RADIO TEST REPORT

Sample: Wireless Headset

Trade Name: N/A

Main Model: X10S

Additional Model: JH-TWS30

Report No.: UNIA22080915ER-02

Prepared for

SHENZHEN JIUHU TECHNOLOGY CO., LTD.

Floor 4, Building E, No.10 HuanGuan South Road, GuanLan JunLong Community, ShenZhen

Prepared by

Shenzhen United Testing Technology Co., Ltd.

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TEST RESULT CERTIFICATION

Applicant	:	SHENZHEN JIUHU TECHNOLOGY CO., LTD.
Address	:	Floor 4, Building E, No.10 HuanGuan South Road, GuanLan JunLong Community, ShenZhen
Manufacturer	:	SHENZHEN JIUHU TECHNOLOGY CO., LTD.
Address	:	Floor 4, Building E, No.10 HuanGuan South Road, GuanLan JunLong Community,ShenZhen

Product description

Product	:	Wireless Headset
Trade Name	:	N/A
Model Name	:	X10S, JH-TWS30
Standard	:	ETSI EN 300 328 V2.2.2 (2019-07)

This equipment under test described above has been tested by Shenzhen United Testing Technology Co., Ltd., and the test results show that the EUT is in compliance with the 2014/53/EU RE Directive Art.3.2 requirements.

Date of Test

Date (s) of performance of tests	:	Aug. 09, 2022 ~ Aug. 20, 2022
Date of Issue	:	Oct. 10, 2022
Test Result	:	Pass

Prepared by: kahn.yang

Kahn Yang/Editor

Reviewer: kelly cheng

Kelly Cheng/Supervisor

Approved & Authorized Signer: liuze

Liuze/Manager

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1 TEST SUMMARY

1.1 TEST RESULTS

Test procedures according to the technical standards:

ETSI EN 300 328 V2.2.2 (2019-07): Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz band; Harmonised Standard for access to radio spectrum

TRANSMITTER PARAMETERS			
Standard	Limit	Frequency Range (MHz)	Applicable (Yes/No)
RF output power	Clause 4.3.1.2.3	2400-2483.5	Y
Duty Cycle, Tx-sequence, Tx-gap	Clause 4.3.1.3.3		N
Accumulated Transmit time, Frequency Occupation & Hopping Sequence	Clause 4.3.1.4.3		Y
Hopping Frequency Separation	Clause 4.3.1.5.3		Y
Medium Utilisation (MU) factor	Clause 4.3.1.6.3		N
Adaptivity (Adaptive FHSS)	Clause 4.3.1.7		N
Occupied Channel Bandwidth	Clause 4.3.1.8.3		Y
Transmitter unwanted emissions in the OOB domain	Clause 4.3.1.9.3	FL=2400-2BW FH=2483.5+2BW	Y
Transmitter unwanted emissions in the spurious domain(Conducted)	Clause 4.3.1.10.3	30-12750	Y
Transmitter unwanted emissions in the spurious domain(Radiated)			Y
RECEIVER PARAMETERS			
Spurious emissions (Conducted)	Clause 4.3.1.11.3	30-12750	Y
Spurious emissions (Radiated)			Y
Receiver Blocking	Clause 4.3.1.12.4	2400-2483.5	Y
Geo-location capability	Clause 4.3.1.13.3	--	N

Note: Owing to the maximum declared RF Output power (e.i.r.p.) less than 10 dBm, so the item Clause 4.3.1.3.3, Clause 4.3.1.6.3, Clause 4.3.1.7 are not applicable.

1.2 TEST LOCATION

Test Laboratory : Shenzhen United Testing Technology Co., Ltd.

Address : 2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang Community, Xixiang Str, Bao'an District, Shenzhen, China

1.3 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

No.	Item	Uncertainly
1	Uncertainty of Radio Frequency	Uc=±1 x 10^{-7}
2	RF output power, conducted	0.42 dB
3	Adjacent Channel Power, conducted	0.88 dB
4	Unwanted Emissions, conducted	2.76 dB
5	All emissions, radiated	5.20 dB
6	Uncertainty of Temperature	Uc = 0.5° C
7	Uncertainty of Humidity	Uc = ±1 %
8	Uncertainty of DC and low frequency voltages	Uc = ±2 %

1.4 ENVIRONMENTAL CONDITIONS

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

Temperature:	15~35 °C
Relative Humidity:	30~60 %
Air Pressure:	86-106 kPa

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

The following information of EUT submitted and identified by applicant:

Product:	Wireless Headset
Trade Name:	N/A
Main Model:	X10S
Additional Model:	JH-TWS30
Model Difference:	All model's the function, software and electric circuit are the same, only with a product color and model named different. Test sample model: X10S.
Frequency Range:	BT: 2402~2480MHz
Number of Channels:	79CH
Modulation Type:	BR: ☒GFSK EDR: ☒π /4-DQPSK, ☒8DPSK
Bluetooth Version:	V5.1
Antenna designation:	Internal Antenna
Antenna Gain:	3.0dBi
Power supply:	DC 5V by adapter DC 3.7V by battery
Product Description:	The EUT is a Wireless Headset. Based on the application, features, or specification exhibited in User's Manual, more details of EUT technical specification, please refer to the User's Manual.

2.2 CARRIER FREQUENCY OF CHANNELS

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

2.3 TEST MODE

Test Mode	Description
BR_TX_2402_1Mbps	Bluetooth BR Transmitting mode (Channel: 2402, Rate: 1Mbps)
BR_TX_2480_1Mbps	Bluetooth BR Transmitting mode (Channel: 2480, Rate: 1Mbps)
EDR_TX_2402_2Mbps	Bluetooth EDR Transmitting mode (Channel: 2402, Rate: 2Mbps)
EDR_TX_2480_2Mbps	Bluetooth EDR Transmitting mode (Channel: 2480, Rate: 2Mbps)
EDR_TX_2402_3Mbps	Bluetooth EDR Transmitting mode (Channel: 2402, Rate: 3Mbps)
EDR_TX_2480_3Mbps	Bluetooth EDR Transmitting mode (Channel: 2480, Rate: 3Mbps)
BR_HOP_NA_1Mbps	Bluetooth BR Hopping mode (Rate: 1Mbps)
EDR_HOP_NA_2Mbps	Bluetooth EDR Hopping mode (Rate: 2Mbps)
EDR_HOP_NA_3Mbps	Bluetooth EDR Hopping mode (Rate: 3Mbps)
BR_RX_2402_1Mbps	Bluetooth BR Receiving mode (Channel: 2402, Rate: 1Mbps)
BR_RX_2480_1Mbps	Bluetooth BR Receiving mode (Channel: 2480, Rate: 1Mbps)
EDR_RX_2402_2Mbps	Bluetooth EDR Receiving mode (Channel: 2402, Rate: 2Mbps)
EDR_RX_2480_2Mbps	Bluetooth EDR Receiving mode (Channel: 2480, Rate: 2Mbps)
EDR_RX_2402_3Mbps	Bluetooth EDR Receiving mode (Channel: 2402, Rate: 3Mbps)
EDR_RX_2480_3Mbps	Bluetooth EDR Receiving mode (Channel: 2480, Rate: 3Mbps)

Note:
All modes have been tested and the worst mode test data recording in the test report, if no any other data.

2.4 DESCRIPTION OF THE TEST MODES

Test Condition	Temperature(°C)	Relative Humidity(%)
NT/NV	24	50
LT/NV	-10	/
HT/NV	55	/

Note:

1. The HT 55°C and LT -10°C was declared by manufacturer, The EUT couldn't be operate normally with higher or lower temperature.
2. NV: Normal Voltage; NT: Normal Temperature.
3. LT: Low Extreme Test Temperature; HT: High Extreme Test Temperature.
4. The measurements are performed at the highest, middle, lowest available channels.

2.5 DESCRIPTION TEST PERIPHERAL AND EUT PERIPHERAL

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Power Cable Length	Note
E-1	Wireless Headset	N/A	X10S	50cm	EUT
E-2	Adapter	Xiaomi	--	--	AE
E-3	Phone	HUAWEI	--	--	AE

Note:

1. The support equipment was authorized by Declaration of Confirmation.
2. All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.

2.6 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Horn Antenna	Sunol	DRH-118	A101415	2023.09.27
2	Broadband Hybrid Antenna	Sunol	JB1	A090215	2024.02.26
3	PREAMP	HP	8449B	3008A00160	2022.09.22
4	PREAMP	HP	8447D	2944A07999	2023.05.17
5	EMI Test Receiver	Rohde&Schwarz	ESR3	101891	2022.09.22
6	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2022.09.22
7	MXA Signal Analyzer	Agilent	N9020A	MY51110104	2022.09.22
8	RF Power Sensor	DARE	RPR3006W	15I00041SNO88	2023.05.17
9	RF Power Sensor	DARE	RPR3006W	15I00041SNO89	2023.05.17
10	RF Power Divider	Anritsu	K241B	992289	2022.09.22
11	Signal Generator	Agilent	E4421B	MY4335105	2022.09.22
12	VECTOR Signal Generator	Rohde&Schwarz	SMU200A	101521	2022.09.22
13	Wideband Radio Communication Tester	Rohde&Schwarz	CMW500	154987	2022.09.22
14	Active Loop Antenna	Com-Power	AL-130R	10160009	2023.07.25
15	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1680	2023.05.23
16	Horn Antenna	A-INFOMW	LB-180400-KF	J211060660	2022.09.27
17	Microwave Broadband Preamplifier	Schwarzbeck	BBV 9721	100472	2023.05.28
18	Signal Generator	Agilent	N5183A	MY47420153	2023.05.28
19	Spctrum Analyzer	Rohde&Schwarz	FSP 40	100501	2023.05.28
20	Power Meter	KEYSIGHT	N1911A	MY50520168	2023.05.28
21	Frequency Meter	VICTOR	VC2000	997406086	2023.05.28
22	DC Power Source	HYELEC	HY5020E	055161818	2023.06.23

3 RF OUTPUT POWER

3.1 TEST LIMIT

FHSS:
The maximum RF output power for adaptive Frequency Hopping equipment shall be equal to or less than 20dBm.The maximum RF output power for non-adaptive Frequency Hopping equipment shall be declared by the manufacturer.See clause 5.4.1 m). 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 20dBm.
Other than FHSS:
For adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be 20dBm.The maximum RF output power for non-adaptive equipment shall be declared by the supplier and shall not exceed 20dBm. See clause 5.4.1 m). 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.
This limit shall apply for any combination of power level and intended antenna assembly.

