RADIO TEST REPORT

Applicant:	Nebra Ltd
Address:	Unit 4 Bells Yew Green Business Court, Bells Yew Green, East Sussex, United Kingdom
Manufacturer:	Shenzhen Eastech Company Limited.
Address:	2nd floor, 3rd building, Baishixia Development Area, Fuyong Street, Bao'an District, Shenzhen City, Guangdong Province, China.
EUT:	Bluetooth 4.0 usb dongle
Trade Mark:	N/A
Model Number:	FX-8510A
Date of Receipt:	Apr. 19, 2021
Test Date:	Apr. 19, 2021 - Apr. 26, 2021
Date of Report:	Apr. 26, 2021
Prepared By:	Shenzhen DL Testing Technology Co., Ltd.
Address:	101-201, Building C, Shuanghuan, No.8, Baoqing Road, Baolong Industrial Zone, Baolong Street, Longgang District, Shenzhen, Guangdong, China
Applicable Standards:	ETSI EN 300 328 V2.2.2 (2019-07)
Test Result:	Pass
Report Number:	DL-20210425003-3E

Prepared (Engineer):	Alisa Song
Reviewer (Supervisor):	Jack Bu
Approved (Manager):	Jade Yang

This test report is based on a single evaluation of one sample of above mentioned products. It is not permitted to be duplicated in extracts without written approval of Shenzhen DL Testing Technology Co., Ltd.

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1. VERSION

Version No.	Date	Description
00	Apr. 26, 2021	Original

2. TEST SUMMARY

No	Test Item	Clause No	Result
Transmitter Parameters			
1	RF output power	4.3.2.2	PASS
2	Power Spectral Density	4.3.2.3	PASS
3	Duty Cycle, Tx-sequence, Tx-gap	4.3.2.4	N/A
4	Medium Utilisation (MU) factor	4.3.2.5	N/A
5	Adaptive non-FHSS using DAA	4.3.2.6	N/A
6	Occupied Channel Bandwidth	4.3.2.7	PASS
7	Transmitter unwanted emissions in the out-of-band domain	4.3.2.8	PASS
8	Transmitter unwanted emissions in the spurious domain	4.3.2.9	PASS
Receiver Parameters			
9	Receiver spurious emissions	4.3.2.10	PASS
10	Receiver Blocking	4.3.2.11	PASS
11	Geo-location capability	4.3.2.12	N/A

Note: (1)" N/A" denotes test is not applicable in this Test Report

(2) Test Facility: Shenzhen DL Testing Technology Co., Ltd.

Address: 101-201, Building C, Shuanghuan, No.8, Baoqing Road, Baolong Industrial Zone, Baolong Street, Longgang District, Shenzhen, Guangdong, China

3. GENERAL INFORMATION

3.1 Description of Device (EUT)

EUT:	Bluetooth 4.0 usb dongle
Trade Mark:	N/A
Model Number:	FX-8510A
Test Model:	FX-8510A
Model difference:	N/A
Power Supply:	DC 5V
Receiver Category:	3
Operation Frequency:	2402~2480 MHz
Modulation Type:	GFSK
Number of Channel:	40
Data Rate:	3Mbps
Antenna Type:	Internal Antenna
Antenna Gain:	2dBi
Hardware Version:	---
Software Version:	---
Firmware:	---

Note1: For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

Channel List							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2402	20	2440	39	2478	/	/
02	2404	21	2442	40	2480	/	/
~	~	~	~	/	/	/	/
18	2436	37	2474	/	/	/	/
19	2438	38	2476	/	/	/	/

ANNEX E.2

a) The type of wideband data transmission equipment:

□ FHSS

■ non-FHSS

b) In case of FHSS:

•In case of non-Adaptive FHSS equipment:

The number of Hopping Frequencies:

•In case of Adaptive FHSS equipment:

The maximum number of Hopping Frequencies:

The minimum number of Hopping Frequencies:

•The (average) dwell time:

c) Adaptive / non-adaptive equipment:

□ non-adaptive Equipment

■ adaptive Equipment without the possibility to switch to a non-adaptive mode

□ adaptive Equipment which can also operate in a non-adaptive mode

d) In case of adaptive equipment:

The Channel Occupancy Time implemented by the equipment: ms

□ The equipment has implemented an LBT mechanism

• In case of non-FHSS equipment:

□ The equipment is Frame Based equipment

□ The equipment is Load Based equipment

□ The equipment can switch dynamically between Frame Based and Load Based equipment

The CCA time implemented by the equipment: ..... µs

■ The equipment has implemented a DAA mechanism

□ The equipment can operate in more than one adaptive mode

e) In case of non-adaptive Equipment:

The maximum RF Output Power (e.i.r.p.): -1.08dBm

The maximum (corresponding) Duty Cycle: ……. %

Equipment with dynamic behaviour, that behaviour is described here. (e.g. the different combinations of duty cycle and corresponding power levels to be declared):

f) The worst case operational mode for each of the following tests:

- RF Output Power

GFSK

- Power Spectral Density

GFSK

- Duty cycle, Tx-Sequence, Tx-gap

GFSK

- Accumulated Transmit time, Frequency Occupation & Hopping Sequence (only for FHSS equipment)

.....

- Hopping Frequency Separation (only for FHSS equipment)

.....

- Medium Utilisation

.....

- Adaptivity & Receiver Blocking

.....

- Nominal Channel Bandwidth

2MHz

- Transmitter unwanted emissions in the OOB domain

GFSK

- Transmitter unwanted emissions in the spurious domain

GFSK

- Receiver spurious emissions

GFSK

g) The different transmit operating modes (tick all that apply):

■ Operating mode 1: Single Antenna Equipment

■ Equipment with only one antenna

□ Equipment with two diversity antennas but only one antenna active at any moment in time

□ Smart Antenna Systems with two or more antennas, but operating in a (legacy) mode where only one antenna is used (e.g. IEEE 802.11™ legacy mode in smart antenna systems)

□ Operating mode 2: Smart Antenna Systems - Multiple Antennas without beam forming

□ Single spatial stream/Standard throughput/(e.g. IEEE 802.11™ legacy mode)

□ High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1

□ High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2

NOTE1: Add more lines if more channel bandwidths are supported.

□ Operating mode 3: Smart Antenna Systems - Multiple Antennas with beam forming

□ Single spatial stream/Standard throughput (e.g. IEEE 802.11™ legacy mode)

□ High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1

□ High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2

NOTE2: Add more lines if more channel bandwidths are supported.

h) In case of Smart Antenna Systems:

- The number of Receive chains: .....
- The number of Transmit chains: .....

□ symmetrical power distribution

□ asymmetrical power distribution

In case of beam forming, the maximum (additional) beam forming gain: ..... dB

NOTE: The additional beam forming gain does not include the basic gain of a single antenna.

i) Operating Frequency Range(s) of the equipment:

- Operating Frequency Range 1: 2402 MHz to 2480 MHz
- Operating Frequency Range 2: …. MHz to …. MHz

NOTE: Add more lines if more Frequency Ranges are supported.

j) Occupied Channel Bandwidth(s):

- Nominal Channel Bandwidth 1: 1.675MHz
- Nominal Channel Bandwidth 2:

NOTE: Add more lines if more channel bandwidths are supported.

k) Type of Equipment (stand-alone, combined, plug-in radio device, etc.):

■ Stand-alone

□ Combined Equipment

□ Plug-in radio device

□ Other .....

l) The normal and the extreme operating conditions that apply to the equipment:

Normal operating conditions (if applicable):

Operating temperature:25° C

Other (please specify if applicable): ……

Extreme operating conditions:

Operating temperature range: Minimum: -20 °C Maximum 55°C

Other (please specify if applicable): Minimum: …… Maximum ……

Details provided are for the: □ stand-alone equipment

■ combined (or host) equipment

□ test jig

m) The intended combination(s) of the radio equipment power settings and one or more antenna assemblies and their corresponding e.i.r.p. levels:

• Antenna Type

■ Integral Antenna (information to be provided in case of conducted measurements)

Antenna Gain: 2 dBi

If applicable, additional beamforming gain (excluding basic antenna gain): ..... dB

□ Temporary RF connector provided

□ No temporary RF connector provided

□ Dedicated Antennas (equipment with antenna connector)

□ Single power level with corresponding antenna(s)

□ Multiple power settings and corresponding antenna(s)

Number of different Power Levels: .....

Power Level 1: ..... dBm

Power Level 2: ..... dBm

Power Level 3: ..... dBm

NOTE 1: Add more lines in case the equipment has more power levels.

NOTE 2: These power levels are conducted power levels (at antenna connector).

