

**Produkte**  
*Products*

|  |   |   |   |  |   |
|--|---|---|---|--|---|
| <b>Prüfbericht-Nr.:</b><br><i>Test Report No.:</i>   | <b>50157909 001</b>   | <b>Auftrags-Nr.:</b><br><i>Order No.:</i>   | <b>144188130</b>  | <b>Seite 1 von 21</b><br><i>Page 1 of 21</i>     |   |
| <b>Kunden-Referenz-Nr.:</b><br><i>Client Reference No.:</i>  | <b>N/A</b>  | <b>Auftragsdatum:</b><br><i>Order date:</i>   | <b>21.06.2018</b>   |  |   |
| <b>Auftraggeber:</b><br><i>Client:</i>   | <b>Bulk Unlimited Corp.</b><br><b>199 Lee Ave, Suite 464, Brooklyn, NY, United States</b>       |   |   |  |   |
| <b>Prüfgegenstand:</b><br><i>Test Item:</i>  | <b>Microphone with Bluetooth Connectivity</b>   |   |   |  |   |
| <b>Bezeichnung / Typ-Nr.:</b><br><i>Identification / Type No.:</i>   | <b>0516, 2652</b>   |   |   |  |   |
| <b>Auftrags-Inhalt:</b><br><i>Order content:</i>   | <b>FCC Certification</b>  |   |   |  |   |
| <b>Prüfgrundlage:</b><br><i>Test specification:</i>  | <b>FCC Part 15 Subpart B; FCC Part 15 Subpart C</b><br><b>ANSI C63.4-2014; ANSI C63.10-2013</b> |   |   |  |   |
| <b>Wareneingangsdatum:</b><br><i>Date of receipt:</i>  | <b>14.06.2018</b>   |  |   |  |   |
| <b>Prüfmuster-Nr.:</b><br><i>Test sample No.:</i>  | <b>A000758558 (001-002)</b><br><b>A000796782-001</b>  |   |   |  |   |
| <b>Prüfzeitraum:</b><br><i>Testing period:</i>   | <b>21.06.2018 – 05.09.2018</b>  |   |   |  |   |
| <b>Ort der Prüfung:</b><br><i>Place of testing:</i>  | <b>Hong Kong</b>  |   |   |  |   |
| <b>Prüflaboratorium:</b><br><i>Testing laboratory:</i>   | <b>TÜV Rheinland Hong Kong Ltd.</b>   |   |   |  |   |
| <b>Prüfergebnis*:</b><br><i>Test result*:</i>  | <b>Pass</b>   |   |   |  |   |
| <b>geprüft von / tested by:</b>  | <b>kontrolliert von / reviewed by:</b>  |   |   |  |   |
| 27.09.2018   | Joey Leung<br>Project Manager   |  | 27.09.2018  | Mika Chan<br>Project Manager                     |  |
| <b>Datum</b><br><i>Date</i>  | <b>Name / Stellung</b><br><i>Name / Position</i>  | <b>Unterschrift</b><br><i>Signature</i>   | <b>Datum</b><br><i>Date</i>   | <b>Name / Stellung</b><br><i>Name / Position</i> | <b>Unterschrift</b><br><i>Signature</i>   |
| <b>Sonstiges FCC ID: 2AE67-0516</b><br><i>Others:</i>  |   |   |   |  |   |
| <b>Zustand des Prüfgegenstandes bei Anlieferung:</b><br><i>Condition of the test item at delivery:</i>   |   |   | <b>Prüfmuster vollständig und unbeschädigt</b><br><b>Test item complete and undamaged</b> |  |   |
| * 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<br>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                    |   |   |   |  |   |
| <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 relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicate in extracts. This test report does not entitle to carry any test mark.</i> |   |   |   |  |   |

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|   |            |          |
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## Product information

### Manufacturers declarations

|   | <b>Transceiver</b>         |
|---|----------------------------|
| Operating frequency range               | 2402 - 2480 MHz            |
| Type of modulation                      | GFSK; Pi/4 DQPSK; 8 DPSK   |
| Number of channels                      | 79                         |
| Channel separation                      | 1 MHz                      |
| Type of antenna                         | Integral PCB Antenna       |
| Antenna gain (dBi)                      | 0.0                        |
| Power level                             | fix                        |
| Type of equipment                       | stand alone radio device   |
| Connection to public utility power line | No                         |
| Nominal voltage                         | V <sub>nor</sub> : 4.5 VDC |
| Independent Operation Modes             | Transmit and receive       |

### Product function and intended use

The equipment under test (EUT) is a Microphone with Bluetooth connectivity. It has internal memory for sound recording and pre-installed songs. It is powered by battery only.

