FCC TEST REPORT

Application No:	AR/2020/80005
Applicant:	Xiaomi Communications Co., Ltd.
Address of Applicant:	#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085
Manufacturer:	Xiaomi Communications Co., Ltd.
Address of Manufacturer	#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085
EUT Description:	Mobile Phone
Model No.:	M2007J22G
Trade Mark:	Redmi
FCC ID:	2AFZZJ22G
Standards:	47 CFR FCC Part 2, Subpart J 47 CFR Part 15, Subpart C
Test Method:	KDB558074 D01 15.247 Meas Guidance v05r02 ANSI C63.10 (2013)
Date of Receipt:	2020/9/11
Date of Test:	2020/9/11 to 2020/10/12
Date of Issue:	2020/10/12
Test Result:	**PASS ***

. * In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Derek Yang

Derek Yang
Wireless Laboratory Manager

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1 Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2020/10/12		Original

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

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Inspection & Testing Services
SGS-CSTC Standards Technical Services Co.,Ltd. Shenzhen Branch Testing Center LLC Laboratory.

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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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3 General Information

3.1 Client Information

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Address of Applicant:	#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085
Manufacturer:	Xiaomi Communications Co., Ltd.
Address of Manufacturer:	#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085

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
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Telephone:	+86 (0) 755 2601 2053
Fax:	+86 (0) 755 2671 0594
E-mail:	ee.shenzhen@sgs.com

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::	Mobile Phone
Model No.:	M2007J22G
Trade Mark:	Redmi
Hardware Version:	P2
Software Version:	MIUI12
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 IEEE for 802.11N(HT40) : OFDM
Sample Type:	☒ Portable Device, ☐Module
Antenna Type:	PIFA Antenna
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:	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		
Operation Frequency of each channel (802.11N HT40)							
Channel	Frequency	Channel	Frequency	Channel	Frequency		
3	2422MHz	6	2437MHz	9	2452MHz		
4	2427MHz	7	2442MHz				
5	2432MHz	8	2447MHz				

Remark:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the

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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)	Frequency for 802.11N (HT40)
The Lowest channel	2412MHz	2422MHz
The Middle channel	2437MHz	2437MHz
The Highest channel	2462MHz	2452MHz

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 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. 5) 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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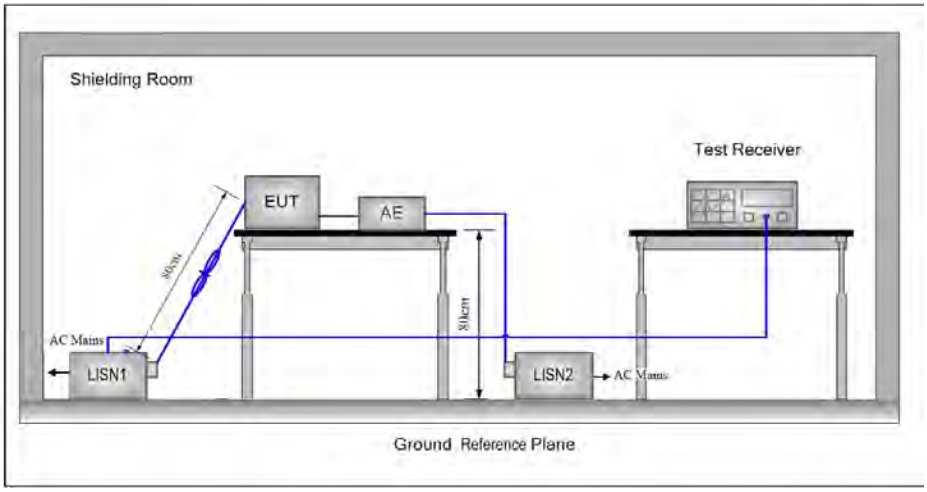
Test Setup:	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates at lowest, middle and highest channel. Charge + Transmitting mode.
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate of 802.11B at lowest channel is the worst case. Charge + Transmitting mode. Only the worst case is recorded in the report.
Instruments Used:	Refer to section 5.10 for details
Test Results:	Pass

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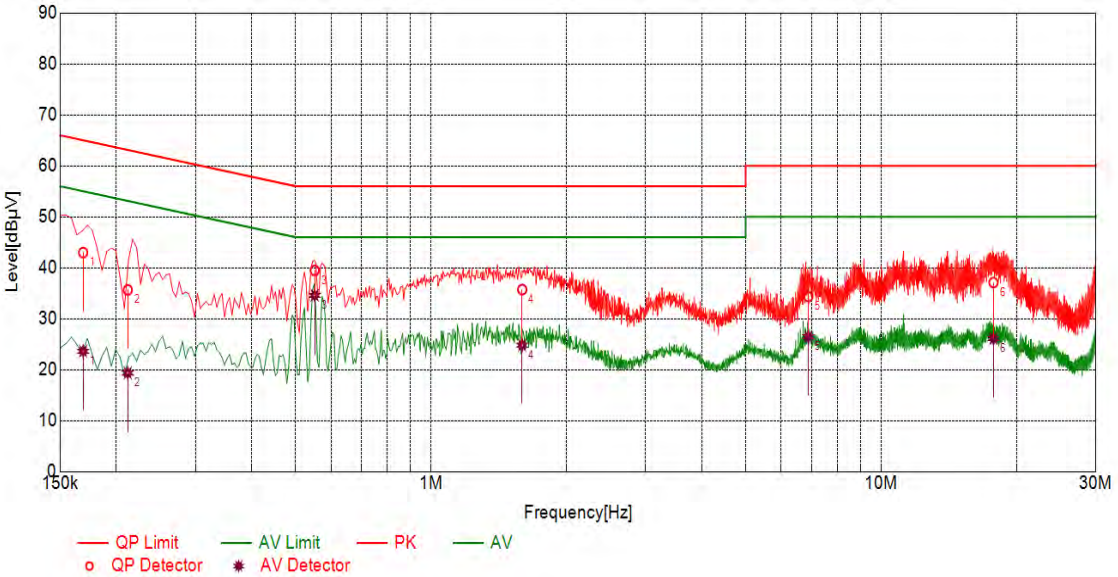
Measurement Data

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.

Live Line:



Test Graph

Final Data List									
NO.	Freq. [MHz]	Factor [dB]	QP Value	QP Limit	QP Margin	AV Value	AV Limit	AV Margin	Type
1	0.1688	10.10	42.99	65.02	22.03	23.61	55.02	31.41	L
2	0.2121	10.10	35.65	63.12	27.47	19.36	53.12	33.76	L
3	0.5519	10.10	39.47	56.00	16.53	34.58	46.00	11.42	L
4	1.5950	10.10	35.72	56.00	20.28	24.82	46.00	21.18	L
5	6.8922	10.10	34.38	60.00	25.62	26.47	50.00	23.53	L
6	17.7654	10.11	37.10	60.00	22.90	26.10	50.00	23.90	L

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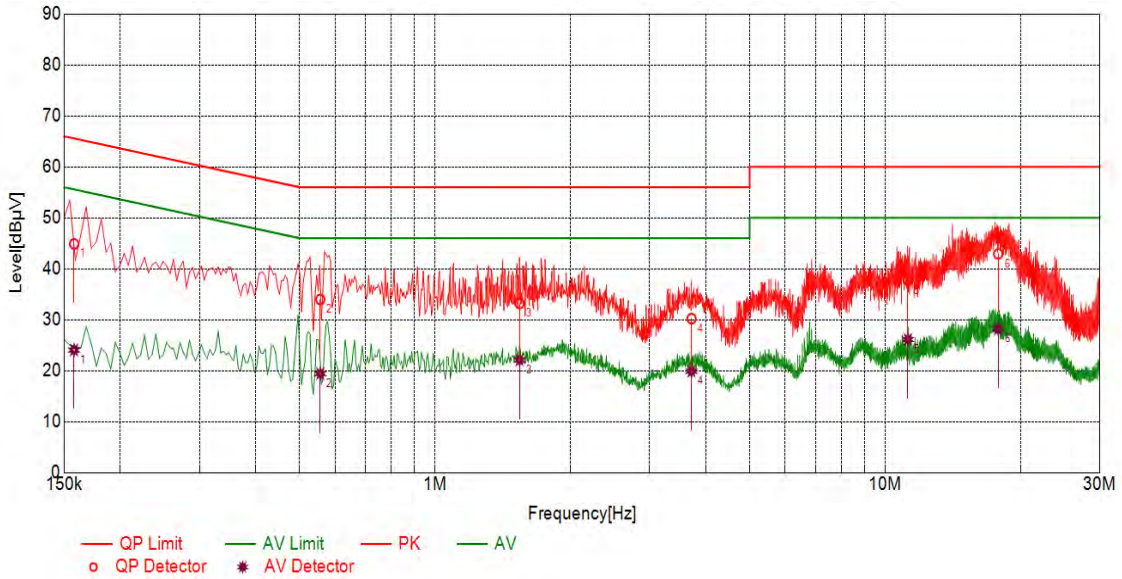
Neutral Line:



Test Graph

Final Data List									
NO.	Freq. [MHz]	Factor [dB]	QP Value	QP Limit	QP Margin	AV Value	AV Limit	AV Margin	Type
1	0.1579	10.10	44.89	65.57	20.68	24.05	55.57	31.52	N
2	0.5564	10.10	33.99	56.00	22.01	19.41	46.00	26.59	N
3	1.5421	10.10	33.21	56.00	22.79	22.10	46.00	23.90	N
4	3.7153	10.10	30.22	56.00	25.78	19.89	46.00	26.11	N
5	11.2376	10.10	37.74	60.00	22.26	26.13	50.00	23.87	N
6	17.8275	10.11	42.92	60.00	17.08	28.19	50.00	21.81	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

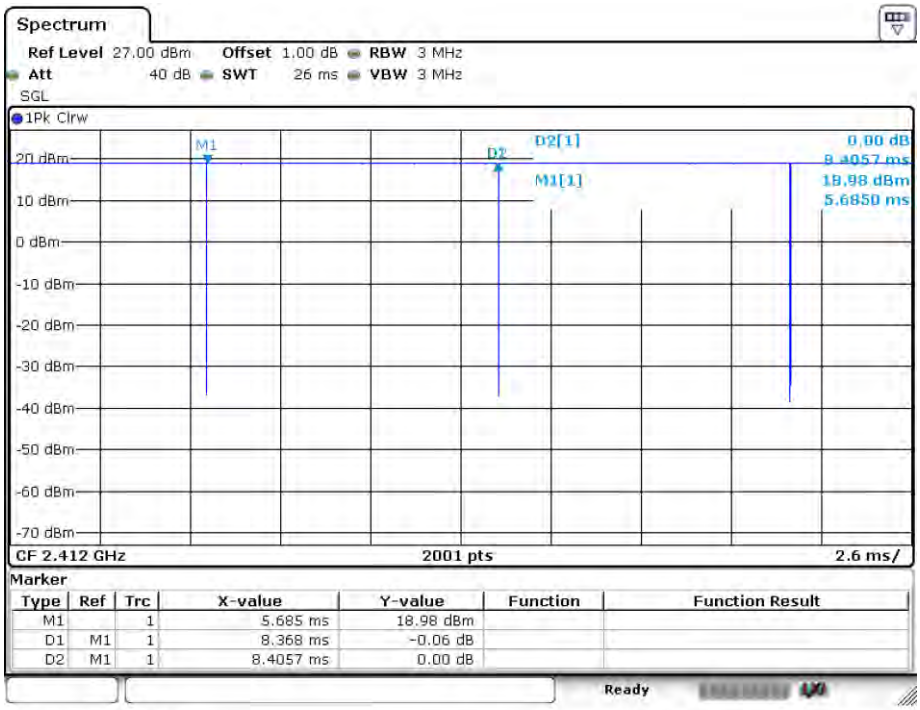
4.3.1 Test Results

Test Mode	TX Freq. [MHz]	Duty cycle [%]
11B	Ant 1: CH1,CH6,CH11	99.55
11G	Ant 1: CH1,CH6,CH11	96.77
11N20	Ant 1: CH1,CH6,CH11	96.97
11N40	Ant 1: CH3,CH6,CH9	94.87

4.3.1 Test Plots

4.3.1.1 ANT1

4.3.1.1.1 11B



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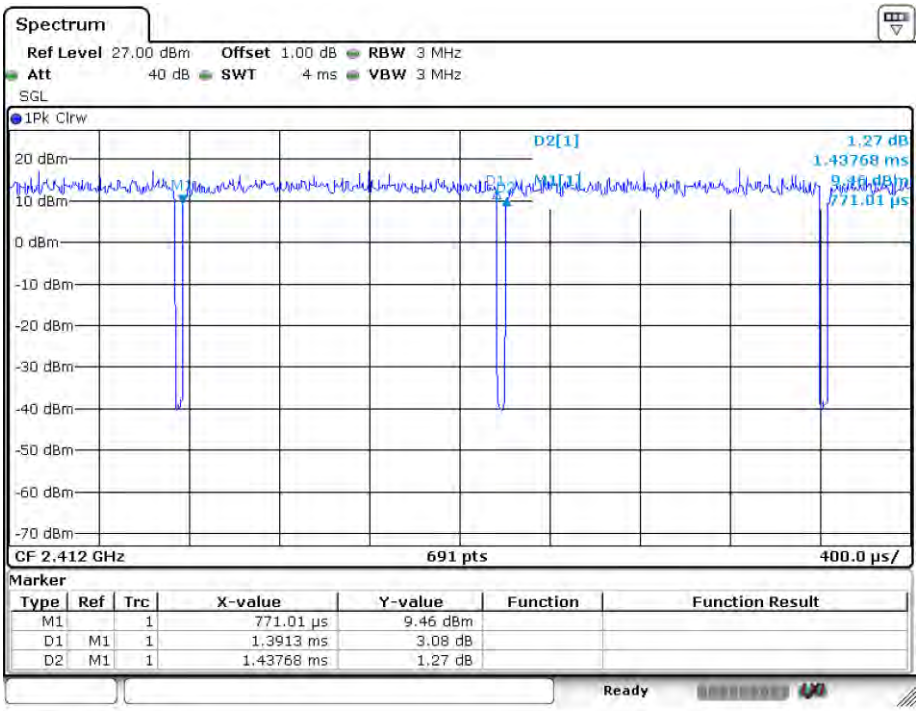
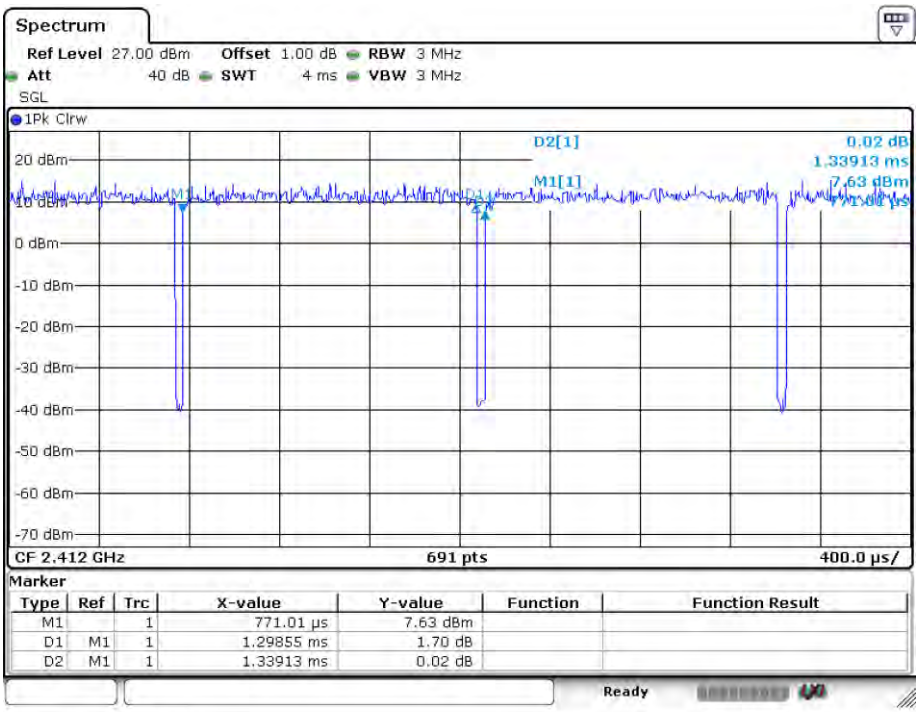
4.3.1.1.2 11G



Date: 18.SEP.2020 21:10:17

4.3.1.1.3 11N20



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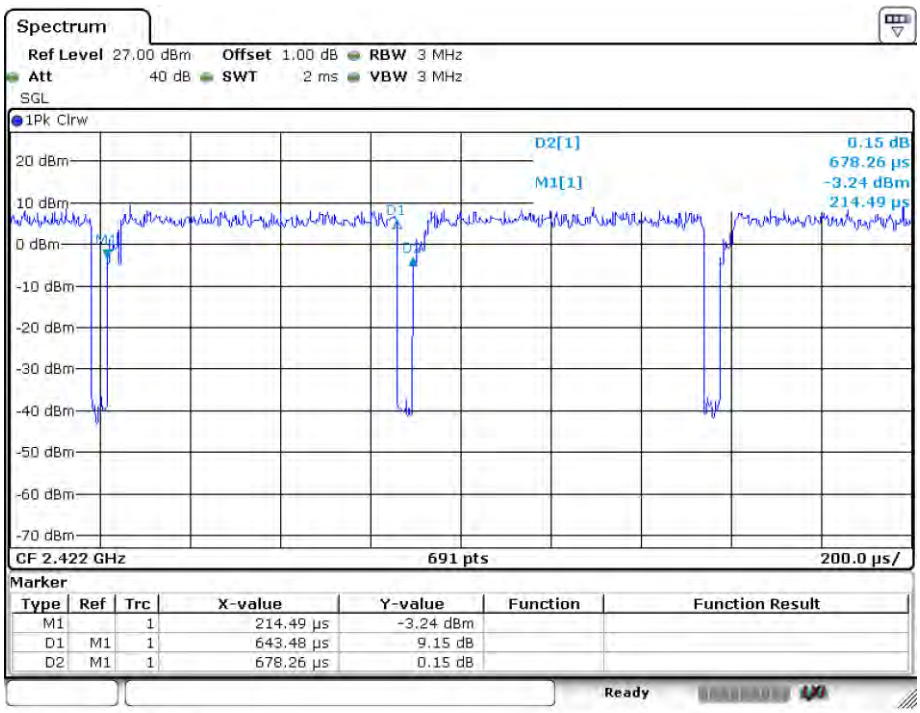
4.3.1.1.4 11N40



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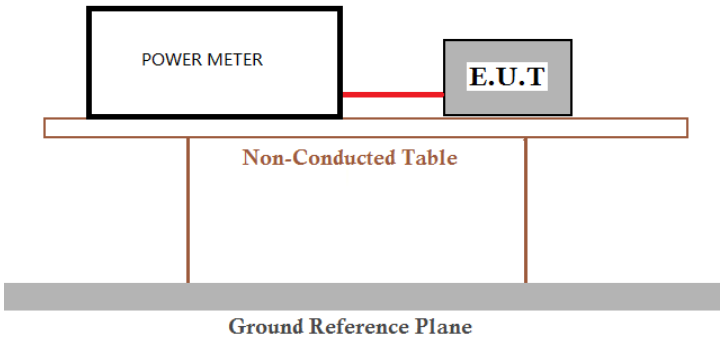
4.4 Conducted Output Power

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); 13.5Mbps of rate is the worst case of 802.11N(HT40).
Limit:	30dBm
Test Results:	Pass

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4.4.1 Test Results

Mode	Test Channel	Peak Output Power (dBm)	Limit (dBm)	Result
802.11B	Lowest	18.36	30.00	Pass
	Middle	19.15	30.00	Pass
	Highest	18.78	30.00	Pass
802.11G	Lowest	14.56	30.00	Pass
	Middle	15.18	30.00	Pass
	Highest	14.94	30.00	Pass
802.11N20	Lowest	12.44	30.00	Pass
	Middle	13.13	30.00	Pass
	Highest	12.84	30.00	Pass
802.11N40	Lowest	10.91	30.00	Pass
	Middle	11.13	30.00	Pass
	Highest	11.17	30.00	Pass

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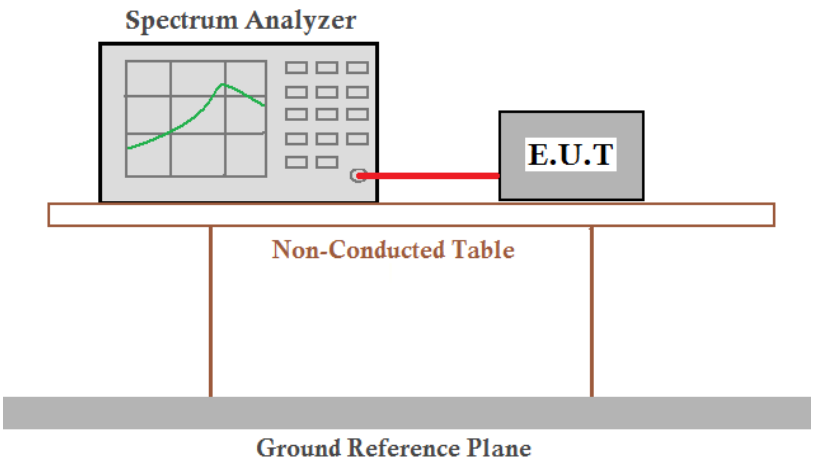
4.5 DTS (6 dB) Bandwidth & 99% Occupied Bandwidth

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); 13.5Mbps of rate is the worst case of 802.11N(HT40).
Limit:	≥ 500 kHz
Test Results:	Pass

4.5.1 Test Results

Mode	Test Channel	Occupied Bandwidth (MHz)	6dB Emission Bandwidth (MHz)	Limit (kHz)	Result
802.11B	Lowest	13.07	9.03	≥500	Pass
	Middle	13.20	9.03	≥500	Pass
	Highest	13.11	9.03	≥500	Pass
802.11G	Lowest	16.80	16.02	≥500	Pass
	Middle	16.85	16.28	≥500	Pass
	Highest	16.89	16.06	≥500	Pass
802.11N20	Lowest	17.80	17.28	≥500	Pass
	Middle	17.80	17.28	≥500	Pass
	Highest	17.76	17.15	≥500	Pass
802.11N40	Lowest	36.12	35.27	≥500	Pass
	Middle	36.21	35.10	≥500	Pass
	Highest	36.21	35.69	≥500	Pass

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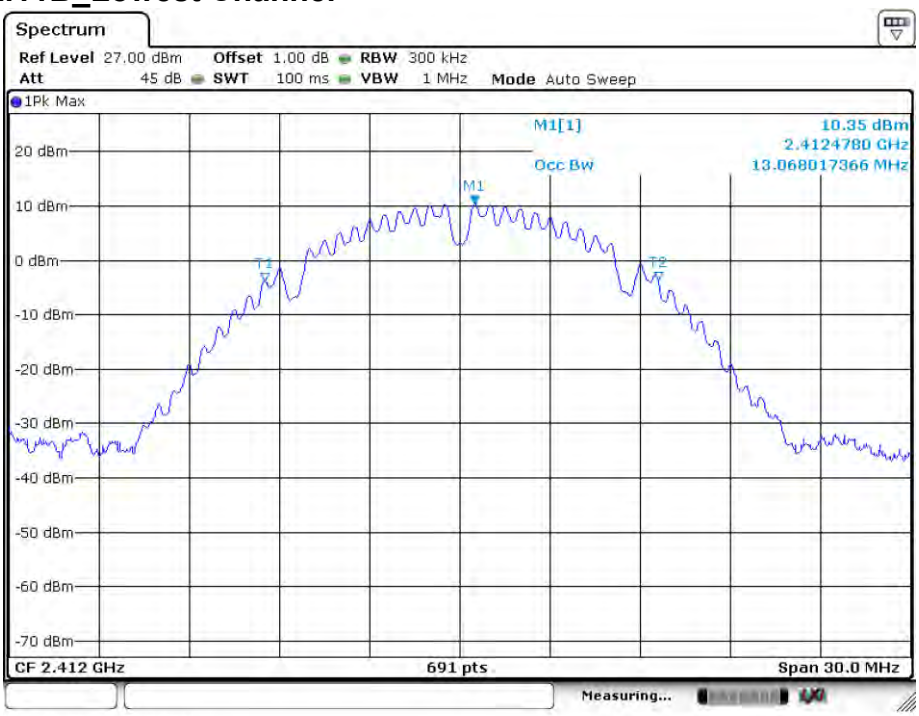
4.5.2 Test plots

4.5.2.1 ANT1

4.5.2.1.1 802.11B_Lowest Channel



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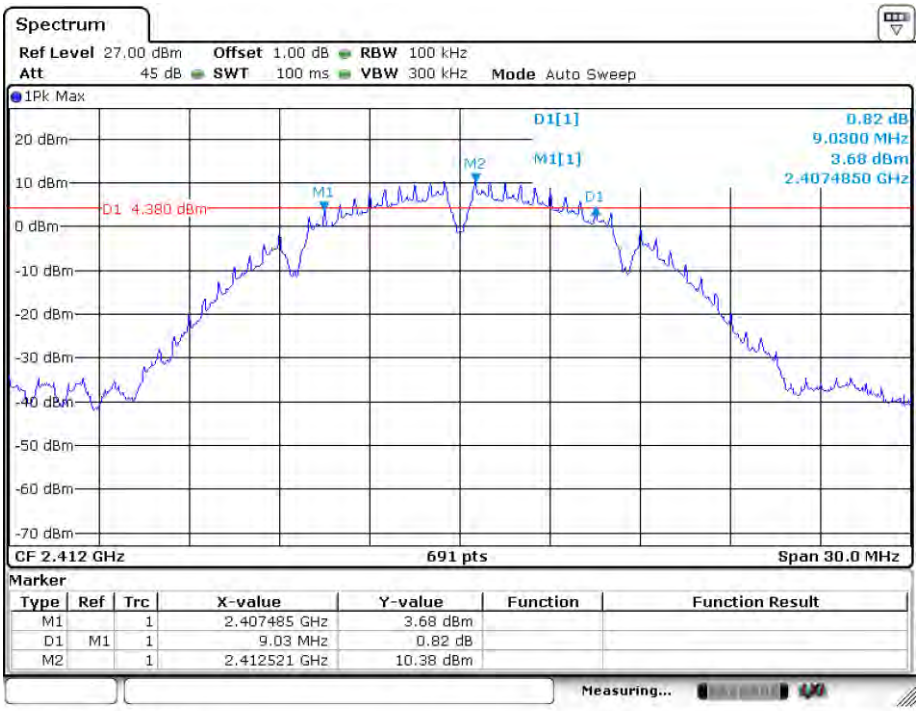

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.407485 GHz	3.68 dBm		
D1	M1	1	9.03 MHz	0.82 dB		
M2		1	2.412521 GHz	10.38 dBm		

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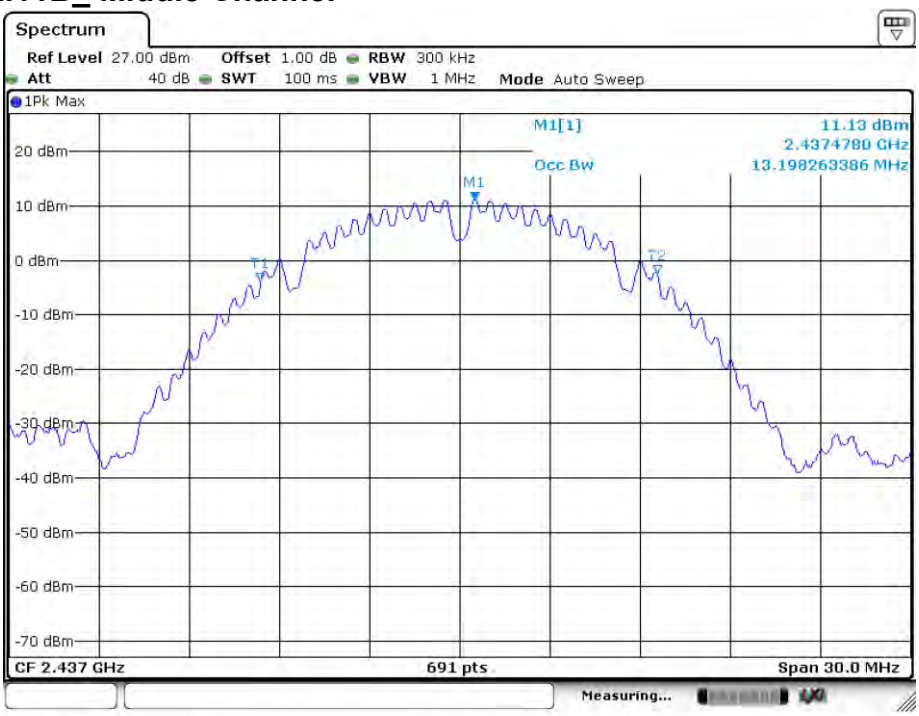
4.5.2.1.2 802.11B_ Middle Channel



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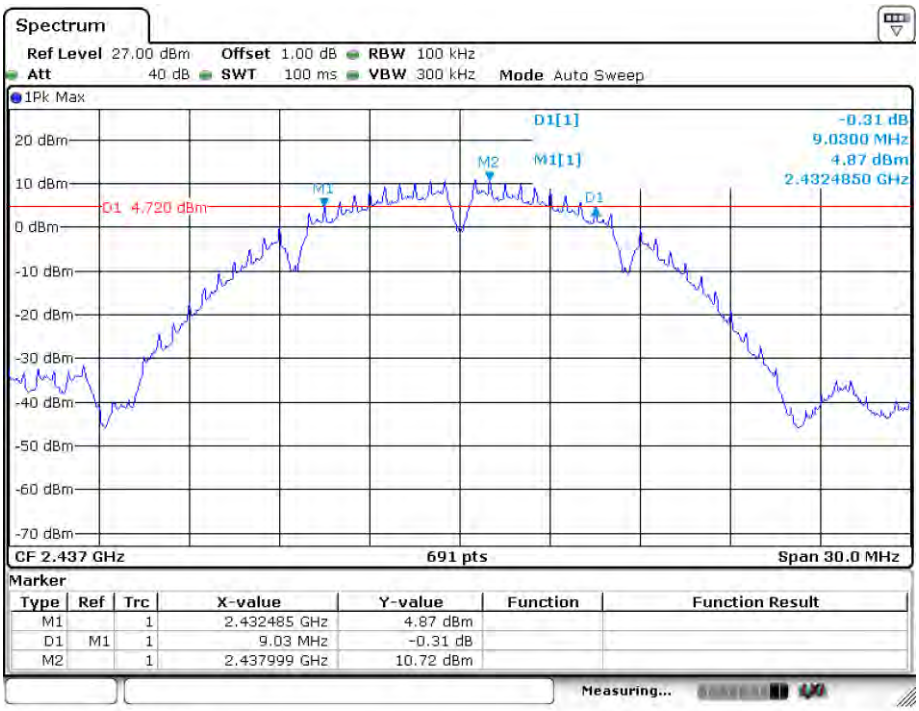

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.432485 GHz	4.87 dBm		
D1	M1	1	9.03 MHz	-0.31 dB		
M2		1	2.437999 GHz	10.72 dBm		

