



Zacta

TEST REPORT

Report number : Z101C-14043

Issue date : June 19, 2014

The device, as described herewith, was tested pursuant to applicable test procedure and complies with the requirements of;

FCC Part15 Subpart C IC RSS-210

- Class II Permissive Change -

The test results are traceable to the international or national standards.

Applicant	: Japan Radio Co., Ltd.
Equipment under test (EUT)	: WLAN MODULE
Model number	: CMN-851
FCC ID	: CKECMN851
IC Certification Number	: 768B-CMN851

Date of test : June 2, 3, 5, 6, 2014
 Test place : TÜV SÜD Zacta Ltd. Yonezawa Testing Center
 4149-7 Hachimanpara 5-chome
 Yonezawa-shi Yamagata 992-1128 Japan
 Phone: +81-238-28-2880 Fax: +81-238-28-2888
 Test results : Complied

The results in this report are applicable only to the equipment tested.
 This report shall not be re-produced except in full without the written approval of TÜV SÜD Zacta Ltd.
 This test report must not be used by client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

Tested by : Chiaki Kanno Taiki Watanabe
 Chiaki Kanno Taiki Watanabe

Authorized by : Hiroaki Suzuki
 Hiroaki Suzuki
 Manager of EMC Technical Department



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1. Summary of Test

1.1 Purpose of test

EUT, FCC ID:CKECPMN851, has been granted on Oct, 13, 2011.
Purpose of test is retest of EUT by adding antenna type.

1.2 Standards

CFR47 FCC Part 15 Subpart C, RSS-210

1.2.1 Test Methods

ANSI C63.4-2003, KDB558074

1.2.2 Deviation from standards

None

1.3 List of applied test to the EUT

Test items Section	Test items	Condition	Result
15.247(d) 15.205 15.209 IC RSS-210 A8.5 RSS-Gen 4.9&4.10	Spurious Emissions	Radiated	PASS
15.247(d) 15.205 15.209 IC RSS-210 2.2	Restricted Bands of Operation	Radiated	PASS

NOTE: Since there is no change in EUT, only the Radiated test items were performed.

1.3.1 Test set up

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1.4 Modification to the EUT by laboratory

None

2. Equipment Under Test

2.1 General Description of equipment

EUT is the WLAN MODULE.

2.2 EUT information

Applicant	: Japan Radio Co., Ltd. 1011 SW Klickitat Way, Suite 201B, Seattle, WA 98134 U.S.A. Phone: 206-654-5644 Fax: 206-654-7030
Equipment under test	: WLAN MODULE
Trade name	: JRC
Model number	: CMN-851
Serial number	: 983108010011
EUT condition	: Pre-Production
Power ratings	: DC 3.3V
Size	: (W) 30 × (D) 26.8 × (H) 4.75 mm
Environment	: Indoor only use
Terminal limitation	: 0°C to 50°C
RF Specification Protocol	: IEEE802.11b, IEEE802.11g, IEEE802.11n (HT20), IEEE802.11n (HT40)
Frequency range	: 2412 - 2462MHz (IEEE802.11b/g/n (HT20)) 2422 - 2452MHz (IEEE802.11n (HT40))
Number of RF Channels	: 11 Channels (IEEE802.11b/g/n (HT20)) 7 Channels (IEEE802.11n (HT40))
Modulation type	: IEEE802.11b: DSSS (DBPSK, DQPSK, CCK) IEEE802.11g / n (HT20/40): OFDM (BPSK, QPSK, 16QAM, 64QAM)
Data rate	: IEEE802.11b: 1, 2, 5.5, 11Mbps IEEE802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps IEEE802.11n (HT20 1S): 6.5, 13, 19.5, 26, 39, 52, 58.5, 65Mbps IEEE802.11n (HT20 2S): 13, 26, 39, 52, 78, 104, 117, 130Mbps IEEE802.11n (HT40 1S): 13.5, 27, 40.5, 54, 81, 108, 121.5, 135Mbps IEEE802.11n (HT40 2S): 27, 54, 81, 108, 162, 216, 243, 270Mbps
Channel separation	: 5MHz
Antenna type	: PIFA antenna
Antenna gain	: 2.11dBi

2.3 Variation of the family model(s)

Not applicable.

2.4 Operating channels and frequencies

Channel	Frequency [MHz]
1	2412
2	2417
3	2422
4	2427
5	2432
6	2437
7	2442
8	2447
9	2452
10	2457
11	2462

2.5 Operating mode

The EUT had been tested under operating condition.
There are three channels have been tested as following:

Tested Channel	Frequency (MHz) 11b/g/n (HT20)	Frequency (MHz) 11n (HT40)
Low	2412	2422
Middle	2437	2437
High	2462	2452

The pre-test has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates.

Tested Channel	Modulation Type	Data Rate
Low, Middle, High	IEEE802.11b: DSSS	1Mbps
Low, Middle, High	IEEE802.11g: OFDM	6Mbps
Low, Middle, High	IEEE802.11n (HT20): OFDM	MCS0 (6.5Mbps)
Low, Middle, High	IEEE802.11n (HT40): OFDM	MCS0 (13.5Mbps)



2.6 Operating mode

[Tx mode]

- i) Test program setup to the ART tool
- ii) Select a Test mode
Operating frequency: Channel Low: 2412MHz, Channel Middle: 2437MHz, Channel High: 2462MHz
- iii) Start test mode

[Rx mode]

- i) Test program setup to the ART tool
- ii) Select a Test mode
Operating frequency: Channel Low: 2412MHz, Channel Middle: 2437MHz, Channel High: 2462MHz
- iii) Start test mode



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3. Configuration of equipment

3.1 Equipment(s) used

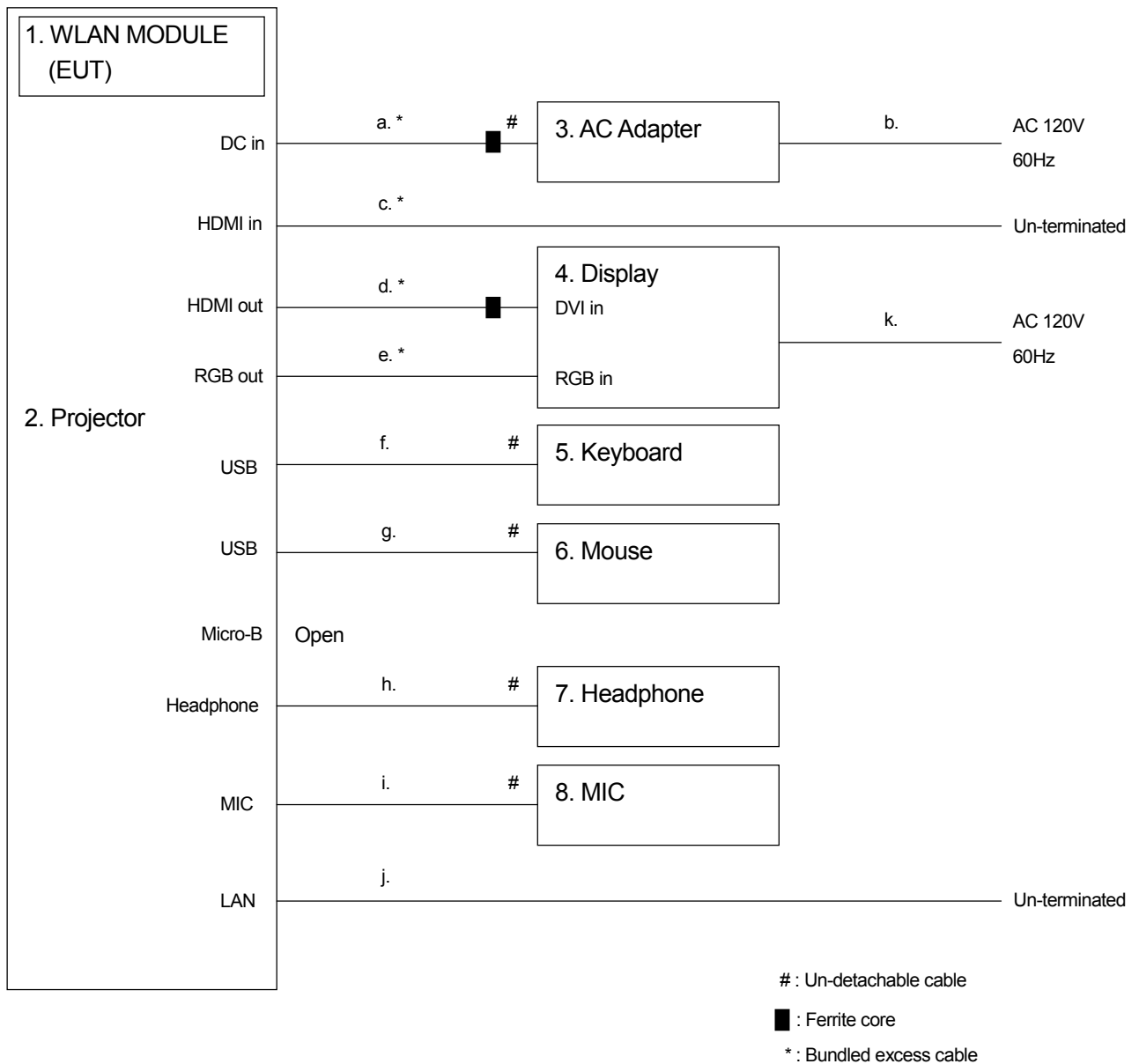
No.	Equipment	Company	Model No.	Serial No.	FCC ID / DoC	Comment
1	WLAN MODULE	Japan Radio Co., Ltd,	CMN-851	983108010011	CKECMN851	EUT
2	Projector	RICOH	P3500	48CZ-100203	N/A	Host device
3	AC adapter for Projector	RICOH	3A-905DA19	J031500C140400207	DoC	Accessory
4	Display	NEC	LCD-231WMi	04000080NJ	DoC	-
5	Keyboard	Logicool	Y-UR83	868017-0116 SY750UK	N/A	-
6	Mouse	Logitech	M-BT85	LNA43400219	DoC	-
7	Headphone	SONY	N/A	N/A	N/A	-
8	MIC	NEC	N/A	N/A	N/A	-

3.2 Cable(s) used

No.	Cable	Length[m]	Shield	Connector	Comment
a	AC adapter cord for Projector	1.5	YES	Metal	Accessory With one ferrite core *
b	AC power cord for AC adapter	0.9	NO	Plastic	Accessory
c	HDMI cable	0.9	YES	Metal	*
d	HDMI to DVI conversion cable	1.5	YES	Metal	With one ferrite core *
e	RGB cable	1.7	YES	Metal	*
f	Keyboard cable	1.5	YES	Metal	-
g	Mouse cable	1.6	YES	Metal	-
h	Headphone cable	1.7	YES	Metal	-
i	MIC cable	1.8	YES	Metal	-
j	LAN cable	2.1	NO	Plastic	*
k	AC power cord for Display	1.6	NO	Plastic	-

*Bundled excess cable

3.3 System configuration



- Note 1: Numbers assigned to equipment or cables on this diagram correspond to the list in "3.1 Equipment(s) used" and "3.2 Cable(s) used".
- Note 2: AC adapter cord (No.a) with one ferrite core is supplied with EUT.
- Note 3: One ferrite core for AC adapter cord (No.a) is not added during testing.
- Note 4: One ferrite core for HDMI to DVI conversion cable (No.d) is not added during testing.

4. Spurious Emissions - Radiated -

4.1 Measurement procedure

[FCC 247(d), 15.205, 15.209, IC RSS-210 A8.5, RSS-Gen 4.9&4.10]

Test was applied by following conditions.

