RADIO TEST REPORT

Report Number:	**ZKT-2607201209E-3**
Date of Test	Jul. 20, 2026 to Jul. 28, 2026
Date of issue:	Jul. 28, 2026
Total number of pages	47
Test Result:	PASS
Testing Laboratory:	**Shenzhen ZKT Technology Co., Ltd.**
Address:	1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China
Applicant's name:	**Mid Ocean Brands B.V.**
Address:	Unit 711 - 716, 7/F., Tower A, 83 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong.
Manufacturer's name:	**118897**
Address:	Shenzhen, Guangdong
Test specification:	
Standard:	ETSI EN 300 328 V2.2.2 (2019-07)
Test procedure:	/
Non-standard test method:	N/A
Test Report Form No.:	TRF-EL-121_V0
Test Report Form(s) Originator:	ZKT Testing
Master TRF:	Dated: 2020-01-06

This device described above has been tested by ZKT, 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.

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Product name:	**Smart watch**
Trademark:	/
Model/Type reference:	MO2271
Ratings:	Input: 5V⎓ 0.5A Battery: 3.7V, 180mAh, 0.666Wh

Testing procedure and testing location:

Testing Laboratory......................................:	**Shenzhen ZKT Technology Co., Ltd.**
Address.. :	1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China
Tested by (name + signature).......................:	Jomcat Cao Jomcat Cao
Reviewer (name + signature)...................... :	Jackson Fang Jackson Fang
Approved (name + signature)...................... :	Lake Xie Lake Xie

Shenzhen ZKT Technology Co., Ltd. Approved

TABLE OF CONTENT

1. VERSION

Report No.	Issue Date	Description	Approved
ZKT-2607201209E-3	Jul. 28, 2026	Original	Valid

2.TEST SUMMARY

The Product has been tested according to the following specifications:

No.	Test Parameter	Clause No	Results
Transmitter Parameters			
1	RF output power	4.3.1.2	PASS
2	Duty Cycle, Tx-sequence, Tx-gap	4.3.1.3	N/A
3	Accumulated Transmit Time, Frequency Occupation and Hopping Sequence	4.3.1.4	PASS
4	Hopping Frequency Separation	4.3.1.5	PASS
5	Medium Utilization (MU) factor	4.3.1.6	N/A
6	Adaptivity (Adaptive Frequency Hopping)	4.3.1.7	N/A
7	Occupied Channel Bandwidth	4.3.1.8	PASS
8	Transmitter unwanted emissions in the out-of-band domain	4.3.1.9	PASS
9	Transmitter unwanted emissions in the spurious domain (Radiated)	4.3.1.10	PASS
Receiver Parameters			
10	Receiver spurious emissions (Radiated)	4.3.1.11	PASS
11	Receiver Blocking	4.3.1.12	PASS
12	Geo-location Capability	4.3.1.13	N/A
Note: N/A is an abbreviation for Not Applicable and means this test intem is not applicable for this device according to the technology characteristic of device.			

Remark:
N/A is an abbreviation for Not Applicable and means this test item is not applicable for this device according to the technology characteristic of device.

3.MEASUREMENT UNCERTAINTY

3.1 TEST FACILITY

Shenzhen ZKT Technology Co., Ltd.
Add.: ZKT Building & 1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China
FCC Test Firm Registration Number: 927491
IC Registered No.: 27033

3.2 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	Uncertainty
1	3m camber Radiated spurious emission(9KHz-30MHz)	U=4.5dB
2	3m camber Radiated spurious emission(30MHz-1GHz)	U=4.8dB
3	3m chamber Radiated spurious emission(1GHz-6GHz)	U=4.9dB
4	3m chamber Radiated spurious emission(6GHz-40GHz)	U=5.0dB
5	Conducted disturbance	U=3.2dB
6	RF Band Edge	U=1.68dB
7	RF power conducted	U=1.86dB
8	RF conducted Spurious Emission	U=2.2dB
9	RF Occupied Bandwidth	U=1.8dB
10	RF Power Spectral Density	U=1.75dB
11	humidity uncertainty	U=5.3%
12	Temperature uncertainty	U=0.59℃

4.GENERAL INFORMATION

4.1 General Description Of EUT

Product Name:	Smart watch
Model No.:	MO2271
Series Models:	/
Model Difference:	/
Hardware Version:	/
Software Version:	/
Channel Number:	79 channels
Channel Spacing:	1MHz
Operation Frequency:	2402-2480MHz
Max. EIRP:	1.19 dBm
Bluetooth Version:	V6.0
Modulation Type:	GFSK, π/4-DQPSK, 8-DPSK
Antenna installation:	Chip Antenna
Antenna Gain :	0dBi Note: the antenna gain is provided by the customer, and the final test result has nothing to do with us.
Power Supply:	Input: 5V⎓ 0.5A
Battery Capacity:	3.7V, 180mAh, 0.666Wh

4.2 Test Setup Configuration

See test photographs attached in EUT TEST SETUP PHOTOGRAPHS for the actual connections between Product and support equipment.

4.3 Support Equipment

No.	Device Type	Brand	Model	Series No.	Data Cable	Power Cord
1.	---	---	---	---	---	--

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.4 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test mode	Low channel	Middle channel	High channel
Transmitting (GFSK, π/4-DQPSK, 8-DPSK)	2402MHz	2441MHz	2480MHz
Receiving (GFSK, π/4-DQPSK, 8-DPSK)	2402MHz	2441MHz	2480MHz

4.5 Test Environment

Extreme Test Conditions:
For tests at extreme temperatures, measurements shall be made over the extremes of the operating temperature range as declared by the manufacturer.
For tests at extreme voltages, measurements shall be made over the extremes of the power source voltage range as declared by the manufacturer.

Test Conditions	LTLV	LTHV	HTHV	HTLV
Temperature (℃)	-10	-10	40	40
Test Voltage (DC)	3.2	4.3	4.3	3.2

4.6 Equipments List For All Test Items

Radiation Emissions & Radiation Spurious Emissions Test

Item	Equipment	Manufacturer	Type No.	Serial No.	Firmware Version	Last calibration	Calibrated until
1	Spectrum Analyzer (9kHz-26.5GHz)	KEYSIGHT	N9020A	MY55370835	A.17.05	Sep. 20, 2025	Sep. 19, 2026
2	Spectrum Analyzer (10kHz-39.9GHz)	R&S	FSV40-N	100363	1.71 SP2	Sep. 20, 2025	Sep. 19, 2026
3	EMI Test Receiver (9kHz-7GHz)	R&S	ESCI7	100969	4.32	Oct. 24, 2025	Oct. 23, 2026
4	Bilog Antenna (30MHz-1500MHz)	Schwarzbeck	VULB9168	00877	N/A	Sep. 20, 2025	Sep. 19, 2026
5	Horn Antenna (1GHz-18GHz)	Agilent	AH-118	071145	N/A	Sep. 20, 2025	Sep. 19, 2026
6	Horn Antenna (15GHz-40GHz)	A.H.System	SAS-574	588	N/A	Sep. 30, 2025	Sep. 29, 2026
7	Loop Antenna	TESEQ	HLA6121	58357	N/A	Sep. 20, 2025	Sep. 19, 2026
8	Amplifier (30-1000MHz)	EM Electronics	EM330 Amplifier	60747	N/A	Sep. 19, 2025	Sep. 18, 2026
9	Amplifier (1GHz-26.5GHz)	HuiPu	8449B	3008A00315	N/A	Sep. 19, 2025	Sep. 18, 2026
10	Amplifier (500MHz-40GHz)	QuanJuDa	DLE-161	097	N/A	Oct. 24, 2025	Oct. 23, 2026
11	Test Cable	N/A	R-01	N/A	N/A	May 25, 2026	May 24, 2027
12	Test Cable	N/A	R-02	N/A	N/A	May 25, 2026	May 24, 2027
13	Test Cable	N/A	R-03	N/A	N/A	May 26, 2026	May 25, 2027
14	D.C. Power Supply	LongWei	TPR-6405D	N/A	N/A	\	\
15	EMC Software	Frad	EZ-EMC	Ver.EMC-CON 3A1.1	N/A	\	\
16	Turntable	MF	MF-7802BS	N/A	N/A	\	\
17	Antenna tower	MF	MF-7802BS	N/A	N/A	\	\

RF Conducted Test

Item	Equipment	Manufacturer	Type No.	Serial No.	Firmware Version	Last calibration	Calibrated until
1	Spectrum Analyzer (9kHz-26.5GHz)	KEYSIGHT	N9020A	MY55370835	A.17.05	Sep. 20, 2025	Sep. 19, 2026
2	Spectrum Analyzer (10kHz-39.9GHz)	R&S	FSV40-N	100363	1.71 SP2	Sep. 20, 2025	Sep. 19, 2026
3	Test Cable	N/A	RF-01	N/A	N/A	May 25, 2026	May 24, 2027
4	Test Cable	N/A	RF-02	N/A	N/A	May 25, 2026	May 24, 2027
5	Test Cable	N/A	RF-03	N/A	N/A	May 25, 2026	May 24, 2027
6	ESG Signal Generator	Agilent	E4421B	N/A	B.03.84	Sep. 19, 2025	Sep. 18, 2026
7	Signal Generator	Agilent	N5182A	N/A	A.01.87	Sep. 20, 2025	Sep. 19, 2026
8	Magnetic Field Probe Tester	Narda	ELT-400	0-0344/M-1752	N/A	Sep. 25, 2025	Sep. 24, 2026
9	SHIELD BOX	TESCOM	TC-5970C	5970C015553	N/A	Dec. 18, 2025	Dec. 17, 2026
10	Wideband Radio Communication Test	R&S	CMW500	106504	V 3.7.22	Sep. 28, 2025	Sep. 27, 2026
11	MWRF Power Meter Test system	MW	MW100-RFCB	N/A	N/A	Sep. 19, 2025	Sep. 18, 2026
12	D.C. Power Supply	LongWei	TPR-6405D	N/A	N/A	\	\
13	RF Software	MW	MTS8310	V2.0.0.0	N/A	\	\

5.INFORMATION AS REQUIRED

ETSI EN 300 328 Annex E

a) The type of modulation used by the equipment:
☒ FHSS ☐ other forms of modulation
b) In case of FHSS modulation:
☐ In case of non-Adaptive Frequency Hopping equipment:
The number of Hopping Frequencies: _
☒ In case of Adaptive Frequency Hopping Equipment:
The maximum number of Hopping Frequencies: 79 The minimum number of Hopping Frequencies: 79
☒ The (average) Dwell Time:
c) Adaptive / non-adaptive equipment:
☐ non-adaptive Equipment ☒ adaptive Equipment without the possibility to switch to a non-adaptive mode ☐ adaptive Equipment which can also operate in a non-adaptive mode
d) In case of adaptive equipment:
The Channel Occupancy Time implemented by the equipment:
☒ The equipment has implemented an LBT based DAA mechanism
The CCA time implemented by the equipment: .... µs
☐ The equipment has implemented an non-LBT based DAA mechanism
☐ The equipment can operate in more than one adaptive mode
e) In case of non-adaptive Equipment:
The maximum RF Output Power (e.i.r.p.): dbm
The maximum (corresponding) Duty Cycle:
Equipment with dynamic behaviour, that behaviour is described here. (e.g. the different combinations of duty cycle and corresponding power levels to be declared): …………………………………………………………………………
f) The worst case operational mode for each of the following tests:
☒ RF Output Power: GFSK, π/4-DQPSK, 8-DPSK
☐ Power Spectral Density:
☐ Duty cycle, Tx-Sequence, Tx-gap:
☒ Accumulated Transmit time, Frequency Occupation & Hopping Sequence (only for FHSS equipment): GFSK
☒ Hopping Frequency Separation (only for FHSS equipment): GFSK
☐ Medium Utilization:
☐ Adaptivity:
☒ Nominal Channel Bandwidth: GFSK
☒ Transmitter unwanted emissions in the OOB domain: GFSK
☒ Transmitter unwanted emissions in the spurious domain: GFSK
☒ Receiver spurious emissions : GFSK
☒ Receiver blocking : GFSK
g) The different transmit operating modes (tick all that apply):
☒ Operating mode 1: Single Antenna Equipment
☐ Equipment with only one antenna
☐ Equipment with two diversity antennas but only one antenna active at any moment in time
☒ Smart Antenna Systems with two or more antennas, but operating in a (legacy) mode where only One antenna is used (e.g. IEEE 802.11™ [i.3] legacy mode in smart antenna systems)
☐ Operating mode 2: Smart Antenna Systems - Multiple Antennas without beam forming
☐ Single spatial stream / Standard throughput / (e.g. IEEE 802.11™ [i.3] legacy mode)
☐ High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1
☐ High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2
NOTE 1: Add more lines if more channel bandwidths are supported.
☐ Operating mode 3: Smart Antenna Systems - Multiple Antennas with beam forming
☐ Single spatial stream / Standard throughput (e.g. IEEE 802.11™ [i.3] legacy mode)
☐ High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1

☐ High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2
NOTE 2: Add more lines if more channel bandwidths are supported.
h) In case of Smart Antenna Systems:
The number of Receive chains:
The number of Transmit chains:
☐ symmetrical power distribution
☐ asymmetrical power distribution
In case of beam forming, the maximum (additional) beam forming gain:
NOTE: The additional beam forming gain does not include the basic gain of a single antenna.
i) Operating Frequency Range(s) of the equipment:
Operating Frequency Range 1: Refer to section 4.1
Operating Frequency Range 2:_
NOTE: Add more lines if more Frequency Ranges are supported.
j) Nominal Channel Bandwidth(s):
Nominal Channel Bandwidth 1:
NOTE: Add more lines if more channel bandwidths are supported.
k) Type of Equipment (stand-alone, combined, plug-in radio device, etc.):
☒ Stand-alone
☐ Combined Equipment (Equipment where the radio part is fully integrated within another type of equipment)
☐ Plug-in radio device (Equipment intended for a variety of host systems)
☐ Other
l) The normal and the extreme operating conditions that apply to the equipment:
Refer to section 4.6
m) The intended combination(s) of the radio equipment power settings and one or more antenna assemblies and their corresponding e.i.r.p. levels:
Antenna Type:
☒ Chip Antennas (information to be provided in case of conducted measurements)
Antenna Gain: Refer to section 4.1
If applicable, additional beamforming gain (excluding basic antenna gain):
☐ Temporary RF connector provided
☐ No temporary RF connector provided
☐ Dedicated Antennas (equipment with antenna connector)
☐ Single power level with corresponding antenna(s)
☐ Multiple power settings and corresponding antenna(s)
Number of different Power Levels:
Power Level 1:
Power Level 2:
Power Level 3:
NOTE 1: Add more lines in case the equipment has more power levels.
NOTE 2: These power levels are conducted power levels (at antenna connector).
For each of the Power Levels, provide the intended antenna assemblies, their corresponding gains (G) and the resulting e.i.r.p. levels also taking into account the beamforming gain (Y) if applicable
Power Level 1:
Number of antenna assemblies provided for this power level:

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

NOTE 3: Add more rows in case more antenna assemblies are supported for this power level.
Power Level 2:
Number of antenna assemblies provided for this power level:

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

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

Power Level 3:

Number of antenna assemblies provided for this power level:

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

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

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

Refer to section 8.

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

p) The equipment type (e.g. Bluetooth®, IEEE 802.11™ [i.3], IEEE 802.15.4™ [i.4], proprietary, etc.):…………………………………………………………………

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

(to be provided as separate attachment)

r) If applicable, the statistical analysis referred to in clause 5.4.1 r)
(to be provided as separate attachment)

s) Geo-location capability supported by the equipment:

☐ Yes

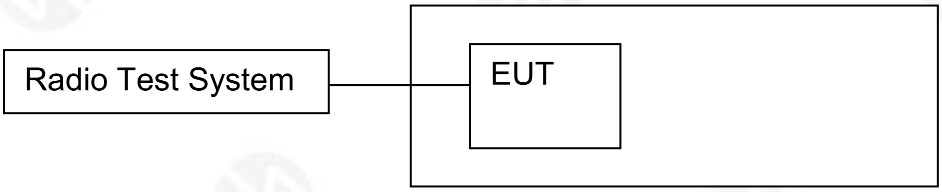
☐ The geographical location determined by the equipment as defined in clause 4.3.1.13.2 or clause 4.3.2.12.2 is not accessible to the user

☒ No

t) Describe the minimum performance criteria that apply to the equipment (see clause 4.3.1.12.3 or clause 4.3.2.11.3):
………………………………………………………………………………...

6. RF OUTPUT POWER

6.1 Block Diagram Of Test Setup



6.2 Limit

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 5.3.1 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
20dBm

6.3 Test procedure

Step 1:

• Use a fast power sensor suitable for 2.4 GHz and capable of minimum 1 MS/s.
• Use the following settings:
- Sample speed 1 MS/s or faster.
- The samples shall represent the RMS power of the signal.
- Measurement duration: For non-adaptive equipment: equal to the observation period defined in 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) are captured.

NOTE 1: For adaptive equipment, to increase the measurement accuracy, a higher number of bursts may be used.

Step 2:

• For conducted measurements on devices with one transmit chain:
- Connect the power sensor to the transmit port, sample the transmit signal and store the raw data. Use these stored samples in all following steps.
• For conducted measurements on devices with multiple transmit chains:
- Connect one power sensor to each transmit port for a synchronous measurement on all transmit ports.
- Trigger the power sensors so that they start sampling at the same time. Make sure the time difference between the samples of all sensors is less than 500 ns.
- For each individual sampling point (time domain), sum the coincident power samples of all ports and store them. Use these summed samples in all following steps.

Step 3:

• Find the start and stop times of each burst in the stored measurement samples.
The start and stop times are defined as the points where the power is at least 30 dB below the highest value of the stored samples in step 2.
NOTE 2: In case of insufficient dynamic range, the value of 30 dB may need to be reduced appropriately.

Step 4:

• Between the start and stop times of each individual burst calculate the RMS power over the burst using the formula below. Save these Pburst 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

Step 5:

• The highest of all Pburst values (value "A" in dBm) will be used for maximum e.i.r.p. calculations.

Step 6:

• Add the (stated) antenna assembly gain "G" in dBi of the individual antenna.
• If applicable, add the additional beamforming gain "Y" in dB.
• If more than one antenna assembly is intended for this power setting, the maximum overall antenna gain (G or G + Y) shall be used.
• The RF Output Power (P) shall be calculated using the formula below:

P = A + G + Y

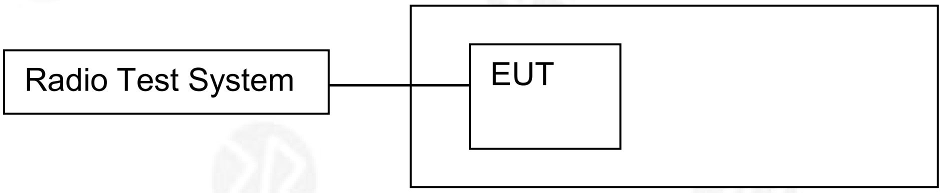
• This value, which shall comply with the limit given in clause 4.3.1.2.3 or clause 4.3.2.2.3, shall be recorded in the test report.

6.4 Test Result

Modulation	Test conditions	Packet	Frequency (MHz)	Meas Duty Cycle (%)	Power (dBm)	
					Measured Conducted	EIRP
GFSK	NVNT	1-DH5	Hopping	77.60	1.19	1.19
	LVNT		Hopping	77.96	1.16	1.16
	HVNT		Hopping	77.53	1.19	1.19
π/4-DQPSK	NVNT	2-DH5	Hopping	77.72	0.53	0.53
	LVNT		Hopping	77.91	0.59	0.59
	HVNT		Hopping	77.58	0.57	0.57
8-DPSK	NVNT	3-DH5	Hopping	77.74	-0.02	-0.02
	LVNT		Hopping	77.86	-0.11	-0.11
	HVNT		Hopping	77.60	-0.07	-0.07
Limit					≤100mW (20dBm)	
Remark: EIRP = A + G + Y, G = 0dBi.						

7.ACCUMULATED TRANSMIT TIME, MINIMUM FREQUENCY OCCUPATION AND HOPPING SEQUENCE

7.1 Block Diagram Of Test Setup



7.2 Limit

Adaptive FHSS equipment shall be capable of operating over a minimum of 70 % of the band specified in table 1.

Table 1: Service frequency bands

	Service frequency bands
Transmit	2 400 MHz to 2 483,5 MHz
Receive	2 400 MHz to 2 483,5 MHz

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.

7.3 Test procedure

Step 1:

• The output of the transmitter shall be connected to a spectrum analyzer or equivalent.

• The analyzer shall be set as follows:

- Centre Frequency: Equal to the hopping frequency being investigated
- Frequency Span: 0 Hz
- RBW: ~ 50 % of the Occupied Channel Bandwidth
- VBW: ≥ RBW
- Detector Mode: RMS
- Sweep time: Equal to the applicable observation period (see clause 4.3.1.4.3.1 or clause 4.3.1.4.3.2)
- Number of sweep points: 30 000
- Trace mode: Clear / Write
- Trigger: Free Run

Step 2:

• Save the trace data to a file for further analysis by a computing device using an appropriate software application or program.

Step 3:

• Identify the data points related to the frequency being investigated by applying a threshold.

The data points resulting from transmissions on the hopping frequency being investigated are assumed to have much higher levels compared to data points resulting from transmissions on adjacent hopping frequencies. If a clear determination between these transmissions is not possible, the RBW in step 1 shall be further reduced. In addition, a channel filter may be used.

