# TEST REPORT

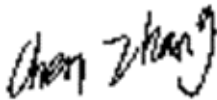| | |
|---|---|
| Product Name: | Wi-Fi + BT Module |
| Trademark: | B&T博安通　　A.i 安信可科技 Ai-Thinker |
| Model Number: | Ai-WB2-12F, Ai-WB2-12S, Ai-WB2-07S, Ai-WB2-32S, Ai-WB2-13, Ai-WB2-13U, Ai-WB2-01M, Ai-WB2-01N, Ai-WB2-01D, Ai-WB2-01C, Ai-WB2-M1 |
| Prepared For: | Shenzhen Ai-Thinker Technology Co., Ltd |
| Address: | 410, Block C, Huafeng Smart Innovation Port, Gushu 2nd Road, Gushu Community, Xixiang Street, Baoan District, Shenzhen, China |
| Manufacturer: | Shenzhen Ai-Thinker Technology Co., Ltd |
| Address: | 410, Block C, Huafeng Smart Innovation Port, Gushu 2nd Road, Gushu Community, Xixiang Street, Baoan District, Shenzhen, China |
| Prepared By: | Shenzhen CTB Testing Technology Co., Ltd. |
| Address: | Floor 1&2, Building A, No. 26 of Xinhe Road, Xinqiao Community, Xinqiao Street, Baoan District, Shenzhen, Guangdong, China |
| Sample Received Date: | Jun. 28, 2022 |
| Sample tested Date: | Jun. 28, 2022 to Jul. 11, 2022 |
| Issue Date: | Jul. 11, 2022 |
| Report No.: | CTB220711034RFX |
| Test Standards | ETSI EN 300 328 V2.2.2 (2019-07) |
| Test Results | PASS |
| Remark: | This is Bluetooth BLE radio test report. |

| Compiled by: | Reviewed by: | Approved by: |
|---|---|---|
| Chen Zheng | Arron Liu | Bin Mei / Director |

Note: If there is any objection to the inspection results in this report, please submit a written report to the company within 15 days from the date of receiving the report. The test report is effective only with both signature and specialized stamp. This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen CTB Testing Technology Co., Ltd. this report can't be reproduced except in full. The tested sample(s) and the sample information are provided by the client. "*" indicates the testing items were fulfilled by subcontracted lab. "#" indicates the items are not in CNAS accreditation scope.

## TABLE OF CONTENT

*(Note: N/A means not applicable)*

## 1. VERSION

| Report No. | Issue Date | Description | Approved |
|---|---|---|---|
| CTB220711034RFX | Jul. 11, 2022 | Original | Valid |

## 2. TEST SUMMARY

The Product has been tested according to the following specifications:

| Standard | ETSI EN 300 328 V2.2.2 | | |
|---|---|---|---|
| Test Item | Test Requirement | Test Method | Results |
| Transmitter Parameters | | | |
| RF Output Power | Clause 4.3.2.2 | Clause 5.4.2 | PASS |
| Power Spectral Density | Clause 4.3.2.3 | Clause 5.4.3 | PASS |
| Duty cycle, Tx-Sequence, Tx-gap | Clause 4.3.2.4 | Clause 5.4.4 | N/A[1] |
| Medium Utilization (MU) factor | Clause 4.3.2.5 | Clause 5.4.5 | N/A[2] |
| Adaptivity (adaptive equipment using modulations other than FHSS) | Clause 4.3.2.6 | Clause 5.4.6 | N/A[3] |
| Occupied Channel Bandwidth | Clause 4.3.2.7 | Clause 5.4.7 | PASS |
| Transmitter unwanted emissions in the out-of-band domain | Clause 4.3.2.8 | Clause 5.4.8 | PASS |
| Transmitter unwanted emissions in the spurious domain | Clause 4.3.2.9 | Clause 5.4.9 | PASS |
| Receiver Parameters | | | |
| Receiver spurious emissions | Clause 4.3.2.10 | Clause 5.4.10 | PASS |
| Receiver Blocking | Clause 4.3.2.11 | Clause 5.4.11 | PASS |
| Geo-location capability | Clause 4.3.2.12 | Clause 5.4.12 | N/A[4] |

Remark:

N/A[1]: Because these requirements apply to non-adaptive frequency hopping equipment mode and RF output power of greater than or equal to 10 dBm.

N/A[2]: Because these requirements apply to non-adaptive frequency hopping equipment mode and RF output power of greater than or equal to 10 dBm.

N/A[3]: Because these requirements apply to adaptive equipment mode and RF output power of greater than or equal to 10 dBm.

N/A[4]: Only for equipment with geo-location capability

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

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

RF: In this whole report RF means Radiated Frequency.

CH: In this whole report CH means channel.

## 3.    MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated
for tests performed on the Product 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.

| Item | Uncertainty |
|------|-------------|
| Occupancy bandwidth | 54.3kHz |
| Conducted output power Above 1G | 0.9dB |
| Conducted output power below 1G | 0.9dB |
| Power Spectral Density , Conduction | 0.9dB |
| Conduction spurious emissions | 2.0dB |
| Out of band emission | 2.0dB |
| 3m camber Radiated spurious emission(30MHz-1GHz) | 4.6dB |
| 3m chamber Radiated spurious emission(1GHz-18GHz) | 5.1dB |
| 3m chamber Radiated spurious emission(18GHz-40GHz) | 3.4dB |
| Receiver Reference Sensitivity level | 1.9dB |
| humidity uncertainty | 5.5% |
| Temperature uncertainty | 0.63℃ |
| frequency | $1\times10^{-7}$ |

## 4.  PRODUCT INFORMATION AND TEST SETUP

4.1  Product Information

| | |
|---|---|
| Model(s): | Ai-WB2-12F, Ai-WB2-12S, Ai-WB2-07S, Ai-WB2-32S, Ai-WB2-13, Ai-WB2-13U, Ai-WB2-01M, Ai-WB2-01N, Ai-WB2-01D, Ai-WB2-01C, Ai-WB2-M1 |
| Model Description: | All the model are the same circuit and RF module, only for model name. Test sample model: Ai-WB2-12F |
| Bluetooth Version: | Bluetooth 5.0 |
| Hardware Version: | V1.1 |
| Software Version: | V1.0 |
| Operation Frequency: | Bluetooth: 2402-2480MHz |
| Max. RF output power: | Bluetooth: 3.98dBm |
| Type of Modulation: | Bluetooth: GFSK |
| Antenna installation: | Bluetooth: PCB antenna |
| Antenna Gain: | Bluetooth: 1.0dBi |
| Ratings: | DC3.3 by Notebook |

4.2  Test Setup Configuration
See test photographs attached in EUT TEST SETUP Photographs for the actual connections between Product and support equipment.

4.3  Support Equipment

| Item | Equipment | Mfr/Brand | Model/Type No. | Series No. | Note |
|------|-----------|-----------|----------------|------------|------|
| 1 | Notebook | DELL | Vostro 5490 | / | AE |

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.

2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.4   Channel List

| CH No. | Frequency (MHz) | CH No. | Frequency (MHz) | CH No. | Frequency (MHz) | CH No. | Frequency (MHz) |
|---|---|---|---|---|---|---|---|
| 0 | 2402 | 1 | 2404 | 2 | 2406 | 3 | 2408 |
| 4 | 2410 | 5 | 2412 | 6 | 2414 | 7 | 2416 |
| 8 | 2418 | 9 | 2420 | 10 | 2422 | 11 | 2424 |
| 12 | 2426 | 13 | 2428 | 14 | 2430 | 15 | 2432 |
| 16 | 2434 | 17 | 2436 | 18 | 2438 | 19 | 2440 |
| 20 | 2442 | 21 | 2444 | 22 | 2446 | 23 | 2448 |
| 24 | 2450 | 25 | 2452 | 26 | 2454 | 27 | 2456 |
| 28 | 2458 | 29 | 2460 | 30 | 2462 | 31 | 2464 |
| 32 | 2466 | 33 | 2468 | 34 | 2470 | 35 | 2472 |
| 36 | 2474 | 37 | 2476 | 38 | 2478 | 39 | 2480 |

4.5   Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

| Test mode | Low channel | Middle channel | High channel |
|---|---|---|---|
| Transmitting(GFSK) | 2402MHz | 2440MHz | 2480MHz |
| Receiving(GFSK) | 2402MHz | 2440MHz | 2480MHz |

4.6   Test Environment

| | |
|---|---|
| Humidity(%): | 54 |
| Atmospheric Pressure(kPa): | 101 |
| Normal Voltage(DC)( V): | 3.3 |
| Normal Temperature(℃) : | 23 |
| Low Temperature(℃) : | 0 |
| High Temperature(℃) : | 40 |

## 5.    TEST FACILITY AND TEST INSTRUMENT USED

### 5.1    Test Facility

All measurement facilities used to collect the measurement data are located at Floor 1&2, Building A, No. 26 of Xinhe Road, Xinqiao Street, Baoan District, Shenzhen China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

