ECOFLOW INC.

TEST REPORT

SCOPE OF WORK:
Article 3.2 of RE directive (2014/53/EU) – RF report

Model:
EFG200

REPORT NUMBER
220500957HZH-001

ISSUE DATE
July 18, 2022

DOCUMENT CONTROL NUMBER
TTRF300328-02_V2

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TEST REPORT

Report no. 220500957HZH-001

Applicant	:	ECOFLOW INC. Plant A202, Founder Technology Industrial Park, Shiyan Sub-district, Bao'an District Shenzhen, Guangdong 518000 China
Manufacturer	:	Chongqing Rato Technology Co., Ltd. Zone B, Shuangfu Industry Park, Jiangjin District, Chongqing 402247, P.R. China
Manufacturing site	:	Chongqing Rato Technology Co., Ltd. Zone B, Shuangfu Industry Park, Jiangjin District, Chongqing 402247, P.R. China

Summary

The equipment complies with the requirements according to the following standard(s) or Specification:
EN 300 328 V2.2.2: Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz band; Harmonised Standard for access to radio spectrum

PREPARED BY:	**REVIEWED BY:**
Alex Wu	Wakeyou Wang
Project Engineer	Reviewer

Contents

Revision History

Report No.	Version	Description	Issued Date
220500957HZH-001	Rev. 01	Initial issue of report	July 18, 2022

Measurement result summary

TEST ITEM	TEST RESULT	NOTE
RF Output Power	Pass	
Power Spectral Density	Pass	
Duty Cycle, Tx-sequence, Tx-gap	NA	Only for non-adaptive equipment or mode
Medium Utilization (MU) factor	NA	Only for non-adaptive equipment or mode
Occupied Channel Bandwidth	Pass	
Transmitter unwanted emissions in the out-of-band domain	Pass	
Transmitter unwanted emissions in the spurious domain	Pass	
Adaptivity (non-FHSS)	NA	Not applied for equipment with e.i.r.p. less than 10dBm
Receiver Blocking	Pass	
Receiver spurious emission	Pass	
Geo-location capability	NA	

Notes: 1: NA =Not Applicable

2: Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.

3: Additions, Deviations and Exclusions from Standards: None.

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name	:	Low Power Generating sets (Ecoflow Smart Generator Dual Fuel)
Type/Model	:	EFG200
Description of EUT	:	This machine is portable gasoline and LPG engine driven generator with AC 230V, 50Hz output and DC max. 58,8V output. The EUT include the WIFI module and Bluetooth module which can be controlled by App. We test it and the worst testing data is listed in the report as representative.
Rating	:	1,8kW (Gasoline)/1,6kW (LPG), Max. 1,9kW (Gasoline)/1,7kW (LPG), CosΦ=1,0 / DC42-58,8V, 32A
Hardware version	:	/
Software version	:	/
Sample received date	:	May 28, 2022
Date of test	:	June 01, 2022 ~ June 26, 2022

1.2 RF Technical Information

No.	Protocol	Channel Frequency (MHz)	Channel No.
1	Bluetooth Low Energy	2402 - 2480	40
Modulation: GFSK			

Antenna information:			
No.	Antenna Type	Gain (dBi)	Note
1	PCB antenna	3.96dBi	-

Equipment types	
Modulation types:	
☐	Frequency Hopping Spread Spectrum (FHSS) equipment, further referred to as FHSS equipment.
☒	Other types of Wideband Data Transmission equipment, further referred to as non-FHSS equipment (e.g. DSSS, OFDM, etc.).
Adaptive and 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 non-adaptive mode
Receiver categories:	
☐	Receiver category 1: Adaptive equipment with a maximum RF output power greater than 10 dBm e.i.r.p.
☒	Receiver category 2: • Non-adaptive equipment with a Medium Utilization (MU) factor greater than 1 % and less than or equal to 10 % (irrespective of the maximum RF output power); or • equipment (adaptive or non-adaptive) with a maximum RF output power greater than 0 dBm e.i.r.p. and less than or equal to 10 dBm e.i.r.p.
☐	Receiver category 3: • Non-adaptive equipment with a maximum Medium Utilization (MU) factor of 1 % (irrespective of the maximum RF output power) or • equipment (adaptive or non-adaptive) with a maximum RF output power of 0 dBm e.i.r.p.

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

1.3 Description of Test Facility

Name	:	Intertek Testing Services Shanghai
Address	:	Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Telephone	:	86 21 61278200
Telefax	:	86 21 54262353

The test facility is recognized, certified, or accredited by these organizations	:	CNAS Accreditation Lab Registration No. CNAS L0139 FCC Accredited Lab Designation Number: CN1175 IC Registration Lab CAB identifier.: CN0014 VCCI Registration Lab Registration No.: R-14243, G-10845, C-14723, T-12252 A2LA Accreditation Lab Certificate Number: 3309.02

2 TEST SPECIFICATIONS

2.1 Standards or specification

EN 300 328 V2.2.2: Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz band; Harmonised Standard for access to radio spectrum

2.2 Mode of operation during the test

While testing transmitting mode of EUT, the continuously transmission was applied by following software.

Software name	Manufacturer	Version	Supplied by
EspRFTesTool	-	2.8	Client

The lowest, middle and highest channel were tested as representatives.

Frequency Band (MHz)	Modulation	Lowest (L) (MHz)	Middle (M) (MHz)	Highest (H) (MHz)
2400-2483.5	GFSK	2402	2440	2480

Channel Frequency	2402MHz	2440MHz	2480MHz
Power Setting	Level 8	Level 8	Level 8

2.3 Test peripherals used

Item No	Description	Band and Model	S/No
1	Laptop computer	DELL, 5480	NA

2.4 Record of normal and extreme test conditions

Test Item	Normal Temperature (°C)	Relative Humidity (%)
RF Output Power	23	54
Duty Cycle, Tx-sequence, Tx-gap		
Medium Utilization (MU) factor		
Occupied Channel Bandwidth		
Transmitter unwanted emissions in the out-of-band domain		
Hopping Frequency Separation, Accumulated Transmit time, Frequency Occupation and Hopping Sequence		
Adaptivity (non-FHSS)		
Receiver Blocking		
Transmitter unwanted emissions in the spurious domain	24	52
Receiver spurious emission		

Extremes of the operating temperature range as declared by the manufacturer
-40 °C to +85 °C

Abbreviations	
Tnom	Normal Temperature
Tmin	Extreme Low Temperature
Tmax	Extreme High Temperature

2.5 Instrument list

Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESIB 26	EC 3045	2022-10-19
☒	Bilog Antenna	TESEQ	CBL 6112B	EC 6411	2022-08-06
☒	Pre-amplifier	R&S	AFS42-00101800-25-S-42	EC 5262	2022-09-08
☒	Horn antenna	Tonscend	BHA9120D	EC 6432-2	2023-01-09
☐	Horn antenna	ETS	3117	EC 4792-1	2023-03-27
☐	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2023-07-08
☐	Active loop antenna	Schwarzbeck	FMZB1519	EC 5345	2022-07-23
☐	Horn antenna	ETS	3116c	EC 5955	2022-08-20
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2023-03-14
☒	Power sensor	Agilent	U2021XA	EC 5338-1	2023-03-14
☒	Vector Signal Generator	Agilent	N5182B	EC 5175	2023-03-14
☒	Universal Radio Communication Tester	R&S	CMW500	EC 5944	2023-01-20
☒	MXG Analog Signal Generator	Agilent	N5181A	EC 5338-2	2023-03-14
☐	Mobile Test System	Litepoint	Iqxel	EC 5176	2023-01-11
☐	Test Receiver	R&S	ESCI 7	EC 4501	2022-12-09
☐	Climate chamber	GWS	MT3065	EC 6021	2023-03-06
☐	Spectrum Analyzer	Keysight	N9030b	EC 6078	2022-09-06
☐	Universal Radio Communication Tester	R&S	CMW500	EC 6209	2023-01-20
☐	Signal generator	Agilent	N5182A	EC 6172	2022-08-19
☐	Signal generator	Agilent	N5181A	EC 6171	2022-08-19
Tet Site					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☐	Shielded room	Zhongyu	-	EC 2838	2023-01-11
☐	Shielded room	Zhongyu	-	EC 2839	2023-01-11
☒	Semi-anechoic chamber	Albatross project	-	EC 3048	2022-08-22
☐	Fully-anechoic chamber	Albatross project	-	EC 3047	2022-08-22

Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☐	Spectrum analyzer	Agilent	E7402A	EC 2254	2022-07-09
☐	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2023-03-24
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5198	2023-03-08
☐	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3442	2023-01-03
☐	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5844	2023-03-08
☐	Pressure meter	YM3	Shanghai Mengde	EC 3320	2022-07-22

Test software	Manufacturer	Version
ES-K1	R&S	V1.71
ETSI certification of Regulations Test Solution	ETSI certification of	V1.01.42

2.6 Measurement Uncertainty

Item No.	Test Items	Expanded Uncertainty (k=2)
1	Radio frequency	± 0.84 × 10^{-7}
2	RF power, conducted	± 0.74 dB
3	RF power, radiated	± 5.92 dB
4	Maximum Frequency Deviation	± 2.77 %
5	Adjacent channel power	± 1.45 dB
6	Spurious emissions of transmitter, conducted	± 2.89 dB
7	Spurious emissions of receiver, conducted	± 2.80 dB
8	Spurious emissions, radiated	± 5.93 dB
9	Power Spectral Density, conducted	± 2.99 dB
10	Occupied Channel Bandwidth	± 0.88 %
11	Time	± 1.15 %
12	Temperature	± 1 °C
13	Humidity	± 5 %
14	DC and low frequency voltages	± 1.3 %

