.0         | Vertical            |

| Field Strength of Band-edge Compliance<br>Average Value |                                     |                              |                                   |                              |              |                     |
|---------------------------------------------------------|-------------------------------------|------------------------------|-----------------------------------|------------------------------|--------------|---------------------|
| Frequency<br>MHz                                        | Measured<br>Level @3m<br>dB $\mu$ V | Correction<br>Factor<br>dB/m | Field<br>Strength<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>dB | E-Field<br>Polarity |
| 2390.0                                                  | 0.9                                 | 36.8                         | 37.7                              | 54.0                         | 16.3         | Vertical            |

### **Result: RF Radiated Emissions (Highest) -GFSK**

| Field Strength of Band-edge Compliance<br>Peak Value |                                     |                              |                                   |                              |              |                     |
|------------------------------------------------------|-------------------------------------|------------------------------|-----------------------------------|------------------------------|--------------|---------------------|
| Frequency<br>MHz                                     | Measured<br>Level @3m<br>dB $\mu$ V | Correction<br>Factor<br>dB/m | Field<br>Strength<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>dB | E-Field<br>Polarity |
| 2483.5                                               | 8.7                                 | 36.4                         | 45.1                              | 74.0                         | 28.9         | Horizontal          |

| Field Strength of Band-edge Compliance<br>Average Value |                                     |                              |                                   |                              |              |                     |
|---------------------------------------------------------|-------------------------------------|------------------------------|-----------------------------------|------------------------------|--------------|---------------------|
| Frequency<br>MHz                                        | Measured<br>Level @3m<br>dB $\mu$ V | Correction<br>Factor<br>dB/m | Field<br>Strength<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>dB | E-Field<br>Polarity |
| 2483.5                                                  | 1.7                                 | 36.4                         | 38.1                              | 54.0                         | 16.0         | Horizontal          |

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### Limits for Radiated Emissions FCC 47 CFR 15.247 Class B1:

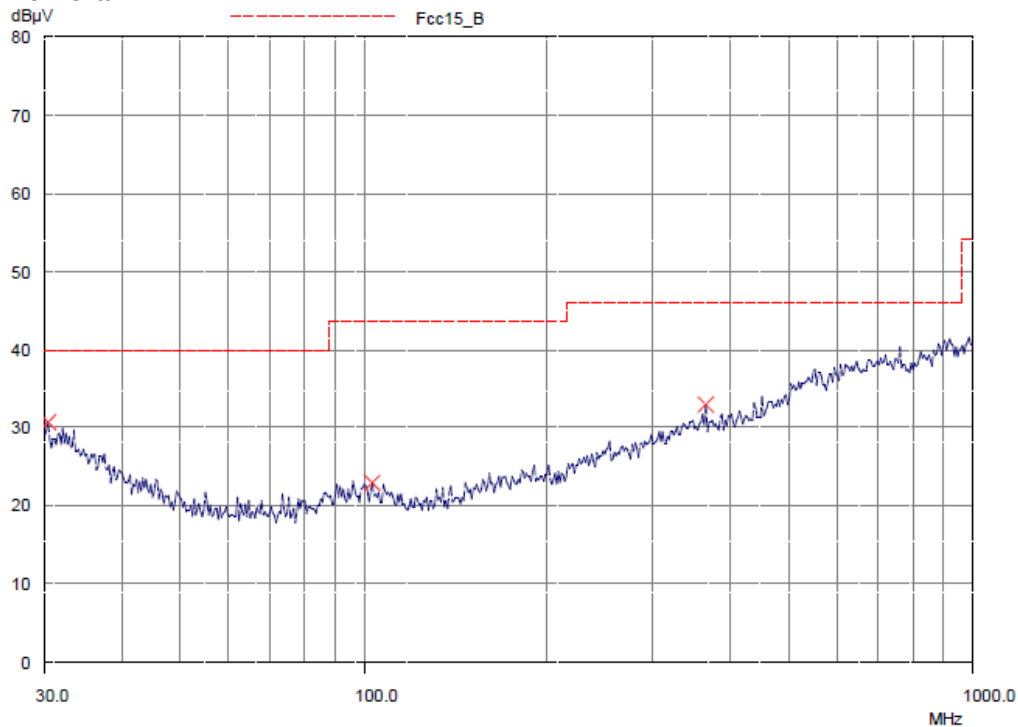
| Frequency Range | Quasi-Peak Limits   |
|-----------------|---------------------|
| [MHz]           | [ $\mu\text{V/m}$ ] |
| 0.009-0.490     | 2400/F (kHz)        |
| 0.490-1.705     | 24000/F (kHz)       |
| 1.705-30        | 30                  |
| 30-88           | 100                 |
| 88-216          | 150                 |
| 216-960         | 200                 |
| Above960        | 500                 |

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

### Results of Bluetooth Communication mode (2402.0 MHz) (30MHz – 1GHz): Pass

Please refer to the following table for result details(The data is the worst cases)

Horizontal



| Frequency<br>MHz | QP Level<br>dBμV | QP Limit<br>dBμV | QP Delta<br>dB |
|------------------|------------------|------------------|----------------|
| 30.1875          | 30.68            | 40.00            | 9.32           |
| 103.5            | 22.88            | 43.50            | 20.62          |
| 363.375          | 32.86            | 46.00            | 13.14          |

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### Limits for Radiated Emissions FCC 47 CFR 15.247 Class B]:

