| | | | | |
|---|---|---|---|---|
| **Prüfbericht-Nr.:** *Test report no.:* | **CN23Q5RT 001** | **Auftrags-Nr.:** *Order no.:* | **168413053** | Seite 1 von 23 *Page 1 of 23* |
| **Kunden-Referenz-Nr.:** *Client reference no.:* | N/A | **Auftragsdatum:** *Order date:* | 2023-02-07 | |
| **Auftraggeber:** *Client:* | **SKYWORTH OPTICAL-ELECTRONIC CO., LTD.** 3rd Floor-4th Floor, Mould Factory, Skyworth Technology Park, Tangtou Community, Shiyan Street, Baoan District, Shenzhen, Guangdong Province,China. | | | |
| **Prüfgegenstand:** *Test item:* | WIFI+BT Module IEEE 802.11 a/b/g/n/ac/ax 2T/2R | | | |
| **Bezeichnung / Typ-Nr.:** *Identification / Type no.:* | WXT2IM2511 | | | |
| **Auftrags-Inhalt:** *Order content:* | Test Report | | | |
| ***Prüfgrundlage:*** *Test specification:* | CFR47 FCC Part 15: Subpart C Section 15.247<br>CFR47 FCC Part 15: Subpart C Section 15.207<br>CFR47 FCC Part 15: Subpart C Section 15.209 | | RSS-247 Issue 2 February 2017<br>RSS-Gen Issue 5 February 2021 | |

| | | |
|---|---|---|
| **Wareneingangsdatum:** *Date of sample receipt:* | 2023-01-04 | Refer to photo documentation |
| **Prüfmuster-Nr.:** *Test sample no.:* | T230104007-Y01/01 | |
| **Prüfzeitraum:** *Testing period:* | 2023-01-04 to 2023-03-13 | |
| **Ort der Prüfung:** *Place of testing:* | Shenzhen Central Standard International Center Co., Ltd. | |
| **Prüflaboratorium:** *Testing laboratory:* | TÜV Rheinland (Shenzhen) Co., Ltd. | |
| **Prüfergebnis*:** *Test result*:* | Pass | |

| | | | |
|---|---|---|---|
| ***geprüft von:*** *tested by:* | X Hardy Suo | **genehmigt von:** *authorized by:* | X Lin Lin |
| ***Datum:*** *Date:* 2023-04-14 | | **Ausstellungsdatum:** *Issue date:* 2023-04-14 | |
| **Stellung** / Position | Engineer | **Stellung** / Position | Reviewer |

**Sonstiges /** *Other:* FCC ID: 2BAD6-7METZIFPD
IC: 30102-7METZIFPD
HVIN: WXT2IM2511

**Zustand des Prüfgegenstandes bei Anlieferung:** *Condition of the test item at delivery:* Prüfmuster vollständig und unbeschädigt *Test item complete and undamaged:*

| | | | | | |
|---|---|---|---|---|---|
| * Legende: | 1 = sehr gut | 2 = gut | 3 = befriedigend | 4 = ausreichend | 5 = mangelhalt |
| | P(ass) = entspricht o.g. Prüfgrundlage(n) | | F(ail) = entspricht nicht o.g. Prüfgrundlage(n) | N/A = nicht anwendbar | N/T = nicht getestet |
| *Legend:* | *1 = very good* | *2 = good* | *3 = satisfactory* | *4 = sufficient* | *5 = poor* |
| | *P(ass) = passed a.m. test specifications(s)* | | *F(ail) = failed a.m. test specifications(s)* | *N/A = not applicable* | *N/T = not tested* |





TÜV Rheinland (Shenzhen) Co., Ltd. 1601 R&D Room, 1602-1604, 17-18F, Building 7 Site C, Vanke Cloud City Phase I, Xingke First Street, Xili Street, Xili Community, Nanshan District, Shenzhen 518052, P.R. China
Mail: service@de.tuv.com · Web: www.tuv.com

