FCC TEST REPORT

Application No:	ZR/2019/50026
Applicant:	TCL Communication Ltd.
Address of Applicant	7/F, Block F4, TCL Communication Technology Building, TCL International E City, Zhong Shan Yuan Road, Nanshan District, Shenzhen, Guangdong, P.R. China 518052
Manufacturer:	TCL Communication Ltd.
Address of Manufacturer	7/F, Block F4, TCL Communication Technology Building, TCL International E City, Zhong Shan Yuan Road, Nanshan District, Shenzhen, Guangdong, P.R. China 518052
EUT Description:	HSUPA/HSDPA/UMTS quad band /GSM quad band mobile phone
Model No.:	4034T
Trade Mark:	alcatel
FCC ID:	2ACCJH106
Standards:	47 CFR FCC Part 2, Subpart J 47 CFR Part 15, Subpart C
Test Method	KDB558074 D01 15.247 Meas Guidance v05 ANSI C63.10 (2013)
Date of Receipt:	2019/5/21
Date of Test:	2019/5/22 to 2019/6/10
Date of Issue:	2019/6/10
Test Result:	**PASS ***

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

Derek Yang

Wireless Laboratory Manager

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1 Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
00		2019/6/10		Original

Authorized for issue by:				
Tested By		Mike Hu **(Mike Hu) /Project Engineer**		2019/6/10 **Date**
Checked By		David Chen **(David Chen) /Reviewer**		2019/6/10 **Date**

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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

Applicant:	TCL Communication Ltd.
Address of Applicant:	7/F, Block F4, TCL Communication Technology Building, TCL International E City, Zhong Shan Yuan Road, Nanshan District, Shenzhen, Guangdong, P.R. China 518052
Manufacturer:	TCL Communication Ltd.
Address of Manufacturer:	7/F, Block F4, TCL Communication Technology Building, TCL International E City, Zhong Shan Yuan Road, Nanshan District, Shenzhen, Guangdong, P.R. China 518052

3.2 Test Location

Company:	SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch
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3.3 Test Facility

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

• CNAS (No. CNAS L2929)

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 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::	HSUPA/HSDPA/UMTS quad band /GSM quad band mobile phone
Model No.:	4034T
Trade Mark:	alcatel
Hardware Version:	PIO
Software Version:	vAK52
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:	☐ External, ☒ Integrated
Antenna Ports	☒ Ant 1, ☐ Ant 2, ☐ Ant 3
Smart System	☒ SISO (for 802.11B/G/N), ☐ MIMO (for 802.11N): 2 Tx & 2 Rx, ☐ Diversity (for 802.11B/G) : Tx & Rx
Antenna Gain:	2dBi
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 2dBi.	

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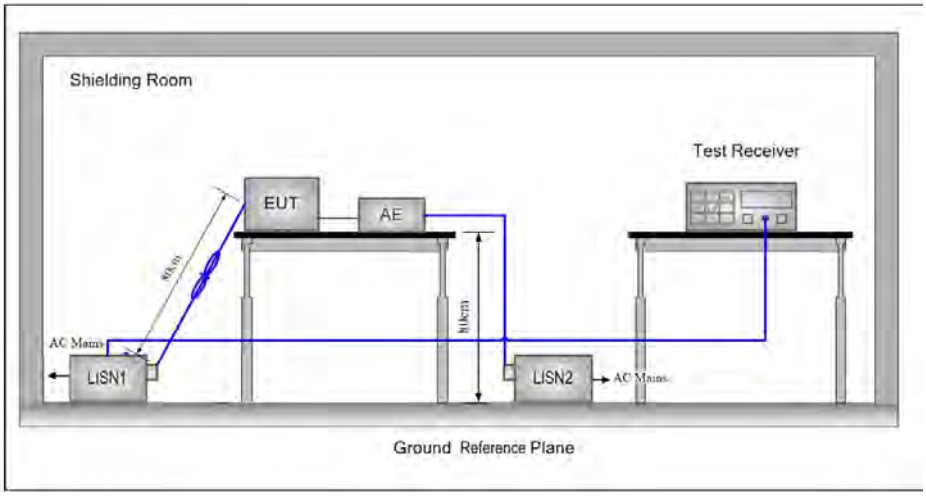
Test Setup:	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates at lowest, middle and highest channel. Charge + Transmitting mode.
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate of 802.11B at lowest channel is the worst case. Charge + Transmitting mode. Only the worst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

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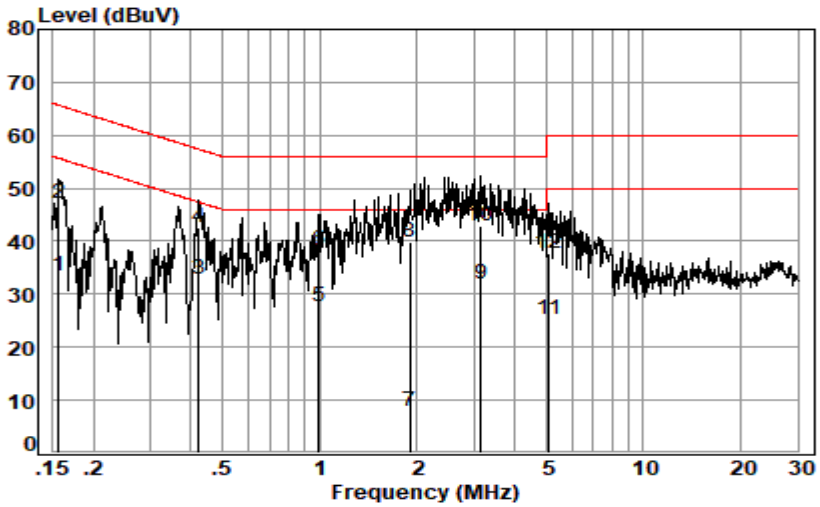
Measurement Data

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:



Site : Shielding Room
Condition: Line
Job No. : 14418CR
Test mode: g

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.1565	0.01	9.66	23.78	33.45	55.65	-22.20	Average
2	0.1565	0.01	9.66	37.62	47.29	65.65	-18.36	QP
3	0.4237	0.05	9.67	22.99	32.71	47.37	-14.66	Average
4	0.4237	0.05	9.67	32.86	42.58	57.37	-14.79	QP
5	0.9944	0.09	9.74	17.81	27.64	46.00	-18.36	Average
6	0.9944	0.09	9.74	28.41	38.24	56.00	-17.76	QP
7	1.8979	0.15	9.72	-1.91	7.96	46.00	-38.04	Average
8	1.8979	0.15	9.72	30.09	39.96	56.00	-16.04	QP
9	3.1563	0.16	9.71	22.18	32.05	46.00	-13.95	Average
10	3.1563	0.16	9.71	33.07	42.94	56.00	-13.06	QP
11	5.1118	0.17	9.74	15.47	25.38	50.00	-24.62	Average
12	5.1118	0.17	9.74	27.93	37.84	60.00	-22.16	QP

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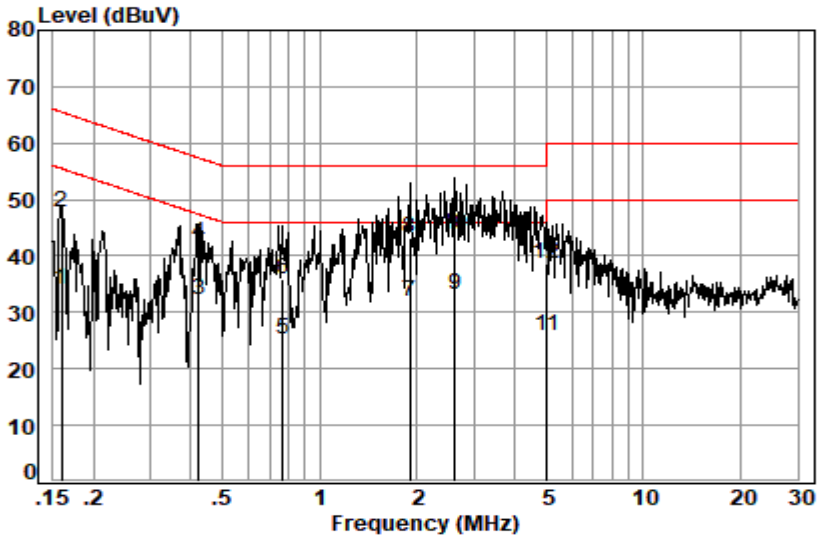
Neutral Line:



Site : Shielding Room
Condition: Neutral
Job No. : 14418CR
Test mode: g

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.1590	0.01	9.63	24.31	33.95	55.52	-21.57	Average
2	0.1590	0.01	9.63	38.02	47.66	65.52	-17.86	QP
3	0.4237	0.05	9.65	22.44	32.14	47.37	-15.23	Average
4	0.4237	0.05	9.65	32.48	42.18	57.37	-15.19	QP
5	0.7670	0.08	9.69	15.55	25.32	46.00	-20.68	Average
6	0.7670	0.08	9.69	26.28	36.05	56.00	-19.95	QP
7	1.8979	0.15	9.69	22.10	31.94	46.00	-14.06	Average
8	1.8979	0.15	9.69	33.24	43.08	56.00	-12.92	QP
9	2.6221	0.16	9.68	23.33	33.17	46.00	-12.83	Average
10	2.6221	0.16	9.68	34.11	43.95	56.00	-12.05	QP
11	5.0312	0.17	9.71	16.04	25.92	50.00	-24.08	Average
12	5.0312	0.17	9.71	28.66	38.54	60.00	-21.46	QP

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

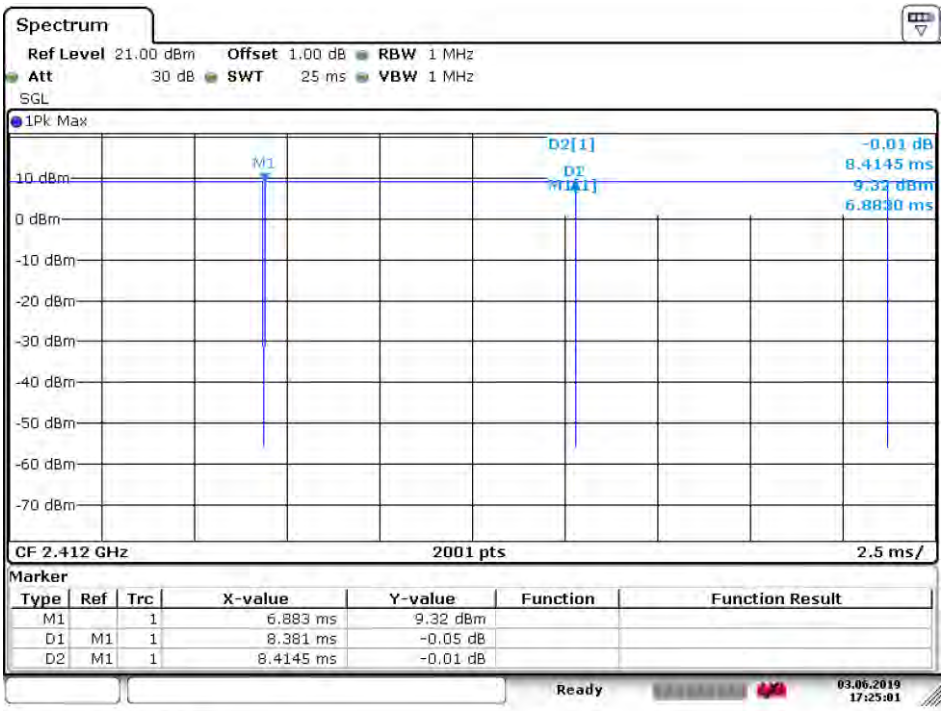
4.3.1 Test Results

Test Mode	TX Freq. [MHz]	Duty cycle [%]
11B	Ant 1: CH1	99.64
11G	Ant 1: CH1	95.63
11N20	Ant 1: CH1	95.83
11N40	Ant 1: CH3	89.23

4.3.1 Test Plots

4.3.1.1 ANT1

4.3.1.1.1 11B



Date: 3.JUN.2019 17:25:01

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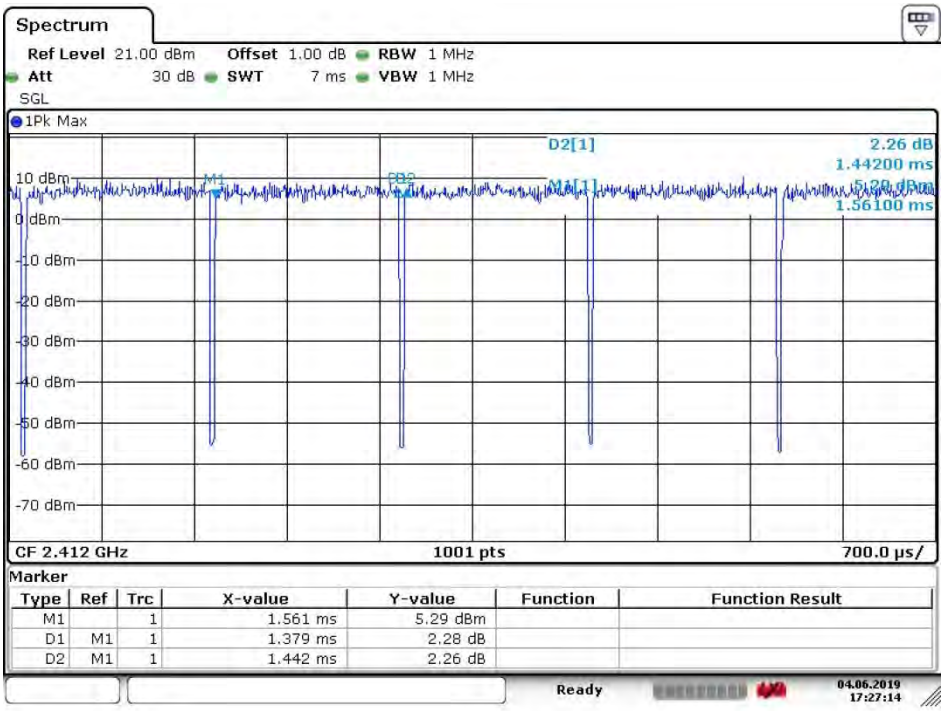
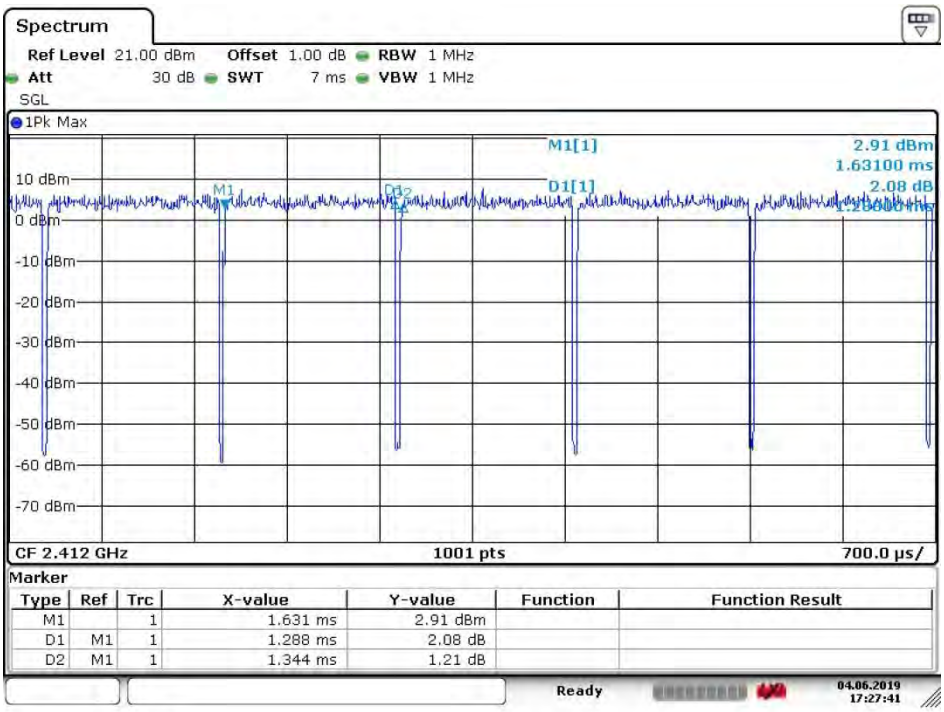
4.3.1.1.2 11G



Date: 4.JUN.2019 17:27:14

4.3.1.1.3 11N20



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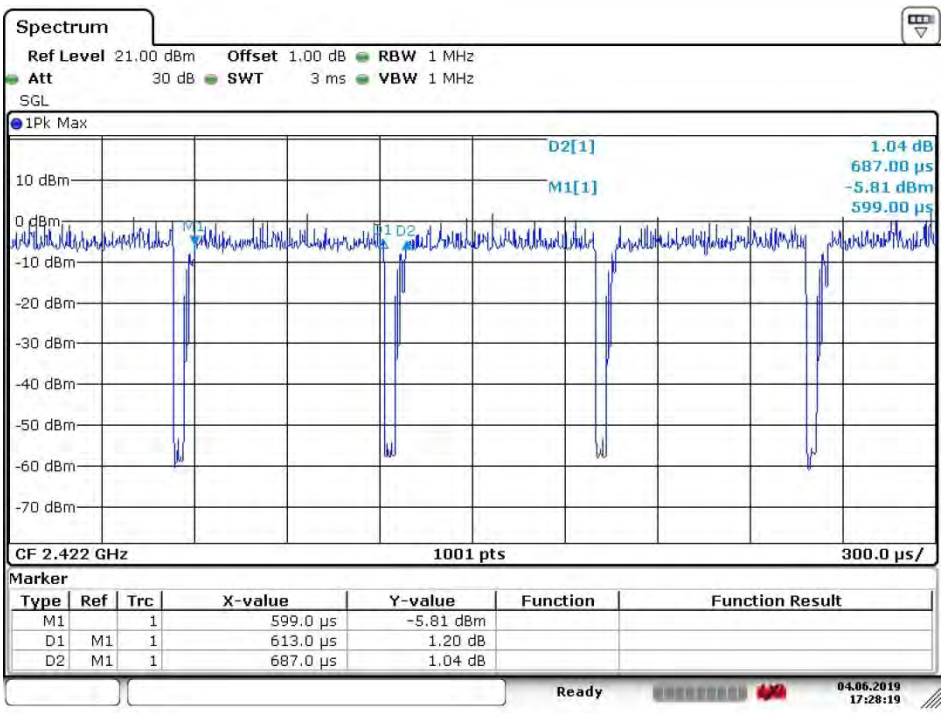
4.3.1.1.4 11N40



Date: 4.JUN.2019 17:28:19

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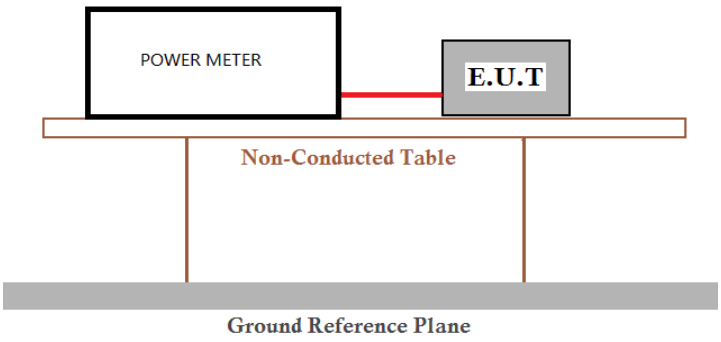
4.4 Conducted Output Power

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)	Result
802.11B	Lowest	17.51	Report purpose only
	Middle	17.53	Report purpose only
	Highest	17.25	Report purpose only
802.11G	Lowest	14.61	Report purpose only
	Middle	14.29	Report purpose only
	Highest	14.10	Report purpose only
802.11N20	Lowest	13.24	Report purpose only
	Middle	13.70	Report purpose only
	Highest	13.71	Report purpose only
802.11N40	Lowest	11.82	Report purpose only
	Middle	11.48	Report purpose only
	Highest	11.50	Report purpose only

Measurement Data of Peak Power:

Mode	Test Channel	Peak Output Power (dBm)	Limit (dBm)	Result
802.11B	Lowest	20.66	30.00	Pass
	Middle	20.90	30.00	Pass
	Highest	20.94	30.00	Pass
802.11G	Lowest	21.75	30.00	Pass
	Middle	21.93	30.00	Pass
	Highest	21.42	30.00	Pass
802.11N20	Lowest	20.74	30.00	Pass
	Middle	20.75	30.00	Pass
	Highest	20.82	30.00	Pass
802.11N40	Lowest	19.25	30.00	Pass
	Middle	19.41	30.00	Pass
	Highest	18.54	30.00	Pass

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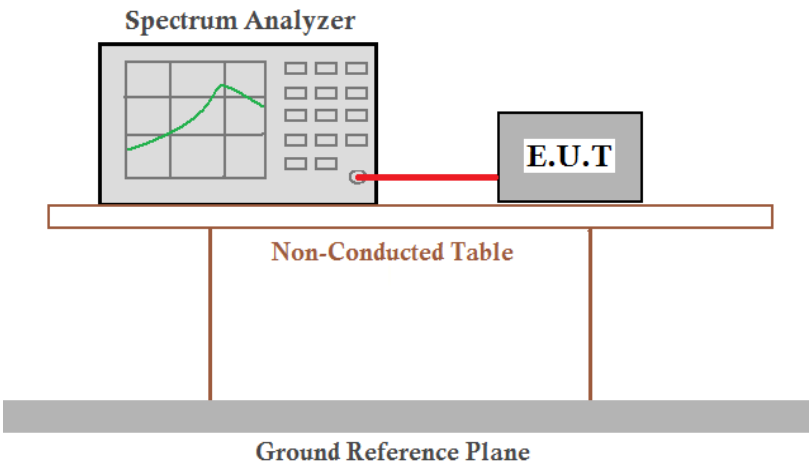
4.5 DTS (6 dB) Bandwidth & 99% Occupied Bandwidth

