RADIO TEST REPORT

Product： Omega 2

Trade Name： N/A

Model Name： OM-O2

Serial Model： OM-O2P

Report No.： UNIA19042501ER-02

Prepared for

Onion Corporation

895 Don Mills Road, Tower-2, Suite 900, Toronto, Ontario, M3C 1W3, Canada

Prepared by

Shenzhen United Testing Technology Co., Ltd.

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TEST RESULT CERTIFICATION

Applicant's name	:	Onion Corporation
Address	:	895 Don Mills Road, Tower-2, Suite 900, Toronto, Ontario, M3C 1W3, Canada
Manufacture's Name	:	Onion Corporation
Address	:	895 Don Mills Road, Tower-2, Suite 900, Toronto, Ontario, M3C 1W3, Canada

Product description

Product name	:	Omega 2
Trade Mark	:	N/A
Model and/or type reference	:	OM-O2, OM-O2P
Standards	:	ETSI EN 300 328 V2.1.1 (2016-11)

This device described above has been tested by Shenzhen United Testing Technology Co., Ltd., and the test results show that the equipment under test (EUT) is in compliance with the 2014/53/EU RE Directive Art.3.2 requirements. And it is applicable only to the tested sample identified in the report.
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Date of Test	:	
Date (s) of performance of tests	:	Apr. 25, 2019 ~ Apr. 30, 2019
Date of Issue	:	Apr. 30, 2019
Test Result	:	Pass

Prepared by: Bob liao

Bob liao/Editor

Reviewer:

Kahn yang/Supervisor

Approved & Authorized Signer:

Liuze/Manager

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1 TEST SUMMARY

TEST RESULTS

Test procedures according to the technical standards:
ETSI EN 300 328 V2.1.1 (2016-11)

TRANSMITTER PARAMETERS			
Standard	Limit	Frequency Range (MHz)	Applicable (Yes/No)
RF output power	Clause 4.3.2.2.3	2400-2483.5	Y
Power Spectral Density	Clause 4.3.2.3.3		Y
Duty Cycle, Tx-sequence, Tx-gap	Clause 4.3.2.4.3		N
Medium Utilisation	Clause 4.3.2.5.3		N
Adaptivity(adaptive equipment using modulations other than FHSS)	Clause 4.3.2.6		Y
Occupied Channel Bandwidth	Clause 4.3.2.7.3		Y
Transmitter unwanted emissions in the OOB domain	Clause 4.3.2.8.3	FL=2400-2BW FH=2483.5+2BW	Y
Transmitter unwanted emissions in the spurious domain(Conducted)	Clause 4.3.2.9.3	30-12750	N
Transmitter unwanted emissions in the spurious domain(Radiated)			Y
RECEIVER PARAMETERS			
Spurious emissions (Conducted)	Clause 4.3.2.10.3	30-12750	N
Spurious emissions (Radiated)			Y
Receiver Blocking	Clause 4.3.2.11.3	2400-2483.5	Y
Geo-location capability	Clause 4.3.2.12.3	——	N

TEST FACTORY

Test Firm : Shenzhen United Testing Technology Co., Ltd.

Address : 2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang Community, Xixiang Str, Bao'an District, Shenzhen, China

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19.The testing quality system of our laboratory meets with ISO/IEC-17025 requirements, which is approved by CNAS. This approval result is accepted by MRA of APLAC.

Our test facility is recognized, certified, or accredited by the following organizations:
CNAS-LAB Code: L6494
The EMC Laboratory has been assessed and in compliance with CNAS-CL01 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:2017 General Requirements) for the Competence of testing Laboratories.

Designation Number: CN1227
Test Firm Registration Number: 674885
The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission. The acceptance letter from the FCC is maintained in our files.

MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

No.	Item	Uncertainly
1	RF output power,conducted	±0.71dB
2	Unwanted Emissions,conducted	±0.63dB
3	All emissions,radiated 30-200MHz	±3.43dB
4	All emissions,radiated 200MHz-1GHz	±3.57dB
5	All emissions,radiated>1G	±4.13dB

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment:	Omega 2
Trade Mark:	N/A
Model Name:	OM-O2
Serial No.:	OM-O2P
Model Difference:	All model's the function, software and electric circuit are the same, only with a product color and model named different. Test sample model: OM-O2.
Frequency Range:	WiFi 2.4G 802.11b/g/n(HT20): 2412~2472 MHz WiFi 2.4G 802.11n(HT40): 2422~2462 MHz
Number of Channels:	802.11b/g/n(HT20): 13CH 802.11n(HT40): 9CH
Modulation Type:	CCK, OFDM, DBPSK, DAPSK
Product Description:	The EUT is a Omega 2. Operating frequency: N/A Connecting I/O port: N/A Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.

2.2 CARRIER FREQUENCY OF CHANNELS

Channel List for 802.11b/g/n(20MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2412	05	2432	09	2452	13	2472
02	2417	06	2437	10	2457		
03	2422	07	2442	11	2462		
04	2427	08	2447	12	2467		

Channel List for 802.11n(40MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
03	2422	06	2437	09	2452		
04	2427	07	2442	10	2457		
05	2432	08	2447	11	2462		

2.3 TEST MODE

EUT

The EUT was programmed to be in continuously transmitting mode.

Channel List for 802.11b/g/n(20MHz)		
Test Channel	EUT Channel	Test Frequency (MHz)
Low	CH01	2412
Middle	CH07	2442
High	CH13	2472

Channel List for 802.11n(40MHz)		
Test Channel	EUT Channel	Test Frequency (MHz)
Low	CH03	2422
Middle	CH07	2442
High	CH11	2462

2.4 DESCRIPTION OF THE TEST MODES

Test Condition	Temperature(°C)	Relative Humidity(%)
NT/NV	24	50
LT/NV	-10	/
HT/NV	55	/

Note:

1. The HT 55°C and LT -10°C was declared by manufacturer, The EUT couldn't be operate normally with higher or lower temperature.
2. NV: Normal Voltage; NT: Normal Temperature.
3. LT: Low Extreme Test Temperature; HT: High Extreme Test Temperature.
4. The measurements are performed at the highest, middle, lowest available channels.

2.5 DESCRIPTION TEST PERIPHERAL AND EUT PERIPHERAL

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Note
E-1	Omega 2	N/A	OM-O2	EUT

Item	Shielded Type	Ferrite Core	Length	Note

Note:

1. The support equipment was authorized by Declaration of Confirmation.
2. For detachable type I/O cable should be specified the length in cm in『Length』column.
3. "YES" is means "shielded" "with core"; "NO" is means "unshielded" "without core".