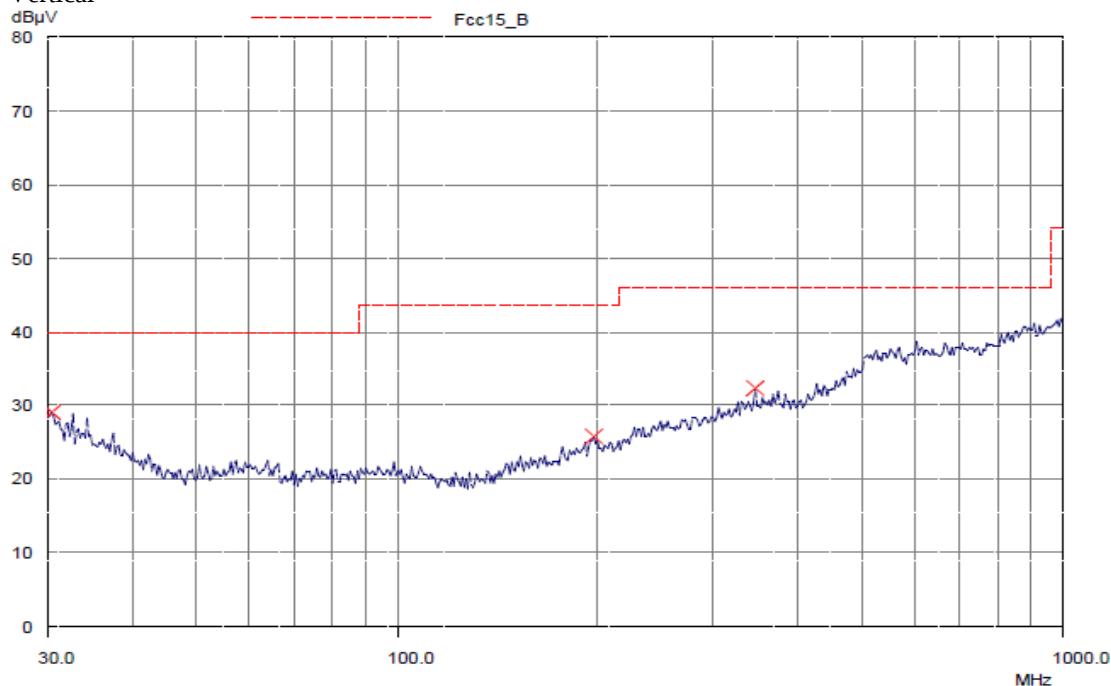
| Frequency Range | Quasi-Peak Limits   |
|-----------------|---------------------|
| [MHz]           | [ $\mu\text{V/m}$ ] |
| 0.009-0.490     | 2400/F (kHz)        |
| 0.490-1.705     | 24000/F (kHz)       |
| 1.705-30        | 30                  |
| 30-88           | 100                 |
| 88-216          | 150                 |
| 216-960         | 200                 |
| Above960        | 500                 |

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

### Results of Bluetooth Communication mode (2402.0 MHz) (30MHz – 1GHz): Pass

Please refer to the following table for result details(The data is the worst cases)

Vertical



| Frequency<br>MHz | QP Level<br>dBμV | QP Limit<br>dBμV | QP Delta<br>dB |
|------------------|------------------|------------------|----------------|
| 30.25            | 29.12            | 40.00            | 10.88          |
| 197.3125         | 25.70            | 43.50            | 17.80          |
| 344.4375         | 32.24            | 46.00            | 13.76          |

Remarks: Calculated measurement uncertainty (30MHz – 1GHz): 4.9dB

Emissions in the vertical and horizontal polarizations have been investigated and the worst-case test results are recorded in this report.

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### 3.1.3 Power Spectral Density

Test Requirement: FCC 47CFR 15.247(e)  
Test Method: ANSI C63.10:2013  
Test Date: 2019-06-12  
Mode of Operation: Tx mode

Ambient Temperature: 25°C      Relative Humidity: 51%      Atmospheric Pressure: 101 kPa

#### Test Method:

The RF output of the EUT was connected to the spectrum analyzer. Set the fundamental frequency as the center frequency of the spectral analyzer. Use RBW=3kHz, VBW= 10KHz, Set the span to 1.5 times the DTS channel bandwidth. Detector = peak, Sweep time = auto couple, Trace mode = max hold. Measure the Power Spectral Density (PSD) and record the results in dBm.

#### Test Setup:

As Test Setup of clause 3.1.1 in this test report.

#### Test Limit:

The maximum power spectral density (PSD) shall not exceed 8dBm in any 3kHz band.

#### Results of Tx Mode GFSK (Tx:2402MHz to 2480MHz) : Pass (Tx Unit)

##### Maximum power spectral density

| Transmitter Frequency<br>(MHz) | Maximum Power spectral density<br>level / 3kHz band<br>(dBm) | Maximum Power spectral density<br>/ 3kHz band limit |
|--------------------------------|--------------------------------------------------------------|-----------------------------------------------------|
| 2402.0                         | -19.041                                                      | 8dBm                                                |
| 2440.0                         | -18.316                                                      | 8dBm                                                |
| 2480.0                         | -18.775                                                      | 8dBm                                                |

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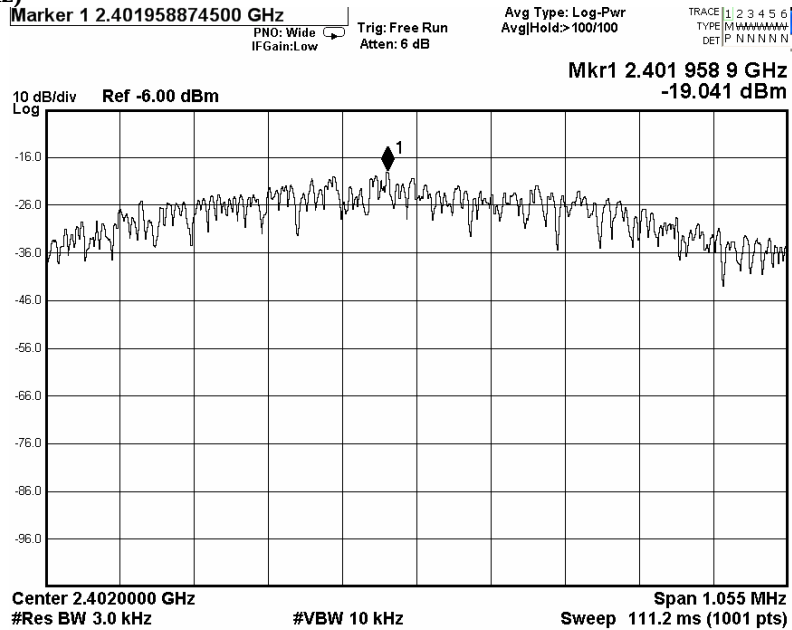
Date : 2019-06-14

