

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                       |                                                                                                                                                                           |                  |                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------------------------|
| <b>Prüfbericht-Nr.:</b><br><i>Test Report No.:</i>                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>50254142 001</b>                                                   | <b>Auftrags-Nr.:</b><br><i>Order No.:</i>                                                                                                                                 | <b>238105139</b> | Seite 1 von 41<br><i>Page 1 of 41</i> |
| <b>Kunden-Referenz-Nr.:</b><br><i>Client Reference No.:</i>                                                                                                                                                                                                                                                                                                                                                                                                         | N/A                                                                   | <b>Auftragsdatum:</b><br><i>Order date:</i>                                                                                                                               | 08-May-2019      |                                       |
| <b>Auftraggeber:</b><br><i>Client:</i>                                                                                                                                                                                                                                                                                                                                                                                                                              | SMK Corporation<br>5-5 Togoshi 6-chome Shinagawa-kuTokyo142-8511Japan |                                                                                                                                                                           |                  |                                       |
| <b>Prüfgegenstand:</b><br><i>Test item:</i>                                                                                                                                                                                                                                                                                                                                                                                                                         | Bluetooth low energy Module                                           |                                                                                                                                                                           |                  |                                       |
| <b>Bezeichnung / Typ-Nr.:</b><br><i>Identification / Type No.:</i>                                                                                                                                                                                                                                                                                                                                                                                                  | BTS05                                                                 |                                                                                                                                                                           |                  |                                       |
| <b>Auftrags-Inhalt:</b><br><i>Order content:</i>                                                                                                                                                                                                                                                                                                                                                                                                                    | FCC Part 15C / IC RSS-247 Test report (BLE)                           |                                                                                                                                                                           |                  |                                       |
| <b>Prüfgrundlage:</b><br><i>Test specification:</i>                                                                                                                                                                                                                                                                                                                                                                                                                 | FCC 47CFR Part 15: Subpart C Section 15.247(DTS)<br>RSS-247 (02-2017) |                                                                                                                                                                           |                  |                                       |
| <b>Wareneingangsdatum:</b><br><i>Date of receipt:</i>                                                                                                                                                                                                                                                                                                                                                                                                               | 14-May-2019                                                           |                                                                                                                                                                           |                  |                                       |
| <b>Prüfmuster-Nr.:</b><br><i>Test sample No.:</i>                                                                                                                                                                                                                                                                                                                                                                                                                   | A000922090-001 to 002                                                 |                                                                                                                                                                           |                  |                                       |
| <b>Prüfzeitraum:</b><br><i>Testing period:</i>                                                                                                                                                                                                                                                                                                                                                                                                                      | 15-May-2019 – 20-May-2019                                             |                                                                                                                                                                           |                  |                                       |
| <b>Ort der Prüfung:</b><br><i>Place of testing:</i>                                                                                                                                                                                                                                                                                                                                                                                                                 | EMC/RF Laboratory Taipei                                              |                                                                                                                                                                           |                  |                                       |
| <b>Prüflaboratorium:</b><br><i>Testing laboratory:</i>                                                                                                                                                                                                                                                                                                                                                                                                              | TUV Rheinland Taiwan Ltd.                                             |                                                                                                                                                                           |                  |                                       |
| <b>Prüfergebnis*:</b><br><i>Test result*:</i>                                                                                                                                                                                                                                                                                                                                                                                                                       | Pass                                                                  |                                                                                                                                                                           |                  |                                       |
| <b>Report date / tested by:</b><br>11-Jul-2019 Jack Chang/Project Manager<br><i>Datum Name / Stellung Unterschrift</i><br><i>Date Name / Position Signature</i>                                                                                                                                                                                                                                                                                                     |                                                                       | <b>kontrolliert von / reviewed by:</b><br>11-Jul-2019 Arvin Ho/Vice General Manager<br><i>Datum Name / Stellung Unterschrift</i><br><i>Date Name / Position Signature</i> |                  |                                       |
| <b>Sonstiges / Other:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                       |                                                                                                                                                                           |                  |                                       |
| <b>Zustand des Prüfgegenstandes bei Anlieferung:</b><br><i>Condition of the test item at delivery:</i>                                                                                                                                                                                                                                                                                                                                                              |                                                                       | Prüfmuster vollständig und unbeschädigt<br><i>Test item complete and undamaged</i>                                                                                        |                  |                                       |
| <p>* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft<br/>P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet</p> <p>Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor<br/>P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested</p>                      |                                                                       |                                                                                                                                                                           |                  |                                       |
| <p><b>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</b><br/> <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i></p> |                                                                       |                                                                                                                                                                           |                  |                                       |

## TEST SUMMARY

### **5.1.1 ANTENNA REQUIREMENT**

RESULT: *Passed*

### **5.1.2 MAXIMUM CONDUCTED PEAK OUTPUT POWER**

RESULT: *Passed*

### **5.1.3 6dB BANDWIDTH AND 99% BANDWIDTH**

RESULT: *Passed*

### **5.1.4 POWER DENSITY**

RESULT: *Passed*

### **5.1.5 CONDUCTED SPURIOUS EMISSIONS AND FREQUENCY BAND EDGE MEASURED IN 100kHz BANDWIDTH**

RESULT: *Passed*

### **5.1.6 SPURIOUS EMISSION**

RESULT: *Passed*

### **5.2.1 MAINS CONDUCTED EMISSIONS**

RESULT: *Passed*

### **6.1.1 ELECTROMAGNETIC FIELDS**

RESULT: *Passed*

## Contents

|            |                                                                                               |           |
|------------|-----------------------------------------------------------------------------------------------|-----------|
| <b>1.</b>  | <b>GENERAL REMARKS .....</b>                                                                  | <b>5</b>  |
| <b>1.1</b> | <b>COMPLEMENTARY MATERIALS.....</b>                                                           | <b>5</b>  |
| <b>1.2</b> | <b>DECISION RULE OF CONFORMITY.....</b>                                                       | <b>5</b>  |
| <b>2.</b>  | <b>TEST SITES .....</b>                                                                       | <b>6</b>  |
| <b>2.1</b> | <b>TEST LABORATORY .....</b>                                                                  | <b>6</b>  |
| <b>2.2</b> | <b>TEST FACILITY.....</b>                                                                     | <b>6</b>  |
| <b>2.3</b> | <b>LIST OF TEST AND MEASUREMENT INSTRUMENTS.....</b>                                          | <b>7</b>  |
| <b>2.4</b> | <b>TRACEABILITY .....</b>                                                                     | <b>8</b>  |
| <b>2.5</b> | <b>CALIBRATION .....</b>                                                                      | <b>8</b>  |
| <b>2.6</b> | <b>MEASUREMENT UNCERTAINTY .....</b>                                                          | <b>8</b>  |
| <b>3.</b>  | <b>GENERAL PRODUCT INFORMATION.....</b>                                                       | <b>9</b>  |
| <b>3.1</b> | <b>PRODUCT FUNCTION AND INTENDED USE .....</b>                                                | <b>9</b>  |
| <b>3.2</b> | <b>SYSTEM DETAILS AND RATINGS.....</b>                                                        | <b>9</b>  |
| <b>3.3</b> | <b>INDEPENDENT OPERATION MODES.....</b>                                                       | <b>10</b> |
| <b>3.4</b> | <b>NOISE GENERATING AND NOISE SUPPRESSING PARTS .....</b>                                     | <b>10</b> |
| <b>3.5</b> | <b>SUBMITTED DOCUMENTS.....</b>                                                               | <b>10</b> |
| <b>4.</b>  | <b>TEST SET-UP AND OPERATION MODES.....</b>                                                   | <b>11</b> |
| <b>4.1</b> | <b>PRINCIPLE OF CONFIGURATION SELECTION .....</b>                                             | <b>11</b> |
| <b>4.2</b> | <b>TEST OPERATION AND TEST SOFTWARE.....</b>                                                  | <b>11</b> |
| <b>4.3</b> | <b>SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT .....</b>                                      | <b>12</b> |
| <b>4.4</b> | <b>COUNTERMEASURES TO ACHIEVE EMC COMPLIANCE.....</b>                                         | <b>12</b> |
| <b>4.5</b> | <b>TEST SETUP DIAGRAM .....</b>                                                               | <b>12</b> |
| <b>5.</b>  | <b>TEST RESULTS .....</b>                                                                     | <b>14</b> |
| <b>5.1</b> | <b>TRANSMITTER REQUIREMENT &amp; TEST SUITES .....</b>                                        | <b>14</b> |
| 5.1.1      | <i>Antenna Requirement .....</i>                                                              | <i>14</i> |
| 5.1.2      | <i>Maximum conducted output power (average).....</i>                                          | <i>15</i> |
| 5.1.3      | <i>6dB Bandwidth and 99% Bandwidth.....</i>                                                   | <i>16</i> |
| 5.1.4      | <i>Power Density .....</i>                                                                    | <i>22</i> |
| 5.1.5      | <i>Conducted spurious emissions and Frequency Band Edge measured in 100kHz Bandwidth.....</i> | <i>26</i> |
| 5.1.6      | <i>Spurious Emission .....</i>                                                                | <i>32</i> |
| <b>5.2</b> | <b>MAINS EMISSIONS.....</b>                                                                   | <b>33</b> |
| 5.2.1      | <i>Mains Conducted Emissions.....</i>                                                         | <i>33</i> |

|            |                                                  |           |
|------------|--------------------------------------------------|-----------|
| <b>6.</b>  | <b>SAFETY HUMAN EXPOSURE .....</b>               | <b>34</b> |
| <b>6.1</b> | <b>RADIO FREQUENCY EXPOSURE COMPLIANCE .....</b> | <b>34</b> |
| 6.1.1      | <i>Electromagnetic Fields.....</i>               | <i>34</i> |
| <b>7.</b>  | <b>PHOTOGRAPHS OF THE TEST SET-UP.....</b>       | <b>35</b> |
| <b>8.</b>  | <b>LIST OF TABLES .....</b>                      | <b>41</b> |
| <b>9.</b>  | <b>LIST OF PHOTOGRAPHS.....</b>                  | <b>41</b> |

