TEST REPORT

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

Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz band; Harmonised Standard for access to radio spectrum

MEASUREMENT AND TEST REPORT

For

Shenzhen Jiaomao Technology Co., Ltd.

Jiaomao,1003, Unit 1, Fucheng Digital Innovation Park, No. 15, Shijing Road, Fumin Community, Longhua District, Shenzhen

Model: JMMGW-mini, JMMGW-mini1, JMMGW-mini2

2022-10-09

This Report Concerns:	Equipment Type:
☒ Original Report	Mini Multi-Mode Gateway

Test Engineer:	Blue Hu/ Blue Hu
Report Number:	TH2209253-C01-R01
Test Date:	2022-09-22 to 2022-10-09
Reviewed By:	Neo Dong/ Neo Dong
Approved By:	Binglee/ Binglee
Prepared By:	**Shenzhen Tian Hai Test Technology Co., Ltd.** 125-126, No.66, Zhangge Road, Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong, China Tel: +86-755-86615100 Fax: +86-755-86615105

Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior written consent of Shenzhen Tian Hai Test Technology Co., Ltd

125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

TEST REPORT

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

Report Reference No.	TH2209253-C01-R01
Tested by (signature)	Blue Hu/
Reviewed by (signature)	Neo Dong/
Approved by (signature)	Binglee/
Date of issue	2022-10-09

Testing Laboratory Name	**Shenzhen Tian Hai Test Technology Co., Ltd.**
Address	125-126, No.66, Zhangge Road, Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong, China
Testing location	Same as above

Applicant's Name	**Shenzhen Jiaomao Technology Co., Ltd.**
Address	Jiaomao,1003, Unit 1, Fucheng Digital Innovation Park, No. 15, Shijing Road, Fumin Community, Longhua District, Shenzhen
Manufacturer's Name	**Shenzhen Jiaomao Technology Co., Ltd.**
Address	Jiaomao,1003, Unit 1, Fucheng Digital Innovation Park, No. 15, Shijing Road, Fumin Community, Longhua District, Shenzhen

Test specification	
Standard	ETSI EN 300 328 V2.2.2 (2019-07)
TRF Originator	Shenzhen Tian Hai Test Technology Co., Ltd.
Master TRF	Dated 2019-03

Test item description	**Mini Multi-Mode Gateway**
Trade mark	/
Model and/or type reference	JMMGW-mini, JMMGW-mini1, JMMGW-mini2
Model Difference:	The circuit design of all models is the same, but the appearance and model are different.
Rating(s)	DC 5V/1.0A power from adapter: Model: TPA-147C050100VU01 Input: AC 100-240V, 50/60Hz, 0.2A Output: DC 5V, 1.0A, 5.0W
Modulation Type	GFSK
Operation Frequency	2402MHz-2480MHz

125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

TABLE OF CONTENTS

125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

1 Test Standard

The tests were performed according to following standards:

ETSI EN 300 328 V2.2.2(2019-07) – Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonized EN covering essential requirements under article 3.2 of the RED Directive

125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

2 Summary

2.1 Product Description

The “EUT” as referred to in this report; more general information as follows, for more details, refer to the user’s manual of the EUT.

Name of EUT	Mini Multi-Mode Gateway
Model Number	JMMGW-mini, JMMGW-mini1, JMMGW-mini2
Operation Frequency	2402MHz-2480MHz
Channel Numbers	40 channels for BLE
Channel Separation	2MHz for BLE
Antenna Type	PCB Antenna
Antenna Gain	1dBi
Sample No.	TH2209253
Ratings	DC 5V/1.0A power from adapter: Model: TPA-147C050100VU01 Input: AC 100-240V, 50/60Hz, 0.2A Output: DC 5V, 1.0A, 5.0W

2.2 Equipment Under Test

Description of the test mode

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

2.3 Equipment Under Test

For more details, refer to the user’s manual of the EUT.

2.4 EUT operation mode

The EUT has been tested under typical operating condition. The Applicant provides software to control the EUT for staying in continous transmitting and receiving mode for testing.

125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

2.5 EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - supplied by the lab

2.6 Modifications

No modifications were implemented to meet testing criteria.

2.7 Test Conditions and Channel

	Normal Test Conditions	Extreme Test Conditions
Temperature	15°C - 35°C	-20°C ~ 35°C Note: (1)
Relative Humidity	20% - 75%	N/A

Test Channel	EUT Channel	Test Frequency (MHz)
lowest	CH00	2402
middle	CH19	2440
highest	CH39	2480

Note:

(1) Where tests at extreme temperatures are required, measurements shall be made over the extremes of the operating temperature range as declared by the manufacturer.
The HT 35°C and LT -20°C was declared by manufacturer, The EUT couldn't be operate normally with higher or lower temperature.