#### FCC ID: 2AE67-0516

| <b>Models</b> | <b>Product description</b>         |
|---------------|------------------------------------|
| 0516          | Sing With Me Bluetooth Microphone  |
| 2652          | Let's Sing-Lomir Zingen Microphone |

### Submitted documents

Circuit Diagram  
 Block Diagram  
 Technical Description  
 Bill of materials  
 User manual  
 Label Artwork

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### **Independent Operation Modes**

The basic operation modes are:

- Bluetooth transmit and receive mode.
- Playing pre-installed songs and sound recording without Bluetooth

For further information refer to User Manual

### **Related Submittal(s) Grants**

This is a single application for certification of the transmitter.

### **Remark**

The test results in this test report are only relevant to the tested sample and does not involve any assessment in the production.

## Test Set-up and Operation Mode

### Principle of Configuration Selection

**Emission:** The EUT was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

### Test Operation and Test Software

Test operation should refer to test methodology.

- 1) Special software is provided by the applicant to set the device to operate in a fixed frequency channel and maximum RF output power level. The setting of the maximum RF output power shall be fixed on the final product.
- 2) Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate.

### Special Accessories and Auxiliary Equipment

There is no special accessories and auxiliary equipment tested together with the product.

### Countermeasures to achieve EMC Compliance

There is no countermeasures implemented during testing to achieve EMC compliance.

## Test Methodology

### Radiated Emission

The radiated emission measurements of the transmitter part were performed according to the procedures in ANSI C63.10-2013. The radiated emission measurements of the battery pack charging part were performed according to the procedures in ANSI C63.4-2014.

For measurement below 1GHz - the equipment under test (EUT) was placed at the middle of the 80 cm height turntable. For measurement above 1GHz - the EUT was placed at the middle of the 1.5 m height turntable and RF absorbing material was placed on ground plane between turntable and measuring antenna. During the testing, the EUT was operated standalone and arranged for maximum emissions. The EUT was tested in three orthogonal planes.

The investigation is performed with the EUT rotated 360°, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained.

All radiated tests were performed at an antenna to EUT with 3 meters distance, unless stated otherwise in particular parts of this test report.

### Field Strength Calculation

The field strength at 3 m was established by adding the meter reading of the spectrum analyzer to the factors associated with antenna correction factor, cable loss, preamplifiers and filter attenuation.

The equation is expressed as follow:

