

TEST REPORT

For

GPON ONT

**Model Number: ZXHN F6201B, ZXHN F6117A, ZXHN F6515N,
ZXHN F6211B, ZXHN F6601P, ZXHN F6310SP**

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Revision History

No	Date	Remark
V1.0	2024-7-1	Initial issue

TEST REPORT DECLARATION

Applicant : ZTE Corporation
Address : ZTE Plaza, Keji Road South, Hi-Tech Industrial Park,
Nanshan District, Shenzhen, Guangdong 518057, China
Manufacturer : ZTE Corporation
Address : ZTE Plaza, Keji Road South, Hi-Tech Industrial Park,
Nanshan District, Shenzhen, Guangdong 518057, China
EUT Description : GPON ONT
Model No. : ZXHN F6201B, ZXHN F6117A, ZXHN F6515N,
ZXHN F6211B, ZXHN F6601P, ZXHN F6310SP
Trade mark : ZTE
Serial Number : -----
Date of EUT : 2024-5-20
Receive
Test Standards: : ETSI EN 300 328 V2.2.2 (2019-07)

The EUT described above is tested by Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory to determine the maximum emissions from the EUT and ensure the EUT to be compliance with the immunity requirements of the EUT. Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory is assumed full responsibility for the accuracy of the test results, unless they depend on the manufacturer information.

The test report is valid for above tested sample only and shall not be reproduced in part without written approval of the laboratory.

Project Engineer: 陈司林 Date: 2024-7-1
(陈司林 Chen SiLin)
Checked by: 万晓婧 Date: 2024-7-1
(万晓婧 Wan XiaoJing)
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1. TEST RESULTS SUMMARY

Table 1 Test Results Summary

Test Items	Test Results
Spurious emissions	PASS
RF Output Power	PASS
Power Spectral Density	PASS
Adaptivity	PASS
Occupied Channel Bandwidth	PASS
Transmitter unwanted emissions in the out-of-band domain	PASS
Transmitter unwanted emissions in the spurious domain	PASS
Receiver Blocking	PASS

Test Items	Test Results
Accumulated Transmit Time, Frequency Occupation & Hopping Sequence	N/A ¹
Hopping Frequency Separation	N/A ¹
Duty cycle, Tx-Sequence, Tx-gap	N/A ²
Medium Utilisation (MU) factor	N/A ²
Geo-location capability	N/A ³

Remark: "N/A" means "Not applicable."

1. This device can NOT operate in the non-FHSS mode.
2. The manufacturer declared that the EUT can operate in adaptive mode only and non-adaptive mode is not supported.
3. This device does NOT support Geo-location capability.

2. GENERAL INFORMATION

2.1. Report information

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The testing report were performed by the Shenzhen Academy of Metrology and quality Inspection EMC Laboratory (Guangdong EMC compliance testing center), in their facilities located at NETC Building, No.4 Tongfa Rd., Xili, Nanshan, Shenzhen, China. At the time of testing, Laboratory is accredited by the following organizations:

China National Accreditation Service for Conformity Assessment (CNAS) accredits the Laboratory for conformance to FCC standards, EMC international standards and EN standards. The Registration Number is CNAS L0579.

The Laboratory is Accredited Testing Laboratory of FCC with Designation number CN1165 and Site registration number 582918.

The Laboratory is registered to perform emission tests with Innovation, Science and Economic Development (ISED), and the registration number is 11177A.

The Laboratory is registered to perform emission tests with VCCI, and the

registration number are C-20048, G20076, R-20077, R-20078 and T-20047.

The Laboratory is Accredited Testing Laboratory of American Association for Laboratory Accreditation (A2LA) and certificate number is 3292.01.

2.3. Measurement Uncertainty

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated 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)). Principles for the calculation of measurement uncertainty are contained in ETSI TR 100 028 [i.6] and [i.7], in particular in annex D of the ETSI TR 100 028-2 [i.7].

Table 2 Measurement Uncertainty

Test Items	Measurement Uncertainty
RF Output Power	0.349 dB
Power timing	< 500ns
Power Spectral Density	0.372 dB
Occupied Channel Bandwidth	0.224 MHz
Transmitter unwanted emissions, conducted	1.39 dB
Radiated spurious emissions , valid between 30 MHz and 1 GHz	±4.8 dB
Radiated spurious emissions, valid between 1 GHz and 12.75 GHz	±4.4 dB
Temperature	±0.698°C

3. PRODUCT DESCRIPTION

3.1.EUT Description

Operate Frequency	:	Wi-Fi: 802.11b/ g/ n HT20/ VHT 20: 2.412 GHz~2.472 GHz 802.11n HT40/ ax HE40: 2.422 GHz~2.462 GHz
Nominal Channel Bandwidth(s):	:	20 MHz, 40 MHz
Antenna Designation	:	Dipole
Modulation	:	Wi-Fi: DSSS (DBPSK, DQPSK, CCK) for 802.11b OFDM (BPSK, QPSK, 16QAM, 64QAM) for 802.11g/n OFDM/ OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM,1024QAM) for 80.11ax
Antenna Gain	:	ANT1: 4 dBi ANT2: 4dBi Max Beamforming gain: 3 dBi
Number Of Transmission Chain	:	2
Max RF Output Power (EIRP)	:	19.75 dBm
Adaptive/ Non-adaptive	:	<input type="checkbox"/> non-adaptive Equipment <input checked="" type="checkbox"/> adaptive Equipment without the possibility to switch to a non-adaptive mode <input type="checkbox"/> adaptive Equipment which can also operate in a non-adaptive mode
The equipment has implemented an LBT based DAA mechanism	:	<input type="checkbox"/> The equipment is Frame Based equipment <input checked="" type="checkbox"/> The equipment is Load Based equipment <input type="checkbox"/> The equipment can switch dynamically between Frame Based and Load Based equipment
Type of Equipment	:	<input checked="" type="checkbox"/> Stand-alone equipment <input type="checkbox"/> Combined equipment <input type="checkbox"/> Plug-in radio device

Remark: ZXHN F6117A, ZXHN F6515N, ZXHN F6211B, ZXHN F6601P, ZXHNF6310SP compared with ZXHN F6201B, only have different model number. All of the models' circuit theory, electrical design and the critical components are the same. ZXHN F6117A, ZXHN F6515N, ZXHN F6211B, ZXHN F6601P, ZXHN F6201B, ZXHNF6310SP has four configs, all of the configs use the same PCB, the differences are shown in the following table.

No.	ZXHN F6117A/ZXHN F6515N/ZXHN F6211B/ZXHN F6601P/ZXHN F6201B/ZXHNF6310SP Config	Power Adapter
1	WAN interface: GPON LAN interface: 4*GE+1*FXS+1*USB2.0+2x2 802.11ax@2.4GHz& 2x2 802.11ax@5GHz(two dual band external antennas with 5dBi gain)	12V, 1.5A or 12V, 1.0A
2	WAN interface: GPON LAN interface: 4*GE+1*FXS+2x2 802.11ax@2.4GHz& 2x2 802.11ax@5GHz(two dual band external antennas with 5dBi gain)	12V, 1.5A or 12V, 1.0A
3	WAN interface: GPON LAN interface: 4*GE+1*USB2.0+2x2 802.11ax@2.4GHz& 2x2 802.11ax@5GHz(two dual band external antennas with 5dBi gain)	12V, 1.5A or 12V, 1.0A
4	WAN interface: GPON LAN interface: 4*GE+2x2 802.11ax@2.4GHz& 2x2 802.11ax@5GHz(two dual band external antennas with 5dBi gain)	12V, 1.5A or 12V, 1.0A

Unless otherwise specified, config 1 was selected as representative model to perform all the tests.

