RADIO TEST REPORT

ETSI EN 300 328 V2.2.2 (2019-07)

Report Reference No.	:	**POCE210310027VRW**
Applicant's Name	:	ESCAM Technology Co., Ltd.
Address of Applicant	:	C Building, Hongshengyuan, No.339, Bulong Road, Yangmei, Bantian, Longgang, Shenzhen, China 518129
Test Firm	:	Shenzhen POCE Technology Co., Ltd.
Address of Test Firm	:	101-102 Building H5 & 1/F., Building H, Hongfa Science & Technology Park, Tangtou, Shiyan, Bao'an District, Shenzhen, Guangdong, China
Test Standard	:	**ETSI EN 300 328 V2.2.2 (2019-07)**
Product Name	:	Solar panel battery IP camera
Model/Type Reference	:	QF280
Listed Models	:	QF480, QF260, QF290, QF609, QF130, QF110, QF120, QF150, QF160, QF170, QF180, QF190, QF450, QF490, QF330, QF320, QF350, QF310, QF360, QF370, QF380, QF390, QF250, G08, G12, G15, QFXXX, GXX
Date of Receipt	:	Mar. 03, 2021
Date of Test	:	Mar. 03, 2021 - Mar. 17, 2021
Data of Issue	:	Mar. 17, 2021
Test Result	:	**PASS**

Compiled by:	Supervised by:	Approved by:
Amy Zhu	Stone Yin	
Amy Zhu/ File administrators	Stone Yin/ Technique principal	Bill Yuan/ Manager

Revision History Of Report

Version	Description	REPORT No.	Issue Date
V1.0	Original	POCE210310027VRW	Mar. 17, 2021

NOTE1:
The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EC Declaration of Conformity and compliance with all relevant EU Directives.

NOTE2:
The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

CONTENTS

1 TEST SUMMARY

1.1 Test Standards

The tests were performed according to following standards:

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.

1.2 Summary of Test Result

Item	Reference	Result
RF output power	ETSI EN 300 328 V2.2.2 Sub-clause 4.3.2.2	PASS
Power Spectral Density	ETSI EN 300 328 V2.2.2 Sub-clause 4.3.2.3	PASS
Duty Cycle, Tx-sequence, Tx-gap	ETSI EN 300 328 V2.2.2 Sub-clause 4.3.2.4	N/A_{note1}
Medium Utilisation (MU) factor	ETSI EN 300 328 V2.2.2 Sub-clause 4.3.2.5	N/A_{note1}
Adaptivity (non-FHSS)	ETSI EN 300 328 V2.2.2 Sub-clause 4.3.2.6	PASS
Occupied Channel Bandwidth	ETSI EN 300 328 V2.2.2 Sub-clause 4.3.2.7	PASS
Transmitter unwanted emissions in the out-of-band domain	ETSI EN 300 328 V2.2.2 Sub-clause 4.3.2.8	PASS
Transmitter unwanted emissions in the spurious domain	ETSI EN 300 328 V2.2.2 Sub-clause 4.3.2.9	PASS
Receiver spurious emissions	ETSI EN 300 328 V2.2.2 Sub-clause 4.3.2.10	PASS
Receiver Blocking	ETSI EN 300 328 V2.2.2 Sub-clause 4.3.2.11	PASS
Geo-location capability	ETSI EN 300 328 V2.2.2 Sub-clause 4.3.2.12	N/A_{note2}

Note1: This requirement does not apply to adaptive equipment.
Note2: This equipment without geo-location capability function.

2 GENERAL INFORMATION

2.1 Client Information

Applicant : **ESCAM Technology Co., Ltd.**

Address : C Building, Hongshengyuan, No.339, Bulong Road, Yangmei, Bantian, Longgang, Shenzhen, China 518129

Manufacturer : **ESCAM Technology Co., Ltd.**

Address : C Building, Hongshengyuan, No.339, Bulong Road, Yangmei, Bantian, Longgang, Shenzhen, China 518129

2.2 Test Environmental conditions

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

Temperature	Normal Temperature:	25°C
Voltage	Normal Voltage	DC 3.7V
Other	Relative Humidity	55 %
	Air Pressure	101 kPa

Note: The environmental conditions and voltage of this test are in accordance with the specifications of the standard sub-clause 5.1.2., All test results shall only be performed at normal test conditions.

2.3 Description of Support Units

The EUT has been tested with support equipments as below:

Description	Information	Manufacturer	Remark	Certificate
/	/	/	/	/
/	/	/	/	/

2.4 Description of EUT

Equipment	Solar panel battery IP camera
Trade Mark	ESCAM
Model Name	QF280
Series model	QF480, QF260, QF290, QF609, QF130, QF110, QF120, QF150, QF160, QF170, QF180, QF190, QF450, QF490, QF330, QF320, QF350, QF310, QF360, QF370, QF380, QF390, QF250, G08, G12, G15, QFXXX, GXX
Model Difference	All models have the same functionality, software and electronics, only the color, front frame shape and model names may differ. Test sample model: QF280
Power Source	DC 3.7V from battery
2.4G WIFI	
Supported type	IEEE 802.11b/802.11g/802.11n(H20)/802.11n(HT40)
Operation frequency	IEEE 802.11b/g/n20: 2412-2472MHz IEEE 802.11 n(HT40): 2422MHz-2462MHz
Modulation Type	IEEE 802.11b/g/n(HT20): CCK/DSSS IEEE 802.11 n(HT40): OFDM
Number of Channels	IEEE 802.11b/802.11g/802.11n(HT20): 13 IEEE 802.11 n(HT40): 9
Channels Separation	5MHz
Antenna type	Internal Antenna
Antenna gain	0 dBi

Note: For more detailed parameters and information, please refer to the manual.

2.5 Test Frequency and Description of Test Modes

Frequency list

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	**2412**	8	2447
2	2417	9	2452
3	**2422**	10	2457
4	2427	11	**2462**
5	2432	12	2467
6	2437	**13**	**2472**
7	**2442**		

The EUT has been tested under typical operating condition. The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing.

Through Preliminary tests were performed in all tests in different data rata and antenna configurations at lowest channel, the data rates of worse case as above were chosen for final test.

Channel	802.11 b/g/n(HT20)				
	No.	Frequency	Data Rate		
			B	G	N20
Lowest	CH01	2412MHz	1Mbps	6Mbps	MCS0
Middle	CH07	2442MHz	1Mbps	6Mbps	MCS0
Hightest	CH13	2472MHz	1Mbps	6Mbps	MCS0

Channel	802.11 n(HT40)		
	No.	Frequency	Data Rate
			N40
Lowest	CH03	2422MHz	MCS7
Middle	CH07	2442MHz	MCS7
Hightest	CH11	2462MHz	MCS7

2.6 Test Facility

CNAS Registration Number is L8229
Shenzhen POCE Technology Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories,
Date of Registration: Jan. 06, 2016.

VCCI Membership No.: 3941
The 3m Semi-anechoic chamber of Shenzhen POCE Technology Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.:R-3941.
Date of Registration: Oct. 22, 2018.

2.7 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate.
The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities.
The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen POCE Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025.
Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

No.	Item	Uncertainty
1	Radio Frequency	$< \pm 1 \times 10^{-5}$
2	RF power density, conducted	±2.5dB
3	RF power, conducted	±1.5dB
4	Spurious emissions,conducted	±2.5dB
5	All emissions,radiated(<1G)	±3.38dB
6	All emissions,radiated(>1G)	±3.38dB
7	Frequency Stability	$\pm 1.3 \times 10^{-6}$
8	Humidity	± 4%

2.8 Measurement Instruments List

No.	Equipment	Manufacturer	Type No.	Serial No.		Calibration Date
1	Spectrum Analyzer	Agilent	E4408B	56110	POCE-EY-002	2021/12/09
2	Spectrum Analyzer	Keysight	N9020A	MY53420323	POCE-EY-032	2021/12/09
3	Power Sensor	Keysight	U2002H	MY51190005	POCE-EY-049	2021/12/09
4	Power Meter	Keysight	E4416A	MY5303506	POCE-EY-048	2021/12/09
5	Signal generator	Keysight	N5182A	MY50143455	POCE-EY-034	2021/12/09
6	Vector signal generator	Keysight	N5181A	MY48180415	POCE-EY-040	2021/12/09
7	Horn Antenna	Schwarzbeck	JB1	A091114	POCE-EY-037	2021/12/09
8	Broadband Antenna	Sunol Sciences Corp	DRH-118	A062013	POCE-EY-036	2021/12/09
9	Wideband radio communication tester	R&S	CMW500	113410	POCE-EY-033	2021/12/09
10	Power amplifier(HF)	Schwarzbeck	BBV9718	9718-282	POCE-EY-011	2021/12/09
11	Power amplifier(LF)	Schwarzbeck	BBV9743	9743-151	POCE-EY-016	2021/12/09
12	LF Line 2	Germany	/	/	POCE-EY-020	2021/12/09
13	LF Line 1	Germany	/	/	POCE-EY-017	2021/12/09
14	Thermometer	/	CTH-608	/	POCE-EY-027	2021/12/09
15	HF line 1	/	/	/	POCE-EY-018	2021/12/09
16	HF line 2	/	/	/	POCE-EY-019	2021/12/09
17	Humidity Chamber	/	WHTH-800-40-880	/	POCE-SY-062	2021/08/11

Note: Calibration is valid for one year.

3 TEST ITEM AND RESULTS

3.1 RF output power

Limit

ETSI EN 300 328 V2.2.2 -- Sub-clause 4.3.2.2 : be equal to or less than 20 dBm

Test method

Step 1:

- Use a fast power sensor with a minimum sensitivity of -40 dBm 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 sensitivity of the power sensor (e.g. in case of radiated measurements), 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.
- In case of smart antenna systems operating in mode with beamforming (see clause 5.3.2.2.4), 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 (Pout) shall be calculated using the formula below:

$$P_{out} = A + G + Y$$

- 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.

Test Results

Wifi

802.11b mode							
Test conditions		**Channel**	**Measured power (dBm)**	**Antenna Gain (dBi)**	**EIRP (dBm)**	**Limit (dBm)**	**Result**
Voltage (V)	**Temperature (℃)**						
3.7	25	CH01	12.54	0.00	12.54	20.00	Pass
		CH07	11.65	0.00	11.65		
		CH13	11.27	0.00	11.27		
	-20	CH01	11.75	0.00	11.75		
		CH07	10.62	0.00	10.62		
		CH13	10.57	0.00	10.57		
	+55	CH01	11.57	0.00	11.57		
		CH07	10.82	0.00	10.82		
		CH13	10.72	0.00	10.72		

802.11g mode							
Test conditions		**Channel**	**Measured power (dBm)**	**Antenna Gain (dBi)**	**EIRP (dBm)**	**Limit (dBm)**	**Result**
Voltage (V)	**Temperature (℃)**						
3.7	25	CH01	12.46	0.00	12.46	20.00	Pass
		CH07	11.61	0.00	11.61		
		CH13	11.12	0.00	11.12		
	-20	CH01	11.44	0.00	11.44		
		CH07	10.57	0.00	10.57		
		CH13	10.46	0.00	10.46		
	+55	CH01	11.68	0.00	11.68		
		CH07	10.72	0.00	10.72		
		CH13	10.64	0.00	10.64		

802.11n(H20) mode							
Test conditions		Channel	Measured power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Result
Voltage (V)	Temperature (℃)						
3.7	25	CH01	11.84	0.00	11.84	20.00	Pass
		CH07	11.41	0.00	11.41		
		CH13	10.93	0.00	10.93		
	-20	CH01	10.39	0.00	10.39		
		CH07	9.86	0.00	9.86		
		CH13	9.52	0.00	9.52		
	+55	CH01	10.69	0.00	10.69		
		CH07	9.92	0.00	9.92		
		CH13	9.74	0.00	9.74		

802.11n(H40) mode							
Test conditions		Channel	Measured power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Result
Voltage (V)	Temperature (℃)						
3.7	25	CH03	10.83	0.00	10.83	20.00	Pass
		CH07	10.52	0.00	10.52		
		CH11	10.46	0.00	10.46		
	-20	CH03	10.34	0.00	10.34		
		CH07	10.22	0.00	10.22		
		CH11	10.14	0.00	10.14		
	+55	CH03	10.47	0.00	10.47		
		CH07	10.42	0.00	10.42		
		CH11	10.24	0.00	10.24		

Note: 1. Measured Power includes the cable loss.

2. Captured 30 bursts for each mode and recorded the maximum average power.

3.2 Power Spectral Density

Limit

ETSI EN 300 328 V2.2.2 -- Sub-clause 4.3.2.3 : 10 dBm/ MHz.

Test method

Step 1: Connect the UUT to the spectrum analyser and use the following settings:

Start Frequency:	2400 MHz
Stop Frequency:	2483.5 MHz
Resolution BW:	10 kHz
Video BW:	30 kHz
Sweep Points:	>8350; for spectrum analysers not supporting this number of sweep points, the frequency band may be segmented
Detector:	RMS
Trace Mode:	Max Hold
Sweep time:	10s

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 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.

Test Results

WIFI				
Mode	**Channel**	**Measured value (dBm/MHz)**	**Limit (dBm/MHz)**	**Result**
802.11b	CH01	2.41	10.00	Pass
	CH07	2.28		
	CH13	2.35		
802.11g	CH01	1.34		
	CH07	1.43		
	CH13	1.35		
802.11n(H20)	CH01	0.40		
	CH07	0.44		
	CH13	0.67		
802.11n(H40)	CH03	-1.29		
	CH07	-1.45		
	CH11	-1.66		

Remark: Duty Cycle(x)= 100%

PSD= Reading Value+ 10 log (1/x) + Cable loss + Antenna Gain

3.3 Duty Cycle, Tx-sequence, Tx-gap

Limit

ETSI EN 300 328 V2.2.2 -- Sub-clause 4.3.2.4 :
Non-adaptive FHSS equipment shall comply with the following:

- The Duty Cycle shall be equal to or less than the maximum value declared by the manufacturer.
- The maximum Tx-sequence time shall be 5 ms.
- The minimum Tx-gap time shall be 5 ms.

Test method

Step 1:

- Use the same stored measurement samples from the procedure described in clause 5.4.2.2.1.2.
- 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 case of insufficient sensitivity of the power sensor (e.g. in case of radiated measurements), the value of 30 dB may need to be reduced appropriately.

Step 2:

- Between the saved start and stop times of each individual burst, calculate the TxOn time. Save these TxOn values.

Step 3:

- Duty Cycle (DC) is the sum of all TxOn times between the end of the first gap (which is the start of the first burst within the observation period) and the start of the last burst (within this observation period) divided by the observation period. The observation period is defined in clause 4.3.1.3.2 or clause 4.3.2.4.2.

