FCC TEST REPORT

Application No:	ZR/2020/50007
Applicant:	Motorola Mobility LLC
Address of Applicant:	222 W Merchandise Mart Plaza, Suite 1800, Chicago IL 60654, USA
Manufacturer:	Company Name: Motorola Mobility LLC
Address of Manufacturer	222 W Merchandise Mart Plaza, Suite 1800, Chicago IL 60654, USA
EUT Description:	Mobile Cellular Phone
Model No.:	XT2081-2
Type Name:	MC367
Trade Mark:	Motorola
FCC ID:	IHDT56ZD2
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:	2020/05/09
Date of Test:	2020/05/10 to 2020/06/21
Date of Issue:	2021/4/30
Test Result:	**PASS ***

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

Authorized Signature:

Derek Yang
Wireless Laboratory Manager

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1 Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2020/8/10		Original
02		2021/4/30	Flora Wang	1.Add test site Information 2.Modify data conversion error of antenna height 3.Update equipment list

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

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2 Test Summary

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

Remark：All test were performed by Lab A and B.
Parts of test items above were subcontracted to Lab B.
Lab A SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

Lab B SGS-CSTC STANDARDS TECHNICAL SERVICES (XI 'AN) CO., LTD.

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Contents

1 VERSION 2

2 TEST SUMMARY 3

3 GENERAL INFORMATION 5

3.1 CLIENT INFORMATION 5
3.2 TEST LOCATION 5
3.3 TEST FACILITY 5
3.4 GENERAL DESCRIPTION OF EUT 6
3.5 TEST ENVIRONMENT AND MODE 7
3.6 DESCRIPTION OF SUPPORT UNITS 7

4 TEST RESULTS AND MEASUREMENT DATA 8

4.1 ANTENNA REQUIREMENT 8
4.2 AC POWER LINE CONDUCTED EMISSIONS 9
4.3 DUTY CYCLE 13
4.3.1 Test Results 13
4.3.1 Test Plots 13
4.4 CONDUCTED OUTPUT POWER 16
4.4.1 Test Results 17
4.5 DTS (6 DB) BANDWIDTH & 99% OCCUPIED BANDWIDTH 18
4.5.1 Test Results 18
4.5.2 Test plots 19
4.6 POWER SPECTRAL DENSITY 29
4.6.1 Test Results 29
4.6.2 Test plots 30
4.7 BAND-EDGE FOR RF CONDUCTED EMISSIONS 35
4.7.1 Test plots 36
4.8 RF CONDUCTED SPURIOUS EMISSIONS 40
4.8.1 Test plots 41
4.9 RADIATED SPURIOUS EMISSIONS 47
4.9.1 Radiated emission below 1GHz 50
4.9.2 Transmitter emission above 1GHz 52
4.10 RESTRICTED BANDS AROUND FUNDAMENTAL FREQUENCY 70
4.10.1 ANT1 72

5 MEASUREMENT UNCERTAINTY (95% CONFIDENCE LEVELS, K=2) 84

6 EQUIPMENT LIST 85

7 PHOTOGRAPHS - EUT CONSTRUCTIONAL DETAILS 86

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3 General Information

3.1 Client Information

Applicant:	Motorola Mobility LLC
Address of Applicant:	222 W Merchandise Mart Plaza, Suite 1800, Chicago IL 60654, USA
Manufacturer:	Company Name: Motorola Mobility LLC
Address of Manufacturer:	222 W Merchandise Mart Plaza, Suite 1800, Chicago IL 60654, USA

3.2 Test Location

Lab A:

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

Lab B:

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

3.3 Test Facility

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

Lab A:

• A2LA (Certificate No. 3816.01)

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

• VCCI

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

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• FCC –Designation Number: CN1178

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

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

• Innovation, Science and Economic Development Canada

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

CAB identifier: CN0006.

IC#: 4620C.

Lab B:

A2LA (Certificate No. 4854.01)

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FCC-Designation Number: CN1271.

3.4 General Description of EUT

EUT Description::	Mobile Cellular Phone
Model No.:	XT2081-2
Type Name:	MC367
Trade Mark:	Motorola
Hardware Version:	DVT2-2
Software Version:	QPZ30.30-Q3
IEEE 802.11 WLAN Mode Supported	☒ 802.11B (20 MHz channel bandwidth), ☒ 802.11G (20 MHz channel bandwidth) ☒ 802.11N (20 MHz channel bandwidth), ☐ 802.11N (40 MHz channel bandwidth)
Operation Frequency:	2400 MHz -2483.5MHz fc = 2407 MHz + N * 5 MHz, where: -fc = “Operating Frequency” in MHz, -N = “Channel Number” with the range from 1 to 11 for the 20 MHz channel bandwidth, or 3 to 9 for the 40 MHz channel bandwidth.
Type of Modulation:	IEEE for 802.11B: DSSS IEEE for 802.11G : OFDM IEEE for 802.11N(HT20) : OFDM
Sample Type:	☒ Portable Device, ☐Module
Antenna Type:	☐ External, ☒ Integrated
Antenna Ports	☒ Ant 1, ☐ Ant 2, ☐ Ant 3
Smart System	☒ SISO (for 802.11B/G/N),

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	☐ MIMO (for 802.11N): 2 Tx & 2 Rx, ☐ Diversity (for 802.11B/G) : Tx & Rx
Antenna Gain:	-0.5dBi
Power Supply	☒ AC/DC Adapter; ☐ Battery ☐ PoE:; ☐ Other:
Accsessories	AC Aadpte:Model No.: SC-41;SC-42;SC-43;SC-46;SC-47;MC-101;MC-102;MC-103;MC-106;MC-107 I/P:100-240 300mA O/P:5V,2000mA; Battery: Model No.:JK50,3.8V

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		

Remark:

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

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

3.5 Test Environment and Mode

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

3.6 Description of Support Units

The EUT has been tested independent unit.

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4 Test results and Measurement Data

4.1 Antenna Requirement

Standard requirement:	47 CFR Part 15C Section 15.203 /247(c)
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	
The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is -0.5dBi.	

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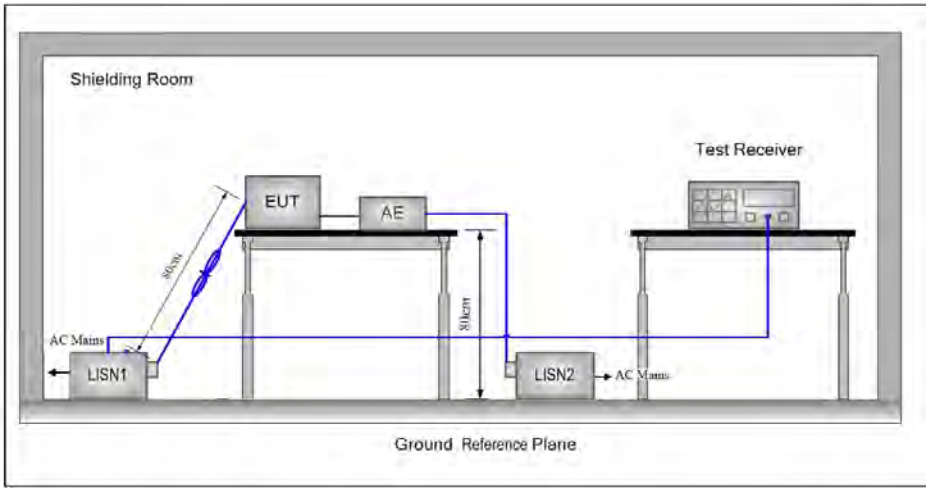
Test Setup:	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates at lowest, middle and highest channel. Charge + Transmitting mode.
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate of 802.11B at lowest channel is the worst case. Charge + Transmitting mode. Only the worst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

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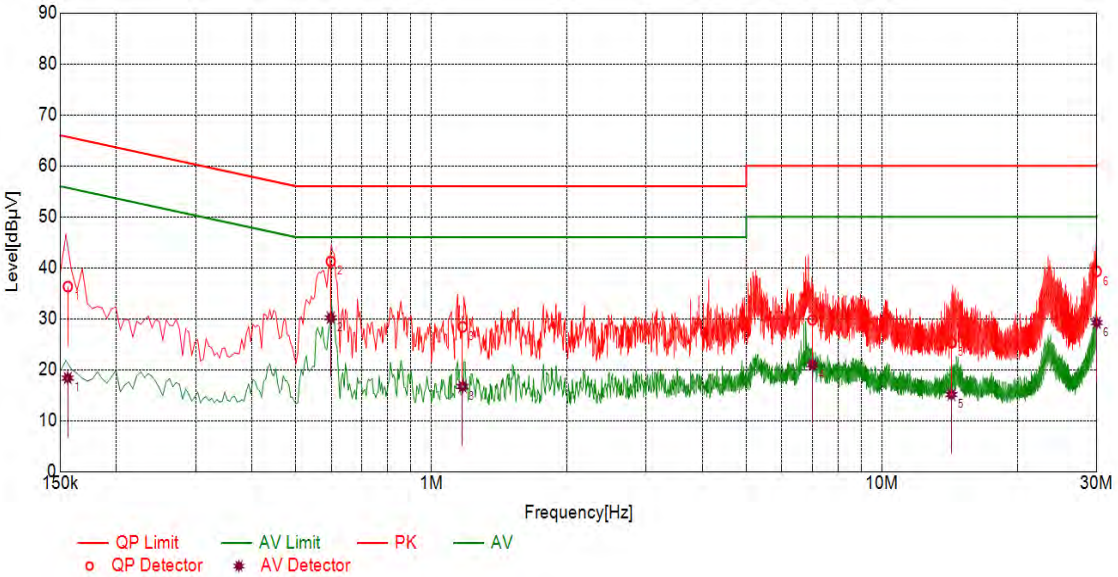
Measurement Data

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 [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Type
1	0.1560	10.10	36.31	65.68	29.37	18.35	55.68	37.33	L
2	0.5980	10.10	41.25	56.00	14.75	30.19	46.00	15.81	L
3	1.1731	10.10	28.40	56.00	27.60	16.70	46.00	29.30	L
4	7.0120	10.10	29.78	60.00	30.22	20.98	50.00	29.02	L
5	14.2720	10.11	25.29	60.00	34.71	15.12	50.00	34.88	L
6	29.9989	10.11	39.29	60.00	20.71	29.23	50.00	20.77	L

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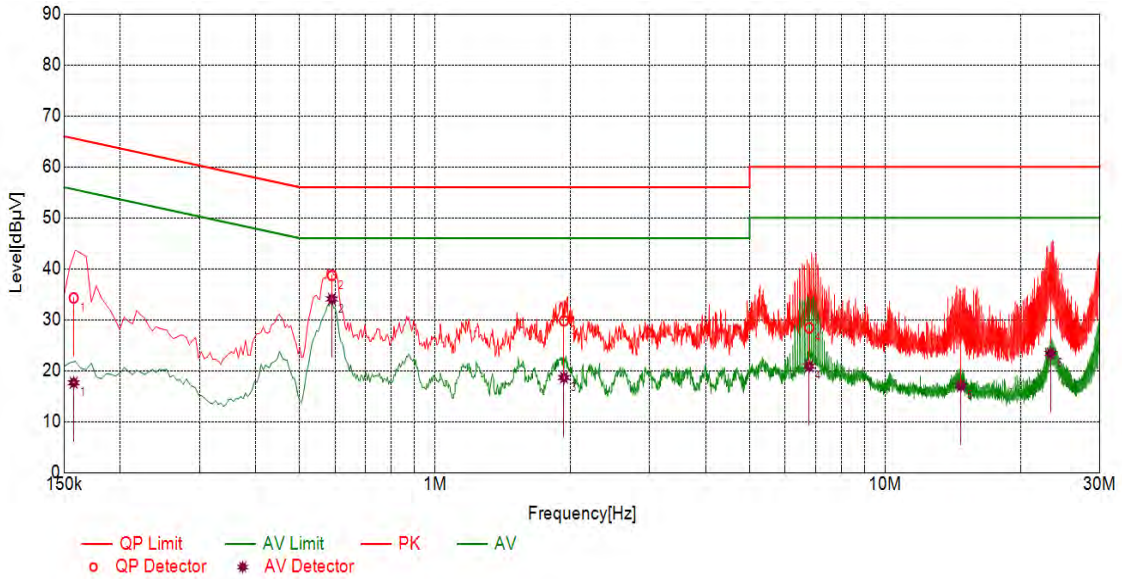
Neutral Line:



Test Graph

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	0.1576	10.10	34.28	65.59	31.31	17.62	55.59	37.97	N
2	0.5904	10.10	38.70	56.00	17.30	34.08	46.00	11.92	N
3	1.9352	10.10	29.79	56.00	26.21	18.65	46.00	27.35	N
4	6.7810	10.10	28.44	60.00	31.56	20.87	50.00	29.13	N
5	14.7389	10.11	28.08	60.00	31.92	17.04	50.00	32.96	N
6	23.3064	10.11	36.79	60.00	23.21	23.40	50.00	26.60	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

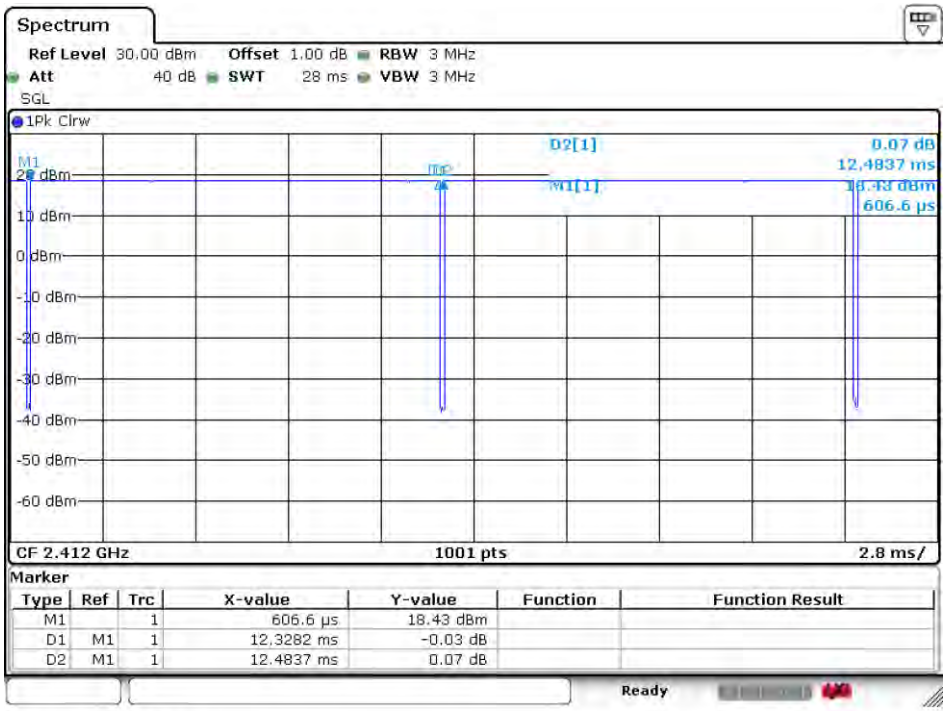
4.3.1 Test Results

Test Mode	TX Freq. [MHz]	Duty cycle [%]
11B	Ant 1: CH1,CH6,CH11	98.75
11G	Ant 1: CH1,CH6,CH11	97.93
11N20	Ant 1: CH1,CH6,CH11	97.78

4.3.1 Test Plots

4.3.1.1 ANT1

4.3.1.1.1 11B



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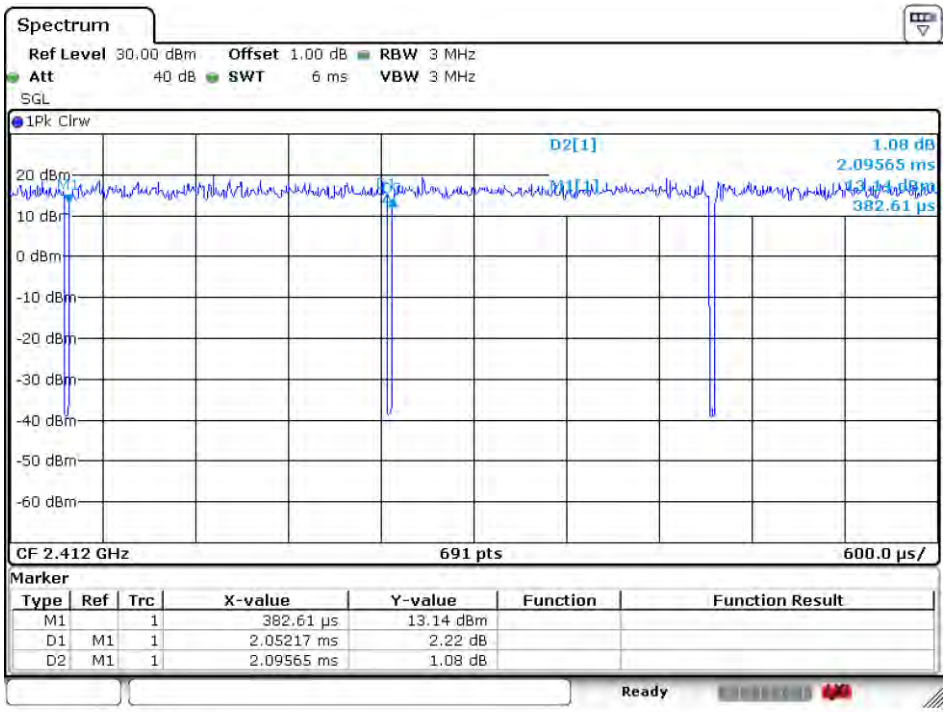
4.3.1.1.2 11G



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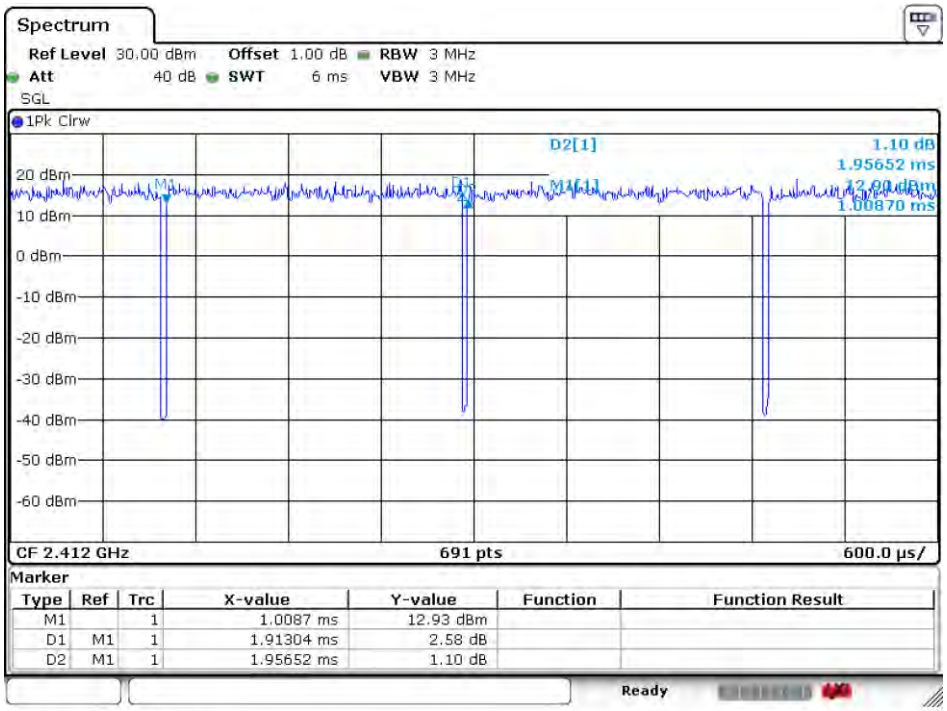
4.3.1.1.3 11N20



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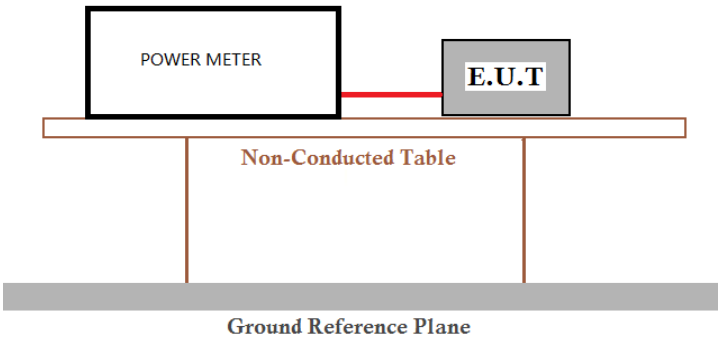
4.4 Conducted Output Power

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); 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

Measurement Data of Average Power:

Mode	Test Channel	Average Output Power (dBm) [Duty Cycle Considered]	Result
802.11B	Lowest	17.74	Report purpose only
	Middle	17.78	Report purpose only
	Highest	18.05	Report purpose only
802.11G	Lowest	15.92	Report purpose only
	Middle	15.94	Report purpose only
	Highest	16.29	Report purpose only
802.11N20	Lowest	14.83	Report purpose only
	Middle	14.78	Report purpose only
	Highest	15.11	Report purpose only

Measurement Data of Peak Power:

Mode	Test Channel	Peak Output Power (dBm)	Limit (dBm)	Result
802.11B	Lowest	18.06	30.00	Pass
	Middle	18.22	30.00	Pass
	Highest	18.22	30.00	Pass
802.11G	Lowest	17.35	30.00	Pass
	Middle	17.24	30.00	Pass
	Highest	17.44	30.00	Pass
802.11N20	Lowest	17.03	30.00	Pass
	Middle	17.07	30.00	Pass
	Highest	17.18	30.00	Pass

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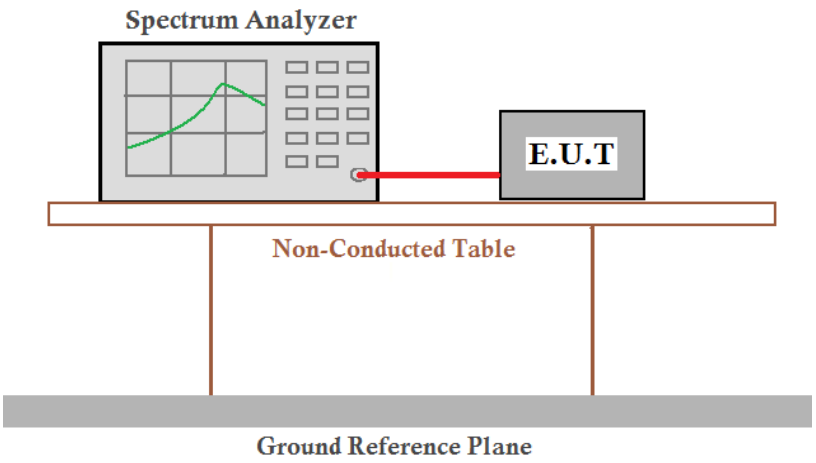
4.5 DTS (6 dB) Bandwidth & 99% Occupied Bandwidth

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	14.02	9.07	≥500	Pass
	Middle	13.89	9.03	≥500	Pass
	Highest	13.85	9.07	≥500	Pass
802.11G	Lowest	17.06	16.32	≥500	Pass
	Middle	16.93	15.98	≥500	Pass
	Highest	16.85	15.72	≥500	Pass
802.11N20	Lowest	18.10	17.33	≥500	Pass
	Middle	18.10	17.11	≥500	Pass
	Highest	17.97	16.59	≥500	Pass

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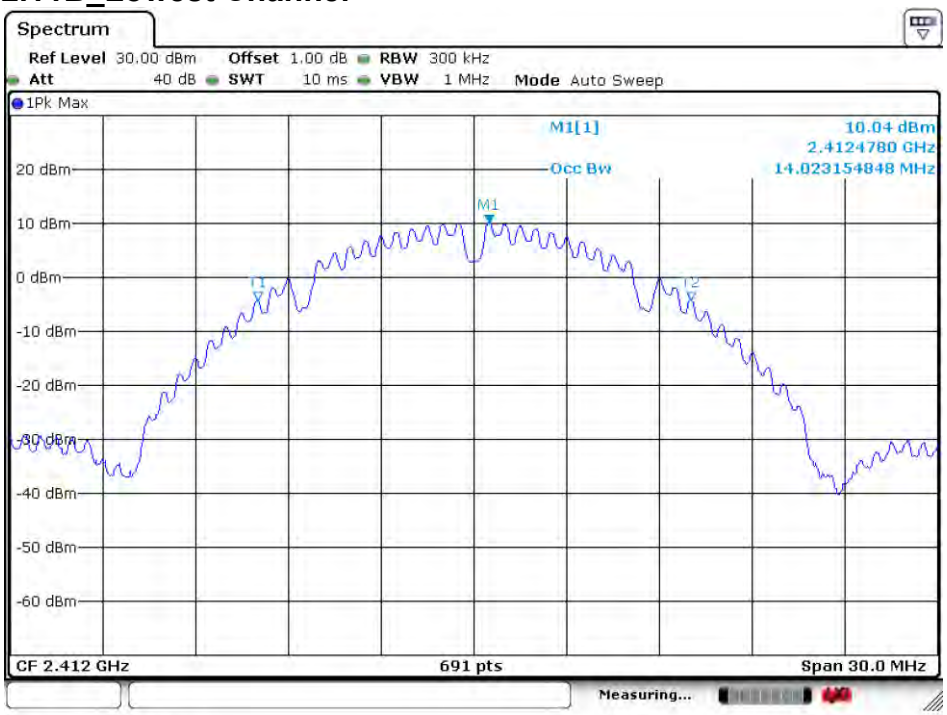
4.5.2 Test plots

