# TEST REPORT

| | |
|---|---|
| **Applicant:** | Woan Technology (Shenzhen) Co., Ltd. |
| **Address:** | Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R. China, 518100 |
| **Equipment Type:** | SwitchBot Lock Pro |
| **Model Name:** | W3500000 (refer to section 2.3) |
| **Brand Name:** | SwitchBot |
| **Test Standard:** | EN IEC 62311: 2020<br>(refer to section 3.1) |
| **Sample Arrival Date:** | Sep. 18, 2023 |
| **Test Date:** | Sep. 21, 2023 - Jan. 06, 2024 |
| **Date of Issue:** | Jan. 18, 2024 |

**ISSUED BY:**

Shenzhen BALUN Technology Co., Ltd.

**Tested by:** Xiong Lining **Checked by:** Xu Rui **Approved by:** Tolan Tu

(Testing Director)

**Revision History**

| Version | Issue Date | Revisions Content |
|---|---|---|
| Rev. 01 | Jan. 18, 2024 | Initial Issue |

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# 1 GENERAL INFORMATION

## 1.1 Test Laboratory

| | |
|---|---|
| Name | Shenzhen BALUN Technology Co., Ltd. |
| Address | Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China |
| Phone Number | +86 755 6685 0100 |

## 1.2 Test Location

| | |
|---|---|
| Name | Shenzhen BALUN Technology Co., Ltd. |
| Location | ☑ Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China |
| | ☐ 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China |

# 2 PRODUCT INFORMATION

## 2.1 Applicant Information

| | |
|---|---|
| Applicant | Woan Technology (Shenzhen) Co., Ltd. |
| Address | Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R. China, 518100 |

## 2.2 Manufacturer Information

| | |
|---|---|
| Manufacturer | Woan Technology (Shenzhen) Co., Ltd. |
| Address | Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R. China, 518100 |

## 2.3 General Description for Equipment under Test (EUT)

| | |
|---|---|
| EUT Name | SwitchBot Lock Pro |
| Model Name Under Test | W3500000 |
| Series Model Name | W3500001, W3500002, W3500003, W3500004, W3500005 |
| Description of Model name differentiation | All models are same with electrical parameters and internal circuit structure, but only differ in model name and different accessories. (this information provided by the applicant) |
| Hardware Version | V01 |
| Software Version | V1.0 |
| Dimensions (Approx.) | N/A |
| Weight (Approx.) | N/A |

## 2.4 Technical Information

| | |
|---|---|
| Network and Wireless connectivity | Bluetooth (BLE) |

The requirement for the following technical information of the EUT was tested in this report:

| | | |
|---|---|---|
| Operating Mode | Bluetooth | |
| Frequency Range | Bluetooth | 2400 ~ 2483.5 MHz |
| Antenna Type | Bluetooth | PCB Antenna |
| Exposure Category | General Population/Uncontrolled Exposure | |
| EUT Type | Mobile Device | |

# 3 SUMMARY OF TEST RESULT

## 3.1 Test Standards

| No. | Identity | Document Title |
|---|---|---|
| 1 | EN IEC 62311: 2020 | Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz) |

## 3.2 Limit Standards

| No. | Identity | Document Title |
|---|---|---|
| 1 | 1999/519/EC | Council Recommendation of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz) |

# 4 DEVICE CATEGORY AND LEVELS LIMITS

The field calculation does not take into account the antenna size, which is assumed to be a point source. An ideal isotropic antenna is used as a reference to compare the performance of practical antennas: ***P*** watts is radiated, from a point, uniformly over the surface of sphere of radius ***r***. The POINTING VECTOR gives the power density:

Assumed use distance from EUT to Human, **20 cm** separation distance warning is required. In this section, the power density at 20 cm location is calculated to examine if it is lower than the limit.

$$S = \frac{PG}{4\pi R^2}$$

Where:

S = power density

P = output power (W)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Separation distance between radiator and human body (m)

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the following limits.

**Compliance criteria**

The electronic and electrotechnical apparatus shall comply with the basic restriction as specified in Annex II of Council Recommendation 1999/519/EC.

**1999/519/EC Limit**

**Reference levels for electric, magnetic and electromagnetic fields (0 Hz to 300 GHz, unperturbed rms values)**

| Frequency range | E-field strength (V/m) | H-field strength (A/m) | B-field (μT) | Equivalent plane wave power density $S_{eq}$ (W/m²) |
|---|---|---|---|---|
| 0-1 Hz | — | $3,2 \times 10^4$ | $4 \times 10^4$ | — |
| 1-8 Hz | 10 000 | $3,2 \times 10^4/f^2$ | $4 \times 10^4/f^2$ | — |
| 8-25 Hz | 10 000 | 4 000/f | 5 000/f | — |
| 0,025-0,8 kHz | 250/f | 4/f | 5/f | — |
| 0,8-3 kHz | 250/f | 5 | 6,25 | — |
| 3-150 kHz | 87 | 5 | 6,25 | — |
| 0,15-1 MHz | 87 | 0,73/f | 0,92/f | — |
| 1-10 MHz | $87/f^{1/2}$ | 0,73/f | 0,92/f | — |
| 10-400 MHz | 28 | 0,073 | 0,092 | 2 |
| 400-2 000 MHz | $1,375\ f^{1/2}$ | $0,0037\ f^{1/2}$ | $0,0046\ f^{1/2}$ | f/200 |
| 2-300 GHz | 61 | 0,16 | 0,20 | 10 |

# 5 ASSESSMENT RESULT

## 5.1 Output Power

| Bluetooth | |
|---|---|
| Mode | BLE |
| EIRP (dBm) | 2.4 |
| Note: This report listed the maximal case power value, please refer to BL-SZ2390803-601 report for more details. | |

## 5.2 Assessment Result

| Mode | Max. EIRP (dBm) | Antenna Gain (dBi) | Distance (cm) | Power Density (W/m²) | Limit of Power Density (W/m²) | Verdict |
|---|---|---|---|---|---|---|
| Bluetooth | 2.4 | -0.45 | 20 | 0.003 | 10.000 | Pass |

## 5.3 Conclusion

This EUT is deemed to comply with the reference level limits by Council Recommendation 1999/519/EC, therefore the basic restrictions are compliant with human exposure limits.

# Statement

1. The laboratory guarantees the scientificity, accuracy and impartiality of the test, and is responsible for all the information in the report, except the information provided by the customer. The customer is responsible for the impact of the information provided on the validity of the results.
2. The report without China inspection body and laboratory Mandatory Approval (CMA) mark has no effect of proving to the society.
3. For the report with CNAS mark or A2LA mark, the items marked with "☆" are not within the accredited scope.
4. This report is invalid if it is altered, without the signature of the testing and approval personnel, or without the “inspection and testing dedicated stamp” or test report stamp.
5. The test data and results are only valid for the tested samples provided by the customer.
6. This report shall not be partially reproduced without the written permission of the laboratory.
7. Any objection shall be raised to the laboratory within 30 days after receiving the report.

--END OF REPORT--

# TEST REPORT

| | |
|---|---|
| **Applicant:** | Woan Technology (Shenzhen) Co., Ltd. |
| **Address:** | Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R. China, 518100 |
| **Equipment Type:** | SwitchBot Lock Pro |
| **Model Name:** | W3500000 (refer to section 2.3) |
| **Brand Name:** | SwitchBot |
| **Test Standard:** | ETSI EN 300 328 V2.2.2 (2019-07) |
| **Sample Arrival Date:** | Sep. 18, 2023 |
| **Test Date:** | Sep. 21, 2023 - Jan. 06, 2024 |
| **Date of Issue:** | Jan. 18, 2024 |

**ISSUED BY:**

Shenzhen BALUN Technology Co., Ltd.

**Tested by:** Julie Zhu **Checked by:** Ye Hongji **Approved by:** Liao Jianming (Technical Director)

**Revision History**

| Version | Issue Date | Revisions |
|---|---|---|
| Rev. 01 | Jan. 18, 2024 | Initial Issue |

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| Address | Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China |
| Phone Number | +86 755 6685 0100 |

## 1.2 Test Location

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| Location | ☑ Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China |
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# 2 PRODUCT INFORMATION

## 2.1 Applicant Information

| | |
|---|---|
| Applicant | Woan Technology (Shenzhen) Co., Ltd. |
| Address | Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R. China, 518100 |

## 2.2 Manufacturer Information

| | |
|---|---|
| Manufacturer | Woan Technology (Shenzhen) Co., Ltd. |
| Address | Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R. China, 518100 |

## 2.3 General Description for Equipment under Test (EUT)

| | |
|---|---|
| EUT Name | SwitchBot Lock Pro |
| Model Name Under Test | W3500000 |
| Series Model Name | W3500001, W3500002, W3500003, W3500004, W3500005 |
| Description of Model name differentiation | All models are same with electrical parameters and internal circuit structure, but only differ in model name and different accessories. (this information provided by the applicant) |
| Hardware Version | V01 |
| Software Version | V1.0 |
| Dimensions (Approx.) | N/A |
| Weight (Approx.) | N/A |

## 2.4 Technical Information

| | |
|---|---|
| EUT Type | Stand-alone equipment |
| Network and Wireless connectivity | Bluetooth (BLE) |

The requirement for the following technical information of the EUT was tested in this report:

| | |
|---|---|
| Modulation Technology | Bluetooth Low Energy: Wide band modulations other than FHSS |
| Modulation Type | Bluetooth Low Energy: GFSK |
| Transfer Rate | BLE: 1 Mbps |
| Frequency Range | The frequency range used is 2402 MHz – 2480 MHz;<br>The frequency block is 2400 MHz to 2483.5 MHz. |
| Number of channel | Bluetooth Low Energy: 40 (at intervals of 2 MHz) |
| Tested Channel | Bluetooth Low Energy:<br>1Mbps: 0 (2402 MHz), 19 (2440 MHz), 39 (2480 MHz) |
| Nominal Channel Bandwidth | 1 MHz |
| Antenna Type | PCB Antenna |
| Antenna Gain | -0.45 dBi (In test items related to antenna gain, the final results reflect this figure. This value is provided by the applicant.) |
| Beamforming Gain | N/A |
| Adaptive or Non-Adaptive | Adaptive |
| LBT Based | Non-LBT |
| The Max RF Output power | Bluetooth Low Energy: 2.4 dBm |
| Receiver Category | Bluetooth Low Energy: 2 |

| Description | Modulation Type (BLE) | Transfer Rate (BLE) |
|---|---|---|
| Transmitter Parameters | | |
| RF output power | GFSK | 1 Mbps |
| Power Spectral Density | GFSK | 1 Mbps |
| Duty Cycle, Tx-sequence, Tx-gap | N/A | N/A |
| Accumulated Transmit Time, Frequency Occupation and Hopping Sequence | -- | -- |
| Hopping Frequency Separation | -- | -- |
| Medium Utilization (MU) factor | N/A | N/A |
| Adaptivity | N/A | N/A |
| Occupied Channel Bandwidth | GFSK | 1 Mbps |
| Transmitter unwanted emissions in the out-of-band domain | GFSK | 1 Mbps |
| Transmitter unwanted emissions in the spurious domain | GFSK | 1 Mbps |
| Receiver Parameters | | |
| Receiver spurious emissions | GFSK | 1 Mbps |
| Receiver Blocking | GFSK | 1 Mbps |
| Other Parameters | | |
| Geo-location capability | -- | -- |

# 3 SUMMARY OF TEST RESULTS

The EUT has been tested according to ETSI EN 300 328 V2.2.2 (2019-07).

| No. | Identity | Document Title |
|---|---|---|
| 1 | ETSI EN 300 328 V2.2.2 (2019-07) | Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz band; Harmonised Standard for access to radio spectrum |

