TEST REPORT

Applicant:	Shenzhen Hohem Technology Co., Ltd.
Address:	B106, Building 2, jiuxianglin industrial park, 4227 Xili lake road, Xili street, Nanshan, Shenzhen city Guangdong, China
Equipment Type:	iSteady V3 AI Tracking Smartphone Gimbal, iSteady X3 3-Axis Smartphone Gimbal, iSteady X3 SE 3-Axis Smartphone Gimbal
Model Name:	HPG-V3 (refer to section 2.3)
Brand Name:	hohem
Test Standard:	ETSI EN 300 328 V2.2.2 (2019-07)
Sample Arrival Date:	Apr. 02, 2024
Test Date:	Apr. 07, 2024 - May 31, 2024
Date of Issue:	Sep. 12, 2024

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Julie Zhu **Checked by:** Ye Hongji **Approved by:** Sunny Zou (Technical Director)

Revision History

Version	Issue Date	Revisions
Rev. 01	Sep. 12, 2024	Initial Issue

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1 GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	☑ Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
	☐ 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Shenzhen Hohem Technology Co., Ltd.
Address	B106, Building 2, jiuxianglin industrial park, 4227 Xili lake road, Xili street, Nanshan, Shenzhen city Guangdong, China

2.2 Manufacturer Information

Manufacturer	Shenzhen Hohem Technology Co., Ltd.
Address	B106, Building 2, jiuxianglin industrial park, 4227 Xili lake road, Xili street, Nanshan, Shenzhen city Guangdong, China

2.3 General Description for Equipment under Test (EUT)

EUT Name	iSteady V3 AI Tracking Smartphone Gimbal, iSteady X3 3-Axis Smartphone Gimbal, iSteady X3 SE 3-Axis Smartphone Gimbal
Model Name Under Test	HPG-V3
Series Model Name	HPG-X3P, HPG-X3 SE
Description of Model name differentiation	1. Model HPG-X3 SE without related accessories (fill light, stand, telescopic rod), change the battery; 2. Model HPG-X3P changed the battery. (this information provided by the applicant)
Hardware Version	N/A
Software Version	N/A
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.4 Technical Information

EUT Type	Stand-alone equipment
Network and Wireless connectivity	Bluetooth (BLE)

The requirement for the following technical information of the EUT was tested in this report:

Modulation Technology	Bluetooth Low Energy: Wide band modulations other than FHSS
Modulation Type	Bluetooth Low Energy: GFSK
Transfer Rate	BLE: 1 Mbps BLE: 2 Mbps
Frequency Range	The frequency range used is 2402 MHz – 2480 MHz; The frequency block is 2400 MHz to 2483.5 MHz.
Number of channel	Bluetooth Low Energy: 40 (at intervals of 2 MHz) Note 1
Tested Channel	Bluetooth Low Energy: 1 Mbps: 0 (2402 MHz), 19 (2440 MHz), 39 (2480 MHz) 2 Mbps: 1 (2404 MHz), 19 (2440 MHz), 38 (2478 MHz)
Nominal Channel Bandwidth	1 MHz, 2 MHz
Antenna Type	PCB Antenna
Antenna Gain	-3.82 dBi (In test items related to antenna gain, the final results reflect this figure. This value is provided by the applicant.)
Beamforming Gain	N/A
Adaptive or Non-Adaptive	Adaptive
LBT Based	Non-LBT
The Max RF Output power	Bluetooth Low Energy: -5.8 dBm
Receiver Category	Bluetooth Low Energy: 3
Note 1: 2 Mbps does not support Channel 0, Channel 12, and Channel 39.	

Description	Modulation Type (BLE)	Transfer Rate (BLE)
Transmitter Parameters		
RF output power	GFSK	1 Mbps, 2 Mbps
Power Spectral Density	GFSK	1 Mbps, 2 Mbps
Duty Cycle, Tx-sequence, Tx-gap	N/A	N/A
Accumulated Transmit Time, Frequency Occupation and Hopping Sequence	N/A	N/A
Hopping Frequency Separation	N/A	N/A
Medium Utilization (MU) factor	N/A	N/A
Adaptivity	--	N/A
Occupied Channel Bandwidth	GFSK	1 Mbps, 2 Mbps
Transmitter unwanted emissions in the out-of-band domain	GFSK	1 Mbps, 2 Mbps
Transmitter unwanted emissions in the spurious domain	GFSK	1 Mbps, 2 Mbps
Receiver Parameters		
Receiver spurious emissions	GFSK	1 Mbps, 2 Mbps
Receiver Blocking	GFSK	1 Mbps
Other Parameters		
Geo-location capability	N/A	N/A

3 SUMMARY OF TEST RESULTS

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

No.	Identity	Document Title
1	ETSI EN 300 328 V2.2.2 (2019-07)	Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz band; Harmonised Standard for access to radio spectrum

Test items and the results are as follows:

Report Section	Standard Rule	Description	Channel (BLE)	Test Result	Verdict	Remark
Transmitter Parameters						
5.1.1	4.3.1.2 4.3.2.2	RF output power	Low/Middle/High	ANNEX A.1	Pass	Note [8]
5.1.2	4.3.2.3	Power Spectral Density	Low/Middle/High	ANNEX A.2	Pass	Note [4]
5.1.3	4.3.1.3 4.3.2.4	Duty Cycle, Tx-sequence, Tx-gap	N/A	ANNEX A.3	N/A	Note [2] Note [7]
5.1.4	4.3.1.4	Accumulated Transmit Time, Frequency Occupation and Hopping Sequence	N/A	ANNEX A.4	N/A	Note [5]
5.1.5	4.3.1.5	Hopping Frequency Separation	N/A	ANNEX A.5	N/A	Note [5]
5.1.6	4.3.1.6 4.3.2.5	Medium Utilization (MU) factor	N/A	ANNEX A.6	N/A	Note [2] Note [7]
5.1.7	4.3.1.7 4.3.2.6	Adaptivity	N/A	ANNEX A.7	N/A	Note [2] Note [3]
5.1.8	4.3.1.8 4.3.2.7	Occupied Channel Bandwidth	Low/High	ANNEX A.8	Pass	Note [8]
5.1.9	4.3.1.9 4.3.2.8	Transmitter unwanted emissions in the out-of-band domain	Low/High	ANNEX A.9	Pass	Note [8]
5.1.10	4.3.1.10 4.3.2.9	Transmitter unwanted emissions in the spurious domain	Low/High	ANNEX A.10	Pass	Note [8]
Receiver Parameters						
5.2.1	4.2.3.2	Receiver categories	--	--	--	--
5.2.2	4.3.1.11 4.3.2.10	Receiver spurious emissions	Low/High	ANNEX A.11	Pass	Note [8]
5.2.3	4.3.1.12 4.3.2.11	Receiver Blocking	Low/High	ANNEX A.12	Pass	Note [8]
Other Parameters						
5.3.1	4.3.1.13 4.3.2.12	Geo-location capability	N/A	N/A	N/A	Note [6]

Note [1]: This requirement does not apply to adaptive equipment unless operating in a non-adaptive mode.
Note [2]: This test doesn't apply for the EUT which has the RF Output power is less than 10 dBm e.i.r.p.
Note [3]: This requirement does not apply to non-adaptive equipment or adaptive equipment operating in a non-adaptive mode.
Note [4]: This requirement apply to the equipment is using wide band modulations other than FHSS.
Note [5]: This requirement apply to the equipment is using FHSS.
Note [6]: This requirement does not apply to devices that do not support Geo-location capability.
Note [7]: These requirements apply to non-adaptive frequency hopping equipment or to adaptive frequency hopping equipment operating in a non-adaptive mode.
Note [8]: Compared with the EUT of test report BL-SZ2431032-601, the EUT of this report shows different things as below:

1. Added the model name (HPG-V3P, HPG-V3 SE) and the EUT name (iSteady X3 3-Axis Smartphone Gimbal, iSteady X3 SE 3-Axis Smartphone Gimbal);
2. Model HPG-X3 SE without related accessories (fill light, stand, telescopic rod), change the battery;
3. Model HPG-X3P changed the battery.

Other hardware circuit and software are the same as EUT referred to in test report BL-SZ2431032-601.
Therefore, in addition to the above differences, all test data and EUT information are derived from the report BL-SZ2431032-601 published by Shenzhen BALUN Technology Co., Ltd. on Jun. 13, 2024.

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

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

Relative Humidity	51% to 70%	
Atmospheric Pressure	98 kPa to 102 kPa	
Temperature	NT (Normal Temperature)	+20.0℃ to +24.1℃
	LT (Low Temperature)	+10.0℃
	HT (High Temperature)	+45.0℃
Working Voltage of the EUT	NV (Normal Voltage)	7.4 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-40	101544	2023.12.27	2024.12.26
Vector Signal Generator	ROHDE&SCHWARZ	SMBV100A	260592	2023.12.27	2024.12.26
Signal Generator	ROHDE&SCHWARZ	SMB100A	177746	2023.05.16	2024.05.15
				2024.05.08	2025.05.07
Switch Unit with OSP-B157	ROHDE&SCHWARZ	OSP120	101270	2023.05.16	2024.05.15
				2024.05.08	2025.05.07
Signaling Unit	ROHDE&SCHWARZ	CMW270	100607	2023.05.16	2024.05.15
				2024.05.09	2025.05.08
Temperature Chamber	AHK	NTH64-40A	1310	2023.12.05	2024.12.04
Spectrum Analyzer	KEYSIGHT	N9020A	MY46471071	2023.07.25	2024.07.24
Spectrum Analyzer	KEYSIGHT	N9020A	MY50531259	2023.09.05	2024.09.04
Signaling Unit	ROHDE&SCHWARZ	CMW500	171150	2023.06.19	2024.06.18
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9163	01415	2024.01.19	2025.01.18
Test Antenna-Horn	SCHWARZBECK	BBHA 9120D	02460	2021.05.20	2024.05.19
				2024.05.16	2027.05.15
Anechoic Chamber	RAINFORD	9m*6m*6m	140	2022.02.19	2024.08.15
Amplifier	COM-MV	ZT30-1000M	07210897	2023.09.05	2024.09.04
Amplifier	COM-MV	LSCX_LNA 1-12G-01	7210214	2023.09.05	2024.09.04
Amplifier	COM-MV	XKu_LNA7-18G-01	7210209	2023.09.05	2024.09.04

4.3 Test Software List

Description	Manufacturer	Software Version	Serial No.
TS8997 EMC32	ROHDE&SCHWARZ	V10.01.00	N/A
BL410R	BALUN	V3.0.1.528	N/A
BL410E	BALUN	V22.930	N/A

4.4 Measurement Uncertainty

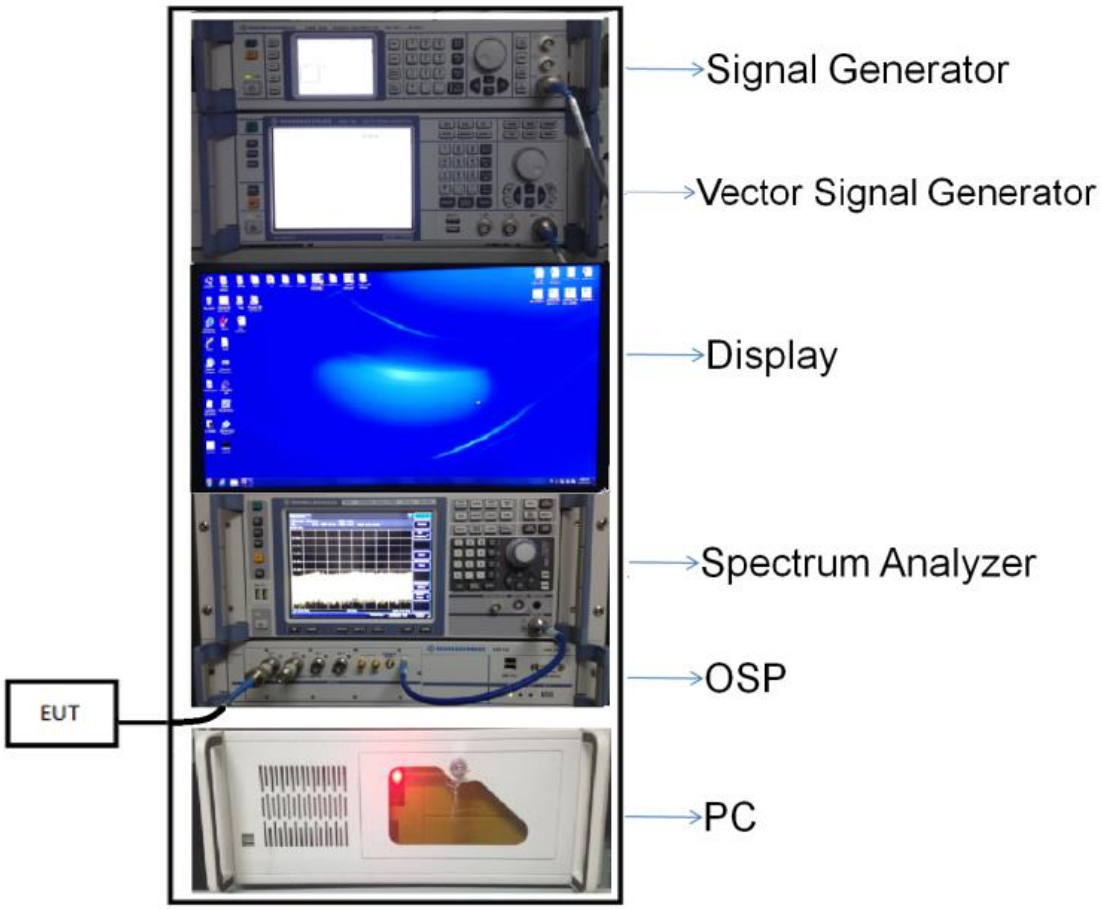
The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Parameters	Uncertainty
Occupied Channel Bandwidth	3.6 %
RF output power, conducted	0.66 dB
Power Spectral Density, conducted	0.90 dB
Unwanted Emissions, conducted	1.78 dB
All emissions, radiated	5.36 dB
Temperature	0.8 °C
Humidity	4 %

