TEST REPORT

MANUFACTURER	:	Winners'Sun Plastic & Electronic (Shenzhen) Co., Ltd.
PRODUCT NAME	:	TravelPod Selfie
MODEL NAME	:	WS-21005
BRAND NAME	:	ShiftCam
STANDARD(S)	:	ETSI EN 300 328 V2.2.2 (2019-07)
RECEIPT DATE	:	2021-05-24
TEST DATE	:	2021-05-27 to 2021-06-04
ISSUE DATE	:	2023-07-17

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Change History		
Version	**Date**	**Reason for change**
1.0	2023-07-17	First edition

1. Technical Information

Note: Provide by manufacturer.

1.1. Manufacturer and Factory Information

Manufacturer:	Winners'Sun Plastic & Electronic (Shenzhen) Co., Ltd.
Manufacturer Address:	Detai Industrial Park, 496 Huarong Road, Langkou Community, Dalang Sub-district, Longhua District, Shenzhen, Guangdong, China
Factory:	Winners'Sun Plastic & Electronic (Shenzhen) Co., Ltd.
Factory Address:	Detai Industrial Park, 496 Huarong Road, Langkou Community, Dalang Sub-district, Longhua District, Shenzhen, Guangdong, China

1.2. Equipment Under Test (EUT) Description

<table>
<tr><td>Product Name:</td><td colspan="2">TravelPod Selfie</td></tr>
<tr><td>Sample No.:</td><td colspan="2">1#</td></tr>
<tr><td>Hardware Version:</td><td colspan="2">V1.1</td></tr>
<tr><td>Software Version:</td><td colspan="2">V1.0</td></tr>
<tr><td>Equipment Type:</td><td colspan="2">Bluetooth LE</td></tr>
<tr><td>Bluetooth Version:</td><td colspan="2">4.2</td></tr>
<tr><td>Modulation Type:</td><td colspan="2">GFSK</td></tr>
<tr><td>Data Rate:</td><td colspan="2">1Mbps</td></tr>
<tr><td>Operating Frequency Range:</td><td colspan="2">2402MHz-2480MHz</td></tr>
<tr><td>Channel Number:</td><td colspan="2">Refer 1.3</td></tr>
<tr><td>Maximum E.I.R.P.:</td><td colspan="2">-2.90dBm</td></tr>
<tr><td rowspan="3">Adaptive Mode:</td><td>Adaptive/non-adaptive equipment:</td><td>Non-adaptive Equipment</td></tr>
<tr><td>Number of transmit chain:</td><td>1</td></tr>
<tr><td>Number of receive chain:</td><td>1</td></tr>
<tr><td>Antenna Type:</td><td colspan="2">PCB Antenna</td></tr>
<tr><td>Antenna Gain:</td><td colspan="2">-3.01dBi</td></tr>
<tr><td>Power Supply:</td><td colspan="2">Battery</td></tr>
<tr><td>Operating Voltage:</td><td>Rated</td><td>3.7V</td></tr>
<tr><td rowspan="3">Operating Temperature:</td><td>Normal</td><td>25°C</td></tr>
<tr><td>Low</td><td>0°C</td></tr>
<tr><td>High</td><td>45°C</td></tr>
</table>

Note 1: This test report is variant from the original report (Report No.: SZ21050259W01, Model: WS-21005), based on the similarity between before, only changed the product name and brand name. No other changes. The changes do not affect the test results.

Note 2: The EUT contains Bluetooth Module operating at 2.4GHz ISM band, only the Bluetooth LE was covered in this report. For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.3. The Channel Number and Frequency

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	**2402**	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	**19**	**2440**	29	2460	**39**	**2480**

Note 1: The black bold channels were selected for test.

1.4. Test Standards and Results

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

ETSI EN 300 328 V2.2.2 (2019-07)	Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz band; Harmonised Standard for access to radio spectrum

Test items and the results are as bellow:

EN Reference		**EN 300 328 V2.2.2 (2019-07) Test Items**	**Test Engineer**	**Result**	**Method Determination /Remark**
No.	**Sub Clause**				
1	4.3.2.2	RF output power	Liu Bo	PASS Note1	No deviation
2	4.3.2.3	Power Spectral Density	Liu Bo	PASS Note1	No deviation
3	4.3.2.4	Duty cycle, Tx-sequence, Tx-gap	N/A	N/A Note2	N/A
4	4.3.2.5	Medium Utilization (MU) factor	N/A	N/A Note2	N/A
5	4.3.2.7	Occupied Channel Bandwidth	Liu Bo	PASS Note1	No deviation
6	4.3.2.8	Transmitter unwanted emissions in the out-of-band domain	Liu Bo	PASS Note1	No deviation
7	4.3.2.9	Transmitter unwanted emissions in the spurious domain	Liu Bo Yang Jie	PASS Note1	No deviation
8	4.3.2.10	Receiver spurious emissions	Liu Bo Yang Jie	PASS Note1	No deviation
9	4.3.2.11	Receiver Blocking	Liu Bo	PASS Note1	No deviation
10	4.3.2.12	Geo-location capability	N/A	N/A	N/A

Note 1: The test results of these test items in this report refer to the test report (Report No.: SZ21050259W01).

Note 1: This requirement does not apply for equipment with a maximum declared RF Output power level of less than 10dBm e.i.r.p. or for equipment when operating in a mode where the RF Output power is less than 10dBm e.i.r.p..

Note 2: Additions to, deviation, or exclusions from the method shall be judged in the "method determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table.

Note 3: When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% confidence intervals.

1.5. EUT Setup and Operating Conditions

The EUT is activated and controlled by the System Simulator and software. The EUT is powered by battery.

Supply Voltage:	Conducted	Normal(NV)	3.7V
	Radiated	Normal(NV)	3.7V
Test Temperature:	Conducted	Normal(NT)	25°C
		Lowest(LT)	0°C
		Highest(HT)	45°C
	Radiated	Normal	25°C

1.6. Environmental Conditions

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

Temperature (°C):	15-35
Relative Humidity (%):	20-75
Atmospheric Pressure (kPa):	86-106

2. Transmitter Parameters

2.1. RF output power

2.1.1. Definition

The RF output power is defined as the mean equivalent isotropic radiated power (e.i.r.p.) of the equipment during a transmission burst.

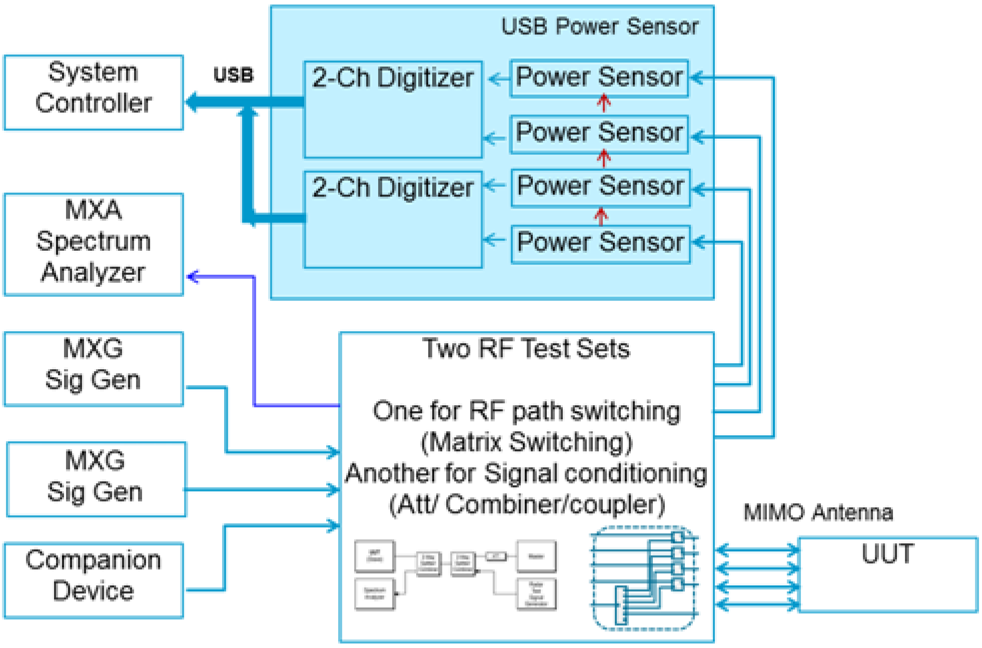
2.1.2. Limit

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 manufacturer and shall not exceed 20 dBm (See clause 5.4.1 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 manufacturer.
This limit shall apply for any combination of power level and intended antenna assembly.

2.1.3. Test condition

See clause 5.1 for the environmental test conditions. Apart from the RF output power, these measurements need only to be performed at normal environmental conditions. The measurements for RF output power shall be performed at both normal environmental conditions and at the extremes of the operating temperature range.
In the case of equipment intended for use with an integral antenna and where no antenna connectors are provided, a test fixture as described in clause B.4 may be used to perform relative measurements at the extremes of the operating temperature range.
In case of Adaptive equipment, the equipment shall be operated under its worst case configuration w.r.t. RF output power. In case of non-Adaptive equipment, the equipment shall be operated under its worst case configuration w.r.t. Medium Utilization factor (see clause 5.3.1).
For FHSS equipment, the measurements shall be performed during normal operation (hopping) and the equipment is assumed to have no blacklisted frequencies (operating on all hopping frequencies).
For non-FHSS equipment, the measurement shall be performed at the lowest, the middle, and the highest channel on which the equipment can operate. These frequencies shall be recorded.

2.1.4.Test procedures



The test procedure shall be as follows:

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) is captured.

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 as the new stored data set.

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.

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. The start and stop points shall be included. Save these P_{burst} 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 P_{burst} 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:

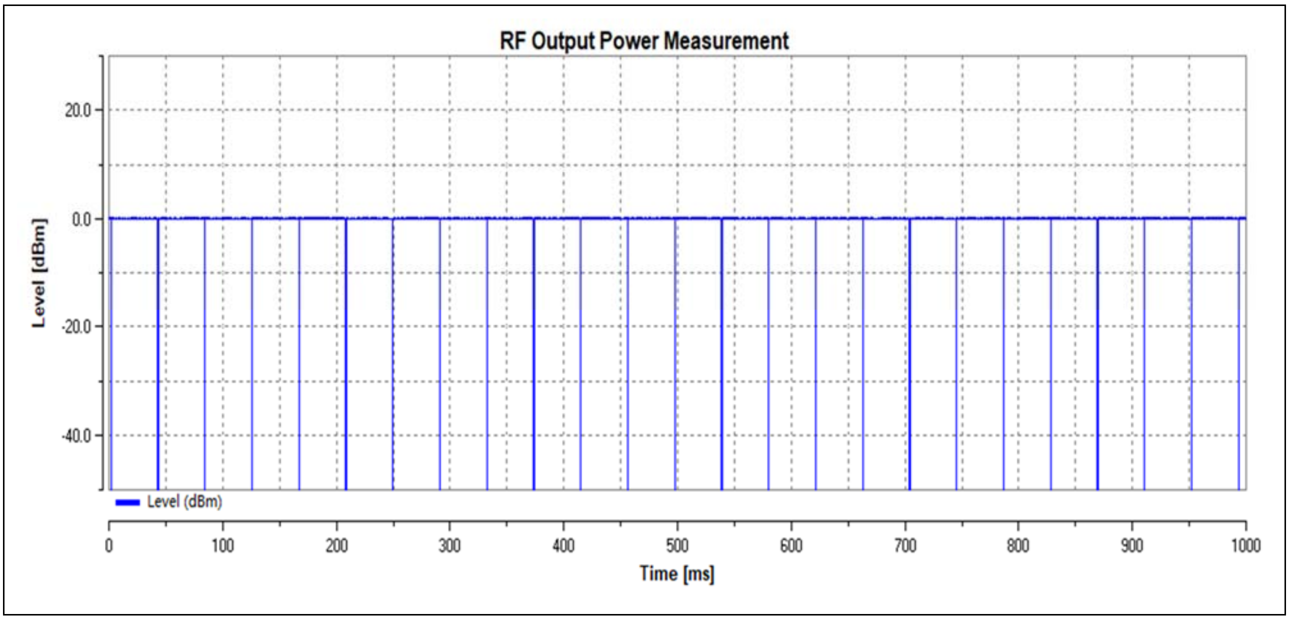
P = A + G + Y

• 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.

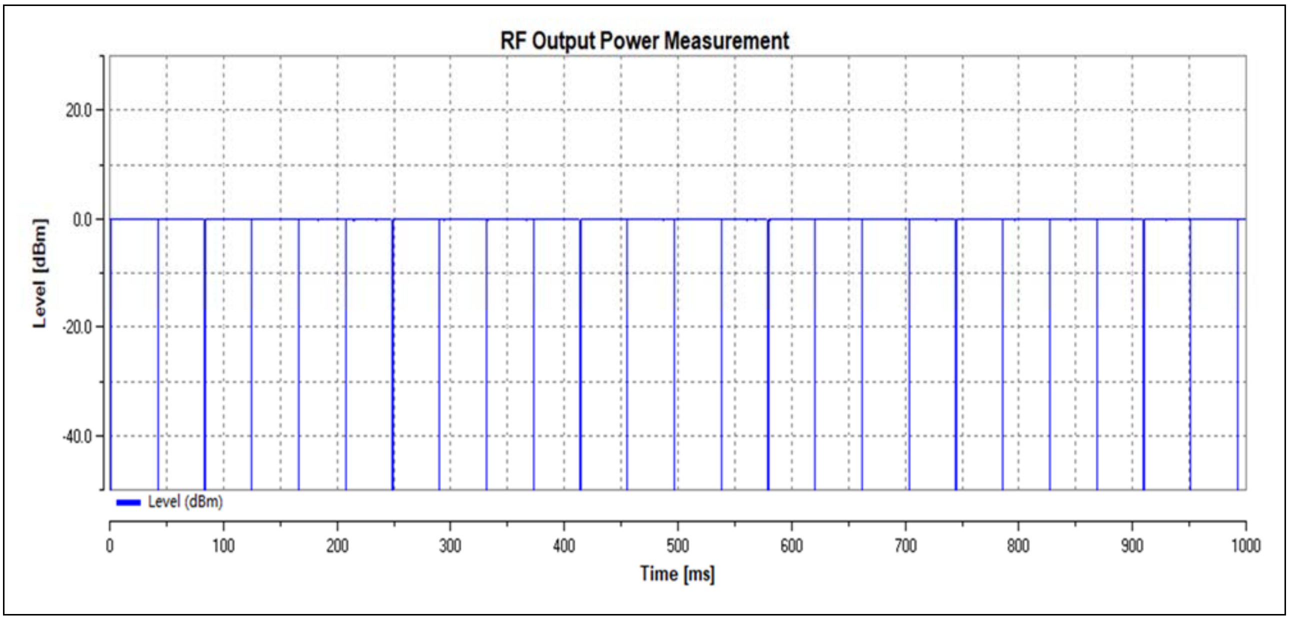
2.1.5.Result

Test Mode	Test Conditions		E.I.R.P. (dBm)			Result
			CH0 2402MHz	CH19 2440MHz	CH39 2480MHz	
GFSK	NV	NT	-2.90	-3.06	-3.78	PASS
		LT	-3.11	-3.15	-3.84	PASS
		HT	-3.13	-3.11	-3.86	PASS

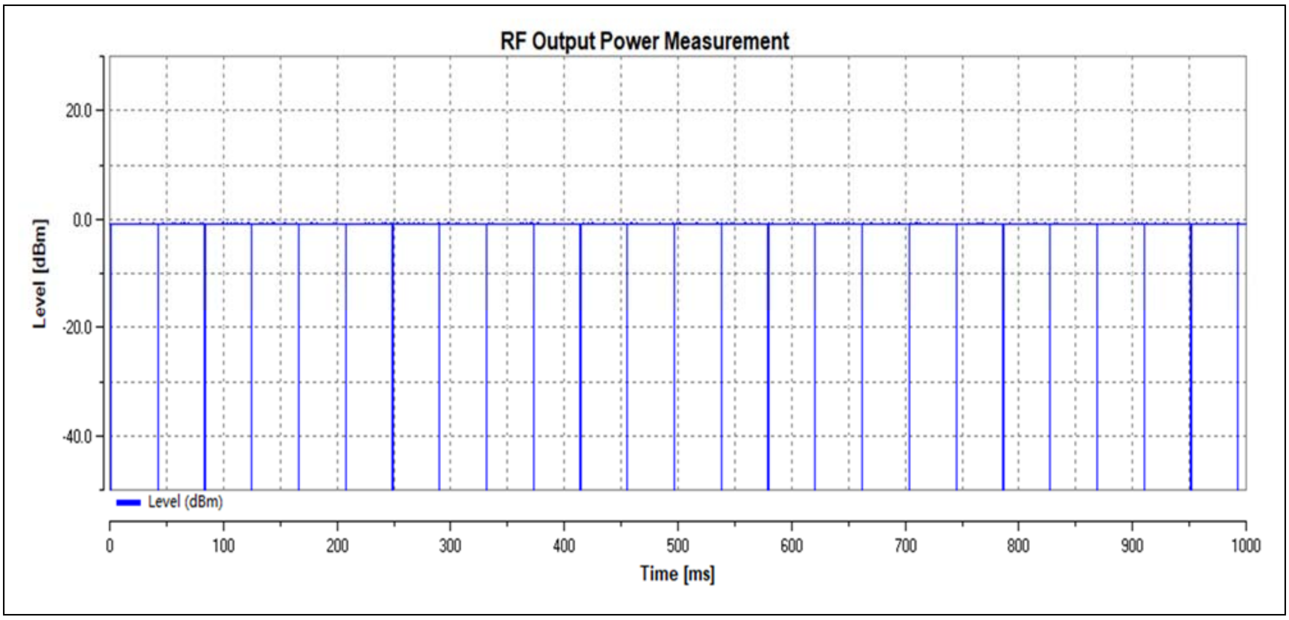
Test Plot



(Output Power_ BLE_ 2402MHz)



(Output Power_ BLE_2440MHz)



(Output Power_ BLE_2480MHz)

Note 1: Conducted measurement method was used.

