RF TEST REPORT for Intentional Radiator
No. 150101400SHA-001

Applicant	:	Aruba Networks, Inc
		1344 Crossman Ave. Sunnyvale, CA,94089
Manufacturer	:	Aruba Networks, Inc
		1344 Crossman Ave. Sunnyvale, CA,94089
Product Name	:	Access Point
Type/Model	:	APIN0228

SUMMARY

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

47CFR Part 15 (2014): Radio Frequency Devices

ANSI C63.4 (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

Date of issue: Jan 23, 2015

Prepared by:

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Description of Test Facility

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1. 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 Items	FCC Reference	Result
Minimum 6dB Bandwidth	15.247(a)(2)	Pass
Output power	15.247(b)	Pass
Power spectrum density	15.247(e)	Pass
Emissions in non-restricted frequency bands	15.247(d)	Pass
Emissions in restricted frequency bands	15.247(d) & 15.205 & 15.209	Pass
Power line conducted emission	15.207	Pass

2. General Information

2.1 Applicant Information

Applicant	:	Aruba Networks, Inc
		1344 Crossman Ave. Sunnyvale, CA,94089
Name of contact	:	Rob Hastings
Tel	:	(408) 990 2557
Fax	:	/
Manufacturer	:	Aruba Networks, Inc
		1344 Crossman Ave. Sunnyvale, CA,94089

2.2 Identification of the EUT

Equipment	:	Access Point
Type/model	:	APIN0228
FCC ID	:	Q9DAPIN0228
IC	:	4675A-APIN0228

2.3 Technical specification

Operation Frequency Band	:	2412~2462 MHz
Type of Modulation	:	DBPSK, DQPSK, CCK, BPSK, QPSK, 16-QAM, 64-QAM
Transfer Rate	:	802.11b: 11.0/5.5/2.0/1.0Mbps 802.11g: 54.0/48.0/36.0/24.0/18.0/12.0/9.0/6.0Mbps 802.11n: up to 450Mbps
EUT Modes of Modulation	:	802.11b/g; 802.11n20, 40;
Channel Number	:	11Channel for 2412MHz~2462MHz for 11b,11g,11n20; 7 Channel for 2422MHz~2452MHz for 11n40;
Description of EUT	:	The EUT is a wireless access point, the device is a MIMO product, it has one main mode of assembly ways with different antennas, Each assembly way have the same schematic diagram, PCB layout and electronic construction, also have same electric parameters except its antennas.
Port identification	:	RJ45 ports 2; Console USB port 1.
Rating	:	DC 48V,0.6A (PoE)
Declared Temperature range	:	-40°C ~ 60°C
Category of EUT	:	Class B
EUT type	:	☒ Table top☐ Floor standing
Sample received date	:	2014.10.15
Sample Identification No	:	/
Date of test	:	2014.10.15~2015.01.15

Antenna chosen and test plan:

By technical analysis and evaluation, the following models of antennas were chosen to perform the tests as representative.

Test Mode No.	Model	Type	Band(s)	Typical Gain	Conducted Test	Radiated Test
1	AP-ANT-1B	Omnidirectional	2.400 GHz - 2.500 GHz	3.8 dBi		
			4.900 GHz - 5.875 GHz	5.8 dBi		
2	AP-ANT-13B	Downtiltomni	2.400 GHz - 2.500 GHz	4.4dBi		√
			4.900 GHz - 5.900 GHz	3.3dBi		
3	AP-ANT-16	Downtilt 3x3 MIMO omni	2.400 GHz - 2.500 GHz	3.9dBi		
			4.900 GHz - 5.900 GHz	4.7dBi		
4	AP-ANT-32	Omnidirectional	2.400-2.500 GHz	2.2 dBi		
			5.150-5.925 GHz	4.0 dBi		
5	AP-ANT-19	Dual band omni	2.400 GHz - 2.500 GHz	3.0 dBi		
			5.150 GHz - 5.875 GHz	6.0 dBi		
6	AP-ANT-20	Omnidirectional	2.400 GHz - 2.500 GHz	2.0 dBi	√	√
			4.900 GHz - 5.875 GHz	2.0 dBi		
7	AP-ANT-35	Multipolarized	4.9 GHz - 6.0 GHz	5 dBi min		
			2.4 GHz - 2.5 GHz			
8	AP-ANT-38	Multipolarized	4.9 GHz - 6.0 GHz	7.5 dBi min		
			2.4 GHz - 2.5 GHz			
9	AP-ANT-93	3x3 MIMO directional	5.150 GHz - 5.875 GHz	14.0 dBi		
10	ANT-3X3-D905	Multipolarized	2.4 GHz - 2.5 GHz	5 dBi min		√
			4.9 GHz - 6.0 GHz			
11	ANT-3X3-D608	Multipolarized	2.4 GHz - 2.5 GHz	7.5 dBi min		
			4.9 GHz - 6.0 GHz			
12	ANT-3X3-2005	Omnidirectional	2.4 GHz - 2.5 GHz	5 dBi max		√
13	ANT-3X3-5005	Omnidirectional	4.9 GHz - 5.875 GHz	5 dBi max		
14	ANT-3X3-5010	Omnidirectional	4.9 GHz - 5.875 GHz	10 dBi max		
15	ANT-3X3-5712	Multipolarized	4.900 GHz - 6.000 GHz	11.5 dBi min		
16	ANT-2X2-2314	Directional	2.400 GHz - 2.500 GHz	14.0 dBi	√ (1)	√
17	ANT-2X2-5314	Directional	4.900 GHz - 5.875 GHz	14.0 dBi		
18	ANT-2X2-2714	2x2 MIMO directional	2.400 GHz - 2.483 GHz	14.0 dBi		√
19	AP-ANT-35A	Multipolarized	4.9 GHz - 6.0 GHz	5 dBi min		
			2.4 GHz - 2.5 GHz			
20	AP-ANT-1W	Omnidirectional	2.400 GHz - 2.500 GHz	3.8 dBi		
			4.900 GHz - 5.875 GHz	5.8 dBi		
21	ANT-3X3-D100	multi polarized	4.9 GHz - 6.0 GHz	5 dBi min		
			2.4 GHz - 2.5 GHz			

Note: (1) means the conducted test performed partially.

MIMO Function Description:

Freq. Band	Modulation	Tx/Rx Function	Beam forming
2412-2462MHz	802.11b	3TX/3RX	NO
	802.11g	3TX/3RX	NO
	802.11n20	3TX/3RX	YES
	802.11n40	3TX/3RX	YES

Test Mode No.	Model	Band(s)	Typical Gain	Bean Forming Gain(dBi)
1	AP-ANT-1B	2.400 GHz - 2.500 GHz	3.8 dBi	4.7
		4.900 GHz - 5.875 GHz	5.8 dBi	
2	AP-ANT-13B	2.400 GHz - 2.500 GHz	4.4dBi	4.7
		4.900 GHz - 5.900 GHz	3.3dBi	
3	AP-ANT-16	2.400 GHz - 2.500 GHz	3.9dBi	4.7
		4.900 GHz - 5.900 GHz	4.7dBi	
4	AP-ANT-32	2.400-2.500 GHz	2.2 dBi	4.7
		5.150-5.925 GHz	4.0 dBi	
5	AP-ANT-19	2.400 GHz - 2.500 GHz	3.0 dBi	4.7
		5.150 GHz - 5.875 GHz	6.0 dBi	
6	AP-ANT-20	2.400 GHz - 2.500 GHz	2.0 dBi	4.7
		4.900 GHz - 5.875 GHz	2.0 dBi	
7	AP-ANT-35	4.9 GHz - 6.0 GHz	5 dBi min	3
		2.4 GHz - 2.5 GHz		
8	AP-ANT-38	4.9 GHz - 6.0 GHz	7.5 dBi min	3
		2.4 GHz - 2.5 GHz		
9	AP-ANT-93	5.150 GHz - 5.875 GHz	14.0 dBi	3
10	ANT-3X3-D905	2.4 GHz - 2.5 GHz	5 dBi min	3
		4.9 GHz - 6.0 GHz		
11	ANT-3X3-D608	2.4 GHz - 2.5 GHz	7.5 dBi min	3
		4.9 GHz - 6.0 GHz		
12	ANT-3X3-2005	2.4 GHz - 2.5 GHz	5 dBi max	3
13	ANT-3X3-5005	4.9 GHz - 5.875 GHz	5 dBi max	3
14	ANT-3X3-5010	4.9 GHz - 5.875 GHz	10 dBi max	3
15	ANT-3X3-5712	4.900 GHz - 6.000 GHz	11.5 dBi min	3
16	ANT-2X2-2314	2.400 GHz - 2.500 GHz	14.0 dBi	3
17	ANT-2X2-5314	4.900 GHz - 5.875 GHz	14.0 dBi	3
18	ANT-2X2-2714	2.400 GHz - 2.483 GHz	14.0 dBi	3
19	AP-ANT-35A	4.9 GHz - 6.0 GHz	5 dBi min	3
		2.4 GHz - 2.5 GHz		
20	AP-ANT-1W	2.400 GHz - 2.500 GHz	3.8 dBi	4.7
		4.900 GHz - 5.875 GHz	5.8 dBi	
21	ANT-3X3-D100	4.9 GHz - 6.0 GHz	5 dBi min	3
		2.4 GHz - 2.5 GHz		

Note 1: For CDD transmissions,according KDB 662911 D01 Multiple Transmitter Output v02r01 f),the power measurements on IEEE 802.11 devices, *Array Gain = 0 dB* (i.e., no array gain) for $N_{ANT} \leq 4$.
Note 2: when 802.11n/ac have beamforming fuction the Beamforming gain should calculate according KDB 662911 D01 Multiple Transmitter Output v02r01 c) (ii).