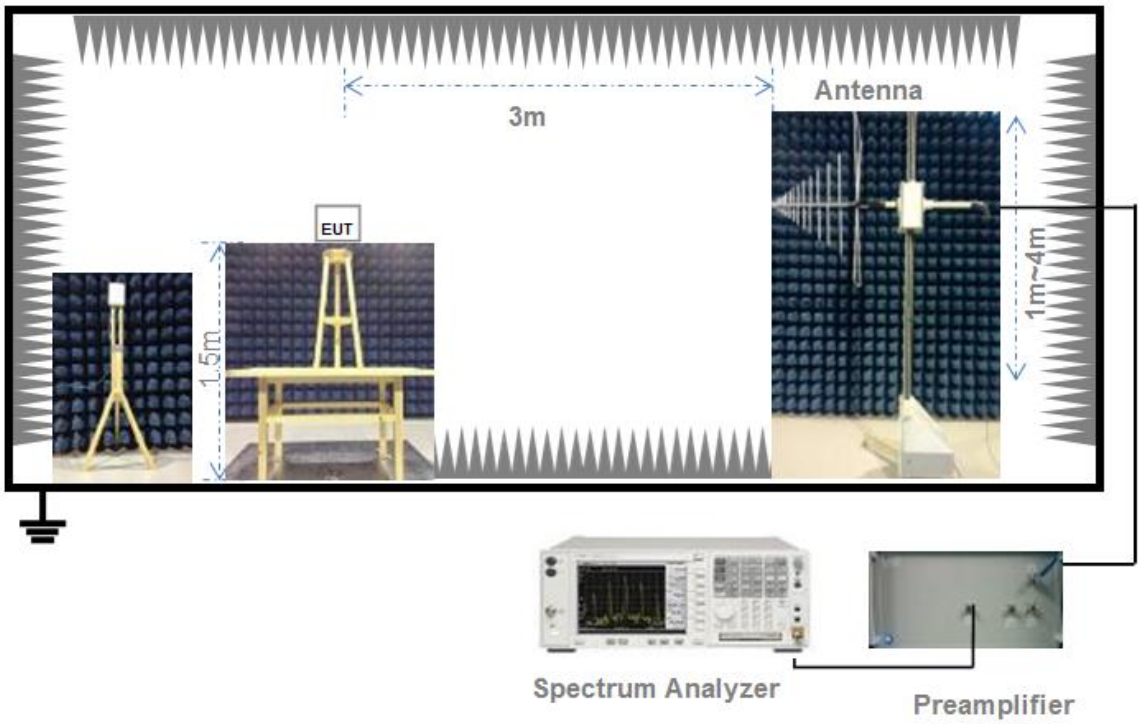
4.5 Description of Test Setup

4.5.1 For Conducted Test

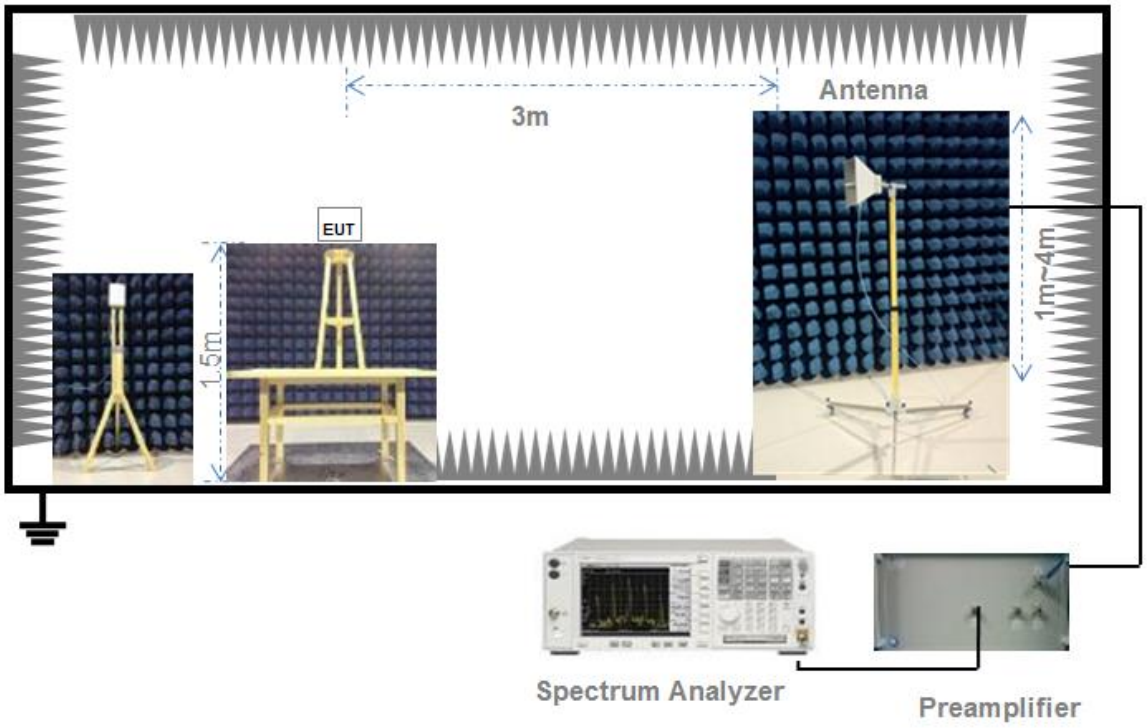


(Diagram 1)

4.5.2 For Radiated Test

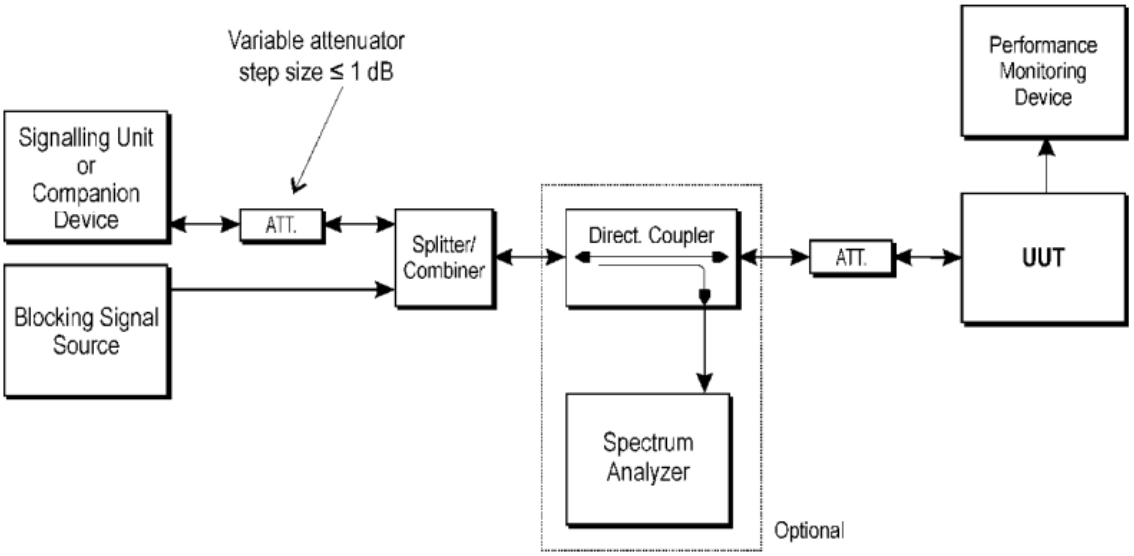


(Diagram 2)



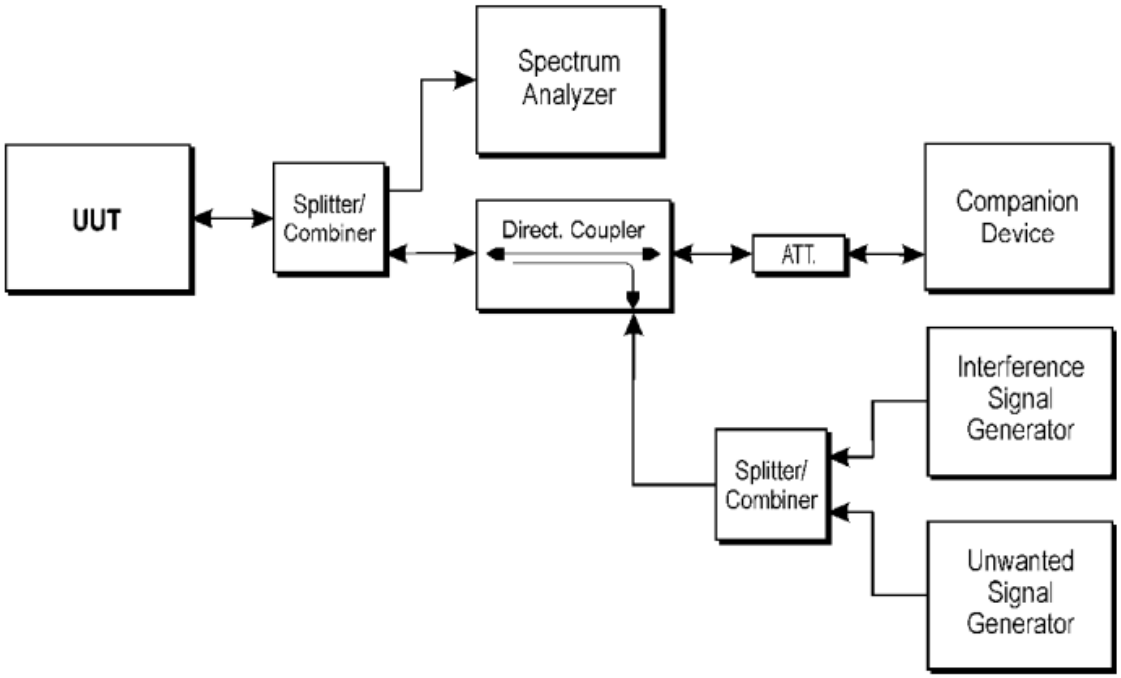
(Diagram 3)

4.5.3 For Receiver Blocking Test



(Diagram 4)

4.5.4 For Adaptivity Test



(Diagram 5)

5 Test Type and Test Results

5.1 Transmitter Parameters

5.1.1 RF output power

5.1.1.1 Limit

The maximum RF output power shall be equal to or less than 20 dBm.

5.1.1.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.1.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.2.2.

5.1.1.4 Test Result

Please refer to ANNEX A.1.

5.1.2 Power Spectral Density

5.1.2.1 Limit

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

5.1.2.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.2.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.3.2.

5.1.2.4 Test Result

Please refer to ANNEX A.2.

5.1.3 Duty Cycle, Tx-sequence, Tx-gap

5.1.3.1 Limit

The Duty Cycle shall be equal to or less than the maximum value declared by the manufacturer.

The Tx-sequence time shall be equal to or less than 10 ms.

The minimum Tx-gap time following a Tx-sequence shall be equal to the duration of that proceeding Tx-sequence with a minimum of 3,5 ms.

5.1.3.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.3.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.2.2.

5.1.3.4 Test Result

Please refer to ANNEX A.3.

5.1.4 Accumulated Transmit Time, Frequency Occupation and Hopping Sequence

5.1.4.1 Limit

The Accumulated Transmit Time on any hopping frequency shall not be greater than 400 ms within any observation period of 400 ms multiplied by the minimum number of hopping frequencies (N) that have to be used.

The hopping sequence(s) shall contain at least N hopping frequencies where N is 15 or 15 divided by the minimum Hopping Frequency Separation in MHz, whichever is the greater.

In order for the equipment to comply with the Frequency Occupation requirement, it shall meet either of the following two options:

Option 1: Each hopping frequency of the hopping sequence shall be occupied at least once within a period not exceeding four times the product of the dwell time and the number of hopping frequencies in use.

Option 2: The occupation probability for each frequency shall be between ((1 / U) × 25 %) and 77 % where U is the number of hopping frequencies in use.

5.1.4.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.4.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.4.2.

5.1.4.4 Test Result

Please refer to ANNEX A.4.

