REPORT No.: SZ18050201W05

TEST REPORT

MANUFACTURER	:	Shenzhen Chainway Information Technology Co.,Ltd.
PRODUCT NAME	:	Mobile Data Terminal
MODEL NAME	:	C75
BRAND NAME	:	CHAINWAY
STANDARD(S)	:	ETSI EN 300 328 V2.1.1 (2016-11)
TEST DATE	:	2018-06-06 to 2018-06-13
ISSUE DATE	:	2018-07-13

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Change History		
Issue	**Date**	**Reason for change**
1.0	2018-07-13	First edition

1. Technical Information

Note: Provide by manufacturer.

1.1. Manufacturer and Factory Information

Manufacturer:	Shenzhen Chainway Information Technology Co.,Ltd.
Manufacturer Address:	9/F, Building 2, Daqian Industrial Park, Longchang Rd., District 67, Bao'an, Shenzhen
Factory:	Shenzhen Chainway Information Technology Co.,Ltd.
Factory Address:	9/F, Building 2, Daqian Industrial Park, Longchang Rd., District 67, Bao'an, Shenzhen

1.2. Equipment Under Test (EUT) Description

Product Name:	Mobile Data Terminal	
Serial No:	(N/A, marked #1 by test site)	
Hardware Version:	C70_MB_V11	
Software Version:	C75E_MT6737_V1.2_EU_GITe4dc346_201805171136	
Equipment type:	Bluetooth LE	
Modulation Type:	GFSK	
Operating Frequency Range:	2.402GHz - 2.480GHz	
Channel Number:	Refer 1.3	
Maximum e.r.i.p:	-2.34dBm	
Adaptive Mode:	Adaptive/non-adaptive equipment:	Adaptive Equipment without the possibility to switch to a non-adaptive mode
	LBT Base DAA:	Yes
	Non-LBT Base DAA:	No
	Number of transmit chain:	1
	Number of receive chain:	1
Antenna Gain:	Antenna Type:	FPC Antenna
	Antenna Gain:	0.49 dBi
Power Supply:	Battery/AC Adaptor	
Operating voltage:	Normal(NV):	3.8V
Operating temperature:	Normal(NT):	25°C
	Lowest(LT):	-20°C
	Highest(HT):	50°C

Note 1: This test report is updated from report SZ17080130W05, based on the similarity between before, the model name, the software and hardware version, the antenna type and the appearance of EUT are changed. The changes only affect the test results of transmitter unwanted emissions in the spurious domain and receiver spurious emissions in radiated measurement.

Note 2: The EUT is 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 of EUT

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: The Lowest Channel 0, Middle 19 and Highest 39 were selected for test in the report.

1.4. Setting of test system

Setting	**Value**
Test Mode:	GFSK
EUT frequency configurable:	Yes
Test channel-Low:	2402MHz
Test channel-Middle:	2440MHz
Test channel-High:	2480MHz
Adaptive:	Yes
With TPC function:	No
Number of the antenna:	1
Number of transmission chains:	1
Beam forming:	No
Maximum beam forming gain:	N/A
Antenna gain:	0.49 dBi

1.5. Test Standards and Results

The EUT has been tested according to ETSI EN 300 328 V2.1.1 (2016-11).

ETSI EN 300 328 V2.1.1 (2016-11)	Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

Test items and the results are as bellow:

EN Reference		EN 300 328 v2.1.1 (2016-11) Test Items	Test Engineer	Result
№	Sub clause			
1	4.3.2.2	RF Output Power	Tu Ya'nan	**PASS** Note2
2	4.3.2.3	Power Spectral Density	Tu Ya'nan	**PASS** Note2
3	4.3.2.6	Adaptivity	N/A	**N/A** Note1
4	4.3.2.7	Occupied Channel Bandwidth	Tu Ya'nan	**PASS** Note2
5	4.3.2.8	Transmitter unwanted emissions in the OOB domain	Tu Ya'nan	**PASS** Note2
6	4.3.2.9	Transmitter unwanted emissions in the spurious domain	Tu Ya'nan Peng Xuewei	**PASS**
7	4.3.2.10	Receiver spurious emissions	Tu Ya'nan Peng Xuewei	**PASS**
8	4.3.2.11	Receiver Blocking	Tu Ya'nan	**PASS** Note2
9	4.3.2.12	Geo-location capability	N/A	**N/A**

Note1: This requirement does not apply for equipment with a maximum declared RF Output power level of less than 10 dBm e.i.r.p. or for equipment when operating in a mode where the RF Output power is less than 10 dBm e.i.r.p.

Note2: The test results of these test items in this report refer to the test report (Report No.: SZ17080130W05).

1.6. EUT Setup and Operating Conditions

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

1.7. Environmental Conditions

Ambient temperature: +15~+35°C
Relative humidity: 20~75%
Atmosphere pressure: 86-106kPa

2. Transmitter Parameters

2.1. EN 300 328 §4.3.2.2 Maximum transmit 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.

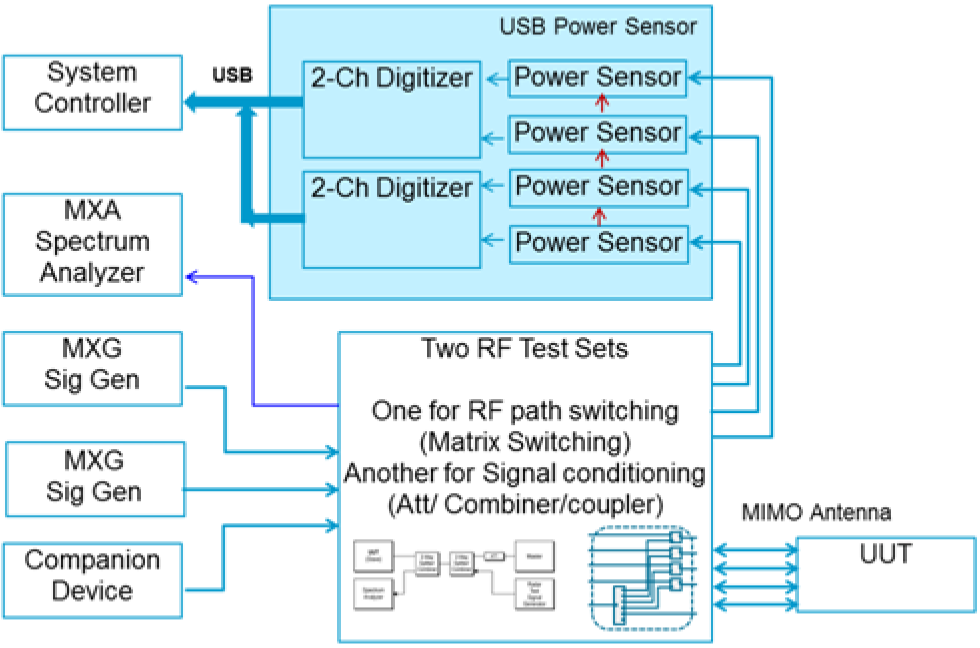
2.1.2. Limits

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 e 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.
The equipment shall be operated under its worst case configuration (for example modulation, bandwidth, data rate. power) with regards to the requirement being tested. Measurement of multiple data sets may be required.
For equipment using FHSS modulation, the measurements shall be performed during normal operation (hopping) and he equipment is assumed to have no blacklisted frequencies (operating on all hopping positions).
For equipment using wide band modulations other than FHSS, 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 Pburst values, as well as the start and stop times for each burst.

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

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

Step 5:

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

Step 6:

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

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

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

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

$$P = A + G + Y$$

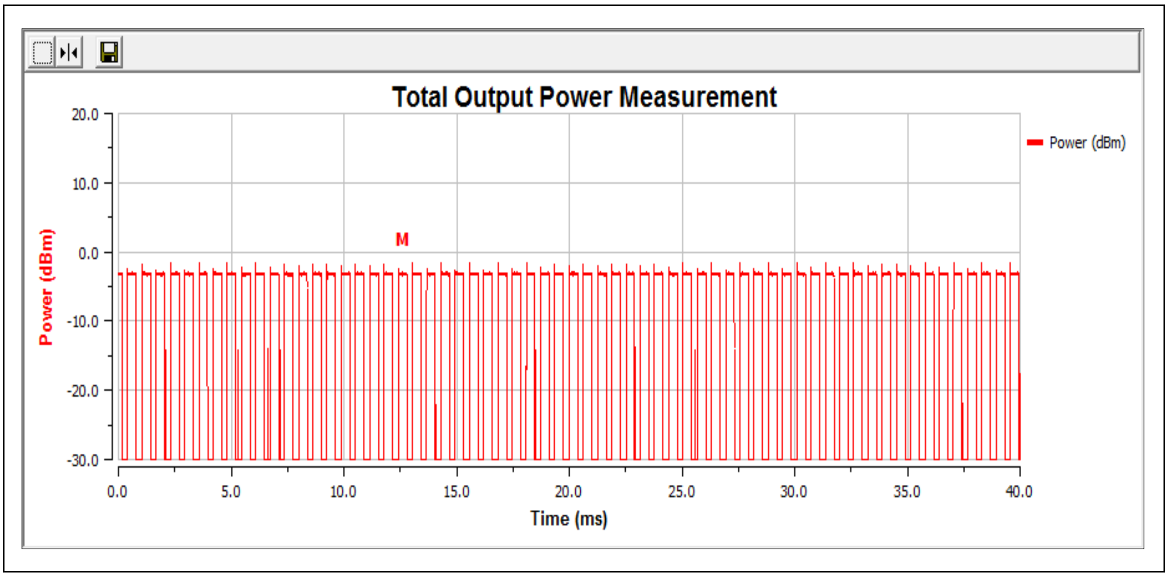
• This value, which shall comply with the limit given in clause 4.3.1.2.3 or clause 4.3.2.2.3, shall be recorded in the test report.

2.1.5. Result

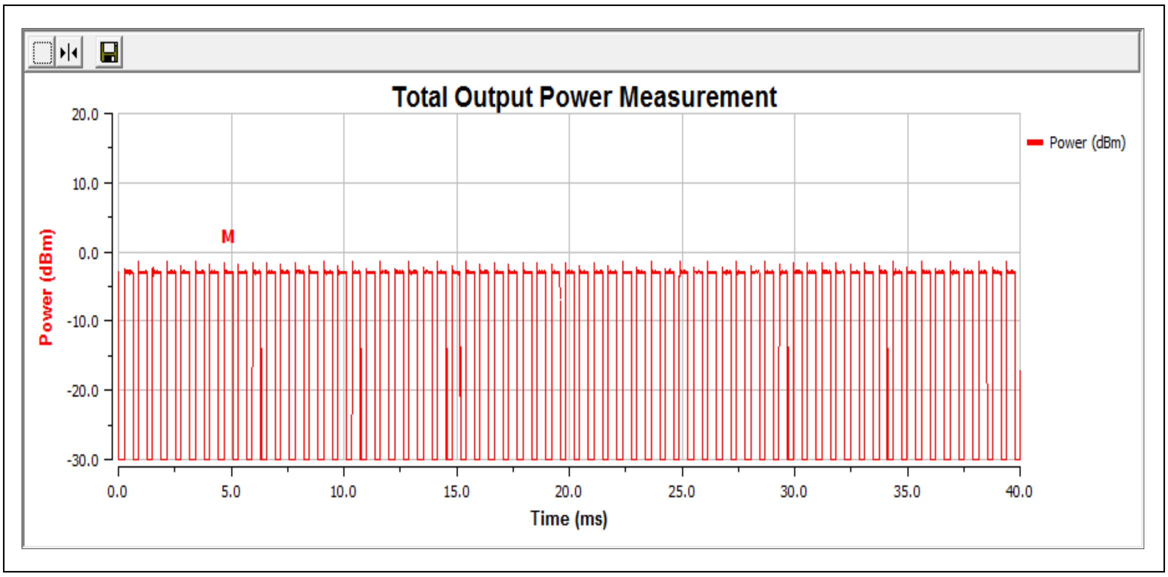
2.1.5.1 GFSK Mode:

Test Conditions		EIRP (dBm)			Result
		CH0 2402MHz	CH20 2440MHz	CH39 2480MHz	
NV	NT	-2.60	-2.34	-3.23	**PASS**
	LT	-2.58	-2.36	-3.15	**PASS**
	HT	-2.63	-2.39	-3.31	**PASS**

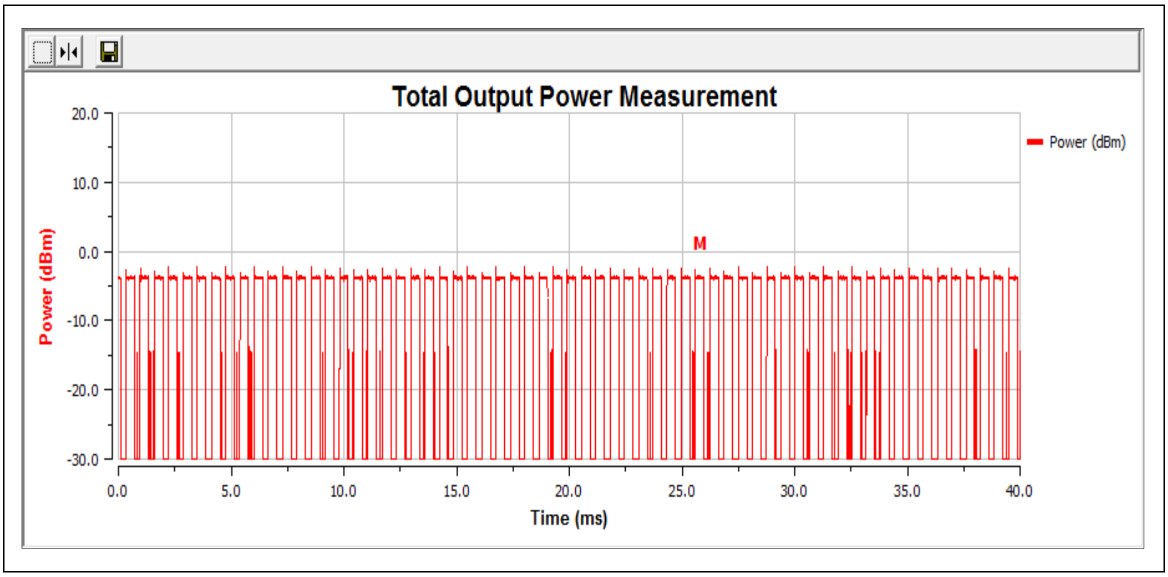
2.1.5.2 Test Plot



(Output Power_ BLE_ 2402MHz)



(Output Power_ BLE_2440MHz)



(Output Power_ BLE_2480MHz)

Notes:

(1) Conducted measurement method was used.