(2) The measurements are performed at the highest, middle, lowest available channels.

125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

3 Test Environment

3.1 Environmental conditions

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

Normal Temperature: 25 °C
High Temperature: 35 °C
Low Temperature: -20 °C
Normal Voltage: DC 5V
Relative Humidity: 55 %
Air Pressure: 989 HPa

3.2 Test Description

EN 300 328 V2.2.2		
Clause	**Test Parameter**	**Results**
TRANSMITTER PARAMETERS		
4.3.2.2	RF Output Power	Pass
4.3.2.3	Power Spectral Density	Pass
4.3.2.6	Adaptivity	Not Applicable (Note)
4.3.2.7	Occupied Channel Bandwidth	Pass
4.3.2.8	Transmitter unwanted emission in the OOB domain	Pass
4.3.2.9	Transmitter unwanted emissions in the spurious domain	Pass
4.3.2.12	Geo-location capability	Not Applicable
RECEIVER PARAMETERS		
4.3.2.10	Receiver Spurious Emissions	Pass
4.3.2.11	Receiver Blocking	Pass

Remark: The measurement uncertainty is not included in the test result.

125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

3.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics;Part 1" and TR-100028-02 "Electromagnetic compatibilityand Radio spectrum Matters (ERM);Uncertainties in the measurementof mobile radio equipment characteristics;Part 2 " and is documented in the Bontek Compliance Testing Laboratory quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similarto that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Test Items	Measurement Uncertainty	Notes
RF Output Power	±0.352 dB	
Transmitter power conducted	±1.24 dB	(1)
Power Spectral Density	±1.50 dB	(1)
Occupied Channel Bandwidth	±0.0005%	(1)
Duty cycle, Tx-sequence and Tx-gap&Medium utilization	±0.566%	(1)
Adjacent channel power	±0.751 dB	(1)
Conducted spurious emission (30-1000HMz)	±0.746 dB	(1)
Conducted spurious emission (1000-12750HMz)	±1.328 dB	(1)
Conducted spurious emission (12750-26000HMz)	±1.04 dB	(1)
All emission, radiated	±6 dB	(1)

Note: (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

(2)The measurement uncertainty is not included in the test result.

3.4 Equipments Used during the Test

Radiated Emission (3m)				
Kind of Equipment	**Manufacturer**	**Type**	**S/N**	**Calibrate until**
EMI Test Receiver	R&S	ESR7	102333	2022-11-15
MXA Signal Analyzer	Keysight	N9020A	MY50143107	2023-04-15
Bilog Antenna	Schwarzbeck	VULB 9168	01148	2022-11-20
Pre-Amplifier	Schwarzbeck	BBV 9718 B	00109	2022-11-16
Pre-Amplifier	Schwarzbeck	BBV 9743 B	00253	2022-11-15
Horn Antenna	Schwarzbeck	BBHA 9120	02379	2022-11-20
RF Test System				
Wideband radio communication tester	R&S	CMW500	131134	2022-11-15
EXA Signal Analyzer	Keysight	N9010A	MY54488841	2023-04-15
MXG Vector Signal Generator	Agilent	N5182B	MY59100603	2022-11-15
MXG Analog Signal Generator	Agilent	SMB100A	103827	2022-11-15
RF control unit	Tonscend	JS0806-2	21C8060397	2022-12-08
DC Power supply	Agilent	E3632A	MY50120052	/
Software Version Information				
EMI Conduction Test	FALA	E-EMC	Ver. EMC-CON 3A1.1	N/A
EMI Radiation test	FALA	E-EMC	Ver. FA-03A2 RE+	N/A
RF test system	Tonscend	TS1120-3	Ver: 2.6.88.0346	N/A
RF Communication test system	R&S	CMW 500	Ver: V2.6.88.0346	N/A

125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

4 Test conditions and results

4.1 ETSI EN 300 328 REQUIREMENTS

4.1.1. Maximum Transmit Power

Limit

Condition	Frequency BAND	Limit (e.i.r.p.)
Under all test conditions	2400 ~ 2483.5 MHz	20dBm

Test Procedure

Refer to chapter 5.4.2.2 of ETSI EN 300 328 V2.2.2.

