EMC TEST REPORT for Intentional Radiator
No. SH10100900-001

Applicant	: Aruba Networks, Inc. 1322 Crossman Ave., Sunnyvale CA 94089 USA
Manufacturer	: Aruba Networks, Inc. 1322 Crossman Ave., Sunnyvale CA 94089 USA
Product Name	: Indoor Wireless Mesh Router
Type/Model	: MSR1200, MSR1K2SN0, MSR1K2SN0-US

SUMMARY

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

47CFR Part 15 (2009): 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 8 (December 2010): Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

RSS-Gen Issue 3 (December 2010): General Requirements and Information for the Certification of Radiocommunication Equipment

Date of issue: Jan 27, 2011

Prepared by:

Wakeyou Wang (*Project Engineer*)

Reviewed by:

Daniel Zhao (*Reviewer*)

Description of Test Facility

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IC Assigned Code: 2042B-1

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Content

1. General Information

1.1 Applicant Information

Applicant:		Aruba Networks, Inc. 1322 Crossman Ave., Sunnyvale CA 94089 USA
Name of contact:		Ivaylo Tankov
Tel:		408-754-3035
Fax:		408-227-4550
Manufacturer:		Aruba Networks, Inc. 1322 Crossman Ave., Sunnyvale CA 94089 USA
Sample received date	:	May 17, 2010
Sample Identification No	:	*0100722-30-001*
Date of test	:	May 17, 2010 ~ Nov 10, 2010

1.2 Identification of the EUT

Equipment:	Indoor Wireless Mesh Router
Type/model:	MSR1200, MSR1K2SN0, MSR1K2SN0-US
FCC ID:	Q9DMSR1200N
IC:	4675A-MSR1200N

1.3 Technical specification

Operation Frequency Band: 2412 - 2462 MHz , 2422 – 2452MHz
5745 – 5825 MHz, 5755 – 5795MHz

Modulation:
DBPSK @1Mbps
DQPSK@2Mbp
CCK@5.5/11Mbps
BPSK@6/9 Mbps
QPSK@12/18Mbps
16-QAM@24Mbps
64-QAM@48/54Mpb and above

Description of EUT: Here are three models. They are electrically identical except for different mode name. Therefore, the model MSR1K2SN0 was chose to perform test as representative.
The EUT supports wireless network of 802.11a/b/g/n. There are two same wireless modules (namely card 1 and card 2) inserted in the EUT. Nevertheless, the two modules cannot work on the same channel at no time. Each module contains of two chains, namely chain 0 and chain 1. The 802.11n supports both single and dual chain modes (Note: under 802.11n single chain mode, the RF module only support chain 0 to be used and chain 1 is not opened to ender user).

Antenna Designation: External, Reverse Omnidirectional Antenna
Gain of Antenna: 5.0dBi max.
Rating: 48V d.c. powered by:
1. POE: input 100-240Va.c., 1.5A, 47-63Hz;
   output 48V d.c., 1.2A
2. Adapter: input 100-240Va.c., 50/60Hz, 1.2A
   output 49.5V d.c., 0.8A

Signal terminal: POE, CONSOLE (USB)

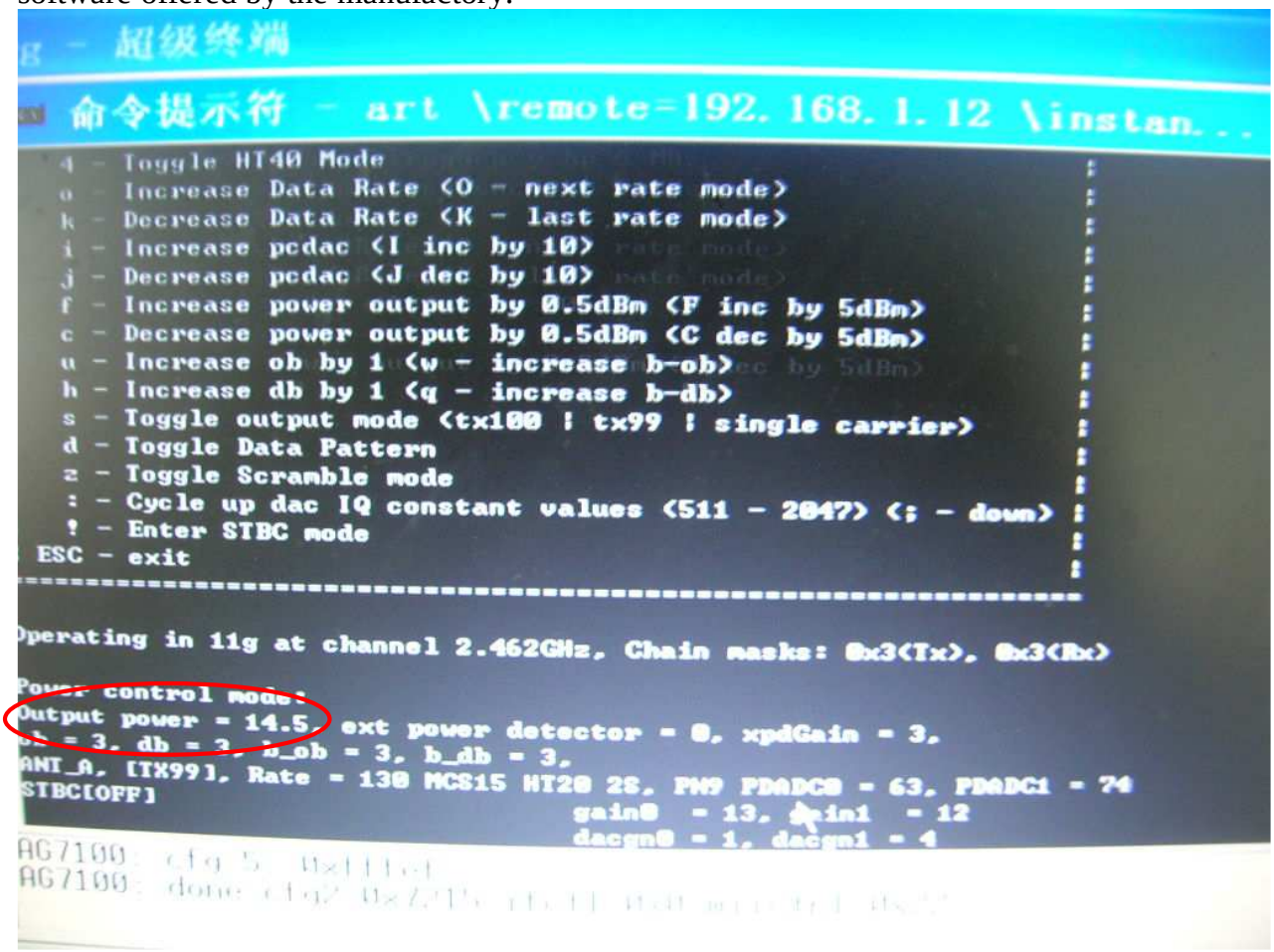
Channel Description:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	149	5745
2	2417	153	5765
3	2422	157	5785
4	2427	161	5805
5	2432	165	5825
6	2437	151	5755