Test items and the results are as follows:

| Report Section | Standard Rule | Description | Channel (BLE) | Test Result | Verdict | Remark |
|---|---|---|---|---|---|---|
| Transmitter Parameters | | | | | | |
| 5.1.1 | 4.3.1.2<br>4.3.2.2 | RF output power | Low/Middle/High | ANNEX A.1 | Pass | -- |
| 5.1.2 | 4.3.2.3 | Power Spectral Density | Low/Middle/High | ANNEX A.2 | Pass | Note [4] |
| 5.1.3 | 4.3.1.3<br>4.3.2.4 | Duty Cycle, Tx-sequence, Tx-gap | N/A | ANNEX A.3 | N/A | Note [2], Note [7] |
| 5.1.4 | 4.3.1.4 | Accumulated Transmit Time, Frequency Occupation and Hopping Sequence | -- | ANNEX A.4 | N/A | Note [5] |
| 5.1.5 | 4.3.1.5 | Hopping Frequency Separation | -- | ANNEX A.5 | N/A | Note [5] |
| 5.1.6 | 4.3.1.6<br>4.3.2.5 | Medium Utilization (MU) factor | N/A | ANNEX A.6 | N/A | Note [2], Note [7] |
| 5.1.7 | 4.3.1.7<br>4.3.2.6 | Adaptivity | N/A | ANNEX A.7 | N/A | Note [2], Note [3] |
| 5.1.8 | 4.3.1.8<br>4.3.2.7 | Occupied Channel Bandwidth | Low/High | ANNEX A.8 | Pass | -- |
| 5.1.9 | 4.3.1.9<br>4.3.2.8 | Transmitter unwanted emissions in the out-of-band domain | Low/High | ANNEX A.9 | Pass | -- |
| 5.1.10 | 4.3.1.10<br>4.3.2.9 | Transmitter unwanted emissions in the spurious domain | Low/High | ANNEX A.10 | Pass | -- |
| Receiver Parameters | | | | | | |
| 5.2.1 | 4.2.3.2 | Receiver categories | -- | -- | -- | -- |
| 5.2.2 | 4.3.1.11<br>4.3.2.10 | Receiver spurious emissions | Low/High | ANNEX A.11 | Pass | -- |
| 5.2.3 | 4.3.1.12<br>4.3.2.11 | Receiver Blocking | Low/High | ANNEX A.12 | Pass | -- |
| Other Parameters | | | | | | |
| 5.3.1 | 4.3.1.13<br>4.3.2.12 | Geo-location capability | -- | -- | N/A | Note [6] |

Note [1]: This requirement does not apply to adaptive equipment unless operating in a non-adaptive mode.
Note [2]: This test doesn't apply for the EUT which has the RF Output power is less than 10 dBm e.i.r.p.
Note [3]: This requirement does not apply to non-adaptive equipment or adaptive eq uipment operating in a non-adaptive mode.
Note [4]: This requirement apply to the equipment is using wide band modulations other than FHSS.
Note [5]: This requirement apply to the equipment is using FHSS.
Note [6]: This requirement does not apply to devices that do not support Geo-location capability.
Note [7]: These requirements apply to non-adaptive frequency hopping equipment or to adaptive frequency hopping equipment operating in a non-adaptive mode.

# 4 GENERAL TEST CONFIGURATIONS

## 4.1 Test Environments

During the measurement, the normal environmental conditions were within the listed ranges:

| | | |
|---|---|---|
| Relative Humidity | 47% to 65% | |
| Atmospheric Pressure | 98 kPa to 102 kPa | |
| Temperature | NT (Normal Temperature) | +21.3℃ to +22.4℃ |
| | LT (Low Temperature) | -10.0℃ |
| | HT (High Temperature) | +45.0℃ |
| Working Voltage of the EUT | NV (Normal Voltage) | 6 V |

## 4.2 Test Equipment List

| Description | Manufacturer | Model | Serial No. | Cal. Date | Cal. Due |
|---|---|---|---|---|---|
| Spectrum Analyzer | ROHDE&SCHWARZ | FSV-40 | 101544 | 2023.01.03 | 2024.01.02 |
| | | | | 2023.12.27 | 2024.12.26 |
| Vector Signal Generator | ROHDE&SCHWARZ | SMBV100A | 260592 | 2023.02.07 | 2024.02.06 |
| Signal Generator | ROHDE&SCHWARZ | SMB100A | 177746 | 2023.05.16 | 2024.05.15 |
| Switch Unit with OSP-B157 | ROHDE&SCHWARZ | OSP120 | 101270 | 2023.05.16 | 2024.05.15 |
| Signaling Unit | ROHDE&SCHWARZ | CMW270 | 100607 | 2023.05.16 | 2024.05.15 |
| Temperature Chamber | AHK | NTH64-40A | 1310 | 2022.12.28 | 2023.12.27 |
| | | | | 2023.12.05 | 2024.12.04 |
| Spectrum Analyzer | KEYSIGHT | N9020A | MY56060183 | 2023.09.05 | 2024.09.04 |
| Spectrum Analyzer | KEYSIGHT | N9020A | MY50531259 | 2023.09.05 | 2024.09.04 |
| Signaling Unit | ROHDE&SCHWARZ | CMW500 | 171150 | 2023.06.19 | 2024.06.18 |
| Test Antenna-Bi-Log | SCHWARZBECK | VULB 9163 | 01415 | 2021.03.08 | 2024.03.07 |
| Test Antenna-Horn | SCHWARZBECK | BBHA 9120D | 02460 | 2021.05.19 | 2024.05.08 |
| Anechoic Chamber | RAINFORD | 9m*6m*6m | 140 | 2022.02.19 | 2024.08.15 |

## 4.3 Test Software List

| Description | Manufacturer | Software Version | Serial No. |
|---|---|---|---|
| TS8997 EMC32 | ROHDE&SCHWARZ | V10.01.00 | N/A |
| BL410R | BALUN | V3.0.1.528 | N/A |
| BL410E | BALUN | V22.930 | N/A |

## 4.4 Measurement Uncertainty

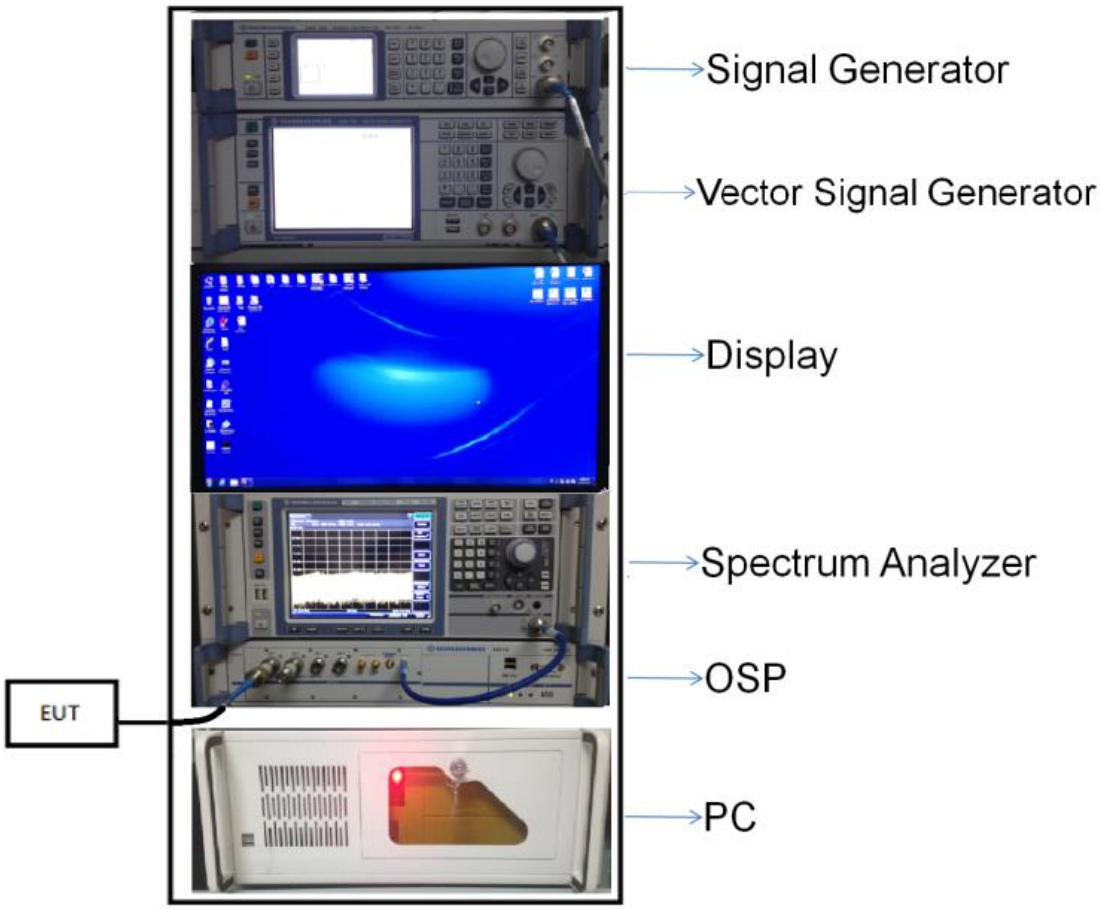
The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

| Parameters | Uncertainty |
|---|---|
| Occupied Channel Bandwidth | 3.6 % |
| RF output power, conducted | 0.66 dB |
| Power Spectral Density, conducted | 0.90 dB |
| Unwanted Emissions, conducted | 1.78 dB |
| All emissions, radiated | 5.36 dB |
| Temperature | 0.8 °C |
| Humidity | 4 % |

