FCC TEST REPORT

Application No.:	ZR/2020/A0016
Applicant:	HMD global Oy
Address of Applicant	Bertel Jungin aukio 9, 02600 Espoo, Finland
Manufacturer:	HMD global Oy
Address of Manufacturer	Bertel Jungin aukio 9, 02600 Espoo, Finland
EUT Description:	Smart Phone
Model No.:	TA-1329
Trade Mark:	NOKIA
FCC ID:	2AJOTTA-1329
Standards:	47 CFR FCC Part 2, Subpart J 47 CFR Part 15, Subpart C
Date of Receipt:	2020/10/19
Date of Test:	2020/10/23 to 2020/12/10
Date of Issue:	2021/6/4
Test Result :	**PASS ***

* In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Remark:TA-1323 has the Dual SIM tray,TA-1329 has the Single SIM tray.

Authorized Sugnature:

Derek Yang
Wireless Laboratory Manager

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1 Version

Revision Record				
Version	***Chapter***	***Date***	***Modifier***	***Remark***
01		2020-12-11		Original
02		2021-6-4	Eason Wang	1.Add test site Information 2. Modify data conversion error of antenna height 3.Update equipment list

*This test report supersedes the original report (report No.: ZR/2020/A001610, issue date: 2020-12-11), original report shall be invalid.

Authorized for issue by:		
Prepared By		Eason Wang **(Eason Wang) /Engineer**
Checked By		David Chen **(David Chen) /Reviewer**

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2 Test Summary

Test Item	Test Requirement	Test Method	Test Result	Result	Test Lab*
AC Power Line Conducted Emission	15.207	ANSI C63.10 2013	Clause 4.2	PASS	B
Duty Cycle	--	--	Clause 4.3	PASS	A
Conducted Output Power	15.247 (b)(3)	ANSI C63.10 2013	Clause 4.4	PASS	A
DTS (6 dB) Bandwidth & 99% Occupied Bandwidth	15.247 (a)(2)	ANSI C63.10 2013	Clause 4.5	PASS	A
Power Spectral Density	15.247 (e)	ANSI C63.10 2013	Clause 4.6	PASS	A
Band-edge for RF Conducted Emissions	15.247(d)	ANSI C63.10 2013	Clause 4.7	PASS	A
RF Conducted Spurious Emissions	15.247(d)	ANSI C63.10 2013	Clause 4.8	PASS	A
Radiated Spurious Emissions	15.247(d);15.205/15.209	ANSI C63.10 2013	Clause 4.9	PASS	B
Restricted bands around fundamental frequency (Radiated Emission)	15.247(d);15.205/15.209	ANSI C63.10 2013	Clause 4.10	PASS	B

Remark1：All test were performed by Lab A and B.
Parts of test items above were subcontracted to Lab B.
Lab A SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch
Lab B SGS-CSTC STANDARDS TECHNICAL SERVICES (XI 'AN) CO., LTD.

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Remark2 :
This test report (Report No.: ZR/2020/A001610-01) is base on the original test report (Report No.: ZR/2020/A001604-01).
Review this report and original report, this report just changing the parts according to the declaration letter from client.
According to the declaration from the applicant, the models: **TA-1323** and **TA-1329** are identical in specifications, only different according to the declaration letter from client.
Considering to the difference, pre-scan were performed on the sample in this report to find the items which can be influential to the result in the original test report for fully retest.
Therefore in this report all items do not need to retest and all test data in this report are base on the previous report with report number ZR/2020/A001604-01.

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3 General Information

3.1 Details of Client

Applicant:	HMD global Oy
Address of Applicant	Bertel Jungin aukio 9, 02600 Espoo, Finland
Manufacturer:	HMD global Oy
Address of Manufacturer	Bertel Jungin aukio 9, 02600 Espoo, Finland

3.2 Test Location

Lab A:

Company:	SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch
Address:	No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China
Post code:	518057
Test engineer:	Dee Zheng,Mike Hu

Lab B:

Company:	SGS-CSTC STANDARDS TECHNICAL SERVICES (XI 'AN) CO., LTD.
Address:	1/F, Unit D, Building 1, Kanghong Orange Technology Park, No.137, Keyuan 3rd Road, Fengdong New City, Xi'an, Shaanxi China
Post code:	710086
Test engineer:	Ben Huang, Leah Chen

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3.3 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

Lab A:

• A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• VCCI

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

• FCC –Designation Number: CN1178

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

• Innovation, Science and Economic Development Canada

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

Lab B:

• A2LA (Certificate No. 4854.01)

SGS-CSTC STANDARDS TECHNICAL SERVICES (XI 'AN) CO., LTD. is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 4854.01.

• FCC –Designation Number: CN1271

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3.4 General Description of EUT

EUT Description:	Smart Phone
Model No.:	TA-1329
Trade Mark:	NOKIA
Hardware Version:	V1.0
Software Version:	00WW_0_070
IEEE 802.11 WLAN Mode Supported	☒ 802.11B (20 MHz channel bandwidth), ☒ 802.11G (20 MHz channel bandwidth) ☒ 802.11N (20 MHz channel bandwidth), ☐ 802.11N (40 MHz channel bandwidth)
Operation Frequency:	2400 MHz -2483.5MHz fc = 2407 MHz + N * 5 MHz, where: -fc = "Operating Frequency" in MHz, -N = "Channel Number" with the range from 1 to 11 for the 20 MHz channel bandwidth, or 3 to 9 for the 40 MHz channel bandwidth.
Type of Modulation:	IEEE for 802.11B: DSSS IEEE for 802.11G : OFDM IEEE for 802.11N(HT20) : OFDM
Sample Type:	☒ Portable Device, ☐Module
Antenna Type:	☐ External, ☒ Integrated
Antenna Ports	☒ Ant 1, ☐ Ant 2, ☐ Ant 3
Smart System	☒ SISO (for 802.11B/G/N), ☐ MIMO (for 802.11N): 2 Tx & 2 Rx, ☐ Diversity (for 802.11B/G) : Tx & Rx
Antenna Gain:	-1.0dBi
Power Supply	☒ AC/DC Adapter; ☐ Battery ☐ PoE:; ☐ Other:

Operation Frequency of each channel (802.11B/G/N HT20)							
Channel	**Frequency**	**Channel**	**Frequency**	**Channel**	**Frequency**	**Channel**	**Frequency**
1	2412MHz	4	2427MHz	7	2442MHz	10	2457MHz
2	2417MHz	5	2432MHz	8	2447MHz	11	2462MHz
3	2422MHz	6	2437MHz	9	2452MHz		

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Remark:
In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency for 802.11B/G/N (HT20)
The Lowest channel	2412MHz
The Middle channel	2437MHz
The Highest channel	2462MHz

3.5 Test Environment and Mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	50 % RH
Atmospheric Pressure:	101.30 KPa
Test mode:	
Transmitting mode:	Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate.

3.6 Description of Support Units

The EUT has been tested independent unit.

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4 Test results and Measurement Data

4.1 Antenna Requirement

Standard requirement:	47 CFR Part 15C Section 15.203 /247(c)
15.203 requirement: 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 use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	
The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is -1.0dBi.	

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4.2 AC Power Line Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207		
Test Method:	ANSI C63.10: 2013		
Test Frequency Range:	150kHz to 30MHz		
Limit:	Frequency range (MHz)	Limit (dBuV)	
		Quasi-peak	Average
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	5-30	60	50
	* Decreases with the logarithm of the frequency.		
Test Procedure:	1) The mains terminal disturbance voltage test was conducted in a shielded room. 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded. 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.		

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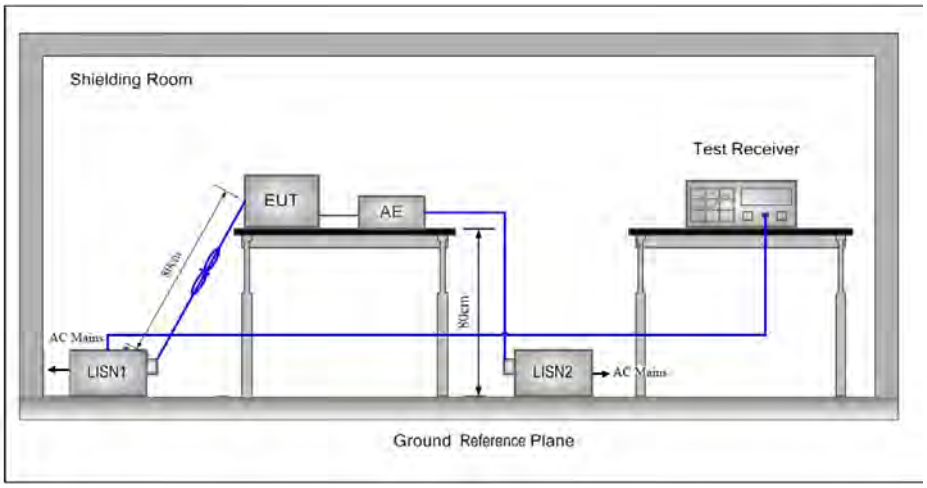
Test Setup:	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates at lowest, middle and highest channel. Charge + Transmitting mode.
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate of 802.11B at lowest channel is the worst case. Charge + Transmitting mode. Only the worst case is recorded in the report.
Instruments Used:	Refer to section 5.10 for details
Test Results:	Pass

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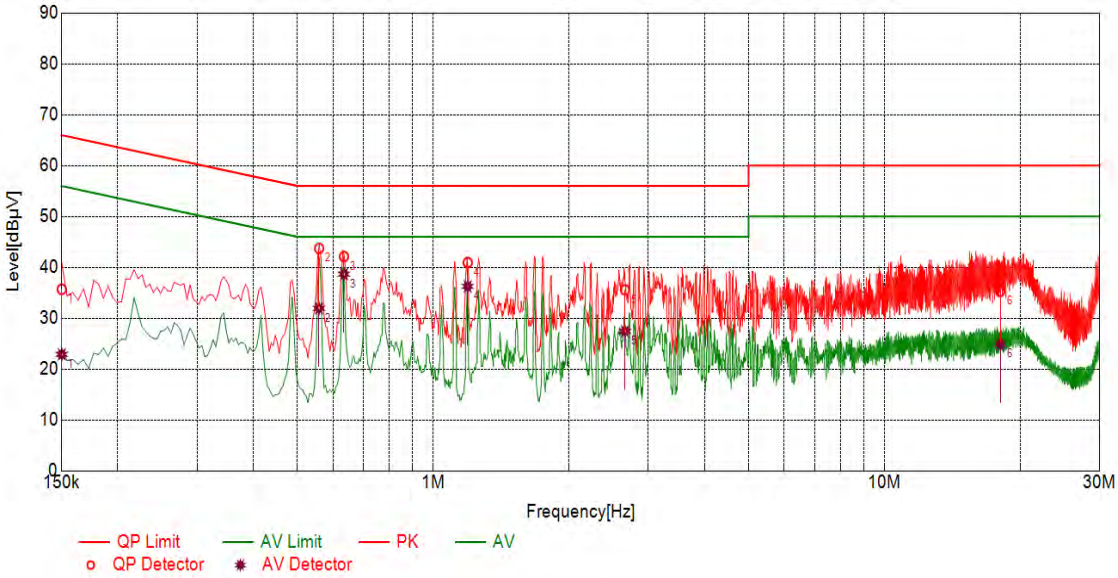
Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Firstly Supply:

Live Line:



Final Data List									
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Type
1	0.1504	10.10	35.68	65.98	30.30	22.89	55.98	33.09	L
2	0.5589	10.10	43.73	56.00	12.27	31.93	46.00	14.07	L
3	0.6347	10.10	42.13	56.00	13.87	38.67	46.00	7.33	L
4	1.1931	10.10	40.93	56.00	15.07	36.25	46.00	9.75	L
5	2.6624	10.10	35.55	56.00	20.45	27.42	46.00	18.58	L
6	18.0641	10.11	35.27	60.00	24.73	24.90	50.00	25.10	L

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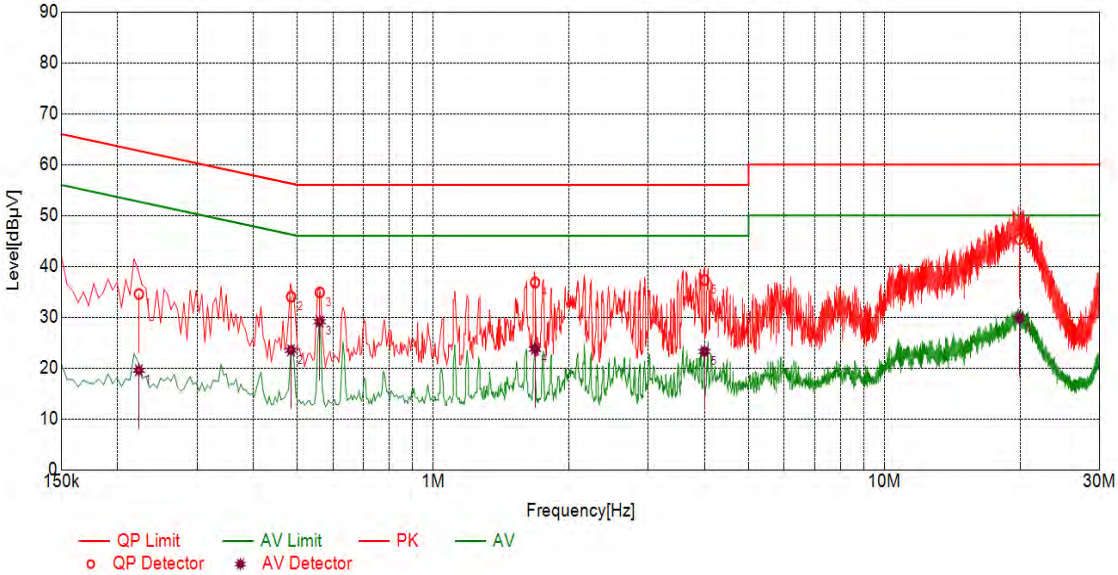
Neutral Line:



Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Type
1	0.2229	10.10	34.55	62.71	28.16	19.57	52.71	33.14	N
2	0.4845	10.10	34.02	56.26	22.24	23.50	46.26	22.76	N
3	0.5609	10.10	34.86	56.00	21.14	29.13	46.00	16.87	N
4	1.6823	10.10	36.80	56.00	19.20	23.73	46.00	22.27	N
5	3.9959	10.10	37.31	56.00	18.69	23.27	46.00	22.73	N
6	19.9261	10.11	45.34	60.00	14.66	29.84	50.00	20.16	N

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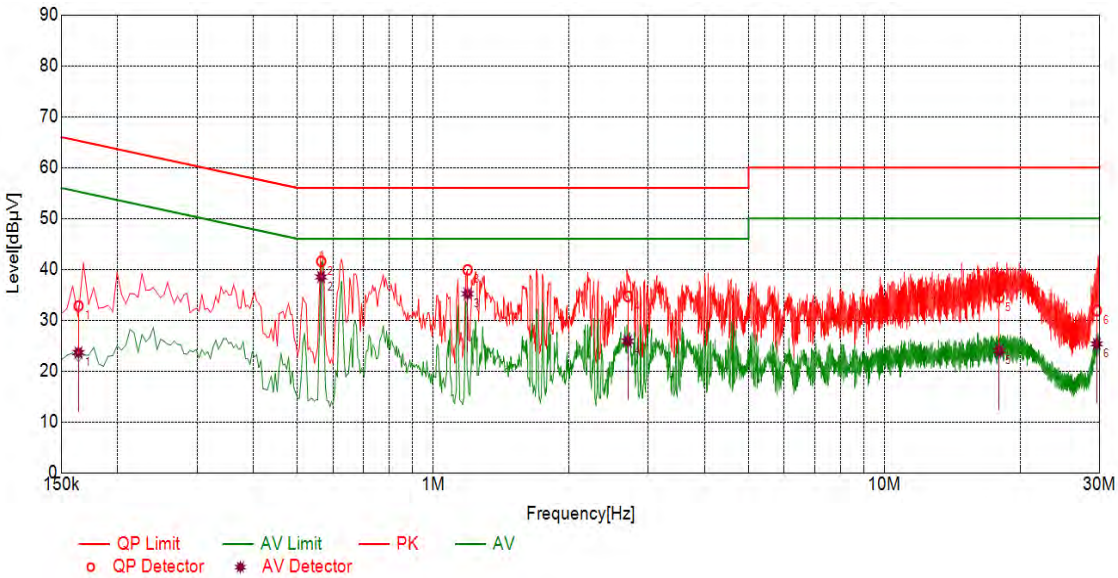
Secondly Supply:

Live Line:



Final Data List									
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Type
1	0.1638	10.10	32.79	65.27	32.48	23.64	55.27	31.63	L
2	0.5650	10.10	41.55	56.00	14.45	38.51	46.00	7.49	L
3	1.1924	10.10	39.89	56.00	16.11	35.20	46.00	10.80	L
4	2.7019	10.10	34.66	56.00	21.34	25.89	46.00	20.11	L
5	17.9746	10.11	34.47	60.00	25.53	24.00	50.00	26.00	L
6	29.5575	10.11	31.90	60.00	28.10	25.34	50.00	24.66	L

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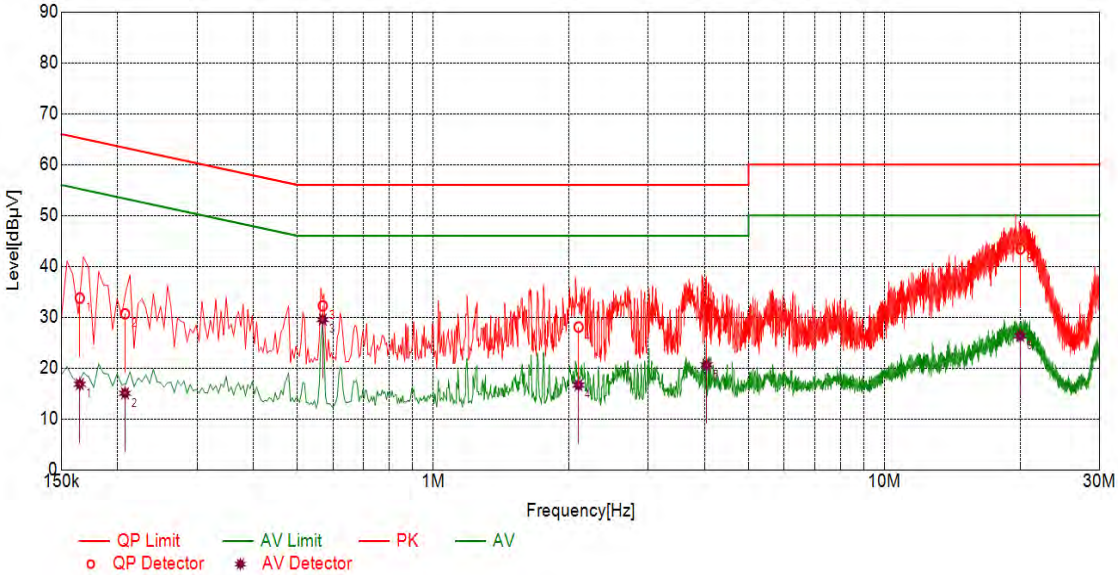
Neutral Line:



Final Data List									
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Type
1	0.1649	10.10	33.76	65.21	31.45	16.82	55.21	38.39	N
2	0.2077	10.10	30.66	63.30	32.64	15.04	53.30	38.26	N
3	0.5696	10.10	32.24	56.00	23.76	29.55	46.00	16.45	N
4	2.1006	10.10	28.06	56.00	27.94	16.66	46.00	29.34	N
5	4.0374	10.10	32.85	56.00	23.15	20.63	46.00	25.37	N
6	19.9997	10.11	43.42	60.00	16.58	26.34	50.00	23.66	N

Remarks:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.

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4.3 Duty Cycle

4.3.1 Test Results

Test Mode	TX Freq. [MHz]	Duty cycle [%]
11B	Ant 1: CH1,CH6,CH11	97.67
11G	Ant 1: CH1,CH6,CH11	87.04
11N20	Ant 1: CH1,CH6,CH11	86.70

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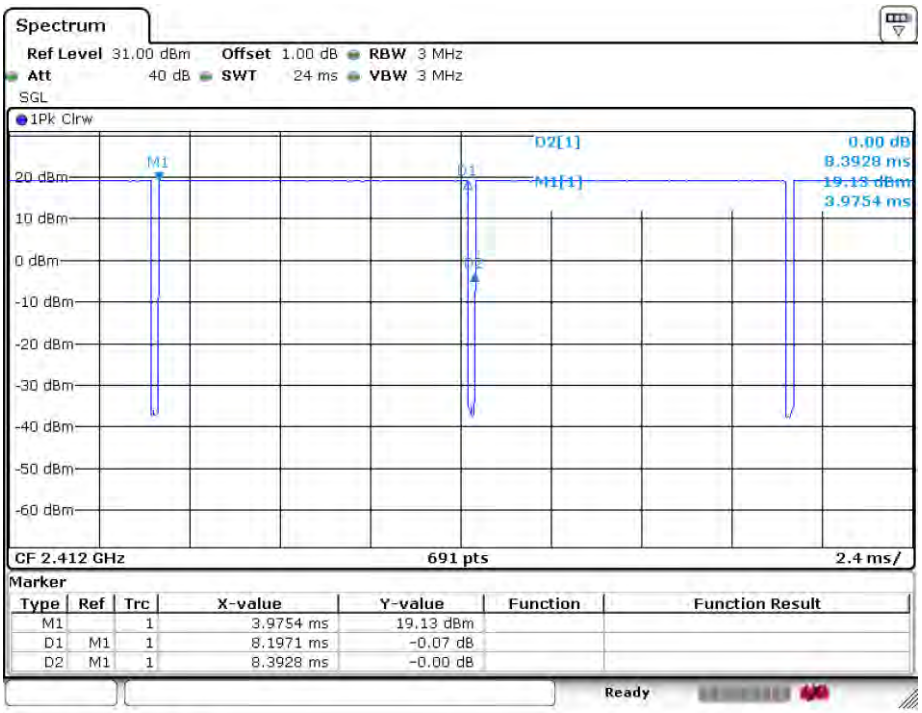
4.3.2 Test Plots

4.3.2.1 ANT1

4.3.2.1.1 11B



Date: 8.NOV.2020 14:58:49

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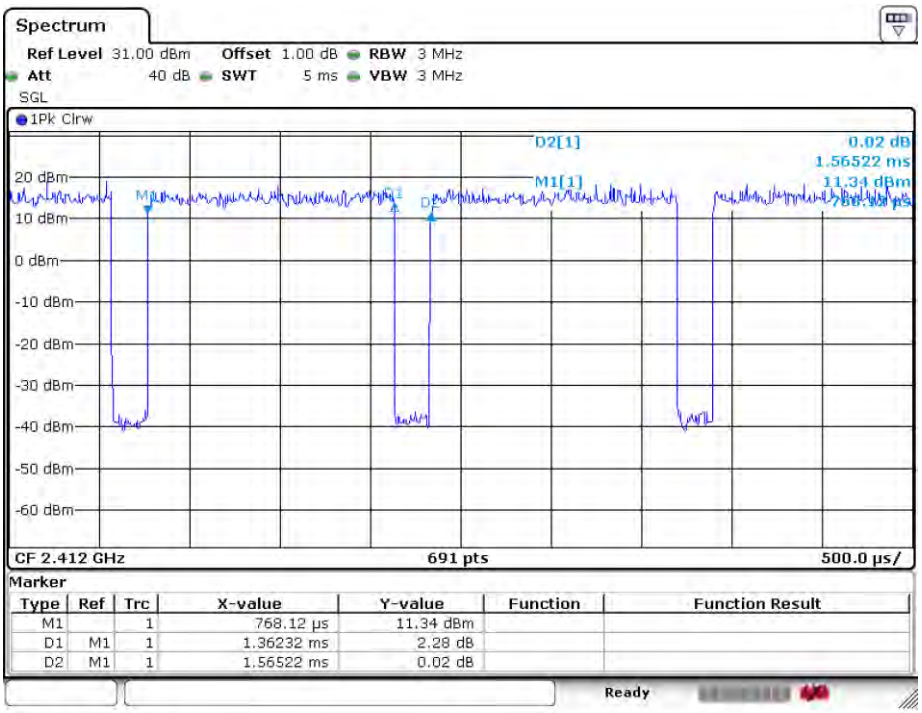
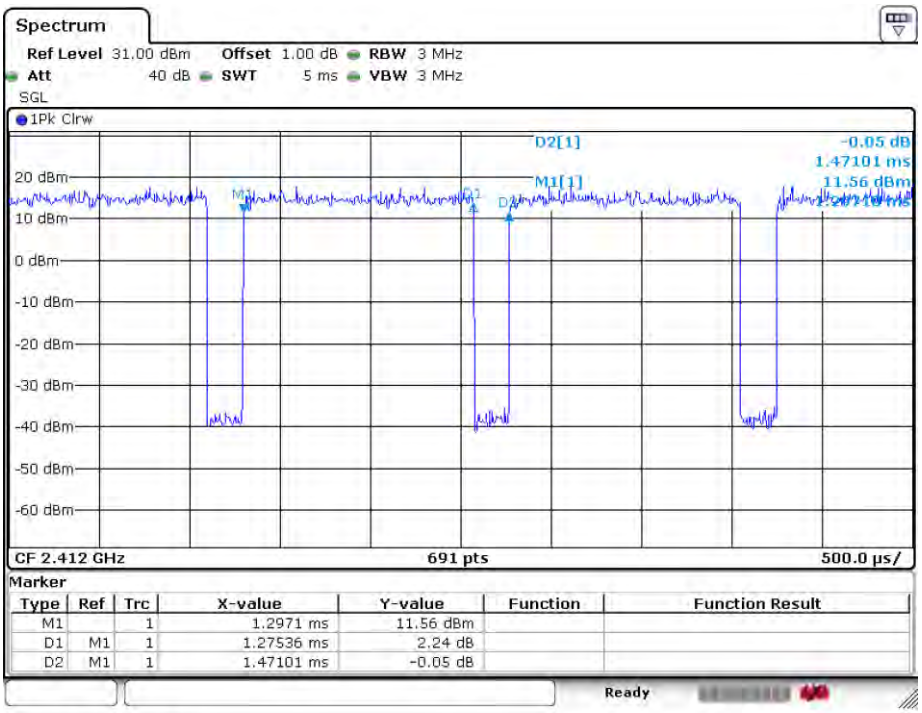
4.3.2.1.2 11G



Date: 8.NOV.2020 14:57:15

4.3.2.1.3 11N20



Date: 8.NOV.2020 14:57:59

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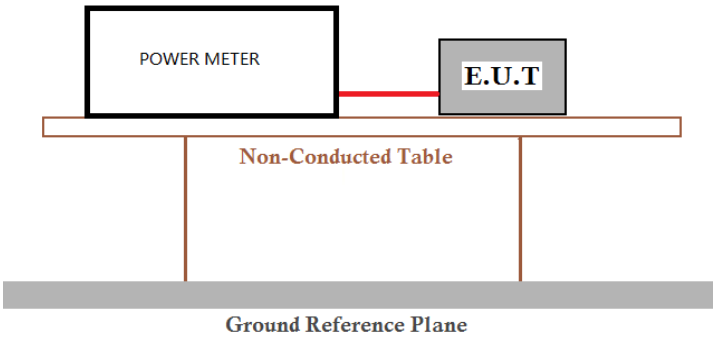
4.4 Conducted Output Power

Test Requirement:	47 CFR Part 15C Section 15.247 (b)(3)
Test Method:	ANSI C63.10 :2013 Section 11.9.1.3
Test Setup:	
Test Instruments:	Refer to section 5.10 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11B; 6Mbps of rate is the worst case of 802.11G ; 6.5Mbps of rate is the worst case of 802.11N(HT20);
Limit:	30dBm
Test Results:	Pass

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4.4.1 Test Results

Measurement Data of Peak Power:

Mode	Test Channel	Peak Output Power (dBm)	Limit (dBm)	Result
802.11B	Lowest	19.69	30.00	Pass
	Middle	19.47	30.00	Pass
	Highest	19.21	30.00	Pass
802.11G	Lowest	16.61	30.00	Pass
	Middle	16.37	30.00	Pass
	Highest	16.37	30.00	Pass
802.11N20	Lowest	15.64	30.00	Pass
	Middle	15.25	30.00	Pass
	Highest	15.55	30.00	Pass

