



RADIO TEST REPORT

Report No: TMC160125002-R

File reference No: 2016-1-28

Applicant: Shenzhen Wins Novelty Co.,Ltd

Product: Head Up Display

Brand Name: N/A

Model No: X3

Test Standards: ETSI EN 300 328 V1.9.1(205-02)

Test result: The EMC testing has been performed on the submitted samples and found in compliance with council EMC Directive 2004/108/EC and R&TTE Directive 1999/5/EC

Approved By



Lemon Rao

EMC Manager

Dated: January 28, 2016

Results appearing herein relate only to the sample tested

The technical reports is issued errors and omissions exempt and is subject to withdrawal at

TMC International Inspection & Certification Group LTD

D103, Tianhui Building, Yousong Road, Longhua District, Shenzhen,
Guangdong, P.R. China.

Tel:86-755-86642861 Fax:86-755-86642996

1. General Information

1.1 Notes

The test results of this report relate exclusively to the test item specified in 1.5. The TMC Lab does not assume Responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the TMC Lab.

1.2 Testing Laboratory

TMC International Inspection & Certification Group LTD

D103, Tianhui Building, Yousong Road, Longhua District, Shenzhen, Guangdong, China

Tel: 86-755-86642861 Fax : :86-755-86642996

Internet: www.tmc-lab.com

1.3 Details of Applicant

Name: Shenzhen Wins Novelty Co.,Ltd

Address: 3F,Gushu No 1 road (NO. 171), Gushu community, Xixiang Street,Bao an district,Shen zhen,China

1.4 Test Item

Manufacturer: Shenzhen Wins Novelty Co.,Ltd

Address: 3F,Gushu No 1 road (NO. 171), Gushu community, Xixiang Street,Bao an district,Shen zhen,China

Brand Name: N/A

Model No.: X3

Additional Model No.: N/A

Additional Brand Name: N/A

Description: Head Up Display

Additional Information

Frequency: 2402-2480 MHz

Number of Channels: 79 Channels

Antenna Designation: Integral Antenna

Type of Modulation: GFSK, π /4DQPSK, 8DPSK for Bluetooth

Extreme Temp. Tolerance: -20°C to 55°C

1.6 Test Standards

ETSI EN300 328 V1.9.1(205-02)

Electromagnetic compatibility and Radio spectrum Matters(ERM);

Wideband Transmission systems;

Data transmission equipment operating in the 2.4GHz ISM band and using spread spectrum modulation techniques;

Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive

Note: All radiated measurements were made in all three orthogonal planes. The values reported are the maximum values.

1.7 Configuration of The EUT

The EUT was configured according to **CISPR16**. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

A. EUT

Device	Manufacturer	Model
Head Up Display	Shenzhen Wins Novelty Co.,Ltd	X3

B. Internal Devices

Device	Manufacturer	Model
N/A		

C. Peripherals

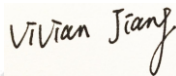
Device	Manufacturer	Model	Cable
N/A			

D. EUT Exercise

The EUT (Transmitter) was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements.

1.8 Tests or Witness Test Engineering

Test By:



Printing Name: Vivian Jiang

2. Test Description

2.1 No deviations from the test standards

For Bluetooth 3.0 +EDR +BLE function:

Technical requirements for Frequency Hopping equipment

Performed Test Item	Normative References	Test Performed	Deviation
RF Output Power	ETSI EN 300 328 V1.8.1 (2012-06)	Yes	No
Duty cycle, Tx-Sequence, Tx-gap	ETSI EN 300 328 V1.8.1 (2012-06)	N/A	N/A
Dwell time, Minimum Frequency Occupation, Hopping Sequence	ETSI EN 300 328 V1.8.1 (2012-06)	Yes	No
Hopping Frequency Separation	ETSI EN 300 328 V1.8.1 (2012-06)	Yes	No
Medium Utilisation (MU) factor	ETSI EN 300 328 V1.8.1 (2012-06)	N/A	N/A
Adaptivity (Adaptive Frequency Hopping)	ETSI EN 300 328 V1.8.1 (2012-06)	N/A	N/A
Occupied Channel Bandwidth	ETSI EN 300 328 V1.8.1 (2012-06)	Yes	No
Transmitter unwanted emissions in the out-of-band domain	ETSI EN 300 328 V1.8.1 (2012-06)	Yes	No
Transmitter unwanted emissions in the spurious domain	ETSI EN 300 328 V1.8.1 (2012-06)	Yes	No
Receiver Spurious Emissions	ETSI EN 300 328 V1.8.1 (2012-06)	Yes	No
Receiver Blocking	ETSI EN 300 328 V1.8.1 (2012-06)	N/A	N/A

Note: The EUT can operate in a adaptive mode, and can't operate in a non-adaptive mode which is stated by the supplier.

For Bluetooth 4.0 (BLE) function:

Technical requirements for the equipment using wide band modulations other than FHSS

Performed Test Item	Normative References	Test Performed	Deviation
RF Output Power	ETSI EN 300 328 V1.8.1 (2012-06)	Yes	No
Power Spectral Density	ETSI EN 300 328 V1.8.1 (2012-06)	Yes	No
Duty cycle, Tx-Sequence, Tx-gap	ETSI EN 300 328 V1.8.1 (2012-06)	N/A	N/A
Medium Utilisation (MU) factor	ETSI EN 300 328 V1.8.1 (2012-06)	N/A	N/A
Adaptivity (Adaptive Frequency Hopping)	ETSI EN 300 328 V1.8.1 (2012-06)	N/A	N/A
Occupied Channel Bandwidth	ETSI EN 300 328 V1.8.1 (2012-06)	Yes	No
Transmitter unwanted emissions in the out-of-band domain	ETSI EN 300 328 V1.8.1 (2012-06)	Yes	No
Transmitter unwanted emissions in the spurious domain	ETSI EN 300 328 V1.8.1 (2012-06)	Yes	No
Receiver Spurious Emissions	ETSI EN 300 328 V1.8.1 (2012-06)	Yes	No
Receiver Blocking	ETSI EN 300 328 V1.8.1 (2012-06)	N/A	N/A

2.2 Statement of the measurement uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±1,5 dB
Power Spectral Density, conducted	±3 dB
Unwanted Emissions, conducted	±3 dB
All emissions, radiated	±6 dB
Temperature	±1 °C
Humidity	±5 %
DC and low frequency voltages	±3 %
Time	±5 %
Duty Cycle	±5 %

3. TEST CONDITIONS AND RESULTS

3.1 ETSI EN 300 328 REQUIREMENTS

3.1.1. RF Output Power

LIMIT

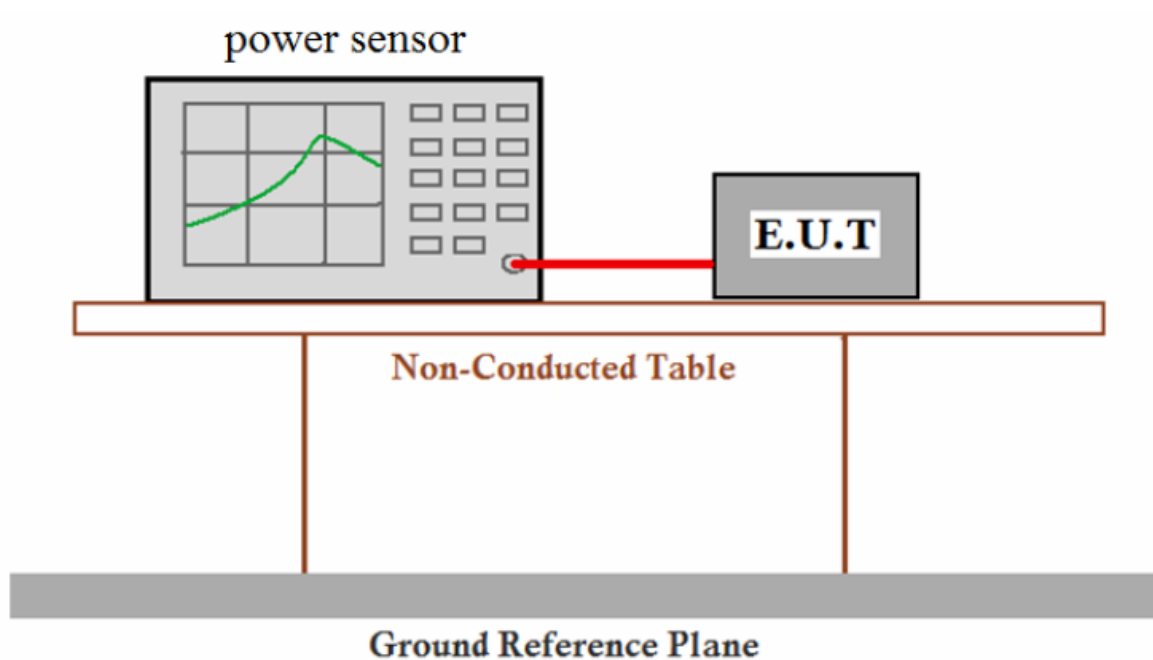
For non-adaptive frequency hopping systems

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

For adaptive frequency hopping systems

The maximum RF output power for adaptive Frequency Hopping equipment shall be equal to or less than 20dBm.

