

EN 300 328 RADIO TEST REPORT

FOR

Applicant	:	Audioengine LLC
Address	:	6500 River Place Blvd, Bldg 7, Ste 250, Austin, Tx 78730, USA
Equipment under Test	:	A2+BT desktop powered bluetooth speaker
Model No.	:	A2+BT
Trade Mark	:	Audioengine
Manufacturer	:	Evervictory Electronic Company Limited
Address	:	Chu Chi Management District, Hu Men Town, Dong-Guan City, Guang-Dong Province, P.R.China

Issued By: Dongguan Dongdian Testing Service Co., Ltd.

Add: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan
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REPORT

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TEST REPORT DECLARE

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Model No.	:	A2+BT
Trade mark	:	Audioengine
Manufacturer	:	Everictory Electronic Company Limited
Address	:	Chu Chi Management District, Hu Men Town, Dong-Guan City, Guang-Dong Province, P.R.China

Test Standard Used: EN 300 328 V2.1.1 (2016-11)

We Declare:

The equipment described above is tested by Dongguan Dongdian Testing Service Co., Ltd and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and Dongguan Dongdian Testing Service Co., Ltd is assumed of full responsibility for the accuracy and completeness of these tests.

After test and evaluation, our opinion is that the equipment In Accordance with EN 300 328 V2.1.1 about the effective uses allocated spectrum requirements of Directive 2014/53/EU.

Report No.:	DDT-R18031306-1E5		
Date of Receipt:	May 21, 2018	Date of Test:	May 21, 2018 ~ Sep. 30, 2018



Prepared By:

Approved By:

Sam Li/Engineer

Damon Hu/EMC Manager

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Dongguan Dongdian Testing Service Co., Ltd.

Revision history

Rev.	Revisions	Issue Date	Revised By
---	Initial issue	Oct. 10, 2018	

1. Summary of test results

1.1. Standard description

EN 300 328 V2.1.1: Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU.

1.2. Test result

Harmonized Standard EN 300 328				
The following essential requirements and test specifications are relevant to the presumption of conformity under Article 3.2 of the RED Directive				
No	Test Parameter	Clause No	Condition	Results
1	RF Output Power	4.3.1.2 or 4.3.2.2	Apply all equipment	PASS
2	Power Spectral Density	4.3.2.3	Only for equipment using wide band modulations other than FHSS	N/A
3	Duty Cycle, Tx-Sequence, Tx-gap	4.3.1.3 or 4.3.2.4	Only for non-adaptive equipment	Only for ≥ 10 dBm and non-adaptive
4	Accumulated Transmit time, Frequency Occupation & Hopping Sequence	4.3.1.4	Only for FHSS equipment	PASS
5	Hopping Frequency Separation	4.3.1.5	Only for FHSS	PASS
6	Medium Utilisation	4.3.1.6 or 4.3.2.5	Only for non-adaptive equipment	Only for ≥ 10 dBm and non-adaptive
7	Adaptive	4.3.1.7 or 4.3.2.6	Only for adaptive equipment	Only for ≥ 10 dBm and non-adaptive
8	Occupied Channel Bandwidth	4.3.1.8 or 4.3.2.7	Apply all equipment	PASS
9	Transmitter unwanted emissions in the OOB domain	4.3.1.9 or 4.3.2.8	Apply all equipment	PASS
10	Transmitter unwanted emissions in the spurious domain	4.3.1.10 or 4.3.2.9	Apply all equipment	PASS
11	Receiver spurious emissions	4.3.1.11 or 4.3.2.10	Apply all equipment	PASS
12	Receiver Blocking	4.3.1.12 or 4.3.2.11	Apply all equipment	PASS
13	Geo-location capability	4.3.1.13 or 4.3.2.12	Only for equipment with geo-location capability	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.

2. General test information

2.1. Description of EUT

EUT* Name	: A2+BT desktop powered bluetooth speaker
Model Number	: A2+BT
EUT function description	: Please reference user manual of this device
Power supply	: DC 17.5V from external AC Adapter
Hardware Version	:
Software Version	:
Radio Specification	:
Operation frequency	: 2402MHz-2480MHz
Modulation	: GFSK, $\pi/4$ -DQPSK, 8DPSK
Data rate	: 1Mbps, 2Mbps, 3Mbps
Antenna Type	: External FPC antenna, maximum PK gain: 2.5dBi
Sample Type	: Series production

Note: EUT is the ab. of equipment under test.

2.2. Accessories of EUT

Description of Accessories	Trade mark	Model number	Serial No.	Other
AC Adapter	audioengine	SZFB-S175180-A0	N/A	INPUT: AC 100-240 50/60Hz 1.5A OUTPUT: DC \pm 17.5V 1.8A

2.3. Assistant equipment used for test

Description of Assistant equipment	Manufacturer	Model number or Type	EMC Compliance	SN:
Notebook	DELL	Latitude D610	FCC DOC	00045-534-136-300

2.4. Block diagram of EUT configuration for test



The test software was used to control EUT work in Continuous Tx mode, and select test channel, wireless mode as below table.

Test software: BlueSuite 2.6.2.EXE

Tested mode, channel, information		
Mode	Channel	Frequency (MHz)
GFSK hopping on Tx mode	CH0 to CH78	2402 to 2480
$\pi/4$ -DQPSK hopping on Tx mode	CH0 to CH78	2402 to 2480
8DPSK hopping on Tx mode	CH0 to CH78	2402 to 2480
GFSK hopping off Tx mode	LCH: CH0	2402
	MCH: CH39	2441
	HCH: CH78	2480
$\pi/4$ -DQPSK hopping off Tx mode	LCH: CH0	2402
	MCH: CH39	2441
	HCH: CH78	2480
8DPSK hopping off Tx mode	LCH: CH0	2402
	MCH: CH39	2441
	HCH: CH78	2480

Note: For $\pi/4$ -DQPSK its same modulation type with 8DPSK, and based exploratory test, there is no significant difference of that two types test result, after the preliminary scan, 8DPSK will have higher emission, all other items final test was only performed with the worst case 8DPSK and GFSK.

2.5. Test environment conditions

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

/	Normal Conditions	Extreme Conditions
Temperature range	21-25°C	-20°C to +55°C
Humidity range	40-75%	N/A
Pressure range	86-106kPa	N/A
Power supply	NV: DC 17.5V from external AC Adapter	N/A

Note: The Extreme temperature range and extreme voltages are declared by the manufacturer.

2.6. Deviations of test standard

No Deviation.

2.7. Test laboratory

Dongguan Dongdian Testing Service Co., Ltd

Add: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China, 523808

Tel: +86-0769-38826678, <http://www.dgddt.com>, Email: ddt@dgddt.com

CNAS Accreditation No. L6451; A2LA Accreditation No. 3870.01

Designation Number: CN1182; Test Firm Registration Number: 540522

Industry Canada site registration number: 10288A-1

2.8. Measurement uncertainty

Test Item	Uncertainty
Occupied Channel Bandwidth	1.1%
RF Output power, conducted	0.74dB
Power Spectral Density, Conducted	0.74dB
Unwanted Emissions, Conducted	0.86dB (10MHz ≤ f < 3.6GHz);
	1.40dB (3.6GHz ≤ f < 8GHz)
	1.66dB (8GHz ≤ f < 22GHz)
Temperature	0.4°C
Humidity	2%
DC and Low frequency voltage	1.0%
Time	0.6%
Duty Cycle	0.6%
Radiated Spurious Emissions (Substitution method)	3.57dB
Radiated Spurious Emissions (Pre-correction method)	4.14dB (30MHz-1GHz)
	5.32dB (1GHz-18GHz)

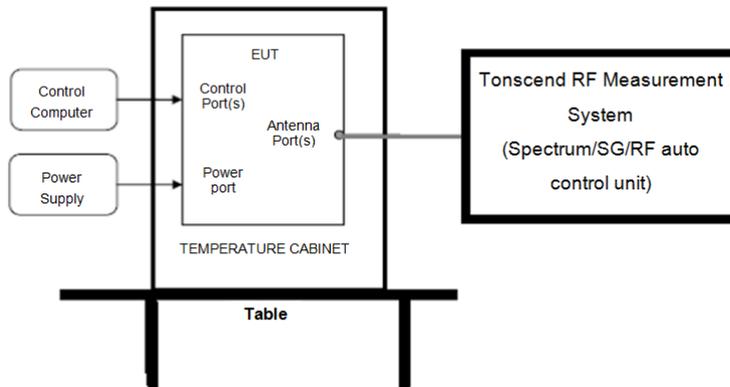
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3. Equipment used during test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
RF Connected Test (Tonscend RF Measurement System)					
Spectrum analyzer	R&S	FSU26	200071	Oct. 23, 2017	1 Year
Wideband Radio Communication tester	R&S	CMW500	117491	Jun. 29, 2018	1 Year
Vector Signal Generator	Agilent	E8267D	US49060192	Oct. 23, 2017	1 Year
Vector Signal Generator	Agilent	N5182A	MY48180737	Jun. 29, 2018	1 Year
Power Sensor	Agilent	U2021XA	MY55150010	Oct. 21, 2017	1 Year
Power Sensor	Agilent	U2021XA	MY55150011	Oct. 23, 2017	1 Year
DC Power Source	MATRIS	MPS-3005L-3	D813058W	Aug. 18, 2018	1 Year
Attenuator	Mini-Circuits	BW-S10W2	101109	Aug. 18, 2018	1 Year
RF Cable	Micable	C10-01-01-1	100309	Oct. 21, 2017	1 Year
Temp&Humi Programmable	ZHIXIANG	ZXGDJS-150L	ZX170110-A	Oct. 21, 2017	1 Year
Test Software	JS Tonscend	JS1120-3	Ver.2.7	N/A	N/A
Radiated Emission Test Chamber 1#					
EMI Test Receiver	R&S	ESU8	100316	Oct. 21, 2017	1 Year
Spectrum analyzer	Agilent	E4447A	MY50180031	Jun. 29, 2018	1 Year
Trilog Broadband Antenna	Schwarzbeck	VULB9163	9163-462	Nov. 09, 2017	1 Year
Active Loop antenna	Schwarzbeck	FMZB-1519	1519-038	Oct. 17, 2017	1 Year
Double Ridged Horn Antenna	R&S	HF907	100276	Oct. 17, 2017	1 Year
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	790	Nov. 09, 2017	1 Year
Pre-amplifier	A.H.	PAM-0118	360	Oct. 21, 2017	1 Year
Pre-amplifier	TERA-MW	TRLA-0040G35	101303	Oct. 21, 2017	1 Year
RF Cable	HUBSER	CP-X2+ CP-X1	W11.03+ W12.02	Oct. 21, 2017	1 Year
RF Cable	N/A	SMAJ-SMAJ-1M + 11M	17070133+17070131	Nov. 08, 2017	1 Year
MI Cable	HUBSER	C10-01-01-1M	1091629	Oct. 21, 2017	1 Year
Test software	Audix	E3	V 6.11111b	N/A	N/A

4. RF Output Power

4.1. Block diagram of test setup



4.2. Limits

The maximum RF output power for adaptive Frequency Hopping equipment shall be equal to or less than 20 dBm.

The maximum RF output power for this equipment shall be equal to or less than the value declared by the manufacturer. This declared value shall be equal to or less than 20 dBm. This limit shall apply for any combination of power level and intended antenna assembly.

4.3. Test Procedure

- (1) Connect each EUT's antenna output to power sensor by RF cable and attenuator.
- (2) Refer to EN 300 328 V2.1.1 Clause 5.4.2.2.1.
- (3) For adaptive equipment, the measurement duration shall be long enough to ensure a minimum number of bursts (at least 10) is captured.

4.4. Test Result

GFSK Modulation					
Test conditions		Power (dBm)	EIRP (dBm)	Limit (dBm)	Verdict
Voltage (V)	Temperature (°C)				
NV	LT	7.24	9.74	20.00	Pass
	NT	7.36	9.86		
	HT	7.28	9.78		
8DPSK Modulation					
Test conditions		Power (dBm)	EIRP (dBm)	Limit (dBm)	Verdict
Voltage (V)	Temperature (°C)				
NV	LT	4.48	6.98	20.00	Pass
	NT	4.59	7.09		
	HT	4.50	7.00		

Note: EIRP = Measured Highest Pburst Values + Antenna Gain

5. Accumulated Transmit time, Frequency Occupation & Hopping Sequence

5.1. Block diagram of test setup

Same as section 4.1

5.2. Limits

The Dwell Time is the time that a particular hopping frequency would be occupied by the transmitter during a single hop. The equipment itself is not required to transmit on this hopping frequency during the Dwell Time.

For this Adaptive frequency hopping systems, the maximum accumulated dwell time on any hopping frequency shall be 400 ms within any period of 400 ms multiplied by the minimum number of hopping frequencies (79) that have to be used.

The Minimum Frequency Occupation Time shall be equal to one dwell time within a period not exceeding four times the product of the dwell time per hop and the number of hopping frequencies in use.

5.3. Test Procedure

- (1) Connect EUT's antenna output to spectrum analyzer by RF cable and an attenuator.
- (2) Refer to EN 300 328 V2.1.1 Clause 5.4.4
- (3) JS Tonscend test software is used to control the spectrum analyzer to use the following settings:

Centre Frequency:	Equal to the hopping frequency being investigated
Frequency Span:	0 Hz
RBW:	~ 50 % of the Occupied Channel Bandwidth
VBW:	≥ RBW
Detector Mode:	RMS
Sweep time:	Auto
Trace Mode	Max Hold

5.4. Test Result

Accumulated Dwell Time

Test Mode	Test Channel	Ant	Accumulated Dwell time [ms]	Limit [ms]	Verdict
DH5	2402	Ant1	306.510	<=400	PASS
DH5	2480	Ant1	308.616	<=400	PASS
3DH5	2402	Ant1	312.830	<=400	PASS
3DH5	2480	Ant1	313.883	<=400	PASS

Note: Save the trace data to a file for further analysis by a computing device using an appropriate software application.

