



Test report No. : 4788774190-US-R0-V0
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Issued date : Jun. 4, 2019
FCC ID : VGY2620

RADIO TEST REPORT

Product : Vigor2620PVn series Router
Model Name : Vigor2620PVn
Series Model : Refer to Ch.6.1 Note.2
FCC ID : VGY2620
Test Regulation : FCC 47 CFR Part 15 Subpart C (Section 15.247)
Received Date : Nov. 2, 2018
Test Date : Dec. 4, 2018 ~ May 31, 2019
Issued Date : Jun. 4, 2019

Applicant : DrayTek Corp.
No.26 Fu Shing Rd., HuKou County,Hsin-Chu Industrial
Park,Hsin-Chu,Taiwan 303 R.O.C

Issued By : Underwriters Laboratories Taiwan Co., Ltd.
Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd.,
Zhudong Township, Hsinchu County, Taiwan



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Doc No: 17-EM-F0876 / 2.0



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REVISION HISTORY

Original Test Report No.: 4788774190-US-R0-V0

[illegible]

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1. Attestation of Test Results

APPLICANT: DrayTek Corp.
No.26 Fu Shing Rd., HuKou County,Hsin-Chu Industrial Park,Hsin-Chu,Taiwan 303 R.O.C

MANUFACTURER DrayTek Corp.
No.26 Fu Shing Rd., HuKou County,Hsin-Chu Industrial Park,Hsin-Chu,Taiwan 303 R.O.C

EUT DESCRIPTION: Vigor2620PVn series Router

BRAND: DrayTek

MODEL: Vigor2620PVn

SERIES MODEL Refer to Ch.6.1 Note.2

SAMPLE STAGE: Production Unit

DATE of TESTED: Dec. 4, 2018 ~ May 31, 2019

APPLICABLE STANDARDS	
STANDARD	Test Results
FCC 47 CFR PART 15 Subpart C (Section 15.247)	PASS

Underwriters Laboratories Taiwan Co., Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by Underwriters Laboratories Taiwan Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Underwriters Laboratories Taiwan Co., Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Underwriters Laboratories Taiwan Co., Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Prepared By:

Evelyn Lee
Project Handler

Date : Jun. 4, 2019

Approved and Authorized By:

Stanley Wu
Senior Project Engineer

Date : Jun. 4, 2019

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2. Summary of Test Results

Summary of Test Results		
FCC Clause	Test Items	Result
15.247(a)(2)	6dB Bandwidth	PASS
15.247(b)	Conducted Output Power	PASS
15.247(e)	Power Spectral Density	PASS
15.247(d)	Antenna Port Emission	PASS
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS
15.207	AC Power Conducted Emission	PASS
15.203	Antenna Requirement	PASS

Note:

1. For the Radiated Band Edge test plots were recorded in Appendix I, the Radiated Emissions test plots were recorded in Appendix II.

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3. Test Methodology

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, KDB558074 D01 DTS Meas Guidance v05r02, KDB414788 D01 Radiated Test Site v01, ANSI C63.10-2013 and KDB 662911 D01 Multiple Transmitter Output v02r01.

4. Facilities and Accreditation

Test Location	Underwriters Laboratories Taiwan Co., Ltd.
Address	Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan
Accreditation Certificate	Underwriters Laboratories Taiwan Co., Ltd. is accredited by TAF, Laboratory Code 3398. The full scope of accreditation can be viewed at http://accreditation.taftw.org.tw/taf/public/basic/viewApplyItems.action?unitNo=3398

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5. Measurement Uncertainty

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k=2$.

Test Item	Measurement Frequency Range	K	U(dB)
Conducted disturbance at mains terminals ports	0.15MHz ~ 30MHz	2	2.6
RF Conducted	9 kHz - 40GHz	2	1.0
Radiated disturbance below 30MHz	9 kHz - 30 MHz	2	2.4
Radiated disturbance below 1 GHz	30MHz ~ 1GHz	2	5.5
Radiated disturbance above 1GHz	1GHz ~ 40GHz	2	5.0

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6. Equipment under Test

6.1. Description of EUT

Product	Vigor2620PVn series Router
Brand Name	DrayTek
Model Name	Vigor2620PVn
Series Model	Refer to Note 2
Operating Frequency	2412MHz ~ 2462MHz
Modulation	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Transfer Rate	802.11b: up to 11 Mbps 802.11g: up to 54 Mbps 802.11n: up to MCS7
Number of Channel	11 for 802.11b, 802.11g, 802.11n (HT20) 7 for 802.11n (HT40)
Maximum Output Power	802.11b: 24.65 dBm 802.11g: 27.19 dBm 802.11n (HT20): 27.07 dBm 802.11n (HT40): 27.24 dBm
Normal Voltage	12Vdc from adapter 48Vdc from PoE
Hardware Version	V0A
Software Version	V2620_For_VoIP_FW_Jj V2620_r77002_3.8.9RC7_STD

Note:

1. The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and two receivers.

Modulation Mode	Tx,Rx Function
802.11b	1TX,1RX
802.11g	2TX,2RX
802.11n (HT20)	2TX,2RX
802.11n (HT40)	2TX,2RX

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2. The models difference table as below:

Main Model	Function				
	PoE	DSL	LAN	Wi-Fi 2.4G	FXS
Vigor2620PVn	PD	VDSL2/ADSL2+/RJ11	Eth/RJ45x2	V	V
Series Model	Function difference				
	PoE	DSL	LAN	Wi-Fi 2.4G	FXS
Vigor2620n		VDSL2/ADSL2+/RJ11	Eth/RJ45x2	V	
Vigor2620Vn		VDSL2/ADSL2+/RJ11	Eth/RJ45x2	V	V
Vigor2620Pn	PD	VDSL2/ADSL2+/RJ11	Eth/RJ45x2	V	
Vigor2620ne		VDSL2/ADSL2+/RJ11	Eth/RJ45x4	V	
Vigor2620Vne		VDSL2/ADSL2+/RJ11	Eth/RJ45x4	V	V
Vigor2620Pne	PD	VDSL2/ADSL2+/RJ11	Eth/RJ45x4	V	
Vigor2620PVne	PD	VDSL2/ADSL2+/RJ11	Eth/RJ45x4	V	V

Note:

- The above models are declared by the manufacturer for market segmentation that difference between the main model and the series model is the combination of hardware design and appearance, there is nothing changed to RF related part that does not affect the RF characteristics.

3. The EUT contains following accessory devices.

Product	Brand	Model	Description
Adaptor	Asian Power Devices Inc.	WA-24Q12FU	Input:100~240Vac, 50~60Hz, 0.7A Max. Output:12Vdc, 2A
RJ-45 Cable	N/A	N/A	Non-shield, Length: 1m
RJ-11 Cable	N/A	N/A	Non-shield, Length: 1m

The above EUT information is declared by manufacturer and for more detailed features description, please refer the manufacturer's or user's manual.



6.2. Channel List

11 channels are provided for 802.11b, 802.11g and 802.11n (HT20):

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

7 channels are provided for 802.11n (HT40):

Channel	Frequency	Channel	Frequency
3	2422MHz	7	2442MHz
4	2427MHz	8	2447MHz
5	2432MHz	9	2452MHz
6	2437MHz	-	-

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6.3. Test Condition

Test Item	Test Site No.	Environmental Condition	Input Power	Test Date	Tested by
Antenna Port Conducted Measurement	SR4	24°C / 62%RH	120Vac / 60 Hz	Dec. 6, 2018 ~ Dec. 10, 2018	Wayne Chen
Radiated Spurious Emission	966-2	26°C / 60%RH	120Vac / 60 Hz	Dec. 4, 2018 ~ May. 31, 2019	Wayne Chen
AC power Line Conducted Emission	SR1	26°C / 54%RH	120Vac / 60 Hz	Dec. 13, 2018 ~ Mar. 15, 2019	Wayne Chen

FCC Test Firm Registration Number: 498077

6.4. Description Of Available Antennas

Antenna	Brand Name	Model Name	Antenna Type	Antenna Gain(dBi)
0	LYNwave	ALA160-052022	PIFA	2.68
1				

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6.5. Test Mode Applicability and Tested Channel Detail

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- For below 1 GHz radiated emission and AC power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case.
- For Antenna Port Conducted Measurement, this item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- The EUT had pre-scanned radiation and conduction in adapter mode and PoE mode. The worst case was found in adapter mode.
- The fundamental of the EUT was investigated in three orthogonal axes X/Y/Z, it was determined that X axis was worst-case . Therefore, all final radiated testing was performed with the EUT in X axis.

Test item	Mode	Modulation Technology	Modulation Type	Available Channel	Test Channel	Data Rate
Radiated Emissions (Above 1GHz)	802.11b	DSSS	DBPSK	1 to 11	1,6,11	1.0
	802.11g	OFDM	BPSK	1 to 11	1,6,11	6.0
	802.11n(HT20)	OFDM	BPSK	1 to 11	1,6,11	MCS0
	802.11n(HT40)	OFDM	BPSK	3 to 9	3,6,9	MCS0
Radiated Emissions (Below 1GHz)	802.11n(HT20)	OFDM	BPSK	1 to 11	1	MCS0
AC Power Line Conducted Emission	802.11n(HT20)	OFDM	BPSK	1 to 11	1	MCS0
Antenna Port Conducted Measurement	802.11b	DSSS	DBPSK	1 to 11	1,6,11	1.0
	802.11g	OFDM	BPSK	1 to 11	1,6,11	6.0
	802.11n(HT20)	OFDM	BPSK	1 to 11	1,6,11	MCS0
	802.11n(HT40)	OFDM	BPSK	3 to 9	3,6,9	MCS0



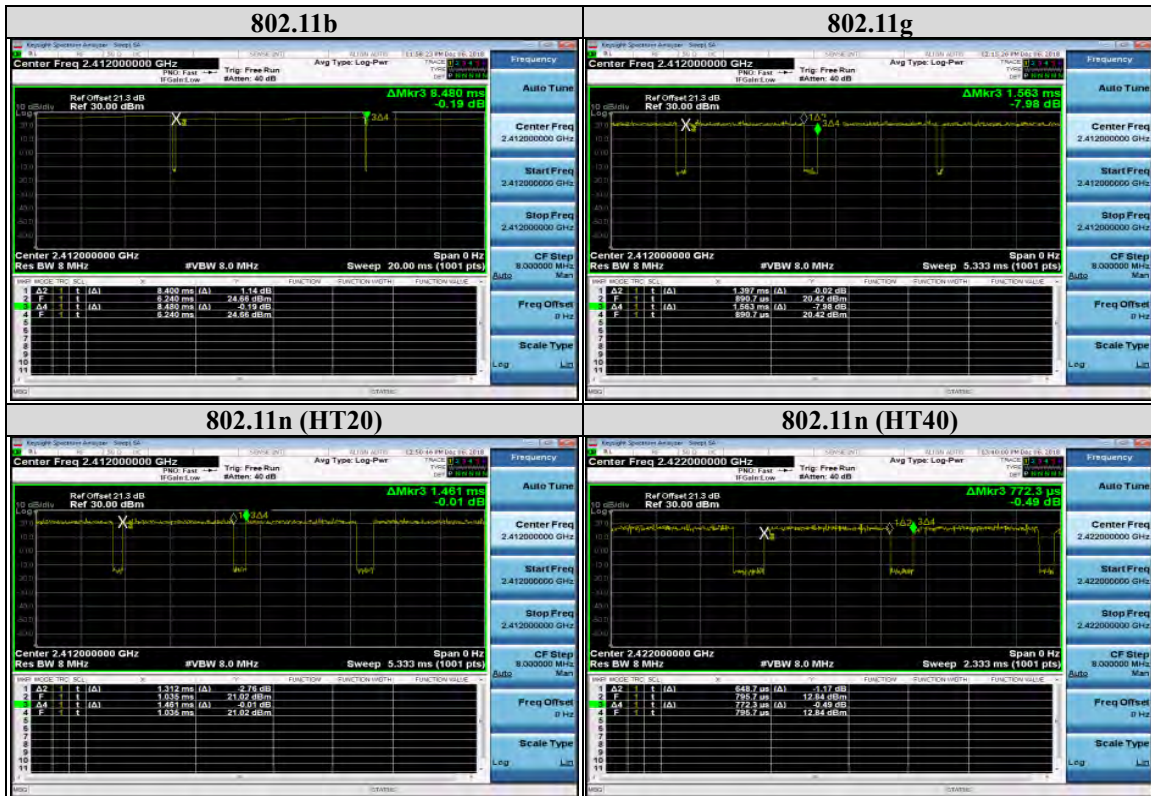
6.6. Duty cycle

802.11b: Duty cycle of test signal is $\geq 98\%$, duty factor is not required.

802.11g: Duty cycle = $1.397/1.563 = 0.8938$, Duty factor = $10 * \log(1/0.8938) = 0.49$

802.11n (HT20): Duty cycle = $1.31/1.46 = 0.8973$, Duty factor = $10 * \log(1/0.8973) = 0.47$

802.11n (HT40): Duty cycle = $0.6487/0.7723 = 0.84$, Duty factor = $10 * \log(1/0.84) = 0.76$



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7. Test Equipment

Test Equipment List					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
Radiated Spurious Emission					
Spectrum Analyzer	Keysight	N9010A	MY56070827	Nov. 8, 2018	1 year
EMI Test Receiver	Rohde & Schwarz	ESR7	101754	Nov. 8, 2018	1 year
Loop Antenna	ETS lindgren	6502	00213440	Dec. 7, 2017 Dec. 11, 2018	1 year
Trilog-Broadband Antenna with 5dB Attenuator	Schwarzbeck & EMCI	VULB 9168 & N-6-05	774 & AT-N0538	Feb. 12, 2018 Jan.14, 2019	1 year
Horn Antenna (1-18 GHz)	Schwarzbeck	BBHA 9120 D	01690	Jan. 23, 2018 Jan. 25, 2019	1 year
Horn Antenna(18-40 GHz)	Schwarzbeck	BBHA 9170	781	Jan.12, 2018 Jan.16, 2019	1 year
Preamplifier (30-1000 MHz)	EMCI	EMC330E	980405	Feb. 1, 2018 Jan. 30, 2019	1 year
Preamplifier (1-18 GHz)	EMCI	EMC051835BE	980406	Feb. 2, 2018 Jan. 29, 2019	1 year
Preamplifier (18-40GHz)	EMCI	EMC184040SE E	980426	Apr. 26, 2018 May. 8, 2019	1 year
RF Cable (9 KHz~18 GHz)	UltraPhase & EMC Instrument	A1K50-UP0358-A1K50-1500&EMC106-NM-SM-2500/7000	170111-4&170219/170102	Feb. 1, 2018 Jan. 29, 2019	1 year
RF Cable (18 GHz~40 GHz)	UltraPhase	K1K50-UP0264-K1K50-2500/2500/600	170214-2/170214-6/170111-1	Feb. 1, 2018 Jan. 29, 2019	1 year

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Test Equipment List					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
Antenna Port Conducted Measurement					
Spectrum Analyzer	Keysight	N9010A	MY56070834	Nov. 8, 2018	1 year
Pulse Power Sensor	Anrisu	MA2411B	1531202	Dec. 14, 2017	1 year
				Dec. 17, 2018	
Power Meter	Anrisu	ML2495A	1645002	Dec. 14, 2017	1 year
				Dec. 17, 2018	
AC power Line Conducted Emission					
EMI Test Receiver	Rohde & Schwarz	ESR7	101753	Nov. 14, 2018	1 year
Two-Line V-Network	Rohde & Schwarz	ENV216	102136	Aug. 5, 2018	1 year
Impuls-Begrenzer Pulse Limiter	Rohde & Schwarz	ESH3-Z2	102219-Qt	Aug. 2, 2018	1 year
Cables	Huber+Suhner	RG 214/U	FCC-BCICF-4 RF	Feb. 1, 2018	1 year
				Jan. 29, 2019	

UL Software		
Description	Name	Version
Radiated measurement	EZ EMC	1.1.4.2
Conducted measurement	Keysight.TestSystem	1.0.0.0
AC power Line Conducted Emission	EZ EMC	1.1.4.2

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8. Description of Test Setup

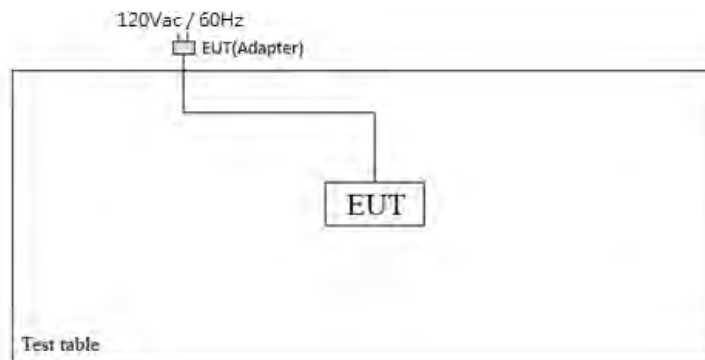
Support Equipment

Item	Equipment	Brand Name	Model Name	P/N
1	Notebook	DELL	Latitude E5470	3JFKWF2
2	PoE	YODA	PU100GA-60	1706020001

Test Setup

Controlled using a bespoke application (Teraterm469) on a test Notebook. The application was used to enable a continuous transmission mode and to select the test channels, data rates, modulation schemes and power setting as required.