Date: 18.SEP.2020 20:32:48

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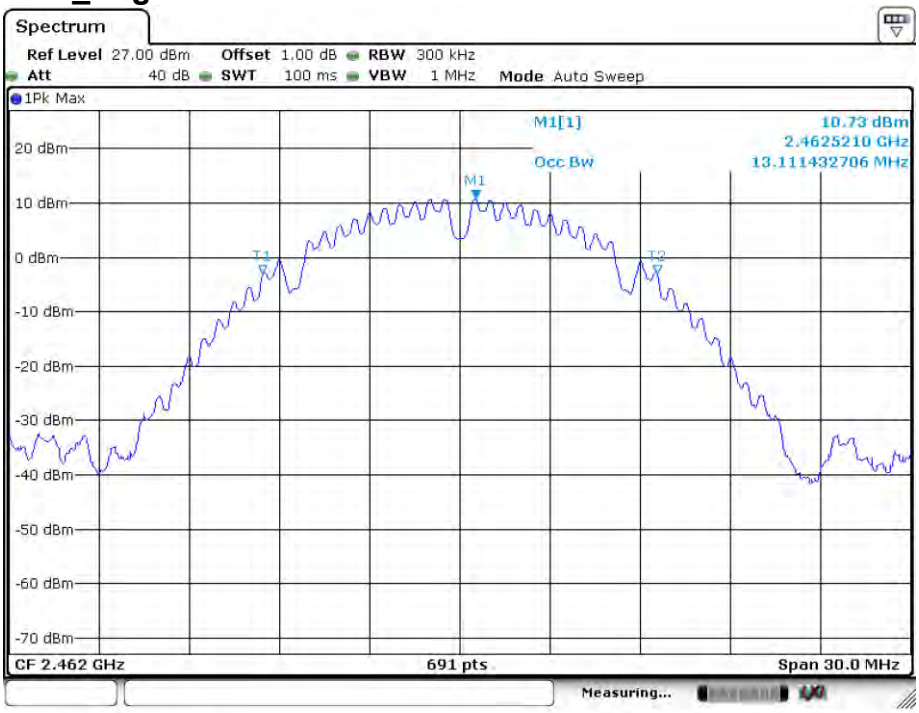
4.5.2.1.3 802.11B_ Highest Channel



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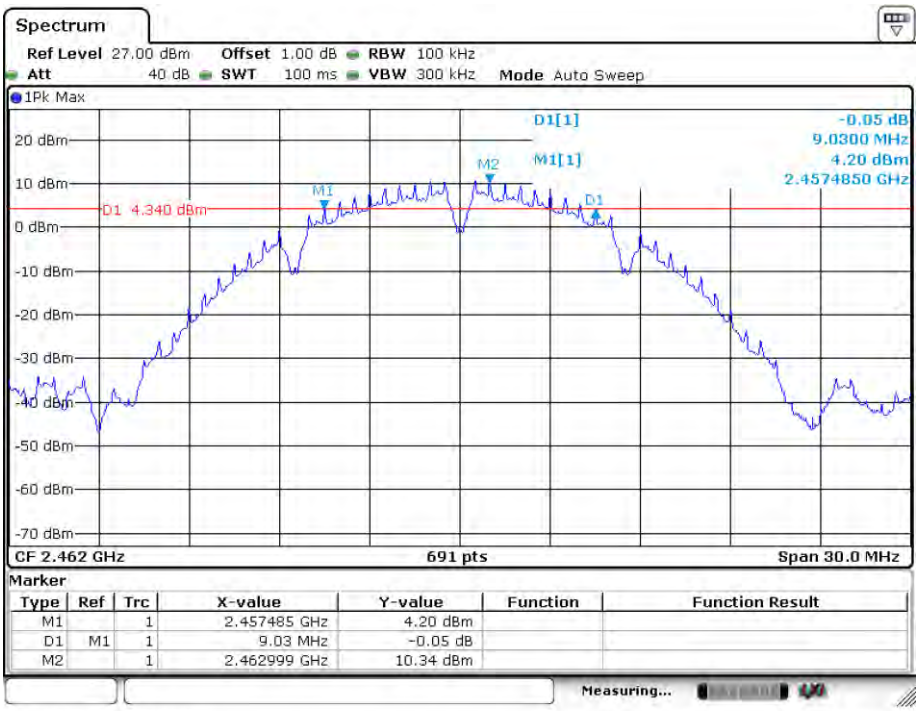

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.457485 GHz	4.20 dBm		
D1	M1	1	9.03 MHz	-0.05 dB		
M2		1	2.462999 GHz	10.34 dBm		

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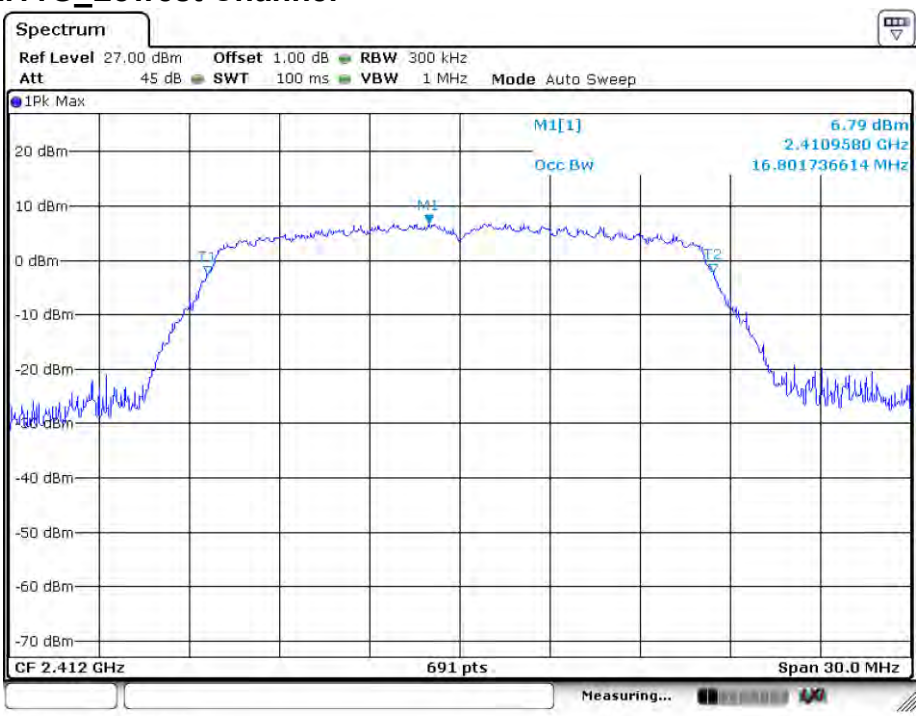
4.5.2.1.4 802.11G_Lowest Channel



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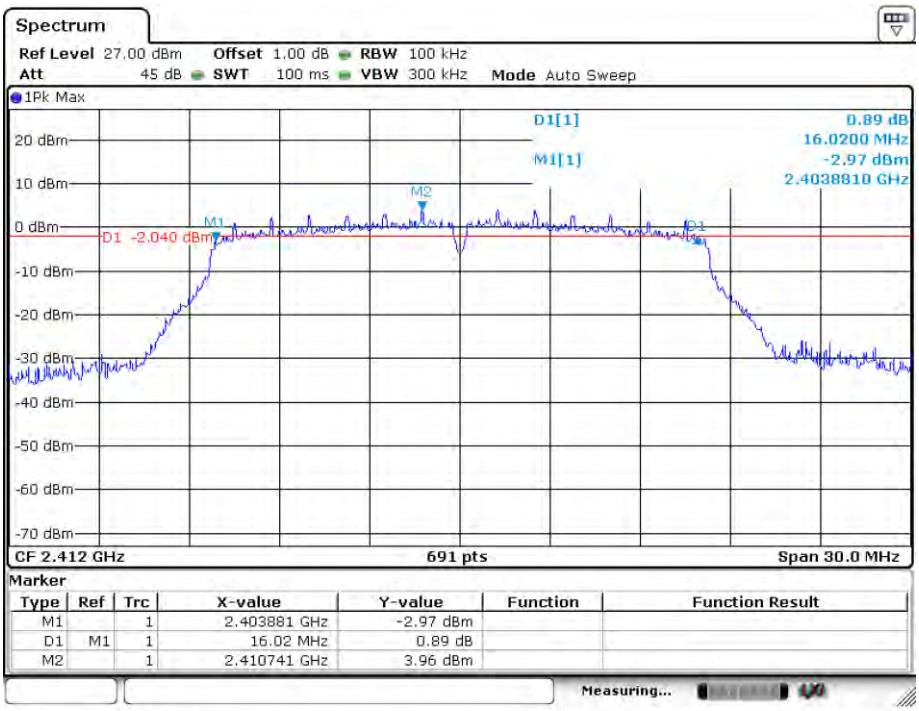

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.403881 GHz	-2.97 dBm		
D1	M1	1	16.02 MHz	0.89 dB		
M2		1	2.410741 GHz	3.96 dBm		

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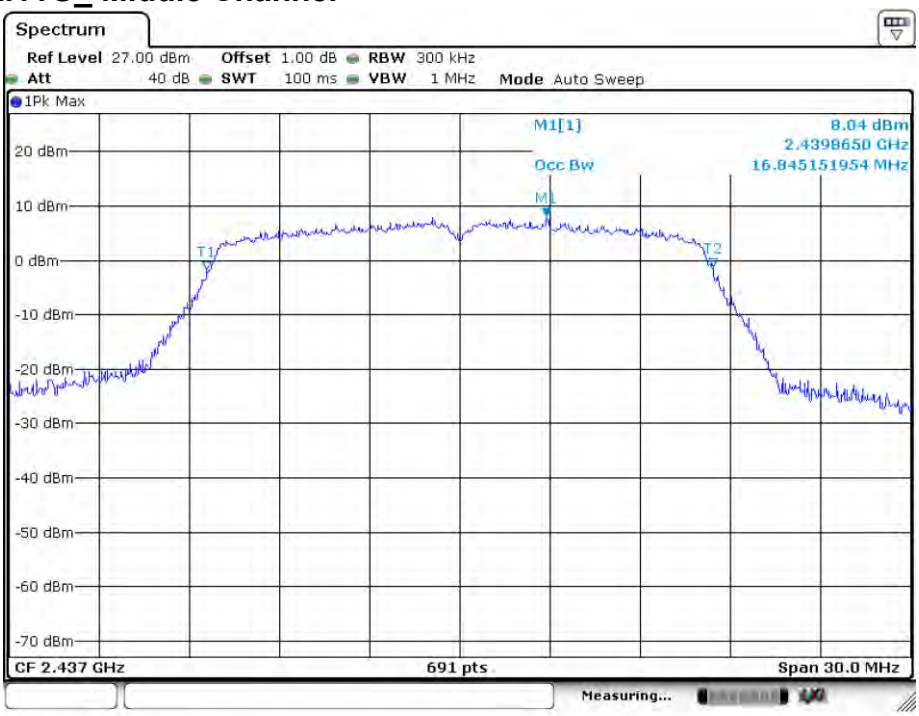
4.5.2.1.5 802.11G_ Middle Channel



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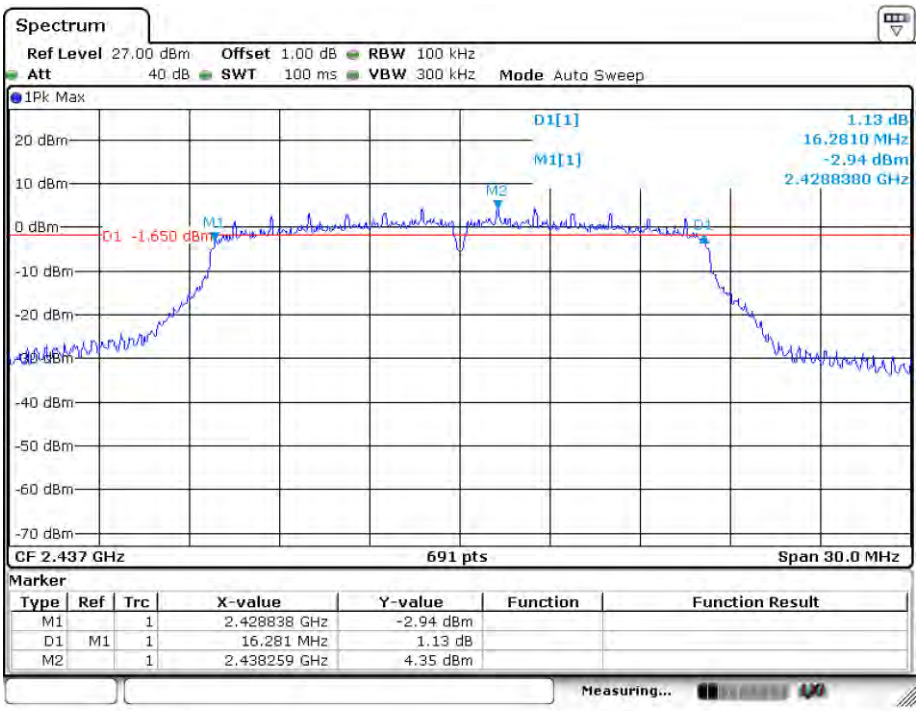

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.428838 GHz	-2.94 dBm		
D1	M1	1	16.281 MHz	1.13 dB		
M2		1	2.438259 GHz	4.35 dBm		

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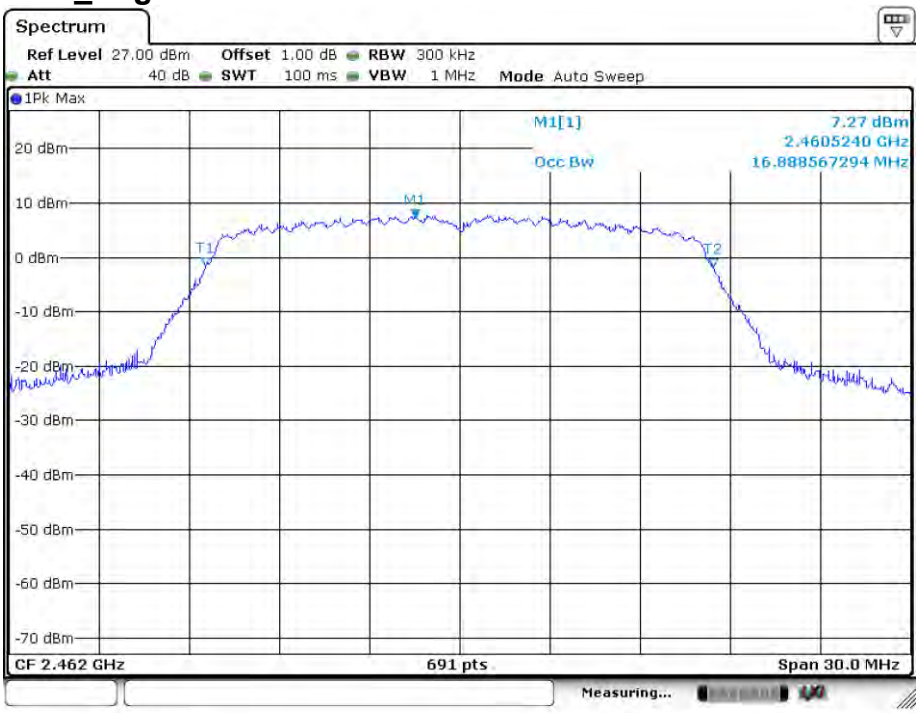
4.5.2.1.6 802.11G_ Highest Channel



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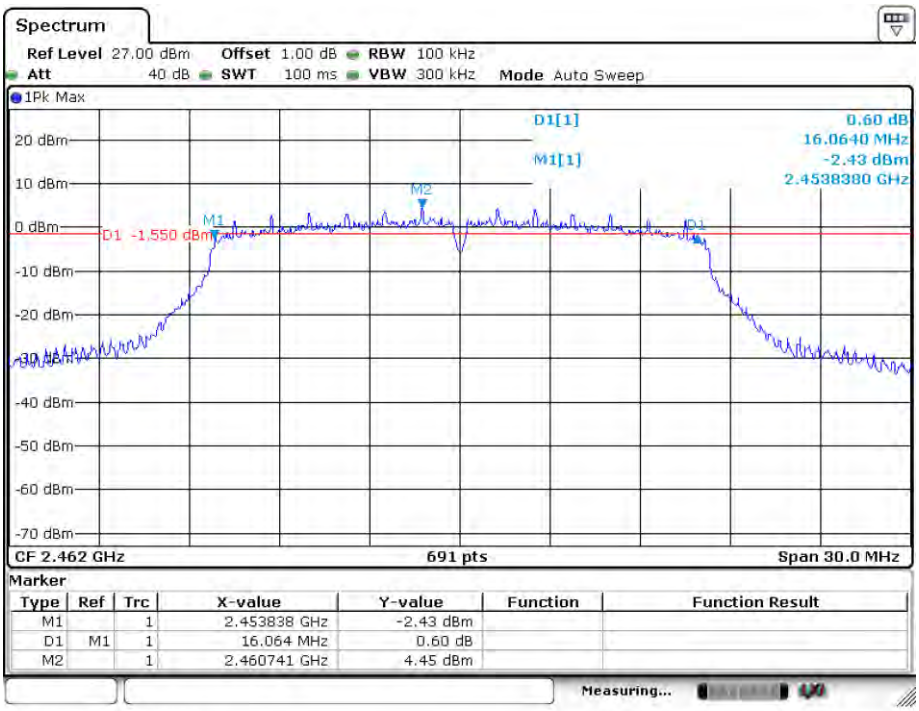

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.453838 GHz	-2.43 dBm		
D1	M1	1	16.064 MHz	0.60 dB		
M2		1	2.460741 GHz	4.45 dBm		

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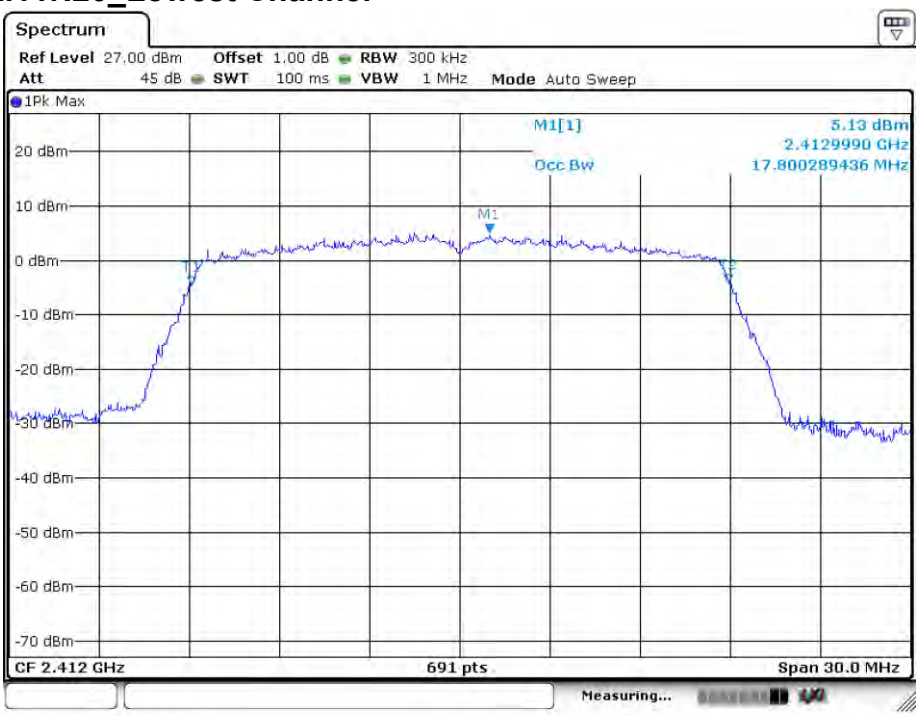
4.5.2.1.7 802.11N20_Lowest Channel



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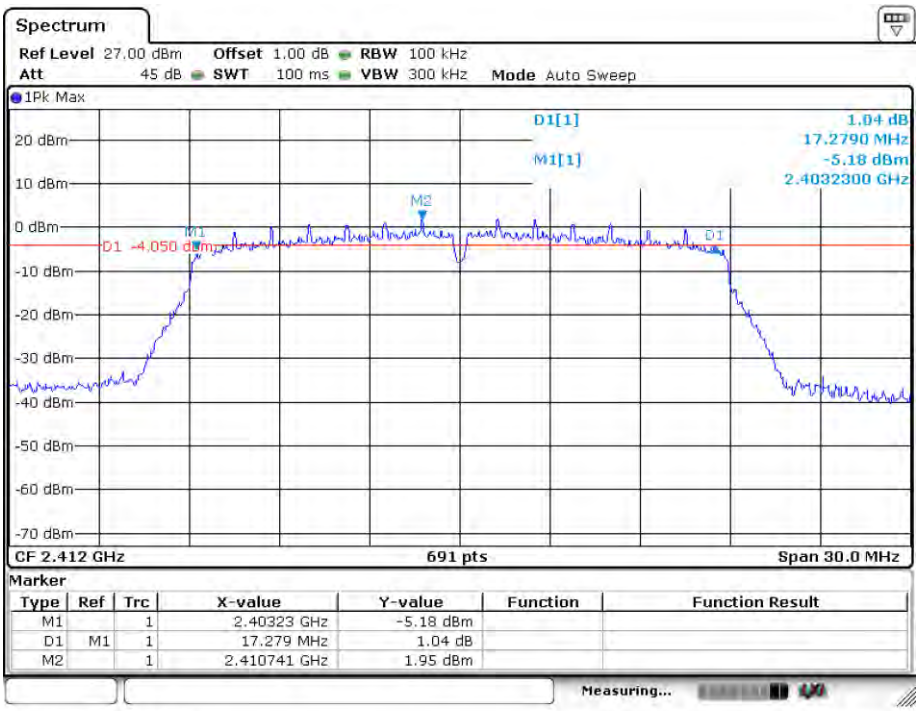

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Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40323 GHz	-5.18 dBm		
D1	M1	1	17.279 MHz	1.04 dB		
M2		1	2.410741 GHz	1.95 dBm		

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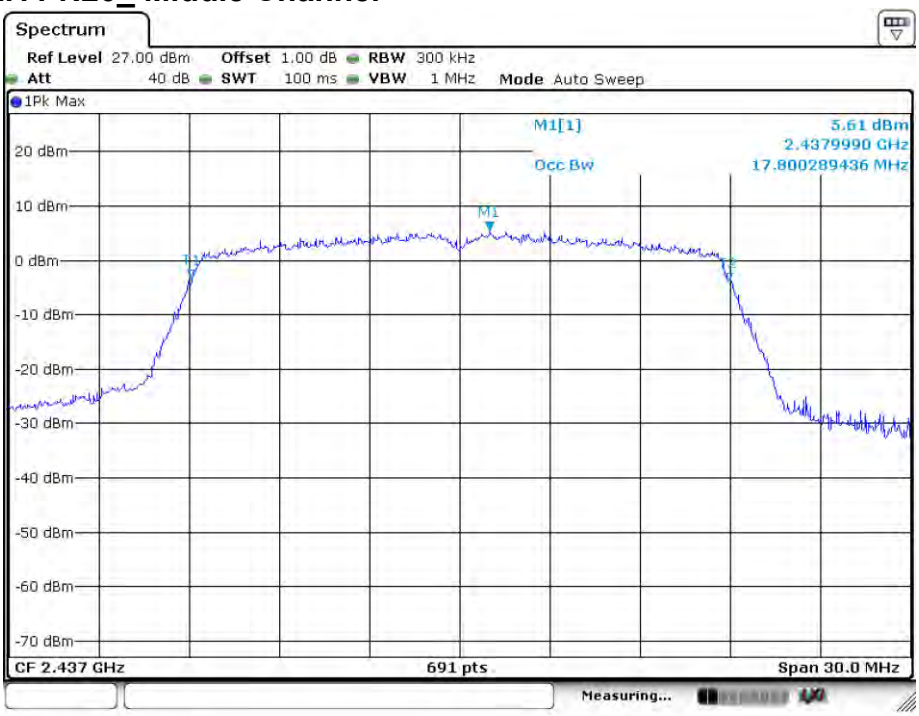
4.5.2.1.8 802.11 N20_ Middle Channel



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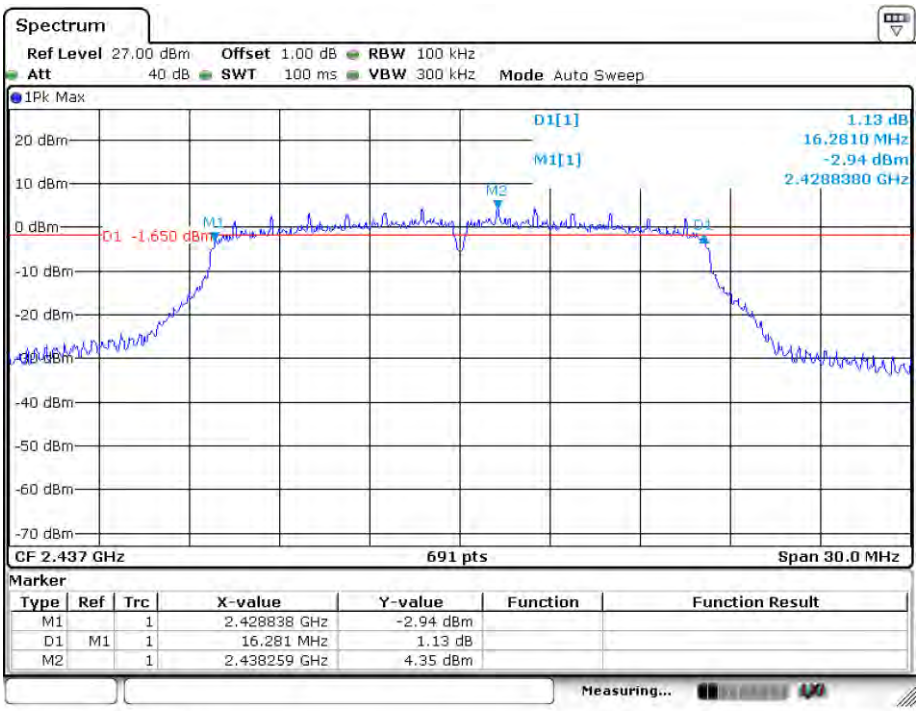

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.428838 GHz	-2.94 dBm		
D1	M1	1	16.281 MHz	1.13 dB		
M2		1	2.438259 GHz	4.35 dBm		

Date: 18.SEP.2020 20:32:15

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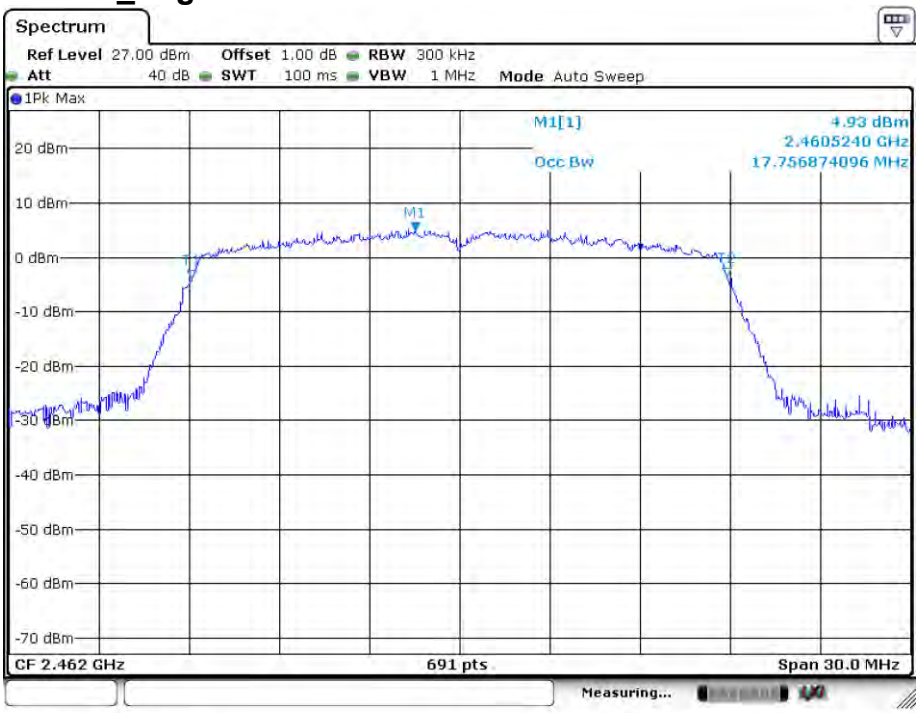
4.5.2.1.9 802.11 N20_ Highest Channel



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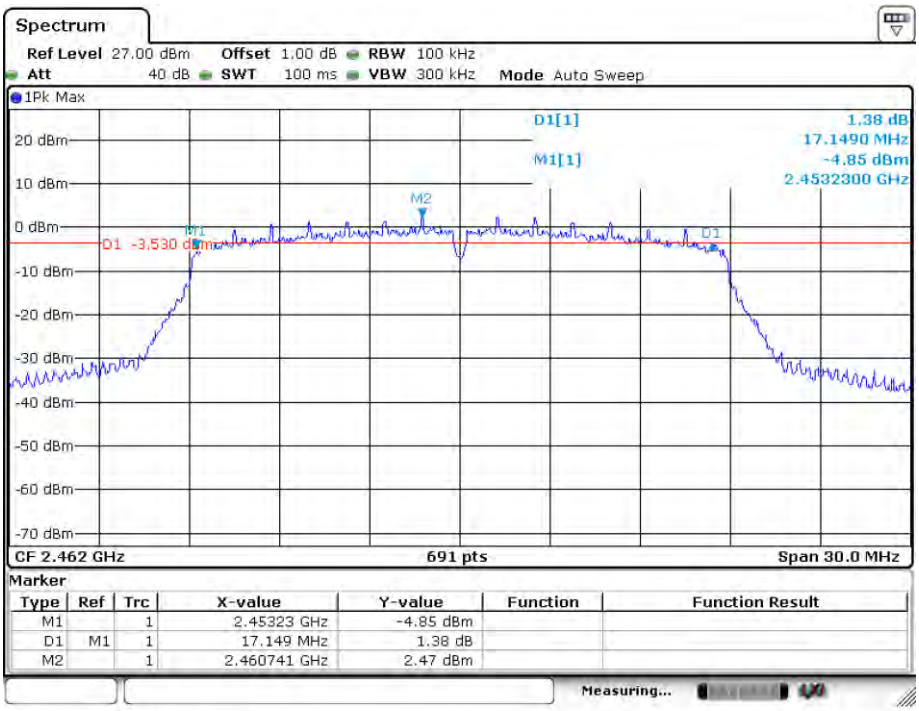

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45323 GHz	-4.85 dBm		
D1	M1	1	17.149 MHz	1.38 dB		
M2		1	2.460741 GHz	2.47 dBm		