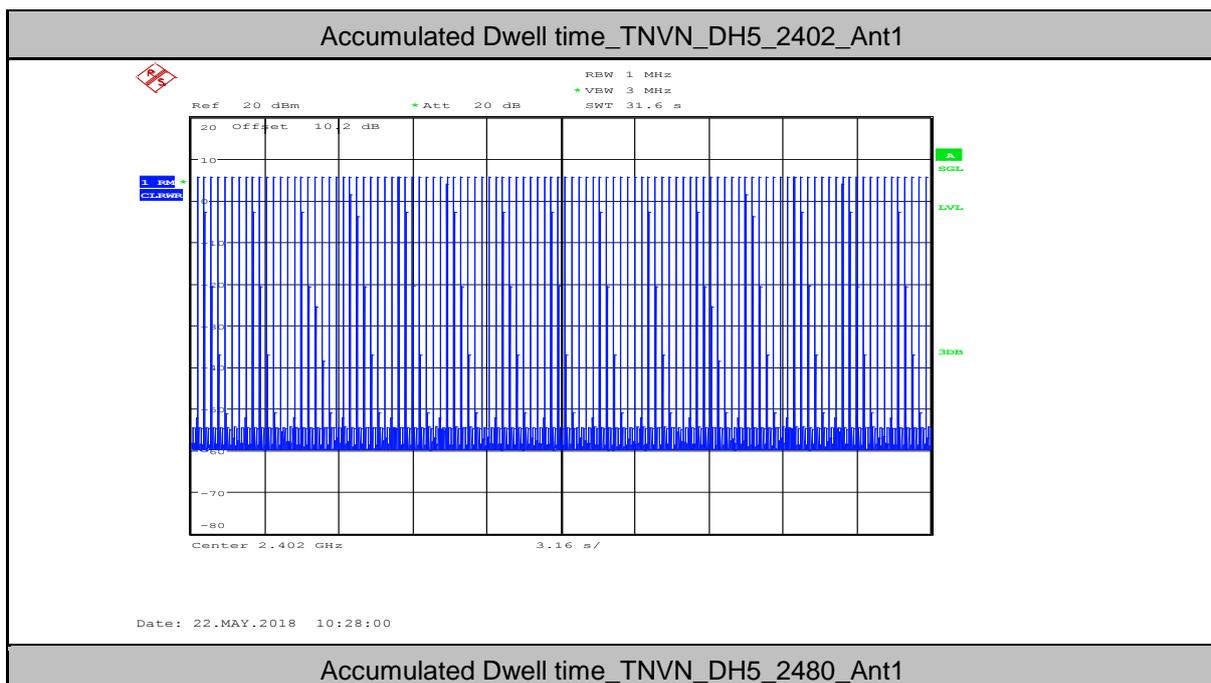
Minimum Frequency Occupation

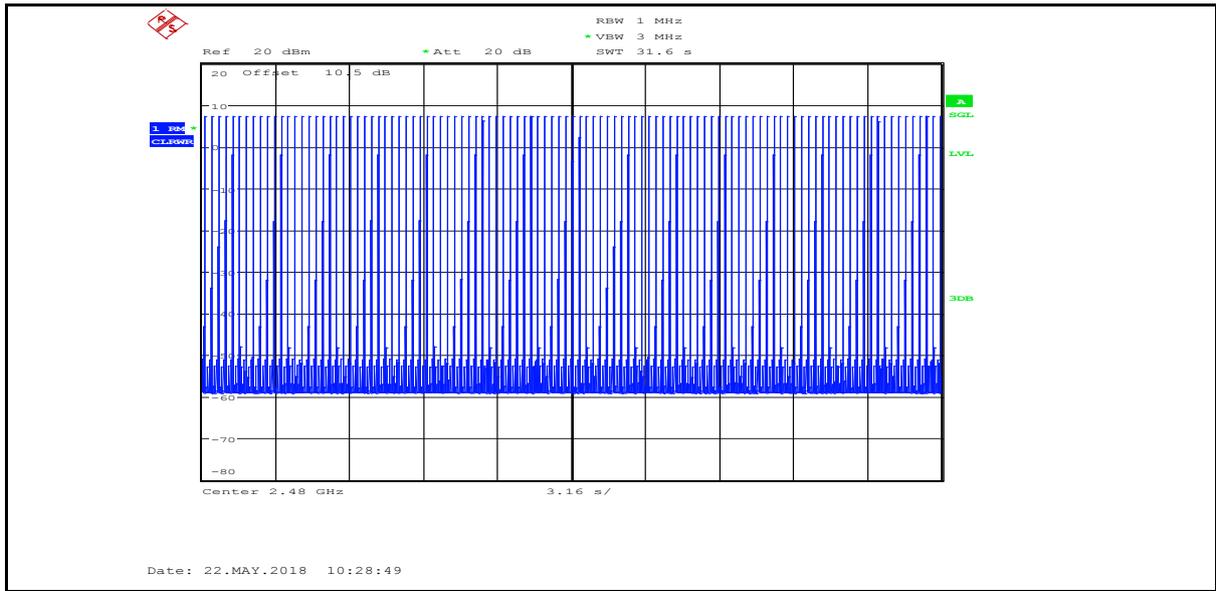
Channel	Modulation	Frequency occupation times (N)	Limit (N)	Result
LCH	GFSK	3	≥1	Pass
HCH		3		Pass
LCH	8DPSK	51		Pass
HCH		45		Pass

Hopping Sequence

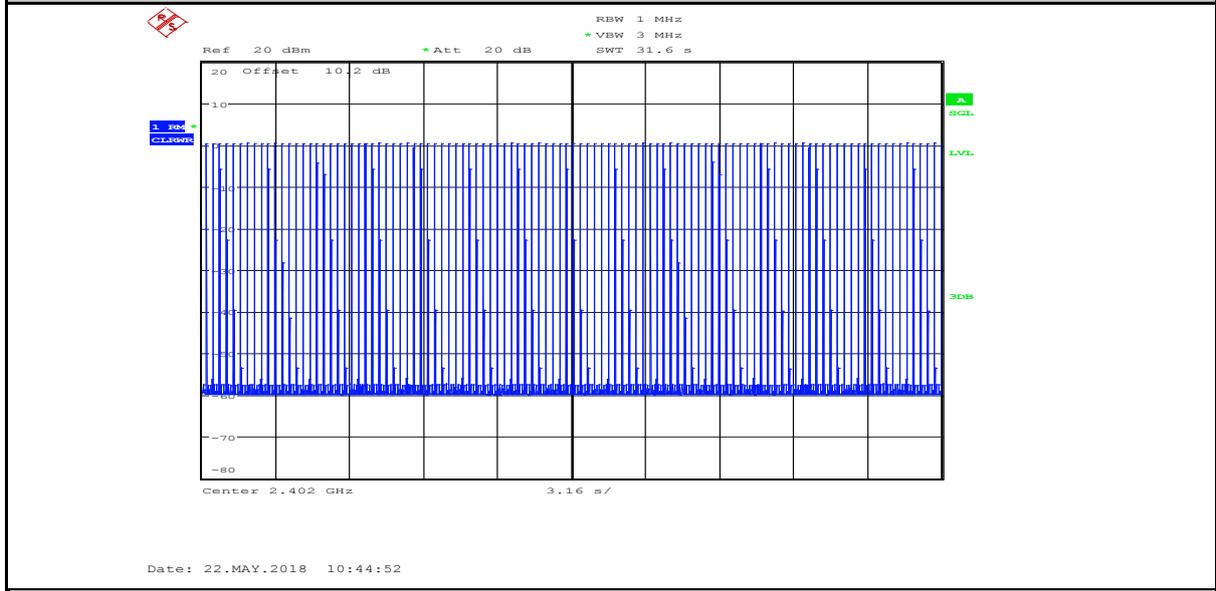
Modulation	Number of Hopping Channel	Limit	-20 dB Bandwidth (%)	Limit	Result
GFSK	79	≥15	95.55	70 % of the band 2400MHz-2483.5MHz	Pass
8DPSK	79		96.00		

5.5. Original test data

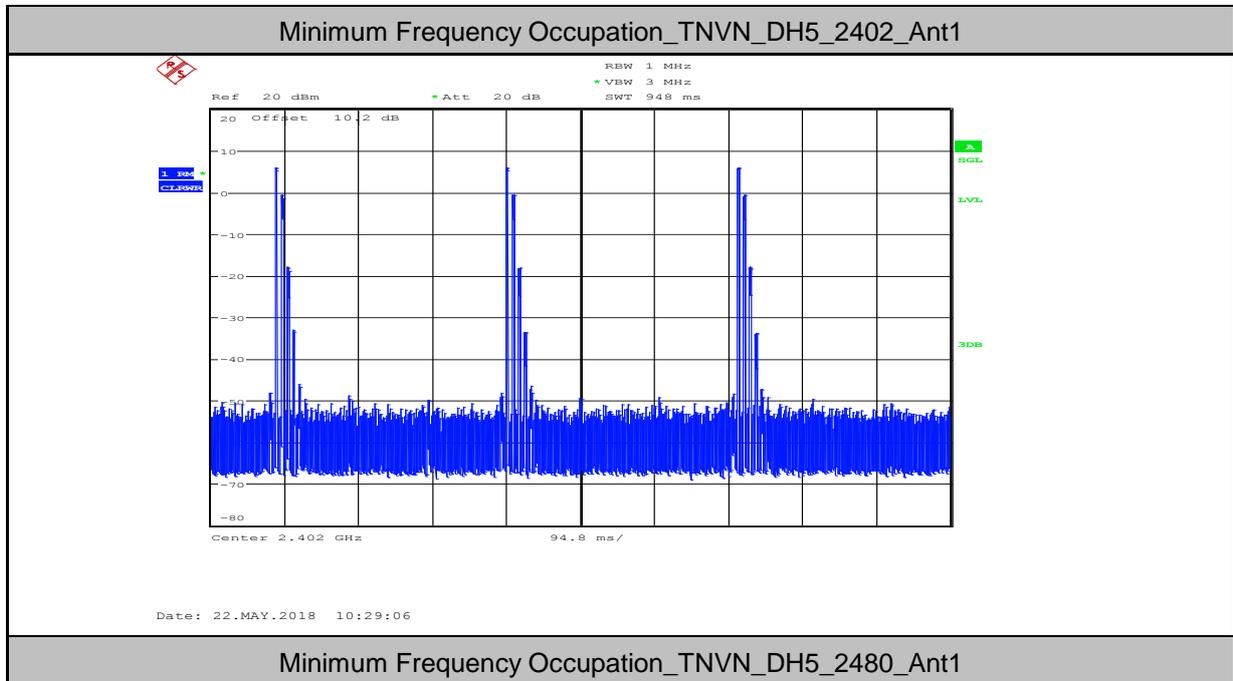
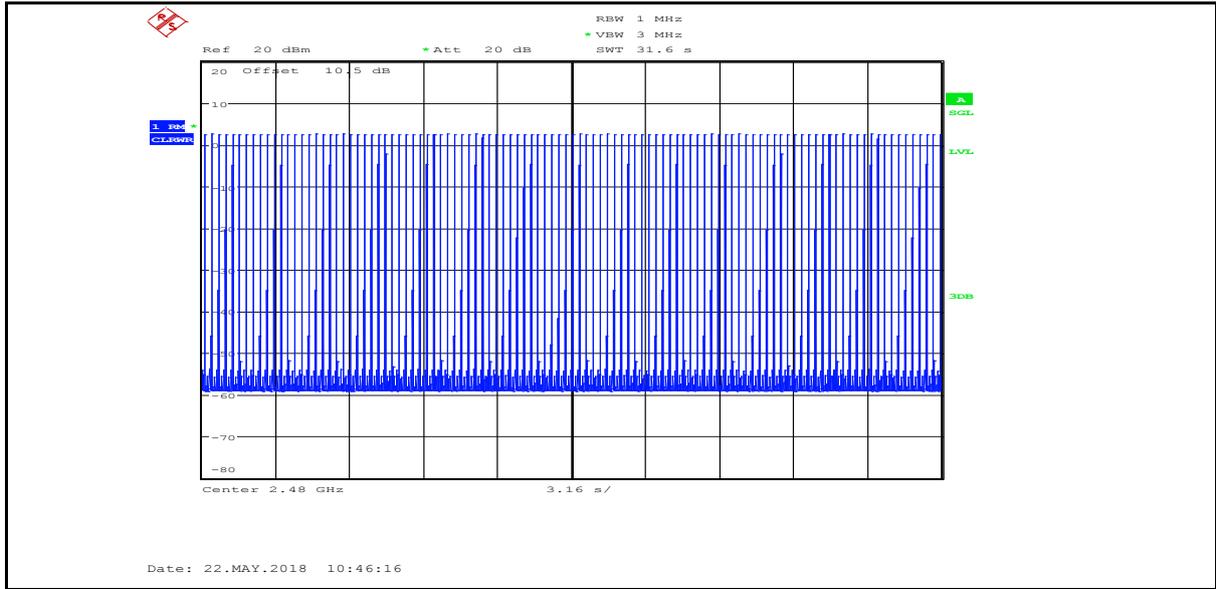