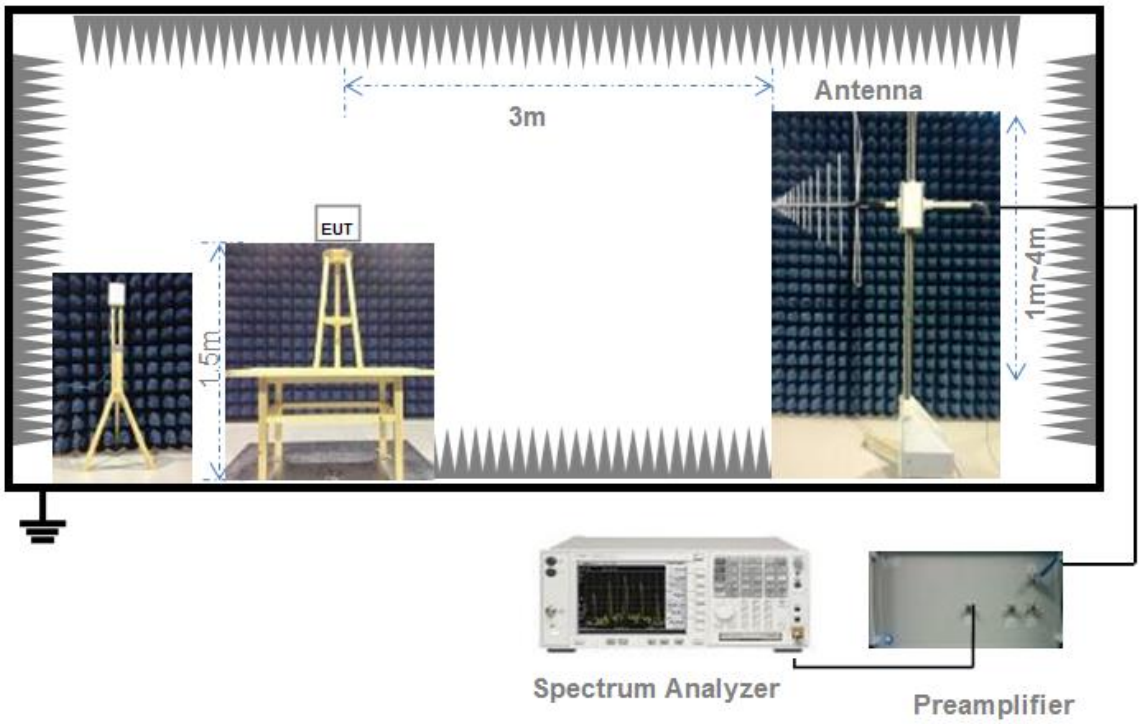
## 4.5 Description of Test Setup

### 4.5.1 For Conducted Test

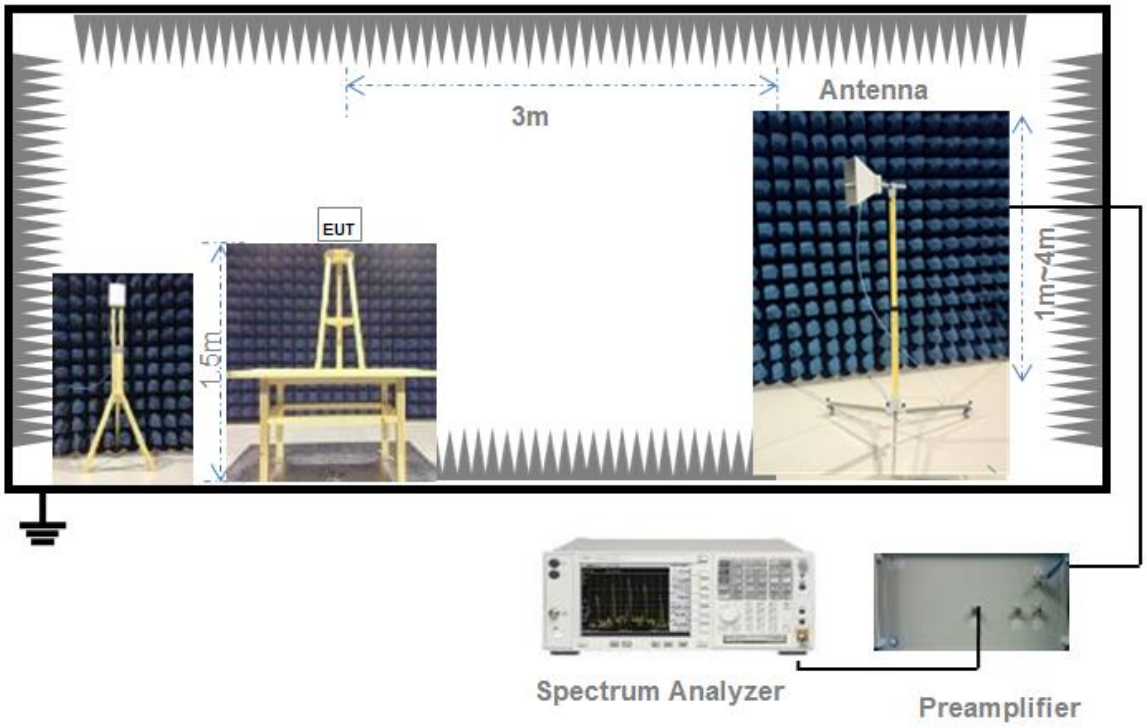



(Diagram 1)

4.5.2 For Radiated Test

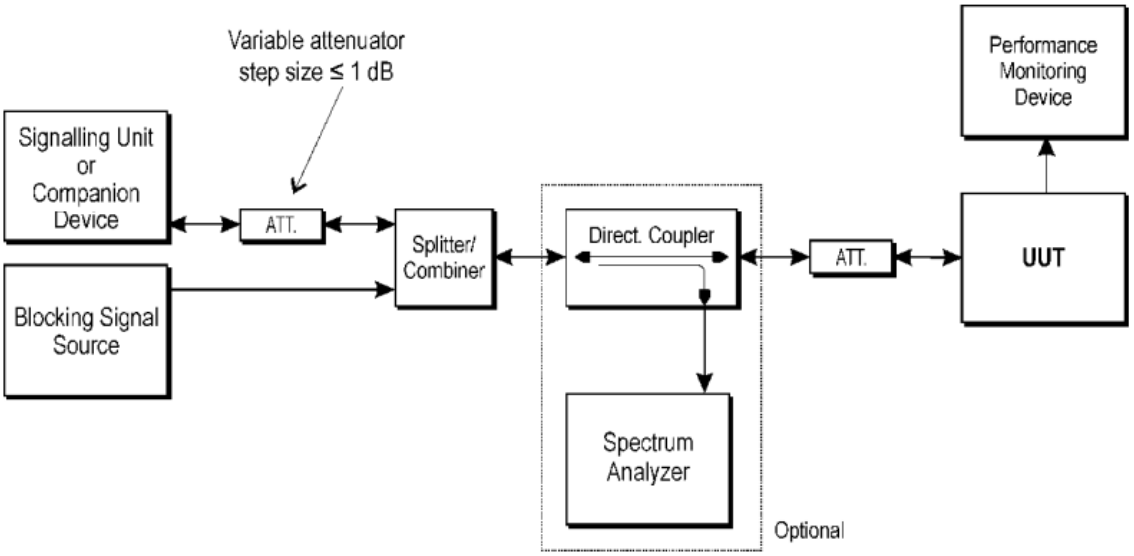



(Diagram 2)



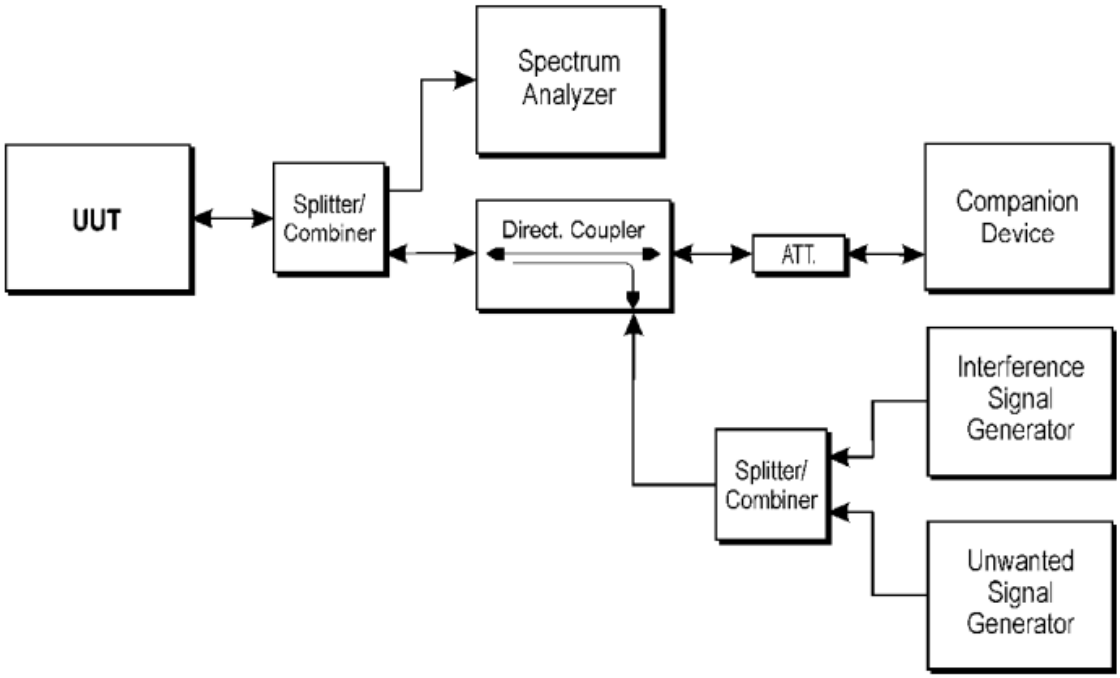

(Diagram 3)

### 4.5.3 For Receiver Blocking Test




(Diagram 4)

### 4.5.4 For Adaptivity Test




(Diagram 5)

# 5 Test Type and Test Results

## 5.1 Transmitter Parameters

### 5.1.1 RF output power

#### 5.1.1.1 Limit

The maximum RF output power shall be equal to or less than 20 dBm.

#### 5.1.1.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

#### 5.1.1.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.2.2.

#### 5.1.1.4 Test Result

Please refer to ANNEX A.1.

### 5.1.2 Power Spectral Density

#### 5.1.2.1 Limit

The maximum Power Spectral Density for non-FHSS equipment is 10 dBm per MHz.

#### 5.1.2.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

#### 5.1.2.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.3.2.

#### 5.1.2.4 Test Result

Please refer to ANNEX A.2.

### 5.1.3 Duty Cycle, Tx-sequence, Tx-gap

#### 5.1.3.1 Limit

The Duty Cycle shall be equal to or less than the maximum value declared by the manufacturer.

The Tx-sequence time shall be equal to or less than 10 ms.

The minimum Tx-gap time following a Tx-sequence shall be equal to the duration of that proceeding Tx-sequence with a minimum of 3,5 ms.

#### 5.1.3.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

#### 5.1.3.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.2.2.

#### 5.1.3.4 Test Result

Please refer to ANNEX A.3.

## 5.1.4 Accumulated Transmit Time, Frequency Occupation and Hopping Sequence

### 5.1.4.1 Limit

The Accumulated Transmit Time on any hopping frequency shall not be greater than 400 ms within any observation period of 400 ms multiplied by the minimum number of hopping frequencies (N) that have to be used.

The hopping sequence(s) shall contain at least N hopping frequencies where N is 15 or 15 divided by the minimum Hopping Frequency Separation in MHz, whichever is the greater.

In order for the equipment to comply with the Frequency Occupation requirement, it shall meet either of the following two options:

Option 1: Each hopping frequency of the hopping sequence shall be occupied at least once within a period not exceeding four times the product of the dwell time and the number of hopping frequencies in use.

Option 2: The occupation probability for each frequency shall be between ((1 / U) × 25 %) and 77 % where U is the number of hopping frequencies in use.

### 5.1.4.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

### 5.1.4.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.4.2.

### 5.1.4.4 Test Result

Please refer to ANNEX A.4.

### 5.1.5 Hopping Frequency Separation

#### 5.1.5.1 Limit

For adaptive frequency hopping systems, the minimum Hopping Frequency Separation shall be 100 kHz.

#### 5.1.5.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

#### 5.1.5.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.5.2.

#### 5.1.5.4 Test Result

Please refer to ANNEX A.5.

### 5.1.6 Medium Utilization (MU) factor

#### 5.1.6.1 Limit

The maximum Medium Utilization factor for non-adaptive equipment shall be 10 %.

#### 5.1.6.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

#### 5.1.6.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.2.2.

#### 5.1.6.4 Test Result

Please refer to ANNEX A.6.

## 5.1.7 Adaptivity

### 5.1.7.1 Limit

Adaptive Frequency Hopping

| Requirement | Operational Mode | |
|---|---|---|
| | Non-LBT based Detect and Avoid | LBT based Detect and Avoid |
| Minimum Clear Channel Assessment (CCA) Time | NA | 18 us (see note 1) |
| Maximum Channel Occupancy (COT) Time | 40 ms | 60 ms |
| Minimum Idle Period | 5% of COT | 5% of COT |
| Extended CCA check | NA | NA |
| Short Control Signalling Transmissions | Maximum duty cycle of 10 % within an observation period of 50 ms (see note 2) | |
| NOTE 1: The CCA time used by the equipment shall be declared by the supplier.<br>NOTE 2: Adaptive equipment may or may not have Short Control Signalling Transmissions.<br>NOTE 3: The Idle Period is considered to be equal to the CCA or Extended CCA time defined in clause 4.3.2.6.3.2.3, step 1 and step 2.<br>NOTE 4: The Idle Period in between transmissions is considered to be the CCA or the Extended CCA check as there are no transmissions during this period. | | |

Interference threshold level:

| Maximum transmit power ($P_H$) EIRP dBm | Threshold level (TL) (see notes 1 and 2) |
|---|---|
| 20 | -70 dBm / MHz |
| NOTE 1: TL = -70 dBm/MHz + 10 × log10 (100 mW / Pout) (Pout in mW e.i.r.p.).<br>NOTE 2: Transmitter the CCA threshold level (TL) shall be equal or lower than -70 dBm/MHz at the input to the receiver (assuming a 0 dBi receive antenna). | |

Unwanted Signal parameters

| Wanted signal mean power from companion device | Unwanted signal frequency (MHz) | Unwanted CW signal power (dBm) |
|---|---|---|
| sufficient to maintain the link (see note 2) | 2 395 or 2 488,5 (see note 1) | -35 (see note 3) |
| NOTE 1: The highest frequency shall be used for testing operating channels within the range 2400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483.5 MHz. See clause 5.4.6.1.<br>NOTE 2: A typical value which can be used in most cases is -50 dBm/MHz.<br>NOTE 3: The level specified is the level in front of the UUT antenna. In case of conducted measurements, this level has to be corrected by the actual antenna assembly gain. | | |

Adaptive equipment using modulations other than FHSS

| Requirement | Operational Mode | | | |
|---|---|---|---|---|
| | Non-LBT based Detect and Avoid | LBT based Detect and Avoid | | |
| | | Frame Based Equipment | Load Based Equipment (CCA using 'energy detect') | Load Based Equipment (CCA not using any of the mechanisms referenced as note 2) |
| Minimum Clear Channel Assessment (CCA) Time | NA | 18 us (see note 1) | (see note 2) | 18 us (see note 1) |
| Maximum Channel Occupancy (COT) Time | 40 ms | 1 ms to 10 ms | (see note 2) | 13 ms |
| Minimum Idle Period | 5% of COT | 5% of COT | (see note 2) | NA |
| Extended CCA check | NA | NA | (see note 2) | a random duration in the range between 18 µs and at least 160 µs |
| Short Control Signalling Transmissions | Maximum duty cycle of 10 % within an observation period of 50 ms (see note 3) | | | |

NOTE 1: The CCA time used by the equipment shall be declared by the supplier.
NOTE 2: Load Based Equipment may implement an LBT based spectrum sharing mechanism based on the Clear Channel Assessment (CCA) mode using energy detect, as described in IEEE 802.11™-2012 [i.3] clause 9, clause 10, clause 16, clause 17, clause 19 and clause 20, or in IEEE 802.15.4™-2011 [i.4], clause 4, clause 5 and clause 8.
NOTE 3: Adaptive equipment may or may not have Short Control Signalling Transmissions.
NOTE 4: The Idle Period is considered to be equal to the CCA or Extended CCA time defined in clause 4.3.2.6.3.2.3, step 1 and step 2.
NOTE 5: The Idle Period in between transmissions is considered to be the CCA or the Extended CCA check as there are no transmissions during this period.

