Huaxun testing (Shenzhen) Group Co., Ltd

Report No: RF08230018-KY

RADIO TEST REPORT

Applicant:	Shenzhen KY Intelligent Digital Co., Ltd
Address:	B1 Building 5th floor XuJingChang Industry zoom, Fuhai road, Baoan, SZ. 518126
Manufacturer:	Shenzhen KY Intelligent Digital Co., Ltd
Address:	B1 Building 5th floor XuJingChang Industry zoom, Fuhai road, Baoan, SZ. 518126
Product name:	SMART WATCH
Model:	X22
Serial model:	X22 MAX
Brand Name：	N/A
Sample Received Date:	Aug. 16, 2024
Testing Period:	Aug. 16, 2024~Aug. 23, 2024
Test Standard:	ETSI EN 300 328 V2.2.2 (2019-07)
TEST FACTORY:	Huaxun testing (Shenzhen) Group Co., Ltd Goldman Sachs building, No. 18, Shaqi Community Center Road, Xinqiao street, Bao'an District, Shenzhen, Guangdong, China

Test Requirement:

This device described above has been tested by Huaxun testing (Shenzhen) Group Co., Ltd., and the test results show that the equipment under test (EUT) is in compliance with the 2014/53/EU RED Directive Art.3.2 requirements. And it is applicable only to the tested sample identified in the report.

Prepared by: Rite

Reviewer: Heidi

Approved & Authorized Signer: Spike

Huaxun testing (Shenzhen) Group Co., Ltd. APPROVED

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TEST SUMMARY

TEST RESULTS

Test procedures according to the technical standards:
ETSI EN 300 328 V2.2.2 (2019-07)

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	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	N
Transmitter unwanted emissions in the spurious domain(Radiated)			Y
RECEIVER PARAMETERS			
Spurious emissions (Conducted)	Clause 4.3.1.11.3	30-12750	N
Spurious emissions (Radiated)			Y
Receiver Blocking	Clause 4.3.1.12.3	2400-2483.5	Y
Geo-location capability	Clause 4.3.1.13.3	——	N

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 (dB)
1	RF output power, conducted	0.42
2	Adjacent Channel Power, conducted	0.88
3	Unwanted Emissions, conducted	2.76
4	All emissions, radiated	5.20

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Product Name:	SMART WATCH
Brand Name:	N/A
Main Model:	X22
Additional Model:	X22 MAX
Model Difference:	All model's the function, software and electric circuit are the same, only with a product color and model named different.
Power supply：	Input: DC 5V, 160mA Battery: 3.8V, 330mAh, 1.25Wh Operating frequency: 2402-2480MHz
Product Description:	The EUT is a SMART WATCH. 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 List							
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

EUT

The EUT was programmed to be in continuously transmitting mode.

Channel List for BT		
Test Channel	EUT Channel	Test Frequency (MHz)
Low	CH00	2402
Middle	CH39	2441
High	CH78	2480

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.	Note
E-1	SMART WATCH	N/A	X22	EUT

Item	Shielded Type	Ferrite Core	Length	Note

Note:

1. The support equipment was authorized by Declaration of Confirmation.
2. For detachable type I/O cable should be specified the length in cm in『Length』column.
3. “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.

MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Horn Antenna	Sunol	DMIETUBL-118	A101415	2024.10.18
2	Broadband Hybrid Antenna	Sunol	JB1	A090215	2025.03.01
3	PREAMP	HP	8449B	3008A00160	2024.10.21
4	PREAMP	HP	8447D	2944A07999	2025.05.20
5	EMI Test Receiver	Rohde&Schwarz	ESR3	101891	2024.10.15
6	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2024.10.15
7	MXA Signal Analyzer	Agilent	N9020A	MY51110104	2024.10.15
8	RF Power Sensor	DARE	RPR3006W	15I00041SNO88	2025.05.20
9	RF Power Sensor	DARE	RPR3006W	15I00041SNO89	2025.05.20
10	RF Power Divider	Anritsu	K241B	992289	2024.10.28
11	Signal Generator	Agilent	E4421B	MY4335105	2025.05.20
12	VECTOR Signal Generator	Rohde&Schwarz	SMU200A	101521	2024.10.15
13	Wideband Radio Communication Tester	Rohde&Schwarz	CMW500	154987	2025.05.20
14	Active Loop Antenna	Com-Power	AL-130R	10160009	2025.05.20
15	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1680	2025.05.20
16	Horn Antenna	A-INFOMW	LB-180400-KF	J211060660	2025.05.20
17	Microwave Broadband Preamplifier	Schwarzbeck	BBV 9721	100472	2025.05.20
18	Signal Generator	Agilent	N5183A	MY47420153	2025.05.20
19	Spctrum Analyzer	Rohde&Schwarz	FSP 40	100501	2025.05.20
20	Power Meter	KEYSIGHT	N1911A	MY50520168	2025.05.20
21	Frequency Meter	VICTOR	VC2000	997406086	2025.05.20
22	DC Power Source	HYELEC	HY5020E	055161818	2025.05.20

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 20 dBm. 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 20 dBm.
Other than FHSS:
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 supplier and shall not exceed 20 dBm. 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.