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	9.59	≥500	Pass
	Middle	13.27	10.11	≥500	Pass
	Highest	13.59	10.07	≥500	Pass
802.11G	Lowest	16.94	15.19	≥500	Pass
	Middle	17.18	15.15	≥500	Pass
	Highest	17.06	15.15	≥500	Pass
802.11N20	Lowest	17.78	15.15	≥500	Pass
	Middle	17.94	15.15	≥500	Pass
	Highest	17.86	15.35	≥500	Pass
802.11N40	Lowest	36.12	35.41	≥500	Pass
	Middle	36.20	35.25	≥500	Pass
	Highest	36.20	35.25	≥500	Pass

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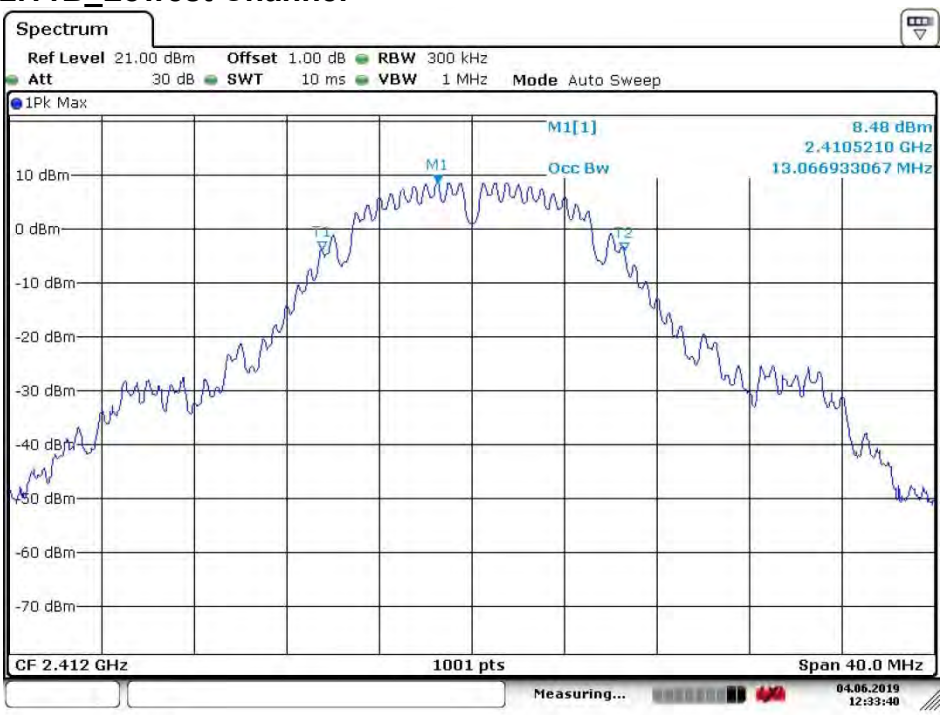
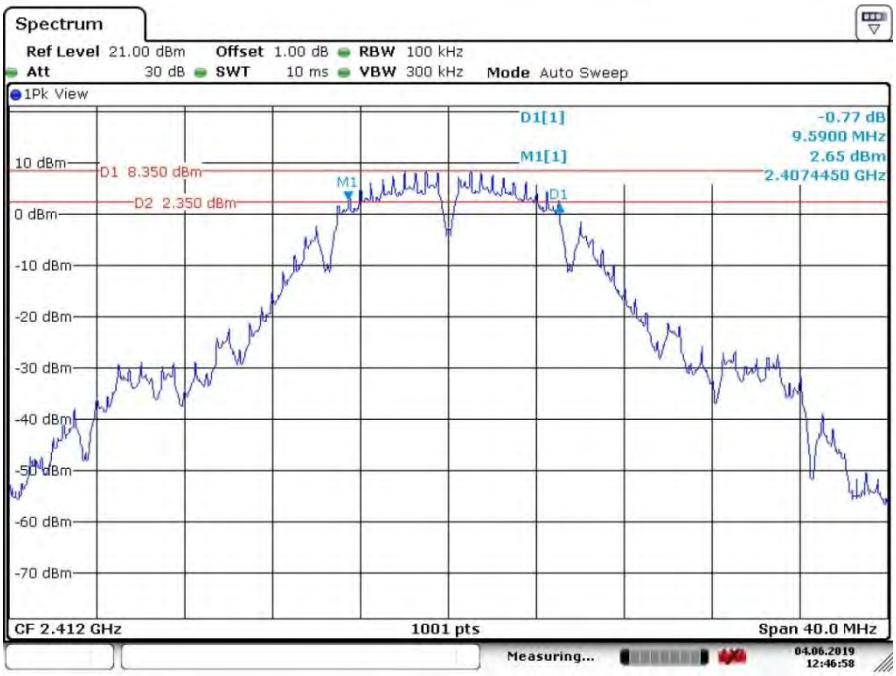
4.5.2 Test plots

4.5.2.1 ANT1

4.5.2.1.1 802.11B_Lowest Channel



Date: 4.JUN.2019 12:33:40



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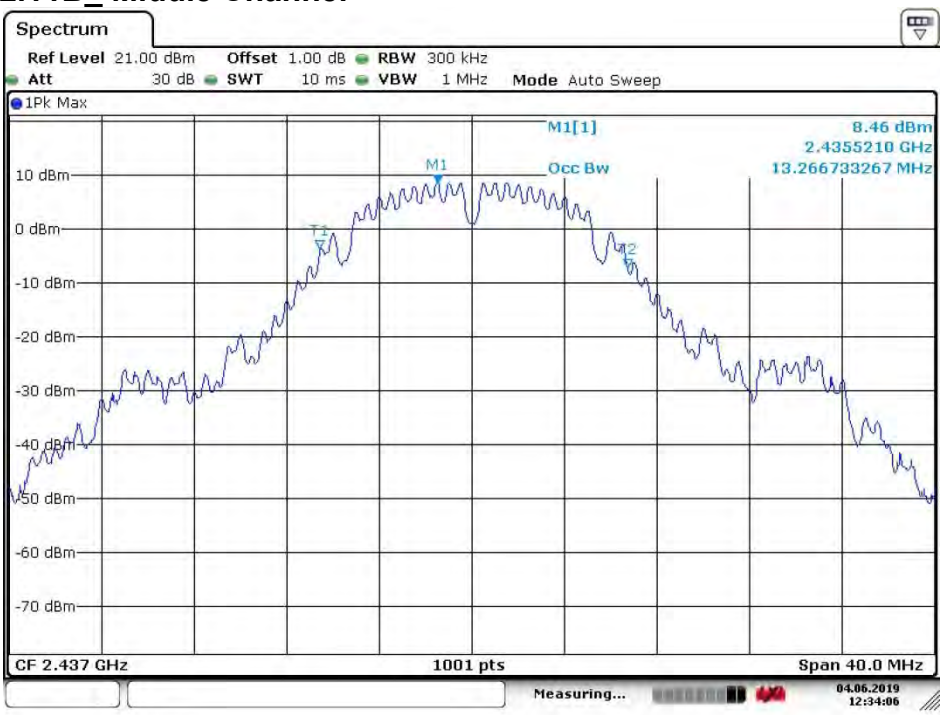
4.5.2.1.2 802.11B_ Middle Channel



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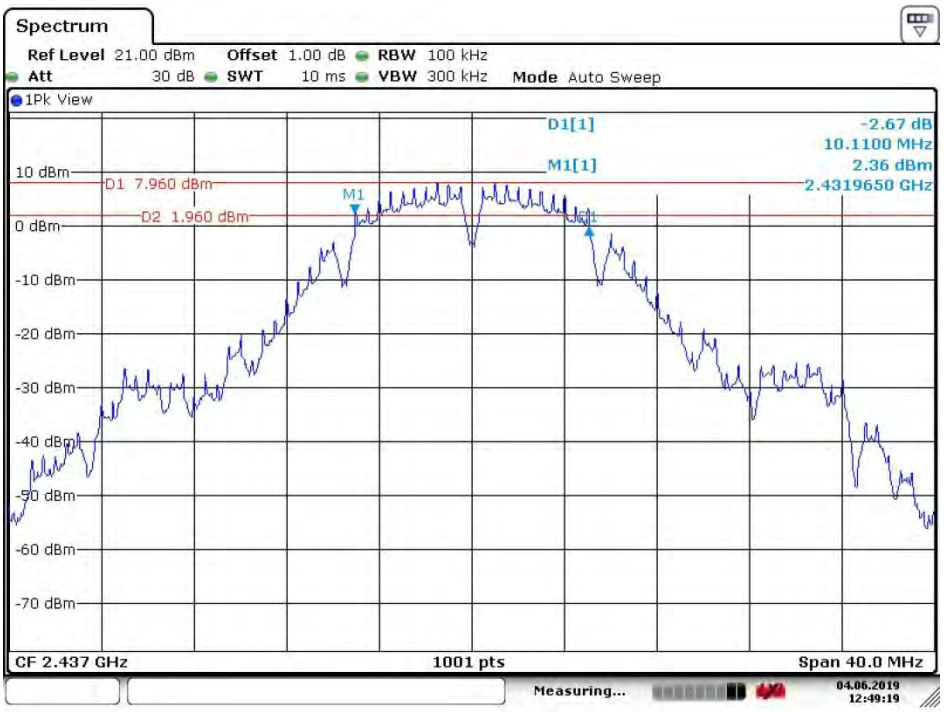

Date: 4.JUN.2019 12:49:19

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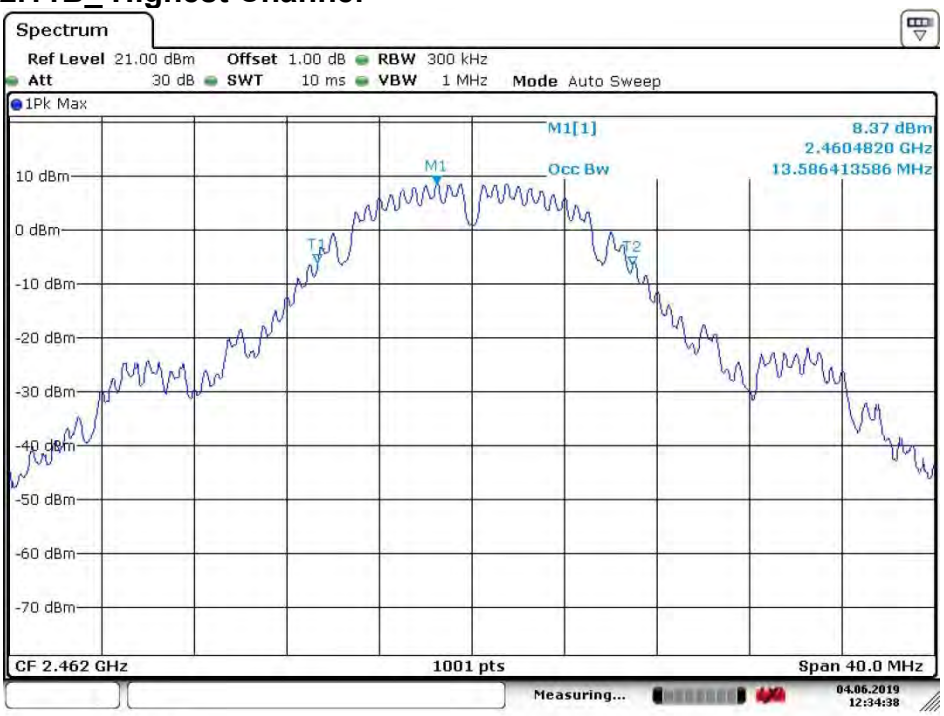
4.5.2.1.3 802.11B_ Highest Channel



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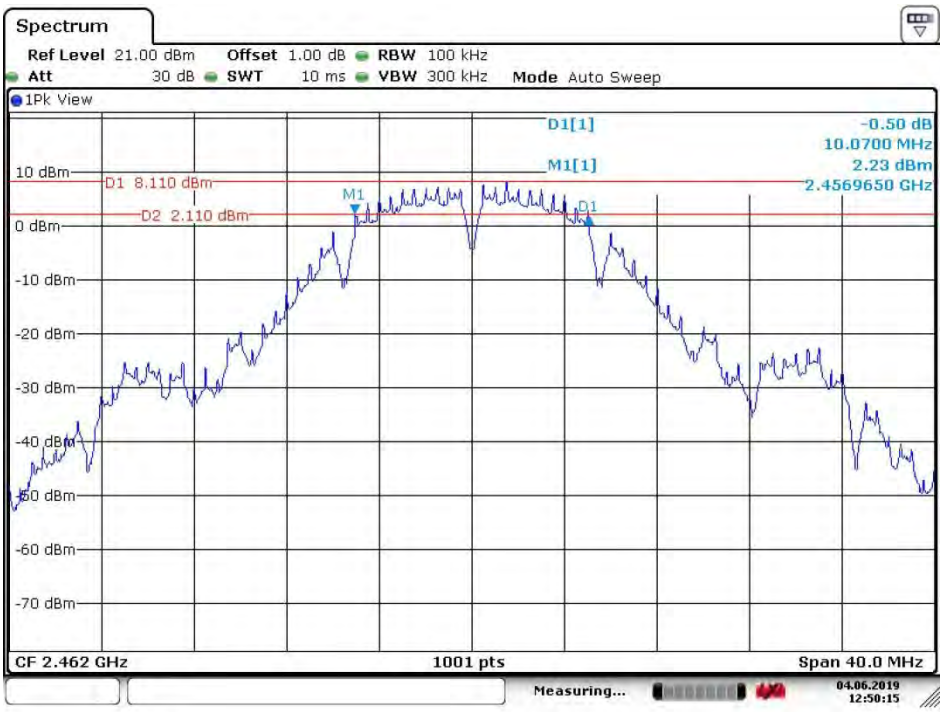

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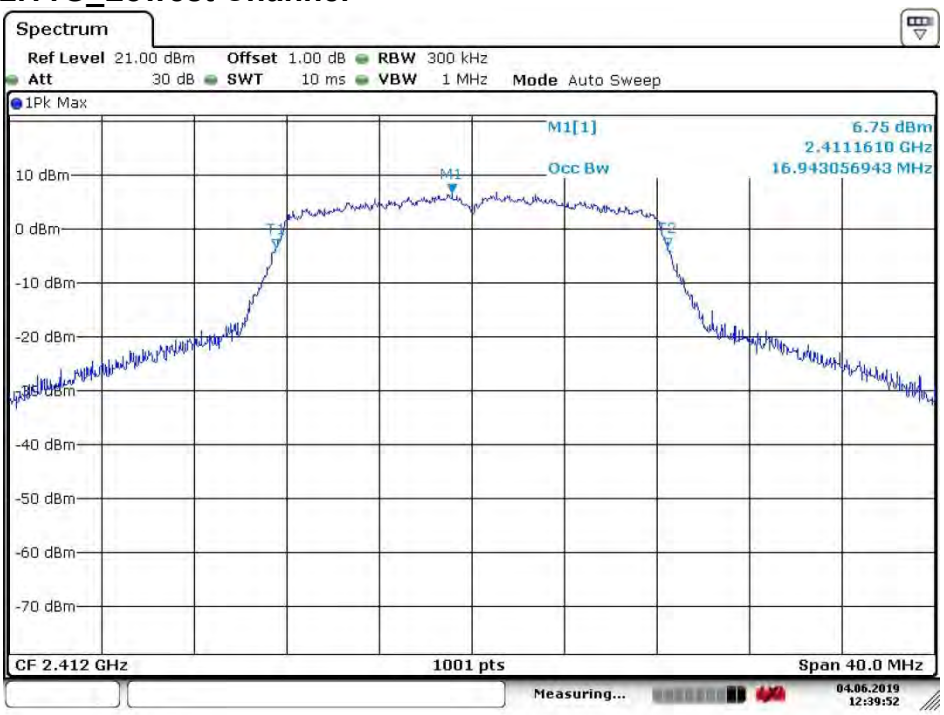
4.5.2.1.4 802.11G_Lowest Channel



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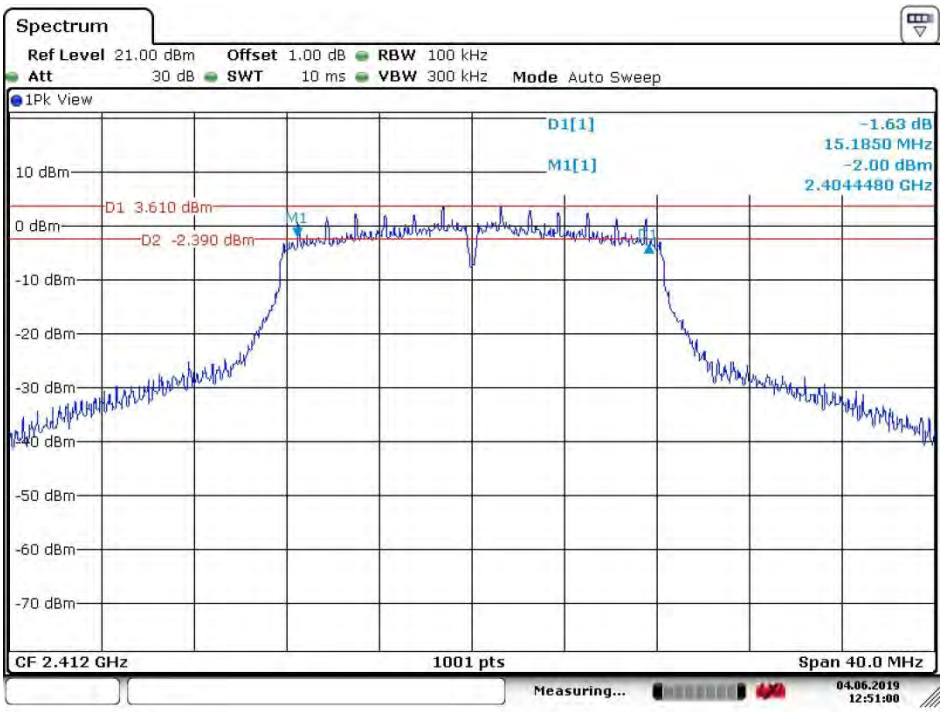

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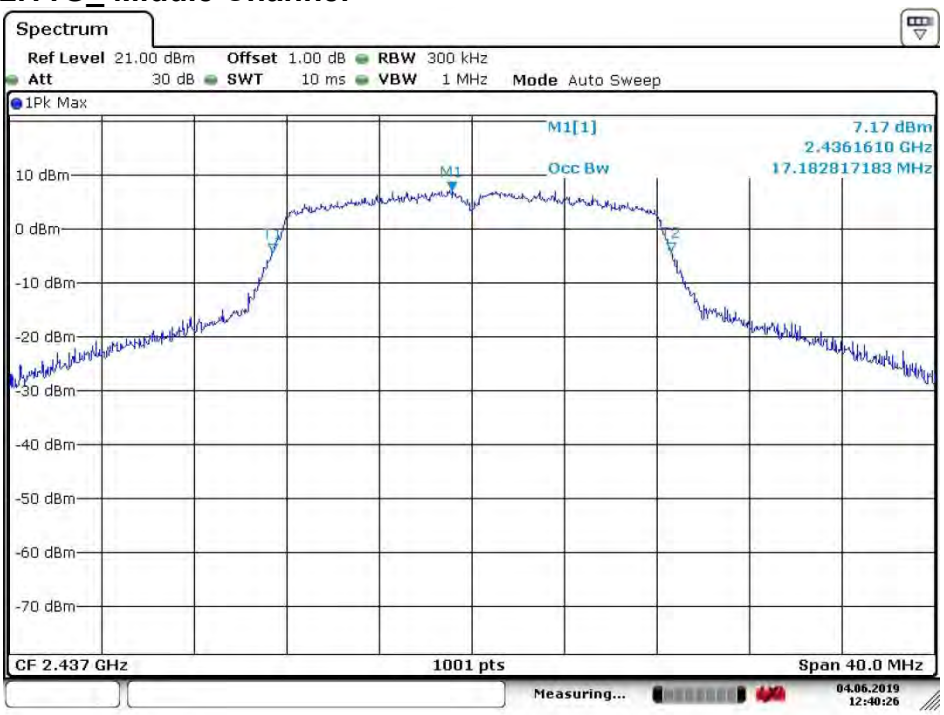
4.5.2.1.5 802.11G_ Middle Channel



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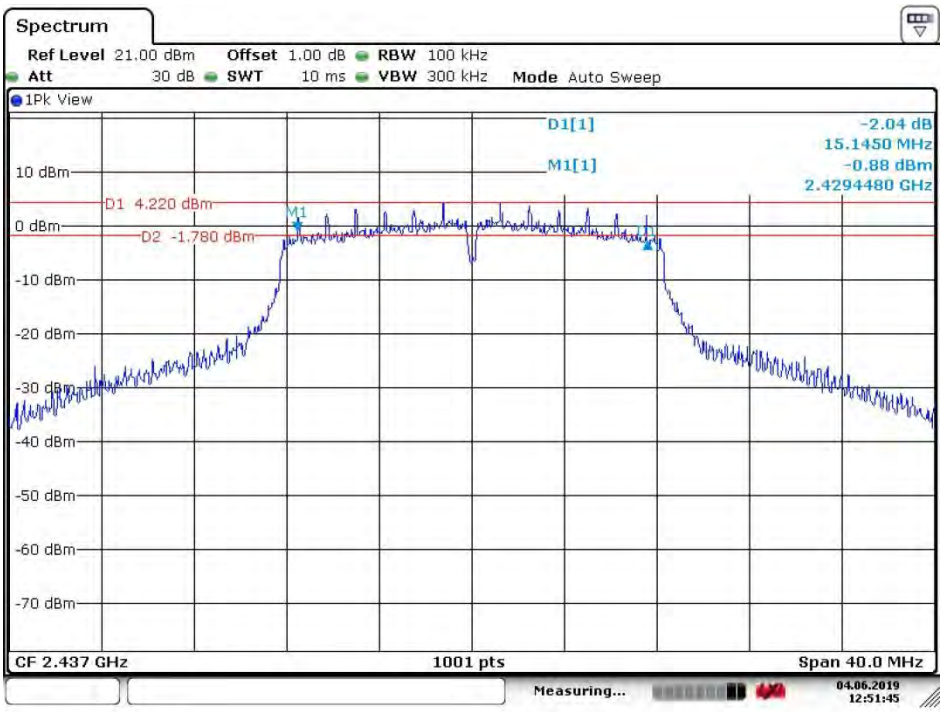

