

Onion Corporation

RADIO REPORT

Prepared For:	Onion Corporation 187 Denison Street, Markham, ON, Canada L3R 1B5
Product Name:	Omega 2
Trade Name:	N/A
Model:	OM-2, OM-2P
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TEST REPORT DECLARATION

Applicant	:	Onion Corporation
Address	:	187 Denison Street, Markham, ON, Canada L3R 1B5
Manufacturer	:	Onion Corporation
Address	:	187 Denison Street, Markham, ON, Canada L3R 1B5
EUT Description	:	Omega 2
Model Number	:	OM-2, OM-2P

Test Standards:

ETSI EN300 328 V2.1.1 (2016-11)

The EUT described above is tested by Shenzhen United 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 United 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.

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1. TEST RESULTS SUMMARY

Test Results Summary

EN Reference		EN 300 328 V2.1.1	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 UNI approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that UNI in any way guarantees the later performance of the product/equipment.

The sample/s mentioned in this report is/are supplied by Applicant, UNI 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 UNI, unless the applicant has authorized UNI in writing to do so.

3. GENERAL INFORMATION

3.1. EUT Description

Description:	Omega 2
Applicant:	Onion Corporation
Model Number:	OM-2
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

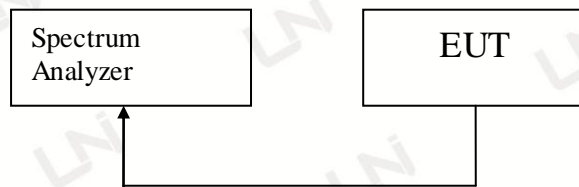


Figure 1 EUT SETUP

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

TS 8997 Test System					
No.	Equipment Name	Serial No.	Model No.	Manufacturer	Cal. Due Date
1	Spectrum Analyzer	101008	FSV-40	R&S	2018.05.20
4	Vector Signal Generator	105328	SMU200A	R&S	2018.05.20
5	Signal Generator	177649	SMB100A	R&S	2018.05.20
6	Switch Unit with OSP-B157	101130	OSI82620	R&S	2018.05.20
EMC 32 Version: 9.15.01/1.15.30					
Climate Chamber					
No.	Equipment Name	Serial No.	Model No.	Manufacturer	Cal. Due Date
1	Constant Temperature humidity chamber	A130301254	GD-7005-100	Dongguan gaoda instrument CO.LTD	2018.05.22

NOTE 1: Equipments listed above have been calibrated and are in the period of validation.

5. MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
RF Output Power	$\pm 0.08\text{dB}$
Power Spectral Density	$\pm 0.08\text{dB}$
Occupied Channel Bandwidth	$\pm 0.0019\text{Hz}$
Transmitter unwanted emissions in the OOB domain	$\pm 2.7\text{dB}$
Transmitter unwanted emissions in the spurious domain	$\pm 2.7\text{dB}$
Receiver spurious emissions	$\pm 2.7\text{dB}$
Adaptivity	$\pm 3.05\text{dB}$
Humidity	$\pm 3.1\%$
Temperature	$\pm 0.8\text{ }^{\circ}\text{C}$
DC and low frequency voltages	$\pm 2.9\%$

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated in according with TR 100 028-1[2] and shall correspond to an expansion to expansion factor (coverage factor) $k=1.96$ or $k=2$ (which provide confidence levels of respectively 95% and 95.45% in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

6. EN 300 328 §4.3.2.2 - RF Output Power

6.1. Test Requirements

6.1.1. Test Standard

ETSI EN300 328 V2.1.1 (2016-11)

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 (V2.1.1) 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}	9	9.2	8.9
-20 °C	V _{min}	8.9	9.1	9
	V _{max}	8.8	9.2	9.1
55 °C	V _{min}	9	9	9.2
	V _{max}	9.1	8.9	9
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}	8.3	8.2	8.2
-20 °C	V _{min}	8.2	8.1	8.3
	V _{max}	8.3	8.3	8.1
55 °C	V _{min}	8.4	8.1	8.2
	V _{max}	8.2	8.4	8.2
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}	7.4	7.5	7.3
-20 °C	V _{min}	7.5	7.2	7.3
	V _{max}	7.5	7.3	7.2
55 °C	V _{min}	7.4	7.1	7.4
	V _{max}	7.3	7.4	7.5
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 EN300 328 V2.1.1 (2016-11)

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 (V2.1.1) Sub-clause 5.3.3.2 for the measurement method.