WLAN:

Table 3 Working Frequency List(802.11b&802.11g&802.11n HT20&802.11ax HE20)

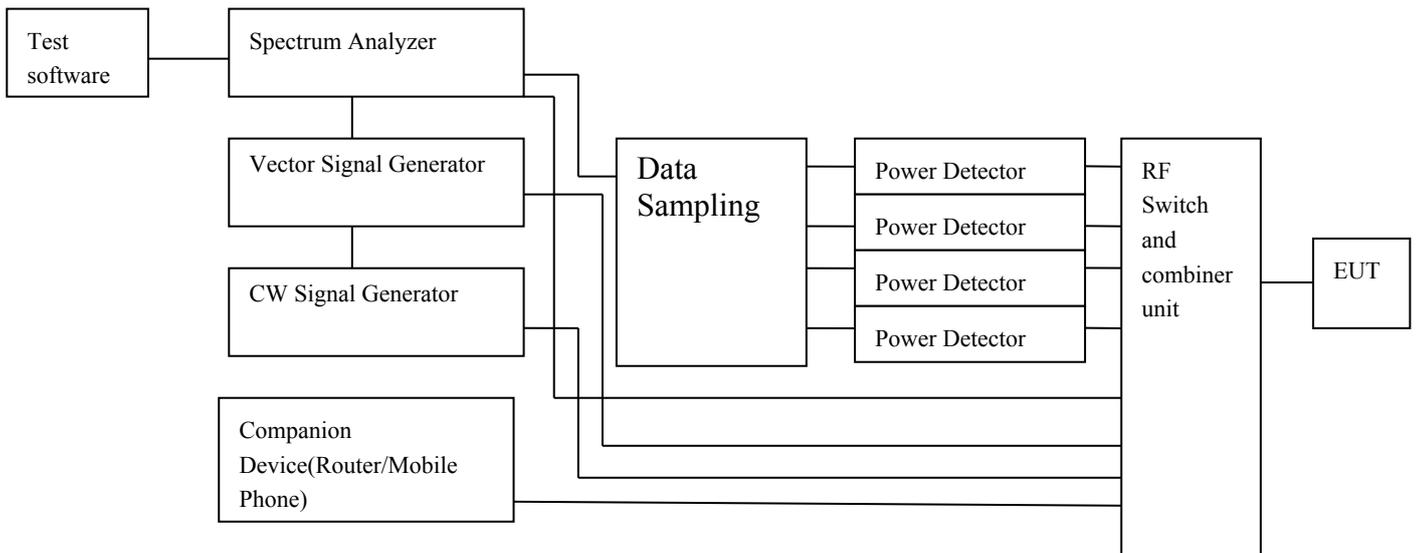
Channel	Center Frequency(MHz)	Channel	Center Frequency(MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	12	2467
6	2437	13	2472
7	2442	---	---

WLAN:

Table 4 Working Frequency List (802.11n HT40&802.11ax HE40)

Channel	Center Frequency(MHz)	Channel	Center Frequency(MHz)
3	2422	8	2447
4	2427	9	2452
5	2432	10	2457
6	2437	11	2462
7	2442	---	---

3.2. Test System Configuration



3.3. Operating Condition of EUT

- Test mode 1: Wi-Fi TX(802.11b)
- Test mode 2: Wi-Fi TX(802.11g)
- Test mode 3: Wi-Fi TX(802.11n HT20)
- Test mode 4: Wi-Fi TX(802.11n HT40)
- Test mode 5: Wi-Fi TX(802.11ax HE20)
- Test mode 6: Wi-Fi TX(802.11ax HE40)
- Test mode 7: Wi-Fi RX(802.11b)
- Test mode 8: Wi-Fi RX(802.11g)
- Test mode 9: Wi-Fi RX(802.11n HT20)
- Test mode 10: Wi-Fi RX(802.11n HT40)
- Test mode 11: Wi-Fi RX(802.11ax HE20)
- Test mode 12: Wi-Fi RX(802.11ax HE40)

Preliminary tests were performed in different data rate and the worst case is decided as below,

802.11b

Pre-scan was performed with 802.11b (the speed are 1 Mbit/s, 2 Mbit/s, 5.5 Mbit/s, 11 Mbit/s).The worst case is 802.11b 1Mbit/s.

802.11g

Pre-scan was performed with 802.11g(the speed are 6 Mbit/s, 9 Mbit/s, 12 Mbit/s, 18Mbit/s, 24 Mbit/s, 36 Mbit/s, 48 Mbit/s, 54 Mbit/s). The worst case is 802.11g 6Mbit/s.

802.11n HT20

Pre-scan was performed with 802.11n HT20. The worst case is 802.11n HT20 at the lowest data rate.

802.11n HT40

Pre-scan was performed with 802.11n HT40. The worst case is 802.11n HT40 at the lowest data rate.

802.11ax HE20

Pre-scan was performed with 802.11ax HE20. The worst case is 802.11ax HE20 at the lowest data rate.

802.11ax HE40

Pre-scan was performed with 802.11ax HE40. The worst case is 802.11ax HE40 at the lowest data rate.

802.11b was the worst case for the test items Spurious emissions and Receiver Blocking.

802.11n/ax can operate in MIMO mode for test items RF Output Power, Power Spectral Density, Transmitter unwanted emissions in the out-of-band domain and Spurious emissions. For MIMO, the 2TX emissions testing are considered as a worst case scenario and were tested at power levels, per transmit chain, greater than or equal to the maximum power in any 1TX mode.

3.4.Support Equipment List

Table 5 Support Equipment list

Name	Model No	S/N	Manufacturer
Notebook	HSN-Q15C	5CD9361KR6	HP
Notebook	E460	SB12961	Lenovo
Wireless Network Card	AX200	--	Intel

3.5.Test Conditions

HT =40 °C

LT =0 °C

NV = DC 12 V by AC/DC adapter

Remark: “NT” means “Normal Temperature”

“LT” means “Low Temperature”

“HT” means “High Temperature”

“NV” means “Normal Voltage”

3.6.Modifications

No modification was made.

4. RF OUTPUT POWER

4.1. Test Requirements

4.1.1. Test Standard

ETSI EN 300 328 V2.2.2 (2019-07)

4.1.2. Test Limit

For non-adaptive frequency hopping systems

The maximum RF output power for non-adaptive Frequency Hopping equipment, shall be declared by the supplier. The maximum RF output power for this equipment shall be equal to or less than the value declared by the supplier. This declared value shall be equal to or less than 20dBm.

The maximum RF output power for non-adaptive equipment shall be declared by the supplier and shall not exceed 20 dBm. For non-adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be equal to or less than the value declared by the supplier.

For adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be 20 dBm.

The maximum RF output power for non-adaptive equipment shall be declared by the manufacturer and shall not exceed 20 dBm. For non-adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be equal to or less than the value declared by the manufacturer.

This limit shall apply for any combination of power level and intended antenna assembly.

4.2. Test Procedure

Refer to EN 300 328 V2.2.2 (2019-07) Clause 5.4.2

R&S®OSP120 module is used for power measurement, and it supports High sampling rate greater than 1 M sample/s and measurement time of up to 32 s at 1 M sample/s. Test software is used to control the power detector and the sampling unit.

For adaptive equipment, the measurement duration shall be long enough to ensure a

minimum number of bursts (at least 10) are captured.

4.3. Test Equipment

No.	Equipment	Manufacturer	Model No.	LAST CALIB	Period
SB11818	Temperature & Humidity Chamber	ESPEC	EH-010U	2023-11-28	12Months
SB11873/01	Power sensor, Power Meter	Rohde & Schwarz	OSP120+O SP-B157	2024-04-22	12Months
SB11873/03	Test software	Tonscend	JS1120-3	---	---

4.4. Test Condition

Date of test: May.27,2024-May.28,2024
Normal Temperature: 26°C
Relative Humidity: (37 ~ 42)%RH
Atmospheric Pressure: (100 ~ 100.1)kPa

4.5. Test Data

Please refer to the Annex A

5. POWER SPECTRAL DENSITY

5.1. Test Requirements

5.1.1. Test Standard

ETSI EN 300 328 V2.2.2 (2019-07)

5.1.2. Test Limit

For equipment using wide band modulations other than FHSS, the maximum Power Spectral Density is limited to 10 dBm per MHz.

5.2. Test Procedure

Refer to EN 300 328 V2.2.2 (2019-07) Clause 5.4.3

Test software is used to control the spectrum analyzer to use the following settings:

Start Frequency: 2 400 MHz

Stop Frequency: 2 483,5 MHz

Resolution BW: 10 kHz

Video BW: 30 kHz

Sweep Points: 15000

Detector: RMS Trace Mode: Max Hold Sweep time: 10s

Test software acquires the trace data and calculate the Spectral Density in 1MHz.