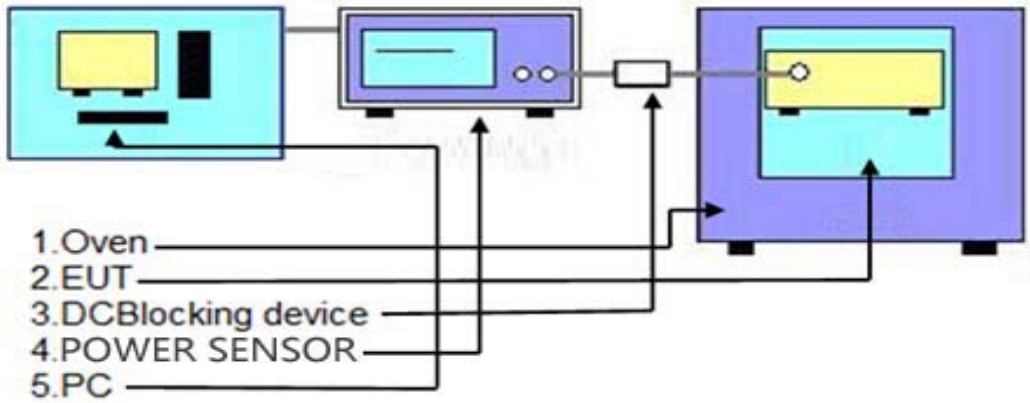
Limit
20 dBm

Between the start and stop times of each individual burst calculate the RMS power over the burst using the formula below. Save these P_{burst} values, as well as the start and stop times for each burst.

$$P_{burst} = \frac{1}{k}\sum_{n=1}^{k} P_{sample}(n)$$

with 'k' being the total number of samples and 'n' the actual sample number

3.2 TEST SETUP



3.3 TEST PROCEDURE

1.Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.2.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.2.2 for the measurement method.
a. Use a fast power sensor suitable for 2,4 GHz and capable of 1 MS/s.
Use the following settings:
- Sample speed 1 MS/s or faster.
- The samples must represent the power of the signal.
- Measurement duration: For non-adaptive equipment: equal to the observation period defined in b)
b. Clause 4.3.1.3.2 or clause 4.3.2.4.2. For adaptive equipment, the measurement duration shall be long enough to ensure a minimum number of bursts (at least 10) is captured
c. Print the plots from power sensor by used power sensor on PC, select the max result and record it.

3.4 TEST RESULT

Modulation		GFSK		
Test conditions		NTNV	Extreme	
			LTNV	HTNV
EIRP (dBm)	Hopping	2.35	2.28	2.31
	Max. E.I.R.P	2.35		
Limits		20dBm		
Burst plot		> 10		
Result		PASS		

Modulation		π/4 DQPSK		
Test conditions		NTNV	Extreme	
			LTNV	HTNV
EIRP (dBm)	Hopping	-1.87	-1.95	-1.93
	Max. E.I.R.P	-1.87		
Limits		20dBm (-10dBW)		
Burst plot		> 10		
Result		PASS		

Modulation		8DPSK		
Test conditions		NTNV	Extreme	
			LTNV	HTNV
EIRP (dBm)	Hopping	-0.91	-0.98	-0.96
	Max. E.I.R.P	-0.91		
Limits		20dBm (-10dBW)		
Burst plot		> 10		
Result		PASS		

Note: Average EIRP Power = Burst power + the antenna gain value

4 ACCUMULATED TRANSMIT TIME,FREQUENCY OCCUPATION & HOPPING SEQUENCE

4.1 TEST LIMIT

ACCUMULATED TRANSMIT TIME	
CONDITION	**LIMIT**
☐Non-adaptive frequency hopping systems	≤ 15 ms
☒Adaptive frequency hopping systems	≤ 400 ms

FREQUENCY OCCUPATION	
CONDITION	**LIMIT (OPTION 1)**
☐Non-adaptive frequency hopping systems	Each hopping frequency of the hopping sequence shall be occupied at least once within a period not exceeding four times the product of the dwell time and the number of hopping frequencies in use.
☒Adaptive frequency hopping systems	

HOPPING SEQUENCE(S)	
CONDITION	**LIMIT**
☐Non-adaptive frequency hopping systems	≥5 hopping frequencies or 5/minimum Hopping Frequency Separation in MHz, whichever is the greater.
☒Adaptive frequency hopping systems	Operating frequency band ≥58.45MHz (Operating over a minimum of 70 % of the operating in the band 2,4 GHz to 2,4835 GHz)
	≥15 hopping frequencies or 15/minimum Hopping Frequency Separation in MHz, whichever is the greater.

Non-adaptive frequency hopping systems

The Accumulated Transmit Time on any hopping frequency shall not be greater than 15 ms within any observation period of 15 ms multiplied by the minimum number of hopping frequencies (N) that have to be used.

Non-adaptive medical devices requiring reverse compatibility with other medical devices placed on the market that are compliant with version 2.0.2 or earlier versions of ETSI EN 300 328, are allowed to have an operating mode in which the maximum Accumulated Transmit Time is 400 ms within any observation period of 400 ms multiplied by the minimum number of hopping frequencies (N) that have to be used, only when communicating to these legacy devicesalready placed on the market. In order for the equipment to comply with the Frequency Occupation requirement, it shall meet either of the following two options:

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

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

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

Adaptive frequency hopping equipment

Adaptive Frequency Hopping equipment shall be capable of operating over a minimum of 70 % of the band specified in clause 1.

The Accumulated Transmit Time on any hopping frequency shall not be greater than 400 ms within any observation period of 400 ms multiplied by the minimum number of hopping frequencies (N) that have to be used.In order for the equipment to comply with the Frequency Occupation requirement, it shall meet either of the following two options:

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

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

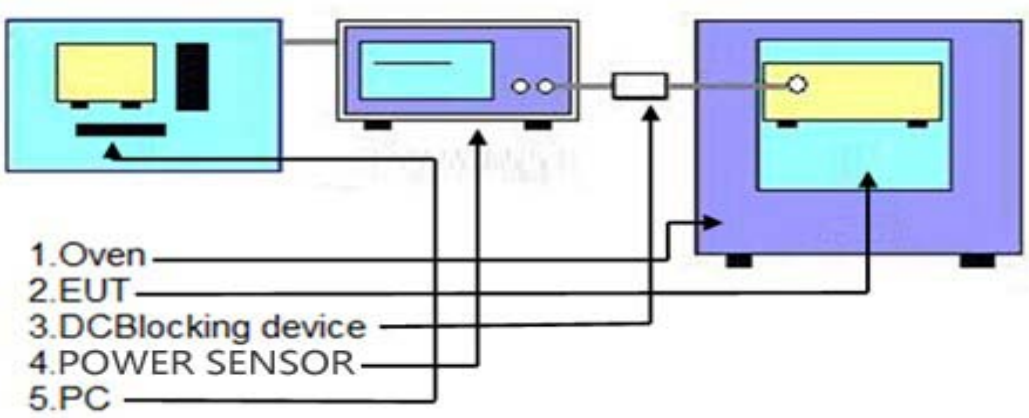
The hopping sequence(s) shall contain at least N hopping frequencies at all times, where N is 15 or 15 divided by the minimum Hopping Frequency Separation in MHz, whichever is the greater.

Other Requirements

For non-Adaptive Frequency Hopping equipment, from the N hopping frequencies defined in clause 4.3.1.4.3.1 above,the equipment shall transmit on at least one hopping frequency while other hopping frequencies are blacklisted.For equipment that blacklists one or more hopping frequencies, these blacklisted frequencies are considered as active transmitting for the calculation of the MU factor of the equipment. See also clause 5.4.2.2.1.3 step 4, second bullet itemand clause 5.4.2.2.1.4 step 3, note 2.For Adaptive Frequency Hopping equipment, from the N hopping frequencies defined in clause 4.3.1.4.3.2 above, the equipment shall consider at least one hopping frequency for its transmissions. Providing that there is no interferencepresent on this frequency with a level above the detection threshold defined in clause 4.3.1.7.2.2 point 5 or clause 4.3.1.7.3.2 point 5, then the equipment shall have transmissions on this frequency.For non-Adaptive Frequency Hopping equipment, when not transmitting on a hopping frequency, the equipment has to occupy that frequency for the duration of the typical dwell time (see also definition for blacklisted frequency in clause 3.1).

For Adaptive Frequency Hopping equipment using LBT based DAA, if a signal is detected during the CCA, the equipment may jump immediately to the next frequency in the hopping sequence (see clause 4.3.1.7.2.2 point 2)provided the limit for maximum dwell is respected.

4.2 TEST SETUP



4.3 TEST PROCEDURE

1.Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.4.1 for the test conditions.
2.Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.4.2 for the measurement method.
a. Set EUT work in hopping mode
b. Centre Frequency: Equal to the hopping frequency being investigated
c. Frequency Span: 0 Hz
d. RBW: ~ 50 % of the Occupied Channel Bandwidth (380KHz for 1M, 591KHz for 3M)
e. VBW: ≥ RBW (380KHz for 1M,591KHz for 3M)
f. Detector Mode: RMS
g. Sweep time: Equal to the applicable observation period (see clause 4.3.1.4.3.1 or clause 4.3.1.4.3.2)
h. Number of sweep points: 30000
j. Race mode: Clear / Write
k. Trigger: Free Run

4.4 TEST RESULT

GFSK Mode:

Data Packet	Frequency	Pulse Duration	Accumulated Transmit Time	Limits
	(MHz)	(ms)	(ms)	(ms)
DH5	2402	2.880	287	400
DH5	2480	2.880	287	400

Minimum Frequency Occupation Time Result:

Data Packet	Frequency	Minimum Frequency occupation Time(ms)	Limit (pcs)
	(MHz)		
DH5	2402	4.352	≥1
DH5	2480	5.821	≥1

Note: Observation period:4×Accumulated Transmit Time × Actual number of hopping frequencies in use

20dB BW(MHz)	Limit	
79.68		
Hopping Sequence(%)	Hopping Sequence >70%	Hopping Channel>15
95.36%		

Remark:
1. For adaptive systems, using the lowest and highest -20 dB points from the total spectrum envelope, it shall be verified whether the system uses 70 % of the band specified.
2. Hopping Sequence(%) = (20dB BW/83.5)*100

8DPSK Mode:

Data Packet	Frequency	Pulse Duration	Accumulated Transmit Time	Limits
	(MHz)	(ms)	(ms)	(ms)
3DH5	2402	2.890	308	400
3DH5	2480	2.890	308	400

Minimum Frequency Occupation Time Result:

Data Packet	Frequency	Minimum Frequency occupation Time(ms)	Limit (pcs)
	(MHz)		
3DH5	2402	4.176	≥1
3DH5	2480	5.539	≥1

Note: Observation period:4×Accumulated Transmit Time × Actual number of hopping frequencies in use

20dB BW(MHz)	Limit	
79.59		
Hopping Sequence(%)	Hopping Sequence >70%	Hopping Channel>15
95.37%		

Remark:
1. For adaptive systems, using the lowest and highest -20 dB points from the total spectrum envelope, it shall be verified whether the system uses 70 % of the band specified.
2. Hopping Sequence(%) = (20dB BW/83.5)*100

5 OPPING FREQUENCY SEPARATION

5.1 TEST LIMIT

Non-adaptive frequency hopping systems

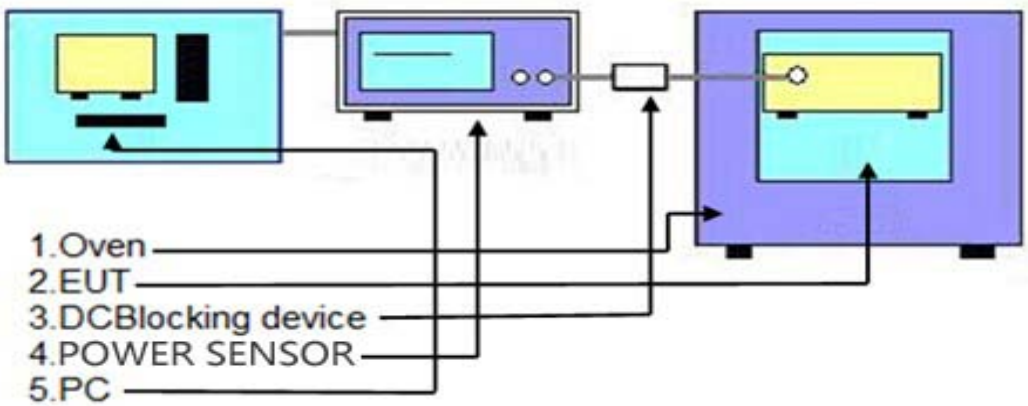
For non-adaptive Frequency Hopping equipment, the Hopping Frequency Separation shall be equal to or greater than the Occupied Channel Bandwidth (see clause 4.3.1.8), with a minimum separation of 100 kHz. For equipment with a maximum declared RF Output power level of less than 10 dBm e.i.r.p. or for non-adaptive 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.