7	2442	159	5795
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. The EUT has transmitting as well as receiving modes, so both were assessed.
While testing transmitting mode of EUT, the internal modulation was used.
While testing receiving mode of EUT, the signal generator was employed to generate continuous answer signal.
During test, the maximum power level for 802.11a/b/g/n was set as “14.5” indicated in software offered by the manufactory.



Test peripherals used:

Item No	Description	Band and Model	S/No
1	Laptop computer	FUJITSU SIMENS, LIFEBOOK	NA

The lowest, middle and highest channel were tested as representatives.
For 802.11a----- lowest, 5745MHz; middle, 5785MHz; highest, 5825MHz.
For 802.11b----- lowest, 2412MHz; middle, 2437MHz; highest, 2462MHz.
For 802.11g----- lowest, 2412MHz; middle, 2437MHz; highest, 2462MHz.
For 802.11n 2.4GHz HT20 ----- lowest, 2412MHz; middle, 2437MHz; highest, 2462MHz.
For 802.11n 2.4GHz HT40 ----- lowest, 2422MHz; middle, 2437MHz; highest, 2452MHz.
For 802.11n 5.8GHz HT20 ----- lowest, 5745MHz; middle, 5785MHz; highest, 5825MHz.
For 802.11n 5.8GHz HT40 ----- lowest, 5755MHz; highest, 5795MHz.

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All the transmission rate were listed here:

a/g	**Data rate (Mbps)**	**b**	**Data rate (Mbps)**	**n HT20 1X**	**Data rate (Mbps)**	**n HT20 2X**	**Data rate (Mbps)**
MCS0	6	MCS0	1 long	MCS0	6.5	MCS8	13
MCS1	9	MCS1	2 long	MCS1	13	MCS9	26
MCS2	12	MCS2	2 short	MCS2	19.5	MCS10	39
MCS3	18	MCS3	5.5 long	MCS3	26	MCS11	52
MCS4	24	MCS4	5.5 short	MCS4	39	MCS12	78
MCS5	36	MCS5	11 short	MCS5	52	MCS13	104
MCS6	48	MCS6	11 long	MCS6	58.5	MCS14	117
MCS7	54	-	-	MCS7	65	MCS15	130
n HT40 (GI=0)1X	**Data rate (Mbps)**	**n HT40 (GI=0)2X**	**Data rate (Mbps)**	**n HT40 (GI=1)1X**	**Data rate (Mbps)**	**n HT40 (GI=1)2X**	**Data rate (Mbps)**
MCS0	13.5	MCS8	27	MCS0	15	MCS8	30
MCS1	27	MCS9	54	MCS1	30	MCS9	60
MCS2	40.5	MCS10	81	MCS2	45	MCS10	90
MCS3	54	MCS11	108	MCS3	60	MCS11	120
MCS4	81	MCS12	162	MCS4	90	MCS12	180
MCS5	108	MCS13	216	MCS5	120	MCS13	240
MCS6	121.5	MCS14	243	MCS6	135	MCS14	270
MCS7	135	MCS15	270	MCS7	150	MCS15	300

2. Test Specification

2.1 Instrument list

Equipment	Type	Manu.	Internal no.	Cal. Date	Due date
Test Receiver	ESIB 26	R&S	EC 3045	2010-6-1	2011-5-31
Semi-anechoic chamber	-	Albatross project	EC 3048	2010-6-1	2011-5-31
A.M.N.	ESH2-Z5	R&S	EC 3119	2010-1-23	2011-1-22
Test Receiver	ESCS 30	R&S	EC 2107	2010-1-23	2011-1-22
Ultra-broadband Antenna	CBL 6112D	TESEQ	EC 4206	2010-5-30	2011-6-1
Horn Antenna	HF 906	R&S	EC 3049	2010-6-30	2011-6-29
Pre-amplifier	Pre-amp 18	R&S	EC 3222	2010-6-30	2011-6-29
Signal generator	SMR 20	R&S	EC 3044-1	2010-8-21	2011-8-20
High Pass Filter	WHKX 1.0/15G-10SS	Wainwright	EC4297-1	2010-2-8	2011-2-7
High Pass Filter	WHKX 2.8/18G-12SS	Wainwright	EC4297-2	2010-2-8	2011-2-7
High Pass Filter	WHKX 7.0/1.8G-8SS	Wainwright	EC4297-3	2010-2-8	2011-2-7
Band Reject Filter	WRCGV 2400/2483-2390/2493-35/10SS	Wainwright	EC4297-4	2010-2-8	2011-2-7
Spectrum Analyzer	E4408B	Agilent	MY45102679	2009-11-20	2010-11-19
Spectrum Analyzer	E4446A	Agilent	MY45300103	2010-6-11	2011-6-10
EMI Test Receiver	ESCI	R&S	100573	2010-5-23	2011-5-22
Preamplifier	AP-025C	Quietek	QT-AP003	2009-11-25	2010-11-24
Preamplifier	AP-180C	Quietek	CHM-0602013	2009-11-25	2010-11-24
Broad-Band Horn Antenna	BBHA9120D	Schwarzbeck	496	2009-11-25	2010-11-24
Broad-Band Horn Antenna	BBHA9170	Schwarzbeck	294	2009-11-25	2010-11-24

2.2 Test Standard

47CFR Part 15 (2009)
ANSI C63.4: 2003
RSS-210 Issue 8 (December 2010)
RSS-Gen Issue 3 (December 2010)