Note 2: The path loss as the factor is calibrated to correct the reading.

2.2. Power Spectral Density

2.2.1. Definition

The Power Spectral Density (PSD) is the mean equivalent isotropically radiated power (e.i.r.p.) spectral density in a 1 MHz bandwidth during a transmission burst.

2.2.2. Limit

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

2.2.3. Test condition

See clause 5.1 for the environmental test conditions. These measurements shall only be performed at normal test conditions.
The measurement shall be repeated for the equipment being configured to operate at the lowest, the middle, and the highest frequency of the stated frequency range. These frequencies shall be recorded.
For the duration of the test, the equipment shall not change its operating frequency.

2.2.4. Test procedures

The transmitter shall be connected to a spectrum analyser and the Power Spectral Density (PSD) as defined in clause 4.3.2.3 shall be measured and recorded.
The test procedure shall be as follows:
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; for spectrum analysers not supporting this number of sweep points, the frequency band may be segmented.
• Detector: RMS
• Trace Mode: Max Hold
• Sweep time: For non-continuous transmissions: 2 × Channel Occupancy Time × number of sweep points
For continuous transmissions: 10 s; the sweep time may be increased further until a value where

the sweep time has no further impact anymore 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 5.3.2.2), 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.

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 5.4.2 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 $P_{Samplecor}r(n)$ (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).

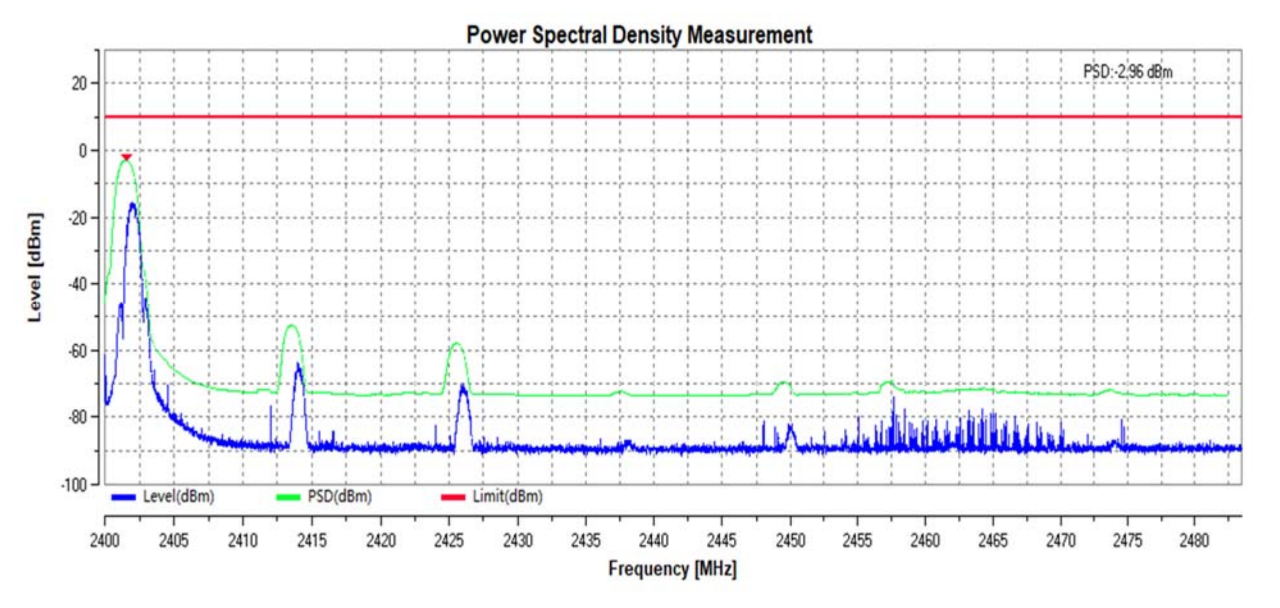
Step 7:

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 (PSD) 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.

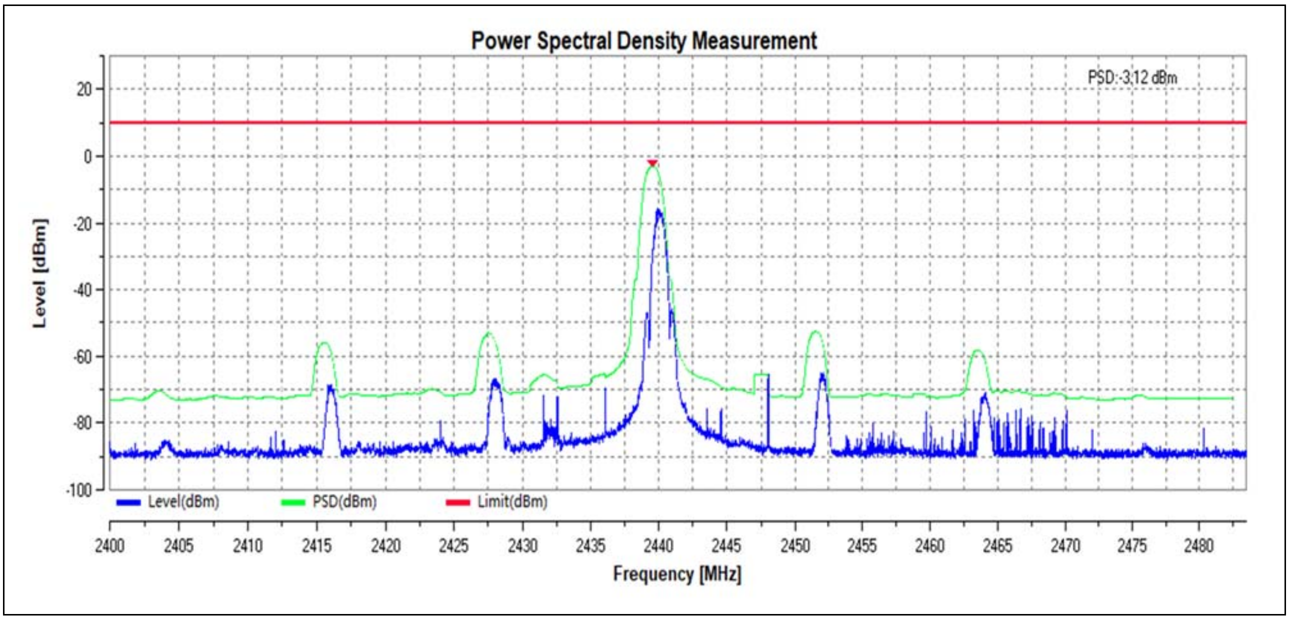
2.2.5.Result

Test Mode	Test Frequency (MHz)	Power Spectral Density (dBm/MHz)	Limit (dBm/MHz)	Result
GFSK	2402	-2.96	10	PASS
	2440	-3.12	10	PASS
	2480	-3.84	10	PASS

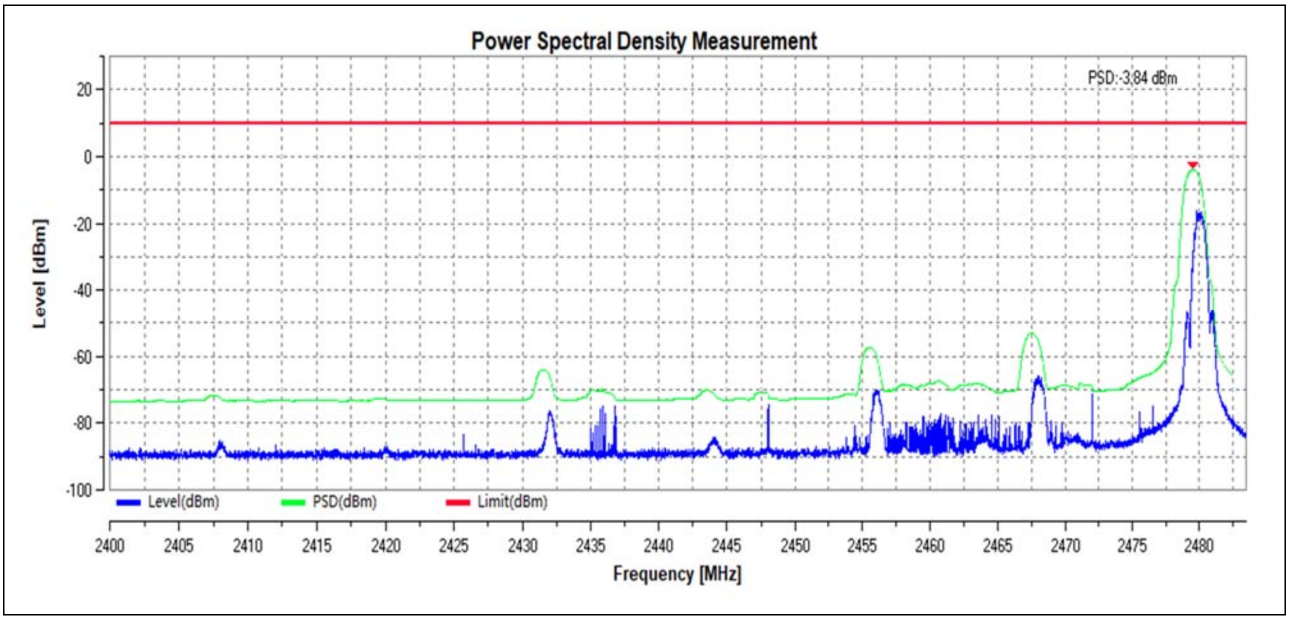
Test Plot



(Power Spectral Density _BLE_2402MHz)



(Power Spectral Density _BLE_2440MHz)



(Power Spectral Density _BLE_2480MHz)

Note 1: Conducted measurement method was used.

Note 2: The path loss as the factor is calibrated to correct the reading.

2.3. Duty Cycle, Tx-sequence, Tx-gap

2.3.1. Definition

Duty Cycle is defined as the ratio of the total transmitter 'on'-time to a 1 second observation period. Tx-sequence is defined as a period in time during which a single or multiple transmissions may occur and which shall be followed by a Tx-gap.
Tx-gap is defined as a period in time during which no transmissions occur.
The maximum Duty Cycle at which the equipment can operate, is declared by the manufacturer.

2.3.2. Limit

The Duty Cycle shall be equal to or less than the maximum value declared by the manufacturer.
The Tx-sequence time shall be equal to or less than 10 ms. The minimum Tx-gap time following a Tx-sequence shall be equal to the duration of that proceeding Tx-sequence with a minimum of 3,5 ms.

2.3.3. Test condition

These measurements need only to be performed at normal environmental conditions.

2.3.4. Test procedures

The conformance tests for this requirement are defined in clause 5.4.2 and specifically in clause 5.4.2.2.1.3.

2.3.5. Result

This test case does not apply this kind of EUT.

2.4. Medium Utilization (MU) factor

2.4.1.Definition

The Medium Utilization (MU) factor is a measure to quantify the amount of resources (Power and Time) used by non-adaptive equipment. The Medium Utilization factor is defined by the formula:

$$MU = (P / 100\ mW) \times DC$$

Where: MU is Medium Utilization factor in %.

P is the RF output power as defined in clause 4.3.2.2.2 expressed in mW.

DC is the Duty Cycle as defined in clause 4.3.2.4.2 expressed in %.

The equipment may have dynamic behavior with regard to duty cycle and corresponding power level. See clause 5.4.1 e).

2.4.2.Limit

For non-adaptive equipment using wide band modulations other than FHSS, the maximum Medium Utilization factor shall be 10 %.

2.4.3.Test condition

These measurements need only to be performed at normal environmental conditions.

2.4.4.Test procedures

The conformance tests for this requirement are defined in clause 5.4.2 and specifically in clause 5.4.2.2.1.4.

2.4.5.Result

This test case does not apply this kind of EUT.

2.5. Occupied Channel Bandwidth

2.5.1.Definition

The Occupied Channel Bandwidth is the bandwidth that contains 99 % of the power of the signal.

2.5.2.Limit

The Occupied Channel Bandwidth shall fall completely within the band given in table 1.
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.

2.5.3.Test condition

See clause 5.1 for the environmental test conditions. These measurements shall only be performed at normal test conditions.
In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains) measurements need only to be performed on one of the active transmit chains (antenna outputs).
For equipment using FHSS modulation and which have overlapping channels, special software might be required to force the UUT to hop or transmit on a single Hopping Frequency.
The measurement shall be performed only on the lowest and the highest frequency within the stated frequency range.
The frequencies on which the tests were performed shall be recorded.
If the equipment can operate with different Nominal Channel Bandwidths(e.g. 20 MHz and 40 MHz), then each channel bandwidth shall be tested separately.

2.5.4.Test procedures

The measurement procedure shall be as follows:
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:

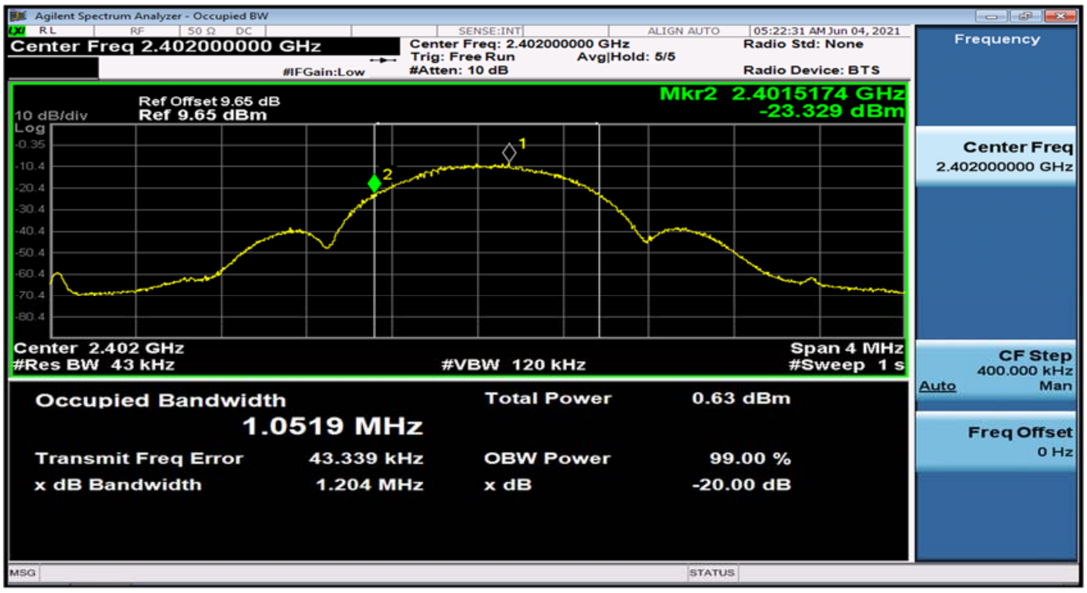
Use the 99 % bandwidth function of the spectrum analyser to measure the Occupied Channel Bandwidth of the UUT. This value shall be recorded.

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 masurement.

