

# SPECTRUM REPORT (Bluetooth)

**Applicant:****Address of Applicant:****Manufacturer/Factory:****Address of****Manufacturer/Factory:****Equipment Under Test (EUT)**

Product Name: Bluetooth headphone

Model No.: B1

**Applicable standards:** ETSI EN 300 328 V2.1.1 (2016-11)**Date of sample receipt:** December 25, 2017**Date of Test:** December 26, 2017-January 02, 2018**Date of report issue:** January 02, 2018**Test Result :** PASS \*

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

The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EC Declaration of Conformity and compliance with all relevant EC Directives. The protection requirements with respect to electromagnetic compatibility contained in Directive 2014/53/EU are considered.

**Robinson Lo****Laboratory Manager**

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

## 2 Version

| Version No. | Date             | Description |
|-------------|------------------|-------------|
| 00          | January 02, 2018 | Original    |
|             |                  |             |
|             |                  |             |
|             |                  |             |
|             |                  |             |

**Prepared By:**

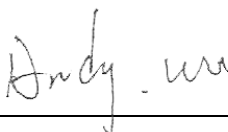


**Date:**

January 02, 2018

**Project Engineer**

**Check By:**



**Date:**

January 02, 2018

**Reviewer**

## 3 Contents

|   | Page |
|---|------|
| 1 COVER PAGE .....  | 1    |
| 2 VERSION .....   | 2    |
| 3 CONTENTS .....  | 3    |
| 4 TEST SUMMARY .....  | 4    |
| 5 GENERAL INFORMATION .....                                       | 5    |
| 5.1 GENERAL DESCRIPTION OF EUT .....                              | 5    |
| 5.2 TEST FACILITY .....   | 7    |
| 5.3 TEST LOCATION .....   | 7    |
| 5.4 DESCRIPTION OF SUPPORT UNITS .....                            | 7    |
| 5.5 DEVIATION FROM STANDARDS.....                                 | 7    |
| 5.6 ABNORMALITIES FROM STANDARD CONDITIONS.....                   | 7    |
| 5.7 OTHER INFORMATION REQUESTED BY THE CUSTOMER.....              | 7    |
| 6 TEST INSTRUMENTS LIST .....                                     | 8    |
| 7 RADIO TECHNICAL SPECIFICATION IN ETSI EN 300 328 .....          | 10   |
| 7.1 TEST ENVIRONMENT AND MODE.....                                | 10   |
| 7.2 TRANSMITTER REQUIREMENT.....                                  | 11   |
| 7.2.1 RF Output Power .....                                       | 11   |
| 7.2.1 Power Spectral Density.....                                 | 14   |
| 7.2.2 Occupied Channel Bandwidth.....                             | 16   |
| 7.2.3 Transmitter unwanted emissions in the OOB domain.....       | 18   |
| 7.2.4 Transmitter unwanted emissions in the spurious domain ..... | 21   |
| 7.3 RECEIVER REQUIREMENT .....                                    | 26   |
| 7.3.1 Spurious Emissions.....                                     | 26   |
| 7.3.2 Receiver Blocking .....                                     | 30   |
| 8 TEST SETUP PHOTO .....  | 32   |
| 9 EUT CONSTRUCTIONAL DETAILS.....                                 | 32   |

## 4 Test Summary

| Radio Spectrum Matter (RSM) Part of Tx                |                  |                    |  |             |        |
|---|------------------|--------------------|--|-------------|--------|
| Test  | Test Requirement | Test method        | Limit/Severity   | Uncertainty | Result |
| RF Output Power                                       | Clause 4.3.2.2   | Clause 5.4.2.2     | 20dBm  | ±1.5dB      | PASS   |
| Power Spectral Density                                | Clause 4.3.2.3   | Clause 5.4.3.2     | 10dBm/MHz  | ±3dB        | PASS   |
| Duty Cycle, Tx-sequence, Tx-gap                       | Clause 4.3.2.4   | Clause 5.4.2.2.1.3 | Clause 4.3.2.4.3   | ±5 %        | N/A    |
| Medium Utilisation (MU) factor                        | Clause 4.3.2.5   | Clause 5.4.2.2.1.4 | ≤ 10%  | ±5 %        | N/A    |
| Adaptivity  | Clause 4.3.2.6   | Clause 5.4.6.2     | Clause 4.3.2.6.2.2 & Clause 4.3.2.6.3.2 & Clause 4.3.2.6.4.2 | --          | N/A    |
| Occupied Channel Bandwidth                            | Clause 4.3.2.7   | Clause 5.4.7.2     | Clause 4.3.2.7.3   | ±5 %        | PASS   |
| Transmitter unwanted emissions in the OOB domain      | Clause 4.3.2.8   | Clause 5.4.8.2     | Clause 4.3.2.8.3   | ±3dB        | PASS   |
| Transmitter unwanted emissions in the spurious domain | Clause 4.3.2.9   | Clause 5.4.9.2     | Clause 4.3.2.9.3   | ±6dB        | PASS   |
| Radio Spectrum Matter (RSM) Part of Rx                |                  |                    |  |             |        |
| Receiver spurious emissions                           | Clause 4.3.2.10  | Clause 5.4.10.2    | Clause 4.3.2.10.3  | ±6dB        | PASS   |
| Receiver Blocking                                     | Clause 4.3.2.11  | Clause 5.4.11.2    | Clause 4.3.2.11.4  | --          | PASS   |
| Geo-location capability                               | Clause 4.3.2.12  | --                 | --   | --          | 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:          | Bluetooth headphone  |
| Model No.:             | B1   |
| Operation Frequency:   | 2402~2480MHz   |
| Channel numbers:       | 40   |
| Channel separation:    | 2MHz   |
| Modulation technology: | GFSK   |
| Antenna Type:          | Integral antenna   |
| Antenna gain:          | 0.0dBi(declare by Applicant)                                       |
| Power Supply:          | Rechargeable battery:DC3.7V , 250mAh<br>Battery charge by USB DC5V |

| Operation Frequency each of channel |           |         |           |         |           |         |           |
|-------------------------------------|-----------|---------|-----------|---------|-----------|---------|-----------|
| Channel                             | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
| 1                                   | 2402MHz   | 11      | 2422MHz   | 21      | 2442MHz   | 31      | 2462MHz   |
| 2                                   | 2404MHz   | 12      | 2424MHz   | 22      | 2444MHz   | 32      | 2464MHz   |
| ⋮                                   | ⋮         | ⋮       | ⋮         | ⋮       | ⋮         | ⋮       | ⋮         |
| 9                                   | 2418MHz   | 19      | 2438MHz   | 29      | 2458MHz   | 39      | 2478MHz   |
| 10                                  | 2420MHz   | 20      | 2440MHz   | 30      | 2460MHz   | 40      | 2480MHz   |

The test frequencies are below:

| Channel  | Frequency (MHz) |
|----------|-----------------|
| Lowest:  | 2402            |
| Middle:  | 2440            |
| Highest: | 2480            |

## 5.2 Test Facility

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

- **Industry Canada (IC) —Registration No.: 9079A-2**

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. Has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-2, August 15, 2016.

## 5.3 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

Address: No. 301-309, 3/F., Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

Tel: 0755-27798480

Fax: 0755-27798960

## 5.4 Description of Support Units

The EUT has been tested as an independent unit.

## 5.5 Deviation from Standards

None.

## 5.6 Abnormalities from Standard Conditions

None.