• For each of the Power Levels, provide the intended antenna assemblies, their corresponding gains (G) and the resulting e.i.r.p. levels also taking into account the beamforming gain (Y) if applicable

Power Level 1: -1.08dBm

Number of antenna assemblies provided for this power level:

Assembly #	Gain (dBi)	e.i.r.p. (dBm)	Part number or model name
1	2	-1.08	

2			
3			
4			

NOTE 3: Add more rows in case more antenna assemblies are supported for this power level.

Power Level 2: ..... dBm

Number of antenna assemblies provided for this power level:

Assembly #	Gain (dBi)	e.i.r.p. (dBm)	Part number or model name
1			
2			
3			
4			

NOTE 4: Add more rows in case more antenna assemblies are supported for this power level.

Power Level 3: ..... dBm

Number of antenna assemblies provided for this power level:

Assembly #	Gain (dBi)	e.i.r.p. (dBm)	Part number or model name
1			
2			
3			
4			

NOTE 5: Add more rows in case more antenna assemblies are supported for this power level.

n) The nominal voltages of the stand-alone radio equipment or the nominal voltages of the combined equipment or test jig in case of plug-in devices:

Details provided are for the: □ stand-alone equipment

■ combined equipment

□ test jig

Supply Voltage □ AC mains State AC voltage V

■ DC State DC voltage : 5 V

In case of DC, indicate the type of power source

□ Internal Power Supply

□ External Power Supply or AC/DC adapter

□ Battery: V

■ Other: Host

o) Describe the test modes available which can facilitate testing:

The EUT can be into the Engineer mode for testing.

p) The equipment type (e.g. Bluetooth®, IEEE 802.11™, IEEE 802.15.4™, proprietary, etc.):

Bluetooth

q) If applicable, the statistical analysis referred to in clause 5.4.1 q)

(to be provided as separate attachment)

r) If applicable, the statistical analysis referred to in clause 5.4.1 r)

(to be provided as separate attachment)

s) Geo-location capability supported by the equipment:

☐ Yes

☐ The geographical location determined by the equipment as defined in clause 4.3.1.13.2 or clause 4.3.2.12.2 is not accessible to the user

■ No

ANNEX E.3

From all combinations of conducted power settings and intended antenna assembly(ies) specified in clause 5.4.1 m),specify the combination resulting in the highest e.i.r.p. for the radio equipment.

Unless otherwise specified in ETSI EN 300 328, this power setting is to be used for testing against the requirements of ETSI EN 300 328. In case there is more than one such conducted power setting resulting in the same (highest) e.i.r.p. level, the highest power setting is to be used for testing. See also ETSI EN 300 328, clause 5.3.2.3.

Highest overall e.i.r.p. value: ..... dBm	
Corresponding Antenna assembly gain: ..... dBi	Antenna Assembly #: .....
Corresponding conducted power setting: ..... dBm (also the power level to be used for testing)	Listed as Power Setting #: .....

ANNEX E.4.1

ITU Class(es) of emission: .....

Can the transmitter operate unmodulated? ☐ yes ☐ no

ANNEX E.4.2

The transmitter is intended for: ☐ Continuous duty

☐ Intermittent duty

☐Continuous operation possible for testing purposes

ANNEX E.4.3

☐ The equipment submitted are representative production models

☐ If not, the equipment submitted are pre-production models?

□ If pre-production equipment are submitted, the final production equipment will be identical in all respects with the equipment tested

□ If not, supply full details

ANNEX E.4.4

☐ Spare batteries (e.g. for portable equipment)

☐ Battery charging device

□ External Power Supply or AC/DC adapter

□ Test jig or interface box

☐ RF test fixture (for equipment with integrated antennas)

□ Combined equipment Manufacturer: .....

Model #: .....

Model name: .....

□ User Manual

□ Technical documentation (Handbook and circuit diagrams)

3.2 Tested System Details

None.

3.3 Block Diagram of Test Set-up

EUT

3.4 Test Mode Description

Mode	data rate (Mbps)	Channel	Frequency (MHz)
GFSK	1	Low: CH1	2402
	1	Middle: CH20	2440
	1	High: CH40	2480

3.5 Test Conditions

	Normal Conditions	Extreme Conditions	
Temperature range	25℃	HTHV	DC 5.5V, 55℃
		HTLV	DC 5.5V, -20℃
Power supply	DC 5V	LTLV	DC 4.5V, -20℃
		LTHV	DC 4.5V, 55℃
Note 1: The test procedure described in clause 5.1of EN300 328 was used for extreme test procedure. 2: The Extreme Temperature and Extreme Voltages declared by the manufacturer.			

3.6 Test Uncertainty

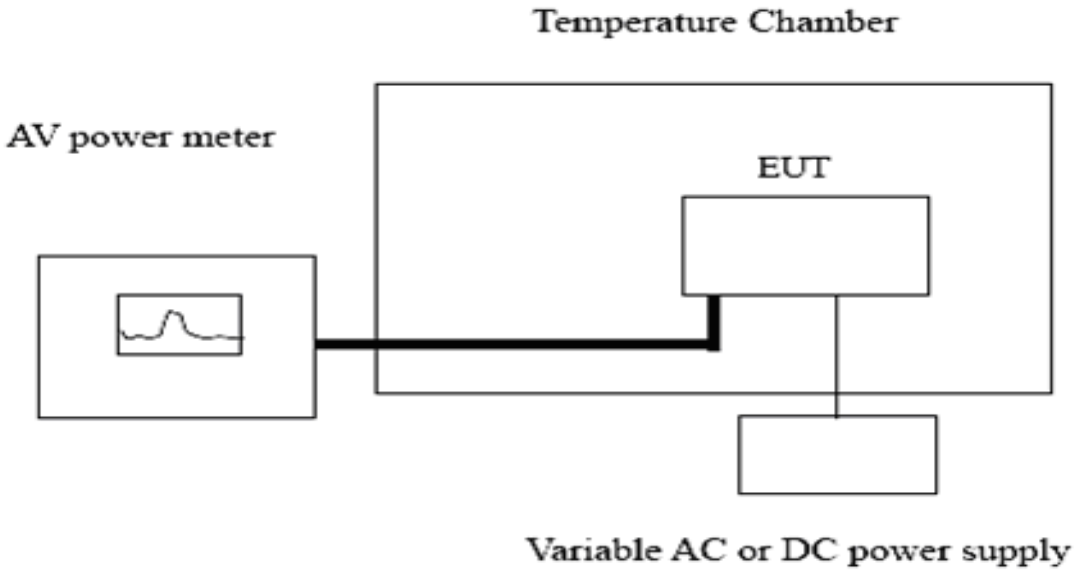
Item	MU	Remark
Uncertainty for Conducted Emission Test	2.50dB	
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.04dB	Polarize: V
	3.02dB	Polarize: H
Uncertainty for Radiation Emission test in 3m chamber (Above)	3.56dB	Polarize: H
	3.84dB	Polarize: V
Uncertainty for radio frequency	1×10^{-9}	
Uncertainty for conducted RF Power	0.65dB	
Uncertainty for temperature	0.6℃	
Uncertainty for humidity	1%	

4. TEST INSTRUMENT USED

For All Test					
Equipment	**Manufacturer**	**Model**	**Serial**	**Last Cal.**	**Next Cal.**
Comprehensive Tester	R&S	CMW500	106504	Dec. 07, 2020	Dec. 06, 2021
Spectrum Analyzer	KEYSIGHT	N9020A	MY55370280	Dec. 07, 2020	Dec. 06, 2021
Signal Source	Agilent	N5182A	MY46240766	Dec. 07, 2020	Dec. 06, 2021
Signal Source	Agilent	83752B	3610A01631	Dec. 07, 2020	Dec. 06, 2021
Probe	KEYSIGHT	U2021XA	MY55210018	Dec. 07, 2020	Dec. 06, 2021
Attenuator	MAIWEI	MANASR0206S2	DLE-160	Dec. 07, 2020	Dec. 06, 2021
RF Control Box	MAIWEI	MW100-RFCB	DLE-179	Dec. 07, 2020	Dec. 06, 2021
RF Control Box	MAIWEI	MW200-RFCB	DLE-180	Dec. 07, 2020	Dec. 06, 2021
RF Cable	MAIWEI	Z302S	18054391	Dec. 07, 2020	Dec. 06, 2021
RF Cable	MAIWEI	Z302S	19051973	Dec. 07, 2020	Dec. 06, 2021
RF Cable	MAIWEI	Z302S	19051987	Dec. 07, 2020	Dec. 06, 2021
RF Cable	MAIWEI	Z302S	19051988	Dec. 07, 2020	Dec. 06, 2021
RF Cable	MAIWEI	Z302S	19063251	Dec. 07, 2020	Dec. 06, 2021
RF Cable	MAIWEI	Z302S	19063254	Dec. 07, 2020	Dec. 06, 2021
RF Cable	MAIWEI	Z302S	19063257	Dec. 07, 2020	Dec. 06, 2021
RF Cable	MAIWEI	Z302S	19063259	Dec. 07, 2020	Dec. 06, 2021
DC power	LODESTAR	LP532DE	LP1908158	Dec. 07, 2020	Dec. 06, 2021
966 Chamber	ChengYu	966 Room	966	Nov. 25, 2019	Nov. 24, 2022
Spectrum Analyzer	Agilent	E4408B	MY50140780	Dec. 07, 2020	Dec. 06, 2021
EMI Receiver	R&S	ESRP7	101393	Dec. 07, 2020	Dec. 06, 2021
Amplifier	Schwarzbeck	BBV9743B	00153	Dec. 07, 2020	Dec. 06, 2021
Amplifier	EMEC	EM01G8GA	00270	Dec. 07, 2020	Dec. 06, 2021
Active Loop Antenna	Daze	ZN30900A	SEL0097	Dec. 07, 2020	Dec. 06, 2021
Broadband Trilog Antenna	Schwarzbeck	VULB9162	00306	Nov. 28, 2020	Nov. 27, 2021
Horn Antenna	Schwarzbeck	BBHA9120D	02139	Nov. 28, 2020	Nov. 27, 2021
966 Cable 1#	ChengYu	966	004	Dec. 07, 2020	Dec. 06, 2021
966 Cable 2#	ChengYu	966	003	Dec. 07, 2020	Dec. 06, 2021
Temperature Controller	Terchy	MHQ	120	Dec. 07, 2020	Dec. 06, 2021