Interference threshold level:

| Maximum transmit power ($P_H$) EIRP dBm | Threshold level (TL) (see notes 1 and 2) |
|---|---|
| 20 | -70 dBm / MHz |

NOTE 1: TL = -70 dBm/MHz + 10 × log10 (100 mW / Pout) (Pout in mW e.i.r.p.).
NOTE 2: transmitter the CCA threshold level (TL) shall be equal or lower than -70 dBm/MHz at the input to the receiver (assuming a 0 dBi receive antenna).

Unwanted Signal parameters

| Wanted signal mean power from companion device | Unwanted signal frequency (MHz) | Unwanted CW signal power (dBm) |
|---|---|---|
| sufficient to maintain the link (see note 2) | 2 395 or 2 488,5 (see note 1) | -35 (see note 3) |
| NOTE 1: The highest frequency shall be used for testing operating channels within the range 2400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483.5 MHz. See clause 5.4.6.1.<br>NOTE 2: A typical value which can be used in most cases is -50 dBm/MHz.<br>NOTE 3: The level specified is the level in front of the UUT antenna. In case of conducted measurements, this level has to be corrected by the actual antenna assembly gain. | | |

### 5.1.7.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

### 5.1.7.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.6.2.

### 5.1.7.4 Test Result

Please refer to ANNEX A.7.

### 5.1.8 Occupied Channel Bandwidth

#### 5.1.8.1 Limit

The Occupied Channel Bandwidth for each hopping frequency shall fall completely within the band 2400 MHz to 2483.5 MHz.

In addition, for non-adaptive FHSS equipment with e.i.r.p. greater than 10 dBm, the Occupied Channel Bandwidth for every occupied hopping frequency shall be equal to or less than 5 MHz.

In addition, for non-adaptive non-FHSS equipment with e.i.r.p. greater than 10 dBm, the Occupied Channel Bandwidth shall be equal to or less than 20 MHz.

#### 5.1.8.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

#### 5.1.8.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.7.2.

#### 5.1.8.4 Test Result

Please refer to ANNEX A.8.

## 5.1.9 Transmitter unwanted emissions in the out-of-band domain

### 5.1.9.1 Limit

The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask in figure 1.

Note: Within the 2400 M Hz to 2483,5 MHz band, the Out-of-band emissions are fulfilled by compliance with the Occupied Channel Bandwidth requirement in clause 4.3.1.8.

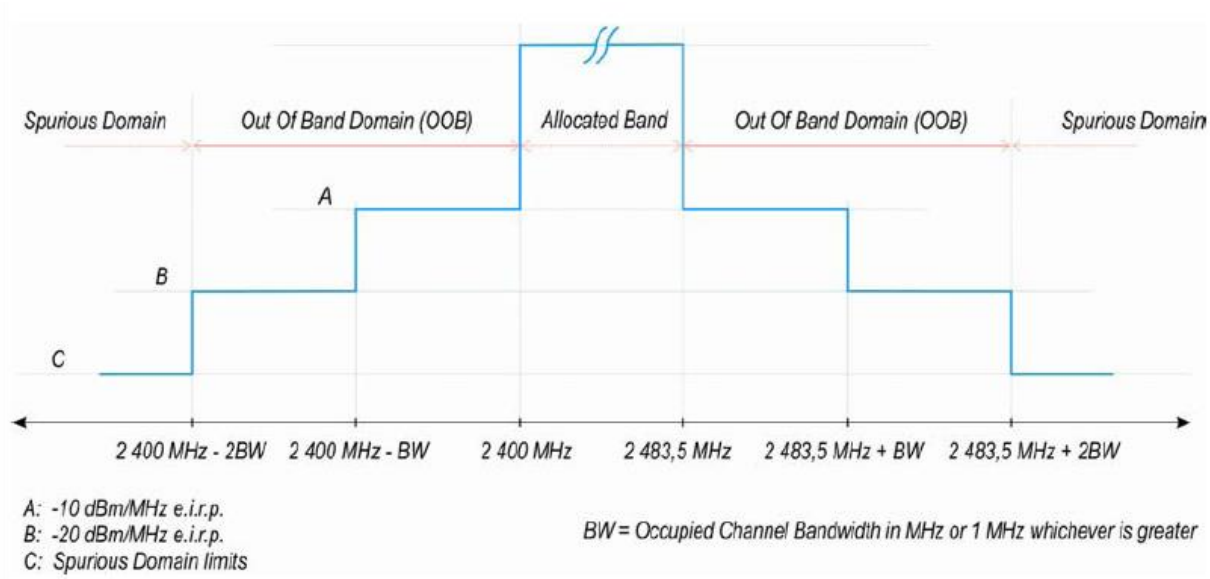



**Figure 1: Transmit mask**

### 5.1.9.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

### 5.1.9.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.8.2.

### 5.1.9.4 Test Result

Please refer to ANNEX A.9.

## 5.1.10 Transmitter unwanted emissions in the spurious domain

### 5.1.10.1 Limit

The transmitter unwanted emissions in the spurious domain shall not exceed the values in following tables:

| Frequency range | Maximum power (dBm) | Bandwidth |
|---|---|---|
| 30 MHz to 47 MHz | -36 | 100 kHz |
| 47 MHz to 74 MHz | -54 | 100 kHz |
| 74 MHz to 87.5 MHz | -36 | 100 kHz |
| 87.5 MHz to 118 MHz | -54 | 100 kHz |
| 118 MHz to 174 MHz | -36 | 100 kHz |
| 174 MHz to 230 MHz | -54 | 100 kHz |
| 230 MHz to 470 MHz | -36 | 100 kHz |
| 470 MHz to 694 MHz | -54 | 100 kHz |
| 694 MHz to 1 GHz | -36 | 100 kHz |
| 1 GHz to 12.75 GHz | -30 | 1 MHz |

### 5.1.10.2 Test Setup

The section 4.5.1 and 4.5.2 (Diagram 1, 2, 3) for test setup description. The photo of test setup please refer to ANNEX B.

### 5.1.10.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.9.2.

### 5.1.10.4 Test Result

Please refer to ANNEX A.10.

## 5.2 Receiver Parameters

### 5.2.1 Receiver categories

There have three different receiver categories for which different receiver requirements and/or corresponding limits apply.

Receiver Category

| Receiver Category | Definition |
|---|---|
| Category 1 | Adaptive equipment with a maximum RF output power greater than 10 dBm e.i.r.p. |
| Category 2 | Non-adaptive equipment with a Medium Utilization (MU) factor greater than 1 % and less than or equal to 10 % or adaptive equipment and non-adaptive with a maximum RF output power of 10 dBm e.i.r.p. |
| Category 3 | Non-adaptive equipment with a maximum Medium Utilization (MU) factor of 1 % or adaptive equipment and non-adaptive with a maximum RF output power of 0 dBm e.i.r.p. |

## 5.2.2 Receiver Spurious Emissions

### 5.2.2.1 Limit

Receiver spurious emissions are emissions at any frequency when the equipment is in receive mode.

The spurious emissions of the transmitter shall not exceed the values in following tables for the EUT in this report.

| Frequency range | Maximum power (dBm) | Bandwidth |
|---|---|---|
| 30 MHz to 1 GHz | -57 | 100 KHz |
| 1 GHz to 12.75 GHz | -47 | 1 MHz |

### 5.2.2.2 Test Setup

The section 4.5.1 (Diagram 1) for test setup description. The photo of test setup please refer to ANNEX B.

### 5.2.2.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.10.2.

### 5.2.2.4 Test Result

Please refer to ANNEX A.11.

## 5.2.3 Receiver Blocking

### 5.2.3.1 Limit

While maintaining the minimum performance criteria as defined in clause 4.3.1.12.3, the blocking levels at specified frequency offsets shall be equal to or greater than the limits defined for the applicable receiver category provided in next table.

Receiver Category 1 equipment

| Wanted signal mean power from companion device (dBm) (see notes 1 and 4) | Blocking signal frequency(MHz) | Blocking signal power (dBm) (see note 4) | Type of blocking signal |
|---|---|---|---|
| (-133 dBm + 10 × $\log_{10}$(OCBW)) or -68 dBm whichever is less (see note 2) | 2 380 | -34 | CW |
| | 2 504 | -34 | CW |
| (-139 dBm + 10 × $\log_{10}$(OCBW)) or -74 dBm whichever is less (see note 3) | 2 300 | -34 | CW |
| | 2 330 | -34 | CW |
| | 2 360 | -34 | CW |
| | 2 524 | -34 | CW |
| | 2 584 | -34 | CW |
| | 2 674 | -34 | CW |

NOTE 1: OCBW is in Hz.

NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to $P_{min}$ + 26 dB where $P_{min}$ is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. $P_{min}$ is the minimum level of wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to $P_{min}$ + 20 dB where $P_{min}$ is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

Receiver Category 2 equipment

| Wanted signal mean power from companion device (dBm) (see notes 1 and 3) | Blocking signal frequency (MHz) | Blocking signal power (dBm) (see note 3) | Type of blocking signal |
|---|---|---|---|
| (-139 dBm + 10 × $\log_{10}$(OCBW) + 10 dB) or (-74 dBm + 10 dB) whichever is less (see note 2) | 2 380 | -34 | CW |
| | 2 504 | -34 | CW |
| | 2 300 | -34 | CW |
| | 2 584 | -34 | CW |

NOTE 1: OCBW is in Hz.

NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 26 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

Receiver Category 3 equipment

| Wanted signal mean power from companion device (dBm) (see notes 1 and 3) | Blocking signal frequency(MHz) | Blocking signal power (dBm) (see note 3) | Type of blocking signal |
|---|---|---|---|
| (-139 dBm + 10 × $\log_{10}$(OCBW) + 20 dB) or (-74 dBm + 20 dB) whichever is less (see note 2) | 2 380 | -34 | CW |
| | 2 504 | -34 | CW |
| | 2 300 | -34 | CW |
| | 2 584 | -34 | CW |

NOTE 1: OCBW is in Hz.

NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 30 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

Categorization

| Receiver category | Definition |
|---|---|
| 1 | Adaptive equipment with a maximum RF output power greater than 10 dBm e.i.r.p. shall be considered as receiver category 1 equipment. |
| 2 | Non-adaptive equipment with a Medium Utilization (MU) factor greater than 1 % and less than or equal to 10 % or adaptive equipment with a maximum RF output power of 10 dBm e.i.r.p. shall be considered as receiver category 2 equipment. |
| 3 | Non-adaptive equipment with a maximum Medium Utilization (MU) factor of 1 % or adaptive equipment with a maximum RF output power of 0 dBm e.i.r.p. shall be considered as receiver category 3 equipment. |

### 5.2.3.2 Test Setup

See the section 4.5.3 (Diagram 4) for test setup description. The photo of test setup please refer to ANNEX B.