## 5.7 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 | 9.0(L)*6.0(W)* 6.0(H) | GTS250        | July. 03 2015       | July. 02 2020           |
| 2                  | Control Room                         | ZhongYu Electron | 6.2(L)*2.5(W)* 2.4(H) | GTS251        | N/A                 | N/A                     |
| 3                  | ESU EMI Test Receiver                | R&S              | ESU26                 | GTS203        | June. 28 2017       | June. 27 2018           |
| 4                  | BiConiLog Antenna                    | SCHWARZBECK      | VULB9163              | GTS214        | June. 28 2017       | June. 27 2018           |
| 5                  | Double-ridged horn antenna           | SCHWARZBECK      | 9120D                 | GTS208        | June. 28 2017       | June. 27 2018           |
| 6                  | Horn Antenna                         | ETS-LINDGREN     | 3160-09               | GTS218        | June. 28 2017       | June. 27 2018           |
| 7                  | RF Amplifier                         | HP               | 8347A                 | GTS204        | June. 28 2017       | June. 27 2018           |
| 8                  | RF Amplifier                         | HP               | 8349B                 | GTS206        | June. 28 2017       | June. 27 2018           |
| 9                  | Broadband Preamplifier               | SCHWARZBECK      | BBV9718               | GTS535        | June. 28 2017       | June. 27 2018           |
| 10                 | PSA Series Spectrum Analyzer         | Agilent          | E4440A                | GTS536        | June. 28 2017       | June. 27 2018           |
| 11                 | Universal Radio Communication tester | ROHDE&SCHWARZ    | CMU 200               | GTS538        | June. 28 2017       | June. 27 2018           |
| 12                 | EMI Test Software                    | AUDIX            | E3                    | N/A           | N/A                 | N/A                     |
| 13                 | Coaxial cable                        | GTS              | N/A                   | GTS210        | N/A                 | N/A                     |
| 14                 | Coaxial Cable                        | GTS              | N/A                   | GTS211        | N/A                 | N/A                     |
| 15                 | Thermo meter                         | N/A              | N/A                   | GTS256        | June. 28 2017       | June. 27 2018           |



| Conducted: |  |               |           |             |                        |                            |
|------------|--|---------------|-----------|-------------|------------------------|----------------------------|
| Item       | Test Equipment                             | Manufacturer  | Model No. | Serial No.  | Cal.Date<br>(mm-dd-yy) | Cal.Due date<br>(mm-dd-yy) |
| 1          | Signal Analyzer                            | Agilent       | N9010A    | MY48030494  | June. 28 2017          | June. 27 2018              |
| 2          | vector Signal Generator                    | Agilent       | E4438C    | MY49070163  | June. 28 2017          | June. 27 2018              |
| 3          | splitter                                   | Mini-Circuits | ZAP-50W   | NN256400424 | June. 28 2017          | June. 27 2018              |
| 4          | Directional Coupler                        | Agilent       | 87300C    | MY44300299  | June. 28 2017          | June. 27 2018              |
| 5          | vector Signal Generator                    | Agilent       | E4438C    | US44271917  | June. 28 2017          | June. 27 2018              |
| 6          | X-series USB Peak and Average Power Sensor | Agilent       | U2021XA   | MY54080020  | June. 28 2017          | June. 27 2018              |
| 7          | X-series USB Peak and Average Power Sensor | Agilent       | U2021XA   | MY54110001  | June. 28 2017          | June. 27 2018              |
| 8          | X-series USB Peak and Average Power Sensor | Agilent       | U2021XA   | MY53480008  | June. 28 2017          | June. 27 2018              |
| 9          | X-series USB Peak and Average Power Sensor | Agilent       | U2021XA   | MY54080019  | June. 28 2017          | June. 27 2018              |
| 10         | 4 Ch.Simultaneous Sampling 14 Bits 2 MS/s  | Agilent       | U2531A    | TW54063507  | June. 28 2017          | June. 27 2018              |
| 11         | 4 Ch.Simultaneous Sampling 14 Bits 2 MS/s  | Agilent       | U2531A    | TW54063513  | June. 28 2017          | June. 27 2018              |
| 12         | splitter                                   | Mini          | PS3-7     | 4463        | June. 28 2017          | June. 27 2018              |

## 7 Radio Technical Specification in ETSI EN 300 328

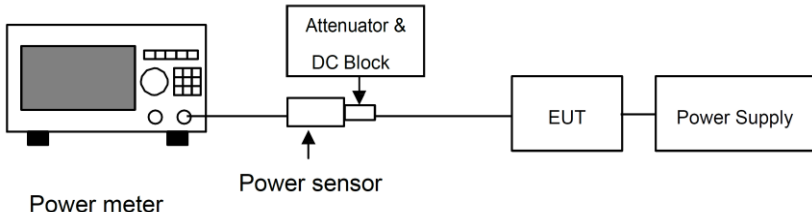
### 7.1 Test Environment and Mode

| 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                                  |      |
|                        |                  | NVHT   | NVLT |
| Temperature            | +25°C            | +40°C  | 0°C  |
| Humidity               | 20%-95%          |  |      |
| Atmospheric Pressure:  | 1008 mbar        |  |      |

| Setting                        | Value   |
|--------------------------------|---------|
| Modulation                     | GFSK    |
| Adaptive                       | Yes     |
| Antenna Gain                   | 0.00dBi |
| Nominal Channel Bandwidth      | 1.2MHz  |
| DUT Frequency not configurable | No      |
| Frequency Low                  | 2402MHz |
| Frequency Mid                  | 2440MHz |
| Frequency High                 | 2480MHz |

## 7.2 Transmitter Requirement

### 7.2.1 RF Output Power

|                   |  |
|-------------------|--|
| Test Requirement: | ETSI EN 300 328 clause 4.3.2.2   |
| Test Method:      | ETSI EN 300 328 clause 5.4.2.2.1.2   |
| Limit:            | 20dBm  |
| Test setup:       |  <pre> graph LR     PM[Power meter] --- PS[Power sensor]     PS --- AB[Attenuator &amp; DC Block]     AB --- EUT[EUT]     EUT --- PSUP[Power Supply]             </pre>  |
| Test procedure:   | <p><b>Step 1:</b></p> <p>Use a fast power sensor suitable for 2,4 GHz and capable of 1 MS/s.</p> <p>Use the following settings:</p> <ul style="list-style-type: none"> <li>- Sample speed 1 MS/s or faster.</li> <li>- The samples must represent the power of the signal.</li> <li>- Measurement duration: For non-adaptive equipment: equal to the observation period defined in 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.</li> </ul> <p>For adaptive equipment, to increase the measurement accuracy, a higher number of bursts may be used.</p> <p><b>Step 2:</b></p> <p>For conducted measurements on devices with one transmit chain:</p> <ul style="list-style-type: none"> <li>-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.</li> </ul> <p>For conducted measurements on devices with multiple transmit chains:</p> <ul style="list-style-type: none"> <li>-Connect one power sensor to each transmit port for a synchronous measurement on all transmit ports.</li> <li>-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.</li> <li>-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.</li> </ul> <p><b>Step 3:</b></p> <p>Find the start and stop times of each burst in the stored measurement samples.</p> <p>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.</p> <p>In case of insufficient dynamic range, the value of 30dB may need to be</p> |

|                     |  |
|---------------------|--|
|                     | <p>reduced appropriately.</p> <p><b>Step 4:</b></p> <p>Between the start and stop times of each individual burst calculate the RMS power over the burst using the formula below. Save these <math>P_{burst}</math> values, as well as the start and stop times for each burst.</p> $P_{burst} = \frac{1}{k} \sum_{n=1}^k P_{sample}(n)$ <p>With "k" being the total number of samples and "n" the actual sample number</p> <p><b>Step 5:</b></p> <p>The highest of all <math>P_{burst}</math> values (value "A" in dBm) will be used for maximum e.i.r.p. calculations.</p> <p><b>Step 6:</b></p> <p>Add the (stated) antenna assembly gain "G" in dBi of the individual antenna.</p> <p>If applicable, add the additional beamforming gain "Y" in dB.</p> <p>If more than one antenna assembly is intended for this power setting, the maximum overall antenna gain (G or G + Y) shall be used.</p> <p>The RF Output Power (P) shall be calculated using the formula below:</p> $P = A + G + Y$ <p><b>Step 7:</b></p> <p>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.</p> |
| Measurement Record: | Uncertainty: $\pm 1.5\text{dB}$  |
| Test Instruments:   | See section 6.0  |
| Test mode:          | Transmitting mode  |