2.6 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Horn Antenna	Sunol	DRH-118	A101415	2019.10.09
2	Broadband Hybrid Antenna	Sunol	JB1 Antenna	A090215	2019.10.09
3	PREAMP	HP	8449B	3008A00160	2019.09.25
4	PREAMP	HP	8447D	2944A07999	2019.09.25
5	EMI TEST RECEIVER	Rohde&Schwarz	ESR3	101891	2019.09.18
6	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2019.9.28
7	MXA Signal Analyzer	Agilent	N9020A	MY51110104	2019.9.28
8	RF Power sensor	DARE	RPR3006W	15I00041SNO88	2020.3.14
9	RF Power sensor	DARE	RPR3006W	15I00041SNO89	2020.3.14
10	RF power divider	Anritsu	K241B	992289	2019.9.25
11	Signal Generator	Agilent	E4421B	MY4335105	2019.9.18
12	VECTOR Signal Generator	Rohde&Schwarz	SMU200A	101521	2019.9.18
13	Wideband radio communication tester	Rohde&Schwarz	CMW500	154987	2019.9.18
14	Active Loop Antenna	Com-Power	AL-130R	10160009	2019.05.10
15	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1680	2019.05.10
16	Horn Antenna	A-INFOMW	LB-180400-KF	J211060660	2019.08.22
17	Microwave Broadband Preamplifier	Schwarzbeck	BBV 9721	100472	2019.10.24
18	Power Meter	KEYSIGHT	N1911A	MY50520168	2020.05.10
19	Frequency Meter	VICTOR	VC2000	997406086	2020.05.10
20	DC Power Source	HYELEC	HY5020E	055161818	2020.05.10

3 RF OUTPUT POWER

3.1 TEST LIMIT

FHSS:
The maximum RF output power for adaptive Frequency Hopping equipment shall be equal to or less than 20 dBm. The maximum RF output power for non-adaptive Frequency Hopping equipment shall be declared by the manufacturer. See clause 5.4.1 m). The maximum RF output power for this equipment shall be equal to or less than the value declared by the manufacturer. This declared value shall be equal to or less than 20 dBm.
Other than FHSS:
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 5.4.1 m). For non-adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be equal to or less than the value declared by the supplier.
This limit shall apply for any combination of power level and intended antenna assembly.

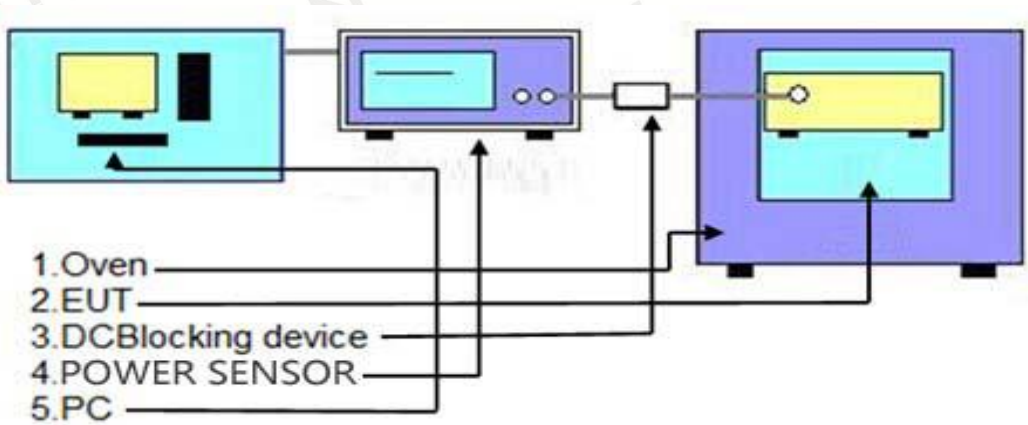
Limit
20 dBm

Between the start and stop times of each individual burst calculate the RMS power over the burst using the formula below. Save these P_{burst} values, as well as the start and stop times for each burst.

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

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

3.2 TEST SETUP



3.3 TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V2.1.1) clause 5.4.2.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.1.1) clause 5.4.2.2 for the measurement method.
   a. Use a fast power sensor suitable for 2,4 GHz and capable of 1 MS/s.
      Use the following settings:
      - Sample speed 1 MS/s or faster.
      - The samples must represent the power of the signal.
      - Measurement duration: For non-adaptive equipment: equal to the observation period defined in b)
   b. Clause 4.3.1.3.2 or clause 4.3.2.4.2. For adaptive equipment, the measurement duration shall be long enough to ensure a minimum number of bursts (at least 10) is captured
   c. Print the plots from power sensor by used power sensor on PC, select the max result and record it.

3.4 TEST RESULT

Test Mode	802.11b		
Test conditions	Average EIRP Power (dBm)		
	CH01	CH07	CH13
T nom (°C)	10.15	11.55	10.58
T min (°C)	10.61	11.61	10.34
T max (°C)	10.25	11.81	10.61
Max. E.I.R.P	11.81		
Limits	20dBm (-10dBW)		
Burst plot	> 10		
Result	PASS		

Note: Average EIRP Power = Burst power + the antenna gain value

Test Mode	802.11g		
Test conditions	Average EIRP Power (dBm)		
	CH01	CH07	CH13
T nom (°C)	9.01	9.59	7.89
T min (°C)	8.89	9.63	8.01
T max (°C)	8.49	9.71	8.01
Max. E.I.R.P	9.71		
Limits	20dBm (-10dBW)		
Burst plot	> 10		
Result	PASS		

Note: Average EIRP Power = Burst power + the antenna gain value

Test Mode	802.11n(HT20)		
Test conditions	Average EIRP Power (dBm)		
	CH01	CH07	CH13
T nom (°C)	5.82	6.08	5.58
T min (°C)	5.98	6.63	5.34
T max (°C)	5.84	6.58	5.66
Max. E.I.R.P	6.63		
Limits	20dBm (-10dBW)		
Burst plot	> 10		
Result	PASS		

Note: Average EIRP Power = Burst power + the antenna gain value

Test Mode	802.11n(HT40)		
Test conditions	Average EIRP Power (dBm)		
	CH03	CH07	CH11
T nom (°C)	5.11	6.29	5.59
T min (°C)	5.28	6.36	5.67
T max (°C)	5.60	6.19	5.94
Max. E.I.R.P	6.36		
Limits	20dBm (-10dBW)		
Burst plot	> 10		
Result	PASS		

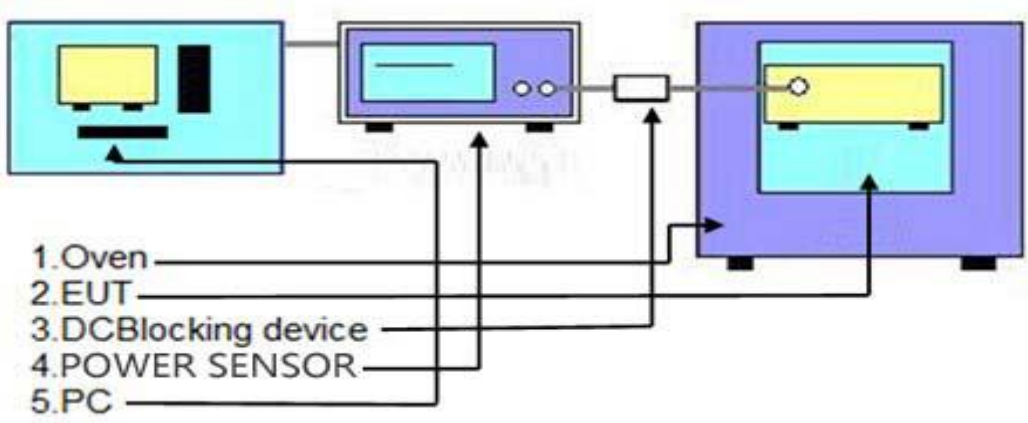
Note: Average EIRP Power = Burst power + the antenna gain value

4 POWER SPECTRAL DENSITY

4.1 TEST LIMIT

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

4.2 TEST SETUP



4.3 TEST PROCEDURE

The measurement shall be repeated for the equipment being configured to operate at the lowest, the middle, and the highest frequency of the stated frequency range.