Step 4:

- For FHSS equipment using blacklisting, the TxOn time measured for a single (and active) hopping frequency shall be multiplied by the number of blacklisted frequencies. This value shall be added to the sum calculated in step 3 above. If the number of blacklisted frequencies cannot be determined, the minimum number of hopping frequencies (N) as defined in clause 4.3.1.4.3 shall be assumed.
- The calculated value for Duty Cycle (DC) shall be recorded in the test report. This value shall be equal to or less than the maximum value declared by the manufacturer.

Step 5:

- Use the same stored measurement samples from the procedure described in clause 5.4.2.2.1.2.
- Identify any TxOff time that is equal to or greater than the minimum Tx-gap time as defined in clause 4.3.1.3.3 or clause 4.3.2.4.3. These are the potential valid gap times to be further considered in this procedure.
- Starting from the second identified gap, calculate the time from the start of this gap to the end of the preceding gap. This time is the Tx-sequence time for this transmission. Repeat this procedure until the last identified gap within the observation period is reached.
- A combination of consecutive Tx-sequence times and Tx-gap times followed by a Tx-gap time, which is at least as long as the duration of this combination, may be considered as a single Tx-sequence time and in which case it shall comply with the limits defined in clause 4.3.1.3.3 or clause 4.3.2.4.3.
- It shall be noted in the test report whether the UUT complies with the limits for the maximum Tx-sequence time and minimum Tx-gap time as defined in clause 4.3.1.3.3 or clause 4.3.2.4.3.

Test Results

N/A

Not applicable to this device

3.4 Medium Utilization (MU) factor

Limit

ETSI EN 300 328 V2.2.2 -- Sub-clause 4.3.2.5 :
The maximum Medium Utilization factor for non-adaptive FHSS equipment shall be 10 %.

Test method

Step 1:

- Use the same stored measurement samples from the procedure described in clause 5.4.2.2.1.2.

Step 2:

- For each burst calculate the product of (Pburst / 100 mW) and the TxOn time. Pburst is expressed in mW. TxOn time is expressed in ms

Step 3:

- Medium Utilization is the sum of all these products divided by the observation period (expressed in ms) which is defined in clause 4.3.1.3.2 or clause 4.3.2.4.2. This value, which shall comply with the limit given in clause 4.3.1.6.3 or clause 4.3.2.5.3, shall be recorded in the test report. If, in case of FHSS equipment, operation without blacklisted frequencies is not possible, the power of the bursts on blacklisted hopping frequencies (for the calculation of the Medium Utilization) is assumed to be equal to the average value of the RMS power of the bursts on all active hopping frequencies.

Test Results

N/A

Not applicable to this device

3.5 Adaptivity (non-FHSS)

Limits

ETSI EN 300 328 V2.2.2 -- Sub-clause 4.3.2.6 : Adaptive non-FHSS using DAA: Sub-clause 4.3.2.6.2 , or Adaptive non-FHSS using LBT: Sub-clause 4.3.2.6.3

Requirements & Limits

LBT based Detect and Avoid is a mechanism by which equipment using wide band modulations other than FHSS, avoids transmissions in a channel in the presence of other transmissions in that channel.

Frame Based Equipment shall comply with the following requirements:

1) Before transmission, the equipment shall perform a Clear Channel Assessment (CCA) check using energy detect. The equipment shall observe the operating channel for the duration of the CCA observation time which shall be not less than 18 µs. The channel shall be considered occupied if the energy level in the channel exceeds the threshold given in step 5 below. If the equipment finds the channel to be clear, it may transmit immediately. See figure 2.
2) If the equipment finds the channel occupied, it shall not transmit on this channel during the next Frame Period. The equipment is allowed to switch to a non-adaptive mode and to continue transmissions on this channel providing it complies with the requirements applicable to non-adaptive equipment. See clause 4.3.2.6.1. Alternatively, the equipment is also allowed to continue Short Control Signalling Transmissions on this channel providing it complies with the requirements given in clause 4.3.2.6.4.
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. The Channel Occupancy Time shall be in the range 1 ms to 10 ms followed by an Idle Period of at least 5 % of the Channel Occupancy Time used in the equipment for the current Frame Period.
4) An equipment, upon correct reception of a transmission which was intended for this equipment can skip CCA and immediately (see also next paragraph) proceed with the transmission of management and control frames. A consecutive sequence of such transmissions by the equipment without a new CCA shall not exceed the maximum Channel Occupancy Time. For the purpose of multi-cast, the ACK transmissions (associated with the same data packet) of the individual devices are allowed to take place in a sequence.
5) The energy detection threshold for the CCA shall be proportional to the transmit power of the transmitter: for a 20 dBm e.i.r.p. transmitter the CCA 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 CCA threshold level may be relaxed to:

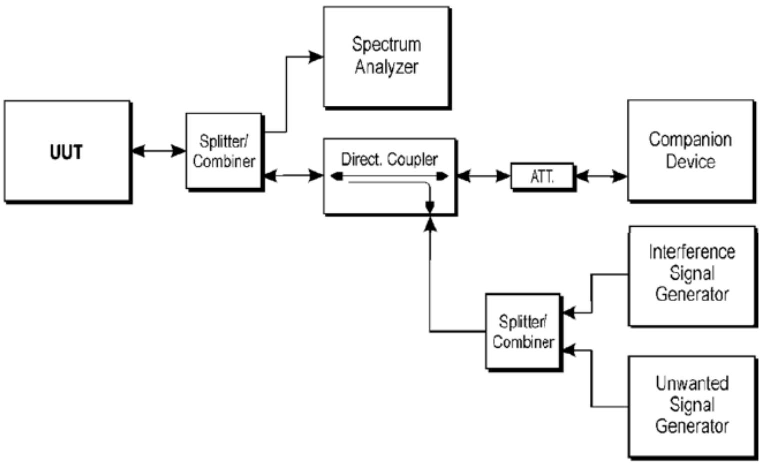
$$TL = -70\ dBm/MHz + 10 \times \log_{10} (100\ mW / P_{out})$$

6) The equipment shall comply with the requirements defined in step 1 to step 4 in the present clause in the presence of an unwanted CW signal as defined in table 10.

Table 10: Unwanted Signal parameters

Wanted signal mean power from companion device	Unwanted signal frequency (MHz)	Unwanted signal power (dBm)
sufficient to maintain the link (see note 2)	2 395 or 2 488,5 (see note 1)	-35 (see note 3)
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: A typical conducted value which can be used in most cases is -50 dBm/MHz.		
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 in front of the UUT antenna.		

Test Configuration

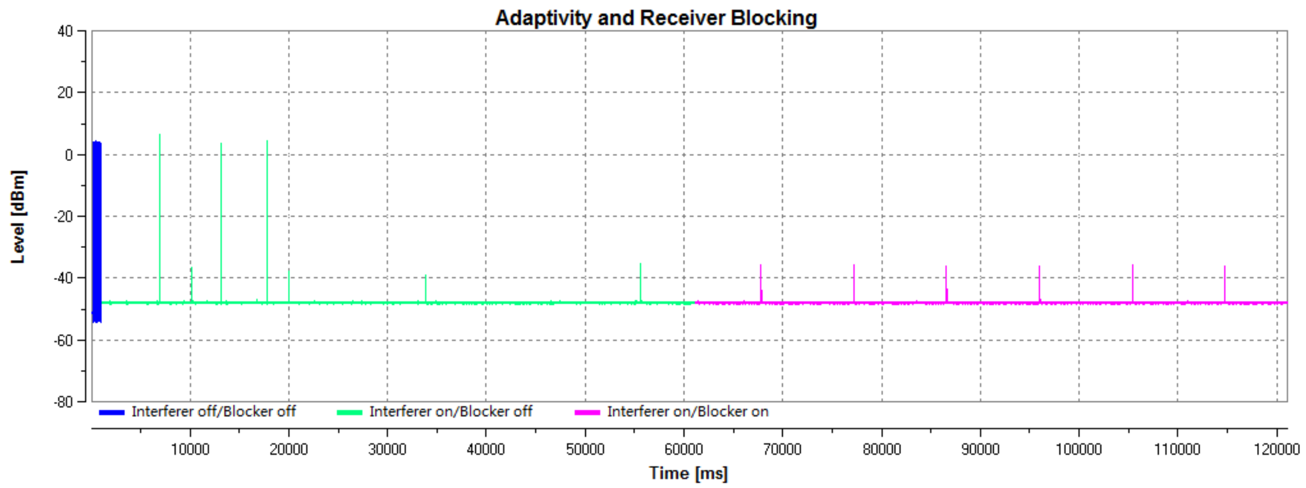


Test Results

Declaration of manufacturer

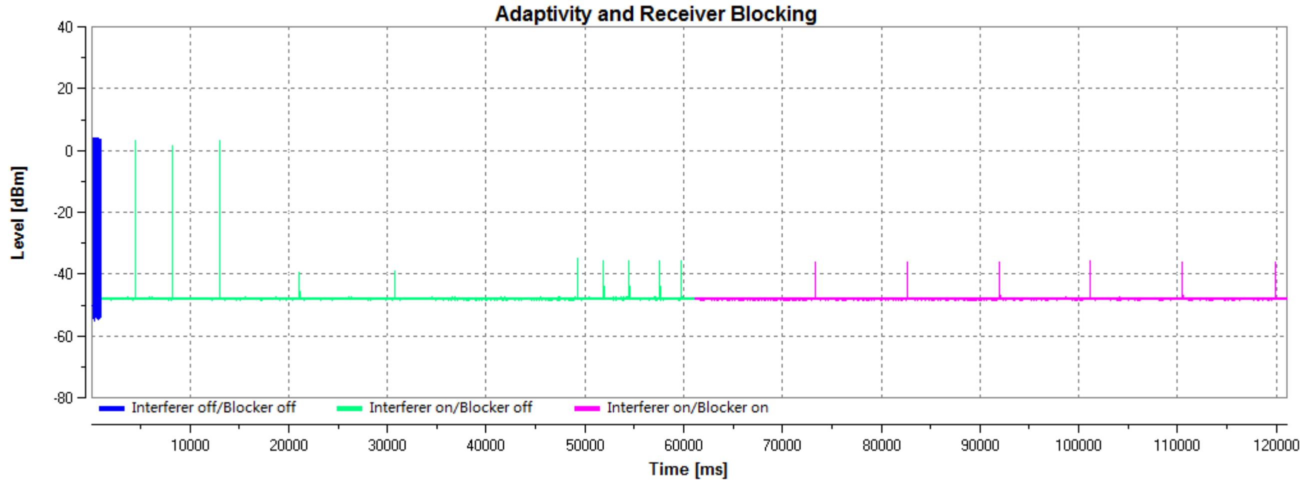
Item	Values	Requirement
CCA (Clear Channel Assessment) Time	24μs	≥18 μs
q factor	32	4 ~ 32
Maximum Channel Occupancy Time	13ms	(13/32)*q ms

Mode:	802.11b	Channel:	01



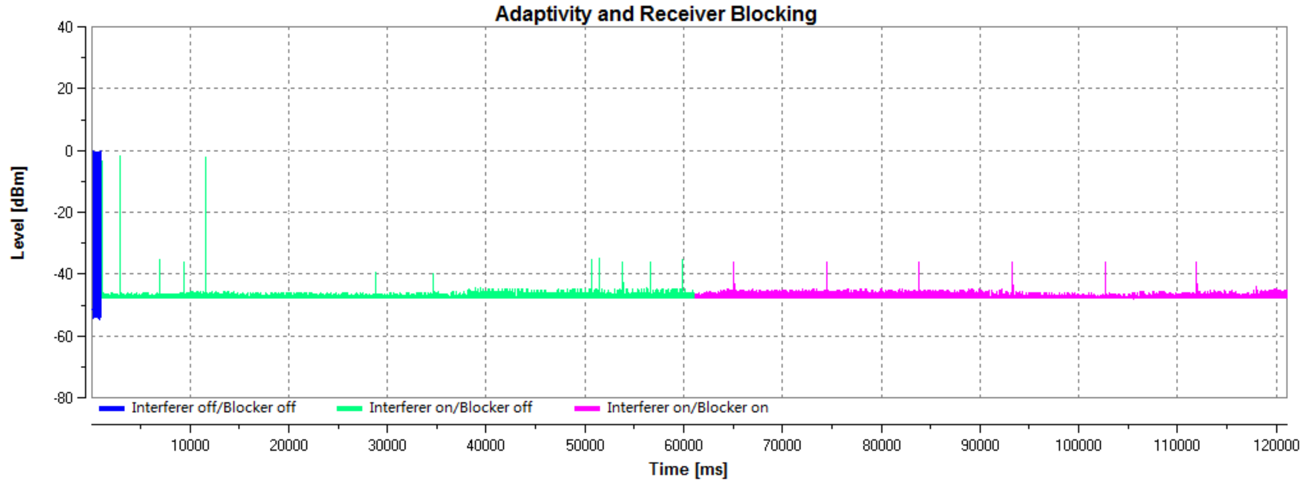
Step1	Interferer signal	Blocking single	COT (ms)	CCA Time(ms)	Result	Comment
	OFF	OFF	0.251	0.035	PASS	Sequence<13 ms
Step2	Interferer signal	Blocking single	Burst observation(ms)		Result	Comment
	ON	OFF	0.442		PASS	Burst< 5 ms; Short Signaling ok
Step3	ON	ON	0.00		PASS	Power<10dBm; no bursts found

Mode:	802.11b	Channel:	13



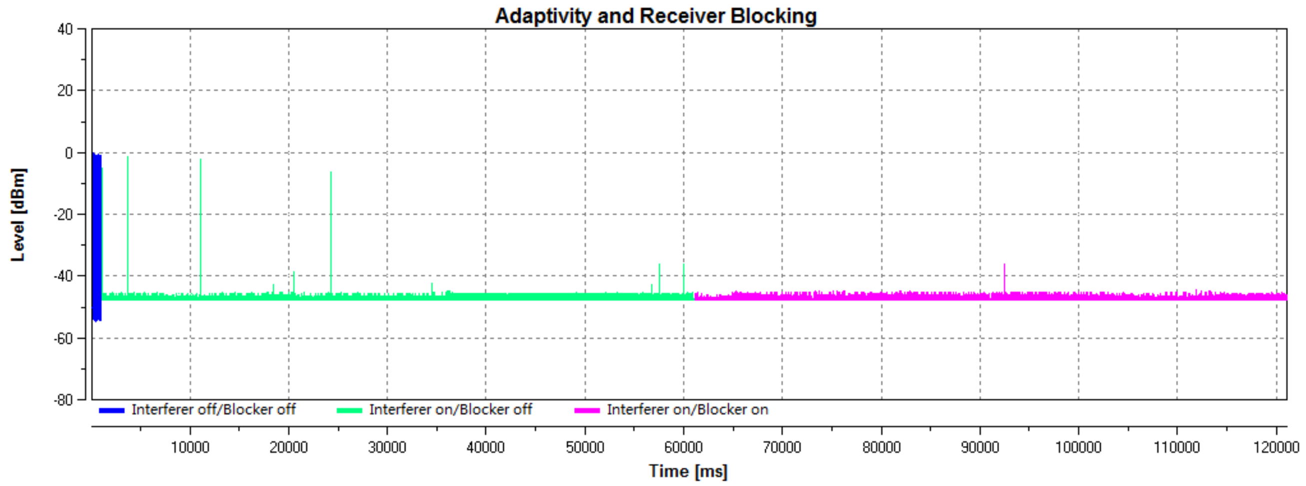
Step1	Interferer signal	Blocking single	COT (ms)	CCA Time(ms)	Result	Comment
	OFF	OFF	0.295	0.041	PASS	Sequence<13 ms
Step2	Interferer signal	Blocking single	Burst observation(ms)		Result	Comment
	ON	OFF	0.436		PASS	Burst<5 ms; Short Signaling ok
Step3	ON	ON	0		PASS	Power<10dBm; no bursts found