5.3. Test Equipment

No.	Equipment	Manufacturer	Model No.	LAST CALIB	Period
SB11873/01	Power sensor, Power Meter	Rohde & Schwarz	OSP120+O SP-B157	2024-04-22	12Months
SB18161	Spectrum Analyzer	Rohde & Schwarz	FSV3030	2024-04-22	12Months
SB11873/03	Test software	Tonscend	JS1120-3	---	---

5.4. Test Condition

Date of test: May.27,2024-May.28,2024

Temperature: 26°C

Relative Humidity: (37 ~ 42)%RH

Atmospheric Pressure: (100 ~ 100.1)kPa

5.5. Test Data

Please refer to the Annex A

6. ADAPTIVITY

6.1. Test Requirements

6.1.1. Test Standard

ETSI EN 300 328 V2.2.2 (2019-07)

6.1.2. Test Limit

Adaptive FHSS

Adaptive FHSS using LBT

- At the start of every dwell time, before transmission on a hopping frequency, the equipment shall perform a Clear Channel Assessment (CCA) check using energy detect. The CCA observation time shall be not less than 0,2 % of the Channel Occupancy Time with a minimum of 18 µs.
- The Channel Occupancy Time for a given hopping frequency, which starts immediately after a successful CCA, shall be less than 60 ms followed by an Idle Period of minimum 5 % of the Channel Occupancy Time with a minimum of 100 µs.
- 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:

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

Table 6 Unwanted Signal parameters

Wanted signal mean power from companion device	Unwanted signal frequency (MHz)	Unwanted CW signal power (dBm)
sufficient to maintain the link (see note 2)	2 395 or 2 488,5 (see note 1)	-35 (see note 3)

NOTE 1: The highest frequency shall be used for testing operating channels within the range 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: A typical value which can be used in most cases is -50 dBm/MHz.

NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna.

Adaptive FHSS using DAA

- The Channel Occupancy Time for a given hopping frequency shall be less than 40 ms. For

equipment using a dwell time > 40 ms that wants to have other transmissions during the same hop (dwell time) an Idle Period (no transmissions) of minimum 5 % of the Channel Occupancy Period with a minimum of 100 µs shall be implemented.

- For FHSS equipment using DAA with a dwell time < 40 ms, the maximum Channel Occupancy Time may be non-contiguous, i.e. spread over a number of Hopping Sequences (equal to 40 ms divided by the dwell time [ms]).
- 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 below 20 dBm e.i.r.p., the detection threshold level may be relaxed to:

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

If implemented, Short Control Signalling Transmissions shall have a maximum TxOn / (TxOn + TxOff) ratio of 10 % within any observation period of 50 ms or within an observation period equal to the dwell time, whichever is less.

Table 7 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.

non-FHSS

Adaptive non-FHSS using DAA

- 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.
- 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:

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

Table 8 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)
<p>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.</p> <p>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.</p>		

Adaptive non-FHSS using LBT(Frame Based Equipment)

- The equipment shall observe the operating channel for the duration of the CCA observation time which shall be not less than 18 μs.
- The Channel Occupancy Time shall be in the range 1 ms to 10 ms followed by an Idle Period of at least 5 % of the Channel Occupancy Time used in the equipment for the current Frame Period.
- The energy detection threshold for the CCA shall be proportional to the transmit power of the transmitter: for a 20 dBm e.i.r.p. transmitter the CCA 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 CCA threshold level may be relaxed to:

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

Table 9 Unwanted Signal parameters

Wanted signal mean power from companion device (dBm)	Unwanted signal frequency (MHz)	Unwanted CW signal power (dBm)
sufficient to maintain the link (see note 2)	2 395 or 2 488,5 (see note 1)	-35 (see note 3)
<p>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.</p> <p>NOTE 2: A typical conducted value which can be used in most cases is -50 dBm/MHz.</p> <p>NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density in front of the UUT antenna.</p>		

Adaptive non-FHSS using LBT(Load Based Equipment)

- The equipment shall observe the operating channel for the duration of the CCA observation time which shall be not less than 18 μs.
- The Channel Occupancy Time shall be less than 13 ms.
- The energy detection threshold for the CCA shall be proportional to the transmit power of the transmitter: for a 20 dBm e.i.r.p. transmitter the CCA 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 CCA threshold level may be relaxed to:

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

Table 10 Unwanted Signal parameters

Wanted signal mean power from companion device (dBm)	Unwanted signal frequency (MHz)	Unwanted CW signal power (dBm)
sufficient to maintain the link (see note 2)	2 395 or 2 488,5 (see note 1)	-35 (see note 2)
<p>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.</p> <p>NOTE 2: A typical conducted value which can be used in most cases is -50 dBm/MHz.</p> <p>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.</p>		

If implemented, Short Control Signalling Transmissions of adaptive non-FHSS equipment shall have a maximum TxOn / (TxOn + TxOff) ratio of 10 % within any observation period of 50 ms.

NOTE: Duty Cycle is defined in clause 4.3.2.4.2.

6.2. Test Procedure

Refer to EN 300 328 V2.2.2 (2019-07) Clause 5.4.6

6.3. Test Equipment

No.	Equipment	Manufacturer	Model No.	LAST CALIB	Period
SB11873/01	Power sensor, Power Meter	Rohde & Schwarz	OSP120+OS P-B157	2024-04-22	12Months
SB11873/02	Vector Signal Generator	Rohde & Schwarz	SMBV100A	2024-04-22	12Months
SB3433	Signal Source	Rohde & Schwarz	SMT03	2024-04-22	12Months
SB9060	Signal Analyzer	Rohde & Schwarz	FSQ40	2024-04-22	12Months
SB11873/03	Test software	Tonscend	JS1120-3	---	---

6.4. Test Condition

Date of test: Jun.6,2024-Jun.11,2024

Temperature: (24 ~ 26)°C

Relative Humidity: (41 ~ 50)%RH

Atmospheric Pressure: (100.3 ~ 100.5)kPa

6.5. Test Data

Please refer to the Annex A

7. OCCUPIED CHANNEL BANDWIDTH

7.1. Test Requirements

7.1.1. Test Standard

ETSI EN 300 328 V2.2.2 (2019-07)

7.1.2. Test Limit

The Occupied Channel Bandwidth shall be within the band 2.4GHz to 2.4835GHz. For non-adaptive FHSS equipment with e.i.r.p. greater than 10 dBm, the Occupied Channel Bandwidth for every occupied hopping frequency shall be equal to or less than 5 MHz.

For non-adaptive non-FHSS equipment with e.i.r.p. greater than 10 dBm, the Occupied Channel Bandwidth shall be equal to or less than 20 MHz.

7.2. Test Procedure

Refer to EN 300 328 V2.2.2 (2019-07) Clause 5.4.7

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

Centre Frequency: The centre frequency of the channel under test

RBW: 500 KHz(HT20), 1 MHz(HT40), 20 KHz(Bluetooth), 50 KHz(Bluetooth(LE))

VBW: 2 MHz(HT20), 3 MHz(HT40), 100 KHz(Bluetooth), 200 KHz(Bluetooth(LE))

Frequency Span: 2 × Nominal Channel Bandwidth

Detector Mode: RMS

Trace Mode: Max Hold

Sweep time: 1s

7.3. Test Equipment

No.	Equipment	Manufacturer	Model No.	LAST CALIB	Period
SB11873/01	Power sensor, Power Meter	Rohde & Schwarz	OSP120+OS P-B157	2024-04-22	12Months
SB18161	Spectrum Analyzer	Rohde & Schwarz	FSV3030	2024-04-22	12Months
SB11873/03	Test software	Tonscend	JS1120-3	---	---

7.4. Test Condition

Date of test: May.27,2024-May.28,2024

Temperature: 26°C

Relative Humidity: (37 ~ 42)%RH

Atmospheric Pressure: (100 ~ 100.1)kPa

7.5. Test Data

Please refer to the Annex A

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

8.1. Test Requirements

8.1.1. Test Standard

ETSI EN 300 328 V2.2.2 (2019-07)

8.1.2. 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 3.

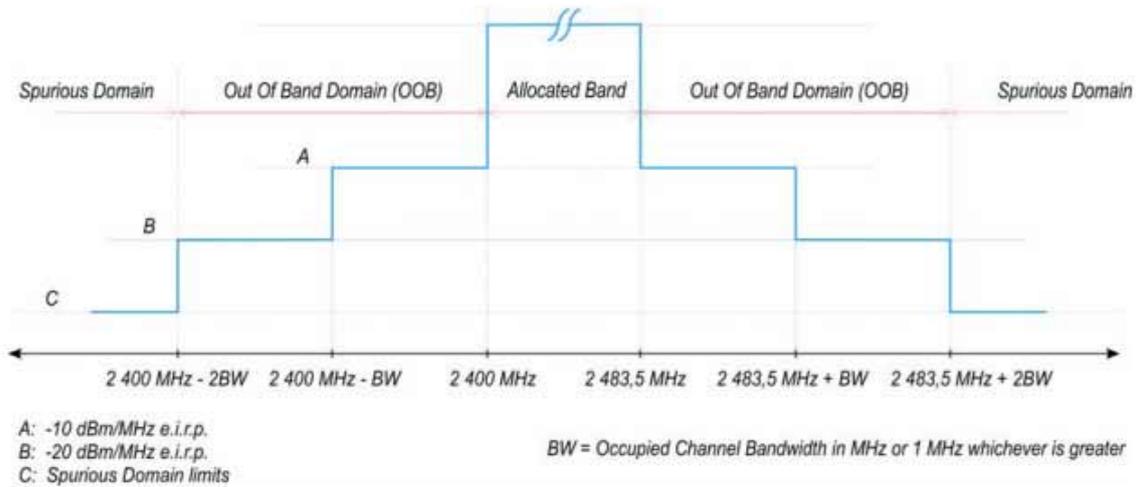


Figure 3: Transmit mask

8.2. Test Procedure

Refer to EN 300 328 V2.2.2 (2019-07) Clause 5.4.8

8.3. Test Equipment

No.	Equipment	Manufacturer	Model No.	LAST CALIB	Period
SB11873/01	Power sensor, Power Meter	Rohde & Schwarz	OSP120+O SP-B157	2024-04-22	12Months
SB18161	Spectrum Analyzer	Rohde & Schwarz	FSV3030	2024-04-22	12Months
SB11873/03	Test software	Tonscend	JS1120-3	---	---