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 8 Annex 8	Pass
Maximum peak output power	15.247(b)(1)	RSS-210 Issue 8 Annex 8	Pass
Power spectrum density	15.247(e)	RSS-210 Issue 8 Annex 8	Pass
Radiated emission	15.205 & 15.209	RSS-210 Issue 8 Clause 2	Pass
Emission outside the frequency band	15.247(d)	RSS-210 Issue 8 Annex 8	Pass
Power line conducted emission	15.207	RSS-Gen Issue 3 Clause 7.2.4	Pass
Channel number of hopping system	15.247(a)(1)(iii)	RSS-210 Issue 8 Annex 8	NA
Average time of occupancy in any channel	15.247(a)(1)(iii)	RSS-210 Issue 8 Annex 8	NA
Occupied bandwidth	-	RSS-Gen Issue 3 Clause 4.6.1	Tested
Spurious emission for receiver	-	RSS-210 Issue 8 Clause 2.3	Pass

2.4 Data rate VS power

Mode	Data Rate	CH	Level at certain a chain (dBm)
11a	MCS0	M	24.08
	MCS1	M	23.98
	MCS2	M	23.88
	MCS3	M	23.84
	MCS4	M	24.33
	MCS5	M	24.13
	MCS6	M	24.17
	MCS7	M	**24.39**
11b	MCS0	M	19.05
	MCS1	M	19.34
	MCS2	M	19.21
	MCS3	M	20.58
	MCS4	M	20.13
	MCS5	M	**21.52**
	MCS6	M	20.41
11g	MCS0	M	26.56
	MCS1	M	26.78
	MCS2	M	26.96
	MCS3	M	27.05
	MCS4	M	27.44
	MCS5	M	27.24
	MCS6	M	27.29
	MCS7	M	**27.62**
11n HT20 2.4GHz	MCS0	M	23.63
	MCS1	M	23.63
	MCS2	M	23.58
	MCS3	M	24.16
	MCS4	M	24.06

	MCS5	M	24.21
	MCS6	M	24.28
	MCS7	M	**24.44**
11n HT40 2.4GHz, GI=0	MCS0	M	25.52
	MCS1	M	25.59
	MCS2	M	25.60
	MCS3	M	25.84
	MCS4	M	25.80
	MCS5	M	25.79
	MCS6	M	25.68
	MCS7	M	**25.94**
11n HT40 2.4GHz, GI=1	MCS0	M	24.53
	MCS1	M	24.21
	MCS2	M	24.19
	MCS3	M	24.74
	MCS4	M	24.36
	MCS5	M	24.52
	MCS6	M	24.62
	MCS7	M	**24.80**
11n HT20 5.8GHz	MCS0	M	24.15
	MCS1	M	23.94
	MCS2	M	24.02
	MCS3	M	24.71
	MCS4	M	24.59
	MCS5	M	24.90
	MCS6	M	24.66
	MCS7	M	**24.94**
11n HT40 5.8GHz, GI=0	MCS0	L	24.07
	MCS1	L	24.06
	MCS2	L	24.56
	MCS3	L	24.44
	MCS4	L	24.52

	MCS5	L	24.68
	MCS6	L	24.71
	MCS7	L	**24.76**
11n HT40 5.8GHz, GI=1	MCS0	H	24.64
	MCS1	H	24.35
	MCS2	H	24.33
	MCS3	H	24.75
	MCS4	H	24.83
	MCS5	H	24.88
	MCS6	H	24.87
	MCS7	H	**25.00**

Conclusion: For all RF test items in this report, MCS7 should be set for 11a/g/n and MCS5 for 11b.

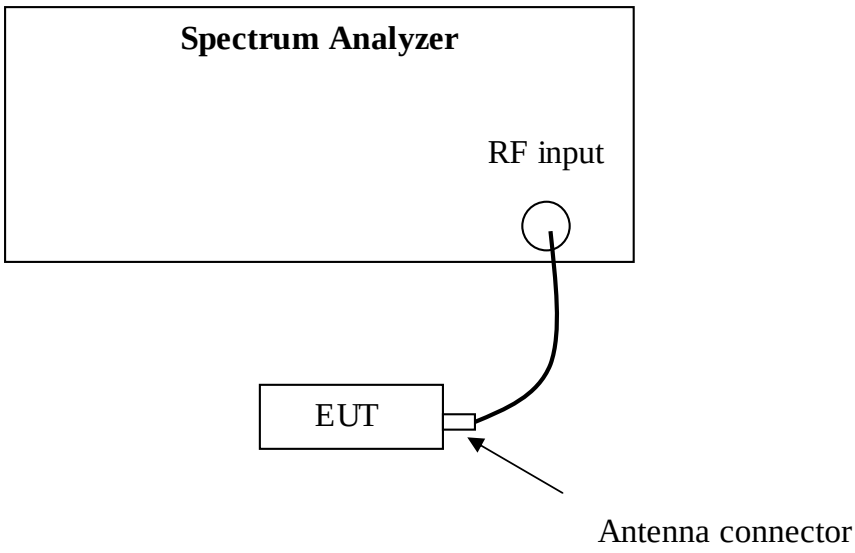
3. Maximum peak output power

Test result: Pass

3.1 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.
For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

3.2 Test Configuration



3.3 Test procedure and test setup

The power output per FCC § 15.247(b)(1) is measured using the Spectrum Analyzer with the resolutions bandwidth set at 1MHz, the video bandwidth set at 3MHz, and the SPAN>>RBW. The test was performed at 3 channels (lowest, middle and highest channel). The EUT was tested according to DTS test procedure of Oct 2002 KDB558074 for compliance to FCC 47CFR 15.247 requirements (Power Output Option 2, method#1).