## Measurement Data

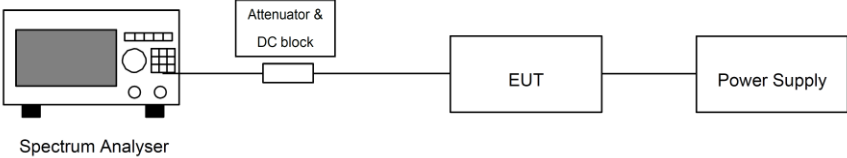
| Test conditions | Channel | Burst RMS power (dBm) | Antenna Gain(dBi) | Calculated Power (dBm) | Limit (dBm) | Result |
|-----------------|---------|-----------------------|-------------------|------------------------|-------------|--------|
| Normal          | Lowest  | -2.90                 | 0.00              | -2.90                  | 20          | Pass   |
|                 | Middle  | -2.90                 | 0.00              | -2.90                  |             |        |
|                 | Highest | -3.00                 | 0.00              | -3.00                  |             |        |
| NVHT            | Lowest  | -2.97                 | 0.00              | -2.97                  |             |        |
|                 | Middle  | -3.00                 | 0.00              | -3.00                  |             |        |
|                 | Highest | -3.10                 | 0.00              | -3.10                  |             |        |
| NVLT            | Lowest  | -2.92                 | 0.00              | -2.92                  |             |        |
|                 | Middle  | -2.92                 | 0.00              | -2.92                  |             |        |
|                 | Highest | -3.02                 | 0.00              | -3.02                  |             |        |

Remark:

1>. Volt= Voltage, Temp= Temperature

2>. Antenna Gain=0.00dBi

## 7.2.1 Power Spectral Density

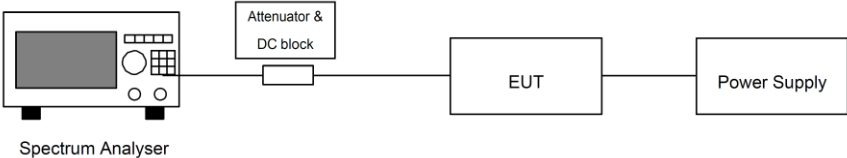
|                   |   |
|-------------------|---|
| Test Requirement: | ETSI EN 300 328 clause 4.3.2.3  |
| Test Method:      | ETSI EN 300 328 clause 5.4.3.2.1  |
| Limit:            | 10dBm/MHz   |
| Test setup:       |  <pre> graph LR     SA[Spectrum Analyser] --- A[Attenuator &amp; DC block]     A --- EUT[EUT]     EUT --- PS[Power Supply]             </pre>   |
| Test procedure:   | <p><b>Step 1:</b><br/>Connect the UUT to the spectrum analyser and use the following settings:</p> <p>Start Frequency: 2400 MHz<br/> Stop Frequency: 2483.5 MHz<br/> Resolution BW: 10 kHz<br/> Video BW: 30 kHz<br/> Sweep Points: &gt; 8350</p> <p>For spectrum analysers not supporting this number of sweep points, the frequency band may be segmented.</p> <p>Detector: RMS<br/> Trace Mode: Max Hold<br/> Sweep time: 10s; the sweep time may be increased further until a value where the sweep time has no impact on the RMS value of the signal</p> <p>For non-continuous signals, wait for the trace to stabilize. Save the (trace data) set to a file.</p> <p><b>Step 2:</b><br/>For conducted measurements on smart antenna systems using either operating mode 2 or 3 (see clause 5.3.2.2), 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.</p> <p><b>Step 3:</b><br/>Add up the values for power for all the samples in the file using the formula below.</p> $P_{Sum} = \sum_{n=1}^k P_{sample}(n)$ <p>With “k” being the total number of samples and “n” the actual sample Number.</p> <p><b>Step 4:</b><br/>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 5.4.2 and save the</p> |

|                     |  |
|---------------------|--|
|                     | <p>corrected data. The following formulas can be used:</p> $C_{Corr} = P_{Sum} - P_{e.i.r.p.}$ $P_{Samplecorr}(n) = P_{Sample}(n) - C_{Corr}$ <p>With "n" being the actual sample number</p> <p><b>Step 5:</b></p> <p>Starting from the first sample <math>P_{samplecorr(n)}</math> (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 #100). This is the Power Spectral Density (e.i.r.p.) for the first 1 MHz segment which shall be recorded.</p> <p><b>Step 6:</b></p> <p>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 #101).</p> <p><b>Step 7:</b></p> <p>Repeat step 6 until the end of the data set and record the Power Spectral Density values for each of the 1 MHz segments.</p> <p>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.</p> |
| Measurement Record: | Uncertainty: $\pm 3\text{dB}$  |
| Test Instruments:   | See section 6.0  |
| Test mode:          | Transmitting mode  |

## Measurement Data

| Bluetooth mode |                                  |                 |        |
|----------------|----------------------------------|-----------------|--------|
| Channel        | Power Spectral Density (dBm/MHz) | Limit (dBm/MHz) | Result |
| Lowest         | -23.05                           | 10.00           | Pass   |
| Middle         | -23.04                           |                 |        |
| Highest        | -23.04                           |                 |        |

## 7.2.2 Occupied Channel Bandwidth

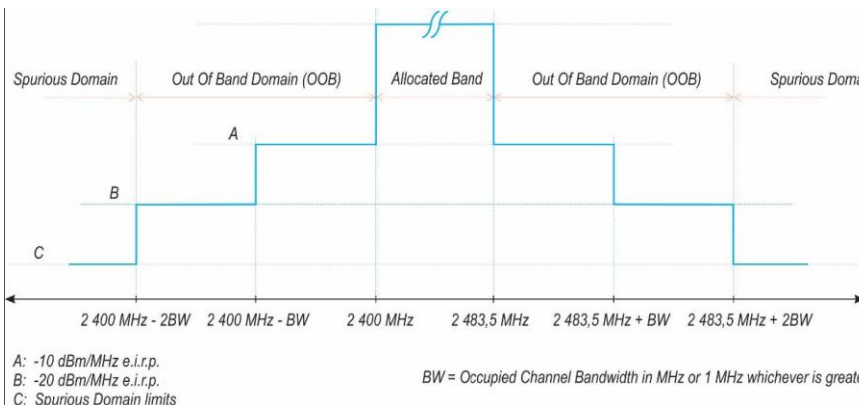
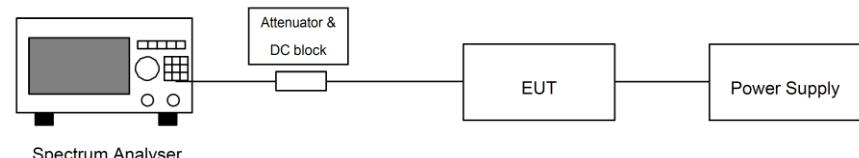
|                   |  |                   |  |                |   |           |         |                |                               |                |     |             |          |             |     |
|-------------------|--|-------------------|--|----------------|---|-----------|---------|----------------|-------------------------------|----------------|-----|-------------|----------|-------------|-----|
| Test Requirement: | ETSI EN 300 328 clause 4.3.2.7   |                   |  |                |   |           |         |                |                               |                |     |             |          |             |     |
| Limit:            | The Occupied Channel Bandwidth for each hopping frequency shall fall completely within the band 2400MHz ~ 2483.5MHz.<br>In addition, for non-adaptive equipment 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.   |                   |  |                |   |           |         |                |                               |                |     |             |          |             |     |
| Test setup:       |  <pre> graph LR     SA[Spectrum Analyser] --- AB[Attenuator &amp; DC block]     AB --- EUT[EUT]     EUT --- PS[Power Supply] </pre>  |                   |  |                |   |           |         |                |                               |                |     |             |          |             |     |
| Test Procedure:   | <p><b>Step 1:</b><br/>Connect the UUT to the spectrum analyser and use the following settings:</p> <table> <tr> <td>Centre Frequency:</td><td>The centre frequency of the channel under test</td></tr> <tr> <td>Resolution BW:</td><td>~ 1 % of the span without going below 1 %</td></tr> <tr> <td>Video BW:</td><td>3 × RBW</td></tr> <tr> <td>Frequency Span</td><td>2 × Nominal Channel Bandwidth</td></tr> <tr> <td>Detector Mode:</td><td>RMS</td></tr> <tr> <td>Trace mode:</td><td>Max Hold</td></tr> <tr> <td>Sweep time:</td><td>1 s</td></tr> </table> <p><b>Step 2:</b><br/>Wait for the trace to stabilize.<br/>Find the peak value of the trace and place the analyser marker on this peak.</p> <p><b>Step 3:</b><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.</p> | 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 |
| 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  |                   |  |                |   |           |         |                |                               |                |     |             |          |             |     |
| Test Instruments: | See section 6.0  |                   |  |                |   |           |         |                |                               |                |     |             |          |             |     |
| Test mode:        | Transmitting mode  |                   |  |                |   |           |         |                |                               |                |     |             |          |             |     |