5.1.5 Hopping Frequency Separation

5.1.5.1 Limit

For adaptive frequency hopping systems, the minimum Hopping Frequency Separation shall be 100 kHz.

5.1.5.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.5.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.5.2.

5.1.5.4 Test Result

Please refer to ANNEX A.5.

5.1.6 Medium Utilization (MU) factor

5.1.6.1 Limit

The maximum Medium Utilization factor for non-adaptive equipment shall be 10 %.

5.1.6.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.6.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.2.2.

5.1.6.4 Test Result

Please refer to ANNEX A.6.

5.1.7 Adaptivity

5.1.7.1 Limit

Adaptive Frequency Hopping

Requirement	Operational Mode	
	Non-LBT based Detect and Avoid	LBT based Detect and Avoid
Minimum Clear Channel Assessment (CCA) Time	NA	18 us (see note 1)
Maximum Channel Occupancy (COT) Time	40 ms	60 ms
Minimum Idle Period	5% of COT	5% of COT
Extended CCA check	NA	NA
Short Control Signalling Transmissions	Maximum duty cycle of 10 % within an observation period of 50 ms (see note 2)	
NOTE 1: The CCA time used by the equipment shall be declared by the supplier. NOTE 2: Adaptive equipment may or may not have Short Control Signalling Transmissions. NOTE 3: The Idle Period is considered to be equal to the CCA or Extended CCA time defined in clause 4.3.2.6.3.2.3, step 1 and step 2. NOTE 4: The Idle Period in between transmissions is considered to be the CCA or the Extended CCA check as there are no transmissions during this period.		

Interference threshold level:

Maximum transmit power (P_H) EIRP dBm	Threshold level (TL) (see notes 1 and 2)
20	-70 dBm / MHz
NOTE 1: TL = -70 dBm/MHz + 10 × log10 (100 mW / Pout) (Pout in mW e.i.r.p.). NOTE 2: Transmitter the CCA threshold level (TL) shall be equal or lower than -70 dBm/MHz at the input to the receiver (assuming a 0 dBi receive antenna).	

Unwanted Signal parameters

Wanted signal mean power from companion device	Unwanted signal frequency (MHz)	Unwanted CW 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 2400 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 value which can be used in most cases is -50 dBm/MHz. NOTE 3: The level specified is the level in front of the UUT antenna. In case of conducted measurements, this level has to be corrected by the actual antenna assembly gain.		

Adaptive equipment using modulations other than FHSS

Requirement	Operational Mode			
	Non-LBT based Detect and Avoid	LBT based Detect and Avoid		
		Frame Based Equipment	Load Based Equipment (CCA using 'energy detect')	Load Based Equipment (CCA not using any of the mechanisms referenced as note 2)
Minimum Clear Channel Assessment (CCA) Time	NA	18 us (see note 1)	(see note 2)	18 us (see note 1)
Maximum Channel Occupancy (COT) Time	40 ms	1 ms to 10 ms	(see note 2)	13 ms
Minimum Idle Period	5% of COT	5% of COT	(see note 2)	NA
Extended CCA check	NA	NA	(see note 2)	a random duration in the range between 18 µs and at least 160 µs
Short Control Signalling Transmissions	Maximum duty cycle of 10 % within an observation period of 50 ms (see note 3)			

NOTE 1: The CCA time used by the equipment shall be declared by the supplier.
NOTE 2: Load Based Equipment may implement an LBT based spectrum sharing mechanism based on the Clear Channel Assessment (CCA) mode using energy detect, as described in IEEE 802.11™-2012 [i.3] clause 9, clause 10, clause 16, clause 17, clause 19 and clause 20, or in IEEE 802.15.4™-2011 [i.4], clause 4, clause 5 and clause 8.
NOTE 3: Adaptive equipment may or may not have Short Control Signalling Transmissions.
NOTE 4: The Idle Period is considered to be equal to the CCA or Extended CCA time defined in clause 4.3.2.6.3.2.3, step 1 and step 2.
NOTE 5: The Idle Period in between transmissions is considered to be the CCA or the Extended CCA check as there are no transmissions during this period.

Interference threshold level:

Maximum transmit power (P_H) EIRP dBm	Threshold level (TL) (see notes 1 and 2)
20	-70 dBm / MHz

NOTE 1: TL = -70 dBm/MHz + 10 × log10 (100 mW / Pout) (Pout in mW e.i.r.p.).
NOTE 2: transmitter the CCA threshold level (TL) shall be equal or lower than -70 dBm/MHz at the input to the receiver (assuming a 0 dBi receive antenna).

Unwanted Signal parameters

Wanted signal mean power from companion device	Unwanted signal frequency (MHz)	Unwanted CW 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 2400 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 value which can be used in most cases is -50 dBm/MHz. NOTE 3: The level specified is the level in front of the UUT antenna. In case of conducted measurements, this level has to be corrected by the actual antenna assembly gain.		

5.1.7.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.7.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.6.2.

5.1.7.4 Test Result

Please refer to ANNEX A.7.

5.1.8 Occupied Channel Bandwidth

5.1.8.1 Limit

The Occupied Channel Bandwidth for each hopping frequency shall fall completely within the band 2400 MHz to 2483.5 MHz.

In addition, for non-adaptive FHSS equipment with e.i.r.p. greater than 10 dBm, the Occupied Channel Bandwidth for every occupied hopping frequency shall be equal to or less than 5 MHz.

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.

5.1.8.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.8.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.7.2.

5.1.8.4 Test Result

Please refer to ANNEX A.8.

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

5.1.9.1 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 1.

Note: Within the 2400 M Hz to 2483,5 MHz band, the Out-of-band emissions are fulfilled by compliance with the Occupied Channel Bandwidth requirement in clause 4.3.1.8.

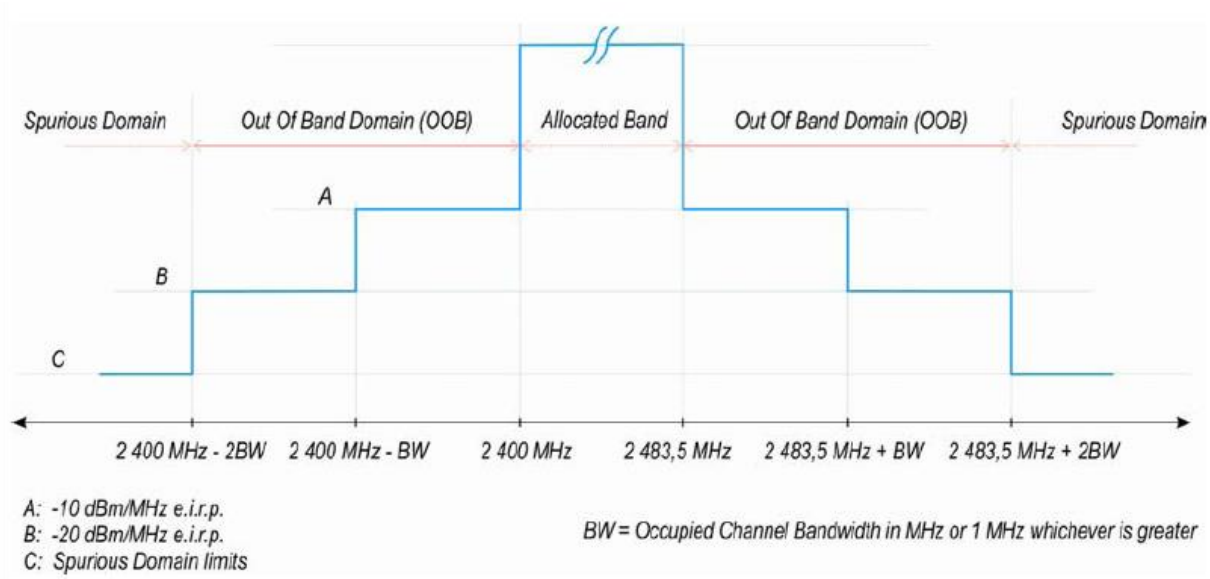


Figure 1: Transmit mask

5.1.9.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.9.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.8.2.

5.1.9.4 Test Result

Please refer to ANNEX A.9.

5.1.10 Transmitter unwanted emissions in the spurious domain

5.1.10.1 Limit

The transmitter unwanted emissions in the spurious domain shall not exceed the values in following tables:

Frequency range	Maximum power (dBm)	Bandwidth
30 MHz to 47 MHz	-36	100 kHz
47 MHz to 74 MHz	-54	100 kHz
74 MHz to 87.5 MHz	-36	100 kHz
87.5 MHz to 118 MHz	-54	100 kHz
118 MHz to 174 MHz	-36	100 kHz
174 MHz to 230 MHz	-54	100 kHz
230 MHz to 470 MHz	-36	100 kHz
470 MHz to 694 MHz	-54	100 kHz
694 MHz to 1 GHz	-36	100 kHz
1 GHz to 12.75 GHz	-30	1 MHz

5.1.10.2 Test Setup

The section 4.5.1 and 4.5.2 (Diagram 1, 2, 3) for test setup description. The photo of test setup please refer to ANNEX B.

5.1.10.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.9.2.

5.1.10.4 Test Result

Please refer to ANNEX A.10.

5.2 Receiver Parameters

5.2.1 Receiver categories

There have three different receiver categories for which different receiver requirements and/or corresponding limits apply.

Receiver Category

Receiver Category	Definition
Category 1	Adaptive equipment with a maximum RF output power greater than 10 dBm e.i.r.p.
Category 2	Non-adaptive equipment with a Medium Utilization (MU) factor greater than 1 % and less than or equal to 10 % or adaptive equipment and non-adaptive with a maximum RF output power of 10 dBm e.i.r.p.
Category 3	Non-adaptive equipment with a maximum Medium Utilization (MU) factor of 1 % or adaptive equipment and non-adaptive with a maximum RF output power of 0 dBm e.i.r.p.

5.2.2 Receiver Spurious Emissions

5.2.2.1 Limit

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

The spurious emissions of the transmitter shall not exceed the values in following tables for the EUT in this report.

Frequency range	Maximum power (dBm)	Bandwidth
30 MHz to 1 GHz	-57	100 KHz
1 GHz to 12.75 GHz	-47	1 MHz

5.2.2.2 Test Setup

The section 4.5.1 (Diagram 1) for test setup description. The photo of test setup please refer to ANNEX B.

5.2.2.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.10.2.

5.2.2.4 Test Result

Please refer to ANNEX A.11.

5.2.3 Receiver Blocking

5.2.3.1 Limit

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 next table.

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	-34	CW
	2 504	-34	CW
(-139 dBm + 10 × $\log_{10}$(OCBW)) or -74 dBm whichever is less (see note 3)	2 300	-34	CW
	2 330	-34	CW
	2 360	-34	CW
	2 524	-34	CW
	2 584	-34	CW
	2 674	-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. P_{min} is the minimum level of wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 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 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	-34	CW
	2 504	-34	CW
	2 300	-34	CW
	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	-34	CW
	2 504	-34	CW
	2 300	-34	CW
	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.

Categorization

Receiver category	Definition
1	Adaptive equipment with a maximum RF output power greater than 10 dBm e.i.r.p. shall be considered as receiver category 1 equipment.
2	Non-adaptive equipment with a Medium Utilization (MU) factor greater than 1 % and less than or equal to 10 % or adaptive equipment with a maximum RF output power of 10 dBm e.i.r.p. shall be considered as receiver category 2 equipment.
3	Non-adaptive equipment with a maximum Medium Utilization (MU) factor of 1 % or adaptive equipment with a maximum RF output power of 0 dBm e.i.r.p. shall be considered as receiver category 3 equipment.

5.2.3.2 Test Setup

See the section 4.5.3 (Diagram 4) for test setup description. The photo of test setup please refer to ANNEX B.

5.2.3.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.11.2.

5.2.3.4 Test Result

Please refer to ANNEX A.12.

5.3 Other Parameters

5.3.1 Geo-location capability

5.3.1.1 Requirements

The geographical location determined by the equipment as defined in following section (5.3.1.2) shall not be accessible to the user.

5.3.1.2 Definition

Geo-location capability is a feature of the equipment to determine its geographical location with the purpose to configure itself according to the regulatory requirements applicable at the geographical location where it operates.

The geo-location capability may be present in the equipment or in an external device (temporary) associated with the equipment operating at the same geographical location during the initial power up of the equipment. The geographical location may also be available in equipment already installed and operating at the same geographical location.

5.3.1.3 Test Result

Note: Not applicable.