3. Test Specification

3.1 Instrument list

Equipment	Type	Manu.	Internal no.	Cal. Date	Due date
Test Receiver	ESCS 30	R&S	EC 2107	2014-10-20	2015-10-19
Test Receiver	ESIB 26	R&S	EC 3045	2014-10-19	2015-10-18
Test Receiver	ESCI 7	R&S	EC4501	2014-12-24	2015-12-23
Test Receiver	FSP40	R&S	/	2014-10-20	2015-10-19
Spectrum Analyzer	N9030	Agilent	EC4890	2014-10-20	2015-10-19
A.M.N.	ESH2-Z5	R&S	EC 3119	2015-1-8	2016-1-7
Bilog Antenna	CBL 6112D	TESEQ	EC 4206	2014-4-27	2015-4-26
Horn antenna	HF 906	R&S	EC 3049	2014-4-27	2015-4-26
Horn antenna	HAP18-26W		EC 4792-3	2014-4-9	2015-4-8
Pre-amplifier	Tpa0118-40	R&S	EC 4792-2	2014-4-11	2015-4-10
Semi-anechoic chamber	-	Albatross project	EC 3048	2014-5-11	2015-5-10
Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3323	2014-4-14	2015-4-13
Pressure meter	YM3	Shanghai Mengde	EC 3320	2014-6-13	2015-6-12
Multi-meter	179	FLUKE	EC 3226	2014-9-10	2015-9-9
Shielded room	-	Zhongyu	EC 2838	2015-1-11	2016-1-9
High Pass Filter	WHKX 1.0/15G-10SS	Wainwright	EC4297-1	2015-1-7	2016-1-6
High Pass Filter	WHKX 2.8/18G-12SS	Wainwright	EC4297-2	2015-1-7	2016-1-6
High Pass Filter	WHKX 7.0/1.8G-8SS	Wainwright	EC4297-3	2015-1-7	2016-1-6
Band Reject Filter	WRCGV 2400/2483-2390/2493-35/10SS	Wainwright	EC4297-4	2015-1-7	2016-1-6
Power sensor / Power meter	N1911A/N1921A	Agilent	EC4318	2014-04-9	2015-04-8

3.2 Test Standard

- ✓ 47CFR Part 15 Subpart C 15.247;
- ✓ ANSI C63.4:2009
- ✓ ANSI C63.10:2009;
- ✓ *558074 D01 DTS Meas Guidance v03r02*
- ✓ *662911 D01 Multiple Transmitter Output v02r01.*

3.3 Mode of operation during the test / Test peripherals used

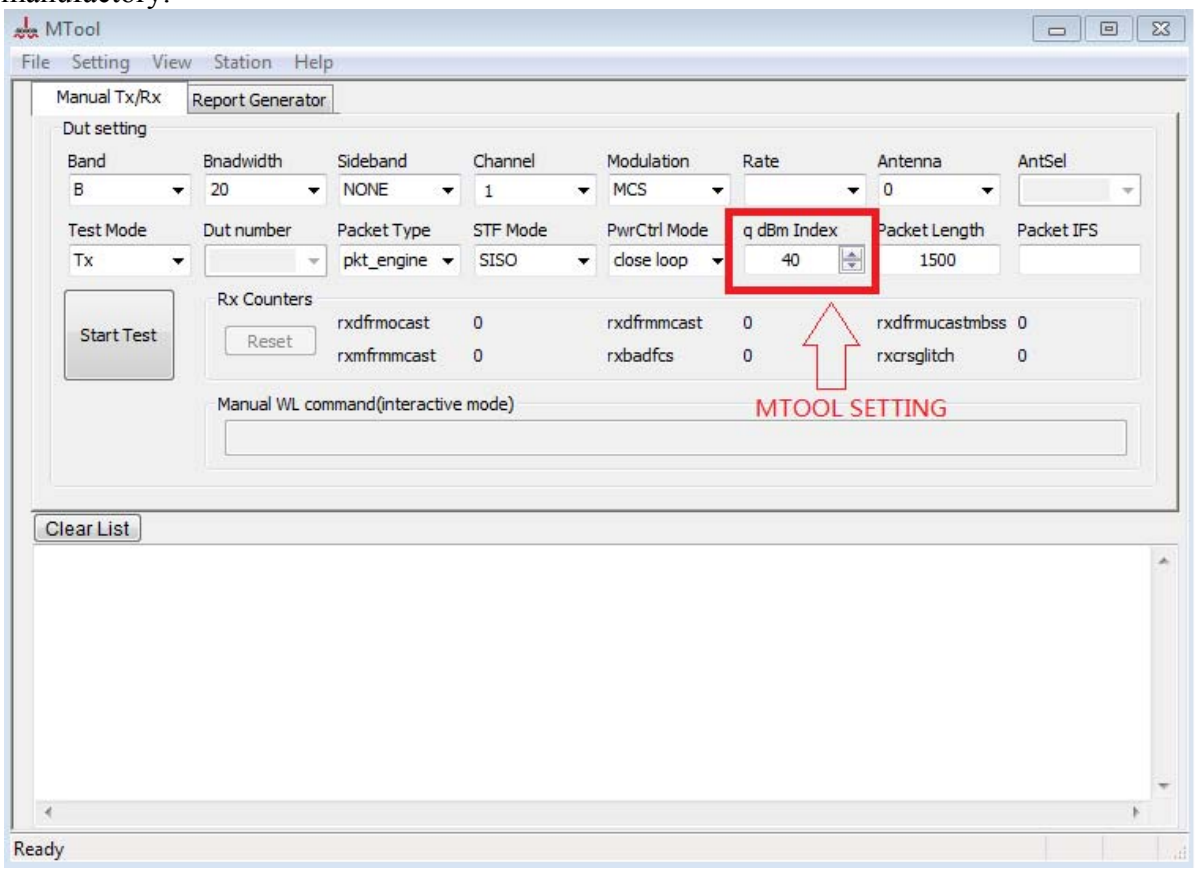
While testing transmitting mode of EUT, the internal modulation and continuously transmission was applied.

The lowest, middle and highest channel were tested as representatives.

Freq. Band	Modulation	Lowest(MHz)	Middle(MHz)	Highest(MHz)
2412-2462MHz	802.11b	2412	2437	2462
	802.11g	2412	2437	2462
	802.11n20	2412	2437	2462
	802.11n40	2422	2437	2452

Test software Setting:

The power level setting for 802.11b/g/n is used with MTOOL software offered by the manufactory.



For 2.4G Band with 2.0dBi antenna:

Mode	Frequency (MHz)	Mtool Setting	Power Expected (dBm)
802.11b	2412	80	20.00
	2437	92	23.00
	2462	84	21.00
802.11g	2412	72	18.00
	2437	92	23.00
	2462	76	19.00
802.11n20	2412	64	16.00
	2437	88	22.00
	2462	72	18.00
802.11n40	2422	56	14.00
	2437	72	18.00
	2452	60	15.00

For 2.4G Band with 14.0dBi antenna:

Mode	Frequency (MHz)	Mtool Setting	Power Expected (dBm)
802.11b	2412	42	10.50
	2437	64	16.00
	2462	46	11.50
802.11g	2412	32	8.00
	2437	64	16.00
	2462	36	9.00
802.11n20	2412	22	5.50
	2437	54	13.50
	2462	24	6.00
802.11n40	2422	23	5.75
	2437	53	13.25
	2452	23	5.75

Note:

1：When using different antennas, it has different power target setting (Mtool setting) by the manufactory to ensure compliance with the limit.

2：This is the function for conducted power with different antenna, max conducted power = min(max regulatory EIRP, board limit + antenna gain) – antenna gain，where the board limit is measured at the board so the antenna gain is not included.

Test peripherals used:

Item No	Description	Band and Model	S/No
1	Laptop computer	HP ProBook 6470b	NA
2	Controller	Aruba 3600	NA
3	POE DC Power	PowerDsine PD-6555G300 (Input:100-240Vac,50/60Hz,0.5A Output:57VDC 0.35A)	NA
4	LAN Cable	Unshielding 2m *3	NA
5	LAN Cable	Unshielding 10m	NA

3.4 Data rate VS Power

The pre-scan for the conducted power with all rates in each modulations and bands was used,and theworst case was found and used in all test cases.

