



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 **Cerpass 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 Apr.06,2017~ Apr.15,2017 at **Cerpass Technology (Suzhou) Co., Ltd.**

Prepared By:

Kerry Zhou

Approved by:

Miro Chueh (EMC/RF Manager)

Laboratory Accreditation:

Cerpass Technology Corporation Test Laboratory



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

Cerpass Technology (SuZhou) Co., Ltd.



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



Release History

Attachment No.	Version	Date	Description
SEFI1703329	Rev 01	2017-04-20	Initial release



Table of Contents

1. Report of Measurements and Examinations.....	4
1.1 List of Measurements and Examinations	4
2. Test Configuration of Equipment under Test.....	5
2.1 Feature of Equipment under Test	5
2.2 Carrier Frequency of Channels	6
2.3 Duty cycle	7
2.4 Test Manner	8
2.5 Description of Test System	9
2.6 Configuration of Tested System	10
2.7 General Information of Test	11
2.8 Measurement Uncertainty	11
2.9 Measuring Equipment	11
3. Antenna Requirements	13
3.1 Standard Applicable	13
3.2 Antenna Construction and Directional Gain	13
4. Test of Radiated Emission	14
4.1 Test Limit	14
4.2 Test Procedures.....	14
4.3 Test Setting	15
4.4 Typical Test Setup	16
4.5 Test Result and Data	18
5. Maximum Output Power	33
5.1 Test Limit	33
5.2 Test Procedure	33
5.3 Test Setup Layout.....	33
5.4 Test Result and Data	34
6. Band Edges Measurement.....	39
6.1 Test Limit	39
6.2 Test Procedure	39
6.3 Test Setting	39
6.4 Test Setup Layout.....	40
6.5 Test Result and Data	41
7. Restricted Bands of Operation.....	47
7.1 Labeling Requirement	47



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 Computer	Lenovo ideapad 720S-13IKB, Lenovo ideapad 720S Touch-13IKB, Lenovo ideapad 720S-13ARR



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	---	---

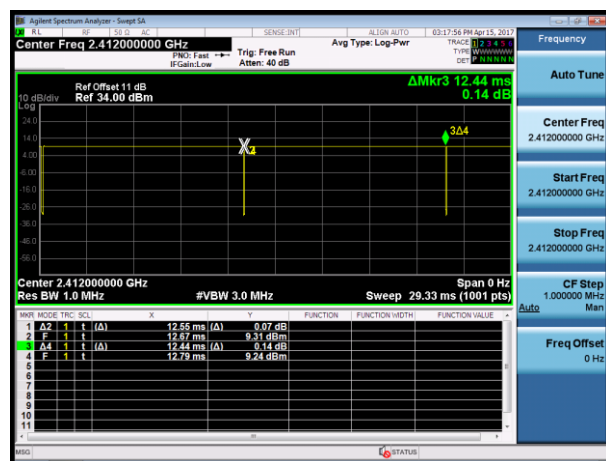
For 2.4G 802.11n (40MHz), 802.11ac (40MHz)

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

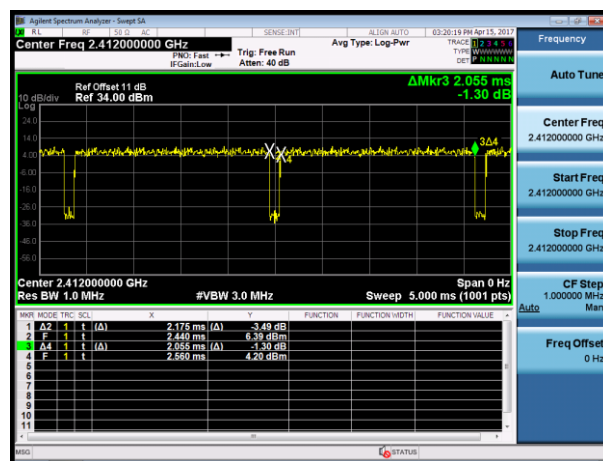
2.3 Duty cycle

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

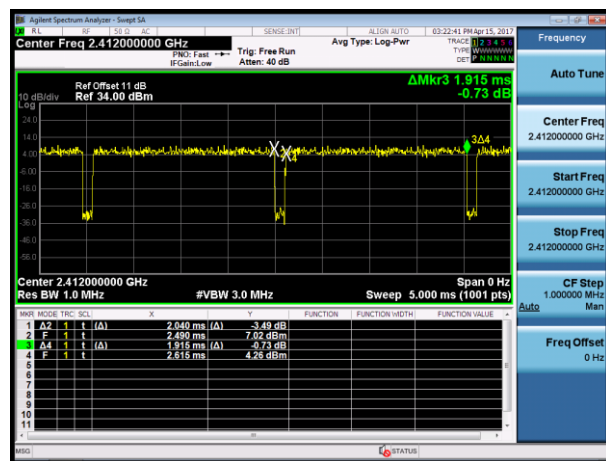
Transmit at 2412MHz by 802.11b



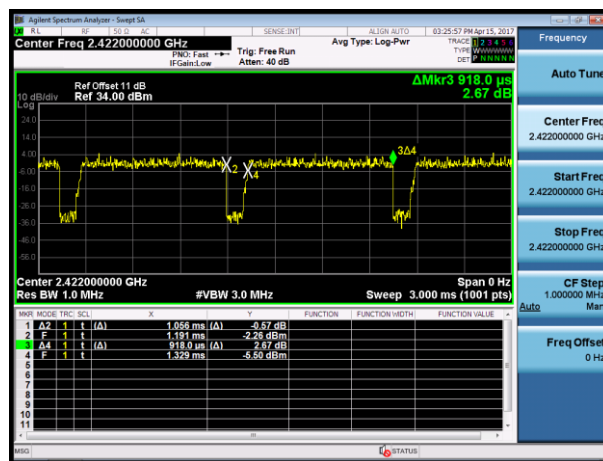
Transmit at 2412MHz by 802.11g



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 802.11ac(20MHz)
4	Transmit by 802.11ac(40MHz)