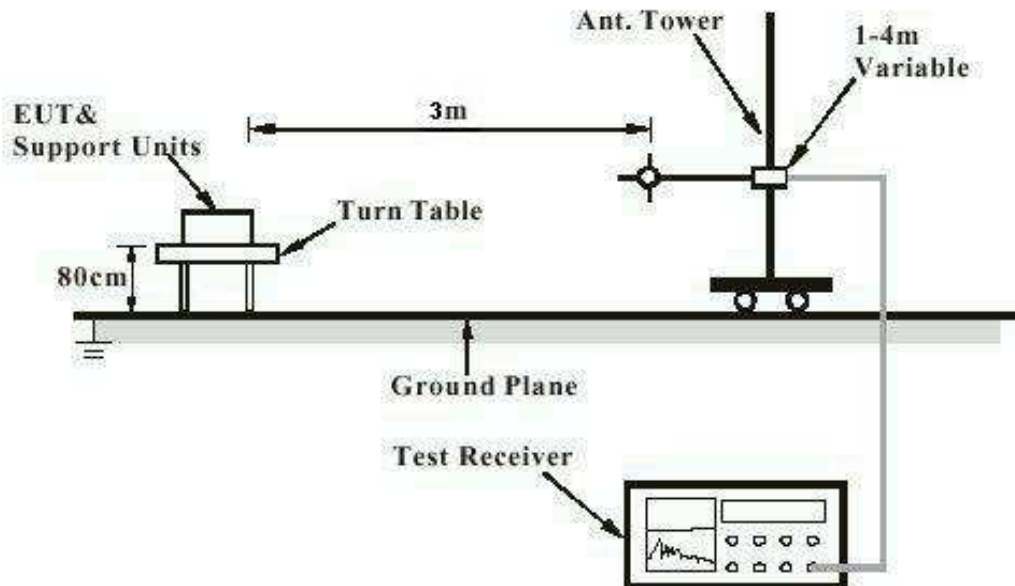
$$FS = R + AF + CF + FA - PA$$

Where FS = Field Strength in dBuV/m at 3 meters.  
R = Reading of Spectrum Analyzer in dBuV.  
AF = Antenna Factor in dB.  
CF = Cable Attenuation Factor in dB.  
FA = Filter Attenuation Factor in dB.  
PA = Preamplifier Factor in dB.

FA and PA are only be used for the measuring frequency above 1 GHz.

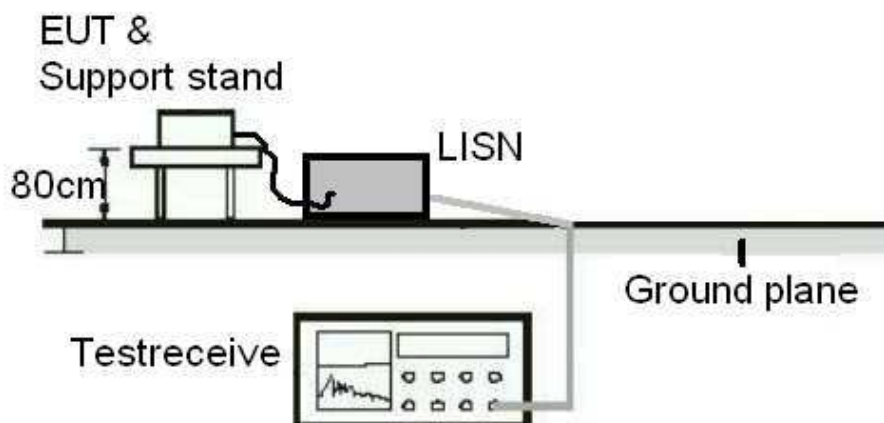
## Test Setup Diagram

Diagram of Measurement Configuration for Radiated Emission Test



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

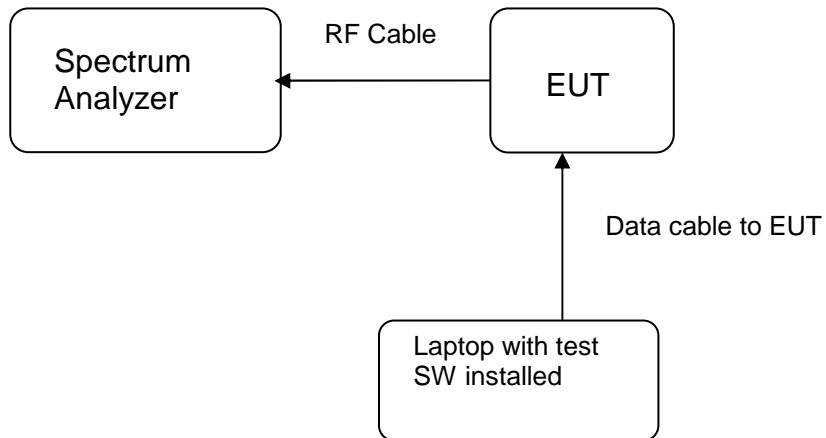
Diagram of Measurement Equipment Configuration for Mains Conduction Measurement (if applicable)





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**Diagram of Equipment Configuration for Antenna-port Conducted Measurement (if applicable)**



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## Test Facility

### Test Laboratory Information

TÜV Rheinland Hong Kong Ltd.