7.3. Test Data

802.11b Mode

Test Condition	Temperature:20℃ , Voltage:230V		
Channel	Frequency (MHz)	Level (dBm)	Limit (dBm)
1	2412	3.6	<= 10
7	2442	2.4	
13	2472	2.1	
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℃ , Voltage:230V		
Channel	Frequency (MHz)	Level (dBm)	Limit (dBm)
1	2412	2.6	<= 10
7	2442	2.4	
13	2472	3.1	
Test Verdict		PASS	

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

802.11n20 Mode

Test Condition	Temperature:20℃ , Voltage:230V		
Channel	Frequency (MHz)	Level (dBm)	Limit (dBm)
1	2412	2.5	<= 10
7	2442	2.0	
13	2472	2.2	
Test Verdict		PASS	

Note: For 802.11b 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 EN300 328 V2.1.1 (2016-11)

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.

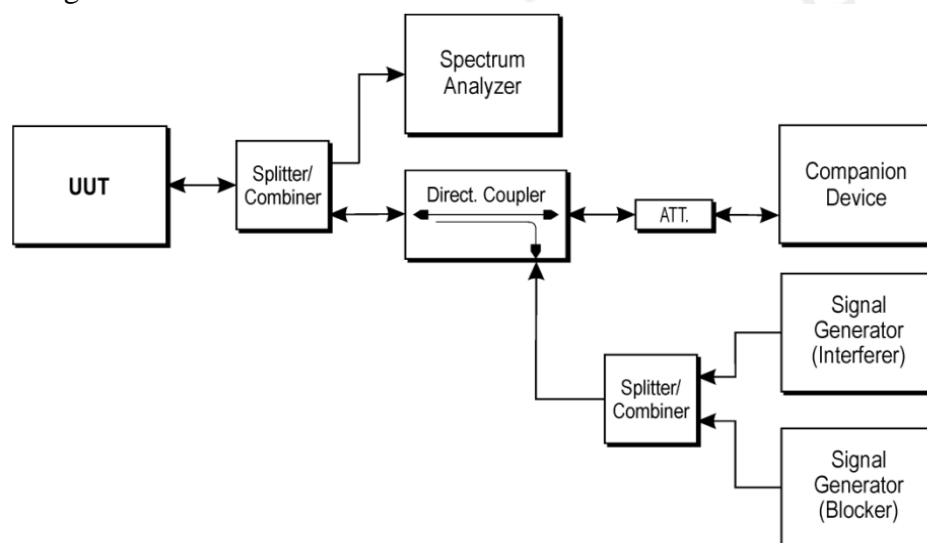
Verification of reaction to the interference signal:

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 (V2.1.1) Sub-clause 5.3.7.2 for the measurement method.

8.3. Test Data

CCA Time	20 μ s
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	33	12	20.0	0.037
2412.0000	Interferer on / Blocker off	0	0	2.2	---
2412.0000	Interferer on / Blocker on	0	0	1.8	---
2472.0000	Interferer off / Blocker off	26	30	20.0	1.112
2472.0000	Interferer on / Blocker off	0	0	1.6	---
2472.0000	Interferer on / Blocker on	5	1	2.3	---

DUT Frequency (MHz)	Maximum Tx Sequence Time (ms)	Result	Comment
2412.0000	1.022	PASS	Sequence < 13 ms
2412.0000	---	PASS	Power < 10dBm
2412.0000	---	PASS	Power < 10dBm
2472.0000	1.146	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	77	30	42.6	0.039
2412.0000	Interferer on / Blocker off	0	0	6.6	---
2412.0000	Interferer on / Blocker on	0	0	5.5	0.054
2472.0000	Interferer off / Blocker off	46	28	13.2	0.027
2472.0000	Interferer on / Blocker off	2	2	11.4	---
2472.0000	Interferer on / Blocker on	89	0	2.5	---