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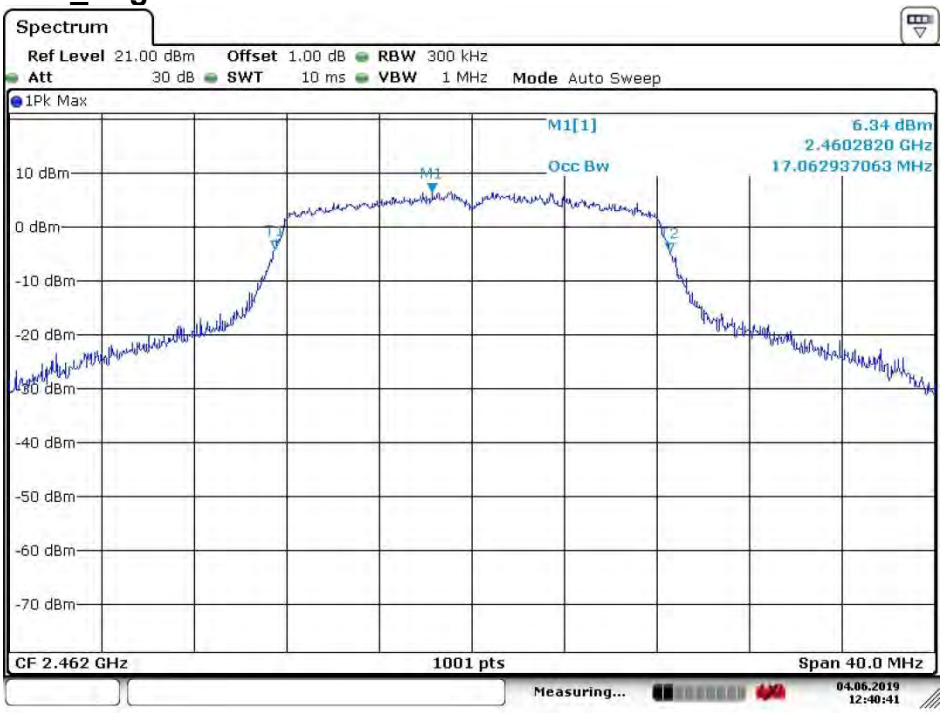
4.5.2.1.6 802.11G_ Highest Channel



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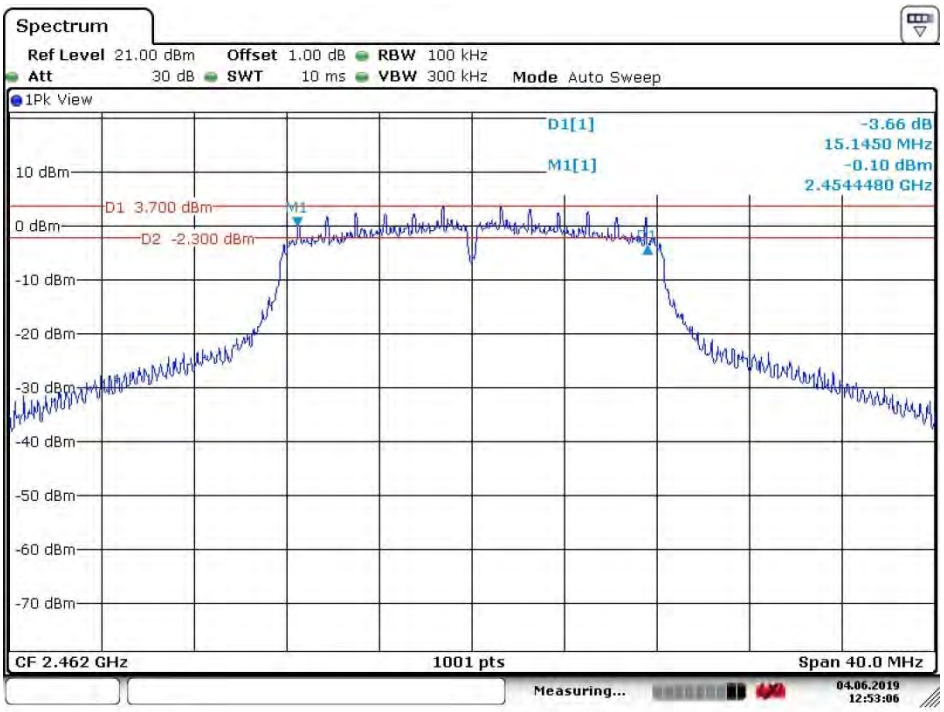

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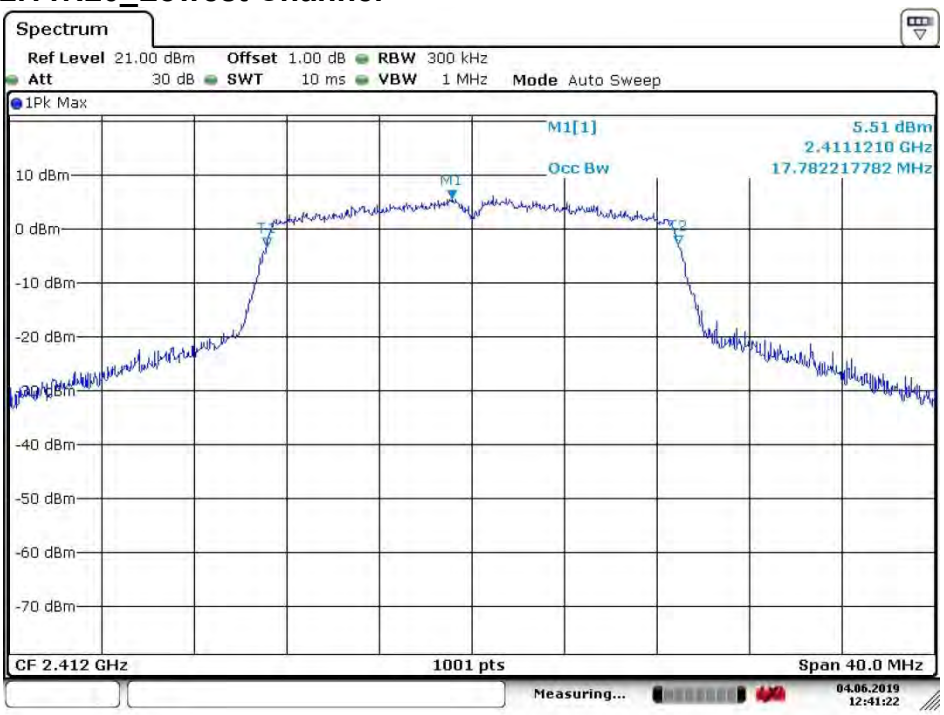
4.5.2.1.7 802.11N20_Lowest Channel



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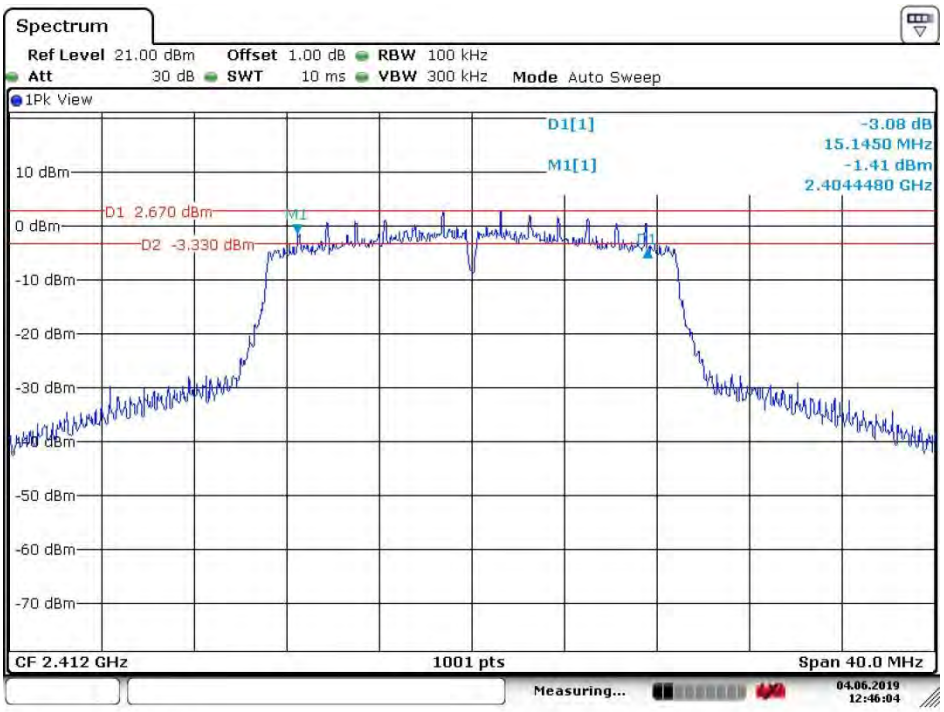

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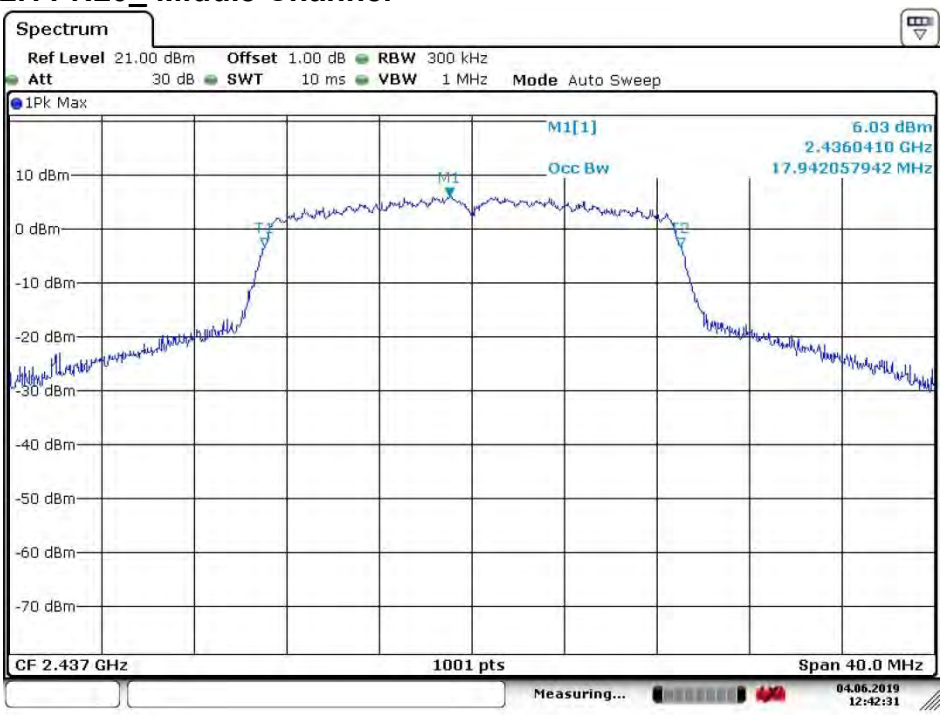
4.5.2.1.8 802.11 N20_ Middle Channel



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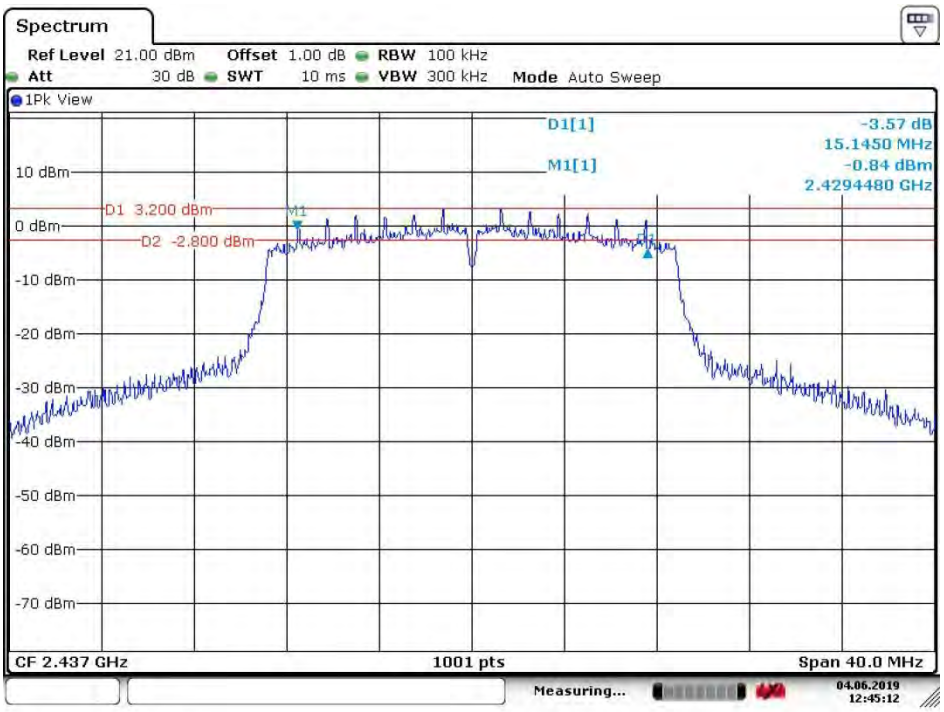

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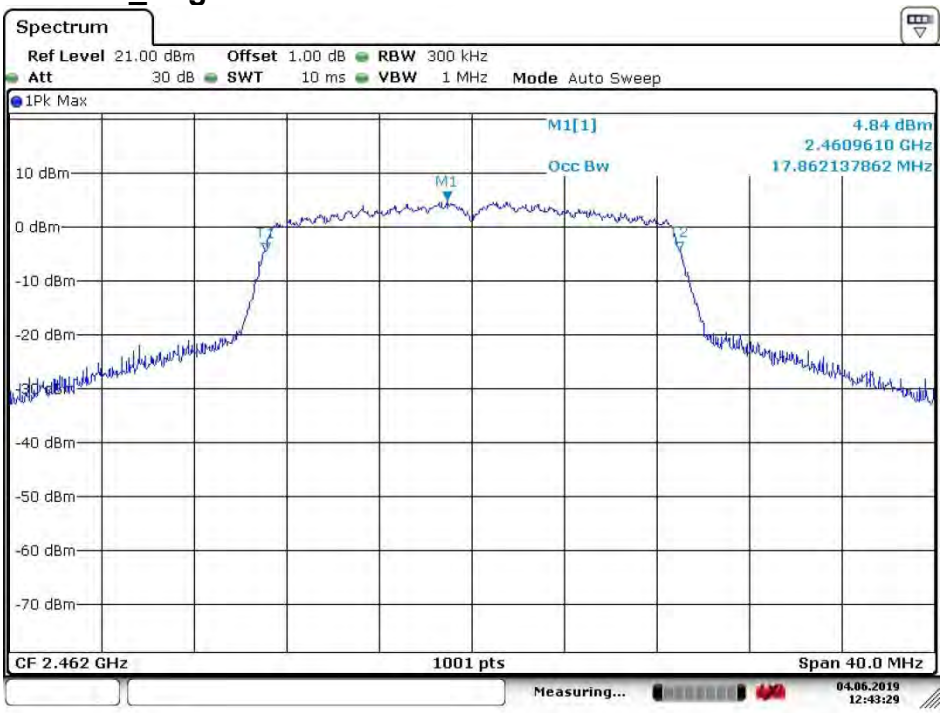
4.5.2.1.9 802.11 N20_ Highest Channel



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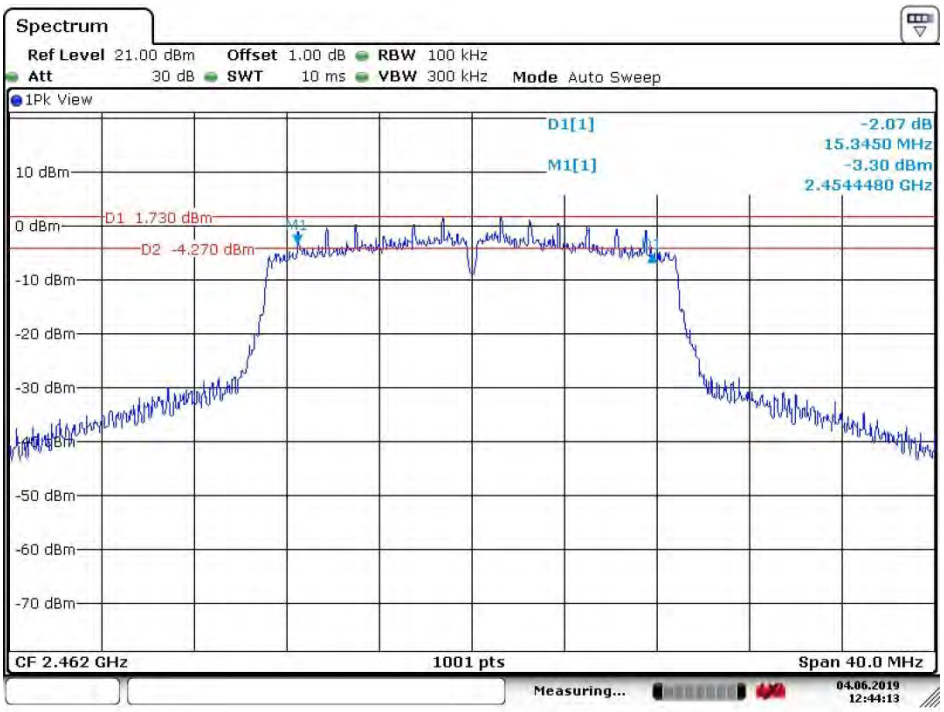

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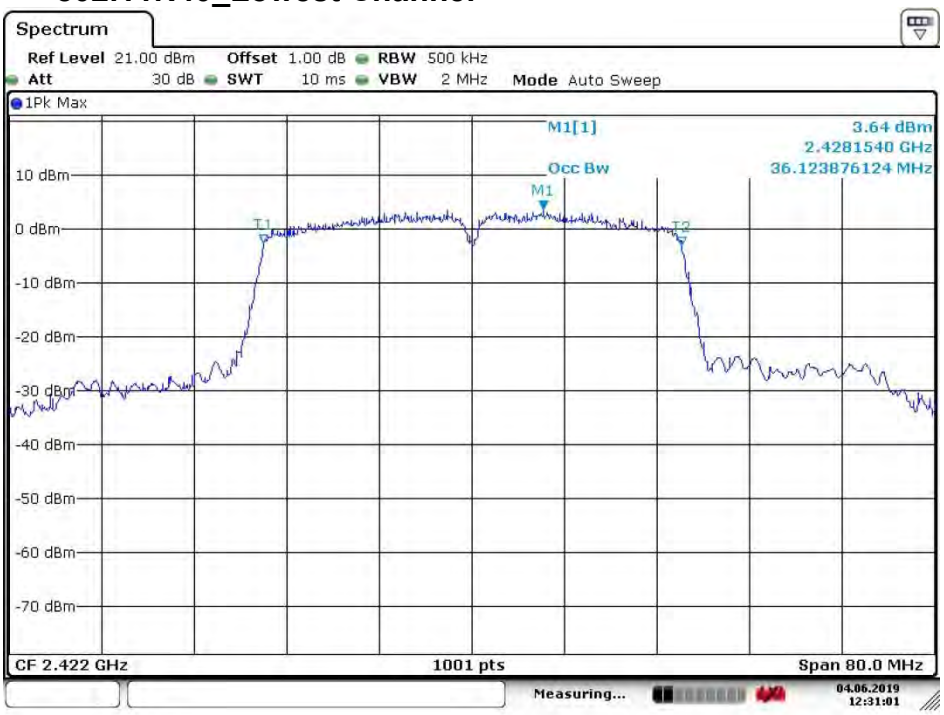
4.5.2.1.10 802.11N40_Lowest Channel



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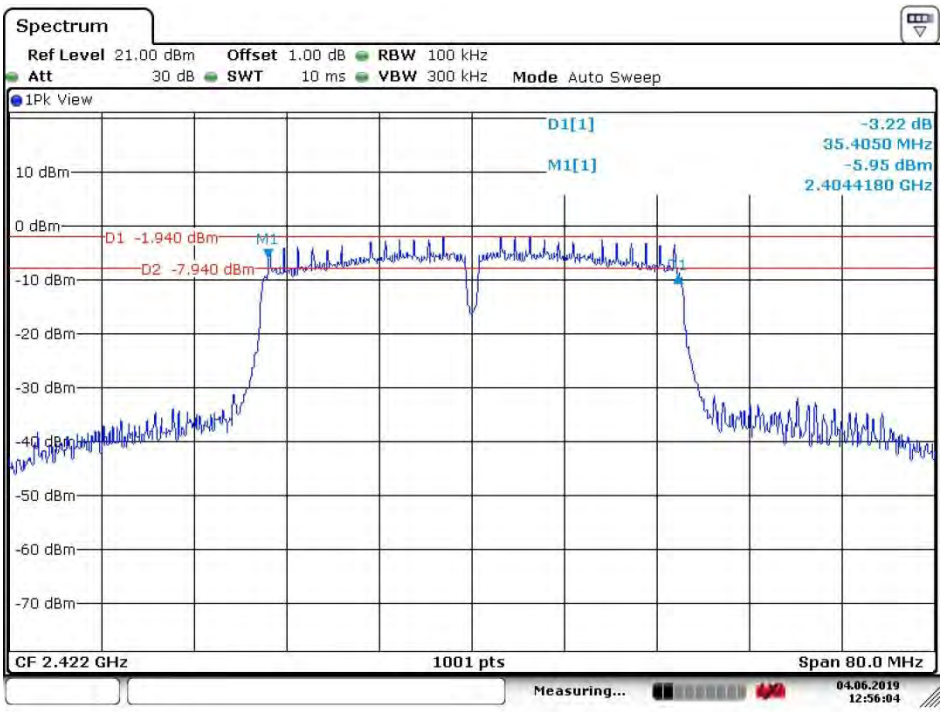