# *Test Summary*

**5.1.1 ANTENNA REQUIREMENT**
*RESULT: Pass*

**5.1.2 MAXIMUM CONDUCTED OUTPUT POWER**
*RESULT: Pass*

**5.1.3 99% BANDWIDTH**
*RESULT: Pass*

**5.1.4 CONDUCTED SPURIOUS EMISSIONS MEASURED IN 100 KHZ BANDWIDTH**
*RESULT: Pass*

**5.1.5 RADIATED SPURIOUS EMISSION**
*RESULT: Pass*

**5.1.6 20DB BANDWIDTH**
*RESULT: Pass*

**5.1.7 CARRIER FREQUENCY SEPARATION**
*RESULT: Pass*

**5.1.8 NUMBER OF HOPPING FREQUENCY**
*RESULT: Pass*

**5.1.9 TIME OF OCCUPANCY**
*RESULT: Pass*

**5.1.10 CONDUCTED EMISSION ON AC MAINS**
*RESULT: Pass*

# *Contents*

# 1 General Remarks

## 1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix A: Photographs of the Test Set-up

Appendix B: Test Results of Bluetooth

# 2 Test Sites

## 2.1 Test Facilities

**Shenzhen Central Standard International Center Co., Ltd.**
**Room 201, Building 1, Mogen Fashion Industrial Park, No. 10, Shilongzai Road, Xinshi Community, Dalang Street, Longhua District, Shenzhen.**
**CNAS No.: L11671**
**A2LA No.: 6426.01**
**FCC Registration No.: 0031378433**
**IC CAB identifier No.: CN0051**

The tests at the test sites have been conducted under the supervision of a TÜV engineer.

## 2.2 List of Test and Measurement Instruments

**Table 1: List of Test and Measurement Equipment**

| **Radio Spectrum Testing** | | | | |
|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model** | **Serial No.** | **Cal. until** |
| Spectrum Analyzer | Agilent | N9020A | MY50200391 | Jun. 13, 2023 |
| Power sensor | KEYSIGHT | U2021XA | MY55080015 | Jun. 13, 2023 |
| Power sensor | KEYSIGHT | U2021XA | MY54250016 | Jun. 13, 2023 |
| Power sensor | KEYSIGHT | U2021XA | MY54250020 | Jun. 13, 2023 |
| Power sensor | KEYSIGHT | U2021XA | MY54210030 | Jun. 13, 2023 |
| Vector Signal Generator | Agilent | N5182A | MY50140130 | Jun. 13, 2023 |
| Signal generator | Agilent | SML03 | 100925 | Jun. 13, 2023 |
| Power sensor Box | MWRFtest | N/A | N/A | N/A |
| RF Switch Box | MWRFtest | MW100-RFCB | N/A | N/A |
| MTS 8310 | MWRFtest | V 2.0.0.0 | | |
| **Unwanted Emission Testing** | | | | |
| **Equipment** | **Manufacturer** | **Model** | **Serial No.** | **Cal. until** |
| Spectrum Analyzer | Agilent | N9020A | MY50200391 | Jun. 13, 2023 |
| Bilog Antenna | Schwarzbeck | VULB9168 | VULB9168-250 | Jul. 25, 2025 |
| Horn Antenna | AARONIAAG | Powerlog 70180 | 3980 | Jul. 04, 2025 |
| Horn Antenna | A-INFOMW | LB-180400-KF | J211020657 | Sep. 26, 2023 |
| Loop Antenna | Schwarzbeck | FMZB1519B | 00023 | Nov. 15, 2023 |
| Amplifier | HP | 8447F | 2634A02050 | Jun. 13, 2023 |
| Amplifier | Agilent | 8449B | 4035A00116 | Jun. 13, 2023 |
| 3M Chamber | Maor | 9*6*6 | -- | Jul. 26, 2023 |
| **Conducted Emission** | | | | |
| **Equipment** | **Manufacturer** | **Model No.** | **Serial No.** | **Cal. Until** |
| EMI Test Receiver | R&S | ESRP3 | 101936 | Jun. 13, 2023 |
| LISN | R&S | ENV216 | 100002 | Jun. 13, 2023 |
| Shelding Room | Maor | 8*4*3 | -- | May. 03, 2023 |
| EZ-EMC | Fara | V 3.1 | | |

## 2.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology) or where calibration is performed in other countries, to equivalent nationally recognized standards organizations.