Test method	:	ANSI C63.4
Frequency range	:	9kHz to 25GHz
Test place	:	3m Semi-anechoic chamber
EUT was placed on	:	FRP table / (W)2.0m × (D)1.0m × (H)0.8m
Antenna distance	:	3m
Test receiver setting	:	Below 1GHz
- Detector	:	Average (9kHz-90kHz, 110kHz-490kHz), Quasi-peak
- Bandwidth	:	200Hz, 120kHz
Spectrum analyzer setting	:	Above 1GHz
- Peak	:	RBW=1MHz, VBW=3MHz, Span=0Hz, Sweep=auto
- Average	:	RBW=1MHz, VBW=10Hz, Span=0Hz, Sweep=auto Display mode=Linear

Radiated emission measurements are performed at 3m distance with the broadband antenna (Loop antenna, Biconical antenna, Log periodic antenna and Double ridged guide antenna). The antenna is positioned both the horizontal and vertical planes of polarization and height is varied 1m to 4m and stopped at height producing the maximum emission. As for the Loop antenna, it is positioned with its plane vertical, and the center of the Loop antenna is 1m above the ground plane.

The EUT is Placed on a turntable, which is 0.8m above ground plane. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. The test results represent the worst case emission for each emission with manipulating the EUT, support equipment, interconnecting cables and varying the mode of operation. Sufficient time for the EUT, support equipment, and test equipment are allowed in order for them to warm up to their normal operating condition.

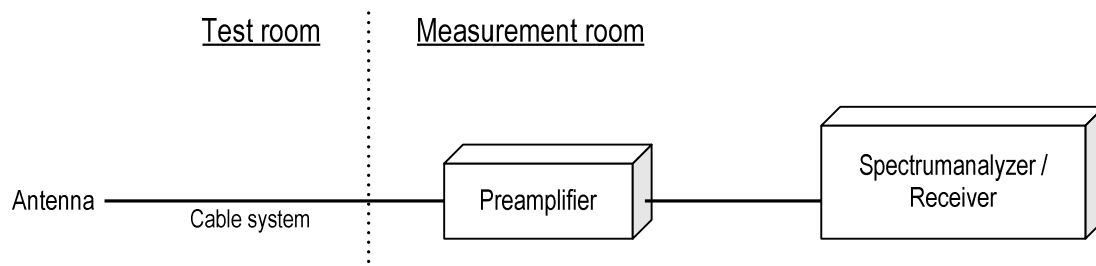
The EUT was set to operate with following conditions.

- Channel Low: 2412MHz, Channel Middle: 2437MHz, Channel High: 2462MHz

The test mode of EUT is as follows.

- Tx mode, Rx mode

- Test configuration



4.2 Calculation method

[9kHz to 150kHz]

Emission level = Reading + (Ant. factor + Cable system loss)

Margin = Limit – Emission level

[150kHz to 25GHz]

Emission level = Reading + (Ant. factor + Cable system loss – Amp. Gain)

Margin = Limit – Emission level

4.3 Limit

Frequency [MHz]	Field strength		Distance [m]
	[uV/m]	[dBuV/m]	
0.009-0.490	2400 / F [kHz]	20logE [uV/m]	300
0.490-1.705	24000 / F [kHz]	20logE [uV/m]	30
1.705-30	30	29.5	30
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	300	54.0	3

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level [dBuV/m] = 20log Emission [uV/m]
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition modulation.

4.4 Test data

Date : Jun. 3, 2014
 Temperature : 23.8 [°C]
 Humidity : 52.3 [%]
 Test place : 3m Semi-anechoic chamber
 Tested by : Taiki Watanabe

Date : Jun. 5, 2014
 Temperature : 22.7 [°C]
 Humidity : 50.7 [%]
 Test place : 3m Semi-anechoic chamber
 Tested by : Taiki Watanabe

Date : Jun. 6, 2014
 Temperature : 22.7 [°C]
 Humidity : 62.8 [%]
 Test place : 3m Semi-anechoic chamber
 Tested by : Taiki Watanabe

[IEEE802.11b]

Channel Low

No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading CAV [dB(μV)]	c.f [dB(1/m)]	Result PK [dB(μV/m)]	Result CAV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [°]
1	4824.000	H	39.6	27.6	13.2	52.8	40.8	74.0	54.0	21.2	13.2	100.0	145.0
2	4824.000	V	40.4	28.3	13.2	53.6	41.5	74.0	54.0	20.4	12.5	100.0	141.0
3	7236.000	H	38.2	24.2	19.3	57.5	43.5	74.0	54.0	16.5	10.5	100.0	111.0
4	7236.000	V	39.1	24.3	19.3	58.4	43.6	74.0	54.0	15.6	10.4	100.0	128.0
5	9648.000	H	37.1	24.4	23.4	60.5	47.8	74.0	54.0	13.5	6.2	100.0	102.0
6	9648.000	V	37.8	24.3	23.4	61.2	47.7	74.0	54.0	12.8	6.3	100.0	118.0

Channel Middle

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [°]
1	60.761	V	39.7	-14.3	25.4	40.0	14.6	235.0	12.0
2	120.760	H	35.1	-8.7	26.4	43.5	17.1	131.0	71.0
3	222.740	H	40.3	-4.3	36.0	46.0	10.0	153.0	207.0
4	668.250	H	40.2	-2.3	37.9	46.0	8.1	100.0	340.0
5	965.264	H	47.5	2.0	49.5	54.0	4.5	100.0	140.0

No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading CAV [dB(μV)]	c.f [dB(1/m)]	Result PK [dB(μV/m)]	Result CAV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [°]
1	4874.000	H	39.6	27.2	13.4	53.0	40.6	74.0	54.0	21.0	13.4	100.0	231.0
2	4874.000	V	40.3	27.0	13.4	53.7	40.4	74.0	54.0	20.3	13.6	103.0	350.0
3	7311.000	H	38.6	25.3	19.4	58.0	44.7	74.0	54.0	16.0	9.3	100.0	236.0
4	7311.000	V	38.2	23.8	19.4	57.6	43.2	74.0	54.0	16.4	10.8	103.0	350.0
5	9748.000	H	37.9	24.5	23.6	61.5	48.1	74.0	54.0	12.5	5.9	100.0	243.0
6	9748.000	V	37.6	24.7	23.6	61.2	48.3	74.0	54.0	12.8	5.7	100.0	359.0

Channel High

No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading CAV [dB(μV)]	c.f [dB(1/m)]	Result CAV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [°]
1	4924.000	H	39.9	27.0	13.7	40.7	74.0	54.0	20.4	13.3	100.0	231.0
2	4924.000	V	39.6	26.8	13.7	40.5	74.0	54.0	20.7	13.5	100.0	344.0
3	7386.000	H	37.9	25.2	19.6	44.8	74.0	54.0	16.5	9.2	100.0	232.0
4	7386.000	V	38.1	25.2	19.6	44.8	74.0	54.0	16.3	9.2	100.0	345.0
5	9848.000	H	38.7	25.1	23.8	48.9	74.0	54.0	11.5	5.1	100.0	232.0
6	9848.000	V	38.0	25.0	23.8	48.8	74.0	54.0	12.2	5.2	100.0	345.0

Note:

1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable - Amp)]
2. No emission were detected in frequency range 9kHz to 30MHz at the 3 meters distance.
3. No emission were detected in frequency range GHz band at the 3 meters distance. Measurement is the floor noise.
4. No emission was detected in the receive mode.



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[IEEE802.11g] Channel Low

No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading CAV [dB(μV)]	c. f [dB(1/m)]	Result PK [dB(μV/m)]	Result CAV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [°]
1	4824.000	H	39.3	26.5	13.2	52.5	39.7	74.0	54.0	21.5	14.3	100.0	231.0
2	4824.000	V	39.6	26.4	13.2	52.8	39.6	74.0	54.0	21.2	14.4	103.0	350.0
3	7236.000	H	39.5	26.0	19.3	58.8	45.3	74.0	54.0	15.2	8.7	100.0	235.0
4	7236.000	V	39.1	26.0	19.3	58.4	45.3	74.0	54.0	15.6	8.7	103.0	350.0
5	9648.000	H	38.4	23.3	23.4	61.8	46.7	74.0	54.0	12.2	7.3	100.0	243.0
6	9648.000	V	38.0	24.8	23.4	61.4	48.2	74.0	54.0	12.6	5.8	100.0	359.0

Channel Middle

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	Reading CAV [dB(μV)]	c. f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [°]
1	36.059	V	31.8		-6.6	25.2	40.0	14.8	148.0	76.0
2	60.750	V	36.5		-14.3	22.2	40.0	17.8	172.0	40.0
3	179.350	H	30.6		-5.2	25.4	43.5	18.1	180.0	352.0
4	222.752	H	38.4		-4.3	34.1	46.0	11.9	146.0	14.0
5	668.260	H	41.0		-2.3	38.7	46.0	7.3	172.0	176.0
6	965.264	H	45.5		2.0	47.5	54.0	6.5	100.0	140.0

No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading CAV [dB(μV)]	c. f [dB(1/m)]	Result CAV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [°]
1	4874.000	H	39.7	27.0	13.4	40.4	74.0	54.0	20.9	13.6	100.0	231.0
2	4874.000	V	40.3	26.9	13.4	40.3	74.0	54.0	20.3	13.7	100.0	344.0
3	7311.000	H	38.1	25.2	19.4	44.6	74.0	54.0	16.5	9.4	100.0	232.0
4	7311.000	V	38.4	25.3	19.4	44.7	74.0	54.0	16.2	9.3	100.0	345.0
5	9748.000	H	37.9	24.5	23.6	48.1	74.0	54.0	12.5	5.9	100.0	232.0
6	9748.000	V	37.7	24.5	23.6	48.1	74.0	54.0	12.7	5.9	100.0	345.0

Channel High

No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading CAV [dB(μV)]	c. f [dB(1/m)]	Result CAV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [°]
1	4924.000	H	39.9	27.0	13.7	40.7	74.0	54.0	20.4	13.3	100.0	231.0
2	4924.000	V	39.6	26.8	13.7	40.5	74.0	54.0	20.7	13.5	100.0	344.0
3	7386.000	H	37.9	25.2	19.6	44.8	74.0	54.0	16.5	9.2	100.0	232.0
4	7386.000	V	38.1	25.2	19.6	44.8	74.0	54.0	16.3	9.2	100.0	345.0
5	9848.000	H	38.7	25.1	23.8	48.9	74.0	54.0	11.5	5.1	100.0	232.0
6	9848.000	V	38.0	25.0	23.8	48.8	74.0	54.0	12.2	5.2	100.0	345.0

Note:

1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable – Amp)]
2. No emission were detected in frequency range 9kHz to 30MHz at the 3 meters distance.
3. No emission were detected in frequency range GHz band at the 3 meters distance. Measurement is the floor noise.
4. No emission was detected in the receive mode.