**Measurement Data:**

| Bluetooth mode |                     |                          |                                      |                     |        |
|----------------|---------------------|--------------------------|--------------------------------------|---------------------|--------|
| Test Channel   | 99% Bandwidth (MHz) | Declared Bandwidth (MHz) | F <sub>L</sub> /F <sub>H</sub> (MHz) | Limit               | Result |
| Lowest         | 1.0273              | 1.1                      | 2401.498                             | 2400MHz ~ 2483.5MHz | Pass   |
| Highest        | 1.0275              | 1.1                      | 2480.528                             |                     | Pass   |

## 7.2.3 Transmitter unwanted emissions in the OOB domain

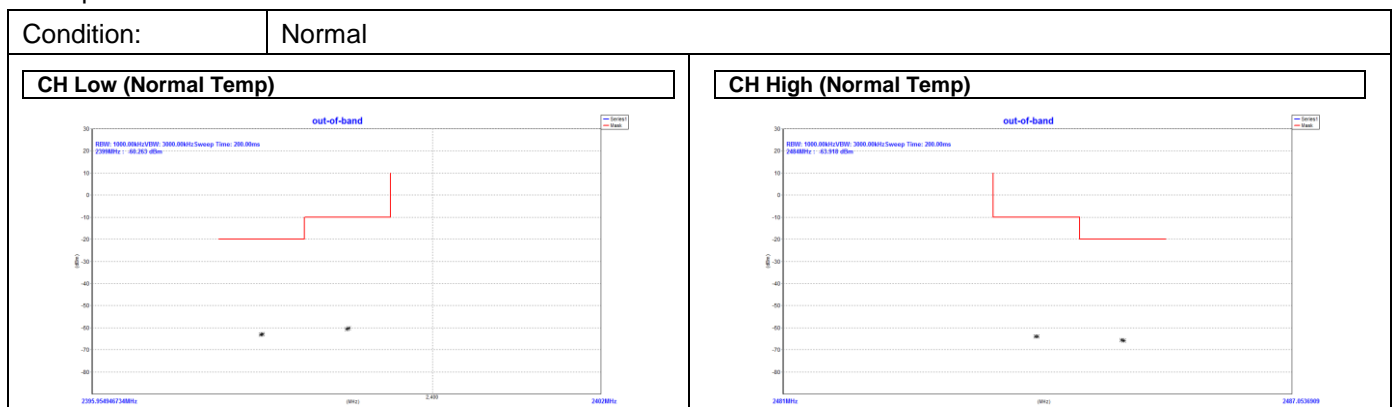
|                   |  |
|-------------------|--|
| Test Requirement: | ETSI EN 300 328 clause 4.3.2.8   |
| Test Method:      | ETSI EN 300 328 clause 5.4.8.2   |
| Limit:            | <p>The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask in figure 1</p> <p>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.</p>  <p>A: -10 dBm/MHz e.i.r.p.<br/>B: -20 dBm/MHz e.i.r.p.<br/>C: Spurious Domain limits</p> <p>BW = Occupied Channel Bandwidth in MHz or 1 MHz whichever is greater</p>  |
| Test setup:       |  <p>Spectrum Analyser</p> <p>Attenuator &amp; DC block</p> <p>EUT</p> <p>Power Supply</p>  |
| Test procedure:   | <p>The applicable mask is defined by the measurement results from the tests performed under clause 5.4.7 (Occupied Channel Bandwidth).</p> <p>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.</p> <p><b>Step 1:</b></p> <p>Connect the UUT to the spectrum analyser and use the following settings:</p> <ul style="list-style-type: none"> <li>Centre Frequency: 2 484 MHz</li> <li>Span: 0Hz</li> <li>Resolution BW: 1 MHz</li> <li>Filter mode: Channel filter</li> <li>Video BW: 3 MHz</li> <li>Detector Mode: RMS</li> <li>Trace Mode: Max Hold</li> <li>Sweep Mode: Continuous</li> <li>Sweep Points: Sweep Time [s] / (1 <math>\mu</math>s) or 5 000 whichever is greater</li> </ul> |

|  |   |
|--|---|
|  | <p>Trigger Mode: Video trigger</p> <p>In case video triggering is not possible, an external trigger source may be used.</p> <p>Sweep Time: &gt;120 % of the duration of the longest burst detected during the measurement of the RF Output Power</p> <p><b>Step 2: (segment 2 483,5 MHz to 2 483,5 MHz + BW)</b></p> <p>Adjust the trigger level to select the transmissions with the highest power level.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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).</p> <p><b>Step 3: (segment 2 483,5 MHz + BW to 2 483,5 MHz + 2BW)</b></p> <p>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).</p> <p><b>Step 4: (segment 2 400 MHz - BW to 2 400 MHz)</b></p> <p>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).</p> <p><b>Step 5: (segment 2 400 MHz - 2BW to 2 400 MHz - BW)</b></p> <p>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).</p> <p><b>Step 6:</b></p> <p>In case of conducted measurements on equipment with a single transmit</p> |
|--|---|

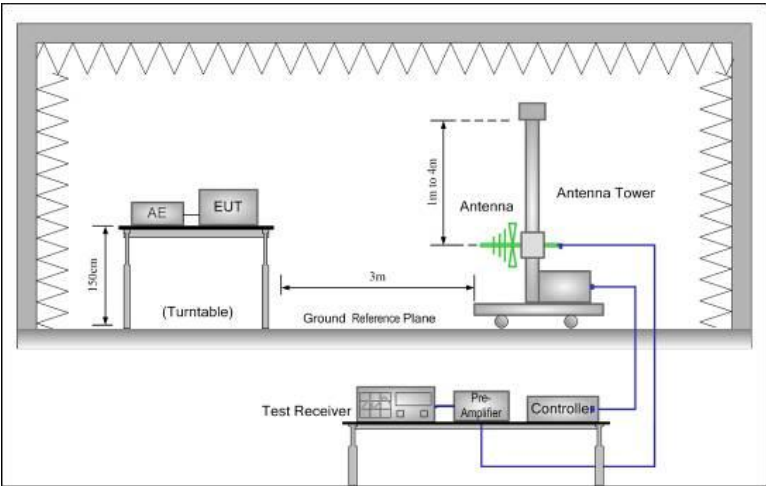
|                     |  |
|---------------------|--|
|                     | <p>chain, the declared antenna assembly gain "G" in dBi shall be added to the results for each of the 1 MHz segments and compared with the limits provided by the mask given in figures 1 or figure 3. If more than one antenna assembly is intended for this power setting, the antenna with the highest gain shall be considered.</p> <p>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:</p> <p>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.</p> <p>Option 2: the limits provided by the mask given in figure 1 or figure 3 shall be reduced by <math>10 \times \log_{10}(A_{ch})</math> and the additional beamforming gain "Y" in dB. The results for each of the transmit chains shall be individually compared with these reduced limits.</p> <p>NOTE: <math>A_{ch}</math> refers to the number of active transmit chains.</p> <p>It shall be recorded whether the equipment complies with the mask provided in figure 1 or figure 3.</p> |
| Measurement Record: | Uncertainty: $\pm 1.5\text{dB}$  |
| Test Instruments:   | See section 6.0  |
| Test mode:          | Transmitting mode  |

