



V-TAC EXPORTS LIMITED

RADIO TEST REPORT

Prepared For:	V-TAC EXPORTS LIMITED ROOM NO.301, KAM ON BUILDING 176A QUEENS ROAD CENTRAL, CERNTRAL, HONGKONG
Product Name:	Wifi smart device
Trade Name:	N/A
Model:	VT-5003, TV-5004, VT-5005, VT-5013, VT-5003-BS, VT-5004-BS, VT-5005-BS
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TEST REPORT DECLARATION

Applicant	V-TAC EXPORTS LIMITED
Address	ROOM NO.301, KAM ON BUILDING 176A QUEENS ROAD CENTRAL, CERNTRAL, HONGKONG
Manufacturer	V-TAC EXPORTS LIMITED
Address	ROOM NO.301, KAM ON BUILDING 176A QUEENS ROAD CENTRAL, CERNTRAL, HONGKONG
EUT Description	Wifi smart device
Model Number	VT-5003, TV-5004, VT-5005, VT-5013, VT-5003-BS, VT-5004-BS, VT-5005-BS

Test Standards:

ETSI EN 300 328 V2.2.0 (2017-11)

The EUT described above is tested by Shenzhen STL Testing Technology Co., Ltd. EMC Laboratory to determine the maximum emissions from the EUT and ensure the EUT to be compliance with the immunity requirements of the EUT. Shenzhen STL Testing Technology Co., Ltd. Laboratory is assumed full responsibility for the accuracy of the test results. Also, this report shows that the EUT technically complies with the 2014/53/EU directive and its amendment requirements.

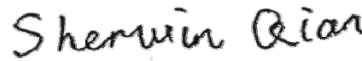
The test report is valid for above tested sample only and shall not be reproduced in part without written approval of the laboratory.

Prepared by:



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Approved & Authorized Signer:



Liuze/Manager





1. TEST RESULTS SUMMARY

Test Results Summary

EN Reference		EN 300 328 V2.2.0 (2017-11)	Result
Nº	Sub clause	Test Items	
1	4.3.2.2	RF Output Power	PASS
2	4.3.2.3	Power Spectral Density	PASS
3	4.3.2.4	Duty cycle ,Tx-sequence, Tx-gap	N/A ^{Note 1}
4	4.3.1.3	Dwell time, Minimum Frequency Occupation & Hopping Sequence	N/A ^{Note 2}
5	4.3.1.4	Hopping Frequency Separation	N/A ^{Note 2}
6	4.3.2.5	Medium Utilization (MU) factor	N/A ^{Note 1}
7	4.3.2.6	Adaptivity (adaptive equipment using modulations other than FHSS)	PASS
8	4.3.2.7	Occupied Channel Bandwidth	PASS
9	4.3.2.8	Transmitter unwanted emissions in the out-of-band domain	PASS
10	4.3.2.9	Transmitter unwanted emissions in the spurious domain	PASS
11	4.3.2.10	Receiver spurious emissions	PASS
12	4.3.2.11	Receiver Blocking	PASS ^{Note 3}
13	4.3.2.12	Geo-location capability	N/A ^{Note 2}

Note 1: The EUT is an adaptive frequency hopping equipment and can't work in a non-adaptive mode.
Note 2: The EUT is using other types of wide band modulation (DSSS, OFDM).
Note 3: The conformance tests for this requirement are part of the conformance tests defined for adaptivity

2. REPORT INFORMATION

This report is not a certificate of quality; it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that STL approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that STL in any way guarantees the later performance of the product/equipment.

The sample/s mentioned in this report is/are supplied by Applicant, STL therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture or any information supplied.

Additional copies of the report are available to the Applicant at an additional fee. No third part can obtain a copy of this report through STL, unless the applicant has authorized STL in writing to do so.

3. GENERAL INFORMATION

3.1. EUT Description

Description:	Wifi smart device
Applicant:	V-TAC EXPORTS LIMITED
Model Number:	VT-5003
Operation Frequency:	2.412-2.472GHz (WIFI, 802.11b/g/n)
Modulation:	802.11b: DSSS (CCK, QPSK, DBPSK); 802.11g/n (HT20); OFDM (64QAM, 16QAM, QPSK, BPSK)

3.2. Block Diagram of EUT Configuration

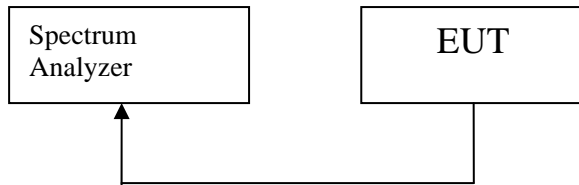


Figure 1 EUT SETUP

3.3. Operating Condition of EUT

The WIFI Module is activated and controlled by the Software.