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[IEEE802.11n (HT20)]**Channel Low**

No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading CAV [dB(μV)]	c. f [dB(1/m)]	Result CAV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [°]
1	4824.000	H	39.3	26.0	13.2	39.2	74.0	54.0	21.5	14.8	100.0	155.0
2	4824.000	V	39.1	26.2	13.2	39.4	74.0	54.0	21.7	14.6	104.0	343.0
3	7236.000	H	39.1	25.7	19.3	45.0	74.0	54.0	15.6	9.0	100.0	156.0
4	7236.000	V	39.1	25.7	19.3	45.0	74.0	54.0	15.6	9.0	105.0	345.0
5	9648.000	H	37.5	24.6	23.4	48.0	74.0	54.0	13.1	6.0	100.0	155.0
6	9648.000	V	37.7	24.6	23.4	48.0	74.0	54.0	12.9	6.0	105.0	345.0

Channel Middle

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	Reading CAV [dB(μV)]	c. f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin QP [dB]	Margin CAV [dB]	Height [cm]	Angle [°]
1	35.955	V	33.3		-6.5	26.8	40.0		13.2		103.0	106.0
2	222.752	H	43.8		-4.3	39.5	46.0		6.5		144.0	2.0
3	668.260	H	44.5		-2.3	42.2	46.0		3.8		152.0	164.0
4	965.264	H	48.2		2.0	50.2	54.0		3.8		100.0	72.0

No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading CAV [dB(μV)]	c. f [dB(1/m)]	Result CAV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [°]
1	4874.000	H	39.7	26.4	13.4	39.8	74.0	54.0	20.9	14.2	100.0	155.0
2	4874.000	V	39.4	26.3	13.4	39.7	74.0	54.0	21.2	14.3	104.0	345.0
3	7311.000	H	38.2	25.1	19.4	44.5	74.0	54.0	16.4	9.5	100.0	156.0
4	7311.000	V	38.2	25.0	19.4	44.4	74.0	54.0	16.4	9.6	105.0	345.0
5	9748.000	H	37.9	24.4	23.6	48.0	74.0	54.0	12.5	6.0	100.0	155.0
6	9748.000	V	37.7	24.6	23.6	48.2	74.0	54.0	12.7	5.8	105.0	345.0

Channel High

No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading CAV [dB(μV)]	c. f [dB(1/m)]	Result CAV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [°]
1	4924.000	H	39.4	26.6	13.7	40.3	74.0	54.0	20.9	13.7	100.0	155.0
2	4924.000	V	39.7	26.7	13.7	40.4	74.0	54.0	20.6	13.6	104.0	345.0
3	7386.000	H	38.2	25.0	19.6	44.6	74.0	54.0	16.2	9.4	100.0	156.0
4	7386.000	V	38.7	25.0	19.6	44.6	74.0	54.0	15.7	9.4	105.0	345.0
5	9848.000	H	37.9	24.8	23.8	48.6	74.0	54.0	12.3	5.4	100.0	155.0
6	9848.000	V	38.2	24.7	23.8	48.5	74.0	54.0	12.0	5.5	105.0	345.0

Note:

1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable – Amp)]
2. No emission were detected in frequency range 9kHz to 30MHz at the 3 meters distance.
3. No emission were detected in frequency range GHz band at the 3 meters distance. Measurement is the floor noise.
4. No emission was detected in the receive mode.



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[IEEE802.11n (HT40)]**Channel Low**

No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading CAV [dB(μV)]	c. f [dB(1/m)]	Result CAV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [°]
1	4824.000	H	39.3	26.0	13.2	39.2	74.0	54.0	21.5	14.8	100.0	155.0
2	4824.000	V	39.2	26.0	13.2	39.2	74.0	54.0	21.6	14.8	104.0	344.0
3	7236.000	H	38.9	25.8	19.3	45.1	74.0	54.0	15.8	8.9	100.0	156.0
4	7236.000	V	38.9	25.8	19.3	45.1	74.0	54.0	15.8	8.9	105.0	345.0
5	9648.000	H	38.3	24.6	23.4	48.0	74.0	54.0	12.3	6.0	100.0	155.0
6	9648.000	V	38.0	24.6	23.4	48.0	74.0	54.0	12.6	6.0	105.0	345.0

Channel Middle

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c. f [dB(1/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [°]
1	59.260	V	35.8	-14.0	40.0	18.2	100.0	108.0
2	222.752	H	44.1	-4.3	46.0	6.2	148.0	0.0
3	668.256	H	44.8	-2.3	46.0	3.5	161.0	192.0
4	965.241	H	49.0	2.0	54.0	3.0	100.0	154.0

No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading CAV [dB(μV)]	c. f [dB(1/m)]	Result CAV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [°]
1	4874.000	H	40.1	26.5	13.4	39.9	74.0	54.0	20.5	14.1	100.0	155.0
2	4874.000	V	40.0	26.5	13.4	39.9	74.0	54.0	20.6	14.1	104.0	345.0
3	7311.000	H	38.6	25.3	19.4	44.7	74.0	54.0	16.0	9.3	100.0	156.0
4	7311.000	V	39.3	25.3	19.4	44.7	74.0	54.0	15.3	9.3	105.0	345.0
5	9748.000	H	37.3	24.5	23.6	48.1	74.0	54.0	13.1	5.9	100.0	155.0
6	9748.000	V	37.7	24.5	23.6	48.1	74.0	54.0	12.7	5.9	105.0	345.0

Channel High

No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading CAV [dB(μV)]	c. f [dB(1/m)]	Result CAV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [°]
1	4924.000	H	39.4	26.6	13.7	40.3	74.0	54.0	20.9	13.7	100.0	155.0
2	4924.000	V	39.7	26.7	13.7	40.4	74.0	54.0	20.6	13.6	104.0	345.0
3	7386.000	H	38.2	25.0	19.6	44.6	74.0	54.0	16.2	9.4	100.0	156.0
4	7386.000	V	38.7	25.0	19.6	44.6	74.0	54.0	15.7	9.4	105.0	345.0
5	9848.000	H	37.9	24.8	23.8	48.6	74.0	54.0	12.3	5.4	100.0	155.0
6	9848.000	V	38.2	24.7	23.8	48.5	74.0	54.0	12.0	5.5	105.0	345.0

Note:

1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable – Amp)]
2. No emission were detected in frequency range 9kHz to 30MHz at the 3 meters distance.
3. No emission were detected in frequency range GHz band at the 3 meters distance. Measurement is the floor noise.
4. No emission was detected in the receive mode.

5. Restricted Band of Operation

5.1 Measurement procedure

[FCC 247(d), 15.205, 15.209, IC RSS-210 2.2]

Test was applied by following conditions.

Test method : ANSI C63.4
 Test place : 3m Semi-anechoic chamber
 EUT was placed on : FRP table / (W)2.0m × (D)1.0m × (H)0.8m
 Antenna distance : 3m

Spectrum analyzer setting
 - Peak : RBW=1MHz, VBW=3MHz, Span=Arbitrary setting, Sweep=auto
 - Average : RBW=1MHz, VBW=10Hz, Span=Arbitrary setting, Sweep=auto
 Display mode=Linear

Average Measurement Setting [VBW]

Mode	Duty Cycle (%)	T _{on} (us)	T _{off} (us)	Determined VBW Setting
IEEE802.11b	99.8	9522	21	10Hz (Duty Cycle \geq 98%)
IEEE802.11g	99.2	3136	24	10Hz (Duty Cycle \geq 98%)
IEEE802.11n(HT20)	99.3	2911	21	10Hz (Duty Cycle \geq 98%)
IEEE802.11n(HT40)	98.6	1424	20	10Hz (Duty Cycle \geq 98%)

Radiated emission measurements are performed at 3m distance with the broadband antenna (Double ridged guide antenna). The antenna is positioned both the horizontal and vertical planes of polarization and height is varied 1m to 4m and stopped at height producing the maximum emission.

The EUT is Placed on a turntable, which is 0.8m above ground plane. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. The test results represent the worst case emission for each emission with manipulating the EUT, support equipment, interconnecting cables and varying the mode of operation. Sufficient time for the EUT, support equipment, and test equipment are allowed in order for them to warm up to their normal operating condition.

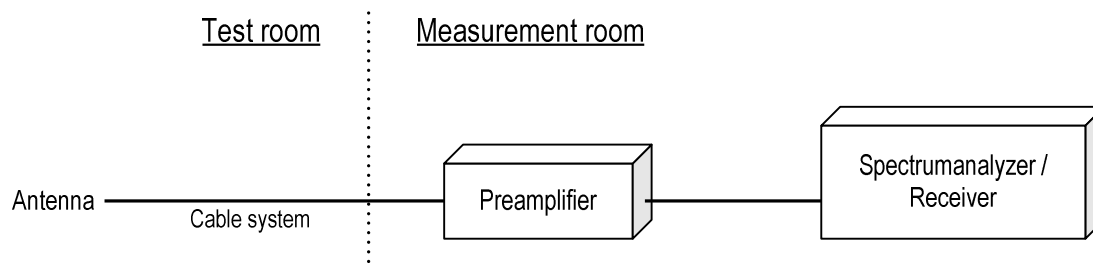
The EUT was set to operate with following conditions.

- Channel Low: 2412MHz, Channel High: 2462MHz

The test mode of EUT is as follows.

- Tx mode

- Test configuration



5.2 Limit

Emission at the boundary of the restricted band provided by 15.205 shall be lower than 15.209 limit.

5.3 Measurement Result

Channel	Frequency [MHz]	Results Chart	Result
Low	2412	See the Trace Data	Pass
High	2462	See the Trace Data	Pass

5.4 Test data

Date : Jun. 6, 2014

Temperature : 22.7 [°C]

Humidity : 62.8 [%]

Test place : 3m Semi-anechoic chamber

Tested by :

Taiki Watanabe

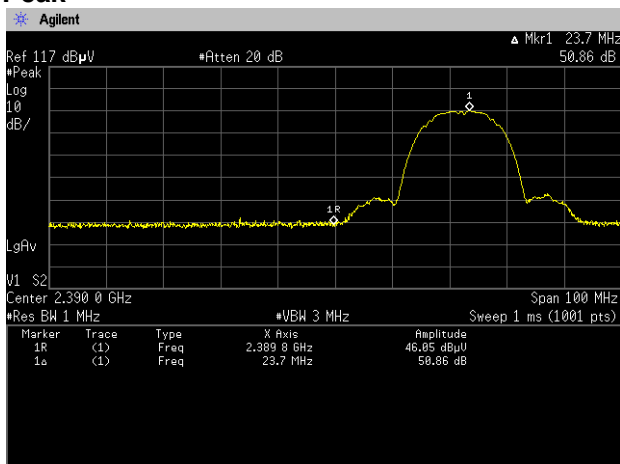
[IEEE802.11b]

Antenna Pole	Frequency [MHz]	Fundamental [dBuV/m]	Correction Factor [dB]	Detector	∠dB	Limit	Result	margin
H	2412	96.65	4.4	PK	50.86	74	50.19	23.81
H	2412	93.07	4.4	AV	58.06	54	39.41	14.59
V	2412	98.41	4.4	PK	51.07	74	51.74	22.26
V	2412	94.62	4.4	AV	58.88	54	40.14	13.86
H	2462	98.80	4.8	PK	52.78	74	50.82	23.18
H	2462	95.07	4.8	AV	59.83	54	40.04	13.96
V	2462	102.59	4.8	PK	51.43	74	55.96	18.04
V	2462	99.24	4.8	AV	61.75	54	42.29	11.71

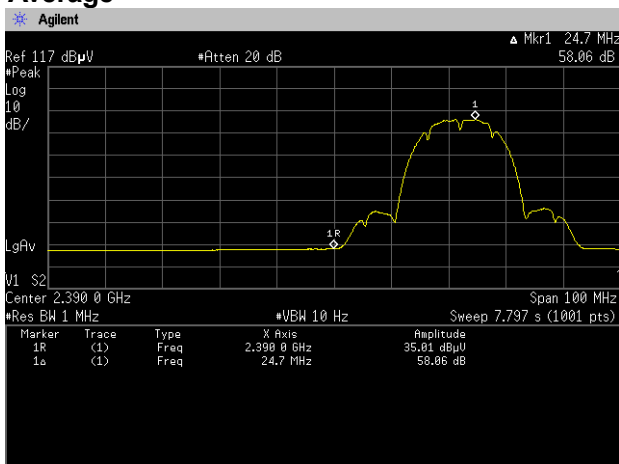


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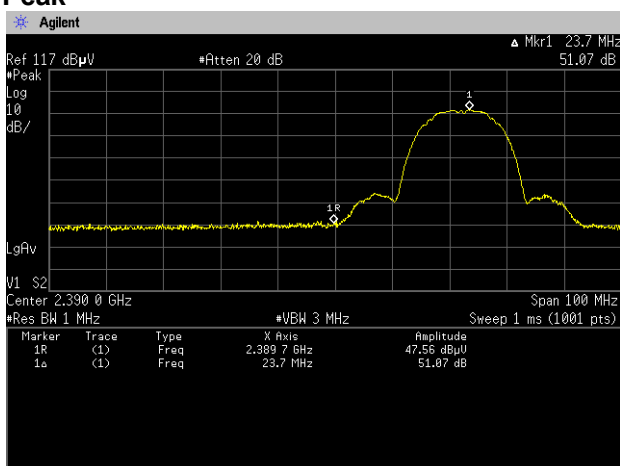
Channel Low Horizontal Peak