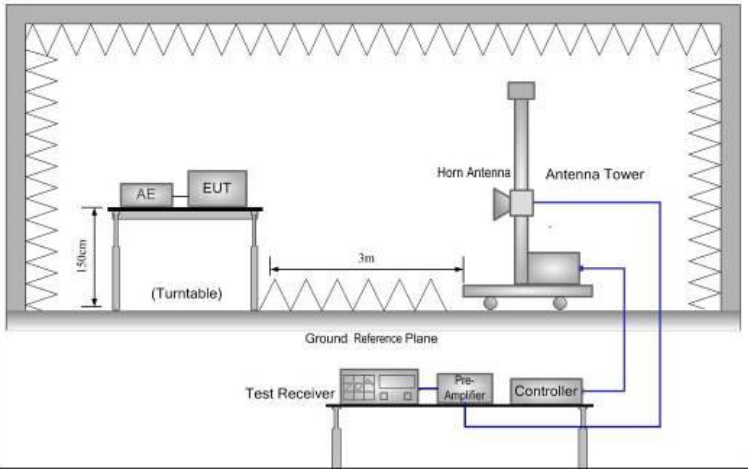
## Measurement Data:

Test plots at normal condition are followed:



## 7.2.4 Transmitter unwanted emissions in the spurious domain

|                       |  |  |           |
|-----------------------|--|--|-----------|
| Test Requirement:     | ETSI EN 300 328 clause 4.3.2.9   |  |           |
| Test Method:          | ETSI EN 300 328 clause 5.4.9.2   |  |           |
| Limit:                | Frequency Range  | Maximum power<br>e.r.p. ( $\leq 1$ GHz)<br>e.i.r.p. ( $> 1$ GHz) | Bandwidth |
|                       | 30 MHz to 47 MHz   | -36 dBm  | 100 kHz   |
|                       | 47 MHz to 74 MHz   | -54 dBm  | 100 kHz   |
|                       | 74 MHz to 87.5 MHz   | -36 dBm  | 100 kHz   |
|                       | 87.5 MHz to 118 MHz  | -54 dBm  | 100 kHz   |
|                       | 118 MHz to 174 MHz   | -36 dBm  | 100 kHz   |
|                       | 174 MHz to 230 MHz   | -54 dBm  | 100 kHz   |
|                       | 230 MHz to 470 MHz   | -36 dBm  | 100 kHz   |
|                       | 470 MHz to 862 MHz   | -54 dBm  | 100 kHz   |
|                       | 862 MHz to 1 GHz   | -36 dBm  | 100 kHz   |
|                       | 1 GHz to 12.75 GHz   | -30 dBm  | 1 MHz     |
| Test Frequency range: | 30MHz to 12.75GHz  |  |           |
| Test setup:           | Below 1GHz   |  |           |
|                       |  |  |           |
|                       | Above 1GHz   |  |           |

|                        |  |
|------------------------|--|
|                        |    |
| <p>Test procedure:</p> | <p><b>1. Pre-scan</b></p> <p>The test procedure below shall be used to identify potential unwanted emissions of the UUT.</p> <p><b>Step 1:</b></p> <p>The sensitivity of the measurement set-up should be such that the noise floor is at least 12 dB below the limits given in table 4 or table 12.</p> <p><b>Step 2:</b></p> <p>The emissions over the range 30 MHz to 1 000 MHz shall be identified.</p> <p>Spectrum analyser settings:</p> <ul style="list-style-type: none"> <li>Resolution BW: 100 kHz</li> <li>Video BW 300 kHz</li> <li>Filter type: 3 dB (Gaussian)</li> <li>Detector mode: Peak</li> <li>Trace Mode: Max Hold</li> <li>Sweep Points: <math>\geq 19\,400</math></li> </ul> <p>For spectrum analysers not supporting this high number of sweep points, the frequency band may need to be segmented.</p> <p>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</p> <p>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.</p> <p>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.</p> <p>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</p> |

|                |   |                |       |          |       |              |                 |                |      |             |          |               |          |
|----------------|---|----------------|-------|----------|-------|--------------|-----------------|----------------|------|-------------|----------|---------------|----------|
|                | <p>5.4.9.2.1.3 and compared to the limits given in table 4 or table 12.</p> <p><b>Step 3:</b></p> <p>The emissions over the range 1 GHz to 12,75 GHz shall be identified.</p> <p>Spectrum analyser settings:</p> <table border="0"> <tr> <td>Resolution BW:</td><td>1 MHz</td></tr> <tr> <td>Video BW</td><td>3 MHz</td></tr> <tr> <td>Filter type:</td><td>3 dB (Gaussian)</td></tr> <tr> <td>Detector mode:</td><td>Peak</td></tr> <tr> <td>Trace Mode:</td><td>Max Hold</td></tr> <tr> <td>Sweep Points:</td><td>≥ 23 500</td></tr> </table> <p>For spectrum analysers not supporting this high number of sweep points, the frequency band may need to be segmented.</p> <p>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</p> <p>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</p> <p>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.</p> <p>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.</p> <p>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.</p> <p><b>Step 4:</b></p> <p>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 (<math>A_{ch}</math>). The limits used to identify emissions during this pre-scan need to be reduced by <math>10 \times \log_{10}(A_{ch})</math></p> <p><b>2. Measurement of the emissions identified during the pre-scan</b></p> <p>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.</p> <p><b>Step 1:</b></p> <p>The level of the emissions shall be measured using the following spectrum analyser settings:</p> | Resolution BW: | 1 MHz | Video BW | 3 MHz | Filter type: | 3 dB (Gaussian) | Detector mode: | Peak | Trace Mode: | Max Hold | Sweep Points: | ≥ 23 500 |
| Resolution BW: | 1 MHz   |                |       |          |       |              |                 |                |      |             |          |               |          |
| Video BW       | 3 MHz   |                |       |          |       |              |                 |                |      |             |          |               |          |
| Filter type:   | 3 dB (Gaussian)   |                |       |          |       |              |                 |                |      |             |          |               |          |
| Detector mode: | Peak  |                |       |          |       |              |                 |                |      |             |          |               |          |
| Trace Mode:    | Max Hold  |                |       |          |       |              |                 |                |      |             |          |               |          |
| Sweep Points:  | ≥ 23 500  |                |       |          |       |              |                 |                |      |             |          |               |          |



|                     |   |
|---------------------|---|
|                     | <p>Measurement Mode: Time Domain Power</p> <p>Centre Frequency: Frequency of emission identified during the pre-scan</p> <p>Resolution BW: 100 kHz (&lt; 1 GHz) / 1 MHz (&gt; 1 GHz)</p> <p>Video BW: 300 kHz (&lt; 1 GHz) / 3 MHz (&gt; 1 GHz)</p> <p>Frequency Span: Zero Span</p> <p>Sweep mode: Single Sweep</p> <p>Sweep time: &gt; 120 % of the duration of the longest burst detected during the measurement of the RF Output Power</p> <p>Sweep points: Sweep time [μs] / (1 μs) with a maximum of 30 000</p> <p>Trigger: Video (burst signals) or Manual (continuous signals)</p> <p>Detector: RMS</p> <p><b>Step 2:</b><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.</p> <p><b>Step 3:</b><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 (<math>A_{ch}</math>).<br/>Sum the measured power (within the observed window) for each of the active transmit chains.</p> <p><b>Step 4:</b><br/>The value defined in step 3 shall be compared to the limits defined in table 4 or table 12.</p> |
| Measurement Record: | Uncertainty: $\pm 6\text{dB}$   |
| Test Instruments:   | See section 6.0   |
| Test mode:          | Transmitting mode   |