## 1. General Remarks

### 1.1 Complementary Materials

The following attachments are integral parts of this test report:

**Appendix P: Photo Documentation internal view**  
(File Name: 50254142 001 APPENDIXP)

**Appendix D: Test Result of Radiated Emissions**  
(File Name: 50254142 001 APPENDIXD)

Test Specifications

The following standards were applied.

**Table 1: Applied Standard and Test Levels**

| Radio                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FCC 47CFR Part 15: Subpart C Section 15.247<br>FCC 47CFR Part 2: Subpart J Section 2.1091<br>RSS-247 Issue 2, Feb 2017<br>RSS-102 Issue 5, March 2015<br>RSS-Gen, Issue 5, April 2018<br>ANSI C63.10:2013<br>KDB558074 D01 DTS Meas Guidance v05r02<br>KDB447498 D01 General RF Exposure Guidance v06 |

### 1.2 Decision Rule of conformity

The decision rule of conformity of this test report is following the requirements of the requested standard in the quotation, and agreed among testing laboratory and manufacturer (applicant) to exclude the consideration of Measurement Uncertainty, unless it is required by the specific standard.

## 2. Test Sites

### 2.1 Test Laboratory

TUV Rheinland Taiwan Ltd.  
Taipei Testing Laboratories

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.  
Taipei City 105  
Taiwan (R.O.C.)

### 2.2 Test Facility

TUV Rheinland Taiwan Ltd.

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.  
Taipei City 105  
Taiwan (R.O.C.)

FCC RegistrationNo.: 180491  
IC Canada Registration No.: 9465A  
TAF Accredited NCC Test Lab. No.:3567  
TAF ISO17025 Certification effective period: 6<sup>th</sup>-May-2019 to 05<sup>th</sup>-May-2022



Testing Laboratory  
**3567**

## 2.3 List of Test and Measurement Instruments

**Table 2: List of Test and Measurement Equipment**

| Kind of Equipment          | Manu-facturer  | Type      | S/N         | Last Calibration | Next Calibration |
|----------------------------|----------------|-----------|-------------|------------------|------------------|
| Test Software              | Farad          | EZ_EMC    | Ver. TUV3A1 | N/A              | N/A              |
| EMI Test Receiver          | R&S            | ESR 7     | 101062      | 2018/10/01       | 2019/10/01       |
| Spectrum Analyzer          | R&S            | FSV 40    | 101514      | 2019/02/07       | 2020/02/07       |
| EXA Signal Analyzer        | KEYSIGHT       | N9010A    | MY52221334  | 2019/02/15       | 2020/02/15       |
| Preamplifier (30MHz -1GHz) | HP             | 8447F     | 2805A03335  | 2018/08/22       | 2019/08/22       |
| Pre-Amplifier (1GHz~18GHz) | EM Electronics | EM01G18G  | 060558      | 2018/11/30       | 2019/11/30       |
| Bilog Antenna              | TESEQ          | CBL 6111D | 29802       | 2018/08/22       | 2019/08/22       |
| Horn Antenna               | ETS-Lindgren   | 3117      | 00138160    | 2018/06/01       | 2019/06/01       |
| Horn Antenna (18GHz~40GHz) | COM-POWER      | AH-840    | 101029      | 2018/12/22       | 2019/12/22       |
| Loop Antenna               | Schwarzbeck    | FMZB 1513 | 1513-076    | 2018/06/21       | 2019/06/21       |
| LISN (1 phase)             | R&S            | ENV216    | 101243      | 2018/06/18       | 2019/06/18       |
| LISN                       | R&S            | ENV216    | 101262      | 2018/06/22       | 2019/06/22       |

## 2.4 Traceability

All measurement equipment calibrations are traceable to NML(Taiwan)/NIST(USA) or where calibration is performed outside Taiwan, to equivalent nationally recognized standards organizations.

## 2.5 Calibration

Equipment requiring calibration is calibrated periodically in a suitably accredited Calibration Lab. Additionally all equipment is verified for proper performance on a regular schedule using in house standards or comparisons.

## 2.6 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements .

**Table 3: Emission Measurement Uncertainty**

| Parameter                     | Uncertainty            |
|-------------------------------|------------------------|
| Radio Frequency               | $\pm 1 \times 10^{-7}$ |
| RF power, conducted           | $\pm 1.5$ dB           |
| RF power density, conducted   | $\pm 3$ dB             |
| spurious emissions, conducted | $\pm 3$ dB             |
| all emissions, radiated       | $\pm 6$ dB             |
| Temperature                   | $\pm 1$ °C             |
| Humidity                      | $\pm 5$ %              |

### 3. General Product Information

#### 3.1 Product Function and Intended Use

The EUT is a Bluetooth low energy Module. It contains a Bluetooth compatible module enabling the user to communicate data through a Wireless interface.

For details refer to the User Guide, Data Sheet and Circuit Diagram.

#### 3.2 System Details and Ratings

**Table 4: Basic Information of EUT**

| Item                        | EUT information             |
|-----------------------------|-----------------------------|
| Kind of Equipment/Test Item | Bluetooth low energy Module |
| Type Designation            | BTS05                       |
| FCC ID                      | GT3SCI01                    |
| IC                          | 3683A-SCI01                 |
| HVIN                        | BTS05                       |

**Table 5: Technical Specification of EUT**

| Technical Specification | Value                                 |
|-------------------------|---------------------------------------|
| Operating Frequencies   | 2402~2480MHz                          |
| Channel number          | 40                                    |
| Operation Voltage       | 1.7Vdc to 3.6Vdc (Tested with 3.3Vdc) |
| Modulation              | LE 1M: GFSK<br>LE 2M: GFSK            |
| Antenna gain            | -1.36dBi                              |

### 3.3 Independent Operation Modes

Basic operation modes are:

- A. Transmitting
  - 1. Low channel
  - 2. Middle channel
  - 3. High channel
- B. Receiving
- C. Standby
- D. Off

### 3.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

### 3.5 Submitted Documents

- Circuit Diagram
- Blocking Diagram
- Rating Label
- Technical Description

## **4. Test Set-up and Operation Modes**

### **4.1 Principle of Configuration Selection**

The equipment under test (EUT) was configured to measure its maximum power level. The test modes were adapted accordingly in reference to the instructions for use.

### **4.2 Test Operation and Test Software**

Setup for testing: The module is mounted on an Evaluation Board provided by the manufacturer. The EVB is provided with an USB interface which makes it possible to control the module through the test software installed on a notebook computer.

This software was running on the laptop computer connected to the EUT. It was used to enable the operation modes listed in section 3.3 as appropriate.

The samples were used as follows:  
Conducted sample: A000922090-001  
Radiation sample: A000922090-002

Full test was applied on all test modes, but only worst case was shown

BLE mode:

Channel Low (2402MHz), Channel Mid (2440MHz) and Channel High (2480MHz) were chosen for full testing.

