EMC TEST REPORT

No. JSH007080425-001

Applicant	:	Azalea Networks U.S.A, Inc 673 S. Milpitas Blvd Suite 105, Milpitas, California, 95035, United States
Manufacturer	:	RAYSON ELECTRONIC MFY 2ND INDUSTRIAL ZONE, LOU VILLAGE.BAO'AN, GONG MING, SHENZHEN, GUANGDONG, CHINA
Equipment	:	Outdoor Wireless Mesh Router
Type/Model	:	MSR4000, DWR-1000, WMS8000, Wawoola R1400

SUMMARY

The equipment complies with the requirements according to the following standard(s):

47CFR Part 15 (2006): Radio Frequency Devices

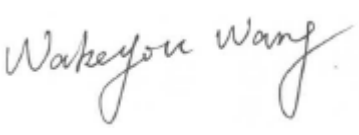
ANSIC63.4 (2003): American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

RSS-210 Issue 7 (June 2007): Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

RSS-Gen Issue 2 (June 2007): General Requirements and Information for the Certification of Radiocommunication Equipment

Date of issue: Sep 17, 2007

Tested by: Reviewed by:



Wakeyou Wang (*Projector Engineer*) Jonny Jing (*Reviewer*)

Description of Test Facility

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Content

1. General Information

1.1 Applicant Information

Applicant:	Azalea Networks U.S.A, Inc 673 S. Milpitas Blvd Suite 105, Milpitas, California, 95035, United States
Name of contact:	David Sun
Tel: Fax:	86 10 58851177 502 86 10 58858479
Manufacturer:	RAYSON ELECTRONIC MFY 2ND INDUSTRIAL ZONE, LOU VILLAGE.BAO'AN, GONG MING, SHENZHEN, GUANGDONG, CHINA
Sample received date :	Aug 15, 2007
Date of test :	Aug 15, 2007~ Sep 17, 2007

1.2 Identification of the EUT

Equipment:	Outdoor Wireless Mesh Router
Type/model:	MSR4000, DWR-1000, WMS8000, Wawoola R1400
FCC ID: IC:	URP-MSR4000 6822A-MSR4000

1.3 Technical specification

Operation Frequency Band: 802.11 a: 5745-5825MHz
802.11 b/g: 2400-2483.5MHz

Modulation: DSSS, OFDM

Antenna Designation: Replaceable antenna using N-K reverse connector to connect to the EUT. As a result, warning information is included in the User Manual as "The installation should be done by experienced antenna installer".

Gain of Antenna: For 2400-2483.5MHz: 14dBi max.
For 5745-5825MHz: 17dBi max.

Rating: AC 110V ~ 240V, 50/60Hz, 1.5A

Description of EUT: Here are four models. They are same except their model name. As a result, one of them was chosen to perform test as representative.
The EUT is an outdoor mesh router. It is built on including AWR wireless routing, Motrix cruss-net roaming, intelligent radio-frequency management and fine-grained quality of service.
There are four RF output terminals which have same RF performance on the EUT. At a certain time, only one of them can work and the others are disabled.
While using, 802.11 a, 802.11 b and 802.11 g can not be set to work simultaneously.

Channel Description: For 802.11 a

Channel	Central frequency (MHz)
145	5745
153	5765
157	5785
161	5805
165	5825

For 802.11 b/g

Channel	Central frequency (MHz)
1	2412
2	2417
3	2422
4	2427
5	2432
6	2437
7	2442
8	2447
9	2452
10	2457
11	2462

1.4 Mode of operation during the test / Test peripherals used

Within this test report, EUT was tested under 120V/60Hz. For *802.11 a* test, channel 145, 157 and 165 as the lowest, middle and highest channel were chosen to perform test; For *802.11 b/g* test, channel 1, 6 and 11 as the lowest, middle and highest channel were chosen to perform test;

For *802.11 a,* the communication rate is 54Mbps which was chosen to perform test.

For *802.11 b,* there are four communication rates namely 1Mbps, 2 Mbps, 5.5Mbps and 11Mbps. Here to obtain the worst test data, 11Mbps was chosen to perform test as representative.

For *802.11 g,* the communication rate is 54Mbps which was chosen to perform test.

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2. Test Specification

2.1 Instrument list

Equipment	Type	Manu.	Internal no.	Cal. Date	Due date
Test Receiver	ESIB 26	R&S	EC 3045	2007-6-1	2008-5-31
Semi-anechoic chamber	-	Albatross project	EC 3048	2007-6-1	2008-5-31
A.M.N.	ESH2-Z5	R&S	EC 3119	2007-1-23	2008-1-22
Test Receiver	ESCS 30	R&S	EC 2107	2007-1-23	2008-1-22
Spectrum Analyzer	E4408B	Agilent	MY45102679	2006-11-20	2007-11-19
Spectrum Analyzer	E4446A	Agilent	MY45300103	2007-6-11	2008-6-10
EMI Test Receiver	ESCI	R&S	100573	2007-5-23	2008-5-22
Preamplifier	AP-025C	Quietek	QT-AP003	2006-11-25	2007-11-24
Preamplifier	AP-180C	Quietek	CHM-0602013	2006-11-25	2007-11-24
Bilog Type Antenna	CBL6112B	Schaffner	2932	2006-11-22	2007-11-21
Broad-Band Horn Antenna	BBHA9120D	Schwarzbeck	496	2006-11-25	2007-11-24
Broad-Band Horn Antenna	BBHA9170	Schwarzbeck	294	2006-11-25	2007-11-24

2.2 Test Standard

47CFR Part 15 (2006)
ANSI C63.4: 2003
RSS-210 Issue 7 (June 2007)
RSS-Gen Issue 2 (June 2007)

2.3 Test Summary

This report applies to tested sample only. This report shall not be reproduced in part without written approval of Intertek Testing Service Shanghai Limited.

