



FCC/ IC TEST REPORT

According to

CFR47 §15.247/ RSS-247 Issue 1

Applicant	:	Qualcomm Atheros, Inc.
Address	:	1700 Technology Drive, San Jose, CA 95110
Manufacturer	:	Qualcomm Atheros, Inc.
Address	:	1700 Technology Drive, San Jose, CA 95110
Equipment	:	802.11a/b/g/n/ac + BT 4.1 M.2 2230 Type Card
Brand	:	Qualcomm Atheros
Model No.	:	QCNFA344A
FCC ID	:	PPD-QCNFA344AH
IC ID	:	4104A-QCNFA344A

■ The test result refers exclusively to the test presented test model / sample.

■ Without written approval of **CerpPASS Technology (Suzhou) Co., Ltd.** the test report shall not be reproduced exc- ept in full.

I HEREBY CERTIFY THAT :

The measurements shown in this test report were made in accordance with the procedures given in **ANSI C63.10 – 2013** and the energy emitted by this equipment was **passed**.

CISPR PUB. 22 and FCC Part 15 in both radiated and conducted emission class B limits. Testing was carried out on Jun.01,2017~ Jun.06,2017 at **CerpPASS Technology (Suzhou) Co., Ltd.**

Prepared By:

Kerry Zhou

Approved by:

Miro Chueh (EMC/RF Manager)

Laboratory Accreditation:

CerpPASS Technology Corporation Test Laboratory



NVLAP LAB Code:	200954-0
TAF LAB Code:	1439

CerpPASS Technology (SuZhou) Co., Ltd.



NVLAP LAB Code:	200814-0
CNAS LAB Code:	L5515



Release History

Attachment No.	Version	Date	Description
SEFI1704145	Rev 01	2017-06-06	Initial release



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1. Report of Measurements and Examinations

1.1 List of Measurements and Examinations

Performed Test Item	Normative References	Test Performed	Deviation	Result
Radiated Emission	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.209 RSS-Gen Issue 4 November 2014 Section 6.13	Yes	No	Pass
Radiated Emission Band Edge	FCC CFR Title 47 Part 15 Subpart C: 2014 15.247(d) RSS-247 Issue 1 May 2015 Section 5.5	Yes	No	Pass
Output Power	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.247(b)(3) RSS-247 Issue 1 May 2015 Section 5.1(4)	Yes	No	Pass



2. Test Configuration of Equipment under Test

2.1 Feature of Equipment under Test

Spreading	802.11b: DSSS 802.11g / n/ac: OFDM
Frequency Range	802.11b/g/n(20MHz)/ac(20MHz): 2412-2462MHz 802.11n(40MHz)/ac(40MHz): 2422-2452MHz
Number of Channels	802.11b/g/n(20MHz)/ac(20MHz):11 802.11n(40MHz)/ac(40MHz): 7
Data Rate	802.11b: 11, 5.5, 2, 1 Mbps 802.11g: 54, 48, 36, 24, 18, 12, 9, 6 Mbps 802.11n: up to 300Mbps
Antenna Type	See antenna requirement

Host Details,

Host Manufacture	Host Type	Host Model
Lenovo	Notebook/Tablet computer	Lenovo N24, 80AF



2.2 Carrier Frequency of Channels

For 2.4G 802.11b, 802.11g, 802.11n (20MHz), 802.11ac (20MHz)

Channel	Frequency(MHz)	Channel	Frequency(MHz)
01	2412	07	2442
02	2417	08	2447
03	2422	09	2452
04	2427	10	2457
05	2432	11	2462
06	2437	---	---

For 2.4G 802.11n (40MHz), 802.11ac (40MHz)

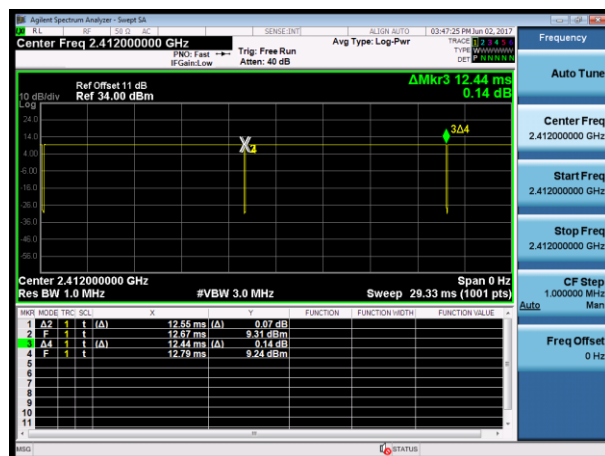
Channel	Frequency(MHz)	Channel	Frequency(MHz)
01	---	08	2447
02	---	09	2452
03	2422	---	---
04	2427	---	---
05	2432	---	---
06	2437	---	---
07	2442	---	---



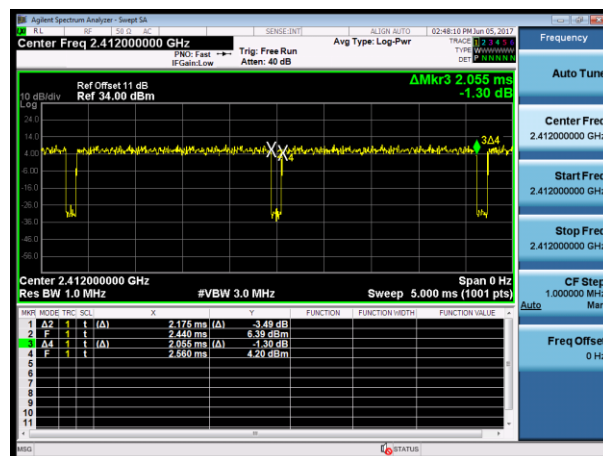
2.3 Duty cycle

Test Item	Duty cycle	
Mode	Frequency (MHz)	Measurement (%)
802.11b	2412	99.12%
802.11g	2412	94.48%
802.11n(20MHz)	2412	93.87%
802.11n(40MHz)	2422	86.93%

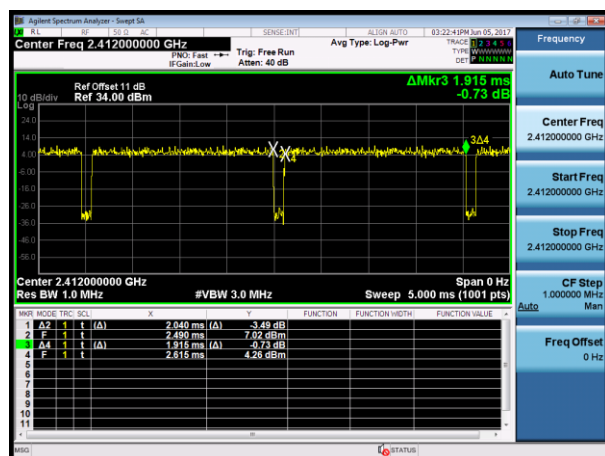
Transmit at 2412MHz by 802.11b



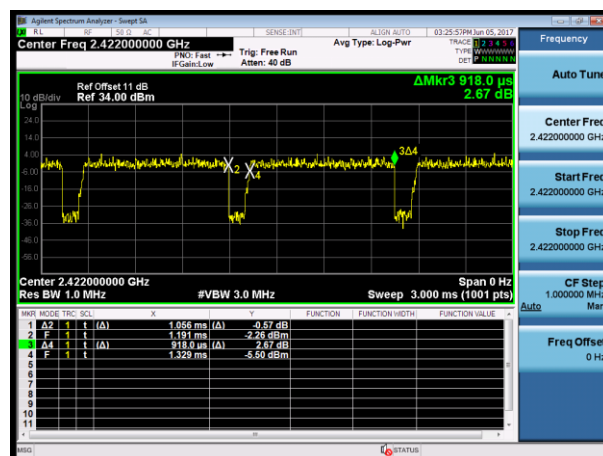
Transmit at 2412MHz by 802.11g



Transmit at 2412MHz by 802.11ac(20MHz)



Transmit at 2422MHz by 802.11ac(40MHz)