### 5.2    Test Instrument Used

RF conduction and RadiationTest equipment

| No. | Equipment | Manufacturer | Model No. | Serial No. | Calibrated until |
|---|---|---|---|---|---|
| 1 | Spectrum Analyzer | Agilent | N9020A | MY52090073 | 2022.08.05 |
| 2 | Power Sensor | Agilent | U2021XA | MY56120032 | 2022.08.05 |
| 3 | Power Sensor | Agilent | U2021XA | MY56120034 | 2022.08.05 |
| 4 | Communication test set | R&S | CMW500 | 108058 | 2022.08.05 |
| 5 | Spectrum Analyzer | R&S | FSP40 | 100550 | 2022.08.05 |
| 6 | Signal Generator | Agilent | N5181A | MY49060920 | 2022.08.16 |
| 7 | Signal Generator | Agilent | N5182A | MY47420195 | 2022.08.05 |
| 8 | Communication test set | Agilent | E5515C | MY50102567 | 2022.08.16 |
| 9 | band rejection filter | Shenxiang | MSF2400-2483.5 MS-1154 | 20181015001 | 2022.08.05 |
| 10 | band rejection filter | Shenxiang | MSF5150-5850M S-1155 | 20181015001 | 2022.08.05 |
| 11 | band rejection filter | Xingbo | XBLBQ-DZA120 | 190821-1-1 | 2022.08.05 |
| 12 | BT&WI-FI Automatic test software | Micowave | MTS8310 | Ver. 2.0.0.0 | 2022.08.05 |
| 13 | Rohde & Schwarz SFU Broadcast Test System | R&S | SFU | 101017 | 2022.08.05 |
| 14 | Temperature humidity chamber | Hongjing | TH-80CH | DG-15174 | 2022.08.05 |
| 15 | 234G Automatic test software | Micowave | MTS8200 | Ver. 2.0.0.0 | 2022.08.05 |
| 16 | 966 chamber | C.R.T. | 966 Room | 966 | 2024.08.11 |
| 17 | Receiver | R&S | ESPI | 100362 | 2022.08.05 |
| 18 | Amplifier | HP | 8447E | 2945A02747 | 2022.08.05 |
| 19 | Amplifier | Agilent | 8449B | 3008A01838 | 2022.08.05 |
| 20 | TRILOG Broadband Antenna | Schwarzbeck | VULB 9163 | 869 | 2022.08.07 |
| 21 | Horn Antenna | Schwarzbeck | BBHA9120D | 1911 | 2022.08.08 |
| 22 | Software | Fala | EZ-EMC | FA-03A2 RE | 2022.08.05 |

| 23 | 3-Loop Antenna | Daze | ZN30401 | 17014 | 2022.08.05 |
|----|----------------|------|----------|-------|------------|
| 24 | loop antenna | ZHINAN | ZN30900A | / | 2022.08.05 |
| 25 | Horn antenna | A/H/System | SAS-574 | 588 | 2022.08.05 |
| 26 | Amplifier | AEROFLEX | / | S/N/ 097 | 2022.08.05 |

## 6.　RF OUTPUT POWER

### 6.1　Block Diagram Of Test Setup
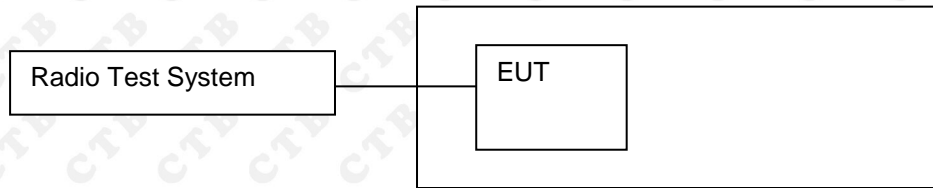


### 6.2　Limit

For adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be 20 dBm.

The maximum RF output power for non-adaptive equipment shall be declared by the supplier and shall not exceed 20 dBm. See clause 5.3.1 m). For non-adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be equal to or less than the value declared by the supplier.

This limit shall apply for any combination of power level and intended antenna assembly.

| Limit |
|-------|
| 20dBm |

### 6.3　Test procedure

**Step 1:**

　　• Use a fast power sensor suitable for 2.4 GHz and capable of minimum 1 MS/s.

　　• Use the following settings:

　　- Sample speed 1 MS/s or faster.

　　- The samples shall represent the RMS power of the signal.

　　- Measurement duration: For non-adaptive equipment: equal to the observation period defined in clause 4.3.1.3.2 or clause 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.

　　NOTE 1: For adaptive equipment, to increase the measurement accuracy, a higher number of bursts may be used.

**Step 2:**

　　• For conducted measurements on devices with one transmit chain:

　　- 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.

　　• For conducted measurements on devices with multiple transmit chains:

　　- Connect one power sensor to each transmit port for a synchronous measurement on all transmit ports.

　　- 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 500 ns.

　　- For each individual sampling point (time domain), sum the coincident power samples of all ports and store them. Use these summed samples in all following steps.

**Step 3:**

　　• Find the start and stop times of each burst in the stored measurement samples.

　　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.

　　NOTE 2: In case of insufficient dynamic range, the value of 30 dB may need to be reduced appropriately.

**Step 4:**

• Between the start and stop times of each individual burst calculate the RMS power over the burst using the formula below. Save these Pburst values, as well as the start and stop times for each burst.

$$P_{burst} = \frac{1}{k} \sum_{n=1}^{k} P_{sample}(n)$$

with 'k' being the total number of samples and 'n' the actual sample number

**Step 5:**

• The highest of all Pburst values (value "A" in dBm) will be used for maximum e.i.r.p. calculations.

**Step 6:**

• Add the (stated) antenna assembly gain "G" in dBi of the individual antenna.

• If applicable, add the additional beamforming gain "Y" in dB.

• If more than one antenna assembly is intended for this power setting, the maximum overall antenna gain (G or G + Y) shall be used.

• The RF Output Power (P) shall be calculated using the formula below:

$$P = A + G + Y$$

• 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.

6.4   Test Result

| Modulation | Test conditions (Temperature) | EIRP (dBm) | | |
|---|---|---|---|---|
| | | Low Channel | Middle Channel | High Channel |
| GFSK | Normal | 3.90 | 3.96 | 3.98 |
| | Low | 3.82 | 3.80 | 3.81 |
| | High | 3.89 | 3.96 | 3.88 |
| Limit | | ≤100mW (20dBm) | | |
| Remark: P = A + G + Y,G=1dBi,x=100% | | | | |

Remark: This Report only show the test plots of the worst case.

| Low Channel |  |
|---|---|
| Mid Channel |  |
| High Channel |  |
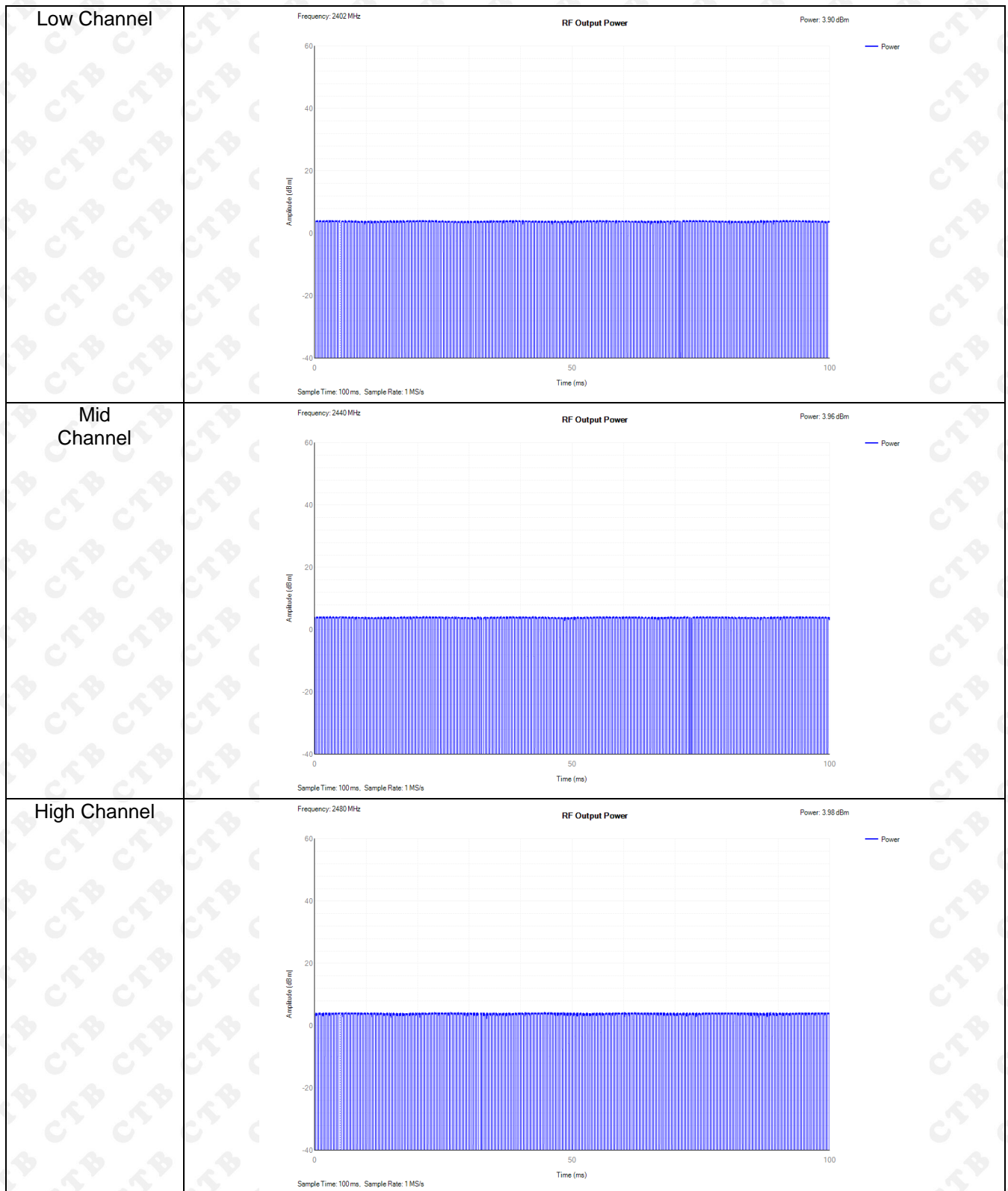
## 7.  POWER SPECTRAL DENSITY