• Count the number of data points identified as resulting from transmissions on the frequency being investigated and multiply this number by the time difference between two consecutive data points.

Step 4:

• The result in step 3 is the Accumulated Transmit Time which shall comply with the limit provided in clause 4.3.1.4.3.1 or clause 4.3.1.4.3.2 and which shall be recorded in the test report.

Step 5:

NOTE 1: This step is only applicable for equipment implementing Option 1 in clause 4.3.1.4.3.1 or clause 4.3.1.4.3.2 for complying with the Frequency Occupation requirement and the manufacturer decides to demonstrate compliance with this requirement via measurement.

• Make the following changes on the analyser and repeat step 2 and step 3.

Sweep time: 4 × Dwell Time × Actual number of hopping frequencies in use

The hopping frequencies occupied by the equipment without having transmissions during the dwell time (blacklisted frequencies) should be taken into account in the actual number of hopping frequencies in use. If this number cannot be determined (number of blacklisted frequencies unknown) it shall be assumed that the equipment uses the maximum possible number of hopping frequencies.

• The result shall be compared to the limit for the Frequency Occupation defined in clause 4.3.1.4.3.1 or clause 4.3.1.4.3.2. The result of this comparison shall be recorded in the test report.

Step 6:

• Make the following changes on the analyzer:

- Start Frequency: 2 400 MHz

- Stop Frequency: 2 483,5 MHz

- RBW: ~ 50 % of the Occupied Channel Bandwidth (single hopping frequency)

- VBW: ≥ RBW

- Detector Mode: RMS

- Sweep time: 1 s

- Trace Mode: Max Hold

- Trigger: Free Run

NOTE 2: The above sweep time setting may result in long measuring times. To avoid such long measuring times, an FFT analyser could be used.

• Wait for the trace to stabilize. Identify the number of hopping frequencies used by the hopping sequence.

• The result shall be compared to the limit (value N) defined in clause 4.3.1.4.3.1 or clause 4.3.1.4.3.2. This value shall be recorded in the test report.

For equipment with blacklisted frequencies, it might not be possible to verify the number of hopping frequencies in use. However they shall comply with the requirement for Accumulated Transmit Time and Frequency Occupation assuming the minimum number of hopping frequencies (N) defined in clause 4.3.1.4.3.1 or clause 4.3.1.4.3.2 is used.

Step 7:

• For adaptive equipment, using the lowest and highest -20 dB points from the total spectrum envelope obtained in step 6, it shall be verified whether the equipment uses 70 % of the band specified in clause 1. The result shall be recorded in the test report.

7.4 Test Result

Dwell Time One Burst

Condition	Packet	Frequency (MHz)	Pulse Time (ms)	Burst Number
NVNT	1-DH5	2441	2.875	107
NVNT	2-DH5	2441	2.891	102
NVNT	3-DH5	2441	2.915	95

Accumulated Transmit Time

Condition	Packet	Frequency (MHz)	Accumulated Transmit Time (ms)	Limit (ms)	Sweep Time (ms)	Result
NVNT	1-DH5	2441	307.732	<400	31600	PASS
NVNT	2-DH5	2441	294.078	<400	31600	PASS
NVNT	3-DH5	2441	276.123	<400	31600	PASS

Minimum Frequency Occupation

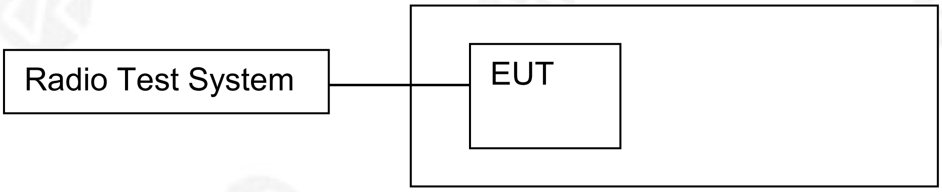
Condition	Packet	Frequency (MHz)	Burst Number	Limit	Sweep Time (ms)	Result
NVNT	1-DH5	2441	3	1	908.478	PASS
NVNT	2-DH5	2441	3	1	913.649	PASS
NVNT	3-DH5	2441	1	1	921.247	PASS

Hopping Sequence

Condition	Packet	Hopping Number	Limit	Band Allocation (%)	Limit Band Allocation (%)	Result
NVNT	1-DH5	79	15	94.62	>70	PASS
NVNT	2-DH5	79	15	94.65	>70	PASS
NVNT	3-DH5	79	15	94.64	>70	PASS

8.HOPPING FREQUENCY SEPARATION

8.1 Block Diagram Of Test Setup



8.2 Limit

For Non-adaptive frequency hopping systems
The minimum Hopping Frequency Separation shall be equal to Occupied Channel Bandwidth (see clause 5.3.1.5.3) of a single hop, with a minimum separation of 100 kHz.
For Adaptive frequency hopping systems
The minimum Hopping Frequency Separation shall be 100 kHz.

8.3 Test procedure

The Hopping Frequency Separation as defined in clause 4.3.1.5 shall be measured and recorded using any of the following options. The selected option shall be stated in the test report.

Option 1

Step 1:

• The output of the transmitter shall be connected to a spectrum analyser or equivalent.

• The analyser shall be set as follows:

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

Step 2:

• Wait for the trace to stabilize.

• Use the marker function of the analyser to define the frequencies corresponding to the lower -20 dBr point and the upper -20 dBr point for both hopping frequencies F1 and F2. This will result in $F1_L$ and $F1_H$ for hopping frequency F1 and in $F2_L$ and $F2_H$ for hopping frequency F2. These values shall be recorded in the report.

Step 3:

• Calculate the centre frequencies $F1_C$ and $F2_C$ for both hopping frequencies using the formulas below. These values shall be recorded in the report.

$$F1_C = \frac{F1_L + F1_H}{2} \qquad F2_C = \frac{F2_L + F2_H}{2}$$

• Calculate the -20 dBr channel bandwidth (BW_{CHAN}) using the formula below. This value shall be recorded in the report.

$$BW_{CHAN} = F1_H - F1_L$$

• Calculate the Hopping Frequency Separation (FHS) using the formula below. This value shall be recorded in the report.

$$F_{HS} = F2_C - F1_C$$

• Compare the measured Hopping Frequency Separation with the limit defined in clause 4.3.1.5.3. In addition, for non-Adaptive Frequency Hopping equipment, the Hopping Frequency Separation shall be equal to or greater than Occupied Channel Bandwidth as defined in clause 4.3.1.8 or:

$$F_{HS} \geq \text{Occupied Channel Bandwidth}$$

• See figure 4:

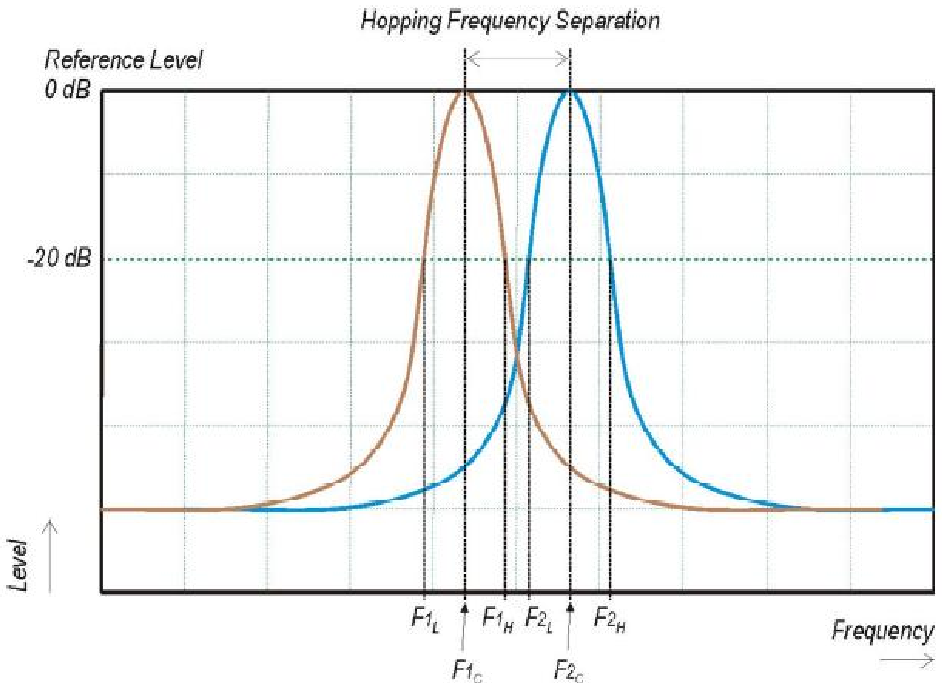


Figure 4: Hopping Frequency Separation

For adaptive equipment, in case of overlapping channels which will prevent the definition of the -20 dBr reference points $F1_H$ and $F2_L$, a higher reference level (e.g. -10 dBr or - 6 dBr) may be chosen to define the reference points $F1_L$; $F1_H$; $F2_L$ and $F2_H$.

Alternatively, special test software may be used to:

• force the UUT to hop or transmit on a single Hopping Frequency by which the -20 dBr reference points can be measured separately for the two adjacent Hopping Frequencies; and/or

• force the UUT to operate without modulation by which the centre frequencies F1C and F2C can be measured directly.

The method used to measure the Hopping Frequency Separation shall be documented in the test report.

8.4 Test Result

Condition	Packet	Frequency (MHz)	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Result
NVNT	1-DH5	2402	2401.984	2402.984	1.000	0.1	PASS
NVNT	1-DH5	2441	2440.990	2441.994	1.004	0.1	PASS
NVNT	1-DH5	2480	2479.979	2480.978	1.000	0.1	PASS
NVNT	2-DH5	2402	2401.976	2402.969	0.993	0.1	PASS
NVNT	2-DH5	2441	2440.999	2441.983	0.985	0.1	PASS
NVNT	2-DH5	2480	2479.984	2480.974	0.990	0.1	PASS
NVNT	3-DH5	2402	2401.995	2402.993	0.997	0.1	PASS
NVNT	3-DH5	2441	2440.979	2441.982	1.003	0.1	PASS
NVNT	3-DH5	2480	2479.994	2480.998	1.004	0.1	PASS

9. ADAPTIVITY (ADAPTIVE FREQUENCY HOPPING)

9.1 Limit

Adaptive Frequency Hopping using other forms of FHSS using LBT
Adaptive FHSS equipment using LBT shall comply with the following minimum set of requirements:
1) At the start of every dwell time, before transmission on a hopping frequency, the equipment shall perform a Clear Channel Assessment (CCA) check using energy detect. The CCA observation time shall be not less than 0,2 % of the Channel Occupancy Time with a minimum of 18 μs. If the equipment finds the hopping frequency to be clear, it may transmit immediately.
2) If it is determined that a signal is present with a level above the detection threshold defined in step 5 the hopping frequency shall be marked as 'unavailable'. Then the equipment may jump to the next frequency in the hopping scheme even before the end of the dwell time, but in that case the 'unavailable' channel cannot be considered as being 'occupied' and shall be disregarded with respect to the requirement of the minimum number of hopping frequencies as defined in clause 4.3.1.4.3.2. Alternatively, the equipment can remain on the frequency during the remainder of the dwell time. However, if the equipment remains on the frequency with the intention to transmit, it shall perform an Extended CCA check in which the (unavailable) channel is observed for a random duration between the value defined for the CCA observation time in step 1 and 5 % of the Channel Occupancy Time defined in step 3. If the Extended CCA check has determined the frequency to be no longer occupied, the hopping frequency becomes available again. If the Extended CCA time has determined the channel still to be occupied, it shall perform new Extended CCA checks until the channel is no longer occupied.
3) The total time during which an equipment has transmissions on a given hopping frequency without re evaluating the availability of that frequency is defined as the Channel Occupancy Time. The Channel Occupancy Time for a given hopping frequency, which starts immediately after a successful CCA, shall be less than 60 ms followed by an Idle Period of minimum 5 % of the Channel Occupancy Time with a minimum of 100 μs. After the Idle Period has expired, the procedure as in step 1 shall be repeated before having new transmissions on this hopping frequency during the same dwell time. EXAMPLE: An equipment with a dwell time of 400 ms can have 6 transmission sequences of 60 ms each, separated with an Idle Period of 3 ms. Each transmission sequence was preceded with a successful CCA check of 120 μs.
For LBT based adaptive FHSS equipment with a dwell time < 60 ms, the maximum Channel Occupancy Time is limited by the dwell time.
4) 'Unavailable' channels may be removed from or may remain in the Hopping Sequence, but in any case:
- apart from Short Control Signalling Transmissions referred to in clause 4.3.1.7.4, there shall be no transmissions on 'unavailable' channels;
- a minimum of N hopping frequencies as defined in clause 4.3.1.4.3.2 shall always be maintained.
5) The detection threshold shall be proportional to the transmit power of the transmitter: for a 20 dBm e.i.r.p. transmitter the detection threshold level (TL) shall be equal to or less than -70 dBm/MHz at the input to the receiver assuming a 0 dBi (receive) antenna assembly. This threshold level (TL) may be corrected for the (receive) antenna assembly gain (G); however, beamforming gain (Y) shall not be taken into account. For power levels less than 20 dBm e.i.r.p., the detection threshold level may be relaxed to:

TL = -70 dBm/MHz + 10 × log10 (100 mW / Pout) (Pout in mW e.i.r.p.)

6) The equipment shall comply with the requirements defined in step 1 to step 4 of the present clause in the presence of an unwanted CW signal as defined in table 2.

Table 2: Unwanted Signal parameters

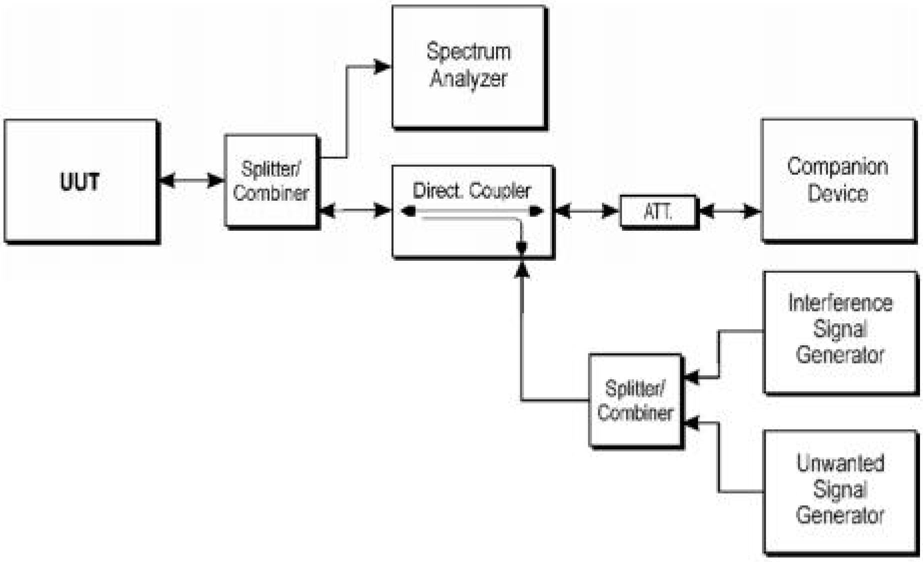
Wanted signal mean power from companion device	Unwanted CW signal frequency (MHz)	Unwanted CW signal power (dBm)
sufficient to maintain the link (see note 2)	2 395 or 2 488,5 (see note 1)	-35 (see note 3)
NOTE 1: The highest frequency shall be used for testing operating channels within the range 2 400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483,5 MHz. See clause 5.4.6.1. NOTE 2: A typical conducted value which can be used in most cases is -50 dBm/MHz. NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna.		

Note 2: The UUT is assumed to stop transmissions within a period equal to the maximum Channel Occupancy Time.

9.2 Test conditions

See ETSI EN 300 328 V2.2.2 Clause 5.4.6.1.

9.3 Test procedure



Interference and blocking signals are emulated by using a modulated signal and a continuous wave (CW) respectively, generated by the vector signal generator (VSG) and the continuous wave generator.

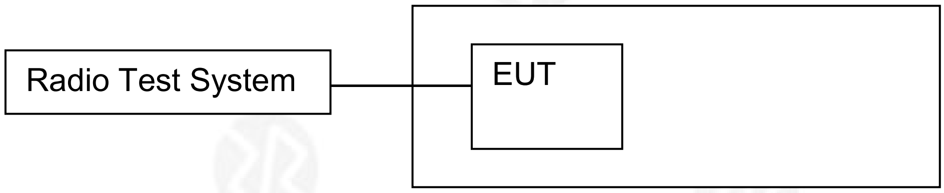
9.4 Test Result

N/A

Remark: this requirement does not apply for equipment when operating in a mode where the RF Output power is less than 10 dBm e.i.r.p.

10. OCCUPIED CHANNEL BANDWIDTH

10.1 Block Diagram Of Test Setup



10.2 Limit

The Occupied Channel Bandwidth shall fall completely within the band given in 2.4GHz to 2.4835GHz.
In addition, for non-adaptive systems using wide band modulations other than FHSS and with e.i.r.p greater than 10 dBm, the occupied channel bandwidth shall be less than 20 MHz.

10.3 Test procedure

Step 1:

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

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

Step 2:

Wait for the trace to stabilize.

Find the peak value of the trace and place the analyser marker on this peak.

Step 3:

Use the 99 % bandwidth function of the spectrum analyser to measure the Occupied Channel Bandwidth of the UUT.

This value shall be recorded.

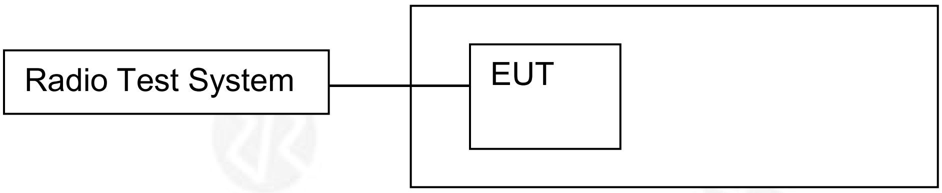
NOTE: Make sure that the power envelope is sufficiently above the noise floor of the analyser to avoid the noise signals left and right from the power envelope being taken into account by this measurement.

10.4 Test Result

Condition	Modulation	Packet Type	Frequency (MHz)	Frequency Range (MHz)		Limit (MHz)	Channel Bandwidth (MHz)
NVNT	GFSK	1-DH5	2402	2401.444	/	>2400	0.8851
			2480	/	2480.502	<2483.50	0.8988
NVNT	π/4-DQPSK	2-DH5	2402	2401.246	/	>2400	1.3489
			2480	/	2480.629	<2483.50	1.3854
NVNT	8-DPSK	3-DH5	2402	2401.393	/	>2400	1.3658
			2480	/	2480.733	<2483.50	1.3887

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

11.1 Block Diagram Of Test Setup



11.2 Limit

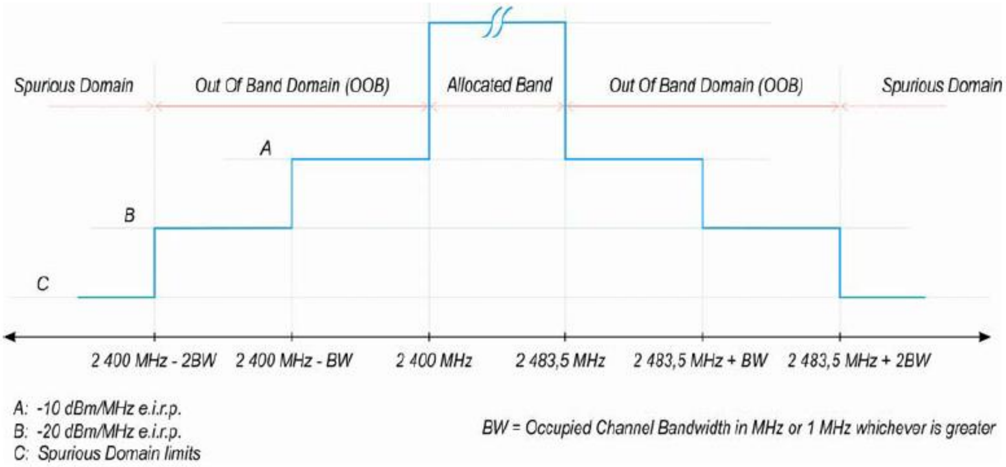


Figure 3: Transmit mask

11.3 Test procedure

The applicable mask is defined by the measurement results from the tests performed under clause 5.3.8 (Occupied Channel Bandwidth).

The test procedure is further as described under clause 5.3.9.2.1.

The Out-of-band emissions within the different horizontal segments of the mask provided in figures 1 and 3 shall be measured using the steps below. This method assumes the spectrum analyser is equipped with the Time Domain Power option.

Step 1:

• Connect the UUT to the spectrum analyser 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

NOTE 1: 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

Step 2 (segment 2 483,5 MHz to 2 483,5 MHz + BW):

• Adjust the trigger level to select the transmissions with the highest power level.

• For frequency hopping equipment operating in a normal hopping mode, the different hops will result in signal bursts with different power levels. In this case the burst with the highest power level shall be selected.

• Set a window (start and stop lines) to match with the start and end of the burst and in which the RMS power shall be measured using the Time Domain Power function.

