Report No.: 23CST040089V0E02

# TEST REPORT

| | |
|---|---|
| **Applicant:** | Shenwei Ruowo (Suzhou) Technology Co., LTD |
| **Address of Applicant:** | No. 116 Chengyang Road, Chengyang Street, Xiangcheng District, Suzhou City, Jiangsu Province |
| **Manufacturer:** | ShenZhen Sky-Win Technology Co., LTD |
| **Address of Manufacturer:** | Building 401, Building 1, Nanchang Huafeng Industrial Park, Nanchang Community, Xixiang Street, Bao'an District, Shenzhen City, Guangdong Province |
| **Factory:** | ShenZhen Sky-Win Technology Co., LTD |
| **Address of Factory:** | Building 401, Building 1, Nanchang Huafeng Industrial Park, Nanchang Community, Xixiang Street, Bao'an District, Shenzhen City, Guangdong Province |
| **Equipment Under Test (EUT)** | |
| Product Name: | Rebocap |
| Model No.: | Rebocap_tracker |
| Trade Mark: | REBOCAP |
| **Applicable standards:** | ETSI EN 300 328 V2.2.2 (2019-07) |
| **Date of sample receipt:** | Apr.26, 2023 |
| **Date of Test:** | Apr.26-May.08,2023 |
| **Date of report issue:** | July.03,2023 |
| **Test Result :** | PASS * |

* In the configuration tested, the EUT detailed in this report complied with the standards specified above.

This device described above has been tested by CST, and the test results show that the equipment under test (EUT) is in compliance with the Radio Equipment regulations 2017(SI. 2017/1206) requirements. And it is applicable only to the tested sample identified in the report.

**David Zhong**
**Laboratory Manager**

## 2 Version

| Version No. | Date | Description |
|---|---|---|
| *00* | *July.03,2023* | *Original* |
| | | |
| | | |
| | | |
| | | |

| | | | |
|---|---|---|---|
| ***Prepared By:*** | Kyle Wang | ***Date:*** | *July.03,2023* |
| | ***Project Engineer*** | | |
| ***Check By:*** | | ***Date:*** | *July.03,2023* |
| | ***Reviewer*** | | |

# 3 Contents

# 4 Test Summary

| Radio Spectrum Matter (RSM) Part of Tx | | | | | |
|---|---|---|---|---|---|
| **Test** | **Test Requirement** | **Test method** | **Limit/Severity** | **Uncertainty** | **Result** |
| RF Output Power | Clause 4.3.1.2 | Clause 5.4.2.2 | 20dBm | ±1.5dB | PASS |
| Duty cycle, Tx-Sequence, Tx-gap | Clause 4.3.1.3 | Clause 5.4.2.2 | Clause 4.3.1.3.3 | ±5 % | N/A |
| Accumulated Transmit Time, Frequency Occupation and Hopping Sequence | Clause 4.3.1.4 | Clause 5.4.4.2 | Clause 4.3.1.4.3 | ±5 % | PASS |
| Hopping Frequency Separation | Clause 4.3.1.5 | Clause 5.4.5.2 | Clause 4.3.1.5.3 | ±5 % | PASS |
| Medium Utilisation | Clause 4.3.1.6 | Clause 5.4.2.2 | Clause 4.3.1.6.3 | -- | N/A |
| Adaptivity | Clause 4.3.1.7 | Clause 5.4.6.2 | Clause 4.3.1.7.2.2 & Clause 4.3.1.7.3.2 & Clause 4.3.1.7.4.2 | -- | N/A |
| Occupied Channel Bandwidth | Clause 4.3.1.8 | Clause 5.4.7.2 | Clause 4.3.1.8.3 | ±5 % | PASS |
| Transmitter unwanted emissions in the out-of-band domain | Clause 4.3.1.9 | Clause 5.4.8.2 | Clause 4.3.1.9.3 | ±1.5dB | PASS |
| Transmitter unwanted emissions in the spurious domain | Clause 4.3.1.10 | Clause 5.4.9.2 | Clause 4.3.1.10.3 | ±6dB | PASS |
| **Radio Spectrum Matter (RSM) Part of Rx** | | | | | |
| Receiver spurious emissions | Clause 4.3.1.11 | Clause 5.4.10.2 | Clause 4.3.1.11.3 | ±6dB | PASS |
| Receiver Blocking | Clause 4.3.1.12 | Clause 5.4.11.2 | Clause 4.3.1.12.4 | -- | PASS |
| Geo-location capability | Clause 4.3.1.13 | -- | Clause 4.3.1.13.3 | -- | N/A |

**Remark:**

Tx: In this whole report Tx (or tx) means Transmitter.

Rx: In this whole report Rx (or rx) means Receiver.

Temperature (Uncertainty): ±1°C Humidity(Uncertainty): ±5%

Uncertainty: ± 3%(for DC and low frequency voltages)

N/A:Not applicable

# 5 General Information

## 5.1 General Description of EUT

| | |
|---|---|
| Product Name: | Rebocap |
| Model No.: | Rebocap_tracker |
| Operation Frequency: | 2402~2480MHz |
| Channel numbers: | 40 |
| Modulation Type: | FHSS |
| Antenna Type: | PCB Antenna |
| Antenna gain: | 0dBi |
| Power Supply: | DC 5.0V/1.0 A |

Remark: The system works in the frequency range of 2402MHz to 2480MHz. This band has been divided to 40 independent channels. Each radio system uses 40 different channels; the minimum channel separation is ≥2MHz. By using various switch-on times, hopping scheme and channel frequencies, the system can guarantee a jamming free radio transmission. The channel list is below.

The test frequencies are below:

| Channel | Frequency |
|---|---|
| The lowest channel | 2402.00MHz |
| The middle channel | 2440.00MHz |
| The Highest channel | 2480.00MHz |

| Operation Frequency each of channel | | | | | | | |
|---|---|---|---|---|---|---|---|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 1 | 2402 | 11 | 2422 | 21 | 2442 | 31 | 2462 |
| 2 | 2404 | 12 | 2424 | 22 | 2444 | 32 | 2464 |
| 3 | 2406 | 13 | 2426 | 23 | 2446 | 33 | 2466 |
| 4 | 2408 | 14 | 2428 | 24 | 2448 | 34 | 2468 |
| 5 | 2410 | 15 | 2430 | 25 | 2450 | 35 | 2470 |
| 6 | 2412 | 16 | 2432 | 26 | 2452 | 36 | 2472 |
| 7 | 2414 | 17 | 2434 | 27 | 2454 | 37 | 2474 |
| 8 | 2416 | 18 | 2436 | 28 | 2456 | 38 | 2476 |
| 9 | 2418 | 19 | 2438 | 29 | 2458 | 39 | 2478 |
| 10 | 2420 | 20 | 2440 | 30 | 2460 | 40 | 2480 |

## 5.2 Test Location

| All tests were performed at: |
|---|
| Shenzhen CST Testing Co., Ltd<br>Room 202-203, Floor 2st, Building B, Baoan Zhigu Technology Park, Xixiang Street,<br>Baoan District, Shenzhen, China. 518101 |

## 5.3 Description of Support Units

| Manufacturer | Description | Model | Serial Number |
|---|---|---|---|
| - | - | - | - |

## 5.4 Deviation from Standards

None.

## 5.5 Abnormalities from Standard Conditions

None.

## 5.6 Other Information Requested by the Customer

None.

# 6 Test Instruments List

| Radiated Emission: | | | | | | |
|---|---|---|---|---|---|---|
| Item | Test Equipment | Manufacturer | Model No. | Inventory No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
| 1 | 3m Semi- Anechoic Chamber | ZhongYu Electron | 9.2(L)*6.2(W)* 6.4(H) | CST250 | July. 02 2020 | July. 01 2025 |
| 2 | Control Room | ZhongYu Electron | 6.2(L)*2.5(W)* 2.4(H) | CST251 | N/A | N/A |
| 3 | EMI Test Receiver | Rohde & Schwarz | ESU26 | CST203 | June. 24 2022 | June. 23 2023 |
| 4 | BiConiLog Antenna | SCHWARZBECK MESS-ELEKTRONIK | VULB9163 | CST214 | June. 24 2022 | June. 23 2023 |
| 5 | Double -ridged waveguide horn | SCHWARZBECK MESS-ELEKTRONIK | BBHA 9120 D | CST208 | June. 24 2022 | June. 23 2023 |
| 6 | Horn Antenna | ETS-LINDGREN | 3160 | CST217 | June. 24 2022 | June. 23 2023 |
| 7 | EMI Test Software | AUDIX | E3 | N/A | N/A | N/A |
| 8 | Coaxial Cable | CST | N/A | CST213 | June. 24 2022 | June. 23 2023 |
| 9 | Coaxial Cable | CST | N/A | CST211 | June. 24 2022 | June. 23 2023 |
| 10 | Coaxial cable | CST | N/A | CST210 | June. 24 2022 | June. 23 2023 |
| 11 | Coaxial Cable | CST | N/A | CST212 | June. 24 2022 | June. 23 2023 |
| 12 | Amplifier(100kHz-3GHz) | HP | 8347A | CST204 | June. 24 2022 | June. 23 2023 |
| 13 | Amplifier(2GHz-20GHz) | HP | 84722A | CST206 | June. 24 2022 | June. 23 2023 |
| 14 | Amplifier (18-26GHz) | Rohde & Schwarz | AFS33-18002 650-30-8P-44 | CST218 | June. 24 2022 | June. 23 2023 |
| 15 | Band filter | Amindeon | 82346 | CST219 | June. 24 2022 | June. 23 2023 |
| 16 | Power Meter | Anritsu | ML2495A | CST540 | June. 24 2022 | June. 23 2023 |
| 17 | Power Sensor | Anritsu | MA2411B | CST541 | June. 24 2022 | June. 23 2023 |
| 18 | Wideband Radio Communication Tester | Rohde & Schwarz | CMW500 | CST575 | June. 24 2022 | June. 23 2023 |
| 19 | Splitter | Agilent | 11636B | CST237 | June. 24 2022 | June. 23 2023 |
| 20 | Loop Antenna | ZHINAN | ZN30900A | CST534 | June. 24 2022 | June. 23 2023 |
| 21 | Breitband hornantenne | SCHWARZBECK | BBHA 9170 | CST579 | June. 24 2022 | June. 23 2023 |
| 22 | Amplifier | TDK | PA-02-02 | CST574 | June. 24 2022 | June. 23 2023 |
| 23 | Amplifier | TDK | PA-02-03 | CST576 | June. 24 2022 | June. 23 2023 |
| 24 | PSA Series Spectrum Analyzer | Rohde & Schwarz | FSP | CST578 | June. 24 2022 | June. 23 2023 |