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Web: [www.tuv.com](http://www.tuv.com)

The test facility is recognized or accredited by the following organizations:

#### **FCC**

|                               |                         |
|-------------------------------|-------------------------|
| Type                          | : Accredited Test Firm  |
| Designation Number            | : HK0013                |
| Test Firm Registration Number | : 371735                |
| Scope                         | : Intentional Radiators |

#### **Industry Canada**

The 10m Semi-anechoic chamber used by TÜV Rheinland Hong Kong Ltd at Hong Kong Productivity Council has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

Test Site Registration Number : 4780A-1

## List of Test and Measurement Instruments

### Hong Kong Productivity Council (FCC Registration number: 90656)

#### Radiated Emission

| Equipment                                       | Manufacturer       | Type               | S/N            | Cal. Date   | Cal. Due Date |
|---|--------------------|--------------------|----------------|-------------|---------------|
| Semi-anechoic Chamber                           | Frankonia          | Nil                | Nil            | 23 Apr 2018 | 23 Apr 2019   |
| Test Receiver                                   | R & S              | ESU40              | 100190         | 12 Jun 2018 | 12 Jun 2019   |
| Bi-conical Antenna                              | R & S              | HK116              | 100241         | 21 Mar 2018 | 21 Mar 2020   |
| Log Periodic Antenna                            | R & S              | HL223              | 841516/017     | 22 Mar 2018 | 22 Mar 2020   |
| Cable with I-Joint Conector                     | Huber+Suhner       | CNM-NMCMILX800-473 | A2803 #0001    | 11 Dec 2017 | 11 Dec 2019   |
| Active Loop Antenna                             | EMCO               | 6502               | 9107-2651      | 30 Oct 2017 | 30 Oct 2018   |
| Semi-anechoic Chamber (SiteVSWR)                | Frankonia          | Nil                | Nil            | 17 May 2018 | 17 May 2019   |
| Double-Ridged Waveguide Horn                    | EMCO               | 3116               | 00109210       | 11 Oct 2016 | 10 Oct 2018   |
| Double-Ridged Waveguide Horn                    | EMCO               | 3117               | 00094998       | 30 Aug 2018 | 29 Aug 2020   |
| Microwave amplifier 0.5-26.5GHz, 25dB gain      | HP                 | 83017A             | 3950M00241     | 18 Jul 2018 | 17 Jul 2020   |
| Preamplifier 18GHz to 40GHz with cable (EMC656) | A.H. Systems, Inc. | PAM-1840VH         | 168            | 29 Jan 2018 | 29 Jan 2019   |
| High Pass Filter (cutoff freq. =1000MHz)        | Trilithic          | 23042              | 9829213        | 30 Oct 2017 | 30 Oct 2019   |
| High Frequency Cable                            | Pasternack         | PE3VNA4001-3M      | 20160707C02493 | 29 Jan 2018 | 29 Jan 2019   |
| Horn Antenna                                    | EMCO               | 3115               | 9002-3347      | 28 Mar 2018 | 28 Mar 2020   |

### TÜV Rheinland Hong Kong Ltd

#### Radio Test

| Equipment         | Manufacturer | Type  | S/N    | Cal. Date   | Cal. Due Date |
|-------------------|--------------|-------|--------|-------------|---------------|
| Spectrum Analyzer | R & S        | FSP30 | 100610 | 03 May 2018 | 02 May 2019   |

## Measurement Uncertainty

The estimated combined standard uncertainty for power-line conducted emissions measurements is  $\pm 2.42$ dB.

The estimated combined standard uncertainty for radiated emissions measurements is  $\pm 4.81$ dB (9kHz to 30MHz) and  $\pm 4.62$ dB (30MHz to 200MHz) and  $\pm 5.67$ dB (200MHz to 1000MHz) and is  $\pm 5.07$ dB (1GHz to 8.2GHz) and  $\pm 4.58$ dB (8.2GHz to 12.4GHz) and  $\pm 4.78$ dB (12.4GHz to 18GHz)

The estimated combined standard uncertainty for antenna conducted emission is  $\pm 2.1$ dB

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor of  $k=2$ , which for the level of confidence is approximately 95%.