TEST CONFIGURATION



TEST PROCEDURE

Refer to ETSI EN 300 328 V1.9.1 (205-02) Clause 5.3.2

TEST RESULTS

Test Mode:GFSK Mode				
Antenna Gain:0 dBi		Test Method: Conducted		
Test Condition		Maximum conducted Burst Power in 15 measured Bursts (RMS) [dBm]		
Test environmental				
Temperature (°C)	Voltage (V)	Measured Power (dBm)	Antenna Gain(dBi)	EIRP (dBm)
T Nor (25℃)	3.70	5.14	0	5.14
T min (-10℃)	3.70	4.89	0	4.89
T Max (+55℃)	3.70	5.01	0	5.01
Result		Pass		
Limit		20dBm		

Test Mode: π /4DQPSK Mode				
Antenna Gain:0 dBi		Test Method: Conducted		
Test Condition		Maximum conducted Burst Power in 15 measured Bursts (RMS) [dBm]		
Test environmental				
Temperature (°C)	Voltage (V)	Measured Power (dBm)	Antenna Gain(dBi)	EIRP (dBm)
T Nor (25℃)	3.70	5.06	0	5.06
T min (-10℃)	3.70	4.74	0	4.74
T Max (+55℃)	3.70	4.88	0	4.88
Result		Pass		
Limit		20dBm		

Test Mode: 8DPSK Mode				
Antenna Gain:0 dBi		Test Method: Conducted		
Test Condition		Maximum conducted Burst Power in 15 measured Bursts (RMS) [dBm]		
Test environmental				
Temperature (°C)	Voltage (V)	Measured Power (dBm)	Antenna Gain(dBi)	EIRP (dBm)
T Nor (25℃)	3.70	5.02	0	5.02
T min (-10℃)	3.70	4.89	0	4.89
T Max (+55℃)	3.70	5.05	0	5.05
Result		Pass		
Limit		20dBm		

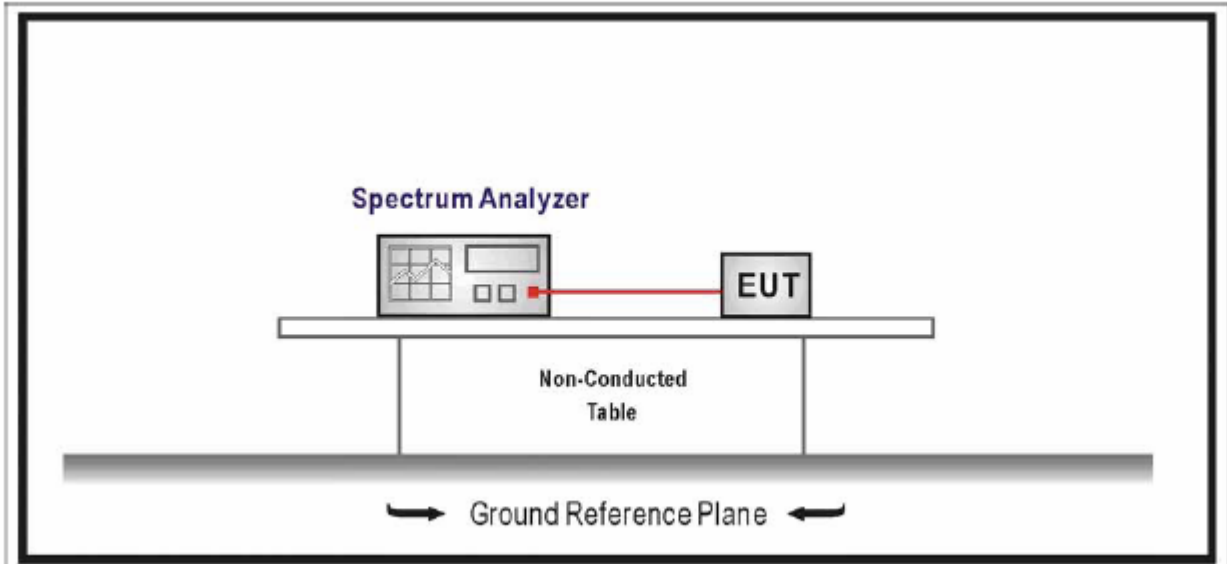
Note :1. Measured Power include the cable loss.

3.1.2. Power Spectral Density

LIMIT

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

TEST CONFIGURATION



MEASUREMENT PARAMETERS:

RBW=10KHz, VBW=30KHz, Sweep Point=15000.

TEST PROCEDURE

Refer to ETSI EN 300 328 V1.9.1 (205-02) Clause 5.3.3

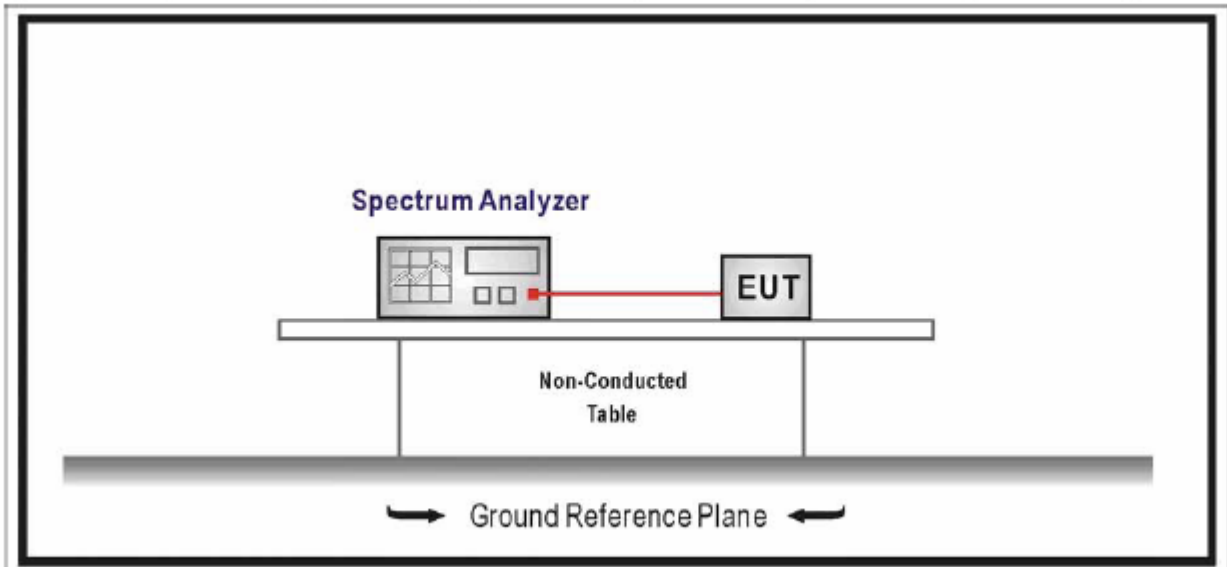
Power Spectral Density is not applicable to Bluetooth 3.0+EDR.

3.1.3. Duty Cycle, Tx-sequence, Tx-gap

LIMIT

For non-adaptive FHSS equipment, the Duty Cycle shall be equal to or less than the maximum value declared by the supplier. In addition, the maximum Tx-sequence time shall be 5 ms while the minimum Tx-gap time shall be 5 ms.

TEST CONFIGURATION



TEST PROCEDURE

Refer to ETSI EN 300 328 V1.9.1(205-02) Clause 5.3.2

TEST RESULTS

These requirements apply to non-adaptive frequency hopping equipment or to adaptive frequency hopping equipment operating in a non-adaptive mode. These requirements do not apply for equipment with a maximum declared RF Output power of less than 10dBm E.I.R.P. or for equipment when operating in a mode where the RF Output power is less than 10dBm E.I.R.P.

