

FCC TEST REPORT

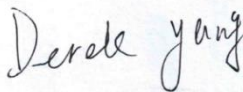
Application No.: ZR/2020/A0016
Applicant: HMD global Oy
Address of Applicant: Bertel Jungin aukio 9, 02600 Espoo, Finland
Manufacturer: HMD global Oy
Address of Manufacturer: Bertel Jungin aukio 9, 02600 Espoo, Finland
EUT Description: Smart Phone
Model No.: TA-1329
Trade Mark: NOKIA
FCC ID: 2AJOTTA-1329
Standards: 47 CFR FCC Part 2, Subpart J
 47 CFR Part 15, Subpart C
Date of Receipt: 2020/10/19(for original report ZR/2020/A001604)
Date of Test: 2020/10/23 to 2020/12/10(for original report ZR/2020/A001604)
Date of Issue: 2020/12/11(for original report ZR/2020/A001604)
 2020/12/16(for new report ZR/2020/A001610)

Test Result :	PASS *
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* 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 Signature:



Derek Yang
 Wireless Laboratory Manager



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1 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2020-12-11		Original

Authorized for issue by:			
Tested By		 <hr/> (Mike Hu) /Project Engineer	
Checked By		 <hr/> (David Chen) /Reviewer	



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2 Test Summary

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



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Remark:

This test report (Report No.: ZR/2020/A001610) is based on the original test report (Report No.: ZR/2020/A001604) issued on 2020-12-11.

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 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 based on the previous report with report number ZR/2020/A001604.



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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

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



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3.3 Test Facility

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

• **CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

• **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.

• **Industry Canada (IC)**

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.



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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	<input checked="" type="checkbox"/> 802.11B (20 MHz channel bandwidth), <input checked="" type="checkbox"/> 802.11G (20 MHz channel bandwidth), <input checked="" type="checkbox"/> 802.11N (20 MHz channel bandwidth), <input type="checkbox"/> 802.11N (40 MHz channel bandwidth)
Operation Frequency:	2400 MHz -2483.5MHz $f_c = 2407 \text{ MHz} + N * 5 \text{ MHz}$, 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:	<input checked="" type="checkbox"/> Portable Device, <input type="checkbox"/> Module
Antenna Type:	<input type="checkbox"/> External, <input checked="" type="checkbox"/> Integrated
Antenna Ports	<input checked="" type="checkbox"/> Ant 1, <input type="checkbox"/> Ant 2, <input type="checkbox"/> Ant 3
Smart System	<input checked="" type="checkbox"/> SISO (for 802.11B/G/N), <input type="checkbox"/> MIMO (for 802.11N): 2 Tx & 2 Rx, <input type="checkbox"/> Diversity (for 802.11B/G) : Tx & Rx
Antenna Gain:	-1.0dBi
Power Supply	<input checked="" type="checkbox"/> AC/DC Adapter; <input type="checkbox"/> Battery <input type="checkbox"/> PoE;; <input type="checkbox"/> 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)
<p>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.</p> <p>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.</p>	
<p>The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is -1.0dBi.</p>	



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:	<p>1) The mains terminal disturbance voltage test was conducted in a shielded room.</p> <p>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.</p> <p>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,</p> <p>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.</p>		



<p>Test Setup:</p>	
<p>Exploratory Test Mode:</p>	<p>Transmitting with all kind of modulations, data rates at lowest, middle and highest channel. Charge + Transmitting mode.</p>
<p>Final Test Mode:</p>	<p>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.</p>
<p>Instruments Used:</p>	<p>Refer to section 5.10 for details</p>
<p>Test Results:</p>	<p>Pass</p>



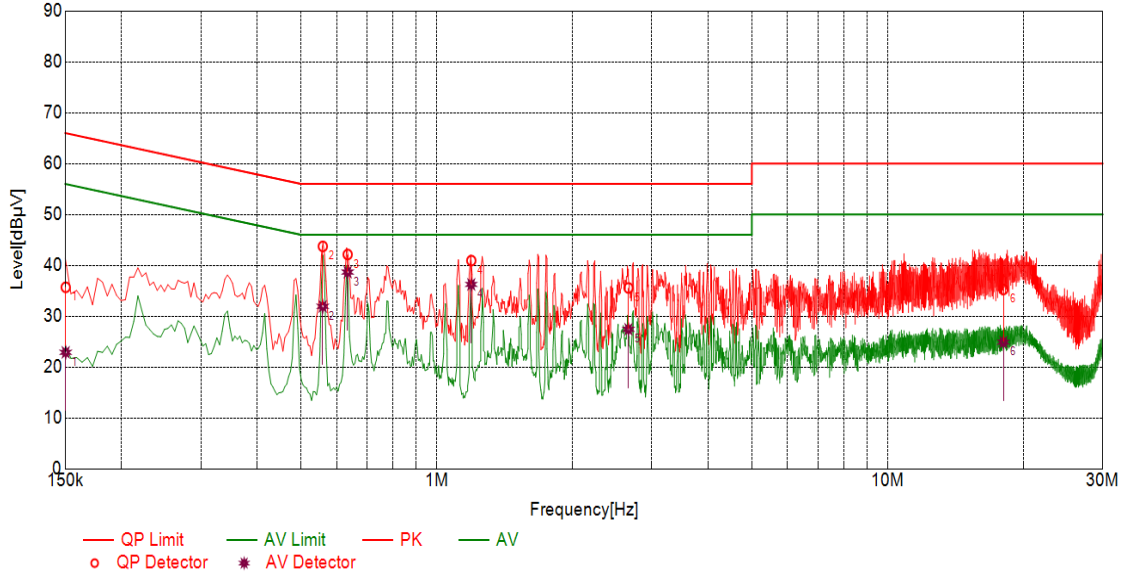
Measurement Data

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:

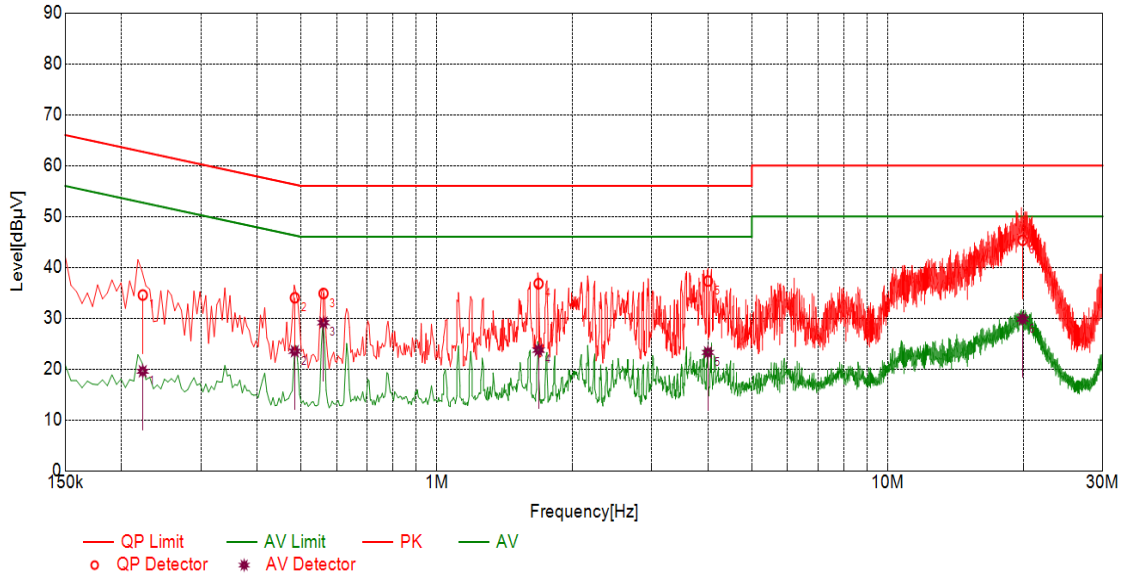


Final Data List									
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Type
1	0.1504	10.10	35.68	65.98	30.30	22.89	55.98	33.09	L
2	0.5589	10.10	43.73	56.00	12.27	31.93	46.00	14.07	L
3	0.6347	10.10	42.13	56.00	13.87	38.67	46.00	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:



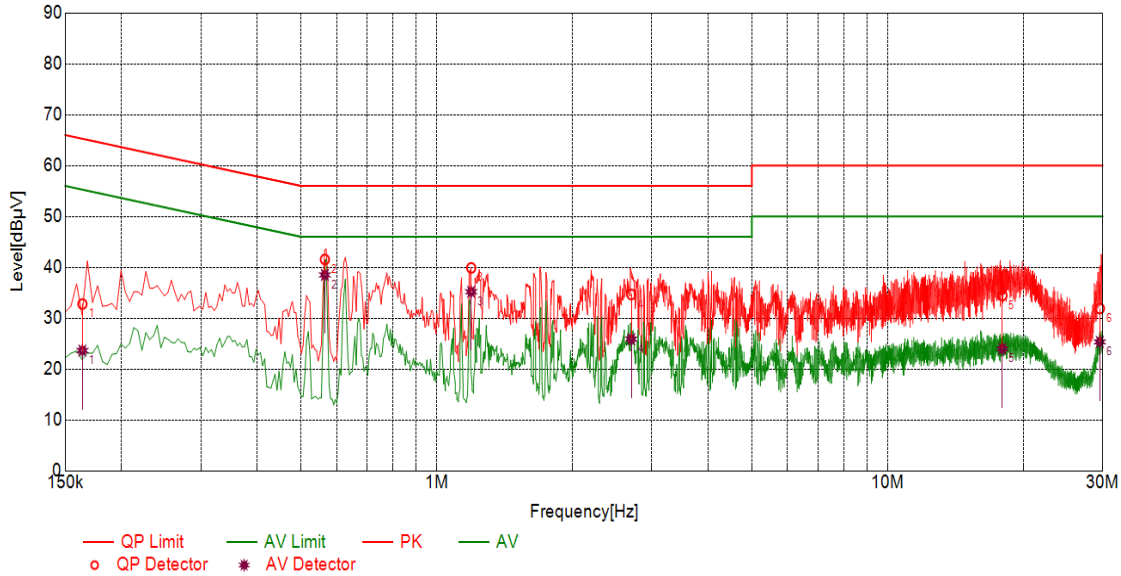
Final Data List									
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Type
1	0.2229	10.10	34.55	62.71	28.16	19.57	52.71	33.14	N
2	0.4845	10.10	34.02	56.26	22.24	23.50	46.26	22.76	N
3	0.5609	10.10	34.86	56.00	21.14	29.13	46.00	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:

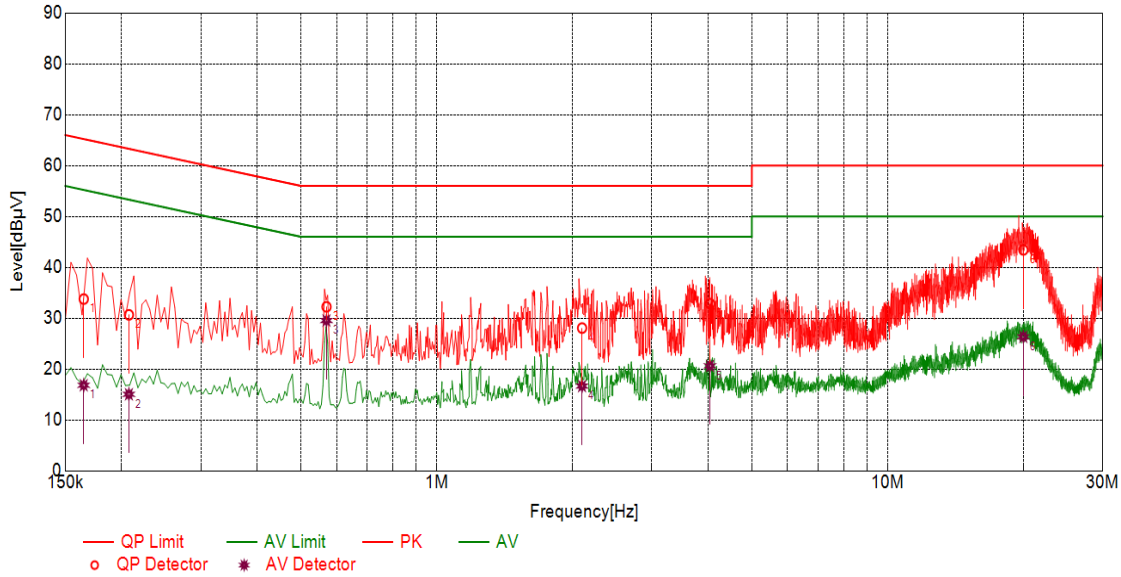


Final Data List									
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Type
1	0.1638	10.10	32.79	65.27	32.48	23.64	55.27	31.63	L
2	0.5650	10.10	41.55	56.00	14.45	38.51	46.00	7.49	L
3	1.1924	10.10	39.89	56.00	16.11	35.20	46.00	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.



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

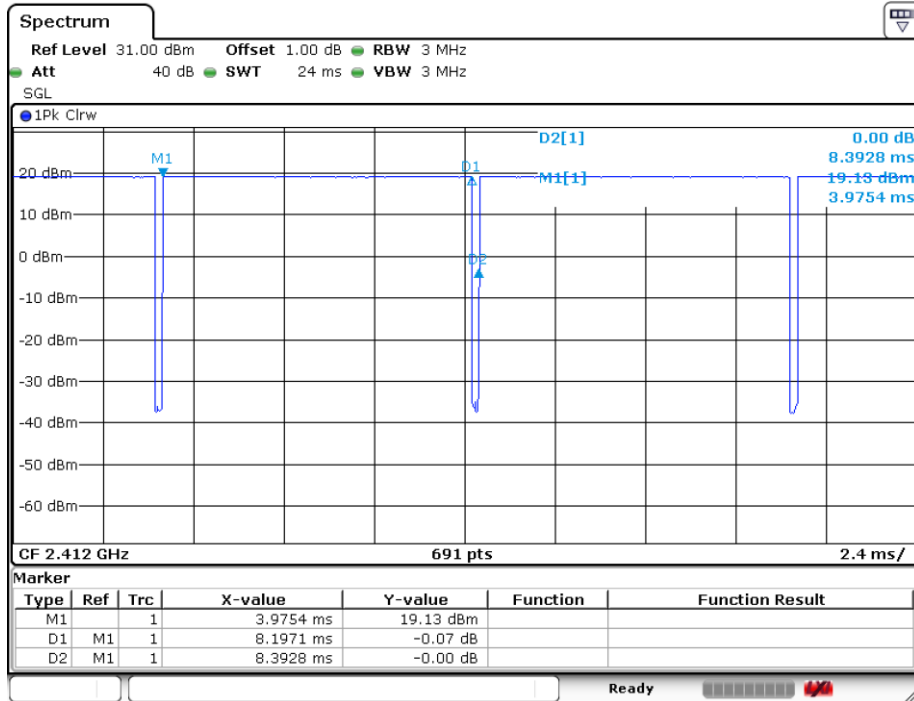


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4.3.2 Test Plots

4.3.2.1 ANT1

4.3.2.1.1 11B



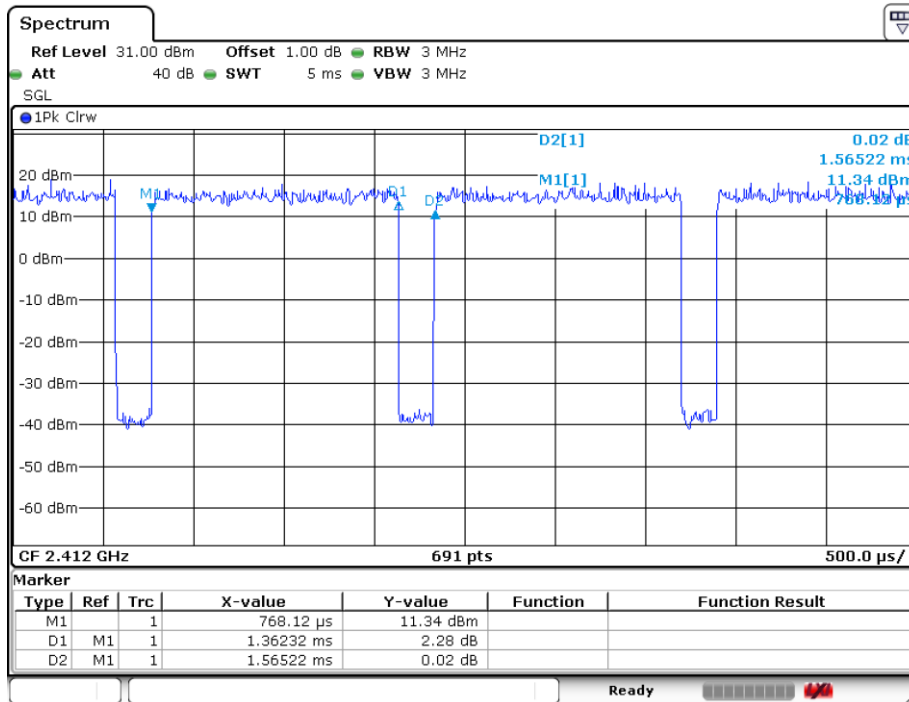
Date: 8.NOV.2020 14:58:49



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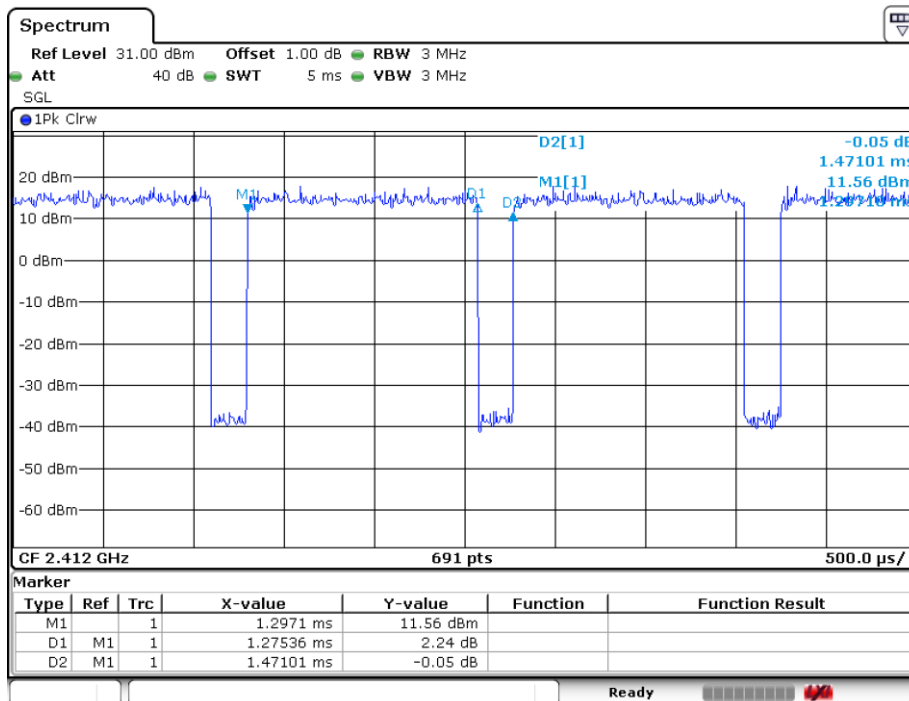
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4.3.2.1.2 11G



