

TEST REPORT

According to

CFR 47 Part 15 Subpart C-15.247

Test Report No : CSTPOC12-FCC0043

EQUIPMENT NAME	:	Access Point
MODEL NO.	:	WRO-100
APPLICANT	:	OPHIT CO., LTD.
MANUFACTURER	:	OPHIT CO., LTD.
TEST STANDARD	:	FCC CFR 47, Part 15. Subpart C-15.247
TEST METHOD	:	ANSI C63.4(2003)
FCC ID	:	R6E-WRO-100

This report applies only to the product named in the title of this report manufactured at the location indicated.

Test results apply only to the particular equipment and functionality described in this test report.

This is the result of test that was carried out from the submitted type-samples of a product in conformity with the specification of the respective standards.

Date : December 21, 2012

Date : December 21, 2012



Tested by
Kwang Min, Lee



Approved by
Ik Seon, Jeong

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Table of Contents

1. General Information	3
1.1 General Description of EUT	3
1.2 Basic Description of EUT	4
1.3 Antenna Description	5
2. Summary of test results	6
2.1 Measurement uncertainty	7
2.2 Testing Facility	8
3. TEST Instruments	9
4. Configuration of system under test	11
4.1 Conducted Test Setup	11
4.2 Radiated Test Setup	12
4.3 Description of support units	13
4.4 Test Software Power Setting (Power Parameters of IEEE 802.11 b/g/n(HT20)	13
4.5 Test Software Power Setting (Power Parameters of IEEE 802.11 n(HT40)	14
5. Test mode applicability and tested channel detail	14
6. Measurement results	15
6.1 6dB Spectrum Bandwidth Measurement	15
6.2 Max. Conducted peak output power	26
6.3 Conducted peak power spectral density	30
6.4 Band-edge Compliance of RF Conducted emissions	42
6.5 Band-edge Compliance of RF Radiated emissions	48
6.6 Spurious RF Conducted emissions	55
6.7 Spurious RF Radiated emissions	67
6.8 Antenna requirement	88
6.9 AC Power Conducted emissions	89

1. General Information

1.1 General Description of EUT

Applicant's Information	
Company Name	OPHIT CO., LTD.
Address	#302, Suntechnovil, 5-27 Mangpo-dong, Yeongtong-gu, Suwon-city, Gyeonggi-do, Korea
Name For Contact Purposes	Eui-Seok Kang
E-mail	onlyqa@ophit.com
Telephone no.	+82-31-205-4191
Fax no.	+82-31-205-4197

Manufacturer Information	
Company Name	OPHIT CO., LTD.
Address	#302, Suntechnovil, 5-27 Mangpo-dong, Yeongtong-gu, Suwon-city, Gyeonggi-do, Korea

1.2 Basic Description of EUT

Basic Description of EUT		
Equipment Name	:	Access Point
Model NO.	:	WRO-100
Serial NO.	:	Proto Type
Frequency Range	:	2412 MHz ~ 2472 MHz (802.11 b, g, n(HT20)), 2422 MHz ~ 2462 MHz (802.11 n(HT40))
Channel	:	13 (802.11 b, g, n(HT20)), 9 (802.11 n(HT40))
Data spreading Method	:	DSSS(802.11b), OFDM (802.11g, n(HT20), n(HT40))
Emission Type	:	G1D, D2D
Communication Type	:	Half duplex
Oscillation Type	:	PLL
RF Output Power	:	802.11b : 9.80 dBm (Port 1), 9.80 dBm (Port 2) 12.43 dBm (Port 1 + Port 2) 802.11g : 9.70 dBm (Port 1), 9.48 dBm (Port 2) 12.35 dBm (Port 1 + Port 2) 802.11n(HT20) : 10.02 dBm (Port 1), 10.03 dBm (Port 2) 12.78 dBm (Port 1 + Port 2) 802.11n(HT40) : 10.11 dBm (Port 1), 10.25 dBm (Port 2) 12.95 dBm (Port 1 + Port 2)
* It is maximum peak conducted power in band		
Power Source	:	AC 110V Adaptor (Input : AC 100V~240V, Output : DC +5V 2.0A)
Dimension	:	140 mm x 85 mm x 50 mm
FCC ID	:	R6E-WRO-100

1.3 Antenna Description

Antenna Description

Type of Antenna : Omni directional ANT. (2ea)
Connector Type : SMA
Frequency Range : 2.4 GHz ~ 2.5 GHz
Model Name : K181-510049-A
Polarization : Linear Vertical
Length : 120 mm
Gain : For all transmitter outputs with equal antenna gains, directional gain is to be computed as follows
1) Any transmit signals are correlated, Directional Gain
= $G_{ANT} + 10 \log(N) \text{ dBi} = 2 + 10 \log(2) = 5 \text{ dBi}$
2) All transmit signals are completely uncorrelated, Directional Gain
= $G_{ANT} = 2 \text{ dBi}$

2. Summary of test results

The EUT has been tested according to the follow specification:

Description of Test	FCC Rule	Reference Clause	Pass/Fail	Test Result
6dB Spectrum Bandwidth	15.247(a)(2)	Clause 5.1	Pass	Compliance
Max. Conducted peak output power	15.247(b)(1)	Clause 5.4	Pass	Compliance
Conducted peak output power spectrum density	15.247(e)	Clause 5.5	Pass	Compliance
Band edge compliance of RF conducted emissions	15.247(d)	Clause 5.6	Pass	Compliance
Band edge compliance of RF radiated emissions	15.247(d) 15.205 & 15.209	Clause 5.7	Pass	Compliance
Spurious RF conducted emissions	15.247(d)	Clause 5.8	Pass	Compliance
Spurious RF radiated emissions	15.247(d), 15.209	Clause 5.9	Pass	Compliance
Antenna requirement	15.203, 15.247	Clause 5.10	Pass	Compliance
AC Power line Conducted emission	15.207	Clause 5.10	Pass	Compliance
Compliance : The EUT complies with the essential requirements in the standard. Not Compliance : The EUT does not comply with the essential requirements in the standard. N/A : The test was not applicable in the standard.				
<ul style="list-style-type: none"> The measurement report and tested in accordance with measurement procedures specified in <u>ANSI C 63.4-2003</u>. 				

I hereby declare that I am entitled to sign on behalf of the applicant and that the information supplied is correct and complete.

Name	Kwang Min, Lee
Position held	Engineer / RF Team
Date	December 21, 2012

Begin Test : November 26, 2012

End Test : December 12, 2012

2.1 Measurement uncertainty

Conducted Emissions

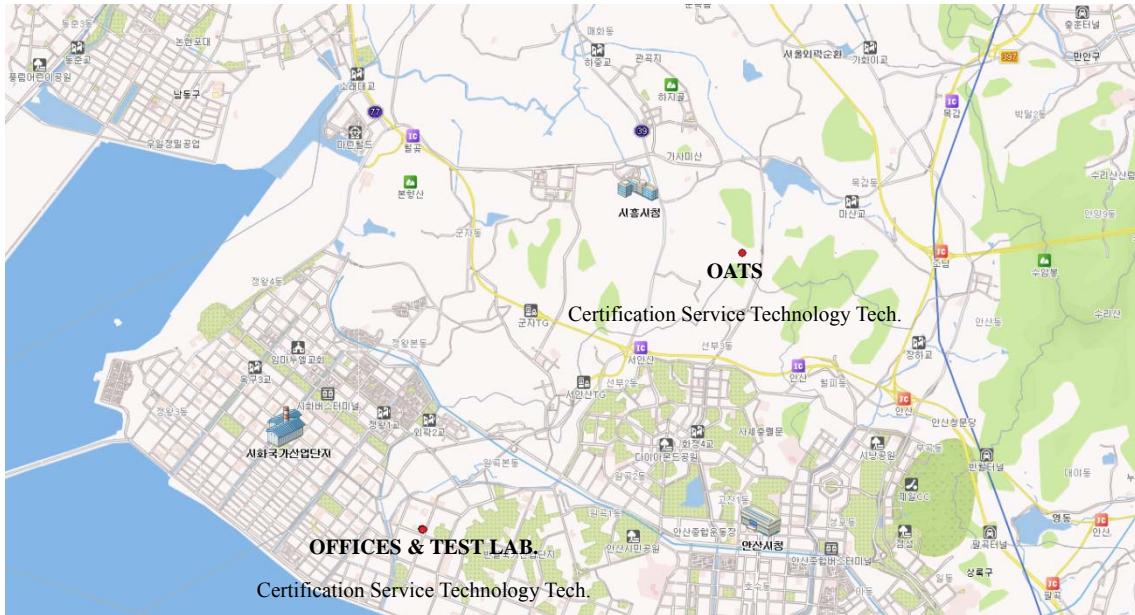
TYPE	Contribution	Probability Distribution	Uncertainty	Remark
B	LISN			
	Impedance	normal(k=2)	±1.3	CAL.
	Voltage Division Factor	normal(k=2)	±0.12	CAL.
	cable	normal (k=2)	±0.2	NONCAL.
	Receiver			
	Input Impedance	normal(k=1.64)	±0.0070	
	QP Sine-Wave Voltage Accuracy	normal(k=2)	±0.20 dB	
	QP-Pulse Amplitude Sensibility	normal(k=2)	±0.40 dB	CAL.
	QP-Pulse Frequency Response	normal(k=2)	±0.57 dB	
	Random Noise	normal(k=2)	±0.35 dB	
A	Mismatch			
	AMN to Receiver	U-Shaped	+0.7/-0.8	CISPR Theory
A	System Repeatability	Std deviation	±0.0721	
Combined Standard Uncertainty		normal	± 1.1155 [dB]	
Expanded Uncertainty U		normal(k=2)	± 2.23	95.45 %

Radiated Emission

TYPE	Contribution	Probability Distribution	Uncertainty 3/10m	Remark
B	Antenna factor			
	frequency interpolation	normal(k=2)	±0.5 dB	
	height variation	rectangular	±0.1039 dB	NPL
	direcvalupsy difference	rectangular	+1.5/-2.6 dB	NAMAS
	phase center location	rectangular	+0/-1.0 dB ±1.0 dB	NAMAS
	Cable loss	normal(k=2)	±0.5 dB	
	Receiver			
	Input Impedance	normal(k=1.64)	±0.0070	
	QP Sine-Wave Voltage Accuracy	normal(k=2)	±0.20 dB	
	QP-Pulse Amplitude Sensibility	normal(k=2)	±0.40 dB	
A	QP-Pulse Frequency Response	normal(k=2)	±0.57 dB	
	Random Noise	normal(k=2)	±0.35 dB	
	Mismatch : AMN – receiver $\left \frac{\Gamma_{\text{antenna}}}{\Gamma_{\text{receiver}}} \right = 0.33$	U-Shaped	+0.9/-1.0 dB	CISPR
A	System repeatability	Std deviation	±0.1149 dB	
Combined standard Uncertainty		normal	± 1.3193 [dB]	
Expanded Uncertainty U		normal(k=2)	± 2.63	95.45 %

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of $k = 2$.

2.2 Testing Facility



We, Certification Service Technology Inc. are an independent EMC and RF consultancy that was established the whole facility in our laboratories. The test facility has been accredited by the following accreditation Bodies in compliance with ISO 17025:

Test laboratory and address	Certification Service Technology Inc. (CSTech) 1055, Singil-dong, Danwon-gu, Ansan-si, Gyeonggi-do, Korea 425-839
FCC registration number	289252
IC registration number	10024A
KCC registration number (Korea Communication Commission)	KR0074
Contact Person	Ik Seon Jeong Testing Manager
e-mail	isjeong@cstlab.co.kr
Tel	82-31-493-2001
Fax	82-31-493-2055

3. TEST Instruments

No	Description	Model	Manufacturer	S/N	Next Calibration
1	Receiver	ER-265	LIG Nex 1	L0804B002	2013.07.05
2	Receiver	ER-30	LIG Nex 1	861743/024	2013.09.04
3	Bi-Log	3142	EMCO	9701-1128	2014.02.14
4	Biconical ANT.	3104C	EMCO	9012-4380	2013.01.03
5	Log Periodic ANT.	3146	EMCO	9008-2863	2014.03.13
6	LOOP ANT.	HFH2-Z2	Schwarz beck	100187	2013.07.21
7	DC Power Supply	6674A	Agilent	US36372373	2013.01.03
8	Dual Directional Coupler	778D	H.P	18592	2013.01.03
9	Signal Generator	E8257D	Agilent	MY47461024	2013.01.03
10	Signal Generator	E4432B	Agilent	US38441383	2013.01.03
11	Pulse/Pattern Generator	81110A	Agilent	DE41B02781	2013.01.03
12	Universal Radio Communication Tester	CMU200	Rohde &Schwarz	110665	2013.05.25
13	Modulation Analyzer	8901B	H.P	3438A05141	2013.05.25
14	Audio Analyzer	8903B	H.P	3514A16134	2013.06.05
15	Spectrum Analyzer	R3273	Advantest	121100554	2013.05.25
16	Spectrum Analyzer	E7405A	Agilent	US41110271	2013.01.03
17	Attenuator	8498A	H.P	1801A07058	2013.01.03
18	Horn Antenna	BBHA9120D	SCHWARZBECK	0501	2014.10.19
19	Horn Antenna	BBHA9170	SCHWARZBECK	BBHA9170152	2014.10.19
20	Digital Multimeter	45	FLUKE	76669036	2013.07.05
21	Digital Power Meter	ML2495A	Anritsu	824015	2013.01.03
22	High Accuracy Sensor	MA2445D	Anritsu	738191	2013.01.03
23	Highpass Filter	WHKX3.0/18G-10SS	WAINWRIGHT	84	2013.07.05
24	Highpass Filter	WHKX1.0/15G-10SS	WAINWRIGHT	2	2013.07.05
25	Band Reject Filter	WRCG824/849-814/859-80/16SS	WAINWRIGHT	1	2013.07.05
26	Band Reject Filter	WRCG890/915-880/925-80/16SS	WAINWRIGHT	2	2013.07.05
27	Band Reject Filter	WRCG1749.9/1784.9-1730/1805-90/14SS	WAINWRIGHT	6	2013.07.05

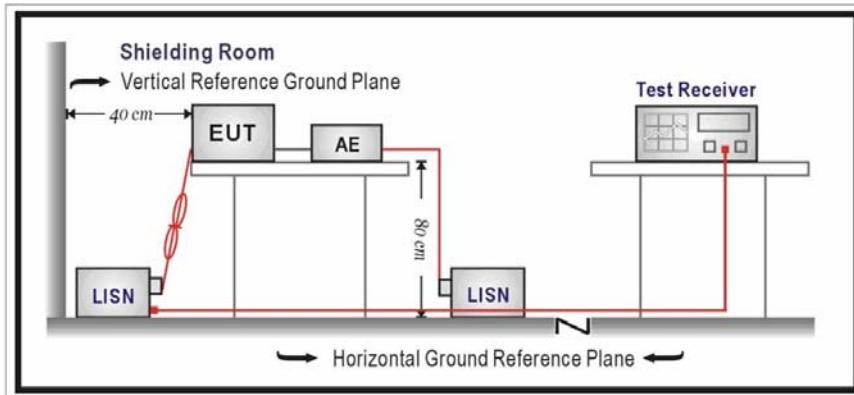
28	Band Reject Filter	WRCG1920/1980-1900/2000-80/14SS	WAINWRIGHT	42	2013.07.05
29	Band Reject Filter	WRCJ5125/5825-4950/6000-80/16SS	WAINWRIGHT	1	2013.07.05
30	TURN TABLE	Dail EMC	D-TT 06	N/A	N/A
31	ANT. MASTER	Dail EMC	D-AM 06	N/A	N/A
32	Controller	Dail EMC	D-CTR	N/A	N/A
33	TEMP&HUMID CHAMBER	KR-3001C	GOREAENG.	20080204-01	2013.01.19
34	TEMP&HUMID CHAMBER	SE-CT-02	SukSan Tech.	CST-RF-078	2013.01.03
35	Signal Generator	Agilent	E4438C	MY45093719	2013.12.03
36	POWER DIVIDER	KRYTAR	6010265	111194	2013.07.05
37	POWER DIVIDER	KRYTAR	6010265	111195	2013.07.05
38	POWER DIVIDER	KRYTAR	6010265	111196	2013.07.05

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to RRA, KRISS, KTL and HCT.
 2. The calibration interval of Horn ant. and Loop, Dipol ant. is 24 months

4. Configuration of system under test

4.1 Conducted Test Setup

AC Power Conducted Test



Limit Of Conducted Emission:

Test Specification

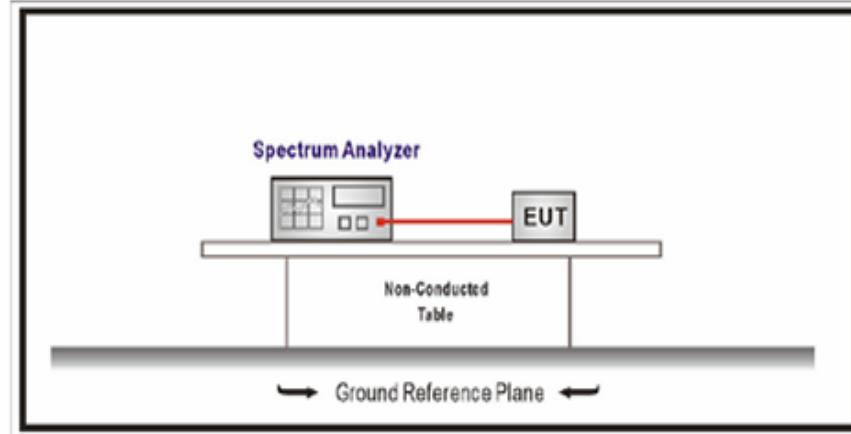
: According to FCC CFR Title 47 Part 15 Subpart C Section 15.207

FREQUENCY (MHz)	Limit	
	Quasi-peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5.0	56	46
5.0 to 30.0	60	50

*Decreases with the logarithm of the frequency.

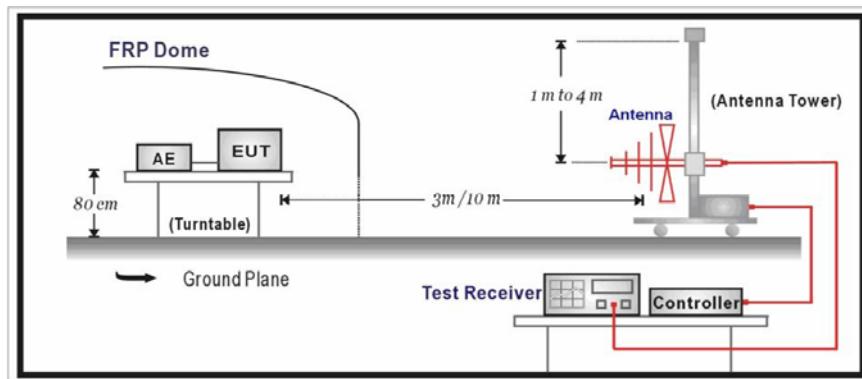
RF Conducted Test

RF Conducted Measurement:

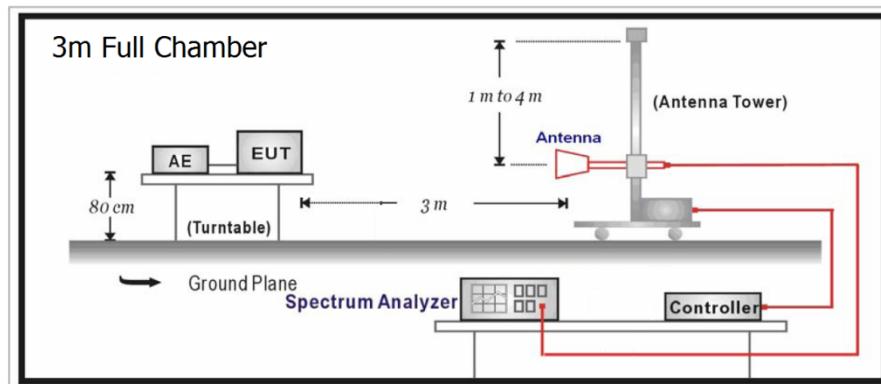


4.2 Radiated Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



Limit Of Radiated Emission :

Test Specification

: According to FCC CFR Title 47 Part 15 Subpart C Section 15.209, 15.247

Limits			
Frequency (MHz)	Field Strength (μ V/meter)	Measurement Distance (meters)	dB μ V/meter
0.009 – 0.490	2400/F (kHz)	300	88.52 – 53.80
0.490 – 1.705	24000/F (kHz)	30	53.80 – 42.97
1.705 – 30.0	30	30	49.54 – 49.54
30 – 88	100	3	40.00
88 – 216	150	3	43.52
216 – 960	200	3	46.02
Above 960	500	3	53.98

Remarks :

1. RF Voltage(dBuv)=20log RF Voltage(uV)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring

4.3 Description of support units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO	PRODUCT	MODEL NO.	SERIAL NO.	Mnufacture
1	Note Book PC	TG AVERAGEC8200	163293	Sam Bo Co., Ltd
2	LAN Cable	0239M	-	-
3	Adaptor	BPM010S05F04	K 1234	Bridge Power Corp.

4.4 Test Software Power Setting. (Power Parameters of IEEE 802.11 b/g/n(HT20))

TEST Mode		2412 MHz(1CH)	2442 MHz(7CH)	2472 MHz(13CH)
Target Power (Port 1)	IEEE802.11b	1B 00	1B 00	1B 00
	IEEE802.11g	1B 00	1B 00	1B 00
	IEEE802.11n(HT20)	1C 00	1C 00	1C 00
TEST Mode		2412 MHz(1CH)	2442 MHz(7CH)	2472 MHz(13CH)
Target Power (Port 2)	IEEE802.11b	03 00	03 00	03 00
	IEEE802.11g	06 00	06 00	06 00
	IEEE802.11n(HT20)	07 00	07 00	07 00

4.5 Test Software Power Setting.(Power Parameters of IEEE 802.11 n(HT40))

TEST Mode		2422 MHz(3CH)	2442 MHz(7CH)	2462 MHz(11CH)
Target Power (Port 1)	IEEE802.11n(HT40)	1E 04	1E 04	1E 04
TEST Mode		2422 MHz(3CH)	2442 MHz(7CH)	2462 MHz(11CH)
Target Power (Port 2)	IEEE802.11n(HT40)	09 00	09 00	09 00

5. Test mode applicability and tested channel detail

Test Items	Mode	Channel NO.	Operated Condition
6dB Spectrum Bandwidth	b/g/n(HT20)	1, 7, 13	Continuous modulation setting mode
	n(HT40)	3, 7, 11	
Conducted peak output power	b/g/n(HT20)	1, 7, 13	Continuous modulation setting mode
	n(HT40)	3, 7, 11	
Band-edge Compliance	b/g/n(HT20)	1, 13	Continuous modulation setting mode
	n(HT40)	3, 11	
Spurious RF conducted emissions	b/g/n(HT20)	1, 7, 13	Continuous modulation setting mode
	n(HT40)	3, 7, 11	
Spurious radiated emissions	b/g/n(HT20)	1, 7, 13	Continuous modulation setting mode
	n(HT40)	3, 7, 11	

*Note : Channel number is selected lowest, middle, highest channel modulation mode operation

6. Measurement Results

6.1 6dB Spectrum Bandwidth Measurement

6.1.1 Limit

For digital modulation systems, the minimum 6dB bandwidth shall be at least 500 kHz.

6.1.2 Test Environment conditions

- Ambient temperature : 22 °C,
- Relative Humidity : (54 ~ 55) % R.H.

6.1.3 Measuring Instruments and Setting

Please refer to section 4 of equipments list in this report. The following table is the setting of the spectrum analyzer.

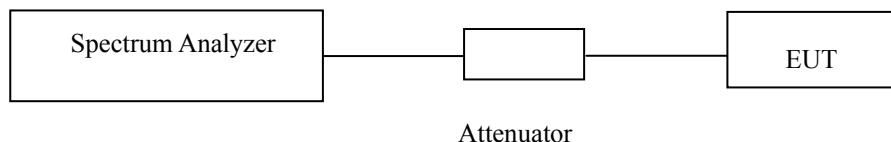
• Spectrum Parameters Setting

Attenuation : Auto
Span Frequency : > 6dB Bandwidth
RBW : 100 kHz
VBW : 300 kHz
Detector : Peak
Trace : Max Hold
Sweep Time : Auto

6.1.4 Test Procedures

- ① The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
- ② For 6dB Bandwidth the resolution bandwidth of 100 kHz and the video bandwidth of 300 kHz were used.
- ③ Measured the spectrum width with power higher than 6dB below carrier.
- ④ For 99% Occupied Bandwidth the resolution Bandwidth of 100 kHz and the video bandwidth of 300 kHz were used.

6.1.5 Test Setup Layout



6.1.6 Test Deviation

There is no deviation with the original standard.