3.4 Test protocol

Temperature : 22 °C
Relative Humidity : 43 %

Single Chain

Mode	CH	Card 1, Chain 0 (dBm)	Card 1, Chain 1 (dBm)	Card 2, Chain 0 (dBm)	Card 2, Chain 1 (dBm)	Limit (dBm)
11a	L	24.76	23.36	/	/	≤30
	M	24.43	23.22	23.63	23.06	≤30
	H	24.28	23.75	/	/	≤30
11b	L	21.76	20.33	/	/	≤30
	M	21.57	20.61	21.43	19.89	≤30
	H	21.34	20.43	/	/	≤30
11g	L	25.05	23.54	/	/	≤30
	M	24.79	23.95	/	/	≤30
	H	24.54	23.45	/	/	≤30
11n HT20 2.4GHz	L	24.61	/	/	/	≤30
	M	24.95	/	/	/	≤30
	H	24.16	/	/	/	≤30
11n HT40 2.4GHz, GI=0	L	25.51	/	/	/	≤30
	M	25.44	/	/	/	≤30
	H	24.96	/	/	/	≤30
11n HT40 2.4GHz, GI=1	L	24.72	/	/	/	≤30
	M	24.83	/	/	/	≤30
	H	24.59	/	/	/	≤30
11n HT20 5.8GHz	L	24.76	/	/	/	≤30
	M	24.96	/	/	/	≤30
	H	24.67	/	/	/	≤30
11n HT40 5.8GHz GI=0	L	24.74	/	/	/	≤30
	H	24.68	/	/	/	≤30
11n HT40	L	24.85	/	/	/	≤30

5.8GHz GI=1	H	25.04	/	/	/	≤30

Note: 1. After testing at 802.11a & 802.11b modes, it is found card 1 has higher output power than that of card 2. Therefore, card 1 is chosen to perform all tests.
2. The EUT doesn't support emission of chain 1 under 802.11n single chain mode.

Dual Chain

Mode	CH	Chain 0 (dBm)	Chain 1 (dBm)	Chain 0 + Chain 1 (dBm)	Limit (dBm)
11n HT20 2.4GHz	L	25.87	23.82	27.98	≤30
	M	25.79	24.00	28.00	≤30
	H	25.18	23.88	27.59	≤30
11n HT40 2.4GHz, GI=0	L	26.04	23.89	**28.11**	≤30
	M	25.99	23.94	28.10	≤30
	H	25.39	23.43	27.53	≤30
11n HT40 2.4GHz, GI=1	L	25.35	23.65	27.59	≤30
	M	25.28	23.82	27.62	≤30
	H	25.01	23.60	27.37	≤30
11n HT20 5.8GHz	L	22.94	22.52	25.75	≤30
	M	22.65	23.32	26.01	≤30
	H	22.15	22.75	25.47	≤30
11n HT40 5.8GHz, GI=0	L	24.96	23.85	27.45	≤30
	H	25.20	23.81	27.57	≤30
11n HT40 5.8GHz, GI=1	L	25.14	23.69	27.49	≤30
	H	25.18	23.63	27.48	≤30

For the gain of Antenna = 5.0dBi, the maximum e.i.r.p = 28.11dBm + 5.00dBi = 33.11dBm = 2.05W (lower than the e.i.r.p limit of 4W showed in RSS-210.).

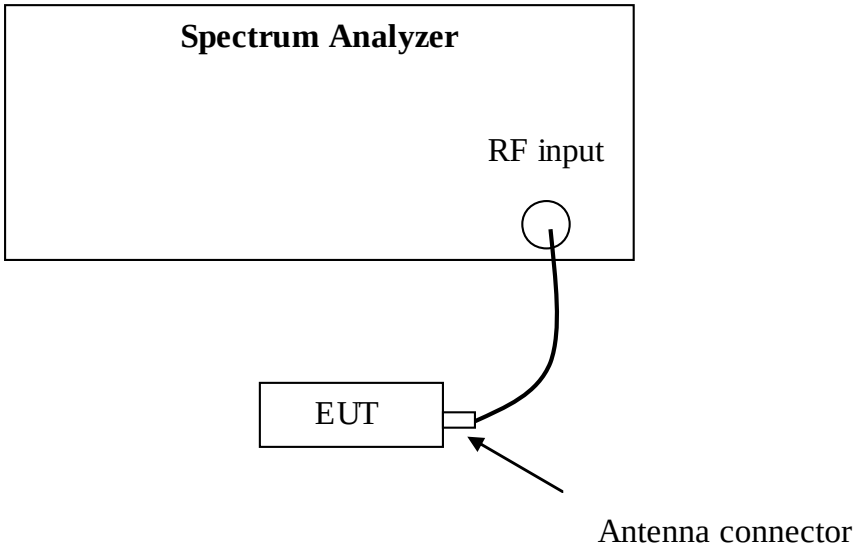
4. Minimum 6dB Bandwidth

Test result: PASS

4.1 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.

4.2 Test Configuration



4.3 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).
The EUT was tested according to DTS test procedure of Oct 2002 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

4.4 Test Protocol

Temperature : 22°C

Relative Humidity : 43%

Single Chain

Mode	CH	Card 1, Chain 0 (MHz)	Limit (MHz)
11a	L	16.51	≥0.5
	M	16.51	≥0.5
	H	16.51	≥0.5
11b	L	11.98	≥0.5
	M	12.02	≥0.5
	H	12.22	≥0.5
11g	L	16.47	≥0.5
	M	16.51	≥0.5
	H	16.51	≥0.5
11n HT20 2.4GHz	L	17.76	≥0.5
	M	17.80	≥0.5
	H	17.72	≥0.5
11n HT40 2.4GHz, GI=0	L	36.55	≥0.5
	M	36.55	≥0.5
	H	36.54	≥0.5
11n HT40 2.4GHz, GI=1	L	36.47	≥0.5
	M	36.46	≥0.5
	H	36.37	≥0.5
11n HT20 5.8GHz	L	17.76	≥0.5
	M	17.72	≥0.5
	H	17.72	≥0.5
11n HT40 5.8GHz GI=0	L	36.47	≥0.5
	H	36.55	≥0.5
11n HT40 5.8GHz GI=1	L	36.55	≥0.5
	H	36.55	≥0.5

Note: It was found the conducted output power of chain0 is higher than that of chain1, therefore chain0 was chosen to perform test as representative.

Dual Chain

Mode	CH	Card 1, Chain 0 (MHz)	Limit (MHz)
11n HT20 2.4GHz	L	17.72	⩾0.5
	M	17.76	⩾0.5
	H	17.72	⩾0.5
11n HT40 2.4GHz, GI=0	L	36.55	⩾0.5
	M	36.54	⩾0.5
	H	36.53	⩾0.5
11n HT40 2.4GHz, GI=1	L	36.47	⩾0.5
	M	36.15	⩾0.5
	H	36.38	⩾0.5
11n HT20 5.8GHz	L	17.80	⩾0.5
	M	17.76	⩾0.5
	H	17.76	⩾0.5
11n HT40 5.8GHz, GI=0	L	36.47	⩾0.5
	H	36.47	⩾0.5
11n HT40 5.8GHz, GI=1	L	36.55	⩾0.5
	H	36.47	⩾0.5

Note: It was found the conducted output power of chain0 is higher than that of chain1, therefore chain0 was chosen to perform test as representative.