2.4 Test Manner

Test Manner	
1	During testing, the interface cables and equipment positions were varied according to RSS-247 Issue 1
2	Adjust the EUT at the test mode and the test channel. Then test.
Test mode	
1	Transmit by 802.11b
2	Transmit by 802.11g
3	Transmit by 802.11n(20MHz)
4	Transmit by 802.11n(40MHz)



2.5 General Information of Test

Test Site:	CerpPASS Technology Corp.
Performand Location :	No.66,Tangzhuang Road, Suzhou Industrial Park, Jiangsu 215006, China
NVLAP LAB Code :	200814-0
FCC Registration Number :	916572, 331395
IC Registration Number :	7290A-1, 7290A-2

2.6 Measurement Uncertainty

Measurement Item	Measurement Frequency	Polarization	Uncertainty
Radiated Emission	30 MHz ~ 40GHz	Vertical	±4.11 dB
		Horizontal	±4.10 dB
Maximum Peak Output Power	---	---	±1.4 dB



3. Antenna Requirements

3.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

3.2 Antenna Construction and Directional Gain

Ant Type	Manufacturer	Part Number
1	HONGLIN TECHNOLOGY Co., LTD.	Main: N/A Aux: N/A
2	Shenzhen South Star Technology Co., LTD	Main: D04-0282-R0A Aux: D04-0281-R0A

Antenna Peak Gain	HongLin: 2.4G: 0.73dBi, 5.2G: 0.58dBi, 5.5G: 0.69dBi, 5.8G: 0.42dBi SouthStar: 2.4G: 3.52dBi, 5.2G: 3.81dBi, 5.5G: 4.01dBi, 5.8G: 2.48dBi
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1. WLAN/BT coexistence mode:

- ◆ 2x2 WLAN + BT:
- 5GHz 802.11a/an (or 11ac) transmit concurrent with BT.
- 2.4GHz: timely shared coexistence.



4. Test of Radiated Emission

4.1 Test Limit

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. If the transmitter measurement is based on the maximum conducted output power, the attenuation required under this paragraph shall be 30dB instead of 20dB. In addition, radiated emissions which fall in section 15.205(a) the restricted bands must also comply with the radiated emission limit specified in section 15.209(a).

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

4.2 Test Procedures

KDB 558074 D01v03r05 - Section 12.0 & Section 12.1



4.3 Test Setting

Quasi-Peak Measurements below 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. Span was set greater than 1MHz
3. RBW = 120 kHz
4. Detector = CISPR quasi-peak
5. Sweep time = auto couple
6. Trace was allowed to stabilize

Peak Measurements above 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Average Measurements above 1GHz

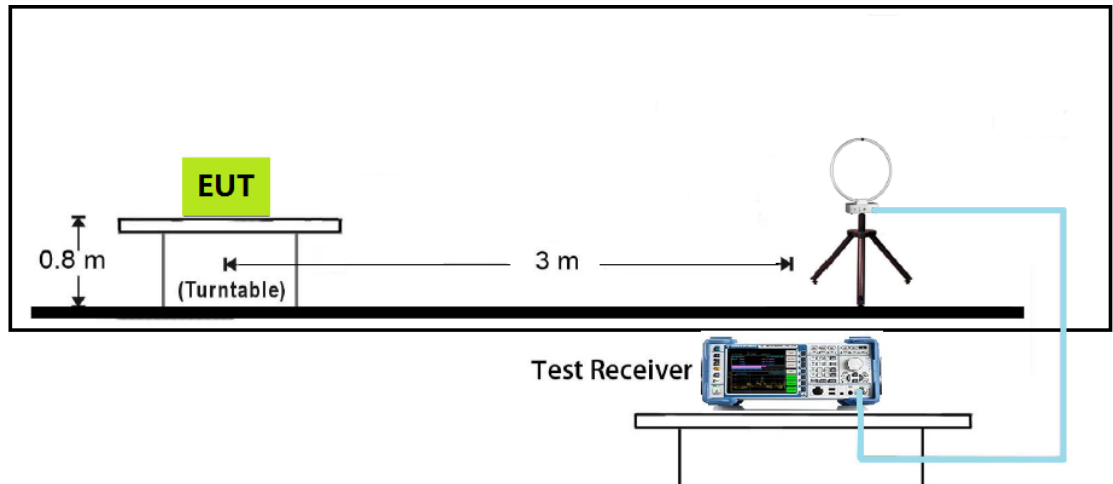
7.8.3. Average Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 1/T
4. De As an alternative, the instrument may be set to linear detector mode. Ensure that video filtering is applied in linear voltage domain (rather than in a log or dB domain). Some instruments require linear display mode in order to accomplish this. Others have a setting for Average-VBW Type, which can be set to "Voltage" regardless of the display mode
5. Detector = Peak
6. Sweep time = auto
7. Trace mode = max hold
8. Allow max hold to run for at least 50 times (1/duty cycle) traces