TEST ITEM	FCC REFERANCE	IC REFERANCE	RESULT
Minimum 6dB Bandwidth	15.247(a)(2)	RSS-210 Issue 7 Annex 8	Pass
Maximum peak output power	15.247(b)(1)	RSS-210 Issue 7 Annex 8	Pass
Power spectrum density	15.247(e)	RSS-210 Issue 7 Annex 8	Pass
Spurious emission	15.209	RSS-210 Issue 7 Clause 2	Pass
Restrict band radiated emission	15.205	RSS-210 Issue 7 Clause 2	Pass
Emission outside the frequency band	15.247(d)	RSS-210 Issue 7 Annex 8	Pass
Power line conducted emission	15.207	RSS-Gen Issue 2 Clause 7.2.2	Pass
Channel number of hopping system	15.247(a)(1)(iii)	RSS-210 Issue 7 Annex 8	NA
Average time of occupancy in any channel	15.247(a)(1)(iii)	RSS-210 Issue 7 Annex 8	NA
Occupied bandwidth	-	RSS-Gen Issue 2 Clause 4.6.1	Tested
Spurious emission for receiver	-	RSS-210 Issue 7 Clause 2.3	Pass

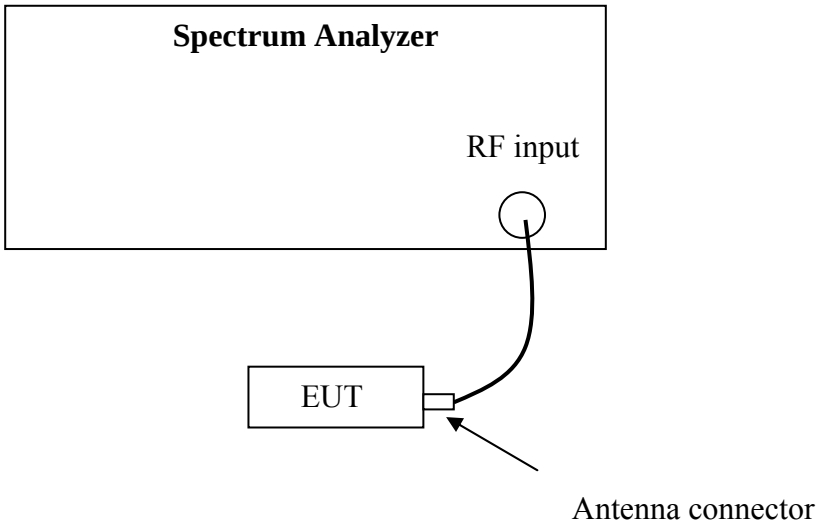
3. Minimum 6dB Bandwidth

Test result: PASS

3.1 Limit

For systems using digital modulation techniques that may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz bands, the minimum 6 dB bandwidth shall be at least 500 kHz.

3.2 Test Configuration



3.3 Test Procedure and test setup

The minimum 6dB bandwidth per FCC §15.247(a)(2) is measured using the Spectrum Analyzer with the resolutions bandwidth set at 100kHz, the video bandwidth set at 300kHz, and the SPAN>>RBW. The test was performed at 3 channels (lowest, middle and highest channel).

3.4 Test Protocol

Temperature : 22°C
Relative Humidity : 43%

For 802.11.b

Channel	Bandwidth (MHz)	Limit (MHz)
1	10.76	≥0.5
6	11.86	≥0.5
11	11.83	≥0.5

Remark: Margin = Bandwidth - Limit

For 802.11.g

Channel	Bandwidth (MHz)	Limit (MHz)
1	16.48	≥0.5
6	16.48	≥0.5
11	16.53	≥0.5

Remark: Margin = Bandwidth - Limit

For 802.11.a

Channel	Bandwidth (MHz)	Limit (MHz)
145	16.51	≥0.5
157	16.51	≥0.5
165	16.51	≥0.5

Remark: Margin = Bandwidth - Limit

3.5 Measurement uncertainty

The measurement uncertainty is ±100Hz.

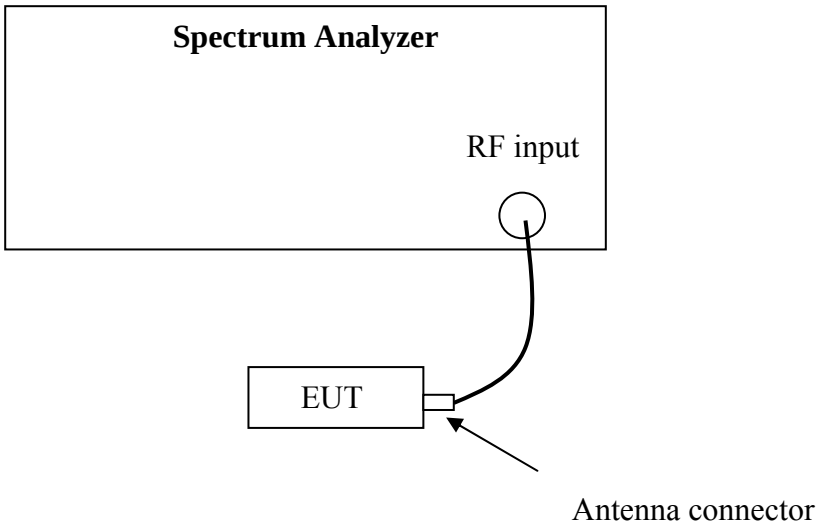
4. Maximum peak output power

Test result: Pass

4.1 Test limit

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt
For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts
If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

4.2 Test Configuration



4.3 Test procedure and test setup

The power output per FCC § 15.247(b)(1) was measured using the Spectrum Analyzer with the resolutions bandwidth set at 1MHz, the video bandwidth set at 3MHz. The test was performed at 3 channels (lowest, middle and highest channel).

4.4 Test protocol

Temperature	:	22 °C
Relative Humidity	:	43 %

For 802.11.b

Channel	Cable loss (dB)	Reading of receiver (dBm)	Limit (dBm)
1	0	14.94	22
6	0	14.01	22
11	0	14.48	22

Remark: 1. Limit = 30dBm – (gain of antenna – 6dBi) = 30 – (14- 6) = 22dBm
2. The cable used to test is a part of EUT, connecting RF port and antenna. Here no cable loss is taken into account.