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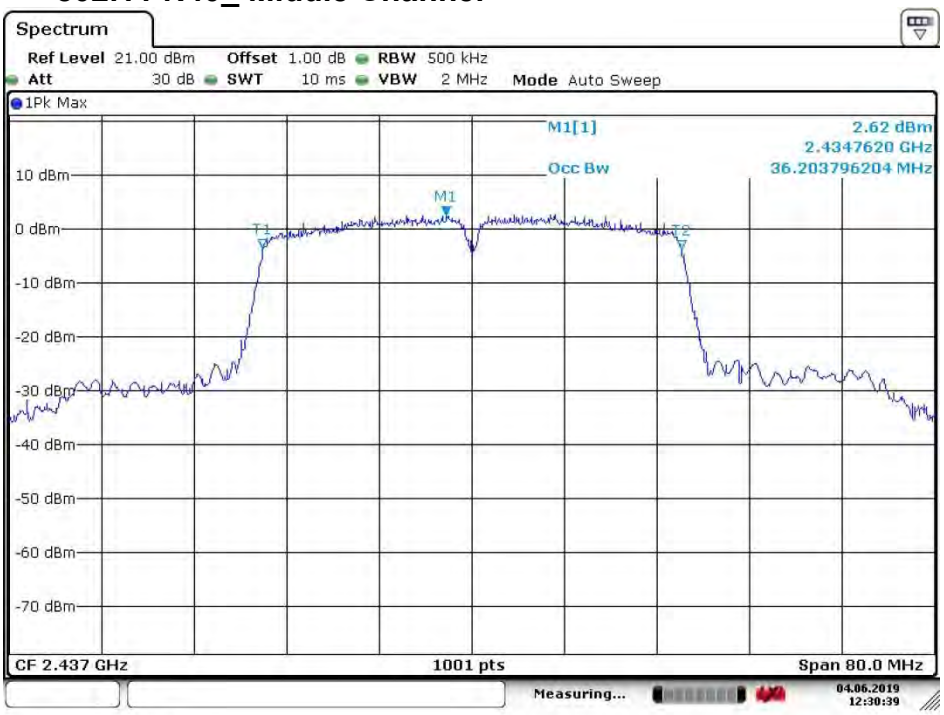
4.5.2.1.11 802.11 N40_ Middle Channel



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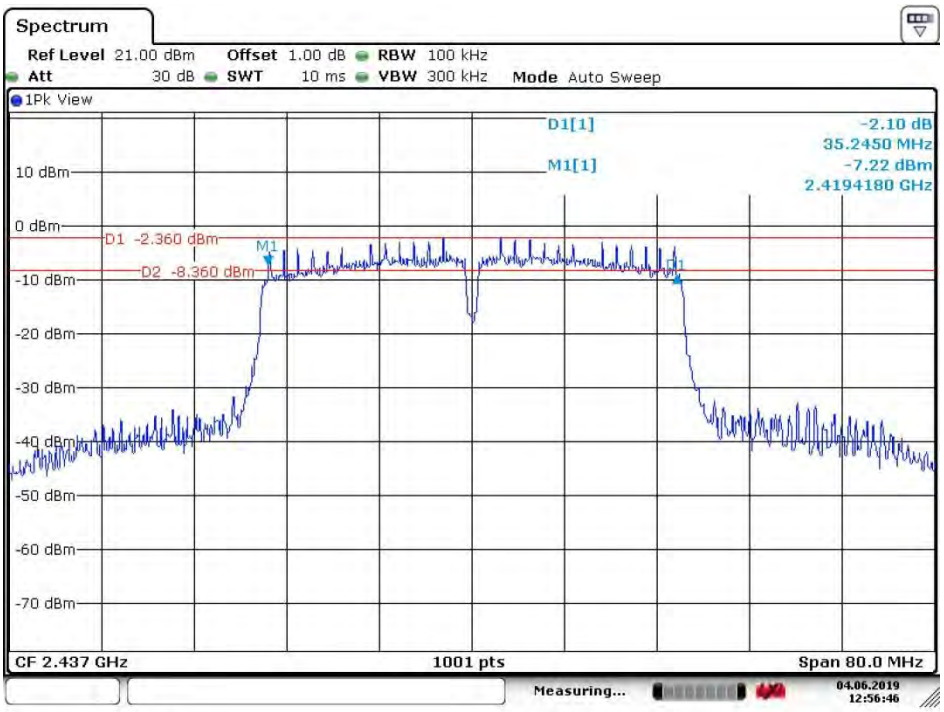

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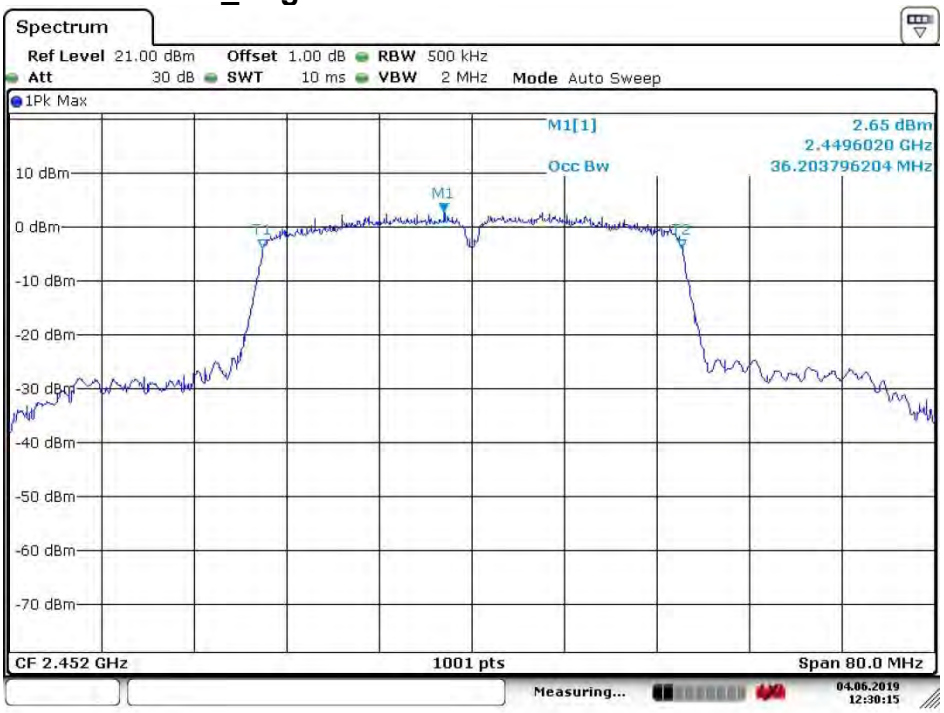
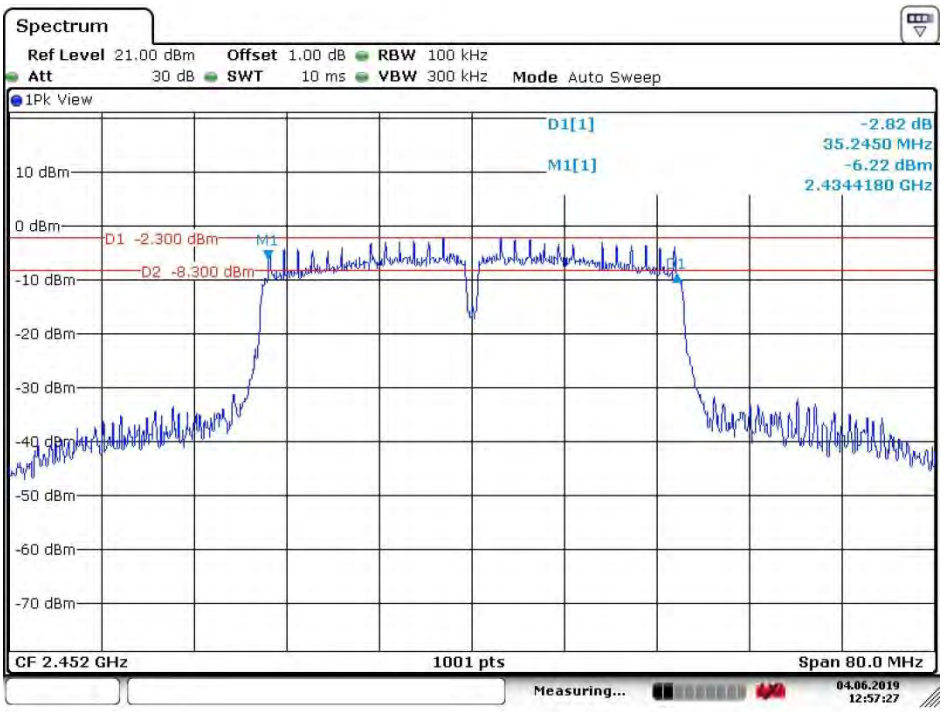
4.5.2.1.12 802.11 N40_ Highest Channel



Date: 4.JUN.2019 12:30:15



Date: 4.JUN.2019 12:57:27

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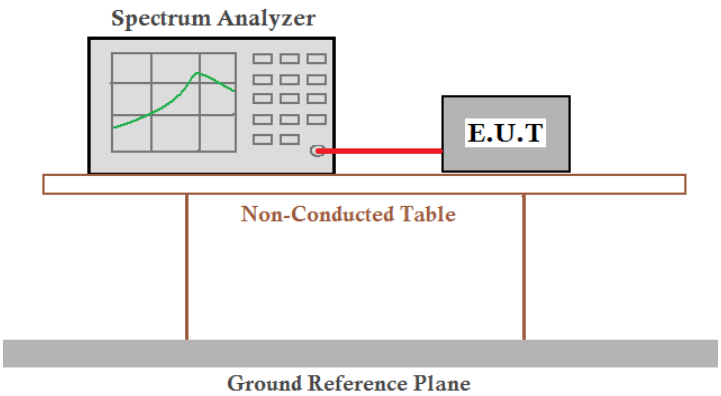
4.6 Power Spectral Density

Test Requirement:	47 CFR Part 15C Section 15.247 (e)
Test Method:	ANSI C63.10 :2013 Section 11.10.2
Test Setup:	
Test Instruments:	Refer to section 5.10 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11B; 6Mbps of rate is the worst case of 802.11G ; 6.5Mbps of rate is the worst case of 802.11N(HT20); 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	-4.58	≤8.00	Pass
	Middle	-5.94	≤8.00	Pass
	Highest	-5.85	≤8.00	Pass
802.11G	Lowest	-7.69	≤8.00	Pass
	Middle	-8.57	≤8.00	Pass
	Highest	-8.06	≤8.00	Pass
802.11N20	Lowest	-10.12	≤8.00	Pass
	Middle	-10.37	≤8.00	Pass
	Highest	-10.93	≤8.00	Pass
802.11N40	Lowest	-14.27	≤8.00	Pass
	Middle	-14.37	≤8.00	Pass
	Highest	-15.80	≤8.00	Pass

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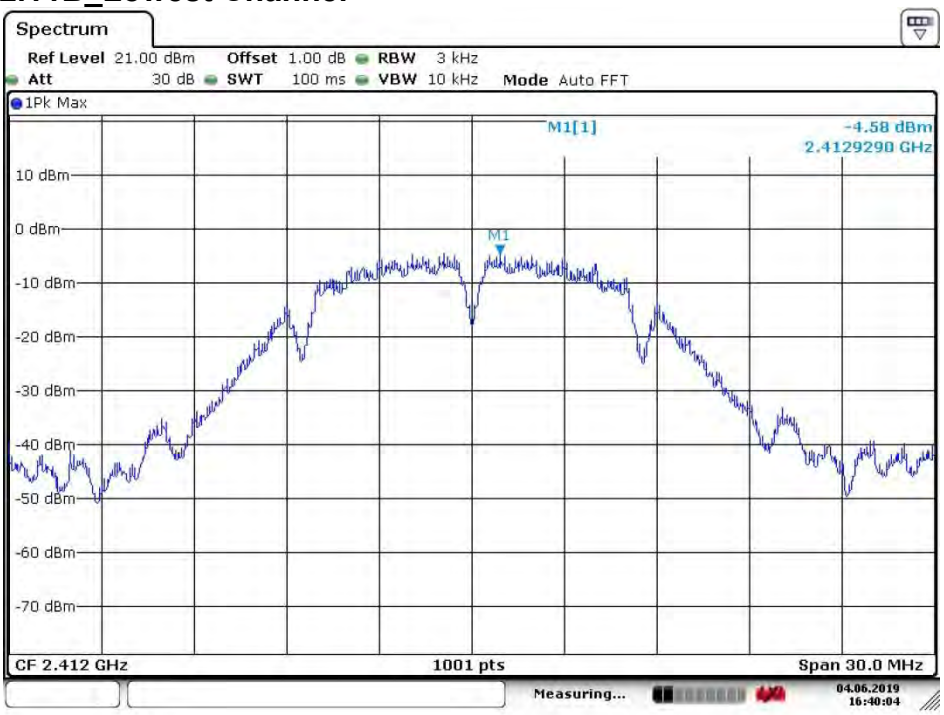
4.6.2 Test plots

4.6.2.1 ANT1

4.6.2.1.1 802.11B_Lowest Channel



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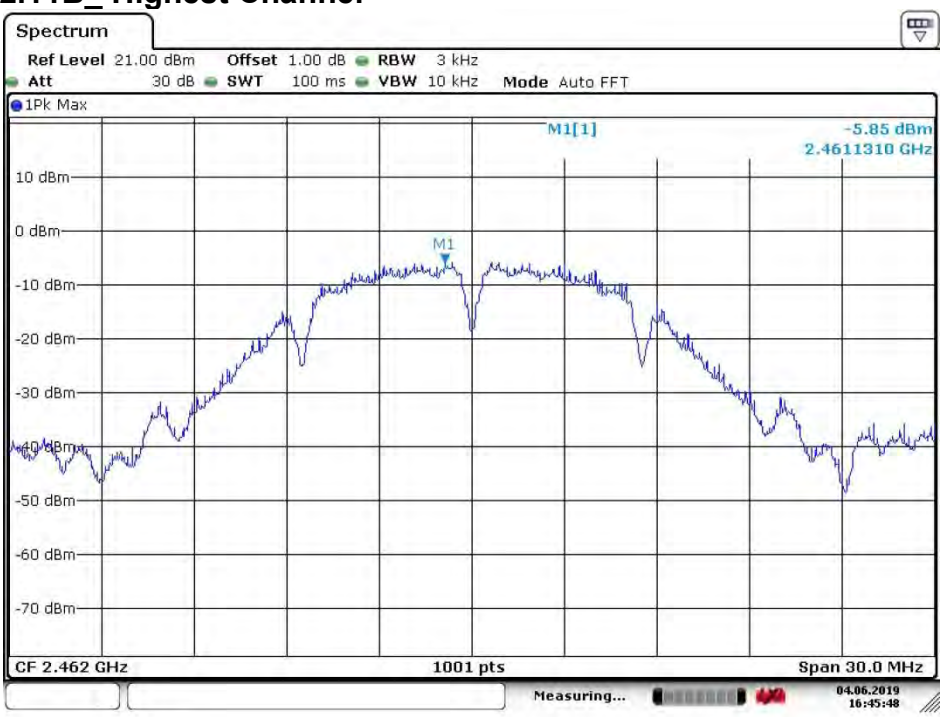
4.6.2.1.2 802.11B_ Middle Channel

Date: 4.JUN.2019 16:45:22

4.6.2.1.3 802.11B_ Highest Channel



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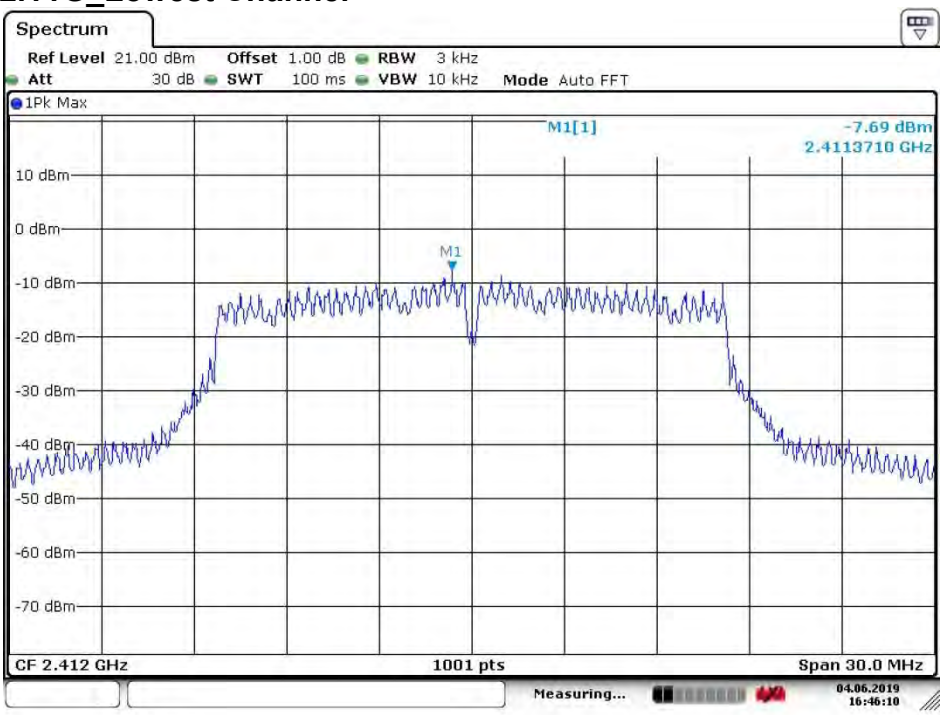
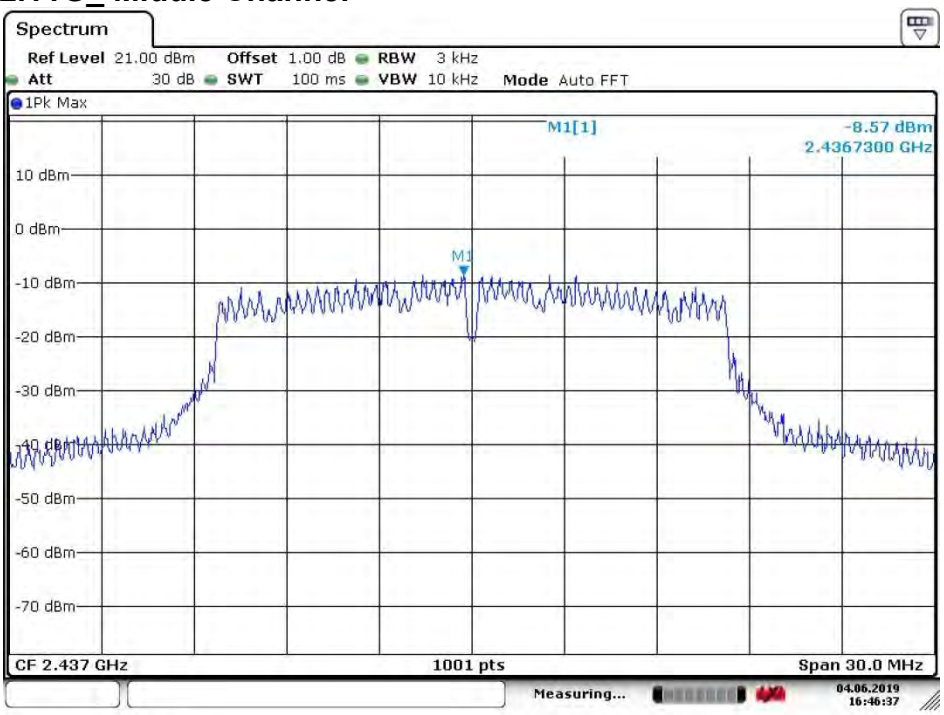
4.6.2.1.4 802.11G_Lowest Channel