3.4. Test Conditions

Temperature: 23-26 °C

Relative Humidity: 50-70 %RH

3.5. Modifications

No modification was made.

3.6. Abbreviations

AC	Alternating Current
AMN	Artificial Mains Network
DC	Direct Current
EM	ElectroMagnetic



EMC ElectroMagnetic Compatibility
 EUT Equipment Under Test
 IF Intermediate Frequency
 RF Radio Frequency
 rms root mean square
 EMI Electromagnetic Interference
 EMS Electromagnetic Susceptibility

4. TEST EQUIPMENT

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Horn Antenna	Sunol	DRH-118	A101415	2019.9.29
2	BicoNILog Antenna	Sunol	JB1 Antenna	A090215	2019.9.29
3	PREAMP	HP	8449B	3008A00160	2019.9.9
4	PREAMP	HP	8447D	2944A07999	2019.9.9
5	EMI TEST RECEIVER	Rohde&Schwarz	ESR3	101891	2019.9.9
6	VECTOR Signal Generator	Rohde&Schwarz	SMU200A	101521	2019.9.28
7	Signal Generator	Agilent	E4421B	MY4335105	2019.9.28
8	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2019.9.28
9	MXA Signal Analyzer	Agilent	N9020A	MY51110104	2019.9.9
10	ANT Tower&Turn table Controller	Champro	EM 1000	60764	2019.9.28
11	Anechoic Chamber	Taihe Maorui	9m*6m*6m	966A0001	2019.9.9
12	Shielding Room	Taihe Maorui	6.4m*4m*3m	643A0001	2019.9.9
13	RF Power sensor	DARE	RPR3006W	15I00041SNO88	2019.9.14
14	RF Power sensor	DARE	RPR3006W	15I00041SNO89	2019.9.14
15	RF power divider	Anritsu	K241B	992289	2019.9.28
16	Wideband radio communication tester	Rohde&Schwarz	CMW500	154987	2019.9.28
17	Biconical antenna	Schwarzbeck	VHA 9103	91032360	2019.9.8
18	Biconical antenna	Schwarzbeck	VHA 9103	91032361	2019.9.8
19	Broadband Hybrid Antennas	Schwarzbeck	VULB9163	VULB9163#958	2019.9.8
20	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1680	2019.9.12
21	Active Receive Loop Antenna	Schwarzbeck	FMZB 1919B	00023	2019.11.02
22	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170651	2019.9.14
23	Microwave Broadband Preamplifier	Schwarzbeck	BBV 9721	100472	2019.10.24



5. MEASUREMENT UNCERTAINTY

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Test Item	Uncertainty
Occupied Channel Bandwidth	$\pm 1\%$
Uncertainty for radio frequency	1×10^{-9}
RF Output power, conducted	$\pm 0.6\text{dB}$
Power Spectral Density, Conducted	$\pm 1.2\text{dB}$
Unwanted Emissions, Conducted	$\pm 0.6\text{dB}$
Temperature	$\pm 0.2^\circ\text{C}$
Humidity	$\pm 1\%$
DC and Low frequency voltage	$\pm 0.5\%$
Time	$\pm 1\%$
Duty Cycle	$\pm 1\%$
Uncertainty for Unwanted Emission, Radiated (30MHz-1GHz)	2.12 dB (Polarize: V)
	2.42 dB (Polarize: H)
Uncertainty for Unwanted Emission, Radiated (Above of 1GHz)	2.08dB(Polarize: V)
	2.16dB (Polarize: H)



6. EN 300 328 §4.3.2.2 - RF Output Power

6.1. Test Requirements

6.1.1. Test Standard

ETSI EN 300 328 V2.2.0 (2017-11)

6.1.2. Test 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.

6.2. Test Procedure

Please refer to ETSI EN 300 328 V2.2.0 (2017-11) Sub-clause 5.3.2.2 for the measurement method.