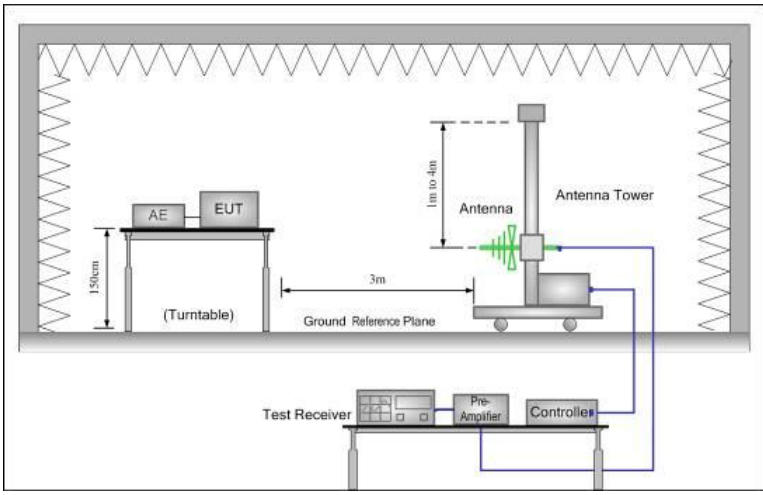
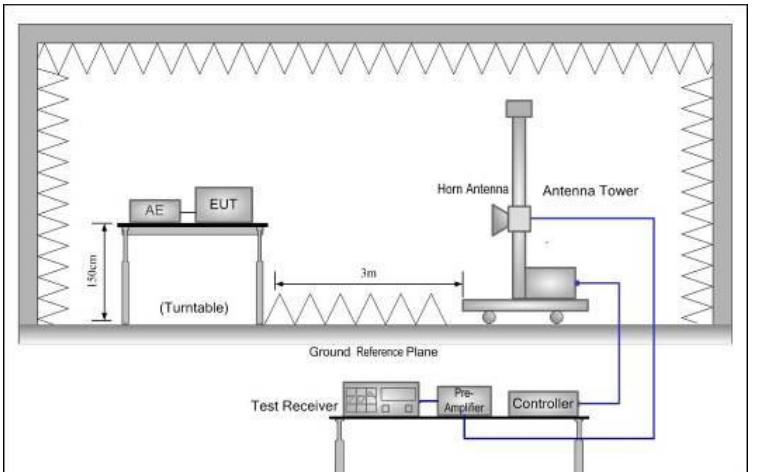


## Measurement Data

| Bluetooth mode      |                   |            |             |             |
|---------------------|-------------------|------------|-------------|-------------|
| The lowest channel  |                   |            |             |             |
| Frequency (MHz)     | Spurious Emission |            | Limit (dBm) | Test Result |
|                     | polarization      | Level(dBm) |             |             |
| 54.46               | Vertical          | -69.30     | -54.00      | Pass        |
| 553.10              | V                 | -65.36     | -54.00      |             |
| 4804.00             | V                 | -50.10     | -30.00      |             |
| 7206.00             | V                 | -45.43     | -30.00      |             |
| 9608.00             | V                 | -41.87     | -30.00      |             |
| 39.28               | Horizontal        | -66.50     | -54.00      |             |
| 842.70              | H                 | -67.58     | -36.00      |             |
| 4804.00             | H                 | -49.74     | -30.00      |             |
| 7206.00             | H                 | -45.99     | -30.00      |             |
| 9608.00             | H                 | -41.71     | -30.00      |             |
| 12010.00            | H                 | -43.93     | -30.00      |             |
| The highest channel |                   |            |             |             |
| Frequency (MHz)     | Spurious Emission |            | Limit (dBm) | Test Result |
|                     | polarization      | Level(dBm) |             |             |
| 44.23               | Vertical          | -66.73     | -36.00      | Pass        |
| 702.53              | V                 | -68.94     | -54.00      |             |
| 4960.00             | V                 | -51.38     | -30.00      |             |
| 7440.00             | V                 | -45.99     | -30.00      |             |
| 9920.00             | V                 | -42.24     | -30.00      |             |
| 45.14               | Horizontal        | -68.26     | -36.00      |             |
| 865.84              | H                 | -69.45     | -36.00      |             |
| 4960.00             | H                 | -51.20     | -30.00      |             |
| 7440.00             | H                 | -46.68     | -30.00      |             |
| 9920.00             | H                 | -42.45     | -30.00      |             |
| 12400.00            | H                 | -44.57     | -30.00      |             |

## 7.3 Receiver Requirement

### 7.3.1 Spurious Emissions

|                       |  |  |                          |
|-----------------------|--|--|--------------------------|
| Test Requirement:     | ETSI EN 300 328 clause 4.3.2.10  |  |                          |
| Test Method:          | ETSI EN 300 328 clause 5.4.10.2  |  |                          |
| Limit:                | Frequency  | Maximum power<br>e.r.p. ( $\leq 1$ GHz)<br>e.i.r.p. ( $> 1$ GHz) | Measurement<br>bandwidth |
|                       | 30MHz to 1000 MHz  | -57 dBm  | 100 kHz                  |
|                       | 1GHz to 12.75GHz   | -47 dBm  | 1 MHz                    |
| Test Frequency range: | 30MHz to 12.75GHz  |  |                          |
| Test setup:           | Below 1GHz   |  |                          |
|                       |   |  |                          |
|                       | Above 1GHz   |  |                          |
|                       |  |  |                          |

|                        |  |                |         |          |         |              |                |                |      |             |          |               |          |             |      |                |       |          |       |              |                 |                |      |             |          |               |  |             |      |
|------------------------|--|----------------|---------|----------|---------|--------------|----------------|----------------|------|-------------|----------|---------------|----------|-------------|------|----------------|-------|----------|-------|--------------|-----------------|----------------|------|-------------|----------|---------------|--|-------------|------|
| <p>Test procedure:</p> | <p><b>1. Pre-scan</b></p> <p>The procedure in step 1 to step 4 below shall be used to identify potential unwanted emissions of the UUT.</p> <p><b>Step 1:</b></p> <p>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 table 13.</p> <p><b>Step 2:</b></p> <p>The emissions over the range 30 MHz to 1 000 MHz shall be identified. Spectrum analyser settings:</p> <table data-bbox="619 667 1074 947"> <tr> <td>Resolution BW:</td><td>100 kHz</td></tr> <tr> <td>Video BW</td><td>300 kHz</td></tr> <tr> <td>Filter type:</td><td>3dB (Gaussian)</td></tr> <tr> <td>Detector mode:</td><td>Peak</td></tr> <tr> <td>Trace Mode:</td><td>Max Hold</td></tr> <tr> <td>Sweep Points:</td><td>≥ 19 400</td></tr> <tr> <td>Sweep time:</td><td>Auto</td></tr> </table> <p>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.</p> <p><b>Step 3:</b></p> <p>The emissions over the range 1 GHz to 12,75 GHz shall be identified. Spectrum analyser settings:</p> <table data-bbox="619 1182 1433 1507"> <tr> <td>Resolution BW:</td><td>1 MHz</td></tr> <tr> <td>Video BW</td><td>3 MHz</td></tr> <tr> <td>Filter type:</td><td>3 dB (Gaussian)</td></tr> <tr> <td>Detector mode:</td><td>Peak</td></tr> <tr> <td>Trace Mode:</td><td>Max Hold</td></tr> <tr> <td>Sweep Points:</td><td>≥ 23500; for spectrum analysers not supporting this high number of sweep points, the frequency band may be segmented</td></tr> <tr> <td>Sweep time:</td><td>Auto</td></tr> </table> <p>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.</p> <p>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.</p> <p><b>Step 4:</b></p> <p>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 (<math>A_{ch}</math>). The limits used to identify emissions during this pre-scan need to be reduced with <math>10 \times \log_{10} (A_{ch})</math></p> <p><b>2. Measurement of the emissions identified during the pre-scan</b></p> | Resolution BW: | 100 kHz | Video BW | 300 kHz | Filter type: | 3dB (Gaussian) | Detector mode: | Peak | Trace Mode: | Max Hold | Sweep Points: | ≥ 19 400 | Sweep time: | Auto | Resolution BW: | 1 MHz | Video BW | 3 MHz | Filter type: | 3 dB (Gaussian) | Detector mode: | Peak | Trace Mode: | Max Hold | Sweep Points: | ≥ 23500; for spectrum analysers not supporting this high number of sweep points, the frequency band may be segmented | Sweep time: | Auto |
| Resolution BW:         | 100 kHz  |                |         |          |         |              |                |                |      |             |          |               |          |             |      |                |       |          |       |              |                 |                |      |             |          |               |  |             |      |
| Video BW               | 300 kHz  |                |         |          |         |              |                |                |      |             |          |               |          |             |      |                |       |          |       |              |                 |                |      |             |          |               |  |             |      |
| Filter type:           | 3dB (Gaussian)   |                |         |          |         |              |                |                |      |             |          |               |          |             |      |                |       |          |       |              |                 |                |      |             |          |               |  |             |      |
| Detector mode:         | Peak   |                |         |          |         |              |                |                |      |             |          |               |          |             |      |                |       |          |       |              |                 |                |      |             |          |               |  |             |      |
| Trace Mode:            | Max Hold   |                |         |          |         |              |                |                |      |             |          |               |          |             |      |                |       |          |       |              |                 |                |      |             |          |               |  |             |      |
| Sweep Points:          | ≥ 19 400   |                |         |          |         |              |                |                |      |             |          |               |          |             |      |                |       |          |       |              |                 |                |      |             |          |               |  |             |      |
| Sweep time:            | Auto   |                |         |          |         |              |                |                |      |             |          |               |          |             |      |                |       |          |       |              |                 |                |      |             |          |               |  |             |      |
| Resolution BW:         | 1 MHz  |                |         |          |         |              |                |                |      |             |          |               |          |             |      |                |       |          |       |              |                 |                |      |             |          |               |  |             |      |
| Video BW               | 3 MHz  |                |         |          |         |              |                |                |      |             |          |               |          |             |      |                |       |          |       |              |                 |                |      |             |          |               |  |             |      |
| Filter type:           | 3 dB (Gaussian)  |                |         |          |         |              |                |                |      |             |          |               |          |             |      |                |       |          |       |              |                 |                |      |             |          |               |  |             |      |
| Detector mode:         | Peak   |                |         |          |         |              |                |                |      |             |          |               |          |             |      |                |       |          |       |              |                 |                |      |             |          |               |  |             |      |
| Trace Mode:            | Max Hold   |                |         |          |         |              |                |                |      |             |          |               |          |             |      |                |       |          |       |              |                 |                |      |             |          |               |  |             |      |
| Sweep Points:          | ≥ 23500; for spectrum analysers not supporting this high number of sweep points, the frequency band may be segmented   |                |         |          |         |              |                |                |      |             |          |               |          |             |      |                |       |          |       |              |                 |                |      |             |          |               |  |             |      |
| Sweep time:            | Auto   |                |         |          |         |              |                |                |      |             |          |               |          |             |      |                |       |          |       |              |                 |                |      |             |          |               |  |             |      |