4.5.2.1 ANT1

4.5.2.1.1 802.11B_Lowest Channel



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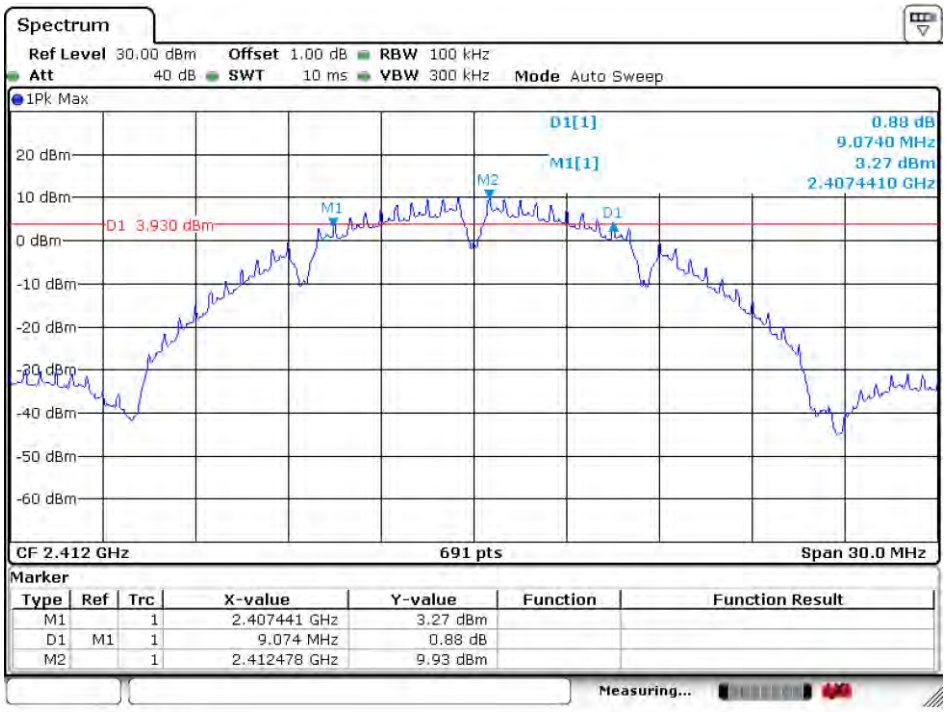

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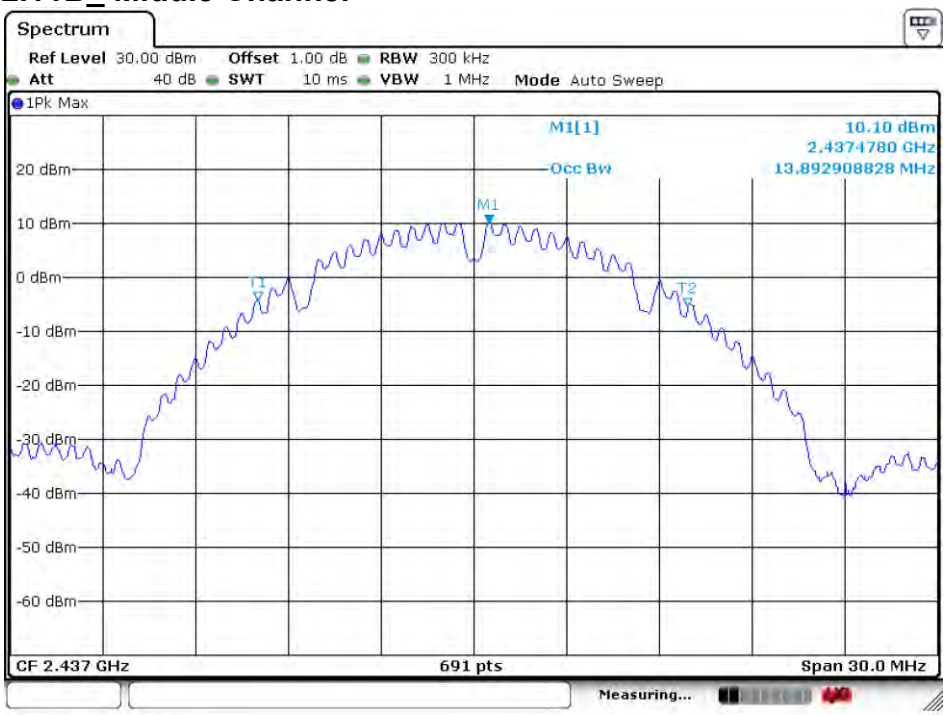
4.5.2.1.2 802.11B_ Middle Channel



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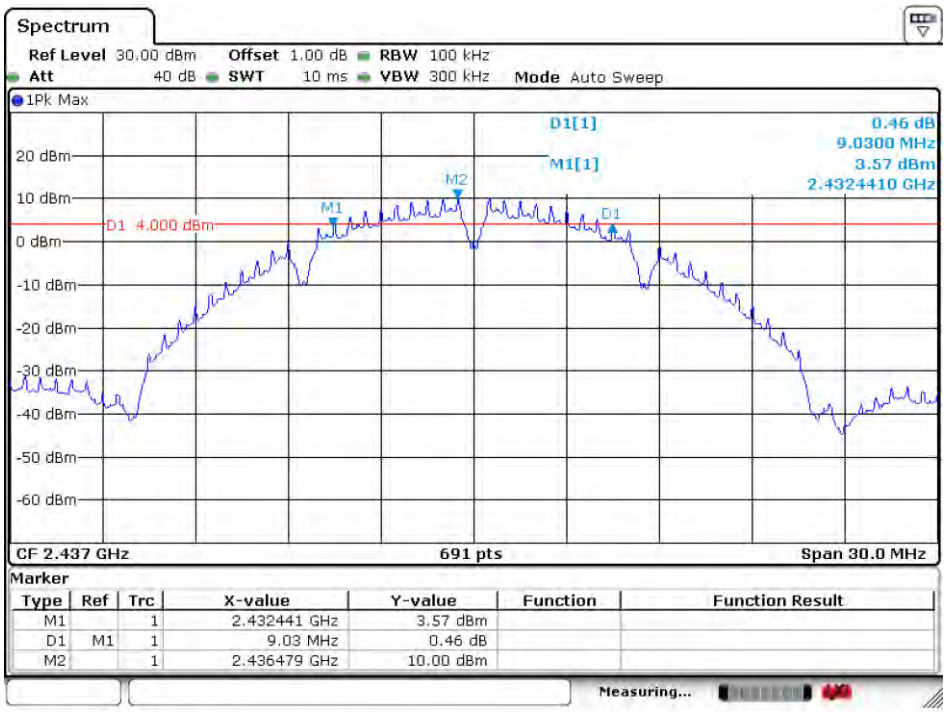

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.432441 GHz	3.57 dBm		
D1	M1	1	9.03 MHz	0.46 dB		
M2		1	2.436479 GHz	10.00 dBm		

Date: 22.MAY.2020 02:59:16

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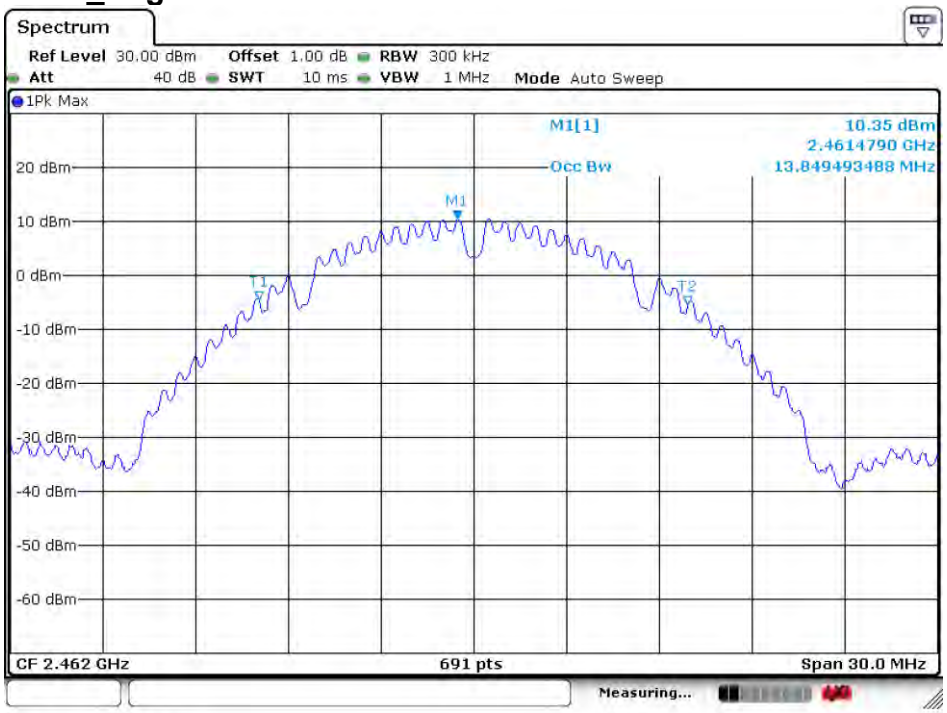
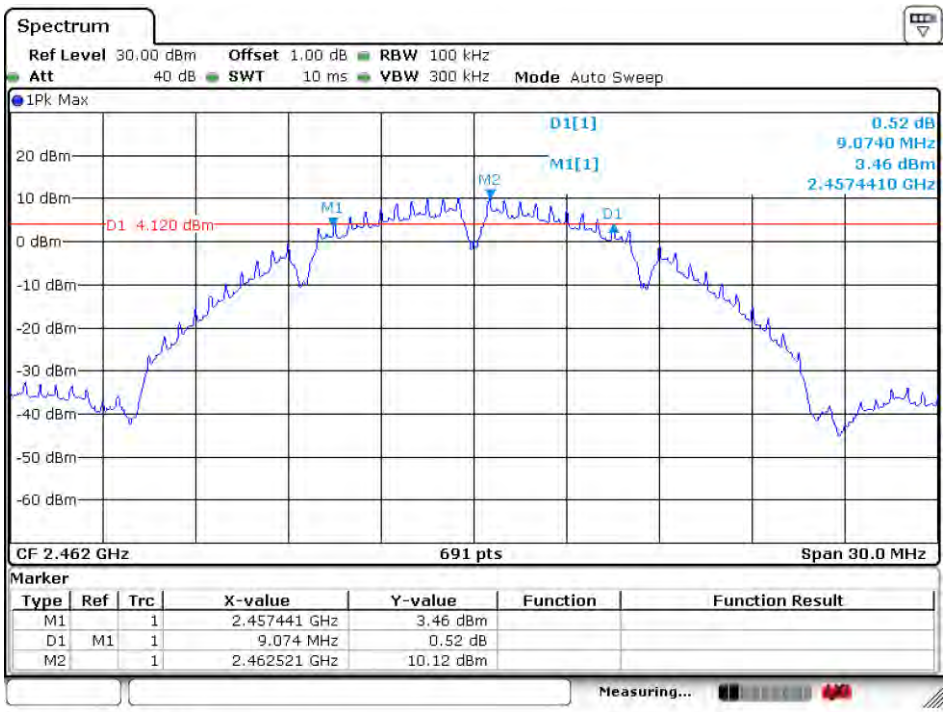
4.5.2.1.3 802.11B_ Highest Channel



Date: 22.MAY.2020 03:02:34



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.457441 GHz	3.46 dBm		
D1	M1	1	9.074 MHz	0.52 dB		
M2		1	2.462521 GHz	10.12 dBm		

Date: 22.MAY.2020 03:00:33

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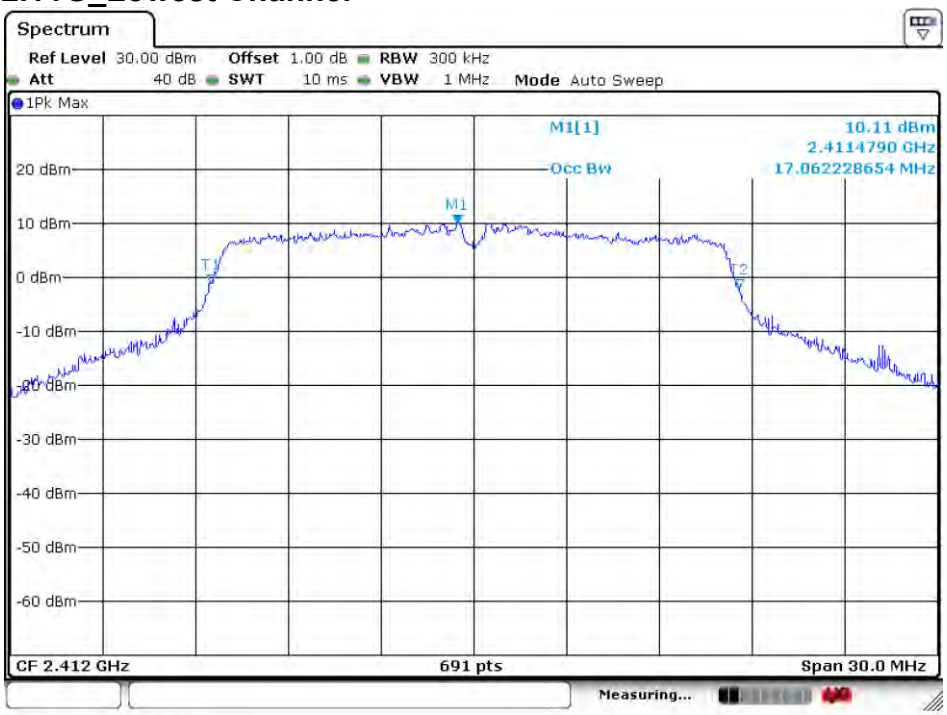
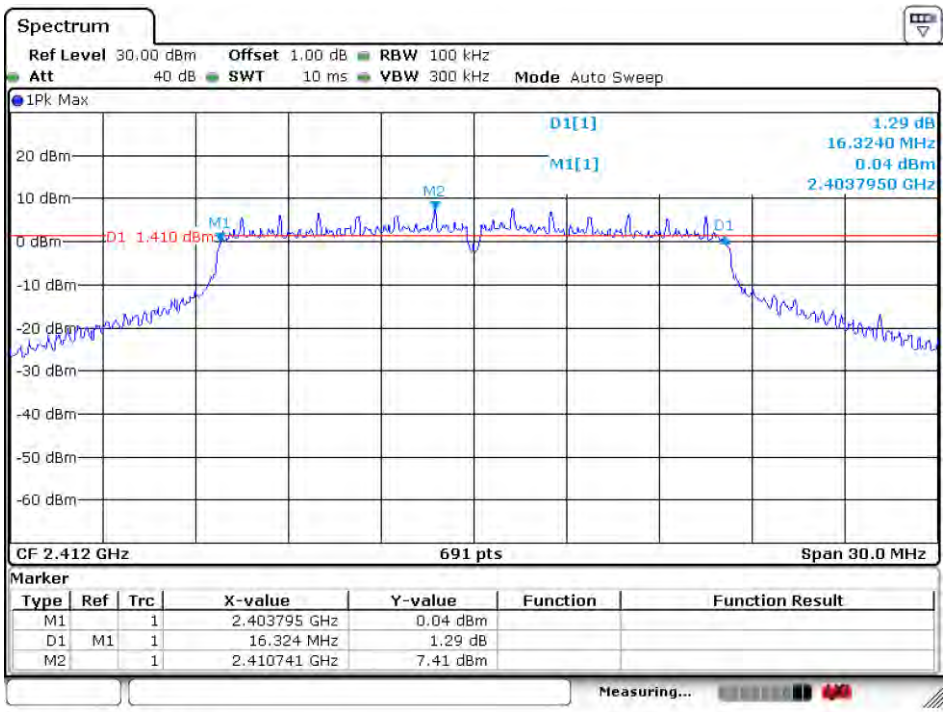
4.5.2.1.4 802.11G_Lowest Channel



Date: 22.MAY.2020 03:03:38



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.403795 GHz	0.04 dBm		
D1	M1	1	16.324 MHz	1.29 dB		
M2		1	2.410741 GHz	7.41 dBm		

Date: 22.MAY.2020 02:50:18

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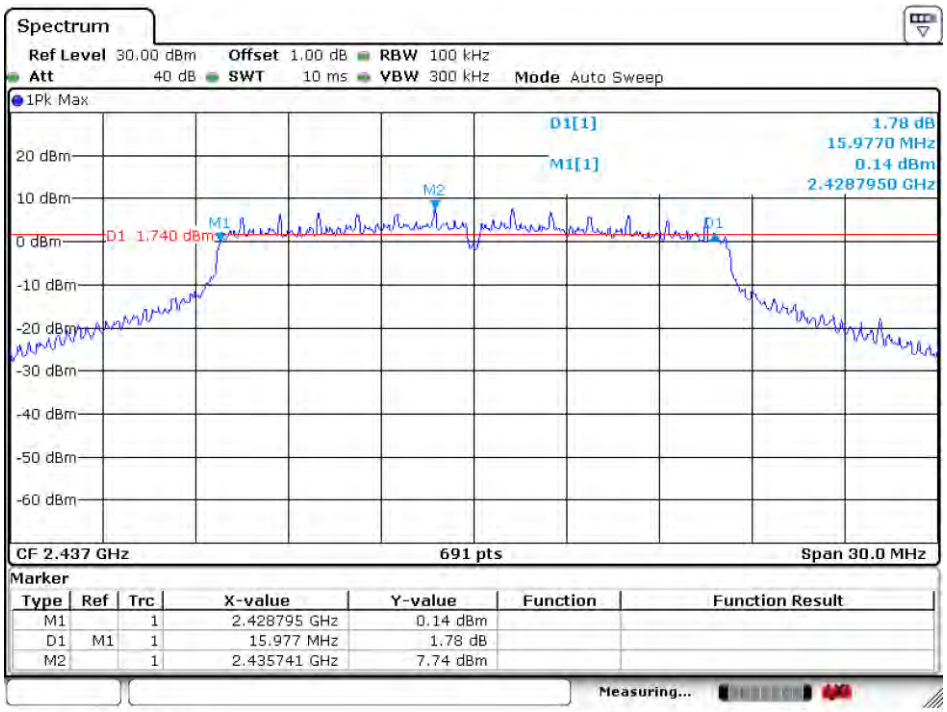
4.5.2.1.5 802.11G_ Middle Channel

Date: 22.MAY.2020 03:03:56



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.428795 GHz	0.14 dBm		
D1	M1	1	15.977 MHz	1.78 dB		
M2		1	2.435741 GHz	7.74 dBm		

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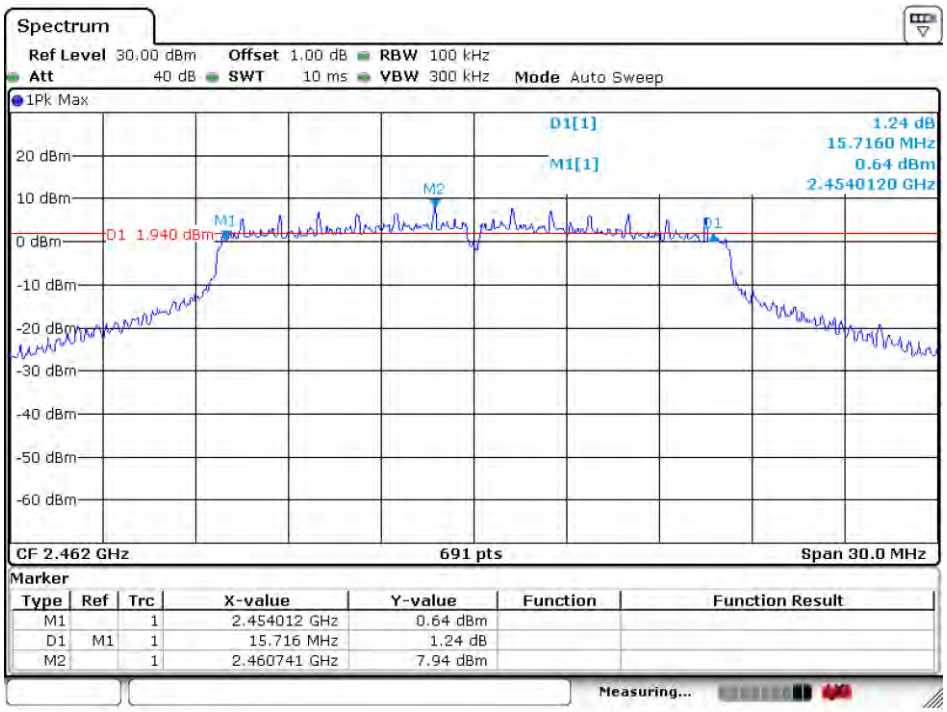
4.5.2.1.6 802.11G_ Highest Channel

Date: 22.MAY.2020 03:04:11



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.454012 GHz	0.64 dBm		
D1	M1	1	15.716 MHz	1.24 dB		
M2		1	2.460741 GHz	7.94 dBm		

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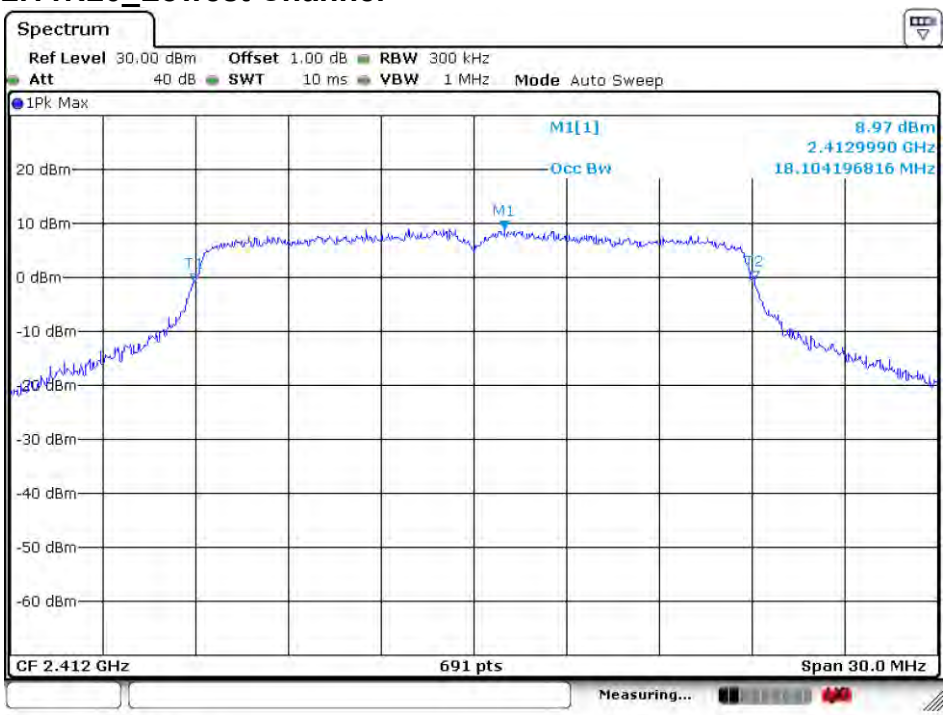
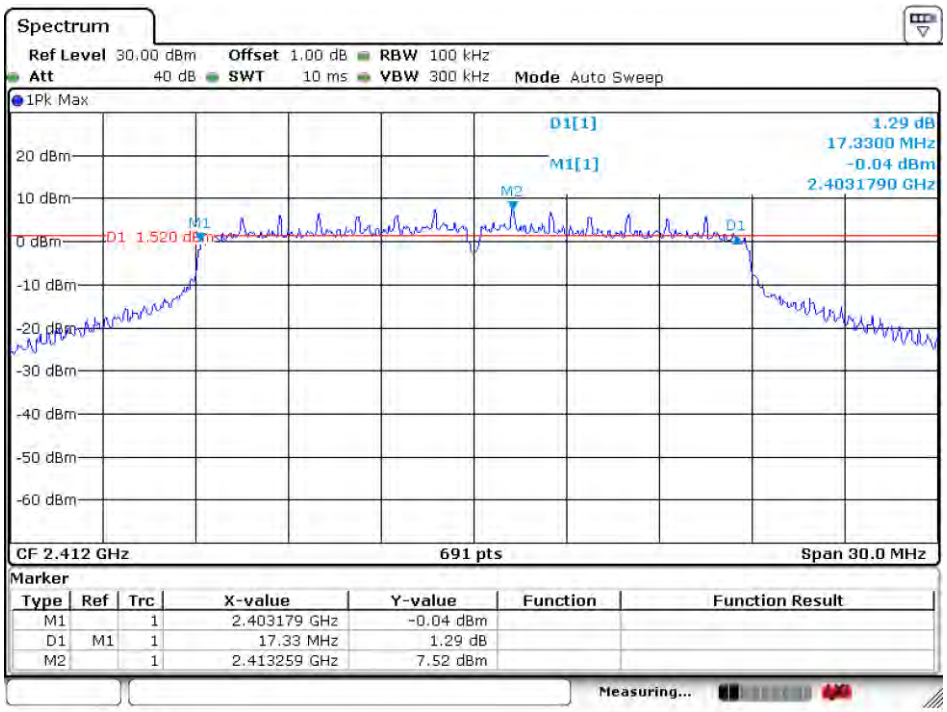
4.5.2.1.7 802.11N20_Lowest Channel