Not applicable.

3.1.4. Dwell Time, Minimum Frequency Occupation and Hopping Sequence

LIMIT

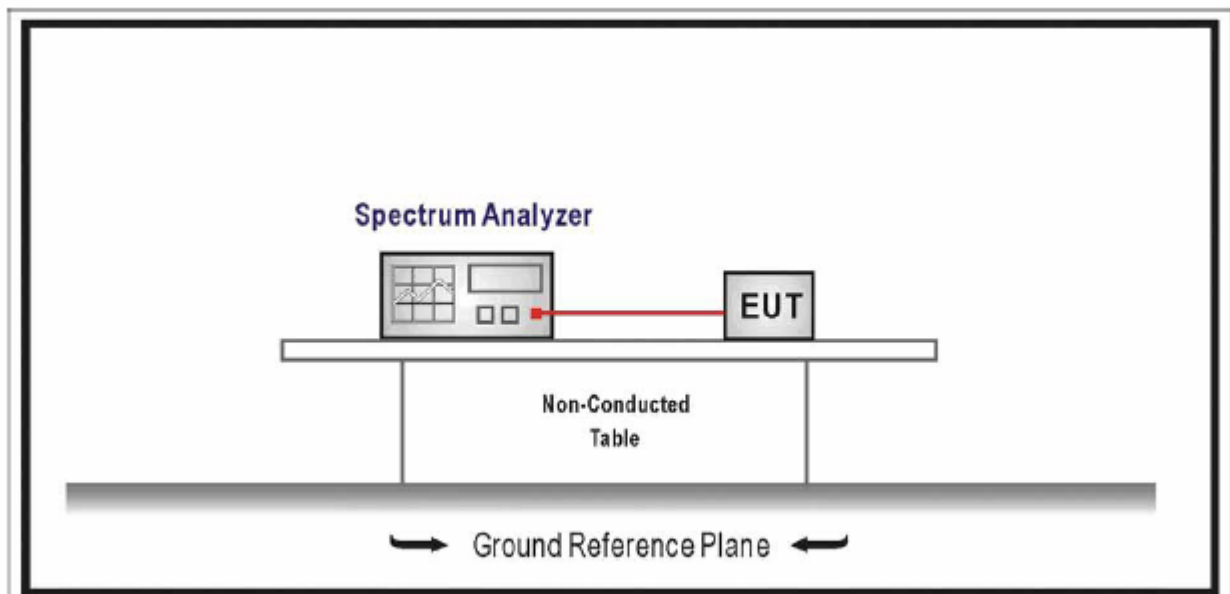
For non-adaptive frequency hopping systems

The accumulated Dwell Time on any hopping frequency shall not be greater than 15 ms within any period of 15 ms multiplied by the minimum number of hopping frequencies (N) that have to be used. The hopping sequence(s) shall contain at least N hopping frequencies where N is 15 or 15 divided by the minimum Hopping Frequency Separation in MHz, whichever is the greater. The Minimum Frequency Occupation Time shall be equal to one dwell time within a period not exceeding four times the product of the dwell time per hop and the number of hopping frequencies in use.

For adaptive frequency hopping systems

Adaptive Frequency Hopping systems shall be capable of operating over a minimum of 70 % of the band specified in clause 1. The maximum accumulated dwell time on any hopping frequency shall be 400 ms within any period of 400 ms multiplied by the minimum number of hopping frequencies (N) that have to be used. 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. The Minimum Frequency Occupation Time shall be equal to one dwell time within a period not exceeding four times the product of the dwell time per hop and the number of hopping frequencies in use.

TEST CONFIGURATION



TEST PROCEDURE

Refer to ETSI EN 300 328 V1.9.1 (205-02) Clause 5.3.4

These measurements shall only be performed at normal test conditions.

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: 1MHz

VBW: 3MHz

Detector Mode: RMS

Sweep time: Equal to the Dwell Time $\times$ Minimum number of hopping frequencies (N) (see clause 4.3.1.3.2)

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 Dwell Time which shall comply with the limit provided in clauses 4.3.1.3.2.1 or 4.3.1.3.2.2 and which shall be recorded in the test report.

Step 5:

- Make the following changes on the analyzer and repeat steps 2 and 3.

Sweep time: $4 \times$ Dwell Time $\times$ Actual number of hopping frequencies in use

The hopping frequencies occupied by the system 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 can not be determined (number of blacklisted frequencies unknown) it shall be assumed that the equipment uses the minimum number of hopping frequencies as defined in clauses 4.3.1.4.2.1 or 4.3.1.4.2.2.

- The result shall be compared to the limit for the Minimum Frequency Occupation Time defined in clauses 4.3.1.3.2.1 or 4.3.1.3.2.2. This value 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:1MHz

VBW: 3MHz

Detector Mode: RMS

Sweep time: Auto

Trace Mode: Max Hold

Trigger: Free Run

- When the trace has completed, identify the number of hopping frequencies used by the hopping sequence.
- The result shall be compared to the limit (value N) defined in clauses 4.3.1.3.2.1 or 4.3.1.3.2.2. 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 Dwell time and Minimum Frequency Occupation Time assuming the minimum number of hopping frequencies defined in clauses 4.3.1.3.2.1 or 4.3.1.3.2.2 are in use.

Step 7:

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

TEST RESULTS

Test Packet	No. of hop measured/s	Dwell Time per hop (ms)	Maximum Accumulated Dwell Time (ms)	Limit (ms)	Result
DH1	5.04	0.426	67.846	≤400	Pass
DH3	4.13	1.695	221.211	≤400	Pass
DH5	2.95	2.939	273.974	≤400	Pass
2-DH1	4.86	0.441	68.145	≤400	Pass
2-DH3	4.27	1.637	220.884	≤400	Pass
2-DH5	2.84	2.906	260.769	≤400	Pass
3-DH1	5.12	0.485	78.469	≤400	Pass
3-DH3	4.26	1.661	223.597	≤400	Pass
3-DH5	3.21	2.922	296.396	≤400	Pass

Remark: 1. Maximum accumulated dwell time = no. of hop within the testing period x dwell time per hop

2. The test period: $T = 400\text{ms} \times 79 \text{ Channel} = 31.6 \text{ s}$ (for accumulated dwell time)

Hopping sequence and Hopping Channel Occupied Band						
Test mode	ISM band (MHz)	Operation band (20dB down)(MHz)	Occupied band (%)	Limit (%)	Hopping sequence	Limit
GFSK	2400-2483.5	80.131	96.25	≥70	79	≥15
$\pi/4$ DQPSK		80.074	96.01		79	
8DPSK		80.048	95.93		79	
Minimum Frequency Occupation						
Frequency Occupation period		Limit			Result	
1		≥one dwell time			Pass	

Note: Dwell Time, Minimum Frequency Occupation and Hopping Sequence are not applicable to BLE.

3.1.5. Hopping Frequency Separation

LIMIT

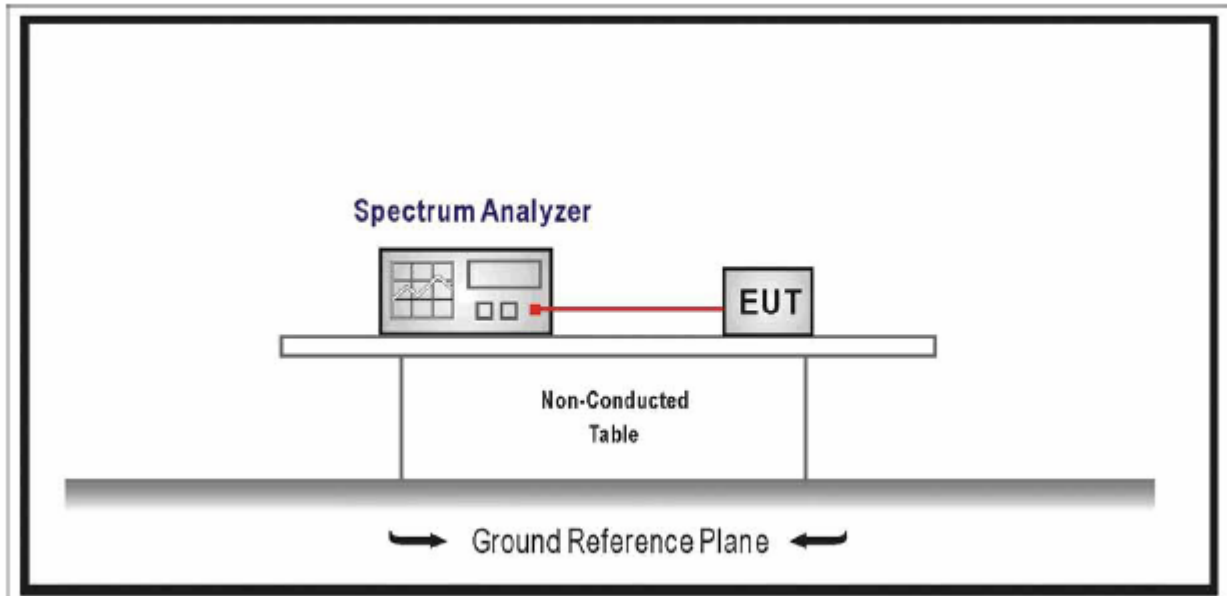
For non-adaptive equipment

The minimum Hopping Frequency Separation shall be equal to Occupied Channel Bandwidth of a single hop, with a minimum separation of 100 kHz.