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

4.3.2.1.3 11N20

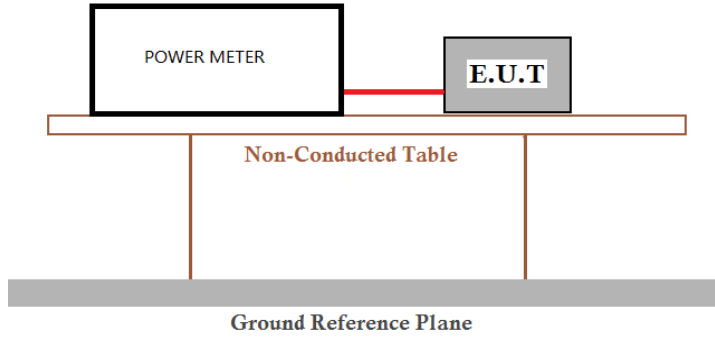


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4.4 Conducted Output Power

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

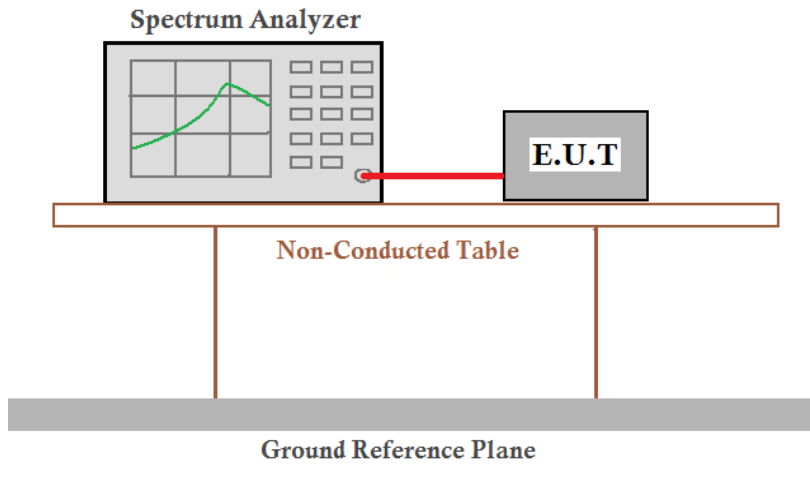
Measurement Data of Peak Power:

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

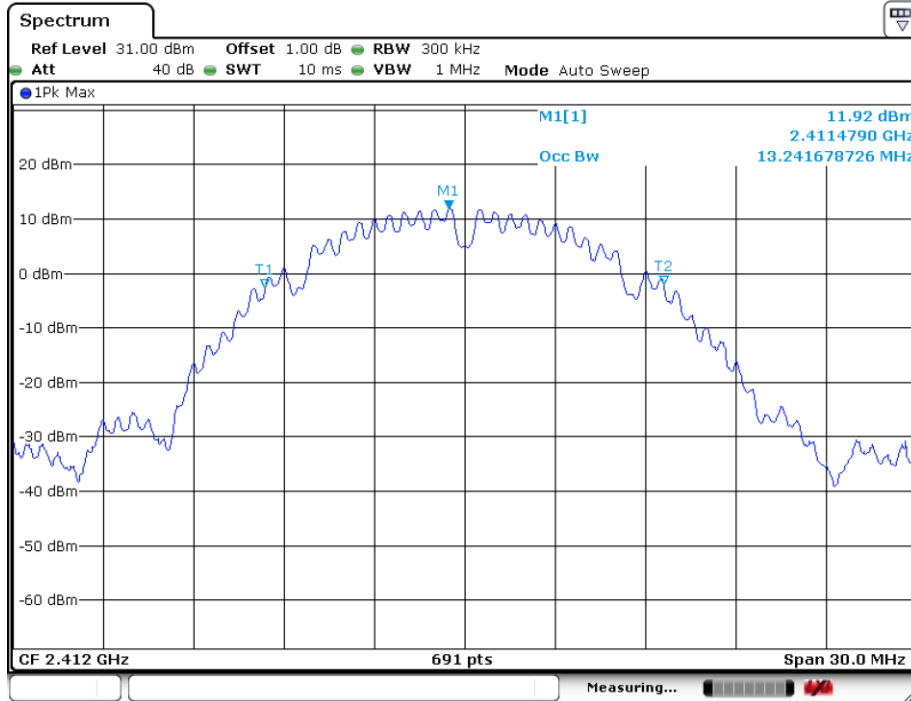


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4.5.2 Test Plots

4.5.2.1 ANT1

4.5.2.1.1 802.11B_Lowest Channel

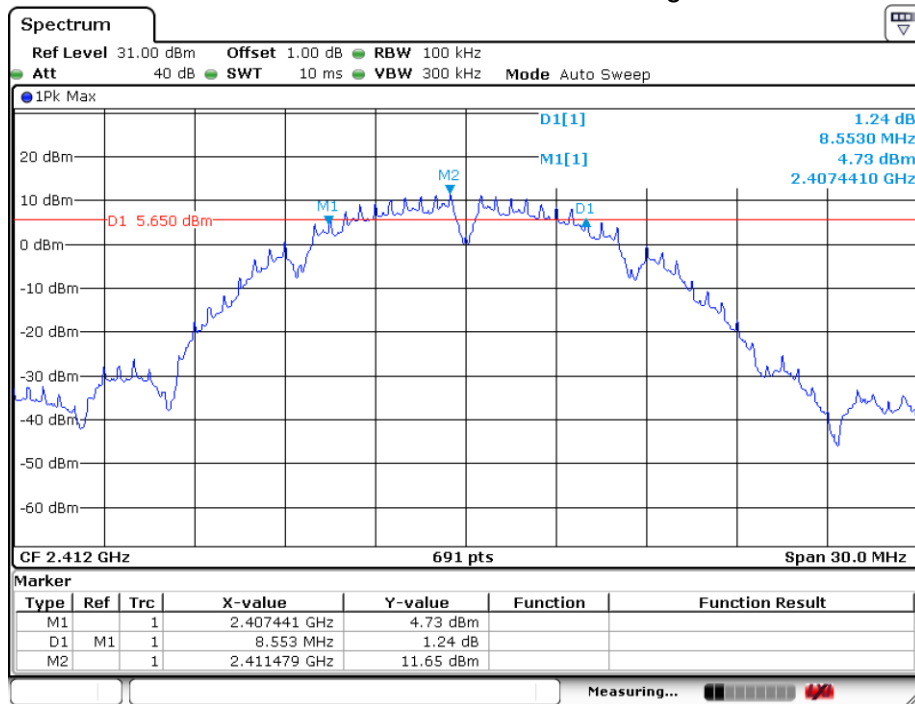


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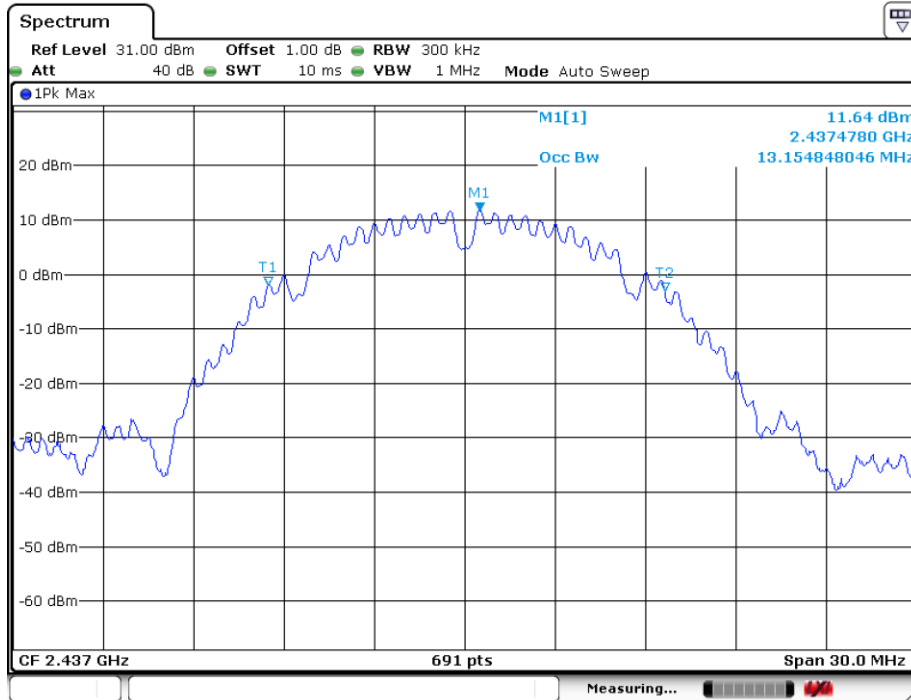
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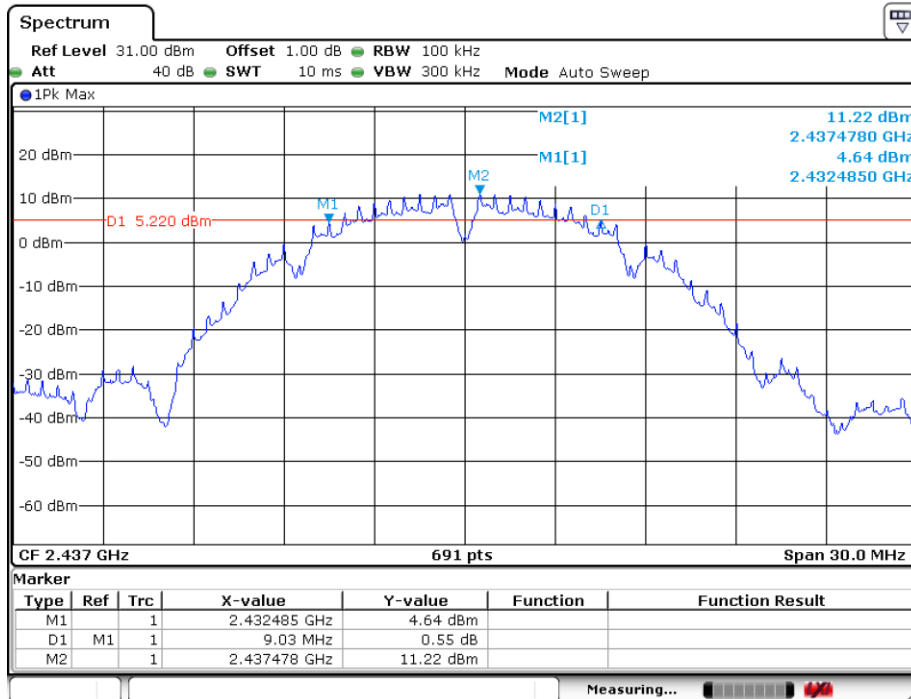
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4.5.2.1.2 802.11B_Middle Channel



Date: 8.NOV.2020 14:44:03

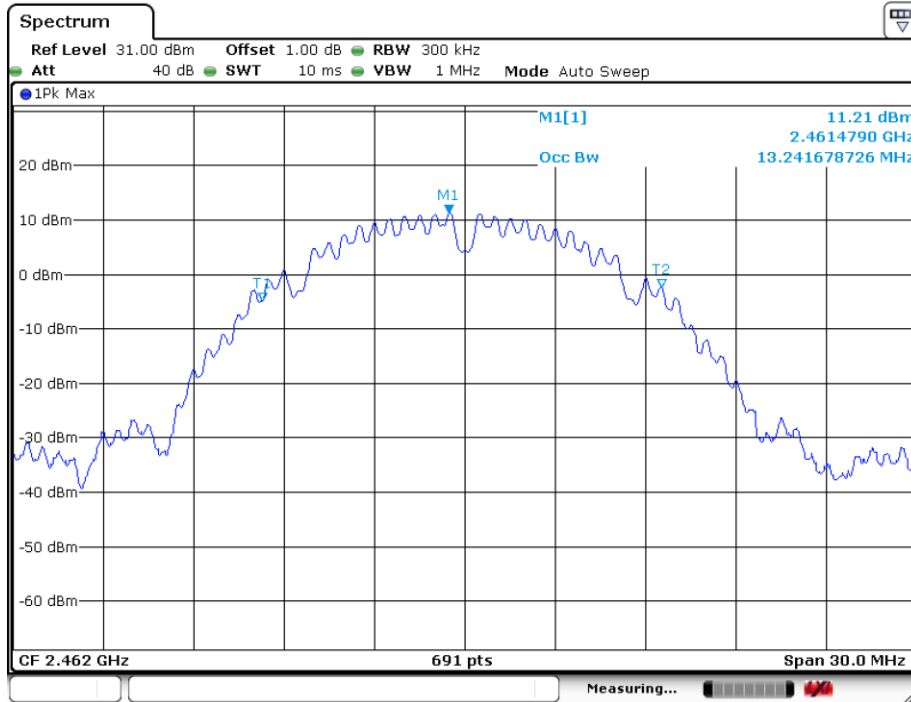


Date: 8.NOV.2020 14:31:12

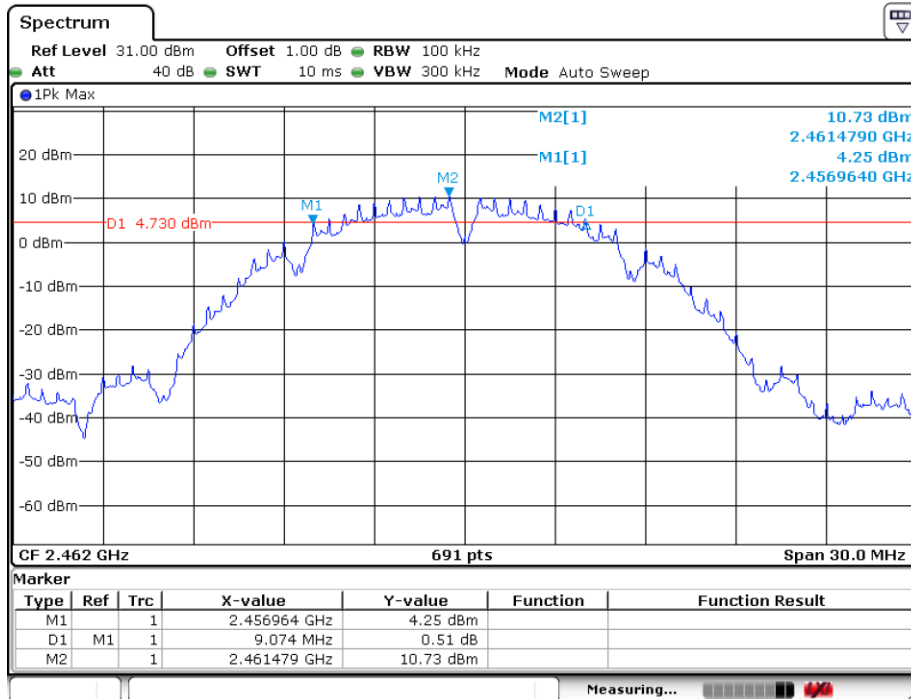


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4.5.2.1.3 802.11B_Highest Channel



Date: 8.NOV.2020 14:44:21

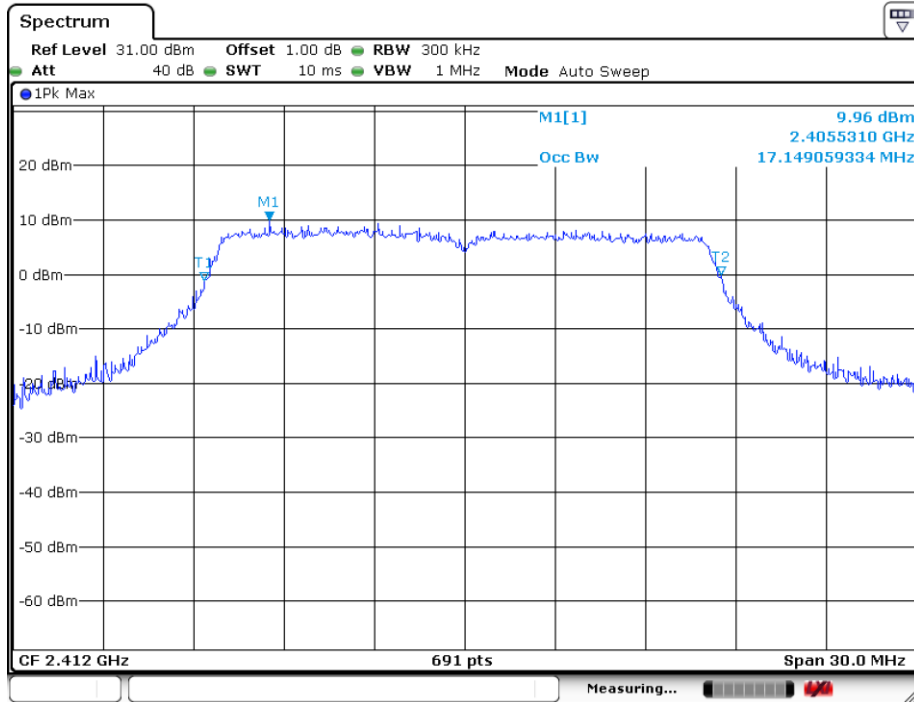


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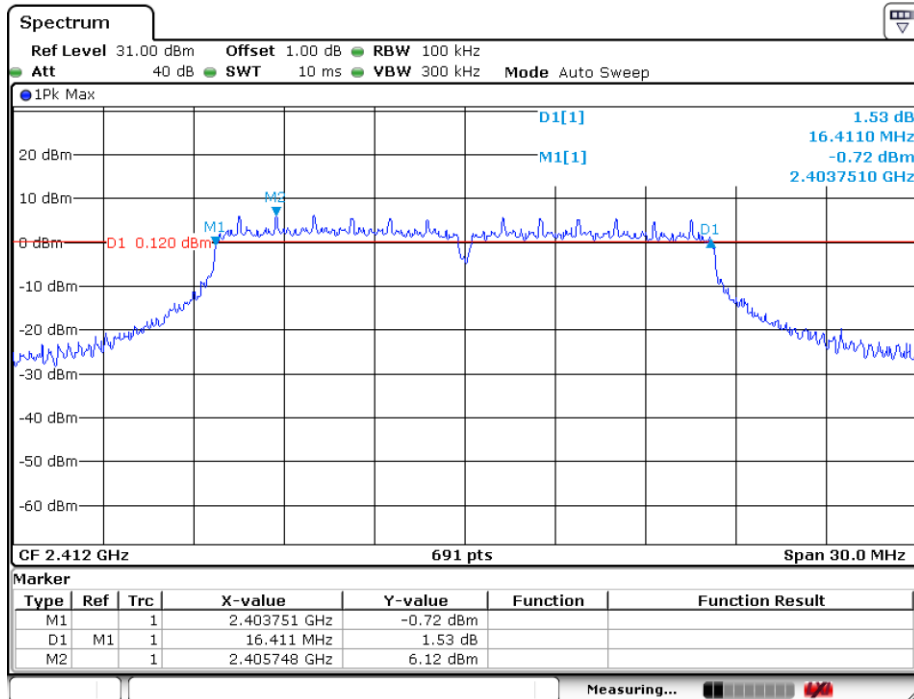