### 5.2.3.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.11.2.

### 5.2.3.4 Test Result

Please refer to ANNEX A.12.

## 5.3 Other Parameters

### 5.3.1 Geo-location capability

#### 5.3.1.1 Requirements

The geographical location determined by the equipment as defined in following section (5.3.1.2) shall not be accessible to the user.

#### 5.3.1.2 Definition

Geo-location capability is a feature of the equipment to determine its geographical location with the purpose to configure itself according to the regulatory requirements applicable at the geographical location where it operates.

The geo-location capability may be present in the equipment or in an external device (temporary) associated with the equipment operating at the same geographical location during the initial power up of the equipment. The geographical location may also be available in equipment already installed and operating at the same geographical location.

#### 5.3.1.3 Test Result

Note: Not applicable.

# ANNEX A TEST RESULT

## A.1 RF output power

Test Data

Note: EIRP Power = Conducted Power + Antenna Gain

| Modulation Mode | | | GFSK (BLE 1Mbps) | | |
|---|---|---|---|---|---|
| Limit | | | 20 dBm | | |
| Test Result | | | | | |
| Test Method | Test Conditions | | Transmitter Power Level (dBm) | | |
| ☐ Radiated<br>☒ Conducted | Voltage | Temperature | Low Channel | Middle Channel | High Channel |
| | | | EIRP | EIRP | EIRP |
| | NV | NT | 2.4 | 2.0 | 1.5 |
| | | LT | 2.1 | 2.2 | 1.7 |
| | | HT | 2.3 | 2.0 | 1.7 |
| Test Verdict | | | Pass | | |

## Bursts Power List

GFSK (BLE 1Mbps): Low Channel

| Burst RMS Power | Start Time | Stop Time | Tx_on | Tx_off |
|---|---|---|---|---|
| dBm | ms | ms | ms | ms |
| 2.4 | 0.000 | 1000.000 | 1000.000 | 0.000 |

GFSK (BLE 1Mbps): Middle Channel

| Burst RMS Power | Start Time | Stop Time | Tx_on | Tx_off |
|---|---|---|---|---|
| dBm | ms | ms | ms | ms |
| 2.2 | 0.000 | 1000.000 | 1000.000 | 0.000 |

GFSK (BLE 1Mbps): High Channel

| Burst RMS Power | Start Time | Stop Time | Tx_on | Tx_off |
|---|---|---|---|---|
| dBm | ms | ms | ms | ms |
| 1.7 | 0.000 | 1000.000 | 1000.000 | 0.000 |

## A.2 Power spectral density

Measuring Parameter

| Frequency Range | | |
|---|---|---|
| 2400 MHz to 2483.5 MHz | RBW (MHz) | 10 kHz |
| | VBW (MHz) | 30 kHz |
| | Sweep points | 8351 |
| | Detector mode | RMS |
| | Trace mode | Max Hold |
| | Sweep time | Auto |

Test Data

Note: The Power density is EIRP Power density, which is contain antenna gain.

| Modulation Mode | | | GFSK (BLE 1Mbps) | | |
|---|---|---|---|---|---|
| Limit | | | 10 dBm/MHz | | |
| Test Result | | | | | |
| Test Method | Test Conditions | | Power density (dBm/MHz) | | |
| ☐ Radiated<br>☒ Conducted | Temperature | Voltage | Low Channel<br>Power Spectral density | Middle Channel<br>Power Spectral density | High Channel<br>Power Spectral density |
| | NT | NV | 2.4 | 2.0 | 1.4 |
| Test Verdict | | | Pass | | |

## A.3 Duty Cycle, Tx-sequence, Tx-gap

Note: The maximum value of Duty Cycle declared by the supplier.

Test Data

| Duty Cycle (%) | Limit Duty Cycle (%)Note1 | Number of Bursts | Minimum Tx-On (ms) | Maximum Tx-On (ms) | Minimum Tx-Off (ms) | Maximum Tx-Off (ms) | Measurement Time (ms) | Comment |
|---|---|---|---|---|---|---|---|---|
| -- | -- | -- | -- | -- | -- | -- | -- | -- |

Note: Not applicable.

## A.4 Accumulated Transmit Time, Frequency Occupation and Hopping Sequence

Note: Not applicable.

## A.5 Hopping Frequency Separation

Note: Not applicable.

## A.6 Medium Utilization (MU) factor

| Medium Utilization (MU) (%) | Limit Medium Utilization (MU) (%) | Verdict |
|---|---|---|
| -- | 10 | -- |

Note: Not applicable.

## A.7 Adaptivity

Note: Not applicable.

## A.8 Occupied Channel Bandwidth

Measuring Parameter

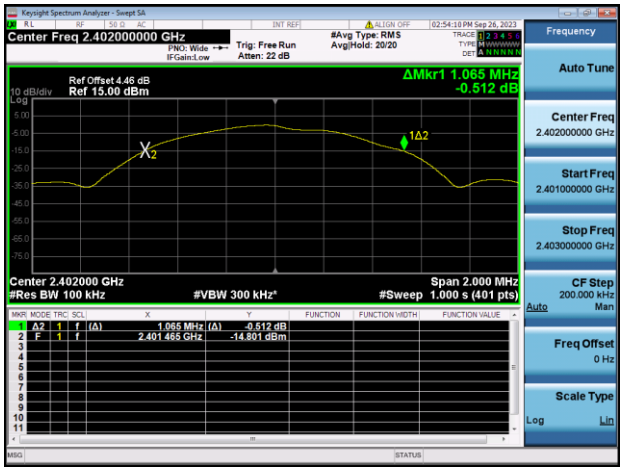
| | |
|---|---|
| Centre Frequency | The centre frequency of the channel under test |
| RBW | ~ 1 % of the span without going below 1 % |
| VBW | 3 × RBW |
| Span | 2 × Nominal Channel Bandwidth |
| Detector mode | RMS |
| Trace mode | Max Hold |
| Sweep time | Auto |
| Test Method | ☐ Radiated<br>☒ Conducted |

Test Data

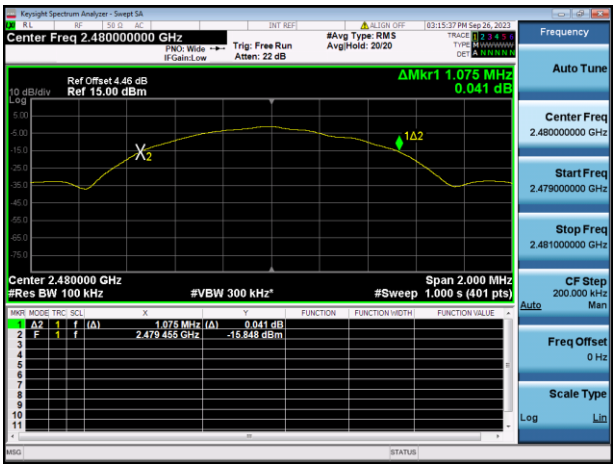
| Test Conditions | | Test Mode | DUT Frequency (MHz) | Occupied Channel Bandwidth (MHz) | Lower Band Edge (MHz) | Upper Band Edge (MHz) | Limit (MHz) |
|---|---|---|---|---|---|---|---|
| Temperature | Voltage | | | | | | |
| NT | NV | GFSK (BLE 1Mbps) | 2402 | 1.065 | 2401.465 | 2402.530 | Within The Band 2400 MHz to 2483.5 MHz |
| | | | 2480 | 1.075 | 2479.455 | 2480.530 | |
| Test Verdict | | Pass | | | | | |

Test Plots

GFSK (BLE 1Mbps): Low Channel




GFSK (BLE 1Mbps): High Channel



## A.9 Transmitter unwanted emissions in the out-of-band domain

Test Data

GFSK (BLE 1Mbps)

| DUT Frequency (MHz) | Nominal Bandwidth (MHz) | Frequency (MHz) | Level (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|---|
| 2402 | 1 | 2398.5 | -38.929 | -20 | Pass |
| 2402 | 1 | 2399.5 | -38.470 | -10 | Pass |
| 2480 | 1 | 2484.0 | -40.510 | -10 | Pass |
| 2480 | 1 | 2485.0 | -42.397 | -20 | Pass |

## A.10 Transmitter unwanted emissions in the spurious domain

Note 1: The test method choose the conducted method. Which power in a specified load (conducted spurious emissions) and their effective radiated power when radiated by the cabinet or structure of the equipment (cabinet radiation).

Note 2: The Frequency band was pre-scanned, the harmonic and other spurious which worst frequency are recorded in the report.

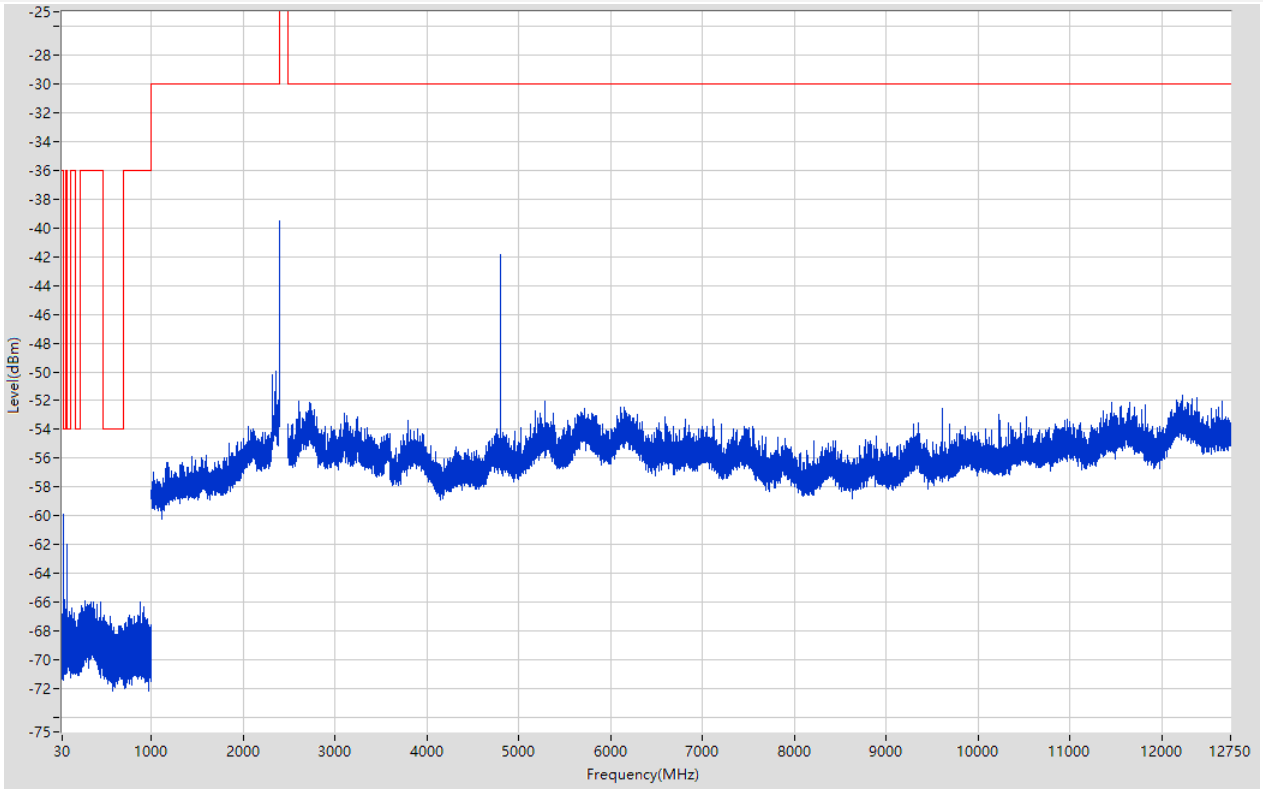
Note 3: The cabinet radiated test data is tested in the normal working mode of the product.