Date: 4.JUN.2019 16:46:11

4.6.2.1.5 802.11G_ Middle Channel



Date: 4.JUN.2019 16:46:38

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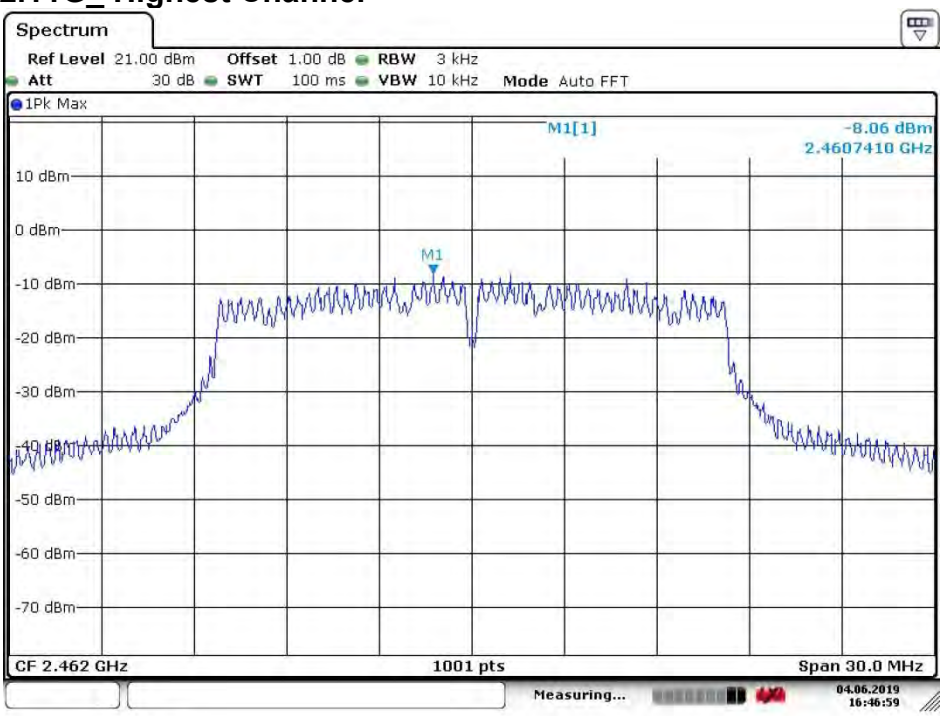
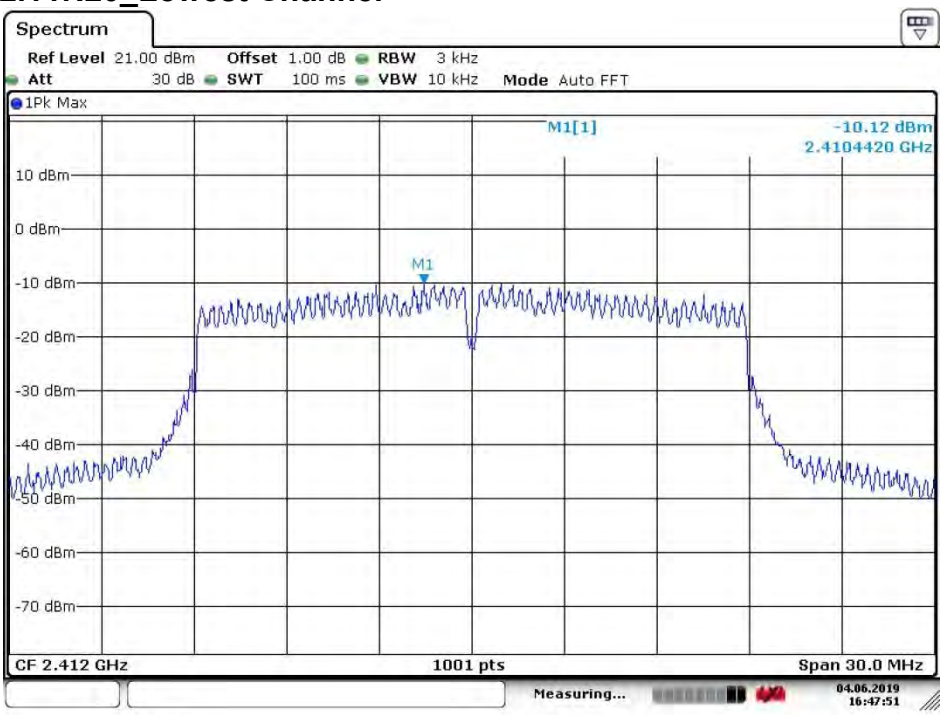
4.6.2.1.6 802.11G_ Highest Channel



Date: 4.JUN.2019 16:46:59

4.6.2.1.7 802.11N20_Lowest Channel



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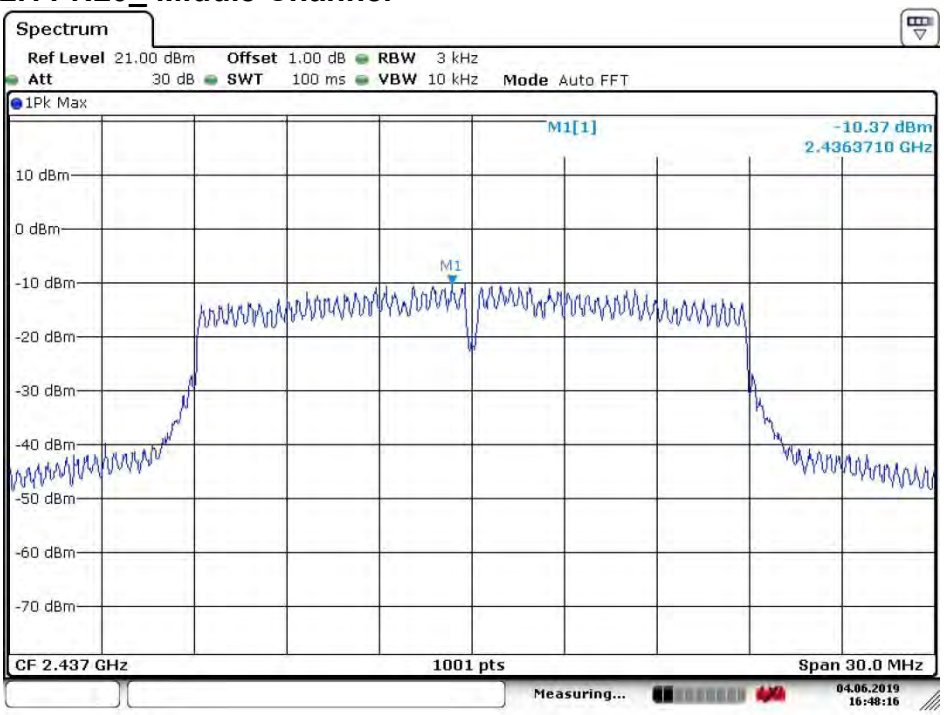
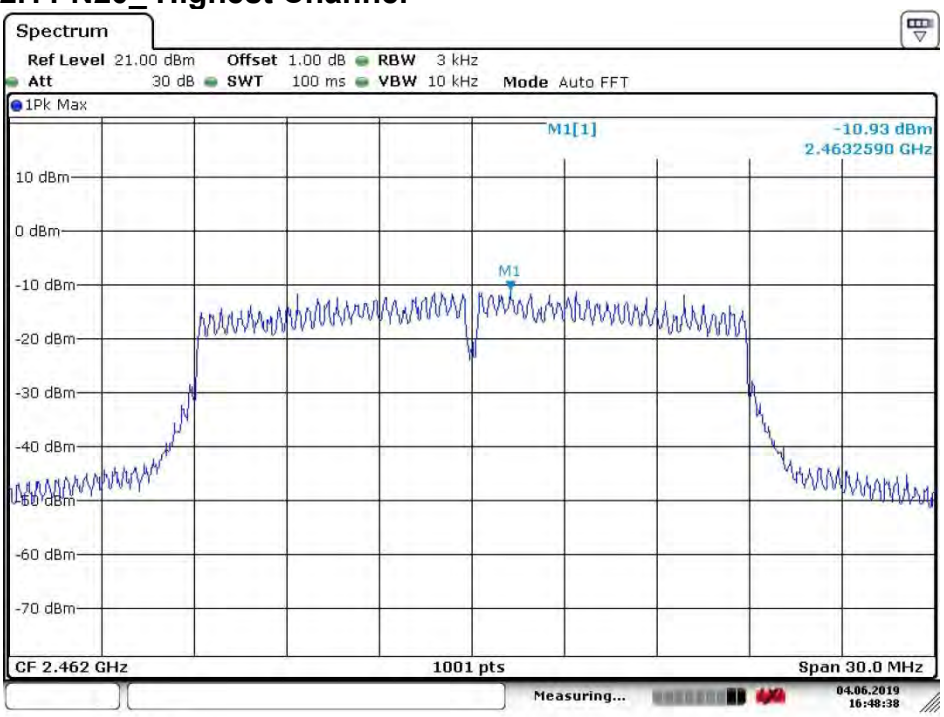
4.6.2.1.8 802.11 N20_ Middle Channel



Date: 4.JUN.2019 16:48:16

4.6.2.1.9 802.11 N20_ Highest Channel



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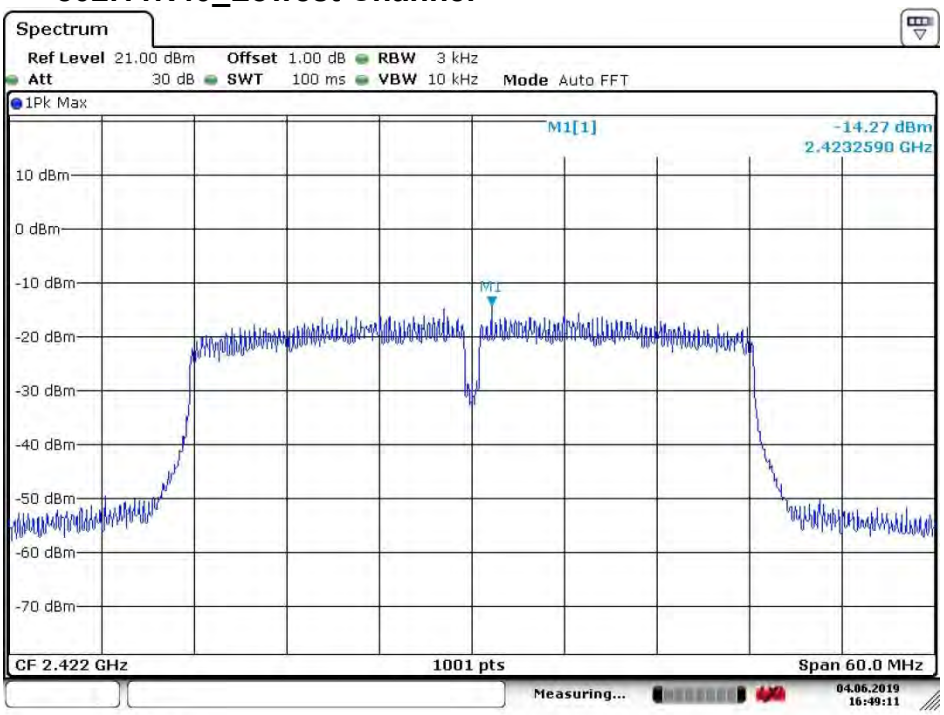
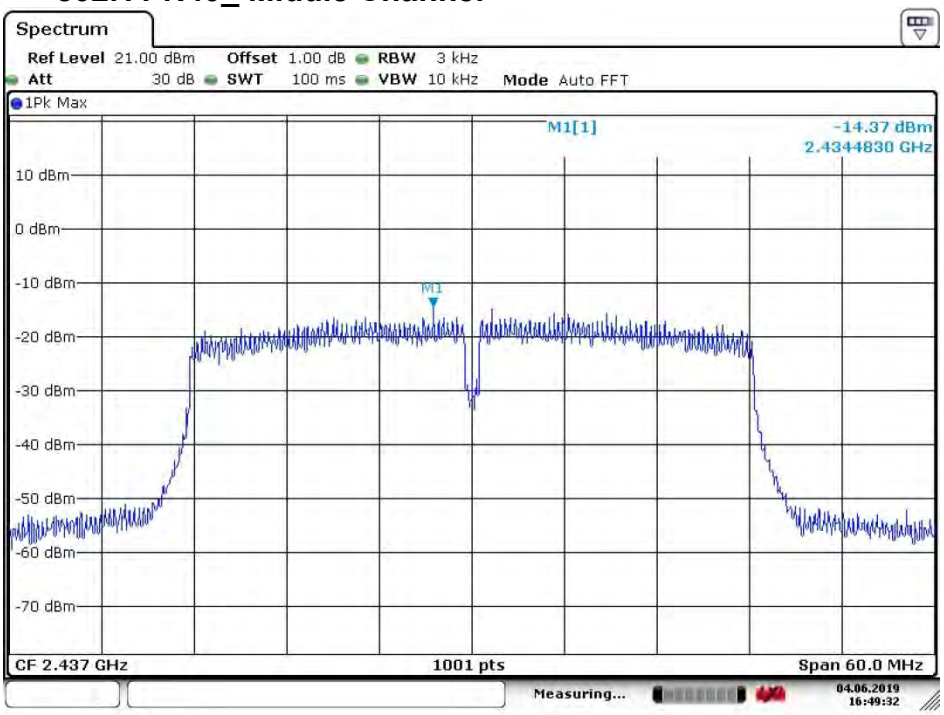
4.6.2.1.10 802.11N40_Lowest Channel



Date: 4.JUN.2019 16:49:12

4.6.2.1.11 802.11 N40_ Middle Channel



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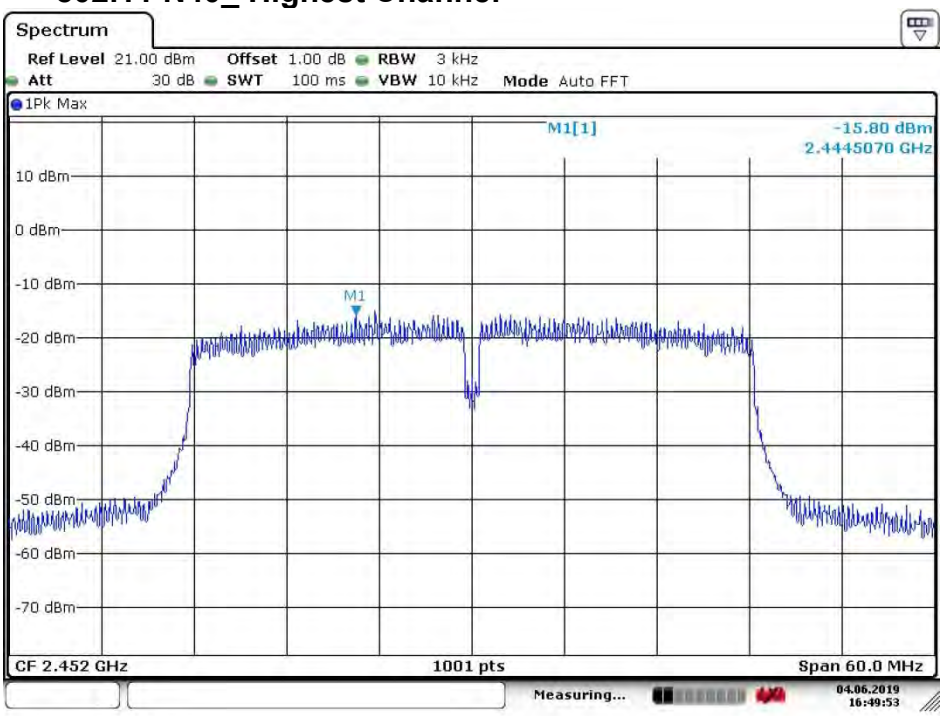
4.6.2.1.12 802.11 N40_ Highest Channel



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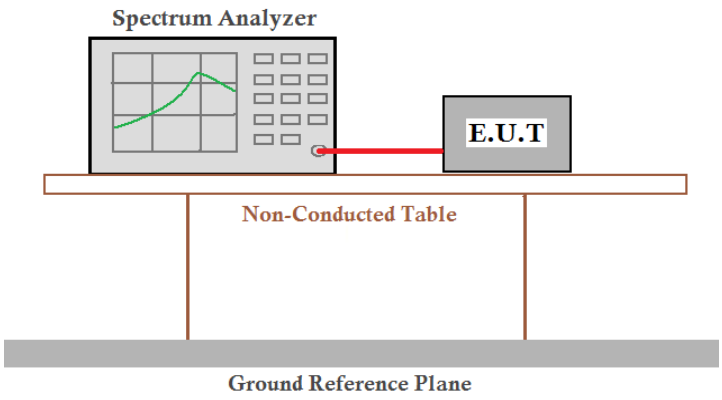
4.7 Band-edge for RF Conducted Emissions

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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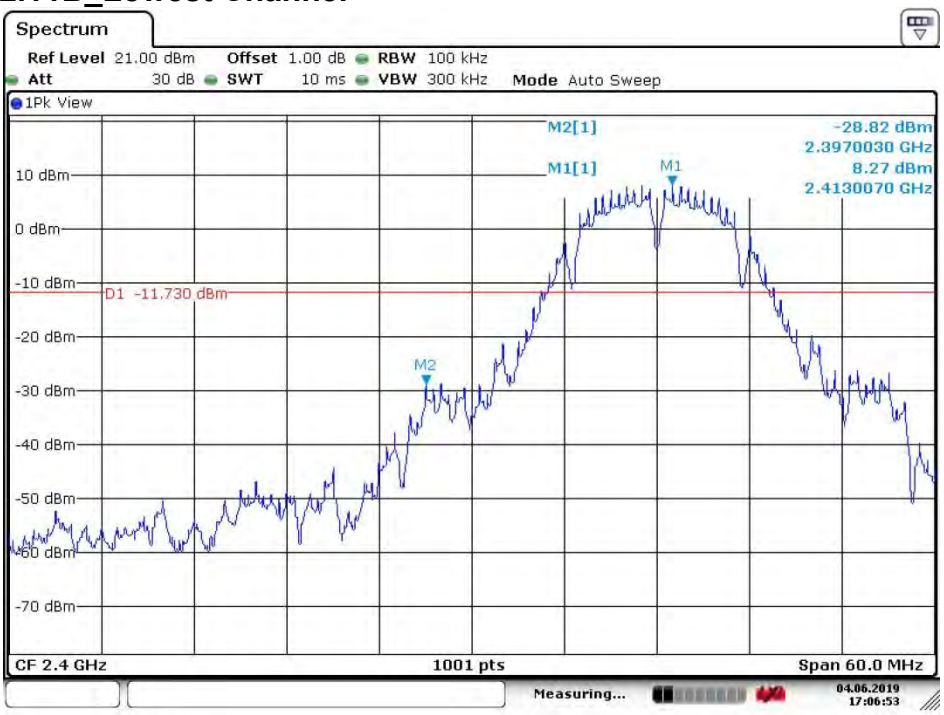
4.7.1 Test plots

4.7.1.1 ANT1

4.7.1.1.1 802.11B_Lowest Channel



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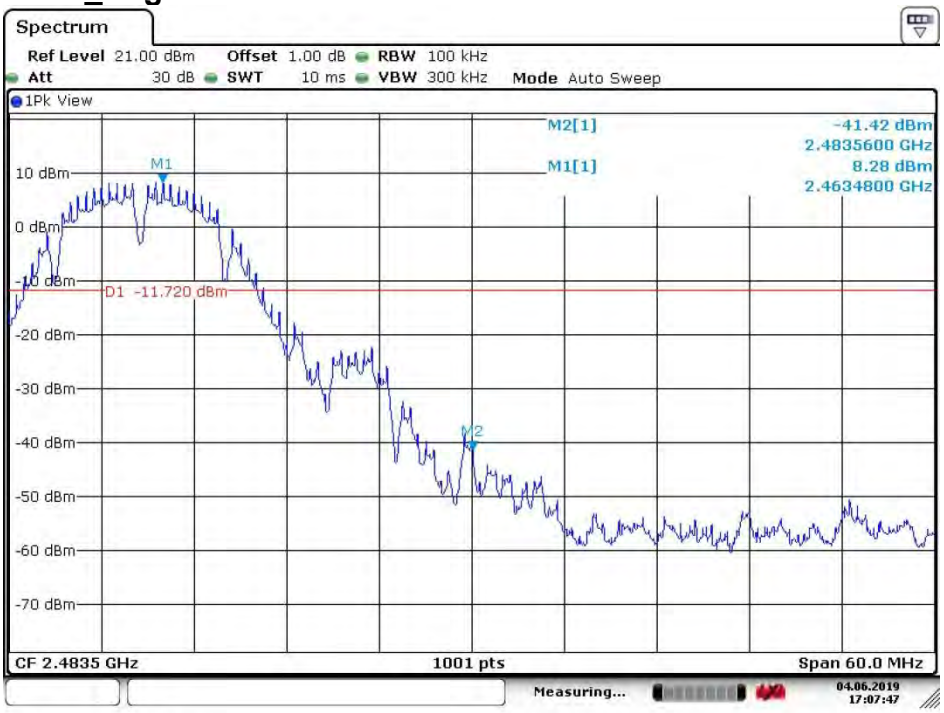
4.7.1.1.2 802.11B_ Highest Channel



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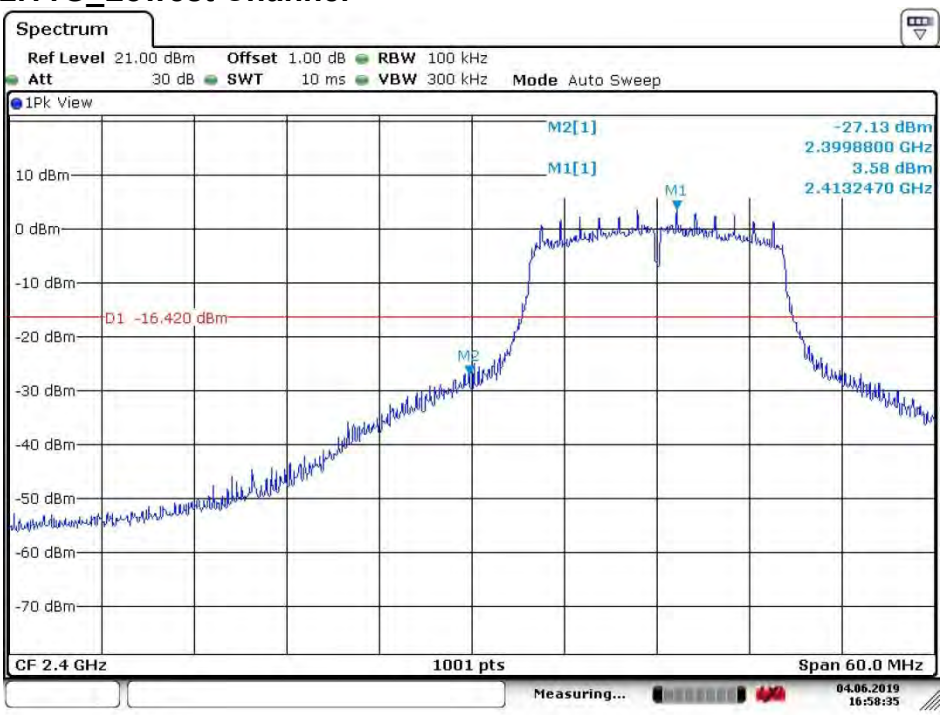
4.7.1.1.3 802.11G_Lowest Channel