For adaptive equipment

The minimum Hopping Frequency Separation shall be 100 kHz.

TEST CONFIGURATION



TEST PROCEDURE

Refer to ETSI EN 300 328 V1.9.1 (205-02) Clause 5.3.5.

TEST RESULTS

Test Channel (Frequency)	Test Mode	Carrier Frequencies Separated(MHz)	Limit(MHz)
Lowest channel: (2402 MHz)	GFSK	1.000	≥ 1
	$\pi/4$ DQPSK	1.000	≥ 1
	8DPSK	1.000	≥ 1
Middle channel: (2441MHz)	GFSK	1.015	≥ 1
	$\pi/4$ DQPSK	1.015	≥ 1
	8DPSK	1.015	≥ 1
Highest channel: (2480MHz)	GFSK	1.015	≥ 1
	$\pi/4$ DQPSK	1.015	≥ 1
	8DPSK	1.015	≥ 1

Note: Hopping Frequency Separation is not applicable to BLE.

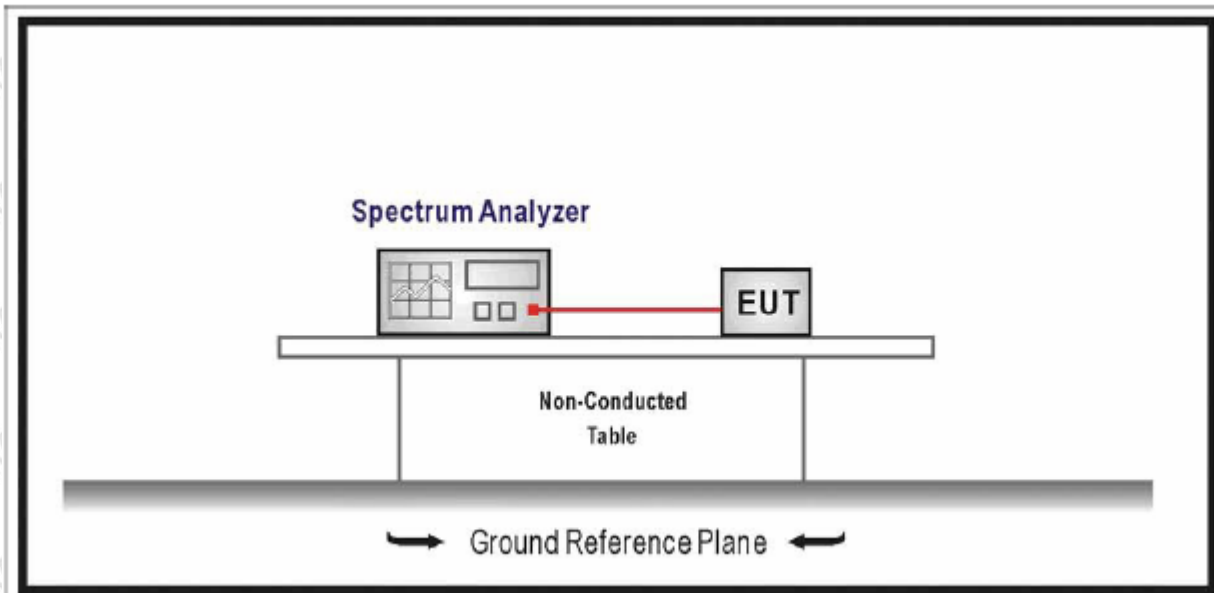
3.1.6. Medium Utilisation (MU) factor

LIMIT

For non-adaptive equipment

The maximum Medium Utilisation factor for non-adaptive Frequency Hopping equipment shall be 10 %.

TEST CONFIGURATION



TEST PROCEDURE

Refer to ETSI EN 300 328 V1.9.1 (205-02) Clause 5.3.2

TEST RESULTS

This requirement does not apply to adaptive equipment unless operating in a non-adaptive mode.

In addition, this requirement does not apply for equipment with a maximum declared RF Output power level of less than 10dBm E.I.R.P. or for equipment when operating in a mode where the RF Output power is less than 10dBm E.I.R.P.

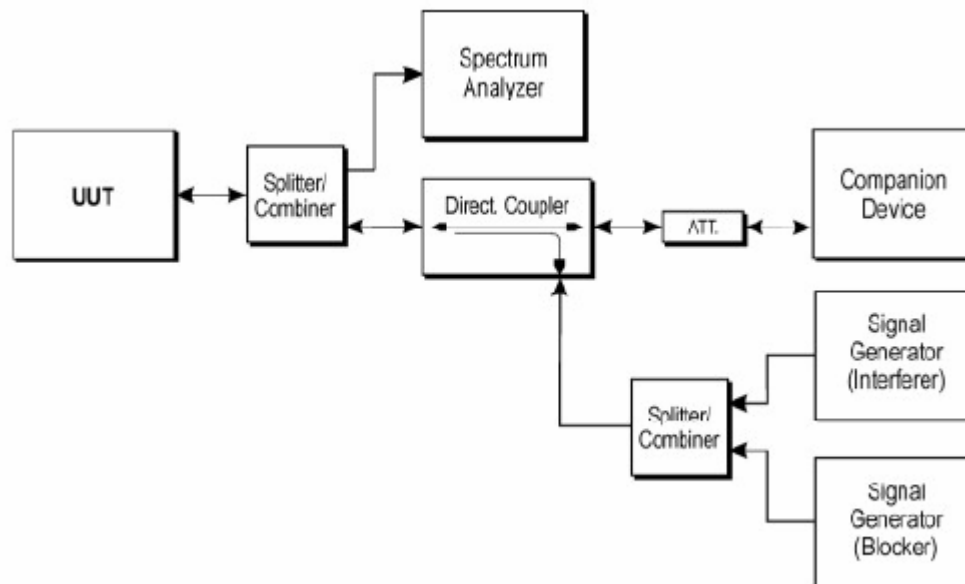
Not applicable.

3.1.7. Adaptivity (Adaptive Frequency Hopping)

LIMIT

Adaptivity Limit	
☐ LBT based Detect and Avoid	➤ Minimum Clear Channel Assessment (CCA) time = 20 us; ➤ CCA observation time declared by the supplier; ➤ $COT \leq 60$ ms; ➤ Idle Period = 5% of COT; ➤ Detection threshold level = $-70\text{dBm/MHz} + 20 - P_{\text{out E.I.R.P}}$ (P_{out} in dBm);
☐ Non-LBT based Detect and Avoid	➤ The frequency shall remain unavailable for a minimum time equal to 1 second or 5 times the actual number of hopping frequencies multiplied with the Channel Occupancy Time whichever is the longest; ➤ $COT \leq 40$ ms; ➤ Idle Period = 5% of COT; ➤ Detection threshold level = $-70\text{dBm/MHz} + 20 - P_{\text{out E.I.R.P}}$ (P_{out} in dBm);
☒ Short Control Signalling Transmissions:	➤ Short Control Signalling Transmissions shall have a maximum duty cycle of 10% within an observation period of 50ms.

TEST CONFIGURATION



TEST PROCEDURE

Refer to ETSI EN 300 328 V1.9.1 (205-02) Clause 5.3.7

TEST RESULTS

This requirement does not apply to non-adaptive equipment or adaptive equipment operating in a non-adaptive mode providing the equipment complies with the requirements and/or restrictions applicable to non-adaptive equipment.

