RED-Radio Test Report

Client Name	:	**EcoFlow Inc.**
Client Address	:	**Plant A202, Founder Technology Industrial Park, Shiyan Sub-district, Bao'an District Shenzhen, Guangdong 518000 China**
Product Name	:	**Portable Fridge**
Report Date	:	**Feb. 03, 2023**

Shenzhen Anbotek Compliance Laboratory Limited

Contents

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TEST REPORT

Applicant	:	EcoFlow Inc.
Manufacturer	:	EcoFlow Inc.
Product Name	:	Portable Fridge
Model No.	:	EFBX100
Trade Mark	:	ECOFLOW, ECOFLOW
Rating(s)	:	Please refer to page 9

Test Standard(s) : ETSI EN 300 328 V2.2.2 (2019-07)

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the ETSI EN 300 328 V2.2.2 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Receipt	Jan. 04, 2023
Date of Test	Jan. 04 ~ 16, 2023
Prepared By	Ella Liang (Ella Liang)
Approved & Authorized Signer	Kingkong Jin (Kingkong Jin)

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Revision History

Report Version	Description	Issued Date
R00	Original Issue.	Feb. 03, 2023

1. General Information

1.1. Client Information

Applicant	:	EcoFlow Inc.
Address	:	Plant A202, Founder Technology Industrial Park, Shiyan Sub-district, Bao'an District Shenzhen, Guangdong 518000 China
Manufacturer	:	EcoFlow Inc.
Address	:	Plant A202, Founder Technology Industrial Park, Shiyan Sub-district, Bao'an District Shenzhen, Guangdong 518000 China

1.2. Description of Device (EUT)

Product Name	:	Portable Fridge
Model No.	:	EFBX100
Trade Mark	:	ECOFLOW , ECOFLOW
Test Power Supply	:	Voltage of EUT: AC 230V, 50Hz for Adapter Output to RF Module: DC 3.3V
Test Sample No.	:	1-2-2(Engineering Sample)
Adapter	:	Model: KT180A2900620M2 Input: 100-240V~50/60Hz 2.5A Output: 29.0⎓6.2A 179.8W
RF Specification		
Operation Mode	:	☒ 802.11b ☒ 802.11g ☒ 802.11n(HT20) ☒ 802.11n(HT40)
Operation Frequency	:	2412~2472MHz
Number of Channel	:	13 Channel for 20MHz bandwidth (2412~2472MHz) 9 channels for 40MHz bandwidth (2422~2462MHz)
Modulation Type	:	☒ 802.11b: DSSS (CCK, DQPSK, DBPSK) ☒ 802.11g: OFDM (BPSK, QPSK, 16QAM, 64QAM) ☒ 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM)
Antenna Type	:	PCB Antenna
Antenna Gain(Peak)	:	3.96dBi (Provided by customer)

Remark: 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

1.3. Auxiliary Equipment Used During Test

Description	Rating(s)
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1.4. Description of Test Configuration

The system was configured for testing in engineering mode, which was provided by manufacturer.

For Wi-Fi 2.4G, 13 channels are provided to testing as below table:

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

For 802.11b, 802.11g, and 802.11n(HT20) modes were test with channel 1, 7, 13.
For 802.11n(HT40) modes were test with channel 3, 7, 11.

1.5. Test Conditions

Temperature	Normal Temperature:	15°C - 35°C
	High Temperature:	45°C
	Low Temperature:	-10°C
Voltage	Normal Voltage	DC 3.3V
	High Voltage	/
	Low Voltage	/
Other	Relative Humidity	20% - 75%
	Air Pressure	101 kPa
Note: The extremes of the operating temperature was declared by manufacture.		

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1.6. Measurement Uncertainty

For the test methods, according to ETSI EN 300 328 standard, the measurement uncertainty figures shall be calculated in accordance with ETR 100 028-1 [4] and shall correspond to an expansion factor (coverage factor) k = 1,96 or k = 2 (which provide confidence levels of respectively 95 % and 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Maximum measurement uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±1,5 dB
Power Spectral Density, conducted	±3 dB
Unwanted Emissions, conducted	±3 dB
All emissions, radiated	±6 dB
Temperature	±1 °C
Humidity	±5 %
DC and low frequency voltages	±3 %
Time	±5 %
Duty Cycle	±5 %

1.7. Description of Test Facility

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

FCC-Registration No.: 184111
Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111.