5. RF OUTPUT POWER

5.1 Block Diagram of Test Setup



5.2 Limit

The RF output power for non-FHSS equipment shall be equal to or less than 20 dBm.

Notes: For Non-adaptive FHSS equipment, the manufacturer may have declared a reduced RF Output Power (seeclause 5.4.1 m)) and associated Duty Cycle (see clause 5.4.1 e)) that will ensure that the equipment meets the requirement for the Medium Utilization (MU) factor further described in clause 4.3.2.5. This is verified by the conformance test referred to in clause 4.3.2.5.4.

For non-adaptive non-FHSS equipment, where the manufacturer has declared an RF output power of less than 20 dBm e.i.r.p., the RF output power shall be equal to or less than that declared value.

5.3 Test Procedure

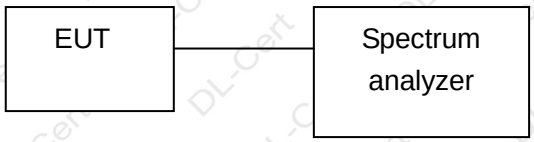
Refer to ETSI EN 300 328 V2.2.2 Clause 5.4.2.2.1.1

5.4 Test Result

Total e.i.r.p (dBm) Result								
Mode	Test CH	Condition					Limit (dBm)	Result
		Normal	HTLV	LTLV	LTHV	HTHV		
GFSK	Low	-1.10	-1.19	-1.28	-1.24	-1.16	20.00	Pass
	Middle	-1.13	-1.14	-1.25	-1.19	-1.13	20.00	Pass
	High	-1.08	-1.16	-1.30	-1.21	-1.14	20.00	Pass

6. POWER SPECTRAL DENSITY

6.1 Block Diagram of Test Setup



6.2 Limit

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

6.3 Test Procedure

Refer to ETSI EN 300 328 V2.2.2 Clause 5.4.3

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

Start Frequency	2400 MHz
Stop Frequency	2483.5 MHz
RBW	10KHz
VBW	30KHz
Detector	RMS
Sweep points	>8350
Trace	Max Hold
Trigger	Free Run

6.4 Test Result

Mode	Channel	Power Spectral Density (dBm/MHz)	Limit (dBm/MHz)	Conclusion
GFSK	Low	-6.16	10.00	PASS
	Middle	-6.28	10.00	PASS
	High	-6.85	10.00	PASS

7. ADAPTIVITY

7.1 Block Diagram of Test Setup

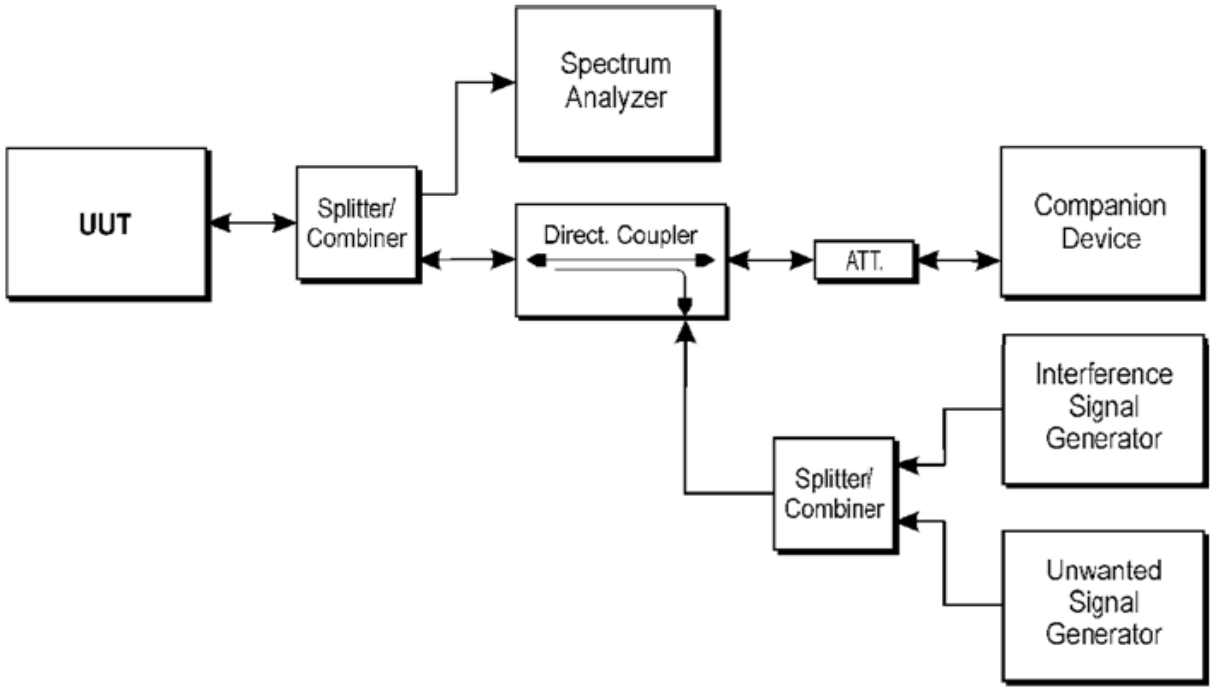


Figure 5: Test set-up for verifying the adaptivity of an equipment

7.2 Limit

Adaptive non-FHSS equipment using DAA shall comply with the following minimum set of requirements:

1) During normal operation, the equipment shall evaluate the presence of a signal on its current operating channel(s). If it is determined that a signal is present with a level above the detection threshold defined in step 5 that channel shall be marked as 'unavailable'.
2) The channel(s) shall remain unavailable for a minimum time equal to 1 s after which the channel may be considered again as an 'available' channel
3) The total time during which an equipment has transmissions on a given channel without re-evaluating the availability of that channel, is defined as the Channel Occupancy Time. The Channel Occupancy Time shall be less than 40 ms. Each such transmission sequence shall be followed by an Idle Period (no transmissions) of minimum 5 % of the Channel Occupancy Time with a minimum of 100 µs. After this, the procedure as in step 1 needs to be repeated.
4) The detection threshold shall be proportional to the transmit power of the transmitter: for a 20 dBm e.i.r.p. transmitter the detection threshold level (TL) shall be equal to or less than -70 dBm/MHz at the input to the receiver assuming a 0 dBi (receive) antenna assembly. This threshold level (TL) may be corrected for the (receive) antenna assembly gain (G); however, beamforming gain (Y) shall not be taken into account. For power levels less than 20 dBm e.i.r.p., the detection threshold level may be relaxed to:

$$TL = -70 \text{ dBm/MHz} + 10 \times \log10 (100 \text{ mW} / P_{out}) \ (P_{out} \text{ in mW e.i.r.p.})$$

5) The equipment shall comply with the requirements defined in step 1 to step 4 of the present clause in the

presence of an unwanted CW signal as defined in table 9.

Table 9: Unwanted Signal parameters

Wanted signal mean power from companion device (dBm)	Unwanted signal frequency (MHz)	Unwanted CW signal power (dBm)
-30 (see note 2)	2 395 or 2 488,5 (see note 1)	-35 (see note 2)
NOTE 1: The highest frequency shall be used for testing operating channels within the range 2 400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483,5 MHz. See clause 5.4.6.1.		
NOTE 2: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density in front of the UUT antenna.		