For 802.11.g

Channel	Cable loss (dB)	Reading of receiver (dBm)	Limit (dBm)
1	0	17.19	22
6	0	16.55	22
11	0	17.30	22

Remark: 1. Limit = 30dBm – (gain of antenna – 6dBi) = 30 – (14- 6) = 22dBm
2. The cable used to test is a part of EUT, connecting RF port and antenna. Here no cable loss is taken into account.

For 802.11.a

Channel	Cable loss (dB)	Reading of receiver (dBm)	Limit (dBm)
145	0	18.32	19
157	0	17.84	19
165	0	18.25	19

Remark: Limit = 30dBm – (gain of antenna – 6dBi) = 30 – (17- 6) = 19dBm

4.5 Measurement uncertainty

The measurement uncertainty is ±1dB.

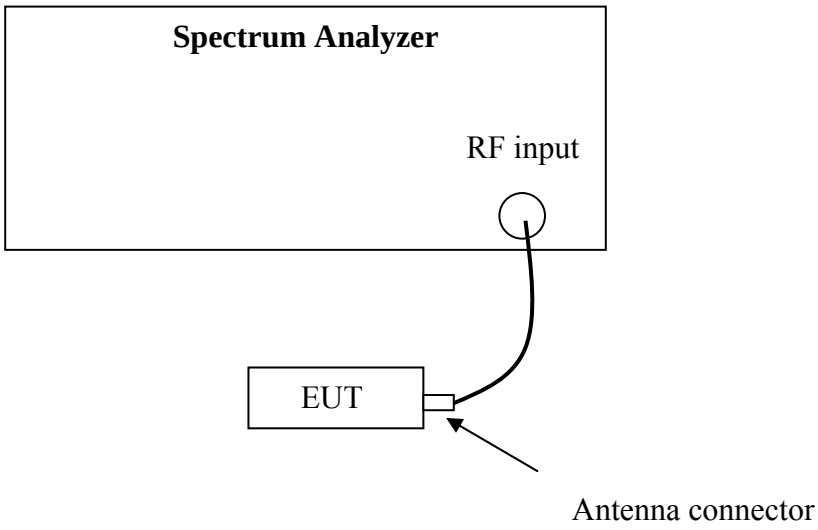
5. Power spectrum density

Test result: **Pass**

5.1 Test limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

5.2 Test Configuration



5.3 Test procedure and test setup

The power output per FCC §15.247(e) was measured using the Spectrum Analyzer with the resolutions bandwidth set at 3kHz, the video bandwidth set at 3kHz. The test was performed at 3 channels (lowest, middle and highest channel).

5.4 Test Protocol

Temperature : 22 °C
Relative Humidity : 43 %

For 802.11.b

Channel	Reading of Receiver (dBm) **R**	Cable loss (dB) **L**	Corrected Reading (dBm/3kHz) **C**	Limit (dBm/3kHz)
1	-16.68	0	-16.68	≤ 8
6	-11.21	0	-11.21	≤ 8
11	-17.85	0	-17.85	≤ 8

Remark: **C = R+ L**

For 802.11.g

Channel	Reading of Receiver (dBm) **R**	Cable loss (dB) **L**	Corrected Reading (dBm/3kHz) **C**	Limit (dBm/3kHz)
1	-19.56	0	-19.56	≤ 8
6	-20.27	0	-20.27	≤ 8
11	-18.83	0	-18.83	≤ 8

Remark: **C = R+ L**

For 802.11.a

Channel	Reading of Receiver (dBm) **R**	Cable loss (dB) **L**	Corrected Reading (dBm/3kHz) **C**	Limit (dBm/3kHz)
145	-19.02	0	-19.02	≤ 8
157	-19.61	0	-19.61	≤ 8
165	-19.72	0	-19.72	≤ 8

Remark: **C = R+ L**

5.5 Measurement uncertainty

The measurement uncertainty is ±1dB/3kHz.

6. Spurious emission

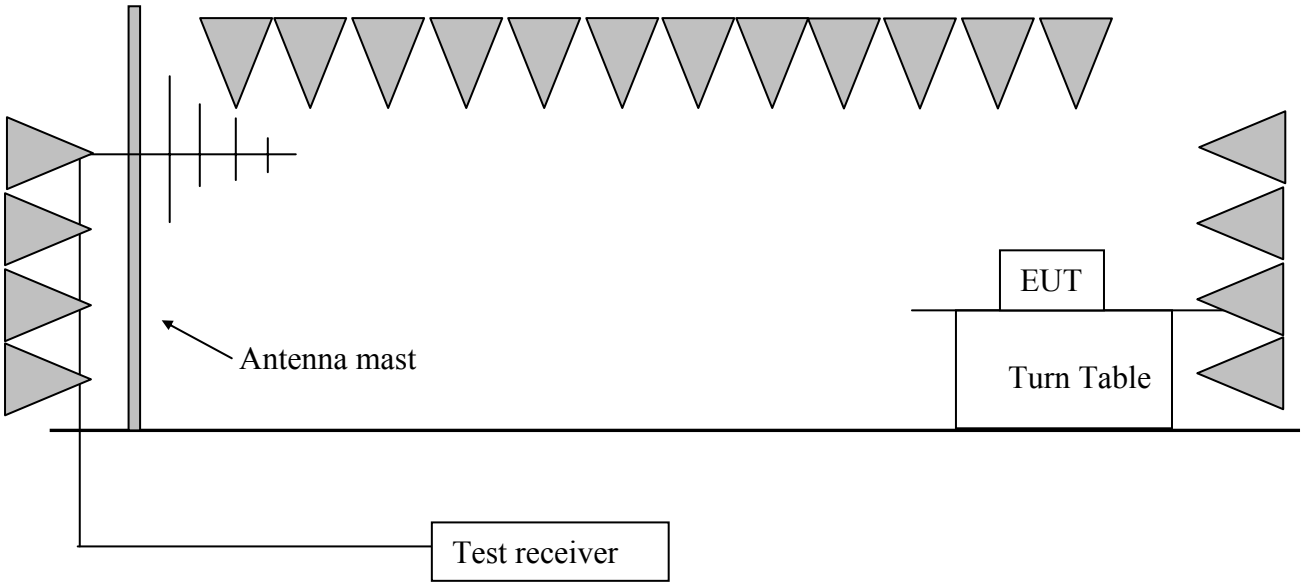
Test result: PASS

6.1 Test limit

The spurious emission shall test through the 10th harmonic or to 40GHz, whichever is lower. It must comply with the radiated emission limits specified in §15.209(a) showed as below:

Frequency (MHz)	Field Strength (dBuV/m)	Measurement Distance (m)
30 - 88	40.0	3
88 - 216	43.5	3
216 - 960	46.0	3
Above 960	54.0	3

6.2 Test Configuration



6.3 Test procedure and test setup

The measurement was applied in a semi-anechoic chamber. While testing for spurious emission higher than 1GHz, the pre-amplifier is equipped just at the output terminal of the antenna.
The EUT and simulators were placed on a 0.8m high wooden turntable above the horizontal metal ground plane. The turn table rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on an antenna mast. The antenna moved up and down between from 1meter to 4 meters to find out the maximum emission level.

6.4 Test protocol

802.11b

Spurious emission for QP test below 1GHz, highest reading related to the limit

Channel	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	H	449.89	16.90	43.70	46.00	2.30
1	V	99.98	10.50	41.90	43.50	1.60
6	H	300.20	12.30	44.30	46.00	1.70
6	V	99.98	10.50	41.70	43.50	1.80
11	H	300.20	12.30	44.90	46.00	1.10
11	V	173.85	10.50	41.30	43.50	2.20

Remark: 1.Correct Factor = Antenna Factor + Cable Loss
2. Corrected Reading = Receiver Reading + Correct Factor
3. Margin = limit - Corrected Reading
4. For more details, please refer to the test data.

Spurious emission for test above 1GHz, highest reading related to the limit

Channel	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	H	7035.00	31.00	62.26	74.00	11.74	PK
1	H	7035.00	31.00	43.21	54.00	10.79	AV
1	V	6893.33	31.00	63.47	74.00	10.53	PK
1	V	6893.33	31.00	44.15	54.00	9.85	AV
6	H	6893.33	31.00	62.68	74.00	11.32	PK
6	H	6893.33	31.00	43.20	54.00	10.80	AV
6	V	6921.67	31.00	62.34	74.00	11.66	PK
6	V	6921.67	31.00	43.17	54.00	10.83	AV
11	H	6921.67	31.00	62.52	74.00	11.48	PK
11	H	6921.67	31.00	43.25	54.00	10.75	AV
11	V	6921.67	31.00	62.52	74.00	11.48	PK
11	V	6921.67	31.00	43.32	54.00	10.68	AV

Remark: 1.Correct Factor = Antenna Factor + Cable Loss - Gain of Preamplifier
2. Corrected Reading = Receiver Reading + Correct Factor
3. Margin = limit - Corrected Reading
5. For more details, please refer to the test data.

802.11g

Spurious emission for QP test below 1GHz, highest reading related to the limit

Channel	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	H	173.85	10.50	42.20	43.50	1.30
1	V	150.52	10.00	42.50	43.50	1.00
6	H	173.85	10.50	40.30	43.50	3.20
6	V	173.85	10.50	40.90	43.50	2.60
11	H	173.85	10.50	41.20	43.50	2.30
11	V	99.98	10.50	41.50	43.50	2.00

Remark: 1.Correct Factor = Antenna Factor + Cable Loss
2. Corrected Reading = Receiver Reading + Correct Factor
3. Margin = limit - Corrected Reading
4. For more details, please refer to the test data.

Spurious emission for test above 1GHz, highest reading related to the limit

Channel	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	H	7006.67	31.00	62.56	74.00	11.44	PK
1	H	7006.67	31.00	43.12	54.00	10.88	AV
1	V	7035.00	31.00	63.22	74.00	10.78	PK
1	V	7035.00	31.00	43.59	54.00	10.41	AV
6	H	7035.00	31.00	62.89	74.00	11.11	PK
6	H	7035.00	31.00	43.40	54.00	10.60	AV
6	V	7091.66	31.00	63.36	74.00	10.64	PK
6	V	7091.66	31.00	44.02	54.00	9.98	AV
11	H	6808.33	31.00	61.86	74.00	12.14	PK
11	H	6808.33	31.00	40.82	54.00	13.18	AV
11	V	7063.33	31.00	63.40	74.00	10.60	PK
11	V	7063.33	31.00	44.20	54.00	9.80	AV

Remark: 1.Correct Factor = Antenna Factor + Cable Loss - Gain of Preamplifier
2. Corrected Reading = Receiver Reading + Correct Factor
3. Margin = limit - Corrected Reading
5. For more details, please refer to the test data.

802.11a

Spurious emission for QP test below 1GHz, highest reading related to the limit

Channel	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)
145	H	199.12	10.80	40.30	43.50	3.20
145	V	98.04	10.50	41.60	43.50	1.90
157	H	199.12	10.80	39.90	43.50	3.60
157	V	150.52	10.00	42.10	43.50	1.40
165	H	199.12	10.80	39.50	43.50	4.00
165	V	99.98	10.50	42.40	43.50	1.10

Remark: 1.Correct Factor = Antenna Factor + Cable Loss
2. Corrected Reading = Receiver Reading + Correct Factor
3. Margin = limit - Corrected Reading
4. For more details, please refer to the test data.