(2) The path loss as the factor is calibrated to correct the reading.

2.2. EN 300 328 §4.3.2 .3- Maximum e.i.r.p. 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.
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.

2.2.3. Test procedures

Option 1: For equipment with continuous and non-continuous transmissions
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. With k being the total number of samples and n the actual sample number

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

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 PSamplecorr(n) (lowest frequency), add up the power (in mW) of the following samples representing a 1 MHz segment and record the results for power and position (i.e. sample #1 to sample #100). This is the Power Spectral Density (e.i.r.p.) for the first 1 MHz segment which shall be recorded.
Step 6:
Shift the start point of the samples added up in step 5 by one sample and repeat the procedure in step 5 (i.e. sample #2 to sample #101).
Step 7:
Repeat step 6 until the end of the data set and record the Power Spectral Density values for each of the 1 MHz segments.
From all the recorded results, the highest value is the maximum Power Spectral Density (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.
Option 2: For equipment with continuous transmission capability or for equipment operating (or with the capability to operate) with a constant duty cycle (e.g. Frame Based equipment)
This option is for equipment that can be configured to operate in a continuous transmit mode (100 %

DC) or with a constant Duty Cycle (DC).

Step 1:

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

- Centre Frequency: The centre frequency of the channel under test
- RBW: 1 MHz
- VBW: 3 MHz
- Frequency Span: 2 × Nominal Bandwidth (e.g. 40 MHz for a 20 MHz channel)
- Detector Mode: Peak
- Trace Mode: Max Hold

Step 2:

• When the trace is complete, find the peak value of the power envelope and record the frequency.

Step 3:

• Make the following changes to the settings of the spectrum analyser:

- Centre Frequency: Equal to the frequency recorded in step 2
- Frequency Span: 3 MHz
- RBW: 1 MHz
- VBW: 3 MHz
- Sweep Time: 1 minute
- Detector Mode: RMS
- Trace Mode: Max Hold

Step 4:

• When the trace is complete, the trace shall be captured using the "Hold" or "View" option on the spectrum analyser.

• Find the peak value of the trace and place the analyser marker on this peak. This level is recorded as the highest mean power (power spectral density) D in a 1 MHz band.

• Alternatively, where a spectrum analyser is equipped with a function to measure power spectral density, this function may be used to display the power spectral density D in dBm / MHz.

• In case of conducted measurements on smart antenna systems operating in a mode with multiple transmit chains active simultaneously, the power spectral density of each transmit chain shall be measured separately to calculate the total power spectral density (value D in dBm / MHz) for the UUT.

Step 5:

• The maximum Power Spectral Density (PSD) e.i.r.p. is calculated from the above measured power spectral density D, the observed Duty Cycle (DC) (see clause 5.4.2.2.1.3, step 4), the applicable antenna assembly gain G in dBi and if applicable the beamforming gain Y in dB, according to the formula below. This value shall be recorded in the test report. If more than one antenna assembly is intended for this power setting, the gain of the antenna assembly with the highest gain shall be used.

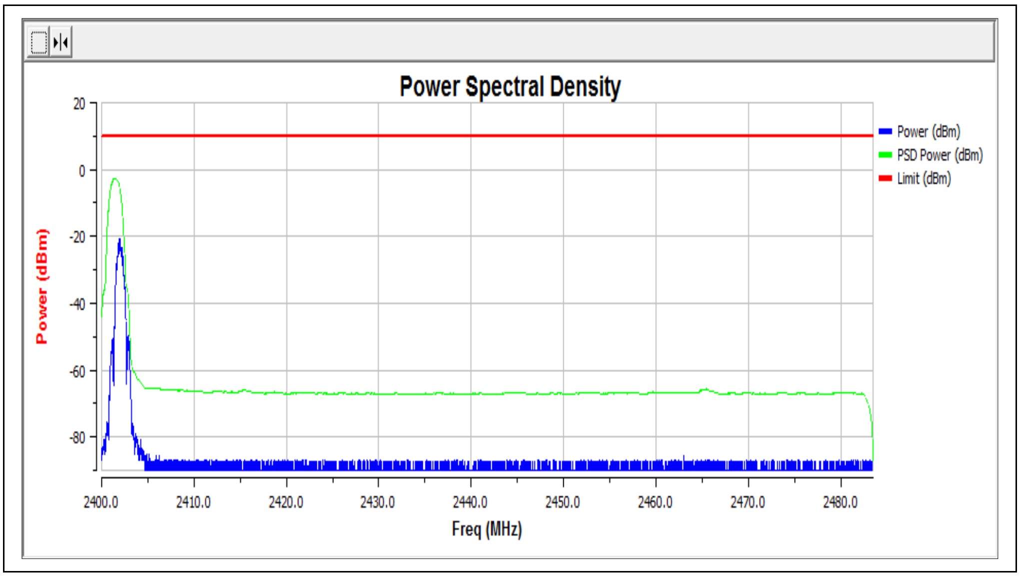
$$PSD = D + G + Y + 10 \times \log (1 / DC) \text{ (dBm / MHz)}$$

2.2.4. Result

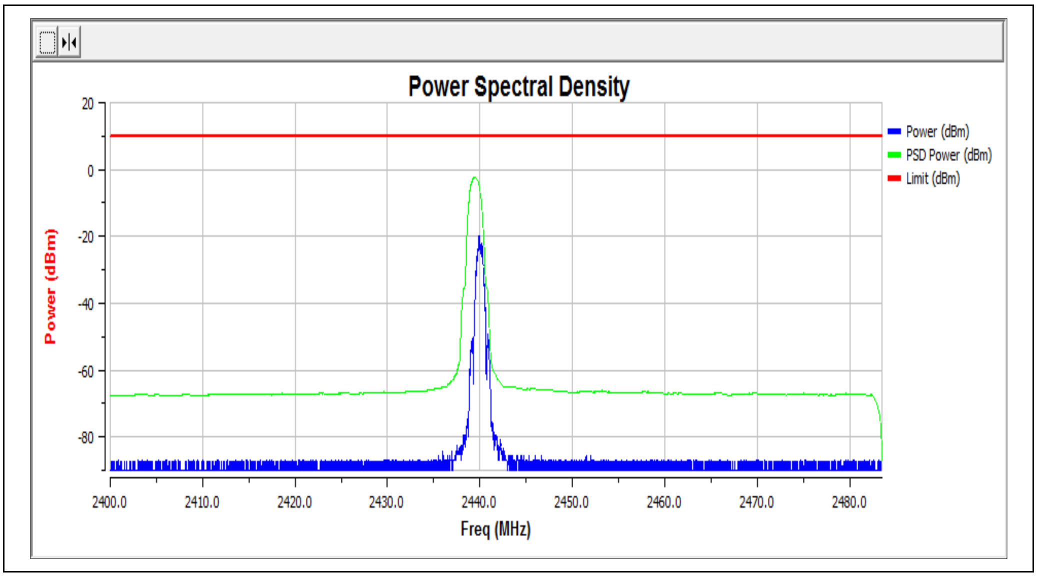
2.2.4.1 GFSK Mode:

Test Conditions		Power Spectral Density (dBm/MHz)			Result
		CH0 2402MHz	CH19 2440MHz	CH39 2480MHz	
NT	NV	-2.65	-2.39	-3.28	**PASS**

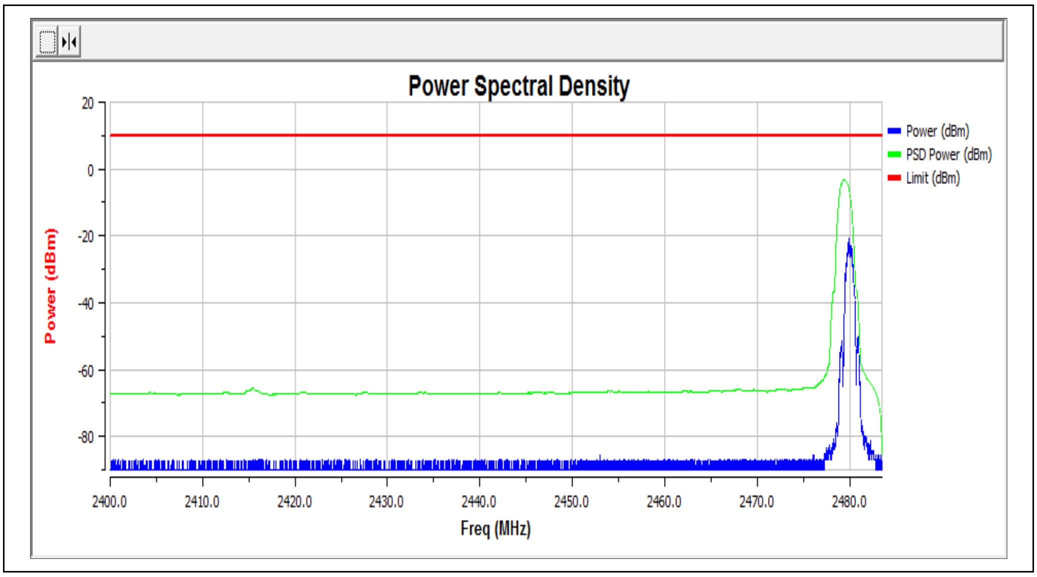
2.2.4.2 Test Plot



(Power Spectral Density _BLE_2402MHz)



(Power Spectral Density _BLE_2440MHz)



(Power Spectral Density _BLE_2480MHz)

Notes:

(1) Conducted measurement method was used.

(2) The path loss as the factor is calibrated to correct the reading.

2.3. EN 300 328 §4.3.2.6 Adaptively

2.3.1. Definition

Non-LBT based Detect and Avoid is a mechanism for equipment using wide band modulations other than FHSS and by which a given channel is made 'unavailable' because an interfering signal was reported after the transmission in that channel. This mechanism shall operate as intended in the presence of an unwanted signal on frequencies other than those of the operating band.

2.3.2. Limit

Equipment using a modulation other than FHSS and using the non-LBT based Detect and Avoid mechanism, shall comply with the following minimum set of requirements:

1) During normal operation, the equipment shall evaluate the presence of a signal on its current operating channel. If it is determined that a signal is present with a level above the detection threshold defined in step 5 the channel shall be marked as 'unavailable'.

2) The channel shall remain unavailable for a minimum time equal to 1 s after which the channel may be considered again as an 'available' channel.

3) The total time during which an equipment has transmissions on a given channel without re-evaluating the availability of that channel, is defined as the Channel Occupancy Time.

4) The Channel Occupancy Time shall be less than 40 ms. Each such transmission sequence shall be followed by an Idle Period (no transmissions) of minimum 5 % of the Channel Occupancy Time with a minimum of 100 µs. After this, the procedure as in step 1 needs to be repeated.

5) The detection threshold shall be proportional to the transmit power of the transmitter: for a 20 dBm e.i.r.p. transmitter the detection threshold level (TL) shall be equal to or less than -70 dBm/MHz at the input to the receiver assuming a 0 dBi (receive) antenna assembly. This threshold level (TL) may be corrected for the (receive) antenna assembly gain (G); however, beamforming gain (Y) shall not be taken into account. For power levels less than 20 dBm e.i.r.p., the detection threshold level may be relaxed to:

$$TL = -70 \text{ dBm/MHz} + 10 \times \log10 (100 \text{ mW} / Pout) \qquad \text{(Pout in mW e.i.r.p.)}$$

6) The equipment shall comply with the requirements defined in step 1 to step 4 of the present clause in the presence of an unwanted CW signal as defined in table 9.

Table 9: Unwanted Signal parameters

Wanted signal mean power from companion device (dBm)	Unwanted signal Frequency (MHz)	Unwanted CW signal power (dBm)
-30	2 395 or 2 488,5 (see note 1)	-35 (see note 2)
NOTE 1: The highest frequency shall be used for testing operating channels within the range 2 400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483,5 MHz. See clause 5.4.6.1. NOTE 2: The level specified is the level in front of the UUT antenna. In case of conducted measurements, this level has to be corrected by the actual antenna assembly gain.		