7.3 Test Procedure

Refer to ETSI EN 300 328 V2.2.2 Clause 5.4.6

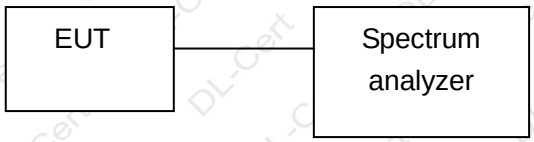
7.4 Test Result

Not applicable

Note: The maximum output power of EUT less than 10dBm, so not applicable.

8. OCCUPIED CHANNEL BANDWIDTH

8.1 Block Diagram of Test Setup



8.2 Limit

The Occupied Channel Bandwidth shall be within the band given in 2.4GHz to 2.4835GHz..

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 20MHz.

8.3 Test Procedure

Refer to ETSI EN 300 328 V2.2.2 Clause 5.4.7

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

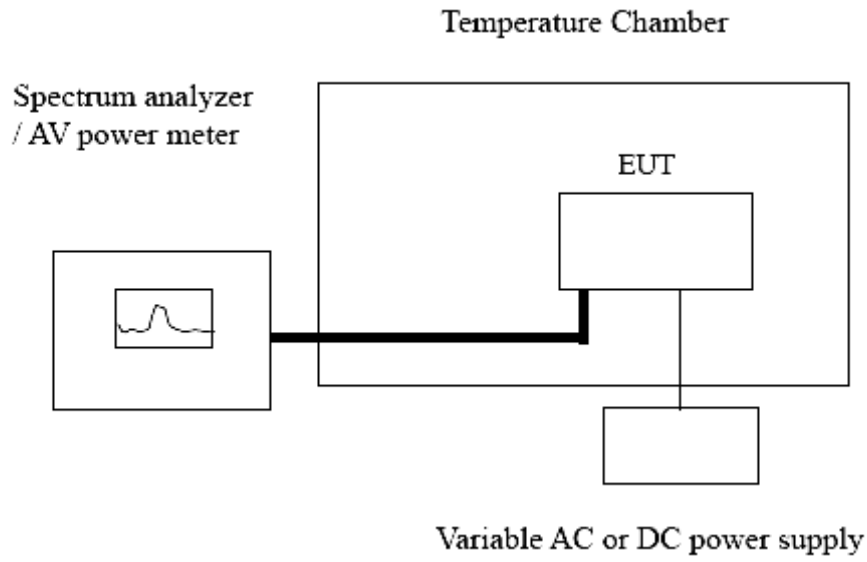
Centre Frequency:	The centre frequency of the channel under test
RBW	~ 1 % of the span without going below 1 %
VBW	3 × RBW
Frequency Span:	2 × Nominal Channel Bandwidth
Detector Mode:	RMS
Trace Mode:	Max Hold
Sweep time:	1s

8.4 Test Result

Test Mode	Test Channel	Occupied Bandwidth	Measured Frequency		Limit	Result
			F_L(MHz)	F_H(MHz)		
GFSK	Low	1.651	2401.351	/	>2400MHz And <2483.5MHz	Pass
	High	1.675	/	2480.729		Pass

9. TRANSMITTER UNWANTED EMISSIONS IN THE OUT-OF-BAND DOMAIN

9.1 Block Diagram of Test Setup



9.2 Limit

The transmitter unwanted emissions in the out-of-band domain shall not exceed the values provided by the mask in figure 3.

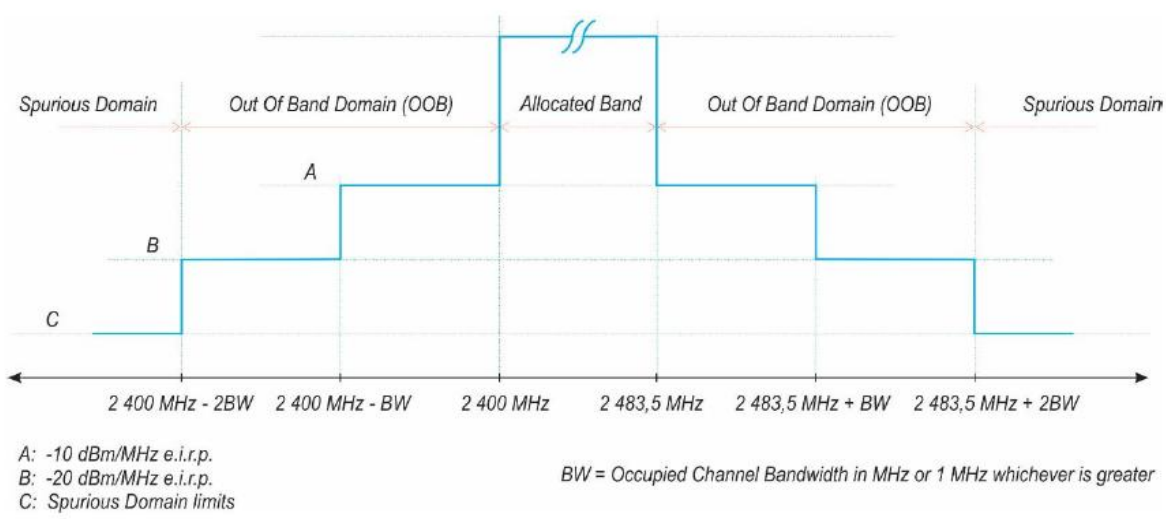


Figure 3: Transmit mask

9.3 Test Procedure

Refer to ETSI EN 300 328 V2.2.2 Clause 5.4.8.

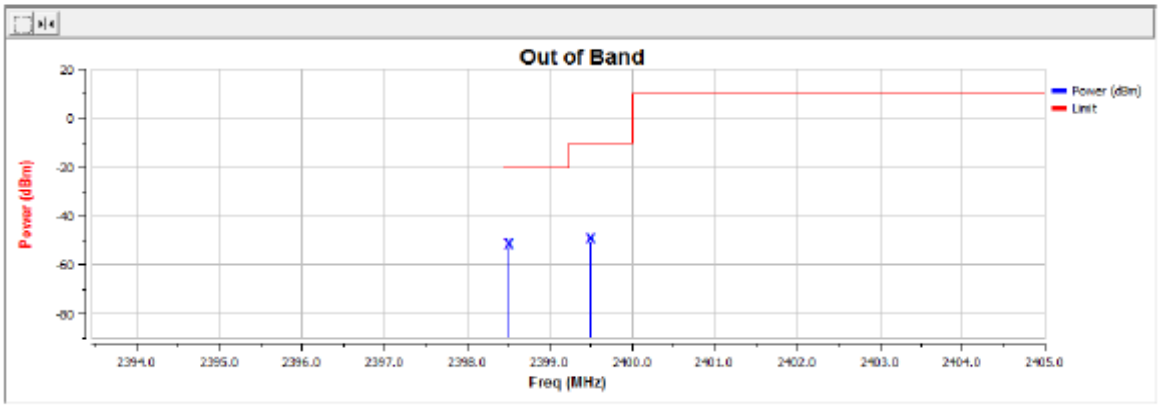
Connect the UUT to the spectrum analyzer and use the following settings:

RBW/VBW	1MHz/3MHz
Span	0Hz
Filter mode	Channel filter
Sweep mode	Continuous
Sweep Points	5000
Detector	RMS
Trace mode	Clear/Write
Trigger Mode	Video trigger

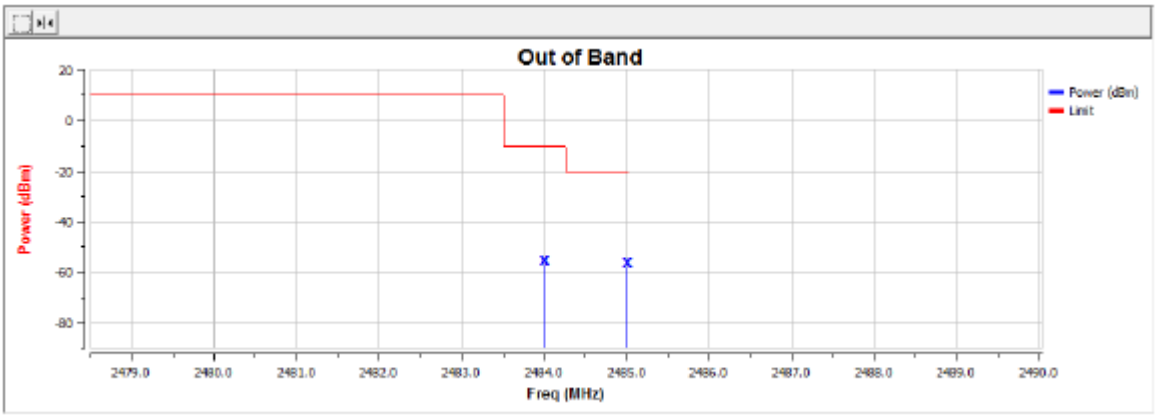
9.4 Test Result

Test Mode	Test Condition	Lower Band Edge		Higher Band Edge	
		Segment A (dBm/MHz)	Segment B (dBm/MHz)	Segment A (dBm/MHz)	Segment B (dBm/MHz)
GFSK	Normal	-51.63	-52.18	-50.79	-51.35
Limit		-10	-20	-10	-20
Conclusion		PASS			
Remark: All modulations of EUT have been tested, but only show the test data of the worst case in this report.					