Spurious emission for test above 1GHz, highest reading related to the limit

Channel	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
145	H	3833.33	29.13	64.67	74.00	9.33	PK
145	H	3833.33	29.13	45.12	54.00	8.88	AV
145	V	4740.00	30.58	67.31	74.00	6.69	PK
145	V	4740.00	30.58	46.10	54.00	7.90	AV
157	H	3861.67	29.18	65.21	74.00	8.79	PK
157	H	3861.67	29.18	45.68	54.00	8.32	AV
157	V	4740.00	30.58	68.46	74.00	5.54	PK
157	V	4740.00	30.58	46.33	54.00	7.67	AV
165	H	3890.00	29.22	65.66	74.00	8.34	PK
165	H	3890.00	29.22	45.51	54.00	8.49	AV
165	V	4768.33	30.63	68.58	74.00	5.42	PK
165	V	4768.33	30.63	46.50	54.00	7.50	AV

Remark: 1.Correct Factor = Antenna Factor + Cable Loss - Gain of Preamplifier
2. Corrected Reading = Receiver Reading + Correct Factor
3. Margin = limit - Corrected Reading
5. For more details, please refer to the test data.

6.5 Measurement uncertainty

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.
Measurement uncertainty of radiated emission is: ± 5.31dB
The measurement uncertainty is given with a confidence of 95%, k=2.
The measurement uncertainty is traceable to internal procedure TI-036.

7. Restrict band radiated emission

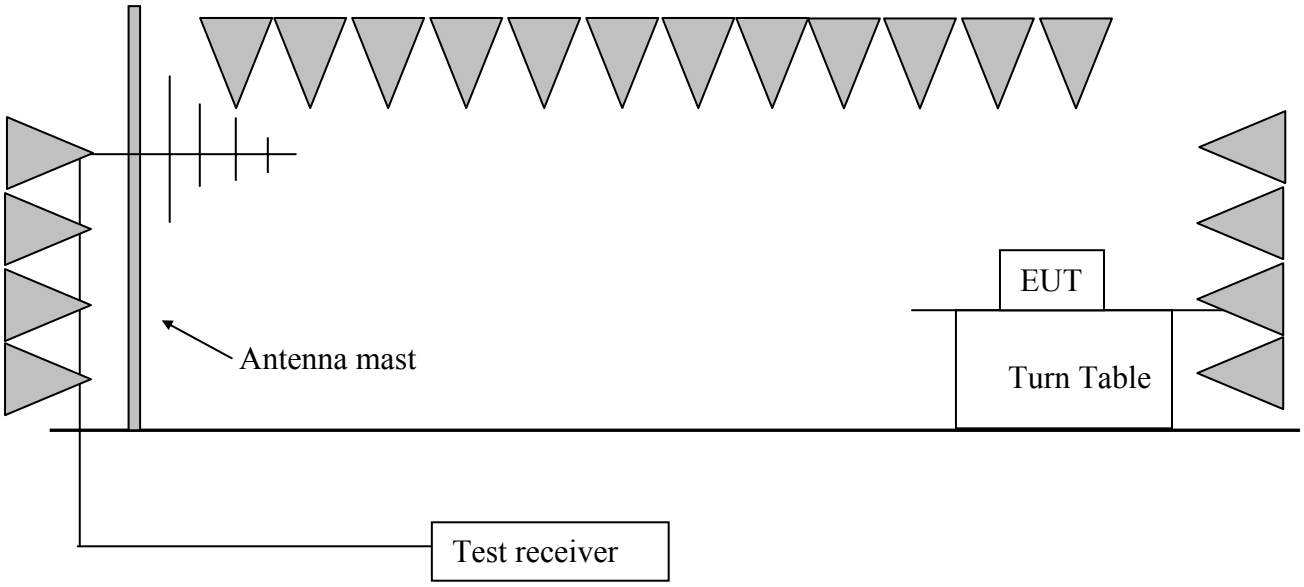
Test result: PASS

7.1 Test limit

The radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) showed as below:

Frequency (MHz)	Field Strength (dBuV/m)	Measurement Distance (m)
30 - 88	40.0	3
88 - 216	43.5	3
216 - 960	46.0	3
Above 960	54.0	3

7.2 Test Configuration



7.3 Test procedure and test setup

1. Perform an in-band field strength measurement of the fundamental emission using the RBW and detector function as the Spurious Radiated Emissions test procedure.
2. Choose a spectrum analyzer span that encompasses both the peak of the fundamental emission and the band-edge emission under investigation. Set the analyzer RBW to 1% of the total span (but never less than 30 kHz) with a video bandwidth equal to or greater than the RBW. Record the peak levels of the fundamental emission and the relevant band-edge emission (i.e., run several sweeps in peak hold mode). Observe the stored trace and measure the amplitude delta between the peak of the fundamental and the peak of the band-edge emission. This is not a field strength measurement; it is only a relative measurement to determine the amount by which the emission drops at the band-edge relative to the highest fundamental emission level.
3. Subtract the delta measured in step (2) from the field strengths measured in step (1). The resultant field strengths (CISPR QP, average, or peak, as appropriate) are then used to determine band-edge compliance as required by Section 15.205.
4. The above "delta" measurement technique may be used for measuring emissions that are up to two "standard" bandwidths away from the band-edge, where a "standard" bandwidth is the bandwidth specified by C63.4 for the frequency being measured. For example, for band-edge measurements in the restricted band that begins at 2483.5 MHz, C63.4 specifies a measurement bandwidth of at least 1 MHz. Therefore you may use the "delta" technique for measuring emissions up to 2 MHz removed from the band-edge.
5. Radiated emissions that are removed by more than two “standard” bandwidths must be measured as the above Spurious Radiated Emissions test procedure.

7.4 Test protocol

802.11b

Highest reading on restrict band 2310MHz ~ 2390MHz, test on the lowest channel

Detector	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)
PK	2390.00	22.15	62.17	74
AV	2390.00	22.15	50.38	54

Highest reading on restrict band 2483.5MHz ~ 2500MHz, test on the highest channel

Detector	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)
PK	2485.02	23.43	60.23	74
AV	2483.50	23.43	49.56	54

802.11g

Highest reading on restrict band 2310MHz ~ 2390MHz, test on the lowest channel

Detector	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)
PK	2390.00	22.15	68.06	74
AV	2390.00	22.15	52.80	54

Highest reading on restrict band 2483.5MHz ~ 2500MHz, test on the highest channel

Detector	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)
PK	2483.50	23.43	68.52	74
AV	2483.50	23.43	52.30	54

802.11a

Highest reading on restrict band 5350MHz ~ 5460MHz, test on the lowest channel

Detector	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)
PK	5350.00	33.18	60.22	74
AV	5410.83	33.18	50.29	54

Highest reading on restrict band 7250MHz ~ 7750MHz, test on the highest channel

Detector	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)
PK	7750.00	36.56	61.36	74
AV	7621.35	36.02	48.69	54

7.5 Measurement uncertainty

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.
Measurement uncertainty of radiated emission is: ± 5.31dB
The measurement uncertainty is given with a confidence of 95%, k=2.
The measurement uncertainty is traceable to internal procedure TI-036.