2.4GHz Band:

802.11b (2437MHz)	Data rate	1	2	5.5	11	/	/	/	/
	Port 0	**24.94**	24.90	24.89	24.88	/	/	/	/
	Port 1	**25.29**	25.12	25.11	25.05	/	/	/	/
	Port 2	**24.07**	23.89	23.88	23.78	/	/	/	/
802.11g (2437MHz)	Data rate	6	9	12	18	24	36	48	54
	Port 0	**24.65**	24.54	24.53	24.49	24.45	24.44	24.42	24.39
	Port 1	**25.14**	25.09	25.06	25.03	25.00	24.98	24.94	24.91
	Port 2	**23.95**	23.93	23.91	23.89	23.87	23.87	23.86	23.85
802.11n20 (2437MHz)	Data rate	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
	Port 0+1+2	**28.29**	28.27	28.24	28.18	28.14	28.13	28.11	28.06
802.11n40 (2437MHz)	Data rate	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
	Port 0+1+2	**23.57**	23.55	23.53	23.51	23.50	23.48	23.46	23.45

After this pre-scan,we choose the following table of the data rata as the worst case.

Freq. Band	Modulation	Worst case data rate
2400-2483.5MHz	802.11b	1Mbps
	802.11g	6Mbps
	802.11n20	MCS0
	802.11n40	MCS0

3.5 Duty cycle

Duty Cycle(X) = (Ton/ (Ton+Toff));
Duty cycle factor =10*LOG10 (1/ Duty Cycle(X));

Duty Cycle (2.4G band):

	Modulation	On (ms)	On+Off (ms)	Duty cycle(x)	Duty cycle factor
Duty cycle	802.11b	12.48	13.08	0.95	0.20
	802.11g	2.08	2.18	0.95	0.20
	802.11n20	0.78	0.9	0.87	0.62
	802.11n40	0.352	0.452	0.78	1.09

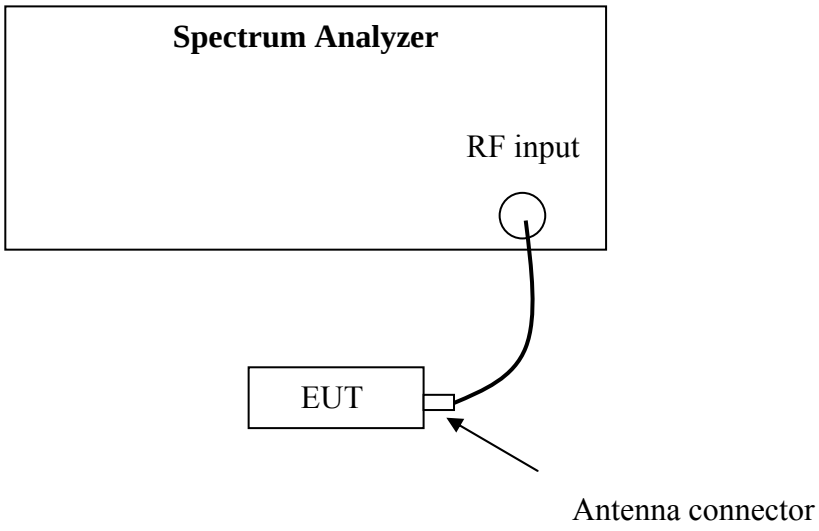
4. Minimum 6dB Bandwidth

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 according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance v03r02" for compliance to FCC 47CFR 15.247 requirements(clause 8.2).

4.4 Test Protocol

Temperature: 22°C
Relative Humidity: 43%

Modulation	Frequency (MHz)	Minimum 6dB Bandwidth (MHz)			Limits (MHz)
		Port0	Port 1	Port 2	
802.11b	2412	8.58	9.00	8.04	> 0.5
	2437	9.06	8.52	8.58	> 0.5
	2462	9.06	8.64	8.58	> 0.5
802.11g	2412	16.32	16.38	16.32	> 0.5
	2437	16.38	16.32	16.32	> 0.5
	2462	16.32	16.38	16.32	> 0.5
802.11n20	2412	17.64	17.64	17.62	> 0.5
	2437	17.34	17.64	17.64	> 0.5
	2462	17.46	17.64	17.64	> 0.5
802.11n40	2422	36.48	36.12	35.92	> 0.5
	2437	36.36	36.48	36.08	> 0.5
	2452	36.08	36.12	36.32	> 0.5

5. Maximum Conducted Output power

Test result: Pass

5.1 Test limit

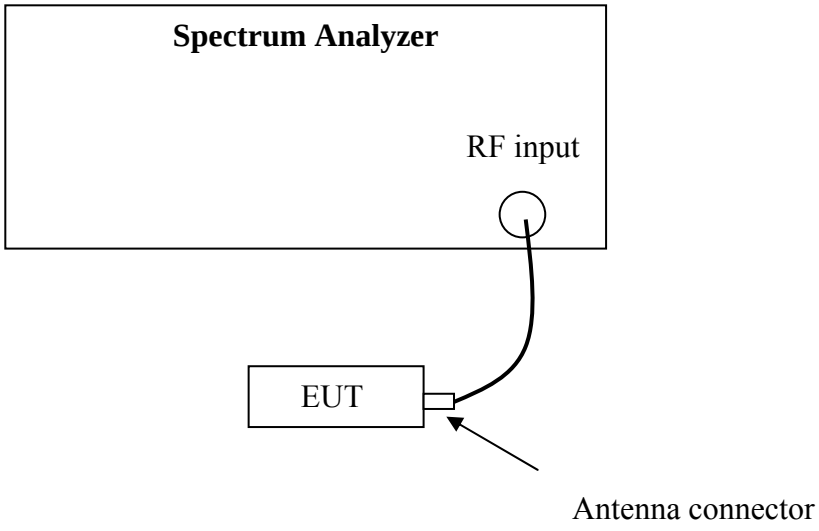
☐ For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt

☐ For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts

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

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. If there have a beam forming type, the limit should be the minimum of 30dBm and 30+ (6 –antenna gain-beam forming gain).

5.2 Test Configuration



5.3 Test procedure and test setup

The EUT was tested according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance v03r02" for compliance to FCC 47CFR 15.247 requirements (clause 9.2.2.4).

a) Measure the duty cycle, x, of the transmitter output signal as described in 6.0.

b) Set span to at least 1.5 times the OBW.

c) Set RBW = 1-5% of the OBW, not to exceed 1 MHz.

d) Set VBW ≥ 3 x RBW.

e) Number of points in sweep ≥ 2 span / RBW. (This gives bin-to-bin spacing ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)

f) Sweep time = auto.

g) Detector = RMS (*i.e.*, power averaging), if available. Otherwise, use sample detector mode.

h) Do not use sweep triggering. Allow the sweep to "free run".

i) Trace average at least 100 traces in power averaging (*i.e.*, RMS) mode; however, the number of traces to be averaged shall be increased above 100 as needed such that the average accurately represents the true average over the on and off periods of the transmitter.

j) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

k) Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission). For example, add 10 log (1/0.25) = 6 dB if the duty cycle is 25 %.

5.4 Test protocol

Temperature: 22 °C

Relative Humidity: 43 %

Test mode 6:

Test Mode	Frequency (MHz)	Reading (dBm)			Duty cycle factor (dB)	Total Power (dBm)	Limit (dBm)	Margin (dB)
		Port0	Port 1	Port 2				
802.11b	2412	20.48	21.07	20.31	0.20	25.61	30.00	4.39
	2437	24.94	25.29	24.07	0.20	29.77	30.00	0.23
	2462	21.54	22.33	21.16	0.20	26.68	30.00	3.32
802.11g	2412	18.20	18.65	18.00	0.20	23.27	30.00	6.73
	2437	24.65	25.14	23.95	0.20	29.58	30.00	0.42
	2462	19.08	19.59	18.73	0.20	24.12	30.00	5.88
802.11n20	2412	16.94	17.34	15.82	0.62	22.14	29.30	7.16
	2437	22.89	23.37	22.36	0.62	28.29	29.30	1.01
	2462	16.48	16.95	16.26	0.62	21.97	29.30	7.33
802.11n40	2422	13.76	14.22	13.91	1.09	19.82	29.30	9.48
	2437	17.48	18.06	17.59	1.09	23.57	29.30	5.73
	2452	14.43	14.96	14.52	1.09	20.50	29.30	8.80

Test mode 16:

Test Mode	Frequency (MHz)	Reading (dBm)			Duty cycle factor (dB)	Total Power (dBm)	Limit (dBm)	Margin (dB)
		Port0	Port 1	Port 2				
802.11b	2412	11.26	10.54	11.14	0.20	15.97	22.00	6.03
	2437	16.18	15.64	16.70	0.20	21.17	22.00	0.83
	2462	12.18	11.62	11.39	0.20	16.72	22.00	5.28
802.11g	2412	8.32	7.32	8.19	0.20	12.94	22.00	9.06
	2437	16.13	15.58	16.64	0.20	21.11	22.00	0.89
	2462	9.38	8.76	9.91	0.20	14.35	22.00	7.65
802.11n20	2412	5.51	4.80	5.52	0.62	10.68	19.00	8.32
	2437	13.40	12.94	13.85	0.62	18.81	19.00	0.19
	2462	6.48	5.42	6.31	0.62	11.49	19.00	7.51
802.11n40	2422	5.03	4.11	4.88	1.09	10.55	19.00	8.45
	2437	13.07	12.42	13.30	1.09	18.80	19.00	0.20
	2452	6.20	4.87	5.90	1.09	11.55	19.00	7.45