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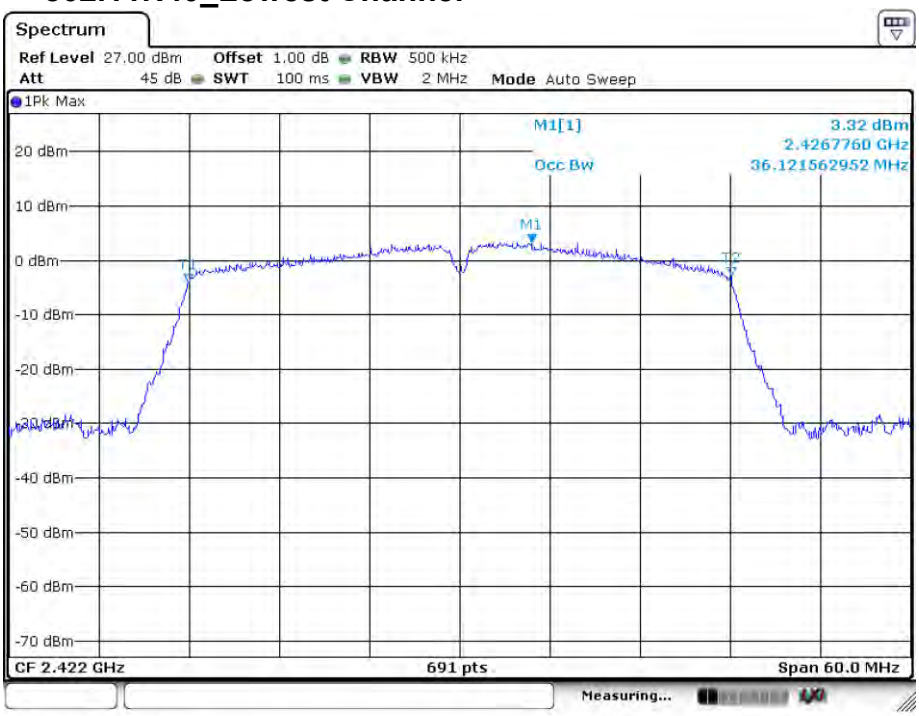
4.5.2.1.10 802.11N40_Lowest Channel



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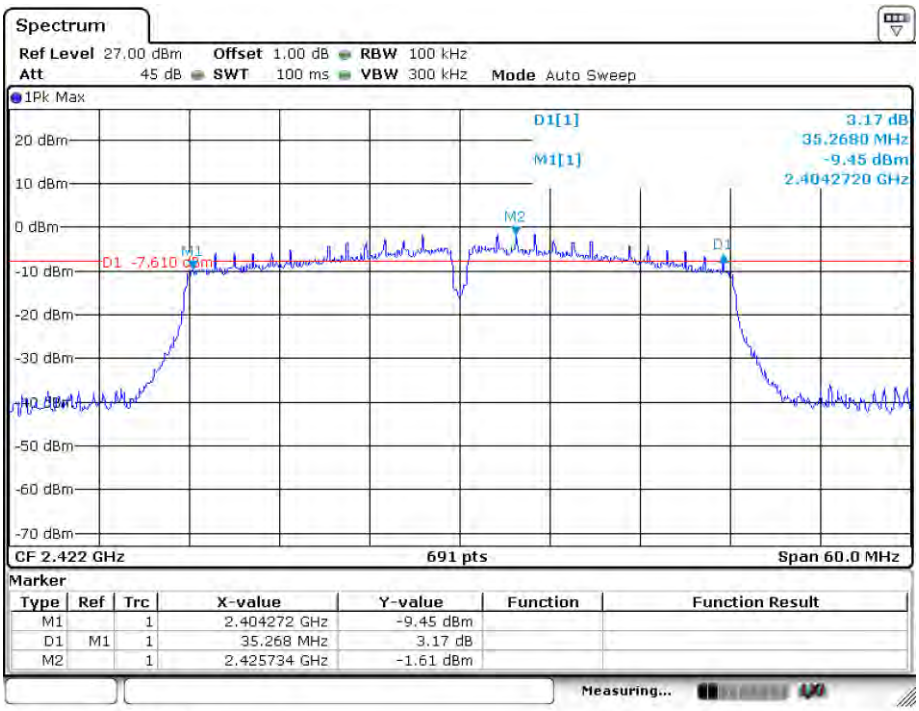

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.404272 GHz	-9.45 dBm		
D1	M1	1	35.268 MHz	3.17 dB		
M2		1	2.425734 GHz	-1.61 dBm		

Date: 18.SEP.2020 19:26:11

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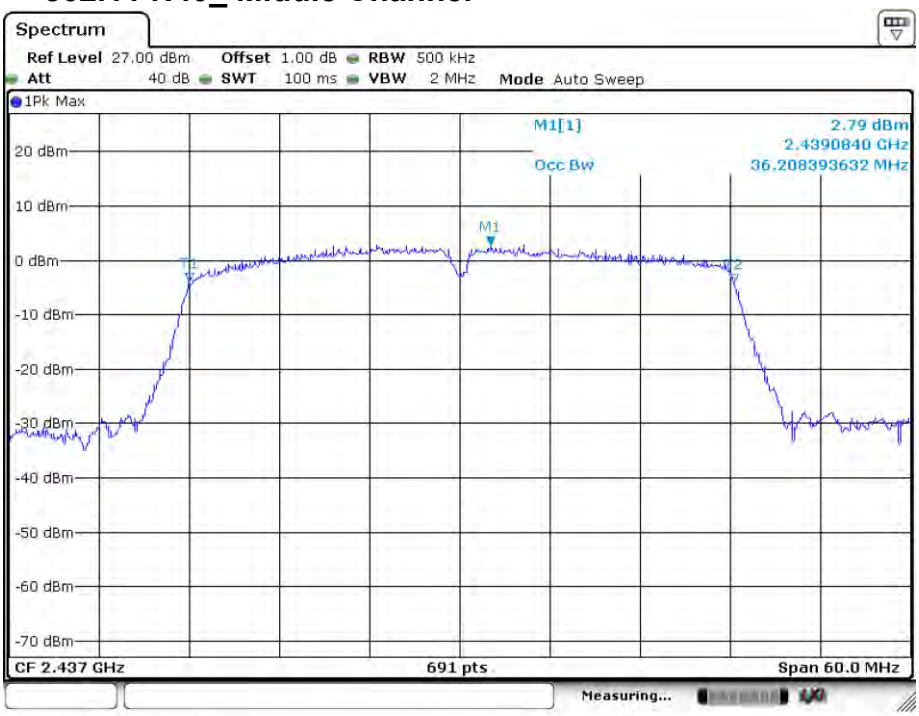
4.5.2.1.11 802.11 N40_ Middle Channel



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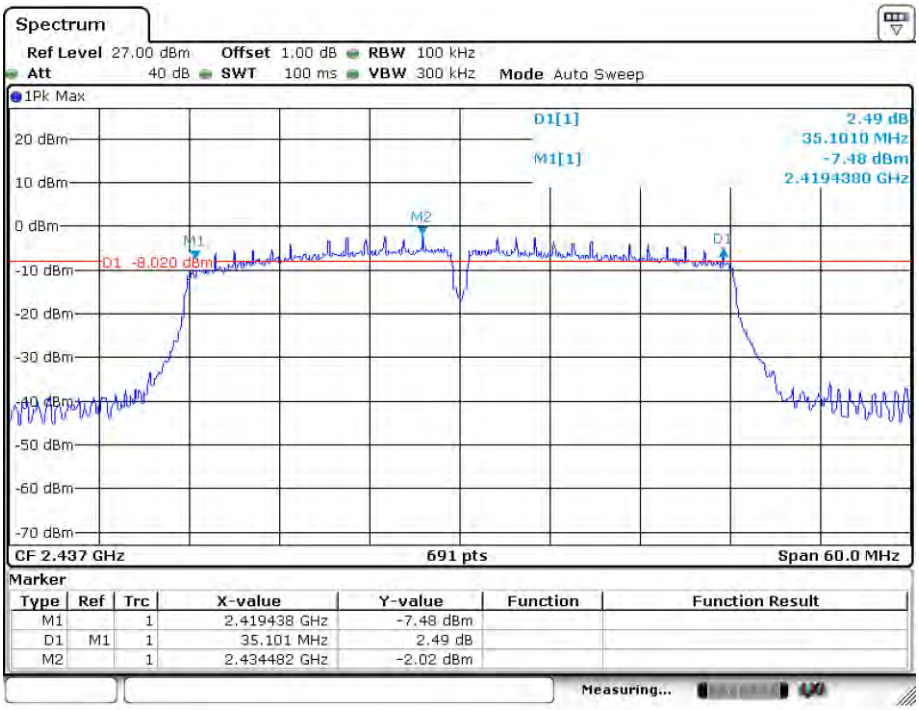

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.419438 GHz	-7.48 dBm		
D1	M1	1	35.101 MHz	2.49 dB		
M2		1	2.434482 GHz	-2.02 dBm		

Date: 18.SEP.2020 20:25:21

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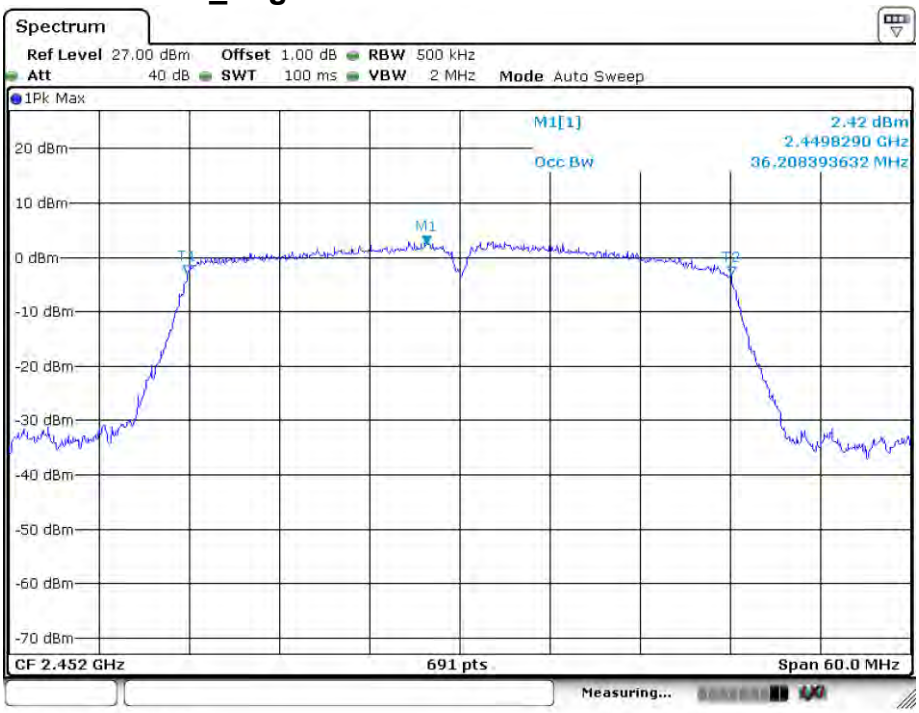
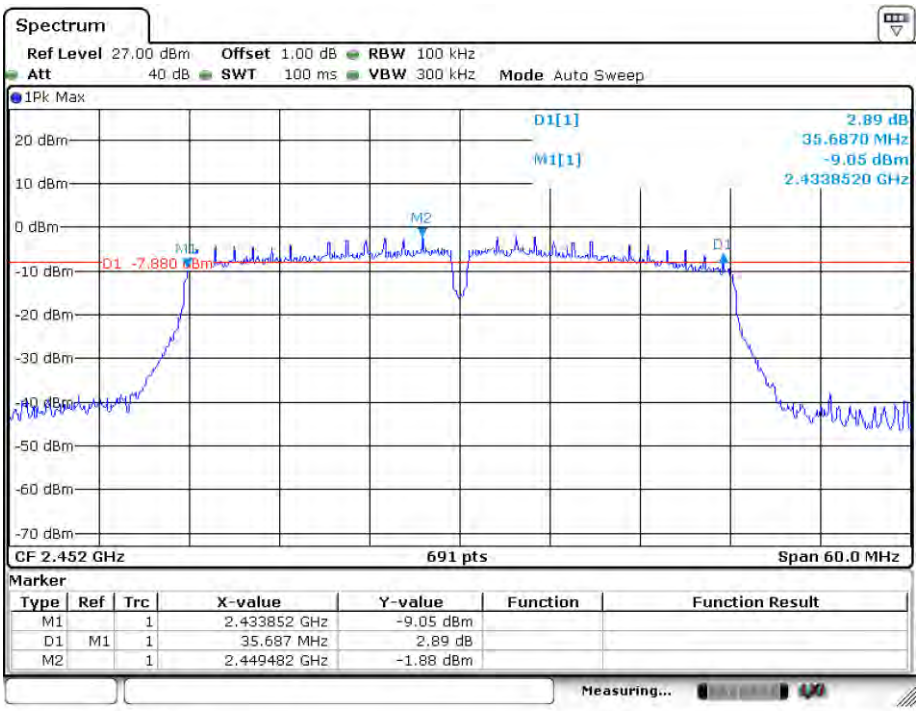
4.5.2.1.12 802.11 N40_ Highest Channel



Date: 18.SEP.2020 20:54:35



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.433852 GHz	-9.05 dBm		
D1	M1	1	35.687 MHz	2.89 dB		
M2		1	2.449482 GHz	-1.88 dBm		

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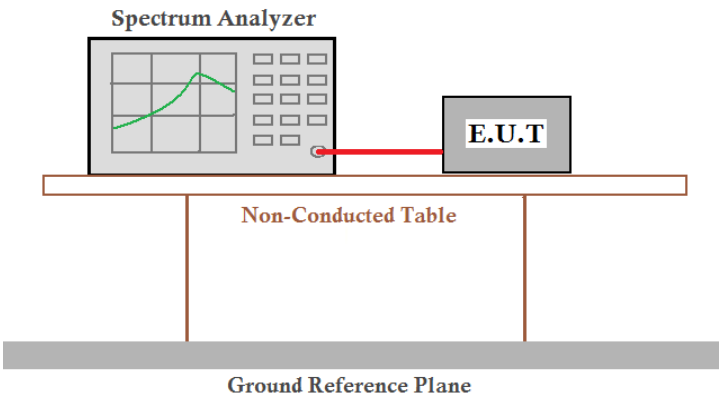
4.6 Power Spectral Density

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); 13.5Mbps of rate is the worst case of 802.11N(HT40).
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	-2.01	≤8.00	Pass
	Middle	-2.09	≤8.00	Pass
	Highest	-1.89	≤8.00	Pass
802.11G	Lowest	-7.22	≤8.00	Pass
	Middle	-8.11	≤8.00	Pass
	Highest	-6.94	≤8.00	Pass
802.11N20	Lowest	-10.40	≤8.00	Pass
	Middle	-9.25	≤8.00	Pass
	Highest	-9.56	≤8.00	Pass
802.11N40	Lowest	-14.49	≤8.00	Pass
	Middle	-13.96	≤8.00	Pass
	Highest	-14.29	≤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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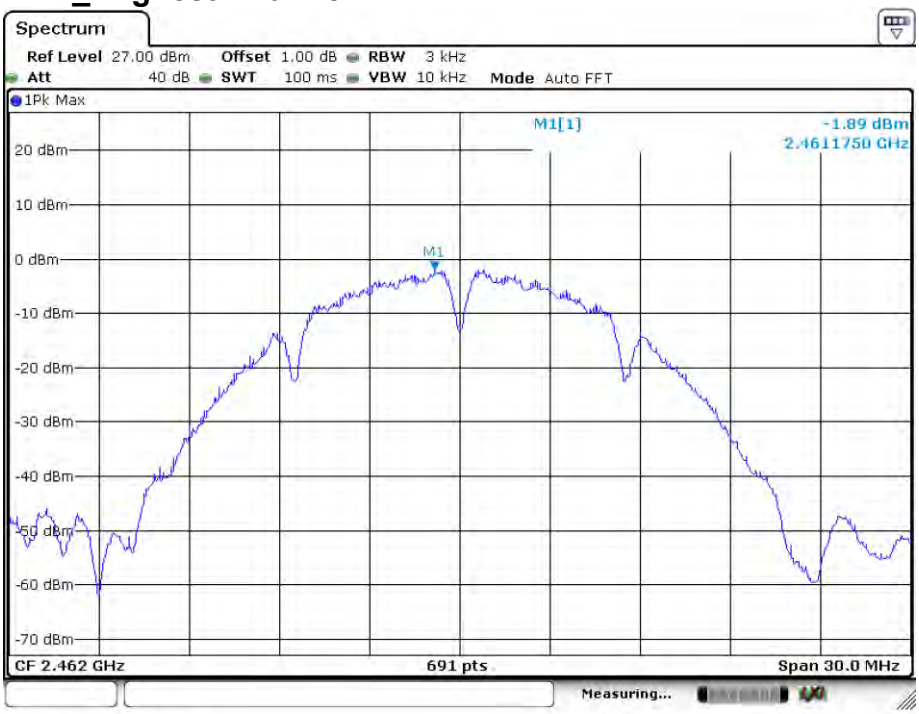
4.6.2.1.2 802.11B_ Middle Channel

Date: 18.SEP.2020 20:18:55

4.6.2.1.3 802.11B_ Highest Channel



Date: 18.SEP.2020 20:19:44

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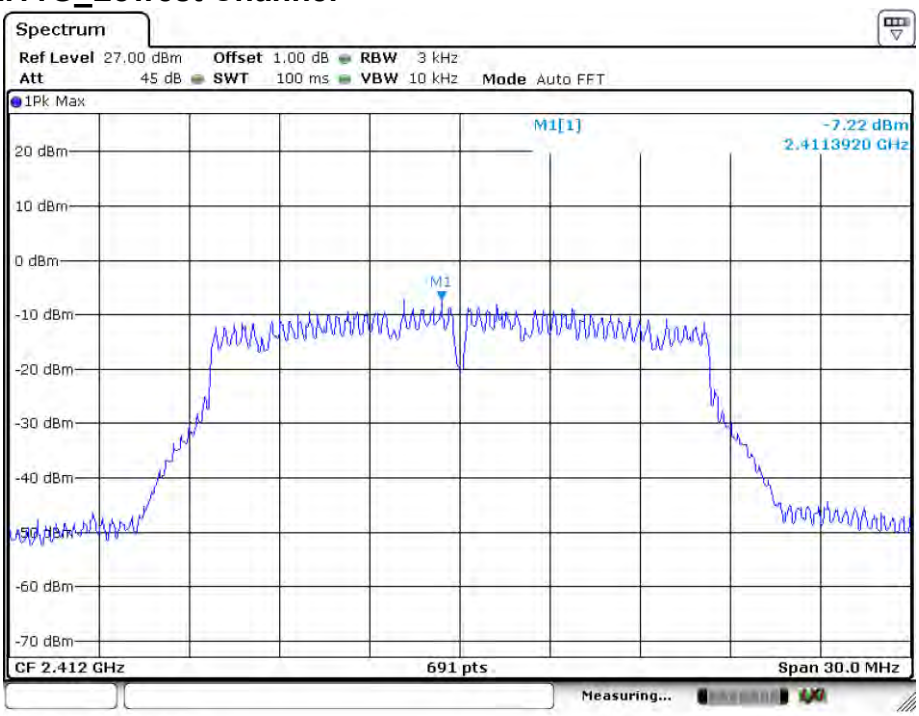
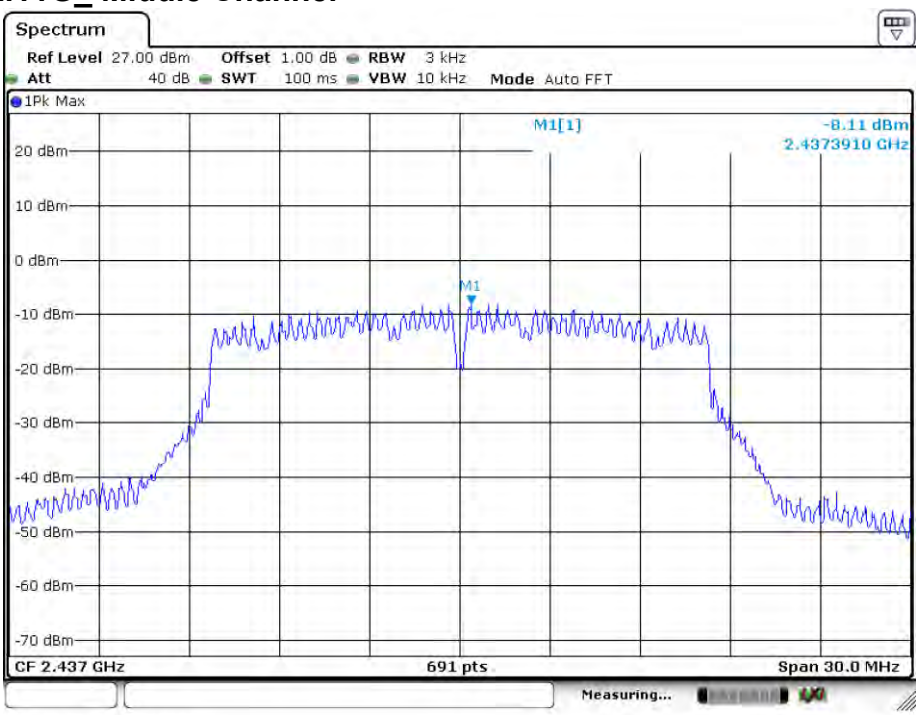
4.6.2.1.4 802.11G_Lowest Channel



Date: 18.SEP.2020 17:59:47

4.6.2.1.5 802.11G_ Middle Channel



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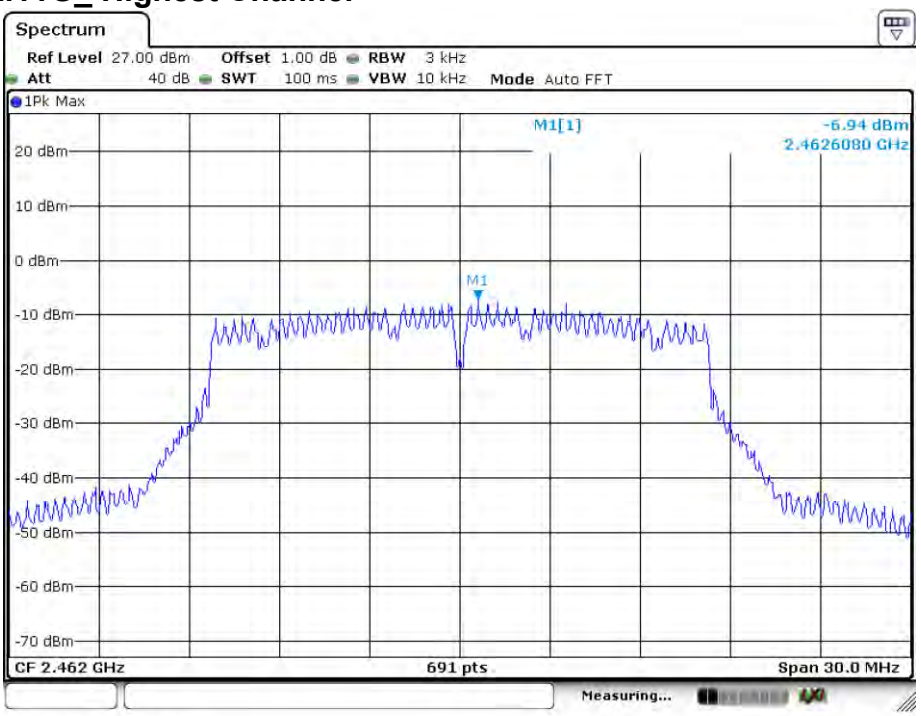
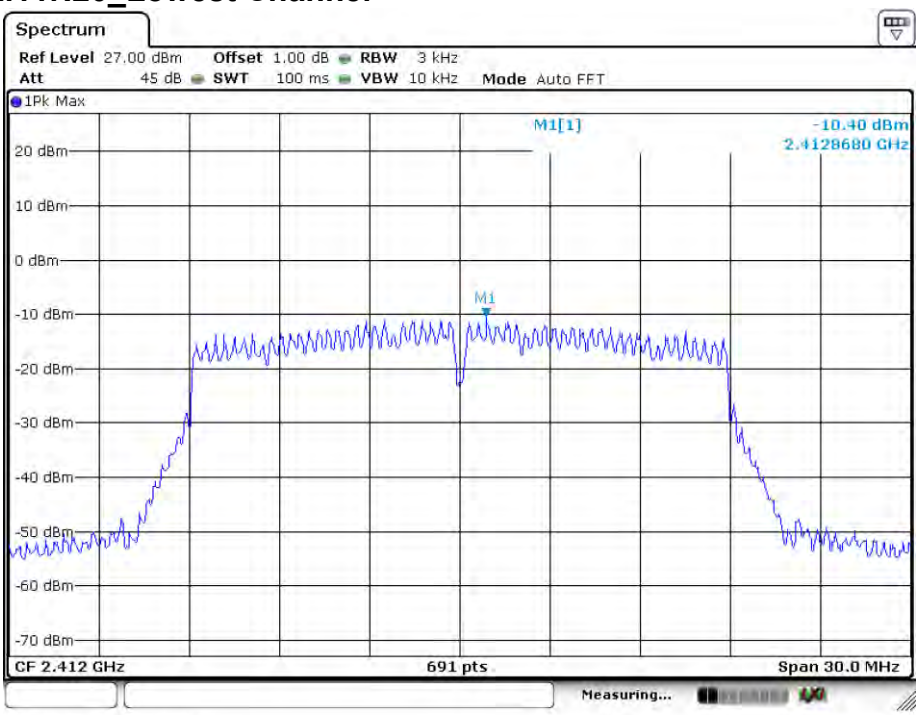
4.6.2.1.6 802.11G_ Highest Channel



Date: 18.SEP.2020 20:20:35

4.6.2.1.7 802.11N20_Lowest Channel



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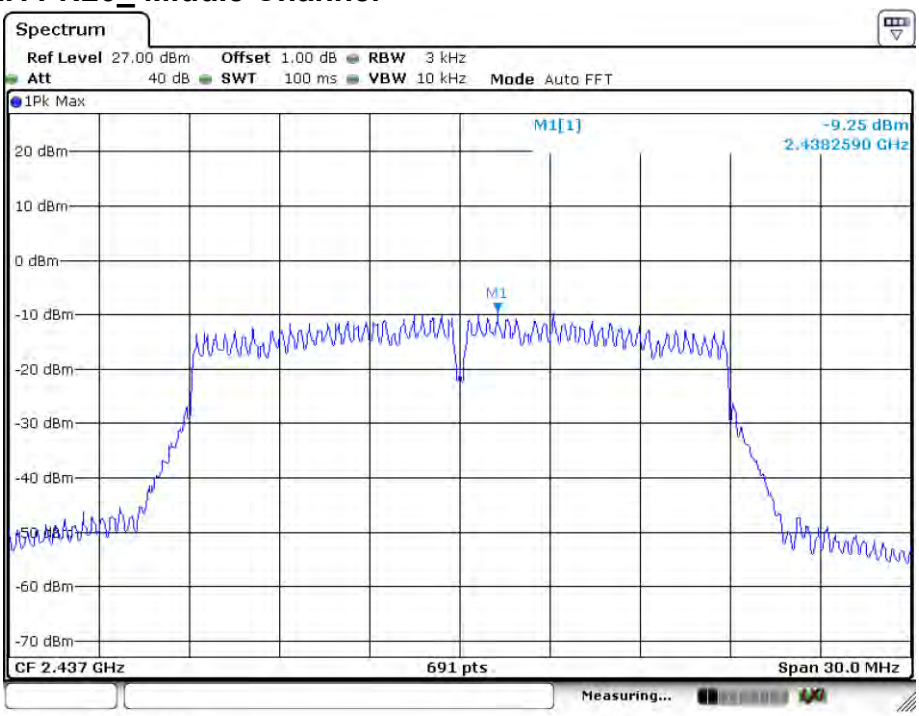
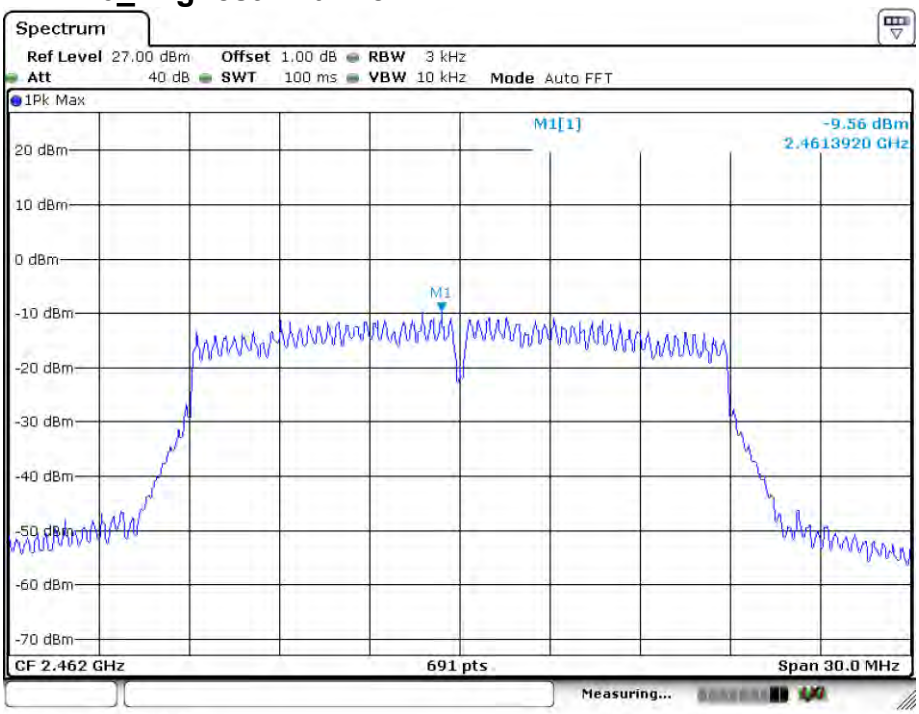
4.6.2.1.8 802.11 N20_ Middle Channel