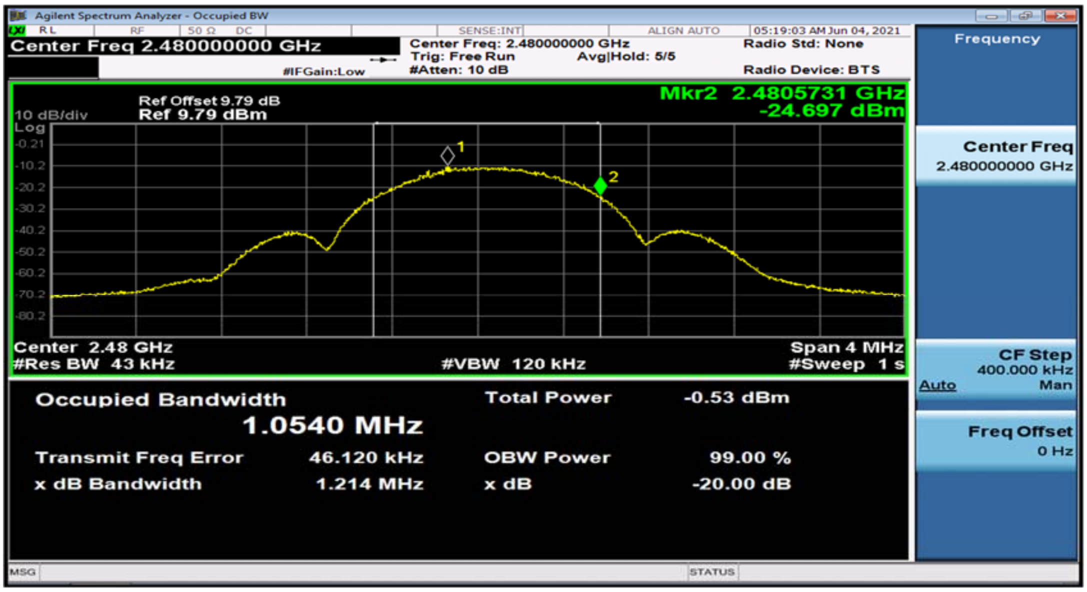
2.5.5.Result

Test Mode	Frequency (MHz)	Measure Frequency (MHz)	Limit (MHz)	Result
GFSK	2402	2401.52	≥2400	PASS
	2480	2480.57	≤2483.5	PASS

Test Plot



(Occupied Channel Bandwidth_BLE_2402MHz)



(Occupied Channel Bandwidth_BLE_2480MHz)

2.6. Transmitter unwanted emissions in the out-of-band domain

2.6.1.Definition

Transmitter unwanted emissions in the out-of-band domain are emissions when the equipment is in Transmit mode, on frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious emissions.

2.6.2.Limit

The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask in figure 3.

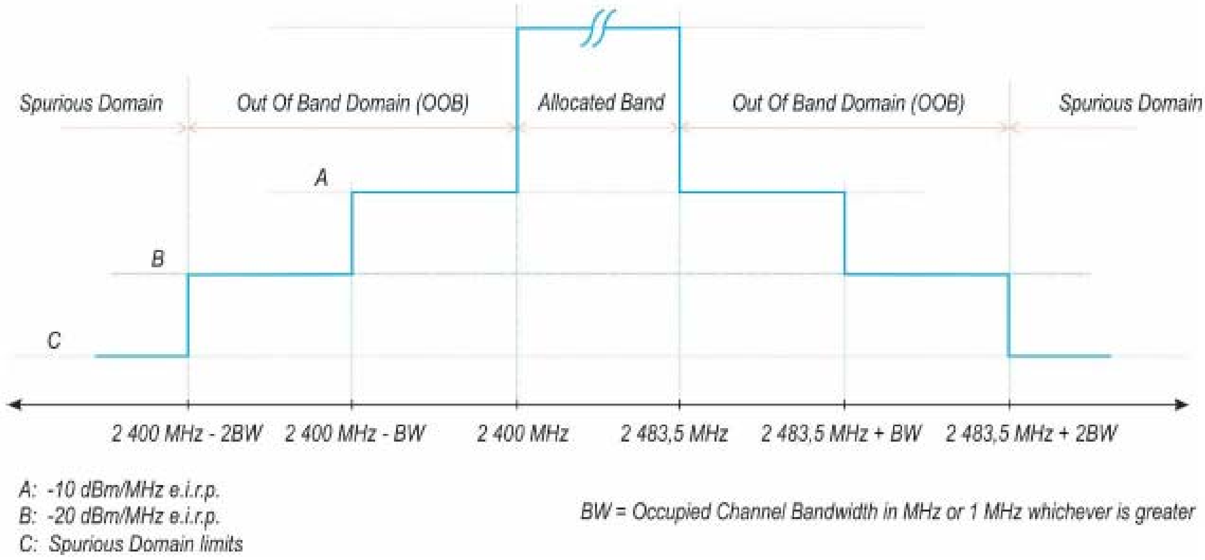


Figure 3: Transmit mask

2.6.3.Test condition

See clause 5.1 for the environmental test conditions.
These measurements shall only be performed at normal test conditions.
For equipment using FHSS modulation, the measurements shall be performed during normal operation (hopping).
For equipment using wide band modulations other than FHSS, the measurement shall be performed at the lowest and the highest channel on which the equipment can operate. These operating channels shall be recorded.
The equipment shall be configured to operate under its worst case situation with respect to output power. If the equipment can operate with different Nominal Channel Bandwidths(e.g. 20 MHz and

40 MHz), then each channel bandwidth shall be tested separately.

2.6.4.Test procedures

The applicable mask is defined by the measurement results from the tests performed under clause 5.4.7 (Occupied Channel Bandwidth).
The Out-of-band emissions within the different horizontal segments of the mask provided in figure 1 and figure 3 shall be measured using the procedure in step 1 to step 6 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: Single Sweep
- Sweep Points: Sweep Time [s] / (1 μs) or 5 000 whichever is greater
- Trigger Mode: Video
- 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 × $\log_{10}(A_{ch})$ and the additional beamforming gain Y in dB. The results for each of the transmit chains shall be individually compared with these reduced limits.

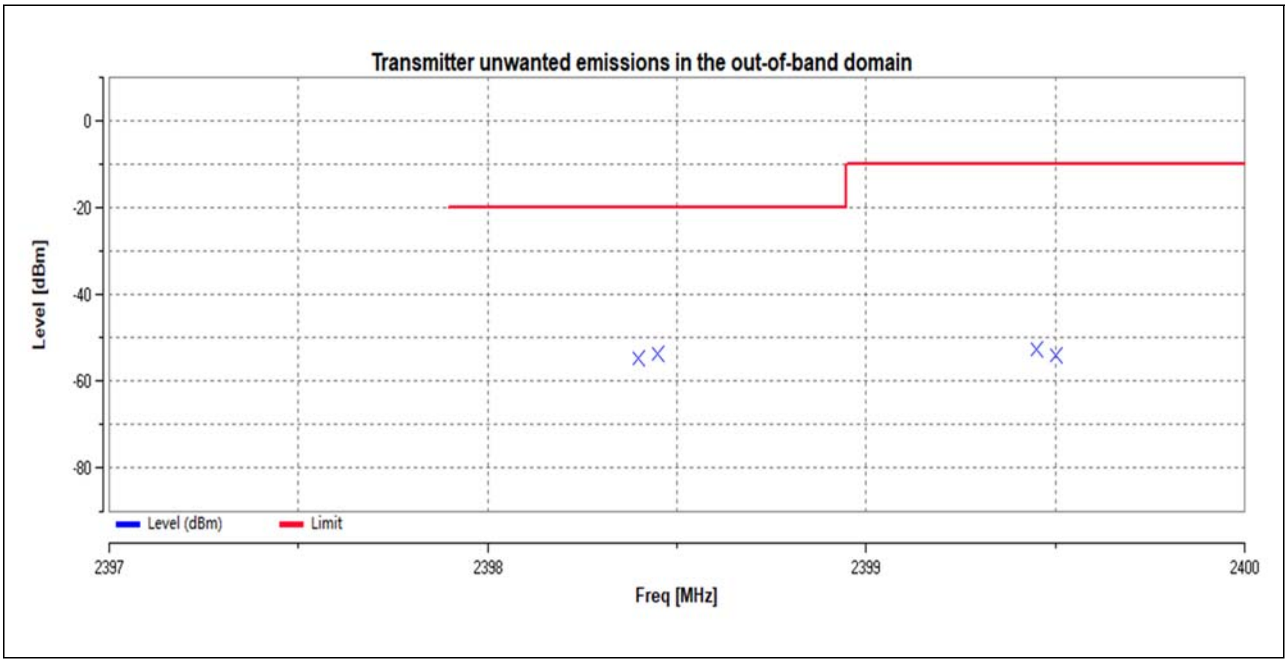
NOTE: A_{ch} refers to the number of active transmit chains.

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

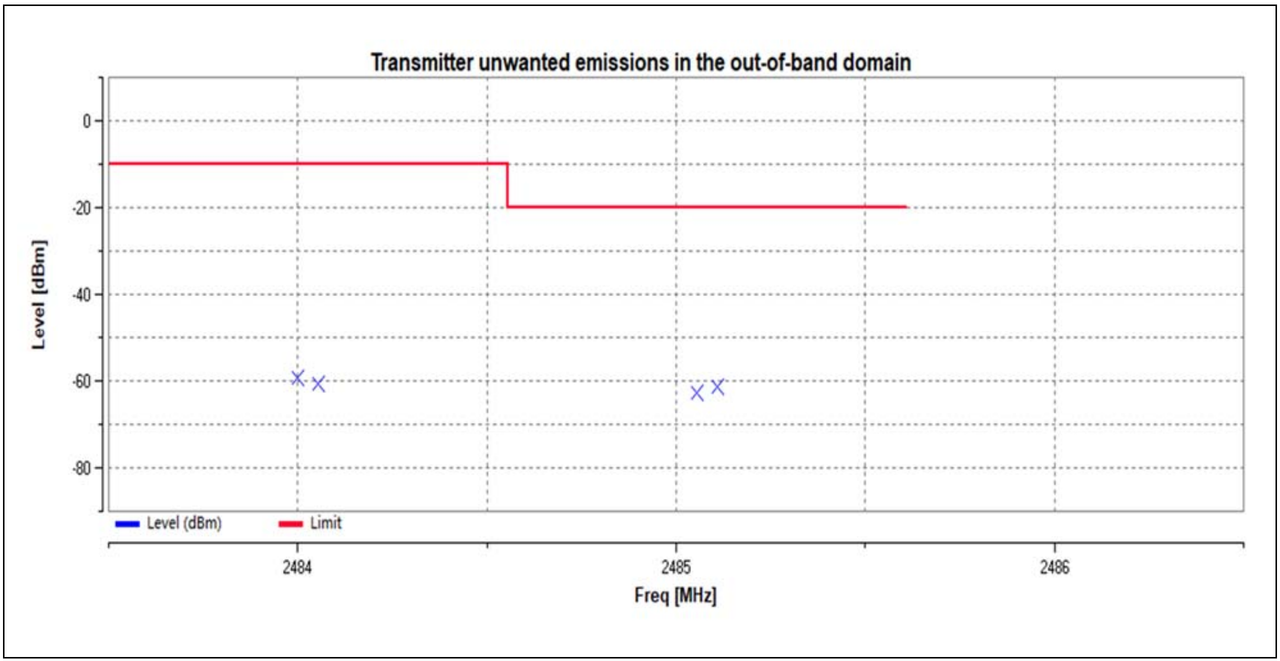
2.6.5.Result

Test Conditions		Out-of-band domain (MHz)		Out-of-band domain (MHz)	
		2400-BW to 2400	2400-2BW to 2400-BW	2483.50 to 2483.5+BW	2483.5+BW to 2483.5+2BW
NT	NV	-52.85	-53.62	-59.19	-61.35
Limit (dBm/MHz)		-10	-20	-10	-20
Result		PASS	PASS	PASS	PASS

Test Plot



(OOB_BLE_ 2402MHz)



(OOB_BLE_2480MHz)

2.7. Transmitter unwanted emissions in the spurious domain

2.7.1. Definition

Transmitter unwanted emissions in the spurious domain are emissions outside the allocated band and outside the Out-of-band Domain as indicated in figure 3 when the equipment is in Transmit mode.

2.7.2. Limit

The transmitter unwanted emissions in the spurious domain shall not exceed the values given in table 12.

In case of equipment with antenna connectors, these limits apply to emissions at the antenna port (conducted). For emissions radiated by the cabinet or emissions radiated by integral antenna equipment (without antenna connectors), these limits are e.r.p. for emissions up to 1 GHz and as e.i.r.p. for emissions above 1 GHz.

Table 12: Transmitter limits for spurious emissions

Frequency Range	Maximum Power	Bandwidth
30 MHz to 47 MHz	-36 dBm	100kHz
47 MHz to 74 MHz	-54 dBm	100kHz
74 MHz to 87,5 MHz	-36 dBm	100kHz
87,5 MHz to 118 MHz	-54 dBm	100kHz
118 MHz to 174 MHz	-36 dBm	100kHz
174 MHz to 230 MHz	-54 dBm	100kHz
230 MHz to 470 MHz	-36 dBm	100kHz
470 MHz to 694 MHz	-54 dBm	100kHz
694 MHz to 1 GHz	-36 dBm	100kHz
1 GHz to 12,75 GHz	-30 dBm	1MHz

2.7.3. Test condition

See clause 5.1 for the environmental test conditions. These measurements shall only be performed at normal test conditions.

The level of spurious emissions shall be measured as, either:

a) Their power in a specified load (conducted spurious emissions) and their effective radiated power when radiated by the cabinet or structure of the equipment (cabinet radiation); or

b) Their effective radiated power when radiated by cabinet and antenna in case of integral antenna equipment with no antenna connectors.

For equipment using FHSS modulation, the measurements may be performed when normal hopping is disabled. In this case measurements need to be performed when operating at the lowest and the highest hopping frequency. When this is not possible, the measurement shall be performed during normal operation (hopping).

For equipment using wide band modulations other than FHSS, the measurement shall be performed at the lowest and the highest channel on which the equipment can operate. These operating channels shall be recorded.

The equipment shall be configured to operate under its worst case situation with respect to output power. If the equipment can operate with different Nominal Channel Bandwidths (e.g. 20 MHz and 40 MHz), then the equipment shall be configured to operate under its worst case situation with respect to spurious emissions.

2.7.4.Test procedures

2.7.4.1Introduction

The spectrum in the spurious domain (see figure 1 or figure 3) shall be searched for emissions that exceed the limit values given in table 4 or table 12 or that come to within 6 dB below these limits. Each occurrence shall be recorded.

The measurement procedure contains 2 parts.

2.7.4.2Pre-scan

The procedure in step 1 to step 4 below shall be used to identify potential unwanted emissions of the UUT.

Step 1:

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.

Step 2:

The emissions over the range 30 MHz to 1 000 MHz shall be identified.

Spectrum analyser settings:

• Resolution bandwidth: 100 kHz

• Video bandwidth: 300 kHz

• Filter type: 3 dB (Gaussian)

• Detector mode: Peak

• Trace Mode: Max Hold

• Sweep Points: ≥ 19 400; for spectrum analysers not supporting this high number of sweep points, the frequency band may be segmented.

• 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.

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 any of the hopping

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frequencies.

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 may be used.

Allow the trace to stabilize. Any emissions identified during the sweeps above and that fall within the 6 dB range below the applicable limit or above, shall be individually measured using the procedure in clause 5.4.9.2.1.3 and compared to the limits given in table 4 or table 12.

Step 3:

The emissions over the range 1 GHz to 12,75 GHz shall be identified.

Spectrum analyser settings:

- Resolution bandwidth: 1 MHz
- Video bandwidth: 3 MHz
- Filter type: 3 dB (Gaussian)
- Detector mode: Peak
- Trace Mode: Max Hold
- Sweep Points: ≥ 23 500; for spectrum analysers not supporting this high number of sweep points, the frequency band may be segmented.
- 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.

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 any of the hopping frequencies.

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 may be used.

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.

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.

Step 4:

- In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), step 2 and step 3 need to be repeated for each of the active transmit chains (A_{ch}).The limits used to identify emissions during this pre-scan need to be reduced by 10 × $\log_{10}$ (A_{ch}).

2.7.4.3Measurement of the emissions identified during the pre-scan

Measurement of the emissions identified during the pre-scan

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.

Step 1:

The level of the emissions shall be measured using the following spectrum analyser settings:

- Measurement Mode: Time Domain Power
- Centre Frequency: Frequency of the emission identified during the pre-scan
- Resolution Bandwidth: 100 kHz (< 1 GHz) / 1 MHz (> 1 GHz)
- Video Bandwidth: 300 kHz (< 1 GHz) / 3 MHz (> 1 GHz)
- Frequency Span: Zero Span
- Sweep mode: Single Sweep
- Sweep time: > 120 % of the duration of the longest burst detected during the measurement of the RF Output Power
- Sweep points: Sweep time [μs] / (1 μs) with a maximum of 30 000
- Trigger: Video (burst signals) or Manual (continuous signals)
- Detector: RMS

Step 2:

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.

Step 3:

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 (A_{ch}).

Sum the measured power (within the observed window) for each of the active transmit chains.