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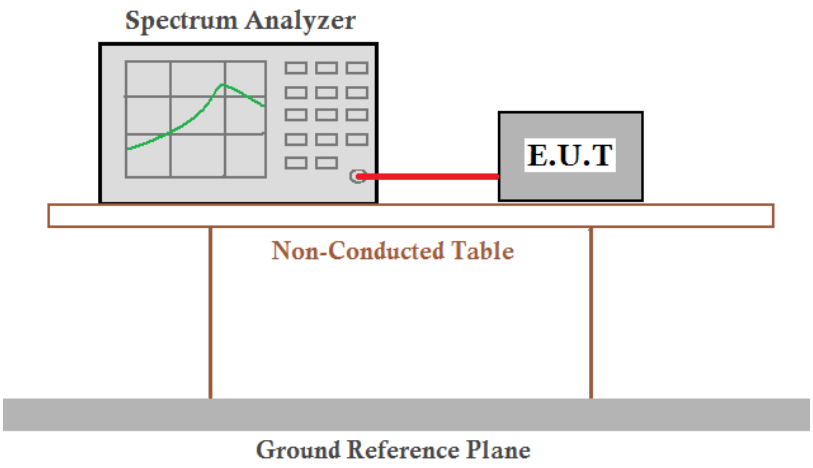
4.5 DTS (6 dB) Bandwidth & 99% Occupied Bandwidth

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(2)
Test Method:	ANSI C63.10: 2013 Section 11.8.1 Option 1
Test Setup:	
Instruments Used:	Refer to section 5.10 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11B; 6Mbps of rate is the worst case of 802.11G ; 6.5Mbps of rate is the worst case of 802.11N(HT20);
Limit:	≥ 500 kHz
Test Results:	Pass

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4.5.1 Test Results

Mode	Test Channel	Occupied Bandwidth (MHz)	6dB Emission Bandwidth (MHz)	Limit (kHz)	Result
802.11B	Lowest	13.24	8.55	≥500	Pass
	Middle	13.15	9.03	≥500	Pass
	Highest	13.24	9.07	≥500	Pass
802.11G	Lowest	17.15	16.41	≥500	Pass
	Middle	17.28	16.45	≥500	Pass
	Highest	17.50	16.45	≥500	Pass
802.11N20	Lowest	18.10	17.54	≥500	Pass
	Middle	18.19	17.58	≥500	Pass
	Highest	18.32	17.58	≥500	Pass

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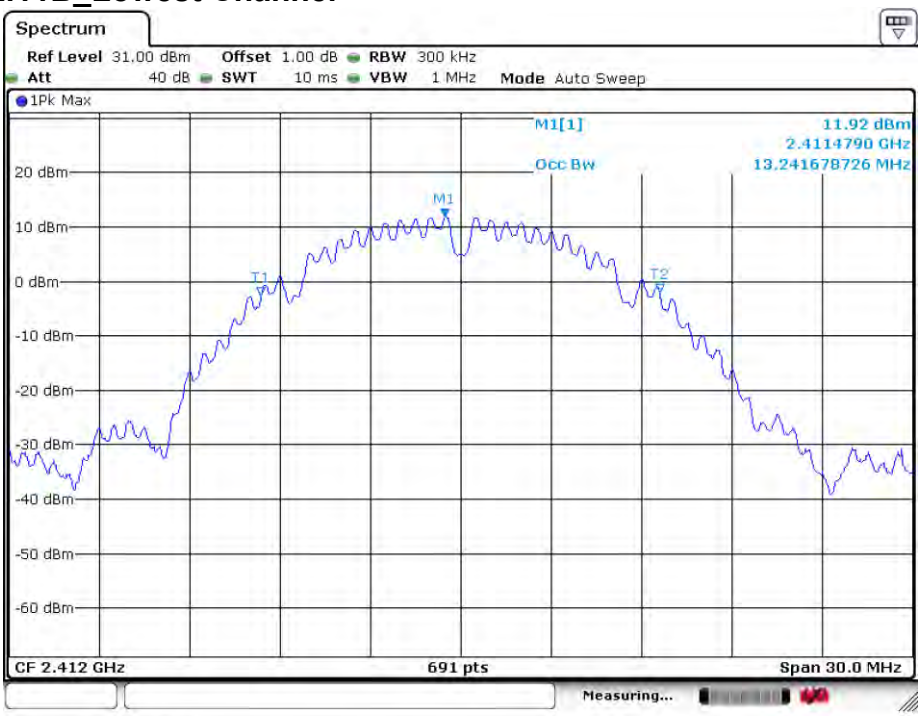
4.5.2 Test Plots

4.5.2.1 ANT1

4.5.2.1.1 802.11B_Lowest Channel



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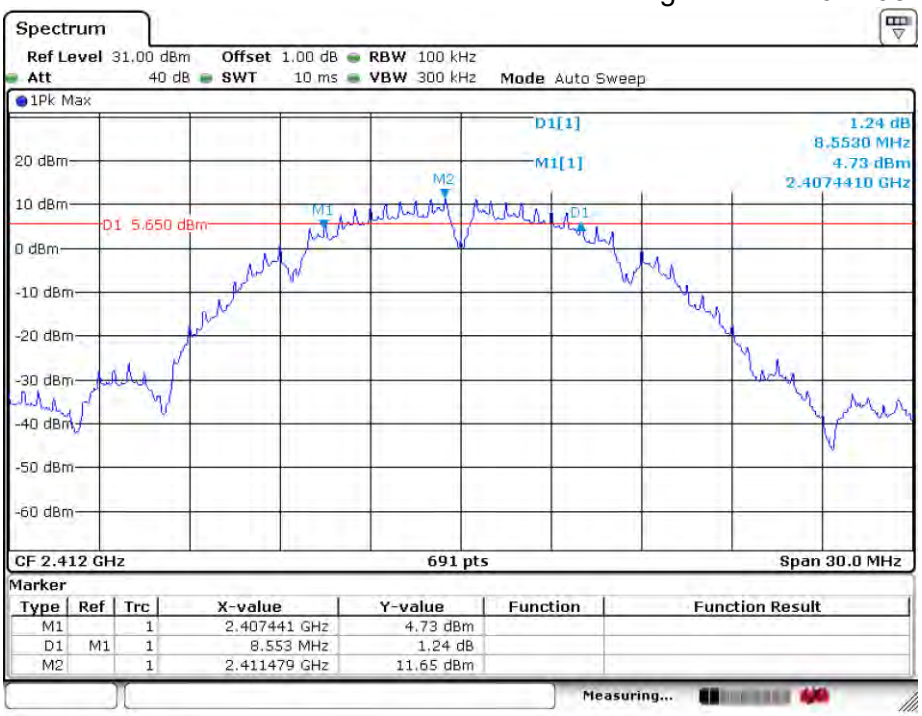

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.407441 GHz	4.73 dBm		
D1	M1	1	8.553 MHz	1.24 dB		
M2		1	2.411479 GHz	11.65 dBm		

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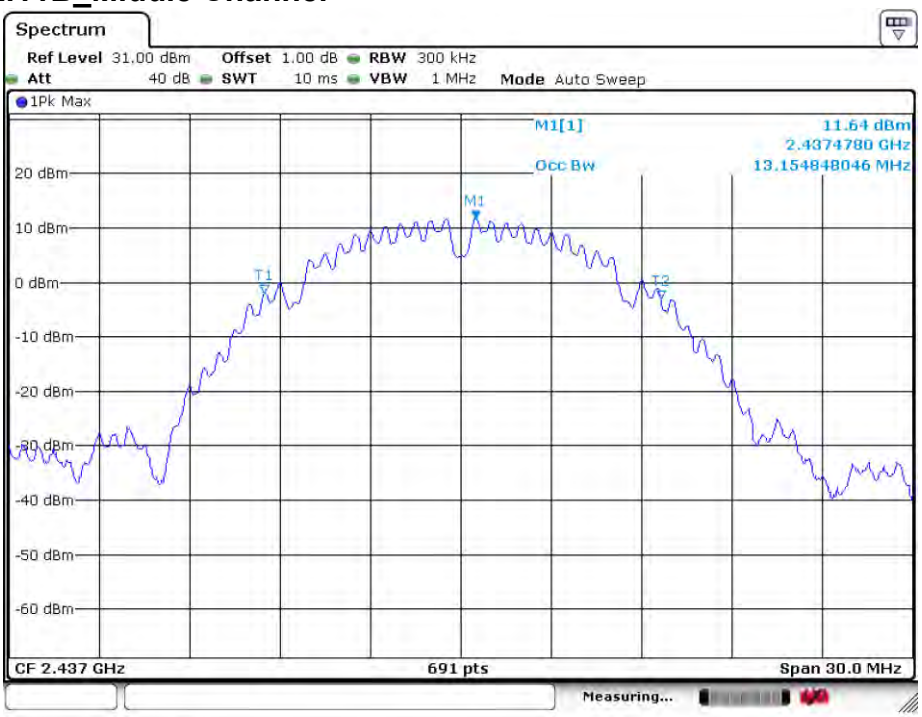
4.5.2.1.2 802.11B_Middle Channel



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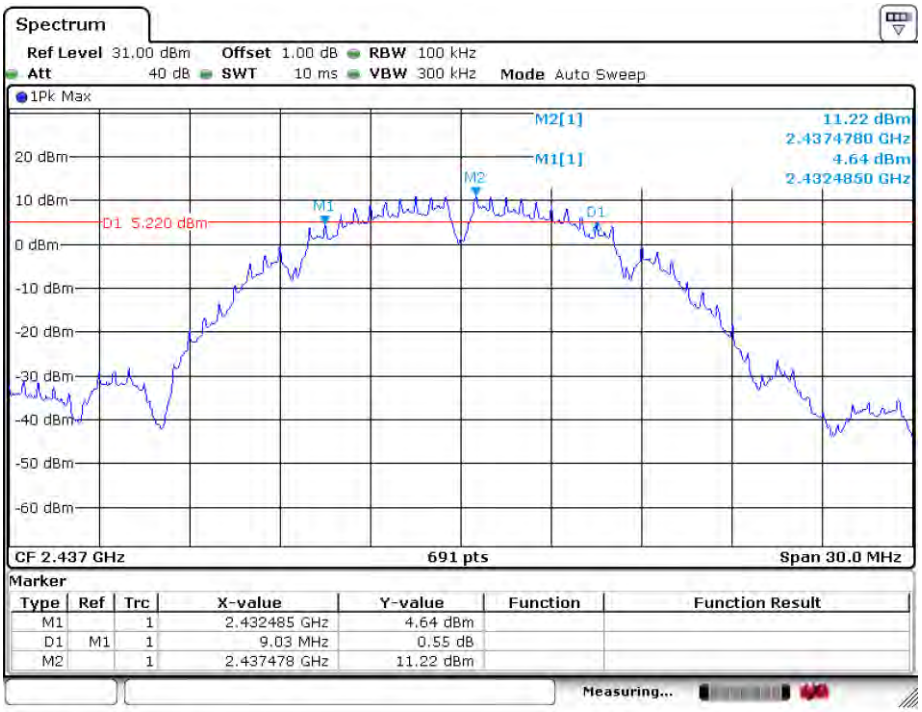

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.432485 GHz	4.64 dBm		
D1	M1	1	9.03 MHz	0.55 dB		
M2		1	2.437478 GHz	11.22 dBm		

Date: 8.NOV.2020 14:31:12

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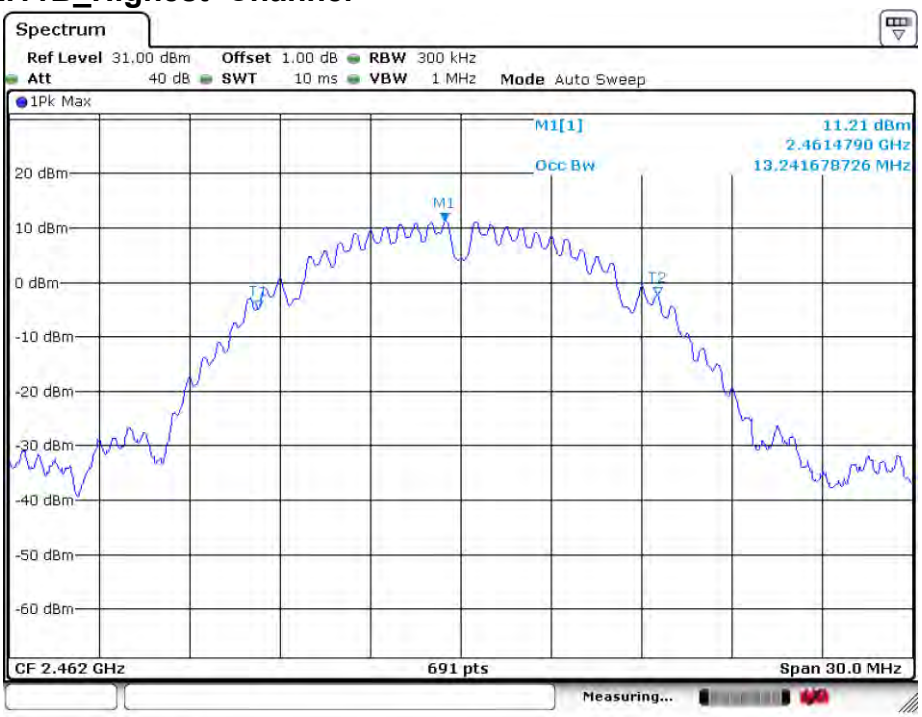
4.5.2.1.3 802.11B_Highest Channel



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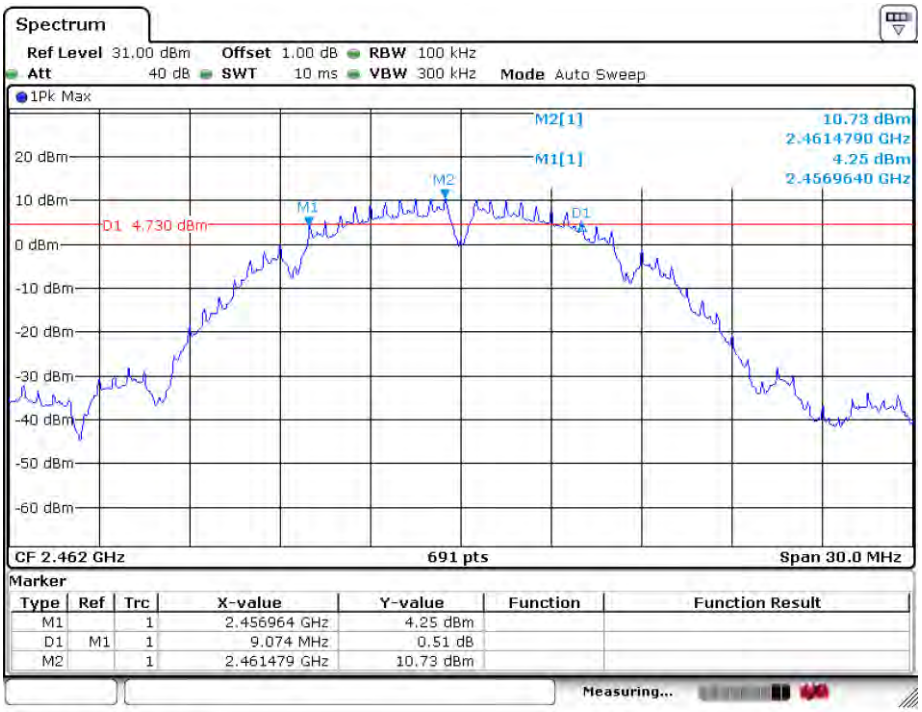

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.456964 GHz	4.25 dBm		
D1	M1	1	9.074 MHz	0.51 dB		
M2		1	2.461479 GHz	10.73 dBm		

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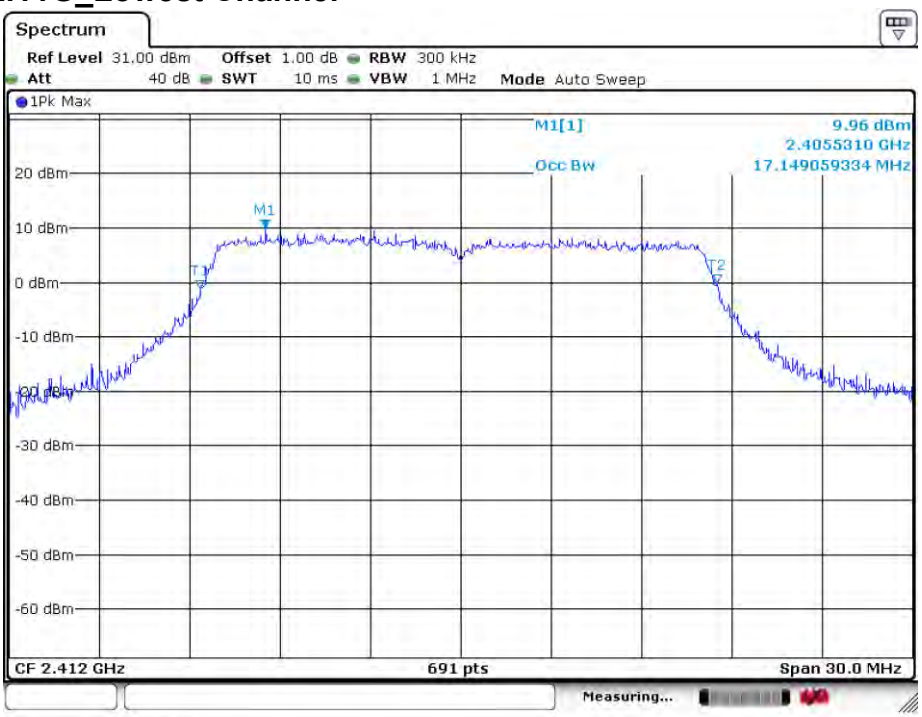
4.5.2.1.4 802.11G_Lowest Channel



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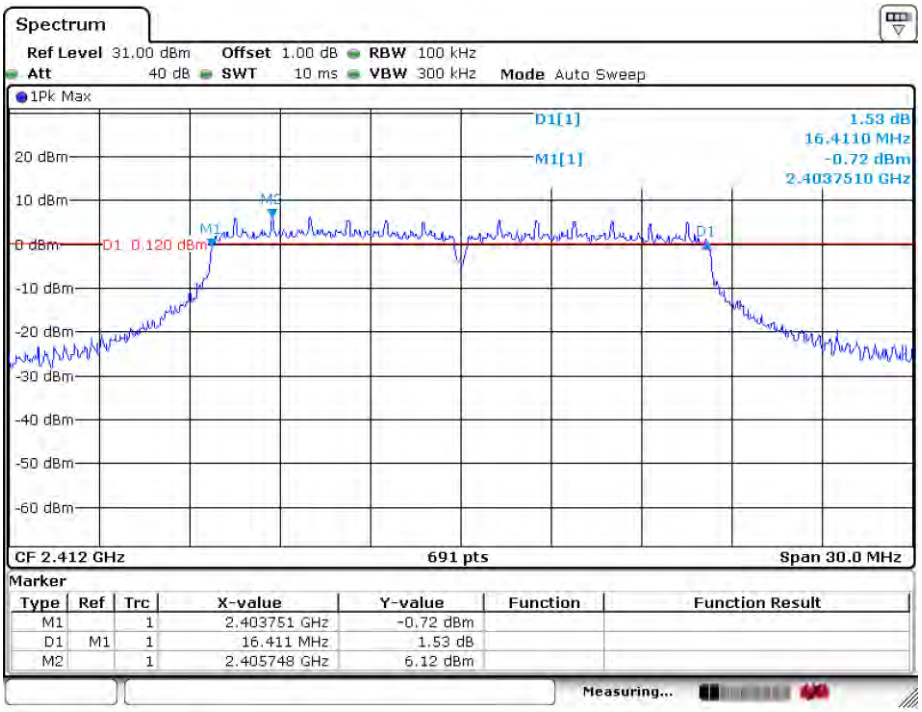

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.403751 GHz	-0.72 dBm		
D1	M1	1	16.411 MHz	1.53 dB		
M2		1	2.405748 GHz	6.12 dBm		

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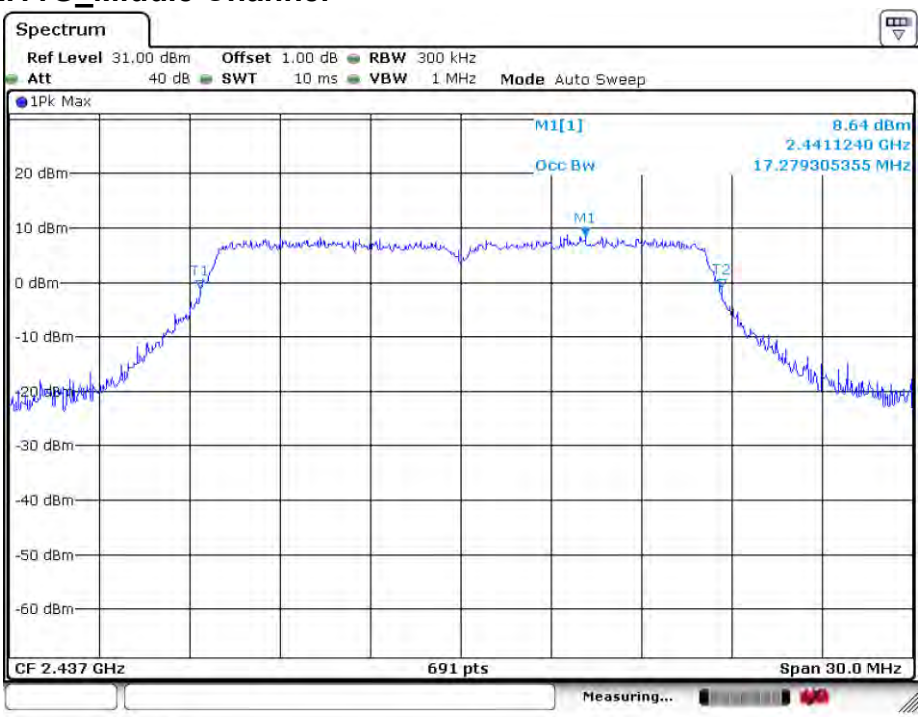
4.5.2.1.5 802.11G_Middle Channel



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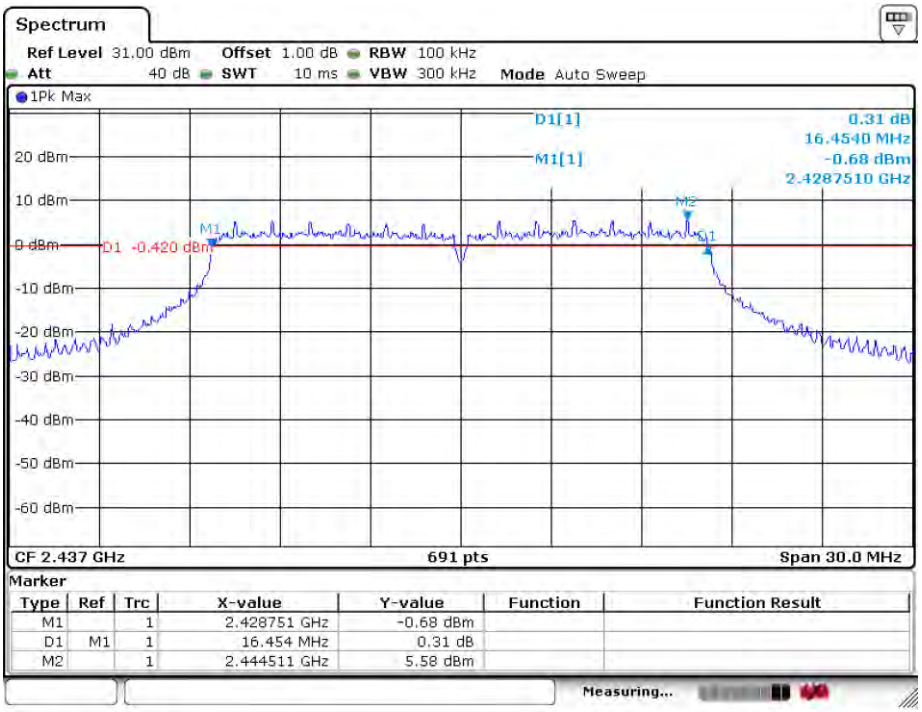

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Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.428751 GHz	-0.68 dBm		
D1	M1	1	16.454 MHz	0.31 dB		
M2		1	2.444511 GHz	5.58 dBm		

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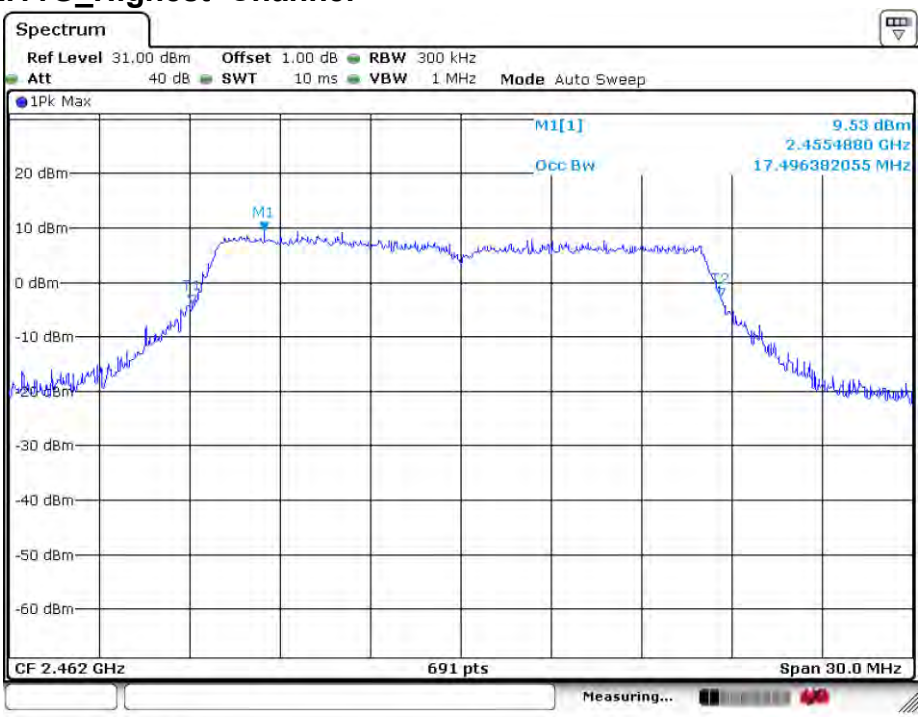
4.5.2.1.6 802.11G_Highest Channel



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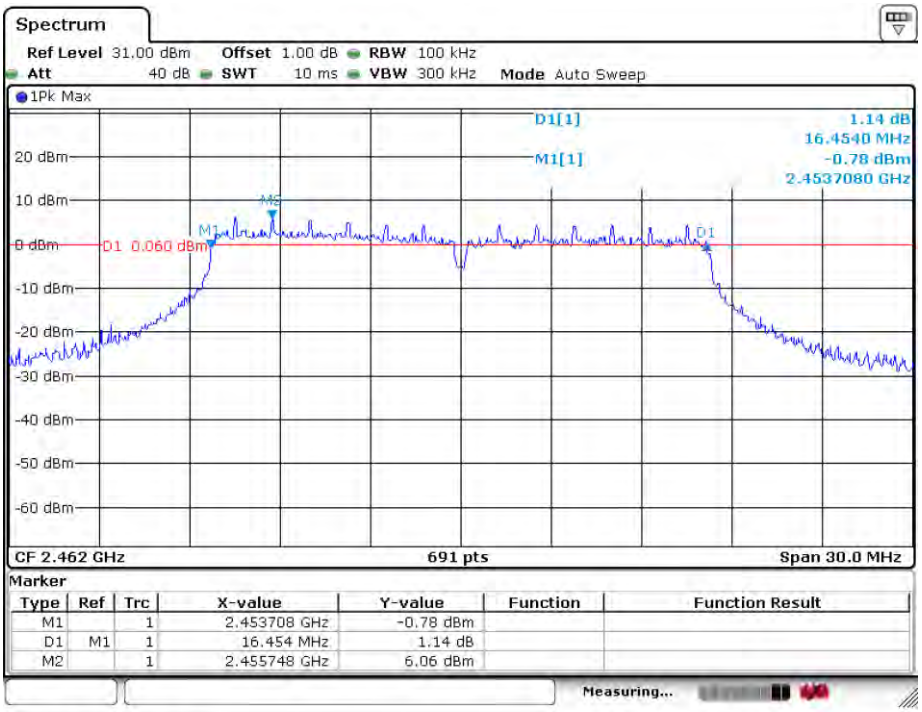