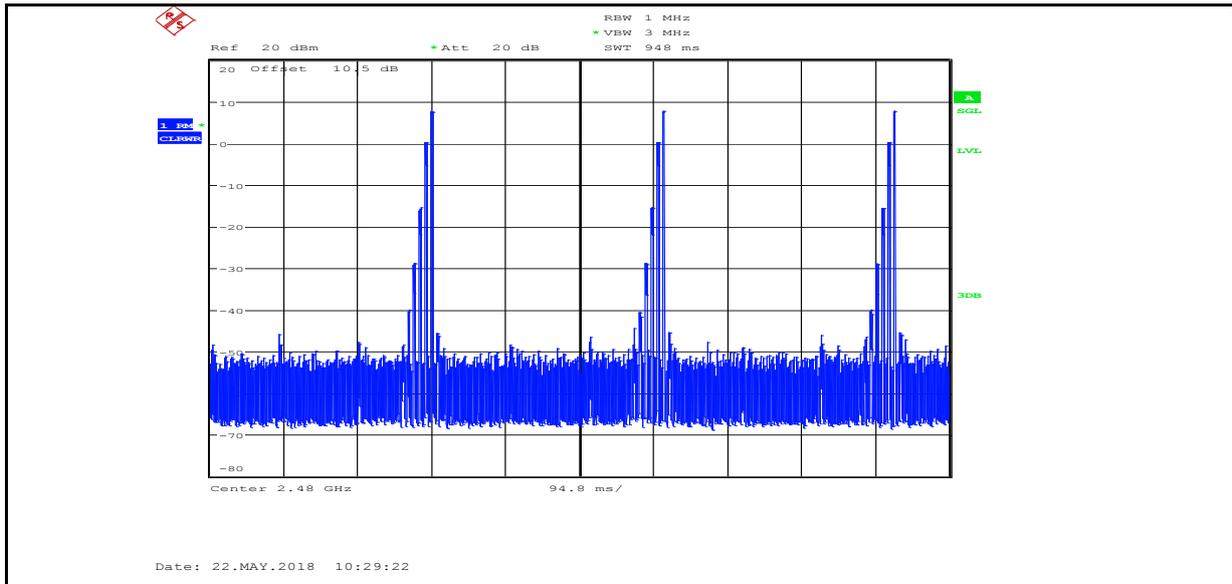


Accumulated Dwell time_TNVN_3DH5_2402_Ant1

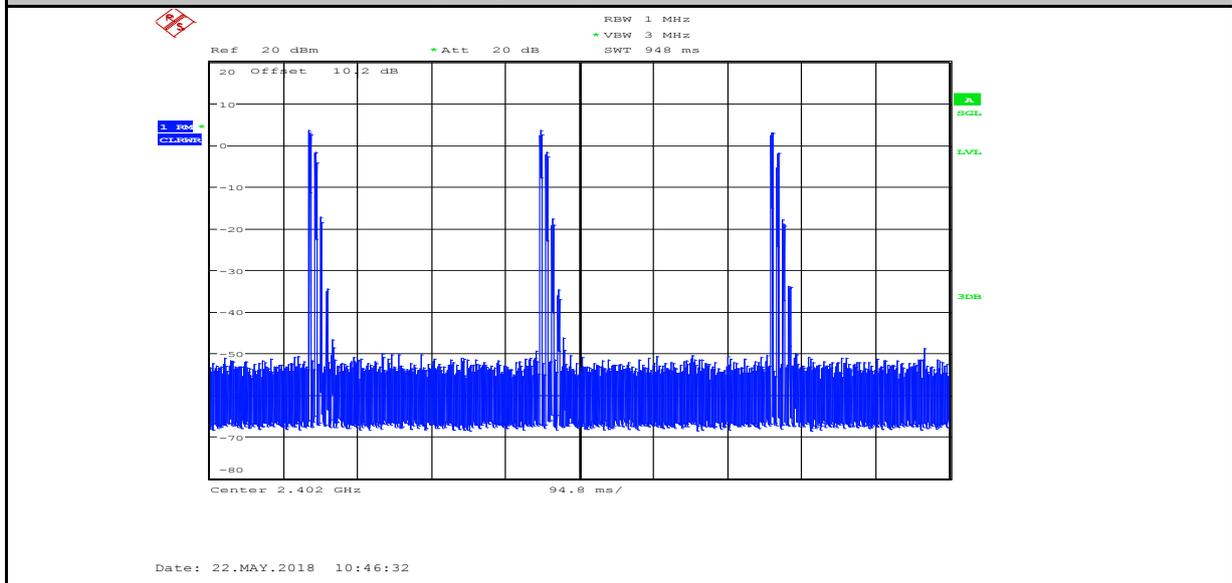


Accumulated Dwell time_TNVN_3DH5_2480_Ant1

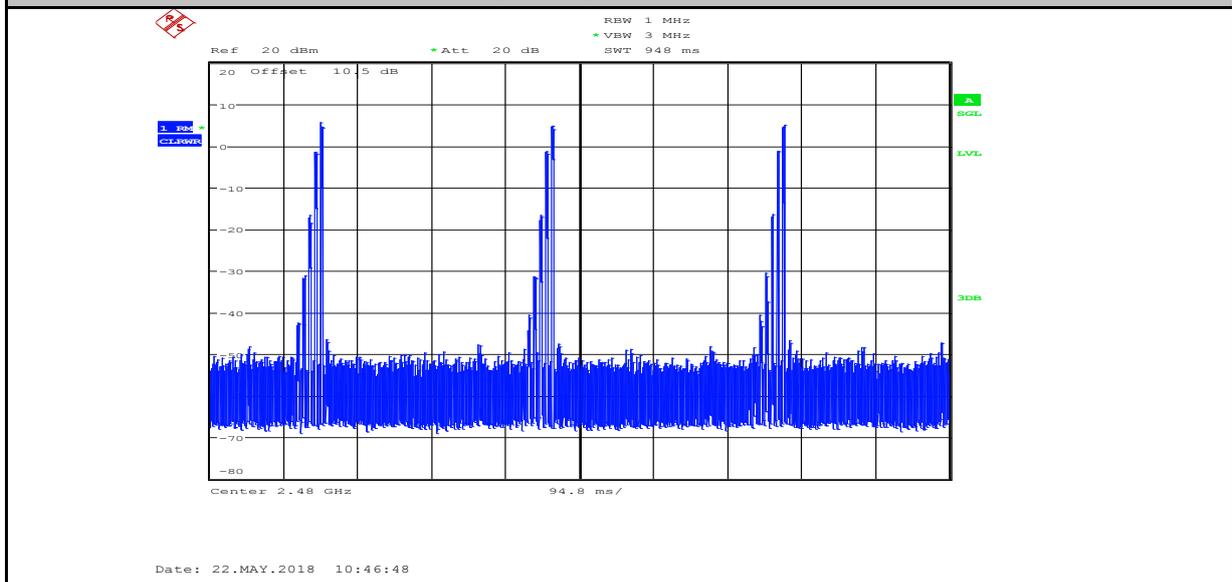




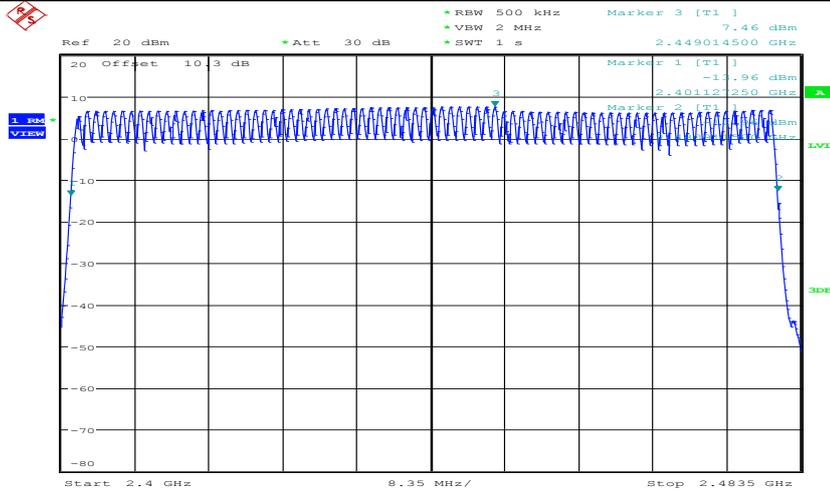
Minimum Frequency Occupation_TNVN_3DH5_2402_Ant1



Minimum Frequency Occupation_TNVN_3DH5_2480_Ant1

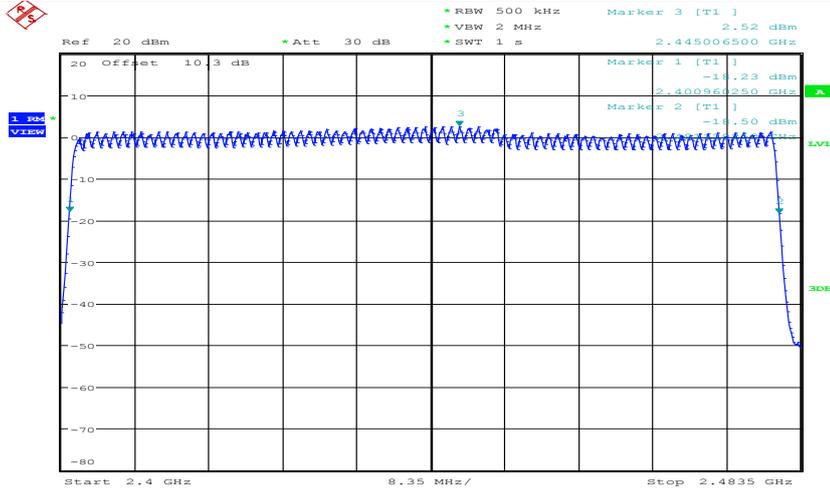


Hopping Sequence_TNVN_DH5_Ant1



Date: 22.MAY.2018 10:17:26

Hopping Sequence_TNVN_3DH5_Ant1



Date: 22.MAY.2018 10:40:51

6. Hopping Frequency Separation

6.1. Block diagram of test setup

Same as section 4.1

6.2. Limits

- (1) For adaptive frequency hopping systems the minimum hopping frequency separation shall be 100 kHz.
- (2) For equipment with a maximum declared RF Output power level of less than 10 dBm e.i.r.p. or for non-adaptive Frequency Hopping equipment operating in a mode where the RF Output power is less than 10 dBm e.i.r.p. only the minimum Hopping Frequency Separation of 100 kHz applies.

6.3. Test Procedure

- (1) Connect EUT's antenna output to spectrum analyzer by RF cable and attenuator.
- (2) Configure EUT work in normal hopping mode.
- (3) Set the spectrum analyzer as follows:

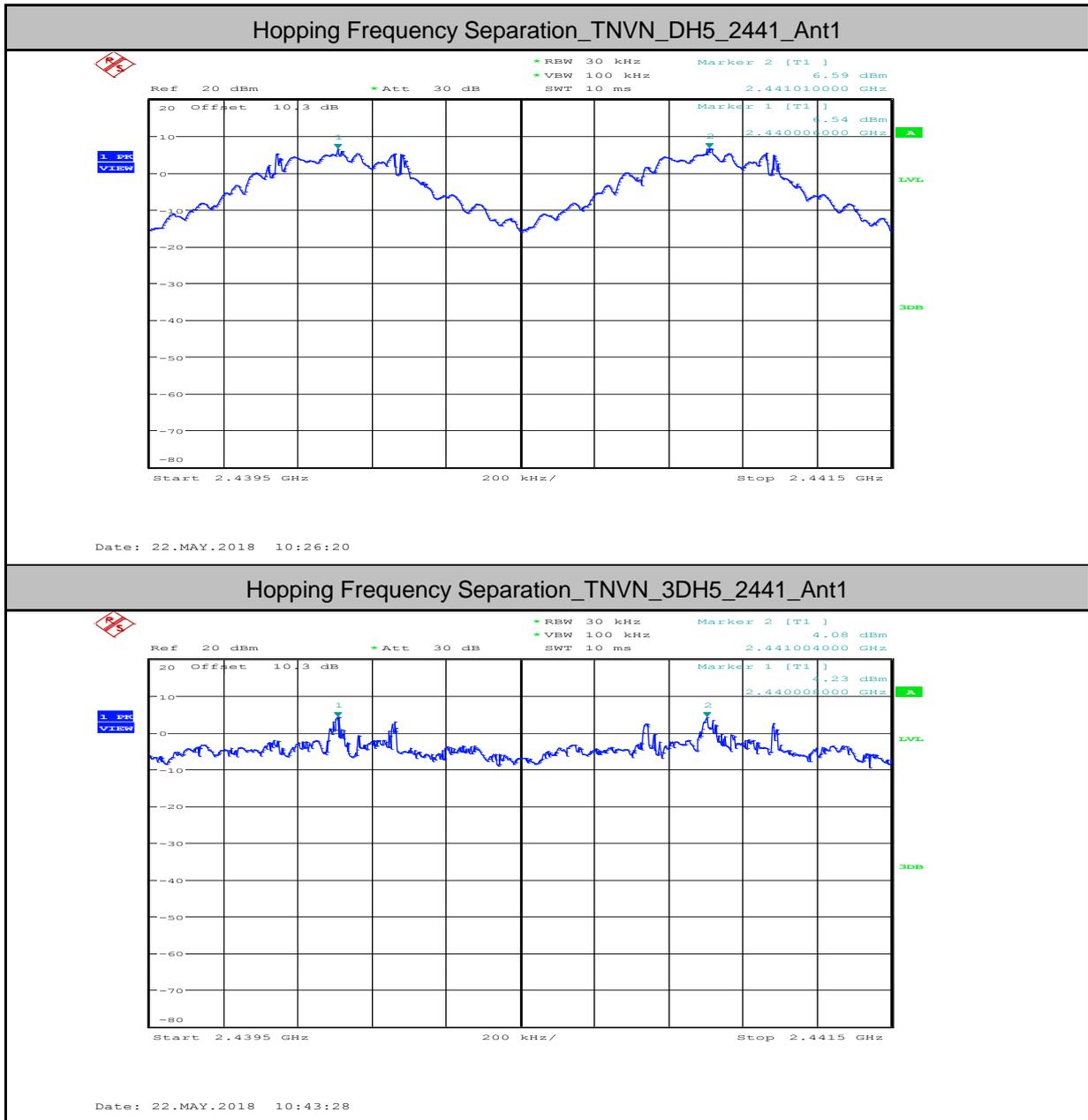
Centre Frequency:	Centre of the two adjacent hopping frequencies
Frequency Span:	Sufficient to see the complete power envelope of both hopping frequencies
RBW:	1 % of the Span
VBW:	3 × RBW
Detector Mode:	Max Peak
Sweep time:	Auto
Trace Mode:	Max Hold

- (4) When the trace has completed, Use the marker-delta function to determine the Hopping Frequency Separation between the peaks of the two adjacent hopping frequencies.

6.4. Test Result

Modulation	Channel	Channel Separation (MHz)	Limit(kHz)	Result
GFSK	N/A	1.004	≥100	Pass
8DPSK	N/A	0.996		Pass

6.5. Original test data



7. Occupied Channel Bandwidth

7.1. Block diagram of test setup

Same as section 4.1

7.2. Limits

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

7.3. Test Procedure

- (1) Connect EUT's antenna output to spectrum analyzer by RF cable and attenuator.
- (2) Configure EUT work in lowest and highest hopping frequency.
- (3) Set the spectrum analyzer as follows:

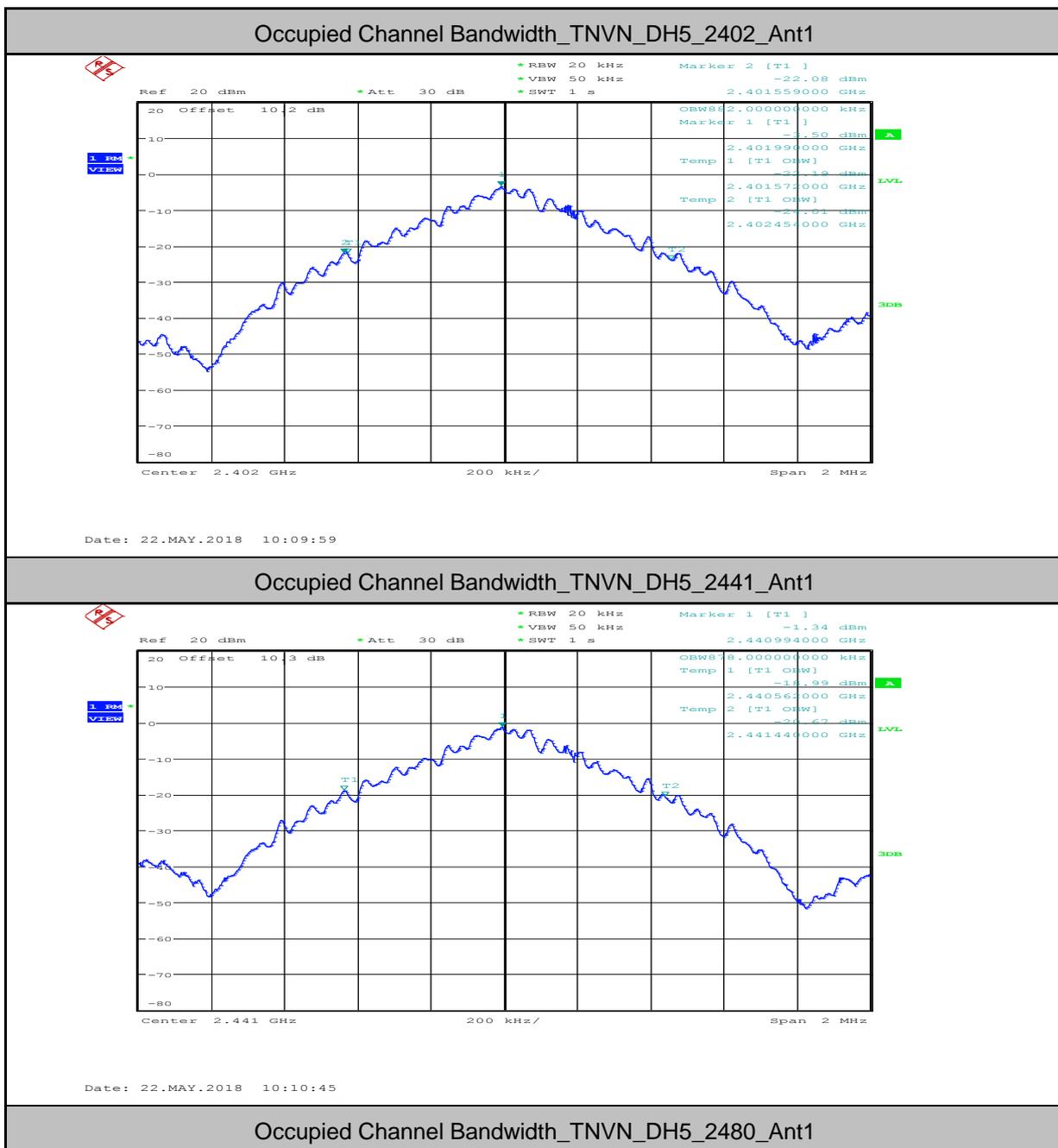
Centre Frequency:	The centre frequency of the channel under test
Frequency Span:	2 × Occupied Channel Bandwidth
RBW:	~ 1 % of the span without going below 1 %
VBW:	3 × RBW
Detector Mode:	RMS
Sweep time:	1s
Trace Mode:	Max Hold

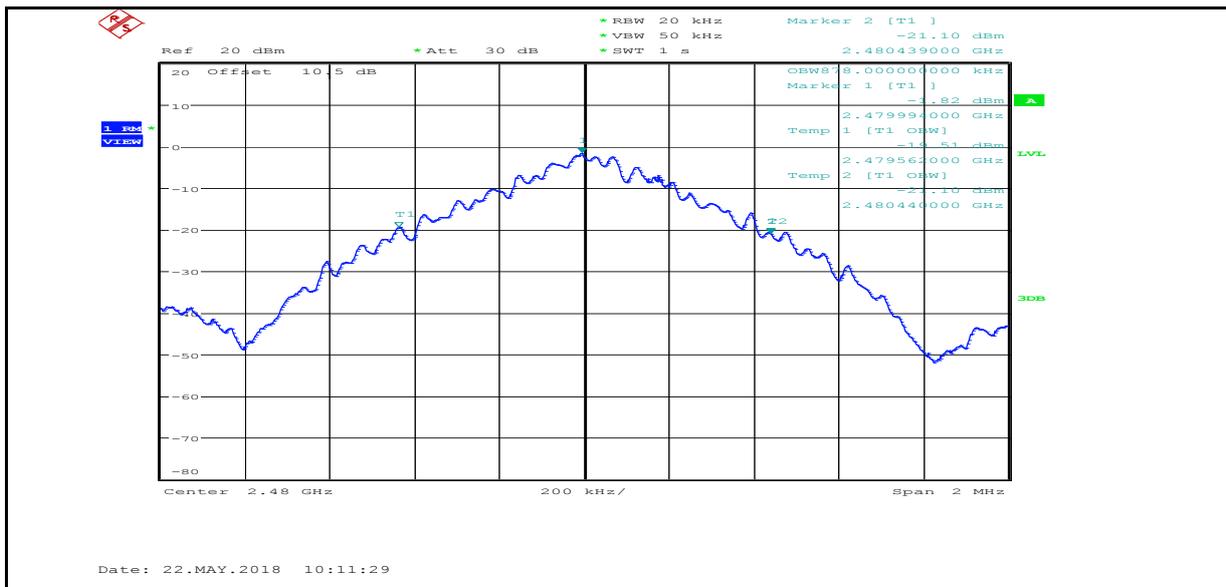
- (4) When the trace has completed, use the 99% bandwidth function of the spectrum analyzer to measure the occupied channel bandwidth of the EUT.

