RED-Radio Test Report

For

E-Power Limited

Bluetooth speaker

Model No.: 12397700, 12397701, BT502, BT503, BT504, BT505, BT506, BT507, BT508, BT509

Prepared For	:	
Address	:	

Prepared By	:	Shenzhen Anbotek Compliance Laboratory Limited
Address	:	1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102 Tel: (86) 755-26066440 Fax: (86) 755-26014772

Report Number	:	SZAWW180518011-04W
Date of Test	:	May 18~29, 2018
Date of Report	:	May 29, 2018

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TEST REPORT

Applicant	:	
Manufacturer	:	
Product Name	:	Bluetooth speaker
Model No.	:	12397700, 12397701, BT502, BT503, BT504, BT505, BT506, BT507, BT508, BT509
Trade Mark	:	N.A.
Rating(s)	:	Input: DC 5V, 350mA (with DC 3.7V, 1200mAh Battery inside)

Test Standard(s) : ETSI EN 300 328 V2.2.0 (2017-11)

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the ETSI EN 300 328 V2.2.0 requirements.

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

Date of Test May 18~29, 2018

Prepared By

(Tested Engineer / Winkey Wang)

Reviewer

(Project Manager / May Lu)

Approved & Authorized Signer

(Manager / Tom Chen)

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1. General Information

1.1. Client Information

Applicant	:	
Address	:	
Manufacturer	:	
Address	:	

1.2. Description of Device (EUT)

Product Name	:	Bluetooth speaker	
Model No.	:	12397700, 12397701, BT502, BT503, BT504, BT505, BT506, BT507, BT508, BT509 (Note: All samples are the same except the model number and housing, so we prepare "12397700" for test only.)	
Trade Mark	:	N.A.	
Test Power Supply	:	DC 3.7V Battery inside	
Product Description	:	Operation Frequency:	2402~2480MHz
		Transfer Rate:	1/2 Mbits/s
		Number of Channel:	79 Channels
		Modulation Type:	GFSK, π/4-DQPSK
		Antenna Type:	PCB Antenna
		Antenna Gain(Peak):	1.2 dBi
Remark: 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.			

1.3. Auxiliary Equipment Used During Test

N/A		

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1.4. Description of Test Modes

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below:

RF Output Power Test

EUT configure mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	0, 39, 78	FHSS	GFSK	DH5
-	0 to 78	0, 39, 78	FHSS	π /4-DQPSK	DH5

Accumulated Transmit Time/ Frequency Occupation/ Hopping Sequence:

EUT configure mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	39	FHSS	GFSK	DH1/3/5

Hopping Frequency Separation:

EUT configure mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	0, 39, 78	FHSS	GFSK	DH5
-	0 to 78	0, 39, 78	FHSS	π /4-DQPSK	DH5

Occupied Channel Bandwidth Test:

EUT configure mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	0, 78	FHSS	GFSK	DH5
-	0 to 78	0, 78	FHSS	π /4-DQPSK	DH5

Transmitter unwanted emissioin in the out-of-band domain Test:

EUT configure mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	0, 78	FHSS	GFSK	DH5
-	0 to 78	0, 78	FHSS	π /4-DQPSK	DH5

Spurious Emissions Test:

EUT configure mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	78	FHSS	GFSK	DH5

Receiver Blocking Test:

EUT configure mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	0, 78	FHSS	GFSK	DH5
-	0 to 78	0, 78	FHSS	π /4-DQPSK	DH5

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1.5. List of channels

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
00	2402	17	2419	34	2436	51	2453	68	2470
01	2403	18	2420	35	2437	52	2454	69	2471
02	2404	19	2421	36	2438	53	2455	70	2472
03	2405	20	2422	37	2439	54	2456	71	2473
04	2406	21	2423	38	2440	55	2457	72	2474
05	2407	22	2424	39	2441	56	2458	73	2475
06	2408	23	2425	40	2442	57	2459	74	2476
07	2409	24	2426	41	2443	58	2460	75	2477
08	2410	25	2427	42	2444	59	2461	76	2478
09	2411	26	2428	43	2445	60	2462	77	2479
10	2412	27	2429	44	2446	61	2463	78	2480
11	2413	28	2430	45	2447	62	2464		
12	2414	29	2431	46	2448	63	2465		
13	2415	30	2432	47	2449	64	2466		
14	2416	31	2433	48	2450	65	2467		
15	2417	32	2434	49	2451	66	2468		
16	2418	33	2435	50	2452	67	2469		

1.6. Test Conditions

	Normal Test Conditions	Extreme Test Conditions
Temperature	15°C - 35°C	-10°C ~ 45°C Note: (1)
Relative Humidity	20% - 75%	N/A
Supply Voltage	DC 3.7V Battery inside	N/A
Note: (1) The HT 45°C and LT -10°C was declarated by manufacture;		

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1.7. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	100055	Nov. 17, 2017	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Nov. 17, 2017	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Nov. 17, 2017	1 Year
4.	Spectrum Analysis	Agilent	E4407B	US39390582	Nov. 17, 2017	1 Year
5.	Spectrum Analysis	Agilent	N9038A	MY53227295	Nov. 17, 2017	1 Year
6.	Preamplifier	SKET Electronic	BK1G18G30D	KD17503	Nov. 17, 2017	1 Year
7.	EMI Test Receiver	Rohde & Schwarz	ESPI	101604	Nov. 17, 2017	1 Year
8.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Nov. 20, 2017	1 Year
9.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Nov. 20, 2017	1 Year
10.	Loop Antenna	Schwarzbeck	HFH2-Z2	100047	Nov. 17, 2017	1 Year
11.	Horn Antenna	Schewarzbeck	BBHA9170	9170-375	Nov. 17, 2017	1 Year
12.	Pre-amplifier	SONOMA	310N	186860	Nov. 17, 2017	1 Year
13.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
14.	RF Test Control System	YIHENG	YH3000	2017430	Nov. 18, 2017	1 Year
15.	Power Sensor	DAER	RPR3006W	15I00041SN045	Nov. 17, 2017	1 Year
16.	Power Sensor	DAER	RPR3006W	15I00041SN046	Nov. 17, 2017	1 Year
17.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Nov. 18, 2017	1 Year
18.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Nov. 18, 2017	1 Year
19.	Signal Generator	Agilent	E4421B	MY41000743	Nov. 18, 2017	1 Year
20.	DC Power Supply	LW	TPR-6410D	349315	Nov. 01, 2017	1 Year
21.	Constant Temperature Humidity Chamber	Sertep	ZJ-HWHS80B	ZJ-17042804	Nov. 01, 2017	1 Year

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1.8. Measurement Uncertainty

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

Maximum measurement uncertainty

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

1.9. Description of Test Facility

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

FCC-Registration No.: 184111

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registed and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111, July 31, 2017.

ISED-Registration No.: 8058A-1

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A-1, June 13, 2016.

Test Location

All Emissions tests were performed at

Shenzhen Anbotek Compliance Laboratory Limited.