6.1.7 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.1.8 Measurement Result

1) IEEE 802.11b Port 1

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Limit (kHz)	Result
1	2412	10.14	14.84	500	Pass
7	2442	8.52	14.66	500	Pass
13	2472	10.18	14.70	500	Pass

2) IEEE 802.11g Port 1

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Limit (kHz)	Result
1	2412	15.72	16.36	500	Pass
7	2442	15.68	16.36	500	Pass
13	2472	15.72	16.38	500	Pass

3) IEEE 802.11n(HT20) Port 1

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Limit (kHz)	Result
1	2412	15.16	17.36	500	Pass
7	2442	15.64	17.34	500	Pass
13	2472	15.98	17.30	500	Pass

4) IEEE 802.11n(HT40) Port 1

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Limit (kHz)	Result
3	2422	33.72	35.36	500	Pass
7	2442	33.80	35.36	500	Pass
11	2462	33.72	35.44	500	Pass

5) IEEE 802.11b Port 2

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Limit (kHz)	Result
1	2412	10.18	14.60	500	Pass
7	2442	10.20	14.64	500	Pass
13	2472	10.14	14.66	500	Pass

6) IEEE 802.11g Port 2

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Limit (kHz)	Result
1	2412	15.12	16.36	500	Pass
7	2442	15.42	16.32	500	Pass
13	2472	15.46	16.36	500	Pass

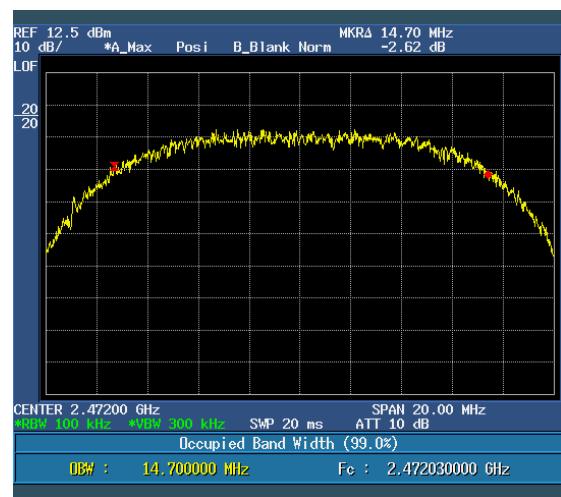
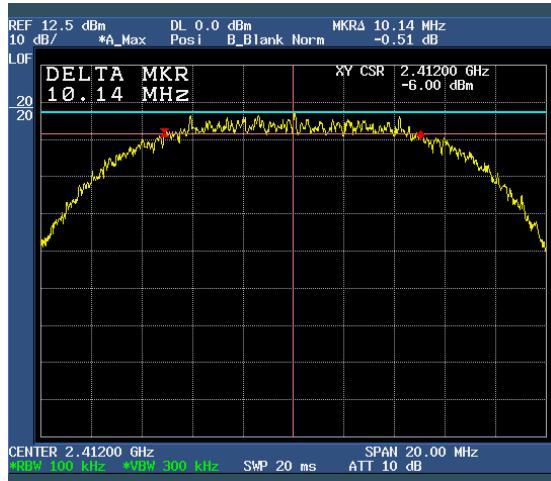
7) IEEE 802.11n(HT20) Port 2

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Limit (kHz)	Result
1	2412	15.88	17.28	500	Pass
7	2442	16.02	17.32	500	Pass
13	2472	16.52	17.26	500	Pass

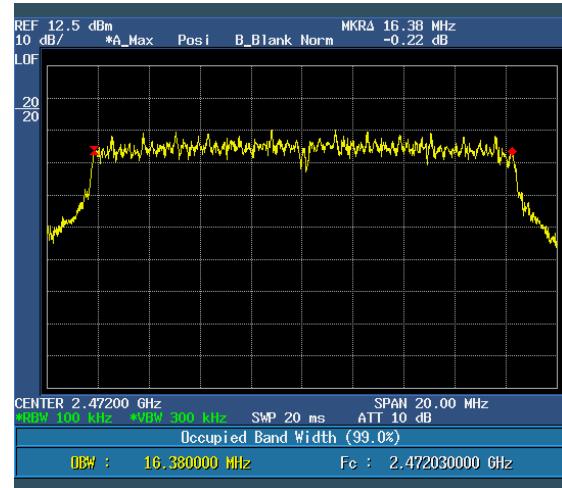
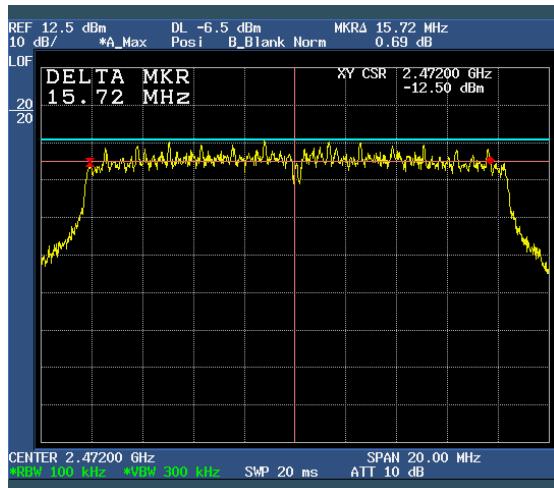
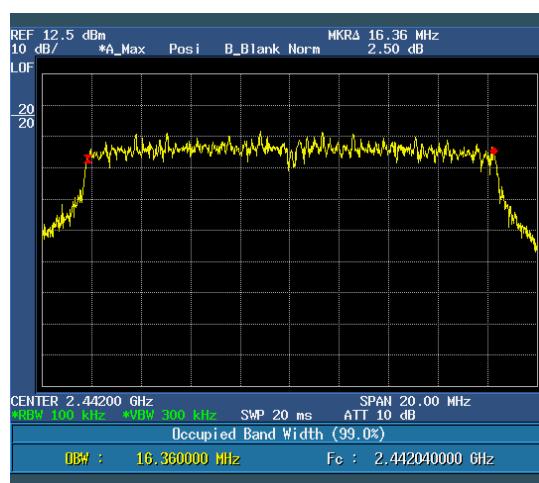
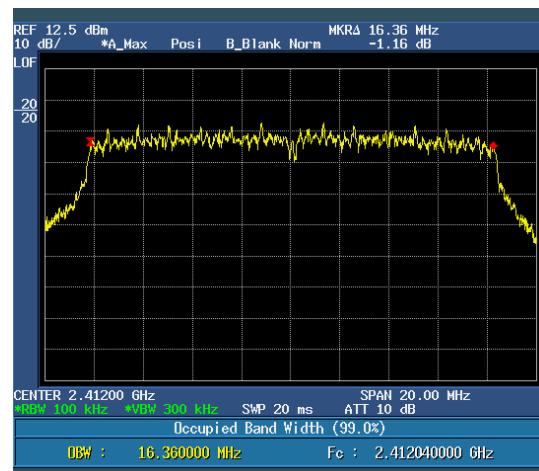
8) IEEE 802.11n(HT40) Port 2

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Limit (kHz)	Result
3	2422	33.76	35.36	500	Pass
7	2442	33.84	35.48	500	Pass
11	2462	33.92	35.40	500	Pass

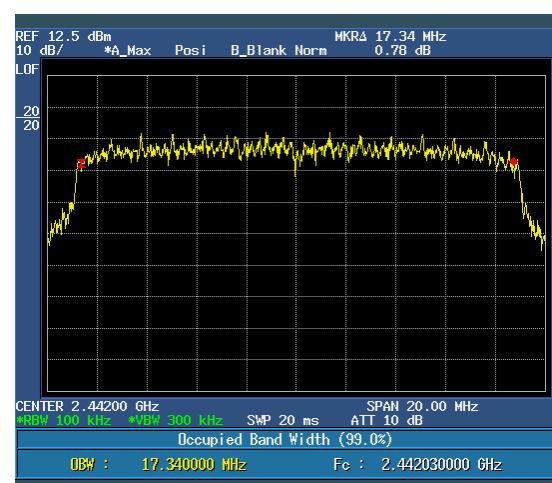
IEEE 802.11b Port 1



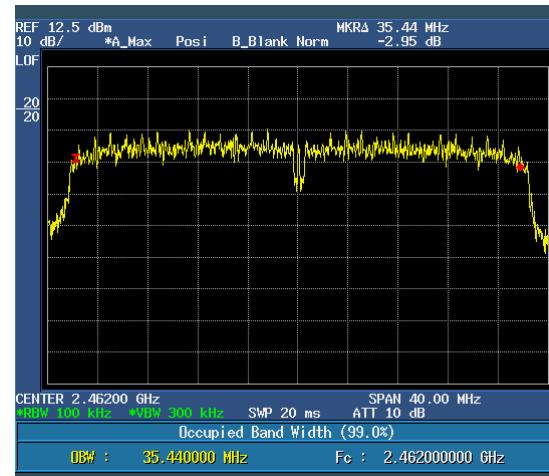
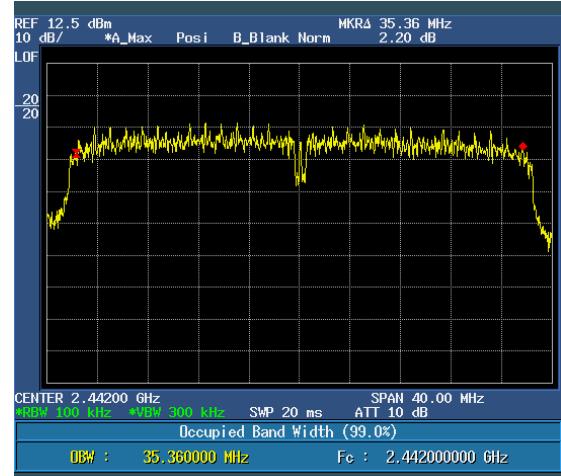
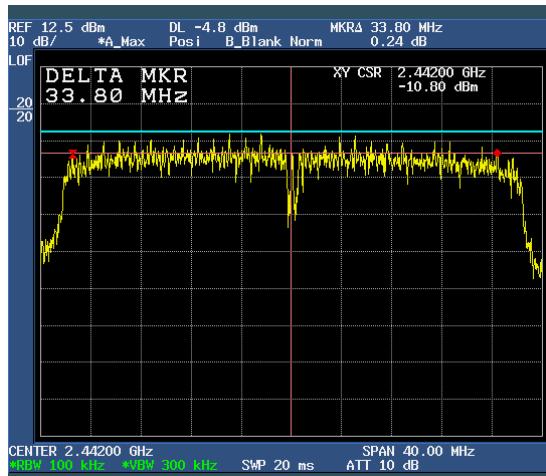
IEEE 802.11g Port 1



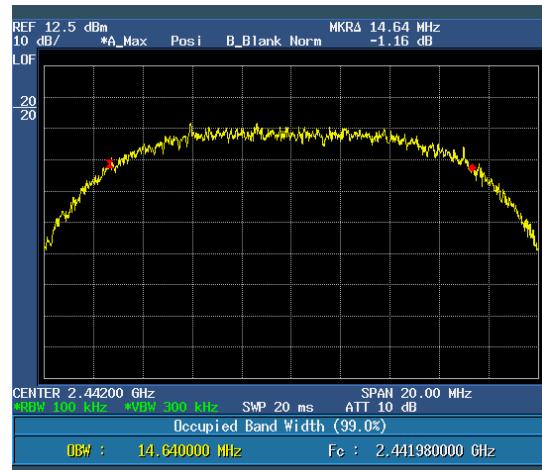
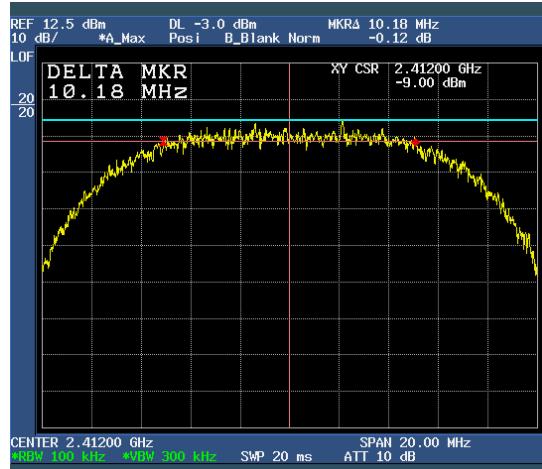
IEEE 802.11n(HT20) Port 1



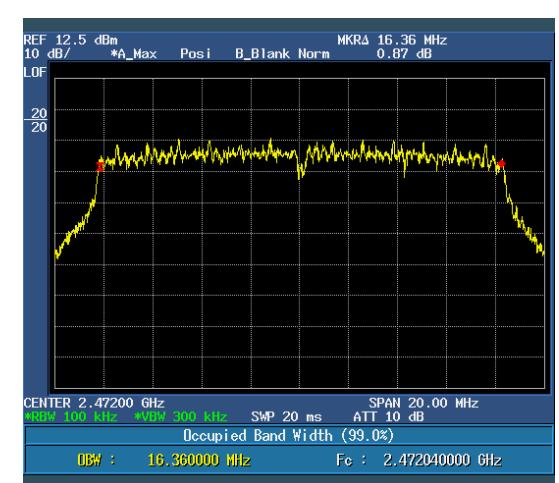
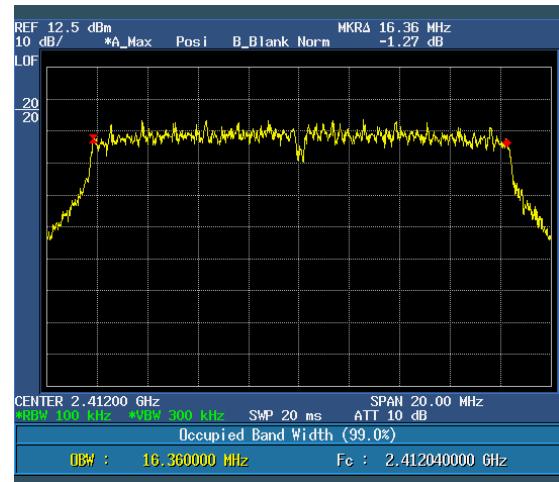
IEEE 802.11n(HT40) Port 1



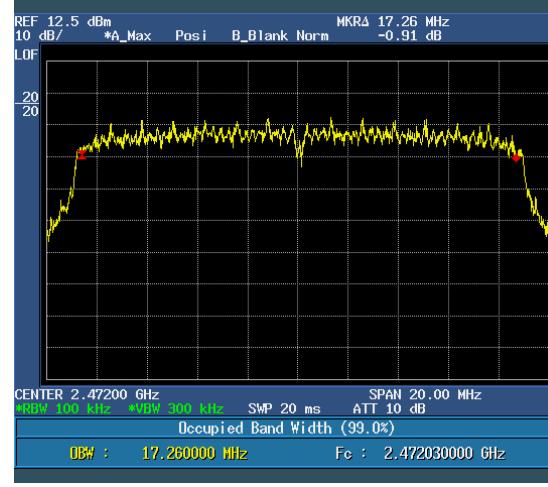
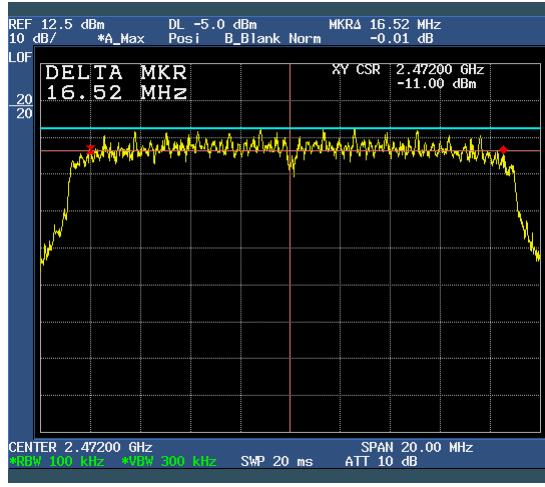
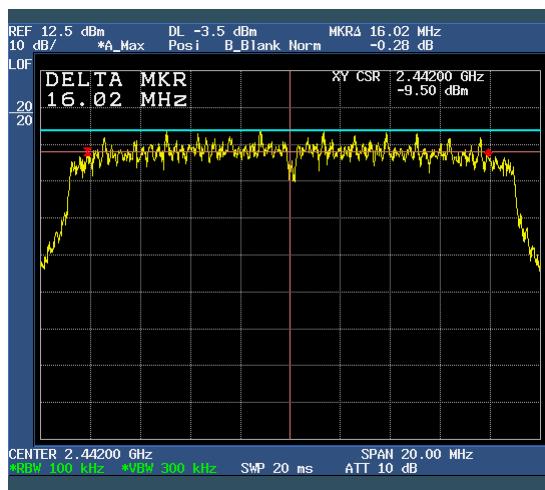
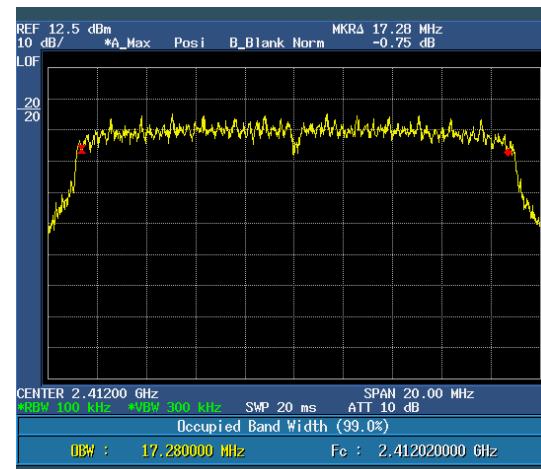
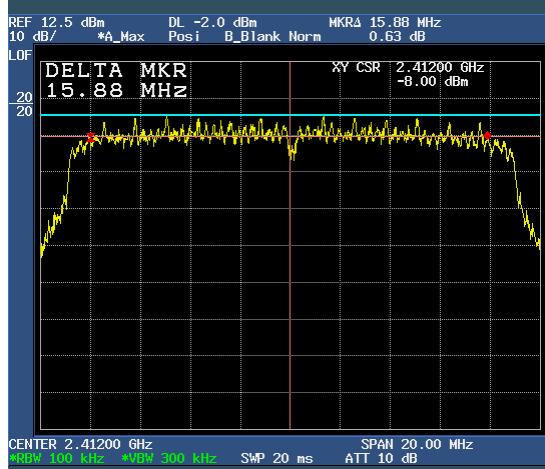
IEEE 802.11b Port 2



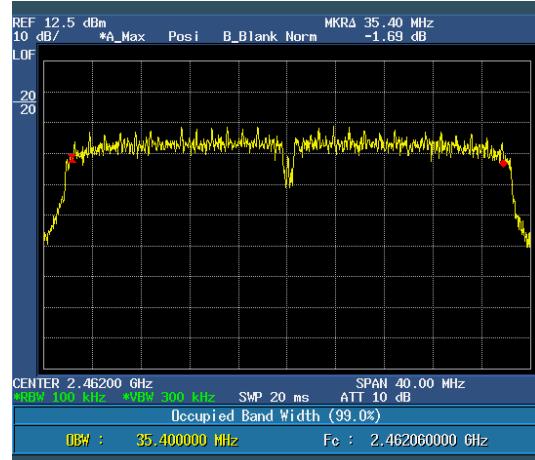
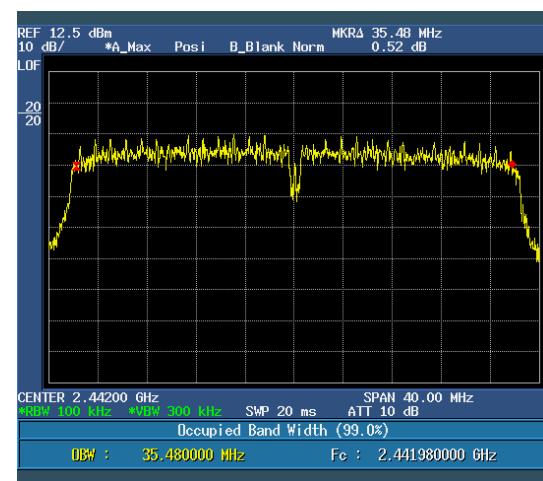
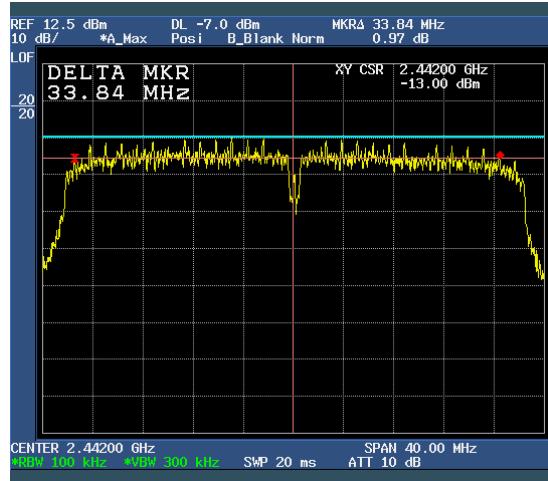
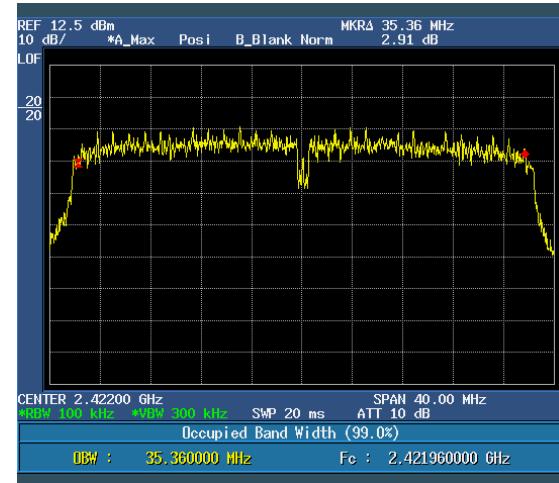
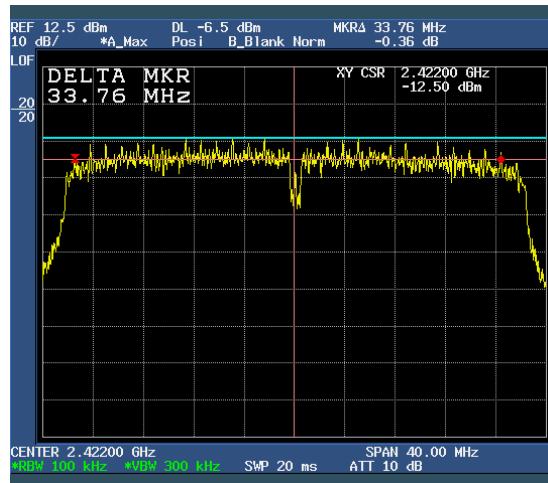
IEEE 802.11g Port 2



IEEE 802.11n(HT20) Port 2



IEEE 802.11n(HT40) Port 2



6.2 Max. Conducted peak output power

6.2.1 Standard Applicable [FCC §15.247(b)(1)]

For systems using digital modulation in the 2400 MHz ~ 2 483.5 MHz bands : 1 Watt.

As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power.

6.2.2 Test Environment conditions

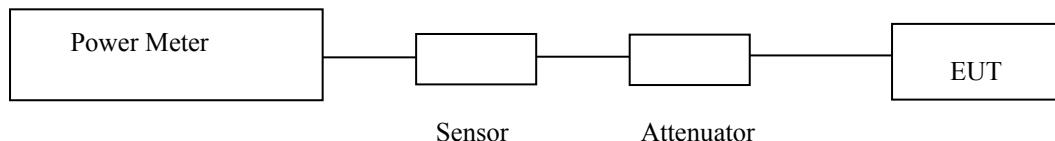
- Ambient temperature : 22 °C,
- Relative Humidity : (54 ~ 55) % R.H.

The maximum peak conducted output power can be measured using a broadband peak RF power meter. The power meter must have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast, average-responding diode type sensor.

6.2.3 Measurement Procedure

- ① Reference frequency generated from the signal generator is supply to power meter input port via RF cable and attenuator, and then, it's apply to offset value on power meter as follows ;
- ② Remove the antenna from the EUT and then connected to power meter via a suitable low loss RF cable and attenuator.
- ③ Place the EUT on the table and set it function disable at the lowest, middle and the highest available channels.
- ④ Power meter was used to directly measure the output power from RF output port on the EUT in continuously transmitting modulation
- ⑤ The indicated level is the peak output power.
- ⑥ Please refer to the detailed procedure method FCC Public Notice(KDB 558074 D01)

6.2.4 Test Setup Configuration



- Power Meter : ML2495A (Anritsu)
- Power Sensor : MA2445D (Anritsu)
- Detector mode : peak

6.2.5 Measurement Result

1) IEEE 802.11b Port 1

Channel No.	Frequency [MHz]	Test Results		
		Measured power [dBm] *	Limit [W]	Result
1	2 412	9.80	≤ 1	Pass
7	2 442	8.25		Pass
13	2 472	6.89		Pass

* it is conducted power

2) IEEE 802.11g Port 1

Channel No.	Frequency [MHz]	Test Results		
		Measured power [dBm] *	Limit [W]	Result
1	2 412	9.70	≤ 1	Pass
7	2 442	8.03		Pass
13	2 472	6.31		Pass

* it is conducted power

3) IEEE 802.11n(HT20) Port 1

Channel No.	Frequency [MHz]	Test Results		
		Measured power [dBm] *	Limit [W]	Result
1	2 412	10.02	≤ 1	Pass
7	2 442	8.58		Pass
13	2 472	6.30		Pass

* it is conducted power

4) IEEE 802.11n(HT40) Port 1

Channel No.	Frequency [MHz]	Test Results		
		Measured power [dBm] *	Limit [W]	Result
3	2 422	10.11	≤ 1	Pass
7	2 442	9.35		Pass
11	2 462	8.61		Pass

* it is conducted power

5) IEEE 802.11b Port 2

Channel No.	Frequency [MHz]	Test Results		
		Measured power [dBm] *	Limit [W]	Result
1	2 412	9.80	≤ 1	Pass
7	2 442	8.54		Pass
13	2 472	7.15		Pass

* it is conducted power

6) IEEE 802.11g Port 2

Channel No.	Frequency [MHz]	Test Results		
		Measured power [dBm] *	Limit [W]	Result
1	2 412	9.48	≤ 1	Pass
7	2 442	8.14		Pass
13	2 472	6.48		Pass

* it is conducted power

7) IEEE 802.11n(HT20) Port 2

Channel No.	Frequency [MHz]	Test Results		
		Measured power [dBm] *	Limit [W]	Result
1	2 412	10.03	≤ 1	Pass
7	2 442	8.50		Pass
13	2 472	7.01		Pass

* it is conducted power

8) IEEE 802.11n(HT40) Port 2

Channel No.	Frequency [MHz]	Test Results		
		Measured power [dBm] *	Limit [W]	Result
3	2 422	10.25	≤ 1	Pass
7	2 442	9.21		Pass
11	2 462	8.23		Pass

* it is conducted power

9) IEEE 802.11b Port 1 + Port 2

Channel No.	Frequency [MHz]	Test Results		
		Measured power [dBm] *	Limit [W]	Result
1	2 412	12.43	≤ 1	Pass
7	2 442	11.21		Pass
13	2 472	9.95		Pass

10) IEEE 802.11g Port 1 + Port 2

Channel No.	Frequency [MHz]	Test Results		
		Measured power [dBm] *	Limit [W]	Result
1	2 412	12.35	≤ 1	Pass
7	2 442	10.98		Pass
13	2 472	9.09		Pass

11) IEEE 802.11n(HT20) Port 1 + Port 2

Channel No.	Frequency [MHz]	Test Results		
		Measured power [dBm] *	Limit [W]	Result
1	2 412	12.78	≤ 1	Pass
7	2 442	11.24		Pass
13	2 472	9.67		Pass

12) IEEE 802.11n(HT40) Port 1 + Port 2

Channel No.	Frequency [MHz]	Test Results		
		Measured power [dBm] *	Limit [W]	Result
3	2 422	12.95	≤ 1	Pass
7	2 442	12.12		Pass
11	2 462	11.45		Pass

6.3 Conducted peak power spectral density

6.3.1 Standard Applicable [FCC §15.247(e)]

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

6.3.2 Test Environment conditions

- Ambient temperature : 22 °C,
- Relative Humidity : (54 ~ 55) % R.H.

6.3.3 Measurement Procedure

The power spectral density conducted from the intentional radiator was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its function disable at the highest, middle and the lowest available channels. This procedure must be used if maximum peak conducted output power was used to demonstrate compliance to the fundamental output power limit, and is optional if the maximum conducted output power was used to demonstrate compliance.