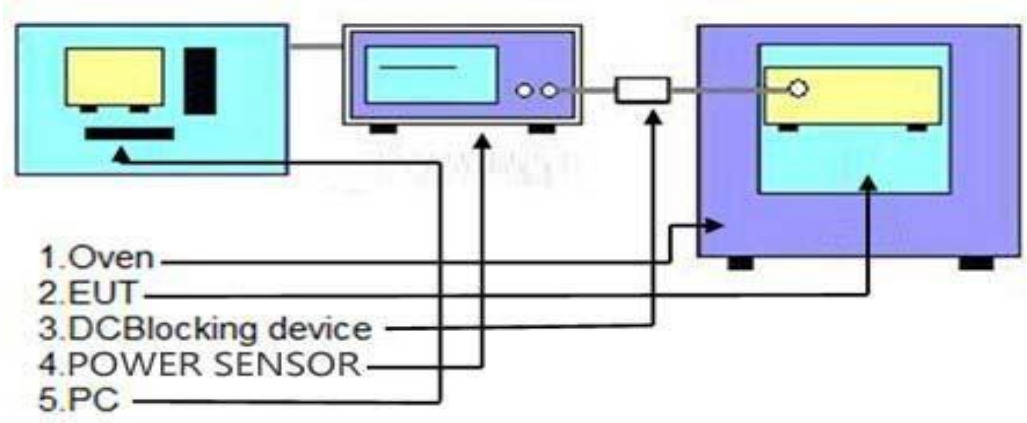
Limit
20 dBm

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	1.14	1.09	1.04
	Max. E.I.R.P	1.14		
Limits		20dBm (-10dBW)		
Burst plot		> 10		
Result		PASS		

Modulation		π/4 DQPSK		
Test conditions		NTNV	Extreme	
			LTNV	HTNV
EIRP (dBm)	Hopping	-0.22	-0.30	-0.41
	Max. E.I.R.P	-0.22		
Limits		20dBm (-10dBW)		
Burst plot		> 10		
Result		PASS		

Modulation		8DPSK		
Test conditions		NTNV	Extreme	
			LTNV	HTNV
EIRP (dBm)	Hopping	-0.34	-0.46	-0.58
	Max. E.I.R.P	-0.34		
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

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 devices already 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

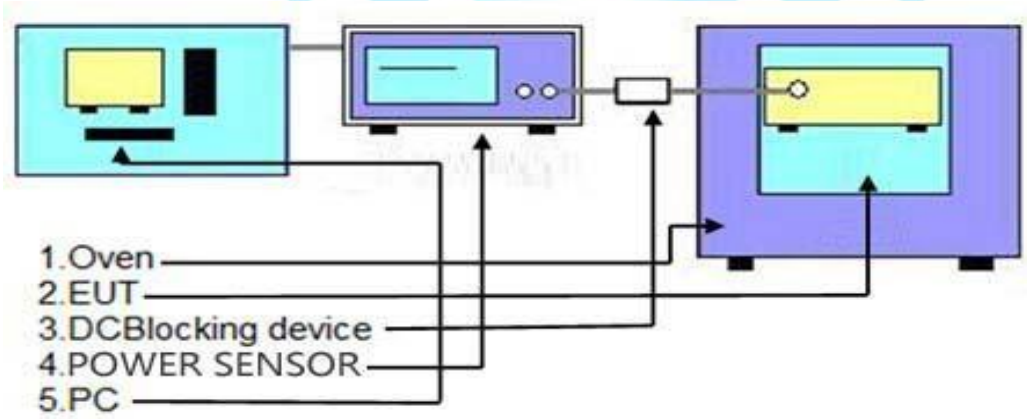
Adaptive Frequency Hopping equipment shall be capable of operating over a minimum of 70 % of the band specified in clause 1.
The Accumulated Transmit Time on any hopping frequency shall not be greater than 400 ms within any observation period of 400 ms multiplied by the minimum number of hopping frequencies (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 item and 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 interference present 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	0.307	400
DH5	2480	2.880	0.307	400

Minimum Frequency Occupation Time Result:

Data Packet	Frequency (MHz)	Minimum Frequency occupation Time(ms)	Observation period
DH5	2402	2.880	4 × DT × 79
DH5	2480	5.760	4 × DT × 79

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

20dB BW(MHz)	Limit	
79.44		
Hopping Sequence(%)	Hopping Sequence >70%	Hopping Channel >15
95.13%		

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	0.308	400
3DH5	2480	2.890	0.308	400

Minimum Frequency Occupation Time Result:

Data Packet	Frequency	Minimum Frequency occupation Time(ms)	Observation period
	(MHz)		
3DH5	2402	5.679	4 × DT × 79
3DH5	2480	8.582	4 × DT × 79

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

20dB BW(MHz)	Limit	
80.60		
Hopping Sequence(%)	Hopping Sequence >70%	Hopping Channel >15
96.53%		

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 HOPPING FREQUENCY SEPARATION

5.1 TEST LIMIT

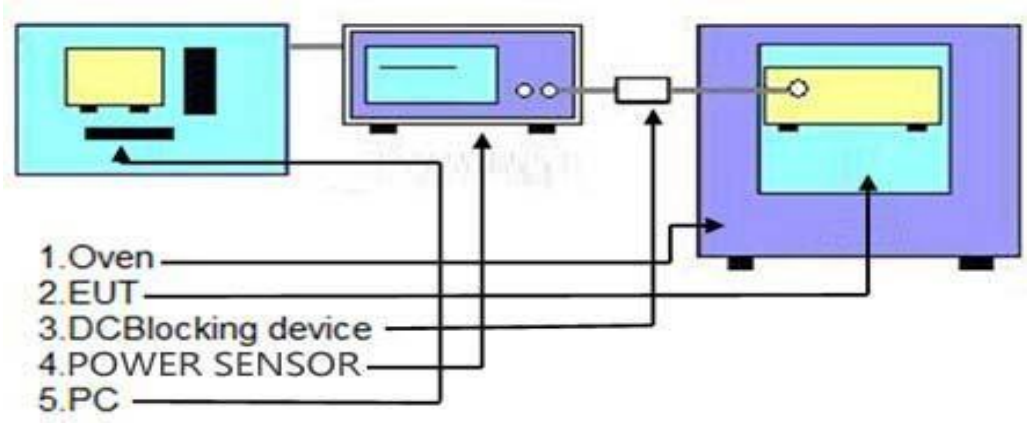
Non-adaptive frequency hopping systems

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	1005	> 100	PASS
	39	2441	1005		PASS
	78	2480	1005		PASS
π/4 DQPSK	00	2402	1006		PASS
	39	2441	1006		PASS
	78	2480	1007		PASS
8DPSK	00	2402	1007		PASS
	39	2441	1008		PASS
	78	2480	1007		PASS

6 ADAPTIVE (ADAPTIVE FHSS)

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).