1. Please refer to ETSI EN 300 328 (V2.1.1) clause 5.4.3.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.1.1) clause 5.4.3.2 for the measurement method.

a. The equipment setup:

Frequency range:	2400MHz-2483.5MHz
RBW/VBW:	10KHz/30KHz
Sweep points:	>8350 (Set as 10000)
Sweep time:	For non-continuous transmissions: 2 × Channel Occupancy Time × number of sweep points
	For continuous transmissions: 10s; the sweep time may be increased further until a value where the sweep time has no further impact anymore on the RMS value of the signal.
Detector:	RMS
Trace:	Max hold

b. For conducted measurements on smart antenna systems using either operating mode 2 or 3 (see clause 5.3.2.2), repeat the measurement for each of the transmit ports. For each frequency point, add up the amplitude (power) values for the different transmit chains and use this as the new data set.

c. Add up the values for amplitude (power) for all the samples in the file.

d. Normalize the individual values for amplitude so that the sum is equal to the RF Output Power (e.i.r.p.)

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

f. Shift the start point of the samples added up in step 5 by 1 sample and repeat the procedure in step e (i.e. sample #2 to #101).

g. Repeat step 6 until the end of the data set and record the radiated Power Spectral Density values for each of the 1 MHz segments.
h. From all the recorded results, the highest value is the maximum Power Spectral Density for the UUT.

4.4 TEST RESULT

Test conditions	Test Mode	EIRP Spectral Power Density (dBm/MHz)		
		Low channel	Middle channel	High channel
T_{nom}(°C) V_{nom}(V)	802.11b	-6.26	-4.84	-6.25
	802.11g	-14.35	-11.37	-14.05
	802.11n(HT20)	-15.28	-16.61	-16.30
	802.11n(HT40)	-16.31	-23.27	-16.91
Limit		≤10dBm/MHz		
Result		PASS		

Note: Maximum spectral power density(EIRP) = power spectral density + the antenna gain value

5 ADAPTIVE (CHANNEL ACCESS MECHANISM)

5.1 TEST LIMIT

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

Non-LBT based Detect and Avoid:

1. The channel shall remain unavailable for a minimum time equal to 1 s after which the channel may be considered again as an 'available' channel.
2. COT ≤ 40ms;
3. Idle Period = 5% of COT;
4. Detection threshold level = -70 dBm/MHz + (20 dBm - Pout e.i.r.p.)/1 MHz (Pout in dBm).

LBT based Detect and Avoid:

1. CCA observation time declared by the supplier:
   If the equipment shall perform a Clear Channel Assessment (CCA) check using energy detect. The equipment shall observe the operating channel for the duration of the CCA observation time which shall be not less than 18 μs.
2. COT = 1~10 ms;
3. Idle Period = 5% of COT;
4. Detection threshold level = -70 dBm/MHz + (20 dBm - Pout e.i.r.p.)/1 MHz (Pout in dBm).

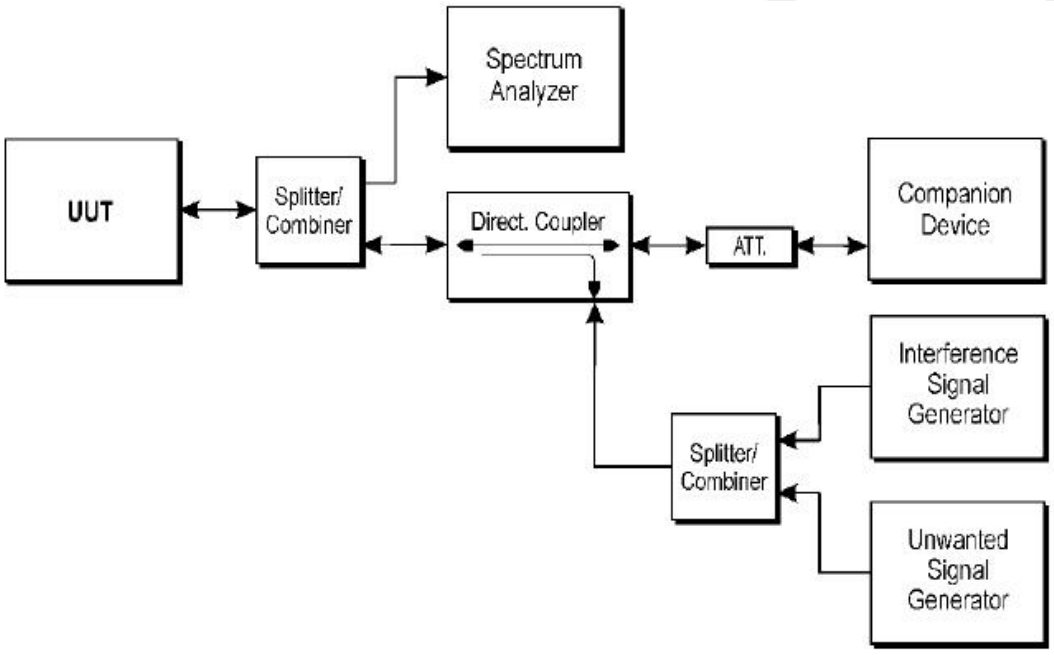
LBT based Detect and Avoid (Load Based Equipment):

1. CCA declared by the manufacturer:
   a. If the equipment shall perform a Clear Channel Assessment (CCA) check using energy detect. The equipment shall observe the operating channel for the duration of the CCA observation time which shall be not less than 18 μs.
   b. If the equipment finds the channel occupied, it shall not transmit on this channel. The equipment shall perform an Extended CCA check in which the channel is observed for a random duration in the range between 18 μs and at least 160 μs.
2. COT ≤ (13 / 32) * q ms; q = [4~32]; 1.625ms~13ms;
3. Detection threshold level = -70 dBm/MHz + (20 dBm - Pout e.i.r.p.)/1 MHz (Pout in dBm).

Short Control Signalling Transmissions:

Short Control Signalling Transmissions shall have a maximum duty cycle TxOn / (TxOn + TxOff) ratio of 10 % within any observation period of 50 ms.

5.2 TEST SETUP



Note:

1. WLAN is normal transmission.
2. Interference shall be injected -> WLAN shall stop transmission.
3. Blocking shall be injected -> WLAN does not resume any normal transmission.
4. Removing the interference signal.

5.3 TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V2.1.1) clause 5.4.6.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.1.1) clause 5.4.6.2 for the measurement method.
3. The spectrum analyzer sweep was triggered by the start of the interfering signal, with the interfering signal present, a 100 % duty cycle CW signal is inserted as the blocking signal.
   - RBW: ≥ Occupied Channel Bandwidth (if the analyzer does not support this setting, the highest available setting shall be used)
   - RBW: use next available RBW setting below the measured Occupied Channel Bandwidth
   - Filter type: Channel Filter
   - RBW: 8M/VBW: 40M (50MHz is the MAX)
   - Detector Mode: RMS
   - Centre Frequency: Equal to the hopping frequency to be tested.
   - Span: 0 Hz
   - Sweep time: > Channel Occupancy Time of the UUT. If the Channel Occupancy Time is non-contiguous (non-LBT based equipment), the sweep time shall be sufficient to cover the period over which the Channel Occupancy Time is spread out
   - Trace Mode: Clear/Write
   - Trigger Mode: Video

5.4 TEST RESULT

Test Mode:	802.11b/2412MHz
AWGN Interference Level (dBm):	-66.25
Blocking Level (dBm):	-31
Interference Start Time (s):	5
Blocking Start Time (s):	62
Max COT (ms):	11.31
Idle Time (ms):	0.21
Duty Cycle (%):	0