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4.5.2.1.4 802.11G_Lowest Channel



Date: 8.NOV.2020 14:45:21

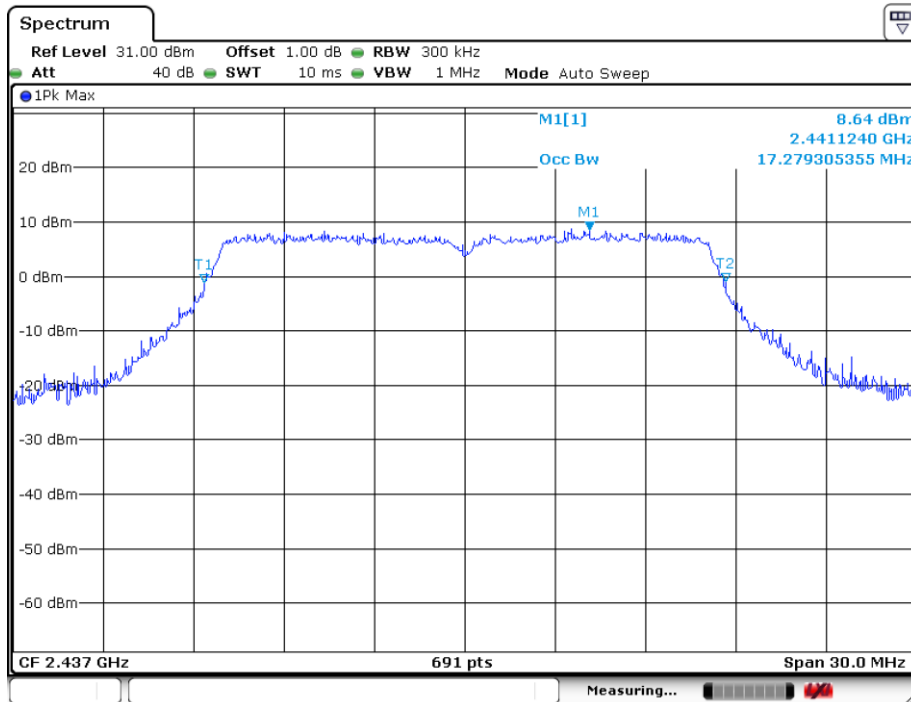


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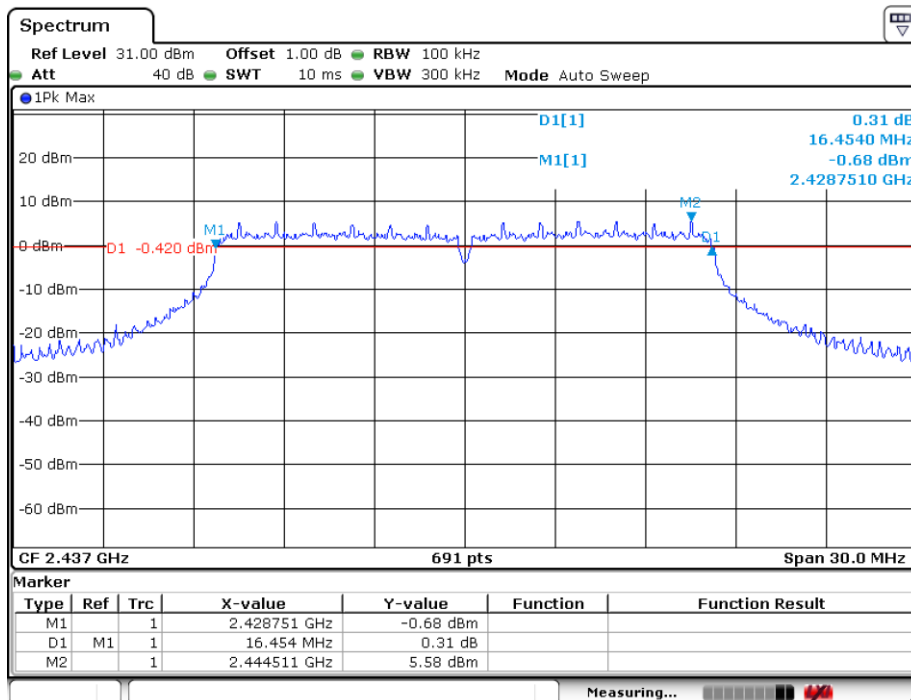


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4.5.2.1.5 802.11G_Middle Channel



Date: 8.NOV.2020 14:45:04

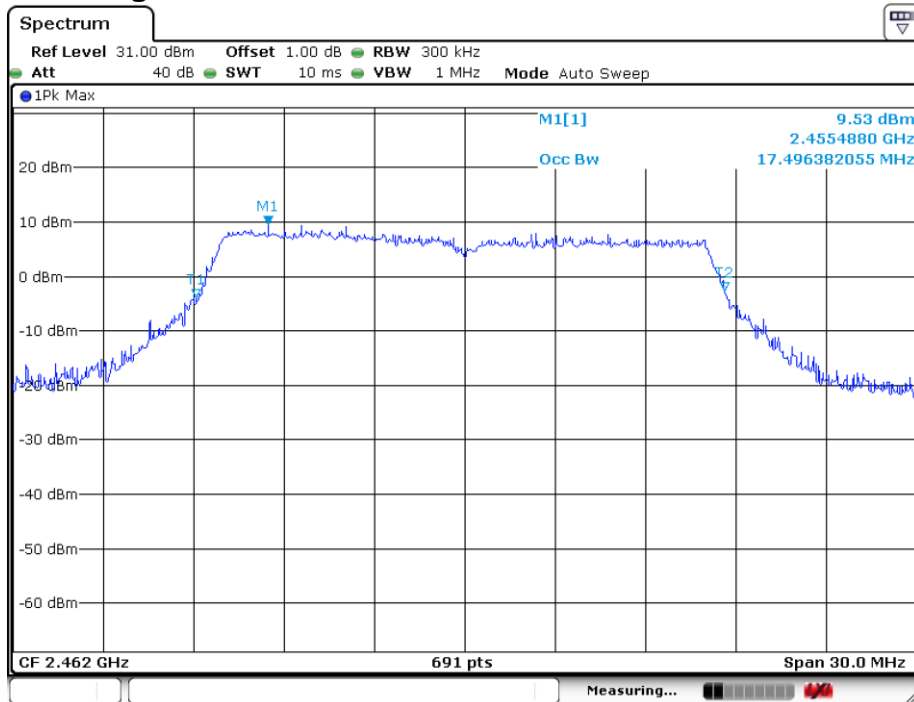


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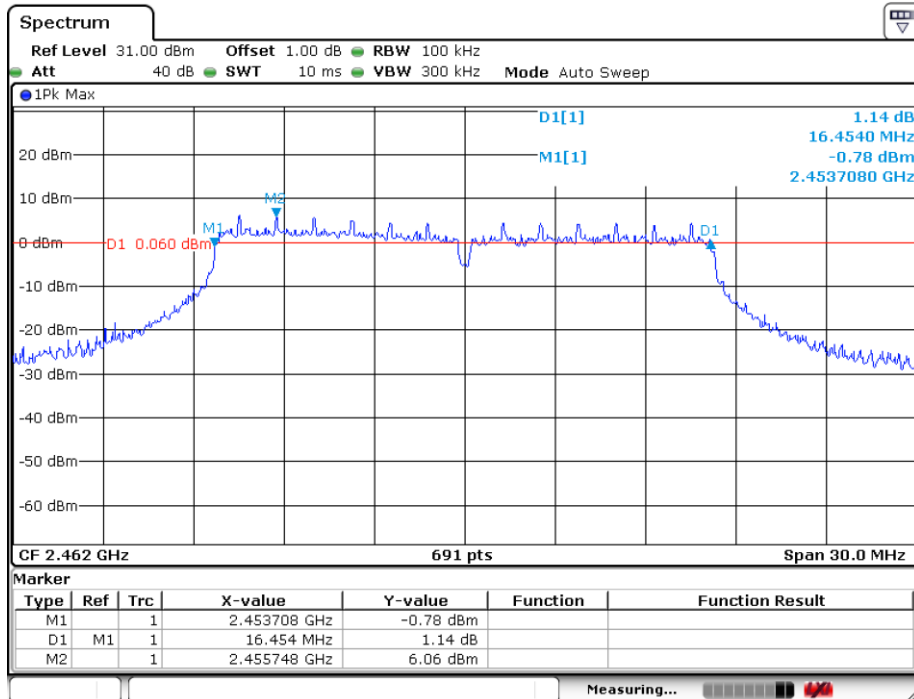


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4.5.2.1.6 802.11G_Highest Channel



Date: 8.NOV.2020 14:44:43

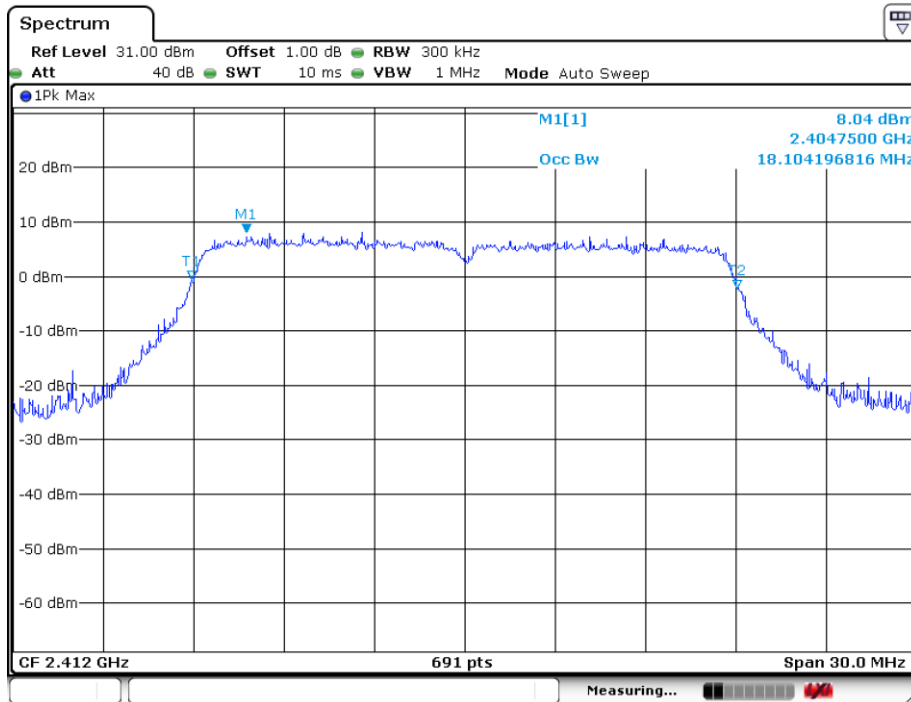


Date: 8.NOV.2020 14:21:02

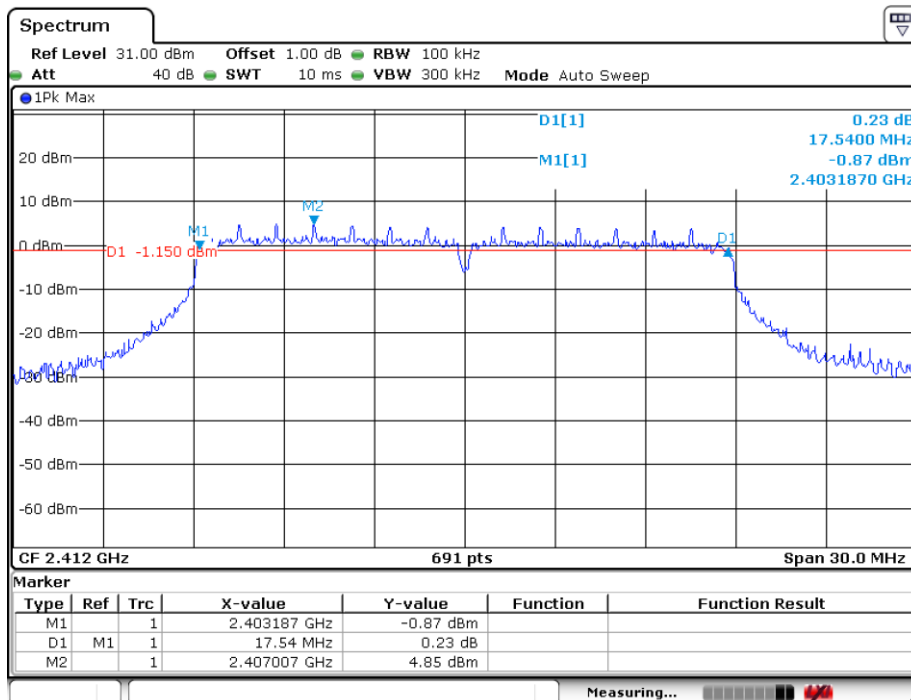


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4.5.2.1.7 802.11N20_Lowest Channel



Date: 8.NOV.2020 14:42:55



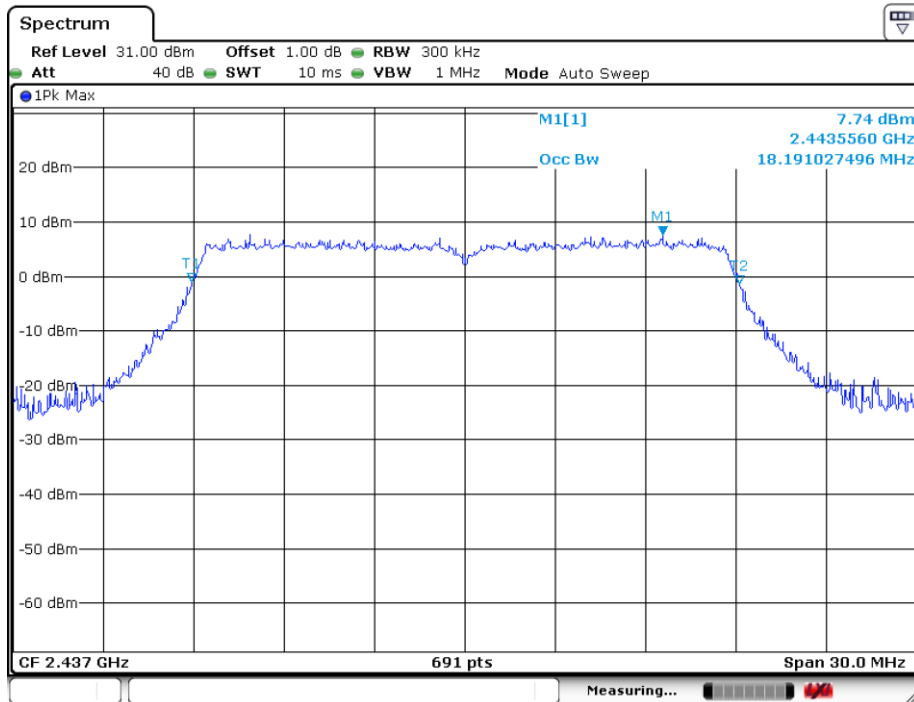
Date: 8.NOV.2020 14:17:51



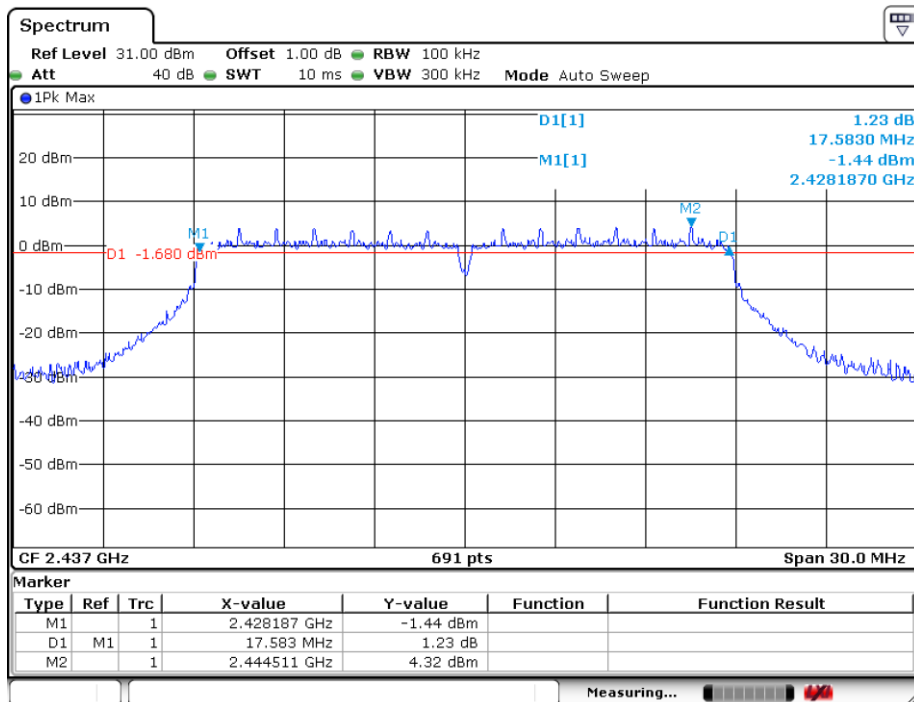
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4.5.2.1.8 802.11N20_Middle Channel