Mode:	802.11g	Channel:	01



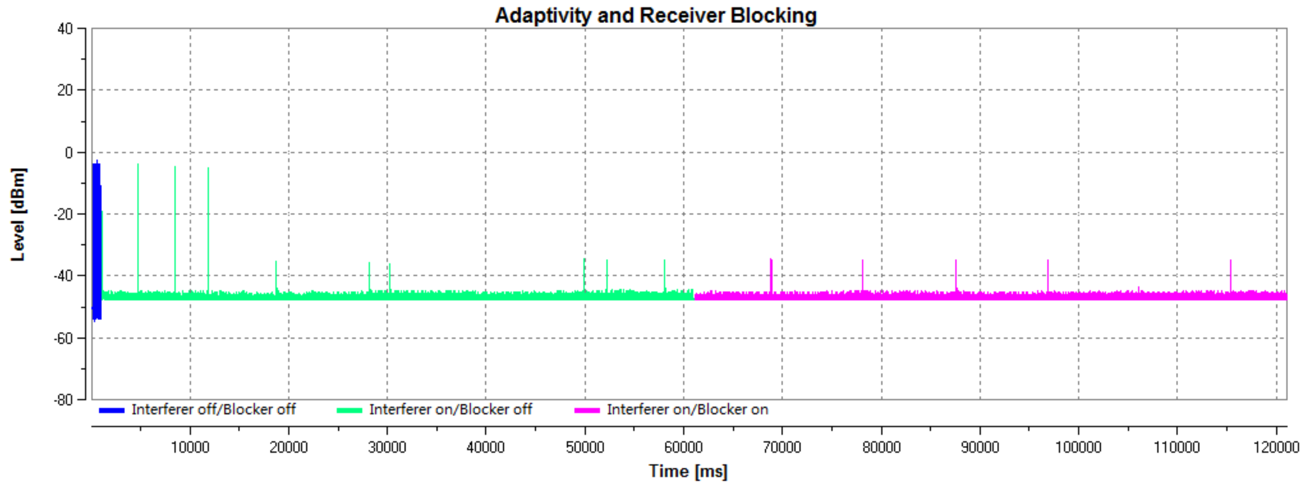
Step1	Interferer signal	Blocking single	COT (ms)	CCA Time(ms)	Result	Comment
	OFF	OFF	0.221	0.0334	PASS	Sequence<13 ms
Step2	Interferer signal	Blocking single	Burst observation(ms)		Result	Comment
	ON	OFF	0.462		PASS	Burst < 5 ms; Short Signaling ok
Step3	ON	ON	0		PASS	Power < 10dBm; no bursts found

Mode:	802.11g	Channel:	13



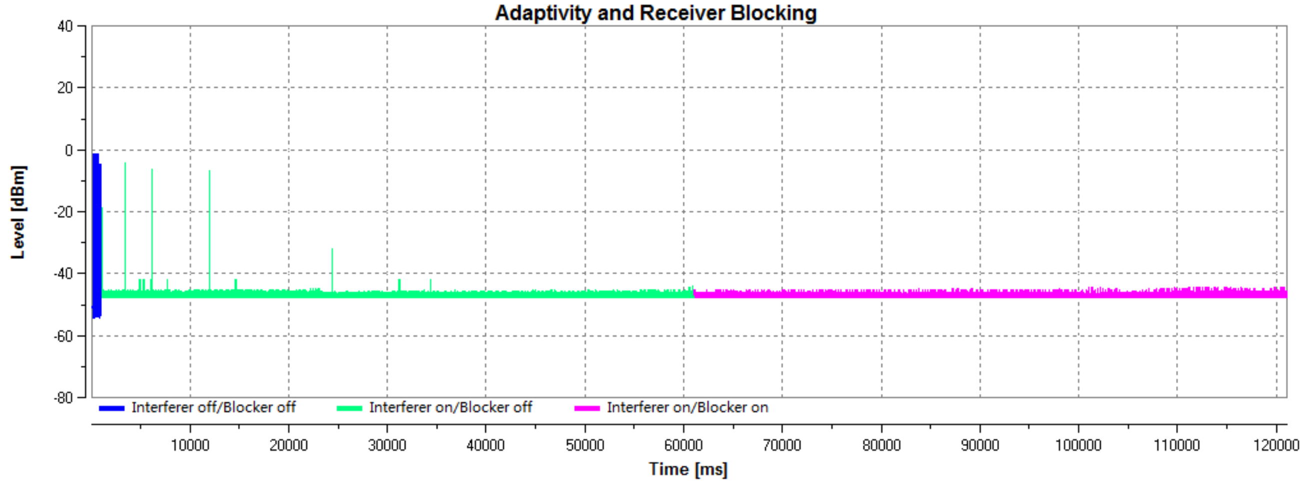
Step1	Interferer signal	Blocking single	COT (ms)	CCA Time(ms)	Result	Comment
	OFF	OFF	0.125	0.042	PASS	Sequence < 13 ms
Step2	Interferer signal	Blocking single	Burst observation(ms)		Result	Comment
	ON	OFF	0.616		PASS	Burst < 5 ms; Short Signaling ok
Step3	ON	ON	0		PASS	Power < 10dBm; no bursts found

Mode:	802.11n(20MHz)	Channel:	01



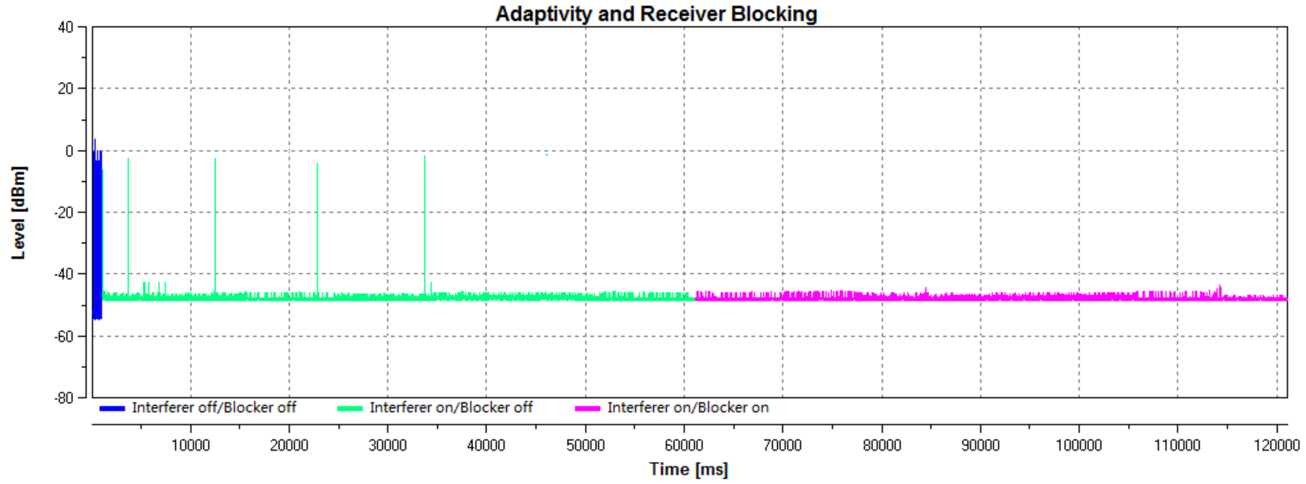
Step1	Interferer signal	Blocking single	COT (ms)	CCA Time(ms)	Result	Comment
	OFF	OFF	0.354	0.042	PASS	Sequence < 13 ms
Step2	Interferer signal	Blocking single	Burst observation(ms)		Result	Comment
	ON	OFF	0.433		PASS	Burst < 5 ms; Short Signaling ok
Step3	ON	ON	0		PASS	Power < 10dBm; no bursts found

Mode:	802.11n(20MHz)	Channel:	13



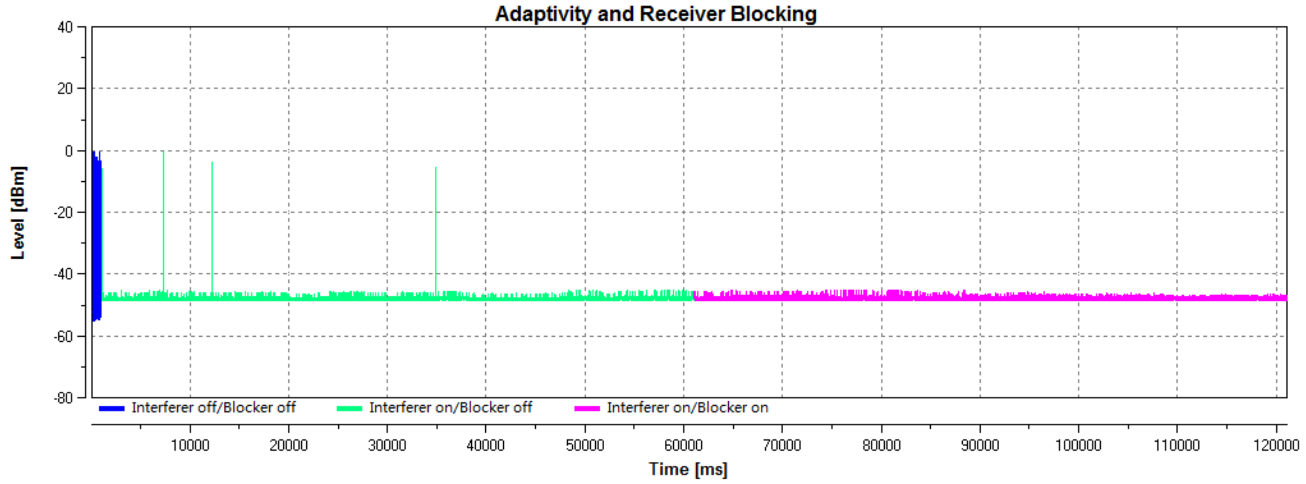
Step1	Interferer signal	Blocking single	COT (ms)	CCA Time(ms)	Result	Comment
	OFF	OFF	0.361	0.042	PASS	Sequence < 13 ms
Step2	Interferer signal	Blocking single	Burst observation(ms)		Result	Comment
	ON	OFF	0.534		PASS	Burst < 5 ms; Short Signaling ok
Step3	ON	ON	0		PASS	Power < 10dBm; no bursts found

Mode:	802.11n(40MHz)	Channel:	03



Step1	Interferer signal	Blocking single	COT (ms)	CCA Time(ms)	Result	Comment
	OFF	OFF	0.152	0.042	PASS	Sequence < 13 ms
Step2	Interferer signal	Blocking single	Burst observation(ms)		Result	Comment
	ON	OFF	0.524		PASS	Burst < 5 ms; Short Signaling ok
Step3	ON	ON	0		PASS	Power < 10dBm; no bursts found

Mode:	802.11n(40MHz)	Channel:	11



Step1	Interferer signal	Blocking single	COT (ms)	CCA Time(ms)	Result	Comment
	OFF	OFF	0.130	0.045	PASS	Sequence < 13 ms
Step2	Interferer signal	Blocking single	Burst observation(ms)		Result	Comment
	ON	OFF	0.414		PASS	Burst < 5 ms; Short Signaling ok
Step3	ON	ON	0		PASS	Power < 10dBm; no bursts found

3.6 Occupied Channel Bandwidth

Limit

ETSI EN 300 328 V2.2.2 -- Sub-clause 4.3.2.7 : The Occupied Channel Bandwidth shall be within the band given in table 1.

In addition, for non-adaptive non-FHSS equipment with e.i.r.p. greater than 10 dBm, the Occupied Channel Bandwidth shall be equal to or less than 20 MHz.

table 1.

Transmit	2 400 MHz to 2 483.5 MHz
Receive	2 400 MHz to 2 483.5 MHz

Test method

- Step1:

  Connect the UUT to the spectrum analyzer 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 × Occupied Channel Bandwidth (e.g. 40 MHz for a 20 MHz channel)
Detector Mode:	RMS
Trace Mode:	MaxHold
Sweep time:	1s

- 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 andright from the power envelope being taken into account by this measurement.

Test Results

Mode	Channel	Occupied Channel Bandwidth (MHz)	f_L (MHz)	f_H (MHz)	Limit	Result
802.11b	CH01	15.604	2403.880	2479.640	f_L≧2.4GHz and f_H≦ 2.4835GHz	Pass
	CH13	16.033				
802.11g	CH01	17.532	2402.480	2479.040		
	CH13	16.074				
802.11n(HT20)	CH01	17.647	2402.640	2480.360		
	CH13	16.967				
802.11n(HT40)	CH03	37.846	2402.080	2479.760		
	CH11	37.269				

Test plot as follows:

802.11b

CH01

CH13

802.11g

CH01

CH13

802.11n(HT20)

CH01

CH13

802.11n(HT40)	
	
CH03	CH11

3.7 Transmitter unwanted emissions in the out-of-band domain

Limit

ETSI EN 300 328 V2.2.2 -- Sub-clause 4.3.2.8 :
The transmitter unwanted emissions in the out-of-band domain shall not exceed the values provided by the mask in figure 1.