6.3. Test Data

802.11 b Mode

Test Conditions		Transmitter Power Level (dBm)		
		Lowest Frequency 2412MHz	Middle Frequency 2442MHz	Highest Frequency 2472MHz
		EIRP	EIRP	EIRP
20°C	V _{nor}	11.0	10.8	10.6
-20°C	V _{min}	10.8	10.4	10.7
	V _{max}	10.6	10.6	10.7
55°C	V _{min}	10.9	10.4	10.6
	V _{max}	10.7	10.5	10.8
Test Verdict		PASS		

Note: 1. For 802.11b mode at final test to get the worst-case emission at 1Mbps.
2. The test results including the cable loss.

**802.11 g Mode**

Test Conditions		Transmitter Power Level (dBm)		
		Lowest Frequency 2412MHz	Middle Frequency 2442MHz	Highest Frequency 2472MHz
		EIRP	EIRP	EIRP
20°C	V _{nor}	9.6	9.5	9.6
-20°C	V _{min}	9.7	9.7	9.8
	V _{max}	9.6	9.8	9.6
55°C	V _{min}	9.6	9.8	9.6
	V _{max}	9.8	9.6	9.7
Test Verdict		PASS		

Note: 1. For 802.11g mode at final test to get the worst-case emission at 6Mbps.
2. The test results including the cable lose.

802.11n20 Mode

Test Conditions		Transmitter Power Level (dBm)		
		Lowest Frequency 2412MHz	Middle Frequency 2442MHz	Highest Frequency 2472MHz
		EIRP	EIRP	EIRP
20°C	V _{nor}	8.8	8.8	8.8
-20°C	V _{min}	8.9	8.9	8.8
	V _{max}	8.7	8.9	8.7
55°C	V _{min}	8.7	8.7	8.6
	V _{max}	8.8	8.7	8.8
Test Verdict		PASS		

Note: 1. For 802.11g mode at final test to get the worst-case emission at 13.5Mbps.
2. The test results including the cable lose.



7. EN 300 328 §4.3.2.3 - Power Spectral Density

7.1. Test Requirements

7.1.1. Test Standard

ETSI EN 300 328 V2.2.0 (2017-11)

7.1.2. Test Limit

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

7.2. Test Procedure

Please refer to ETSI EN 300 328 V2.2.0 (2017-11) Sub-clause 5.3.3.2 for the measurement method.

7.3. Test Data

802.11b Mode

Test Condition	Temperature:20°C , Voltage:230V		
Channel	Frequency (MHz)	Level (dBm)	Limit (dBm)
1	2412	2.8	<= 10
7	2442	3.2	
13	2472	3.1	
Test Verdict		PASS	

Note: For 802.11b mode at final test to get the worst-case at 1Mbps.

802.11g Mode

Test Condition	Temperature:20°C , Voltage:230V		
Channel	Frequency (MHz)	Level (dBm)	Limit (dBm)
1	2412	2.8	<= 10
7	2442	2.8	
13	2472	3.2	
Test Verdict		PASS	

Note: For 802.11g mode at final test to get the worst-case at 1Mbps.

802.11n20 Mode

Test Condition	Temperature:20°C , Voltage:230V		
Channel	Frequency (MHz)	Level (dBm)	Limit (dBm)
1	2412	1.8	<= 10
7	2442	2.5	
13	2472	2.6	
Test Verdict		PASS	

Note: For 802.11n mode at final test to get the worst-case at 13.5Mbps.

8. EN 300 328 §4.3.2.6 - Adaptivity (adaptive equipment using modulations other than FHSS)

8.1. Test Requirements

8.1.1. Test Standard

ETSI EN 300 328 V2.2.0 (2017-11)

8.1.2. Test Limit

The EUT shall observe the operating channel for the duration of the CCA observation time which shall be not less than 20 μ s. (The CCA time used by the equipment shall be declared by the supplier.)

For Load Based Equipment, the EUT shall be verified that the EUT complies with maximum Channel Occupancy Time: $(13/32) \times q$ (ms). (The value of q is selected by the manufacturer in the range 4..32.)

If implemented, Short Control Signalling Transmissions of adaptive equipment using wide band modulations other than FHSS shall have a maximum duty cycle of 10 % within an observation period of 50 ms.