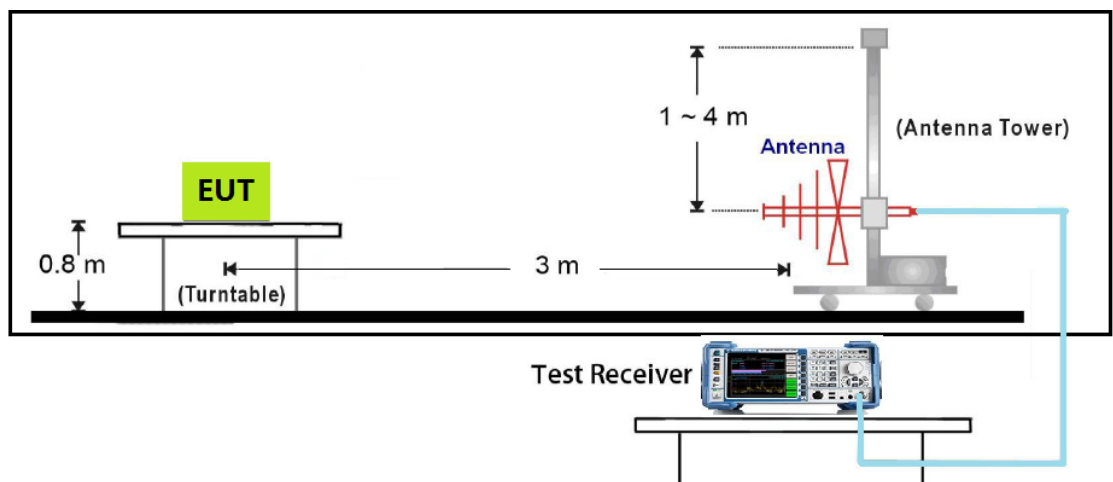


4.4 Typical Test Setup

9kHz~30MHz Test Setup

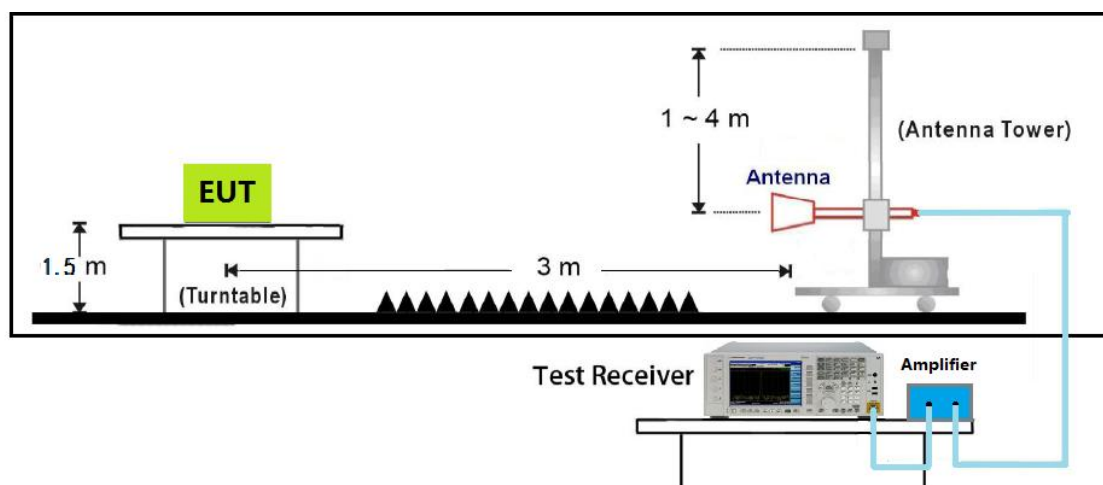


Below 1GHz Test Setup

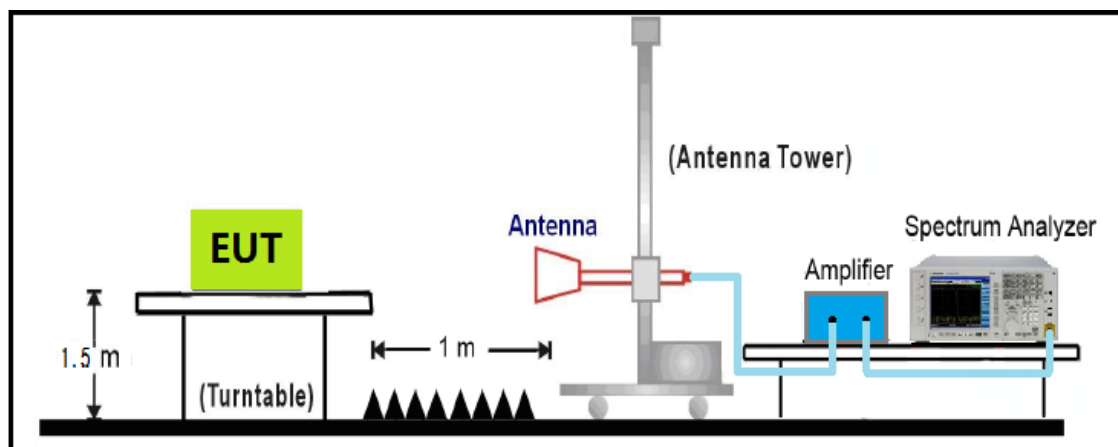




1GHz~18GHz Test Setup



18GHz~40GHz Test Setup





4.5 Measurement Equipment

Instrument/Ancillary	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date.
EMI Test Receiver	R&S	ESCI	101183	2017.03.28	2018.03.29
Spectrum Analyzer	N9010A	Agilent	MY53400169	2016.11.11	2017.11.10
Spectrum Analyzer	R&S	FSP40	100324	2017.03.23	2018.03.24
H64 Preamplifier	HP	8447F	3113A05582	2017.03.24	2018.03.23
Preamplifier	songyi	EM330	60618	201.03.29	2018.03.28
Preamplifier	Agilent	8449B	3008A02342	2017.03.29	2018.03.28
Preamplifier	COM-POWER	PA-840	711885	2017.03.29	2018.03.28
Bilog Antenna	Sunol Science	JB1	A072414-1	2017.04.22	2018.04.21
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	9120D-619	2017.04.20	2018.04.19
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	9170-347	2017.04.20	2018.04.19
Temperature/ Humidity Meter	Zhicheng	ZC1-11	CEP-TH-002	2017.03.31	2018.03.30
EZ-EMC	Fala	Ver CT3A1	N/A	N/A	N/A



4.6 Test Result and Data

The worst case of Radiated Emission below 1GHz:

Engineer :Ternence	Site : EMC Lab AC 102
Limit : FCC_CLASS_B_03M_QP	Margin : 6
EUT : Notebook computer	Probe : VERTICAL/ HORIZONTAL
Power : AC 120V/60Hz	Note : Normal Link

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	AntPol. H/V
1	182.2898	-8.21	38.53	30.32	43.50	-13.18	QP	H
2	230.7898	-12.04	44.72	32.68	46.00	-13.32	QP	H
3	312.2699	-7.03	40.27	33.24	46.00	-12.76	QP	H
4	408.3000	-4.72	38.79	34.07	46.00	-11.93	QP	H
5	605.2100	-1.79	36.18	34.39	46.00	-11.61	QP	H
6	744.8899	1.52	30.64	32.16	46.00	-13.84	QP	H

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	AntPol. H/V
1	36.7899	-5.04	38.34	33.30	40.00	-6.70	QP	V
2	408.3000	-4.72	40.99	36.27	46.00	-9.73	QP	V
3	466.5000	-7.10	42.37	35.27	46.00	-10.73	QP	V
4	587.7500	-2.34	39.31	36.97	46.00	-9.03	QP	V
5	696.3899	0.79	36.59	37.38	46.00	-8.62	QP	V
6	744.8899	1.52	35.56	37.08	46.00	-8.92	QP	V

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or AVG measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor (Correct Factor= Antenna Factor + Cable Loss – Amplifier)
3. The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~40GHz), therefore no data appear in the report.



Above 1G:

Engineer : Ternence	Site : EMC Lab AC 102
Limit : FCC_15_03M_PK	Margin : 6
EUT : Notebook computer	Probe : VERTICAL/ HORIZONTAL
Power : AC 120V/60Hz	Note : Transmit by 802.11b 2412 MHz

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	AntPol. H/V
1	4824.00	6.41	35.72	42.13	74.00	-31.87	peak	H
2	7236.00	12.54	37.79	50.33	74.00	-23.67	peak	H
3	4824.00	6.41	37.46	43.87	74.00	-30.13	peak	V
4	7236.00	12.54	40.18	52.72	74.00	-21.28	peak	V

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or AVG measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor (Correct Factor= Antenna Factor + Cable Loss – Amplifier)
3. The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~40GHz), therefore no data appear in the report.



Engineer : Ternence	Site : EMC Lab AC 102
Limit : FCC_15_03M_PK	Margin : 6
EUT : Notebook computer	Probe : VERTICAL/ HORIZONTAL
Power : AC 120V/60Hz	Note : Transmit by 802.11b 2437 MHz

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	AntPol. H/V
1	4874.00	6.54	44.93	51.47	74.00	-22.53	peak	H
2	7311.00	12.72	38.83	51.55	74.00	-22.45	peak	H
3	4874.00	6.54	45.69	52.23	74.00	-21.77	peak	V
4	7311.00	12.72	40.66	53.38	74.00	-20.62	peak	V

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or AVG measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor (Correct Factor= Antenna Factor + Cable Loss – Amplifier)
3. The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~40GHz), therefore no data appear in the report.



Engineer : Ternence	Site : EMC Lab AC 102
Limit : FCC_15_03M_PK	Margin : 6
EUT : Notebook computer	Probe : VERTICAL/ HORIZONTAL
Power : AC 120V/60Hz	Note : Transmit by 802.11b 2462 MHz

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	AntPol. H/V
1	4924.00	6.66	42.45	49.11	74.00	-24.89	peak	H
2	7386.00	12.90	36.80	49.70	74.00	-24.30	peak	H
3	4924.00	6.66	42.76	49.42	74.00	-24.58	peak	V
4	7386.00	12.90	38.08	50.98	74.00	-23.02	peak	V

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or AVG measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor (Correct Factor= Antenna Factor + Cable Loss – Amplifier)
3. The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~40GHz), therefore no data appear in the report.



Engineer : Ternence	Site : EMC Lab AC 102
Limit : FCC_15_03M_PK	Margin : 6
EUT : Notebook computer	Probe : VERTICAL/ HORIZONTAL
Power : AC 120V/60Hz	Note : Transmit by 802.11g 2412 MHz

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	AntPol. H/V
1	4824.00	6.41	42.12	48.53	74.00	-25.47	peak	H
2	7236.00	12.54	37.23	49.77	74.00	-24.23	peak	H
3	4824.00	6.41	35.63	42.04	74.00	-31.96	peak	V
4	7236.00	12.54	38.63	51.17	74.00	-22.83	peak	V

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or AVG measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor (Correct Factor= Antenna Factor + Cable Loss – Amplifier)
3. The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~40GHz), therefore no data appear in the report.



Engineer : Ternence	Site : EMC Lab AC 102
Limit : FCC_15_03M_PK	Margin : 6
EUT : Notebook computer	Probe : VERTICAL/ HORIZONTAL
Power : AC 120V/60Hz	Note : Transmit by 802.11g 2437 MHz

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	AntPol. H/V
1	4874.00	6.54	43.81	50.35	74.00	-23.65	peak	H
2	7311.00	12.72	40.38	53.10	74.00	-20.90	peak	H
3	4874.00	6.54	36.03	42.57	74.00	-31.43	peak	V
4	7311.00	12.72	34.73	47.45	74.00	-26.55	peak	V

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or AVG measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor (Correct Factor= Antenna Factor + Cable Loss – Amplifier)
3. The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~40GHz), therefore no data appear in the report.