Adaptive frequency hopping systems

For adaptive Frequency Hopping equipment, the minimum Hopping Frequency Separation shall be 100 kHz. Adaptive Frequency Hopping equipment that switched to a non-adaptive mode for one or more hopping frequencies because interference was detected on these hopping frequencies with a level above the threshold level defined in clause 4.3.1.7.2.2, point 5 or clause 4.3.1.7.3.2, point 5, is allowed to continue to operate with a minimum Hopping Frequency Separation of 100 kHz as long as the interference remains present on these hopping frequencies. The equipment shall continue to operate in an adaptive mode on other hopping frequencies.

Adaptive Frequency Hopping equipment which decided to operate in a non-adaptive mode on one or more hopping frequencies without the presence of interference, shall comply with the limit in clause 4.3.1.5.3.1 for these hopping frequencies as well as with all other requirements applicable to non-adaptive frequency hopping equipment.

5.2 TEST SETUP



5.3 TEST PROCEDURE

1.Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.5.1 for the test conditions.
2.Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.5.2 for the measurement method.
- 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
- RBW: 30KHz
  VBW:100KHz
- Detector Mode: RMS
- Trace Mode: Max Hold
- Sweep time: 1S

5.4 TEST RESULT

Mode	Channel	Frequency (MHz)	Ch. Separation(KHz)	Limit(KHz)	Result
GFSK	00	2402	1007	>100	PASS
	39	2441	1007		PASS
	78	2480	1007		PASS
π/4 DQPSK	00	2402	1005		PASS
	39	2441	1005		PASS
	78	2480	1005		PASS
8DPSK	00	2402	1006		PASS
	39	2441	1006		PASS
	78	2480	1006		PASS

6 ADAPTIVE (CHANNEL ACCESS MECHANISM)

6.1 TEST LIMIT

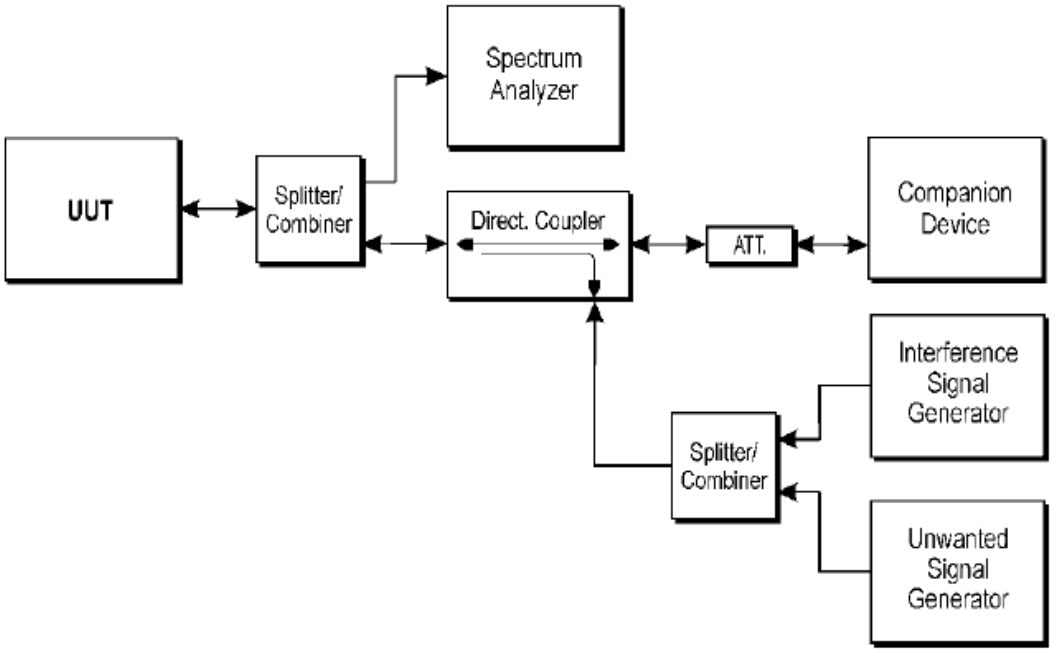
The frequency range of the equipment is determined by the lowest and highest.

Adaptive Frequency Hopping using LBT based DAA:
1. COT ≤60ms;
3. Idle Period = 5% of COT;
4. Detection threshold level = -70 dBm/MHz + (20 dBm - Pout e.i.r.p.)/1 MHz (Pout in dBm).

Adaptive Frequency Hopping using other forms of DAA (non-LBT based):
1. The frequency shall remain unavailable for a minimum time equal to 1 second or 5 times the actual number of hopping frequencies in the current (adapted) channel map used by the equipment;
2. COT ≤ 40ms;
3. Idle Period = 5% of COT;
4. Detection threshold level = -70 dBm/MHz + (20 dBm - Pout e.i.r.p.)/1 MHz (Pout in dBm).

Short Control Signalling Transmissions:
Short Control Signalling Transmissions shall have a maximum duty cycle TxOn / (TxOn + TxOff) ratio of 10 % within any observation period of 50 ms.

6.2 TEST SETUP



Note:

1. BT is normal transmission.
2. Interference shall be injected ->BT shall stop transmission.
3. Blocking shall be injected ->BT does not resume any normal transmission.
4. Removing the interference and blocking signal.

6.3 TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.6.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.6.2 for the measurement method.
3. The spectrum analyzer sweep was triggered by the start of the interfering signal, with theinterfering signal present, a 100 % duty cycle CW signal is inserted as the blocking signal.
   - RBW: ≥ Occupied Channel Bandwidth (if the analyzer does not support this setting, thehighest available setting shall be used)
   - RBW: use next available RBW setting below the measured Occupied Channel Bandwidth
   - Filter type: Channel Filter
   - RBW:1MHz/VBW:3MHz
   - Detector Mode: RMS
   - Centre Frequency: Equal to the hopping frequency to be tested.
   - Span: 0 Hz
   - Sweep time: > Channel Occupancy Time of the UUT. If the Channel Occupancy Time isnon-contiguous (non-LBT based equipment), the sweep time shall be sufficient to cover the period over which the Channel Occupancy Time is spread out
   - Trace Mode: Clear/Write
   - Trigger Mode: Video

6.4 TEST RESULT

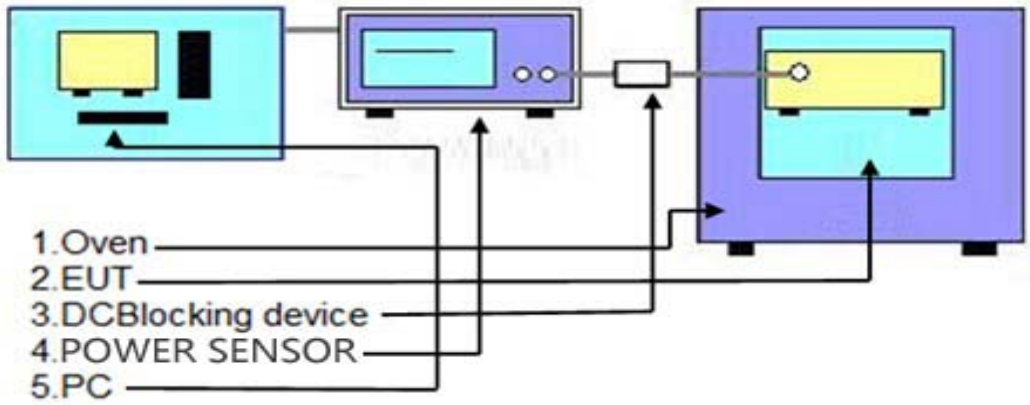
The power is less than 10dBm, so not applicable.

7 OCCUPIED CHANNEL BANDWIDTH

7.1 TEST LIMIT

The Occupied Channel Bandwidth shall all completely within the band given in the table of Page 6. For non-adaptive Frequency Hopping 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 the Nominal Channel Bandwidth declared by the manufacturer. See clause 5.4.1 j). This declared value shall not be greater than 5 MHz.

7.2 TEST SETUP



7.3 TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.7.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.7.2 for the measurement method.
   - Centre Frequency: The centre frequency of the channel under test
   - Resolution BW: ~ 1 % of the span without going below 1 %
   -RBW: 30KHz
   VBW: 100KHz
   -Frequency Span for frequency hopping equipment: Lowest frequency separation that is used within the hopping sequence)
   -Frequency Span for other types of equipment: 2 × Nominal Channel Bandwidth (e.g. 2 MHz for a 1 MHz channel)
   -Detector Mode: RMS
   -Trace Mode: Max Hold
   -Sweep time:1S

7.4 TEST RESULT

Mode	Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	FL/FH(MHz)	Limit	Result
GFSK	00	2402	0.776	2401.617	FL > 2400 MHz and FH < 2483.5 MHz	PASS
	78	2480	0.755	2480.388		PASS
π/4 DQPSK	00	2402	1.248	2401.375		PASS
	78	2480	1.246	2480.626		PASS
8DPSK	00	2402	1.189	2401.402		PASS
	78	2480	1.154	2480.587		PASS

Note: FL is the lowest frequency of the 99% occupied bandwidth of power envelope.
FH is the highest frequency of the 99% occupied bandwidth of power envelope.

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

8.1 TEST LIMIT

Clause	Frequency	Limit
4.3.1.9.3	2400-BW~2400 2483.5~2483.5+BW	-10dBm/MHz
	2400-2BW~2400-BW 2483.5+BW~2483.5+2BW	-20dBm/MHz
	<2400-2BW >2483.5+2BW	-30dBm/MHz

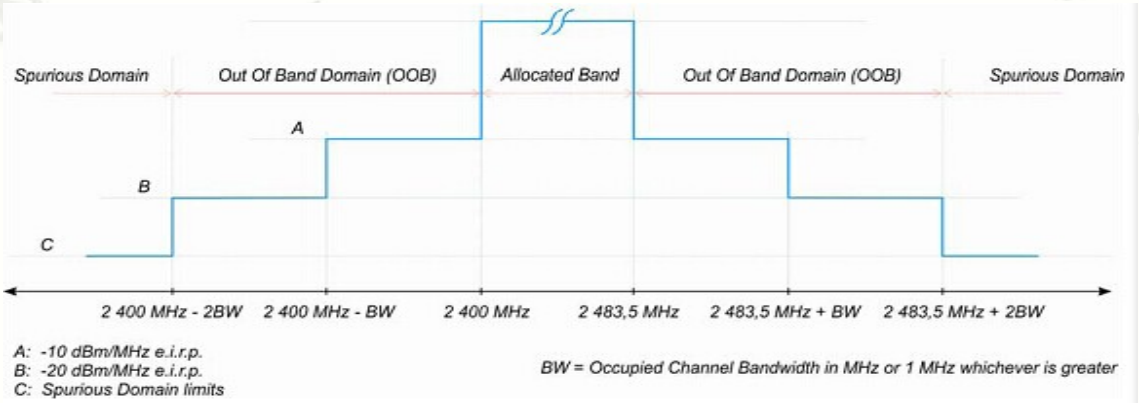
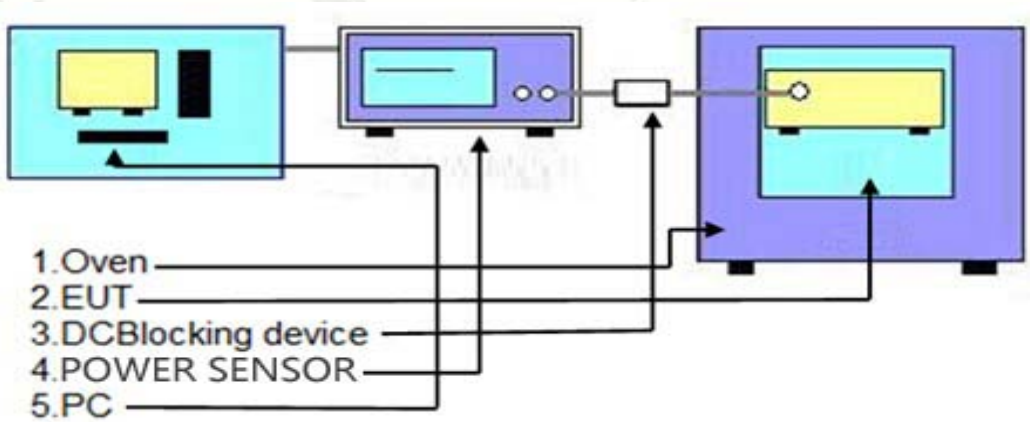