### 7.1  Block Diagram Of Test Setup

```
┌─────────────────────┐         ┌─────────────────┐
│  Radio Test System  │─────────│      EUT        │
└─────────────────────┘         └─────────────────┘
```
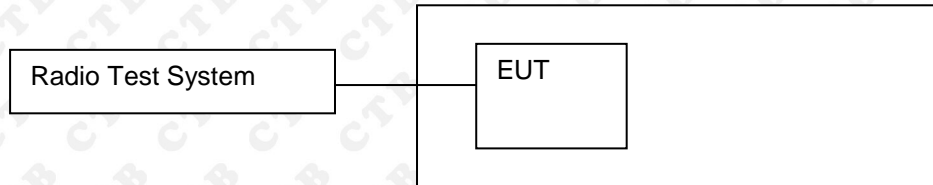
### 7.2  Limit

For equipment using wide band modulations other than FHSS, the maximum Power Spectral Density is limited to 10 dBm per MHz.

| Limit |
|-------|
| 10dBm/MHz |

### 7.3  Test procedure

**Step 1:**

Connect the UUT to the spectrum analyser and use the following settings:

• Start Frequency: 2 400 MHz

• Stop Frequency: 2 483,5 MHz

• Resolution BW: 10 kHz

• Video BW: 30 kHz

• Sweep Points: > 8 350

NOTE: For spectrum analysers not supporting this number of sweep points, the frequency band may be segmented.

• Detector: RMS

• Trace Mode: Max Hold

• Sweep time: 10 s; the sweep time may be increased further until a value where the sweep time has no impact on the RMS value of the signal

For non-continuous signals, wait for the trace to stabilize.

Save the data (trace data) set to a file.

**Step 2:**

For conducted measurements on smart antenna systems using either operating mode 2 or operating mode 3 (see clause 5.1.3.2), repeat the measurement for each of the transmit ports. For each sampling point (frequency domain), add up the coincident power values (in mW) for the different transmit chains and use this as the new data set.

**Step 3:**

Add up the values for power for all the samples in the file using the formula below.

$$P_{Sum} = \sum_{n=1}^{k} P_{sample}(n)$$

with 'k' being the total number of samples and 'n' the actual sample number

**Step 4:**

Normalize the individual values for power (in dBm) so that the sum is equal to the RF Output Power (e.i.r.p.) measured in clause 5.3.2 and save the corrected data. The following formulas can be used:

$$C_{Corr} = P_{Sum} - P_{e.i.r.p.}$$

$$P_{Samplecorr}(n) = P_{Sample}(n) - C_{Corr}$$

with 'n' being the actual sample number

**Step 5:**

Starting from the first sample PSamplecorr(n) (lowest frequency), add up the power (in mW) of the following samples representing a 1 MHz segment and record the results for power and position (i.e. sample #1 to sample #100). This is the Power Spectral Density (e.i.r.p.) for the first 1 MHz segment which shall be recorded.

**Step 6:**

Shift the start point of the samples added up in step 5 by one sample and repeat the procedure in step 5 (i.e. sample #2 to sample #101).

**Step 7:**

Repeat step 6 until the end of the data set and record the Power Spectral Density values for each of the 1 MHz segments.

From all the recorded results, the highest value is the maximum Power Spectral Density for the UUT. This value, which shall comply with the limit given in clause 4.3.2.3.3, shall be recorded in the test report.

## 7.4　Test Result

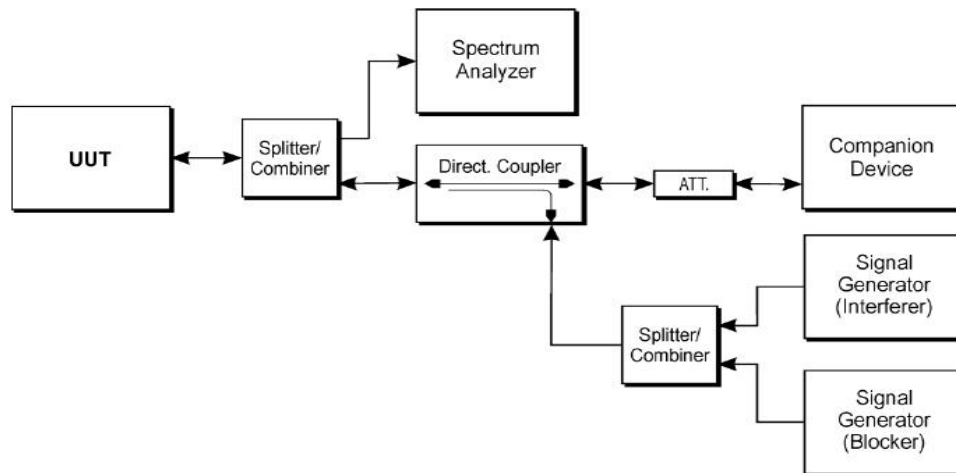| Modulation | Test conditions | Maximum e.i.r.p. Spectral Density (dBm/MHz) | | |
|---|---|---|---|---|
| | | Low Channel | Middle Channel | High Channel |
| GFSK | Normal | 3.84 | 3.9 | 3.92 |
| Limit | | ≤10dBm/MHz | | |