8.4. Test Condition

Date of test: May.27,2024-May.28,2024

Temperature: 26°C

Relative Humidity: (37 ~ 42)%RH

Atmospheric Pressure: (100 ~ 100.1)kPa

8.5. Test Data

Please refer to the Annex A

9. SPURIOUS EMISSIONS

9.1. Test Requirements

9.1.1. Test Standard

ETSI EN 300 328 V2.2.2 (2019-07)

9.1.2. Test Limit

Table 11 Transmitter limits for spurious emissions

Transmitter Limits for Spurious Emissions		
Frequency Range	Maximum power E.R.P. (\leq 1GHz) E.I.R.P. ($>$ 1GHz)	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

Table 12 Spurious emission limits for receivers

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

9.2. Test Procedure

Refer to EN 300 328 V2.2.2 (2019-07) Clause 5.4.9

9.3. Test Equipment

No.	Equipment	Manufacturer	Model No.	LAST CALIB	Period
SB11873/01	Power sensor, Power Meter	Rohde & Schwarz	OSP120+O SP-B157	2024-04-22	12Months
SB18161	Spectrum Analyzer	Rohde & Schwarz	FSV3030	2024-04-22	12Months
SB3435	Horn Antenna	ROHDE&SCHW ARZ	HF906	2023-11-21	12Months
SB8501/09	Test Receiver	ROHDE&SCHW ARZ	ESU40	2024-01-17	12Months
SB9054/08	Broadband Antenna	SCHWARZBEC K	VULB 9163	2023-12-27	12Months
SB9058/03	Low Noise Amplifier	ROHDE&SCHW ARZ	SCU18	2024-01-16	12Months
SB9555/02	Anechoic chamber	Albatross	/	2023-08-15	12Months
SB11873/03	Test software	Tonscend	JS1120-3	---	---

9.4. Test Condition

Date of test: May.28,2024-Jun.4,2024
 Temperature: (20 ~ 26)°C
 Relative Humidity: (36 ~ 56)%RH
 Atmospheric Pressure: (100 ~ 100.4)kPa

9.5. Test Data

Note: Emissions not reported below are too low against the prescribed limits.
 “/” means the test data is too low against the limit.

Table 13 Radiated Spurious Emission Test Data

Test Mode: 11b CH1 TX						
Frequency (MHz)	Reading (dBm)	Limit (dBm)	Margin (dB)	Polarity (Horizontal/ Vertical)	Antenna Height (cm)	Turntable Angle(deg)
/	/	/	/	/	/	/

Table 14 Radiated Spurious Emission Test Data

Test Mode: 11b CH13 TX						
Frequency (MHz)	Reading (dBm)	Limit (dBm)	Margin (dB)	Polarity (Horizontal/ Vertical)	Antenna Height (cm)	Turntable Angle(deg)
/	/	/	/	/	/	/

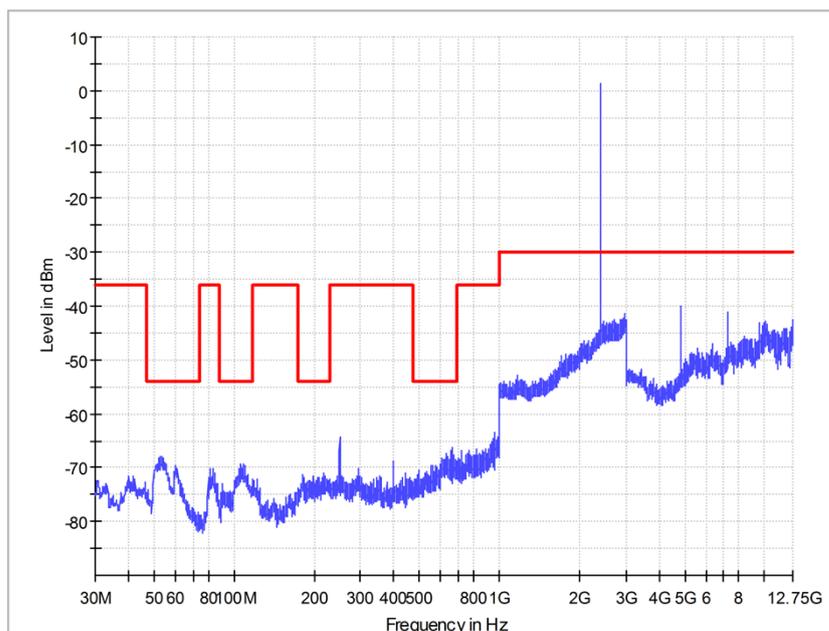
Table 15 Radiated Spurious Emission Test Data

Test Mode: 11b CH1 RX						
Frequency (MHz)	Reading (dBm)	Limit (dBm)	Margin (dB)	Polarity (Horizontal/Vertical)	Antenna Height (cm)	Turntable Angle(deg)
/	/	/	/	/	/	/

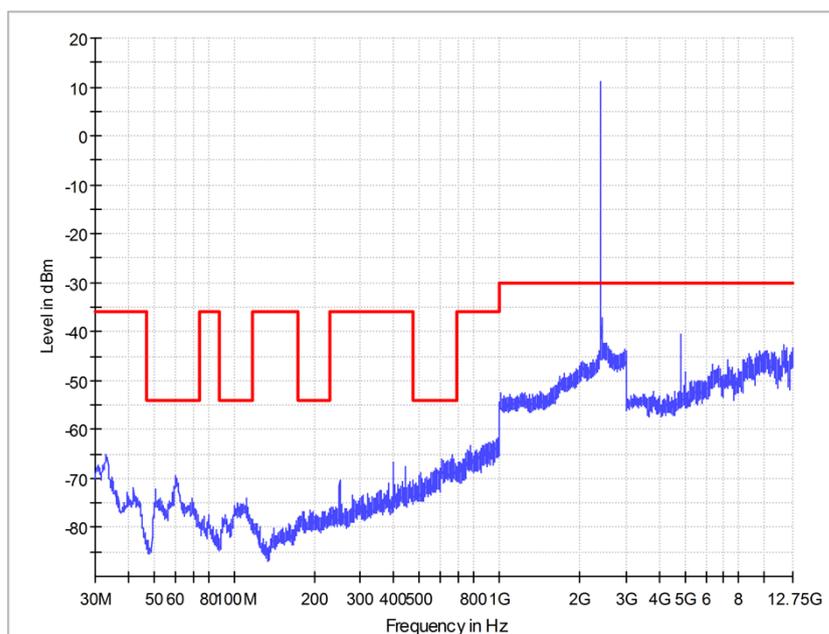
Table 16 Radiated Spurious Emission Test Data

Test Mode: 11b CH13 RX						
Frequency (MHz)	Reading (dBm)	Limit (dBm)	Margin (dB)	Polarity (Horizontal/Vertical)	Antenna Height (cm)	Turntable Angle(deg)
/	/	/	/	/	/	/