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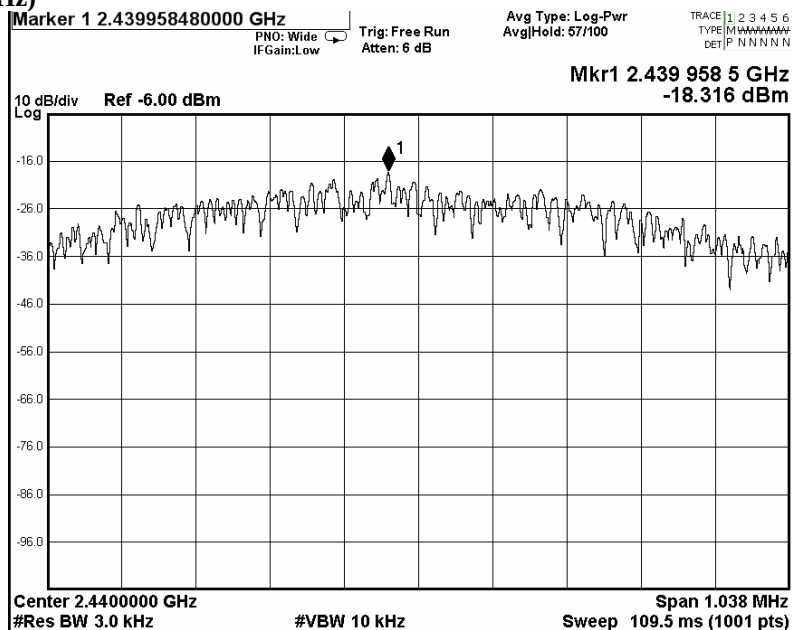
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Tx mode GFSK (Tx: 2402MHz to 2480MHz)

CH 0 (2402.0 MHz)



CH 19 (2440.0 MHz)



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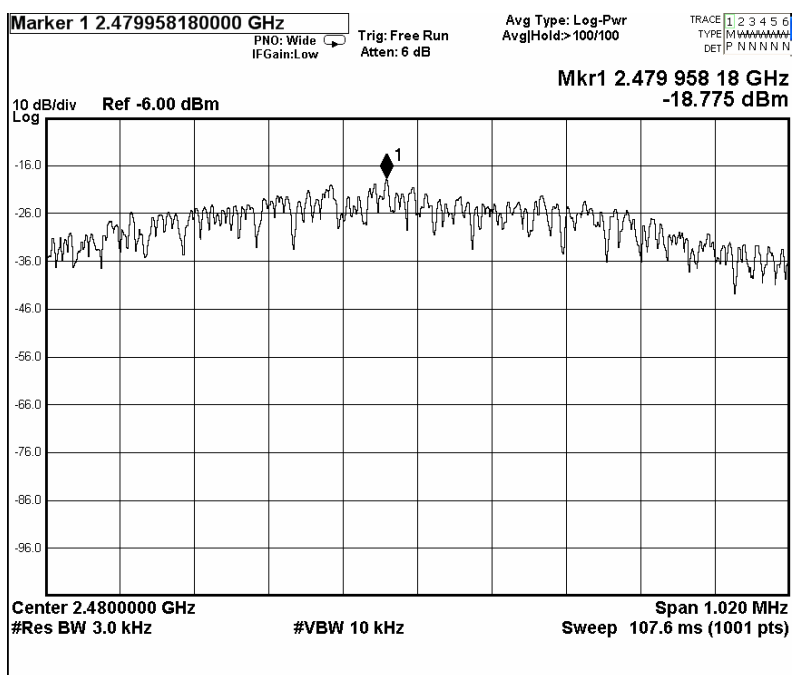


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CH 39 (2480.0 MHz)



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### **3.1.4 6dB Spectrum Bandwidth Measurement**

Test Requirement: FCC 47CFR 15.247(a)(2)  
Test Method: ANSI C63.10:2013  
Test Date: 2019-06-12  
Mode of Operation: Tx mode

Ambient Temperature: 25°C      Relative Humidity: 51%      Atmospheric Pressure: 101 kPa

#### **Test Method:**

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

#### **Test Setup:**

As Test Setup of clause 3.1.1 in this test report.