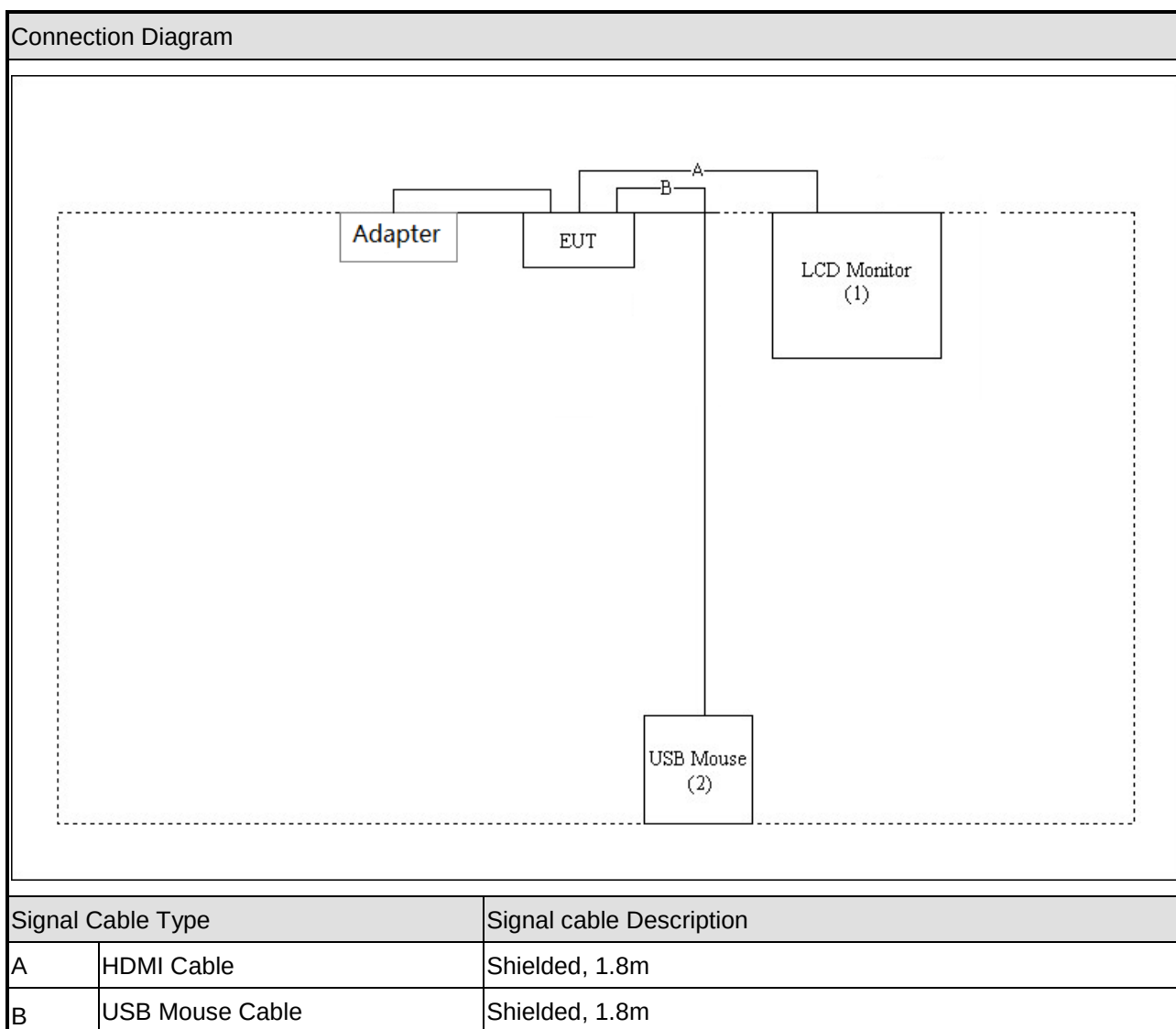


2.5 Description of Test System

Product		Manufacturer	Model No.	Power Cord
1	LCD Monitor	DELL	U2713HMT	Non-Shielded, 1.8m
2	USB Mouse	LENOVO	M-U0025-O	Power by Notebook



2.6 Configuration of Tested System





2.7 General Information of Test

Test Site:	Cerpass 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

2.8 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

2.9 Measuring Equipment

RF Conducted Measuring Equipment-AC104					
Instrument/Ancillary	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date.
Peak Power Sensor	Boonton	55006	9778	2016.06.08	2017.06.07
Series Power Meter	ANRITSU	ML2495A	1224005	2017.03.27	2018.03.26
Spectrum Analyzer	N9010A	Agilent	MY53400169	2016.11.11	2017.11.11
Spectrum Analyzer	E4407B	Agilent	MY44211883	2016.10.15	2017.10.14
Temperature/Humidity Meter	Zhicheng	ZC1-11	CEP-TH-003	2017.03.31	2018.03.30



Radiated Measuring Equipment-AC102					
Instrument/Ancillary	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date.
Loop Antenna	R&S	HFH2-Z2	100150	2017.08.31	2018.08.30
Bilog Antenna	Sunol Science	JB1	A072414-1	2016.04.16	2017.04.15
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	9120D-619	2016.07.16	2017.07.15
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	9170-348	2016.05.07	2017.05.06
Preamplifier	HP	8447F	3113A05582	2017.03.26	2018.03.25
Preamplifier	EMCI	EMC-051835	980085	2016.09.06	2017.09.05
Preamplifier	COM-POWER	PA-840	711885	2017.03.26	2018.03.25
EMI Test Receiver	R&S	ESCI-3	101183	2016.06.29	2017.06.28
Spectrum Analyzer	N9010A	Agilent	MY53400169	2016.11.11	2017.11.11
Spectrum Analyzer	R&S	FS040	100324	2017.03.26	2018.03.25
Temperature/ Humidity Meter	Zhicheng	ZC1-11	CEP-TH-002	2017.03.31	2018.03.30



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

Antenna	Manufacturer	Ant Type	Ant Part number	Peak Gain
Main(chain 1)	Amphenol	PIFA	AM149000C10	-2.45dBi for 2.40~2.50GHz band -1.57dBi for 5.15~5.35GHz band -2.69dBi for 5.47~5.725GHz band -1.68dBi for 5.725~5.85GHz band
Aux(chain 0)			AM149000C10	-1.32dBi for 2.40~2.50GHz band -0.79dBi for 5.15~5.35GHz band -1.14dBi for 5.47~5.725GHz band -1.14dBi for 5.725~5.85GHz band
Main(chain 1)	LUXSHARE-ICT	PIFA	AM149000C00	-3.65dBi for 2.40~2.50GHz band -1.23dBi for 5.15~5.35GHz band -0.75dBi for 5.47~5.725GHz band -2.22dBi for 5.725~5.85GHz band
Aux(chain 0)			AM149000C00	0.70dBi for 2.40~2.50GHz band -0.94dBi for 5.15~5.35GHz band -1.18dBi for 5.47~5.725GHz band -1.18dBi for 5.725~5.85GHz band

Note: The EUT will collocation two kinds of antenna, we choose one of the high peak gain antenna for all RF testing.