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Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.453708 GHz	-0.78 dBm		
D1	M1	1	16.454 MHz	1.14 dB		
M2		1	2.455748 GHz	6.06 dBm		

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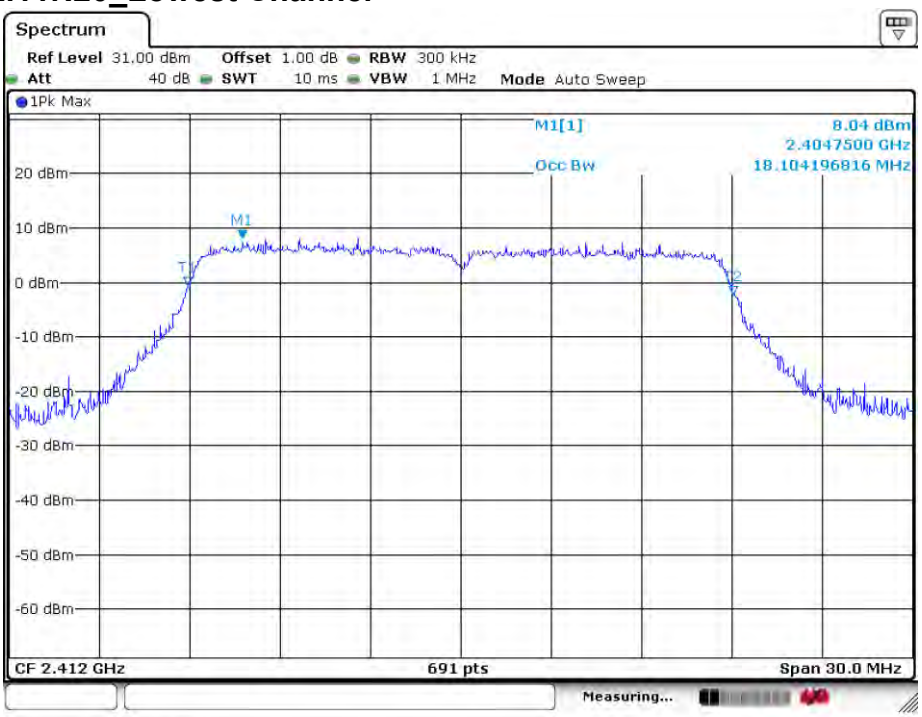
4.5.2.1.7 802.11N20_Lowest Channel



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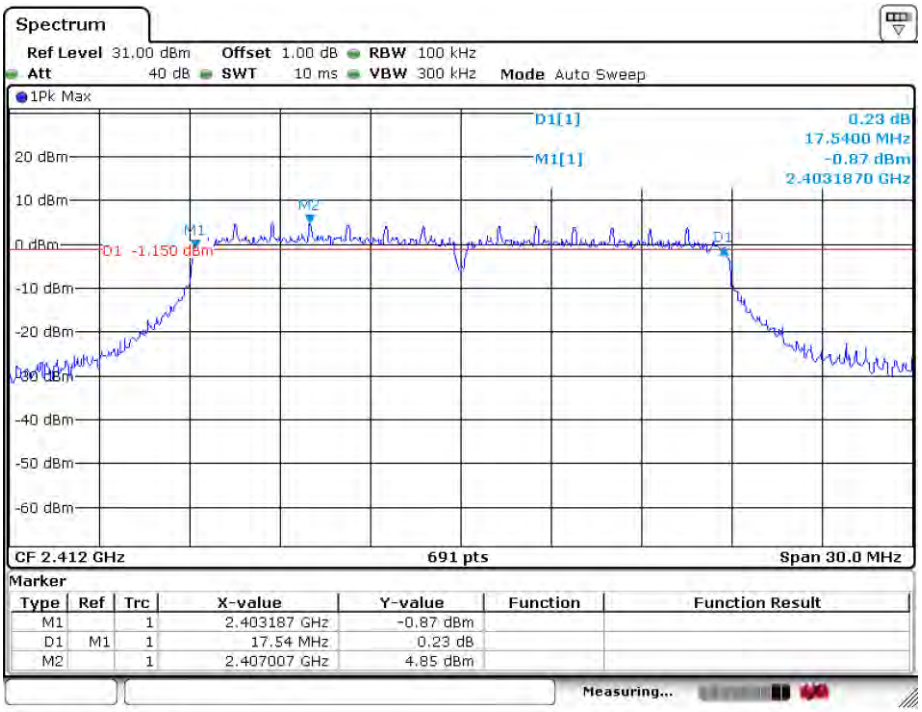

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.403187 GHz	-0.87 dBm		
D1	M1	1	17.54 MHz	0.23 dB		
M2		1	2.407007 GHz	4.85 dBm		

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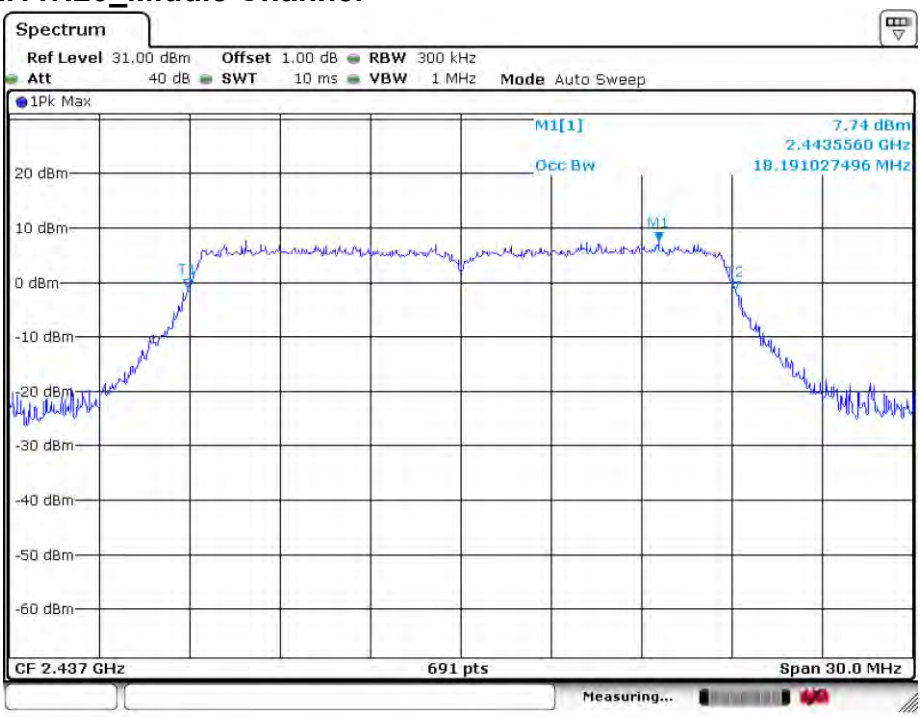
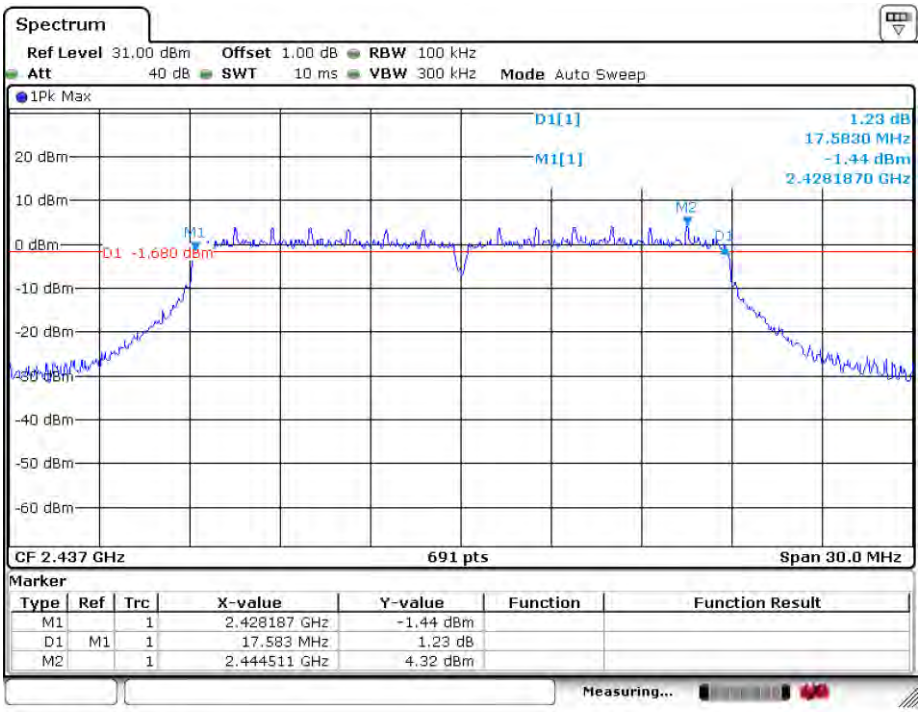
4.5.2.1.8 802.11N20_Middle Channel



Date: 8.NOV.2020 14:42:33



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.428187 GHz	-1.44 dBm		
D1	M1	1	17.583 MHz	1.23 dB		
M2		1	2.444511 GHz	4.32 dBm		

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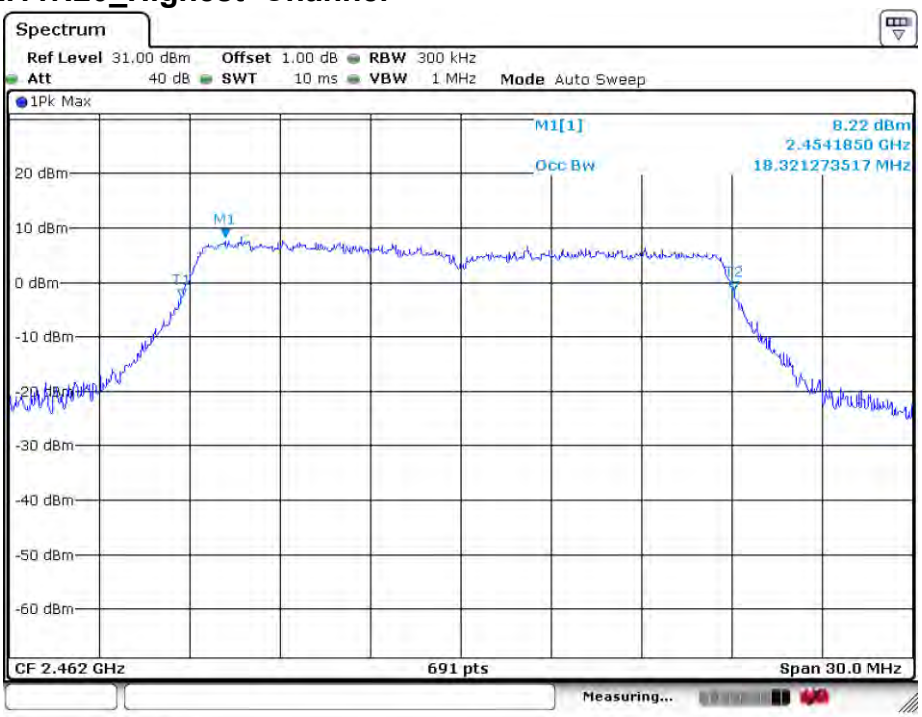
4.5.2.1.9 802.11N20_Highest Channel



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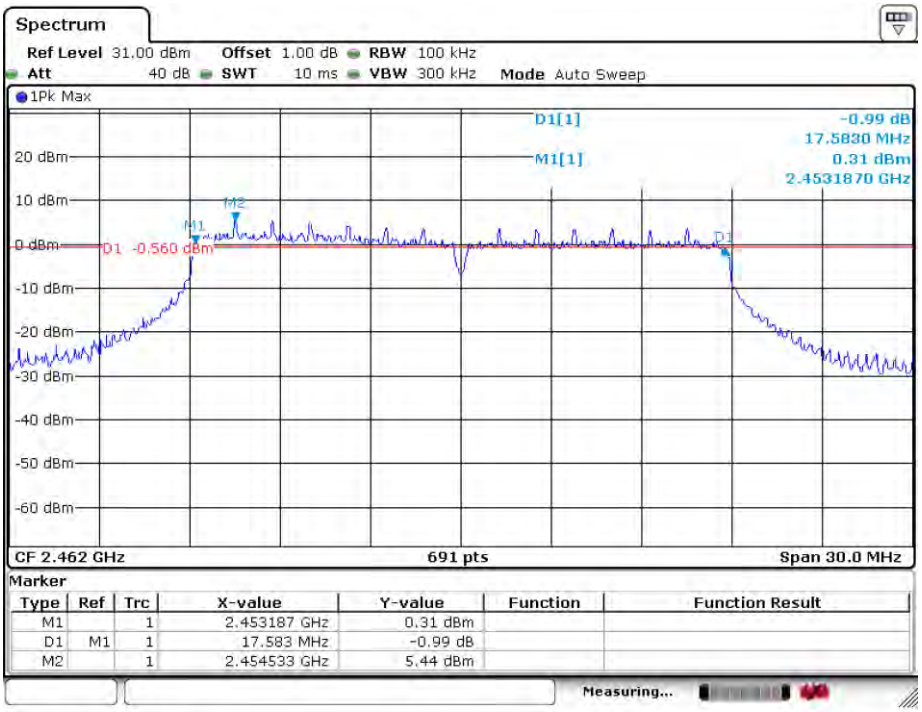

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.453187 GHz	0.31 dBm		
D1	M1	1	17.583 MHz	-0.99 dB		
M2		1	2.454533 GHz	5.44 dBm		

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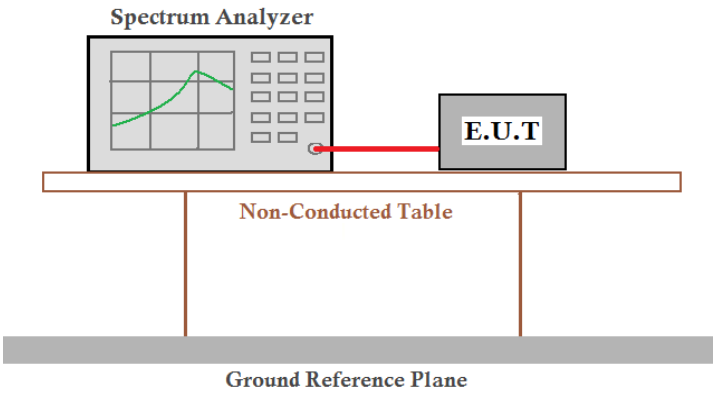
4.6 Power Spectral Density

Test Requirement:	47 CFR Part 15C Section 15.247 (e)
Test Method:	ANSI C63.10 :2013 Section 11.10.2
Test Setup:	
Test Instruments:	Refer to section 5.10 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11B; 6Mbps of rate is the worst case of 802.11G ; 6.5Mbps of rate is the worst case of 802.11N(HT20);
Limit:	≤8.00dBm/3kHz
Test Results:	Pass

4.6.1 Test Results

Mode	Test Channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
802.11B	Lowest	-1.98	≤8.00	Pass
	Middle	-2.44	≤8.00	Pass
	Highest	-2.14	≤8.00	Pass
802.11G	Lowest	-7.02	≤8.00	Pass
	Middle	-5.99	≤8.00	Pass
	Highest	-6.47	≤8.00	Pass
802.11N20	Lowest	-8.04	≤8.00	Pass
	Middle	-8.66	≤8.00	Pass
	Highest	-9.00	≤8.00	Pass

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4.6.2 Test Plots

4.6.2.1 ANT1

4.6.2.1.1 802.11B_Lowest Channel

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4.6.2.1.2 802.11B_Middle Channel

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4.6.2.1.3 802.11B_Highest Channel

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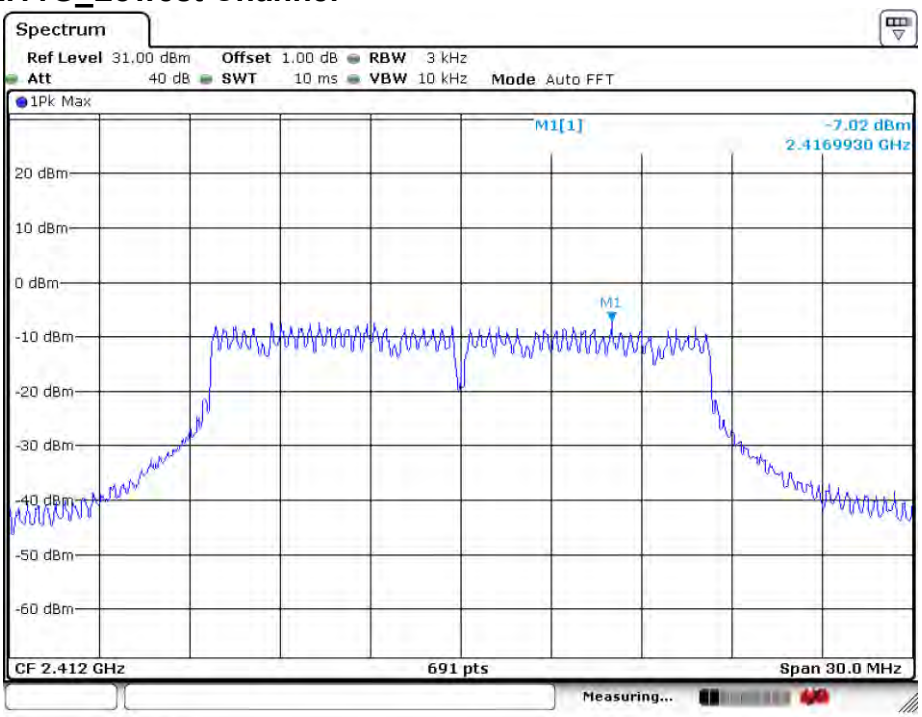
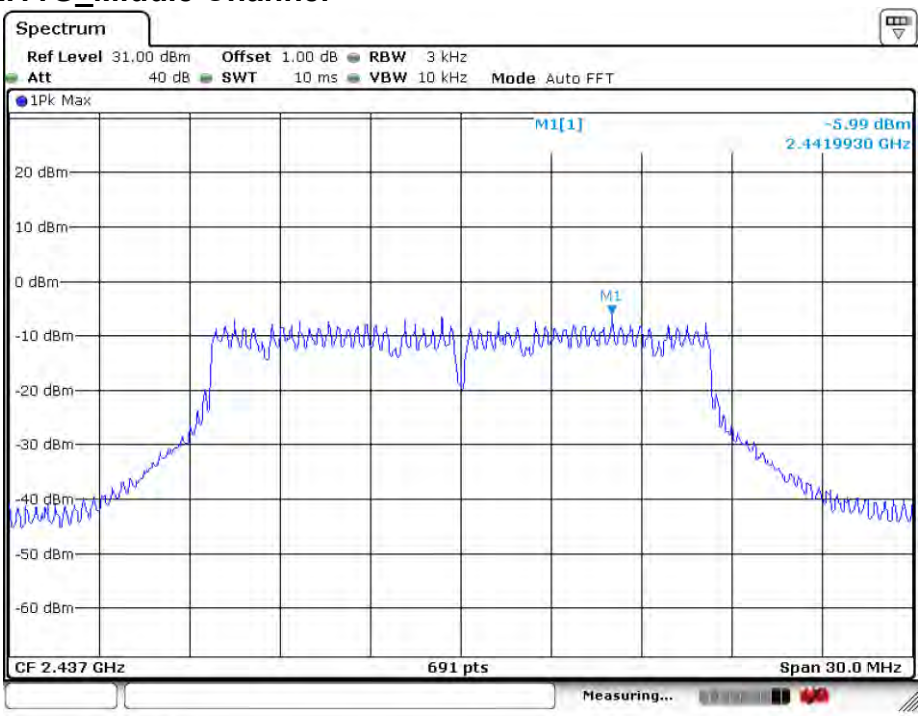
4.6.2.1.4 802.11G_Lowest Channel



Date: 8.NOV.2020 14:45:38

4.6.2.1.5 802.11G_Middle Channel



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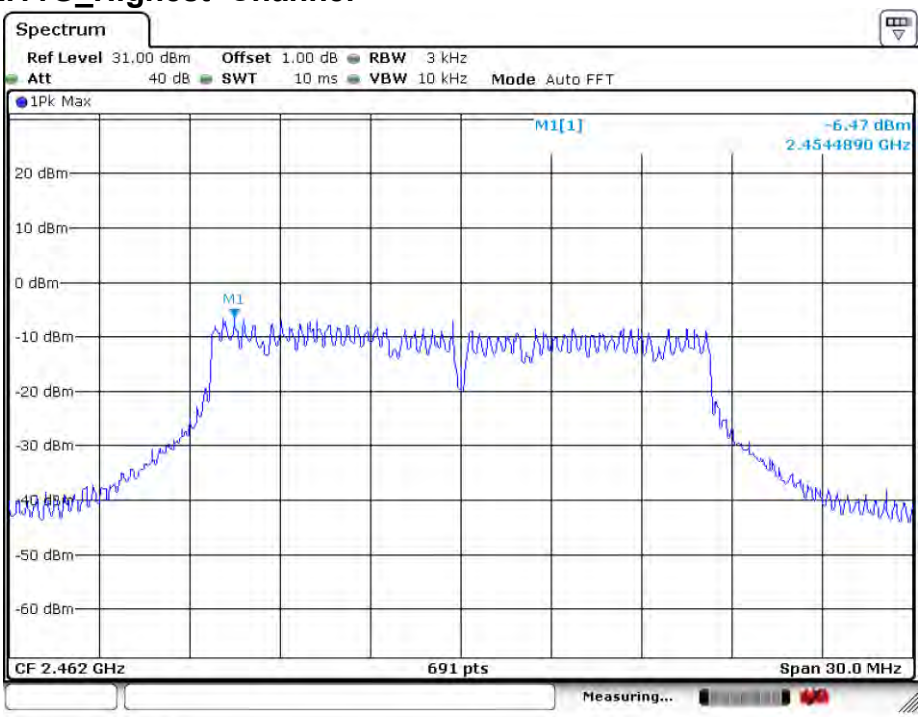
4.6.2.1.6 802.11G_Highest Channel



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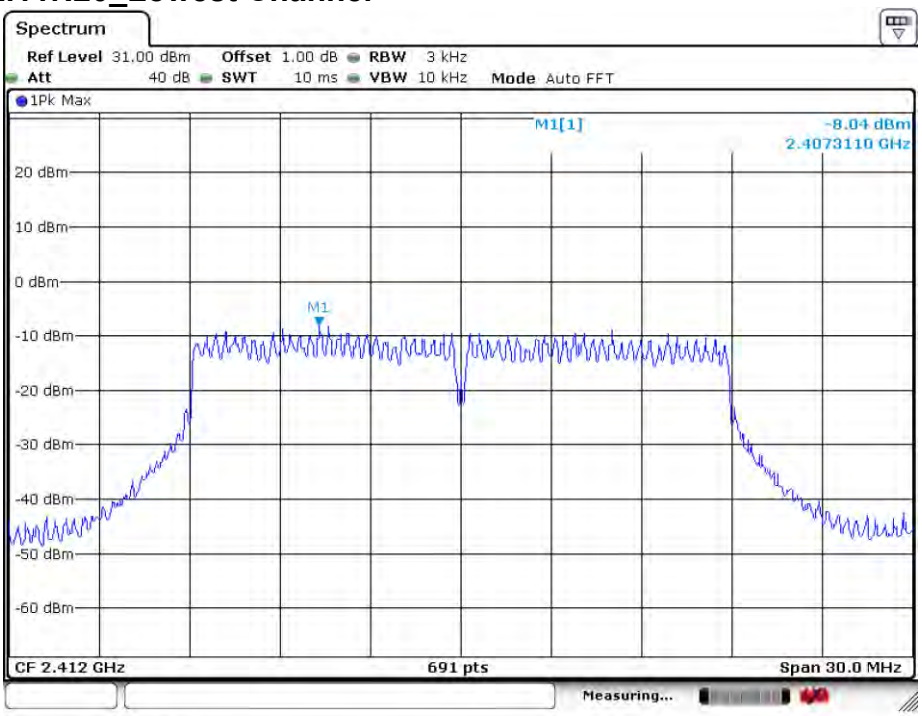
4.6.2.1.7 802.11N20_Lowest Channel



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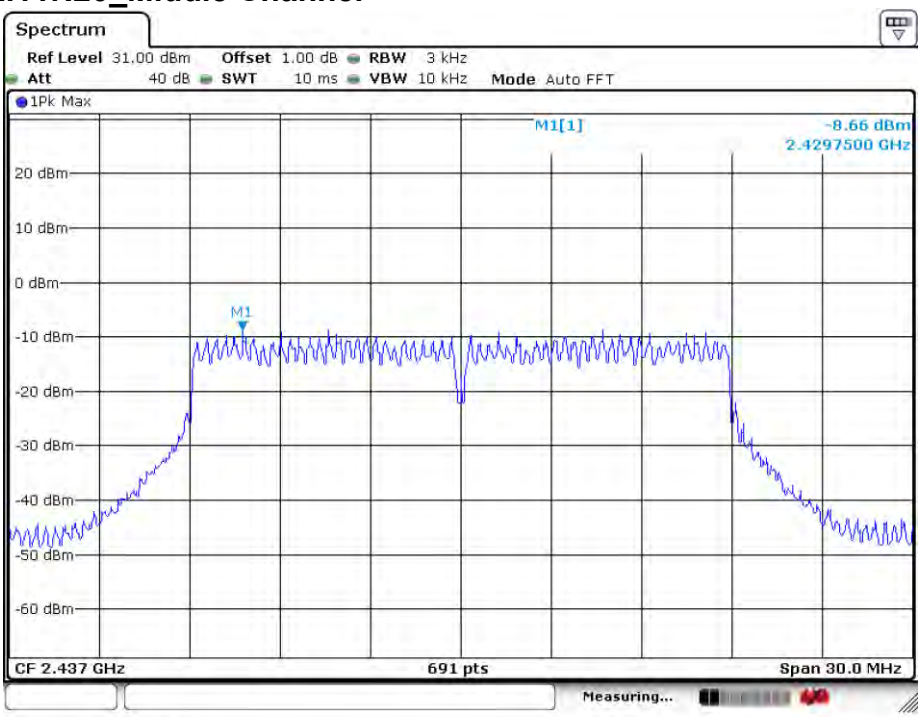
4.6.2.1.8 802.11N20_Middle Channel



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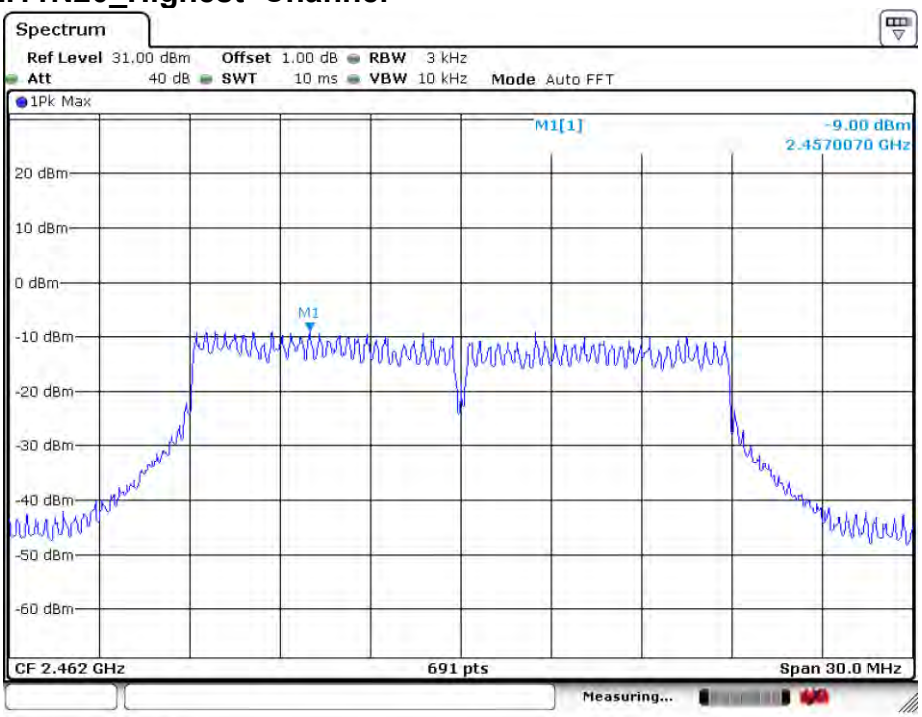
4.6.2.1.9 802.11N20_Highest Channel