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

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2. Summary of Test Results

List of Measurements			
No	Test Items	Clause No.	Results
Transmitter Items			
1	RF output power	4.3.1.2	PASS
2	Duty Cycle, Tx-sequence, Tx-gap	4.3.1.3	N/A
3	Accumulated Transmit Time, Frequency Occupation and Hopping Sequence	4.3.1.4	PASS
4	Hopping Frequency Separation	4.3.1.5	PASS
5	Medium Utilization (MU) factor	4.3.1.6	N/A
6	Adaptivity (Adaptive Frequency Hopping)	4.3.1.7	N/A
7	Occupied Channel Bandwidth	4.3.1.8	PASS
8	Transmitter unwanted emissions in the out-of-band domain	4.3.1.9	PASS
9	Transmitter unwanted emissions in the spurious domain	4.3.1.10	PASS
Receiver Items			
10	Receiver spurious emissions	4.3.1.11	PASS
11	Receiver Blocking	4.3.2.12	PASS
12	Geo-location capability	4.3.2.13	N/A
Note: N/A is an abbreviation for Not Applicable and means this test item is not applicable for this device according to the technology characteristic of device.			

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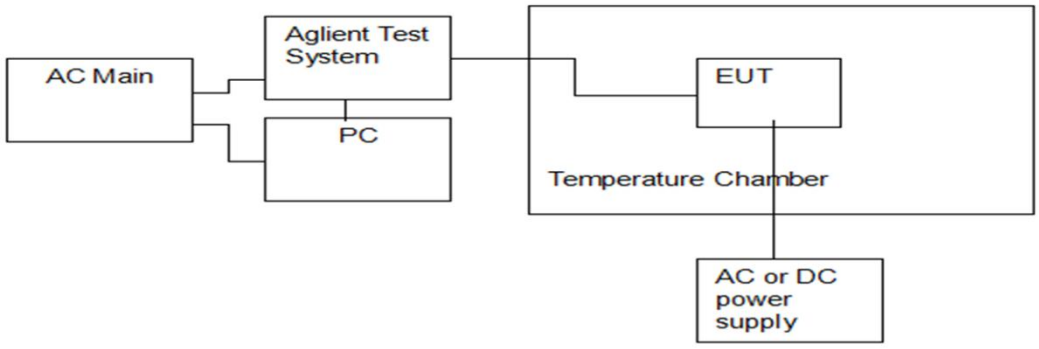
3. RF Output Power

3.1. RF Output Power Limit

Condition	Limit
☐ Non-adaptive frequency hopping systems	Equal to or less than the value declared bythe manufacturer. This declared value shall be equal to or less than 20 dBm.
☒ Adaptive frequency hopping systems	20dBm

3.2. Test Setup



3.3. Test Procedure

Refer to chapter 5.4.2.2.1 of EN 300 328 V2.2.0.

1. Run a test program to control EUT transmitting at specific channel
2. Connect the power sensor to the transmit port
3. Power Meter was setting as below:

Sample speed: 1 MS/s

Number of bursts: at least 10bursts

Detector: RMS

4. A power meter was used to read the response of the power sensor
5. Define Start time and Stop time of a burst by 30dB below the highest value of thestores samples.
6. Find the highest burst value
7. Record the power level
8. EIRP = antenna gain + power level of step 7.

3.4. Test Data

Please to see the following pages

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Temperature:	See below	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 3.7V Battery inside

Test Mode:		TX(CH00/CH39/CH78)-GFSK				
TEST CONDITIONS				Total e.i.r.p (dBm)		
				CH00	CH39	CH78
T nom (°C)	25.00	V nom (V)	DC 3.7V	-3.62	-4.02	-3.17
T min (°C)	-10.00	V nom (V)	DC 3.7V	-3.51	-3.54	-3.22
T max (°C)	45.00	V nom (V)	DC 3.7V	-3.38	-3.28	-3.41
Max RF Power				-3.17		
Limits				20dBm		
Result				PASS		

Test Mode:		TX(CH00/CH39/CH78)- π/4DQPSK				
TEST CONDITIONS				Total e.i.r.p (dBm)		
				CH00	CH39	CH78
T nom (°C)	25.00	V nom (V)	DC 3.7V	-3.63	-4.00	-4.12
T min (°C)	-10.00	V nom (V)	DC 3.7V	-3.65	-3.78	-3.93
T max (°C)	45.00	V nom (V)	DC 3.7V	-3.96	-3.63	-3.91
Max RF Power				-3.63		
Limits				20dBm		
Result				PASS		

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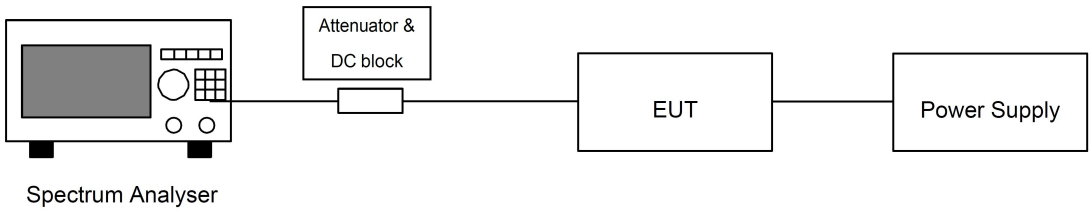
4. Accumulated Transmit Time, Frequency Occupation and Hopping Sequence

4.1. Test Limit

Test Item	Limit
Accumulated Transmit Time	≤ 0.4s
Frequency Occupation	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.
Hopping Sequence	The hopping sequence(s) shall contain at least N hopping frequencies at all times, where N is either 15 or the result of 15MHz divided by the minimum Hopping Frequency Separation in MHz, whichever is the greater.

4.2. Test Setup



4.3. Test Procedure

Refer to EN 300 328,clause 5.4.4 for the test conditions and the measurement method.

The setting of the Spectrum Analyzer

Frequency Center	Equal to the hopping frequency being investigated
Frequency Span	0Hz
Trace Mode	Clear / Write
Trigger Mode	Free Run
Detector	RMS
Sweep Point / Sweep Time	30000 / Equal to the applicable observation period
RBW	~ 50 % of the Occupied Channel Bandwidth
VBW	≥ RBW

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4.4. Test Data

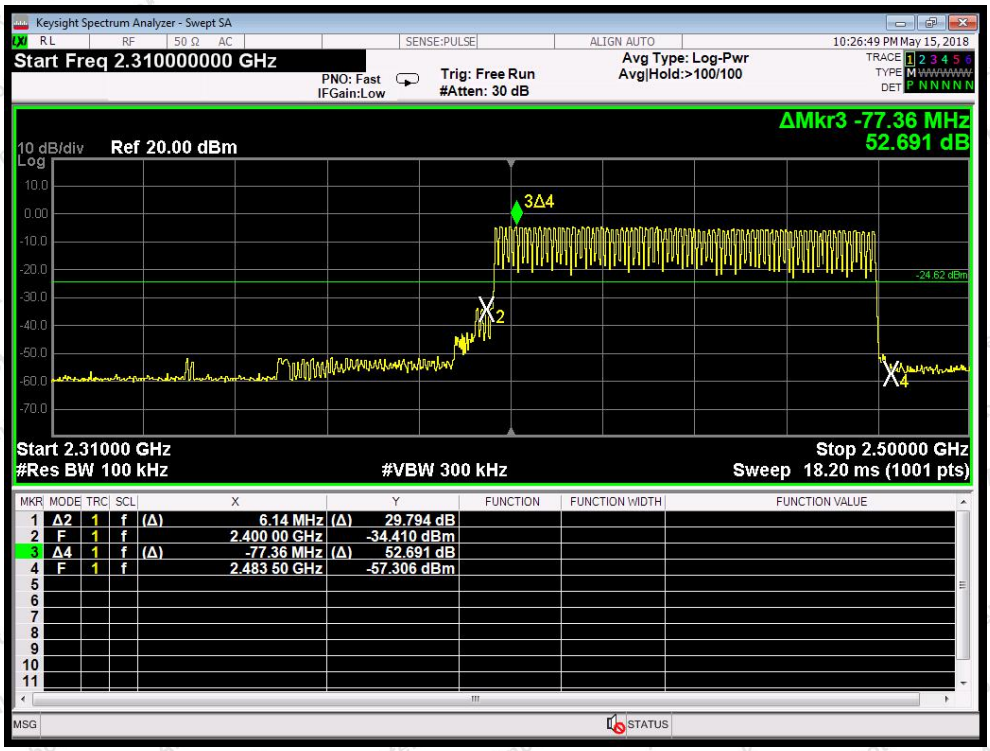
Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 3.7V Battery inside