Test Mode:	802.11b/2472MHz
AWGN Interference Level (dBm):	-66.71
Blocking Level (dBm):	-34
Interference Start Time (s):	5
Blocking Start Time (s):	63
Max COT (ms):	11.72
Idle Time (ms):	0.18
Duty Cycle (%):	0

Test Mode:	802.11g/2412MHz
AWGN Interference Level (dBm):	-63.34
Blocking Level (dBm):	-35
Interference Start Time (s):	5
Blocking Start Time (s):	65
Max COT (ms):	11.58
Idle Time (ms):	0.34
Duty Cycle (%):	0

Test Mode:	802.11g/2472MHz
AWGN Interference Level (dBm):	-63.62
Blocking Level (dBm):	-33
Interference Start Time (s):	5
Blocking Start Time (s):	68
Max COT (ms):	11.65
Idle Time (ms):	0.87
Duty Cycle (%):	0

Test Mode:	802.11n(HT20)/2412MHz
AWGN Interference Level (dBm):	-62.99
Blocking Level (dBm):	-34
Interference Start Time (s):	5
Blocking Start Time (s):	65
Max COT (ms):	11.73
Idle Time (ms):	0.36
Duty Cycle (%):	0

Test Mode:	802.11n(HT20)/2472MHz
AWGN Interference Level (dBm):	-62.81
Blocking Level (dBm):	-35
Interference Start Time (s):	5
Blocking Start Time (s):	65
Max COT (ms):	11.62
Idle Time (ms):	0.32
Duty Cycle (%):	0

Test Mode:	802.11n(HT40)/2422MHz
AWGN Interference Level (dBm):	-62.41
Blocking Level (dBm):	-35
Interference Start Time (s):	4
Blocking Start Time (s):	65
Max COT (ms):	11.83
Idle Time (ms):	0.37
Duty Cycle (%):	0

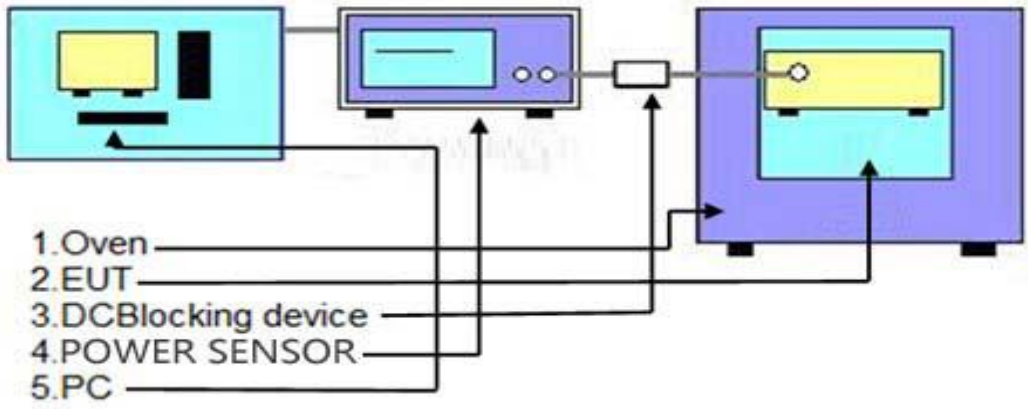
Test Mode:	802.11n(HT40)/2462MHz
AWGN Interference Level (dBm):	-62.48
Blocking Level (dBm):	-35
Interference Start Time (s):	5
Blocking Start Time (s):	65
Max COT (ms):	11.61
Idle Time (ms):	0.38
Duty Cycle (%):	0

6 OCCUPIED CHANNEL BANDWIDTH

6.1 TEST LIMIT

The Occupied Channel Bandwidth shall fall completely within the band given in 2 400 MHz to 2 483,5 MHz. In addition, for non-adaptive equipment using wide band modulations other than FHSS and with e.i.r.p. greater than 10 dBm, the occupied channel bandwidth shall be less than 20 MHz.

6.2 TEST SETUP



6.3 TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V2.1.1) clause 5.4.7.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.1.1) clause 5.4.7.2 for the measurement method.
   - Centre Frequency: The centre frequency of the channel under test
   - Resolution BW: ~ 1 % of the span without going below 1 %
     (430KHz for 20 MHz channel,820KHz for 40MHz)
   - Video BW: (1.3MHz for 20 MHz channel,2.7MHz for 40MHz)
   - Frequency Span for frequency hopping equipment: Lowest frequency separation that is used within the hopping sequence)
   - Frequency Span for other types of equipment: 2 × Nominal Channel Bandwidth (e.g. 40 MHz for a 20 MHz channel, 80 MHz for a 40 MHz channel)
   - Detector Mode: RMS
   - Trace Mode: Max Hold
   - Sweep time: 1S

6.4 TEST RESULT

Test Mode	Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	FL/FH(MHz)	Limit	Result
802.11b	01	2412	12.428	2405.720	FL > 2400 MHz and FH < 2483.5 MHz	PASS
	13	2472	13.216	2478.623		PASS
802.11g	01	2412	16.513	2403.613		PASS
	13	2472	16.766	2480.359		PASS
802.11n(HT20)	01	2412	17.734	2403.097		PASS
	13	2472	17.834	2480.946		PASS
802.11n(HT40)	03	2422	35.281	2404.322		PASS
	11	2462	35.633	2479.152		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.

7 TRANSMITTER UNWANTED EMISSIONS IN THE OUT-OF-BAND DOMAIN

7.1 TEST LIMIT

Clause	Frequency	Limit
4.3.2.8.3	2400-BW~2400 2483.5~2483.5+BW	-10dBm/MHz
	2400-2BW~2400-BW 2483.5+BW~2483.5+2BW	-20dBm/MHz
	<2400-2BW >2483.5+2BW	-30dBm/MHz

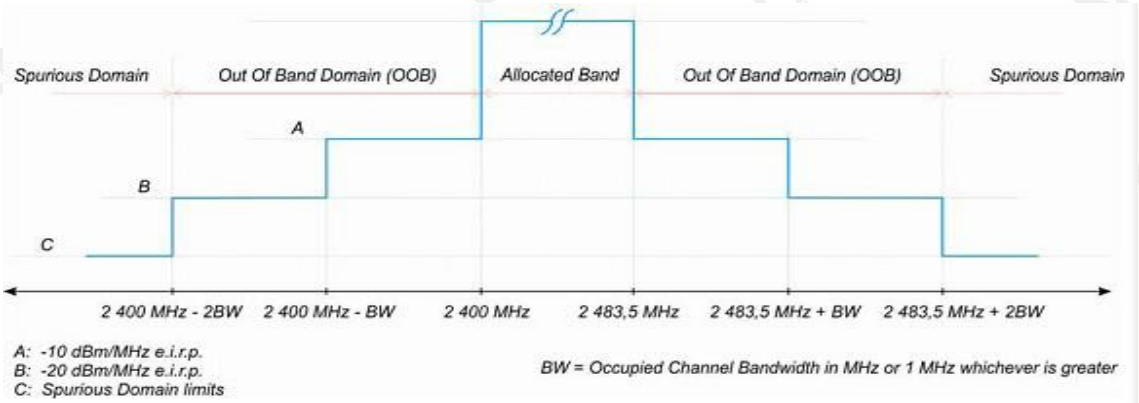
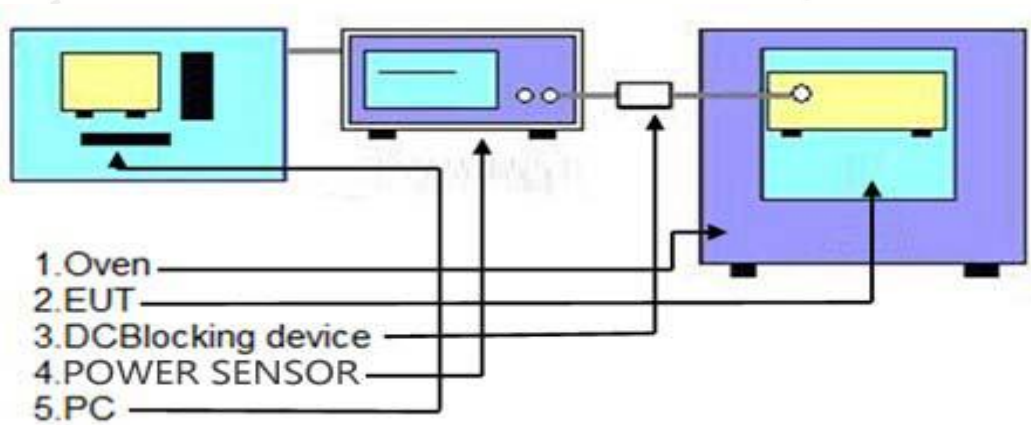