Date: 22.MAY.2020 03:05:51



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.403179 GHz	-0.04 dBm		
D1	M1	1	17.33 MHz	1.29 dB		
M2		1	2.413259 GHz	7.52 dBm		

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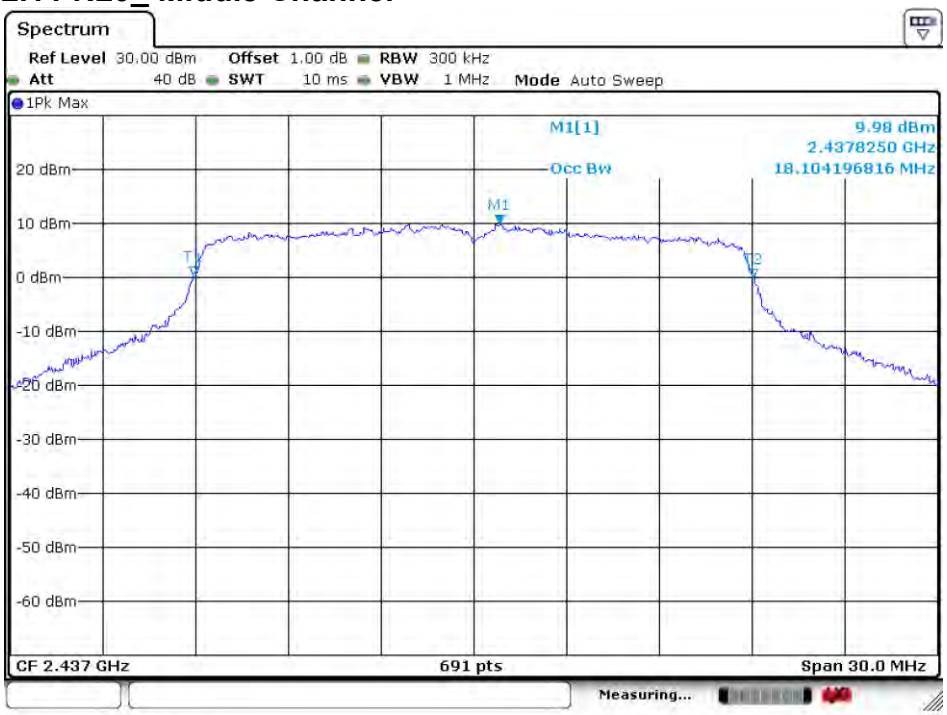
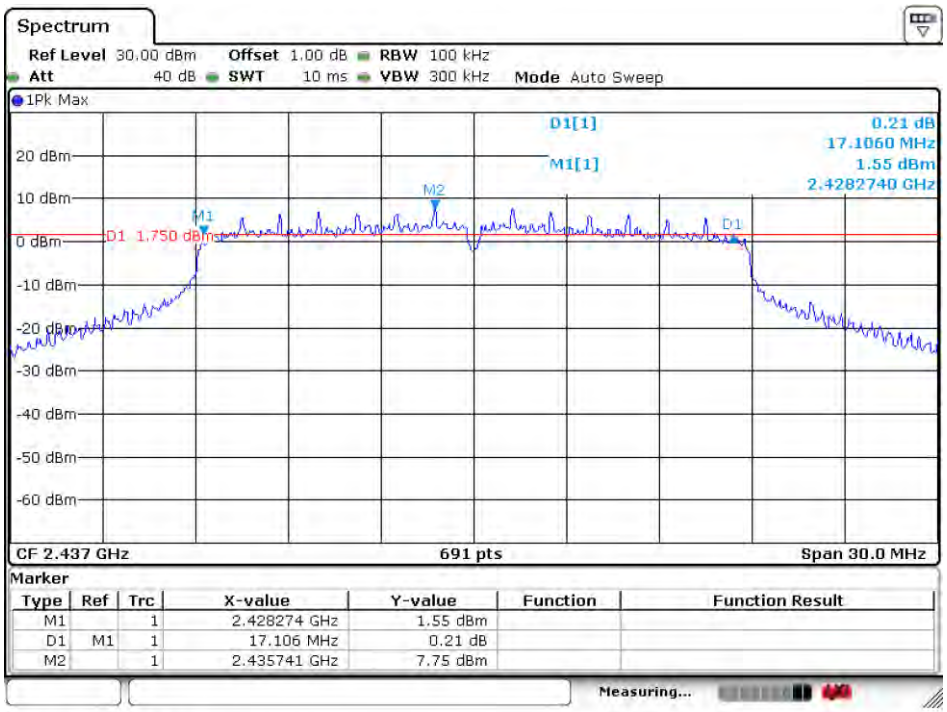
4.5.2.1.8 802.11 N20_ Middle Channel



Date: 22.MAY.2020 03:05:31



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.428274 GHz	1.55 dBm		
D1	M1	1	17.106 MHz	0.21 dB		
M2		1	2.435741 GHz	7.75 dBm		

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4.5.2.1.9 802.11 N20_ Highest Channel

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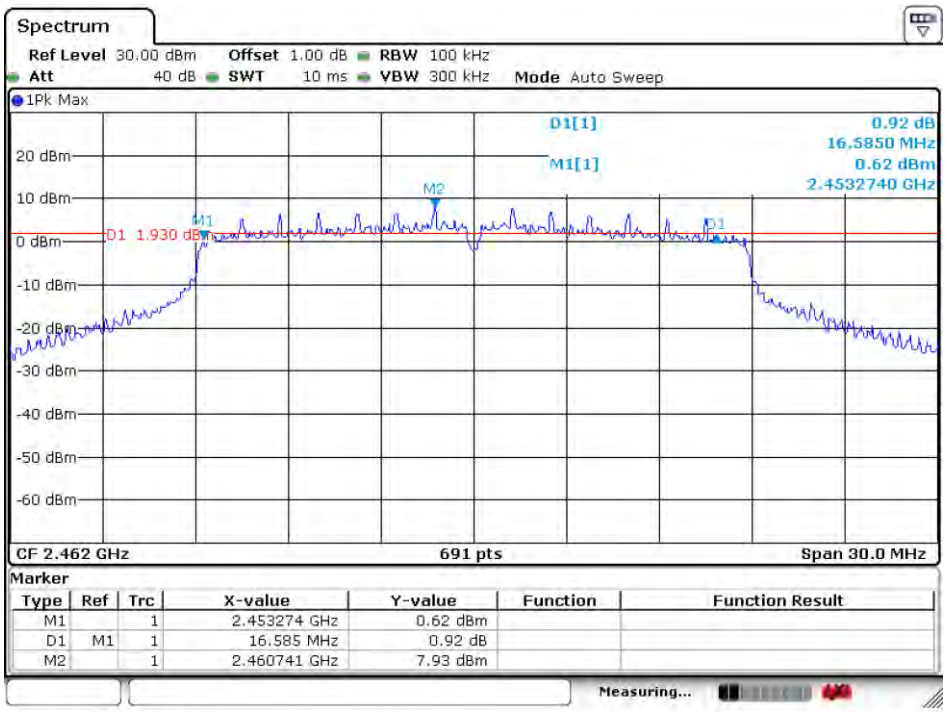

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.453274 GHz	0.62 dBm		
D1	M1	1	16.585 MHz	0.92 dB		
M2		1	2.460741 GHz	7.93 dBm		

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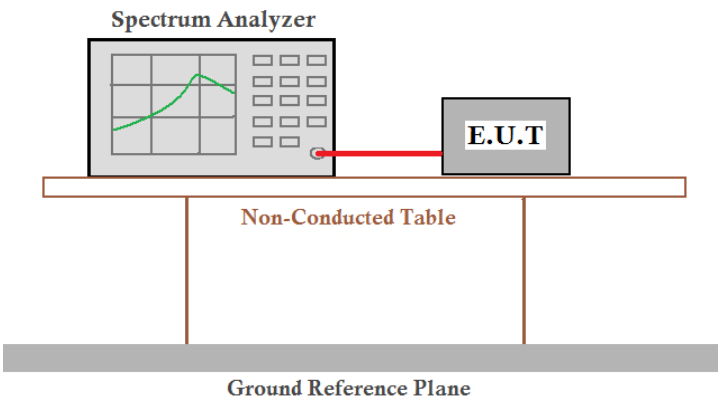
4.6 Power Spectral Density

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

4.6.1 Test Results

Mode	Test Channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
802.11B	Lowest	-3.06	≤8.00	Pass
	Middle	-3.72	≤8.00	Pass
	Highest	-2.83	≤8.00	Pass
802.11G	Lowest	-7.78	≤8.00	Pass
	Middle	-7.74	≤8.00	Pass
	Highest	-7.37	≤8.00	Pass
802.11N20	Lowest	-7.53	≤8.00	Pass
	Middle	-7.70	≤8.00	Pass
	Highest	-8.01	≤8.00	Pass

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4.6.2 Test plots

4.6.2.1 ANT1

4.6.2.1.1 802.11B_Lowest Channel

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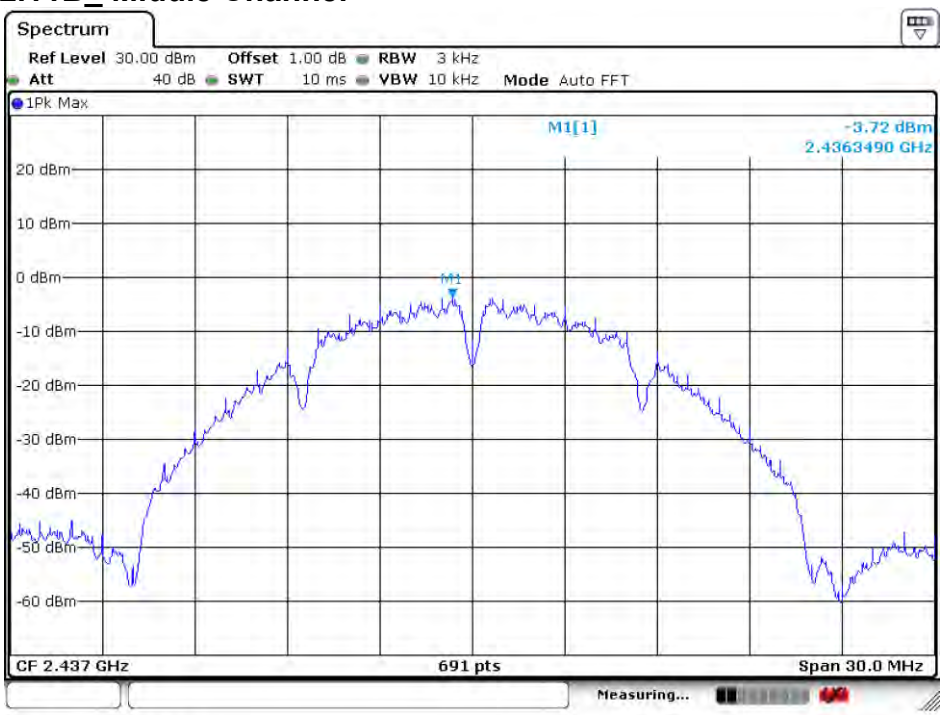
4.6.2.1.2 802.11B_ Middle Channel



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4.6.2.1.3 802.11B_ Highest Channel

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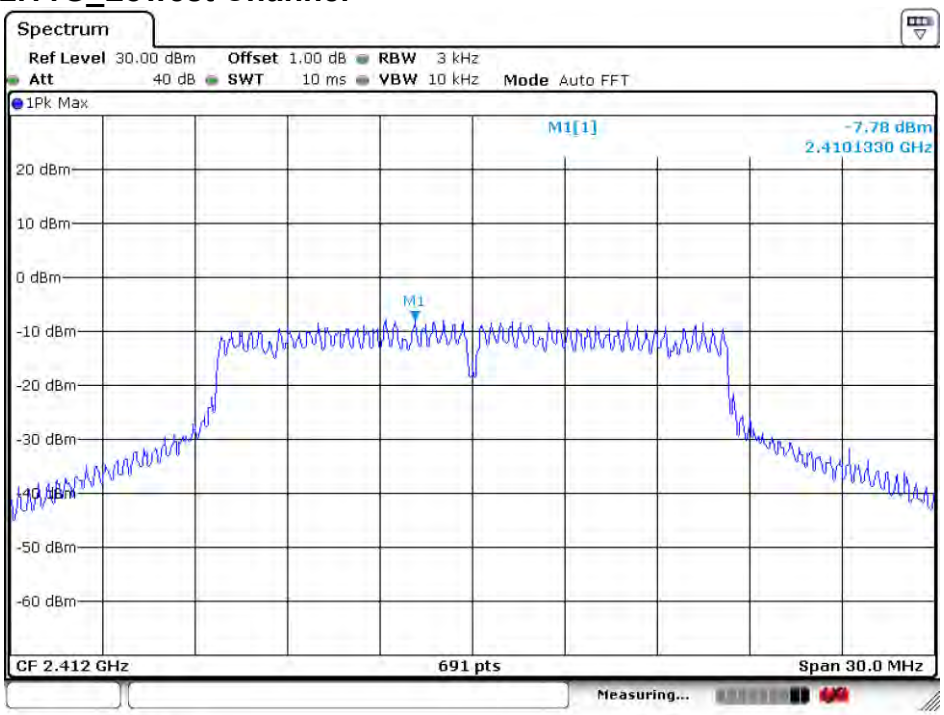
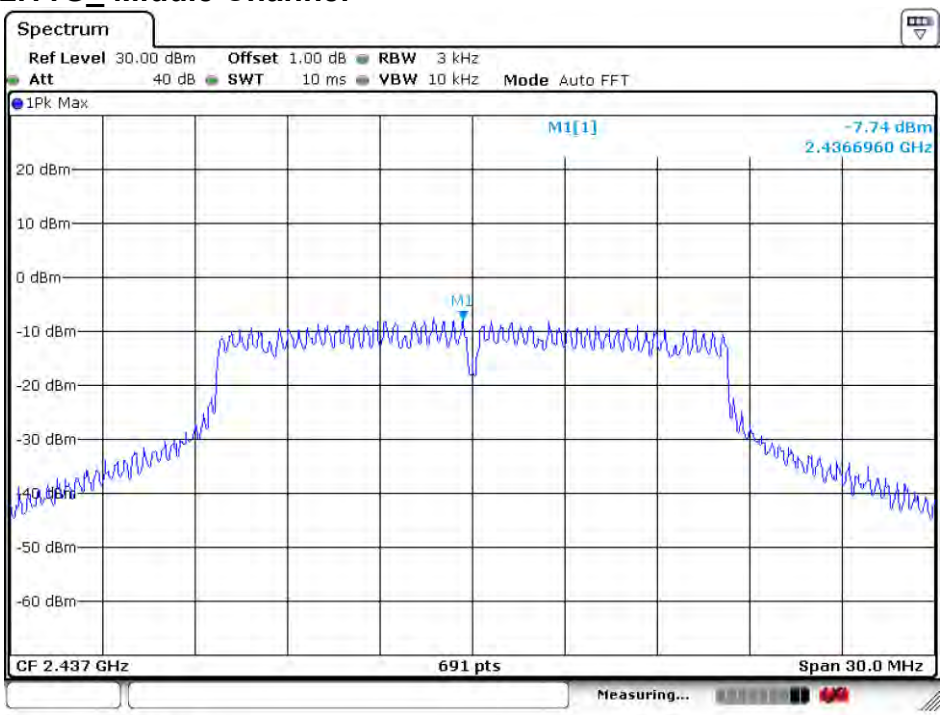
4.6.2.1.4 802.11G_Lowest Channel



Date: 22.MAY.2020 03:11:32

4.6.2.1.5 802.11G_ Middle Channel



Date: 22.MAY.2020 03:11:15

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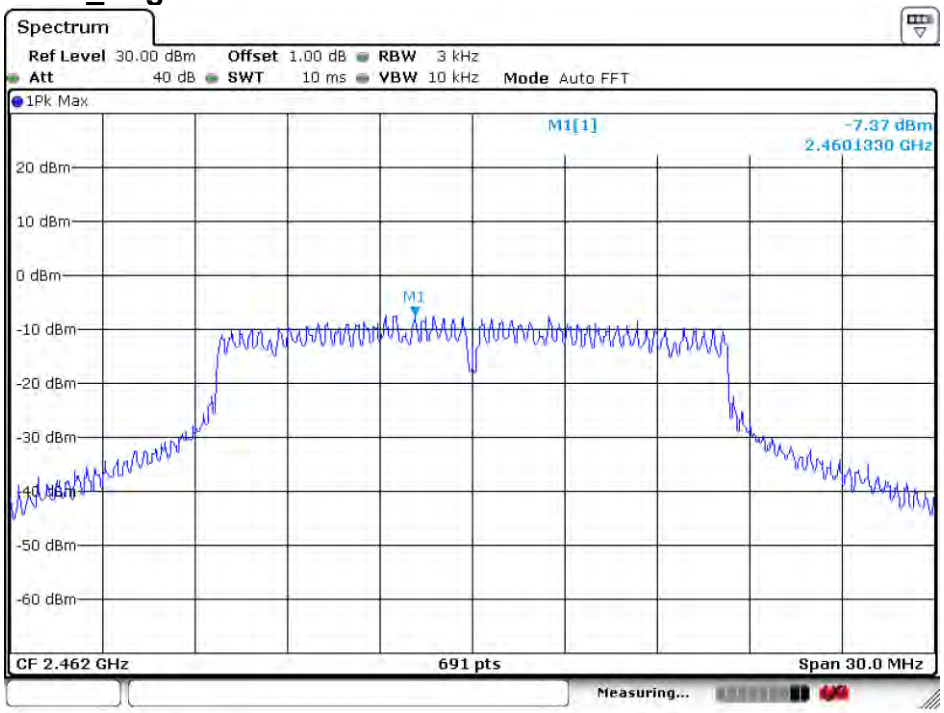
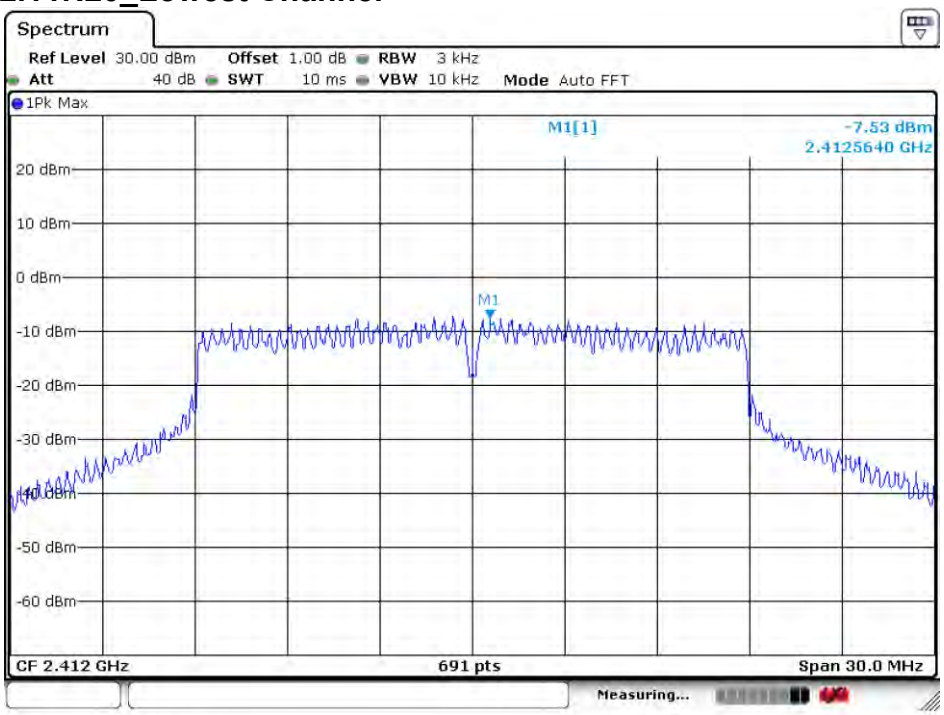
4.6.2.1.6 802.11G_ Highest Channel



Date: 22.MAY.2020 03:10:54

4.6.2.1.7 802.11N20_Lowest Channel



Date: 22.MAY.2020 03:09:20

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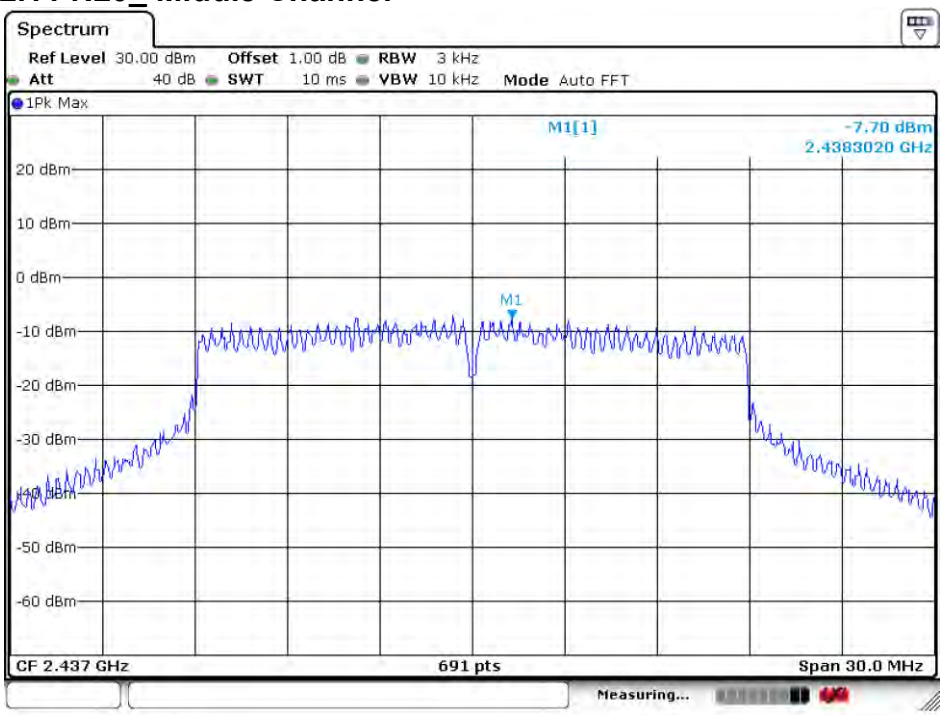
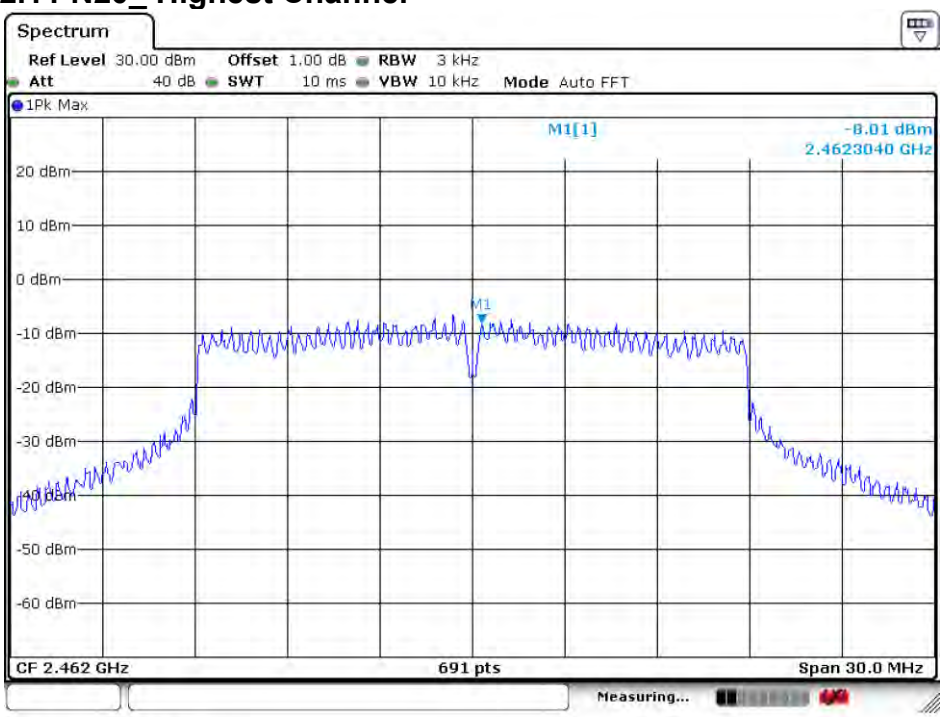
4.6.2.1.8 802.11 N20_ Middle Channel