Step 4:

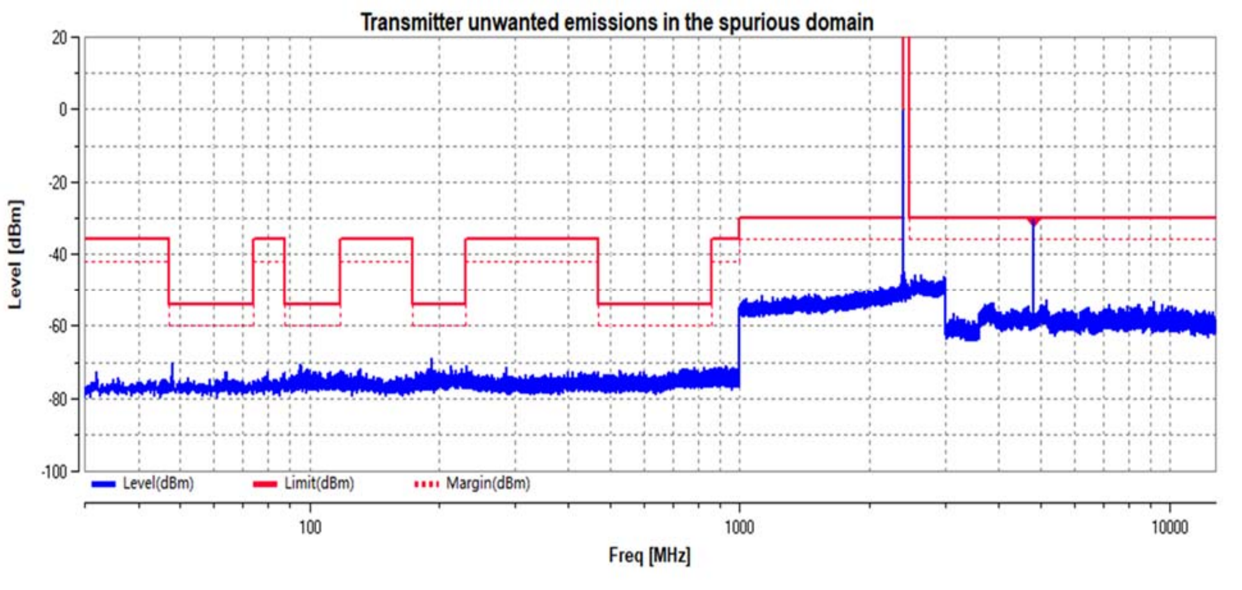
The value defined in step 3 shall be compared to the limits defined in table 4 or table 12.

2.7.5.Result

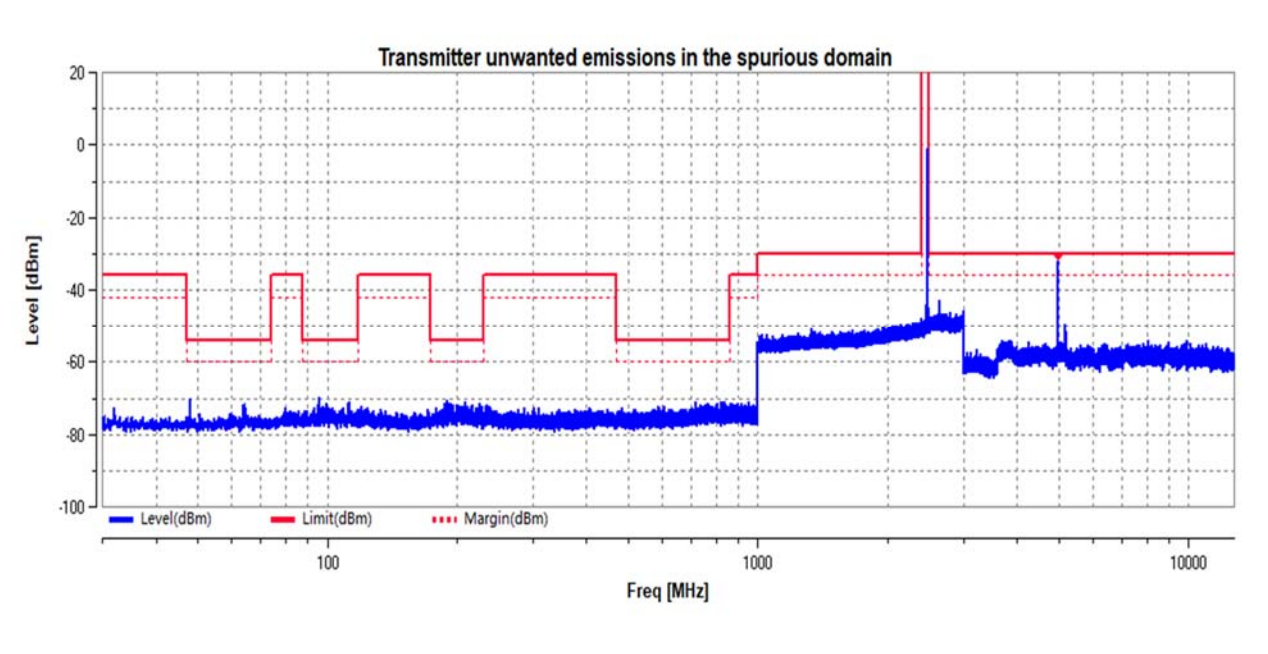
2.7.5.1Conducted test result

Test Mode	Test Frequency (MHz)	Result	Verdict
GFSK	2402	See test plot	PASS
	2480	See test plot	PASS

Test Plot



(TX_CSE_BLE _2402MHz_30MHz to 12.75GHz)

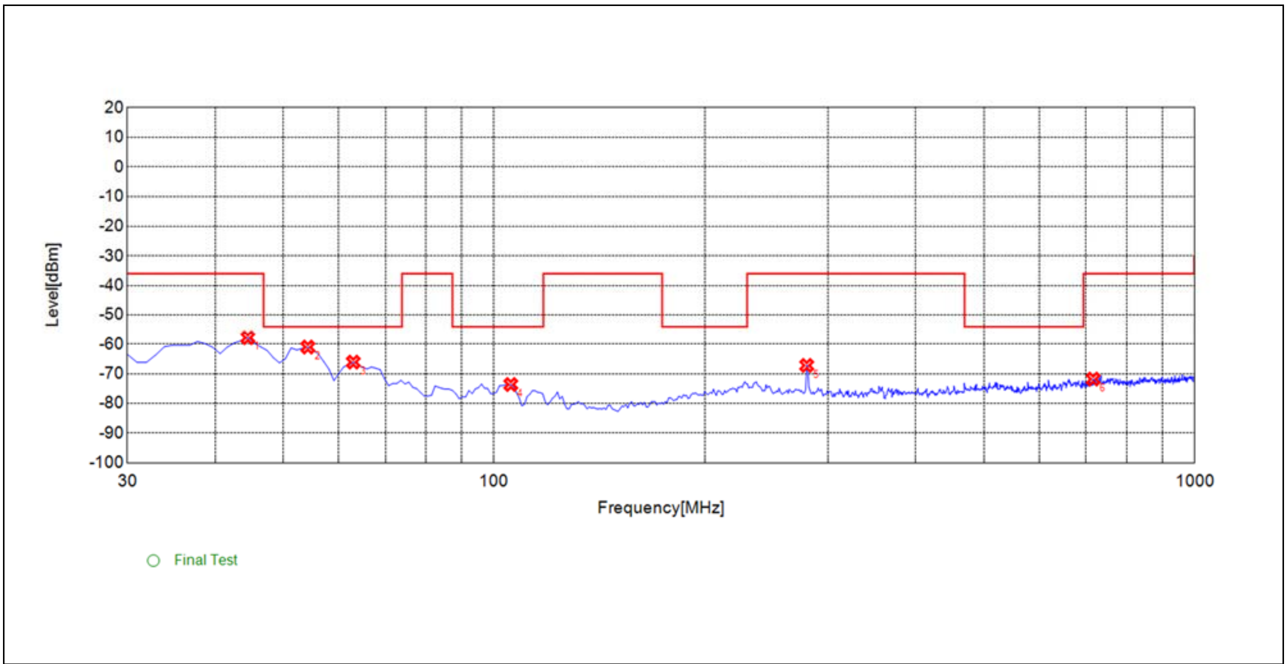


(TX_CSE_BLE _2480MHz_30MHz to 12.75GHz)

2.7.5.2 Radiated test result

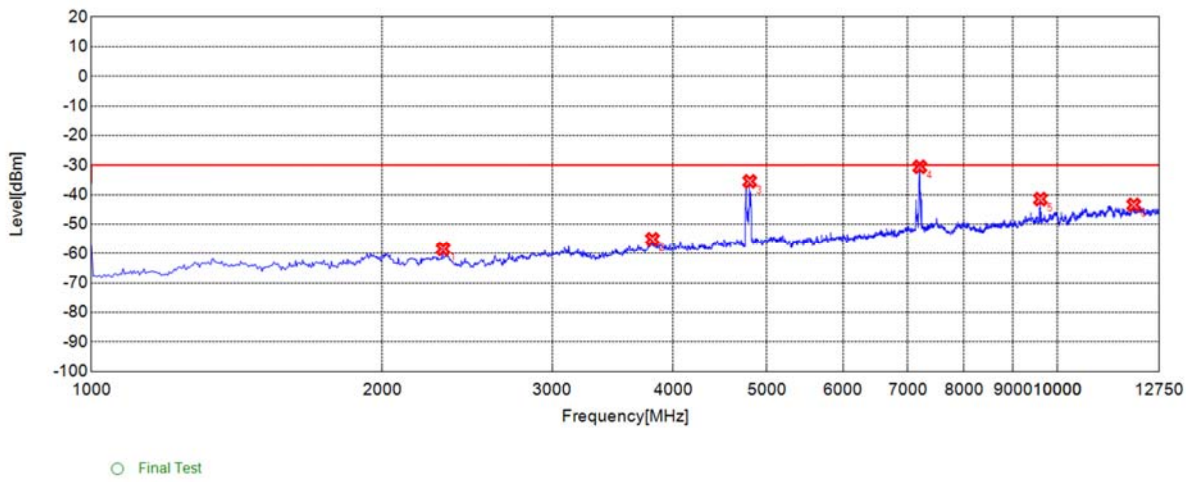
Note: For radiated spurious emissions measurements (30MHz to 100MHz), the measurement distance between the equipment and the measurement antenna cannot be fulfilled and where the measurement distance would result in measurements in the near field, the additional measurement uncertainty has been incorporated into the results, the results still fulfill the requirements of standard.

Plot for Channel 0



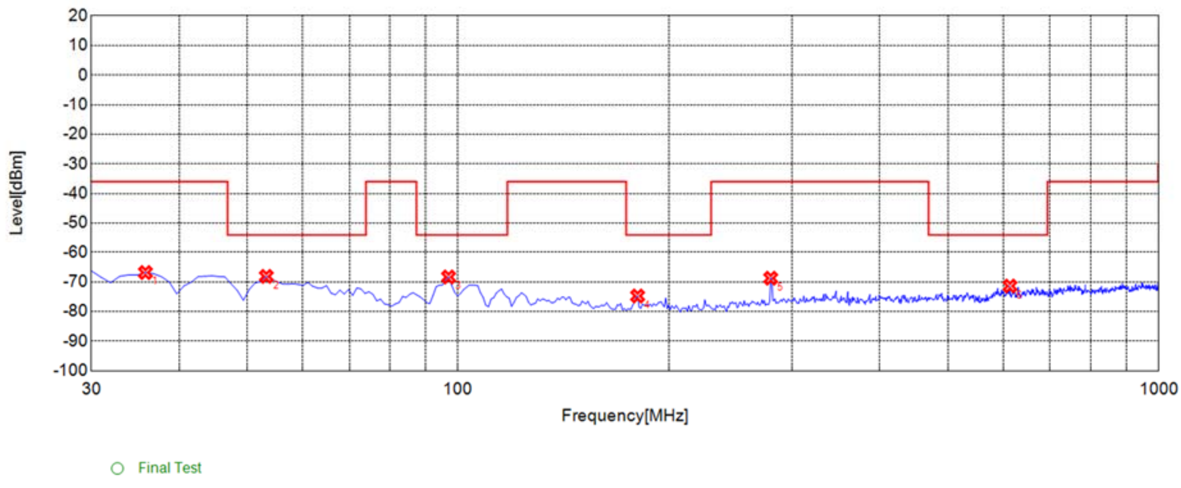
(TX_RSE_BLE_1Mbps_2402MHz_30MHz to 1GHz_ Antenna Horizontal)

Channel 0				
Transmitter with modulation Mode at 2402MHz				
Frequency (MHz)	**Level (dBm)**	**Limit (dBm)**	**Antenna**	**Verdict**
44.5650	-57.85	-36.00	Horizontal	PASS
54.2740	-61.03	-54.00	Horizontal	PASS
63.0130	-66.09	-54.00	Horizontal	PASS
105.7360	-73.63	-54.00	Horizontal	PASS
279.5400	-67.21	-36.00	Horizontal	PASS
716.4760	-71.81	-36.00	Horizontal	PASS



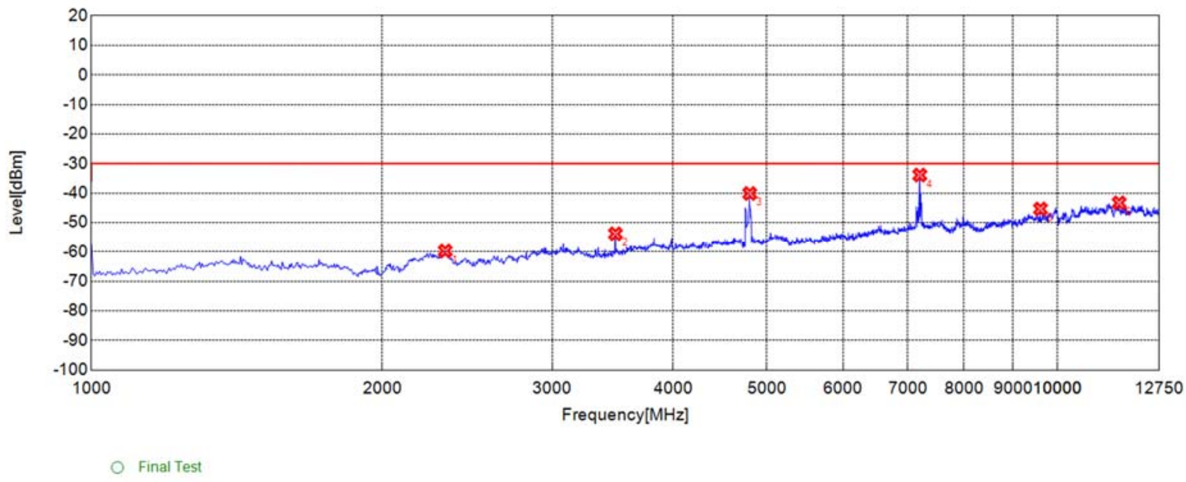
(TX_RSE_BLE_1Mbps_2402MHz_1GHz to 12.75GHz_ Antenna Horizontal)

Channel 0					
Transmitter with modulation Mode at 2402MHz					
Frequency (MHz)	Level (dBm)	RMS (dBm)	Limit (dBm)	Antenna	Verdict
2312.5210	-58.48	N/A	-30.00	Horizontal	PASS
3809.1860	-55.13	N/A	-30.00	Horizontal	PASS
4804.3510	-35.52	N/A	-30.00	Horizontal	PASS
7206.0690	-30.59	-37.81	-30.00	Horizontal	PASS
9607.7860	-41.51	N/A	-30.00	Horizontal	PASS
12001.6670	-43.47	N/A	-30.00	Horizontal	PASS



(TX_RSE_BLE_1Mbps_2402MHz_30MHz to 1GHz_ Antenna Vertical)

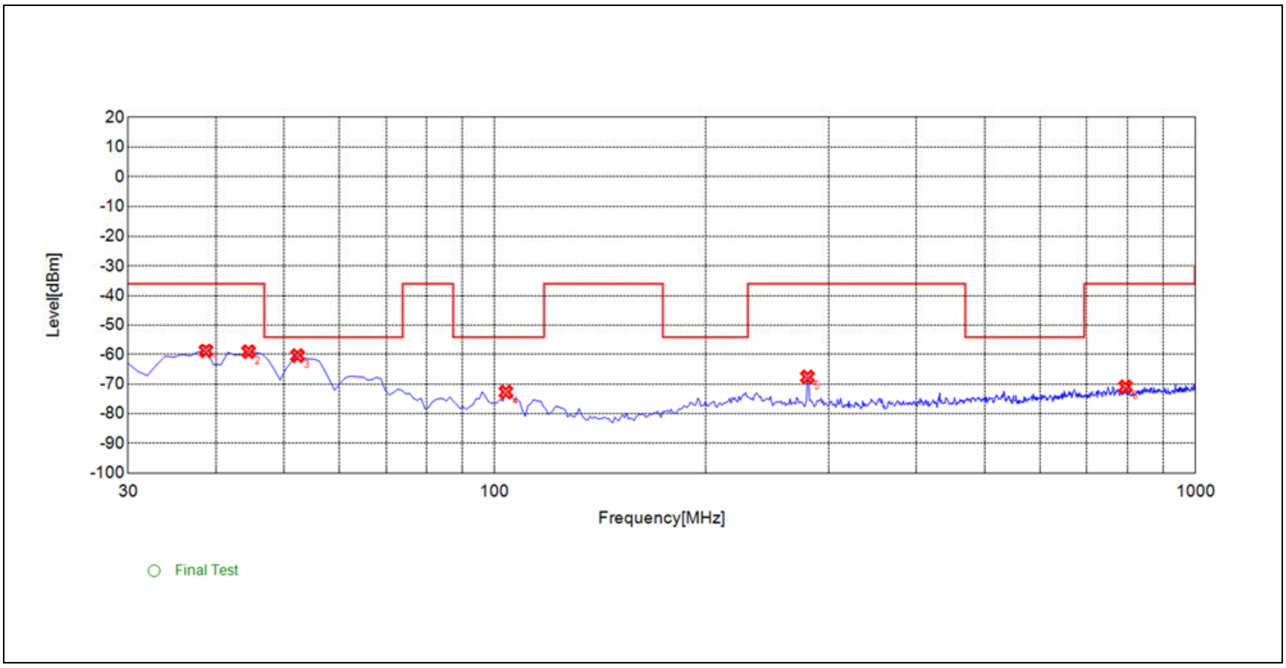
Channel 0				
Transmitter with modulation Mode at 2402MHz				
Frequency (MHz)	**Level (dBm)**	**Limit (dBm)**	**Antenna**	**Verdict**
35.8260	-66.87	-36.00	Vertical	PASS
53.3030	-68.16	-54.00	Vertical	PASS
96.9970	-68.37	-54.00	Vertical	PASS
180.5010	-74.78	-54.00	Vertical	PASS
279.5400	-68.77	-36.00	Vertical	PASS
613.5540	-71.41	-54.00	Vertical	PASS