Engineer : Ternence	Site : EMC Lab AC 102
Limit : FCC_15_03M_PK	Margin : 6
EUT : Notebook computer	Probe : VERTICAL/ HORIZONTAL
Power : AC 120V/60Hz	Note : Transmit by 802.11g 2462 MHz

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	AntPol. H/V
1	4924.00	6.66	41.94	48.60	74.00	-25.40	peak	H
2	7386.00	12.90	40.24	53.14	74.00	-20.86	peak	H
3	4924.00	6.66	39.81	46.47	74.00	-27.53	peak	V
4	7386.00	12.90	37.33	50.23	74.00	-23.77	peak	V

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or AVG measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor (Correct Factor= Antenna Factor + Cable Loss – Amplifier)
3. The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~40GHz), therefore no data appear in the report.



Engineer : Ternence	Site : EMC Lab AC 102
Limit : FCC_15_03M_PK	Margin : 6
EUT : Notebook computer	Probe : VERTICAL/ HORIZONTAL
Power : AC 120V/60Hz	Note : Transmit by 802.11ac20 2412 MHz

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	AntPol. H/V
1	4824.00	6.41	43.24	49.65	74.00	-24.35	peak	H
2	7236.00	12.54	37.10	49.64	74.00	-24.36	peak	H
3	4824.00	6.41	41.78	48.19	74.00	-25.81	peak	V
4	7236.00	12.54	37.06	49.60	74.00	-24.40	peak	V

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or AVG measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor (Correct Factor= Antenna Factor + Cable Loss – Amplifier)
3. The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~40GHz), therefore no data appear in the report.



Engineer : Ternence	Site : EMC Lab AC 102
Limit : FCC_15_03M_PK	Margin : 6
EUT : Notebook computer	Probe : VERTICAL/ HORIZONTAL
Power : AC 120V/60Hz	Note : Transmit by 802.11ac20 2437 MHz

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	AntPol. H/V
1	4874.00	6.54	42.89	49.43	74.00	-24.57	peak	H
2	7311.00	12.72	39.66	52.38	74.00	-21.62	peak	H
3	4874.00	6.54	38.22	44.76	74.00	-29.24	peak	V
4	7311.00	12.72	38.47	51.19	74.00	-22.81	peak	V

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or AVG measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor (Correct Factor= Antenna Factor + Cable Loss – Amplifier)
3. The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~40GHz), therefore no data appear in the report.



Engineer : Ternence	Site : EMC Lab AC 102
Limit : FCC_15_03M_PK	Margin : 6
EUT : Notebook computer	Probe : VERTICAL/ HORIZONTAL
Power : AC 120V/60Hz	Note : Transmit by 802.11ac20 2462 MHz

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	AntPol. H/V
1	4924.00	6.66	44.20	50.86	74.00	-23.14	peak	H
2	7386.00	12.90	38.52	51.42	74.00	-22.58	peak	H
3	4924.00	6.66	45.65	52.31	74.00	-21.69	peak	V
4	7386.00	12.90	39.14	52.04	74.00	-21.96	peak	V

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or AVG measurements as necessary.
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Engineer : Ternence	Site : EMC Lab AC 102
Limit : FCC_15_03M_PK	Margin : 6
EUT : Notebook computer	Probe : VERTICAL/ HORIZONTAL
Power : AC 120V/60Hz	Note : Transmit by 802.11ac40 2422 MHz

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	AntPol. H/V
1	4844.00	6.46	46.47	52.93	74.00	-21.07	peak	H
2	7236.00	12.54	40.44	52.98	74.00	-21.02	peak	H
3	4844.00	6.46	39.32	45.78	74.00	-28.22	peak	V
4	7236.00	12.54	37.75	50.29	74.00	-23.71	peak	V

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or AVG measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor (Correct Factor= Antenna Factor + Cable Loss – Amplifier)
3. The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~40GHz), therefore no data appear in the report.



Engineer : Ternence	Site : EMC Lab AC 102
Limit : FCC_15_03M_PK	Margin : 6
EUT : Notebook computer	Probe : VERTICAL/ HORIZONTAL
Power : AC 120V/60Hz	Note : Transmit by 802.11ac40 2437 MHz

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	AntPol. H/V
1	4874.00	6.54	39.45	45.99	74.00	-28.01	peak	H
2	7311.00	12.72	35.98	48.70	74.00	-25.30	peak	H
3	4874.00	6.54	42.33	48.87	74.00	-25.13	peak	V
4	7311.00	12.72	37.66	50.38	74.00	-23.62	peak	V

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or AVG measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor (Correct Factor= Antenna Factor + Cable Loss – Amplifier)
3. The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~40GHz), therefore no data appear in the report.



Engineer : Ternence	Site : EMC Lab AC 102
Limit : FCC_15_03M_PK	Margin : 6
EUT : Notebook computer	Probe : VERTICAL/ HORIZONTAL
Power : AC 120V/60Hz	Note : Transmit by 802.11ac40 2452 MHz

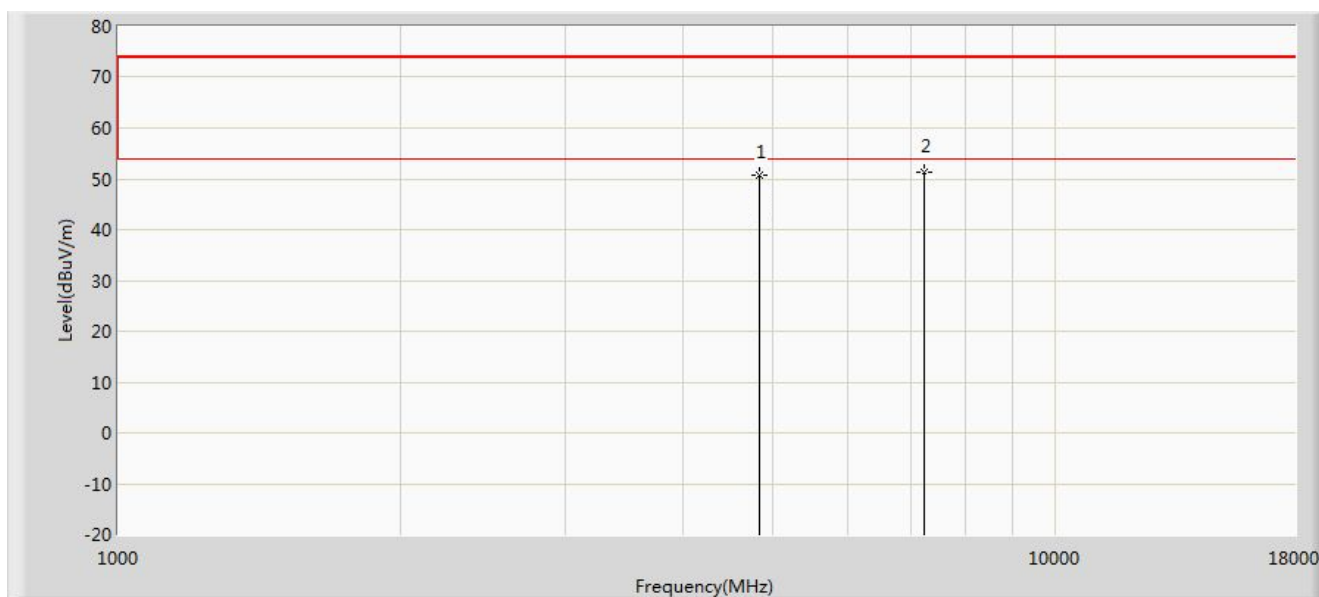
No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	AntPol. H/V
1	4904.00	6.61	43.75	50.36	74.00	-23.64	peak	H
2	7356.00	12.83	40.47	53.30	74.00	-20.70	peak	H
3	4904.00	6.61	44.53	51.14	74.00	-22.86	peak	V
4	7356.00	12.83	39.69	52.52	74.00	-21.48	peak	V

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or AVG measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor (Correct Factor= Antenna Factor + Cable Loss – Amplifier)
3. The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~40GHz), therefore no data appear in the report.