(1) Accumulated Transmit Time

Package Type	Pulse width (ms)	Time slot length(ms)	Dwell time (ms)	Limit (s)	Result
DH1	0.378	time slot length *1600/2 /79 * 31.6	120.96	0.4	Pass
DH3	1.635	time slot length *1600/4 /79 * 31.6	261.60	0.4	Pass
DH5	2.880	time slot length *1600/6 /79 * 31.6	307.20	0.4	Pass
2DH1	0.388	time slot length *1600/2 /79 * 31.6	124.16	0.4	Pass
2DH3	1.640	time slot length *1600/4 /79 * 31.6	262.40	0.4	Pass
2DH5	2.888	time slot length *1600/6 /79 * 31.6	308.05	0.4	Pass

(2) Hopping Sequence&Occupied Frequency

Hopping Mode	Hopping Sequence		Minimum Occupied Frequency		Result
	Number of hopping frequencies	Limit	Occupied Frequency	Limit	
DH1	79	≥15	79.00	≥58.45	Pass



Number of Hopping Frequency

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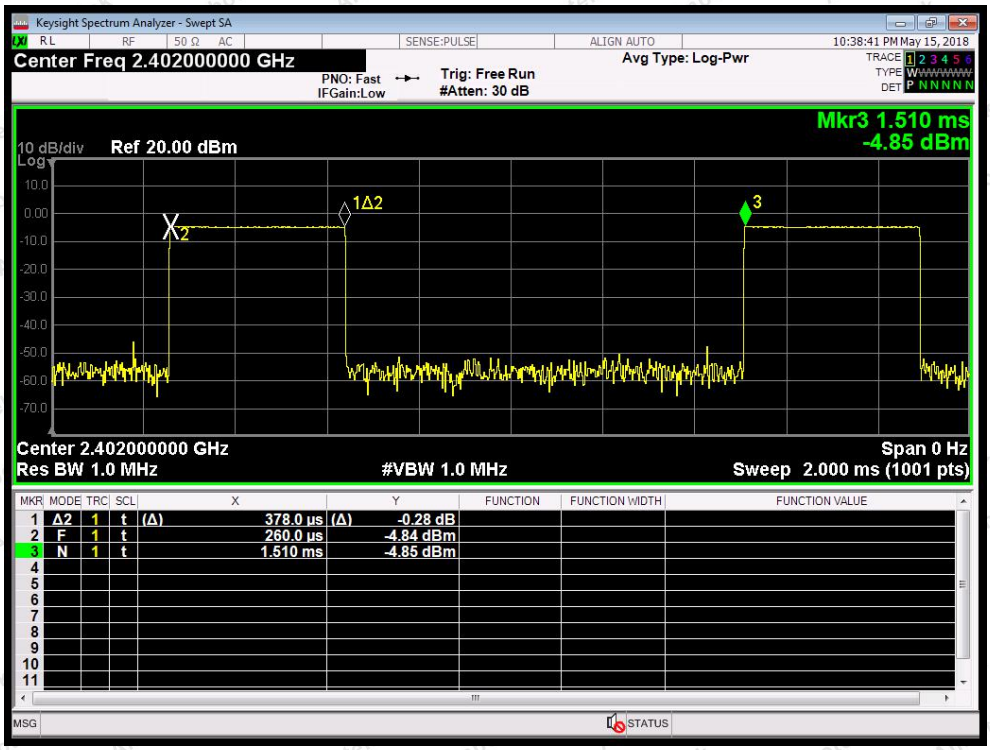
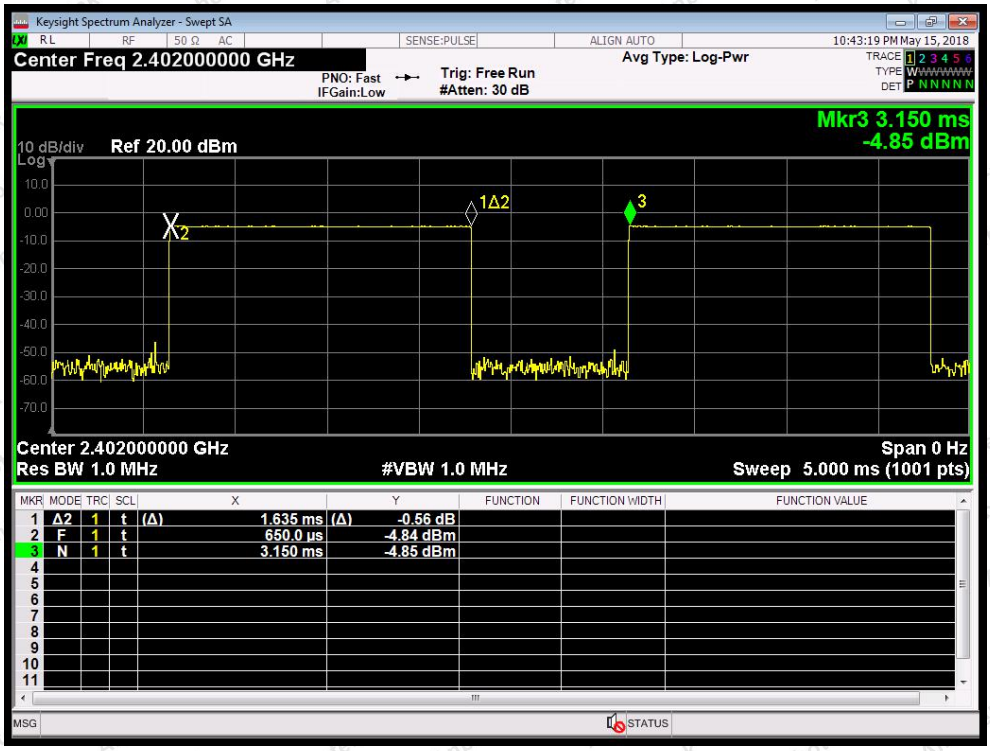