The spectrum analyzer is set to the as follows :

- RBW : ≥ 3 kHz
- VBW : $\geq 3 \times$ RBW
- Sweep : auto
- Detector function : peak
- Trace : max hold

6.3.4 Measurement Result

1) IEEE 802.11b Port 1

Channel NO.	Frequency [MHz]	Test Results		
		Measured PSD [dBm]	Limit	Result
1	2 412	-12.76	8 dBm	Pass
7	2 442	-11.12		Pass
13	2 472	-9.58		Pass

2) IEEE 802.11g Port 1

Channel NO.	Frequency [MHz]	Test Results		
		Measured PSD [dBm]	Limit	Result
1	2 412	-17.02	8 dBm	Pass
7	2 442	-18.59		Pass
13	2 472	-20.06		Pass

3) IEEE 802.11n(HT20) Port 1

Channel NO.	Frequency [MHz]	Test Results		
		Measured PSD [dBm]	Limit	Result
1	2 412	-14.74	8 dBm	Pass
7	2 442	-17.23		Pass
13	2 472	-18.38		Pass

4) IEEE 802.11n(HT40) Port 1

Channel NO.	Frequency [MHz]	Test Results		
		Measured PSD [dBm]	Limit	Result
3	2 422	-18.53	8 dBm	Pass
7	2 442	-20.05		Pass
11	2 462	-20.89		Pass

5) IEEE 802.11b Port 2

Channel NO.	Frequency [MHz]	Test Results		
		Measured PSD [dBm]	Limit	Result
1	2 412	-9.66	8 dBm	Pass
7	2 442	-9.43		Pass
13	2 472	-10.61		Pass

6) IEEE 802.11g Port 2

Channel NO.	Frequency [MHz]	Test Results		
		Measured PSD [dBm]	Limit	Result
1	2 412	-19.09	8 dBm	Pass
7	2 442	-21.20		Pass
13	2 472	-21.71		Pass

7) IEEE 802.11n(HT20) Port 2

Channel NO.	Frequency [MHz]	Test Results		
		Measured PSD [dBm]	Limit	Result
1	2 412	-18.71	8 dBm	Pass
7	2 442	-19.53		Pass
13	2 472	-21.43		Pass

8) IEEE 802.11n(HT40) Port 2

Channel NO.	Frequency [MHz]	Test Results		
		Measured PSD [dBm]	Limit	Result
3	2 422	-20.49	8 dBm	Pass
7	2 442	-22.19		Pass
11	2 462	-22.72		Pass

9) IEEE 802.11b Port 1 + Port 2

Channel NO.	Frequency [MHz]	Test Results		
		Measured PSD [dBm]	Limit	Result
1	2 412	-8.23	8 dBm	Pass
7	2 442	-7.25		Pass
13	2 472	-7.09		Pass

10) IEEE 802.11g Port 1 + Port 2

Channel NO.	Frequency [MHz]	Test Results		
		Measured PSD [dBm]	Limit	Result
1	2 412	-15.05	8 dBm	Pass
7	2 442	-16.87		Pass
13	2 472	-17.85		Pass

11) IEEE 802.11n(HT20) Port 1 + Port 2

Channel NO.	Frequency [MHz]	Test Results		
		Measured PSD [dBm]	Limit	Result
1	2 412	-13.75	8 dBm	Pass
7	2 442	-15.35		Pass
13	2 472	-16.92		Pass

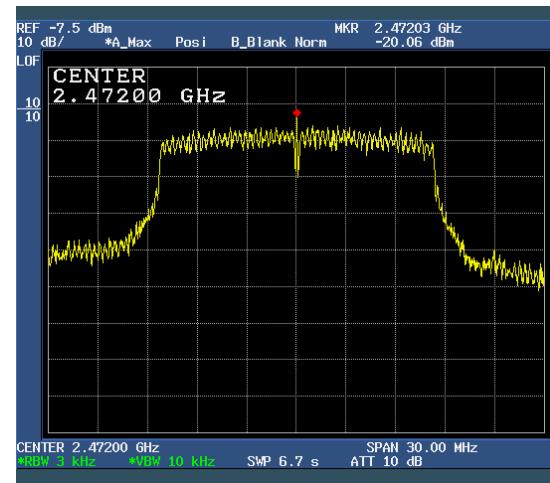
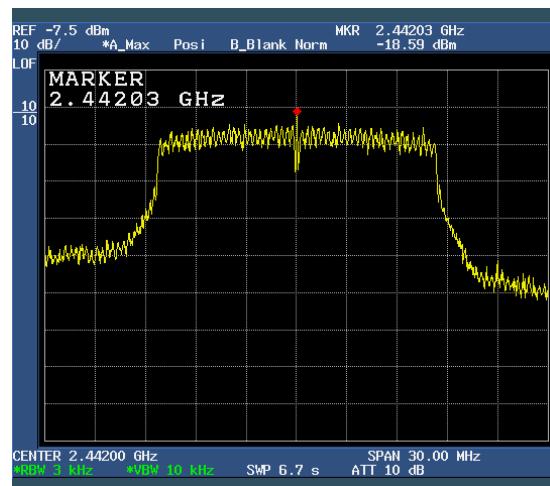
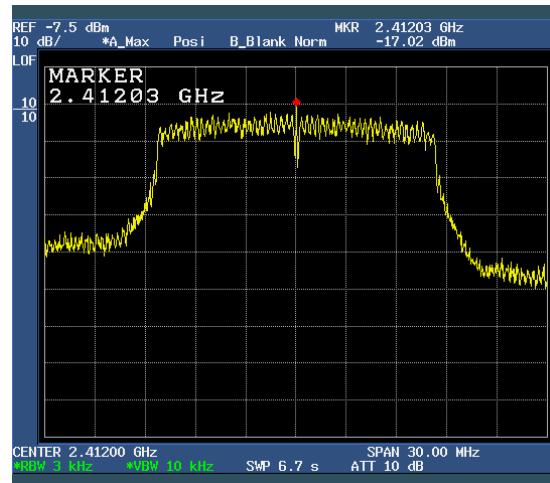
12) IEEE 802.11n(HT40) Port 1 + Port 2

Channel NO.	Frequency [MHz]	Test Results		
		Measured PSD [dBm]	Limit	Result
3	2 422	-16.55	8 dBm	Pass
7	2 442	-18.20		Pass
11	2 462	-18.91		Pass

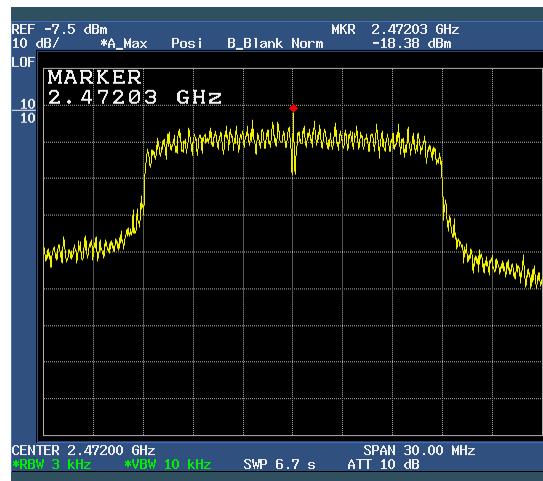
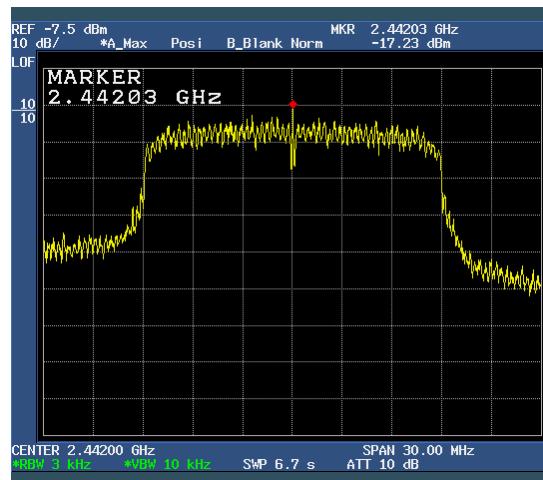
IEEE 802.11b Port 1



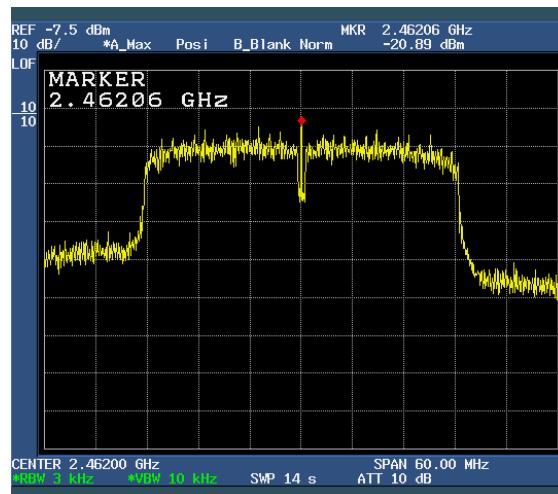
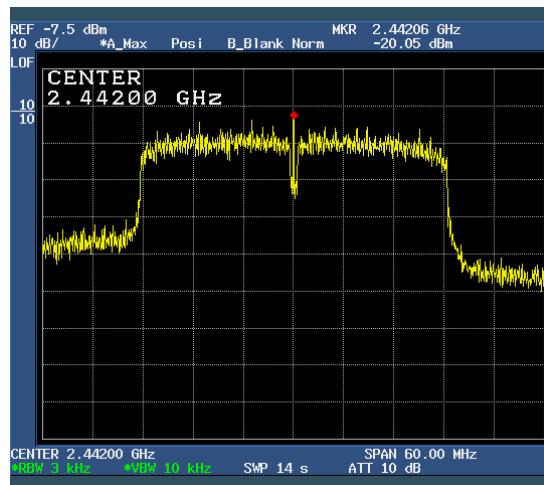
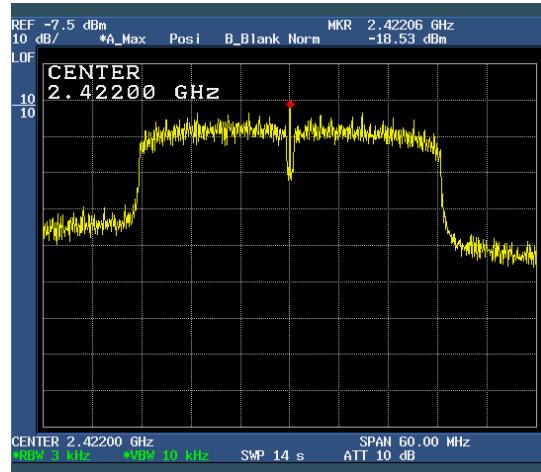
IEEE 802.11g Port 1



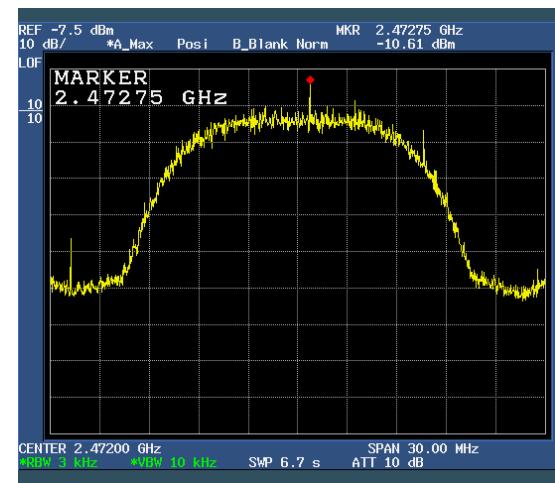
IEEE 802.11n(HT20) Port 1



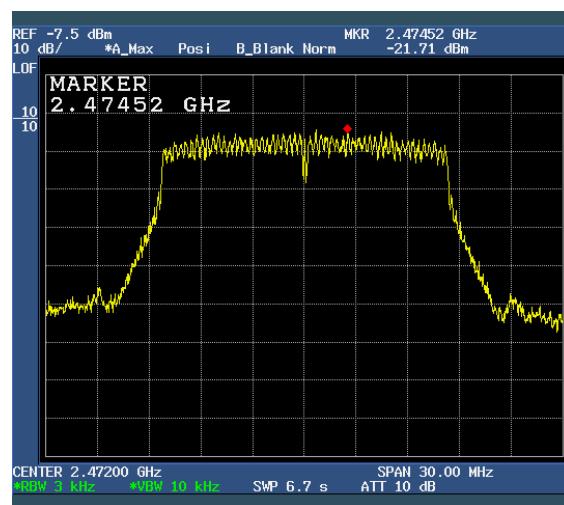
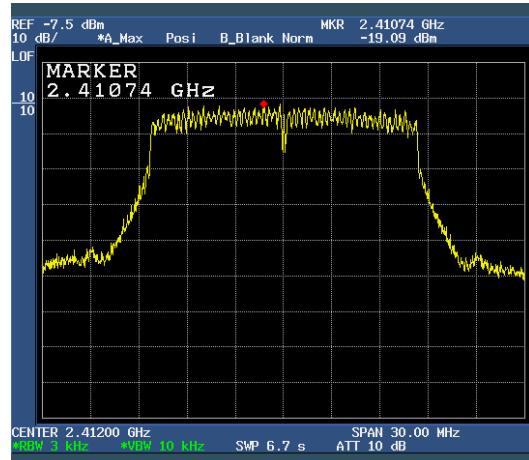
IEEE 802.11n(HT40) Port 1



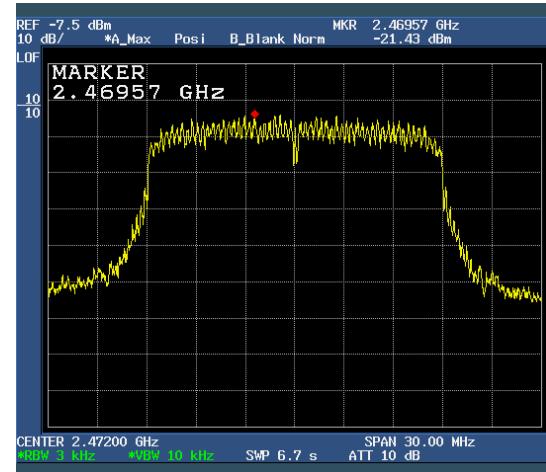
IEEE 802.11b Port 2



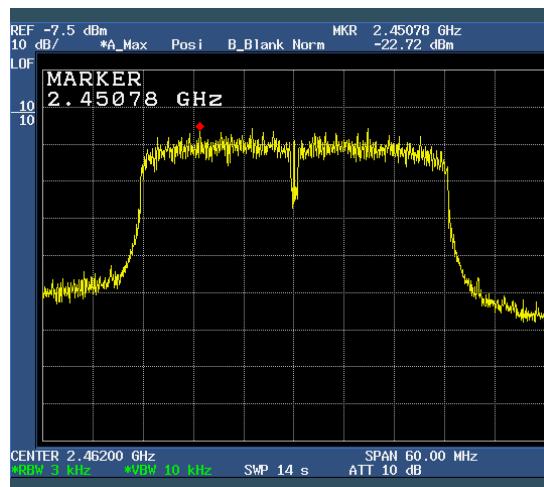
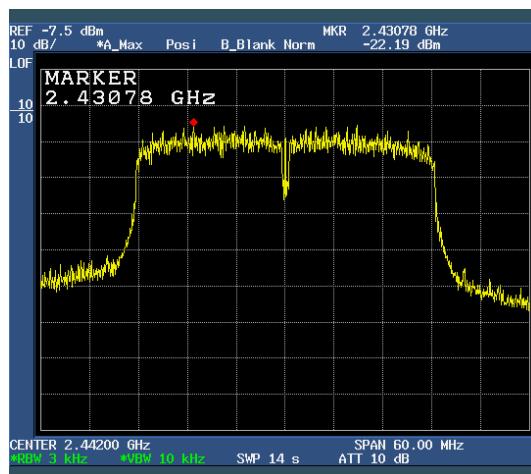
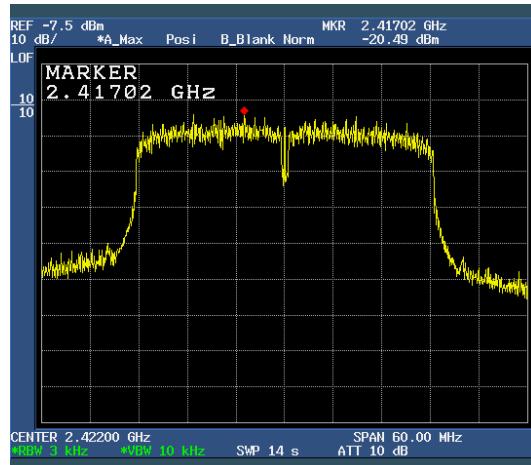
IEEE 802.11g Port 2



IEEE 802.11n(HT20) Port 2



IEEE 802.11n(HT40) Port 2



6.4 Band-edge Compliance of RF Conducted emissions

6.4.1 Standard Applicable [FCC §15.247(d)]

In any 100 kHz 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on RF conducted.

6.4.2 Test Environment conditions

- Ambient temperature : 21 °C,
- Relative Humidity : (55 ~ 56) % R.H.

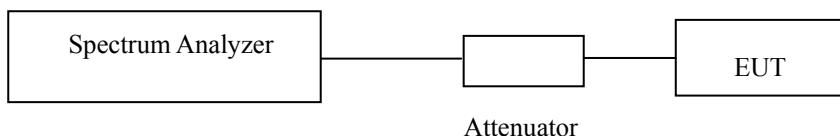
6.4.3 Measurement Procedure

- ① Pre-calibration for the spectrum analyzer has to be done first through a reference CW signal from CAL OUT (-10 dBm)
- ② Reference frequency generated from the signal generator is supply to spectrum analyzer input port via RF cable and attenuator, and then, it's apply to offset value on spectrum analyzer as follows ;
- ③ Remove the antenna from the EUT and then, connected to spectrum analyzer via a dc Block, suitable low loss RF cable and attenuator.
- ④ Place the EUT on the table and set on the emission at the band-edge,
- ⑤ After the trace being stable, Use the marker-to-peak function to move the marker to the peak of the in-band emission.
- ⑥ The marker-delta value now displayed must comply with the limit specified in above standard.
- ⑦ please refer to the detailed procedure method FCC Public Notice(DA 00-705)

The spectrum analyzer is set to the as follows :

- Span : Wide enough to capture the peak level of the emission operating on the channel closet to the Band-edge, as well as any modulation products which fall outside of the authorized band of operation
- RBW : $\geq 1\%$ of the span
- VBW : \geq RBW
- Sweep : auto
- Detector function : peak
- Trace : Max hold

6.4.4 Test Setup Configuration



6.4.5 Measurement Result

1) IEEE 802.11b Port 1

Setting Channel (NO.)	Frequency [MHz]	Test Results		
		Measured value [dBc]	Limit [dBc]	Result
Lowest channel (1)	2412	-41.92	≤ -20	Pass
Highest channel (13)	2472	-47.21		Pass

2) IEEE 802.11g Port 1

Setting Channel (NO.)	Frequency [MHz]	Test Results		
		Measured value [dBc]	Limit [dBc]	Result
Lowest channel (1)	2412	-38.19	≤ -20	Pass
Highest channel (13)	2472	-43.09		Pass

3) IEEE 802.11n(HT20) Port 1

Setting Channel (NO.)	Frequency [MHz]	Test Results		
		Measured value [dBc]	Limit [dBc]	Result
Lowest channel (1)	2412	-35.99	≤ -20	Pass
Highest channel (13)	2472	-40.64		Pass

4) IEEE 802.11n(HT40) Port 1

Setting Channel (NO.)	Frequency [MHz]	Test Results		
		Measured value [dBc]	Limit [dBc]	Result
Lowest channel (3)	2422	-30.19	≤ -20	Pass
Highest channel (11)	2462	-37.63		Pass

5) IEEE 802.11b Port 2

Setting Channel (NO.)	Frequency [MHz]	Test Results		
		Measured value [dBc]	Limit [dBc]	Result
Lowest channel (1)	2412	-47.96	≤ -20	Pass
Highest channel (13)	2472	-49.79		Pass

6) IEEE 802.11g Port 2

Setting Channel (NO.)	Frequency [MHz]	Test Results		
		Measured value [dBc]	Limit [dBc]	Result
Lowest channel (1)	2412	-44.53	≤ -20	Pass
Highest channel (13)	2472	-48.35		Pass

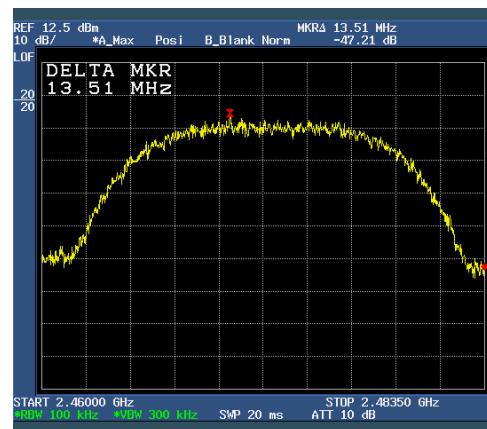
7) IEEE 802.11n(HT20) Port 2

Setting Channel (NO.)	Frequency [MHz]	Test Results		
		Measured value [dBc]	Limit [dBc]	Result
Lowest channel (1)	2412	-43.41	≤ -20	Pass
Highest channel (13)	2472	-48.52		Pass

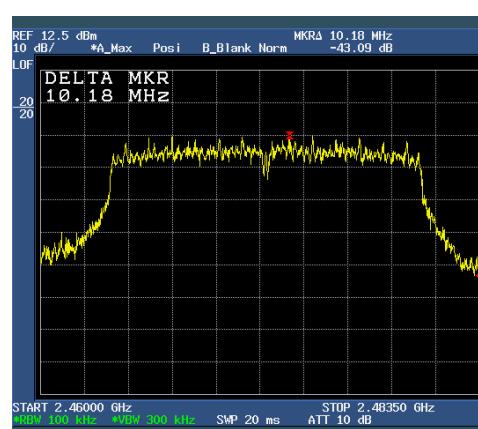
8) IEEE 802.11n(HT40) Port 2

Setting Channel (NO.)	Frequency [MHz]	Test Results		
		Measured value [dBc]	Limit [dBc]	Result
Lowest channel (3)	2422	-37.25	≤ -20	Pass
Highest channel (11)	2462	-44.84		Pass

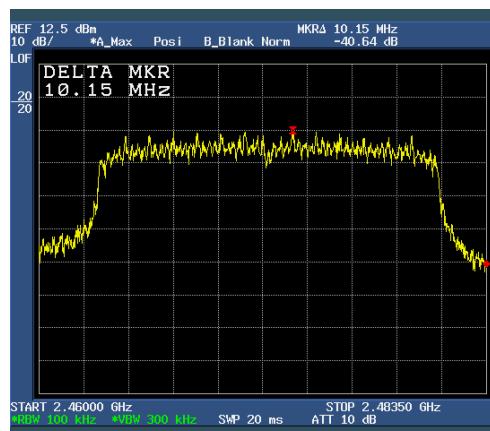
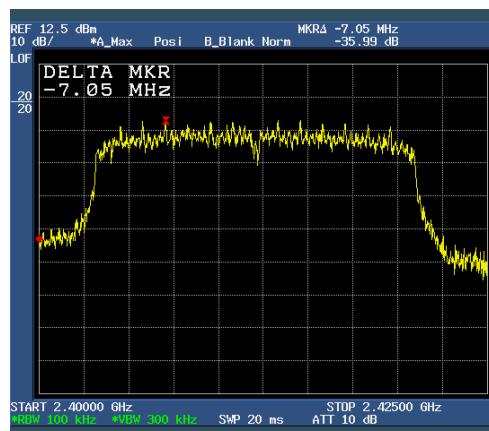
IEEE 802.11b Port 1



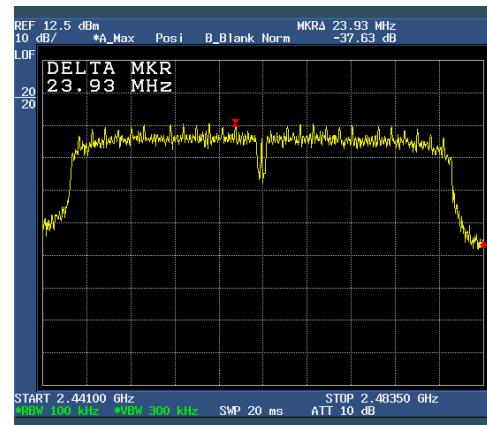
IEEE 802.11g Port 1



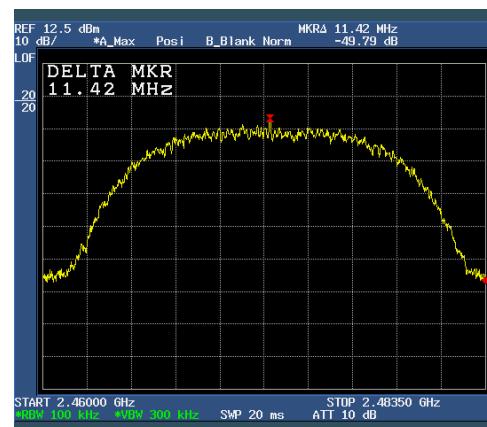
IEEE 802.11n(HT20) Port 1



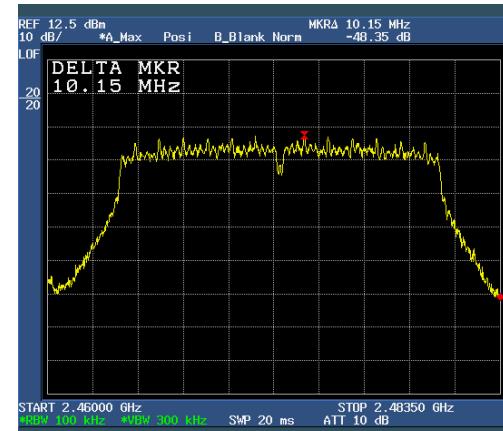
IEEE 802.11n(HT40) Port 1



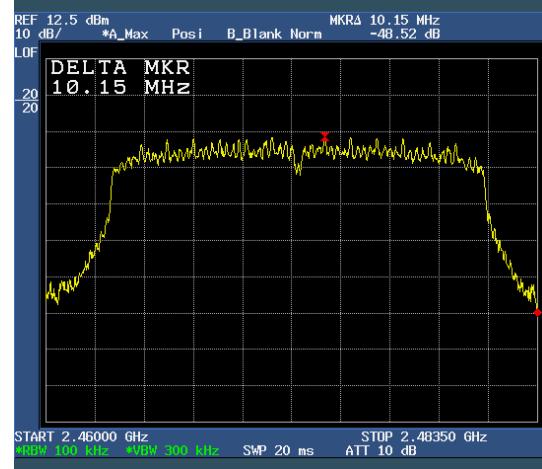
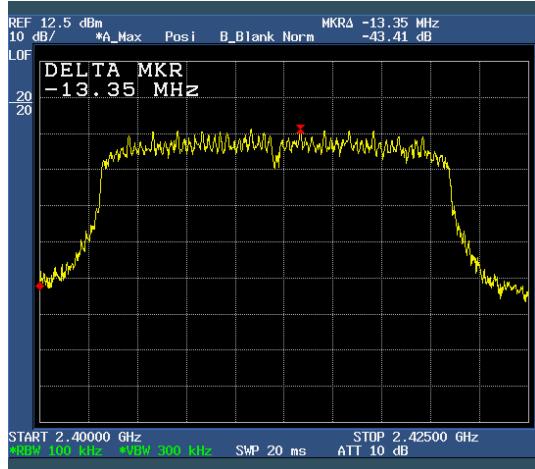
IEEE 802.11b Port 2



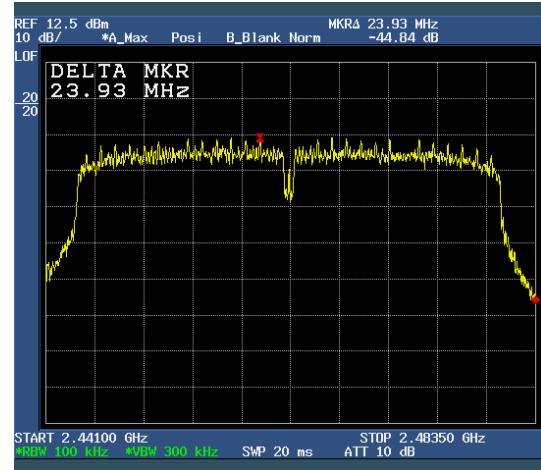
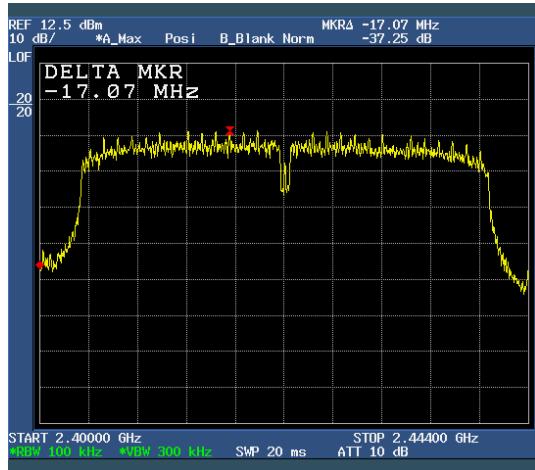
IEEE 802.11g Port 2



IEEE 802.11n(HT20) Port 2



IEEE 802.11n(HT40) Port 2



6.5 Band-edge Compliance of RF Radiated emissions

6.5.1 Standard Applicable [FCC §15.247]

The band-edge emissions outside these bands 2400 MHz ~ 2 483.5 MHz in which operating the hopping modulated intentional radiator is required comply with the provisions in above Required standard with respect to emission falling within restricted frequency bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) Above limitation value is refer to Table [1] & [2] of Clause 5.9.1

6.5.2 Test Environment conditions

- Ambient temperature : 21 °C ,
- Relative Humidity : (55 ~ 56) % R.H.