Short Control Signalling Transmissions:

Short Control Signalling Transmissions are transmissions used by adaptive equipment to send control signals (e.g. ACK/NACK signals, etc.) without sensing the operating channel for the presence of other signals.

Adaptive equipment may or may not have Short Control Signalling Transmissions.

If implemented, Short Control Signalling Transmissions of adaptive equipment using wide band modulations other than FHSS shall have a maximum TxOn / (TxOn + TxOff) ratio of 10 % within any observation period of 50 ms.

2.3.3. Test condition

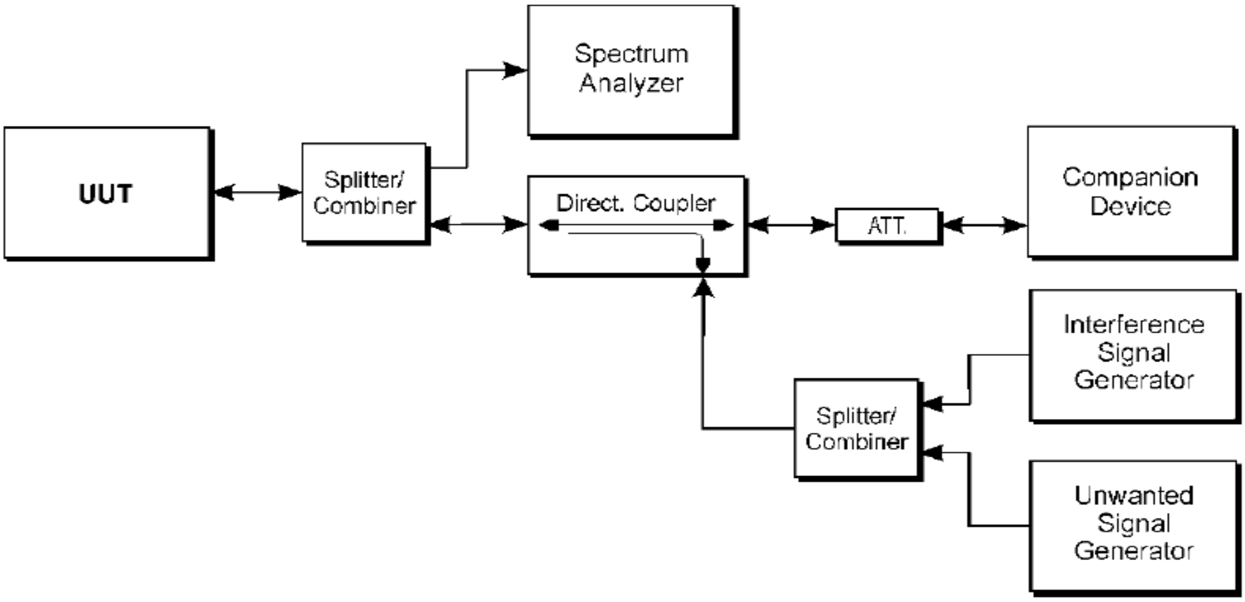
See clause 5.1 for the environmental test conditions. These measurements shall only be performed at normal test conditions.

When supported by the operating frequency range of the equipment, this test shall be performed on two operating (hopping) frequencies randomly selected from the operating frequencies used by the equipment. The first (lower) frequency shall be randomly selected within the range 2 400 MHz to 2 442 MHz while the second (higher) frequency shall be randomly selected within the range 2 442 MHz to 2 483,5 MHz. The equipment shall be in a normal operating (hopping) mode.

For equipment which can operate in an adaptive and a non-adaptive mode, it shall be verified that prior to the test, the equipment is operating in the adaptive mode.

The equipment shall be configured in a mode that results in the longest Channel Occupancy Time.

2.3.4. Test procedures



2.3.4.1 Non-LBT based adaptive equipment using modulations other than FHSS

The different steps below define the procedure to verify the efficiency of the non-LBT based DAA adaptive mechanism of equipment using wide band modulations other than FHSS.

For systems using multiple receive chains only one chain (antenna port) need to be tested. All other receiver inputs shall be terminated.

Step 1:

• The UUT shall connect to a companion device during the test. The interference signal generator, the unwanted signal generator, the spectrum analyser, the UUT and the companion device are connected using a set-up equivalent to the example given by figure 5 although the interference and unwanted signal generator do not generate any signals at this point in time. The spectrum analyser is used to monitor the transmissions of both the UUT and the companion device and it should be possible to distinguish between either transmission. In addition, the spectrum analyser is used to monitor the transmissions of the UUT in response to the interfering and the unwanted signals.

• Adjust the received signal level (wanted signal from the companion device) at the UUT to the value defined in table 9 (clause 4.3.2.6.2.2).

Testing of Unidirectional equipment does not require a link to be established with a companion device.

• The analyser shall be set as follows:

- RBW: ≥ Occupied Channel Bandwidth (if the analyser does not support this setting, the highest available setting shall be used)
- VBW: 3 × RBW (if the analyser does not support this setting, the highest available setting shall be used)
- Detector Mode: RMS

- Centre Frequency: Equal to the centre frequency of the operating channel
- Span: 0 Hz
- Sweep time: > Channel Occupancy Time of the UUT
- Trace Mode: Clear/Write
- Trigger Mode: Video

Step 2:

• Configure the UUT for normal transmissions with a sufficiently high payload resulting in a minimum transmitter activity ratio (TxOn / (TxOn + TxOff)) of 0,3. Where this is not possible, the UUT shall be configured to the maximum payload possible.

• Using the procedure defined in clause 5.4.6.2.1.5, it shall be verified that the UUT complies with the maximum Channel Occupancy Time and minimum Idle Period defined in clause 4.3.2.6.2.2. When measuring the Idle Period of the UUT, it shall not include the transmission time of the companion device.

Step 3: Adding the interference signal

• An interference signal as defined in clause B.7 is injected on the current operating channel of the UUT. The power spectral density level (at the input of the UUT) of this interference signal shall be equal to the detection threshold defined in clause 4.3.2.6.2.2, step 5.

Step 4: Verification of reaction to the interference signal

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

• Using the procedure defined in clause 5.4.6.2.1.5, it shall be verified that:

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

The UUT is assumed to stop transmissions within a period equal to the maximum Channel Occupancy Time defined in clause 4.3.2.6.2.2, step 4.

ii) Apart from Short Control Signalling Transmissions (see iii) below), there shall be no subsequent transmissions on this operating channel for a (silent) period defined in clause 4.3.2.6.2.2, step 2. After that, the UUT may have normal transmissions again for the duration of a single Channel Occupancy Time period. Because the interference signal is still present, another silent period as defined in clause 4.3.2.6.2.2, step 2 needs to be included. This sequence is repeated as long as the interfering signal is present.

To verify that the UUT is not resuming normal transmissions as long as the interference signal is present, the monitoring time may need to be 60 s or more.

iii) The UUT may continue to have Short Control Signalling Transmissions on the operating channel while the interference signal is present. These transmissions shall comply with the limits defined in clause 4.3.2.6.4.2.The verification of the Short Control Signalling transmissions may require the analyser settings to be changed (e.g. sweep time).

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

Step 5: Adding the unwanted signal

• With the interfering signal present, a 100 % duty cycle CW signal is inserted as the unwanted signal. The frequency and the level are provided in table 9 of clause 4.3.2.6.2.2.

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

• Using the procedure defined in clause 5.4.6.2.1.5, it shall be verified that:

i) The UUT shall not resume normal transmissions on the current operating channel as long as both the interference and unwanted signals remain present.

To verify that the UUT is not resuming normal transmissions as long as the interference and unwanted signals are present, the monitoring time may need to be 60 s or more.

ii) The UUT may continue to have Short Control Signalling Transmissions on the operating channel while the interference and unwanted signals are present. These transmissions shall comply with the limits defined in clause 4.3.2.6.4.2. The verification of the Short Control Signalling transmissions may require the analyser settings to be changed (e.g. sweep time).

Step 6: Removing the interference and unwanted signal

• On removal of the interference and unwanted signal the UUT is allowed to start normal transmissions again on this channel however, it shall be verified that this shall only be done after the period defined in clause 4.3.2.6.2.2, step 2.

Step 7:

• Step 2 to step 6 shall be repeated for each of the frequencies to be tested.

2.3.4.2 Generic test procedure for measuring channel/frequency usage

This is a generic test method to evaluate transmissions on the operating (hopping) frequency being investigated. This test is performed as part of the procedures described in clause 5.4.6.2.1.2 to clause 5.4.6.2.1.4.

The test procedure shall be as follows:

Step 1:

• The analyser shall be set as follows:

- Centre Frequency: Equal to the hopping frequency or centre frequency of the channel being investigated.
- Frequency Span: 0 Hz.
- RBW: ~ 50 % of the Occupied Channel Bandwidth (if the analyser does not support this setting, the highest available setting shall be used).
- VBW: ≥ RBW (if the analyser does not support this setting, the highest available setting shall be used).
- Detector Mode: RMS.
- Sweep time: > the Channel Occupancy Time. It shall be noted that if the Channel Occupancy Time is non-contiguous (for non-LBT based Frequency Hopping Equipment), the sweep time shall be sufficient to cover the period over which the Channel Occupancy Time is spread out.
- Number of sweep points: The time resolution has to be sufficient to meet the maximum

measurement uncertainty of 5 % for the period to be measured. In most cases, the Idle Period is the shortest period to be measured and thereby defining the time resolution. If the Channel Occupancy Time is non-contiguous (non-LBT based frequency hopping equipment), there is no Idle Period to be measured and therefore the time resolution can be increased (e.g. to 5 % of the dwell time) to cover the period over which the Channel Occupancy Time is spread out, without resulting in too high a number of sweep points for the analyser.

EXAMPLE 1: For a Channel Occupancy Time of 60 ms, the minimum Idle Period is 3 ms, hence the minimum time resolution should be < 150 μs.

EXAMPLE 2: For a Channel Occupancy Time of 2 ms, the minimum Idle Period is 100 μs, hence the minimum time resolution should be < 5 μs.

EXAMPLE 3: In case of an equipment using the non-contiguous Channel Occupancy Time approach (40 ms) and using 79 hopping frequencies with a dwell time of 3,75 ms, the total period over which the Channel Occupancy Time is spread out is 3,2 s. With a time resolution 0,1875 ms (5 % of the dwell time), the minimum number of sweep points is ~ 17 000.

- Trace mode: Clear / Write
- Trigger: Video

In case of Frequency Hopping Equipment, the data points resulting from transmissions on the hopping frequency being investigated are assumed to have much higher levels compared to data points resulting from transmissions on adjacent hopping frequencies. If a clear determination between these transmissions is not possible, the RBW in step 1 shall be further reduced. In addition, a channel filter may be used.

Step 2:

• Save the trace data to a file for further analysis by a computing device using an appropriate software application or program.

Step 3:

• Identify the data points related to the frequency being investigated by applying a threshold.
• Count the number of consecutive data points identified as resulting from a single transmission on the frequency being investigated and multiply this number by the time difference between two consecutive data points. Repeat this for all the transmissions within the measurement window.
• For measuring idle or silent periods, count the number of consecutive data points identified as resulting from a single transmitter off period on the frequency being investigated and multiply this number by the time difference between two consecutive data points. Repeat this for all the transmitter off periods within the measurement window.

2.3.5. Result

This test case not applies this kind of EUT.

2.4. EN 300 328 §4.3.2.7 Occupied Channel Bandwidth

2.4.1. Definition

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

2.4.2. 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.

2.4.3. 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.

2.4.4. 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

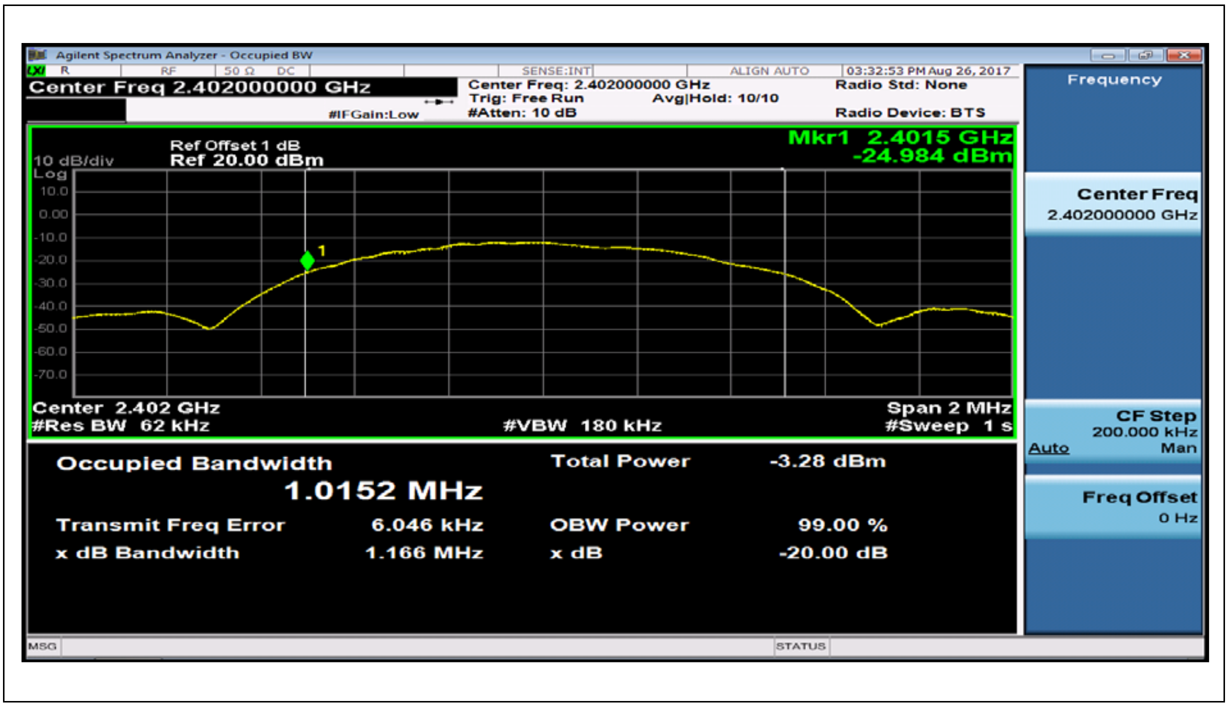
Step 2:
Wait for the trace to stabilize.
Find the peak value of the trace and place the analyser marker on this peak.
Step 3:
Use the 99 % bandwidth function of the spectrum analyser to measure the Occupied Channel Bandwidth of the UUT. This value shall be recorded.
Make sure that the power envelope 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.