7.4. Test Result

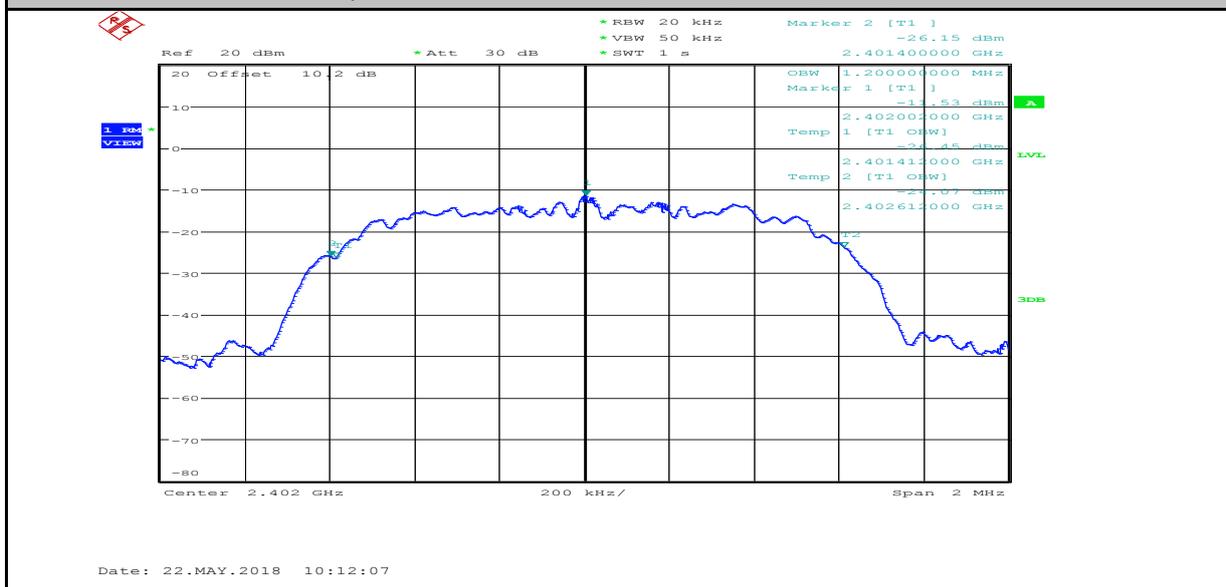
Modulation	Channel	OBW [MHz]	FL@OBW	FH@OBW	Verdict
GFSK	LCH	0.882	2401.559	---	PASS
GFSK	MCH	0.878	---	---	PASS
GFSK	HCH	0.878	---	2480.439	PASS
8DPSK	LCH	1.200	2401.400	---	PASS
8DPSK	MCH	1.206	---	---	PASS
8DPSK	HCH	1.204	---	2480.602	PASS

7.5. Original test data

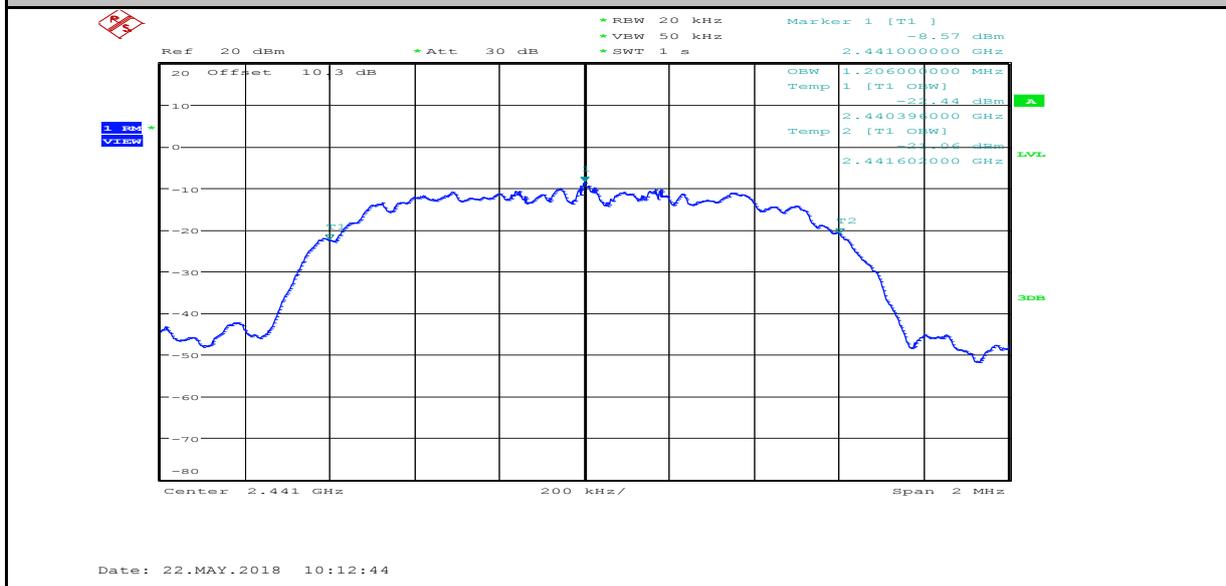


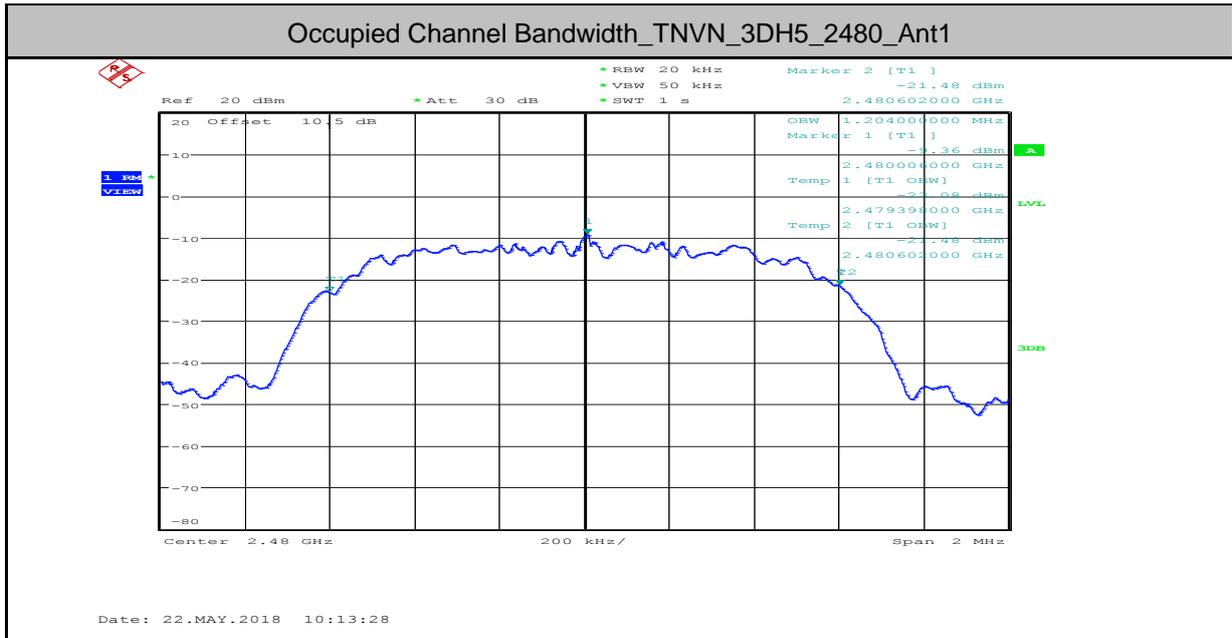


Occupied Channel Bandwidth_TNVN_3DH5_2402_Ant1



Occupied Channel Bandwidth_TNVN_3DH5_2441_Ant1





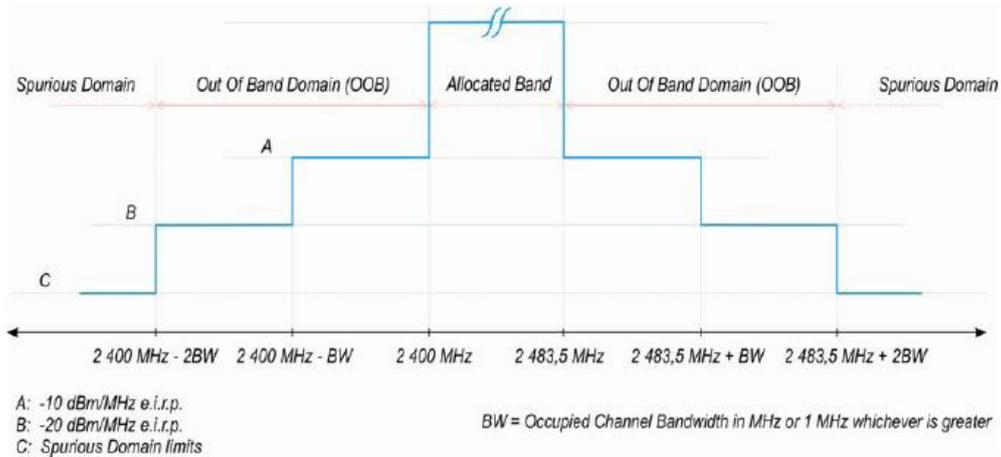
8. Transmitter unwanted emissions in the out-of-band domain

8.1. Block diagram of test setup

Same as section 4.1

8.2. Limits

The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask below:



8.3. Test Procedure

- (1) Connect EUT's antenna output to spectrum analyzer by RF cable and attenuator.
- (2) Configure EUT work in normal hopping mode.
- (3) Refer to EN 300 328 V2.1.1 clause 5.4.8.2

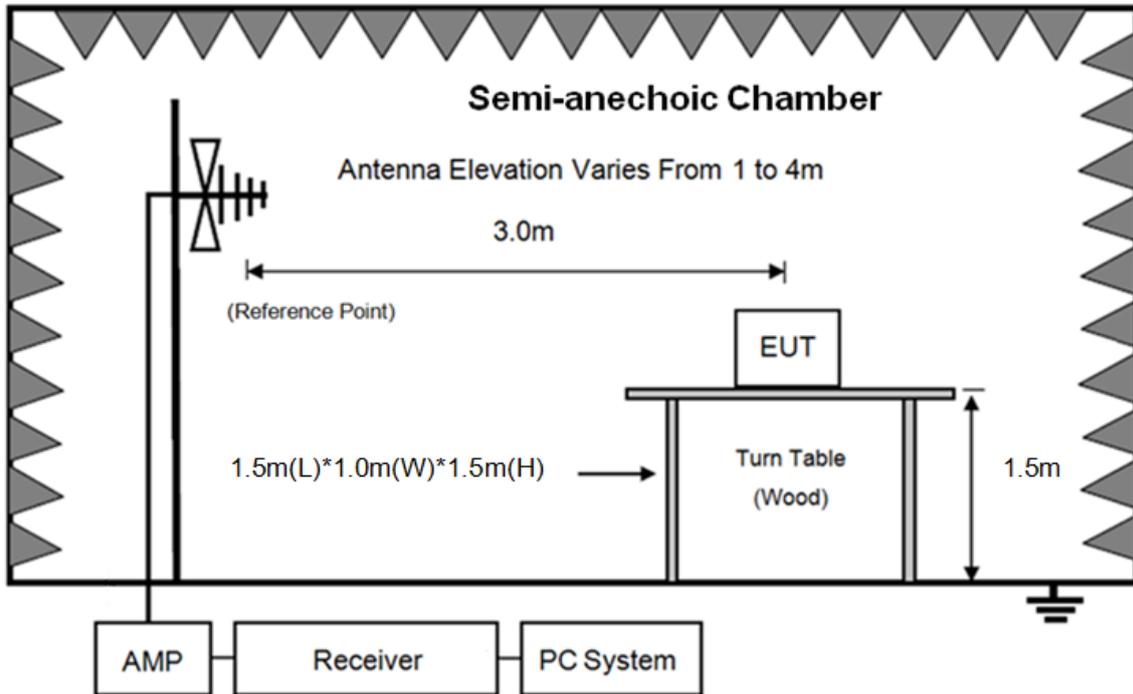
8.4. Test Result

Test Condition	Test Mode	Test Channel	Freq [MHz]	Result [dBm]	Limit [dBm]	Verdict
TNVN	DH5	2402	2398.500	-53.90	<=-20	PASS
TNVN	DH5	2402	2399.500	-58.31	<=-10	PASS
TNVN	DH5	2402	2484.000	-60.90	<=-10	PASS
TNVN	DH5	2402	2485.000	-58.54	<=-20	PASS
TNVN	DH5	2480	2398.500	-58.16	<=-20	PASS
TNVN	DH5	2480	2399.500	-59.73	<=-10	PASS
TNVN	DH5	2480	2484.000	-59.41	<=-10	PASS
TNVN	DH5	2480	2485.000	-56.65	<=-20	PASS
TNVN	3DH5	2402	2398.100	-57.30	<=-20	PASS
TNVN	3DH5	2402	2398.300	-60.34	<=-20	PASS
TNVN	3DH5	2402	2399.300	-35.17	<=-10	PASS
TNVN	3DH5	2402	2399.500	-58.54	<=-10	PASS
TNVN	3DH5	2402	2484.000	-58.12	<=-10	PASS
TNVN	3DH5	2402	2484.200	-57.88	<=-10	PASS
TNVN	3DH5	2402	2485.200	-58.86	<=-20	PASS
TNVN	3DH5	2402	2485.400	-58.66	<=-20	PASS
TNVN	3DH5	2480	2398.092	-58.10	<=-20	PASS
TNVN	3DH5	2480	2398.296	-58.20	<=-20	PASS
TNVN	3DH5	2480	2399.296	-57.18	<=-10	PASS
TNVN	3DH5	2480	2399.500	-44.19	<=-10	PASS
TNVN	3DH5	2480	2484.000	-58.71	<=-10	PASS
TNVN	3DH5	2480	2484.204	-59.48	<=-10	PASS
TNVN	3DH5	2480	2485.204	-57.82	<=-20	PASS
TNVN	3DH5	2480	2485.408	-56.11	<=-20	PASS

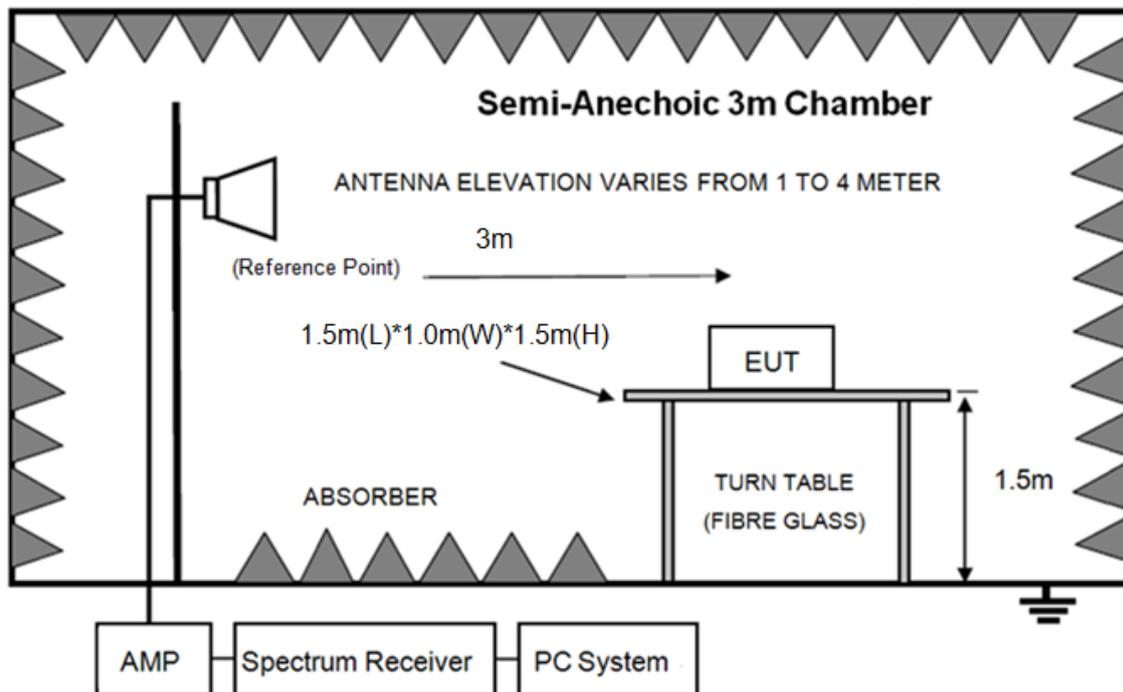
9. Transmitter unwanted emissions in the spurious domain