6.5.3 Measurement Procedure

please refer to the clause 5.9.3

6.5.4 Test Setup Configuration

please refer to the clause 5.9.5

6.5.5 Measurement Result

1) IEEE 802.11b

Low band (2310 MHz ~ 2400 MHz)

Frequency (MHz)	Reading (dBuV/m)	Factor(dB) CL+AF	Limits (dBuV/m)	Result (dBuV/m)	Result	Mode
2398.119	28.97	30.55	74	59.52	Pass	Peak
2398.119	11.40	30.55	54	41.95	Pass	Average

High band (2483.5 MHz ~ 2500 MHz)

Frequency (MHz)	Reading (dBuV/m)	Factor(dB) CL+AF	Limits (dBuV/m)	Result (dBuV/m)	Result	Mode
2483.506	24.04	30.62	74	54.66	Pass	Peak
2483.506	3.89	30.62	54	34.51	Pass	Average

Emission Level (dBuV/m) = Reading Level + Correct Factor.

Note : Correct Factor = AF + CL

AF : Antenna Factor

CL : Cable Loss

2) IEEE 802.11g

Low band (2310 MHz ~ 2400 MHz)

Frequency (MHz)	Reading (dBuV/m)	Factor(dB) CL+AF	Limits (dBuV/m)	Result (dBuV/m)	Result	Mode
2398.608	27.78	30.57	74	58.35	Pass	Peak
2398.608	6.36	30.57	54	36.93	Pass	Average

High band (2483.5 MHz ~ 2500 MHz)

Frequency (MHz)	Reading (dBuV/m)	Factor(dB) CL+AF	Limits (dBuV/m)	Result (dBuV/m)	Result	Mode
2483.652	21.79	30.63	74	52.42	Pass	Peak
2483.652	3.24	30.63	54	33.87	Pass	Average

Emission Level(dBuV/m) = Reading Level + Correct Factor.

Note : Correct Factor = AF + CL

AF : Antenna Factor

CL : Cable Loss

3) IEEE 802.11n(HT20)

Low band (2310 MHz ~ 2400 MHz)

Frequency (MHz)	Reading (dBuV/m)	Factor(dB) CL+AF	Limits (dBuV/m)	Result (dBuV/m)	Result	Mode
2399.995	30.66	30.60	74	61.26	Pass	Peak
2399.995	5.75	30.60	54	36.35	Pass	Average

High band (2483.5 MHz ~ 2500 MHz)

Frequency (MHz)	Reading (dBuV/m)	Factor(dB) CL+AF	Limits (dBuV/m)	Result (dBuV/m)	Result	Mode
2483.579	24.64	30.62	74	55.26	Pass	Peak
2483.579	3.17	30.62	54	33.79	Pass	Average

Emission Level(dBuV/m) = Reading Level + Correct Factor.

Note : Correct Factor = AF + CL

AF : Antenna Factor

CL : Cable Loss

4) IEEE 802.11n(HT40)

Low band (2310 MHz ~ 2400 MHz)

Frequency (MHz)	Reading (dBuV/m)	Factor(dB) CL+AF	Limits (dBuV/m)	Result (dBuV/m)	Result	Mode
2398.241	38.84	30.52	74	69.36	Pass	Peak
2398.241	11.39	30.52	54	41.91	Pass	Average

High band (2483.5 MHz ~ 2500 MHz)

Frequency (MHz)	Reading (dBuV/m)	Factor(dB) CL+AF	Limits (dBuV/m)	Result (dBuV/m)	Result	Mode
2483.506	27.33	30.61	74	57.94	Pass	Peak
2483.506	4.03	30.61	54	34.64	Pass	Average

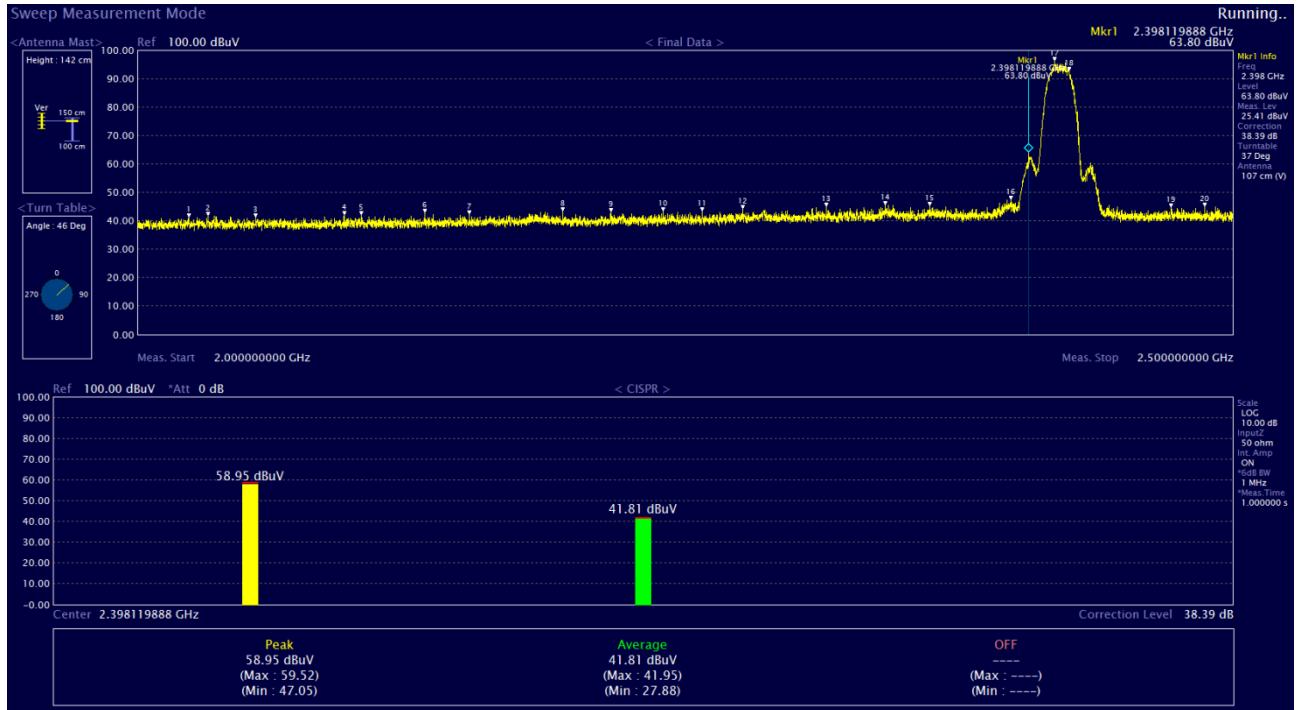
Emission Level(dBuV/m) = Reading Level + Correct Factor.