• Select RMS power to be measured within the selected window and note the result which is the RMS power within this 1 MHz segment (2 483,5 MHz to 2 484,5 MHz). Compare this value with the applicable limit provided by the mask.

• Increase the centre frequency in steps of 1 MHz and repeat this measurement for every 1 MHz segment within the range 2 483,5 MHz to 2 483,5 MHz + BW. The centre frequency of the last 1 MHz segment shall be set to 2 483,5 MHz + BW - 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).

Step 3 (segment 2 483,5 MHz + BW to 2 483,5 MHz + 2BW):

• Change the centre frequency of the analyser to 2 484 MHz + BW and perform the measurement for the first 1 MHz segment within range 2 483,5 MHz + BW to 2 483,5 MHz + 2BW. Increase the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 483,5 MHz + 2 BW - 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).

Step 4 (segment 2 400 MHz - BW to 2 400 MHz):

• Change the centre frequency of the analyser to 2 399,5 MHz and perform the measurement for the first 1 MHz segment within range 2 400 MHz - BW to 2 400 MHz Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - BW + 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).

Step 5 (segment 2 400 MHz - 2BW to 2 400 MHz - BW):

• Change the centre frequency of the analyser to 2 399,5 MHz - BW and perform the measurement for the first 1 MHz segment within range 2 400 MHz - 2BW to 2 400 MHz - BW. Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - 2BW + 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).

Step 6:

• In case of conducted measurements on equipment with a single transmit chain, the declared antenna assembly gain "G" in dBi shall be added to the results for each of the 1 MHz segments and compared with the limits

provided by the mask given in figure 1 or figure 3. If more than one antenna assembly is intended for this power setting, the antenna with the highest gain shall be considered.

• In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), the measurements need to be repeated for each of the active transmit chains. The declared antenna assembly gain "G" in dBi for a single antenna shall be added to these results. If more than one antenna assembly is intended for this power setting, the antenna with the highest gain shall be considered. Comparison with the applicable limits shall be done using any of the options given below:

- Option 1: the results for each of the transmit chains for the corresponding 1 MHz segments shall be added. The additional beamforming gain "Y" in dB shall be added as well and the resulting values compared with the limits provided by the mask given in figure 1 or figure 3.

- Option 2: the limits provided by the mask given in figure 1 or figure 3 shall be reduced by

10 × log10(Ach) and the additional beamforming gain "Y" in dB. The results for each of the transmit chains shall be individually compared with these reduced limits.

NOTE 2: Ach refers to the number of active transmit chains.

It shall be recorded whether the equipment complies with the mask provided in figure 1 or figure 3.

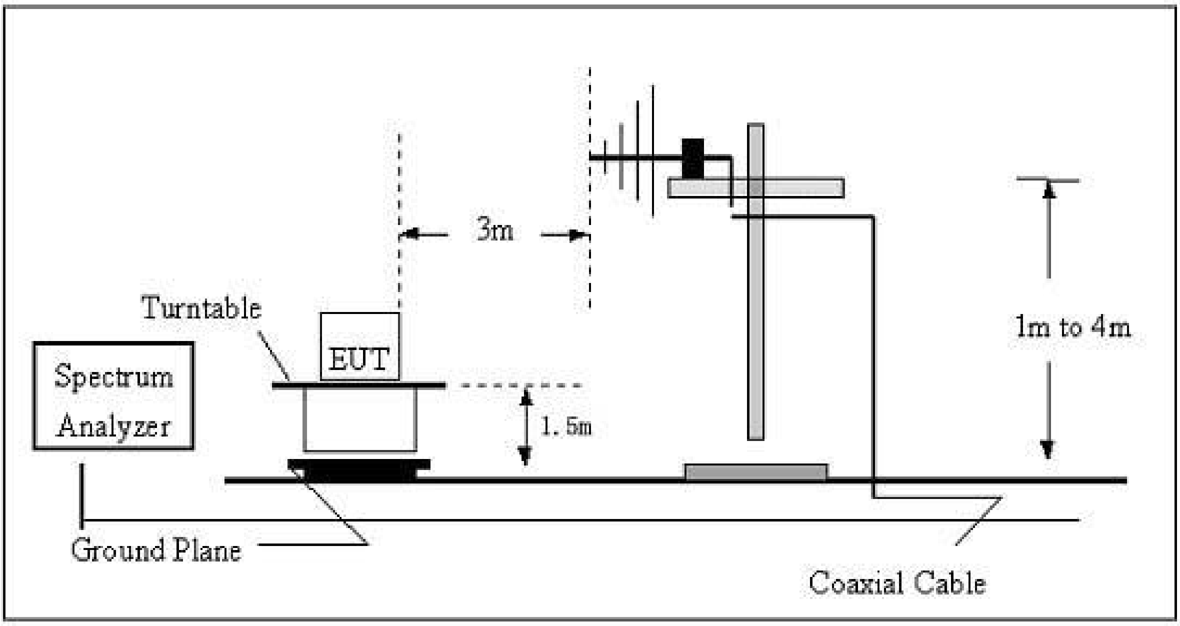
11.4 Test Result

Condition	Mode	Frequency (MHz)	OOB Frequency (MHz)	Level (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	Verdict
NVNT	1-DH5	Hopping	2399.5	-66.05	-10.00	-56.05	Pass
NVNT	1-DH5	Hopping	2398.5	-56.76	-20.00	-36.76	Pass
NVNT	1-DH5	Hopping	2484	-56.03	-10.00	-46.03	Pass
NVNT	1-DH5	Hopping	2485	-55.80	-20.00	-35.80	Pass
NVNT	1-DH5	Hopping	2399.5	-56.50	-10.00	-46.50	Pass
NVNT	1-DH5	Hopping	2398.5	-51.73	-20.00	-31.73	Pass
NVNT	1-DH5	Hopping	2484	-56.75	-10.00	-46.75	Pass
NVNT	1-DH5	Hopping	2485	-66.63	-20.00	-46.63	Pass
NVNT	2-DH5	Hopping	2399.5	-53.86	-10.00	-43.86	Pass
NVNT	2-DH5	Hopping	2398.5	-69.66	-20.00	-49.66	Pass
NVNT	2-DH5	Hopping	2484	-55.13	-10.00	-45.13	Pass
NVNT	2-DH5	Hopping	2485	-65.18	-20.00	-45.18	Pass
NVNT	2-DH5	Hopping	2399.5	-53.32	-10.00	-43.32	Pass
NVNT	2-DH5	Hopping	2398.5	-68.21	-20.00	-48.21	Pass
NVNT	2-DH5	Hopping	2484	-59.34	-10.00	-49.34	Pass
NVNT	2-DH5	Hopping	2485	-60.01	-20.00	-40.01	Pass
NVNT	3-DH5	Hopping	2399.5	-57.60	-10.00	-47.60	Pass
NVNT	3-DH5	Hopping	2398.5	-52.11	-20.00	-32.11	Pass
NVNT	3-DH5	Hopping	2484	-55.32	-10.00	-45.32	Pass
NVNT	3-DH5	Hopping	2485	-50.93	-20.00	-30.93	Pass
NVNT	3-DH5	Hopping	2399.5	-58.98	-10.00	-48.98	Pass
NVNT	3-DH5	Hopping	2398.5	-57.59	-20.00	-37.59	Pass
NVNT	3-DH5	Hopping	2484	-55.53	-10.00	-45.53	Pass
NVNT	3-DH5	Hopping	2485	-67.69	-20.00	-47.69	Pass

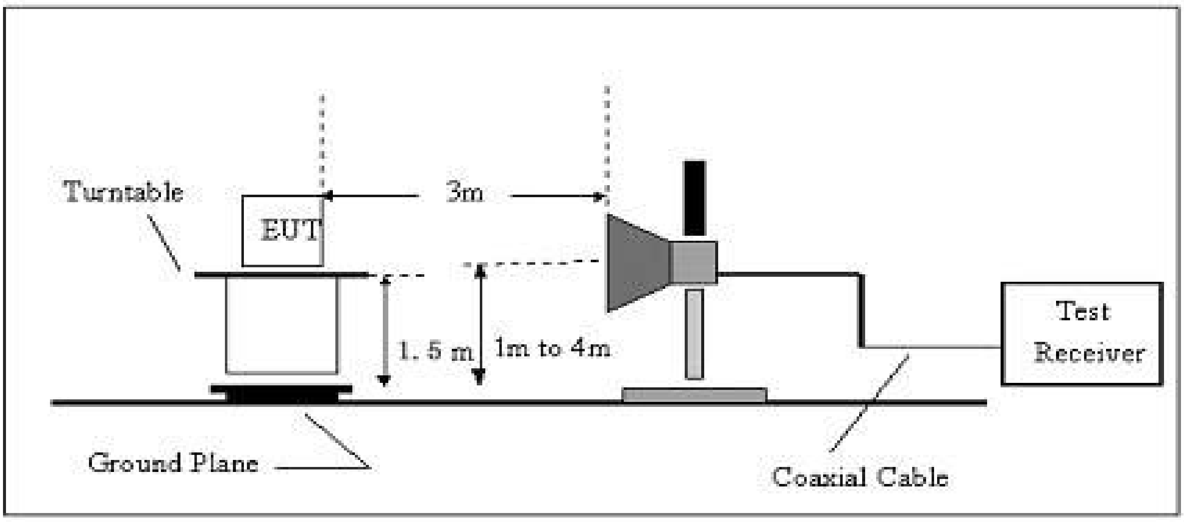
12. TRANSMITTER UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN

12.1 Block Diagram Of Test Setup (Radiated)

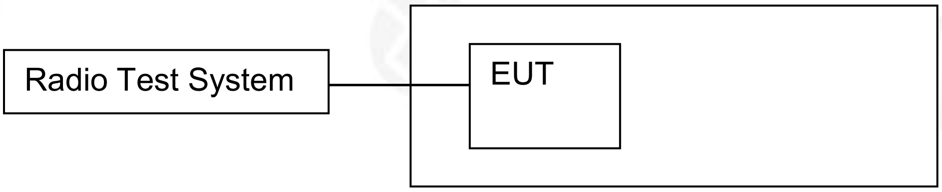
(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



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



Block Diagram Of Test Setup (Conducted)



12.2 Limits

Frequency range	Maximum power, e.r.p. (≤ 1 GHz) e.i.r.p. (> 1 GHz)	RBW/VBW
30 MHz to 47 MHz	-36 dBm	100 kHz/300KHz
47 MHz to 74 MHz	-54 dBm	100 kHz/300KHz
74 MHz to 87,5 MHz	-36 dBm	100 kHz/300KHz
87,5 MHz to 118 MHz	-54 dBm	100 kHz/300KHz
118 MHz to 174 MHz	-36 dBm	100 kHz/300KHz
174 MHz to 230 MHz	-54 dBm	100 kHz/300KHz
230 MHz to 470 MHz	-36 dBm	100 kHz/300KHz
470 MHz to 862 MHz	-54 dBm	100 kHz/300KHz
862 MHz to 1 GHz	-36 dBm	100 kHz/300KHz
1 GHz to 12,75 GHz	-30 dBm	1 MHz/3MHz

12.3 Test Procedure

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	

30MHz ~ 1GHz:

a. The Product was placed on the nonconductive turntable 1.5m above the ground in a full anechoic chamber.

b. Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 120 kHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied between 1~4 m in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.

c. For each frequency whose maximum record was higher or close to limit, measure its QP value: vary the antenna's height and rotate the turntable from 0 to 360 degrees to find the height and degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to QP Detector and specified bandwidth with Maximum Hold Mode, and record the maximum value.

Above 1GHz:

a. The Product was placed on the non-conductive turntable 1.5 m above the ground in a full anechoic chamber..

b. Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 1MHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.

c. For each frequency whose maximum record was higher or close to limit, measure its AV value: rotate the turntable from 0 to 360 degrees to find the degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to AV value and specified bandwidth with Maximum Hold Mode, and record the maximum value.

12.4 Test Results

Radiated Transmitter unwanted emissions:

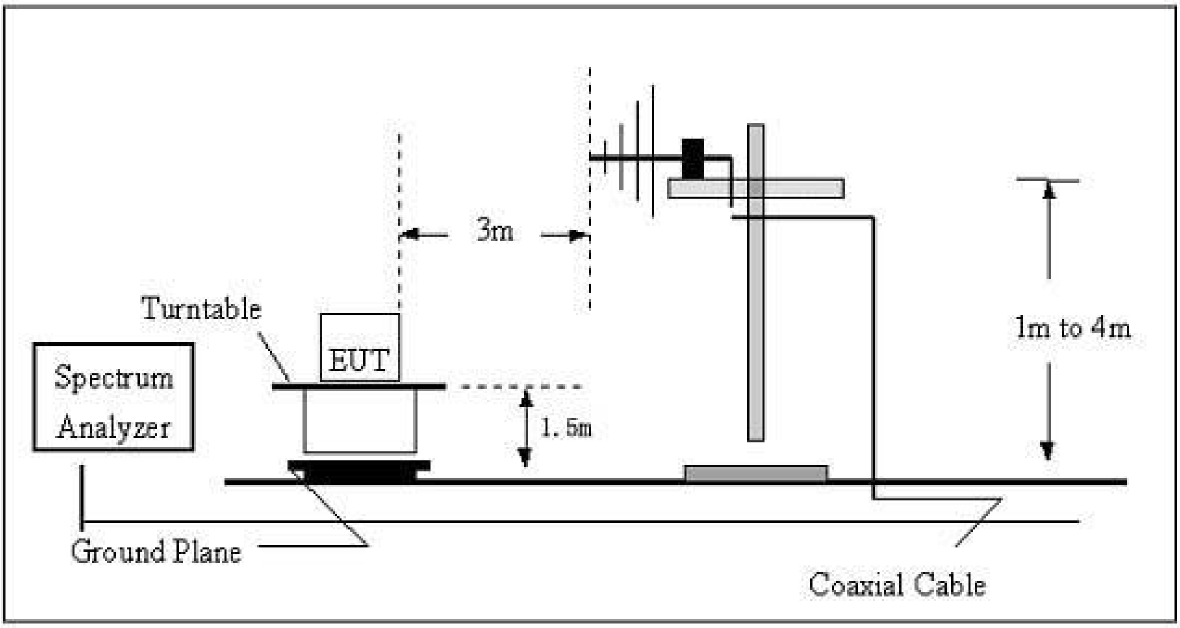
Temperature:	25°C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage :	DC 3.7V

Frequency	Receiver Reading	Turn table Angle	Antenna		Substituted	Absolute Level	Result	
			Height	Polar	Factor		Limit	Margin
(MHz)	(dBm)	Degree	(m)	(H/V)	(dB)	(dBm)	(dBm)	(dB)
GFSK Low channel								
562.203	-56.85	23	1.9	H	-9.59	-66.44	-54.00	-12.44
562.223	-48.04	273	1.7	V	-9.59	-57.63	-54.00	-3.63
4804.033	-48.47	195	1.1	H	-0.12	-48.59	-30.00	-18.59
4804.302	-56.90	68	1.6	V	-0.12	-57.02	-30.00	-27.02
7206.237	-55.98	78	1.9	H	0.55	-55.43	-30.00	-25.43
7206.415	-56.22	302	1.7	V	0.55	-55.67	-30.00	-25.67
GFSK Mid channel								
562.350	-55.46	230	1.7	H	-9.59	-65.05	-54.00	-11.05
562.477	-56.07	306	1.9	V	-9.59	-65.66	-54.00	-11.66
4882.443	-48.76	98	1.4	H	-0.12	-48.88	-30.00	-18.88
4882.531	-48.09	175	1.8	V	-0.12	-48.21	-30.00	-18.21
7323.012	-57.13	119	1.4	H	0.55	-56.58	-30.00	-26.58
7323.278	-56.67	168	1.9	V	0.55	-56.12	-30.00	-26.12
GFSK High channel								
562.273	-55.97	278	2	H	-9.59	-65.56	-54.00	-11.56
562.428	-56.16	204	2	V	-9.59	-65.75	-54.00	-11.75
4960.255	-49.33	286	1.7	H	-0.12	-49.45	-30.00	-19.45
4960.077	-48.31	198	1.3	V	-0.12	-48.43	-30.00	-18.43
7440.022	-57.83	59	1.8	H	0.55	-57.28	-30.00	-27.28
7440.023	-56.34	335	1.6	V	0.55	-55.79	-30.00	-25.79
Remark: Absolute Level = Receiver Reading + Factor, Margin = Absolute Level - Limit. All modes passed the test and only the worst data -GFSK - was recorded.								

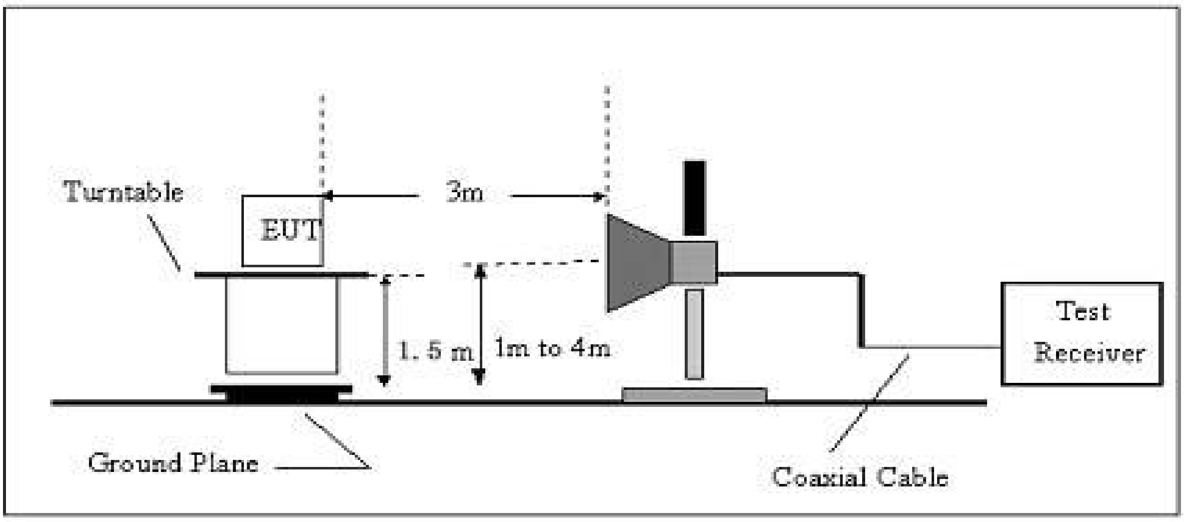
13.RECEIVER SPURIOUS EMISSIONS

13.1 Block Diagram Of Test Setup (Radiated)

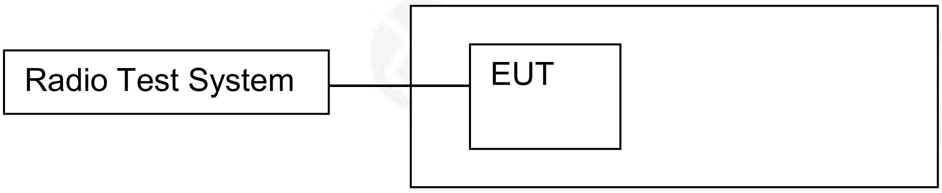
(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



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



Block Diagram Of Test Setup (Conducted)



13.2 Limits

Frequency(MHz)	Limit
30-1000	-57dBm
1000-12750	-47dBm

13.3 Test Procedure

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	

30MHz ~ 1GHz:

a. The Product was placed on the nonconductive turntable 1.5m above the ground in a full anechoic chamber.

b. Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 120 kHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied between 1~4 m in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.

c. For each frequency whose maximum record was higher or close to limit, measure its QP value: vary the antenna's height and rotate the turntable from 0 to 360 degrees to find the height and degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to QP Detector and specified bandwidth with Maximum Hold Mode, and record the maximum value.

Above 1GHz:

a. The Product was placed on the non-conductive turntable 1.5 m above the ground in a full anechoic chamber..

b. Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 1MHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.

c. For each frequency whose maximum record was higher or close to limit, measure its AV value: rotate the turntable from 0 to 360 degrees to find the degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to AV value and specified bandwidth with Maximum Hold Mode, and record the maximum value.