Date: 22.MAY.2020 03:09:44

4.6.2.1.9 802.11 N20_ Highest Channel



Date: 22.MAY.2020 03:10:26

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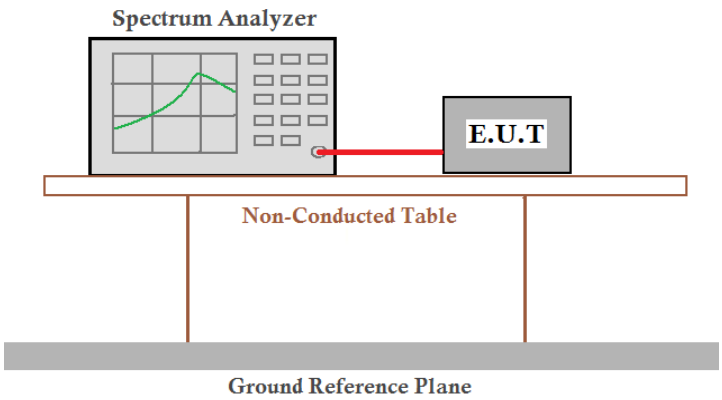
4.7 Band-edge for RF Conducted Emissions

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).
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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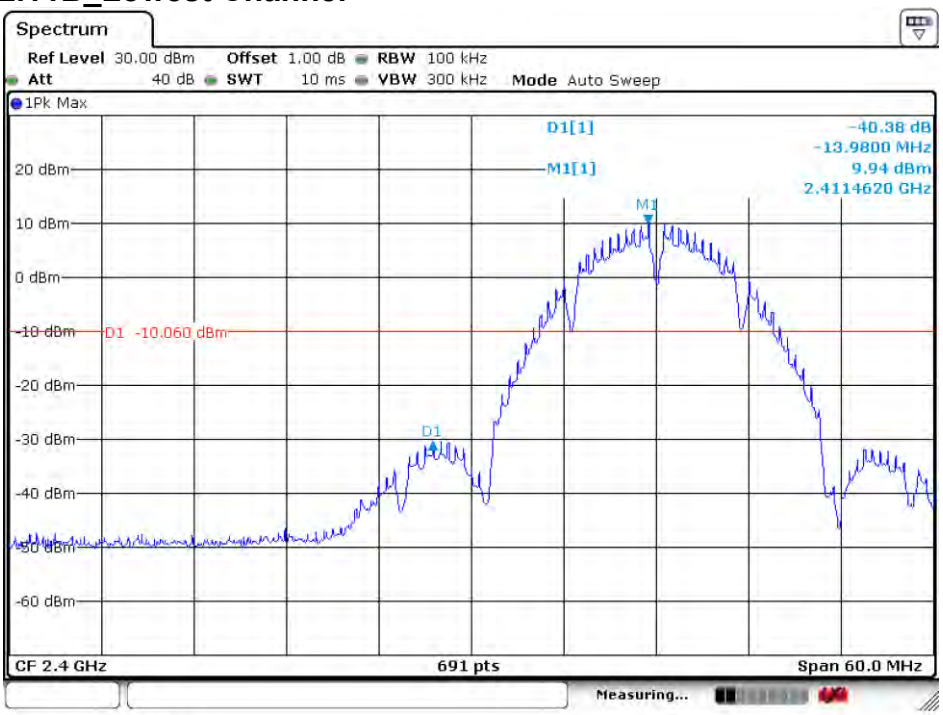
4.7.1 Test plots

4.7.1.1 ANT1

4.7.1.1.1 802.11B_Lowest Channel



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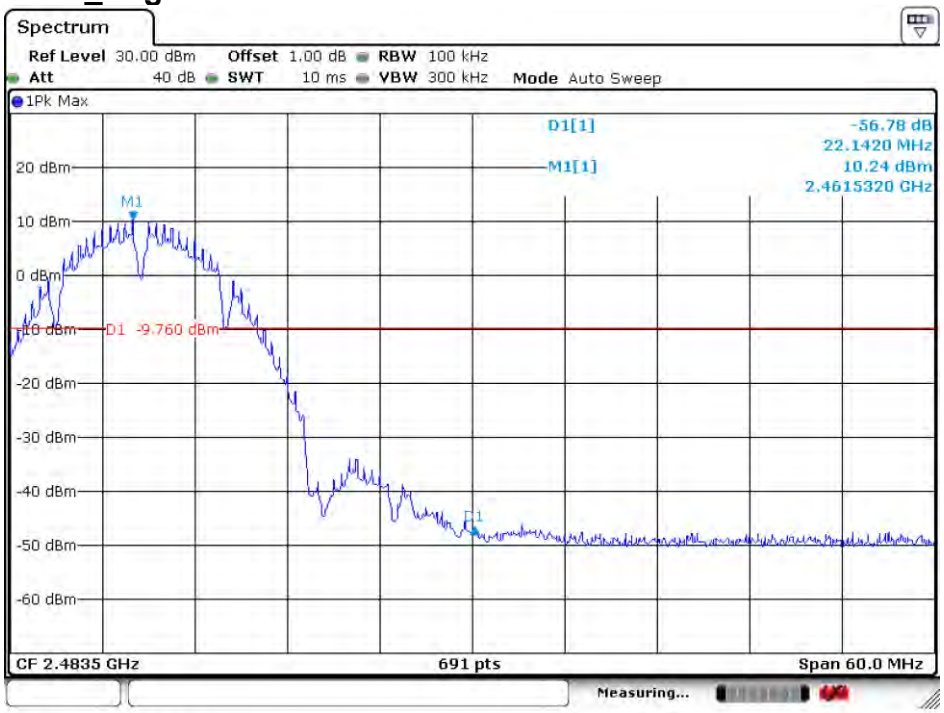
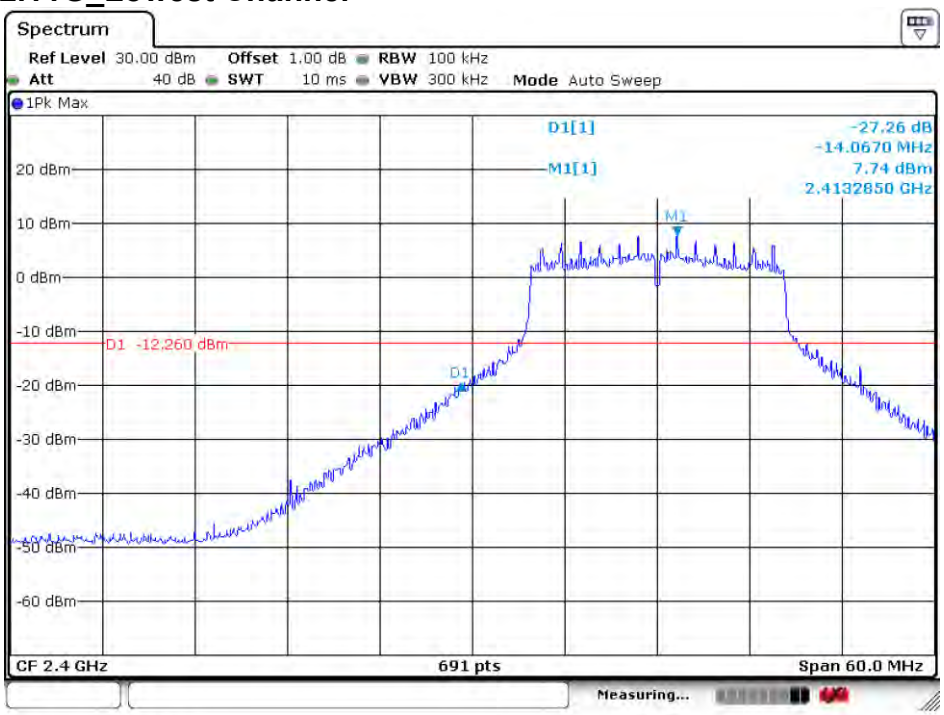
4.7.1.1.2 802.11B_ Highest Channel



Date: 22.MAY.2020 03:13:10

4.7.1.1.3 802.11G_Lowest Channel



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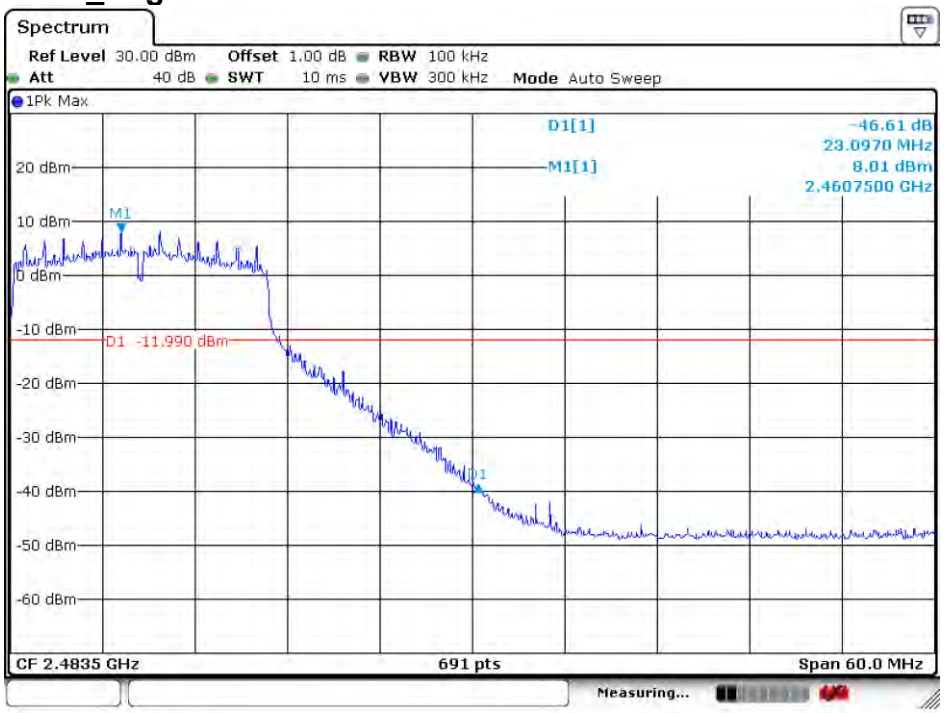
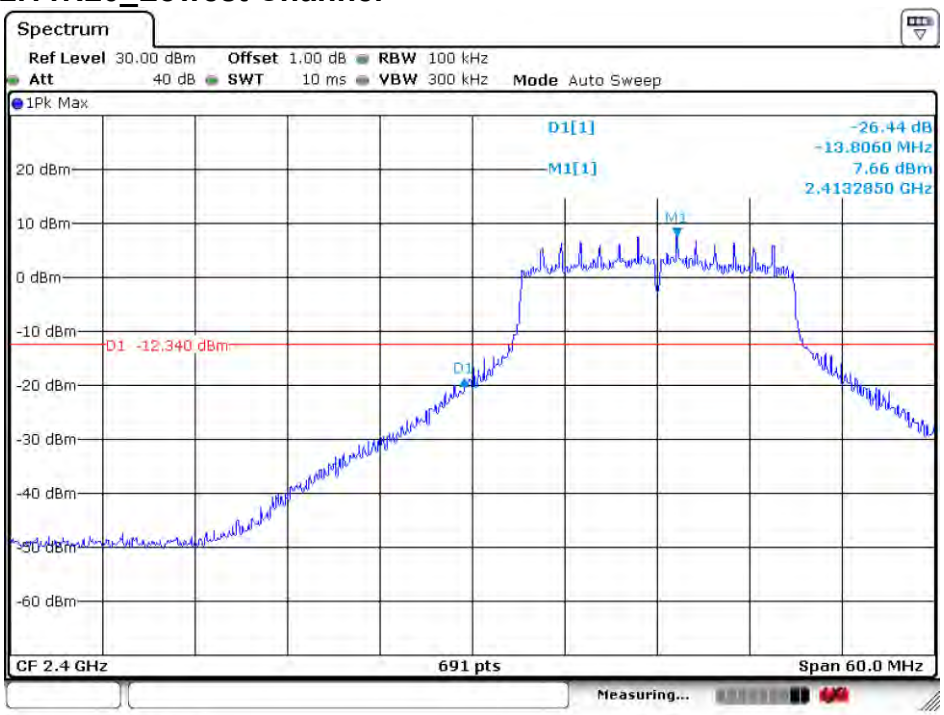
4.7.1.1.4 802.11G_ Highest Channel



Date: 22.MAY.2020 03:19:54

4.7.1.1.5 802.11N20_Lowest Channel



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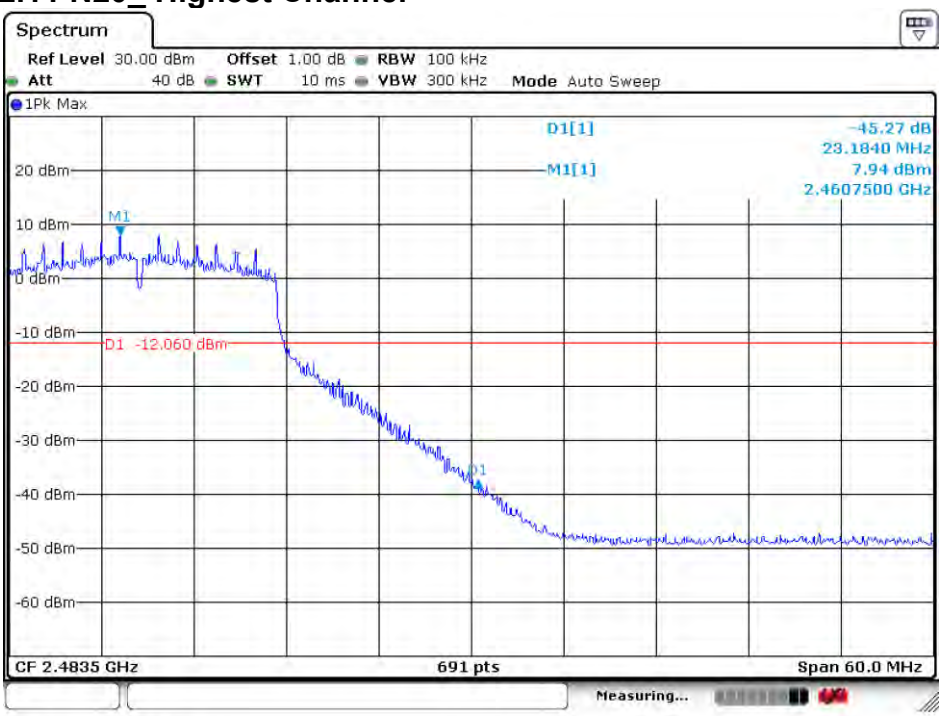
4.7.1.1.6 802.11 N20_ Highest Channel



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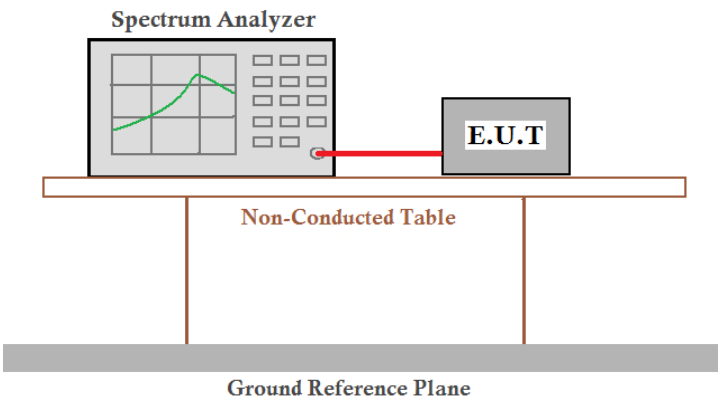
4.8 RF Conducted Spurious Emissions

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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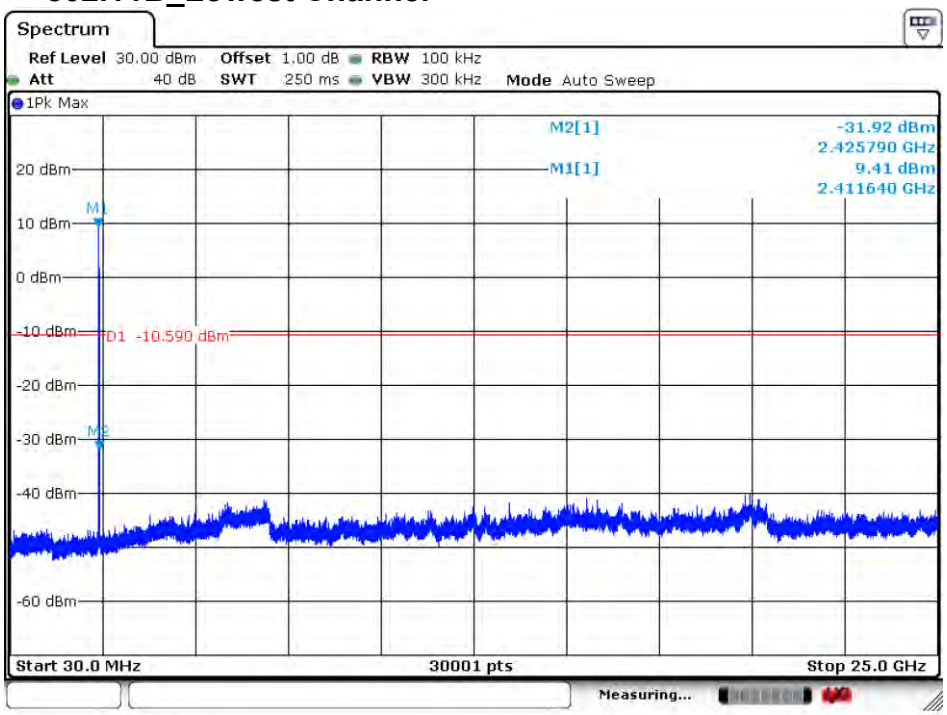
4.8.1 Test plots

4.8.1.1 ANT1

4.8.1.1.1 802.11B_Lowest Channel



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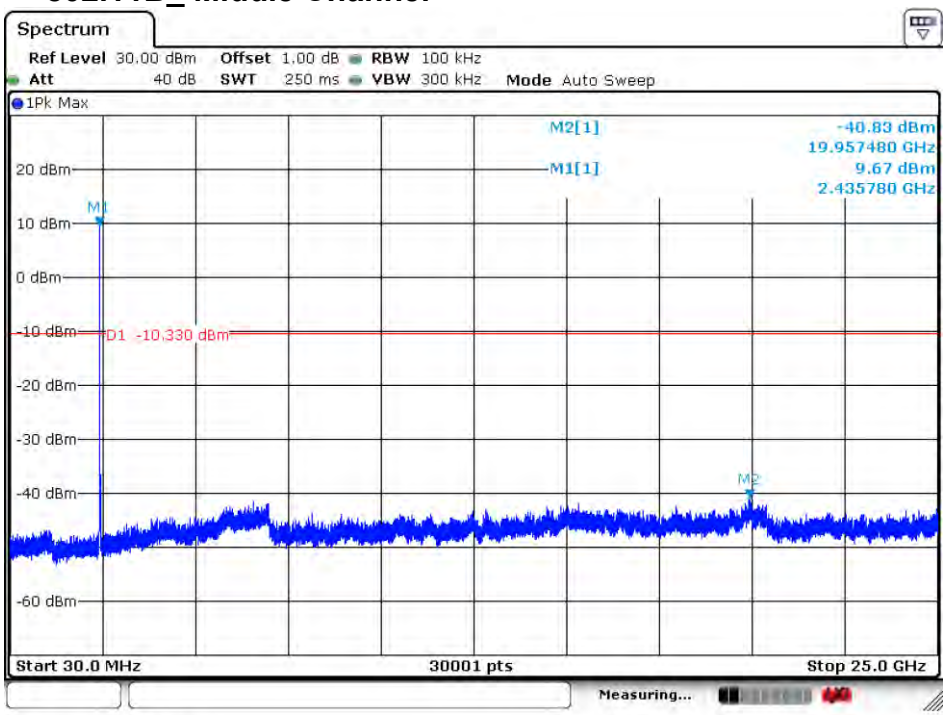
4.8.1.1.2 802.11B_ Middle Channel



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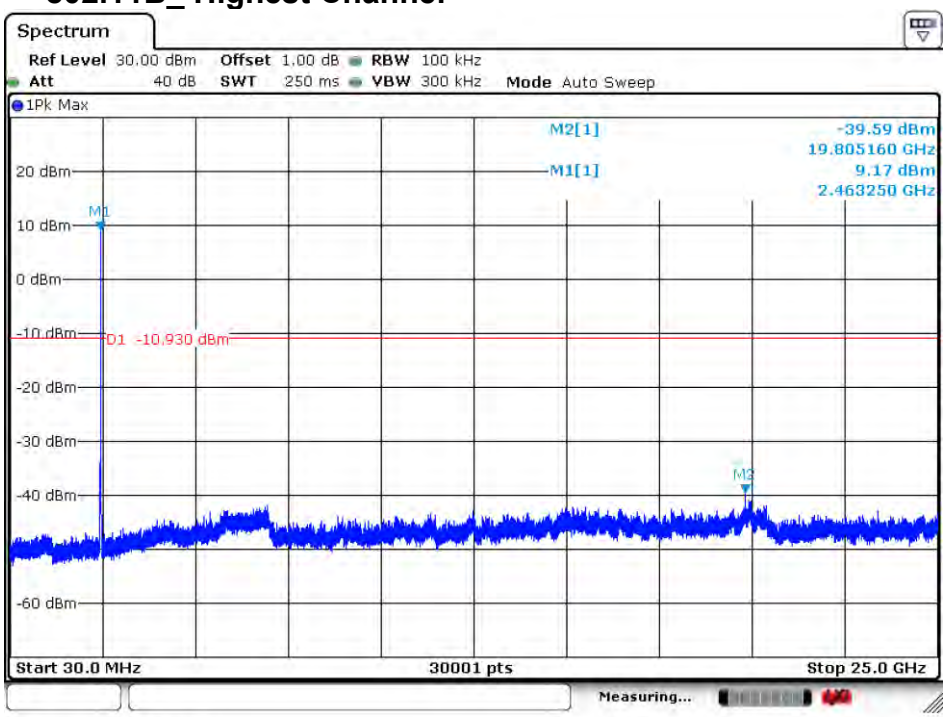
4.8.1.1.3 802.11B_ Highest Channel



Date: 22.MAY.2020 03:41:47

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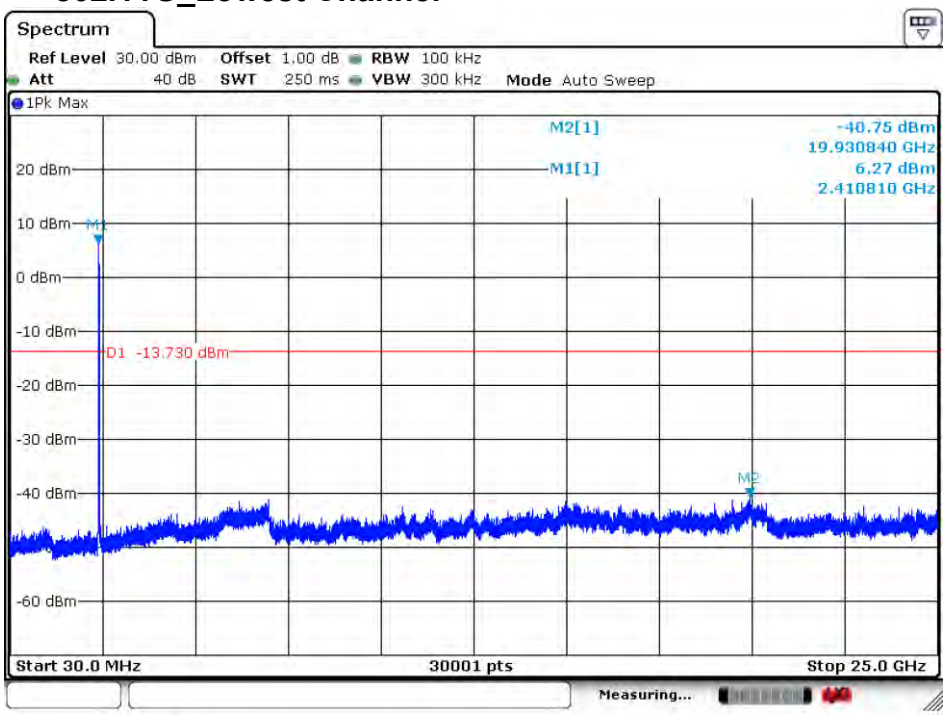
4.8.1.1.4 802.11G_Lowest Channel