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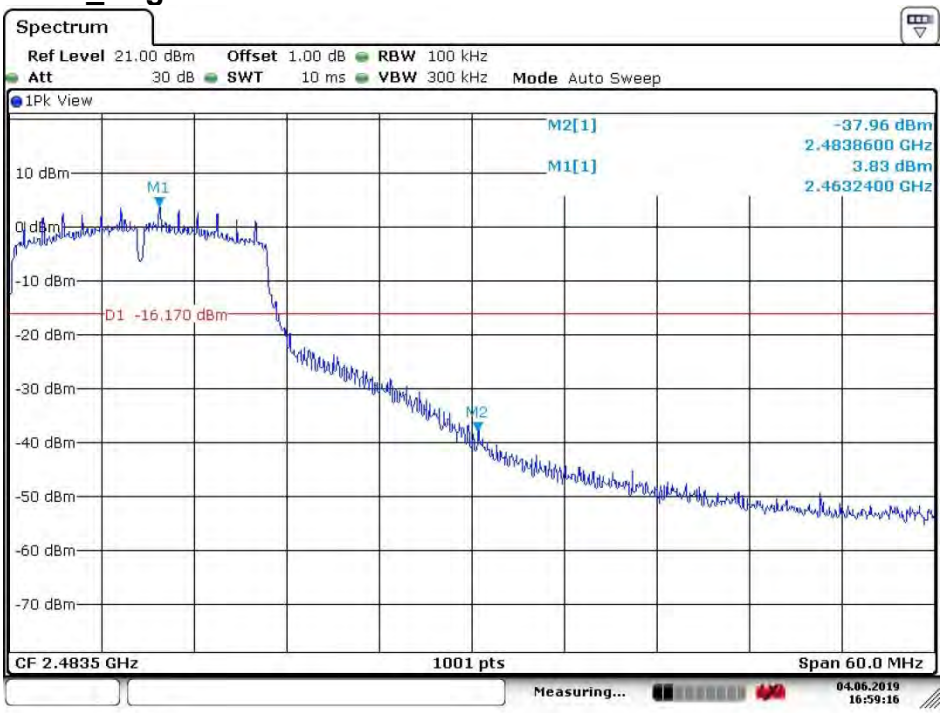
4.7.1.1.4 802.11G_ Highest Channel



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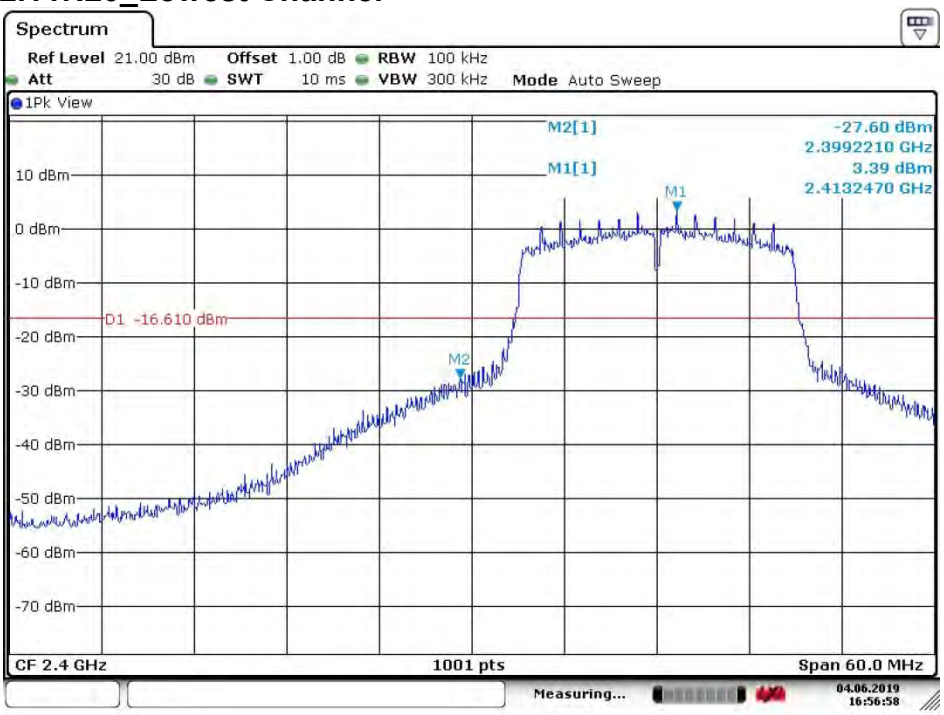
4.7.1.1.5 802.11N20_Lowest Channel



Date: 4.JUN.2019 16:56:58

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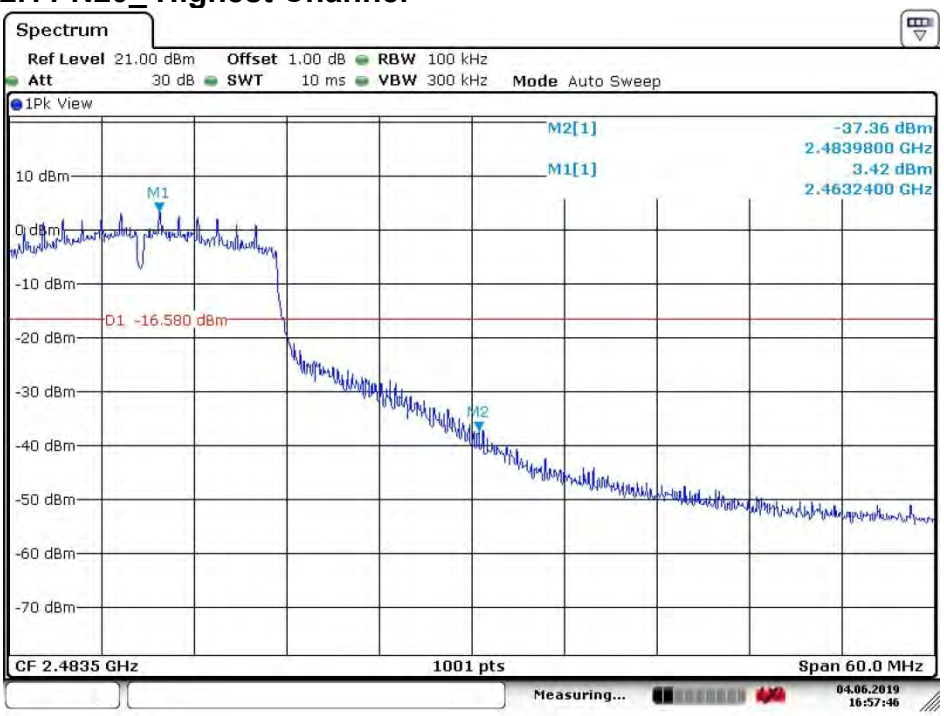
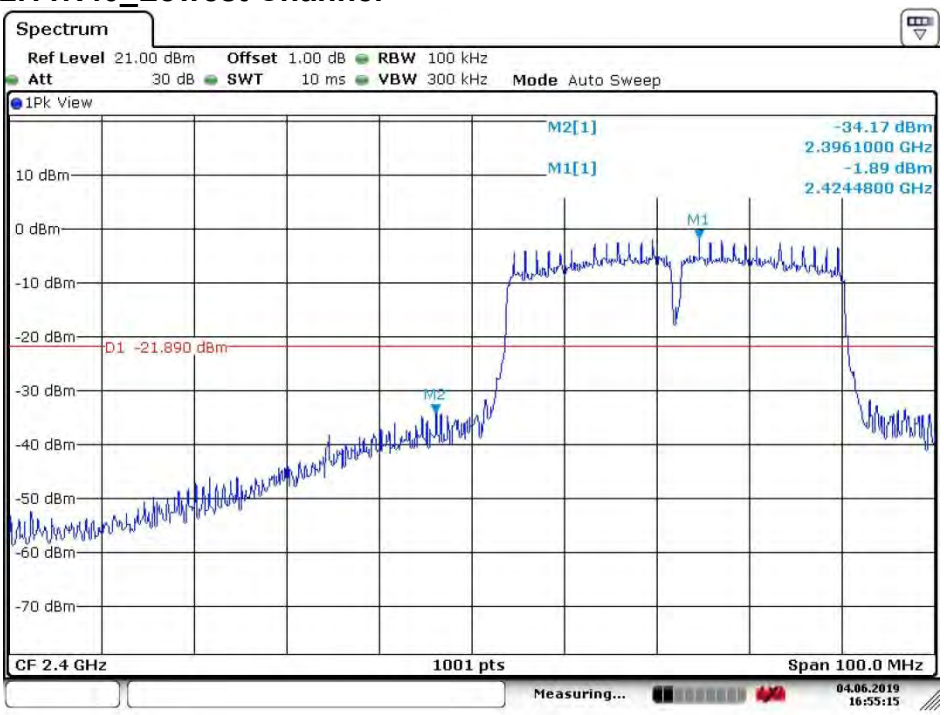
4.7.1.1.6 802.11 N20_ Highest Channel



Date: 4.JUN.2019 16:57:47

4.7.1.1.7 802.11N40_Lowest Channel



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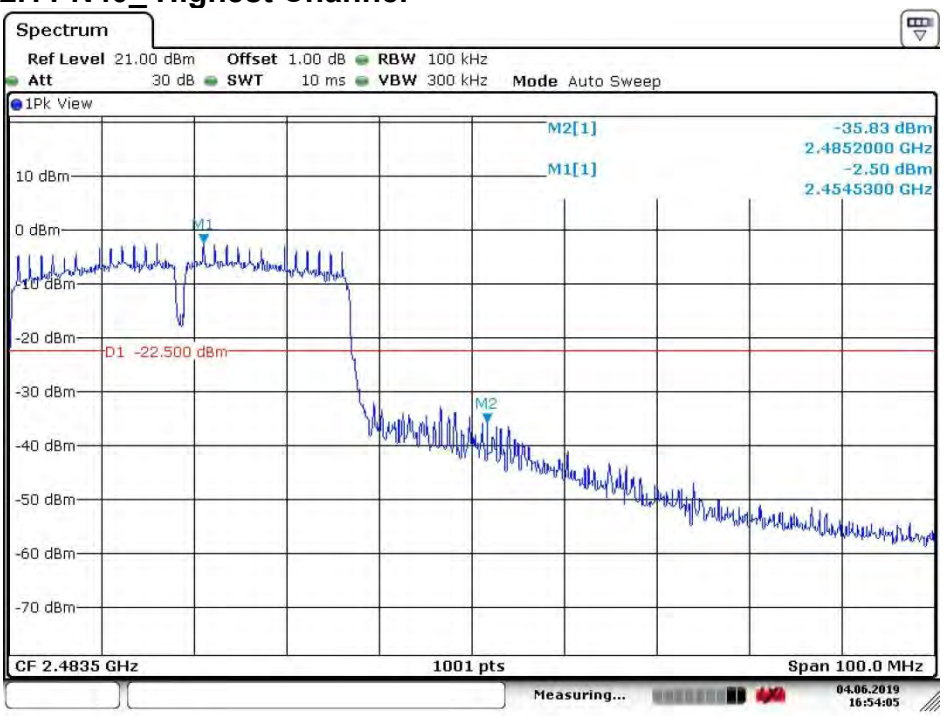
4.7.1.1.8 802.11 N40_ Highest Channel



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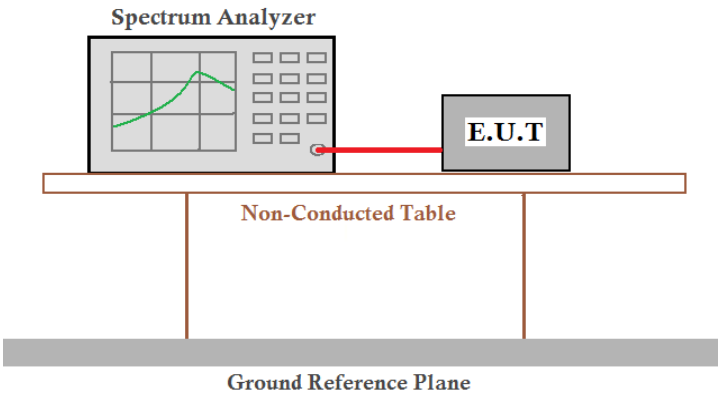
4.8 RF Conducted Spurious Emissions

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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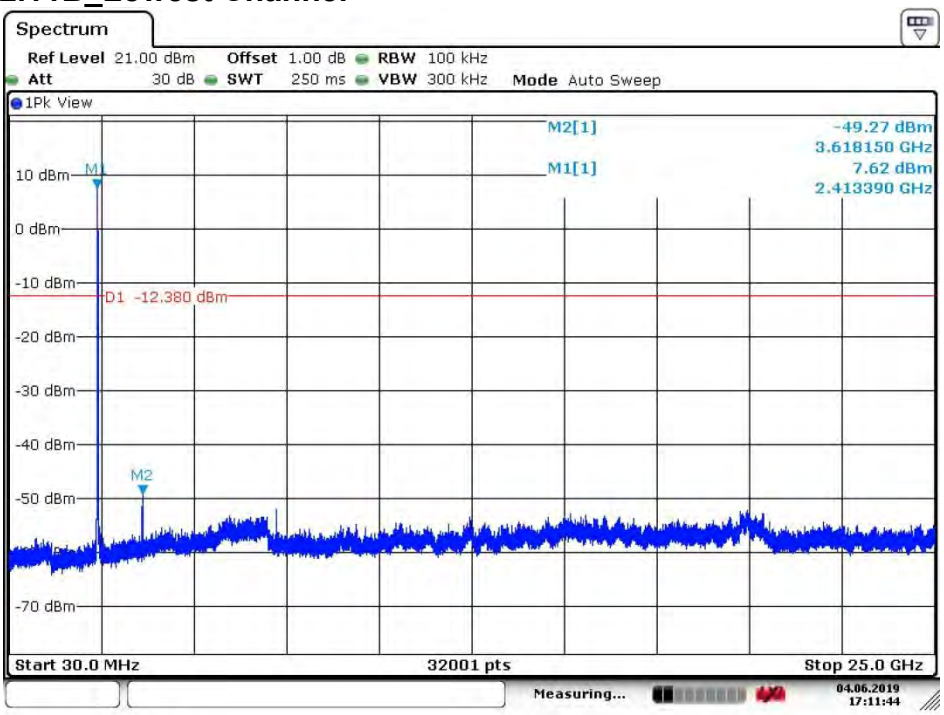
4.8.1 Test plots

4.8.1.1 ANT1

4.8.1.1.1 802.11B_Lowest Channel



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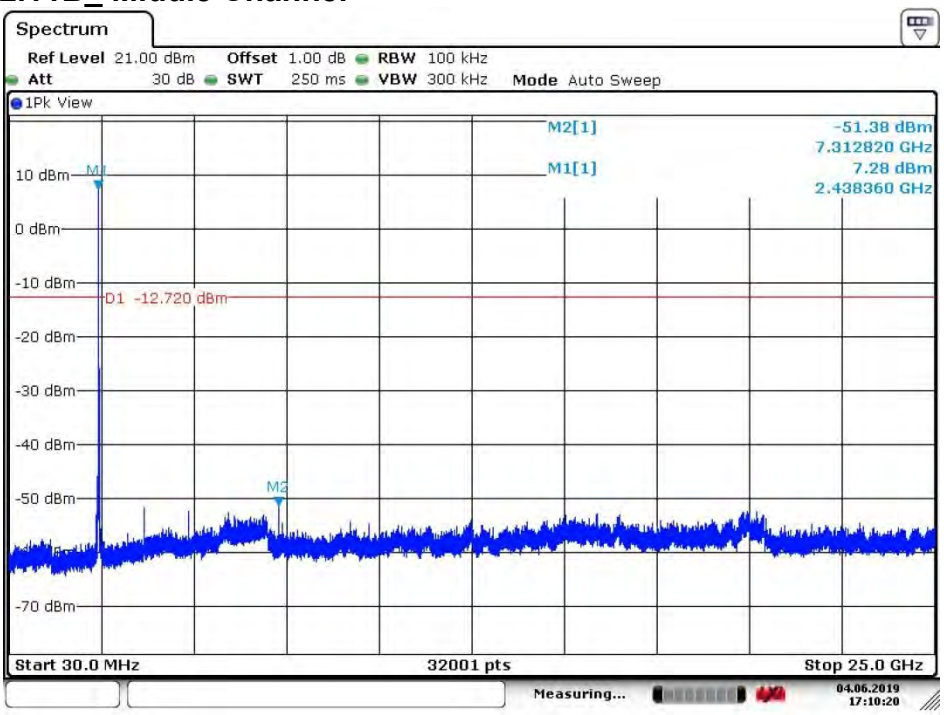
4.8.1.1.2 802.11B_ Middle Channel



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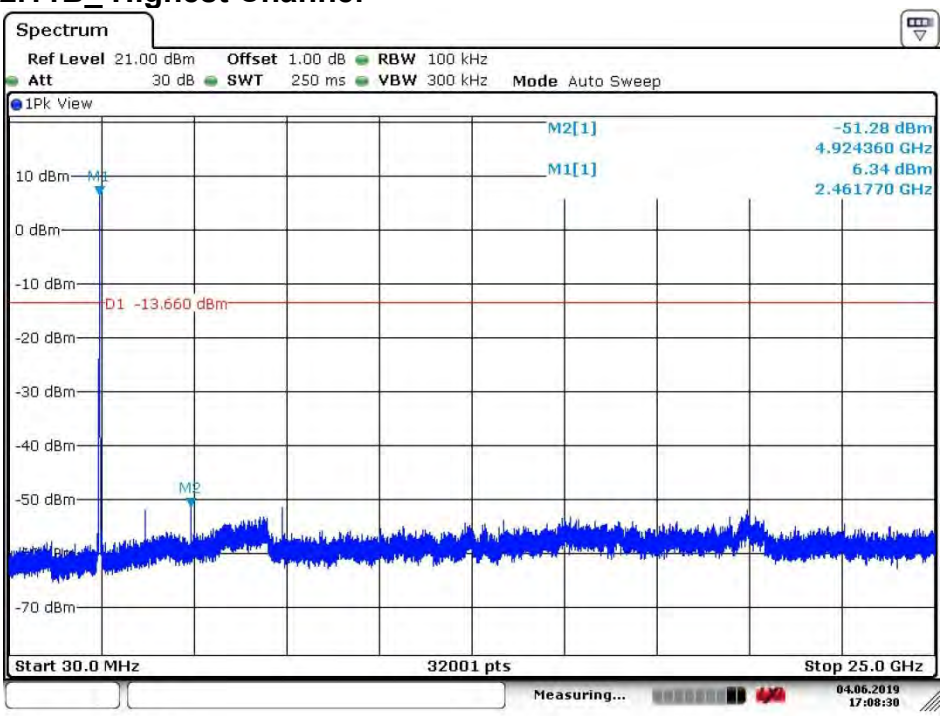
4.8.1.1.3 802.11B_ Highest Channel



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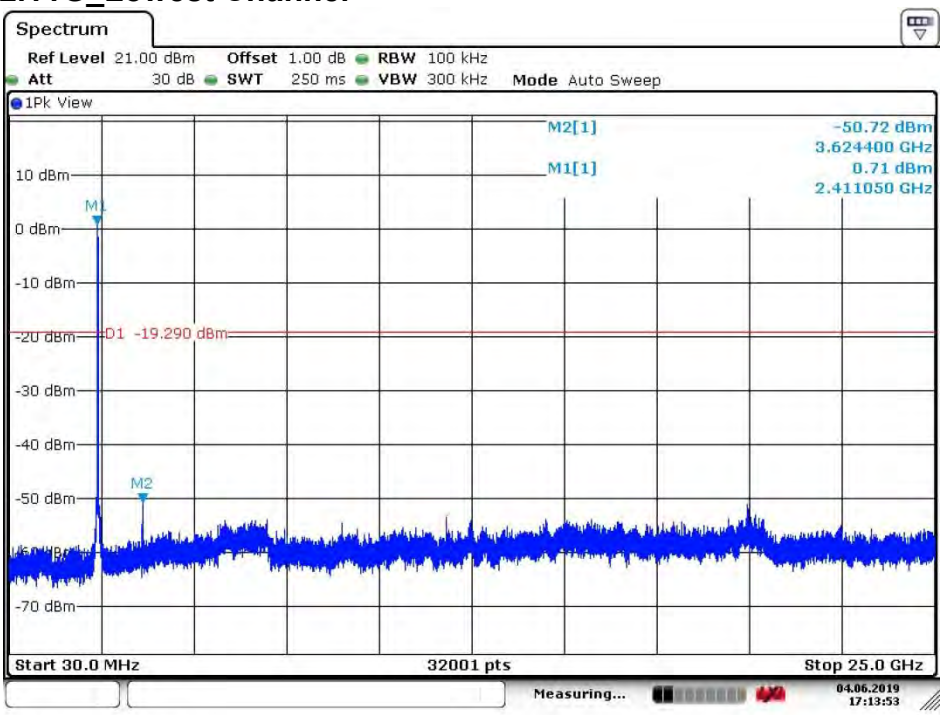
4.8.1.1.4 802.11G_Lowest Channel