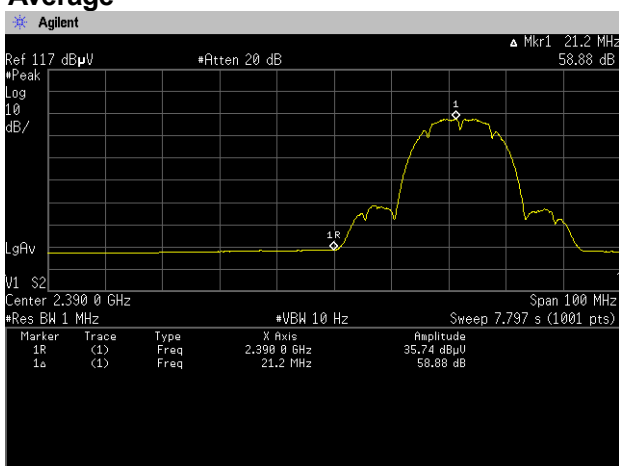
Average



Vertical Peak



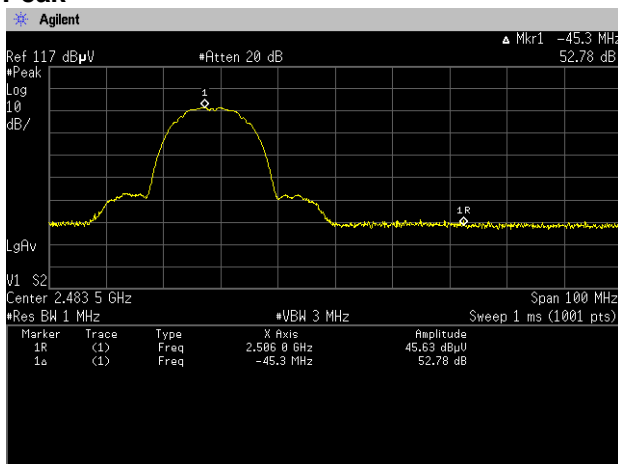
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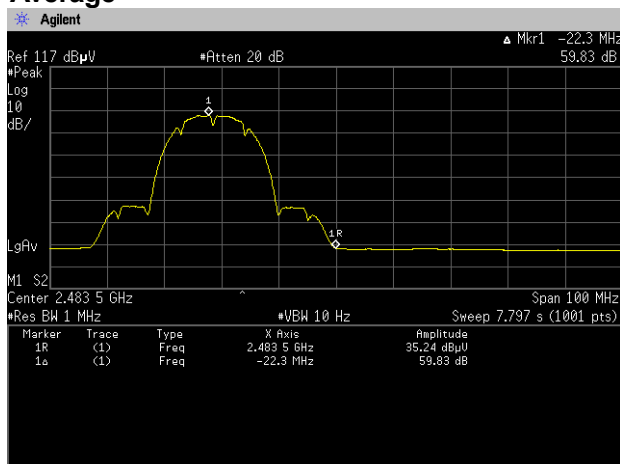


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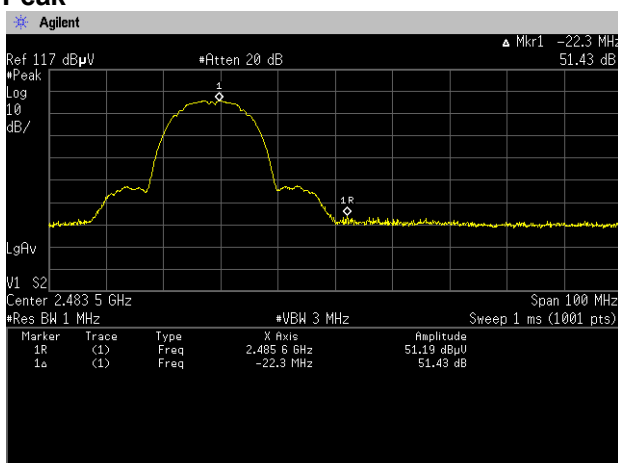
Channel High Horizontal Peak



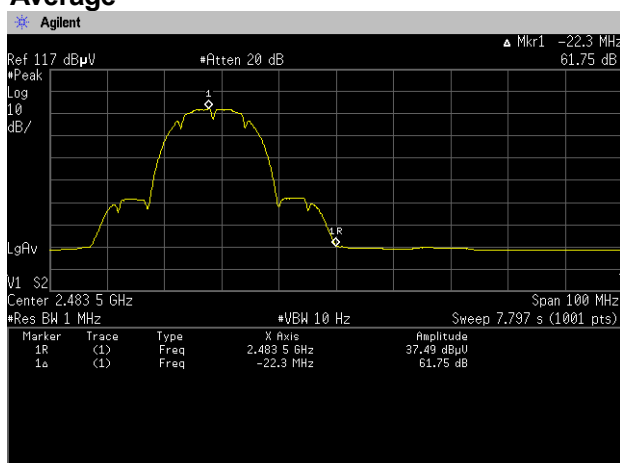
Average



Vertical Peak



Average



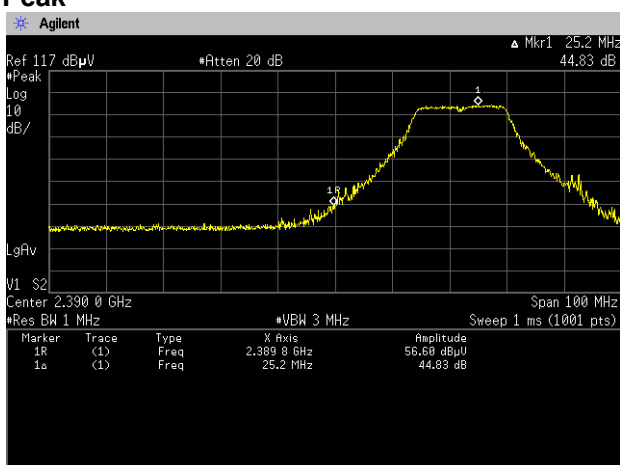


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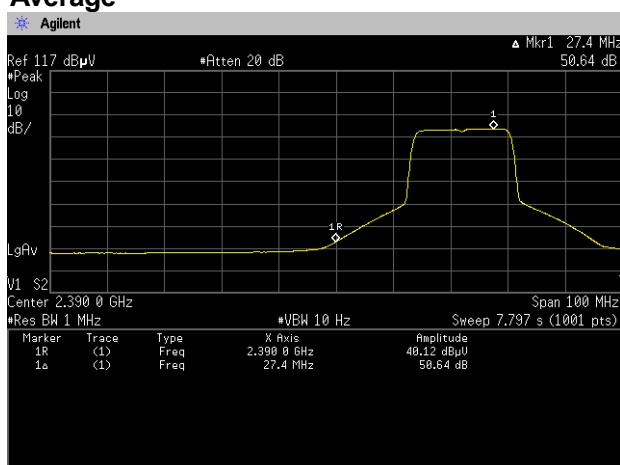
[IEEE802.11g]

Antenna Pole	Frequency [MHz]	Fundamental [dBuV/m]	Correction Factor [dB]	Detector	ΔdB	Limit	Result	margin
H	2412	102.55	4.4	PK	44.83	74	62.12	11.88
H	2412	90.76	4.4	AV	50.64	54	44.52	9.48
V	2412	108.71	4.4	PK	39.62	74	73.49	0.51
V	2412	92.41	4.4	AV	48.81	54	48.00	6.00
H	2462	103.28	4.8	PK	42.28	74	65.80	8.20
H	2462	91.94	4.8	AV	48.88	54	47.86	6.14
V	2462	107.30	4.8	PK	39.19	74	72.91	1.09
V	2462	96.45	4.8	AV	48.01	54	53.24	0.76

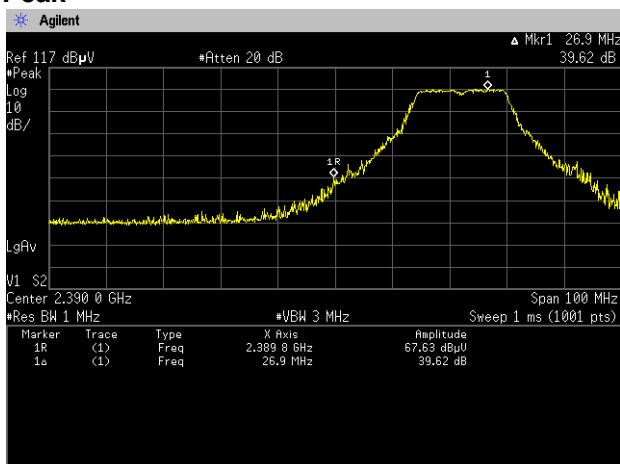
Channel Low
Horizontal
Peak



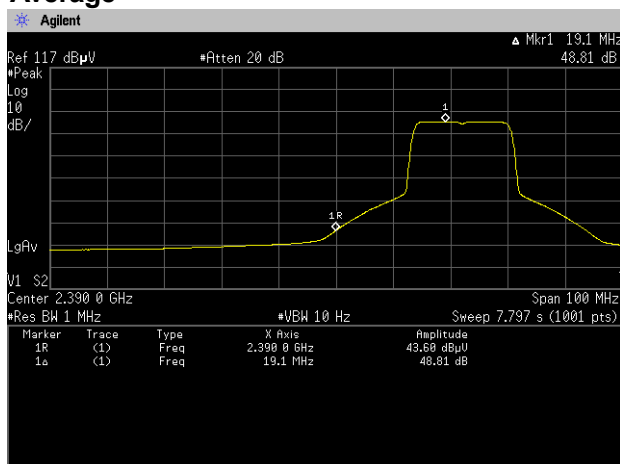
Average



Vertical
Peak



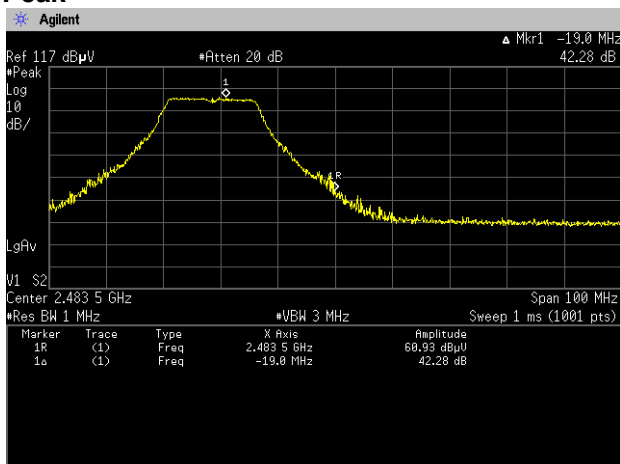
Average



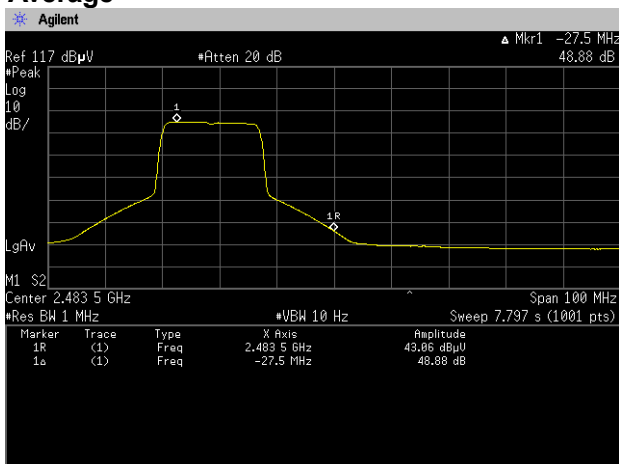


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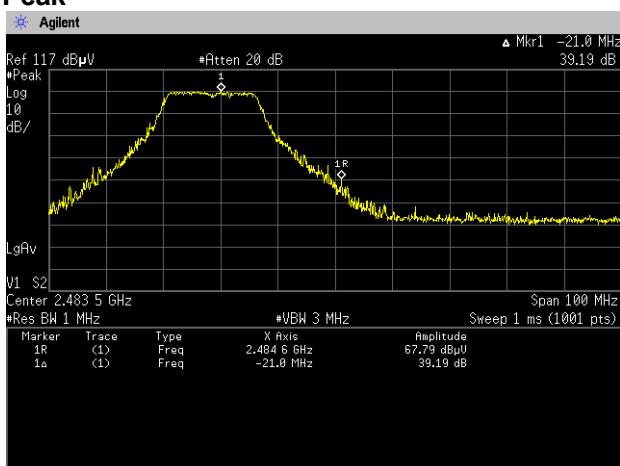
Channel High Horizontal Peak