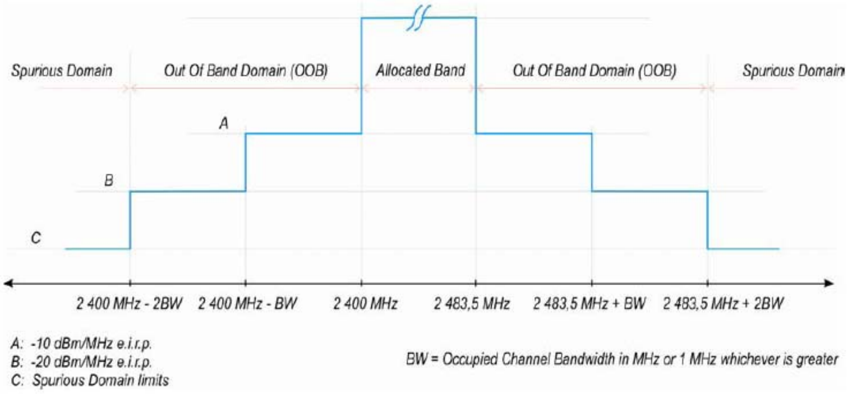


Figure 1: Transmit mask

Test Conditions

These measurements shall only be performed at normal test conditions.
For FHSS equipment, the measurements shall be performed during normal operation (hopping).
For non-FHSS equipment, 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.

Test method

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:

Measurement Mode:	Time Domain Power
Centre Frequency:	2 484 MHz
Frequency Span:	0 Hz
RBW:	1M
VBW:	3M
Filter mode:	Channel filter
Trace Mode:	Max Hold
Detector Mode:	RMS

Sweep mode:	Single Sweep
Sweep Points:	Sweep time [µs] / (1 µs) with a maximum of 30 000
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):

- The measurement shall be performed and repeated while the trigger level is increased until no triggering takes place.
- For FHSS 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 + 2 BW):

- 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 + 2 BW. 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 - 2 BW 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 - 2 BW 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 - 2 BW + 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.

Test Result

Remark:
1. We test all modulation type, and recorded the worst case at 802.11b mode.
2. The datum recorded below represents the worst emission level in each segment compared with the limit.

WIFI

802.11b CH01								
Test Condition			OOB Frequency (MHz)	Measured Level (dBm)	Antenna Gain (dBi)	Results (dBm)	Limit (dBm)	Result
BW (MHz)	Voltage (V)	Temperature (℃)						
15.604	3.7	25	2377.238	-55.49	0.00	-55.49	-20	PASS
			2392.500	-58.28	0.00	-58.28	-10	PASS
			2495.262	-57.32	0.00	-57.32	-10	PASS
			2496.262	-59.57	0.00	-59.57	-20	PASS

802.11b CH13								
Test Condition			OOB Frequency (MHz)	Measured Level (dBm)	Antenna Gain (dBi)	Results (dBm)	Limit (dBm)	Result
BW (MHz)	Voltage (V)	Temperature (℃)						
16.033	3.7	25	2375.884	-56.27	0.00	-56.27	-20	PASS
			2392.500	-54.38	0.00	-54.38	-10	PASS
			2494.000	-52.69	0.00	-52.69	-10	PASS
			2501.308	-58.37	0.00	-58.37	-20	PASS

3.8 Transmitter unwanted emissions in the spurious domain

Limit

ETSI EN 300 328 V2.2.2 -- Sub-clause 4.3.2.9 :
The transmitter unwanted emissions in the spurious domain shall not exceed the values given in table 4. 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 e.i.r.p. for emissions above 1 GHz.

Table 4: Transmitter limits for spurious emissions

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

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 FHSS equipment, 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 non-FHSS equipment, 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.

Test Method

Substitution method was performed to determine the actual spurious emission levels of the EUT.
The following test procedure as below:

- Below 1GHz test procedure:
  1) On the test site as test setup graph above, the EUT shall be placed at the 1.5m support on the turntable and in the position closest to normal use as declared by the provider.
  2) The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the test frequency of the transmitter. The output of the test antenna shall be connected to the measuring receiver.

3) The transmitter shall be switched on, if possible, without modulation and the measuring receiver shall be tuned to the test frequency of the transmitter under test.

4) The test antenna shall be raised and lowered from 1m to 4m until a maximum signal level is detected by the measuring receiver. Then the turntable should be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.

5) Repeat step 4 for test frequency with the test antenna polarized horizontally.

6) Remove the transmitter and replace it with a substitution antenna (the antenna should be halfwavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At the lower frequencies, where the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3 m above the ground.

7) Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a no radiating cable. With the antennas at both ends vertically polarized, and with the signal generator tuned to a particular test frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.

8) Repeat step 7 with both antennas horizontally polarized for each test frequency.

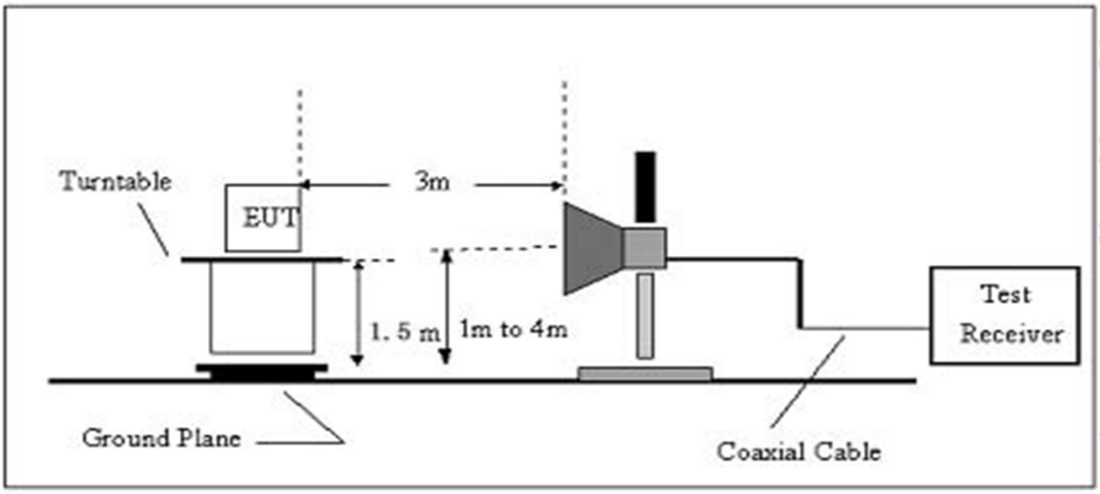
9) Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps 7 and 8 by the power loss in the cable between the generator and the antenna, and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna by the following formula:

ERP(dBm) = Pg(dBm) – cable loss (dB) + antenna gain (dBd)

where: Pg is the generator output power into the substitution antenna.

- above 1GHz test procedure:
  Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber, and the test antenna do not need to raise from 1 to 4m, just test in 1.5m height.

Test Setup



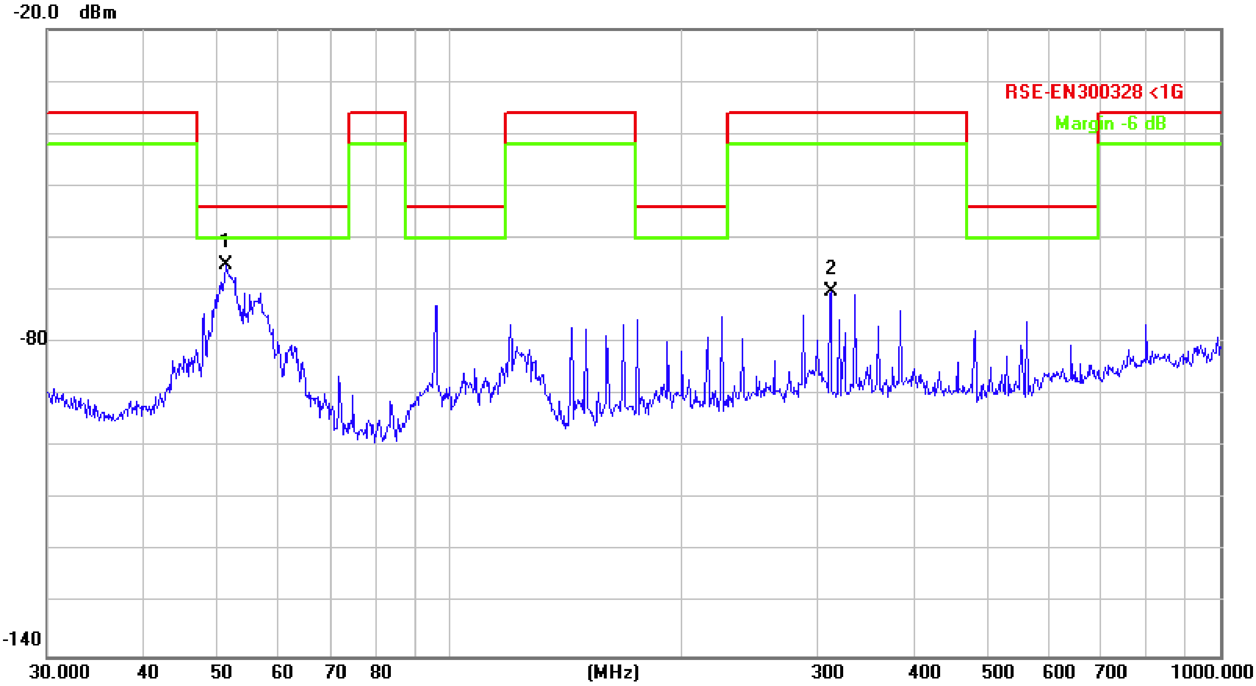
Test Result

Remark: We test all modulation type, and recorded the worst case at 802.11b mode.

802.11b

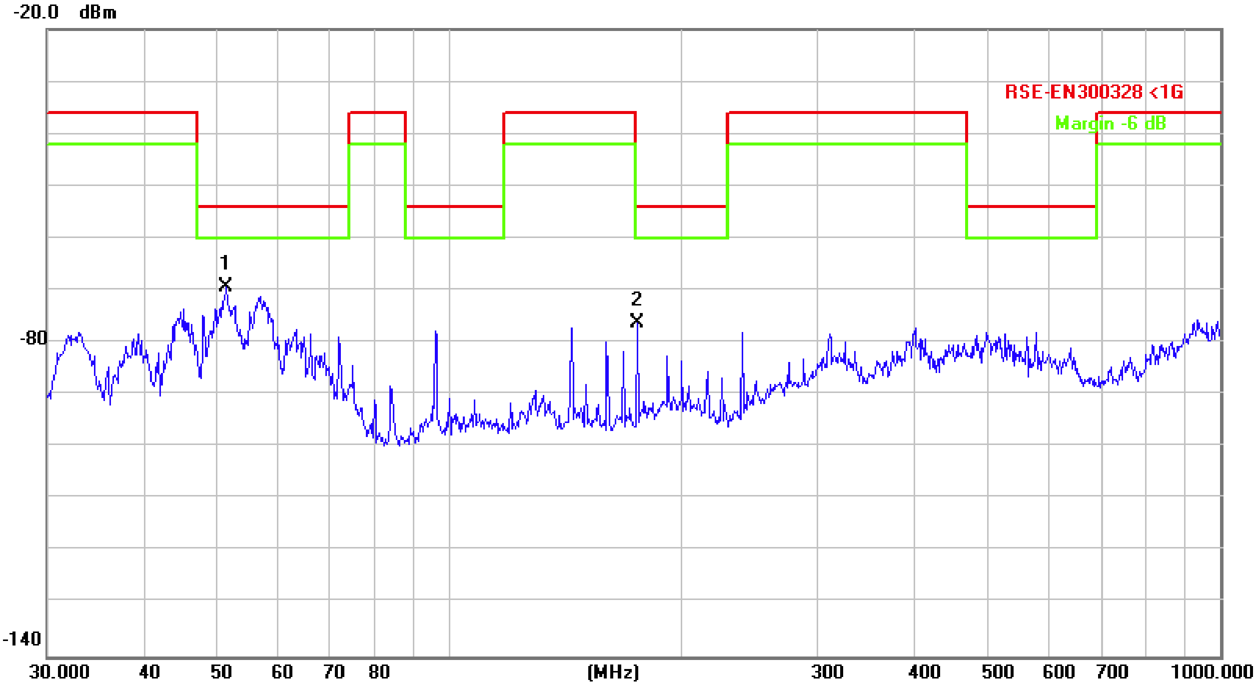
Below 1G

Channel:	CH01	Polarity:	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	51.3004	-47.18	-18.10	-65.28	-54.00	-11.28	peak			
2		312.1792	-59.38	-10.76	-70.14	-36.00	-34.14	peak			

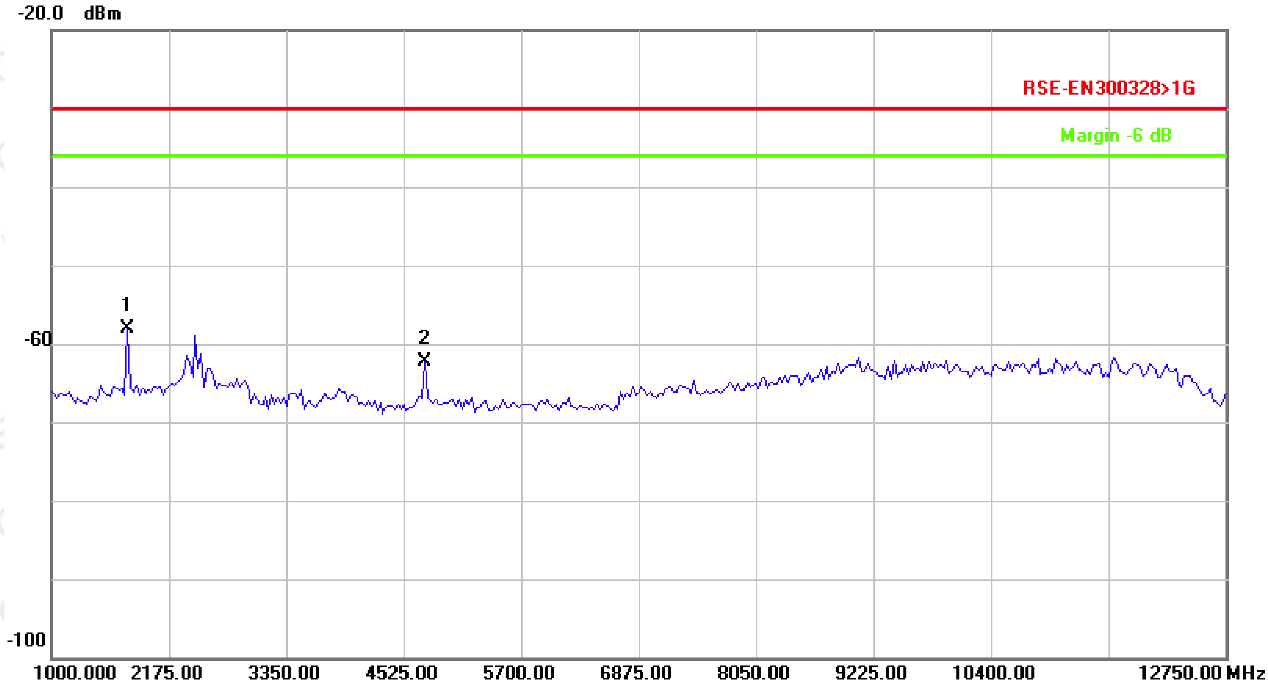
Channel:	CH01	Polarity:	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	51.3004	-50.71	-18.69	-69.40	-54.00	-15.40	peak			
2		175.0364	-62.20	-13.94	-76.14	-54.00	-22.14	peak			