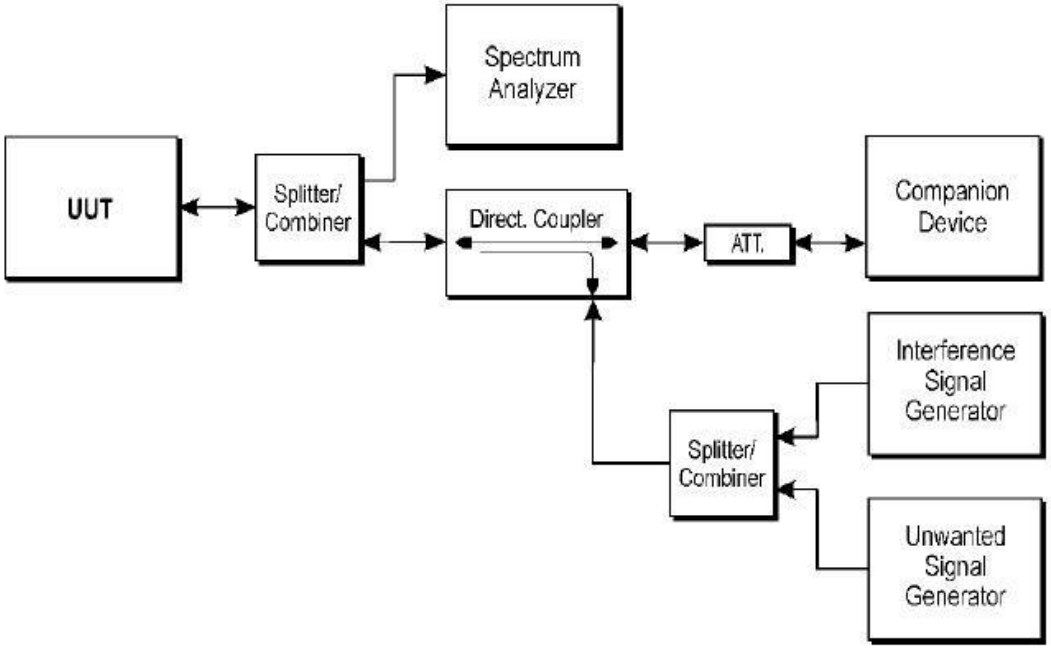
Adaptive Frequency Hopping using other forms of DAA (non-LBT based):

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 the interfering 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, the highest 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 is non-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

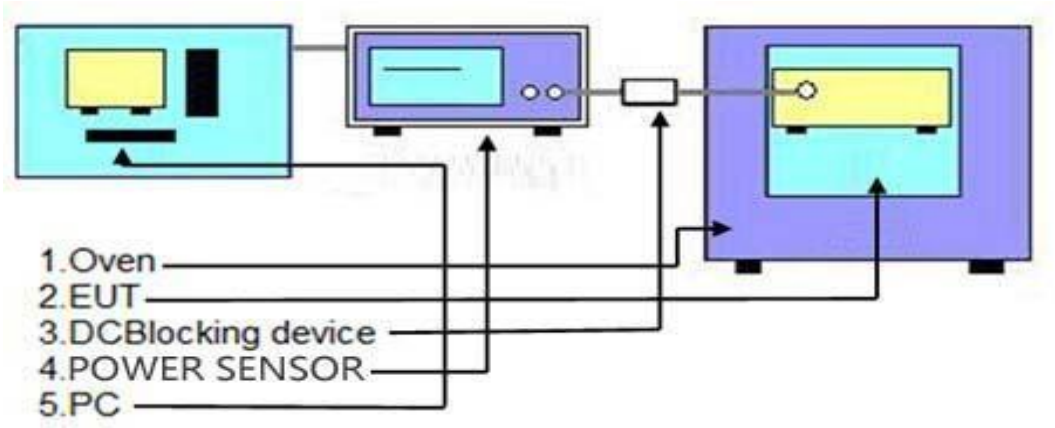
The power is less than 10dBm, so not applicable.

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	0.684	2401.615	FL > 2400 MHz and FH < 2483.5 MHz	PASS
	78	2480	0.688	2480.242		PASS
π/4 DQPSK	00	2402	1.354	2401.352		PASS
	78	2480	1.362	2480.664		PASS
8DPSK	00	2402	1.278	2401.453		PASS
	78	2480	1.269	2480.684		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