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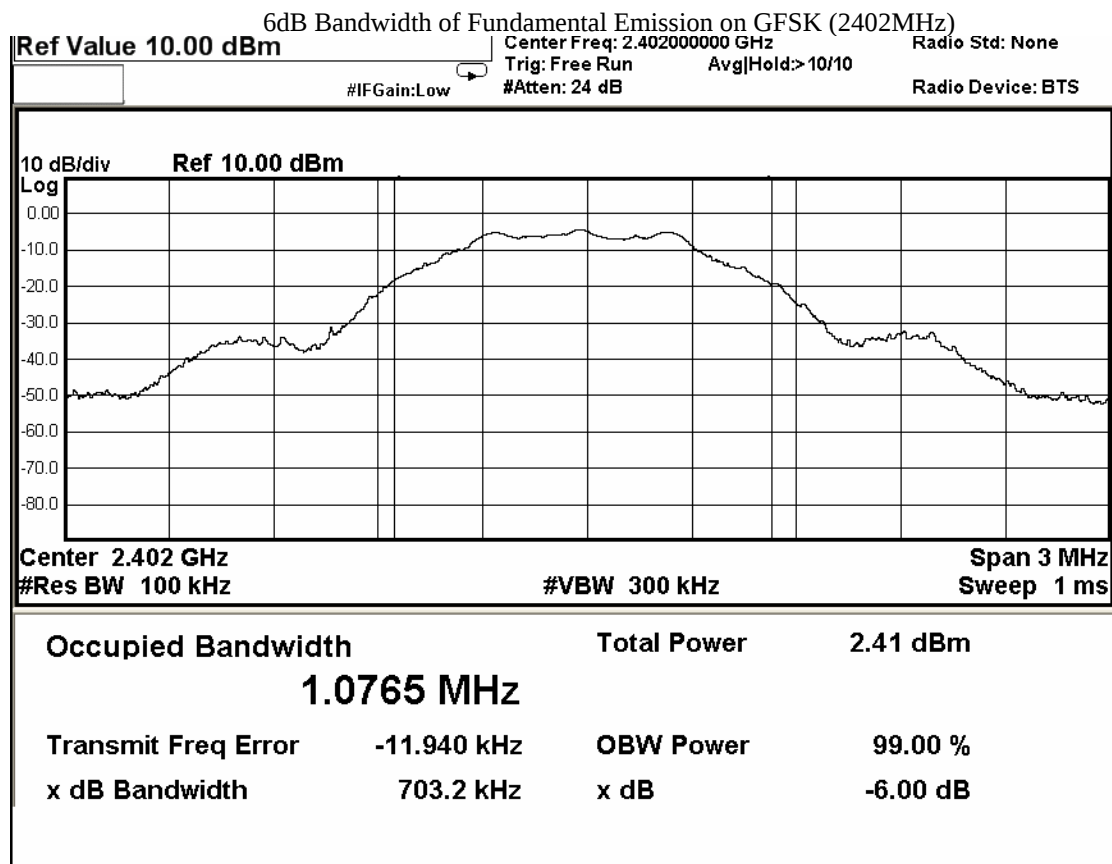
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### Limits for 6dB Spectrum Bandwidth Measurement:

| Center Frequency<br>[MHz] | 6dB Bandwidth<br>[KHz] | FCC Limits<br>[kHz] |
|---------------------------|------------------------|---------------------|
| 2402.0                    | 703.2                  | > 500               |



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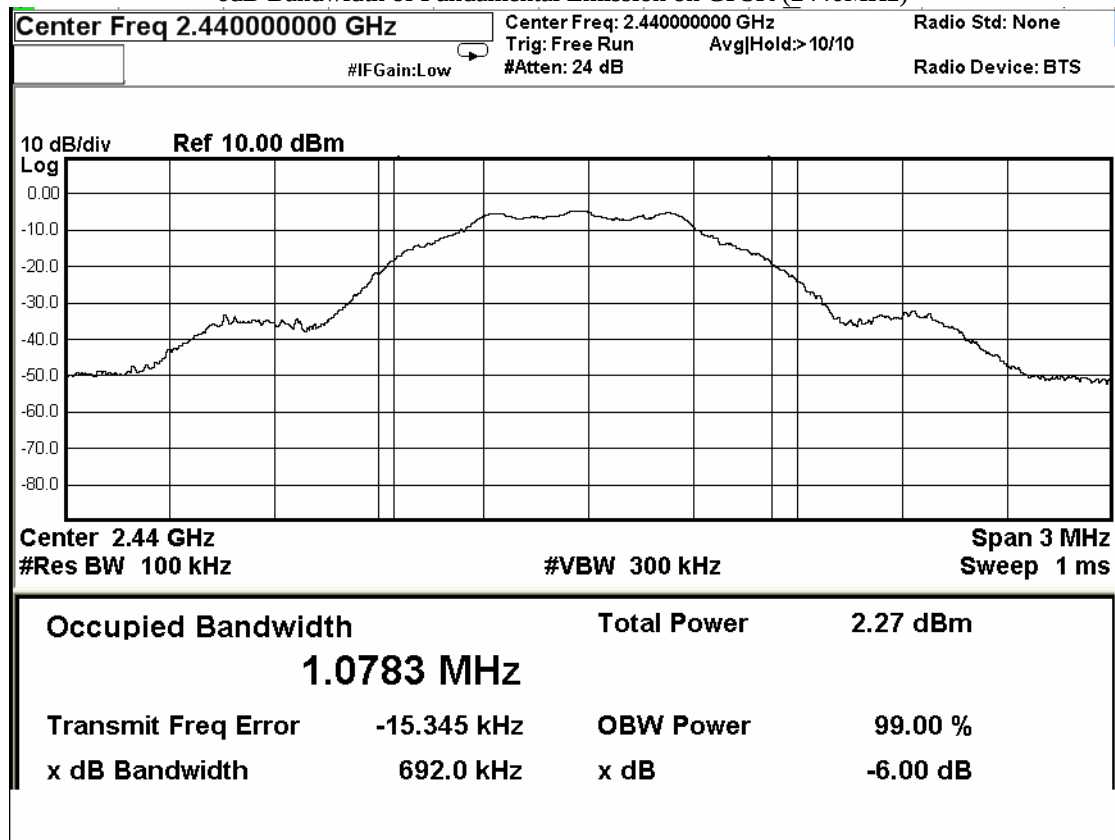
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### Limits for 6dB Spectrum Bandwidth Measurement:

| Frequency Range<br>[MHz] | 6dB Bandwidth<br>[KHz] | FCC Limits<br>[kHz] |
|--------------------------|------------------------|---------------------|
| 2440.0                   | 692.0                  | > 500               |