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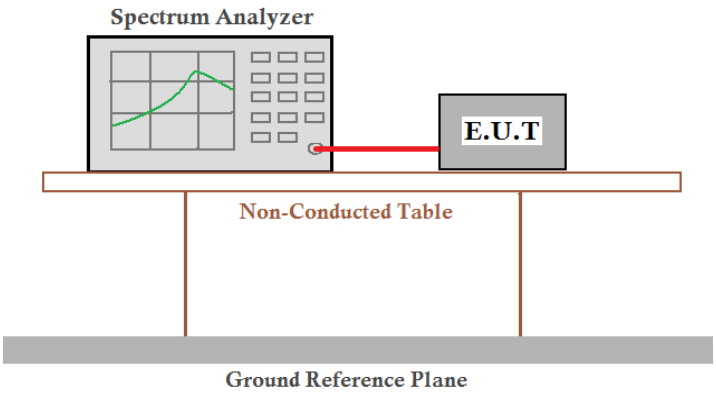
4.7 Band-edge for RF Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013 Section 11.13
Test Setup:	
Instruments Used:	Refer to section 5.10 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11B; 6Mbps of rate is the worst case of 802.11G ; 6.5Mbps of rate is the worst case of 802.11N(HT20); 13.5Mbps of rate is the worst case of 802.11N(HT40).
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.
Test Results:	Pass

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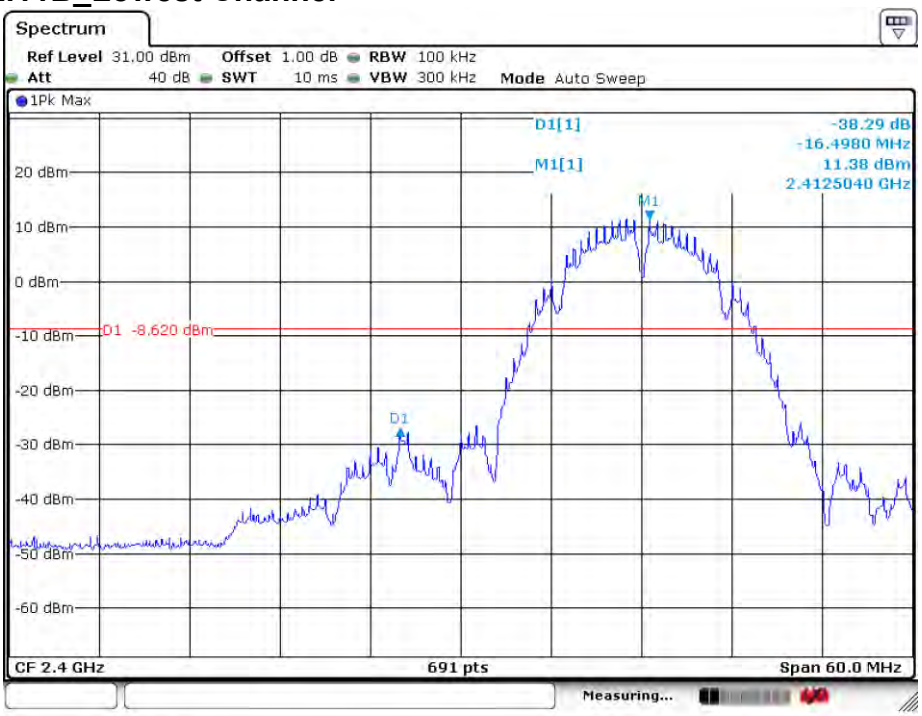
4.7.1 Test Plots

4.7.1.1 ANT1

4.7.1.1.1 802.11B_Lowest Channel



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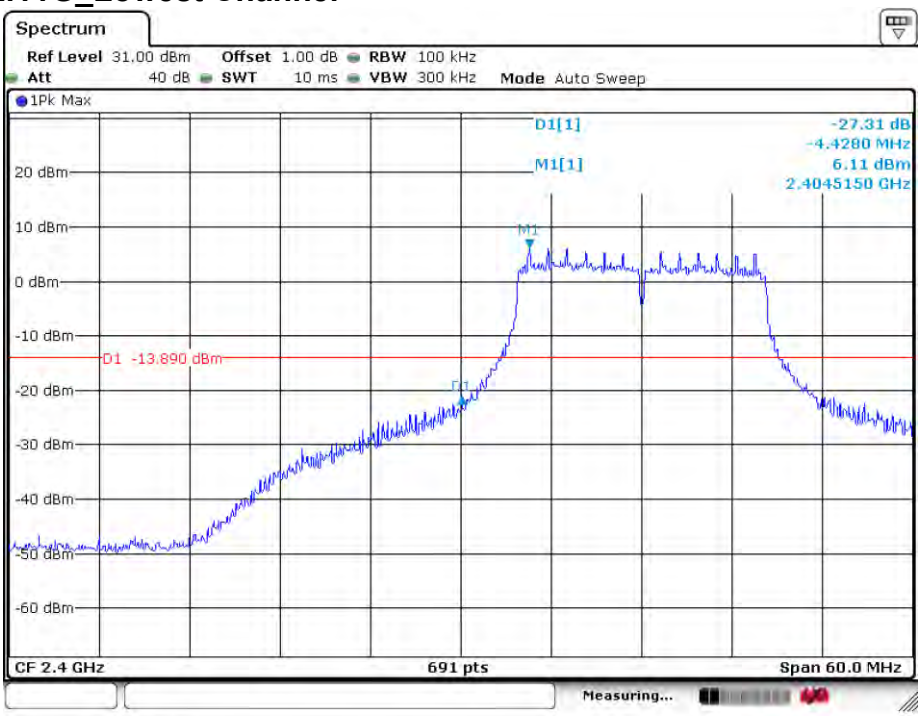
4.7.1.1.2 802.11B_Highest Channel

Date: 8.NOV.2020 14:32:24

4.7.1.1.3 802.11G_Lowest Channel



Date: 8.NOV.2020 14:34:24

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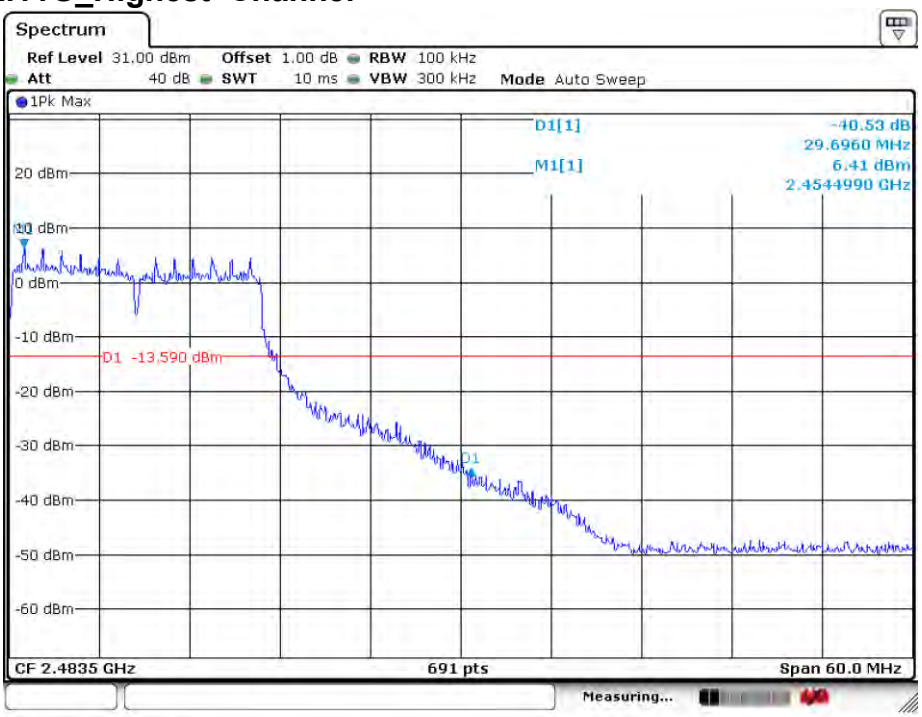
4.7.1.1.4 802.11G_Highest Channel



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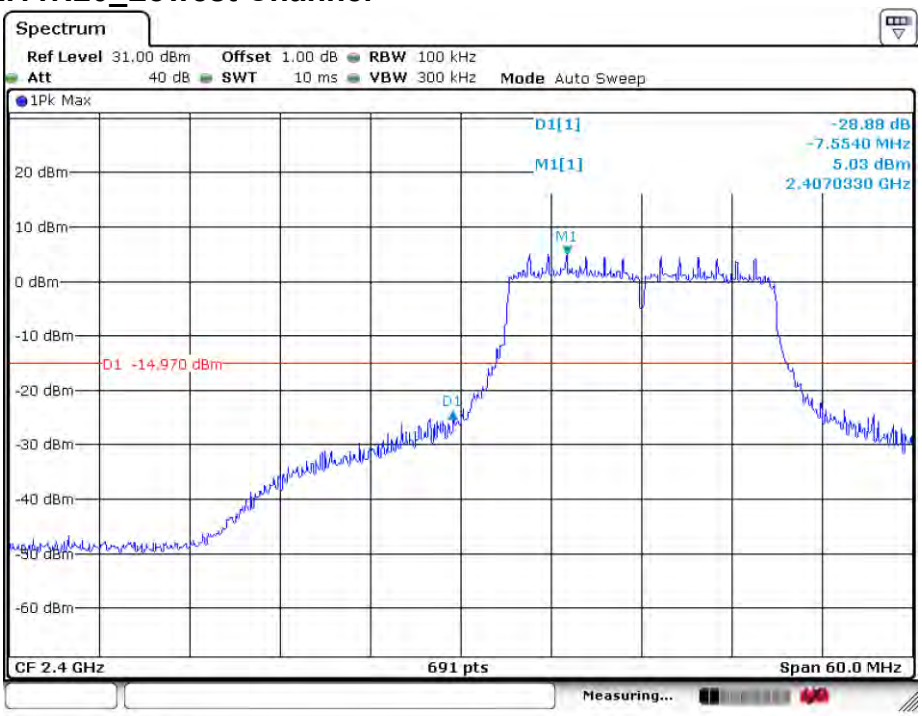
4.7.1.1.5 802.11N20_Lowest Channel



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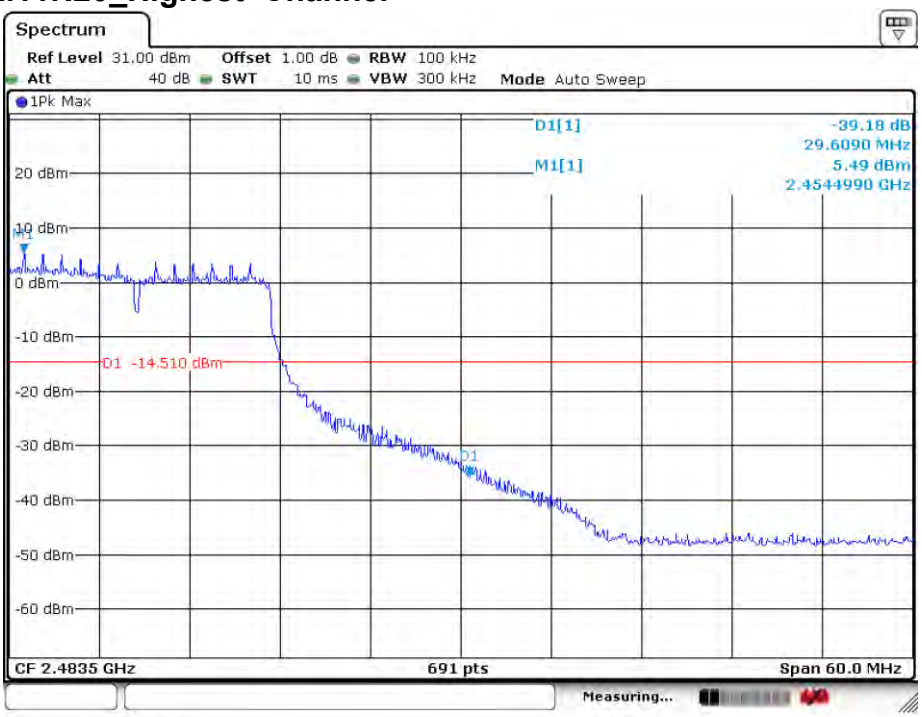
4.7.1.1.6 802.11N20_Highest Channel



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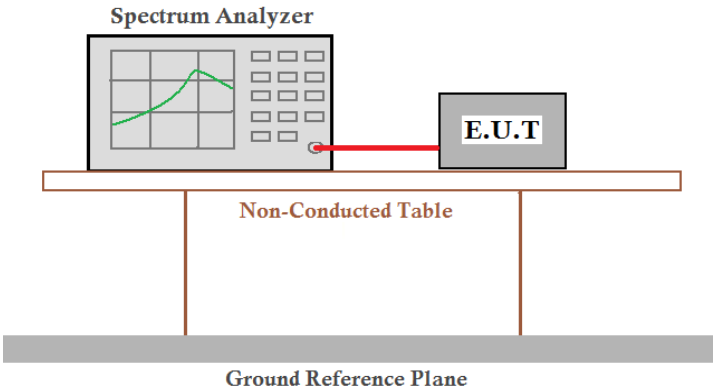
4.8 RF Conducted Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013 Section 11.11
Test Setup:	
Instruments Used:	Refer to section 5.10 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11B; 6Mbps of rate is the worst case of 802.11G ; 6.5Mbps of rate is the worst case of 802.11N(HT20);
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.
Test Results:	Pass

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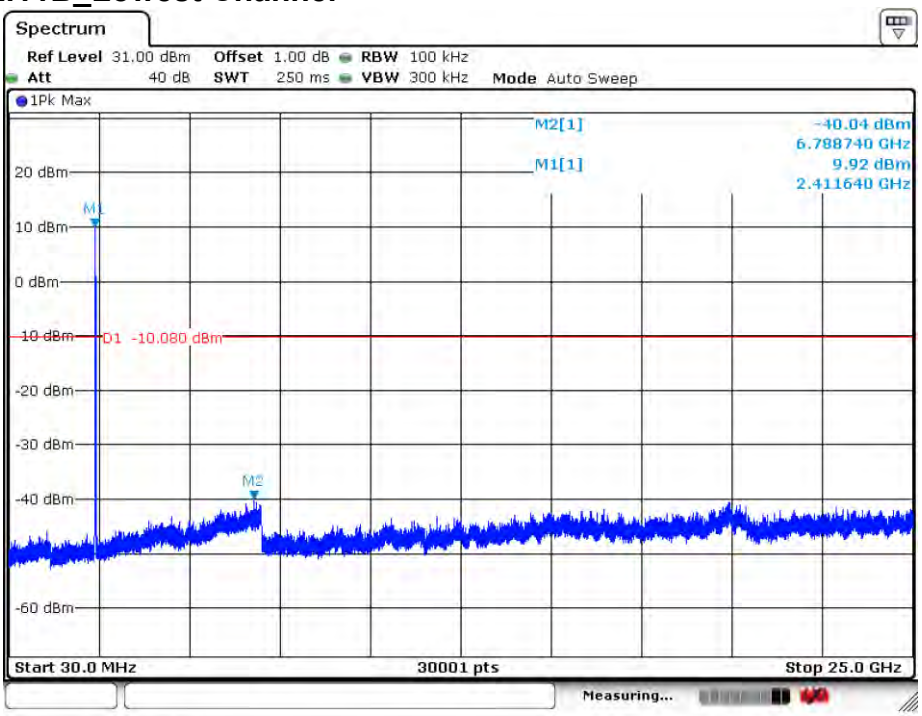
4.8.1 Test Plots

4.8.1.1 ANT1

4.8.1.1.1 802.11B_Lowest Channel



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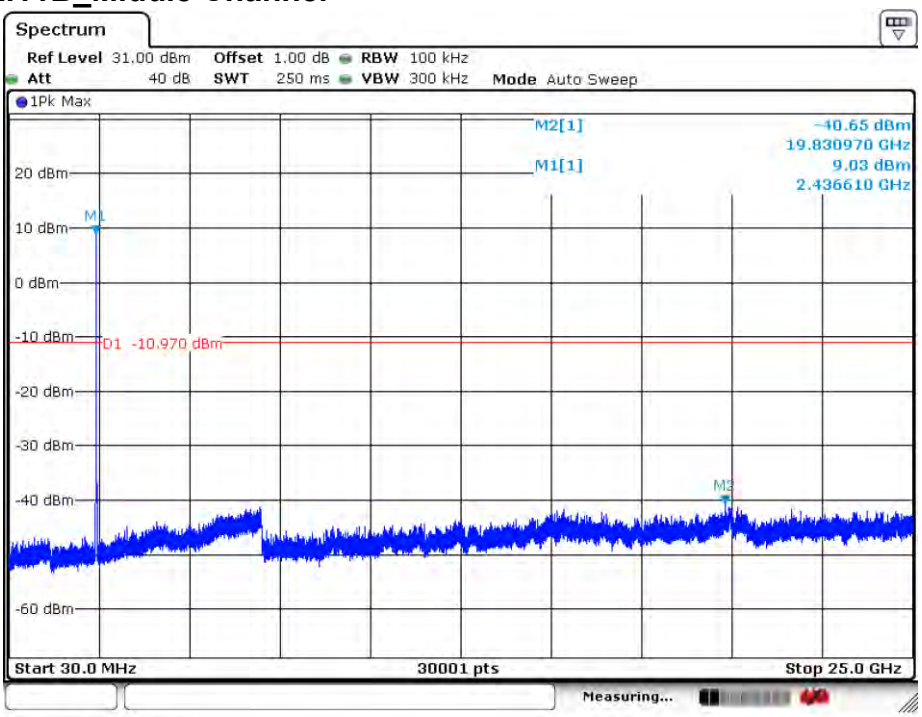
4.8.1.1.2 802.11B_Middle Channel



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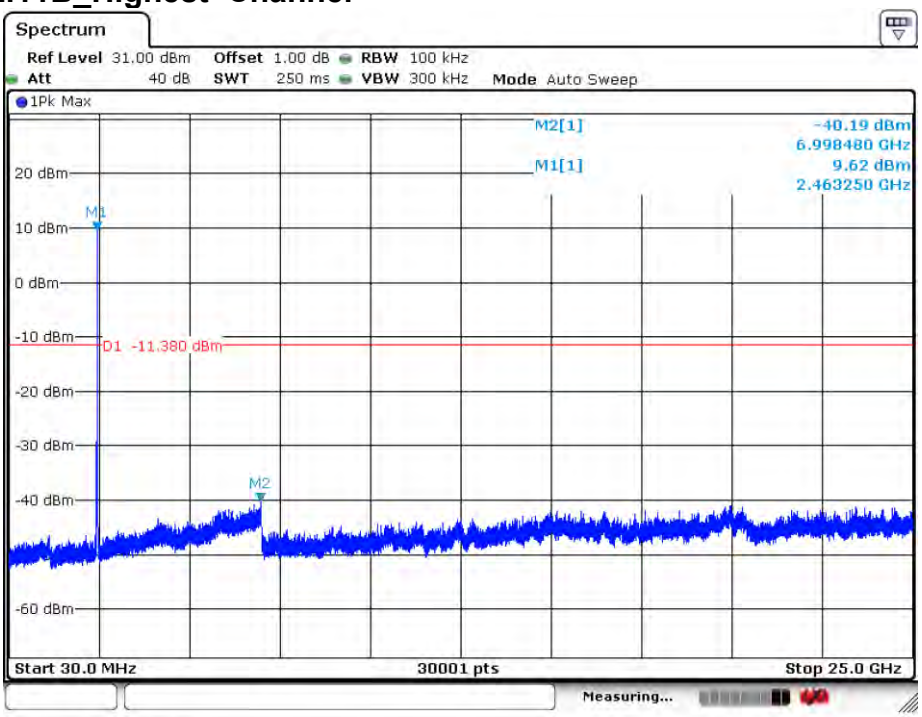
4.8.1.1.3 802.11B_Highest Channel



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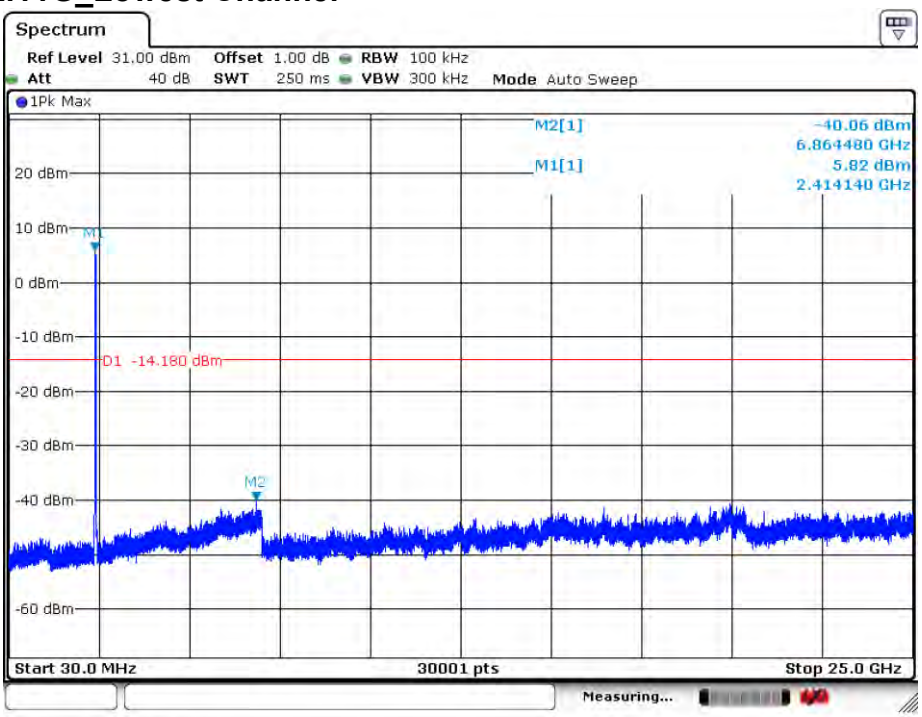
4.8.1.1.4 802.11G_Lowest Channel



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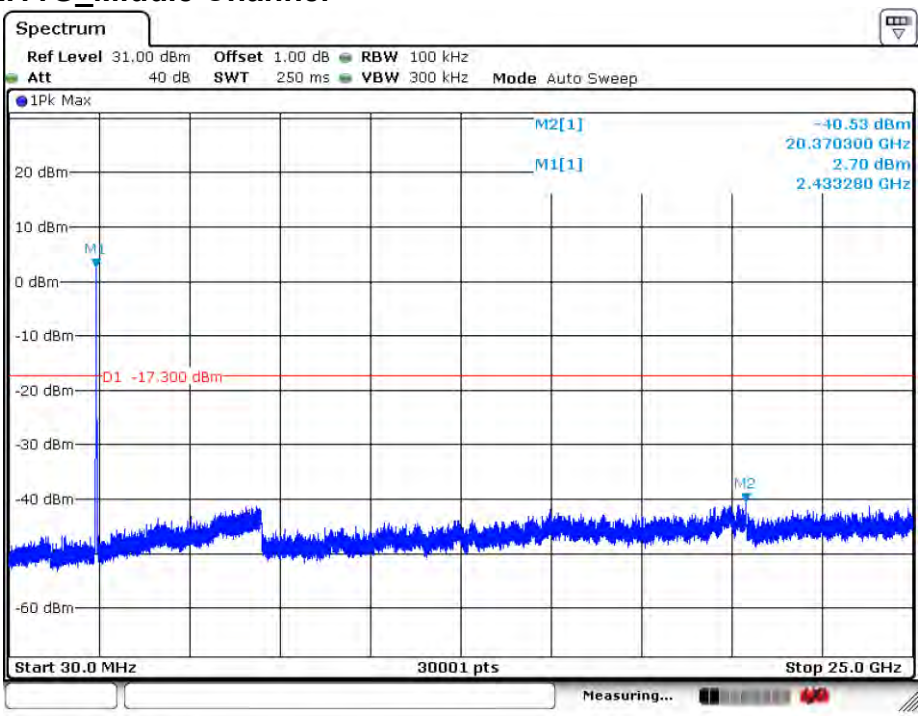
4.8.1.1.5 802.11G_Middle Channel



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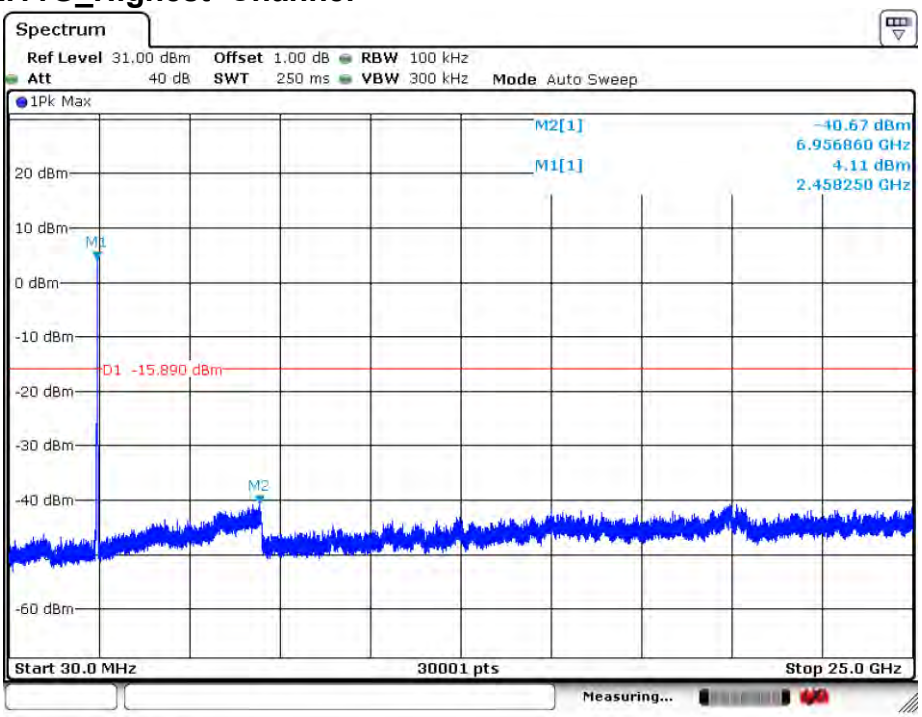
4.8.1.1.6 802.11G_Highest Channel



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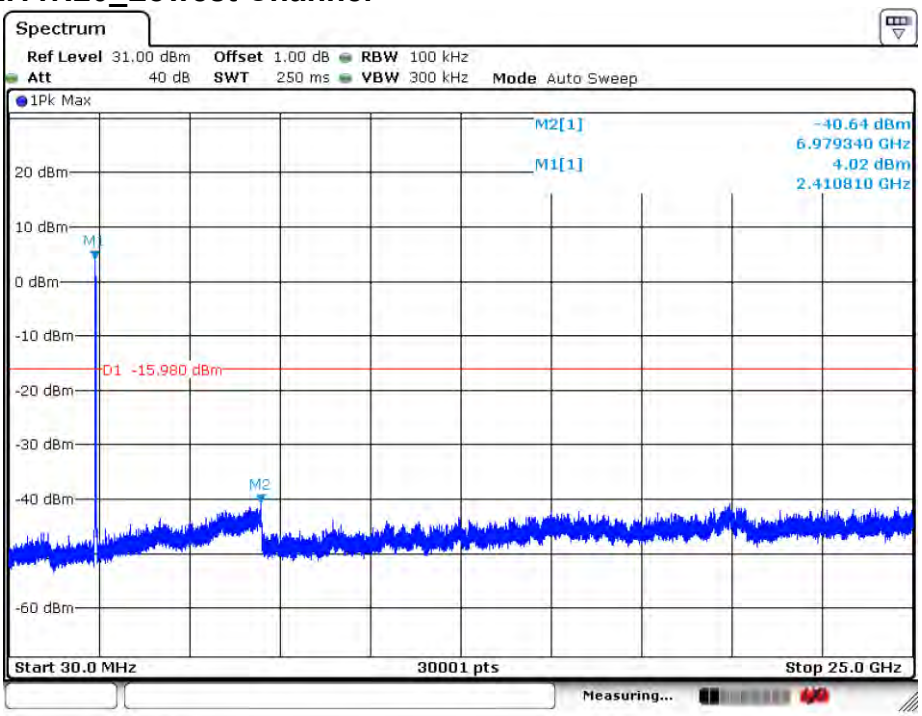
4.8.1.1.7 802.11N20_Lowest Channel