DUT Frequency (MHz)	Maximum Tx Sequence Time (ms)	Result	Comment
2412.0000	0.102	PASS	Sequence < 13 ms
2412.0000	1.206	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	0.044	PASS	Sequence < 13 ms
2472.0000	0.036	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	75	26	20.0	0.062
2412.0000	Interferer on / Blocker off	1	1	---	---
2412.0000	Interferer on / Blocker on	0	0	---	---
2472.0000	Interferer off / Blocker off	76	29	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	1.029	PASS	Sequence < 13 ms
2412.0000	---	PASS	Power < 10dBm; no bursts found
2412.0000	---	PASS	Power < 10dBm; no bursts found
2472.0000	1.102	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 EN300 328 V2.1.1 (2016-11)

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 (V2.1.1) 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)	2412.105568	11.226574	2405.653574	2418.076852
802.11 b(13ch)	2471.746352	12.135471	2465.653698	2478.112474
802.11 g(1ch)	2412.026911	18.020856	2403.203547	2421.238507
802.11 g(13ch)	2471.703682	18.126572	2462.302576	2480.655696
802.11 n20(1ch)	2412.005247	18.703524	2402.524751	2421.568344
802.11 n20(13ch)	2471.685347	19.185206	2462.235102	2481.030277
Test Verdict	PASS			

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

10.1. Test Requirements

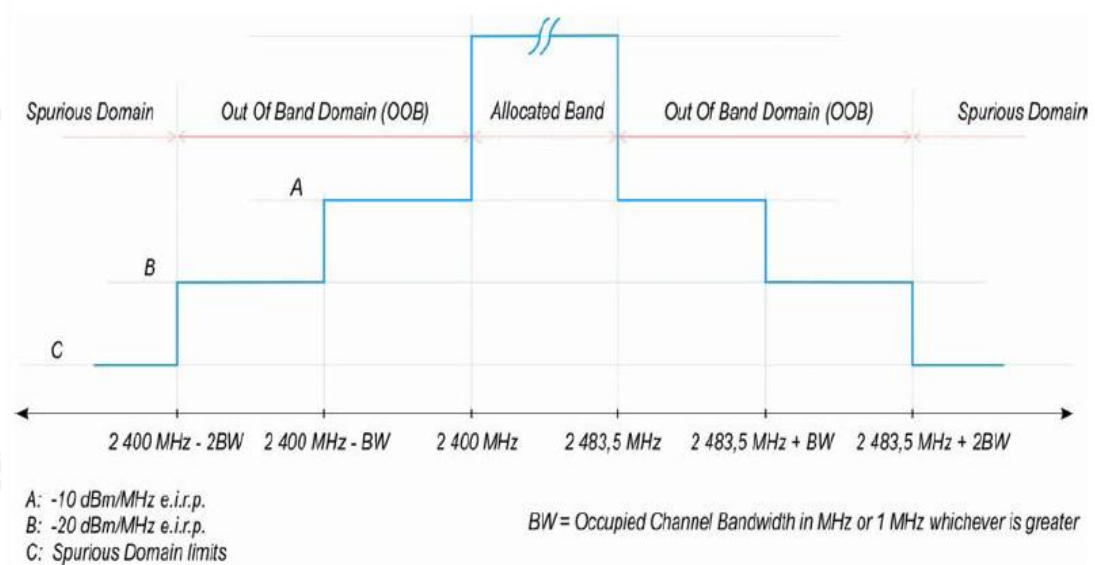
10.1.1. Test Standard

ETSI EN300 328 V2.1.1 (2016-11)

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 (V2.1.1) Sub-clause 5.3.9.2 for the measurement method.