Date: 18.SEP.2020 20:21:29

4.6.2.1.9 802.11 N20_ Highest Channel



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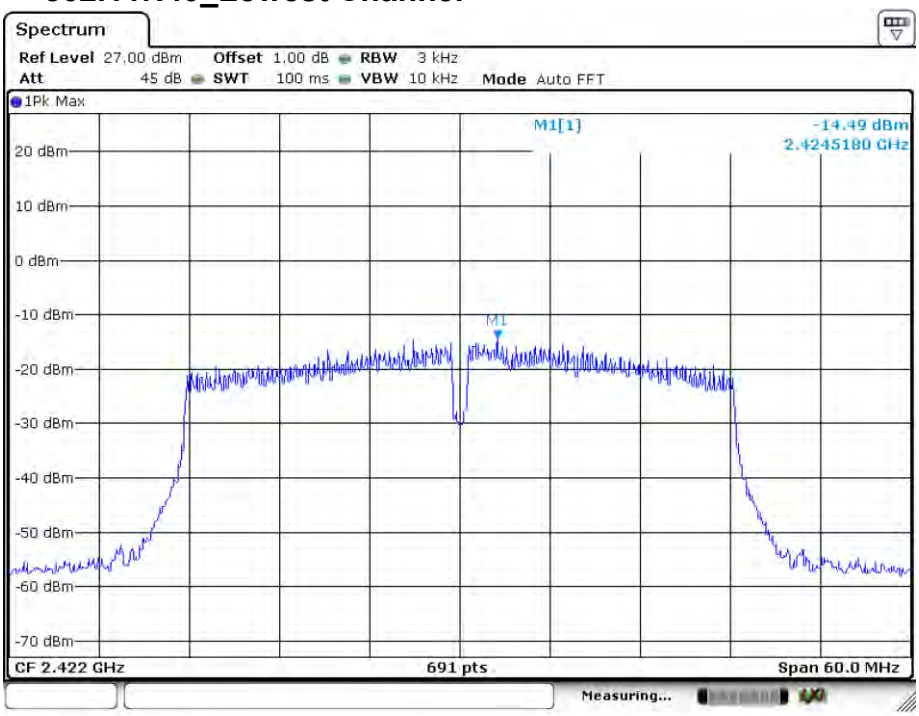
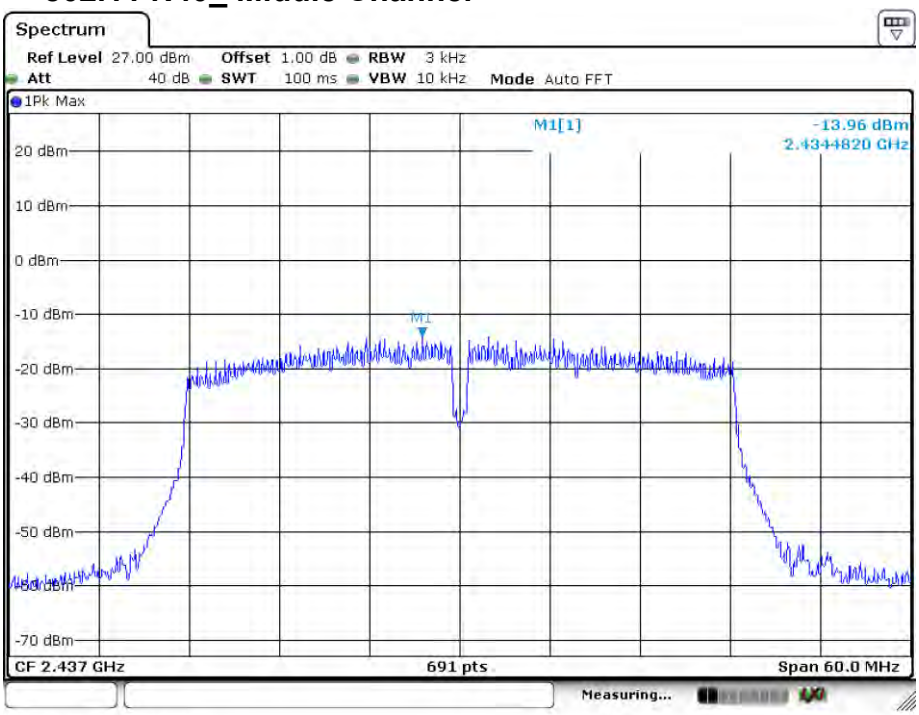
4.6.2.1.10 802.11N40_Lowest Channel



Date: 18.SEP.2020 17:54:49

4.6.2.1.11 802.11 N40_ Middle Channel



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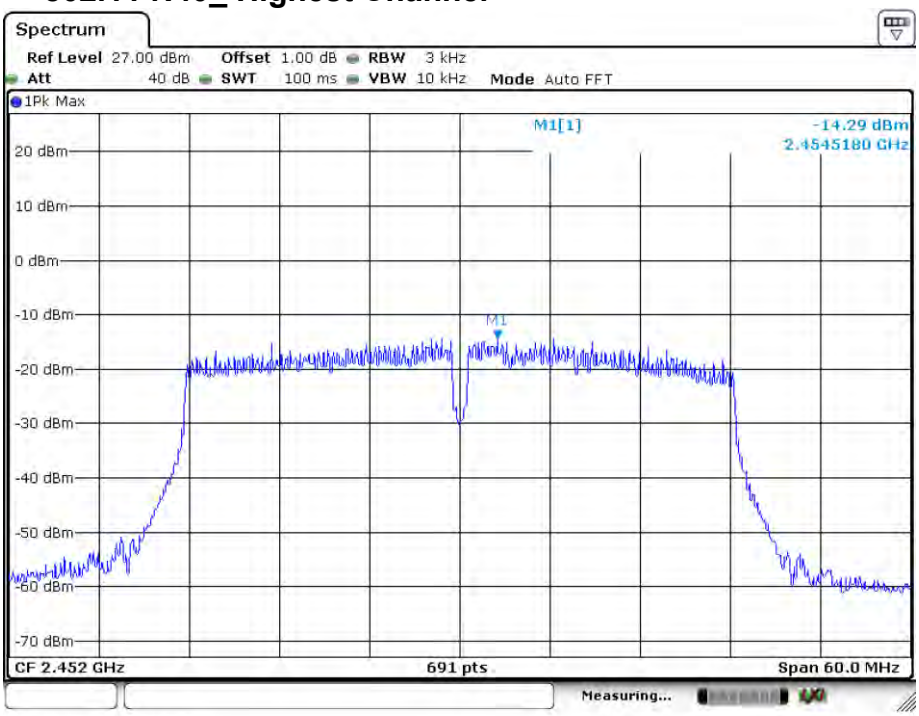
4.6.2.1.12 802.11 N40_ Highest Channel



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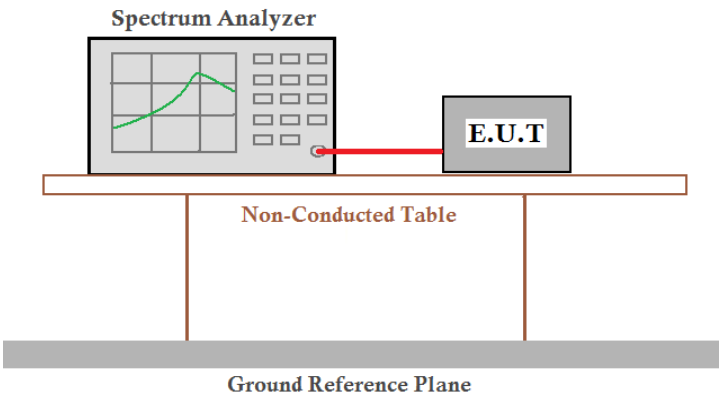
4.7 Band-edge for RF Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013 Section 11.13
Test Setup:	
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.
Instruments Used:	Refer to section 5.10 for details
Test Results:	Pass

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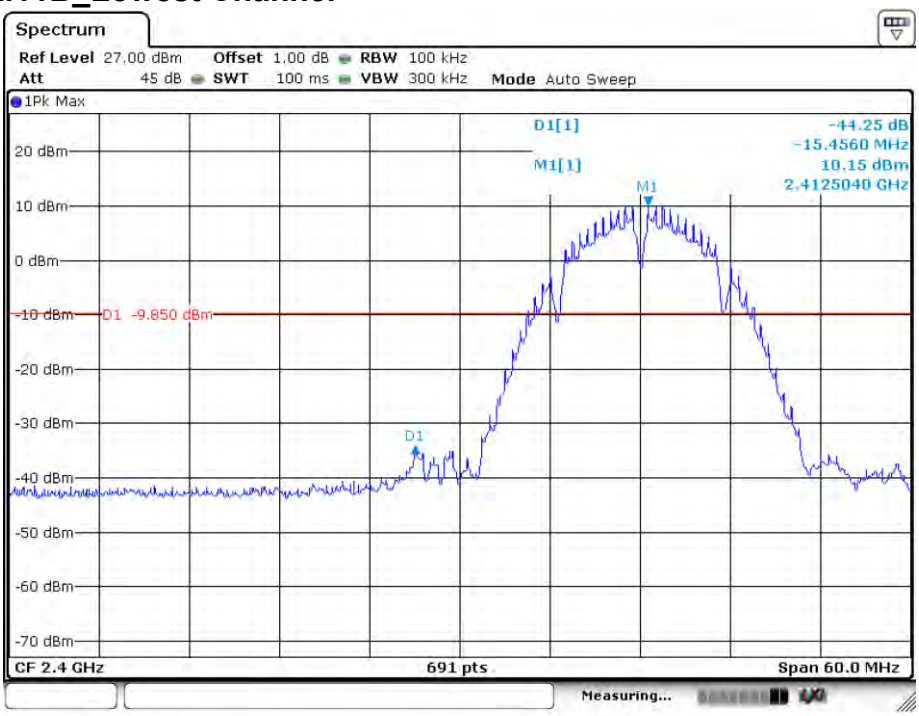
4.7.1 Test plots

4.7.1.1 ANT1

4.7.1.1.1 802.11B_Lowest Channel



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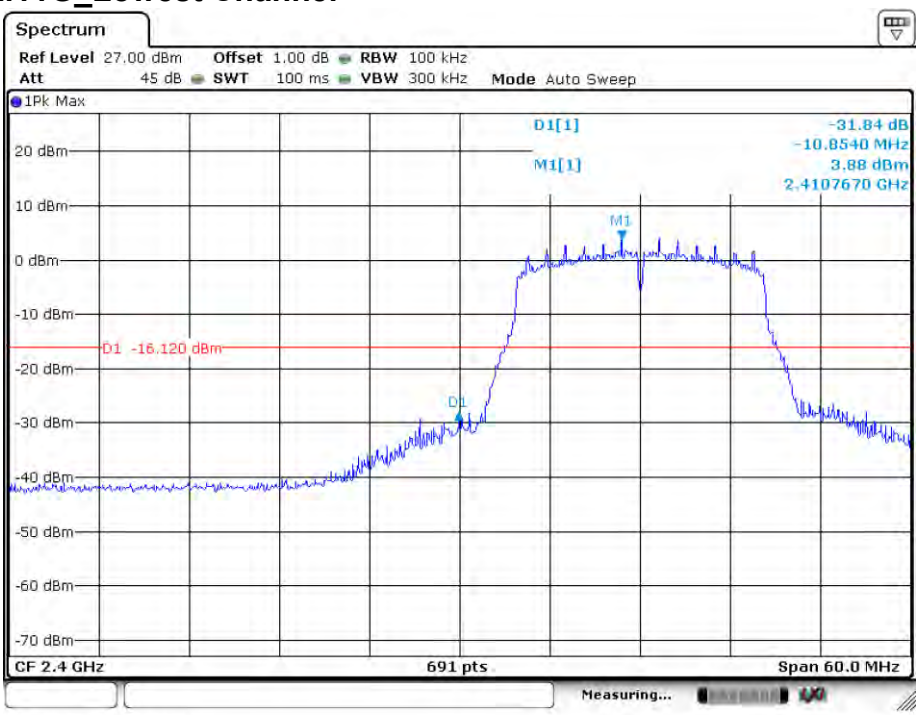
4.7.1.1.2 802.11B_ Highest Channel

Date: 18.SEP.2020 20:57:44

4.7.1.1.3 802.11G_Lowest Channel



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4.7.1.1.4 802.11G_ Highest Channel

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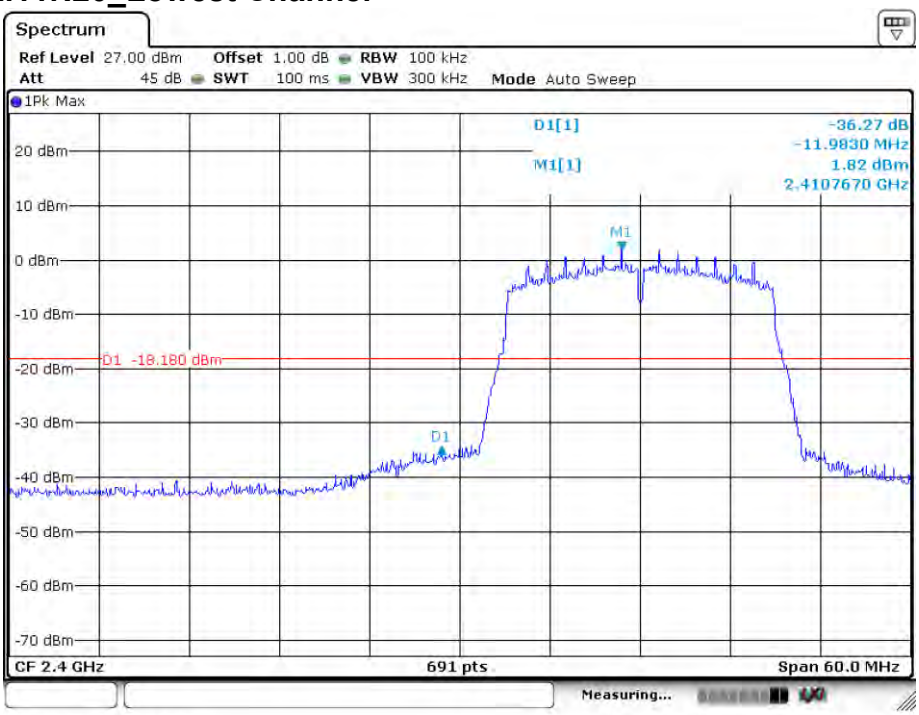
4.7.1.1.5 802.11N20_Lowest Channel



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4.7.1.1.6 802.11 N20_ Highest Channel

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4.7.1.1.7 802.11N40_Lowest Channel

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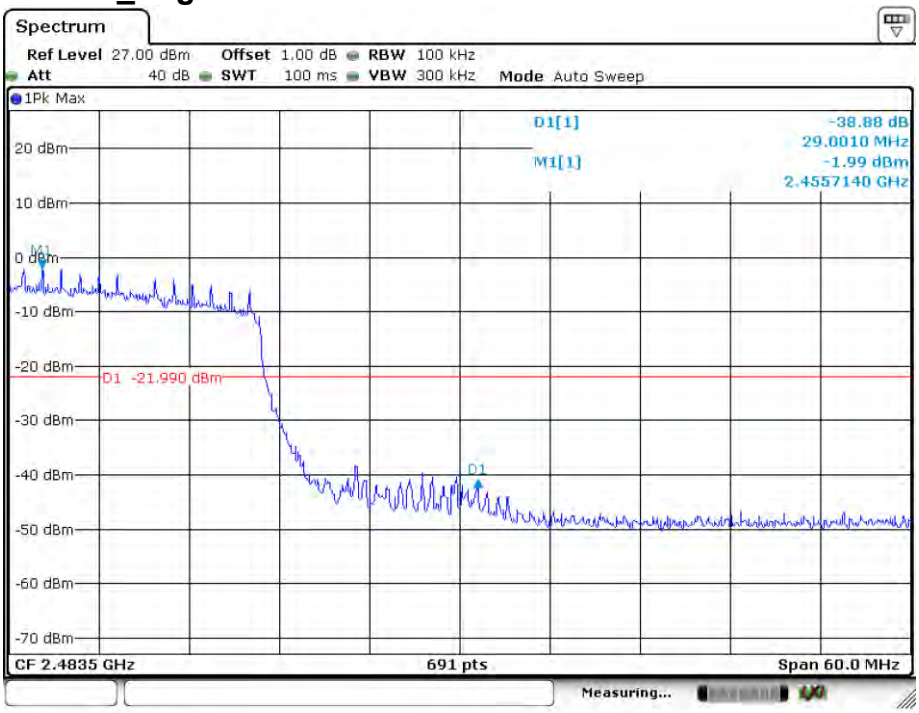
4.7.1.1.8 802.11 N40_ Highest Channel



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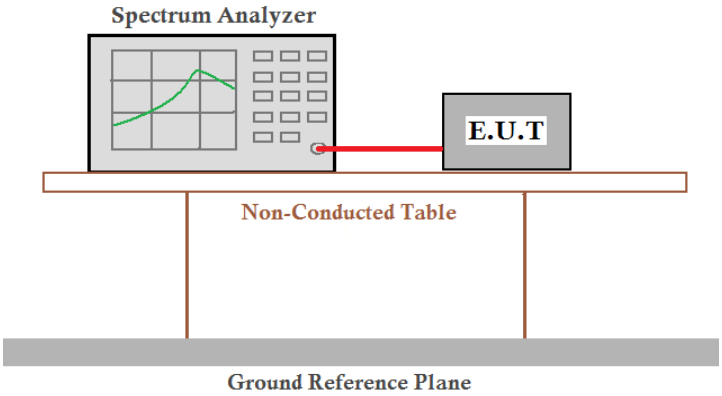
4.8 RF Conducted Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013 Section 11.11
Test Setup:	
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.
Instruments Used:	Refer to section 5.10 for details
Test Results:	Pass

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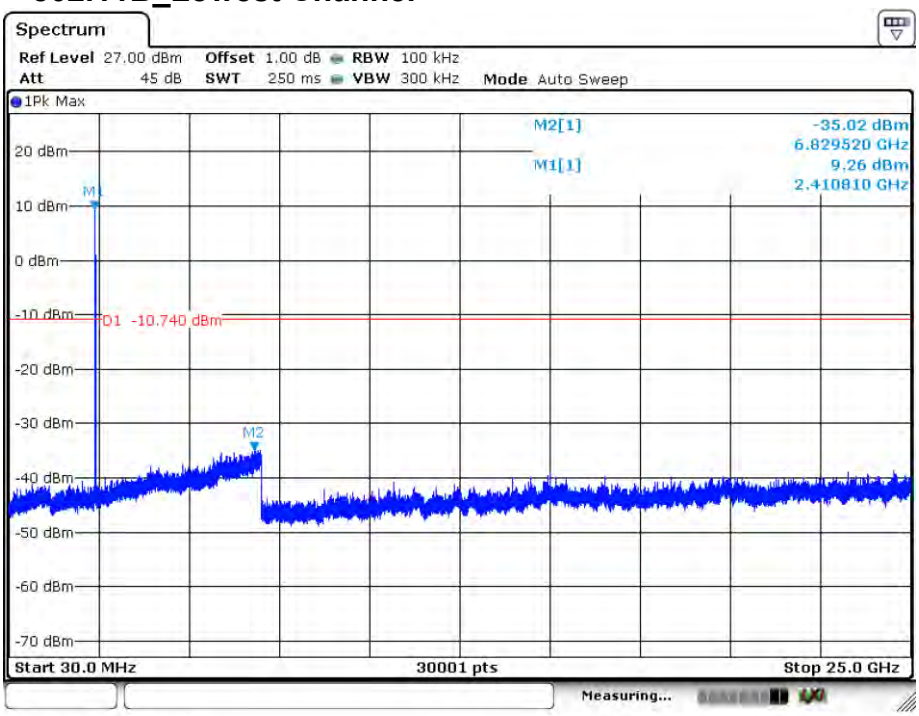
4.8.1 Test plots

4.8.1.1 ANT1

4.8.1.1.1 802.11B_Lowest Channel



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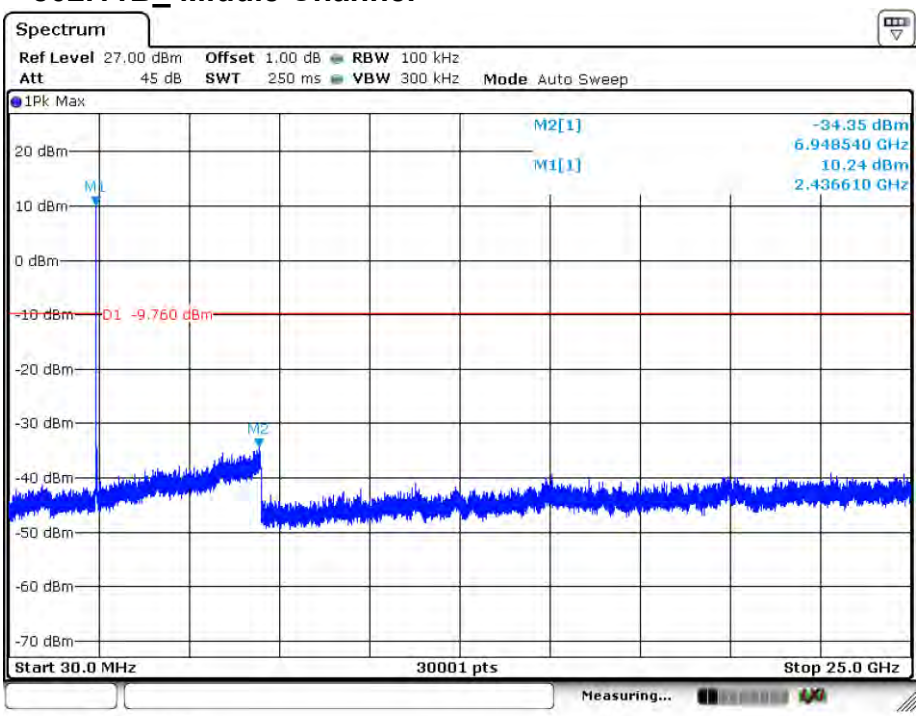
4.8.1.1.2 802.11B_ Middle Channel



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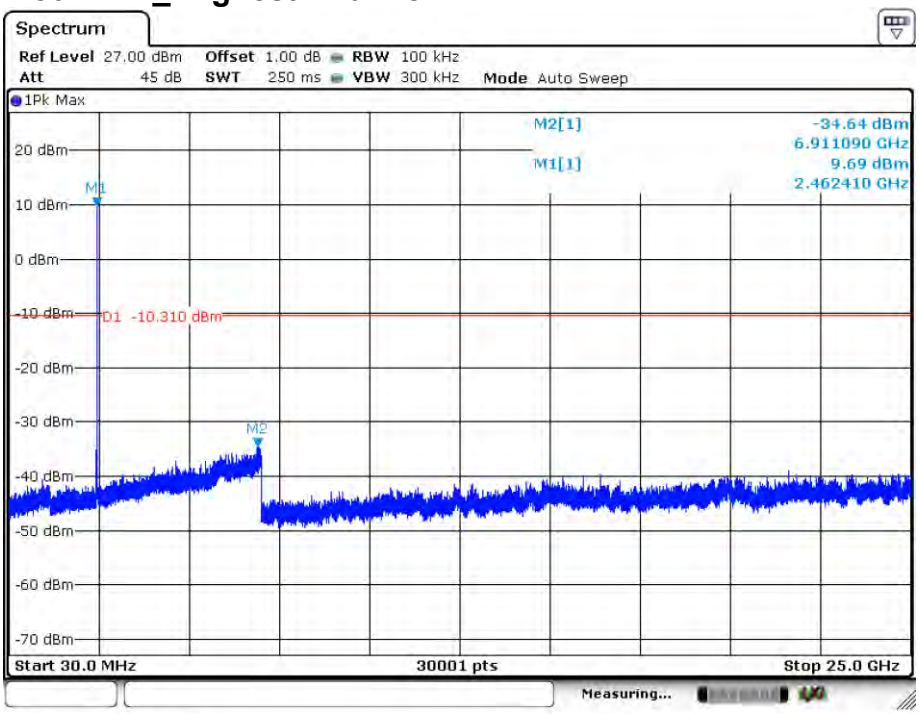
4.8.1.1.3 802.11B_ Highest Channel



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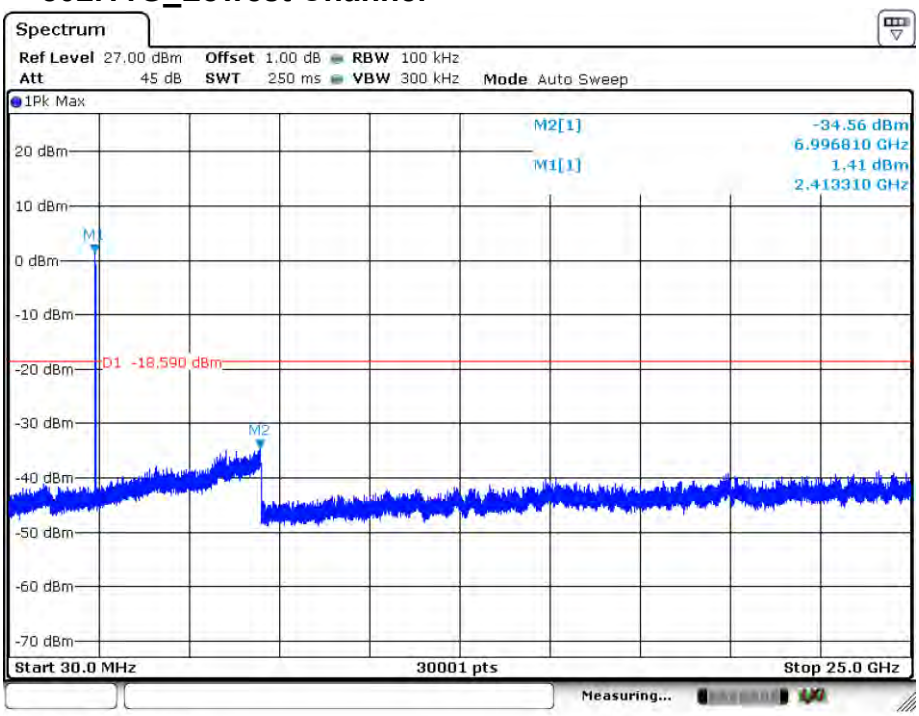
4.8.1.1.4 802.11G_Lowest Channel



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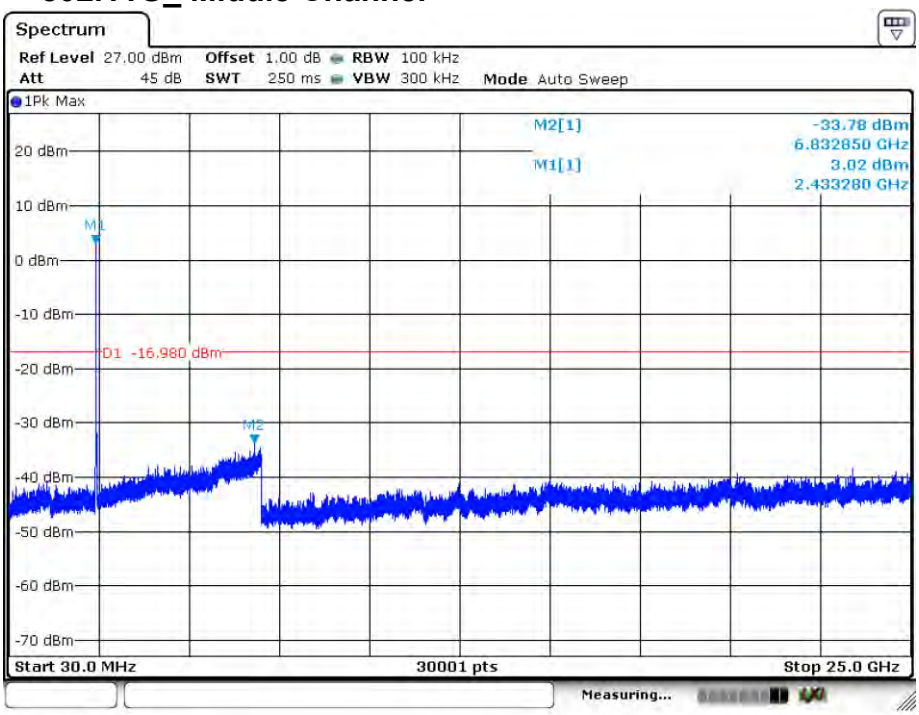
4.8.1.1.5 802.11G_ Middle Channel



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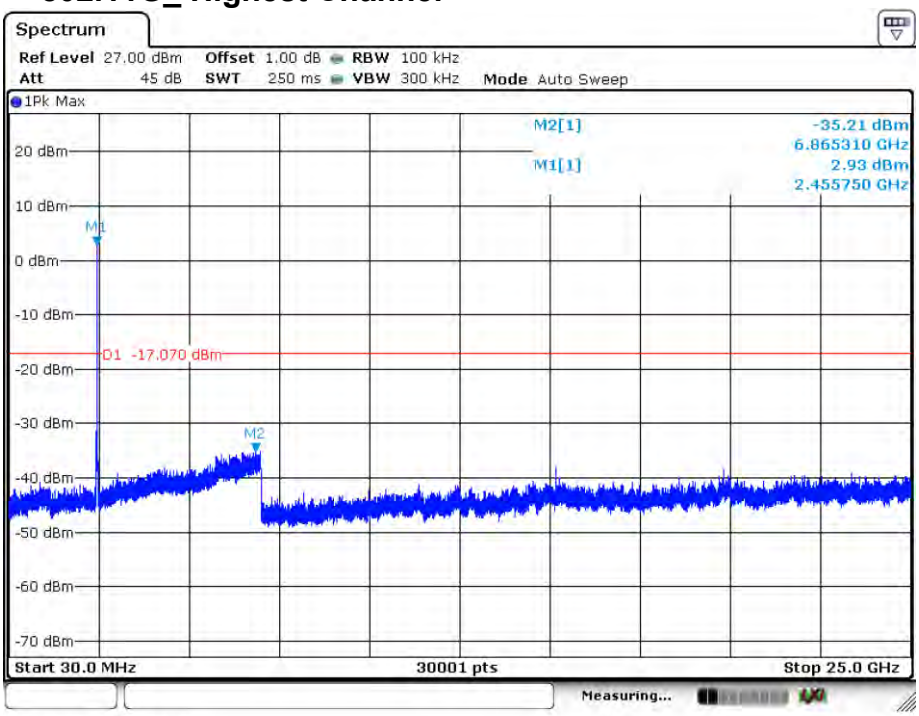
4.8.1.1.6 802.11G_ Highest Channel



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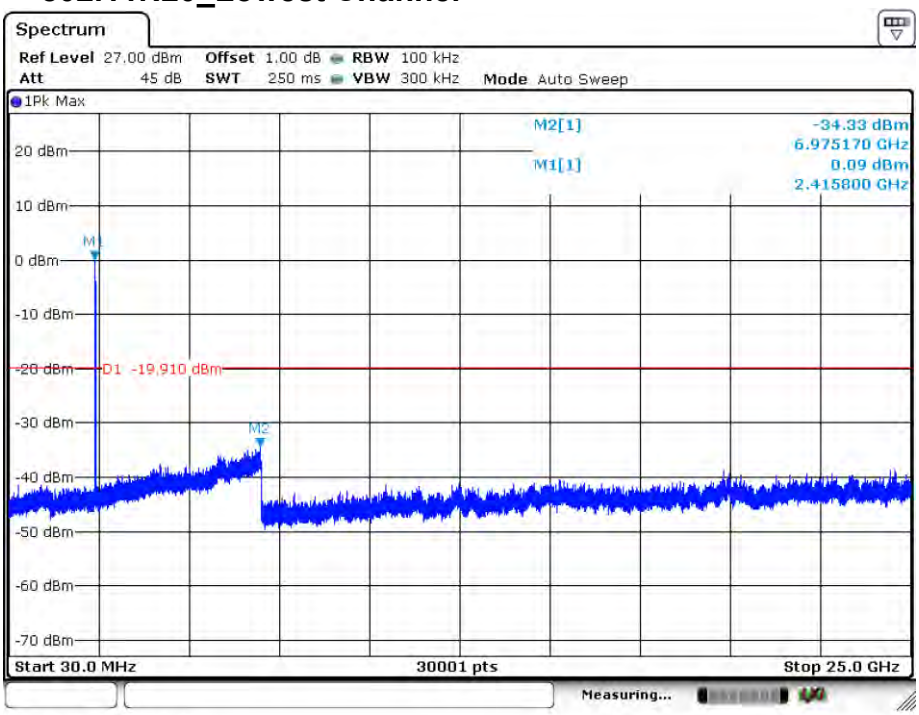
4.8.1.1.7 802.11N20_Lowest Channel