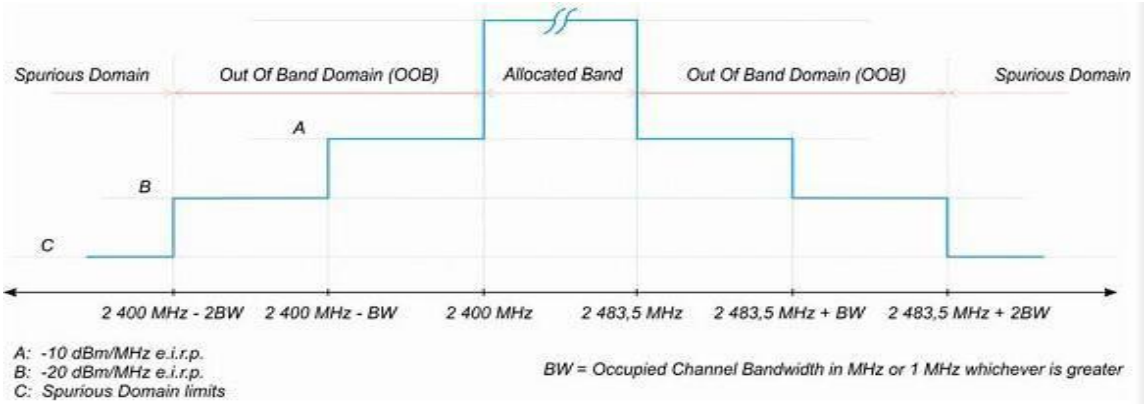
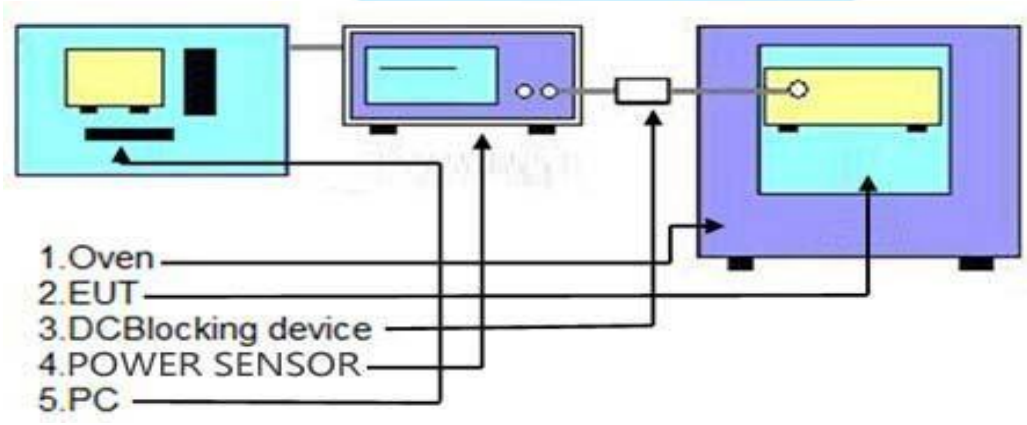


Figure 1: Transmit mask

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 (°c) Nom (V)	GFSK	-60.92	-62.48	-60.90	-63.42
	π/4 DQPSK	-48.55	-60.33	-61.92	-60.86
	8DPSK	-53.48	-63.60	-62.58	-64.15
Limit (dBm)		-10.00	-20.00	-20.00	-10.00
Result		PASS	PASS	PASS	PASS

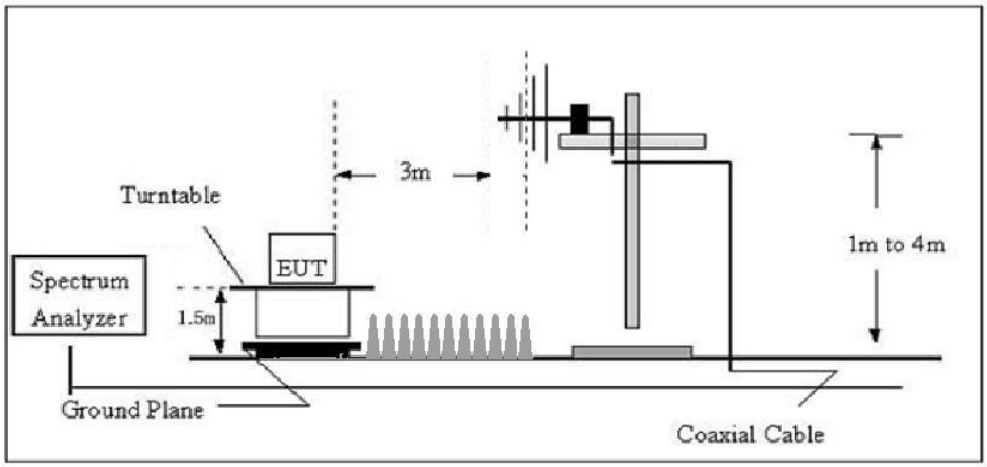
9 SPURIOUS EMISSIONS – TRANSMITTER

9.1 TEST LIMIT

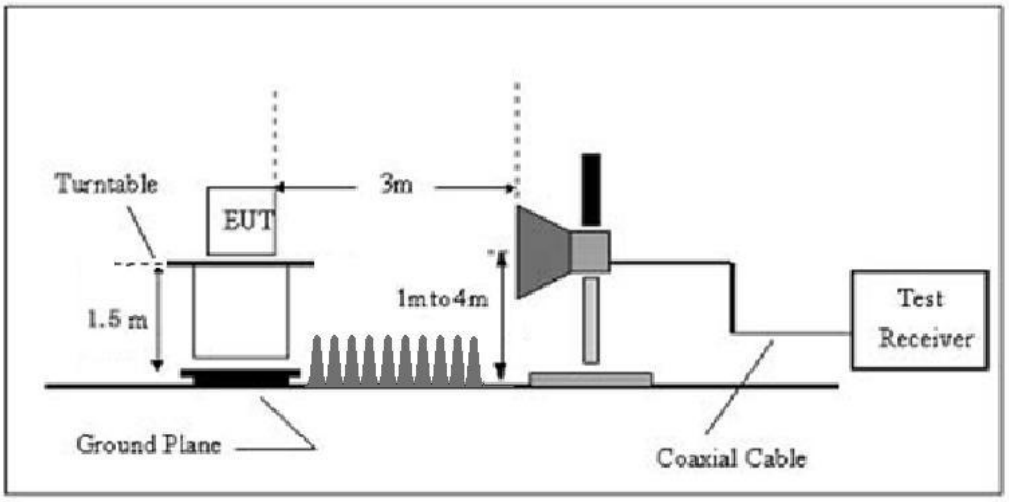
Frequency range	Maximum power, e.r.p(≤1 GHz) e.i.r.p(> 1 GHz)	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 KHz
47 MHz to 74 MHz	-54 dBm	100 KHz
74 MHz to 87.5 MHz	-36 dBm	100 KHz
87.5 MHz to 118 MHz	-54 dBm	100 KHz
118 MHz to 174 MHz	-36 dBm	100 KHz
174 MHz to 230 MHz	-54 dBm	100 KHz
230 MHz to 470 MHz	-36 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

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



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



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.