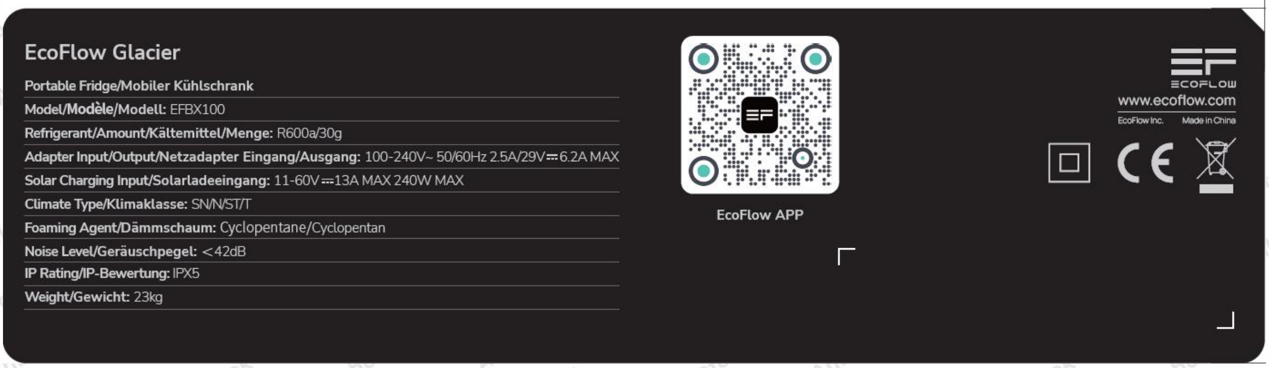
ISED-Registration No.: 8058A
Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A.

Test Location
Shenzhen Anbotek Compliance Laboratory Limited.
1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102

1.8. Test Standard Description

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

Rating(s):



1.9. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	100055	Oct. 23, 2022	1 Year
2.	Three Phase V-type Artificial Power Network	CYBERTEK	EM5040DT	E215040DT001	Jul. 05, 2022	1 Year
3.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Oct. 13, 2022	1 Year
4.	EMI Test Receiver	Rohde & Schwarz	ESR26	101481	Oct. 23, 2022	1 Year
5.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Oct. 22, 2022	1 Year
6.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Oct. 13, 2022	1 Year
7.	EMI Preamplifier	SKET Electronic	LNPA-0118G-45	SKET-PA-002	Oct. 13, 2022	1 Year
8.	Double Ridged Horn Antenna	SCHWARZBECK	BBHA 9120D	02555	Oct. 16, 2022	3 Year
9.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Oct. 23, 2022	1 Year
10.	Loop Antenna	Schwarzbeck	FMZB1519B	00053	Oct. 23, 2022	1 Year
11.	Horn Antenna	A-INFO	LB-180400-KF	J211060628	Oct. 23, 2022	1 Year
12.	Pre-amplifier	SONOMA	310N	186860	Oct. 23, 2022	1 Year
13.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
14.	MXA Spectrum Analysis	KEYSIGHT	N9020A	MY53280032	Oct. 13, 2022	1 Year
15.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Oct. 13, 2022	1 Year
16.	Signal Generator	Agilent	E4421B	MY41000743	Oct. 13, 2022	1 Year
17.	DC Power Supply	IVYTECH	IV3605	1804D360510	Oct. 22, 2022	1 Year
18.	Constant Temperature Humidity Chamber	ZHONGJIAN	ZJ-KHWS80B	N/A	Oct. 19, 2022	1 Year

2. Summary of Test Results

Transmitter Items		
Test Items	Clause No.	Results
RF Output Power	ETSI EN 300 328 V2.2.2 §4.3.2.2	Complies
Power Spectral Density	ETSI EN 300 328 V2.2.2 §4.3.2.3	Complies
Duty Cycle, TX-Sequence, TX-gap	ETSI EN 300 328 V2.2.2 §4.3.2.4	N/A Note (2)(3)
Medium Utilization (MU) factor	ETSI EN 300 328 V2.2.2 §4.3.2.5	N/A Note (2)(3)
Adaptivity	ETSI EN 300 328 V2.2.2 §4.3.2.6	Complies
Occupied Channel Bandwidth	ETSI EN 300 328 V2.2.2 §4.3.2.7	Complies
Transmitter Unwanted Emissions in the Out-Of-Band Domain	ETSI EN 300 328 V2.2.2 §4.3.2.8	Complies
Transmitter Unwanted Emissions in the Spurious Domain	ETSI EN 300 328 V2.2.2 §4.3.2.9	Complies
Receiver Items		
Test Items	Clause No.	Results
Receiver spurious emissions	ETSI EN 300 328 V2.2.2 §4.3.2.10	Complies
Receiver Blocking	ETSI EN 300 328 V2.2.2 §4.3.2.11	Complies
Geo-location capability	ETSI EN 300 328 V2.2.2 §4.3.2.12	N/A

Note:

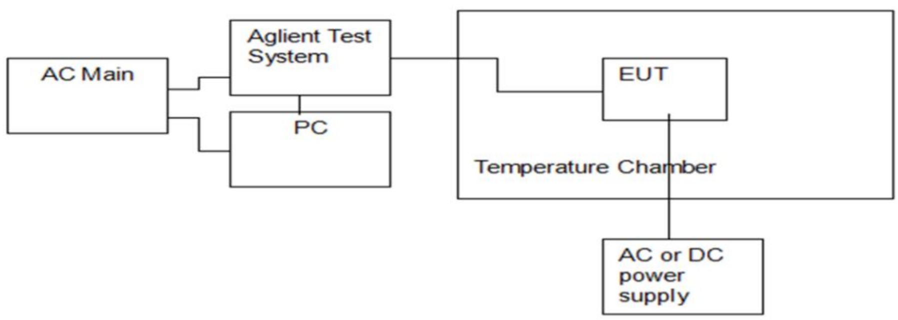
1. “N/A”: indicates test is not applicable in this Test Report.
2. Note(2) These requirements apply to non-adaptive equipment or to adaptive equipment when operating in a non-adaptive mode. The equipment is non-FHSS equipment.
3. Note(3) This requirement applies to non-adaptive equipment or to adaptive equipment when operating in a non-adaptive mode.
4. This requirement does not apply to adaptive equipment unless operating in non-adaptive mode.