Measuring Parameter

| Frequency Range | | |
|---|---|---|
| 30 MHz to 1 000 MHz | RBW (MHz) | 100 kHz |
| | VBW (MHz) | 300 kHz |
| | Sweep points | 19400 |
| | Detector mode | Peak |
| | Trace mode | Max Hold |
| 1 GHz to 12,75 GHz | RBW (MHz) | 1 MHz |
| | VBW (MHz) | 3 MHz |
| | Sweep points | 23500 |
| | Detector mode | Peak |
| | Trace mode | Max Hold |

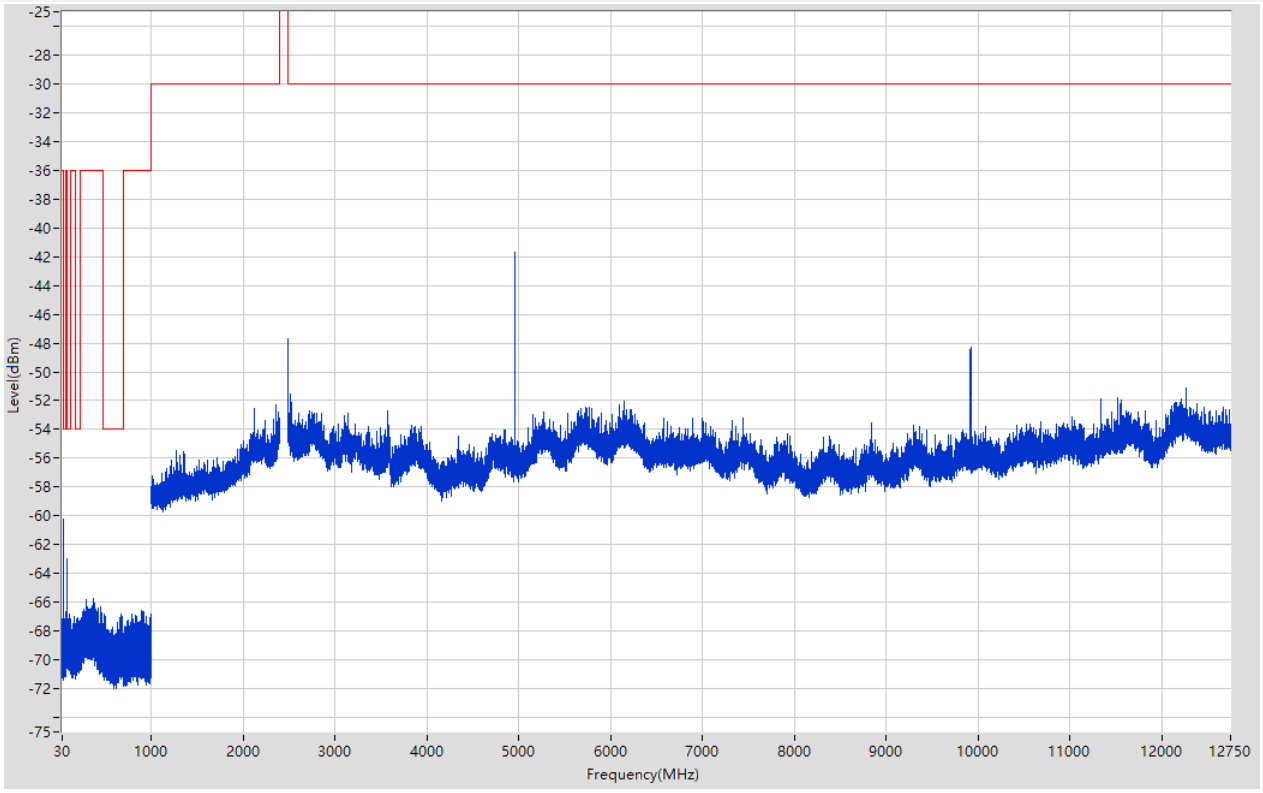
Conducted Test Data

GFSK (BLE 1Mbps) 30 MHz to 12.75 GHz, Low channel




| Start Frequency (MHz) | Stop Frequency (MHz) | RBW (MHz) | Detector | Frequency (MHz) | Power (dBm) | Limit (dBm) | Verdict | Sweep Point |
|---|---|---|---|---|---|---|---|---|
| 30 | 47 | 0.1 | Peak | 39.988 | -59.92 | -36 | Pass | 401 |
| 47 | 74 | 0.1 | Peak | 49.75 | -65.83 | -54 | Pass | 541 |
| 74 | 87.5 | 0.1 | Peak | 80.008 | -61.94 | -36 | Pass | 401 |
| 87.5 | 118 | 0.1 | Peak | 105.1 | -66.69 | -54 | Pass | 611 |
| 118 | 174 | 0.1 | Peak | 134.85 | -66.41 | -36 | Pass | 1121 |
| 174 | 230 | 0.1 | Peak | 220.7 | -66.69 | -54 | Pass | 1121 |
| 230 | 470 | 0.1 | Peak | 281.25 | -65.94 | -36 | Pass | 4801 |
| 470 | 694 | 0.1 | Peak | 487.8 | -66.92 | -54 | Pass | 4481 |
| 694 | 1000 | 0.1 | Peak | 885.5 | -66.01 | -36 | Pass | 6121 |
| 1000 | 2398 | 1 | Peak | 2398 | -39.53 | -30 | Pass | 2797 |
| 2485.5 | 12750 | 1 | Peak | 4804.5 | -41.88 | -30 | Pass | 20530 |

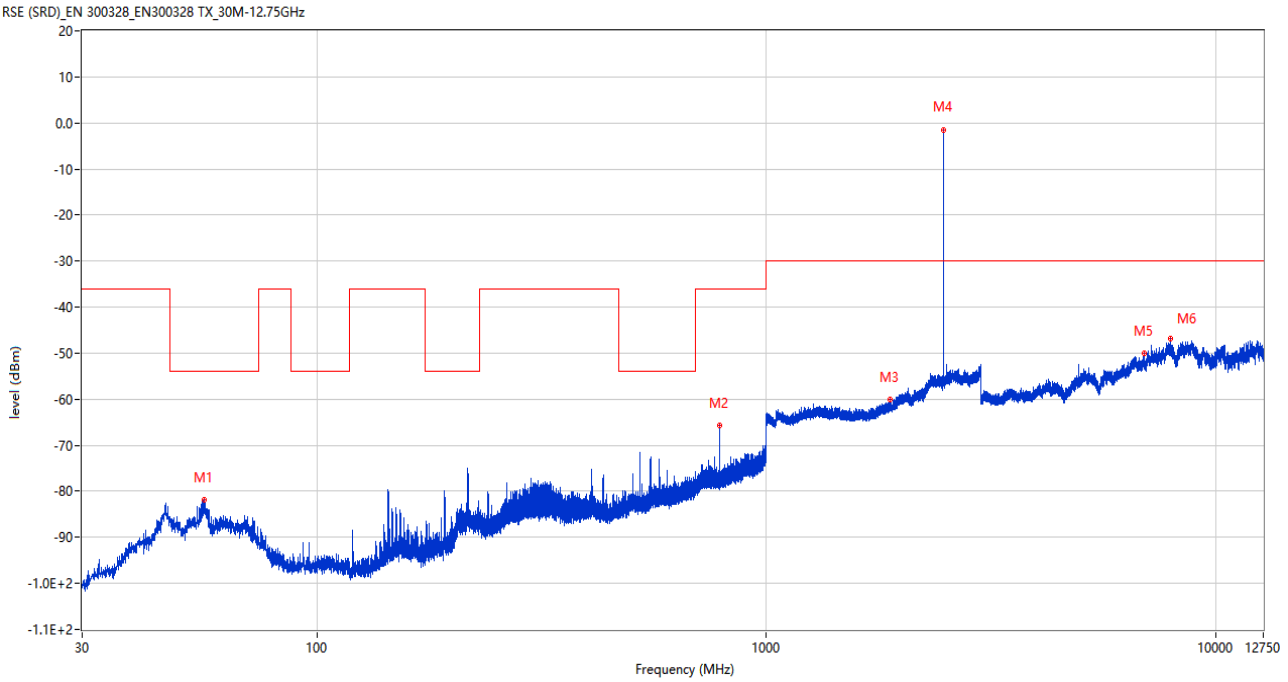
GFSK (BLE 1Mbps) 30 MHz to 12.75 GHz, High channel




| Start Frequency (MHz) | Stop Frequency (MHz) | RBW (MHz) | Detector | Frequency (MHz) | Power (dBm) | Limit (dBm) | Verdict | Sweep Point |
|---|---|---|---|---|---|---|---|---|
| 30 | 47 | 0.1 | Peak | 39.988 | -60.25 | -36 | Pass | 401 |
| 47 | 74 | 0.1 | Peak | 63.45 | -66.69 | -54 | Pass | 541 |
| 74 | 87.5 | 0.1 | Peak | 79.974 | -62.96 | -36 | Pass | 401 |
| 87.5 | 118 | 0.1 | Peak | 110.8 | -66.85 | -54 | Pass | 611 |
| 118 | 174 | 0.1 | Peak | 161.25 | -67.01 | -36 | Pass | 1121 |
| 174 | 230 | 0.1 | Peak | 199.5 | -67.04 | -54 | Pass | 1121 |
| 230 | 470 | 0.1 | Peak | 373.2 | -65.77 | -36 | Pass | 4801 |
| 470 | 694 | 0.1 | Peak | 487.5 | -66.86 | -54 | Pass | 4481 |
| 694 | 1000 | 0.1 | Peak | 893 | -66.59 | -36 | Pass | 6121 |
| 1000 | 2398 | 1 | Peak | 2359 | -52.29 | -30 | Pass | 2797 |
| 2485.5 | 12750 | 1 | Peak | 4960.5 | -41.66 | -30 | Pass | 20530 |

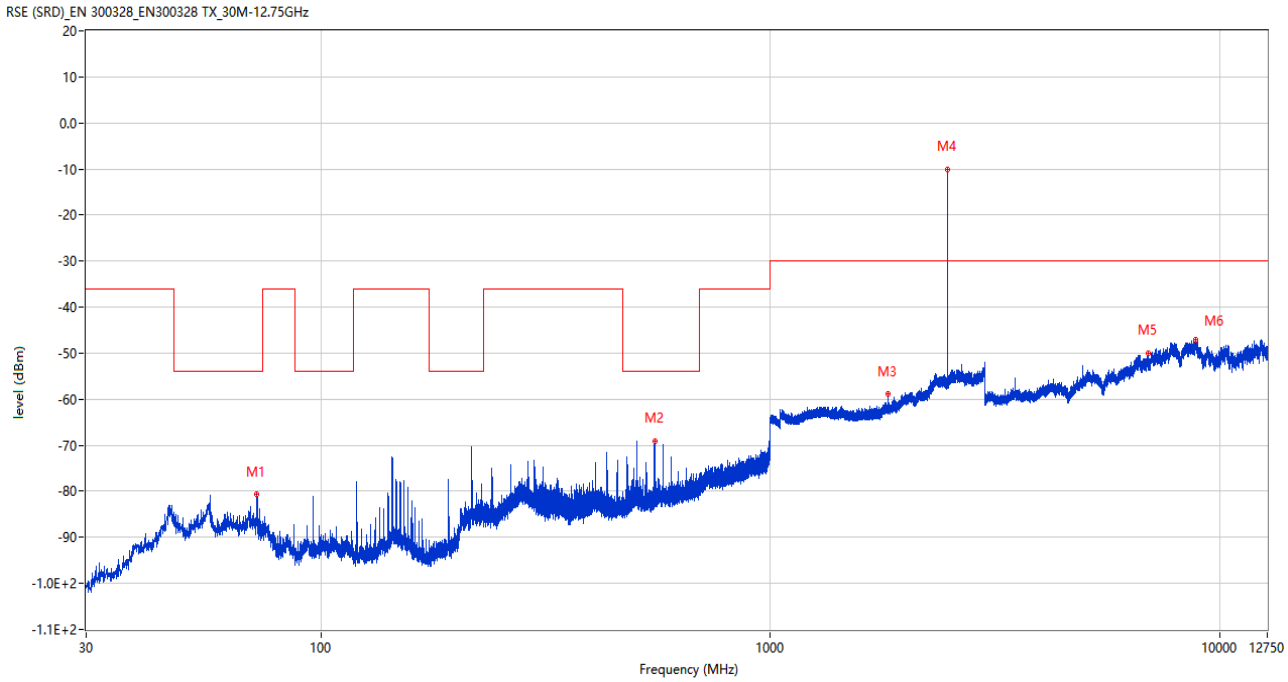
## Cabinet Radiated Test Data

### 30 MHz to 12.75 GHz, ANT H




| Frequency (MHz) | Result (dBm) | Factor (dB) | Limit (dBm) | Margin (dB) | Table (o) | ANT | EUT | Verdict |
|---|---|---|---|---|---|---|---|---|
| 55.996 | -81.84 | -13.77 | -54.0 | 27.84 | 278.00 | Horizontal | Horizontal | Pass |
| 785.775 | -65.69 | -4.02 | -36.0 | 29.69 | 66.00 | Horizontal | Horizontal | Pass |
| 1880.300 | -60.09 | -4.82 | -30.0 | 30.09 | 275.00 | Horizontal | Horizontal | Pass |
| 2479.800 | -1.51 | -0.47 | -30.0 | -28.49 | 360.00 | Horizontal | Horizontal | N/A |
| 6915.500 | -50.08 | 13.25 | -30.0 | 20.08 | 236.00 | Horizontal | Horizontal | Pass |
| 7925.250 | -46.95 | 15.89 | -30.0 | 16.95 | 92.00 | Horizontal | Horizontal | Pass |