# 7 Radio Technical Specification in ETSI EN 300 328

## 7.1 Test Environment and Mode

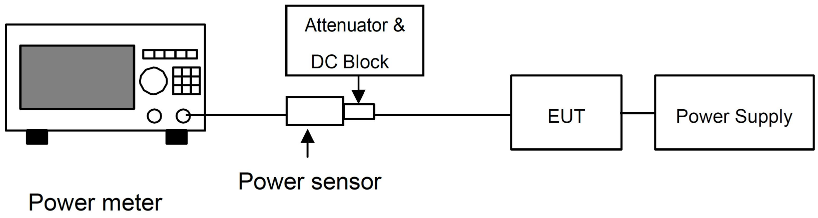
| **Test mode:** | |
|---|---|
| Transmitting mode: | Keep the EUT in transmitting mode with modulation. |
| Receiving mode | Keep the EUT in receiving mode. |

**Operating Environment:**

| **Item** | **Normal condition** | **Extreme condition** | |
|---|---|---|---|
| | | High Temp | Low Temp |
| Temperature | +25ºC | +60ºC | -10ºC |
| Humidity | 20%-95% | | |
| Atmospheric Pressure: | 1008 mbar | | |

## 7.2 Transmitter Requirement

### 7.2.1 RF Output Power

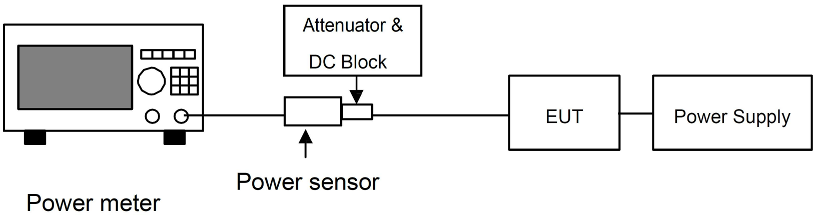
| | |
|---|---|
| Test Requirement: | ETSI EN 300 328 clause 4.3.1.2 |
| Test Method: | ETSI EN 300 328 clause 5.4.2.2 |
| Limit: | 20dBm |
| Test setup: |  |
| Test procedure: | **Step 1:**<br>Use a fast power sensor suitable for 2,4 GHz and capable of 1 MS/s.<br>Use the following settings:<br>- Sample speed 1 MS/s or faster.<br>- The samples must represent the power of the signal.<br>- Measurement duration: For non-adaptive equipment: equal to the observation period defined in<br>clauses 4.3.1.3.2 or 4.3.2.4.2. For adaptive equipment, the measurement duration shall be long enough to ensure a minimum number of bursts (at least 10) are captured.<br>For adaptive equipment, to increase the measurement accuracy, a higher number of bursts may be used.<br>**Step 2:**<br>For conducted measurements on devices with one transmit chain:<br>-Connect the power sensor to the transmit port, sample the transmit signal and store the raw data.Use these stored samples in all following steps.<br>For conducted measurements on devices with multiple transmit chains:<br>-Connect one power sensor to each transmit port for a synchronous measurement on all transmit ports.<br>-Trigger the power sensors so that they start sampling at the same time. Make sure the time difference between the samples of all sensors is less than 500ns.<br>-For each individual smpling point(time domain), sum the coincident power samples of all ports and store them. Use these summed samples in all following steps.<br>**Step 3:**<br>Find the start and stop times of each burst in the stored measurement samples.<br>The start and stop times are defined as the points where the power is at least 30 dB below the highest value of the stored samples in step 2.<br>In case of insufficient dynamic range,the value of 30dB may need to be reduced appropriately.<br>**Step 4:**<br>Between the start and stop times of each individual burst calculate the RMS power over the burst using the formula below. The start and stop |

| | |
|---|---|
| | points shall be included.Save these $P_{burst}$ values, as well as the start and stop times for each burst.<br>$$P_{burst} = \frac{1}{k}\sum_{n=1}^{k} P_{sample}(n)$$<br>With "k" being the total number of samples and "n" the actual sample number<br>**Step 5:**<br>The highest of all $P_{burst}$ values (value "A" in dBm) will be used for maximum e.i.r.p. calculations.<br>**Step 6:**<br>Add the (stated) antenna assembly gain "G" in dBi of the individual antenna.<br>If applicable, add the additional beamforming gain "Y" in dB.<br>If more than one antenna assembly is intended for this power setting, the maximum overall antenna gain (G or G + Y) shall be used.<br>The RF Output Power (P) shall be calculated using the formula below:<br>P = A + G + Y<br>**Step 7:**<br>This value, which shall comply with the limit given in clause 4.3.1.2.3 or clause 4.3.2.2.3, shall be recorded in the test report. |
| Measurement Record: | Uncertainty: 0.7dB |
| Test Instruments: | See section 6.0 |
| Test mode: | Transmitting mode |

**Measurement Data:**

| ENV | Mode | TX Type | Frequency (MHz) | ANT | Gain (dBi) | Power (dBm) | EIRP (dBm) | Limit (dBm) | Verdict |
|---|---|---|---|---|---|---|---|---|---|
| NTNV | FHSS | SISO | HOPP | 1 | 2.00 | 4.32 | 6.32 | <=20 | Pass |
| HTNV | FHSS | SISO | HOPP | 1 | 2.00 | 4.32 | 6.32 | <=20 | Pass |
| LTNV | FHSS | SISO | HOPP | 1 | 2.00 | 4.31 | 6.31 | <=20 | Pass |
| Note1: E.I.R.P = Measured Power + Antenna Gain | | | | | | | | | |

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

| | |
|---|---|
| Test Requirement: | ETSI EN 300 328 clause 4.3.1.3 |
| Test Method: | ETSI EN 300 328 clause 5.4.2.2 |
| Limit: | For non-adaptive FHSS equipment, the Duty Cycle shall be equal to or less than the maximum value declared by the manufacturer. In addition, the maximum Tx-sequence time shall be 5 ms while the minimum Tx-gap time shall be 5 ms. |
| Test setup: |  |
| Test procedure: | Refer to clause 5.4.2.2.1.3 |
| Measurement Record: | Uncertainty: ±5 % |
| Test Instruments: | See section 6.0 |
| Test mode: | Transmitting mode |
| Result: | N/A, RF Output power level of less than 10 dBm e.i.r.p. |

**Measurement Data:**

**Duty Cycle:**

| Duty Cycle | Declared Duty Cycle | Result |
|---|---|---|
| 2.75% | 3% | Pass |

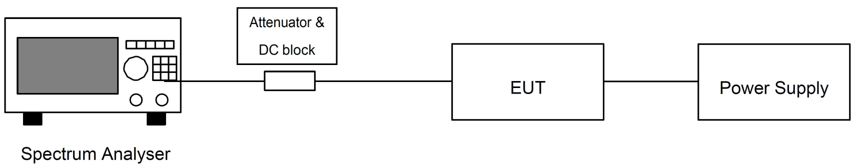
**Tx-sequence:**

| Tx-sequence (ms) | Limit (ms) | Result |
|---|---|---|
| 3.208 | ≤ 5 | Pass |

**Tx-gap:**

| Tx-gap (ms) | Limit (ms) | Result |
|---|---|---|
| 115 | ≥ 5 | Pass |

### 7.2.3 Accumulated Transmit Time, Frequency occupation & Hopping Sequence

| | |
|---|---|
| Test Requirement: | ETSI EN 300 328 clause 4.3.1.4 |
| Test Method: | ETSI EN 300 328 clause 5.4.4.2 |
| Limit: | Non-adaptive frequency hopping equipment:<br>The Accumulated Transmit Time on any hopping frequency shall not be greater than 15 ms within any observation period of 15 ms multiplied by the minimum number of hopping frequencies (N) that have to be used.<br>The hopping sequence(s) shall contain at least N hopping frequencies where N is either 5 or the result of 15 MHz divided by the minimum Hopping Frequency Separation in MHz, whichever is the greater.<br>According to clause 4.3.1.5.3.1 the minimum Hopping Frequency Separation for non-adaptive equipment is equal to the Occupied Channel Bandwidth with a minimum of 100 kHz.<br>Adaptive frequency hopping equipment<br>Adaptive Frequency Hopping equipment shall be capable of operating over a minimum of 70 % of the band specified in table 1.<br>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.<br>The hopping sequence(s) shall contain at least N hopping frequencies at all times, where N is either 15 or the result of 15 MHz divided by the minimum Hopping Frequency Separation in MHz, whichever is the greater. |
| Test setup: |  |
| Test procedure: | The test procedure shall be as follows:<br>**Step 1:**<br>The output of the transmitter shall be connected to a spectrum analyzer or equivalent.<br>The analyzer shall be set as follows:<br>Centre Frequency: Equal to the hopping frequency being investigated<br>Frequency Span: 0 Hz<br>RBW: ~ 50 % of the Occupied Channel Bandwidth<br>VBW: ≥ RBW<br>Detector Mode: RMS<br>Sweep time: Equal to the applicable observation period (see clause 4.3.1.4.3.1 or clause 4.3.1.4.3.2)<br>Number of sweep points: 30000<br>Trace mode: Clear / Write<br>Trigger: Free Run |