3. RF Output Power

3.1. Test Limit

Limit
☒ The RF output power for non-FHSS equipment shall be equal to or less than 20 dBm. NOTE: For Non-adaptive FHSS equipment, the manufacturer may have declared a reduced RF Output Power (see clause 5.4.1 m)) and associated Duty Cycle (see clause 5.4.1 e)) that will ensure that the equipment meets the requirement for the Medium Utilization (MU) factor further described in clause 4.3.2.5. This is verified by the conformance test referred to in clause 4.3.2.5.4.
☐ For non-adaptive non-FHSS equipment, where the manufacturer has declared an RF output power of less than 20 dBm e.i.r.p., the RF output power shall be equal to or less than that declared value.

3.2. Test Setup



3.3. Test Procedure

Refer to ETSI EN 300 328 V2.2.2, clause 5.4.2 for the test conditions and the measurement method.

1. Run a test program to control EUT transmitting at specific channel
2. Connect the power sensor to the transmit port
3. Power Meter was setting as below:
   Sample speed: 1 MS/s
   Number of bursts: at least 10bursts
   Detector: RMS
4. A power meter was used to read the response of the power sensor
5. Define Start time and Stop time of a burst by 30dB below the highest value of the stores samples.
6. Find the highest burst value
7. Record the power level
8. EIRP = antenna gain + power level of step 7.

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3.4. Test Data

Pass

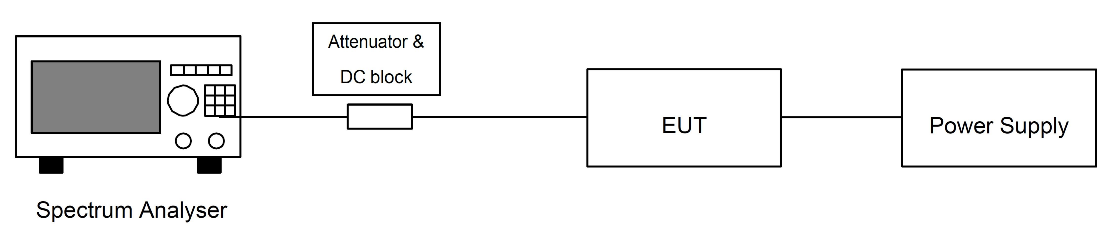
Please refer to Appendix A of the Appendix Test Data.

4. Power Spectral Density

4.1. Test Limit

Condition	Frequency Band	Limit (e.i.r.p.)
Under normal conditions	2400 ~ 2483.5 MHz	10dBm / 1MHz

4.2. Test Setup



4.3. Test Procedure

Refer to ETSI EN 300 328 V2.2.2, clause 5.4.3 for the test conditions and the measurement method.

Step 1:

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

Resolution BW:	10 kHz
Video BW:	30 kHz
Sweep points:	>8350
Detector:	RMS
Trace:	Max hold
Sweep time:	Auto

For non-continuous signals, wait for the trace to stabilize. Save the data (trace data) set to a file.

Step 2:

For each frequency point, add up the amplitude (power) values for the different transmit chains and use this as the new data set.

Step 3:

Add up the values for amplitude (power) for all the samples in the file.

Step 4:

Normalize the individual values for amplitude so that the sum is equal to the RF Output Power (e.i.r.p.).

Step 5:

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

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Step 6:

Shift the start point of the samples added up in step 5 by 1 sample and repeat the procedure in step 5 (i.e. sample #2 to #101).

Step 7:

Repeat step 6 until the end of the data set and record the radiated Power Spectral Density values for each of the 1 MHz segments. From all the recorded results, the highest value is the maximum Power Spectral Density for the UUT.

4.4. Test Data

Pass

Please refer to Appendix B of the Appendix Test Data.

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5. Adaptivity

5.1. Test Limit

See clause 5.1 of ETSI EN 300 328 V2.2.2 for the test conditions. These measurements shall only be performed at normal test conditions.