Figure 1: Transmit mask

8.2 TEST SETUP



8.3 TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.8.1 for the test conditions.
2.Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.8.2 for the measurement method.
For systems using FHSS modulation, the measurements shall be performed during normal operation (hopping).
Connect the UUT to the spectrum analyzer and use the following settings:
- Centre Frequency: 2 484 MHz
- Span: 0 Hz
- Resolution BW: 1 MHz
- Filter mode: Channel filter
- Video BW: 3 MHz
- Detector Mode: RMS
- Trace Mode: Max Hold
- Sweep Mode: Continuous
- Sweep Points: Sweep Time [s] / (1 µs) or 5 000 whichever is greater
- Trigger Mode: Video trigger; in case video triggering is not possible, an external trigger source may be used
- Sweep Time: > 120 % of the duration of the longest burst detected during the measurement of the RF Output Power

8.4 TEST RESULT

Test Condition	Test Mode	2402MHz		2480MHz	
		OOB EMISSION		OOB EMISSION	
		Segment A	Segment B	Segment A	Segment B
		Maximum power	Maximum power	Maximum power	Maximum power
		dBm/MHz	dBm/MHz	dBm/MHz	dBm/MHz
Nom (24°C) Nom (3.7V)	GFSK	-61.12	-63.97	-62.28	-62.36
	π/4DQPSK	-49.59	-61.16	-63.77	-63.83
	8DPSK	-52.46	-62.55	-63.75	-63.94
Limit (dBm)		-10.00	-20.00	-20.00	-10.00
Result		PASS	PASS	PASS	PASS

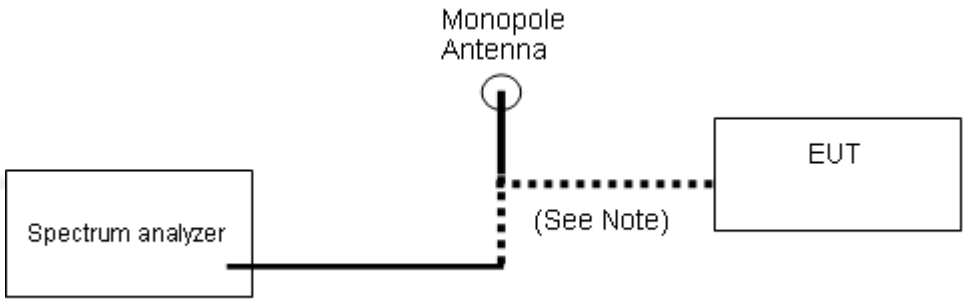
9 SPURIOUS EMISSIONS – TRANSMITTER

9.1 TEST LIMIT

Frequency range	Maximum power, e.r.p(≤1 GHz) e.i.r.p(> 1 GHz)	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 862 MHz	-54 dBm	100 KHz
862 MHz to 1 GHz	-36 dBm	100 KHz
1 GHz to 12.75 GHz	-30 dBm	1 MHz

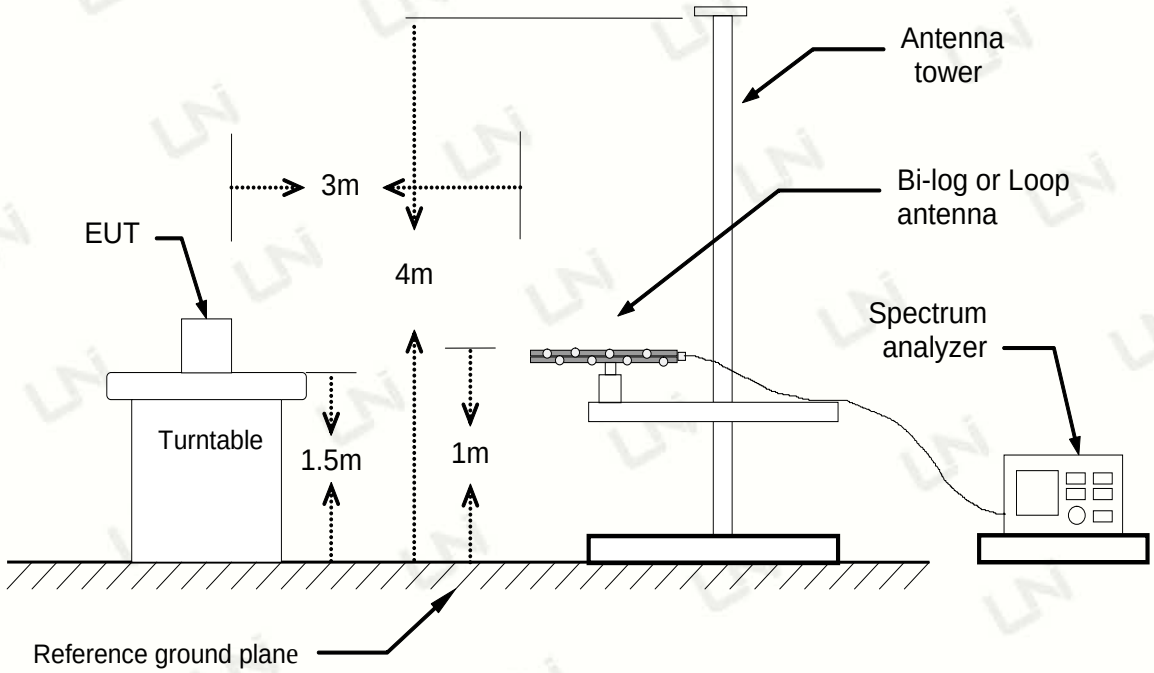
9.2 TEST SETUP

Conducted Method:

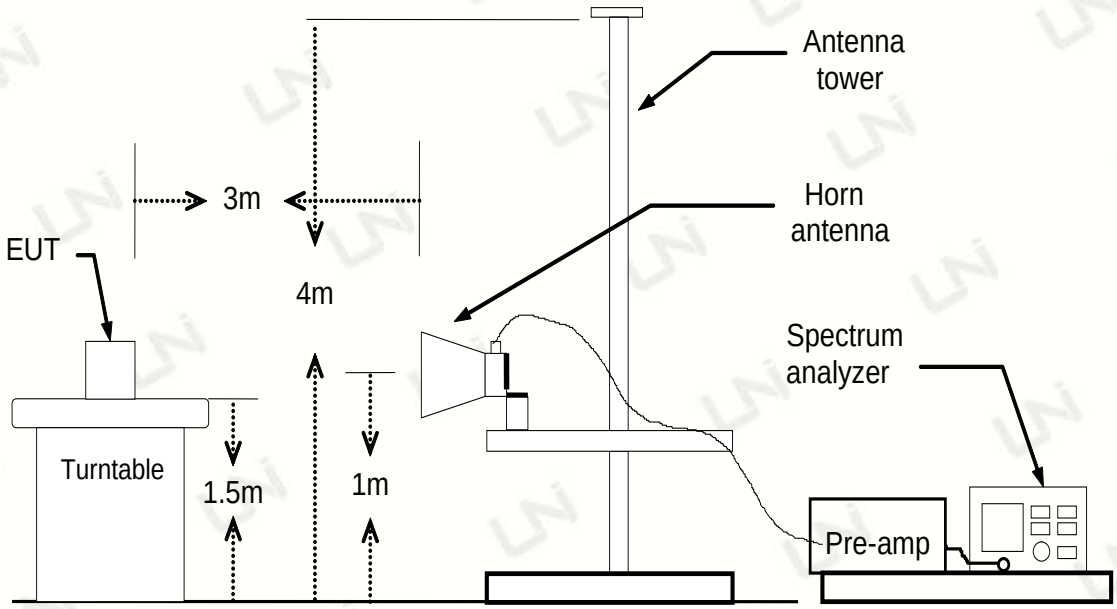


Radiated Method:

Below 1GHz



Above 1GHz



9.3 TEST PROCEDURE

1.Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.9.1 for the test conditions.
2.Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.9.2 for the measurement method.

Spectrum Analyzer	Setting	
Frequency Start to Stop	30 MHz to 1000 MHz	1000 MHz to 12750MHz
Resolution bandwidth	100 kHz	1 MHz
Video bandwidth	300 kHz	3 MHz
Filter type	3 dB (Gaussian)	
Detector mode	Peak	
Trace Mode	Max Hold	
Sweep Points	≥ 19 400 (Set as 20000)	≥ 23 500 (Set as 24000)
Sweep Time	For non continuous transmissions (duty cycle less than 100 %), the sweep time shall be sufficiently long,Below 1GHz such that for each 100 kHz frequency step, Above 1GHz such that for each 1MHz frequency step the measurement time is greater than two transmissions of the UUT, on any channel	

a. The EUT was placed on the top of the turntable in Semi Anechoic Room.
b. The test shall be made in the transmitting mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
c. This measurement shall be repeated with the transmitter in standby mode where applicable.
d. For 30~1000MHz spurious emissions measurement, the broad band bi-log receiving antenna was placed 3 meters far away from the turntable.
e. The broadband receiving antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization. Each recorded suspected value is indicated as Read Level (Raw).
f. Replace the EUT by standard antenna and feed the RF port by signal generator.
g. Adjust the frequency of the signal generator to the suspected emission and slightly rotate the turntable to locate the position with maximum reading.
h. Adjust the power level of the signal generator to reach the same reading with Read Level (Raw).
i. The level of the spurious emission is the power level of (8) plus the gain of the standard antenna in dBi and minus the loss of the cable used between the signal generator and the standard antenna.
j. If the level calculated in (9) is higher than limit by more than 6dB, then lower the RBW of the spectrum analyzer to 30KHz. If the level of this emission does not change by more than 2dB, then it is taken as narrowband emission, otherwise, wideband emission.
k. The measurement shall be repeated at the lowest and the highest channel of the stated frequency range.
l. EUT Orthogonal Axis:
"X" - denotes Laid on Table; "Y" - denotes Vertical Stand; "Z" - denotes Side Stand.

3.EUT OPERATION DURING TEST
a. The EUT was programmed to be in continuously transmitting mode.
b. For the initial investigation on the highest, lowest frequency, no significant differences in spurious emissions were observed between these 2 channels. The worst test data was shown
c. There is a filter used during the test, the fundamental signals will be not shown in the plot.
d. The EUT is connected with the GSM base station when the BT is transmiting.