### 4.3 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

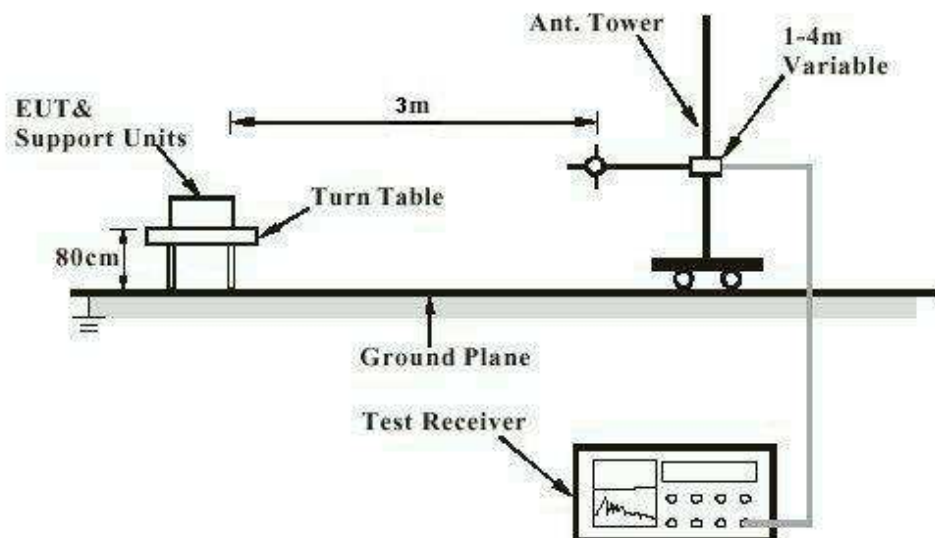
| Description      | Manufacturer | Model No.                | Serial No. |
|------------------|--------------|--------------------------|------------|
| Notebook(EMC-06) | Lenovo       | TP00048A                 | PB-0F8B2   |
| Test tool        | Microchip    | DTM Tool for BTS05 (DLE) | v0.2.0     |

### 4.4 Countermeasures to achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Constructional Data Form or the Technical Construction File. No additional measures were employed to achieve compliance.

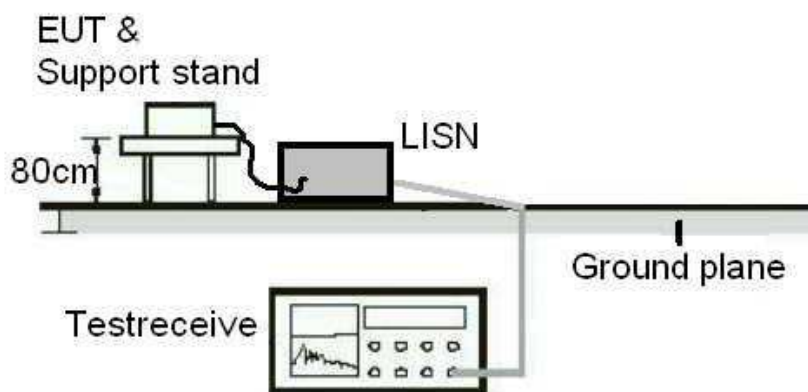
### 4.5 Test Setup Diagram

**Diagram of Measurement Configuration for Radiation Test**

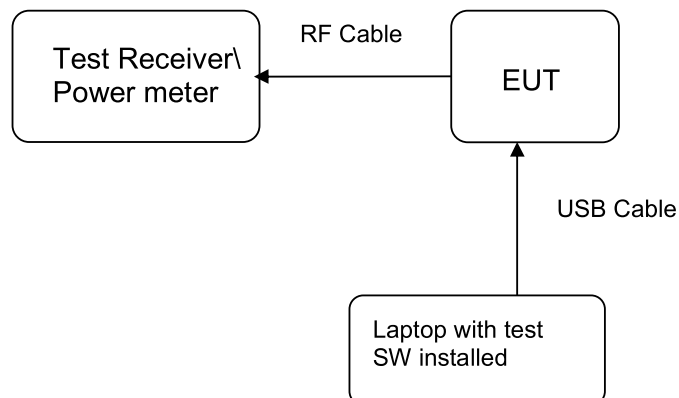


Note: Measurements above 1 GHz are done with a table height of 1.5m

**Diagram of Measurement Equipment Configuration for Mains Conduction Measurement (if applicable)**



**Diagram of Measurement Equipment Configuration for Conducted Transmitter Measurement**



## 5. Test Results

### 5.1 Transmitter Requirement & Test Suites

#### 5.1.1 Antenna Requirement

**RESULT:****Passed**

Test standard : FCC Part 15.247(b)(4), Part 15.203 and RSS-Gen 6.8

Requirement : use of approved antennas only with directional gains that do not exceed 6 dBi

According to the manufacturer declaration, the EUT has an antenna with Max directional gain of -1.36dBi. The antenna is a printed PCB trace with no possibility of replacement with a non-approved antenna by the end-user. Therefore, the EUT is considered to comply with this provision.

Refer to EUT photo for details.

### 5.1.2 Maximum conducted Peak output power

**RESULT:**
**Passed**

Test standard : FCC Part 15.247(b)(3), RSS-247 5.4(b)  
 Basic standard : ANSI C63.10:2013, KDB558074  
 Limit : 1 Watt  
 Kind of test site : Shielded room

**Test setup**

Test Channel : Low/ Middle/ High  
 Operation Mode : A  
  
 Ambient temperature : 20-24 °C  
 Relative humidity : 50-65 %  
 Atmospheric pressure : 100-103 kPa

**Table 6: Test result of Maximum conducted Peak output power, LE 1M**

| Channel        | Channel Frequency (MHz) | Output Power |         | Limit |
|----------------|-------------------------|--------------|---------|-------|
|                |                         | (dBm)        | (W)     | (W)   |
| Low Channel    | 2402                    | 4.02         | 0.00252 | 1     |
| Middle Channel | 2440                    | 4.26         | 0.00267 | 1     |
| High Channel   | 2480                    | 4.00         | 0.00251 | 1     |

Pmax: 4.26dBm, 2.67mW

**Table 7: Test result of Maximum conducted Peak output power, LE 2M**

| Channel        | Channel Frequency (MHz) | Output Power |         | Limit |
|----------------|-------------------------|--------------|---------|-------|
|                |                         | (dBm)        | (W)     | (W)   |
| Low Channel    | 2402                    | 4.13         | 0.00259 | 1     |
| Middle Channel | 2440                    | 4.34         | 0.00272 | 1     |
| High Channel   | 2480                    | 4.12         | 0.00258 | 1     |

Pmax: 4.34dBm, 2.72mW

### 5.1.3 6dB Bandwidth and 99% Bandwidth

**RESULT:**
**Passed**

Test standard : FCC Part 15.247(a)(2), RSS-247 5.2(a)  
 RSS-Gen (Issue 5) 6.7  
 Basic standard : ANSI C63.10:2013, KDB558074  
 Kind of test site : Shielded room

**Test setup**

Test Channel : Low/ Middle/ High  
 Operation Mode : A  
  
 Ambient temperature : 20-24°C  
 Relative humidity : 50-65%  
 Atmospheric pressure : 100-103 kPa

**Table 8: Test result of 6dB Bandwidth, LE 1M**

| Channel      | Channel Frequency (MHz) | 6dB Bandwidth (kHz) | Limit (kHz) | Result |
|--------------|-------------------------|---------------------|-------------|--------|
| Low Channel  | 2402                    | 713.9               | >500        | Pass   |
| Mid Channel  | 2440                    | 716.3               | >500        | Pass   |
| High Channel | 2480                    | 711.9               | >500        | Pass   |

**Table 9: Test result of 99% Bandwidth, LE 1M**

| Channel     | Channel Frequency (MHz) | 99% Bandwidth (MHz) |
|-------------|-------------------------|---------------------|
| Mid Channel | 2440                    | 1.0630              |

**Table 10: Test result of 6dB Bandwidth, LE 2M**

| Channel      | Channel Frequency (MHz) | 6dB Bandwidth (kHz) | Limit (kHz) | Result |
|--------------|-------------------------|---------------------|-------------|--------|
| Low Channel  | 2402                    | 1.168               | >500        | Pass   |
| Mid Channel  | 2440                    | 1.148               | >500        | Pass   |
| High Channel | 2480                    | 1.168               | >500        | Pass   |

**Table 11: Test result of 99% Bandwidth, LE 2M**

| Channel     | Channel Frequency (MHz) | 99% Bandwidth (MHz) |
|-------------|-------------------------|---------------------|
| Mid Channel | 2440                    | 2.0915              |