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

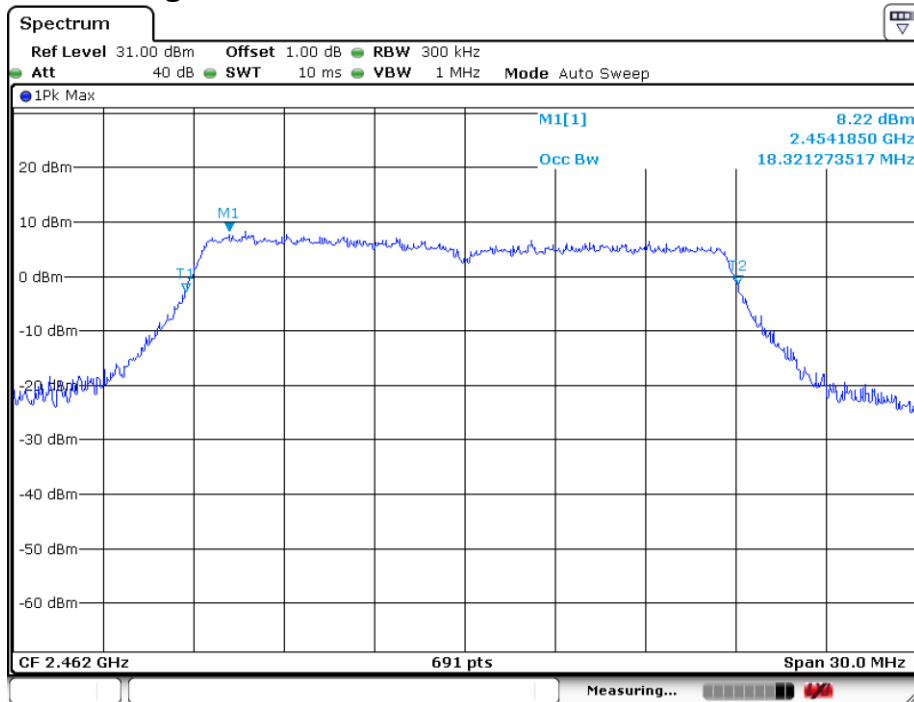


Date: 8.NOV.2020 14:19:01

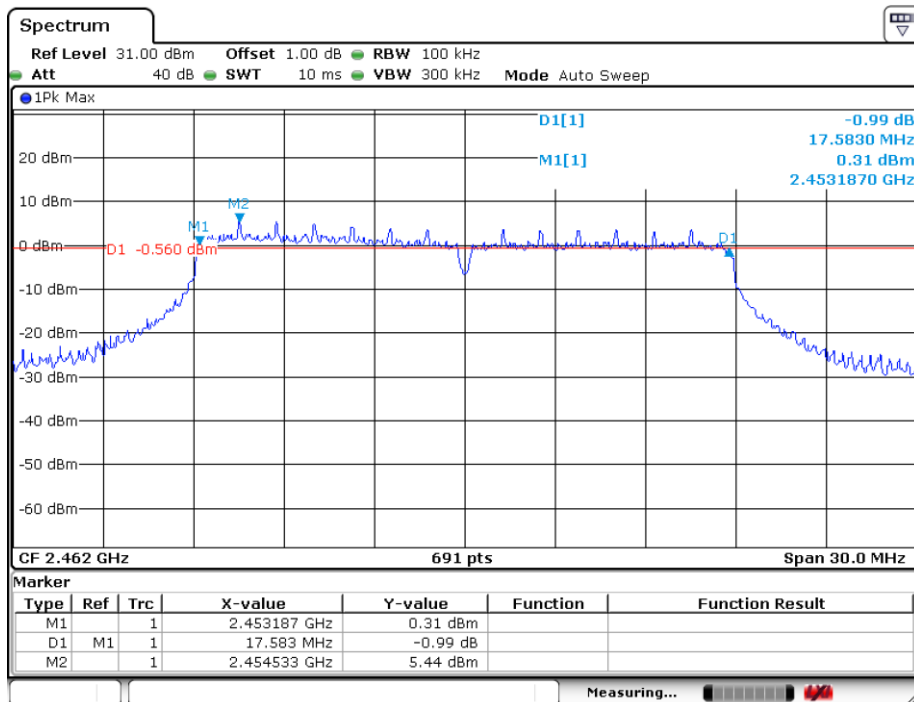


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4.5.2.1.9 802.11N20_Highest Channel



Date: 8.NOV.2020 14:42:13



Date: 8.NOV.2020 14:20:27



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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

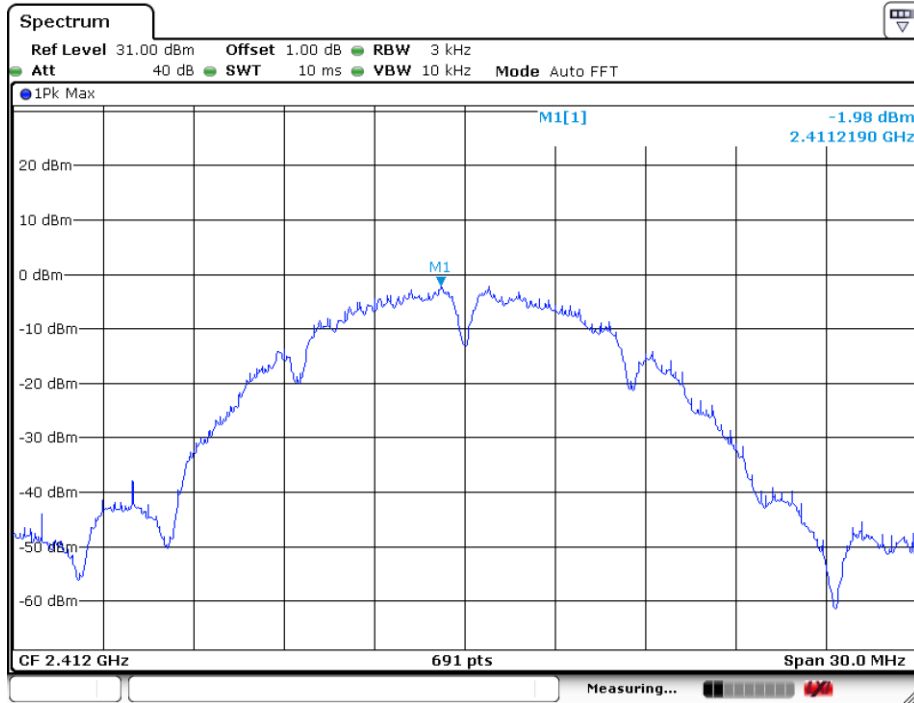


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4.6.2 Test Plots

4.6.2.1 ANT1

4.6.2.1.1 802.11B_Lowest Channel



Date: 8.NOV.2020 14:47:30



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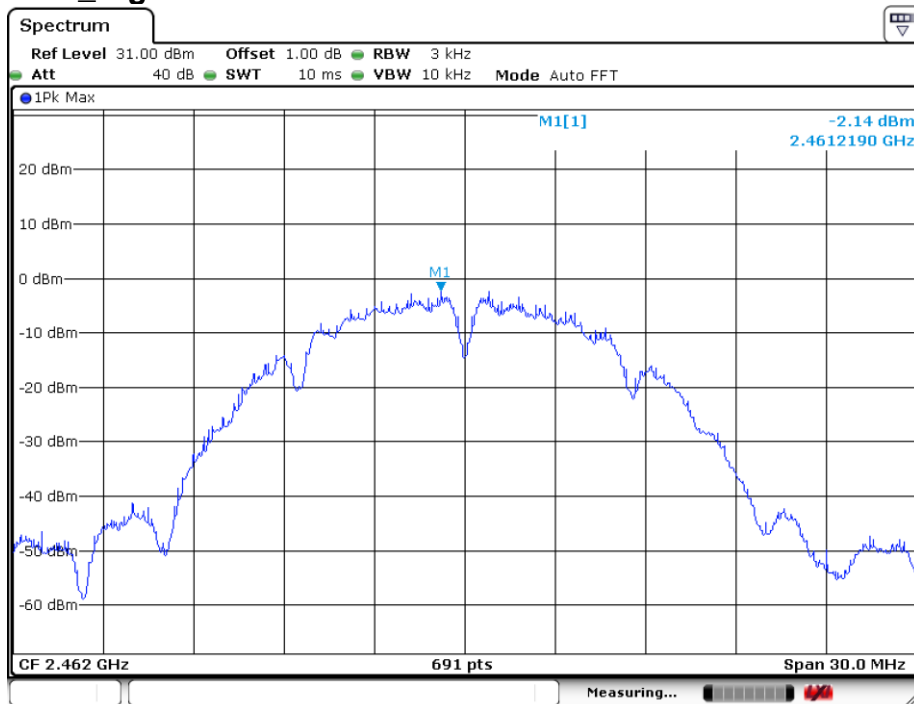
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4.6.2.1.2 802.11B_Middle Channel



Date: 8.NOV.2020 14:47:08

4.6.2.1.3 802.11B_Highest Channel

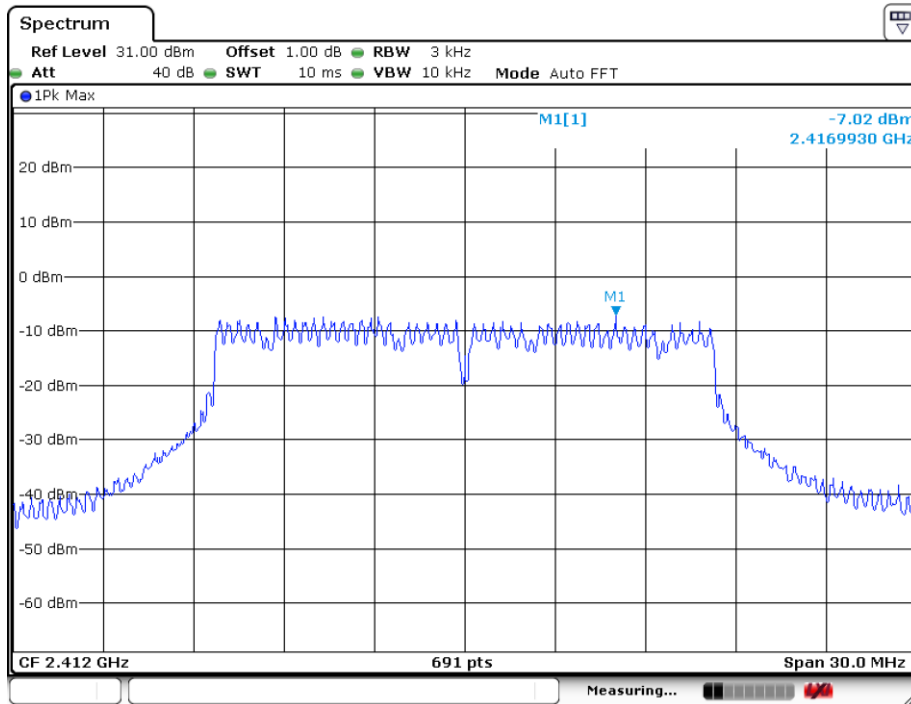


Date: 8.NOV.2020 14:46:45



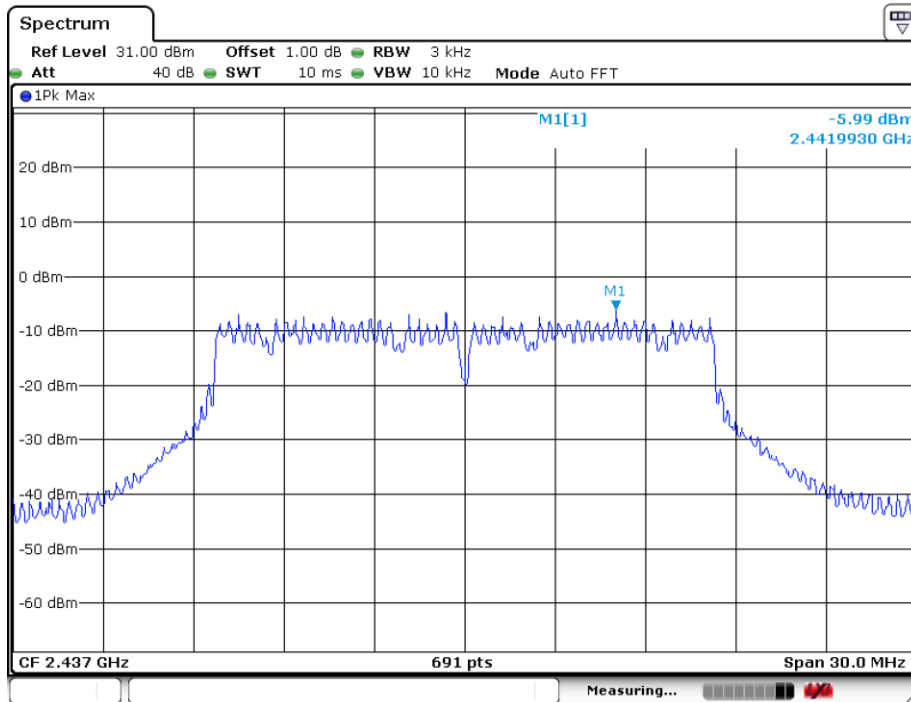
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4.6.2.1.4 802.11G_Lowest Channel



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

4.6.2.1.5 802.11G_Middle Channel

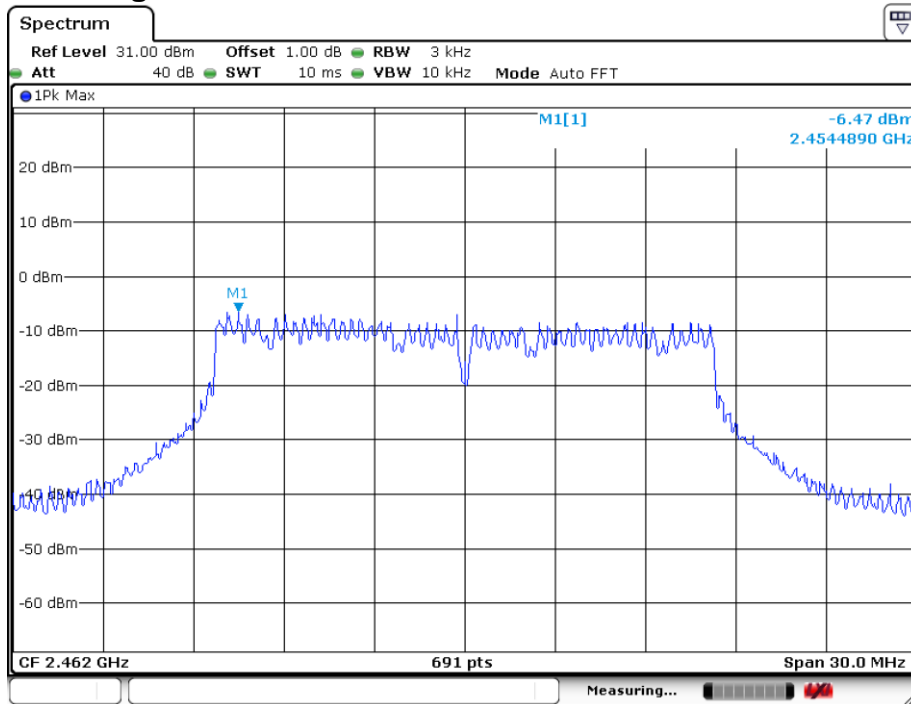


Date: 8.NOV.2020 14:46:04



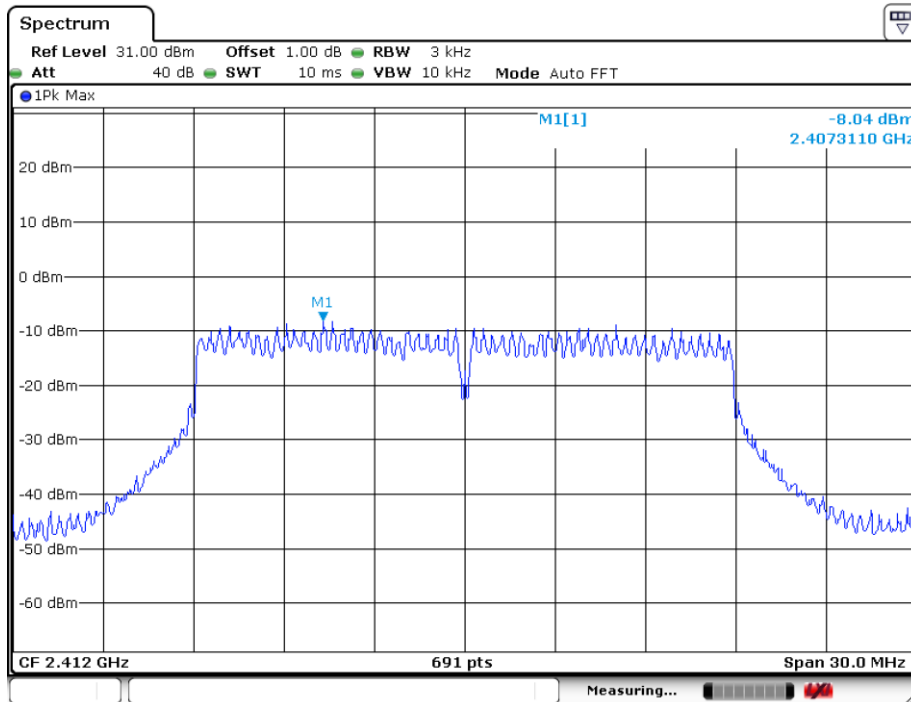
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4.6.2.1.6 802.11G_Highest Channel



Date: 8.NOV.2020 14:46:26

4.6.2.1.7 802.11N20_Lowest Channel

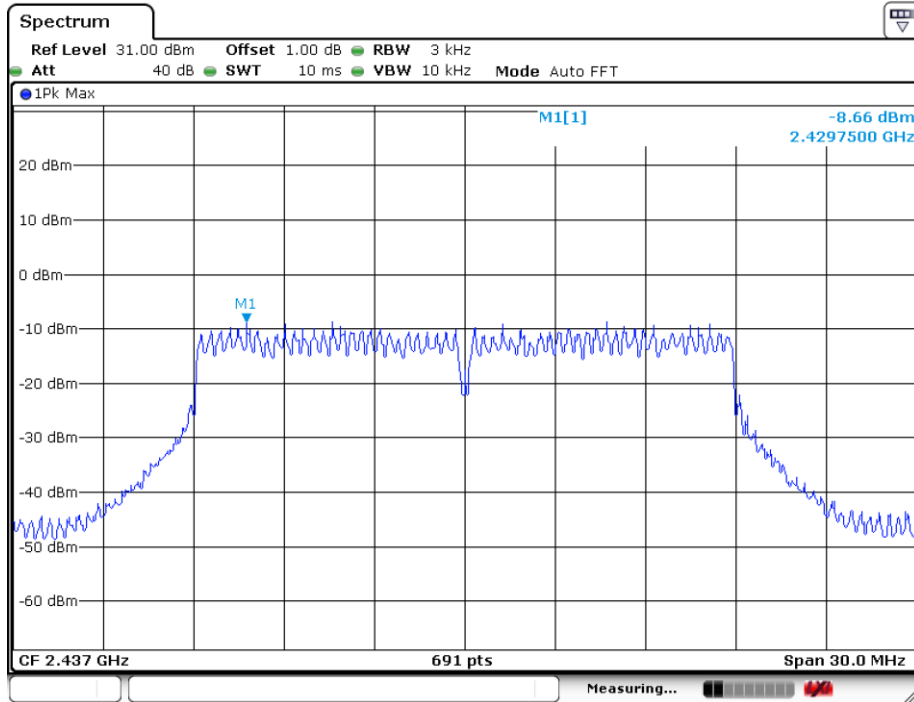


Date: 8.NOV.2020 14:48:49



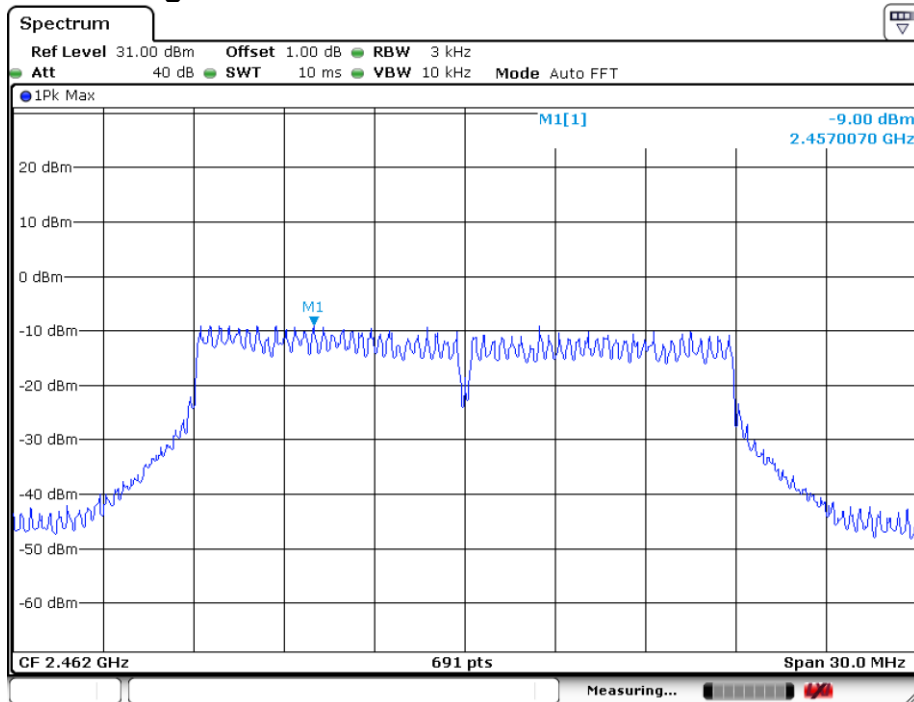
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4.6.2.1.8 802.11N20_Middle Channel