Setup Diagram for Test



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9. Test Results

9.1. 6dB Bandwidth

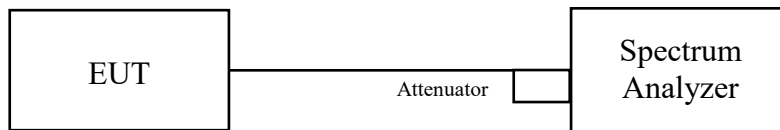
Requirements

The minimum 6 dB bandwidth shall be at least 500 kHz.

Test procedure

- Set resolution bandwidth (RBW) = 100kHz
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

Test Setup



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Test Data

802.11b

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	10.14	0.5	Pass
6	2437	11.07	0.5	Pass
11	2462	10.08	0.5	Pass

802.11g

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	15.72	15.72	0.5	Pass
6	2437	15.09	15.69	0.5	Pass
11	2462	14.94	15.09	0.5	Pass

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802.11n (HT20)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	15.09	16.32	0.5	Pass
6	2437	15.08	16.29	0.5	Pass
11	2462	15.06	15.06	0.5	Pass

802.11n (HT40)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	31.84	28.02	0.5	Pass
6	2437	25.68	28.86	0.5	Pass
9	2452	35.16	33.84	0.5	Pass

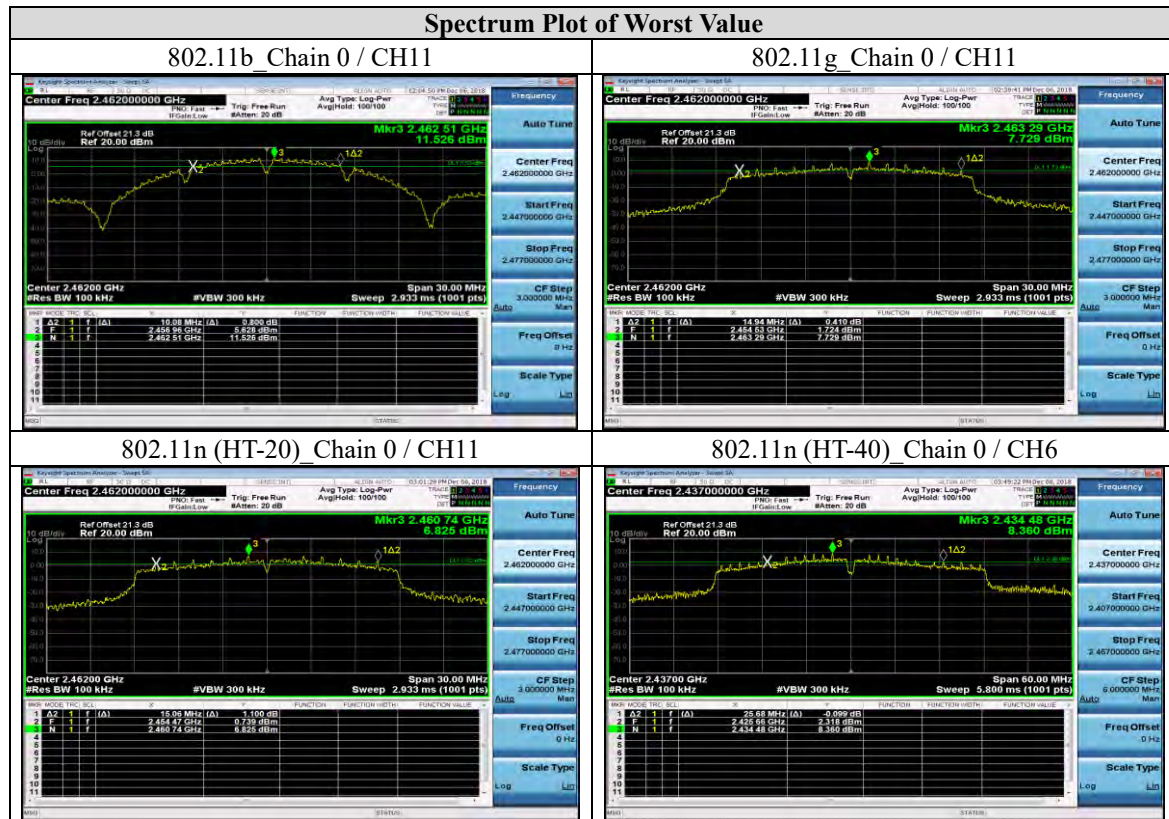
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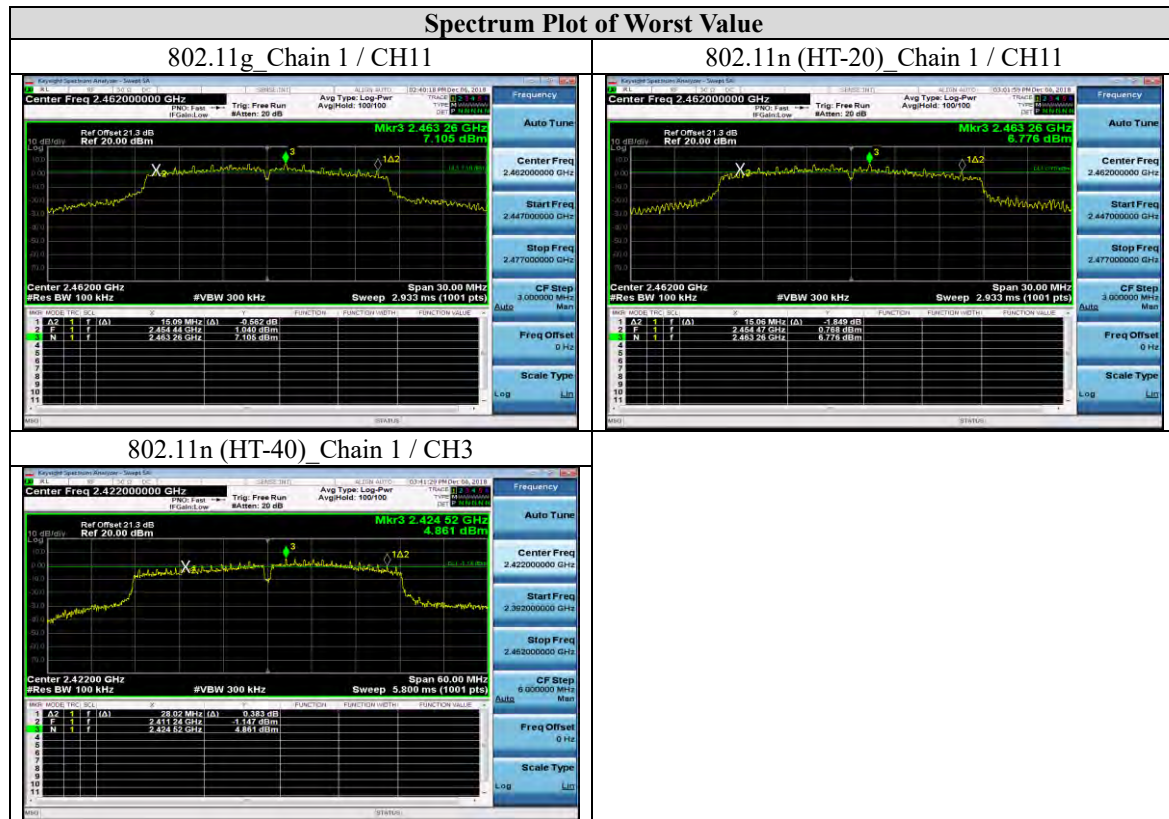
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9.2. Conducted output power

Requirements

For systems using digital modulation in the 2400-2483.5 MHz bands: 1 Watt.

Per KDB 662911 D01 Multiple Transmitter Output Method of conducted output power measurement on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $NANT \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any NANT;

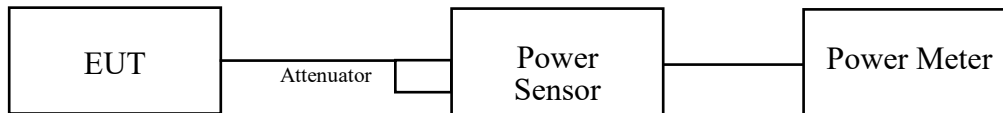
Array Gain = $5 \log(NANT/NSS)$ dB or 3 dB, whichever is less for 20 MHz channel widths with $NANT \geq 5$.

For power measurements on all other devices: Array Gain = $10 \log(NANT/NSS)$ dB.

Test Procedure

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

Test Setup



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Test Data

802.11b

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	221.82	23.46	30	Pass
6	2437	291.743	24.65	30	Pass
11	2462	218.776	23.4	30	Pass

802.11g

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	23.75	23.52	462.042	26.65	30	Pass
6	2437	24.58	23.73	523.126	27.19	30	Pass
11	2462	22.93	22.59	377.888	25.77	30	Pass

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802.11n (HT20)

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	23.53	23.36	442.194	26.46	30	Pass
6	2437	24.39	23.70	509.212	27.07	30	Pass
11	2462	22.81	22.19	356.562	25.52	30	Pass

802.11n (HT40)

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	22.97	22.33	369.155	25.67	30	Pass
6	2437	24.53	23.91	529.829	27.24	30	Pass
9	2452	22.18	21.95	321.871	25.08	30	Pass

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9.3. Power Spectral Density

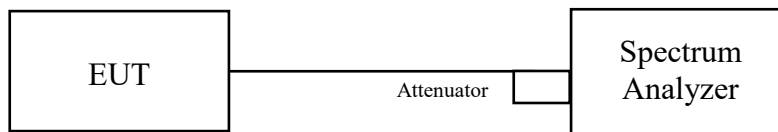
Requirements

The Maximum of Power Spectral Density Measurement is 8dBm in any 3 kHz.

Test procedure

- Set analyzer center frequency to DTS channel center frequency.
- Set the span to 1.5 times the DTS bandwidth.
- Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set the VBW $\geq 3 \times \text{RBW}$.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level within the RBW.

Test Setup



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Test Data

802.11b

Channel	Frequency (MHz)	PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
1	2412	-5.352	8	Pass
6	2437	-2.716	8	Pass
11	2462	-4.173	8	Pass

802.11g

TX Chain	Channel	Freq. (MHz)	PSD (dBm/3 kHz)	10 log (N=2) dB	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	-8.479	3.01	-5.469	8	Pass
	6	2437	-5.130	3.01	-2.120	8	Pass
	11	2462	-9.048	3.01	-6.038	8	Pass
1	1	2412	-8.416	3.01	-5.406	8	Pass
	6	2437	-6.678	3.01	-3.668	8	Pass
	11	2462	-8.586	3.01	-5.576	8	Pass

NOTE: Directional gain = 2.68 dBi + 10log(2) = 5.69 dBi < 6 dBi, so the limit no need to reduced.

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802.11n (HT20)

TX Chain	Channel	Freq. (MHz)	PSD (dBm/3 kHz)	10 log (N=2) dB	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	-8.009	3.01	-4.999	8	Pass
	6	2437	-5.515	3.01	-2.505	8	Pass
	11	2462	-8.647	3.01	-5.637	8	Pass
1	1	2412	-5.986	3.01	-2.976	8	Pass
	6	2437	-4.576	3.01	-1.566	8	Pass
	11	2462	-8.001	3.01	-4.991	8	Pass

NOTE: Directional gain = 2.68 dBi + 10log(2) = 5.69 dBi < 6 dBi, so the limit no need to reduced.

802.11n (HT40)

TX Chain	Channel	Freq. (MHz)	PSD (dBm/3 kHz)	10 log (N=2) dB	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	3	2422	-11.719	3.01	-8.709	8	Pass
	6	2437	-8.446	3.01	-5.436	8	Pass
	9	2452	-14.868	3.01	-11.858	8	Pass
1	3	2422	-10.942	3.01	-7.932	8	Pass
	6	2437	-7.250	3.01	-4.240	8	Pass
	9	2452	-14.111	3.01	-11.101	8	Pass

NOTE: Directional gain = 2.68 dBi + 10log(2) = 5.69 dBi < 6 dBi, so the limit no need to reduced.

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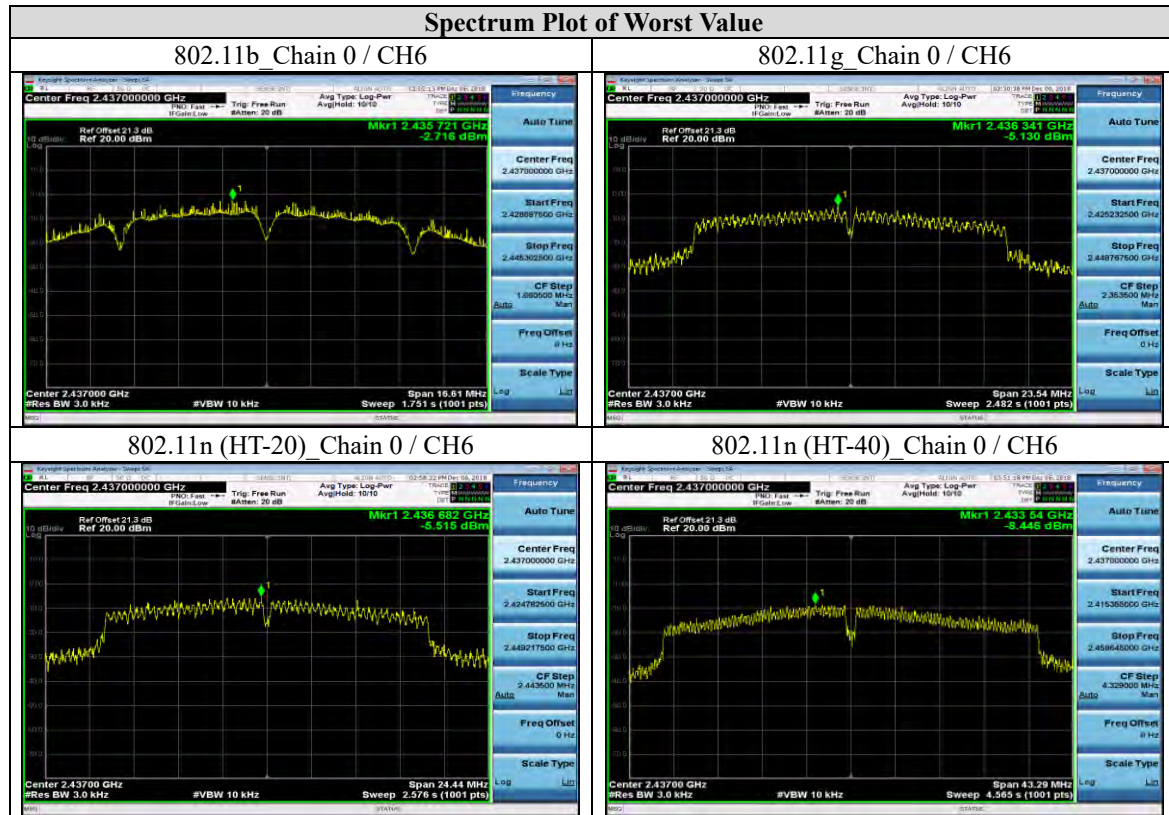
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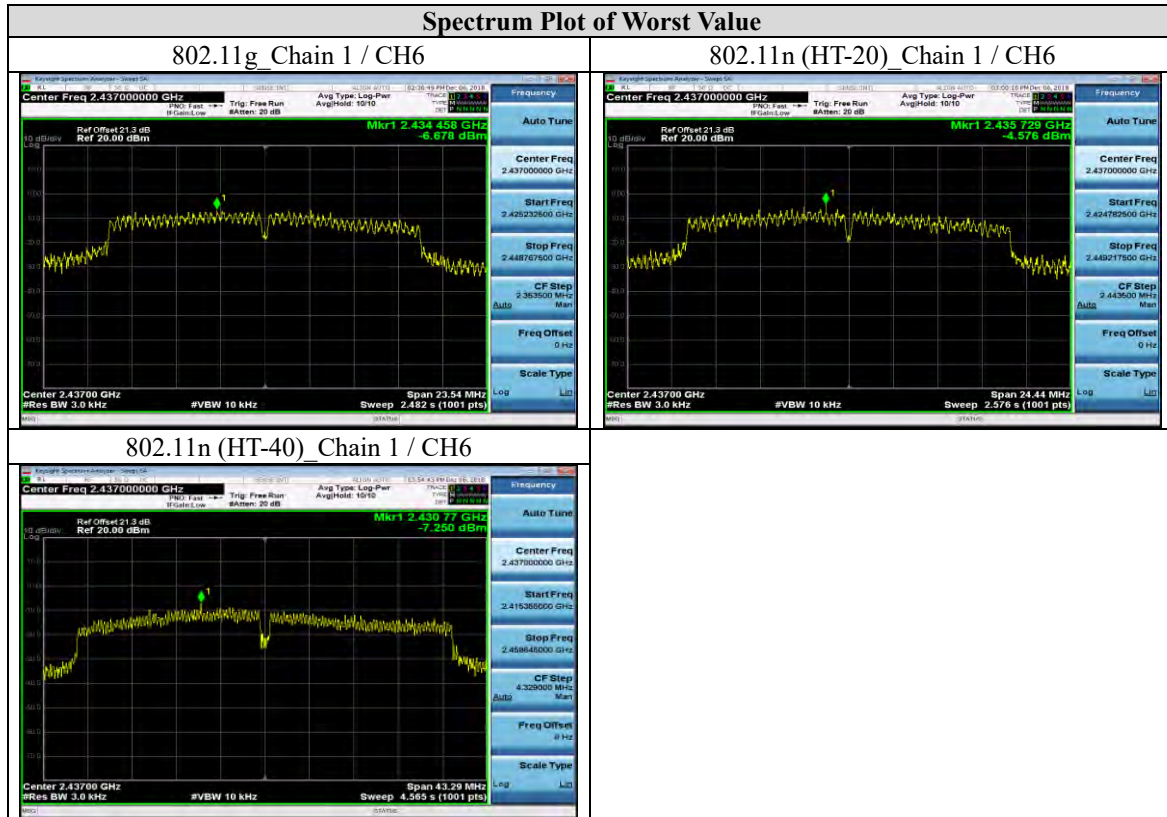
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9.4. Conducted Out of Band Emission

Requirements

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 either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b) (3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209 (a) is not required.