| | |
|---|---|
| | **Step 2:**<br>Save the trace data to a file for further analysis by a computing device using an appropriate software application or program.<br>**Step 3:**<br>Indentify the data points related to the frequency being investigated by applying a threshold.<br>The data points resulting from transmissions on the hopping frequency being investigated are assumed to have much higher levels compared to data points resulting from transmissions on adjacent hopping frequencies. If a clear determination between these transmissions is not possible, the RBW in step 1 shall be further reduced. In addition, a channel filter may be used.<br>Count the number of data points identified as resulting from transmissions on the frequency being investigated and multiply this number by the time difference between two consecutive data points.<br>**Step 4:**<br>The result in step 3 is the Accumulated Transmit Time which shall comply with the limit provided in clause 4.3.1.4.3.1 or clause 4.3.1.4.3.2 and which shall be recorded in the test report.<br>**Step 5:**<br>This step is only applicable for equipment implementing Option 1 in clause 4.3.1.4.3.1 or clause 4.3.1.4.3.2 for complying with the Frequency Occupation requirement and the manufacturer decides to demonstrate compliance with this requirement via measurement.<br>Make the following changes on the analyzer and repeat steps 2 and 3.<br>Sweep time: 4 × Dwell Time × Actual number of hopping frequencies in use<br>The hopping frequencies occupied by the equipment without having transmissions during the dwell time (blacklisted frequencies) should be taken into account in the actual number of hopping frequencies in use. If this number cannot be determined (number of blacklisted frequencies unknown) it shall be assumed that the equipment uses the maximum possible number of hopping frequencies.<br>The result shall be compared to the limit for the Frequency Occupation defined in clause 4.3.1.4.3.1 or clause 4.3.1.4.3.2. The result of this comparison shall be recorded in the test report.<br>**Step 6:**<br>Make the following changes on the analyzer:<br>Start Frequency: 2400MHz<br>Stop Frequency: 2483.5MHz<br>RBW: ~ 50 % of the Occupied Channel Bandwidth (single hopping frequency)<br>VBW: ≥ RBW<br>Detector Mode: RMS<br>Sweep time: 1s;this setting may result in long measuring times. To avoid such long measuring times, an FFT analyser may be used<br>Trace mode: Max Hold<br>Trigger: Free Run<br>Wait for the trace to stabilize. Identify the number of hopping frequencies used by the hopping sequence.<br>The result shall be compared to the limit (value N) defined in clause |

| | |
|---|---|
| | 4.3.1.4.3.1 or clause 4.3.1.4.3.2. This value shall be recorded in the test report.<br>For equipment with blacklisted frequencies, it might not be possible to verify the number of hopping frequencies in use. However they shall comply with the requirement for Accumulated Transmit Time and Frequency Occupation assuming the minimum number of hopping frequencies (N) defined in clause 4.3.1.4.3.1 or clause 4.3.1.4.3.2 is used.<br>**Step 7:**<br>For adaptive frequency hopping equipment, it shall be verified whether the equipment uses 70 % of the band specified in table 1. This verification can be done using the lowest and highest -20 dB points from the total spectrum envelope obtained in step 6. The result shall be recorded in the test report. |
| Measurement Record: | Uncertainty: ±5 % |
| Test Instruments: | See section 6.0 |
| Test mode: | Transmitting mode |

**Measurement Data:**

| Test Condition | Test Mode | Test Channel | Ant | Accumulated Transmit Time (s) | Limit [ms] | Verdict |
|---|---|---|---|---|---|---|
| NVNT | TX | Middle | Ant1 | 12.680 | <=15 | PASS |

Observation period=15ms*5=75ms

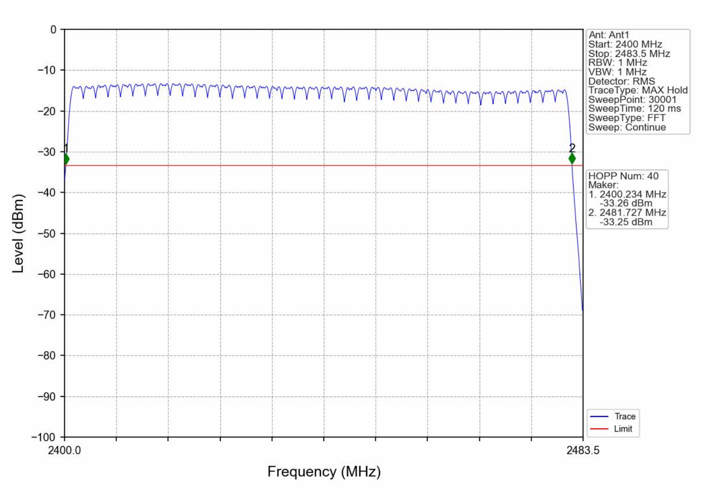
| Test Condition | Test Mode | Test Channel | Ant | Frequency Occupation (N) | Limit [N] | Verdict |
|---|---|---|---|---|---|---|
| NVNT | TX | Middle | Ant1 | 4 | >=1 | PASS |

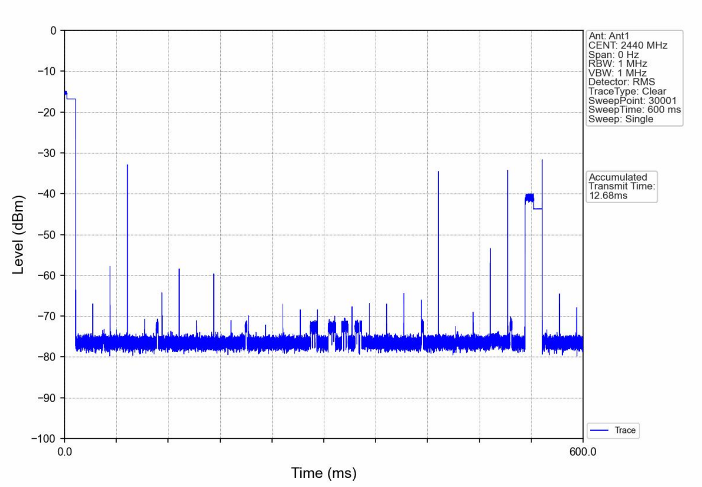
Observation period=4*0.116ms*19=8.816 ms

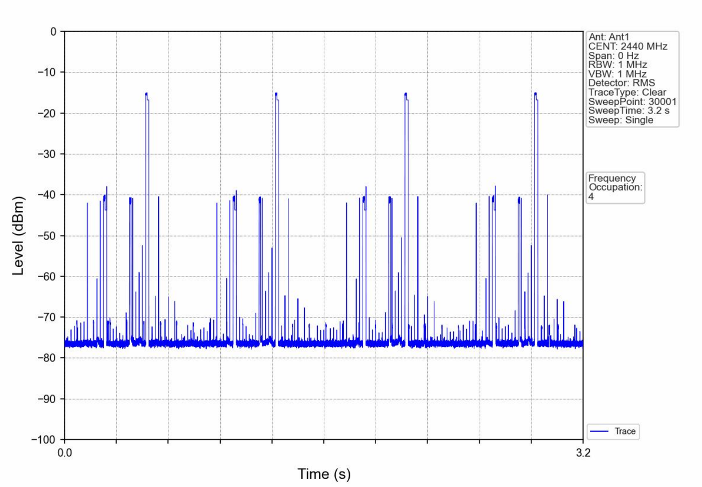
| Test Condition | Test Mode | Ant | Hopping Number [N] | Limit [N] | Verdict |
|---|---|---|---|---|---|
| NVNT | Hopping | Ant1 | 40 | >=5 | PASS |

Test plots at normal condition:

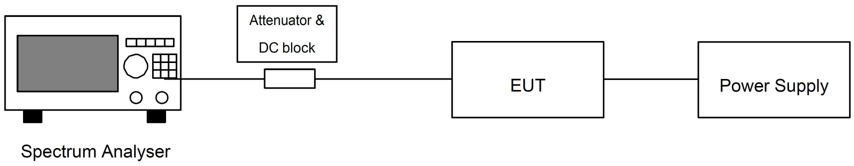
**Hopping Sequence**

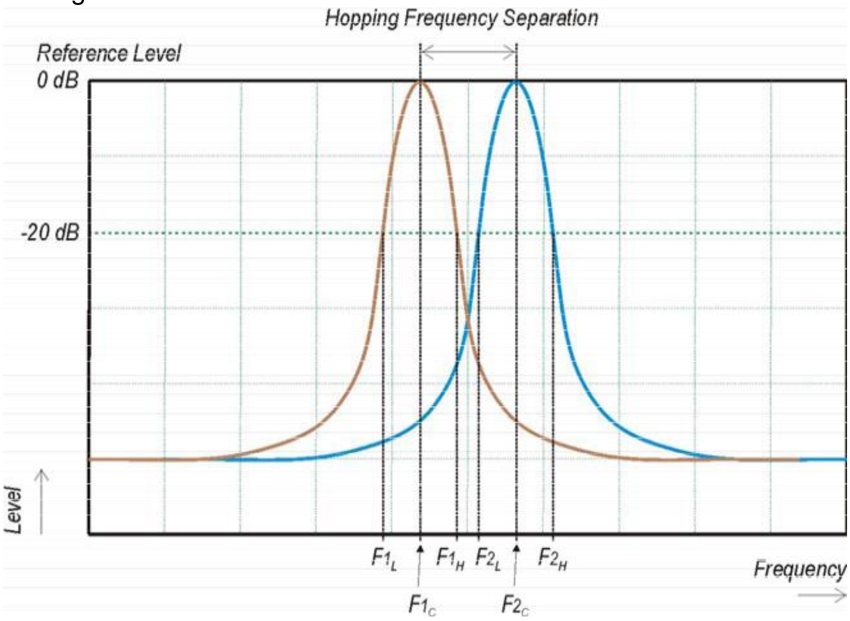


### 7.2.4 Hopping Frequency Separation

| | |
|---|---|
| Test Requirement: | ETSI EN 300 328 clause 4.3.1.5 |
| Test Method: | ETSI EN 300 328 clause 5.4.5.2 |
| Limit: | **For non-adaptive Frequency Hopping equipment**, the Hopping Frequency Separation shall be equal or greater than the Occupied Channel Bandwidth (see clause 4.3.1.8), with a minimum separation of 100 kHz.<br>For equipment with a maximum declared RF Output power level of less than 10 dBm e.i.r.p. or for non-adaptive Frequency Hopping equipment operating in a mode where the RF Output power is less than 10 dBm e.i.r.p. only the minimum Hopping Frequency Separation of 100 kHz applies<br>**For adaptive Frequency Hopping equipment**, the minimum Hopping Frequency Separation shall be 100 kHz |
| Test setup: |  |
| Test procedure: | The test procedure shall be as follows:<br>**Step 1:**<br>The output of the transmitter shall be connected to a spectrum analyzer or equivalent.<br>The analyzer shall be set as follows:<br>Centre Frequency: Centre of the two adjacent hopping frequencies<br>Frequency Span: Sufficient to see the complete power envelope of both hopping frequencies<br>RBW: 1 % of the Span<br>VBW: 3 x RBW<br>Detector Mode: Max peak<br>Trace mode: Max Hold<br>Sweep time: Auto<br><br>**Step 2:**<br>Wait for the trace to stabilize.<br>Use the marker function of the analyser to define the frequencies corresponding to the lower -20 dBr point and the upper -20 dBr point for both hopping frequencies F1 and F2. This will result in F1L and F1H for hopping frequency F1 and in $F2_L$ and $F2_H$ for hopping frequency F2. These values shall be recorded in the report.<br>**Step 3:**<br>Calculate the centre frequencies $F1_C$ and $F2_C$ for both hopping frequencies using the formulas below. These values shall be recorded in the report.<br>$F1_C = (F1_L + F1_H) / 2; \quad F2_C = (F2_L + F2_H) / 2$<br>Calculate the Hopping Frequency Separation (FHS) using the formula |

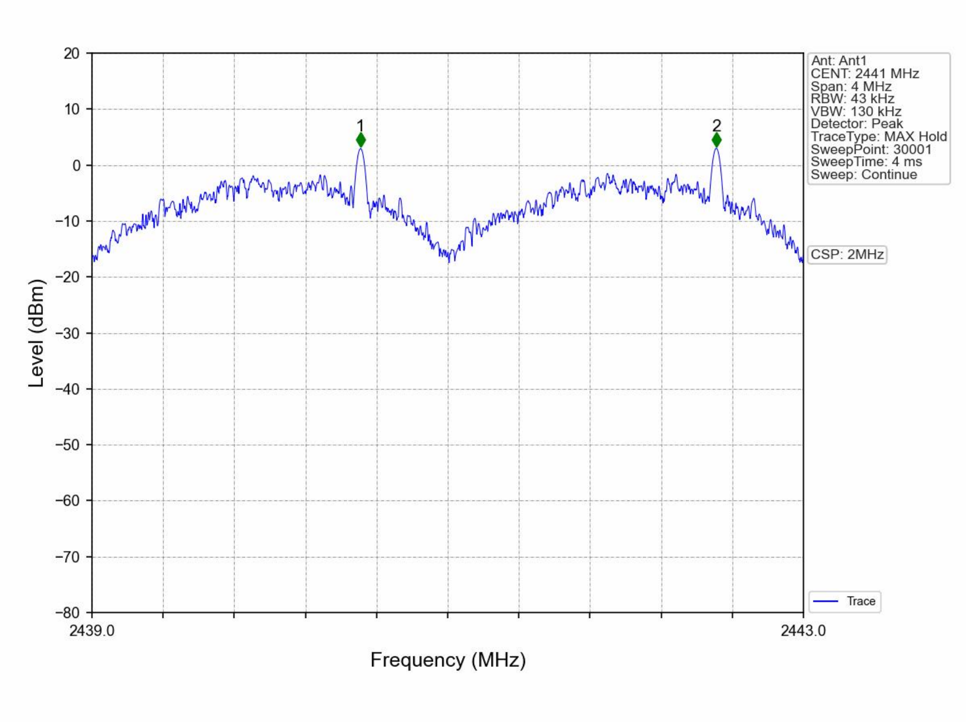
| | |
|---|---|
| | below. This value shall be recorded in the report.<br>$F_{HS}$=F2c-F1c<br>Compare the measured Hopping Frequency Separation with the limit defined in clause 4.3.1.5.3. In addition,for non-Adaptive Frequency Hopping equipment, the Hopping Frequency Separation shall be equal to or greater than the Occupied Channel Bandwidth as defined in clause 4.3.1.8 or:<br>$F_{HS}$ ≥ Occupied Channel Bandwidth<br>See figure 4:<br><br><br>Figure 4: Hopping Frequency Separation<br>For adaptive systems, in case of overlapping channels which will prevent the definition of the -20 dBr reference points $F1_H$ and $F2_L$, a higher reference level (e.g. -10 dBr or - 6 dBr) may be chosen to define the reference points $F1_L$; $F1_H$; $F2_L$ and $F2_H$.<br>Alternatively, special test software may be used to:<br>force the UUT to hop or transmit on a single Hopping Frequency by which the -20 dBr reference points can be measured separately for the 2 adjacent Hopping Frequencies; and/or<br>force the UUT to operate without modulation by which the centre frequencies $F1_C$ and $F2_C$ can be measured directly.<br>The method used to measure the Hopping Frequency Separation shall be documented in the test report. |
| Test Instruments: | See section 6.0 |
| Test mode: | Transmitting mode |

**Measurement Data:**

**Measurement Data:**

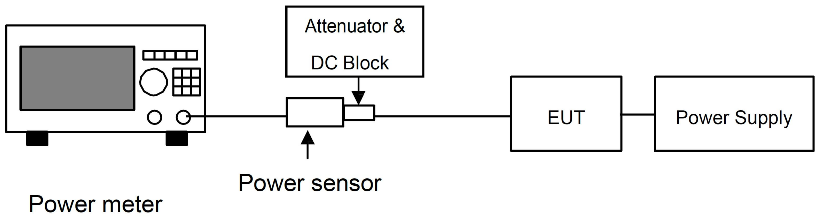
| Ant1 | | | | | | |
|---|---|---|---|---|---|---|
| **ENV** | **Mode** | **TX Type** | **Frequency (MHz)** | **Channel Separation (MHz)** | **Limit (MHz)** | **Verdict** |
| **NTNV** | **FHSS** | **SISO** | **HOPP** | **2.000** | **>=1.92** | **Pass** |

Test plots at normal condition:

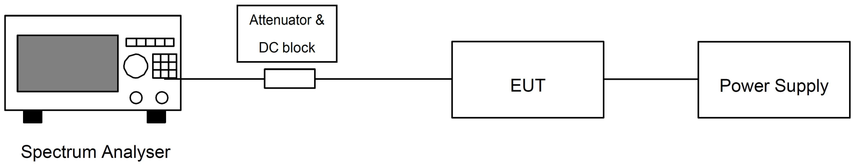



Hopping Frequency Separation_TNVN

### 7.2.5 Medium Utilisation (MU) factor

| | |
|---|---|
| Test Requirement: | ETSI EN 300 328 clause 4.3.1.6 |
| Test Method: | ETSI EN 300 328 clause 5.4.2.2 |
| Limit: | The maximum Medium Utilization factor for non-adaptive Frequency Hopping equipment shall be 10 %.<br>For non-adaptive equipment using wide band modulations other than FHSS, the maximum Medium Utilization factor shall be 10 %. |
| Test setup: |  |
| Test procedure: | Clause 5.4.2.2.1.4 |
| Test Instruments: | See section 6.0 |
| Test mode: | Transmitting mode |
| Result: | N/A, RF Output power level of less than 10 dBm e.i.r.p. |