(TX_RSE_BLE_1Mbps_2402MHz_1GHz to 12.75GHz_ Antenna Vertical)

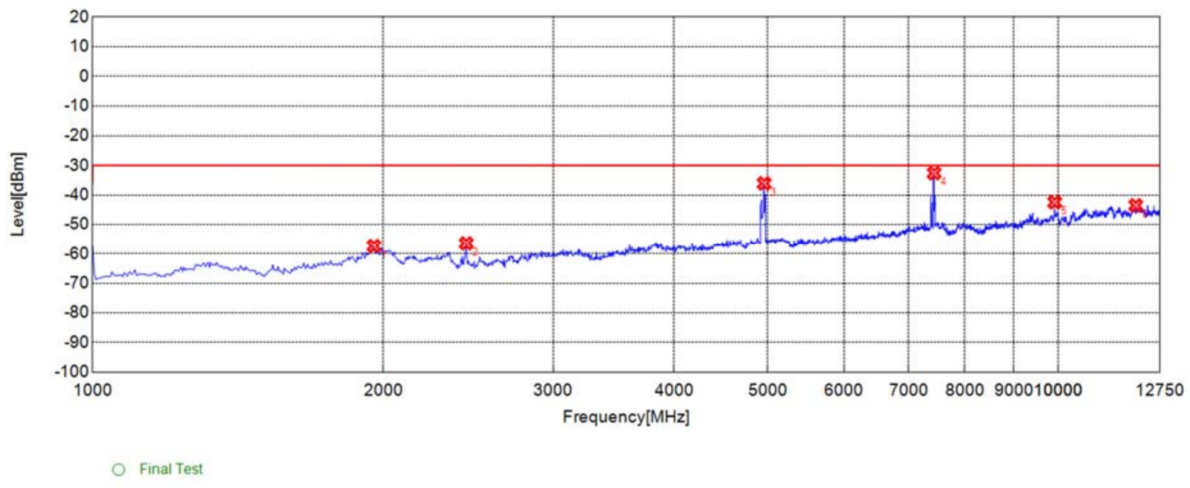
Channel 0				
Transmitter with modulation Mode at 2402MHz				
Frequency (MHz)	**Level (dBm)**	**Limit (dBm)**	**Antenna**	**Verdict**
2324.2750	-59.77	-30.00	Vertical	PASS
3487.9130	-53.82	-30.00	Vertical	PASS
4804.3510	-40.14	-30.00	Vertical	PASS
7206.0690	-33.91	-30.00	Vertical	PASS
9607.7860	-45.39	-30.00	Vertical	PASS
11590.2800	-43.33	-30.00	Vertical	PASS

Plot for Channel 39



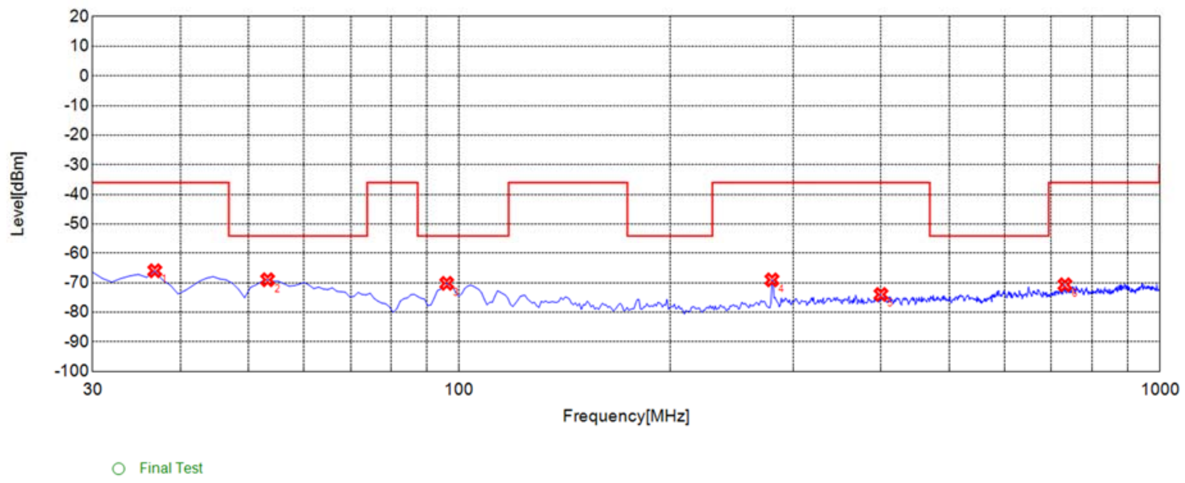
(TX_RSE_BLE_1Mbps_2480MHz_30MHz to 1GHz_ Antenna Horizontal)

Channel 39				
Transmitter with modulation Mode at 2480MHz				
Frequency (MHz)	**Level (dBm)**	**Limit (dBm)**	**Antenna**	**Verdict**
38.7390	-58.8	-36.00	Horizontal	PASS
44.5650	-59.09	-36.00	Horizontal	PASS
52.3320	-60.44	-54.00	Horizontal	PASS
103.7940	-72.71	-54.00	Horizontal	PASS
279.5400	-67.62	-36.00	Horizontal	PASS
795.1250	-70.95	-36.00	Horizontal	PASS



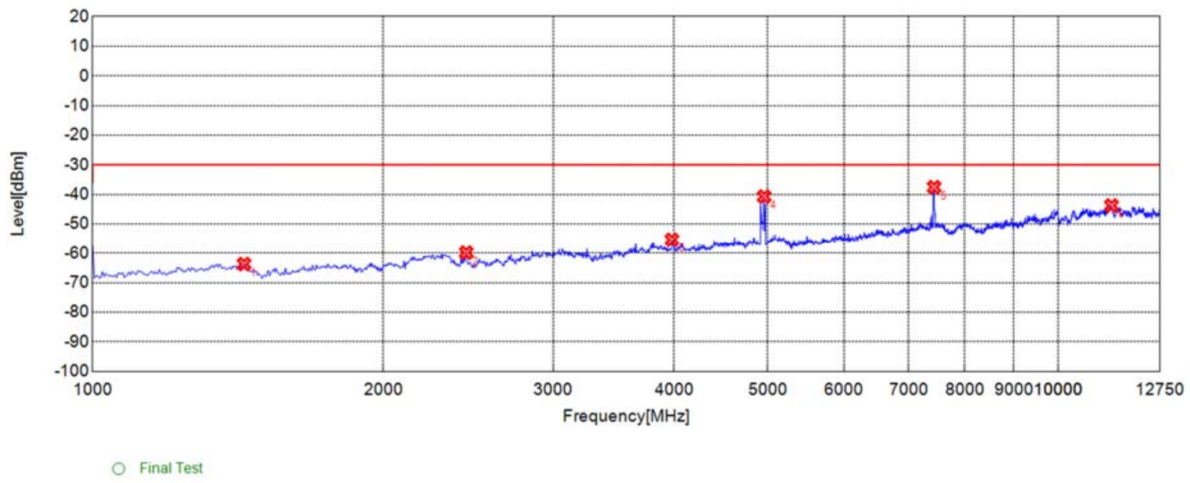
(TX_RSE_BLE_1Mbps_2480MHz_1GHz to 12.75GHz_ Antenna Horizontal)

Channel 39					
Transmitter with modulation Mode at 2480MHz					
Frequency (MHz)	**Level (dBm)**	**RMS (dBm)**	**Limit (dBm)**	**Antenna**	**Verdict**
1955.9850	-57.37	N/A	-30.00	Horizontal	PASS
2437.8960	-56.46	N/A	-30.00	Horizontal	PASS
4961.0700	-36.07	N/A	-30.00	Horizontal	PASS
7441.1470	-32.61	-39.24	-30.00	Horizontal	PASS
9921.2240	-42.46	N/A	-30.00	Horizontal	PASS
12036.9290	-43.53	N/A	-30.00	Horizontal	PASS



(TX_RSE_BLE_1Mbps_2480MHz_30MHz to 1GHz_Antenna Vertical)

Channel 39				
Transmitter with modulation Mode at 2480MHz				
Frequency (MHz)	**Level (dBm)**	**Limit (dBm)**	**Antenna**	**Verdict**
36.7970	-65.97	-36.00	Vertical	PASS
53.3030	-69	-54.00	Vertical	PASS
96.0260	-70.22	-54.00	Vertical	PASS
279.5400	-69.05	-36.00	Vertical	PASS
399.9400	-73.98	-36.00	Vertical	PASS
732.0120	-70.71	-36.00	Vertical	PASS



(TX_RSE_BLE_1Mbps_2480MHz_1GHz to 12.75GHz_Antenna Vertical)

Channel 39				
Transmitter with modulation Mode at 2480MHz				
Frequency (MHz)	**Level (dBm)**	**Limit (dBm)**	**Antenna**	**Verdict**
1434.8950	-63.69	-30.00	Vertical	PASS
2437.8960	-59.82	-30.00	Vertical	PASS
3981.5770	-55.37	-30.00	Vertical	PASS
4961.0700	-40.74	-30.00	Vertical	PASS
7441.1470	-37.58	-30.00	Vertical	PASS
11359.1200	-43.77	-30.00	Vertical	PASS

3. Receiver Parameters

3.1. Receiver spurious emissions

3.1.1. Definition

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

3.1.2. Limit

The spurious emissions of the receiver shall not exceed the values given in table 13.
In case of equipment with antenna connectors, these limits apply to emissions at the antenna port (conducted). For emissions radiated by the cabinet or for emissions radiated by integral antenna equipment (without antenna connectors), these limits are e.r.p. for emissions up to 1 GHz and e.i.r.p. for emissions above 1 GHz.

Table 13: Spurious emission limits for receivers

Frequency range	Maximum power	Measurement bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 12,75 GHz	-47 dBm	1 MHz

3.1.3. Test condition

See clause 5.1 for the environmental test conditions. These measurements shall only be performed at normal test conditions.
The level of spurious emissions shall be measured as, either:
a) Their power in a specified load (conducted spurious emissions) and their effective radiated power when radiated by the cabinet or structure of the equipment (cabinet radiation); or
b) Their effective radiated power when radiated by cabinet and antenna in case of integral antenna equipment with no temporary antenna connectors.
Testing shall be performed when the equipment is in a receive-only mode.
For equipment using wide band modulations other than FHSS, the measurement shall be performed at the lowest and the highest channel on which the equipment can operate. These frequencies shall be recorded.
For equipment using FHSS modulation, the measurements may be performed when normal hopping is disabled. In this case measurements need to be performed when operating at the lowest and the highest hopping frequency. These frequencies shall be recorded. When disabling the normal hopping is not possible, the measurement shall be performed during normal operation (hopping).

3.1.4.Test procedures

3.1.4.1Conducted measurement

Introduction

In case of conducted measurements, the radio equipment shall be connected to the measuring equipment via an attenuator.

The spectrum in the spurious domain (see figure 1 or figure 3) shall be searched for emissions that exceed the limit values given in table 5 or table 13 or that come to within 6 dB below these limits. Each occurrence shall be recorded.

The measurement procedure contains 2 parts.

Pre-scan

The procedure in step 1 to step 4 below shall be used to identify potential unwanted emissions of the UUT.

Step 1:

The sensitivity of the spectrum analyser should be such that the noise floor is at least 12 dB below the limits given in table 5 or table 13.

Step 2:

The emissions over the range 30 MHz to 1 000 MHz shall be identified.

Spectrum analyser settings:

• Resolution bandwidth: 100 kHz
• Video bandwidth: 300 kHz
• Filter type: 3 dB (Gaussian)
• Detector mode: Peak
• Trace Mode: Max Hold.
• Sweep Points: ≥ 19 400
• Sweep time: Auto

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.

Step 3:

The emissions over the range 1 GHz to 12,75 GHz shall be identified.

Spectrum analyser settings:

• Resolution bandwidth: 1 MHz
• Video bandwidth: 3 MHz
• Filter type: 3 dB (Gaussian)
• Detector mode: Peak
• Trace Mode: Max Hold
• Sweep Points: ≥ 23 500; for spectrum analysers not supporting this high number of sweep points, the frequency band may be segmented.

• Sweep time: Auto

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.

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.

Step 4:

• In case of conducted measurements on smart antenna systems (equipment with multiple receive chains), step 2 and step 3 need to be repeated for each of the active receive chains A_{ch}. The limits used to identify emissions during this pre-scan need to be reduced by 10 × $\log_{10} A_{ch}$.

3.1.4.2Measurement of the emissions identified during the pre-scan

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.

Step 1:

The level of the emissions shall be measured using the following spectrum analyser settings:

• Measurement Mode: Time Domain Power
• Centre Frequency: Frequency of the emission identified during the pre-scan
• Resolution Bandwidth: 100 kHz (< 1 GHz) / 1 MHz (> 1 GHz)
• Video Bandwidth: 300 kHz (< 1 GHz) / 3 MHz (> 1 GHz)
• Frequency Span: Zero Span
• Sweep mode: Single Sweep
• Sweep time: 30 ms
• Sweep points: ≥ 30 000
• Trigger: Video (for burst signals) or Manual (for continuous signals)
• Detector: RMS

Step 2:

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.

Step 3:

In case of conducted measurements on smart antenna systems (equipment with multiple receive chains), step 2 needs to be repeated for each of the active receive chains A_{ch}.

Sum the measured power (within the observed window) for each of the active receive chains.

Step 4: The value defined in step 3 shall be compared to the limits defined in table 5 and table 13.

3.1.4.3Radiated measurement

The test site as described in annex B and applicable measurement procedures as described in annex C shall be used. The test procedure is further as described under clause 5.4.10.2.1.