Measurement	
☒ Conducted measurement	☐ Radiated measurement

Deviation From Test Standard

No deviation.

Test Setup

The measurement was performed at both normal environmental conditions and at the extremes of the operating temperature. The measurement was performed at the lowest, the middle, and the highest channel. The equipment was configured to operate under its worst case situation with respect to output power. (In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator.) Controlling software has been activated to set the EUT on specific channel and power level.

Test Results

Test Condition			EIRP Power (dBm)		
			(CH00) 2402 MHz	(CH19) 2440 MHz	(CH39) 2480 MHz
GFSK					
Tnom(℃)	+25	Vnom(v)	2.74	2.37	2.66
Tmin(℃)	-20		2.89	2.49	2.77
Tmax(℃)	+35		2.98	2.56	2.89

NOTE: 1. EIRP = Conducted output power + ANT Gain.

125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

4.1.2. Maximum e.i.r.p. Pectral Density

Limit

Condition	frequency BAND	Limit (e.i.r.p.)
Under normal conditions	2400 ~ 2483.5 MHz	10dBm / 1MHz

Test Procedure

Refer to chapter 5.4.3.2 of ETSI EN 300 328 V2.2.2.

Measurement Method	
☒ Conducted measurement	☐ Radiated measurement
☒ Option 1: For equipment with continuous and non-continuous transmissions	
☐ Option 2: For equipment with continuous transmission capability or for equipment operating (or with the capability to operate) with a constant duty cycle (e.g. Frame Based equipment)	

Deviation From Test Standard

No deviation.

Test Setup

The measurement was performed at normal environmental conditions only. The measurement was performed at the lowest, the middle, and the highest channel. The equipment was configured to operate under its wors case situation with respect to output power. (In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator.) Controlling software has been activated to set the EUT on specific status

Test Results

Channel	Channel Frequency (MHz)	Power Density (dBm/1MHz) (E.I.R.P)	Limit (dBm/1MHz) (E.I.R.P)	Pass/Fail
00	2402	0.99	10	Pass
19	2440	1.23	10	Pass
39	2480	1.32	10	Pass

125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

4.1.3. Occupied Channel Bandwidth

Limit

Condition		Limit
All types of equipment		Shall fall completely within the band 2400 to 2483.5 MHz.
Additional requirement	For non-adaptive using wide band modulations other than FHSS system and e.i.r.p >10dBm.	Less than 20MHz
	For non-adaptive Frequency Hopping system and e.i.r.p >10dBm.	Less than 5MHz

Test Procedure

Refer to chapter 5.4.7.2 of ETSI EN 300 328 V2.2.2.

Measurement	
☒ Conducted measurement	☐ Radiated measurement

Deviation From Test Standard

No deviation.

Test Setup

The measurement was performed at normal environmental conditions only. This measurement was performed at the lowest and the highest channel. The equipment was configured to operate under its worst case situation with respect to output power. (In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator.) Controlling software has been activated to set the EUT on specific status.

Test Results

Channel	Channel Frequency (MHz)	Occupied bandwidth (MHz)	Measured frequencies		Limit	Pass/Fail
			FL (MHz)	FH (MHz)		
00	2402	1.25	2401.30	2402.55	FL > 2400 MHz and FH < 2483.5 MHz	Pass
39	2480	1.21	2479.25	2480.46		Pass

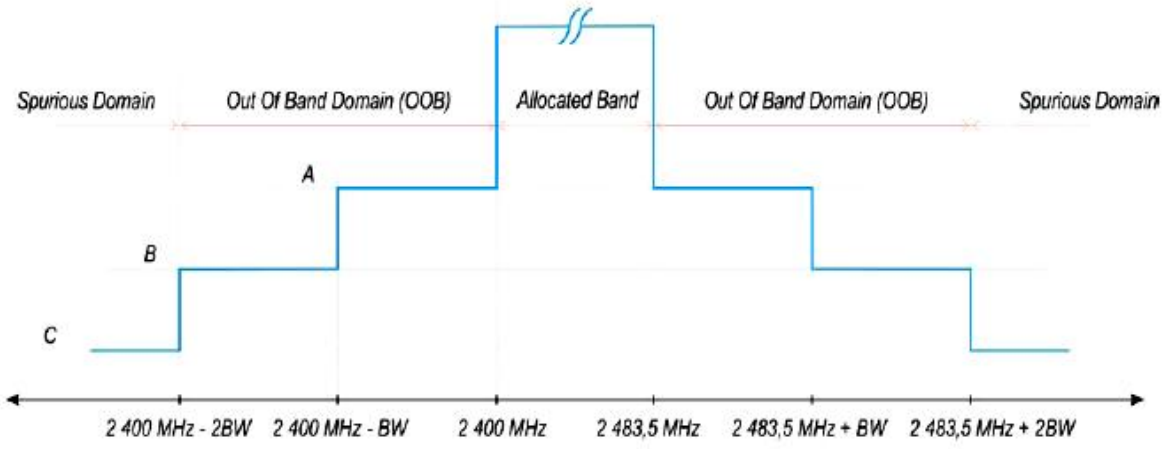
Note: FL is the lowest frequency of the 99% occupied bandwidth of power envelope.
FH is the highest frequency of the 99% occupied bandwidth of power envelope.