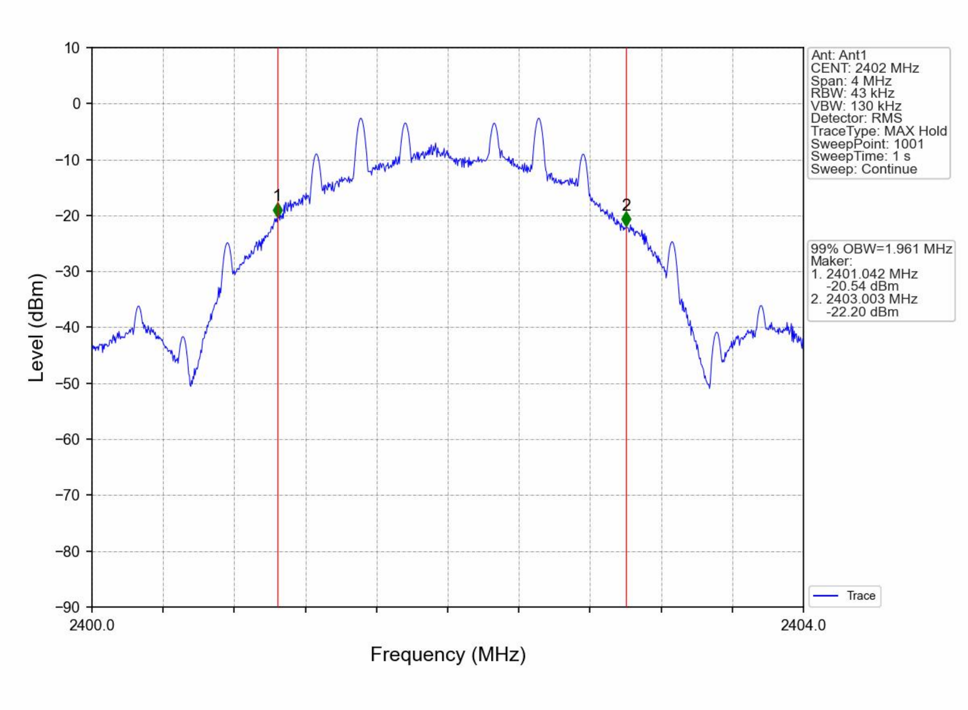
### 7.2.6 Occupied Channel Bandwidth

| | |
|---|---|
| Test Requirement: | ETSI EN 300 328 clause 4.3.1.8 |
| Test Method: | ETSI EN 300 328 clause 5.4.7.2 |
| Limit: | The Occupied Channel Bandwidth for each hopping frequency shall fall completely within the band given in table 1.<br>For non-adaptive Frequency Hopping 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 the Nominal Channel Bandwidth declared by the supplier. See clause 5.4.1 j). This declared value shall not be greater than 5 MHz. |
| Test setup: |  |
| Test Precedure: | **Step 1:**<br>Connect the UUT to the spectrum analyser and use the following settings:<br>Centre Frequency: The centre frequency of the channel under test<br>Resolution BW: ~ 1 % of the span without going below 1 %<br>Video BW: 3 × RBW<br>Frequency Span 2 × Nominal Channel Bandwidth<br>Detector Mode: RMS<br>Trace mode: Max Hold<br>Sweep time: 1 s<br>**Step 2:**<br>Wait for the trace to stabilize.<br>Find the peak value of the trace and place the analyser marker on this peak.<br>**Step 3:**<br>Use the 99 % bandwidth function of the spectrum analyser to measure the Occupied Channel Bandwidth of the UUT. This value shall be recorded.<br>Make sure that the power envelope is sufficiently above the noise floor of the analyser to avoid the noise signals left and right from the power envelope being taken into account by this measurement. |
| Test Instruments: | See section 6.0 |
| Test mode: | Transmitting mode |

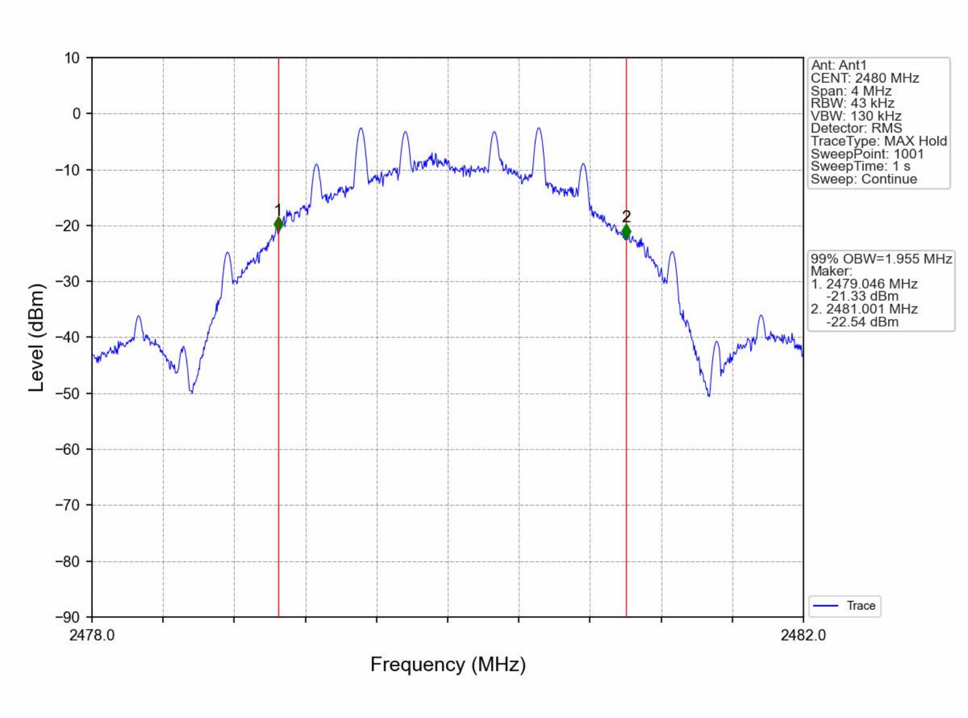
**Measurement Data:**

| Test Condition | Test Mode | Test Channel | OBW [MHz] | $F_L/F_H$ (MHz) | Limit [MHz] | Verdict |
|---|---|---|---|---|---|---|
| TNTV | TX | 2402 | 1.961 | 2401.042 | 2400MHz ~ 2483.5MHz | PASS |
| TNTV | TX | 2480 | 1.955 | 2481.001 | | PASS |

Test plots at normal condition:

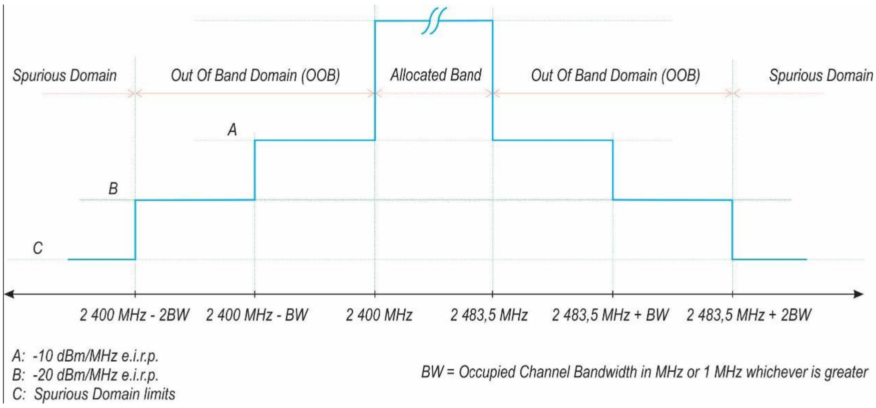
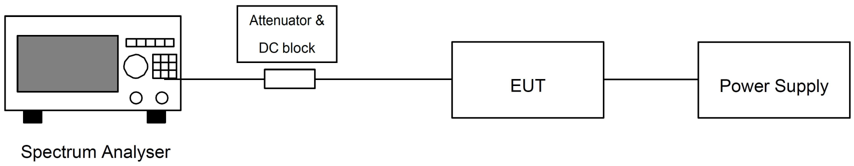



Occupied Channel Bandwidth_TNVN_ TX _2402




Occupied Channel Bandwidth_TNVN_ TX _2480

### 7.2.7 Transmitter unwanted emissions in the OOB domain

| | |
|---|---|
| Test Requirement: | ETSI EN 300 328 clause 4.3.1.9 |
| Test Method: | ETSI EN 300 328 clause 5.4.8.2 |
| 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<br>Within the band specified in table 1, the Out-of-band emissions are fulfilled by compliance with the Occupied Channel Bandwidth requirement in clause 4.3.1.8.<br><br> |
| Test setup: | <br> |
| Test procedure: | The applicable mask is defined by the measurement results from the tests performed under clause 5.4.7 (Occupied Channel Bandwidth).<br>The Out-of-band emissions within the different horizontal segments of the mask provided in figures 1 and 3 shall be measured using the step 1 to step 6 below. This method assumes the spectrum analyser is equipped with the Time Domain Power option.<br>**Step 1:**<br>Connect the UUT to the spectrum analyser and use the following settings:<br>Centre Frequency: 2 484 MHz<br>Span: 0Hz<br>Resolution BW: 1 MHz<br>Filter mode: Channel filter<br>Video BW: 3 MHz<br>Detector Mode: RMS<br>Trace Mode: Max Hold<br>Sweep Mode: Continuous<br>Sweep Points: Sweep Time [s] / (1 μs) or 5 000 whichever is greater<br>Trigger Mode: Video trigger |