4.EUT CONDUCTED TEST

1)The emissions over the range 30 MHz to 1 000 MHz shall be identified.
2)Spectrum analyzer settings:
Resolution bandwidth: 100 kHz
Video bandwidth: 300 kHz
Detector mode: Peak
Sweep Points: ≥19 400
Trace Mode: Max Hold
3)Allow the trace to stabilize. Any emissions identified during the sweeps above and that fall within the 6 dB range below the applicable limit or above, shall be individually measured using RMS detector and compared to the limits.
4) The emissions over the range 1 GHz to 12,75 GHz shall be identified.
5) Resolution bandwidth: 1 MHz
Video bandwidth: 3 MHz
Detector mode: Peak
Trace Mode: Max Hold
Sweep Points: ≥23 500
6) Allow the trace to stabilize. Any emissions identified during the sweeps above and that fall within the 6 dB range below the applicable limit or above, shall be individually measured using RMS detector and compared to the limits.

9.4 TEST RESULT

Pass

Conducted Method:

Test Data of Transmitter Spurious Emissions					
Test Mode	Detector	Frequency [MHz]	Level [dBm]	Limit [dBm]	Verdict
BR_2402_1Mbps	Peak	800.651	-49.72	-36.00	Pass
	Peak	3202.823	-41.59	-30.00	Pass
BR_2480_1Mbps	Peak	826.437	-49.43	-36.00	Pass
	Peak	3306.984	-43.28	-30.00	Pass

Radiated Method:

(Worst Case: Low channel)

Transmitter Spurious Emission below 1GHz (30MHz-1GHz)

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuV/m)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
97.34	32.43	V	-61.88	0.04	1.60	-60.32	-54.00	6.32
158.15	27.17	V	-66.22	0.06	1.00	-65.28	-36.00	29.28
353.45	30.74	V	-68.98	0.25	5.89	-63.34	-36.00	27.34
424.69	27.03	V	-73.71	0.33	7.02	-67.02	-36.00	31.02
630.49	29.98	V	-69.40	0.52	7.30	-62.62	-54.00	8.62
755.24	27.21	V	-71.94	0.61	6.35	-66.20	-36.00	30.20
Other (30-1000)	--	V	--	--	--	--	-36.00/-54.00	--
87.65	31.23	H	-63.16	0.04	0.98	-62.22	-36.00	26.22
153.66	27.76	H	-66.77	0.06	0.70	-66.13	-36.00	30.13
352.33	29.43	H	-68.76	0.25	5.76	-63.25	-36.00	27.25
432.93	26.74	H	-72.60	0.34	6.76	-66.18	-36.00	30.18
632.77	28.85	H	-72.05	0.52	7.26	-65.30	-54.00	11.30
726.89	28.64	H	-69.72	0.59	6.60	-63.70	-36.00	27.70
Other (30-1000)	--	H	--	--	--	--	-36.00/-54.00	--

Transmitter Spurious Emission above 1GHz (1GHz-12.75GHz)

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuV/m)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
4804	51.86	V	-47.16	1.25	7.11	-41.30	-30.00	11.30
7206	49.23	V	-50.35	1.57	7.96	-43.96	-30.00	13.96
--	--	V	--	--	--	--	--	--
--	--	V	--	--	--	--	--	--
--	--	V	--	--	--	--	--	--
Other(1000-12750)	--	V	--	--	--	--	-30.00	--
4804	51.29	H	-48.47	1.25	7.06	-42.65	-30.00	12.65
7206	49.44	H	-49.99	1.93	8.34	-43.59	-30.00	13.59
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
Other(1000-12750)	--	H	--	--	--	--	-30.00	--

Note:1.The margins of the other spectrum are not exceeding the minimum value of margin, and this part of the results without recording in the test report.

2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “--” remark, if no specific emission from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that’s already beyond the background noise floor.

(Worst Case: High channel)

Transmitter Spurious Emission below 1GHz (30MHz-1GHz)

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuV/m)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
98.64	32.32	V	-62.52	0.04	1.50	-61.06	-54.00	7.06
155.76	28.87	V	-64.42	0.06	0.70	-63.78	-36.00	27.78
356.99	30.08	V	-69.77	0.25	6.28	-63.75	-36.00	27.75
427.02	26.98	V	-73.19	0.33	6.96	-66.57	-36.00	30.57
626.86	28.78	V	-71.93	0.51	7.14	-65.31	-54.00	11.31
759.19	27.46	V	-70.68	0.61	6.55	-64.74	-36.00	28.74
Other (30-1000)	--	V	--	--	--	--	-36.00/-54.00	--
87.65	30.75	H	-63.22	0.04	0.98	-62.28	-36.00	26.28
155.09	27.18	H	-66.56	0.06	0.70	-65.92	-36.00	29.92
348.04	29.54	H	-68.02	0.24	5.54	-62.73	-36.00	26.73
432.73	26.38	H	-73.67	0.34	6.76	-67.25	-36.00	31.25
629.20	28.61	H	-71.34	0.51	7.26	-64.60	-54.00	10.60
731.67	27.41	H	-72.17	0.59	6.76	-66.00	-36.00	30.00
Other (30-1000)	--	H	--	--	--	--	-36.00/-54.00	--

Transmitter Spurious Emission above 1GHz (1GHz-12.75GHz)

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuV/m)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
4960	51.78	V	-46.40	1.25	7.11	-40.54	-30.00	10.54
7440	49.13	V	-50.37	1.57	7.96	-43.97	-30.00	13.97
--	--	V	--	--	--	--	--	--
--	--	V	--	--	--	--	--	--
--	--	V	--	--	--	--	--	--
Other(1000-12750)	--	V	--	--	--	--	-30.00	--
4960	51.61	H	-47.87	1.25	7.11	-42.01	-30.00	12.01
7440	49.63	H	-50.54	1.93	8.34	-44.13	-30.00	14.13
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
Other(1000-12750)	--	H	--	--	--	--	-30.00	--

Note:1.The margins of the other spectrum are not exceeding the minimum value of margin, and this part of the results without recording in the test report.

2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “--” remark, if no specific emission from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that’s already beyond the background noise floor.

10 SPURIOUS EMISSIONS – RECEIVER

10.1 TEST LIMIT

Clause	Test Item	Frequency(MHz)	Limit
4.3.2.10.3	Spurious emissions (radiated)	30-1000	-57dBm
		1000-12750	-47dBm

10.2 TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.10.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.10.2 for the measurement method.
   The following table is the setting of the Spectrum Analyzer.

Spectrum Analyzer	Setting	
Frequency Start to Stop	30 MHz to 1000 MHz	1000 MHz to 12750MHz
Resolution bandwidth	100 kHz	1 MHz
Video bandwidth	300 kHz	3 MHz
Filter type	3 dB (Gaussian)	
Detector mode	Peak	
Trace Mode	Max Hold	
Sweep Points	≥ 19 400 (Set as 20000)	≥ 23 500 (Set as 24000)
Sweep Time	For non continuous transmissions (duty cycle less than 100 %), the sweep time shall be sufficiently long,Below 1GHz such that for each 100 kHz frequency step, Above 1GHz such that for each 1MHz frequency step the measurement time is greater than two transmissions of the UUT, on any channel	

a. The EUT was placed on the top of the turntable in Semi Anechoic Room.
b. The test shall be made in the receiving mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
c. For 30~12750MHz spurious emissions measurement, the broad band bi-log receiving antenna was placed 3 meters far away from the turntable. .
d. The broadband receiving antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization. Each recorded suspected value is indicated as Read Level (Raw).
e. Replace the EUT by standard antenna and feed the RF port by signal generator.
f. Adjust the frequency of the signal generator to the suspected emission and slightly rotate the turntable to locate the position with maximum reading.
g. Adjust the power level of the signal generator to reach the same reading with Read Level (Raw).
h. The level of the spurious emission is the power level of (7) plus the gain of the standard antenna in dBi and minus the loss of the cable used between the signal generator and the standard antenna.
i. The measurement shall be repeated at the lowest and the highest channel of the stated frequency range.
j. EUT Orthogonal Axis:
"X" - denotes Laid on Table; "Y" - denotes Vertical Stand; "Z" - denotes Side Stand.
k. EUT was programmed to be in continuously receiving mode.

3.EUT CONDUCTED TEST

1)The emissions over the range 30 MHz to 1 000 MHz shall be identified.

2)Spectrumanalyzersettings:

Resolution bandwidth: 100 kHz

Video bandwidth: 300 kHz

Detector mode: Peak

Sweep Points: ≥19 400

Trace Mode: Max Hold

3)Allow the trace to stabilize. Any emissions identified during the sweeps above and that fall within the 6 dB range below the applicable limit or above, shall be individually measured using RMS detector and compared to the limits given in 5.7.1.

4) The emissions over the range 1 GHz to 12.75 GHz shall be identified.

5) Resolution bandwidth: 1 MHz

Video bandwidth: 3 MHz

Detector mode: Peak

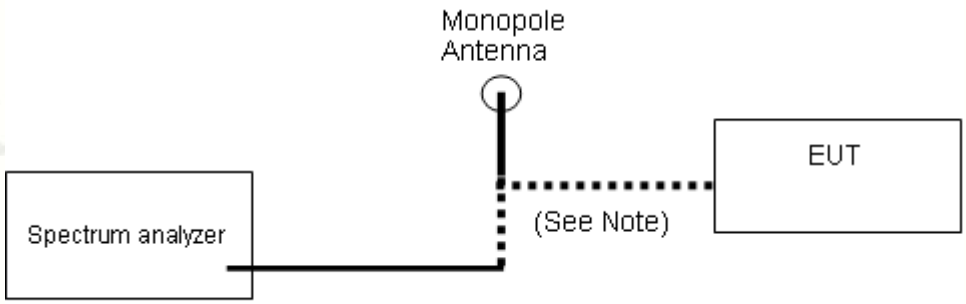
Trace Mode: Max Hold

Sweep Points: ≥23200

6) Allow the trace to stabilize. Any emissions identified during the sweeps above and that fall within the 6 dB range below the applicable limit or above, shall be individually measured using RMS detector and compared to the limits given in 5.7.1.

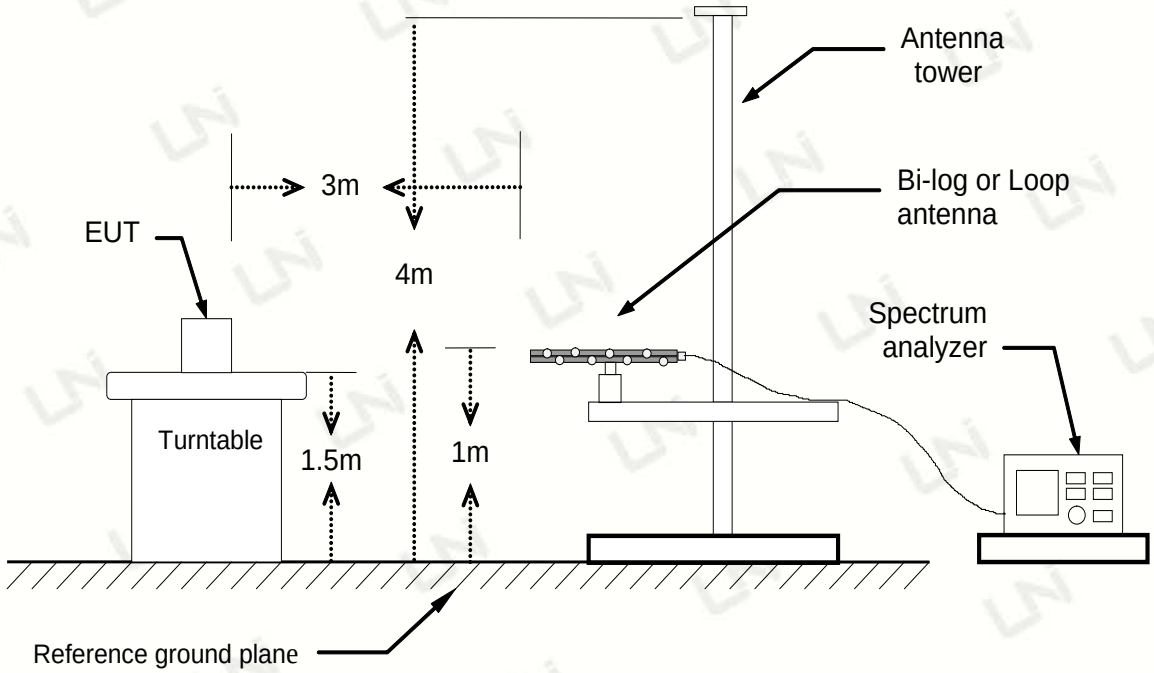
10.3 TEST SETUP

Conducted Method:

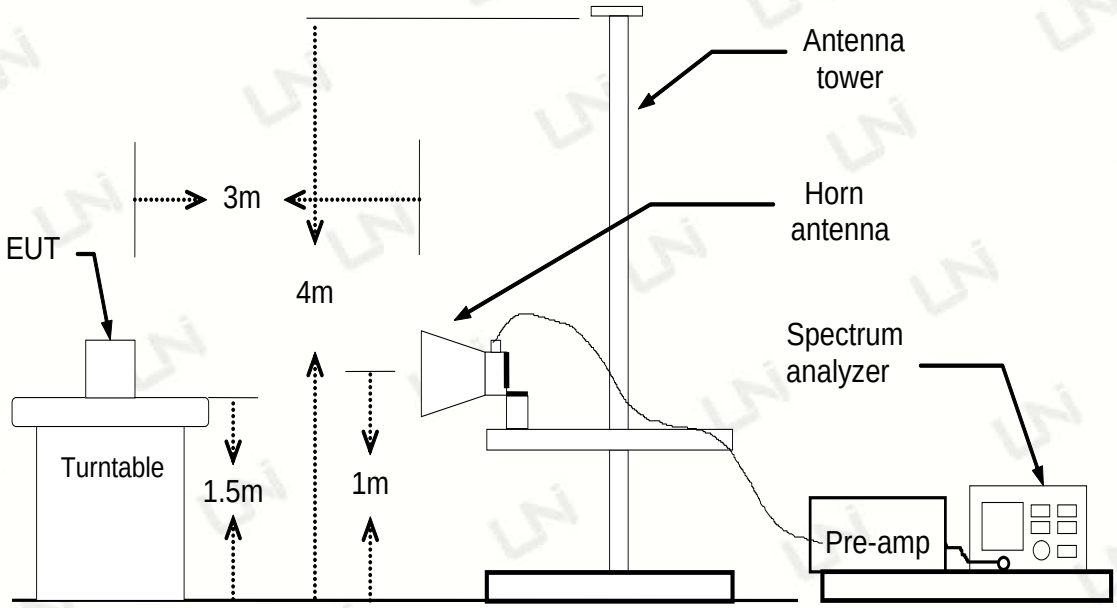


Radiated Method:

Below 1GHz



Above 1GHz



10.4 TEST RESULT

Pass

Conducted Method:

Test Data of Receiver Spurious Emissions					
Test Mode	Detector	Frequency [MHz]	Level [dBm]	Limit [dBm]	Verdict
RX_2402	Peak	911.463	-78.82	-57.00	Pass
	Peak	12185.567	-64.55	-47.00	Pass
RX_2480	Peak	897.632	-78.58	-57.00	Pass
	Peak	5784.781	-64.67	-47.00	Pass

Radiated Method:

(Worst Case: Low channel)

Receiver Spurious Emission below 1GHz (30MHz-1GHz)

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuV/m)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
94.07	27.06	V	-67.96	0.04	1.72	-66.28	-57.00	9.28
160.76	28.13	V	-67.00	0.06	1.20	-65.86	-57.00	8.86
355.80	28.96	V	-69.86	0.25	6.15	-63.96	-57.00	6.96
535.11	26.96	V	-72.16	0.45	6.90	-65.71	-57.00	8.71
676.43	31.49	V	-66.94	0.55	6.56	-60.93	-57.00	3.93
834.93	29.39	V	-68.76	0.66	6.58	-62.84	-57.00	5.84
Other (30-1000)	--	V	--	--	--	--	-57.00	--
137.65	28.53	H	-64.81	0.05	0.00	-64.86	-57.00	7.86
160.94	29.01	H	-65.10	0.06	1.20	-63.96	-57.00	6.96
340.57	29.49	H	-68.26	0.23	5.70	-62.79	-57.00	5.79
540.55	28.76	H	-71.33	0.45	7.20	-64.58	-57.00	7.58
676.62	29.91	H	-70.06	0.55	6.56	-64.05	-57.00	7.05
827.57	27.97	H	-70.42	0.66	6.45	-64.63	-57.00	7.63
Other (30-1000)	--	H	--	--	--	--	-57.00	--

Receiver Spurious Emission above 1GHz (1GHz-12.75GHz)

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuV/m)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
1792.02	32.50	V	-65.07	1.09	5.88	-60.29	-47.00	13.29
--	--	V	--	--	--	--	--	--
--	--	V	--	--	--	--	--	--
--	--	V	--	--	--	--	--	--
--	--	V	--	--	--	--	--	--
Other(1000-12750)	--	V	--	--	--	--	-47.00	--
1680.34	31.75	H	-65.40	1.09	5.88	-60.62	-47.00	13.62
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
Other(1000-12750)	--	H	--	--	--	--	-47.00	--

Note:1.The margins of the other spectrum are not exceeding the minimum value of margin, and this part of the results without recording in the test report.

2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “--” remark, if no specific emission from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that’s already beyond the background noise floor.

(Worst Case: High channel)

Receiver Spurious Emission below 1GHz (30MHz-1GHz)

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuV/m)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
94.07	27.03	V	-68.84	0.04	1.72	-67.16	-57.00	10.16
158.50	29.30	V	-65.25	0.06	1.00	-64.31	-57.00	7.31
355.28	28.10	V	-71.23	0.25	6.15	-65.33	-57.00	8.33
531.43	26.32	V	-73.59	0.44	6.66	-67.37	-57.00	10.37
677.73	30.51	V	-68.90	0.55	6.52	-62.93	-57.00	5.93
830.76	30.18	V	-68.03	0.66	6.30	-62.39	-57.00	5.39
Other (30-1000)	--	V	--	--	--	--	-57.00	--
137.65	27.89	H	-65.58	0.05	0.00	-65.63	-57.00	8.63
163.62	29.26	H	-64.39	0.06	1.44	-63.01	-57.00	6.01
344.60	30.88	H	-67.05	0.24	5.62	-61.67	-57.00	4.67
539.82	27.52	H	-72.17	0.45	7.14	-65.48	-57.00	8.48
675.12	28.82	H	-70.50	0.55	6.60	-64.45	-57.00	7.45
830.85	28.44	H	-69.65	0.66	6.30	-64.01	-57.00	7.01
Other (30-1000)	--	H	--	--	--	--	-57.00	--

Receiver Spurious Emission above 1GHz (1GHz-12.75GHz)

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuV/m)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
1795.08	31.48	V	-66.22	1.08	5.83	-61.47	-47.00	14.47
--	--	V	--	--	--	--	--	--
--	--	V	--	--	--	--	--	--
--	--	V	--	--	--	--	--	--
--	--	V	--	--	--	--	--	--
Other(1000-12750)	--	V	--	--	--	--	-47.00	--
1677.40	31.47	H	-66.66	1.08	5.83	-61.91	-47.00	14.91
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
Other(1000-12750)	--	H	--	--	--	--	-47.00	--

Note:1.The margins of the other spectrum are not exceeding the minimum value of margin, and this part of the results without recording in the test report.

2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “--” remark, if no specific emission from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that’s already beyond the background noise floor.

11 RECEIVER BLOCKING

11.1 TEST LIMIT

While maintaining the minimum performance criteria as defined in clause 4.3.2.11.3, the blocking levels at specified frequency offsets shall be equal to or greater than the limits defined for the applicable receiver category provided in table A, table B or table C.

☐Receiver Category 1:

Table A: 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 × log10(OCBW)) or -68 dBmwhichever is less(see note 2)	2 380 2 504	-34	CW
(-139 dBm + 10 × log10(OCBW)) or -74 dBmwhichever 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 wantedsignal from the companion device cannot be determined, a relative test may be performedusing a wanted signal up to Pmin + 26 dB where Pmin is the minimum level of wanted signalrequired to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in theabsence of any blocking signal.

NOTE 3: In case of radiated measurements using a companion device and the level of the wantedsignal from the companion device cannot be determined, a relative test may be performedusing a wanted signal up to Pmin + 20 dB where Pmin is the minimum level of wanted signalrequired to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in theabsence of any blocking signal.

NOTE 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antennaassembly 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 isequivalent to a power flux density (PFD) in front of the UUT antenna with the UUT beingconfigured/positioned as recorded in clause 5.4.3.2.2.

☒Receiver Category 2:

Table B: Receiver Blocking parameters for 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 × log10(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 wantedsignal from the companion device cannot be determined, a relative test may be performedusing a wanted signal up to Pmin + 26 dB where Pmin is the minimum level of wanted signalrequired to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in theabsence of any blocking signal.

NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antennaassembly 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 isequivalent to a power flux density (PFD) in front of the UUT antenna with the UUT beingconfigured/positioned as recorded in clause 5.4.3.2.2.

☐Receiver Category 3:

Table C: Receiver Blocking parameters for Receiver Category 3 equipment

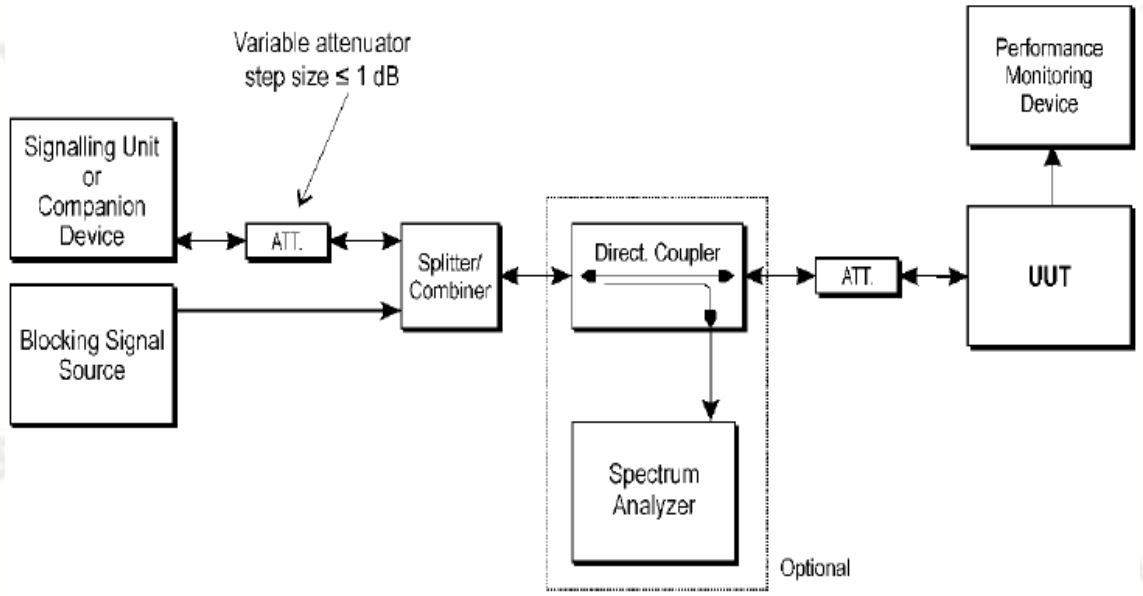
Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	**Blocking signal frequency (MHz)**	**Blocking signal power (dBm) (see note 3)**	**Type of blocking signal**
(-139 dBm + 10 × log10(OCBW) + 20 dB) or (-74 dBm + 20 dB) whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW

NOTE 1: OCBW is in Hz.