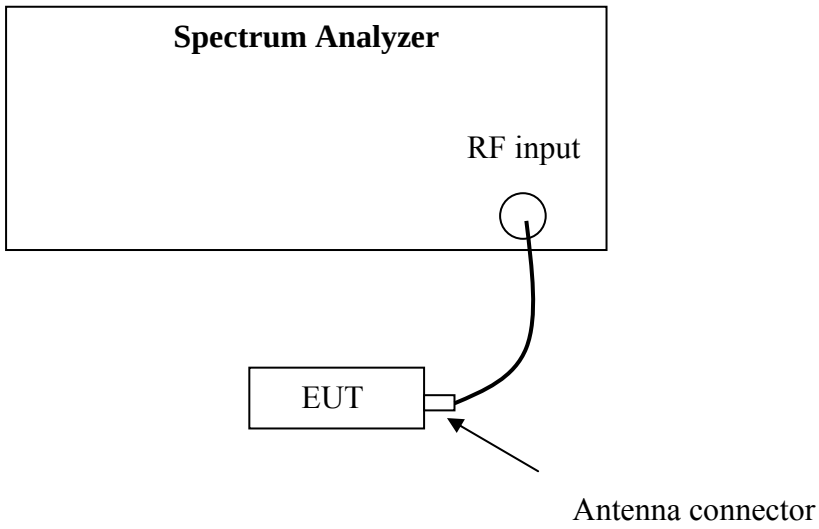
8. Emission outside the frequency Band

Test result: **PASS**

8.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

8.2 Test Configuration



8.3 Test procedure and test setup

The Emission outside the frequency Band per FCC §15.247(d) is measured using the Spectrum Analyzer with the resolutions bandwidth set at 100kHz, the video bandwidth set at 300kHz, and the SPAN>>RBW.

8.4 Test protocol

802.11b

Highest level outside the band edge (dBm)	Highest emission within the band edge (dBm)	Delta (dBm)	Limit
-46.59 (frequency lower than 2.4GHz)	-3.16	43.43	≥ 20dB
-60.82 (frequency higher than 2.4835GHz)	-2.98	57.84	≥ 20dB

802.11g

Highest level outside the band edge (dBm)	Highest emission within the band edge (dBm)	Delta (dBm)	Limit
-35.30 (frequency lower than 2.4GHz)	-3.59	31.71	≥ 20dB
-55.49 (frequency higher than 2.4835GHz)	-3.91	51.58	≥ 20dB

802.11a

Highest level outside the band edge (dBm)	Highest emission within the band edge (dBm)	Delta (dBm)	Limit
-39.33 (frequency lower than 5.725GHz)	-3.52	35.81	≥ 20dB
-57.29 (frequency higher than 5.85GHz)	-4.43	52.86	≥ 20dB

8.5 Measurement uncertainty

The measurement uncertainty is ±1dB.

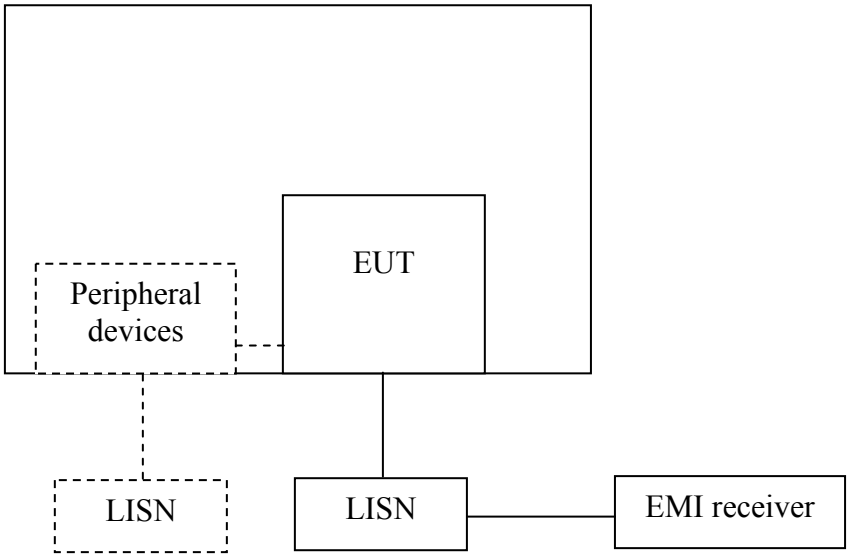
9. Power line conducted emission

Test result: **Pass**

9.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
0.15-0.5	66 to 56*	56 to 46 *
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

9.2 Test configuration



☒ For table top equipment, wooden support is 0.8m height table

☐ For floor standing equipment, wooden support is 0.1m height rack.

9.3 Test procedure and test set up

The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50Ω/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50Ω/50uH coupling impedance with 50Ω termination.
Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4 on conducted measurement.
The bandwidth of the test receiver is set at 9 kHz.

9.4 Test protocol

Power line: L

Frequency	Correct Factor (dB)	Corrected Reading (dBuV)		Limit (dBuV)		Margin (dB)	
		QP	AV	QP	AV	QP	AV
0.16	3.00	47.50	18.75	65.54	55.54	18.04	36.79
0.20	3.00	60.00	49.16	63.68	53.68	3.68	4.52
0.30	3.00	49.98	39.24	60.37	50.37	10.39	11.13
1.09	3.00	26.92	20.02	56.00	46.00	29.08	25.98
3.63	3.00	23.23	2.03	56.00	46.00	32.77	43.97
5.49	3.00	12.86	2.19	60.00	50.00	47.14	47.81
Remark: 1. Correction Factor (dB) = LISN Factor (dB) + Cable Loss (dB). 2. Margin (dB) = Limit - Corrected Reading.							