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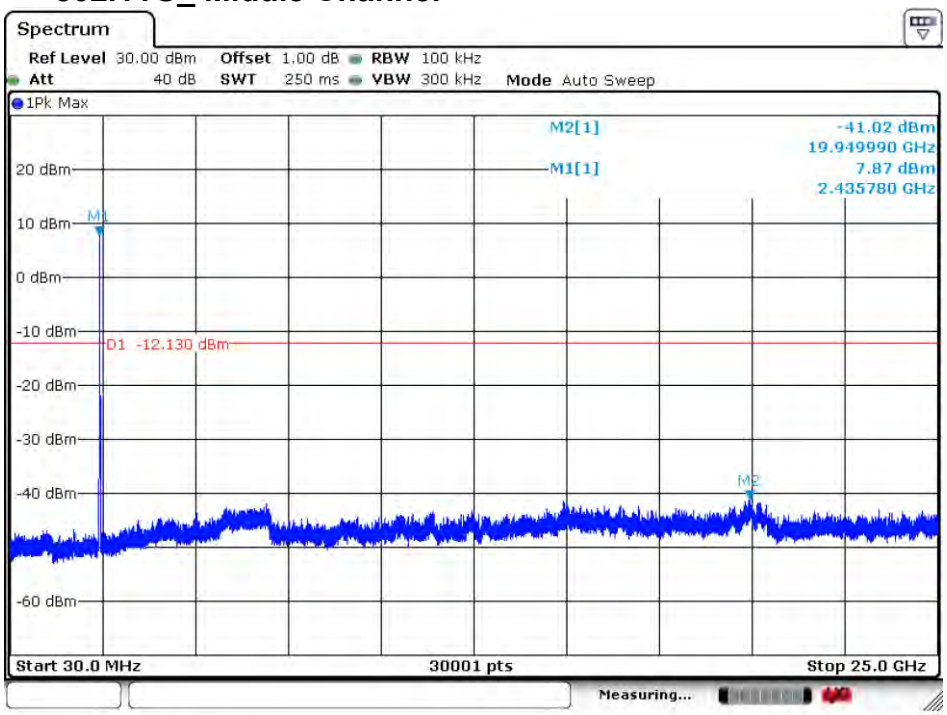
4.8.1.1.5 802.11G_ Middle Channel



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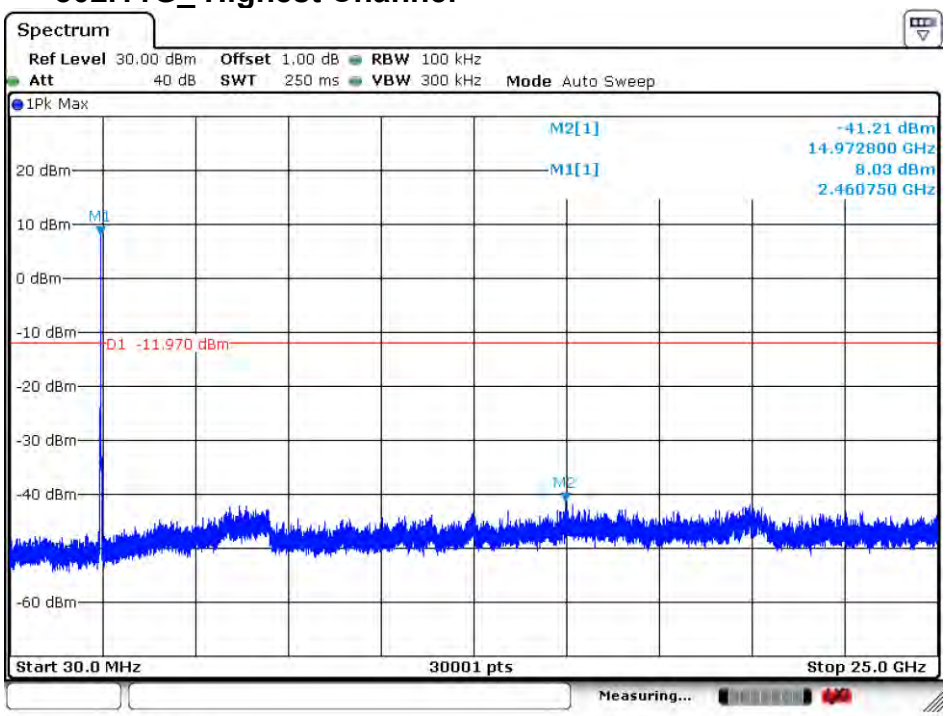
4.8.1.1.6 802.11G_ Highest Channel



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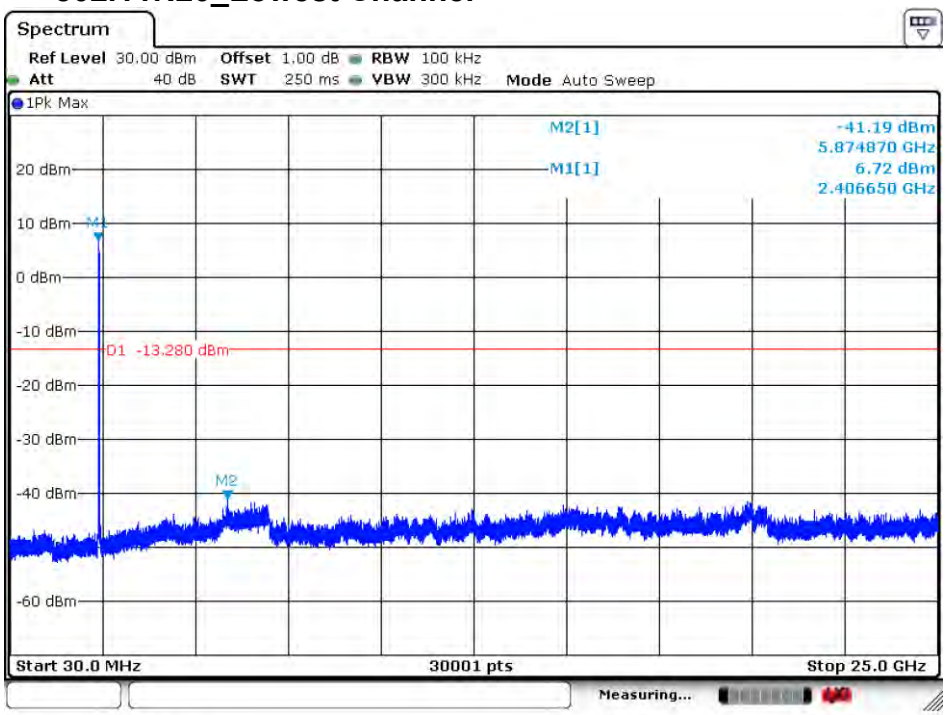
4.8.1.1.7 802.11N20_Lowest Channel



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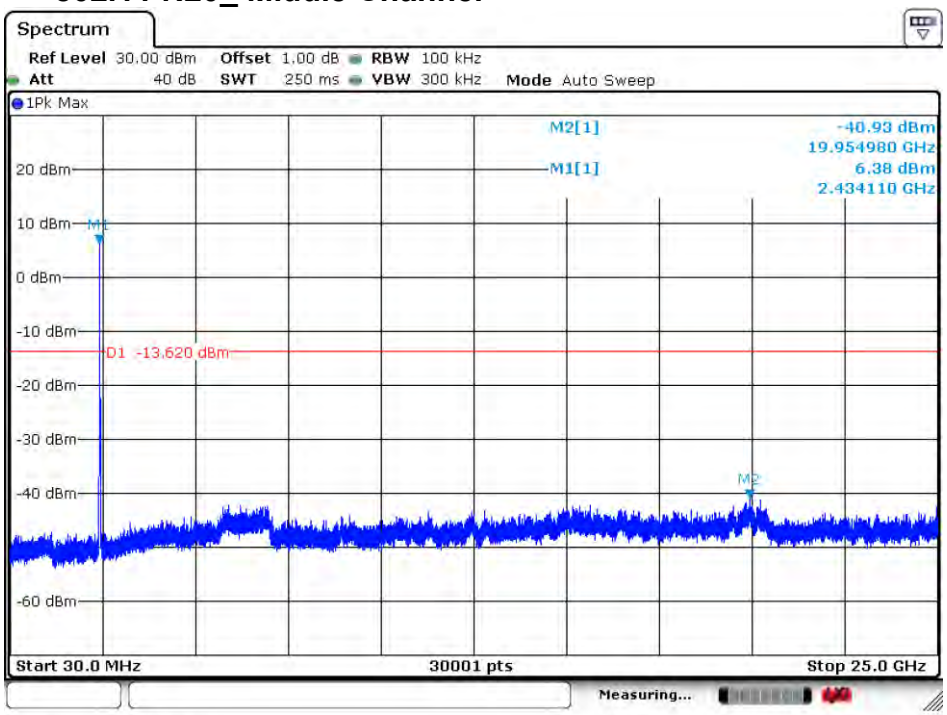
4.8.1.1.8 802.11 N20_ Middle Channel



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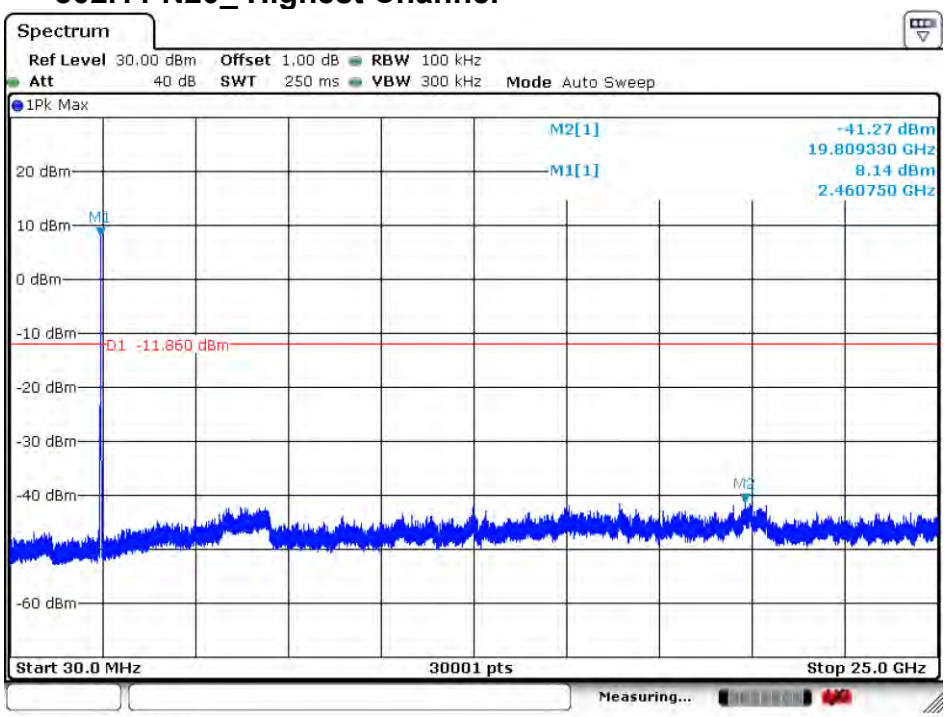
4.8.1.1.9 802.11 N20_ Highest Channel



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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 (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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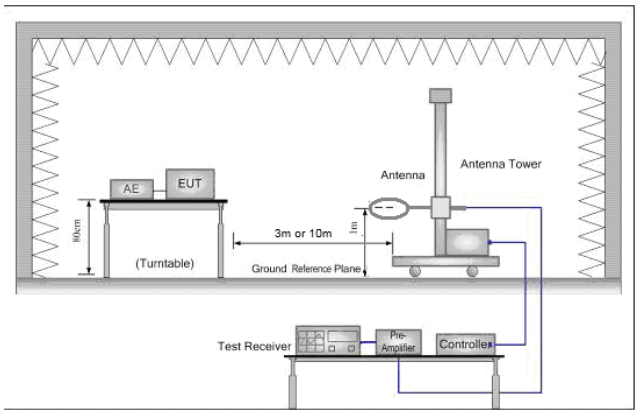

Figure 1. Below 30MHz

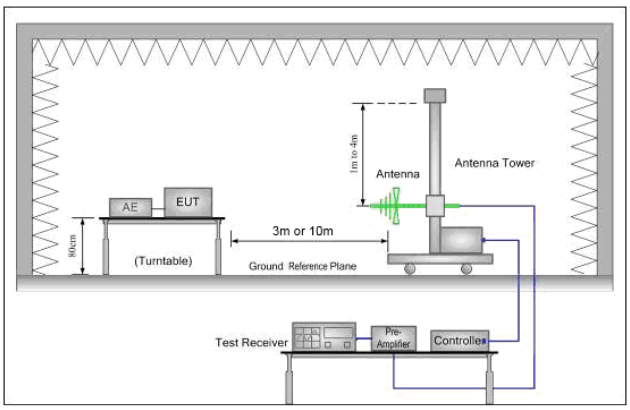

Figure 2. 30MHz to 1GHz

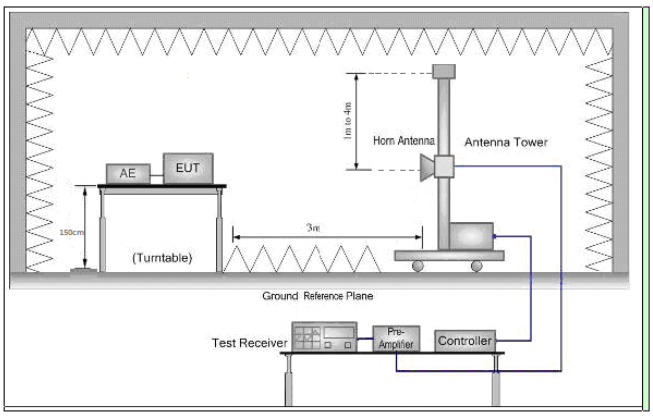

Figure 3. Above 1 GHz

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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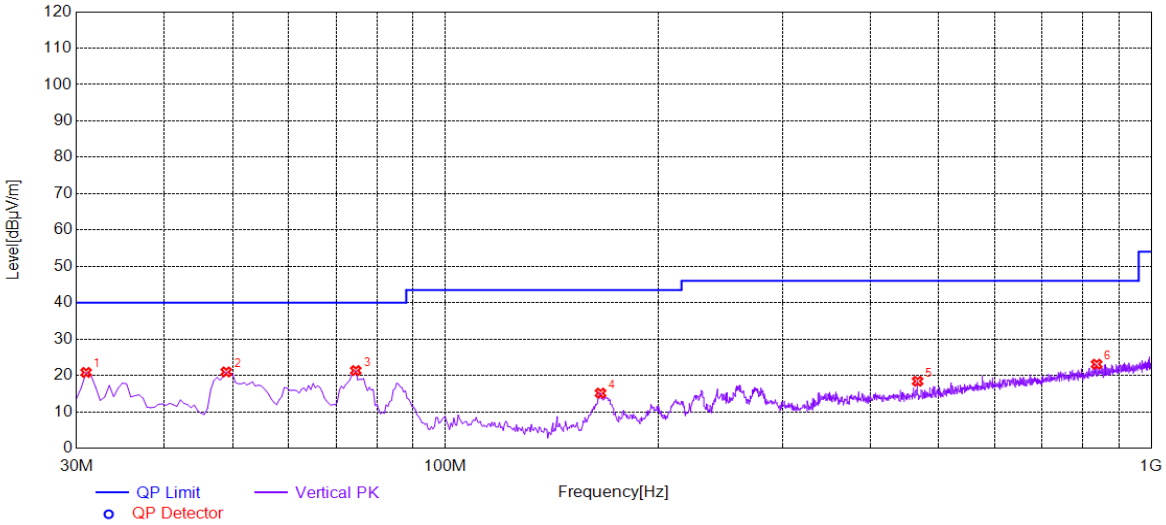
4.9.1 Radiated emission below 1GHz

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	30.9705	20.83	-32.82	40.00	19.17	263	257	Vertical
2	48.9245	20.97	-30.19	40.00	19.03	162	344	Vertical
3	74.6423	21.35	-34.96	40.00	18.65	222	122	Vertical
4	165.867	15.15	-33.90	43.50	28.35	245	170	Vertical
5	466.718	18.41	-23.49	46.00	27.59	279	166	Vertical
6	836.958	23.09	-16.29	46.00	22.91	280	44	Vertical

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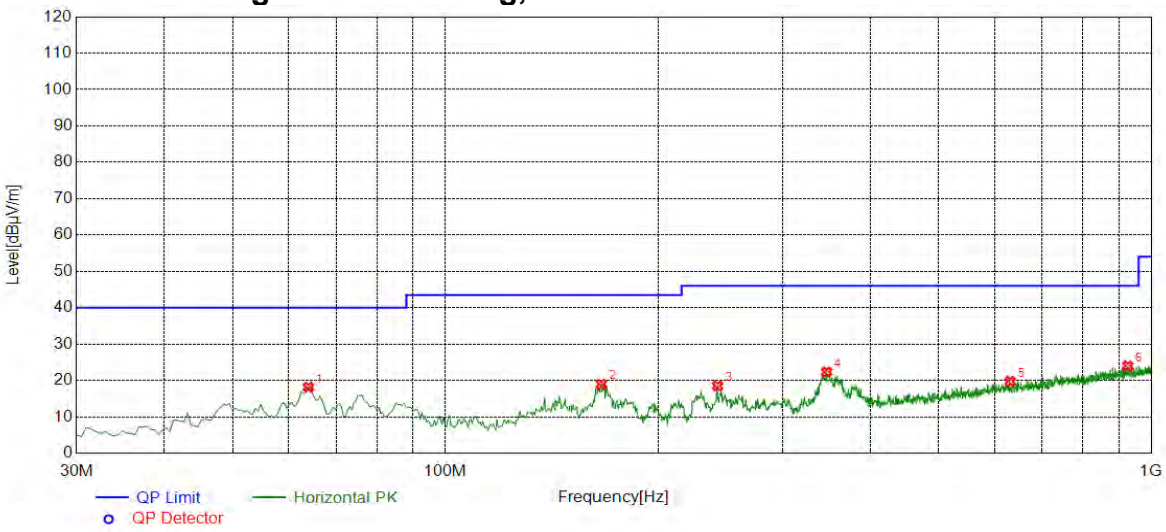
4.9.1.2 Charge + Transmitting, Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	63.9670	18.15	-32.66	40.00	21.85	234	172	Horizontal
2	166.353	18.98	-33.86	43.50	24.52	219	53	Horizontal
3	243.021	18.52	-29.50	46.00	27.48	242	247	Horizontal
4	346.863	22.36	-26.47	46.00	23.64	108	238	Horizontal
5	631.215	19.74	-19.64	46.00	26.26	235	88	Horizontal
6	926.728	24.00	-14.82	46.00	22.00	209	341	Horizontal

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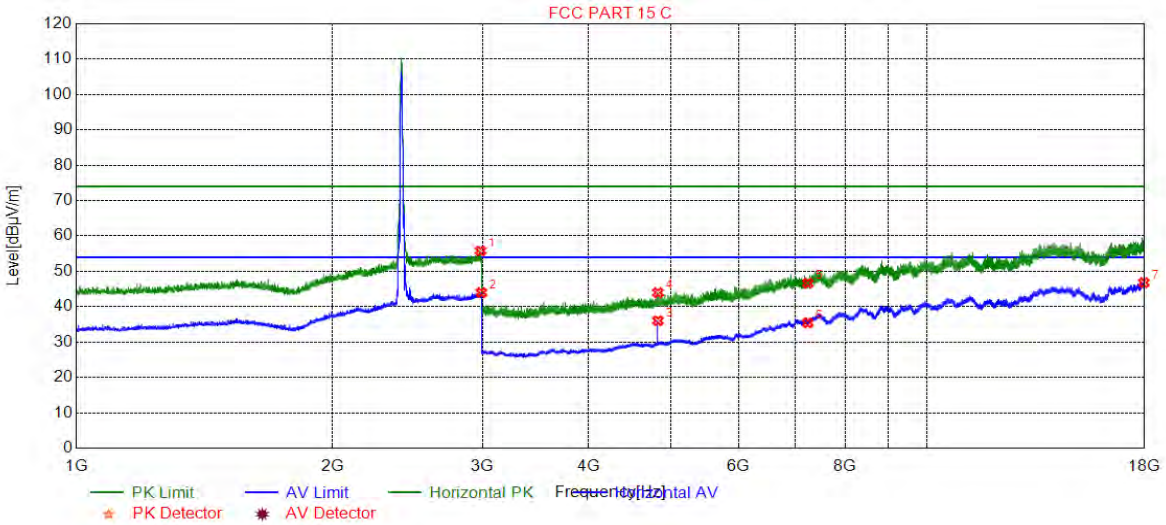
4.9.2 Transmitter emission above 1GHz

4.9.2.1 ANT1

4.9.2.1.1 802.11B_Lowest Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2984.99	55.80	9.52	74.00	18.20	118	360	Horizontal
2	2991.99	44.00	9.49	54.00	10.00	150	31	Horizontal
3	4824.00	36.05	-18.21	54.00	17.95	150	319	Horizontal
4	4824.00	43.96	-18.21	74.00	30.04	165	346	Horizontal
5	7236.00	46.64	-9.99	74.00	27.36	194	140	Horizontal
6	7236.00	35.43	-9.99	54.00	18.57	238	39	Horizontal
7	17962.0	46.79	0.71	54.00	7.21	233	241	Horizontal

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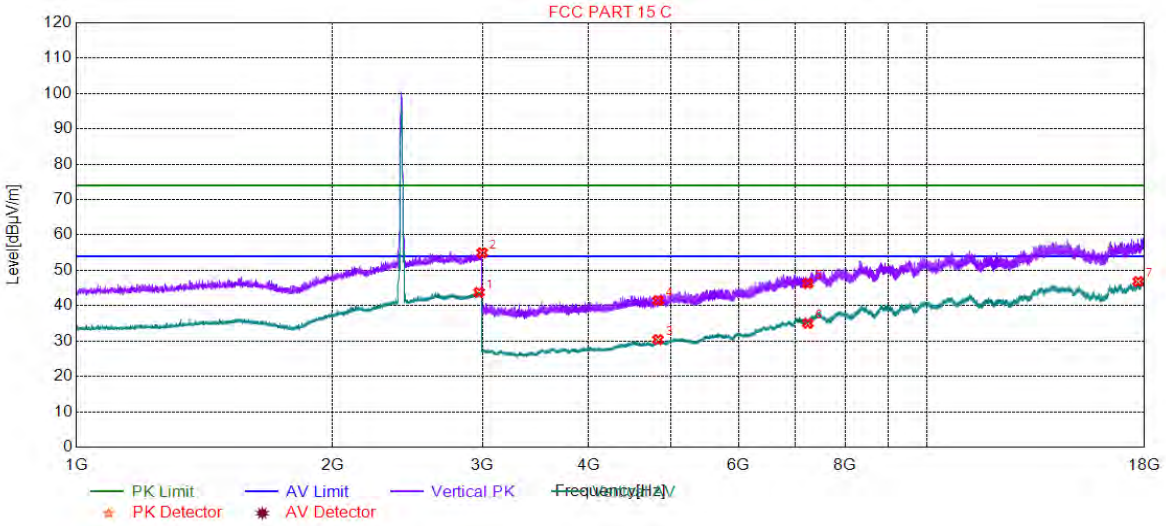
4.9.2.1.2 802.11B_Lowest Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2972.49	43.79	9.58	54.00	10.21	240	191	Vertical
2	2997.99	54.97	9.46	74.00	19.03	287	2	Vertical
3	4824.00	30.43	-18.21	54.00	23.57	225	264	Vertical
4	4824.00	41.48	-18.21	74.00	32.52	240	45	Vertical
5	7236.00	46.27	-9.99	74.00	27.73	200	140	Vertical
6	7236.00	35.02	-9.99	54.00	18.98	168	90	Vertical
7	17691.4	46.85	1.36	54.00	7.15	276	39	Vertical