Figure 1: Transmit mask

7.2 TEST SETUP



7.3 TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V2.1.1) clause 5.4.8.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.1.1) clause 5.4.8.2 for the measurement method.
   Connect the UUT to the spectrum analyzer and use the following settings:
   - Centre Frequency: 2484 MHz
   - Span: 0 Hz
   - Resolution BW: 1 MHz
   - Filter mode: Channel filter
   - Video BW: 3 MHz
   - Detector Mode: RMS
   - Trace Mode: Max Hold
   - Sweep Mode: Continuous
   - Sweep Points: Sweep Time [s] / (1 µs) or 5 000 whichever is greater
   - Trigger Mode: Video trigger; in case video triggering is not possible, an external trigger source may be used
   - Sweep Time: > 120 % of the duration of the longest burst detected during the measurement of the RF Output Power

7.4 TEST RESULT

Test Condition	Test Mode	2412MHz		2472MHz	
		OOB EMISSION		OOB EMISSION	
		Segment A	Segment B	Segment A	Segment B
		Maximum power	Maximum power	Maximum power	Maximum power
		dBm/MHz	dBm/MHz	dBm/MHz	dBm/MHz
Nom(°c) Nom(V)	802.11b	-49.24	-59.18	-46.62	-59.26
Limit (dBm)		-10.00	-20.00	-10.00	-20.00
Result		PASS	PASS	PASS	PASS

Test Condition	Test Mode	2412MHz		2472MHz	
		OOB EMISSION		OOB EMISSION	
		Segment A	Segment B	Segment A	Segment B
		Maximum power	Maximum power	Maximum power	Maximum power
		dBm/MHz	dBm/MHz	dBm/MHz	dBm/MHz
Nom(°c) Nom(V)	802.11g	-48.23	-59.59	-42.66	-59.01
Limit (dBm)		-10.00	-20.00	-10.00	-20.00
Result		PASS	PASS	PASS	PASS

Test Condition	Test Mode	2412MHz		2472MHz	
		OOB EMISSION		OOB EMISSION	
		Segment A	Segment B	Segment A	Segment B
		Maximum power	Maximum power	Maximum power	Maximum power
		dBm/MHz	dBm/MHz	dBm/MHz	dBm/MHz
Nom(°c) Nom(V)	802.11n(HT20)	-49.63	-59.08	-43.69	-59.08
Limit (dBm)		-10.00	-20.00	-10.00	-20.00
Result		PASS	PASS	PASS	PASS

Test Condition	Test Mode	2422MHz		2462MHz	
		OOB EMISSION		OOB EMISSION	
		Segment A	Segment B	Segment A	Segment B
		Maximum power	Maximum power	Maximum power	Maximum power
		dBm/MHz	dBm/MHz	dBm/MHz	dBm/MHz
Nom(°c) Nom(V)	802.11n(HT40)	-53.55	-59.81	-46.34	-58.08
Limit (dBm)		-10.00	-20.00	-10.00	-20.00
Result		PASS	PASS	PASS	PASS

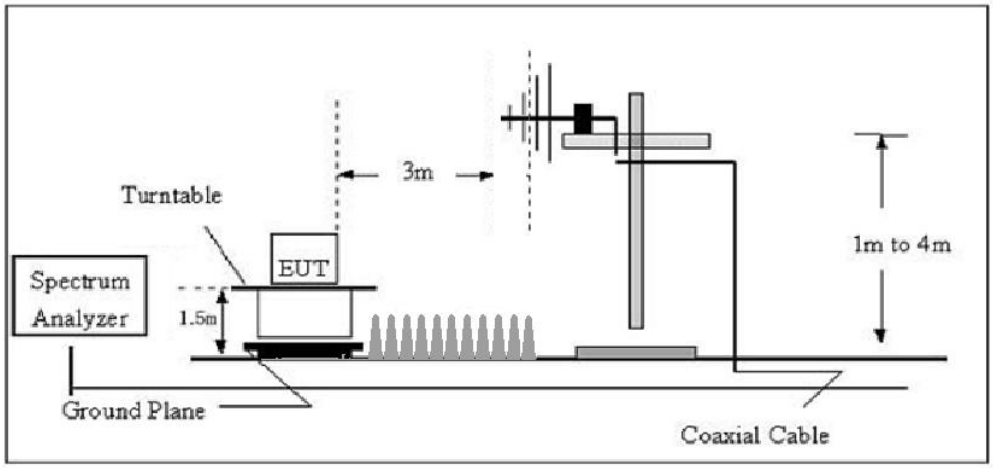
8 SPURIOUS EMISSIONS – TRANSMITTER

8.1 TEST LIMIT

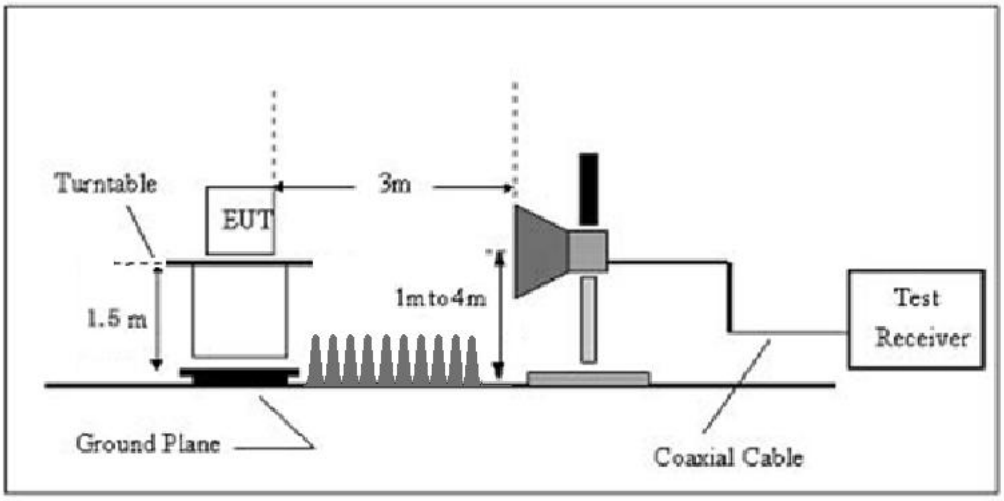
Frequency range	Maximum power, e.r.p(≤1 GHz) e.i.r.p(> 1 GHz)	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 KHz
47 MHz to 74 MHz	-54 dBm	100 KHz
74 MHz to 87.5 MHz	-36 dBm	100 KHz
87.5 MHz to 118 MHz	-54 dBm	100 KHz
118 MHz to 174 MHz	-36 dBm	100 KHz
174 MHz to 230 MHz	-54 dBm	100 KHz
230 MHz to 470 MHz	-36 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

8.2 TEST SETUP

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



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



8.3 TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V2.1.1) clause 5.4.9.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.1.1) clause 5.4.9.2 for the measurement method.
   The following table is the setting of the Spectrum Analyzer.