2.4.5. Result

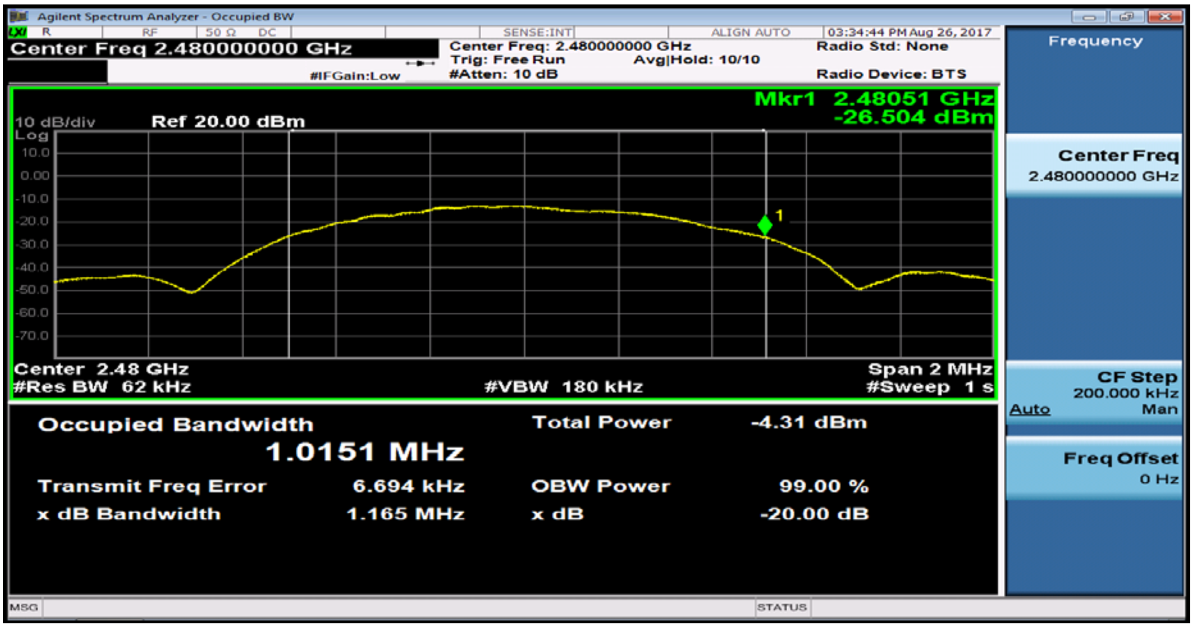
2.4.5.1 GFSK

Channel	Frequency (MHz)	Measure Frequency (MHz)	Limit (MHz)	Result
0	2402	2401.50	≥2400	**PASS**
39	2480	2480.51	≤2483.5	**PASS**

2.4.5.2 Test Plot



(Occupied Channel Bandwidth_BLE_2402MHz)



(Occupied Channel Bandwidth_BLE_2480MHz)

2.5. EN 300 328 §4.3.2.8 Transmitter unwanted emissions in the out-of-band domain

2.5.1. 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..

2.5.2. 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.
Within the band specified in table 1, the Out-of-band emissions are fulfilled by compliance with the Occupied Channel Bandwidth requirement in clause 4.3.2.7..

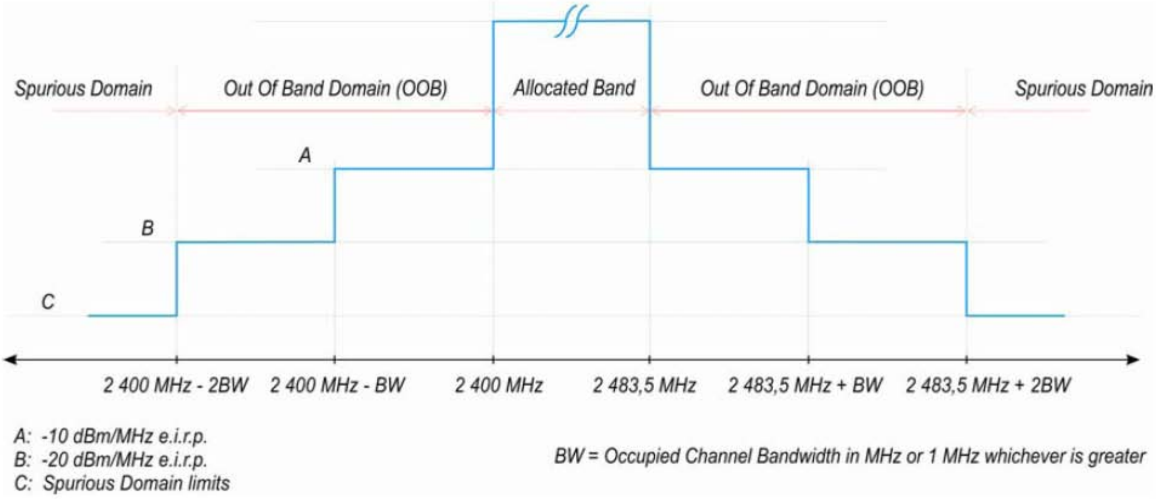


Figure 1: Transmit mask

2.5.3. 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.

2.5.4. 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: Continuous
- Sweep Points: Sweep Time [s] / (1 μs) or 5 000 whichever is greater
- Trigger Mode: Video trigger; in case video triggering is not possible, an external trigger source may
be used
- Sweep Time: > 120 % of the duration of the longest burst detected during the measurement of the RF Output Power

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

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

• For frequency hopping equipment operating in a normal hopping mode, the different hops will result in signal bursts with different power levels. In this case the burst with the highest power level shall be selected.

• Set a window (start and stop lines) to match with the start and end of the burst and in which the RMS power shall be measured using the Time Domain Power function.

• Select RMS power to be measured within the selected window and note the result which is the RMS power within this 1 MHz segment (2 483,5 MHz to 2 484,5 MHz). Compare this value with the applicable limit provided by the mask.

• Increase the centre frequency in steps of 1 MHz and repeat this measurement for every 1 MHz segment within the range 2 483,5 MHz to 2 483,5 MHz + BW. The centre frequency of the last 1

MHz segment shall be set to 2 483,5 MHz + BW - 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).

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

• Change the centre frequency of the analyser to 2 484 MHz + BW and perform the measurement for the first 1 MHz segment within range 2 483,5 MHz + BW to 2 483,5 MHz + 2BW. Increase the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 483,5 MHz + 2 BW - 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).

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

• Change the centre frequency of the analyser to 2 399,5 MHz and perform the measurement for the first 1 MHz segment within range 2 400 MHz - BW to 2 400 MHz Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - BW + 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).

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

• Change the centre frequency of the analyser to 2 399,5 MHz - BW and perform the measurement for the first 1 MHz segment within range 2 400 MHz - 2BW to 2 400 MHz - BW. Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - 2BW + 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).

Step 6:

• In case of conducted measurements on equipment with a single transmit chain, the declared antenna assembly gain G in dBi shall be added to the results for each of the 1 MHz segments and compared with the limits provided by the mask given in figure 1 or figure 3. If more than one antenna assembly is intended for this power setting, the antenna with the highest gain shall be considered.

• In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), the measurements need to be repeated for each of the active transmit chains. The declared antenna assembly gain G in dBi for a single antenna shall be added to these results. If more than one antenna assembly is intended for this power setting, the antenna with the highest gain shall be considered. Comparison with the applicable limits shall be done using any of the options given below:

- Option 1: the results for each of the transmit chains for the corresponding 1 MHz segments shall be

added. The additional beamforming gain Y in dB shall be added as well and the resulting values compared with the limits provided by the mask given in figure 1 or figure 3.

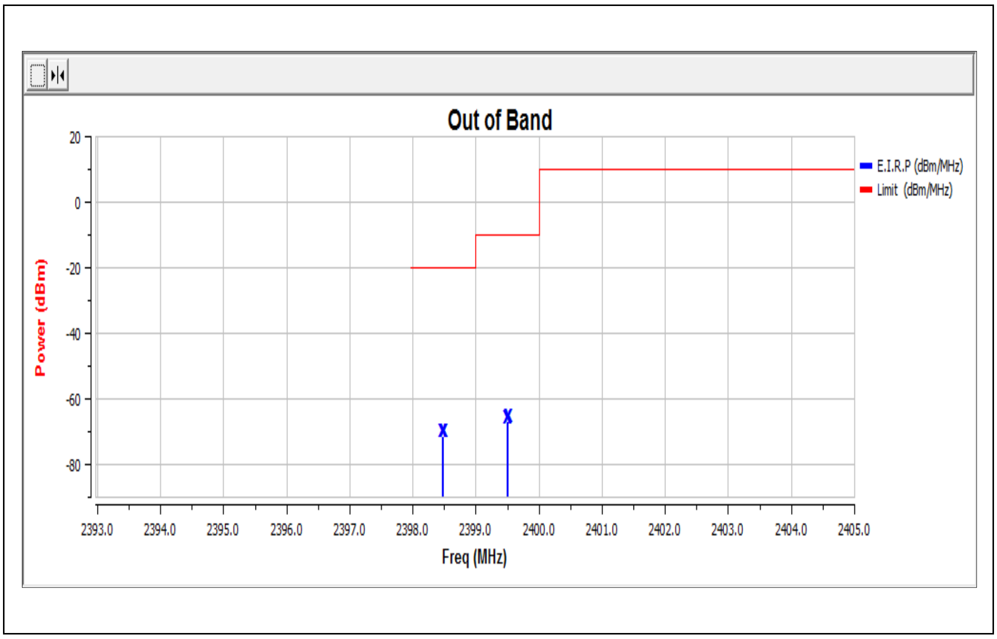
- Option 2: the limits provided by the mask given in figure 1 or figure 3 shall be reduced by 10 × log10(Ach) and the additional beamforming gain Y in dB. The results for each of the transmit chains shall be individually compared with these reduced limits.

NOTE: Ach refers to the number of active transmit chains.
It shall be recorded whether the equipment complies with the mask provided in figure 1 or figure 3.

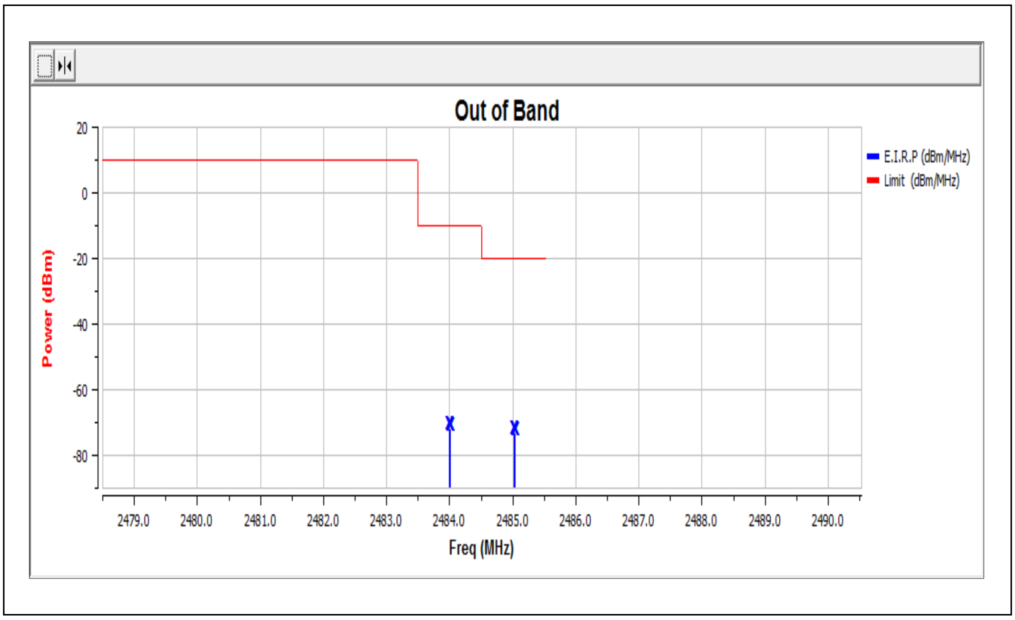
2.5.5. Result

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	-67.13	-71.74	-72.21	-73.34
Limit (dBm/MHz)		-10	-20	-10	-20
Result		**PASS**	**PASS**	**PASS**	**PASS**

Test Plot



(OOB_BLE_ 2402MHz)



(OOB_BLE_2480MHz)

2.6. EN 300 328 §4.3.2.9Transmitter unwanted emissions in the spurious domain

2.6.1. 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.