## Test Plot of 6dB Bandwidth, LE 1M

### Low Channel



### Middle Channel

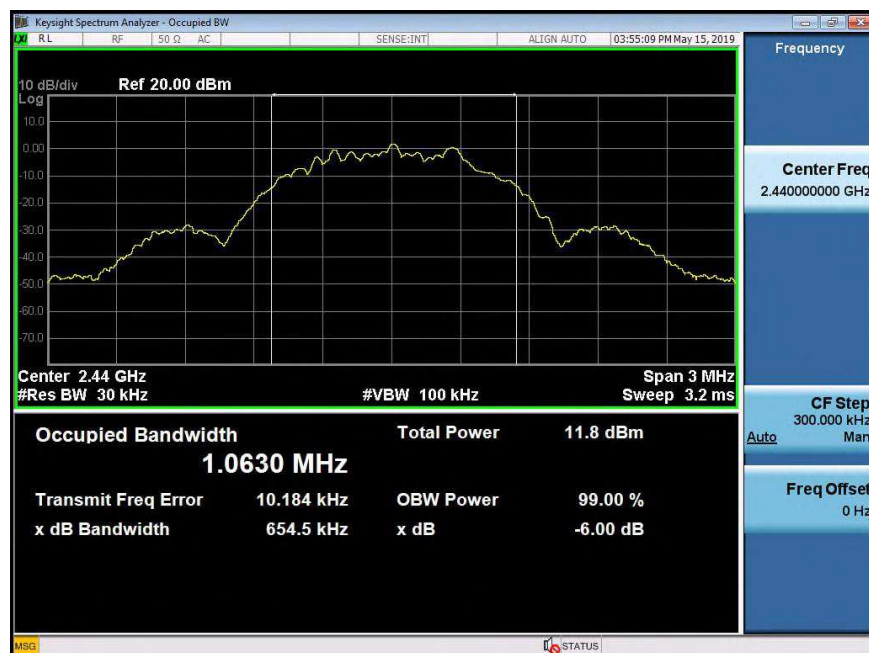


### High Channel



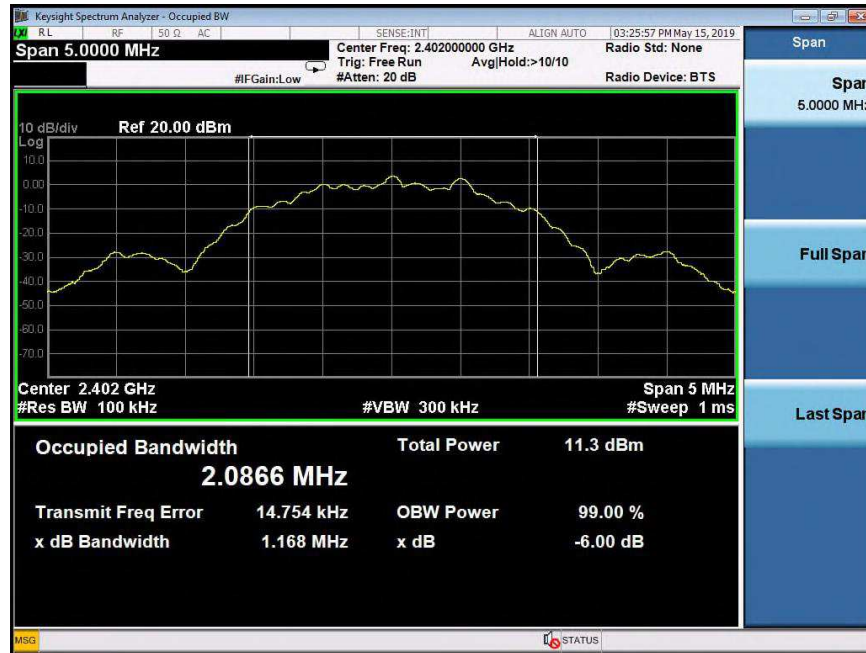
### Test Plot of 99% Bandwidth, LE 1M

#### Middle Channel



## Test Plot of 6dB Bandwidth, LE 2M

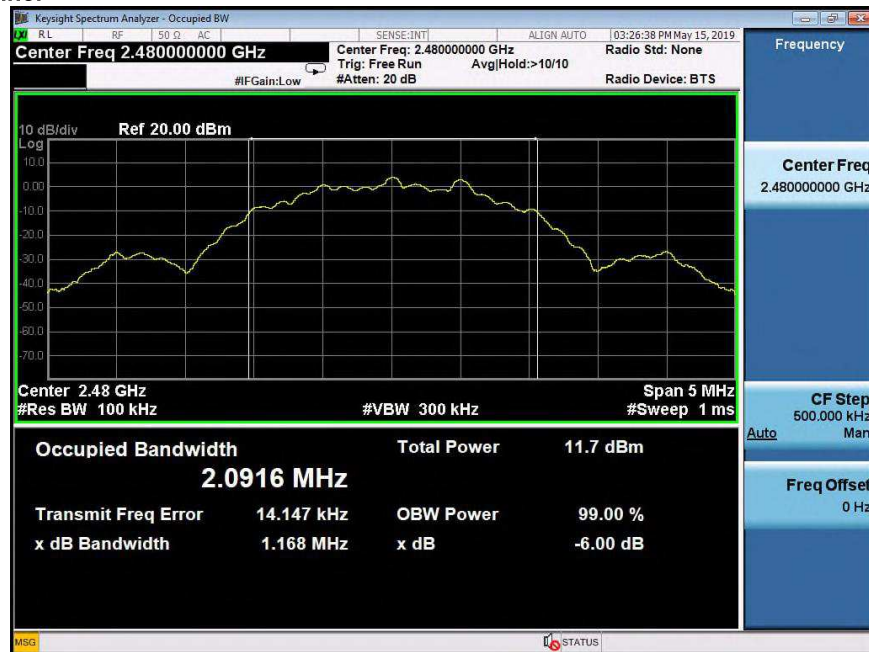
### Low Channel



### Middle Channel



### High Channel



### Test Plot of 99% Bandwidth, LE 2M

#### Middle Channel



### 5.1.4 Power Density

**RESULT:**
**Passed**

Test standard : FCC Part 15.247(e) , RSS-247 5.2(b)  
 Basic standard : ANSI C63.10:2013, KDB558074  
 Kind of test site : Shielded room

**Test setup**

Test Channel : Low/ Middle/ High  
 Operation Mode : A  
 Ambient temperature : 20-24°C  
 Relative humidity : 50-65%  
 Atmospheric pressure : 100-103 kPa

**Table 12: Test result of Power Density, LE 1M**

| Channel        | Channel Frequency (MHz) | Power Density | Limit |
|----------------|-------------------------|---------------|-------|
|                |                         | (dBm)         | (dBm) |
| Low Channel    | 2402                    | -12.14        | 8     |
| Middle Channel | 2440                    | -11.73        | 8     |
| High Channel   | 2480                    | -12.30        | 8     |

**Table 13: Test result of Power Density, LE 2M**

| Channel        | Channel Frequency (MHz) | Power Density | Limit |
|----------------|-------------------------|---------------|-------|
|                |                         | (dBm)         | (dBm) |
| Low Channel    | 2402                    | -13.97        | 8     |
| Middle Channel | 2440                    | -13.79        | 8     |
| High Channel   | 2480                    | -14.02        | 8     |

## Test Plot of Power Density, LE 1M

### Low Channel



### Middle Channel



### High Channel



### Test Plot of Power Density, LE 2M

#### Low Channel



### Middle Channel



### High Channel



**5.1.5 Conducted spurious emissions and Frequency Band Edge  
measured in 100kHz Bandwidth****RESULT:****Passed**

|                   |   |                                                                                                                   |
|-------------------|---|-------------------------------------------------------------------------------------------------------------------|
| Test standard     | : | FCC part 15.247(d), RSS-247 5.5                                                                                   |
| Basic standard    | : | ANSI C63.10:2013, KDB558074                                                                                       |
| Limit             | : | 20dB (below that in the 100kHz bandwidth within the<br>band that contains the highest level of the desired power) |
| Kind of test site | : | Shielded room                                                                                                     |

**Test setup**

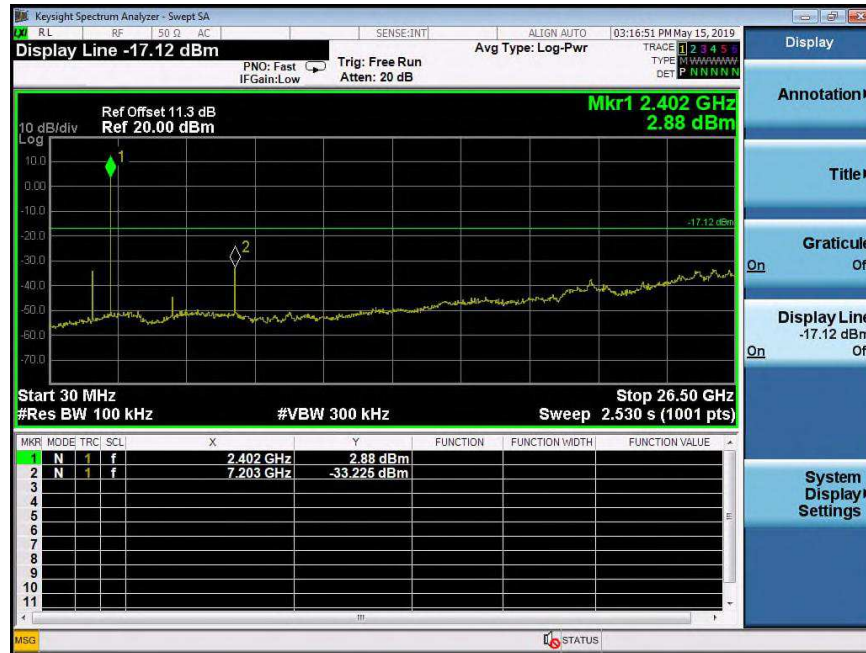
|                      |   |                                                         |
|----------------------|---|---------------------------------------------------------|
| Test Channel         | : | Low/ Mid/ High for spurious, Low/ High for<br>Band Edge |
| Operation mode       | : | A                                                       |
| Ambient temperature  | : | 20-24°C                                                 |
| Relative humidity    | : | 50-65%                                                  |
| Atmospheric pressure | : | 100-103 kPa                                             |

All emissions are more than 20dB below fundamental, details refer to following test plot, and compliance is achieved as well.