3 RF output power

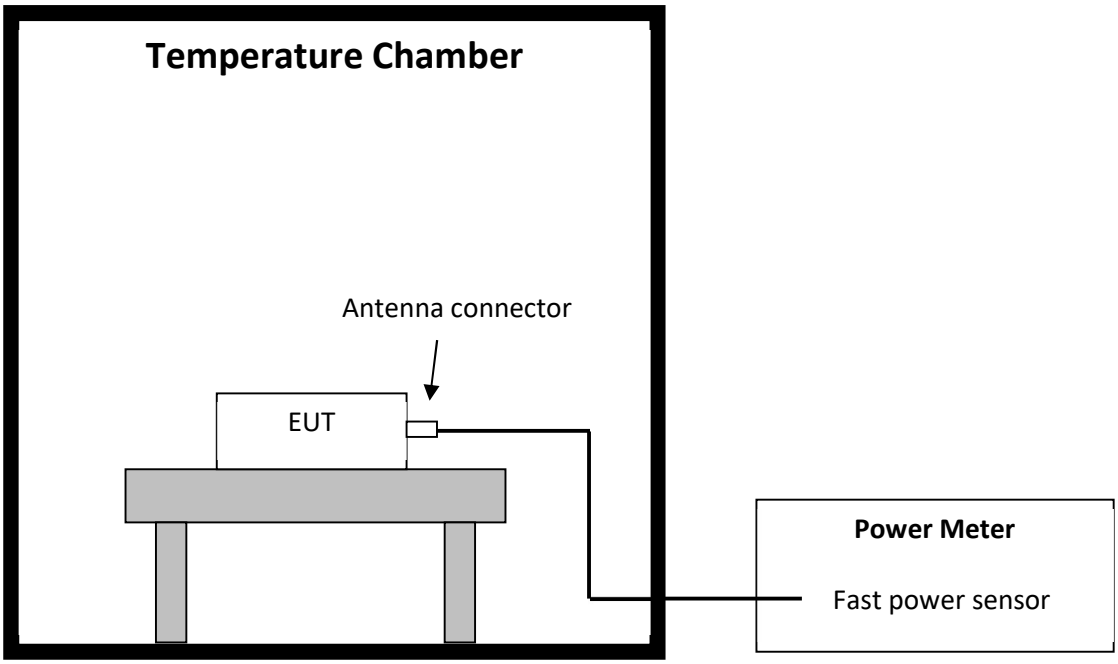
Test result: Pass

3.1 Limit

Mode	Limit	
	(mW)	(dBm)
Adaptive	100	20
Non-adaptive	100	20
Note: the limit for non-adaptive device is declared by the applicant.		

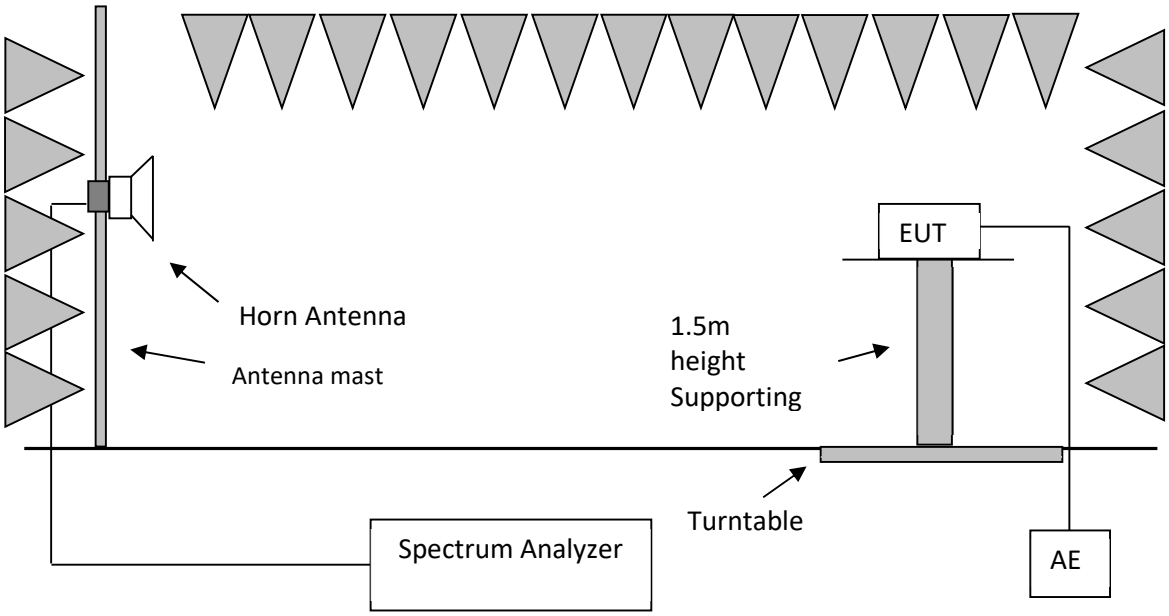
3.2 Block Diagram of Test Setup

3.2.1 For conducted method

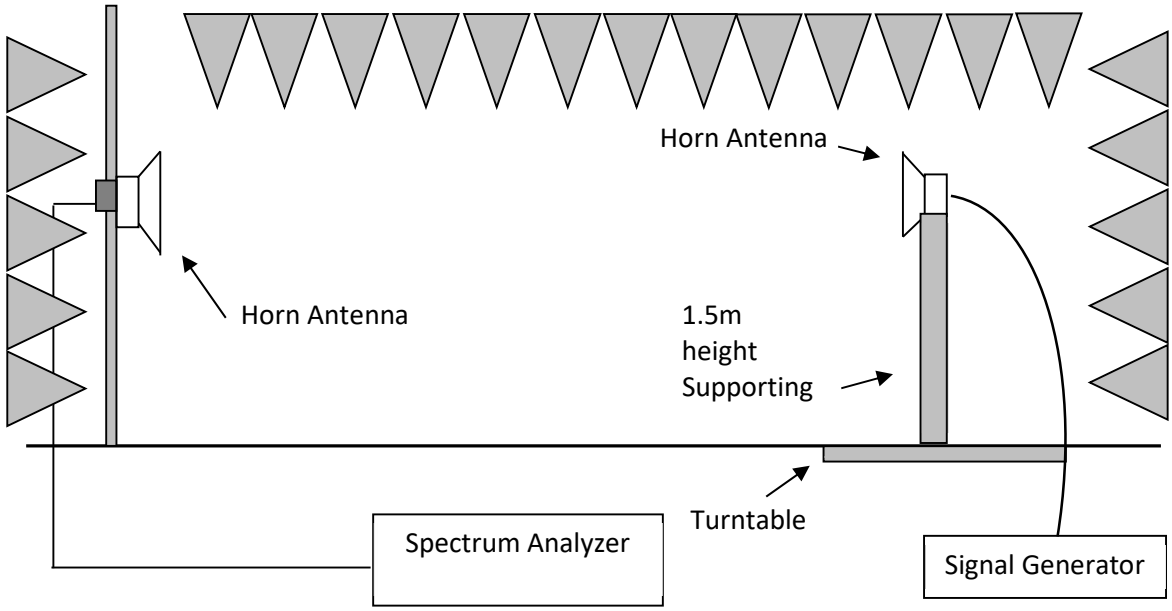


3.2.2 For radiated method

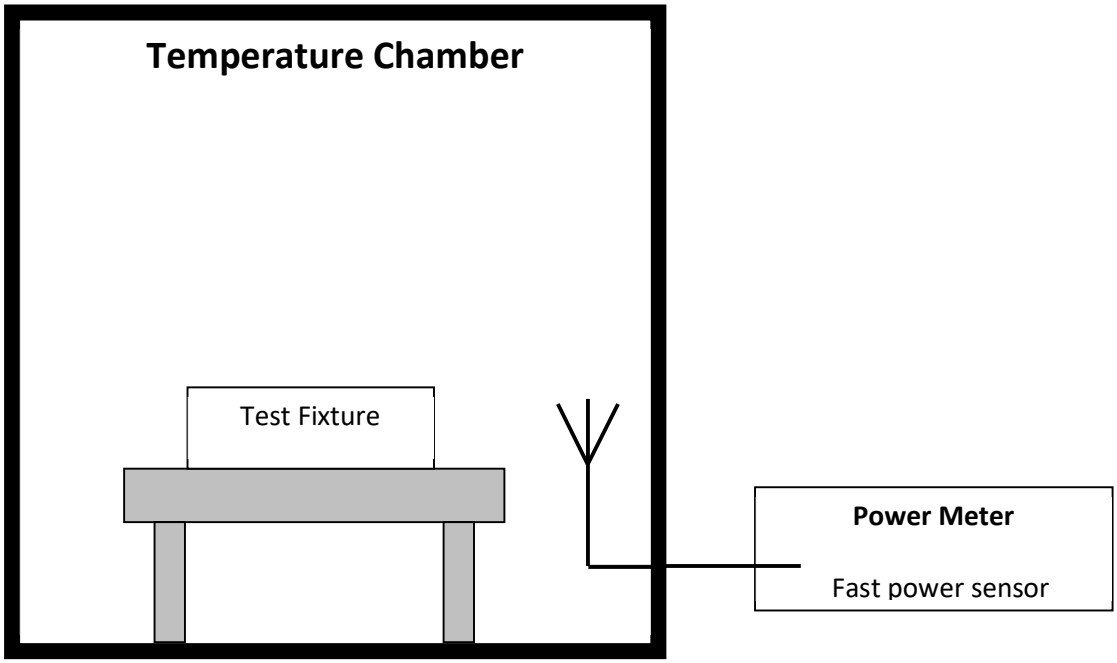
Step one



Step two



Step three



3.3 Test Conditions and Test Method

The measurements for RF output power shall be performed at both normal environmental conditions and at the extremes of the operating temperature range.