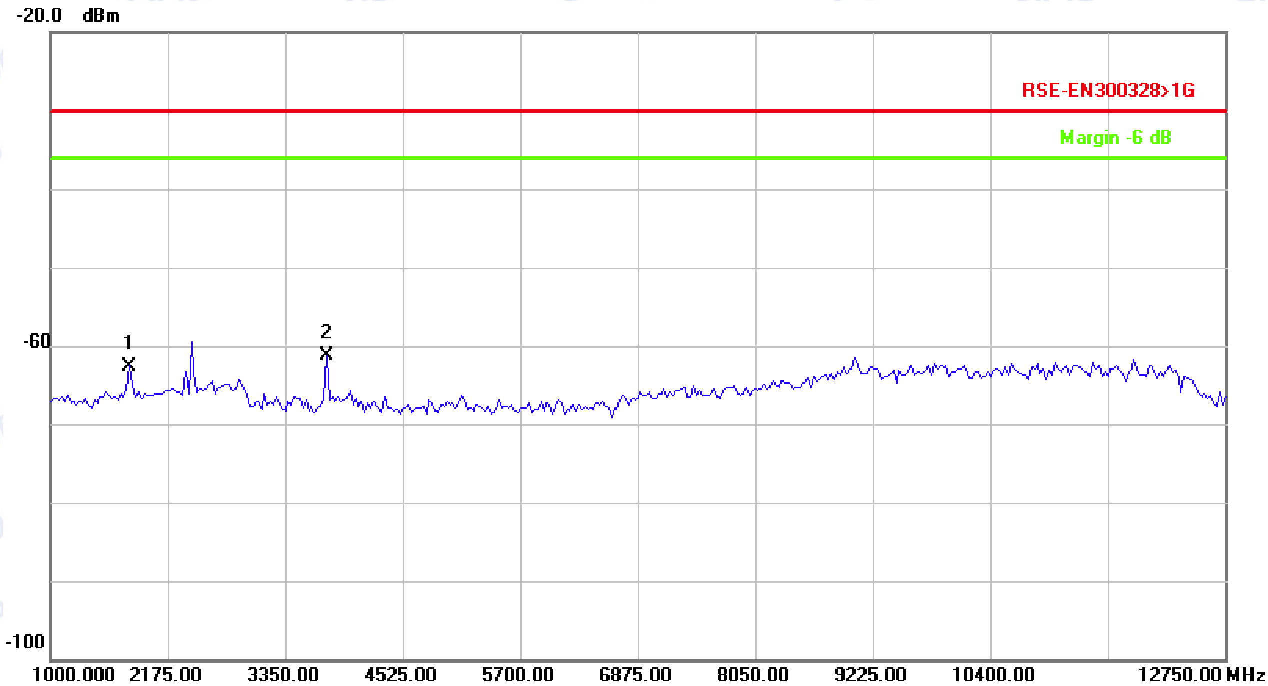
Above 1G

Channel:	CH01	Polarity:	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	1763.750	-52.01	-6.14	-58.15	-30.00	-28.15	peak			
2		4730.625	-58.27	-3.94	-62.21	-30.00	-32.21	peak			

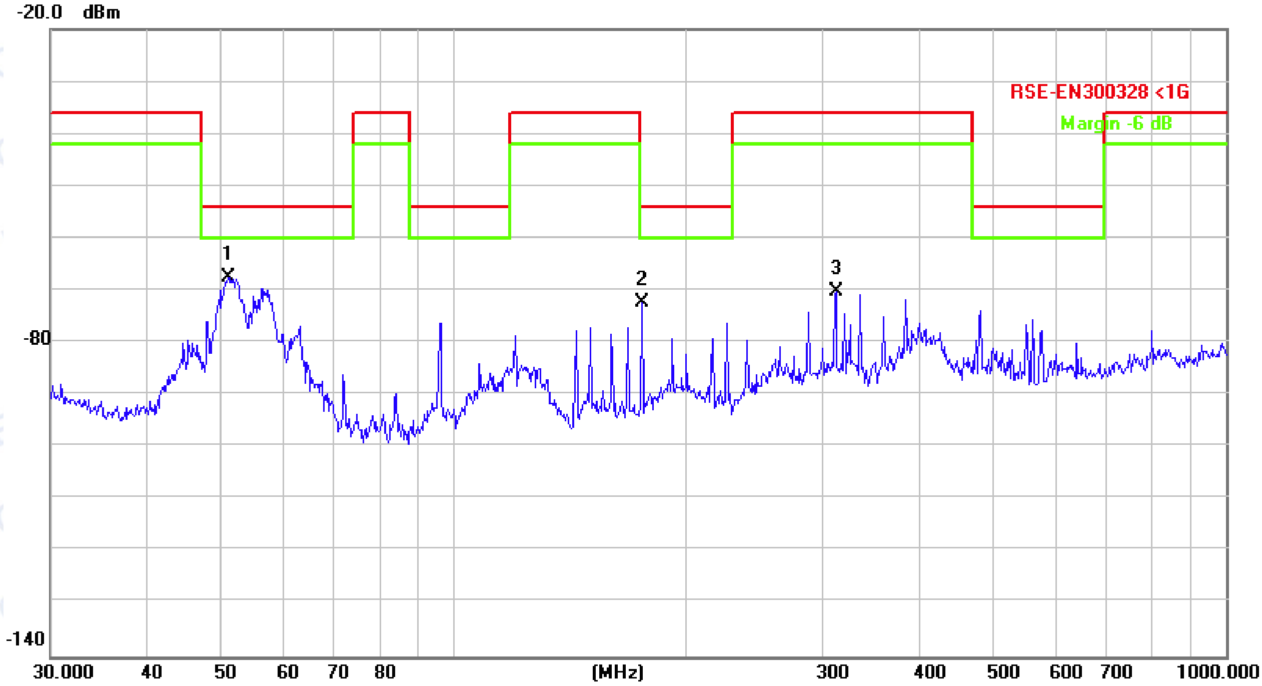
Channel:	CH01	Polarity:	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1		1793.125	-55.69	-6.91	-62.60	-30.00	-32.60	peak			
2	*	3761.250	-56.54	-4.68	-61.22	-30.00	-31.22	peak			

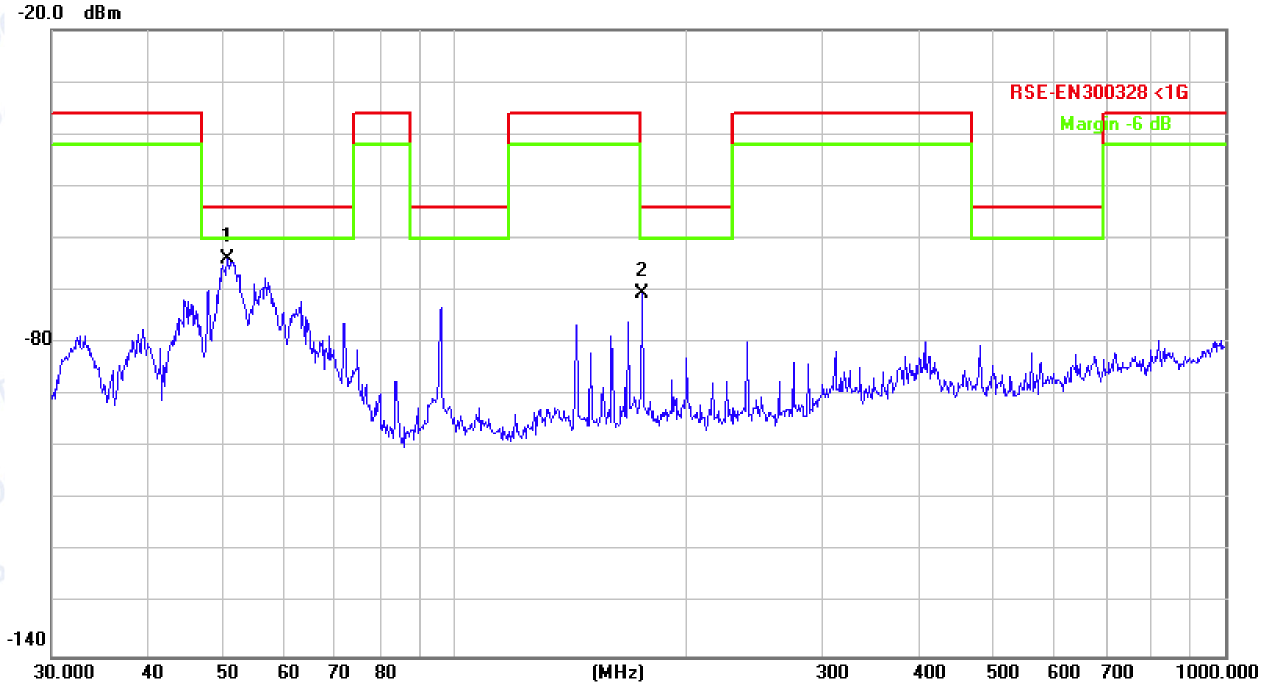
Below 1G

Channel:	CH13	Polarity:	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBm	dB	dBm	dBm	dB		cm	degree	
1	*	50.9420	-49.42	-18.02	-67.44	-54.00	-13.44	peak			
2		175.0365	-58.12	-14.24	-72.36	-54.00	-18.36	peak			
3		312.1792	-59.41	-10.76	-70.17	-36.00	-34.17	peak			

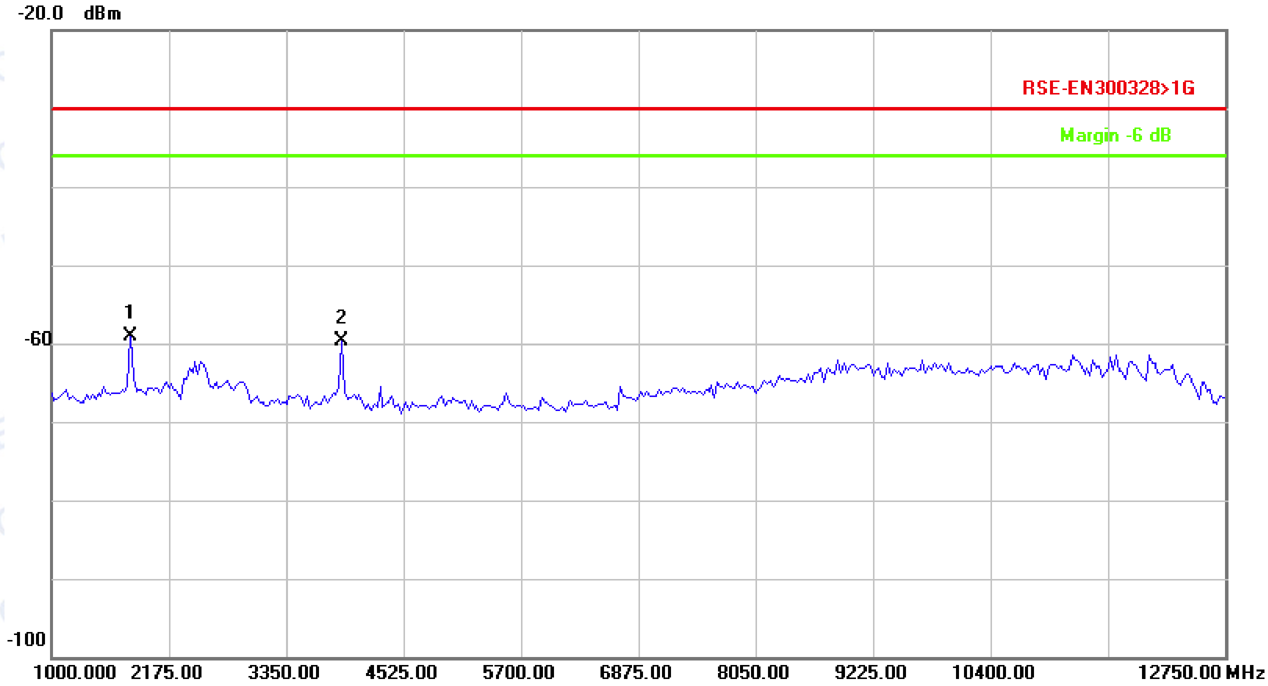
Channel:	CH13	Polarity:	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBm	dB	dBm	dBm	dB		cm	degree	
1	*	50.7637	-45.38	-18.62	-64.00	-54.00	-10.00	peak			
2		175.0365	-56.63	-13.94	-70.57	-54.00	-16.57	peak			

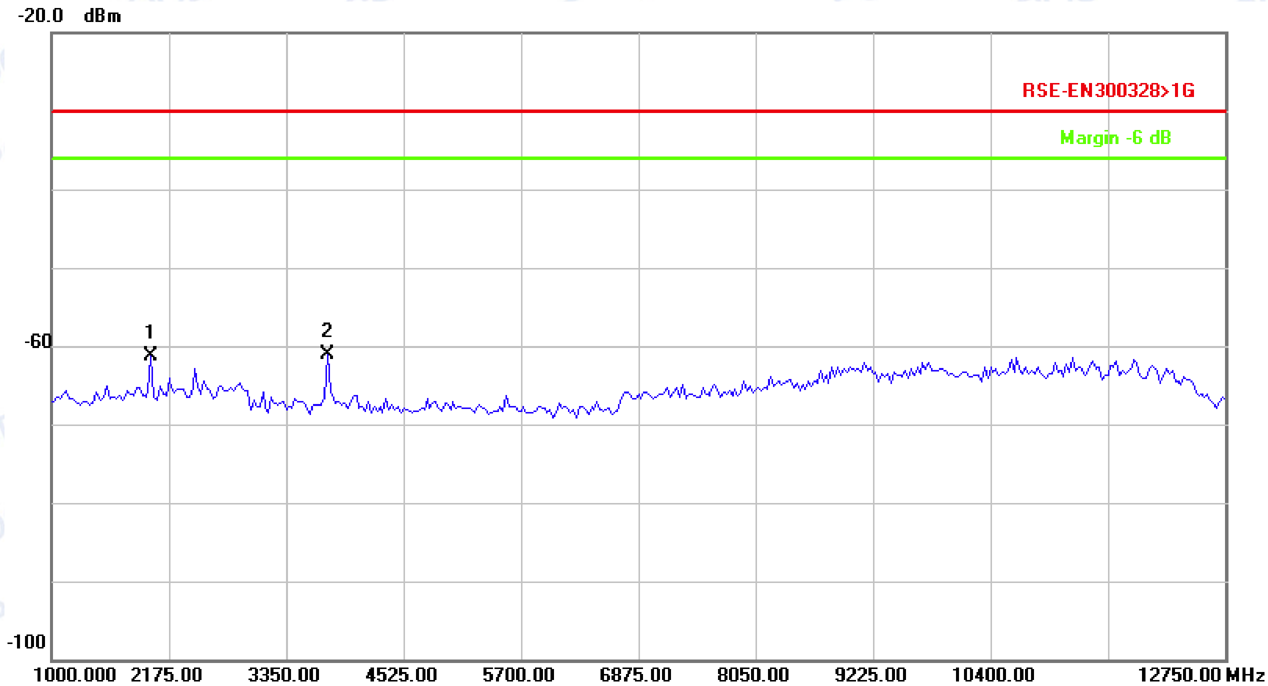
Above 1G

Channel:	CH13	Polarity:	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBm	dB	dBm	dBm	dB		cm	degree	
1		1998.750	-55.30	-6.00	-61.30	-30.00	-31.30	peak			
2	*	3761.250	-56.49	-4.68	-61.17	-30.00	-31.17	peak			

Channel:	CH13	Polarity:	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBm	dB	dBm	dBm	dB		cm	degree	
1	*	1793.125	-52.92	-6.12	-59.04	-30.00	-29.04	peak			
2		3908.125	-55.22	-4.56	-59.78	-30.00	-29.78	peak			

3.9 Receiver spurious emissions

Limit

ETSI EN 300 328 V2.2.2 -- Sub-clause 4.3.2.10 :
The receiver spurious emissions shall not exceed the values given in table 5.
In case of FHSS 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 e.i.r.p. for emissions above 1 GHz.