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 D01v04 - 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

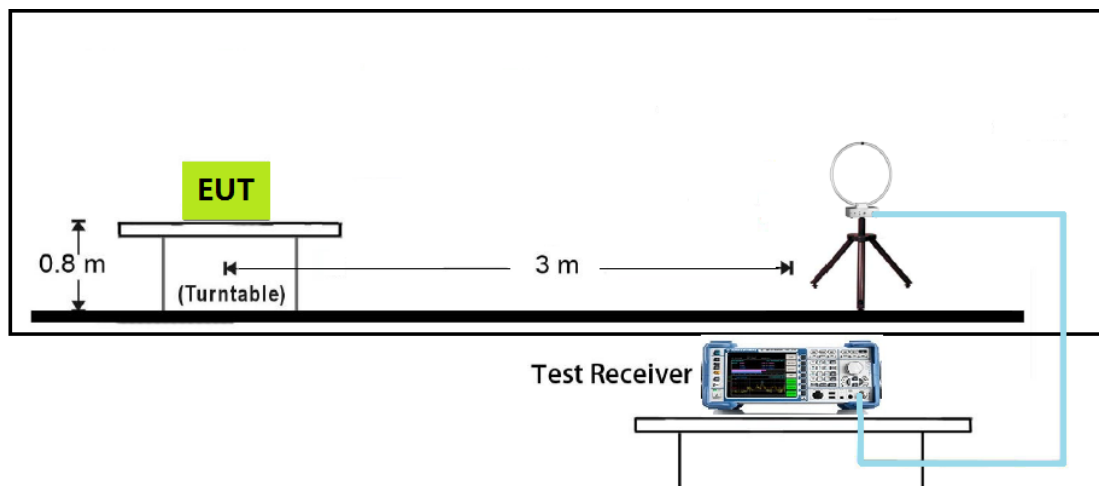
7.8.3. Average Field Strength Measurements

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

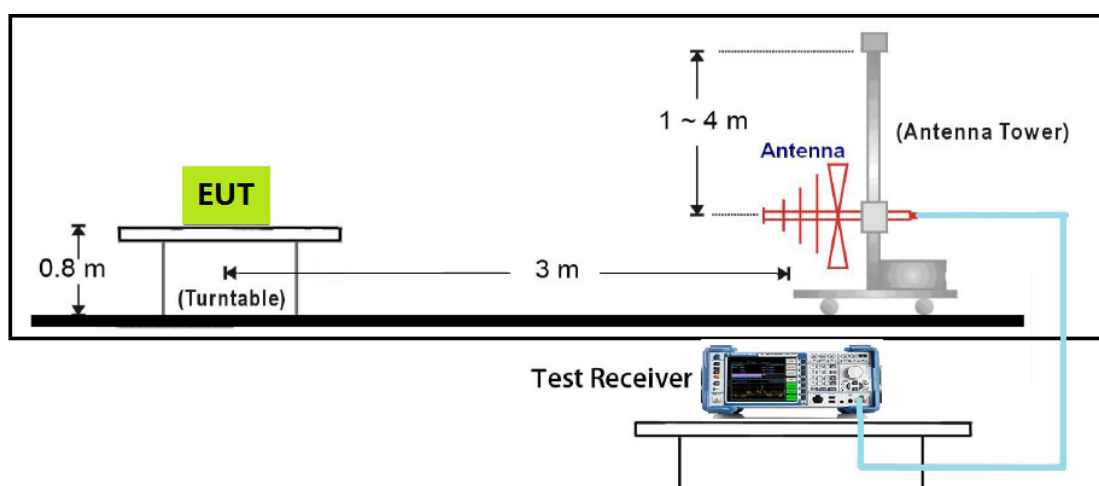


4.4 Typical Test Setup

9kHz~30MHz Test Setup

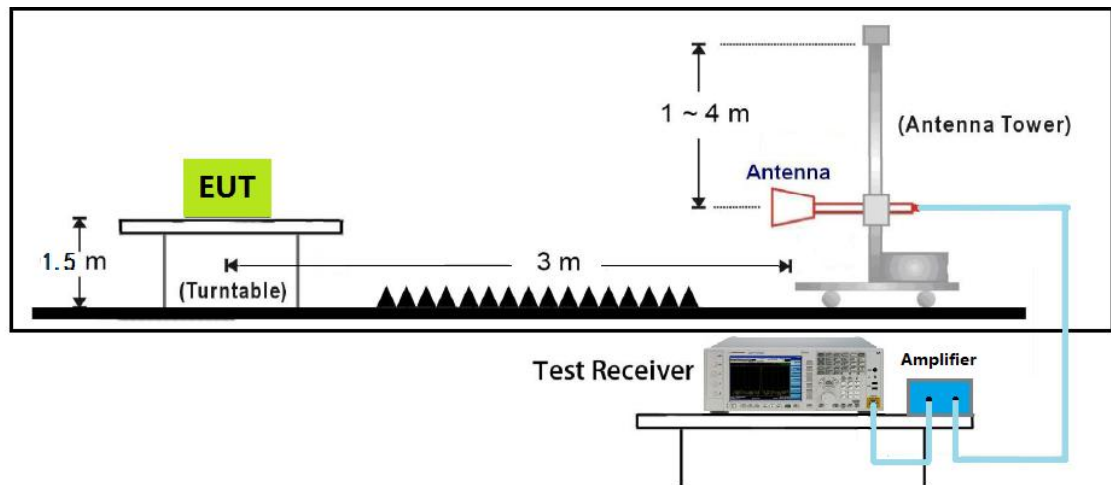


Below 1GHz Test Setup

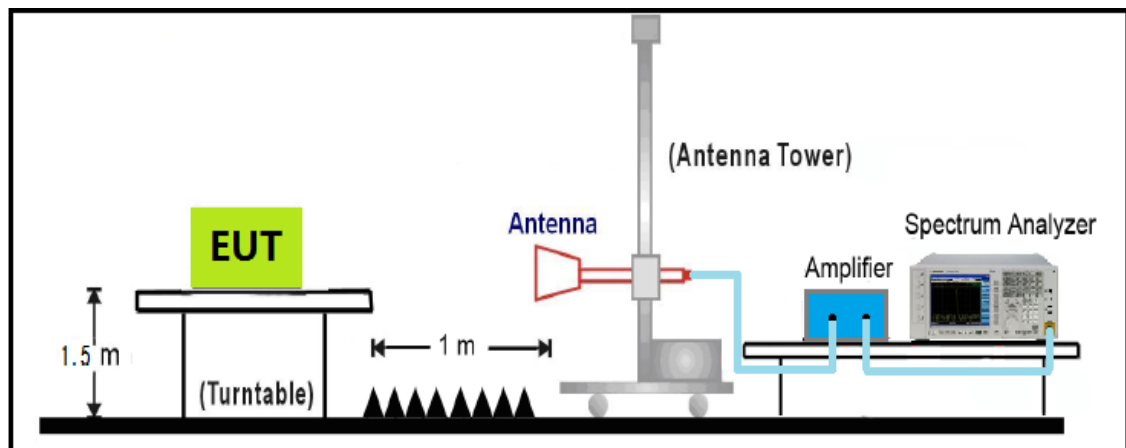




1GHz~18GHz Test Setup



18GHz~40GHz Test Setup





4.5 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	155.1297	-12.57	32.87	20.30	43.50	-23.20	QP	H
2	201.6896	-12.41	34.73	22.32	43.50	-21.18	QP	H
3	276.3798	-9.19	33.05	23.86	46.00	-22.14	QP	H
4	426.7300	-3.99	28.41	24.42	46.00	-21.58	QP	H
5	528.5800	-4.26	36.15	31.89	46.00	-14.11	QP	H
6	733.2500	1.55	30.07	31.62	46.00	-14.38	QP	H