Low Channel

Mid Channel

High Channel
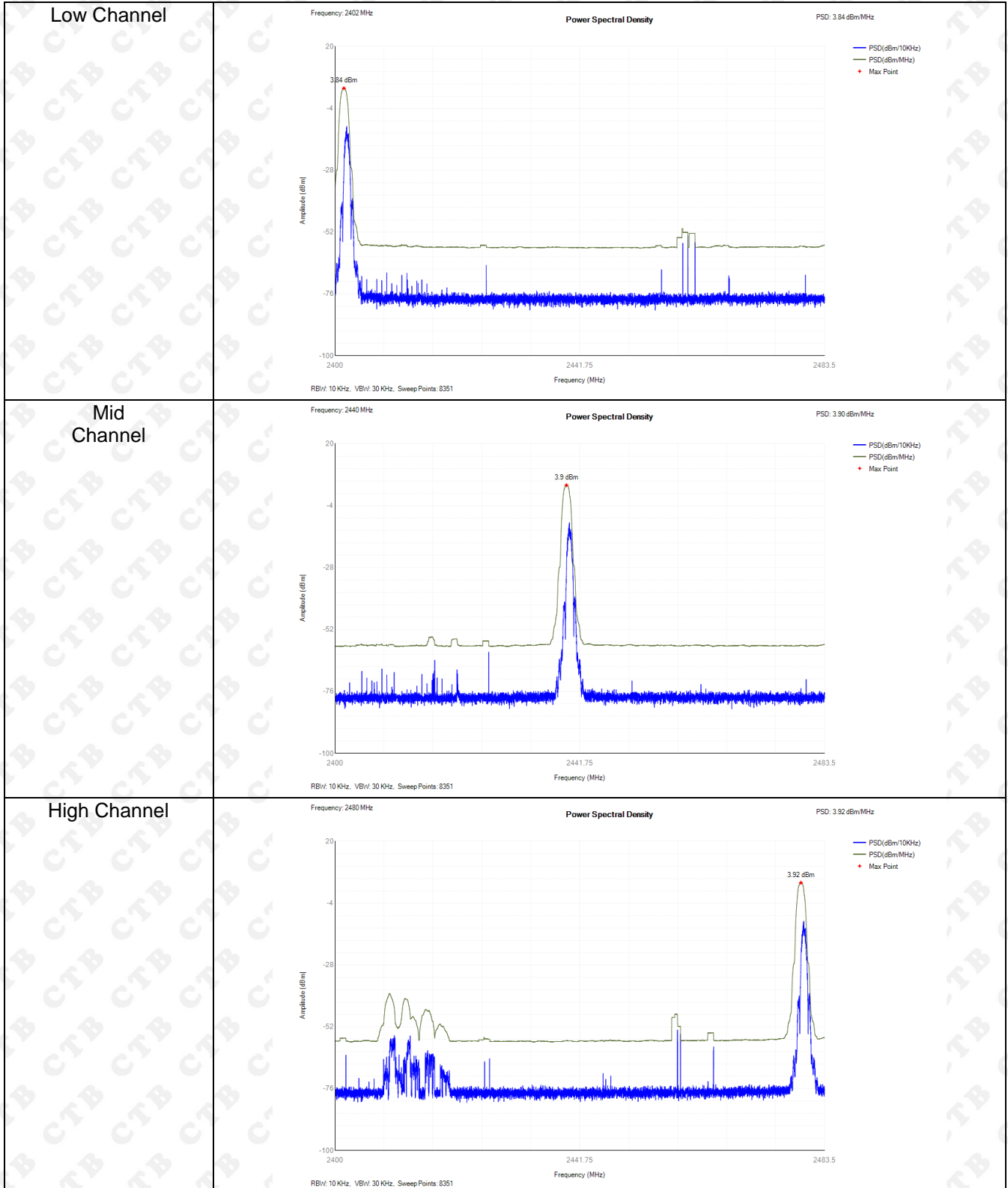
## 8. ADAPTIVITY

### 8.1 Block Diagram Of Test Setup



### 8.2 Limit

The frequency range of the equipment is determined by the lowest and highest

| Non-LBT based Detect and Avoid: |
| --- |
| 　　1 The frequency shall remain unavailable for a minimum time equal to 1 second after which the channel maybe considered again as an 'available' channel;<br>　　2 COT ≤ 40 ms;<br>　　3 Idle Period = 5% of COT;<br>　　4 Detection threshold level = -70dBm/MHz + 20 – Pout E.I.R.P (Pout in dBm); |
| LBT based Detect and Avoid (Frame Based Equipment):<br>　　1 Minimum Clear Channel Assessment (CCA) time = 20 us;<br>　　2 CCA observation time declared by the supplier;<br>　　3 COT = 1~10 ms;<br>　　4 Idle Period = 5% of COT;<br>　　5 Detection threshold level = -70dBm/MHz + 20 – Pout E.I.R.P (Pout in dBm); |
| LBT based Detect and Avoid (Load Based Equipment):<br>　　1 Minimum Clear Channel Assessment (CCA) time = 20 us;<br>　　2 CCA declared by the manufacturer;<br>　　3 COT ≤ (13 / 32) * q ms; q = [4~32]; 1.625ms~13ms;<br>　　4 Detection threshold level = -73dBm/MHz + 20 – Pout E.I.R.P (dBm); |
| Short Control Signalling Transmissions:<br>　　Short Control Signalling Transmissions shall have a maximum duty cycle of 10% within an observation period of 50ms. |

8.3　Test procedure

**Step 1:**

The UUT may connect to a companion device during the test. The interference signal generator, the blocking signal generator, the spectrum analyser, the UUT and the companion device are connected using a set-up equivalent to the example given by figure 5 although the interference and blocking signal generator do not generate any signals at this point in time. The spectrum analyser is used to monitor the transmissions of the UUT in response to the interfering and the blocking signals.

Adjust the received signal level (wanted signal from the companion device) at the UUT to the value defined in table 6

The analyzer shall be set as follows:

- RBW: ≥ Occupied Channel Bandwidth (if the analyser does not support this setting, the highest available setting shall be used)

- VBW: 3 × RBW (if the analyser does not support this setting, the highest available setting shall be used)

- Detector Mode: RMS

- Centre Frequency: Equal to the centre frequency of the operating channel

- Span: 0 Hz

- Sweep time: > Channel Occupancy Time of the UUT

- Trace Mode: Clear/Write

- Trigger Mode: Video

**Step 2:**

Configure the UUT for normal transmissions with a sufficiently high payload to allow demonstration of compliance of the adaptive mechanism on the channel being tested

Using the procedure defined in clause 5.3.7.2.1.4, it shall be verified that the UUT complies with the maximum Channel Occupancy Time and minimum Idle Period

**Step 3: Adding the interference signal**

A 100 % duty cycle interference signal is injected on the current operating channel of the UUT. This interference signal shall be a band limited noise signal which has a flat power spectral density, and shall have a bandwidth greater than the Occupied Channel Bandwidth of the UUT. The maximum ripple of this interfering signal shall be ±1,5 dB within the Occupied Channel Bandwidth and the power spectral density.

**Step 4: Verification of reaction to the interference signal**

The spectrum analyser shall be used to monitor the transmissions of the UUT on the selected operating channel with the interfering signal injected. This may require the spectrum analyser sweep to be triggered by the start of the interfering signal.

Using the procedure defined in clause 5.3.7.2.1.4, it shall be verified that:

The UUT shall stop transmissions on the current operating channel being tested.

Apart from Short Control Signalling Transmissions (see iii) below), there shall be no subsequent transmissions on this operating channel for a (silent) period defined in clause 4.3.2.5.1.2 step 2. After that, the UUT may have normal transmissions again for the duration of a single Channel Occupancy Time period. Because the interference signal is still present, another silent period as defined in clause 4.3.2.5.1.2 step 2 needs to be included. This sequence is repeated as long as the interfering signal is present.

The UUT may continue to have Short Control Signalling Transmissions on the operating channel while the interference signal is present. These transmissions shall comply with the limits

Alternatively, the equipment may switch to a non-adaptive mode

**Step 5: Adding the blocking signal**

With the interfering signal present, a 100 % duty cycle CW signal is inserted as the blocking signal

Repeat step 4 to verify that the UUT does not resume any normal transmissions

**Step 6: Removing the interference and blocking signal**

On removal of the interference and blocking signal the UUT is allowed to start transmissions again on this channel however, it shall be verified that this shall only be done after the period defined in clause 4.3.2.5.1.2 step 2.
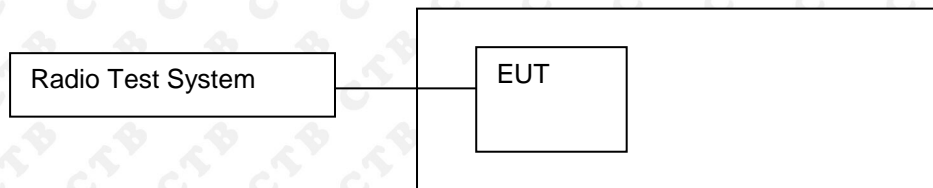
**Step 7:**

The steps 2 to 6 shall be repeated for each of the frequencies to be tested.

8.4　Test Result

Remark: this requirement does not apply for equipment when operating in a mode where the RF Output power is less than 10 dBm e.i.r.p.

## 9.   OCCUPIED CHANNEL BANDWIDTH

9.1   Block Diagram Of Test Setup

| Radio Test System | EUT |
|---|---|

9.2   Limit

The Occupied Channel Bandwidth shall fall completely within the band given in 2.4GHz to 2.4835GHz.
In addition, for non-adaptive systems using wide band modulations other than FHSS and with e.i.r.p greater than 10 dBm, the occupied channel bandwidth shall be less than 20 MHz.

9.3   Test procedure

**Step 1:**

Connect the UUT to the spectrum analyser and use the following settings:

• Centre Frequency: The centre frequency of the channel under test

• Resolution BW:        ~ 1 % of the span without going below 1 %

• Video BW:                3 × RBW

• Frequency Span:    2 × Nominal Channel Bandwidth

• Detector Mode: RMS

• Trace Mode: Max Hold

• Sweep time: 1 s

**Step 2:**

Wait for the trace to stabilize.

Find the peak value of the trace and place the analyser marker on this peak.