Table 5: Spurious emission limits for receivers

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

Test Method

Substitution method was performed to determine the actual spurious emission levels of the EUT.
The following test procedure as below:

- Below 1GHz test procedure:

a) On the test site as test setup graph above, the EUT shall be placed at the 1.5m support on the turntable and in the position closest to normal use as declared by the provider.
b) The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the test frequency of the transmitter. The output of the test antenna shall be connected to the measuring receiver.
c) The transmitter shall be switched on, if possible, without modulation and the measuring receiver shall be tuned to the test frequency of the transmitter under test.
d) The test antenna shall be raised and lowered from 1m to 4m until a maximum signal level is detected by the measuring receiver. Then the turntable should be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
e) Repeat step 4 for test frequency with the test antenna polarized horizontally.
f) Remove the transmitter and replace it with a substitution antenna (the antenna should be halfwavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At the lower frequencies, where the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3 m above the ground.
g) Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a no radiating cable. With the antennas at both ends vertically polarized, and with the signal generator tuned to a particular test frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.
h) Repeat step 7 with both antennas horizontally polarized for each test frequency.
i) Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps 7 and 8 by the power loss in the cable between the generator and the antenna, and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna by the following formula:

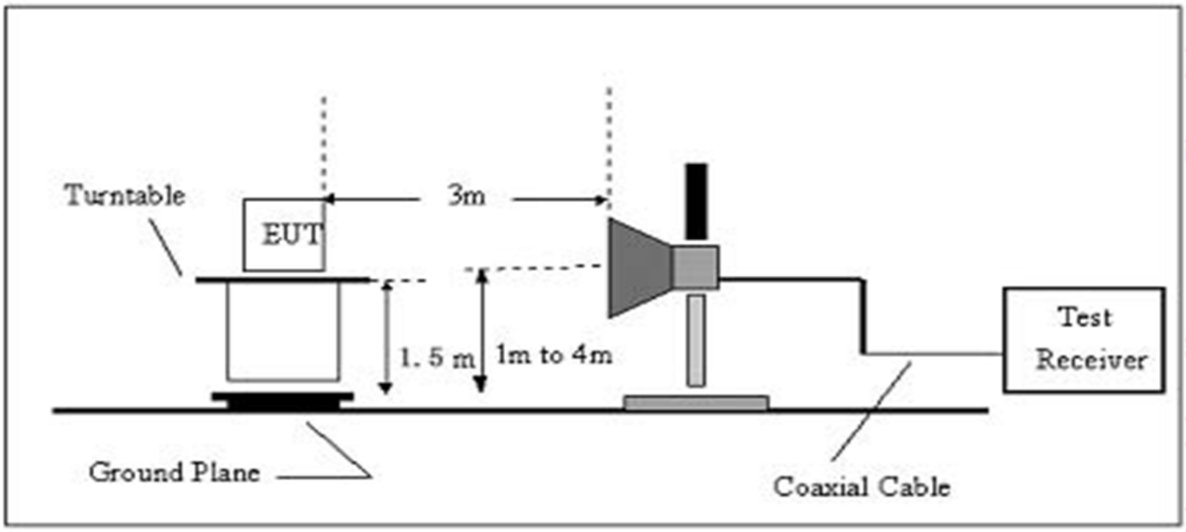
ERP(dBm) = Pg(dBm) – cable loss (dB) + antenna gain (dBd)

where: Pg is the generator output power into the substitution antenna.

- 2) above 1GHz test procedure:

Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber, and the test antenna do not need to raise from 1 to 4m, just test in 1.5m height.

Test Setup



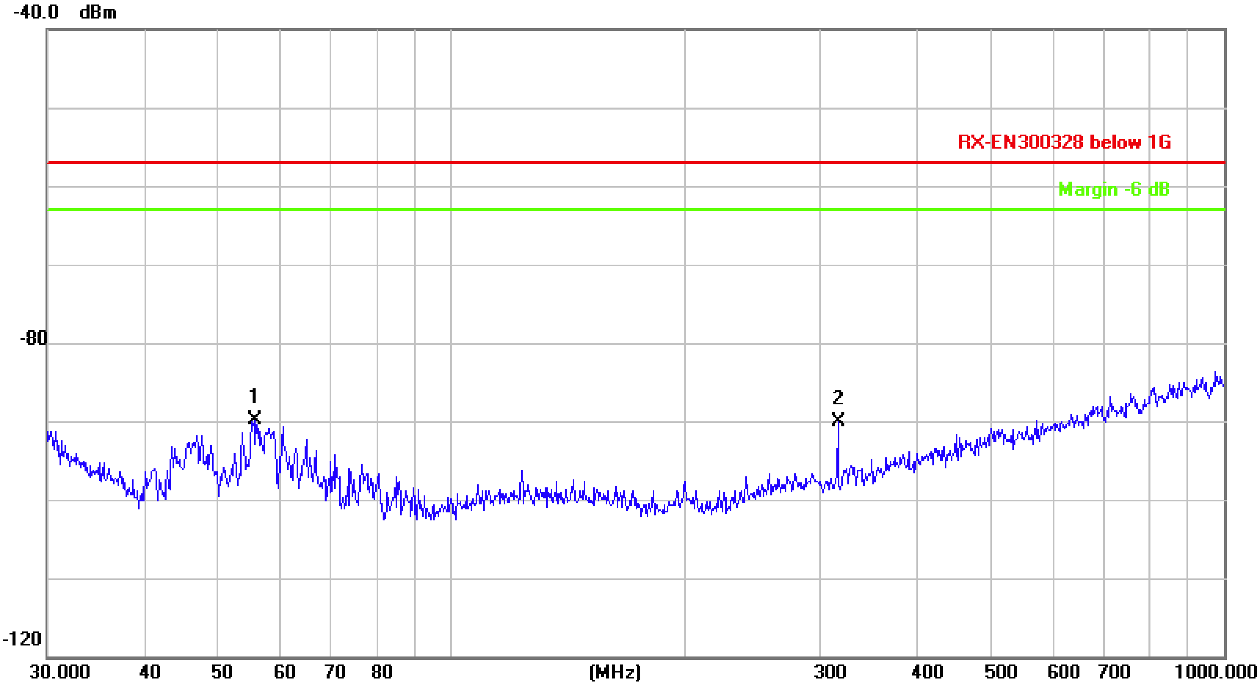
Test results

Remark: We test all modulation type, and recorded the worst case at 802.11b mode.

802.11b

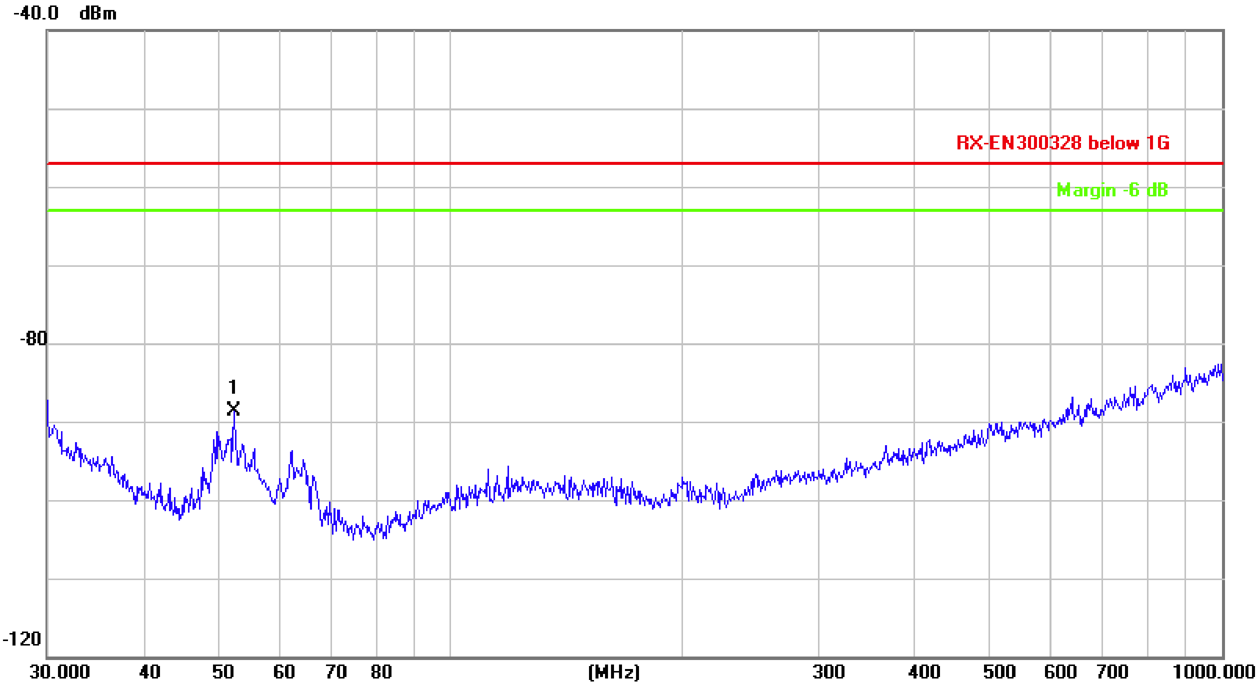
Below 1G

Channel:	CH01	Polarity:	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBm	dB	dBm	dBm	dB		cm	degree	
1	*	55.6094	-70.96	-18.89	-89.85	-57.00	-32.85	peak			
2		316.5890	-79.49	-10.65	-90.14	-57.00	-33.14	peak			

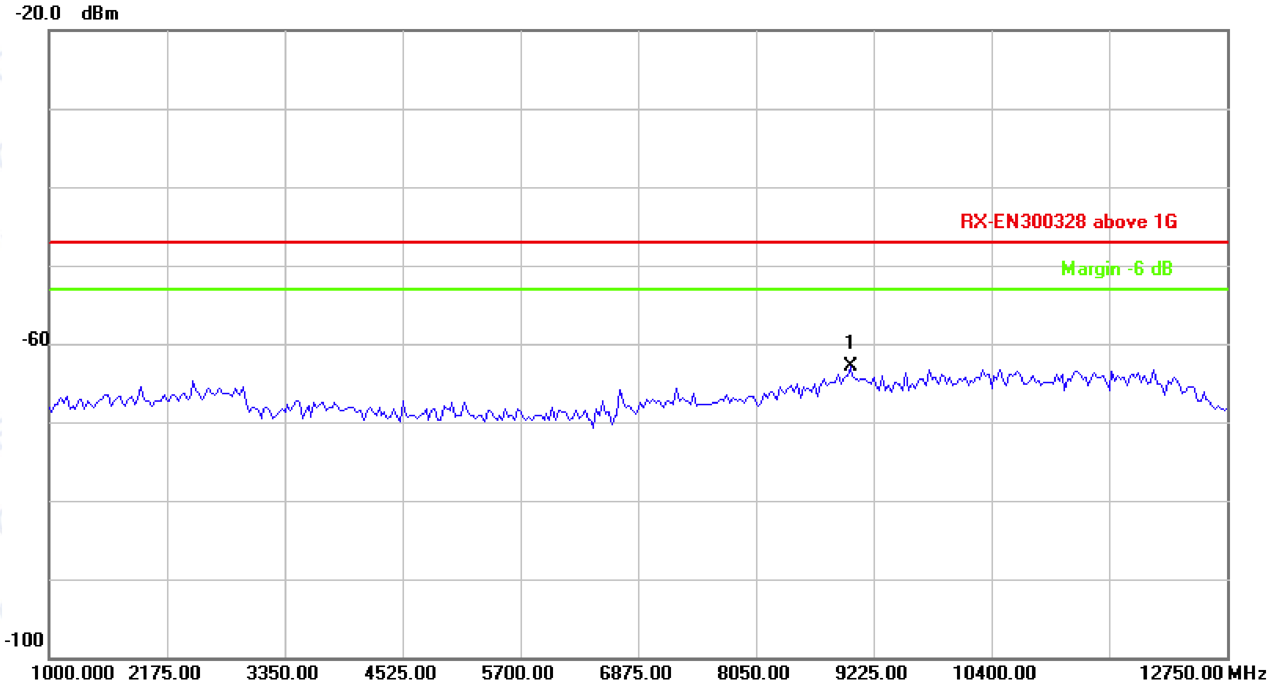
Channel:	CH01	Polarity:	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBm	dB	dBm	dBm	dB		cm	degree	
1	*	52.3912	-69.89	-18.83	-88.72	-57.00	-31.72	peak			