Note:

1. For antenna gain = 2.0 or 14.0dBi and with beam forming, the limit should be corrected.
2. Total power = $10 * \lg(10^{\text{port 0} / 10} + 10^{\text{port 1} / 10} + 10^{\text{port 2} / 10})$

6. Power spectrum density

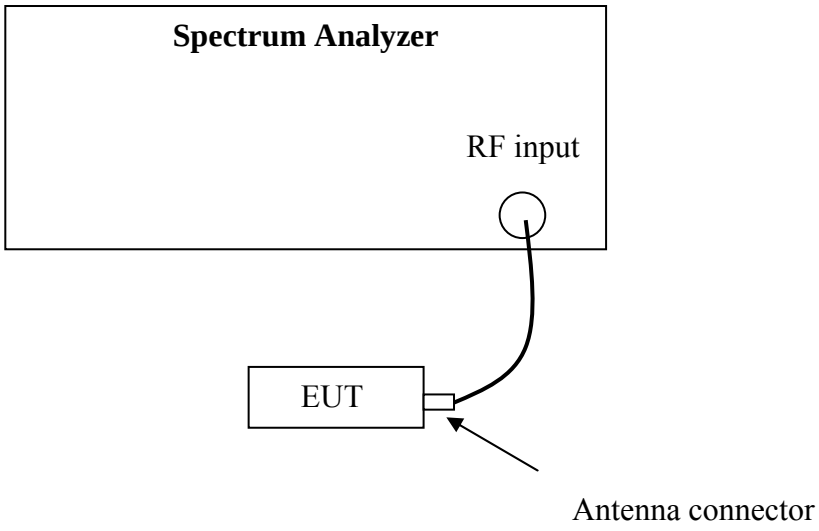
Test result: **Pass**

6.1 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.

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. If there have a beam forming type, the limit should be the minimum of 8dBm/MHz and 8+ (6 – antenna gain-beam forming gain).

6.2 Test Configuration



6.3 Test procedure and test setup

The power output per FCC §15.247(e) was tested according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance v03r02" (clause 10.5) for compliance to FCC 47CFR 15.247 requirements.

This procedure is applicable when the EUT cannot be configured to transmit continuously (*i.e.*, duty cycle < 98%), and when sweep triggering/signal gating cannot be used to measure only when the EUT is transmitting at its maximum power control level, and when the transmission duty cycle is constant (*i.e.*, duty cycle variations are less than ± 2 percent):

a) Measure the duty cycle (x) of the transmitter output signal as described in 6.0.
b) Set instrument center frequency to DTS channel center frequency.
c) Set span to at least 1.5 times the OBW.
d) Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz..
e) Set VBW ≥3 x RBW.
f) Detector = power averaging (RMS) or sample detector (when RMS not available).
g) Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
h) Sweep time = auto couple.
i) Do not use sweep triggering. Allow sweep to "free run".
j) Employ trace averaging (RMS) mode over a minimum of 100 traces.
k) Use the peak marker function to determine the maximum amplitude level.
l) Add 10 log (1/x), where x is the duty cycle measured in step (a, to the measured PSD to compute the average PSD during the actual transmission time.
m) If resultant value exceeds the limit, then reduce RBW (no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span in order to meet the minimum measurement point requirement as the RBW is reduced).

6.4 Test Protocol

Temperature: 22 °C

Relative Humidity: 43 %

Test mode 6:

Test Mode	Frequency (MHz)	PSD (dBm)			Duty cycle Factor (dB)	Max PSD (dBm)	Limit (dBm)	Margin (dB)
		Port 0	Port 1	Port 2				
802.11b	2412	-1.66	-1.01	-1.88	0.20	-0.81	3.20	4.01
	2437	2.51	3.00	2.40	0.20	3.20	3.20	0.00
	2462	-0.64	-0.28	-0.87	0.20	-0.08	3.20	3.28

Test Mode	Frequency (MHz)	PSD (dBm)			Duty cycle Factor (dB)	Max PSD (dBm)	Limit (dBm)	Margin (dB)
		Port 0	Port 1	Port 2				
802.11g	2412	-6.83	-5.41	-5.97	0.20	-5.21	3.20	8.41
	2437	-0.11	0.54	-0.73	0.20	0.74	3.20	2.46
	2462	-5.90	-4.70	-5.80	0.20	-4.50	3.20	7.70

Test Mode	Frequency (MHz)	PSD (dBm)			Duty cycle Factor (dB)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
		Port 0	Port 1	Port 2				
802.11n20	2412	-9.53	-8.97	-9.49	0.62	-3.93	7.30	11.23
	2437	-0.49	-0.10	-1.28	0.62	4.80	7.30	2.50
	2462	-9.14	-8.12	-7.50	0.62	-2.81	7.30	10.11

Test Mode	Frequency (MHz)	PSD (dBm)			Duty cycle Factor (dB)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
		Port 0	Port 1	Port 2				
802.11n40	2422	-14.50	-12.72	-12.79	1.09	-7.41	7.30	14.71
	2437	-10.33	-9.05	-9.40	1.09	-3.70	7.30	11.00
	2452	-13.67	-12.01	-12.01	1.09	-6.64	7.30	13.94

Note:

1. For antenna gain = 2.0 or 14.0dBi and with beam forming, the limit should be corrected.
2. Total PSD= $10 * \lg(10^{\text{port 0 / 10}} + 10^{\text{port 1 / 10}} + 10^{\text{port 2 / 10}})$
3. For CDD transmissions, If all antennas have the same gain, G_{ANT}, Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows.
   • For power spectral density (PSD) measurements on all devices,
   Array Gain = 10 log(N_{ANT}/N_{SS}) dB.

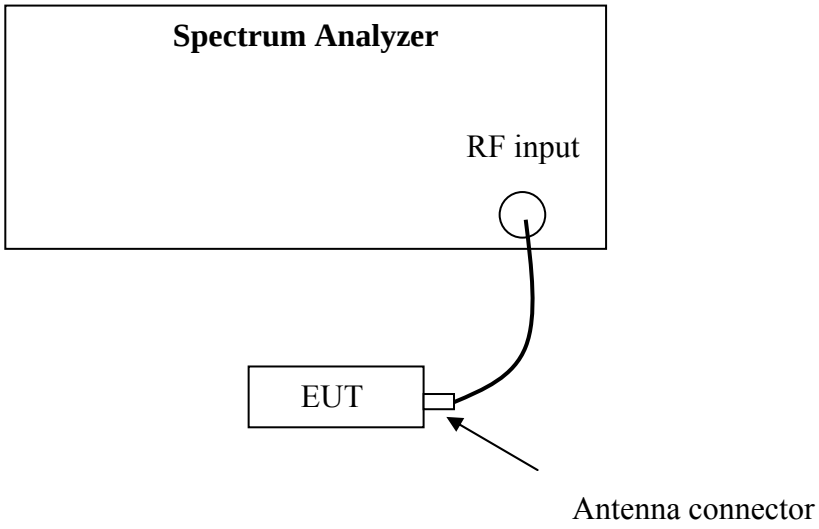
7. Emissions in non-restricted frequency bands

Test result: **Pass**

7.1 Test 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 30 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 "KDB558074 D01 DTS Meas Guidance v03r02" (clause 11.0) for compliance to FCC 47CFR 15.247 requirements.

If maximum conducted (average) output power was used to demonstrate compliance as described in 9.2, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz (*i.e.*, 30 dBc).

Reference level measurement

Establish a reference level by using the following procedure:

a) Set instrument center frequency to DTS channel center frequency.
b) Set the span to ≥ 1.5 times the *DTS bandwidth*.
c) Set the RBW = 100 kHz.
d) Set the VBW ≥ 3 x RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum PSD level.

Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

Emission level measurement

a) Set the center frequency and span to encompass frequency range to be measured.
b) Set the RBW = 100 kHz.
c) Set the VBW ≥ 3 x RBW.
d) Detector = peak.
e) Ensure that the number of measurement points ≥ span/RBW
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in 11.1 a) or 11.1 b). Report the three highest emissions relative to the limit.