13.4 Test Results

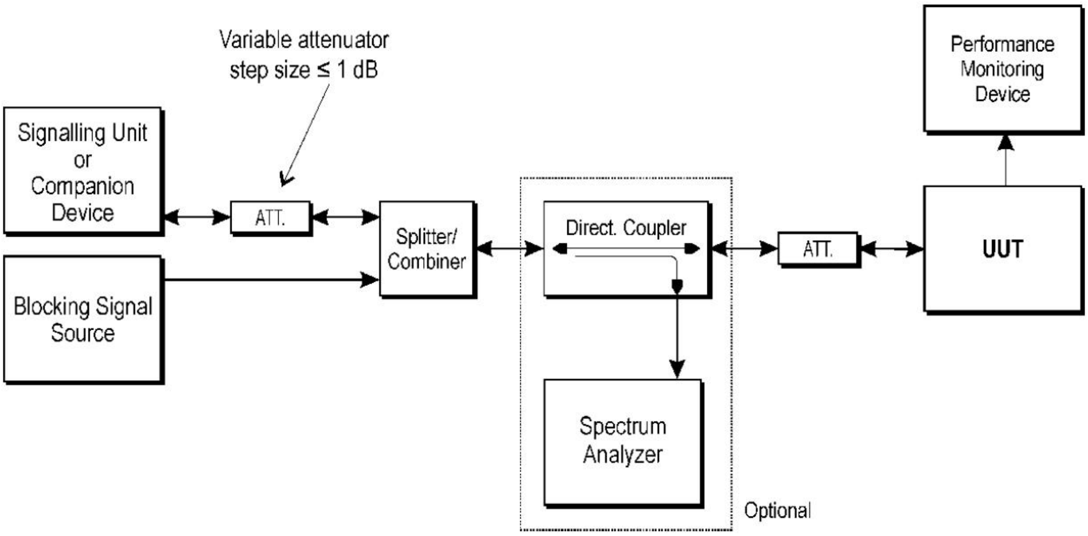
Radiated Receiver spurious emissions:

Temperature:	25°C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage :	DC 3.7V

Frequency	Receiver Reading	Turn table Angle	Antenna		Substituted	Absolute Level	Result	
			Height	Polar	Factor		Limit	Margin
(MHz)	(dBm)	Degree	(m)	(H/V)	(dB)	(dBm)	(dBm)	(dB)
GFSK Low channel								
570.775	-54.94	346	1.5	H	-9.64	-64.58	-54.00	-10.58
570.775	-54.33	90	1.1	V	-9.64	-63.97	-54.00	-9.97
3232.5	-60.72	309	1.3	H	1.41	-59.31	-47.00	-12.31
3232.5	-64.64	264	1.6	V	1.41	-63.23	-47.00	-16.23
8901.875	-69.30	346	1.5	H	15.44	-53.86	-47.00	-6.86
8901.875	-69.36	90	1.1	V	15.44	-53.92	-47.00	-6.92
GFSK Mid channel								
677.475	-55.14	222	1.6	H	-7.68	-62.82	-54.00	-8.82
677.475	-53.28	105	1.7	V	-7.68	-60.96	-54.00	-6.96
2263.125	-61.49	203	1.4	H	-0.12	-61.61	-47.00	-14.61
2263.125	-63.13	67	1.2	V	-0.12	-63.25	-47.00	-16.25
9695	-74.95	222	1.6	H	18.08	-56.87	-47.00	-9.87
9695	-73.53	105	1.7	V	18.08	-55.45	-47.00	-8.45
GFSK High channel								
531.975	-54.78	148	1.1	H	-10.73	-65.51	-54.00	-11.51
531.975	-52.44	333	1.3	V	-10.73	-63.17	-54.00	-9.17
9665.625	-68.65	18	1.6	H	17.98	-50.67	-47.00	-3.67
9665.625	-71.53	80	1.8	V	17.98	-53.55	-47.00	-6.55
11575	-72.95	148	1.1	H	20.23	-52.72	-47.00	-5.72
11575	-74.04	333	1.3	V	20.23	-53.81	-47.00	-6.81
Remark: Absolute Level = Receiver Reading + Factor, Margin = Absolute Level - Limit. All modes passed the test and only the worst data -GFSK - was recorded.								

14. RECEIVER BLOCKING

14.1 Block Diagram Of Test Setup



14.2 Limit

For equipment that supports a PER or FER test to be performed, the minimum performance criterion shall be a PER or FER less than or equal to 10 %.
While maintaining the minimum performance criteria as defined in clause 4.3.1.12.3, 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 6, table 7 or table 8.

Table 14: Receiver Blocking parameters for Receiver Category 1 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 4)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 4)	Type of blocking signal
(-133 dBm + 10 × $\log_{10}$(OCBW)) or -68 dBm whichever is less (see note 2)	2 380 2 504	-34	CW
(-139 dBm + 10 × $\log_{10}$(OCBW)) or -74 dBm whichever is less (see note 3)	2 300 2 330 2 360 2 524 2 584 2 674		

NOTE 1: OCBW is in Hz.
NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 26 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 20 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.
NOTE 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

Table 15: Receiver Blocking parameters receiver Category 2 equipment

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

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

Table 16: Receiver Blocking parameters receiver Category 3 equipment

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

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

14.3 Test procedure

Refer to ETSI EN 300 328 Clause 5.4.11.2.

14.4 Test Result

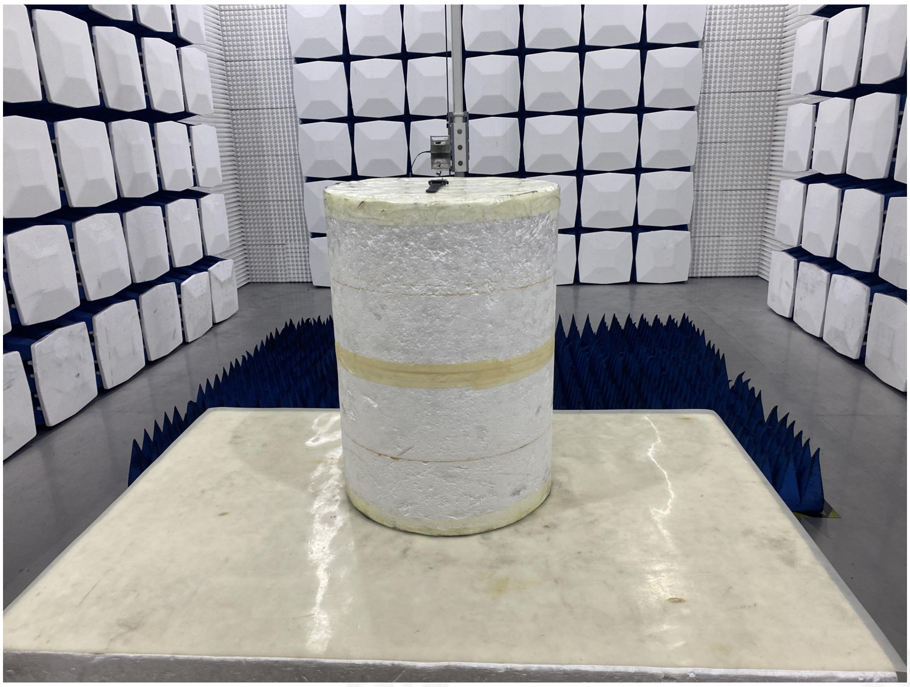
Temperature:	25°C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage :	DC 3.7V
Receiver Category:	2		

Test Mode	Test Channel (MHz)	Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	PER (%)	Limit (%)	Result
1-DH5	2480	-69.46	2380	-34	3.69	10	Pass
			2504		2.91	10	Pass
			2300		3.62	10	Pass
			2584		2.30	10	Pass
Note: The wanted signal mean power from the companion device and the blocking signal power level values are compensated with the declared antenna gain on table above.							

15. EUT TEST SETUP PHOTOGRAPHS

Radiated Emission Test Setup 1
30 MHz － 1 GHz (Transmitter tests)

Radiated Emission Test Setup 2
1 GHz － 12.75 GHz (Transmitter tests)



16. EUT PHOTOGRAPHS

Photo 1

Photo 2

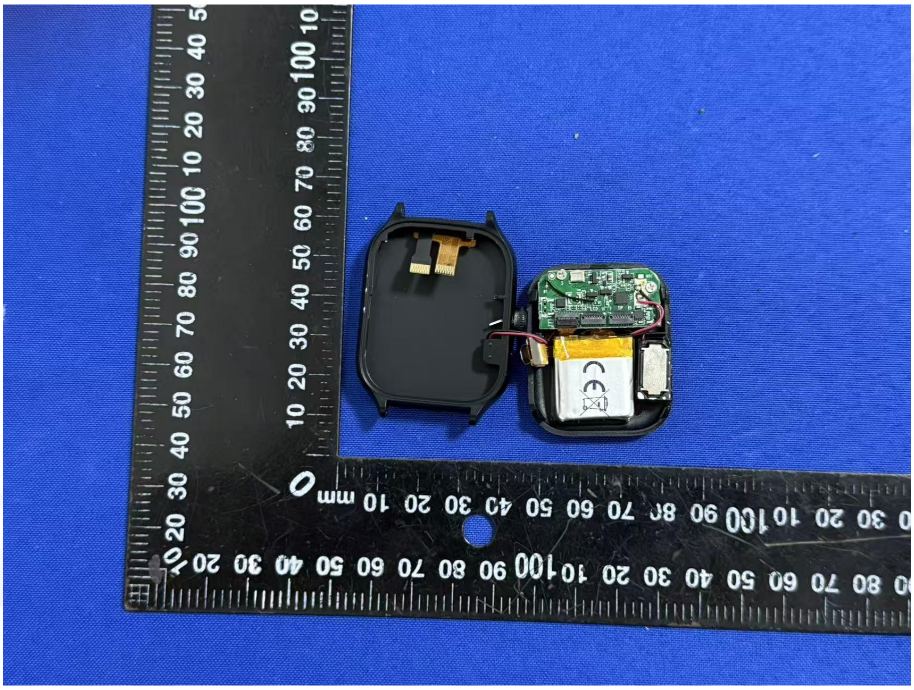


Photo 3

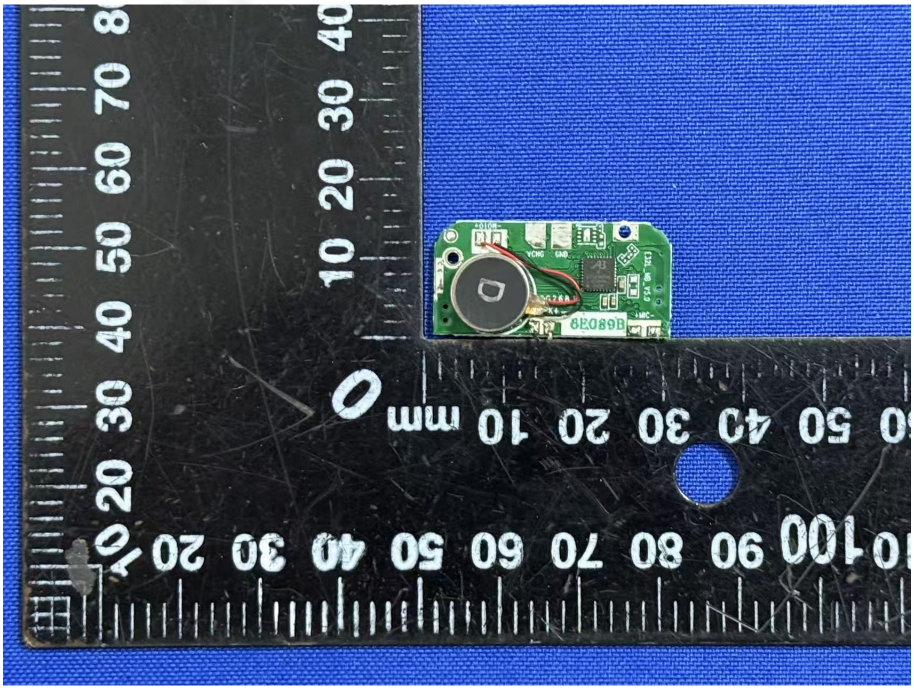


Photo 4

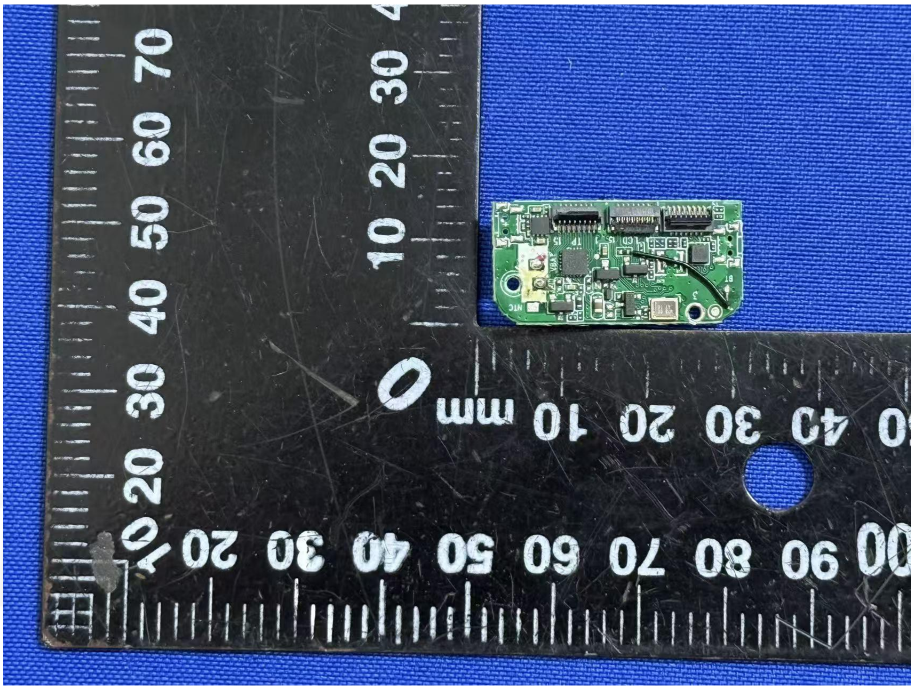


Photo 5

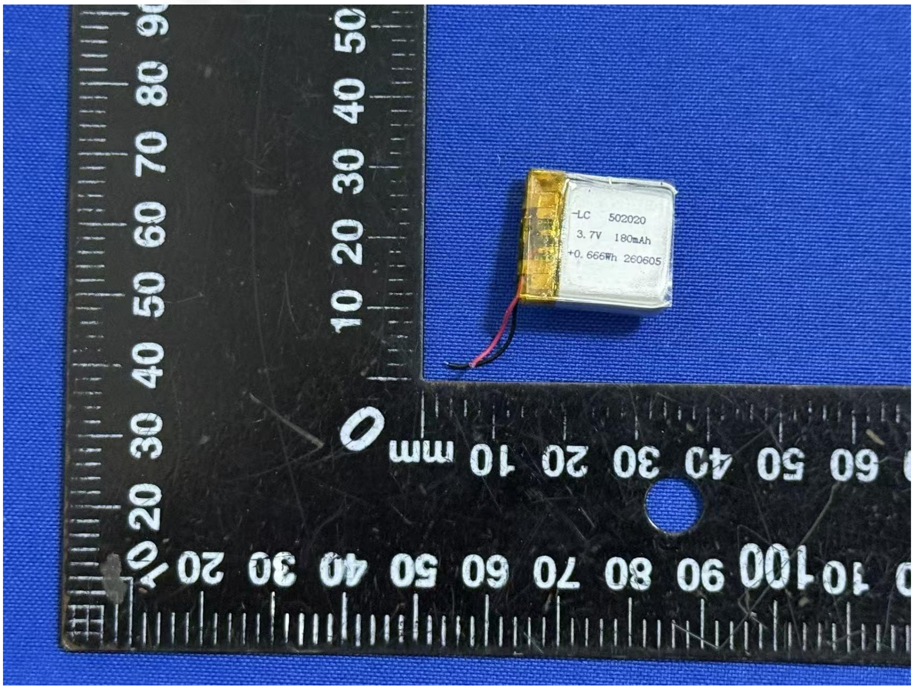


Photo 6

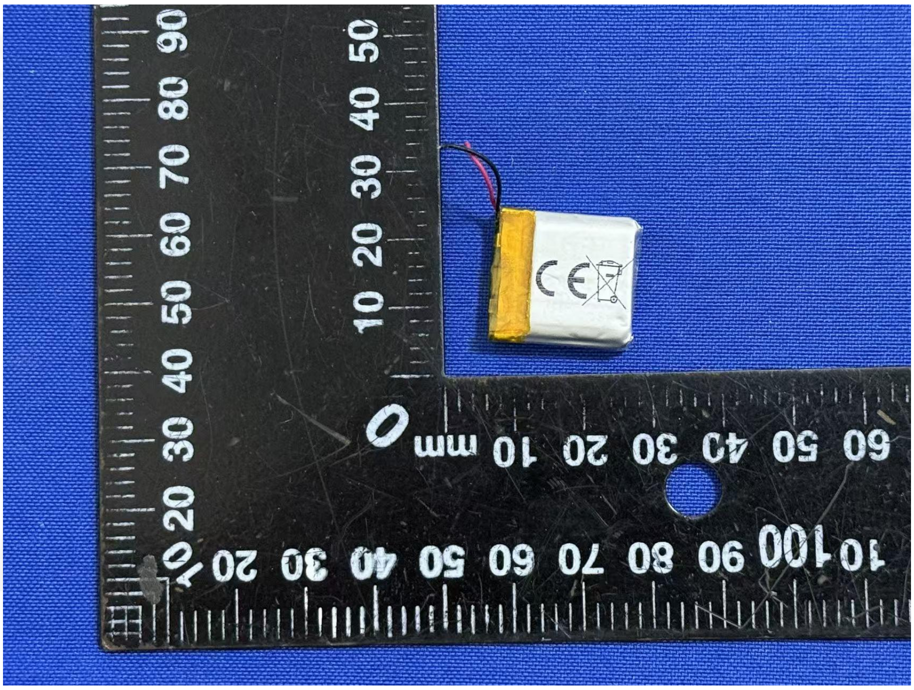


Photo 7

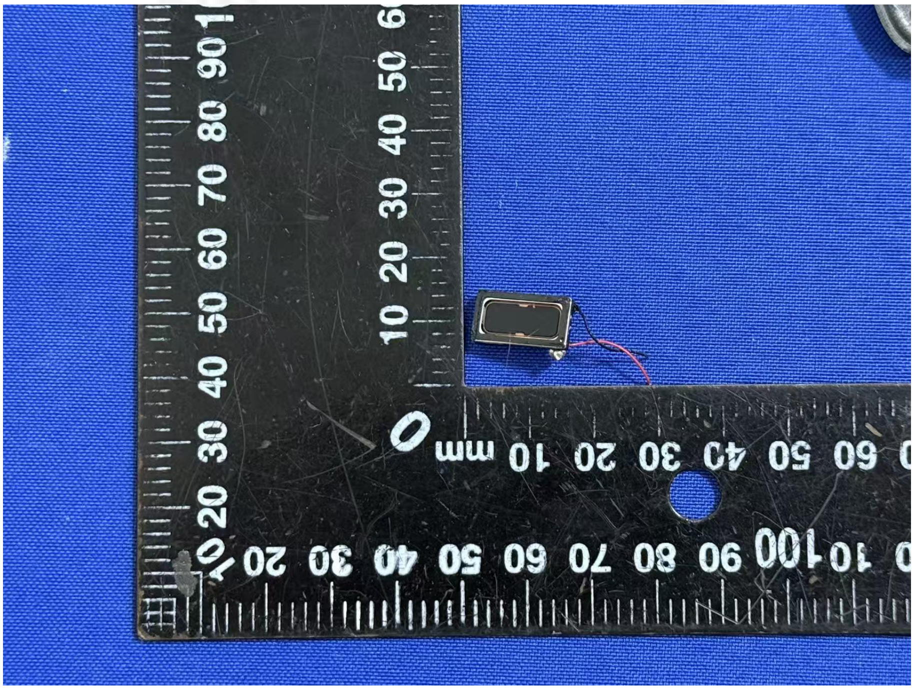


Photo 8

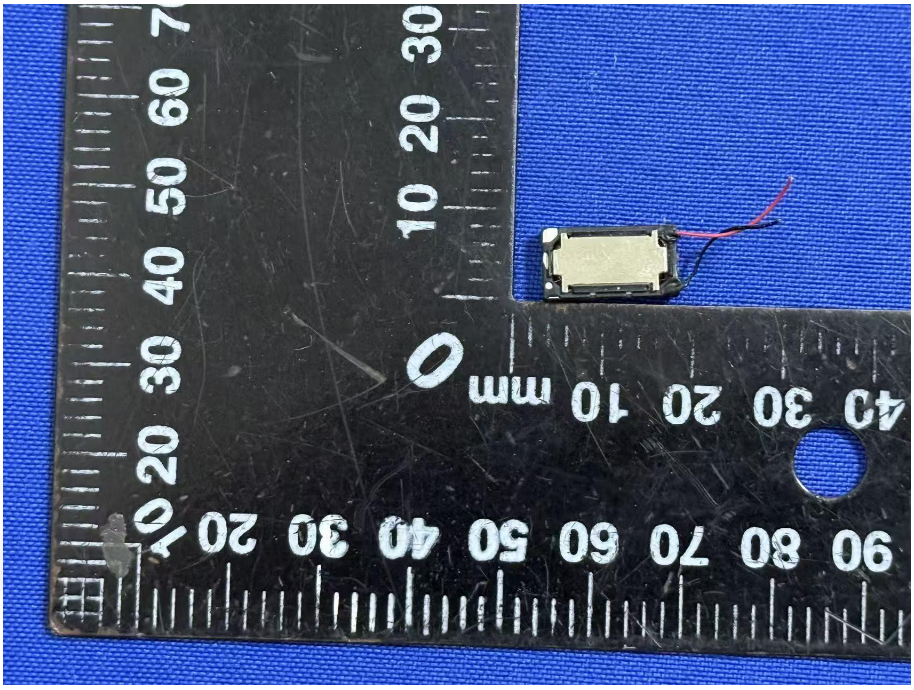


Photo 9

※※※※※ **END OF REPORT** ※※※※※

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

Report Number:	**ZKT-2607201209E-4**
Date of Test	Jul. 20, 2026 to Jul. 28, 2026
Date of issue:	Jul. 28, 2026
Total number of pages	44
Test Result:	PASS
Testing Laboratory:	**Shenzhen ZKT Technology Co., Ltd.**
Address:	1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China
Applicant's name:	**Mid Ocean Brands B.V.**
Address:	Unit 711 - 716, 7/F., Tower A, 83 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong.
Manufacturer's name:	**118897**
Address:	Shenzhen, Guangdong
Test specification:	
Standard:	ETSI EN 300 328 V2.2.2 (2019-07)
Test procedure:	/
Non-standard test method:	N/A
Test Report Form No.:	TRF-EL-120_V0
Test Report Form(s) Originator:	ZKT Testing
Master TRF:	Dated: 2020-01-06

This device described above has been tested by ZKT, and the test results show that the equipment under test (EUT) is in compliance with the 2014/53/EU RED Directive Art.3.1(b) requirements. And it is applicable only to the tested sample identified in the report.