In case of Adaptive equipment, the equipment shall be operated under its worst case configuration w.r.t. RF output power. In case of non-Adaptive equipment, the equipment shall be operated under its worst case configuration w.r.t. Medium Utilization factor.

For FHSS equipment, the measurements shall be performed during normal operation (hopping) and the equipment is assumed to have no blacklisted frequencies (operating on all hopping frequencies).

For non-FHSS equipment, the measurement shall be performed at the lowest, the middle, and the highest channel on which the equipment can operate. These frequencies shall be recorded.

☒ For conducted method

The EUT was connected to the power meter directly. Please refer to EN 300 328 Clause 5.4.2.2.1 for test method.

☐ For radiated method

The measurement was applied in a semi-anechoic chamber. Please refer to EN 300 328 Clause 5.4.2.2.2 and for test method.

3.4 Test Result

Mode	Channel	Condition	EIRP (dBm)	Limit (dBm)	Pass/Fail
BLE_1M	L	Tnom	3.76	20	Pass
		Tmin	3.64		
		Tmax	3.71		
	M	Tnom	3.43	20	Pass
		Tmin	3.38		
		Tmax	3.42		
	H	Tnom	4.62	20	Pass
		Tmin	4.56		
		Tmax	4.59		

Mode	Channel	Condition	EIRP (dBm)	Limit (dBm)	Pass/Fail
BLE_2M	L	Tnom	9.21	20	Pass
		Tmin	9.15		
		Tmax	9.20		
	M	Tnom	8.46	20	Pass
		Tmin	8.44		
		Tmax	8.37		
	H	Tnom	7.15	20	Pass
		Tmin	7.13		
		Tmax	7.09		

4 Power Spectral Density

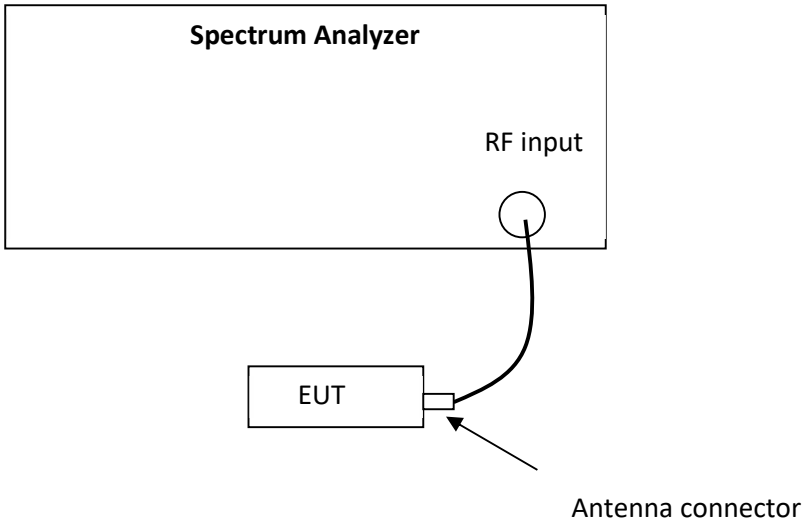
Test result: Pass

4.1 Limit

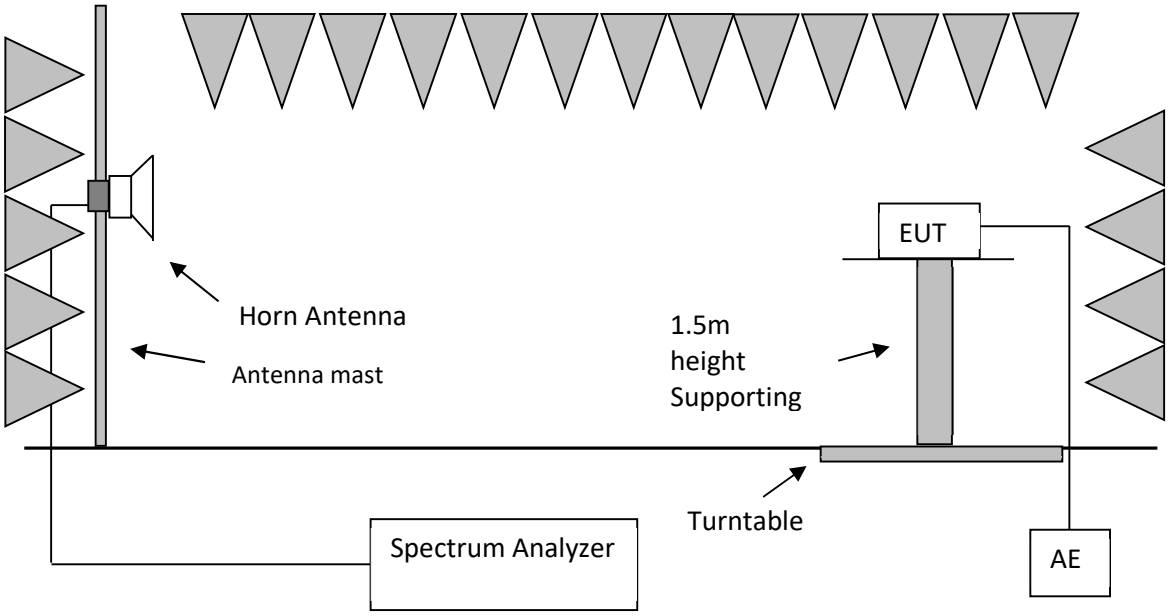
The maximum Power Spectral Density for non-FHSS equipment is 10 dBm per MHz.

4.2 Block Diagram of Test Setup

4.2.1 For conducted method



4.2.2 For radiated method



4.3 Test Conditions and Test Method

These measurements shall only be performed at normal test conditions.

The measurement shall be repeated for the equipment being configured to operate at the lowest, the middle, and the highest frequency of the stated frequency range. These frequencies shall be recorded.

☒ For conducted method

The EUT was connected to the spectrum analyzer directly. Please refer to EN 300 328 Clause 5.4.3.2.1 for test method.

☐ For radiated method

The measurement was applied in a semi-anechoic chamber. Please refer to EN 300 328 Clause 5.4.3.2.2 for test method.

4.4 Test Result

Mode	Channel	Power Density (dBm/MHz)	Limit (dBm/MHz)	Pass/Fail
BLE_1M	L	3.56	10	Pass
	M	3.23	10	Pass
	H	4.41	10	Pass

Mode	Channel	Power Density (dBm/MHz)	Limit (dBm/MHz)	Pass/Fail
BLE_2M	L	8.84	10	Pass
	M	8.05	10	Pass
	H	6.71	10	Pass

5 Duty Cycle, Tx-sequence, Tx-gap

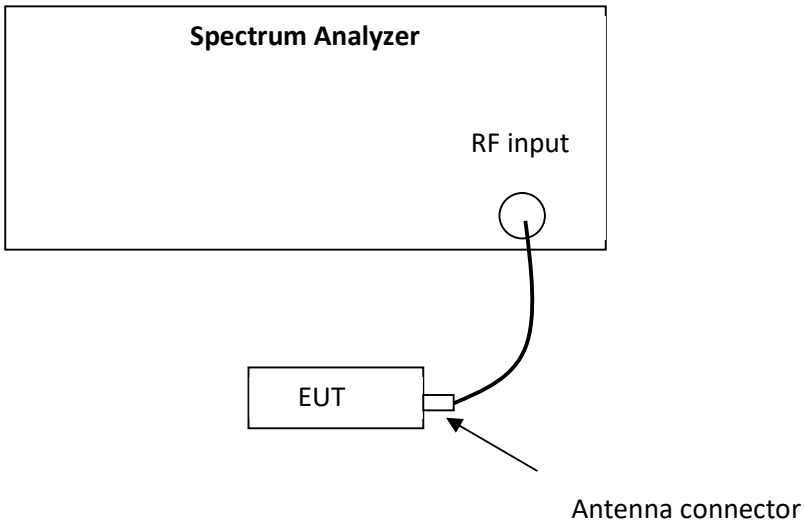
Test result: NA

5.1 Limit

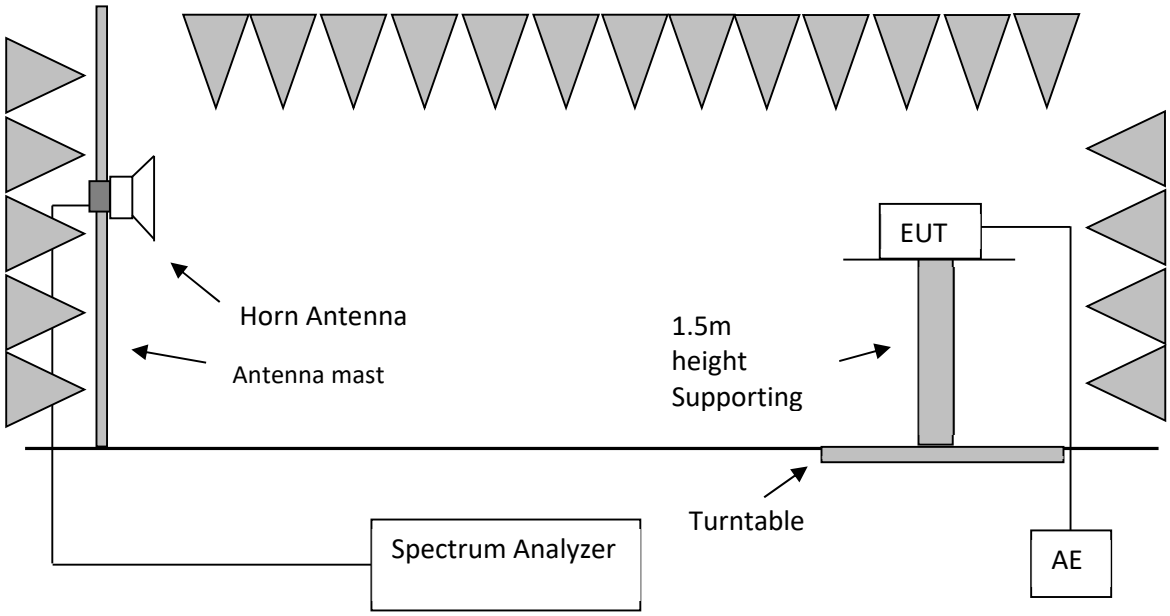
Mode	Maximum Duty Cycle (%)	Maximum Tx-sequence (ms)	Minimum Tx-gap (ms)
Non-adaptive	100	10	3.5
Note: 1. The limit for maximum duty cycle is declared by the applicant. 2. This test is not applied to the device / mode with EIRP less than 10dBm.			