|                     |   |
|---------------------|---|
|                     | <p>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.</p> <p><b>Step 1:</b><br/>The level of the emissions shall be measured using the following spectrum analyser settings:</p> <p>Measurement Mode: Time Domain Power</p> <p>Centre Frequency: Frequency of the emission identified during the pre-scan</p> <p>Resolution Bandwidth: 100 kHz (&lt; 1 GHz) / 1 MHz (&gt; 1 GHz)</p> <p>Video Bandwidth: 300 kHz (&lt; 1 GHz) / 3 MHz (&gt; 1 GHz)</p> <p>Frequency Span: Zero Span</p> <p>Sweep mode: Single Sweep</p> <p>Sweep time: 30 ms</p> <p>Sweep points: <math>\geq 30\,000</math></p> <p>Trigger: Video (for burst signals) or Manual (for continuous signals)</p> <p>Detector: RMS</p> <p><b>Step 2:</b><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.</p> <p><b>Step 3:</b><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 <math>A_{ch}</math>. Sum the measured power (within the observed window) for each of the active receive chains.</p> <p><b>Step 4:</b><br/>The value defined in step 3 shall be compared to the limits defined in table 5 and table 13.</p> |
| Measurement Record: | Uncertainty: $\pm 6\text{dB}$   |
| Test mode:          | Kept Rx in receiving mode   |
| Test Instruments:   | See section 6.0   |

## Measurement Data:

| Bluetooth mode      |                   |            |   |             |
|---------------------|-------------------|------------|---|-------------|
| The lowest channel  |                   |            |   |             |
| Frequency (MHz)     | Spurious Emission |            | Limit (dBm)   | Test Result |
|                     | polarization      | Level(dBm) |   |             |
| 54.43               | Vertical          | -69.89     | 2nW/ -57dBm<br>below 1GHz,<br><br>20nW/ -47dBm<br>above 1GHz. | Pass        |
| 513.49              | V                 | -69.18     |   |             |
| 4804.00             | V                 | -61.16     |   |             |
| 7206.00             | V                 | -57.19     |   |             |
| 9608.00             | V                 | -52.19     |   |             |
| 41.88               | Horizontal        | -70.08     |   |             |
| 818.63              | H                 | -69.12     |   |             |
| 4804.00             | H                 | -63.97     |   |             |
| 7206.00             | H                 | -58.19     |   |             |
| 9608.00             | H                 | -53.70     |   |             |
| 12010.00            | H                 | -55.25     |   |             |
| The highest channel |                   |            |   |             |
| Frequency (MHz)     | Spurious Emission |            | Limit (dBm)   | Test Result |
|                     | polarization      | Level(dBm) |   |             |
| 46.57               | Vertical          | -69.82     | 2nW/ -57dBm<br>below 1GHz,<br><br>20nW/ -47dBm<br>above 1GHz. | Pass        |
| 799.23              | V                 | -67.84     |   |             |
| 4960.00             | V                 | -62.60     |   |             |
| 7440.00             | V                 | -57.27     |   |             |
| 9920.00             | V                 | -52.33     |   |             |
| 52.23               | Horizontal        | -72.66     |   |             |
| 587.86              | H                 | -70.15     |   |             |
| 4960.00             | H                 | -63.76     |   |             |
| 7440.00             | H                 | -56.85     |   |             |
| 9920.00             | H                 | -52.84     |   |             |
| 12400.00            | H                 | -54.49     |   |             |