2.6.2. 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 862 MHz	-54 dBm	100kHz
862 MHz to 1 GHz	-36 dBm	100kHz
1 GHz to 12,75 GHz	-30 dBm	1MHz

2.6.3. 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..

2.6.4. Test procedures

2.6.4.1 Introduction

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..

2.6.4.2 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 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 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 (Ach).The limits used to identify emissions during this pre-scan need to be reduced by 10 × log10 (Ach).

2.6.4.3 Measurement of the emissions identified during the pre-scan

5.4.9.2.1.3 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 (Ach).

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

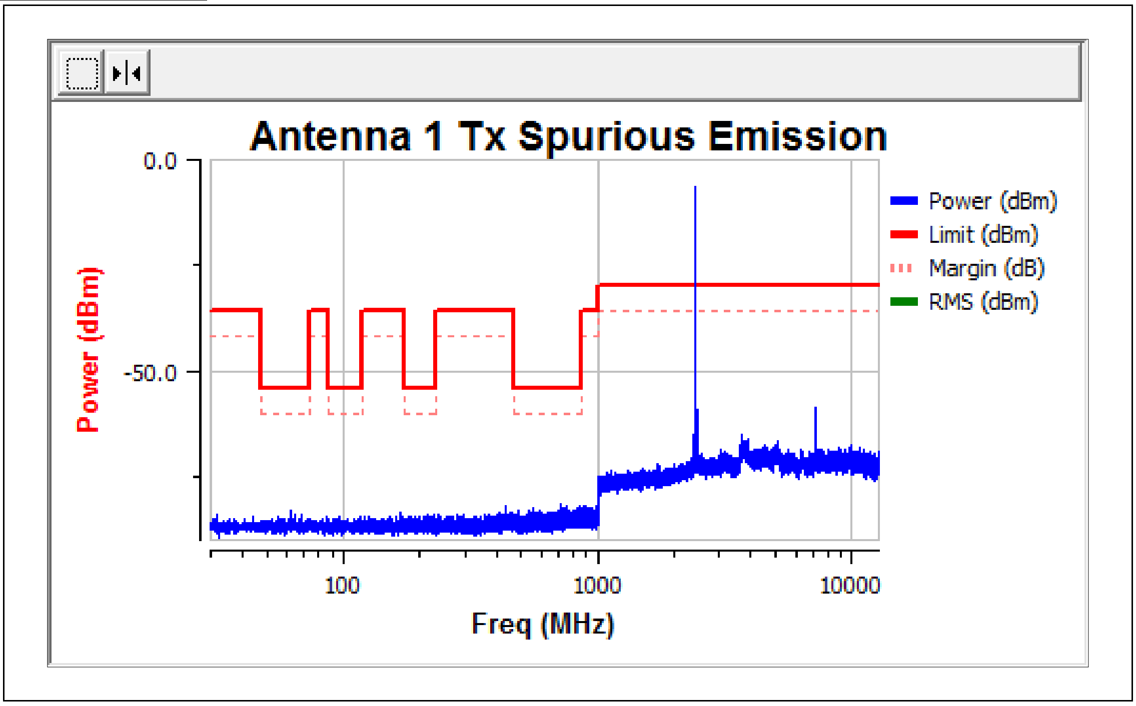
Step 4:

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

2.6.5. Result

2.6.5.1 Conducted test result

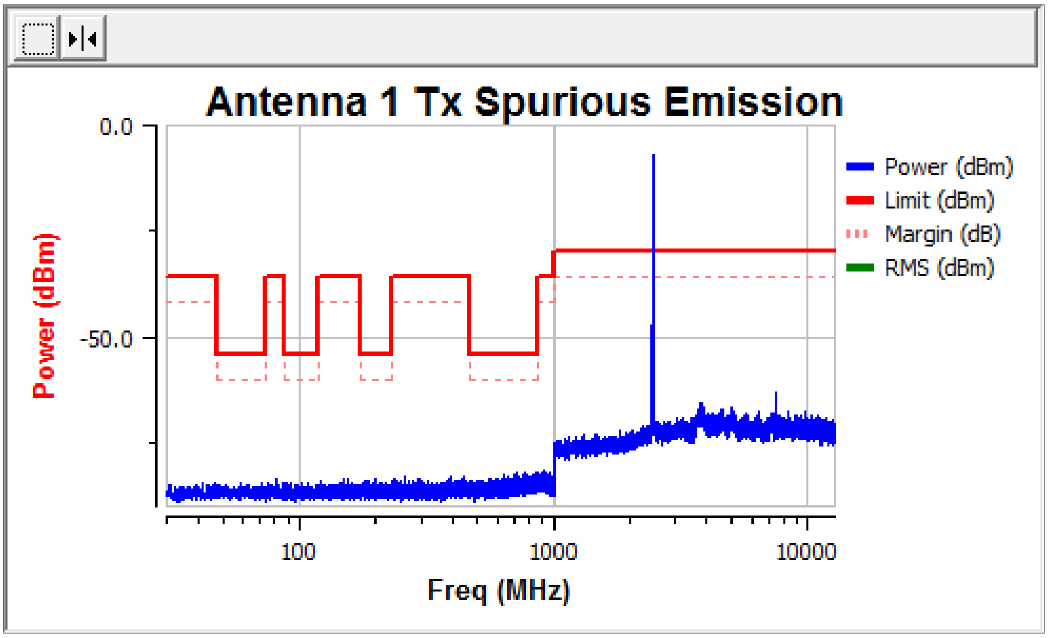
Plot for Channel = 0



(TX_CSE_BLE _2402MHz_30MHz to 12.75GHz)

Freq (MHz)	Peak Level (dBm)	Limit (dBm)	Over Limit (dB)	Status
62.400	-82.33	-54.00	-28.33	PASS
556.900	-82.15	-54.00	-28.15	PASS
713.950	-81.26	-54.00	-27.26	PASS
758.750	-81.74	-54.00	-27.74	PASS
850.100	-81.68	-54.00	-27.68	PASS
2397.000	-65.69	-30.00	-35.69	PASS
3652.500	-64.86	-30.00	-34.86	PASS
3729.000	-66.00	-30.00	-36.00	PASS
3869.000	-65.86	-30.00	-35.86	PASS
7206.000	-58.06	-30.00	-28.06	PASS

Plot for Channel = 39

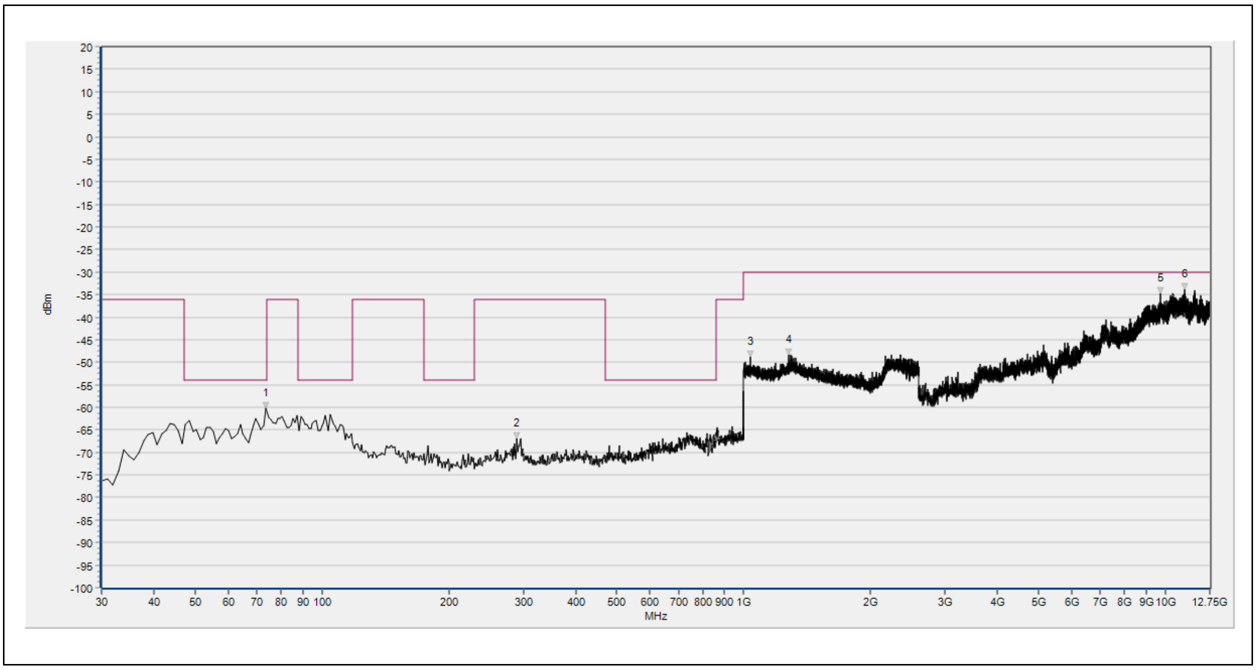


(TX_CSE_BLE _2480MHz_30MHz to 12.75GHz)

Freq (MHz)	Peak Level (dBm)	Limit (dBm)	Over Limit (dB)	Status
718.650	-81.35	-54.00	-27.35	PASS
752.300	-82.12	-54.00	-28.12	PASS
775.100	-81.65	-54.00	-27.65	PASS
826.350	-82.24	-54.00	-28.24	PASS
854.300	-81.66	-54.00	-27.66	PASS
3793.500	-65.26	-30.00	-35.26	PASS
3827.500	-66.32	-30.00	-36.32	PASS
3861.500	-65.90	-30.00	-35.90	PASS
4986.500	-66.06	-30.00	-36.06	PASS
7440.500	-62.79	-30.00	-32.79	PASS

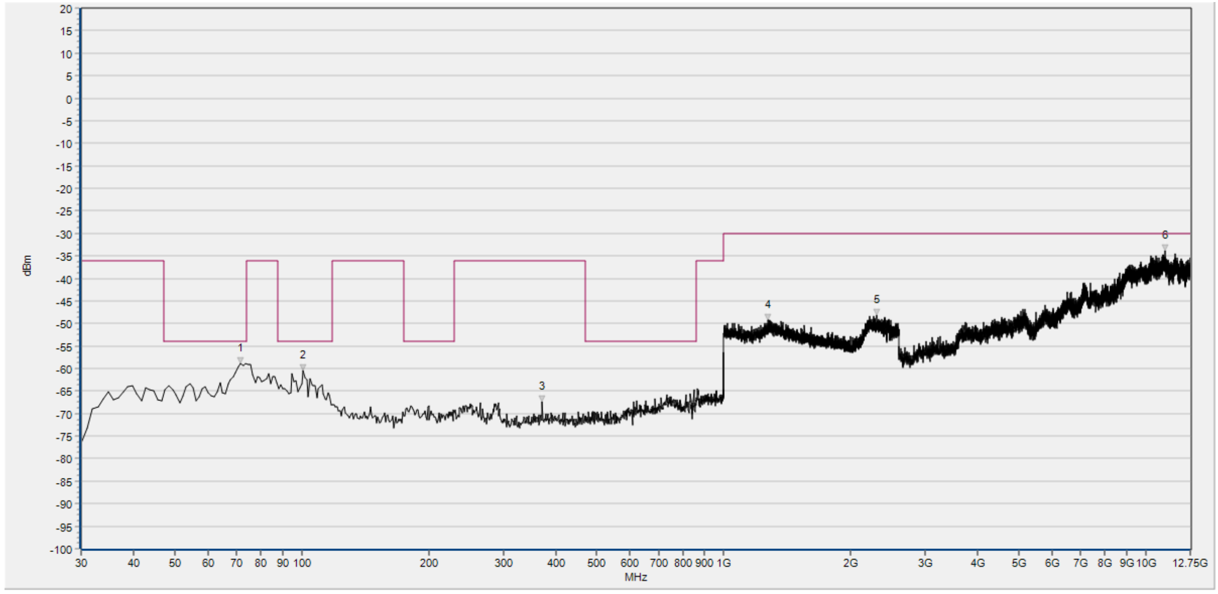
2.6.5.2 Radiated test result

Plot for Channel = 0



(TX_RSE_BLE _2402MHz_30MHz to 12.75GHz_ Antenna Horizontal)