It shall also be verified (if necessary by repeating the test) that the Idle Period varies between CCA and $q \times CCA$.

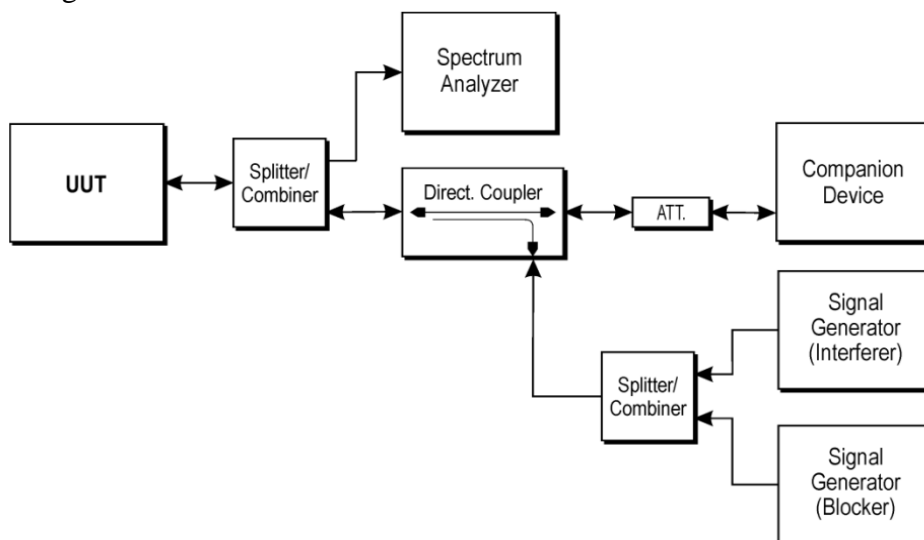
Verification of reaction to the interference signal:

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.

Apart from Short Control Signalling Transmissions, there shall be no subsequent transmissions while the interfering signal is present.

The UUT may continue to have Short Control Signalling Transmissions on the operating channel while the interfering signal is present.

8.2 Test Configuration



8.2. Test Procedure

Please refer to ETSI EN 300 328 V2.2.0 (2017-11) Sub-clause 5.3.7.2 for the measurement method.

8.3. Test Data

CCA Time	20μs
Value q	32
Test Condition	Temperature 20°C, Voltage 230V

802.11b mode

DUT Frequency (MHz)	Test	Number of Bursts	Number of Bursts >10dBm	Max Burst Power (dBm)	minimum Tx Off Time (ms)
2412.0000	Interferer off / Blocker off	22	15	20.0	1.055
2412.0000	Interferer on / Blocker off	0	0	1.2	---
2412.0000	Interferer on / Blocker on	0	0	1.1	---
2472.0000	Interferer off / Blocker off	10	16	20.0	1.032
2472.0000	Interferer on / Blocker off	0	0	1.8	---
2472.0000	Interferer on / Blocker on	7	8	2.2	---

DUT Frequency (MHz)	Maximum Tx Sequence Time (ms)	Result	Comment
2412.0000	0.992	PASS	Sequence < 13 ms
2412.0000	---	PASS	Power < 10dBm
2412.0000	---	PASS	Power < 10dBm
2472.0000	1.005	PASS	Sequence < 13 ms
2472.0000	---	PASS	Power < 10dBm
2472.0000	---	PASS	Power < 10dBm

DUT Frequency (MHz)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	Type of interfering signal
2412	2488.5	-30	CW
2472	2395	-30	



802.11g mode

DUT Frequency (MHz)	Test	Number of Bursts	Number of Bursts >10dBm	Max Burst Power (dBm)	minimum Tx Off Time (ms)
2412.0000	Interferer off / Blocker off	52	30	24.2	0.062
2412.0000	Interferer on / Blocker off	0	0	1.6	---
2412.0000	Interferer on / Blocker on	0	0	1.2	0.025
2472.0000	Interferer off / Blocker off	50	36	9.5	0.046
2472.0000	Interferer on / Blocker off	5	3	10.2	---
2472.0000	Interferer on / Blocker on	66	0	8.8	---