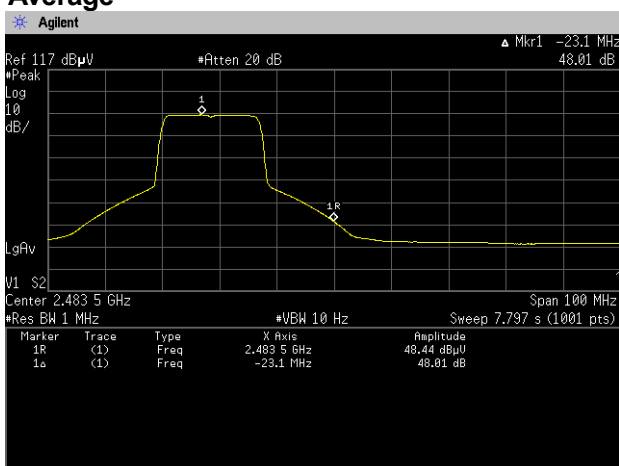
Average



Vertical Peak



Average



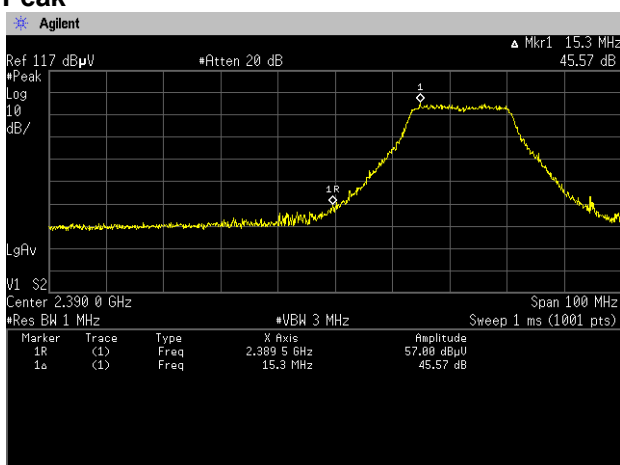


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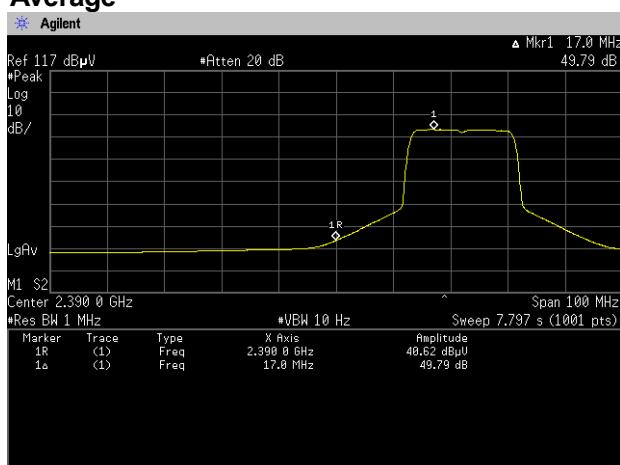
[IEEE802.11n (HT20)] Chain A

Antenna Pole	Frequency [MHz]	Fundamental [dBuV/m]	Correction Factor [dB]	Detector	Δ dB	Limit	Result	margin
H	2412	102.58	4.4	PK	45.57	74	61.41	12.59
H	2412	90.41	4.4	AV	49.79	54	45.02	8.98
V	2412	105.16	4.4	PK	45.51	74	64.05	9.95
V	2412	93.08	4.4	AV	49.96	54	47.52	6.48
H	2462	100.87	4.8	PK	45.44	74	60.23	13.77
H	2462	89.44	4.8	AV	49.67	54	44.57	9.43
V	2462	105.84	4.8	PK	44.13	74	66.51	7.49
V	2462	93.72	4.8	AV	49.14	54	49.38	4.62

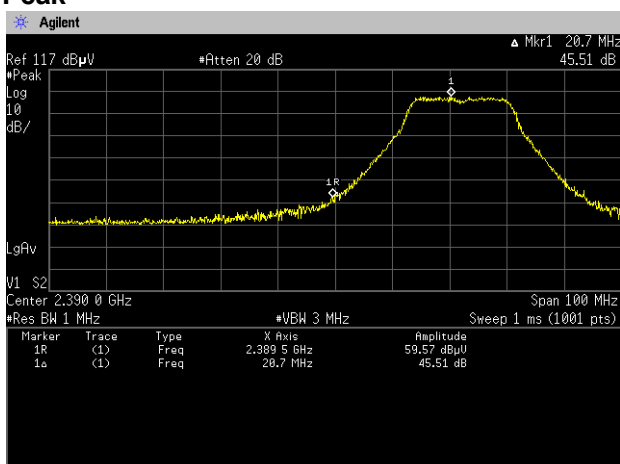
Channel Low Horizontal Peak



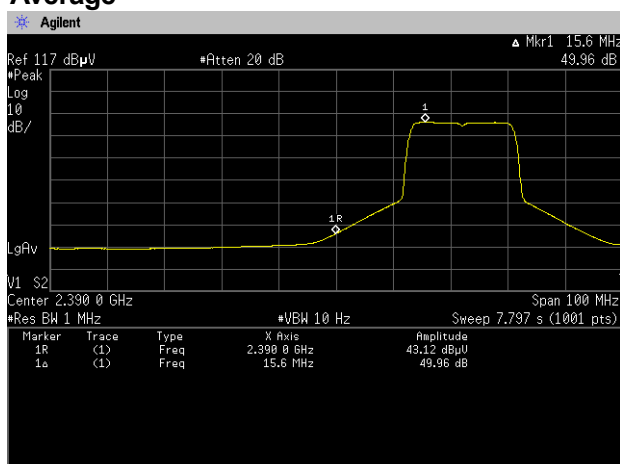
Average



Vertical Peak



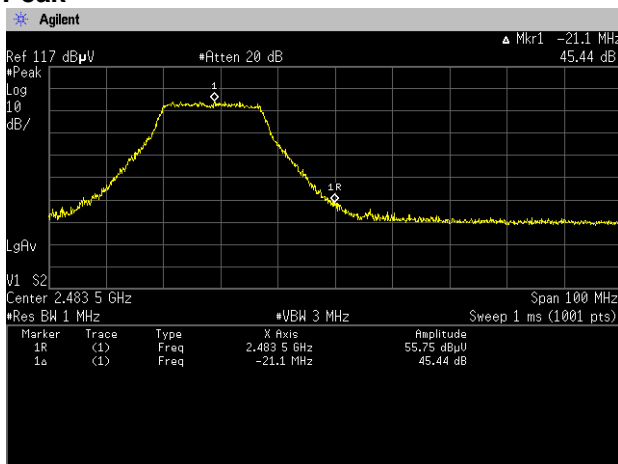
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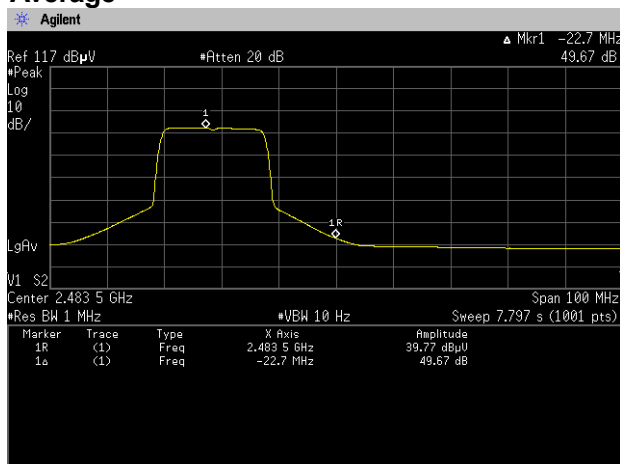


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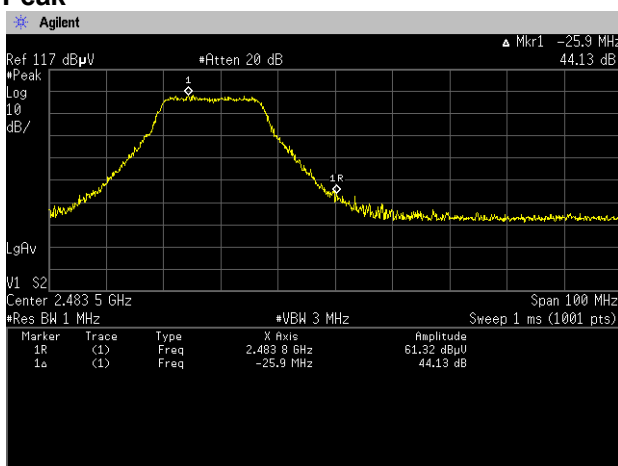
Channel High Horizontal Peak



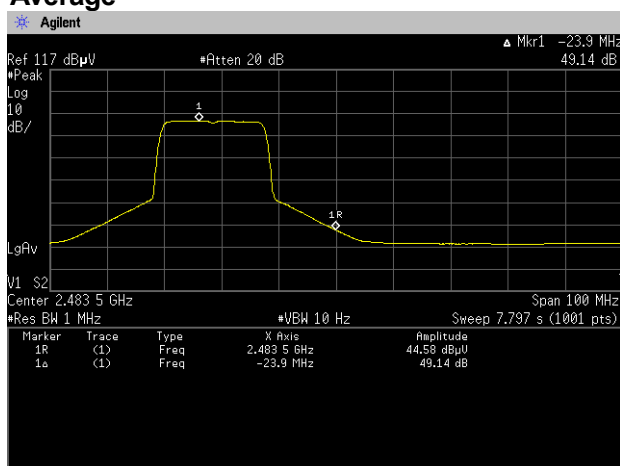
Average



Vertical Peak



Average



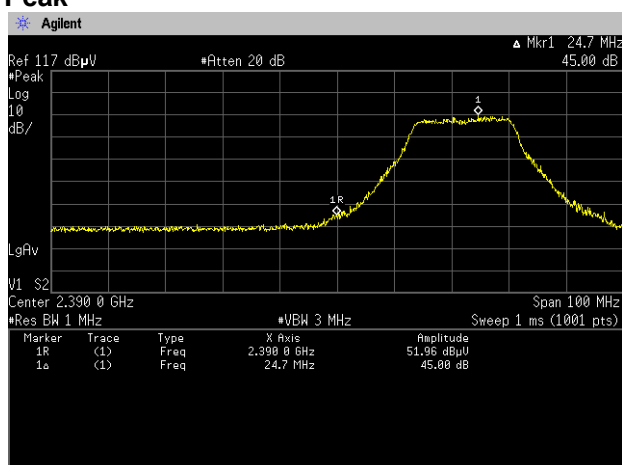


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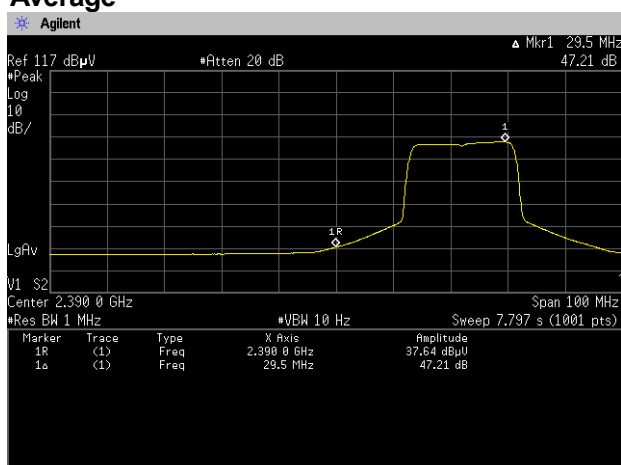
[IEEE802.11n (HT20)] Chain B