CH Low (Normal)				
Channel	**Antenna**	**Frequency (MHz)**	**Level (dBm)**	**Limit (dBm)**
CH Low-2402	Antenna 1	2399.5	-51.63	-10
CH Low-2402	Antenna 1	2398.5	-52.18	-20



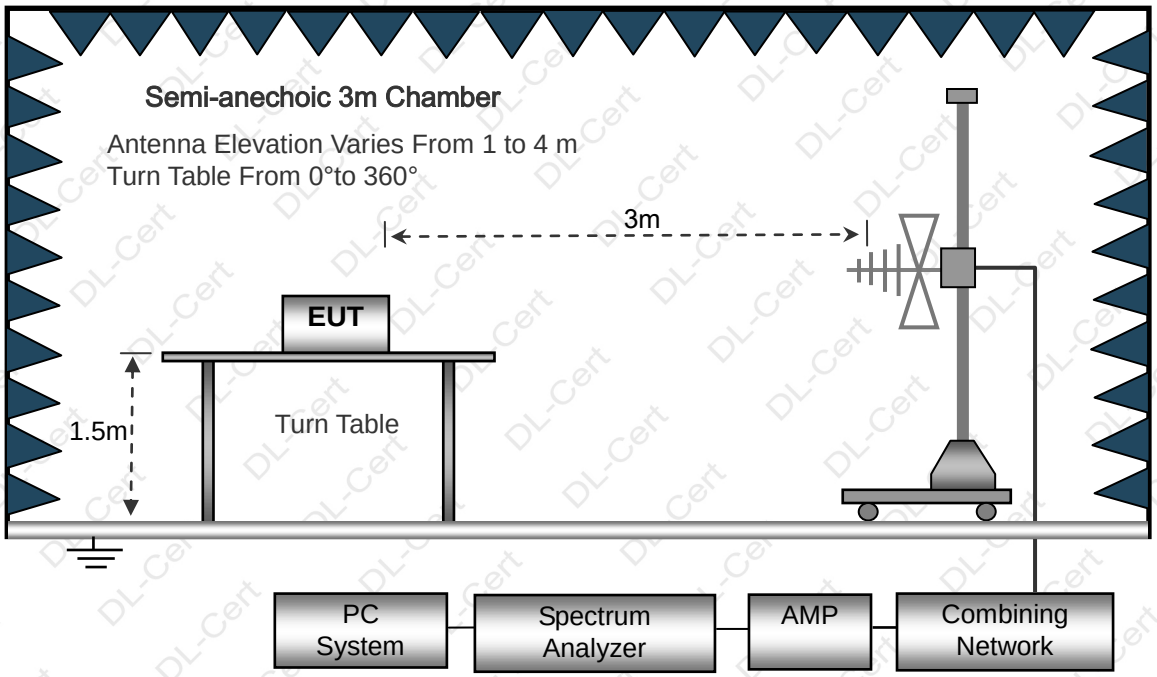
CH Low (Normal)				
Channel	**Antenna**	**Frequency (MHz)**	**Level (dBm)**	**Limit (dBm)**
CH Low-2480	Antenna 1	2484.5	-50.79	-10
CH Low-2480	Antenna 1	2485.5	-51.35	-20



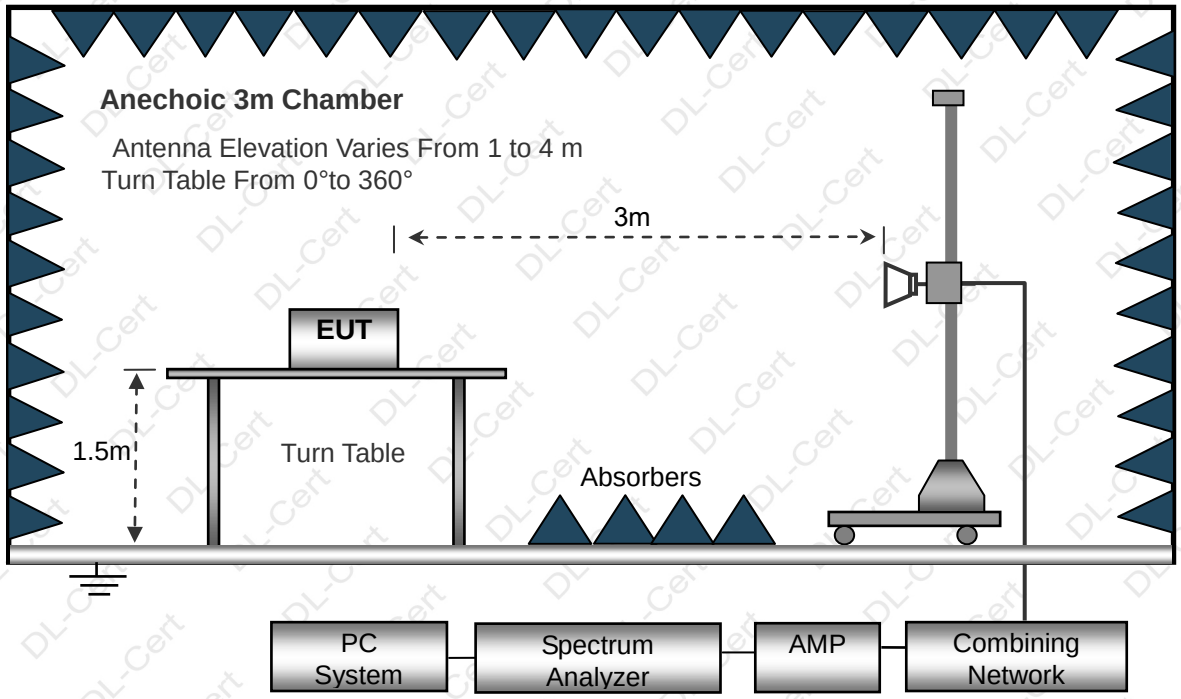
10. TRANSMITTER UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN

10.1 Block Diagram of Test Setup

Below 1GHz



Above 1GHz



10.2 Limit

The transmitter unwanted emissions in the spurious domain shall not exceed the values given in table 12.

Table 12: Transmitter limits for spurious emissions

Frequency range	Maximum power	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87,5 MHz	-36 dBm	100 kHz
87,5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 694 MHz	-54 dBm	100 kHz
694 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 12,75 GHz	-30 dBm	1 MHz

10.3 Test Procedure

Refer to ETSI EN 300 328 V2.2.2 Clause 5.4.9.

10.4 Test Result

Below 1GHz

Spurious Emission Test Data					
Frequency (MHz)	Polarization	Level (dBm)	Limit (dBm)	Marging (dB)	Result
35.05	Vertical	-63.97	-36	-27.97	Pass
58.96	Vertical	-65.01	-54	-11.01	Pass
193.89	Vertical	-63.91	-54	-9.91	Pass
238.78	Vertical	-63.96	-36	-27.96	Pass
504.23	Vertical	-63.95	-54	-9.95	Pass
861.31	Vertical	-64.61	-36	-28.61	Pass
44.47	Horizontal	-64.22	-36	-28.22	Pass
128.22	Horizontal	-63.59	-36	-27.59	Pass
322.10	Horizontal	-63.79	-36	-27.79	Pass
504.23	Horizontal	-64.98	-54	-10.98	Pass
619.09	Horizontal	-66.58	-54	-12.58	Pass
735.94	Horizontal	-62.76	-36	-26.76	Pass