9.1. Block diagram of test setup

Below 1G:



Above 1G:



9.2. Limits

Frequency Range	Maximum power e.r.p ($\leq 1\text{GHz}$) e.i.r.p ($> 1\text{GHz}$)	Bandwidth
30MHz to 47MHz	-36 dBm	100kHz
47MHz to 74MHz	-54 dBm	100kHz
74MHz to 87.5MHz	-36 dBm	100kHz
87.5MHz to 118MHz	-54 dBm	100kHz
118MHz to 174MHz	-36 dBm	100kHz
174MHz to 230MHz	-54 dBm	100kHz
230MHz to 470MHz	-36 dBm	100kHz
470MHz to 862MHz	-54 dBm	100kHz
862MHz to 1GHz	-36 dBm	100kHz
1GHz to 12.75GHz	-30 dBm	1MHz

9.3. Test Procedure

- (1) Scan from 30MHz to 12.75GHz, find the maximum radiation frequency to measure.
- (2) The technique used to find the Spurious Emissions of the transmitter was the antenna substitution method. Substitution method was performed to determine the actual ERP/EIRP emission levels of the EUT.
- (3) Refer to EN 300 328 V2.1.1 Clause 5.4.9.2 and Annex B

9.4. Test Result

Test Mode: GFSK Tx mode 2402MHz				
Frequency (MHz)	Result (dBm)	Limit (dBm)	Antenna polarization	Conclusion
(below 1GHz)				
43.66	-73.11	-36.00	H	PASS
61.56	-75.82	-54.00	H	PASS
128.11	-78.06	-36.00	H	PASS
268.49	-72.33	-36.00	H	PASS
383.93	-69.69	-36.00	H	PASS
582.74	-67.67	-54.00	H	PASS
50.59	-73.10	-54.00	V	PASS
75.71	-76.90	-36.00	V	PASS
160.91	-77.37	-36.00	V	PASS
303.54	-72.60	-36.00	V	PASS
511.84	-69.73	-54.00	V	PASS
912.86	-61.57	-36.00	V	PASS
(above 1GHz)				
3115.00	-54.74	-30.00	H	PASS
4219.50	-50.35	-30.00	H	PASS
5711.75	-48.16	-30.00	H	PASS
7192.25	-47.55	-30.00	H	PASS
8520.00	-45.66	-30.00	H	PASS
9601.00	-40.13	-30.00	H	PASS
3209.00	-54.73	-30.00	V	PASS
4090.25	-51.77	-30.00	V	PASS
5641.25	-47.53	-30.00	V	PASS
6933.75	-46.88	-30.00	V	PASS
8061.75	-47.16	-30.00	V	PASS
10082.75	-41.50	-30.00	V	PASS

Test Mode: GFSK Tx mode 2441MHz				
Frequency (MHz)	Result (dBm)	Limit (dBm)	Antenna polarization	Conclusion
(below 1GHz)				
49.53	-72.88	-54.00	H	PASS
90.22	-78.81	-54.00	H	PASS
160.35	-76.20	-36.00	H	PASS
308.91	-72.23	-36.00	H	PASS
490.75	-70.69	-54.00	H	PASS
897.00	-62.62	-36.00	H	PASS
49.19	-72.65	-54.00	V	PASS
100.58	-76.23	-54.00	V	PASS
204.96	-74.05	-54.00	V	PASS
265.68	-73.04	-36.00	V	PASS
460.73	-71.38	-36.00	V	PASS
916.07	-62.25	-36.00	V	PASS
(above 1GHz)				
4055.00	-52.51	-30.00	H	PASS
5488.50	-47.37	-30.00	H	PASS
6816.25	-47.50	-30.00	H	PASS
8379.00	-48.11	-30.00	H	PASS
9730.25	-42.81	-30.00	H	PASS
11093.25	-40.28	-30.00	H	PASS
3549.75	-51.41	-30.00	V	PASS
4901.00	-46.78	-30.00	V	PASS
6358.00	-46.48	-30.00	V	PASS
7991.25	-44.88	-30.00	V	PASS
9178.00	-43.55	-30.00	V	PASS
10423.50	-39.58	-30.00	V	PASS

Test Mode: GFSK Tx mode 2480MHz				
Frequency (MHz)	Result (dBm)	Limit (dBm)	Antenna polarization	Conclusion
(below 1GHz)				
43.81	-71.54	-36.00	H	PASS
101.64	-75.62	-54.00	H	PASS
189.07	-75.24	-54.00	H	PASS
324.46	-71.85	-36.00	H	PASS
549.02	-68.39	-54.00	H	PASS
912.86	-62.24	-36.00	H	PASS
47.66	-72.65	-54.00	V	PASS
100.58	-76.10	-54.00	V	PASS
218.31	-74.85	-54.00	V	PASS
331.36	-71.35	-36.00	V	PASS
572.61	-68.43	-54.00	V	PASS
909.67	-62.31	-36.00	V	PASS
(above 1GHz)				
3620.25	-52.04	-30.00	H	PASS
4948.00	-49.09	-30.00	H	PASS
6299.25	-47.06	-30.00	H	PASS
7262.75	-47.92	-30.00	H	PASS
8332.00	-48.45	-30.00	H	PASS
9683.25	-40.64	-30.00	H	PASS
4278.25	-50.43	-30.00	V	PASS
5324.00	-48.46	-30.00	V	PASS
6252.25	-47.66	-30.00	V	PASS
7920.75	-45.69	-30.00	V	PASS
9048.75	-43.77	-30.00	V	PASS
10188.50	-40.35	-30.00	V	PASS

Note: All the emissions are measured with PK detector. Scan with GFSK, $\pi/4$ -DQPSK, 8DPSK, the worst case is GFSK Mode was recorded in this report.

10. Receiver Spurious emissions

10.1. Block diagram of test setup

Same with 9.1

10.2. Limits

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

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

10.3. Test Procedure

Refer to clause 9.3

10.4. Test result

Test Mode: Rx mode 2402MHz				
Frequency (MHz)	Result (dBm)	Limit (dBm)	Antenna polarization	Conclusion
(below 1GHz)				
53.32	-73.15	-57.00	H	PASS
96.78	-76.73	-57.00	H	PASS
175.04	-76.92	-57.00	H	PASS
270.38	-72.92	-57.00	H	PASS
605.66	-67.80	-57.00	H	PASS
922.52	-63.12	-57.00	H	PASS
51.48	-72.63	-57.00	V	PASS
106.39	-76.57	-57.00	V	PASS
242.53	-73.78	-57.00	V	PASS
345.60	-71.99	-57.00	V	PASS
640.61	-65.11	-57.00	V	PASS
813.11	-63.52	-57.00	V	PASS
(above 1GHz)				
3914.00	-59.67	-47.00	H	PASS
5324.00	-57.08	-47.00	H	PASS
5841.00	-56.73	-47.00	H	PASS
6369.75	-57.40	-47.00	H	PASS
7768.00	-55.76	-47.00	H	PASS
9095.75	-54.18	-47.00	H	PASS
3690.75	-62.41	-47.00	V	PASS
5018.50	-58.76	-47.00	V	PASS
7098.25	-56.00	-47.00	V	PASS
8332.00	-58.63	-47.00	V	PASS
9977.00	-52.19	-47.00	V	PASS
11763.00	-51.60	-47.00	V	PASS

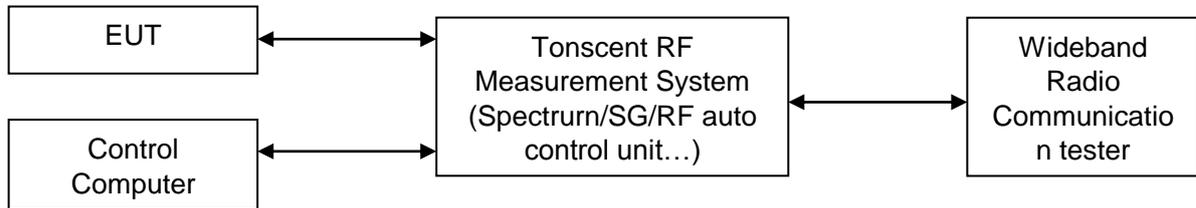
Test Mode: Rx mode 2441MHz				
Frequency (MHz)	Result (dBm)	Limit (dBm)	Antenna polarization	Conclusion
(below 1GHz)				
49.53	-72.35	-57.00	H	PASS
62.65	-75.60	-57.00	H	PASS
102.36	-76.77	-57.00	H	PASS
257.42	-73.59	-57.00	H	PASS
383.93	-70.81	-57.00	H	PASS
629.48	-66.33	-57.00	H	PASS
50.59	-72.36	-57.00	V	PASS
100.23	-75.85	-57.00	V	PASS
193.09	-74.23	-57.00	V	PASS
294.11	-72.77	-57.00	V	PASS
633.91	-66.47	-57.00	V	PASS
952.09	-62.47	-57.00	V	PASS
(above 1GHz)				
3162.00	-63.18	-47.00	H	PASS
4630.75	-60.23	-47.00	H	PASS
6510.75	-56.76	-47.00	H	PASS
8155.75	-57.17	-47.00	H	PASS
9683.25	-52.04	-47.00	H	PASS
11669.00	-53.35	-47.00	H	PASS
4301.75	-60.51	-47.00	V	PASS
4971.50	-58.58	-47.00	V	PASS
5782.25	-57.99	-47.00	V	PASS
7262.75	-57.45	-47.00	V	PASS
9847.75	-51.98	-47.00	V	PASS
11915.75	-51.01	-47.00	V	PASS

Test Mode: Rx mode 2480MHz				
Frequency (MHz)	Result (dBm)	Limit (dBm)	Antenna polarization	Conclusion
(below 1GHz)				
44.74	-73.31	-57.00	H	PASS
99.18	-76.09	-57.00	H	PASS
172.60	-75.91	-57.00	H	PASS
336.04	-72.32	-57.00	H	PASS
679.96	-65.86	-57.00	H	PASS
948.76	-63.25	-57.00	H	PASS
48.33	-71.76	-57.00	V	PASS
98.49	-76.08	-57.00	V	PASS
168.41	-76.31	-57.00	V	PASS
283.98	-71.89	-57.00	V	PASS
627.27	-65.25	-57.00	V	PASS
912.86	-62.14	-57.00	V	PASS
(above 1GHz)				
3361.75	-59.51	-47.00	H	PASS
4924.50	-58.24	-47.00	H	PASS
6275.75	-56.27	-47.00	H	PASS
7345.00	-57.29	-47.00	H	PASS
7768.00	-57.44	-47.00	H	PASS
8473.00	-56.20	-47.00	H	PASS
3397.00	-60.62	-47.00	V	PASS
4889.25	-59.12	-47.00	V	PASS
5911.50	-57.81	-47.00	V	PASS
6933.75	-57.17	-47.00	V	PASS
7920.75	-55.55	-47.00	V	PASS
8308.50	-58.18	-47.00	V	PASS

Note: All the emissions are measured with PK detector.

11. Receiver Blocking

11.1. Block diagram of test setup



11.2. Limits

Table 7: Receiver Blocking parameters receiver category 2 equipment

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal
$P_{\min} + 6$ dB	2 380 2 503,5	-57	CW
$P_{\min} + 6$ dB	2 300 2 583,5	-47	CW

NOTE 1: P_{\min} is the minimum level of the 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 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.

Performance Criteria:

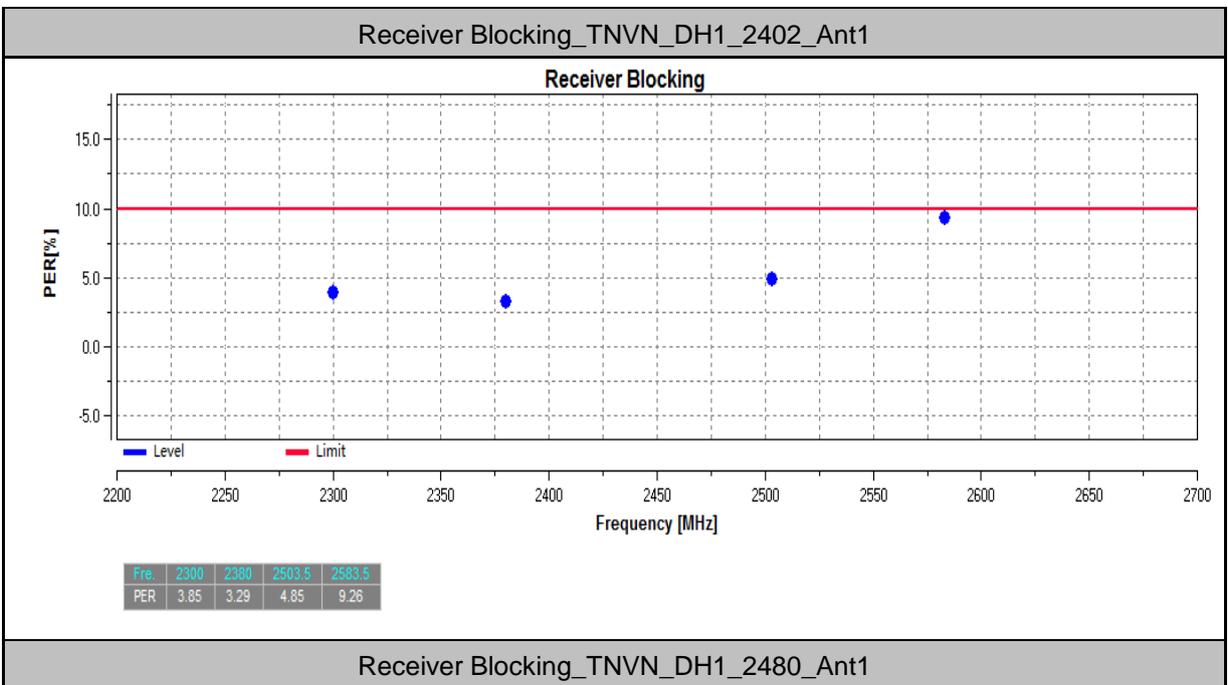
The minimum performance criterion shall be a PER less than or equal to 10 %.