### 6dB Bandwidth of Fundamental Emission on GFSK (2440MHz)



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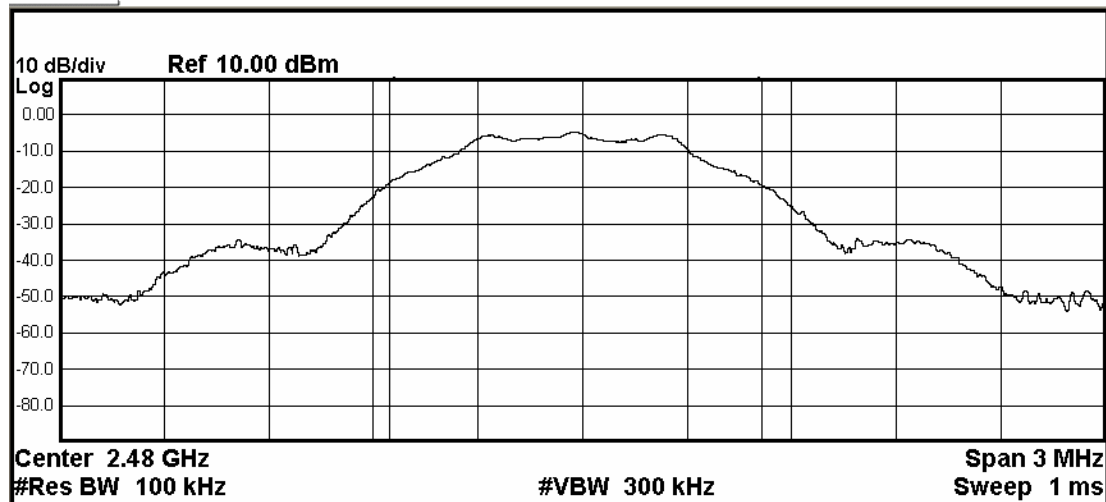
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### Limits for 6dB Spectrum Bandwidth Measurement:

| Frequency Range<br>[MHz] | 6dB Bandwidth<br>[KHz] | FCC Limits<br>[kHz] |
|--------------------------|------------------------|---------------------|
| 2480.0                   | 680.0                  | > 500               |

### 6dB Bandwidth of Fundamental Emission on GFSK (2480MHz)

Ref Value 10.00 dBm Center Freq: 2.480000000 GHz Radio Std: None  
Trig: Free Run Avg|Hold:> 10/10  
#IFGain:Low #Atten: 24 dB Radio Device: BTS



|                     |             |          |
|---------------------|-------------|----------|
| Occupied Bandwidth  | Total Power | 1.93 dBm |
| 1.0634 MHz          |             |          |
| Transmit Freq Error | OBW Power   | 99.00 %  |
| -17.779 kHz         |             |          |
| x dB Bandwidth      | x dB        | -6.00 dB |
| 680.0 kHz           |             |          |

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### **3.1.5 Band Edges Measurement**

Test Requirement: FCC 47CFR 15.247  
Test Method: ANSI C63.10:2013  
Test Date: 2019-06-12  
Mode of Operation: Tx mode

Ambient Temperature: 25°C      Relative Humidity: 51%      Atmospheric Pressure: 101 kPa

#### **Test Method:**

The band edge is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. The RBW are set to 100kHz and VBW are set to 300kHz for this measurement.

#### **Test Setup:**

As Test Setup of clause 3.1.2 in this test report.

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### Band-edge Compliance of RF Conducted Emissions Measurement:

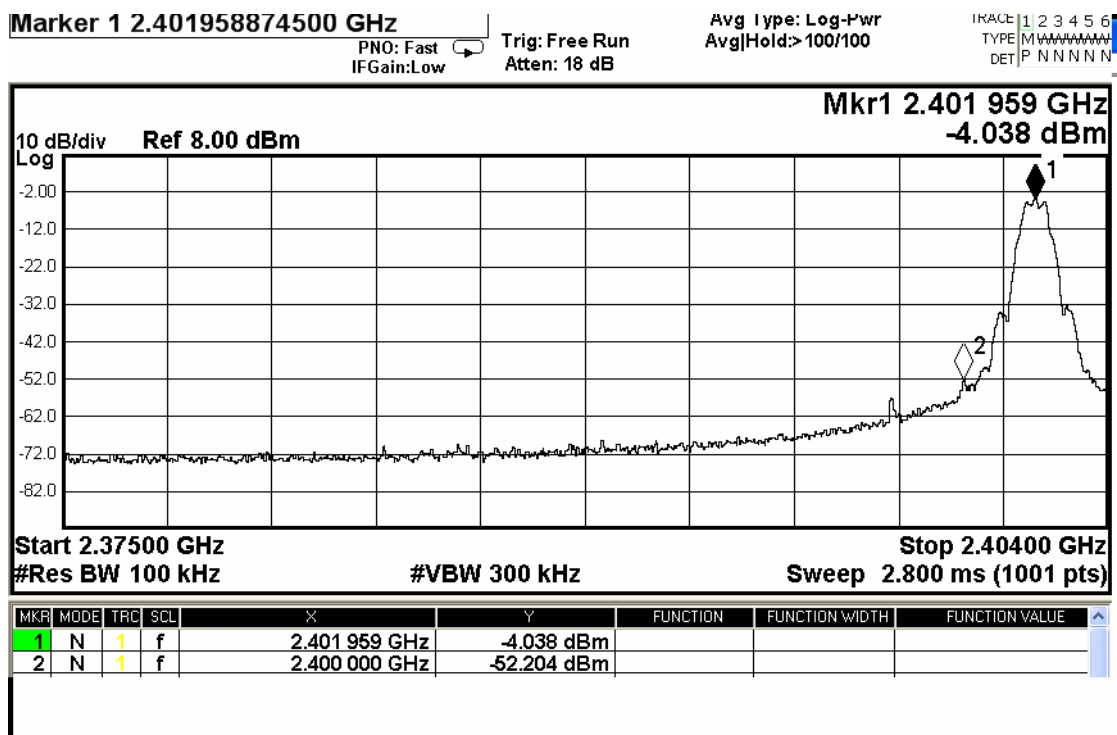
#### Limit :