In addition, this requirement does not apply for equipment with a maximum declared RF Output power level of less than 10dBm E.I.R.P. or for equipment when operating in a mode where the RF Output power is less than 10dBm E.I.R.P.

Not applicable.

3.1.8. OCCUPIED CHANNEL BANDWIDTH

LIMIT

The Occupied Channel Bandwidth for each hopping frequency shall fall completely within the band given in 2.4GHz to 2.4835GHz. For non-adaptive Frequency Hopping equipment with E.I.R.P greater than 10dBm, the Occupied Channel Bandwidth for every occupied hopping frequency shall be equal to or less than the value declared by the supplier. This declared value shall not be greater than 5 MHz.

The Occupied Channel Bandwidth is the bandwidth that contains 99 % of the power of the signal.

These measurements shall only be performed at normal test conditions.

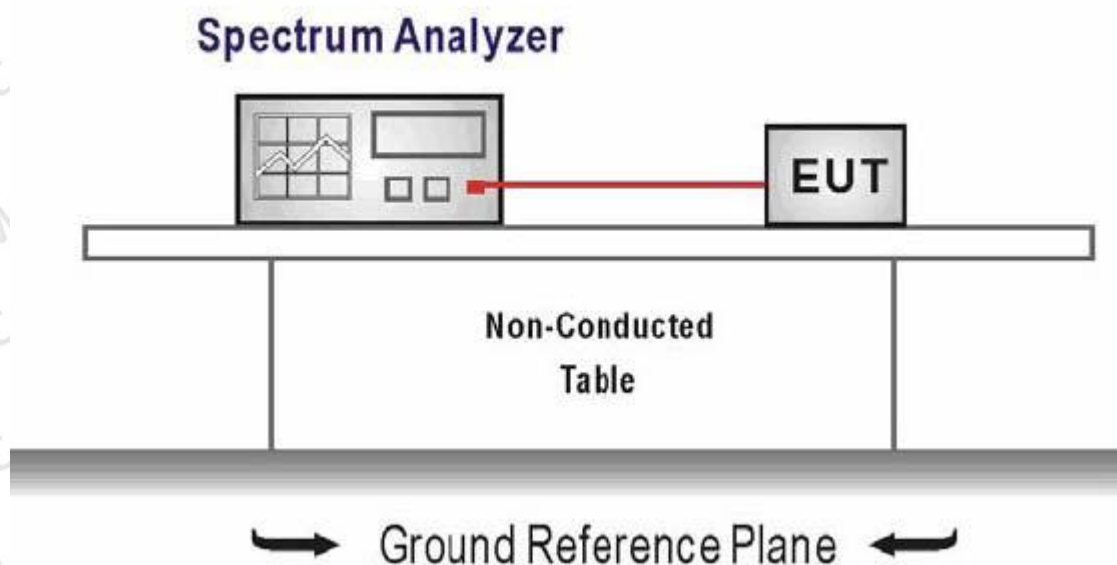
In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains) measurements need only to be performed on one of the active transmit chains (antenna outputs).

For systems using FHSS modulation and which have overlapping channels, special software might be required to force the UUT to hop or transmit on a single Hopping Frequency.

The measurement shall be performed only on the lowest and the highest frequency within the stated frequency range. The frequencies on which the test were performed shall be recorded.

If the equipment can operate with different Occupied Channel Bandwidths (e.g. 20 MHz and 40 MHz), then each channel bandwidth shall be tested separately.

TEST CONFIGURATION



TEST PROCEDURE

Refer to ETSI EN 300 328 V1.9.1(205-02) Clause 5.3.5.

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 × Occupied Channel Bandwidth (e.g. 40 MHz for a 20 MHz channel)
- Detector Mode: RMS
- Trace Mode: Max Hold

Step 2:

Wait until the trace is completed.

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.

EUT DESCRIPTION:

Mode:	BT Test mode
Hopping:	Off
Packet Type:	Longest supported
Modulation:	GFSK, Π/4 DQPSK, 8DPSK

MEASUREMENT DESCRIPTION

Instrument:	Spectrum Analyzer	
Detector:	RMS	
Sweep time:	Auto	
Video bandwidth:	100KHz	
Resolution bandwidth:	30KHz	
Span	3 MHz for 8DPSK & Π/4 DQPSK; 2 MHz for GFSK	
Center:	Transmit channel	
Trace:	Max hold	
Performed:	☒	Conducted
	☐	Radiated (only if no conducted sample is provided)

TEST RESULTS

Product:	Head Up Display
Test Item	99% Occupied Bandwidth
Test Mode	GFSK

Channel No.	Frequency (MHz)	Occupied Bandwidth (MHz)	Result
00	2402	0.9409823	Pass
78	2480	0.9432142	Pass

Product:	Head Up Display
Test Item	99% Occupied Bandwidth
Test Mode	π /4DQPSK

Channel No.	Frequency (MHz)	Occupied Bandwidth (MHz)	Result
00	2402	1.0291	Pass
78	2480	1.0304	Pass

Product:	Head Up Display
Test Item	99% Occupied Bandwidth
Test Mode	8DPSK

Channel No.	Frequency (MHz)	Occupied Bandwidth (MHz)	Result
00	2402	1.0339	Pass
78	2480	1.0272	Pass

3.1.9. Transmitter unwanted emissions in the out-of-band domain

LIMIT

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

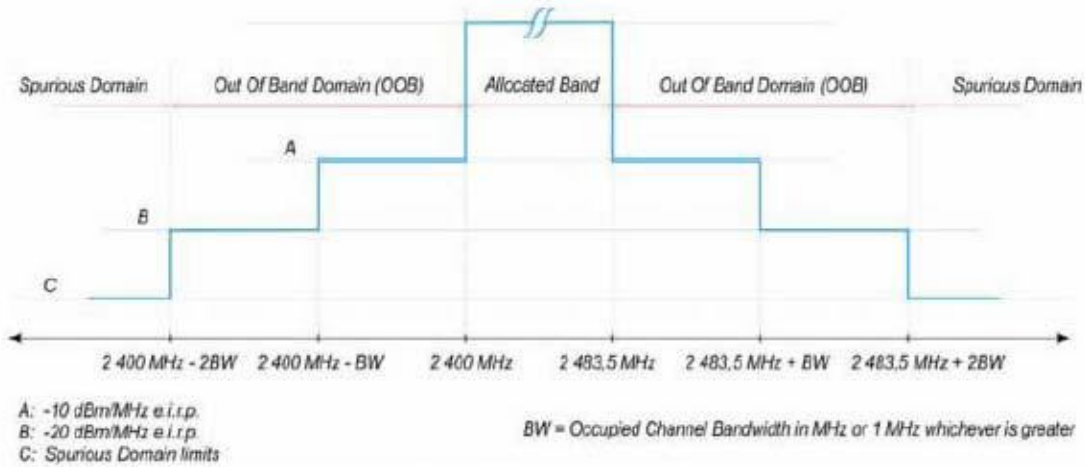
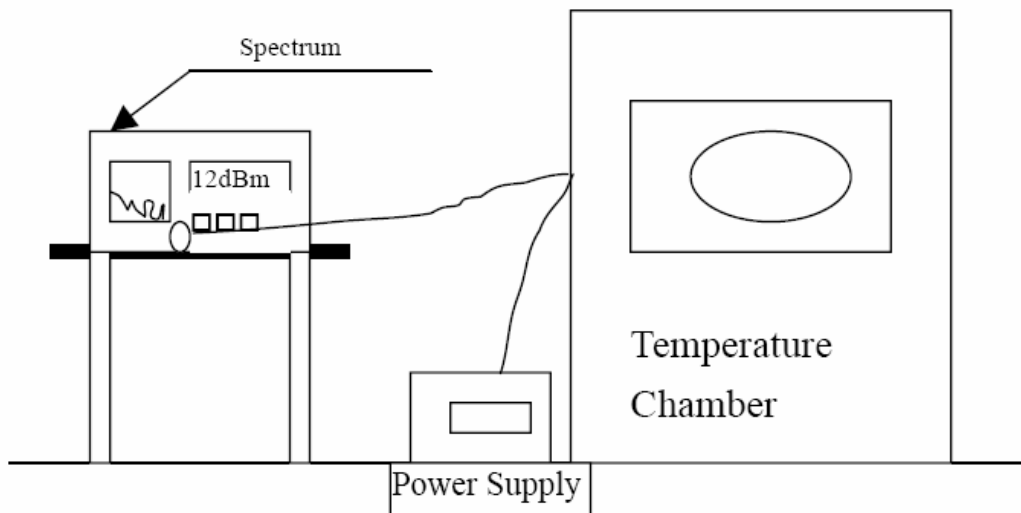


Figure 3: Transmit mask

TEST CONFIGURATION



TEST PROCEDURE

Refer to ETSI EN 300 328 V1.9.1(205-02) Clause 5.3.9

Instrument:	Spectrum Analyzer	
Detector:	RMS	
Sweep time:	depending on packet length	
Video bandwidth:	3MHz	
Resolution bandwidth:	1MHz	
Span	0Hz	
Center:	Trigger to burst	
Trace:	5000	
Performed:	☒	Conducted
	☐	Radiated (only if no conducted sample is provided)

TEST RESULTS
Bluetooth 3.0+EDR:

We tested all GFSK, $\pi/4$ DQPSK, 8DPSK mode at lowest and highest channel, recorded worst case at GFSK mode.