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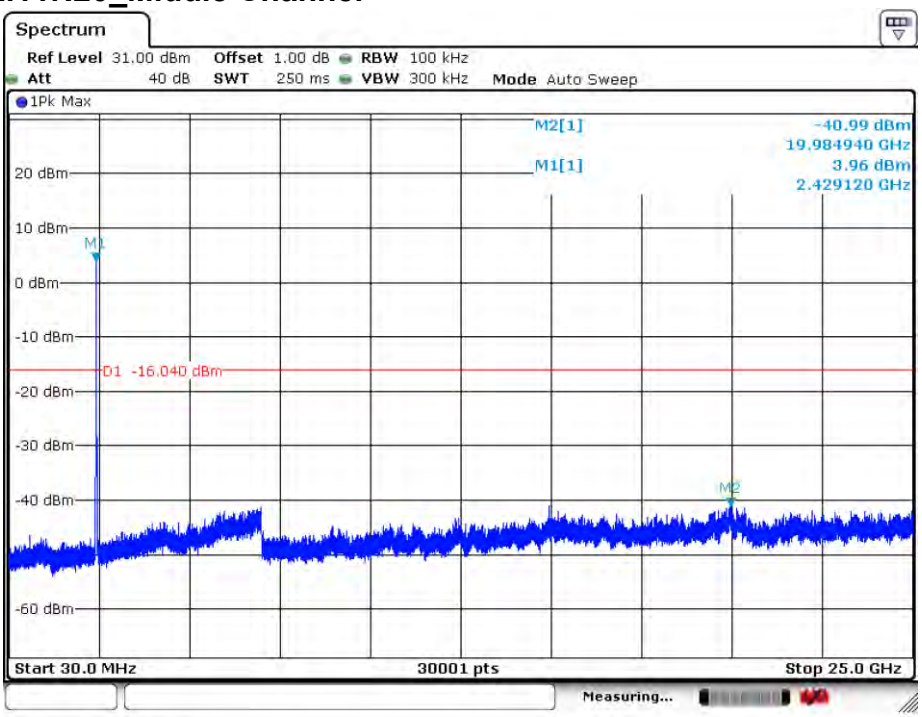
4.8.1.1.8 802.11N20_Middle Channel



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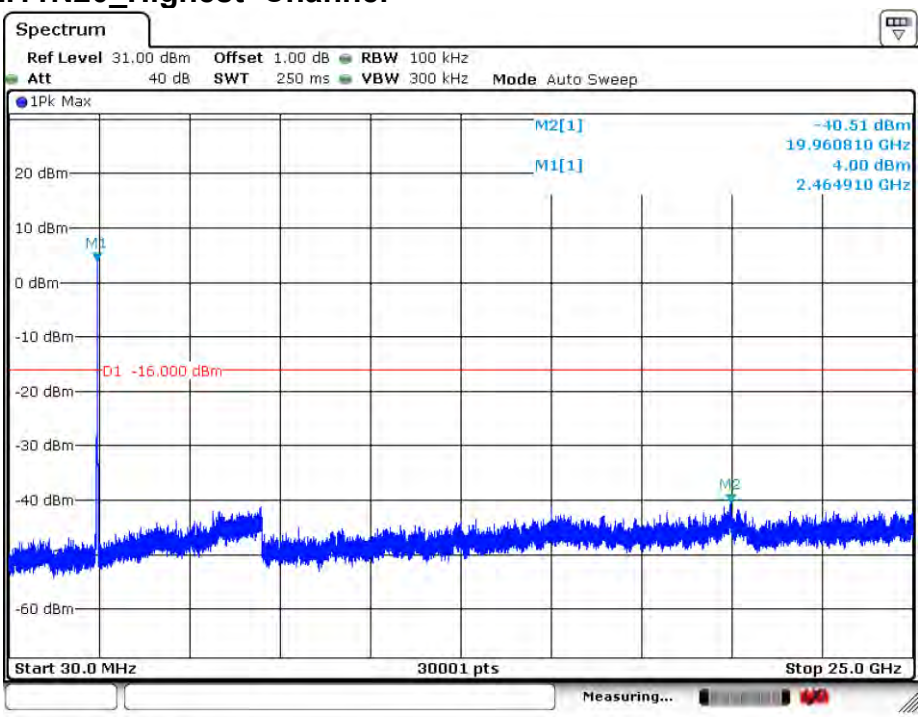
4.8.1.1.9 802.11N20_Highest Channel



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4.9 Radiated Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205				
Test Method:	ANSI C63.10 :2013 Section 11.12				
Test Site:	Measurement Distance: 3m or 10m (Semi-Anechoic Chamber)				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
	0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
	0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
	0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
	0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	100kHz	30kHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz	Average
Limit:	Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz-88MHz	100	40.0	Quasi-peak	3
	88MHz-216MHz	150	43.5	Quasi-peak	3
	216MHz-960MHz	200	46.0	Quasi-peak	3
	960MHz-1GHz	500	54.0	Quasi-peak	3
	Above 1GHz	500	54.0	Average	3
	Remark: 15.35(b),Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.				

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Test Setup:

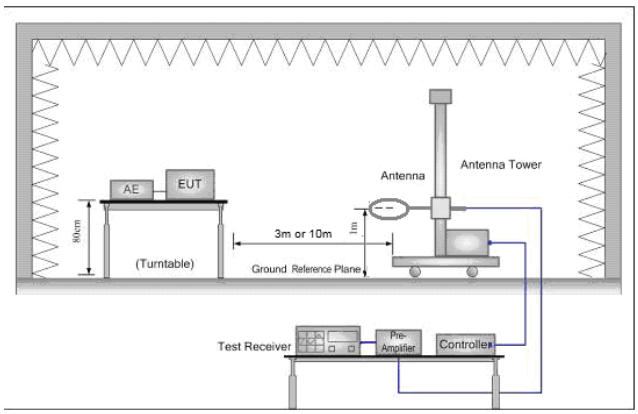

Figure 1. Below 30MHz

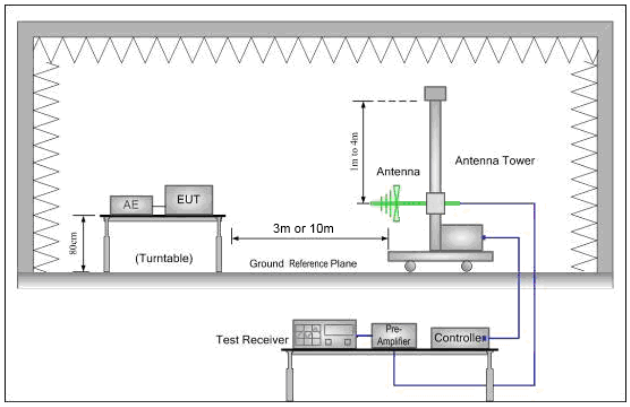

Figure 2. 30MHz to 1GHz

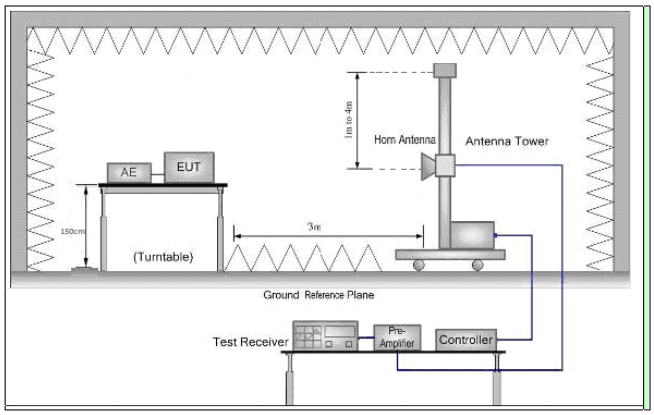

Figure 3. Above 1 GHz

Test Procedure:

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height 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.

e. Use the following spectrum analyzer settings:

(1) Span shall wide enough to fully capture the emission being measured;

(2) Set RBW=100 kHz for f < 1 GHz, RBW=1MHz for f>1GHz ; VBW ⩾ RBW; Sweep = auto;

Detector function = peak; Trace = max hold for peak

(3) For average measurement: use duty cycle correction factor method per 15.35(c).

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	Duty cycle = On time/100 milliseconds On time = N 1 *L 1 +N 2 *L 2 +...+N n-1 *LN n-1 +N n *L n Where N 1 is number of type 1 pulses, L 1 is length of type 1 pulses, etc. Average Emission Level = Peak Emission Level + 20*log(Duty cycle) f. 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(for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. g. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. h. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. i. Test the EUT in the lowest channel, the middle channel ,the Highest channel. j. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, And found the X axis positioning which it is worse case. k. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Charge + Transmitting mode.
Final Test Mode:	Pretest the EUT at Charge + Transmitting mode. Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11B; 6Mbps of rate is the worst case of 802.11G; 6.5Mbps of rate is the worst case of 802.11N(HT20); For below 1GHz, through Pre-scan, find the 1Mbps of rate of 802.11B at lowest channel is the worst case. Only the worst case is recorded in the report.
Instruments Used:	Refer to section 5.10 for details
Test Results:	Pass

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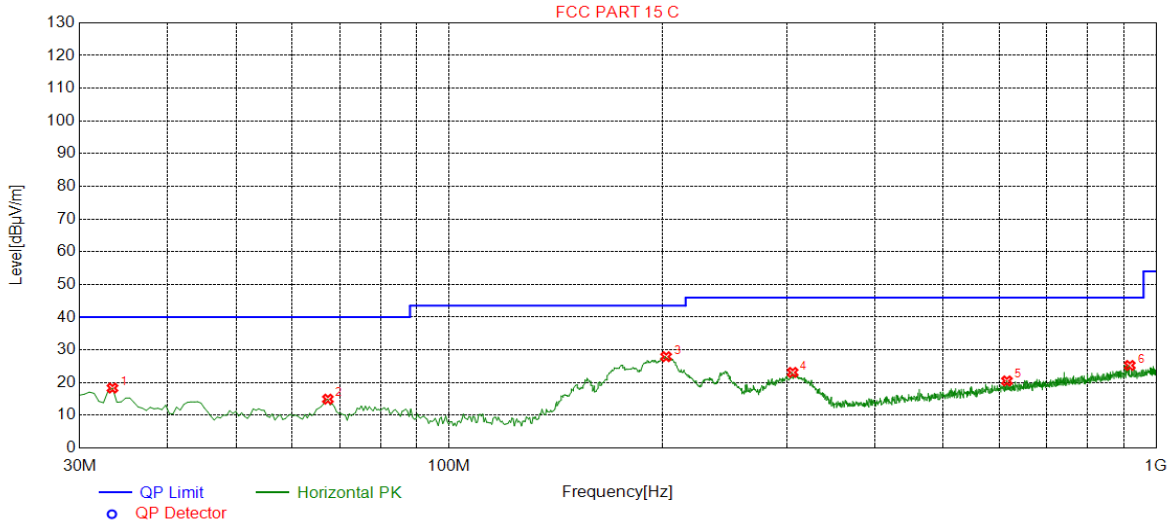
Firstly Supply:

4.9.1 Radiated emission below 1GHz

4.9.1.1 Charge + Transmitting



Suspected List							
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Polarity
1	33.3967	18.33	-32.79	40.00	21.67	167	Horizontal
2	67.3637	14.94	-33.51	40.00	25.06	143	Horizontal
3	202.7464	27.93	-30.76	43.50	15.57	213	Horizontal
4	306.1031	23.12	-27.68	46.00	22.88	141	Horizontal
5	615.2026	20.52	-19.87	46.00	25.48	225	Horizontal
6	917.9940	25.25	-14.96	46.00	20.75	131	Horizontal

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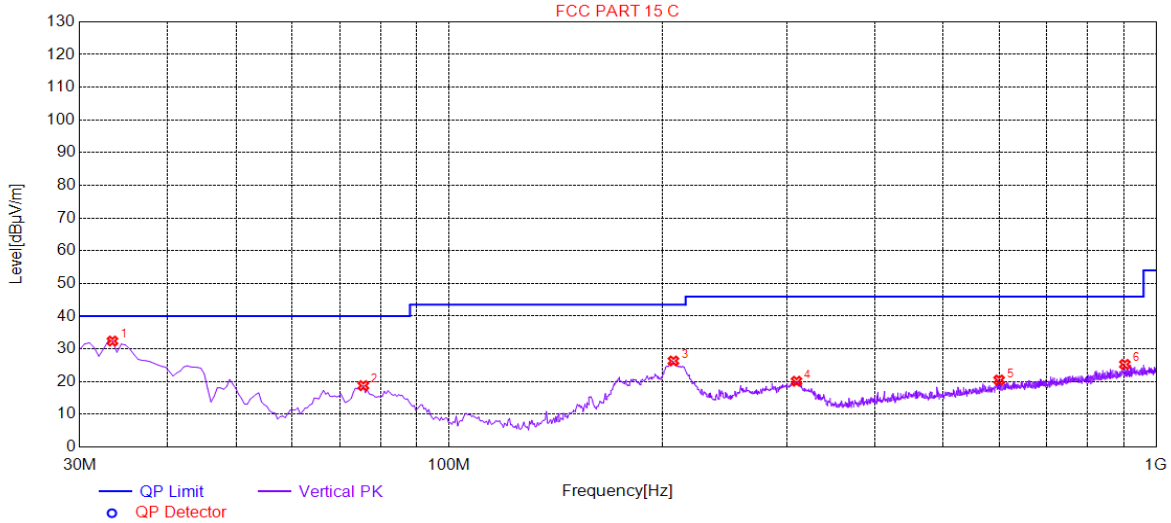

Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Polarity
1	33.3967	32.40	-32.79	40.00	7.60	264	Vertical
2	75.6128	18.77	-35.13	40.00	21.23	187	Vertical
3	207.5988	26.31	-30.67	43.50	17.19	274	Vertical
4	309.9850	20.12	-27.56	46.00	25.88	164	Vertical
5	599.6748	20.49	-20.09	46.00	25.51	165	Vertical
6	903.4367	25.27	-15.18	46.00	20.73	170	Vertical

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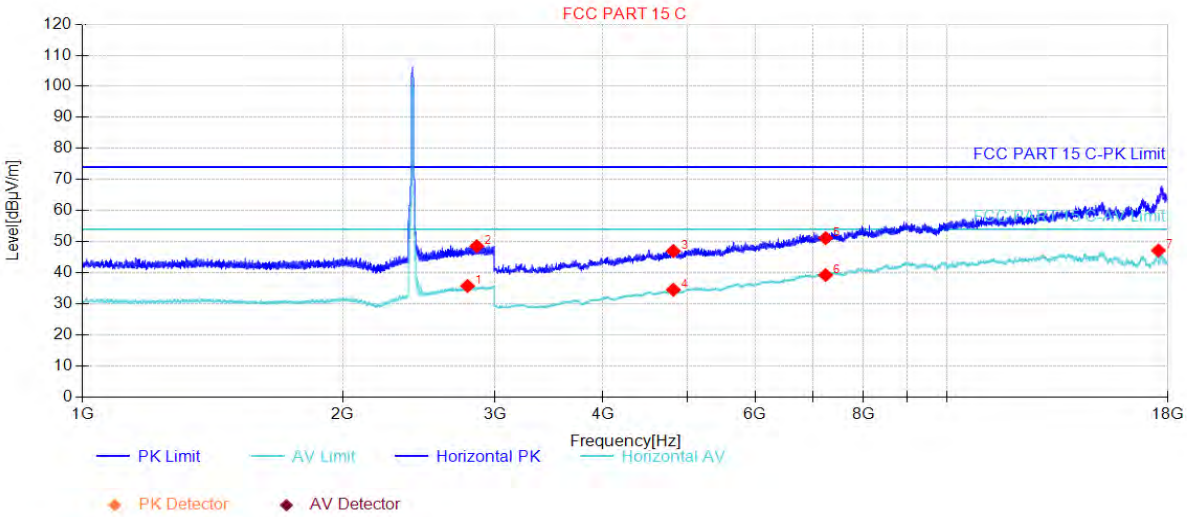
4.9.2 Transmitter emission above 1GHz

4.9.2.1 802.11B_CH1



Suspected List						
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2788.9789	35.73	6.62	54.00	18.27	Horizontal
2	2858.1858	48.53	6.86	74.00	25.47	Horizontal
3	4824.0000	46.96	-10.56	74.00	27.04	Horizontal
4	4824.0000	34.50	-10.56	54.00	19.50	Horizontal
5	7236.0000	51.11	-2.59	74.00	22.89	Horizontal
6	7236.0000	39.23	-2.59	54.00	14.77	Horizontal
7	17554.455	47.17	12.47	54.00	6.83	Horizontal

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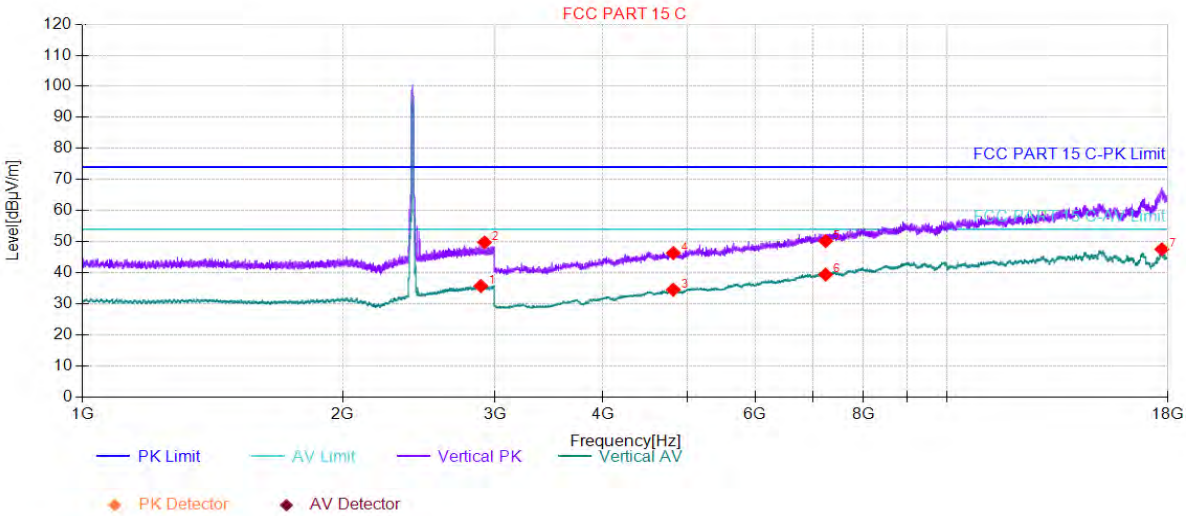
4.9.2.2 802.11B_CH1



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2889.5890	35.70	6.93	54.00	18.30	Vertical
2	2917.5918	49.77	7.03	74.00	24.23	Vertical
3	4824.0000	34.52	-10.56	54.00	19.48	Vertical
4	4824.0000	46.32	-10.56	74.00	27.68	Vertical
5	7236.0000	50.20	-2.59	74.00	23.80	Vertical
6	7236.0000	39.39	-2.59	54.00	14.61	Vertical
7	17713.471	47.52	14.66	54.00	6.48	Vertical

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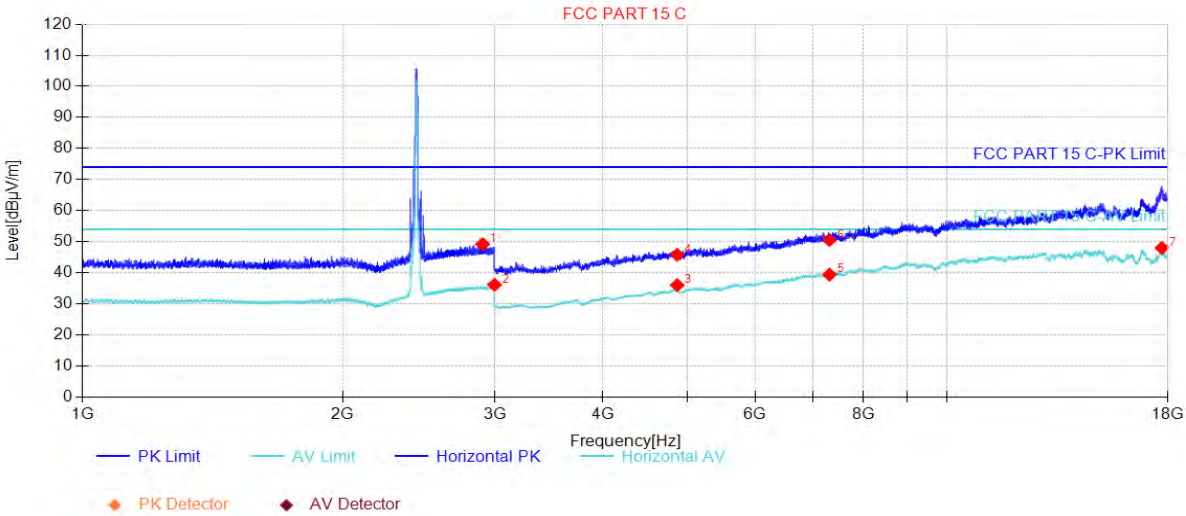
4.9.2.3 802.11B_CH6



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2902.5903	49.19	6.96	74.00	24.81	Horizontal
2	2996.1996	36.11	7.39	54.00	17.89	Horizontal
3	4874.0000	35.98	-10.40	54.00	18.02	Horizontal
4	4874.0000	45.78	-10.40	74.00	28.22	Horizontal
5	7311.0000	39.37	-2.57	54.00	14.63	Horizontal
6	7311.0000	50.52	-2.57	74.00	23.48	Horizontal
7	17717.971	47.94	14.67	54.00	6.06	Horizontal

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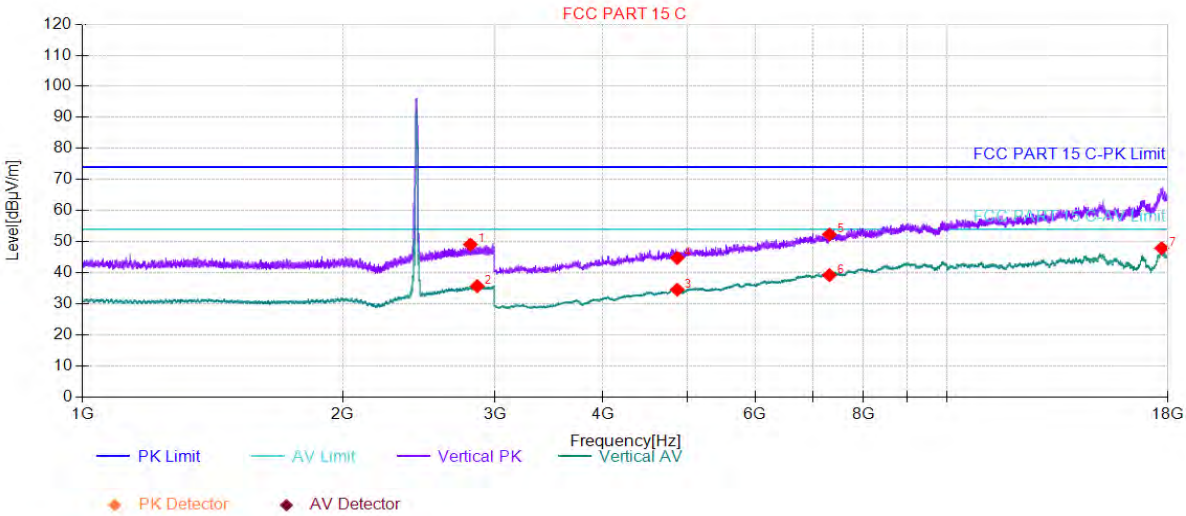
4.9.2.4 802.11B_CH6



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2810.1810	49.06	6.75	74.00	24.94	Vertical
2	2861.5862	35.64	6.87	54.00	18.36	Vertical
3	4874.0000	34.54	-10.40	54.00	19.46	Vertical
4	4874.0000	44.72	-10.40	74.00	29.28	Vertical
5	7311.0000	52.30	-2.57	74.00	21.70	Vertical
6	7311.0000	39.20	-2.57	54.00	14.80	Vertical
7	17710.471	47.87	14.66	54.00	6.13	Vertical

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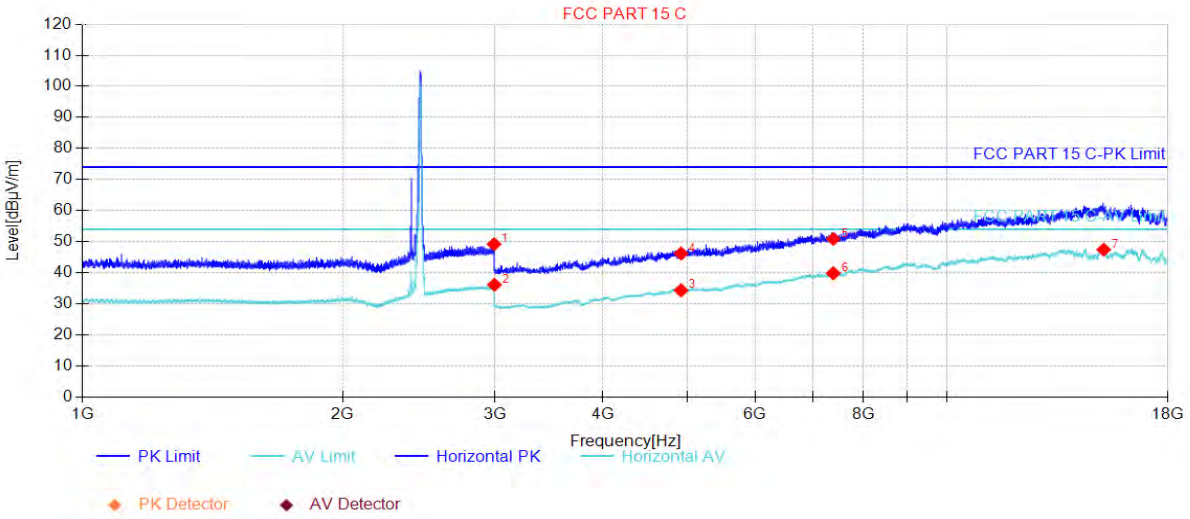
4.9.2.5 802.11B_CH11



Suspected List						
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1	2992.3992	49.18	7.38	74.00	24.82	Horizontal
2	2995.7996	36.10	7.39	54.00	17.90	Horizontal
3	4924.0000	34.31	-10.22	54.00	19.69	Horizontal
4	4924.0000	46.16	-10.22	74.00	27.84	Horizontal
5	7386.0000	50.86	-2.06	74.00	23.14	Horizontal
6	7386.0000	39.81	-2.06	54.00	14.19	Horizontal
7	15173.717	47.43	8.95	54.00	6.57	Horizontal