This report shall not be reproduced except in full, without the written approval of ZKT, this document may be altered or revised by ZKT, personal only, and shall be noted in the revision of the document.

Product name:	**Smart watch**
Trademark:	N/A
Model/Type reference:	MO2271
Ratings:	Input: 5V⎓ 0.5A Battery: 3.7V, 180mAh, 0.666Wh

Testing procedure and testing location:

Testing Laboratory......................................:	**Shenzhen ZKT Technology Co., Ltd.**
Address.. :	1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China
Tested by (name + signature).......................:	Jomcat Cao Jomcat Cao
Reviewer (name + signature)...................... :	Jackson Fang Jackson Fang
Approved (name + signature)......................:	Lake Xie Lake Xie

Shenzhen ZKT Technology Co., Ltd. Approved

TABLE OF CONTENT

1. VERSION

Report No.	Issue Date	Description	Approved
ZKT-2607201209E-4	Jul. 28, 2026	Original	Valid

2. TEST SUMMARY

The Product has been tested according to the following specifications:

Standard	ETSI EN 300 328 V2.2.2		
Test Item	Test Requirement	Test Method	Results
Transmitter Parameters			
RF Output Power	Clause 4.3.2.2	Clause 5.4.2	PASS
Power Spectral Density	Clause 4.3.2.3	Clause 5.4.3	PASS
Duty cycle, Tx-Sequence, Tx-gap	Clause 4.3.2.4	Clause 5.4.4	N/A[1]
Medium Utilization (MU) factor	Clause 4.3.2.5	Clause 5.4.5	N/A[2]
Adaptivity (adaptive equipment using modulations other than FHSS)	Clause 4.3.2.6	Clause 5.4.6	N/A[3]
Occupied Channel Bandwidth	Clause 4.3.2.7	Clause 5.4.7	PASS
Transmitter unwanted emissions in the out-of-band domain	Clause 4.3.2.8	Clause 5.4.8	PASS
Transmitter unwanted emissions in the spurious domain	Clause 4.3.2.9	Clause 5.4.9	PASS
Receiver Parameters			
Receiver spurious emissions	Clause 4.3.2.10	Clause 5.4.10	PASS
Receiver Blocking	Clause 4.3.2.11	Clause 5.4.11	PASS
Geo-location capability	Clause 4.3.2.12	Clause 5.4.12	N/A[4]

Remark:
N/A[1]: Because these requirements apply to non-adaptive frequency hopping equipment mode and RF output power of greater than or equal to 10 dBm.
N/A[2]: Because these requirements apply to non-adaptive frequency hopping equipment mode and RF output power of greater than or equal to 10 dBm.
N/A[3]: Because these requirements apply to adaptive equipment mode and RF output power of greater than or equal to 10 dBm.
N/A[4]: Only for equipment with geo-location capability
Tx: In this whole report Tx (or tx) means Transmitter.
Rx: In this whole report Rx (or rx) means Receiver.
RF: In this whole report RF means Radiated Frequency.
CH:In this whole report CH means channel.

3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Uncertainty
1	3m camber Radiated spurious emission(9KHz-30MHz)	U=4.5dB
2	3m camber Radiated spurious emission(30MHz-1GHz)	U=4.8dB
3	3m chamber Radiated spurious emission(1GHz-6GHz)	U=4.9dB
4	3m chamber Radiated spurious emission(6GHz-40GHz)	U=5.0dB
5	Conducted disturbance	U=3.2dB
6	RF Band Edge	U=1.68dB
7	RF power conducted	U=1.86dB
8	RF conducted Spurious Emission	U=2.2dB
9	RF Occupied Bandwidth	U=1.8dB
10	RF Power Spectral Density	U=1.75dB
11	humidity uncertainty	U=5.3%
12	Temperature uncertainty	U=0.59℃

TEST FACILITY

Shenzhen ZKT Technology Co., Ltd.
Add. : 1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China

FCC Test Firm Registration Number: 927491
Designation Number: CN1431
IC Registered No.: 27033

4. PRODUCT INFORMATION AND TEST SETUP

4.1 Product Information

EUT Name	Smart watch
Model(s):	MO2271
Serial Model	N/A
Model Description:	N/A
Hardware Version:	N/A
Software Version:	N/A
Operation Frequency:	2402MHz-2480MHz
Max. EIRP:	4.52dBm
Type of Modulation:	GFSK
Antenna installation:	Chip Antenna
Antenna Gain:	0dBi
Ratings:	Input: 5V⎓ 0.5A
Battery capacity:	3.7V, 180mAh, 0.666Wh

4.2 Test Setup Configuration

See test photographs attached in EUT TEST SETUP Photographs for the actual connections between Product and support equipment.

4.3 Support Equipment

No.	Device Type	Brand	Model	Series No.	Note
1	--	--	--	--	--

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.4 Channel List

CH No.	Frequency (MHz)	CH No.	Frequency (MHz)	CH No.	Frequency (MHz)	CH No.	Frequency (MHz)
0	2402	1	2404	2	2406	3	2408
4	2410	5	2412	6	2414	7	2416
8	2418	9	2420	10	2422	11	2424
12	2426	13	2428	14	2430	15	2432
16	2434	17	2436	18	2438	19	2440
20	2442	21	2444	22	2446	23	2448
24	2450	25	2452	26	2454	27	2456
28	2458	29	2460	30	2462	31	2464
32	2466	33	2468	34	2470	35	2472
36	2474	37	2476	38	2478	39	2480

4.5 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test mode	Low channel	Middle channel	High channel
Transmitting(GFSK)	2402MHz	2440MHz	2480MHz
Receiving(GFSK)	2402MHz	2440MHz	2480MHz

4.6 Test Environment

Humidity(%):	55
Atmospheric Pressure(kPa):	101.1
Normal Voltage(DC)(V):	3.7
Normal Temperature(℃) :	25
Low Temperature(℃) :	0
High Temperature(℃) :	40

4.7 Test Instrument Used

Radiation Emissions & Radiation Spurious Emissions Test

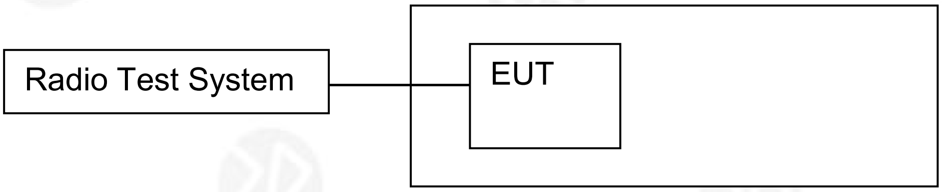
Item	Equipment	Manufacturer	Type No.	Serial No.	Firmware Version	Last calibration	Calibrated until
1	Spectrum Analyzer (9kHz-26.5GHz)	KEYSIGHT	N9020A	MY55370835	A.17.05	Sep. 20, 2025	Sep. 19, 2026
2	Spectrum Analyzer (10kHz-39.9GHz)	R&S	FSV40-N	100363	1.71 SP2	Sep. 20, 2025	Sep. 19, 2026
3	EMI Test Receiver (9kHz-7GHz)	R&S	ESCI7	100969	4.32	Oct. 24, 2025	Oct. 23, 2026
4	Bilog Antenna (30MHz-1500MHz)	Schwarzbeck	VULB9168	00877	N/A	Sep. 20, 2025	Sep. 19, 2026
5	Horn Antenna (1GHz-18GHz)	Agilent	AH-118	071145	N/A	Sep. 20, 2025	Sep. 19, 2026
6	Horn Antenna (15GHz-40GHz)	A.H.System	SAS-574	588	N/A	Sep. 30, 2025	Sep. 29, 2026
7	Loop Antenna	TESEQ	HLA6121	58357	N/A	Sep. 20, 2025	Sep. 19, 2026
8	Amplifier (30-1000MHz)	EM Electronics	EM330 Amplifier	60747	N/A	Sep. 19, 2025	Sep. 18, 2026
9	Amplifier (1GHz-26.5GHz)	HuiPu	8449B	3008A00315	N/A	Sep. 19, 2025	Sep. 18, 2026
10	Amplifier (500MHz-40GHz)	QuanJuDa	DLE-161	097	N/A	Oct. 24, 2025	Oct. 23, 2026
11	Test Cable	N/A	R-01	N/A	N/A	May 25, 2026	May 24, 2027
12	Test Cable	N/A	R-02	N/A	N/A	May 25, 2026	May 24, 2027
13	Test Cable	N/A	R-03	N/A	N/A	May 26, 2026	May 25, 2027
14	D.C. Power Supply	LongWei	TPR-6405D	N/A	N/A	\	\
15	EMC Software	Frad	EZ-EMC	Ver.EMC-CON 3A1.1	N/A	\	\
16	Turntable	MF	MF-7802BS	N/A	N/A	\	\
17	Antenna tower	MF	MF-7802BS	N/A	N/A	\	\

RF Conducted Test

Item	Equipment	Manufacturer	Type No.	Serial No.	Firmware Version	Last calibration	Calibrated until
1	Spectrum Analyzer (9kHz-26.5GHz)	KEYSIGHT	N9020A	MY55370835	A.17.05	Sep. 20, 2025	Sep. 19, 2026
2	Spectrum Analyzer (10kHz-39.9GHz)	R&S	FSV40-N	100363	1.71 SP2	Sep. 20, 2025	Sep. 19, 2026
3	Test Cable	N/A	RF-01	N/A	N/A	May 25, 2026	May 24, 2027
4	Test Cable	N/A	RF-02	N/A	N/A	May 25, 2026	May 24, 2027
5	Test Cable	N/A	RF-03	N/A	N/A	May 25, 2026	May 24, 2027
6	ESG Signal Generator	Agilent	E4421B	N/A	B.03.84	Sep. 19, 2025	Sep. 18, 2026
7	Signal Generator	Agilent	N5182A	N/A	A.01.87	Sep. 20, 2025	Sep. 19, 2026
8	Magnetic Field Probe Tester	Narda	ELT-400	0-0344/M-1752	N/A	Sep. 25, 2025	Sep. 24, 2026
9	SHIELD BOX	TESCOM	TC-5970C	5970C015553	N/A	Dec. 18, 2025	Dec. 17, 2026
10	Wideband Radio Communication Test	R&S	CMW500	106504	V 3.7.22	Sep. 28, 2025	Sep. 27, 2026
11	MWRF Power Meter Test system	MW	MW100-RFCB	N/A	N/A	Sep. 19, 2025	Sep. 18, 2026
12	D.C. Power Supply	LongWei	TPR-6405D	N/A	N/A	\	\
13	RF Software	MW	MTS8310	V2.0.0.0	N/A	\	\

5. RF OUTPUT POWER

5.1 Block Diagram Of Test Setup



5.2 Limit

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 5.3.1 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
20dBm

5.3 Test procedure

Step 1:

• Use a fast power sensor suitable for 2.4 GHz and capable of minimum 1 MS/s.
• Use the following settings:
- Sample speed 1 MS/s or faster.
- The samples shall represent the RMS power of the signal.
- Measurement duration: For non-adaptive equipment: equal to the observation period defined in 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) are captured.

NOTE 1: For adaptive equipment, to increase the measurement accuracy, a higher number of bursts may be used.

Step 2:

• For conducted measurements on devices with one transmit chain:
- Connect the power sensor to the transmit port, sample the transmit signal and store the raw data. Use these stored samples in all following steps.

• For conducted measurements on devices with multiple transmit chains:
- Connect one power sensor to each transmit port for a synchronous measurement on all transmit ports.
- Trigger the power sensors so that they start sampling at the same time. Make sure the time difference between the samples of all sensors is less than 500 ns.
- For each individual sampling point (time domain), sum the coincident power samples of all ports and store them. Use these summed samples in all following steps.

Step 3:

• Find the start and stop times of each burst in the stored measurement samples.
The start and stop times are defined as the points where the power is at least 30 dB below the highest value of the stored samples in step 2.

NOTE 2: In case of insufficient dynamic range, the value of 30 dB may need to be reduced appropriately.

Step 4:

• Between the start and stop times of each individual burst calculate the RMS power over the burst using the formula below. Save these Pburst 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

Step 5:

• The highest of all Pburst values (value "A" in dBm) will be used for maximum e.i.r.p. calculations.

Step 6:

• Add the (stated) antenna assembly gain "G" in dBi of the individual antenna.

• If applicable, add the additional beamforming gain "Y" in dB.

• If more than one antenna assembly is intended for this power setting, the maximum overall antenna gain (G or G + Y) shall be used.

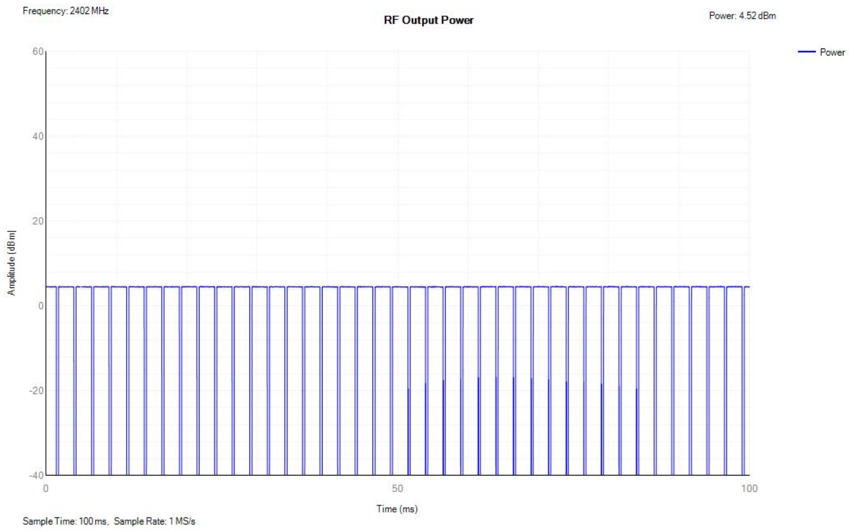
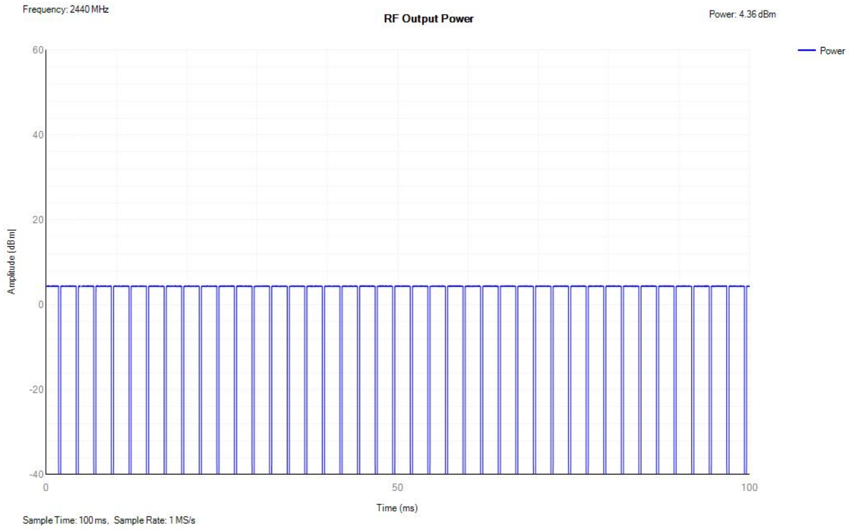
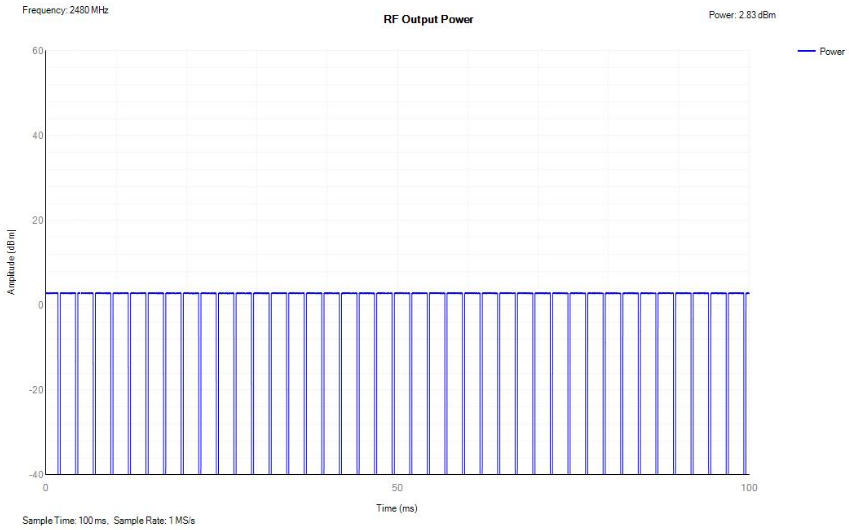
• The RF Output Power (P) shall be calculated using the formula below:

P = A + G + Y

• This value, which shall comply with the limit given in clause 4.3.1.2.3 or clause 4.3.2.2.3, shall be recorded in the test report.

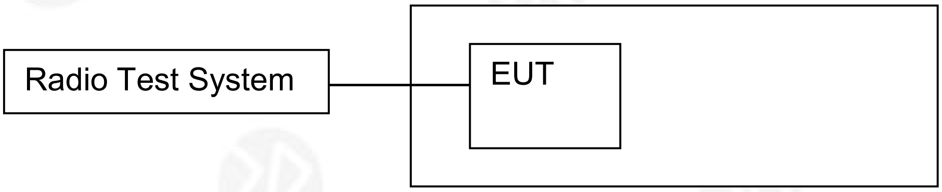
5.4 Test Result

Modulation	Test conditions		Channel (MHz)	Meas Duty Cycle (%)	Power (dBm)	
	Volt (Vdc)	Temp (°C)			Measured Conducted	EIRP
GFSK	3.7	25	2402	87.62	4.52	4.52
			2440	87.61	4.36	4.36
			2480	87.56	2.83	2.83
Limit					≤100mW (20dBm)	
Remark: EIRP = A + G + Y, G = 0dBi						

Test Channel	Test conditions - Normal
2402MHz	
2440MHz	
2480MHz	

6. POWER SPECTRAL DENSITY

6.1 Block Diagram Of Test Setup



6.2 Limit

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

Limit
10dBm/MHz

6.3 Test procedure

Step 1:

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

- Start Frequency: 2 400 MHz
- Stop Frequency: 2 483,5 MHz
- Resolution BW: 10 kHz
- Video BW: 30 kHz
- Sweep Points: > 8 350

NOTE: For spectrum analysers not supporting this number of sweep points, the frequency band may be segmented.

- Detector: RMS
- Trace Mode: Max Hold
- Sweep time: 10 s; the sweep time may be increased further until a value where the sweep time has no impact on the RMS value of the signal

For non-continuous signals, wait for the trace to stabilize.

Save the data (trace data) set to a file.

Step 2:

For conducted measurements on smart antenna systems using either operating mode 2 or operating mode 3 (see clause 5.1.3.2), repeat the measurement for each of the transmit ports. For each sampling point (frequency domain), add up the coincident power values (in mW) for the different transmit chains and use this as the new data set.

Step 3:

Add up the values for power for all the samples in the file using the formula below.

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

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

Step 4:

Normalize the individual values for power (in dBm) so that the sum is equal to the RF Output Power (e.i.r.p.) measured in clause 5.3.2 and save the corrected data. The following formulas can be used:

$$C_{Corr} = P_{Sum} - P_{e.i.r.p.}$$

$$P_{Samplecorr}(n) = P_{Sample}(n) - C_{Corr}$$

with 'n' being the actual sample number

Step 5:

Starting from the first sample PSamplecorr(n) (lowest frequency), add up the power (in mW) of the following samples representing a 1 MHz segment and record the results for power and position (i.e. sample #1 to sample #100). This is the Power Spectral Density (e.i.r.p.) for the first 1 MHz segment which shall be recorded.

Step 6:

Shift the start point of the samples added up in step 5 by one sample and repeat the procedure in step 5 (i.e. sample #2 to sample #101).