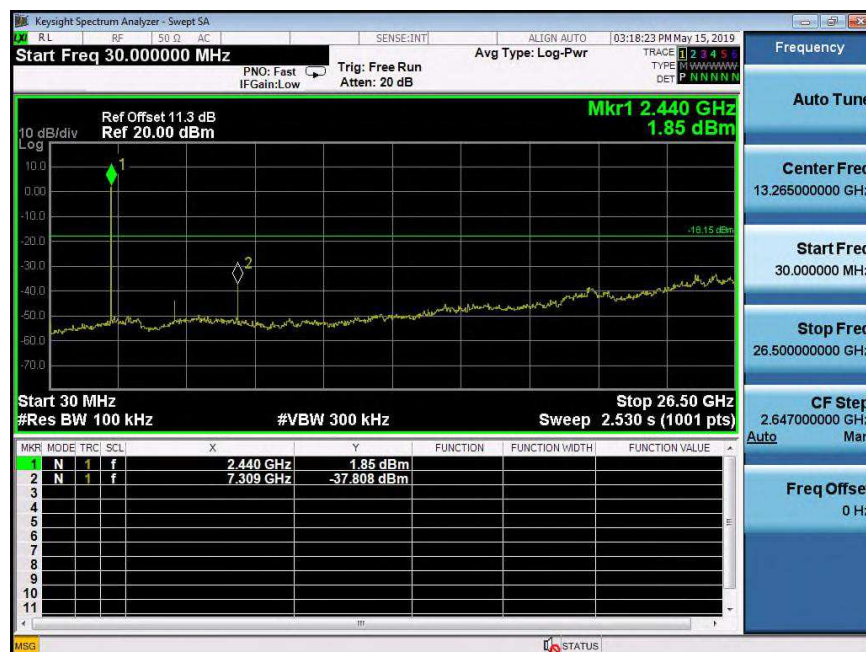
Due to the small size of the product and that there are no inductive components of significant size, 9kHz to 30MHz frequency range is not tested based on technical judgment.