Test Mode: BDR---DH1



Test Mode: BDR---DH3

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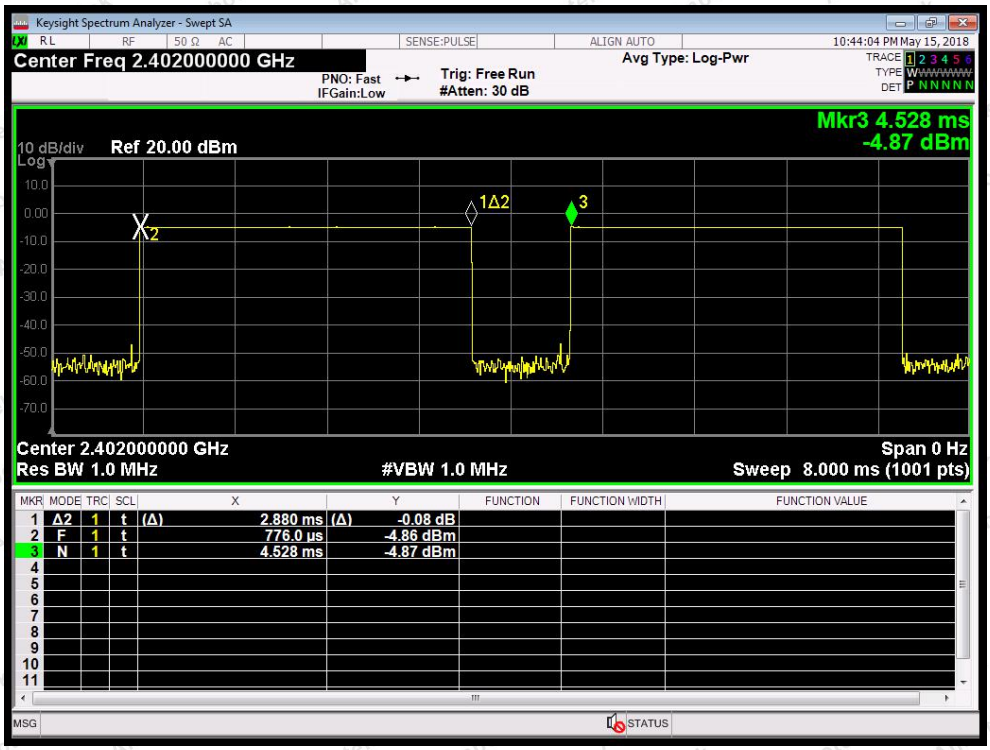
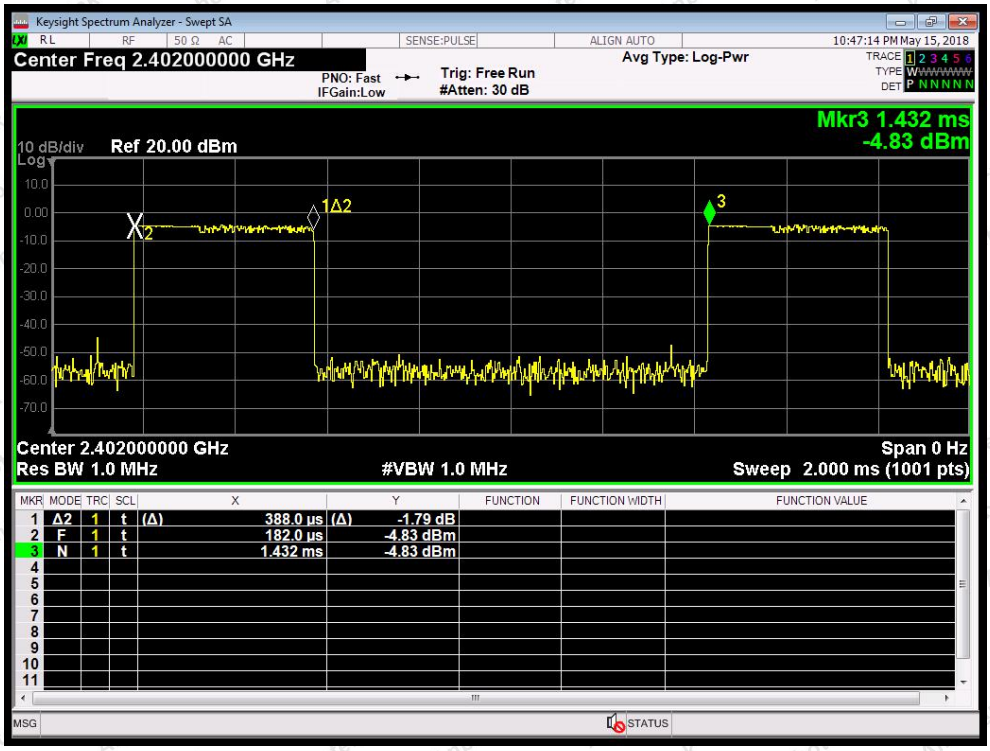


Test Mode: BDR—DH5



Test Mode: EDR---2DH1

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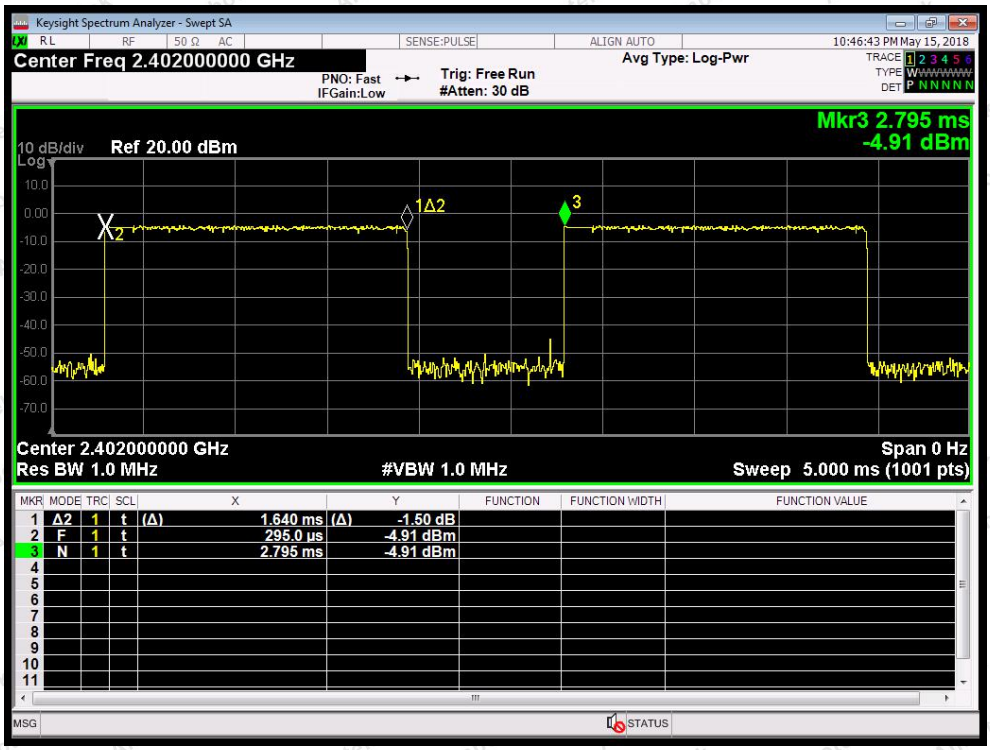
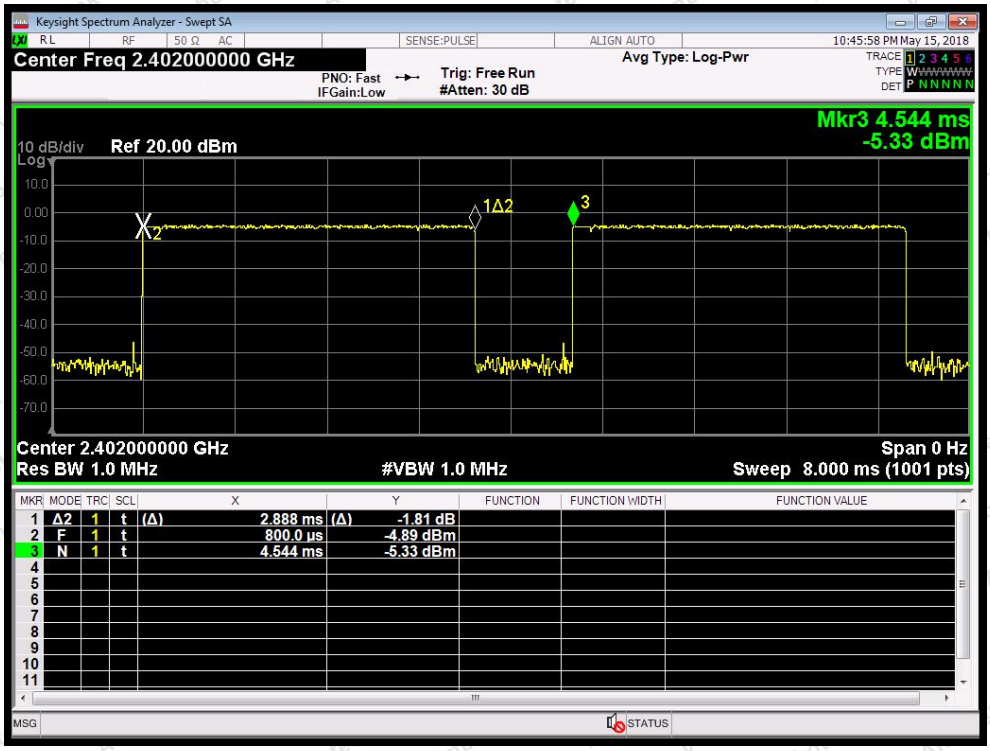