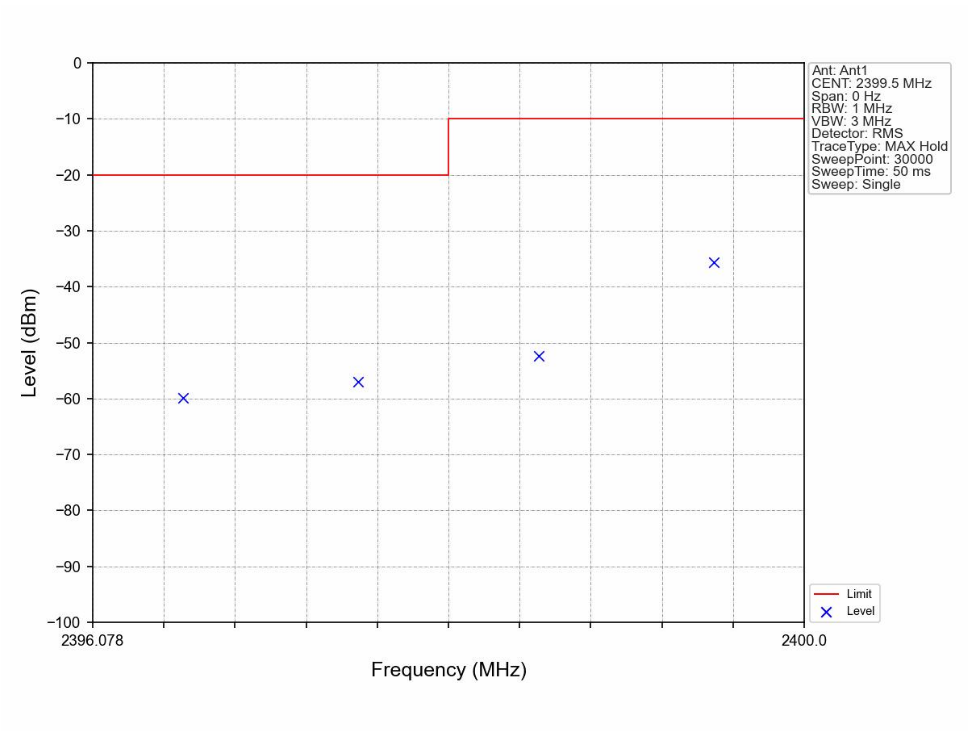
| | |
|---|---|
| | In case video triggering is not possible, an external trigger source may be used.<br>Sweep Time: >120 % of the duration of the longest burst detected during the measurement of the RF Output Power<br><br>**Step 2: (segment 2 483,5 MHz to 2 483,5 MHz + BW)**<br>Adjust the trigger level to select the transmissions with the highest power level.<br>For frequency hopping equipment operating in a normal hopping mode, the different hops will result in signal bursts with different power levels. In this case the burst with the highest power level shall be selected.<br>Set a window (start and stop lines) to match with the start and end of the burst and in which the RMS power shall be measured using the Time Domain Power function.<br>Select RMS power to be measured within the selected window and note the result which is the RMS power within this 1 MHz segment (2 483,5 MHz to 2 484,5 MHz). Compare this value with the applicable limit provided by the mask.<br>Increase the centre frequency in steps of 1 MHz and repeat this measurement for every 1 MHz segment within the range 2 483,5 MHz to 2 483,5 MHz + BW. The centre frequency of the last 1 MHz segment shall be set to 2 483,5 MHz + BW - 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).<br>**Step 3: (segment 2 483,5 MHz + BW to 2 483,5 MHz + 2BW)**<br>Change the centre frequency of the analyser to 2 484 MHz + BW and perform the measurement for the first 1 MHz segment within range 2 483,5 MHz + BW to 2 483,5 MHz + 2BW. Increase the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 483,5 MHz + 2 BW - 0,5 MHz. (which means this may partly overlap with the previous 1 MHz segment).<br>**Step 4: (segment 2 400 MHz - BW to 2 400 MHz)**<br>Change the centre frequency of the analyser to 2 399,5 MHz and perform the measurement for the first 1 MHz segment within range 2 400 MHz - BW to 2 400 MHz Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - BW + 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).<br>**Step 5: (segment 2 400 MHz - 2BW to 2 400 MHz - BW)**<br>Change the centre frequency of the analyser to 2 399,5 MHz - BW and perform the measurement for the first 1 MHz segment within range 2 400 MHz - 2BW to 2 400 MHz - BW. Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - 2BW + 0,5 MHz. (which means this may partly overlap with the previous 1 MHz segment).<br>**Step 6:**<br>In case of conducted measurements on equipment with a single transmit chain, the declared antenna assembly gain "G" in dBi shall be added to the results for each of the 1 MHz segments and compared with the limits |

| | |
|---|---|
| | provided by the mask given in figures 1 or figure 3. If more than one antenna assembly is intended for this power setting, the antenna with the highest gain shall be considered.<br>In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), the measurements need to be repeated for each of the active transmit chains. The declared antenna assembly gain "G" in dBi for a single antenna shall be added to these results. If more than one antenna assembly is intended for this power setting, the antenna with the highest gain shall be considered.<br>Comparison with the applicable limits shall be done using any of the options given below:<br>Option 1: the results for each of the transmit chains for the corresponding 1 MHz segments shall be added. The additional beamforming gain "Y" in dB shall be added as well and the resulting values compared with the limits provided by the mask given in figure 1 or figure 3.<br>Option 2: the limits provided by the mask given in figure 1 or figure 3 shall be reduced by 10 x log10($A_{ch}$) and the additional beamforming gain "Y" in dB. The results for each of the transmit chains shall be individually compared with these reduced limits.<br>NOTE: $A_{ch}$ refers to the number of active transmit chains.<br>It shall be recorded whether the equipment complies with the mask provided in figure 1 or figure 3. |
| Measurement Record: | Uncertainty: ± 1.5dB |
| Test Instruments: | See section 6.0 |
| Test mode: | Transmitting mode |
| Test results: | Pass |

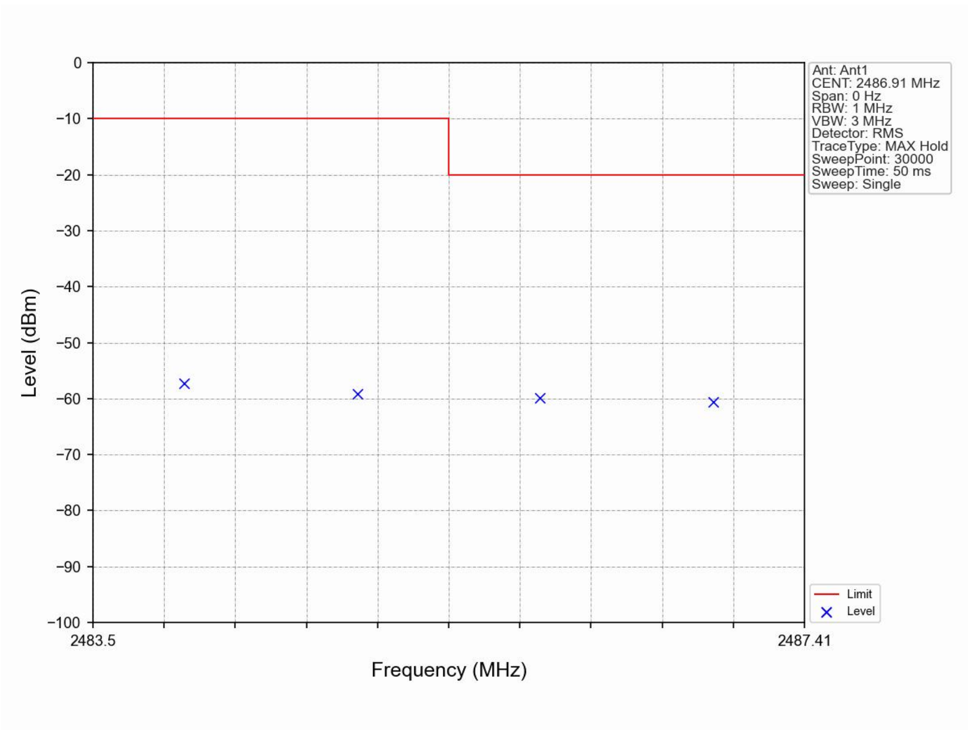
**Measurement Data:**

| FHSS-Ant1-NTNV | | | | | | | |
|---|---|---|---|---|---|---|---|
| Mode | TX Type | Frequency (MHz) | ANT | Test Freq (MHz) | Result (dBm/MHz) | Limit (dBm/MHz) | Verdict |
| FHSS | SISO | 2402 | 1 | 2396.578 | -59.95 | <=-20 | Pass |
| | | | | 2397.539 | -56.93 | <=-20 | Pass |
| | | | | 2398.539 | -52.41 | <=-10 | Pass |
| | | | | 2399.500 | -35.61 | <=-10 | Pass |
| | | 2480 | 1 | 2484.000 | -57.34 | <=-10 | Pass |
| | | | | 2484.955 | -59.20 | <=-10 | Pass |
| | | | | 2485.955 | -59.83 | <=-20 | Pass |
| | | | | 2486.910 | -60.67 | <=-20 | Pass |

Test plots at normal condition:



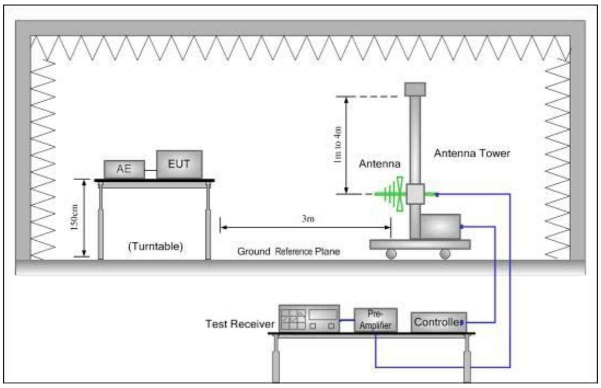

FHSS_2402MHz_Ant1_NTNV



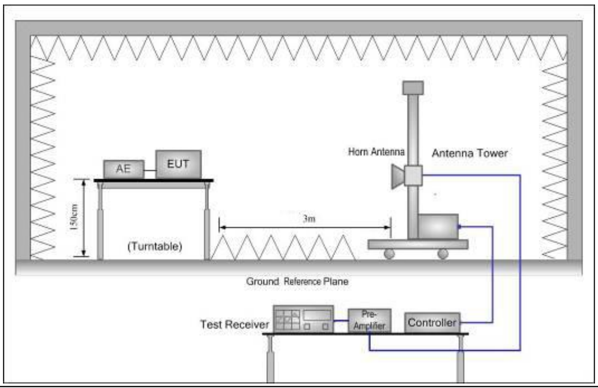

FHSS_2480MHz_Ant1_NTNV

### 7.2.8 Transmitter unwanted emissions in the spurious domain

<table>
<tr><td>Test Requirement:</td><td>ETSI EN 300 328 clause 4.3.1.10</td></tr>
<tr><td>Test Method:</td><td>ETSI EN 300 328 clause 5.4.9.2</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><th>Frequency Range</th><th>Maximum power<br>e.r.p. (≤ 1 GHz)<br>e.i.r.p. (> 1 GHz)</th><th>Bandwidth</th></tr>
<tr><td>30 MHz to 47 MHz</td><td>-36 dBm</td><td>100 kHz</td></tr>
<tr><td>47 MHz to 74 MHz</td><td>-54 dBm</td><td>100 kHz</td></tr>
<tr><td>74 MHz to 87.5 MHz</td><td>-36 dBm</td><td>100 kHz</td></tr>
<tr><td>87.5 MHz to 118 MHz</td><td>-54 dBm</td><td>100 kHz</td></tr>
<tr><td>118 MHz to 174 MHz</td><td>-36 dBm</td><td>100 kHz</td></tr>
<tr><td>174 MHz to 230 MHz</td><td>-54 dBm</td><td>100 kHz</td></tr>
<tr><td>230 MHz to 470 MHz</td><td>-36 dBm</td><td>100 kHz</td></tr>
<tr><td>470 MHz to 694 MHz</td><td>-54 dBm</td><td>100 kHz</td></tr>
<tr><td>694 MHz to 1 GHz</td><td>-36 dBm</td><td>100 kHz</td></tr>
<tr><td>1 GHz to 12.75 GHz</td><td>-30 dBm</td><td>1 MHz</td></tr>
</table>
</td></tr>
<tr><td>Test Frequency range:</td><td>30MHz to 12.75GHz</td></tr>
<tr><td>Test setup:</td><td>Below 1GHz