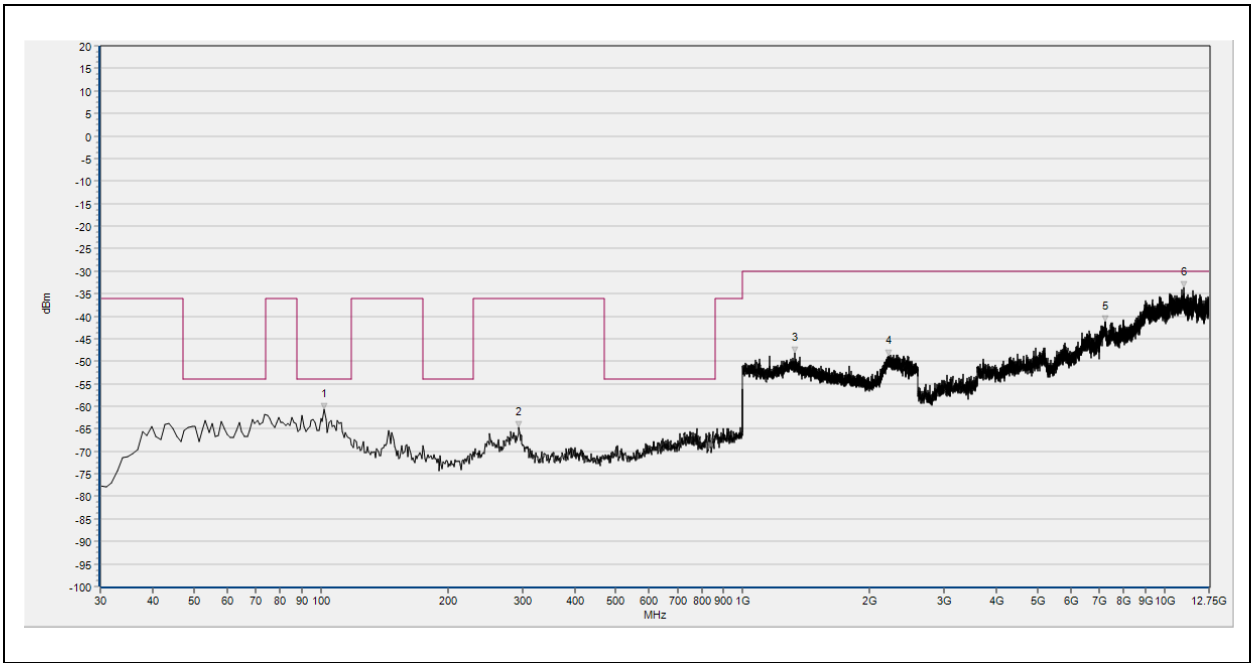
Test frequency range 30MHz to 12.75 GHz	Channel = 0				
	Transmitter with modulation Mode at 2402MHz				
	Frequency (MHz)	**Peak (dBm)**	**Limit(PK)**	**Antenna**	**Verdict**
	73.650	-60.21	-54.00	Horizontal	PASS
	289.960	-66.95	-36.00	Horizontal	PASS
	1038.400	-48.87	-30.00	Horizontal	PASS
	1279.467	-48.43	-30.00	Horizontal	PASS
	9747.630	-34.77	-30.00	Horizontal	PASS
	11121.940	-33.75	-30.00	Horizontal	PASS



(TX_RSE_BLE _2402MHz_30MHz to 12.75GHz_ Antenna Vertical)

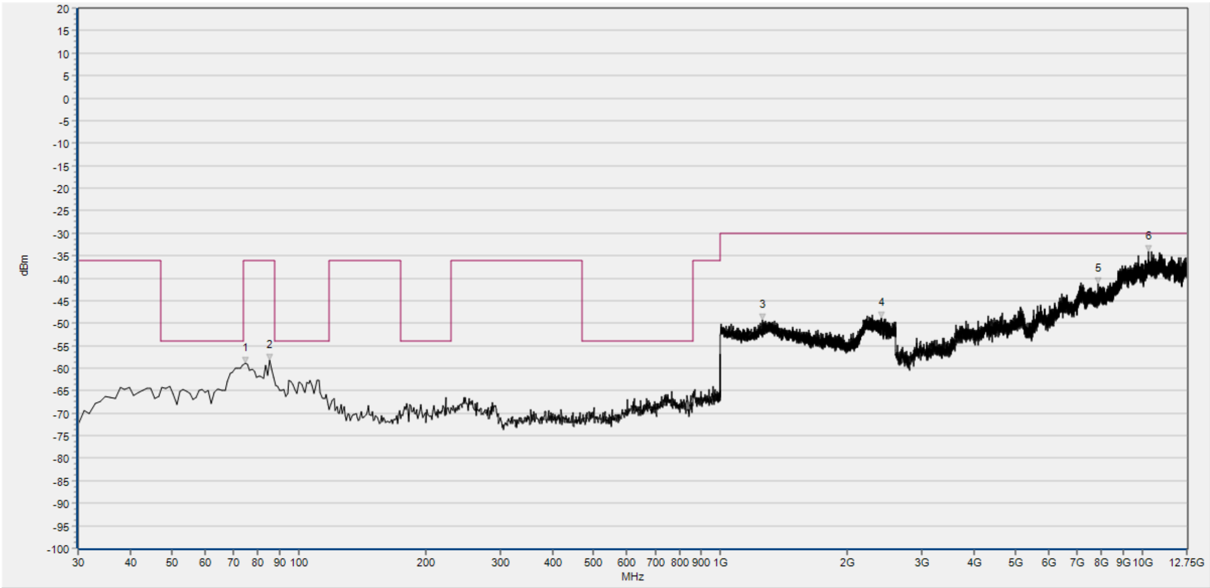
Test frequency range 30MHz to 12.75 GHz	Channel = 0				
	Transmitter with modulation Mode at 2402MHz				
	Frequency (MHz)	**Peak (dBm)**	**Limit(PK)**	**Antenna**	**Verdict**
	71.710	-58.90	-54.00	Vertical	PASS
	100.810	-60.37	-54.00	Vertical	PASS
	371.440	-67.41	-36.00	Vertical	PASS
	1274.667	-49.34	-30.00	Vertical	PASS
	2302.933	-48.25	-30.00	Vertical	PASS
	11136.150	-33.96	-30.00	Vertical	PASS

Plot for Channel = 39



(TX_RSE_BLE _2480MHz_30MHz to 12.75GHz_ Antenna Horizontal)

	Channel = 39				
	Transmitter with modulation Mode at 2480MHz				
Test frequency range 30MHz to 12.75 GHz	**Frequency (MHz)**	**Peak (dBm)**	**Limit(PK)**	**Antenna**	**Verdict**
	101.780	-60.66	-54.00	Horizontal	PASS
	294.810	-64.59	-36.00	Horizontal	PASS
	1330.133	-48.24	-30.00	Horizontal	PASS
	2220.267	-48.75	-30.00	Horizontal	PASS
	7242.610	-41.25	-30.00	Horizontal	PASS
	11128.030	-33.59	-30.00	Horizontal	PASS



(TX_RSE_BLE _2480MHz_30MHz to 12.75GHz_Antenna Vertical)

Test frequency range 30MHz to 12.75 GHz	Channel = 39				
	Transmitter with modulation Mode at 2480MHz				
	Frequency (MHz)	**Peak (dBm)**	**Limit(PK)**	**Antenna**	**Verdict**
	74.620	-58.95	-36.00	Vertical	PASS
	85.290	-58.26	-36.00	Vertical	PASS
	1254.933	-49.35	-30.00	Vertical	PASS
	2405.867	-48.88	-30.00	Vertical	PASS
	7837.400	-41.18	-30.00	Vertical	PASS
	10352.570	-34.08	-30.00	Vertical	PASS

3. Receiver Parameters

3.1. EN 300 328 §4.3.2.10 - 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

3.1.4.1 Conducted 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 AchThe limits used to identify emissions during this pre-scan need to be reduced by 10 × log10 Ach.

3.1.4.2 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: 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 Ach.

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.

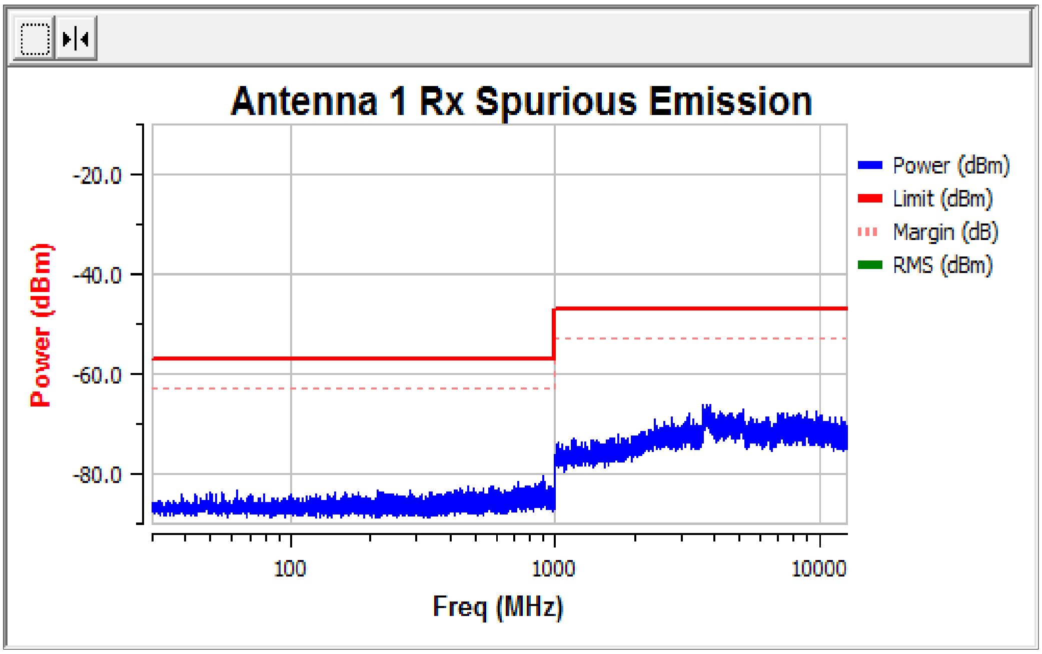
3.1.4.3 Radiated measurement

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. Results

3.1.5.1 Conducted test result

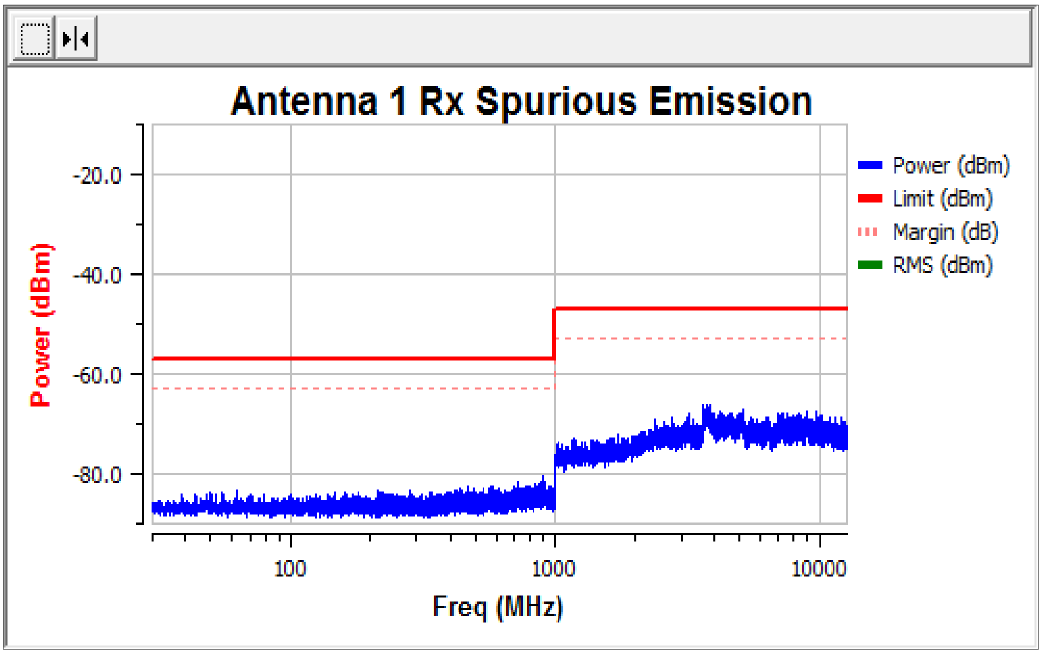
Plot for Channel = 0



(RX_CSE_BLE _2402MHz_30MHz to 12.75GHz)

Freq (MHz)	Peak Level (dBm)	Limit (dBm)	Over Limit (dB)	Status
214.500	-81.02	-57.00	-24.02	PASS
604.550	-81.34	-57.00	-24.34	PASS
704.950	-81.38	-57.00	-24.38	PASS
744.350	-79.53	-57.00	-22.53	PASS
863.600	-80.55	-57.00	-23.55	PASS
3746.500	-65.60	-47.00	-18.60	PASS
3782.000	-65.39	-47.00	-18.39	PASS
3809.500	-66.39	-47.00	-19.39	PASS
3836.000	-66.50	-47.00	-19.50	PASS
5096.000	-66.42	-47.00	-19.42	PASS