**Step 3:**
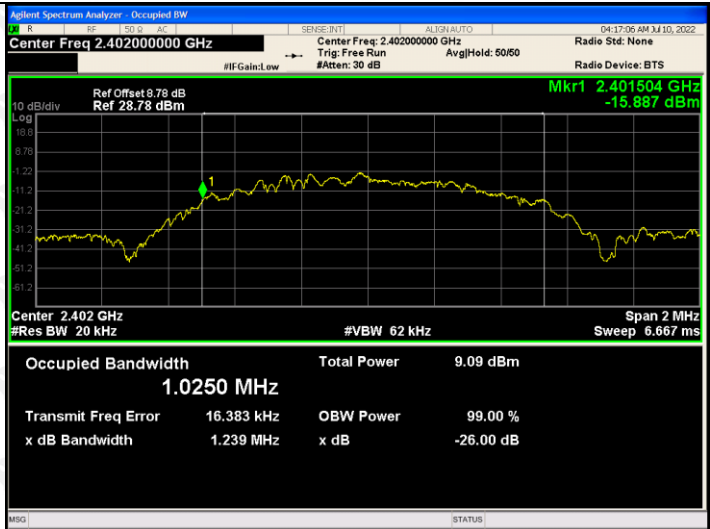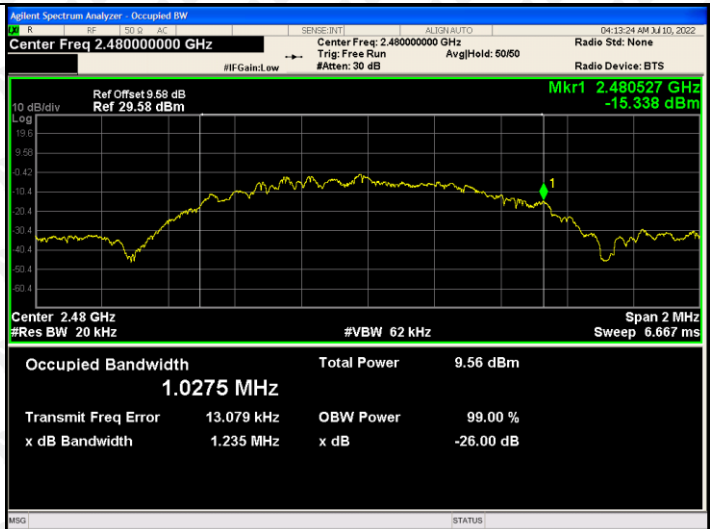
Use the 99 % bandwidth function of the spectrum analyser to measure the Occupied Channel Bandwidth of the UUT.

This value shall be recorded.

NOTE: 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.

9.4   Test Result

| Modulation | Frequency (MHz) | Frequency Range (MHz) | | Occupied Channel (MHz) |
|---|---|---|---|---|
| GFSK | Low | 2402.016 | / | 1.025 |
| | High | / | 2480.013 | 1.028 |

| | |
|---|---|
| Low Channel |  |
| High Channel |  |

## 10. TRANSMITTER UNWANTED EMISSIONS IN THE OUT-OF-BAND DOMAIN

### 10.1　Block Diagram Of Test Setup



### 10.2　Limit



A: -10 dBm/MHz e.i.r.p.
B: -20 dBm/MHz e.i.r.p.
C: Spurious Domain limits

BW = Occupied Channel Bandwidth in MHz or 1 MHz whichever is greater
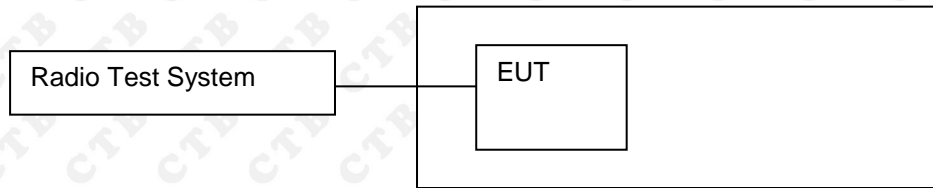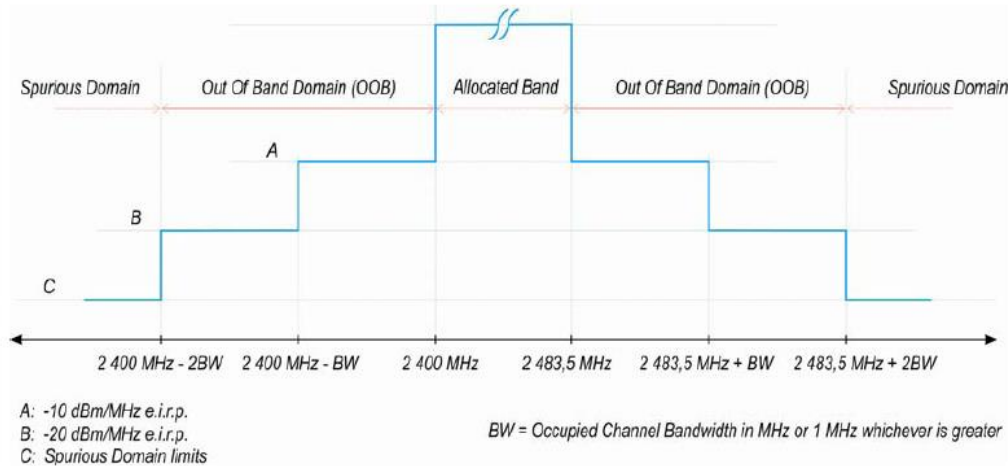
**Figure 3: Transmit mask**

### 10.3　Test procedure

The applicable mask is defined by the measurement results from the tests performed under clause 5.3.8 (Occupied Channel Bandwidth).

The test procedure is further as described under clause 5.3.9.2.1.

The Out-of-band emissions within the different horizontal segments of the mask provided in figures 1 and 3 shall be measured using the steps below. This method assumes the spectrum analyser is equipped with the Time Domain Power option.

**Step 1:**

• Connect the UUT to the spectrum analyser and use the following settings:

- Centre Frequency: 2 484 MHz

- Span: 0 Hz

- Resolution BW: 1 MHz

- Filter mode: Channel filter

- Video BW: 3 MHz

- Detector Mode: RMS

- Trace Mode: Max Hold

- Sweep Mode: Continuous

- Sweep Points: Sweep Time [s] / (1 µs) or 5 000 whichever is greater

- Trigger Mode: Video trigger

NOTE 1: In case video triggering is not possible, an external trigger source may be used.

- Sweep Time: > 120 % of the duration of the longest burst detected during the measurement of the RF Output Power

**Step 2 (segment 2 483,5 MHz to 2 483,5 MHz + BW):**

• Adjust the trigger level to select the transmissions with the highest power level.

• 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.

• 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.

• 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.

• 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).

**Step 3 (segment 2 483,5 MHz + BW to 2 483,5 MHz + 2BW):**

• 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).

**Step 4 (segment 2 400 MHz - BW to 2 400 MHz):**

• 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).

**Step 5 (segment 2 400 MHz - 2BW to 2 400 MHz - BW):**

• 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).

**Step 6:**

• 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 figure 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.

• 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. Comparison with the applicable limits shall be done using any of the options given below:

- 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.

- Option 2: the limits provided by the mask given in figure 1 or figure 3 shall be reduced by

$10 \times \log10(Ach)$ and the additional beamforming gain "Y" in dB. The results for each of the transmit chains shall be individually compared with these reduced limits.

NOTE 2: Ach refers to the number of active transmit chains.

It shall be recorded whether the equipment complies with the mask provided in figure 1 or figure 3.

10.4   Test Result

| Low Channel | | | | |
|---|---|---|---|---|
| **Test Freq (MHz)** | **Antenna** | **Freq(MHz)** | **Level** | **Limit** |
| 2402 | Antenna 1 | 2399.475 | -49.67 | -10 |
| 2402 | Antenna 1 | 2398.475 | -51.6 | -20 |



| High Channel | | | | |
|---|---|---|---|---|
| **Test Freq (MHz)** | **Antenna** | **Freq(MHz)** | **Level** | **Limit** |
| 2480 | Antenna 1 | 2484.028 | -50.68 | -10 |
| 2480 | Antenna 1 | 2485.028 | -50.79 | -20 |
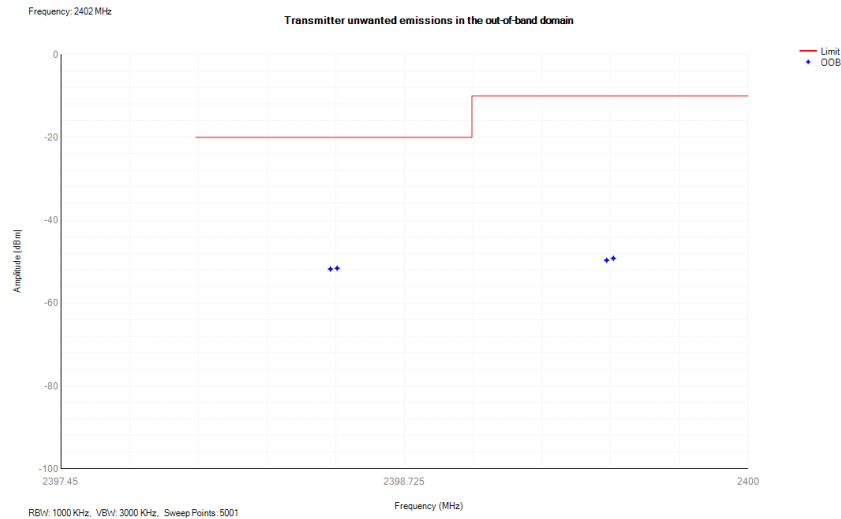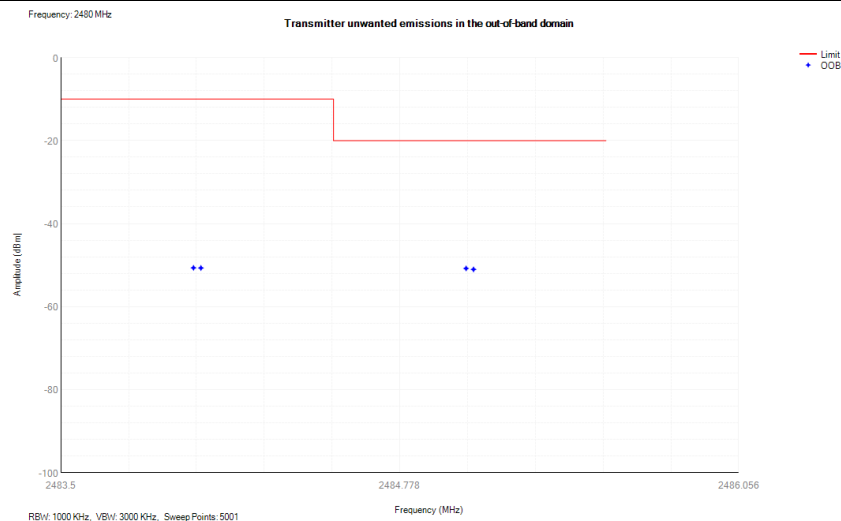
## 11. TRANSMITTER UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN

### 11.1 Block Diagram Of Test Setup



| Below 1GHz | Above 1GHz |
| --- | --- |
| Below 1GHz | Above 1GHz |
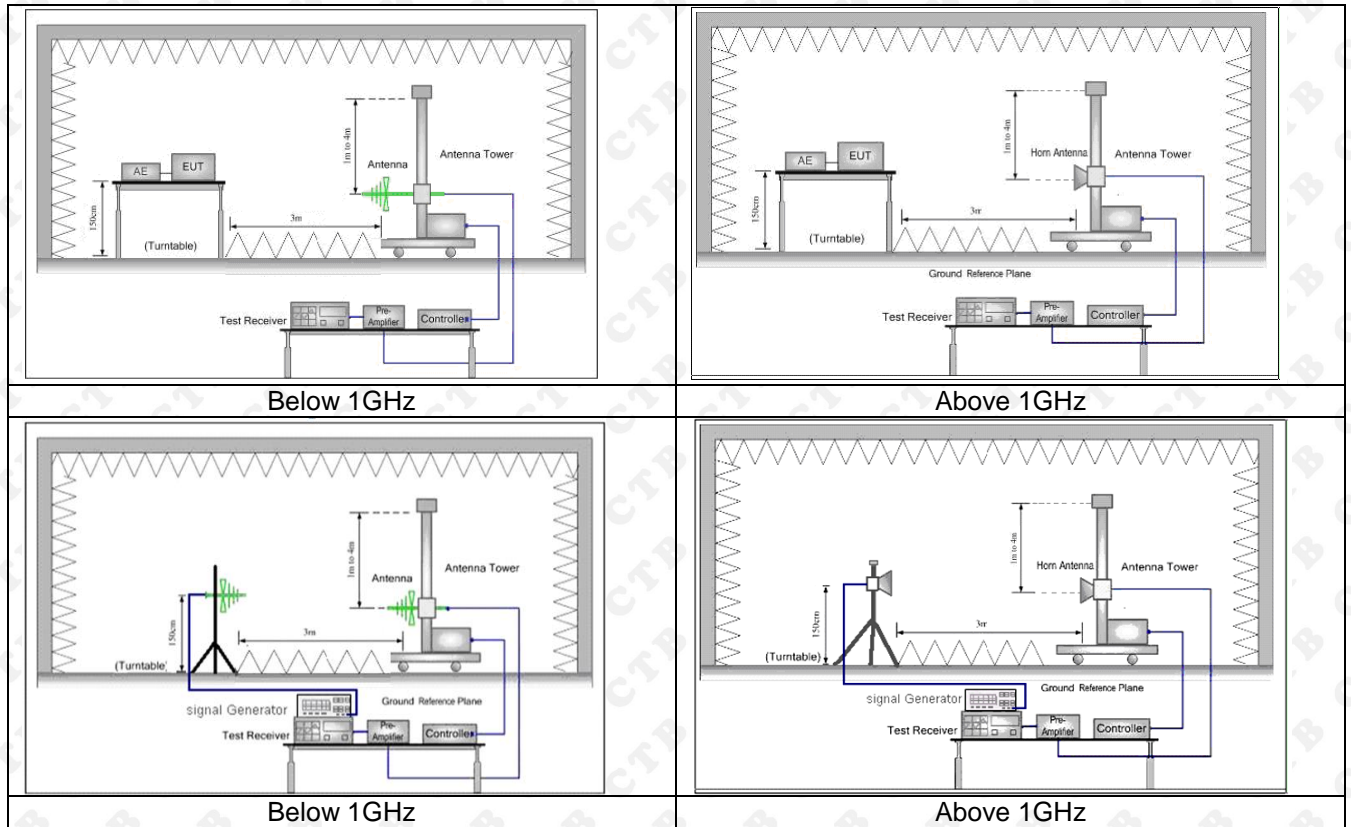
### 11.2 Limits

| Frequency range | Maximum power, e.r.p. (≤ 1 GHz) e.i.r.p. (> 1 GHz) | RBW/VBW |
| --- | --- | --- |
| 30 MHz to 47 MHz | -36 dBm | 100 kHz/300KHz |
| 47 MHz to 74 MHz | -54 dBm | 100 kHz/300KHz |
| 74 MHz to 87,5 MHz | -36 dBm | 100 kHz/300KHz |
| 87,5 MHz to 118 MHz | -54 dBm | 100 kHz/300KHz |
| 118 MHz to 174 MHz | -36 dBm | 100 kHz/300KHz |
| 174 MHz to 230 MHz | -54 dBm | 100 kHz/300KHz |
| 230 MHz to 470 MHz | -36 dBm | 100 kHz/300KHz |
| 470 MHz to 694 MHz | -54 dBm | 100 kHz/300KHz |
| 694 MHz to 1 GHz | -36 dBm | 100 kHz/300KHz |
| 1 GHz to 12,75 GHz | -30 dBm | 1 MHz/3MHz |

### 11.3 Test Procedure

1. Scan from 30MHz to 12.75GHz, find the maximum radiation frequency to measure.
2. The technique used to find the Spurious Emissions of the transmitter was the antenna substitution method. Substitution method was performed to determine the actual ERP/EIRP emission levels of the EUT.
Test procedure as below:

1) The EUT was powered ON and placed on a 1.5m high table at a 3 meter fully Anechoic Chamber. The antenna of the transmitter was extended to its maximum length. modulation   mode and the measuring receiver shall be tuned to the frequency of the transmitter under test.
2) The EUT was set 3 meters(above 18GHz the distance is 1 meter) away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3) The disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.
4) Steps 1) to 3) were performed with the EUT and the receive antenna in both vertical and horizontal polarization.
5) The transmitter was then removed and replaced with another antenna. The center of the antenna was approximately at the same location as the center of the transmitter.
6) A signal at the disturbance was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 3) is obtained for this set of conditions.
7) The output power into the substitution antenna was then measured.
8) Steps 6) and 7)were repeated with both antennas polarized.
9) Calculate power in dBm by the following formula:

$ERP(dBm) = P_{SG} (dBm) – cable loss (dB) + antenna gain (dBd)$

$EIRP(dBm) = P_{SG} (dBm) – cable loss (dB) + antenna gain (dBi)$

$EIRP = ERP + 2.15 dB$

where:

$P_{SG}$ is the generator output power into the substitution antenna.

10) Test the EUT in the lowest channel , the Highest channel

Repeat above procedures until all frequencies measured was complete.