**The worst case of Radiated Emission 1~18GHz:**

Engineer: Ternence	
Site: AC102	Time: 2017/06/01
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D(1-18GHz)	Polarity: Horizontal
EUT: QCNFA344A	Power: 120V/60HZ
Note : Transmit by 802.11b 2437 MHz	



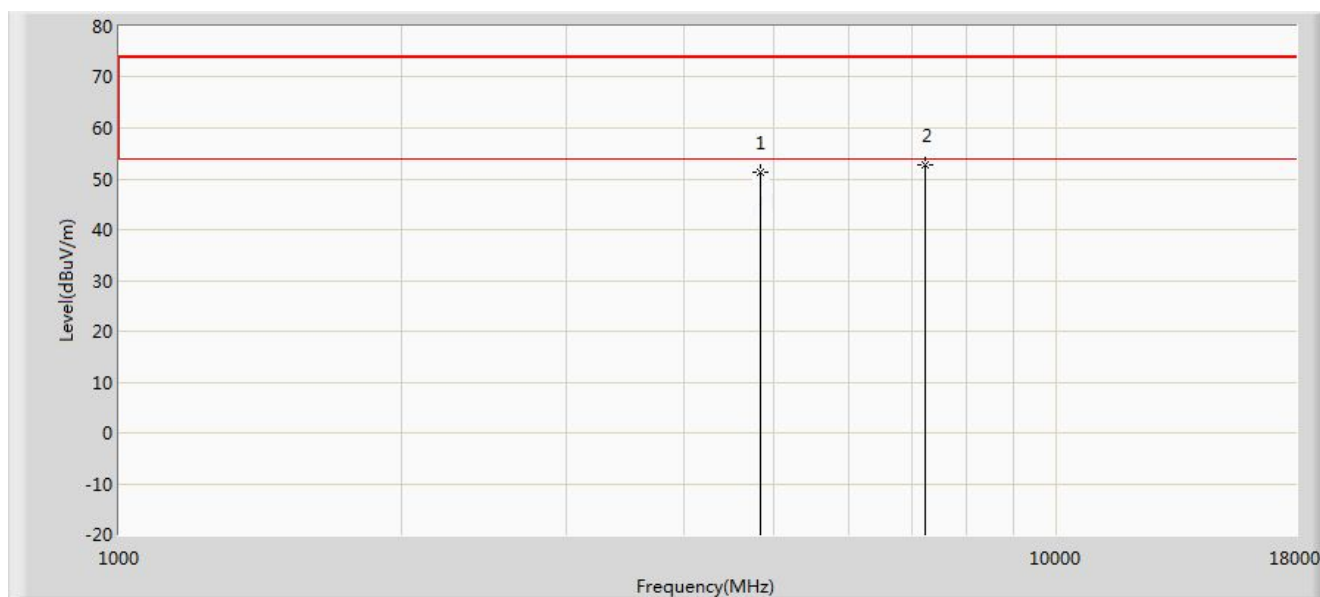
No	Mark	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Type
1		4874.00	6.54	44.93	51.47	74.00	-22.53	PK
2	*	7311.00	12.72	38.83	51.55	74.00	-22.45	PK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or AVG measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor (Correct Factor= Antenna Factor + Cable Loss – Amplifier)
3. The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~40GHz), therefore no data appear in the report.



Engineer: Ternence	
Site: AC102	Time: 2017/06/01
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D(1-18GHz)	Polarity: Vertical
EUT: QCNFA344A	Power: 120V/60HZ
Note : Transmit by 802.11b 2437 MHz	



No	Mark	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Type
1		4874.00	6.54	45.69	52.23	74.00	-21.77	PK
2	*	7311.00	12.72	40.66	53.38	74.00	-20.62	PK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or AVG measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor (Correct Factor= Antenna Factor + Cable Loss – Amplifier)
3. The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~40GHz), therefore no data appear in the report.



5. Maximum Output Power

5.1 Test Limit

The maximum power shall be less 1Watt (30dBm).

The conducted output power limits specified in §15.247(b) are based on the use of transmit antennae with directional gains that do not exceed 6 dBi. If transmit antennae with an effective directional gain greater than 6 dBi are used, then the conducted output power from the EUT shall be reduced as specified in §15.247(b) and (c).

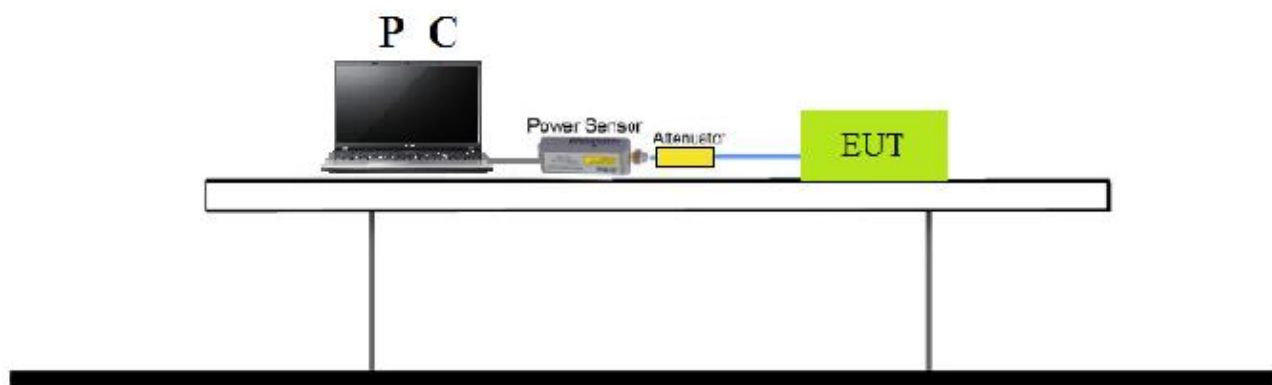
Per RSS247 Issue 1 Section 5.4(4), for DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum conducted output power shall not exceed 1W.

5.2 Test Procedure

The EUT was tested according to DTS test procedure of KDB 558074 for compliance to FCC 47CFR 15.247 requirements. The maximum conducted AVG output power using KDB 558074 D01v03r05 - Section 9.2.3.2 AVGPm-G Average Power Method.

The Maximum peak conducted output power using KDB 558074 D01v03r05 - Section 9.1.1 RBW ≥ DTS bandwidth Method.

5.3 Test Setup Layout



5.4 Measurement Equipment

Instrument	Manufacturer	Type No.	Serial No.	Calibration Date	Valid Date.
PC	Lenovo	E40-70	MP078UQV	N/A	N/A
POWER SENSOR	Agilent	U2021XA	MY53260020	2017/03/27	2018/03/26
Series Power Meter	ANRITSU	ML2495A	1224005	2017/03/27	2018/03/26
Temperature/Humidity Meter	Zhicheng	ZC1-11	CEP-TH-003	2017/03/31	2018/03/30



5.5 Test Result and Data

Power output test was verified over all data rates of each mode shown as below, and then choose the maximum power output (blue marker) for final test of each channel.