Test Mode: EDR---2DH3



Test Mode: EDR—2DH5

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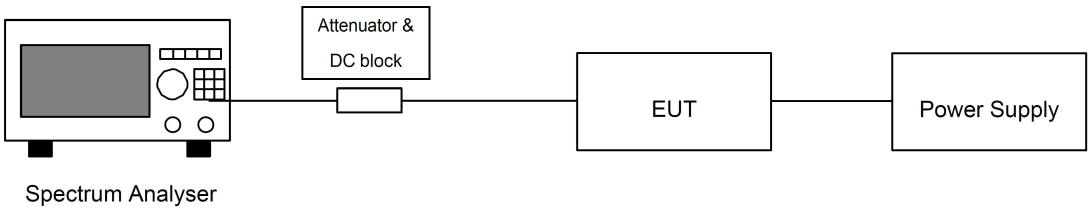
5. Hopping Frequency Separation

5.1. Test Limit

Test Limit	a) For non-adaptive Frequency Hopping equipment, the Hopping Frequency Separation shall be equal or greater than the b) For adaptive Frequency Hopping equipment, the minimum Hopping Frequency Separation shall be 100 kHz

Condition	Limit
☐ Non-adaptive frequency hopping systems	The Hopping Frequency Separation shall beequal or greater than the Occupied ChannelBandwidth of a single hop, with a minimumseparation of 100 kHz.
☒ Adaptive frequency hopping systems	The minimum Hopping Frequency Separationshall be 100 kHz.

5.2. Test Setup



5.3. Test Procedure

Refer as EN 300 328, clause 5.4.5for the test conditions and the measurement method.

The test procedure shall be as follows:

Step 1:

• The output of the transmitter shall be connected to a spectrum analyser or equivalent.

• The analyser shall be set as follows:

- Centre Frequency: Centre of the two adjacent hopping frequencies
- Frequency Span: Sufficient to see the complete power envelope of both hopping frequencies
- RBW: 1 % of the span（30KHz）
- VBW: 3 × RBW（100KHz）
- Detector Mode: Max Peak
- Trace Mode: Max Hold
- Sweep Time: Auto

Step 2:

• Wait for the trace to stabilize.

• Use the marker-delta function to determine the Hopping Frequency Separation between the centres of the two adjacent hopping frequencies (e.g. by identifying peaks or notches at the centre of the power envelope for the two adjacent signals). This value shall be compared with the limits defined in clause 4.3.1.5.3 and shall be recorded in the test report.

5.4. Test Data

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 3.7V Battery inside

Channel	Frequency (MHz)	Separation Read Value (kHz)	Limit (kHz)	Modulation Mode
Low	2402	1000	100kHz	BDR
Middle	2441	1000	100kHz	BDR
High	2480	1000	100kHz	BDR
Low	2402	1000	100kHz	EDR
Middle	2441	1000	100kHz	EDR
High	2480	1000	100kHz	EDR

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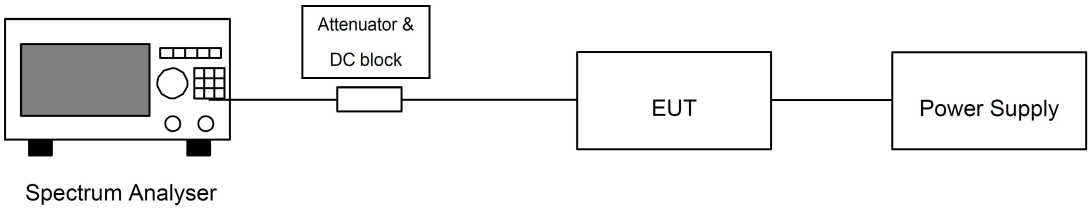
6. Occupied Channel Bandwidth

6.1. Test Limit

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

6.2. Test Setup



6.3. Test Procedure

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

The setting of the Spectrum Analyzer

Center Frequency	The centre frequency of the channel under test
Frequency Span	2 × Nominal Channel Bandwidth (e.g. 2MHz for BT)
Detector	RMS
RBW	~ 1 % of the span without going below 1 %
VBW	3 × RBW
Trace	Max hold
Sweep time	1S

6.4. Test Data

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Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 3.7V Battery inside

Modulation Type	Test Channel	99% Bandwidth (MHz)	FL/FH (MHz)	Limit	Result
GFSK	Lowest	0.83	2401.04	2400MHz ~ 2483.5MHz	Pass
	Highest	0.83	2480.20		Pass
π/4DQPSK	Lowest	1.17	2401.17	2400MHz ~ 2483.5MHz	Pass
	Highest	1.17	2480.48		Pass

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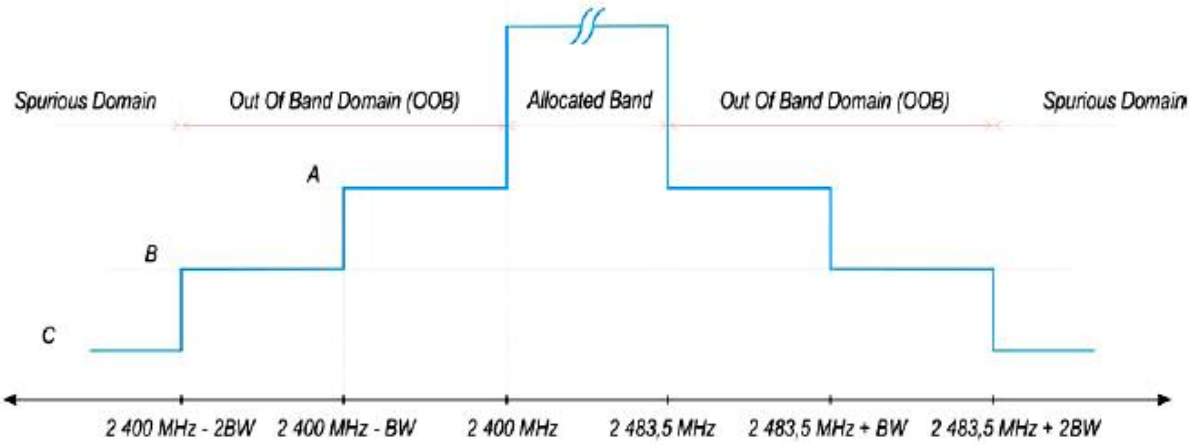
7. Transmitter Unwanted Emissions in the out-of-band Domain