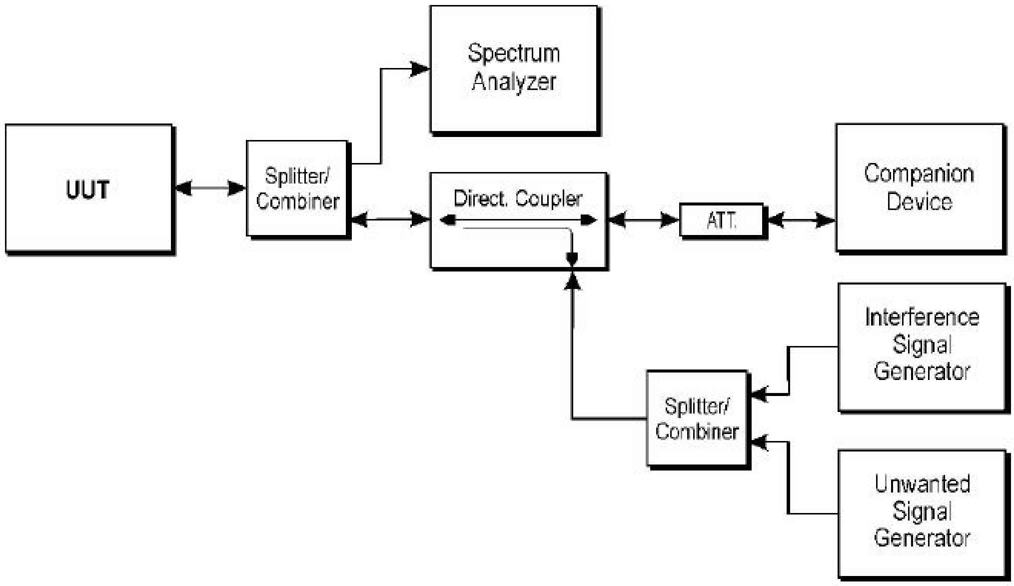
When supported by the operating frequency range of the equipment, this test shall be performed on two operating (hopping) frequencies randomly selected from the operating frequencies used by the equipment. The first (lower) frequency shall be randomly selected within the range 2 400 MHz to 2 442 MHz 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.

☐ Non-LBT based Detect and Avoid: 1 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; 2 COT ≤ 40 ms; 3 Idle Period shall be minimum 5% of COT with a minimum of 100us; 4 Detection threshold level = -70dBm/MHz +10*log(100mW/Pout)(Pout in mW E.I.R.P)
☐ LBT based Detect and Avoid (Frame Based Equipment): 1 The CCA observation time shall be not less than 18 us; 2 CCA observation time declared by the supplier; 3 COT = 1~10 ms; 4 Idle Period ≥ 5% of COT; 5 Detection threshold level = -70dBm/MHz +10*log(100mW/Pout)(Pout in mW E.I.R.P)
☒ LBT based Detect and Avoid (Load Based Equipment): 1 The CCA observation time shall be not less than 18 us; 2 CCA declared by the manufacturer; 3 COT ≤ 13 ms; 4 Detection threshold level =-70dBm/MHz +10*log(100mW/Pout)(Pout in mW E.I.R.P)
☐ Short Control Signalling Transmissions: Short Control Signalling Transmissions shall have a maximum TxOn / (TxOn + TxOff) ratio of 10 % within any observation period of 50 ms or within an observation period equal to the dwell time, whichever is less.

5.2. Test Setup



5.3. Test Procedure

Refer to ETSI EN 300 328 V2.2.2 Clause 5.4.6

5.4. Test Data

Pass

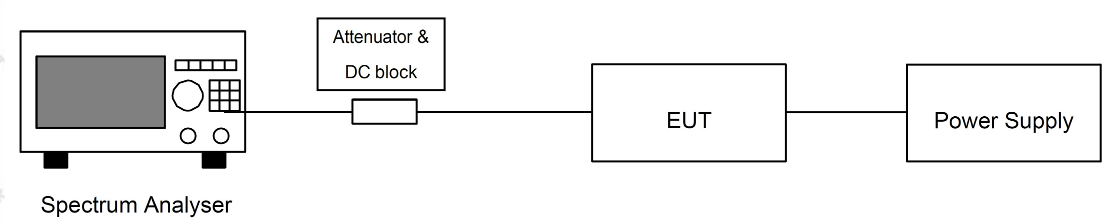
Please refer to Appendix G of the Appendix Test Data.

6. Occupied Channel Bandwidth

6.1. Test Limit

Condition		Limit
All types of equipment		Shall fall completely within the band 2400 to 2483.5 MHz.
Additional requirement	For non-adaptive using wide band modulations other than FHSS system and e.i.r.p >10dBm.	Less than 20MHz
	For non-adaptive Frequency Hopping system and e.i.r.p >10dBm.	Less than 5MHz

6.2. Test Setup



6.3. Test Procedure

Refer to ETSI EN 300 328 V2.2.2, clause 5.4.7 for the test conditions and the measurement method.