Above 1GHz



</td></tr>
<tr><td>Test procedure:</td><td>1. Pre-scan<br>The test procedure below shall be used to identify potential unwanted emissions of the UUT.<br>Step 1:<br>The sensitivity of the measurement set-up should be such that the noise</td></tr>
</table>

| | |
|---|---|
| | floor is at least 12 dB below the limits given in table 4 or table 12.<br>**Step 2:**<br>The emissions over the range 30 MHz to 1 000 MHz shall be identified.<br>Spectrum analyser settings:<br>Resolution BW: 100 kHz<br>Video BW 300 kHz<br>Filter type: 3 dB (Gaussian)<br>Detector mode: Peak<br>Trace Mode: Max Hold<br>Sweep Points: ≥19 400<br>For spectrum analysers not supporting this high number of sweep points, the frequency band may need to be segmented.<br>Sweep time: For non continuous transmissions (duty cycle less than 100 %), the sweep time shall be sufficiently long, such that for each 100 kHz frequency step, the measurement time is greater than two transmissions of the UUT.on any channel<br>For Frequency Hopping equipment operating in a normal operating (hopping not disabled) mode, the sweep time shall be further increased to capture multiple transmissions on the same hopping frequency in different hopping sequences.<br>The above sweep time setting may result in long measuring times in case of frequency hopping equipment. To avoid such long measuring times, an FFT analyser could be used.<br>Allow the trace to stabilize. Any emissions identified during the sweeps above and that fall within the 6 dB range below the applicable limit or above, shall be individually measured using the procedure in clause 5.4.9.2.1.3 and compared to the limits given in table 4 or table 12.<br>**Step 3:**<br>The emissions over the range 1 GHz to 12,75 GHz shall be identified.<br>Spectrum analyser settings:<br>Resolution BW: 1 MHz<br>Video BW 3 MHz<br>Filter type: 3 dB (Gaussian)<br>Detector mode: Peak<br>Trace Mode: Max Hold<br>Sweep Points: ≥ 23 500<br>For spectrum analysers not supporting this high number of sweep points, the frequency band may need to be segmented.<br>Sweep time: For non continuous transmissions (duty cycle less than 100 %), the sweep time shall be sufficiently long, such that for each 1 MHz frequency step, the measurement time is greater than two transmissions of the UUT.on any channel<br>For Frequency Hopping equipment operating |

| | |
|---|---|
| | in a normal operating (hopping not disabled) mode, the sweep time shall be further increased to capture multiple transmissions on the same hopping frequencies<br>The above sweep time setting may result in long measuring times in case of frequency hopping equipment. To avoid such long measuring times, an FFT analyser could be used.<br><br>Allow the trace to stabilize. Any emissions identified during the sweeps above that fall within the 6 dB range below the applicable limit or above, shall be individually measured using the procedure in clause 5.4.9.2.1.3 and compared to the limits given in table 4 or table 12.<br>Frequency Hopping equipment may generate a block (or several blocks) of spurious emissions anywhere within the spurious domain. If this is the case, only the highest peak of each block of emissions shall be measured using the procedure in clause 5.4.9.2.1.3.<br>**Step 4:**<br>In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), the steps 2 and 3 need to be repeated for each of the active transmit chains (Ach).The limits used to identify emissions during this pre-scan need to be reduced by<br>10 × log10 (Ach)<br>**2. Measurement of the emissions identified during the pre-scan**<br>The procedure in step 1 to step 4 below shall be used to accurately measure the individual unwanted emissions identified during the pre-scan measurements above. This method assumes the spectrum analyser has a Time Domain Power function.<br>**Step 1:**<br>The level of the emissions shall be measured using the following spectrum analyser settings:<br>Measurement Mode: Time Domain Power<br>Centre Frequency: Frequency of emission identified during the pre-scan<br>Resolution BW: 100 kHz (< 1 GHz) / 1 MHz (> 1 GHz)<br>Video BW: 300 kHz (< 1 GHz) / 3 MHz (> 1 GHz)<br>Frequency Span: Zero Span<br>Sweep mode: Single Sweep<br>Sweep time: > 120 % of the duration of the longest burst detected during the measurement of the RF Output Power<br>Sweep points: Sweep time [μs] / (1 μs) with a maximum of 30 000<br>Trigger: Video (burst signals) or Manual (continuous signals)<br>Detector: RMS<br><br>**Step 2:**<br>Set a window where the start and stop indicators match the start and end of the burst with the highest level and record the value of the power measured within this window.If the spurious emission to be measured is a continuous transmission, the measurement window shall be set to |

| | |
|---|---|
| | match the start and stop times of the sweep.<br>**Step 3:**<br>In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), step 2 needs to be repeated for each of the active transmit chains (Ach).<br>Sum the measured power (within the observed window) for each of the active transmit chains.<br>**Step 4:**<br>The value defined in step 3 shall be compared to the limits defined in table 4 or table 12. |
| Measurement Record: | Uncertainty: 4.64dB |
| Test Instruments: | See section 6.0 |
| Test mode: | Transmitting mode |

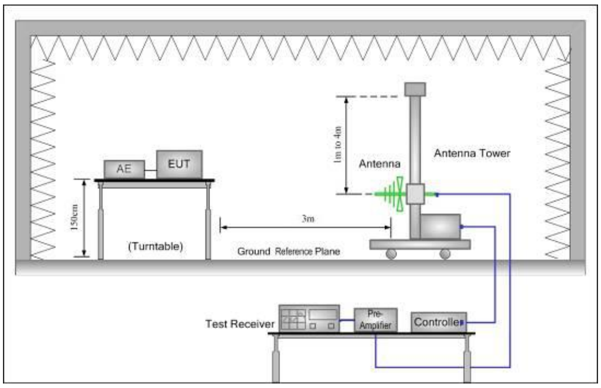
**Measurement Data:**

| The lowest channel | | | | |
|---|---|---|---|---|
| Frequency (MHz) | Spurious Emission | | Limit (dBm) | Test Result |
| | polarization | Level(dBm) | | |
| 64.1 | Vertical | -67.78 | -36.00 | Pass |
| 551.17 | V | -62.85 | -36.00 | |
| 4807.54 | V | -46.6 | -30.00 | |
| 7210.54 | V | -40.93 | -30.00 | |
| 9613.54 | V | -36.38 | -30.00 | |
| 12016.54 | V | -35.77 | -30.00 | |
| 55.93 | Horizontal | -58.99 | -36.00 | |
| 847.24 | H | -59.07 | -54.00 | |
| 4813.54 | H | -40.24 | -30.00 | |
| 7216.54 | H | -35.49 | -30.00 | |
| 9619.54 | H | -30.23 | -30.00 | |
| 12022.54 | H | -31.46 | -30.00 | |
| The highest channel | | | | |
| Frequency (MHz) | Spurious Emission | | Limit (dBm) | Test Result |
| | polarization | Level(dBm) | | |
| 51.53 | Vertical | -65.3 | -36.00 | Pass |
| 698.91 | V | -66.51 | -54.00 | |
| 4963.54 | V | -47.95 | -30.00 | |
| 7444.54 | V | -41.56 | -30.00 | |
| 9925.54 | V | -36.8 | -30.00 | |
| 12406.54 | V | -36.84 | -30.00 | |
| 59.25 | Horizontal | -60.83 | -36.00 | |
| 869.58 | H | -61.01 | -54.00 | |
| 4969.54 | H | -41.77 | -30.00 | |
| 7450.54 | H | -36.24 | -30.00 | |
| 9931.54 | H | -31.01 | -30.00 | |
| 12412.54 | H | -32.13 | -30.00 | |