DUT Frequency (MHz)	Maximum Tx Sequence Time (ms)	Result	Comment
2412.0000	0.038	PASS	Sequence < 13 ms
2412.0000	1.302	PASS	Burst < 5 ms; Short Signaling ok; TX switch off time < 15 ms
2412.0000	1.000	PASS	Burst < 5 ms; Short Signaling ok
2472.0000	0.077	PASS	Sequence < 13 ms
2472.0000	0.026	PASS	Burst < 5 ms; Short Signaling ok; TX switch off time < 15 ms
2472.0000	---	PASS	Power < 10dBm

DUT Frequency (MHz)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	Type of interfering signal
2412	2488.5	-30	CW
2472	2395	-30	



802.11n20 mode

DUT Frequency (MHz)	Test	Number of Bursts	Number of Bursts >10dBm	Max Burst Power (dBm)	minimum Tx Off Time (ms)
2412.0000	Interferer off / Blocker off	52	44	20.0	0.033
2412.0000	Interferer on / Blocker off	0	0	---	---
2412.0000	Interferer on / Blocker on	0	0	---	---
2472.0000	Interferer off / Blocker off	55	60	20.0	0.000
2472.0000	Interferer on / Blocker off	0	0	---	---
2472.0000	Interferer on / Blocker on	0	2	---	---

DUT Frequency (MHz)	Maximum Tx Sequence Time (ms)	Result	Comment
2412.0000	1.338	PASS	Sequence < 13 ms
2412.0000	---	PASS	Power < 10dBm; no bursts found
2412.0000	---	PASS	Power < 10dBm; no bursts found
2472.0000	1.012	PASS	Sequence < 13 ms
2472.0000	---	PASS	Power < 10dBm; no bursts found
2472.0000	---	PASS	Power < 10dBm; no bursts found

DUT Frequency (MHz)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	Type of interfering signal
2412	2488.5	-30	CW
2472	2395	-30	



9. EN 300 328 §4.3.2.7 - Occupied Channel Bandwidth

9.1. Test Requirements

9.1.1. Test Standard

ETSI EN 300 328 V2.2.0 (2017-11)

9.1.2. Test Limit

The Occupied Channel Bandwidth for each hopping frequency shall fall completely within the band 2400MHz to 2483.5MHz.

9.2. Test Procedure

Please refer to ETSI EN 300 328 V2.2.0 (2017-11) Sub-clause 5.3.8.2 for the measurement method.

9.3. Test Data

Test Condition	Temperature 20°C, Voltage 230V			
Mode and channel	Channel center Frequency (MHz)	Occupied Channel Bandwidth (MHz)	Lower Band Edge (MHz)	Upper Band Edge (MHz)
802.11 b(1ch)	2412.086206	12.245285	2404.223685	2419.023655
802.11 b(13ch)	2471.672564	12.125646	2466.663722	2478.123206
802.11 g(1ch)	2412.105265	17.116528	2402.203652	2422.212658
802.11 g(13ch)	2471.710682	18.126732	2460.226427	2480.623777
802.11 n20(1ch)	2412.008324	16.699626	2402.403652	2420.665827
802.11 n20(13ch)	2471.614526	18.162875	2462.312677	2481.072535
Test Verdict	PASS			