9.4 TEST RESULT

Remark: The all data rate modes had been test, but only worse test data was recorded in the test report.

Frequency (MHz)	Antenna	TX/RX	Measured (dBm)	Limits (dBm)	Margin	Result
CH00: 2402MHz						
261.44	H	TX	-61.85	-36	-25.85	PASS
622.34	H	TX	-71.78	-54	-17.78	PASS
1853.72	H	TX	-47.19	-30	-17.19	PASS
4882.18	H	TX	-41.17	-30	-11.17	PASS
261.44	V	TX	-61.32	-36	-25.32	PASS
622.34	V	TX	-69.64	-54	-15.64	PASS
1853.72	V	TX	-47.27	-30	-17.27	PASS
4882.18	V	TX	-41.26	-30	-11.26	PASS
CH78: 2480MHz						
250.76	H	TX	-60.86	-36	-24.86	PASS
672.27	H	TX	-70.97	-54	-16.97	PASS
1873.55	H	TX	-46.55	-30	-16.55	PASS
4962.28	H	TX	-40.78	-30	-10.78	PASS
250.76	V	TX	-60.68	-36	-24.68	PASS
672.27	V	TX	-68.18	-54	-14.18	PASS
1873.55	V	TX	-46.67	-30	-16.67	PASS
4962.28	V	TX	-41.14	-30	-11.14	PASS

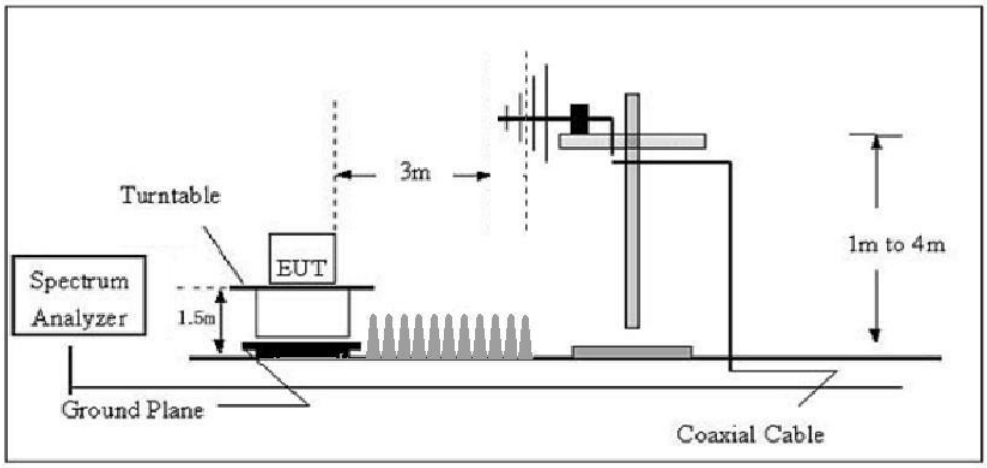
10 SPURIOUS EMISSIONS – RECEIVER

10.1 TEST LIMIT

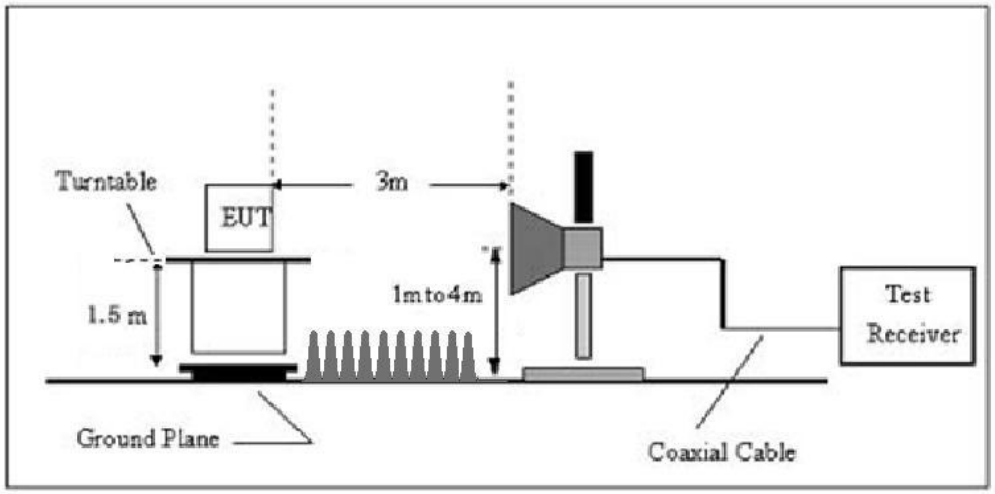
Clause	Test Item	Frequency(MHz)	Limit
4.3.2.10.3	Spurious emissions (radiated)	30-1000	-57dBm
		1000-12750	-47dBm

10.2 TEST SETUP

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



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



10.3 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 standardantenna.
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.

10.4 TEST RESULT

Remark: The all data rate modes had been test, but only worse test data was recorded in the test report.