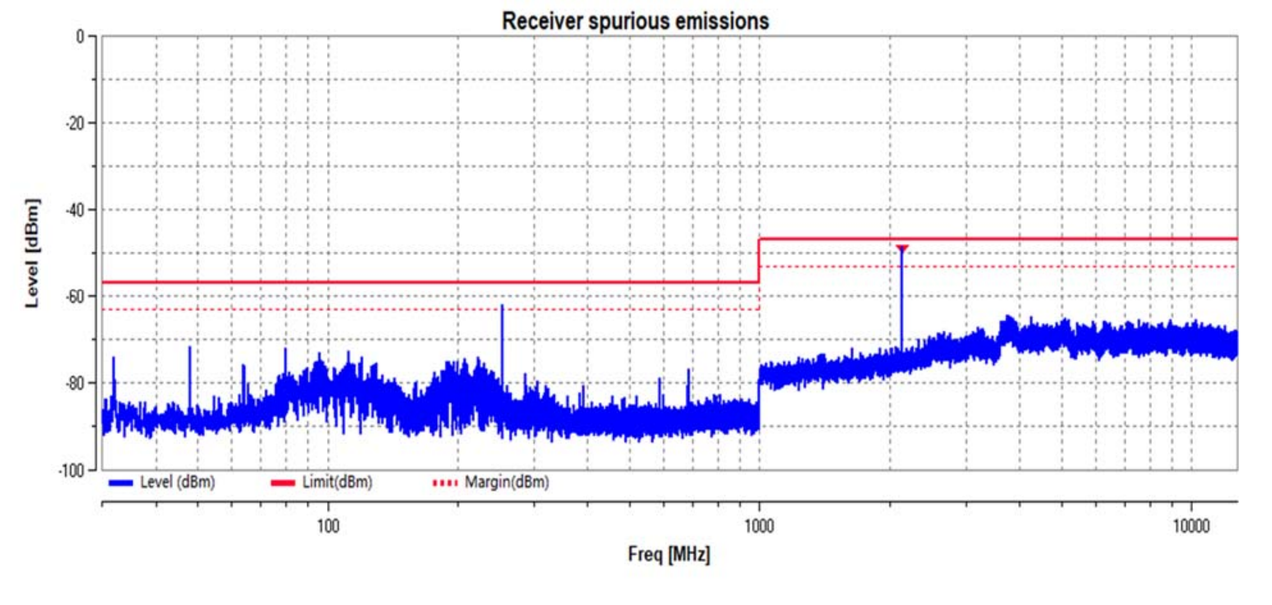
3.1.5.Result

3.1.5.1Conducted test result

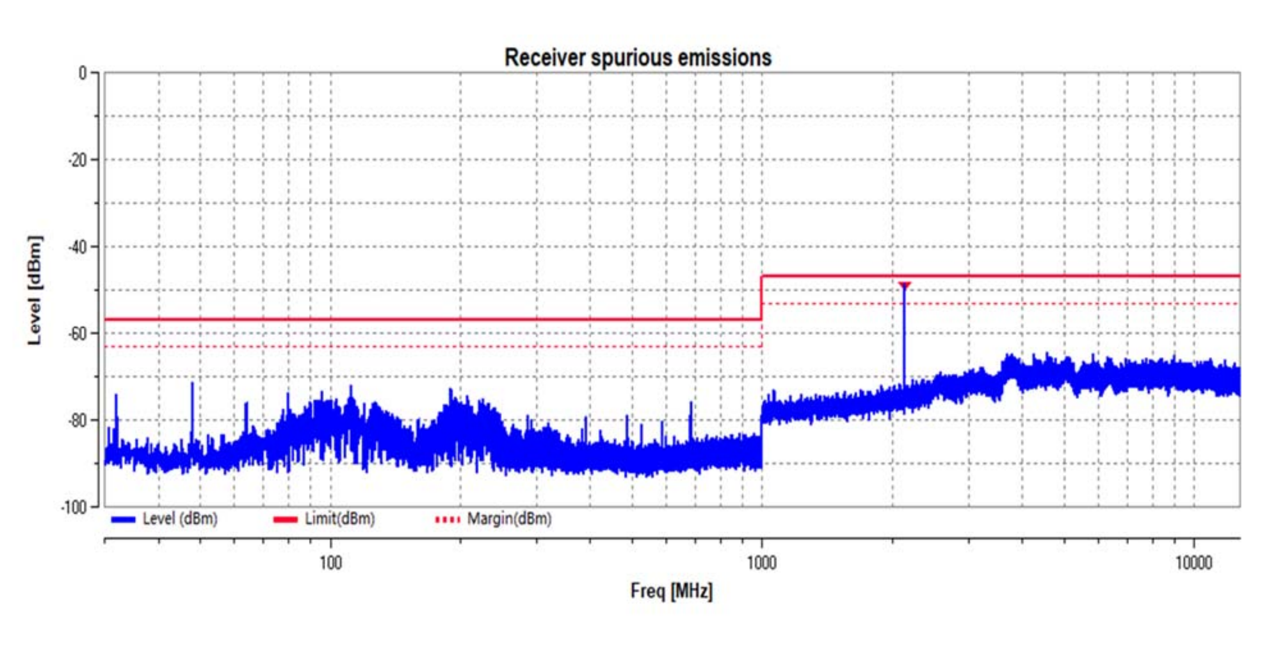
Below is the worst case situation test data:

Test Mode	Test Frequency (MHz)	Result	Verdict
GFSK	2402	See test plot	PASS
	2480	See test plot	PASS

Test Plot



(RX_CSE_BLE _2402MHz_30MHz to 12.75GHz)

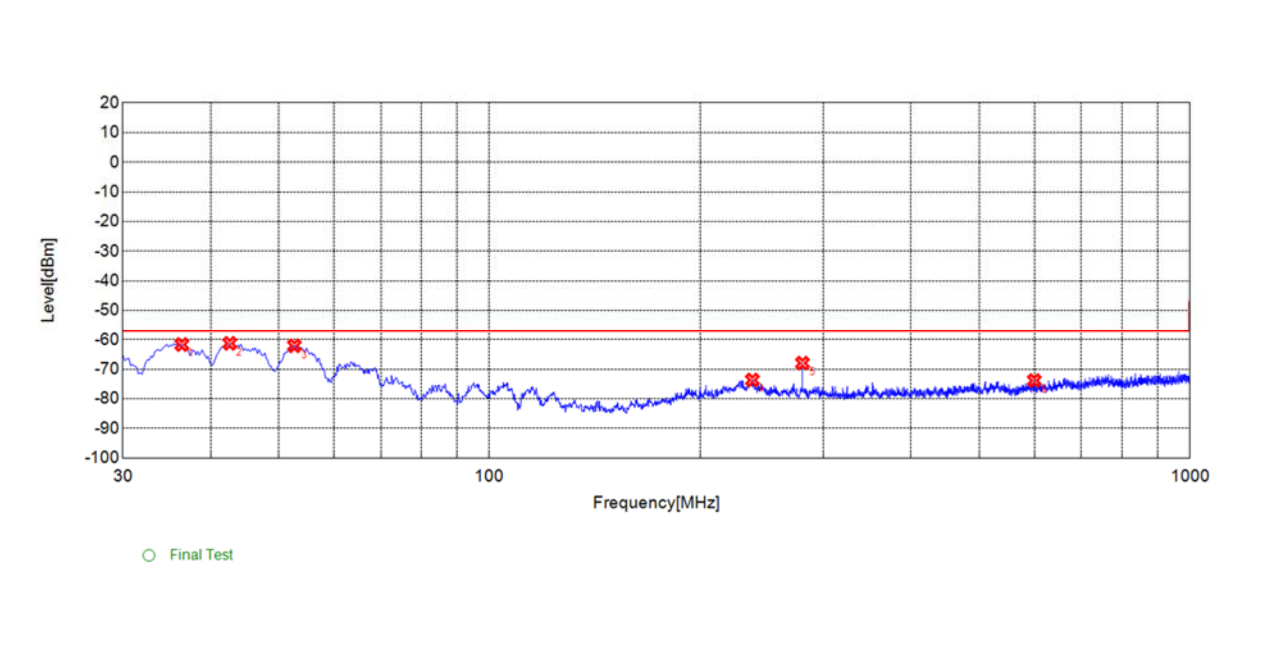


(RX_CSE_BLE _2480MHz_30MHz to 12.75GHz)

3.1.5.2 Radiated test result

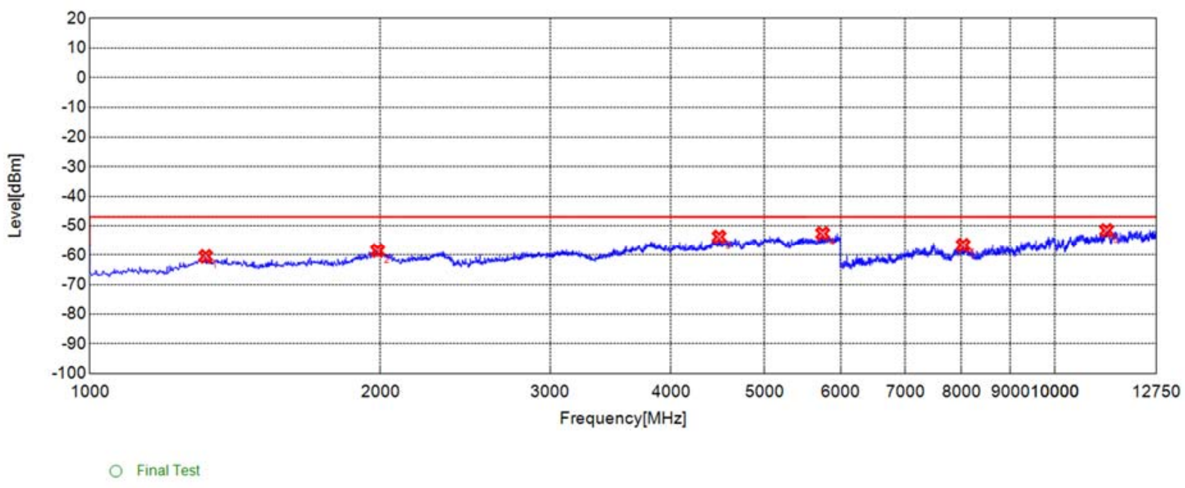
Note: For radiated spurious emissions measurements (30MHz to 100MHz), the measurement distance between the equipment and the measurement antenna cannot be fulfilled and where the measurement distance would result in measurements in the near field, the additional measurement uncertainty has been incorporated into the results, the results still fulfill the requirements of standard.

Plot for Channel 0



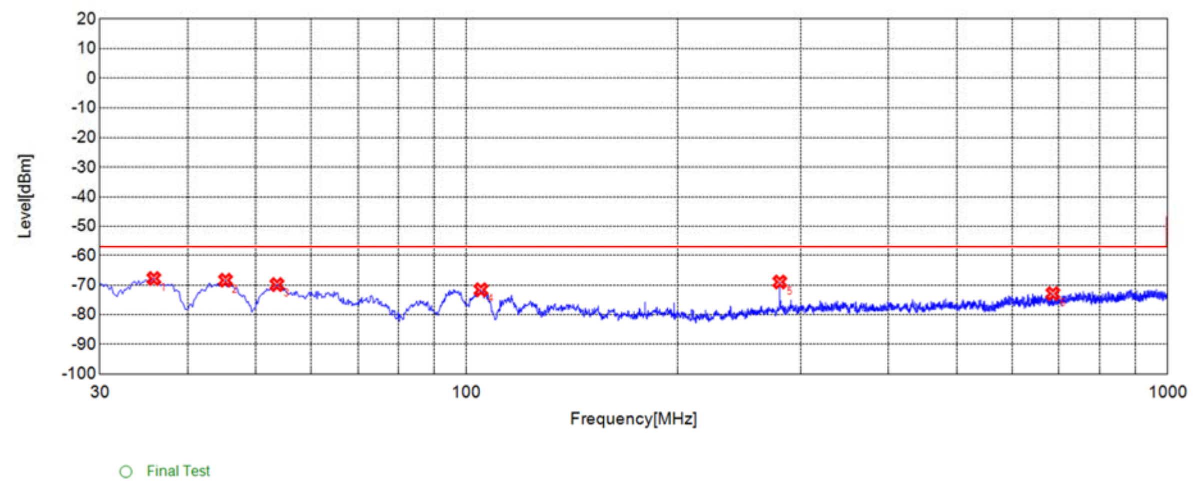
(RX_RSE_BLE_1Mbps_2402MHz_30MHz to 1GHz_Antenna Horizontal)

Channel 0				
Receiver with modulation Mode at 2402MHz				
Frequency (MHz)	**Level (dBm)**	**Limit (dBm)**	**Antenna**	**Verdict**
36.4030	-61.66	-57.00	Horizontal	PASS
42.6130	-61.26	-57.00	Horizontal	PASS
52.7030	-62.09	-57.00	Horizontal	PASS
237.4270	-73.66	-57.00	Horizontal	PASS
279.9220	-67.95	-57.00	Horizontal	PASS
599.6980	-73.83	-57.00	Horizontal	PASS



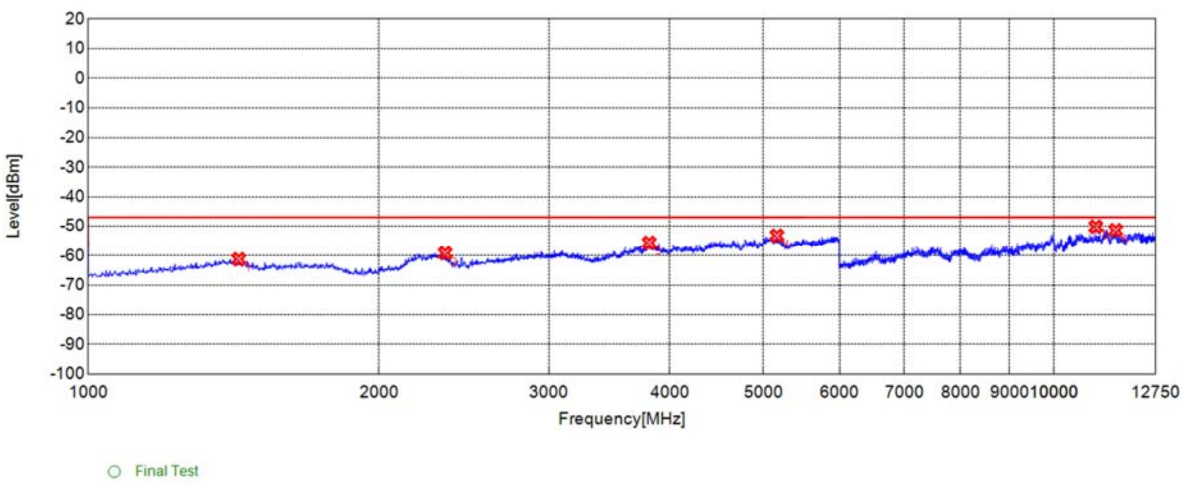
(RX_RSE_BLE_1Mbps_2402MHz_1GHz to 12.75GHz_Antenna Horizontal)

Channel 0				
Receiver with modulation Mode at 2402MHz				
Frequency (MHz)	**Level (dBm)**	**Limit (dBm)**	**Antenna**	**Verdict**
1318.4390	-60.49	-47.00	Horizontal	PASS
1986.9960	-58.54	-47.00	Horizontal	PASS
4489.4960	-53.8	-47.00	Horizontal	PASS
5748.2490	-52.65	-47.00	Horizontal	PASS
8039.1800	-56.66	-47.00	Horizontal	PASS
11320.7740	-51.6	-47.00	Horizontal	PASS



(RX_RSE_BLE_1Mbps_2402MHz_30MHz to 1GHz_Antenna Vertical)

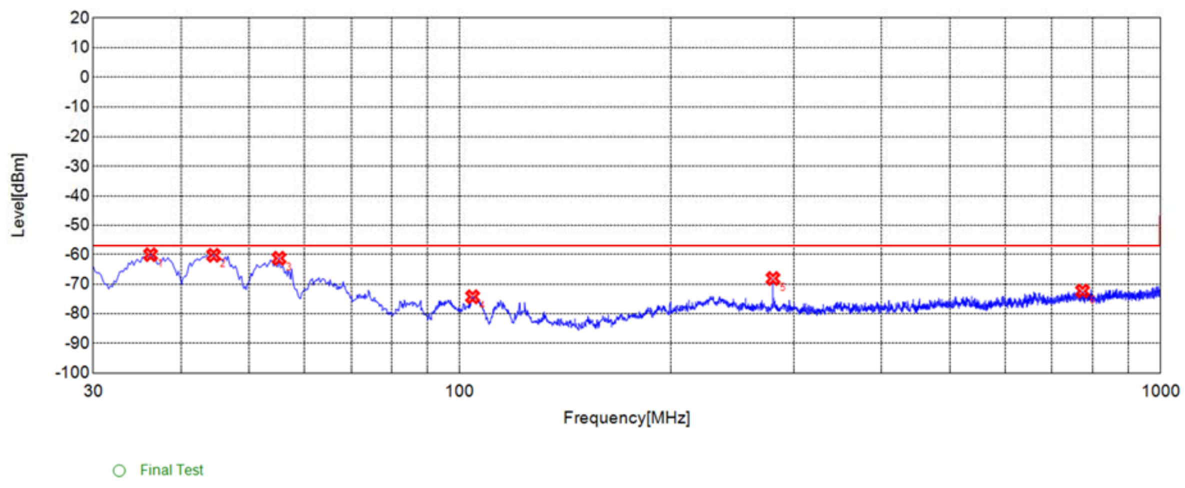
Channel 0				
Receiver with modulation Mode at 2402MHz				
Frequency (MHz)	**Level (dBm)**	**Limit (dBm)**	**Antenna**	**Verdict**
35.8210	-67.82	-57.00	Vertical	PASS
45.3290	-68.38	-57.00	Vertical	PASS
53.6730	-69.87	-57.00	Vertical	PASS
104.8990	-71.61	-57.00	Vertical	PASS
279.9220	-68.98	-57.00	Vertical	PASS
686.2390	-72.89	-57.00	Vertical	PASS



(RX_RSE_BLE_1Mbps_2402MHz_1GHz to 12.75GHz_Antenna Vertical)