7.4 Test Protocol

Temperature: 22 °C
Relative Humidity: 43 %

Test mode 6:

Test Mode	Frequency (MHz)	Results		
		Port0	Port 1	Port 2
802.11b	2412	Pass	Pass	Pass
	2437	Pass	Pass	Pass
	2462	Pass	Pass	Pass
802.11g	2412	Pass	Pass	Pass
	2437	Pass	Pass	Pass
	2462	Pass	Pass	Pass
802.11n20	2412	Pass	Pass	Pass
	2437	Pass	Pass	Pass
	2462	Pass	Pass	Pass
802.11n40	2422	Pass	Pass	Pass
	2437	Pass	Pass	Pass
	2452	Pass	Pass	Pass

8. Radiated Emissions in restricted frequency bands

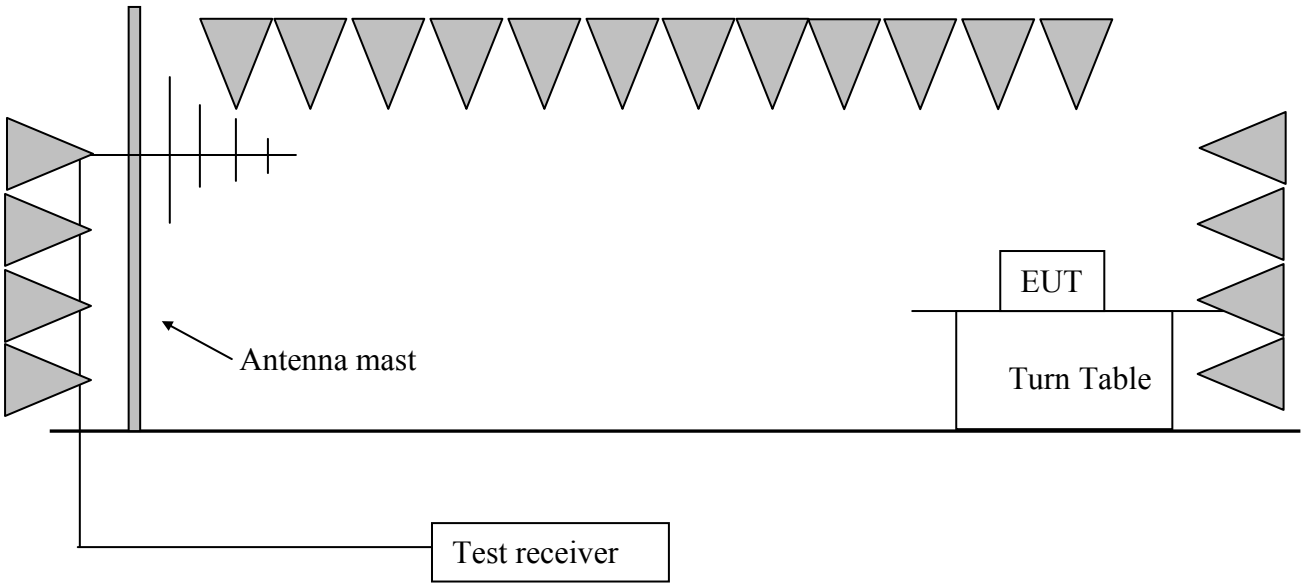
Test result: Pass

8.1 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:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

8.2 Test Configuration



8.3 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 turntable 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 KDB558074 D01 DTS "Meas Guidance v03r02" for compliance to FCC 47CFR 15.247 requirements.

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

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

Remark:
1. Factor= Antenna Factor + Cable Loss (-Amplifier, is employed)
2. Measured level= Original Receiver Reading + Factor
3. Margin = limit – Measured level
4. If the PK measured level is lower than AV limit, the AV test can be elided.

Example:

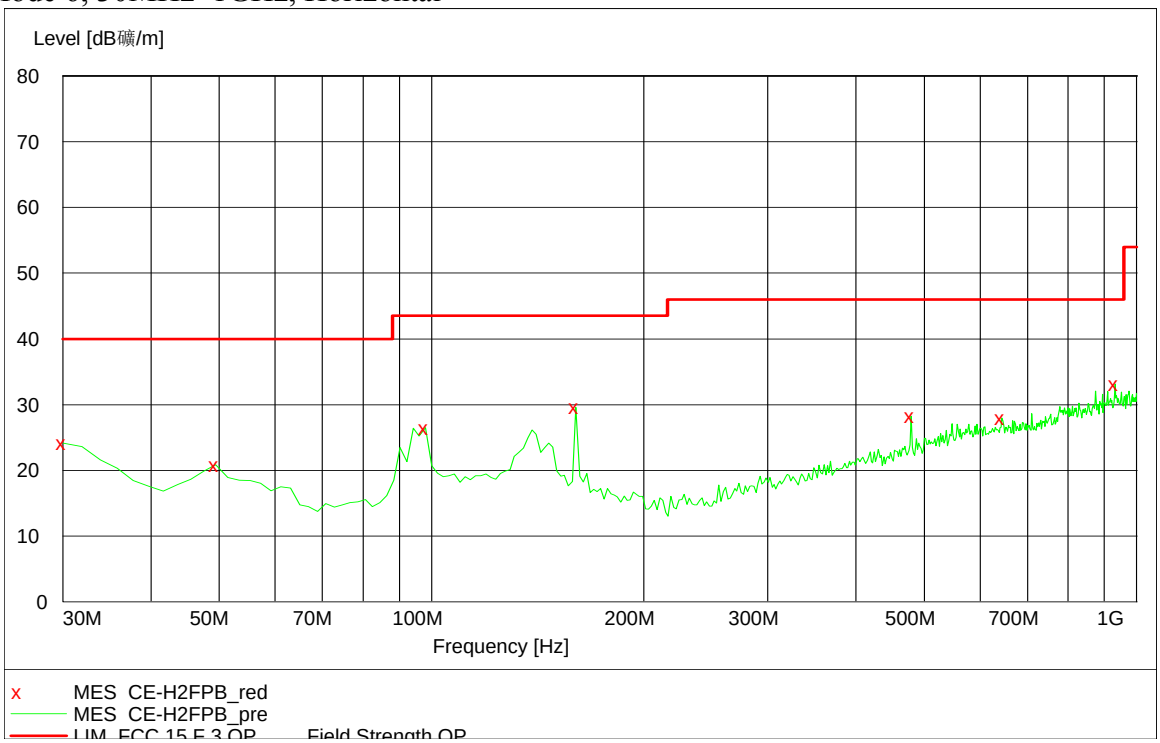
Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10dBuV.
Then Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;
Measured level = 10dBuV + 0.20dB/m = 10.20dBuV/m
Assuming limit = 54dBuV/m,
Measured level = 10.20dBuV/m, then Margin = 54 -10.20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

8.4 Test Protocol

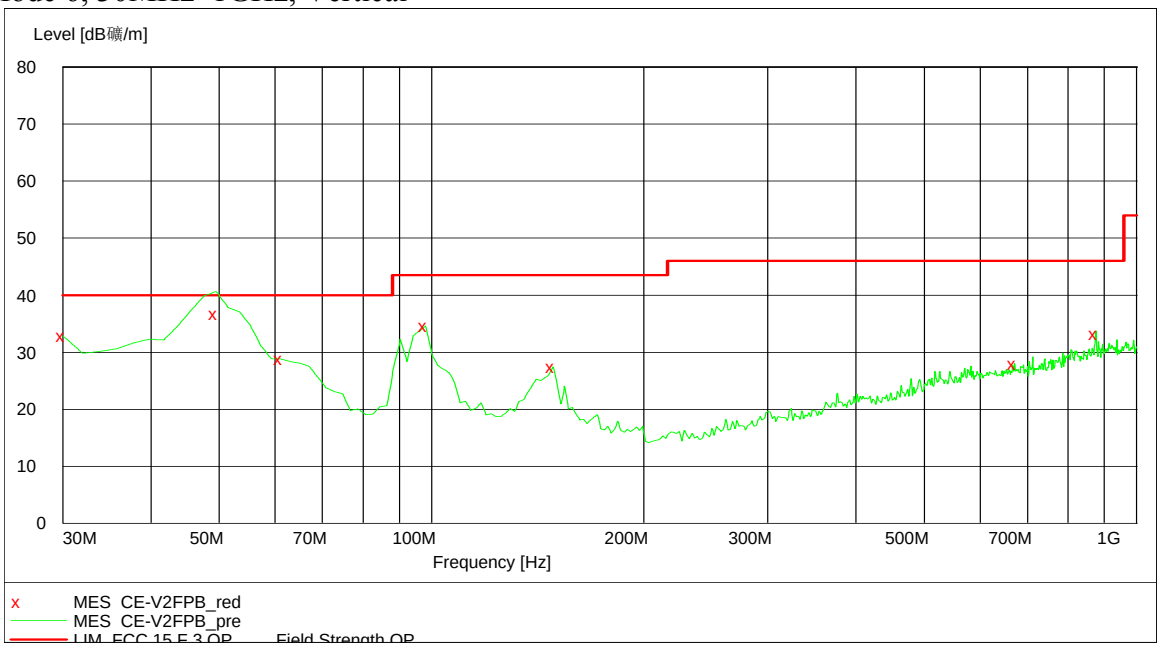
Temperature: 25 °C
Relative Humidity: 55 %

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

Mode 6, 30MHz~1GHz, Horizontal



Mode 6, 30MHz~1GHz, Vertical



Mode 6, 30MHz~1GHz, Test data:

Polarization	Frequency (MHz)	Measured level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
H	30.00	24.1	40.0	15.9	PK
	49.44	20.8	40.0	19.2	PK
	98.04	26.5	43.5	17.0	PK
	160.24	29.6	43.5	13.9	PK
	479.04	28.2	46.0	17.8	PK
	644.27	27.9	46.0	18.1	PK
	931.96	33.1	46.0	12.9	PK
V	30.00	32.8	40.0	7.2	PK
	49.44	36.7	40.0	3.3	QP
	61.10	28.8	40.0	11.2	PK
	98.04	34.6	43.5	8.9	PK
	148.58	27.4	43.5	16.1	PK
	671.48	28.0	46.0	18.0	PK
	875.59	33.2	46.0	12.8	PK

Note: The test model 6 was chosen to perform the bellow 1GHz tests as representative.