10. EN 300 328 §4.3.2.8 - Transmitter unwanted emissions in the out-of-band domain

10.1. Test Requirements

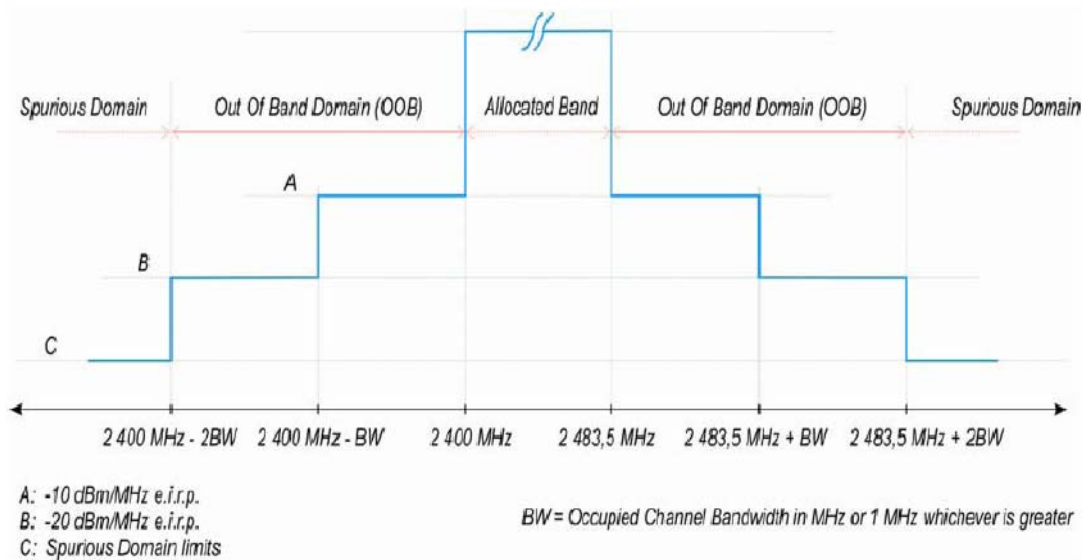
10.1.1. Test Standard

ETSI EN 300 328 V2.2.0 (2017-11)

10.1.2. Test 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 1.

NOTE: Within the 2 400 MHz to 2 483,5 MHz band, the Out-of-band emissions are fulfilled by compliance with the Occupied Channel Bandwidth requirement in §2.4 in this report.



10.2. Test Procedure

Please refer to ETSI EN 300 328 V2.2.0 (2017-11) Sub-clause 5.3.9.2 for the measurement method.



10.3.Test Data

Test conditions		Mode	Channel		Result
			Low	High	
20°C	Vnor	802.11b	1channel	13channel	PASS
		802.11g	1channel	13channel	PASS
		802.11n20	1channel	13channel	PASS
-20°C	Vmax	802.11b	1channel	13channel	PASS
		802.11g	1channel	13channel	PASS
		802.11n20	1channel	13channel	PASS
-20°C	Vmin	802.11b	1channel	13channel	PASS
		802.11g	1channel	13channel	PASS
		802.11n20	1channel	13channel	PASS
55°C	Vmax	802.11b	1channel	13channel	PASS
		802.11g	1channel	13channel	PASS
		802.11n20	1channel	13channel	PASS
55°C	Vmin	802.11b	1channel	13channel	PASS
		802.11g	1channel	13channel	PASS
		802.11n20	1channel	13channel	PASS

11. EN 300 328 §4.3.2.9 - Transmitter unwanted emissions in the spurious domain

11.1. Test Requirements

11.1.1. Test Standard

ETSI EN 300 328 V2.2.0 (2017-11)

11.1.2. Test Limit

Frequency range	Maximum power, e.r.p. (\leq 1 GHz) e.i.r.p. ($>$ 1 GHz) (dBm)	Bandwidth
30MHz to 47MHz	-36	100kHz
47MHz to 74MHz	-54	100kHz
74MHz to 87.5MHz	-36	100kHz
87.5MHz to 118MHz	-54	100kHz
118MHz to 174MHz	-36	100kHz
174MHz to 230MHz	-54	100kHz
230MHz to 470MHz	-36	100kHz
470MHz to 862MHz	-54	100kHz
862MHz to 1GHz	-36	100kHz
1GHz to 12.75GHz	-30	1MHz

11.2. Test Procedure

Please refer to ETSI EN 300 328 V2.2.0 (2017-11) Sub-clause 5.3.10.2 for the measurement method.

11.3. Test Data

Mode	Low Channel	Transmitter unwanted emissions in the spurious domain	High Channel	Transmitter unwanted emissions in the spurious domain
802.11b	1channel	PASS	13channel	PASS
802.11g	1channel	PASS	13channel	PASS
802.11n20	1channel	PASS	13channel	PASS

12. EN 300 328 §4.3.1.10 - Receiver spurious emissions

12.1. Test Requirements

12.1.1. Test Standard

ETSI EN 300 328 V2.2.0 (2017-11)

12.1.2. Test Limit

Frequency range	Maximum power, e.r.p. (\leq 1 GHz) e.i.r.p. ($>$ 1 GHz) (dBm)	Bandwidth
30MHz to 1GHz	-57	100KHz
1GHz to 12.75GHz	-47	1MHz

11.2. Test Procedure

Please refer to ETSI EN 300 328 V2.2.0 (2017-11) Sub-clause 5.3.11.2 for the measurement method.