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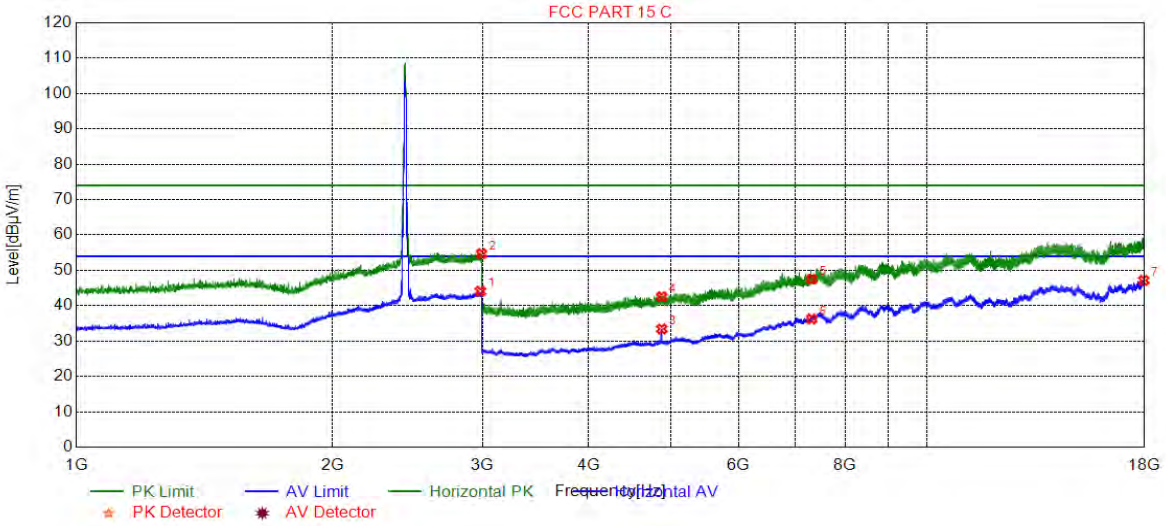
4.9.2.1.3 802.11B_ Middle Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2983.99	44.09	9.52	54.00	9.91	223	18	Horizontal
2	2993.49	54.73	9.48	74.00	19.27	213	236	Horizontal
3	4874.00	33.43	-17.99	54.00	20.57	199	321	Horizontal
4	4874.00	42.57	-17.99	74.00	31.43	213	18	Horizontal
5	7311.00	47.50	-9.74	74.00	26.50	200	142	Horizontal
6	7311.00	36.25	-9.74	54.00	17.75	125	42	Horizontal
7	17954.3	47.16	0.71	54.00	6.84	240	342	Horizontal

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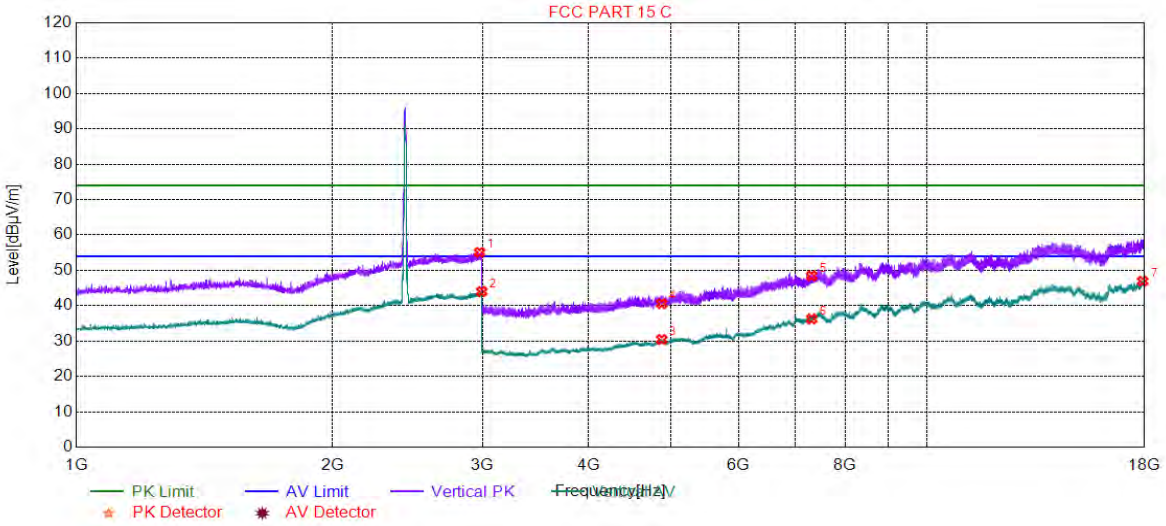
4.9.2.1.4 802.11B_ Middle Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2977.49	55.12	9.55	74.00	18.88	252	287	Vertical
2	2994.99	44.02	9.47	54.00	9.98	227	218	Vertical
3	4874.00	30.45	-17.99	54.00	23.55	273	237	Vertical
4	4874.00	40.58	-17.99	74.00	33.42	228	72	Vertical
5	7311.00	48.43	-9.74	74.00	25.57	262	291	Vertical
6	7311.00	36.27	-9.74	54.00	17.73	295	190	Vertical
7	17904.8	46.95	0.69	54.00	7.05	298	140	Vertical

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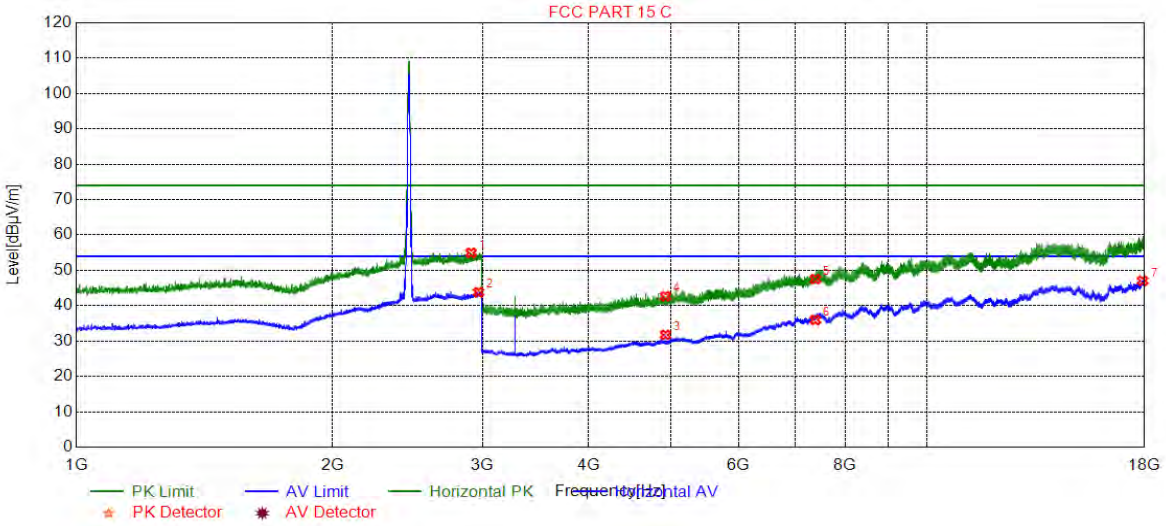
4.9.2.1.5 802.11B_ Highest Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2909.97	54.95	9.25	74.00	19.05	153	169	Horizontal
2	2968.99	43.83	9.59	54.00	10.17	223	321	Horizontal
3	4924.00	31.76	-17.72	54.00	22.24	241	327	Horizontal
4	4924.00	42.70	-17.72	74.00	31.30	179	245	Horizontal
5	7386.00	47.50	-9.55	74.00	26.50	246	190	Horizontal
6	7386.00	35.98	-9.55	54.00	18.02	216	342	Horizontal
7	17905.9	47.04	0.69	54.00	6.96	167	39	Horizontal

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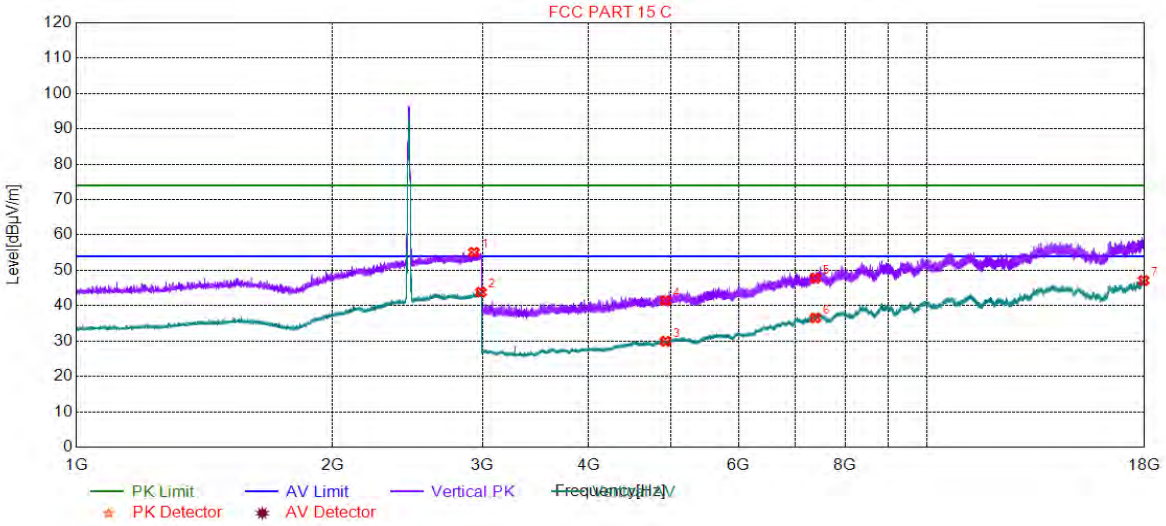
4.9.2.1.6 802.11B_ Highest Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2931.98	55.12	9.49	74.00	18.88	239	165	Vertical
2	2988.49	43.84	9.50	54.00	10.16	184	13	Vertical
3	4924.00	29.92	-17.72	54.00	24.08	276	73	Vertical
4	4924.00	41.43	-17.72	74.00	32.57	162	293	Vertical
5	7386.00	47.80	-9.55	74.00	26.20	155	291	Vertical
6	7386.00	36.55	-9.55	54.00	17.45	193	90	Vertical
7	17950.4	47.14	0.71	54.00	6.86	271	39	Vertical

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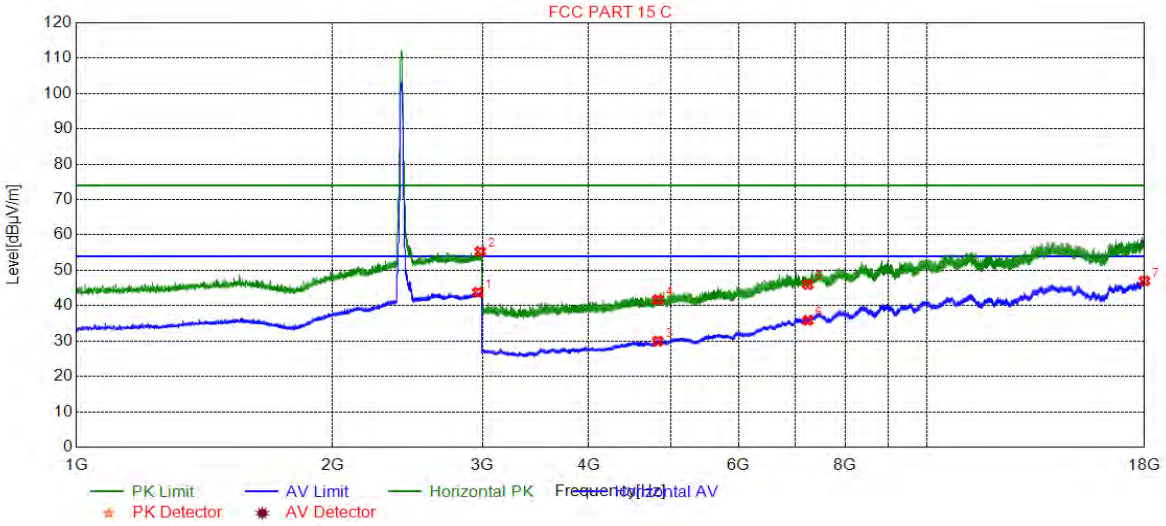
4.9.2.1.7 802.11G_Lowest Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2963.49	43.77	9.62	54.00	10.23	218	304	Horizontal
2	2982.49	55.33	9.53	74.00	18.67	199	112	Horizontal
3	4824.00	29.99	-18.21	54.00	24.01	218	100	Horizontal
4	4824.00	41.74	-18.21	74.00	32.26	248	265	Horizontal
5	7236.00	46.00	-9.99	74.00	28.00	140	89	Horizontal
6	7236.00	35.83	-9.99	54.00	18.17	207	191	Horizontal
7	17993.9	47.03	0.72	54.00	6.97	171	342	Horizontal

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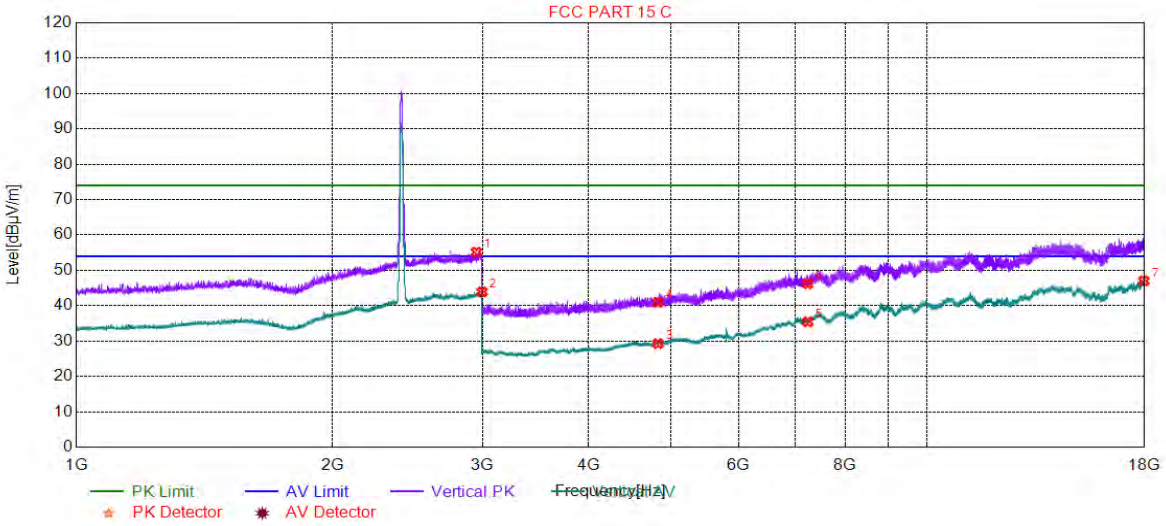
4.9.2.1.8 802.11G_Lowest Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2951.98	55.19	9.67	74.00	18.81	233	193	Vertical
2	2997.99	43.91	9.46	54.00	10.09	184	68	Vertical
3	4824.00	29.29	-18.21	54.00	24.71	178	292	Vertical
4	4824.00	40.98	-18.21	74.00	33.02	265	18	Vertical
5	7236.00	35.43	-9.99	54.00	18.57	220	238	Vertical
6	7236.00	46.22	-9.99	74.00	27.78	291	342	Vertical
7	17959.2	47.03	0.71	54.00	6.97	285	86	Vertical

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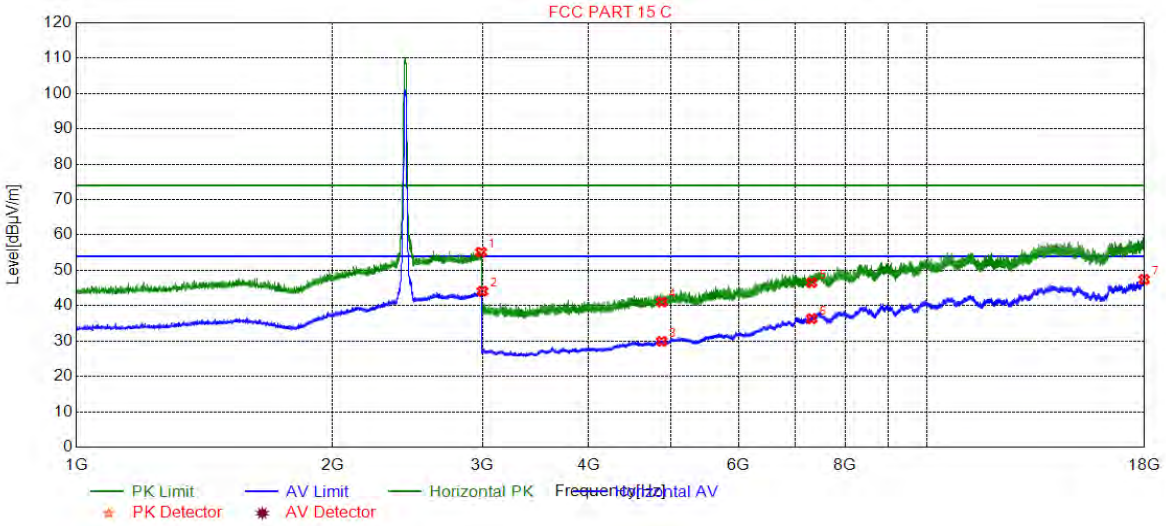
4.9.2.1.9 802.11G_ Middle Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2989.49	55.16	9.50	74.00	18.84	111	224	Horizontal
2	3000.00	44.09	9.45	54.00	9.91	222	265	Horizontal
3	4874.00	29.92	-17.99	54.00	24.08	139	265	Horizontal
4	4874.00	41.05	-17.99	74.00	32.95	106	155	Horizontal
5	7311.00	46.53	-9.74	74.00	27.47	178	342	Horizontal
6	7311.00	36.33	-9.74	54.00	17.67	182	191	Horizontal
7	17978.5	47.42	0.71	54.00	6.58	190	141	Horizontal

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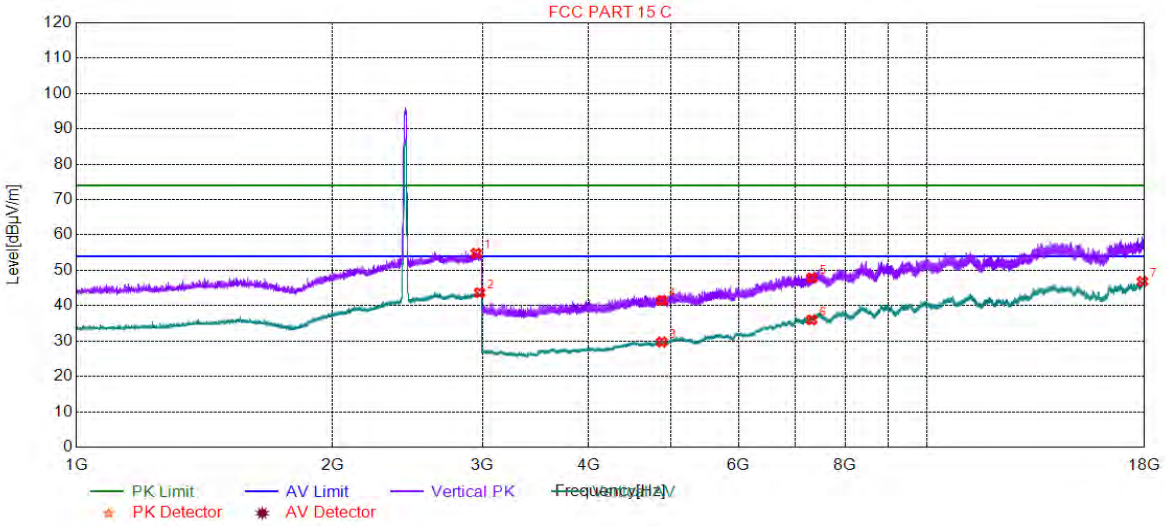
4.9.2.1.10 802.11G_ Middle Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2949.98	54.83	9.68	74.00	19.17	217	342	Vertical
2	2977.49	43.70	9.55	54.00	10.30	232	274	Vertical
3	4874.00	29.72	-17.99	54.00	24.28	222	264	Vertical
4	4874.00	41.48	-17.99	74.00	32.52	155	73	Vertical
5	7311.00	47.86	-9.74	74.00	26.14	182	86	Vertical
6	7311.00	35.98	-9.74	54.00	18.02	219	192	Vertical
7	17894.9	46.84	0.62	54.00	7.16	156	36	Vertical

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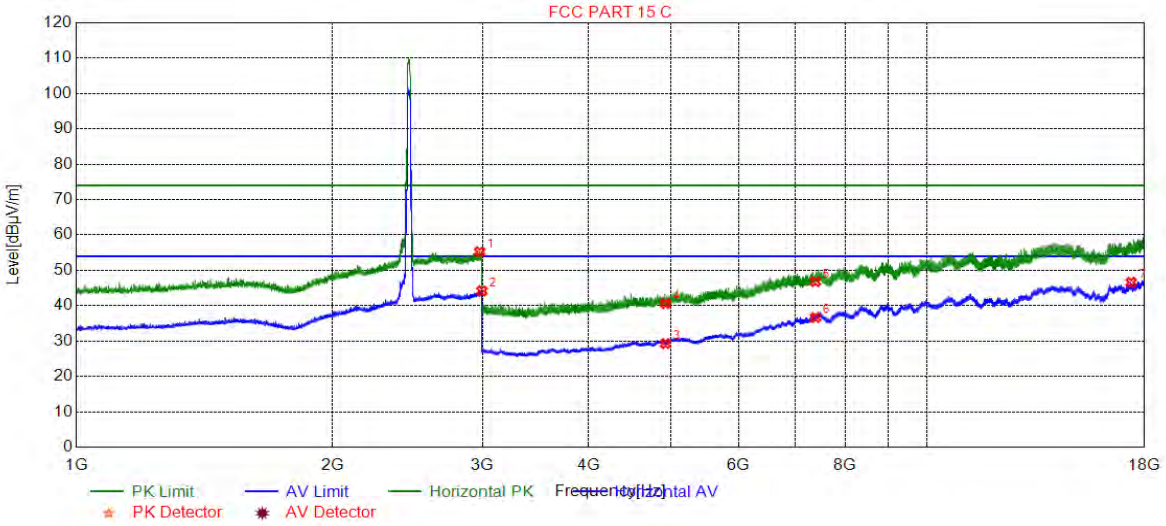
4.9.2.1.11 802.11G_ Highest Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2978.49	55.24	9.55	74.00	18.76	124	114	Horizontal
2	2996.49	44.18	9.47	54.00	9.82	192	360	Horizontal
3	4924.00	29.28	-17.72	54.00	24.72	160	360	Horizontal
4	4924.00	40.60	-17.72	74.00	33.40	180	209	Horizontal
5	7386.00	46.81	-9.55	74.00	27.19	238	0	Horizontal
6	7386.00	36.66	-9.55	54.00	17.34	240	140	Horizontal
7	17357.5	46.61	0.07	54.00	7.39	160	0	Horizontal

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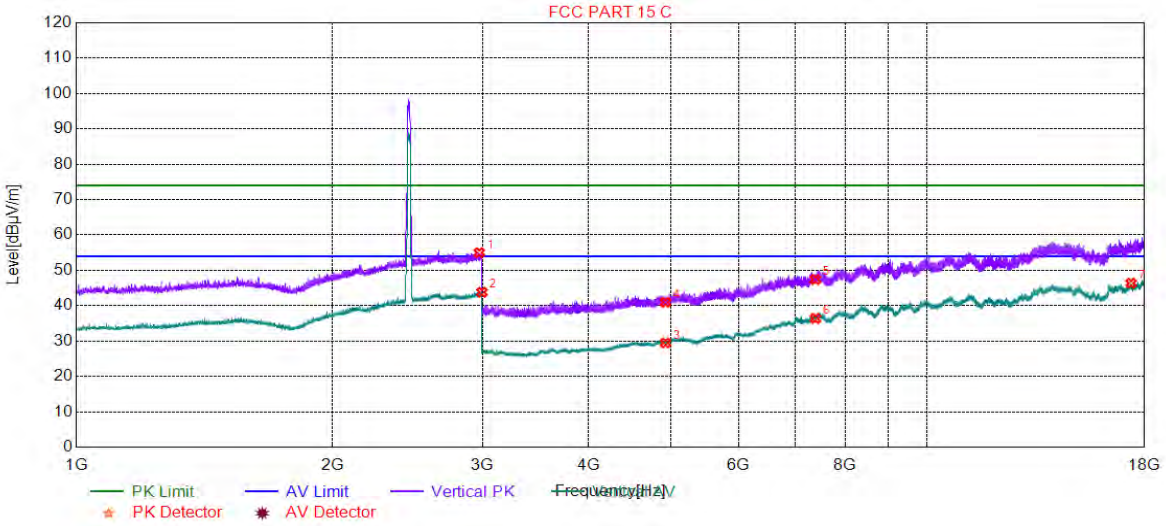
4.9.2.1.12 802.11G_ Highest Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2974.99	55.02	9.57	74.00	18.98	212	342	Vertical
2	2996.49	43.81	9.47	54.00	10.19	293	94	Vertical
3	4924.00	29.49	-17.72	54.00	24.51	243	265	Vertical
4	4924.00	40.96	-17.72	74.00	33.04	276	238	Vertical
5	7386.00	47.40	-9.55	74.00	26.60	224	191	Vertical
6	7386.00	36.40	-9.55	54.00	17.60	273	291	Vertical
7	17351.5	46.37	0.04	54.00	7.63	185	0	Vertical