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

Remark: Emissions under the fixed frequency mode and hopping mode have been investigated, the worst-case measurement results were recorded in the test report

| Frequency Range<br>[MHz]         | Conducted Emission Attenuated below the<br>Fundamental<br>[dB] |
|----------------------------------|----------------------------------------------------------------|
| 2400 – Lowest Fundamental (2402) | 48.166                                                         |

### Band-edge Compliance of RF Emissions – Lowest (GFSK)



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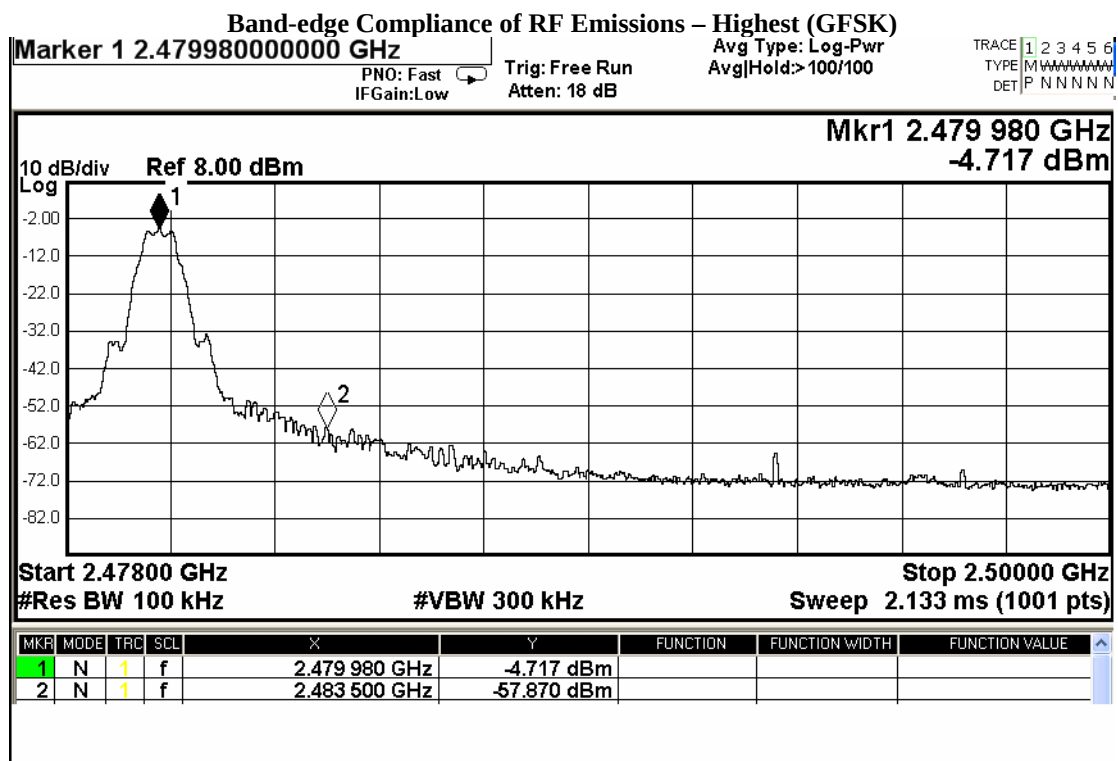
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### Band-edge Compliance of RF Conducted Emissions Measurement:

| Frequency Range<br>[MHz]            | Conducted Emission Attenuated below the<br>Fundamental<br>[dB] |
|-------------------------------------|----------------------------------------------------------------|
| 2483.5 - Highest Fundamental (2480) | 53.153                                                         |



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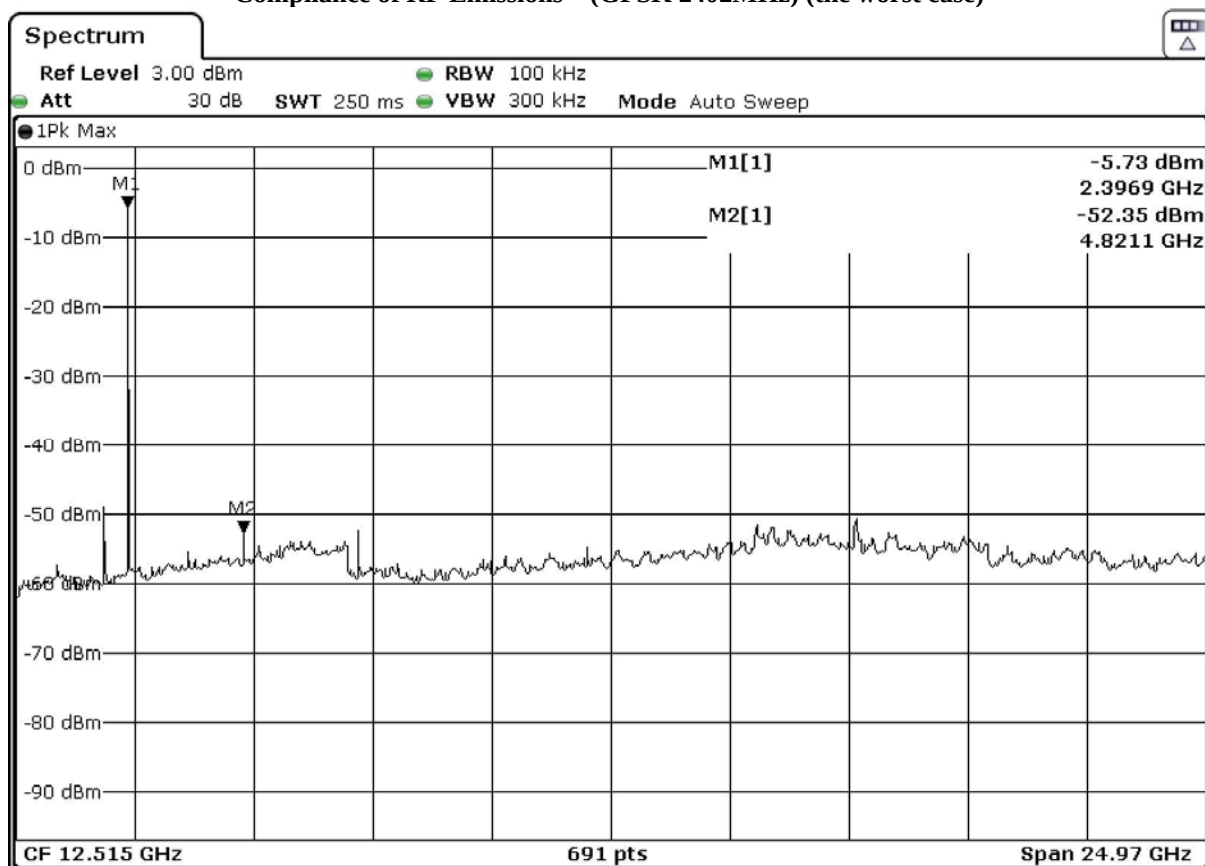
### Compliance of RF Emissions Measurement:

#### Limit :

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

Remark: Emissions under the fixed frequency mode and hopping mode have been investigated, the worst-case measurement results were recorded in the test report

### Compliance of RF Emissions – (GFSK 2402MHz) (the worst case)



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### **3.1.6 Antenna Requirement**

Ambient Temperature: 25°C

Relative Humidity: 51%

Atmospheric Pressure: 101 kPa

**Test Requirements:** § 15.203

#### **Test Specification:**

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

#### **Test Results:**

This is Monopole antenna. There is no external antenna, the antenna gain = 0dBi. User is unable to remove or changed the Antenna.

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### Appendix A

#### List of Measurement Equipment

##### Radiated Emission

| EQP NO. | DESCRIPTION                                     | MANUFACTURER                | MODEL NO.           | SERIAL NO.         | LAST CAL   | DUE CAL    |
|---------|-------------------------------------------------|-----------------------------|---------------------|--------------------|------------|------------|
| EM215   | MULTIDEVICE CONTROLLER                          | EMCO                        | 2090                | 00024676           | N/A        | N/A        |
| EM217   | ELECTRIC POWERED<br>TURNABLE                    | EMCO                        | 2088                | 00029144           | N/A        | N/A        |
| EM218   | ANECHOIC CHAMBER                                | ETS-LINDGREN                | FACT-3              | --                 | 2018/04/20 | 2020/04/20 |
| EM356   | ANTENNA<br>POSITIONING TOWER                    | ETS-LINDGREN                | 2171B               | 00150346           | N/A        | N/A        |
| EM355   | Biconilog Antenna                               | ETS-Lindgren                | 3143B               | 00094856           | 2018/05/24 | 2020/05/24 |
| EM229   | EMI TEST RECEIVER                               | R&S                         | ESIB40              | 100248             | 2018/06/01 | 2020/06/01 |
| EM276   | BROADBAND HORN ANTENNA                          | A-INFOMW                    | JXTXLB-<br>10180-SF | J203109090300<br>7 | 2018/04/27 | 2020/04/27 |
| EM300   | PYRAMIDAL STANDARD GAIN<br>HORN ANTENNA         | ETS-LINDGREN                | 3160-09             | 00130130           | 2018/05/13 | 2020/05/13 |
| EM301   | PYRAMIDAL STANDARD GAIN<br>HORN ANTENNA         | ETS-LINDGREN                | 3160-10             | 00130988           | 2018/05/13 | 2020/05/13 |
| EM302   | PRECISION OMNIDIRECTIONAL<br>DIPOLE (1 – 6GHZ)  | SEIBERSDORF<br>LABORATORIES | POD 16              | 161806/L           | 2018/05/11 | 2020/05/11 |
| EM303   | PRECISION OMNIDIRECTIONAL<br>DIPOLE (6 – 18GHZ) | SEIBERSDORF<br>LABORATORIES | POD 618             | 6181908/L          | 2018/05/11 | 2020/05/11 |
| EM353   | LOOP ANTENNA                                    | ETS LINDGREN                | 6502                | 00206533           | 2018/04/16 | 2020/04/16 |
| EM045   | POWER METER                                     | ROHDE & SCHWARZ             | NRVD                | 843246/028         | 2018/06/01 | 2020/06/01 |

##### Line Conducted

| EQP NO. | DESCRIPTION                            | MANUFACTURER                        | MODEL NO. | SERIAL NO.          | LAST CAL   | DUE CAL    |
|---------|----------------------------------------|-------------------------------------|-----------|---------------------|------------|------------|
| EM119   | LISN                                   | R & S                               | ESH3-Z5   | 0831.5518.52        | 2018/11/09 | 2019/11/09 |
| EM145   | EMI TEST RECEIVER                      | R & S                               | ESCS 30   | 830245/021          | 2018/06/01 | 2020/06/01 |
| EM179   | IMPULSE LIMITER                        | ROHDE & SCHWARZ                     | ESH3-Z2   | 357-<br>8810.52/54  | 2019/01/11 | 2020/01/11 |
| EM154   | SHIELDING ROOM                         | SIEMENS<br>MATSUSHITA<br>COMPONENTS | N/A       | 803-740-057-<br>99A | 2017/02/02 | 2022/02/02 |
| N/A     | MEASUREMENT AND<br>EVALUATION SOFTWARE | ROHDE & SCHWARZ                     | BSIB-K1   | V1.20               | N/A        | N/A        |