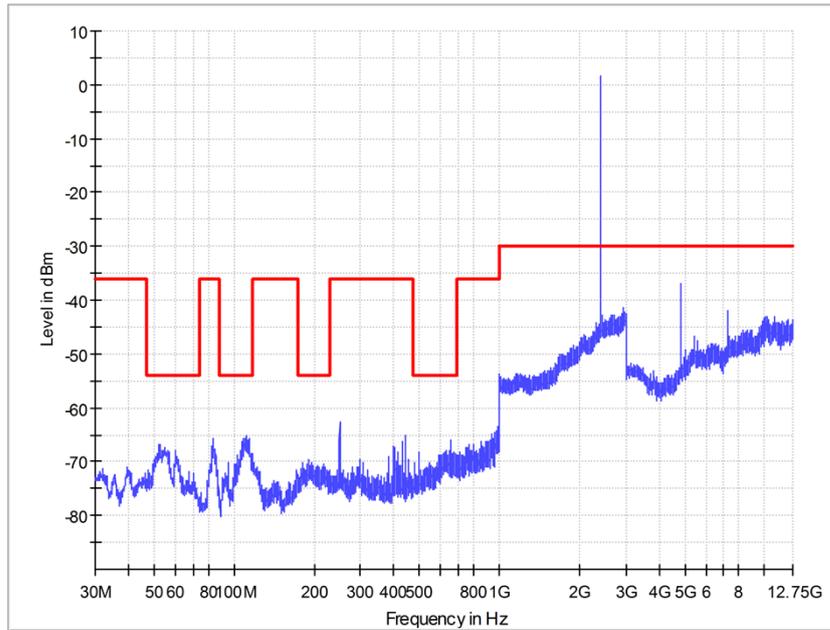
Test Mode: 11b CH1 TX
11b CH1 TX H:



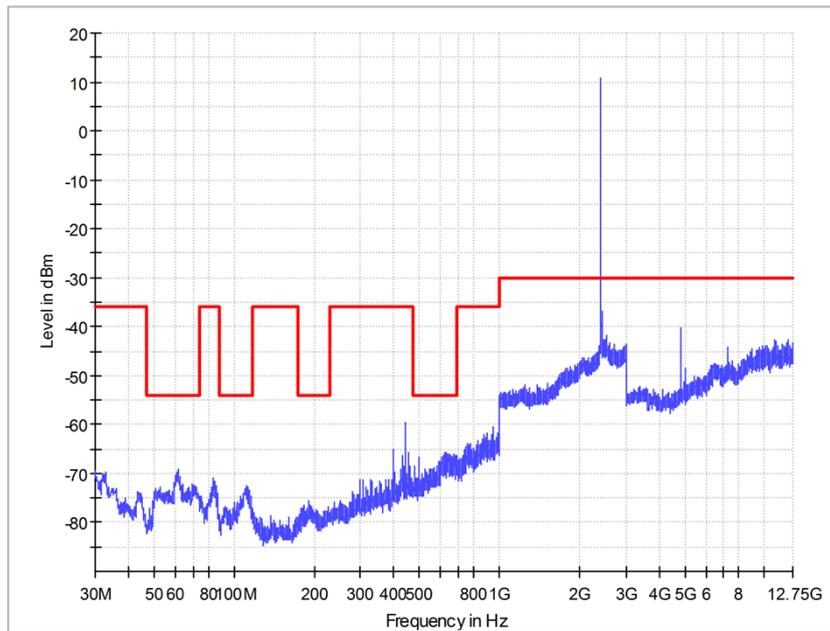
11b CH1 TX V:



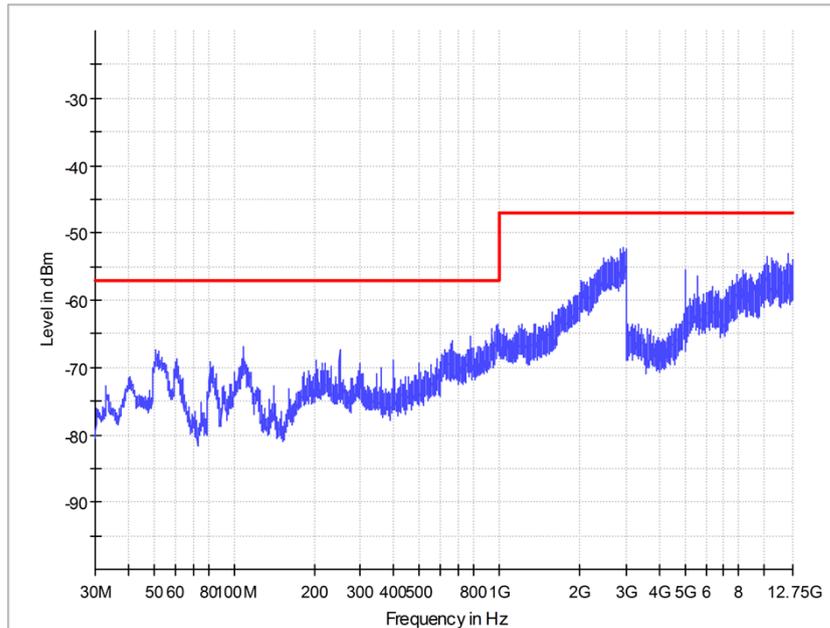
Test Mode: 11b CH13 TX
11b CH13 TX H:



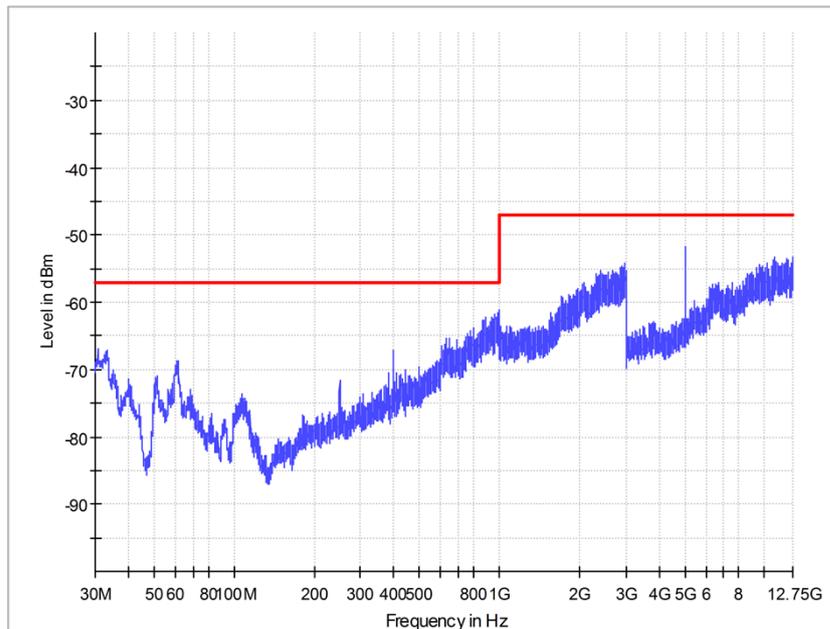
11b CH13 TX V:



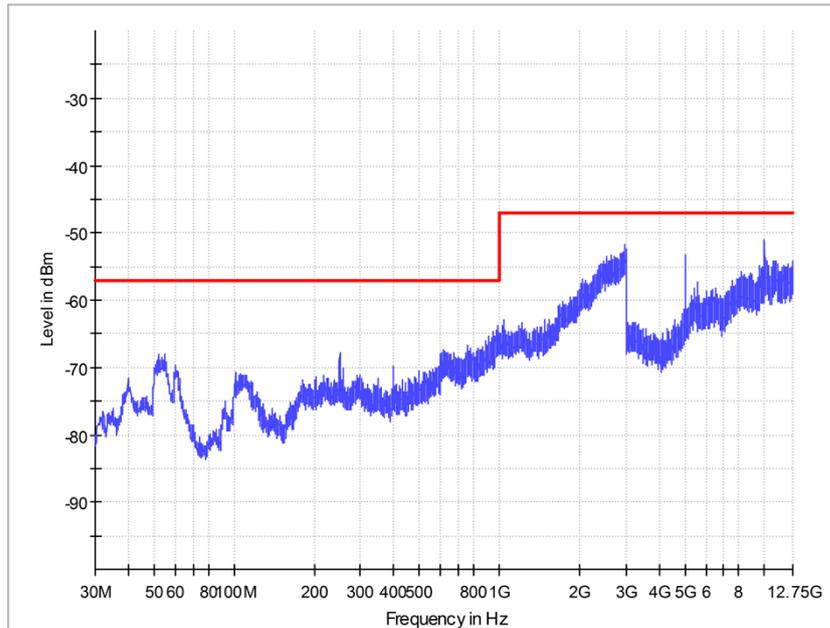
Test Mode: 11b CH1 RX
11b CH1 RX H:



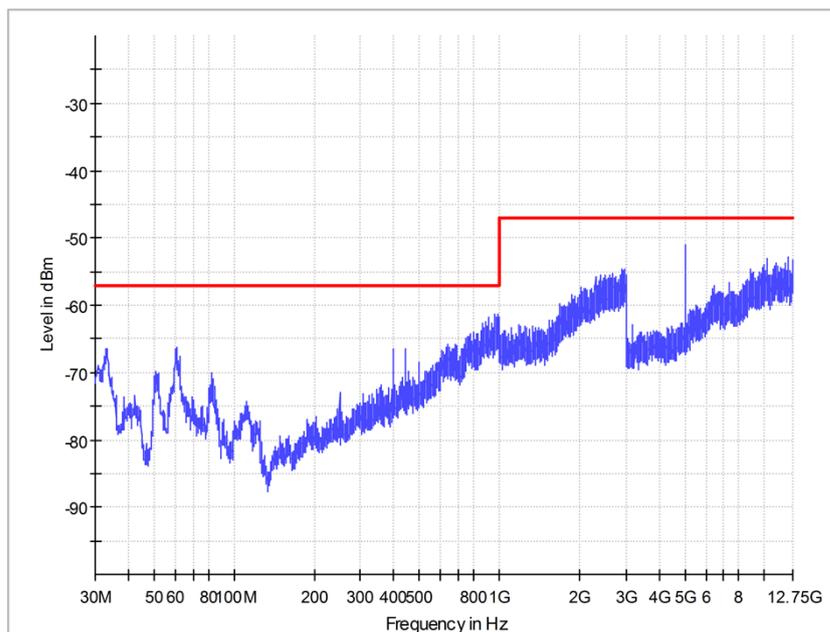
11b CH1 RX V:



Test Mode: 11b CH13 RX
11b CH13 RX H:



11b CH13 RX V:



10. RECEIVER BLOCKING

10.1. Test Requirements

10.1.1. Test Standard

ETSI EN 300 328 V2.2.2 (2019-07)

10.1.2. Test Limit

Table 17 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
$(-133 \text{ dBm} + 10 \times \log_{10}(\text{OCBW}))$ or -68 dBm whichever is less (see note 2)	2 380 2 504	-34	CW
$(-139 \text{ dBm} + 10 \times \log_{10}(\text{OCBW}))$ 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 4.3.2.2.

Table 18 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
$(-139 \text{ dBm} + 10 \times \log 10 (\text{OCBW}) + 10 \text{ dB})$ or $(-74 \text{ dBm} + 10 \text{ dB})$ 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 19 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
$(-139 \text{ dBm} + 10 \times \log_{10}(\text{OCBW}) + 20 \text{ dB})$ or $(-74 \text{ dBm} + 20 \text{ dB})$ 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.

10.2. Test Procedure

Refer to EN 300 328 V2.2.2 (2019-07) Clause 5.4.8

10.3. Test Equipment

No.	Equipment	Manufacturer	Model No.	LAST CALIB	Period
SB11873/01	Power sensor, Power Meter	Rohde & Schwarz	OSP120+OS P-B157	2024-04-22	12Months
SB11873/02	Vector Signal Generator	Rohde & Schwarz	SMBV100A	2024-04-22	12Months
SB13989	Wireless Connectivity Tester	Rohde & Schwarz	CMW270	2024-04-22	12Months
SB11873/03	Test software	Tonscend	JS1120-3	---	---

10.4. Test Condition

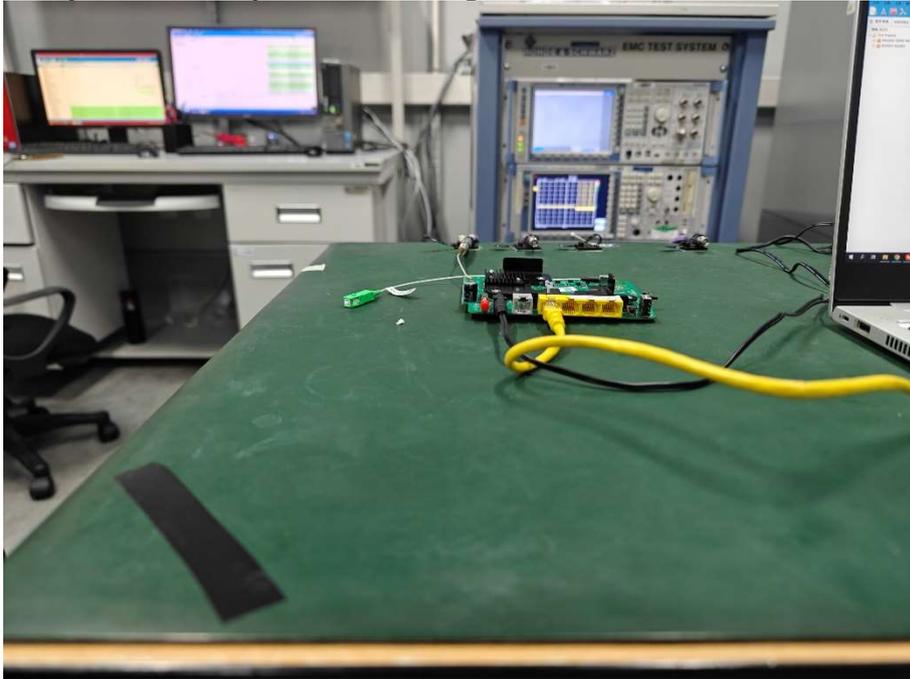
Date of test: Jun.13,2024
Temperature: 27°C
Relative Humidity: 50%RH
Atmospheric Pressure: 100.4kPa

10.5. Test Data

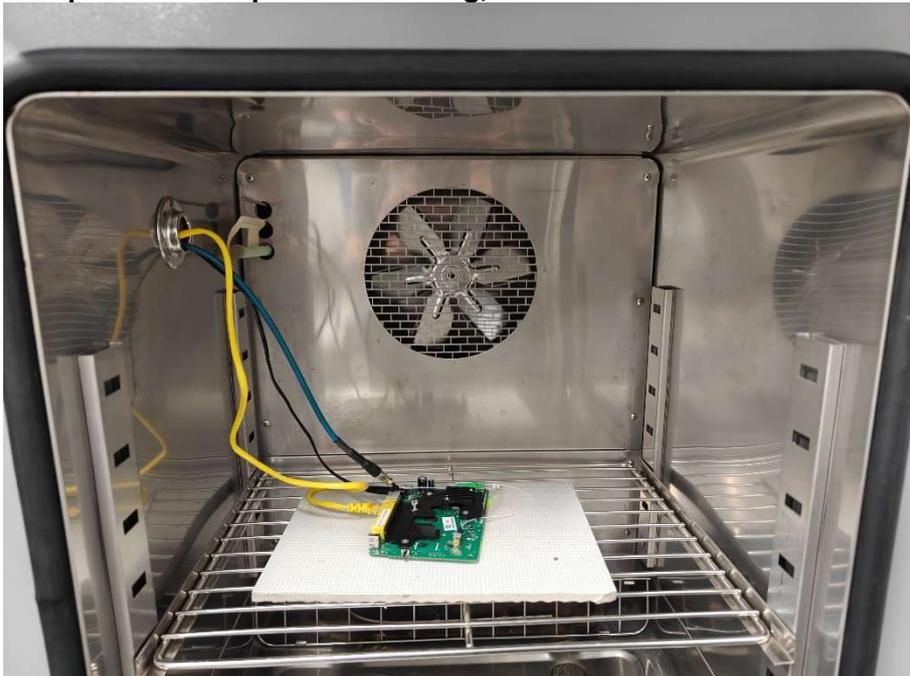
Please refer to the Annex A

11. TEST SETUP PHOTOS

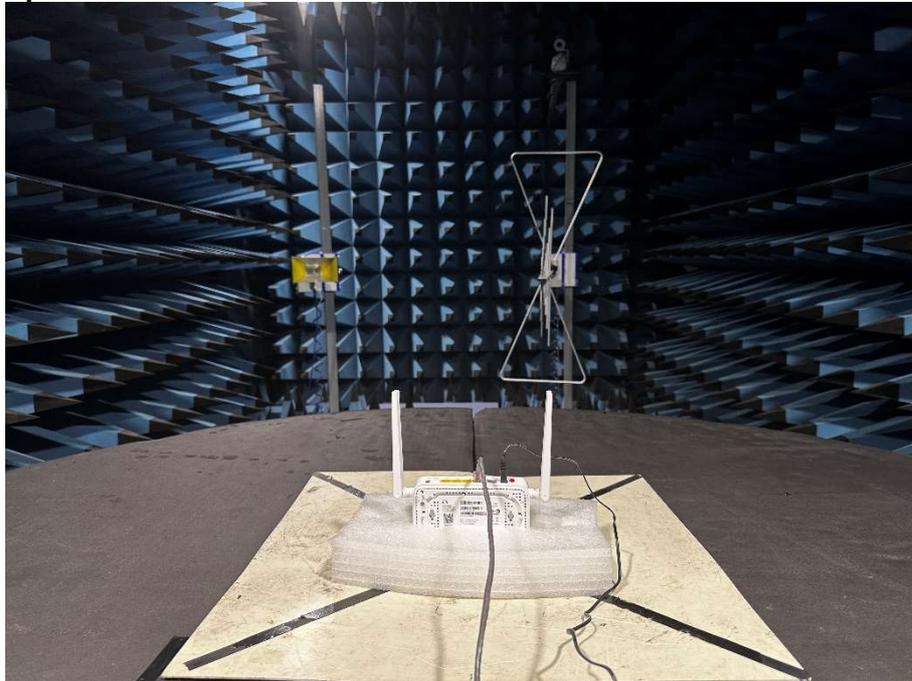
Setup for Radio Spectrum Testing, Normal condition