NOTE 2: In case of radiated measurements using a companion device and the level of the wantedsignal from the companion device cannot be determined, a relative test may be performedusing a wanted signal up to Pmin + 30 dB where Pmin is the minimum level of wanted signalrequired to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in theabsence of any blocking signal.

NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antennaassembly 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 isequivalent to a power flux density (PFD) in front of the UUT antenna with the UUT beingconfigured/positioned as recorded in clause 5.4.3.2.2.

11.2 TEST SETUP



11.3 TEST PROCEDURE

The simplified conducted measure procedures are as follows:

1)he UUT shall be set to hopping mode.

2)The blocking signal generator is set to the first frequency as defined in the appropriate table corresponding to the receiver category and type of equipment.

3)With the blocking signal generator switched off, a communication link is established between the UUT and the associated companion device using the test setup. The level of the wanted signal shall be set to the value provided in the table corresponding to the receiver category and type of equipment.This level may be measured directly at the output of the companion device and a correction is made for the coupling loss into the UUT. The actual level for the wanted signal shall be recorded in the test report.

4) The blocking signal at the UUT is set to the level provided in the table corresponding to the receiver category and type of equipment. It shall be verified and recorded in the test report that the performance criteria is met.

5) Repeat step 4 for each remaining combination of frequency and level for the blocking signal as provided in the table corresponding to the receiver category and type of equipment.

11.4 TEST RESULT

Remark: The power is more than 0dBm, less than 10dBm, belong to category 2.

Test Condition	Blocking Signal Frequency(MHz)	Blocking Signal Power(dBm)	Wanted signal mean power from companion device(dBm)	Performance PER	Limit PER	Result
GFSK Hopping Mode	2 300	-31.00	-67.10	1.24%	10%	Pass
	2 380	-31.00	-67.10	0.87%	10%	
	2 504	-31.00	-67.22	2.76%	10%	
	2 584	-31.00	-67.22	1.58%	10%	

Test Condition	Blocking Signal Frequency(MHz)	Blocking Signal Power(dBm)	Wanted signal mean power from companion device(dBm)	Performance PER	Limit PER	Result
π/4-DQPSK Hopping Mode	2 300	-31.00	-65.04	1.15%	10%	Pass
	2 380	-31.00	-65.04	1.24%	10%	
	2 504	-31.00	-65.04	2.71%	10%	
	2 584	-31.00	-65.04	1.98%	10%	

Test Condition	Blocking Signal Frequency(MHz)	Blocking Signal Power(dBm)	Wanted signal mean power from companion device(dBm)	Performance PER	Limit PER	Result
8-DPSK Hopping Mode	2 300	-31.00	-65.25	1.53%	10%	Pass
	2 380	-31.00	-65.25	1.21%	10%	
	2 504	-31.00	-65.38	2.95%	10%	
	2 584	-31.00	-65.38	1.56%	10%	

Note: The levels of the blocking signal and wanted signal have to be corrected for the (in-band) antenna assembly gain.

12 PHOTO OF EUT

PHOTO 01

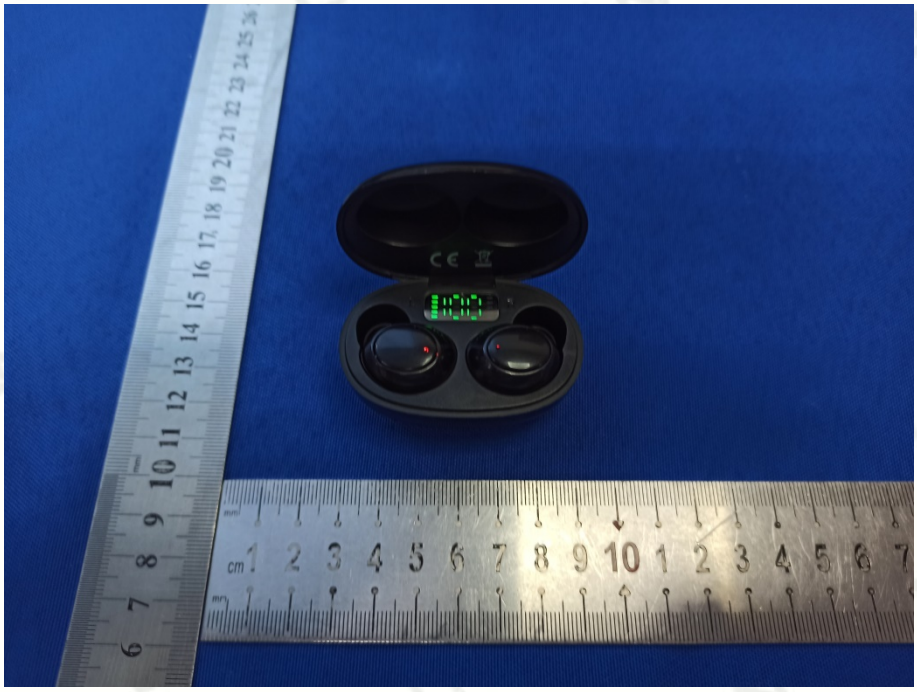


PHOTO 02

PHOTO 03

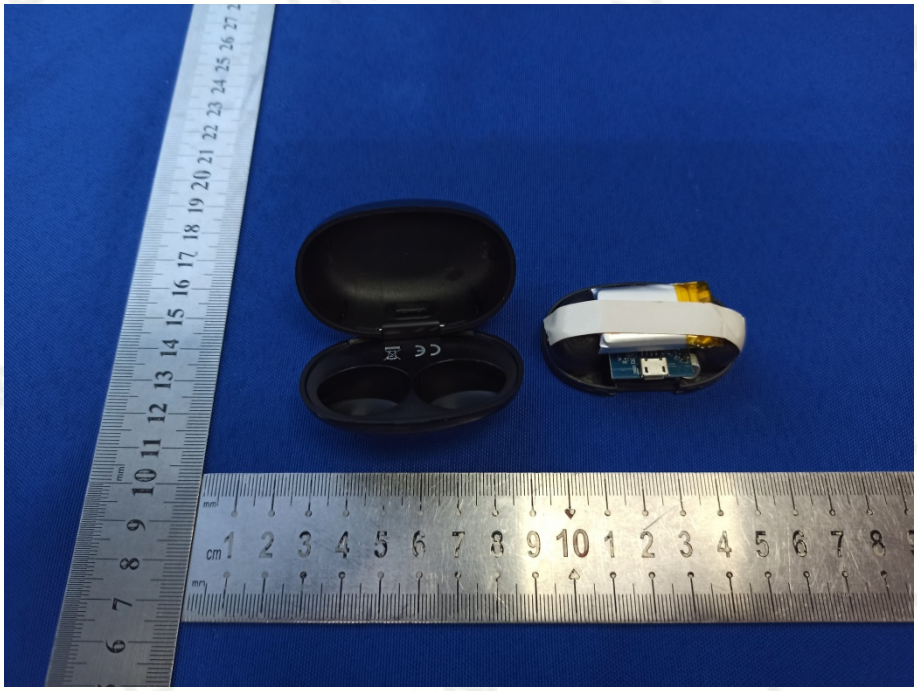


PHOTO 04

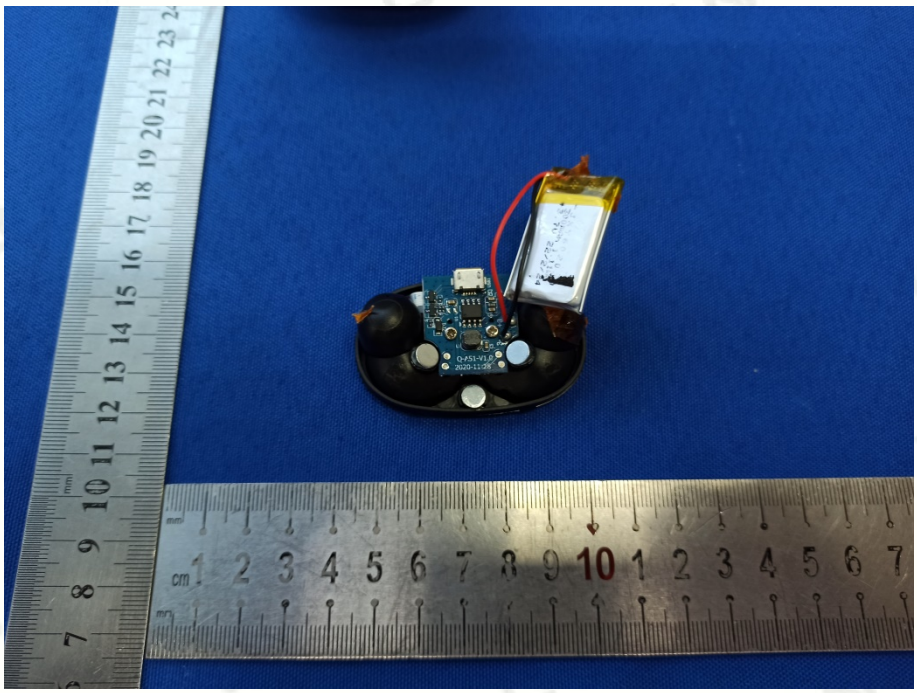
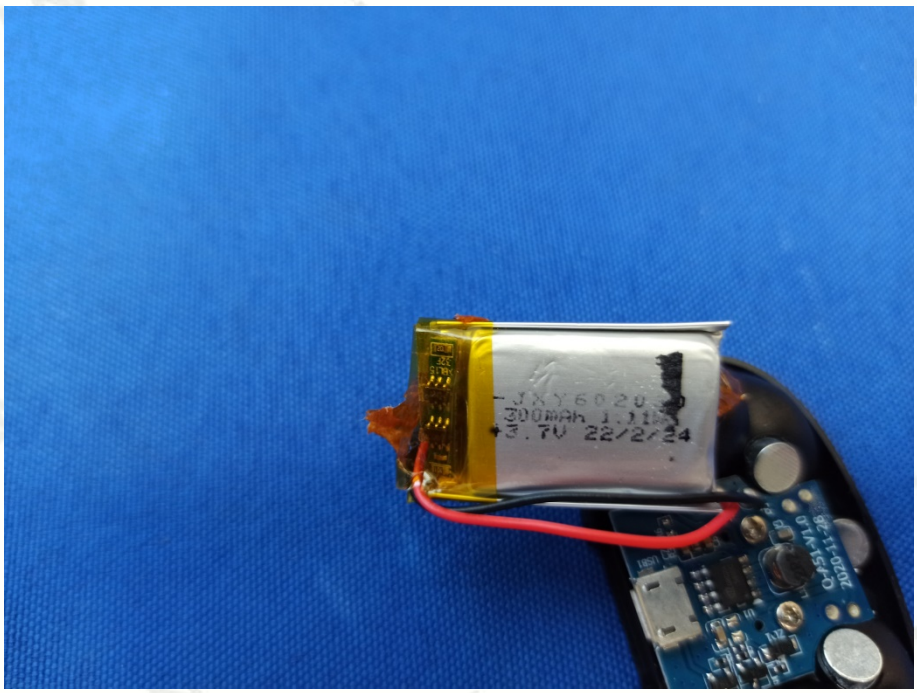