The setting of the Spectrum Analyzer

Center Frequency:	The centre frequency of the channel under test
Frequency Span:	2 × Nominal Channel Bandwidth
Detector:	RMS
RBW:	~ 1 % of the span without going below 1 %
VBW:	3 × RBW
Trace Mode:	Max hold
Sweep time:	1s

6.4. Test Data

Pass

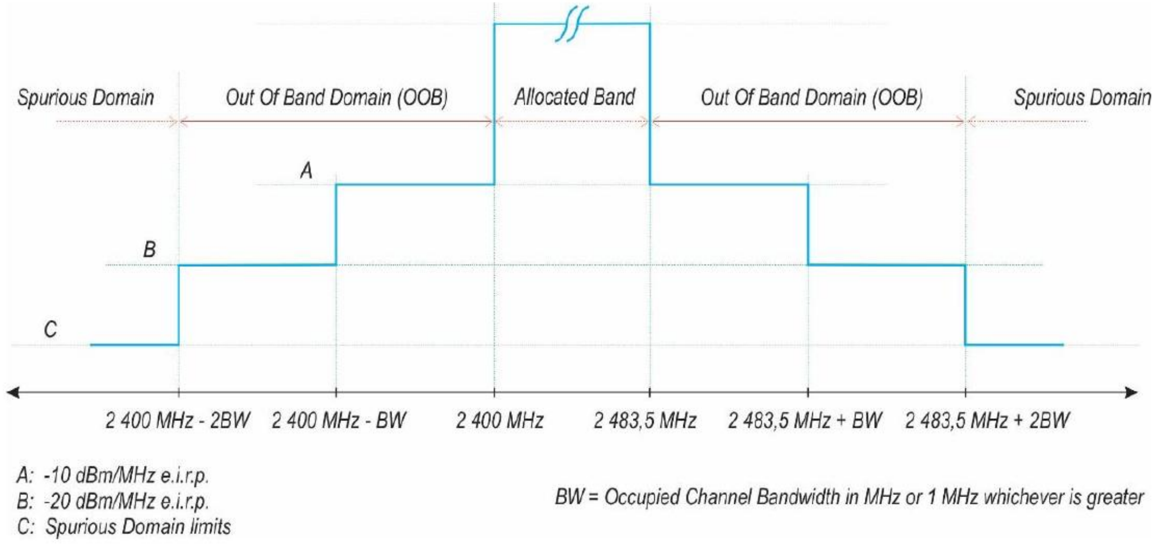
Please refer to Appendix C of the Appendix Test Data.

7. Transmitter Unwanted Emissions in the out-of-band Domain

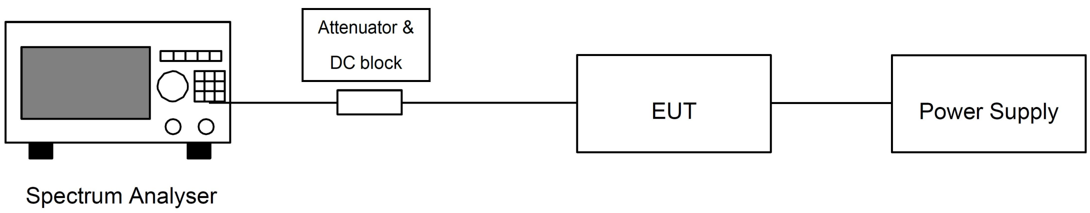
7.1. Test Limit

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 as below.

Note: Within the 2400MHz to 2483.5MHz band, the Out-of band emissions are fulfilled by compliance with the Occupied Channel Bandwidth requirement in clause 4.3.2.7.



7.2. Test Setup



7.3. Test Procedure

Refer as ETSI EN 300 328 V2.2.2, clause 5.4.8 for the test conditions and the measurement method.

Step 1:

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

- Measurement Mode: Time Domain Power
- Centre Frequency: 2 484 MHz
- Span: Zero Span
- Resolution BW: 1 MHz
- Filter mode: Channel filter
- Video BW: 3 MHz

- Detector Mode: RMS
- Trace Mode: Max Hold
- Sweep Mode: Single Sweep
- Sweep Points: Sweep time [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 × $\log_{10}(A_{ch})$ and the additional beamforming gain Y in dB. The results for each of the transmit chains shall be individually compared with these reduced limits.

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

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

7.4. Test Data

Pass

Please refer to Appendix D of the Appendix Test Data.

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8. Transmitter Unwanted Emissions in the Spurious Domain