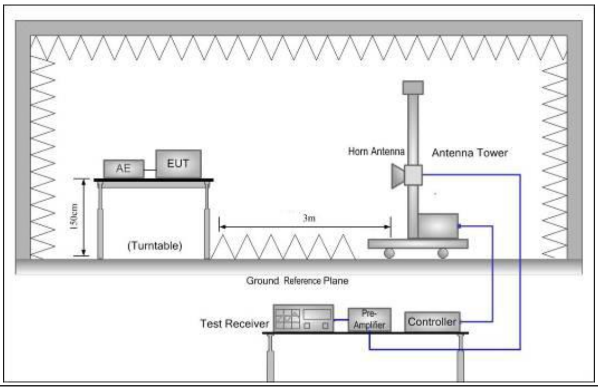
## 7.3 Receiver Requirement

### 7.3.1 Spurious Emissions

<table>
<tr><td>Test Requirement:</td><td>ETSI EN 300 328 clause 4.3.1.11</td></tr>
<tr><td>Test Method:</td><td>ETSI EN 300 328 clause 5.4.10.2</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><th>Frequency</th><th>Maximum power<br>e.r.p. (≤ 1 GHz)<br>e.i.r.p. (> 1 GHz)</th><th>Measurement bandwidth</th></tr>
<tr><td>30MHz to 1000 MHz</td><td>-57 dBm</td><td>100 kHz</td></tr>
<tr><td>1GHz to 12.75GHz</td><td>-47 dBm</td><td>1 MHz</td></tr>
</table>
</td></tr>
<tr><td>Test Frequency range:</td><td>30MHz to 12.75GHz</td></tr>
<tr><td>Test setup:</td><td>Below 1GHz<br>




Above 1GHz<br>



</td></tr>
<tr><td>Test procedure:</td><td>1. Pre-scan<br>The procedure in step 1 to step 4 below shall be used to identify potential unwanted emissions of the UUT.<br>Step 1:<br>The sensitivity of the spectrum analyser should be such that the noise floor is at least 12 dB below the limits given in tables 5 or table13.<br>Step 2:<br>The emissions over the range 30 MHz to 1 000 MHz shall be identified.<br>Spectrum analyser settings:<br>Resolution BW: 100 kHz<br>Video BW 300 kHz<br>Filter type: 3dB (Gaussian)</td></tr>
</table>

| | |
|---|---|
| | Detector mode: Peak<br>Trace Mode: Max Hold<br>Sweep Points: ≥ 19 400<br>Sweep time: Auto<br>Wait for the trace to stabilize. Any emissions identified during the sweeps above and that fall within the 6 dB range below the applicable limit or above, shall be individually measured using the procedure in clause 5.4.10.2.1.3 and compared to the limits given in table 5 or table 13.<br>**Step 3:**<br>The emissions over the range 1 GHz to 12,75 GHz shall be identified.<br>Spectrum analyser settings:<br>Resolution BW: 1 MHz<br>Video BW 3 MHz<br>Filter type: 3 dB (Gaussian)<br>Detector mode: Peak<br>Trace Mode: Max Hold<br>Sweep Points: ≥ 23500; for spectrum analysers not supporting this high number of sweep points,the frequency band may be segmented<br>Sweep time: Auto<br><br>Wait for the trace to stabilize. Any emissions identified during the sweeps above that fall within the 6 dB range below, the applicable limit or above, shall be individually measured using the procedure in clause 5.4.10.2.1.3 and compared to the limits given in table 5 or table 13.<br>Frequency Hopping equipment may generate a block (or several blocks) of spurious emissions anywhere within the spurious domain. If this is the case, only the highest peak of each block of emissions shall be measured using the procedure in clause 5.4.10.2.1.3.<br>**Step 4:**<br>In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), the steps 2 and 3 need to be repeated for each of the active transmit chains ($A_{ch}$).The limits used to identifyemissions during this pre-scan need to be reduced with<br>$10 \times \log_{10}(A_{ch})$<br>**2. Measurement of the emissions identified during the pre-scan**<br>The procedure in step 1 to step 4 below shall be used to accurately measure the individual unwanted emissions identified during the pre-scan measurements above. This method assumes the spectrum analyser has a Time Domain Power function.<br>**Step 1:**<br>The level of the emissions shall be measured using the following spectrum analyser settings:<br>Measurement Mode: Time Domain Power<br>Centre Frequency: Frequency of the emission identified during the pre-scan<br>Resolution Bandwidth: 100 kHz (< 1 GHz) / 1 MHz (> 1 GHz)<br>Video Bandwidth: 300 kHz (< 1 GHz) / 3 MHz (> 1 GHz) |

| | |
|---|---|
| | Frequency Span: Zero Span<br>Sweep mode: Single Sweep<br>Sweep time: 30 ms<br>Sweep points: ⩾ 30 000<br>Trigger: Video (for burst signals) or Manual (for continuous signals<br>Detector: RMS<br>**Step 2:**<br>Set a window where the start and stop indicators match the start and end of the burst with the highest level and record, the value of the power measured within this window. If the spurious emission to be measured is a continuous, transmission, the measurement window shall be set to the start and stop times of the sweep.<br>**Step 3:**<br>In case of conducted measurements on smart antenna systems (equipment with multiple receive chains), step 2 needs to be repeated for each of the active receive chains $A_{ch}$.Sum the measured power (within the observed window) for each of the active receive chains.<br>**Step 4:**<br>The value defined in step 3 shall be compared to the limits defined in table 5 and table 13. |
| Measurement Record: | Uncertainty: 4.64dB |
| Test mode: | Receiving mode |
| Test Instruments: | See section 6.0 |

**Measurement Data:**

| The lowest channel | | | | |
|---|---|---|---|---|
| **Frequency (MHz)** | **Spurious Emission** | | **Limit (dBm)** | **Test Result** |
| | **polarization** | **Level(dBm)** | | |
| 128.77 | Vertical | -63.31 | 2nW/ -57dBm below 1GHz,<br><br>20nW/ -47dBm above 1GHz. | Pass |
| 829.89 | V | -68.07 | | |
| 4823.44 | V | -51.39 | | |
| 7234.44 | V | -49.08 | | |
| 9645.44 | V | -47.4 | | |
| 12056.45 | V | -47.61 | | |
| 284.16 | Horizontal | -64.77 | | |
| 495.92 | H | -66.4 | | |
| 4829.44 | H | -45.16 | | |
| 7240.44 | H | -42.88 | | |
| 9651.44 | H | -42.55 | | |
| 12062.45 | H | -42.34 | | |

| The highest channel | | | | |
|---|---|---|---|---|
| **Frequency (MHz)** | **Spurious Emission** | | **Limit (dBm)** | **Test Result** |
| | **polarization** | **Level(dBm)** | | |
| 170.75 | Vertical | -59.42 | 2nW/ -57dBm below 1GHz,<br><br>20nW/ -47dBm above 1GHz. | Pass |
| 679.73 | V | -66.66 | | |
| 4959.33 | V | -51.24 | | |
| 7437.33 | V | -48.17 | | |
| 9915.33 | V | -45.89 | | |
| 12393.34 | V | -45.62 | | |
| 144.05 | Horizontal | -66.61 | | |
| 587.17 | H | -64.5 | | |
| 4965.33 | H | -45.07 | | |
| 7443.33 | H | -41.87 | | |
| 9921.33 | H | -39.74 | | |
| 12399.34 | H | -38.87 | | |

### 7.3.2 Receiver Blocking

| | |
|---|---|
| Test Requirement: | ETSI EN300 328clause 4.3.1.12 |
| Test Method: | ETSI EN300 328clause 5.4.11.2. |
| Limit: | While maintaining the minimum performance criteria as defined in clause 4.3.1.12.3, the blocking levels at specifiedfrequency offsets shall be equal to or greater than the limits defined for the applicable receiver category provided intable 6, table 7 or table 8. |

**Table 6: Receiver Blocking parameters for 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<br>2 504 | -34 | CW |
| (-139 dBm + 10 × $\log_{10}$(OCBW)) or -74 dBm whichever is less (see note 3) | 2 300<br>2 330<br>2 360<br>2 524<br>2 584<br>2 674 | | |

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.
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.

**Table 7: Receiver Blocking parameters 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<br>2 504<br>2 300<br>2 584 | -34 | CW |

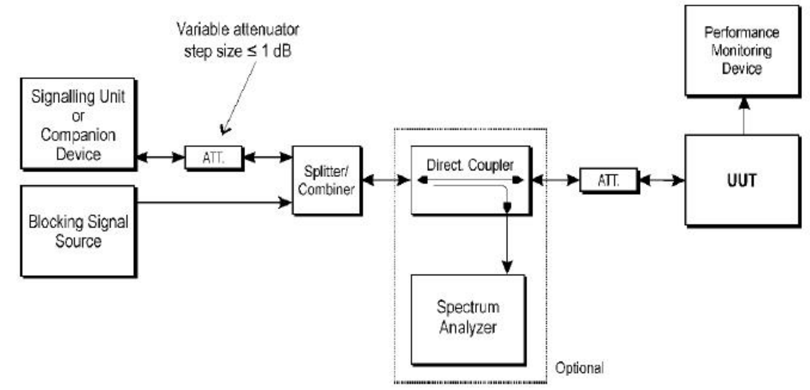
NOTE 1: OCBW is in Hz.
NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to $P_{min}$ + 26 dB where $P_{min}$ is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
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.

**Table 8: Receiver Blocking parameters 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<br>2 504<br>2 300<br>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 the test may be performed using a wanted signal up to $P_{min}$ + 30 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 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.

Test setup:




| | |
|---|---|
| Test procedure: | Refer to the procedure of adaptivity |
| Measurement Record: | Uncertainty: N/A |
| Test Instruments: | See section 6.0 |
| Test mode: | Normal link mode |

**Measurement Data:**

| Receiver Category | Test Channel | Wanted signal mean power from companion device (dBm) | Blocking signal frequency (MHz) | Blocking signal power (dBm) (see note 2) | Performance | Limit | Result |
|---|---|---|---|---|---|---|---|
| 3 | All channel Hopping | -68 | 2402 | -34+ antenna assembly gain | Work as intended | Link as intended | Pass |
| | | | 2422 | | | | Pass |
| | | | 2440 | | | | Pass |
| | | | 2480 | | | | Pass |

# 8 Test setup photo

Reference to the **appendix I** for details.

# 9 EUT Constructional Details

Reference to the **appendix II** for details.

------End------