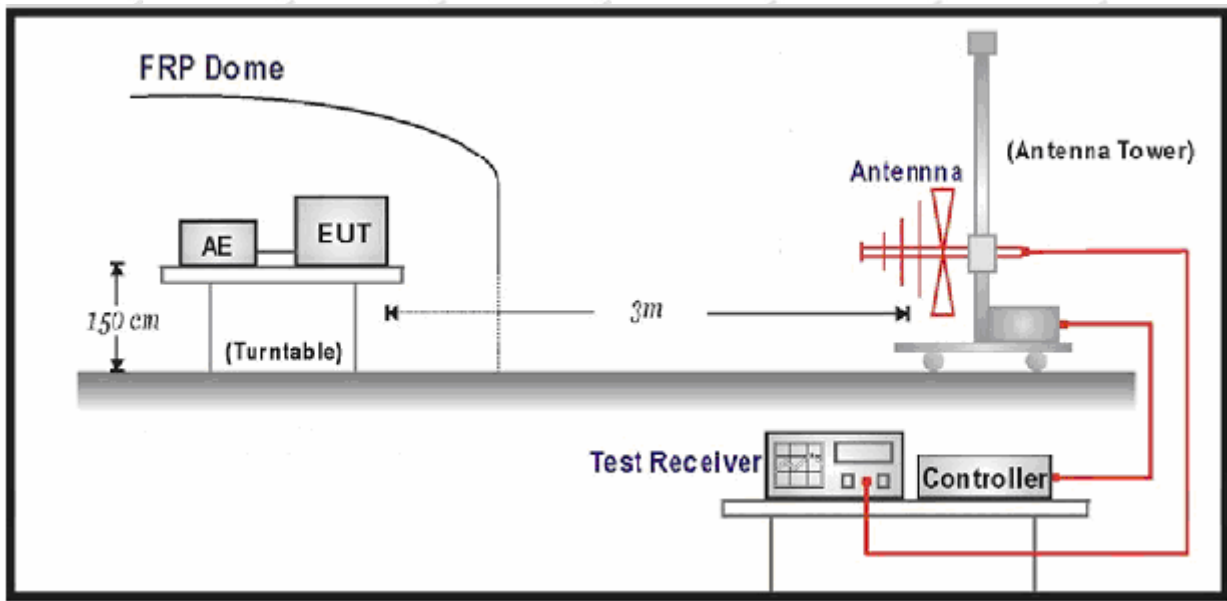
Test Conditions		Mode	Test Segment (MHz)	Max. Reading (dBm)	Limit (dBm)	Result
Temp (°C)	Volt (V DC)					
Normal (25)	Vnorm: 3.7	GFSK	2400-2BW to 2400-BW	-70.61	-20	PASS
			2400-BW to 2400	-63.18	-10	PASS
			2483.5 to 2483.5+BW	-65.72	-10	PASS
			2483.5+BW to 2483.5+2BW	-68.57	-20	PASS
-20	Vmin: 3.145	GFSK	2400-2BW to 2400-BW	-71.13	-20	PASS
			2400-BW to 2400	-64.26	-10	PASS
			2483.5 to 2483.5+BW	-65.09	-10	PASS
			2483.5+BW to 2483.5+2BW	-70.34	-20	PASS
-20	Vmax: 4.225	GFSK	2400-2BW to 2400-BW	-70.92	-20	PASS
			2400-BW to 2400	-63.06	-10	PASS
			2483.5 to 2483.5+BW	-64.43	-10	PASS
			2483.5+BW to 2483.5+2BW	-69.28	-20	PASS
55	Vmin: 3.145	GFSK	2400-2BW to 2400-BW	-71.92	-20	PASS
			2400-BW to 2400	-63.57	-10	PASS
			2483.5 to 2483.5+BW	-64.48	-10	PASS
			2483.5+BW to 2483.5+2BW	-70.04	-20	PASS
55	Vmax: 4.225	GFSK	2400-2BW to 2400-BW	-72.01	-20	PASS
			2400-BW to 2400	-63.06	-10	PASS
			2483.5 to 2483.5+BW	-62.13	-10	PASS
			2483.5+BW to 2483.5+2BW	-70.55	-20	PASS

3.1.10. Transmitter unwanted emissions in the spurious domain

LIMIT

Transmitter Limits for Spurious Emissions		
Frequency Range	Maximum power E.R.P. ($\leq 1\text{GHz}$) E.I.R.P. ($> 1\text{GHz}$)	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87,5 MHz	-36 dBm	100 kHz
87,5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 862 MHz	-54 dBm	100 kHz
862 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 12,75 GHz	-30 dBm	1 MHz

TEST CONFIGURATION



Test Procedure

Refer to ETSI EN 300 328 V1.9.1 (205-02) Clause 5.3.10

Instrument:	Spectrum Analyzer	
Detector:	Peak for prescan / RMS for emission retest	
Sweep time:	Auto	
Video bandwidth:	Below 1 GHz: 300 kHz / above 3MHz	
Resolution bandwidth:	Below 1 GHz: 100 kHz / above 1MHz	
Center:	Max hold	
Trace:	40001	
Performed:	☒	Conducted
	☒	Radiated (only if no conducted sample is provided)

Test Result

Bluetooth 4.1+EDR:

 We tested all GFSK, $\pi/4$ DQPSK, 8DPSK mode at lowest and highest channel, recorded worst case at GFSK mode.

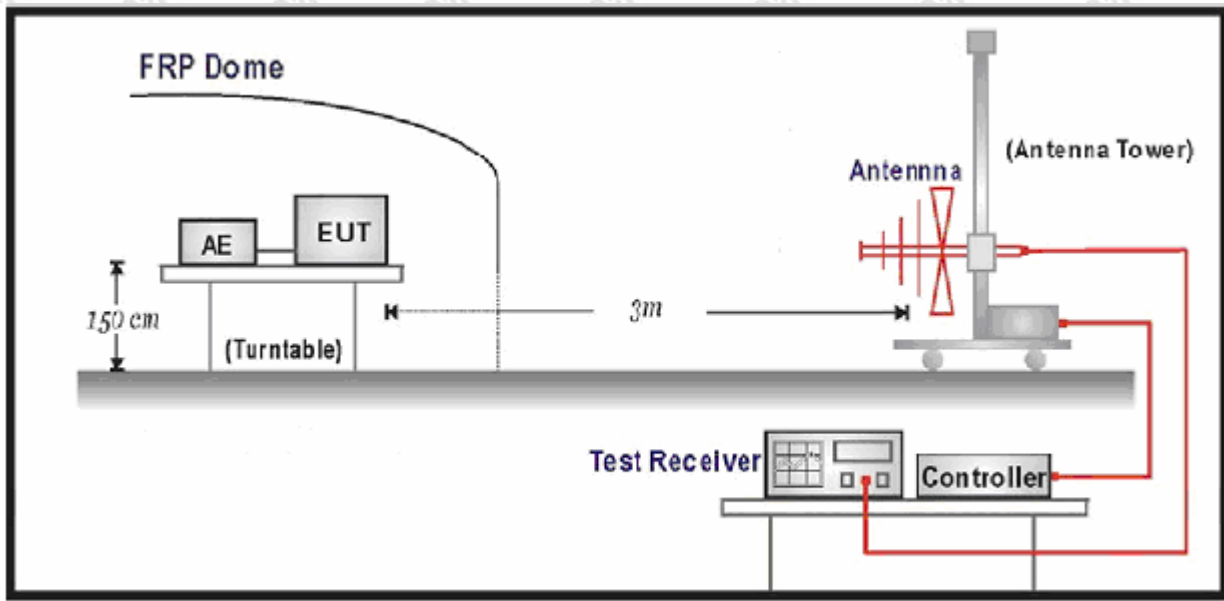
Frequency (MHz)	Polarization (H/V)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector
Channel 00(2402)					
104.3	H	-71.13	-.36	35.13	PK
104.5	V	-68.06	.36	32.06	PK
477.9	H	-65.43	-54	11.43	PK
477.4	V	-64.96	-54	10.96	PK
4803.8	H	-48.14	-30	18.14	PK
4803.4	V	-46.01	-30	16.01	PK
7206.2	H	-55.04	-30	25.04	PK
7206.1	V	-54.73	-30	24.73	PK
Channel 78 (2480)					
227.1	H	-71.08	-54	17.08	PK
227.8	V	-67.42	-54	13.42	PK
503.4	H	-65.77	-.36	29.77	PK
503.5	V	-64.68	.36	28.68	PK
4959.8	H	-48.13	-30	18.13	PK
4959.6	V	-42.58	-30	12.58	PK
7440.2	H	-55.47	-30	25.47	PK
7440.1	V	-54.31	-30	24.31	PK