Test procedure

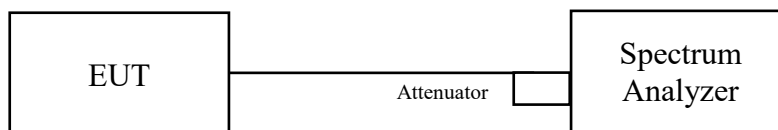
Measurement Procedure REF

1. Set the RBW = 100 kHz.
2. Set the VBW \geq 300 kHz.
3. Detector = peak.
4. Set the span to 1.5 times the DTS bandwidth.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

Measurement Procedure OOBE

1. Set RBW = 100 kHz.
2. Set VBW \geq 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

Test Setup



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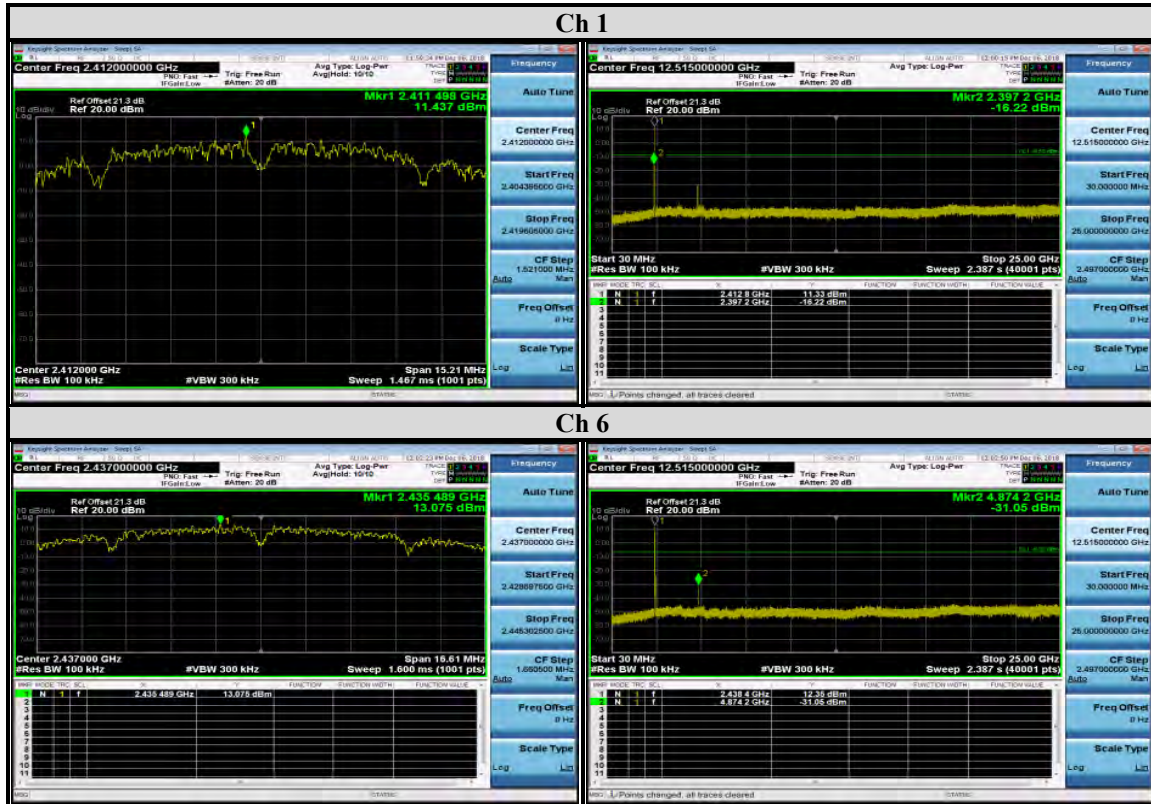
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Test Data

802.11b



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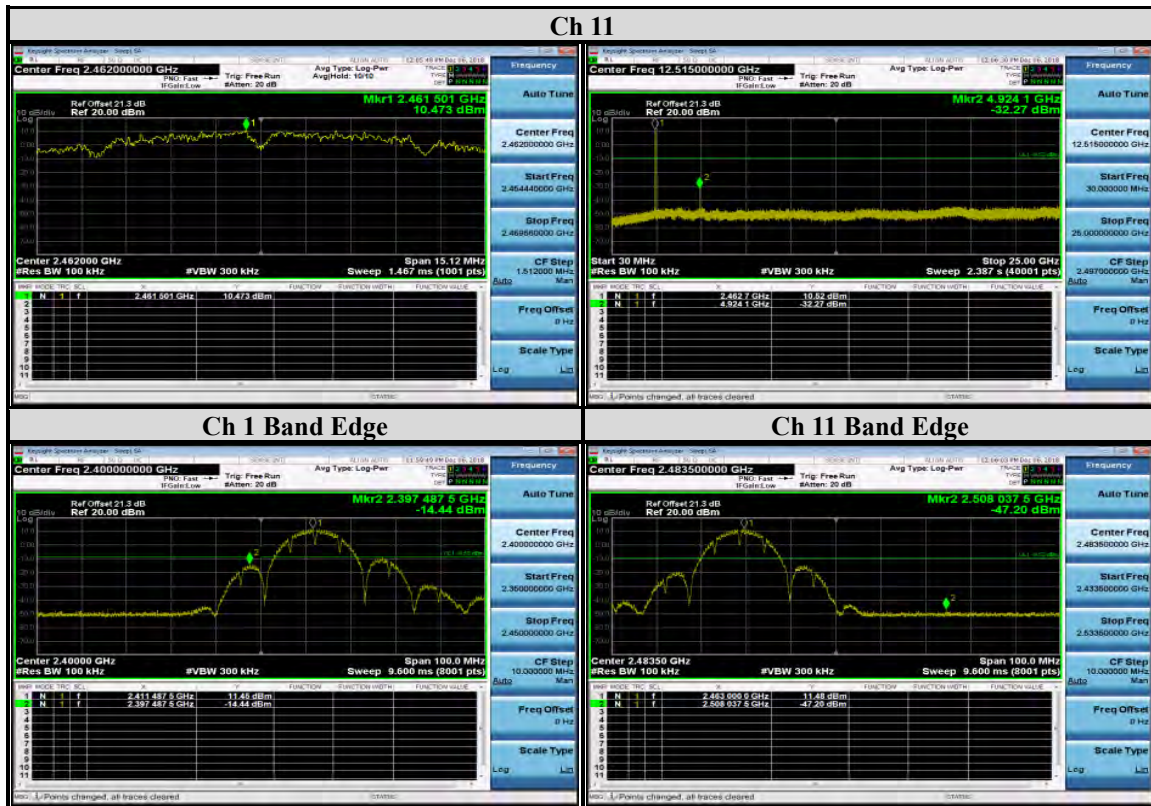
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802.11g

Chain 0



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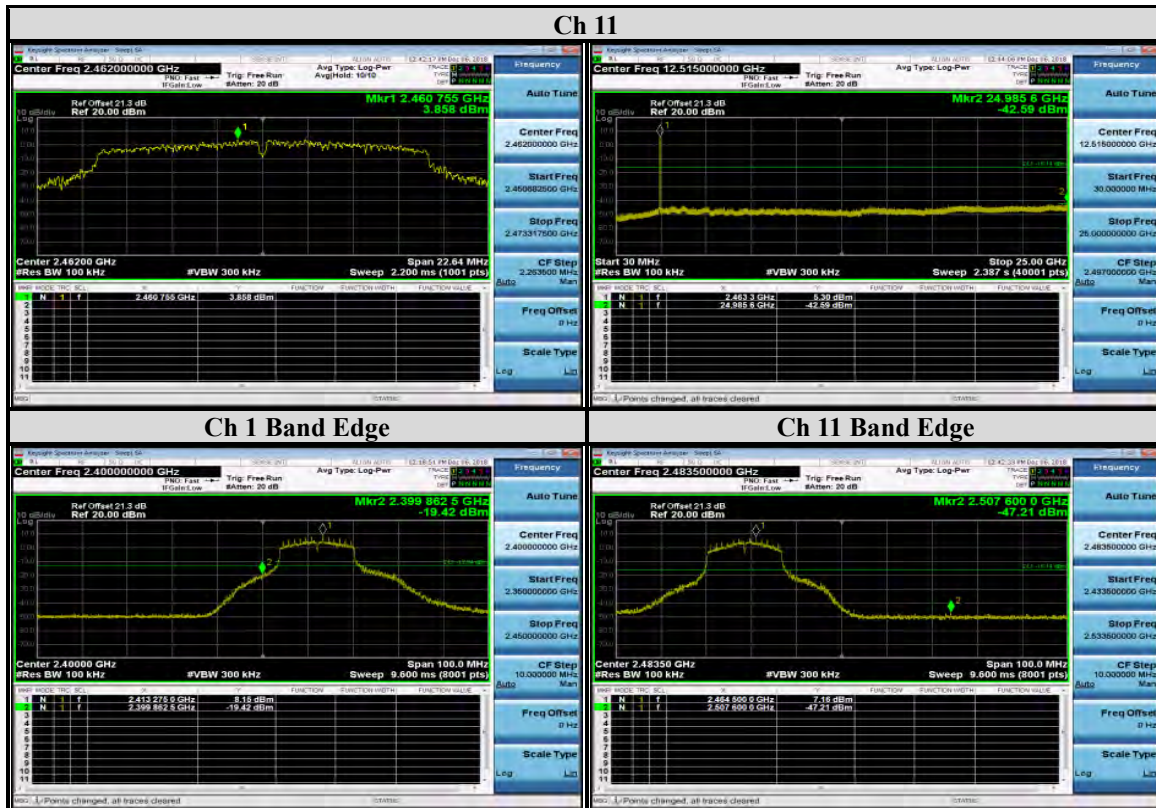
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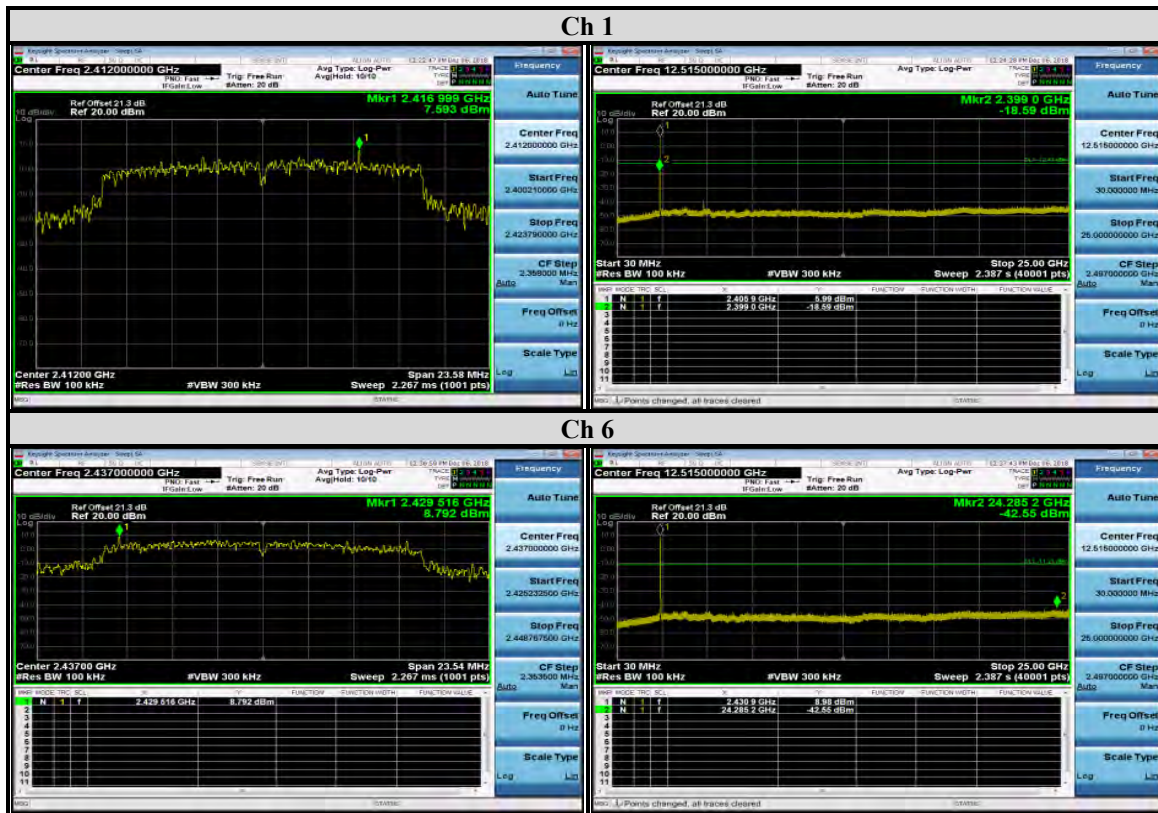
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Chain 1