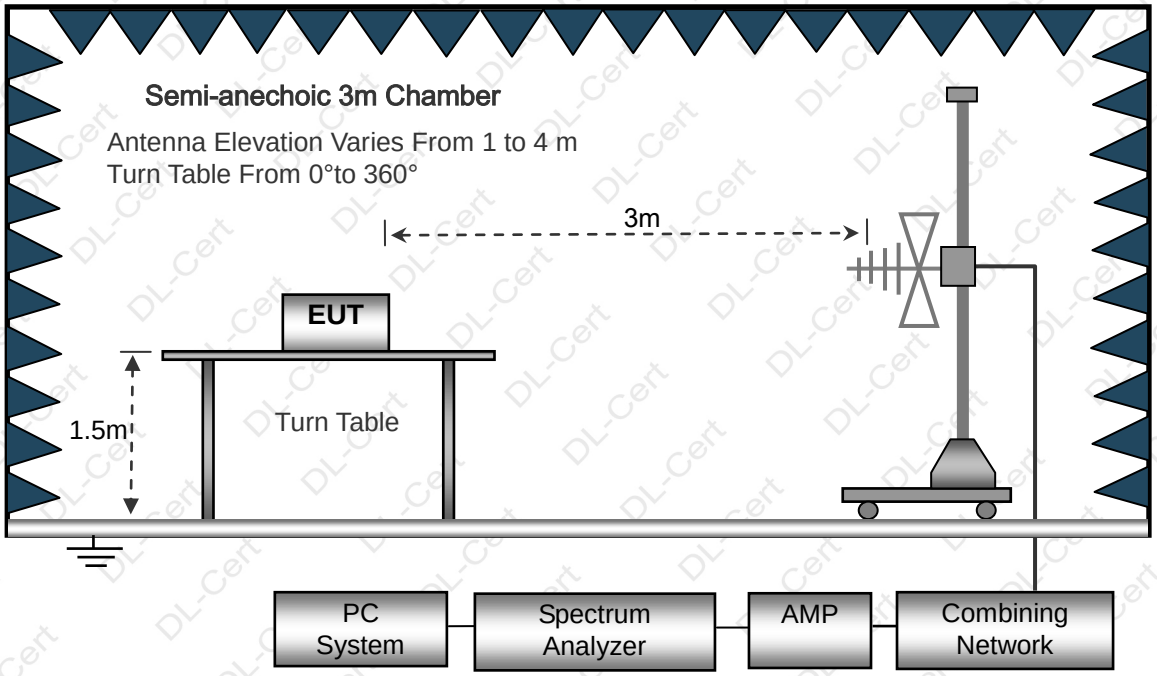
Above 1GHz

Spurious Emission Test Data						
Mode	**Frequency (MHz)**	**Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**	**Result**
GFSK Low Channel	4804	Vertical	-42.74	-30.00	-12.74	Pass
	7206	Vertical	-45.31	-30.00	-15.31	Pass
	9608	Vertical	-48.23	-30.00	-18.23	Pass
	4804	Horizontal	-42.97	-30.00	-12.97	Pass
	7206	Horizontal	-46.63	-30.00	-16.63	Pass
	9608	Horizontal	-48.90	-30.00	-18.90	Pass
GFSK Middle Channel	4804	Vertical	-42.68	-30.00	-12.68	Pass
	7206	Vertical	-44.77	-30.00	-14.77	Pass
	9608	Vertical	-51.41	-30.00	-21.41	Pass
	4804	Horizontal	-43.15	-30.00	-13.15	Pass
	7206	Horizontal	-47.39	-30.00	-17.39	Pass
	9608	Horizontal	-50.53	-30.00	-20.53	Pass
GFSK High Channel	4804	Vertical	-43.56	-30.00	-13.56	Pass
	7206	Vertical	-45.51	-30.00	-15.51	Pass
	9608	Vertical	-49.10	-30.00	-19.10	Pass
	4804	Horizontal	-43.52	-30.00	-13.52	Pass
	7206	Horizontal	-46.83	-30.00	-16.83	Pass
	9608	Horizontal	-50.66	-30.00	-20.66	Pass

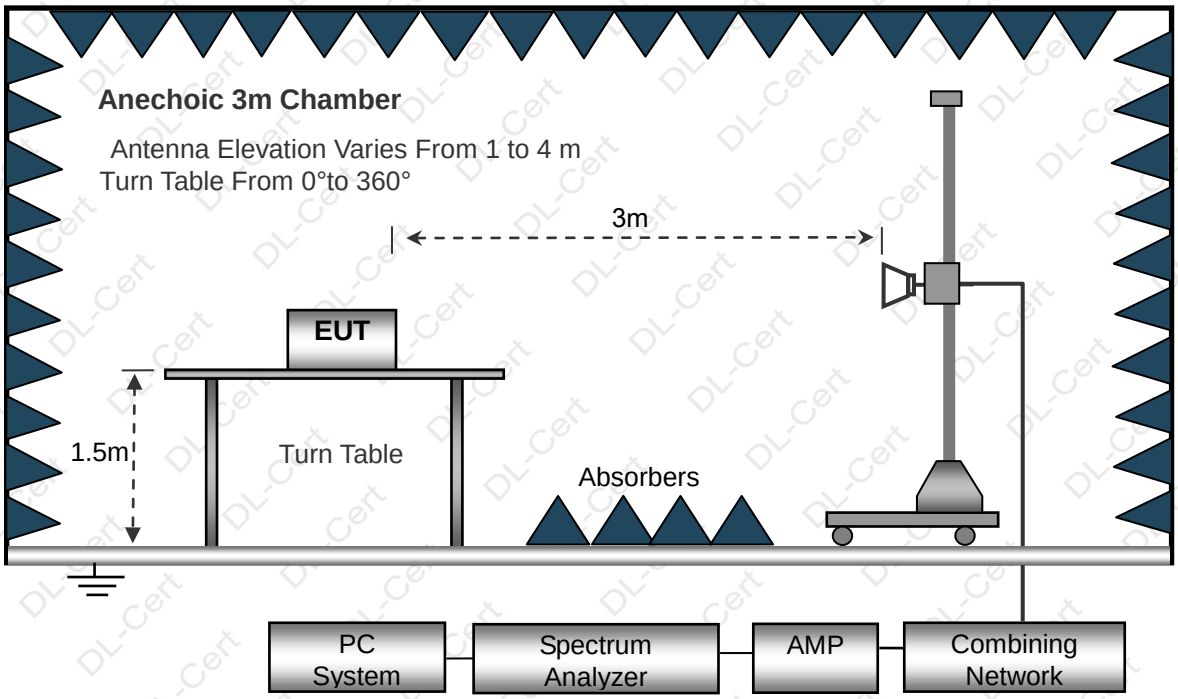
11. RECEIVER SPURIOUS EMISSIONS

11.1 Block Diagram of Test Setup

Below 1GHz



Above 1GHz



11.2 Limit

The spurious emissions of the receiver shall not exceed the values given in table 13.

Table 13: Spurious emission limits for receivers

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

11.3 Test Procedure

Refer to ETSI EN 300 328 V2.2.2 Clause 5.4.9.

11.4 Test Result

Below 1GHz

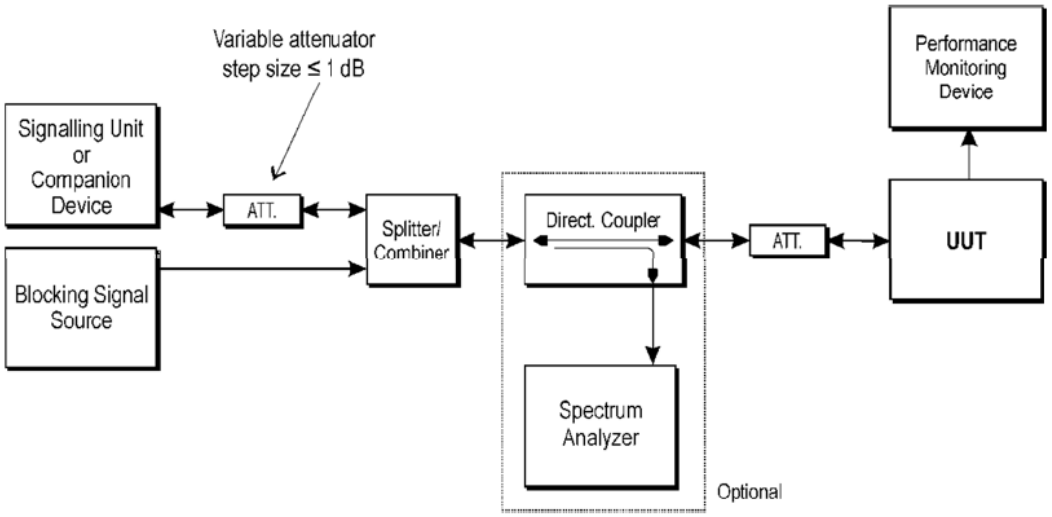
Receiver Spurious Emissions Test Data					
Frequency (MHz)	**Polarization**	**Level (dBm)**	**Limit (dBm)**	**Marging (dB)**	**Result**
34.96	Vertical	-67.48	-57.00	-10.48	Pass
58.81	Vertical	-68.50	-57.00	-11.50	Pass
193.40	Vertical	-68.41	-57.00	-11.41	Pass
238.18	Vertical	-68.46	-57.00	-11.46	Pass
502.95	Vertical	-68.41	-57.00	-11.41	Pass
859.14	Vertical	-68.10	-57.00	-11.10	Pass
44.36	Horizontal	-68.71	-57.00	-11.71	Pass
127.89	Horizontal	-68.09	-57.00	-11.09	Pass
321.29	Horizontal	-68.29	-57.00	-11.29	Pass
502.95	Horizontal	-69.46	-57.00	-12.46	Pass
617.52	Horizontal	-70.09	-57.00	-13.09	Pass
734.08	Horizontal	-69.28	-57.00	-12.28	Pass