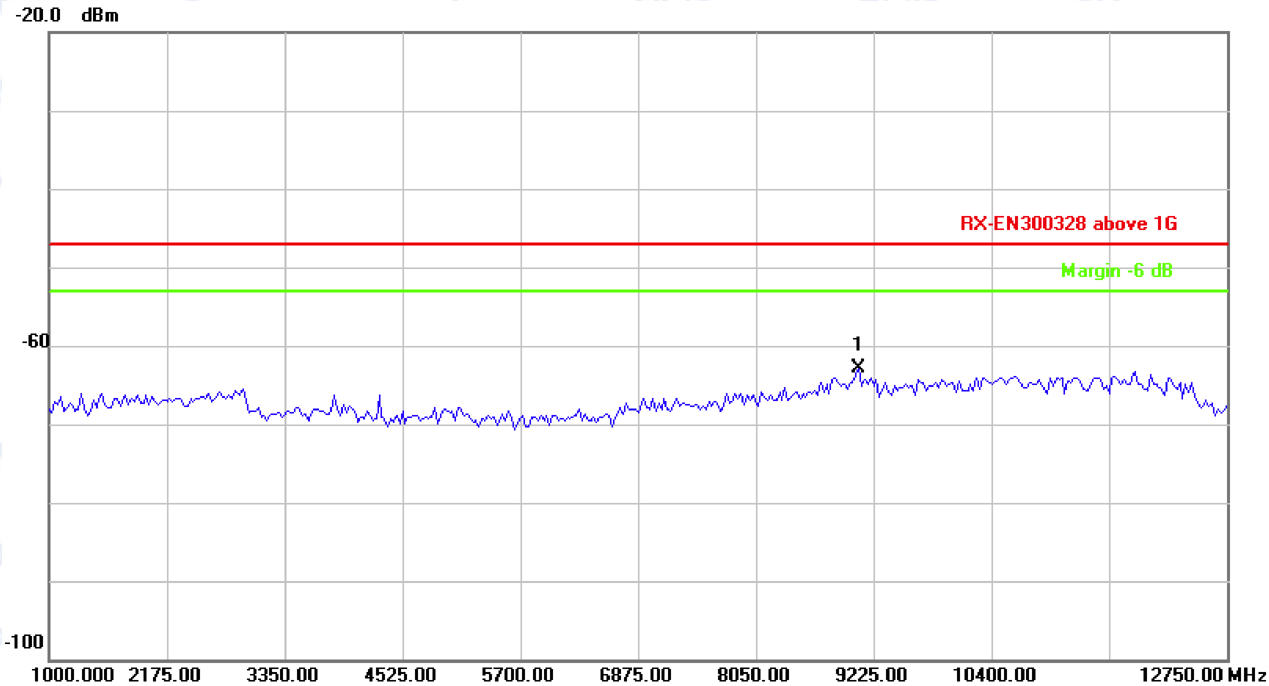
Above 1G

Channel:	CH01	Polarity:	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	8990.000	-63.17	0.29	-62.88	-47.00	-15.88	peak			

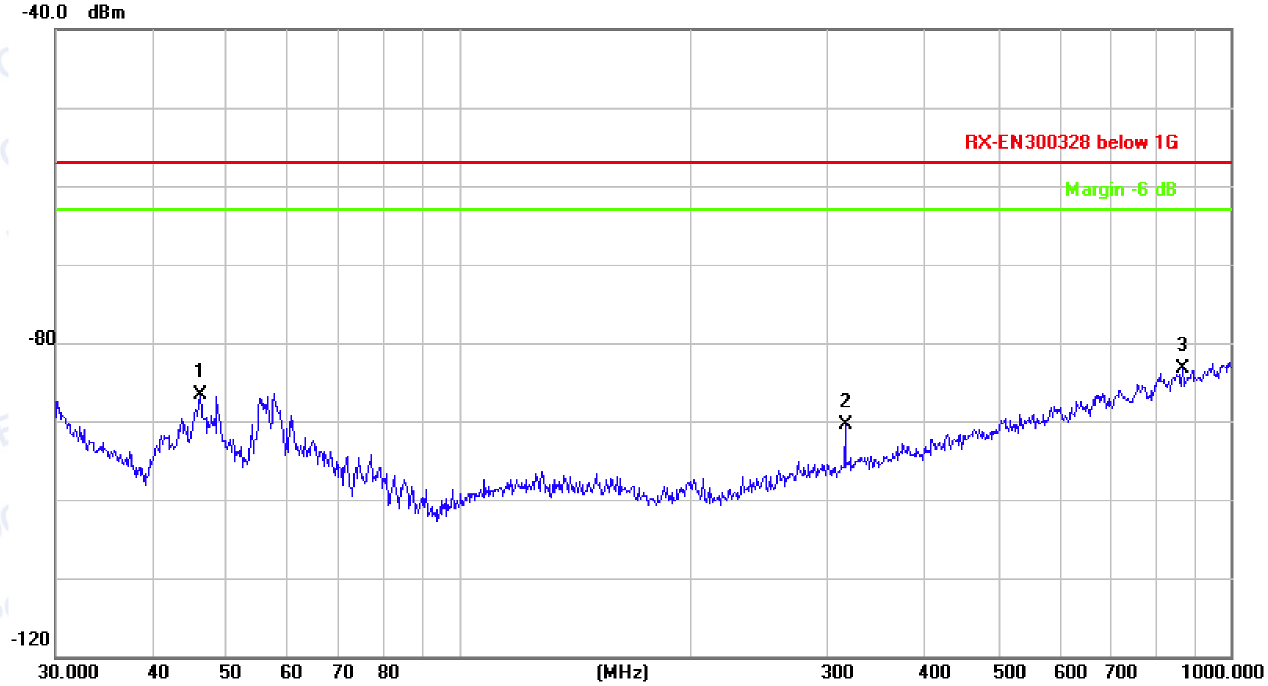
Channel:	CH01	Polarity:	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	9078.125	-63.21	0.36	-62.85	-47.00	-15.85	peak			

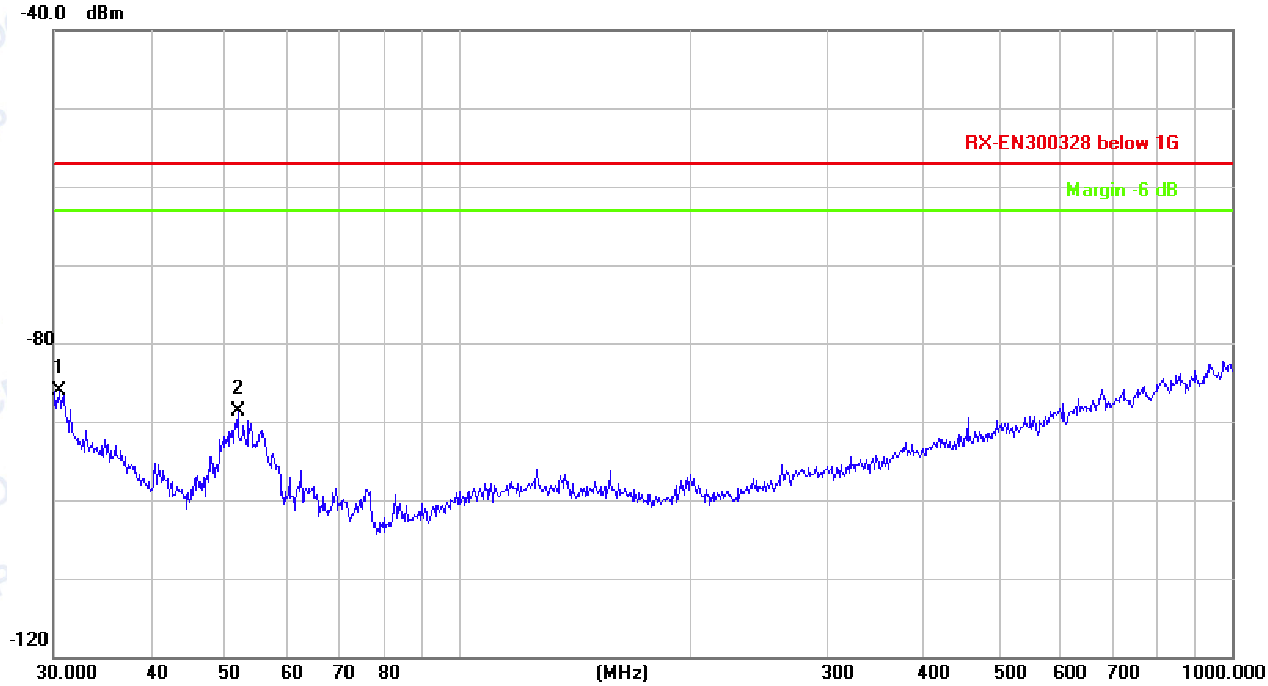
Below 1G

Channel:	CH13	Polarity:	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1		46.1779	-70.78	-15.92	-86.70	-57.00	-29.70	peak			
2		316.5889	-79.85	-10.65	-90.50	-57.00	-33.50	peak			
3	*	866.0878	-83.12	-0.14	-83.26	-57.00	-26.26	peak			

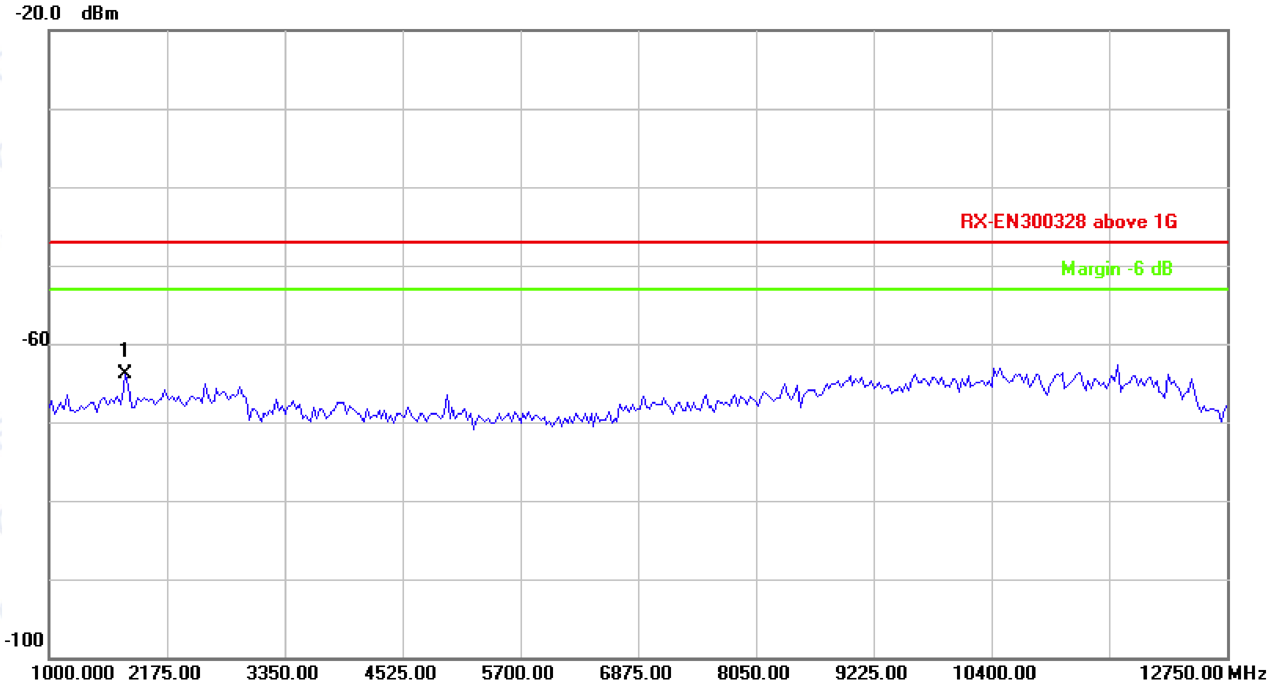
Channel:	CH13	Polarity:	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	30.5305	-80.83	-5.34	-86.17	-57.00	-29.17	peak			
2		51.8430	-69.99	-18.76	-88.75	-57.00	-31.75	peak			

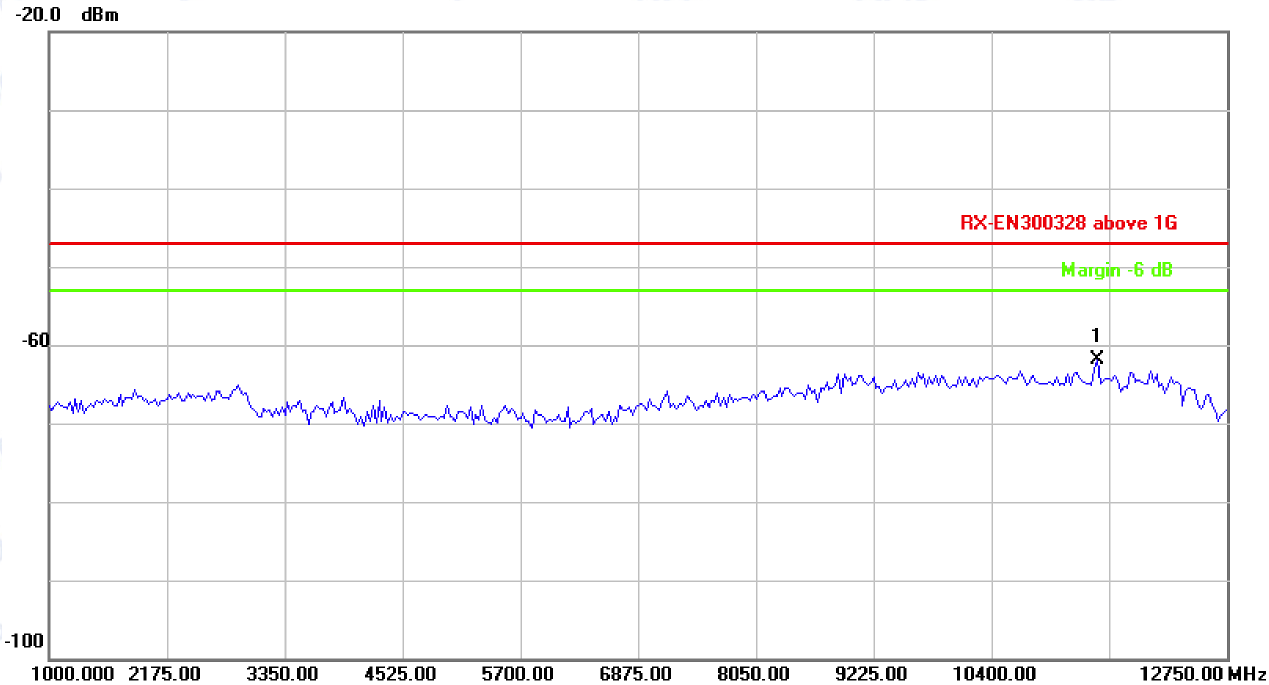
Above 1G

Channel:	CH13	Polarity:	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	1763.750	-57.68	-6.14	-63.82	-47.00	-16.82	peak			

Channel:	CH13	Polarity:	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBm	dB	dBm	dBm	dB	Detector	cm	degree	Comment
1	*	11457.500	-63.01	1.02	-61.99	-47.00	-14.99	peak			

3.10 Receiver Blocking

Limits

ETSI EN 300 328 V2.2.2 -- Sub-clause 4.3.2.11 :
Performance Criteria:
For equipment that supports a PER or FER test to be performed, the minimum performance criterion shall be a PER or FER less than or equal to 10 %.
For equipment that does not support a PER or a FER test to be performed, the minimum performance criterion shall be no loss of the wireless transmission function needed for the intended use of the equipment.