7.1. Test Limit

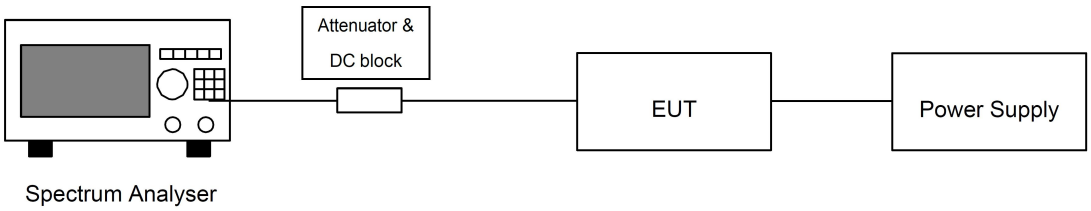
The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask in figure 1of clause 4.3.1.9



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

7.2. Test Setup



7.3. Test Procedure

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

The setting of the Spectrum Analyzer

RBW/ VBW	1MHz/3MHz
Span	0Hz
Filter mode	Channel filter
Sweep mode	Continuous
Sweep Points	Sweep Time[s]/(1us) or 5000 points, whichever is greater
Detector	RMS
Trace mode	Max Hold
Trigger Mode	Video trigger

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7.4. Test Data

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 3.7V Battery inside

Mode: BDR

Channel frequency		2402MHz		2480MHz	
Test condition		OOB Emission(MHz)		OOB Emission(MHz)	
		2400-BW ~2400	2400-2BW ~2400-BW	2483.5 ~ 2483.5+BW	2483.5+BW ~ 2483.5+2BW
		Maximum power (dBm)	Maximum power (dBm)	Maximum power (dBm)	Maximum power (dBm)
V nom (V)	DC 3.7V	-68.22	-71.29	-71.34	-70.51
Limits		-10.00	-20.00	-10.00	-20.00
PASS/FAIL		PASS	PASS	PASS	PASS

Mode: EDR

Channel frequency		2402MHz		2480MHz	
Test condition		OOB Emission(MHz)		OOB Emission(MHz)	
		2400-BW ~2400	2400-2BW ~2400-BW	2483.5 ~ 2483.5+BW	2483.5+BW ~ 2483.5+2BW
		Maximum power (dBm)	Maximum power (dBm)	Maximum power (dBm)	Maximum power (dBm)
V nom (V)	DC 3.7V	-68.01	-70.35	-66.52	-70.13
Limits		-10.00	-20.00	-10.00	-20.00
PASS/FAIL		PASS	PASS	PASS	PASS

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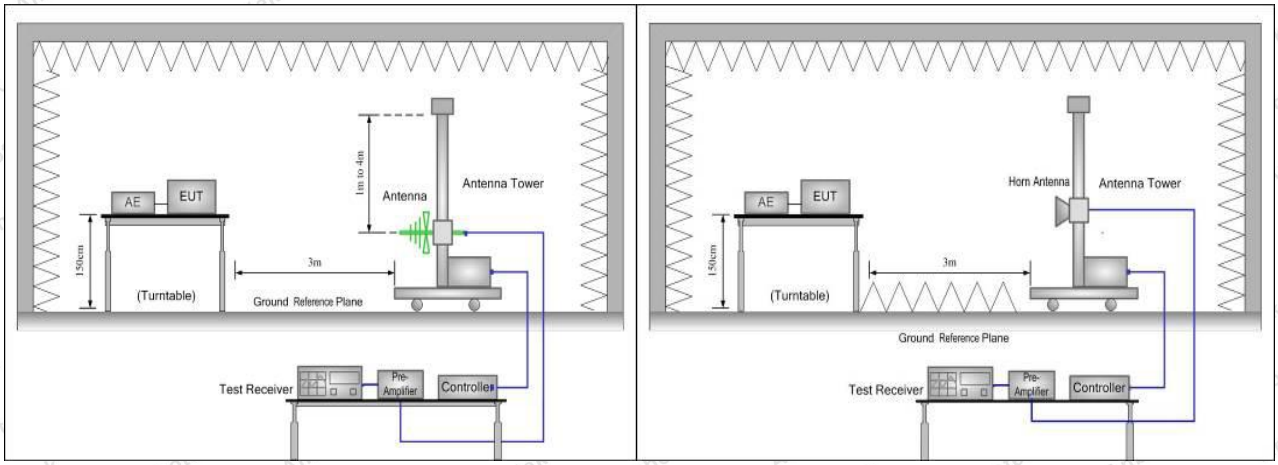
8. Transmitter Unwanted Emissions in the Spurious Domain

8.1. Test Limit

Frequency Range	Maximum Power	Bandwidth
30 MHz to 47 MHz	-36dBm	100kHz
47 MHz to 74 MHz	-54dBm	100kHz
74 MHz to 87,5 MHz	-36dBm	100kHz
87,5 MHz to 118 MHz	-54dBm	100kHz
118 MHz to 174 MHz	-36dBm	100kHz
174 MHz to 230 MHz	-54dBm	100kHz
230 MHz to 470 MHz	-36dBm	100kHz
470 MHz to 862 MHz	-54dBm	100kHz
862 MHz to 1 GHz	-36dBm	100kHz
1GHz ~ 12.75GHz	-30dBm	1MHz

8.2. Test Setup

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



8.3. Test Procedure

Refer to chapter 5.4.9.2.2 of EN 300 328 V2.2.0 for radiated measurement.

1. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration).
2. The measurements were performed when normal hopping was disabled. In this case measurements were performed when operating at the lowest and the highest hopping frequency.
3. The equipment was configured to operate under its worst case situation with respect to output power.
4. The test setup has been constructed as the normal use condition. Controlling software has been activated to set the EUT on specific status.

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8.4. Test Data

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 3.7V Battery inside

worst case: GFSK modulation

The low channel					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
51.57	-70.57	-54.00	-16.57	H	PASS
149.77	-67.05	-36.00	-31.05	H	
419.93	-67.21	-36.00	-31.21	H	
683.38	-68.22	-54.00	-14.22	H	
4804.51	-57.66	-30.00	-27.66	H	
7206.13	-60.50	-30.00	-30.50	H	
54.12	-74.99	-54.00	-20.99	V	
160.05	-66.18	-36.00	-30.18	V	
431.62	-67.77	-36.00	-31.77	V	
739.84	-67.91	-54.00	-13.91	V	
4804.77	-61.14	-30.00	-31.14	V	
7206.67	-66.48	-30.00	-36.48	V	

The high channel					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
70.73	-70.12	-54.00	-16.12	H	PASS
161.25	-68.05	-36.00	-32.05	H	
287.44	-66.43	-36.00	-30.43	H	
569.26	-66.18	-54.00	-12.18	H	
4960.88	-67.75	-30.00	-37.75	H	
7440.98	-60.52	-30.00	-30.52	H	
67.23	-71.27	-54.00	-17.27	V	
135.12	-65.32	-36.00	-29.32	V	
379.22	-71.28	-36.00	-35.28	V	
517.96	-66.40	-54.00	-12.40	V	
4960.92	-55.21	-30.00	-25.21	V	
7440.50	-61.60	-30.00	-31.60	V	

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9. Receiver Spurious Emissions