Date: 8.NOV.2020 14:48:31

4.6.2.1.9 802.11N20_Highest Channel



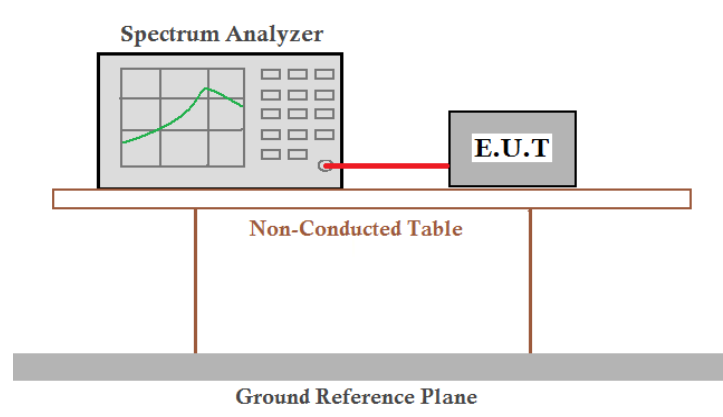
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4.7 Band-edge for RF Conducted Emissions

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

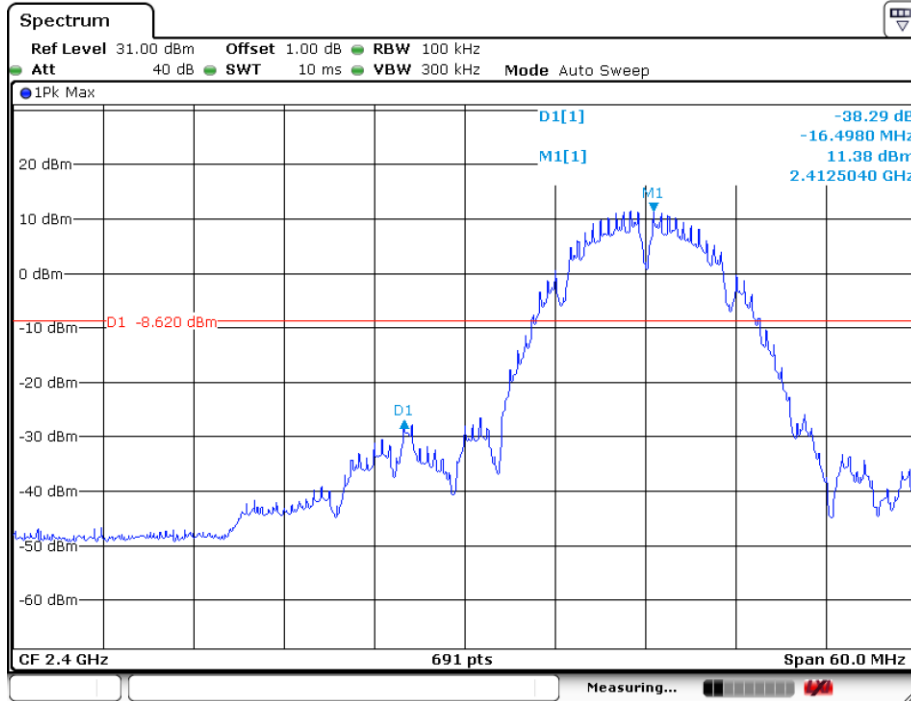


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4.7.1 Test Plots

4.7.1.1 ANT1

4.7.1.1.1 802.11B_Lowest Channel



Date: 8.NOV.2020 14:33:36



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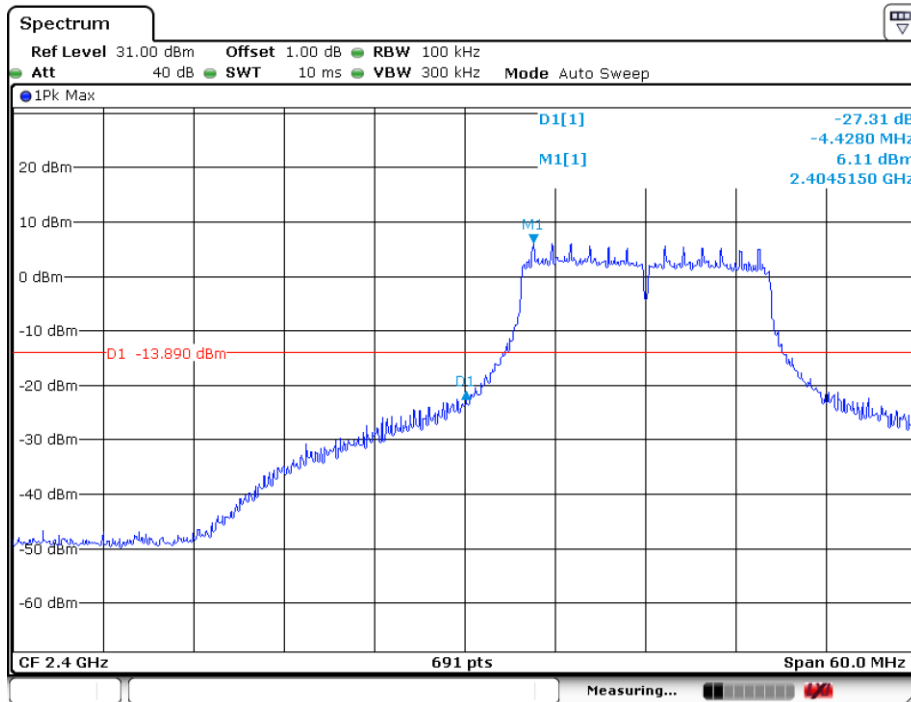
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4.7.1.1.2 802.11B_Highest Channel



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

4.7.1.1.3 802.11G_Lowest Channel

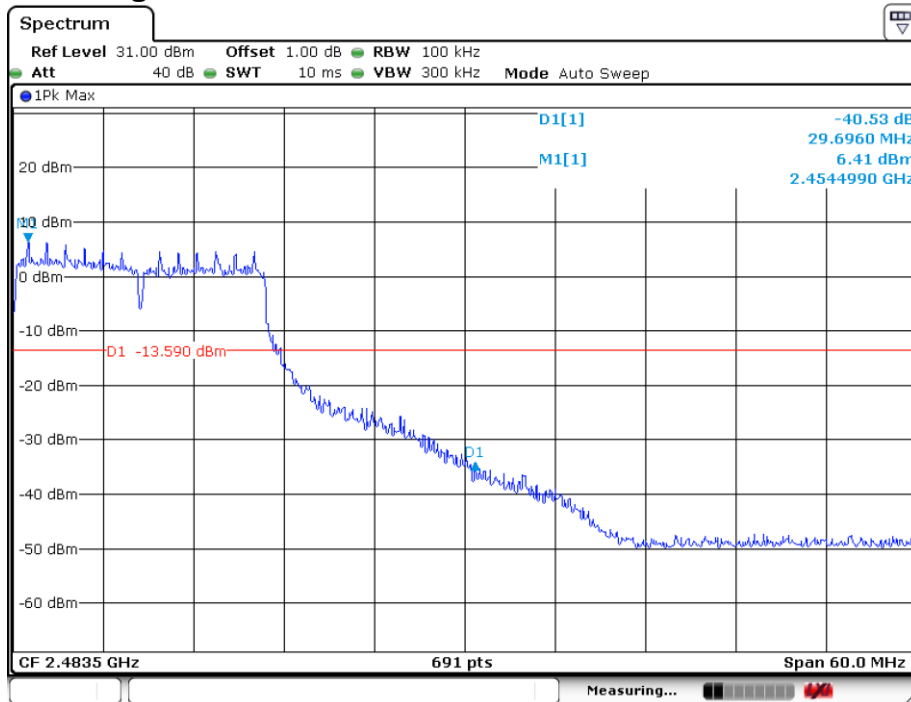


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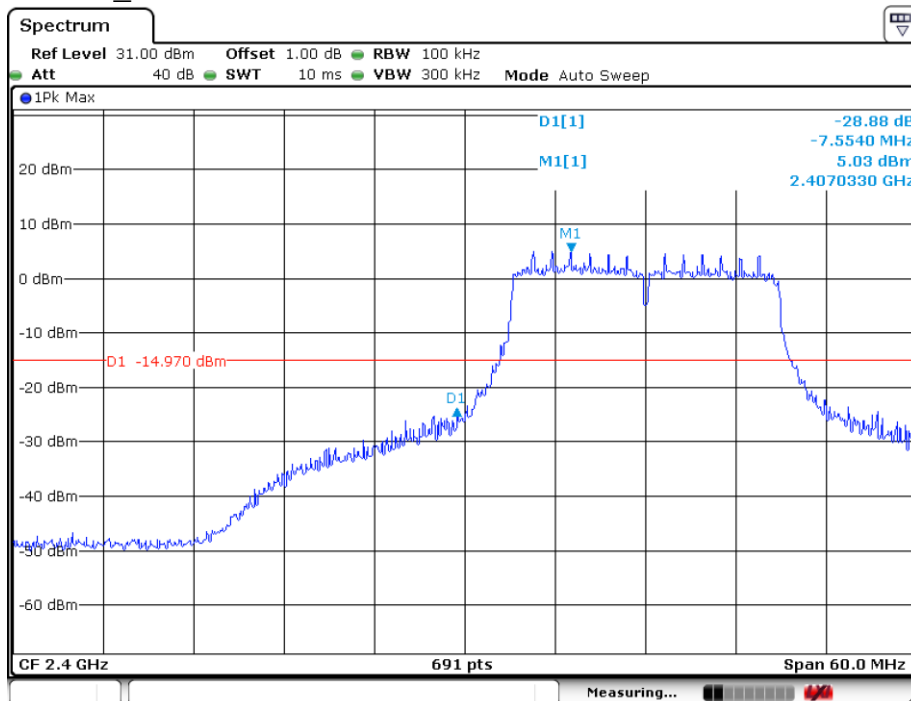
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4.7.1.1.4 802.11G_Highest Channel



Date: 8.NOV.2020 14:34:57

4.7.1.1.5 802.11N20_Lowest Channel



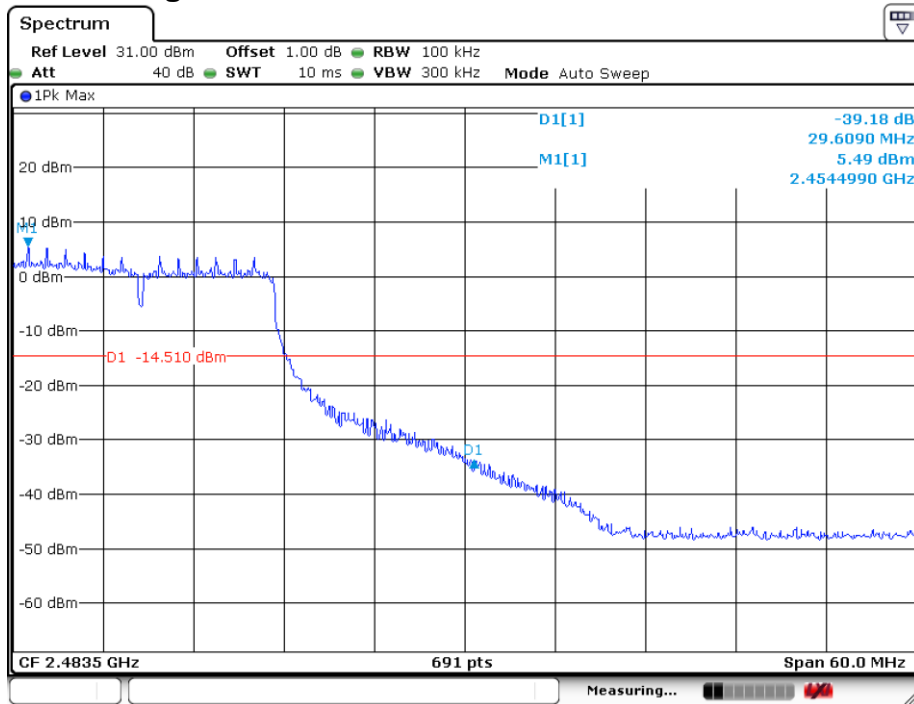
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4.7.1.1.6 802.11N20_Highest Channel



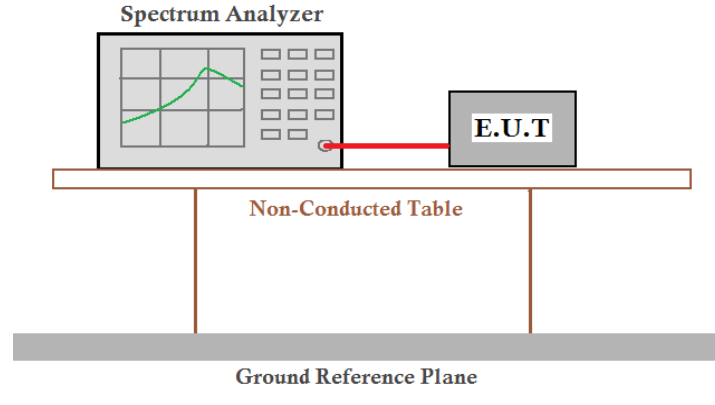
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4.8 RF Conducted Spurious Emissions

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

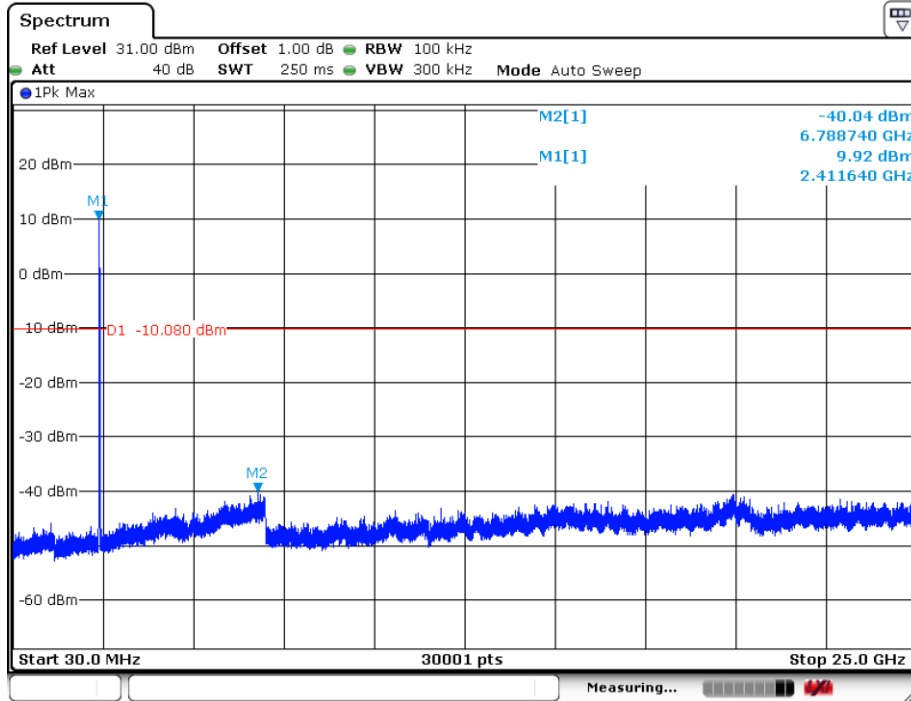


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4.8.1 Test Plots

4.8.1.1 ANT1

4.8.1.1.1 802.11B_Lowest Channel



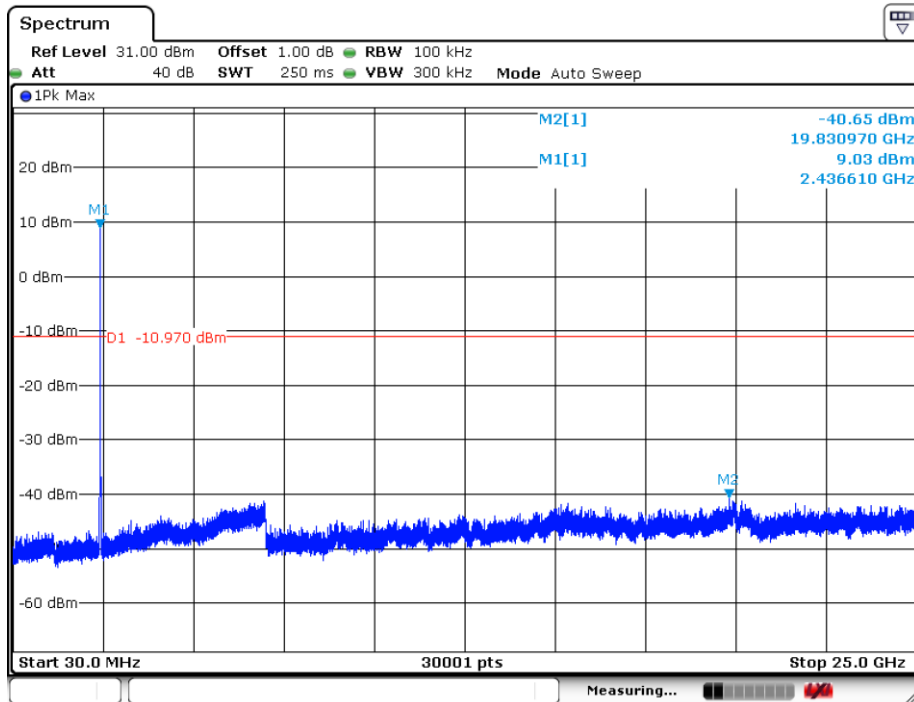
Date: 8.NOV.2020 14:53:43



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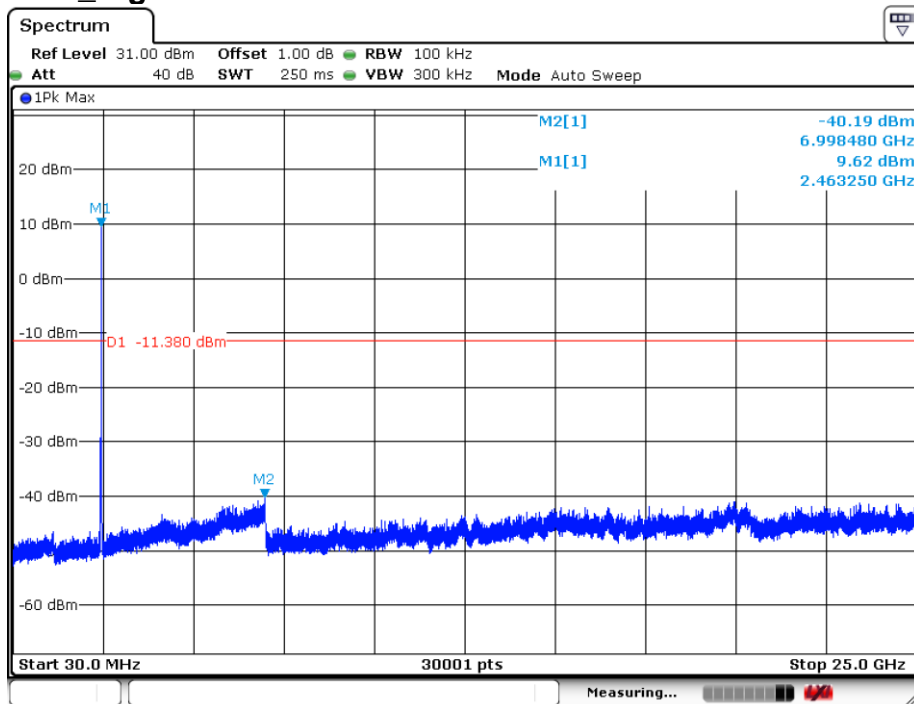
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4.8.1.1.2 802.11B_Middle Channel