Frequency (MHz)	Antenna	TX/RX	Measured (dBm)	Limits (dBm)	Margin	Result
CH00: 2402MHz						
354.26	H	RX	-68.62	-57	-11.62	PASS
822.34	H	RX	-67.36	-57	-10.36	PASS
1234.36	H	RX	-57.92	-47	-10.92	PASS
2285.78	H	RX	-56.23	-47	-9.23	PASS
354.26	V	RX	-69.64	-57	-12.64	PASS
822.34	V	RX	-67.22	-57	-10.22	PASS
1234.36	V	RX	-58.27	-47	-11.27	PASS
2285.78	V	RX	-57.01	-47	-10.01	PASS
CH78: 2480MHz						
324.82	H	RX	-68.34	-57	-11.34	PASS
811.15	H	RX	-67.85	-57	-10.85	PASS
1144.25	H	RX	-58.82	-47	-11.82	PASS
2252.62	H	RX	-58.95	-47	-11.95	PASS
324.82	V	RX	-71.16	-57	-14.16	PASS
811.15	V	RX	-67.68	-57	-10.68	PASS
1144.25	V	RX	-56.42	-47	-9.42	PASS
2252.62	V	RX	-58.26	-47	-11.26	PASS

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)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	Type of blocking Signal
Pmin + 6 dB	2 380 2 503,5	-53	CW
Pmin + 6 dB	2 300 2 330 2 360	-47	CW
Pmin + 6 dB	2 523,5 2 553,5 2 583,5 2 613,5 2 643,5 2 673,5	-47	CW
NOTE 1: Pmin is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal. NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.			

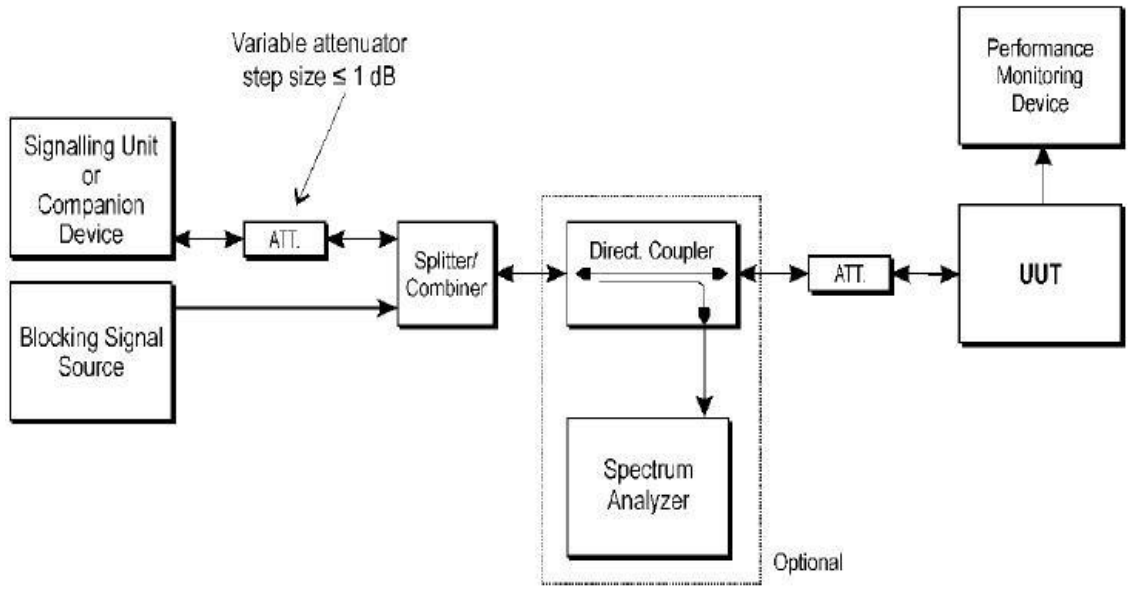
Receiver Category 2:
Table B: Receiver Blocking parameters for Receiver Category 2 equipment

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	Type of blocking Signal
Pmin + 6 dB	2 380 2 503,5	-57	CW
Pmin + 6 dB	2 300 2 583,5	-47	CW
NOTE 1: Pmin is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal. NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.			

Receiver Category 3:
Table C: Receiver Blocking parameters for Receiver Category 3 equipment

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	Type of blocking Signal
Pmin + 12 dB	2 380 2 503,5	-57	CW
Pmin + 12 dB	2 300 2 583,5	-47	CW
NOTE 1: Pmin is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal. NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.			

11.2 TEST SETUP



11.3 TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.11.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.2.2) clause 5.4.11.2 for the measurement method.
   - RBW: ≥ Occupied Channel Bandwidth (use next available RBW setting above the 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 is non-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

11.4 TEST RESULT

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

CH00: 2402MHz

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power(dBm) CW	PER (%)	Limit (%)	Result
-64	2 380 2 503,5	-57	0.20%	≤10%	PASS
			0.50%		
	2 300 2 583,5	-47	0.40%		PASS
			0.40%		
NOTE 1: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain. NOTE 2: The minimum performance criterion shall be a PER less than or equal to 10 %. The manufacturer may declare alternative performance criteria as long as that is appropriate for the intended use of the equipment (see clause 5.4.1.t)).					

CH39: 2441MHz

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power(dBm) CW	PER (%)	Limit (%)	Result
-64	2 380 2 503,5	-57	0.50%	≤10%	PASS
			0.60%		
	2 300 2 583,5	-47	0.30%		PASS
			0.60%		
NOTE 1: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain. NOTE 2: The minimum performance criterion shall be a PER less than or equal to 10 %. The manufacturer may declare alternative performance criteria as long as that is appropriate for the intended use of the equipment (see clause 5.4.1.t)).					

CH78: 2480MHz

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power(dBm) CW	PER (%)	Limit (%)	Results
-64	2 380 2 503,5	-57	0.80%	≤10%	PASS
			0.70%		
	2 300 2 583,5	-47	0.40%		PASS
			0.50%		
NOTE 1: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain. NOTE 2: The minimum performance criterion shall be a PER less than or equal to 10 %. The manufacturer may declare alternative performance criteria as long as that is appropriate for the intended use of the equipment (see clause 5.4.1.t)).					