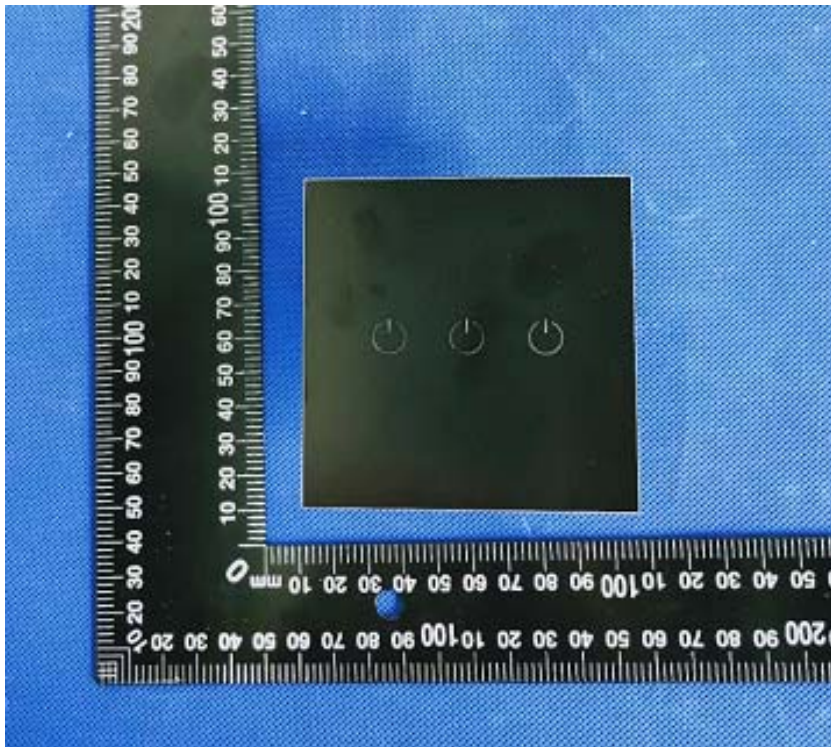
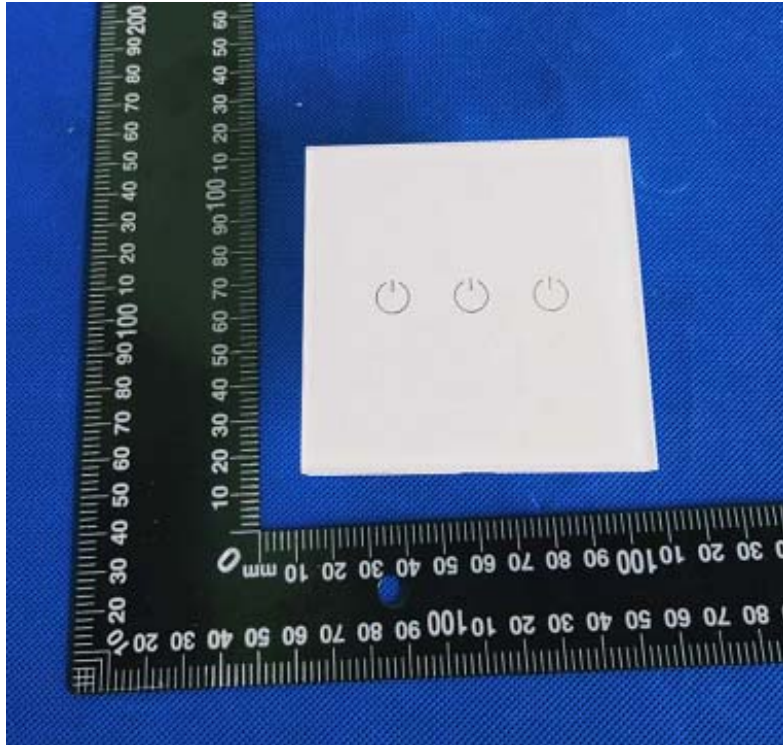
11.3. Test Data

Mode	Low Channel	Receiver spurious emissions	High Channel	Receiver spurious emissions
802.11b	1channel	PASS	13channel	PASS
802.11g	1channel	PASS	13channel	PASS
802.11n20	1channel	PASS	13channel	PASS



APPENDIX I





End of the Report