Note : Correct Factor = AF + CL

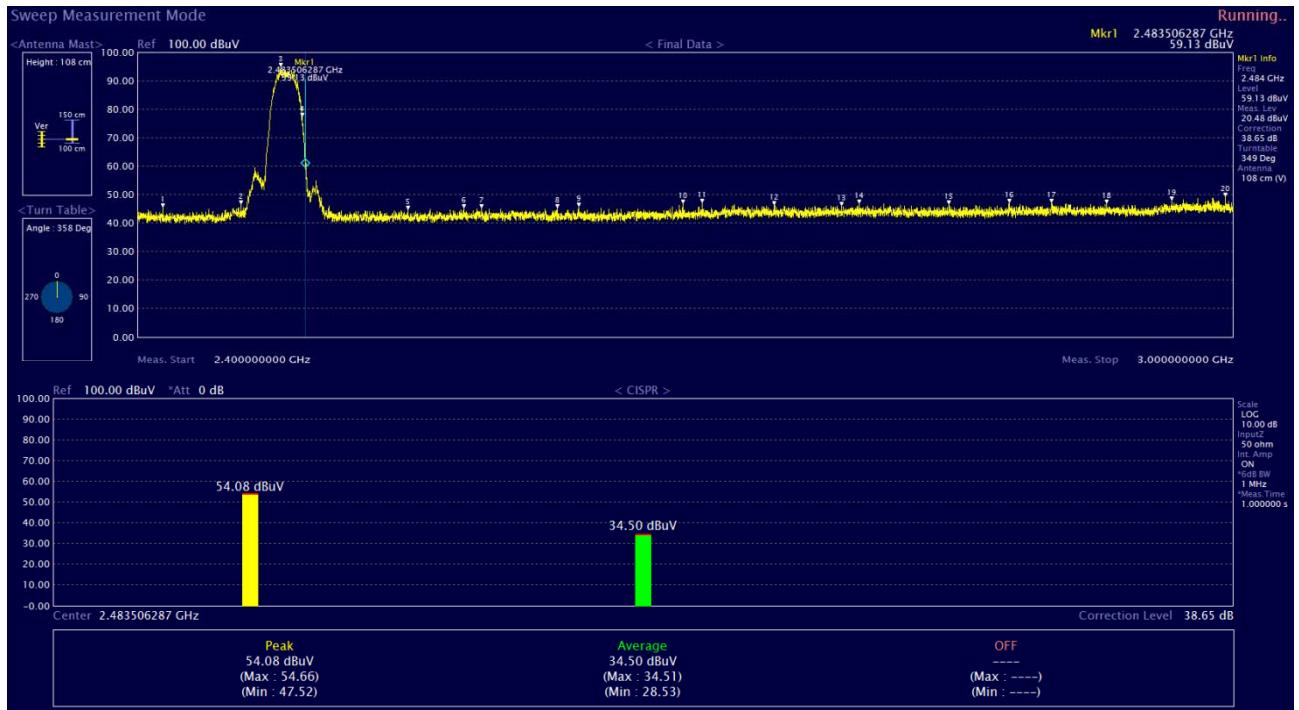
AF : Antenna Factor

CL : Cable Loss

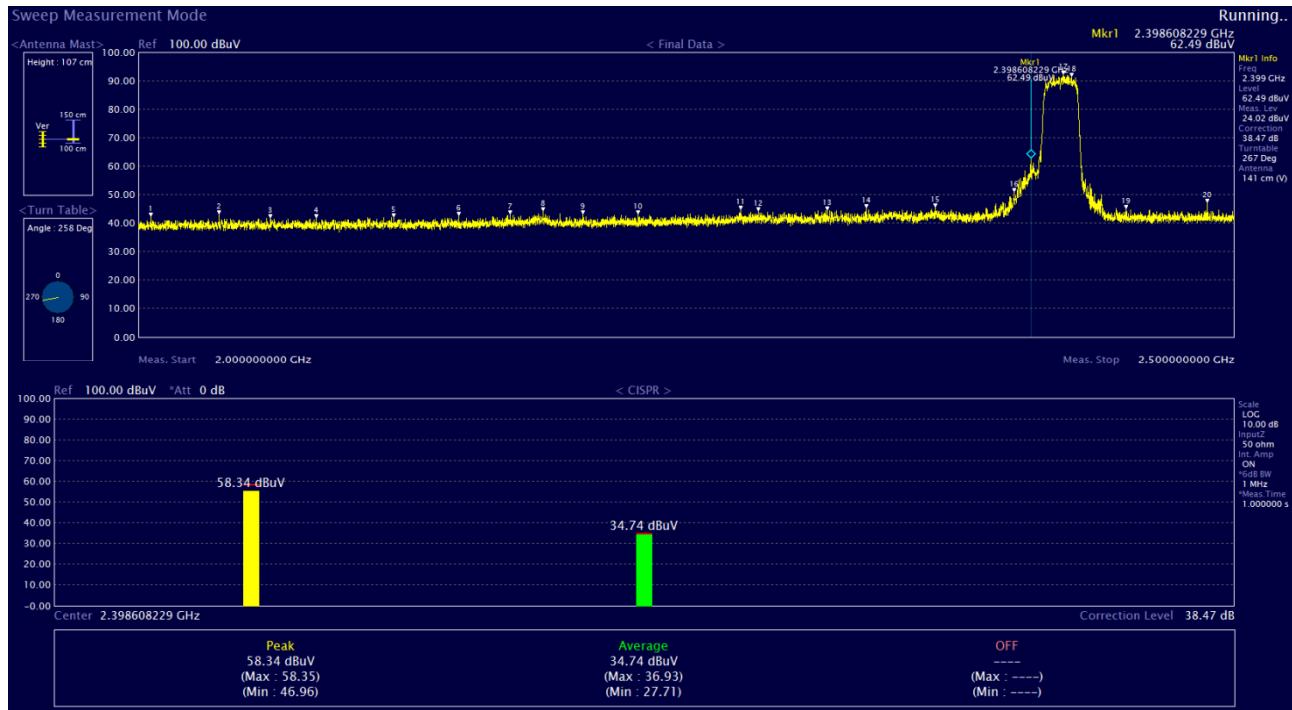
IEEE 802.11b Low band



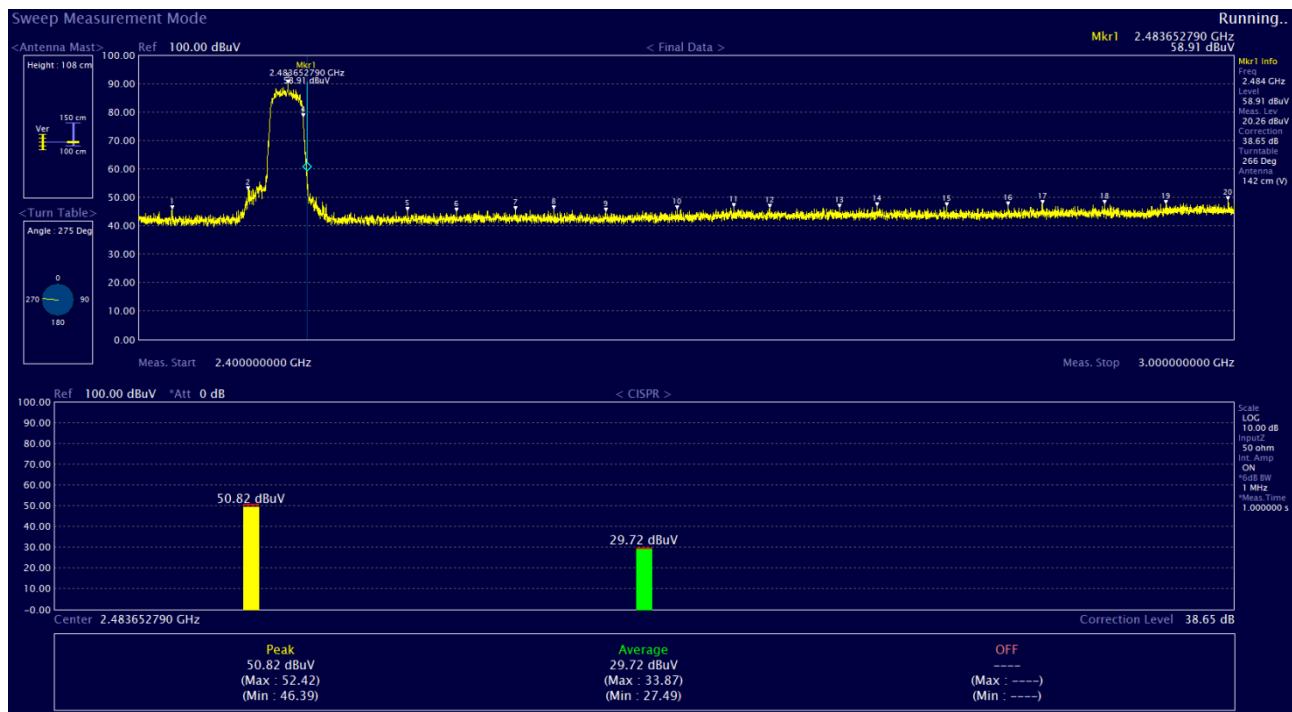
IEEE 802.11b High band



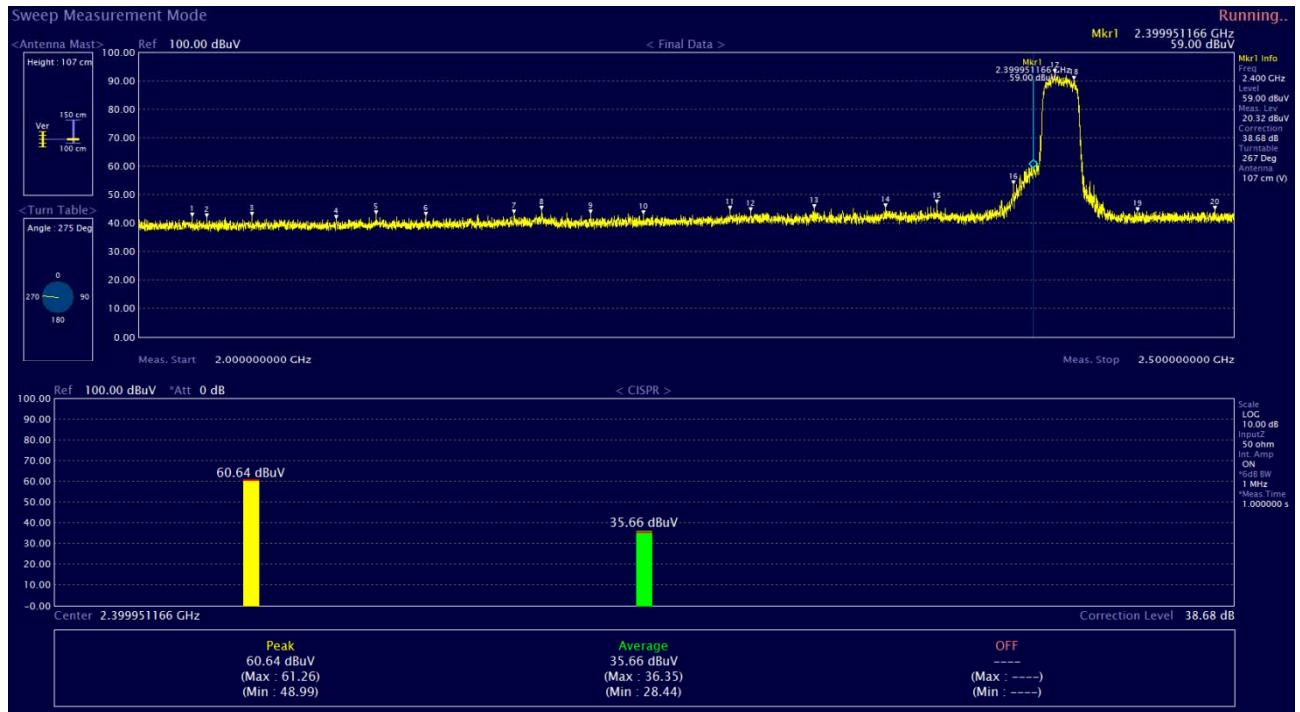
IEEE 802.11g Low band



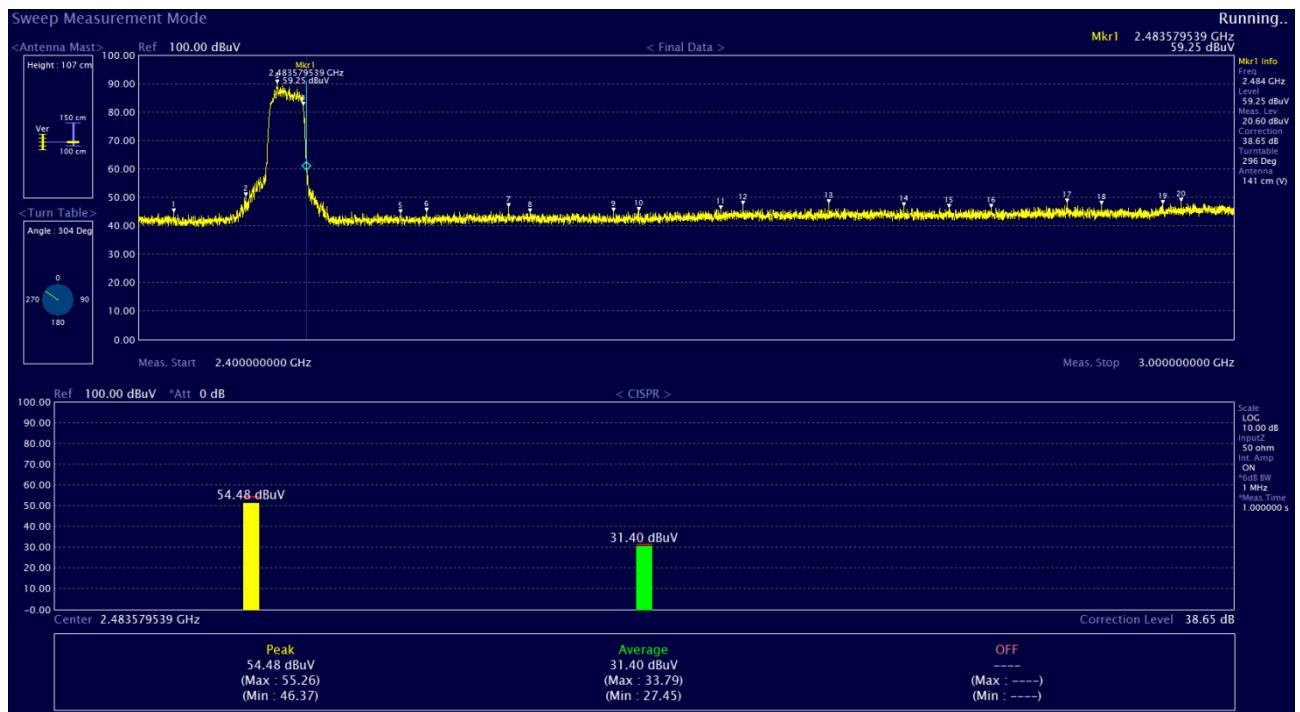
IEEE 802.11g High band



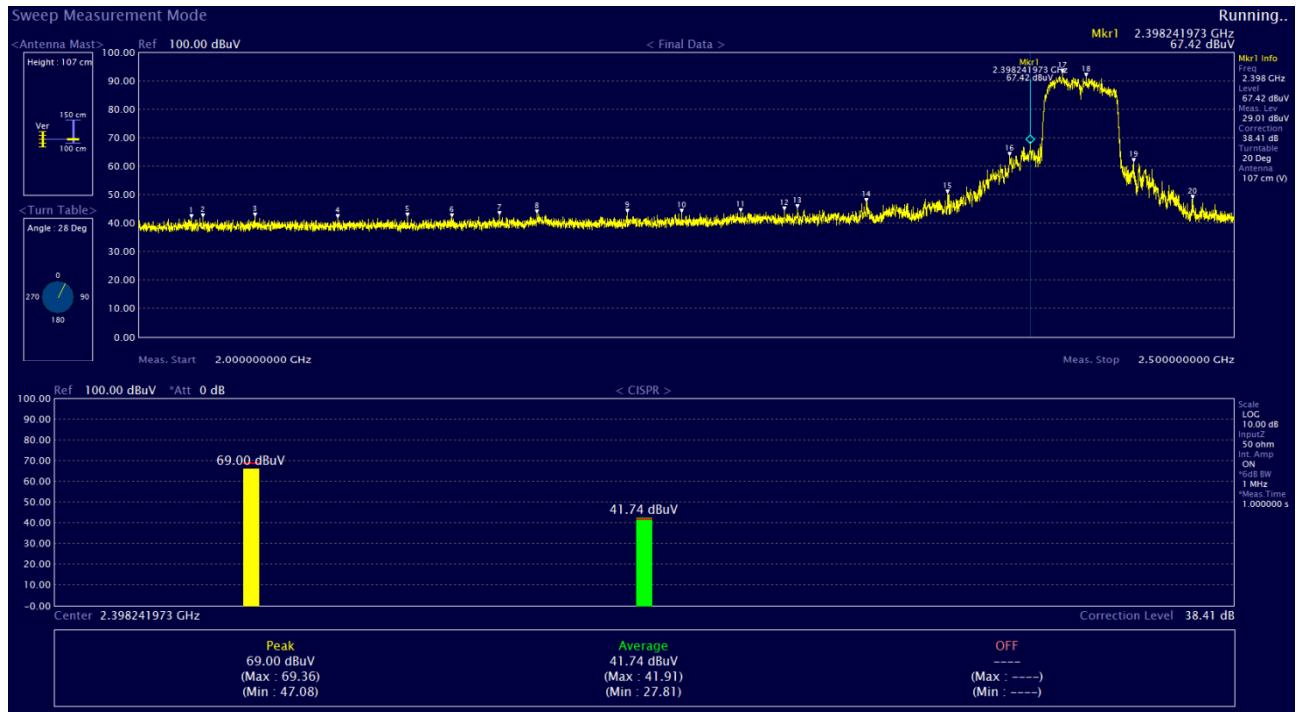
IEEE 802.11n(HT20) Low Band



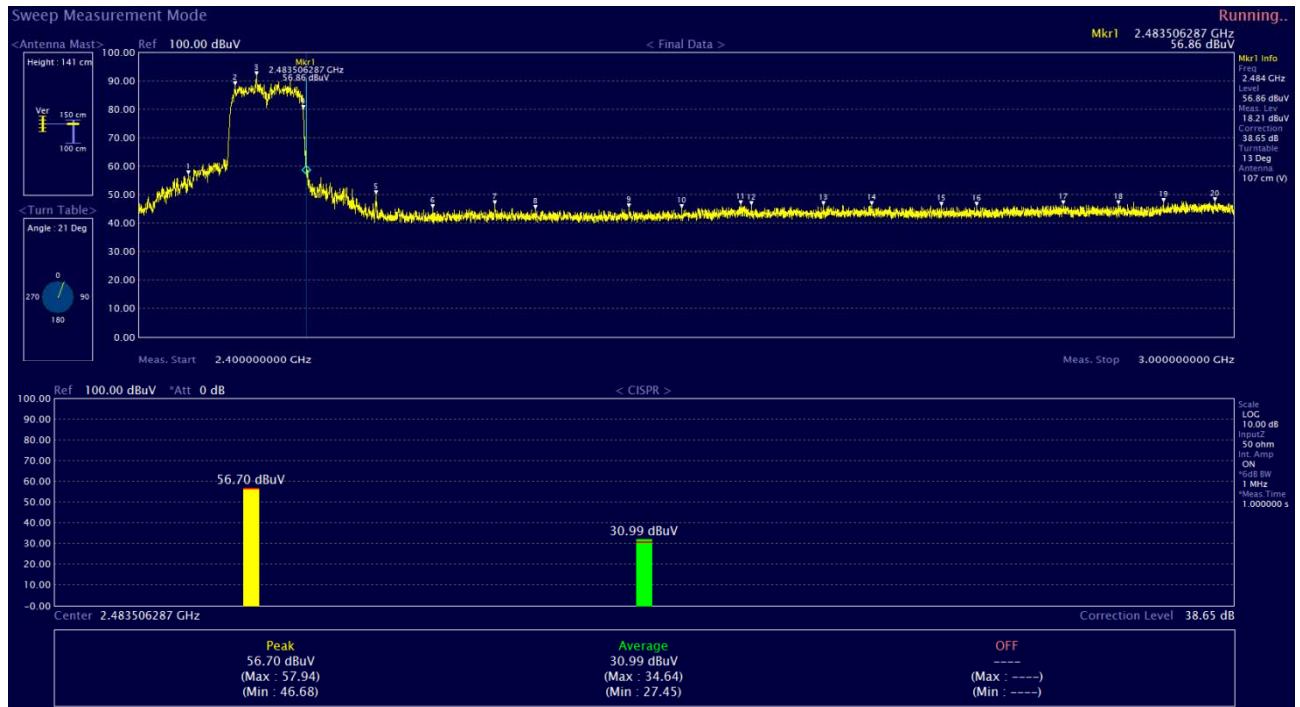
IEEE 802.11n(HT20) High Band



IEEE 802.11n(HT40) Low Band



IEEE 802.11n(HT40) High Band



6.6 Spurious RF Conducted emissions

6.6.1 Standard Applicable [FCC §15.247(d)]

In any 100 kHz 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

6.6.2 Test Environment conditions

- Ambient temperature : 22 °C,
- Relative Humidity : (54 ~ 55) % R.H.

6.6.3 Measurement Procedure

- ① Pre-calibration for the spectrum analyzer has to be done first through a reference CW signal from CAL OUT(-10 dBm)
- ② Reference frequency generated from the signal generator is supply to spectrum analyzer input port via RF cable and attenuator, and then, it's apply to offset value on spectrum analyzer as follows ;
- ③ Remove the antenna from the EUT and then, connected to spectrum analyzer via a dc Block, suitable low loss RF cable and attenuator.
- ④ Place the EUT on the table and set on the emission at the out band
- ⑤ After the trace being stable, Use the marker-to-peak function to move the marker to the peak of the in-band emission.
- ⑥ The marker-delta value now displayed spurious emission must comply with the limit specified in above standard.
- ⑦ please refer to the detailed procedure method FCC Public Notice(DA 00-705)

The spectrum analyzer is set to the as follows :

- Span : wide enough to capture the peak level of the in-band emission and all spurious emissions from the Lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
- RBW : 100 kHz
- VBW : \geq RBW
- Sweep : Auto
- Detector function : Peak
- Trace : Max hold

6.6.4 Measurement Result

1) IEEE 802.11b Port 1

Channel NO.	Frequency	Frequency Range	Test Results		
			Measured value [dBc]	Limit [dBc]	Result
1	2412 MHz	30 MHz ~ 2.5 GHz	-50.68	≤ - 20	Pass
		2 GHz ~ 26.5 GHz	-49.81		Pass
7	2442 MHz	30 MHz ~ 2.5 GHz	-49.99	≤ - 20	Pass
		2 GHz ~ 26.5 GHz	-49.18		Pass
13	2472 MHz	30 MHz ~ 3.0 GHz	-50.18	≤ - 20	Pass
		2 GHz ~ 26.5 GHz	-45.13		Pass

*Note : Continuous modulation mode and Harmonic level is 20dB below within the band that contains the highest level of the desired power

2) IEEE 802.11g Port 1

Channel NO.	Frequency	Frequency Range	Test Results		
			Measured value [dBc]	Limit [dBc]	Result
1	2412 MHz	30 MHz ~ 2.5 GHz	-53.00	≤ - 20	Pass
		2 GHz ~ 26.5 GHz	-48.41		Pass
7	2442 MHz	30 MHz ~ 2.5 GHz	-51.26	≤ - 20	Pass
		2 GHz ~ 26.5 GHz	-45.67		Pass
13	2472 MHz	30 MHz ~ 3.0 GHz	-48.76	≤ - 20	Pass
		2 GHz ~ 26.5 GHz	-44.20		Pass

*Note : Continuous modulation mode and Harmonic level is 20dB below within the band that contains the highest level of the desired power

3) IEEE 802.11n(HT20) Port 1

Channel NO.	Frequency	Frequency Range	Test Results		
			Measured value [dBc]	Limit [dBc]	Result
1	2412 MHz	30 MHz ~ 2.5 GHz	-52.80	≤ - 20	Pass
		2 GHz ~ 26.5 GHz	-48.38		Pass
7	2442 MHz	30 MHz ~ 2.5 GHz	-57.60	≤ - 20	Pass
		2 GHz ~ 26.5 GHz	-55.02		Pass
13	2472 MHz	30 MHz ~ 3.0 GHz	-48.69	≤ - 20	Pass
		2 GHz ~ 26.5 GHz	-42.36		Pass

*Note : Continuous modulation mode and Harmonic level is 20dB below within the band that contains the highest level of the desired power

4) IEEE 802.11n(HT40) Port 1

Channel NO.	Frequency	Frequency Range	Test Results		
			Measured value [dBc]	Limit [dBc]	Result
3	2422 MHz	30 MHz ~ 2.5 GHz	-48.85	≤ -20	Pass
		2 GHz ~ 26.5 GHz	-47.91		Pass
7	2442 MHz	30 MHz ~ 2.5 GHz	-46.85	≤ -20	Pass
		2 GHz ~ 26.5 GHz	-46.76		Pass
11	2462 MHz	30 MHz ~ 3.0 GHz	-46.24	≤ -20	Pass
		2 GHz ~ 26.5 GHz	-45.18		Pass

*Note : Continuous modulation mode and Harmonic level is 20dB below within the band that contains the highest level of the desired power

5) IEEE 802.11b Port 2

Channel NO.	Frequency	Frequency Range	Test Results		
			Measured value [dBc]	Limit [dBc]	Result
1	2412 MHz	30 MHz ~ 2.5 GHz	-54.99	≤ -20	Pass
		2 GHz ~ 26.5 GHz	-47.64		Pass
7	2442 MHz	30 MHz ~ 2.5 GHz	-53.88	≤ -20	Pass
		2 GHz ~ 26.5 GHz	-48.58		Pass
13	2472 MHz	30 MHz ~ 3.0 GHz	-49.77	≤ -20	Pass
		2 GHz ~ 26.5 GHz	-49.41		Pass

*Note : Continuous modulation mode and Harmonic level is 20dB below within the band that contains the highest level of the desired power

6) IEEE 802.11g Port 2

Channel NO.	Frequency	Frequency Range	Test Results		
			Measured value [dBc]	Limit [dBc]	Result
1	2412 MHz	30 MHz ~ 2.5 GHz	-49.95	≤ -20	Pass
		2 GHz ~ 26.5 GHz	-43.78		Pass
7	2442 MHz	30 MHz ~ 2.5 GHz	-48.63	≤ -20	Pass
		2 GHz ~ 26.5 GHz	-44.58		Pass
13	2472 MHz	30 MHz ~ 3.0 GHz	-47.18	≤ -20	Pass
		2 GHz ~ 26.5 GHz	-43.22		Pass

*Note : Continuous modulation mode and Harmonic level is 20dB below within the band that contains the highest level of the desired power

7) IEEE 802.11n(HT20) Port 2

Channel NO.	Frequency	Frequency Range	Test Results		
			Measured value [dBc]	Limit [dBc]	Result
1	2412 MHz	30 MHz ~ 2.5 GHz	-48.65	≤ -20	Pass
		2 GHz ~ 26.5 GHz	-46.61		Pass
7	2442 MHz	30 MHz ~ 2.5 GHz	-47.09	≤ -20	Pass
		2 GHz ~ 26.5 GHz	-45.63		Pass
13	2472 MHz	30 MHz ~ 3.0 GHz	-46.22	≤ -20	Pass
		2 GHz ~ 26.5 GHz	-45.49		Pass

*Note : Continuous modulation mode and Harmonic level is 20dB below within the band that contains the highest level of the desired power

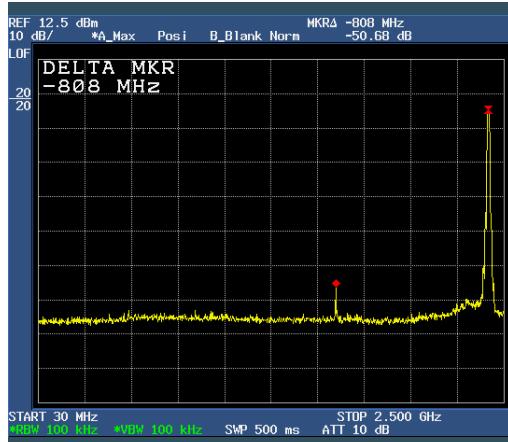
8) IEEE 802.11n(HT40) Port 2

Channel NO.	Frequency	Frequency Range	Test Results		
			Measured value [dBc]	Limit [dBc]	Result
3	2422 MHz	30 MHz ~ 2.5 GHz	-46.38	≤ -20	Pass
		2 GHz ~ 26.5 GHz	-43.52		Pass
6	2442 MHz	30 MHz ~ 2.5 GHz	-45.48	≤ -20	Pass
		2 GHz ~ 26.5 GHz	-44.85		Pass
11	2462 MHz	30 MHz ~ 3.0 GHz	-43.65	≤ -20	Pass
		2 GHz ~ 26.5 GHz	-43.90		Pass

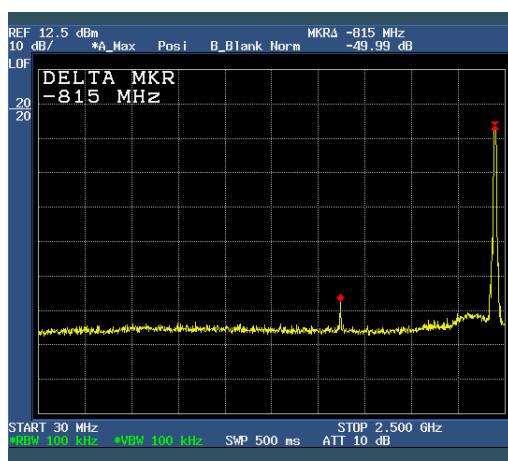
*Note : Continuous modulation mode and Harmonic level is 20dB below within the band that contains the highest level of the desired power

IEEE 802.11b Port 1

CH 1



CH 7

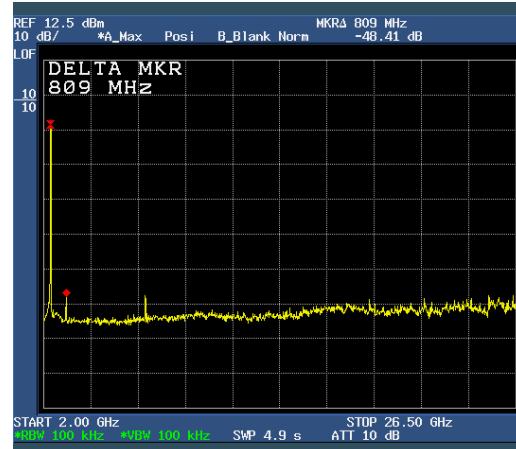
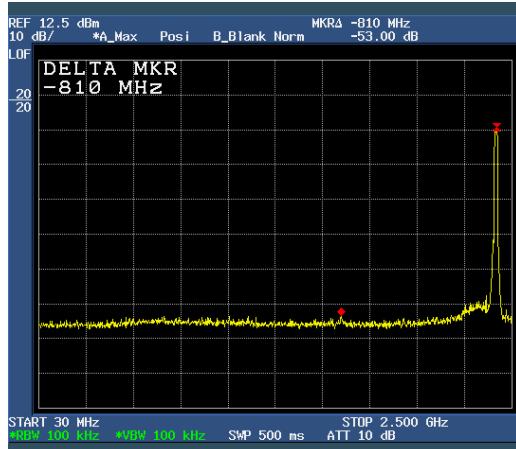


CH 13

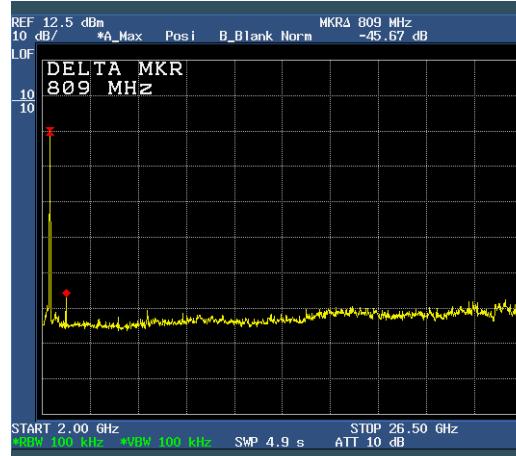
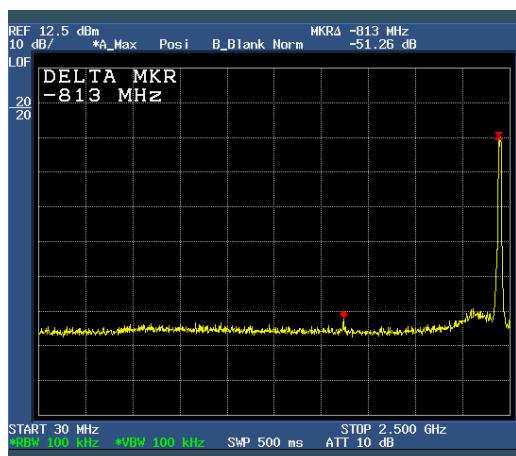


IEEE 802.11g Port 1

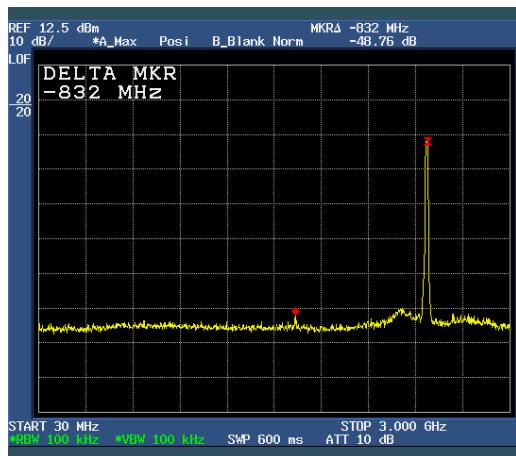
CH 1



CH 7



CH 13

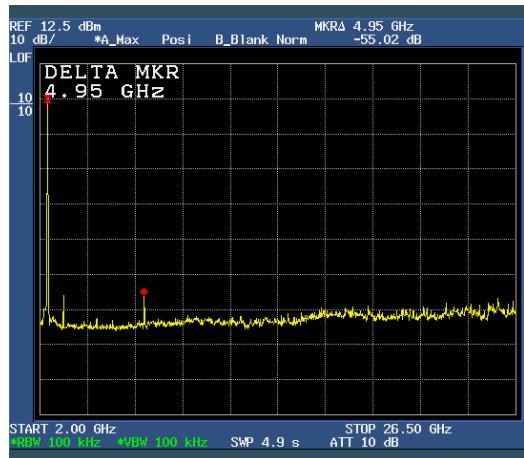
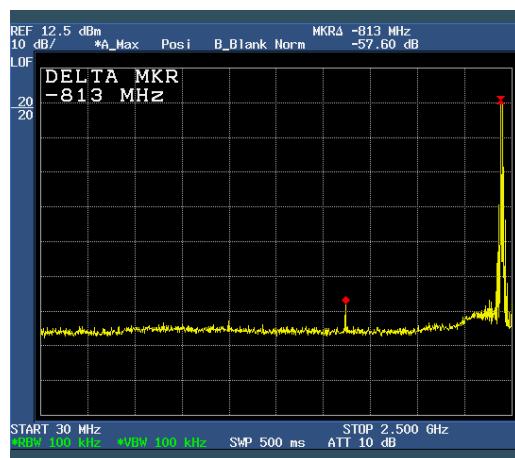


IEEE 802.11n(HT20) Port 1

CH 1



CH 7

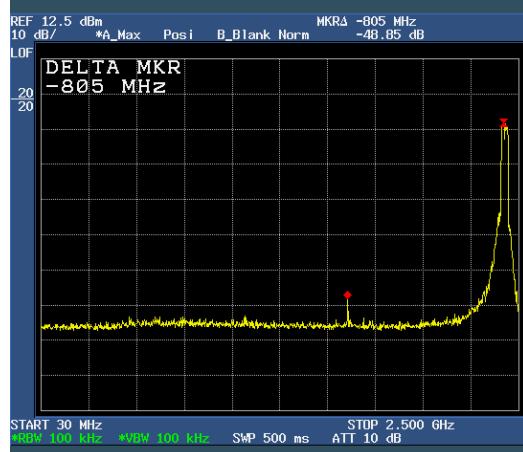


CH 13



IEEE 802.11n(HT40) Port 1

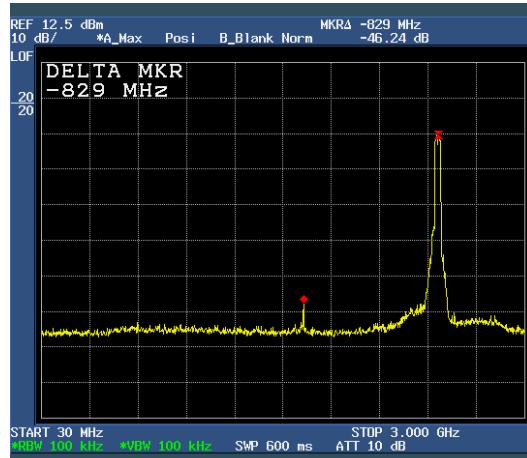
CH 3



CH 7

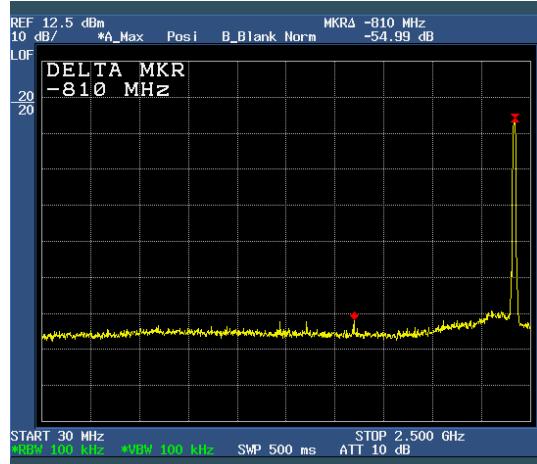


CH 11

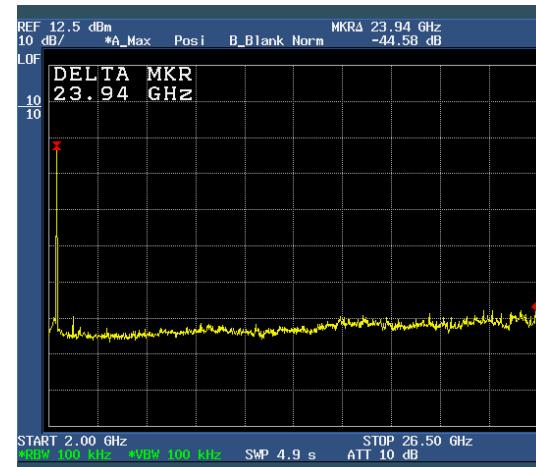
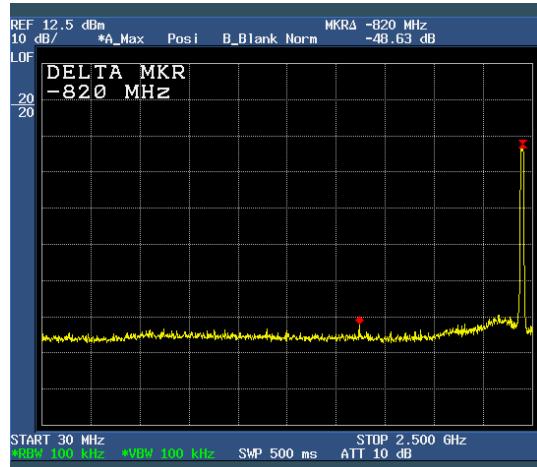


IEEE 802.11b Port 2

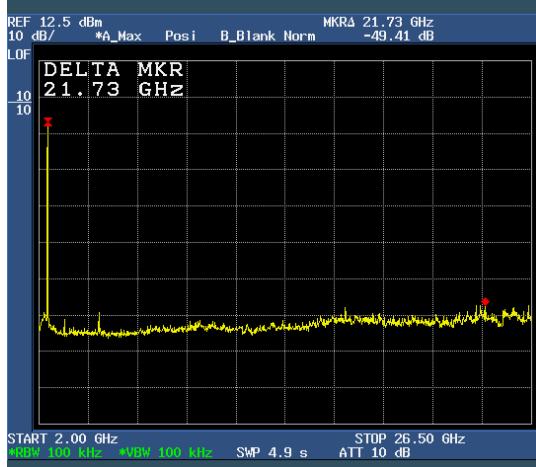
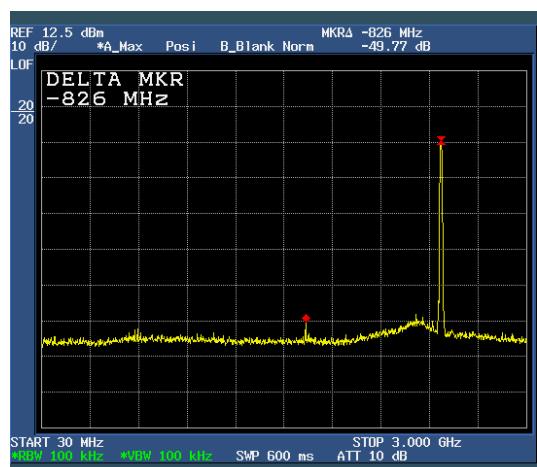
CH 1



CH 7

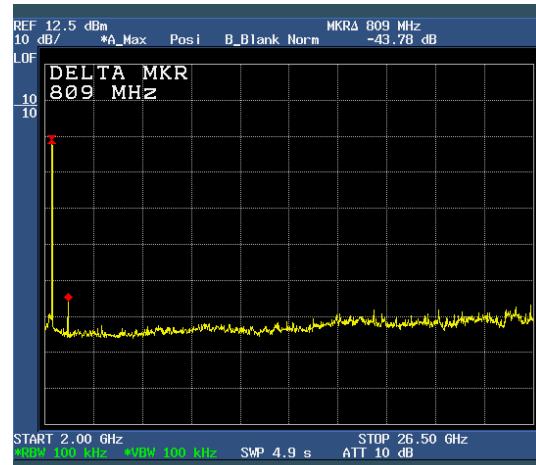
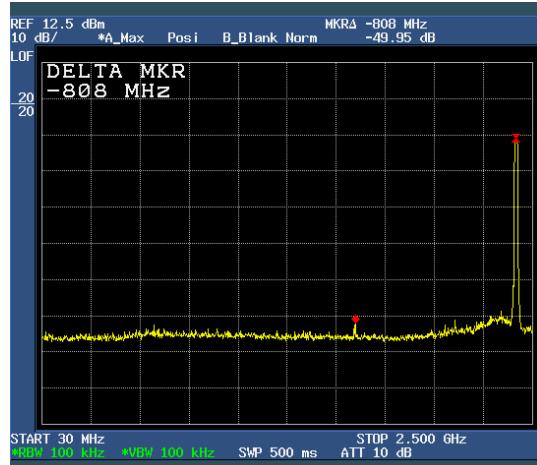