12 PHOTO OF EUT

PHOTO 01

PHOTO 02

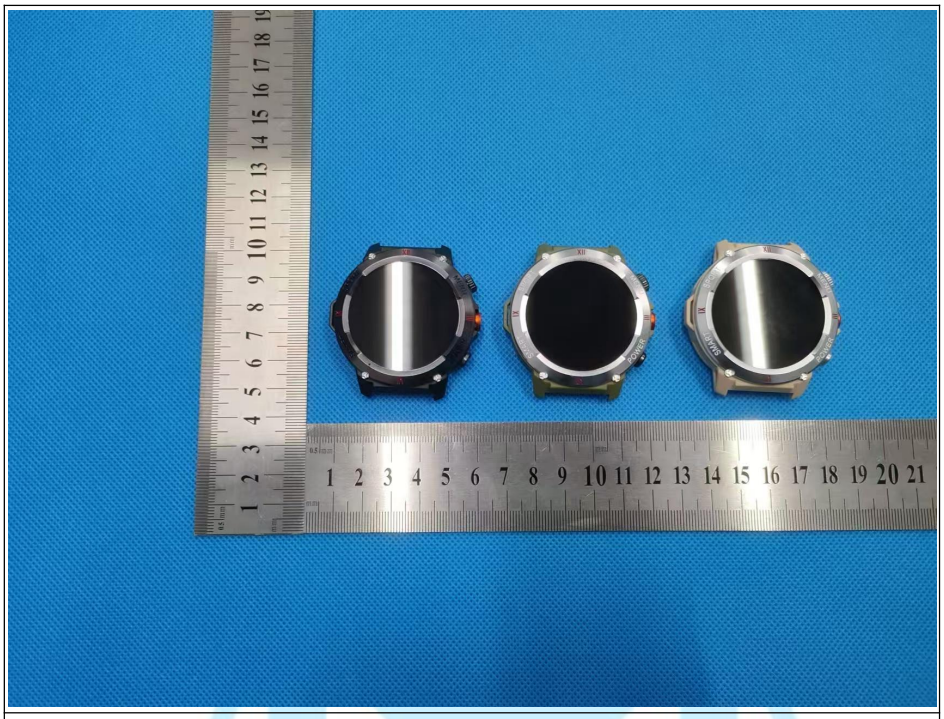


PHOTO 03

PHOTO 04

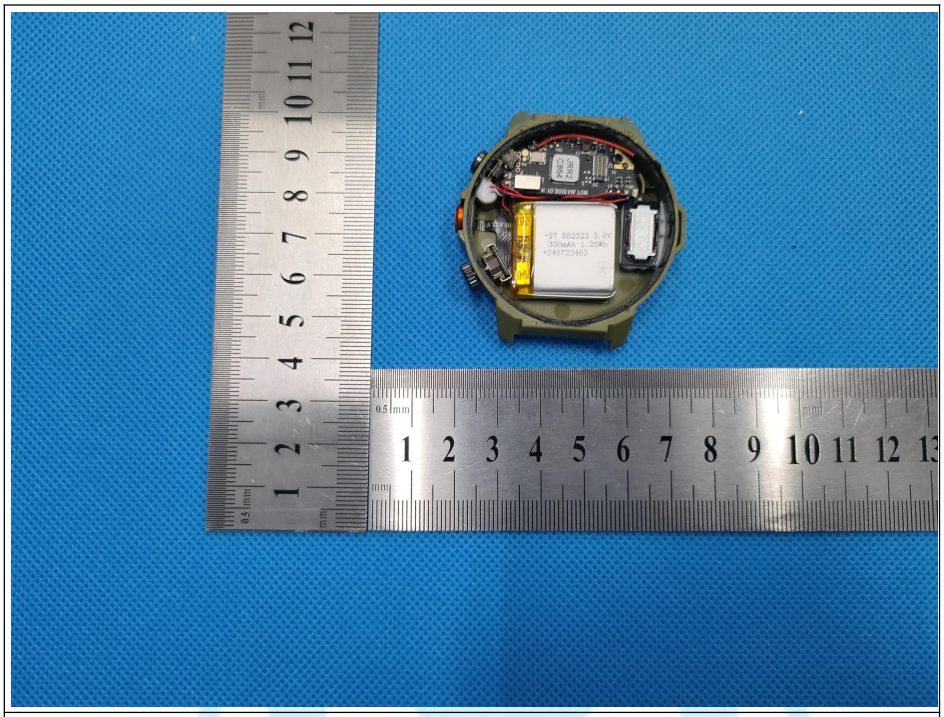


PHOTO 05