Setup for Radio Spectrum Testing, Extreme condition



Spurious emissions Test



12. EUT PHOTOS

Photo 1 Appearance of EUT



Photo 2 Appearance of EUT



Photo 3 Appearance of EUT



Photo 4 Appearance of EUT



Photo 5 Appearance of EUT

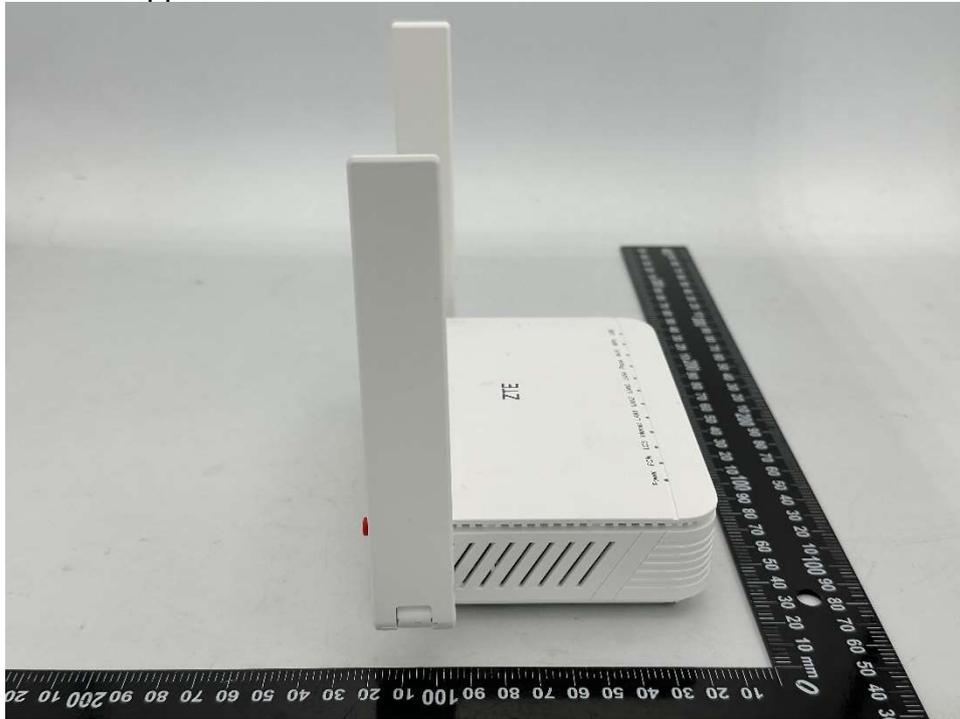


Photo 6 Appearance of EUT

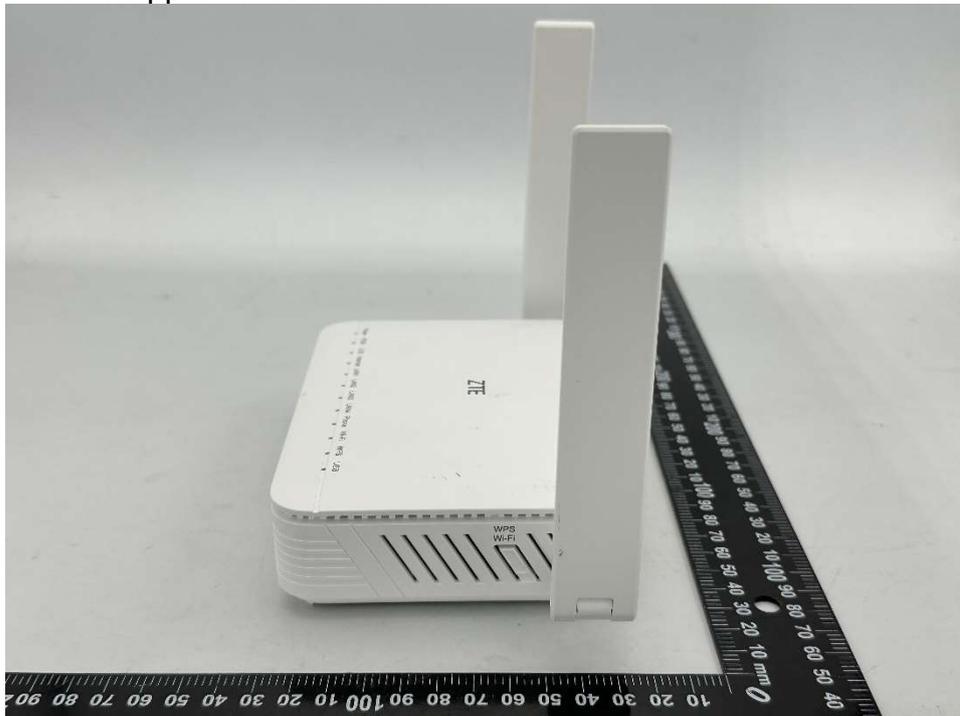