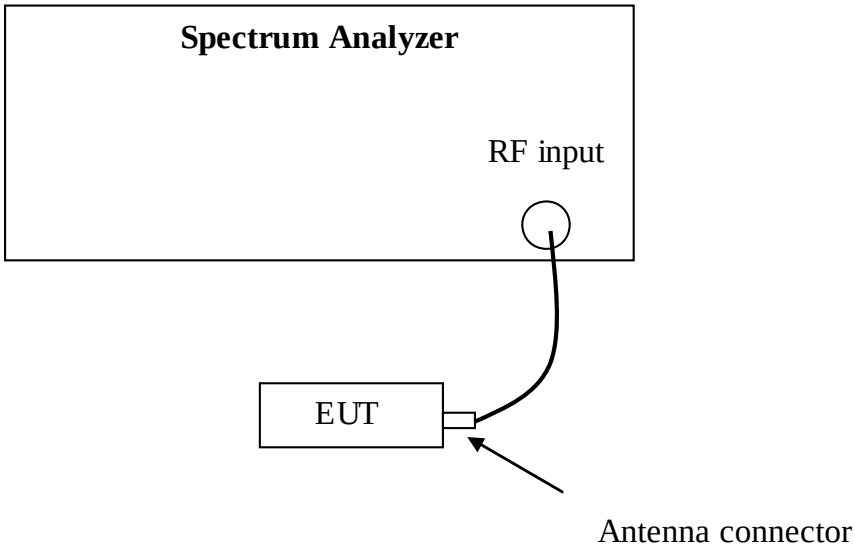
5. Power spectrum density

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 10kHz. The test was performed at 3 channels (lowest, middle and highest channel).
The EUT was tested according to DTS test procedure of Oct 2002 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

5.4 Test Protocol

Temperature : 22 °C
Relative Humidity : 43 %

Single Chain

Mode	CH	Card 1, Chain 0 (dBm/3kHz)	Limit (dBm/3kHz)
11a	L	-3.44	≤8
	M	-1.63	≤8
	H	-7.63	≤8
11b	L	-8.49	≤8
	M	-8.97	≤8
	H	-8.67	≤8
11g	L	-8.78	≤8
	M	-7.49	≤8
	H	-8.37	≤8
11n HT20 2.4GHz	L	-10.03	≤8
	M	-10.03	≤8
	H	-8.98	≤8
11n HT40 2.4GHz, GI=0	L	-8.41	≤8
	M	-7.98	≤8
	H	-8.62	≤8
11n HT40 2.4GHz, GI=1	L	-8.92	≤8
	M	-9.88	≤8
	H	-8.48	≤8
11n HT20 5.8GHz	L	-4.38	≤8
	M	-5.58	≤8
	H	-6.03	≤8
11n HT40 5.8GHz GI=0	L	-10.95	≤8
	H	-4.10	≤8
11n HT40 5.8GHz GI=1	L	-7.19	≤8
	H	-9.45	≤8

Dual Chain

Mode	CH	Card 1, Chain 0 (dBm/3kHz)	Limit (dBm/3kHz)
11n HT20 2.4GHz	L	-3.67	≤8
	M	-1.69	≤8
	H	-3.15	≤8
11n HT40 2.4GHz, GI=0	L	-4.43	≤8
	M	-5.30	≤8
	H	-5.56	≤8
11n HT40 2.4GHz, GI=1	L	-10.58	≤8
	M	-12.36	≤8
	H	-10.33	≤8
11n HT20 5.8GHz	L	-8.30	≤8
	M	-8.42	≤8
	H	-6.72	≤8
11n HT40 5.8GHz, GI=0	L	-3.11	≤8
	H	-10.31	≤8
11n HT40 5.8GHz, GI=1	L	-9.44	≤8
	H	-8.88	≤8

6. Radiated emission

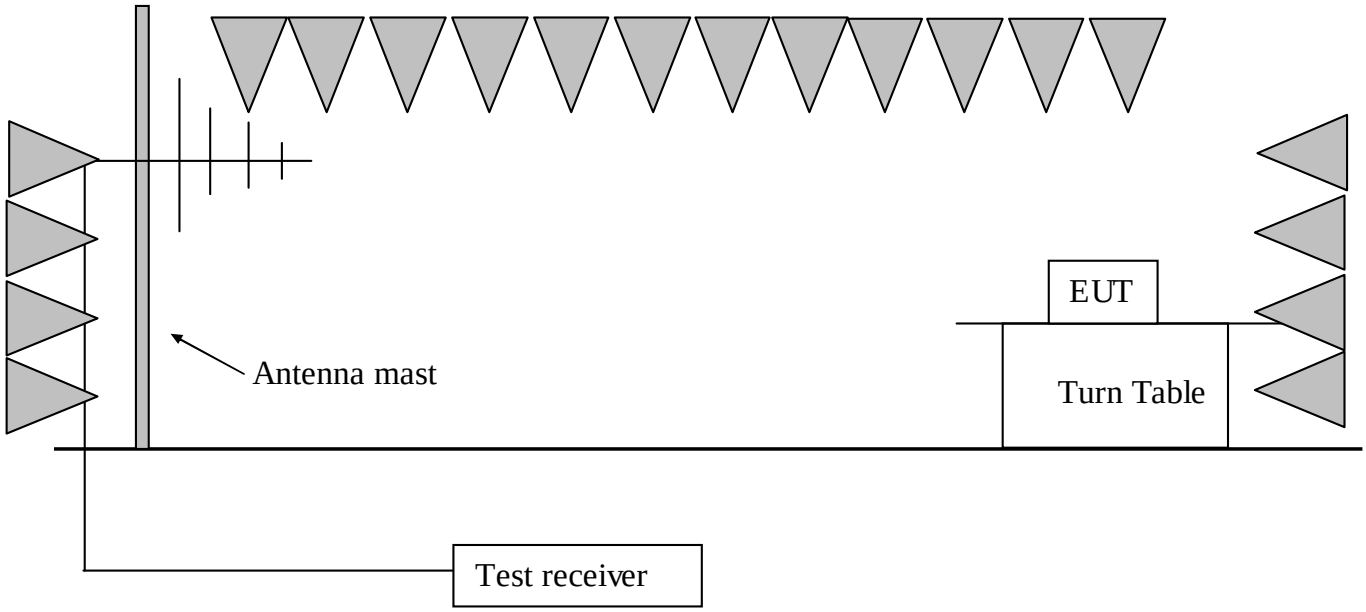
Test result: PASS

6.1 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

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, if applied, the pre-amplifier would be 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.
The EUT was tested according to DTS test procedure of Oct 2002 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