Antenna Pole	Frequency [MHz]	Fundamental [dBuV/m]	Correction Factor [dB]	Detector	Δ dB	Limit	Result	margin
H	2412	97.56	4.4	PK	45.00	74	56.96	17.04
H	2412	84.85	4.4	AV	47.21	54	42.04	11.96
V	2412	103.10	4.4	PK	43.88	74	63.62	10.38
V	2412	90.69	4.4	AV	49.23	54	45.86	8.14
H	2462	103.13	4.8	PK	40.61	74	67.32	6.68
H	2462	90.14	4.8	AV	47.17	54	47.77	6.23
V	2462	101.78	4.8	PK	43.45	74	63.13	10.87
V	2462	89.35	4.8	AV	47.73	54	46.42	7.58

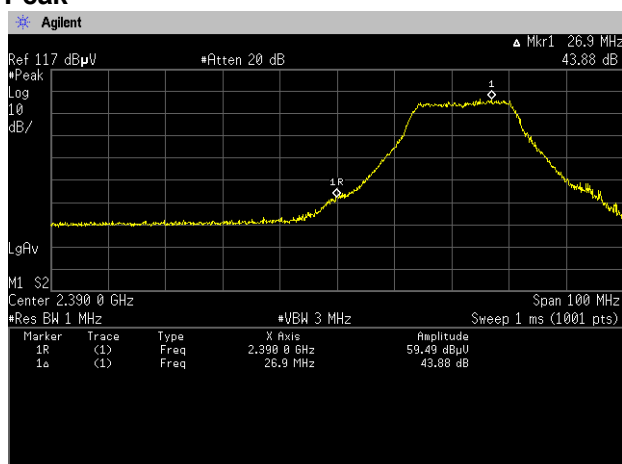
Channel Low Horizontal Peak



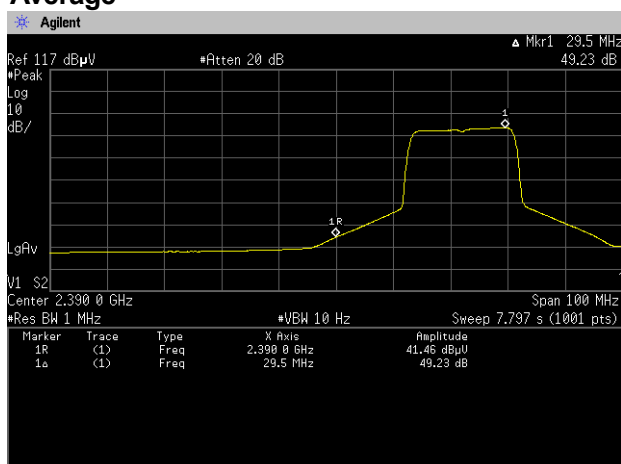
Average



Vertical Peak



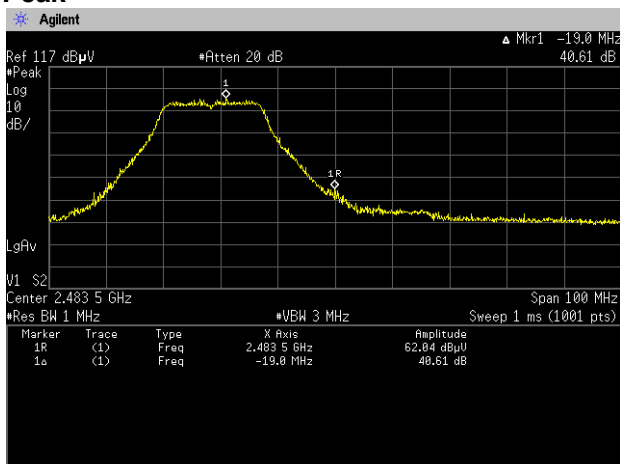
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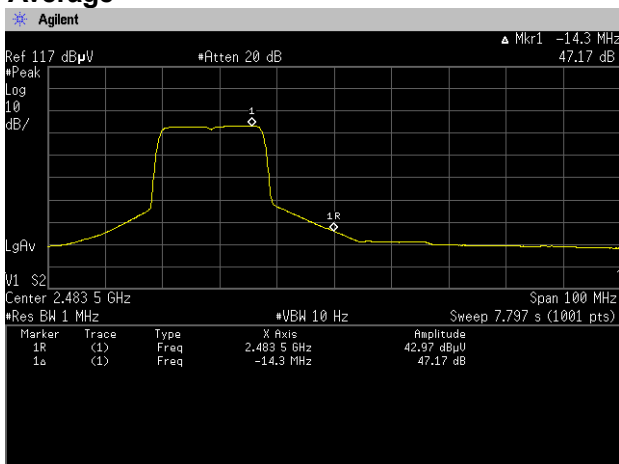


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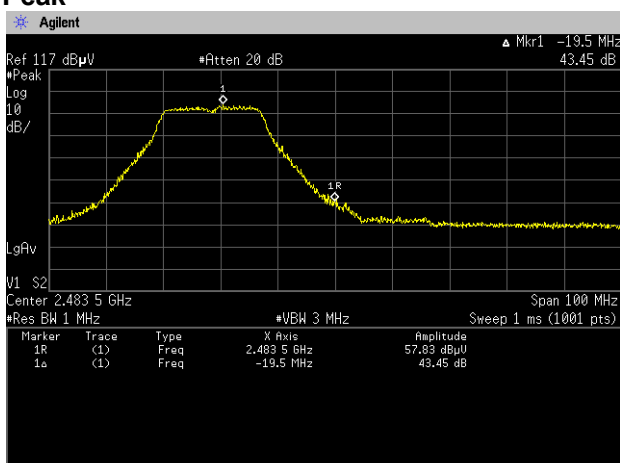
Channel High Horizontal Peak



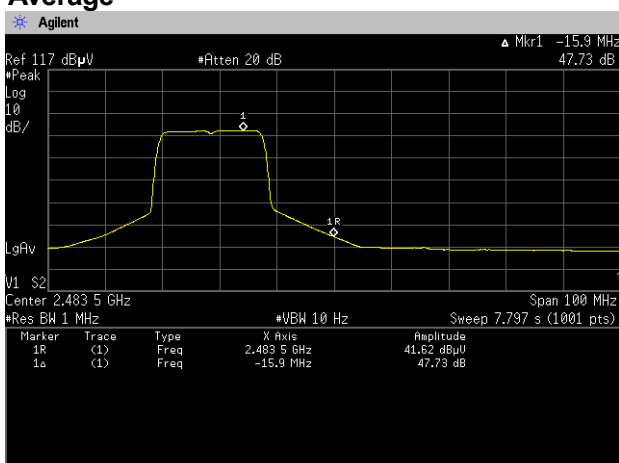
Average



Vertical Peak



Average



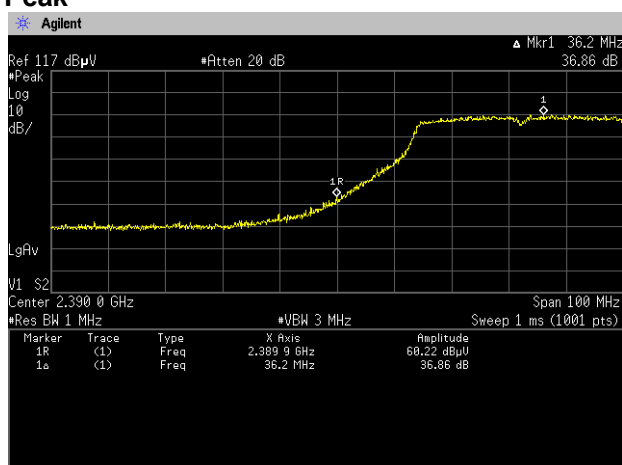


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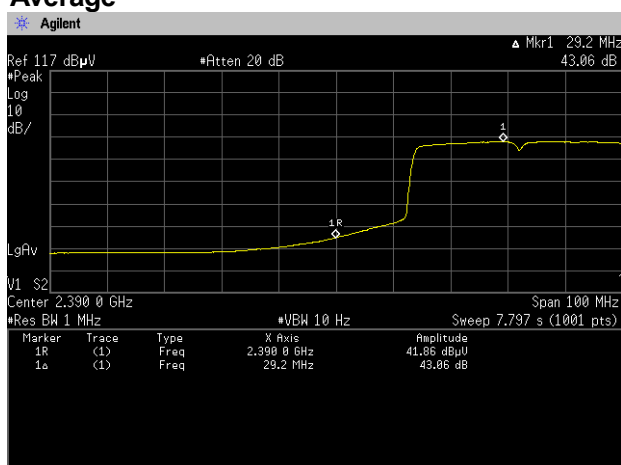
[IEEE802.11n (HT40)] Chain A

Antenna Pole	Frequency [MHz]	Fundamental [dBuV/m]	Correction Factor [dB]	Detector	ΔdB	Limit	Result	margin
H	2412	98.43	4.4	PK	36.86	74	65.97	8.03
H	2412	84.92	4.4	AV	43.06	54	46.26	7.74
V	2412	100.44	4.4	PK	36.56	74	68.28	5.72
V	2412	87.82	4.4	AV	42.04	54	50.18	3.82
H	2462	98.90	4.8	PK	33.96	74	69.74	4.26
H	2462	85.15	4.8	AV	41.06	54	48.89	5.11
V	2462	98.48	4.8	PK	36.57	74	66.71	7.29
V	2462	86.05	4.8	AV	39.78	54	51.07	2.93