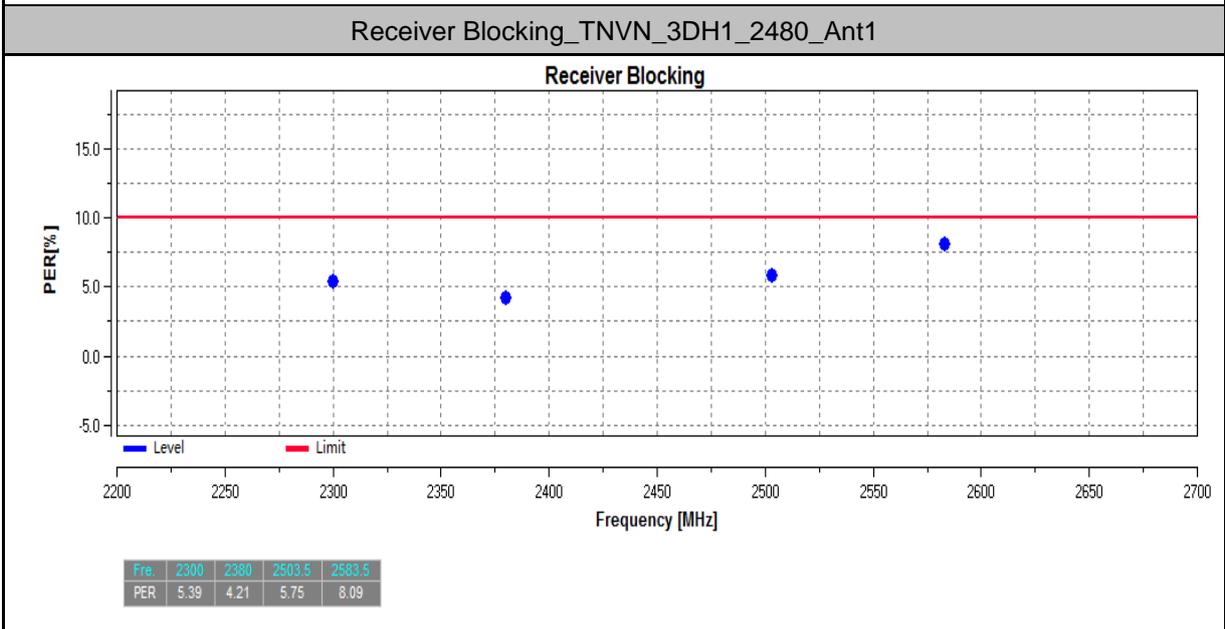
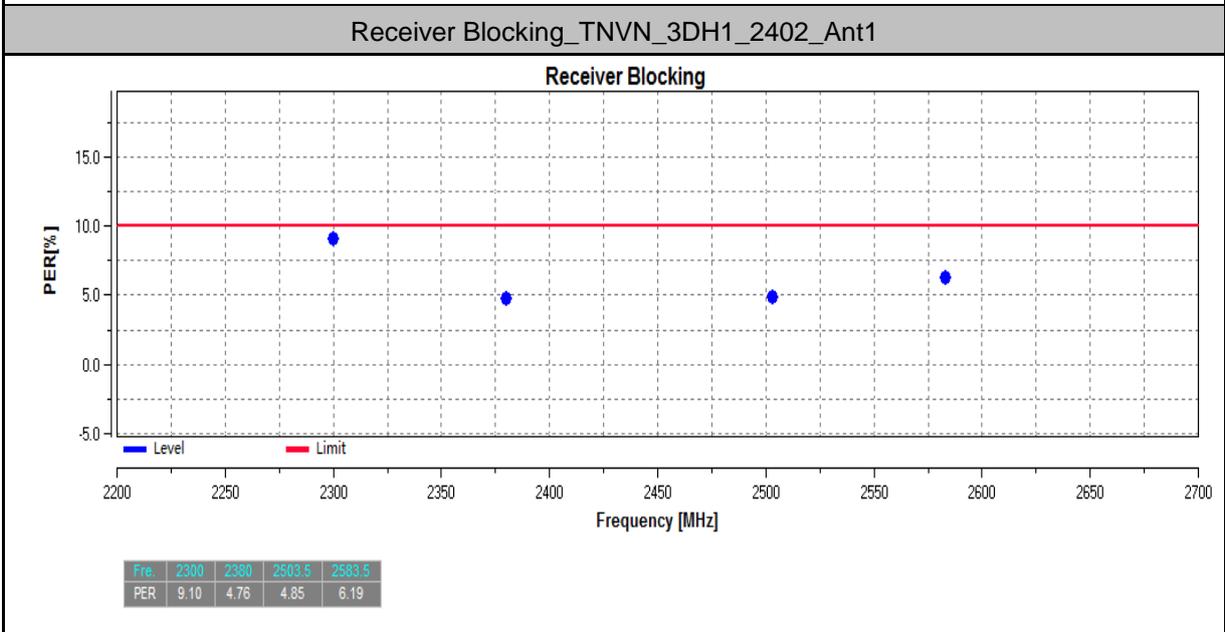
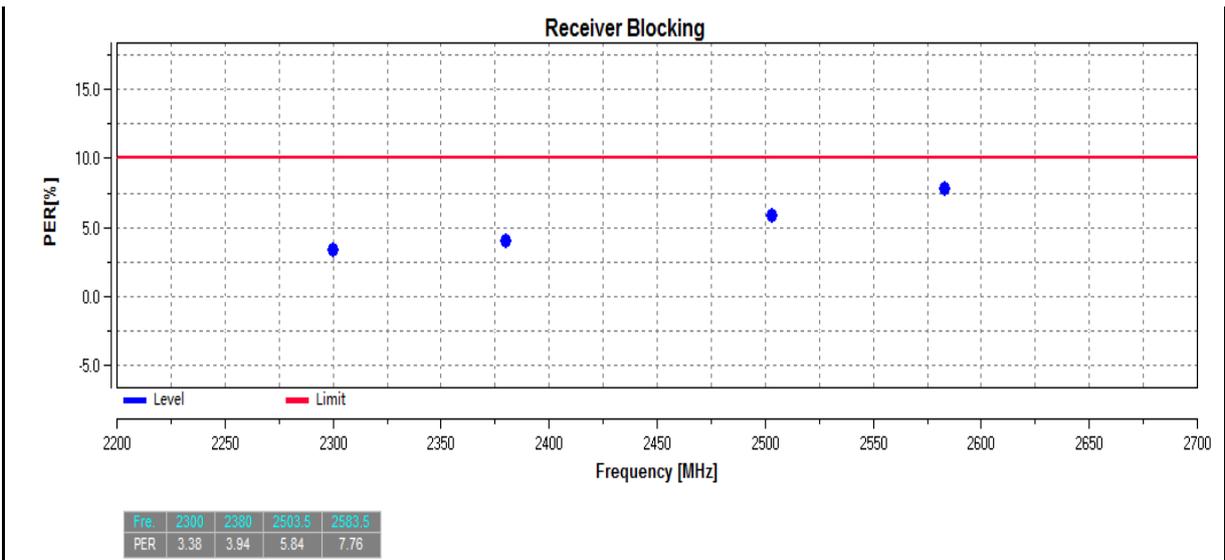
11.3. Test Procedure

Refer to EN 300 328 V2.1.1 clause 5.4.11.2.1

11.4. Test Result

Test Condition	Test Mode	Test Channel	Pmin[dBm]	Wanted signal Level[dBm]	Freq [MHz]	CW Level [dBm]	PER [%]	Limit [%]	Verdict
TNVN	DH1	2402	-88.93	-82.93	2380	-54.5	3.29	<=10	PASS
TNVN	DH1	2402	-88.93	-82.93	2503.5	-54.5	4.85	<=10	PASS
TNVN	DH1	2402	-88.93	-82.93	2583.5	-44.5	9.26	<=10	PASS
TNVN	DH1	2402	-88.93	-82.93	2300	-44.5	3.85	<=10	PASS
TNVN	DH1	2480	-88.75	-82.75	2583.5	-44.5	7.76	<=10	PASS
TNVN	DH1	2480	-88.75	-82.75	2300	-44.5	3.38	<=10	PASS
TNVN	DH1	2480	-88.75	-82.75	2380	-54.5	3.94	<=10	PASS
TNVN	DH1	2480	-88.75	-82.75	2503.5	-54.5	5.84	<=10	PASS
TNVN	3DH1	2402	-88.93	-82.93	2380	-54.5	4.76	<=10	PASS
TNVN	3DH1	2402	-88.93	-82.93	2503.5	-54.5	4.85	<=10	PASS
TNVN	3DH1	2402	-88.93	-82.93	2583.5	-44.5	6.19	<=10	PASS
TNVN	3DH1	2402	-88.93	-82.93	2300	-44.5	9.10	<=10	PASS
TNVN	3DH1	2480	-90.75	-84.75	2583.5	-44.5	8.09	<=10	PASS
TNVN	3DH1	2480	-90.75	-84.75	2300	-44.5	5.39	<=10	PASS
TNVN	3DH1	2480	-90.75	-84.75	2380	-54.5	4.21	<=10	PASS
TNVN	3DH1	2480	-90.75	-84.75	2503.5	-54.5	5.75	<=10	PASS