ANNEX A TEST RESULT

A.1 RF output power

Test Data

Modulation Mode			GFSK (BLE 1Mbps)		
Limit			20 dBm		
Test Result					
Test Method	Test Conditions		Transmitter Power Level (dBm)		
	Voltage	Temperature	Low Channel	Middle Channel	High Channel
			EIRP	EIRP	EIRP
☐ Radiated ☒ Conducted	NV	NT	-6.4	-6.0	-5.9
		LT	-6.8	-6.0	-6.1
		HT	-6.6	-5.9	-6.2
Test Verdict			Pass		

Modulation Mode			GFSK (BLE 2Mbps)		
Limit			20 dBm		
Test Result					
Test Method	Test Conditions		Transmitter Power Level (dBm)		
	Voltage	Temperature	Low Channel	Middle Channel	High Channel
			EIRP	EIRP	EIRP
☐ Radiated ☒ Conducted	NV	NT	-6.3	-5.9	-5.8
		LT	-6.3	-6.0	-6.2
		HT	-6.3	-5.8	-6.1
Test Verdict			Pass		

Bursts Power List

GFSK (BLE 1Mbps): Low Channel

Burst RMS Power	Start Time	Stop Time	Tx_on	Tx_off
dBm	ms	ms	ms	ms
-6.4	0.237	0.621	0.384	0.004
-6.4	0.862	1.246	0.384	0.004
-6.4	1.487	1.871	0.384	0.004
-6.4	2.112	2.496	0.384	0.004
-6.4	2.737	3.121	0.384	0.004
-6.4	3.362	3.746	0.384	0.004
-6.4	3.987	4.371	0.384	0.004
-6.4	4.612	4.996	0.384	0.004
-6.4	5.237	5.621	0.384	0.004
-6.4	5.862	6.246	0.384	0.241
-6.4	6.487	6.871	0.384	0.241
-6.4	7.112	7.496	0.384	0.241
-6.4	7.737	8.121	0.384	0.241
-6.4	8.362	8.746	0.384	0.241
-6.4	8.987	9.371	0.384	0.241
-6.4	9.612	9.996	0.384	0.241
-6.4	10.237	10.621	0.384	0.241
-6.4	10.862	11.246	0.384	0.241
-6.4	11.487	11.871	0.384	0.241
-6.4	12.112	12.496	0.384	0.241
-6.4	12.737	13.121	0.384	0.241
-6.4	13.362	13.746	0.384	0.241
-6.4	13.987	14.371	0.384	0.241
-6.4	14.612	14.996	0.384	0.241
-6.4	15.237	15.621	0.384	0.241
-6.4	15.862	16.246	0.384	0.241
-6.4	16.487	16.871	0.384	0.241
-6.4	17.112	17.496	0.384	0.241
-6.4	17.737	18.121	0.384	0.241
-6.4	18.362	18.746	0.384	0.241
-6.4	18.987	19.371	0.384	0.241
-6.4	19.612	19.996	0.384	0.241
-6.4	20.237	20.621	0.384	0.238
-6.4	20.862	21.245	0.383	0.242

GFSK (BLE 1Mbps): Middle Channel

Burst RMS Power	Start Time	Stop Time	Tx_on	Tx_off
dBm	ms	ms	ms	ms
-5.9	0.000	0.384	0.384	0.241
-5.9	0.625	1.009	0.384	0.241
-5.9	1.250	1.634	0.384	0.241
-5.9	1.875	2.259	0.384	0.241
-5.9	2.500	2.884	0.384	0.241
-5.9	3.125	3.509	0.384	0.241
-5.9	3.750	4.134	0.384	0.241
-5.9	4.375	4.759	0.384	0.241
-5.9	5.000	5.384	0.384	0.241
-5.9	5.625	6.009	0.384	0.241
-5.9	6.250	6.634	0.384	0.241
-5.9	6.875	7.259	0.384	0.241
-5.9	7.500	7.884	0.384	0.241
-5.9	8.125	8.509	0.384	0.241
-5.9	8.750	9.134	0.384	0.241
-5.9	9.375	9.759	0.384	0.241
-5.9	10.000	10.384	0.384	0.241
-5.9	10.625	11.009	0.384	0.241
-5.9	11.250	11.633	0.383	0.242
-5.9	11.875	12.259	0.384	0.241
-5.9	12.500	12.884	0.384	0.241
-5.9	13.125	13.508	0.383	0.239
-5.9	13.750	14.133	0.383	0.242
-5.9	14.375	14.758	0.383	0.239
-5.9	15.000	15.383	0.383	0.242
-5.9	15.625	16.008	0.383	0.239
-5.9	16.250	16.633	0.383	0.239
-5.9	16.875	17.258	0.383	0.239
-5.9	17.500	17.883	0.383	0.239
-5.9	18.125	18.508	0.383	0.239
-5.9	18.750	19.133	0.383	0.239
-5.9	19.375	19.758	0.383	0.239
-5.9	20.000	20.383	0.383	0.239
-5.9	20.625	21.008	0.383	0.004

GFSK (BLE 1Mbps): High Channel

Burst RMS Power	Start Time	Stop Time	Tx_on	Tx_off
dBm	ms	ms	ms	ms
-5.9	0.237	0.621	0.384	0.004
-5.9	0.862	1.246	0.384	0.004
-5.9	1.487	1.871	0.384	0.004
-5.9	2.112	2.496	0.384	0.004
-5.9	2.737	3.121	0.384	0.004
-5.9	3.362	3.746	0.384	0.004
-5.9	3.987	4.371	0.384	0.004
-5.9	4.612	4.996	0.384	0.004
-5.9	5.237	5.621	0.384	0.004
-5.9	5.862	6.246	0.384	0.004
-5.9	6.487	6.871	0.384	0.004
-5.9	7.112	7.496	0.384	0.004
-5.9	7.737	8.121	0.384	0.004
-5.9	8.362	8.746	0.384	0.241
-5.9	8.987	9.371	0.384	0.241
-5.9	9.612	9.996	0.384	0.241
-5.9	10.237	10.621	0.384	0.241
-5.9	10.862	11.246	0.384	0.241
-5.9	11.487	11.871	0.384	0.241
-5.9	12.112	12.496	0.384	0.241
-5.9	12.737	13.121	0.384	0.241
-5.9	13.362	13.746	0.384	0.241
-5.9	13.987	14.371	0.384	0.241
-5.9	14.612	14.996	0.384	0.241
-5.9	15.237	15.621	0.384	0.241
-5.9	15.862	16.246	0.384	0.241
-5.9	16.487	16.871	0.384	0.241
-5.9	17.112	17.496	0.384	0.241
-5.9	17.737	18.121	0.384	0.241
-5.9	18.362	18.746	0.384	0.241
-5.9	18.987	19.371	0.384	0.241
-5.9	19.612	19.996	0.384	0.241
-5.9	20.237	20.620	0.383	0.242
-5.9	20.862	21.246	0.384	0.241

GFSK (BLE 2Mbps): Low Channel

Burst RMS Power	Start Time	Stop Time	Tx_on	Tx_off
dBm	ms	ms	ms	ms
-6.4	0.417	0.621	0.204	0.004
-6.4	1.042	1.246	0.204	0.004
-6.3	1.667	1.871	0.204	0.004
-6.4	2.292	2.496	0.204	0.004
-6.4	2.917	3.121	0.204	0.004
-6.4	3.542	3.746	0.204	0.004
-6.4	4.167	4.371	0.204	0.004
-6.4	4.792	4.996	0.204	0.004
-6.4	5.417	5.621	0.204	0.004
-6.4	6.042	6.246	0.204	0.004
-6.4	6.667	6.871	0.204	0.004
-6.4	7.292	7.496	0.204	0.004
-6.4	7.917	8.121	0.204	0.004
-6.4	8.542	8.746	0.204	0.004
-6.4	9.167	9.371	0.204	0.004
-6.4	9.792	9.996	0.204	0.004
-6.4	10.417	10.621	0.204	0.004
-6.4	11.042	11.246	0.204	0.004
-6.3	11.667	11.871	0.204	0.004
-6.3	12.292	12.496	0.204	0.004
-6.4	12.917	13.121	0.204	0.004
-6.4	13.542	13.746	0.204	0.004
-6.3	14.167	14.371	0.204	0.004
-6.3	14.792	14.996	0.204	0.004
-6.3	15.417	15.621	0.204	0.004
-6.3	16.042	16.246	0.204	0.004
-6.4	16.667	16.871	0.204	0.004
-6.3	17.292	17.495	0.203	0.419
-6.3	17.917	18.120	0.203	0.419
-6.3	18.542	18.745	0.203	0.419
-6.3	19.167	19.370	0.203	0.419
-6.3	19.792	19.995	0.203	0.419
-6.3	20.417	20.620	0.203	0.419
-6.4	21.042	21.245	0.203	0.419

GFSK (BLE 2Mbps): Middle Channel

Burst RMS Power	Start Time	Stop Time	Tx_on	Tx_off
dBm	ms	ms	ms	ms
-5.8	0.003	0.206	0.203	0.419
-5.8	0.628	0.831	0.203	0.419
-5.8	1.253	1.456	0.203	0.004
-5.8	1.878	2.081	0.203	0.004
-5.8	2.503	2.706	0.203	0.004
-5.8	3.128	3.331	0.203	0.004
-5.8	3.752	3.956	0.204	0.004
-5.8	4.377	4.581	0.204	0.004
-5.8	5.002	5.206	0.204	0.004
-5.8	5.627	5.831	0.204	0.004
-5.8	6.252	6.456	0.204	0.004
-5.8	6.877	7.081	0.204	0.004
-5.8	7.502	7.706	0.204	0.004
-5.8	8.127	8.331	0.204	0.004
-5.8	8.752	8.956	0.204	0.004
-5.8	9.377	9.581	0.204	0.004
-5.8	10.002	10.206	0.204	0.004
-5.8	10.627	10.831	0.204	0.004
-5.8	11.252	11.456	0.204	0.004
-5.8	11.877	12.081	0.204	0.004
-5.8	12.502	12.706	0.204	0.004
-5.8	13.127	13.331	0.204	0.004
-5.8	13.752	13.956	0.204	0.004
-5.8	14.377	14.581	0.204	0.004
-5.9	15.002	15.206	0.204	0.004
-5.9	15.627	15.831	0.204	0.004
-5.8	16.252	16.456	0.204	0.004
-5.8	16.877	17.081	0.204	0.004
-5.9	17.502	17.706	0.204	0.004
-5.9	18.127	18.331	0.204	0.004
-5.8	18.752	18.956	0.204	0.004
-5.8	19.377	19.581	0.204	0.004
-5.9	20.002	20.206	0.204	0.004
-5.8	20.627	20.831	0.204	0.004

GFSK (BLE 2Mbps): High Channel

Burst RMS Power	Start Time	Stop Time	Tx_on	Tx_off
dBm	ms	ms	ms	ms
-5.8	0.000	0.204	0.204	0.004
-5.8	0.625	0.829	0.204	0.004
-5.9	1.250	1.454	0.204	0.004
-5.8	1.875	2.079	0.204	0.004
-5.8	2.500	2.704	0.204	0.004
-5.8	3.125	3.329	0.204	0.004
-5.8	3.750	3.954	0.204	0.004
-5.8	4.375	4.579	0.204	0.004
-5.8	5.000	5.203	0.203	0.005
-5.8	5.625	5.828	0.203	0.005
-5.8	6.250	6.454	0.204	0.004
-5.8	6.875	7.078	0.203	0.005
-5.8	7.500	7.703	0.203	0.005
-5.8	8.125	8.328	0.203	0.419
-5.8	8.750	8.953	0.203	0.005
-5.8	9.375	9.578	0.203	0.419
-5.8	10.000	10.203	0.203	0.419
-5.8	10.625	10.828	0.203	0.419
-5.8	11.250	11.453	0.203	0.419
-5.8	11.875	12.078	0.203	0.419
-5.8	12.500	12.703	0.203	0.419
-5.8	13.125	13.328	0.203	0.419
-5.8	13.750	13.953	0.203	0.419
-5.8	14.375	14.578	0.203	0.004
-5.8	15.000	15.203	0.203	0.004
-5.8	15.625	15.828	0.203	0.004
-5.8	16.250	16.453	0.203	0.004
-5.8	16.874	17.078	0.204	0.004
-5.8	17.499	17.703	0.204	0.004
-5.8	18.124	18.328	0.204	0.004
-5.8	18.749	18.953	0.204	0.004
-5.8	19.374	19.578	0.204	0.004
-5.8	19.999	20.203	0.204	0.004
-5.8	20.624	20.828	0.204	0.004

A.2 Power spectral density

Measuring Parameter

Frequency Range		
2400 MHz to 2483.5 MHz	RBW (MHz)	10 kHz
	VBW (MHz)	30 kHz
	Sweep points	8351
	Detector mode	RMS
	Trace mode	Max Hold
	Sweep time	Auto

Test Data

Note: The Power density is EIRP Power density, which is contain antenna gain.

Modulation Mode			GFSK (BLE 1Mbps)		
Limit			10 dBm/MHz		
Test Result					
Test Method	Test Conditions		Power density (dBm/MHz)		
☐ Radiated ☒ Conducted	Temperature	Voltage	Low Channel Power Spectral density	Middle Channel Power Spectral density	High Channel Power Spectral density
	NT	NV	-6.56	-6.15	-6.04
Test Verdict			Pass		

Modulation Mode			GFSK (BLE 2Mbps)		
Limit			10 dBm/MHz		
Test Result					
Test Method	Test Conditions		Power density (dBm/MHz)		
☐ Radiated ☒ Conducted	Temperature	Voltage	Low Channel Power Spectral density	Middle Channel Power Spectral density	High Channel Power Spectral density
	NT	NV	-7.58	-7.15	-7.05
Test Verdict			Pass		

A.3 Duty Cycle, Tx-sequence, Tx-gap

Note: The maximum value of Duty Cycle declared by the supplier.