10.3. Test Data

Test conditions		Mode	Channel		Result
			Low	High	
20℃	Vnor	802.11b	1channel	13channel	PASS
		802.11g	1channel	13channel	PASS
		802.11n20	1channel	13channel	PASS
-20℃	Vmax	802.11b	1channel	13channel	PASS
		802.11g	1channel	13channel	PASS
		802.11n20	1channel	13channel	PASS
-20℃	Vmin	802.11b	1channel	13channel	PASS
		802.11g	1channel	13channel	PASS
		802.11n20	1channel	13channel	PASS
55℃	Vmax	802.11b	1channel	13channel	PASS
		802.11g	1channel	13channel	PASS
		802.11n20	1channel	13channel	PASS
55℃	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 EN300 328 V2.1.1 (2016-11)

11.1.2. Test Limit

Frequency range	Maximum power, e.r.p. (≤ 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 (V2.1.1) 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	1 channel	PASS	13 channel	PASS
802.11g	1 channel	PASS	13 channel	PASS
802.11n20	1 channel	PASS	13 channel	PASS

12. EN 300 328 §4.3.1.10 - Receiver spurious emissions

12.1. Test Requirements

12.1.1. Test Standard

ETSI EN300 328 V2.1.1 (2016-11)

12.1.2. Test Limit

Frequency range	Maximum power, e.r.p. (≤ 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

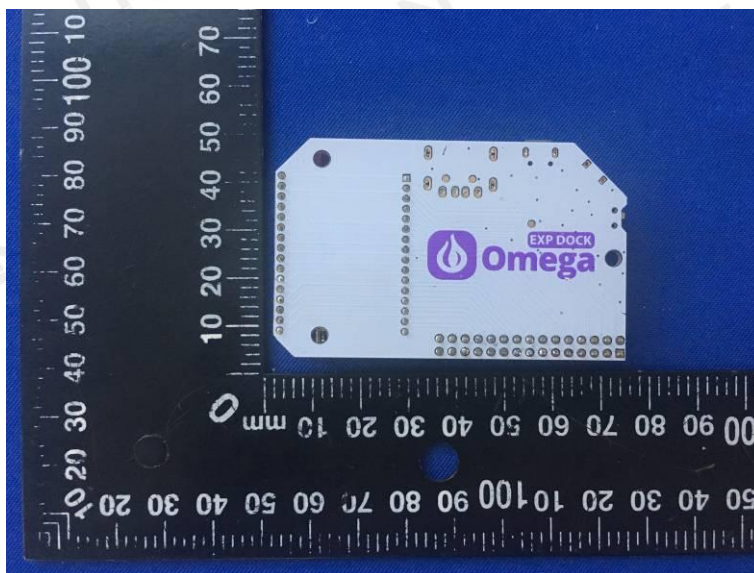
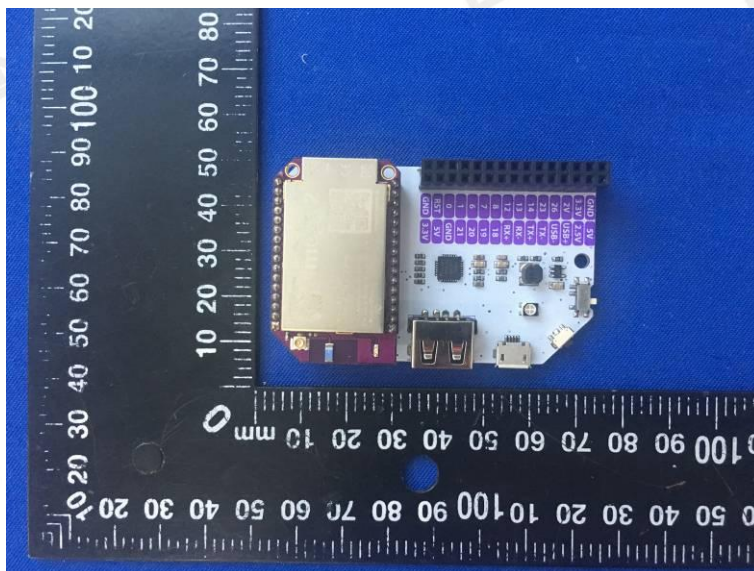
Please refer to ETSI EN 300 328 (V2.1.1) Sub-clause 5.3.11.2 for the measurement method.