## Results FCC Part 15 – Subpart B

|  |            |
|--|------------|
| <b>FCC 15.107 – Conducted Emission on AC Mains</b>     | <b>N/A</b> |
| There is no AC power input or output ports on the EUT. |            |

|  |   |                                   |
|--|---|-----------------------------------|
| <b>FCC 15.109 – Radiated Emissions</b>   | <b>Pass</b>   |                                   |
| Test Specification : ANSI C63.4-2014<br>Mode of operation : Pre-installed songs playing mode<br>Port of testing : Enclosure<br>Frequency range : 30MHz – 1GHz<br>Supply voltage : 4.5VDC<br>Temperature : 23°C<br>Humidity : 50% |   |                                   |
| Requirement:   | The field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the radiated limits shown in §15.109(a). |                                   |
| <b>Results:</b>  | Pass  |                                   |
| Vertical Polarization  |   |                                   |
| <b>Freq<br/>MHz</b>  | <b>Level<br/>dBuV/m</b>   | <b>Limit<br/>dBuV/m</b>           |
| 357.990  | 33.2  | 46.0                              |
| 423.172  | 26.9  | 46.0                              |
| Horizontal Polarization  |   |                                   |
| <b>Freq<br/>MHz</b>  | <b>Level<br/>dBuV/m</b>   | <b>Limit/ Detector<br/>dBuV/m</b> |
| No peak found  | ---   | 40.0                              |

## Results FCC Part 15 – Subpart C

|   |                               |                      |
|---|-------------------------------|----------------------|
| <b>FCC 15.203 – Antenna Requirement 1</b>   |                               | <b>Pass</b>          |
| <b>FCC Requirement:</b> No antenna other than that furnished by the responsible party shall be used with the device |                               |                      |
| <b>Results:</b>   | a) Antenna type:              | Integral PCB antenna |
|   | b) Manufacturer and model no: | N/A                  |
|   | c) Peak Gain:                 | 0 dBi                |
| <b>Verdict:</b>   | Pass                          |                      |

|  |  |            |
|--|--|------------|
| <b>FCC 15.204 – Antenna Requirement 2</b>  |  | <b>N/A</b> |
| <b>FCC Requirement:</b> An intentional radiator may be operated only with the antenna with which it is authorized. If an antenna is marketed with the intentional radiator, it shall be of a type which is authorized with the intentional radiator. |  |            |
| <b>Results:</b>  | Only one integral antenna can be used. |            |
| <b>Verdict:</b>  | N/A                                    |            |

|  |  |            |
|--|--|------------|
| <b>FCC 15.207 – Conducted Emission on AC Mains</b>     |  | <b>N/A</b> |
| There is no AC power input or output ports on the EUT. |  |            |

|   |   |                          |                             |
|---|---|--------------------------|-----------------------------|
| <b>FCC 15.247 (a)(1) – 20 dB Bandwidth</b>              |   | <b>Pass</b>              |                             |
| Test Specification : ANSI C63.10-2013                   |   |                          |                             |
| Test date : 09.07.2018                                  |   |                          |                             |
| Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz) |   |                          |                             |
| Port of testing : Temporary antenna port                |   |                          |                             |
| Supply voltage : 4.5VDC                                 |   |                          |                             |
| Temperature : 23°C                                      |   |                          |                             |
| Humidity : 50%  |   |                          |                             |
| <b>Results:</b>   | Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types. |                          |                             |
|   | For test protocols refer to Appendix 1.   |                          |                             |
| <b>GFSK Modulation</b>                                  |   |                          |                             |
| <b>Frequency (MHz)</b>                                  | <b>20 dB left (MHz)</b>   | <b>20 dB right (MHz)</b> | <b>20dB bandwidth (MHz)</b> |
| 2402  | 2401.424  | 2402.544                 | 1.120                       |
| 2441  | 2440.424  | 2441.544                 | 1.120                       |
| 2480  | 2479.424  | 2480.544                 | 1.120                       |

| <b>8DPSK Modulation</b> |                         |                          |                             |
|-------------------------|-------------------------|--------------------------|-----------------------------|
| <b>Frequency (MHz)</b>  | <b>20 dB left (MHz)</b> | <b>20 dB right (MHz)</b> | <b>20dB bandwidth (MHz)</b> |
| 2402                    | 2401.272                | 2402.648                 | 1.376                       |
| 2441                    | 2440.296                | 2441.648                 | 1.352                       |
| 2480                    | 2479.296                | 2480.648                 | 1.352                       |