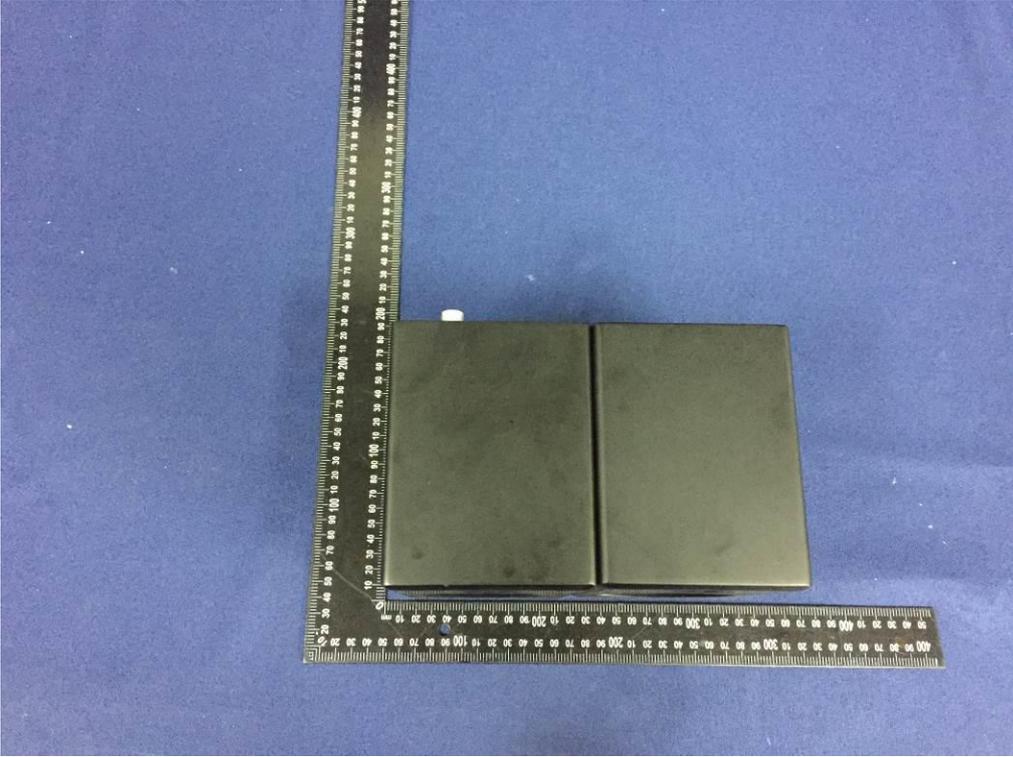


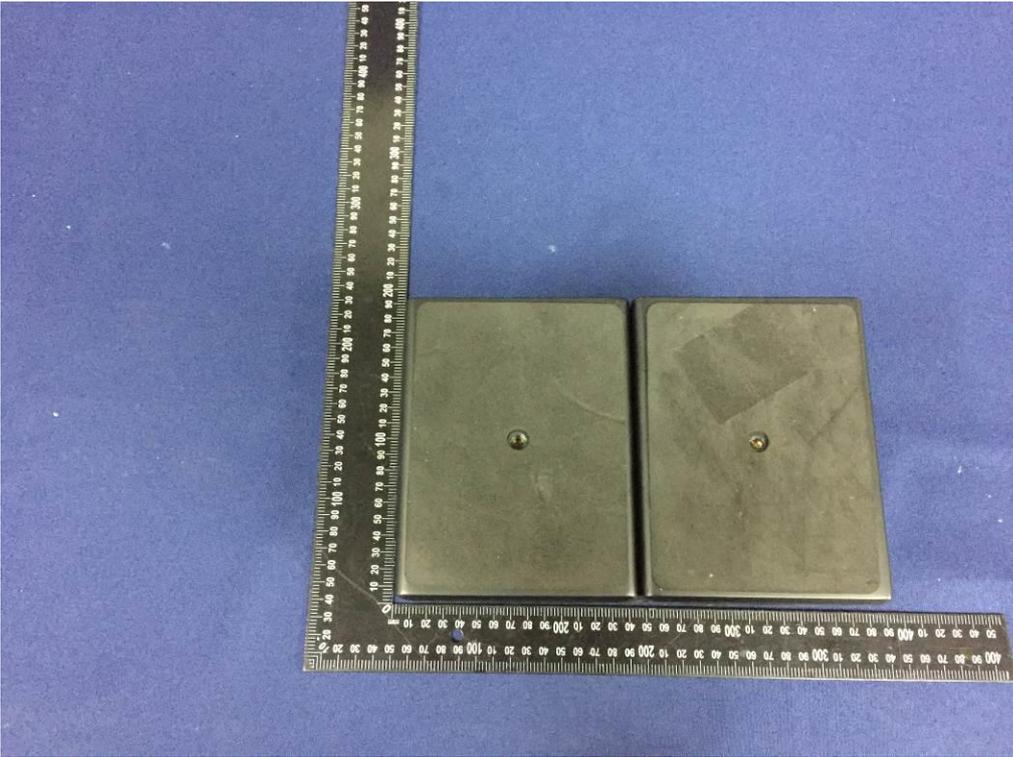
12. Test setup photograph

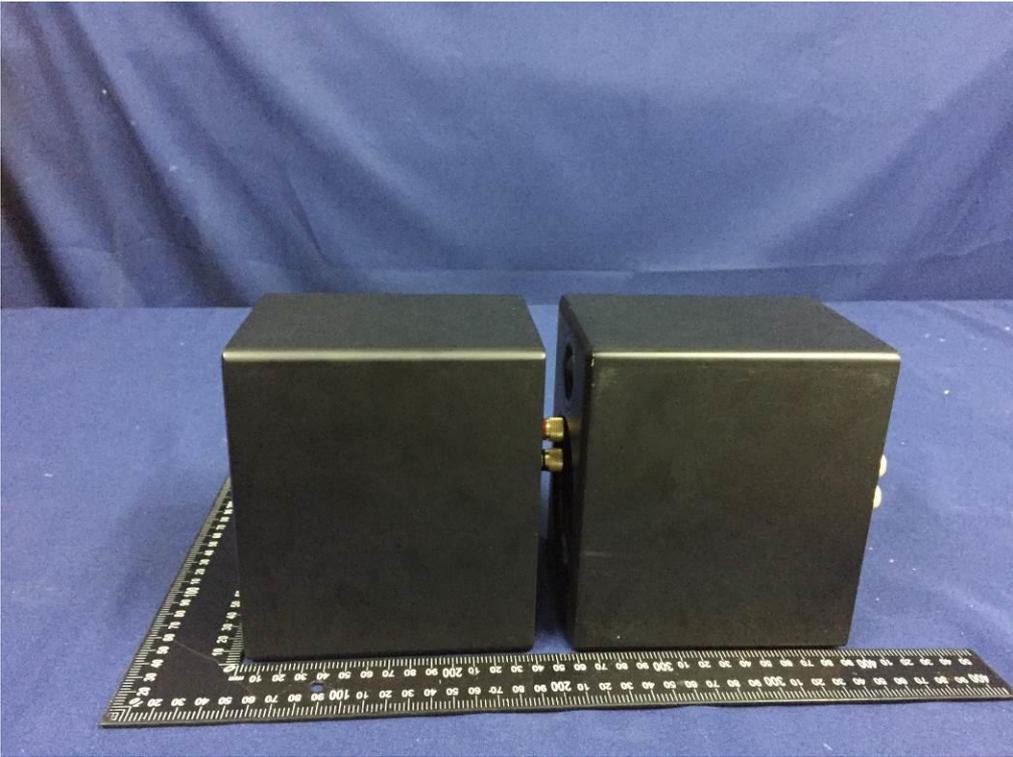


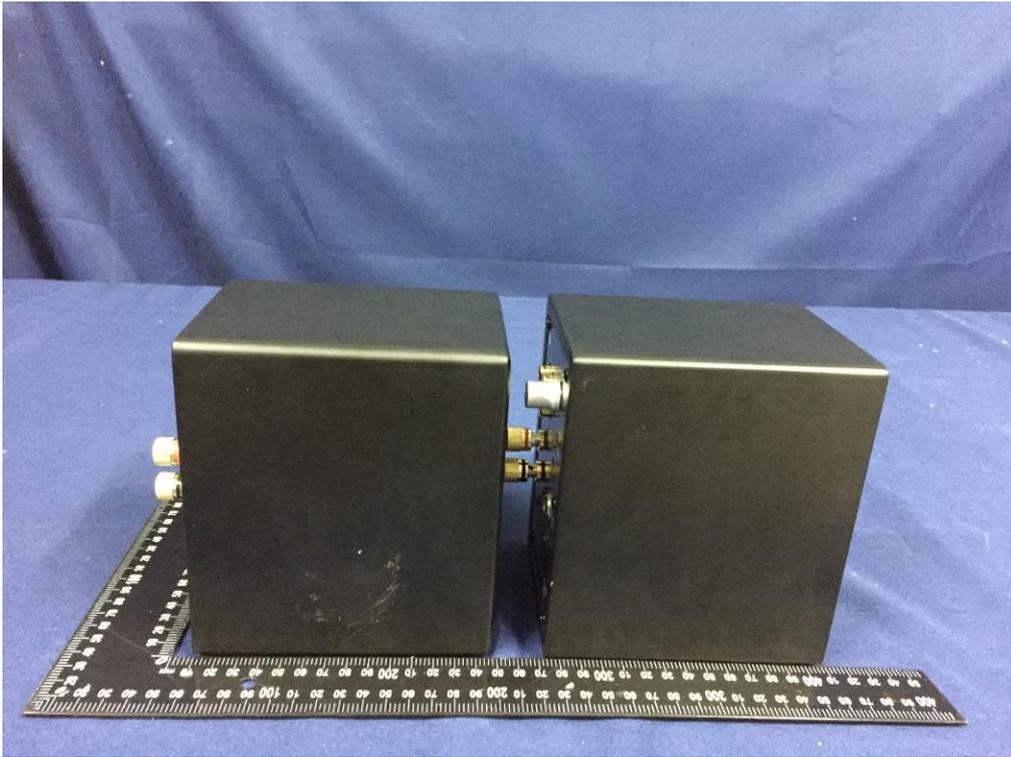


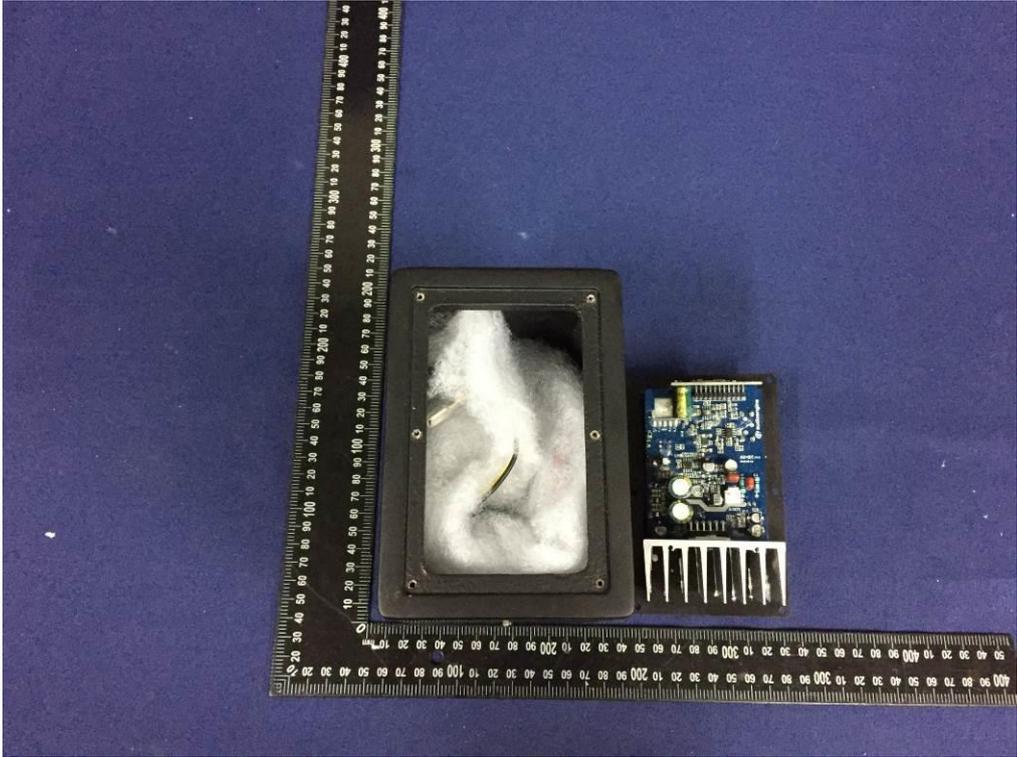
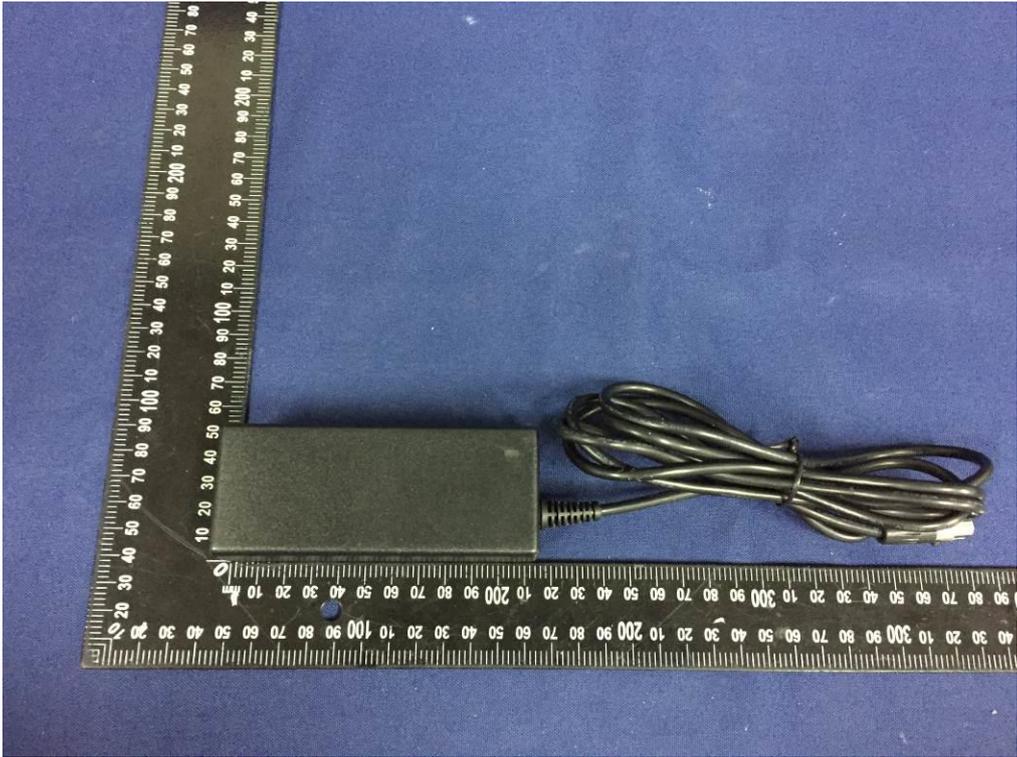
13. Photos of the EUT

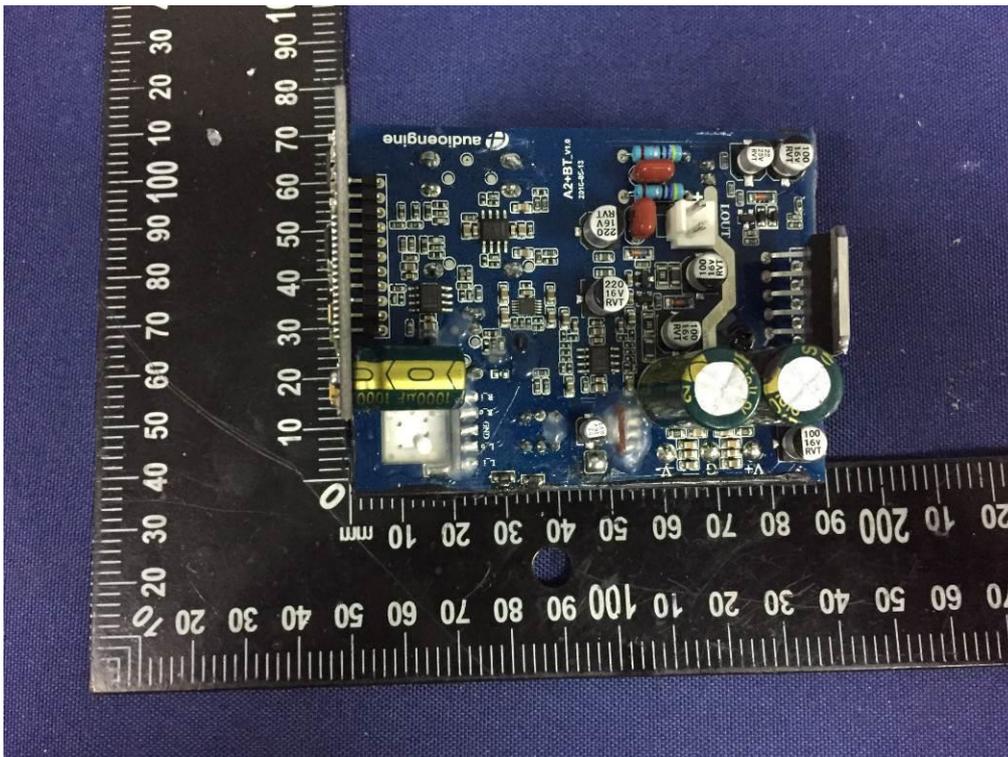
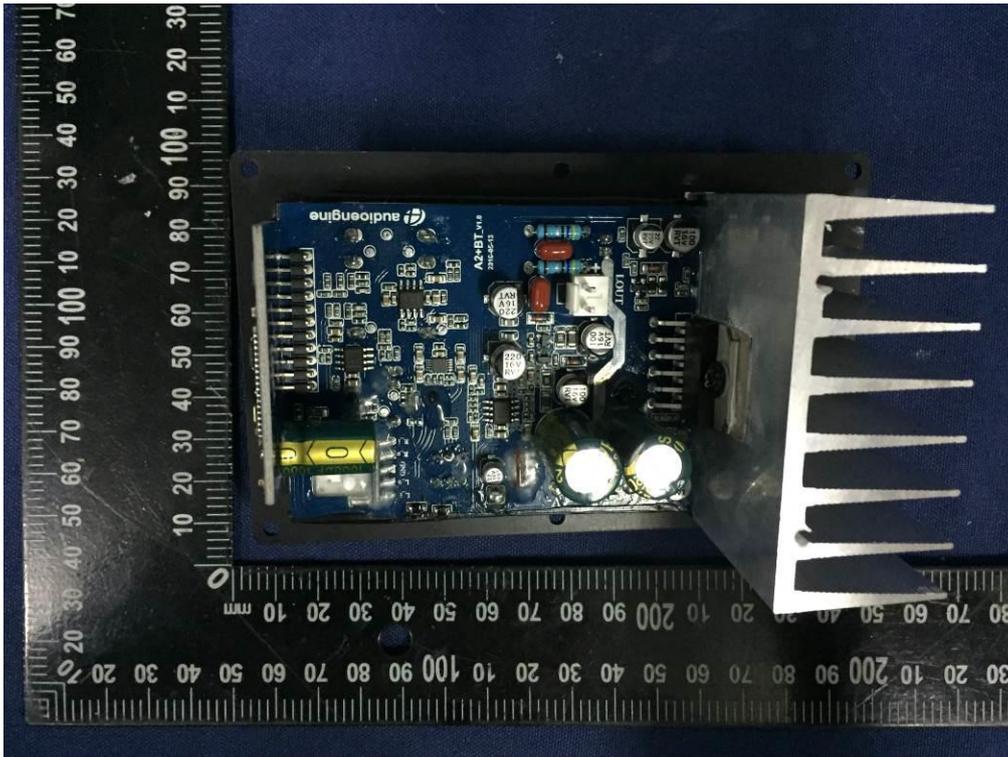


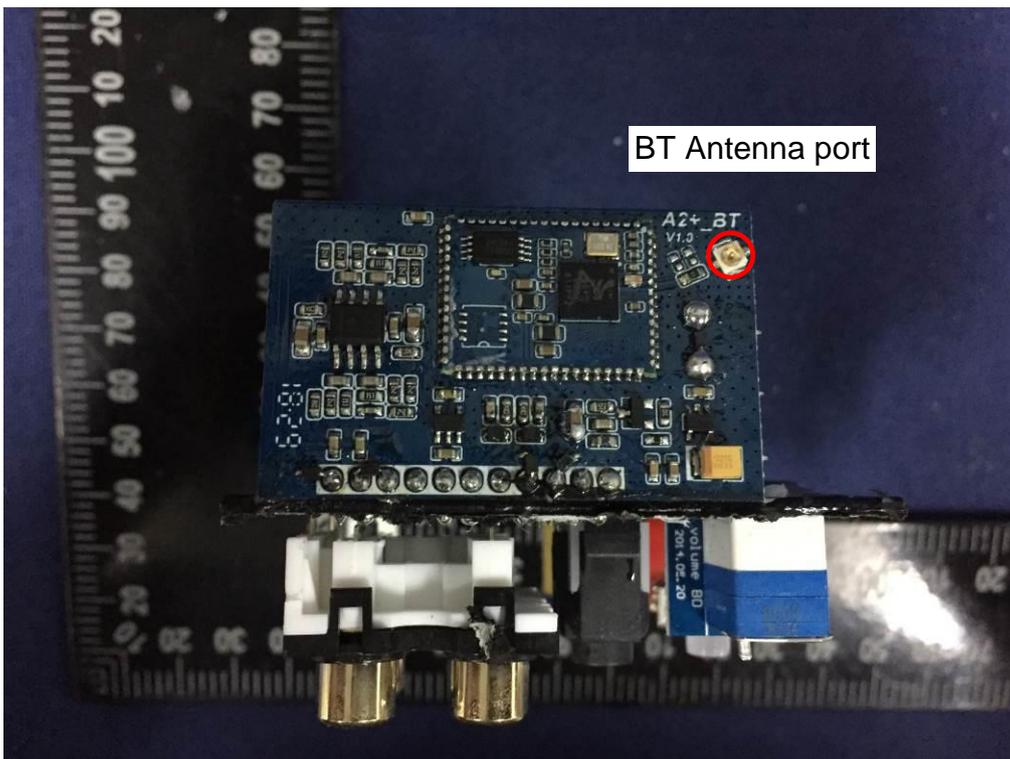
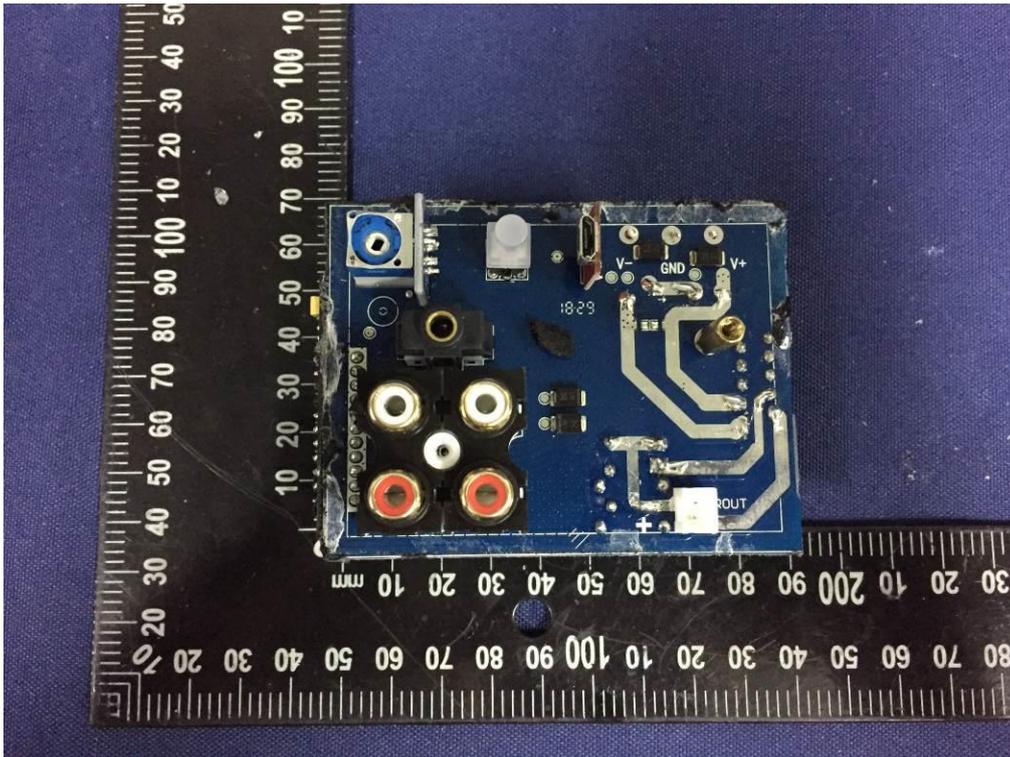