Spectrum Analyzer	Setting	
Frequency Start to Stop	30 MHz to 1000 MHz	1000 MHz to 12750MHz
Resolution bandwidth	100 kHz	1 MHz
Video bandwidth	300 kHz	3 MHz
Filter type	3 dB (Gaussian)	
Detector mode	Peak	
Trace Mode	Max Hold	
Sweep Points	≥ 19 400 (Set as 20000)	≥ 23 500 (Set as 24000)
Sweep Time	For non continuous transmissions (duty cycle less than 100 %), the sweep time shall be sufficiently long,Below 1GHz such that for each 100 kHz frequency step, Above 1GHz such that for each 1MHz frequency step the measurement time is greater than two transmissions of the UUT, on any channel	

a. The EUT was placed on the top of the turntable in Semi Anechoic Room.
b. The test shall be made in the transmitting mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
c. This measurement shall be repeated with the transmitter in standby mode where applicable.
d. For 30~1000MHz spurious emissions measurement, the broad band bi-log receiving antenna was placed 3 meters far away from the turntable.
e. The broadband receiving antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization. Each recorded suspected value is indicated as Read Level (Raw).
f. Replace the EUT by standard antenna and feed the RF port by signal generator.
g. Adjust the frequency of the signal generator to the suspected emission and slightly rotate the turntable to locate the position with maximum reading.
h. Adjust the power level of the signal generator to reach the same reading with Read Level (Raw).
i. The level of the spurious emission is the power level of (8) plus the gain of the standard antenna in dBi and minus the loss of the cable used between the signal generator and the standard antenna.
j. If the level calculated in (9) is higher than limit by more than 6dB, then lower the RBW of the spectrum analyzer to 30KHz. If the level of this emission does not change by more than 2dB, then it is taken as narrowband emission, otherwise, wideband emission.
k. The measurement shall be repeated at the lowest and the highest channel of the stated frequency range.
l. EUT Orthogonal Axis:
"X" - denotes Laid on Table; "Y" - denotes Vertical Stand; "Z" - denotes Side Stand.

3. EUT OPERATION DURING TEST
a. The EUT was programmed to be in continuously transmitting mode.
b. For the initial investigation on the highest, lowest frequency, no significant differences in spurious emissions were observed between these 2 channels. The worst test data was shown
c. There is a filter used during the test, the fundamental signals will be not shown in the plot.
d. The EUT is connected with the GSM base station when the BT is transmiting.

8.4 TEST RESULT

Remark: The all data rate modes had been test, but only worse test data was recorded in the test report.

Frequency (MHz)	Antenna	TX/RX	Measured (dBm)	Limits (dBm)	Margin	Result
802.11b: 2412MHz						
260.51	H	TX	-62.31	-36	-26.31	PASS
644.23	H	TX	-70.84	-54	-16.84	PASS
1814.81	H	TX	-48.26	-30	-18.26	PASS
4803.10	H	TX	-42.07	-30	-12.07	PASS
261.74	V	TX	-63.51	-36	-27.51	PASS
645.23	V	TX	-71.60	-54	-17.6	PASS
1823.72	V	TX	-47.08	-30	-17.08	PASS
4804.08	V	TX	-41.32	-30	-11.32	PASS
802.11b: 2472MHz						
260.58	H	TX	-61.63	-36	-25.63	PASS
647.13	H	TX	-71.35	-54	-17.35	PASS
1823.09	H	TX	-47.42	-30	-17.42	PASS
4804.14	H	TX	-41.73	-30	-11.73	PASS
261.63	V	TX	-61.53	-36	-25.53	PASS
644.29	V	TX	-68.66	-54	-14.66	PASS
1824.75	V	TX	-46.70	-30	-16.7	PASS
4803.01	V	TX	-43.21	-30	-13.21	PASS

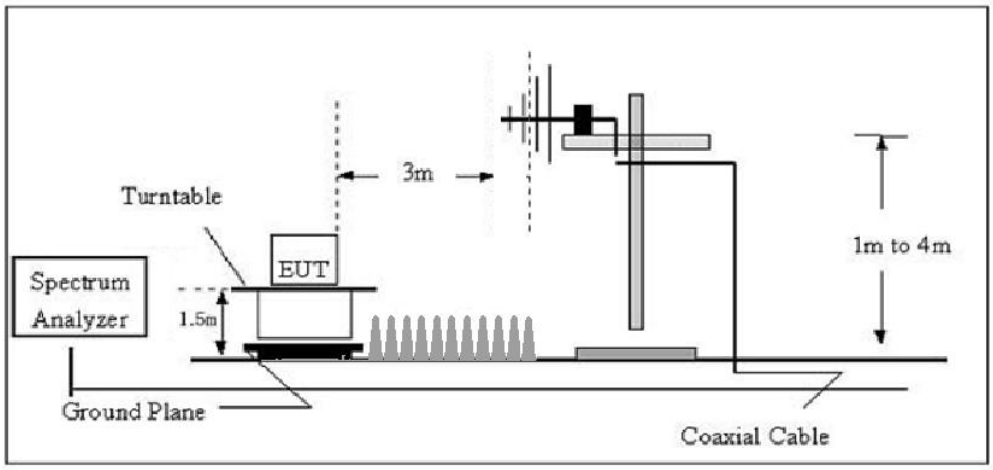
9 SPURIOUS EMISSIONS – RECEIVER

9.1 TEST LIMIT

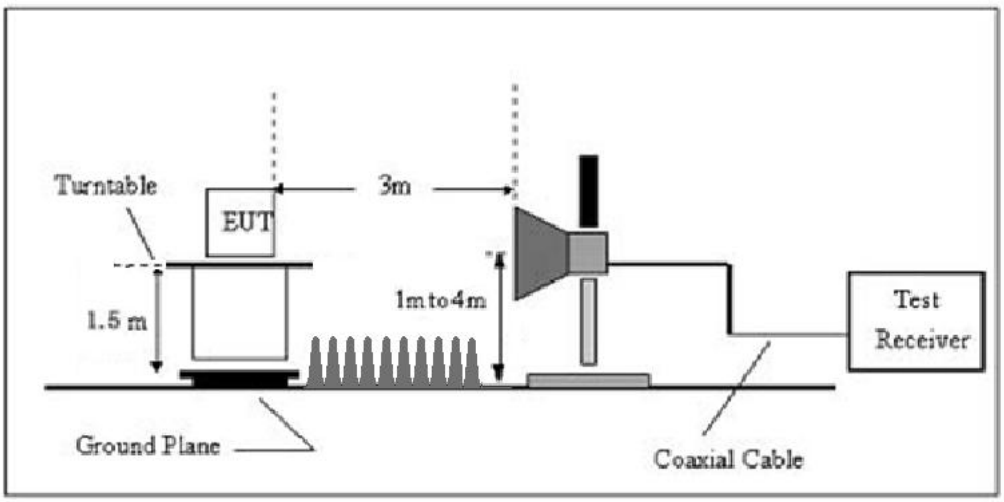
Clause	Test Item	Frequency(MHz)	Limit
4.3.2.10.3	Spurious emissions (Radiated)	30-1000	-57dBm
		1000-12750	-47dBm

9.2 TEST SETUP

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



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



9.3 TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V2.1.1) clause 5.4.10.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.1.1) clause 5.4.10.2 for the measurement method.
   The following table is the setting of the Spectrum Analyzer.