MCS Index for 802.11n	Spatial Streams	Data Rate(Mbps)					
		802.11b	802.11g	20MHz Bandwidth		40MHz Bandwidth	
				800ns GI	400ns GI	800ns GI	400ns GI
0	1	1	6	6.5	7.2	13.5	15.0
1	1	2	9	13.0	14.4	27.0	30.0
2	1	5.5	12	19.5	21.7	40.5	45.0
3	1	11	18	26.0	28.9	54.0	60.0
4	1	--	24	39.0	43.3	81.0	90.0
5	1	--	36	52.0	57.8	108.0	120.0
6	1	--	48	58.5	65.0	121.5	135.0
7	1	--	54	65.0	72.2	135.0	150.0
8	2	--	--	13.0	14.4	27.0	30.0
9	2	--	--	26.0	28.9	54.0	60.0
10	2	--	--	39.0	43.3	81.0	90.0
11	2	--	--	52.0	57.8	108.0	120.0
12	2	--	--	78.0	86.7	162.0	180.0
13	2	--	--	104.0	115.6	216.0	240.0
14	2	--	--	117.0	130.0	243.0	270.0
15	2	--	--	130.0	144.0	270.0	300.0



FOR AVERAGE POWER

Test Item	Maximum Output Power
Test Mode	Transmit by 802.11b
Test Date	2017-06-05

< QCNFA344A_Chain0_Main> (Unit: dBm)

Configurations	Mode		
	Channel / Frequency (MHz)		
2.4GHz WLAN Average Power	802.11b		
	1/2412	6/2437	11/2462
	20.37	20.45	20.32
	802.11g		
	1/2412	6/2437	11/2462
	17.86	19.33	17.96
	802.11n(HT20)		
	1/2412	6/2437	11/2462
	16.85	19.45	15.73
	802.11n(VHT20)		
	1/2412	6/2437	11/2462
	16.81	19.29	15.85
	802.11n(HT40)		
	3/2422	6/2437	9/2452
	12.83	18.42	10.89
	802.11n(VHT40)		
	3/2422	6/2437	9/2452
	12.95	18.36	10.99



< QCNFA344A_Chain1_Aux> (Unit: dBm)

Configurations	Mode		
	Channel / Frequency (MHz)		
2.4GHz WLAN Average Power	802.11b		
	1/2412	6/2437	11/2462
	20.38	20.45	20.36
	802.11g		
	1/2412	6/2437	11/2462
	17.81	19.34	17.97
	802.11n(HT20)		
	1/2412	6/2437	11/2462
	16.81	19.35	15.81
	802.11n(VHT20)		
	1/2412	6/2437	11/2462
	16.82	19.21	15.89
	802.11n(HT40)		
	3/2422	6/2437	9/2452
	12.85	18.29	10.85
	802.11n(VHT40)		
	3/2422	6/2437	9/2452
	12.91	18.39	10.93

The Result: PASS



6. Band Edges Measurement

6.1 Test Limit

Below -20dB of the highest emission level of operating band (In 100 kHz Resolution Bandwidth)

6.2 Test Procedure

KDB 558074 D01v03r05 – Section 12.2.4 (peak power measurements)

KDB 558074 D01v03r05 – Section 12.2.5 (average power measurements)

6.3 Test Setting

Peak Measurements above 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Average Measurements above 1GHz

7.8.3. Average Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW $\geq 1/T$

Note: For b mode VBW=82Hz; For g mode VBW=510Hz; For n(20MHz) mode VBW=560Hz; For n(40MHz) mode VBW=1.1KHz.

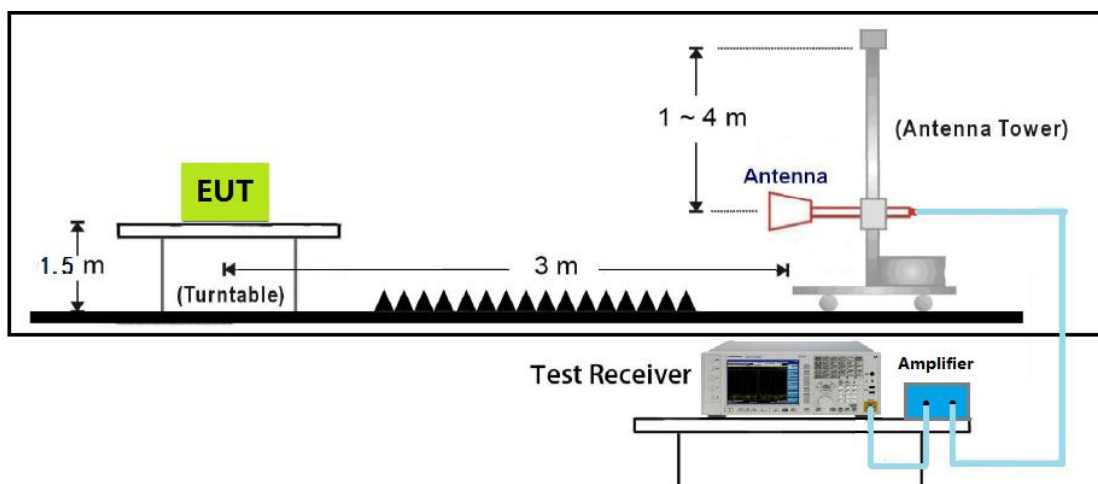
4. De As an alternative, the instrument may be set to linear detector mode. Ensure that video filtering is applied in linear voltage domain (rather than in a log or dB domain). Some instruments require linear display mode in order to accomplish this. Others have a setting for Average-VBW Type, which can be set to "Voltage" regardless of the display mode

5. Detector = Peak
6. Sweep time = auto
7. Trace mode = max hold
8. Allow max hold to run for at least 50 times (1/duty cycle) traces



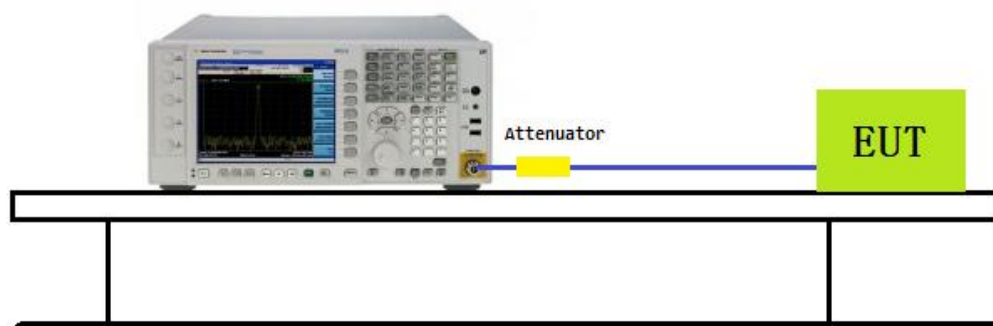
6.4 Test Setup Layout

Radiated



Conducted

Spectrum Analyzer





6.5 Measurement Equipment

Instrument/Ancillary	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date.
EMI Test Receiver	R&S	ESCI	101183	2017.03.28	2018.03.29
Spectrum Analyzer	N9010A	Agilent	MY53400169	2016.11.11	2017.11.10
Spectrum Analyzer	R&S	FSP40	100324	2017.03.23	2018.03.24
H64 Preamplifier	HP	8447F	3113A05582	2017.03.24	2018.03.23
Preamplifier	songyi	EM330	60618	2017.03.29	2018.03.28
Preamplifier	Agilent	8449B	3008A02342	2017.03.29	2018.03.28
Preamplifier	COM-POWER	PA-840	711885	2017.03.29	2018.03.28
Bilog Antenna	Sunol Science	JB1	A072414-1	2017.04.22	2018.04.21
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	9120D-619	2017.04.20	2018.04.19
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	9170-347	2017.04.20	2018.04.19
Temperature/ Humidity Meter	Zhicheng	ZC1-11	CEP-TH-002	2017.03.31	2018.03.30



6.6 Test Result and Data

802.11b

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type	Antenna Pole (V/H)
1	2390.000	62.524	29.413	-11.476	74.000	33.111	PK	H
2	2390.000	50.675	17.564	-2.925	54.000	33.111	AV	H
3	2390.000	62.616	29.505	-11.384	74.000	33.111	PK	V
4	2390.000	50.264	17.153	-3.736	54.000	33.111	AV	V
5	2483.500	63.334	29.841	-10.666	74.000	33.493	PK	H
6	2483.500	50.173	16.680	-3.827	54.000	33.493	AV	H
7	2483.500	62.811	29.318	-11.189	74.000	33.493	PK	V
8	2483.500	49.458	15.965	-4.542	54.000	33.493	AV	V

Note 1: Measure Level = Reading Level + Factor. (Factor= Antenna Factor + Cable Loss – Amplifier)

802.11g

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type	Antenna Pole (V/H)
1	2390.000	64.845	31.734	-9.155	74.000	33.111	PK	H
2	2390.000	50.244	17.133	-3.756	54.000	33.111	AV	H
3	2390.000	64.516	31.405	-9.484	74.000	33.111	PK	V
4	2390.000	50.476	17.365	-3.524	54.000	33.111	AV	V
5	2483.500	65.044	31.551	-8.956	74.000	33.493	PK	H
6	2483.500	50.840	17.347	-3.160	54.000	33.493	AV	H
7	2483.500	64.782	31.289	-9.218	74.000	33.493	PK	V
8	2483.500	50.538	17.045	-3.462	54.000	33.493	AV	V