5.2 Block Diagram of Test Setup

5.2.1 For conducted method



5.2.2 For radiated method



5.3 Test Conditions and Test Method

These measurements shall only be performed at normal test conditions.

In case of Adaptive equipment, the equipment shall be operated under its worst case configuration w.r.t. RF output power.

In case of non-Adaptive equipment, the equipment shall be operated under its worst case configuration w.r.t. Medium Utilization factor.

For FHSS equipment, the measurements shall be performed during normal operation (hopping) and the equipment is assumed to have no blacklisted frequencies (operating on all hopping frequencies).

For non-FHSS equipment, the measurement shall be performed at the lowest, the middle, and the highest channel on which the equipment can operate. These frequencies shall be recorded.

☐ For conducted method

The EUT was connected to the power meter directly. Please refer to EN 300 328 Clause 5.4.2.2.1 for test method.

☐ For radiated method

The measurement was applied in a semi-anechoic chamber. Please refer to EN 300 328 Clause 5.4.2.2.2 and for test method.

5.4 Test Result

Maximum Duty Cycle			
Channel	Observed value (%)	Limit (%)	Pass/Fail
L		100	
M			
H			

Maximum Tx-sequence			
Channel	Observed value (ms)	Limit (ms)	Pass/Fail
L		10	
M			
H			

Minimum Tx-gap			
Channel	Observed value (ms)	Limit (ms)	Pass/Fail
L		3.5	
M			
H			

6 Medium Utilisation (MU) factor

Test result: NA

6.1 Limit

Mode	Maximum MU factor (%)
Non-adaptive	10
Note: this requirement does not apply for non-FHSS equipment with a maximum declared RF Output power level of less than 10 dBm e.i.r.p. or for non-FHSS equipment when operating in a mode where the RF Output power is less than 10 dBm e.i.r.p.	

6.2 Calculation Procedure

MU factor = (RF output power / 100 mW) * Duty Cycle

6.3 Test Result

MU factor			
Channel	Calculated value (%)	Limit (%)	Pass/Fail
L		≤ 10	
M			
H			

7 Occupied Channel Bandwidth

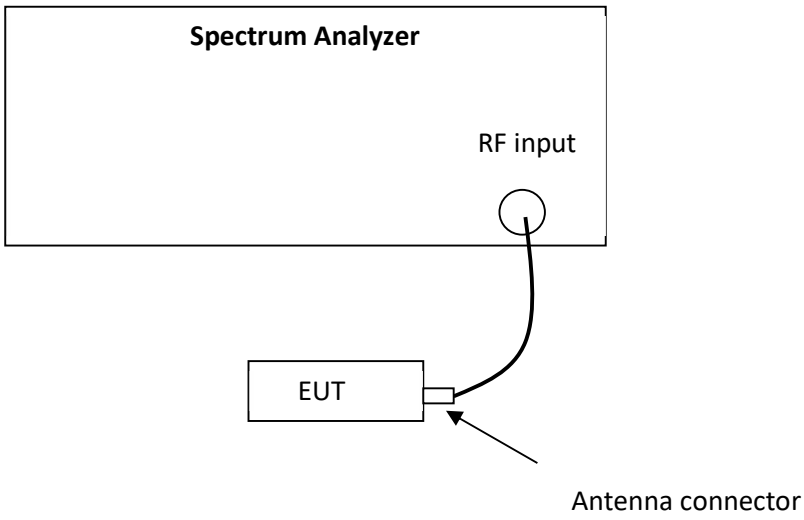
Test result: Pass

7.1 Limit

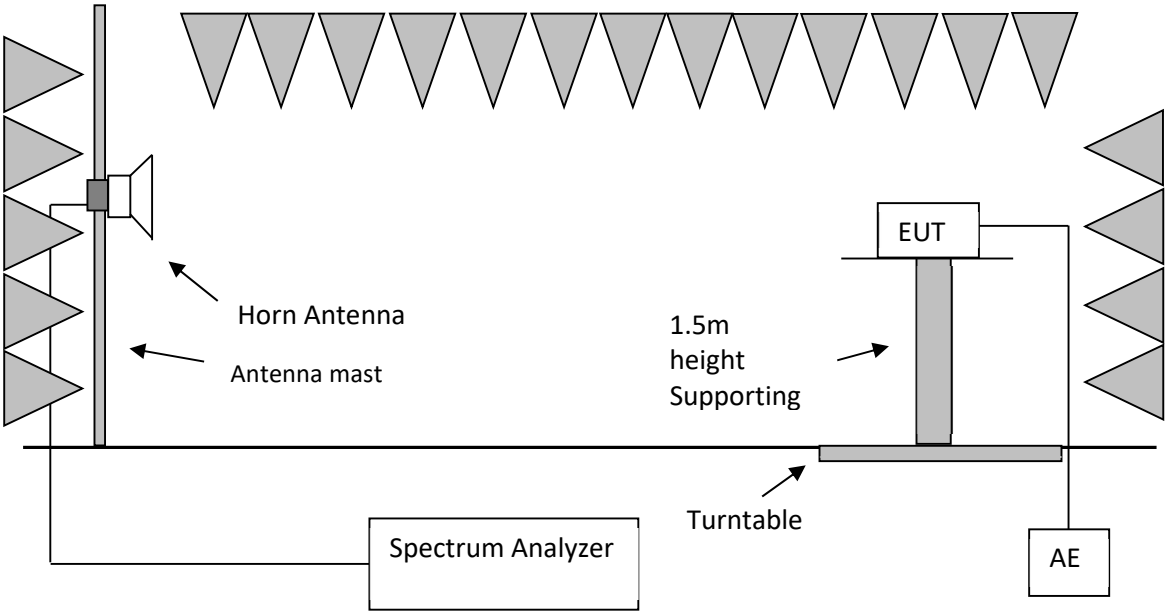
☒ Occupied channel Bandwidth shall fall within the band 2400-2483.50MHz.
☐ For non-adaptive non-FHSS equipment with e.i.r.p. greater than 10 dBm, the Occupied Channel Bandwidth shall be equal to or less than 20 MHz.

7.2 Block Diagram of Test Setup

7.2.1 For conducted method



7.2.2 For radiated method



7.3 Test Conditions and Test Method

These measurements shall only be performed at normal test conditions.

In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains) measurements need only to be performed on one of the active transmit chains (antenna outputs).

For FHSS equipment having overlapping channels, special software might be required to force the UUT to hop or transmit on a single Hopping Frequency.

The measurement shall be performed only on the lowest and the highest frequency within the stated frequency range. The frequencies on which the tests were performed shall be recorded.

If the equipment can operate with different Nominal Channel Bandwidths (e.g. 20 MHz and 40 MHz), then each channel bandwidth shall be tested separately.

☒ For conducted method

The EUT was connected to the spectrum analyzer directly. Please refer to EN 300 328 Clause 5.4.7.2.1 for test method.

☐ For radiated method

The measurement was applied in a semi-anechoic chamber. Please refer to EN 300 328 Clause 5.4.7.2.2 and for test method.

7.4 Test Result

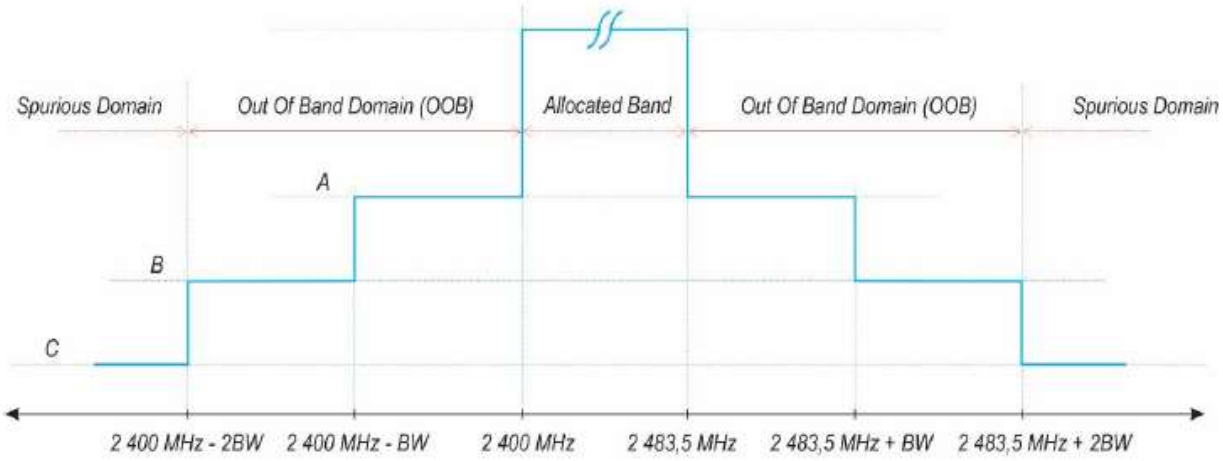
Mode	Channel	99% Bandwidth (MHz)	F_L at 99% BW (MHz)	F_H at 99% BW (MHz)	Limit (MHz)	Pass/Fail
BLE_1M	L	1.0442	2401.4458	2402.4900	2400 to 2483.5	Pass
	H	1.0439	2479.4462	2480.4901		Pass