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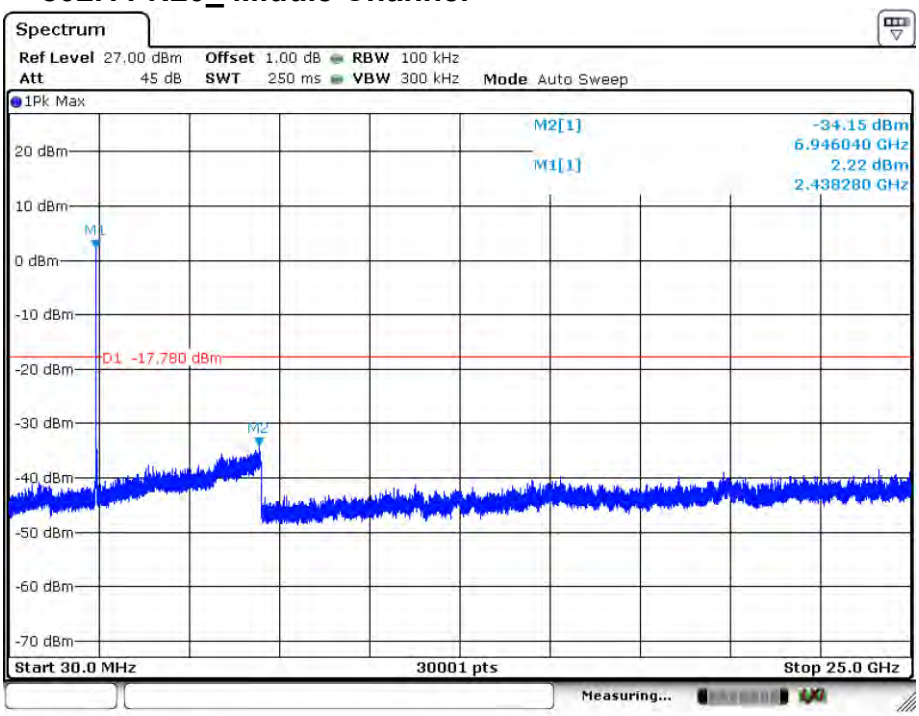
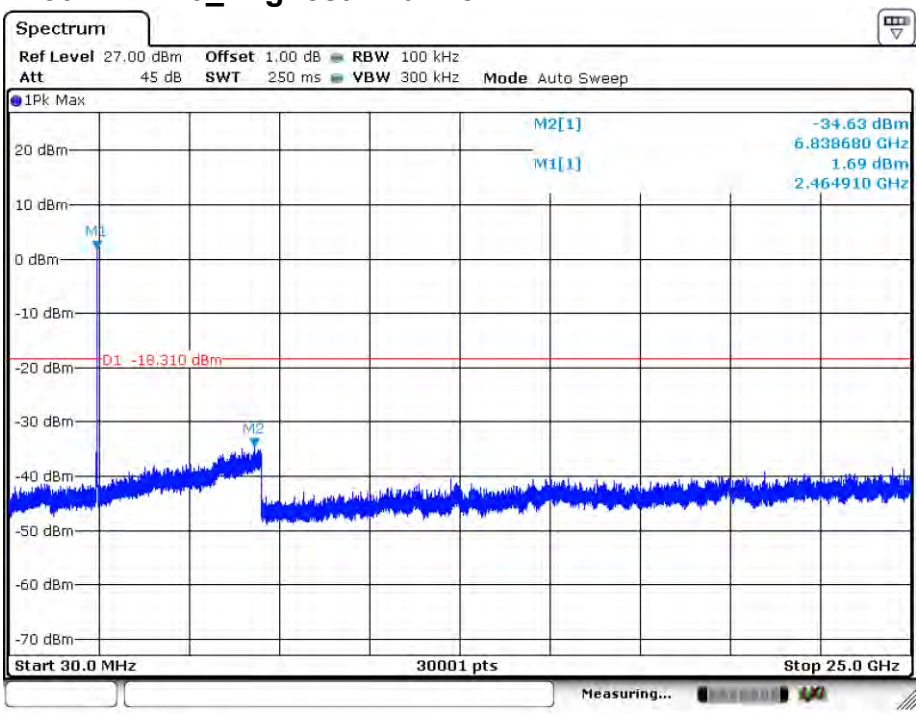
4.8.1.1.8 802.11 N20_ Middle Channel



Date: 18.SEP.2020 20:12:39

4.8.1.1.9 802.11 N20_ Highest Channel



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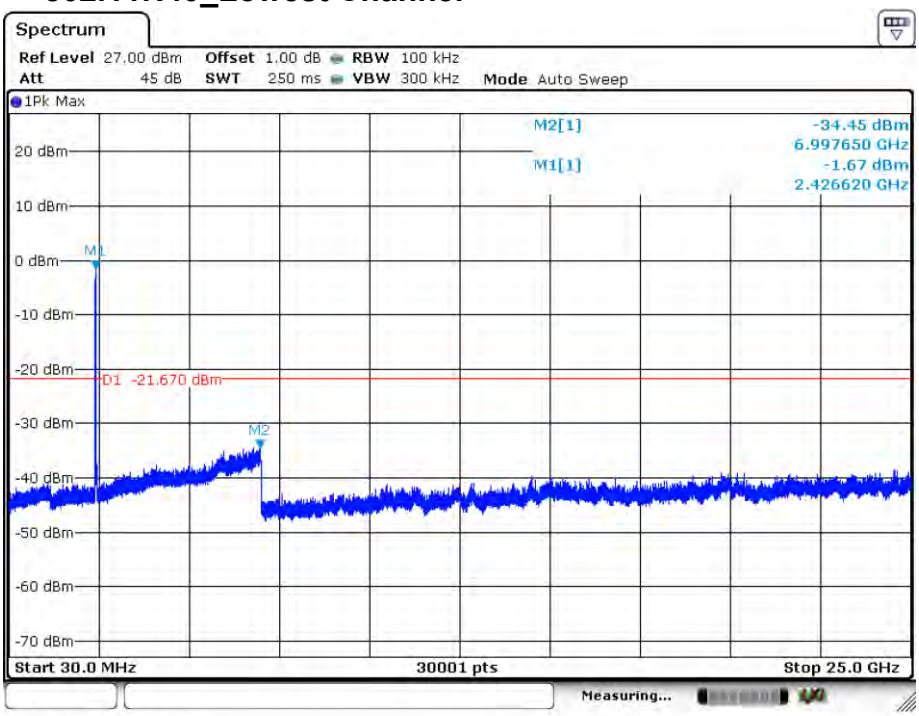
4.8.1.1.10 802.11N40_Lowest Channel



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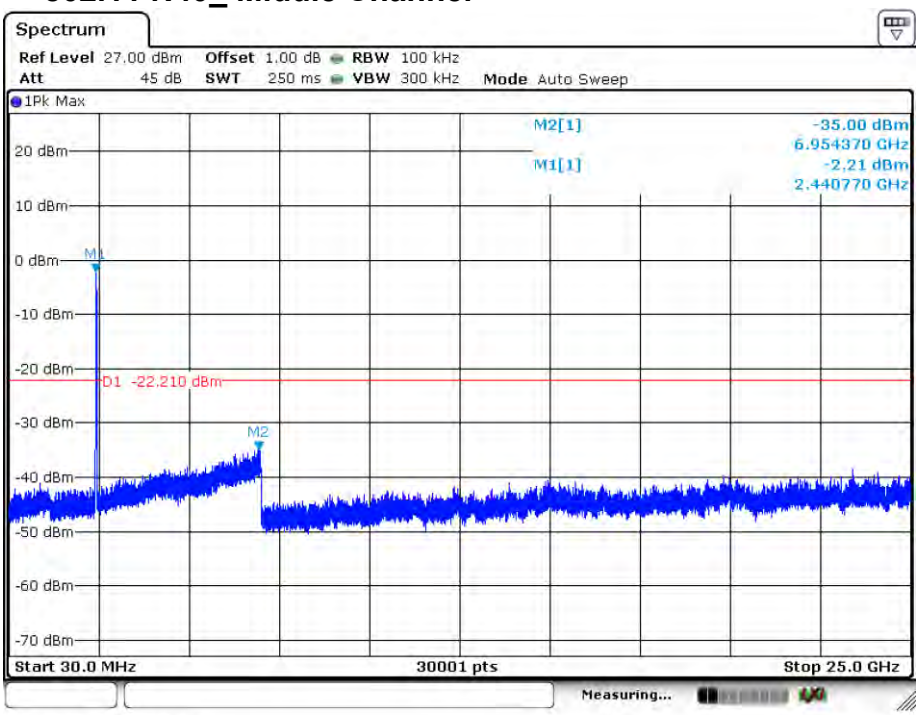
4.8.1.1.11 802.11 N40_ Middle Channel



Date: 18.SEP.2020 20:04:18

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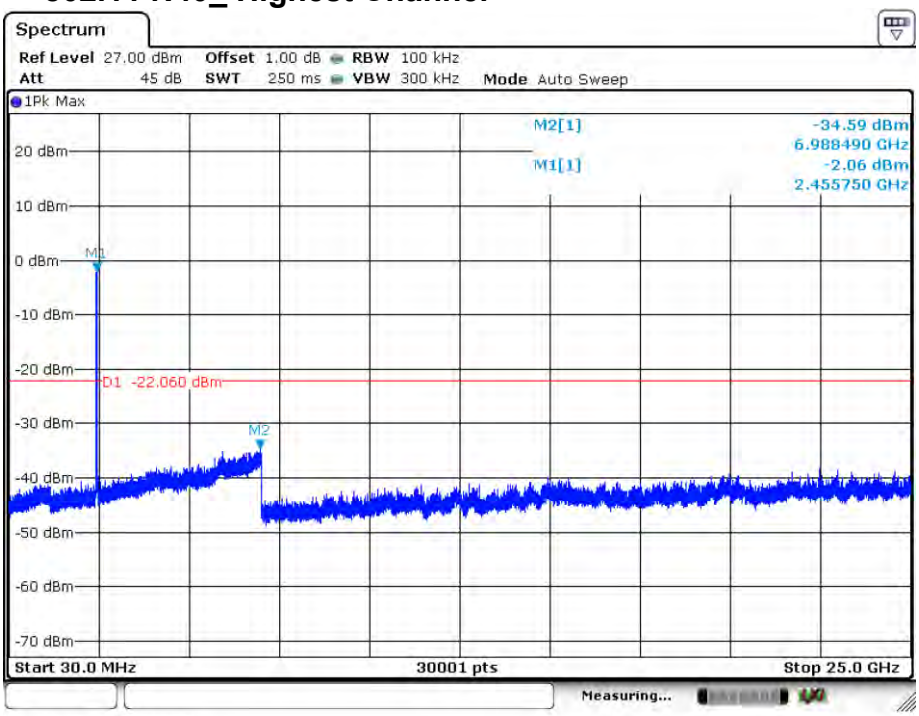
4.8.1.1.12 802.11 N40_ Highest Channel



Date: 18.SEP.2020 20:03:45

Remark:

Scan from 9kHz to 25GHz, the disturbance between 9KHz to 30MHz 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.

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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	100 kHz	300kHz	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.				

Test Setup:	

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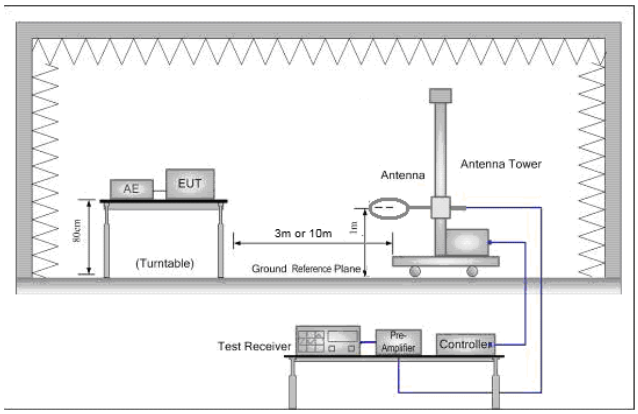

Figure 1. Below 30MHz

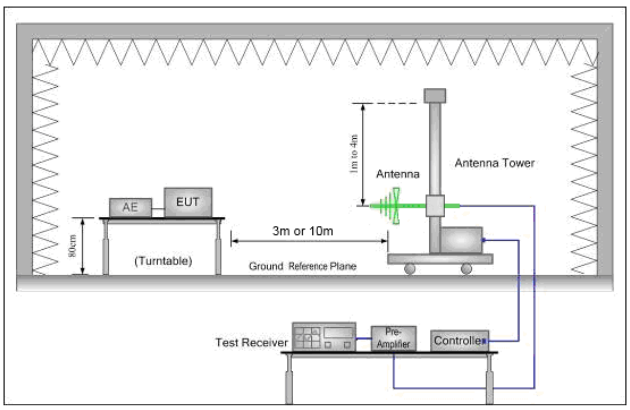

Figure 2. 30MHz to 1GHz

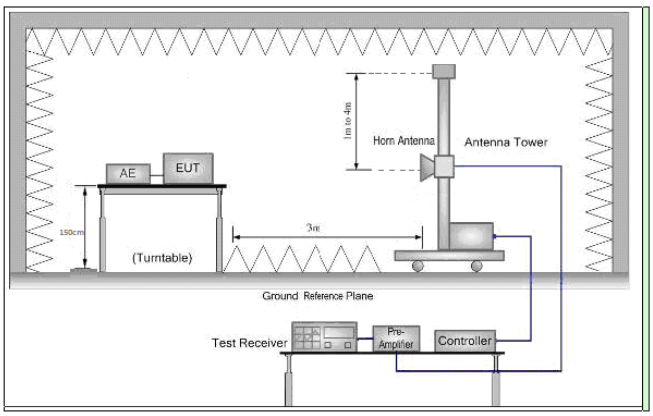

Figure 3. Above 1 GHz

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). Duty cycle = On time/100 milliseconds

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	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 cycl 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); 13.5Mbps of rate is the worst case of 802.11N(HT40) 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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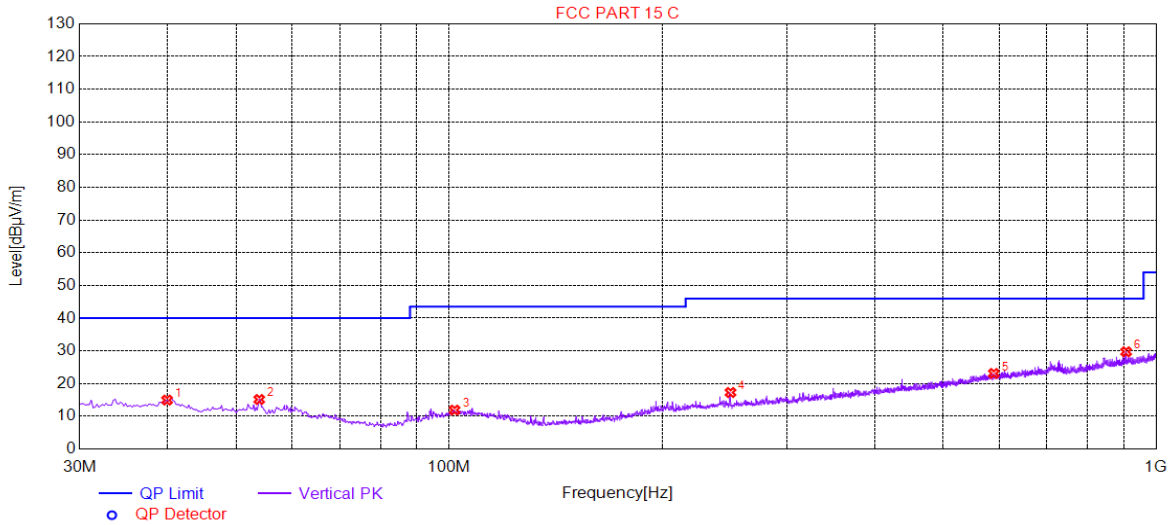
4.9.1 Radiated emission below 1GHz

4.9.1.1 Charge + Transmitting, Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	39.8960	14.96	-28.37	40.00	25.04	100	72	Vertical
2	53.8668	15.15	-30.95	40.00	24.85	100	292	Vertical
3	101.7944	11.90	-32.00	43.50	31.60	100	232	Vertical
4	250.0400	17.28	-29.66	46.00	28.72	100	31	Vertical
5	589.4139	23.11	-20.93	46.00	22.89	100	22	Vertical
6	907.0554	29.73	-15.95	46.00	16.27	100	14	Vertical

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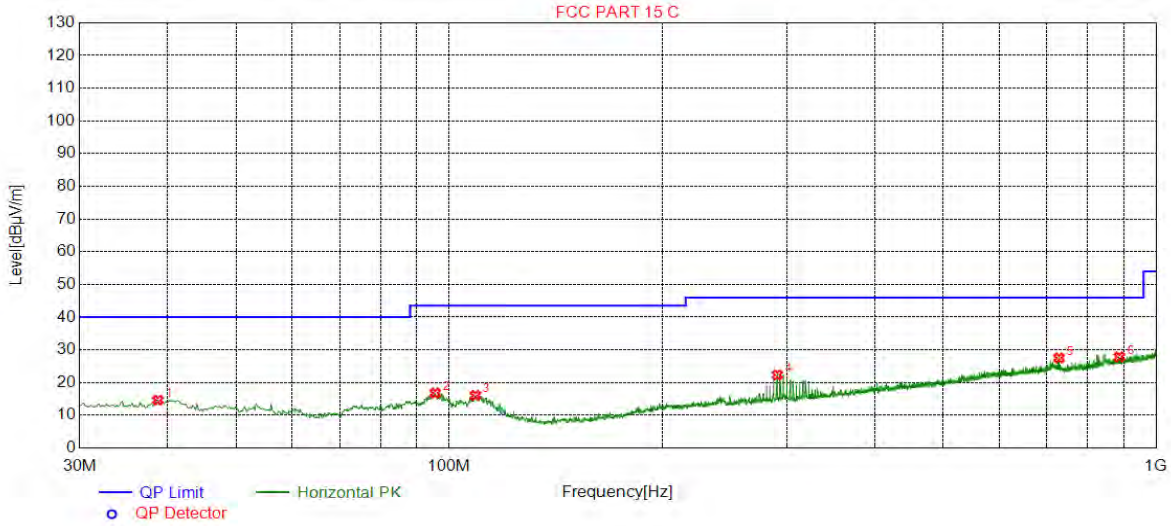
4.9.1.2 Charge + Transmitting, Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	38.7317	14.64	-28.75	40.00	25.36	200	229	Horizontal
2	95.5851	16.80	-32.79	43.50	26.70	200	329	Horizontal
3	108.9738	16.09	-32.00	43.50	27.41	200	346	Horizontal
4	291.1762	22.37	-28.60	46.00	23.63	100	267	Horizontal
5	729.1218	27.52	-18.82	46.00	18.48	100	360	Horizontal
6	887.2635	27.86	-16.25	46.00	18.14	200	144	Horizontal

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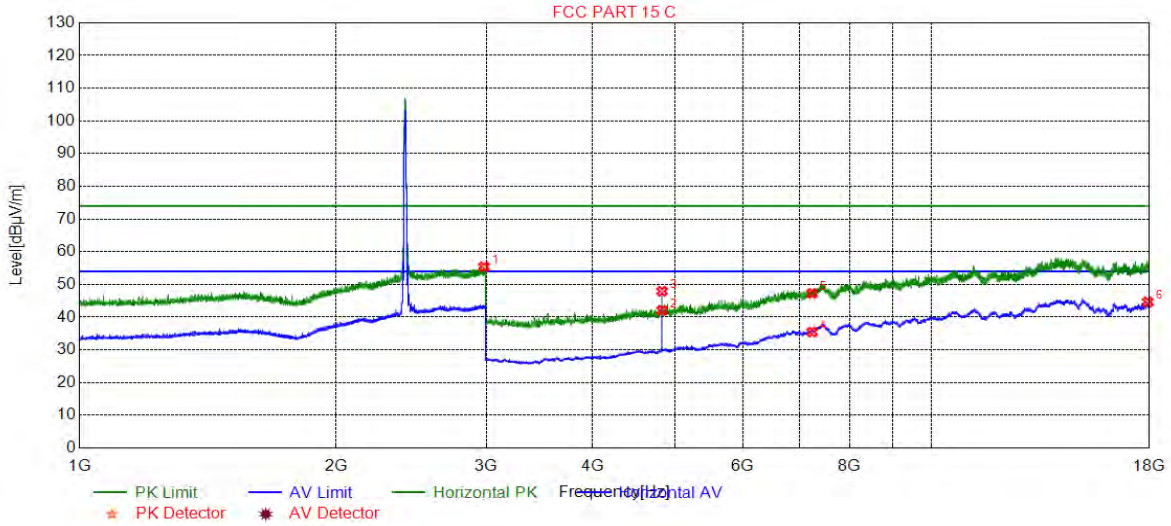
4.9.2 Transmitter emission above 1GHz

4.9.2.1 802.11B_Channel 1

Test Graph



Suspected List

Suspected List								
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1	2982.4956	55.40	9.53	74.00	18.60	150	238	Horizontal
2	4824.0000	42.09	-18.21	54.00	11.91	150	45	Horizontal
3	4824.0000	47.94	-18.21	74.00	26.06	150	347	Horizontal
4	7236.0000	35.47	-9.76	54.00	18.53	150	292	Horizontal
5	7236.0000	47.27	-9.76	74.00	26.73	150	265	Horizontal
6	17918.9919	44.64	-1.30	54.00	9.36	150	182	Horizontal

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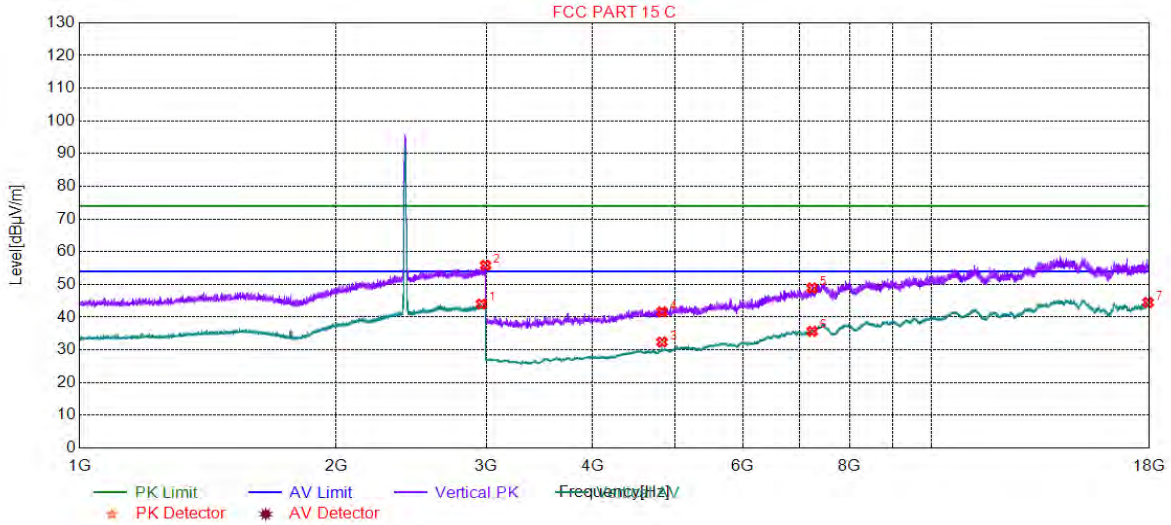
4.9.2.2 802.11B_Channel 1

Test Graph



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2	2994.9988	55.85	9.47	74.00	18.15	150	2	Vertical
3	4824.0000	32.39	-18.21	54.00	21.61	150	12	Vertical
4	4824.0000	41.61	-18.21	74.00	32.39	150	259	Vertical
5	7236.0000	48.92	-9.76	74.00	25.08	150	67	Vertical
6	7236.0000	35.68	-9.76	54.00	18.32	150	12	Vertical
7	17930.9931	44.50	-1.30	54.00	9.50	150	67	Vertical

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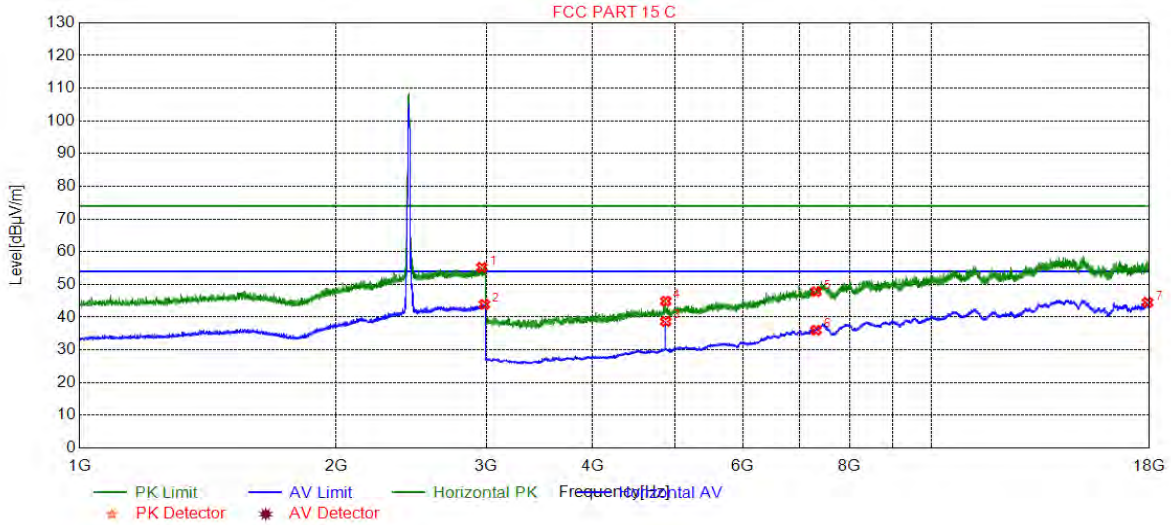
4.9.2.3 802.11B_Channel 6

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2964.9912	55.23	9.61	74.00	18.77	150	32	Horizontal
2	2985.4964	43.91	9.52	54.00	10.09	150	86	Horizontal
3	4874.0000	38.70	-17.99	54.00	15.30	150	360	Horizontal
4	4874.0000	44.89	-17.99	74.00	29.11	150	346	Horizontal
5	7311.0000	47.80	-9.59	74.00	26.20	150	100	Horizontal
6	7311.0000	36.02	-9.59	54.00	17.98	150	209	Horizontal
7	17906.9907	44.51	-1.31	54.00	9.49	150	18	Horizontal

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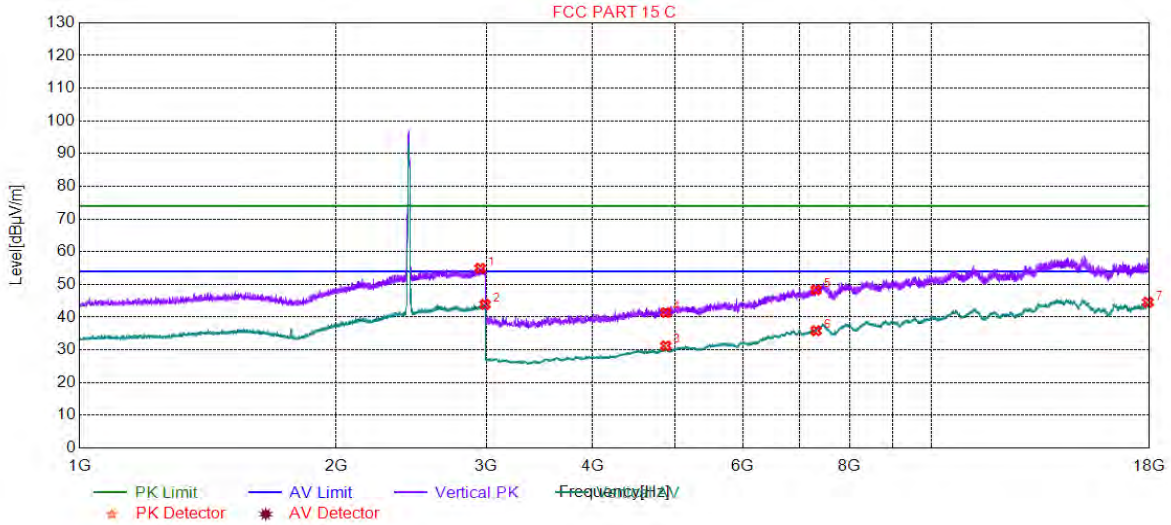
4.9.2.4 802.11B_Channel 6

Test Graph



Suspected List

Suspected List								
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1	2951.9880	54.95	9.67	74.00	19.05	150	342	Vertical
2	2990.4976	43.90	9.49	54.00	10.10	150	342	Vertical
3	4874.0000	31.25	-17.99	54.00	22.75	150	287	Vertical
4	4874.0000	41.41	-17.99	74.00	32.59	150	233	Vertical
5	7311.0000	48.30	-9.59	74.00	25.70	150	41	Vertical
6	7311.0000	35.87	-9.59	54.00	18.13	150	314	Vertical
7	17921.9922	44.55	-1.30	54.00	9.45	150	14	Vertical

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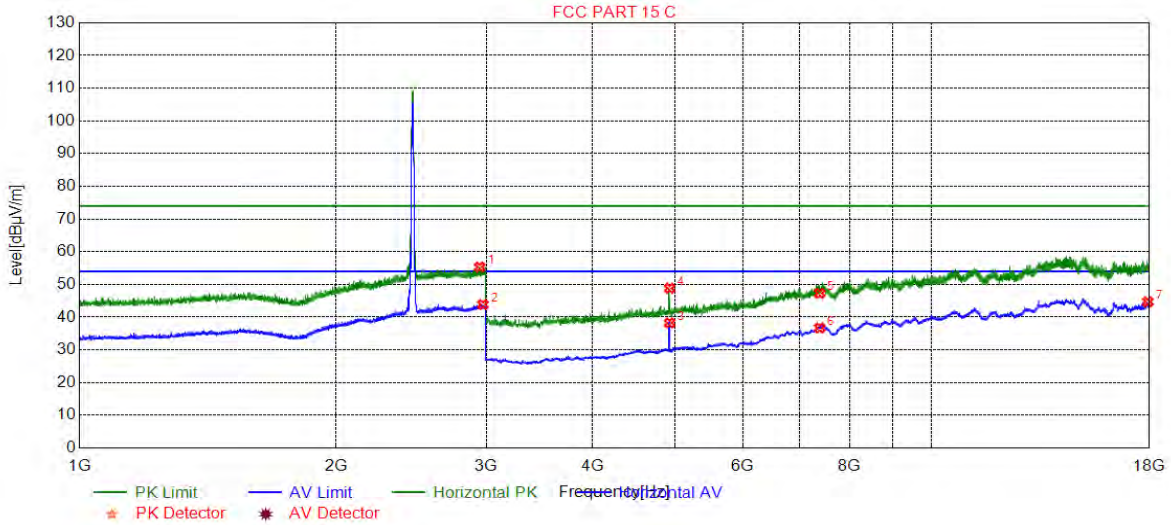
4.9.2.5 802.11B_Channel 11

Test Graph



Suspected List

Suspected List								
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1	2948.4871	55.34	9.66	74.00	18.66	150	210	Horizontal
2	2973.4934	43.89	9.57	54.00	10.11	150	292	Horizontal
3	4924.0000	38.23	-17.71	54.00	15.77	150	346	Horizontal
4	4924.0000	48.84	-17.71	74.00	25.16	150	360	Horizontal
5	7386.0000	47.30	-9.20	74.00	26.70	150	291	Horizontal
6	7386.0000	36.69	-9.20	54.00	17.31	150	319	Horizontal
7	17920.4920	44.69	-1.30	54.00	9.31	150	155	Horizontal