## Test Plot 100kHz Conducted Emissions, LE 1M

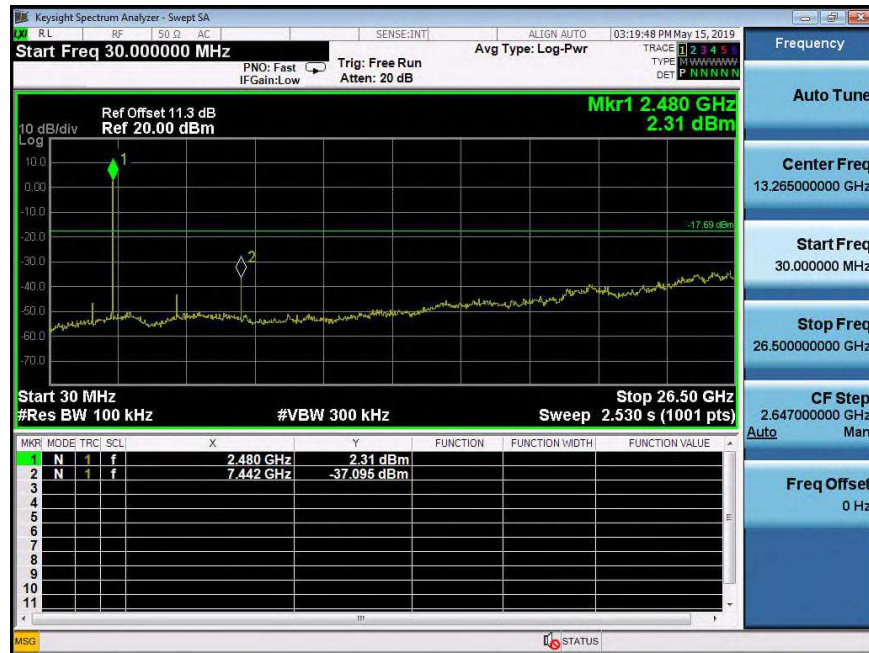
### Low Channel



### Middle Channel



## High Channel

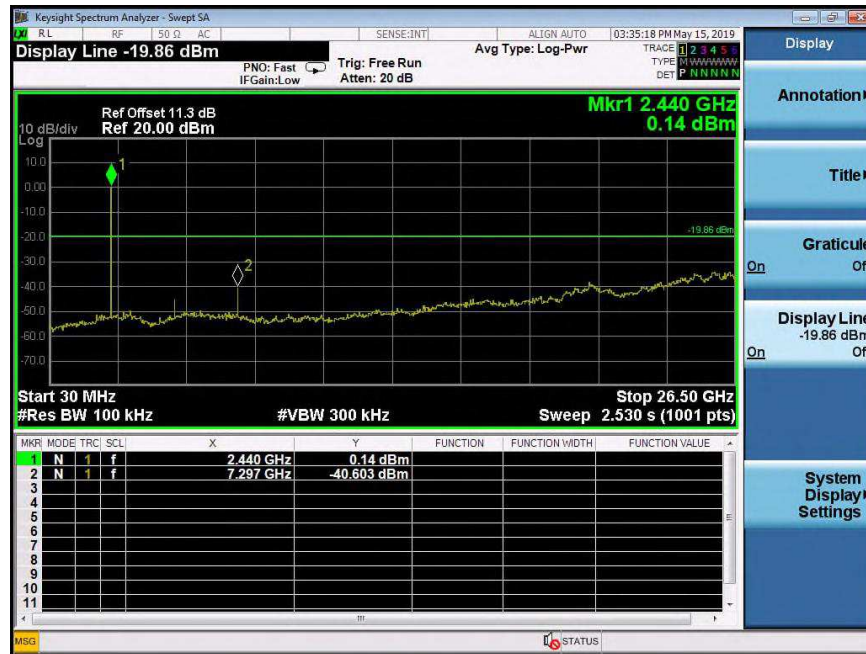


## Test Plot 100kHz Conducted Emissions, LE 2M

### Low Channel



### Middle Channel

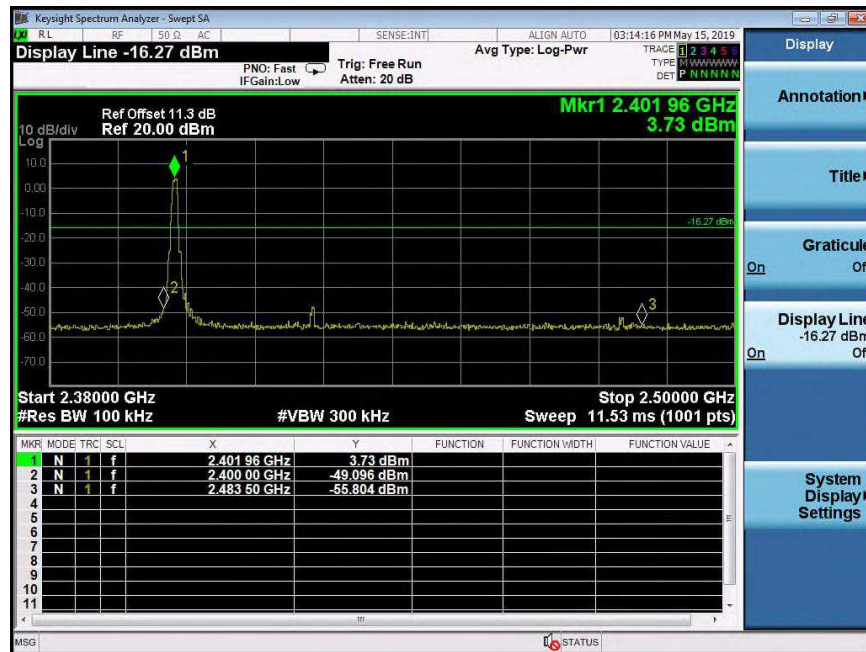


### High Channel

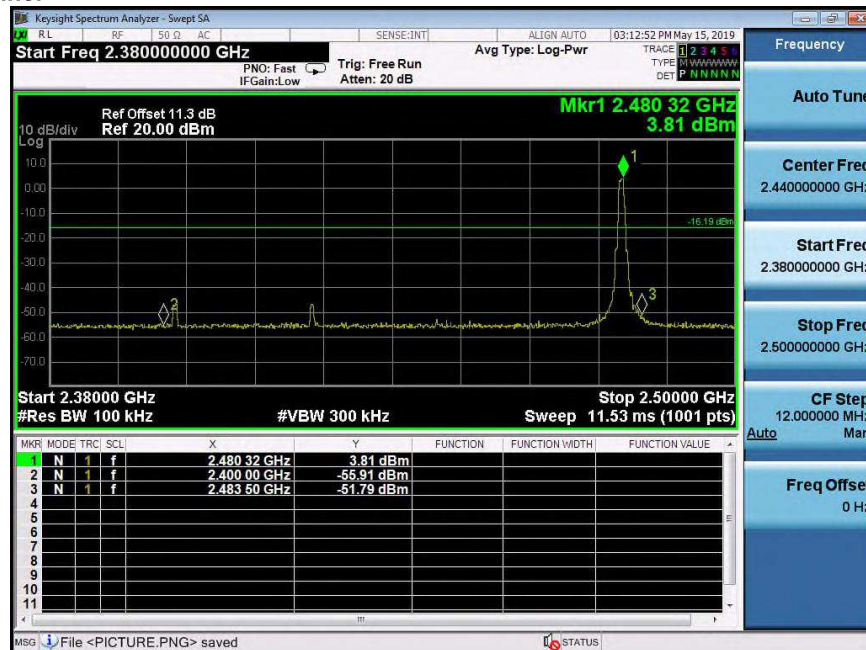


## Test Plot 100kHz RBW of Band Edge, LE 1M

### Low Channel

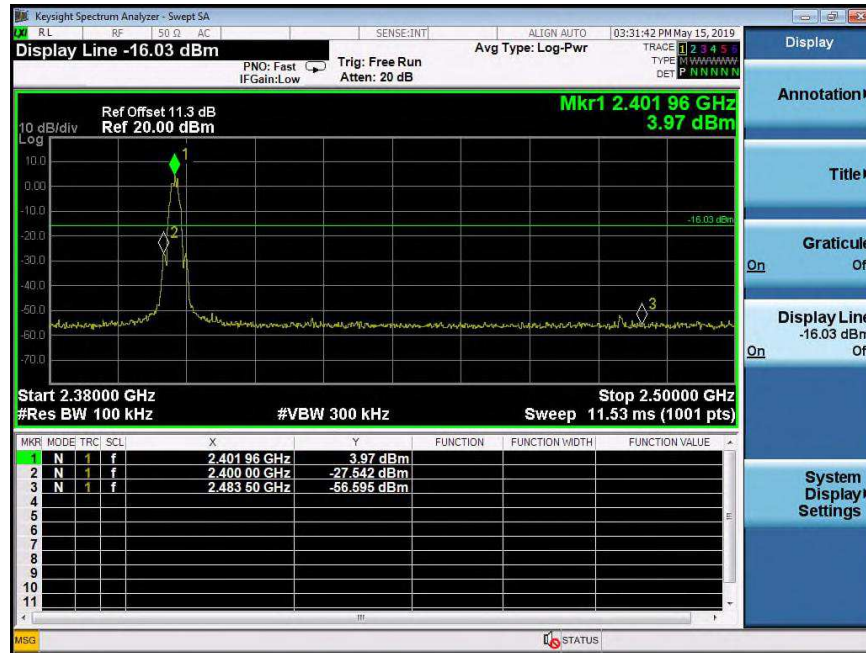


### High Channel

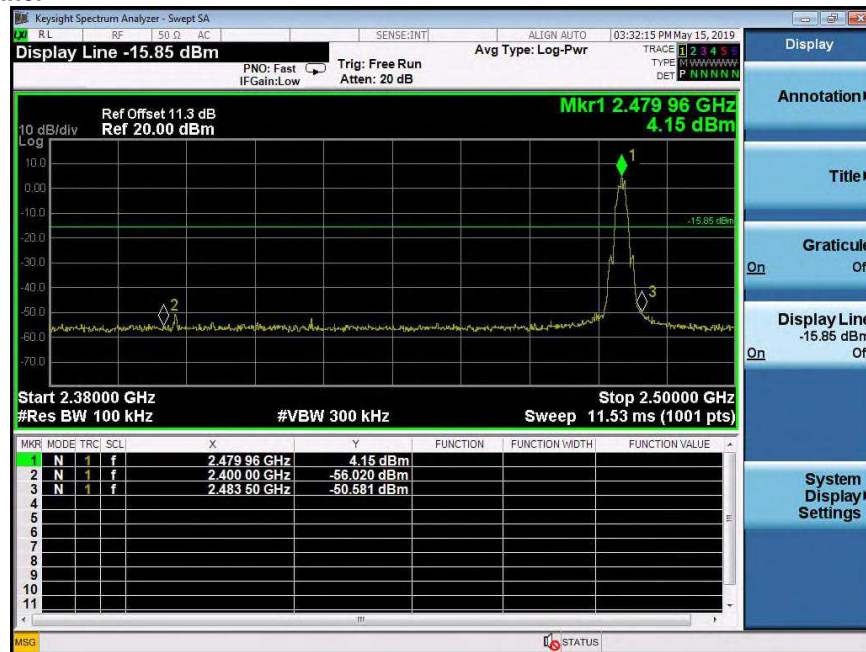


## Test Plot 100kHz RBW of Band Edge, LE 2M

### Low Channel



### High Channel



### 5.1.6 Spurious Emission

**RESULT:****Passed**

Test standard : FCC part 15.247(d), FCC 15.205, FCC 15.209,  
RSS-247 5.5 and RSS-Gen issue 5  
LP0002(2018): 3.10.1, (5)

Basic standard : ANSI C63.10: 2013

Limits : Radiated emissions which fall in the restricted bands, as  
defined in FCC 15.205(a) and RSS-Gen i5, 8.10 (Table 7),  
must comply with the radiated emission limits specified in  
FCC 15.209(a) and RSS-Gen i5, 8.9 (Table 5 and 6).  
Emission radiated outside the specified frequency bands  
must comply with the radiated emission limits specified in  
FCC 15.209(a) and RSS-Gen i5, 8.9 (Table 5 and 6).

Kind of test site : 3m Semi-Anechoic Chamber

**Test setup**

Test Channel : Low/ Middle/ High

Operation mode : A, B

For details refer to Appendix D.

The Radiated Emissions testing was performed in the X, Y and Z axis orientation. The worst-case Axis orientation is recorded in this test report.

Factor (dB/m)=Antenna Factor(dB/m)+Cable loss (dB)  
Level(dBuV/m)=Reading(dBuV)+ Factor(dB/m)

## 5.2 Mains Emissions

### 5.2.1 Mains Conducted Emissions

**RESULT:****Passed**

Test standard : FCC Part 15.207  
FCC Part 15.107  
RSS-Gen i5 8.8

Limits : Mains Conducted emissions as defined in  
above test standards must comply with the  
mains conducted emission limits specified

Kind of test site : Shielded Room

**Test setup**

Test Channel : Middle  
Operation mode : A

Remark: For details refer to Appendix D.

## 6. Safety Human exposure

### 6.1 Radio Frequency Exposure Compliance

#### 6.1.1 Electromagnetic Fields

**RESULT:****Passed**

Test standard : FCC KDB Publication 447498 D01 v06  
47CFR 1.1310  
47CFR 2.1091  
RSS-102 issue 5

**FCC:****LE 1M:**

Therefore the maximum output power of the transmitter is  $2.67\text{mW} < 10\text{mW}$  (Distance: 5 mm), hence the EUT is excluded from SAR evaluation according to FCC KDB publication 447498 D01: Mobile Portable RF Exposure.

**LE 2M:**

Therefore the maximum output power of the transmitter is  $2.72\text{mW} < 10\text{mW}$  (Distance: 5 mm), hence the EUT is excluded from SAR evaluation according to FCC KDB publication 447498 D01: Mobile Portable RF Exposure.

**Canada:****LE 1M:**

Maximum conducted peak power: 2.67 mW  
Antenna Gain: -1.36 dbi  
Maximum EIRP available 1.95 mW

Since maximum output power of the transmitter is  $1.95\text{mW} < 4\text{mW}$  (distance  $\leq 5\text{ mm}$ ), hence the EUT is excluded from SAR evaluation according to Table 1 in RSS-102, For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in Table 1 of RSS-102 are multiplied by a factor of 2.5.

**LE 2M:**

Maximum conducted peak power: 2.72 mW  
Antenna Gain: -1.36 dbi  
Maximum EIRP available 1.99 mW

Since maximum output power of the transmitter is  $1.99\text{mW} < 4\text{mW}$  (distance  $\leq 5\text{ mm}$ ), hence the EUT is excluded from SAR evaluation according to Table 1 in RSS-102, For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in Table 1 of RSS-102 are multiplied by a factor of 2.5.