The radiated emission was measured using the Spectrum Analyzer with the resolutions bandwidth set as:

RBW = 100kHz, VBW = 300kHz (30MHz~1GHz)
RBW = 1MHz, VBW = 3MHz (>1GHz for PK);
RBW = 1MHz, VBW = 10Hz (>1GHz for AV);

6.4 Test protocol

11n HT40, 2.4GHz, GI=0, dual chain (which mode with max. 2.4GHz output power)

CH	Polarization	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	V	2425.15	28.80	116.80	Fundamental	/	PK
	V	37.78	14.00	39.00	40.00	1.00	QP
	H	166.58	10.30	28.50	43.50	15.00	PK
	H	270.34	13.50	28.30	46.00	17.70	PK
	V	2737.47	-3.80	51.10	54.00	2.90	PK
	V	2388.08	28.60	70.90	74.00	3.10	PK
	V	2388.40	28.60	53.20	54.00	0.80	AV
	V	2483.50	28.80	43.70	54.00	10.30	PK
	V	4855.17	-2.10	47.30	54.00	6.70	PK
M	V	2441.28	28.80	116.10	Fundamental	/	PK
	V	37.78	14.00	39.00	40.00	1.00	QP
	H	166.58	10.30	28.50	43.50	15.00	PK
	H	270.34	13.50	28.30	46.00	17.70	PK
	V	2737.47	-3.80	51.10	54.00	2.90	PK
	V	2390.00	28.60	43.50	54.00	10.50	PK
	V	2483.50	28.80	43.70	54.00	10.30	PK
	V	4883.57	-2.10	47.60	54.00	6.40	PK
H	V	2462.93	28.80	115.90	Fundamental	/	PK
	V	37.78	14.00	39.00	40.00	1.00	QP
	H	166.58	10.30	28.50	43.50	15.00	PK
	H	270.34	13.50	28.30	46.00	17.70	PK
	V	2737.47	-3.80	51.10	54.00	2.90	PK
	V	2390.00	28.60	43.30	54.00	10.70	PK
	V	2483.53	28.80	72.20	74.00	1.80	PK
	V	2483.65	28.80	53.00	54.00	1.00	AV
	V	4930.26	-2.10	46.70	54.00	7.30	PK

11n HT40, 5.8GHz, GI=0, dual chain (which mode with max. 5.8GHz output power)

CH	Polarization	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	V	5768.43	33.60	112.40	Fundamental	/	PK
	V	37.78	14.00	39.00	40.00	1.00	QP
	H	166.58	10.30	28.50	43.50	15.00	PK
	H	270.34	13.50	28.30	46.00	17.70	PK
	V	2737.47	-3.80	51.10	54.00	2.90	PK
	H	4100.25	-2.60	50.60	54.00	3.40	PK
	V	11439.15	12.30	64.20	74.00	9.80	PK
	V	11439.15	12.30	43.40	54.00	10.60	AV
H	V	5801.81	33.60	111.60	Fundamental	/	PK
	V	37.78	14.00	39.00	40.00	1.00	QP
	H	166.58	10.30	28.50	43.50	15.00	PK
	H	270.34	13.50	28.30	46.00	17.70	PK
	V	2737.47	-3.80	51.10	54.00	2.90	PK
	H	4100.25	-2.60	50.60	54.00	3.40	PK
	V	11618.44	12.80	63.90	74.00	10.10	PK
	V	11618.44	12.80	42.50	54.00	11.50	AV

Remark: 1. For fundamental & restrict emission at 2300-2390MHz and 2483.5-2500MHz test, no amplifier is employed.
2. Correct Factor = Antenna Factor + Cable Loss (-Amplifier, is employed)
3. Corrected Reading = Original Receiver Reading + Correct Factor
4. Margin = limit – Corrected Reading
5. If the PK reading is lower than AV limit, the AV test can be elided.
6. Please refer to the “test data” for PK reading lower than 1GHz.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB, Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10dBuV. Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m; Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m
Assuming limit = 54dBuV/m, Corrected Reading = 10.20dBuV/m, then Margin = 54 -10.20 = 43.80dBuV/m

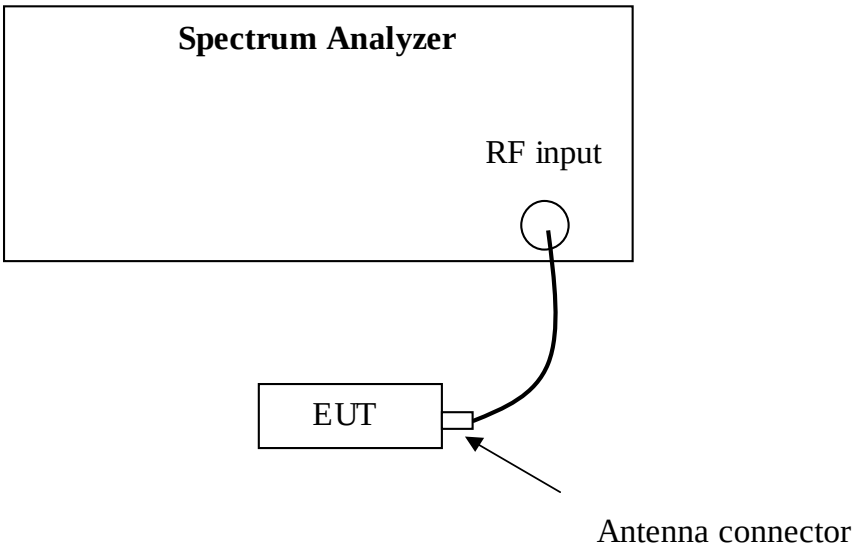
7. Emission outside the frequency Band

Test result: **PASS**

7.1 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.