| <b>FCC 15.247 (a)(1) – Carrier Frequency Separation</b>   |                                 | <b>Pass</b>                              |
|---|---------------------------------|--|
| <p><b>FCC Requirement:</b> Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.</p>   |                                 |  |
| <p>Test Specification : ANSI C63.10-2013<br/>           Test date : 09.07.2018<br/>           Mode of operation : Tx mode (hopping on), GFSK and 8DPSK<br/>           Port of testing : Temporary antenna port<br/>           Supply voltage : 4.5VDC<br/>           Temperature : 23°C<br/>           Humidity : 50%</p>       |                                 |  |
| <p><b>Results:</b> Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types.<br/>           The centre frequencies of the hopping channels are separated by more than the 2/3*20dB bandwidth. For test Results plots refer to Appendix 1.</p> |                                 |  |
| <p><b>Verdict:</b> Pass</p>   |                                 |  |
| <b>GFSK Modulation</b>  |                                 |  |
| <b>Test Frequency (MHz)</b>   | <b>Channel separation (MHz)</b> | <b>Two-third of 20dB bandwidth (MHz)</b> |
| 2441  | 1.004                           | 0.746                                    |
| <b>8DPSK Modulation</b>   |                                 |  |
| <b>Test Frequency (MHz)</b>   | <b>channel separation (MHz)</b> | <b>Two-third of 20dB bandwidth (MHz)</b> |
| 2441  | 1.008                           | 0.917                                    |

|  |              |                |
|--|--------------|----------------|
| <b>FCC 15.247 (a)(1)(iii) – Number of hopping channels</b>   |              | <b>Pass</b>    |
| <b>FCC Requirement:</b> Frequency hopping systems operating in the 2400MHz-2483.5MHz bands shall use at least 15 hopping frequencies.  |              |                |
| Test Specification : ANSI C63.10-2013<br>Test date : 09.07.2018<br>Mode of operation : Tx mode (hopping on), GFSK<br>Port of testing : Temporary antenna port<br>Supply voltage : 4.5VDC<br>Temperature : 23°C<br>Humidity : 50% |              |                |
| <b>Results:</b> For test Results plots refer to Appendix 1.  |              |                |
| <b>No. of hopping channels</b>   | <b>Limit</b> | <b>Verdict</b> |
| 79   | 15           | Pass           |

|  |  |             |
|--|--|-------------|
| <b>FCC 15.247 (a)(1)(iii) – Time of Occupancy (Dwell Time)</b>   |  | <b>Pass</b> |
| <b>FCC Requirement:</b> Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. |  |             |
| Test Specification : ANSI C63.10-2013<br>Test date : 09.07.2018<br>Mode of operation : Tx mode (hopping on), DH5 packet<br>Port of testing : Temporary antenna port<br>Supply voltage : 4.5VDC<br>Temperature : 23°C<br>Humidity : 50%   |  |             |
| <b>Results:</b> Time period calculation = $0.4 \times 79 = 31.6\text{s}$<br>Dwell time = $76 \times 2.940 \times 10^{-3} = 223.44 \times 10^{-3} \text{ s}$<br>$\leq 400 \times 10^{-3} \text{ s}$   |  |             |
| For test protocols please refer to Appendix 1.   |  |             |
| <b>Verdict:</b>  |  | Pass        |



|  |             |
|--|-------------|
| <b>FCC 15.247 (a) – Hopping Sequence</b>   | <b>Pass</b> |
| <p><b>FCC Requirement:</b> The system radio frequency (RF) bandwidth is equal to the channel bandwidth multiplied by the number of channels in the hopset. The hopset shall be such that the near-term distribution of frequencies appears random, with sequential hops randomly distributed in both direction and magnitude of change in the hopset, while the long-term distribution appears evenly distributed.</p> |             |
| <p>As stated in the technical description, the EUT is controlled by microchip to generate Pseudorandom Frequency Hopping Sequence base on CCITT16 and distributed it over 23 hopping channels. The sequential hops are randomly distributed in both direction and magnitude of change in the hop set</p>   |             |

|  |             |
|--|-------------|
| <b>FCC 15.247 (a) – Equal Hopping Frequency Use</b>  | <b>Pass</b> |
| <p><b>FCC Requirement:</b> Each of the transmitter's hopping channels is used equally on average.</p> <p>The system radio frequency (RF) bandwidth is equal to the channel bandwidth multiplied by the number of channels in the hopset. The hopset shall be such that the near-term distribution of frequencies appears random, with sequential hops randomly distributed in both direction and magnitude of change in the hopset, while the long-term distribution appears evenly distributed.</p> |             |
| <p>As stated in the technical description, a single data frame is transmitted on each frequency location before skipping to the next hopping frequency in the list. So each hopping channels is used equally on average in long term.</p>  |             |