11.4  Test Results

Below 1GHz

| Freq (MHz) | Rd_level (dBm) | Factor (dB) | Level (dBm) | Limit (dBm) | Over (dB) | detector | Height | Degree | Antenna polarization |
|---|---|---|---|---|---|---|---|---|---|
| Low Channel | | | | | | | | | |
| 46.125 | -55.04 | -11.98 | -67.02 | -36.00 | -31.02 | peak | 1.6 | 3 | H |
| 66.077 | -55.09 | -12.41 | -67.50 | -54.00 | -13.50 | peak | 1.2 | 32 | H |
| 103.595 | -56.13 | -11.70 | -67.83 | -54.00 | -13.83 | peak | 1.2 | 336 | H |
| 218.605 | -53.10 | -11.00 | -64.10 | -54.00 | -10.10 | peak | 1.7 | 266 | H |
| 328.467 | -53.33 | -9.51 | -62.84 | -36.00 | -26.84 | peak | 1.4 | 336 | H |
| 871.172 | -51.85 | -0.64 | -52.50 | -36.00 | -16.50 | peak | 1.7 | 211 | H |
| 47.324 | -54.87 | -12.23 | -67.11 | -36.00 | -31.11 | peak | 1.1 | 305 | V |
| 100.031 | -55.19 | -11.89 | -67.08 | -54.00 | -13.08 | peak | 1.7 | 160 | V |
| 183.459 | -55.52 | -12.41 | -67.93 | -54.00 | -13.93 | peak | 1.1 | 268 | V |
| 219.431 | -53.33 | -10.45 | -63.79 | -54.00 | -9.79 | peak | 1.8 | 140 | V |
| 326.208 | -53.53 | -9.49 | -63.01 | -36.00 | -27.01 | peak | 1.8 | 31 | V |
| 871.780 | -52.32 | 0.17 | -52.15 | -36.00 | -16.15 | peak | 1.6 | 238 | V |
| High Channel | | | | | | | | | |
| 46.119 | -54.99 | -11.98 | -66.96 | -36.00 | -30.96 | peak | 1.3 | 206 | H |
| 67.541 | -54.83 | -11.83 | -66.66 | -54.00 | -12.66 | peak | 1.8 | 148 | H |
| 104.722 | -55.44 | -12.48 | -67.92 | -54.00 | -13.92 | peak | 1.5 | 251 | H |
| 219.539 | -53.20 | -11.06 | -64.26 | -54.00 | -10.26 | peak | 1.1 | 107 | H |
| 328.311 | -53.22 | -9.98 | -63.20 | -36.00 | -27.20 | peak | 1.9 | 353 | H |
| 871.231 | -52.45 | -0.46 | -52.91 | -36.00 | -16.91 | peak | 1.3 | 177 | H |
| 46.672 | -55.54 | -12.59 | -68.13 | -36.00 | -32.13 | peak | 1.7 | 24 | V |
| 100.363 | -54.95 | -12.27 | -67.21 | -54.00 | -13.21 | peak | 1.9 | 300 | V |
| 182.440 | -55.47 | -12.44 | -67.90 | -54.00 | -13.90 | peak | 1.8 | 286 | V |
| 218.942 | -53.32 | -10.68 | -64.00 | -54.00 | -10.00 | peak | 1.6 | 206 | V |
| 326.954 | -52.66 | -9.43 | -62.09 | -36.00 | -26.09 | peak | 1.0 | 14 | V |
| 871.790 | -52.61 | -0.25 | -52.86 | -36.00 | -16.86 | peak | 1.1 | 304 | V |

Remark:

Absolute Level = Receiver Reading + Factor

Factor = Antenna Factor + Cable Loss – Pre-amplifier

Above 1G:

| Freq (MHz) | Rd_level (dBm) | Factor (dB) | Level (dBm) | Limit (dBm) | Over (dB) | detector | Height | Degree | Antenna polarization |
|---|---|---|---|---|---|---|---|---|---|
| Low Channel | | | | | | | | | |
| 4804 | -54.34 | 8.41 | -45.93 | -30.00 | -15.93 | peak | 1.5 | 323 | H |
| 7206 | -52.35 | 12.55 | -39.80 | -30.00 | -9.80 | peak | 1.4 | 207 | H |
| 4804 | -54.89 | 8.41 | -46.48 | -30.00 | -16.48 | peak | 1.1 | 344 | V |
| 7206 | -51.77 | 12.55 | -39.22 | -30.00 | -9.22 | peak | 1.0 | 358 | V |
| High Channel | | | | | | | | | |
| 4960 | -54.59 | 8.51 | -46.08 | -30.00 | -16.08 | peak | 1.4 | 279 | H |
| 7440 | -52.50 | 12.69 | -39.81 | -30.00 | -9.81 | peak | 1.6 | 68 | H |
| 4960 | -54.46 | 8.51 | -45.95 | -30.00 | -15.95 | peak | 1.0 | 306 | V |
| 7440 | -52.20 | 12.69 | -39.51 | -30.00 | -9.51 | peak | 1.5 | 152 | V |

Remark:
Absolute Level = Receiver Reading + Factor
Factor = Antenna Factor + Cable Loss – Pre-amplifier

## 12. RECEIVER SPURIOUS EMISSIONS

### 12.1 Block Diagram Of Test Setup



| Below 1GHz | Above 1GHz |
|---|---|



| Below 1GHz | Above 1GHz |
|---|---|
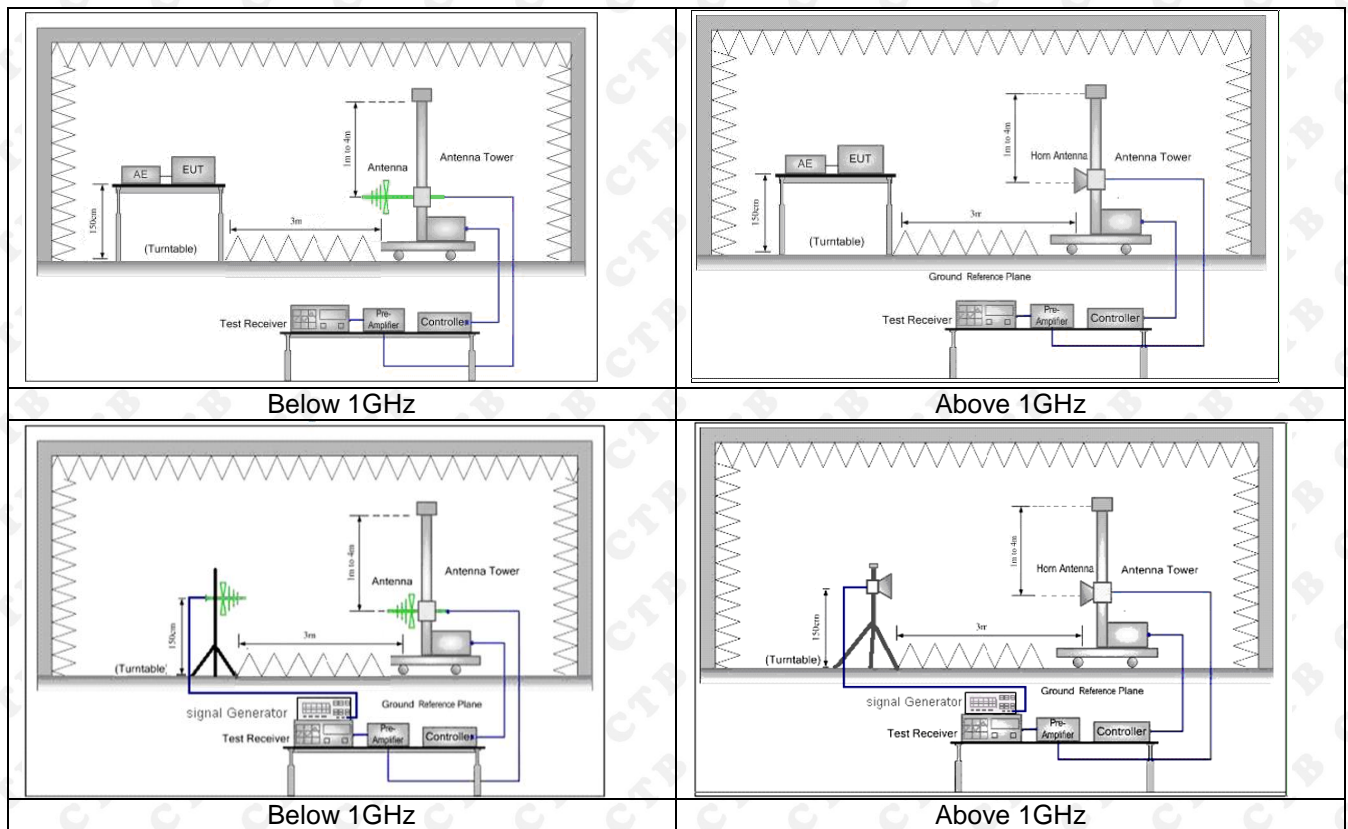
### 12.2 Limits

| Frequency(MHz) | Limit |
|---|---|
| 30-1000 | -57dBm |
| 1000-12750 | -47dBm |

12.3　　　　　Test Procedure

1. Scan from 30MHz to 12.75GHz, find the maximum radiation frequency to measure.
2. The technique used to find the Spurious Emissions of the transmitter was the antenna substitution method. Substitution method was performed to determine the actual ERP/EIRP emission levels of the EUT.
Test procedure as below:
1) The EUT was powered ON and placed on a 1.5m hight table    at a 3 meter fully Anechoic Chamber. The antenna of the transmitter was extended to its maximum length. modulation    mode and the measuring receiver shall be tuned to the frequency of the transmitter under test.
2) The EUT was set 3 meters(above 18GHz the distance is 1 meter) away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3) The disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.
4) Steps 1) to 3) were performed with the EUT and the receive antenna in both vertical and horizontal polarization.
5) The transmitter was then removed and replaced with another antenna. The center of the antenna was approximately at the same location as the center of the transmitter.
6) A signal at the disturbance was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 3) is obtained for this set of conditions.
7) The output power into the substitution antenna was then measured.
8) Steps 6) and 7)were repeated with both antennas polarized.
9) Calculate power in dBm by the following formula:
　　　　ERP(dBm) = $P_{SG}$ (dBm) – cable loss (dB) + antenna gain (dBd)
　　　　EIRP(dBm) = $P_{SG}$ (dBm) – cable loss (dB) + antenna gain (dBi)
　　　　EIRP=ERP+2.15dB
　　where:
　　　　　$P_{SG}$ is the generator output power into the substitution antenna.
11) Test the EUT in the lowest channel , the Highest channel
Repeat above procedures until all frequencies measured was complete.