## 2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basics using in house standards or comparisons.

## 2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements as below table

Table 2: Measurement Uncertainty

| **Item** | | **Extended Uncertainty** |
|---|---|---|
| Conducted Emission | | ± 3.26 dB |
| Radiated Emission (30-1000MHz) | Field strength (dBμV/m) | 4.58dB |
| Radiated Emission (above 1000MHz) | Field strength (dBμV/m) | 5.10dB |
| Radio Spectrum | | ± 1.5 dB |

## 2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix A & B of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) file for certification follow-up purposes.

## 2.7 Status of Facility Used for Testing

Shenzhen Central Standard International Center Co., Ltd.

Room 201, Building 1, Mogen Fashion Industrial Park, No. 10, Shilongzai Road, Xinshi Community, Dalang Street, Longhua District, Shenzhen

# 3 General Product Information

## 3.1 Product Function and Intended Use

The EUT is a RF Module which supports Bluetooth, 2.4G Wi-Fi 802.11 b/g/n/ax, 5G Wi-Fi 802.11a/n/ac/ax wireless technology.

For details refer to the User Manual, Technical Description and Circuit Diagram.

Note: This report is for Classic Bluetooth mode only.

## 3.2 Ratings and System Details

**Table 3: Technical Specification of EUT**

| **General Information of EUT** | **Value** |
|---|---|
| Kind of Equipment | WIFI+BT Module IEEE 802.11 a/b/g/n/ac/ax 2T/2R |
| Type Designation | WXT2IM2511 |
| FCC ID | 2BAD6-7METZIFPD |
| IC | 30102-7METZIFPD |
| HVIN | WXT2IM2511 |
| Operating Voltage | DC 5V |
| **Technical Specification of Bluetooth** | |
| **Technical Specification** | **Value** |
| Operating Frequency | 2402 - 2480 MHz |
| Type of Modulation | GFSK, π/4DQPSK, 8DPSK |
| Channel Number | BDR & EDR mode:79 channels |
| Channel Separation | BDR & EDR mode:1MHz |
| Wireless Technology | Bluetooth 5.2 |
| Antenna Type | PIFA Antenna |
| Max. Antenna Gain | 1.85 dBi |

**Table 4: RF Channel and Frequency of Bluetooth**

| RF Channel | Frequency (MHz) | RF Channel | Frequency (MHz) | RF Channel | Frequency (MHz) | RF Channel | Frequency (MHz) |
|---|---|---|---|---|---|---|---|
| **00** | **2402.00** | 20 | 2422.00 | 40 | 2442.00 | 60 | 2462.00 |
| 01 | 2403.00 | 21 | 2423.00 | 41 | 2443.00 | 61 | 2463.00 |
| 02 | 2404.00 | 22 | 2424.00 | 42 | 2444.00 | 62 | 2464.00 |
| 03 | 2405.00 | 23 | 2425.00 | 43 | 2445.00 | 63 | 2465.00 |
| 04 | 2406.00 | 24 | 2426.00 | 44 | 2446.00 | 64 | 2466.00 |
| 05 | 2407.00 | 25 | 2427.00 | 45 | 2447.00 | 65 | 2467.00 |
| 06 | 2408.00 | 26 | 2428.00 | 46 | 2448.00 | 66 | 2468.00 |
| 07 | 2409.00 | 27 | 2429.00 | 47 | 2449.00 | 67 | 2469.00 |
| 08 | 2410.00 | 28 | 2430.00 | 48 | 2450.00 | 68 | 2470.00 |
| 09 | 2411.00 | 29 | 2431.00 | 49 | 2451.00 | 69 | 2471.00 |
| 10 | 2412.00 | 30 | 2432.00 | 50 | 2452.00 | 70 | 2472.00 |
| 11 | 2413.00 | 31 | 2433.00 | 51 | 2453.00 | 71 | 2473.00 |
| 12 | 2414.00 | 32 | 2434.00 | 52 | 2454.00 | 72 | 2474.00 |
| 13 | 2415.00 | 33 | 2435.00 | 53 | 2455.00 | 73 | 2475.00 |
| 14 | 2416.00 | 34 | 2436.00 | 54 | 2456.00 | 74 | 2476.00 |
| 15 | 2417.00 | 35 | 2437.00 | 55 | 2457.00 | 75 | 2477.00 |
| 16 | 2418.00 | 36 | 2438.00 | 56 | 2458.00 | 76 | 2478.00 |
| 17 | 2419.00 | 37 | 2439.00 | 57 | 2459.00 | 77 | 2479.00 |
| 18 | 2420.00 | 38 | 2440.00 | 58 | 2460.00 | **78** | **2480.00** |
| 19 | 2421.00 | **39** | **2441.00** | 59 | 2461.00 | | |