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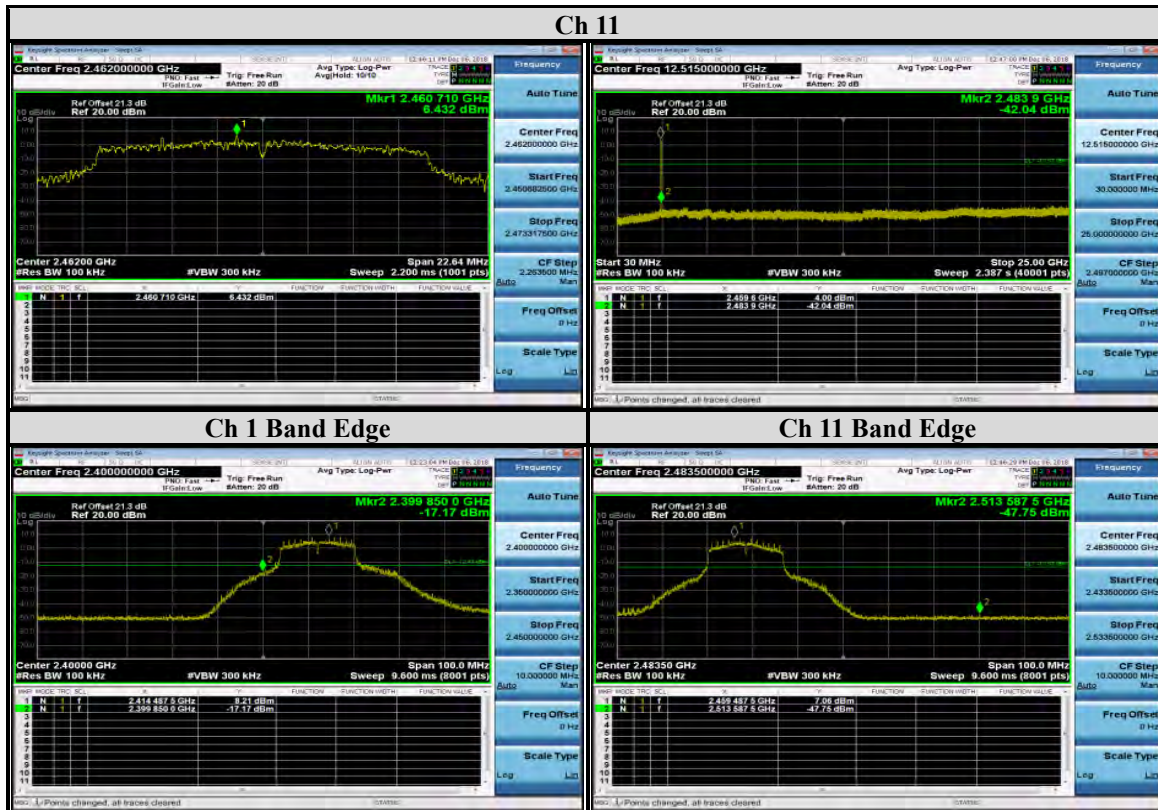
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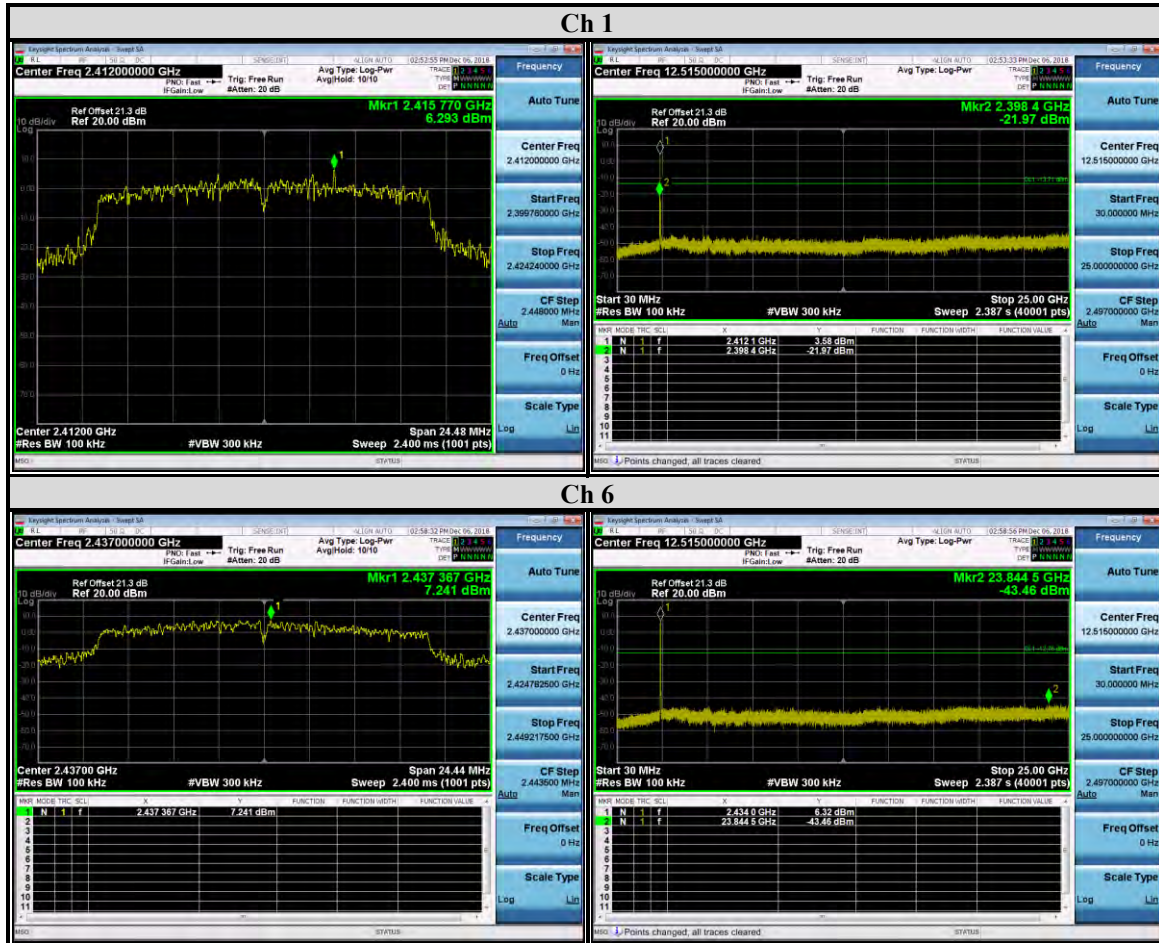
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802.11n (HT20)

Chain 0



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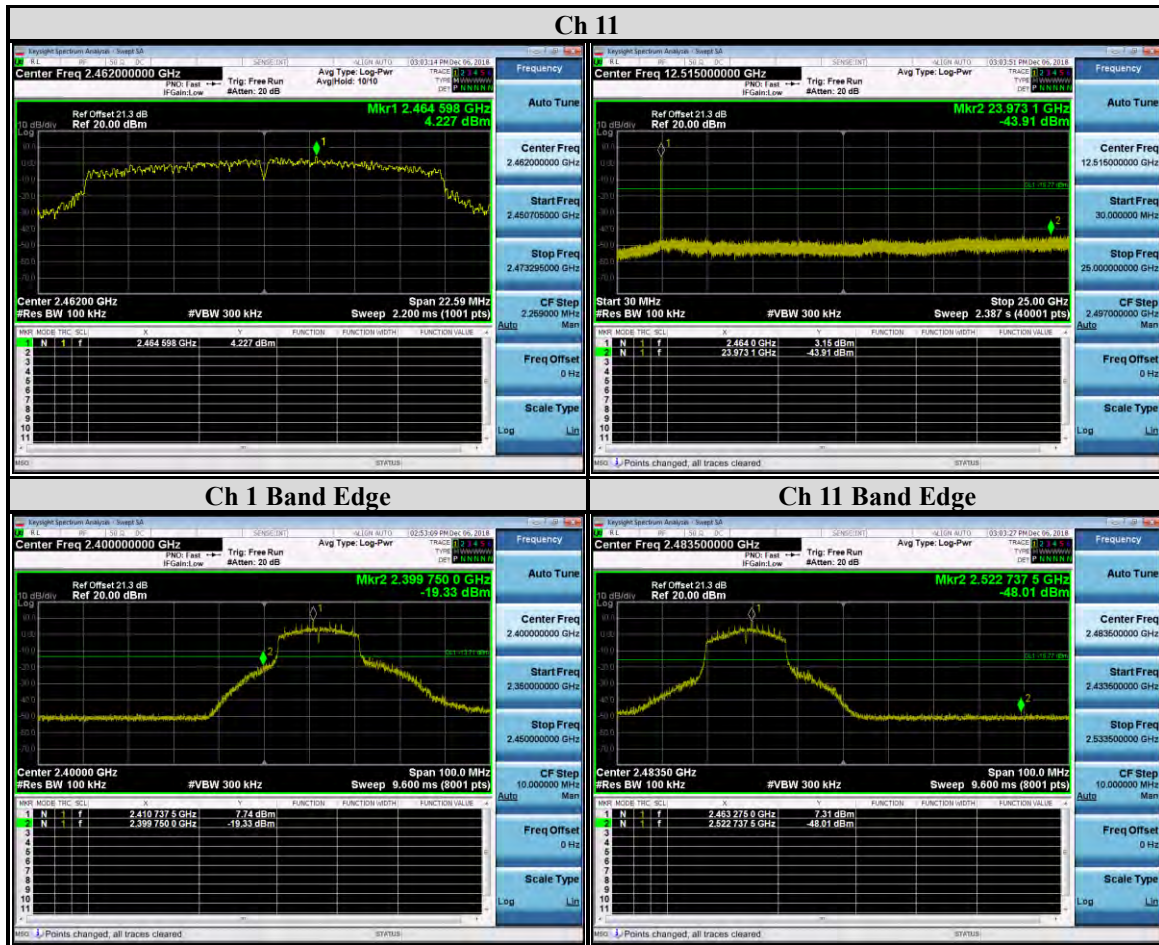
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802.11n (HT40)

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9.5. Radiated Spurious Emission

Requirements

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

Frequency(MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. 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 of modulation.

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Test Procedures

[For 9 kHz ~ 30 MHz]

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. For measurement below 30MHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

[For above 30 MHz]

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
- f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

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Note:

- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
- The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle $< 98\%$) or 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.

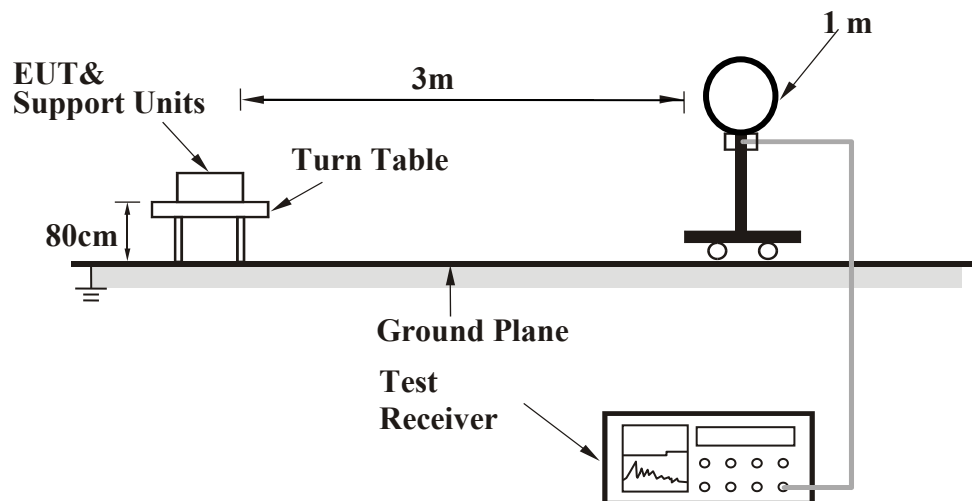
Configuration	Average	
	RBW	VBW
802.11b	1MHz	10 Hz
802.11g		1 kHz
802.11n (HT20)		1 kHz
802.11n (HT40)		2 kHz

Note: Refer to section 6.6 for duty cycle.

- All modes of operation were investigated and the worst-case emissions are reported.

Test Setup

<Frequency Range 9 kHz ~ 30 MHz>



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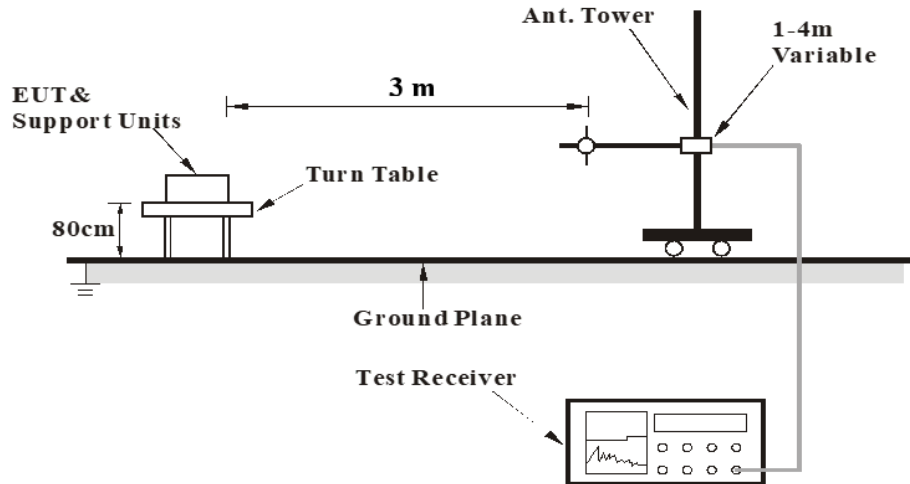
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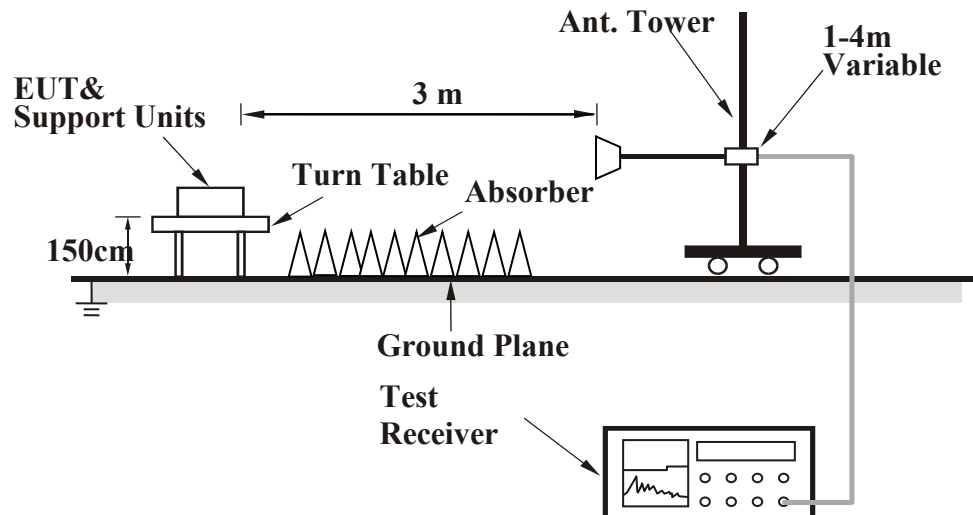
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<Frequency Range 30 MHz ~ 1 GHz >



<Frequency Range above 1 GHz>



For the actual test configuration, please refer to the Setup Configurations.



Test Data

Above 1GHz Data

SISO Mode

802.11b

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	1 GHz ~ 26 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
@	2413.293	100.56	11.51	112.07	-	-	peak
-	2387.547	46.84	11.54	58.38	74.00	-15.62	peak
-	2387.773	37.05	11.54	48.59	54.00	-5.41	AVG
@	2412.780	97.04	11.52	108.56	-	-	AVG
*	4824.000	53.59	-4.36	49.23	74.00	-24.77	peak
#	7236.000	55.17	1.34	56.51	92.07	-35.56	peak
#	9648.000	41.26	5.59	46.85	92.07	-45.22	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	2387.753	45.49	11.54	57.03	74.00	-16.97	peak
@	2413.453	97.38	11.51	108.89	-	-	peak
-	2387.573	36.55	11.54	48.09	54.00	-5.91	AVG
@	2413.120	94.20	11.51	105.71	-	-	AVG
*	4824.000	49.97	-4.36	45.61	74.00	-28.39	peak
#	7236.000	54.30	1.34	55.64	88.89	-33.25	peak
#	9648.000	42.09	5.59	47.68	88.89	-41.21	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

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Doc No: 17-EM-F0876 / 2.0



EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	1 GHz ~ 26 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	2390.000	43.26	11.53	54.79	74.00	-19.21	peak
@	2435.747	102.00	11.50	113.50	-	-	peak
-	2483.500	45.05	11.45	56.50	74.00	-17.50	peak
@	2436.253	98.66	11.50	110.16	-	-	AVG
-	2390.000	30.83	11.53	42.36	54.00	-11.64	AVG
-	2483.500	33.89	11.45	45.34	54.00	-8.66	AVG
*	4874.000	48.28	-4.24	44.04	74.00	-29.96	peak
-	7311.000	54.71	1.56	56.27	74.00	-17.73	peak
-	7311.000	49.60	1.56	51.16	54.00	-2.84	AVG
#	9748.000	40.43	5.75	46.18	93.50	-47.32	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	2390.000	43.00	11.53	54.53	74.00	-19.47	peak
@	2435.753	98.54	11.50	110.04	-	-	peak
-	2483.500	44.04	11.45	55.49	74.00	-18.51	peak
-	2390.000	30.96	11.53	42.49	54.00	-11.51	AVG
@	2436.220	94.28	11.50	105.78	-	-	AVG
-	2483.500	31.88	11.45	43.33	54.00	-10.67	AVG
*	4874.000	51.65	-4.24	47.41	74.00	-26.59	peak
-	7311.000	54.22	1.56	55.78	74.00	-18.22	peak
-	7311.000	49.13	1.56	50.69	54.00	-3.31	AVG
#	9748.000	44.90	5.75	50.65	90.04	-39.39	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