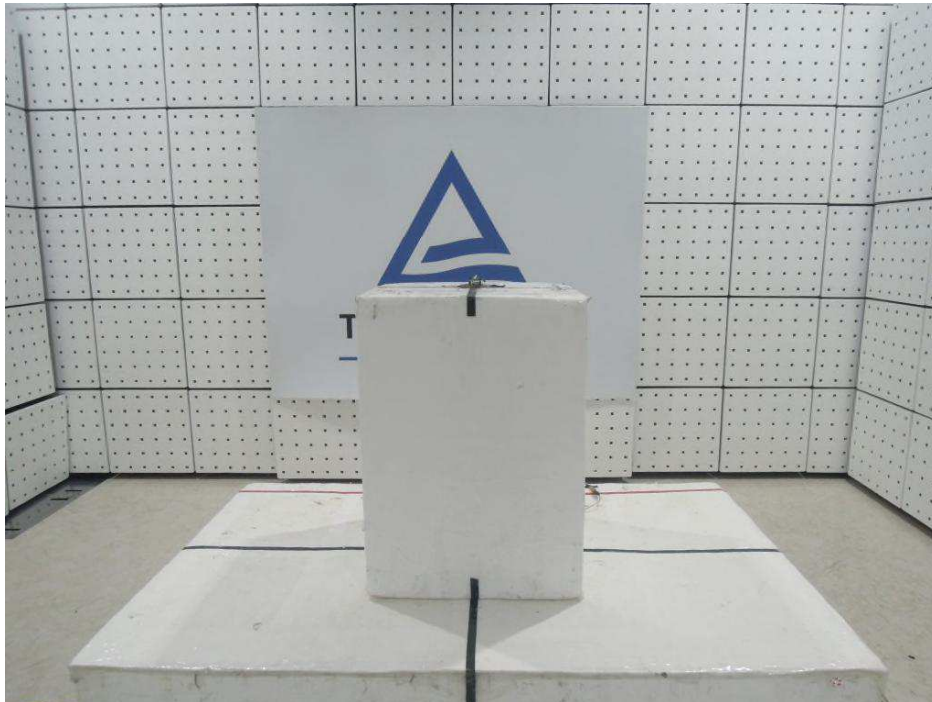
**---End---**

## 7. Photographs of the Test Set-Up

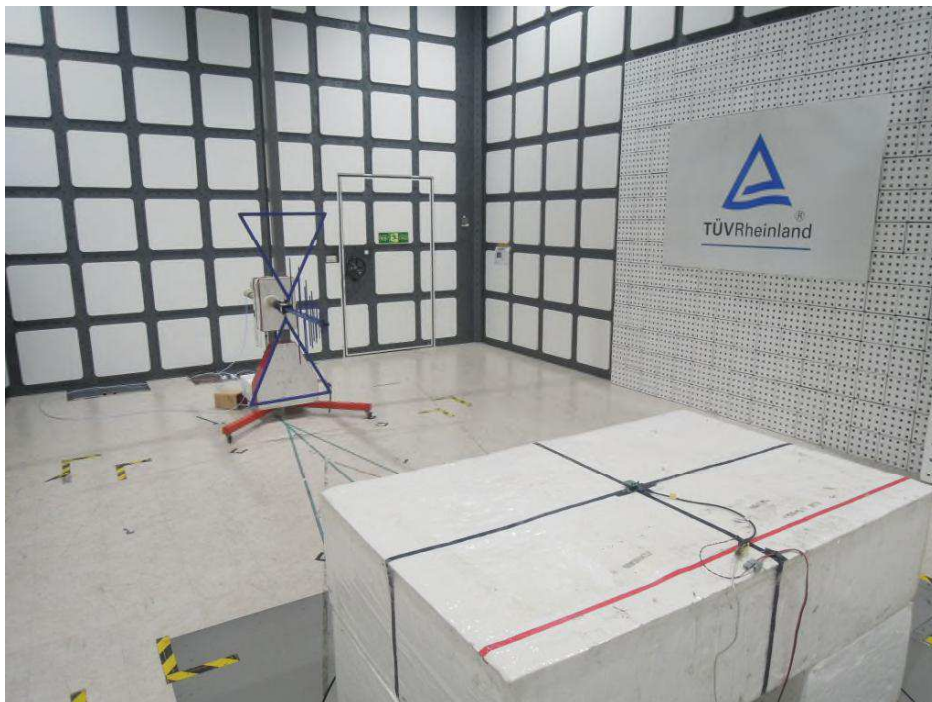
Photograph 1: Set-up for Spurious Emissions (Front View 1)



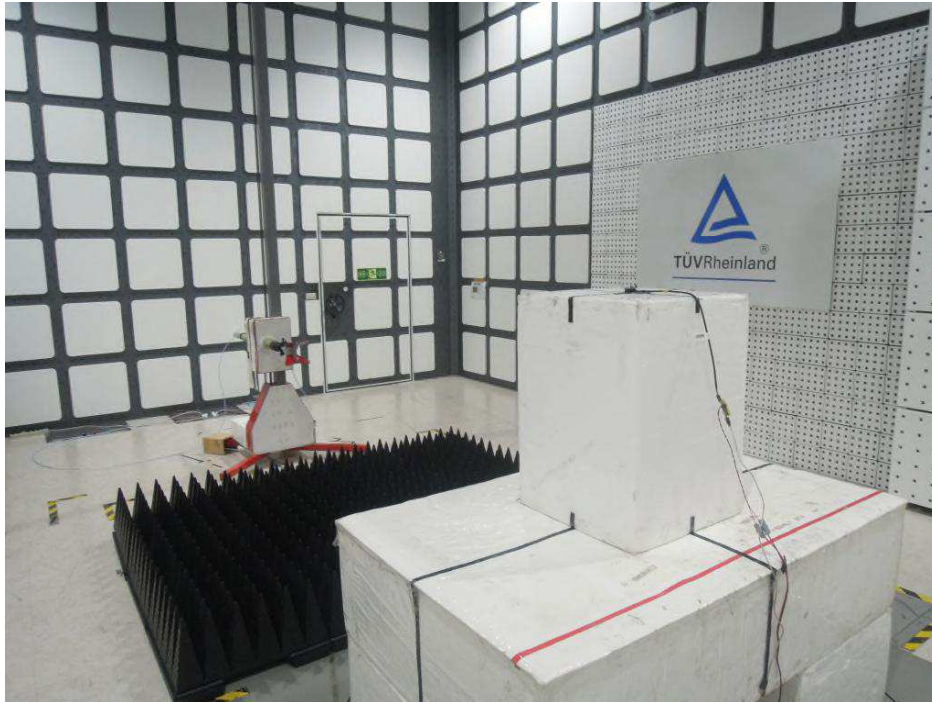
**Photograph 2: Set-up for Spurious Emissions (Front View 2)**



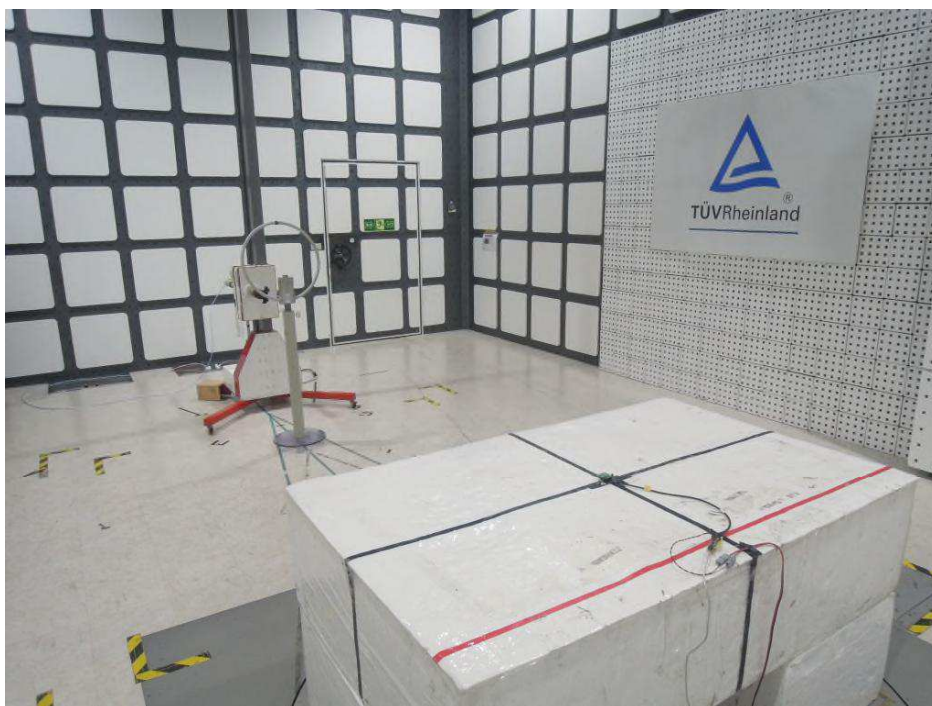
**Photograph 3: Set-up for Spurious Emissions (Back View 1)**