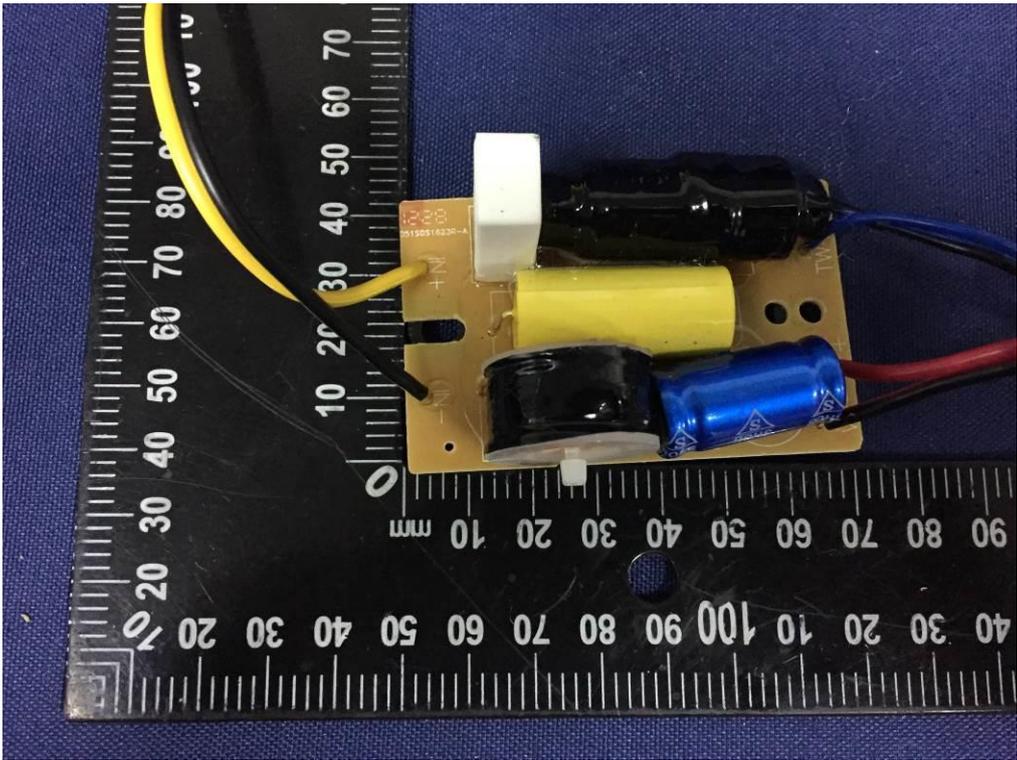
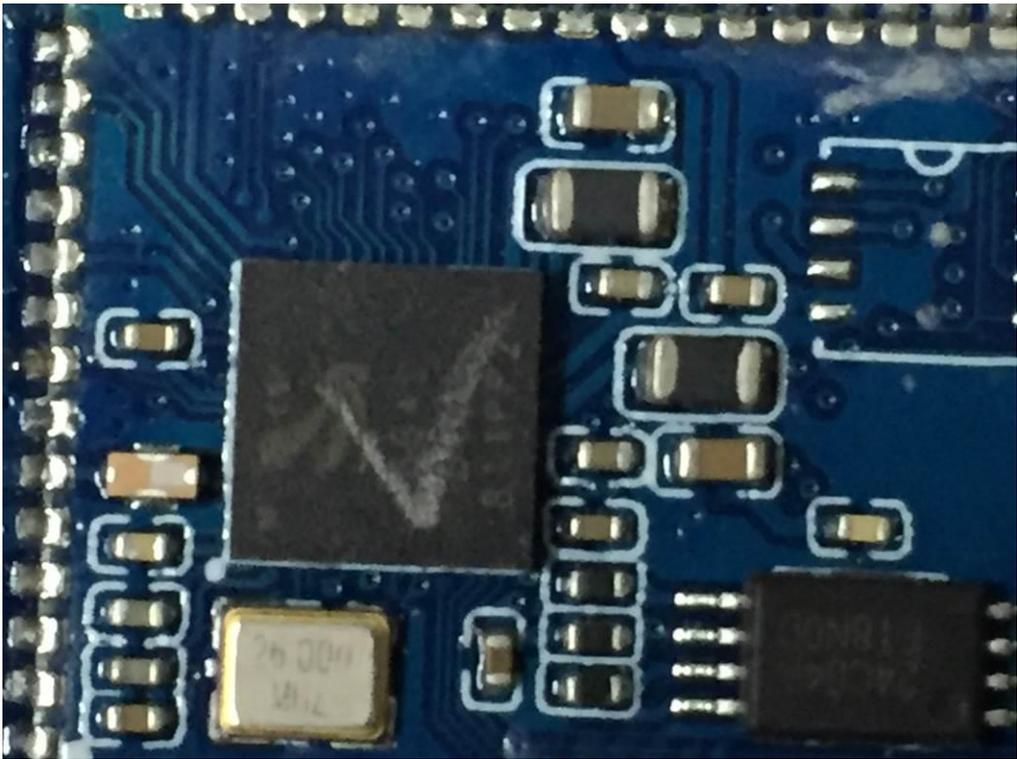


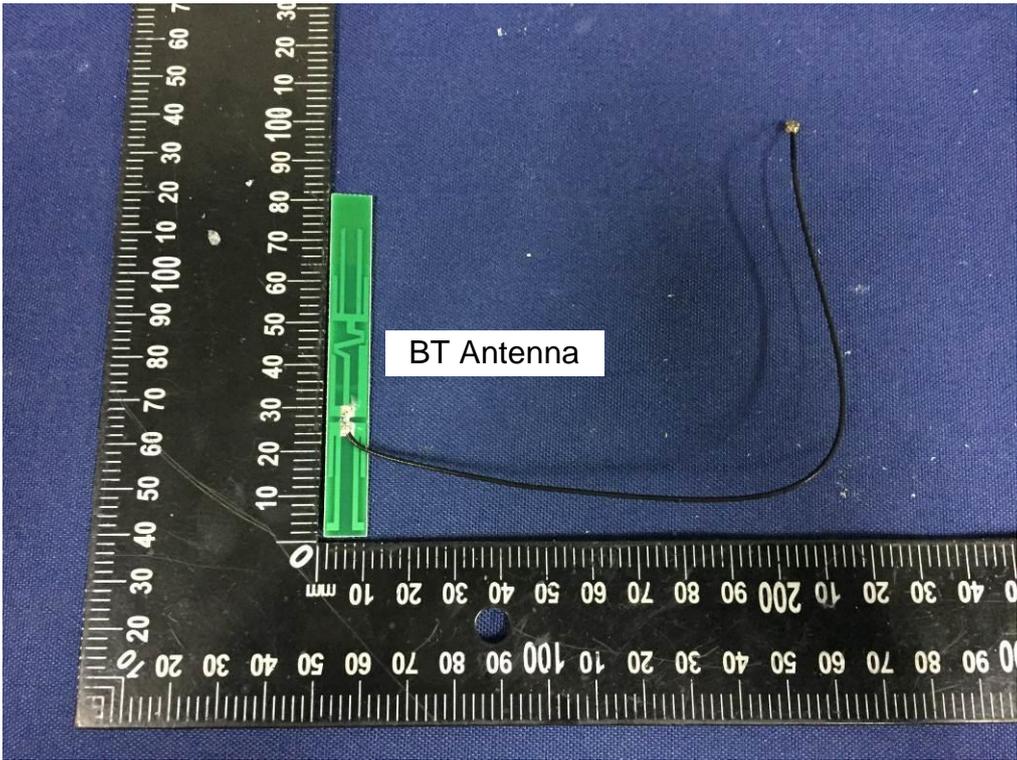
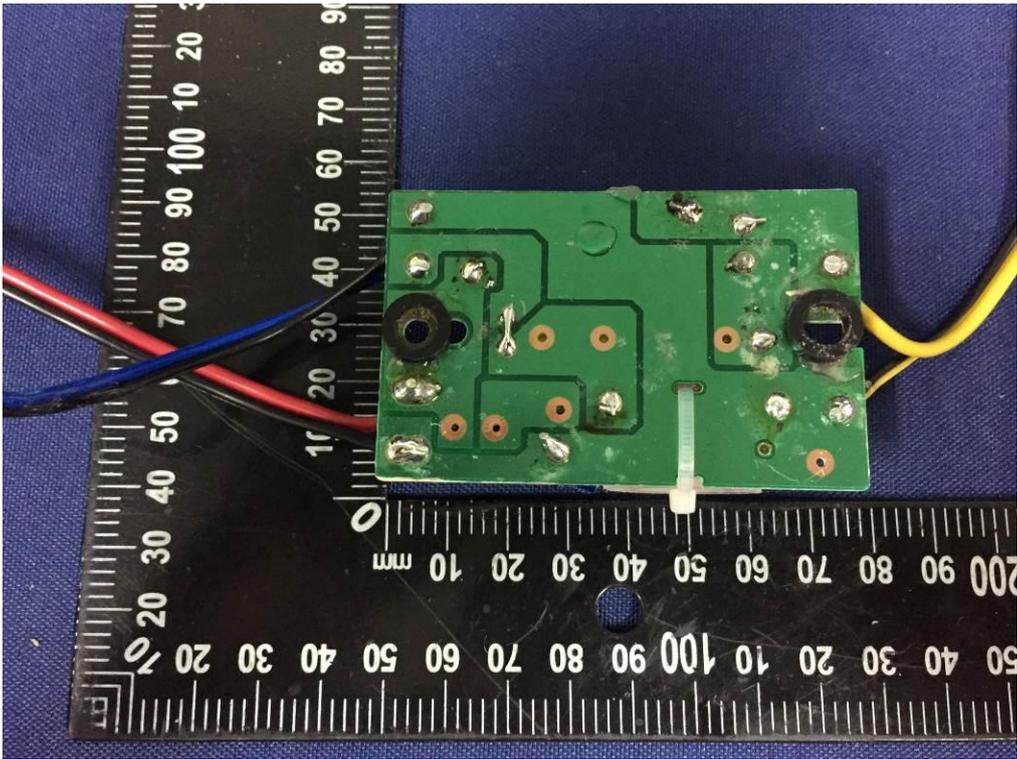


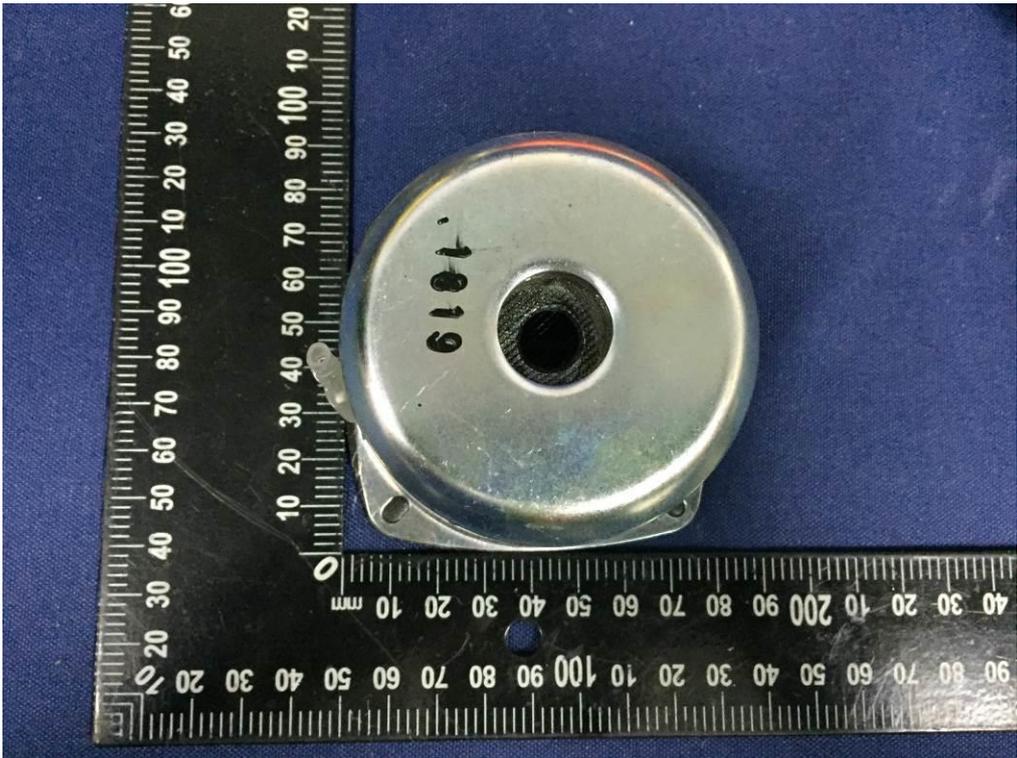
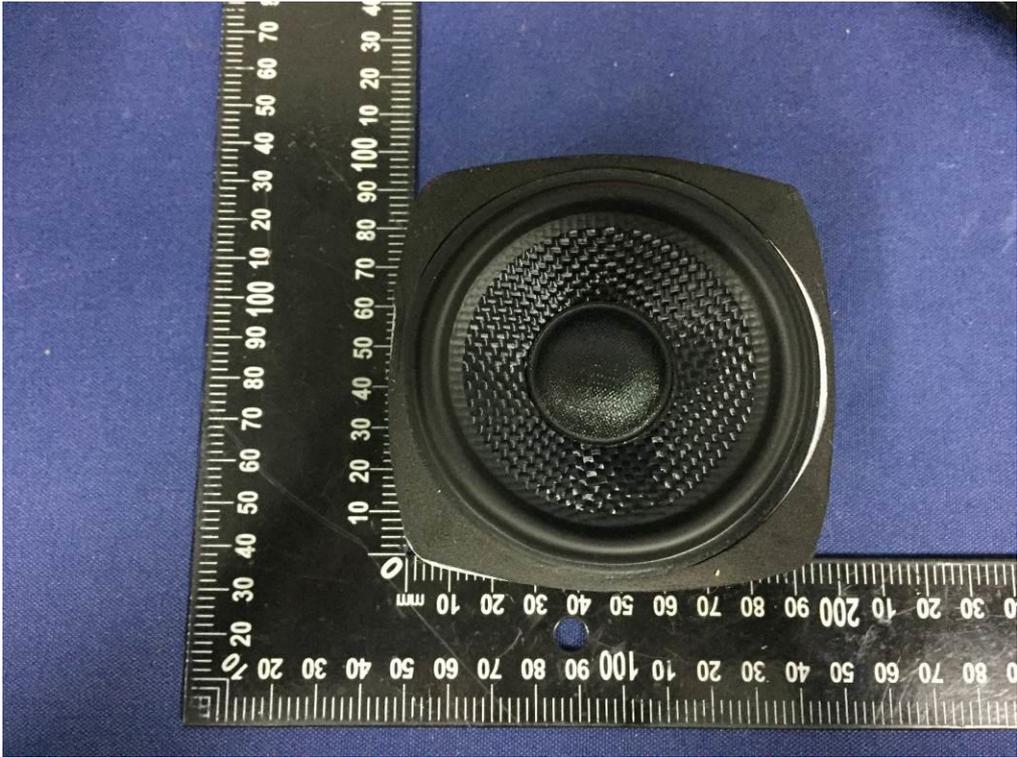












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