CH 13



IEEE 802.11g Port 2

CH 1



CH 7

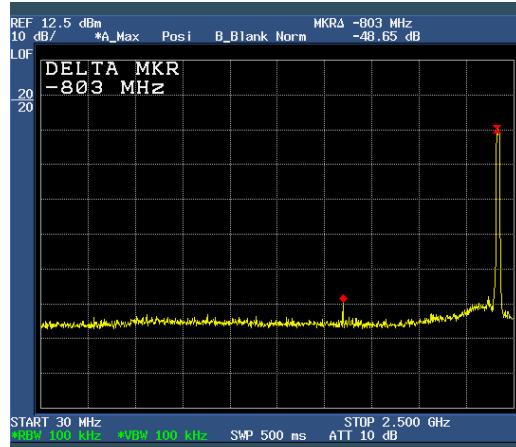


CH 13



IEEE 802.11n(HT20) Port 2

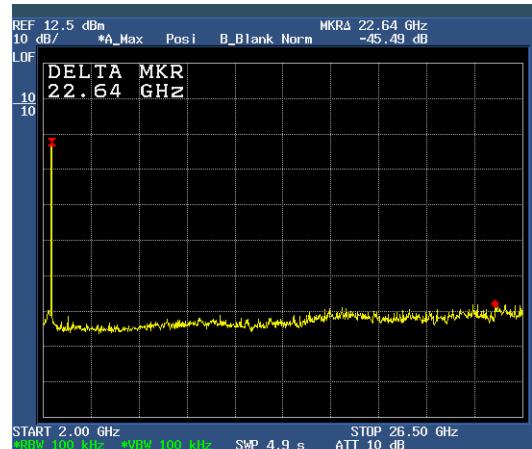
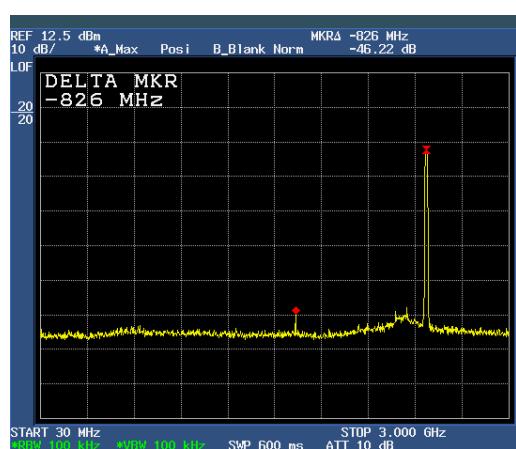
CH 1



CH 7

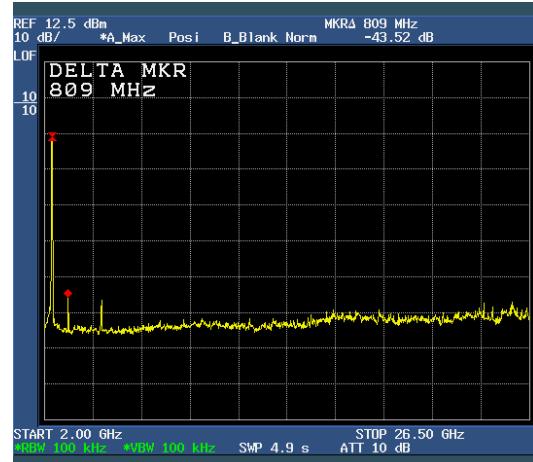
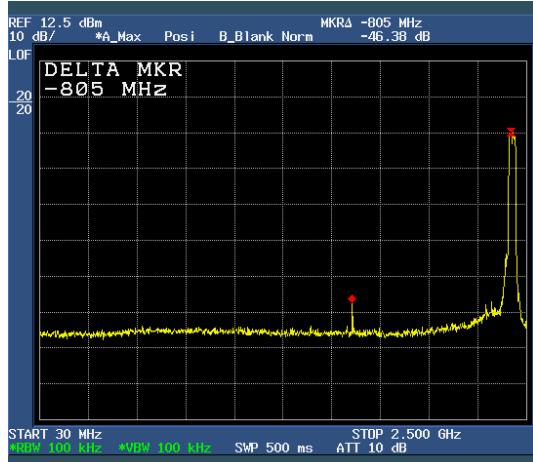


CH 13

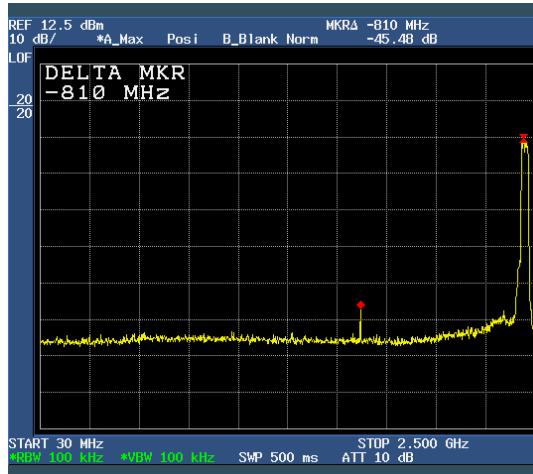


IEEE 802.11n(HT40) Port 2

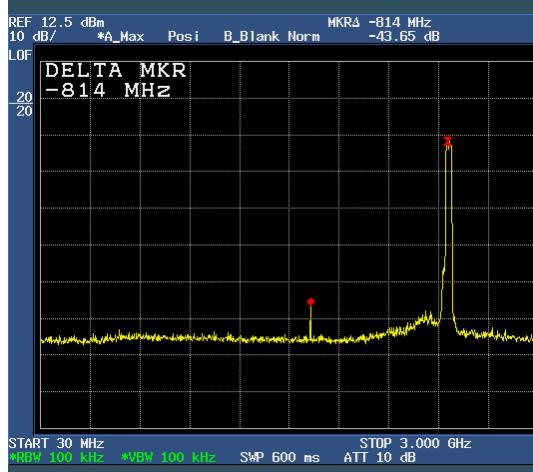
CH 3



CH 7



CH 11



6.7 Spurious RF Radiated emissions

6.7.1 Standard Applicable [FCC §15.247(d)]

All other emissions outside these bands shall not exceed the general radiated emission limits specified in §15.209(a). And according to §15.33(a)(1), for an intentional radiator operates below 10 GHz, the frequency Range of measurements : to the tenth harmonic of the highest fundamental frequency or to 40 GHz, Whichever is lower. In addition, radiated emissions which fall in the restricted bands, as defined in Sec.15.205(a), must also comply with the radiated emission limits specified in Sec. 15.209(a)

§15.209. [Table 1] limits for radiated emissions measurements (distance at 3m)

Frequency Band [MHz]	Limit [μ V/m]	Limit [dB/ μ V/m]	Detector
30 - 88	100 **	40.00	Quasi peak
88 - 216	150 **	43.52	Quasi peak
216 - 960	200 **	46.02	Quasi peak
Above 960	500	54.00	Average

** fundamental emissions from intentional radiators operation under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz, or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part Section 15.231 and 15.241

§15.205. [Table 2] Restrict Band of Operation

Only spurious emissions are permitted in any of the frequency bands listed below ;			
[MHz]	[MHz]	[MHz]	[GHz]
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505**	16.694 75 - 16.695 25	608 - 614	5.35 - 5.46
2.173 5 - 2.190 5	16.804 25 - 16.804 75	960 - 1 240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1 300 - 1 427	8.025 - 8.
4.177 25 - 4.177 75	37.5 - 38.25	1 435 - 1 626.5	9.0 - 9.2
4.207 25 - 4.207 75	73 - 74.6	1 645.5 - 1 646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1 660 - 1 710	10.6 - 12.7
6.267 75 - 6.268 25	108 - 121.94	1 718.8 - 1 722.2	13.25 - 13.
6.311 75 - 6.312 25	123 - 138	2 200 - 2 300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2 310 - 2 390	15.35 - 16.2
8.362 - 8.366	156.524 75 - 156.525 25	2 483.5 - 2 500	17.7 - 21.4
8.376 25 - 8.38 6 75	156.7 - 156.9	2 690 - 2 900	22.01 - 23.12
8.414 25 - 8.414 75	162.012 5 - 167.17	3 260 - 3 267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3 332 - 3 339	31.2 - 31.8
12.519 75 - 12.520 25	240 - 285	3 345.8 - 3 358	36.43 - 36.5
12.576 75 - 12.577 25	322 - 335.4	3 600 - 4 400	Above 38.6

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

6.7.2 Test Environment conditions

- Ambient temperature : 21 °C,
- Relative Humidity : (54 ~ 55) % R.H.

6.7.3 Measurement Procedure

The measurements procedure of the transmitter radiated E-field is as following describe method.

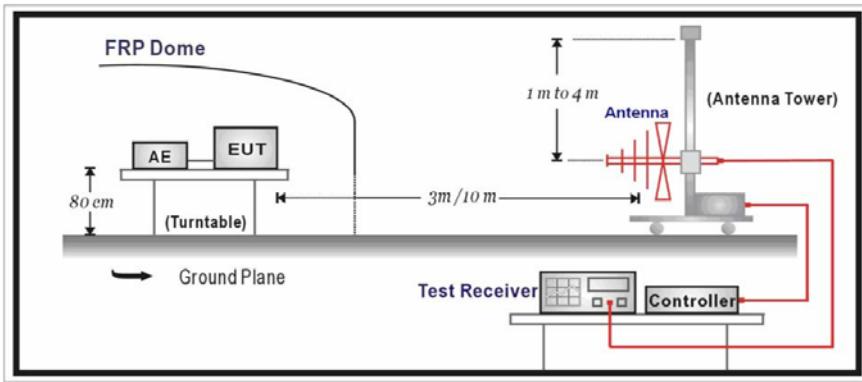
A pre-scan is performed in a Shield chamber to determine the accurate frequencies before final test, after maximum emissions level will be checked on a open test site and measuring distance is 3 m from EUT to test antenna.(O.A.T.S is ensured that comply with at least 6 dB above the ambient noise level)

- ① The EUT was powered ON with normal operating mode and placed on a 0.8 meter high non-conductive table on the reference ground plane. If EUT is connected to cables, that were fixed to cause maximum emission.
- ② For above 1 GHz, the test antenna is used on Horn antenna, and if the below 1 GHz, loop and broad- band antenna were used. It made with the antenna positioned in both the horizontal and vertical plane of polarization.
- ③ The output of the test antenna will be connected to a measuring receiver, and it is set to tuned over the frequency range according to required standard
- ④ For emission frequencies measured below 1 GHz, The measuring bandwidth and detector type of the measurement receiver is set on using measurement instrumentation employing a CISPR Quasi Peak detector, and for above 1GHz, set the spectrum analyzer on a 1 MHz resolution bandwidth with average and peak detector for each frequency.
- ⑤ The frequencies at which a relevant radiated signal component is detected, the test antenna will be raised and lowered through the specified heights range(from 1 to 4 meters) in horizontal polarized orientation, until an maximum signal level is detected on the measuring receiver(or spectrum analyzer).
- ⑥ Repeat step ⑤ with antennal in vertical polarized orientations.
- ⑦ The transmitter is position x, y, z axis on turn table rotating through 360 degrees, until the maximum signal level is detected by the measuring receiver.
- ⑧ The receiver is scanned from requested measuring frequency band and then the maximum meter reading is recorded. The radiated emissions were record the test result.

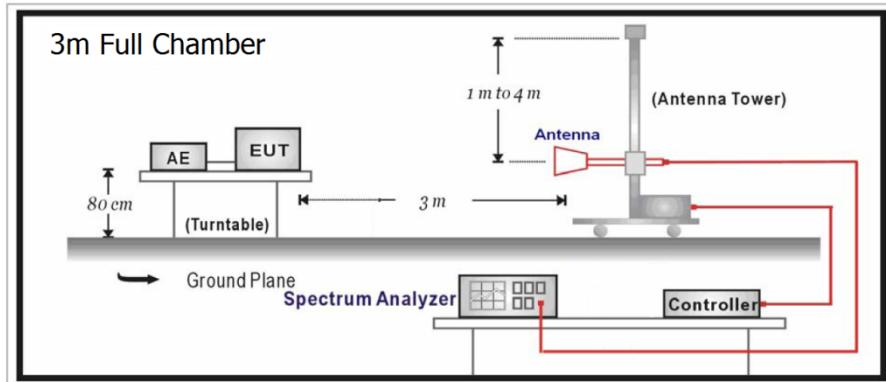
• The measurement results are obtained as described below:
Result(dB μ A/m) = Reading(dB μ A) + Antenna factor(dB/m)+ CL(dB) + other applicable factor (dB)
※ if necessary, additionally receiver is adopted high-pass filter and preamp because lower radiated signal

6.7.4 Test Configuration

Below 1GHz Test Setup:



Above 1GHz Test Setup:



6.7.5 Measurement Result

1) IEEE 802.11b

Lowest Channel 1 (2412 MHz)

Below 1 GHz

Frequency (MHz)	Reading (dBuV/m)	Factor(dB) CL+AF	Limits (dBuV/m)	Meas Result (dBuV/m)	P (V/H)	Result
258.40	13.14	15.73	46.02	28.87	H	Pass
452.48	12.90	21.52	46.02	34.42	H	Pass
934.34	11.47	29.92	46.02	41.39	H	Pass

Above 1 GHz

Frequency (MHz)	Reading (dBuV/m)	Factor(dB) CL+AF+AMP	Limits (dBuV/m)	Meas Result (dBuV/m)	P (V/H)	Result
4768.97	53.42	11.53	74	64.95	V	Pass
4768.97	41.30	11.53	54	52.83	V	Pass
10985.90	35.23	25.11	74	60.34	V	Pass
10985.90	24.87	25.11	54	49.98	V	Pass

Middle Channel 7 (2442 MHz)

Below 1 GHz

Frequency (MHz)	Reading (dBuV/m)	Factor(dB) CL+AF	Limits (dBuV/m)	Meas Result (dBuV/m)	P (V/H)	Result
333.95	17.93	17.67	46.02	35.60	H	Pass
452.34	18.51	21.51	46.02	40.02	H	Pass
933.36	8.84	29.91	46.02	38.75	H	Pass

Above 1 GHz

Frequency (MHz)	Reading (dBuV/m)	Factor(dB) CL+AF+AMP	Limits (dBuV/m)	Meas Result (dBuV/m)	P (V/H)	Result
4824.37	50.50	11.70	74	62.20	V	Pass
4824.37	40.27	11.70	54	51.97	V	Pass
11113.52	34.94	24.87	74	59.81	V	Pass
11113.52	24.92	24.87	54	49.79	V	Pass

Highest Channel 13 (2472 MHz)

Below 1 GHz

Frequency (MHz)	Reading (dB _u V/m)	Factor(dB) CL+AF	Limits (dB _u V/m)	Meas Result (dB _u V/m)	P (V/H)	Result
334.17	18.95	17.67	46.02	36.62	H	Pass
452.52	15.77	21.52	46.02	37.29	H	Pass
513.38	2.74	23.43	46.02	26.17	H	Pass

Above 1 GHz

Frequency (MHz)	Reading (dB _u V/m)	Factor(dB) CL+AF+AMP	Limits (dB _u V/m)	Meas Result (dB _u V/m)	P (V/H)	Result
5750.11	35.66	13.59	74	49.25	V	Pass
5750.11	25.72	13.59	54	39.31	V	Pass
8055.68	36.58	21.01	74	57.59	V	Pass
8055.68	26.49	21.01	54	47.50	V	Pass

Note : 1. Measurement level = reading level + correct factor (Antenna Factor + Cable loss+AMP)
 2. X axis plane was the worst test result than Y axis plane and Z axis plane.
 3. Above 1 GHz is measured average and peak detector mode in accordance with FCC Rule15.35
 4. Limit: 54 dB_uV/m(Average), 74 dB_uV/m(Peak)

2) IEEE 802.11g

Lowest Channel 1 (2412 MHz)

Below 1 GHz

Frequency (MHz)	Reading (dB _u V/m)	Factor(dB) CL+AF	Limits (dB _u V/m)	Meas Result (dB _u V/m)	P (V/H)	Result
37.95	1.42	14.94	40.00	16.36	H	Pass
452.31	17.97	21.51	46.02	39.48	H	Pass
934.34	12.55	29.92	46.02	42.47	H	Pass

Above 1 GHz

Frequency (MHz)	Reading (dB _u V/m)	Factor(dB) CL+AF+AMP	Limits (dB _u V/m)	Meas Result (dB _u V/m)	P (V/H)	Result
4768.97	47.93	11.53	74	59.46	V	Pass
4768.97	37.29	11.53	54	48.82	V	Pass
14453.31	37.83	26.34	74	64.17	V	Pass
14453.31	26.55	26.34	54	52.89	V	Pass

■ Middle Channel 7 (2442 MHz)

Below 1 GHz

Frequency (MHz)	Reading (dB _u V/m)	Factor(dB) CL+AF	Limits (dB _u V/m)	Meas Result (dB _u V/m)	P (V/H)	Result
258.47	13.93	15.73	46.02	29.66	V	Pass
452.27	17.00	21.51	46.02	38.51	H	Pass
934.35	11.75	29.92	46.02	41.67	H	Pass

Above 1 GHz

Frequency (MHz)	Reading (dB _u V/m)	Factor(dB) CL+AF+AMP	Limits (dB _u V/m)	Meas Result (dB _u V/m)	P (V/H)	Result
4820.85	45.23	11.70	74	56.93	V	Pass
4820.85	35.19	11.70	54	46.89	V	Pass
14765.76	37.55	26.62	74	64.17	V	Pass
14765.76	26.16	26.62	54	52.78	V	Pass

■ Highest Channel 13 (2472 MHz)

Below 1 GHz

Frequency (MHz)	Reading (dB _u V/m)	Factor(dB) CL+AF	Limits (dB _u V/m)	Meas Result (dB _u V/m)	P (V/H)	Result
333.76	17.25	17.66	46.02	34.91	H	Pass
484.70	11.06	22.57	46.02	33.63	H	Pass
933.33	9.02	29.91	46.02	38.93	H	Pass

Above 1 GHz

Frequency (MHz)	Reading (dB _u V/m)	Factor(dB) CL+AF+AMP	Limits (dB _u V/m)	Meas Result (dB _u V/m)	P (V/H)	Result
7904.56	37.32	20.70	74	58.02	V	Pass
7904.56	27.43	20.70	54	48.13	V	Pass
14919.74	37.83	26.75	74	64.58	V	Pass
14919.74	26.01	26.75	54	52.76	V	Pass

Note : 1. Measurement level = reading level + correct factor (Antenna Factor + Cable loss+AMP)
 2. X axis plane was the worst test result than Y axis plane and Z axis plane.
 3. Above 1 GHz is measured average and peak detector mode in accordance with FCC Rule15.35
 4. Limit: 54 dB_uV/m(Average), 74 dB_uV/m(Peak)

3) IEEE 802.11n(HT20)

Lowest Channel 1 (2412 MHz)

Below 1 GHz

Frequency (MHz)	Reading (dBuV/m)	Factor(dB) CL+AF	Limits (dBuV/m)	Meas Result (dBuV/m)	P (V/H)	Result
332.84	10.42	17.63	46.02	28.05	H	Pass
645.91	6.46	26.40	46.02	32.86	H	Pass
934.36	8.26	29.92	46.02	38.18	H	Pass

Above 1 GHz

Frequency (MHz)	Reading (dBuV/m)	Factor(dB) CL+AF+AMP	Limits (dBuV/m)	Meas Result (dBuV/m)	P (V/H)	Result
4768.97	47.93	11.53	74	59.46	V	Pass
4768.97	38.01	11.53	54	49.54	V	Pass
8019.51	35.90	21.09	74	56.99	V	Pass
8019.51	25.86	21.09	54	46.95	V	Pass

Middle Channel 7 (2442 MHz)

Below 1 GHz

Frequency (MHz)	Reading (dBuV/m)	Factor(dB) CL+AF	Limits (dBuV/m)	Meas Result (dBuV/m)	P (V/H)	Result
180.08	0.67	12.50	43.52	13.17	H	Pass
452.36	16.98	21.51	46.02	38.49	H	Pass
934.36	10.13	29.92	46.02	40.05	H	Pass

Above 1 GHz

Frequency (MHz)	Reading (dBuV/m)	Factor(dB) CL+AF+AMP	Limits (dBuV/m)	Meas Result (dBuV/m)	P (V/H)	Result
4828.55	43.93	11.71	74	55.64	V	Pass
4828.55	34.00	11.71	54	45.71	V	Pass
14975.85	37.29	26.79	74	64.08	V	Pass
14975.85	25.98	26.79	54	52.77	V	Pass

■ Highest Channel 13 (2472 MHz)

Below 1 GHz

Frequency (MHz)	Reading (dB _u V/m)	Factor(dB) CL+AF	Limits (dB _u V/m)	Meas Result (dB _u V/m)	P (V/H)	Result
71.99	2.44	8.07	40.00	10.51	H	Pass
452.45	14.84	21.52	46.02	36.36	H	Pass
934.32	6.43	29.92	46.02	36.35	H	Pass

Above 1 GHz

Frequency (MHz)	Reading (dB _u V/m)	Factor(dB) CL+AF+AMP	Limits (dB _u V/m)	Meas Result (dB _u V/m)	P (V/H)	Result
8042.70	35.95	21.04	74	56.99	V	Pass
8042.70	25.84	21.04	54	46.88	V	Pass
10797.21	35.10	24.53	74	59.63	V	Pass
10797.21	25.19	24.53	54	49.72	V	Pass

Note : 1. Measurement level = reading level + correct factor (Antenna Factor + Cable loss+AMP)
 2. X axis plane was the worst test result than Y axis plane and Z axis plane.
 3. Above 1 GHz is measured average and peak detector mode in accordance with FCC Rule15.35
 4. Limit: 54 dB_uV/m(Average), 74 dB_uV/m(Peak)

3) IEEE 802.11n(HT40)

■ Lowest Channel 1 (2422 MHz)

Below 1 GHz

Frequency (MHz)	Reading (dB _u V/m)	Factor(dB) CL+AF	Limits (dB _u V/m)	Meas Result (dB _u V/m)	P (V/H)	Result
333.39	10.80	17.65	46.02	28.45	H	Pass
452.23	16.65	21.51	46.02	38.16	H	Pass
934.35	8.35	29.92	46.02	38.27	H	Pass

Above 1 GHz

Frequency (MHz)	Reading (dB _u V/m)	Factor(dB) CL+AF+AMP	Limits (dB _u V/m)	Meas Result (dB _u V/m)	P (V/H)	Result
4774.21	48.11	11.56	74	59.67	V	Pass
4774.21	38.14	11.56	54	49.70	V	Pass
14971.02	37.23	26.79	74	64.02	V	Pass
14971.02	26.06	26.79	54	52.85	V	Pass

■ Middle Channel 7 (2442 MHz)

Below 1 GHz

Frequency (MHz)	Reading (dB _u V/m)	Factor(dB) CL+AF	Limits (dB _u V/m)	Meas Result (dB _u V/m)	P (V/H)	Result
290.79	16.02	16.41	46.02	32.43	H	Pass
452.41	17.89	21.51	46.02	39.40	H	Pass
934.37	8.9	29.92	46.02	38.82	H	Pass

Above 1 GHz

Frequency (MHz)	Reading (dB _u V/m)	Factor(dB) CL+AF+AMP	Limits (dB _u V/m)	Meas Result (dB _u V/m)	P (V/H)	Result
4816.79	41.26	11.68	74	52.94	V	Pass
4816.79	31.21	11.68	54	42.89	V	Pass
15095.64	37.61	26.64	74	64.25	H	Pass
15095.64	26.11	26.64	54	52.75	H	Pass

■ Highest Channel 13 (2462 MHz)

Below 1 GHz

Frequency (MHz)	Reading (dB _u V/m)	Factor(dB) CL+AF	Limits (dB _u V/m)	Meas Result (dB _u V/m)	P (V/H)	Result
333.39	10.80	17.65	46.02	28.45	H	Pass
452.23	16.65	21.51	46.02	38.16	H	Pass
934.35	8.35	29.92	46.02	38.27	H	Pass

Above 1 GHz

Frequency (MHz)	Reading (dB _u V/m)	Factor(dB) CL+AF+AMP	Limits (dB _u V/m)	Meas Result (dB _u V/m)	P (V/H)	Result
4866.34	48.16	11.84	74	60.00	V	Pass
4866.34	38.14	11.84	54	49.98	V	Pass
14791.06	37.77	26.64	74	64.41	V	Pass
14791.06	26.12	26.64	54	52.76	V	Pass

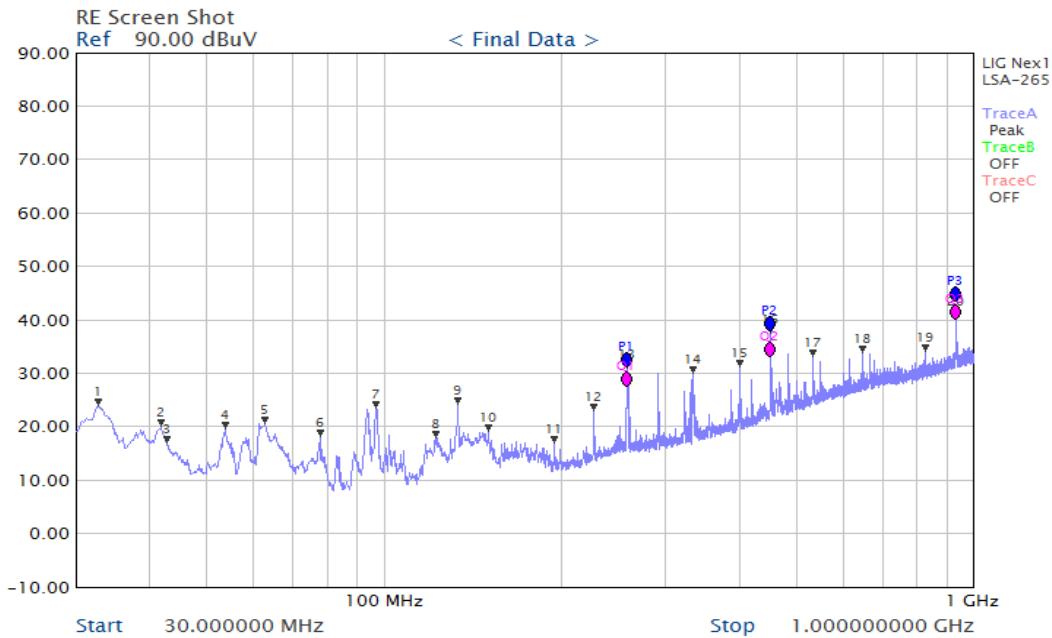
Note : 1. Measurement level = reading level + correct factor (Antenna Factor + Cable loss+AMP)
 2. X axis plane was the worst test result than Y axis plane and Z axis plane.
 3. Above 1 GHz is measured average and peak detector mode in accordance with FCC Rule15.35
 4. Limit: 54 dB_uV/m(Average), 74 dB_uV/m(Peak)