## 3.3 Independent Operation Modes

The basic operation modes are:

A. On
   1. Bluetooth transmitting mode (BDR & EDR mode)
      a) Low Channel
      b) Middle Channel
      c) High Channel

B. On, Transmitting on Hopping channel

C. On, Bluetooth connecting mode

D. Off

## 3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

## 3.5 Submitted Documents

- Application Form
- Block Diagram
- Schematics
- Technical Description
- FCC/IC Label and Location Info
- Photo Document
- User Manual

# 4 Test Set-up and Operation Modes

## 4.1 Principle of Configuration Selection

**Radio Spectrum:** The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

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

## 4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All testing were performed according to the procedures in ANSI C63.10: 2013.

## 4.3 Special Accessories and Auxiliary Equipment

**Table 5: List of Accessories and Auxiliary Equipment**

| Description | Manufacturer | Model | Rating |
|---|---|---|---|
| Notebook | DELL | Vostro 3400 | N/A |

## 4.4 Countermeasures to Achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Technical Construction File (TCF).

No additional measures were employed to achieve compliance.

## 4.5 Test Setup Diagram

**Diagram of Measurement Configuration for Radiation Test (Below 30MHz)**

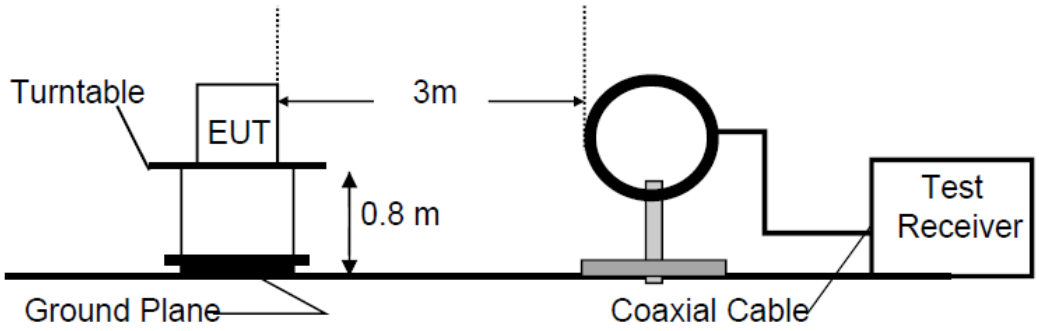



**Diagram of Measurement Configuration for Radiation Test (Below 1GHz)**

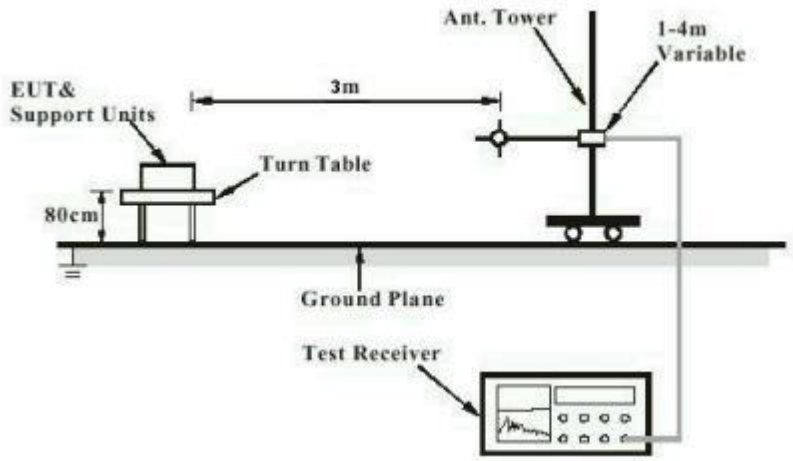



**Diagram of Measurement Configuration for Radiation Test (Above 1GHz)**

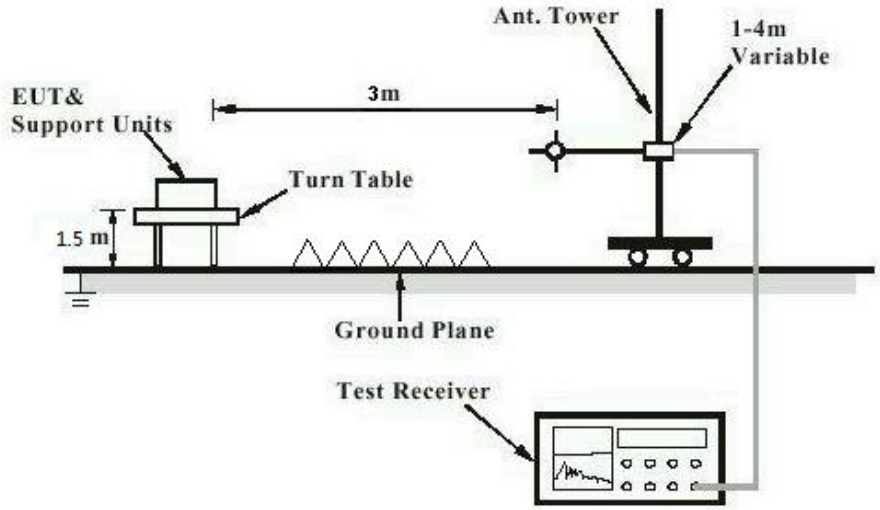


**Diagram of Measurement Configuration for Mains Conduction Measurement**

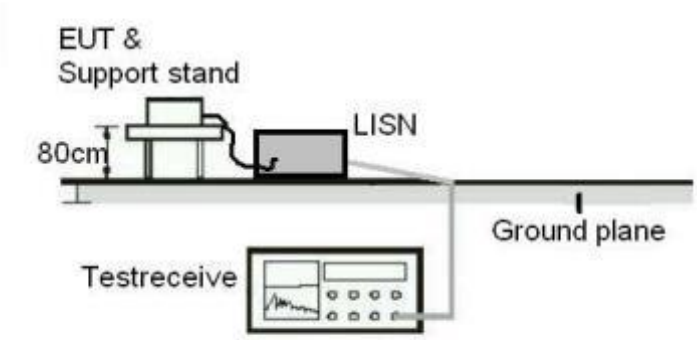
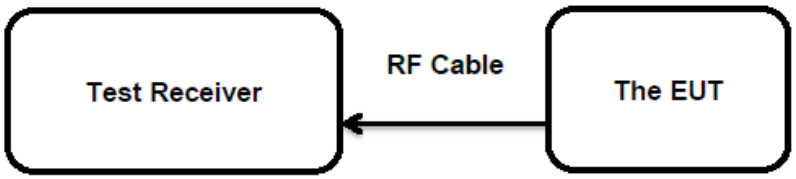



**Diagram of Measurement Configuration for Conducted Transmitter Measurement**



# 5 Test Results

## 5.1 Transmitter Requirement & Test Suites

### 5.1.1 Antenna Requirement

**RESULT:** **Pass**

**Test Specification**

Test standard : FCC Part 15.247(b)(4) and Part 15.203
RSS-Gen Clause 8.3

According to the manufacturer declared, the EUT has an PIFA antenna, the directional gain of antenna is 1.85 dBi, which that use of a non-standard antenna connector and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.

Refer to EUT Photo for further details.