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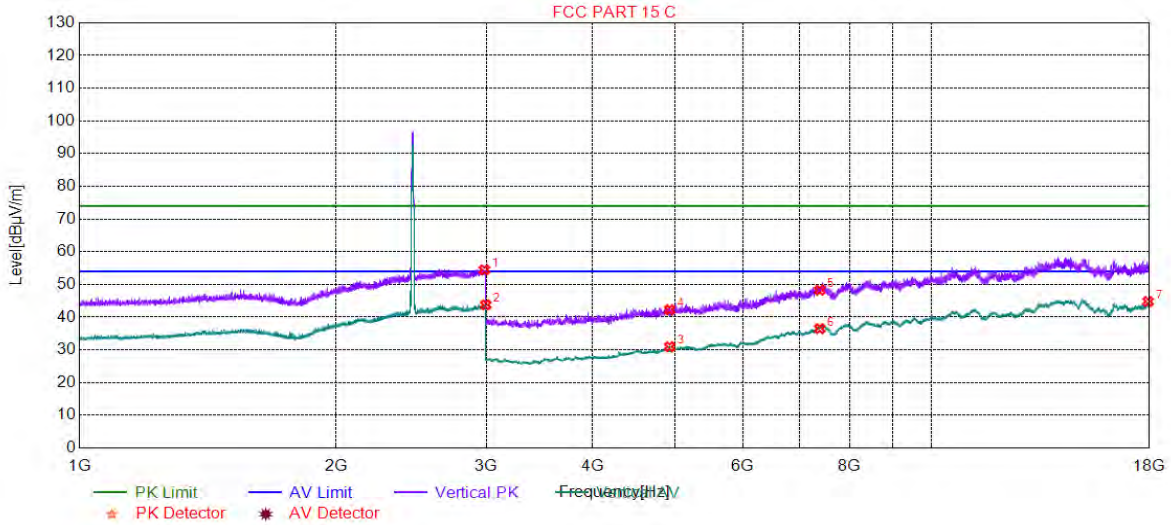
4.9.2.6 802.11B_Channel 11

Test Graph



Suspected List

Suspected List								
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1	2985.4964	54.50	9.52	74.00	19.50	150	164	Vertical
2	2995.9990	43.78	9.47	54.00	10.22	150	315	Vertical
3	4924.0000	30.98	-17.71	54.00	23.02	150	205	Vertical
4	4924.0000	42.27	-17.71	74.00	31.73	150	178	Vertical
5	7386.0000	48.27	-9.20	74.00	25.73	150	288	Vertical
6	7386.0000	36.49	-9.20	54.00	17.51	150	314	Vertical
7	17930.9931	44.78	-1.30	54.00	9.22	150	68	Vertical

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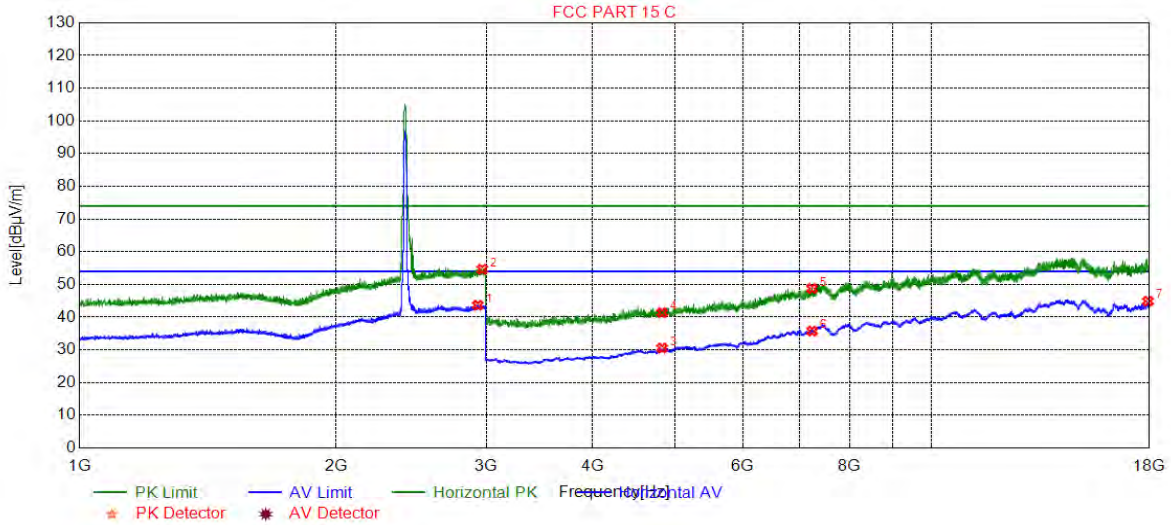
4.9.2.7 802.11G_Channel 1

Test Graph



Suspected List

Suspected List								
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1	2932.4831	43.65	9.49	54.00	10.35	150	358	Horizontal
2	2968.4921	54.68	9.59	74.00	19.32	150	183	Horizontal
3	4824.0000	30.57	-18.21	54.00	23.43	150	45	Horizontal
4	4824.0000	41.37	-18.21	74.00	32.63	150	73	Horizontal
5	7236.0000	48.74	-9.76	74.00	25.26	150	210	Horizontal
6	7236.0000	35.75	-9.76	54.00	18.25	150	348	Horizontal
7	17924.9925	44.89	-1.30	54.00	9.11	150	45	Horizontal

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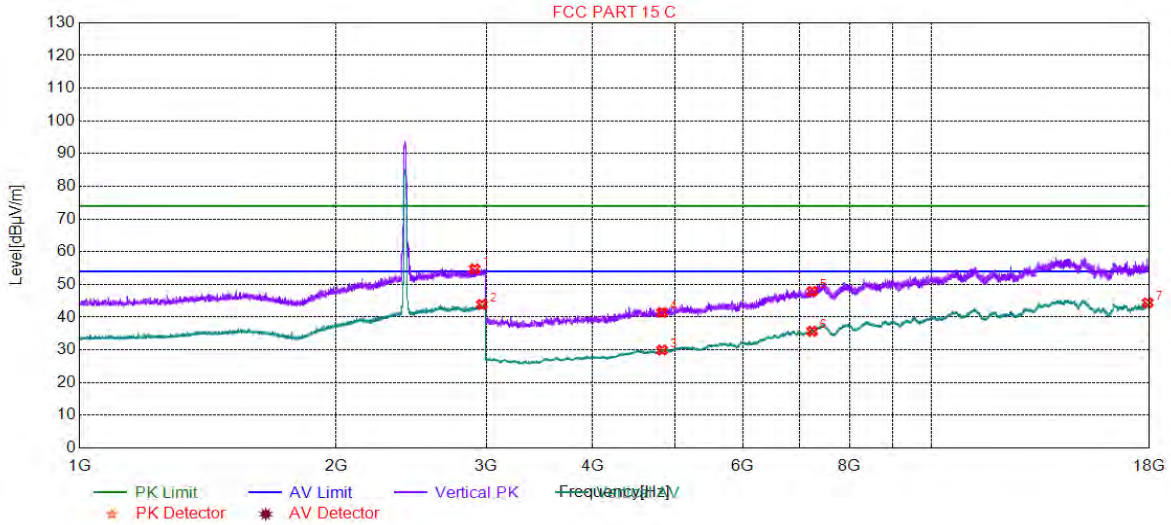
4.9.2.8 802.11G_Channel 1

Test Graph



Suspected List

Suspected List								
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1	2908.4771	54.74	9.23	74.00	19.26	150	261	Vertical
2	2964.9912	43.91	9.61	54.00	10.09	150	28	Vertical
3	4824.0000	29.97	-18.21	54.00	24.03	150	233	Vertical
4	4824.0000	41.45	-18.21	74.00	32.55	150	14	Vertical
5	7236.0000	47.89	-9.76	74.00	26.11	150	14	Vertical
6	7236.0000	35.71	-9.76	54.00	18.29	150	41	Vertical
7	17915.9916	44.42	-1.31	54.00	9.58	150	68	Vertical

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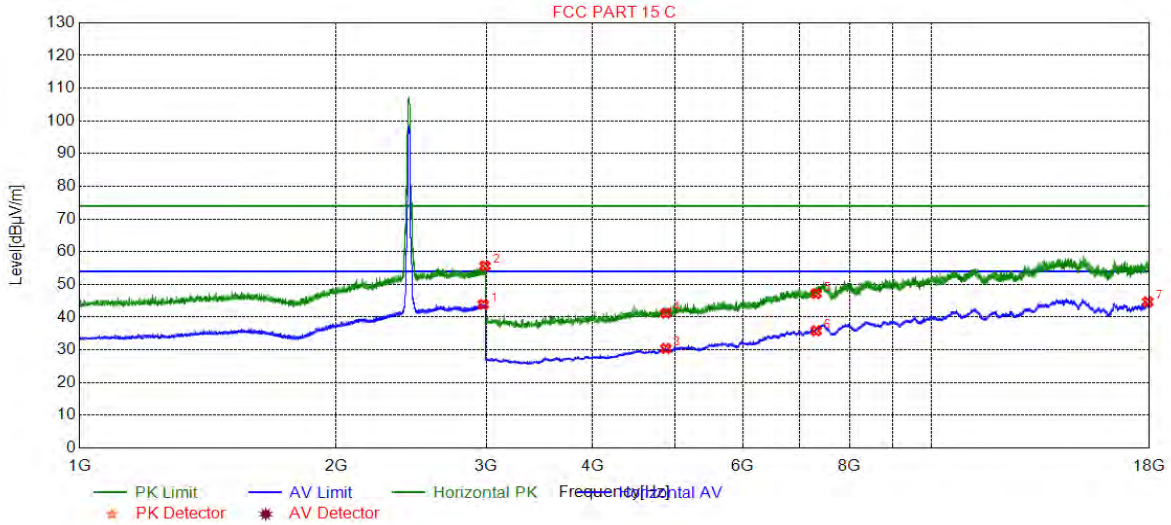
4.9.2.9 802.11G_Channel 6

Test Graph



Suspected List

Suspected List								
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1	2975.9940	43.91	9.56	54.00	10.09	150	142	Horizontal
2	2989.9975	55.66	9.50	74.00	18.34	150	156	Horizontal
3	4874.0000	30.43	-17.99	54.00	23.57	150	292	Horizontal
4	4874.0000	41.22	-17.99	74.00	32.78	150	360	Horizontal
5	7311.0000	47.20	-9.59	74.00	26.80	150	72	Horizontal
6	7311.0000	35.83	-9.59	54.00	18.17	150	18	Horizontal
7	17917.4917	44.66	-1.30	54.00	9.34	150	292	Horizontal

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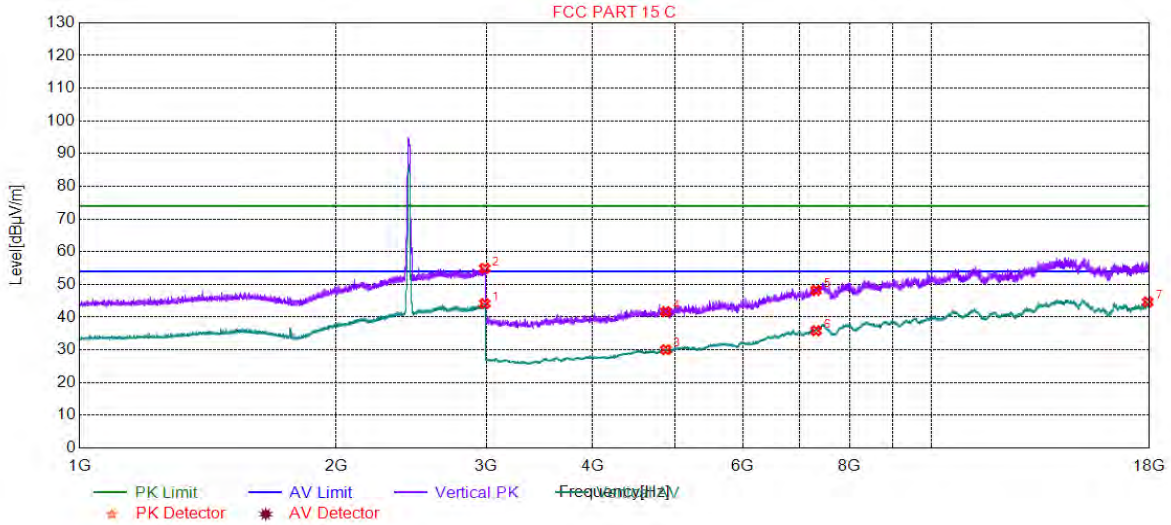
4.9.2.10 802.11G_Channel 6

Test Graph



Suspected List

Suspected List								
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1	2987.9970	44.17	9.51	54.00	9.83	150	123	Vertical
2	2988.4971	54.94	9.50	74.00	19.06	150	246	Vertical
3	4874.0000	30.05	-17.99	54.00	23.95	150	260	Vertical
4	4874.0000	41.69	-17.99	74.00	32.31	150	123	Vertical
5	7311.0000	48.21	-9.59	74.00	25.79	150	260	Vertical
6	7311.0000	35.86	-9.59	54.00	18.14	150	233	Vertical
7	17915.9916	44.65	-1.31	54.00	9.35	150	178	Vertical

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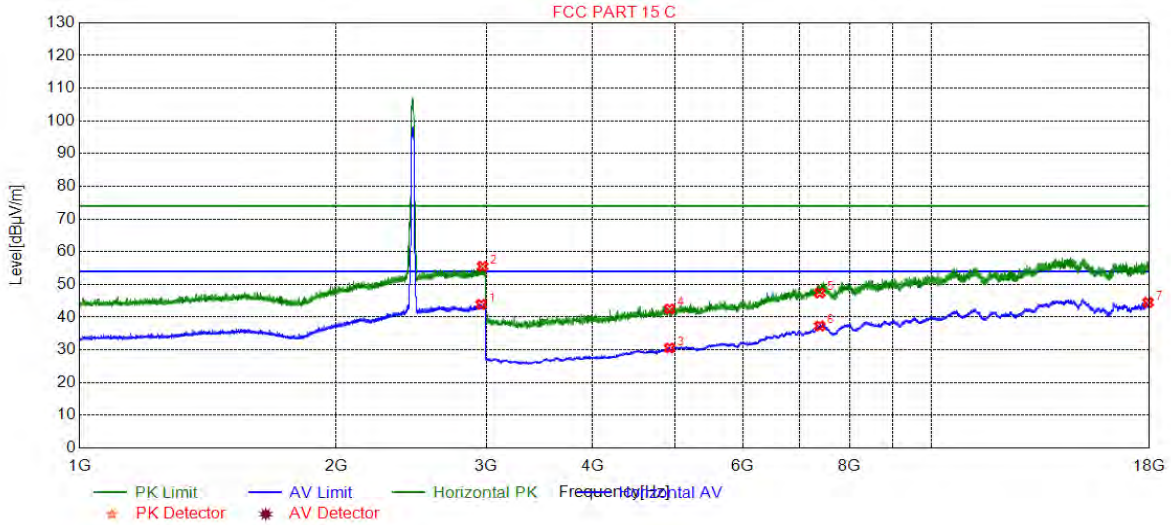
4.9.2.11 802.11G_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2959.4899	43.92	9.64	54.00	10.08	150	46	Horizontal
2	2970.4926	55.51	9.59	74.00	18.49	150	156	Horizontal
3	4924.0000	30.59	-17.71	54.00	23.41	150	45	Horizontal
4	4924.0000	42.53	-17.71	74.00	31.47	150	45	Horizontal
5	7386.0000	47.41	-9.20	74.00	26.59	150	72	Horizontal
6	7386.0000	37.30	-9.20	54.00	16.70	150	182	Horizontal
7	17929.4929	44.52	-1.30	54.00	9.48	150	182	Horizontal

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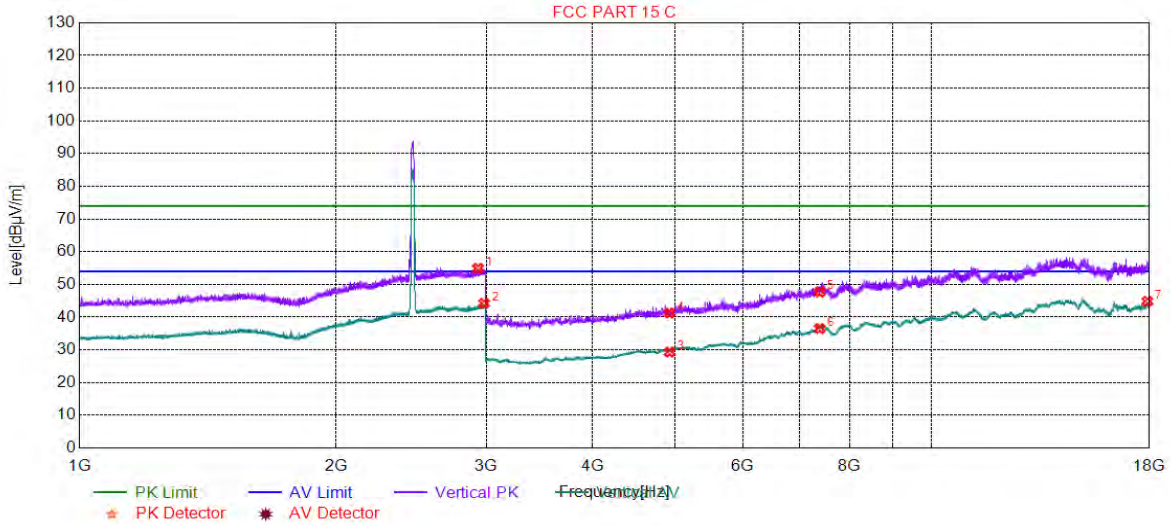
4.9.2.12 802.11G_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2933.9835	54.94	9.51	74.00	19.06	150	260	Vertical
2	2982.4956	44.24	9.53	54.00	9.76	150	246	Vertical
3	4924.0000	29.33	-17.71	54.00	24.67	150	287	Vertical
4	4924.0000	41.25	-17.71	74.00	32.75	150	14	Vertical
5	7386.0000	47.69	-9.20	74.00	26.31	150	287	Vertical
6	7386.0000	36.52	-9.20	54.00	17.48	150	287	Vertical
7	17899.4899	44.86	-1.32	54.00	9.14	150	260	Vertical

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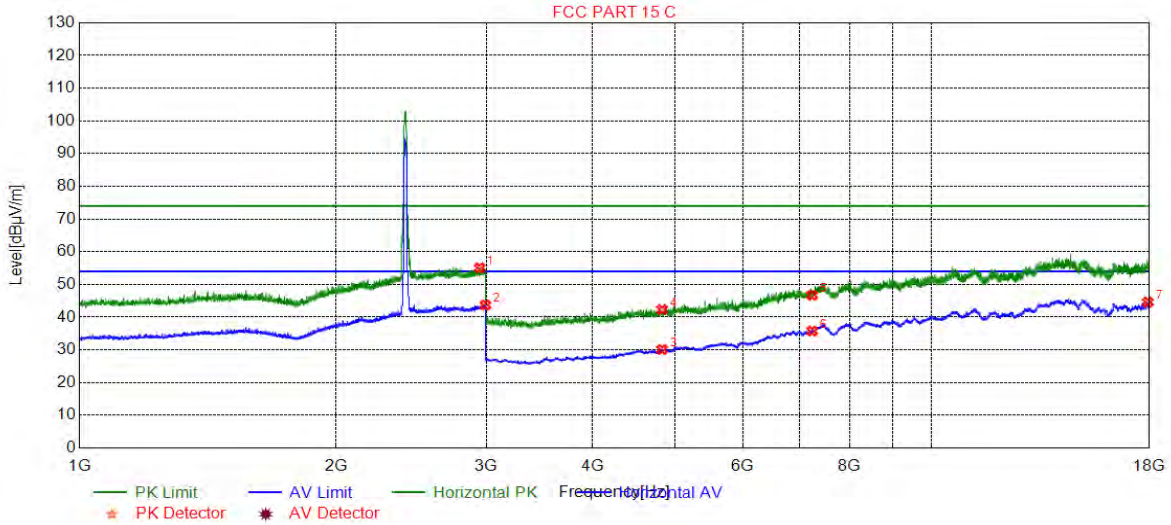
4.9.2.13 802.11N20_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2947.4869	55.10	9.65	74.00	18.90	150	360	Horizontal
2	2993.9985	43.70	9.48	54.00	10.30	150	114	Horizontal
3	4824.0000	30.13	-18.21	54.00	23.87	150	18	Horizontal
4	4824.0000	42.31	-18.21	74.00	31.69	150	210	Horizontal
5	7236.0000	46.71	-9.76	74.00	27.29	150	46	Horizontal
6	7236.0000	35.77	-9.76	54.00	18.23	150	360	Horizontal
7	17918.9919	44.61	-1.30	54.00	9.39	150	46	Horizontal

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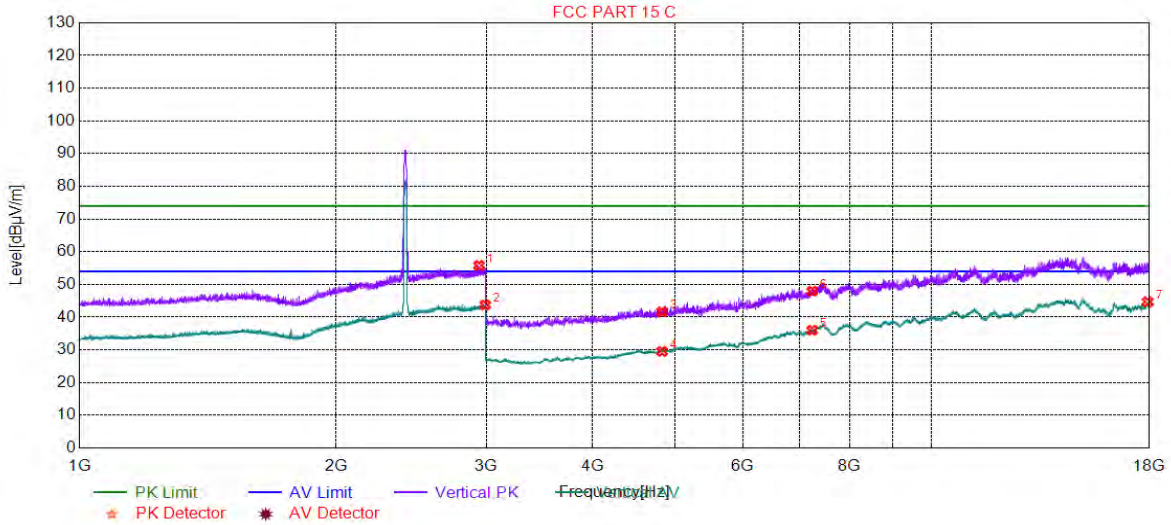
4.9.2.14 802.11N20_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2941.9855	55.83	9.59	74.00	18.17	150	302	Vertical
2	2991.4979	43.74	9.49	54.00	10.26	150	302	Vertical
3	4824.0000	41.65	-18.21	74.00	32.35	150	315	Vertical
4	4824.0000	29.54	-18.21	54.00	24.46	150	315	Vertical
5	7236.0000	36.01	-9.76	54.00	17.99	150	233	Vertical
6	7236.0000	47.98	-9.76	74.00	26.02	150	178	Vertical
7	17911.4911	44.68	-1.31	54.00	9.32	150	40	Vertical

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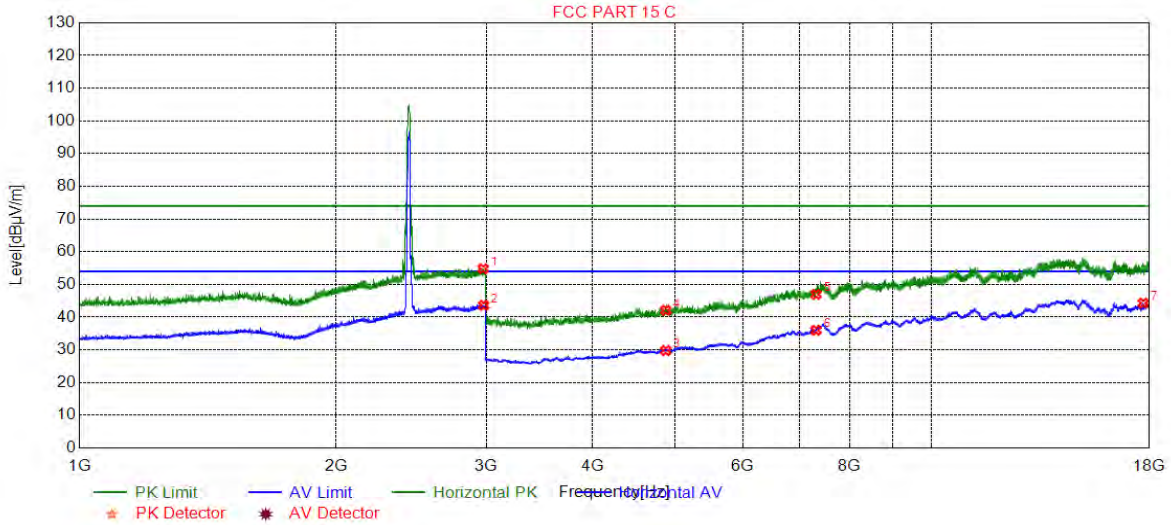
4.9.2.15 802.11N20_Channel 6

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2975.4939	54.82	9.56	74.00	19.18	150	58	Horizontal
2	2979.9950	43.63	9.54	54.00	10.37	150	141	Horizontal
3	4874.0000	29.79	-17.99	54.00	24.21	150	360	Horizontal
4	4874.0000	42.12	-17.99	74.00	31.88	150	100	Horizontal
5	7311.0000	46.97	-9.59	74.00	27.03	150	317	Horizontal
6	7311.0000	36.01	-9.59	54.00	17.99	150	262	Horizontal
7	17701.4701	44.30	-0.67	54.00	9.70	150	73	Horizontal

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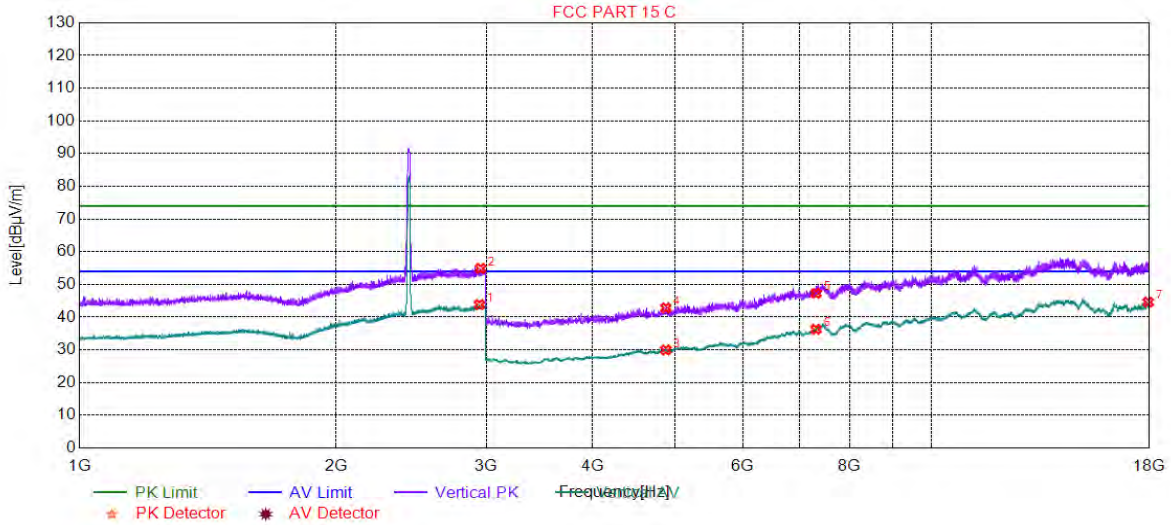
4.9.2.16 802.11N20_Channel 6

Test Graph



Suspected List

Suspected List								
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1	2945.9865	43.86	9.64	54.00	10.14	150	328	Vertical
2	2953.9885	54.91	9.66	74.00	19.09	150	342	Vertical
3	4874.0000	29.96	-17.99	54.00	24.04	150	68	Vertical
4	4874.0000	42.84	-17.99	74.00	31.16	150	96	Vertical
5	7311.0000	47.29	-9.59	74.00	26.71	150	260	Vertical
6	7311.0000	36.29	-9.59	54.00	17.71	150	178	Vertical
7	17935.4935	44.62	-1.30	54.00	9.38	150	260	Vertical

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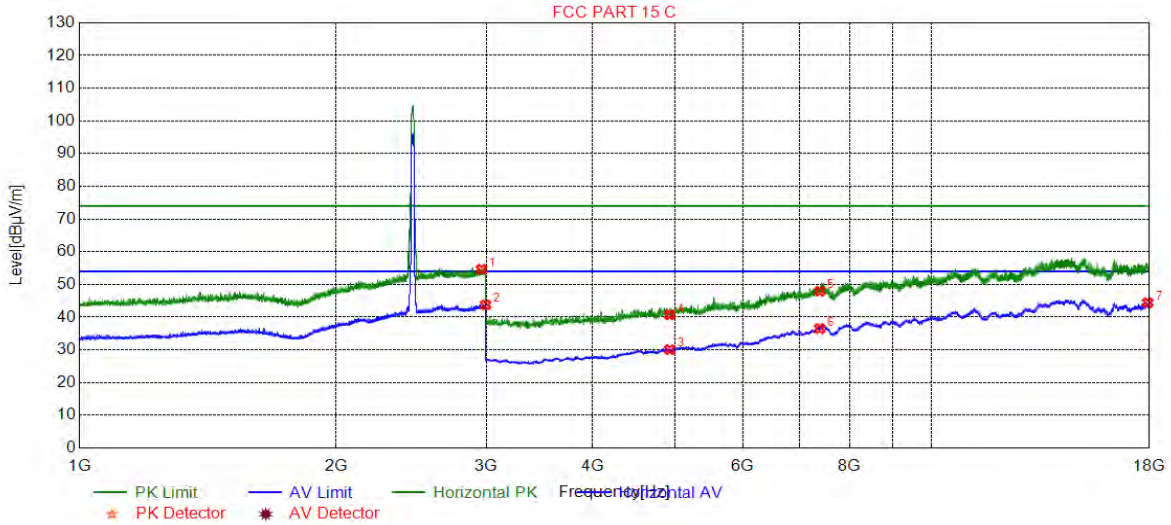
4.9.2.17 802.11N20_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2961.9905	54.66	9.62	74.00	19.34	150	346	Horizontal
2	2995.4989	43.78	9.47	54.00	10.22	150	101	Horizontal
3	4924.0000	30.11	-17.71	54.00	23.89	150	18	Horizontal
4	4924.0000	40.71	-17.71	74.00	33.29	150	184	Horizontal
5	7386.0000	47.96	-9.20	74.00	26.04	150	184	Horizontal
6	7386.0000	36.52	-9.20	54.00	17.48	150	18	Horizontal
7	17915.9916	44.42	-1.31	54.00	9.58	150	266	Horizontal