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Doc No: 17-EM-F0876 / 2.0



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FCC ID : VGY2620

EUT Test Condition		Measurement Detail	
Channel	Channel 11	Frequency Range	1 GHz ~ 26 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
@	2460.680	99.73	11.48	111.21	-	-	peak
-	2483.500	47.73	11.45	59.18	74.00	-14.82	peak
@	2461.240	96.18	11.48	107.66	-	-	AVG
-	2483.500	41.84	11.45	53.29	54.00	-0.71	AVG
*	4924.000	46.80	-4.13	42.67	74.00	-31.33	peak
*	7386.000	51.33	1.78	53.11	74.00	-20.89	peak
#	9848.000	36.40	5.90	42.30	91.21	-48.91	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
@	2460.833	97.83	11.48	109.31	-	-	peak
-	2483.500	46.56	11.45	58.01	74.00	-15.99	peak
@	2461.253	94.52	11.48	106.00	-	-	AVG
-	2483.500	39.04	11.45	50.49	54.00	-3.51	AVG
*	4924.000	50.34	-4.13	46.21	74.00	-27.79	peak
-	7386.000	56.06	1.78	57.84	74.00	-16.16	peak
-	7386.000	50.76	1.78	52.54	54.00	-1.46	AVG
#	9848.000	43.62	5.90	49.52	89.31	-39.79	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

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Doc No: 17-EM-F0876 / 2.0



MIMO Mode

802.11g

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	1 GHz ~ 26 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
@	2413.233	104.36	11.51	115.87	-	-	peak
-	2390.000	58.27	11.53	69.80	74.00	-4.20	peak
@	2413.553	93.35	11.51	104.86	-	-	AVG
-	2390.000	38.02	11.53	49.55	54.00	-4.45	AVG
*	4824.000	51.70	-4.36	47.34	74.00	-26.66	peak
#	7236.000	53.42	1.34	54.76	95.87	-41.11	peak
#	9648.000	38.89	5.59	44.48	95.87	-51.39	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	2390.000	52.55	11.53	64.08	74.00	-9.92	peak
@	2413.780	99.43	11.51	110.94	-	-	peak
@	2413.713	89.50	11.51	101.01	-	-	AVG
-	2390.000	34.32	11.53	45.85	54.00	-8.15	AVG
*	4824.000	57.67	-4.36	53.31	74.00	-20.69	peak
#	7236.000	58.13	1.34	59.47	90.94	-31.47	peak
#	9648.000	42.65	5.59	48.24	90.94	-42.70	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

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Doc No: 17-EM-F0876 / 2.0



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EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	1 GHz ~ 26 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	2390.000	43.53	11.53	55.06	74.00	-18.94	peak
@	2438.193	106.16	11.50	117.66	-	-	peak
-	2483.500	44.69	11.45	56.14	74.00	-17.86	peak
-	2390.000	30.98	11.53	42.51	54.00	-11.49	AVG
@	2438.047	96.04	11.50	107.54	-	-	AVG
-	2483.500	32.83	11.45	44.28	54.00	-9.72	AVG
*	4874.000	47.97	-4.24	43.73	74.00	-30.27	peak
-	7311.000	53.21	1.56	54.77	74.00	-19.23	peak
-	7311.000	42.78	1.56	44.34	54.00	-9.66	AVG
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	2390.000	43.24	11.53	54.77	74.00	-19.23	peak
@	2437.867	101.89	11.50	113.39	-	-	peak
-	2483.500	43.82	11.45	55.27	74.00	-18.73	peak
-	2390.000	30.96	11.53	42.49	54.00	-11.51	AVG
@	2437.820	90.25	11.50	101.75	-	-	AVG
-	2483.500	32.29	11.45	43.74	54.00	-10.26	AVG
*	4874.000	51.92	-4.24	47.68	74.00	-26.32	peak
-	7311.000	59.00	1.56	60.56	74.00	-13.44	peak
-	7311.000	48.63	1.56	50.19	54.00	-3.81	AVG

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. " * ": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
6. The other emission levels were very low against the limit.

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Doc No: 17-EM-F0876 / 2.0



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EUT Test Condition		Measurement Detail	
Channel	Channel 11	Frequency Range	1 GHz ~ 26 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
@	2463.173	103.30	11.48	114.78	-	-	peak
-	2483.500	59.07	11.45	70.52	74.00	-3.48	peak
@	2463.347	93.63	11.48	105.11	-	-	AVG
-	2483.500	42.02	11.45	53.47	54.00	-0.53	AVG
*	4924.000	47.73	-4.13	43.60	74.00	-30.40	peak
*	7386.000	46.69	1.78	48.47	74.00	-25.53	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
@	2463.087	101.76	11.48	113.24	-	-	peak
-	2483.500	55.21	11.45	66.66	74.00	-7.34	peak
@	2462.927	92.38	11.48	103.86	-	-	AVG
-	2483.500	40.64	11.45	52.09	54.00	-1.91	AVG
*	4924.000	50.27	-4.11	46.16	74.00	-27.84	peak
-	7386.000	53.39	1.78	55.17	74.00	-18.83	peak
-	7386.000	43.48	1.78	45.26	54.00	-8.74	AVG

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. " * ": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
6. The other emission levels were very low against the limit.

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802.11n (HT-20)

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	1 GHz ~ 26 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	2390.000	59.07	11.53	70.60	74.00	-3.40	peak
@	2411.533	103.01	11.51	114.52	-	-	peak
-	2390.000	42.35	11.53	53.88	54.00	-0.12	AVG
@	2414.180	93.37	11.51	104.88	-	-	AVG
*	4824.000	53.59	-4.36	49.23	74.00	-24.77	peak
#	7236.000	52.62	1.34	53.96	94.52	-40.56	peak
#	9648.000	38.75	5.59	44.34	94.52	-50.18	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	2390.000	52.13	11.53	63.66	74.00	-10.34	peak
@	2410.320	96.71	11.52	108.23	-	-	peak
-	2390.000	38.15	11.53	49.68	54.00	-4.32	AVG
@	2410.420	87.57	11.52	99.09	-	-	AVG
*	4824.000	56.82	-4.36	52.46	74.00	-21.54	peak
#	7236.000	59.11	1.34	60.45	88.23	-27.78	peak
#	9648.000	42.11	5.59	47.70	88.23	-40.53	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

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EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	1 GHz ~ 26 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	2390.000	43.77	11.53	55.30	74.00	-18.70	peak
@	2432.413	104.55	11.50	116.05	-	-	peak
-	2483.500	45.45	11.45	56.90	74.00	-17.10	peak
-	2390.000	31.43	11.53	42.96	54.00	-11.04	AVG
@	2434.740	95.48	11.50	106.98	-	-	AVG
-	2483.500	32.72	11.45	44.17	54.00	-9.83	AVG
*	4874.000	47.72	-4.24	43.48	74.00	-30.52	peak
-	7311.000	53.24	1.56	54.80	74.00	-19.20	peak
-	7311.000	43.16	1.56	44.72	54.00	-9.28	AVG
#	9748.000	37.15	5.75	42.90	96.05	-53.15	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	2390.000	42.58	11.53	54.11	74.00	-19.89	peak
@	2436.420	100.45	11.50	111.95	-	-	peak
-	2483.500	42.88	11.45	54.33	74.00	-19.67	peak
-	2390.000	30.98	11.53	42.51	54.00	-11.49	AVG
@	2436.453	91.21	11.50	102.71	-	-	AVG
-	2483.500	31.63	11.45	43.08	54.00	-10.92	AVG
*	4874.000	52.24	-4.24	48.00	74.00	-26.00	peak
-	7311.000	58.77	1.56	60.33	74.00	-13.67	peak
-	7311.000	48.32	1.56	49.88	54.00	-4.12	AVG
#	9748.000	40.00	5.75	45.75	91.95	-46.20	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "#": The radiated frequency is out of the restricted band.
6. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
7. The other emission levels were very low against the limit.

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EUT Test Condition		Measurement Detail	
Channel	Channel 11	Frequency Range	1 GHz ~ 26 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
@	2460.047	100.82	11.48	112.30	-	-	peak
-	2483.500	56.97	11.45	68.42	74.00	-5.58	peak
-	2483.500	41.83	11.45	53.28	54.00	-0.72	AVG
@	2460.160	92.23	11.48	103.71	-	-	AVG
*	4924.000	47.25	-4.13	43.12	74.00	-30.88	peak
*	7386.000	44.76	1.78	46.54	74.00	-27.46	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
@	2461.120	96.92	11.48	108.40	-	-	peak
-	2483.500	54.53	11.45	65.98	74.00	-8.02	peak
@	2461.420	87.92	11.48	99.40	-	-	AVG
-	2483.500	38.47	11.45	49.92	54.00	-4.08	AVG
*	4924.000	49.40	-4.13	45.27	74.00	-28.73	peak
*	7386.000	51.05	1.78	52.83	74.00	-21.17	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. " * ": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
6. The other emission levels were very low against the limit.

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802.11n (HT-40)

EUT Test Condition		Measurement Detail	
Channel	Channel 3	Frequency Range	1 GHz ~ 26 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	2390.000	53.70	11.53	65.23	74.00	-8.77	peak
@	2425.067	98.02	11.51	109.53	-	-	peak
-	2389.973	41.63	11.53	53.16	54.00	-0.84	AVG
@	2427.353	88.49	11.51	100.00	-	-	AVG
*	4844.000	45.02	-4.30	40.72	74.00	-33.28	peak
*	7266.000	45.00	1.44	46.44	74.00	-27.56	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	2390.000	51.30	11.53	62.83	74.00	-11.17	peak
@	2425.420	95.02	11.50	106.52	-	-	peak
-	2390.000	37.00	11.53	48.53	54.00	-5.47	AVG
@	2423.600	85.70	11.51	97.21	-	-	AVG
*	4844.000	47.40	-4.30	43.10	74.00	-30.90	peak
*	7266.000	45.89	1.44	47.33	74.00	-26.67	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. "*": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
6. The other emission levels were very low against the limit.

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Doc No: 17-EM-F0876 / 2.0



Test report No. : 4788774190-US-R0-V0
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FCC ID : VGY2620

EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	1 GHz ~ 26 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	2390.000	49.32	11.53	60.85	74.00	-13.15	peak
@	2435.120	102.40	11.50	113.90	-	-	peak
-	2483.500	57.93	11.45	69.38	74.00	-4.62	peak
-	2390.000	37.18	11.53	48.71	54.00	-5.29	AVG
@	2434.733	92.05	11.50	103.55	-	-	AVG
-	2483.500	42.32	11.45	53.77	54.00	-0.23	AVG
*	4874.000	44.80	-4.24	40.56	74.00	-33.44	peak
*	7311.000	47.30	1.56	48.86	74.00	-25.14	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	2390.000	46.79	11.53	58.32	74.00	-15.68	peak
@	2434.900	98.05	11.50	109.55	-	-	peak
-	2483.500	55.49	11.45	66.94	74.00	-7.06	peak
-	2390.000	34.83	11.53	46.36	54.00	-7.64	AVG
@	2435.240	87.86	11.50	99.36	-	-	AVG
-	2483.500	40.09	11.45	51.54	54.00	-2.46	AVG
*	4874.000	51.09	-4.24	46.85	74.00	-27.15	peak
-	7311.000	55.03	1.56	56.59	74.00	-17.41	peak
-	7311.000	43.39	1.56	44.95	74.00	-29.05	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. " * ": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
6. The other emission levels were very low against the limit.

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Test report No. : 4788774190-US-R0-V0
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EUT Test Condition		Measurement Detail	
Channel	Channel 9	Frequency Range	1 GHz ~ 26 GHz

Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
@	2455.000	96.14	11.48	107.62	-	-	peak
-	2483.500	58.24	11.45	69.69	74.00	-4.31	peak
@	2457.427	86.19	11.48	97.67	-	-	AVG
-	2483.500	41.76	11.45	53.21	54.00	-0.79	AVG
*	4904.000	41.68	-4.16	37.52	74.00	-36.48	peak
*	7356.000	40.82	1.69	42.51	74.00	-31.49	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
@	2453.633	92.44	11.48	103.92	-	-	peak
-	2483.500	54.40	11.45	65.85	74.00	-8.15	peak
@	2453.520	83.30	11.48	94.78	-	-	AVG
-	2483.500	39.02	11.45	50.47	54.00	-3.53	AVG
*	4904.000	46.42	-4.16	42.26	74.00	-31.74	peak
*	7356.000	46.30	1.69	47.99	74.00	-26.01	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. "@": Fundamental Frequency.
5. " * ": The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
6. The other emission levels were very low against the limit.

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Below 1GHz Data

No non-compliance noted:

KDB 414788 D01 OATS and Chamber Correlation Justification

- Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

- OATs and chamber correlation testing had been performed and chamber measured test results is the worst case test result.

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30m open area test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

9 kHz ~ 30 MHz Data

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

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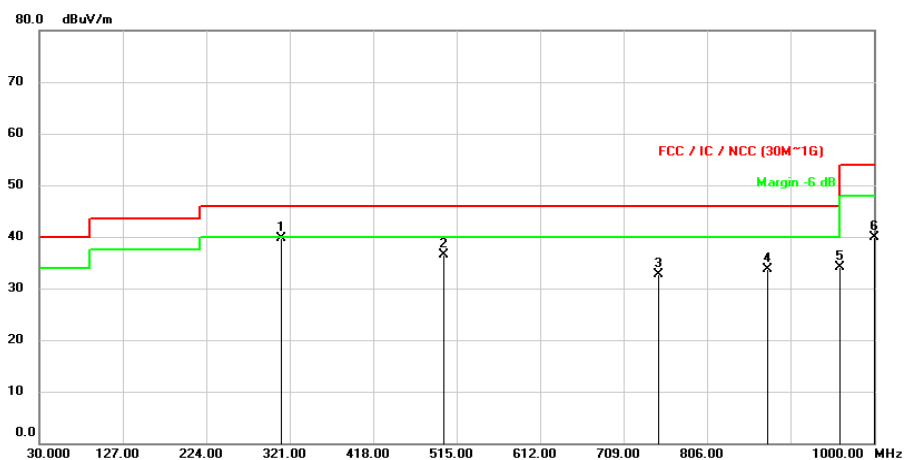
30 MHz ~ 1 GHz Worst Case Data

MIMO Mode

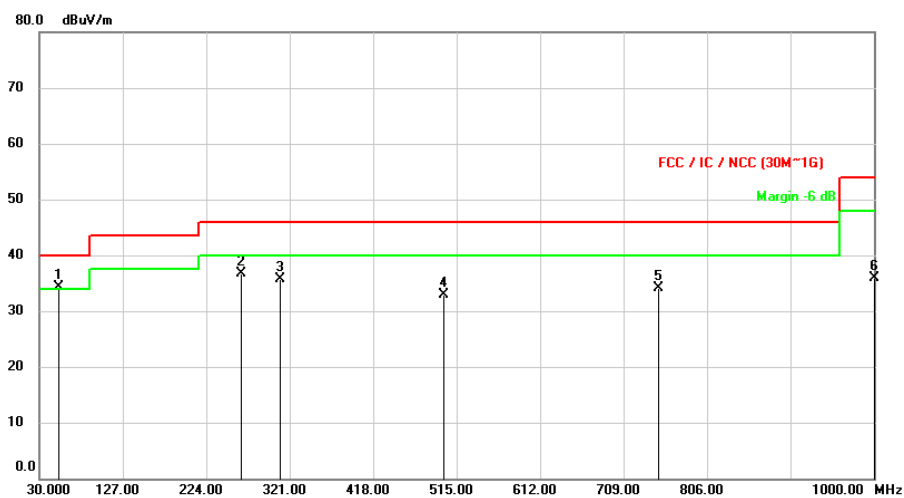
802.11n (HT-20)

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	30 MHz ~ 1 GHz

Horizontal



Vertical



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Antenna Polarity & Test Distance: Horizontal at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	312.0113	53.89	-14.19	39.70	46.00	-6.30	peak
-	499.9650	46.36	-9.84	36.52	46.00	-9.48	peak
-	749.9986	37.72	-4.96	32.76	46.00	-13.24	peak
-	874.9670	37.10	-3.44	33.66	46.00	-12.34	peak
-	959.9390	36.18	-2.03	34.15	46.00	-11.85	peak
-	999.9353	41.62	-1.65	39.97	54.00	-14.03	peak
Antenna Polarity & Test Distance: Vertical at 3 m							
Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
-	52.0190	49.62	-15.36	34.26	40.00	-5.74	peak
-	264.0287	52.60	-15.86	36.74	46.00	-9.26	peak
-	310.0067	49.98	-14.25	35.73	46.00	-10.27	peak
-	499.9973	42.69	-9.84	32.85	46.00	-13.15	peak
-	749.9986	39.01	-4.96	34.05	46.00	-11.95	peak
-	999.9353	37.55	-1.65	35.90	54.00	-18.10	peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

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9.6. AC Power Line Conducted Emission

Requirements

Frequency (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

Test Procedures

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

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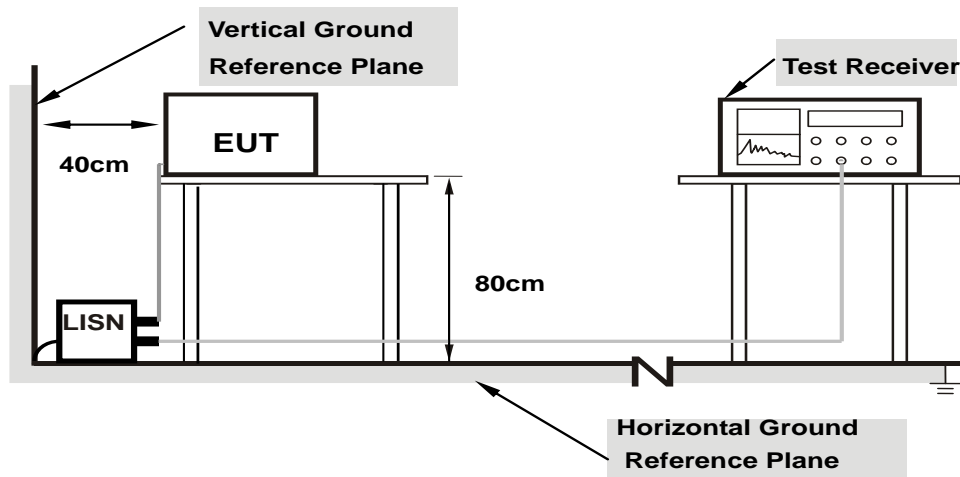
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Test Setup



Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the Setup Configurations.