Mode	Channel	99% Bandwidth (MHz)	F_L at 99% BW (MHz)	F_H at 99% BW (MHz)	Limit (MHz)	Pass/Fail
BLE_2M	L	2.0437	2400.9455	2402.9892	2400 to 2483.5	Pass
	H	2.0438	2478.9432	2480.9870		Pass

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

Test result: Pass

8.1 Limit

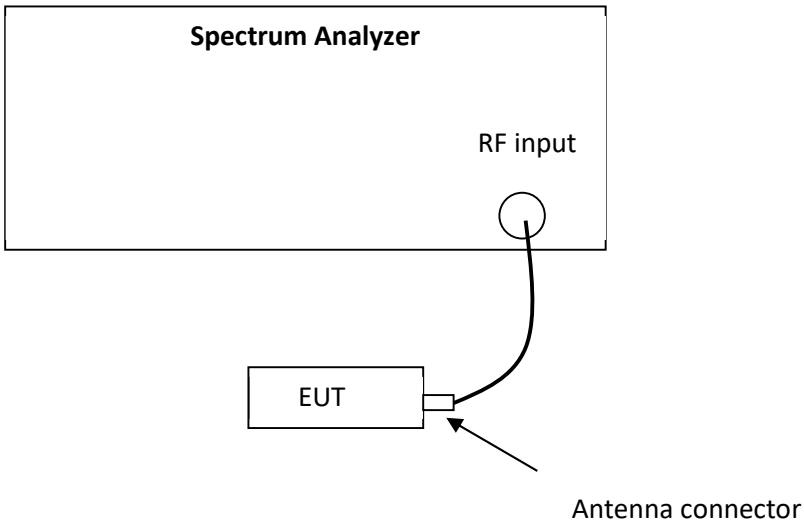


A: -10 dBm/MHz e.i.r.p.
B: -20 dBm/MHz e.i.r.p.
C: Spurious Domain limits

BW = Occupied Channel Bandwidth in MHz or 1 MHz whichever is greater

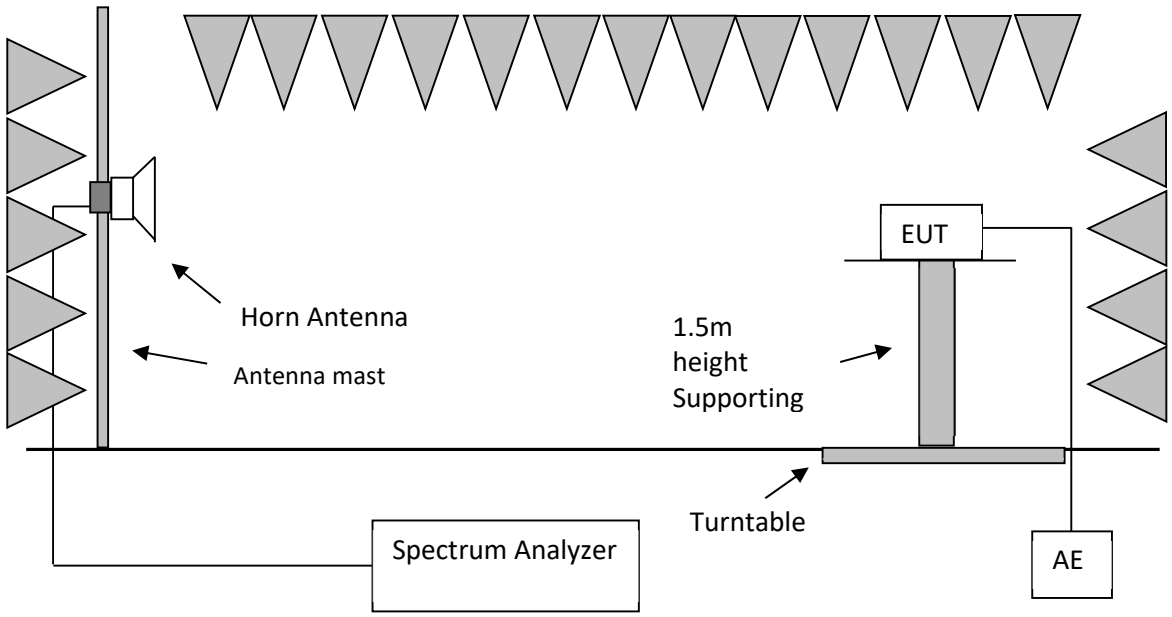
8.2 Block Diagram of Test Setup

8.2.1 For conducted method

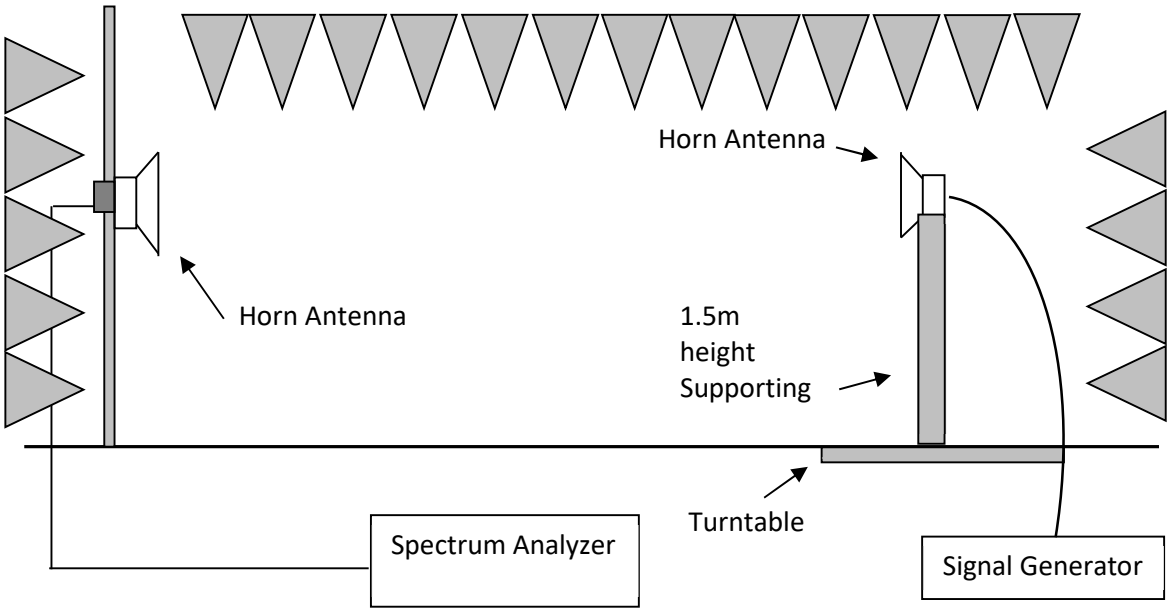


8.2.2 For radiated method

Step one



Step two



8.3 Test Conditions and Test Method

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.

☒ For conducted method

The EUT was connected to the spectrum analyzer directly. Please refer to EN 300 328 Clause 5.4.8.2.1 for test method.

☐ For radiated method

The measurement was applied in a semi-anechoic chamber. Please refer to EN 300 328 Clause 5.4.8.2.2 for test method.

8.4 Test Result

Mode	Channel	Out-of-band emission			
		Test Frequency (MHz)	OOB Emission (dBm/MHz)	Limit (dBm/MHz)	Pass/Fail
BLE_1M	L	2400-BW ~ 2400	-50.12	-10	Pass
		2400-2BW ~ 2400-BW	-51.99	-20	Pass
	H	2483.5 ~ 2483.5+BW	-51.90	-10	Pass
		2483.5+BW ~ 2483.5+2*BW	-52.70	-20	Pass

Mode	Channel	Out-of-band emission			
		Test Frequency (MHz)	OOB Emission (dBm/MHz)	Limit (dBm/MHz)	Pass/Fail
BLE_2M	L	2400-BW ~ 2400	-45.90	-10	Pass
		2400-2BW ~ 2400-BW	-49.23	-20	Pass
	H	2483.5 ~ 2483.5+BW	-49.78	-10	Pass
		2483.5+BW ~ 2483.5+2*BW	-51.47	-20	Pass

9 Transmitter unwanted emissions in the spurious domain

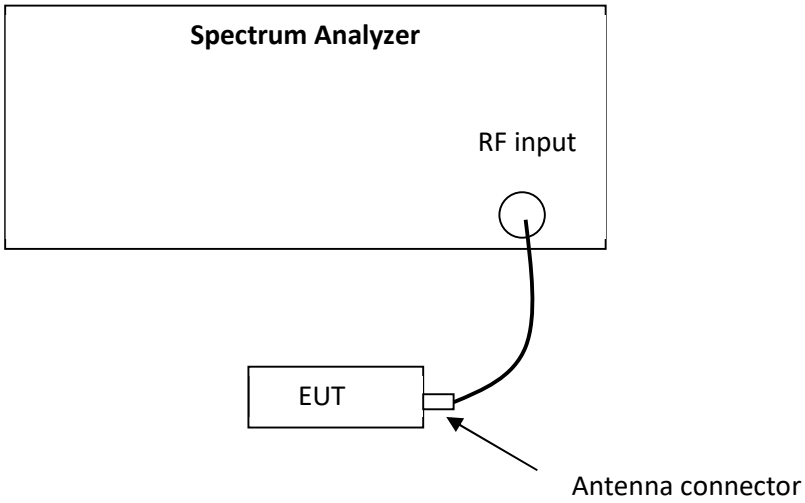
Test result: Pass

9.1 Limit

Frequency range	Maximum power, e.r.p. (≤1 GHz) e.i.r.p. (> 1 GHz)	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47MHz to 74MHz	-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