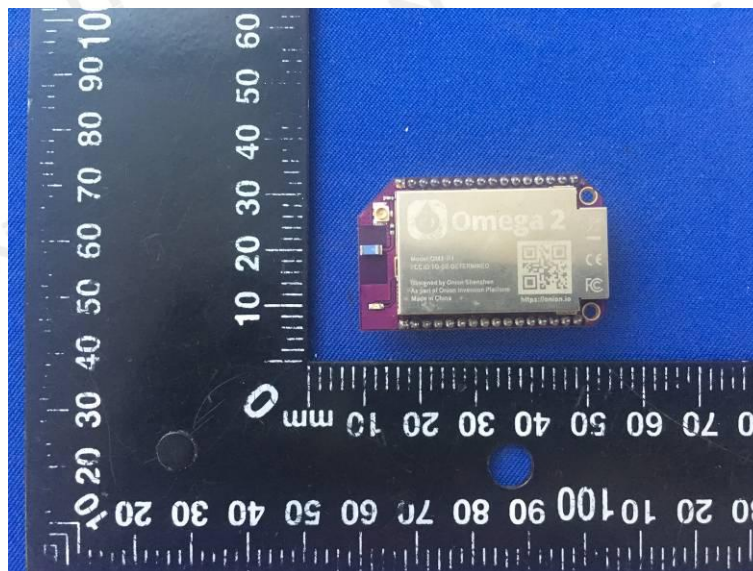
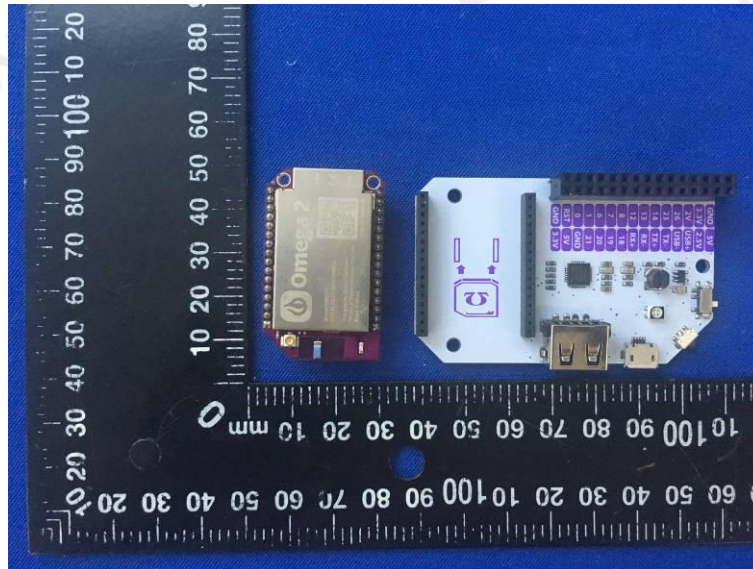
11.3. Test Data

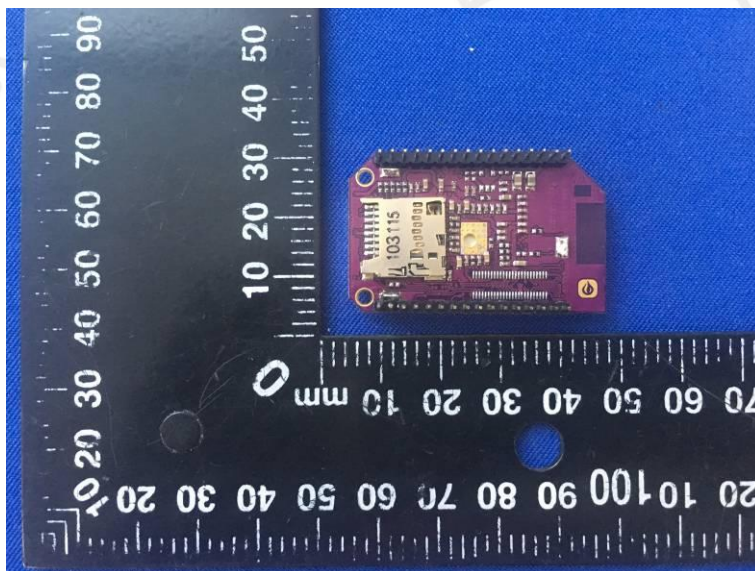
Mode	Low Channel	Receiver spurious emissions	High Channel	Receiver spurious emissions
802.11b	1 channel	PASS	13channel	PASS
802.11g	1 channel	PASS	13channel	PASS
802.11n20	1 channel	PASS	13channel	PASS



APPENDIX I







End of the Report