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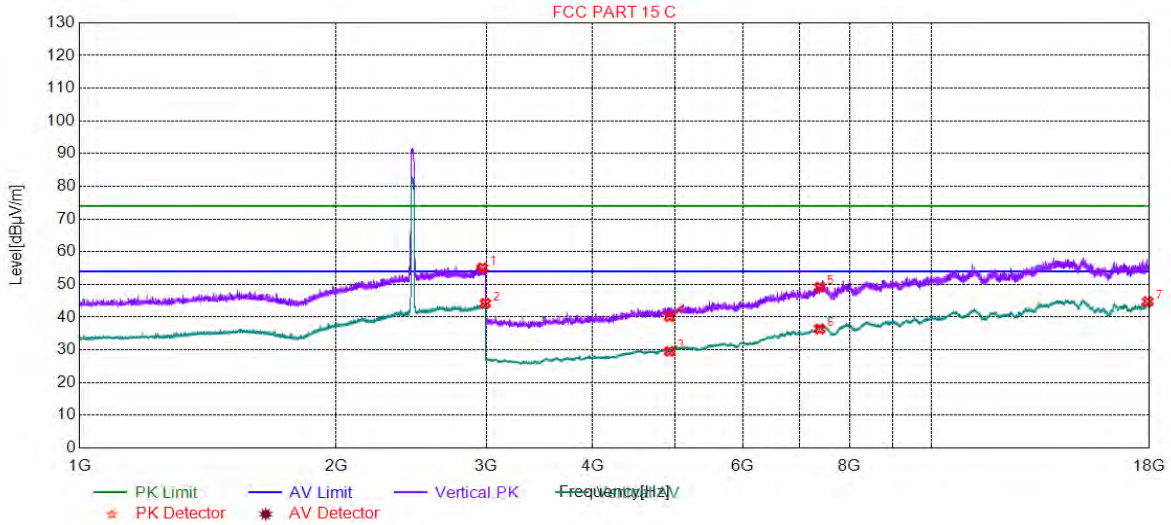
4.9.2.18 802.11N20_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2970.4926	55.08	9.59	74.00	18.92	150	12	Vertical
2	2992.9983	44.23	9.48	54.00	9.77	150	288	Vertical
3	4924.0000	29.54	-17.71	54.00	24.46	150	342	Vertical
4	4924.0000	40.17	-17.71	74.00	33.83	150	315	Vertical
5	7386.0000	49.17	-9.20	74.00	24.83	150	123	Vertical
6	7386.0000	36.41	-9.20	54.00	17.59	150	96	Vertical
7	17918.9919	44.75	-1.30	54.00	9.25	150	14	Vertical

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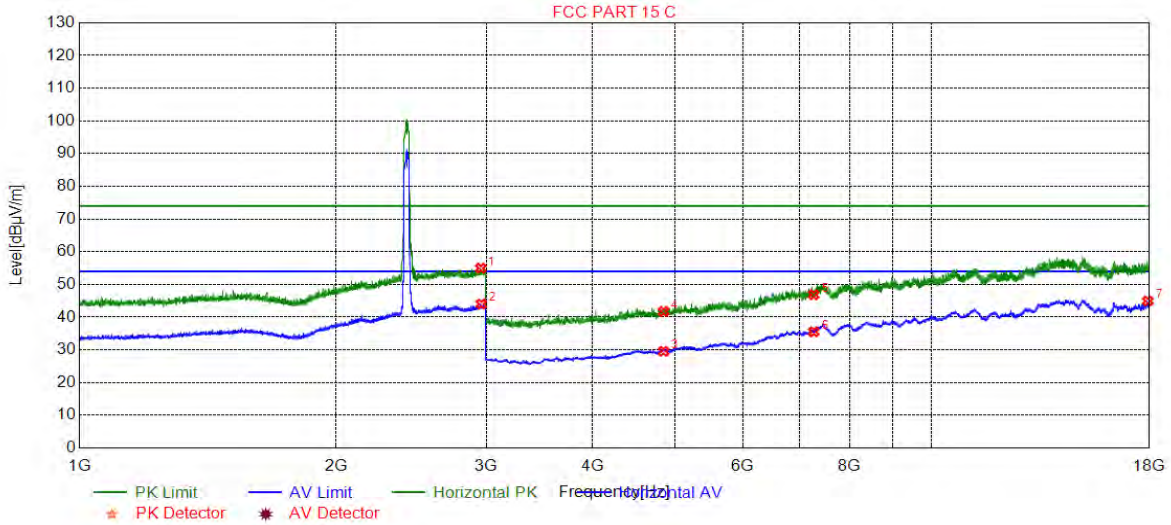
4.9.2.19 802.11N40_Channel 3

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2955.9890	54.97	9.65	74.00	19.03	150	305	Horizontal
2	2960.9902	44.03	9.63	54.00	9.97	150	141	Horizontal
3	4844.0000	29.57	-18.12	54.00	24.43	150	209	Horizontal
4	4844.0000	41.77	-18.12	74.00	32.23	150	101	Horizontal
5	7266.0000	46.87	-9.71	74.00	27.13	150	263	Horizontal
6	7266.0000	35.55	-9.71	54.00	18.45	150	317	Horizontal
7	17915.9916	44.96	-1.31	54.00	9.04	150	18	Horizontal

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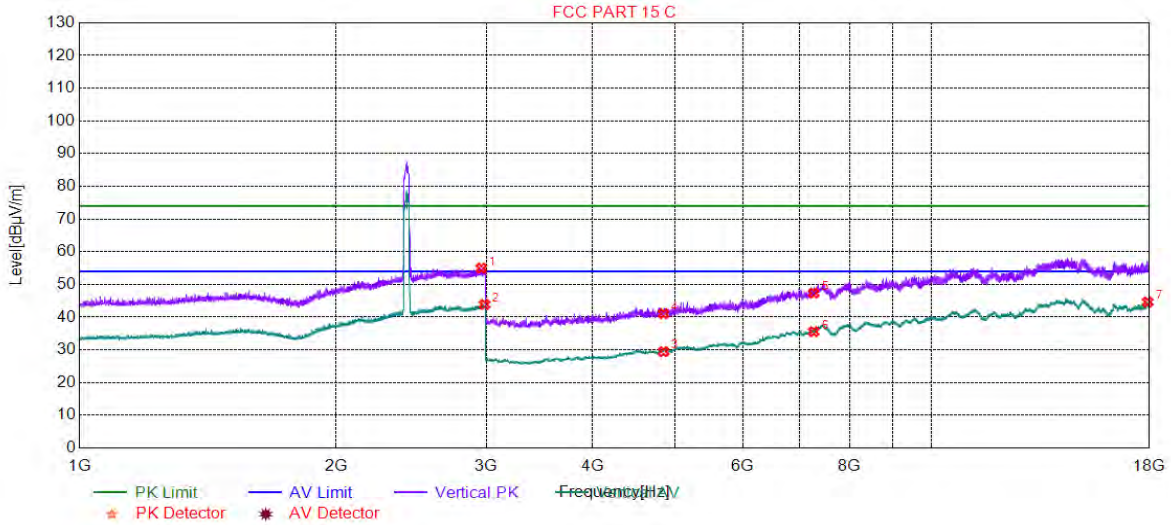
4.9.2.20 802.11N40_Channel 3

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2960.9902	54.98	9.63	74.00	19.02	150	151	Vertical
2	2986.4966	43.88	9.51	54.00	10.12	150	191	Vertical
3	4844.0000	29.46	-18.12	54.00	24.54	150	122	Vertical
4	4844.0000	41.07	-18.12	74.00	32.93	150	314	Vertical
5	7266.0000	47.36	-9.71	74.00	26.64	150	204	Vertical
6	7266.0000	35.59	-9.71	54.00	18.41	150	41	Vertical
7	17915.9916	44.62	-1.31	54.00	9.38	150	204	Vertical

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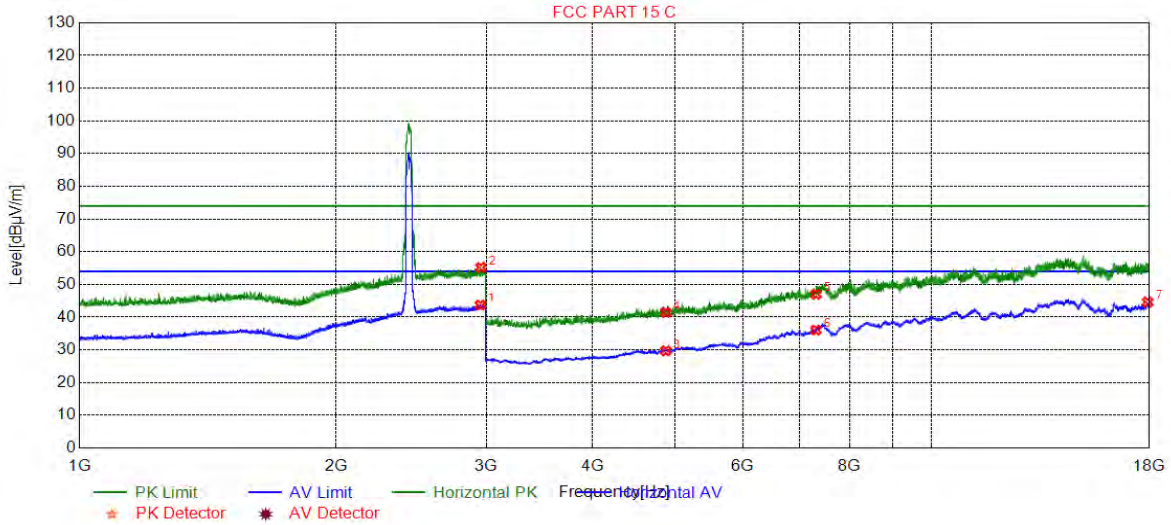
4.9.2.21 802.11N40_Channel 6

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2952.9882	43.71	9.67	54.00	10.29	150	18	Horizontal
2	2957.4894	55.22	9.65	74.00	18.78	150	86	Horizontal
3	4874.0000	29.70	-17.99	54.00	24.30	150	128	Horizontal
4	4874.0000	41.45	-17.99	74.00	32.55	150	238	Horizontal
5	7311.0000	47.00	-9.59	74.00	27.00	150	183	Horizontal
6	7311.0000	36.06	-9.59	54.00	17.94	150	238	Horizontal
7	17911.4911	44.63	-1.31	54.00	9.37	150	46	Horizontal

Final Data List

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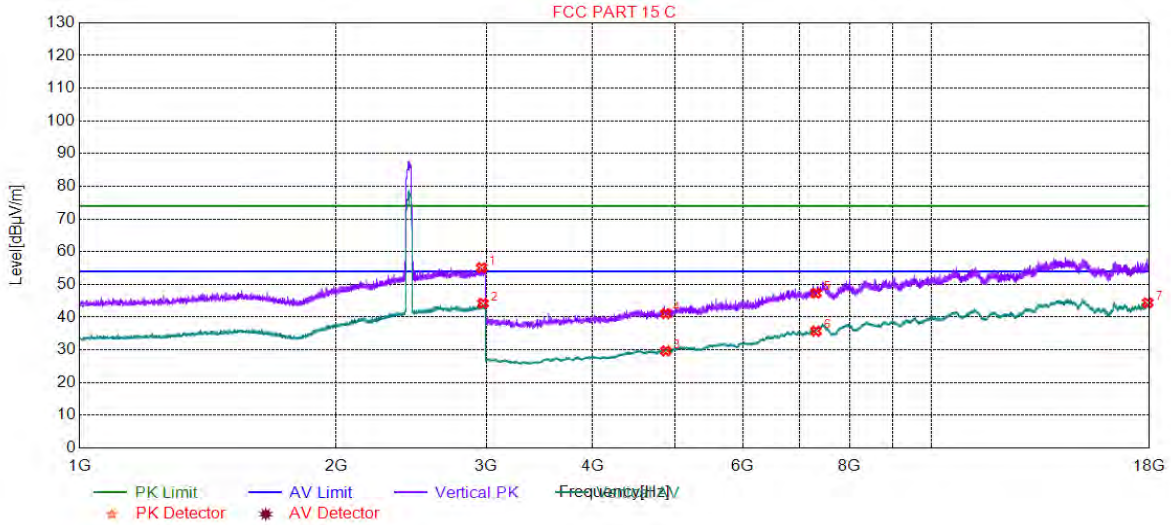
4.9.2.22 802.11N40_Channel 6

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2963.4909	55.14	9.62	74.00	18.86	150	316	Vertical
2	2974.4936	44.24	9.57	54.00	9.76	150	12	Vertical
3	4874.0000	29.69	-17.99	54.00	24.31	150	261	Vertical
4	4874.0000	41.06	-17.99	74.00	32.94	150	96	Vertical
5	7311.0000	47.32	-9.59	74.00	26.68	150	0	Vertical
6	7311.0000	35.74	-9.59	54.00	18.26	150	342	Vertical
7	17915.9916	44.42	-1.31	54.00	9.58	150	178	Vertical

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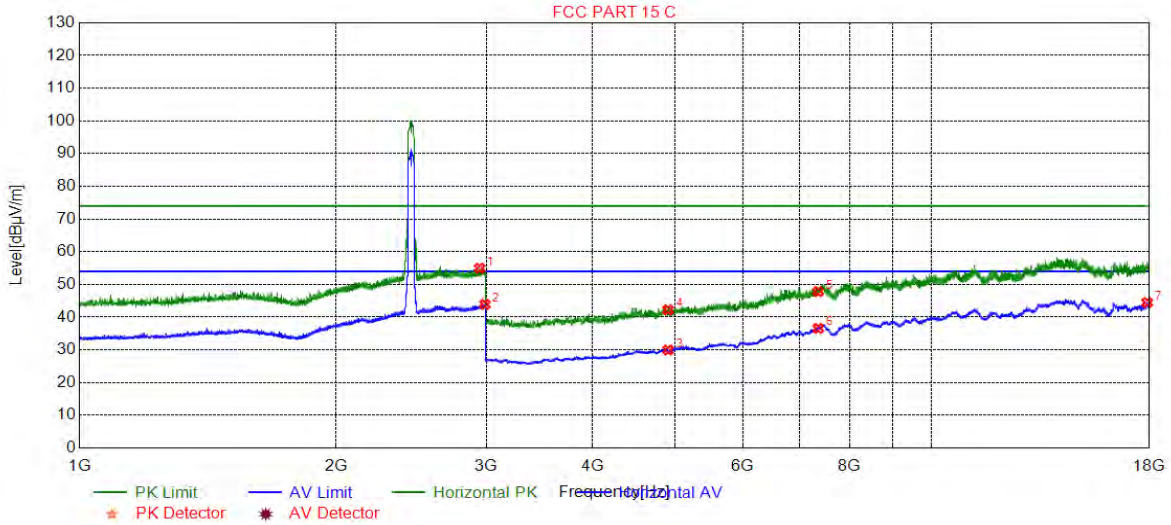
4.9.2.23 802.11N40_Channel 9

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2946.9867	54.96	9.65	74.00	19.04	150	169	Horizontal
2	2989.4974	43.93	9.50	54.00	10.07	150	334	Horizontal
3	4904.0000	29.95	-17.84	54.00	24.05	150	293	Horizontal
4	4904.0000	42.25	-17.84	74.00	31.75	150	238	Horizontal
5	7356.0000	47.82	-9.36	74.00	26.18	150	18	Horizontal
6	7356.0000	36.57	-9.36	54.00	17.43	150	238	Horizontal
7	17890.4890	44.49	-1.44	54.00	9.51	150	128	Horizontal

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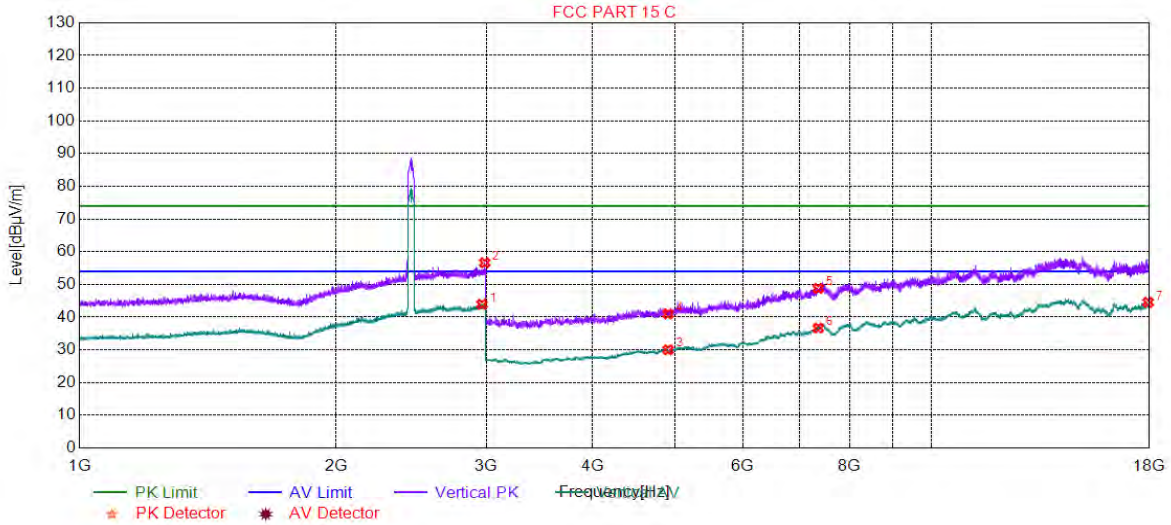
4.9.2.24 802.11N40_Channel 9

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2965.4914	43.95	9.61	54.00	10.05	150	233	Vertical
2	2987.9970	56.64	9.51	74.00	17.36	150	274	Vertical
3	4904.0000	30.02	-17.84	54.00	23.98	150	123	Vertical
4	4904.0000	40.99	-17.84	74.00	33.01	150	342	Vertical
5	7356.0000	48.80	-9.36	74.00	25.20	150	40	Vertical
6	7356.0000	36.70	-9.36	54.00	17.30	150	12	Vertical
7	17930.9931	44.54	-1.30	54.00	9.46	150	233	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 Restricted bands around fundamental frequency

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 @3m)	Remark
	30MHz-88MHz	40.0	Quasi-peak Value
	88MHz-216MHz	43.5	Quasi-peak Value
	216MHz-960MHz	46.0	Quasi-peak Value
	960MHz-1GHz	54.0	Quasi-peak Value
	Above 1GHz	54.0	Average Value
		74.0	Peak Value
Test Setup:			

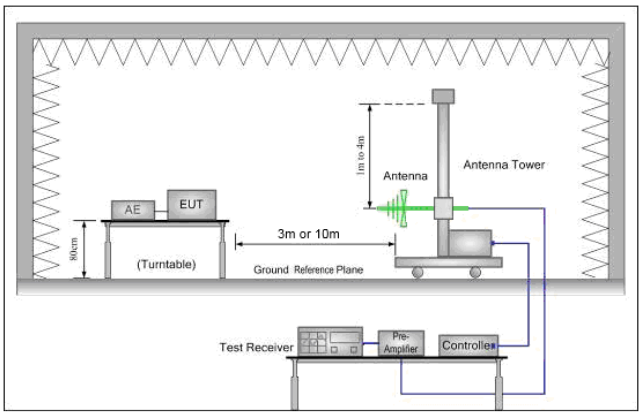

Figure 1. 30MHz to 1GHz

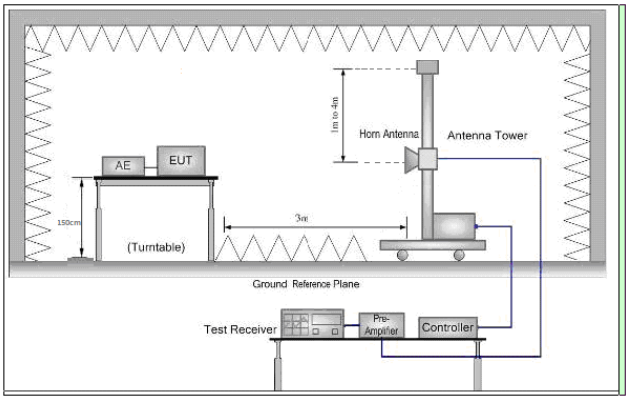

Figure 2. Above 1 GHz

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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); 13.5Mbps of rate is the worst case of 802.11N(HT40). 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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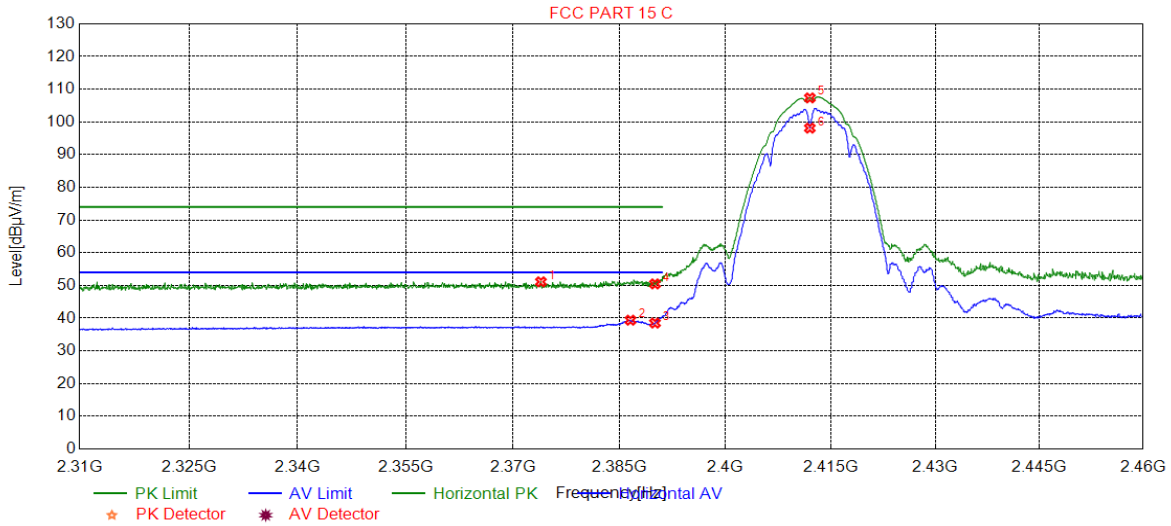
Test plot as follows:

4.10.1 ANT1

4.10.1.1 802.11B_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2373.9320	51.12	7.79	74.00	22.88	150	283	Horizontal
2	2386.5383	39.39	7.77	54.00	14.61	150	200	Horizontal
3	2390.0000	38.51	7.77	54.00	15.49	150	200	Horizontal
4	2390.0000	50.48	7.77	74.00	23.52	150	222	Horizontal
5	2412.0000	107.35	7.81	0.00	-107.35	150	200	Horizontal
6	2412.0000	98.11	7.81	0.00	-98.11	150	200	Horizontal

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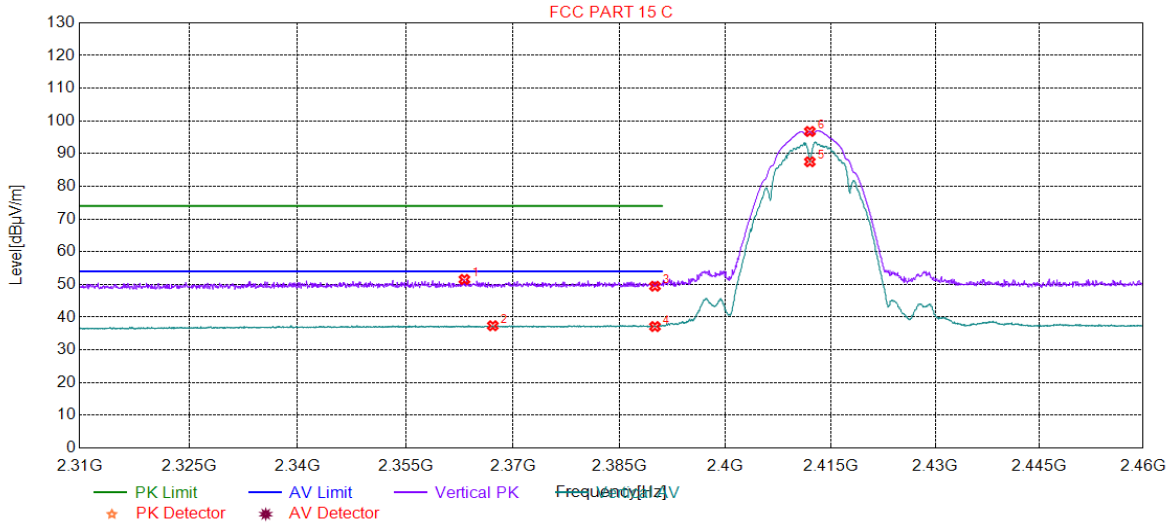
4.10.1.2 802.11B_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2363.2016	51.54	7.80	74.00	22.46	150	49	Vertical
2	2367.1786	37.39	7.79	54.00	16.61	150	204	Vertical
3	2390.0000	49.47	7.77	74.00	24.53	150	176	Vertical
4	2390.0000	37.14	7.77	54.00	16.86	150	215	Vertical
5	2412.0000	87.51	7.81	0.00	-87.51	150	325	Vertical
6	2412.0000	96.78	7.81	0.00	-96.78	150	325	Vertical

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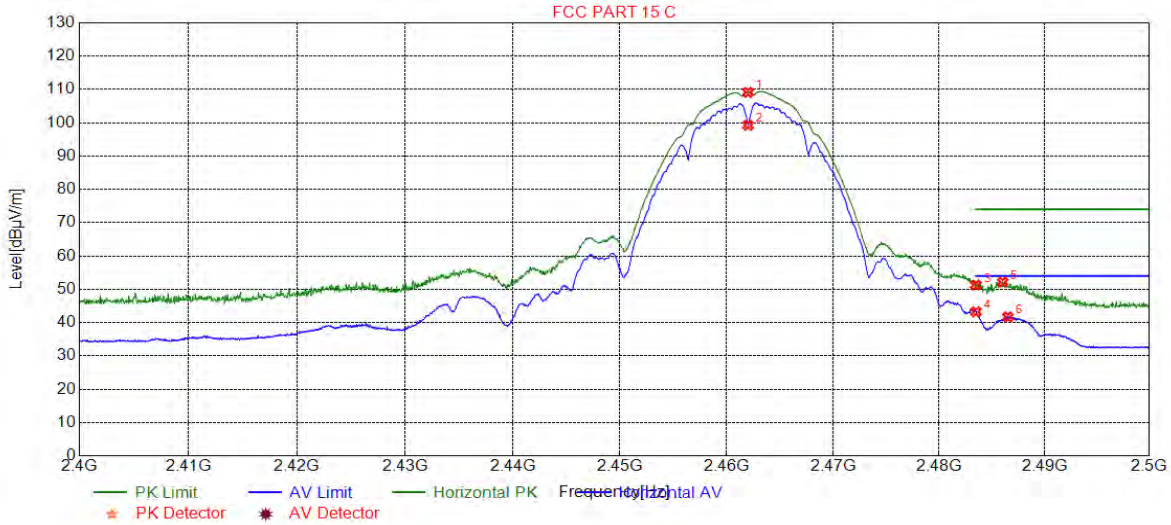
4.10.1.3 802.11B_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.0000	109.15	7.98	0.00	-109.15	150	216	Horizontal
2	2462.0000	99.26	7.98	0.00	-99.26	150	216	Horizontal
3	2483.5000	51.30	8.01	74.00	22.70	150	199	Horizontal
4	2483.5000	43.25	8.01	54.00	10.75	150	221	Horizontal
5	2486.0430	52.18	8.01	74.00	21.82	150	216	Horizontal
6	2486.5433	41.74	8.01	54.00	12.26	150	216	Horizontal

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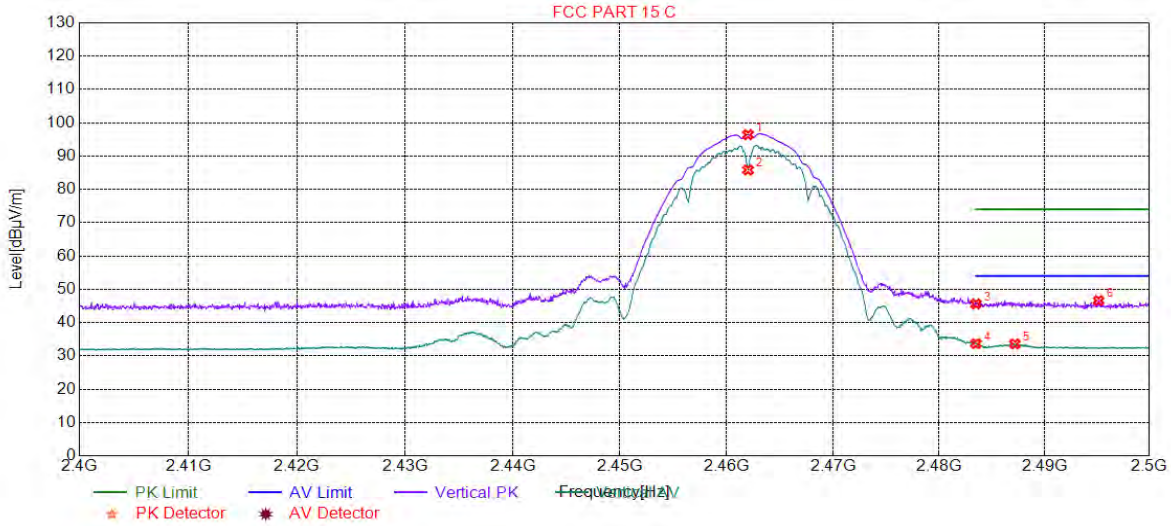
4.10.1.4 802.11B_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.0000	96.42	7.98	0.00	-96.42	150	325	Vertical
2	2462.0000	85.84	7.98	0.00	-85.84	150	325	Vertical
3	2483.5000	45.65	8.01	74.00	28.35	150	88	Vertical
4	2483.5000	33.70	8.01	54.00	20.30	150	1	Vertical
5	2487.1936	33.63	8.01	54.00	20.37	150	1	Vertical
6	2495.1476	46.65	8.02	74.00	27.35	150	204	Vertical

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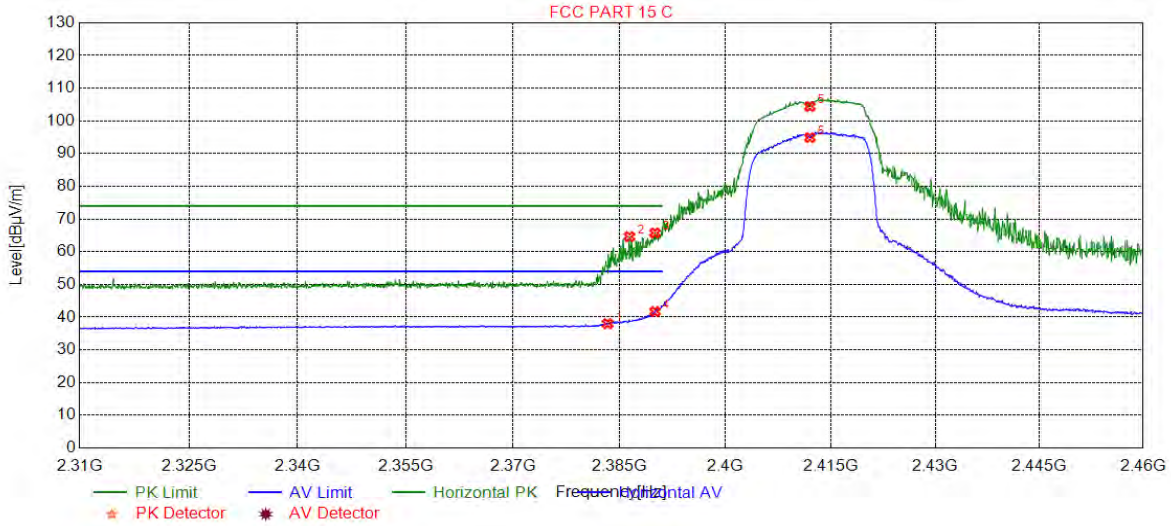
4.10.1.5 802.11G_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2383.3117	38.03	7.78	54.00	15.97	150	209	Horizontal
2	2386.3882	64.64	7.77	74.00	9.36	150	198	Horizontal
3	2390.0000	65.78	7.77	74.00	8.22	150	209	Horizontal
4	2390.0000	41.71	7.77	54.00	12.29	150	198	Horizontal
5	2412.0000	104.40	7.81	0.00	-104.40	150	220	Horizontal
6	2412.0000	94.92	7.81	0.00	-94.92	150	215	Horizontal