Test Data

Duty Cycle (%)	Limit Duty Cycle (%)Note1	Number of Bursts	Minimum Tx-On (ms)	Maximum Tx-On (ms)	Minimum Tx-Off (ms)	Maximum Tx-Off (ms)	Measurement Time (ms)	Comment
--	--	--	--	--	--	--	--	--

Note: Not applicable.

A.4 Accumulated Transmit Time, Frequency Occupation and Hopping Sequence

Note: Not applicable.

A.5 Hopping Frequency Separation

Note: Not applicable.

A.6 Medium Utilization (MU) factor

Medium Utilization (MU) (%)	Limit Medium Utilization (MU) (%)	Verdict
--	10	--

Note: Not applicable.

A.7 Adaptivity

Note: Not applicable.

A.8 Occupied Channel Bandwidth

Measuring Parameter

Centre Frequency	The centre frequency of the channel under test
RBW	~ 1 % of the span without going below 1 %
VBW	3 × RBW
Span	2 × Nominal Channel Bandwidth
Detector mode	RMS
Trace mode	Max Hold
Sweep time	Auto
Test Method	☐ Radiated ☒ Conducted

Test Data

Test Conditions		Test Mode	DUT Frequency (MHz)	Occupied Channel Bandwidth (MHz)	Lower Band Edge (MHz)	Upper Band Edge (MHz)	Limit (MHz)
Temperature	Voltage						
NT	NV	GFSK (BLE 1Mbps)	2402	1.040	2401.495	2402.535	Within The Band 2400 MHz to 2483.5 MHz
			2480	1.040	2479.495	2480.535	
		GFSK (BLE 2Mbps)	2404	2.080	2402.970	2405.050	
			2478	2.080	2476.970	2479.050	
Test Verdict		Pass					

Test Plots

GFSK (BLE 1Mbps): Low Channel

GFSK (BLE 1Mbps): High Channel

GFSK (BLE 2Mbps): Low Channel

GFSK (BLE 2Mbps): High Channel

A.9 Transmitter unwanted emissions in the out-of-band domain

Test Data

GFSK (BLE 1Mbps)

DUT Frequency (MHz)	Nominal Bandwidth (MHz)	Frequency (MHz)	Level (dBm)	Limit (dBm)	Result
2402	1	2398.5	-41.813	-20	Pass
2402	1	2399.5	-39.197	-10	Pass
2480	1	2484.0	-49.833	-10	Pass
2480	1	2485.0	-53.542	-20	Pass

GFSK (BLE 2Mbps)

DUT Frequency (MHz)	Nominal Bandwidth (MHz)	Frequency (MHz)	Level (dBm)	Limit (dBm)	Result
2402	2	2396.5	-49.156	-20	Pass
2402	2	2397.5	-40.144	-20	Pass
2402	2	2398.5	-38.731	-10	Pass
2402	2	2399.5	-47.271	-10	Pass
2480	2	2484.0	-52.634	-10	Pass
2480	2	2485.0	-56.051	-10	Pass
2480	2	2486.0	-55.894	-20	Pass
2480	2	2487.0	-56.662	-20	Pass

A.10 Transmitter unwanted emissions in the spurious domain

Note 1: The test method choose the conducted method. Which 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).

Note 2: The Frequency band was pre-scanned, the harmonic and other spurious which worst frequency are recorded in the report.

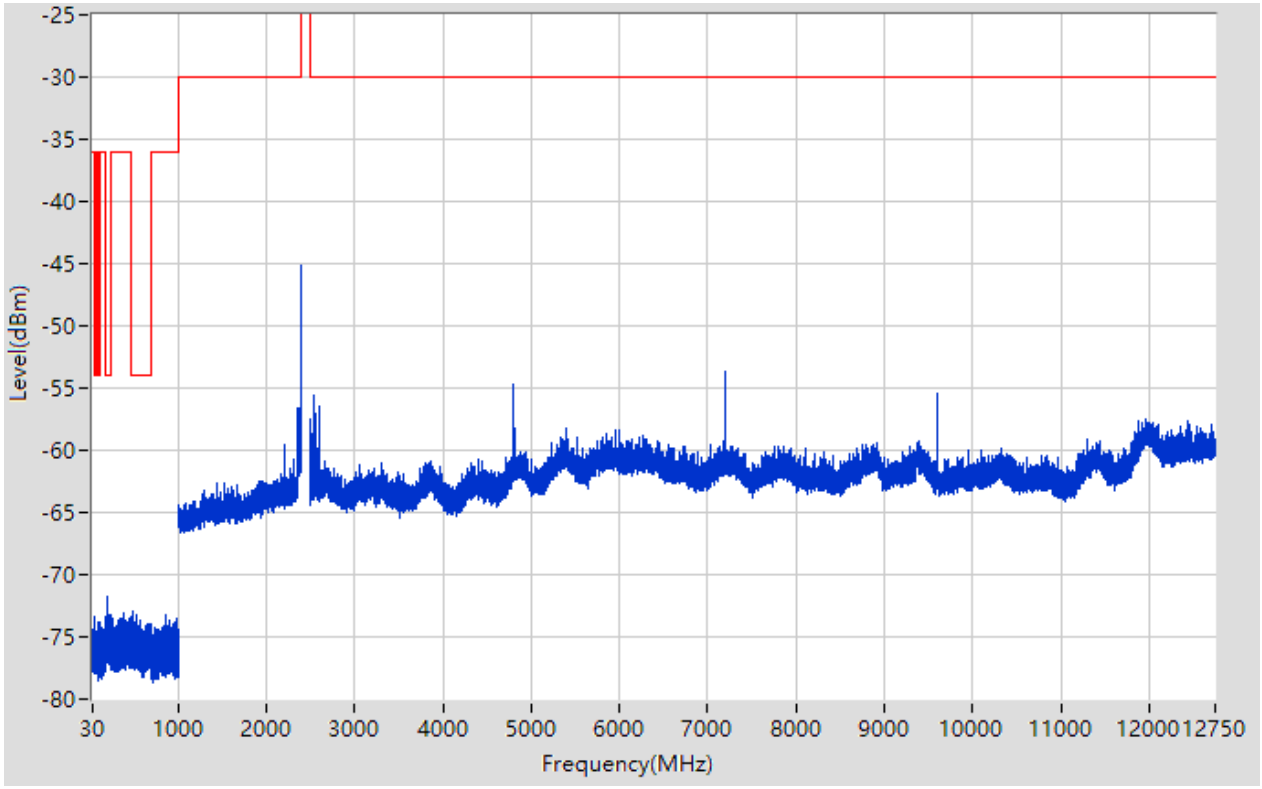
Note 3: The cabinet radiated test data is tested in the normal working mode of the product.

Measuring Parameter

Frequency Range		
30 MHz to 1 000 MHz	RBW (MHz)	100 kHz
	VBW (MHz)	300 kHz
	Sweep points	19400
	Detector mode	Peak
	Trace mode	Max Hold
1 GHz to 12.75 GHz	RBW (MHz)	1 MHz
	VBW (MHz)	3 MHz
	Sweep points	23500
	Detector mode	Peak
	Trace mode	Max Hold

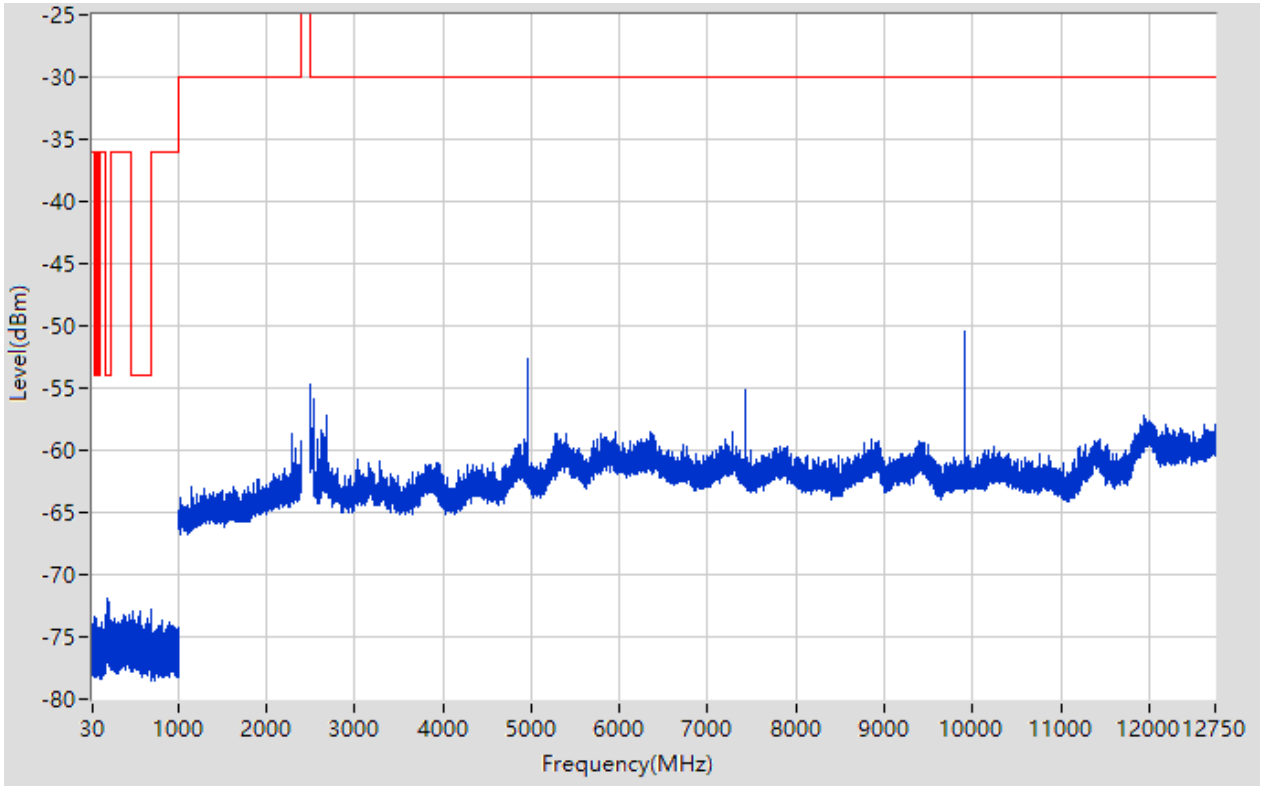
Conducted Test Data

GFSK (BLE 1Mbps) 30 MHz to 12.75 GHz, Low channel



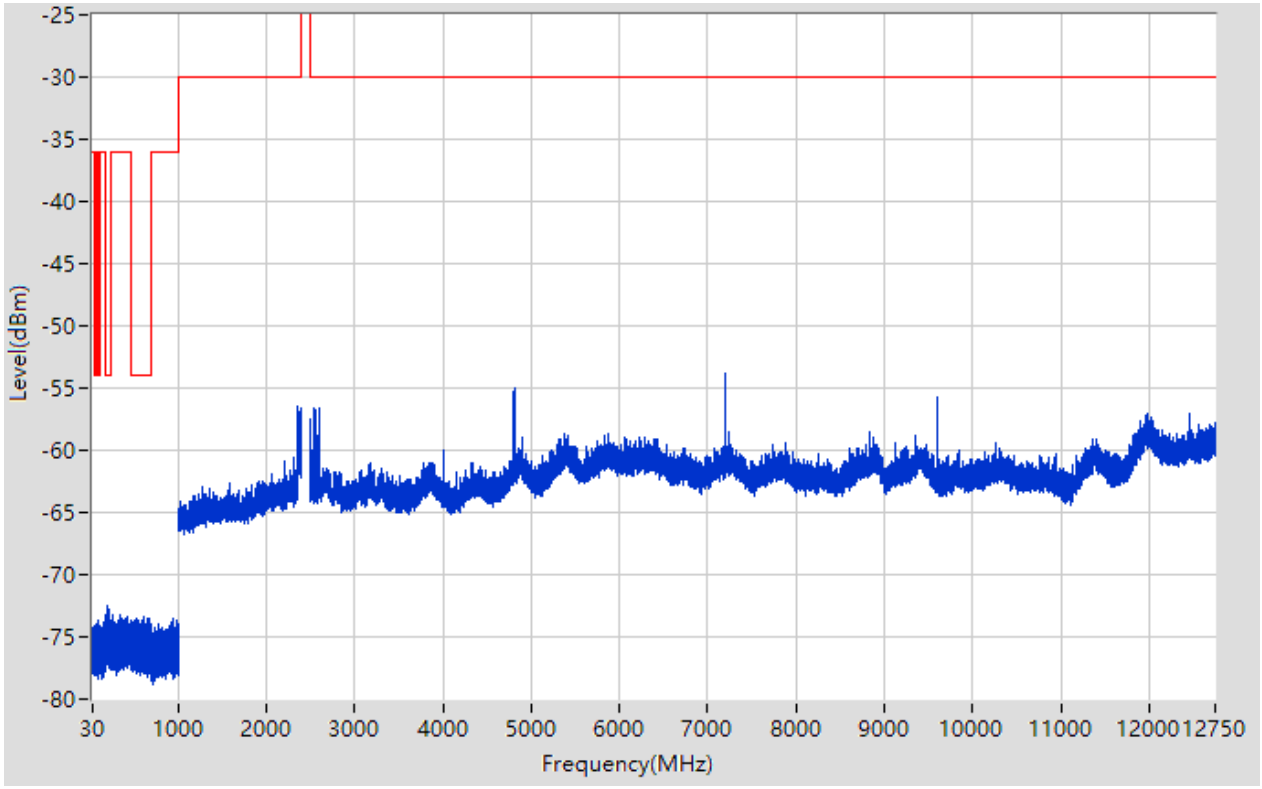
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	47	0.1	Peak	41.943	-74.37	-36	Pass	401
47	74	0.1	Peak	48	-73.45	-54	Pass	541
74	87.5	0.1	Peak	80.48	-74.69	-36	Pass	401
87.5	118	0.1	Peak	100.3	-73.81	-54	Pass	611
118	174	0.1	Peak	171.85	-73.68	-36	Pass	1121
174	230	0.1	Peak	192	-71.75	-54	Pass	1121
230	470	0.1	Peak	386.35	-73.14	-36	Pass	4801
470	694	0.1	Peak	495.8	-72.98	-54	Pass	4481
694	1000	0.1	Peak	865.4	-73.3	-36	Pass	6121
1000	2398	1	Peak	2398	-45.19	-30	Pass	2797
2485.5	12750	1	Peak	7200	-53.7	-30	Pass	20530