6.7.6 Test Plot

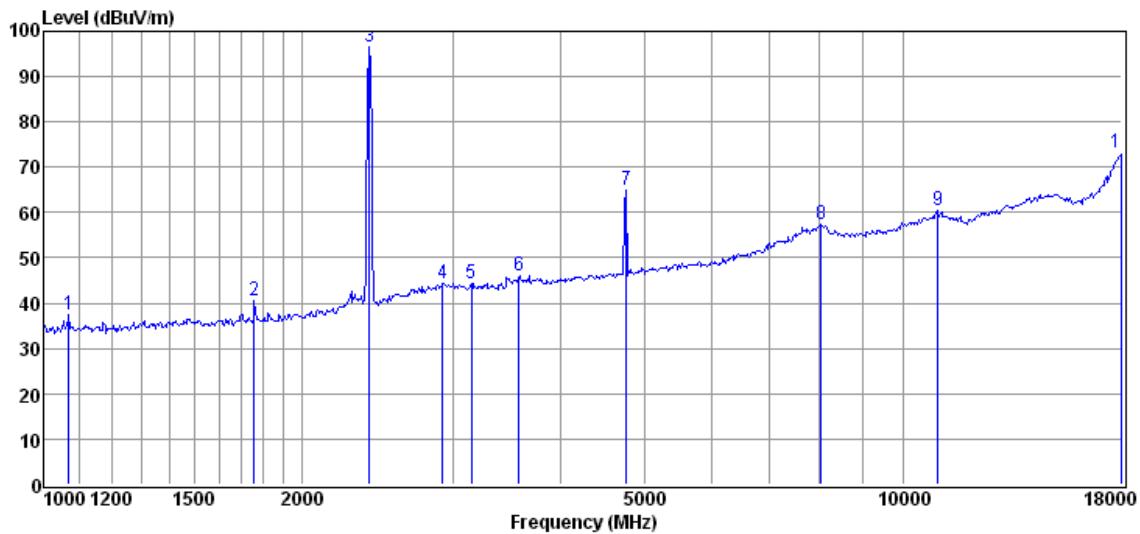
IEEE 802.11b

CH 1

Below 1 GHz

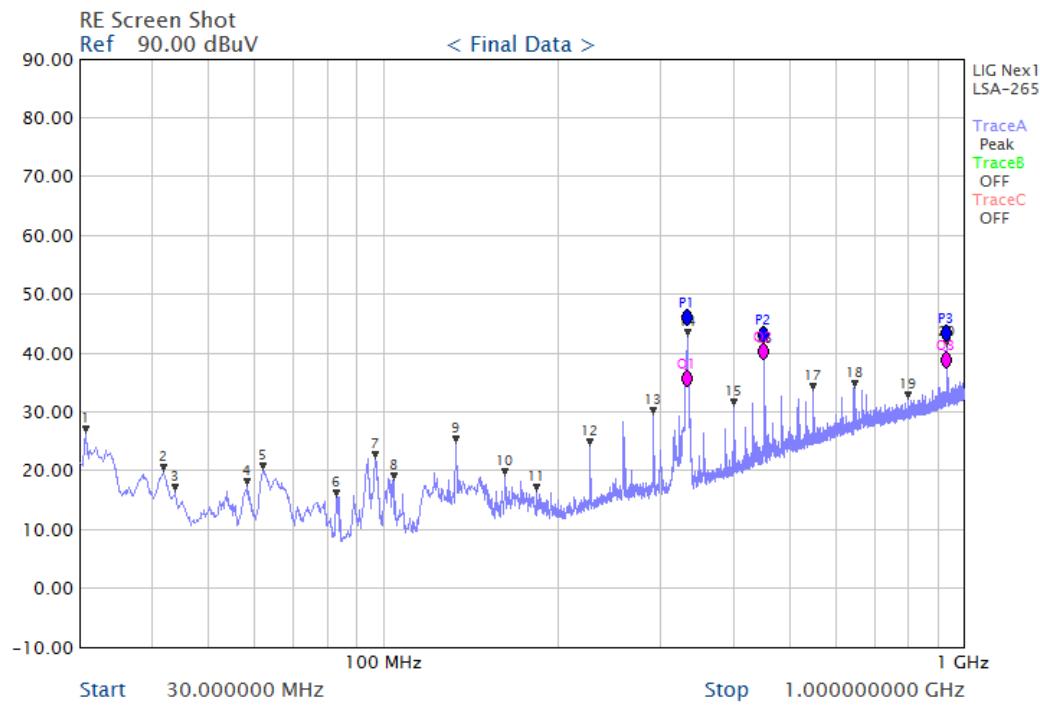


Above 1 GHz

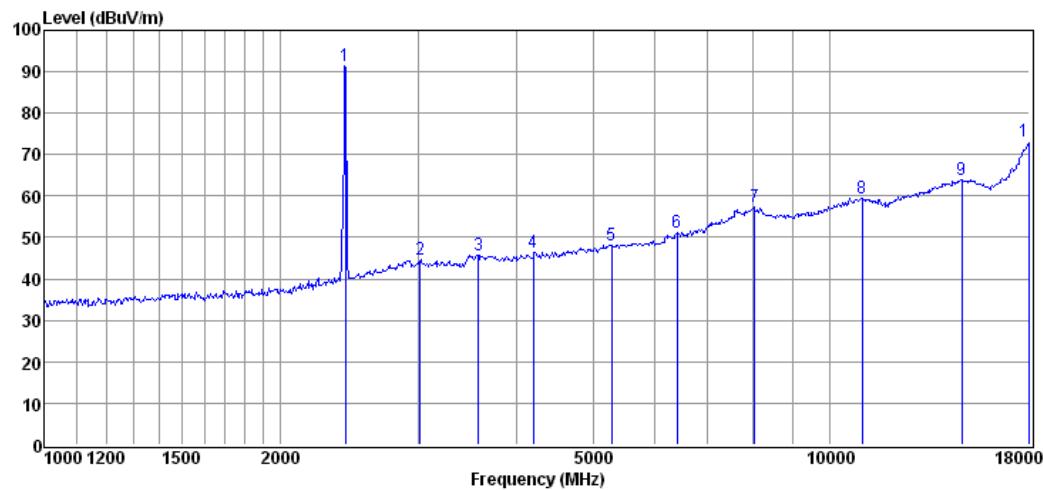


CH 7

Below 1 GHz

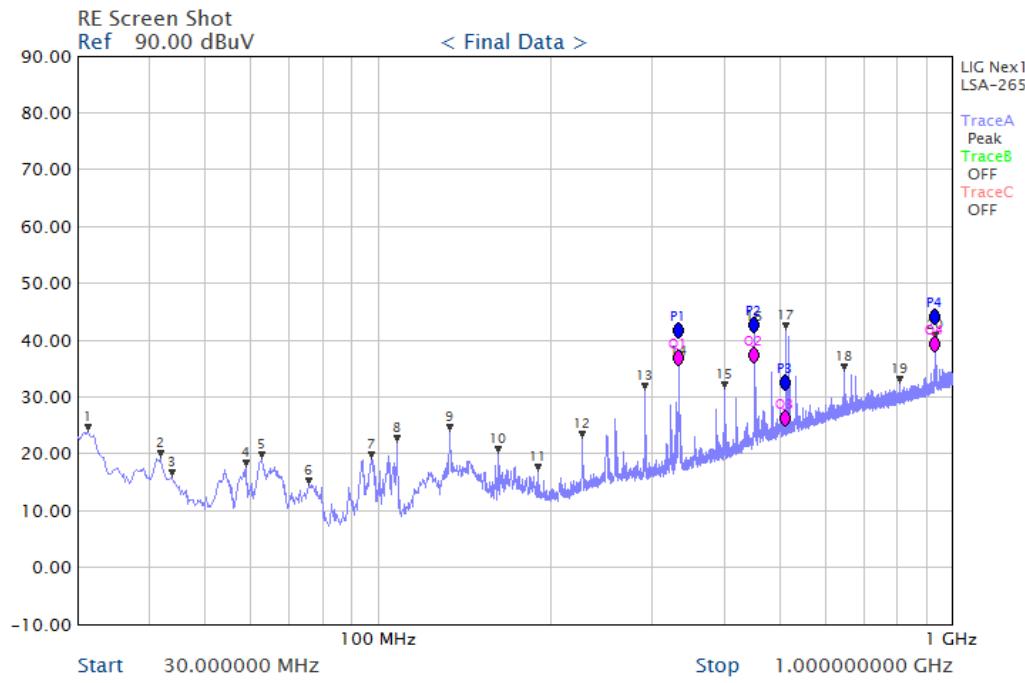


Above 1 GHz

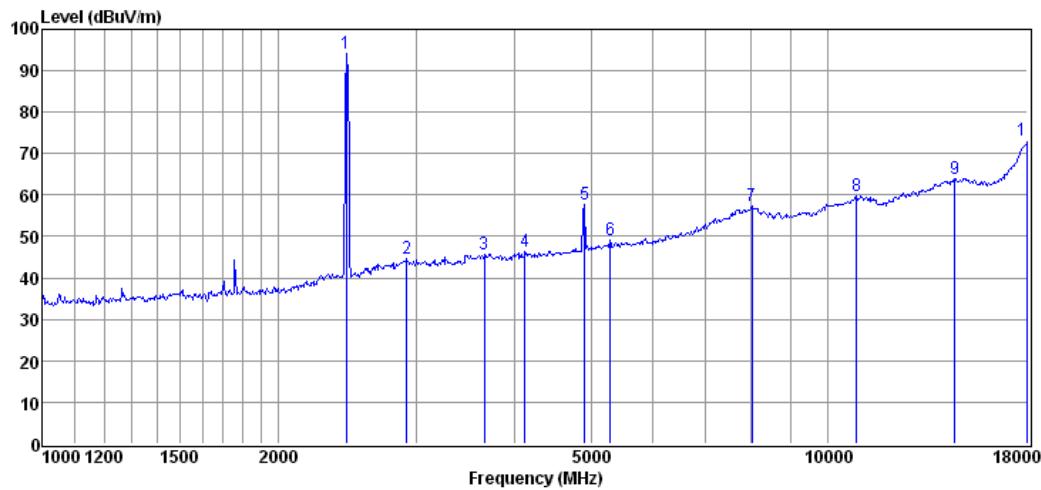


CH 13

Below 1 GHz



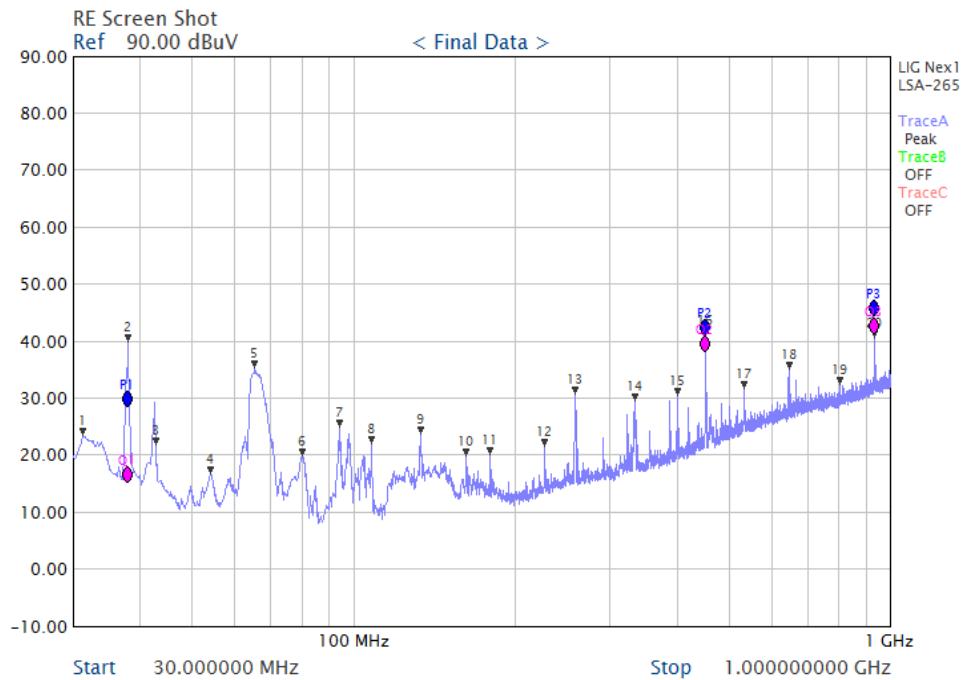
Above 1 GHz



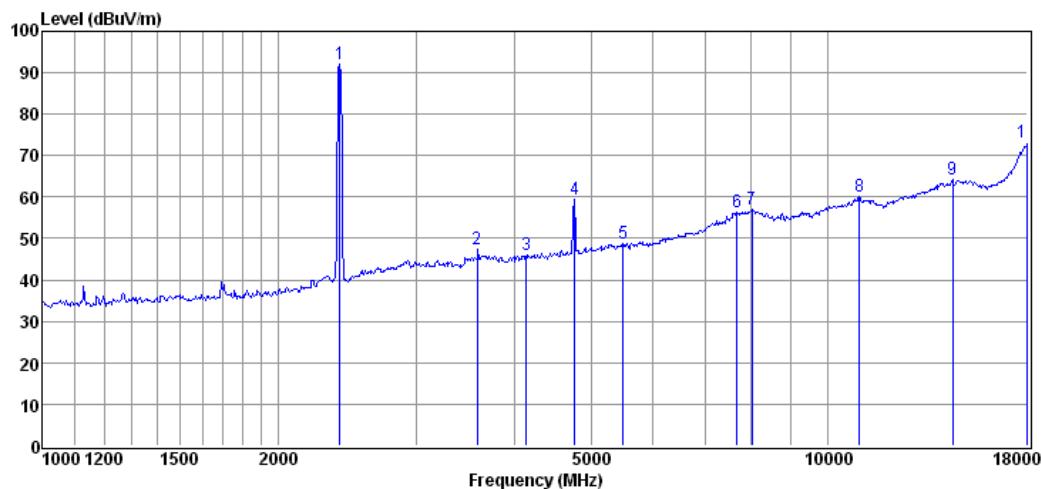
IEEE 802.11g

CH 1

Below 1 GHz

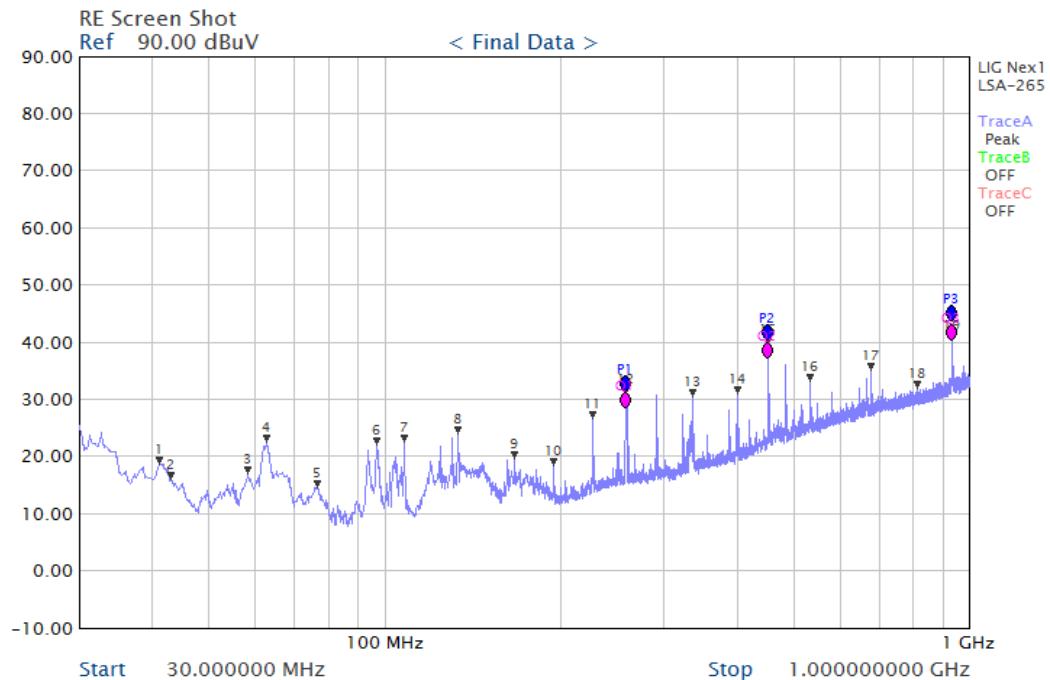


Above 1 GHz

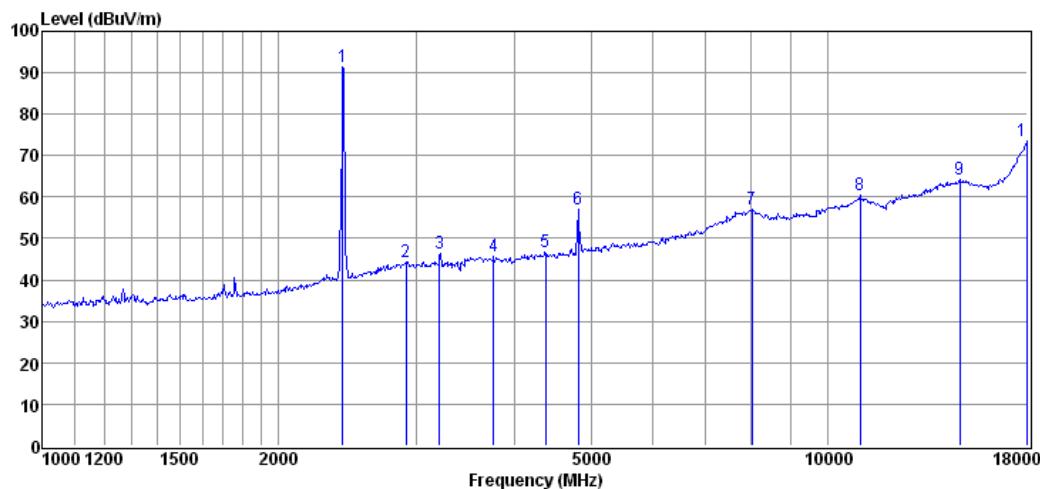


CH 7

Below 1 GHz

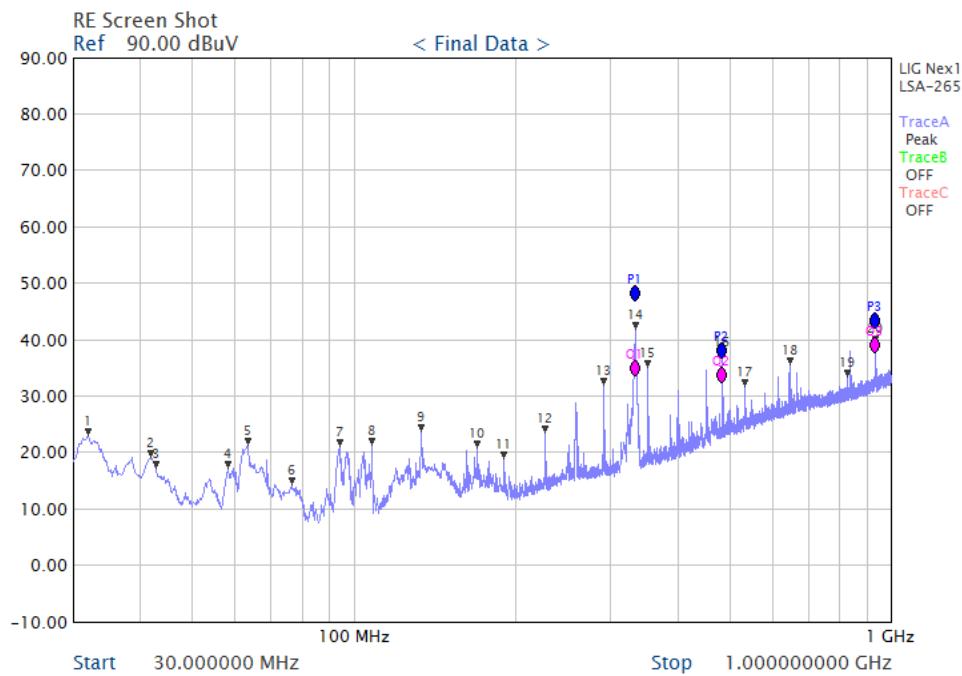


Above 1 GHz

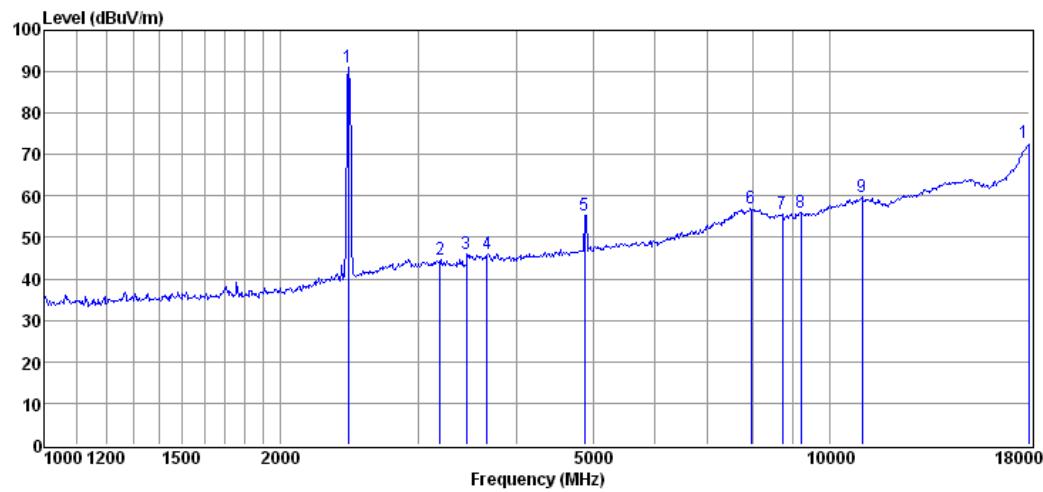


CH 13

Below 1 GHz



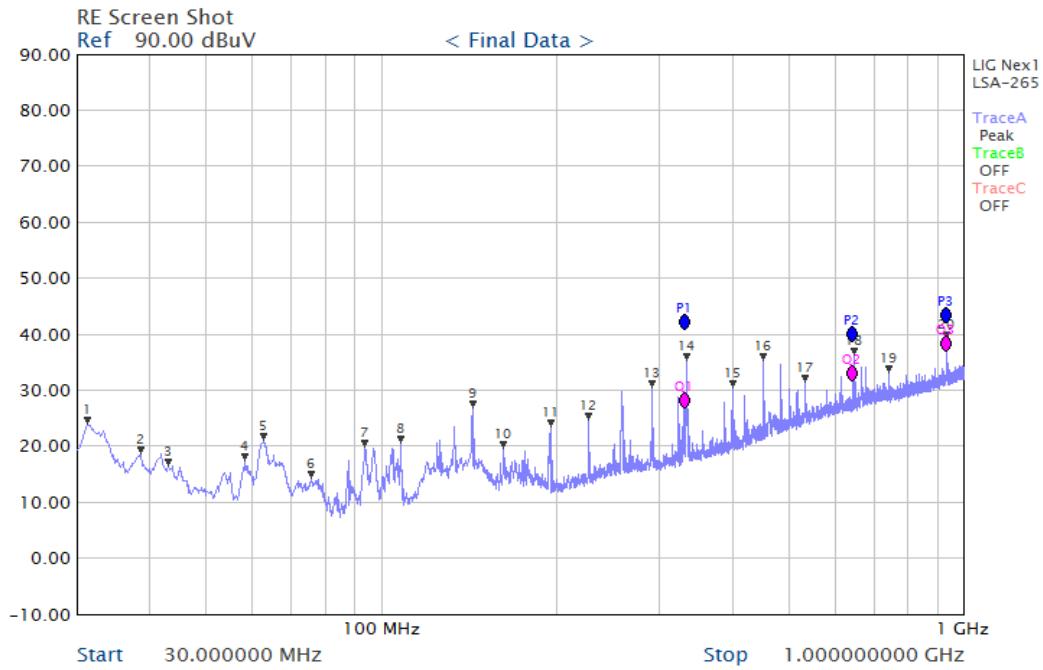
Above 1 GHz



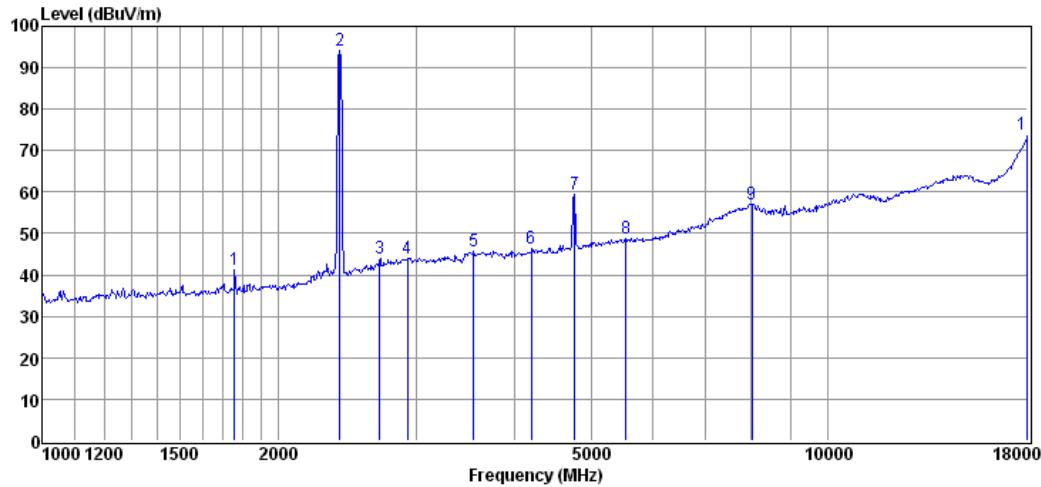
IEEE 802.11n(HT20)