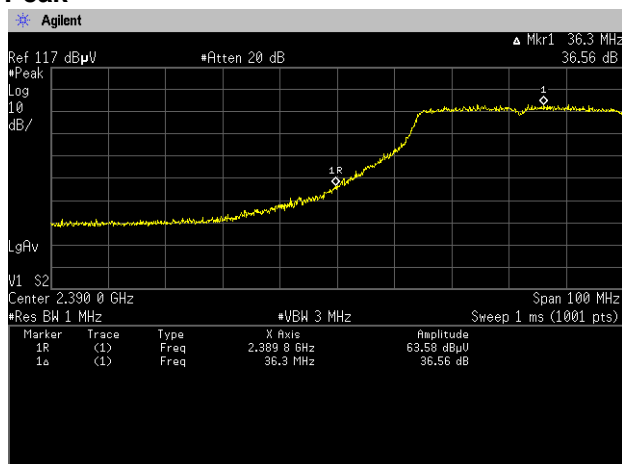
Channel Low Horizontal Peak



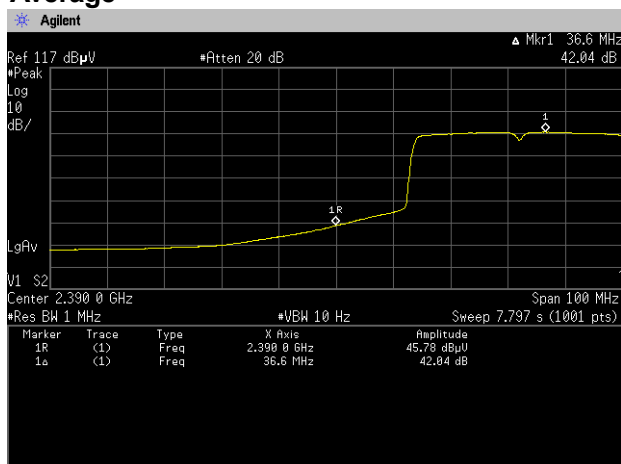
Average



Vertical Peak



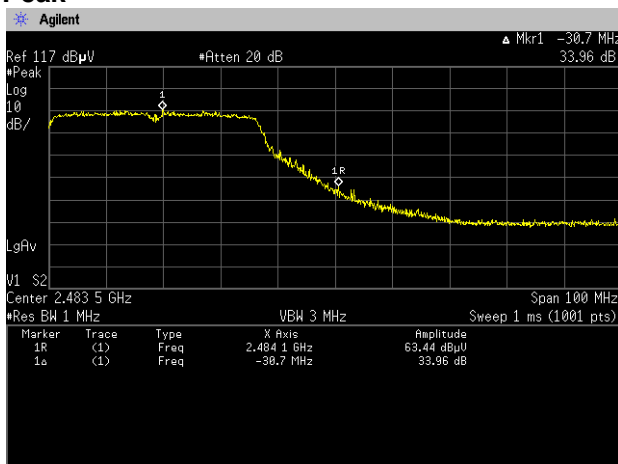
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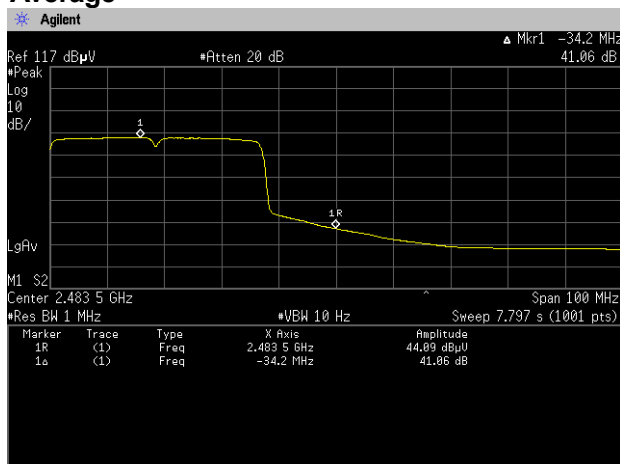


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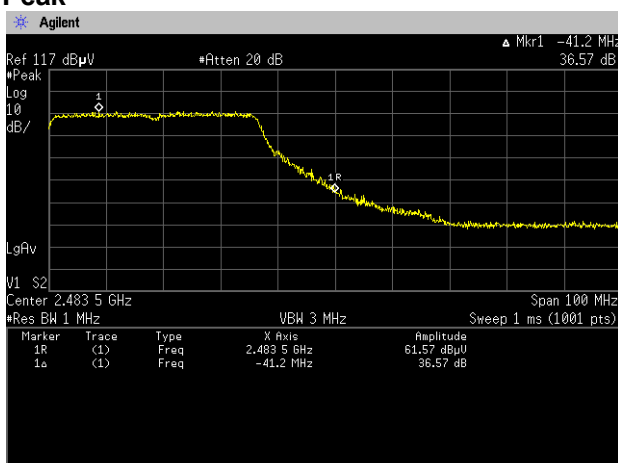
Channel High Horizontal Peak



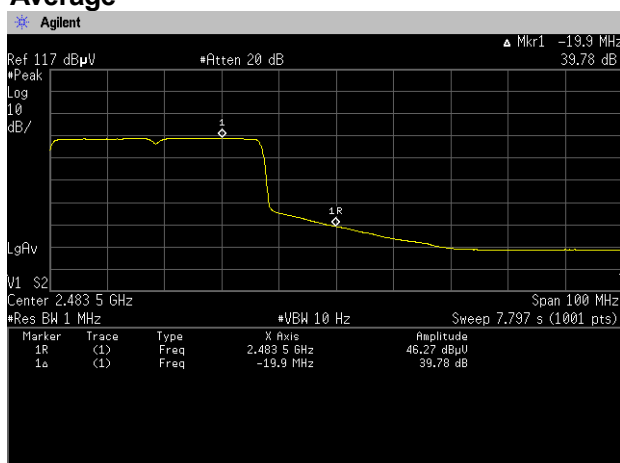
Average



Vertical Peak



Average



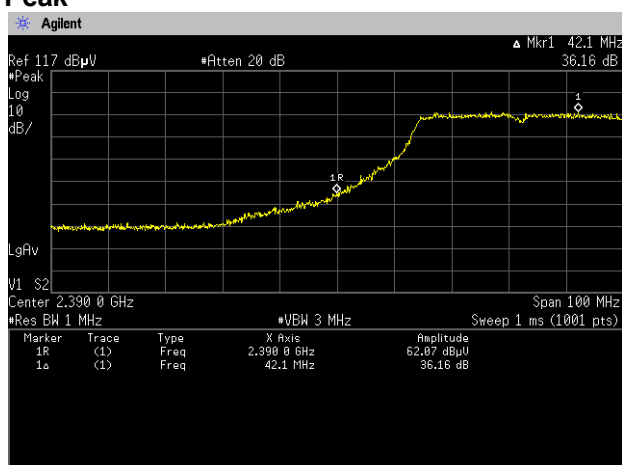


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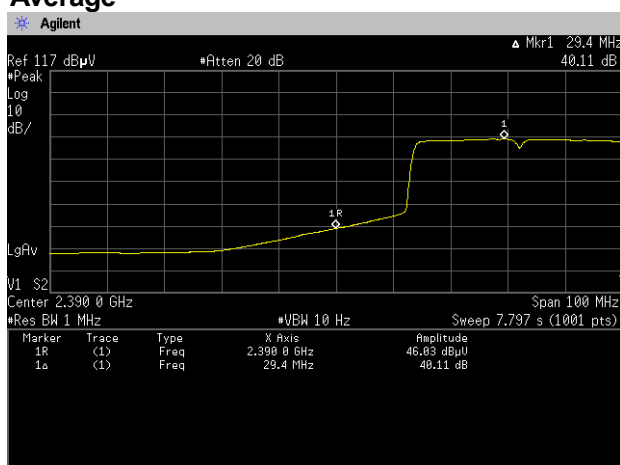
[IEEE802.11n (HT40)] Chain B

Antenna Pole	Frequency [MHz]	Fundamental [dBuV/m]	Correction Factor [dB]	Detector	ΔdB	Limit	Result	margin
H	2412	99.08	4.4	PK	36.16	74	67.32	6.68
H	2412	86.14	4.4	AV	40.11	54	50.43	3.57
V	2412	100.25	4.4	PK	37.11	74	67.54	6.46
V	2412	87.71	4.4	AV	40.54	54	51.57	2.43
H	2462	99.56	4.8	PK	34.38	74	69.98	4.02
H	2462	85.31	4.8	AV	38.94	54	51.17	2.83
V	2462	100.91	4.8	PK	33.23	74	72.48	1.52
V	2462	87.69	4.8	AV	38.92	54	53.57	0.43

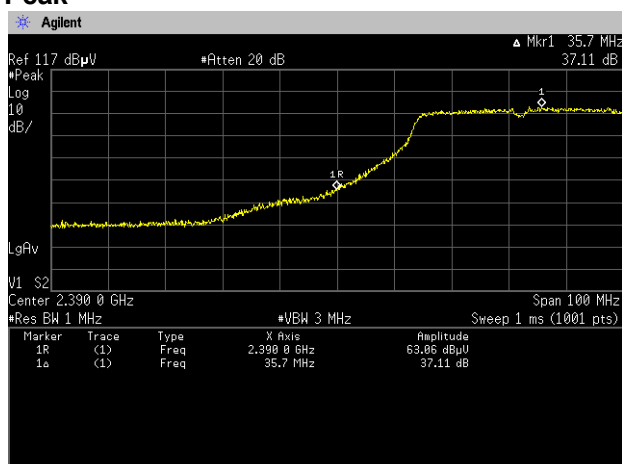
Channel Low Horizontal Peak



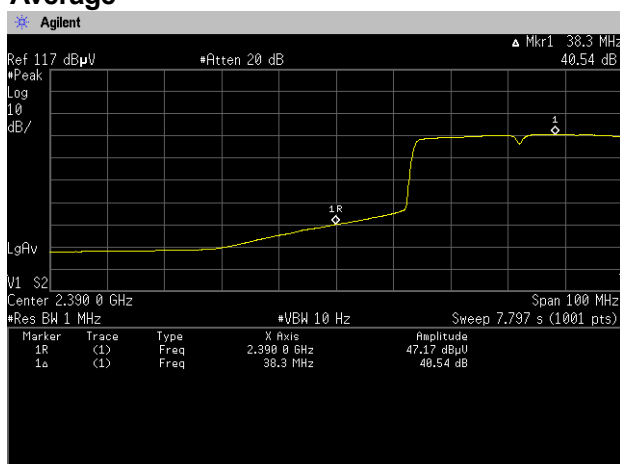
Average



Vertical Peak



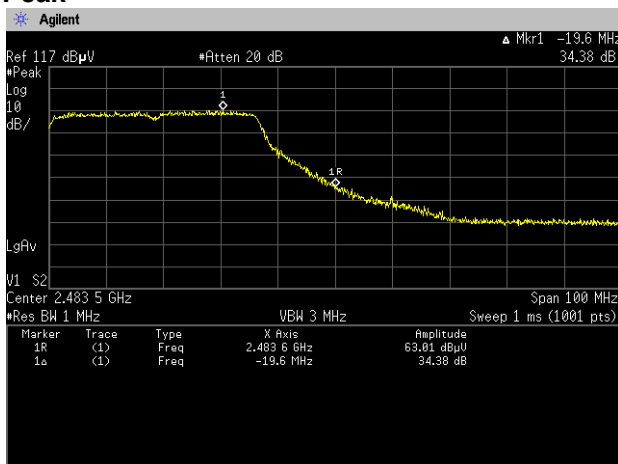
Average



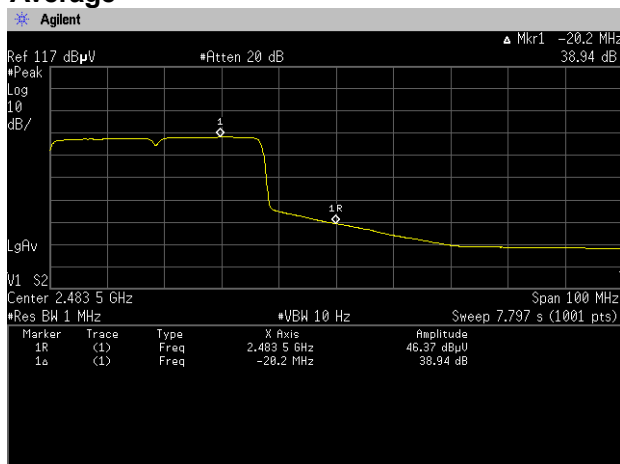


Zacta

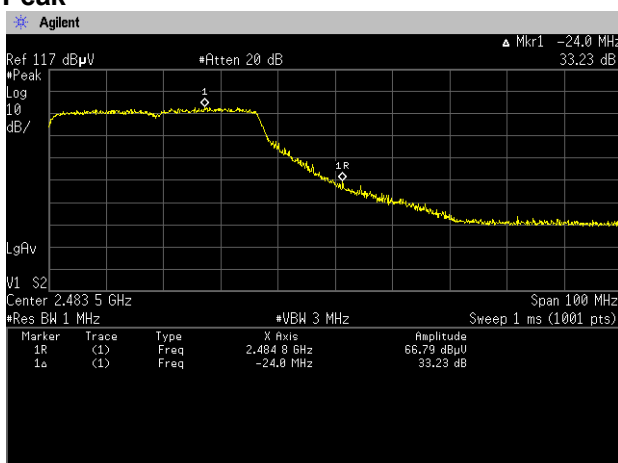
Channel High Horizontal Peak



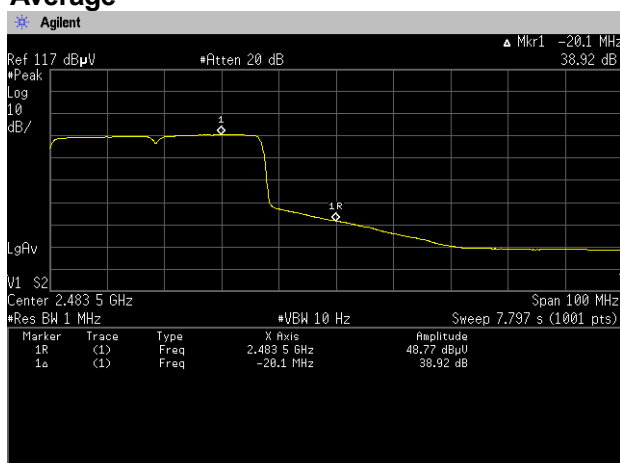
Average



Vertical Peak



Average





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6. Antenna requirement

According to FCC 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.