GFSK (BLE 1Mbps) 30 MHz to 12.75 GHz, High channel



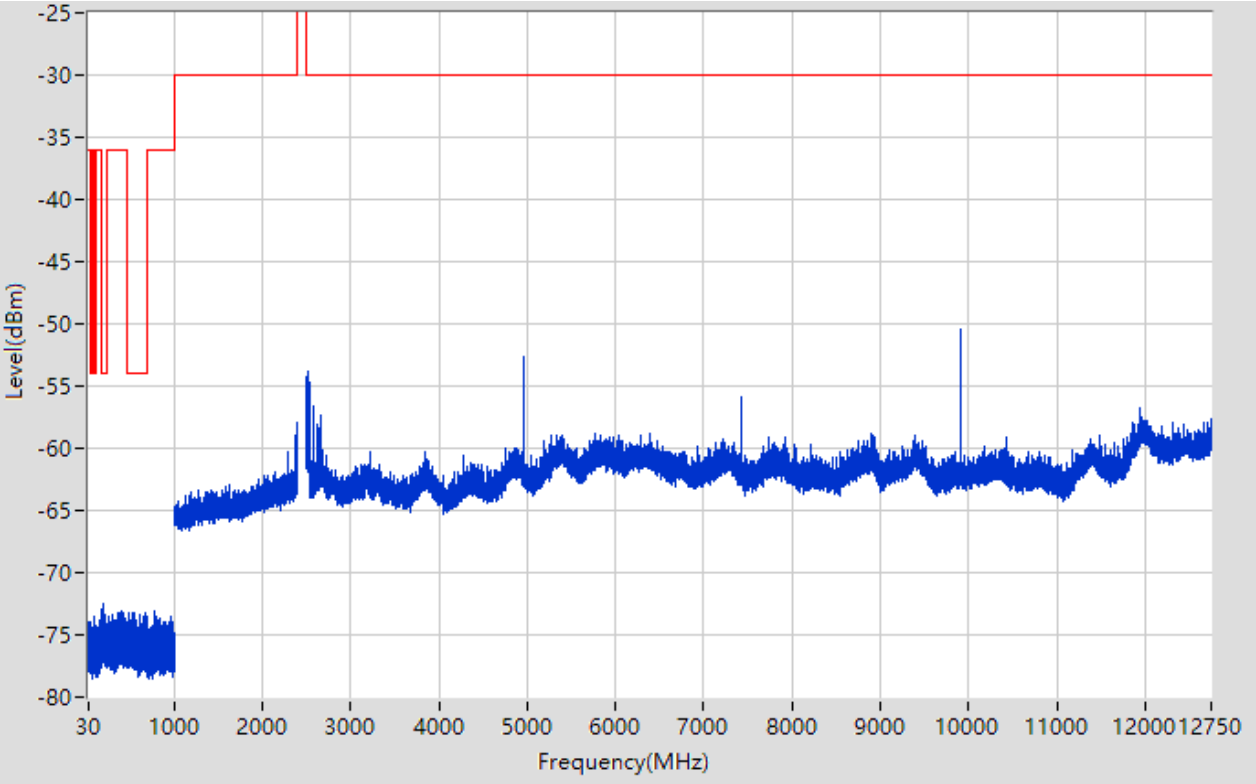
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	47	0.1	Peak	34.93	-74	-36	Pass	401
47	74	0.1	Peak	48	-73.42	-54	Pass	541
74	87.5	0.1	Peak	75.283	-74.6	-36	Pass	401
87.5	118	0.1	Peak	96	-74.22	-54	Pass	611
118	174	0.1	Peak	126	-73.83	-36	Pass	1121
174	230	0.1	Peak	192	-71.95	-54	Pass	1121
230	470	0.1	Peak	441.75	-73.19	-36	Pass	4801
470	694	0.1	Peak	688.25	-72.87	-54	Pass	4481
694	1000	0.1	Peak	825.85	-73.73	-36	Pass	6121
1000	2398	1	Peak	2288	-58.74	-30	Pass	2797
2485.5	12750	1	Peak	9914	-50.37	-30	Pass	20530

GFSK (BLE 2Mbps) 30 MHz to 12.75 GHz, Low channel



Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	47	0.1	Peak	31.403	-74.24	-36	Pass	401
47	74	0.1	Peak	48.05	-74.06	-54	Pass	541
74	87.5	0.1	Peak	79.096	-73.93	-36	Pass	401
87.5	118	0.1	Peak	96	-73.74	-54	Pass	611
118	174	0.1	Peak	160.45	-73.84	-36	Pass	1121
174	230	0.1	Peak	191.95	-72.53	-54	Pass	1121
230	470	0.1	Peak	252.5	-73.22	-36	Pass	4801
470	694	0.1	Peak	614.75	-73.39	-54	Pass	4481
694	1000	0.1	Peak	947.15	-73.58	-36	Pass	6121
1000	2396	1	Peak	2356.057	-56.52	-30	Pass	2797
2487.5	12750	1	Peak	7206.58	-53.78	-30	Pass	20530

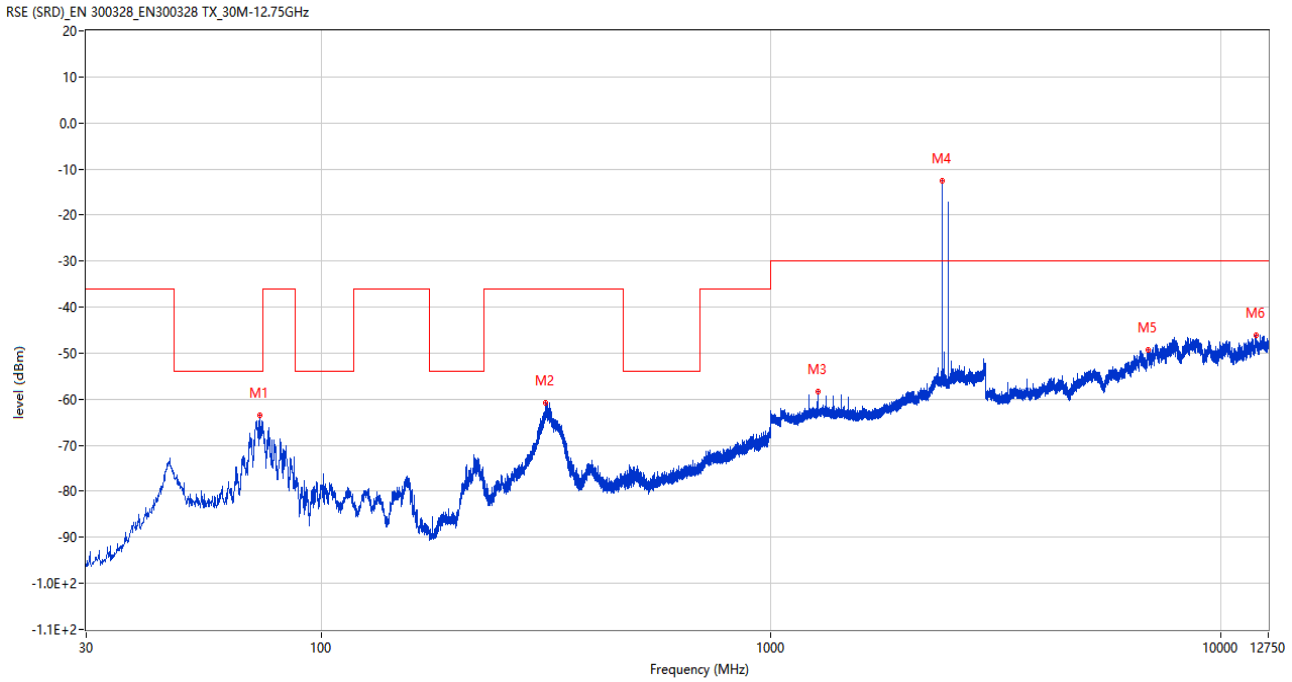
GFSK (BLE 2Mbps) 30 MHz to 12.75 GHz, High channel



Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	47	0.1	Peak	35.908	-73.96	-36	Pass	401
47	74	0.1	Peak	48	-74	-54	Pass	541
74	87.5	0.1	Peak	78.084	-74.7	-36	Pass	401
87.5	118	0.1	Peak	96	-73.49	-54	Pass	611
118	174	0.1	Peak	153.75	-73.78	-36	Pass	1121
174	230	0.1	Peak	192	-72.49	-54	Pass	1121
230	470	0.1	Peak	406.8	-73.14	-36	Pass	4801
470	694	0.1	Peak	665.45	-73.2	-54	Pass	4481
694	1000	0.1	Peak	782.8	-73.04	-36	Pass	6121
1000	2396	1	Peak	2382.519	-58.01	-30	Pass	2797
2487.5	12750	1	Peak	9906.054	-50.41	-30	Pass	20530

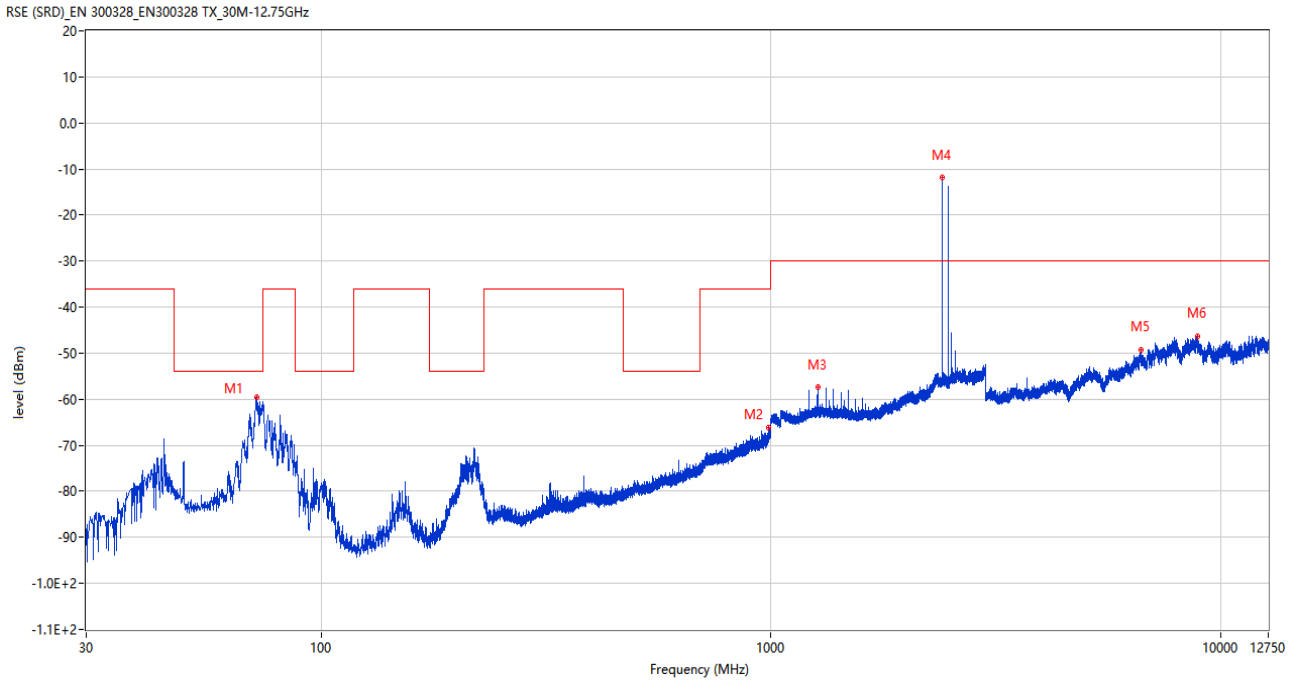
Cabinet Radiated Test Data

30 MHz to 12.75 GHz, ANT H



Frequency (MHz)	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
72.874	-63.47	-17.56	-54.0	9.47	147.00	Horizontal	Horizontal	Pass
314.792	-60.78	-15.25	-36.0	24.78	27.00	Horizontal	Horizontal	Pass
1269.100	-58.35	-5.75	-30.0	28.35	118.00	Horizontal	Horizontal	Pass
2404.400	-12.58	-0.18	-30.0	-17.42	164.00	Horizontal	Horizontal	N/A
6897.500	-49.34	12.89	-30.0	19.34	187.00	Horizontal	Horizontal	Pass
11955.088	-46.22	16.24	-30.0	16.22	204.00	Horizontal	Horizontal	Pass

30 MHz to 12.75 GHz, ANT V



Frequency (MHz)	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
71.710	-59.47	-17.29	-54.0	5.47	107.00	Vertical	Horizontal	Pass
988.748	-66.10	1.23	-36.0	30.10	153.00	Vertical	Horizontal	Pass
1268.900	-57.43	-5.57	-30.0	27.43	139.00	Vertical	Horizontal	Pass
2404.200	-11.94	-0.17	-30.0	-18.06	336.00	Vertical	Horizontal	N/A
6631.500	-49.17	12.23	-30.0	19.17	344.00	Vertical	Horizontal	Pass
8863.549	-46.28	16.17	-30.0	16.28	207.00	Vertical	Horizontal	Pass

A.11 Receiver Spurious Emissions

Note 1: The test method choose the conducted method. Which 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).