CH 1

Below 1 GHz

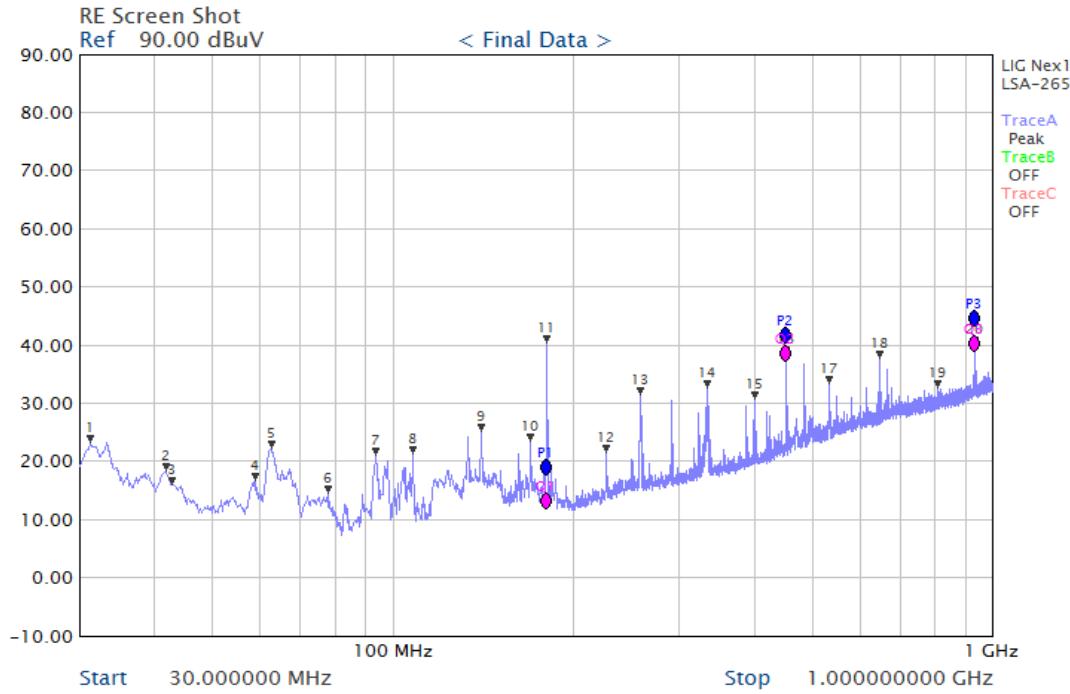


Above 1 GHz

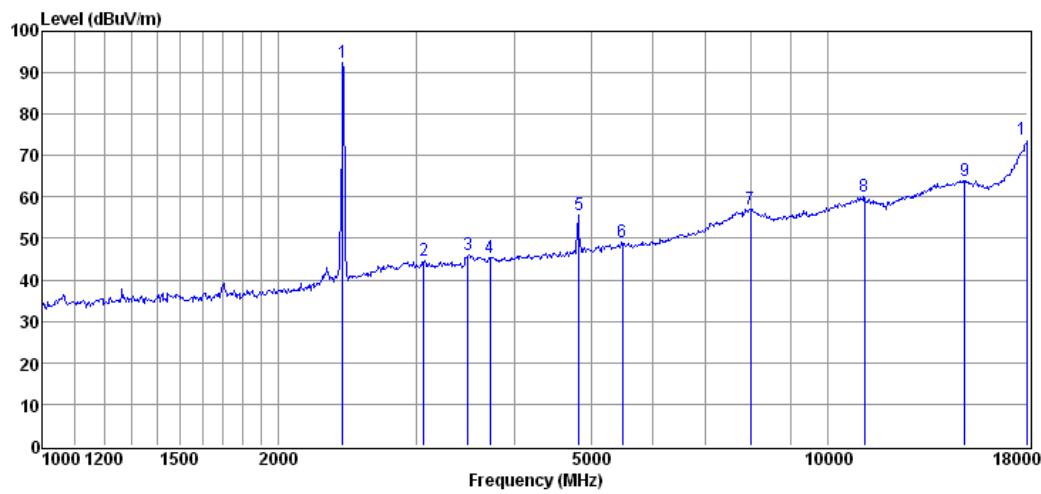


CH 7

Below 1 GHz

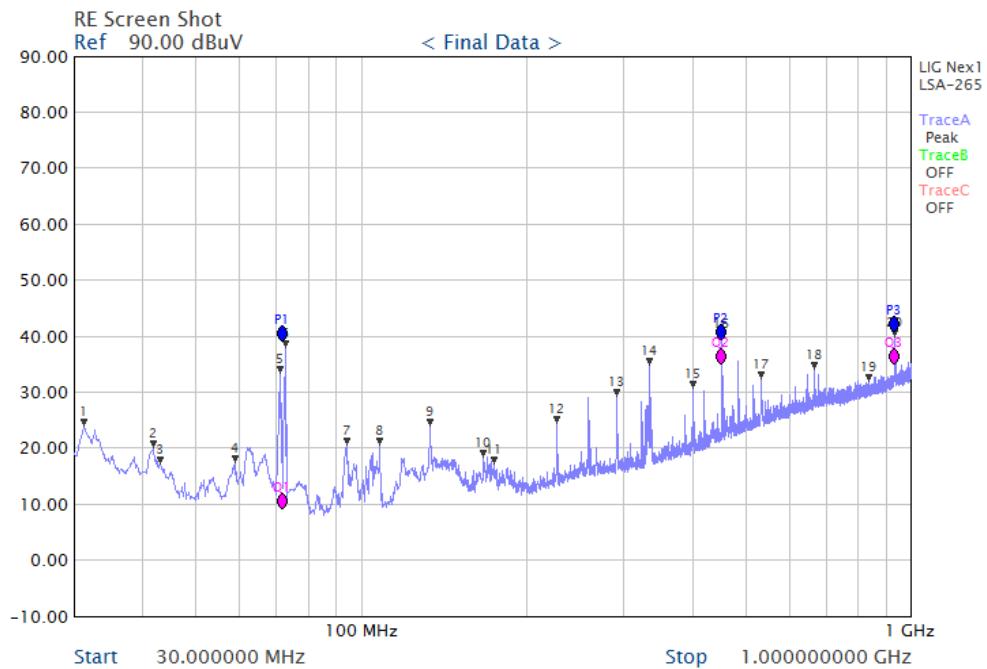


Above 1 GHz

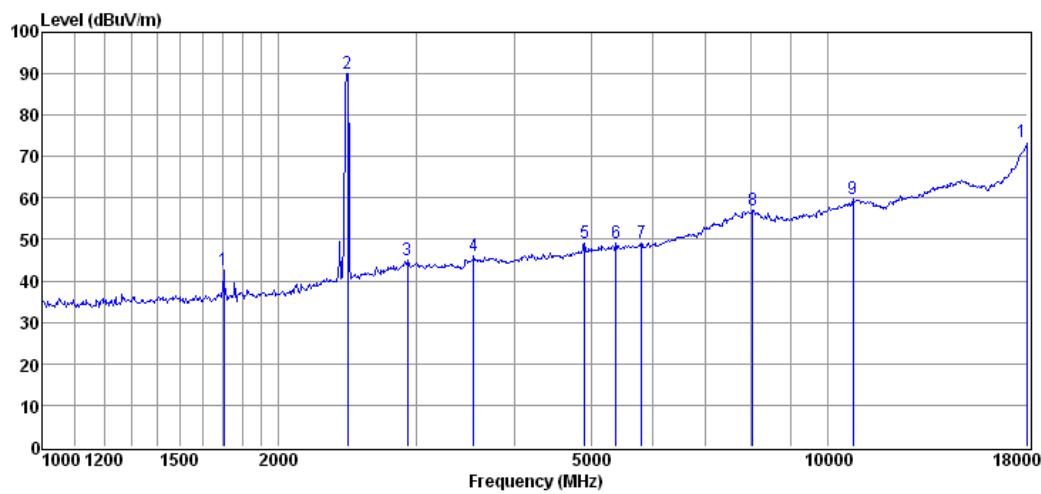


CH 13

Below 1 GHz



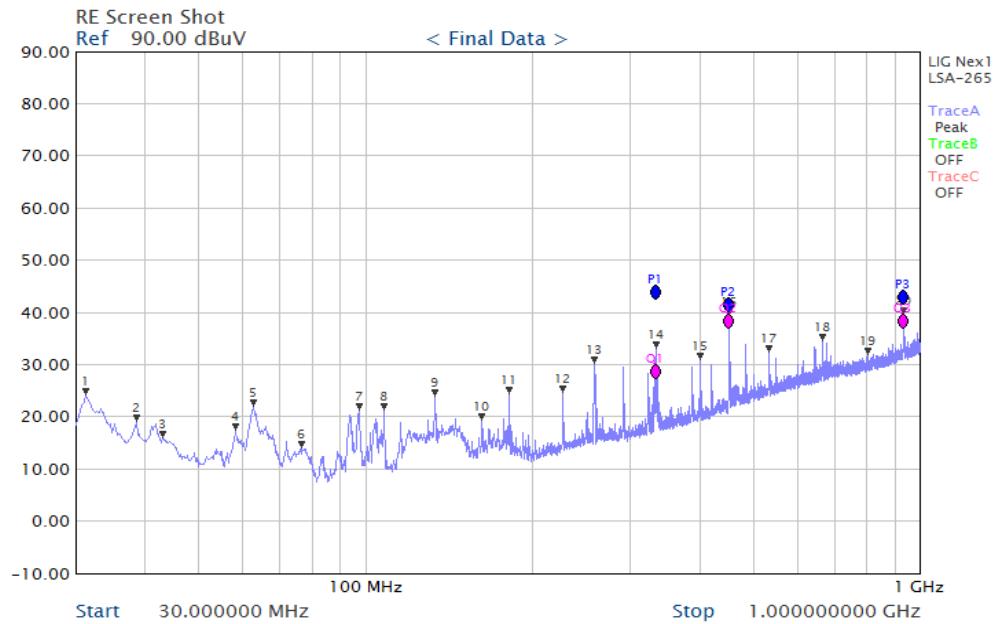
Above 1 GHz



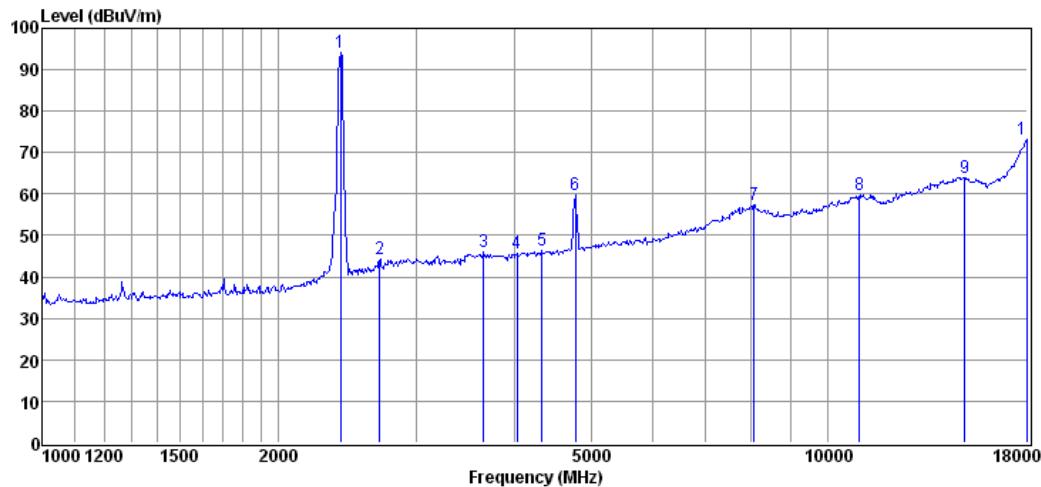
IEEE 802.11n(HT40)

CH 3

Below 1 GHz

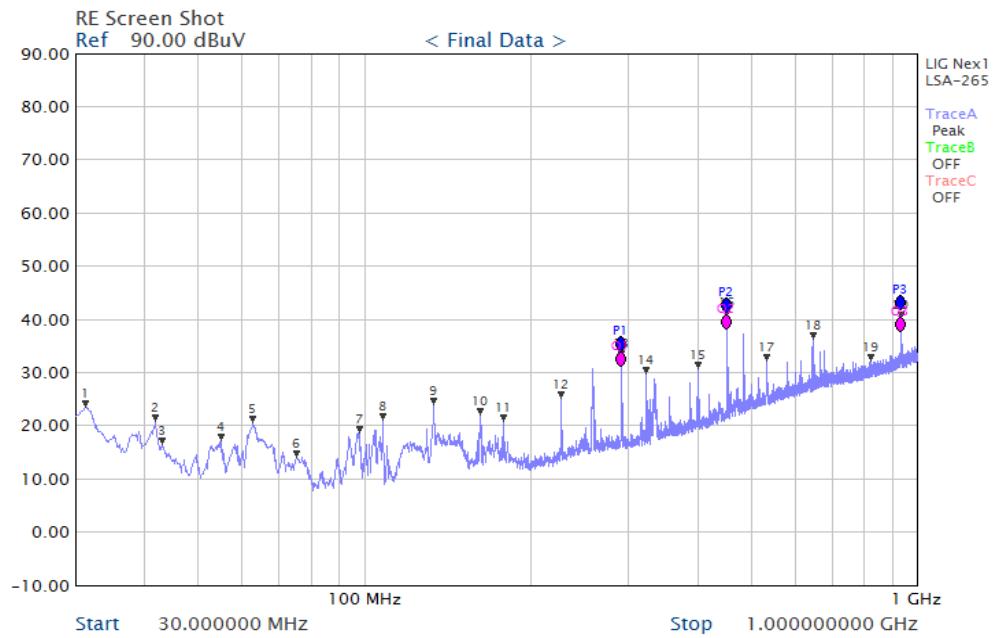


Above 1 GHz

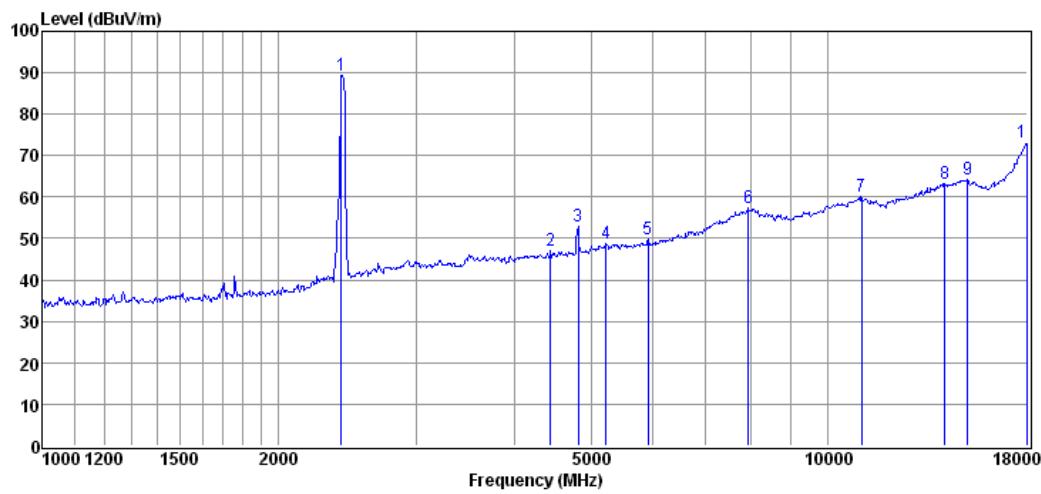


CH 7

Below 1 GHz

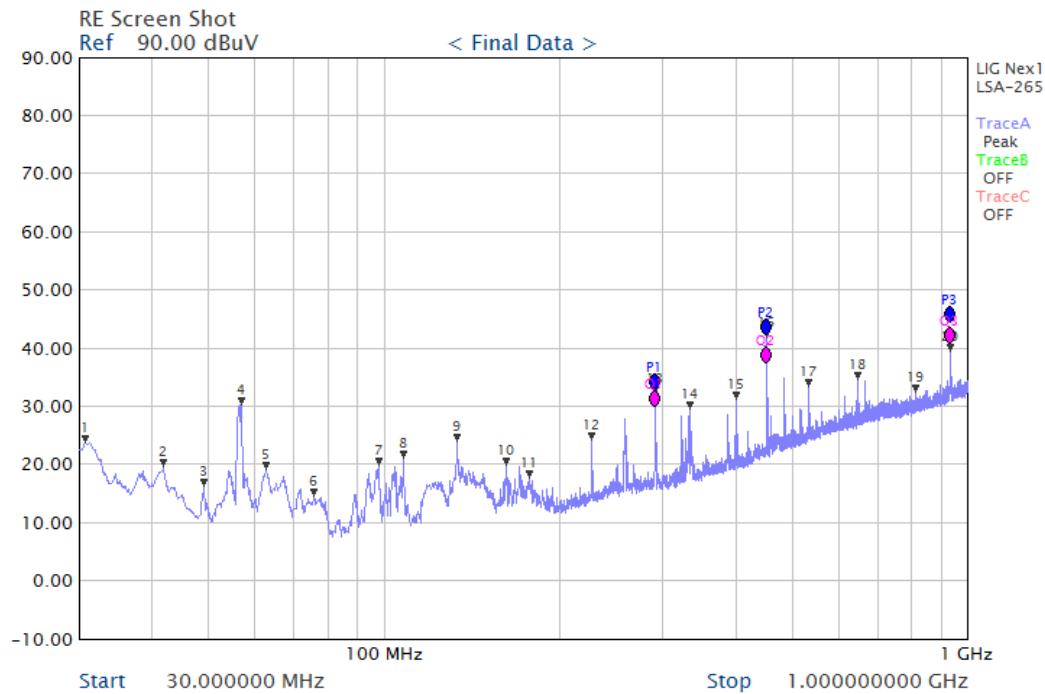


Above 1 GHz

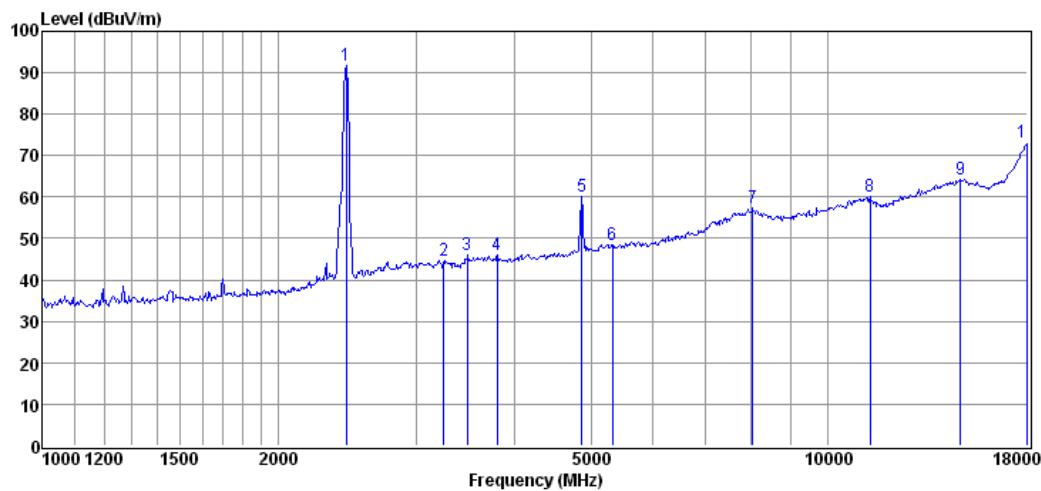


CH 11

Below 1 GHz



Above 1 GHz



6.8 Antenna requirement

6.8.1 Standard applicable [FCC §15.203, §15.247(4)(1)]

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

The use of a permanently attached antenna or of an antenna that user a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

The manufacturer may design the unit So that broken antenna can be replaced by the user, but the Use of a standard antenna jack or electrical connector is prohibited.

And according to §15.247(4)(1), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6dBi.

According to above requirement standard's This product's antenna type is an Omni directional type and it's gain is 2 dBi, So radiated emission field strength from EUT is below requirement standard limit

6.8.2 Antenna gain

Frequency Range	Gain [dBi]	Limit [dBi]	Results
2400 MHz ~ 2483.5 MHz	2	≤ 6	Pass

6.9 AC Power Conducted emissions

6.9.1 Standard Applicable [FCC §15.207(a)]

For intentional radiator that is designed to be connected to the public utility(AC)power line, the radio frequency Voltage that is conducted back onto the AC power line on any frequencies hopping mode within the band 150kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50uH/50 ohms line Impedance stabilization network(LISN). Compliance with the provisions of this paragraph shall be based on The measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

§15.207 limits for AC line conducted emissions;

Frequency of Emission(MHz)	Conducted Limit (dB μ V)	
	Quasi-peak	Average
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

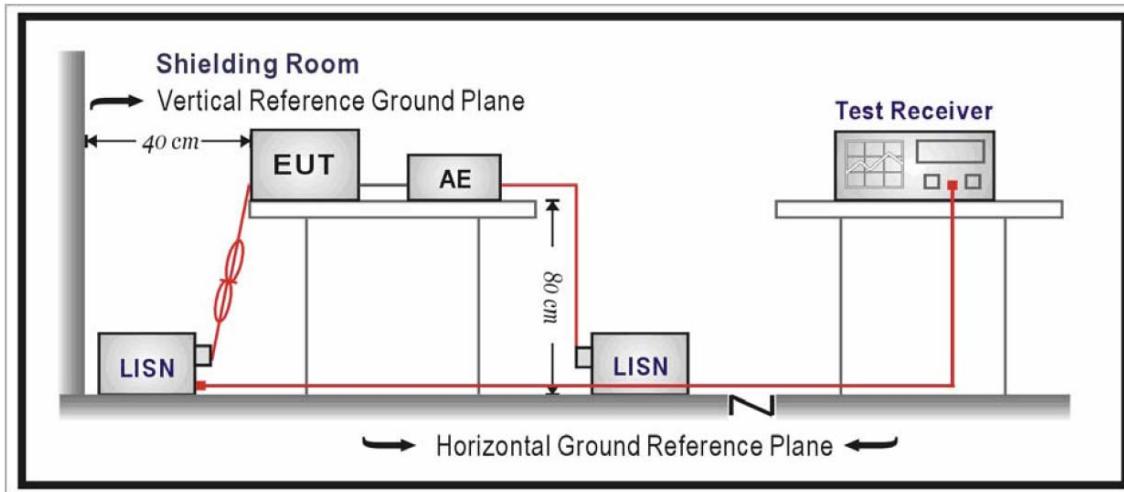
6.9.2 EUT used cable

Cable Type	Shield	Length (m)	Ferrite	Connector	Connection Point 1	Connection Point 2
LAN Cable	No	1.0	No	No	E.U.T.	Note book PC

6.9.3 Used Peripherals

Description	Manufacturer	Model / Part No	Serial Number
Note book PC	Sam Bo Co., Ltd	TG AVERATEC8200	163293
LAN Cable	-	0239M	-
Adaptor	Bridge Power Corp.	BPM010S05F04	K 1234

6.9.4 E.U.T Test Configuration



6.9.5 Measurement Procedure

EUT was placed on a non- metallic table height of 0.8 m above the reference ground plane.

Cables connected to EUT were fixed to cause maximum emission.

Test was made with the antenna positioned in both the horizontal and vertical planes of polarization.

The measurement antenna was varied in height above the conducting ground plane to obtain the Maximum signal strength.

6.9.6 Test environment conditions

- Normal temperature : 22 °C
- Relative humidity : (44 ~ 45) % R.H.
- Pressure : 98 k Pa

6.9.7 Measurement Result

Live

Freq. [MHz]	Reading [dB μ V]		Limit [dB μ V]		Factor [dB] [CL+LISN]	Meas Result [dB μ V]		Result
	Q-peak	Average	Q-peak	Average		Q-peak	Average	
0.172	23.22	14.54	64.84	54.84	9.87	33.09	24.41	Pass
0.258	20.69	15.37	61.50	51.50	9.87	30.56	25.24	Pass
0.402	27.08	22.87	57.81	47.81	9.90	36.98	32.77	Pass
1.270	21.31	15.64	56.00	46.00	9.99	31.30	25.63	Pass
2.755	19.34	13.66	56.00	46.00	10.12	29.46	23.78	Pass
26.488	21.33	16.53	60.00	50.00	10.56	31.89	27.09	Pass

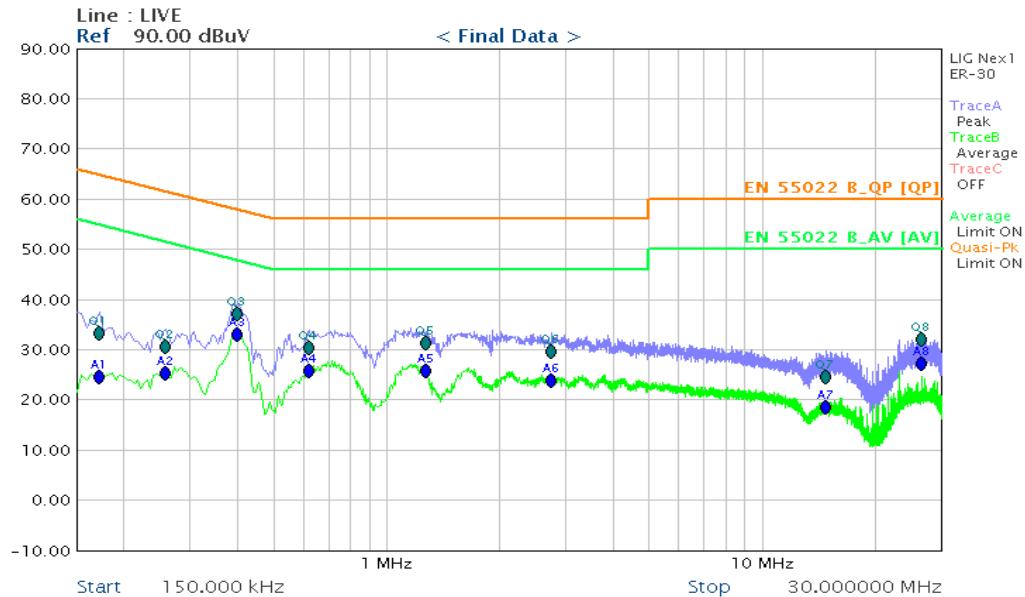
Neutral

Freq. [MHz]	Reading [dB μ V]		Limit [dB μ V]		Factor [dB] [CL+LISN]	Meas Result [dB μ V]		Result
	Q-peak	Average	Q-peak	Average		Q-peak	Average	
0.159	24.96	14.08	65.52	55.52	9.86	34.82	23.94	Pass
0.262	20.06	14.84	61.35	51.35	9.88	29.94	24.72	Pass
0.397	27.03	23.00	57.91	47.91	9.89	36.92	32.89	Pass
1.581	21.51	15.50	56.00	46.00	10.01	31.52	25.51	Pass
2.985	20.01	13.87	56.00	46.00	10.14	30.15	24.01	Pass
26.488	19.34	13.89	60.00	50.00	10.56	29.90	24.45	Pass

* Meas Result = Reading level + Factor (LISN Insertion Loss + Cable Loss)

6.9.8 Test Plot

Line : Live



Line : Neutral