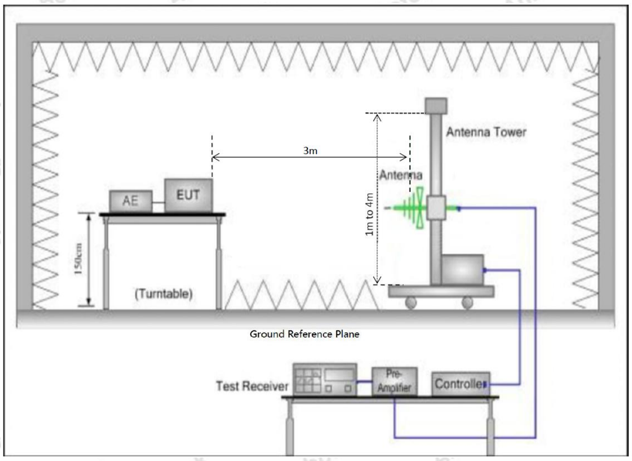
8.1. Test Limit

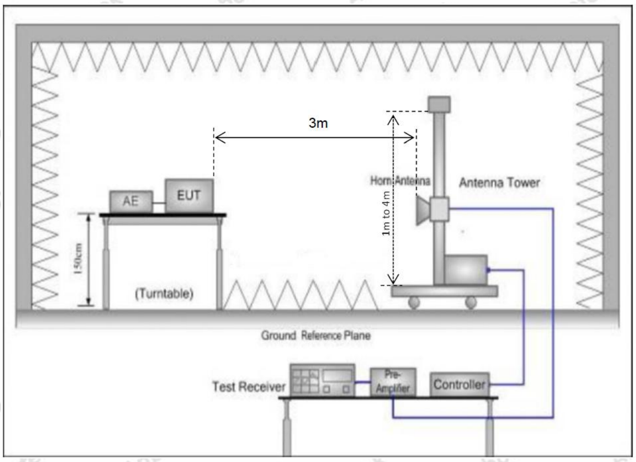
Frequency Range	Maximum power E.R.P. (≤ 1GHz) E.I.R.P. (> 1GHz)	Bandwidth
30 MHz to 47 MHz	-36dBm	100kHz
47 MHz to 74 MHz	-54dBm	100kHz
74 MHz to 87,5 MHz	-36dBm	100kHz
87,5 MHz to 118 MHz	-54dBm	100kHz
118 MHz to 174 MHz	-36dBm	100kHz
174 MHz to 230 MHz	-54dBm	100kHz
230 MHz to 470 MHz	-36dBm	100kHz
470 MHz to 694 MHz	-54dBm	100kHz
694 MHz to 1 GHz	-36dBm	100kHz
1 GHz to 12,75 GHz	-30dBm	1MHz

8.2. Test Setup

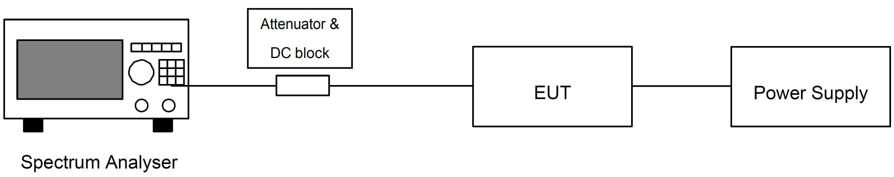
For Radiated Measurement:

(A) Radiated Emission Test Set-Up Frequency Below 1 GHz. (B) Radiated Emission Test Set-Up Frequency Above 1 GHz





For Conducted Measurement:



8.3. Test Procedure

Refer to ETSI EN 300 328 V2.2.2, clause 5.4.9 for the test conditions and the measurement method.

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 FHSS 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 FHSS 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.

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 × $\log_{10}(A_{ch})$.

8.4. Test Data

Note: All mode of EUT have been tested and only record the worst data in the report.

Temperature:	23.6° C	Relative Humidity:	56 %
Pressure:	1012 hPa	Test Voltage:	DC 3.3V

Radiated Measurement:

Worst case: 802.11b

Test Result: 30-1000MHz

Test Mode: TX Mode			Test Channel: 802.11b		
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
61.22	-74.83	-54.00	-20.83	H	PASS
149.59	-66.28	-36.00	-30.28	H	
452.93	-70.57	-36.00	-34.57	H	
593.29	-70.24	-54.00	-16.24	H	
738.59	-70.88	-36.00	-34.88	H	
888.85	-68.23	-36.00	-32.23	H	
50.08	-69.42	-54.00	-15.42	V	
162.38	-69.08	-36.00	-33.08	V	
401.71	-66.41	-36.00	-30.41	V	
552.12	-74.62	-54.00	-20.62	V	
769.74	-74.60	-36.00	-38.60	V	
917.52	-69.10	-36.00	-33.10	V	

Test Result: above 1000MHz

Test Mode: TX Mode			Test Channel: 802.11b CH01		
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
4824.00	-44.93	-30.00	-14.93	H	PASS
7236.00	-47.77	-30.00	-17.77	H	
9648.00	-47.04	-30.00	-17.04	H	
4824.00	-48.13	-30.00	-18.13	V	
7236.00	-50.74	-30.00	-20.74	V	
9648.00	-47.11	-30.00	-17.11	V	

Test Mode: TX Mode			Test Channel: 802.11b CH13		
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
4944.00	-41.80	-30.00	-11.80	H	PASS
7416.00	-49.00	-30.00	-19.00	H	
9888.00	-46.81	-30.00	-16.81	H	
4944.00	-45.37	-30.00	-15.37	V	
7416.00	-49.77	-30.00	-19.77	V	
9888.00	-47.12	-30.00	-17.12	V	

Conducted Measurement:

Please refer to Appendix E of the Appendix Test Data.