7.2 Test Configuration



7.3 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.
The EUT was tested according to DTS test procedure of Oct 2002 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

7.4 Test protocol

First, take a prescan (please refer to the test data for prescan graph);
Second, conduct final measurement per 1GHz frequency bandwidth. It was found all the emission outside the frequency band is at least 20 dB below that in the 100 kHz bandwidth within the band.

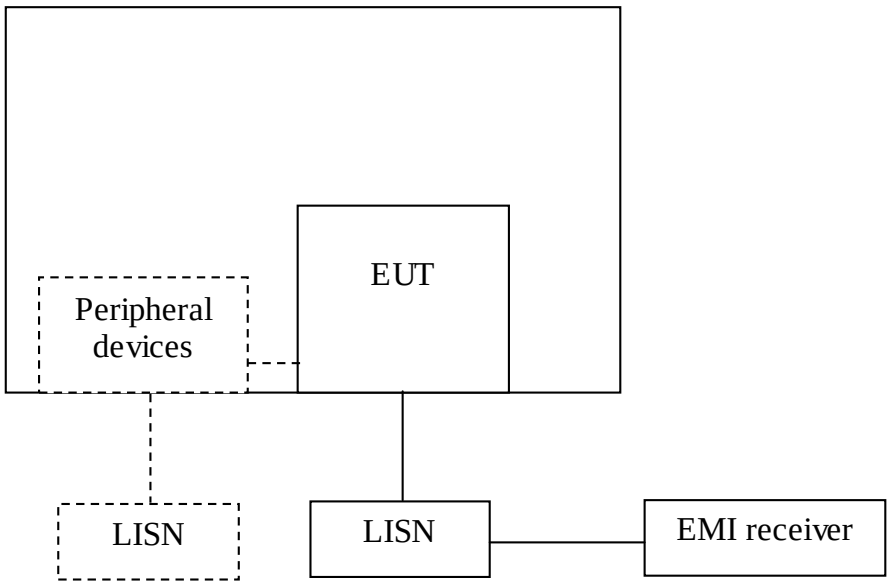
8. Power line conducted emission

Test result: **Pass**

8.1 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.		

8.2 Test configuration



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

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

8.3 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.
The EUT was tested according to DTS test procedure of Oct 2002 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

8.4 Test protocol

POE powered

Frequency	Correct Factor (dB)	Corrected Reading (dBuV)		Limit (dBuV)		Margin (dB)	
		QP	AV	QP	AV	QP	AV
0.31 (L)	3.00	36.97	27.25	60.04	50.04	23.07	22.79
0.38 (L)	3.00	34.47	26.04	58.19	48.19	23.72	22.15
0.46 (N)	3.00	34.47	26.00	56.68	46.68	21.73	20.68
4.73 (L)	3.00	14.65	11.99	56.00	46.00	41.35	34.01
17.64 (N)	3.00	25.47	20.01	60.00	50.00	34.53	29.99
26.91 (N)	3.00	32.28	28.34	60.00	50.00	27.72	21.66
Remark: 1. Correction Factor (dB) = LISN Factor (dB) + Cable Loss (dB). 2. Margin (dB) = Limit - Corrected Reading.							

Adapter powered

Frequency	Correct Factor (dB)	Corrected Reading (dBuV)		Limit (dBuV)		Margin (dB)	
		QP	AV	QP	AV	QP	AV
0.18 (N)	3.00	37.68	28.36	64.31	54.31	26.63	25.95
0.25 (N)	3.00	36.08	32.16	61.79	51.79	25.71	19.63
3.35 (N)	3.00	28.72	21.63	56.00	46.00	27.28	24.37
23.01 (L)	3.00	39.16	32.61	60.00	50.00	20.84	17.39
23.03 (N)	3.00	30.42	22.24	60.00	50.00	29.58	27.76
27.09 (N)	3.00	43.33	36.94	60.00	50.00	16.67	13.06
Remark: 1. Correction Factor (dB) = LISN Factor (dB) + Cable Loss (dB). 2. Margin (dB) = Limit - Corrected Reading.							

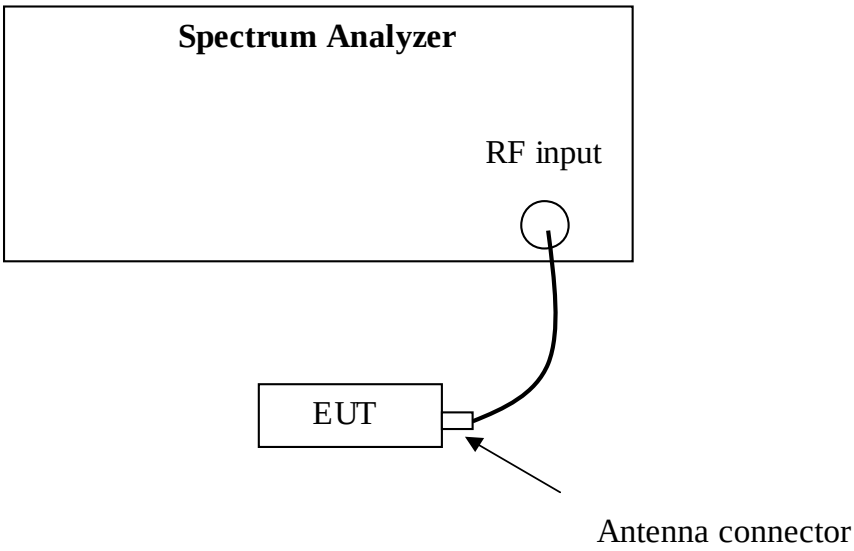
9. Channel Number of hopping system

Test result: **NA**

9.1 Limit

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

9.2 Test Configuration



9.3 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.