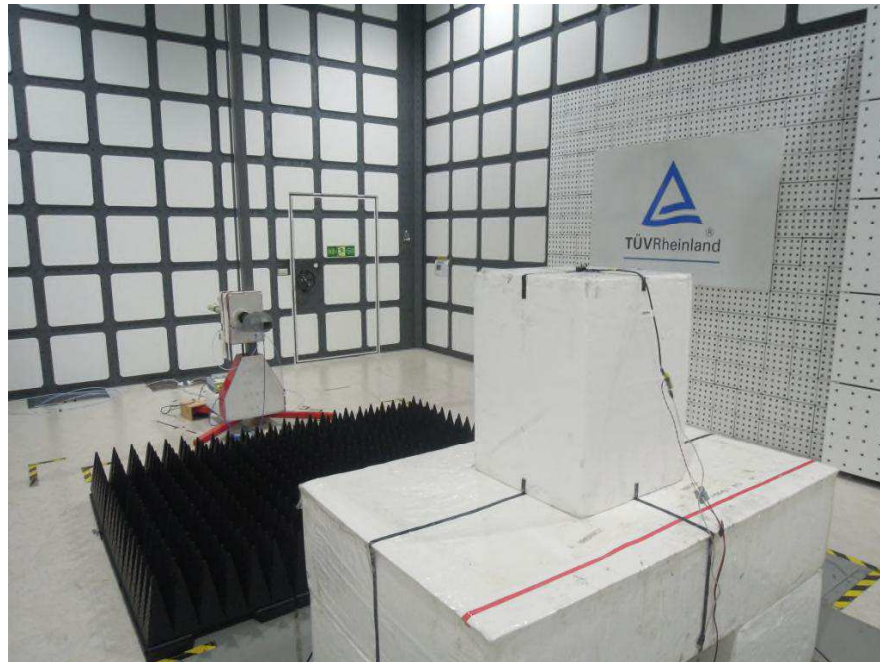
**Photograph 4: Set-up for Spurious Emissions (Back View 2)**



**Photograph 5: Set-up for Spurious Emissions (Back View 3)**



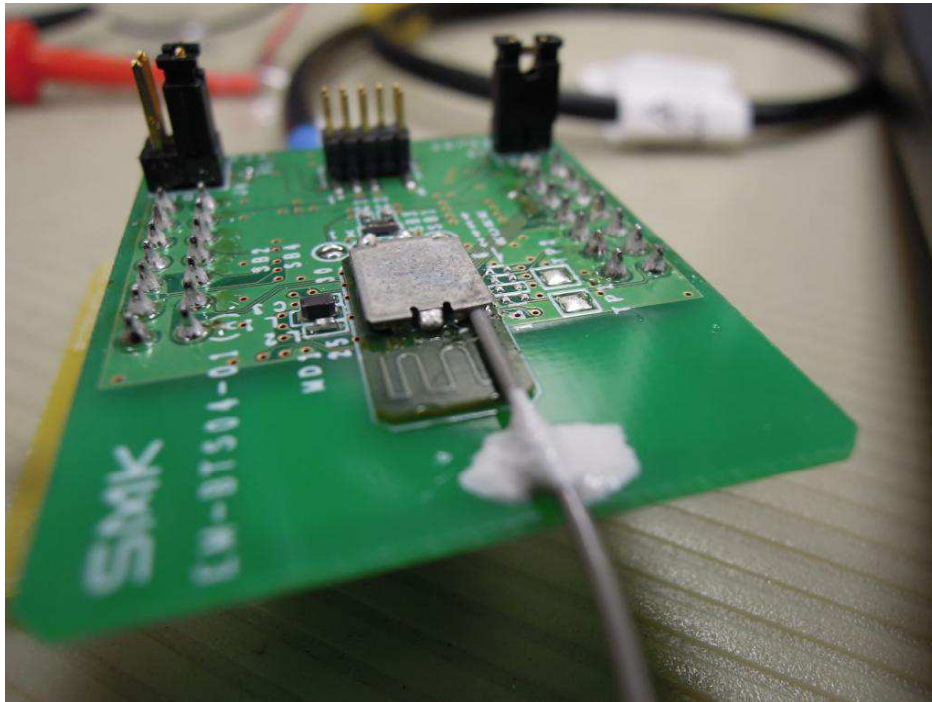
**Photograph 6: Set-up for Spurious Emissions (Back View 4)**



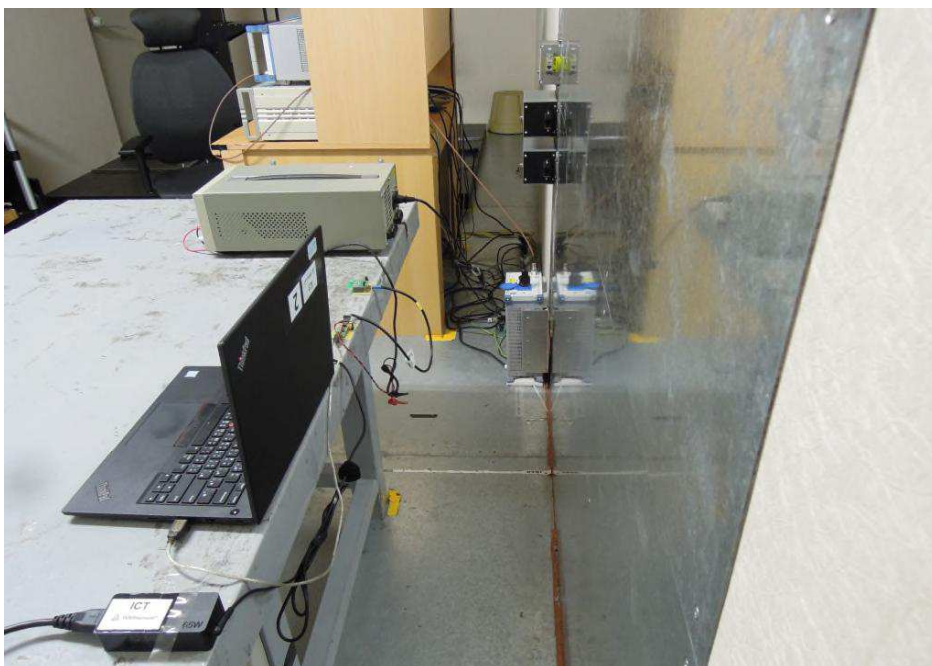
**Photograph 7: Set-up for Conducted testing**



**Photograph 8: Set-up for Conducted testing**



**Photograph 9: Set-up for Mains Conducted testing (Back View)**



**Photograph 10: Set-up for Mains Conducted testing (Front View)**



## 8. List of Tables

|                                                                         |    |
|-------------------------------------------------------------------------|----|
| Table 1: Applied Standard and Test Levels .....                         | 5  |
| Table 2: List of Test and Measurement Equipment .....                   | 7  |
| Table 3: Emission Measurement Uncertainty.....                          | 8  |
| Table 4: Basic Information of EUT .....                                 | 9  |
| Table 5: Technical Specification of EUT .....                           | 9  |
| Table 6: Test result of Maximum conducted Peak output power, LE 1M..... | 15 |
| Table 7: Test result of Maximum conducted Peak output power, LE 2M..... | 15 |
| Table 8: Test result of 6dB Bandwidth, LE 1M.....                       | 16 |
| Table 9: Test result of 99% Bandwidth, LE 1M .....                      | 16 |
| Table 10: Test result of 6dB Bandwidth, LE 2M .....                     | 17 |
| Table 11: Test result of 99% Bandwidth, LE 2M .....                     | 17 |
| Table 12: Test result of Power Density, LE 1M .....                     | 22 |
| Table 13: Test result of Power Density, LE 2M .....                     | 22 |

## 9. List of Photographs

|                                                                     |    |
|---------------------------------------------------------------------|----|
| Photograph 1: Set-up for Spurious Emissions (Front View 1).....     | 35 |
| Photograph 2: Set-up for Spurious Emissions (Front View 2).....     | 36 |
| Photograph 3: Set-up for Spurious Emissions (Back View 1) .....     | 36 |
| Photograph 4: Set-up for Spurious Emissions (Back View 2) .....     | 37 |
| Photograph 5: Set-up for Spurious Emissions (Back View 3) .....     | 37 |
| Photograph 6: Set-up for Spurious Emissions (Back View 4) .....     | 38 |
| Photograph 7: Set-up for Conducted testing .....                    | 38 |
| Photograph 8: Set-up for Conducted testing .....                    | 39 |
| Photograph 9: Set-up for Mains Conducted testing (Back View) .....  | 39 |
| Photograph 10: Set-up for Mains Conducted testing (Front View)..... | 40 |