3.1.11. Receiver Spurious Emissions

LIMIT

Spurious emissions limits for receivers		
Frequency Range	Maximum power E.R.P. ($\leq 1\text{GHz}$) E.I.R.P. ($> 1\text{GHz}$)	Measurement bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 12.75 GHz	-47 dBm	1 MHz

TEST CONFIGURATION



Test Procedure

Refer to ETSI EN 300 328 V1.9.1 (205-02) Clause 5.3.11

Instrument:	Spectrum Analyzer	
Detector:	Peak for prescan / RMS for emission retest	
Sweep time:	Auto	
Video bandwidth:	Below 1 GHz: 300 kHz / above 3MHz	
Resolution bandwidth:	Below 1 GHz: 100 kHz / above 1MHz	
Center:	Max hold	
Trace:	40001	
Performed:	☒	Conducted
	☒	Radiated (only if no conducted sample is provided)

Test Result

Bluetooth 3.0+EDR:

We tested all GFSK, $\pi/4$ DQPSK, 8DPSK mode at lowest and highest channel, recorded worst case at GFSK mode.

		Measurement method: EIRP(Radiated)		
		Highest power RX mode		
Rel. Humidity: 65 %		Ambient Temp.: 25 °C		
Lowest Frequency: 2402MHz		Test Result		
Frequency range	Res. Bandwidth (kHz)	Maximum Emission Observed (MHz)	Limit (dBm)	Margin (dB)
30 ~ 1000	100	-72.66	-57	15.66
1000 ~ 12750	1000	-54.84	-47	7.84
Highest Frequency: 2480MHz				
30 ~ 1000	100	-72.66	-57	15.66
1000 ~ 12750	1000	-54.84	-47	7.84
Test Result		Pass		

3.1.12. Receiver Blocking

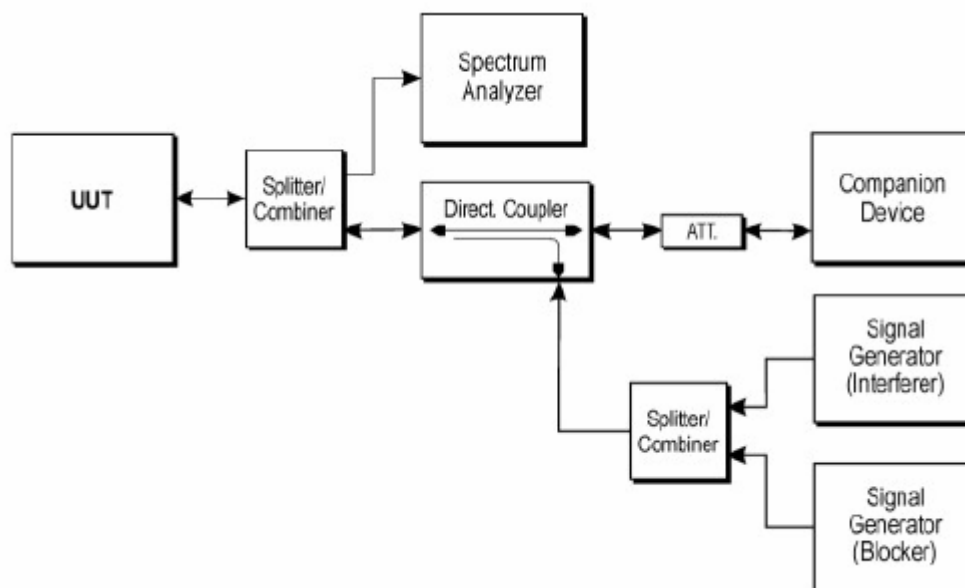
LIMIT

Adaptive Frequency Hopping equipment shall comply with the requirements defined in clauses 4.3.1.6.1 (LBT based DAA) or 4.3.1.6.2 (non-LBT based DAA) in the presence of a blocking signal with characteristics as provided in the table below.

Receiver Blocking parameters

Equipment Type (LBT / non-LBT)	Wanted signal mean power from companion device	Blocking signal frequency [MHz]	Blocking signal power [dBm]	Type of interfering signal
LBT	sufficient to maintain the link (see note 2)	2 395 or 2 488,5 (see note 1)	-30	CW
Non-LBT	-30 dBm			
NOTE 1: The highest blocking frequency shall be used for testing the lowest operating hopping frequency, while the lowest blocking frequency shall be used for testing the highest hopping frequency.				
NOTE 2: A typical value which can be used in most cases is -50 dBm/MHz.				

TEST CONFIGURATION



TEST PROCEDURE

Refer to ETSI EN 300 328 V1.9.1 (205-02) Clause 5.3.7

TEST RESULTS

This requirement does not apply for equipment with a maximum declared RF Output power level of less than 10dBm E.I.R.P. or for equipment when operating in a mode where the RF Output power is less than 10dBm E.I.R.P.

The RF Output power level of this equipment is less than 10dBm, so this item does not need to test.

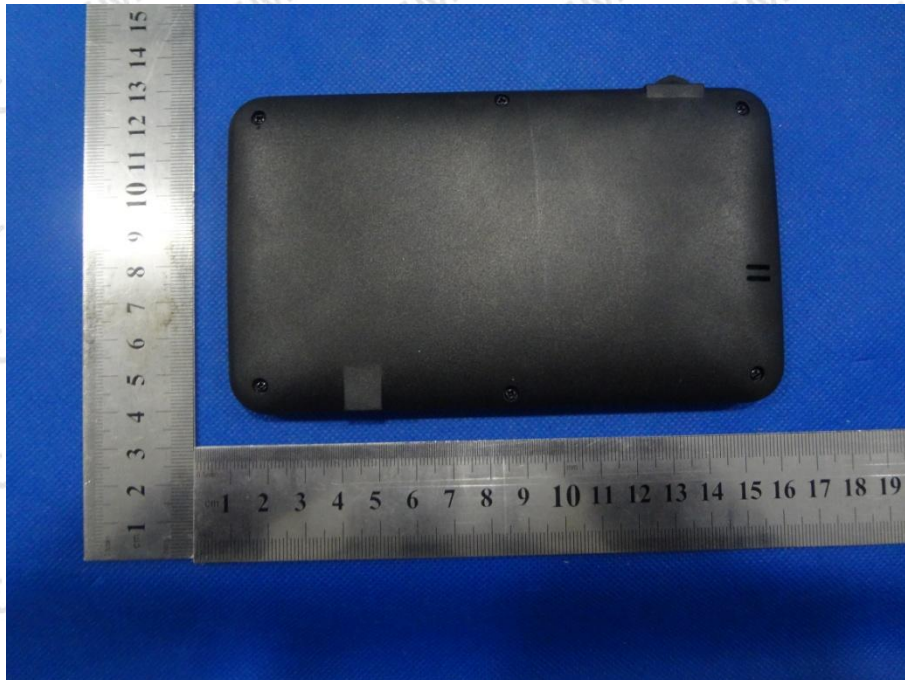
No applicable.