Note 2: The Frequency band was pre-scanned, the harmonic and other spurious which worst frequency are recorded in the report.

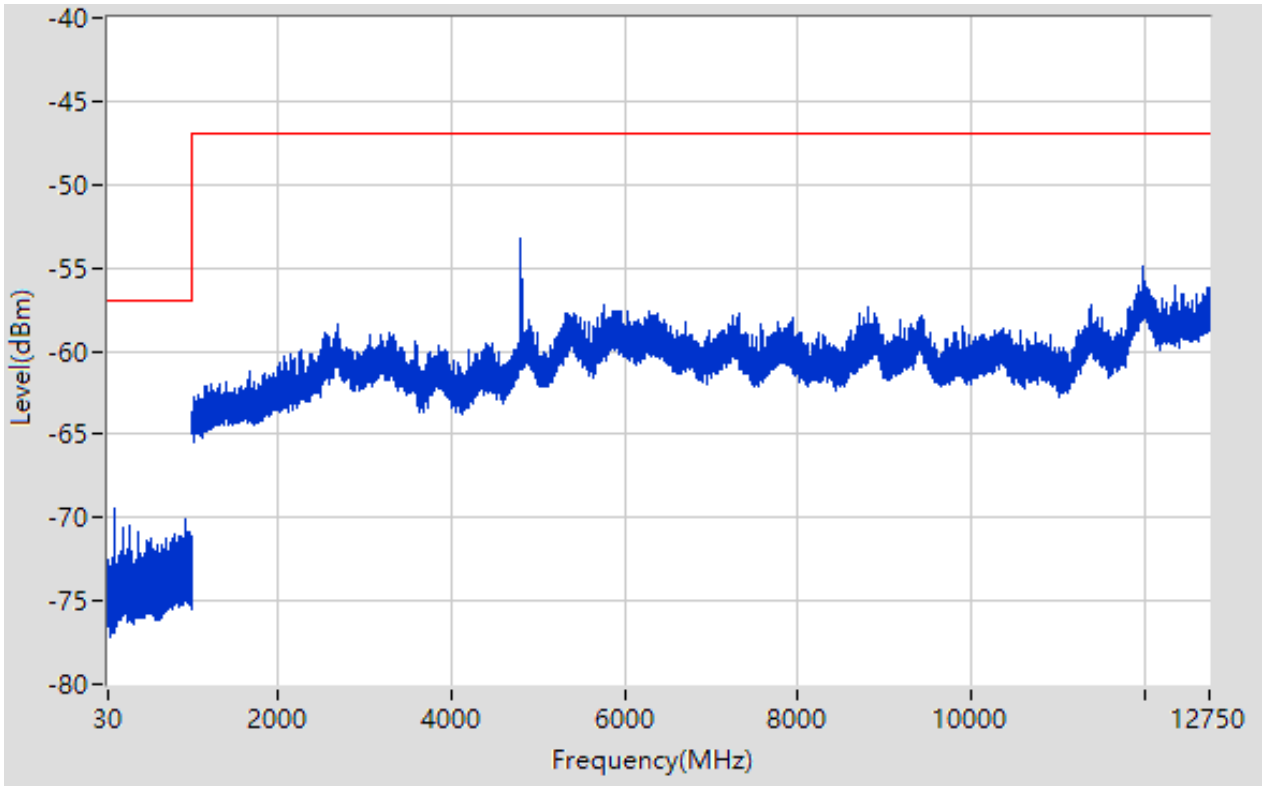
Note 3: The cabinet radiated test data is tested in the normal working mode of the product.

Measuring Parameter

Frequency Range		
30 MHz to 1 000 MHz	RBW (MHz)	100 kHz
	VBW (MHz)	300 kHz
	Sweep points	19400
	Detector mode	Peak
	Trace mode	Max Hold
1 GHz to 12.75 GHz	RBW (MHz)	1 MHz
	VBW (MHz)	3 MHz
	Sweep points	23500
	Detector mode	Peak
	Trace mode	Max Hold

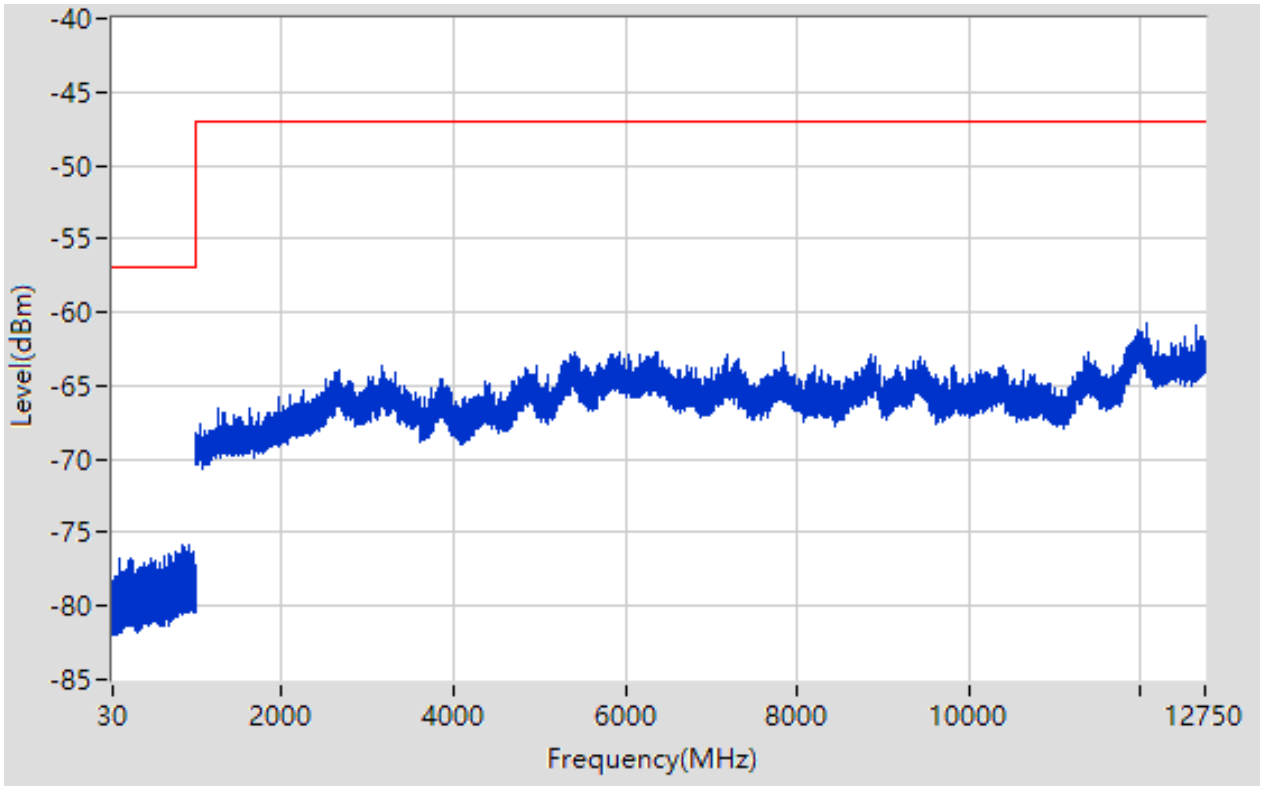
Conducted Test Data

GFSK (BLE 1Mbps) 30 MHz to 12.75 GHz, Low channel



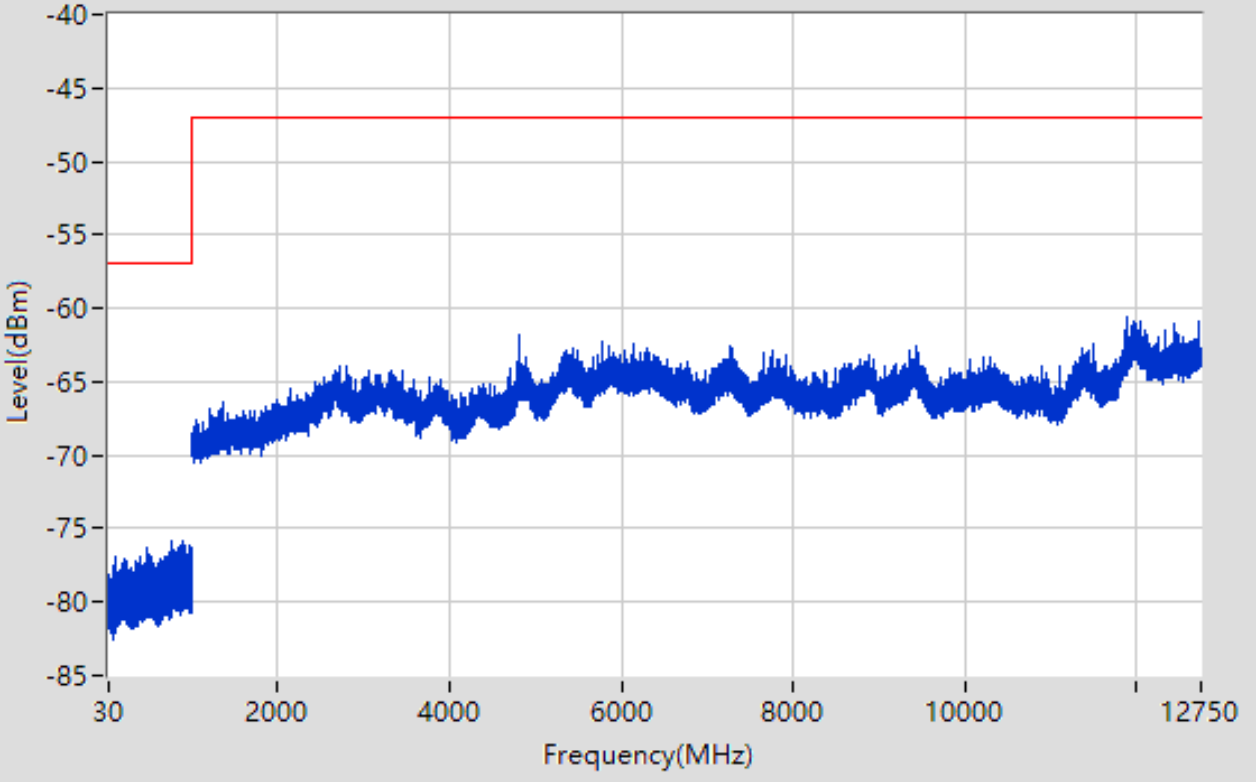
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	1000	0.1	Peak	96	-69.4	-57	Pass	19401
1000	12750	1	Peak	4801	-53.3	-47	Pass	23501