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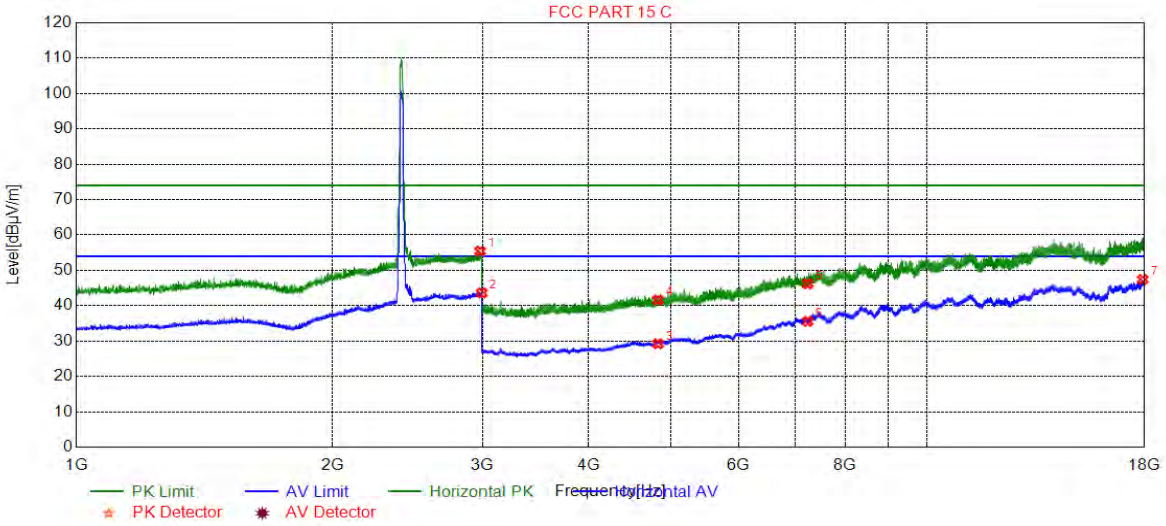
4.9.2.1.13 802.11N20_Lowest Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2981.99	55.44	9.53	74.00	18.56	134	80	Horizontal
2	2995.99	43.62	9.47	54.00	10.38	241	233	Horizontal
3	4824.00	29.23	-18.21	54.00	24.77	165	346	Horizontal
4	4824.00	41.65	-18.21	74.00	32.35	175	292	Horizontal
5	7236.00	46.22	-9.99	74.00	27.78	159	0	Horizontal
6	7236.00	35.58	-9.99	54.00	18.42	155	0	Horizontal
7	17909.2	47.42	0.69	54.00	6.58	111	342	Horizontal

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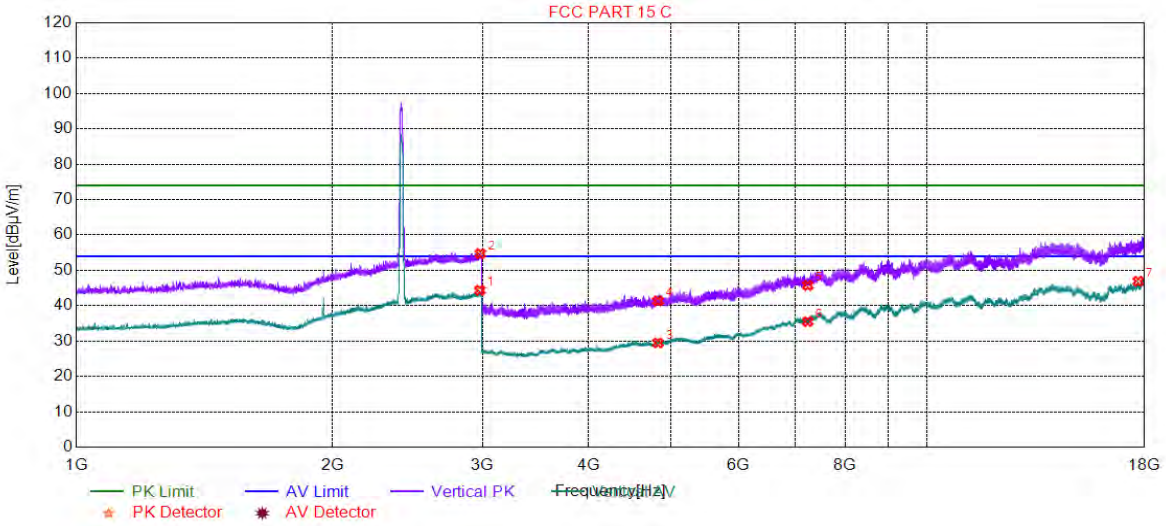
4.9.2.1.14 802.11N20_Lowest Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2979.99	44.36	9.54	54.00	9.64	223	60	Vertical
2	2982.99	54.74	9.53	74.00	19.26	222	155	Vertical
3	4824.00	29.48	-18.21	54.00	24.52	217	156	Vertical
4	4824.00	41.34	-18.21	74.00	32.66	162	321	Vertical
5	7236.00	45.74	-9.99	74.00	28.26	280	0	Vertical
6	7236.00	35.52	-9.99	54.00	18.48	209	0	Vertical
7	17694.1	46.91	1.36	54.00	7.09	221	90	Vertical

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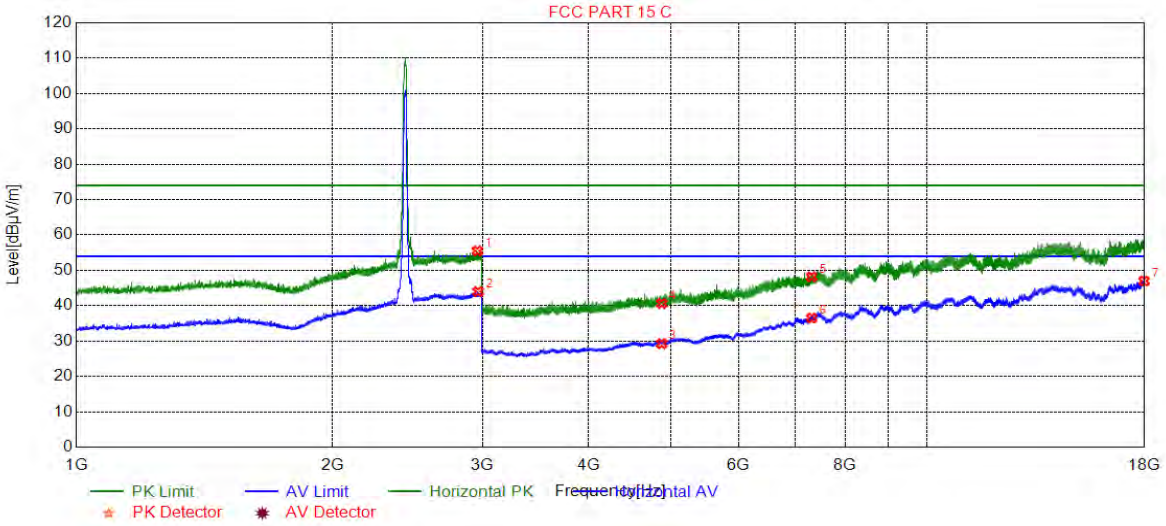
4.9.2.1.15 802.11N20_ Middle Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2959.48	55.50	9.64	74.00	18.50	214	94	Horizontal
2	2965.99	43.98	9.61	54.00	10.02	217	52	Horizontal
3	4874.00	29.25	-17.99	54.00	24.75	193	127	Horizontal
4	4874.00	40.64	-17.99	74.00	33.36	221	100	Horizontal
5	7311.00	48.17	-9.74	74.00	25.83	195	342	Horizontal
6	7311.00	36.51	-9.74	54.00	17.49	127	140	Horizontal
7	17971.9	46.99	0.71	54.00	7.01	222	292	Horizontal

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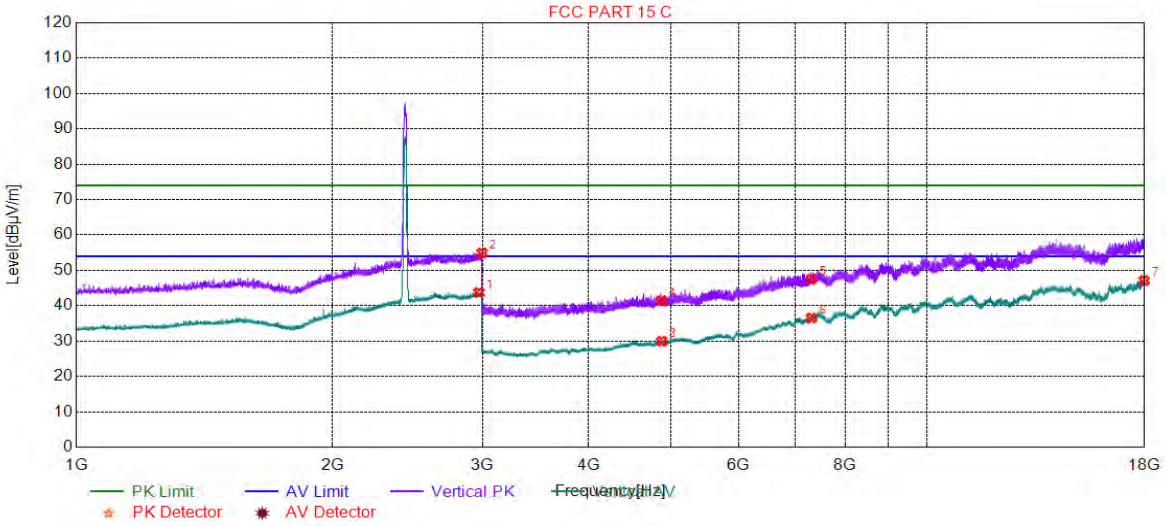
4.9.2.1.16 802.11N20_ Middle Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2971.99	43.75	9.58	54.00	10.25	221	154	Vertical
2	2997.99	54.90	9.46	74.00	19.10	186	72	Vertical
3	4874.00	29.94	-17.99	54.00	24.06	223	18	Vertical
4	4874.00	41.41	-17.99	74.00	32.59	203	155	Vertical
5	7311.00	47.56	-9.74	74.00	26.44	203	90	Vertical
6	7311.00	36.56	-9.74	54.00	17.44	279	342	Vertical
7	17971.3	47.14	0.71	54.00	6.86	168	292	Vertical

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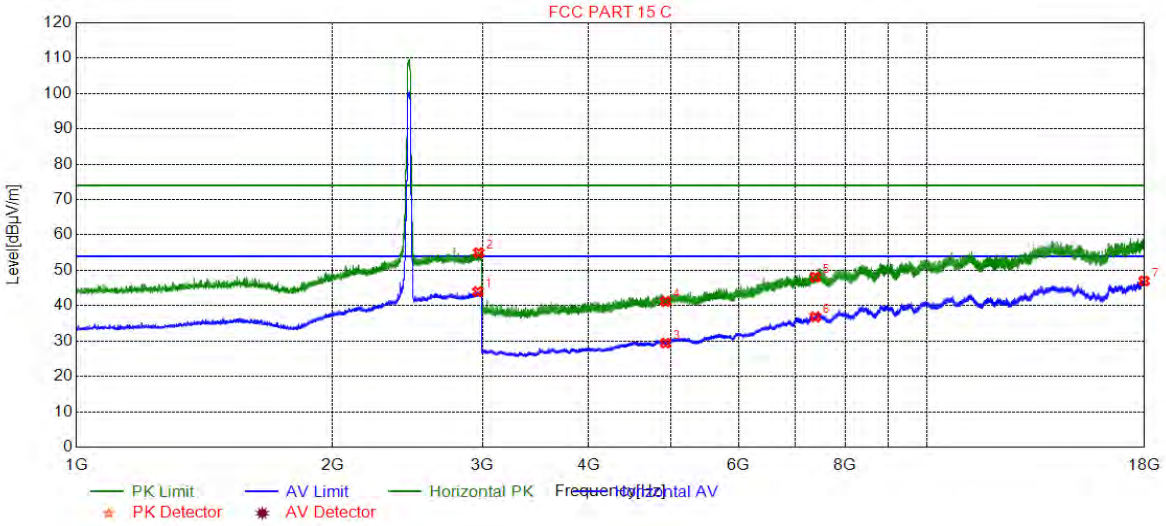
4.9.2.1.17 802.11N20_ Highest Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2963.49	43.98	9.62	54.00	10.02	100	273	Horizontal
2	2969.99	54.98	9.59	74.00	19.02	136	287	Horizontal
3	4924.00	29.41	-17.72	54.00	24.59	192	163	Horizontal
4	4924.00	41.21	-17.72	74.00	32.79	243	46	Horizontal
5	7386.00	48.08	-9.55	74.00	25.92	103	124	Horizontal
6	7386.00	36.84	-9.55	54.00	17.16	197	23	Horizontal
7	17972.4	47.00	0.71	54.00	7.00	214	74	Horizontal

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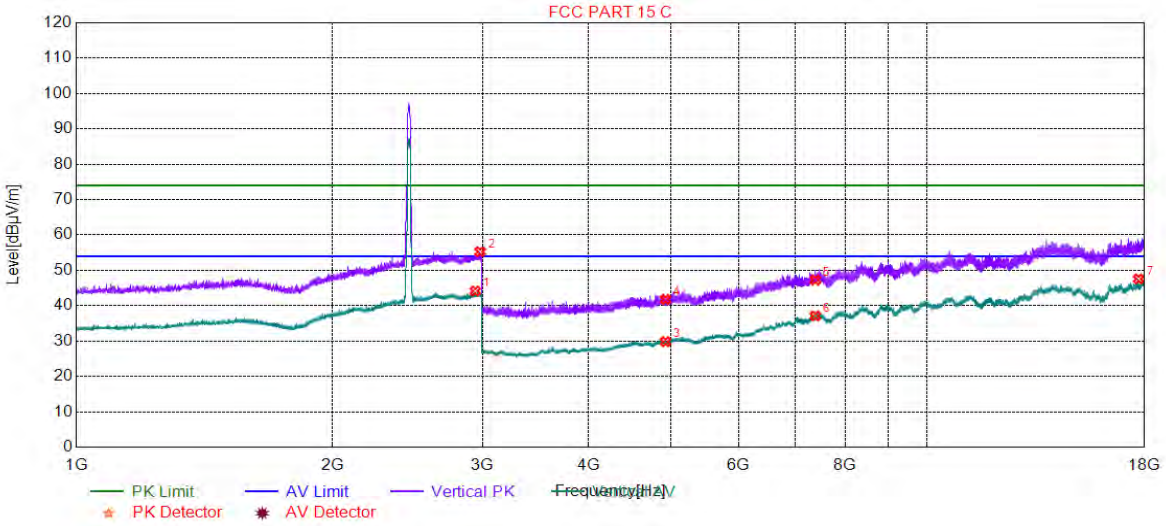
4.9.2.1.18 802.11N20_ Highest Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2942.48	44.14	9.60	54.00	9.86	283	18	Vertical
2	2981.99	55.29	9.53	74.00	18.71	157	18	Vertical
3	4924.00	29.82	-17.72	54.00	24.18	261	275	Vertical
4	4924.00	41.77	-17.72	74.00	32.23	281	329	Vertical
5	7386.00	47.26	-9.55	74.00	26.74	164	342	Vertical
6	7386.00	37.11	-9.55	54.00	16.89	172	91	Vertical
7	17706.8	47.58	1.22	54.00	6.42	197	41	Vertical

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:			

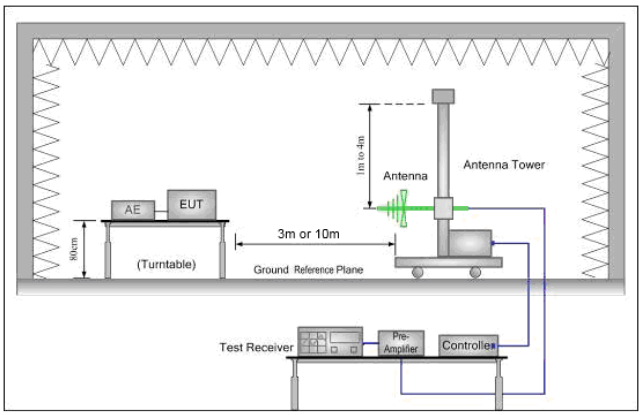

Figure 1. 30MHz to 1GHz

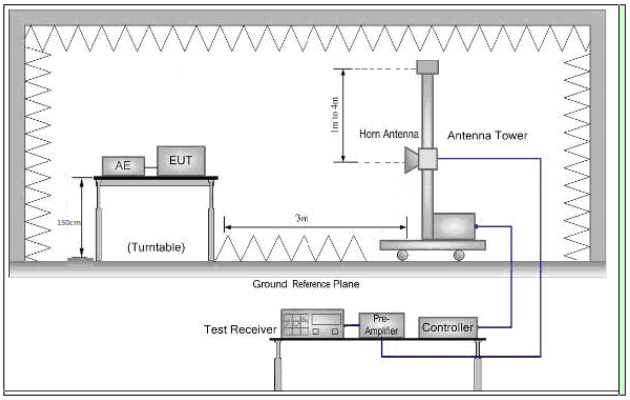

Figure 2. Above 1 GHz

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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). 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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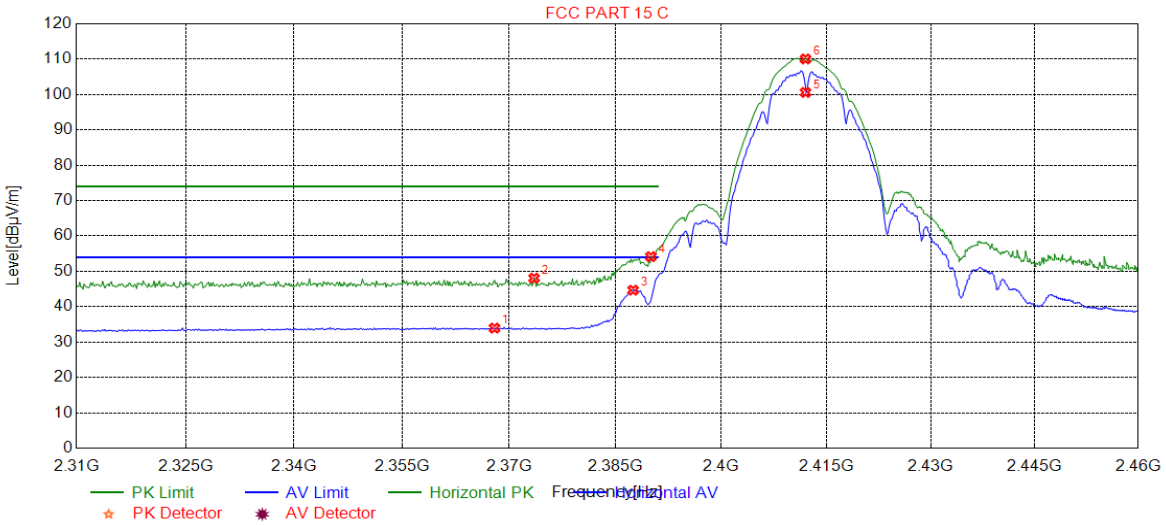
Test plot as follows:

4.10.1 ANT1

4.10.1.1 802.11B_Lowest Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2367.95	33.96	7.79	54.00	20.04	108	310	Horizontal
2	2373.51	48.08	7.79	74.00	25.92	213	252	Horizontal
3	2387.47	44.68	7.77	54.00	9.32	203	310	Horizontal
4	2390.00	54.16	7.77	74.00	19.84	139	326	Horizontal
5	2412.00	100.60	7.81	0.00	-100.60	159	310	Horizontal
6	2412.00	110.05	7.81	0.00	-110.05	112	310	Horizontal

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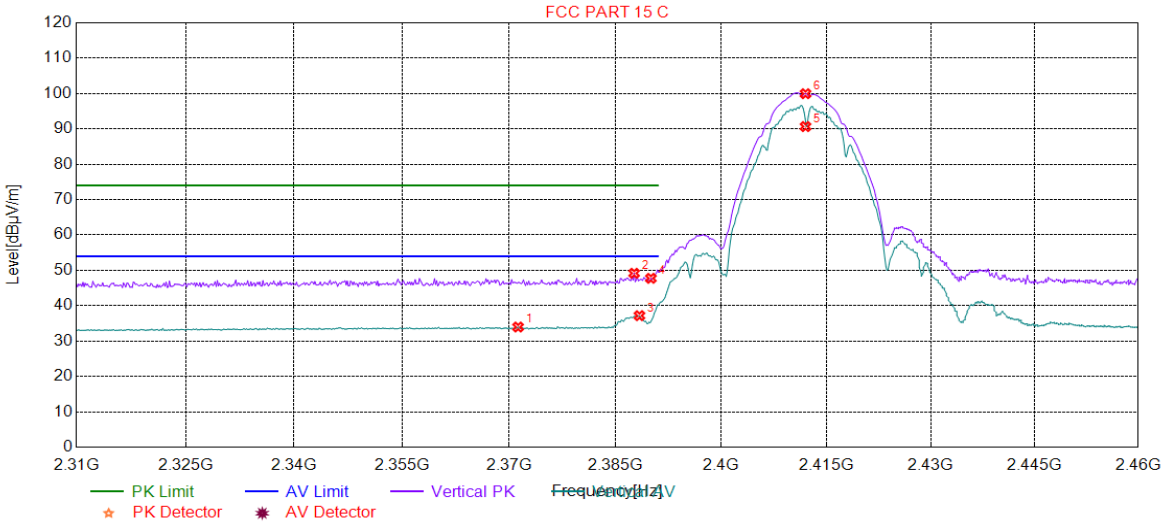
4.10.1.2 802.11B_Lowest Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2371.26	33.98	7.79	54.00	20.02	193	96	Vertical
2	2387.62	49.18	7.77	74.00	24.82	229	242	Vertical
3	2388.37	37.19	7.77	54.00	16.81	176	291	Vertical
4	2390.00	47.75	7.77	74.00	26.25	251	242	Vertical
5	2412.00	90.66	7.81	0.00	-90.66	155	294	Vertical
6	2412.00	99.95	7.81	0.00	-99.95	238	291	Vertical

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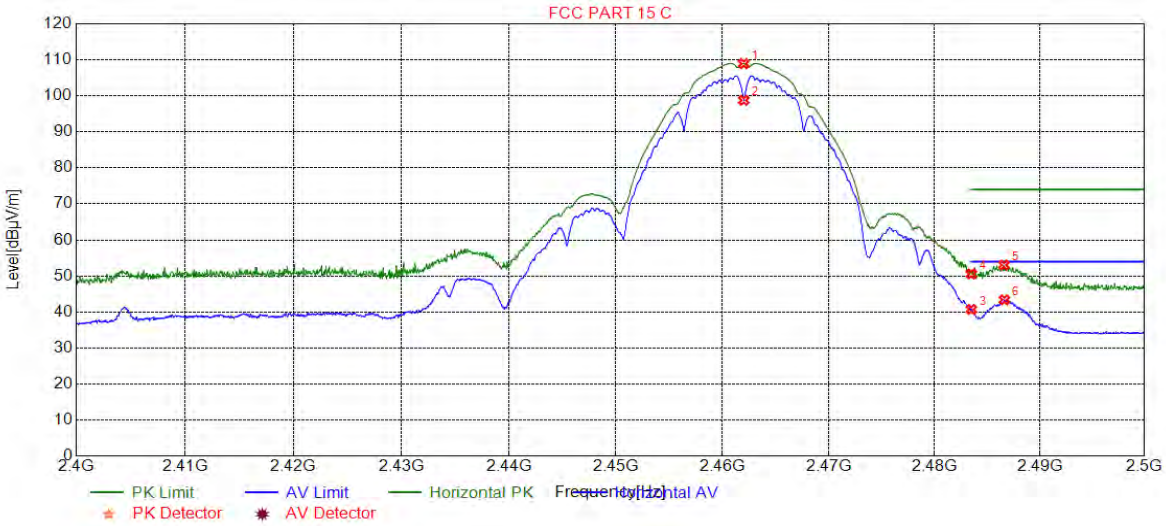
4.10.1.3 802.11B_ Highest Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	108.94	7.98	0.00	-108.94	203	306	Horizontal
2	2462.00	98.76	7.98	0.00	-98.76	208	300	Horizontal
3	2483.50	40.70	8.01	54.00	13.30	115	300	Horizontal
4	2483.50	50.56	8.01	74.00	23.44	204	306	Horizontal
5	2486.59	53.02	8.01	74.00	20.98	233	306	Horizontal
6	2486.64	43.38	8.01	54.00	10.62	113	300	Horizontal