Power line: N

Frequency	Correct Factor (dB)	Corrected Reading (dBuV)		Limit (dBuV)		Margin (dB)	
		QP	AV	QP	AV	QP	AV
0.19	3.00	52.00	41.19	63.95	53.95	11.95	12.76
0.30	3.00	49.69	38.67	60.31	50.31	10.62	11.64
0.76	3.00	30.86	2.48	56.00	46.00	25.14	43.52
0.95	3.00	23.42	2.50	56.00	46.00	32.58	43.50
3.46	3.00	35.60	17.46	56.00	46.00	20.40	28.54
14.89	3.00	35.55	31.00	60.00	50.00	24.45	19.00
Remark: 1. Correction Factor (dB) = LISN Factor (dB) + Cable Loss (dB). 2. Margin (dB) = Limit - Corrected Reading.							

9.5 Measurement Uncertainty

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.
Measurement uncertainty at mains terminal: ± 1.99dB
The measurement uncertainty is given with a confidence of 95%, k=2.
The measurement uncertainty is traceable to internal procedure TI-036.

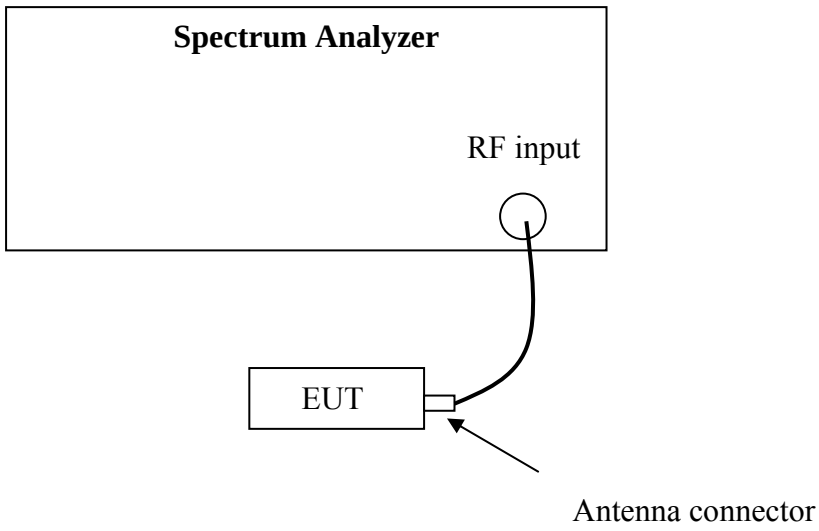
10. Channel Number of hopping system

Test result: **NA**

10.1 Limit

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

10.2 Test Configuration



10.3 Test procedure and test setup

The channel number per FCC §15.247(a)(1)(iii) is measured using the Spectrum Analyzer with the resolutions bandwidth set at 100kHz, the video bandwidth set at 300kHz, and the SPAN>>RBW.
The RF passband of the EUT was divided into 3 appropriate bands to test.

10.4 Test protocol

Channel Number	Limit
-	≥15

10.5 Measurement uncertainty

The measurement uncertainty is ±1dB.

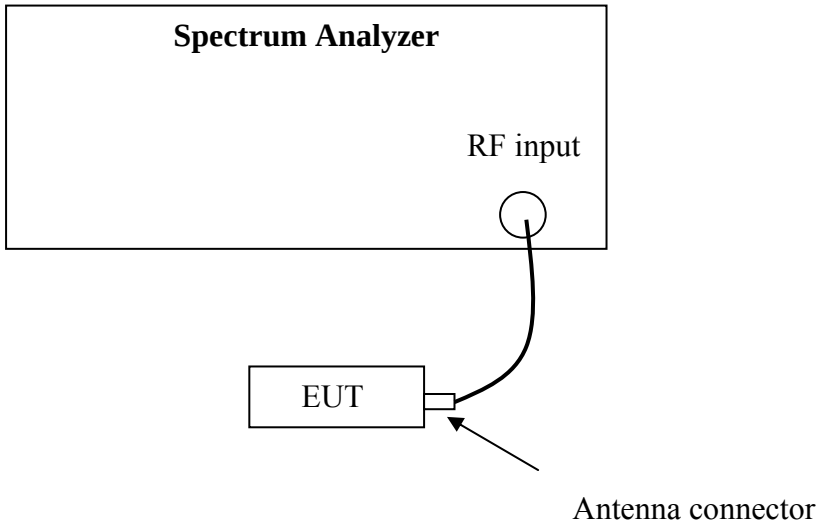
11. Average time of occupancy in any channel

Test result: **NA**

11.1 Limit

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

11.2 Test Configuration



11.3 Test procedure and test setup

Average time of occupancy in any channel per FCC § 15.247(a)(1)(iii)
is measured using the Spectrum Analyzer with the resolutions bandwidth set at 100kHz, the video bandwidth set at 300kHz, and the SPAN set to be 0Hz to test in time domain. The test is performed at the middle channel.

11.4 Test protocol

Packet	Observed period (s) **P**	Time of occupancy for single hopping (ms) **O**	Hops among the interval of 3.6 s **I**	Average time of occupancy (s) **T**	Limit (s)
Packet Type 4	-	-	-	-	≤0.4
Packet Type 11	-	-	-	-	≤0.4
Packet Type 15	-	-	-	-	≤0.4

Remark: 1. There are 79 channels in all. So the observed period P = 0.4 * 79 = 31.6 s.
2. Average time of occupancy **T = O *I * P / 3.6**

11.5 Measurement uncertainty

The measurement uncertainty is ± 10μs.