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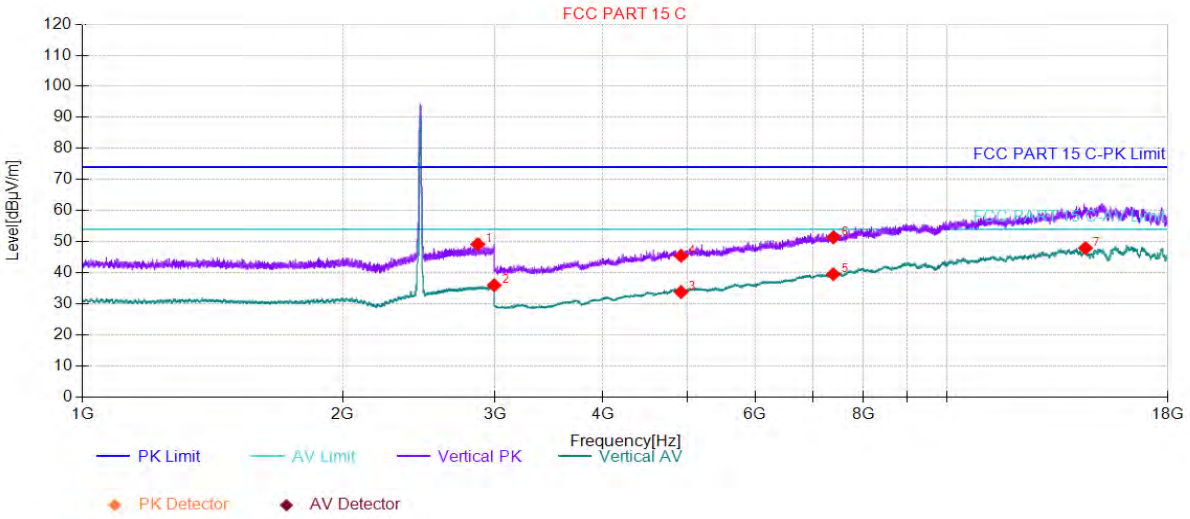
4.9.2.6 802.11B_CH11



Suspected List						
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2865.9866	49.16	6.88	74.00	24.84	Vertical
2	2994.1994	35.97	7.38	54.00	18.03	Vertical
3	4924.0000	33.77	-10.22	54.00	20.23	Vertical
4	4924.0000	45.42	-10.22	74.00	28.58	Vertical
5	7386.0000	39.52	-2.06	54.00	14.48	Vertical
6	7386.0000	51.37	-2.06	74.00	22.63	Vertical
7	14456.6457	47.93	7.69	54.00	6.07	Vertical

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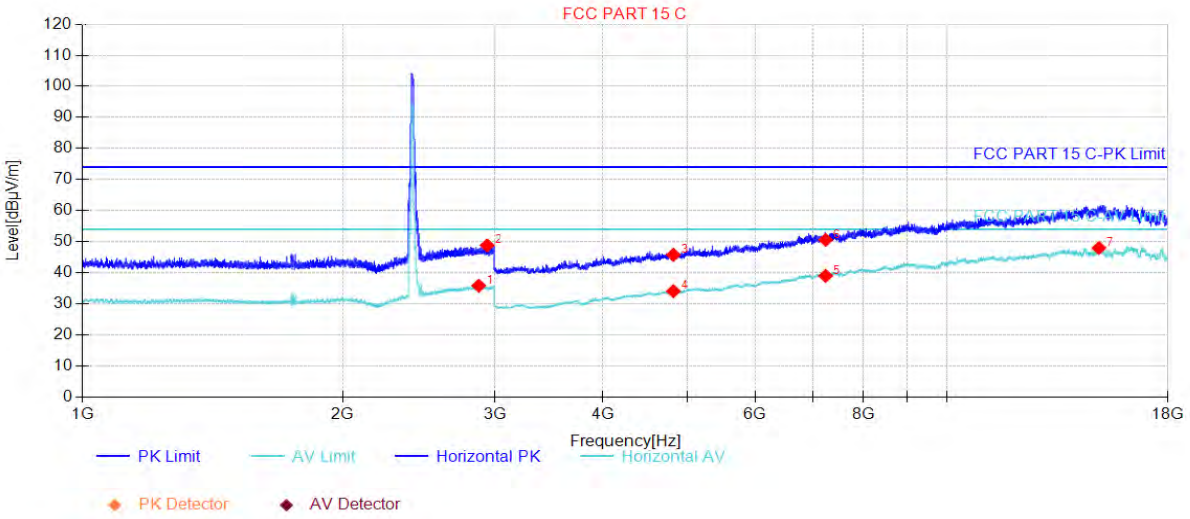
4.9.2.7 802.11G_CH1



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2873.3873	35.81	6.89	54.00	18.19	Horizontal
2	2938.7939	48.79	7.13	74.00	25.21	Horizontal
3	4824.0000	45.73	-10.56	74.00	28.27	Horizontal
4	4824.0000	34.03	-10.56	54.00	19.97	Horizontal
5	7236.0000	38.98	-2.59	54.00	15.02	Horizontal
6	7236.0000	50.57	-2.59	74.00	23.43	Horizontal
7	14983.198	47.94	8.49	54.00	6.06	Horizontal

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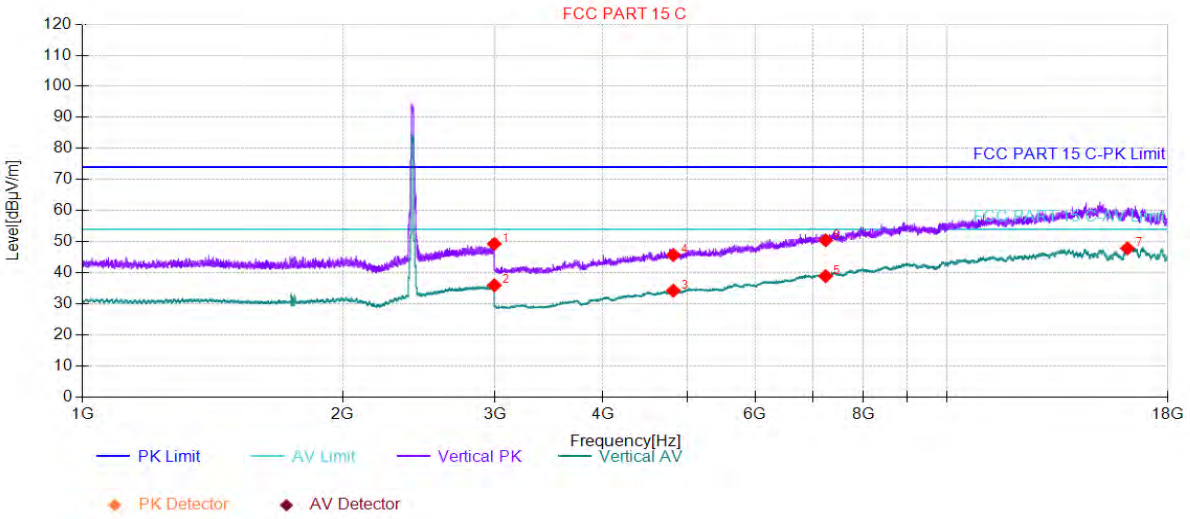
4.9.2.8 **802.11G_CH1**



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2994.5995	49.28	7.39	74.00	24.72	Vertical
2	2995.5996	35.94	7.39	54.00	18.06	Vertical
3	4824.0000	34.20	-10.56	54.00	19.80	Vertical
4	4824.0000	45.70	-10.56	74.00	28.30	Vertical
5	7236.0000	38.90	-2.59	54.00	15.10	Vertical
6	7236.0000	50.43	-2.59	74.00	23.57	Vertical
7	16166.816	47.82	8.40	54.00	6.18	Vertical

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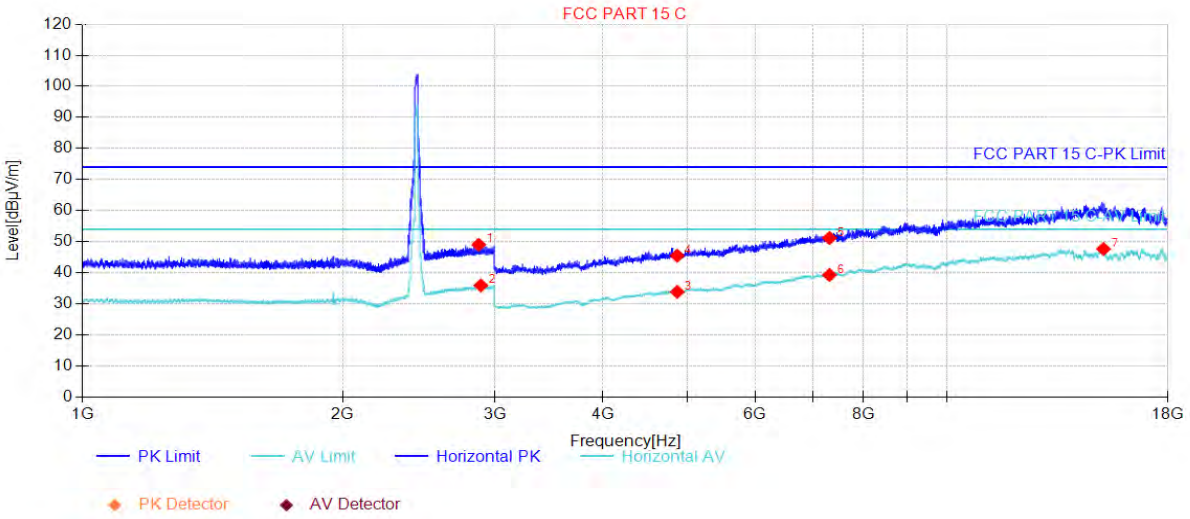
4.9.2.9 802.11G_CH6



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2872.7873	49.01	6.89	74.00	24.99	Horizontal
2	2889.5890	35.89	6.93	54.00	18.11	Horizontal
3	4874.0000	33.81	-10.40	54.00	20.19	Horizontal
4	4874.0000	45.45	-10.40	74.00	28.55	Horizontal
5	7311.0000	51.16	-2.57	74.00	22.84	Horizontal
6	7311.0000	39.25	-2.57	54.00	14.75	Horizontal
7	15163.216	47.64	8.98	54.00	6.36	Horizontal

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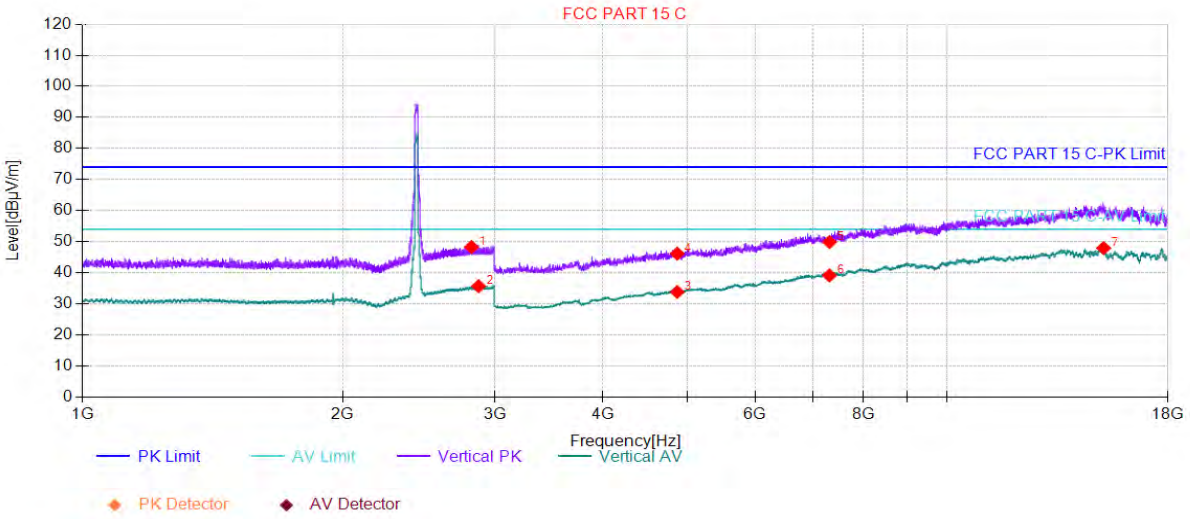
4.9.2.10 **802.11G_CH6**



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2817.7818	48.28	6.77	74.00	25.72	Vertical
2	2871.9872	35.65	6.89	54.00	18.35	Vertical
3	4874.0000	33.80	-10.40	54.00	20.20	Vertical
4	4874.0000	46.15	-10.40	74.00	27.85	Vertical
5	7311.0000	49.87	-2.57	74.00	24.13	Vertical
6	7311.0000	39.12	-2.57	54.00	14.88	Vertical
7	15169.216	47.91	8.96	54.00	6.09	Vertical

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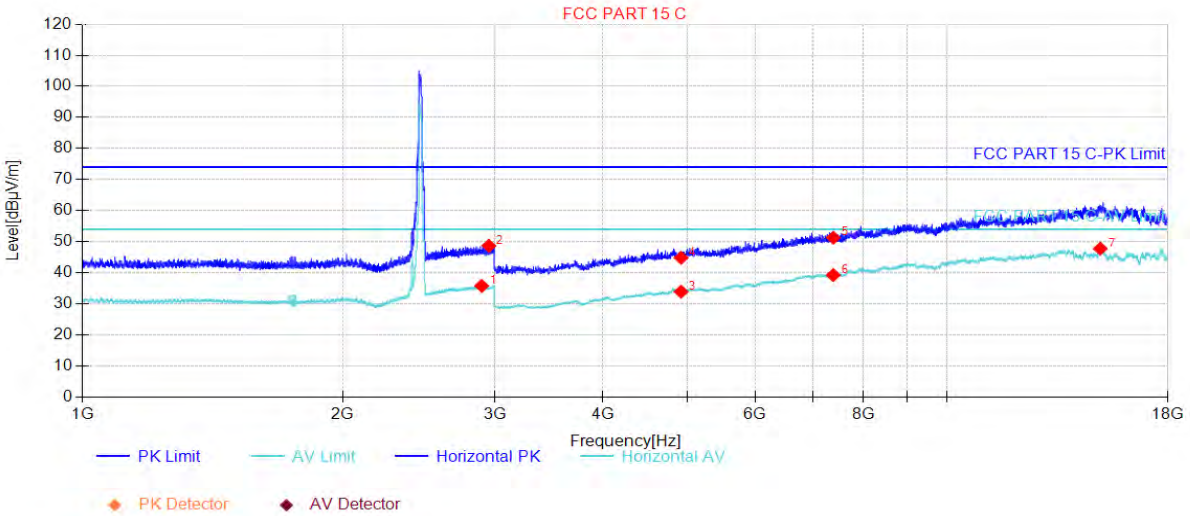
4.9.2.11 802.11G_CH11



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2895.5896	35.76	6.94	54.00	18.24	Horizontal
2	2951.5952	48.66	7.19	74.00	25.34	Horizontal
3	4924.0000	33.88	-10.22	54.00	20.12	Horizontal
4	4924.0000	44.79	-10.22	74.00	29.21	Horizontal
5	7386.0000	51.26	-2.06	74.00	22.74	Horizontal
6	7386.0000	39.21	-2.06	54.00	14.79	Horizontal
7	15034.203	47.75	8.75	54.00	6.25	Horizontal

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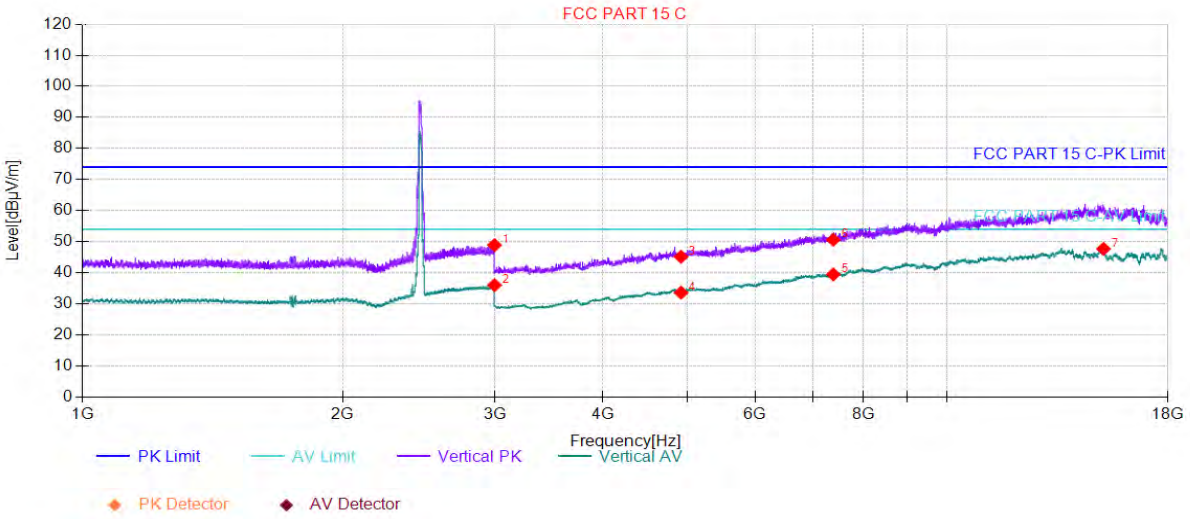
4.9.2.12 802.11G_CH11



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2995.9996	48.90	7.39	74.00	25.10	Vertical
2	2996.7997	35.98	7.40	54.00	18.02	Vertical
3	4924.0000	45.13	-10.22	74.00	28.87	Vertical
4	4924.0000	33.56	-10.22	54.00	20.44	Vertical
5	7386.0000	39.43	-2.06	54.00	14.57	Vertical
6	7386.0000	50.60	-2.06	74.00	23.40	Vertical
7	15166.216	47.66	8.97	54.00	6.34	Vertical

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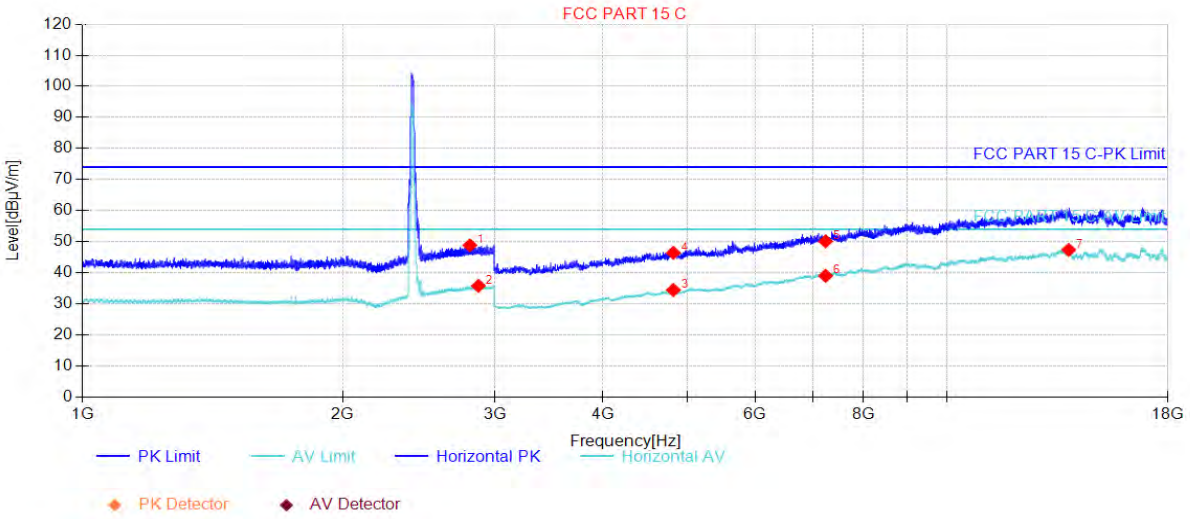
4.9.2.13 802.11N20_CH1



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2806.5807	48.82	6.74	74.00	25.18	Horizontal
2	2870.7871	35.78	6.89	54.00	18.22	Horizontal
3	4824.0000	34.43	-10.56	54.00	19.57	Horizontal
4	4824.0000	46.39	-10.56	74.00	27.61	Horizontal
5	7236.0000	50.10	-2.59	74.00	23.90	Horizontal
6	7236.0000	38.99	-2.59	54.00	15.01	Horizontal
7	13825.082	47.34	5.79	54.00	6.66	Horizontal

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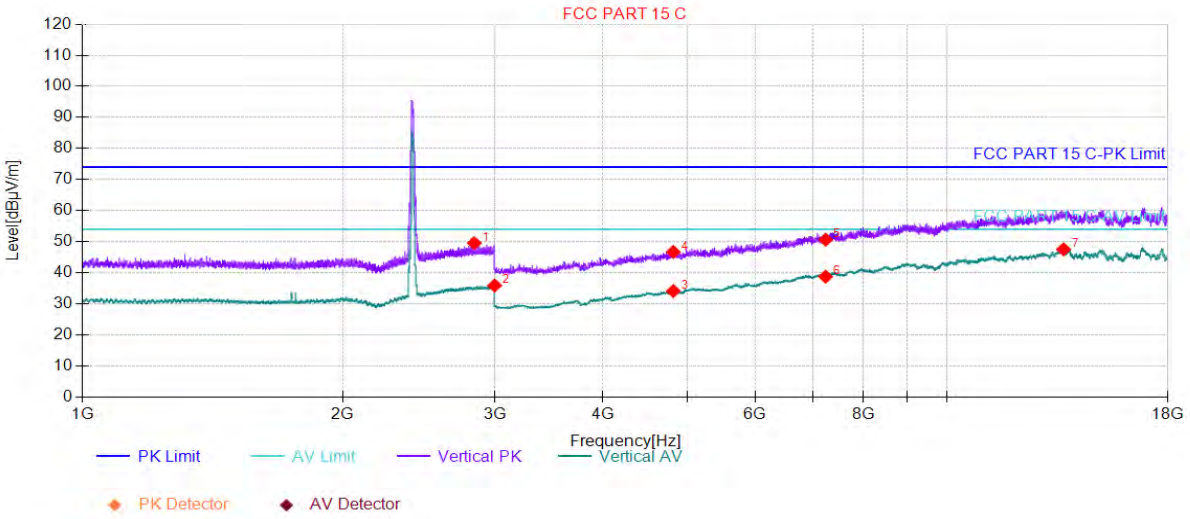
4.9.2.14 **802.11N20_CH1**



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2839.5840	49.53	6.82	74.00	24.47	Vertical
2	2997.5998	35.87	7.40	54.00	18.13	Vertical
3	4824.0000	34.08	-10.56	54.00	19.92	Vertical
4	4824.0000	46.66	-10.56	74.00	27.34	Vertical
5	7236.0000	50.63	-2.59	74.00	23.37	Vertical
6	7236.0000	38.72	-2.59	54.00	15.28	Vertical
7	13636.063	47.51	6.05	54.00	6.49	Vertical

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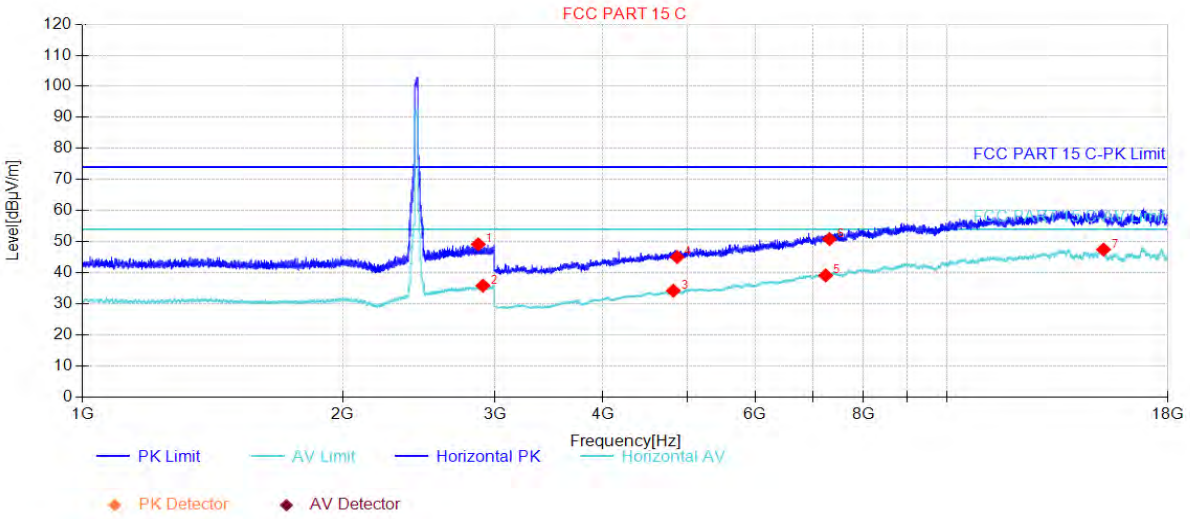
4.9.2.15 802.11N20_CH6



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2869.5870	49.15	6.88	74.00	24.85	Horizontal
2	2905.3905	35.82	6.97	54.00	18.18	Horizontal
3	4824.0000	34.19	-10.56	54.00	19.81	Horizontal
4	4874.0000	45.00	-10.40	74.00	29.00	Horizontal
5	7236.0000	39.12	-2.59	54.00	14.88	Horizontal
6	7311.0000	50.81	-2.57	74.00	23.19	Horizontal
7	15166.216	47.44	6.97	54.00	6.56	Horizontal

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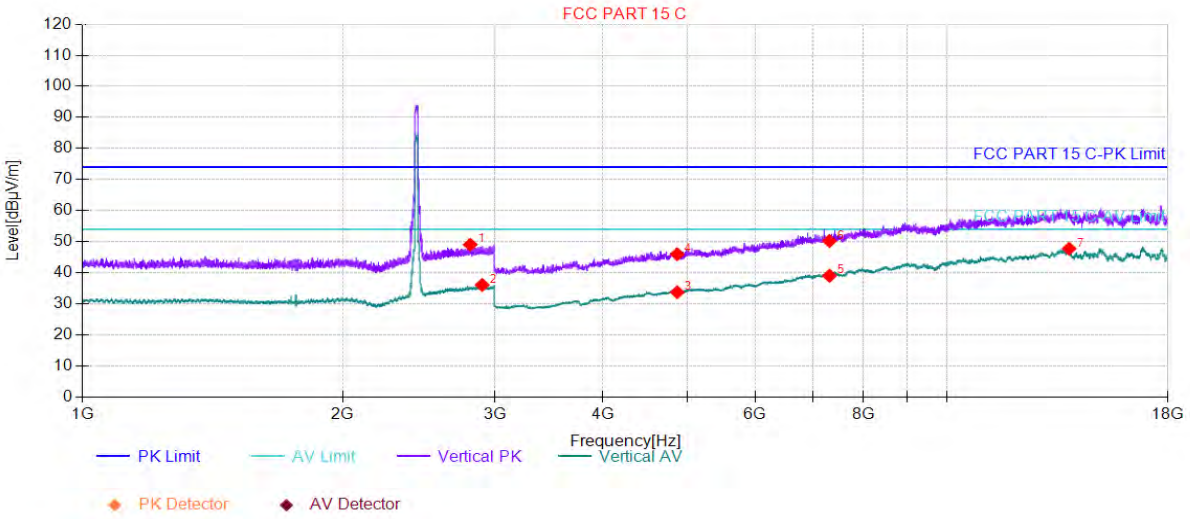
4.9.2.16 802.11N20_CH6



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2809.1809	49.04	6.75	74.00	24.96	Vertical
2	2899.3899	36.04	6.95	54.00	17.96	Vertical
3	4874.0000	33.69	-10.40	54.00	20.31	Vertical
4	4874.0000	45.95	-10.40	74.00	28.05	Vertical
5	7311.0000	39.02	-2.57	54.00	14.98	Vertical
6	7311.0000	50.21	-2.57	74.00	23.79	Vertical
7	13840.084	47.72	5.86	54.00	6.28	Vertical

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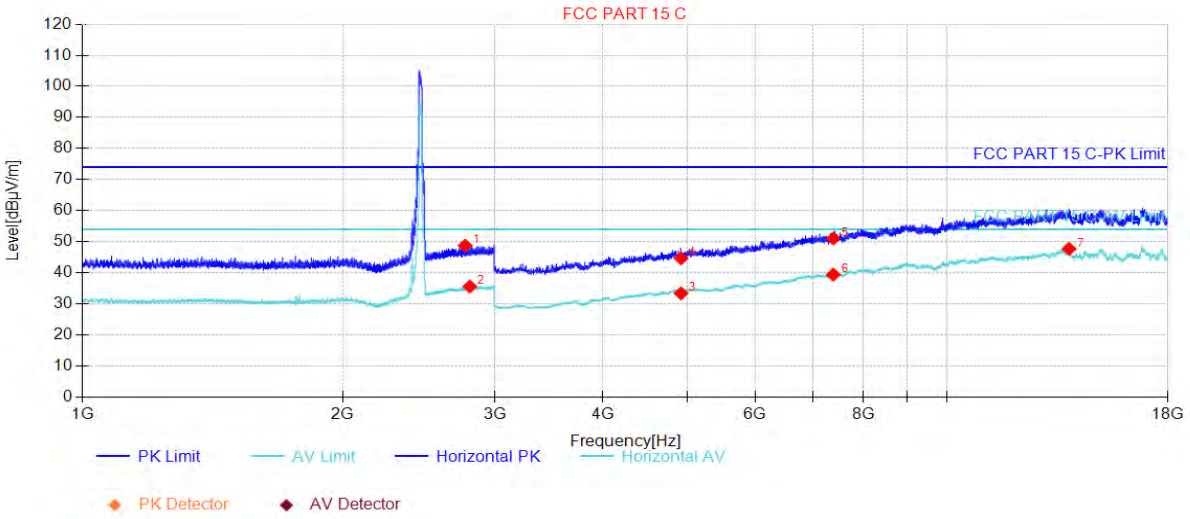
4.9.2.17 802.11N20_CH11