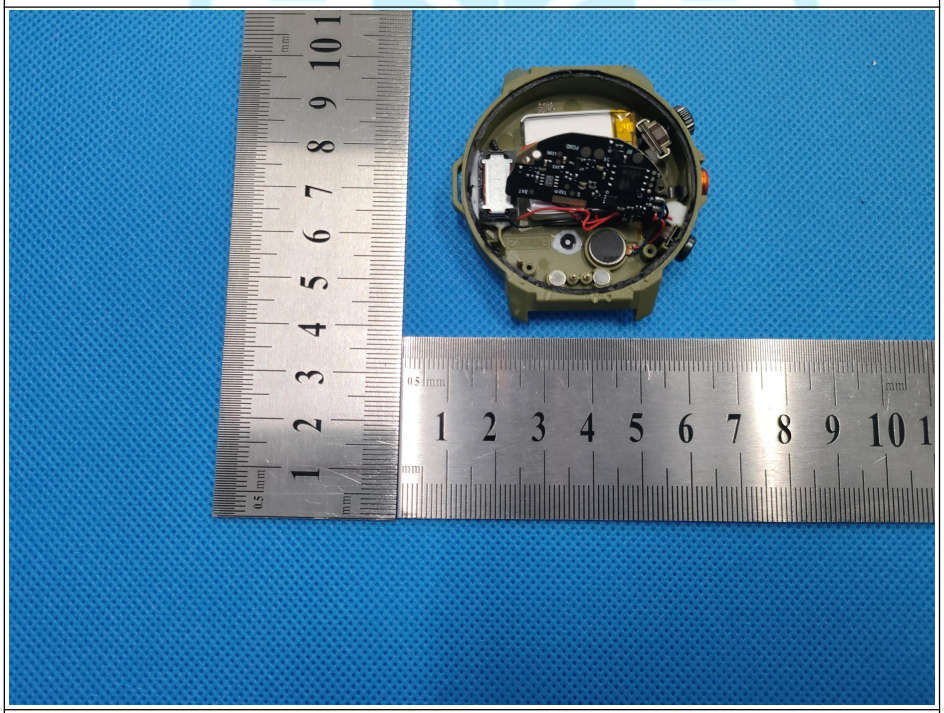


PHOTO 06

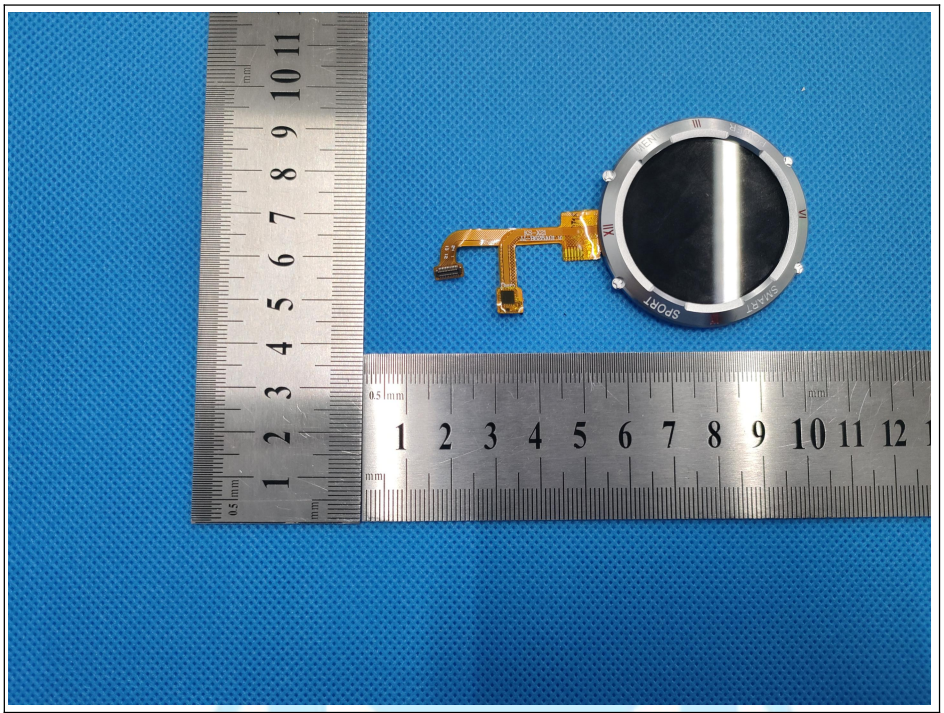


PHOTO 07

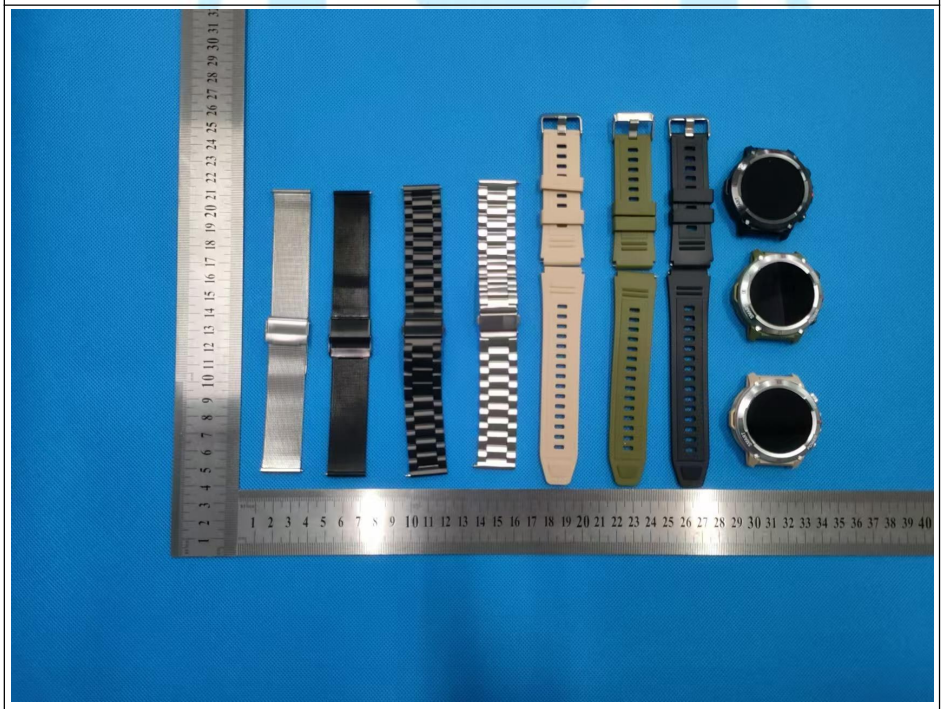


PHOTO 08

****End of Report****