While maintaining the minimum performance criteria as defined in clause 4.3.1.12.3, the blocking levels at specified frequency offsets shall be equal to or greater than the limits defined for the applicable receiver category provided in table 6, table 7 or table 8.

Table 14: Receiver Blocking parameters for Receiver Category 1

Wanted signal mean power from companion device (dBm) (see notes 1 and 4)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 4)	Type of blocking signal
(-133 dBm + 10 × log_{10}(OCBW)) or -68 dBm whichever is less (see note 2)	2 380 2 504	-34	CW
(-139 dBm + 10 × log_{10}(OCBW)) or -74 dBm whichever is less (see note 3)	2 300 2 330 2 360 2 524 2 584 2 674		

NOTE 1: OCBW is in Hz.
NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 26 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 20 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

Table 15: Receiver Blocking parameters receiver Category 2

Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
(-139 dBm + 10 × log_{10}(OCBW) + 10 dB) or (-74 dBm + 10 dB) whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW

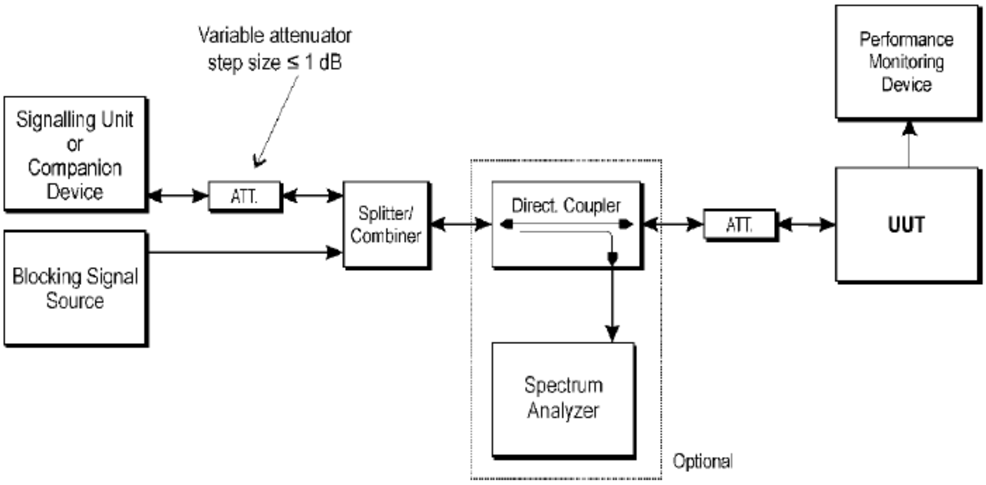
NOTE 1: OCBW is in Hz.
NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 26 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

Table 8: Receiver Blocking parameters receiver Category 3

Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
(-139 dBm + 10 × $\log_{10}$(OCBW) + 20 dB) or (-74 dBm + 20 dB) whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW

NOTE 1: OCBW is in Hz.
NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 30 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

Test Configuration



Test Procedure

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.
- 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 Pmin. This signal level (Pmin) 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. Where the manufacturer has declared the actual antenna gain for each of the applicable blocking frequencies (see clause 5.4.1 m) ii)) this blocking level shall be adjusted for the difference between the in-band antenna assembly gain (G) and the actual antenna gain for the blocking frequency being tested. See also note 5 in table 6, note 4 in table 7 and note 4 in table 8 or note 5 in table 14, note 4 in table 15 and note 4in table 16. Where the actual antenna gains at the blocking frequencies have not been declared, then the antenna gain at the blocking frequencies shall be assumed identical to the in-band antenna gain.
- If the performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is 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 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.

Test result

WIFI

<table>
<tr><td>Test Mode</td><td colspan="6">802.11b</td></tr>
<tr><td>Wanted signal Mean power From companion device (dBm)</td><td>Blocking signal frequency (MHz)</td><td>Blocking signal Power (dBm)</td><td>Type of blocking signal</td><td>PER (%)</td><td>PER (%) Limit</td><td>Result</td></tr>
<tr><td rowspan="4">68</td><td>2380.0</td><td rowspan="2">-34</td><td rowspan="2">CW</td><td>3.01</td><td rowspan="2">≦10</td><td>Pass</td></tr>
<tr><td>2503.5</td><td>2.36</td><td>Pass</td></tr>
<tr><td>2300.0</td><td rowspan="2">-34</td><td rowspan="2">CW</td><td>0.81</td><td rowspan="2">≦10</td><td>Pass</td></tr>
<tr><td>2583.5</td><td>0.38</td><td>Pass</td></tr>
</table>

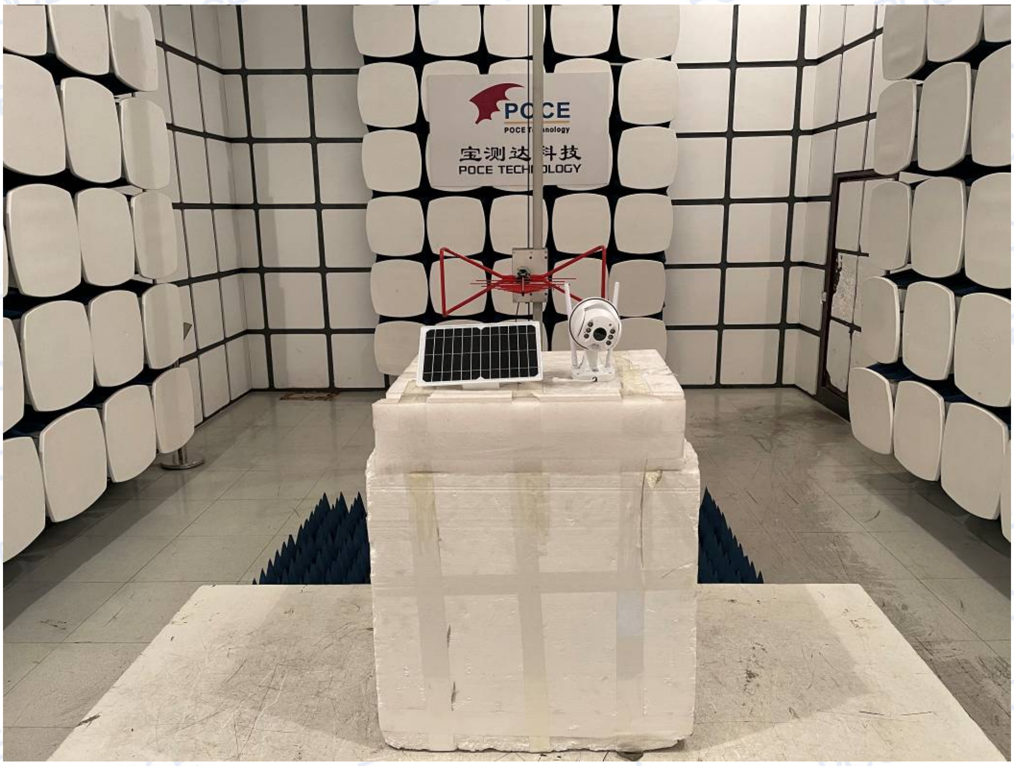
<table>
<tr><td>Test Mode</td><td colspan="6">802.11g</td></tr>
<tr><td>Wanted signal Mean power From companion device (dBm)</td><td>Blocking signal frequency (MHz)</td><td>Blocking signal Power (dBm)</td><td>Type of blocking signal</td><td>PER (%)</td><td>PER (%) Limit</td><td>Result</td></tr>
<tr><td rowspan="4">-68</td><td>2380.0</td><td rowspan="2">-34</td><td rowspan="2">CW</td><td>1.03</td><td rowspan="2">≦10</td><td>Pass</td></tr>
<tr><td>2503.5</td><td>2.09</td><td>Pass</td></tr>
<tr><td>2300.0</td><td rowspan="2">-34</td><td rowspan="2">CW</td><td>0.74</td><td rowspan="2">≦10</td><td>Pass</td></tr>
<tr><td>2583.5</td><td>0.26</td><td>Pass</td></tr>
</table>

<table>
<tr><td>Test Mode</td><td colspan="6">802.11n20</td></tr>
<tr><td>Wanted signal Mean power From companion device (dBm)</td><td>Blocking signal frequency (MHz)</td><td>Blocking signal Power (dBm)</td><td>Type of blocking signal</td><td>PER (%)</td><td>PER (%) Limit</td><td>Result</td></tr>
<tr><td rowspan="4">-68</td><td>2380.0</td><td rowspan="2">-34</td><td rowspan="2">CW</td><td>068</td><td rowspan="2">≦10</td><td>Pass</td></tr>
<tr><td>2503.5</td><td>1.30</td><td>Pass</td></tr>
<tr><td>2300.0</td><td rowspan="2">-34</td><td rowspan="2">CW</td><td>2.30</td><td rowspan="2">≦10</td><td>Pass</td></tr>
<tr><td>2583.5</td><td>1.61</td><td>Pass</td></tr>
</table>

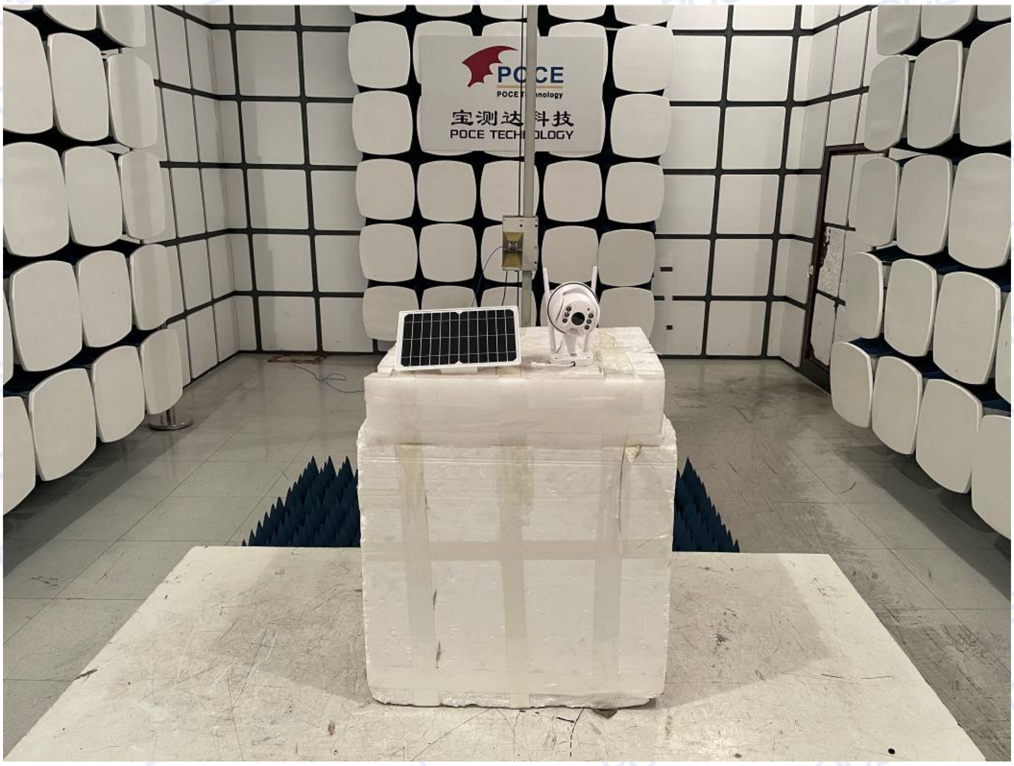
Test Mode	802.11n40					
Wanted signal Mean power From companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal Power (dBm)	Type of blocking signal	PER (%)	PER (%) Limit	Result
-68	2380.0	-34	CW	0.15	≦10	Pass
	2503.5			3.200		Pass
	2300.0	-34	CW	0.800	≦10	Pass
	2583.5			0.17		Pass

Remark:
1 According to the Power measurement the device belongs to Receiver category 1.
2 (-139 dBm + 10 ×log10(OCBW)) or -68 dBm whichever is less

4 PHOTOGRAPHS OF TEST



Below1G



Above 1G

5 PHOTOGRAPHS OF EUT

Please refer to the report NO.: POCE210310025QRW

************************ **THE END** ************************

6 ANNEX E

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

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

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 Channel Occupancy Time implemented by the equipment: 13ms

☒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: 15

☐The equipment has implemented an 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
  802.11b 1Mbps, 802.11g 6Mbps, 802.11(HT20) 6.5Mbps,802.11(HT40) 13.5Mbps
- Power Spectral Density
  802.11b 1Mbps, 802.11g 6Mbps, 802.11(HT20) 6.5Mbps,802.11(HT40) 13.5Mbps
- 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

802.11b 1Mbps, 802.11g 6Mbps, 802.11(HT20) 6.5Mbps,802.11(HT40) 13.5Mbps

- Occupied Channel Bandwidth

  802.11b 1Mbps, 802.11g 6Mbps, 802.11(HT20) 6.5Mbps,802.11(HT40) 13.5Mbps
- Transmitter unwanted emissions in the OOB domain

  802.11b 1Mbps, 802.11g 6Mbps, 802.11(HT20) 6.5Mbps,802.11(HT40) 13.5Mbps
- Transmitter unwanted emissions in the spurious domain

  802.11b 1Mbps
- Receiver spurious emissions

  802.11b 1Mbps
- Receiver Blocking

  802.11b 1Mbps

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

☐Operating mode 1: Single Antenna Equipment

☐Equipment with only 1 antenna

☐Equipment with 2 diversity antennas but only 1 antenna active at any moment in time

☐Smart Antenna Systems with 2 or more antennas, but operating in a (legacy) mode where only 1 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 Occupied Channel Bandwidth 1

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

☒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 Occupied Channel Bandwidth 1

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

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:

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

- Operating Frequency Range 1: 2412/2422MHz to2472/2462MHz
- Operating Frequency Range 2: MHz to MHz

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

j) Occupied Channel Bandwidth(s):

- Occupied Channel Bandwidth 1: 20/40MHz
- Occupied Channel Bandwidth 2: MHz

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 extreme operating conditions that apply to the equipment:

Operating temperature range: -20° C to +55° C

Operating voltage range: 3.15V to 4.26V ☐AC ☒DC

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:

☒ Internal Antenna

Antenna Gain: 0 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

n) 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:

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

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			

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			

o) 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 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: DC 5V from PC

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

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

r) 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

s) Describe the minimum performance criteria that apply to the equipment (see clause 4.3.1.12.3 or clause 4.3.2.11.3):
N/A