## 30 MHz to 12.75 GHz, ANT V




| Frequency (MHz) | Result (dBm) | Factor (dB) | Limit (dBm) | Margin (dB) | Table (o) | ANT | EUT | Verdict |
|---|---|---|---|---|---|---|---|---|
| 72.001 | -80.63 | -17.33 | -54.0 | 26.63 | 234.00 | Vertical | Horizontal | Pass |
| 552.054 | -69.08 | -9.33 | -54.0 | 15.08 | 81.00 | Vertical | Horizontal | Pass |
| 1829.900 | -58.92 | -5.26 | -30.0 | 28.92 | 111.00 | Vertical | Horizontal | Pass |
| 2480.100 | -10.03 | -0.42 | -30.0 | -19.97 | 150.00 | Vertical | Horizontal | N/A |
| 6914.750 | -49.93 | 13.20 | -30.0 | 19.93 | 184.00 | Vertical | Horizontal | Pass |
| 8838.850 | -47.00 | 16.51 | -30.0 | 17.00 | 150.00 | Vertical | Horizontal | Pass |

## A.11 Receiver Spurious Emissions

Note 1: The test method choose the conducted method. Which power in a specified load (conducted spurious emissions) and their effective radiated power when radiated by the cabinet or structure of the equipment (cabinet radiation).

Note 2: The Frequency band was pre-scanned, the harmonic and other spurious which worst frequency are recorded in the report.

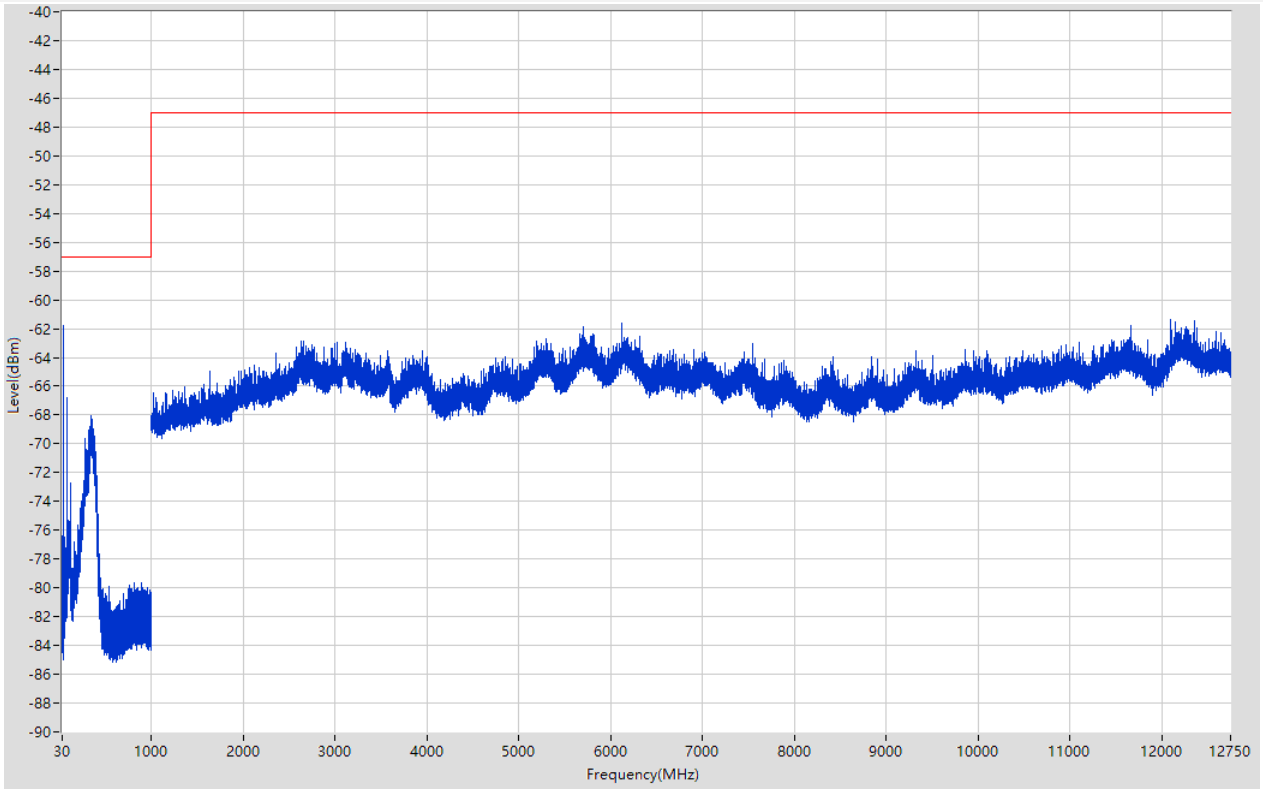
Note 3: The cabinet radiated test data is tested in the normal working mode of the product.

Measuring Parameter

| Frequency Range | | |
|---|---|---|
| 30 MHz to 1 000 MHz | RBW (MHz) | 100 kHz |
| | VBW (MHz) | 300 kHz |
| | Sweep points | 19400 |
| | Detector mode | Peak |
| | Trace mode | Max Hold |
| 1 GHz to 12,75 GHz | RBW (MHz) | 1 MHz |
| | VBW (MHz) | 3 MHz |
| | Sweep points | 23500 |
| | Detector mode | Peak |
| | Trace mode | Max Hold |

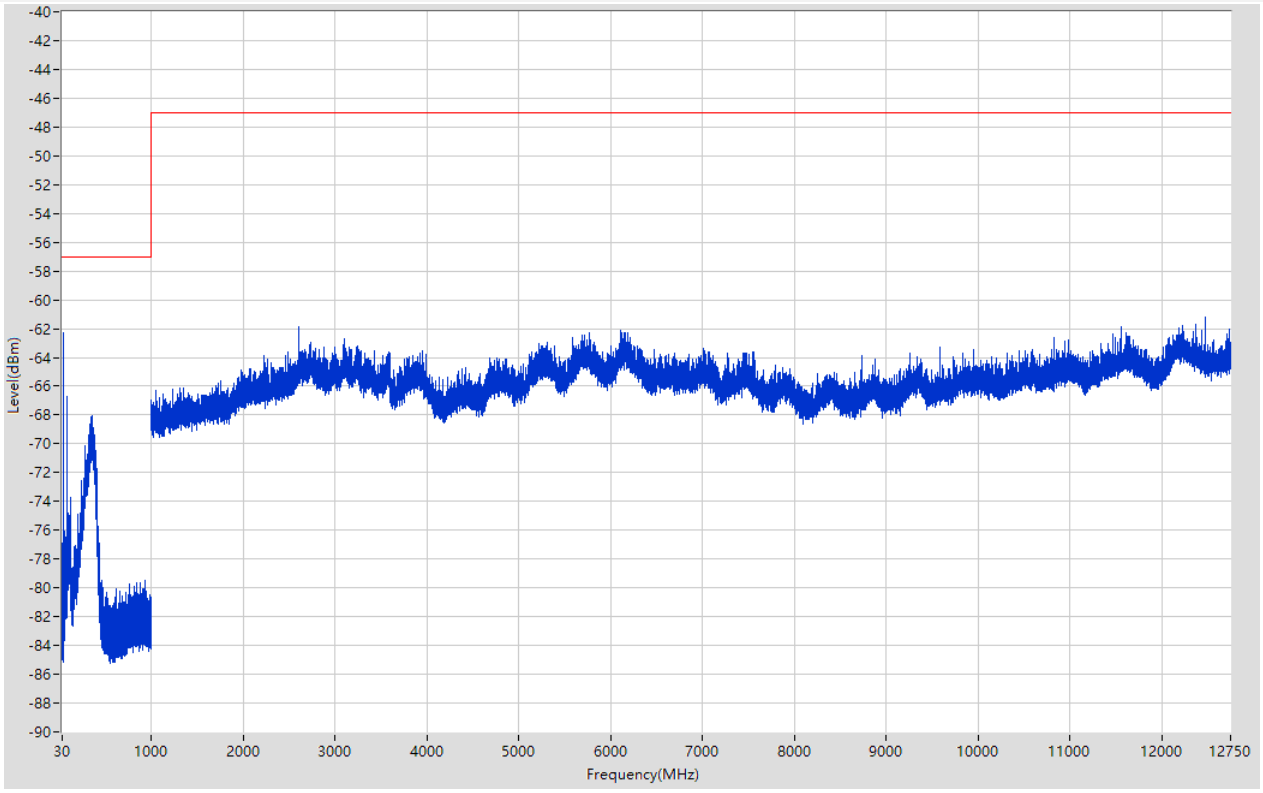
Conducted Test Data

GFSK (BLE 1Mbps) 30 MHz to 12.75 GHz, Low channel




| Start Frequency (MHz) | Stop Frequency (MHz) | RBW (MHz) | Detector | Frequency (MHz) | Power (dBm) | Limit (dBm) | Verdict | Sweep Point |
|---|---|---|---|---|---|---|---|---|
| 30 | 1000 | 0.1 | Peak | 40 | -61.82 | -57 | Pass | 19401 |
| 1000 | 12750 | 1 | Peak | 12097 | -61.33 | -47 | Pass | 23501 |