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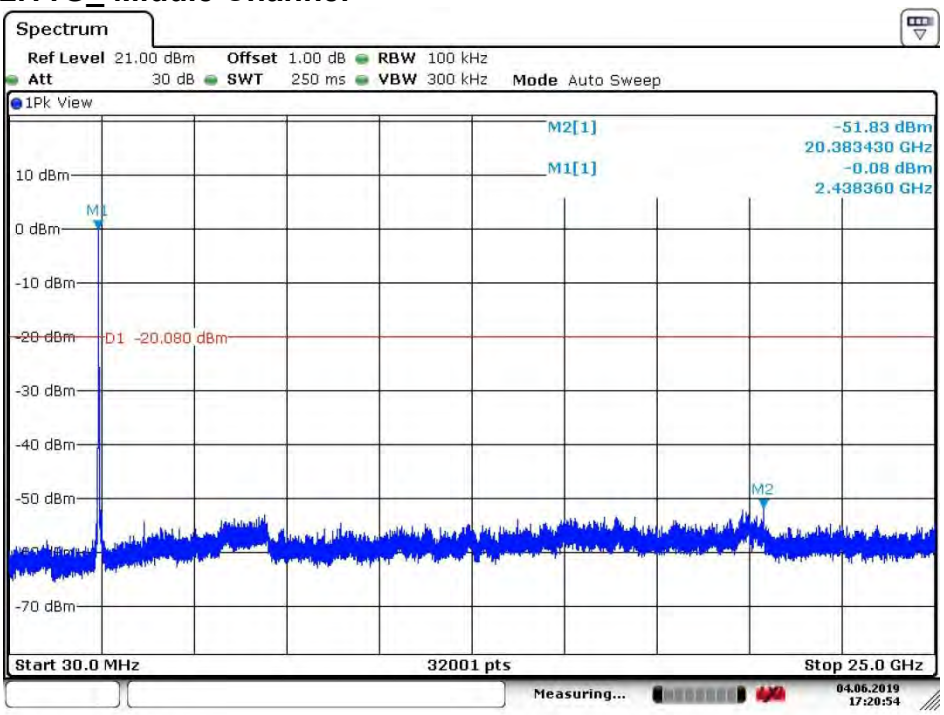
4.8.1.1.5 802.11G_ Middle Channel



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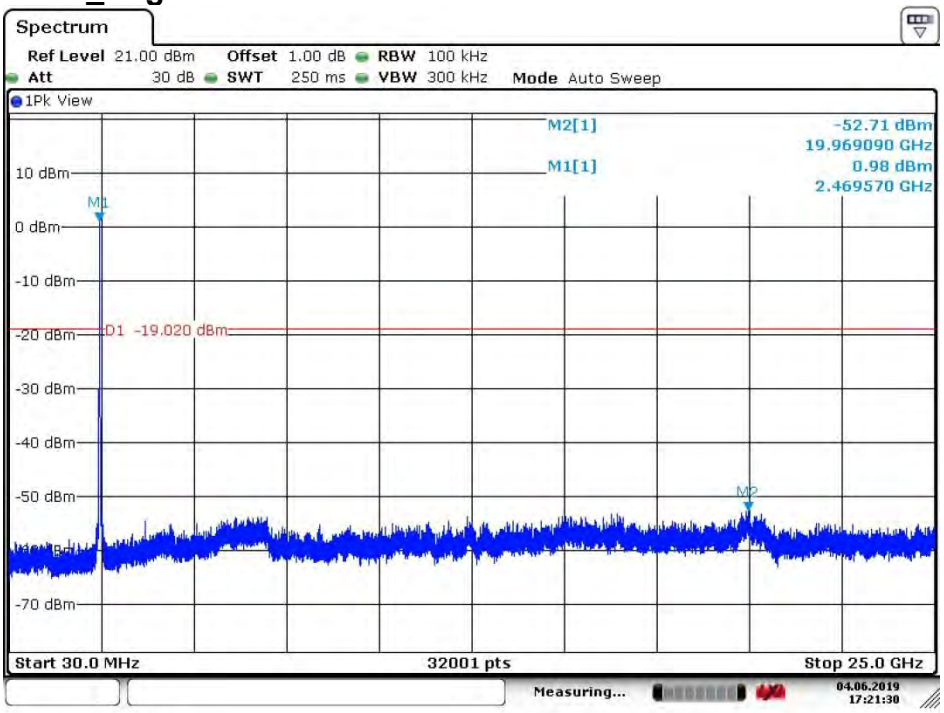
4.8.1.1.6 802.11G_ Highest Channel



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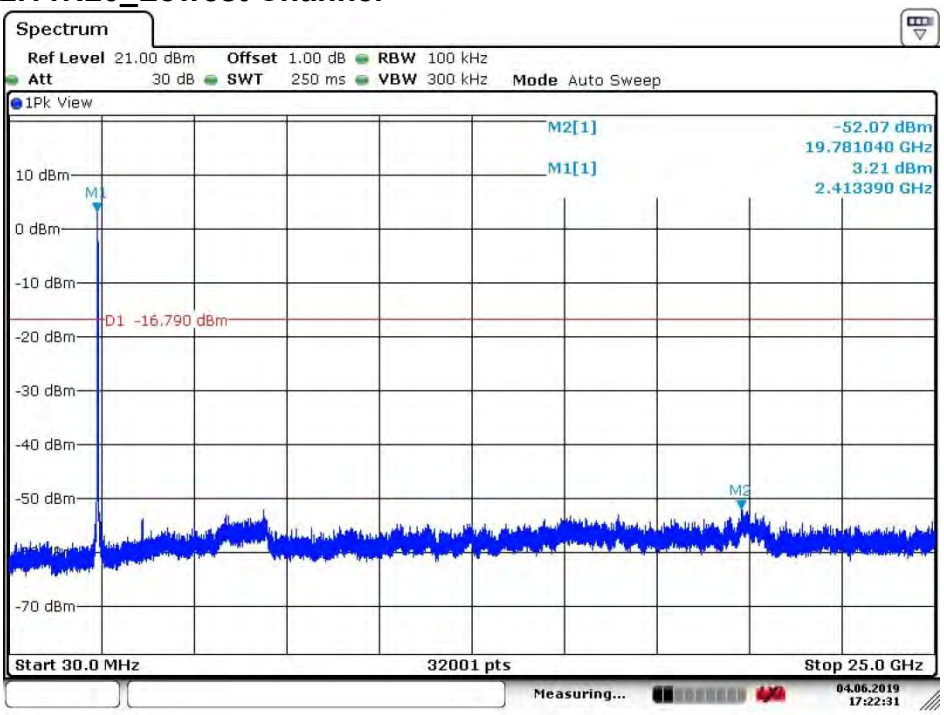
4.8.1.1.7 802.11N20_Lowest Channel



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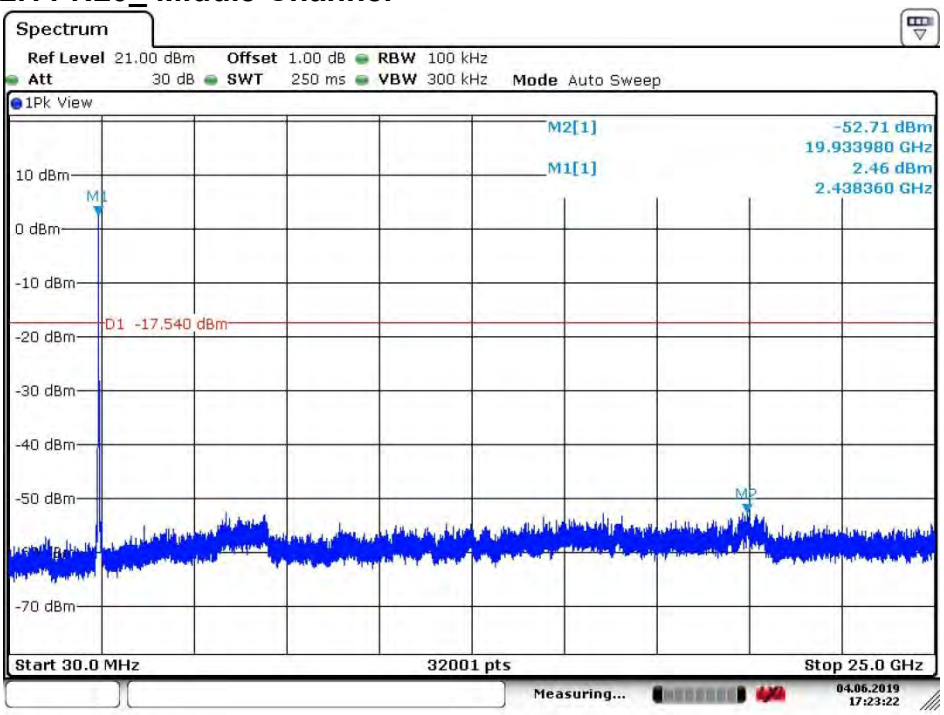
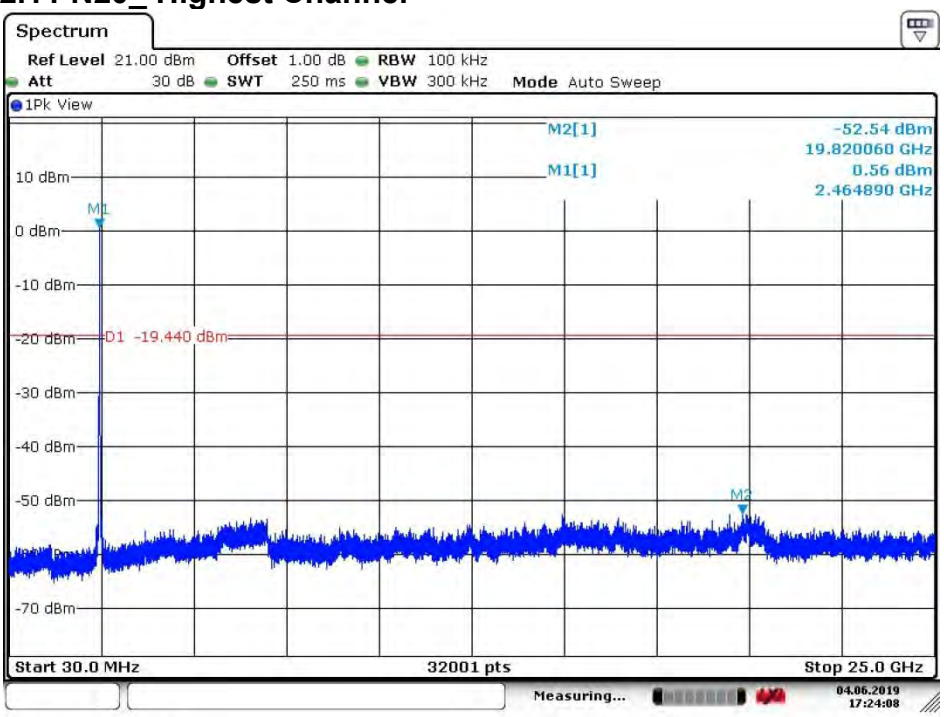
4.8.1.1.8 802.11 N20_ Middle Channel



Date: 4.JUN.2019 17:23:22

4.8.1.1.9 802.11 N20_ Highest Channel



Date: 4.JUN.2019 17:24:08

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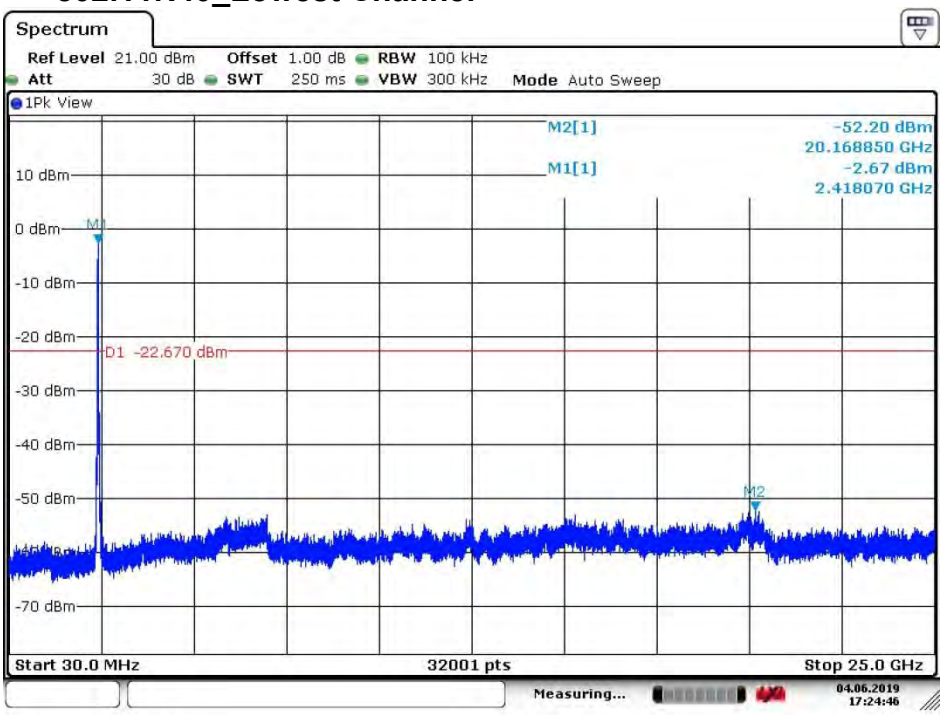
4.8.1.1.10 802.11N40_Lowest Channel



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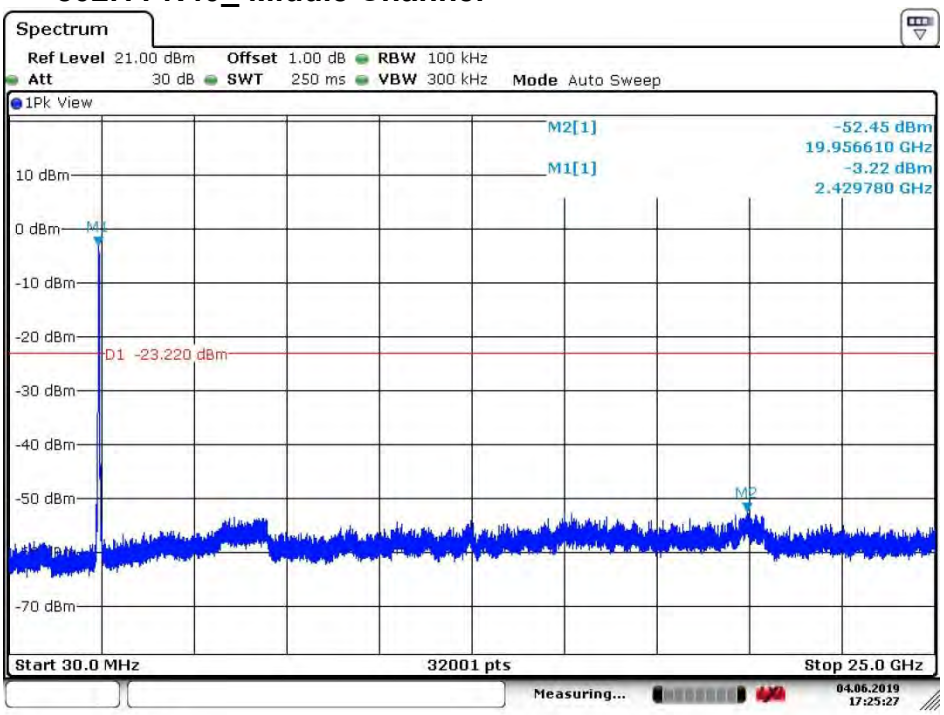
4.8.1.1.11 802.11 N40_ Middle Channel



Date: 4.JUN.2019 17:25:28

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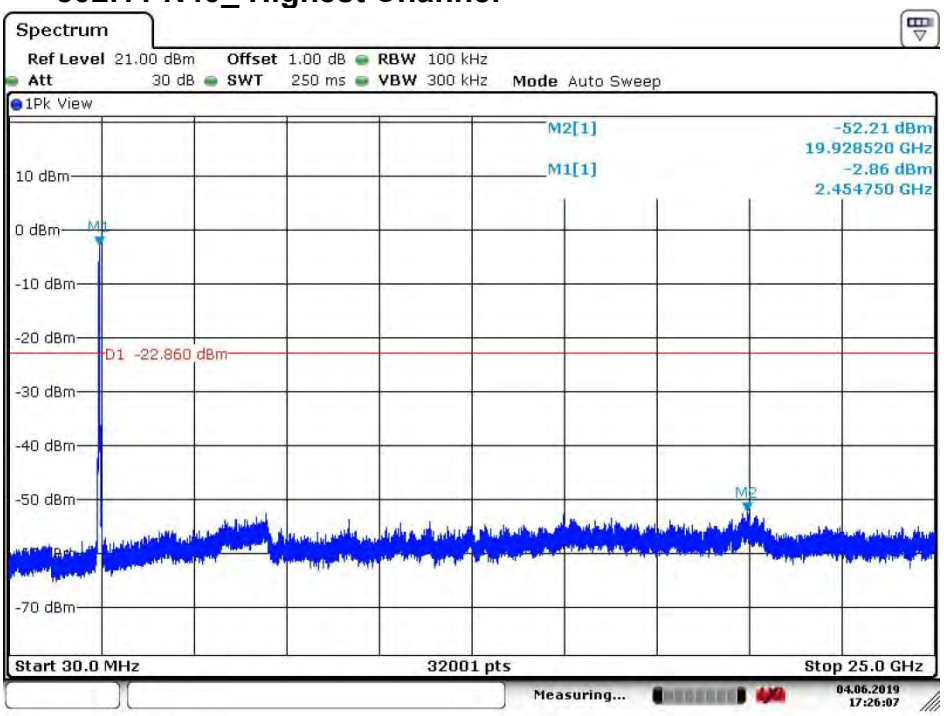
4.8.1.1.12 802.11 N40_ Highest Channel



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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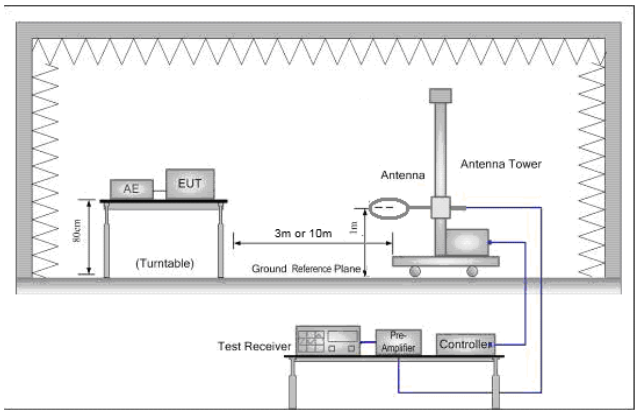

Figure 1. Below 30MHz

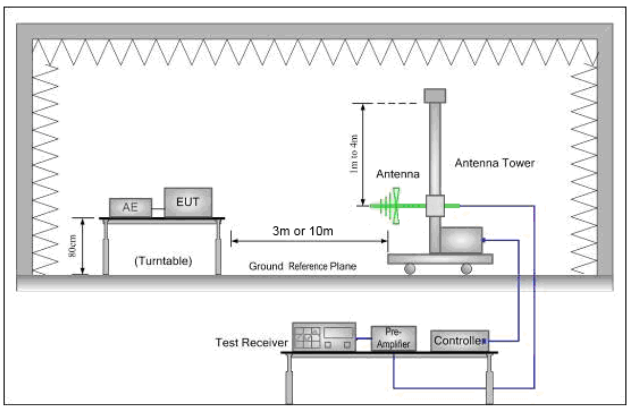

Figure 2. 30MHz to 1GHz

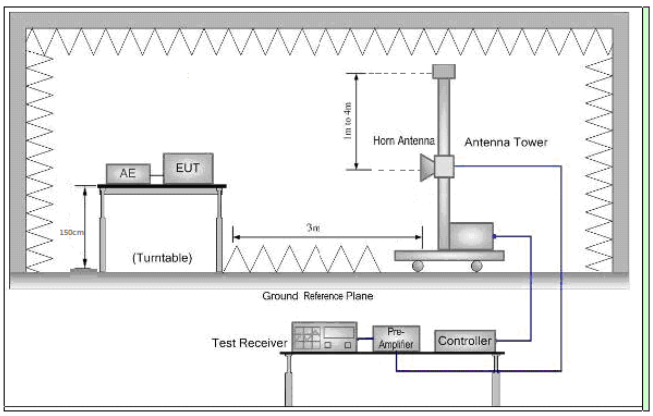

Figure 3. Above 1 GHz

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. 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. f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. g. 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

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	re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. h. Test the EUT in the lowest channel, the middle 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) 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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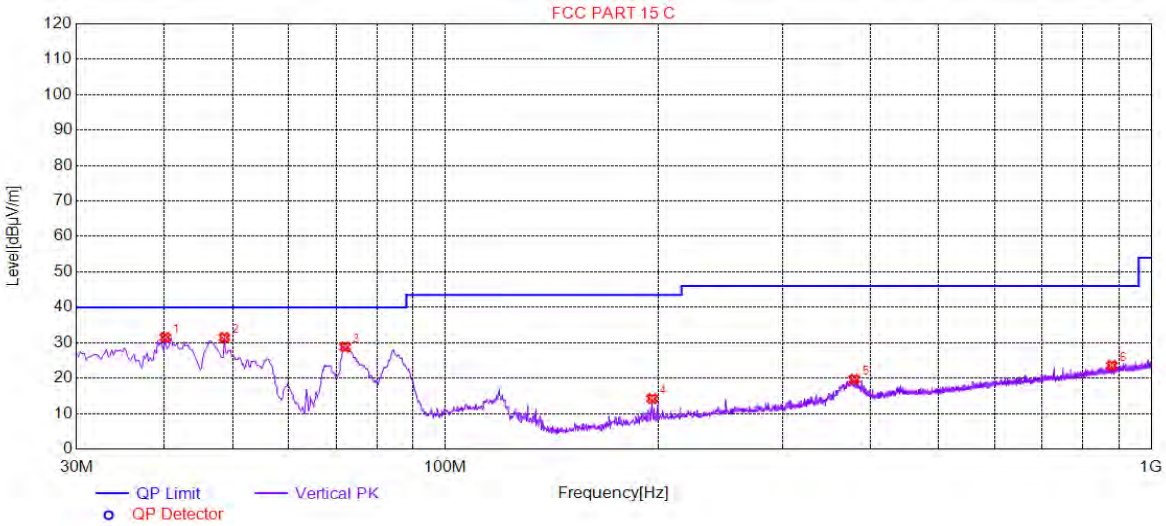
4.9.1 Radiated emission below 1GHz