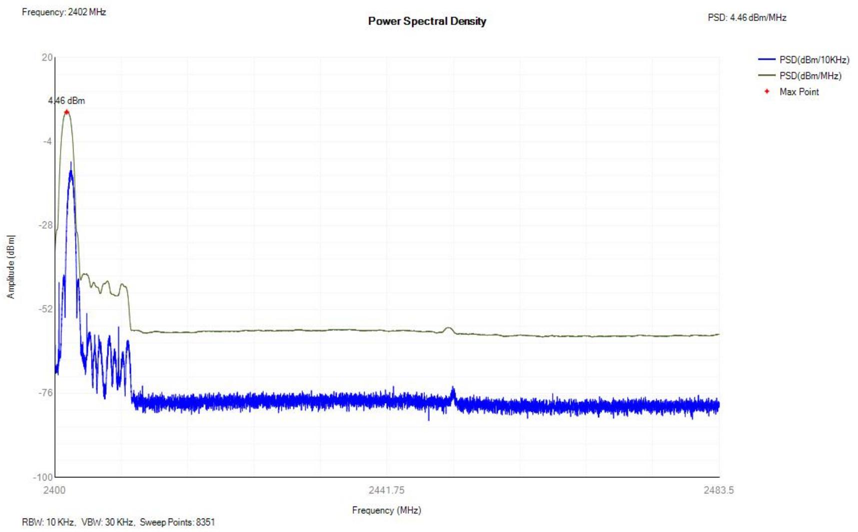
Step 7:

Repeat step 6 until the end of the data set and record the Power Spectral Density values for each of the 1 MHz segments.

From all the recorded results, the highest value is the maximum Power Spectral Density for the UUT. This value, which shall comply with the limit given in clause 4.3.2.3.3, shall be recorded in the test report.

6.4 Test Result

Modulation	Test conditions		Channel (MHz)	Maximum e.i.r.p. Spectral Density (dBm/MHz)	
	Volt (Vdc)	Temp (°C)		Measured value	Total value
GFSK	3.7	25	2402	4.46	4.46
			2440	4.3	4.3
			2480	2.77	2.77
Limit				≤100mW (20dBm)	
Remark: Total value = Measured value + Gain, Gain = 0dBi					

<table>
<tr><td>Low Channel</td><td>
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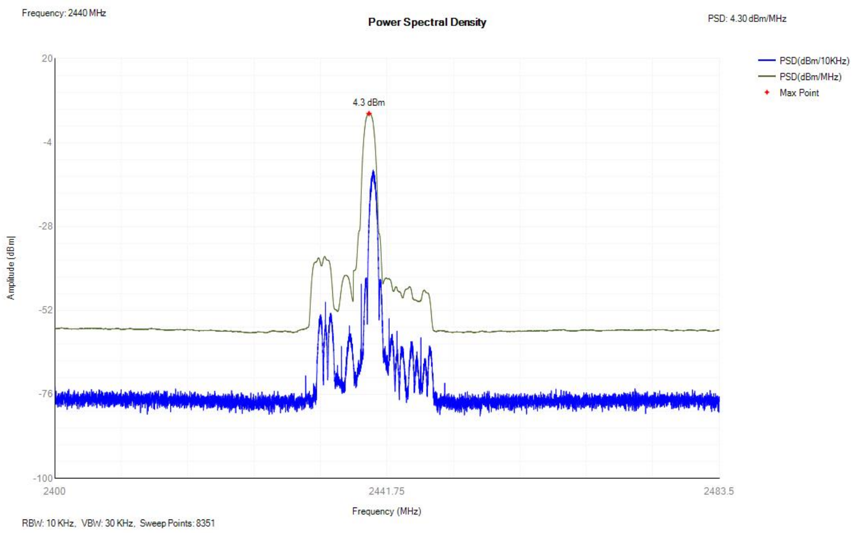
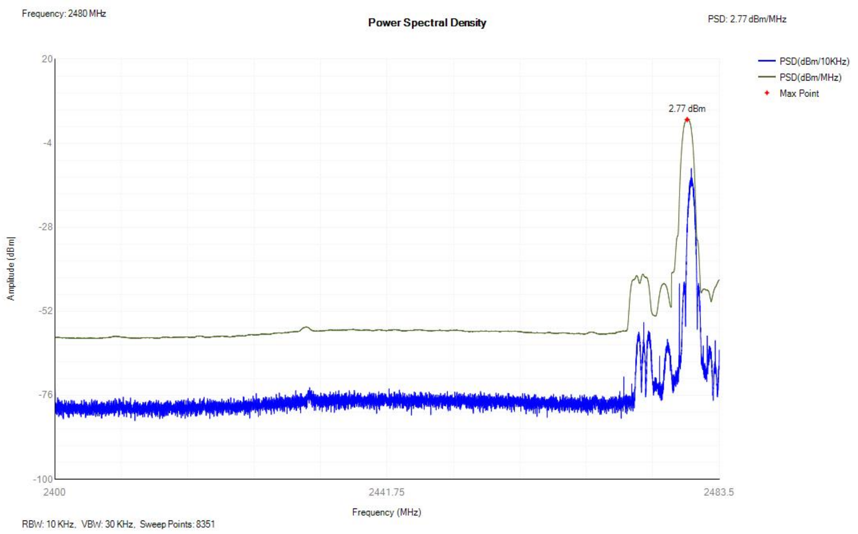
<tr><td>Mid Channel</td><td>
</td></tr>
<tr><td>High Channel</td><td>
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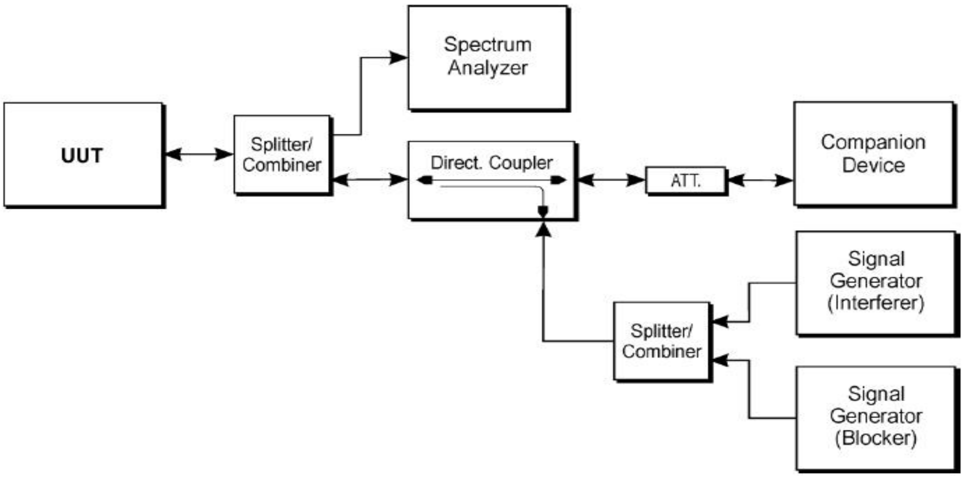
7. ADAPTIVITY

7.1 Block Diagram Of Test Setup



7.2 Limit

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

Non-LBT based Detect and Avoid:

1 The frequency shall remain unavailable for a minimum time equal to 1 second after which the channel maybe considered again as an 'available' channel;

2 COT ≤ 40 ms;

3 Idle Period = 5% of COT;

4 TL = -70 dBm/MHz + 10 × log10 (100 mW / Pout) (Pout in mW e.i.r.p.)

5 The equipment shall comply with the requirements defined in step 1 to step 4 of the present clause in the presence of an unwanted CW signal as defined in table 9.

Table 9: Unwanted Signal parameters

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

LBT based Detect and Avoid (Frame Based Equipment):

1 Minimum Clear Channel Assessment (CCA) time = 20 us;
2 CCA observation time declared by the supplier;
3 COT = 1~10 ms;
4 Idle Period = 5% of COT;
5 TL = -70 dBm/MHz + 10 × log10 (100 mW / Pout) (Pout in mW e.i.r.p.)
6 The equipment shall comply with the requirements defined in step 1 to step 4 in the present clause in the presence of an unwanted CW signal as defined in table 10.

Table 10: Unwanted Signal parameters

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

NOTE 1: The highest frequency shall be used for testing operating channels within the range 2 400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483,5 MHz. See clause 5.4.6.1.
NOTE 2: A typical conducted value which can be used in most cases is -50 dBm/MHz.
NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density in front of the UUT antenna.

LBT based Detect and Avoid (Load Based Equipment):

1 Minimum Clear Channel Assessment (CCA) time = 20 us;
2 CCA declared by the manufacturer;
3 COT ≤ (13 / 32) * q ms; q = [4~32]; 1.625ms~13ms;
4 TL = -70 dBm/MHz + 10 × log10 (100 mW / Pout) (Pout in mW e.i.r.p.)
5 The equipment shall comply with the requirements defined in step 1 to step 4 of the present clause in the presence of an unwanted CW signal as defined in table 11.

Table 11: Unwanted Signal parameters

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

NOTE 1: The highest frequency shall be used for testing operating channels within the range 2 400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483,5 MHz. See clause 5.4.6.1.
NOTE 2: A typical conducted value which can be used in most cases is -50 dBm/MHz.
NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna.

Short Control Signalling Transmissions:

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

7.3 Test procedure

Step 1:

The UUT may connect to a companion device during the test. The interference signal generator, the blocking signal generator, the spectrum analyser, the UUT and the companion device are connected using a set-up equivalent to the example given by figure 5 although the interference and blocking signal generator do not generate any signals at this point in time. The spectrum analyser is used to monitor the transmissions of the UUT in response to the interfering and the blocking signals.

Adjust the received signal level (wanted signal from the companion device) at the UUT to the value defined in table 6

The analyzer shall be set as follows:

- RBW: ⩾ Occupied Channel Bandwidth (if the analyser does not support this setting, the highest available setting shall be used)
- VBW: 3 × RBW (if the analyser does not support this setting, the highest available setting shall be used)
- Detector Mode: RMS
- Centre Frequency: Equal to the centre frequency of the operating channel
- Span: 0 Hz
- Sweep time: > Channel Occupancy Time of the UUT
- Trace Mode: Clear/Write
- Trigger Mode: Video

Step 2:

Configure the UUT for normal transmissions with a sufficiently high payload to allow demonstration of compliance of the adaptive mechanism on the channel being tested

Using the procedure defined in clause 5.3.7.2.1.4, it shall be verified that the UUT complies with the maximum Channel Occupancy Time and minimum Idle Period

Step 3: Adding the interference signal

A 100 % duty cycle interference signal is injected on the current operating channel of the UUT. This interference signal shall be a band limited noise signal which has a flat power spectral density, and shall have a bandwidth greater than the Occupied Channel Bandwidth of the UUT. The maximum ripple of this interfering signal shall be ±1,5 dB within the Occupied Channel Bandwidth and the power spectral density.

Step 4: Verification of reaction to the interference signal

The spectrum analyser shall be used to monitor the transmissions of the UUT on the selected operating channel with the interfering signal injected. This may require the spectrum analyser sweep to be triggered by the start of the interfering signal.

Using the procedure defined in clause 5.3.7.2.1.4, it shall be verified that:

The UUT shall stop transmissions on the current operating channel being tested.

Apart from Short Control Signalling Transmissions (see iii) below), there shall be no subsequent transmissions on this operating channel for a (silent) period defined in clause 4.3.2.5.1.2 step 2. After that, the UUT may have normal transmissions again for the duration of a single Channel Occupancy Time period. Because the interference signal is still present, another silent period as defined in clause 4.3.2.5.1.2 step 2 needs to be included. This sequence is repeated as long as the interfering signal is present.

The UUT may continue to have Short Control Signalling Transmissions on the operating channel while the interference signal is present. These transmissions shall comply with the limits

Alternatively, the equipment may switch to a non-adaptive mode

Step 5: Adding the blocking signal

With the interfering signal present, a 100 % duty cycle CW signal is inserted as the blocking signal

Repeat step 4 to verify that the UUT does not resume any normal transmissions

Step 6: Removing the interference and blocking signal

On removal of the interference and blocking signal the UUT is allowed to start transmissions again on this channel however, it shall be verified that this shall only be done after the period defined in clause 4.3.2.5.1.2 step 2.

Step 7:

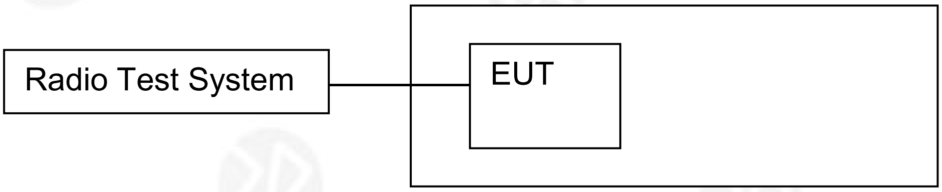
The steps 2 to 6 shall be repeated for each of the frequencies to be tested.

7.4 Test Result

Remark: this requirement does not apply for equipment when operating in a mode where the RF Output power is less than 10 dBm e.i.r.p.

8. OCCUPIED CHANNEL BANDWIDTH

8.1 Block Diagram Of Test Setup



8.2 Limit

The Occupied Channel Bandwidth shall fall completely within the band given in 2.4GHz to 2.4835GHz.
In addition, for non-adaptive systems using wide band modulations other than FHSS and with e.i.r.p greater than 10 dBm, the occupied channel bandwidth shall be less than 20 MHz.

8.3 Test procedure

Step 1:

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

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

Step 2:

Wait for the trace to stabilize.

Find the peak value of the trace and place the analyser marker on this peak.

Step 3:

Use the 99 % bandwidth function of the spectrum analyser to measure the Occupied Channel Bandwidth of the UUT.

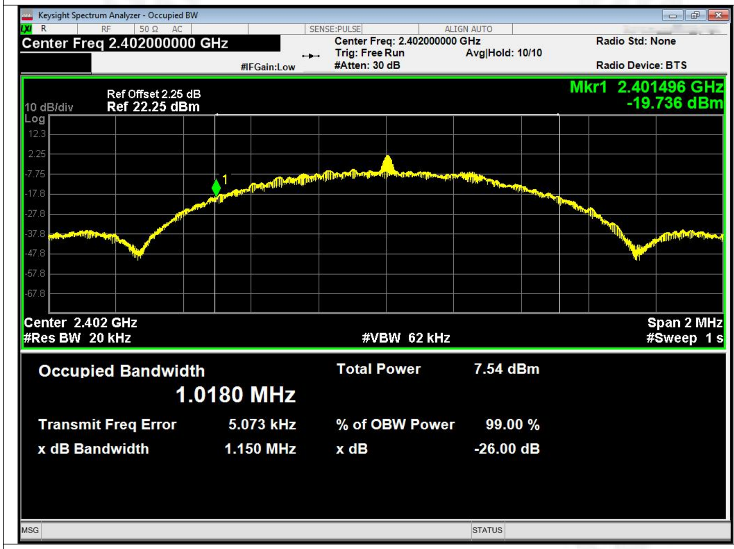
This value shall be recorded.

NOTE: Make sure that the power envelope is sufficiently above the noise floor of the analyser to avoid the noise signals left and right from the power envelope being taken into account by this measurement.

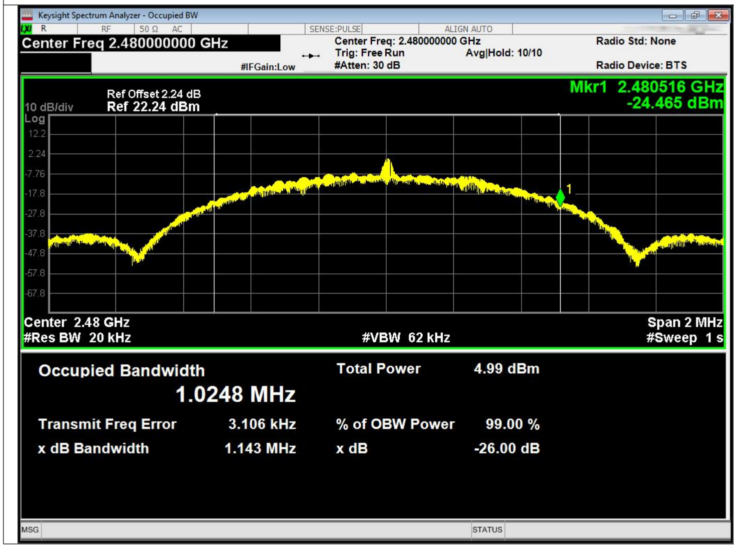
8.4 Test Result

Test conditions		Modulation	Frequency (MHz)	Frequency Range (MHz)		Limit (MHz)	Occupied Channel (MHz)
Volt (Vdc)	Temp (°C)						
3.7	25	GFSK	2402	2401.496	/	>2400	1.018
			2480	/	2480.516	<2483.5	1.025

OBW NVNT BLE 2402MHz

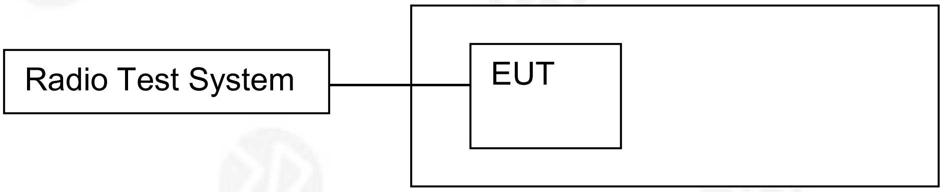


OBW NVNT BLE 2480MHz



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

9.1 Block Diagram Of Test Setup



9.2 Limit

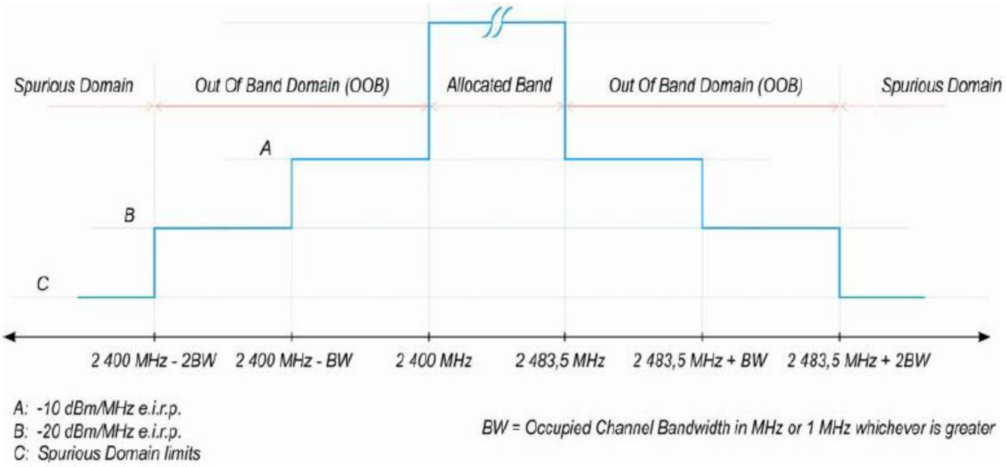


Figure 3: Transmit mask

9.3 Test procedure

The applicable mask is defined by the measurement results from the tests performed under clause 5.3.8 (Occupied Channel Bandwidth).

The test procedure is further as described under clause 5.3.9.2.1.

The Out-of-band emissions within the different horizontal segments of the mask provided in figures 1 and 3 shall be measured using the steps below. This method assumes the spectrum analyser is equipped with the Time Domain Power option.

Step 1:

- Connect the UUT to the spectrum analyser 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

NOTE 1: 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

Step 2 (segment 2 483,5 MHz to 2 483,5 MHz + BW):

• Adjust the trigger level to select the transmissions with the highest power level.

• For frequency hopping equipment operating in a normal hopping mode, the different hops will result in signal bursts with different power levels. In this case the burst with the highest power level shall be selected.

• Set a window (start and stop lines) to match with the start and end of the burst and in which the RMS power shall be measured using the Time Domain Power function.

• Select RMS power to be measured within the selected window and note the result which is the RMS power within this 1 MHz segment (2 483,5 MHz to 2 484,5 MHz). Compare this value with the applicable limit provided by the mask.

• Increase the centre frequency in steps of 1 MHz and repeat this measurement for every 1 MHz segment within the range 2 483,5 MHz to 2 483,5 MHz + BW. The centre frequency of the last 1 MHz segment shall be set to 2 483,5 MHz + BW - 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).

Step 3 (segment 2 483,5 MHz + BW to 2 483,5 MHz + 2BW):

• Change the centre frequency of the analyser to 2 484 MHz + BW and perform the measurement for the first 1 MHz segment within range 2 483,5 MHz + BW to 2 483,5 MHz + 2BW. Increase the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 483,5 MHz + 2 BW - 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).

Step 4 (segment 2 400 MHz - BW to 2 400 MHz):

• Change the centre frequency of the analyser to 2 399,5 MHz and perform the measurement for the first 1 MHz segment within range 2 400 MHz - BW to 2 400 MHz Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - BW + 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).

Step 5 (segment 2 400 MHz - 2BW to 2 400 MHz - BW):

• Change the centre frequency of the analyser to 2 399,5 MHz - BW and perform the measurement for the first 1 MHz segment within range 2 400 MHz - 2BW to 2 400 MHz - BW. Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - 2BW + 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).

Step 6:

• In case of conducted measurements on equipment with a single transmit chain, the declared antenna assembly gain "G" in dBi shall be added to the results for each of the 1 MHz segments and compared with the limits

provided by the mask given in figure 1 or figure 3. If more than one antenna assembly is intended for this power setting, the antenna with the highest gain shall be considered.

• In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), the measurements need to be repeated for each of the active transmit chains. The declared antenna assembly gain "G" in dBi for a single antenna shall be added to these results. If more than one antenna assembly is intended for this power setting, the antenna with the highest gain shall be considered. Comparison with the applicable limits shall be done using any of the options given below:

- Option 1: the results for each of the transmit chains for the corresponding 1 MHz segments shall be added. The additional beamforming gain "Y" in dB shall be added as well and the resulting values compared with the limits provided by the mask given in figure 1 or figure 3.