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	AntPol. H/V
1	117.2998	-12.82	33.01	20.19	43.50	-23.31	QP	V
2	202.6596	-12.40	33.70	21.30	43.50	-22.20	QP	V
3	323.9100	-6.31	29.77	23.46	46.00	-22.54	QP	V
4	492.6899	-5.35	34.29	28.94	46.00	-17.06	QP	V
5	511.1200	-4.63	36.66	32.03	46.00	-13.97	QP	V
6	698.3300	0.97	29.52	30.49	46.00	-15.51	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	35.70	42.11	74.00	-31.89	peak	H
2	7236.00	12.54	38.61	51.15	74.00	-22.85	peak	H
3	4824.00	6.41	37.45	43.86	74.00	-30.14	peak	V
4	7236.00	12.54	39.66	52.20	74.00	-21.80	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	44.97	51.51	74.00	-22.49	peak	H
2	7311.00	12.72	39.35	52.07	74.00	-21.93	peak	H
3	4874.00	6.54	45.15	51.69	74.00	-22.31	peak	V
4	7311.00	12.72	40.16	52.88	74.00	-21.12	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	42.32	48.98	74.00	-25.02	peak	H
2	7386.00	12.90	36.72	49.62	74.00	-24.38	peak	H
3	4924.00	6.66	42.52	49.18	74.00	-24.82	peak	V
4	7386.00	12.90	38.55	51.45	74.00	-22.55	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 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	42.31	48.72	74.00	-25.28	peak	H
2	7236.00	12.54	37.27	49.81	74.00	-24.19	peak	H
3	4824.00	6.41	36.18	42.59	74.00	-31.41	peak	V
4	7236.00	12.54	38.87	51.41	74.00	-22.59	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	43.75	50.29	74.00	-23.71	peak	H
2	7311.00	12.72	40.14	52.86	74.00	-21.14	peak	H
3	4874.00	6.54	35.66	42.20	74.00	-31.80	peak	V
4	7311.00	12.72	35.29	48.01	74.00	-25.99	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	41.33	47.99	74.00	-26.01	peak	H
2	7386.00	12.90	40.51	53.41	74.00	-20.59	peak	H
3	4924.00	6.66	40.02	46.68	74.00	-27.32	peak	V
4	7386.00	12.90	37.88	50.78	74.00	-23.22	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 (Chain 0+1)

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	42.89	49.30	74.00	-24.70	peak	H
2	7236.00	12.54	37.39	49.93	74.00	-24.07	peak	H
3	4824.00	6.41	42.35	48.76	74.00	-25.24	peak	V
4	7236.00	12.54	37.28	49.82	74.00	-24.18	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 (Chain 0+1)

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	42.58	49.12	74.00	-24.88	peak	H
2	7311.00	12.72	39.53	52.25	74.00	-21.75	peak	H
3	4874.00	6.54	38.59	45.13	74.00	-28.87	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 (Chain 0+1)

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	43.76	50.42	74.00	-23.58	peak	H
2	7386.00	12.90	37.89	50.79	74.00	-23.21	peak	H
3	4924.00	6.66	45.50	52.16	74.00	-21.84	peak	V
4	7386.00	12.90	39.58	52.48	74.00	-21.52	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 2422 MHz (Chain 0+1)

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	45.93	52.39	74.00	-21.61	peak	H
2	7236.00	12.54	40.46	53.00	74.00	-21.00	peak	H
3	4844.00	6.46	38.80	45.26	74.00	-28.74	peak	V
4	7236.00	12.54	38.20	50.74	74.00	-23.26	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 (Chain 0+1)

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	39.01	45.55	74.00	-28.45	peak	H
2	7311.00	12.72	35.76	48.48	74.00	-25.52	peak	H
3	4874.00	6.54	43.16	49.70	74.00	-24.30	peak	V
4	7311.00	12.72	38.03	50.75	74.00	-23.25	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 (Chain 0+1)

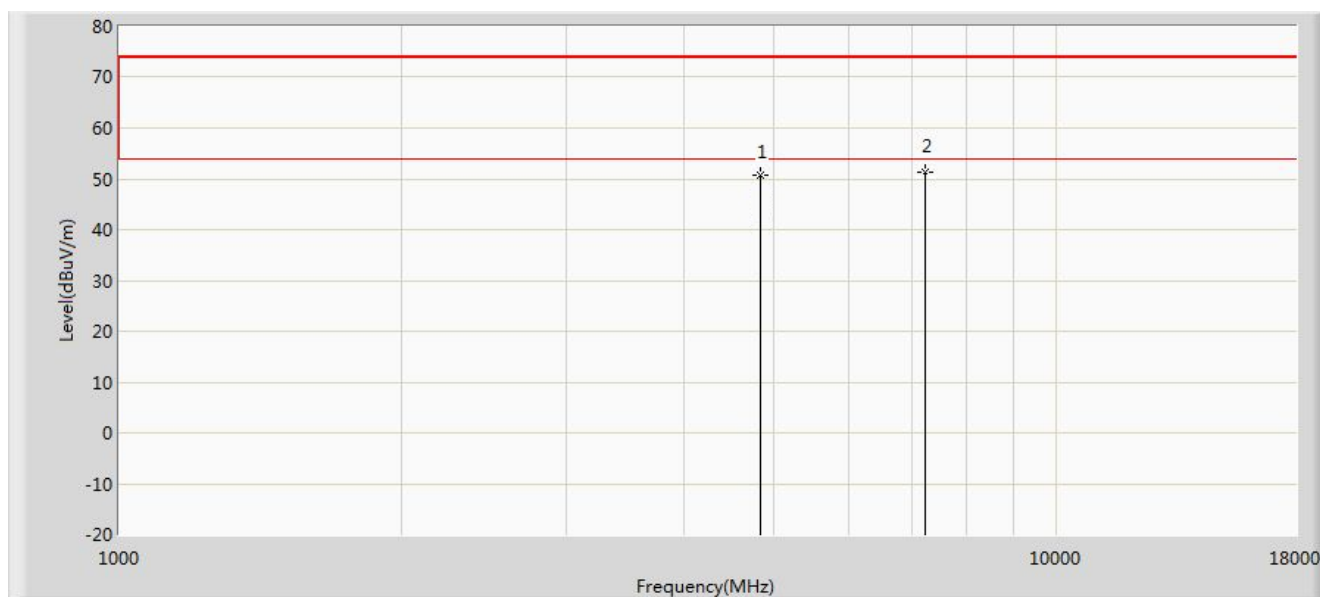
No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	AntPol. H/V
1	4904.00	6.61	44.23	50.84	74.00	-23.16	peak	H
2	7356.00	12.83	40.25	53.08	74.00	-20.92	peak	H
3	4904.00	6.61	44.57	51.18	74.00	-22.82	peak	V
4	7356.00	12.83	40.13	52.96	74.00	-21.04	peak	V