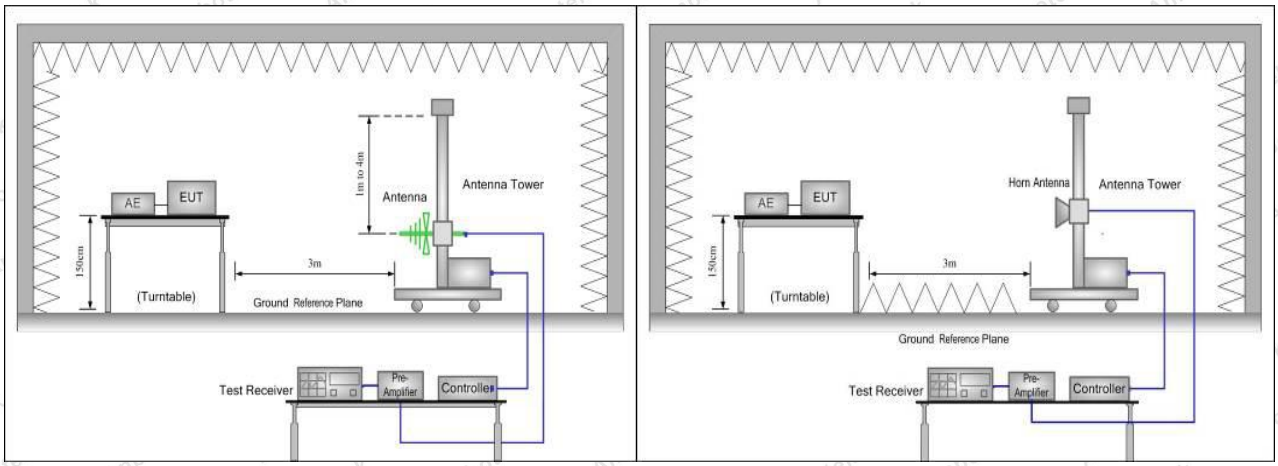
9.1. Test Limit

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

Frequency Range	Maximum Power
30MHz ~ 1GHz	-57dBm
1GHz ~ 12.75GHz	-47dBm

9.2. Test Setup

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



9.3. Test Procedure

Refer as EN 300 328, Refer to chapter 5.4.10.2.2 for radiated measurement.

1. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration).
2. Testing was performed when the equipment was in a receive-only mode.
3. The measurements were performed when normal hopping was disabled. In this case measurements were performed when operating at the lowest and the highest hopping frequency.
4. The test setup has been constructed as the normal use condition. Controlling software has been activated to set the EUT on specific status.

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9.4. Test Data

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 3.7V Battery inside

worst case: GFSK modulation

The low channel					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
59.03	-68.00	-57.00	-11.00	H	PASS
134.16	-68.08	-57.00	-11.08	H	
324.45	-67.02	-57.00	-10.02	H	
807.71	-68.82	-57.00	-11.82	H	
3982.00	-64.66	-47.00	-17.66	H	
6516.87	-63.66	-47.00	-16.66	H	
60.16	-74.37	-57.00	-17.37	V	
135.56	-68.86	-57.00	-11.86	V	
331.67	-68.67	-57.00	-11.67	V	
601.88	-66.25	-57.00	-9.25	V	
3905.85	-61.04	-47.00	-14.04	V	
6147.90	-63.93	-47.00	-16.93	V	

The high channel					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
64.13	-67.41	-57.00	-10.41	H	PASS
147.53	-68.96	-57.00	-11.96	H	
353.86	-68.43	-57.00	-11.43	H	
611.62	-71.39	-57.00	-14.39	H	
3437.08	-58.17	-47.00	-11.17	H	
6392.34	-66.65	-47.00	-19.65	H	
68.86	-74.88	-57.00	-17.88	V	
161.81	-67.76	-57.00	-10.76	V	
390.34	-68.14	-57.00	-11.14	V	
825.62	-66.29	-57.00	-9.29	V	
3257.49	-65.67	-47.00	-18.67	V	
6413.89	-66.79	-47.00	-19.79	V	

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10. Receiver Blocking

10.1. Test Limit

This requirement applies to all receiver categories.

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

Table 14: Receiver Blocking parameters for Receiver Category 1 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 4)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 5)	Type of blocking signal
(-139 dBm + 10 × $\log_{10}$(OCBW)) or -68 dBm whichever is less (see note 2)	2 380 2 503,5	-34	CW
(-139 dBm + 10 × $\log_{10}$(OCBW)) or -74 dBm whichever is less (see note 3)	2 300 2 330 2 360 2 523,5 2 553,5 2 583,5 2 613,5 2 643,5 2 673,5		

NOTE 1: OCBW is in Hz.
NOTE 2: As an alternative the test may be performed using a wanted signal equal to P_{min} + 26 dB where 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: As an alternative the test may be performed using a wanted signal equal to P_{min} + 20 dB where 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 4: In case of radiated measurements, this wanted signal level is the level in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2. In the case of conducted measurements this wanted signal level is the level applied at the antenna connector.
NOTE 5: In case of radiated measurements, the blocking levels specified are levels in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2. In the case of conducted measurements this blocking level is the level applied at the antenna connector. Alternatively, in case the actual antenna performance at the blocking frequencies has been declared (see clause 5.4.1 m) ii)), the difference between the in-band antenna gain and the actual antenna gain at each of the blocking frequencies shall be taken into account.

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Table 15: Receiver Blocking parameters receiver Category 2 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 4)	Type of blocking signal
(-139 dBm + 10 × $\log_{10}$(OCBW) + 10) or (-74 dBm + 10) whichever is less (see note 2)	2 380 2 503,5 2 300 2 583,5	-34	CW
NOTE 1: OCBW is in Hz. NOTE 2: As an alternative the test may be performed using a wanted signal equal to P_{min} + 26 dB where 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, this wanted signal level is the level in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2. In the case of conducted measurements this wanted signal level is the level applied at the antenna connector. NOTE 4: In case of radiated measurements, the blocking levels specified are levels in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2. In the case of conducted measurements this blocking level is the level applied at the antenna connector. Alternatively, in case the actual antenna performance at the blocking frequencies has been declared (see clause 5.4.1 m) ii)), the difference between the in-band antenna gain and the actual antenna gain at each of the blocking frequencies shall be taken into account.			

Table 16: Receiver Blocking parameters receiver Category 3 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 4)	Type of blocking signal
(-139 dBm + 10 × $\log_{10}$(OCBW) + 20) or (-74 dBm + 20) whichever is less (see note 2)	2 380 2 503,5 2 300 2 583,5	-34	CW
NOTE 1: OCBW is in Hz. NOTE 2: As an alternative the test may be performed using a wanted signal equal to P_{min} + 30 dB where 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, this wanted signal level is the level in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2. In the case of conducted measurements this wanted signal level is the level applied at the antenna connector. NOTE 4: In case of radiated measurements, the blocking levels specified are levels in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2. In the case of conducted measurements this blocking level is the level applied at the antenna connector. Alternatively, in case the actual antenna performance at the blocking frequencies has been declared (see clause 5.4.1 m) ii)), the difference between the in-band antenna gain and the actual antenna gain at each of the blocking frequencies shall be taken into account.			