9. Receiver Spurious Emissions

9.1. Test Limit

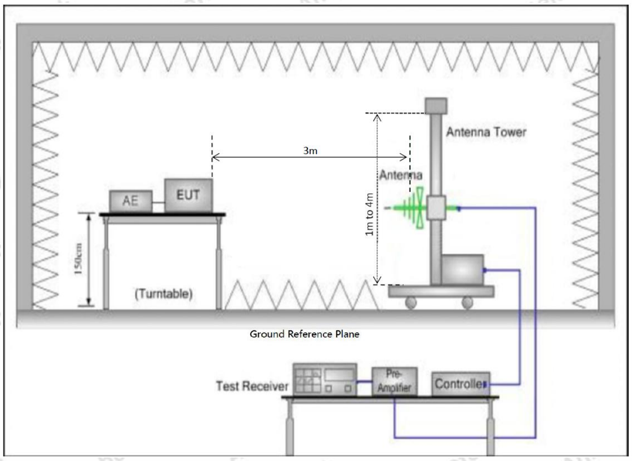
The spurious emissions of the receiver shall not exceed the values given in table.

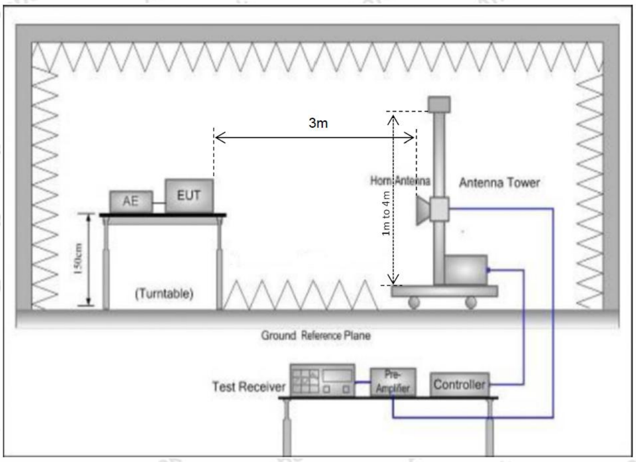
Frequency Range	Maximum power E.R.P. (≤ 1GHz) E.I.R.P. (> 1GHz)	Bandwidth
30MHz ~ 1GHz	-57dBm	100 kHz
1GHz ~ 12.75GHz	-47dBm	1 MHz

9.2. Test Setup

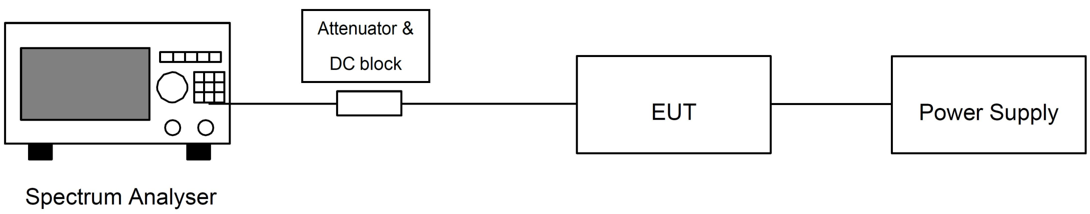
For Radiated Measurement:

(A) Radiated Emission Test Set-Up Frequency Below 1 GHz. (B) Radiated Emission Test Set-Up Frequency Above 1 GHz





For Conducted Measurement:



9.3. Test Procedure

Refer to ETSI EN 300 328 V2.2.2, clause 5.4.10 for the test conditions and the measurement method.

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.

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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.

FHSS 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 × $\log_{10} A_{ch}$.

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9.4. Test Data

Note: All mode of EUT have been tested and only record the worst data in the report.

Temperature:	23.6° C	Relative Humidity:	56 %
Pressure:	1012 hPa	Test Voltage:	DC 3.3V

Radiated Measurement:

worst case: 802.11b

Test Result: 30-1000MHz

Test Mode: RX Mode			Test Channel: 802.11 b		
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
48.89	-66.36	-57.00	-9.36	H	PASS
89.62	-69.98	-57.00	-12.98	H	
133.44	-64.68	-57.00	-7.68	H	
212.99	-67.46	-57.00	-10.46	H	
444.77	-66.02	-57.00	-9.02	H	
523.24	-66.26	-57.00	-9.26	H	
63.75	-69.08	-57.00	-12.08	V	
91.83	-68.02	-57.00	-11.02	V	
159.78	-64.34	-57.00	-7.34	V	
219.61	-71.19	-57.00	-14.19	V	
314.92	-76.73	-57.00	-19.73	V	
600.03	-71.11	-57.00	-14.11	V	

Test Result: above 1000MHz

Test Mode: RX Mode			Test Channel: 802.11b CH01		
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
4824.00	-60.35	-47.00	-13.35	H	PASS
7236.00	-64.64	-47.00	-17.64	H	
9648.00	-66.75	-47.00	-19.75	H	
4824.00	-66.38	-47.00	-19.38	V	
7236.00	-65.43	-47.00	-18.43	V	
9648.00	-68.39	-47.00	-21.39	V	

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Test Mode: RX Mode			Test Channel: 802.11b CH13		
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
4944.00	-68.59	-47.00	-21.59	H	PASS
7416.00	-67.94	-47.00	-20.94	H	
9888.00	-67.94	-47.00	-20.94	H	
4944.00	-70.14	-47.00	-23.14	V	
7416.00	-65.20	-47.00	-18.20	V	
9888.00	-66.73	-47.00	-19.73	V	

Conducted Measurement:

Please refer to Appendix F of the Appendix Test Data.