125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

4.1.4. Protocol Transmitter Unwanted Emissions in the out-of-band domain

Limit

Condition	Limit
Under all test conditions	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 below figure.



A: -10 dBm/MHz e.i.r.p.
B: -20 dBm/MHz e.i.r.p.
C: Spurious Domain limits

BW = Occupied Channel Bandwidth in MHz or 1 MHz whichever is greater

Test Procedure

Refer to chapter 5.4.8.2 of ETSI EN 300 328 V2.2.2.

Measurement	
☒ Conducted measurement	☐ Radiated measurement

Deviation From Test Standard

No deviation.

Test Setup

The measurement was performed at normal environmental conditions only. This measurement was performed at the lowest and the highest channel. The equipment was configured to operate under its worst case situation with respect to output power. (In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator.) The frequency has to be recorded for the right and left end above threshold of highest and lowest channel respectively.

125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

Test Results

Channel Frequency (MHz)			2402MHz				2480MHz			
Test Condition			OOB Emission (MHz)				OOB Emission (MHz)			
			2398.94 ~2400		2397.88 ~2398.94		2483.5 ~2484.56		2484.56 ~2485.62	
Temperature		Voltage	Freq. (MHz)	Power (dBm)	Freq. (MHz)	Power (dBm)	Freq. (MHz)	Power (dBm)	Freq. (MHz)	Power (dBm)
Tnorm(℃)	+25	Normal	2399.3	-40.49	2398.47	-48.63	2484.51	-47.59	2485.49	-48.30
Limit (dBm/MHz)			-10.00		-20.00		-10.00		-20.00	
Pass/Fail			Pass		Pass		Pass		Pass	

125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

4.1.5. Transmitter Spurious Emissions

Limit

Transmitter limits for narrowband spurious emissions:

Frequency Range	Maximum Power Limit (e.r.p. (≤ 1 GHz) e.i.r.p. (> 1 GHz))	Bandwidth
30 MHz to 47 MHz	-36dBm	100kHz
47 MHz to 74 MHz	-54dBm	100kHz
74 MHz to 87,5 MHz	-36dBm	100kHz
87,5 MHz to 118 MHz	-54dBm	100kHz
118 MHz to 174 MHz	-36dBm	100kHz
174 MHz to 230 MHz	-54dBm	100kHz
230 MHz to 470 MHz	-36dBm	100kHz
470 MHz to 694 MHz	-54dBm	100kHz
694 MHz to 1 GHz	-36dBm	100kHz
1GHz ~ 12.75GHz	-30dBm	1MHz

Note: These limits are e.r.p. for emissions up to 1 GHz and as e.i.r.p. for emissions above 1GHz.

Test Procedure

Refer to chapter 5.4.9.2 of ETSI EN 300 328 V2.2.2.

Measurement	
☐ Conducted measurement	☒ Radiated measurement
For Conducted measurement: The level of unwanted emissions shall be measured as their power in a specified load (conducted spurious emissions) and their effective radiated power when radiated by the cabinet or structure of the equipment with the antenna connector(s) terminated by a specified load (cabinet radiation).	
Conducted measurement (For equipment with multiple transmit chains): ☐ Option 1: The results for each of the transmit chains for the corresponding 1MHz segments shall be added and compared with the limits. ☐ Option 2: The results for each of the transmit chains shall be individually compared with the limits after these limits have been reduced by 10 x log (N) (number of active transmit chains)	

Deviation From Test Standard

No deviation.

Test Setup

For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration).

125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

The equipment was configured to operate under its worst case situation with respect to output power.
The measurement was performed at normal environmental conditions only. Controlling software has been activated to set the EUT on specific status.
This measurement was performed at the lowest and the highest channel.