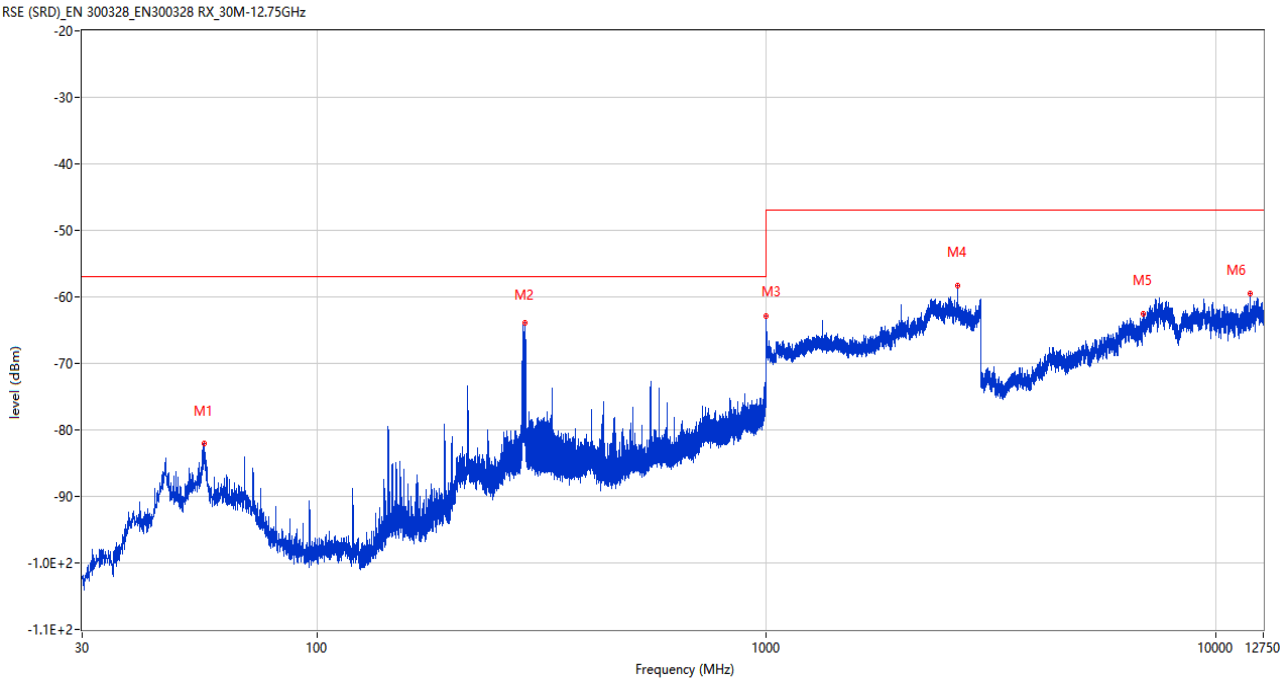
GFSK (BLE 1Mbps) 30 MHz to 12.75 GHz, High channel




| Start Frequency (MHz) | Stop Frequency (MHz) | RBW (MHz) | Detector | Frequency (MHz) | Power (dBm) | Limit (dBm) | Verdict | Sweep Point |
|---|---|---|---|---|---|---|---|---|
| 30 | 1000 | 0.1 | Peak | 40 | -62.26 | -57 | Pass | 19401 |
| 1000 | 12750 | 1 | Peak | 12471.5 | -61.23 | -47 | Pass | 23501 |

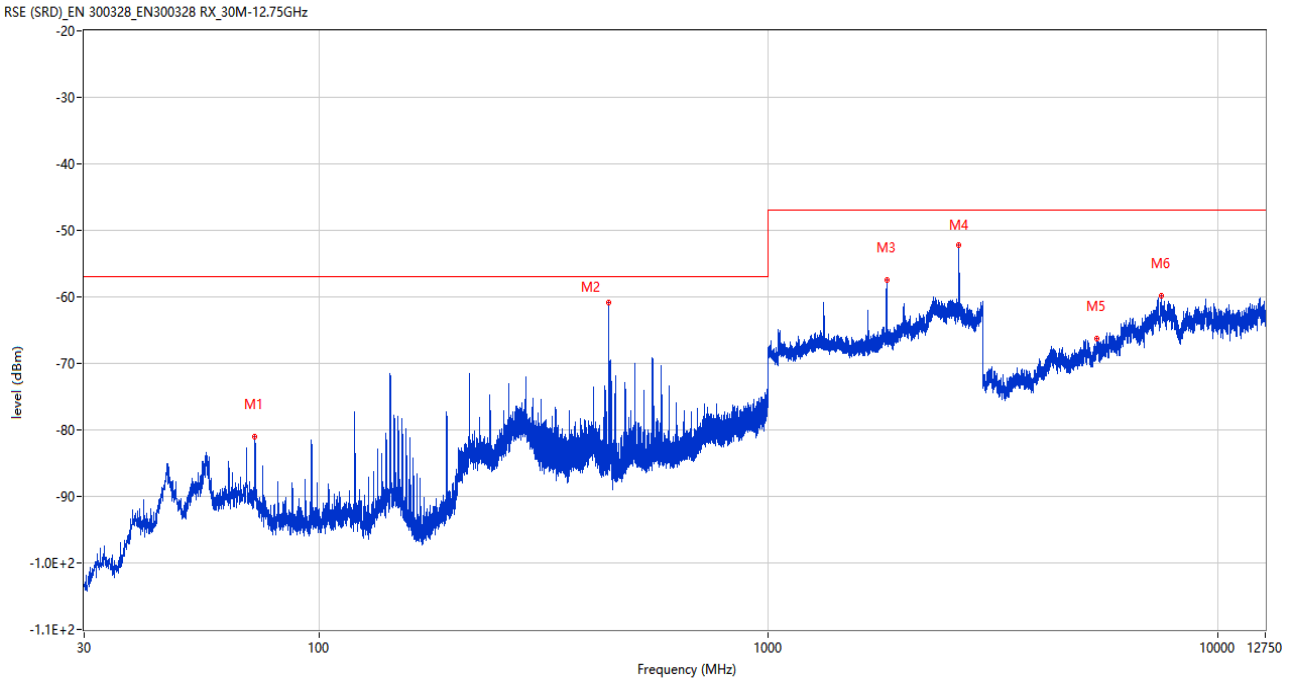
## Cabinet Radiated Test Data

### 30 MHz to 12.75 GHz, ANT H




| Frequency (MHz) | Result (dBm) | Factor (dB) | Limit (dBm) | Margin (dB) | Table (o) | ANT | EUT | Verdict |
|---|---|---|---|---|---|---|---|---|
| 55.947 | -82.08 | -13.78 | -57.0 | 25.08 | 360.00 | Horizontal | Horizontal | Pass |
| 290.009 | -63.97 | -16.38 | -57.0 | 6.97 | 68.00 | Horizontal | Horizontal | Pass |
| 999.466 | -62.87 | 2.05 | -57.0 | 5.87 | 157.00 | Horizontal | Horizontal | Pass |
| 2660.700 | -58.25 | -0.66 | -47.0 | 11.25 | 320.00 | Horizontal | Horizontal | Pass |
| 6892.250 | -62.53 | 1.23 | -47.0 | 15.53 | 17.00 | Horizontal | Horizontal | Pass |
| 11931.099 | -59.57 | 2.27 | -47.0 | 12.57 | 36.00 | Horizontal | Horizontal | Pass |

## 30 MHz to 12.75 GHz, ANT V




| Frequency (MHz) | Result (dBm) | Factor (dB) | Limit (dBm) | Margin (dB) | Table (o) | ANT | EUT | Verdict |
|---|---|---|---|---|---|---|---|---|
| 72.001 | -81.02 | -17.33 | -57.0 | 24.02 | 212.00 | Vertical | Horizontal | Pass |
| 439.970 | -60.83 | -12.77 | -57.0 | 3.83 | 196.00 | Vertical | Horizontal | Pass |
| 1831.900 | -57.52 | -5.33 | -47.0 | 10.52 | 221.00 | Vertical | Horizontal | Pass |
| 2656.300 | -52.28 | -0.48 | -47.0 | 5.28 | 250.00 | Vertical | Horizontal | Pass |
| 5379.000 | -66.30 | -4.48 | -47.0 | 19.30 | 126.00 | Vertical | Horizontal | Pass |
| 7490.750 | -59.89 | 3.69 | -47.0 | 12.89 | 254.00 | Vertical | Horizontal | Pass |

## A.12 Receiver Blocking

For Bluetooth Low Energy

Note 1: The combination of the smallest channel bandwidth and the lowest data rate was reported.

Note 2: Blocking signal levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels corrected by the actual antenna assembly gain.

Note 3: During the Blocking test, the number of packets sent by the system is 1500.

Test Data

Receiver Category 2 equipment

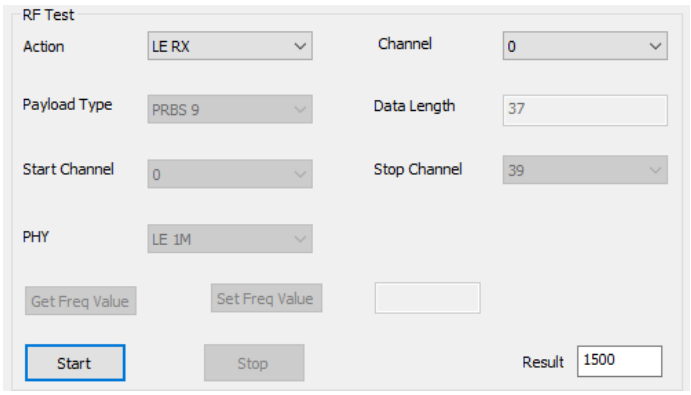
| Wanted signal mean power from companion device (dBm) | Blocking signal Frequency (MHz) | Blocking signal power (dBm) (see note 2) | PER Result | | Limit | Verdict |
|---|---|---|---|---|---|---|
| | | | Low channel | High channel | | |
| (-139 dBm + 10 × $\log_{10}$(OCBW) + 10 dB) or (-74 dBm + 10 dB) whichever is less | 2 380 | -34 | 0.00% | 0.00% | ≦10% | Pass |
| | 2 504 | -34 | 0.00% | 0.00% | | |
| | 2 300 | -34 | 0.00% | 0.00% | | |
| | 2 584 | -34 | 0.00% | 0.00% | | |

Test Plot (PER)

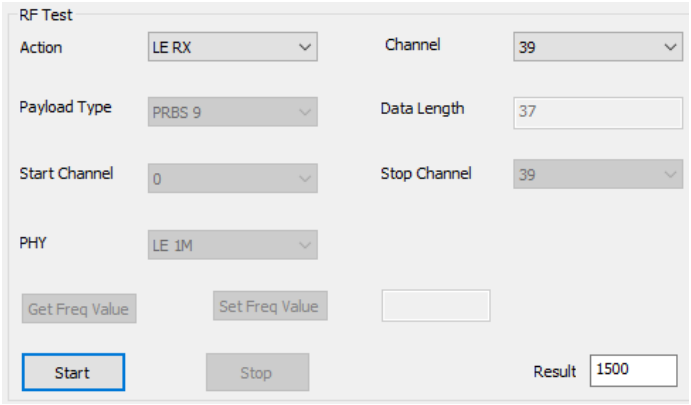
Note: All the configuration were tested, but only the worst PER Plot were reported in this report.

For Bluetooth Low Energy

Low Channel




High Channel



# ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ2390803-AR.pdf”.

# ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ2390803-AW.pdf”.

# ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ2390803-AI.pdf”.

# ANNEX E EUT DECLARATION TECHNOLOGY TYPE

Application form for testing please refer to the document “BL-SZ2390803-AM.pdf”.

# Statement

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--END OF REPORT--

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# *VERIFICATION OF CONFORMITY*

**Certificate No.:** BL-SZ2390803D01

**Applicant:** Woan Technology (Shenzhen) Co., Ltd.

**Address:** Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R.China, 518100

**Manufacturer:** Woan Technology (Shenzhen) Co., Ltd.

**Address:** Room 1101, Qiancheng Commercial Center, No. 5 Haicheng Road, Mabu Community, Xixiang Sub-district, Bao'an District, Shenzhen, Guangdong, P.R.China, 518100

**Product:** SwitchBot Lock Pro

**Brand name:** SwitchBot

**Model name:** W3500000, W3500001, W3500002, W3500003, W3500004, W3500005

The submitted sample of the above product has been tested according with following standards. Standard(s) used for showing compliance with the essential requirements in the **RED directive 2014/53/EU**:

| **Essential requirements** | **Standards:** | **Report No.:** |
|---|---|---|
| Safety (Article 3.1 a) | IEC 62368-1: 2018<br>EN IEC 62368-1: 2020+A11: 2020 | BL-SZ2390803-101 |
| EMC (Article 3.1 b) | ETSI EN 301 489-1 V2.2.3 (2019-11)<br>Draft ETSI EN 301 489-17 V3.2.6 (2023-06)<br>EN 55032: 2015+A1: 2020<br>EN 55035: 2017+A11: 2020<br>EN IEC 61000-3-2: 2019+A1: 2021<br>EN 61000-3-3: 2013+A2: 2021 | BL-SZ2390803-401<br>BL-SZ2390803-402 |
| Radio (Article 3.2) | ETSI EN 300 328 V2.2.2 (2019-07) | BL-SZ2390803-601 |
| Health (Article 3.1 a) | EN IEC 62311: 2020 | BL-SZ2390803-701 |

CE

Liao Jianming
(Technical Director)
Date of Issue: January 23, 2024