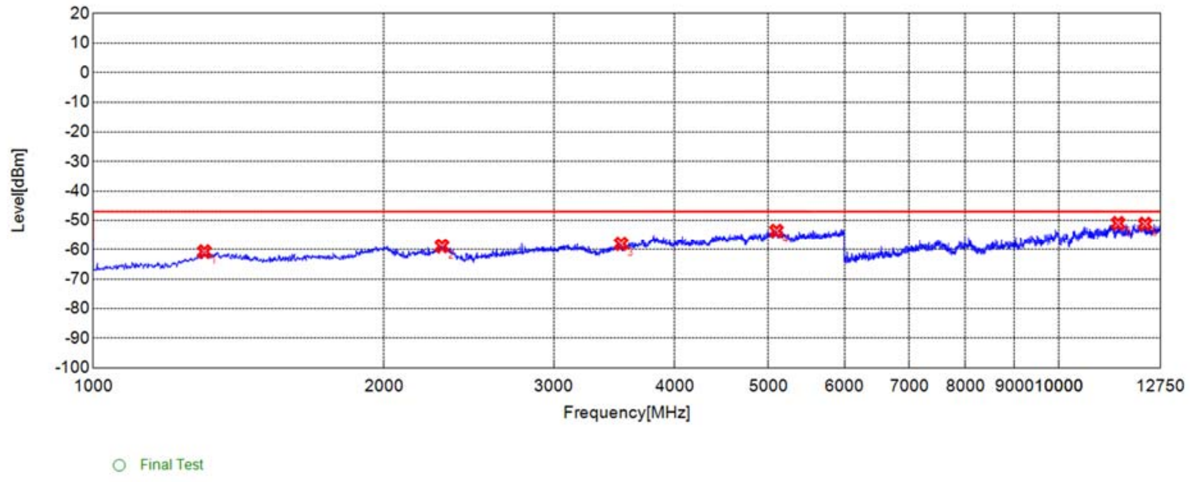
Channel 0				
Receiver with modulation Mode at 2402MHz				
Frequency (MHz)	**Level (dBm)**	**Limit (dBm)**	**Antenna**	**Verdict**
1431.8110	-61.24	-47.00	Vertical	PASS
2342.1140	-59.18	-47.00	Vertical	PASS
3810.9370	-55.7	-47.00	Vertical	PASS
5168.0560	-53.24	-47.00	Vertical	PASS
11055.1850	-50.19	-47.00	Vertical	PASS
11593.1140	-51.38	-47.00	Vertical	PASS

Plot for Channel 39



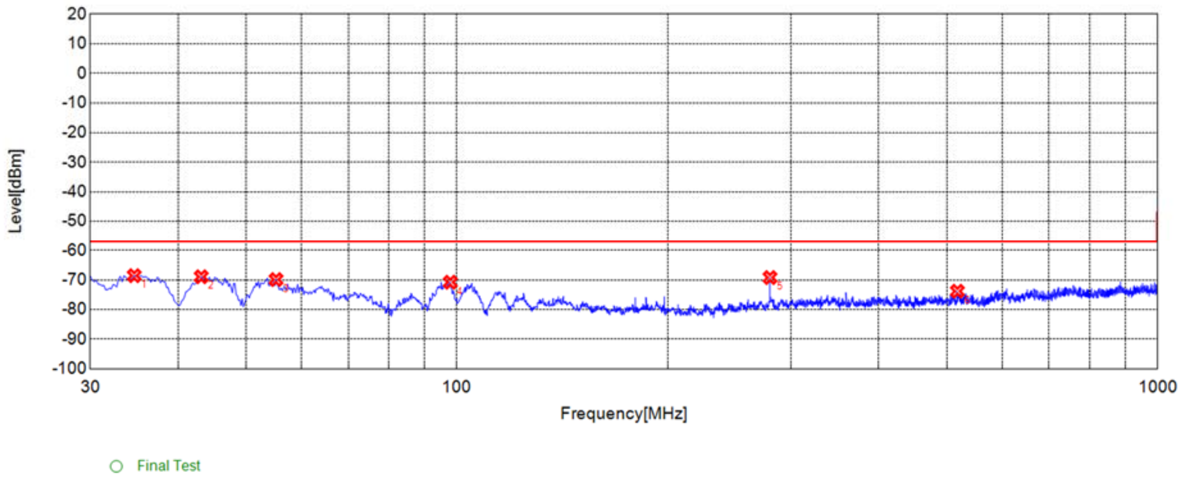
(RX_RSE_BLE_1Mbps_2480MHz_30MHz to 1GHz_Antenna Horizontal)

Channel 39				
Receiver with modulation Mode at 2480MHz				
Frequency (MHz)	**Level (dBm)**	**Limit (dBm)**	**Antenna**	**Verdict**
36.2090	-60.08	-57.00	Horizontal	PASS
44.5530	-60.27	-57.00	Horizontal	PASS
55.2250	-61.3	-57.00	Horizontal	PASS
104.3170	-74.29	-57.00	Horizontal	PASS
279.9220	-68.12	-57.00	Horizontal	PASS
773.9450	-72.34	-57.00	Horizontal	PASS



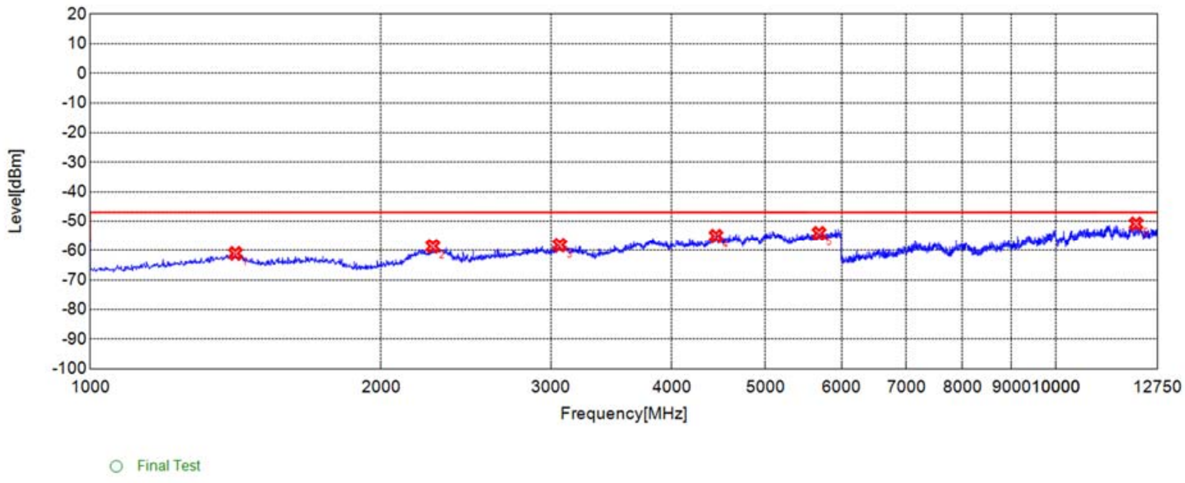
(RX_RSE_BLE_1Mbps_2480MHz_1GHz to 12.75GHz_Antenna Horizontal)

Channel 39				
Receiver with modulation Mode at 2480MHz				
Frequency (MHz)	**Level (dBm)**	**Limit (dBm)**	**Antenna**	**Verdict**
1303.4340	-60.72	-47.00	Horizontal	PASS
2297.0990	-58.83	-47.00	Horizontal	PASS
3522.5080	-58.02	-47.00	Horizontal	PASS
5101.3670	-53.6	-47.00	Horizontal	PASS
11523.3410	-50.98	-47.00	Horizontal	PASS
12290.8470	-51.21	-47.00	Horizontal	PASS



(RX_RSE_BLE_1Mbps_2480MHz_30MHz to 1GHz_Antenna Vertical)

Channel 39				
Receiver with modulation Mode at 2480MHz				
Frequency (MHz)	**Level (dBm)**	**Limit (dBm)**	**Antenna**	**Verdict**
34.6570	-68.56	-57.00	Vertical	PASS
43.1950	-68.94	-57.00	Vertical	PASS
55.2250	-69.88	-57.00	Vertical	PASS
97.9140	-70.78	-57.00	Vertical	PASS
279.9220	-69.21	-57.00	Vertical	PASS
518.0080	-73.81	-57.00	Vertical	PASS



(RX_RSE_BLE_1Mbps_2480MHz_1GHz to 12.75GHz_Antenna Vertical)

Channel 39				
Receiver with modulation Mode at 2480MHz				
Frequency (MHz)	**Level (dBm)**	**Limit (dBm)**	**Antenna**	**Verdict**
1413.4710	-61.04	-47.00	Vertical	PASS
2263.7550	-58.6	-47.00	Vertical	PASS
3064.0210	-58.21	-47.00	Vertical	PASS
4447.8160	-55.06	-47.00	Vertical	PASS
5686.5620	-54.09	-47.00	Vertical	PASS
12113.0380	-50.89	-47.00	Vertical	PASS

3.2. Receiver Blocking

3.2.1.Definition

Receiver blocking is a measure of the ability of the equipment to receive a wanted signal on its operating channel without exceeding a given degradation in the presence of an unwanted signal (blocking signal) at frequencies other than those of the operating band and spurious responses.

3.2.2.Limit

3.2.2.1General

While maintaining the minimum performance criteria as defined in clause 4.3.2.11.3, 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 14, table 15 or table 16.

3.2.2.2Receiver Category 1

Table 14 contains the Receiver Blocking parameters for Receiver Category 1 equipment.

Table 14: Receiver Blocking parameters for Receiver Category 1 equipment

<table>
<tr><th>Wanted signal mean power from companion device (dBm)
(see notes 1 and 4)</th><th>Blocking signal frequency (MHz)</th><th>Blocking signal power (dBm)
(see note 4)</th><th>Type of blocking signal</th></tr>
<tr><td>(-133 dBm + 10 × $\log_{10}$(OCBW)) or -68 dBm whichever is less
(see note 2)</td><td>2380
2504</td><td rowspan="2">-34</td><td rowspan="2">CW</td></tr>
<tr><td>(-139 dBm + 10 × $\log_{10}$(OCBW)) or -74 dBm whichever is less
(see note 3)</td><td>2 300
2 330
2 360
2 524
2 584
2 674</td></tr>
<tr><td colspan="4">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</td></tr>
</table>

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.

3.2.2.3Receiver Category 2

Table 15 contains the Receiver Blocking parameters for Receiver Category 2 equipment.

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 × $\log_{10}$(OCBW) + 10 dB) or (-74 dBm + 10 dB) whichever is less (see note 2)	2380 2504 2300 2584	-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.			

3.2.2.4Receiver Category 3

Table 16 contains the Receiver Blocking parameters for Receiver Category 3 equipment.

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 × $\log_{10}$(OCBW) + 20 dB) or (-74 dBm + 20 dB) whichever is less (see note 2)	2380 2504 2300 2584	-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.			

3.2.3.Test condition

See clause 5.1 for the environmental test conditions. These measurements shall only be performed at normal test conditions. For non-FHSS equipment, having more than one operating channel, the operating channels on which the testing has to be performed shall be selected as follows:

• For testing blocking frequencies less than 2 400 MHz, the equipment shall operate on the lowest operating channel.

• For testing blocking frequencies greater than 2 500 MHz, the equipment shall operate on the highest operating channel.

Equipment which can change their operating channel automatically (adaptive channel allocation), and where this function cannot be disabled, shall be tested as a FHSS equipment.

If the equipment can be configured to operate with different Nominal Channel Bandwidths (e.g. 20 MHz and 40 MHz) and different data rates, then the combination of the smallest channel bandwidth and the lowest data rate for this channel bandwidth which still allows the equipment to operate as intended shall be used. This mode of operation shall be aligned with the performance criteria defined in clause 4.3.1.12.3 or clause 4.3.2.11.3 and shall be described in the test report.

3.2.4.Test procedures (Conducted)

For systems using multiple receive chains only one chain (antenna port) need to be tested. All other receiver inputs shall be terminated.
Figure 6 shows the test set-up which can be used for performing the receiver blocking test.

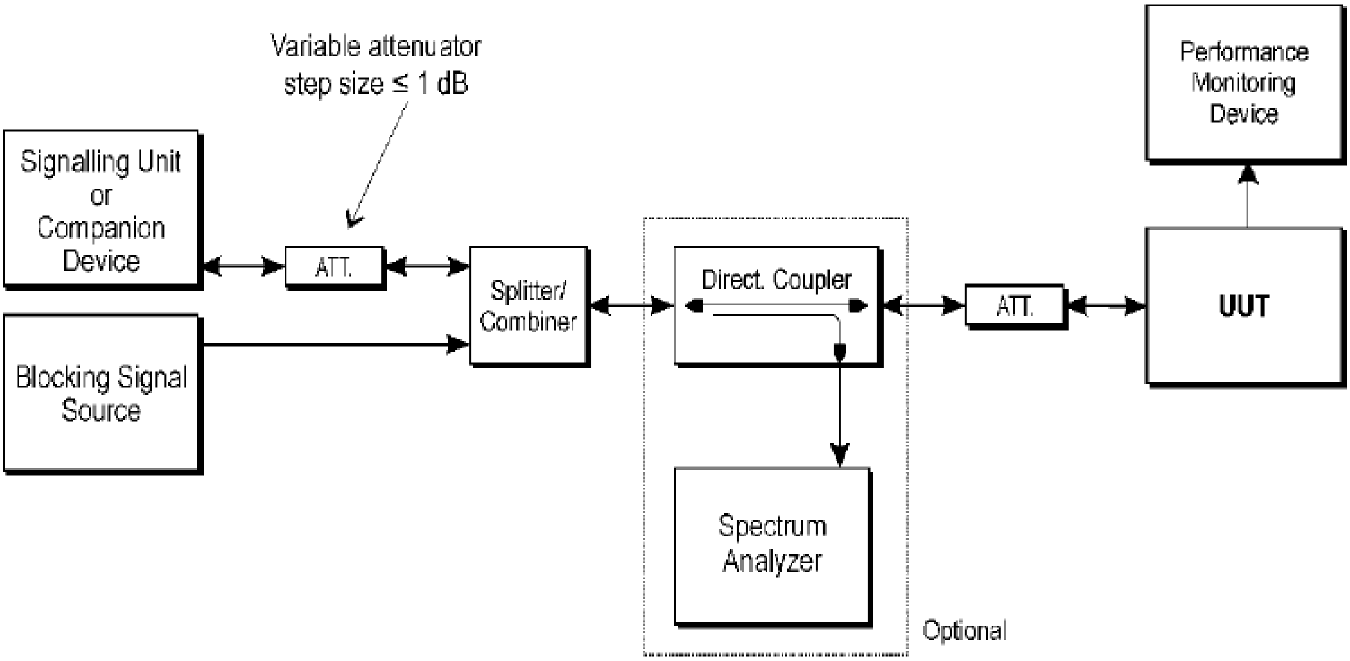


Figure 6: Test Set-up for receiver blocking

The procedure in step 1 to step 6 below shall be used to verify the receiver blocking requirement as described in clause 4.3.1.12 or clause 4.3.2.11. The performance monitoring device is capable of verifying the performance criteria as defined in clause 4.3.1.12.3 or clause 4.3.2.11.3.
Table 6, table 7 and table 8 in clause 4.3.1.12.4 contain the applicable blocking frequencies and blocking levels for each of the receiver categories for testing Receiver Blocking on FHSS equipment.
Table 14, table 15 and table 16 in clause 4.3.2.11.4 contain the applicable blocking frequencies and blocking levels for each of the receiver categories for testing Receiver Blocking on non-FHSS equipment.

Step 1:

• For non-FHSS equipment, the UUT shall be set to the lowest operating channel on which the blocking test has to be performed (see clause 5.4.11.1).

Step 2:

• The blocking signal generator is set to the first frequency as defined in the appropriate table corresponding to the receiver category and type of equipment.

Step 3:

• With the blocking signal generator switched off, a communication link is established between the UUT and the associated companion device using the test setup shown in figure 6.

• Unless the option provided in note 2 of the applicable table referred to in clause 5.4.11.2.1 is used, the level of the wanted signal shall be set to the value provided in the table corresponding to the receiver category and type of equipment. The test procedure defined in clause 5.4.2, and more in particular clause 5.4.2.2.1.2, can be used to measure the (conducted) level of the wanted signal however no correction shall be made for antenna gain of the companion device (step 6 in clause 5.4.2.2.1.2 shall be ignored). This level may be measured directly at the output of the companion device and a correction is made for the coupling loss into the UUT. The actual level for the wanted signal shall be recorded in the test report.

• When the option provided in note 2 of the applicable table referred to in clause 5.4.11.2.1 is used, the attenuation of the variable attenuator shall be increased in 1 dB steps to a value at which the minimum performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is still met. The resulting level for the wanted signal at the input of the UUT is P_{min}. This signal level (P_{min}) is increased by the value provided in note 2 of the applicable table corresponding to the receiver category and type of equipment.

Step 4:

• The blocking signal at the UUT is set to the level provided in the table corresponding to the receiver category and type of equipment.

• If the performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 are met then proceed to step 6.

Step 5:

• If the performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is not met, step 3 and step 4 shall be repeated after that the frequency of the blocking signal set in step 2 has been increased with a value equal to the Occupied Channel Bandwidth except:

- For the blocking frequency 2 380 MHz, where this frequency offset shall be less than or equal to 10 MHz. If this frequency offset is more than 7 MHz, the level of the wanted signal shall be increased by 3 dB.
- For the blocking frequency 2 503,5 MHz, where this frequency offset shall be less than or equal to 10 MHz. If this frequency offset is more than 7 MHz, the level of the wanted signal shall be decreased by 3 dB.