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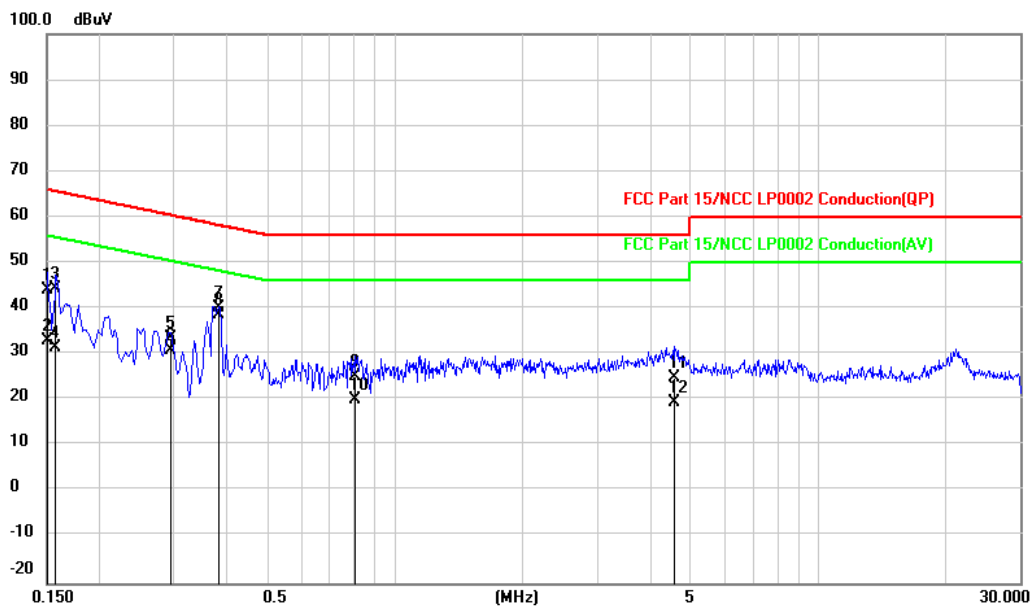
Test Data

MIMO Mode

802.11n (HT-20)

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	150 kHz ~ 30 MHz

Phase of Power : Line (L)



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No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	dB	(dBuV)	(dBuV)	(dB)	
1	0.1500	24.56	19.55	44.11	66.00	-21.89	QP
2	0.1500	13.44	19.55	32.99	56.00	-23.01	AVG
3	0.1578	24.93	19.55	44.48	65.58	-21.10	QP
4	0.1578	11.86	19.55	31.41	55.58	-24.17	AVG
5	0.2933	14.06	19.54	33.60	60.43	-26.83	QP
6	0.2933	11.31	19.54	30.85	50.43	-19.58	AVG
7	0.3817	20.75	19.53	40.28	58.24	-17.96	QP
8	0.3817	19.11	19.53	38.64	48.24	-9.60	AVG
9	0.8078	5.48	19.54	25.02	56.00	-30.98	QP
10	0.8078	0.62	19.54	20.16	46.00	-25.84	AVG
11	4.5722	5.40	19.58	24.98	56.00	-31.02	QP
12	4.5722	0.00	19.58	19.58	46.00	-26.42	AVG

Remarks:

1. Result value (dBuV) = Reading value (dBuV) + Correction Factor (dB)
2. Margin(dB) = Result value (dBuV) - Limit value (dBuV)
3. Correction Factor(dB) = Insertion loss(dB) + Cable loss(dB)
4. The other emission levels were very low against the limit.

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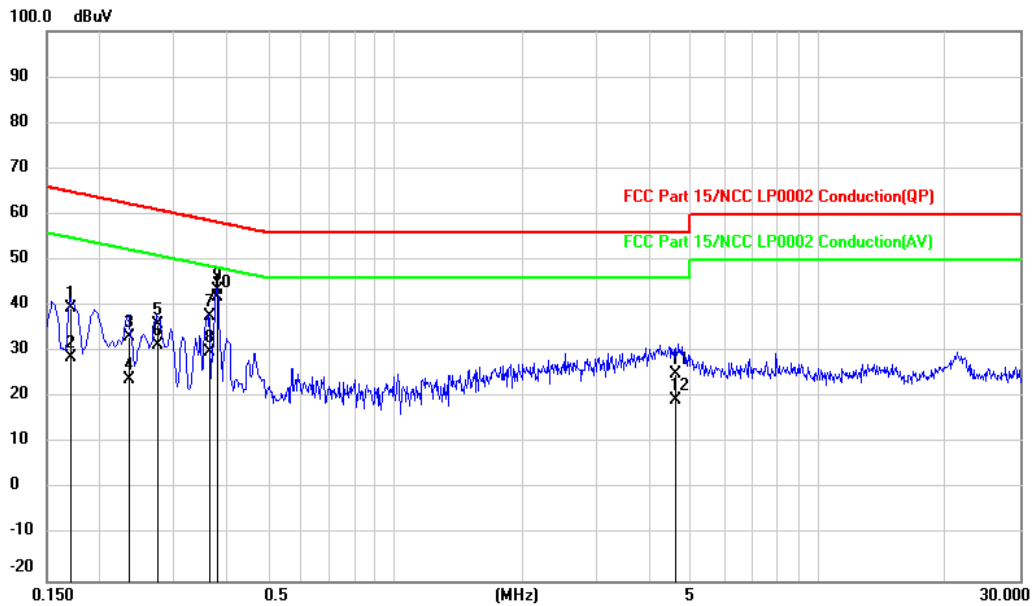
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Phase of Power : Neutral (N)



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No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	dB	(dBuV)	(dBuV)	(dB)	
1	0.1711	20.05	19.54	39.59	64.91	-25.32	QP
2	0.1711	9.17	19.54	28.71	54.91	-26.20	AVG
3	0.2346	13.66	19.54	33.20	62.29	-29.09	QP
4	0.2346	4.29	19.54	23.83	52.29	-28.46	AVG
5	0.2751	16.35	19.54	35.89	60.96	-25.07	QP
6	0.2751	11.79	19.54	31.33	50.96	-19.63	AVG
7	0.3639	18.26	19.53	37.79	58.64	-20.85	QP
8	0.3639	10.28	19.53	29.81	48.64	-18.83	AVG
9	0.3794	23.86	19.53	43.39	58.29	-14.90	QP
10	0.3794	22.34	19.53	41.87	48.29	-6.42	AVG
11	4.6291	5.64	19.60	25.24	56.00	-30.76	QP
12	4.6291	-0.10	19.60	19.50	46.00	-26.50	AVG

Remarks:

1. Result value (dBuV) = Reading value (dBuV) + Correction Factor (dB)
2. Margin(dB) = Result value (dBuV) - Limit value (dBuV)
3. Correction Factor(dB) = Insertion loss(dB) + Cable loss(dB)
4. The other emission levels were very low against the limit.

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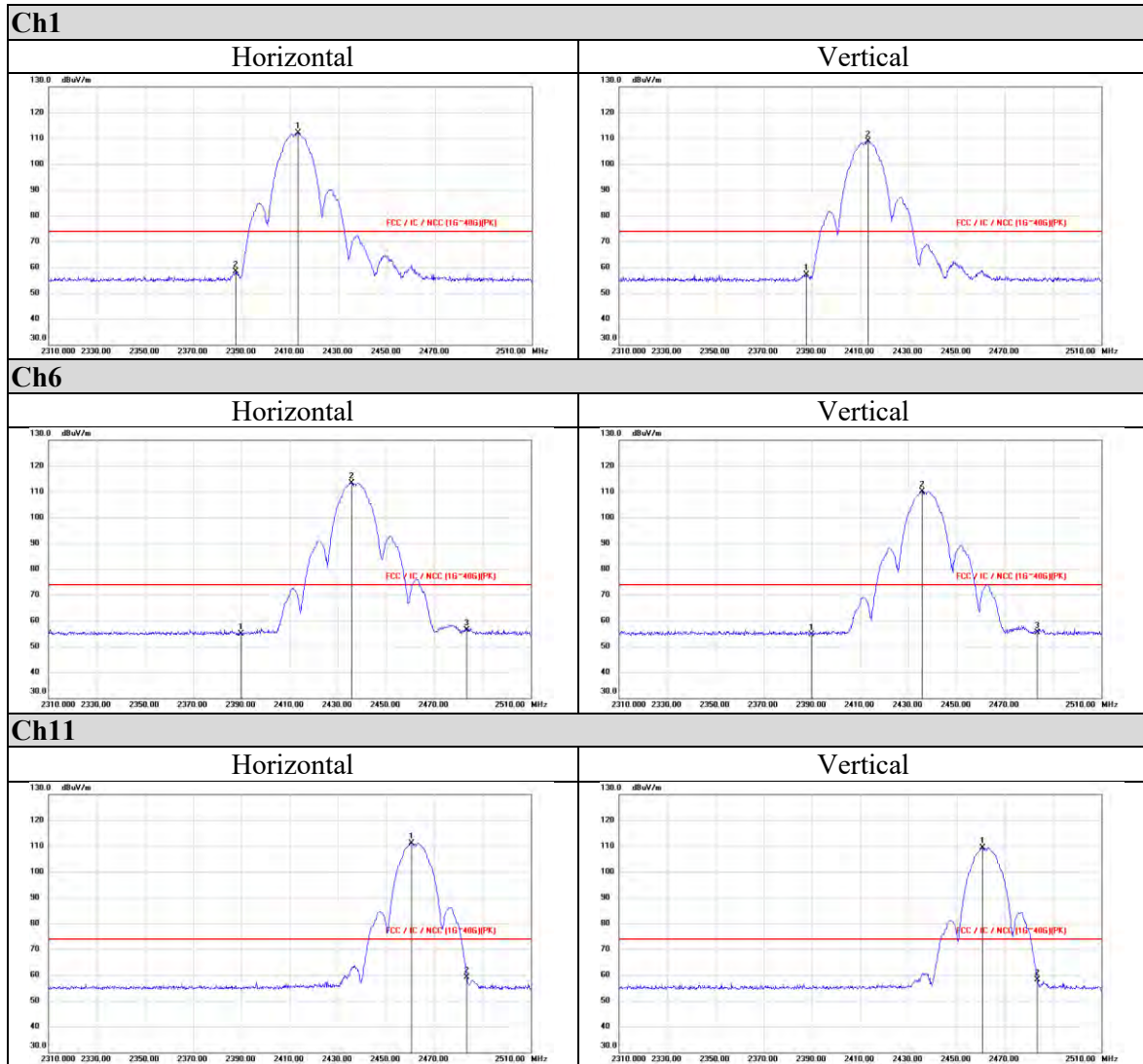


Appendix I Radiated Band Edge Measurement

SISO Mode

802.11b

Peak



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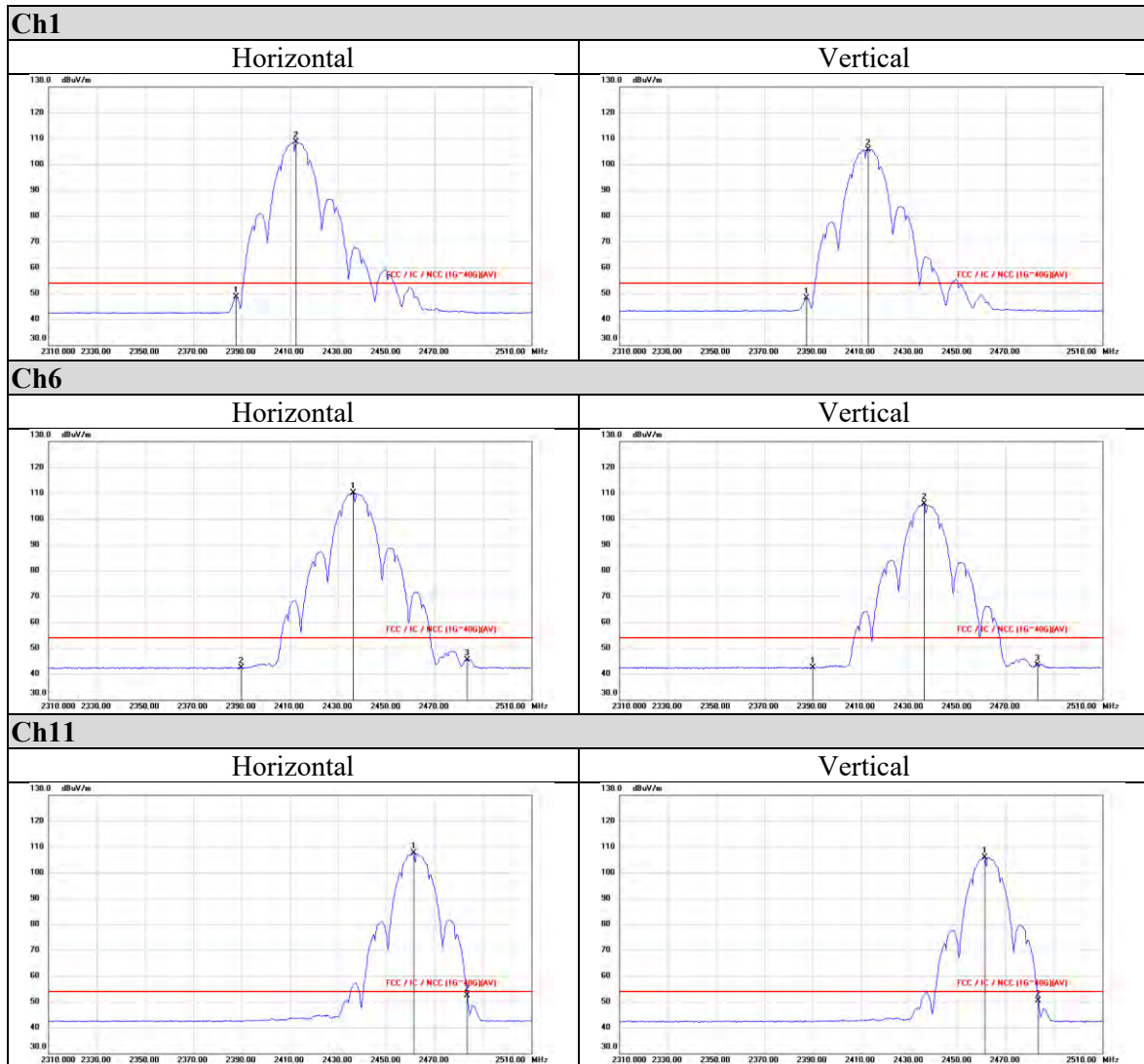
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Average