Test Results

Below 1GHz Data

Frequency Range	30MHz ~ 1GHz	Operating Channel	00

Spurious Emissions Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
30.9619	H	-56.49	-36.00	-20.49
102.0014	H	-79.69	-54.00	-25.69
191.7450	H	-74.49	-54.00	-20.49
345.5952	H	-65.96	-36.00	-29.96
601.4265	H	-73.49	-54.00	-19.49
760.7036	H	-63.16	-36.00	-27.16

Frequency Range	30MHz ~ 1GHz	Operating Channel	00

Spurious Emissions Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
30.9619	V	-72.19	-36.00	-36.19
99.1797	V	-70.79	-54.00	-16.79
199.2855	V	-65.39	-54.00	-11.39
386.6338	V	-68.88	-36.00	-32.88
554.8254	V	-66.96	-54.00	-12.96
760.7036	V	-57.69	-36.00	-21.69

125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

Frequency Range	30MHz ~ 1GHz	Operating Channel	39

Spurious Emissions Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
30.9645	H	-64.15	-36.00	-28.15
102.0023	H	-79.69	-54.00	-25.69
191.7445	H	-78.46	-54.00	-24.46
345.5987	H	-74.16	-36.00	-38.16
601.4289	H	-69.97	-54.00	-15.97
760.7044	H	-65.55	-36.00	-29.55

Frequency Range	30MHz ~ 1GHz	Operating Channel	39

Spurious Emissions Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
30.9622	V	-70.36	-36.00	-34.36
99.1745	V	-77.63	-54.00	-23.63
199.2878	V	-69.36	-54.00	-15.36
386.6327	V	-70.36	-36.00	-34.36
554.8289	V	-77.89	-54.00	-23.89
760.7045	V	-58.79	-36.00	-22.79

125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

Above 1GHz Data

Frequency Range	1GHz ~ 12.75GHz	Operating Channel	00

Spurious Emissions Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
4804	H	-51.36	-30.00	-21.36
7206	H	-41.69	-30.00	-11.69
9608	H	-49.63	-30.00	-19.63
4804	V	-47.69	-30.00	-17.69
7206	V	-46.66	-30.00	-16.66
9608	V	-41.69	-30.00	-11.69

Frequency Range	1GHz ~ 12.75GHz	Operating Channel	39

Spurious Emissions Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
4960	H	-46.66	-30.00	-16.66
7440	H	-49.36	-30.00	-19.36
9920	H	-43.63	-30.00	-13.63
4960	V	-43.97	-30.00	-13.97
7440	V	-44.36	-30.00	-14.36
9920	V	-47.36	-30.00	-17.36

125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

4.1.6. Receiver Spurious Emissions

Limit

Frequency Range	Maximum Power Limit (e.r.p. (≤ 1 GHz) e.i.r.p. (> 1 GHz)
30MHz ~ 1GHz	-57dBm
1GHz ~ 12.75GHz	-47dBm

Test Procedure

Refer to chapter 5.4.10.2 of ETSI EN 300 328 V2.2.2.

Measurement	
☐ Conducted measurement	☒ Radiated measurement
For Conducted measurement: The level of unwanted emissions shall be measured as their power in a specified load (conducted spurious emissions) and their effective radiated power when radiated by the cabinet or structure of the equipment with the antenna connector(s) terminated by a specified load (cabinet radiation).	
Conducted measurement (For equipment with multiple transmit chains): ☐ Option 1: The results for each of the transmit chains for the corresponding 1MHz segments shall be added and compared with the limits. ☐ Option 2: The results for each of the transmit chains shall be individually compared with the limits after these limits have been reduced by 10 x log (N) (number of active transmit chains)	

Deviation From Test Standard

No deviation.

Test Setup

For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration).
Testing was performed when the equipment was in a receive-only mode.
The measurement was performed at normal environmental conditions only. Controlling software has been activated to set the EUT on specific status.
This measurement was performed at the lowest and the highest channel.