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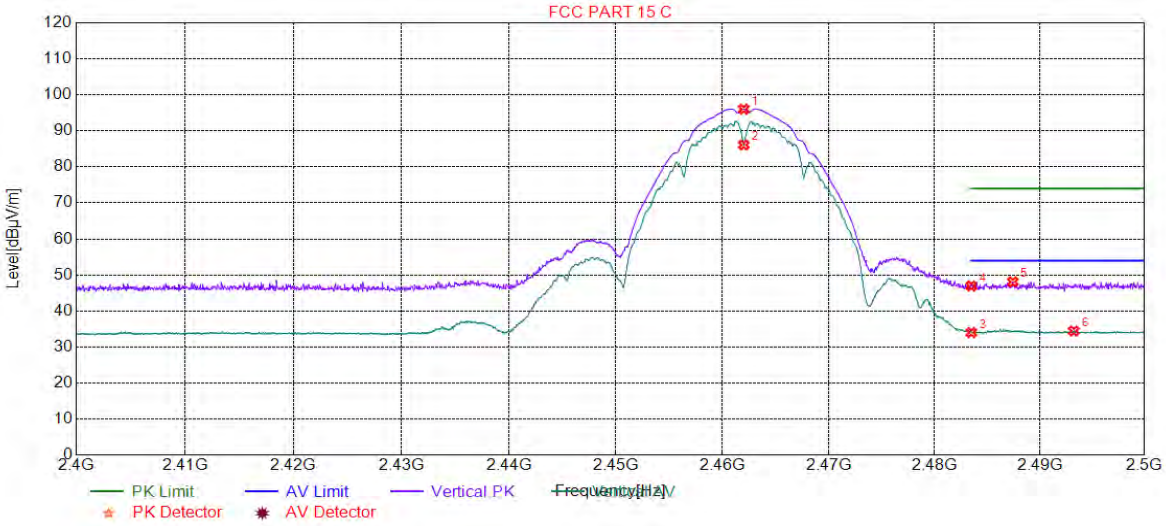
4.10.1.4 802.11B_ Highest Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	96.02	7.98	0.00	-96.02	224	227	Vertical
2	2462.00	86.09	7.98	0.00	-86.09	237	227	Vertical
3	2483.50	34.01	8.01	54.00	19.99	280	1	Vertical
4	2483.50	46.94	8.01	74.00	27.06	232	210	Vertical
5	2487.44	48.09	8.01	74.00	25.91	287	108	Vertical
6	2493.24	34.45	8.02	54.00	19.55	176	119	Vertical

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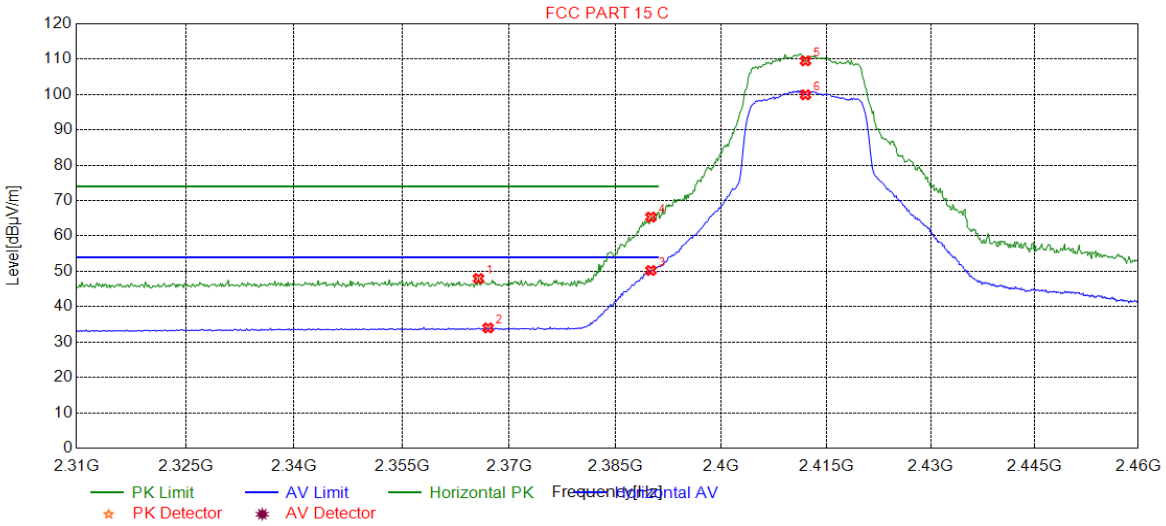
4.10.1.5 802.11G_Lowest Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2365.70	47.97	7.79	74.00	26.03	163	42	Horizontal
2	2367.05	34.00	7.79	54.00	20.00	214	350	Horizontal
3	2390.00	50.25	7.77	54.00	3.75	125	309	Horizontal
4	2390.00	65.34	7.77	74.00	8.66	200	317	Horizontal
5	2412.00	109.52	7.81	0.00	-109.52	108	312	Horizontal
6	2412.00	99.91	7.81	0.00	-99.91	126	317	Horizontal

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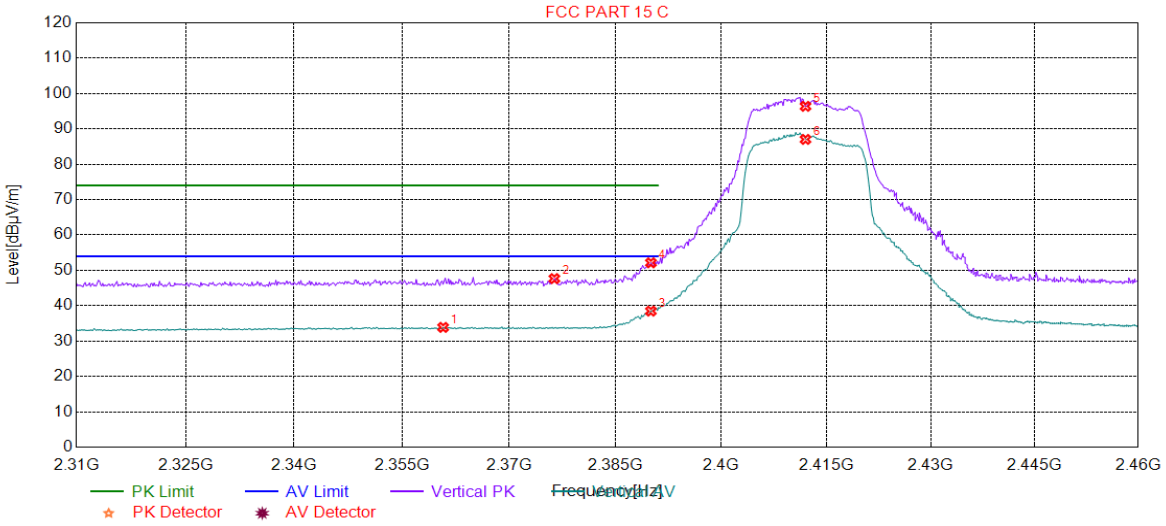
4.10.1.6 802.11G_Lowest Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2360.75	33.88	7.80	54.00	20.12	278	1	Vertical
2	2376.36	47.67	7.78	74.00	26.33	205	210	Vertical
3	2390.00	38.48	7.77	54.00	15.52	211	240	Vertical
4	2390.00	52.13	7.77	74.00	21.87	206	240	Vertical
5	2412.00	96.38	7.81	0.00	-96.38	268	240	Vertical
6	2412.00	87.03	7.81	0.00	-87.03	275	240	Vertical

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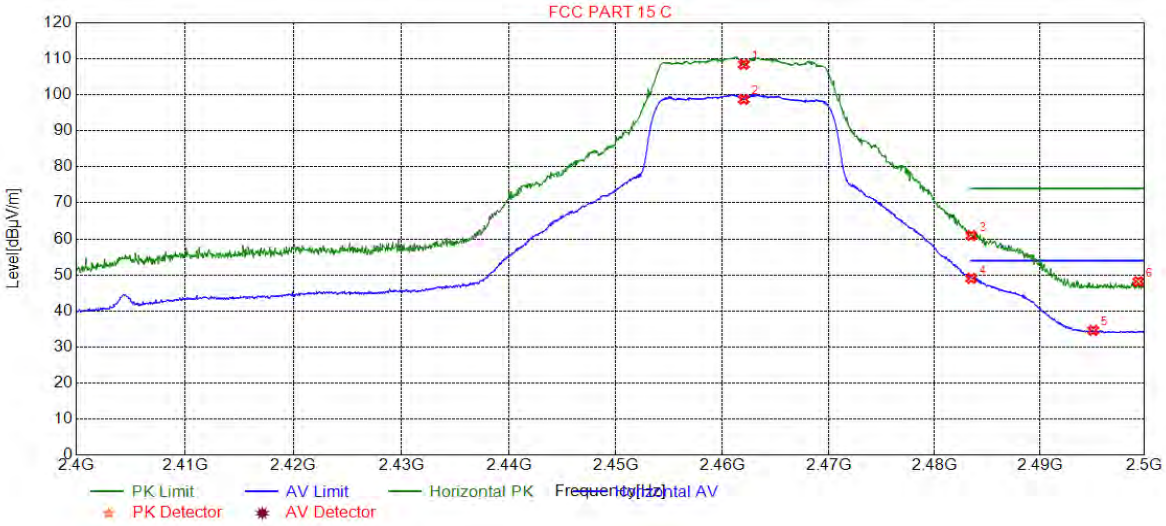
4.10.1.7 802.11G_ Highest Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	108.43	7.98	0.00	-108.43	109	322	Horizontal
2	2462.00	98.73	7.98	0.00	-98.73	178	317	Horizontal
3	2483.50	60.94	8.01	74.00	13.06	134	311	Horizontal
4	2483.50	49.05	8.01	54.00	4.95	164	295	Horizontal
5	2495.09	34.61	8.02	54.00	19.39	247	344	Horizontal
6	2499.39	48.18	8.03	74.00	25.82	199	339	Horizontal

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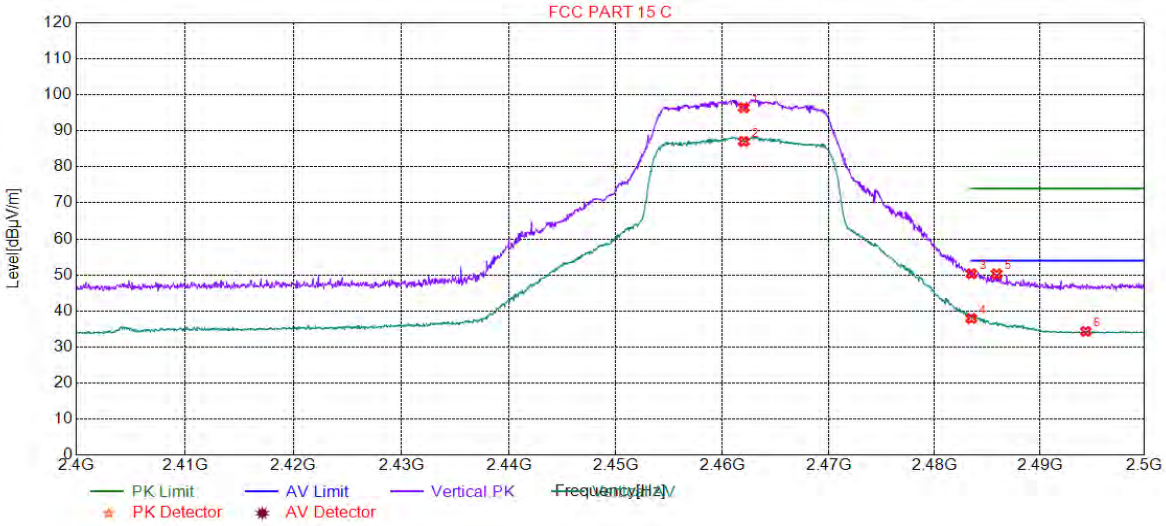
4.10.1.8 802.11G_ Highest Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	96.46	7.98	0.00	-96.46	293	238	Vertical
2	2462.00	87.07	7.98	0.00	-87.07	288	243	Vertical
3	2483.50	50.34	8.01	74.00	23.66	240	243	Vertical
4	2483.50	37.92	8.01	54.00	16.08	165	80	Vertical
5	2485.89	50.28	8.01	74.00	23.72	291	243	Vertical
6	2494.39	34.33	8.02	54.00	19.67	213	3	Vertical

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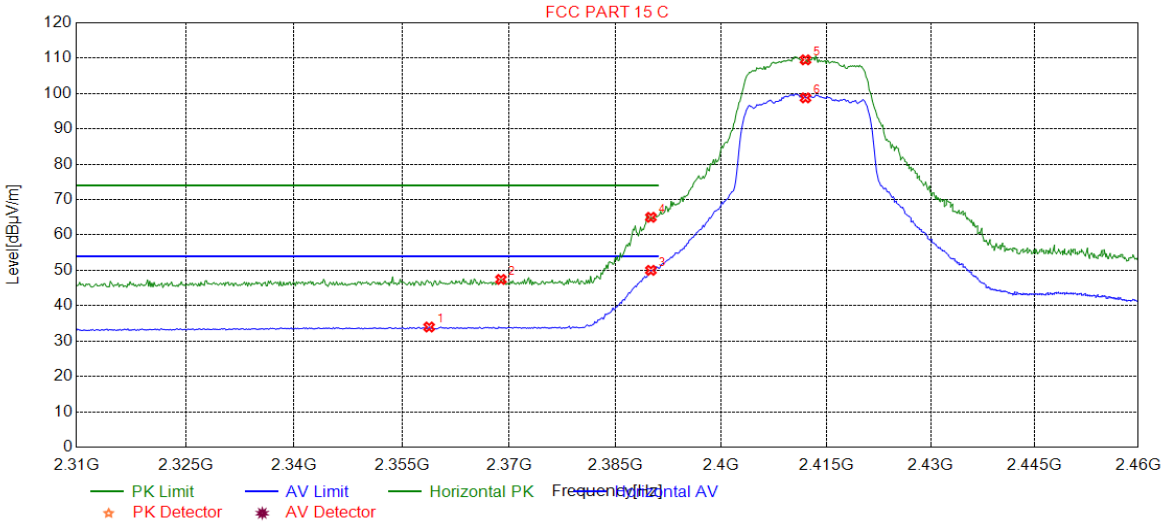
4.10.1.9 802.11N20_ Lowest Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2358.79	33.98	7.80	54.00	20.02	146	311	Horizontal
2	2368.85	47.43	7.79	74.00	26.57	221	282	Horizontal
3	2390.00	50.01	7.77	54.00	3.99	198	311	Horizontal
4	2390.00	65.00	7.77	74.00	9.00	100	311	Horizontal
5	2412.00	109.52	7.81	0.00	-109.52	174	307	Horizontal
6	2412.00	98.76	7.81	0.00	-98.76	148	311	Horizontal

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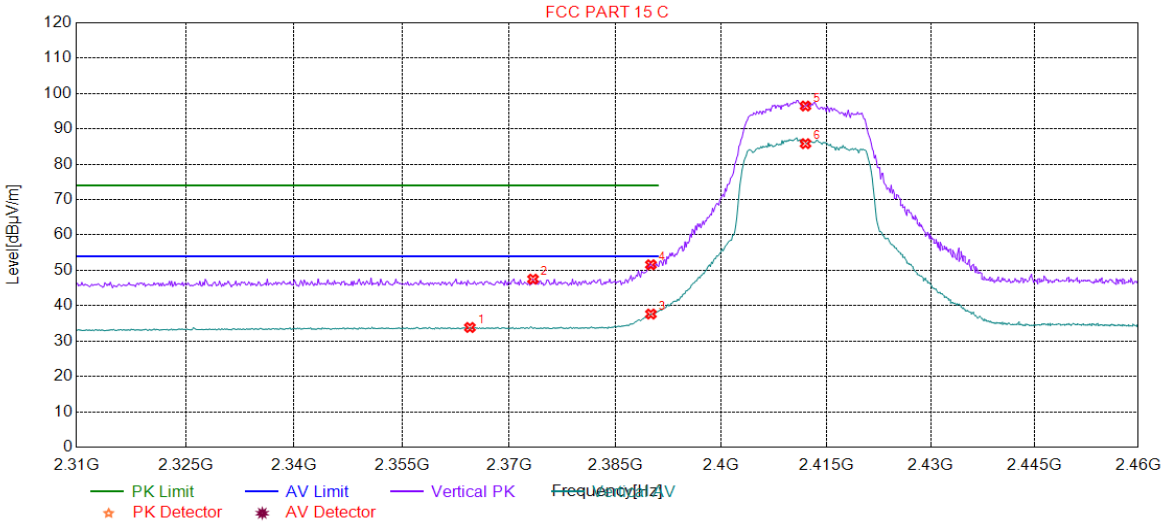
4.10.1.10 802.11N20_Lowest Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2364.50	33.85	7.80	54.00	20.15	226	146	Vertical
2	2373.36	47.52	7.79	74.00	26.48	199	14	Vertical
3	2390.00	37.65	7.77	54.00	16.35	170	241	Vertical
4	2390.00	51.59	7.77	74.00	22.41	150	220	Vertical
5	2412.00	96.46	7.81	0.00	-96.46	234	244	Vertical
6	2412.00	85.83	7.81	0.00	-85.83	200	244	Vertical

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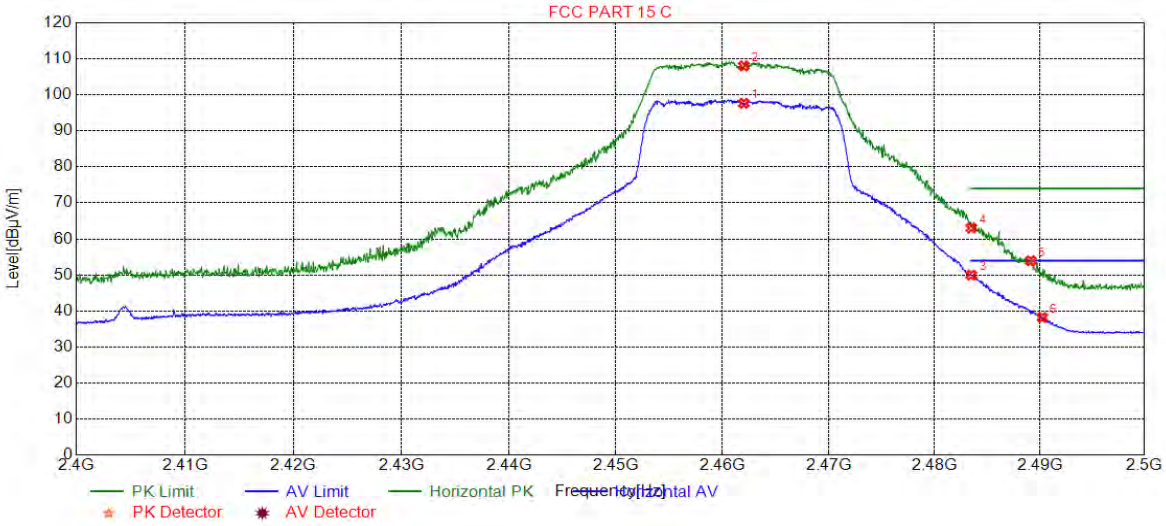
4.10.1.11 802.11N20_ Highest Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	97.65	7.98	0.00	-97.65	220	239	Horizontal
2	2462.00	108.03	7.98	0.00	-108.03	119	239	Horizontal
3	2483.50	49.96	8.01	54.00	4.04	103	233	Horizontal
4	2483.50	63.06	8.01	74.00	10.94	108	222	Horizontal
5	2489.14	53.93	8.02	74.00	20.07	103	239	Horizontal
6	2490.24	38.20	8.02	54.00	15.80	177	239	Horizontal

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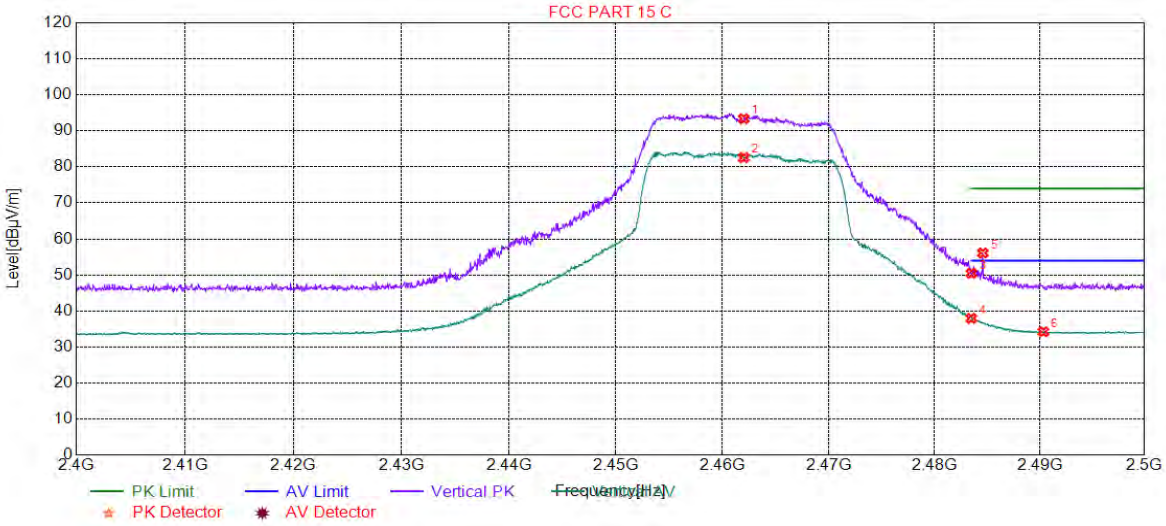
4.10.1.12 802.11N20_ Highest Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	93.37	7.98	0.00	-93.37	216	325	Vertical
2	2462.00	82.57	7.98	0.00	-82.57	208	325	Vertical
3	2483.50	50.45	8.01	74.00	23.55	284	160	Vertical
4	2483.50	37.95	8.01	54.00	16.05	214	325	Vertical
5	2484.59	56.10	8.01	74.00	17.90	218	6	Vertical
6	2490.34	34.25	8.02	54.00	19.75	191	198	Vertical

Remark:
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

All Modes have been tested, but only the worst case data displayed in this report.

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

Lab A:

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

Lab B:

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

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6 Equipment List

RF conducted test					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy-mm-dd)	Cal.Duedate (yyyy-mm-dd)
DC Power Supply	Agilent Technologies Inc	66311B	W009-09	2019/7/15	2020/7/15
Signal Analyzer	Rohde & Schwarz	FSV	W025-05	2020/1/3	2021/1/2
Coaxial Cable	SGS	N/A	SEM031-01	2019/7/12	2020/7/11
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2019/7/14	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	2019/7/14	2021/7/14

CE Test System					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Shielding Room	Brilliant-emc	N/A	XAW03-35-01	2019-09-11	2022-09-10
Test receiver	ROHDE&SCHWARZ	ESR	XAW01-08-01	2019-09-07	2020-09-06
Artificial network	ROHDE&SCHWARZ	ENV216	XAW01-04-01	2019-07-16	2020-07-15
Temperature and humidity meter	MingGao	TH101B	XAW01-01-01	2019-11-28	2020-11-28
Measurement Software	Tonscend	TS+ CE V2.5	XAW02-05-02	NCR	NCR

RSE Test System					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Semi-Anechoic Chamber	Brilliant-emc	N/A	XAW03-35-01	2019-09-11	2022-09-10
MXA signal analyzer	Keysight	N9020A	XAW01-06-01	2020-04-02	2021-04-01
Test receiver	ROHDE&SCHWARZ	ESR	XAW01-08-01	2019-09-07	2020-09-06
Receiving antenna (30MHz-3GHz)	Schwarzbeck	VULB 9163	XAW01-09-01	2019-10-13	2021-10-12
Receiving antenna (1GHz~18GHz)	Schwarzbeck	BBHA 9120D	XAW01-09-02	2019-10-13	2021-10-12
Receiving antenna (15GHz~40GHz)	Schwarzbeck	BBHA 9170	XAW01-09-03	2019-10-13	2021-10-12
Directional antenna rack controller	Max-Full	MF-7802BS	XAW03-03-01	NCR	NCR
High-speed antenna rack controller	Max-Full	MF-7802	XAW03-04-01	NCR	NCR
Filter bank	Tonscend	JS0806-F	XAW03-05-01	NCR	NCR

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Filter bank	Tonscend	JS0806s	XAW03-05-02	NCR	NCR
Amplifier	Tonscend	TAP00903040	XAW01-41-01	2019-11-18	2020-11-17
Amplifier	Tonscend	TAP01018048	XAW01-41-02	2019-11-18	2020-11-17
Amplifier	Tonscend	TAP18040048	XAW01-41-03	2019-12-03	2020-12-02
Amplifier	Shanghai Steed	YX28980930	XAW01-41-06	2019-11-18	2020-11-17
Temperature and humidity meter	MingGao	TH101B	XAW01-01-01	2019-11-18	2020-11-17
Measurement Software	Tonscend	TS+ RSE V3.0.0.2	XAW02-05-01	NCR	NCR

7 Photographs - EUT Constructional Details

Refer to Appendix A - Photographs of Set-Up for ZR/2020/50007.

The End

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