Date: 8.NOV.2020 14:52:38

4.8.1.1.3 802.11B_Highest Channel



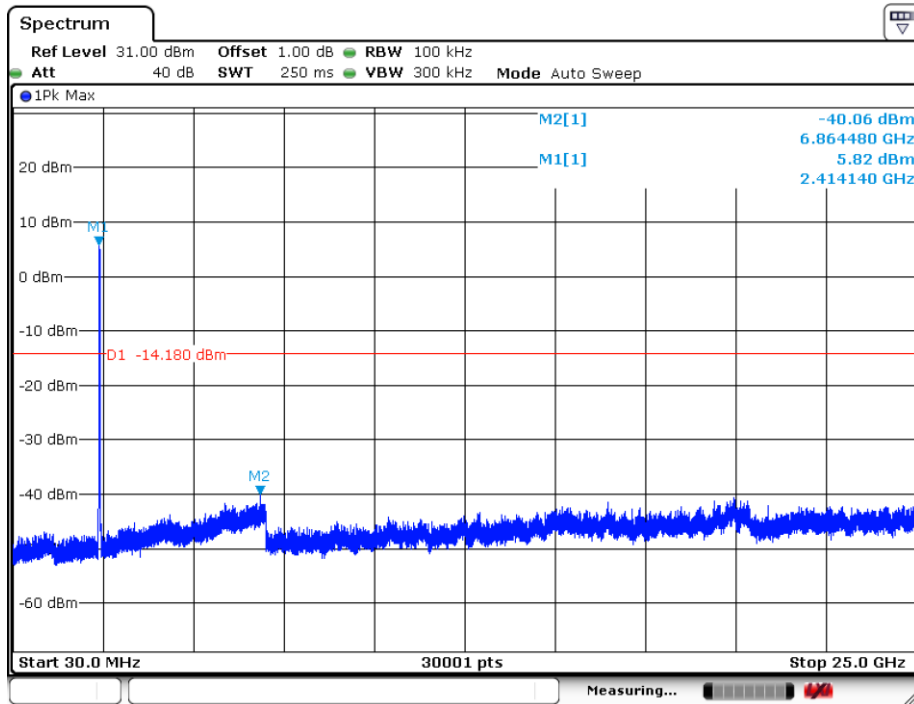
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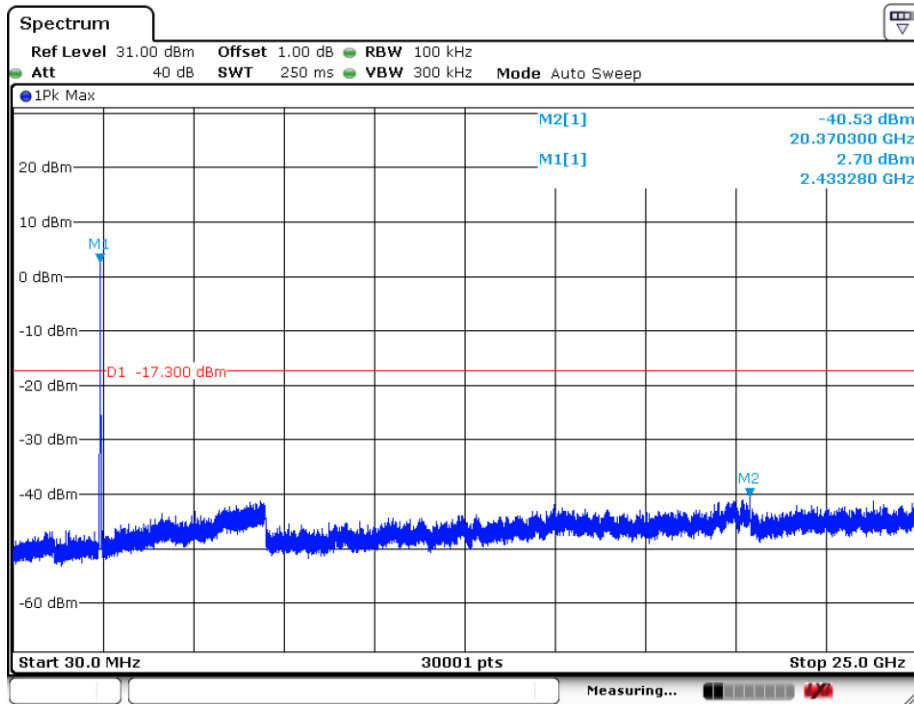
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4.8.1.1.4 802.11G_Lowest Channel

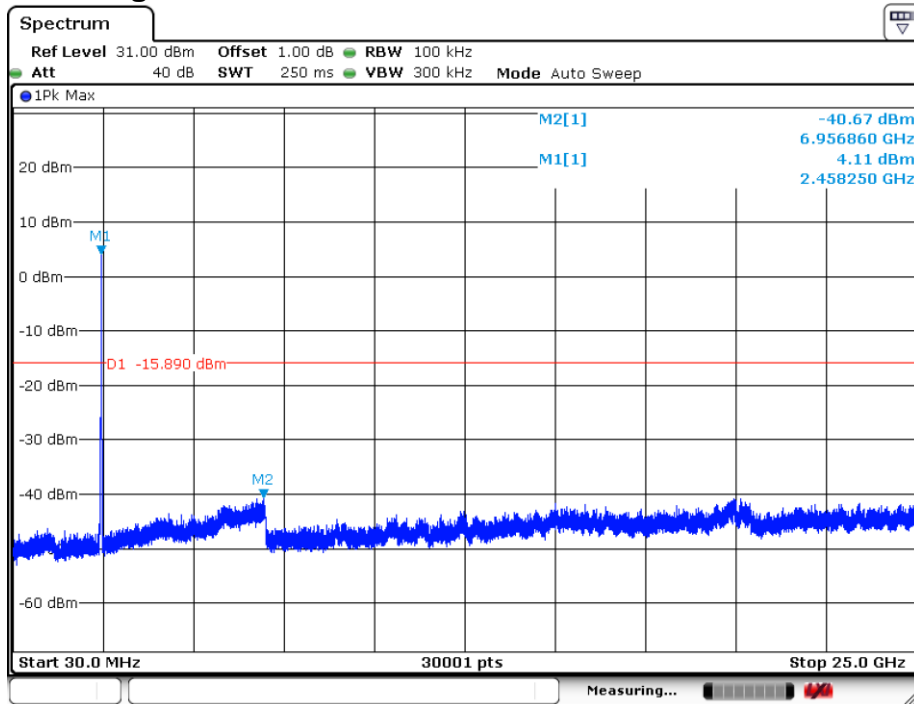


4.8.1.1.5 802.11G_Middle Channel



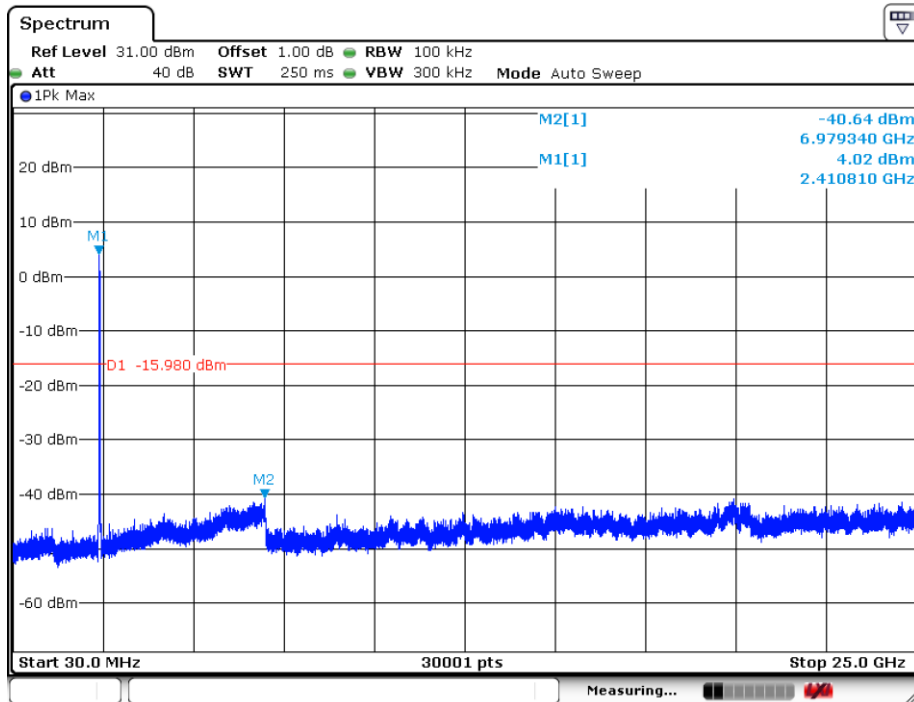
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4.8.1.1.6 802.11G_Highest Channel



Date: 8.NOV.2020 14:56:22

4.8.1.1.7 802.11N20_Lowest Channel



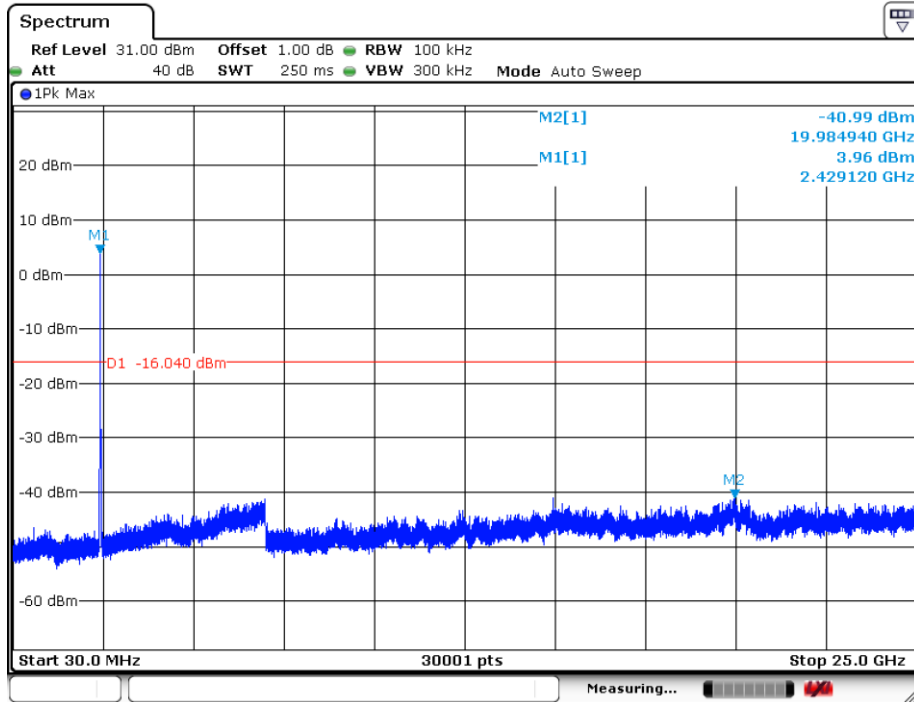
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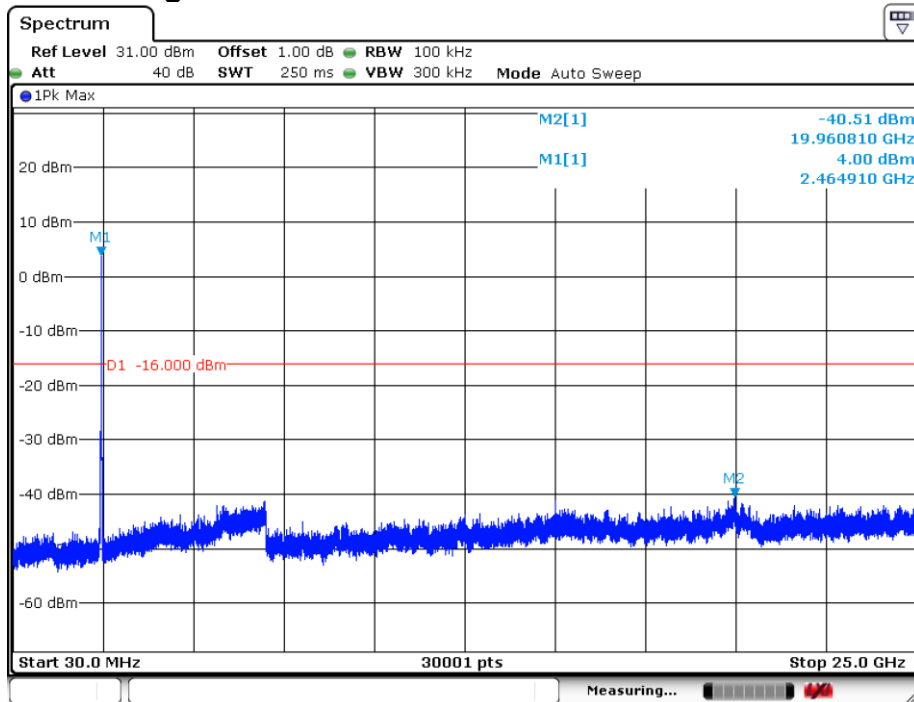
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4.8.1.1.8 802.11N20_Middle Channel



Date: 8.NOV.2020 14:50:26

4.8.1.1.9 802.11N20_Highest Channel



Date: 8.NOV.2020 14:50:56



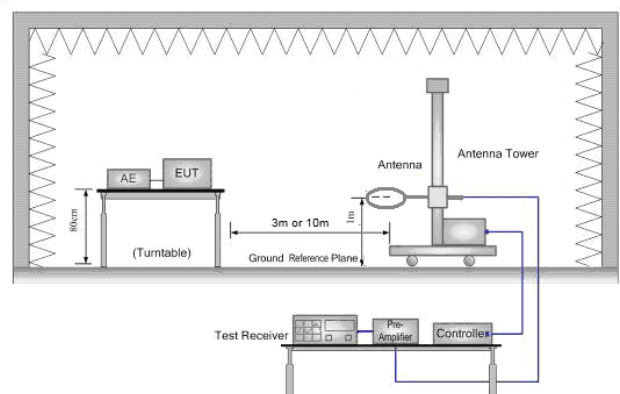
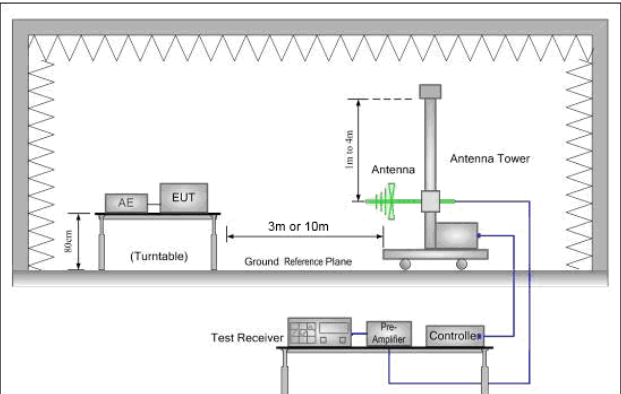
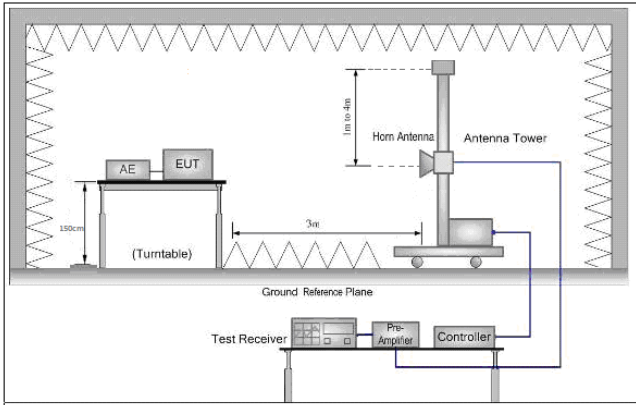
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4.9 Radiated Spurious Emissions

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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<p>Test Setup:</p>	
	
<p>Figure 1. Below 30MHz</p>	<p>Figure 2. 30MHz to 1GHz</p>
	
<p>Figure 3. Above 1 GHz</p>	
<p>Test Procedure:</p>	<ol style="list-style-type: none"> 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 chamber. The table was rotated 360 degrees to determine the position of the highest radiation. 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 chamber. The table was rotated 360 degrees to determine the position of the highest radiation 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. 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. Use the following spectrum analyzer settings: <ol style="list-style-type: none"> Span shall wide enough to fully capture the emission being measured; Set RBW=100 kHz for $f < 1$ GHz, RBW=1MHz for $f > 1$GHz ; VBW \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak For average measurement: use duty cycle correction factor method per 15.35(c).