125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

Test Results

Below 1GHz Data

Frequency Range	30MHz ~ 1GHz	Operating Channel	00

Spurious Emissions Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
30.4238	H	-65.36	-57.00	-8.36
69.1141	H	-80.49	-57.00	-23.49
180.0165	H	-73.59	-57.00	-16.59
345.5952	H	-71.48	-57.00	-14.48
663.4729	H	-68.69	-57.00	-11.69
965.5421	H	-66.79	-57.00	-9.79

Frequency Range	30MHz ~ 1GHz	Operating Channel	00

Spurious Emissions Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
30.7455	V	-69.63	-57.00	-12.63
96.0986	V	-81.36	-57.00	-24.36
191.7450	V	-74.16	-57.00	-17.16
399.0302	V	-70.69	-57.00	-13.69
533.8321	V	-72.36	-57.00	-15.36
830.4002	V	-69.31	-57.00	-12.31

125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

Frequency Range	30MHz ~ 1GHz	Operating Channel	39

Spurious Emissions Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
30.4278	H	-66.99	-57.00	-9.99
69.1156	H	-81.32	-57.00	-24.32
180.0165	H	-71.69	-57.00	-14.69
345.5978	H	-73.64	-57.00	-16.64
663.4734	H	-65.49	-57.00	-8.49
965.5445	H	-66.49	-57.00	-9.49

Frequency Range	30MHz ~ 1GHz	Operating Channel	39

Spurious Emissions Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
30.747	V	-73.63	-57.00	-16.63
96.098	V	-77.69	-57.00	-20.69
191.7455	V	-69.31	-57.00	-12.31
399.0314	V	-72.46	-57.00	-15.46
533.8356	V	-69.46	-57.00	-12.46
830.4145	V	-63.33	-57.00	-6.33

125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

Above 1GHz Data

Frequency Range	1GHz ~ 12.75GHz	Operating Channel	00

Spurious Emissions Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
2290	H	-60.89	-47.00	-13.89
4567	H	-58.63	-47.00	-11.63
8793	H	-56.46	-47.00	-9.46
2295	V	-59.87	-47.00	-12.87
4561	V	-56.63	-47.00	-9.63
8768	V	-54.49	-47.00	-7.49

Frequency Range	1GHz ~ 12.75GHz	Operating Channel	39

Spurious Emissions Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
3013	H	-61.49	-47.00	-14.49
5189	H	-57.49	-47.00	-10.49
8065	H	-56.88	-47.00	-9.88
1990	V	-59.37	-47.00	-12.37
3897	V	-56.49	-47.00	-9.49
9780	V	-55.91	-47.00	-8.91

125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

4.1.7. Receiver Blocking

This requirement applies to all receiver categories.

Receiver Category		
☐ Category 1(EIRP>10dBm)	☒ Category 2(EIRP≦10dBm)	☐ Category 3(EIRP≦0dBm)
Minimum performance criterion	☒ PER ≦10%	
	☐ Alternative performance criteria (See note)	
Note: The manufacturer was declared the minimum performance criterion shall be no loss of the wireless transmission function needed for the intended use of the equipment.		

Receiver Category 1 Equipment			
Wanted signal mean power from companion device (dBm)(See note 1 and 4)	**Blocking Signal Frequency (MHz)**	**Blocking Signal Power (dBm) (See note 4)**	**Type of blocking signal**
(-133dBm+10x $\log_{10}$ (OCBW) Or -68dBm whichever is less (See note 2)	2 380 2 504	-34	CW
(-139dBm+10x$\log_{10}$ (OCBW) Or -74dBm 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 Pmin + 26 dB where Pmin 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 Pmin + 20 dB where Pmin 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.

125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

Receiver Category 2 Equipment			
Wanted signal mean power from companion device (dBm)(See note 1 and 3)	**Blocking Signal Frequency (MHz)**	**Blocking Signal Power (dBm) (See note 3)**	**Type of blocking signal**
(-139dBm+10xlog$_{10}$ (OCBW)+10dB) Or -74dBm+10dB) 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 Pmin + 26 dB where Pmin 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.			

Receiver Category 3 Equipment			
Wanted signal mean power from companion device (dBm) (See note 1 and 3)	**Blocking Signal Frequency (MHz)**	**Blocking Signal Power (dBm) (See note 3)**	**Type of blocking signal**
(-139dBm+10xlog$_{10}$(OCBW)+20dB) Or -74dBm+20dB) 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 the test may be performed using a wanted signal up to Pmin + 30 dB where Pmin 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.			