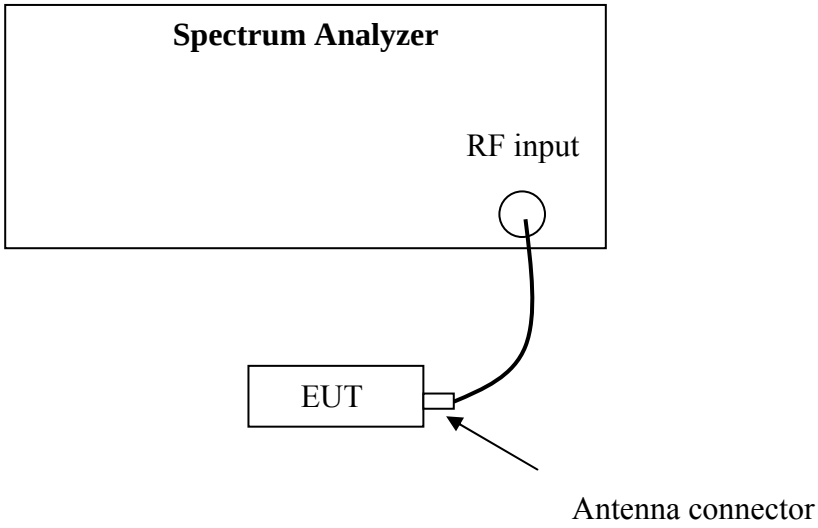
12. Occupied Bandwidth

Test Status: Tested

12.1 Test limit

None

12.2 Test Configuration



12.3 Test procedure and test setup

The occupied bandwidth per RSS-Gen Issue 2 Clause 4.6.1 was measured using the Spectrum Analyzer with the resolutions bandwidth set at 1MHz, the video bandwidth set at 3MHz. The test was performed at 3 channels (lowest, middle and highest channel).

12.4 Test protocol

Temperature : 22 °C
Relative Humidity : 43 %

802.11b

Channel	Occupied Bandwidth (MHz)	Max. Value (MHz)
1	15.73	15.93
6	15.93	
11	15.93	

Remark: "Max. Value" is the maximum test result of the three measured occupied bandwidth.

802.11g

Channel	Occupied Bandwidth (MHz)	Max. Value (MHz)
1	18.34	18.54
6	18.34	
11	18.54	

Remark: "Max. Value" is the maximum test result of the three measured occupied bandwidth.

802.11a

Channel	Occupied Bandwidth (MHz)	Max. Value (MHz)
145	18.64	18.64
157	18.54	
165	18.64	

Remark: "Max. Value" is the maximum test result of the three measured occupied bandwidth.

12.5 Measurement uncertainty

The measurement uncertainty is ±1dB.

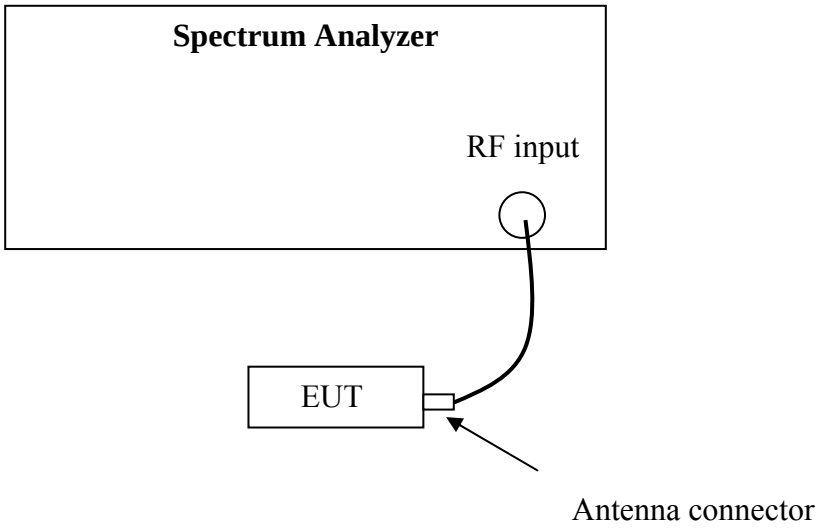
13. Spurious emission for receiver

Test result: **PASS**

13.1 Test limit

The spurious emission shall test through 3 times tuneable or local oscillator frequency whichever is the higher, without exceeding 40 GHz. If a conducted measurement is made, no spurious output signals appearing at the antenna terminals shall exceed 2nW per any 4 kHz spurious frequency in the band 30-1000 MHz, or 5nW above 1 GHz.

13.2 Test Configuration



13.3 Test procedure and test setup

The receiver spurious emission per RSS-210 Issue 7 Clause 2.3 is measured using the Spectrum Analyzer with the resolution bandwidth / video bandwidth set at 5kHz for 30MHz ~ 1GHz and with the resolution bandwidth / video bandwidth set at 1MHz for higher than 1GHz.

13.4 Test protocol

802.11b, highest reading related to the limit

Detector	Frequency (MHz)	Correct Factor (dB)	Corrected Receiver Reading (dBm)	Limit (dBm)
PK for ≤1GHz	78.60	0	-89.68	-57
PK for ≥1GHz	6735.47	0	-77.08	-53

Note: For frequency higher than 1GHz, the PK detector is employed while the limit is AV limit.

802.11g, highest reading related to the limit

Detector	Frequency (MHz)	Correct Factor (dB)	Corrected Receiver Reading (dBm)	Limit (dBm)
PK for ≤1GHz	760.90	0	-95.82	-57
PK for ≥1GHz	6735.47	0	-75.77	-53

Note: For frequency higher than 1GHz, the PK detector is employed while the limit is AV limit.

802.11a, highest reading related to the limit

Detector	Frequency (MHz)	Correct Factor (dB)	Corrected Receiver Reading (dBm)	Limit (dBm)
PK for ≤1GHz	949.46	0	-95.29	-57
PK for ≥1GHz	6699.40	0	-77.84	-53

Note: For frequency higher than 1GHz, the PK detector is employed while the limit is AV limit.

13.5 Measurement uncertainty

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.
Measurement uncertainty of radiated emission is: ± 5.31dB
The measurement uncertainty is given with a confidence of 95%, k=2.
The measurement uncertainty is traceable to internal procedure TI-036.