9.4 Test protocol

Channel Number	Limit
-	≥15

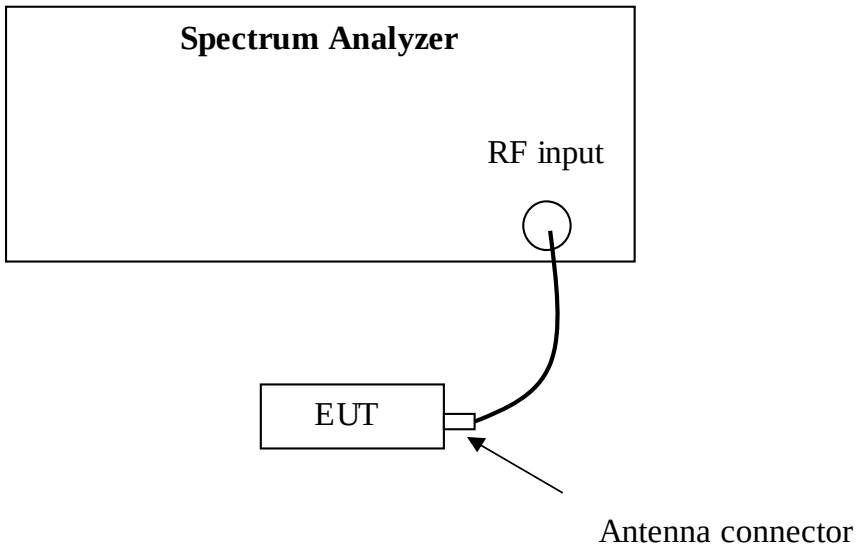
10. Average time of occupancy in any channel

Test result: **NA**

10.1 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.

10.2 Test Configuration



10.3 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.

10.4 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**

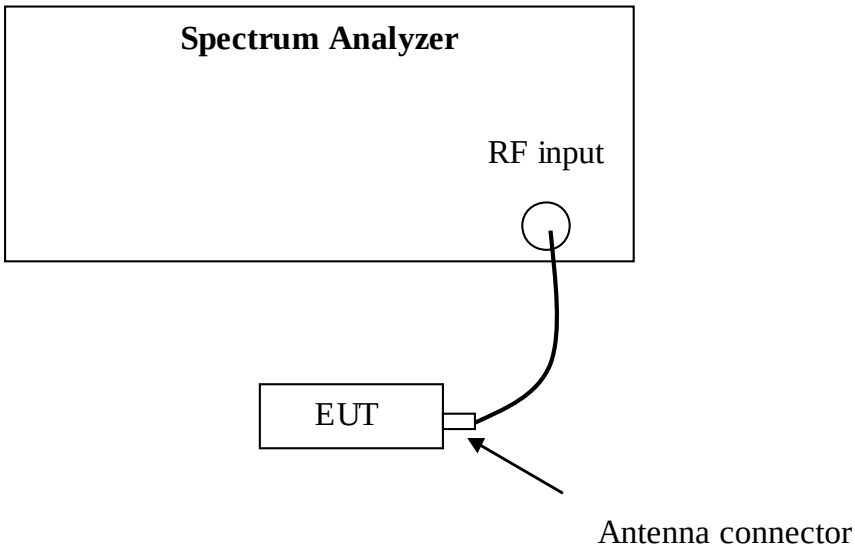
11. Occupied Bandwidth

Test Status: Tested

11.1 Test limit

None

11.2 Test Configuration



11.3 Test procedure and test setup

The occupied bandwidth per RSS-Gen Issue 3 Clause 4.6.1 was measured using the Spectrum Analyzer with the resolutions bandwidth set at 1MHz, the video bandwidth set at 3MHz.

11.4 Test protocol

Temperature : 22 °C
Relative Humidity : 43 %

Mode	Occupied Bandwidth (MHz)
11a	20.84
11b	15.93
11g	21.44
11n HT20 2.4GHz	20.94
11n HT40 2.4GHz, GI=0	38.00
11n HT40 2.4GHz, GI=1	38.88
11n HT20 5.8GHz	22.44
11n HT40 5.8GHz, GI=0	40.28
11n HT40 5.8GHz, GI=1	39.48

Conclusion: Max. Value of "802.11b/g/n 2.4GHz HT20" is 21.44MHz;
Max. Value of "802.11n 2.4GHz HT40" is 38.88MHz.
Max. Value of "802.11a/n 5.8GHz HT20" is 22.44MHz;
Max. Value of "802.11n 5.8GHz HT40" is 40.28MHz.

12. Spurious emission for receiver

Test result: PASS

12.1 Test limit

The spurious emission shall test through 3 times tuneable or local oscillator frequency whichever is the higher, without exceeding 40 GHz.
1) 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.
2) If a radiated measurement is made, all spurious emissions shall comply with the limits of Table 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

12.2 Test Configuration

Please refer to clause 6.2

12.3 Test procedure and test setup

Please refer to clause 6.3.

12.4 Test protocol

POE powered

Polarization	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
V	37.78	14.00	39.20	40.00	0.80	QP
V	43.61	10.90	38.60	40.00	1.40	QP
H	199.12	10.50	40.40	43.50	3.10	PK
H	339.08	16.30	41.00	46.00	5.00	PK
H	366.29	17.20	42.50	46.00	3.50	PK
H	376.01	17.50	43.40	46.00	2.60	PK
V	2737.47	-3.80	51.10	54.00	2.90	PK
H	4100.20	-2.60	40.40	54.00	13.60	PK

Remark: 1. Correct Factor = Antenna Factor + Cable Loss (-Amplifier, is employed)
2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = limit – Corrected Reading
4. Please refer to the “test data” for PK reading lower than 1GHz.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Original Receiver Reading = 10dBuV.
Then Correct Factor = 30.20 + 2.00 = 32.20dB/m; Corrected Reading = 10dBuV + 32.20dB/m = 42.20dBuV/m
Assuming limit = 54dBuV/m, Corrected Reading = 42.20dBuV/m, then
Margin = 54 -42.20 = 11.80dBuV/m

Adapter powered

Polarization	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
V	30.00	18.80	37.10	40.00	2.90	PK
V	43.61	10.90	38.90	40.00	1.10	QP
H	63.05	5.90	37.50	40.00	2.50	PK
H	199.12	10.50	36.10	43.50	7.40	PK
H	300.20	15.00	45.00	46.00	1.00	PK
H	366.29	17.20	43.00	46.00	3.00	PK
H	376.01	17.50	44.60	46.00	1.40	PK
V	2737.47	-3.80	51.10	54.00	2.90	PK
H	4100.20	-2.60	40.40	54.00	13.60	PK