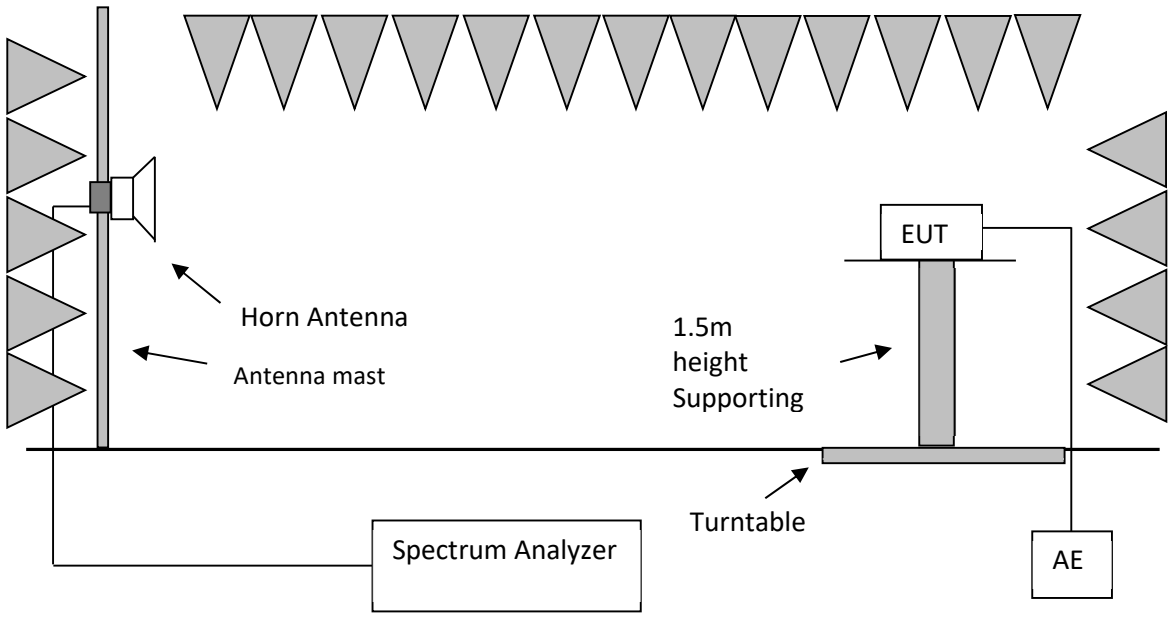
9.2 Block Diagram of Test Setup

9.2.1 For conducted method

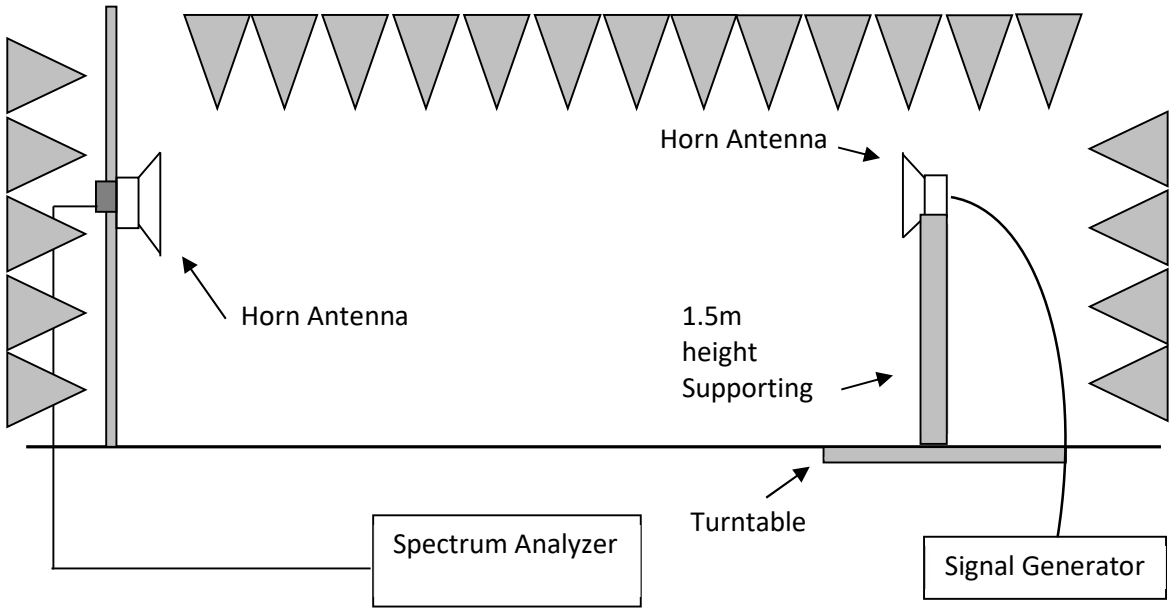


9.2.2 For radiated method

Step one



Step two



Note: for frequency lower than the 1GHz, the horn antennas among the two block diagrams above should be replaced with dipole antennas (or other antennas provided they can be referenced to a dipole).

9.3 Test Conditions and Test Method

These measurements shall only be performed at normal test conditions.

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.

☐ For conducted method

The EUT was connected to the spectrum analyzer directly. Please refer to EN 300 328 Clause 5.4.9.2.1 for test method.

☒ For radiated method

The measurement was applied in a semi-anechoic chamber. Please refer to EN 300 328 Clause 5.4.9.2.2 for test method.

9.4 Test Result

All the modes were pretested and the mode BLE_1M was the worst, the data of BLE_1M was listed in the report.

Channel	Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization	Pass/Fail
L	33.88	-58.60	-36.00	22.60	H	Pass
	57.21	-77.30	-54.00	23.30	H	Pass
	103.86	-74.50	-54.00	20.50	H	Pass
	541.24	-73.80	-54.00	19.80	H	Pass
	2130.68	-63.30	-30.00	33.30	H	Pass
	4768.32	-56.70	-30.00	26.70	H	Pass
	88.31	-78.90	-54.00	24.90	V	Pass
	280.76	-77.00	-36.00	41.00	V	Pass
	601.50	-70.70	-54.00	16.70	V	Pass
	620.94	-72.30	-54.00	18.30	V	Pass
	2342.13	-64.60	-30.00	34.60	V	Pass
	4673.75	-56.90	-30.00	26.90	V	Pass
H	37.77	-68.90	-36.00	32.90	H	Pass
	59.15	-74.80	-54.00	20.80	H	Pass
	107.75	-75.40	-54.00	21.40	H	Pass
	611.22	-71.90	-54.00	17.90	H	Pass
	2201.84	-63.40	-30.00	33.40	H	Pass
	4815.42	-41.00	-30.00	11.00	H	Pass
	105.81	-76.40	-54.00	22.40	V	Pass
	362.40	-72.40	-36.00	36.40	V	Pass
	617.05	-71.60	-54.00	17.60	V	Pass
	797.83	-70.70	-36.00	34.70	V	Pass
	2413.27	-60.10	-30.00	30.10	V	Pass
	4838.19	-51.30	-30.00	21.30	V	Pass

10 Adaptivity (non-FHSS)

Result: **NA**

10.1 Limit

☐ For non-FHSS equipment using DAA mechanism, please refer to EN 300 328 clause 4.3.2.6.2;
☐ For Frame Based Equipment, please refer to EN 300 328 clause 4.3.2.6.3.2.2;
☐ For Load Based Equipment, please refer to EN 300 328 clause 4.3.2.6.3.2.3;
☐ For Short Control Signaling Transmissions, please refer to EN 300 328 clause 4.3.2.6.4

Unwanted signal parameters			
Equipment Type	Wanted signal mean power from companion device (dBm)	Unwanted signal frequency (MHz)	Unwanted CW signal power (dBm)
DAA	-30 (see note 2)	2395 or 2488,5 (see note 1)	-35 (see note 2)

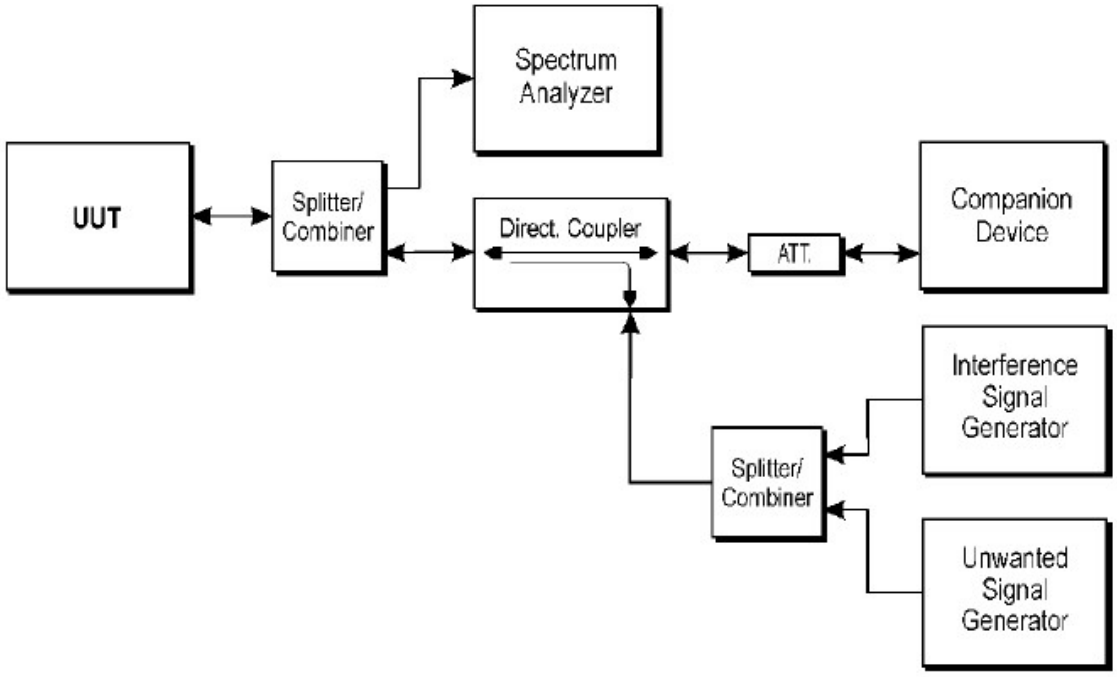
NOTE 1: The highest frequency shall be used for testing operating channels within the range 2 400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483,5 MHz.
NOTE 2: The level specified is the level at the UUT receiver input assuming 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.