The antenna is a special antenna mounted inside of the EUT. Therefore, the EUT complies with the antenna requirement of FCC section 15.203.



7. Uncertainty of measurement

Expanded uncertainties stated are calculated with a coverage Factor $k=2$.

Please note that these results are not taken into account when determining compliance or non-compliance with test result.

Test item	Measurement uncertainty
Conducted emission at mains port	$\pm 3.0\text{dB}$
Radiated emission (9kHz – 30MHz)	$\pm 4.4\text{dB}$
Radiated emission (30MHz – 1000MHz)	$\pm 4.5\text{dB}$
Radiated emission (1000MHz – 26GHz)	$\pm 3.9\text{dB}$

8. Laboratory description

1. Location:

TÜV SÜD Zacta Ltd. Yonezawa Testing Center
4149-7 Hachimanpara 5-chome Yonezawa-shi Yamagata 992-1128 Japan
Phone: +81-238-28-2880 Fax: +81-238-28-2888

2. Facility filing information:

1) NVLAP accreditation: NVLAP Lab. code: 200306-0

2) VLAC accreditation: Lab. code: VLAC-013

Site name	Radiated emission	Conducted emission for mains port	Conducted emission for telecom port	Radiated emission (CMAD)	Expiry Date
3m Semi-anechoic chamber	VLAC-013	VLAC-013	VLAC-013	-	Jul. 3, 2015
10m Semi-anechoic chamber No.1				VLAC-013	
10m Semi-anechoic chamber No.2				VLAC-013	
Shielded room No.1	-	VLAC-013	VLAC-013	-	

3) FCC filing:

Site name	Registration Number	Expiry Date
Site 3	91065	Oct.31, 2014
3m Semi-anechoic chamber	540072	Feb. 20, 2017
10m Semi-anechoic chamber No.1		
10m Semi-anechoic chamber No.2		
Shielded room No.1		

4) Industry Canada Oats site filing:

Site name	Sites on file: Oats 3m/10m	Expiry Date
Site 3	4224A-3	Jan. 23, 2015
3m Semi-anechoic chamber	4224A-4	
10m Semi-anechoic chamber No.1	4224A-5	
10m Semi-anechoic chamber No.2	4224A-6	Jan. 15, 2017

5) VCCI site filing:

Site name	Radiated emission	Conducted emission for mains port	Conducted emission for telecom port	Expiry Date
Site 3	R-138	C-134	T-1222	Nov. 16, 2014 Nov. 28, 2014* (*:Telecom port)
3m Semi-anechoic chamber	A-0166	A-0166	A-0166	Jul. 3, 2015
10m Semi-anechoic chamber No.1				
10m Semi-anechoic chamber No.2				
Shielded room No.1	-	A-0166	A-0166	

6) TÜV SÜD PS authorization:

Authorized as an EMC test laboratory

7) TÜV Rheinland authorization:

Authorized as an EMC test laboratory



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Appendix A. Test equipment

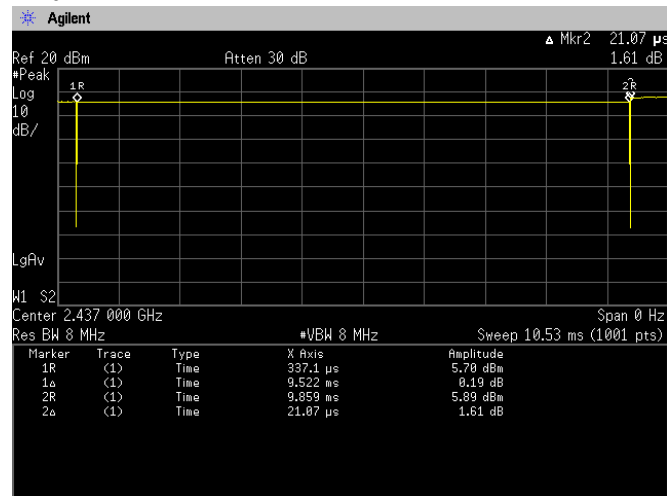
Radiated emission

Equipment	Company	Model No.	Serial No.	Cal. Due	Cal. Date
EMI Receiver	ROHDE&SCHWARZ	ECSI	100451	Nov. 2014	Nov. 16, 2013
Preamplifier	ANRITSU	MH648A	M96057	Jun. 2014	Jun. 12, 2013
Loop antenna	ROHDE&SCHWARZ	HFH2-Z2	892246/010	Oct. 2014	Oct. 5, 2013
Biconical Antenna	Schwarzbeck	VHA9103/BBA9106	2155	May 2015	May 7, 2014
Log periodic Antenna	Schwarzbeck	UHALP9108A	0560	May 2015	May 7, 2014
Attenuator	TME	CFA-01NPJ-6	N/A (S275)	Jun. 2014	Jun. 6, 2013
Attenuator	TME	CFA-01NPJ-3	N/A (S272)	Jun. 2014	Jun. 6, 2013
Notch Filter	Micro-Tronics	BRM50702	045	Nov. 2014	Nov. 12 2013
Spectrum analyzer	Agilent Technologies	E4440A	US44302655	May 2015	May 30, 2014
Preamplifier	Agilent Technologies	8449B	3008A1008	Dec. 2014	Dec. 9, 2013
Double ridged guide antenna	EMCO	3115	5205	Dec. 2014	Dec. 10, 2013
Attenuator	AEROFLEX	40A-03	081217-20	Feb. 2015	Feb. 23, 2014
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	BBHA9170189	May 2015	May 2, 2013
Preamplifier	TSJ	MLA-1840-B03-35	1240332	May 2015	May 2, 2013
Microwave cable	SUHNER	SUCOFLEX104/9m	346316/4	Oct. 2014	Oct. 6, 2013
		SUCOFLEX104/1m	322084/4	Oct. 2014	Oct. 6, 2013
		SUCOFLEX104/1.5m	317226/4	Oct. 2014	Oct. 6, 2013
		SUCOFLEX104/7m	41625/6	Oct. 2014	Oct. 6, 2013
PC	DELL	DIMENSION E521	75465BX	N/A	N/A
Software	TOYO Corporation	EP5/RE-AJ	0611193/V5.3.61	N/A	N/A
3m Semi-anechoic chamber	TOKIN	N/A	N/A (9002-NSA)	May 2015	May 6, 2014
3m Semi-anechoic chamber	TOKIN	N/A	N/A (9002-SVSWR)	May 2015	May 6, 2014

Appendix B. Duty Cycle

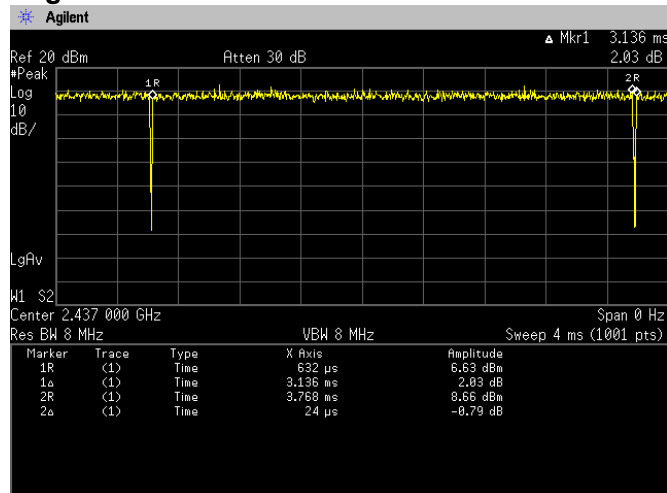
[Plot & Calculation]

11b



$$\text{Duty Cycle} = T_{\text{on}} / (T_{\text{on}} + T_{\text{off}}) = 9522[\mu\text{s}] / (9522[\mu\text{s}] + 21[\mu\text{s}]) = 99.8[\%]$$

11g

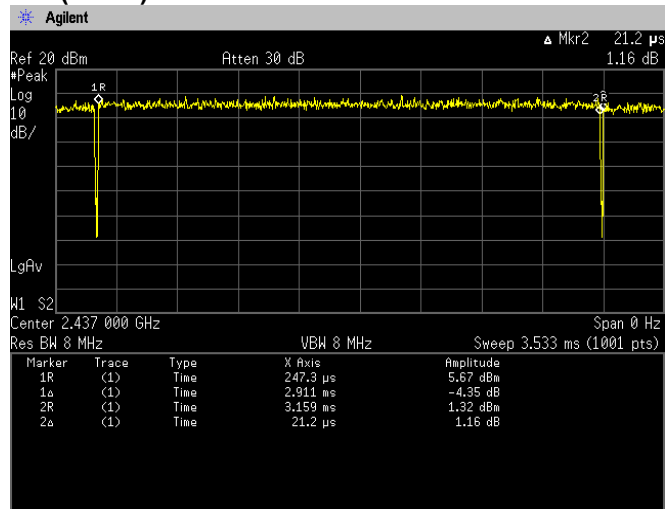


$$\text{Duty Cycle} = T_{\text{on}} / (T_{\text{on}} + T_{\text{off}}) = 3136[\mu\text{s}] / (3136[\mu\text{s}] + 24[\mu\text{s}]) = 99.2[\%]$$



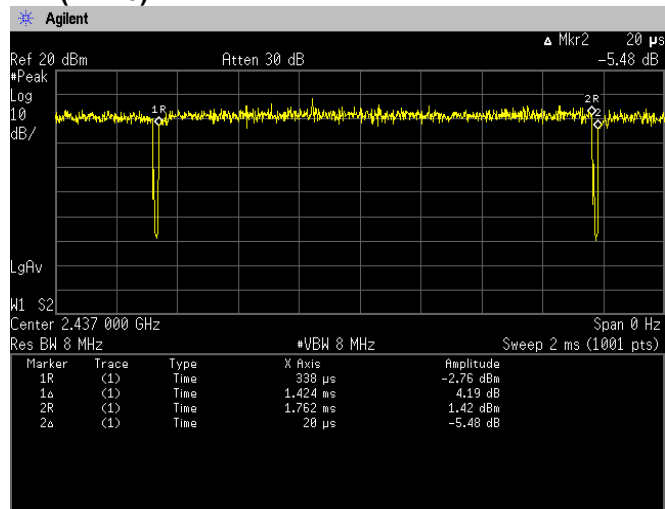
Zacta

11n(HT:20)



$$\text{Duty Cycle} = T_{\text{on}} / (T_{\text{on}} + T_{\text{off}}) = 2908[\mu\text{s}] / (2908[\mu\text{s}] + 21[\mu\text{s}]) = 99.3[\%]$$

11n(HT:40)



$$\text{Duty Cycle} = T_{\text{on}} / (T_{\text{on}} + T_{\text{off}}) = 1422[\mu\text{s}] / (1422[\mu\text{s}] + 20[\mu\text{s}]) = 98.6[\%]$$