## 5.1.2 Maximum Conducted Output Power

**RESULT:** **Pass**

**Test Specification**

| | | |
|---|---|---|
| Test standard | : | FCC Part 15.247(b)(1)<br>RSS-247 Clause 5.4(b) |
| Basic standard | : | ANSI C63.10: 2013 |
| Limits | : | FHSS<0.125W(Maximum peak conducted output power)<br>< 4 W (e.i.r.p.) |
| Kind of test site | : | Shielded Room |

**Test Setup**

| | | |
|---|---|---|
| Date of testing | : | 2023-01-04 – 2023-03-13 |
| Input voltage | : | DC 5V |
| Operation mode | : | A.1 |
| Test channel | : | Low / Middle / High |
| Ambient temperature | : | 25 ℃ |
| Relative humidity | : | 53 % |
| Atmospheric pressure | : | 101 kPa |

**Table 6: Test Result of Maximum Conducted Output Power**

| Test Mode | Channel Frequency (MHz) | Measured Average Output Power | | Limit (W) |
|---|---|---|---|---|
| | | (dBm) | (W) | |
| BDR | 2402 | 8.606 | 0.0073 | < 0.125 |
| | 2441 | 9.053 | 0.0080 | |
| | 2480 | 9.099 | 0.0081 | |
| EDR | 2402 | 8.767 | 0.0075 | < 0.125 |
| | 2441 | 8.822 | 0.0076 | |
| | 2480 | 8.992 | 0.0079 | |

Note: The cable loss is taken into account in results.

## 5.1.3 99% Bandwidth

**RESULT:** **Pass**

**Test Specification**

| | | |
|---|---|---|
| Test standard | : | RSS-Gen Clause 6.7 |
| Basic standard | : | ANSI C63.10: 2013 |
| Kind of test site | : | Shielded Room |

**Test Setup**

| | | |
|---|---|---|
| Date of testing | : | 2023-01-04 – 2023-03-13 |
| Input voltage | : | DC 5V |
| Operation mode | : | A.1 |
| Test channel | : | Low / Middle / High |
| Ambient temperature | : | 25 ℃ |
| Relative humidity | : | 53 % |
| Atmospheric pressure | : | 101 kPa |

For the measurement records, refer to the appendix B

## 5.1.4 Conducted Spurious Emissions Measured in 100 kHz Bandwidth

**RESULT:** **Pass**

**Test Specification**

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

**Test Setup**

| | | |
|---|---|---|
| Date of testing | : | 2023-01-04 – 2023-03-13 |
| Input voltage | : | DC 5V |
| Operation mode | : | A.1 |
| Test channel | : | Low / Middle / High |
| Ambient temperature | : | 25 ℃ |
| Relative humidity | : | 53 % |
| Atmospheric pressure | : | 101 kPa |

Test results of 100kHz Bandwidth of Frequency Band Edge by Conducted method refer to following test plot, and compliance is achieved as well.

For the measurement records, refer to the appendix B.

## 5.1.5 Radiated Spurious Emission

**RESULT:** **Pass**

**Test Specification**

| | | |
|---|---|---|
| Test standard | : | FCC Part 15.247(d) & FCC Part 15.205<br>RSS-247 Clause 3.3 |
| Basic standard | : | ANSI C63.10: 2013 |
| Limits | : | Refer to 15.209(a) of FCC part 15.247(d)<br>RSS-Gen Table 6 & Table 7 |
| Kind of test site | : | 3m Semi-anechoic Chamber |

**Test Setup**

| | | |
|---|---|---|
| Date of testing | : | 2023-01-04 – 2023-03-13 |
| Input voltage | : | DC 5V |
| Operation mode | : | A.1 |
| Test channel | : | Low / Middle / High |
| Ambient temperature | : | 23 ℃ |
| Relative humidity | : | 55 % |
| Atmospheric pressure | : | 101 kPa |

Remark:
During the pretest the EUT was rotated through three orthogonal axes to determine the attitude that maximizes the emissions. After that the EUT was manually handled to find the orientation that has the maximum emission, which is the orientation shown in the test set-up photos.

Testing was carried out within frequency range 9kHz to the tenth harmonics.

For the measurement records, refer to the appendix B.

## 5.1.6 20dB Bandwidth

**RESULT:** **Pass**

**Test Specification**

| | | |
|---|---|---|
| Test standard | : | FCC Part 15.247(a)(1)<br>RSS-247 Clause 5.1(a) |
| Basic standard | : | ANSI C63.10: 2013 |
| Kind of test site | : | Shielded Room |

**Test Setup**

| | | |
|---|---|---|
| Date of testing | : | 2023-01-04 – 2023-03-13 |
| Input voltage | : | DC 5V |
| Operation mode | : | A.1 |
| Test channel | : | Low / Middle / High |
| Ambient temperature | : | 25 ℃ |
| Relative humidity | : | 53 % |
| Atmospheric pressure | : | 101 kPa |

For the measurement records, refer to the appendix B.