Equipment Type	Wanted signal mean power from companion device	Unwanted signal frequency (MHz)	Unwanted CW signal power (dBm)
LBT	sufficient to maintain the link (see note 2)	2395 or 2488,5 (see note 1)	-35 (see note 3)

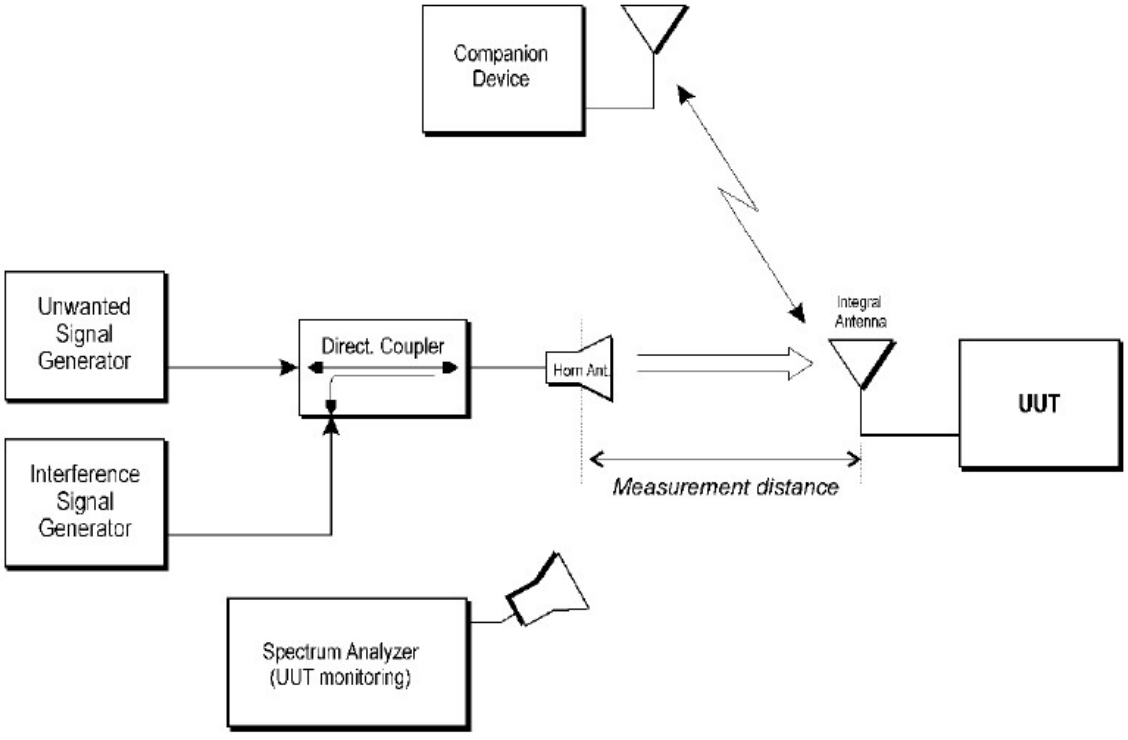
NOTE 1: The highest frequency shall be used for testing operating channels within the range 2 400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483,5 MHz.
NOTE 2: A typical conducted value which can be used in most cases is -50 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.

10.2 Block Diagram of Test Setup

10.2.1 For conducted method



10.2.2 For radiated method



10.3 Test Conditions and Test Method

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. In case of FHSS equipment, it shall be ensured that none of the test frequencies are blacklisted, otherwise another test frequency shall be selected.

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.

☐ For conducted method

The EUT was connected to the spectrum analyzer directly. Please refer to EN 300 328 Clause 5.4.6.2.1 for test method.

☐ For radiated method

The measurement was applied in a semi-anechoic chamber. Please refer to EN 300 328 Clause 5.4.6.2.2 for test method.

10.4 Test Result

None

11 Receiver Blocking

Result: **Pass**

11.1 Limit

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		

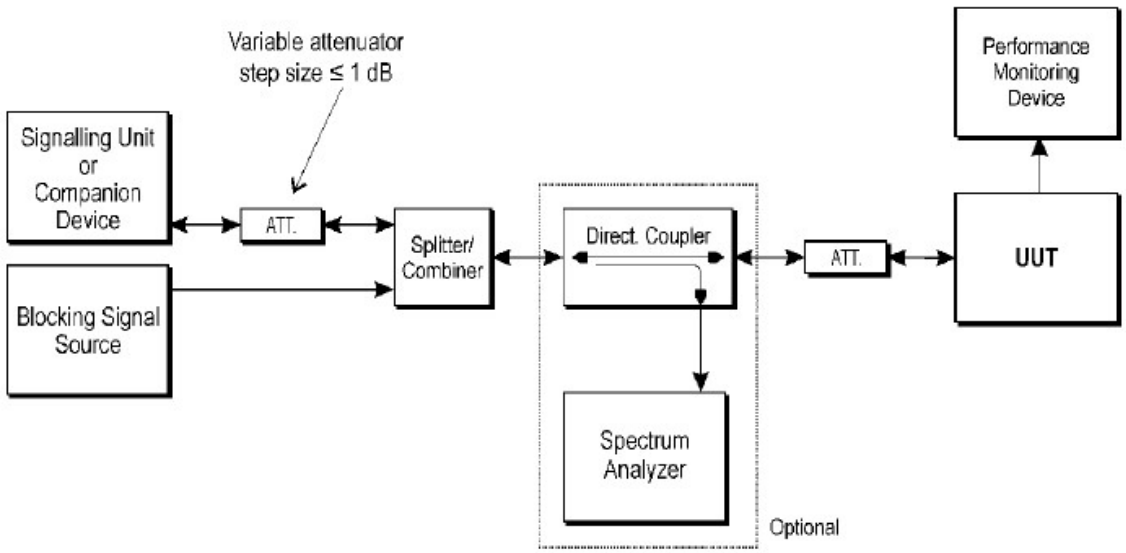
NOTE 1: OCBW is in Hz.
NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 26 dB where Pmin is the minimum level of wanted signal required 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 Pmin + 20 dB where Pmin 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 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 Pmin + 26 dB where Pmin 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.			

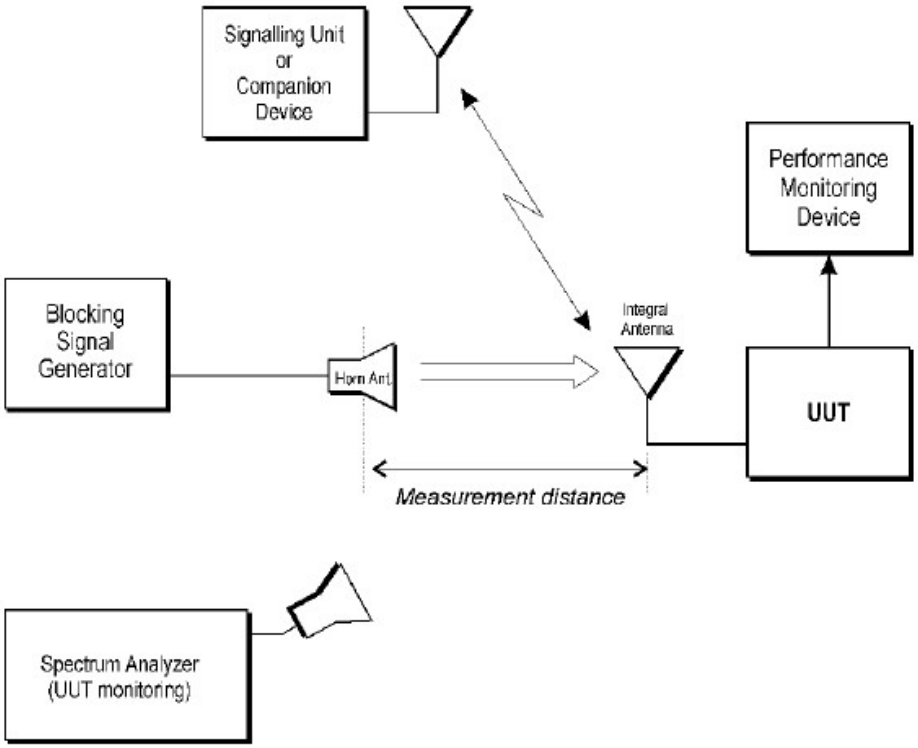
Receiver Category 3 Equipment			
Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm) (See note 3)	Type of blocking signal
(-139 dBm + 10 × $\log_{10}$(OCBW) + 20 dB) or (-74 dBm + 20 dB) whichever is less (see note 2)	2 380 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 Pmin + 30 dB where Pmin 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.			

11.2 Block Diagram of Test Setup

11.2.1 For conducted method



11.2.2 For radiated method



11.3 Test Conditions and Test Method

These measurements shall only be performed at normal test conditions.