• If the performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is still not met, step 3 and step 4 shall be repeated after that the frequency of the blocking signal set in step 2 has been decreased with a value equal to the Occupied Channel Bandwidth except:

- For the blocking frequency 2 380 MHz, where this frequency offset shall be less than or equal to 10 MHz. If this frequency offset is more than 7 MHz, the level of the wanted signal shall be decreased by 3 dB.

- For the blocking frequency 2 503,5 MHz, where this frequency offset shall be less than or equal to 10 MHz. If this frequency offset is more than 7 MHz, the level of the wanted signal shall be increased by 3 dB.

• If the performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is still not met, the UUT fails to comply with the Receiver Blocking requirement and step 6 and step 7 are no longer required.

• It shall be recorded in the test report whether the shift of blocking frequencies as described in the present step was used.

Step 6:

• Repeat step 4 and step 5 for each remaining combination of frequency and level for the blocking signal as provided in the table corresponding to the receiver category and type of equipment.

Step 7:

• For non-FHSS equipment, repeat step 2 to step 6 with the UUT operating at the highest operating channel on which the blocking test has to be performed (see clause 5.4.11.1).

Step 8:

• It shall be assessed and recorded in the test report whether the UUT complies with the Receiver Blocking requirement.

3.2.5.Result

Note: The EUT operate in normal link mode.

<table>
<tr><th colspan="7">Channel 1, 2402MHz</th></tr>
<tr><th colspan="7">Receiver Blocking parameters for Receiver Category 2 equipment</th></tr>
<tr><th rowspan="2">Wanted signal mean power from companion device (dBm) (see note 1)</th><th rowspan="2">Blocking signal frequency (MHz)</th><th rowspan="2">Type of blocking signal</th><th rowspan="2">Performance Criteria</th><th colspan="2">Blocking signal power(dBm) (see note 2)</th><th rowspan="2">Verdict</th></tr>
<tr><th>Test Value</th><th>Limit</th></tr>
<tr><td rowspan="4">-58.78</td><td>2380</td><td rowspan="4">CW</td><td rowspan="4">PER≤10%</td><td>1</td><td rowspan="4">≥-34</td><td>PASS</td></tr>
<tr><td>2504</td><td>2</td><td>PASS</td></tr>
<tr><td>2300</td><td>2</td><td>PASS</td></tr>
<tr><td>2584</td><td>0</td><td>PASS</td></tr>
<tr><td colspan="7">Note 1: The wanted signal mean power from companion device is equal to "-139dBm+10log$_{10}$(OCBW)+10dB" or "-74dBm+10dB", whichever is less, OCBW is in Hz.
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.</td></tr>
</table>

<table>
<tr><th colspan="7">Channel 39, 2480MHz</th></tr>
<tr><th colspan="7">Receiver Blocking parameters for Receiver Category 2 equipment</th></tr>
<tr><th rowspan="2">Wanted signal mean power from companion device (dBm) (see note 1)</th><th rowspan="2">Blocking signal frequency (MHz)</th><th rowspan="2">Type of blocking signal</th><th rowspan="2">Performance Criteria</th><th colspan="2">Blocking signal power(dBm) (see note 2)</th><th rowspan="2">Verdict</th></tr>
<tr><th>Test Value</th><th>Limit</th></tr>
<tr><td rowspan="4">-58.77</td><td>2 380</td><td rowspan="4">CW</td><td rowspan="4">PER≤10%</td><td>2</td><td rowspan="4">≥-34</td><td>PASS</td></tr>
<tr><td>2504</td><td>1</td><td>PASS</td></tr>
<tr><td>2300</td><td>1</td><td>PASS</td></tr>
<tr><td>2584</td><td>0</td><td>PASS</td></tr>
<tr><td colspan="7">Note 1: The wanted signal mean power from companion device is equal to "-139dBm+10log$_{10}$(OCBW)+10dB" or "-74dBm+10dB", whichever is less, OCBW is in Hz.
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.</td></tr>
</table>

Shenzhen Morlab Communications Technology Co., Ltd.
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3.3. Geo-location capability

3.3.1. Definition

Geo-location capability is a feature of the equipment to determine its geographical location with the purpose to configure itself according to the regulatory requirements applicable at the geographical location where it operates.
The geo-location capability may be present in the equipment or in an external device (temporary) associated with the equipment operating at the same geographical location during the initial power up of the equipment. The geographical location may also be available in equipment already installed and operating at the same geographical location.

3.3.2. Requirement

The geographical location determined by the equipment as defined in clause 3.3.1 shall not be accessible to the user.

3.3.3. Result

The EUT does not support Geo-location capability. This test case does not apply this kind of EUT.

Annex A Photographs of Test Setup

1. Radiated Measurement Setup

2. Conducted Measurement Setup

MORLAB
Shenzhen Morlab Communications Technology Co., Ltd.
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Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China
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Annex B Test Uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	±5%
RF output power, conducted	±1,5%
Power Spectral Density, conducted	±3dB
Unwanted Emissions, conducted	±3dB
All emissions, radiated	±6dB
Temperature	±3°C
Supply voltages	±3%
Time	±5%

Annex C Information of EUT

C.1 Introduction

Notwithstanding the provisions of the copyright clause related to the text of the present document, ETSI grants that users of the present document may freely reproduce the application form pro forma in this annex so that it can be used for its intended purposes and may further publish the completed application form.

The form contained in this annex may be used by the manufacturer to comply with the requirement contained in clause 5.4.1 to provide the necessary information about the equipment to the test laboratory prior to the testing. It contains product information as well as other information which might be required to define which configurations are to be tested, which tests are to be performed as well the test conditions.

This application form should form an integral part of the test report.

C.2 Information as required by ETSI EN 300 328 V2.2.2, clause 5.4.1

In accordance with ETSI EN 300 328, clause 5.4.1, the following information is provided by the manufacturer.

a) The type of modulation used by the equipment:

☐FHSS

☑Other forms of modulation

b) In case of FHSS modulation:

• In case of non-Adaptive Frequency Hopping equipment:

The number of Hopping Frequencies: …………..

• In case of Adaptive Frequency Hopping Equipment:

The maximum number of Hopping Frequencies: …………..

The minimum number of Hopping Frequencies: …………..

• The (average) Dwell Time: …………..

c) Adaptive / non-adaptive equipment:

☑non-adaptive Equipment

☐adaptive Equipment without the possibility to switch to a non-adaptive mode

☐adaptive Equipment which can also operate in a non-adaptive mode

d) In case of adaptive equipment:

The maximum Channel Occupancy Time implemented by the equipment: N/A ms

☐The equipment has implemented an LBT based DAA mechanism

• In case of equipment using modulation different from FHSS:

☐The equipment is Frame Based equipment

☐The equipment is Load Based equipment

☐The equipment can switch dynamically between Frame Based and Load Based equipment

The CCA time implemented by the equipment: N/A μs

☐The equipment has implemented a non-LBT based DAA mechanism

☐The equipment can operate in more than one adaptive mode

e) In case of non-adaptive Equipment:

The maximum RF Output Power (e.i.r.p.): -2.90dBm

The maximum (corresponding) Duty Cycle: N/A %

Equipment with dynamic behaviour, that behaviour is described here. (e.g. the different combinations of duty cycle and corresponding power levels to be declared):N/A

f) The worst case operational mode for each of the following tests:

• RF Output Power: GFSK

• Power Spectral Density: GFSK

• Duty cycle, Tx-Sequence, Tx-gap: N/A

• Dwell time, Minimum Frequency Occupation & Hopping Sequence (only for FHSS equipment): N/A

•Hopping Frequency Separation (only for FHSS equipment) : N/A

• Medium Utilisation: N/A

• Adaptivity & Receiver Blocking: N/A

• Occupied Channel Bandwidth: GFSK

• Transmitter unwanted emissions in the OOB domain: GFSK

• Transmitter unwanted emissions in the spurious domain: GFSK

• Receiver spurious emissions: GFSK

g) The different transmit operating modes (tick all that apply):

☑Operating mode 1: Single Antenna Equipment

☑Equipment with only one antenna

☐Equipment with two diversity antennas but only one antenna active at any moment in time

☐Smart Antenna Systems with two or more antennas, but operating in a (legacy) mode where only one antenna is used (e.g. IEEE 802.11™ [i.3] legacy mode in smart antenna systems)

☐Operating mode 2: Smart Antenna Systems - Multiple Antennas without beam forming

☐Single spatial stream / Standard throughput / (e.g. IEEE 802.11™ [i.3] legacy mode)

☐High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1

☐High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2

NOTE 1: Add more lines if more channel bandwidths are supported.

☐Operating mode 3: Smart Antenna Systems - Multiple Antennas with beam forming

☐Single spatial stream / Standard throughput (e.g. IEEE 802.11™ [i.3] legacy mode)

☐High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1

☐High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2

NOTE 2: Add more lines if more channel bandwidths are supported.

h) In case of Smart Antenna Systems:

• The number of Receive chains: ....

• The number of Transmit chains: ....

☐ symmetrical power distribution

☐ asymmetrical power distribution

In case of beam forming, the maximum (additional) beam forming gain: .... dB

NOTE: The additional beam forming gain does not include the basic gain of a single antenna.

i) Operating Frequency Range(s) of the equipment:

• Operating Frequency Range 1: 2402 MHz to 2480 MHz

NOTE: Add more lines if more Frequency Ranges are supported.

j) Nominal Channel Bandwidth(s):

• Occupied Channel Bandwidth 1: 1MHz

NOTE: Add more lines if more channel bandwidths are supported.

k) Type of Equipment (stand-alone, combined, plug-in radio device, etc.):

☑Stand-alone

☐Combined Equipment (Equipment where the radio part is fully integrated within another type of equipment)

☐Plug-in radio device (Equipment intended for a variety of host systems)

☐Other

l) The normal and the extreme operating conditions that apply to the equipment:

Normal operating conditions (if applicable):

Operating temperature: 25°C

Extreme operating conditions:

Operating temperature range: Minimum: 0°C Maximum 45°C

Details provided are for the:

☑ stand-alone equipment

☐ combined (or host) equipment

☐ test jig

m) The intended combination(s) of the radio equipment power settings and one or more antenna assemblies and their corresponding e.i.r.p. levels:

• Antenna Type:

☑Integral Antenna (information to be provided in case of conducted measurements)

Antenna Gain: -3.01dBi

If applicable, additional beamforming gain (excluding basic antenna gain): .... dB

☐Temporary RF connector provided

☐No temporary RF connector provided

☐Dedicated Antennas (equipment with antenna connector)

☐Single power level with corresponding antenna(s)

☐Multiple power settings and corresponding antenna(s)

Number of different Power Levels: ....

Power Level 1: .... dBm

Power Level 2: .... dBm

Power Level 3: .... dBm

NOTE 1: Add more lines in case the equipment has more power levels.
NOTE 2: These power levels are conducted power levels (at antenna connector).
• For each of the Power Levels, provide the intended antenna assemblies, their corresponding gains (G) and the resulting e.i.r.p. levels also taking into account the beamforming gain (Y) if applicable

Power Level 1: .... dBm
Number of antenna assemblies provided for this power level: N/A

Assembly #	Gain (dBi)	e.i.r.p. (dBm)	Part number or model name
1			
2			
3			
4			

NOTE3: Add more rows in case more antenna assemblies are supported for this power level.

Power Level 2: .... dBm
Number of antenna assemblies provided for this power level: ....

Assembly #	Gain (dBi)	e.i.r.p. (dBm)	Part number or model name
1			
2			
3			
4			

NOTE4: Add more rows in case more antenna assemblies are supported for this power level.

Power Level 3: .... dBm
Number of antenna assemblies provided for this power level: ....

Assembly #	Gain (dBi)	e.i.r.p. (dBm)	Part number or model name
1			
2			
3			
4			

NOTE5: Add more rows in case more antenna assemblies are supported for this power level.

n) The nominal voltages of the stand-alone radio equipment or the nominal voltages of the combined (host) equipment or test jig in case of plug-in devices:

Details provided are for the:
☑stand-alone equipment
☐combined (or host) equipment
☐test jig
Supply Voltage:
☐AC mains State AC voltage N/A V
☑DC State DC voltage 3.7V

In case of DC, indicate the type of power source:

☐Internal Power Supply

☐External Power Supply or AC/DC adapter

☑Battery

☐Other: ....

o) Describe the test modes available which can facilitate testing:

Use special software to control the EUT transmit or receiver.

p) The equipment type (e.g. Bluetooth®, IEEE 802.11™ [i.3], IEEE 802.15.4™ [i.4], proprietary, etc.): Bluetooth

q) If applicable, the statistical analysis referred to in clause 5.4.1 q)

(to be provided as separate attachment)

r) If applicable, the statistical analysis referred to in clause 5.4.1 r)

(to be provided as separate attachment)

s) Geo-location capability supported by the equipment:

☐Yes

☐The geographical location determined by the equipment as defined in clause 4.3.1.13.2 or clause 4.3.2.12.2 is not accessible to the user

☑No

C.3: Configuration for testing (see clause 5.3.2.3 of ETSI EN 300 328 V2.2.2)

From all combinations of conducted power settings and intended antenna assembly(ies) specified in clause 5.4.1 m), specify the combination resulting in the highest e.i.r.p. for the radio equipment. Unless otherwise specified in ETSI EN 300 328, this power setting is to be used for testing against the requirements of ETSI EN 300 328. In case there is more than one such conducted power setting resulting in the same (highest) e.i.r.p. level, the highest power setting is to be used for testing. See also ETSI EN 300 328, clause 5.3.2.3.

Highest overall e.i.r.p. value: -2.90dBm	
Corresponding Antenna assembly gain: -3.01dBi	Antenna Assembly #: ....
Corresponding conducted power setting: N/A dBm (also the power level to be used for testing)	Listed as Power Setting #: ....

C.4 Additional information provided by the applicant

C.4.1 Modulation

ITU Class(es) of emission: ....

Can the transmitter operate unmodulated? ☐yes ☑no

C.4.2 Duty Cycle

The transmitter is intended for:

☑ Continuous duty

☐Intermittent duty

☐Continuous operation possible for testing purposes

C.4.3 About the UUT

☑The equipment submitted are representative production models
☐If not, the equipment submitted are pre-production models?
☐If pre-production equipment are submitted, the final production equipment will be identical in all respects with the equipment tested
☐If not, supply full details

C.4.4 Additional items and/or supporting equipment provided

☐Spare batteries (e.g. for portable equipment)
☑Battery charging device
☐External Power Supply or AC/DC adapter
☐Test jig or interface box
☐RF test fixture (for equipment with integrated antennas)
☑Host System Manufacturer: Winners'Sun Plastic & Electronic (Shenzhen) Co., Ltd.
Model #: N/A
Model name: WS-21005
☐Combined equipment Manufacturer: ....
Model #: ....
Model name: ....
☑User Manual
☑Technical documentation (Handbook and circuit diagrams)

Annex D Testing Laboratory Information

1. Identification of the Responsible Testing Laboratory

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Laboratory Address:	FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Address:	FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

3. Test Equipments Utilized

3.1 EN300328 Test system

Description	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
Radio Communication Tester	R&S	CMW500	108950	2021.03.25	2022.03.24
Temperature Chamber	YOMA	DTL-003S/01	12108015	2020.10.26	2021.10.25
MXG Vector Signal Generator	Agilent	N5182B	MY53050961	2021.03.25	2022.03.24
EXG Analog Signal Generator	Agilent	N5171B	MY53050558	2021.03.25	2022.03.24
EXA Signal Analyzer	Agilent	N9010A	MY53470836	2021.03.25	2022.03.24
USB Power Sensor	Agilent	U2021XA	MY54210011	2021.03.25	2022.03.24

3.2 List of Software Used

Description	Manufacturer	Software Version
Test System	Tonscend	V2.5.77.0418
TS+ -[JS36-RSE]	Tonscend	V2.0.1.3

3.3 RSE Test System

Equipment Name	Serial No.	Model No.	Manufacturer	Cal. Date	Due Date
MXE EMI Receiver	MY54130016	N9038A	Agilent	2020.07.21	2021.07.20
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2019.05.24	2022.05.23
Test Antenna - Horn	01774	BBHA 9120D	Schwarzbeck	2019.07.26	2022.07.25
Test Antenna -Horn	9120D-963	BBHA 9120D	Schwarzbeck	2019.05.24	2022.05.23
Test Antenna - Bi-Log	9163-274	VULB 9163	Schwarzbeck	2019.11.23	2022.11.22
Anechoic Chamber	N/A	9m*6m*6m	CRT	2020.01.06	2023.01.05
Radiated Disturbance Preamplifier	61171/61172	S020180L3203	rflight	2020.07.21	2021.07.20
Radiated Disturbance Preamplifier	46732	S10M100L3802	rflight	2020.07.21	2021.07.20
Signal Generator	203403	MG3692C	anritsu	2020.10.28	2021.10.27
RF Cable	EMC180201	PE332-600CM	PASTERNACK	N/A	N/A
RF Cable	EMC180202	PE332-1300CM	PASTERNACK	N/A	N/A
RF Cable	EMC180202	PE332-1300CM	PASTERNACK	N/A	N/A

——— END OF REPORT ———