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: 2017/04/09
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D(1-18GHz)	Polarity: Horizontal
EUT: QCNFA344A	Power: 120V/60HZ
Note : Transmit by 802.11g 2462 MHz	



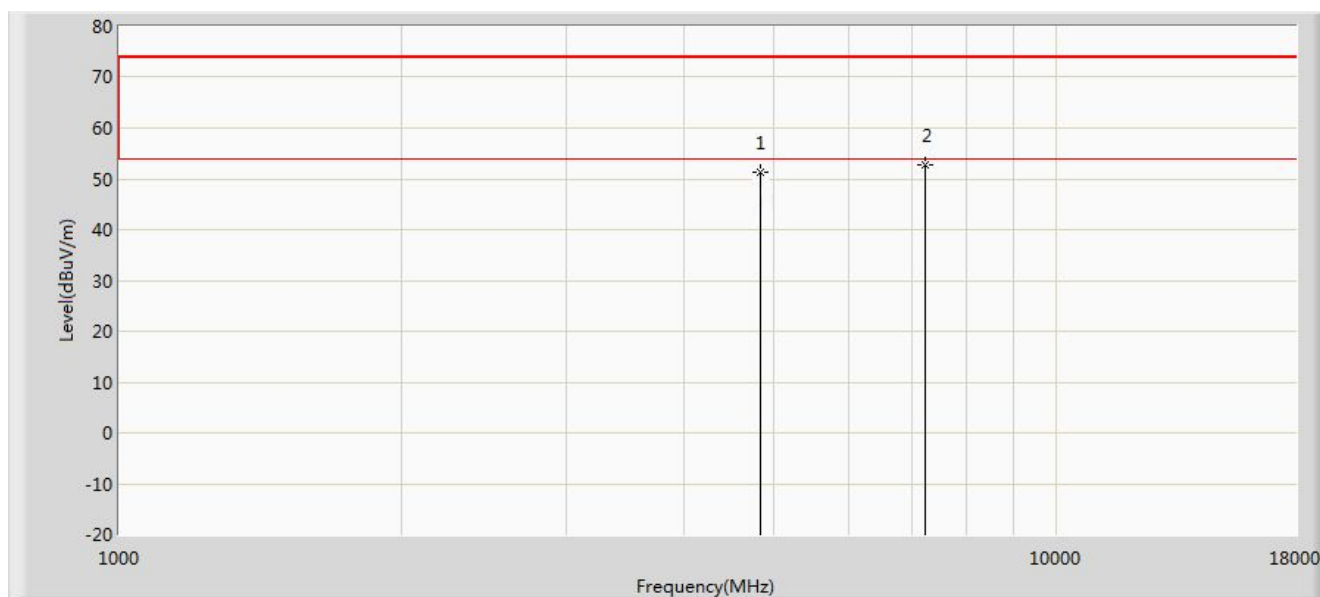
No	Mark	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Type
1		4924.00	6.66	41.33	47.99	74.00	-26.01	PK
2	*	7386.00	12.90	40.51	53.41	74.00	-20.59	PK

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: 2017/04/09
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D(1-18GHz)	Polarity: Vertical
EUT: QCNFA344A	Power: 120V/60HZ
Note : Transmit by 802.11g 2462 MHz	



No	Mark	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Type
1		4924.00	6.66	40.02	46.68	74.00	-27.32	PK
2	*	7386.00	12.90	37.88	50.78	74.00	-23.22	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).

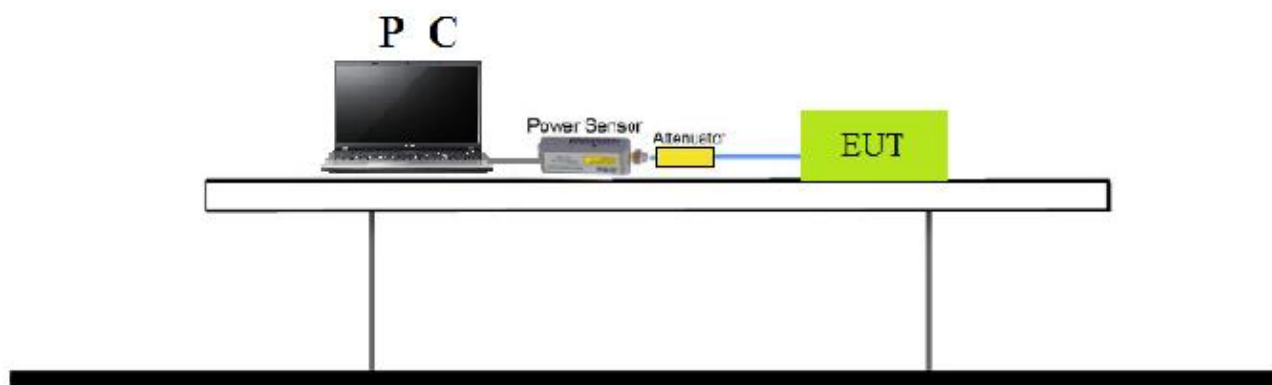
Per RSS247 Issue 1 Section 5.4(4), for DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum conducted output power shall not exceed 1W.

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 D01v04 - Section 9.2.3.2 AVGPM-G Average Power Method.

The Maximum peak conducted output power using KDB 558074 D01v04 - Section 9.1.1 RBW ≥ DTS bandwidth Method.