Above 1GHz

Receiver Spurious Emissions Test Data						
Mode	**Frequency (MHz)**	**Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**	**Result**
GFSK Low Channel	4804	Vertical	-55.70	-47.00	-8.70	Pass
	7206	Vertical	-54.64	-47.00	-7.64	Pass
	9608	Vertical	-59.44	-47.00	-12.44	Pass
	4804	Horizontal	-55.03	-47.00	-8.03	Pass
	7206	Horizontal	-58.90	-47.00	-11.90	Pass
	9608	Horizontal	-58.29	-47.00	-11.29	Pass
GFSK Middle Channel	4804	Vertical	-56.74	-47.00	-9.74	Pass
	7206	Vertical	-56.84	-47.00	-9.84	Pass
	9608	Vertical	-55.39	-47.00	-8.39	Pass
	4804	Horizontal	-55.35	-47.00	-8.35	Pass
	7206	Horizontal	-58.01	-47.00	-11.01	Pass
	9608	Horizontal	-59.39	-47.00	-12.39	Pass
GFSK High Channel	4804	Vertical	-57.43	-47.00	-10.43	Pass
	7206	Vertical	-58.64	-47.00	-11.64	Pass
	9608	Vertical	-55.17	-47.00	-8.17	Pass
	4804	Horizontal	-54.64	-47.00	-7.64	Pass
	7206	Horizontal	-54.42	-47.00	-7.42	Pass
	9608	Horizontal	-56.52	-47.00	-9.52	Pass

12. RECEIVER BLOCKING

12.1 Block Diagram of Test Setup



12.2 Limit

Table 14 contains the Receiver Blocking parameters for Receiver Category 1 equipment.

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 4)	Type of blocking signal
(-133 dBm + 10 × $\log_{10}$(OCBW)) or -68 dBm whichever is less (see note 2)	2 380 2 504	-34	CW
(-139 dBm + 10 × $\log_{10}$(OCBW)) or -74 dBm whichever is less (see note 3)	2 300 2 330 2 360 2 524 2 584 2 674		

NOTE 1: OCBW is in Hz.

NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 26 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 20 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

Table 15 contains the Receiver Blocking parameters for Receiver Category 2 equipment.

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 3)	Type of blocking signal
(-139 dBm + 10 × $\log_{10}$(OCBW) + 10 dB) or (-74 dBm + 10 dB) whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW
NOTE 1: OCBW is in Hz. NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 26 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.			

Table 16 contains the Receiver Blocking parameters for Receiver Category 3 equipment.

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 3)	Type of blocking signal
(-139 dBm + 10 × $\log_{10}$(OCBW) + 20 dB) or (-74 dBm + 20 dB) whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW
NOTE 1: OCBW is in Hz. NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 30 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.			

12.3 Test Procedure

Refer to ETSI EN 300 328 V2.2.2 Clause 5.4.11.

12.4 Test Results

Mode	Wanted Power (dBm)	Blocking Frequency (MHz)	Blocking Power (dB)	Measured PER (%)	Limit (%)
GFSK	-74	2380	-34	0.35	10
	-74	2504	-34	0.39	10
	-74	2300	-34	0.27	10
	-74	2584	-34	0.37	10

13. GEO-LOCATION CAPABILITY

13.1 Definition and Requirements

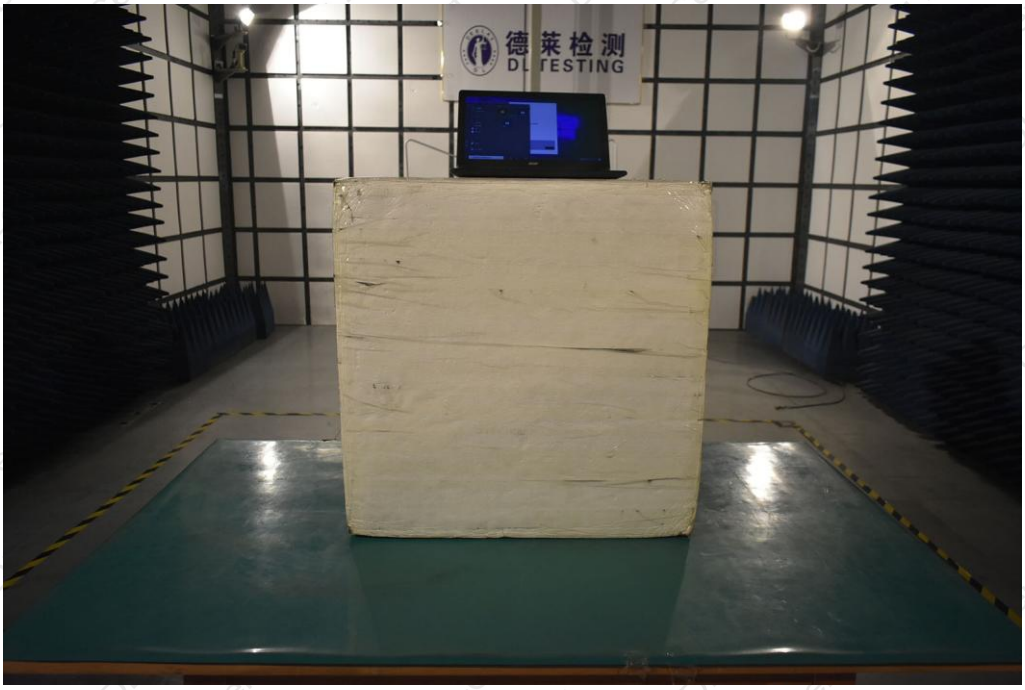
Geo-location capability is a feature of the equipment to determine its geographical location with the purpose to configure itself according to the regulatory requirements applicable at the geographical location where it operates.

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.