Photo 7 Inside of EUT

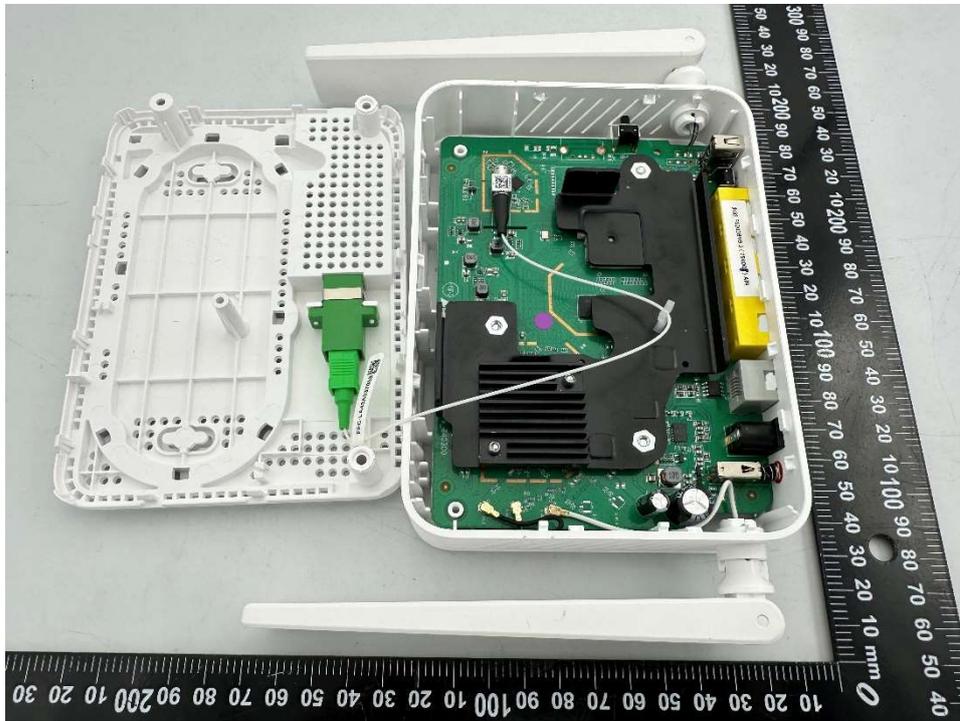


Photo 8 Inside of EUT

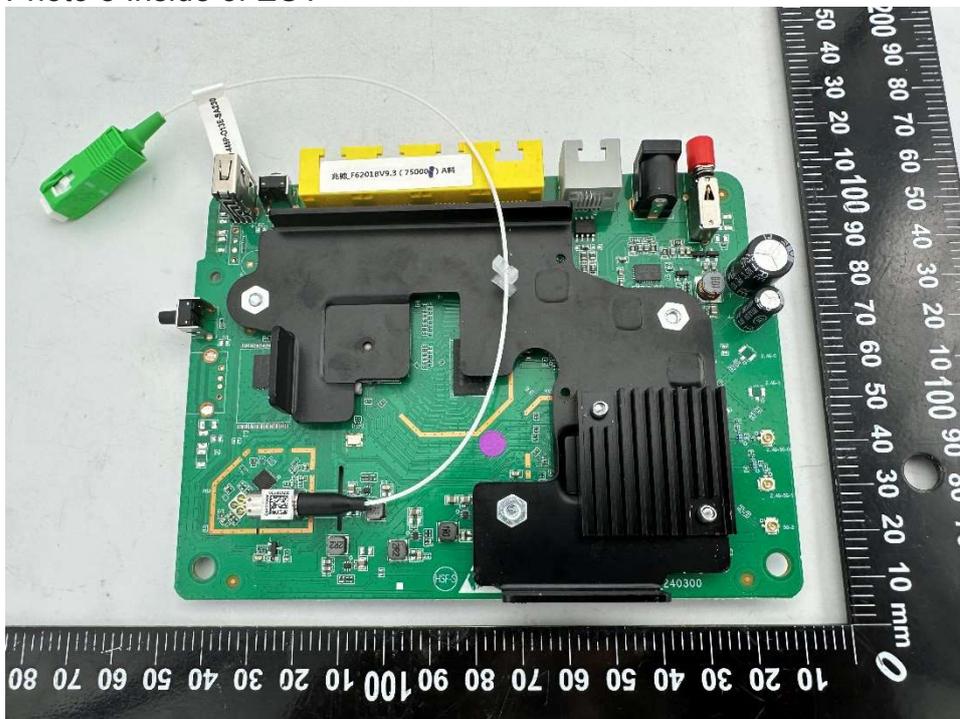


Photo 9 Inside of EUT

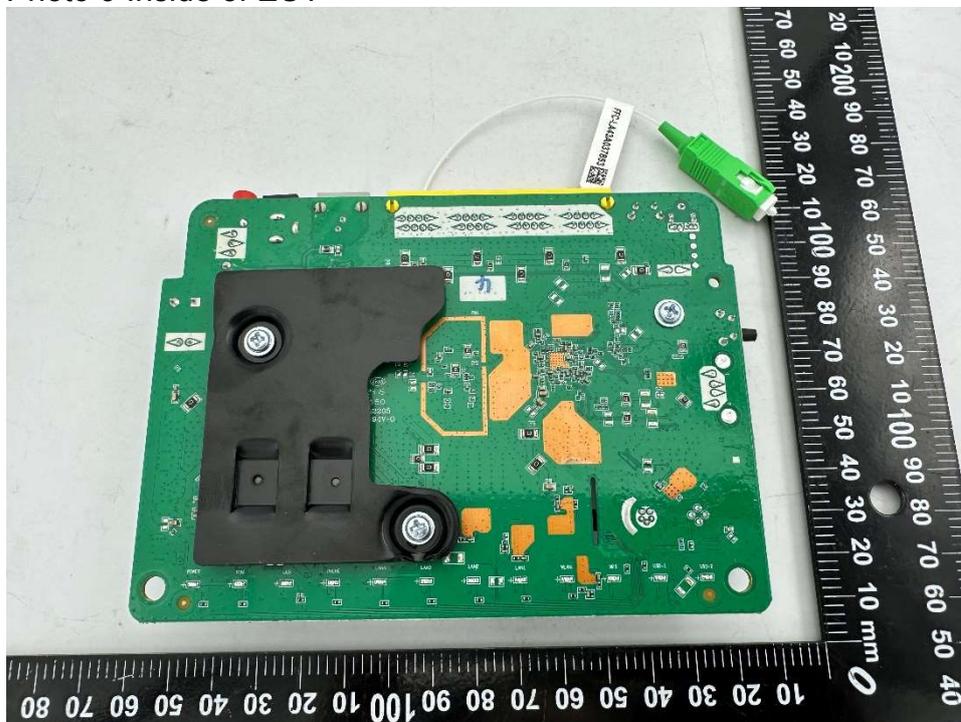


Photo 10 Inside of EUT

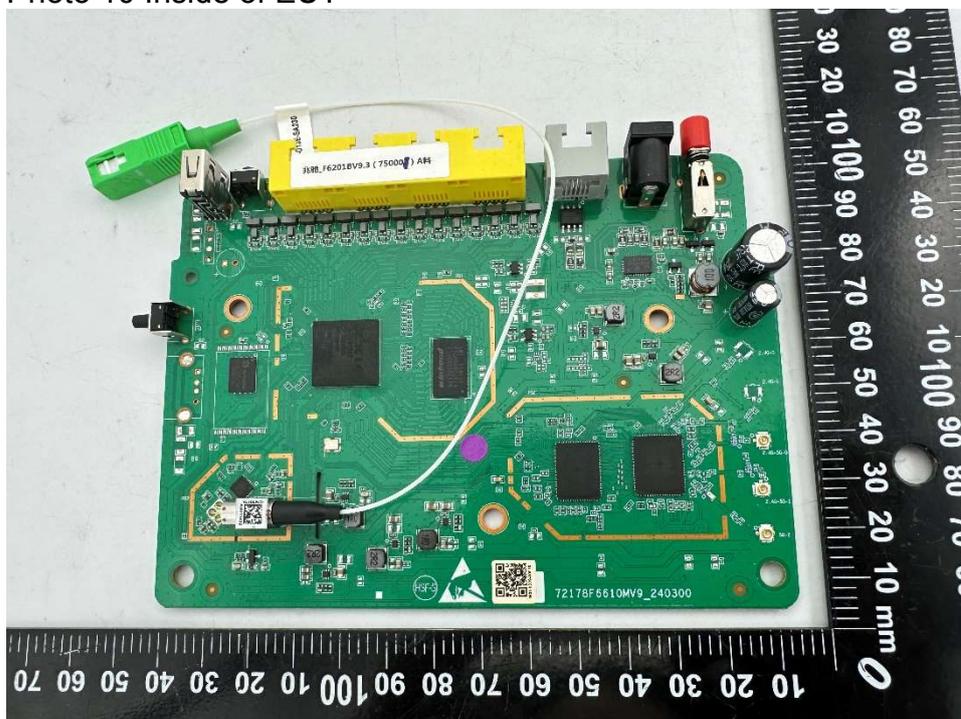
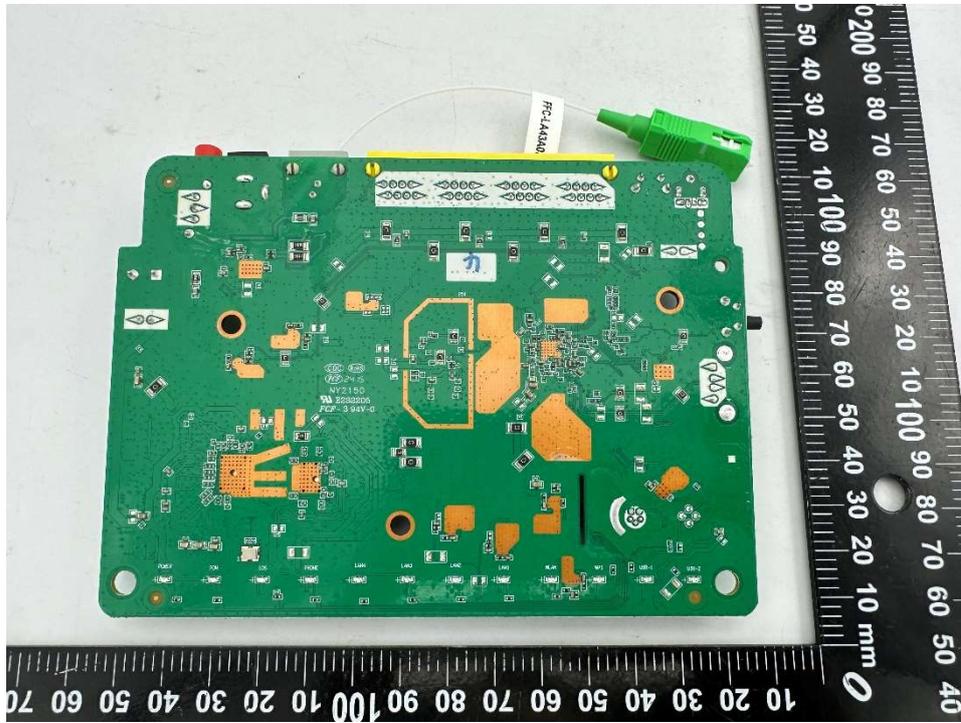


Photo 11 Inside of EUT



-----End of Report-----