Note 1: Measure Level = Reading Level + Factor. (Factor= Antenna Factor + Cable Loss – Amplifier)



802.11n20

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type	Antenna Pole (V/H)
1	2390.000	65.118	32.007	-8.882	74.000	33.111	PK	H
2	2390.000	50.068	16.957	-3.932	54.000	33.111	AV	H
3	2390.000	64.889	31.778	-9.111	74.000	33.111	PK	V
4	2390.000	50.247	17.136	-3.753	54.000	33.111	AV	V
5	2483.500	69.625	36.132	-4.375	74.000	33.493	PK	H
6	2483.500	51.766	18.273	-2.234	54.000	33.493	AV	H
7	2483.500	69.641	36.148	-4.359	74.000	33.493	PK	V
8	2483.500	50.775	17.282	-3.225	54.000	33.493	AV	V

Note 1: Measure Level = Reading Level + Factor. (Factor= Antenna Factor + Cable Loss – Amplifier)

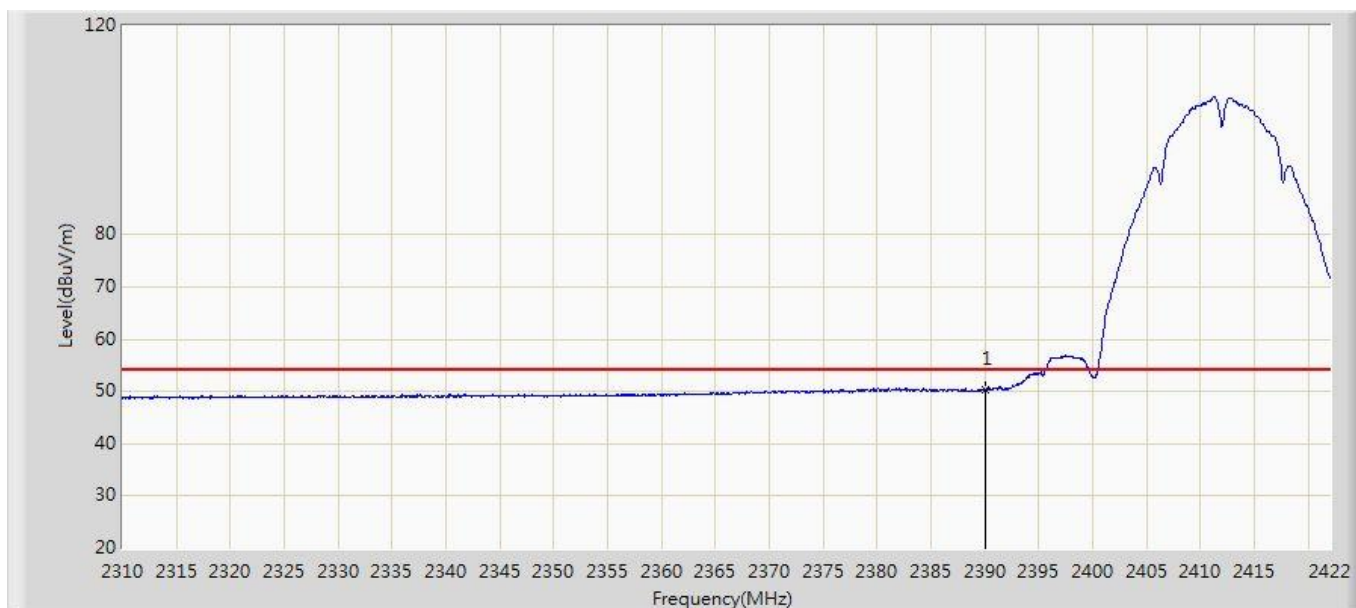
802.11n40

No	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type	Antenna Pole (V/H)
1	2390.000	70.363	37.252	-3.637	74.000	33.111	PK	H
2	2390.000	50.012	16.901	-3.988	54.000	33.111	AV	H
3	2390.000	70.355	37.244	-3.645	74.000	33.111	PK	V
4	2390.000	49.646	16.535	-4.354	54.000	33.111	AV	V
5	2483.500	69.471	35.978	-4.529	74.000	33.493	PK	H
6	2483.500	50.968	17.475	-3.032	54.000	33.493	AV	H
7	2483.500	66.875	33.382	-7.125	74.000	33.493	PK	V
8	2483.500	50.602	17.109	-3.398	54.000	33.493	AV	V

Note 1: Measure Level = Reading Level + Factor. (Factor= Antenna Factor + Cable Loss – Amplifier)

**The worst-case plots of bandedge for each mode in each operating band:**

Site: AC102	Time: 2017/05/29
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D(1-18GHz)	Polarity: Horizontal
EUT: QCNFA435	Power: AC 120V/60Hz
Note: Mode1: Transmit at 2412MHz by 802.11b	

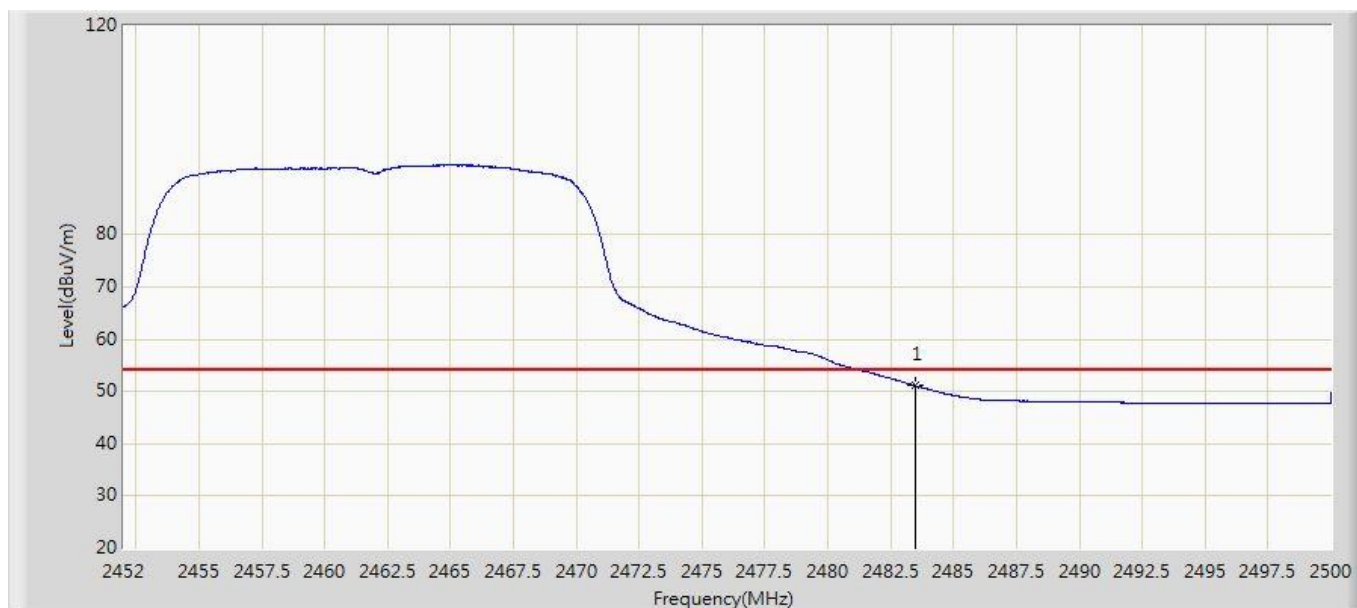


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2390.000	50.675	17.564	-2.925	54.000	33.111	AV

Note 1: Measure Level = Reading Level + Factor. (Factor= Antenna Factor + Cable Loss – Amplifier)



Site: AC102	Time: 2017/05/29
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D(1-18GHz)	Polarity: Horizontal
EUT: QCNFA435	Power: AC 120V/60Hz
Note: Model1: Transmit at 2462MHz by 802.11g	