|   |             |
|---|-------------|
| <b>FCC 15.247 (a) – Receiver Input Bandwidth</b>  | <b>Pass</b> |
| <p><b>FCC Requirement:</b> The associated receiver(s) complies with the requirement that its input bandwidth matches the bandwidth of the transmitted signal.</p> |             |
| <p>As stated in the technical description, both receiver and transmitter are set to same bandwidth of 1MHz</p>  |             |

|   |             |
|---|-------------|
| <b>FCC 15.247 (a) – Receiver Hopping Capability</b>   | <b>Pass</b> |
| <p><b>FCC Requirement:</b> The associated receiver has the ability to shift frequencies in synchronisation with the transmitted signals.</p>  |             |
| <p>Both transmitter and receiver will share the same device ID so the same sequence is generated for the communication. Moreover, the microchip has a clock recovery mechanism to synchronize the timing between the transmitter and receiver. With the same hopping sequence and timing, the receiver can shift frequencies in synchronization with the transmitted signals.</p> |             |

| <b>FCC 15.247 (b)(1) – Peak Output Power</b>   |                                 |                        |                    |               |         | <b>Pass</b> |
|--|---------------------------------|------------------------|--------------------|---------------|---------|-------------|
| Test Specification : ANSI C63.10-2013<br>Test date : 05.09.2018<br>Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), GFSK and 8DPSK<br>Port of testing : Temporary antenna port<br>Supply voltage : 4.5VDC<br>Temperature : 23°C<br>Humidity : 50%  |                                 |                        |                    |               |         |             |
| <b>FCC Requirement:</b> For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 Watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 Watts. |                                 |                        |                    |               |         |             |
| <b>Results:</b> For test protocols please refer to Appendix 1.   |                                 |                        |                    |               |         |             |
| <b>GFSK Modulation</b>   |                                 |                        |                    |               |         |             |
| Frequency (MHz)  | Maximum peak output power (dBm) | Cable attenuation (dB) | Output power (dBm) | Limit (W/dBm) | Verdict |             |
| 2402   | -4.54                           | 0                      | -4.54              | 1 / 30.0      | Pass    |             |
| 2441   | -5.09                           | 0                      | -5.09              | 1 / 30.0      | Pass    |             |
| 2480   | -5.73                           | 0                      | -5.73              | 1 / 30.0      | Pass    |             |
| <b>8DPSK Modulation</b>  |                                 |                        |                    |               |         |             |
| Frequency (MHz)  | Maximum peak output power (dBm) | Cable attenuation (dB) | Output power (dBm) | Limit (W/dBm) | Verdict |             |
| 2402   | -4.48                           | 0                      | -4.48              | 0.125 / 21.0  | Pass    |             |
| 2441   | -5.24                           | 0                      | -5.24              | 0.125 / 21.0  | Pass    |             |
| 2480   | -6.09                           | 0                      | -6.09              | 0.125 / 21.0  | Pass    |             |

| <b>FCC 15.247 (d) – Spurious Conducted Emissions</b>   |                                 |                             |                              |                   | <b>Pass</b>    |
|--|---------------------------------|-----------------------------|------------------------------|-------------------|----------------|
| Test Specification : ANSI C63.10-2013<br>Test date : 09.07.2018<br>Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), GFSK<br>Port of testing : Temporary antenna port<br>Supply voltage : 4.5VDC<br>Temperature : 23 °C<br>Humidity : 50 %  |                                 |                             |                              |                   |                |
| <b>FCC Requirement:</b> 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. |                                 |                             |                              |                   |                |
| <b>Results:</b> Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types.<br><br>All three transmit frequency modes comply with the limit stated in subclause 15.247(d). For test protocols refer to Appendix 1.   |                                 |                             |                              |                   |                |
| <b>Operating frequency (MHz)</b>   | <b>Spurious frequency (MHz)</b> | <b>Spurious Level (dBm)</b> | <b>Reference value (dBm)</b> | <b>Delta (dB)</b> | <b>Verdict</b> |
| 2402   | No peak found                   | ---                         | -5.34                        | ---               | Pass           |
| 2441   | No peak found                   | ---                         | -6.05                        | ---               | Pass           |
| 2480   | No peak found                   | ---                         | -6.85                        | ---               | Pass           |