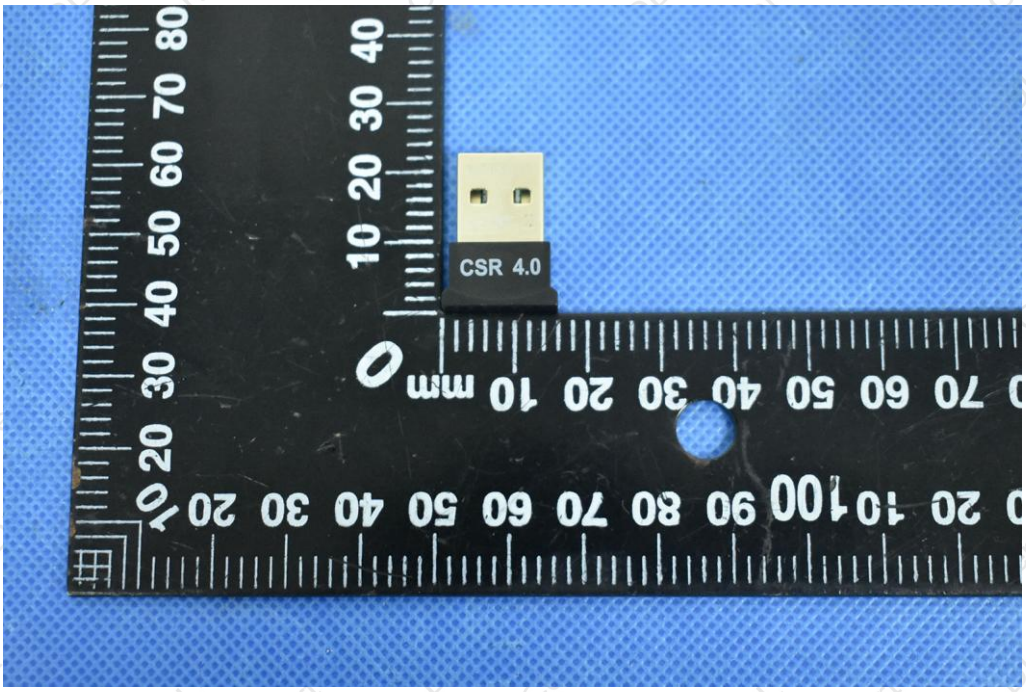
13.2 Test Results

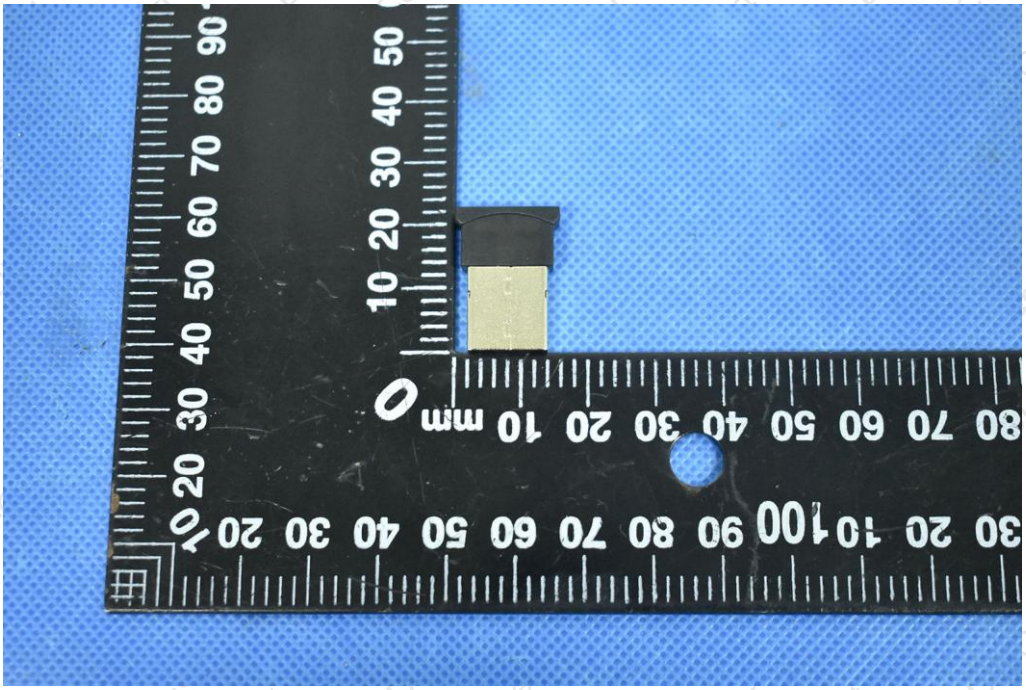
This product doesn't support Geo-location.

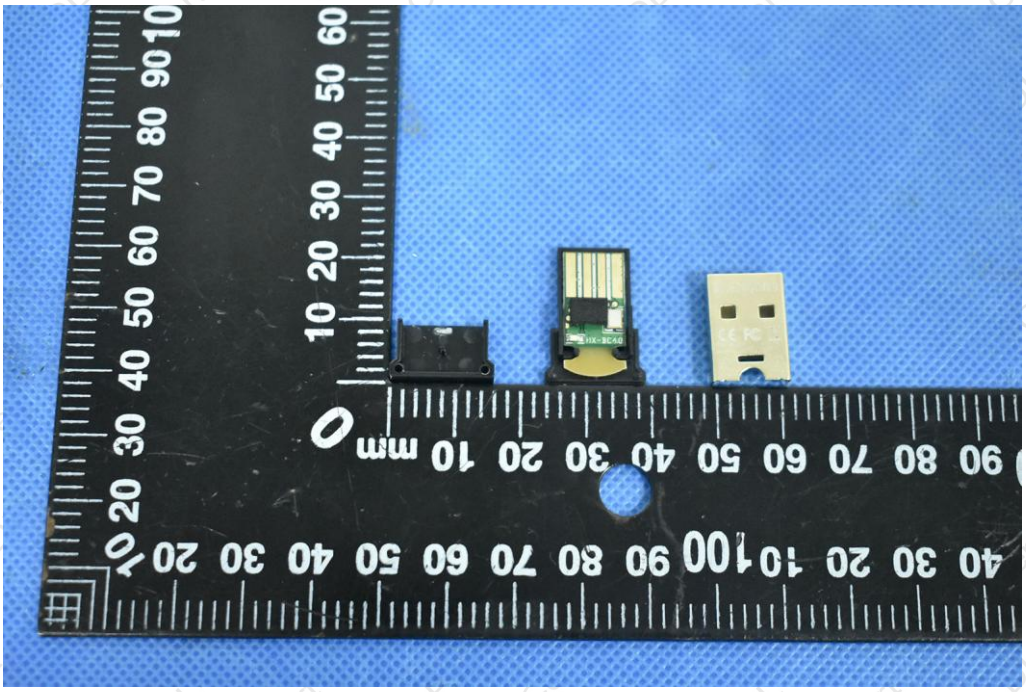
14. SETUP PHOTOGRAPHS

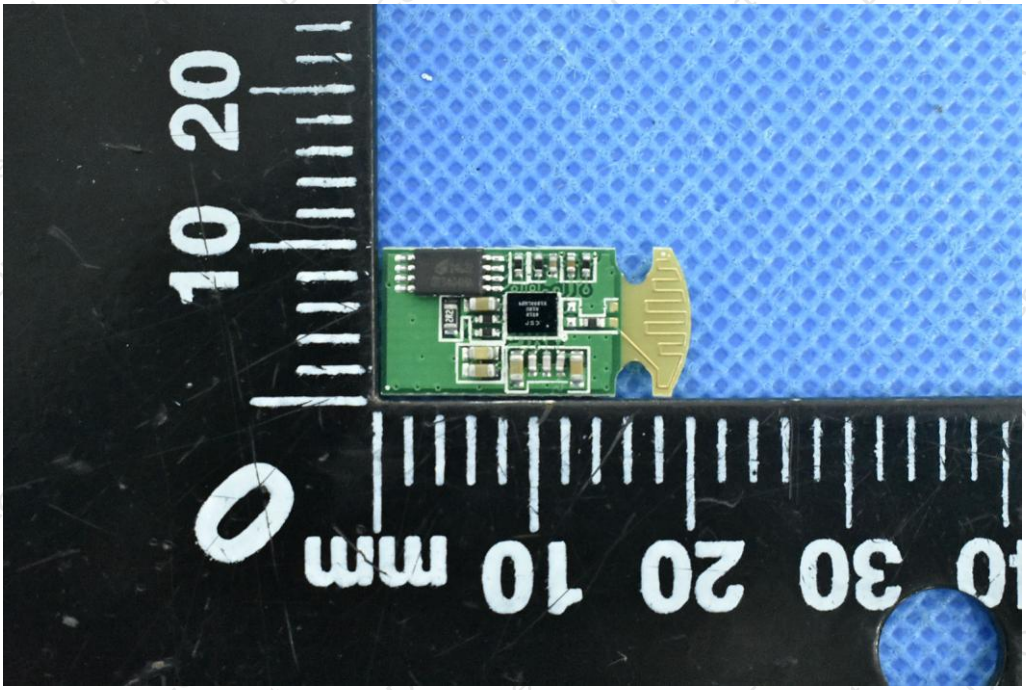


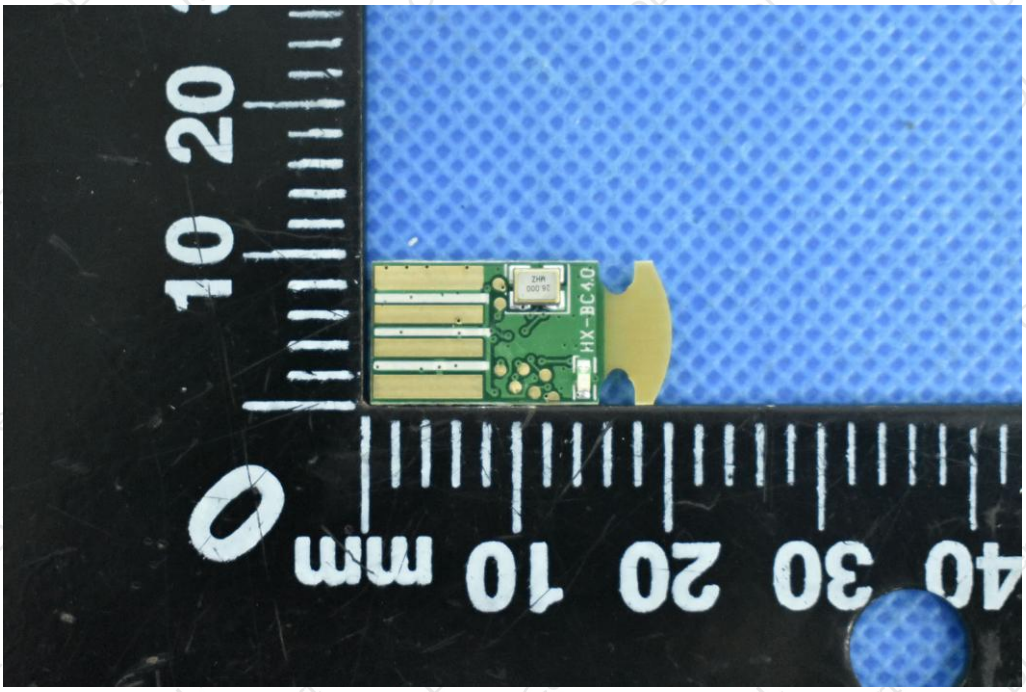
15. EUT PHOTOGRAPHS











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