Test result above 1GHz:

The emission was conducted from 1GHz to 25GHz.
We tested mode 2, 6, 10, 12, 16, 18 for this product, and listed mode 2, 6, 18 in this report.

Mode 2:

1：2.4G band 802.11b

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2390	60.10	74	-7.80	100	190	13.90	PK
		46.55	54	-7.80	100	190	7.45	AV
	2412	120.30	-	-7.80	100	190	-	PK
		115.20	-	-7.80	100	190	-	AV
	4824	42.50	74	-2.10	100	190	31.50	PK
		31.50	54	-2.10	100	190	22.50	AV
Note:	2412MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2437	123.80	-	-7.80	100	190	-	PK
		118.90	-	-7.80	100	190	-	AV
	4874	42.30	74	-2.10	100	190	31.70	PK
		32.50	54	-2.10	100	190	21.50	AV
	7311	46.50	74	6.50	100	190	27.50	PK
		37.50	54	6.50	100	190	16.50	AV
Note:	2437MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2462	120.30	-	-7.80	100	190	-	PK
		116.20	-	-7.80	100	190	-	AV
	2483.5	59.60	74	-7.50	100	190	14.40	PK
		48.50	54	-7.50	100	190	5.50	AV
	4924	41.20	74	-2.10	100	190	32.80	PK
		31.60	54	-2.10	100	190	22.40	AV
	7386	45.80	74	6.50	100	190	28.20	PK
		36.40	54	6.50	100	190	17.60	AV
Note:	2462MHz is fundamental signal.							

2：2.4G band 802.11g

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2390	67.42	74	-7.80	100	190	6.58	PK
		50.12	54	-7.80	100	190	3.88	AV
	2412	120.30	-	-7.80	100	190	-	PK
		112.50	-	-7.80	100	190	-	AV
	4824	43.20	74	-2.10	100	190	30.80	PK
		31.60	54	-2.10	100	190	22.40	AV
Note:	2412MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2437	122.20	-	-7.80	100	190	-	PK
		113.70	-	-7.80	100	190	-	AV
	4874	43.60	74	-2.10	100	190	30.40	PK
		34.70	54	-2.10	100	190	19.30	AV
	7311	48.20	74	6.50	100	190	25.80	PK
		39.40	54	6.50	100	190	14.60	AV
Note:	2437MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2462	117.60	-	-7.80	100	190	-	PK
		108.00	-	-7.80	100	190	-	AV
	2483.5	71.23	74	-7.50	100	190	2.77	PK
		51.78	54	-7.50	100	190	2.22	AV
	4924	42.10	74	-2.10	100	190	31.90	PK
		32.70	54	-2.10	100	190	21.30	AV
	7386	45.30	74	6.50	100	190	28.70	PK
		36.40	54	6.50	100	190	17.60	AV
Note:	2462MHz is fundamental signal.							

3：2.4G band 802.11n20

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2390	66.30	74	-7.80	100	190	7.70	PK
		51.23	54	-7.80	100	190	2.77	AV
	2412	115.40	-	-7.80	100	190	-	PK
		106.30	-	-7.80	100	190	-	AV
	4824	41.20	74	-2.10	100	190	32.80	PK
		32.20	54	-2.10	100	190	21.80	AV
Note:	2412MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2437	120.10	-	-7.80	100	190	-	PK
		112.60	-	-7.80	100	190	-	AV
	4874	45.30	74	-2.10	100	190	28.70	PK
		37.10	54	-2.10	100	190	16.90	AV
	7311	48.20	74	6.50	100	190	25.80	PK
		36.40	54	6.50	100	190	17.60	AV
Note:	2437MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2462	115.30	-	-7.80	100	190	-	PK
		106.40	-	-7.80	100	190	-	AV
	2483.5	68.32	74	-7.50	100	190	5.68	PK
		50.16	54	-7.50	100	190	3.84	AV
	4924	43.60	74	-2.10	100	190	30.40	PK
		34.20	54	-2.10	100	190	19.80	AV
	7386	45.30	74	6.50	100	190	28.70	PK
		36.30	54	6.50	100	190	17.70	AV
Note:	2462MHz is fundamental signal.							

4：2.4G band 802.11n40

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2390	71.12	74	-7.80	100	190	2.88	PK
		52.85	54	-7.80	100	190	1.15	AV
	2422	113.30	-	-7.80	100	190	-	PK
		102.80	-	-7.80	100	190	-	AV
	4844	41.20	74	-2.10	100	190	32.80	PK
		32.40	54	-2.10	100	190	21.60	AV
	7266	45.20	74	6.50	100	190	28.80	PK
		35.60	54	6.50	100	190	18.40	AV
Note:	2422MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2437	115.60	-	-7.80	100	190	-	PK
		106.90	-	-7.80	100	190	-	AV
	4874	43.90	74	-2.10	100	190	30.10	PK
		33.50	54	-2.10	100	190	20.50	AV
	7311	46.30	74	6.50	100	190	27.70	PK
		35.60	54	6.50	100	190	18.40	AV
Note:	2437MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2452	115.40	-	-7.80	100	190	-	PK
		102.80	-	-7.80	100	190	-	AV
	2483.5	72.30	74	-7.50	100	190	1.70	PK
		51.44	54	-7.50	100	190	2.56	AV
	4904	43.10	74	-2.10	100	190	30.90	PK
		33.20	54	-2.10	100	190	20.80	AV
	7386	46.20	74	6.50	100	190	27.80	PK
		35.40	54	6.50	100	190	18.60	AV
Note:	2452MHz is fundamental signal.							

Mode 6

1：2.4G band 802.11b

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2390	72.26	74	-7.80	100	190	1.74	PK
		51.18	54	-7.80	100	190	2.82	AV
	2412	122.50	-	-7.80	100	190	-	PK
		117.00	-	-7.80	100	190	-	AV
	4824	42.10	74	-2.10	100	190	31.90	PK
		31.80	54	-2.10	100	190	22.20	AV
Note:	2412MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2437	123.80	-	-7.80	100	190	-	PK
		116.60	-	-7.80	100	190	-	AV
	4874	42.10	74	-2.10	100	190	31.90	PK
		32.50	54	-2.10	100	190	21.50	AV
	7311	46.60	74	6.50	100	190	27.40	PK
		37.40	54	6.50	100	190	16.60	AV
Note:	2437MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2462	122.10	-	-7.80	100	190	-	PK
		115.70	-	-7.80	100	190	-	AV
	2483.5	71.21	74	-7.50	100	190	2.79	PK
		52.56	54	-7.50	100	190	1.44	AV
	4924	41.10	74	-2.10	100	190	32.90	PK
		31.80	54	-2.10	100	190	22.20	AV
	7386	45.50	74	6.50	100	190	28.50	PK
		36.50	54	6.50	100	190	17.50	AV
Note:	2462MHz is fundamental signal.							

2：2.4G band 802.11g

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2390	73.21	74	-7.80	100	190	0.79	PK
		53.22	54	-7.80	100	190	0.78	AV
	2412	121.20	-	-7.80	100	190	-	PK
		113.70	-	-7.80	100	190	-	AV
	4824	41.30	74	-2.10	100	190	32.70	PK
		31.60	54	-2.10	100	190	22.40	AV
Note:	2412MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2437	123.20	-	-7.80	100	190	-	PK
		114.70	-	-7.80	100	190	-	AV
	4874	43.30	74	-2.10	100	190	30.70	PK
		34.50	54	-2.10	100	190	19.50	AV
	7311	48.10	74	6.50	100	190	25.90	PK
		39.30	54	6.50	100	190	14.70	AV
Note:	2437MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2462	121.60	-	-7.80	100	190	-	PK
		115.00	-	-7.80	100	190	-	AV
	2483.5	73.25	74	-7.50	100	190	0.75	PK
		53.36	54	-7.50	100	190	0.64	AV
	4924	42.20	74	-2.10	100	190	31.80	PK
		32.50	54	-2.10	100	190	21.50	AV
	7386	45.20	74	6.50	100	190	28.80	PK
		36.50	54	6.50	100	190	17.50	AV
Note:	2462MHz is fundamental signal.							