4 Photographs – Test Setup

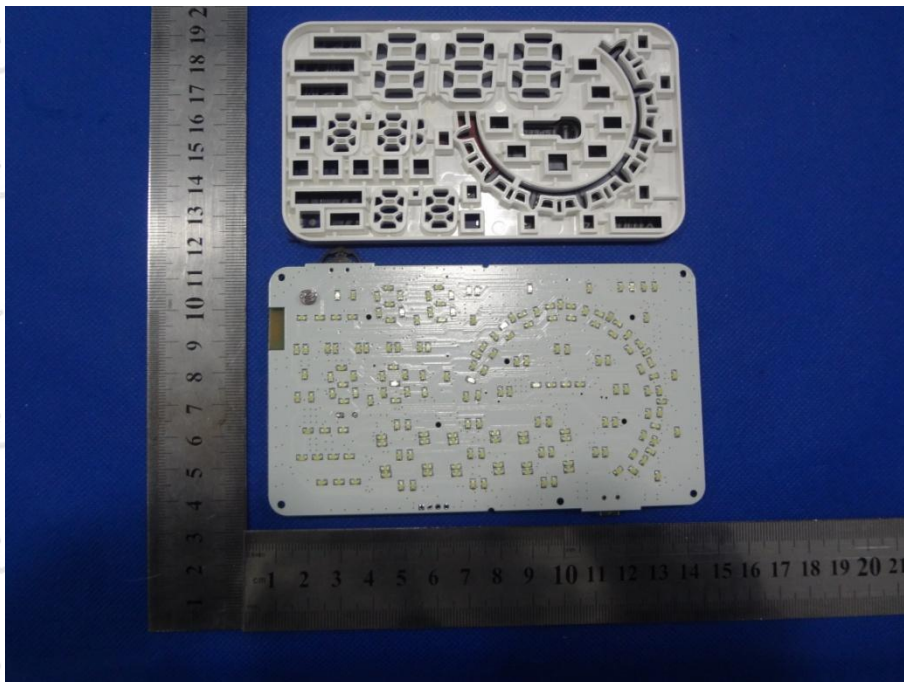
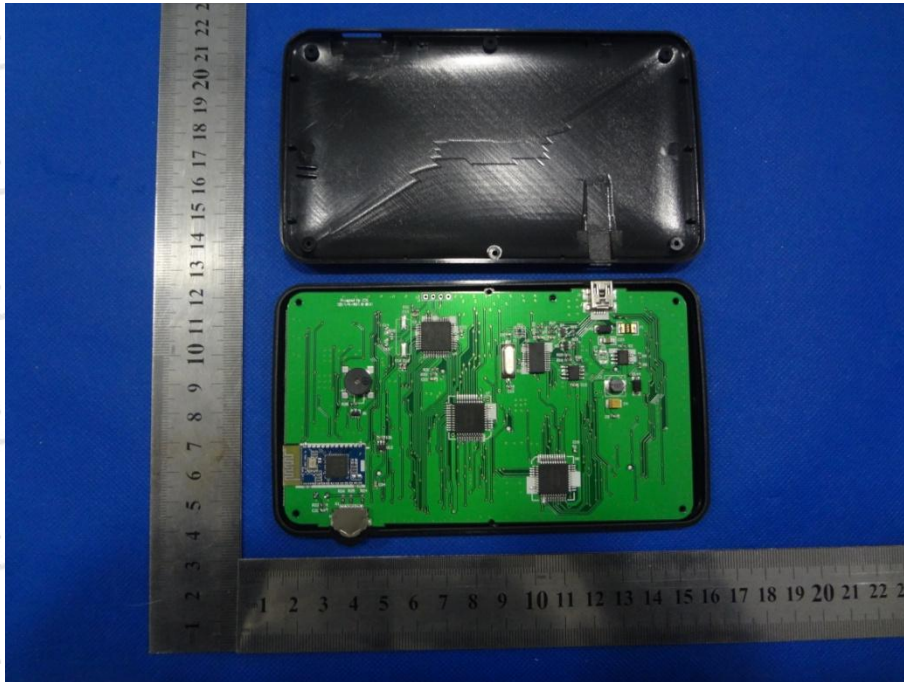
Spurious Radiated emission test view

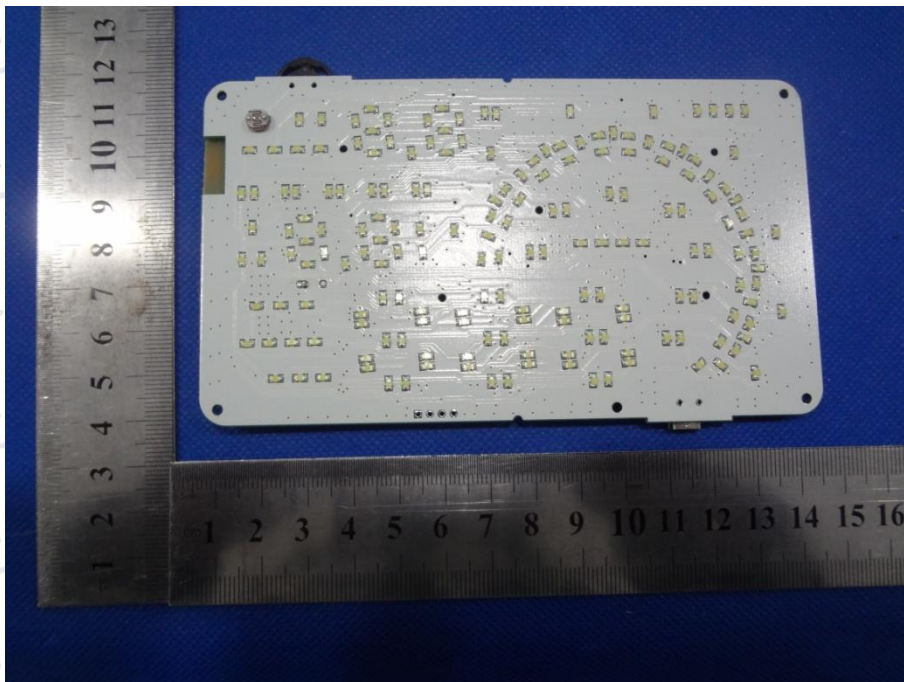
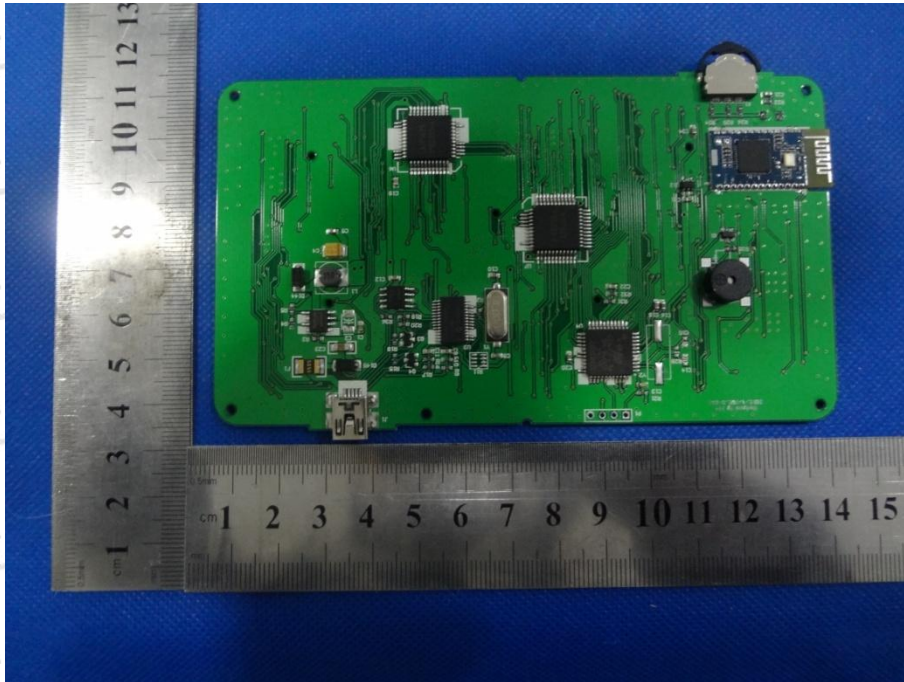


5 Photo for the EUT









End of the report