12.4  Test Results

Below 1GHz

| Freq (MHz) | Rd_level (dBm) | Factor (dB) | Level (dBm) | Limit (dBm) | Over (dB) | detector | Height | Degree | Antenna polarization |
|---|---|---|---|---|---|---|---|---|---|
| Low Channel | | | | | | | | | |
| 45.568 | -60.48 | -11.93 | -72.41 | -57.00 | -15.41 | peak | 1.7 | 176 | H |
| 67.234 | -60.87 | -12.08 | -72.95 | -57.00 | -15.95 | peak | 1.1 | 135 | H |
| 103.819 | -60.73 | -12.28 | -73.02 | -57.00 | -16.02 | peak | 1.4 | 257 | H |
| 219.675 | -62.10 | -10.94 | -73.04 | -57.00 | -16.04 | peak | 1.7 | 174 | H |
| 327.265 | -61.47 | -9.45 | -70.93 | -57.00 | -13.93 | peak | 1.8 | 252 | H |
| 869.576 | -69.38 | 0.03 | -69.35 | -57.00 | -12.35 | peak | 1.3 | 187 | H |
| 48.235 | -60.11 | -12.51 | -72.62 | -57.00 | -15.62 | peak | 1.2 | 171 | V |
| 101.121 | -60.87 | -12.06 | -72.92 | -57.00 | -15.92 | peak | 1.8 | 211 | V |
| 183.516 | -62.68 | -12.57 | -75.25 | -57.00 | -18.25 | peak | 1.7 | 335 | V |
| 218.393 | -60.83 | -10.83 | -71.66 | -57.00 | -14.66 | peak | 1.6 | 323 | V |
| 327.004 | -59.47 | -10.29 | -69.76 | -57.00 | -12.76 | peak | 1.9 | 51 | V |
| 870.089 | -69.65 | 0.14 | -69.51 | -57.00 | -12.51 | peak | 1.3 | 124 | V |
| High Channel | | | | | | | | | |
| 44.497 | -60.36 | -12.42 | -72.78 | -57.00 | -15.78 | peak | 1.2 | 231 | H |
| 67.591 | -60.78 | -12.34 | -73.12 | -57.00 | -16.12 | peak | 1.1 | 82 | H |
| 103.880 | -60.85 | -11.94 | -72.79 | -57.00 | -15.79 | peak | 1.7 | 326 | H |
| 219.407 | -62.77 | -11.27 | -74.04 | -57.00 | -17.04 | peak | 1.7 | 116 | H |
| 327.086 | -61.27 | -10.30 | -71.56 | -57.00 | -14.56 | peak | 1.3 | 350 | H |
| 869.806 | -68.92 | -0.19 | -69.11 | -57.00 | -12.11 | peak | 1.5 | 311 | H |
| 47.419 | -60.15 | -12.22 | -72.38 | -57.00 | -15.38 | peak | 1.7 | 100 | V |
| 101.581 | -61.50 | -11.93 | -73.43 | -57.00 | -16.43 | peak | 1.0 | 286 | V |
| 182.820 | -62.67 | -12.52 | -75.19 | -57.00 | -18.19 | peak | 1.4 | 251 | V |
| 218.789 | -61.21 | -10.65 | -71.86 | -57.00 | -14.86 | peak | 1.7 | 71 | V |
| 327.409 | -59.12 | -9.74 | -68.86 | -57.00 | -11.86 | peak | 1.8 | 174 | V |
| 870.723 | -70.30 | 0.06 | -70.25 | -57.00 | -13.25 | peak | 1.7 | 227 | V |

Remark:

Absolute Level = Receiver Reading + Factor

Factor = Antenna Factor + Cable Loss – Pre-amplifier

Above 1G:

| Freq (MHz) | Rd_level (dBm) | Factor (dB) | Level (dBm) | Limit (dBm) | Over (dB) | detector | Height | Degree | Antenna polarization |
|---|---|---|---|---|---|---|---|---|---|
| Low Channel | | | | | | | | | |
| 2248.45 | -61.29 | 3.12 | -58.17 | -47.00 | -11.17 | peak | 1.9 | 57 | H |
| 2248.85 | -60.20 | 3.16 | -57.03 | -47.00 | -10.03 | peak | 1.9 | 246 | V |
| High Channel | | | | | | | | | |
| 2443.40 | -59.73 | 3.52 | -56.21 | -47.00 | -9.21 | peak | 1.1 | 340 | H |
| 2443.74 | -62.47 | 3.57 | -58.90 | -47.00 | -11.90 | peak | 1.4 | 161 | V |

Remark:
Absolute Level = Receiver Reading + Factor
Factor = Antenna Factor + Cable Loss – Pre-amplifier

## 13. RECEIVER BLOCKING

### 13.1 Block Diagram Of Test Setup
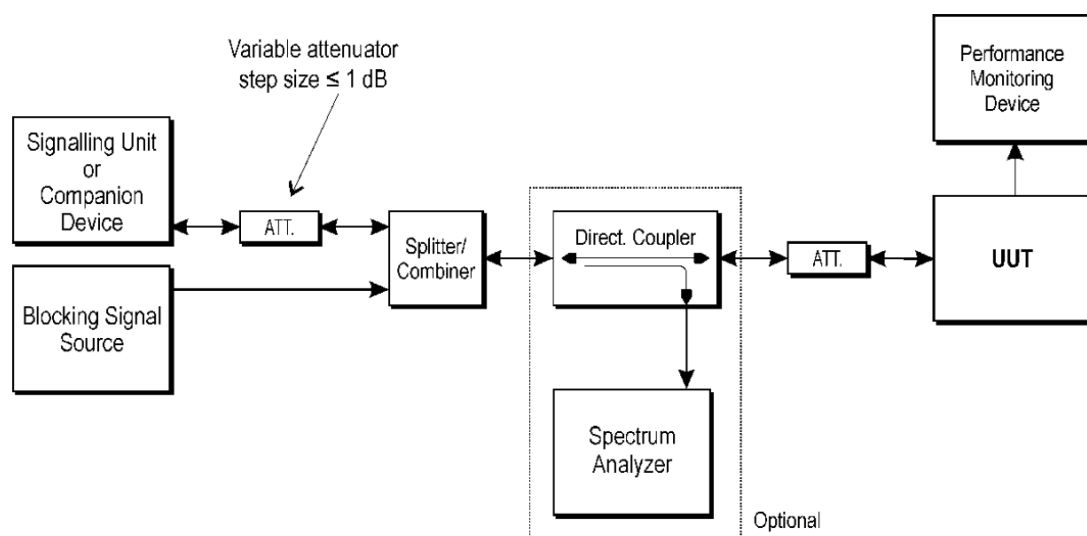


### 13.2 Limit

#### Table 14: 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 2 504 | | |
| (-139 dBm + 10 × log$_{10}$(OCBW)) or -74 dBm whichever is less (see note 3) | 2 300 2 330 2 360 2 524 2 584 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.

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 15: 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 + $10 \times \log_{10}$(OCBW) + 10 dB) or ($-74$ dBm + 10 dB) whichever is less (see note 2) | 2 380 2 504 2 300 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 16: 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 + $10 \times \log_{10}$(OCBW) + 20 dB) or ($-74$ dBm + 20 dB) whichever is less (see note 2) | 2 380 2 504 2 300 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 $P_{min}$ + 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.

### 13.3　Test procedure

Refer to ETSI EN 300 328 V2.2.2 (2020-07) Clause 5.4.11.2.

13.4   Test Result

| Receiver Category 2 | | | | | |
|---|---|---|---|---|---|
| Transmitting | $P_{min}$(dBm) | Blocking Frequency(MHz) | Blocking Power(dB) | Measured PER(%) | Limit (%) |
| 2402 | -64 | 2380 | -34 | 0.28 | 10 |
| 2402 | -64 | 2504 | -34 | 0.44 | 10 |
| 2402 | -64 | 2300 | -34 | 0.31 | 10 |
| 2402 | -64 | 2584 | -34 | 0.43 | 10 |
| 2441 | -64 | 2380 | -34 | 0.42 | 10 |
| 2441 | -64 | 2504 | -34 | 0.45 | 10 |
| 2441 | -64 | 2300 | -34 | 0.51 | 10 |
| 2441 | -64 | 2584 | -34 | 0.50 | 10 |
| 2480 | -64 | 2380 | -34 | 0.76 | 10 |
| 2480 | -64 | 2504 | -34 | 0.67 | 10 |
| 2480 | -64 | 2300 | -34 | 0.34 | 10 |
| 2480 | -64 | 2584 | -34 | 0.33 | 10 |
| Note:This report only shows the worst case test data. | | | | | |

## 14.  EUT PHOTOGRAPHS

Refer to Report No.: CTB220711032REX for EUT external and internal photos.

## 15. EUT TEST SETUP PHOTOGRAPHS

Spurious emissions



※※※※※ **END OF REPORT** ※※※※※