| <b>FCC 15.205 – Radiated Emissions in Restricted Frequency Bands</b>   |              | <b>Pass</b>             |
|--|--------------|-------------------------|
| Test Specification : ANSI C63.10 – 2013<br>Test date : 03.09.2018<br>Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), GFSK<br>Port of testing : Enclosure<br>Frequency range : 9kHz – 25GHz<br>Supply voltage : 4.5 VDC<br>Temperature : 23°C<br>Humidity : 50%  |              |                         |
| <b>FCC Requirement:</b> In any 100kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. 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 15.205(c). |              |                         |
| <b>Results:</b> Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types.<br><br>All three transmit frequency modes comply with the field strength within the restricted bands. There is no spurious found below 30MHz.                      |              |                         |
| Tx frequency 2402MHz   |              | Vertical Polarization   |
| Freq MHz   | Level dBuV/m | Limit/ Detector dBuV/m  |
| 2400.000   | 56.9         | 74.0 / PK               |
| 2400.000   | 33.4         | 54.0 / AV               |
| 4804.003   | 52.9         | 74.0 / PK               |
| 4804.003   | 42.4         | 54.0 / AV               |
| 7206.004   | 56.7         | 74.0 / PK               |
| 7206.004   | 44.1         | 54.0 / AV               |
| Tx frequency 2402MHz   |              | Horizontal Polarization |
| Freq MHz   | Level dBuV/m | Limit/ Detector dBuV/m  |
| 2400.000   | 57.3         | 74.0 / PK               |
| 2400.000   | 33.5         | 54.0 / AV               |
| 4803.604   | 55.4         | 74.0 / PK               |
| 4803.604   | 44.5         | 54.0 / AV               |
| 7205.474   | 58.3         | 74.0 / PK               |
| 7205.474   | 45.0         | 54.0 / AV               |
| Tx frequency 2441MHz   |              | Vertical Polarization   |
| Freq MHz   | Level dBuV/m | Limit/ Detector dBuV/m  |
| 4881.500   | 53.5         | 74.0 / PK               |
| 4881.500   | 41.1         | 54.0 / AV               |
| 7322.250   | 56.7         | 74.0 / PK               |
| 7322.250   | 43.7         | 54.0 / AV               |

| Tx frequency 2441MHz |              | Horizontal Polarization |  |
|----------------------|--------------|-------------------------|--|
| Freq MHz             | Level dBuV/m | Limit/ Detector dBuV/m  |  |
| 4881.948             | 55.1         | 74.0 / PK               |  |
| 4881.948             | 45.5         | 54.0 / AV               |  |
| 7322.923             | 56.3         | 74.0 / PK               |  |
| 7322.923             | 43.2         | 54.0 / AV               |  |
| Tx frequency 2480MHz |              | Vertical Polarization   |  |
| Freq MHz             | Level dBuV/m | Limit/ Detector dBuV/m  |  |
| 2483.500             | 54.8         | 74.0 / PK               |  |
| 2483.500             | 36.4         | 54.0 / AV               |  |
| 4959.948             | 55.4         | 74.0 / PK               |  |
| 4959.948             | 45.7         | 54.0 / AV               |  |
| 7439.923             | 53.7         | 74.0 / PK               |  |
| 7439.923             | 40.1         | 54.0 / AV               |  |
| Tx frequency 2480MHz |              | Horizontal Polarization |  |
| Freq MHz             | Level dBuV/m | Limit/ Detector dBuV/m  |  |
| 2483.500             | 59.6         | 74.0 / PK               |  |
| 2483.500             | 40.4         | 54.0 / AV               |  |
| 4959.602             | 56.4         | 74.0 / PK               |  |
| 4959.602             | 45.5         | 54.0 / AV               |  |
| 7439.852             | 53.2         | 74.0 / PK               |  |
| 7439.852             | 40.2         | 54.0 / AV               |  |