125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

Test Procedure

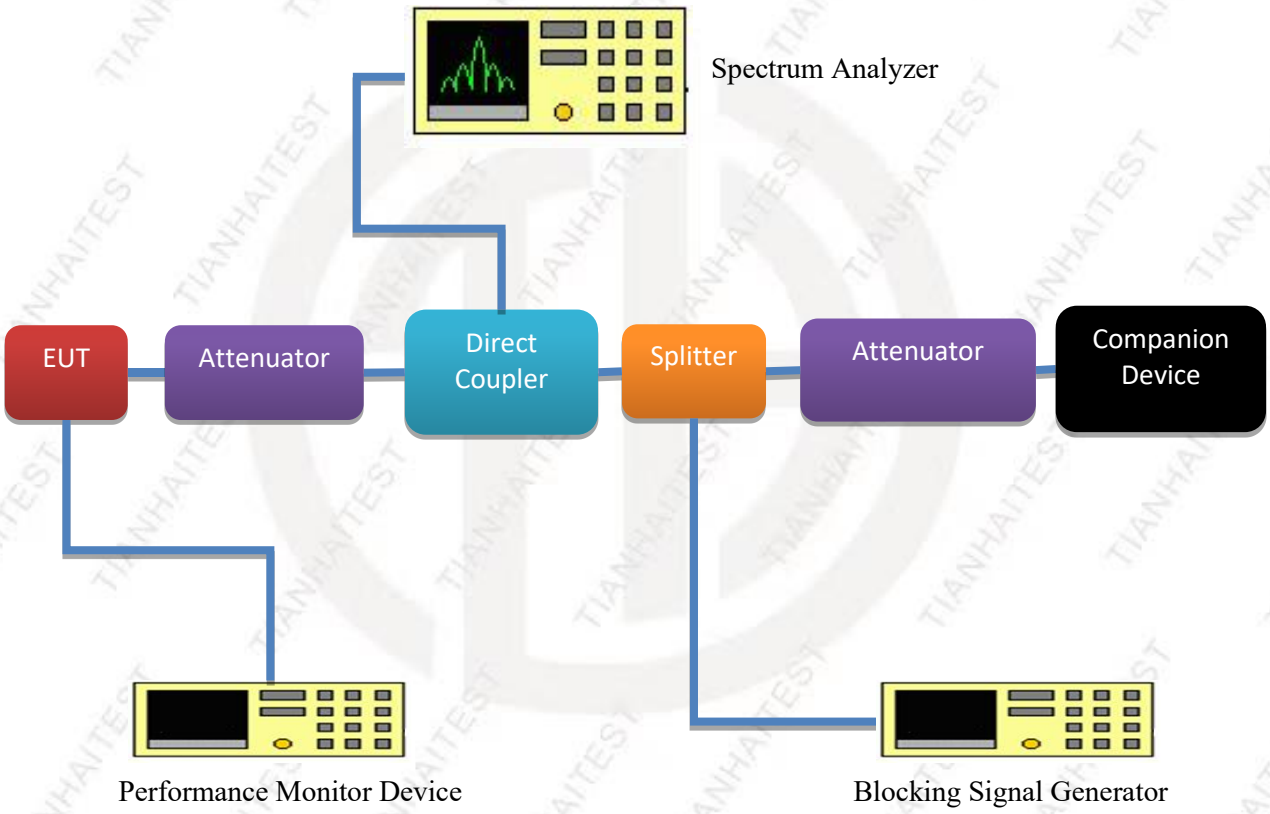
Refer to chapter 5.4.11.2. of ETSI EN 300 328 V2.2.2.

Measurement	
☒ Conducted measurement	☐ Radiated measurement

Deviation From Test Standard

No deviation.