GFSK (BLE 1Mbps) 30 MHz to 12.75 GHz, High channel



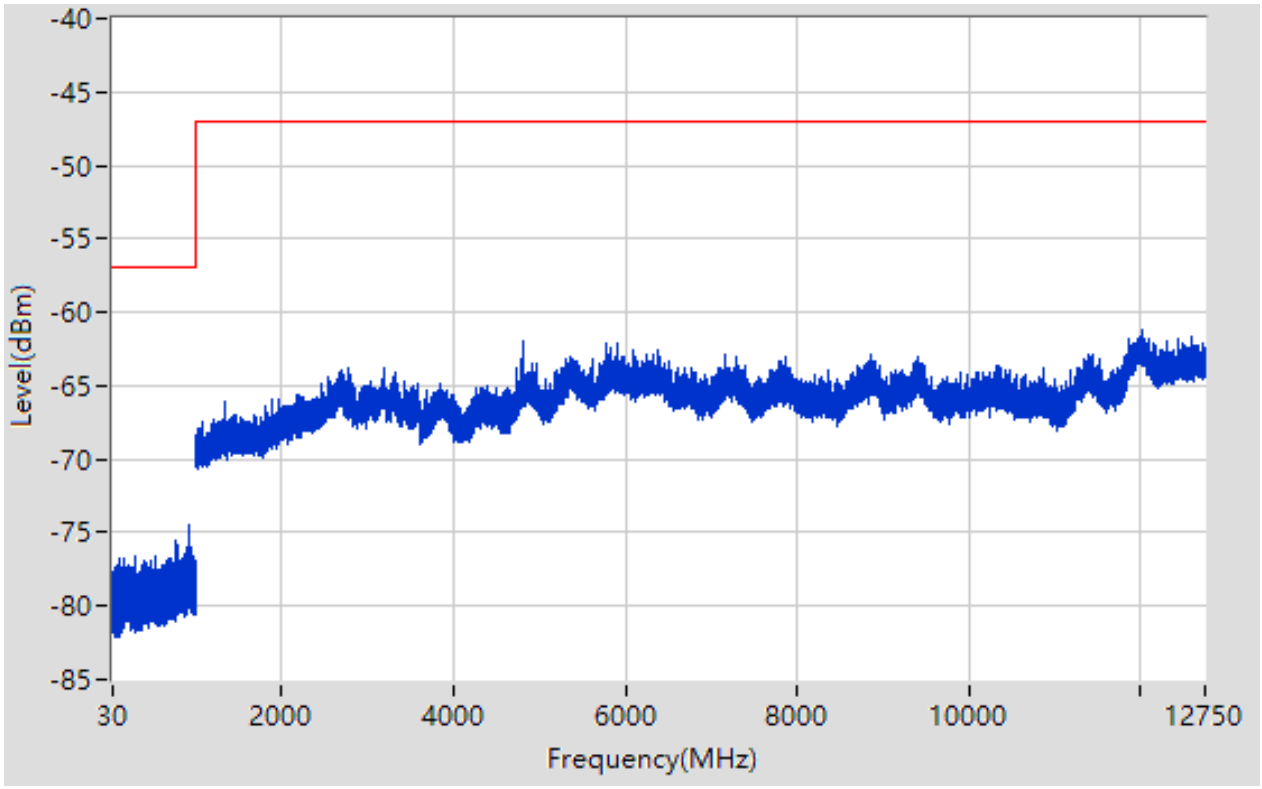
Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	1000	0.1	Peak	926.9	-75.82	-57	Pass	19401
1000	12750	1	Peak	12058	-60.8	-47	Pass	23501

GFSK (BLE 2Mbps) 30 MHz to 12.75 GHz, Low channel



Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	1000	0.1	Peak	761.05	-75.83	-57	Pass	19401
1000	12750	1	Peak	11900.5	-60.6	-47	Pass	23501

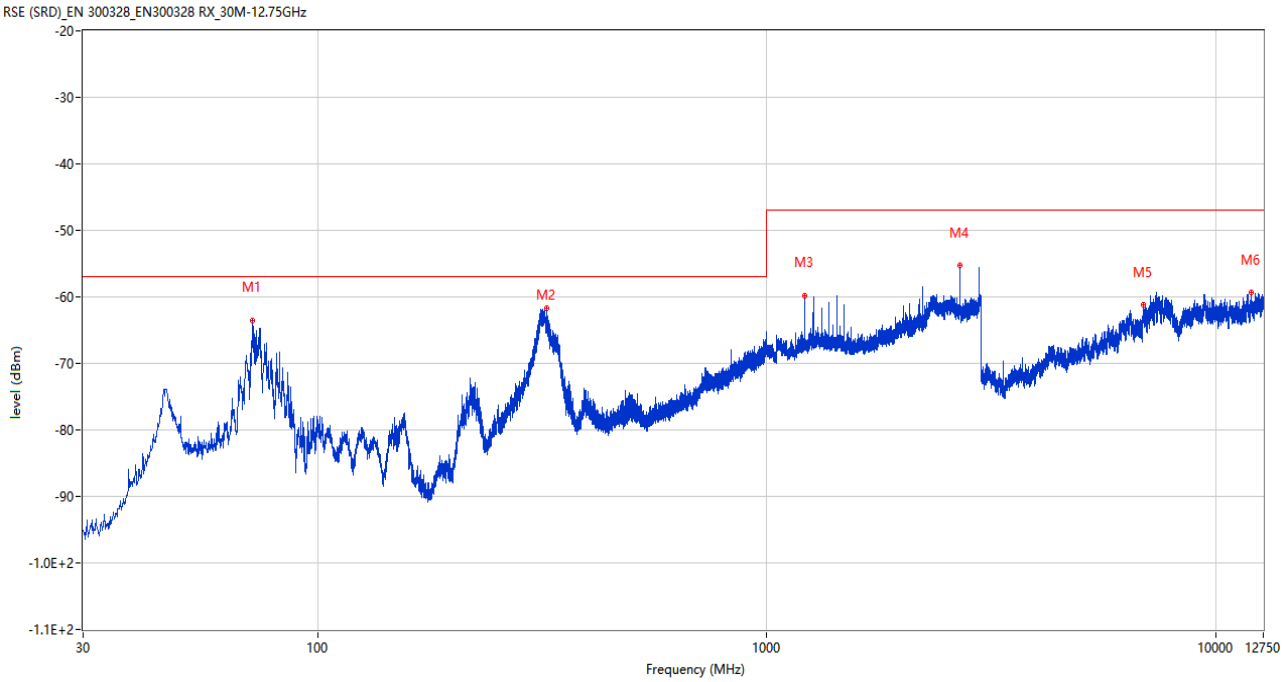
GFSK (BLE 2Mbps) 30 MHz to 12.75 GHz, High channel



Start Frequency (MHz)	Stop Frequency (MHz)	RBW (MHz)	Detector	Frequency (MHz)	Power (dBm)	Limit (dBm)	Verdict	Sweep Point
30	1000	0.1	Peak	930.05	-74.51	-57	Pass	19401
1000	12750	1	Peak	12009	-61.13	-47	Pass	23501

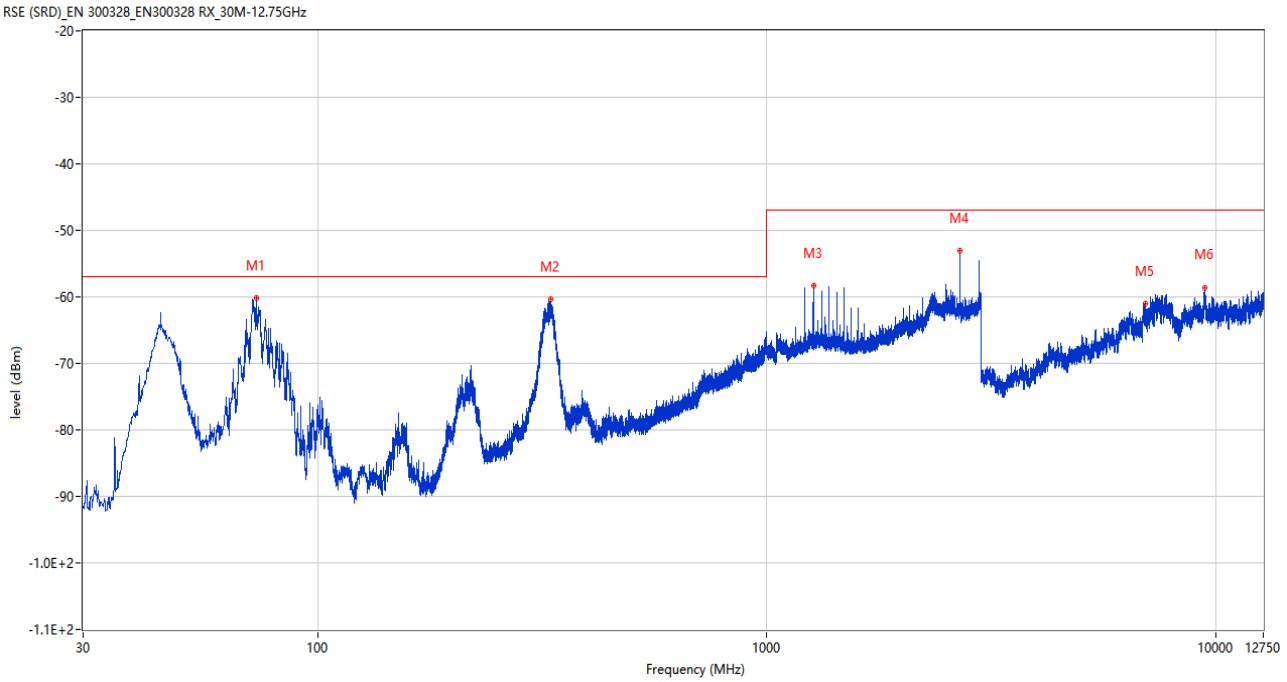
Cabinet Radiated Test Data

30 MHz to 12.75 GHz, ANT H



Frequency (MHz)	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
71.516	-63.55	-17.18	-57.0	6.55	159.00	Horizontal	Horizontal	Pass
323.813	-61.68	-14.63	-57.0	4.68	52.00	Horizontal	Horizontal	Pass
1215.100	-59.76	-5.95	-47.0	12.76	136.00	Horizontal	Horizontal	Pass
2687.800	-55.32	-0.43	-47.0	8.32	4.00	Horizontal	Horizontal	Pass
6892.000	-61.25	1.38	-47.0	14.25	180.00	Horizontal	Horizontal	Pass
11973.375	-59.37	2.75	-47.0	12.37	309.00	Horizontal	Horizontal	Pass

30 MHz to 12.75 GHz, ANT V



Frequency (MHz)	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Table (o)	ANT	EUT	Verdict
72.874	-60.17	-17.56	-57.0	3.17	65.00	Vertical	Horizontal	Pass
329.827	-60.31	-13.94	-57.0	3.31	313.00	Vertical	Horizontal	Pass
1268.900	-58.38	-5.57	-47.0	11.38	150.00	Vertical	Horizontal	Pass
2687.700	-53.05	-0.40	-47.0	6.05	12.00	Vertical	Horizontal	Pass
6965.500	-61.03	0.88	-47.0	14.03	187.00	Vertical	Horizontal	Pass
9443.049	-58.63	2.57	-47.0	11.63	0.00	Vertical	Horizontal	Pass

A.12 Receiver Blocking

For Bluetooth Low Energy

Note 1: The combination of the smallest channel bandwidth and the lowest data rate was reported.

Note 2: Blocking signal levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels corrected by the actual antenna assembly gain.

Note 3: During the Blocking test, the number of packets sent by the system is 1500.

Test Data

Receiver Category 3 equipment

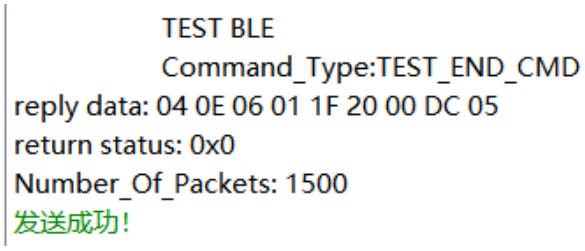
Wanted signal mean power from companion device (dBm)	Blocking signal Frequency (MHz)	Blocking signal power (dBm) (see note 2)	PER Result		Limit	Verdict
			Low channel	High channel		
(-139 dBm + 10 × $\log_{10}$(OCBW) + 20 dB) or (-74 dBm + 20 dB) whichever is less	2 380	-34	0.00%	0.00%	≦10%	Pass
	2 504	-34	0.00%	0.00%		
	2 300	-34	0.00%	0.00%		
	2 584	-34	0.00%	0.00%		

Test Plot (PER)

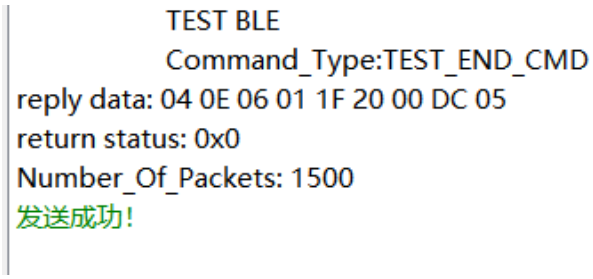
Note: All the configuration were tested, but only the worst PER Plot were reported in this report.

For Bluetooth Low Energy

Low Channel



High Channel



ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ2480682-AR.pdf”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ2480682-AW.pdf”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ2480682-AI.pdf”.

ANNEX E EUT DECLARATION TECHNOLOGY TYPE

Application form for testing please refer to the document “BL-SZ2480682-AM.pdf”.

Statement

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--END OF REPORT--