5.3 Test Setup Layout





5.4 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 PEAK POWER

Test Item	Maximum Output Power
Test Mode	Transmit by 802.11b
Test Date	2017-04-12

Channel No.	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Required Limit (dBm)	Result
		Chain 0	Chain 1				
01	2412	22.17	21.85	318.07	25.03	30	Pass
06	2437	22.17	22.09	326.60	25.14	30	Pass
11	2462	22.14	21.99	321.83	25.08	30	Pass

Test Item	Maximum Output Power
Test Mode	Transmit by 802.11g
Test Date	2017-04-12

Channel No.	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Required Limit (dBm)	Result
		Chain 0	Chain 1				
01	2412	20.92	21.00	249.57	23.97	30	Pass
06	2437	22.75	22.72	375.38	25.74	30	Pass
11	2462	21.25	20.98	258.55	24.13	30	Pass

Test Item	Maximum Output Power
Test Mode	Transmit by 802.11ac(20MHz)
Test Date	2017-04-12

Channel No.	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Required Limit (dBm)	Result
		Chain 0	Chain 1				
01	2412	20.79	20.44	230.46	23.63	30	Pass
06	2437	22.94	22.84	389.08	25.90	30	Pass
11	2462	19.60	19.75	185.62	22.69	30	Pass



Test Item	Maximum Output Power
Test Mode	Transmit by 802.11ac(40MHz)
Test Date	2017-04-12

Channel No.	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Required Limit (dBm)	Result
		Chain 0	Chain 1				
03	2422	18.16	18.27	132.60	21.23	30	Pass
06	2437	23.55	23.29	439.77	26.43	30	Pass
09	2452	16.23	16.23	84.01	19.24	30	Pass



FOR AVERAGE POWER

Test Item	Maximum Output Power
Test Mode	Transmit by 802.11b
Test Date	2017-04-12

Channel No.	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Required Limit (dBm)	Result
		Chain 0	Chain 1				
01	2412	20.39	20.34	217.64	23.38	30	Pass
06	2437	20.44	20.45	221.63	23.46	30	Pass
11	2462	20.38	20.34	217.17	23.37	30	Pass

Test Item	Maximum Output Power
Test Mode	Transmit by 802.11g
Test Date	2017-04-12

Channel No.	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Required Limit (dBm)	Result
		Chain 0	Chain 1				
01	2412	17.78	17.85	121.00	20.83	30	Pass
06	2437	19.37	19.32	171.97	22.35	30	Pass
11	2462	17.97	17.96	125.14	20.97	30	Pass

Test Item	Maximum Output Power
Test Mode	Transmit by 802.11ac(20MHz)
Test Date	2017-04-12

Channel No.	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Required Limit (dBm)	Result
		Chain 0	Chain 1				
01	2412	16.82	16.80	95.88	19.82	30	Pass
06	2437	19.21	19.27	167.97	22.25	30	Pass
11	2462	15.91	15.90	77.85	18.91	30	Pass



Test Item	Maximum Output Power
Test Mode	Transmit by 802.11ac(40MHz)
Test Date	2017-04-12

Channel No.	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Required Limit (dBm)	Result
		Chain 0	Chain 1				
03	2422	12.90	12.92	39.08	15.92	30	Pass
06	2437	18.38	18.31	136.74	21.36	30	Pass
09	2452	10.95	10.97	24.94	13.97	30	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 D01v04 – Section 12.2.4 (peak power measurements)

KDB 558074 D01v04 – 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 $VBW=82\text{Hz}$; For g mode $VBW=510\text{Hz}$; For n(20MHz) mode $VBW=560\text{Hz}$; For n(40MHz) mode $VBW=1.1\text{KHz}$.

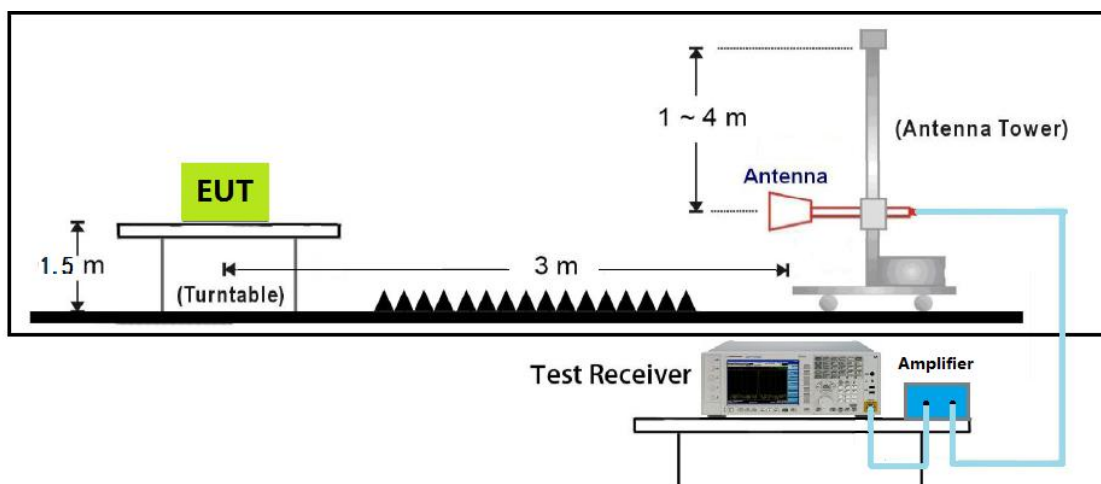
4. De As an alternative, the instrument may be set to linear detector mode. Ensure that video filtering is applied in linear voltage domain (rather than in a log or dB domain). Some instruments require linear display mode in order to accomplish this. Others have a setting for Average-VBW Type, which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



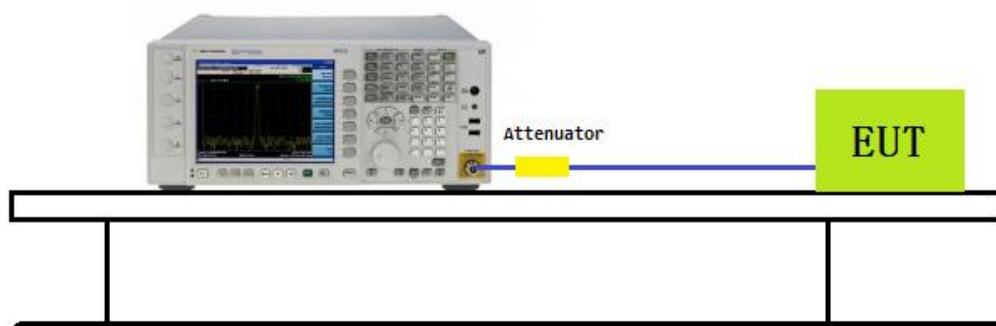
6.4 Test Setup Layout

Radiated



Conducted

Spectrum Analyzer





6.5 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	62.384	29.273	-11.616	74.000	33.111	PK	H
2	2390.000	50.645	17.534	-3.355	54.000	33.111	AV	H
3	2390.000	62.571	29.460	-11.429	74.000	33.111	PK	V
4	2390.000	50.362	17.251	-3.638	54.000	33.111	AV	V
5	2483.500	63.407	29.914	-10.593	74.000	33.493	PK	H
6	2483.500	50.197	16.704	-3.803	54.000	33.493	AV	H
7	2483.500	62.830	29.337	-11.170	74.000	33.493	PK	V
8	2483.500	49.410	15.917	-4.590	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	50.253	17.142	-3.747	54.000	33.111	AV	H
3	2390.000	64.489	31.378	-9.511	74.000	33.111	PK	V
4	2390.000	50.431	17.320	-3.569	54.000	33.111	AV	V
5	2483.500	65.046	31.553	-8.954	74.000	33.493	PK	H
6	2483.500	51.824	18.331	-2.176	54.000	33.493	AV	H
7	2483.500	64.550	31.057	-9.450	74.000	33.493	PK	V
8	2483.500	50.642	17.149	-3.358	54.000	33.493	AV	V