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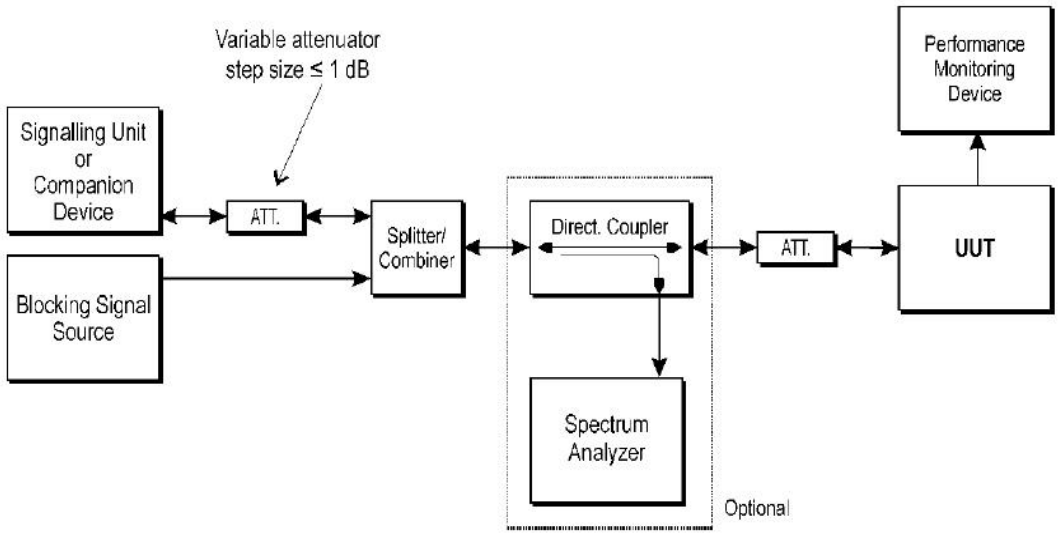
10.2. Test Setup



10.3. Test Procedure

Refer to chapter 5.4.11.2.1 of EN 300 328 V2.2.0

10.4. Minimum Performance Declaration

	CH	Pmin (dBm)	PER (≦10%)
GFSK	0	-91	Pass
	78	-91	Pass
π /4-DQPSK	0	-91	Pass
	78	-91	Pass

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

10.5. Test Data

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 3.7V Battery inside

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GFSK Mode

Wanted Signal Mean Power from Companion Device (dBm/MHz)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm)	Type of Blocking Signal	Pass / Fail
Pmin + 26 dB	2380	-34	CW	PASS
	2503.5			PASS

π /4-DQPSK

Wanted Signal Mean Power from Companion Device (dBm/MHz)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm)	Type of Blocking Signal	Pass / Fail
Pmin + 26 dB	2380	-34	CW	PASS
	2503.5			PASS

Note: Antenna Gain(Peak) is 1.2dBi, so the above table is given with the calculated levels.

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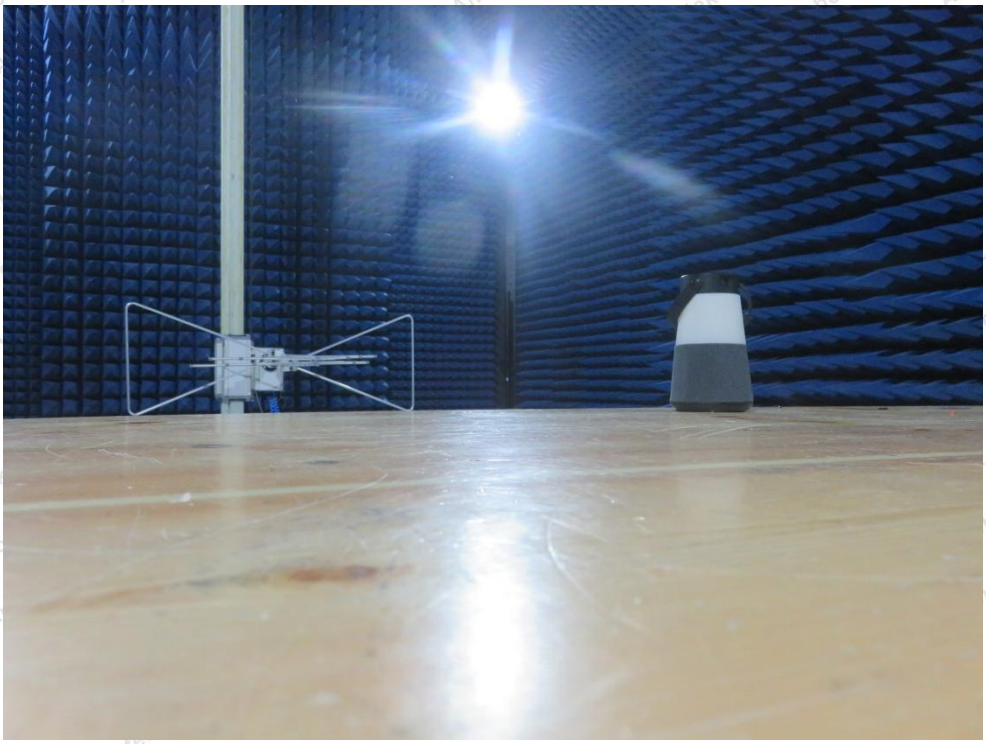
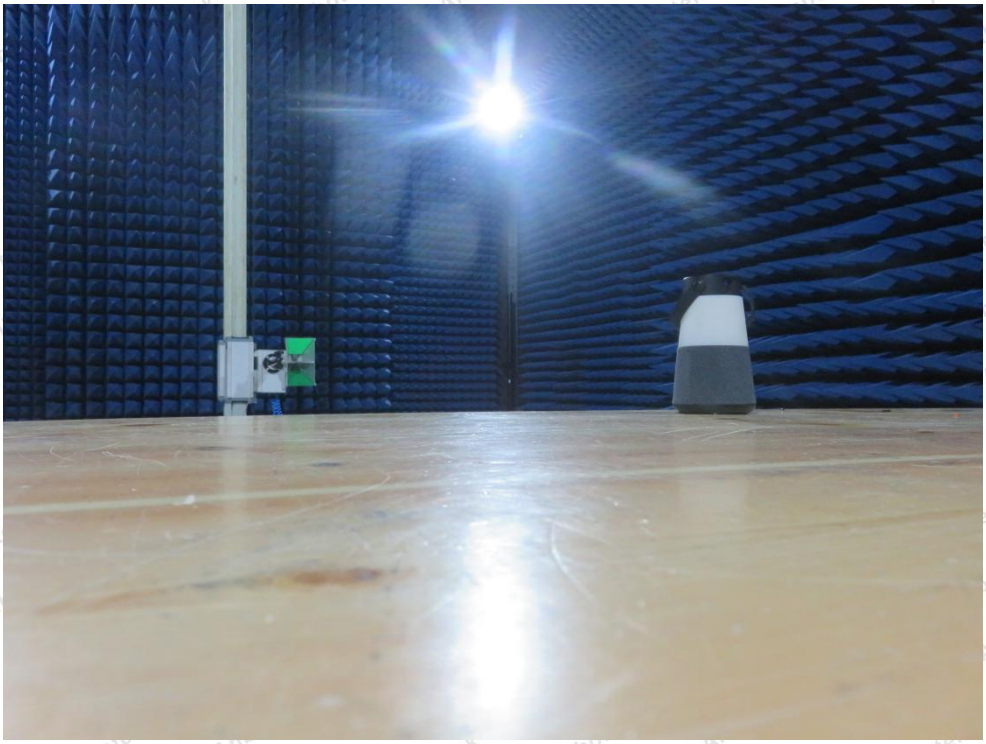
APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Radiation Emission Test





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