Spectrum Analyzer	Setting	
Frequency Start to Stop	30 MHz to 1000 MHz	1000 MHz to 12750MHz
Resolution bandwidth	100 kHz	1 MHz
Video bandwidth	300 kHz	3 MHz
Filter type	3 dB (Gaussian)	
Detector mode	Peak	
Trace Mode	Max Hold	
Sweep Points	≥ 19 400 (Set as 20000)	≥ 23 500 (Set as 24000)
Sweep Time	For non continuous transmissions (duty cycle less than 100 %), the sweep time shall be sufficiently long,Below 1GHz such that for each 100 kHz frequency step, Above 1GHz such that for each 1MHz frequency step the measurement time is greater than two transmissions of the UUT, on any channel	

a. The EUT was placed on the top of the turntable in Semi Anechoic Room.
b. The test shall be made in the receiving mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
c. For 30~12750MHz spurious emissions measurement, the broad band bi-log receiving antenna was placed 3 meters far away from the turntable. .
d. The broadband receiving antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization. Each recorded suspected value is indicated as Read Level (Raw).
e. Replace the EUT by standard antenna and feed the RF port by signal generator.
f. Adjust the frequency of the signal generator to the suspected emission and slightly rotate the turntable to locate the position with maximum reading.
g. Adjust the power level of the signal generator to reach the same reading with Read Level (Raw).
h. The level of the spurious emission is the power level of (7) plus the gain of the standard antenna in dBi and minus the loss of the cable used between the signal generator and the standard antenna.
i. The measurement shall be repeated at the lowest and the highest channel of the stated frequency range.
j. EUT Orthogonal Axis:
"X" - denotes Laid on Table; "Y" - denotes Vertical Stand; "Z" - denotes Side Stand.
k. EUT was programmed to be in continuously receiving mode.

9.4 TEST RESULT

Remark: The all data rate modes had been test, but only worse test data was recorded in the test report.

Frequency (MHz)	Antenna	TX/RX	Measured (dBm)	Limits (dBm)	Margin	Result
CH01: 2412MHz						
353.58	H	RX	-69.26	-57	-12.26	PASS
801.08	H	RX	-68.54	-57	-11.54	PASS
1215.40	H	RX	-58.22	-47	-11.22	PASS
2231.73	H	RX	-57.69	-47	-10.69	PASS
352.18	V	RX	-70.41	-57	-13.41	PASS
800.09	V	RX	-67.86	-57	-10.86	PASS
1205.39	V	RX	-58.34	-47	-11.34	PASS
2232.58	V	RX	-56.05	-47	-9.05	PASS
CH13: 2472MHz						
353.03	H	RX	-69.52	-57	-12.52	PASS
800.11	H	RX	-68.09	-57	-11.09	PASS
1205.95	H	RX	-55.85	-47	-8.85	PASS
2232.68	H	RX	-56.31	-47	-9.31	PASS
353.15	V	RX	-71.02	-57	-14.02	PASS
800.28	V	RX	-66.81	-57	-9.81	PASS
1215.06	V	RX	-55.58	-47	-8.58	PASS
2232.62	V	RX	-56.84	-47	-9.84	PASS

10 RECEIVER BLOCKING

10.1 TEST LIMIT

While maintaining the minimum performance criteria as defined in clause 4.3.2.11.3, the blocking levels at specified frequency offsets shall be equal to or greater than the limits defined for the applicable receiver category provided in table A, table B or table C.

Receiver Category 1:
Table A: Receiver Blocking parameters for Receiver Category 1 equipment

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	Type of blocking Signal
Pmin + 6 dB	2 380 2 503,5	-53	CW
Pmin + 6 dB	2 300 2 330 2 360	-47	CW
Pmin + 6 dB	2 523,5 2 553,5 2 583,5 2 613,5 2 643,5 2 673,5	-47	CW
NOTE 1: Pmin is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal. NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.			

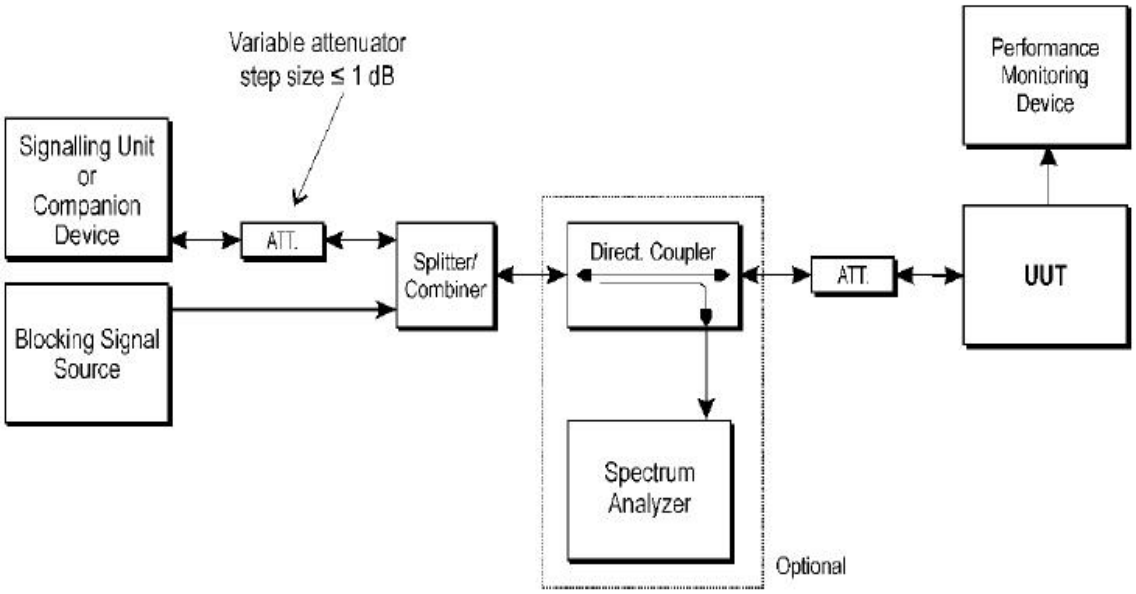
Receiver Category 2:
Table B: Receiver Blocking parameters for Receiver Category 2 equipment

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	Type of blocking Signal
Pmin + 6 dB	2 380 2 503,5	-57	CW
Pmin + 6 dB	2 300 2 583,5	-47	CW
NOTE 1: Pmin is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal. NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.			

Receiver Category 3:
Table C: Receiver Blocking parameters for Receiver Category 3 equipment

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	Type of blocking Signal
Pmin + 12 dB	2 380 2 503,5	-57	CW
Pmin + 12 dB	2 300 2 583,5	-47	CW
NOTE 1: Pmin is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal. NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.			