PHOTO 05



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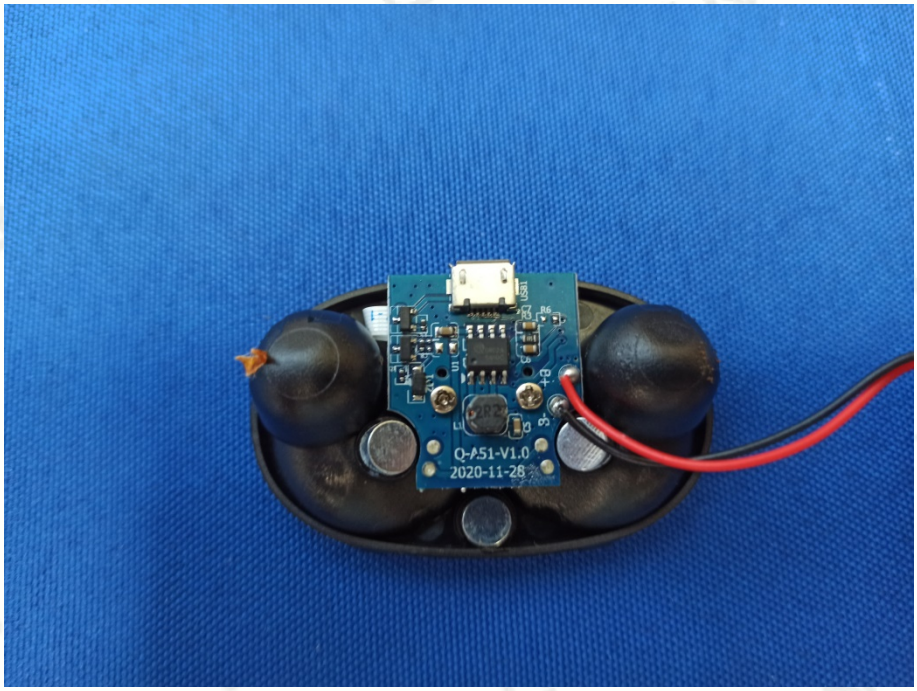

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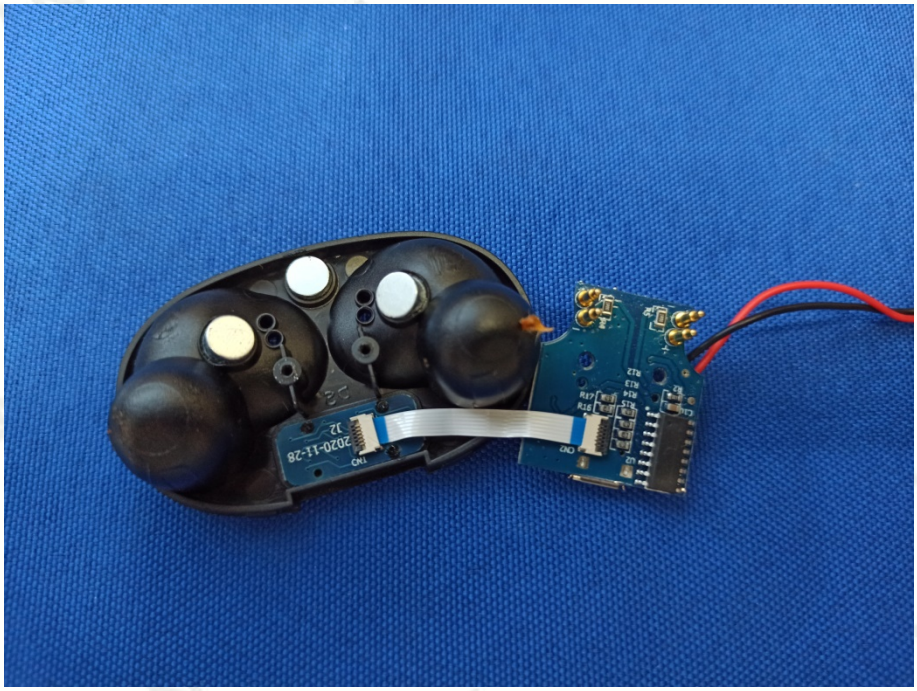

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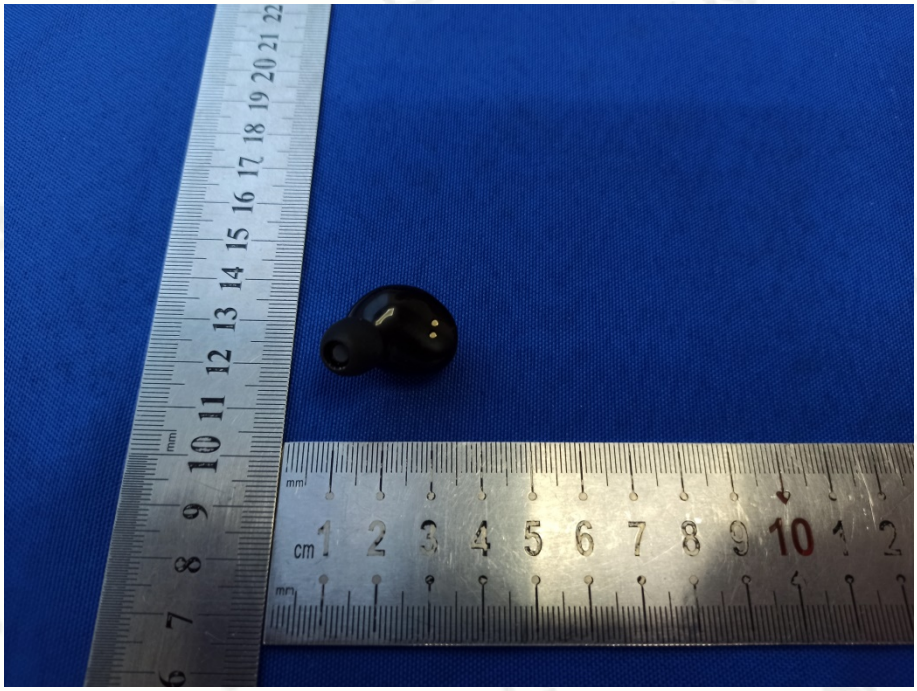

PHOTO 09

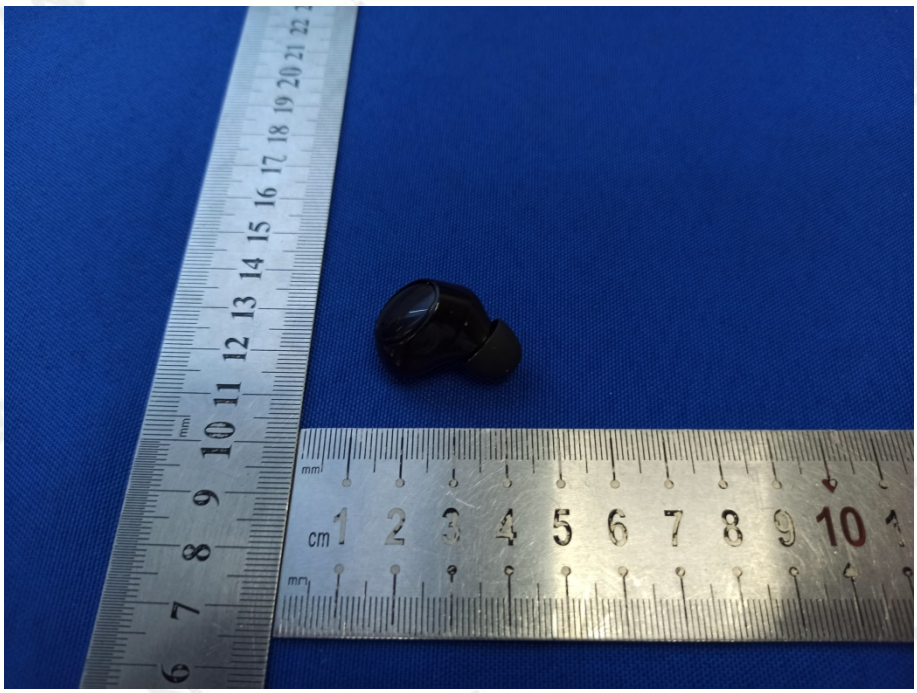

PHOTO 10

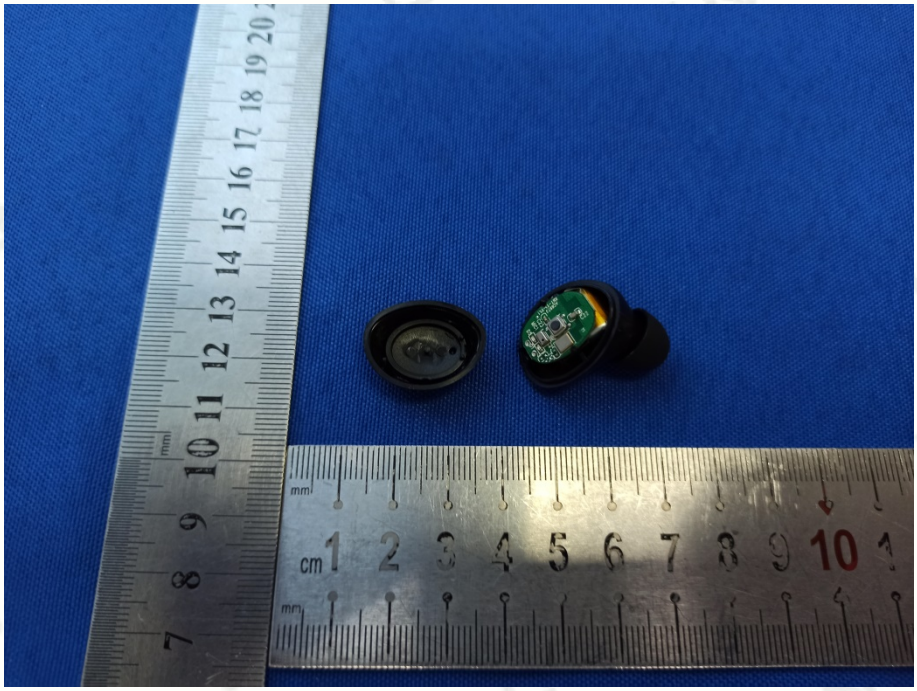

PHOTO 11

PHOTO 12

End of Report

Statement

1.This report must have the signature of the authorized signatory and the special seal of the report, otherwise it will be considered invalid.If there is no anti-counterfeiting electronic seal of the laboratory in the report in PDF format or it is displayed as "×", the report is invalid.

2.This report shall not be modified, added or deleted without authorization.

3.The results of this report are only valid for the EUT provided by Applicant to our laboratory for inspection (That is,EUT received by our laboratory.Without special explanation, it refers to the samples presented in the report "PHOTO OF EUT").

4.If there is any objection to the test data and conclusions of this report, please submit it in writing within 10 working days after the date of issuance of the report.

5.Without the written consent of the laboratory, this report shall not be copied (except for full copy), nor shall it be used as publicity materials or advertising.

6.The cover of the report is for decoration only, not included in the body of the report.

7.The paper report issued by our laboratory has the same effect as the electronic report. In case of any difference between the two, the electronic report shall prevail.

8.The Chinese and English reports issued by our laboratory have the same effect. In case of any difference in understanding, the Chinese version shall prevail.

9.Please provide the complete report documents issued by our laboratory when inquiring the report.

10.For cases where compliance is determined based on test values, when relevant specifications, standards, documents, and customers have no relevant requirements and no other special instructions, the test report issued by this laboratory is carried out in full value and adopts ILAC-G8:09 /2019 "Simple Acceptance Rule" for judgment.

11.In the People's Republic of China, when there is no CMA Accredited Symbol in this report, the report is only for scientific research, teaching or internal quality control activities.