- Option 2: the limits provided by the mask given in figure 1 or figure 3 shall be reduced by

10 × log10(Ach) and the additional beamforming gain "Y" in dB. The results for each of the transmit chains shall be individually compared with these reduced limits.

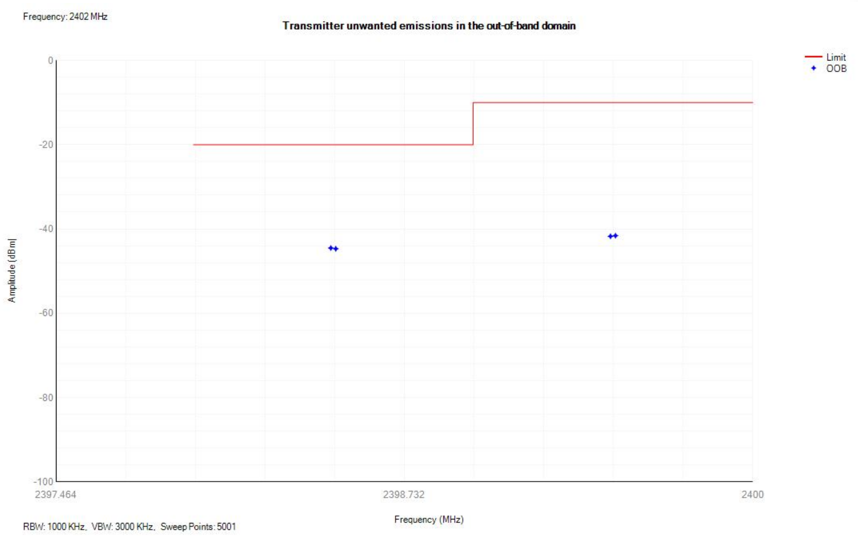
NOTE 2: Ach refers to the number of active transmit chains.

It shall be recorded whether the equipment complies with the mask provided in figure 1 or figure 3.

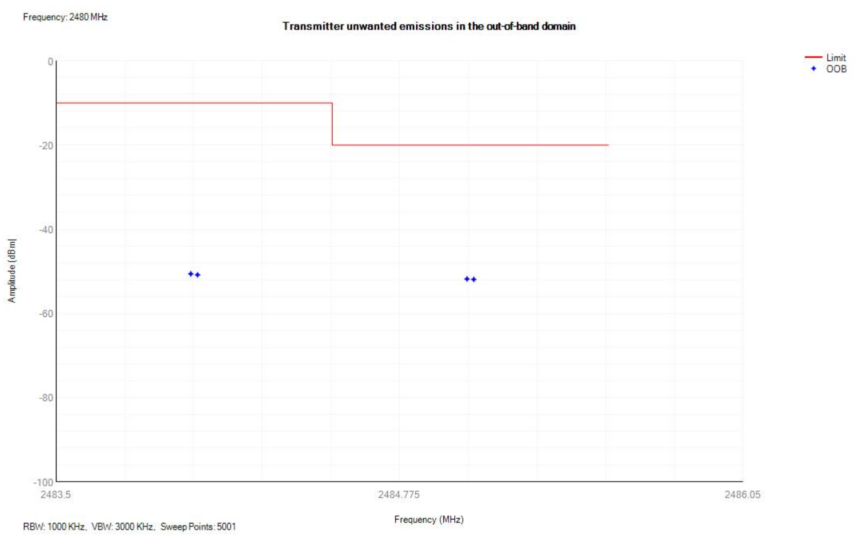
9.4 Test Result

Test conditions		Modulation	Test Freq (MHz)	Freq (MHz)	Level	Limit
Volt (Vdc)	Temp (°C)					
3.7	25	GFSK	2402	2399.500	-41.59	-10
		GFSK	2402	2399.482	-41.73	-10
		GFSK	2402	2398.482	-44.69	-20
		GFSK	2402	2398.464	-44.51	-20
3.7	25	GFSK	2480	2484.000	-50.59	-10
		GFSK	2480	2484.025	-50.82	-10
		GFSK	2480	2485.025	-51.80	-20
		GFSK	2480	2485.05	-51.91	-20

Low Channel

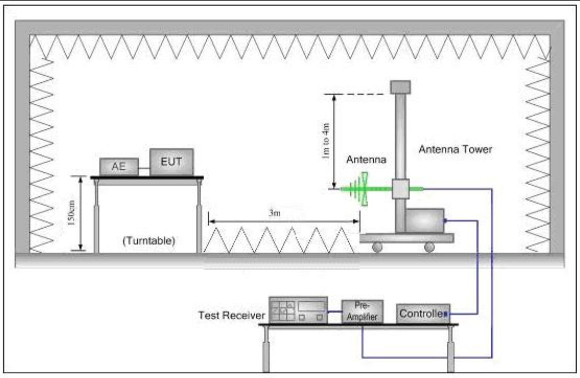


High Channel

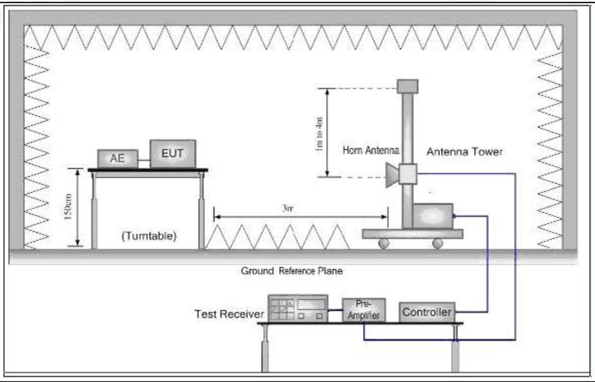


10. TRANSMITTER UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN

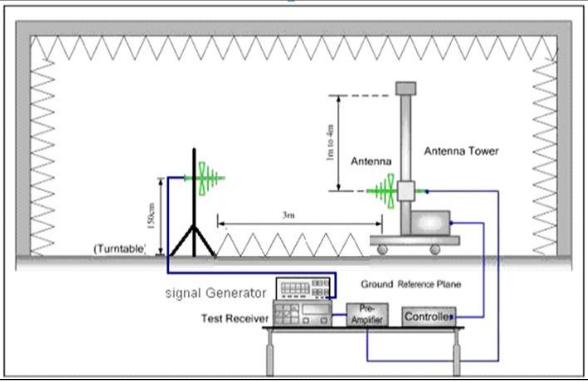
10.1 Block Diagram Of Test Setup



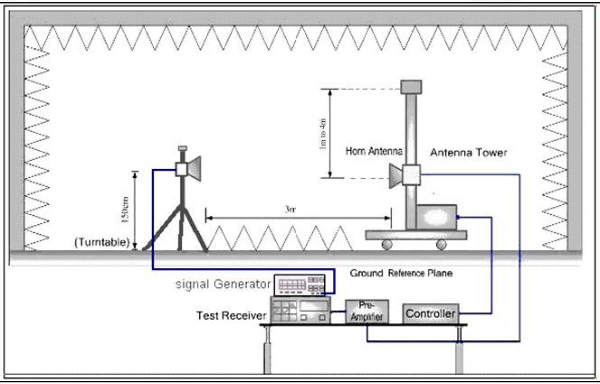
Below 1GHz



Above 1GHz



Below 1GHz



Above 1GHz

10.2 Limits

Frequency range	Maximum power, e.r.p. (≤ 1 GHz) e.i.r.p. (> 1 GHz)	RBW/VBW
30 MHz to 47 MHz	-36 dBm	100 kHz/300KHz
47 MHz to 74 MHz	-54 dBm	100 kHz/300KHz
74 MHz to 87,5 MHz	-36 dBm	100 kHz/300KHz
87,5 MHz to 118 MHz	-54 dBm	100 kHz/300KHz
118 MHz to 174 MHz	-36 dBm	100 kHz/300KHz
174 MHz to 230 MHz	-54 dBm	100 kHz/300KHz
230 MHz to 470 MHz	-36 dBm	100 kHz/300KHz
470 MHz to 694 MHz	-54 dBm	100 kHz/300KHz
694 MHz to 1 GHz	-36 dBm	100 kHz/300KHz
1 GHz to 12,75 GHz	-30 dBm	1 MHz/3MHz

10.3 Test Procedure

1. Scan from 30MHz to 12.75GHz, find the maximum radiation frequency to measure.
2. The technique used to find the Spurious Emissions of the transmitter was the antenna substitution method. Substitution method was performed to determine the actual ERP/EIRP emission levels of the EUT.

Test procedure as below:

1) The EUT was powered ON and placed on a 1.5m high table at a 3 meter fully Anechoic Chamber. The antenna of the transmitter was extended to its maximum length. modulation mode and the measuring receiver shall be tuned to the frequency of the transmitter under test.
2) The EUT was set 3 meters(above 18GHz the distance is 1 meter) away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3) The disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.
4) Steps 1) to 3) were performed with the EUT and the receive antenna in both vertical and horizontal polarization.
5) The transmitter was then removed and replaced with another antenna. The center of the antenna was approximately at the same location as the center of the transmitter.
6) A signal at the disturbance was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 3) is obtained for this set of conditions.
7) The output power into the substitution antenna was then measured.
8) Steps 6) and 7)were repeated with both antennas polarized.
9) Calculate power in dBm by the following formula:

   $ERP(dBm) = P_{SG}$ (dBm) – cable loss (dB) + antenna gain (dBd)

   $EIRP(dBm) = P_{SG}$ (dBm) – cable loss (dB) + antenna gain (dBi)

   EIRP=ERP+2.15dB

   where:

   P_{SG} is the generator output power into the substitution antenna.
10) Test the EUT in the lowest channel , the Highest channel

Repeat above procedures until all frequencies measured was complete.

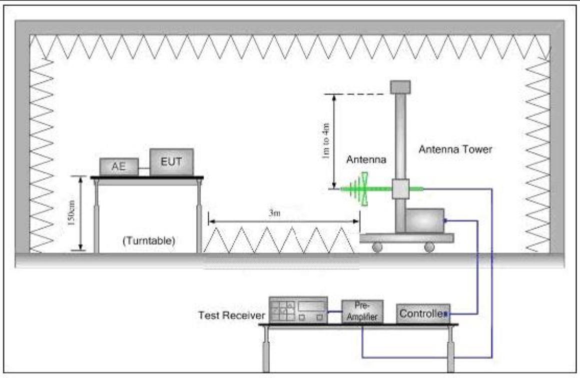
10.4 Test Results

Temperature:	25°C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage :	DC 3.7V

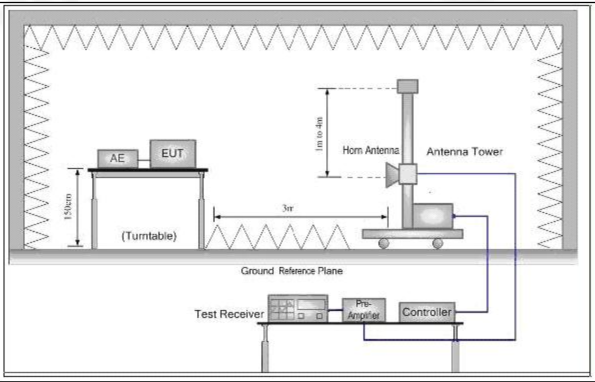
Frequency	Receiver Reading	Turn table Angle	Antenna		Substituted	Absolute Level	Result	
			Height	Polar	Factor		Limit	Margin
(MHz)	(dBμV)	Degree	(m)	(H/V)	(dB)	(dBm)	(dBm)	(dB)
GFSK Low channel								
562.454	-56.99	23	1.9	H	-9.59	-66.58	-54.00	-12.58
562.231	-47.83	273	1.7	V	-9.59	-57.42	-54.00	-3.42
4804.121	-48.10	195	1.1	H	-0.12	-48.22	-30.00	-18.22
4804.103	-57.12	68	1.6	V	-0.12	-57.24	-30.00	-27.24
7206.452	-56.13	78	1.9	H	0.55	-55.58	-30.00	-25.58
7206.343	-55.93	302	1.7	V	0.55	-55.38	-30.00	-25.38
GFSK Mid channel								
562.566	-55.45	230	1.7	H	-9.59	-65.04	-54.00	-11.04
562.302	-56.01	306	1.9	V	-9.59	-65.60	-54.00	-11.60
4882.128	-49.15	98	1.4	H	-0.12	-49.27	-30.00	-19.27
4882.177	-47.87	175	1.8	V	-0.12	-47.99	-30.00	-17.99
7323.458	-56.71	119	1.4	H	0.55	-56.16	-30.00	-26.16
7323.590	-56.61	168	1.9	V	0.55	-56.06	-30.00	-26.06
GFSK High channel								
562.401	-56.02	278	2	H	-9.59	-65.61	-54.00	-11.61
562.342	-56.37	204	2	V	-9.59	-65.96	-54.00	-11.96
4960.322	-49.12	286	1.7	H	-0.12	-49.24	-30.00	-19.24
4960.038	-48.30	198	1.3	V	-0.12	-48.42	-30.00	-18.42
7440.081	-57.86	59	1.8	H	0.55	-57.31	-30.00	-27.31
7440.002	-56.28	335	1.6	V	0.55	-55.73	-30.00	-25.73
Remark: Absolute Level = Receiver Reading + Factor, Margin = Absolute Level - Limit.								

11. RECEIVER SPURIOUS EMISSIONS

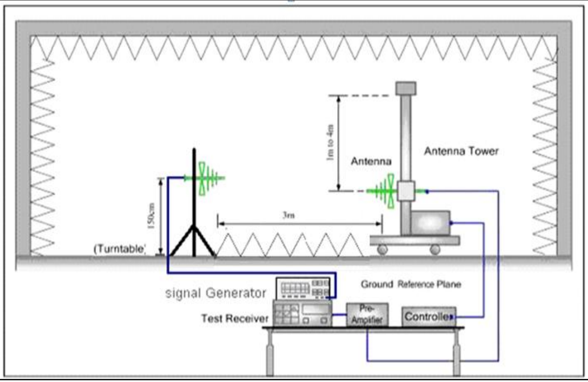
11.1 Block Diagram Of Test Setup



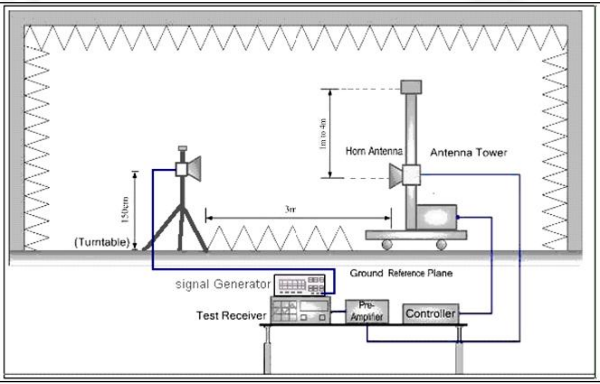
Below 1GHz



Above 1GHz



Below 1GHz



Above 1GHz

11.2 Limits

Frequency(MHz)	Limit
30-1000	-57dBm
1000-12750	-47dBm

11.3 Test Procedure

1. Scan from 30MHz to 12.75GHz, find the maximum radiation frequency to measure.
2. The technique used to find the Spurious Emissions of the transmitter was the antenna substitution method. Substitution method was performed to determine the actual ERP/EIRP emission levels of the EUT.
Test procedure as below:
1) The EUT was powered ON and placed on a 1.5m hight table at a 3 meter fully Anechoic Chamber. The antenna of the transmitter was extended to its maximum length. modulation mode and the measuring receiver shall be tuned to the frequency of the transmitter under test.
2) The EUT was set 3 meters(above 18GHz the distance is 1 meter) away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3) The disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.
4) Steps 1) to 3) were performed with the EUT and the receive antenna in both vertical and horizontal polarization.
5) The transmitter was then removed and replaced with another antenna. The center of the antenna was approximately at the same location as the center of the transmitter.
6) A signal at the disturbance was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 3) is obtained for this set of conditions.
7) The output power into the substitution antenna was then measured.
8) Steps 6) and 7)were repeated with both antennas polarized.
9) Calculate power in dBm by the following formula:

$$ERP(dBm) = P_{SG}\ (dBm) – cable\ loss\ (dB) + antenna\ gain\ (dBd)$$

$$EIRP(dBm) = P_{SG}\ (dBm) – cable\ loss\ (dB) + antenna\ gain\ (dBi)$$

$$EIRP=ERP+2.15dB$$

where:

P_{SG} is the generator output power into the substitution antenna.

11) Test the EUT in the lowest channel , the Highest channel
Repeat above procedures until all frequencies measured was complete.

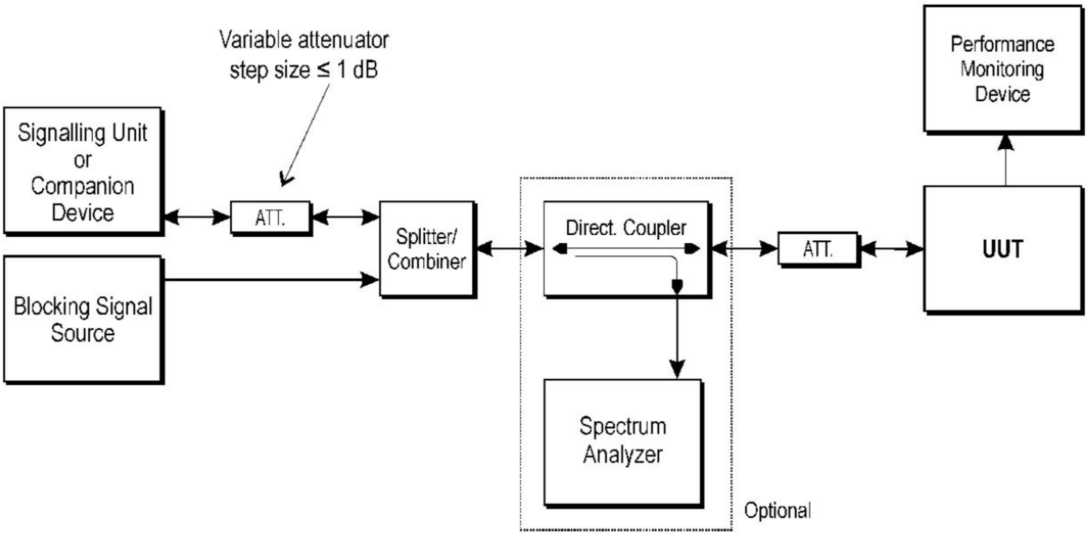
11.4 Test Results

Temperature:	25°C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage :	DC 3.7V

Frequency	Receiver Reading	Turn table Angle	Antenna		Substituted	Absolute Level	Result	
			Height	Polar	Factor		Limit	Margin
(MHz)	(dBµV)	Degree	(m)	(H/V)	(dB)	(dBm)	(dBm)	(dB)
GFSK Low channel								
570.775	-55.21	346	1.5	H	-9.64	-64.85	-54.00	-10.85
570.775	-54.67	90	1.1	V	-9.64	-64.31	-54.00	-10.31
3232.5	-60.92	309	1.3	H	1.41	-59.51	-47.00	-12.51
3232.5	-64.48	264	1.6	V	1.41	-63.07	-47.00	-16.07
8901.875	-69.00	346	1.5	H	15.44	-53.56	-47.00	-6.56
8901.875	-69.83	90	1.1	V	15.44	-54.39	-47.00	-7.39
GFSK Mid channel								
677.475	-55.16	222	1.6	H	-7.68	-62.84	-54.00	-8.84
677.475	-53.19	105	1.7	V	-7.68	-60.87	-54.00	-6.87
2263.125	-61.95	203	1.4	H	-0.12	-62.07	-47.00	-15.07
2263.125	-63.10	67	1.2	V	-0.12	-63.22	-47.00	-16.22
9695	-74.60	222	1.6	H	18.08	-56.52	-47.00	-9.52
9695	-73.29	105	1.7	V	18.08	-55.21	-47.00	-8.21
GFSK High channel								
531.975	-55.27	148	1.1	H	-10.73	-66.00	-54.00	-12.00
531.975	-52.43	333	1.3	V	-10.73	-63.16	-54.00	-9.16
9665.625	-68.83	18	1.6	H	17.98	-50.85	-47.00	-3.85
9665.625	-71.95	80	1.8	V	17.98	-53.97	-47.00	-6.97
11575	-72.63	148	1.1	H	20.23	-52.40	-47.00	-5.40
11575	-73.98	333	1.3	V	20.23	-53.75	-47.00	-6.75
Remark: Absolute Level = Receiver Reading + Factor, Margin = Absolute Level - Limit.								

12. RECEIVER BLOCKING

12.1 Block Diagram Of Test Setup



12.2 Limit

Table 14: Receiver Blocking parameters for Receiver Category 1 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 4)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 4)	Type of blocking signal
(-133 dBm + 10 × $\log_{10}$(OCBW)) or -68 dBm whichever is less (see note 2)	2 380 2 504	-34	CW
(-139 dBm + 10 × $\log_{10}$(OCBW)) or -74 dBm whichever is less (see note 3)	2 300 2 330 2 360 2 524 2 584 2 674		

NOTE 1: OCBW is in Hz.

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

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

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

Table 15: Receiver Blocking parameters receiver Category 2 equipment

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

Table 16: Receiver Blocking parameters receiver Category 3 equipment

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

12.3 Test procedure

Refer to ETSI EN 300 328 V2.2.2 (2020-07) Clause 5.4.11.2.