10.2 TEST SETUP



10.3 TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V2.1.1) clause 5.4.11.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.1.1) clause 5.4.11.2 for the measurement method.
   - RBW: use next available RBW setting below the measured Occupied Channel Bandwidth
   - VBW: 3 × RBW (if the analyser does not support this setting, the highest available setting shall be used)
   - Filter type: Channel Filter
   - RBW: 8M/VBW: 40M (50MHz is the MAX)
   - Detector Mode: RMS
   - Centre Frequency: Equal to the hopping frequency to be tested
   - Span: 0 Hz
   - Sweep time: > Channel Occupancy Time of the UUT. If the Channel Occupancy Time is non-contiguous (non-LBT based equipment), the sweep time shall be sufficient to cover the period over which the Channel Occupancy Time is spread out.
   - Trace Mode: Clear/Write
   - Trigger Mode: Video

10.4 TEST RESULT

Remark: The power is more than 10dBm, belong to category 1.

802.11b: 2412MHz

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power(dBm) CW	PER (%)	Limit (%)	Results
-65	2 380 2 503,5	-53	0.34%	≤10%	PASS
			0.46%		
	2 300 2330 2360	-47	0.51%		PASS
			0.08%		
			0.41%		
	2523.5 2553.5 2583.5 2613.5 2643.5 2673.5	-47	0.16%		PASS
			0.31%		
			0.48%		
			0.51%		
			0.26%		
			0.17%		
NOTE 1: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain. NOTE 2: The minimum performance criterion shall be a PER less than or equal to 10 %. The manufacturer may declare alternative performance criteria as long as that is appropriate for the intended use of the equipment (see clause 5.4.1.t)).					

802.11b: 2472MHz

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power(dBm) CW	PER (%)	Limit (%)	Results
-65	2 380 2 503,5	-53	0.43%	≤10%	PASS
			0.39%		
	2 300 2330 2360	-47	0.41%		PASS
			0.18%		
			0.15%		
	2523.5 2553.5 2583.5 2613.5 2643.5 2673.5	-47	0.49%		PASS
			0.21%		
			0.53%		
			0.35%		
			0.17%		
			0.31%		
NOTE 1: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain. NOTE 2: The minimum performance criterion shall be a PER less than or equal to 10 %. The manufacturer may declare alternative performance criteria as long as that is appropriate for the intended use of the equipment (see clause 5.4.1.t)).					

802.11g: 2412MHz

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power(dBm) CW	PER (%)	Limit (%)	Results
-65	2 380 2 503,5	-53	0.35%	≤10%	PASS
			0.44%		
	2 300 2330 2360	-47	0.51%		PASS
			0.08%		
			0.43%		
	2523.5 2553.5 2583.5 2613.5 2643.5 2673.5	-47	0.19%		PASS
			0.31%		
			0.44%		
			0.53%		
			0.26%		
			0.20%		
NOTE 1: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain. NOTE 2: The minimum performance criterion shall be a PER less than or equal to 10 %. The manufacturer may declare alternative performance criteria as long as that is appropriate for the intended use of the equipment (see clause 5.4.1.t)).					

802.11g: 2472MHz

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power(dBm) CW	PER (%)	Limit (%)	Results
-65	2 380 2 503,5	-53	0.41%	≤10%	PASS
			0.42%		
	2 300 2330 2360	-47	0.53%		PASS
			0.09%		
			0.41%		
	2523.5 2553.5 2583.5 2613.5 2643.5 2673.5	-47	0.18%		PASS
			0.31%		
			0.43%		
			0.52%		
			0.26%		
			0.17%		
NOTE 1: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain. NOTE 2: The minimum performance criterion shall be a PER less than or equal to 10 %. The manufacturer may declare alternative performance criteria as long as that is appropriate for the intended use of the equipment (see clause 5.4.1.t)).					

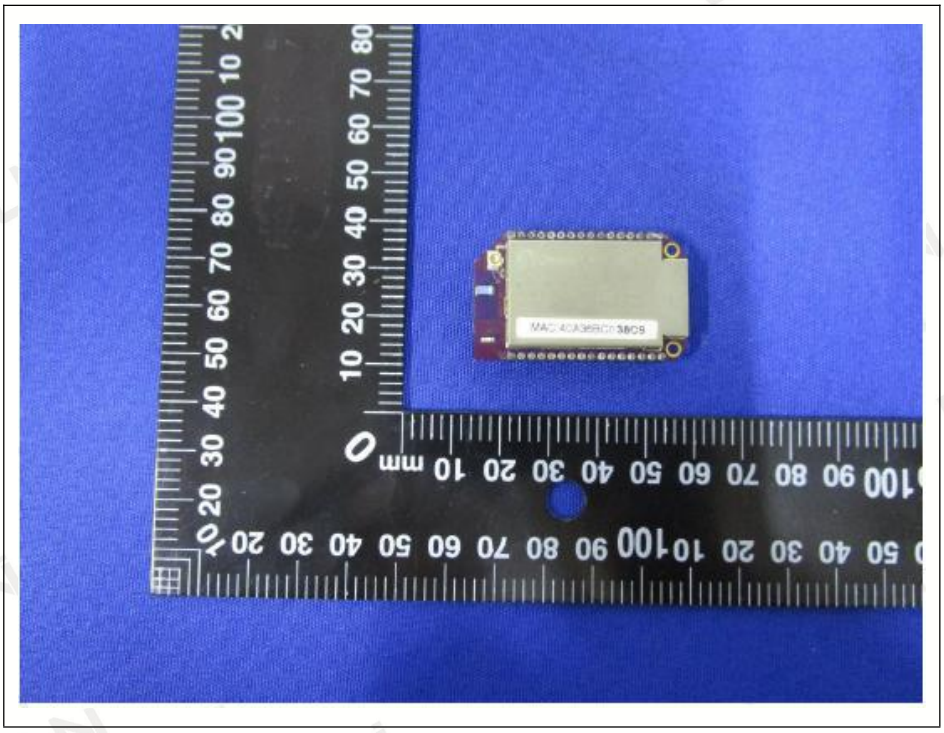
802.11n(HT20): 2412MHz

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power(dBm) CW	PER (%)	Limit (%)	Results
-65	2 380 2 503,5	-53	0.31%	≤10%	PASS
			0.42%		
	2 300 2330 2360	-47	0.53%		PASS
			0.08%		
			0.41%		
	2523.5 2553.5 2583.5 2613.5 2643.5 2673.5	-47	0.19%		PASS
			0.33%		
			0.44%		
			0.51%		
			0.26%		
			0.16%		
NOTE 1: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain. NOTE 2: The minimum performance criterion shall be a PER less than or equal to 10 %. The manufacturer may declare alternative performance criteria as long as that is appropriate for the intended use of the equipment (see clause 5.4.1.t)).					

802.11n(HT20): 2472MHz

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power(dBm) CW	PER (%)	Limit (%)	Results
-65	2 380 2 503,5	-53	0.31%	≤10%	PASS
			0.45%		
	2 300 2330 2360	-47	0.51%		PASS
			0.14%		
			0.43%		
	2523.5 2553.5 2583.5 2613.5 2643.5 2673.5	-47	0.16%		PASS
			0.31%		
			0.43%		
			0.51%		
			0.26%		
			0.17%		
NOTE 1: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain. NOTE 2: The minimum performance criterion shall be a PER less than or equal to 10 %. The manufacturer may declare alternative performance criteria as long as that is appropriate for the intended use of the equipment (see clause 5.4.1.t)).					

11 PHOTO OF TEST



End of Report