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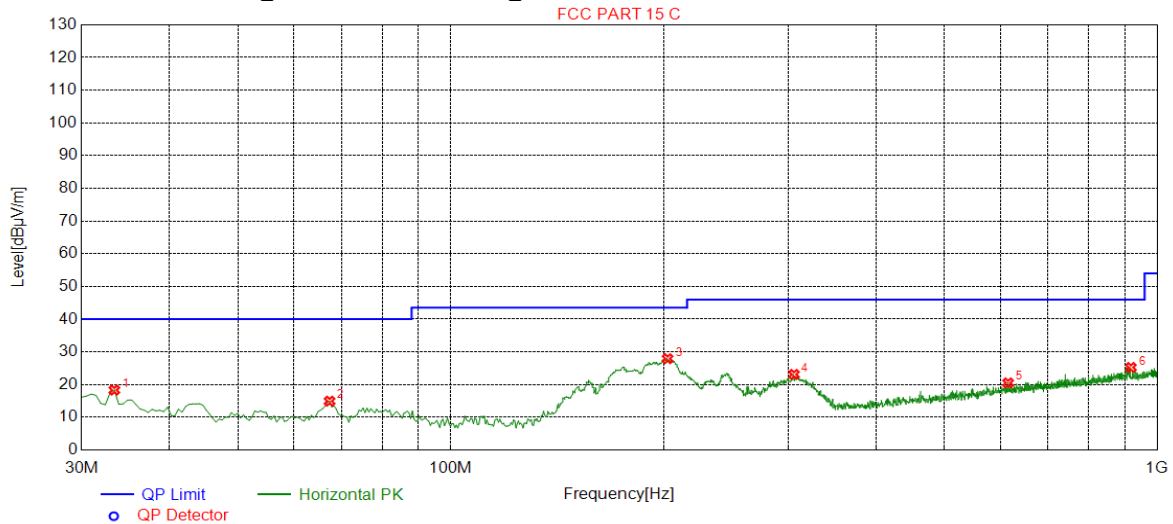
	<p>Duty cycle = On time/100 milliseconds On time = $N_1 * L_1 + N_2 * L_2 + \dots + N_{n-1} * L_{n-1} + N_n * L_n$ Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc. Average Emission Level = Peak Emission Level + 20*log(Duty cycle)</p> <p>f. For each suspected emission, the EUT 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.</p> <p>g. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</p> <p>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.</p> <p>i. Test the EUT in the lowest channel, the middle channel ,the Highest channel.</p> <p>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.</p> <p>k. Repeat above procedures until all frequencies measured was complete.</p>
<p>Exploratory Test Mode:</p>	<p>Transmitting with all kind of modulations, data rates. Charge + Transmitting mode.</p>
<p>Final Test Mode:</p>	<p>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.</p>
<p>Instruments Used:</p>	<p>Refer to section 5.10 for details</p>
<p>Test Results:</p>	<p>Pass</p>



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Firstly Supply:

4.9.1 Radiated emission below 1GHz
4.9.1.1 Charge + Transmitting

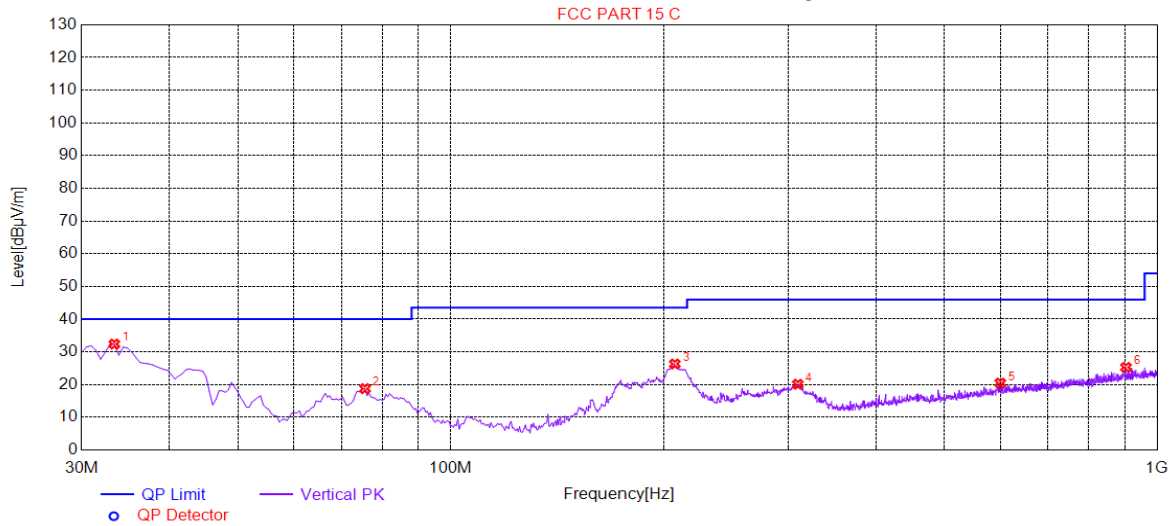


Suspected List							
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Polarity
1	33.3967	18.33	-32.79	40.00	21.67	150	Horizontal
2	67.3637	14.94	-33.51	40.00	25.06	150	Horizontal
3	202.7464	27.93	-30.76	43.50	15.57	150	Horizontal
4	306.1031	23.12	-27.68	46.00	22.88	150	Horizontal
5	615.2026	20.52	-19.87	46.00	25.48	150	Horizontal
6	917.9940	25.25	-14.96	46.00	20.75	150	Horizontal

Final Data List



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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	150	Vertical
2	75.6128	18.77	-35.13	40.00	21.23	150	Vertical
3	207.5988	26.31	-30.67	43.50	17.19	150	Vertical
4	309.9850	20.12	-27.56	46.00	25.88	150	Vertical
5	599.6748	20.49	-20.09	46.00	25.51	150	Vertical
6	903.4367	25.27	-15.18	46.00	20.73	150	Vertical

Final Data List

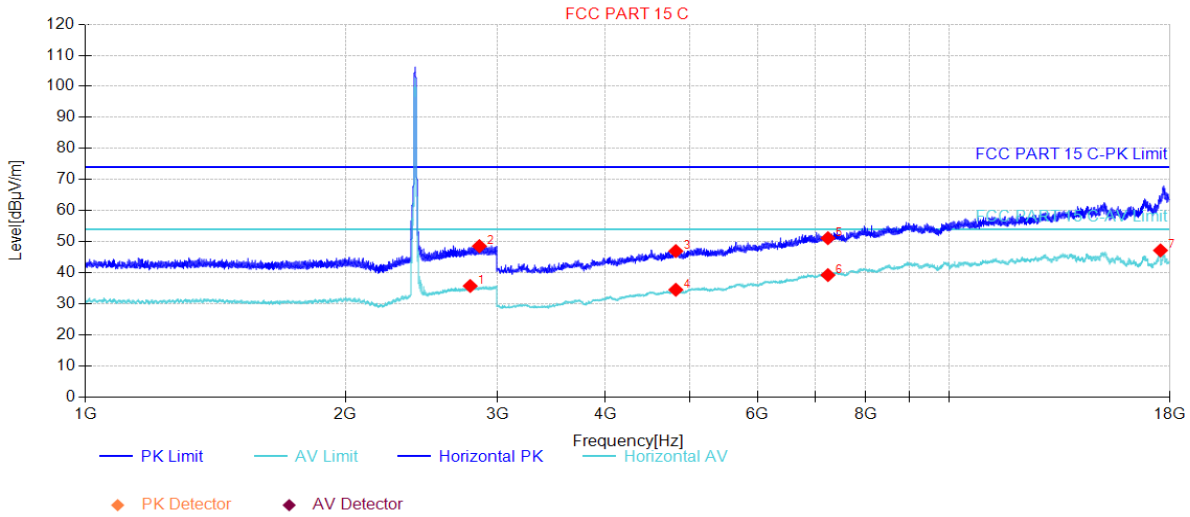


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4.9.2 Transmitter emission above 1GHz

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

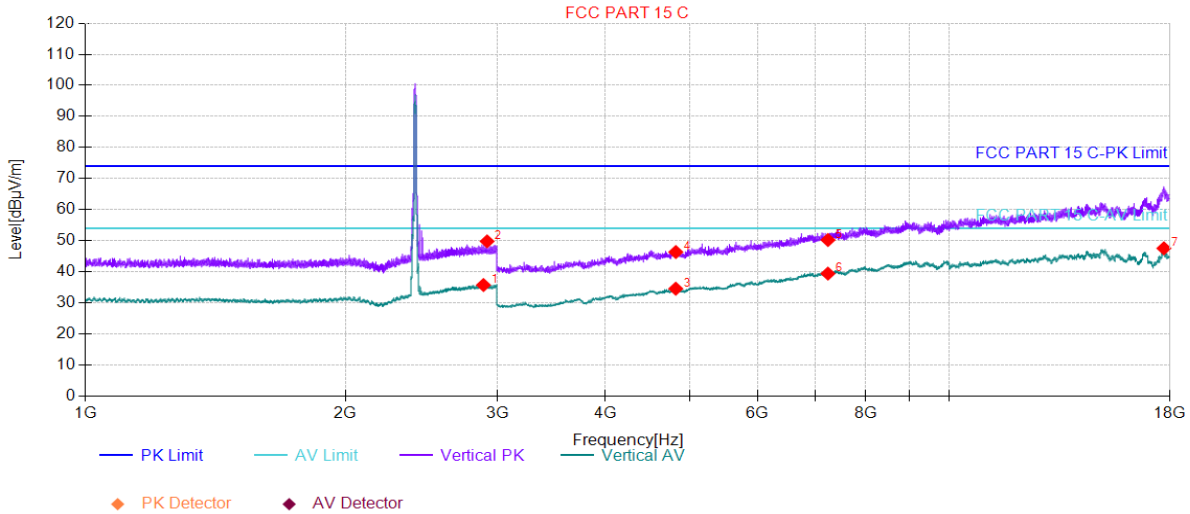
Final Data List



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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

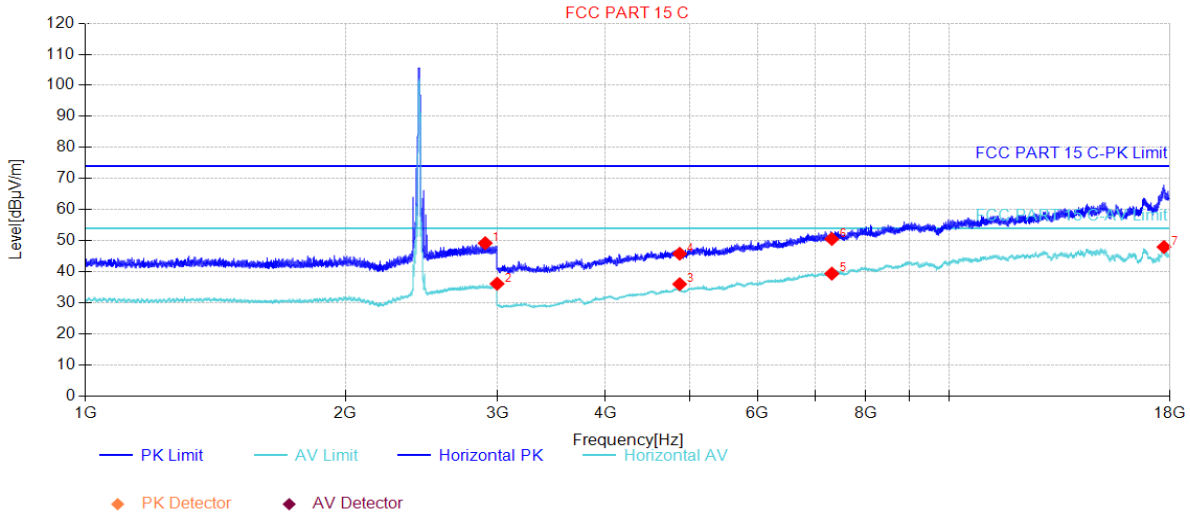
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4.9.2.3 802.11B_CH6



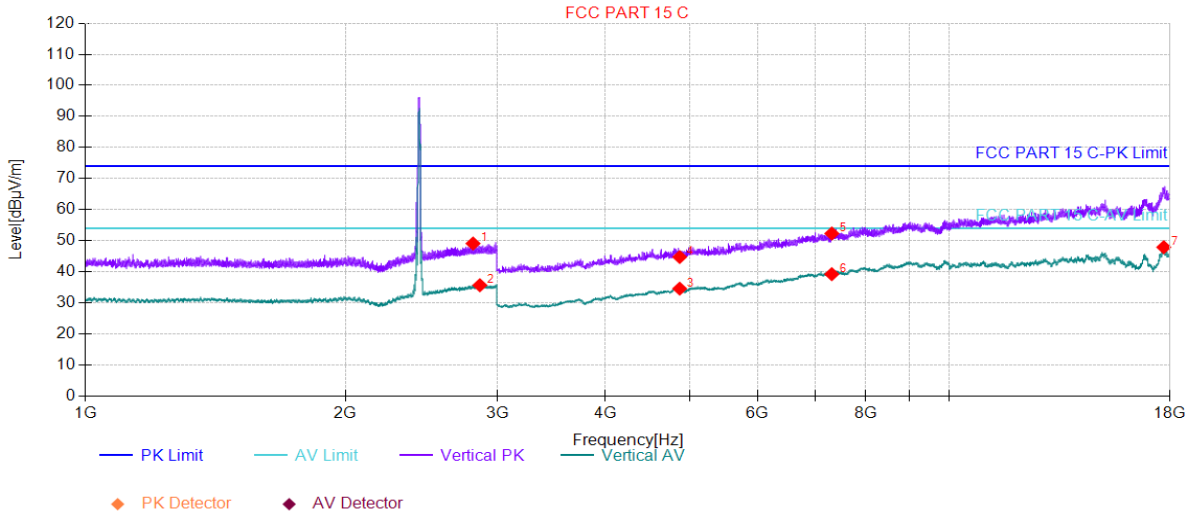
Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2902.5903	49.19	6.96	74.00	24.81	Horizontal
2	2996.1996	36.11	7.39	54.00	17.89	Horizontal
3	4874.0000	35.98	-10.40	54.00	18.02	Horizontal
4	4874.0000	45.78	-10.40	74.00	28.22	Horizontal
5	7311.0000	39.37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



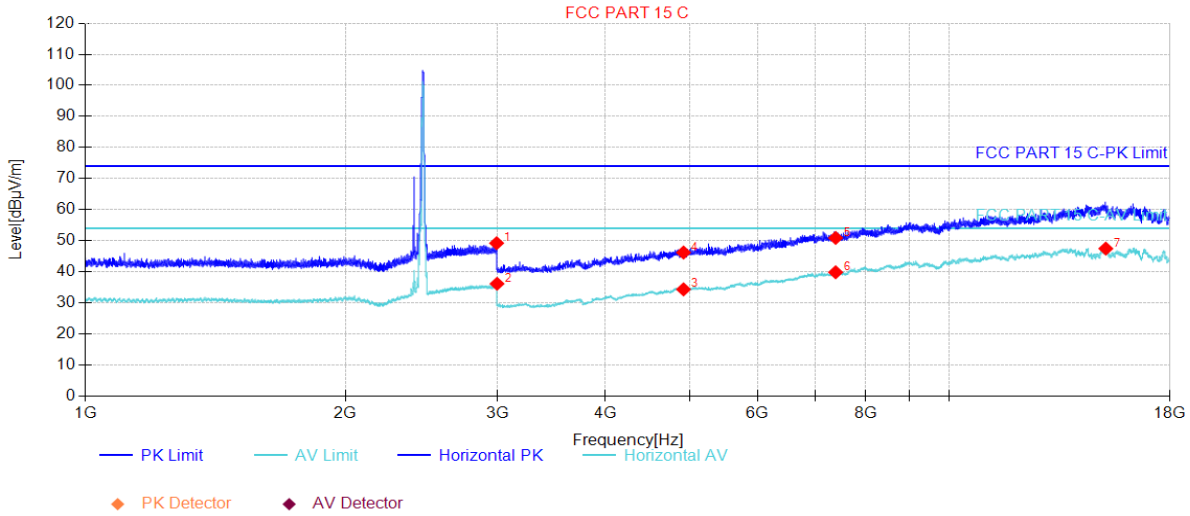
Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2810.1810	49.06	6.75	74.00	24.94	Vertical
2	2861.5862	35.64	6.87	54.00	18.36	Vertical
3	4874.0000	34.54	-10.40	54.00	19.46	Vertical
4	4874.0000	44.72	-10.40	74.00	29.28	Vertical
5	7311.0000	52.30	-2.57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



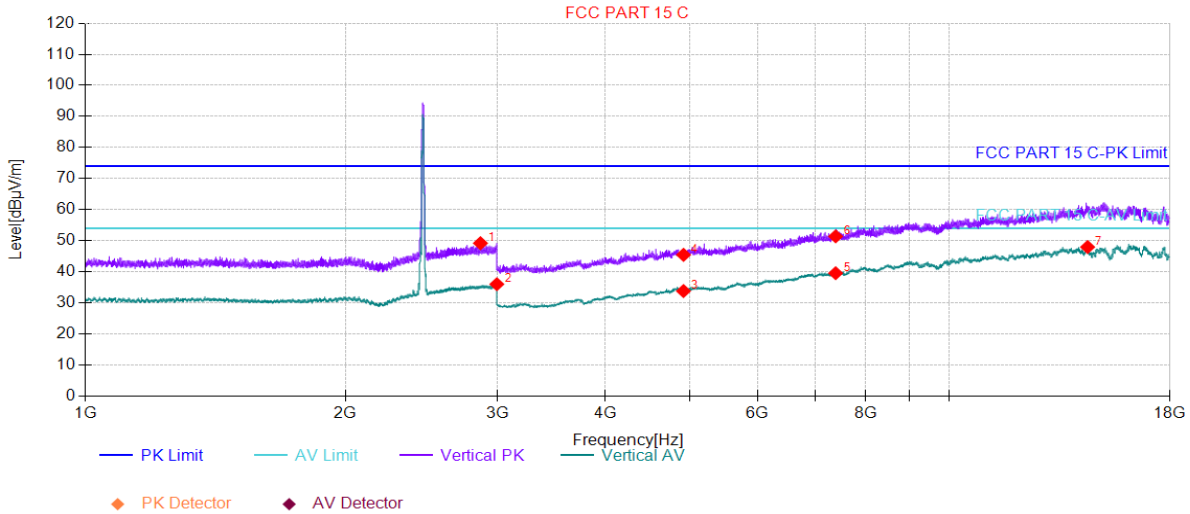
Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2992.3992	49.18	7.38	74.00	24.82	Horizontal
2	2995.7996	36.10	7.39	54.00	17.90	Horizontal
3	4924.0000	34.31	-10.22	54.00	19.69	Horizontal
4	4924.0000	46.16	-10.22	74.00	27.84	Horizontal
5	7386.0000	50.86	-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]	Height [cm]	Polarity
1	2865.986	49.16	6.88	74.00	24.84	150	Vertical
2	2994.199	35.97	7.38	54.00	18.03	150	Vertical
3	4924.000	33.77	-10.22	54.00	20.23	150	Vertical
4	4924.000	45.42	-10.22	74.00	28.58	150	Vertical
5	7386.000	39.52	-2.06	54.00	14.48	150	Vertical
6	7386.000	51.37	-2.06	74.00	22.63	150	Vertical
7	14456.64	47.93	7.69	54.00	6.07	150	Vertical