12.4 Test Result

Temperature:	25°C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage :	DC 3.7V
Test Mode:	GFSK - 2402MHz		

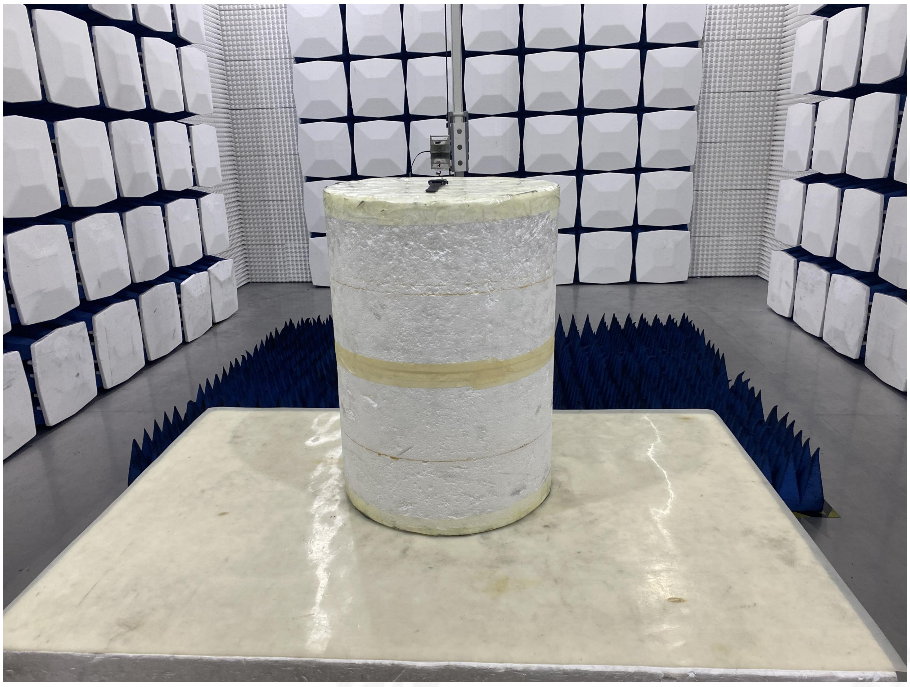
Receiver Category	Test Channel (MHz)	Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	PER (%)	Limit (%)	Result
2	2402	-68.92	2380	-34	3.62	10	Pass
			2504		2.93	10	Pass
			2300		3.71	10	Pass
			2584		2.25	10	Pass

Note: This report only shows the worst case test data.
The wanted signal mean power from the companion device and the blocking signal power level values are compensated with the declared antenna gain on table above

13. TEST SETUP PHOTO

Radiated Emission Test Setup 1
30 MHz – 1 GHz (Transmitter tests)

Radiated Emission Test Setup 2
1 GHz – 12.75 GHz (Transmitter tests)



14. EUT CONSTRUCTIONAL DETAILS

Photo 1

Photo 2

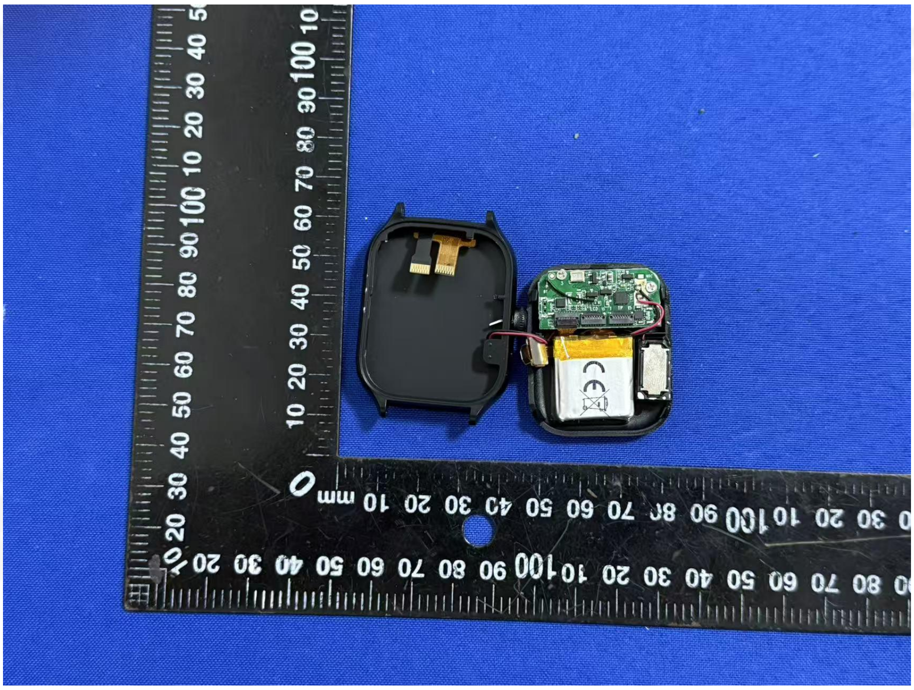


Photo 3

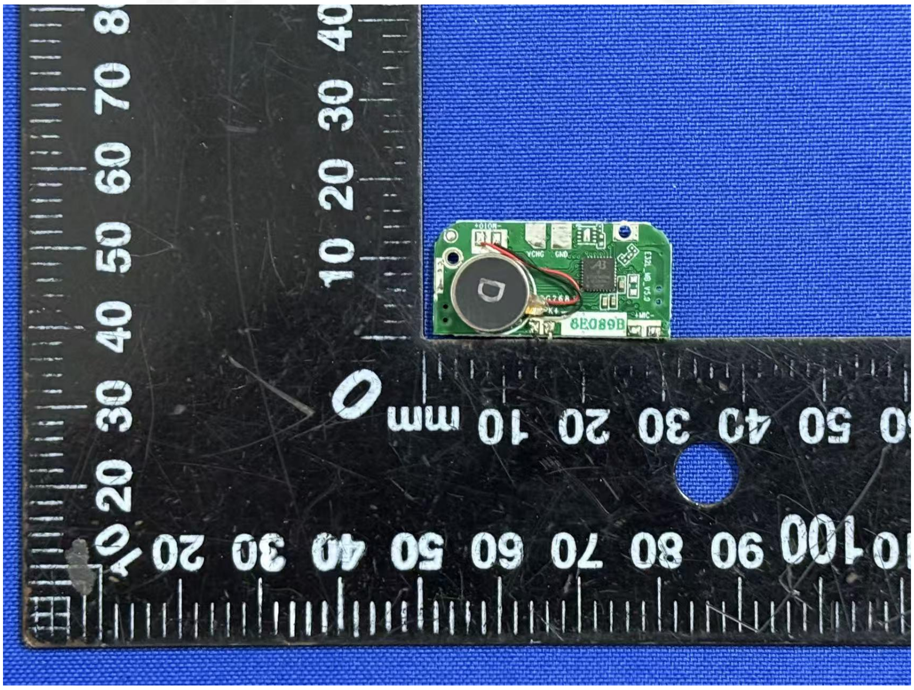


Photo 4

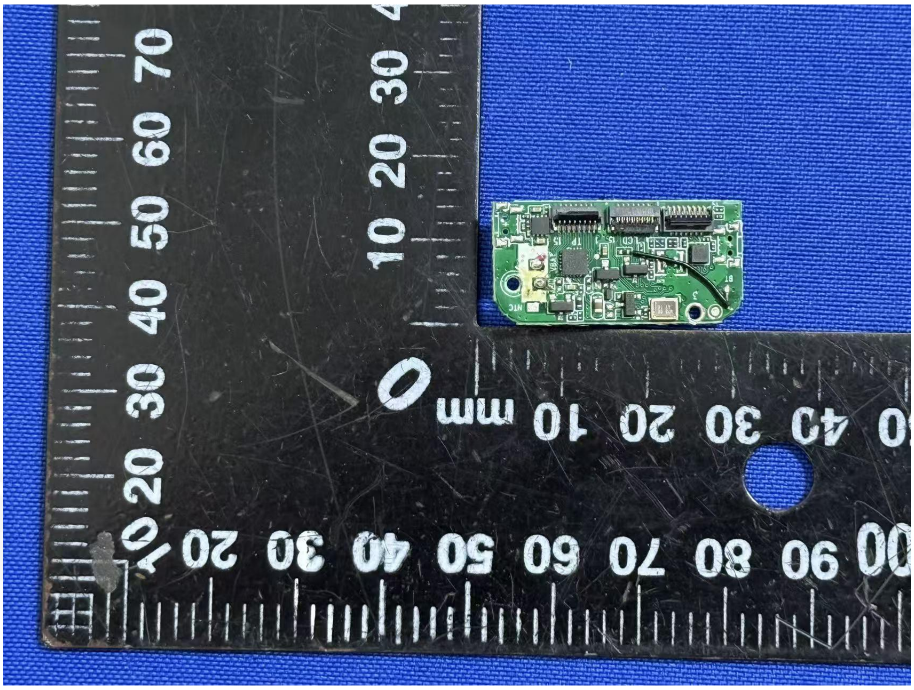


Photo 5

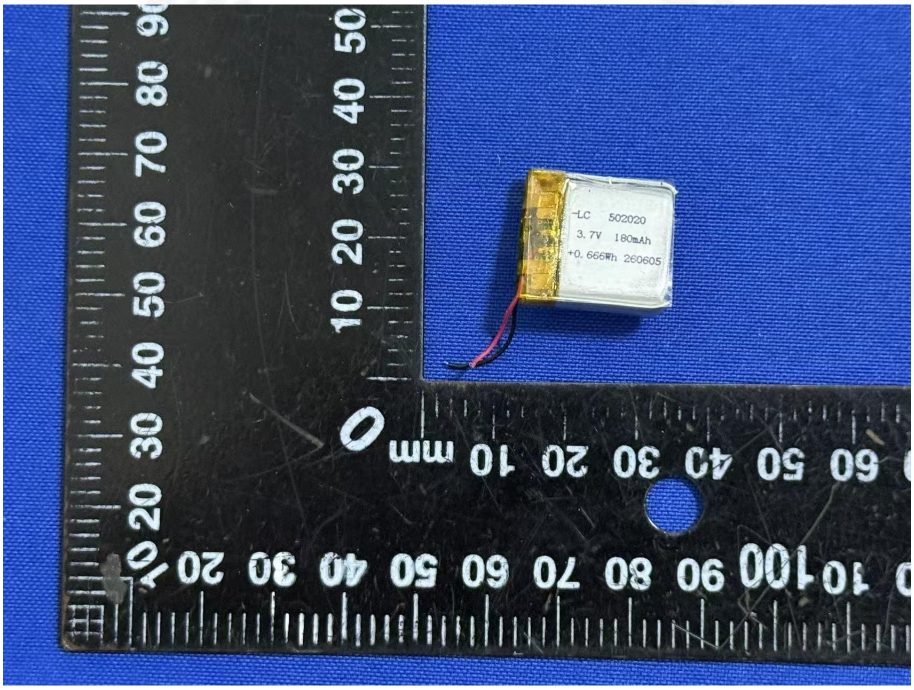


Photo 6

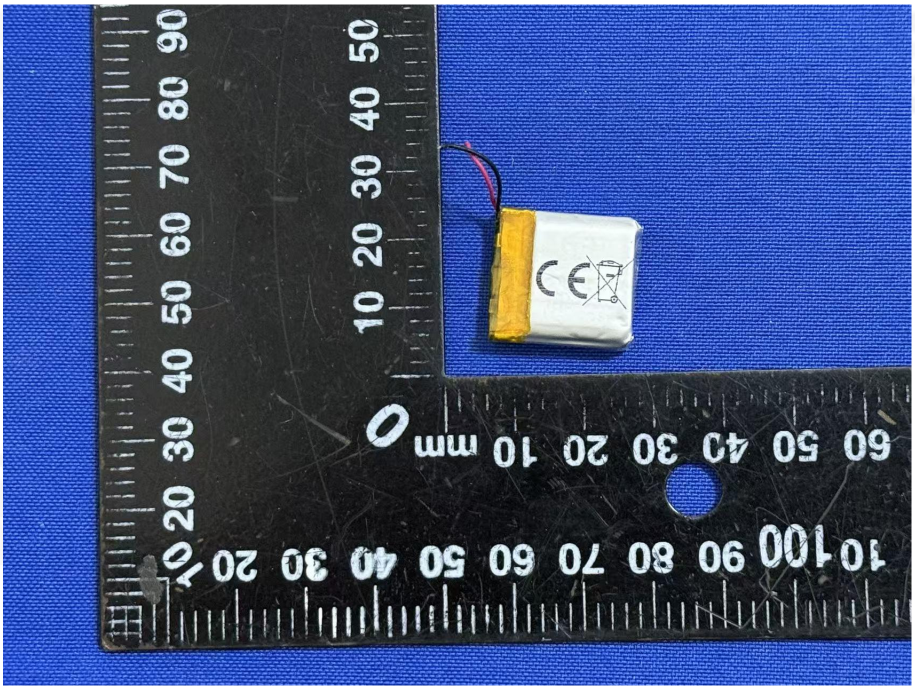


Photo 7

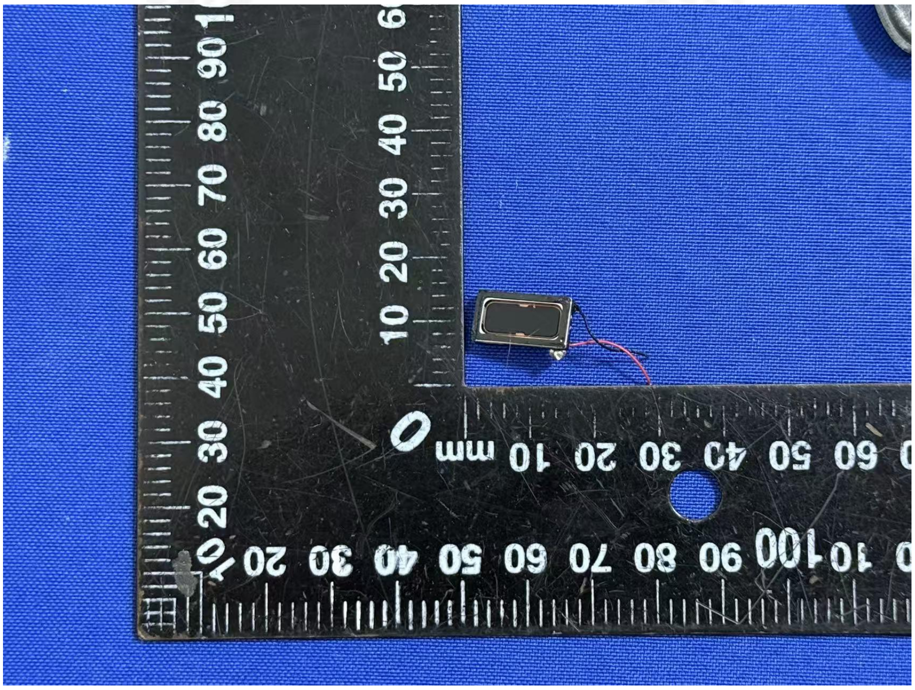


Photo 8

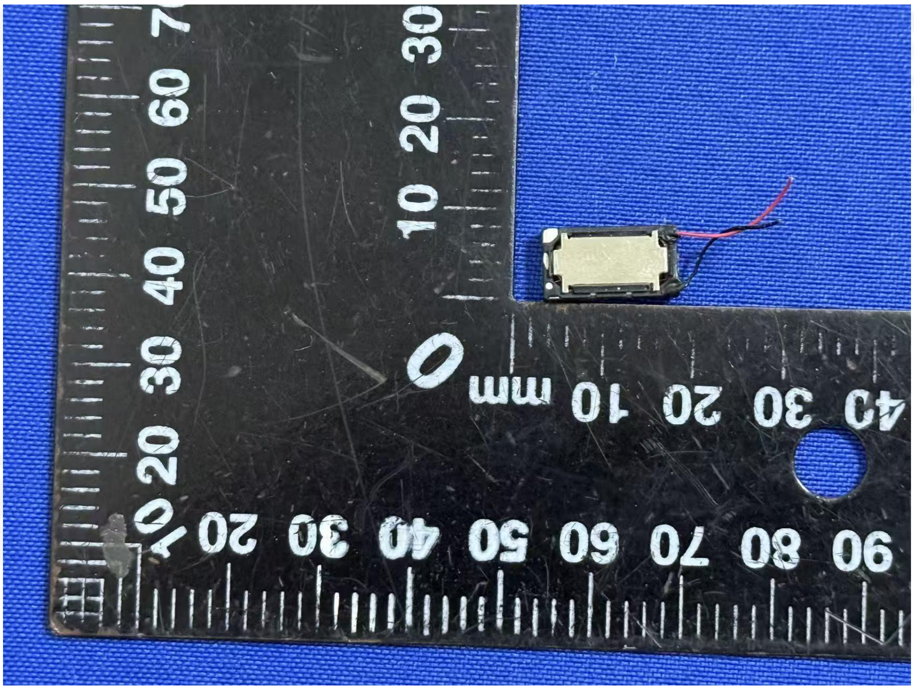


Photo 9

※※※※※ END OF REPORT ※※※※※

EMF TEST REPORT

Report Number.................................:	**ZKT-2607201209E-1**
Date of Test..	Jul. 20, 2026 to Jul. 28, 2026
Date of issue..:	Jul. 28, 2026
Total number of pages.........................	7
Test Result ....:	PASS
Testing Laboratory............................:	**Shenzhen ZKT Technology Co., Ltd.**
Address ....:	1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China
Applicant's name ....:	**Mid Ocean Brands B.V.**
Address ....:	Unit 711- 716, 7/F., Tower A, 83 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong.
Manufacturer's name ....:	**118897**
Address ....:	Shenzhen, Guangdong
Test specification:	
Standard..:	EN 62479:2010 EN 50663:2017
Test procedure.....................................:	/
Non-standard test method ....:	N/A
Test Report Form No.......................:	TRF-EL-139_V0
Test Report Form(s) Originator.....:	ZKT Testing
Master TRF ....:	Dated: 2020-01-06

This device described above has been tested by ZKT, and the test results show that the equipment under test (EUT) is in compliance with the 2014/53/EU RED Directive Art.3.1(a) requirements. And it is applicable only to the tested sample identified in the report.

This report shall not be reproduced except in full, without the written approval of ZKT, this document may be altered or revised by ZKT, personal only, and shall be noted in the revision of the document.

Product name....................................:	**Smart watch**
Trademark ....:	/
Model/Type reference.........................:	MO2271
Ratings...:	Input: 5V⎓ 0.5A Battery: 3.7V, 180mAh, 0.666Wh

Testing procedure and testing location:

Testing Laboratory.......................................: **Shenzhen ZKT Technology Co., Ltd.**

Address...: 1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China

Jomcat Cao

Tested by (name + signature).......................: Jomcat Cao

Jackson Fang

Reviewer (name + signature)...................... : Jackson Fang

Shenzhen ZKT Technology Co., Ltd.
Approved
Lake Xie

Approved (name + signature).......................: Lake Xie

Table of Contents **Page**

1. Version

Report No.	Issue Date	Description	Approved
ZKT-2607201209E-1	Jul. 28, 2026	Original	Valid

2. GENERAL INFORMATION

Product Name:	Smart watch
Model No.:	MO2271
Series Models:	/
Model Difference:	/
Hardware Version:	/
Software Version:	/
Channel Number:	RED: 79 channels BLE: 40 channels
Channel Spacing:	RED: 1MHz BLE: 2MHz
Operation Frequency:	2402-2480MHz
Max. EIRP:	RED: 1.19dBm BLE: 4.52dBm
Bluetooth Version:	V6.0
Type of Modulation:	GFSK for BLE GFSK, π/4-DQPSK, 8-DPSK for EDR
Antenna installation:	Chip Antenna
Antenna Gain :	0dBi Note: the antenna gain is provided by the customer, and the final test result has nothing to do with us.
Power Supply:	Input: 5V⎓ 0.5A
Battery Capacity:	3.7V, 180mAh, 0.666Wh

3. EN 62479 REQUIREMENT

3.1 GENERAL INFORMATION

According to its specifications, the EUT must comply with the requirements of the following standards:

EN 62479: 2010 [Assessment of the compliance of low power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz)]

3.2 LIMIT

A. Typical usage, installation and the physical characteristics of equipment make it inherently compliant with the applicable EMF exposure levels such as those listed in the bibliography. This low-power equipment includes unintentional (or non-intentional) radiators, for example incandescent light bulbs and audio/visual (A/V) equipment, information technology equipment (ITE) and multimedia equipment (MME) that does not contain radio transmitters.

NOTE Equipment is described as A/V equipment, ITE or MME if its main use is playback/recording of music, voice or images, or processing of digital information.

B. The input power level to electrical or electronic components that are capable of radiating electromagnetic energy in the relevant frequency range is so low that the available antenna power and/or the average total radiated power cannot exceed the low-power exclusion level defined in 4.2.

C. The available antenna power and/or the average total radiated power are limited by product standards for transmitters to levels below the low-power exclusion level defined in 4.2.

D. Measurements or calculations show that the available antenna power and/or the average total radiated power are below the low-power exclusion level defined in 4.2.

4. RESULT

The available antenna power of this EUT is RED **1.32mW (1.19dBm)**&BLE **2.83mW(4.52dBm)**, the power are below the low-power exclusion level defined in 4.2(Pmax: 20mW).”

※※※※※ END OF REPORT ※※※※※