For non-FHSS equipment, having more than one operating channel, the operating channels on which the testing has to be performed shall be selected as follows:

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

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

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

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

☒ For conducted method

The EUT was connected to the spectrum analyzer directly. Please refer to EN 300 328 Clause 5.4.11.2.1 for test method.

☐ For radiated method

The measurement was applied in a semi-anechoic chamber. Please refer to EN 300 328 Clause 5.4.11.2.2 for test method.

11.4 Test Result

Mode	Channel	Wanted Signal mean power from companion device (dBm)	Blocking signal (MHz)	Blocking signal power (dBm)	PER (%)	Pass/Fail
BLE_1M	L	-68.81	2 380 2 300	-30.04	2.28 2.42	Pass
	H	-68.81	2 504 2 584	-30.04	2.23 2.25	Pass

Note 1: OCBW is in Hz.
Note 2: The Performance Criteria is based on the PER less than or equal to 10 %.
Note 3: For the conducted measurements, the actual blocking signal power = blocking signal power + Antenna Gain

Mode	Channel	Wanted Signal mean power from companion device (dBm)	Blocking signal (MHz)	Blocking signal power (dBm)	PER (%)	Pass/Fail
BLE_2M	L	-65.89	2 380 2 300	-30.04	2.71 2.55	Pass
	H	-65.89	2 504 2 584	-30.04	2.87 2.76	Pass

Note 1: OCBW is in Hz.
Note 2: The Performance Criteria is based on the PER less than or equal to 10 %.
Note 3: For the conducted measurements, the actual blocking signal power = blocking signal power + Antenna Gain

12 Receiver spurious emission

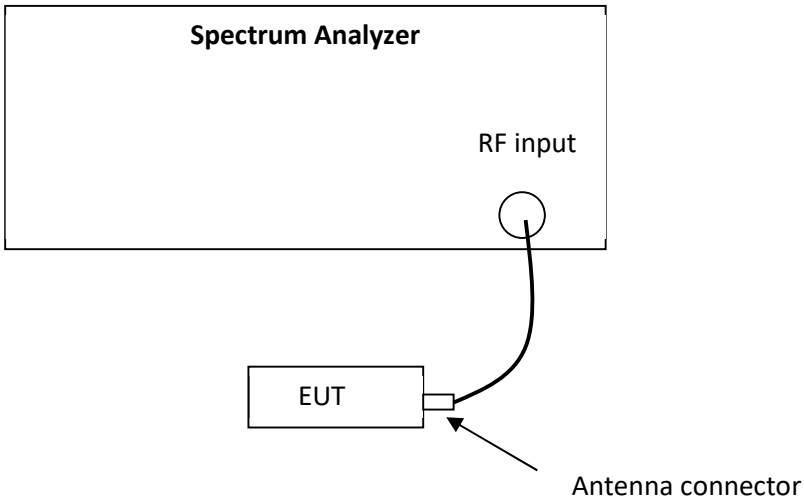
Test result: Pass

12.1 Limit

Frequency range	Maximum power, e.r.p. (≤1 GHz) e.i.r.p. (> 1 GHz)	Bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 12,75 GHz	-47 dBm	1 MHz

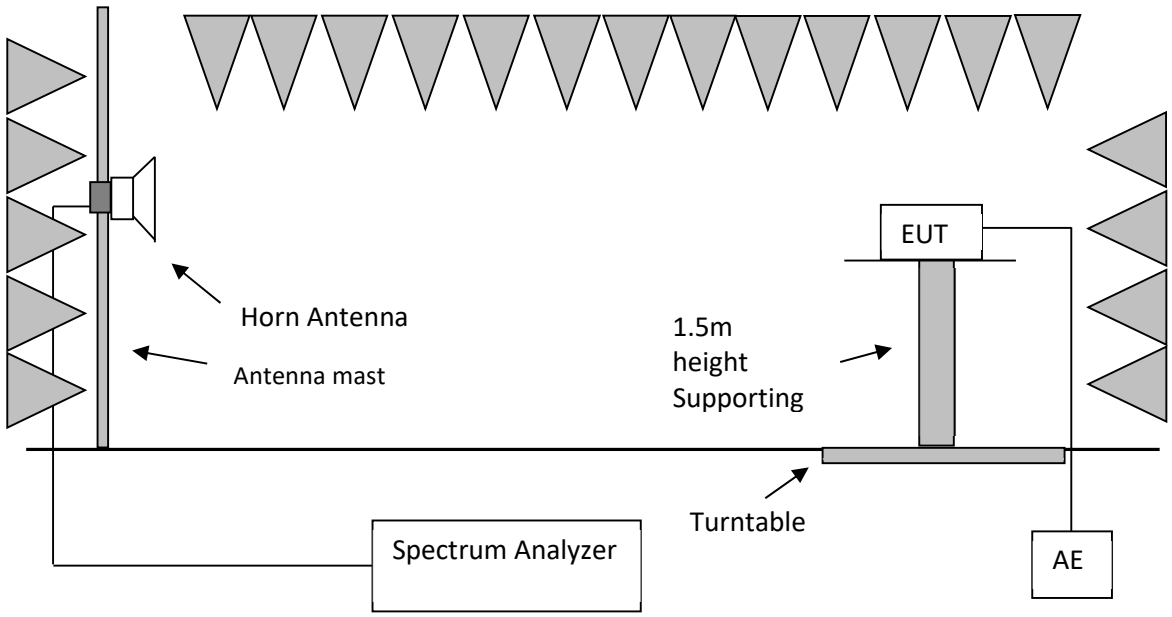
12.2 Block Diagram of Test Setup

12.2.1 For conducted method

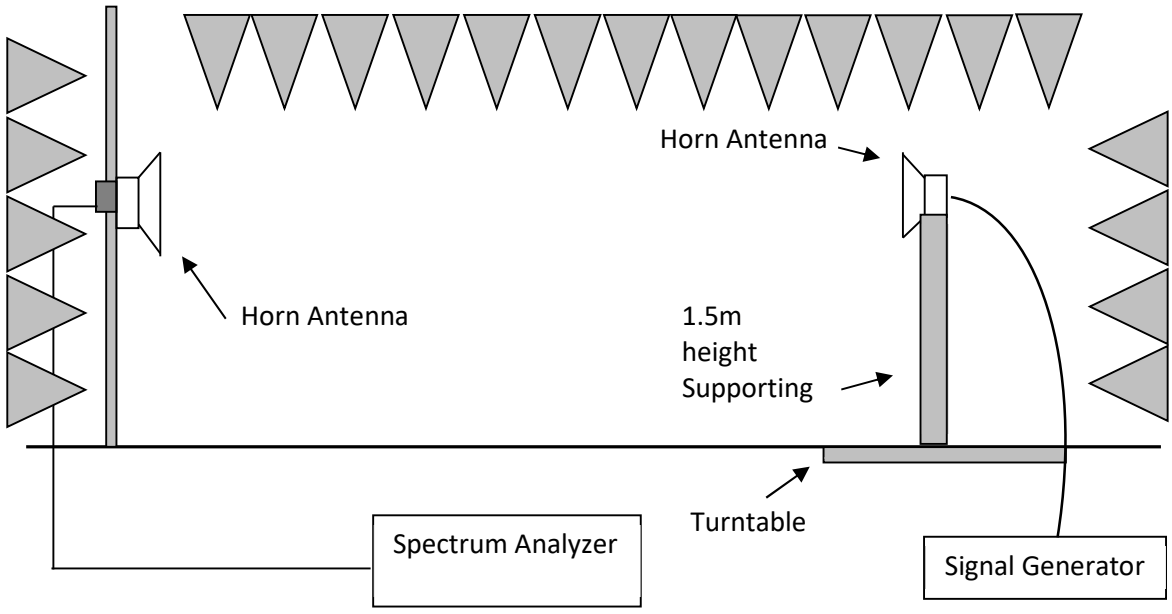


12.2.2 For radiated method

Step one



Step two



Note: for frequency lower than the 1GHz, the horn antennas among the two block diagrams above should be replaced with dipole antennas (or other antennas provided they can be referenced to a dipole).

12.3 Test Conditions and Test Method

These measurements shall only be performed at normal test conditions.

Testing shall be performed when the equipment is in a receive-only mode.

For non-FHSS equipment, the measurement shall be performed at the lowest and the highest channel on which the equipment can operate. These frequencies shall be recorded.

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. These frequencies shall be recorded. When disabling the normal hopping is not possible, the measurement shall be performed during normal operation (hopping).

☐ For conducted method

The EUT was connected to the spectrum analyzer directly. Please refer to EN 300 328 Clause 5.4.10.2.1 for test procedure.

☒ For radiated method

The measurement was applied in a semi-anechoic chamber. Please refer to EN 300 328 Clause 5.4.10.2.2 for test procedure.

12.4 Test protocol

All the modes were pretested and the mode BLE_1M was the worst, the data of BLE_1M was listed in the report.

Channel	Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Antenna Polarization	Pass/Fail
L	≤ 1GHz	< -67.00	-57.00	H	Pass
	≤ 1GHz	< -67.00	-57.00	V	Pass
	> 1GHz	< -57.00	-47.00	H	Pass
	> 1GHz	< -57.00	-47.00	V	Pass
H	> 1GHz	< -57.00	-47.00	H	Pass
	> 1GHz	< -57.00	-47.00	V	Pass
	≤ 1GHz	< -67.00	-57.00	H	Pass
	≤ 1GHz	< -67.00	-57.00	V	Pass

13 Geo-location capability

Test result: NA

13.1 Applicability

This requirement only applies to non-FHSS equipment with geo-location capability.

13.2 Requirements

The geographical location determined by the non-FHSS equipment shall not be accessible to the user in a way that would allow the user to alter it.

13.3 Description

This device doesn't support this capability declared by the manufacturer.

Appendix I: Photograph of equipment under test

More detail refer to 220500957HZH-003

********** END **********