## 5.1.7 Carrier Frequency Separation

**RESULT:** **Pass**

**Test Specification**

| | | |
|---|---|---|
| Test standard | : | FCC Part 15.247(a)(1)<br>RSS-247 Clause 5.1(b) |
| Basic standard | : | ANSI C63.10: 2013 |
| Limits | : | ≥ 25kHz or 2/3 of 20dB bandwidth, whichever is greater |
| Kind of test site | : | Shielded Room |

**Test Setup**

| | | |
|---|---|---|
| Date of testing | : | 2023-01-04 – 2023-03-13 |
| Input voltage | : | DC 5V |
| Operation mode | : | B |
| Test channel | : | Low / Middle / High |
| Ambient temperature | : | 25 ℃ |
| Relative humidity | : | 53 % |
| Atmospheric pressure | : | 101 kPa |

Note:

The limit is maximum 2/3 of the 20 dB bandwidth: 770.000 kHz.

For the measurement records, refer to the appendix B.

## 5.1.8 Number of Hopping Frequency

**RESULT:** **Pass**

**Test Specification**

| | | |
|---|---|---|
| Test standard | : | FCC part 15.247(a)(1)(iii)<br>RSS-247 Clause 5.1(d) |
| Basic standard | : | ANSI C63.10: 2013 |
| Limits | : | ≥ 15 non-overlapping channels |
| Kind of test site | : | Shielded Room |

**Test Setup**

| | | |
|---|---|---|
| Date of testing | : | 2023-01-04 – 2023-03-13 |
| Input voltage | : | DC 5V |
| Operation mode | : | B |
| Ambient temperature | : | 25 ℃ |
| Relative humidity | : | 53 % |
| Atmospheric pressure | : | 101 kPa |

For the measurement records, refer to the appendix B.

## 5.1.9 Time of Occupancy

**RESULT:** **Pass**

**Test Specification**

| | | |
|---|---|---|
| Test standard | : | FCC part 15.247(a)(1)(iii)<br>RSS-247 Clause 5.1(d) |
| Basic standard | : | ANSI C63.10: 2013 |
| Limits | : | < 0.4s |
| Kind of test site | : | Shielded Room |

**Test Setup**

| | | |
|---|---|---|
| Date of testing | : | 2023-01-04 – 2023-03-13 |
| Input voltage | : | DC 5V |
| Operation mode | : | B |
| Test channel | : | Low / Middle / High |
| Ambient temperature | : | 25 ℃ |
| Relative humidity | : | 53 % |
| Atmospheric pressure | : | 101 kPa |

Note:

Dwell time = Pulse width x (Hopping rate / Number of channels) x Period

Period = 0.4 x 79 (channel) = 31.6 seconds

For the measurement records, refer to the appendix B.

## 5.1.10 Conducted Emission on AC Mains

**RESULT:** **Pass**

**Test Specification**

| | | |
|---|---|---|
| Test standard | : | FCC Part 15.207(a)<br>RSS-Gen Clause 8.8 |
| Basic standard | : | ANSI C63.10: 2013 |
| Frequency range | : | 0.15 – 30MHz |
| Limits | : | FCC Part 15.207(a)<br>RSS-Gen Table 4 |
| Kind of test site | : | Shielded Room |

**Test Setup**

| | | |
|---|---|---|
| Date of testing | : | 2023-01-04 – 2023-03-13 |
| Input voltage | : | AC 120V, 60Hz |
| Operation mode | : | C |
| Earthing | : | Not connected |
| Ambient temperature | : | 23.4 |
| Relative humidity | : | 60 |
| Atmospheric pressure | : | 101 kPa |

For the measurement records, refer to the appendix B.

# 6 Photographs of the Test Set-Up

For photographs of the test set-up, refer to the appendix A.

# 7 List of Tables