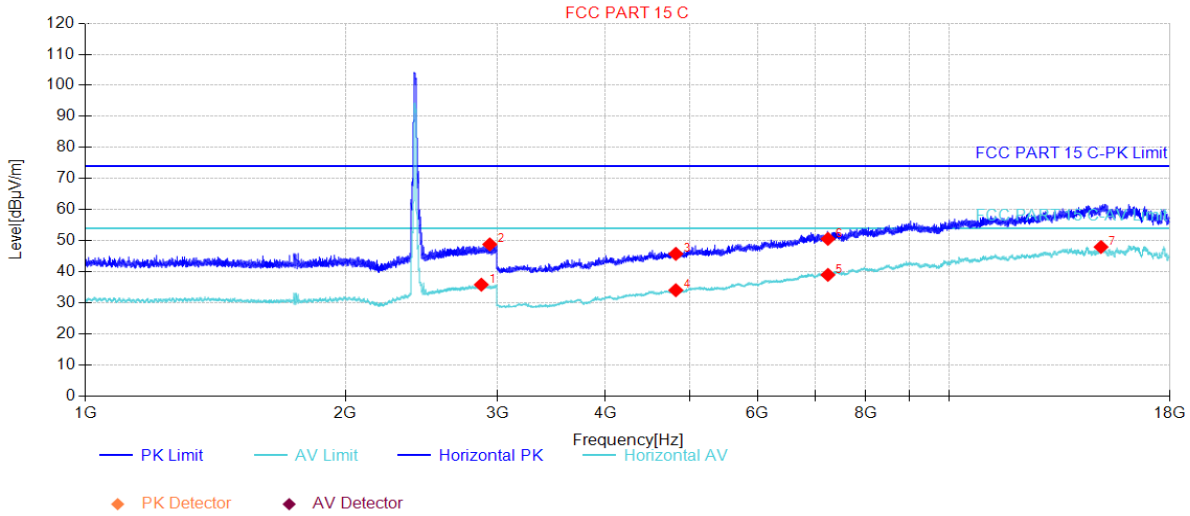
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4.9.2.7 802.11G_CH1



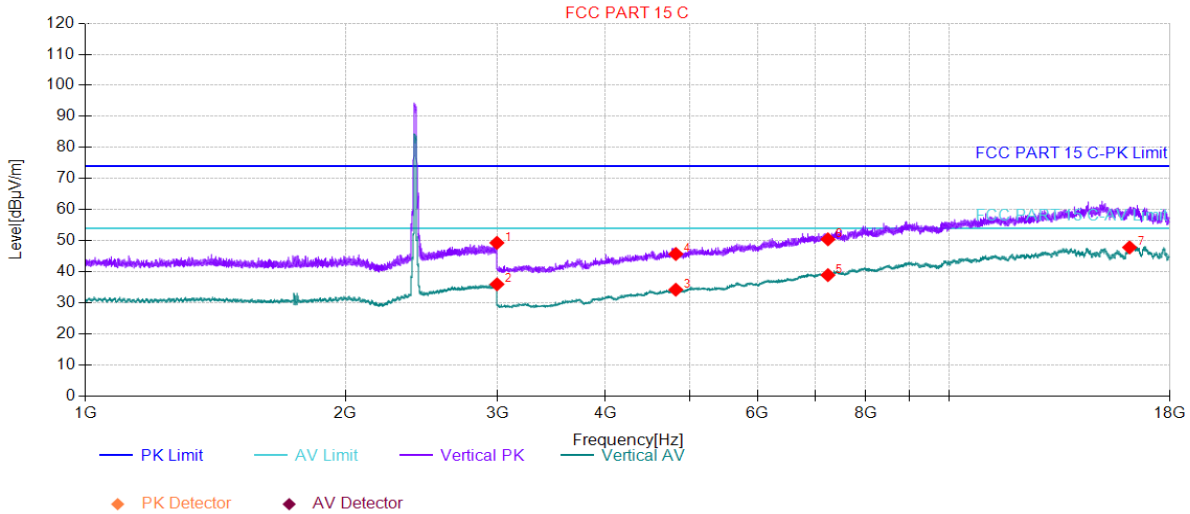
Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2873.3873	35.81	6.89	54.00	18.19	Horizontal
2	2938.7939	48.79	7.13	74.00	25.21	Horizontal
3	4824.0000	45.73	-10.56	74.00	28.27	Horizontal
4	4824.0000	34.03	-10.56	54.00	19.97	Horizontal
5	7236.0000	38.98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



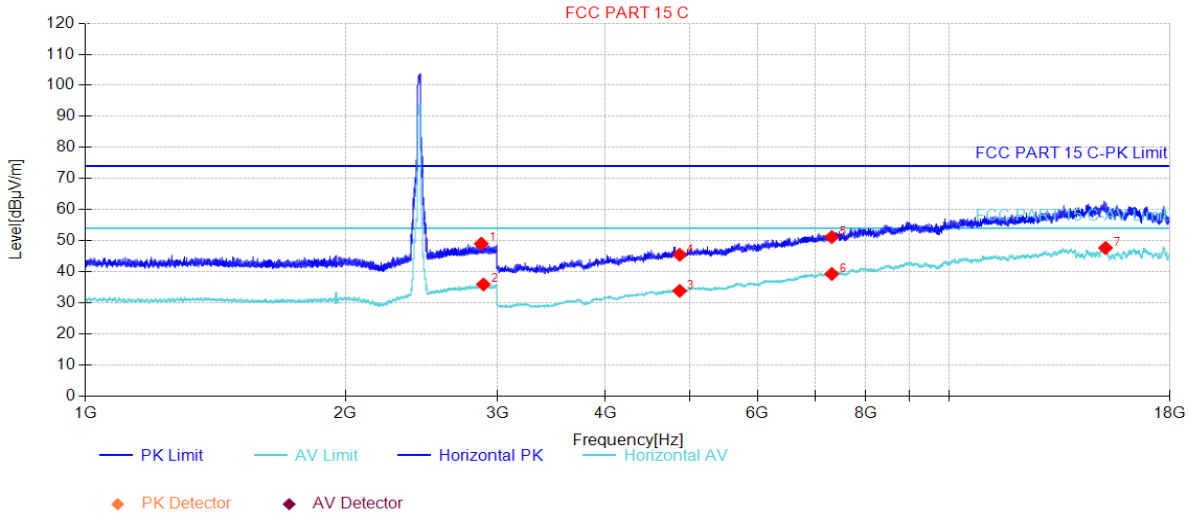
Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2994.5995	49.28	7.39	74.00	24.72	Vertical
2	2995.5996	35.94	7.39	54.00	18.06	Vertical
3	4824.0000	34.20	-10.56	54.00	19.80	Vertical
4	4824.0000	45.70	-10.56	74.00	28.30	Vertical
5	7236.0000	38.90	-2.59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



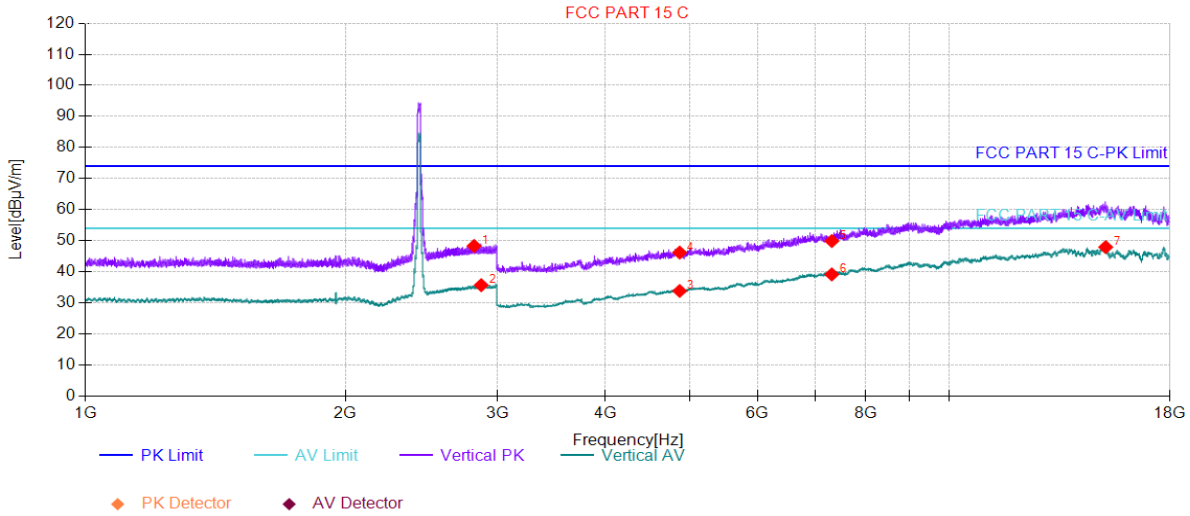
Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2872.7873	49.01	6.89	74.00	24.99	Horizontal
2	2889.5890	35.89	6.93	54.00	18.11	Horizontal
3	4874.0000	33.81	-10.40	54.00	20.19	Horizontal
4	4874.0000	45.45	-10.40	74.00	28.55	Horizontal
5	7311.0000	51.16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



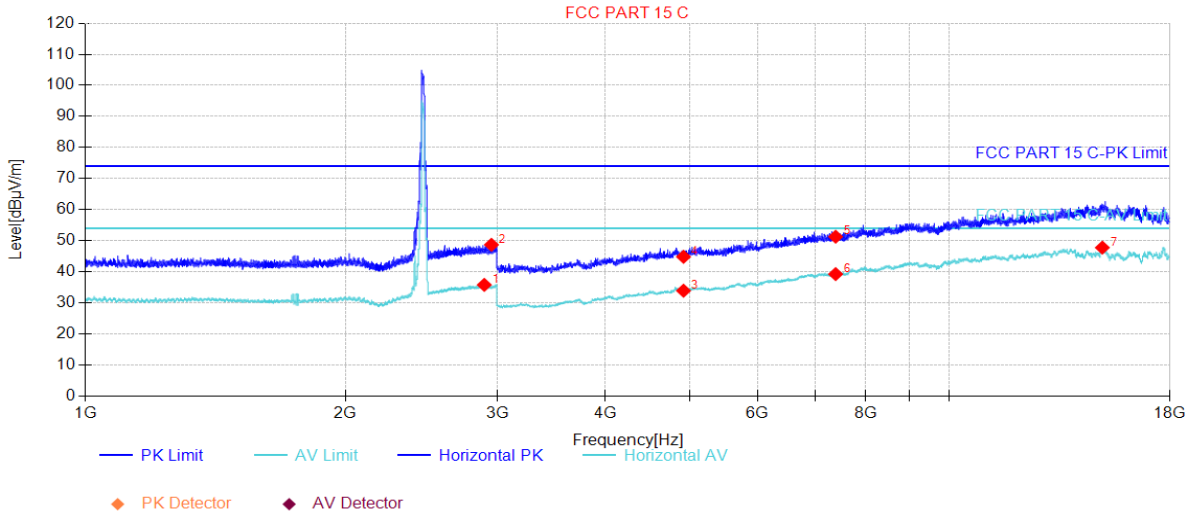
Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2817.7818	48.28	6.77	74.00	25.72	Vertical
2	2871.9872	35.65	6.89	54.00	18.35	Vertical
3	4874.0000	33.80	-10.40	54.00	20.20	Vertical
4	4874.0000	46.15	-10.40	74.00	27.85	Vertical
5	7311.0000	49.87	-2.57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

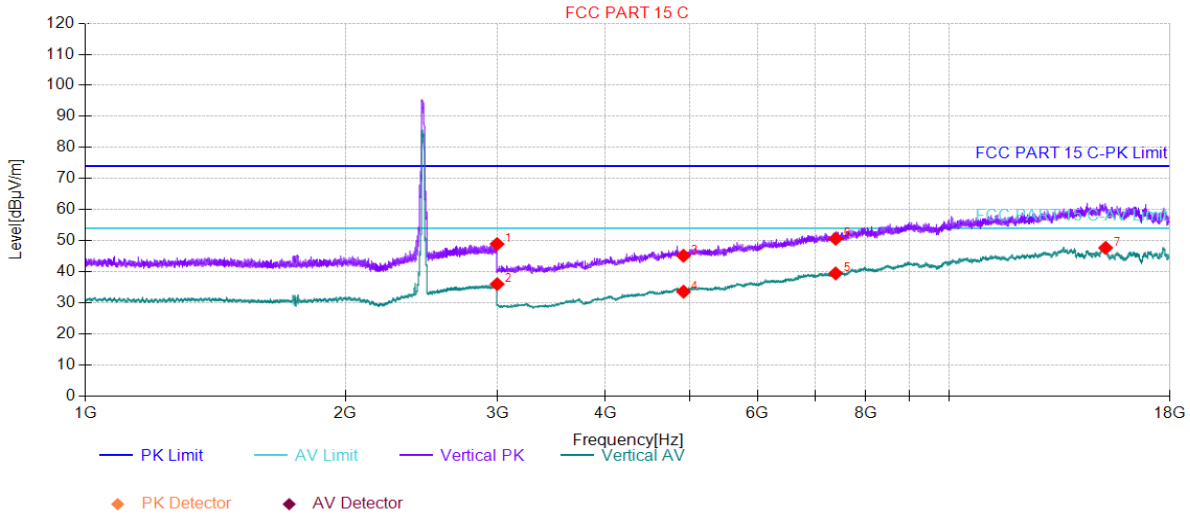
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4.9.2.12

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

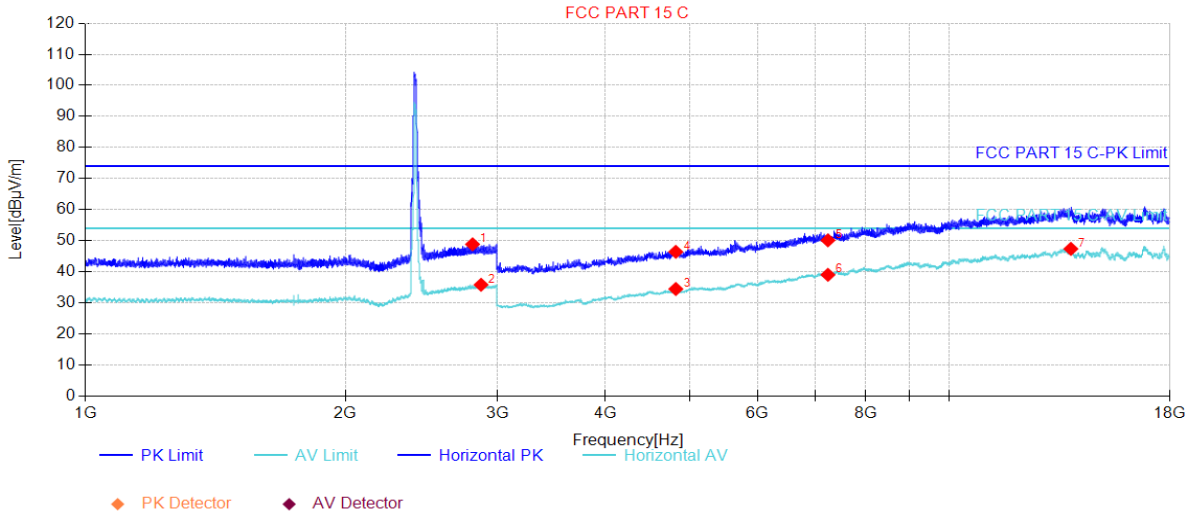
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4.9.2.13 802.11N20_CH1



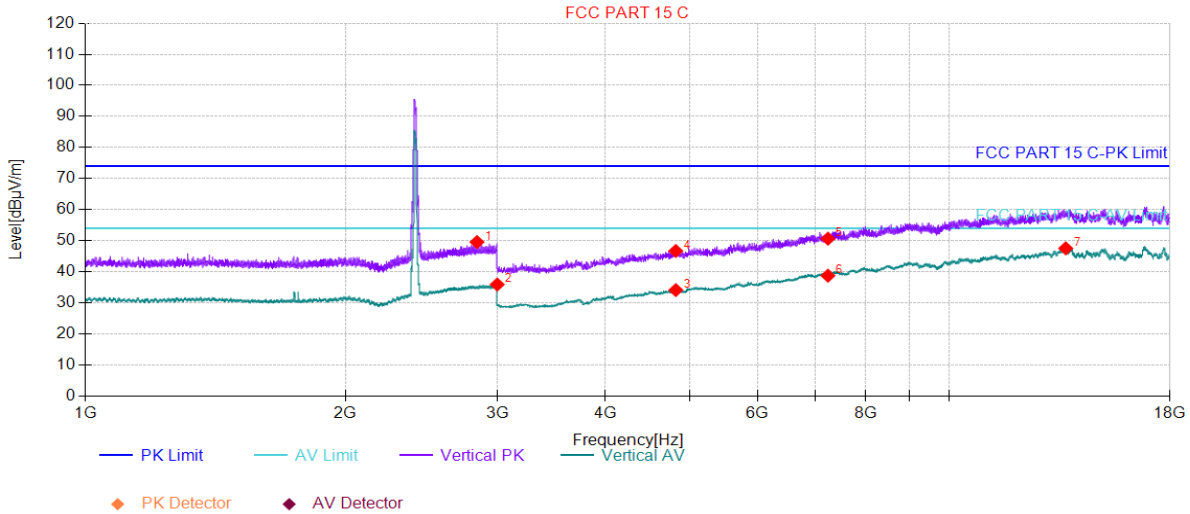
Suspected List						
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2806.5807	48.82	6.74	74.00	25.18	Horizontal
2	2870.7871	35.78	6.89	54.00	18.22	Horizontal
3	4824.0000	34.43	-10.56	54.00	19.57	Horizontal
4	4824.0000	46.39	-10.56	74.00	27.61	Horizontal
5	7236.0000	50.10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

Final Data List



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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

Final Data List



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