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

**802.11n20 (Chain 0+1)**

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	64.981	31.870	-9.019	74.000	33.111	PK	H
2	2390.000	49.824	16.713	-4.176	54.000	33.111	AV	H
3	2390.000	64.948	31.837	-9.052	74.000	33.111	PK	V
4	2390.000	50.001	16.890	-3.999	54.000	33.111	AV	V
5	2483.500	69.634	36.141	-4.366	74.000	33.493	PK	H
6	2483.500	51.951	18.458	-2.049	54.000	33.493	AV	H
7	2483.500	69.490	35.997	-4.510	74.000	33.493	PK	V
8	2483.500	51.670	18.177	-2.330	54.000	33.493	AV	V

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

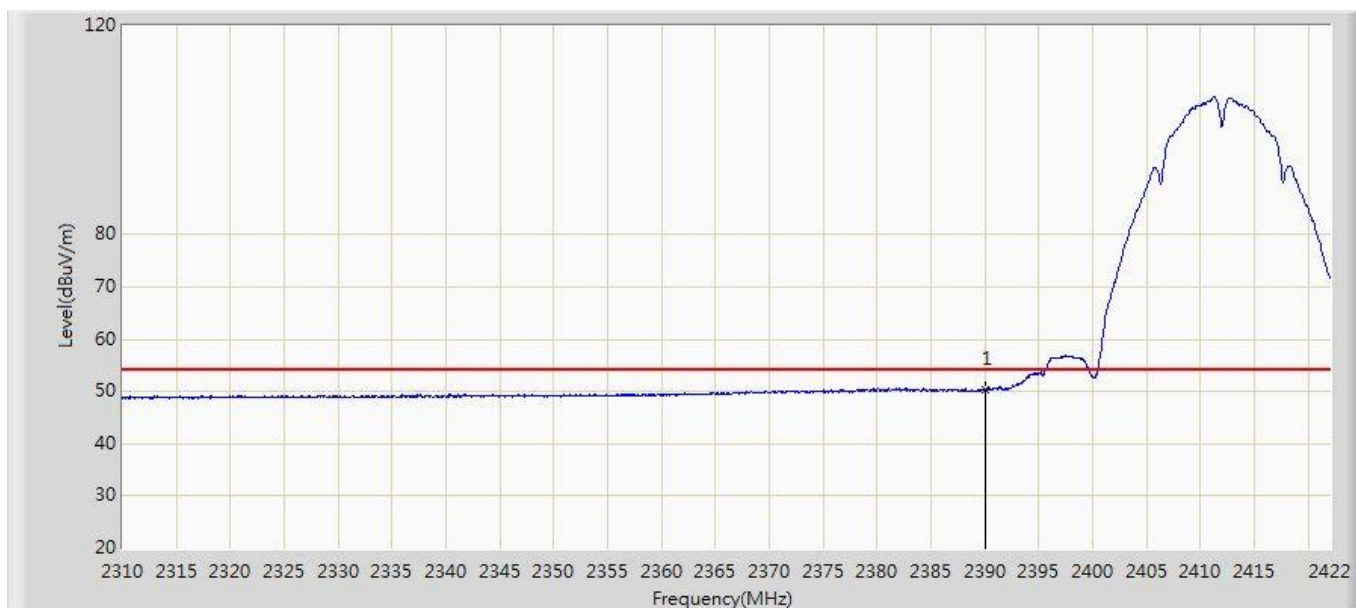
802.11n40 (Chain 0+1)

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	71.693	38.582	-2.307	74.000	33.111	PK	H
2	2390.000	50.199	17.088	-3.801	54.000	33.111	AV	H
3	2390.000	70.451	37.340	-3.549	74.000	33.111	PK	V
4	2390.000	49.853	16.742	-4.147	54.000	33.111	AV	V
5	2483.500	69.338	35.845	-4.662	74.000	33.493	PK	H
6	2483.500	50.962	17.469	-3.038	54.000	33.493	AV	H
7	2483.500	66.958	33.465	-7.042	74.000	33.493	PK	V
8	2483.500	50.586	17.093	-3.414	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: 2017/04/06
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	

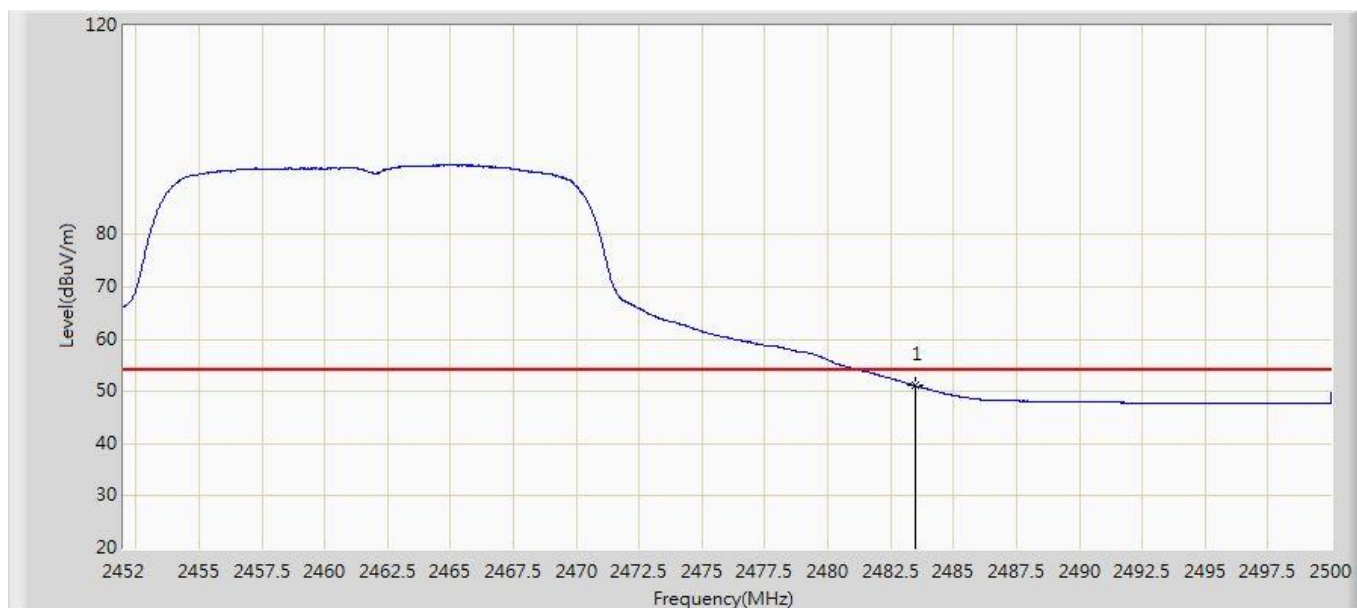


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2390.000	50.645	17.534	-3.355	54.000	33.111	AV