3：2.4G band 802.11n20

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2390	73.30	74	-7.80	100	190	0.70	PK
		52.20	54	-7.80	100	190	1.80	AV
	2412	120.50	-	-7.80	100	190	-	PK
		109.30	-	-7.80	100	190	-	AV
	4824	41.20	74	-2.10	100	190	32.80	PK
		32.60	54	-2.10	100	190	21.40	AV
Note:	2412MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2437	122.20	-	-7.80	100	190	-	PK
		114.70	-	-7.80	100	190	-	AV
	4874	45.50	74	-2.10	100	190	28.50	PK
		37.50	54	-2.10	100	190	16.50	AV
	7311	48.30	74	6.50	100	190	25.70	PK
		36.50	54	6.50	100	190	17.50	AV
Note:	2437MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2462	120.70	-	-7.80	100	190	-	PK
		111.20	-	-7.80	100	190	-	AV
	2483.5	73.21	74	-7.50	100	190	0.79	PK
		53.25	54	-7.50	100	190	0.75	AV
	4924	43.40	74	-2.10	100	190	30.60	PK
		34.60	54	-2.10	100	190	19.40	AV
	7386	45.40	74	6.50	100	190	28.60	PK
		36.20	54	6.50	100	190	17.80	AV
Note:	2462MHz is fundamental signal.							

4：2.4G band 802.11n40

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2390	71.34	74	-7.80	100	190	2.66	PK
		52.12	54	-7.80	100	190	1.88	AV
	2422	116.40	-	-7.80	100	190	-	PK
		106.60	-	-7.80	100	190	-	AV
	4844	41.40	74	-2.10	100	190	32.60	PK
		32.10	54	-2.10	100	190	21.90	AV
	7266	45.50	74	6.50	100	190	28.50	PK
		35.50	54	6.50	100	190	18.50	AV
Note:	2422MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2437	116.20	-	-7.80	100	190	-	PK
		107.70	-	-7.80	100	190	-	AV
	4874	43.70	74	-2.10	100	190	30.30	PK
		33.20	54	-2.10	100	190	20.80	AV
	7311	46.50	74	6.50	100	190	27.50	PK
		35.70	54	6.50	100	190	18.30	AV
Note:	2437MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2452	114.20	-	-7.80	100	190	-	PK
		105.50	-	-7.80	100	190	-	AV
	2483.5	73.35	74	-7.50	100	190	0.65	PK
		53.18	54	-7.50	100	190	0.82	AV
	4904	43.30	74	-2.10	100	190	30.70	PK
		33.10	54	-2.10	100	190	20.90	AV
	7386	46.30	74	6.50	100	190	27.70	PK
		35.20	54	6.50	100	190	18.80	AV
Note:	2452MHz is fundamental signal.							

Mode 18

1：2.4G band 802.11b

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2390	67.56	74	-7.80	100	190	6.44	PK
		48.34	54	-7.80	100	190	5.66	AV
	2412	121.50	-	-7.80	100	190	-	PK
		111.30	-	-7.80	100	190	-	AV
	4824	42.20	74	-2.10	100	190	31.80	PK
		31.40	54	-2.10	100	190	22.60	AV
Note:	2412MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2437	122.50	-	-7.80	100	190	-	PK
		113.70	-	-7.80	100	190	-	AV
	4874	43.10	74	-2.10	100	190	30.90	PK
		33.50	54	-2.10	100	190	20.50	AV
	7311	46.50	74	6.50	100	190	27.50	PK
		37.60	54	6.50	100	190	16.40	AV
Note:	2437MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2462	120.30	-	-7.80	100	190	-	PK
		112.70	-	-7.80	100	190	-	AV
	2483.5	67.55	74	-7.50	100	190	6.45	PK
		51.08	54	-7.50	100	190	2.92	AV
	4924	42.10	74	-2.10	100	190	31.90	PK
		33.80	54	-2.10	100	190	20.20	AV
	7386	46.50	74	6.50	100	190	27.50	PK
		37.50	54	6.50	100	190	16.50	AV
Note:	2462MHz is fundamental signal.							

2：2.4G band 802.11g

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2390	65.71	74	-7.80	100	190	8.29	PK
		49.15	54	-7.80	100	190	4.85	AV
	2412	118.50	-	-7.80	100	190	-	PK
		108.10	-	-7.80	100	190	-	AV
	4824	43.30	74	-2.10	100	190	30.70	PK
		32.60	54	-2.10	100	190	21.40	AV
Note:	2412MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2437	121.30	-	-7.80	100	190	-	PK
		112.70	-	-7.80	100	190	-	AV
	4874	43.60	74	-2.10	100	190	30.40	PK
		33.50	54	-2.10	100	190	20.50	AV
	7311	47.10	74	6.50	100	190	26.90	PK
		36.30	54	6.50	100	190	17.70	AV
Note:	2437MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2462	116.20	-	-7.80	100	190	-	PK
		107.50	-	-7.80	100	190	-	AV
	2483.5	68.62	74	-7.50	100	190	5.38	PK
		51.50	54	-7.50	100	190	2.50	AV
	4924	43.20	74	-2.10	100	190	30.80	PK
		31.50	54	-2.10	100	190	20.50	AV
	7386	46.20	74	6.50	100	190	27.80	PK
		36.80	54	6.50	100	190	17.20	AV
Note:	2462MHz is fundamental signal.							

3：2.4G band 802.11n20

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2390	65.56	74	-7.80	100	190	8.44	PK
		49.80	54	-7.80	100	190	4.20	AV
	2412	115.80	-	-7.80	100	190	-	PK
		105.70	-	-7.80	100	190	-	AV
	4824	42.20	74	-2.10	100	190	31.80	PK
		31.60	54	-2.10	100	190	20.40	AV
Note:	2412MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2437	117.90	-	-7.80	100	190	-	PK
		108.30	-	-7.80	100	190	-	AV
	4874	44.50	74	-2.10	100	190	29.50	PK
		36.50	54	-2.10	100	190	17.50	AV
	7311	47.30	74	6.50	100	190	26.70	PK
		35.50	54	6.50	100	190	18.50	AV
Note:	2437MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2462	116.50	-	-7.80	100	190	-	PK
		104.80	-	-7.80	100	190	-	AV
	2483.5	67.26	74	-7.50	100	190	6.74	PK
		50.34	54	-7.50	100	190	3.66	AV
	4924	44.40	74	-2.10	100	190	29.60	PK
		33.60	54	-2.10	100	190	20.40	AV
	7386	46.40	74	6.50	100	190	27.60	PK
		36.60	54	6.50	100	190	17.40	AV
Note:	2462MHz is fundamental signal.							

4：2.4G band 802.11n40

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2390	69.44	74	-7.80	100	190	4.56	PK
		49.11	54	-7.80	100	190	4.89	AV
	2422	114.50	-	-7.80	100	190	-	PK
		103.80	-	-7.80	100	190	-	AV
	4844	43.40	74	-2.10	100	190	30.60	PK
		31.10	54	-2.10	100	190	20.90	AV
	7266	45.30	74	6.50	100	190	28.70	PK
		35.70	54	6.50	100	190	18.30	AV
Note:	2422MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2437	114.40	-	-7.80	100	190	-	PK
		103.20	-	-7.80	100	190	-	AV
	4874	44.70	74	-2.10	100	190	29.30	PK
		33.50	54	-2.10	100	190	20.50	AV
	7311	47.50	74	6.50	100	190	26.50	PK
		36.70	54	6.50	100	190	17.30	AV
Note:	2437MHz							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2452	115.50	-	-7.80	100	190	-	PK
		103.80	-	-7.80	100	190	-	AV
	2483.5	67.87	74	-7.50	100	190	6.13	PK
		48.79	54	-7.50	100	190	5.21	AV
	4904	43.50	74	-2.10	100	190	30.50	PK
		33.30	54	-2.10	100	190	20.70	AV
	7386	46.70	74	6.50	100	190	27.30	PK
		35.30	54	6.50	100	190	18.70	AV
Note:	2452MHz is fundamental signal.							

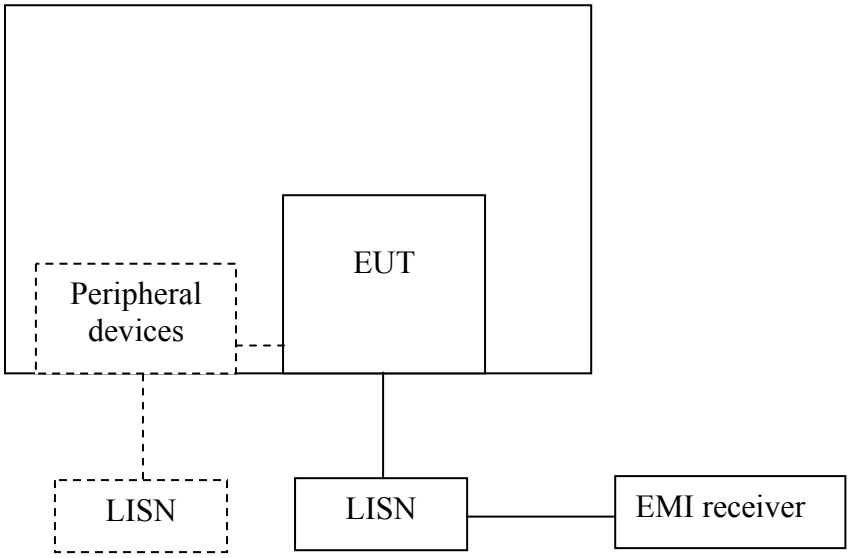
9. Power line conducted emission

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.