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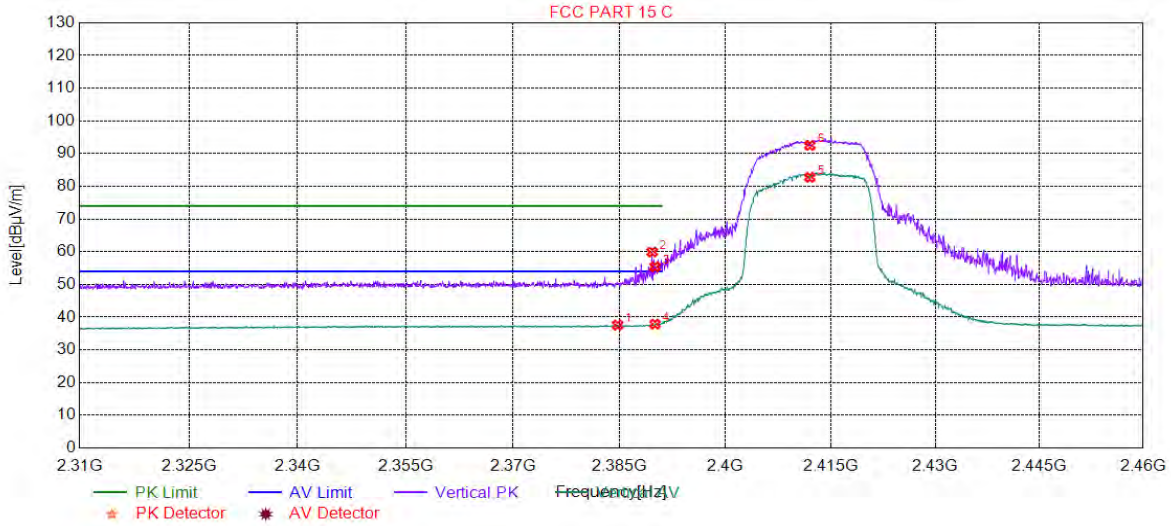
4.10.1.6 802.11G_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2384.7374	37.58	7.78	54.00	16.42	150	308	Vertical
2	2389.6148	59.95	7.77	74.00	14.05	150	43	Vertical
3	2390.0000	55.41	7.77	74.00	18.59	150	65	Vertical
4	2390.0000	37.90	7.77	54.00	16.10	150	308	Vertical
5	2412.0000	82.75	7.81	0.00	-82.75	150	286	Vertical
6	2412.0000	92.51	7.81	0.00	-92.51	150	314	Vertical

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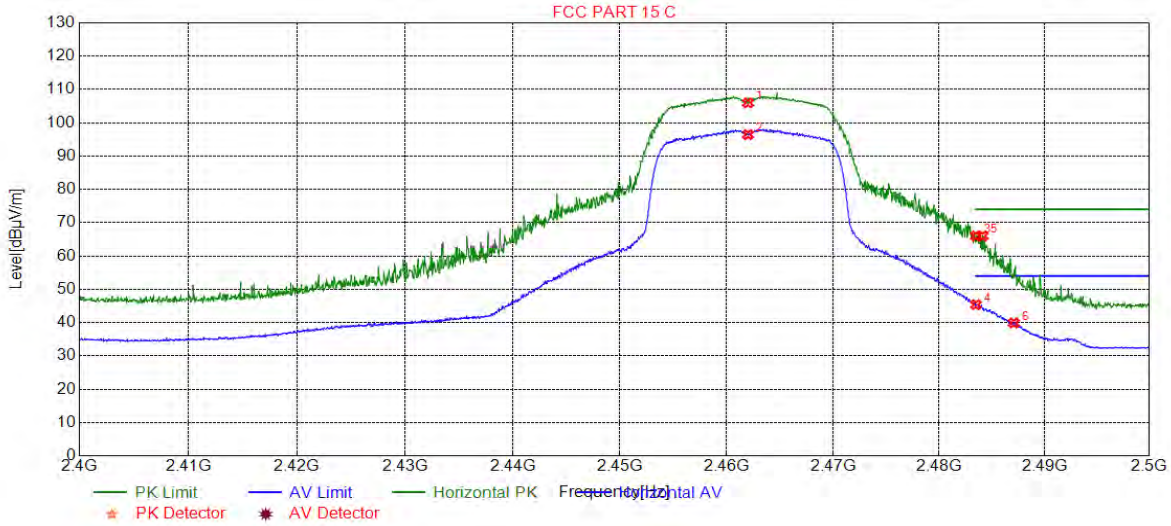
4.10.1.7 802.11G_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.0000	105.96	7.98	0.00	-105.96	150	216	Horizontal
2	2462.0000	96.44	7.98	0.00	-96.44	150	222	Horizontal
3	2483.5000	66.05	8.01	74.00	7.95	150	222	Horizontal
4	2483.5000	45.40	8.01	54.00	8.60	150	216	Horizontal
5	2484.1421	66.02	8.01	74.00	7.98	150	216	Horizontal
6	2487.0935	39.92	8.01	54.00	14.08	150	216	Horizontal

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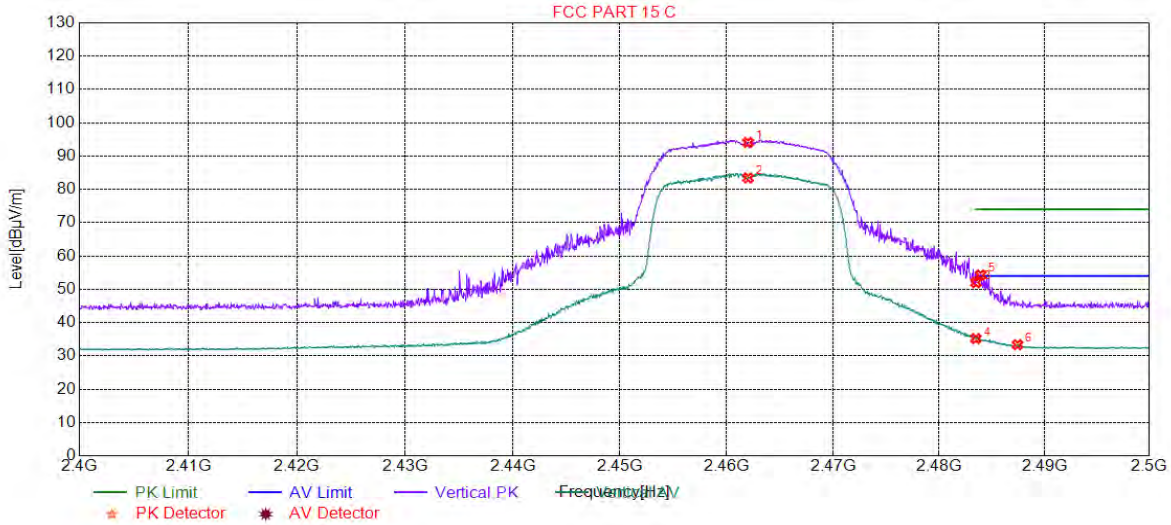
4.10.1.8 802.11G_Channel 11

Test Graph



Suspected List

Suspected List								
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1	2462.0000	94.08	7.98	0.00	-94.08	150	303	Vertical
2	2462.0000	83.43	7.98	0.00	-83.43	150	303	Vertical
3	2483.5000	52.01	8.01	74.00	21.99	150	297	Vertical
4	2483.5000	35.21	8.01	54.00	18.79	150	0	Vertical
5	2483.9420	54.32	8.01	74.00	19.68	150	3	Vertical
6	2487.4437	33.38	8.01	54.00	20.62	150	0	Vertical

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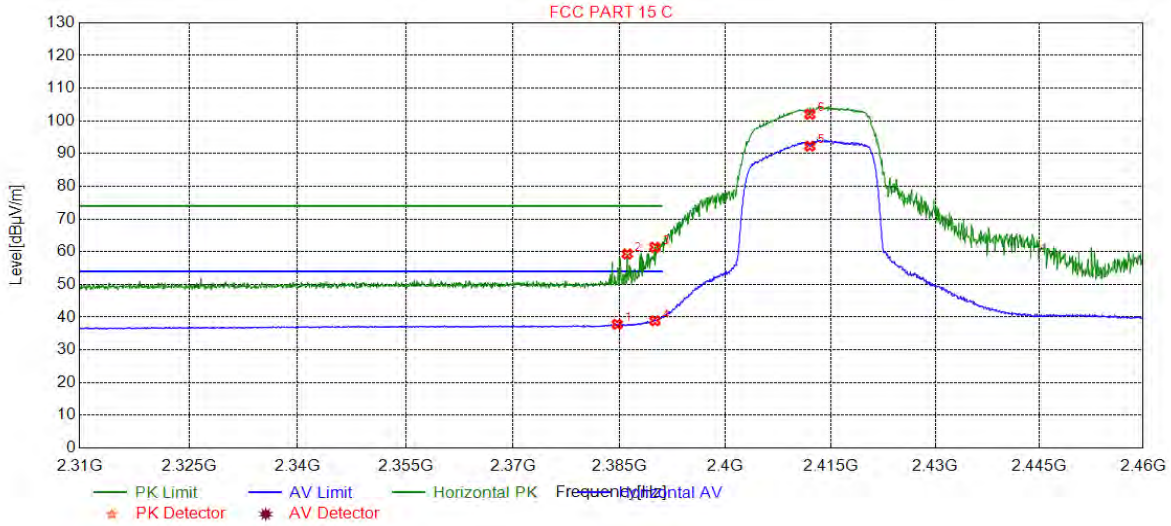
4.10.1.9 802.11N20_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2384.6623	37.83	7.78	54.00	16.17	150	199	Horizontal
2	2386.0880	59.33	7.77	74.00	14.67	150	260	Horizontal
3	2389.9900	61.37	7.77	74.00	12.63	150	67	Horizontal
4	2390.0000	38.90	7.77	54.00	15.10	150	199	Horizontal
5	2412.0000	92.26	7.81	0.00	-92.26	150	216	Horizontal
6	2412.0000	102.00	7.81	0.00	-102.00	150	221	Horizontal

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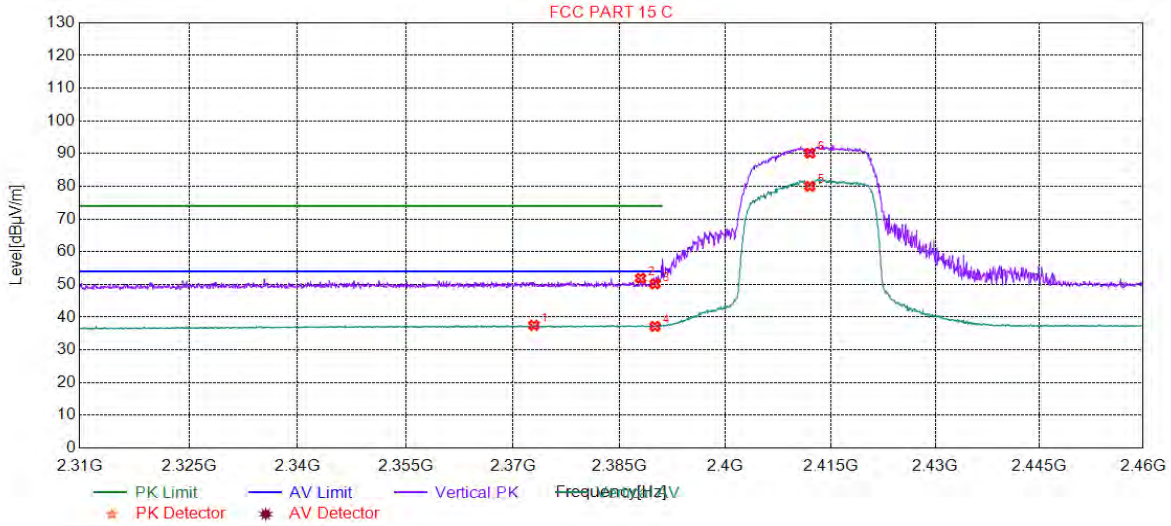
4.10.1.10 802.11N20_Channel 1

Test Graph



Suspected List

Suspected List								
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1	2372.9565	37.51	7.79	54.00	16.49	150	116	Vertical
2	2387.9640	51.90	7.77	74.00	22.10	150	330	Vertical
3	2390.0000	50.17	7.77	74.00	23.83	150	55	Vertical
4	2390.0000	37.20	7.77	54.00	16.80	150	319	Vertical
5	2412.0000	80.00	7.81	0.00	-80.00	150	199	Vertical
6	2412.0000	90.14	7.81	0.00	-90.14	150	199	Vertical

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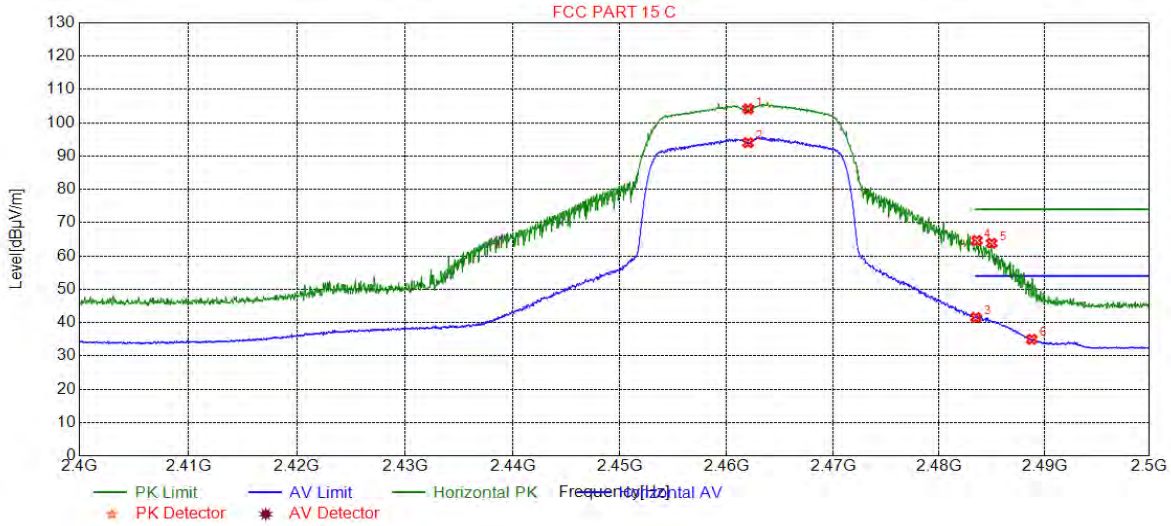
4.10.1.11 802.11N20_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.0000	104.14	7.98	0.00	-104.14	150	215	Horizontal
2	2462.0000	94.01	7.98	0.00	-94.01	150	215	Horizontal
3	2483.5000	41.53	8.01	54.00	12.47	150	215	Horizontal
4	2483.5918	64.67	8.01	74.00	9.33	150	220	Horizontal
5	2484.9925	63.84	8.01	74.00	10.16	150	215	Horizontal
6	2488.7944	35.00	8.02	54.00	19.00	150	215	Horizontal

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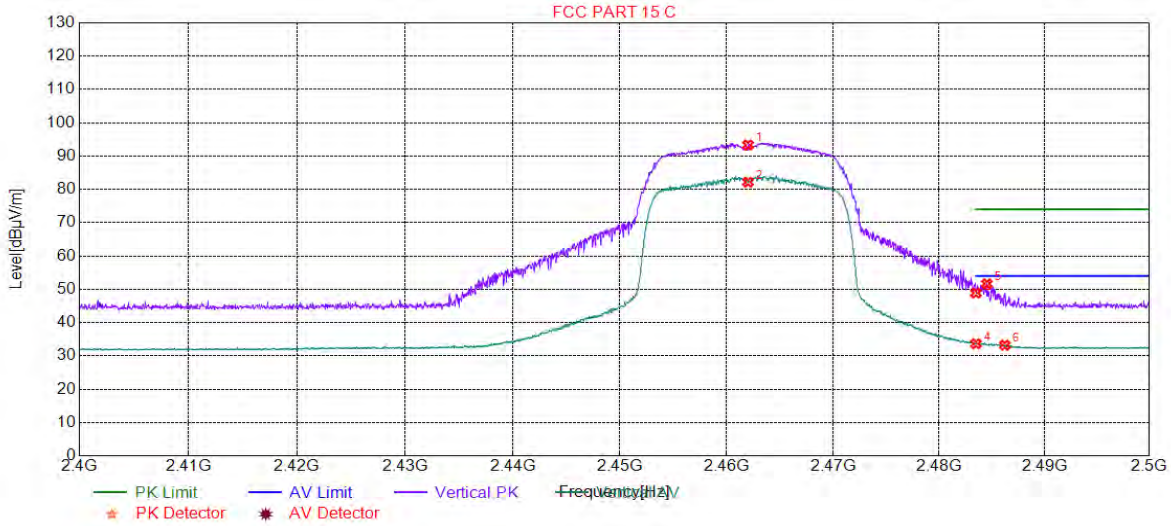
4.10.1.12 802.11N20_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.0000	93.36	7.98	0.00	-93.36	150	308	Vertical
2	2462.0000	82.20	7.98	0.00	-82.20	150	308	Vertical
3	2483.5000	48.88	8.01	74.00	25.12	150	198	Vertical
4	2483.5000	33.66	8.01	54.00	20.34	150	308	Vertical
5	2484.5423	51.67	8.01	74.00	22.33	150	132	Vertical
6	2486.2431	33.25	8.01	54.00	20.75	150	60	Vertical

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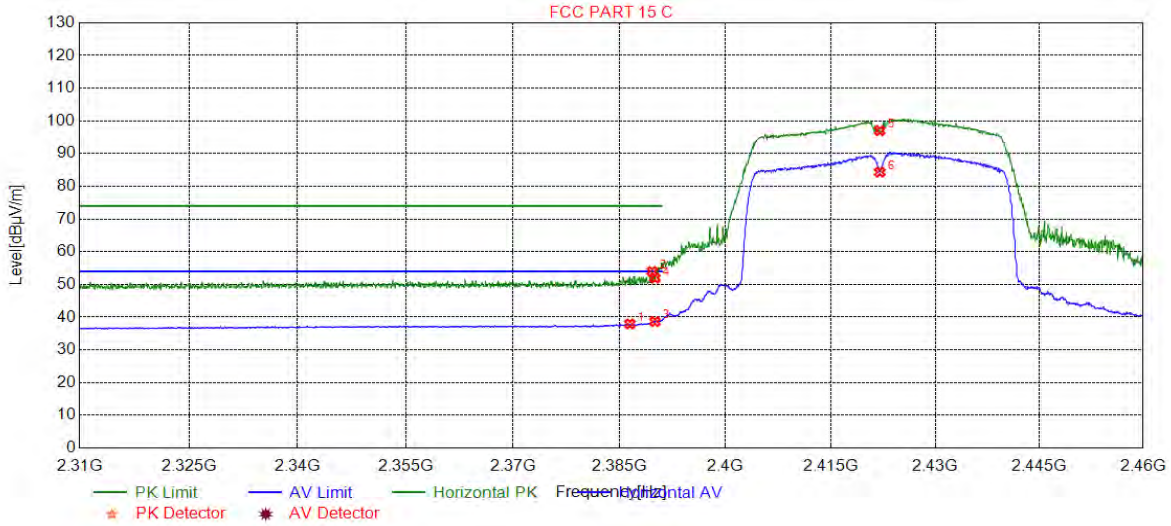
4.10.1.13 802.11N40_Channel 3

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2386.4632	37.96	7.77	54.00	16.04	150	262	Horizontal
2	2389.6148	54.00	7.77	74.00	20.00	150	213	Horizontal
3	2390.0000	38.65	7.77	54.00	15.35	150	213	Horizontal
4	2390.0000	51.97	7.77	74.00	22.03	150	218	Horizontal
5	2422.0000	97.04	7.85	0.00	-97.04	150	218	Horizontal
6	2422.0000	84.35	7.85	0.00	-84.35	150	213	Horizontal

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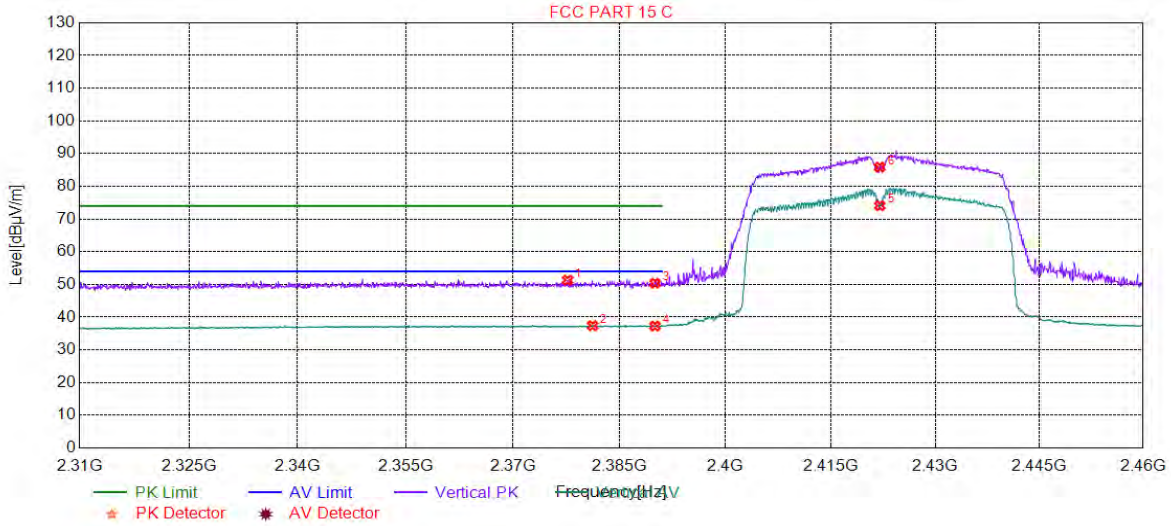
4.10.1.14 802.11N40_Channel 3

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2377.6838	51.33	7.78	74.00	22.67	150	88	Vertical
2	2381.2106	37.40	7.78	54.00	16.60	150	6	Vertical
3	2390.0000	50.39	7.77	74.00	23.61	150	88	Vertical
4	2390.0000	37.29	7.77	54.00	16.71	150	310	Vertical
5	2422.0000	74.09	7.85	0.00	-74.09	150	310	Vertical
6	2422.0000	85.89	7.85	0.00	-85.89	150	310	Vertical

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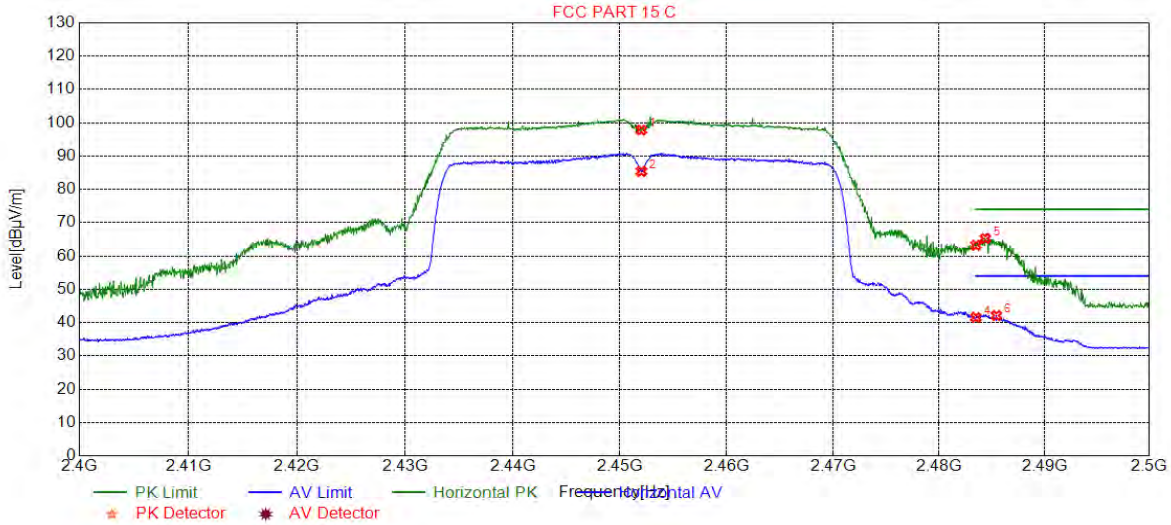
4.10.1.15 802.11N40_Channel 9

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2452.0000	97.84	7.97	0.00	-97.84	150	213	Horizontal
2	2452.0000	85.41	7.97	0.00	-85.41	150	213	Horizontal
3	2483.5000	63.23	8.01	74.00	10.77	150	213	Horizontal
4	2483.5000	41.56	8.01	54.00	12.44	150	213	Horizontal
5	2484.3922	65.28	8.01	74.00	8.72	150	218	Horizontal
6	2485.4427	42.14	8.01	54.00	11.86	150	218	Horizontal

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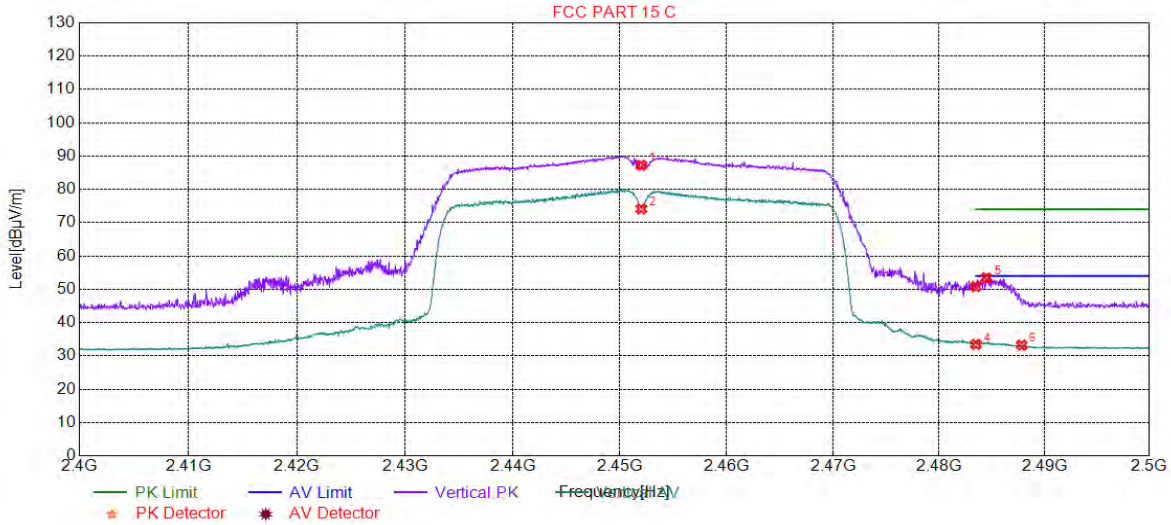
4.10.1.16 802.11N40_Channel 9

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2452.0000	87.27	7.97	0.00	-87.27	150	12	Vertical
2	2452.0000	74.15	7.97	0.00	-74.15	150	12	Vertical
3	2483.5000	50.83	8.01	74.00	23.17	150	67	Vertical
4	2483.5000	33.49	8.01	54.00	20.51	150	321	Vertical
5	2484.4922	53.49	8.01	74.00	20.51	150	62	Vertical
6	2487.8439	33.26	8.02	54.00	20.74	150	51	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)

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	Radiated Spurious emission test	±4.5dB (30MHz-1GHz)
		±4.8dB (1GHz-25GHz)
5	Conduct emission test	±3.12 dB (9KHz- 30MHz)
6	Temperature test	±1°C
7	Humidity test	±3%
8	DC and low frequency voltages	±0.5%

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6 Equipment List

Conducted Emission					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy-mm-dd)	Cal.Duedate (yyyy-mm-dd)
Shielding Room	ZhongYu Electron	GB-88	SEM001-06	2020/5/10	2023/5/9
LISN	Rohde & Schwarz	ENV216	SEM007-01	2020/7/14	2023/7/14
LISN	ETS-LINDGREN	Feb-16	SEM007-02	2020/4/1	2021/3/31
Measurement Software	AUDIX	e3 V5.4.1221d	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM024-01	2020/6/12	2021/6/11
2 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T2-02	EMC0122	2020/2/11	2021/2/10
EMI Test Receiver	Rohde & Schwarz	ESCI	SEM004-02	2020/3/2	2021/3/1

RF conducted test					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy-mm-dd)	Cal.Duedate (yyyy-mm-dd)
DC Power Supply	Agilent Technologies 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	2019/10/27	2020/10/27
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2020/7/14	2021/7/14

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RE in Chamber					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy-mm-dd)	Cal.Due date (yyyy-mm-dd)
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2018/3/13	2021/3/12
Measurement Software	AUDIX	e3V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2020/6/12	2021/6/11
EXA Signal Analyzer (10Hz-26.5GHz)	Agilent Technologies Inc	N9010A	SEM004-09	2020/3/12	2021/3/11
BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-01	2020/6/27	2023/6/26
Horn Antenna (0.8-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2018/4/13	2021/4/12
Pre-amplifier(0.1-1.3GHz)	HP	8447D	SEM005-02	2020/7/14	2021/7/14
Low Noise Amplifier(100MHz-18GHz)	Black Diamond Series	BDLNA-0118-352810	SEM005-05	2020/9/3	2021/9/2
Horn Antenna (15-40GHz)	Schwarzbeck	BBHA 9170	SEM003-15	2017/10/17	2020/10/16
Pre-amplifier(18-26GHz)	Rohde & Schwarz	CH14-H052	SEM005-17	2020/3/2	2021/3/1
Band filter	N/A	N/A	SEM023-01	N/A	N/A

RE in Chamber					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy-mm-dd)	Cal.Due date (yyyy-mm-dd)
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2020/8/5	2023/8/4
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2020/6/12	2021/6/11
MXE EMI Receiver (20Hz-8.4GHz)	Agilent Technologies	N9038A	SEM004-05	2020/7/14	2021/7/14
BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEM003-01	2020/6/27	2023/6/26
Pre-amplifier (0.1-1.3GHz)	Agilent Technologies	8447D	SEM005-01	2020/3/2	2021/3/1

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RE in Chamber					
Test Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal. Date (yyyy-mm-dd)**	**Cal. Due date (yyyy-mm-dd)**
10m Semi-Anechoic Chamber	SAEMC	FSAC1018	SEM001-03	2018/3/31	2021/3/30
EMI Test Receiver (9k-7GHz)	Rohde & Schwarz	ESR	SEM004-03	2020/3/2	2021/3/1
Trilog-Broadband Antenna(25M-2GHz)	Schwarzbeck	VULB9168	SEM003-18	2020/3/15	2022/3/14
Pre-amplifier (9k-1GHz)	Sonoma	310N	SEM005-03	2020/3/12	2021/3/11
Loop Antenna (9kHz-30MHz)	ETS-Lindgren	6502	SEM003-08	2020/8/22	2023/8/21
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM029-01	2020/6/12	2021/6/11

7 Photographs - EUT Constructional Details

Refer to Appendix A - Photographs of Set-Up for AR/2020/80005.

The End

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