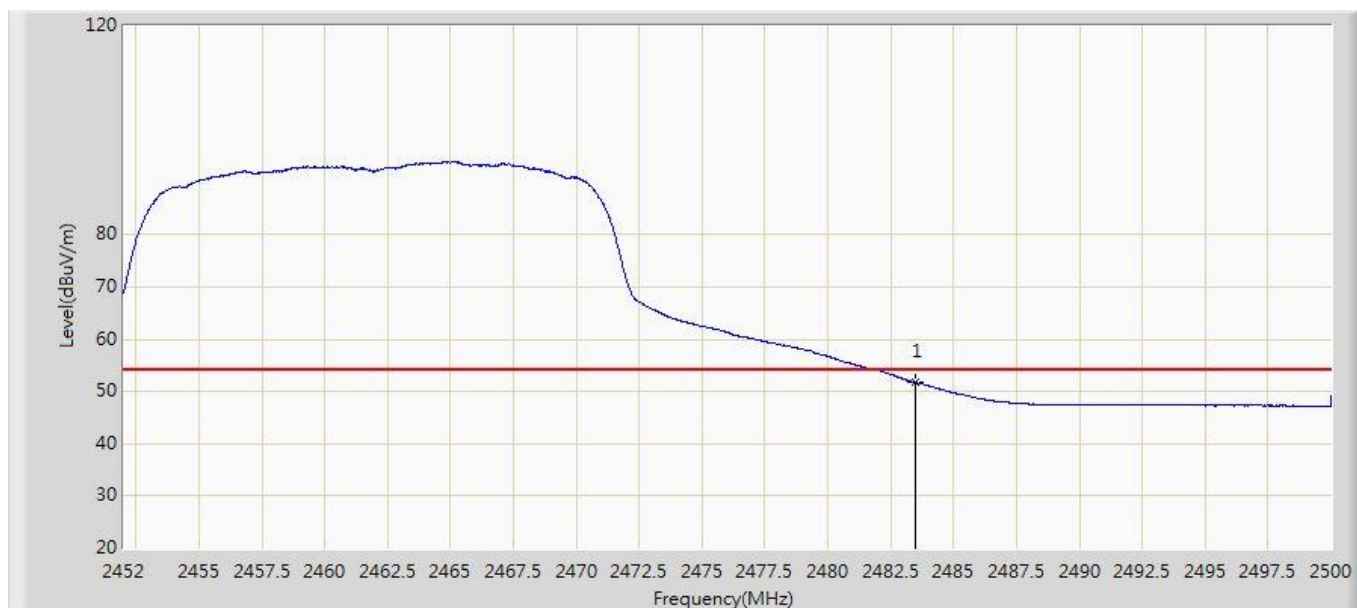


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2483.500	50.840	17.347	-3.160	54.000	33.493	AV

Note 1: Measure Level = Reading Level + Factor. (Factor= Antenna Factor + Cable Loss – Amplifier)



Site: AC102	Time: 2017/05/29
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D(1-18GHz)	Polarity: Horizontal
EUT: QCNFA435	Power: AC 120V/60Hz
Note: Model1: Transmit at 2462MHz by 802.11n20	

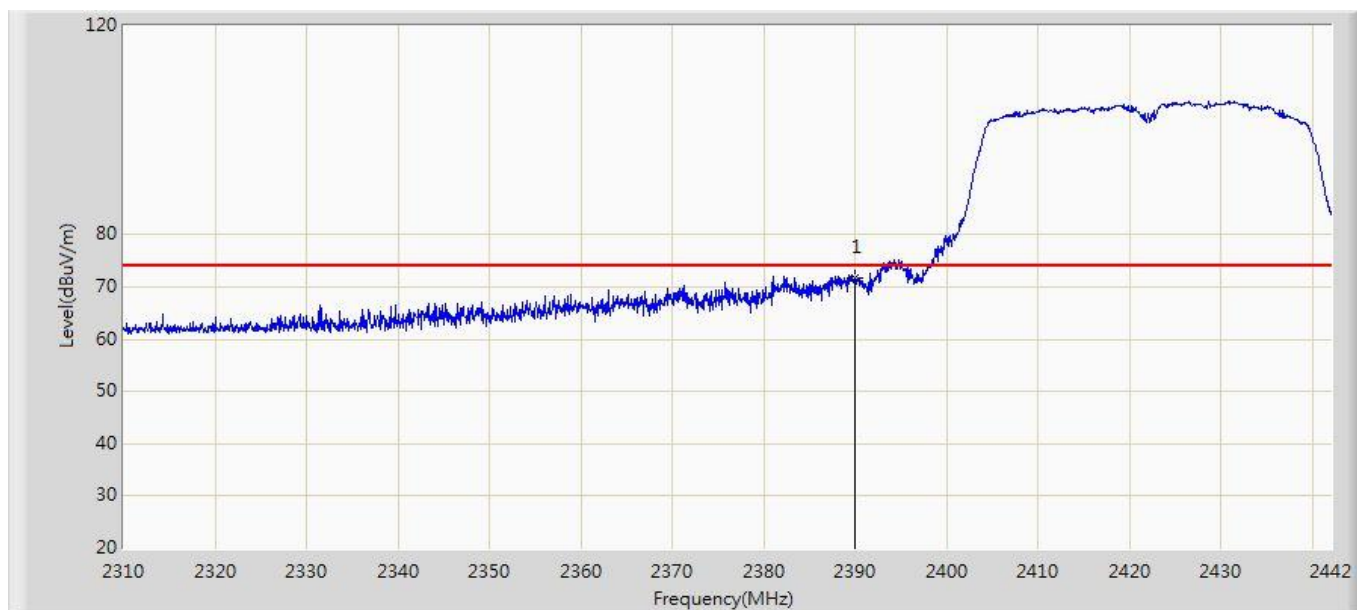


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2483.500	51.766	18.273	-2.234	54.000	33.493	AV

Note 1: Measure Level = Reading Level + Factor. (Factor= Antenna Factor + Cable Loss – Amplifier)



Site: AC102	Time: 2017/05/29
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D(1-18GHz)	Polarity: Horizontal
EUT: QCNFA435	Power: AC 120V/60Hz
Note: Mode1: Transmit at 2422MHz by 802.11n40	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2390.000	70.363	37.252	-3.637	74.000	33.111	PK

Note 1: Measure Level = Reading Level + Factor. (Factor= Antenna Factor + Cable Loss – Amplifier)



7. Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.09000 – 0.11000	16.42000 – 16.42300	399.9 – 410.0	4.500 – 5.250
0.49500 – 0.505**	16.69475 – 16.69525	608.0 – 614.0	5.350 – 5.460
2.17350 – 2.19050	16.80425 – 16.80475	960.0 – 1240.0	7.250 – 7.750
4.12500 – 4.12800	25.50000 – 25.67000	1300.0 – 1427.0	8.025 – 8.500
4.17725 – 4.17775	37.50000 – 38.25000	1435.0 – 1626.5	9.000 – 9.200
4.20725 – 4.20775	73.00000 – 74.60000	1645.5 – 1646.5	9.300 – 9.500
6.21500 – 6.21800	74.80000 – 75.20000	1660.0 – 1710.0	10.600 – 12.700
6.26775 – 6.26825	108.00000 – 121.94000	1718.8 – 1722.2	13.250 – 13.400
6.31175 – 6.31225	123.00000 – 138.00000	2200.0 – 2300.0	14.470 – 14.500
8.29100 – 8.29400	149.90000 – 150.05000	2310.0 – 2390.0	15.350 – 16.200
8.36200 – 8.36600	156.52475 – 156.52525	2483.5 – 2500.0	17.700 – 21.400
8.37625 – 8.38675	156.70000 – 156.90000	2655.0 – 2900.0	22.010 – 23.120
8.41425 – 8.41475	162.01250 – 167.17000	3260.0 – 3267.0	23.600 – 24.000
12.29000 – 12.29300	167.72000 – 173.20000	3332.0 – 3339.0	31.200 – 31.800
12.51975 – 12.52025	240.00000 – 285.00000	3345.8 – 3358.0	36.430 – 36.500
12.57675 – 12.57725	322.00000 – 335.40000	3600.0 – 4400.0	Above 38.6
13.36000 – 13.41000			

** : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

7.1 Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.