#### Remarks:-

CM Corrective Maintenance  
N/A Not Applicable  
TBD To Be Determined

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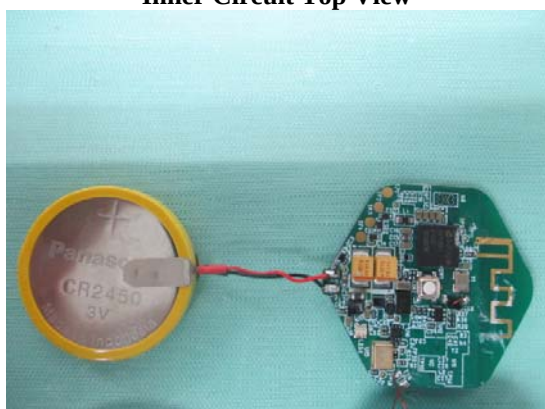
### Appendix B

#### Photographs of EUT

View of the product



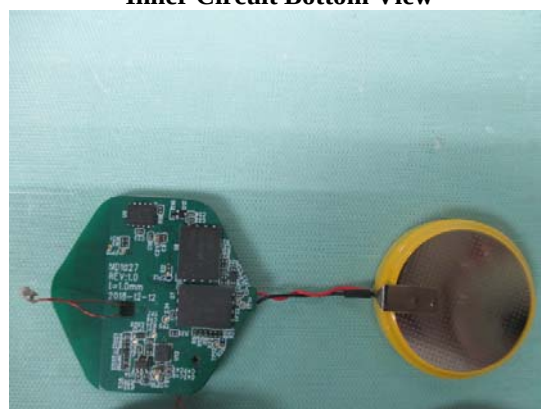
Inner Circuit Top View



View of the product



Inner Circuit Bottom View



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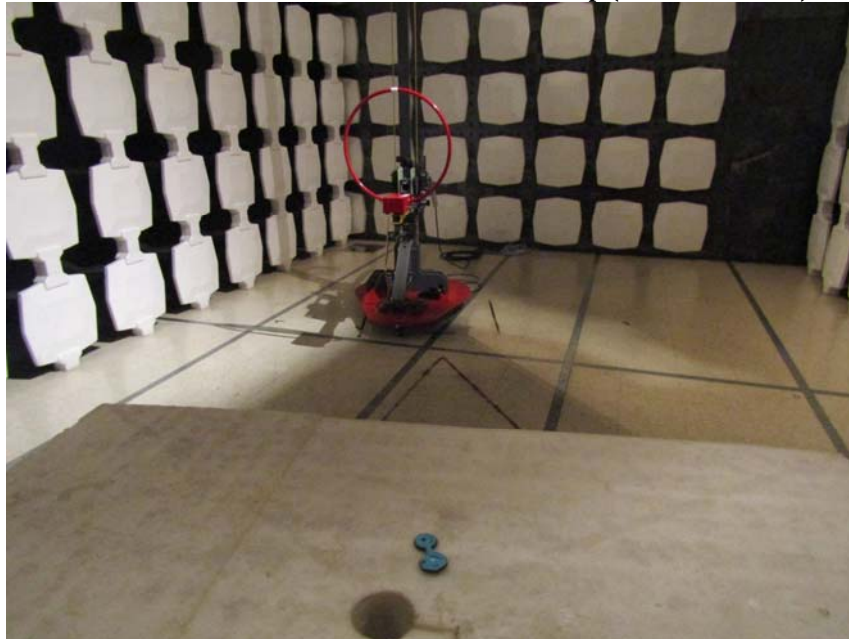
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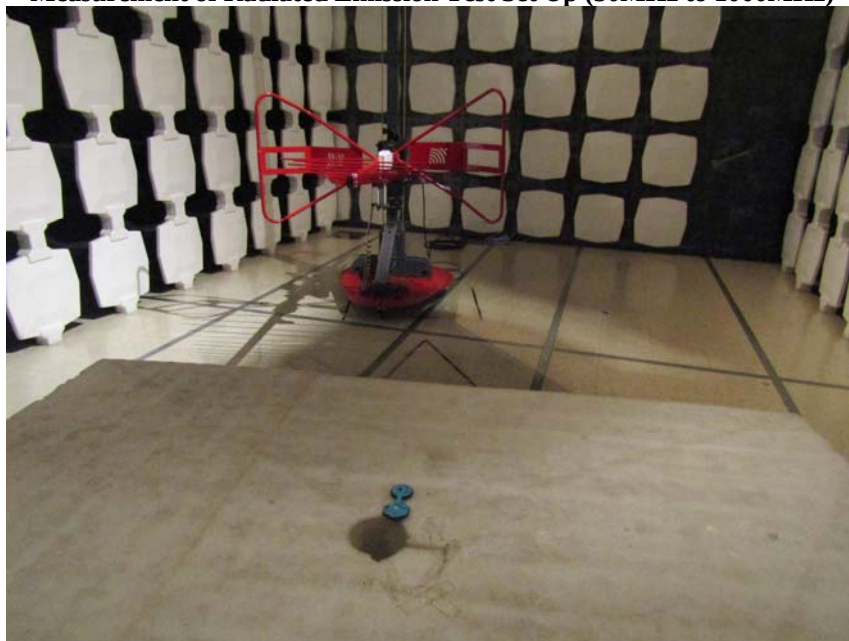
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### Photographs of EUT

**Measurement of Radiated Emission Test Set Up (9kHz to 30MHz)**



**Measurement of Radiated Emission Test Set Up (30MHz to 1000MHz)**



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### Photographs of EUT

**Measurement of Radiated Emission Test Set Up (Above 1000MHz)**



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

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