Test Setup



125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

Test Results

Receiver Category 2 Equipment

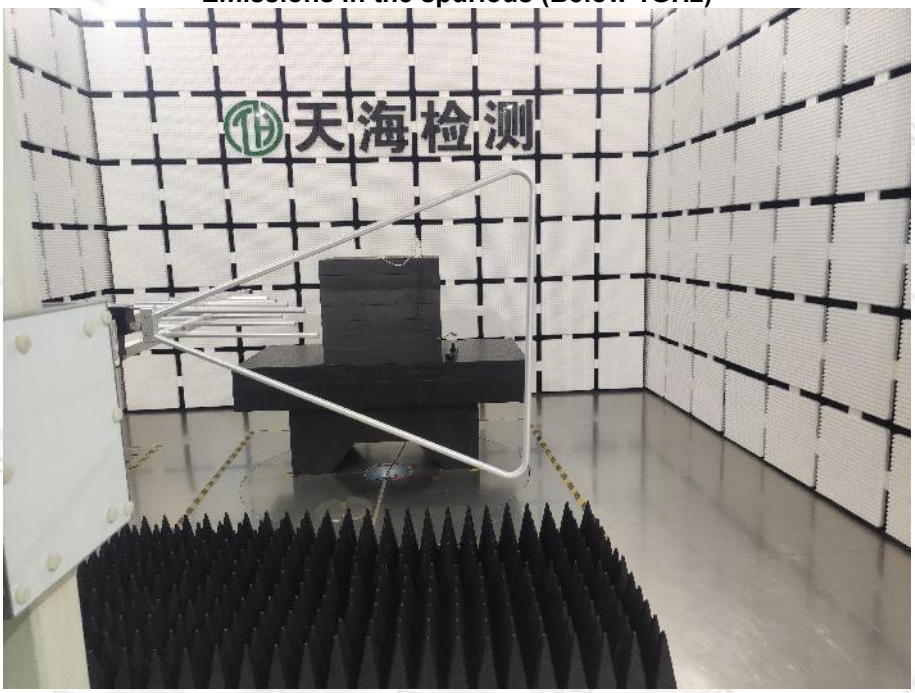
Receiver blocking performance when operating at the lowest operating channel (CH0)				
OCBWmin: 1.25MHz			antenna gain(G): 0dBi	
The actual blocking signal power (Note1)			☒ at the antenna connector	
			☐ in front of the antenna	
Note1: For the conducted measurement, the level shall be corrected as follows: the actual blocking signal power = blocking signal power + antenna gain				
Wanted signal mean power from companion device (dBm)	**Blocking signal frequency (MHz)**	**The actual blocking signal power (dBm)**	**PER (%)**	**Pass/Fail**
-68.03	2380	-34	0.9	Pass
	2504		1.1	Pass
	2300		0.7	Pass
	2584		1.3	Pass

Receiver blocking performance when operating at the Highest operating channel (CH39)				
OCBWmin: 1.21MHz			antenna gain(G): 0dBi	
The actual blocking signal power (Note1)			☒ at the antenna connector	
			☐ in front of the antenna	
Note1: For the conducted measurements, the level shall be corrected as follows: the actual blocking signal power = blocking signal power + antenna gain				
Wanted signal mean power from companion device (dBm)	**Blocking signal frequency (MHz)**	**The actual blocking signal power (dBm)**	**PER (%)**	**Pass/Fail**
-68.17	2380	-34	0.4	Pass
	2504		0.5	Pass
	2300		1.0	Pass
	2584		1.3	Pass

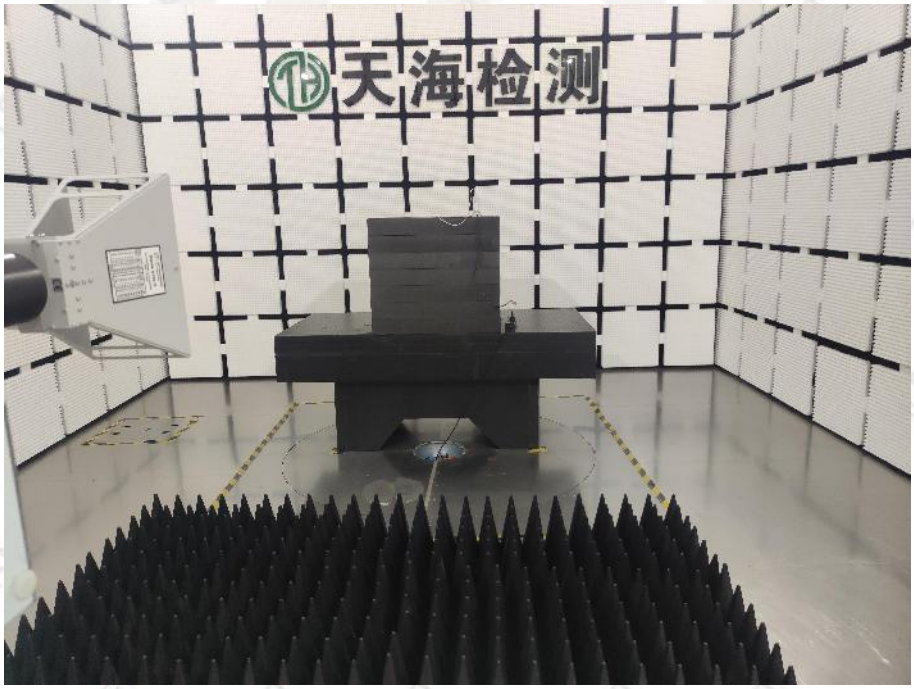
125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

5. Photographs of the test configuration

Emissions in the spurious (Below 1GHz)



Emissions in the spurious (Above 1GHz)



125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net

6 External and Internal Photos of the EUT

Reference to the test report No.: TH2209253-C01-R04

**********END OF THE REPORT**********

125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.net