Plot for Channel = 39

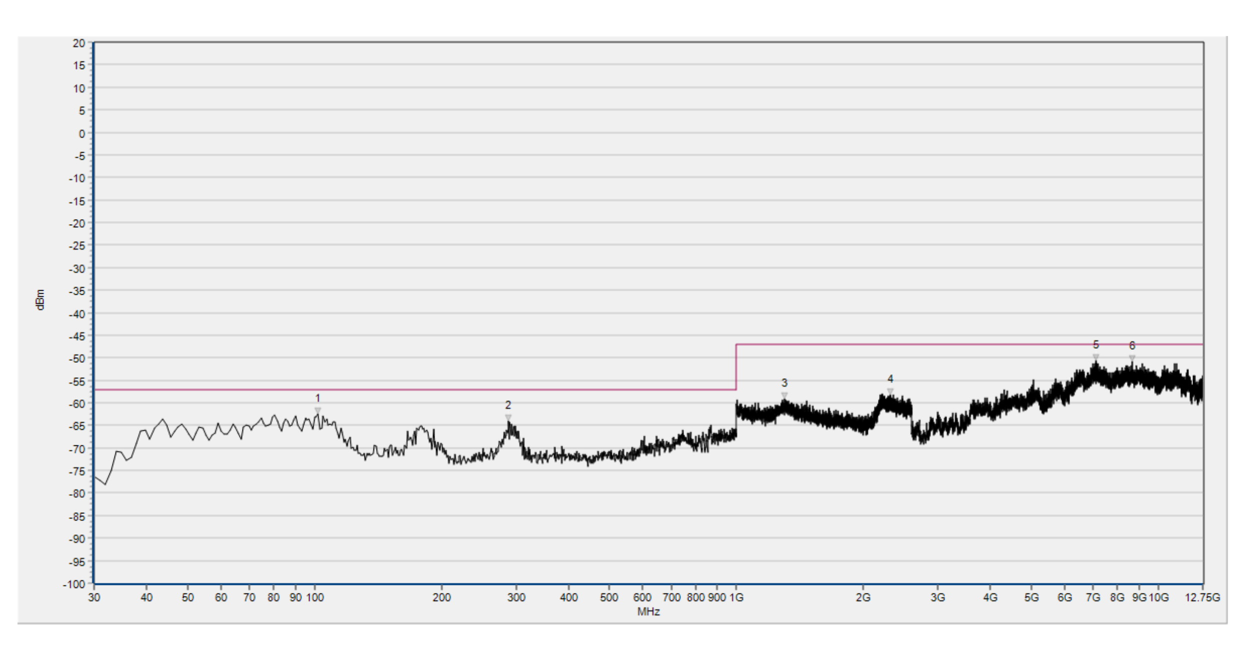


(RX_CSE_BLE _2480MHz_30MHz to 12.75GHz)

Freq (MHz)	Peak Level (dBm)	Limit (dBm)	Over Limit (dB)	Status
470.800	-81.89	-57.00	-24.89	PASS
722.700	-81.31	-57.00	-24.31	PASS
865.100	-81.64	-57.00	-24.64	PASS
895.800	-80.00	-57.00	-23.00	PASS
916.500	-81.42	-57.00	-24.42	PASS
3618.500	-66.40	-47.00	-19.40	PASS
3643.000	-65.95	-47.00	-18.95	PASS
3743.000	-65.95	-47.00	-18.95	PASS
3792.000	-66.40	-47.00	-19.40	PASS
3852.000	-65.74	-47.00	-18.74	PASS

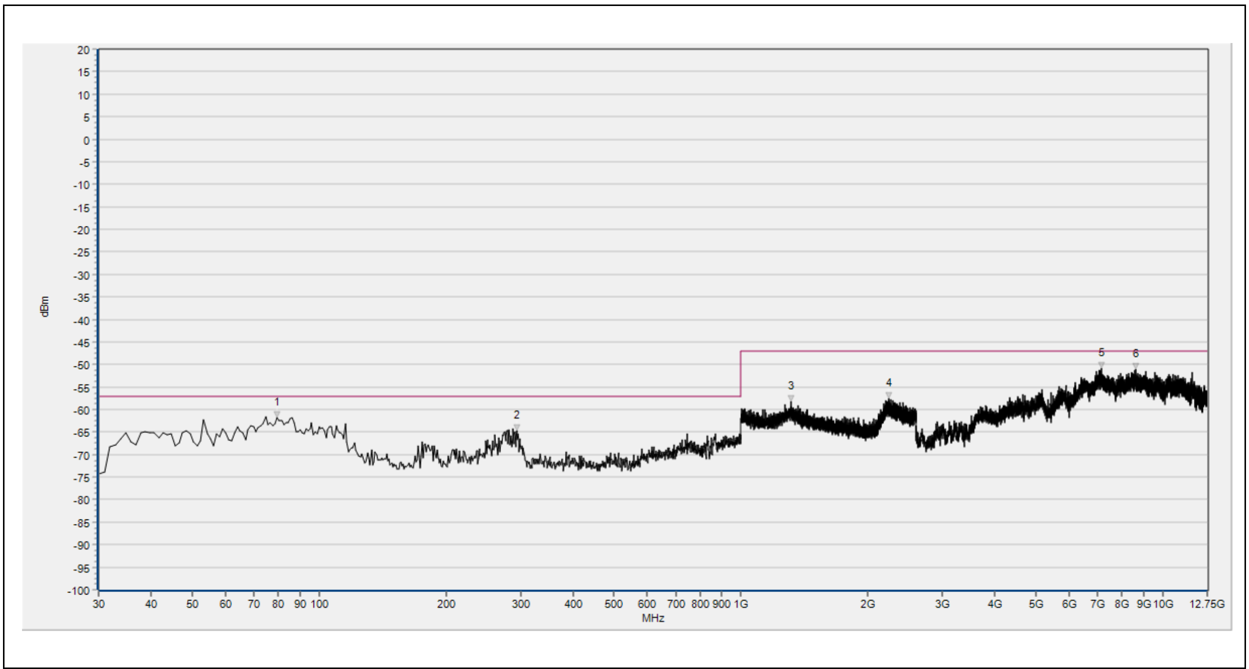
3.1.5.2 Radiated test result

Plot for Channel = 0



(RX_RSE_BLE _2402MHz_30MHz to 12.75GHz_Antenna Horizontal)

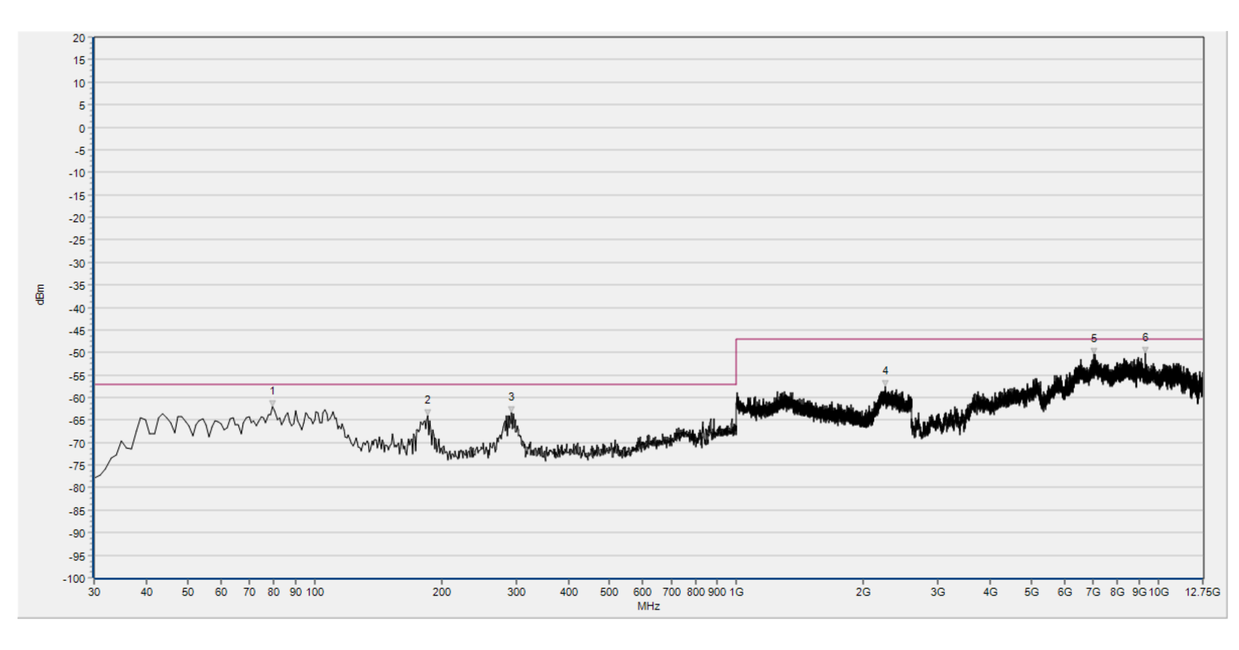
Test frequency range 30MHz to 12.75 GHz	Channel = 0				
	Receiver with modulation Mode at 2402MHz				
	Frequency (MHz)	**Peak (dBm)**	**Limit(PK)**	**Antenna**	**Verdict**
	101.852	-62.52	-57.00	Horizontal	PASS
	288.278	-64.12	-57.00	Horizontal	PASS
	1301.333	-59.05	-47.00	Horizontal	PASS
	2312.000	-58.25	-47.00	Horizontal	PASS
	7135.020	-50.54	-47.00	Horizontal	PASS
	8687.970	-50.89	-47.00	Horizontal	PASS



(RX_RSE_BLE _2402MHz_30MHz to 12.75GHz_Antenna Vertical)

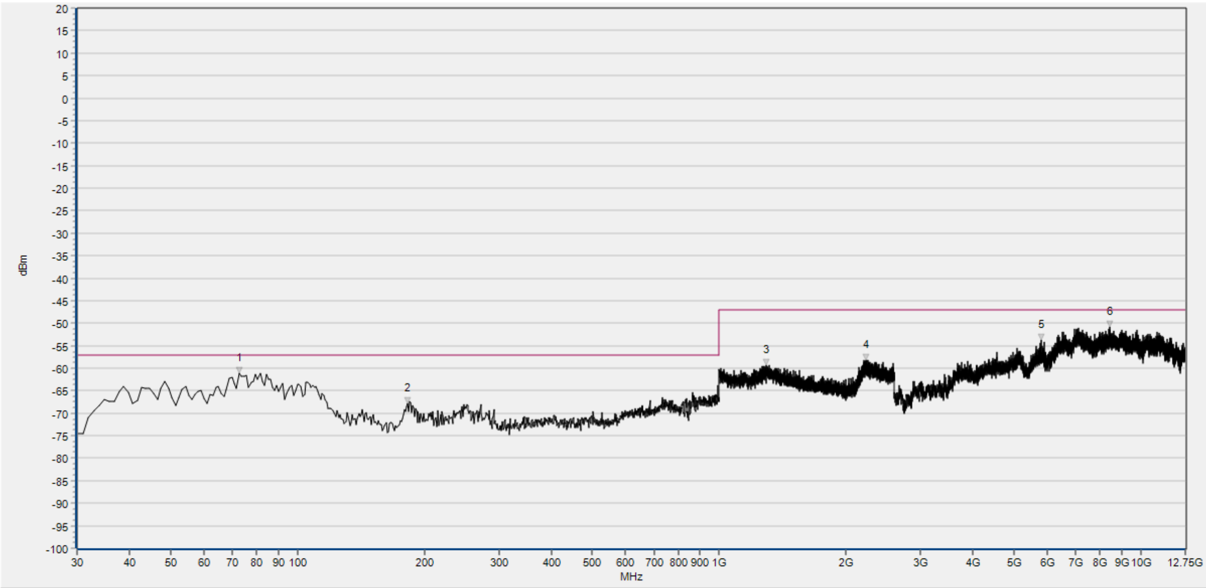
Test frequency range 30MHz to 12.75 GHz	Channel = 0				
	Receiver with modulation Mode at 2402MHz				
	Frequency (MHz)	**Peak (dBm)**	**Limit(PK)**	**Antenna**	**Verdict**
	79.520	-61.73	-57.00	Vertical	PASS
	294.104	-64.73	-57.00	Vertical	PASS
	1313.600	-58.15	-47.00	Vertical	PASS
	2236.800	-57.53	-47.00	Vertical	PASS
	7141.110	-50.77	-47.00	Vertical	PASS
	8614.890	-51.07	-47.00	Vertical	PASS

Plot for Channel = 39



(RX_RSE_BLE _2480MHz_30MHz to 12.75GHz_Antenna Horizontal)

Test frequency range 30MHz to 12.75 GHz	Channel = 39				
	Receiver with modulation Mode at 2480MHz				
	Frequency (MHz)	**Peak (dBm)**	**Limit(PK)**	**Antenna**	**Verdict**
	79.520	-61.94	-57.00	Horizontal	PASS
	185.355	-63.94	-57.00	Horizontal	PASS
	293.133	-63.39	-57.00	Horizontal	PASS
	2251.733	-57.51	-47.00	Horizontal	PASS
	7025.400	-50.36	-47.00	Horizontal	PASS
	9325.390	-50.06	-47.00	Horizontal	PASS



(RX_RSE_BLE _2480MHz_30MHz to 12.75GHz_Antenna Vertical)

Test frequency range 30MHz to 12.75 GHz	Channel = 39				
	Receiver with modulation Mode at 2480MHz				
	Frequency (MHz)	**Peak (dBm)**	**Limit(PK)**	**Antenna**	**Verdict**
	72.723	-61.14	-57.00	Vertical	PASS
	182.442	-67.73	-57.00	Vertical	PASS
	1289.600	-59.33	-47.00	Vertical	PASS
	2227.733	-58.32	-47.00	Vertical	PASS
	5803.340	-53.67	-47.00	Vertical	PASS
	8432.190	-50.95	-47.00	Vertical	PASS

3.2. EN 300 328 §4.3.2.11 - 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.

3.2.2. Limit

3.2.2.1 General

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.