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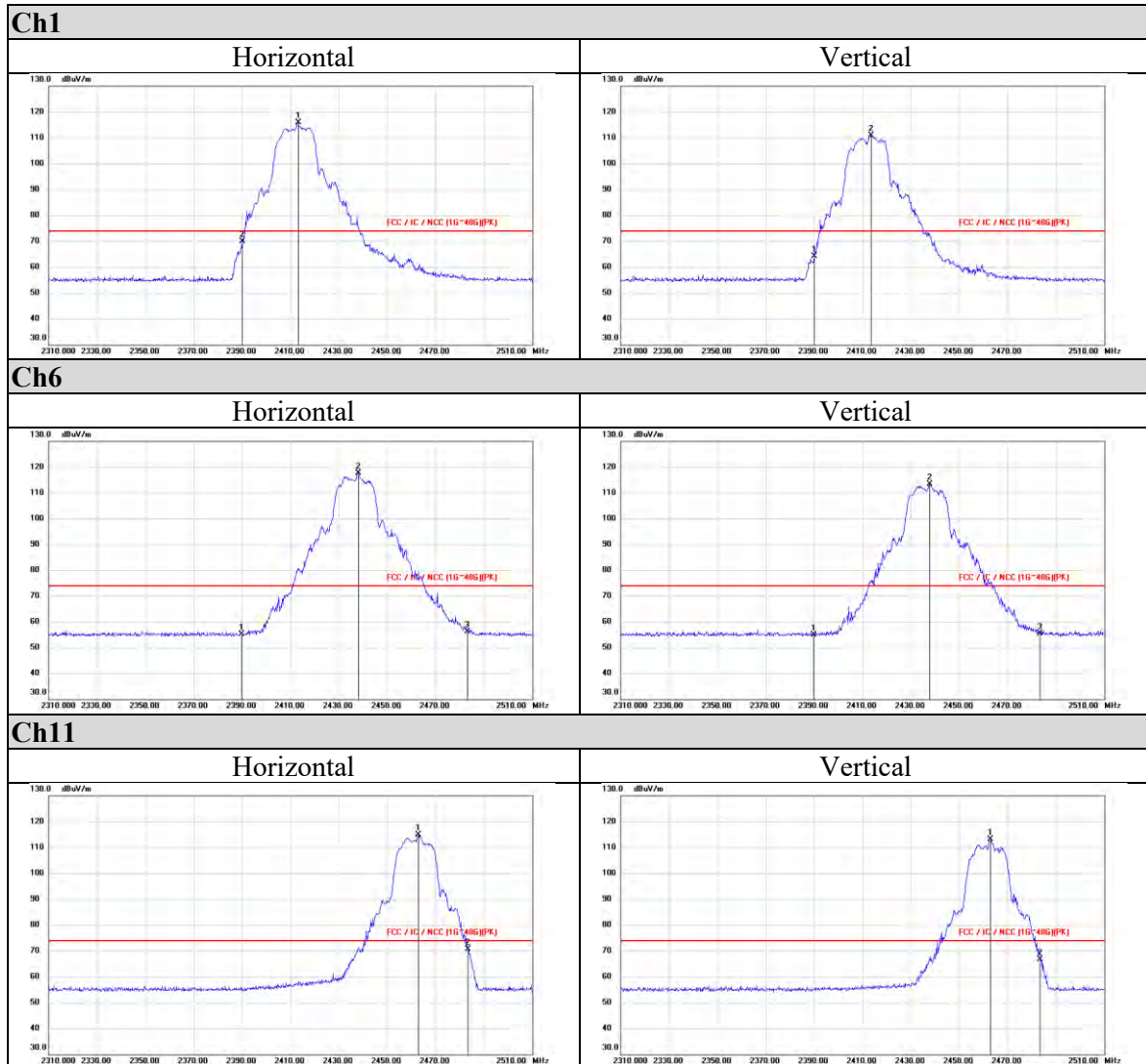
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MIMO Mode

802.11g

Peak



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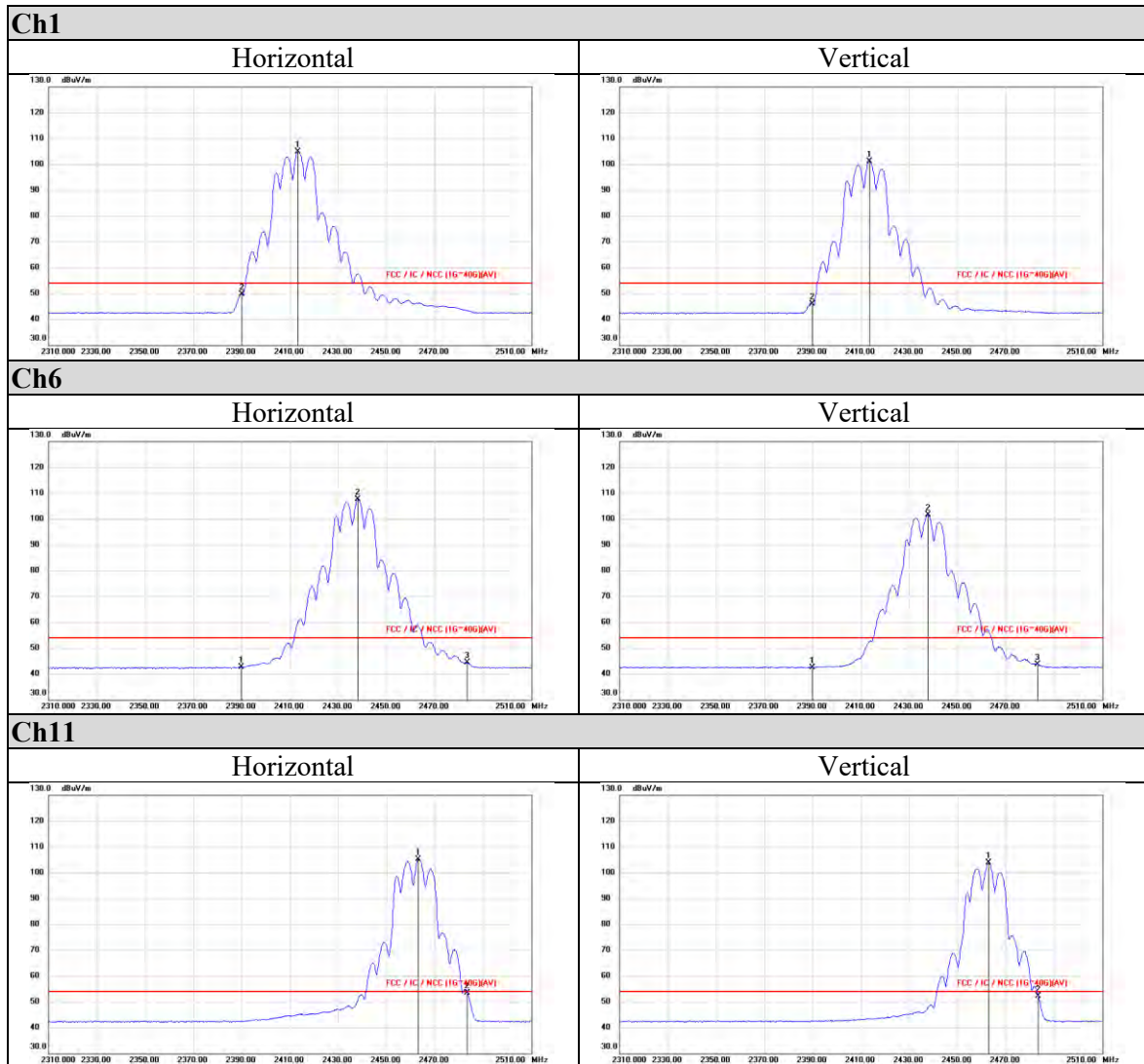
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Average



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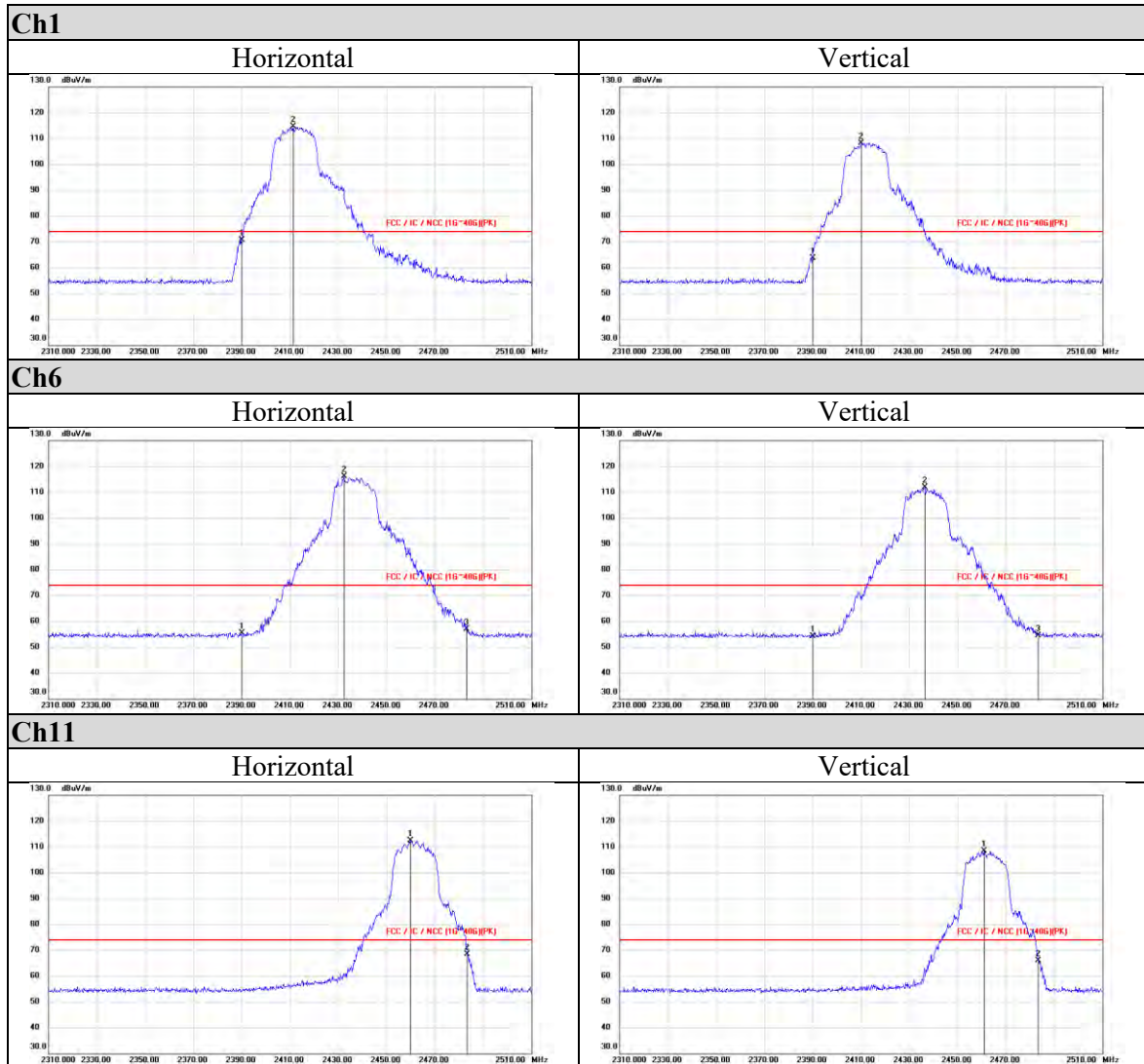
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802.11n (HT-20)

Peak



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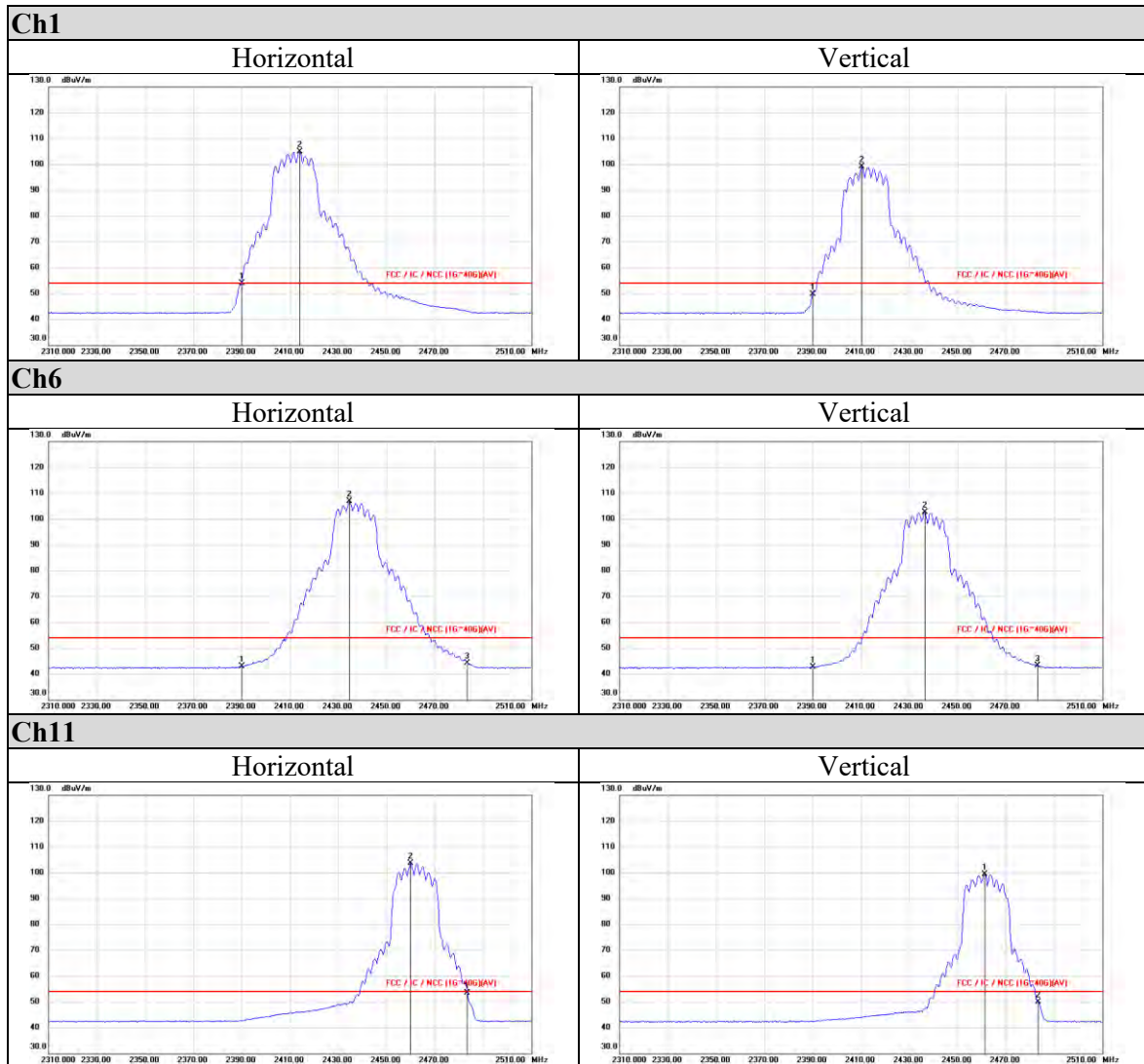
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Average



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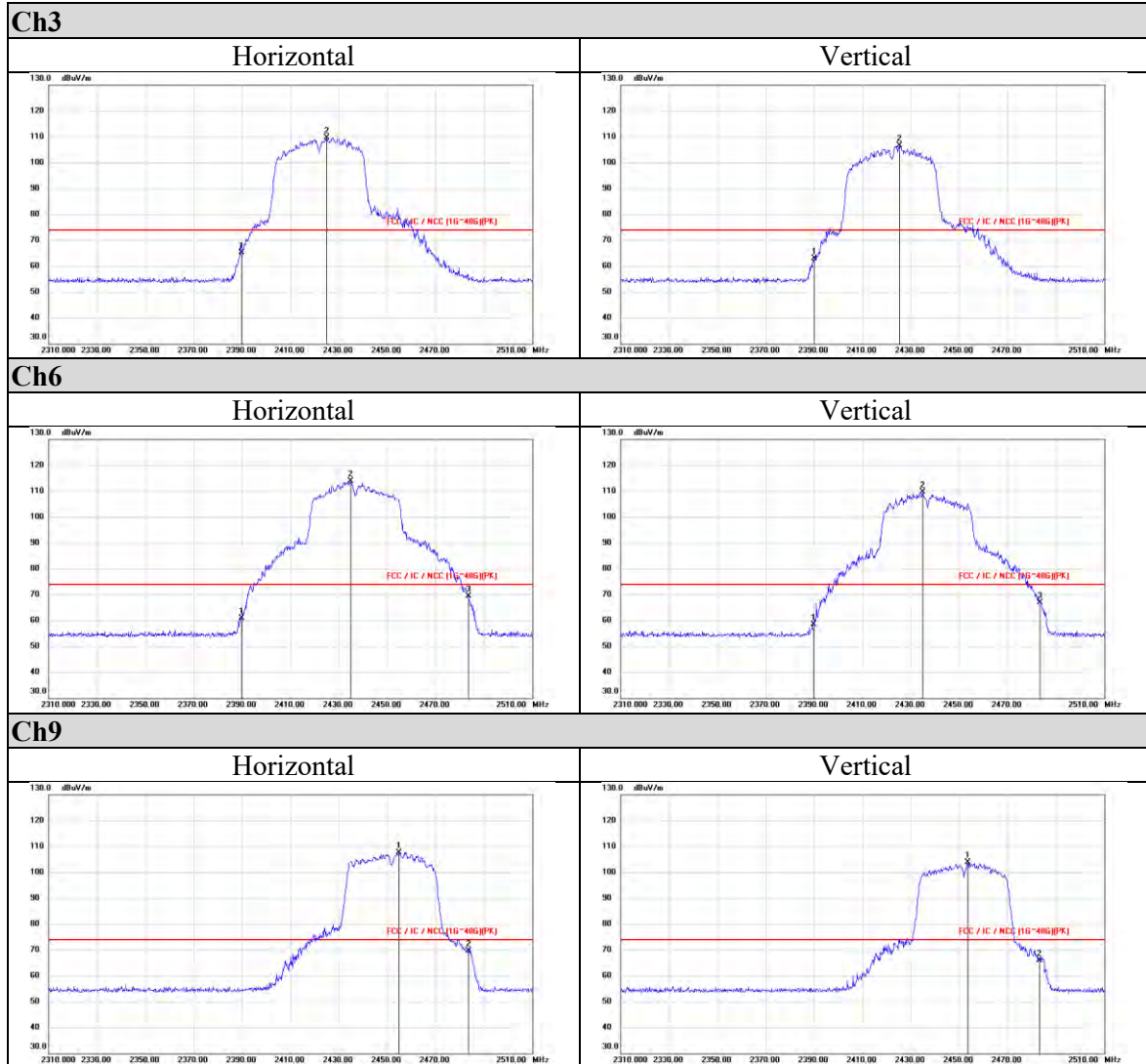
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802.11n (HT-40)