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2770.5771	48.70	6.43	74.00	25.30	Horizontal
2	2805.5806	35.54	6.74	54.00	18.46	Horizontal
3	4924.0000	33.35	-10.22	54.00	20.65	Horizontal
4	4924.0000	44.65	-10.22	74.00	29.35	Horizontal
5	7386.0000	51.02	-2.06	74.00	22.98	Horizontal
6	7386.0000	39.37	-2.06	54.00	14.63	Horizontal
7	13837.083	47.67	5.85	54.00	6.33	Horizontal

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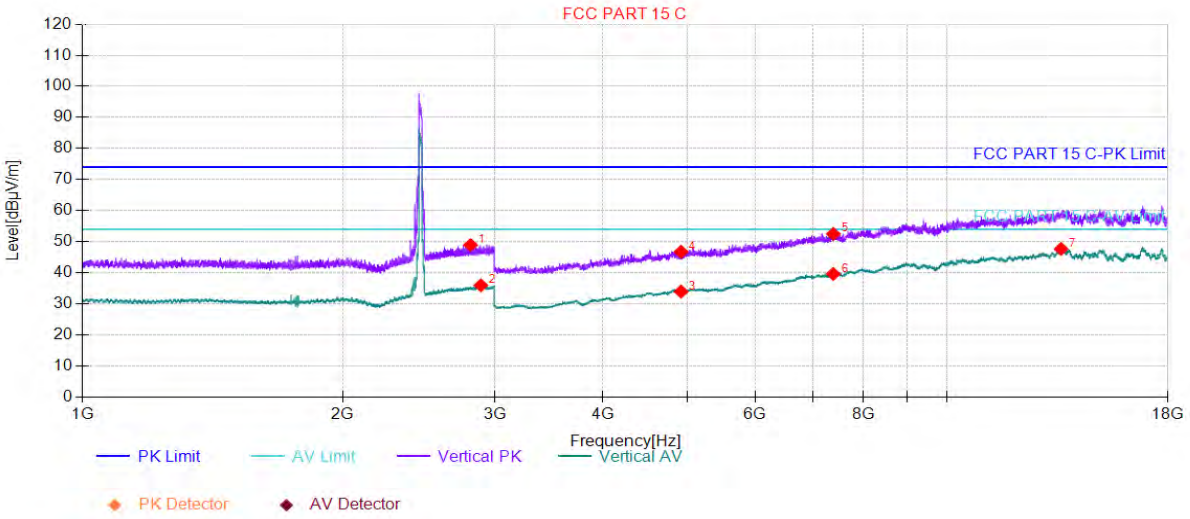
4.9.2.18 **802.11N20_CH11**



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2811.1811	48.92	6.75	74.00	25.08	Vertical
2	2888.7889	35.93	6.93	54.00	18.07	Vertical
3	4924.0000	33.91	-10.22	54.00	20.09	Vertical
4	4924.0000	46.71	-10.22	74.00	27.29	Vertical
5	7386.0000	52.47	-2.06	74.00	21.53	Vertical
6	7386.0000	39.59	-2.06	54.00	14.41	Vertical
7	13549.054	47.64	6.00	54.00	6.36	Vertical

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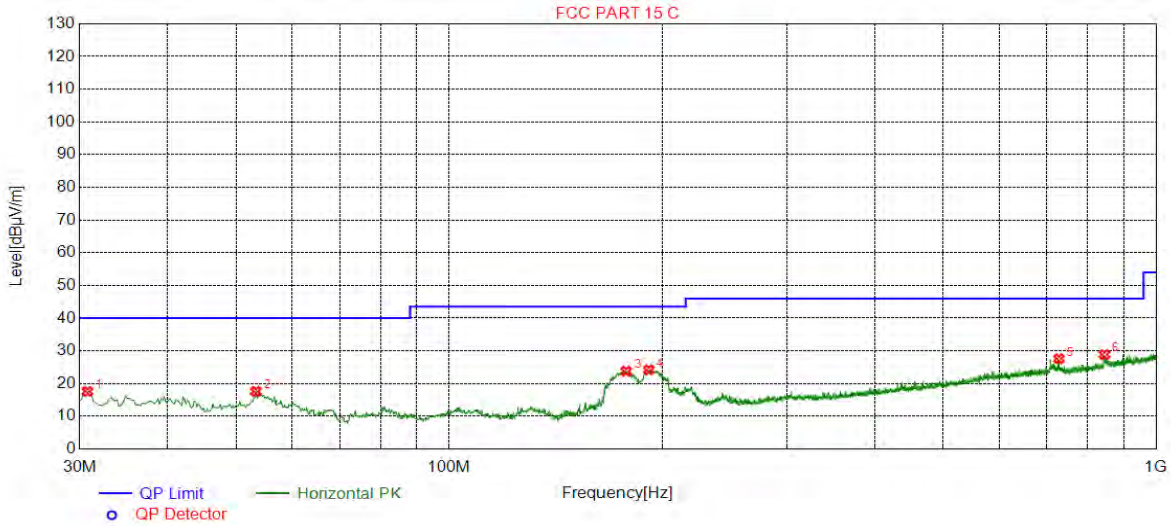
Secondly Supply:

4.9.3 Radiated Emission below 1GHz

4.9.3.1 Charge + Transmitting



Suspected List					
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	30.7762	17.61	40.00	22.39	Horizontal
2	53.2847	17.62	40.00	22.38	Horizontal
3	178.0516	23.77	43.50	19.73	Horizontal
4	191.6343	24.24	43.50	19.26	Horizontal
5	728.7337	27.60	46.00	18.40	Horizontal
6	845.1570	28.88	46.00	17.12	Horizontal

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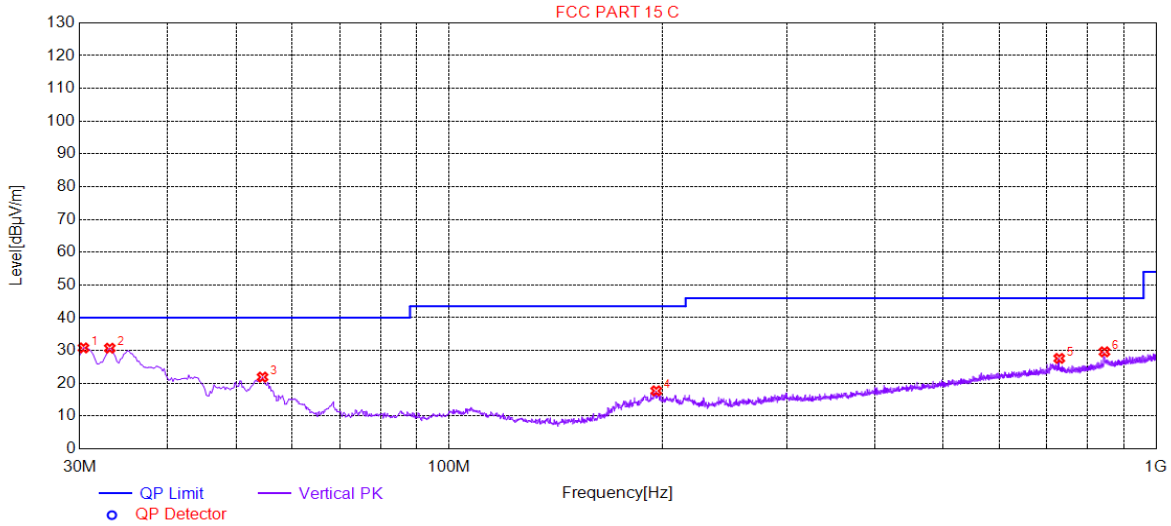

Suspected List					
NO.	Freq. [MHz]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	30.3881	30.82	40.00	9.18	Vertical
2	33.1046	30.73	40.00	9.27	Vertical
3	54.4489	21.90	40.00	18.10	Vertical
4	196.2913	17.71	43.50	25.79	Vertical
5	729.5099	27.61	46.00	18.39	Vertical
6	845.1570	29.62	46.00	16.38	Vertical

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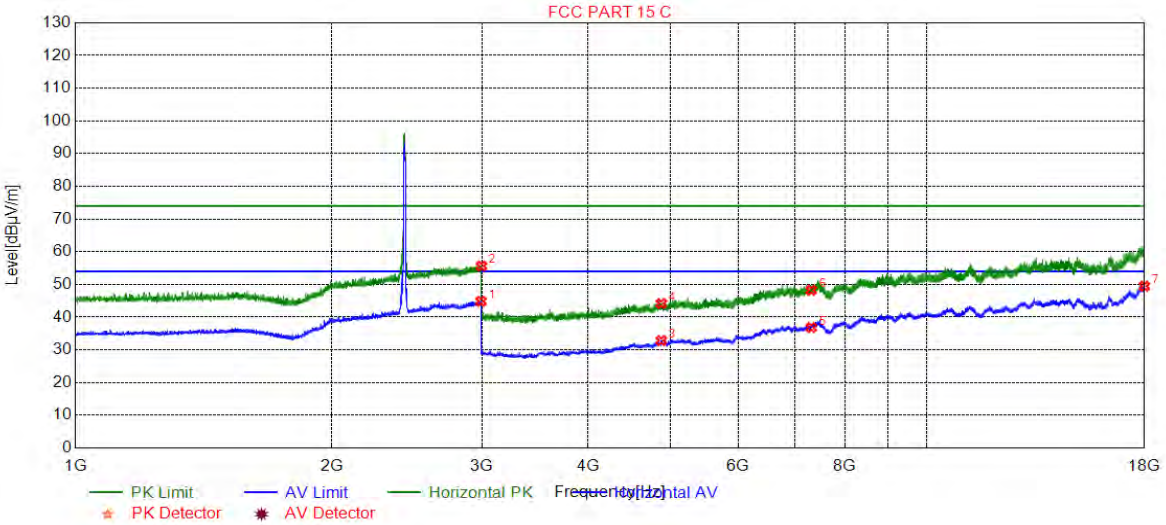
4.9.4 Transmitter emission above 1GHz

4.9.4.1 802.11B_Channel 6



Suspected List					
NO.	Freq. [MHz]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2993.4984	44.87	54.00	9.13	Horizontal
2	2997.4994	55.65	74.00	18.35	Horizontal
3	4874.0000	32.86	54.00	21.14	Horizontal
4	4874.0000	44.17	74.00	29.83	Horizontal
5	7311.0000	36.84	54.00	17.16	Horizontal
6	7311.0000	48.22	74.00	25.78	Horizontal
7	17992.4996	49.47	54.00	4.53	Horizontal

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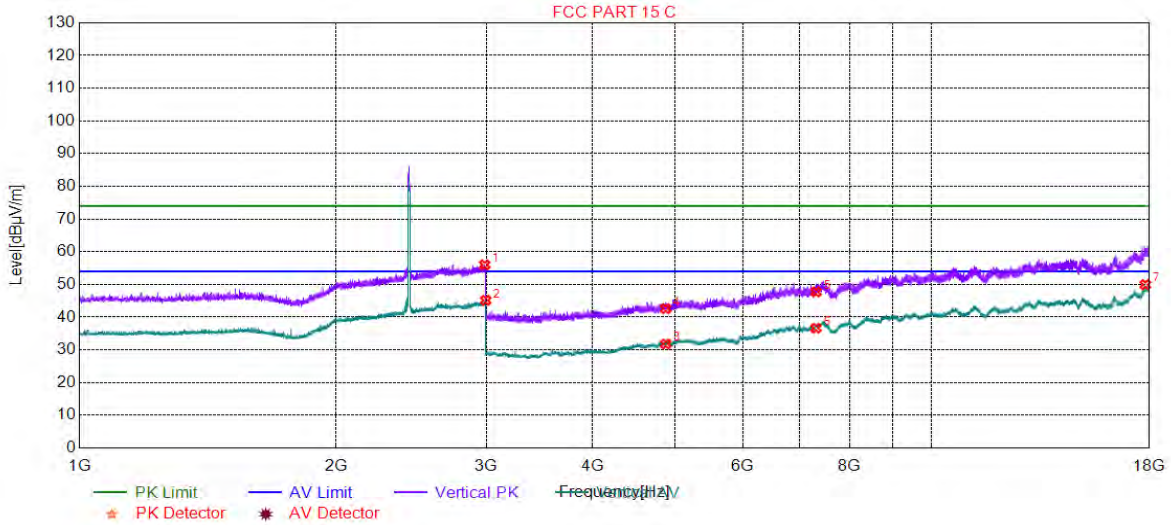
4.9.4.2 802.11B_Channel 6



Suspected List					
NO.	Freq. [MHz]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2987.4969	56.00	74.00	18.00	Vertical
2	2995.9990	45.16	54.00	8.84	Vertical
3	4874.0000	31.81	54.00	22.19	Vertical
4	4874.0000	42.62	74.00	31.38	Vertical
5	7311.0000	47.71	74.00	26.29	Vertical
6	7311.0000	36.65	54.00	17.35	Vertical
7	17801.9901	49.94	54.00	4.06	Vertical

Final Data List

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
   Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor
2) Scan from 9kHz to 25GHz, the disturbance between 9KHz to 30MHz and 18GHz to 25GHz was very low, and the above harmonics were the highest point could be found when testing, The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
3）As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.
4）All Modes have been tested, but only the worst case data displayed in this report.

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4.10 Radiated Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205		
Test Method:	ANSI C63.10: 2013 Section 11.12		
Test Site:	Measurement Distance: 3m or 10m (Semi-Anechoic Chamber)		
Limit:	Frequency	Limit (dBuV/m)	Remark
	30MHz-88MHz	40.0	Quasi-peak
	88MHz-216MHz	43.5	Quasi-peak
	216MHz-960MHz	46.0	Quasi-peak
	960MHz-1GHz	54.0	Quasi-peak
	Above 1GHz	54.0	Average Value
		74.0	Peak Value
Test Setup:			

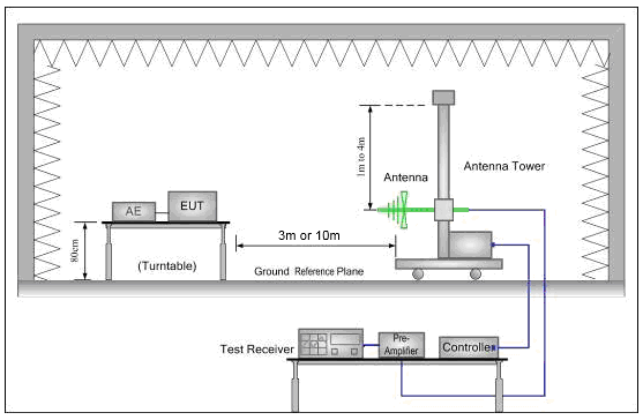

Figure 1. 30MHz to 1GHz

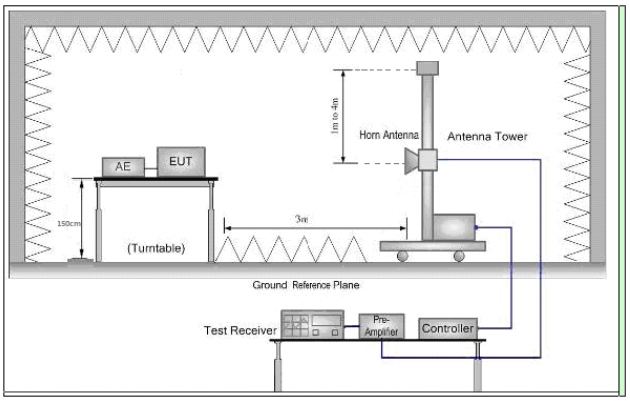

Figure 2. Above 1 GHz

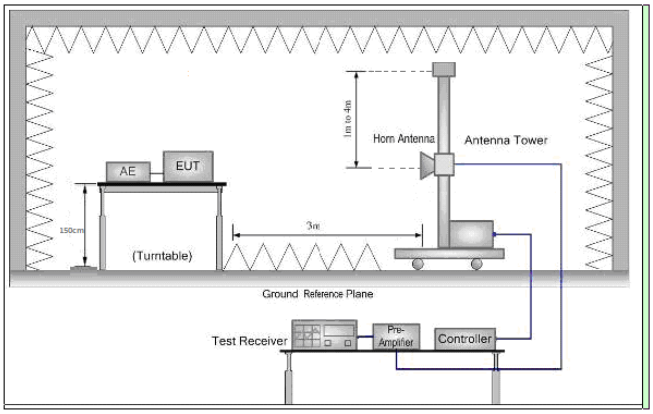

Figure 3. Above 1 GHz

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Test Procedure:	a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. d. The antenna height 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. e. 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. f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. g. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel h. Test the EUT in the lowest channel , the Highest channel i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode,And found the X axis positioning which it is worse case. j. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Charge + Transmitting mode.
Final Test Mode:	Pretest the EUT at Charge + Transmitting mode. Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11B; 6Mbps of rate is the worst case of 802.11G; 6.5Mbps of rate is the worst case of 802.11N(HT20); Only the worst case is recorded in the report.
Instruments Used:	Refer to section 5.10 for details
Test Results:	Pass

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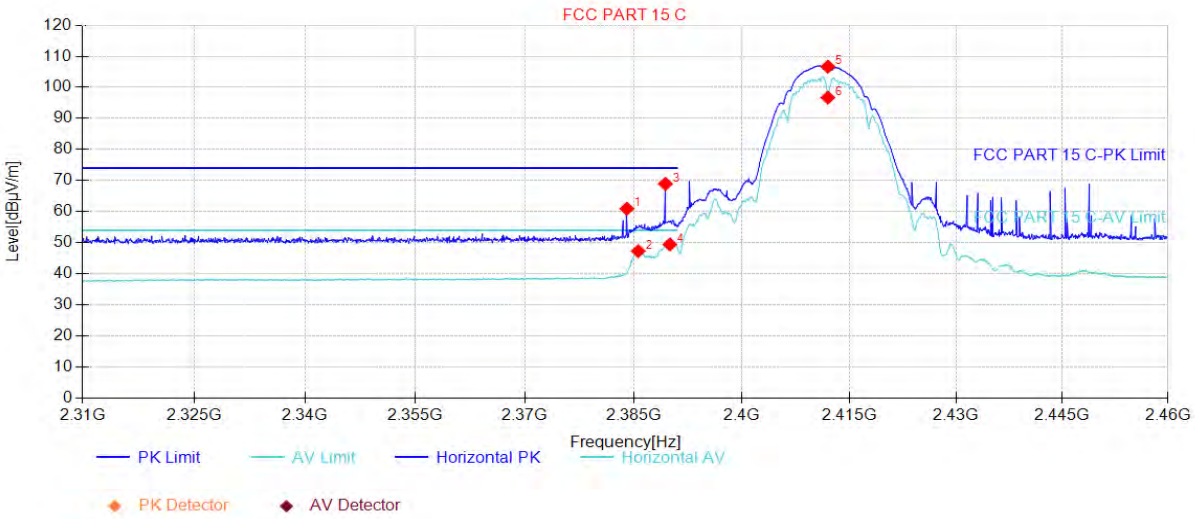
Firstly Supply:

4.10.1 Test Plots

4.10.1.1 802.11B_CH1



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2384.0620	60.94	4.28	74.00	13.06	Horizontal
2	2385.6378	47.28	4.29	54.00	6.72	Horizontal
3	2389.3897	68.91	4.31	74.00	5.09	Horizontal
4	2390.0000	49.42	4.31	54.00	4.58	Horizontal
5	2412.0000	106.67	4.37	0.00	-106.67	Horizontal
6	2412.0000	96.69	4.37	0.00	-96.69	Horizontal

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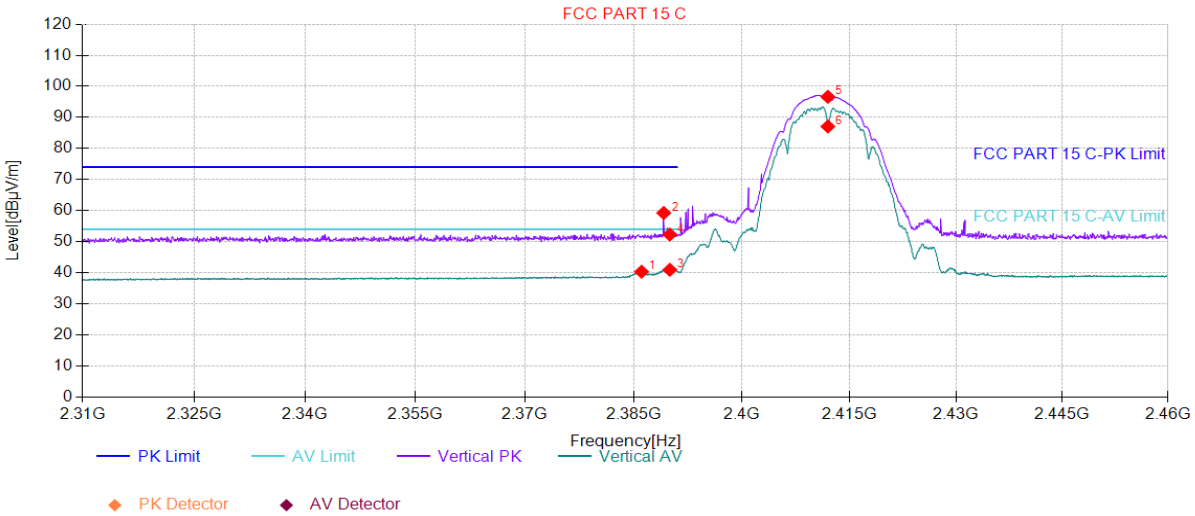
4.10.1.2 802.11B_CH1



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2386.0880	40.31	4.29	54.00	13.69	Vertical
2	2389.1646	59.23	4.30	74.00	14.77	Vertical
3	2390.0000	40.93	4.31	54.00	13.07	Vertical
4	2390.0000	52.28	4.31	74.00	21.72	Vertical
5	2412.0000	96.65	4.37	0.00	-96.65	Vertical
6	2412.0000	87.07	4.37	0.00	-87.07	Vertical

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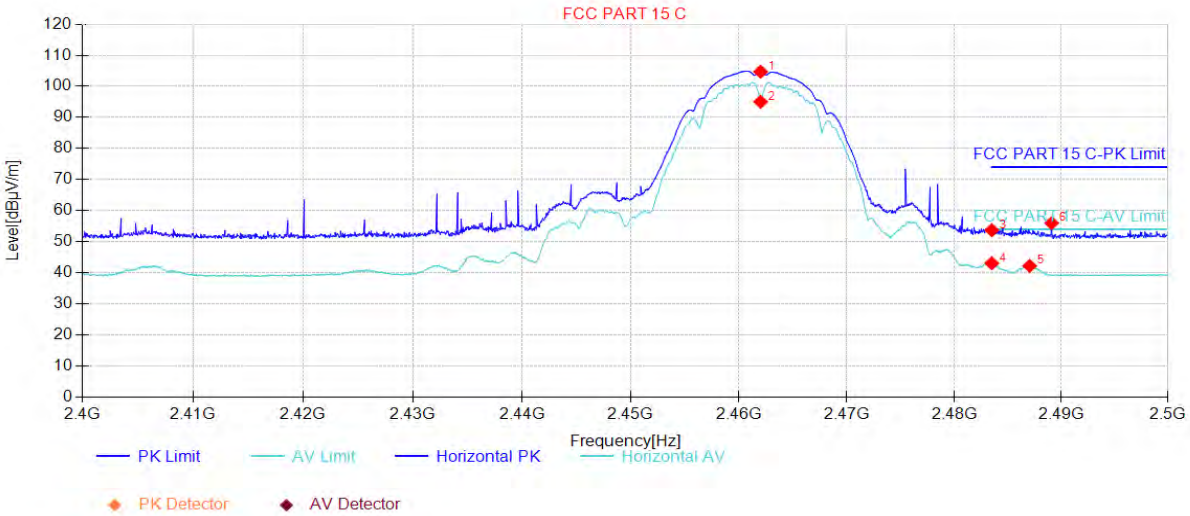
4.10.1.3 802.11B_CH11



Suspected List						
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1	2462.0000	104.74	4.44	0.00	-104.74	Horizontal
2	2462.0000	95.03	4.44	0.00	-95.03	Horizontal
3	2483.5000	53.67	4.47	74.00	20.33	Horizontal
4	2483.5000	43.03	4.47	54.00	10.97	Horizontal
5	2487.0435	42.18	4.47	54.00	11.82	Horizontal
6	2489.0945	55.98	4.47	74.00	18.02	Horizontal

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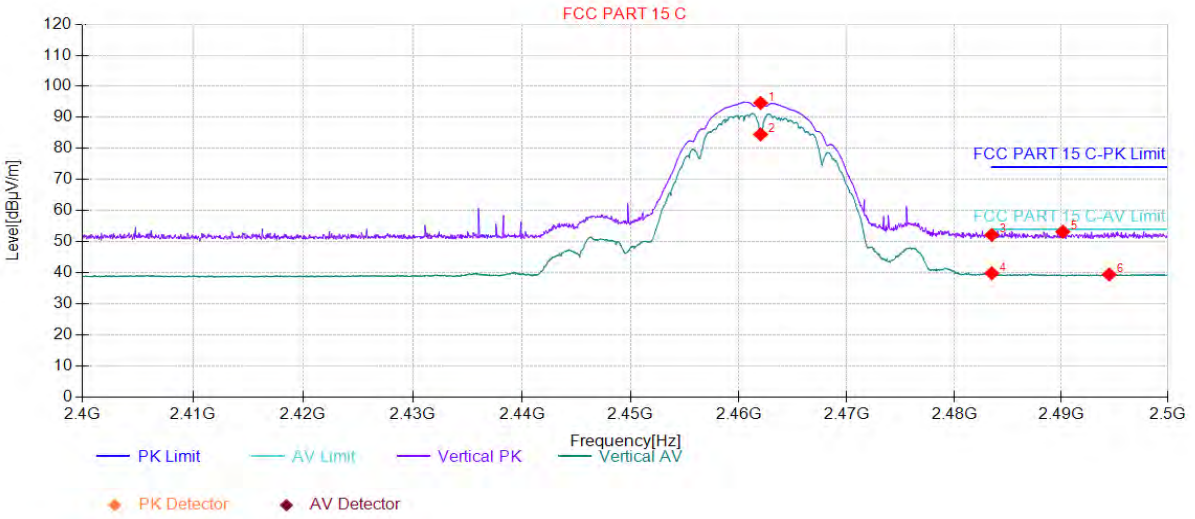
4.10.1.4 802.11B_CH11



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2462.0000	94.67	4.44	0.00	-94.67	Vertical
2	2462.0000	84.53	4.44	0.00	-84.53	Vertical
3	2483.5000	52.15	4.47	74.00	21.85	Vertical
4	2483.5000	39.82	4.47	54.00	14.18	Vertical
5	2490.1451	53.19	4.48	74.00	20.81	Vertical
6	2494.4972	39.41	4.48	54.00	14.59	Vertical