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10. Receiver Blocking

10.1. Test Limit

This requirement applies to all receiver categories.

RECEIVER CATEGORY		
☒ Category 1	☐ Category 2	☐ Category 3
Minimum performance criterion	☒ PER ≦10 %	
	☐ Alternative performance criteria	

Receiver Blocking parameters for Receiver Category 1 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 4)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 4)	Type of blocking signal
(-133 dBm + 10 × $\log_{10}$(OCBW)) or -68 dBm whichever is less (see note 2)	2 380 2 504	-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.

Receiver Blocking parameters receiver Category 2 equipment

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

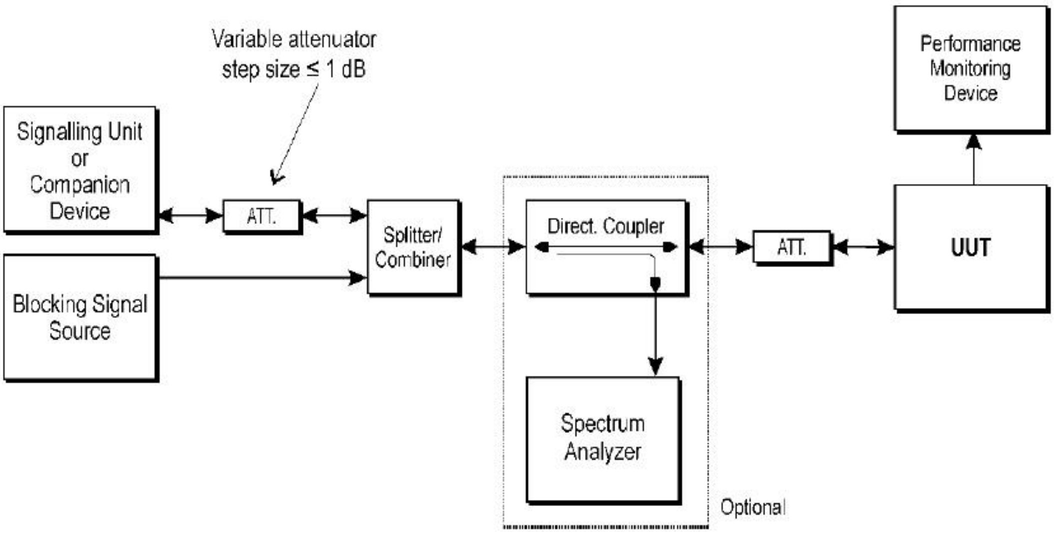
NOTE 1: OCBW is in Hz.
NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 26 dB where P_{min} is the minimum level of wanted signal 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.

Receiver Blocking parameters receiver Category 3 equipment

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

10.2. Test Setup



10.3. Test Procedure

Refer to ETSI EN 300 328 V2.2.2, clause 5.4.11 for the test conditions and the measurement method.

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.

Step 2:

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

Step 3:

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

• When the option provided in note 2 of the applicable table referred to in clause 5.4.11.2.1 is used, the attenuation of the variable attenuator shall be increased in 1 dB steps to a value at which the minimum performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is still met. The resulting level for the wanted signal at the input of the UUT is 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.

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

Step 5:

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

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

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

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

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

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

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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.

Step 8:

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

10.4. Minimum Performance Declaration

Mode	CH	Pmin (dBm)	PER (≦10%)
802.11b	01	-91	Pass
	13	-91	Pass

Note: Pmin is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria.

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10.5. Test Data

Temperature:	24.6° C	Relative Humidity:	52 %
Pressure:	1012 hPa	Test Voltage:	DC 3.3V

Test Mode	Test Channel	Wanted Signal Mean Power from Companion Device (dBm/MHz)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm)	Type of Blocking Signal	PER (%)	Test Result
802.11b	CH01	-68	2380	-30.04	CW	0.97	PASS
			2504			1.35	PASS
		-74	2300	-30.04	CW	0.90	PASS
			2330			0.89	PASS
			2360			0.76	PASS
			2524			1.00	PASS
			2584			0.57	PASS
			2627			1.14	PASS
	CH13	-68	2380	-30.04	CW	1.14	PASS
			2504			0.76	PASS
		-74	2300	-30.04	CW	1.30	PASS
			2330			1.06	PASS
			2360			1.17	PASS
			2524			1.25	PASS
			2584			0.37	PASS
			2627			1.27	PASS

Note:

1. According to ETSI EN 300328 clause 5.4.11.1. Only the lowest data rate(802.11b) mode was tested and recorded.
2. Antenna Gain(Peak) is 3.96 dBi, so the above table is given with the calculated levels.

APPENDIX I -- TEST SETUP PHOTOGRAPH

Please refer to separated files Appendix I -- Test Setup Photograph_RF

APPENDIX II -- EXTERNAL PHOTOGRAPH

Please refer to separated files Appendix II -- External Photograph

APPENDIX III -- INTERNAL PHOTOGRAPH

Please refer to separated files Appendix III -- Internal Photograph

--------------- End of Report ---------------