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



Site: AC102	Time: 2017/04/06
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	

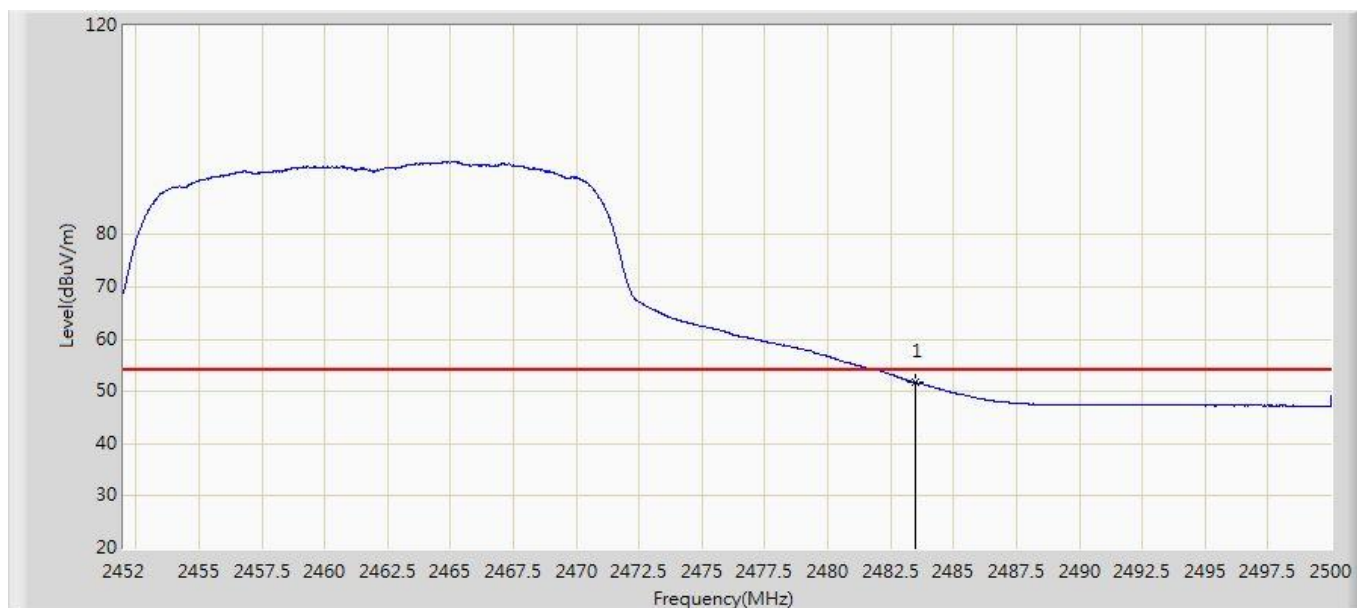


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2483.500	51.824	18.331	-2.176	54.000	33.493	AV

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



Site: AC102	Time: 2017/04/06
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 (Chain 0+1)	

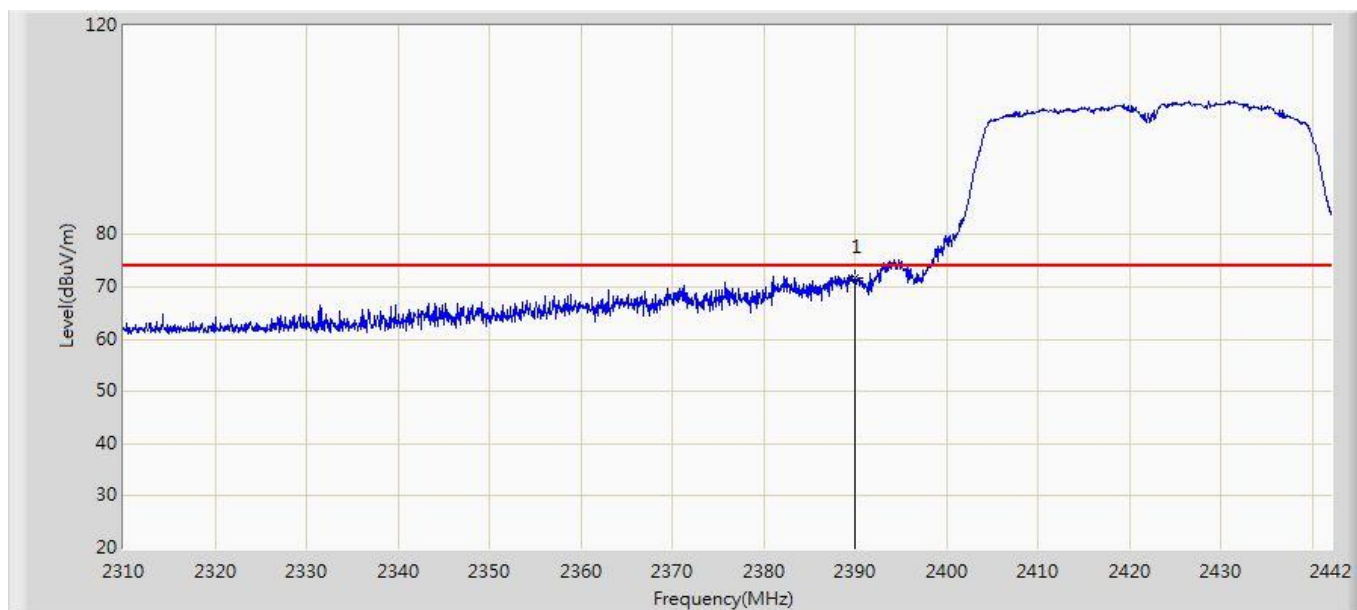


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2483.500	51.951	18.458	-2.049	54.000	33.493	AV

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



Site: AC102	Time: 2017/04/06
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA9120D(1-18GHz)	Polarity: Horizontal
EUT: QCNFA435	Power: AC 120V/60Hz
Note: Model1: Transmit at 2422MHz by 802.11n40 (Chain 0+1)	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2390.000	71.693	38.582	-2.307	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.