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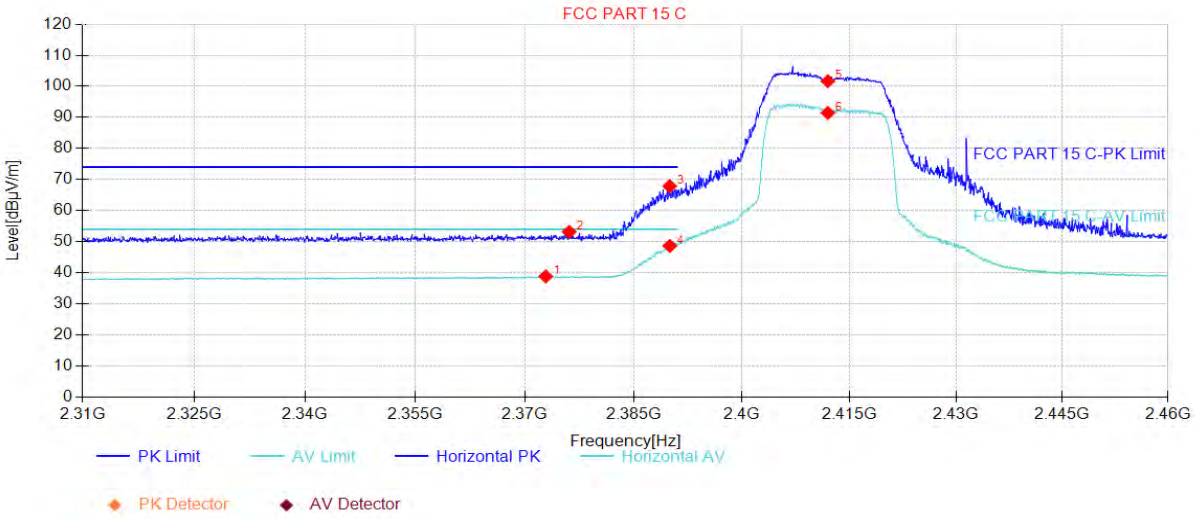
4.10.1.5 802.11G_CH1



Suspected List						
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1	2372.8814	38.79	4.23	54.00	15.21	Horizontal
2	2376.1081	53.14	4.25	74.00	20.86	Horizontal
3	2389.9900	67.86	4.31	74.00	6.14	Horizontal
4	2390.0000	48.62	4.31	54.00	5.38	Horizontal
5	2412.0000	101.67	4.37	0.00	-101.67	Horizontal
6	2412.0000	91.46	4.37	0.00	-91.46	Horizontal

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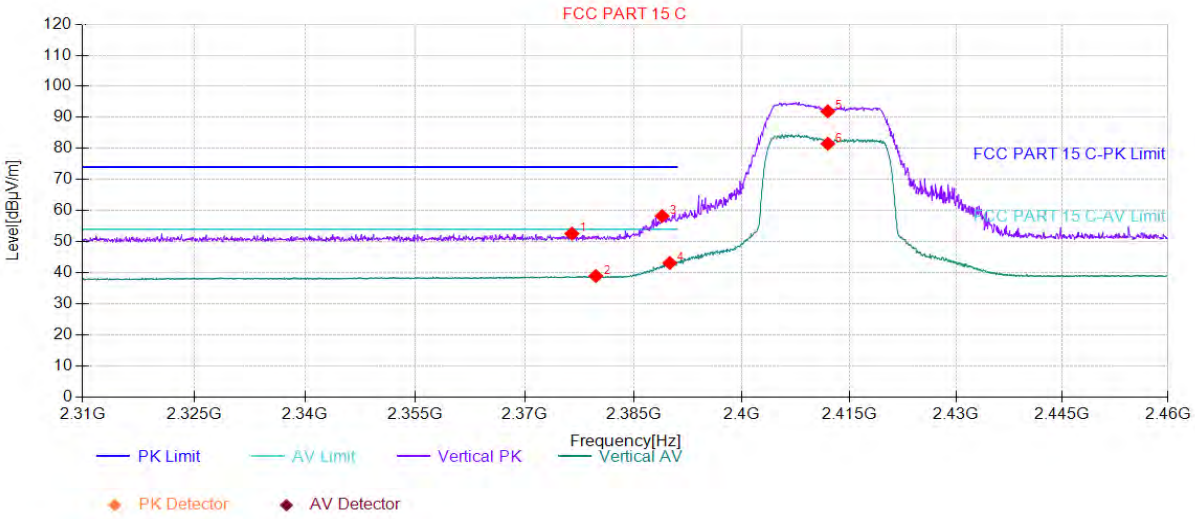
4.10.1.6 802.11G_CH1



Suspected List						
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2376.4832	52.57	4.25	74.00	21.43	Vertical
2	2379.7849	38.91	4.26	54.00	15.09	Vertical
3	2388.9395	58.24	4.30	74.00	15.76	Vertical
4	2390.0000	43.12	4.31	54.00	10.88	Vertical
5	2412.0000	91.95	4.37	0.00	-91.95	Vertical
6	2412.0000	81.55	4.37	0.00	-81.55	Vertical

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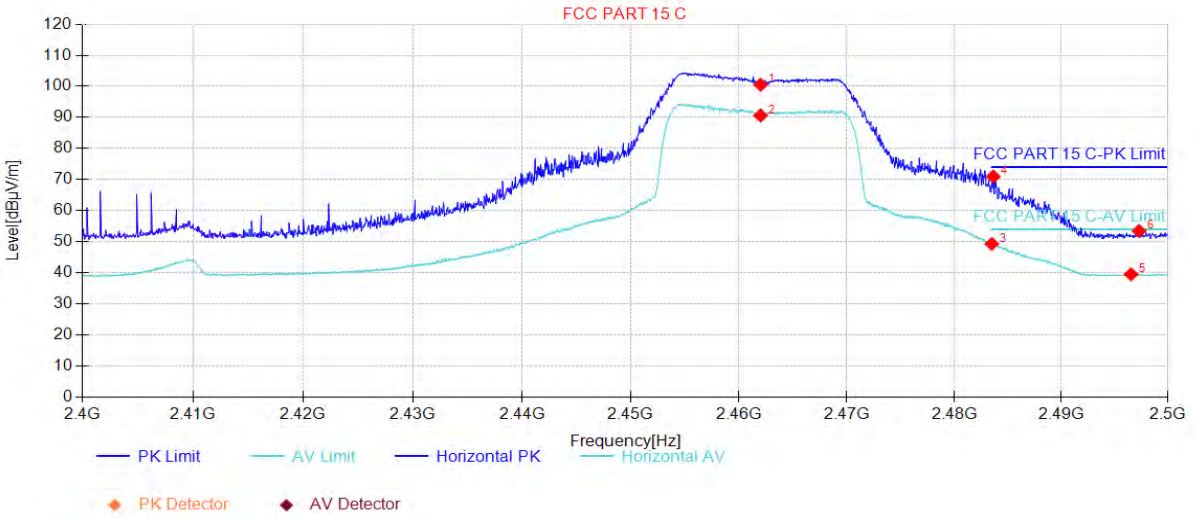
4.10.1.7 802.11G_CH11



Suspected List						
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1	2462.0000	100.51	4.44	0.00	-100.51	Horizontal
2	2462.0000	90.60	4.44	0.00	-90.60	Horizontal
3	2483.5000	49.27	4.47	54.00	4.73	Horizontal
4	2483.6418	70.97	4.47	74.00	3.03	Horizontal
5	2496.5483	39.49	4.49	54.00	14.51	Horizontal
6	2497.2986	53.43	4.49	74.00	20.57	Horizontal

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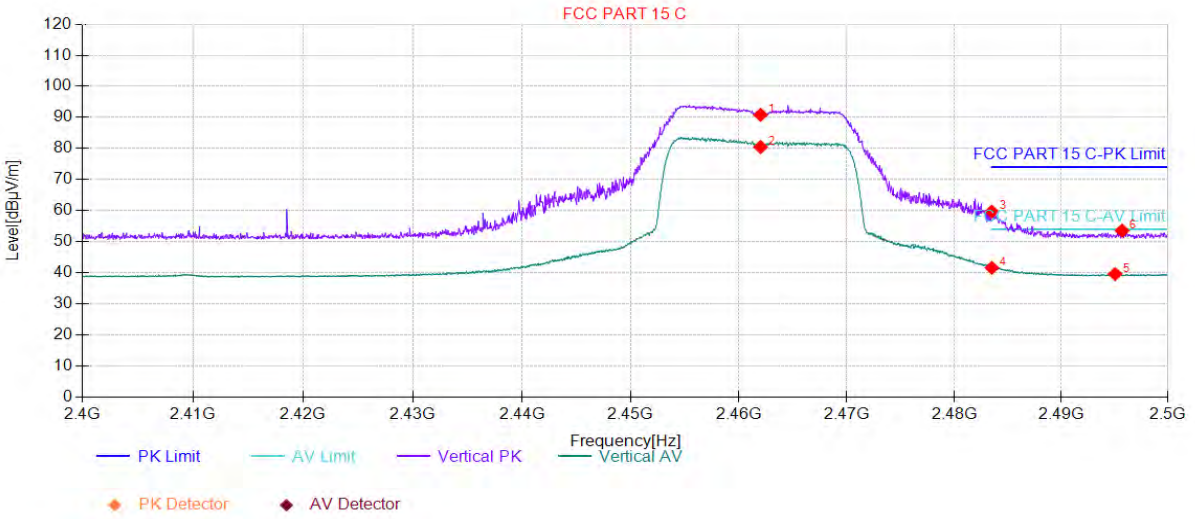
4.10.1.8 802.11G_CH11



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1	2462.0000	90.84	4.44	0.00	-90.84	Vertical
2	2462.0000	80.45	4.44	0.00	-80.45	Vertical
3	2483.5000	59.66	4.47	74.00	14.34	Vertical
4	2483.5000	41.58	4.47	54.00	12.42	Vertical
5	2495.0475	39.57	4.48	54.00	14.43	Vertical
6	2495.6978	53.54	4.48	74.00	20.46	Vertical

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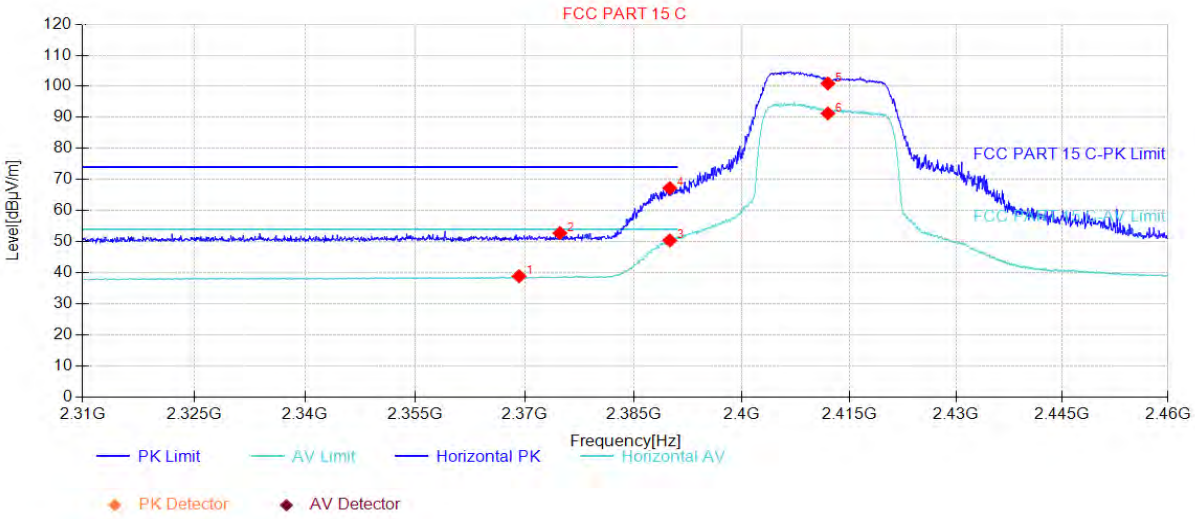
4.10.1.9 802.11N20_CH1



Suspected List						
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1	2369.2046	38.85	4.22	54.00	15.15	Horizontal
2	2374.8324	52.73	4.24	74.00	21.27	Horizontal
3	2390.0000	50.39	4.31	54.00	3.61	Horizontal
4	2390.0000	67.25	4.31	74.00	6.75	Horizontal
5	2412.0000	100.95	4.37	0.00	-100.95	Horizontal
6	2412.0000	91.29	4.37	0.00	-91.29	Horizontal

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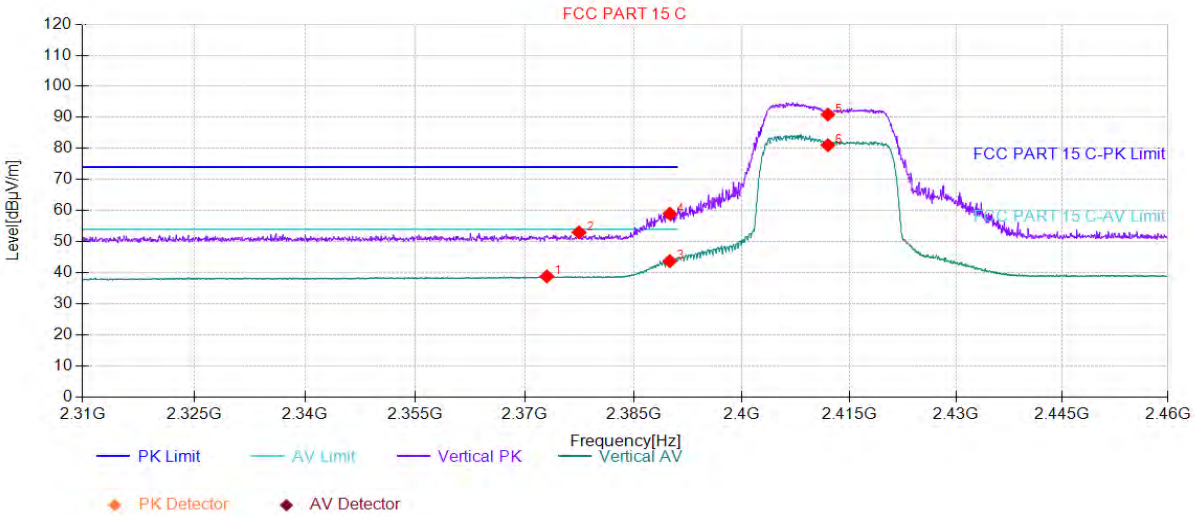
4.10.1.10 802.11N20_CH1



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2373.0315	38.79	4.23	54.00	15.21	Vertical
2	2377.4587	52.98	4.25	74.00	21.02	Vertical
3	2390.0000	43.72	4.31	54.00	10.28	Vertical
4	2390.0000	59.00	4.31	74.00	15.00	Vertical
5	2412.0000	90.95	4.37	0.00	-90.95	Vertical
6	2412.0000	81.07	4.37	0.00	-81.07	Vertical

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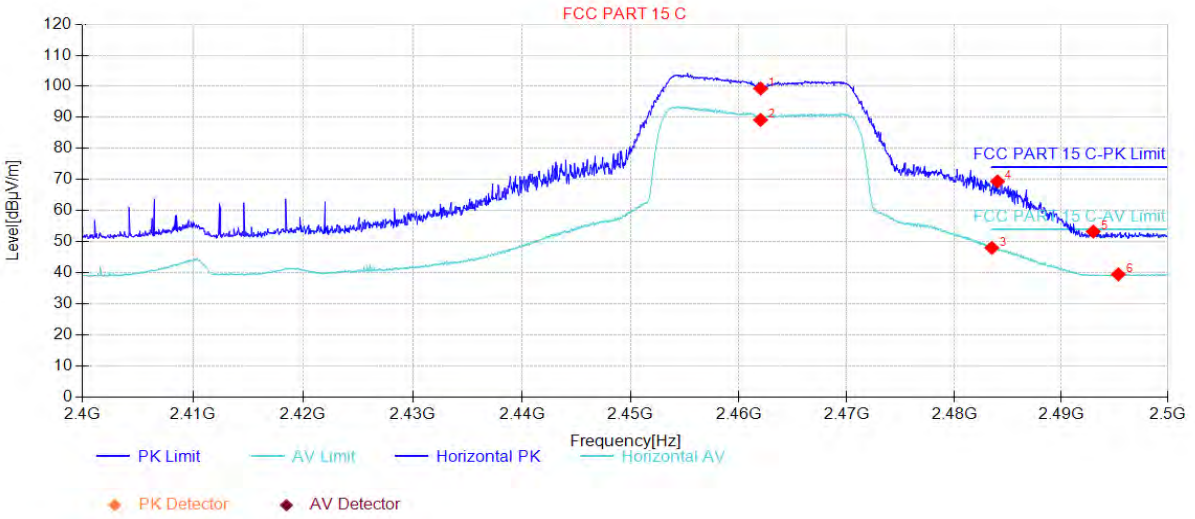
4.10.1.11 802.11N20_CH11



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2462.0000	99.30	4.44	0.00	-99.30	Horizontal
2	2462.0000	89.18	4.44	0.00	-89.18	Horizontal
3	2483.5000	48.00	4.47	54.00	6.00	Horizontal
4	2484.0420	69.39	4.47	74.00	4.61	Horizontal
5	2492.9965	53.24	4.48	74.00	20.76	Horizontal
6	2495.3477	39.47	4.48	54.00	14.53	Horizontal

Final Data List

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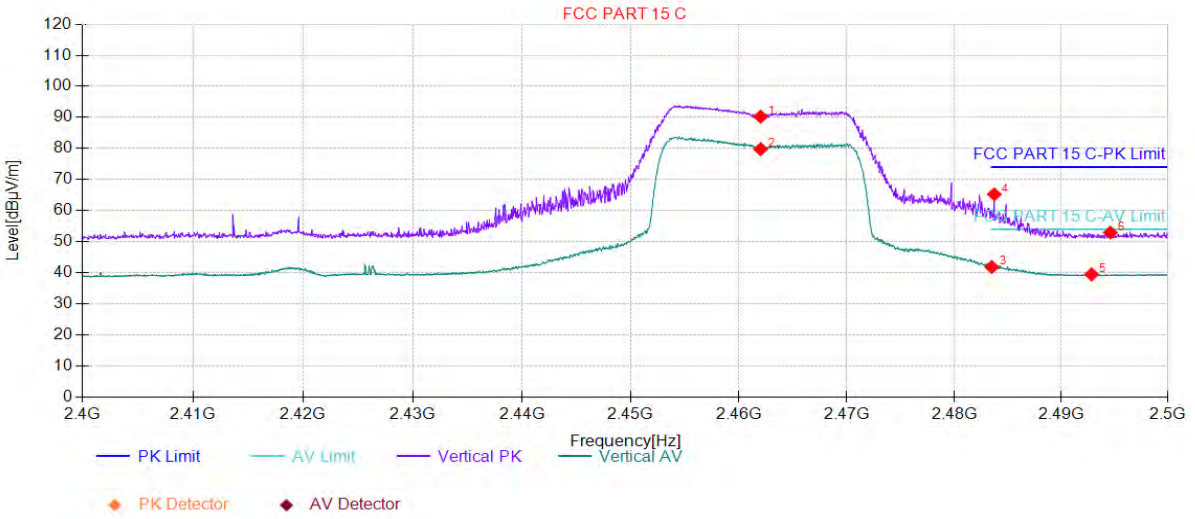
4.10.1.12 802.11N20_CH11



Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2462.0000	90.26	4.44	0.00	-90.26	Vertical
2	2462.0000	79.78	4.44	0.00	-79.78	Vertical
3	2483.5000	41.84	4.47	54.00	12.16	Vertical
4	2483.7419	65.23	4.47	74.00	8.77	Vertical
5	2492.8464	39.45	4.48	54.00	14.55	Vertical
6	2494.5973	52.90	4.48	74.00	21.10	Vertical

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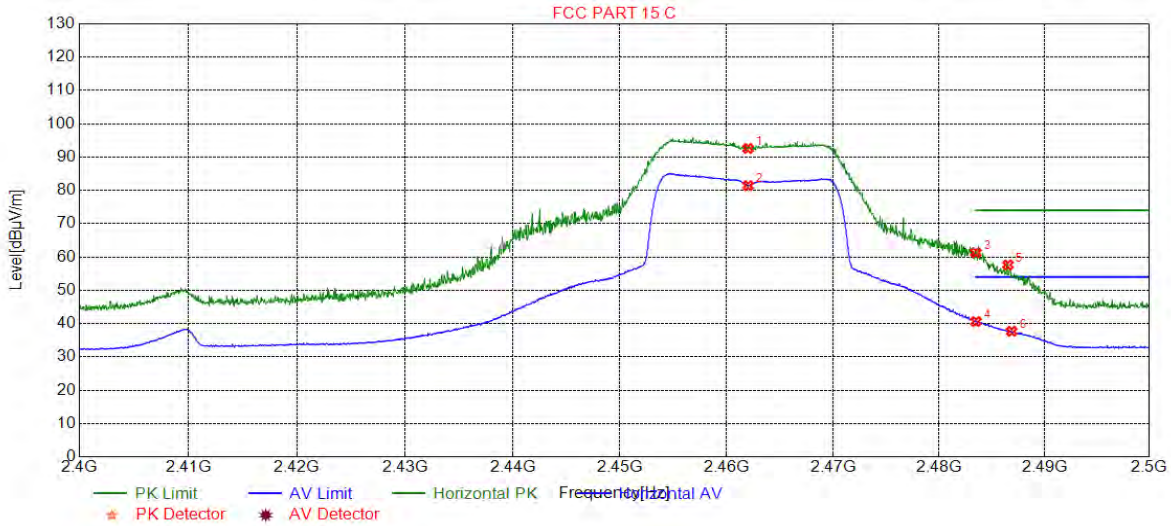
Secondly Supply:

4.10.1.13 802.11G_Channel 11



Suspected List					
NO.	Freq. [MHz]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2462.0000	92.57	0.00	-92.57	Horizontal
2	2462.0000	81.42	0.00	-81.42	Horizontal
3	2483.5000	61.33	74.00	12.67	Horizontal
4	2483.5000	40.63	54.00	13.37	Horizontal
5	2486.5433	57.65	74.00	16.35	Horizontal
6	2486.8934	37.71	54.00	16.29	Horizontal

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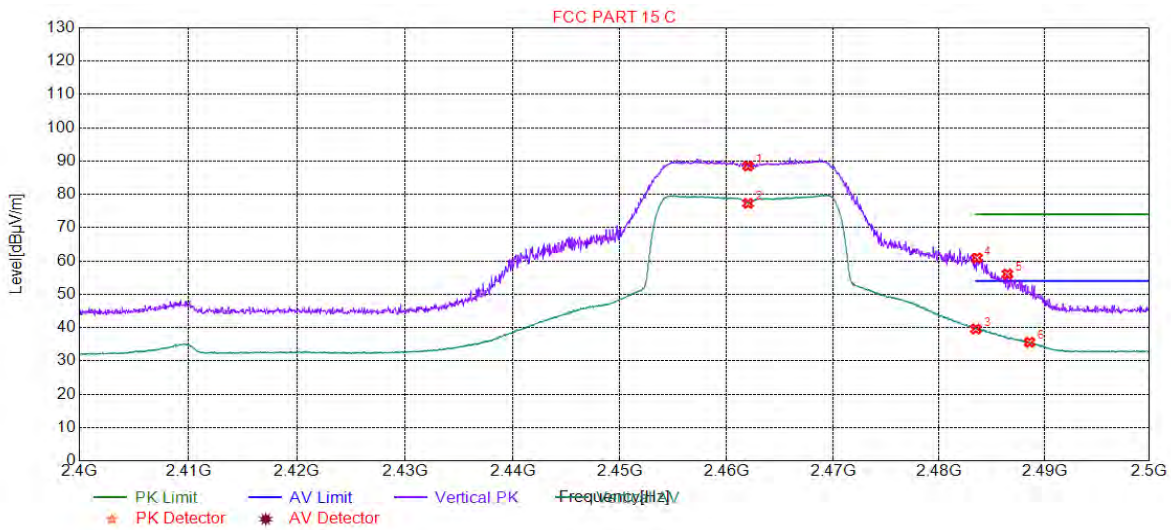
4.10.1.14 802.11G_Channel 11



Suspected List					
NO.	Freq. [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2462.0000	88.50	0.00	-88.50	Vertical
2	2462.0000	77.31	0.00	-77.31	Vertical
3	2483.5000	39.60	54.00	14.40	Vertical
4	2483.5918	60.94	74.00	13.06	Vertical
5	2486.4932	56.09	74.00	17.91	Vertical
6	2488.5943	35.63	54.00	18.37	Vertical

Final Data List

Remark:
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor
All Modes have been tested, but only the worst case data displayed in this report.

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5 Measurement Uncertainty (95% confidence levels, k=2)

Lab A:

No.	Item	Measurement Uncertainty
1	Total RF power, conducted	±0.75dB
2	RF power density, conducted	±2.84dB
3	Spurious emissions, conducted	±0.75dB
4	Temperature test	±1°C
5	Humidity test	±3%
6	DC and low frequency voltages	±0.5%

Lab B:

No.	Item	Measurement Uncertainty
1	Conduction Emission	± 3.0dB (150kHz to 30MHz)
2	Radiated Emission	± 4.8dB (Below 1GHz)
		± 4.8dB (1GHz to 6GHz)
		± 4.5dB (6GHz to 18GHz)
		± 5.02dB (Above 18GHz)

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6 Equipment List

RF conducted test					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy-mm-dd)	Cal.Duedate (yyyy-mm-dd)
DC Power Supply	Agilent Technologie Inc	66311B	W009-09	2020/7/15	2021/7/15
Signal Analyzer	Rohde & Schwarz	FSV	W025-05	2020/1/3	2021/1/2
Coaxial Cable	SGS	N/A	SEM031-01	2020/6/12	2021/6/11
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2020/7/14	2021/7/14
Temperature Chamber	GIANT FORCE	ICT-150-40-CP AR	W027-03	2020/10/27	2021/10/27
				2019/10/26	2020/10/27
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2020/7/14	2021/7/14

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CE Test System					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Shielding Room	Brilliant-emc	N/A	XAW03-35-01	2019-09-11	2022-09-10
Test receiver	ROHDE&SCHWARZ	ESR	XAW01-08-05	2020-04-12	2021-04-11
Artificial network	ROHDE&SCHWARZ	ENV216	XAW01-04-01	2020-08-04	2021-08-03
Temperature and humidity meter	MingGao	TH101B	XAW01-01-01	2019-12-06	2020-12-05
				2020-11-06	2021-11-05
Measurement Software	Tonscend	TS+ CE V2.5	XAW02-05-02	NCR	NCR

RSE Test System					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Semi-Anechoic Chamber	Brilliant-emc	N/A	XAW03-35-01	2019-09-11	2022-09-10
MXA signal analyzer	Keysight	N9020A	XAW01-06-01	2020-04-02	2021-04-01
Test receiver	ROHDE&SCHWARZ	ESR	XAW01-08-01	2020-09-11	2021-09-10
Receiving antenna (30MHz-3GHz)	Schwarzbeck	VULB 9163	XAW01-09-01	2019-10-13	2021-10-12
Receiving antenna (1GHz~18GHz)	Schwarzbeck	BBHA 9120D	XAW01-09-02	2019-10-13	2021-10-12
Receiving antenna (15GHz~40GHz)	Schwarzbeck	BBHA 9170	XAW01-09-03	2019-10-13	2021-10-12
Directional antenna rack controller	Max-Full	MF-7802BS	XAW03-03-01	NCR	NCR
High-speed antenna rack controller	Max-Full	MF-7802	XAW03-04-01	NCR	NCR
Filter bank	Tonscend	JS0806-F	XAW03-05-01	NCR	NCR
Filter bank	Tonscend	JS0806s	XAW03-05-02	NCR	NCR
Amplifier	Tonscend	TAP00903040	XAW01-41-01	2019-11-18	2020-11-17
				2020-10-26	2021-10-25
Amplifier	Tonscend	TAP01018048	XAW01-41-02	2019-11-18	2020-11-17
				2020-10-26	2021-10-25
Amplifier	Tonscend	TAP18040048	XAW01-41-03	2019-12-03	2020-12-02
				2020-10-27	2021-10-26
Amplifier	Shanghai Steed	YX28980930	XAW01-41-06	2019-11-18	2020-11-17
				2020-10-26	2021-10-25
Temperature and humidity meter	MingGao	TH101B	XAW01-01-01	2019-12-06	2020-12-05
				2020-11-06	2021-11-05
Measurement Software	Tonscend	TS+ RSE V3.0.0.2	XAW02-05-01	NCR	NCR

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7 Photographs - EUT Constructional Details

Refer to Appendix A - Photographs of Set-Up for ZR/2020/A0016.

The End

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