3.2.2.2 Receiver Category 1

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

Table 14: Receiver Blocking parameters for Receiver Category 1 equipment

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 dB	2 380 2 503,5	-53	CW
P_{min} + 6 dB	2 300 2 330 2 360	-47	CW
P_{min} + 6 dB	2 523,5 2 553,5 2 583,5 2 613,5 2 643,5 2 673,5	-47	CW
NOTE 1: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal. 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.			

3.2.2.3 Receiver 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)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal
P_{min} + 6 dB	2 380 2 503,5	-57	CW
P_{min} + 6 dB	2 300 2 583,5	-47	CW
NOTE 1: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal. 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.			

3.2.2.4 Receiver 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)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal
P_{min} + 12 dB	2 380 2 503,5	-57	CW
P_{min} + 12 dB	2 300 2 583,5	-47	CW
NOTE 1: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal. 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.			

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-frequency hopping equipment, having more than one operating channel, the equipment shall be tested operating at both the lowest and highest operating channels. Equipment which can change their operating channel automatically (adaptive channel allocation), and where this function cannot be disabled, shall be tested as a frequency hopping 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 as declared by the manufacturer (see clause 5.4.1 t)) and shall be described in the test report.

It shall be verified that this performance criteria as declared by the manufacturer is achieved..

3.2.4. Test procedures

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..

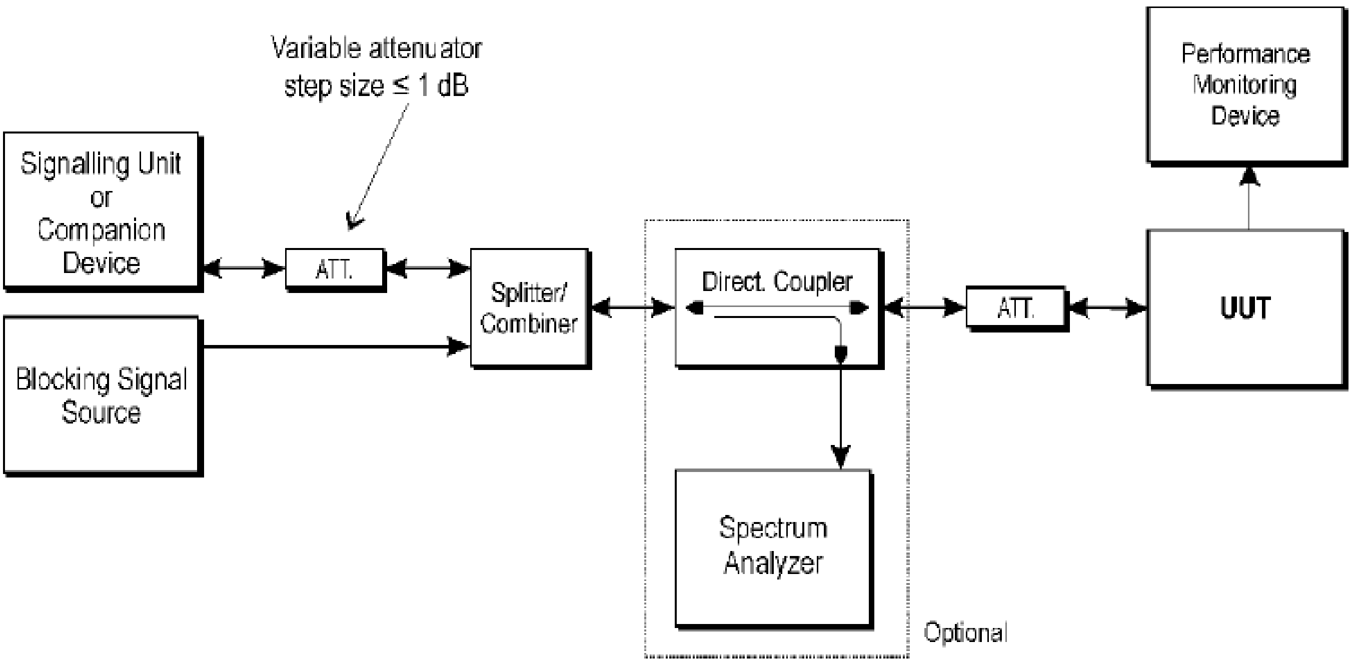


Figure 6: Test Set-up for receiver blocking

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.

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 frequency hopping 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 equipment using wide band modulations other than FHSS.

Step 1:

• For non-frequency hopping equipment, the UUT shall be set to the lowest operating channel.

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. 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 Pmin.

• This signal level (Pmin) is increased by the value provided in the 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. It shall be verified and recorded in the test report that the performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is met.

Step 5:

• Repeat step 4 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 6:

• For non-frequency hopping equipment, repeat step 2 to step 5 with the UUT operating at the highest operating channel.

3.2.5. Results

Note: The EUT operate in normal link mode.

Channel: 2402MHz

Table 7: Receiver Blocking parameters for Receiver Category 3 equipment							
P_{min}=-79dBm							
Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal	Send pack	Receiver Pack	PER (%)	Verdict
P_{min} + 12 dB	2 380	-57	CW	1000	1000	0	PASS
	2 503,5	-57	CW	1000	999	0.1	PASS
P_{min} + 12 dB	2 300	-47	CW	1000	1000	0	PASS
	2583,5	-47	CW	1000	1000	0	PASS
NOTE 1: P_{min} is the minimum level of wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 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.							

Channel: 2480MHz

Table 7: Receiver Blocking parameters for Receiver Category 3 equipment							
P_{min}=-81dBm							
Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal	Send pack	Receiver Pack	PER (%)	Verdict
P_{min} + 12 dB	2 380	-57	CW	1000	1000	0	PASS
	2 503,5	-57	CW	1000	1000	0	PASS
P_{min} + 12 dB	2 300	-47	CW	1000	999	0.1	PASS
	2583,5	-47	CW	1000	1000	0	PASS
NOTE 1: P_{min} is the minimum level of wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 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.							

3.3. EN 300 328 §4.3.2.12 - 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. Requirements

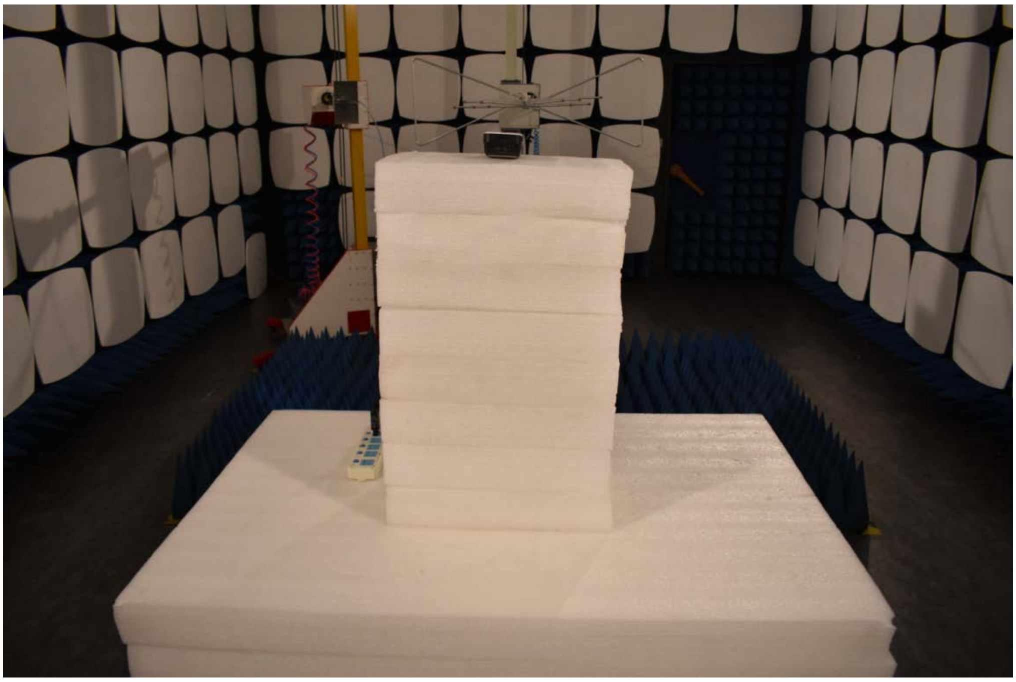
The geographical location determined by the equipment as defined in clause 3.3.1 shall not be accessible to the user.

3.3.3. Results

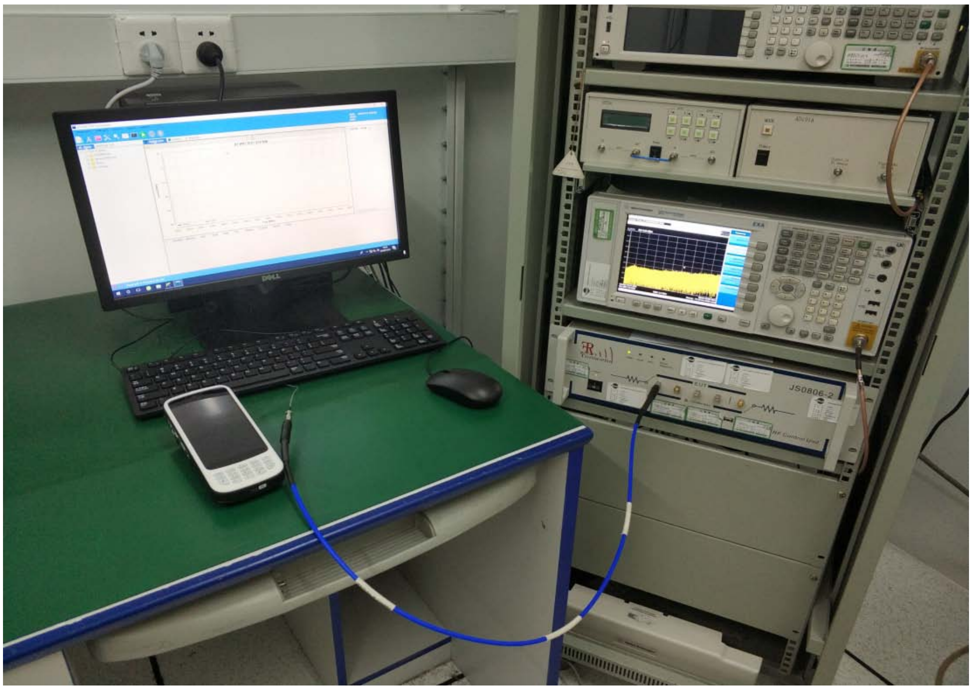
The EUT does not support Geo-location capability. This test case does not apply this kind of EUT.

Annex A Photographs of Test Setup

1. Radiated Measurement Setup



2. Conducted Measurement Setup



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%

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Http://www.morlab.cn E-mail: service@morlab.cn

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 V2.1.1, 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.): ………. dBm

The maximum (corresponding) Duty Cycle: ………. %

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

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: -20° C Maximum 50° 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: 0.49 dBi

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 3.8 V

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

t) Describe the minimum performance criteria that apply to the equipment (see clause 4.3.1.12.3 or clause 4.3.2.11.3): ……

C.3: Configuration for testing (see clause 5.3.2.3 of ETSI EN 300 328 V2.1.1)

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:-2.34 dBm	
Corresponding Antenna assembly gain: 0.49 dBi	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: Shenzhen Chainway Information Technology Co.,Ltd.
Model #: N/A
Model name: C75

☐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

Company Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Department:	Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Responsible Test Lab Manager:	Mr. Su Feng
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
Address:	FL.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	Cal. Due
Base Station	Anritsu	MT8852B	6K00006210	2018.04.17	2019.04.16
Temperature Chamber	CHONGQING HANBA EXPERIMENTAL EQUIPMENT CO.,LTD	HUT705P	(N/A.)	2018.04.17	2019.04.16
Power Splitter	Mini-Circuits	ZFRSC-183+	SF808201417	2018.04.17	2019.04.16
DC Power Supply	Good Will Instrument Co.,Ltd.	(N/A)	(N/A)	2018.04.17	2019.04.16
Attenuator 1	Resnet	20dB	(N/A)	2018.04.17	2019.04.16
MXG Vector Signal Generator	Angilent	N5182B	MY53050961	2018.04.17	2019.04.16
EXG Analog Signal Generator	Angilent	N5171B	MY53050558	2018.04.17	2019.04.16
EXA Signal analyzer	Angilent	N9010A	MY53470836	2017.12.02	2018.12.01
USB Power Sensor	Angilent	U2021XA	MY54210011	2018.04.17	2019.04.16

3.2 List of Software Used

Description	Manufacturer	Software Version
Test system	Tonscend	V2.6
Power Panel	Agilent	V3.8
MORLAB EMCR V1.2	MORLAB	V 1.0

3.3 RSE Test System

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
MXE EMI Receiver	MY54130016	N9038A	Agilent	2018.05.08	2019.05.07
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2018.05.08	2019.05.07
Test Antenna - Horn	01774	BBHA 9120D	Schwarzbeck	2017.09.13	2018.09.12
Anechoic Chamber	N/A	9m*6m*6m	CRT	2017.11.19	2020.11.18

END OF REPORT