Peak



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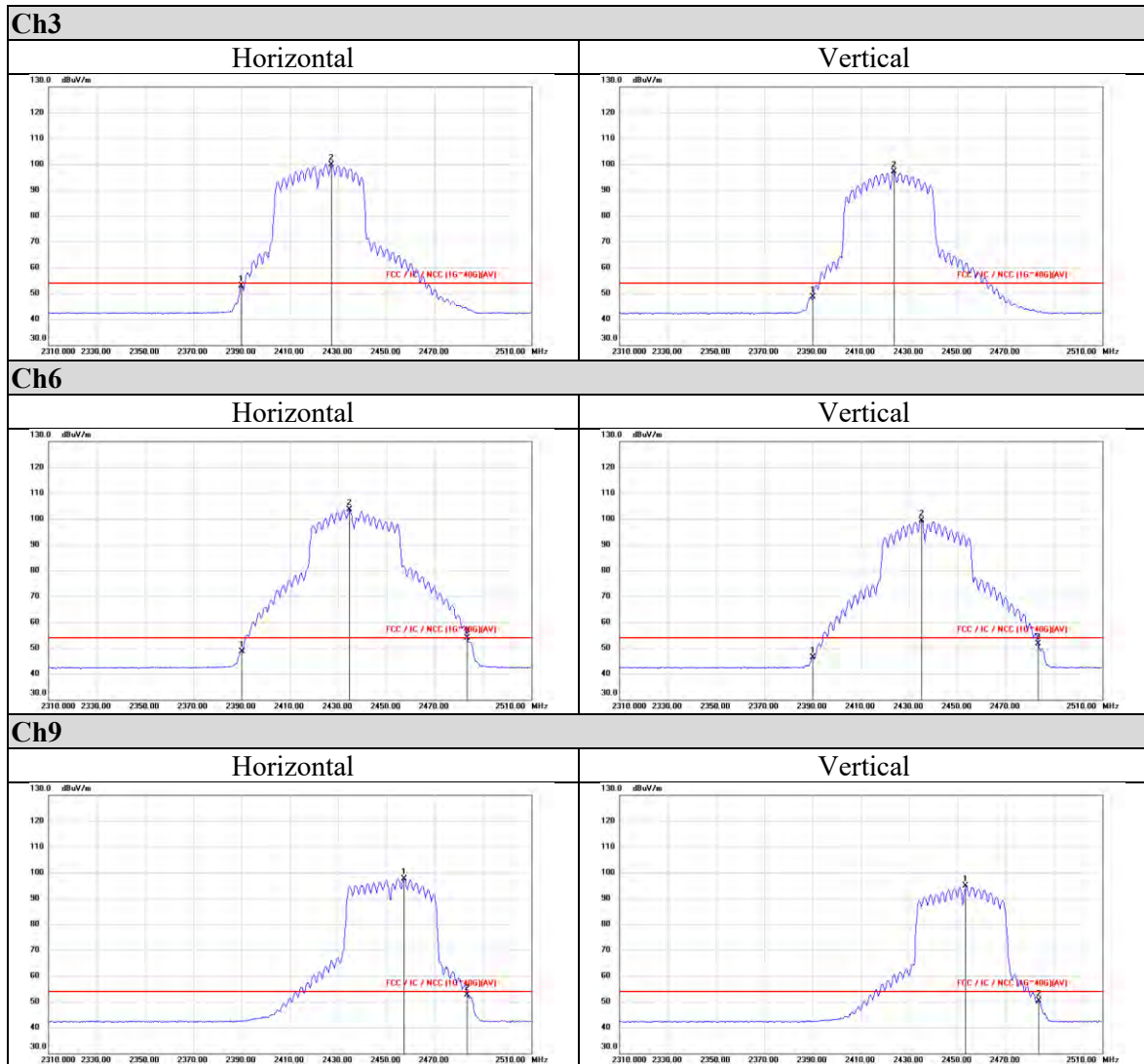
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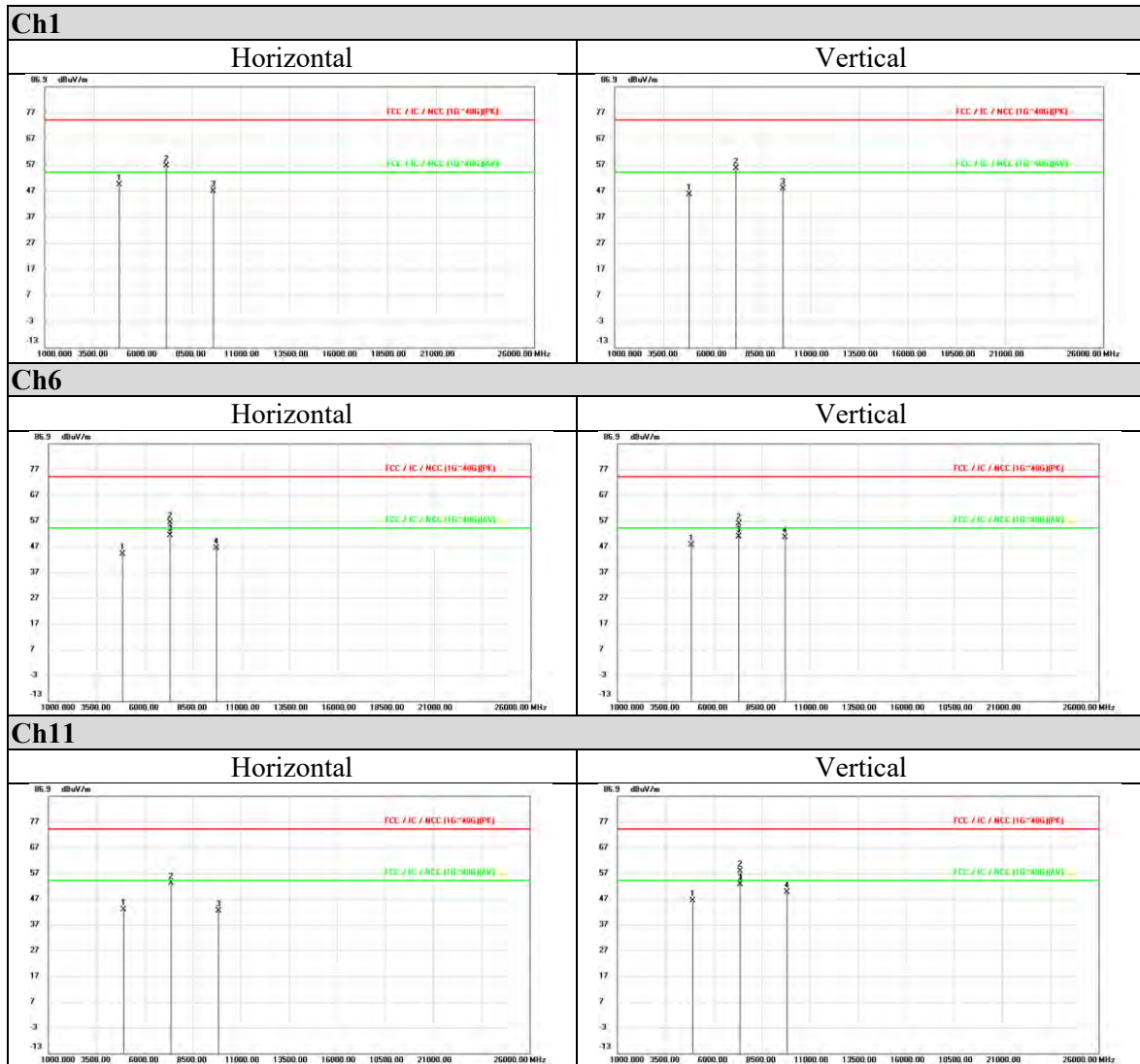
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Appendix II Radiated Spurious Emission Measurement

SISO Mode

802.11b



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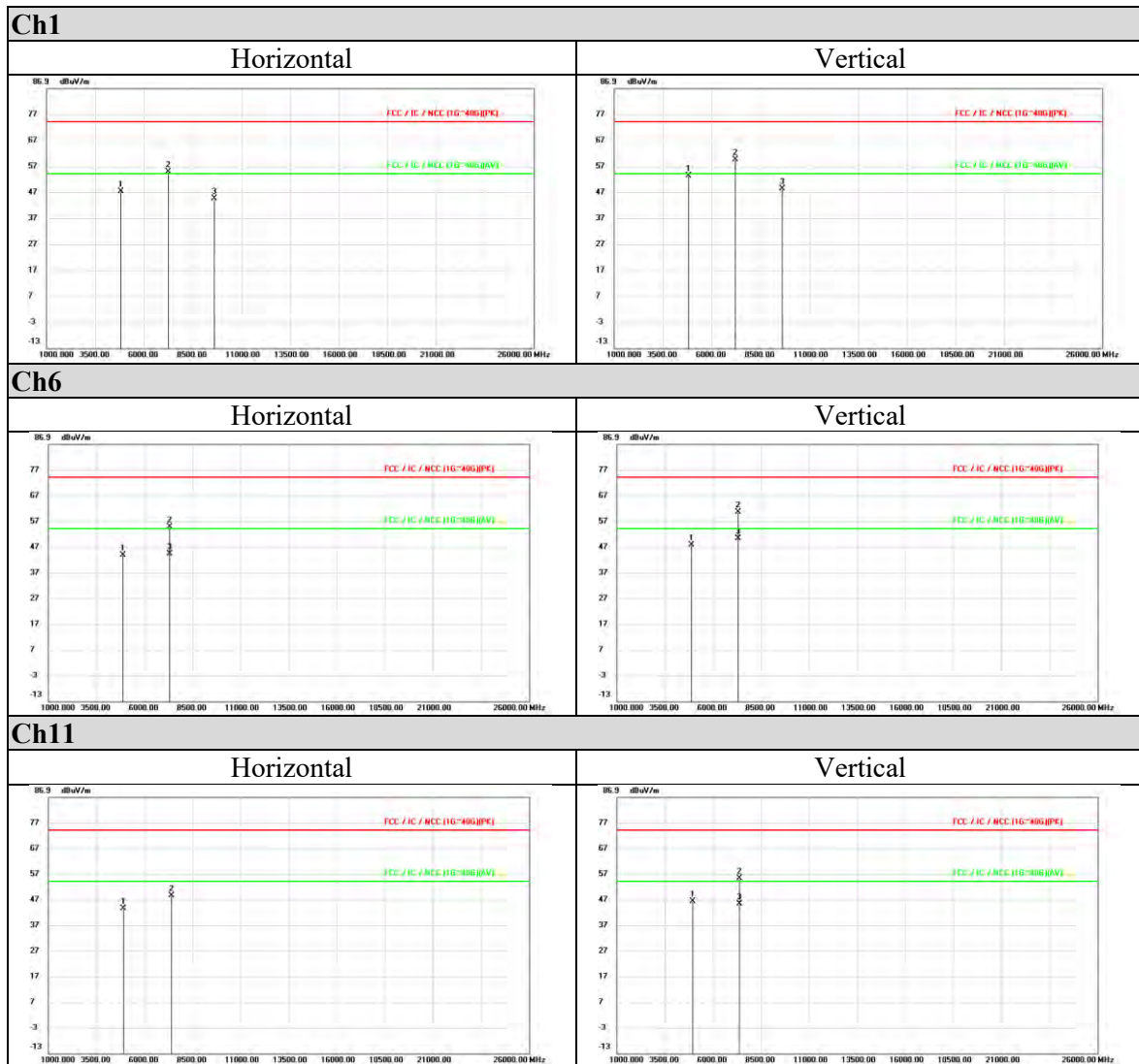
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MIMO Mode

802.11g



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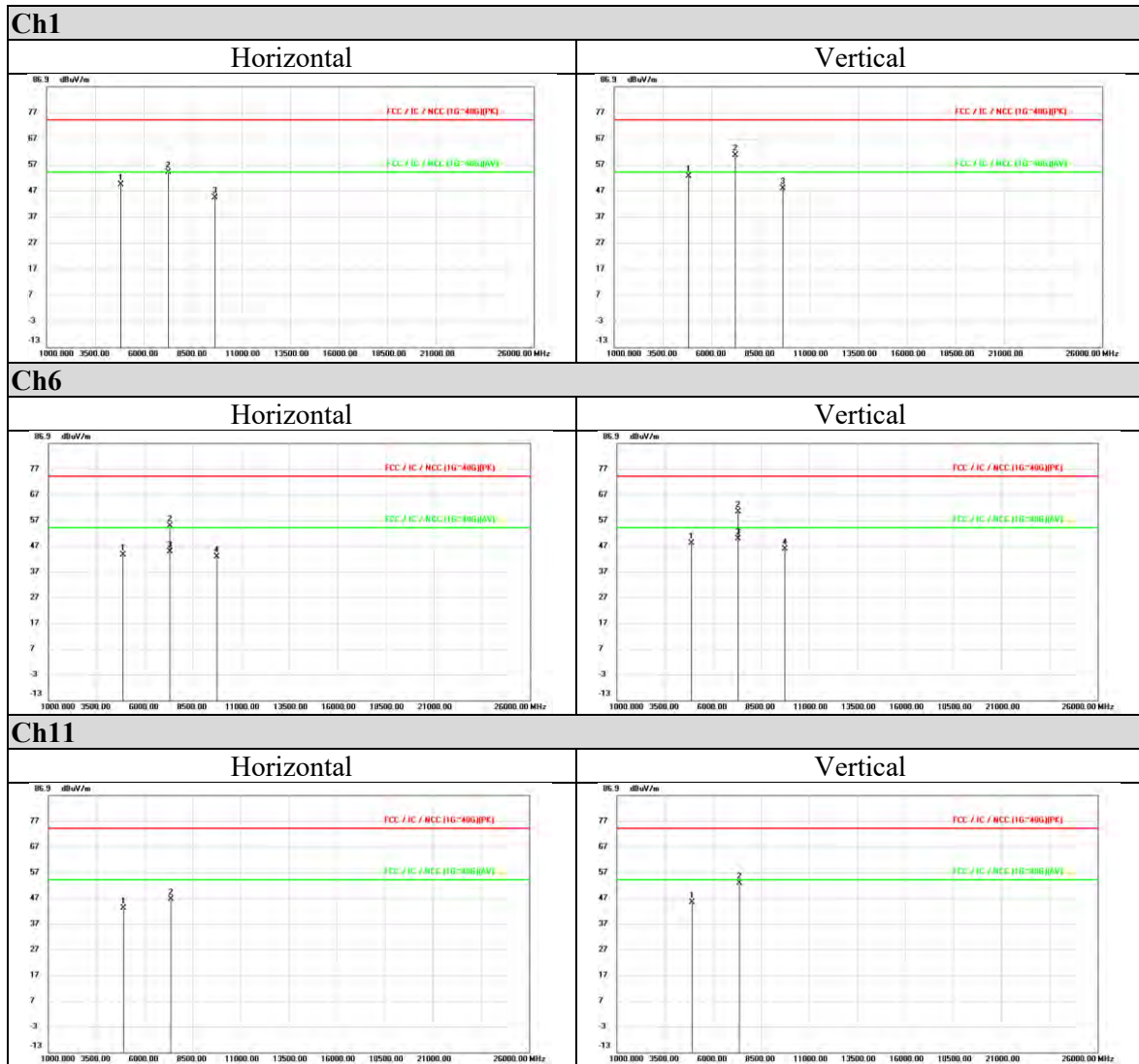
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802.11n (HT-20)





802.11n (HT-40)