## 7.3.2 Receiver Blocking

| Test Requirement:                                    | ETSI EN 300 328 clause 4.3.1.12  |  |                                 |  |                         |                          |                  |     |    |                          |                         |     |    |                          |  |     |    |  |                                 |  |                         |                          |                  |     |    |                          |                  |     |    |  |                                 |  |                         |                           |                  |     |    |                           |                  |     |    |
|--|--|--|---------------------------------|--|-------------------------|--------------------------|------------------|-----|----|--------------------------|-------------------------|-----|----|--------------------------|--|-----|----|--|---------------------------------|--|-------------------------|--------------------------|------------------|-----|----|--------------------------|------------------|-----|----|--|---------------------------------|--|-------------------------|---------------------------|------------------|-----|----|---------------------------|------------------|-----|----|
| Test Method:   | ETSI EN 300 328 clause 5.4.11.2.   |  |                                 |  |                         |                          |                  |     |    |                          |                         |     |    |                          |  |     |    |  |                                 |  |                         |                          |                  |     |    |                          |                  |     |    |  |                                 |  |                         |                           |                  |     |    |                           |                  |     |    |
| Limit:   | <p>While maintaining the minimum performance criteria as defined in clause 4.3.1.12.3, the blocking levels at specified frequency offsets shall be equal to or greater than the limits defined for the applicable receiver category provided in table 6, table 7 or table 8.</p> <p>Table 6: Receiver Blocking parameters for Receiver Category 1 equipment</p> <table><tr><th>Wanted signal mean power from companion device (dBm)</th><th>Blocking signal frequency (MHz)</th><th>Blocking signal power (dBm) (see note 2)</th><th>Type of blocking signal</th></tr><tr><td><math>P_{min} + 6 \text{ dB}</math></td><td>2 380<br/>2 503,5</td><td>-53</td><td>CW</td></tr><tr><td><math>P_{min} + 6 \text{ dB}</math></td><td>2 300<br/>2 330<br/>2 360</td><td>-47</td><td>CW</td></tr><tr><td><math>P_{min} + 6 \text{ dB}</math></td><td>2 523,5<br/>2 553,5<br/>2 583,5<br/>2 613,5<br/>2 643,5<br/>2 673,5</td><td>-47</td><td>CW</td></tr></table> <p>NOTE 1: <math>P_{min}</math> is the minimum level of wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.</p> <p>NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.</p> <p>Table 7: Receiver Blocking parameters receiver category 2 equipment</p> <table><tr><th>Wanted signal mean power from companion device (dBm)</th><th>Blocking signal frequency (MHz)</th><th>Blocking signal power (dBm) (see note 2)</th><th>Type of blocking signal</th></tr><tr><td><math>P_{min} + 6 \text{ dB}</math></td><td>2 380<br/>2 503,5</td><td>-57</td><td>CW</td></tr><tr><td><math>P_{min} + 6 \text{ dB}</math></td><td>2 300<br/>2 583,5</td><td>-47</td><td>CW</td></tr></table> <p>NOTE 1: <math>P_{min}</math> is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.</p> <p>NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.</p> <p>Table 8: Receiver Blocking parameters receiver category 3 equipment</p> <table><tr><th>Wanted signal mean power from companion device (dBm)</th><th>Blocking signal frequency (MHz)</th><th>Blocking signal power (dBm) (see note 2)</th><th>Type of blocking signal</th></tr><tr><td><math>P_{min} + 12 \text{ dB}</math></td><td>2 380<br/>2 503,5</td><td>-57</td><td>CW</td></tr><tr><td><math>P_{min} + 12 \text{ dB}</math></td><td>2 300<br/>2 583,5</td><td>-47</td><td>CW</td></tr></table> <p>NOTE 1: <math>P_{min}</math> is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.</p> <p>NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.</p> | Wanted signal mean power from companion device (dBm) | Blocking signal frequency (MHz) | Blocking signal power (dBm) (see note 2) | Type of blocking signal | $P_{min} + 6 \text{ dB}$ | 2 380<br>2 503,5 | -53 | CW | $P_{min} + 6 \text{ dB}$ | 2 300<br>2 330<br>2 360 | -47 | CW | $P_{min} + 6 \text{ dB}$ | 2 523,5<br>2 553,5<br>2 583,5<br>2 613,5<br>2 643,5<br>2 673,5 | -47 | CW | Wanted signal mean power from companion device (dBm) | Blocking signal frequency (MHz) | Blocking signal power (dBm) (see note 2) | Type of blocking signal | $P_{min} + 6 \text{ dB}$ | 2 380<br>2 503,5 | -57 | CW | $P_{min} + 6 \text{ dB}$ | 2 300<br>2 583,5 | -47 | CW | Wanted signal mean power from companion device (dBm) | Blocking signal frequency (MHz) | Blocking signal power (dBm) (see note 2) | Type of blocking signal | $P_{min} + 12 \text{ dB}$ | 2 380<br>2 503,5 | -57 | CW | $P_{min} + 12 \text{ dB}$ | 2 300<br>2 583,5 | -47 | CW |
| Wanted signal mean power from companion device (dBm) | Blocking signal frequency (MHz)  | Blocking signal power (dBm) (see note 2)             | Type of blocking signal         |  |                         |                          |                  |     |    |                          |                         |     |    |                          |  |     |    |  |                                 |  |                         |                          |                  |     |    |                          |                  |     |    |  |                                 |  |                         |                           |                  |     |    |                           |                  |     |    |
| $P_{min} + 6 \text{ dB}$                             | 2 380<br>2 503,5   | -53  | CW                              |  |                         |                          |                  |     |    |                          |                         |     |    |                          |  |     |    |  |                                 |  |                         |                          |                  |     |    |                          |                  |     |    |  |                                 |  |                         |                           |                  |     |    |                           |                  |     |    |
| $P_{min} + 6 \text{ dB}$                             | 2 300<br>2 330<br>2 360  | -47  | CW                              |  |                         |                          |                  |     |    |                          |                         |     |    |                          |  |     |    |  |                                 |  |                         |                          |                  |     |    |                          |                  |     |    |  |                                 |  |                         |                           |                  |     |    |                           |                  |     |    |
| $P_{min} + 6 \text{ dB}$                             | 2 523,5<br>2 553,5<br>2 583,5<br>2 613,5<br>2 643,5<br>2 673,5   | -47  | CW                              |  |                         |                          |                  |     |    |                          |                         |     |    |                          |  |     |    |  |                                 |  |                         |                          |                  |     |    |                          |                  |     |    |  |                                 |  |                         |                           |                  |     |    |                           |                  |     |    |
| Wanted signal mean power from companion device (dBm) | Blocking signal frequency (MHz)  | Blocking signal power (dBm) (see note 2)             | Type of blocking signal         |  |                         |                          |                  |     |    |                          |                         |     |    |                          |  |     |    |  |                                 |  |                         |                          |                  |     |    |                          |                  |     |    |  |                                 |  |                         |                           |                  |     |    |                           |                  |     |    |
| $P_{min} + 6 \text{ dB}$                             | 2 380<br>2 503,5   | -57  | CW                              |  |                         |                          |                  |     |    |                          |                         |     |    |                          |  |     |    |  |                                 |  |                         |                          |                  |     |    |                          |                  |     |    |  |                                 |  |                         |                           |                  |     |    |                           |                  |     |    |
| $P_{min} + 6 \text{ dB}$                             | 2 300<br>2 583,5   | -47  | CW                              |  |                         |                          |                  |     |    |                          |                         |     |    |                          |  |     |    |  |                                 |  |                         |                          |                  |     |    |                          |                  |     |    |  |                                 |  |                         |                           |                  |     |    |                           |                  |     |    |
| Wanted signal mean power from companion device (dBm) | Blocking signal frequency (MHz)  | Blocking signal power (dBm) (see note 2)             | Type of blocking signal         |  |                         |                          |                  |     |    |                          |                         |     |    |                          |  |     |    |  |                                 |  |                         |                          |                  |     |    |                          |                  |     |    |  |                                 |  |                         |                           |                  |     |    |                           |                  |     |    |
| $P_{min} + 12 \text{ dB}$                            | 2 380<br>2 503,5   | -57  | CW                              |  |                         |                          |                  |     |    |                          |                         |     |    |                          |  |     |    |  |                                 |  |                         |                          |                  |     |    |                          |                  |     |    |  |                                 |  |                         |                           |                  |     |    |                           |                  |     |    |
| $P_{min} + 12 \text{ dB}$                            | 2 300<br>2 583,5   | -47  | CW                              |  |                         |                          |                  |     |    |                          |                         |     |    |                          |  |     |    |  |                                 |  |                         |                          |                  |     |    |                          |                  |     |    |  |                                 |  |                         |                           |                  |     |    |                           |                  |     |    |

|                     |                                      |
|---------------------|--------------------------------------|
| 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:

| Test Channel  | P <sub>min</sub> (dBm) | PER(%) | Limit of PER(%) | Wanted signal mean power companion (P <sub>min</sub> +6dB) | Blocking signal frequency (MHz) | Blocking signal Power (dBm) | Type of blocking signal | Result |
|---|------------------------|--------|-----------------|--|---------------------------------|-----------------------------|-------------------------|--------|
| Lowest Channel  | -78.20                 | 8.70   | 10              | -72.20   | 2300.00                         | -47                         | CW                      | Pass   |
|   |                        |        |                 | -72.20   | 2380.00                         | -57                         |                         |        |
| Highest Channel   | -80.30                 | 8.80   |                 | -74.30   | 2503.50                         | -57                         |                         |        |
|   |                        |        |                 | -74.30   | 2583.50                         | -47                         |                         |        |
| Note: During the blocking test. The value of PER which display on the CMW 500 was no changed.Maybe the value of PER has a slight floating,but no bigger than 10%. |                        |        |                 |  |                                 |                             |                         |        |



## 8 Test setup photo

Radiated Emission



## 9 EUT Constructional Details

Reference to the test report No. : GTS201712000154E01

-----End-----