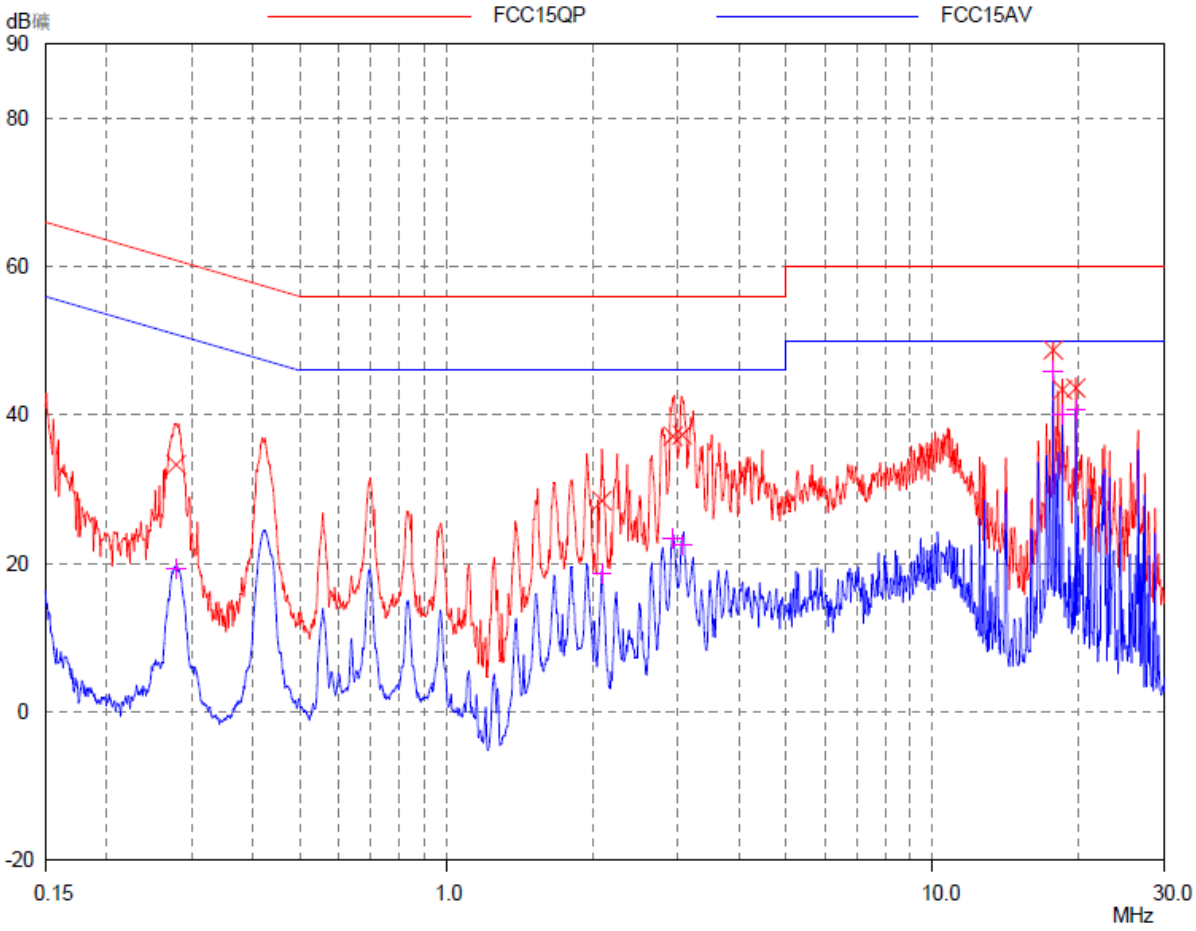
9.3 Test procedure and test set up

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

Temperature : 21 °C
Relative Humidity : 45 %

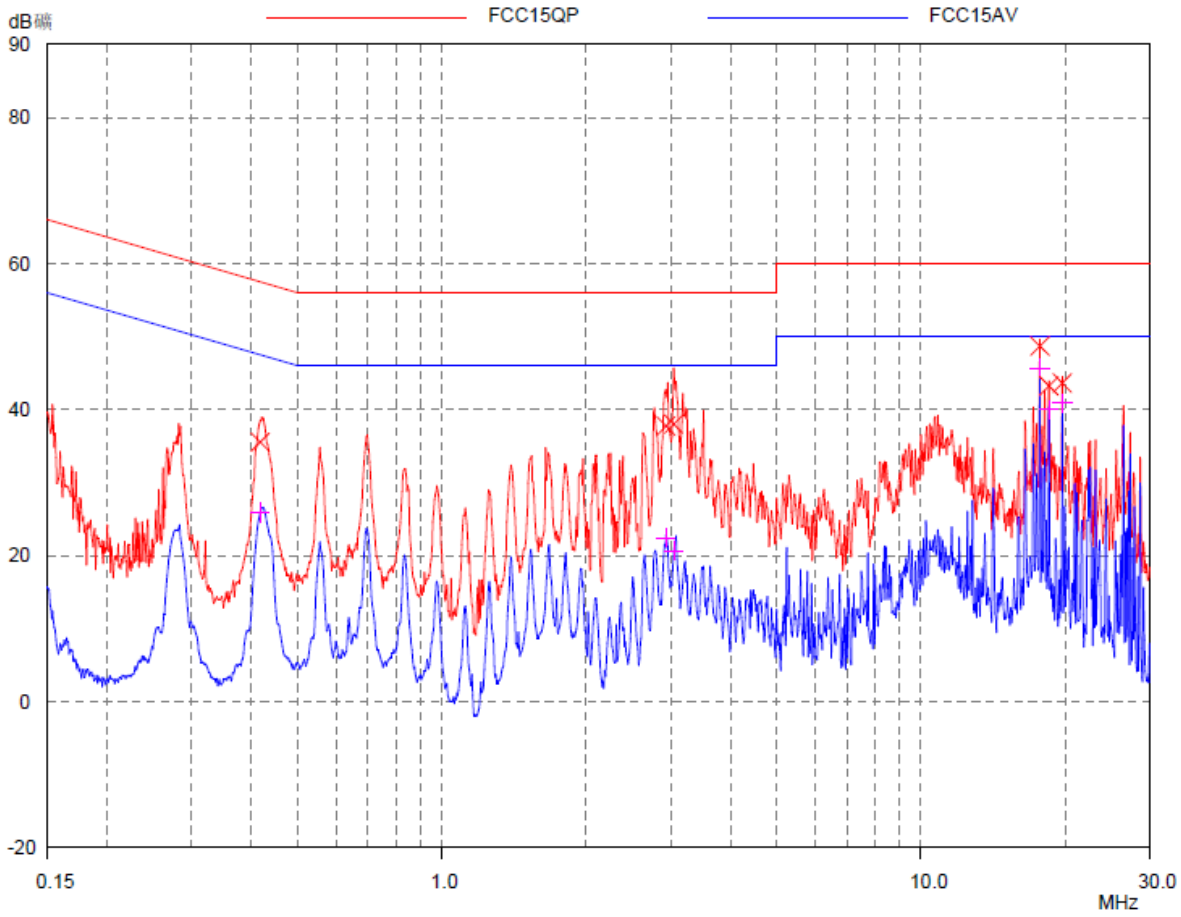
L Line



Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(µV)	Limit dB(µV)	Margin (dB)	level dB(µV)	limit dB(µV)	Margin (dB)
0.28	33.32	60.86	27.54	19.34	50.86	31.52
2.09	28.47	56.00	27.53	18.67	46.00	27.33
2.92	37.14	56.00	18.86	23.30	46.00	22.70
3.06	37.33	56.00	18.67	22.50	46.00	23.50
17.70	48.77	60.00	11.23	45.85	50.00	4.15
18.49	43.41	60.00	16.59	40.15	50.00	9.85
19.71	43.63	60.00	16.37	40.77	50.00	9.23

N Line



Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(μV)	Limit dB(μV)	Margin (dB)	level dB(μV)	limit dB(μV)	Margin (dB)
0.42	35.56	57.51	21.95	25.90	47.51	21.61
2.94	37.76	56.00	18.24	22.47	46.00	23.53
3.04	38.02	56.00	17.98	20.70	46.00	25.30
17.70	48.69	60.00	11.31	45.70	50.00	4.30
18.49	43.27	60.00	16.73	39.95	50.00	10.05
19.71	43.63	60.00	16.37	40.90	50.00	9.10