4.9.1.1 Charge + Transmitting, Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	40.0900	31.49	-31.32	40.00	8.51	100	16	Vertical
2	48.6277	31.44	-30.38	40.00	8.56	100	165	Vertical
3	72.1064	28.77	-34.76	40.00	11.23	100	66	Vertical
4	196.291	14.22	-31.58	43.50	29.28	100	74	Vertical
5	379.657	19.68	-26.08	46.00	26.32	100	157	Vertical
6	879.307	23.59	-16.38	46.00	22.41	200	162	Vertical

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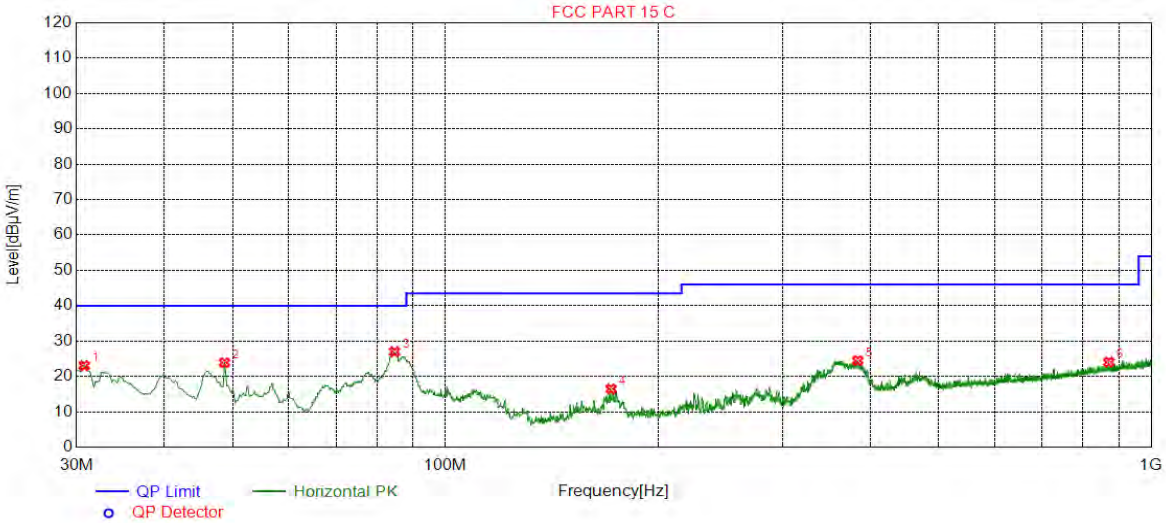
4.9.1.2 Charge + Transmitting, Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	30.7762	23.05	-33.06	40.00	16.95	200	70	Horizontal
2	48.6277	23.89	-30.38	40.00	16.11	200	326	Horizontal
3	84.7189	26.96	-35.01	40.00	13.04	200	84	Horizontal
4	171.648	16.46	-33.92	43.50	27.04	200	261	Horizontal
5	383.926	24.50	-25.95	46.00	21.50	100	196	Horizontal
6	870.964	24.07	-16.52	46.00	21.93	100	271	Horizontal

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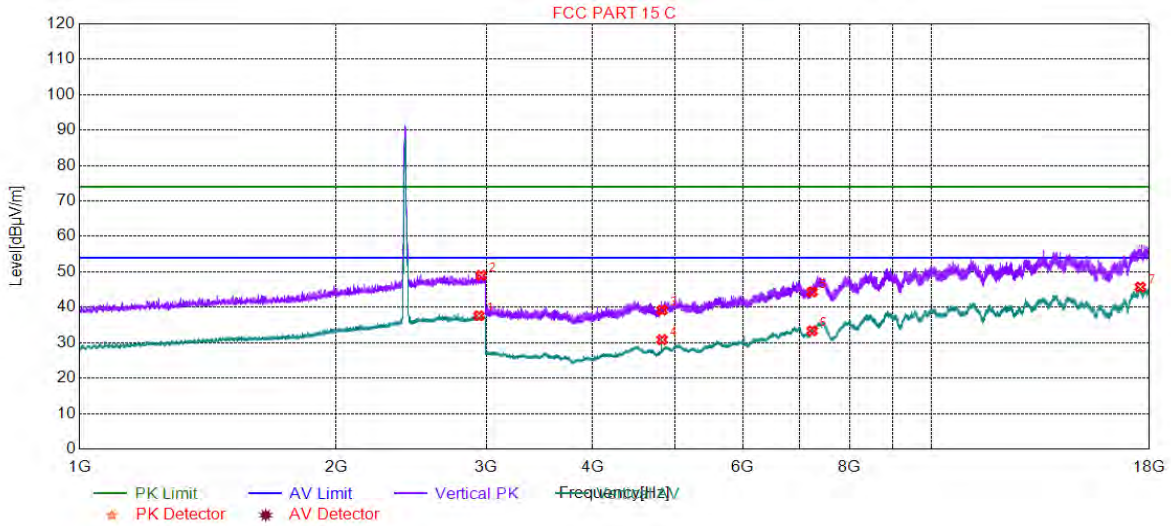
4.9.2 Transmitter emission above 1GHz

4.9.2.1 ANT1

4.9.2.1.1 802.11B_Lowest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2940.9852	37.61	2.29	54.00	16.39	150	337	Vertical
2	2958.9897	48.99	2.30	74.00	25.01	150	30	Vertical
3	4824.0000	39.17	-20.09	74.00	34.83	150	307	Vertical
4	4824.0000	30.87	-20.09	54.00	23.13	150	291	Vertical
5	7236.0000	44.34	-12.40	74.00	29.66	150	147	Vertical
6	7236.0000	33.38	-12.40	54.00	20.62	150	99	Vertical
7	17554.477	45.71	1.05	54.00	8.29	150	115	Vertical

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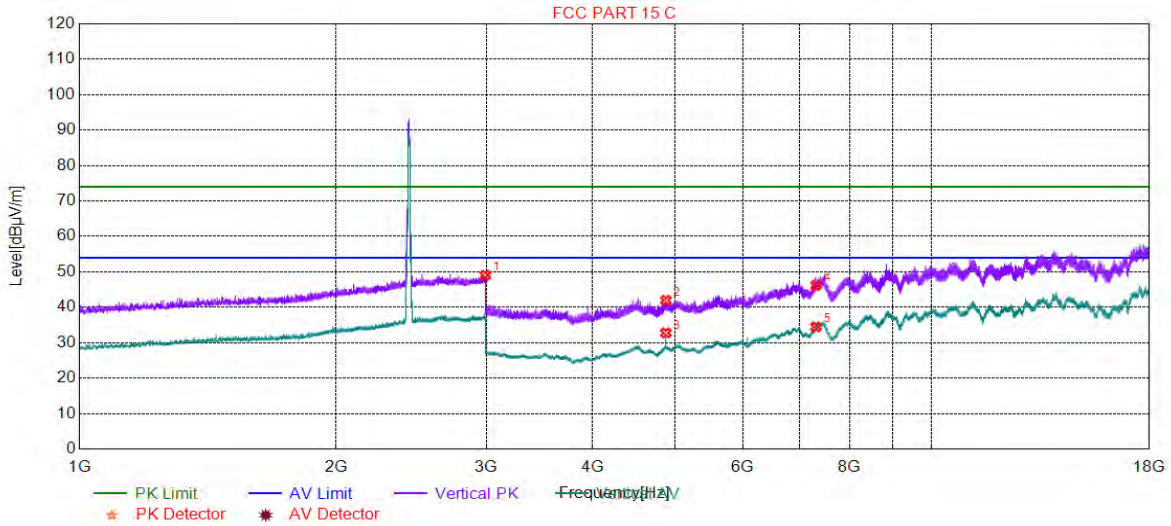
4.9.2.1.2 802.11B_ Middle Channel_ Vertical



Suspected List								
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1	2992.9983	49.03	2.33	74.00	24.97	150	289	Vertical
2	4874.0000	41.95	-19.37	74.00	32.05	150	308	Vertical
3	4874.0000	32.78	-19.37	54.00	21.22	150	147	Vertical
4	7311.0000	46.21	-11.50	74.00	27.79	150	18	Vertical
5	7311.0000	34.49	-11.50	54.00	19.51	150	179	Vertical

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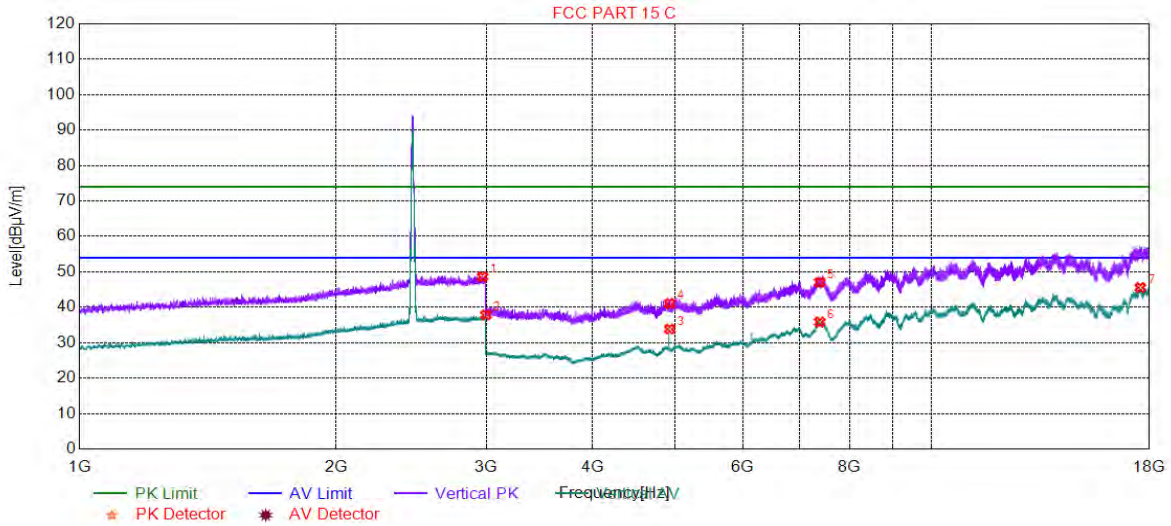
4.9.2.1.3 802.11B_ Highest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2970.4926	48.62	2.31	74.00	25.38	150	6	Vertical
2	2997.4994	37.84	2.33	54.00	16.16	150	186	Vertical
3	4924.0000	33.88	-18.87	54.00	20.12	150	292	Vertical
4	4924.0000	41.09	-18.87	74.00	32.91	150	309	Vertical
5	7386.0000	47.05	-10.72	74.00	26.95	150	276	Vertical
6	7386.0000	35.82	-10.72	54.00	18.18	150	131	Vertical
7	17559.4780	45.57	1.11	54.00	8.43	150	342	Vertical

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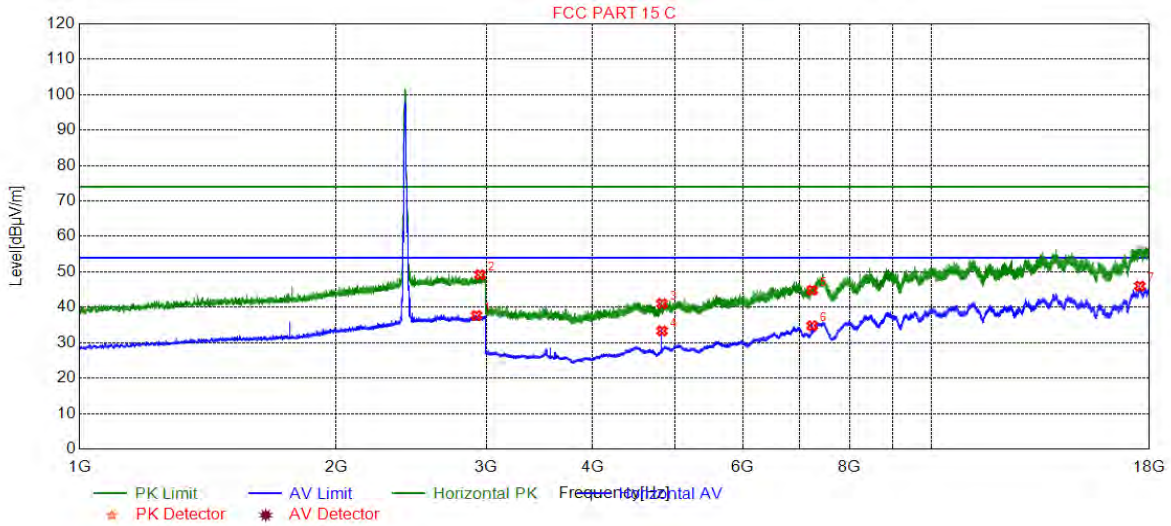
4.9.2.1.4 802.11B_Lowest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2921.4804	37.69	2.28	54.00	16.31	150	144	Horizontal
2	2950.4876	49.20	2.30	74.00	24.80	150	32	Horizontal
3	4824.0000	41.04	-20.09	74.00	32.96	150	324	Horizontal
4	4824.0000	33.33	-20.09	54.00	20.67	150	355	Horizontal
5	7236.0000	44.83	-12.40	74.00	29.17	150	195	Horizontal
6	7236.0000	34.79	-12.40	54.00	19.21	150	211	Horizontal
7	17536.976	45.99	0.82	54.00	8.01	150	57	Horizontal

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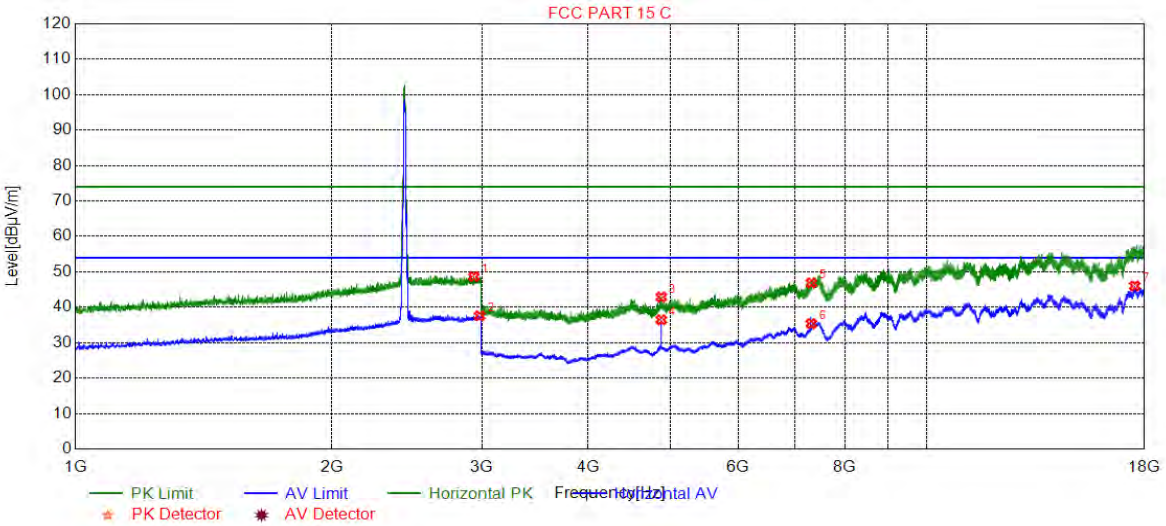
4.9.2.1.5 802.11B_ Middle Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2936.4841	48.66	2.29	74.00	25.34	150	17	Horizontal
2	2982.4956	37.60	2.32	54.00	16.40	150	64	Horizontal
3	4874.0000	42.91	-19.37	74.00	31.09	150	360	Horizontal
4	4874.0000	36.46	-19.37	54.00	17.54	150	350	Horizontal
5	7311.0000	46.86	-11.50	74.00	27.14	150	233	Horizontal
6	7311.0000	35.37	-11.50	54.00	18.63	150	217	Horizontal
7	17531.476	46.04	0.75	54.00	7.96	150	283	Horizontal

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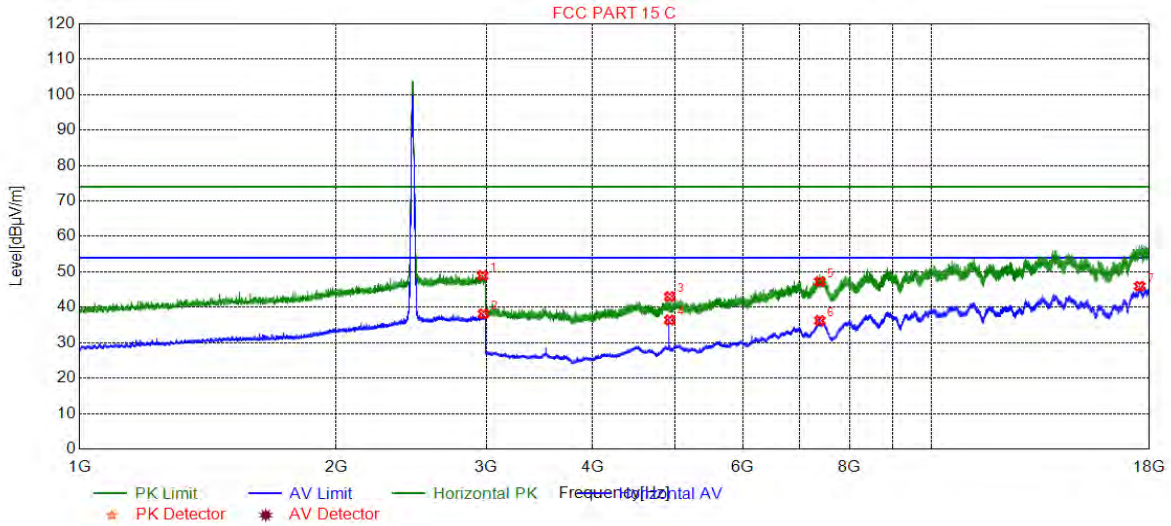
4.9.2.1.6 802.11B_ Highest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2970.4926	48.94	2.31	74.00	25.06	150	41	Horizontal
2	2976.9942	38.13	2.31	54.00	15.87	150	314	Horizontal
3	4924.0000	43.00	-18.87	74.00	31.00	150	358	Horizontal
4	4924.0000	36.39	-18.87	54.00	17.61	150	347	Horizontal
5	7386.0000	47.22	-10.72	74.00	26.78	150	215	Horizontal
6	7386.0000	36.24	-10.72	54.00	17.76	150	231	Horizontal
7	17528.476	45.95	0.71	54.00	8.05	150	17	Horizontal

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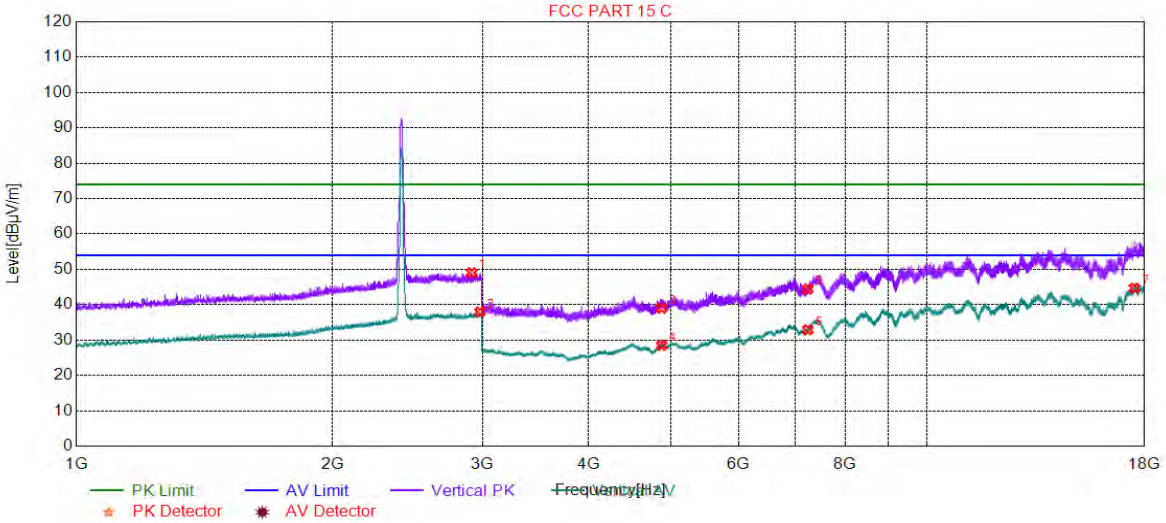
4.9.2.1.7 802.11G_Lowest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2914.4786	49.05	2.27	74.00	24.95	150	108	Vertical
2	2979.9950	37.98	2.32	54.00	16.02	150	22	Vertical
3	4874.0000	39.02	-19.37	74.00	34.98	150	99	Vertical
4	4874.0000	28.50	-19.37	54.00	25.50	150	50	Vertical
5	7236.0000	44.42	-12.40	74.00	29.58	150	34	Vertical
6	7236.0000	32.92	-12.40	54.00	21.08	150	34	Vertical
7	17509.4755	44.66	0.47	54.00	9.34	150	114	Vertical

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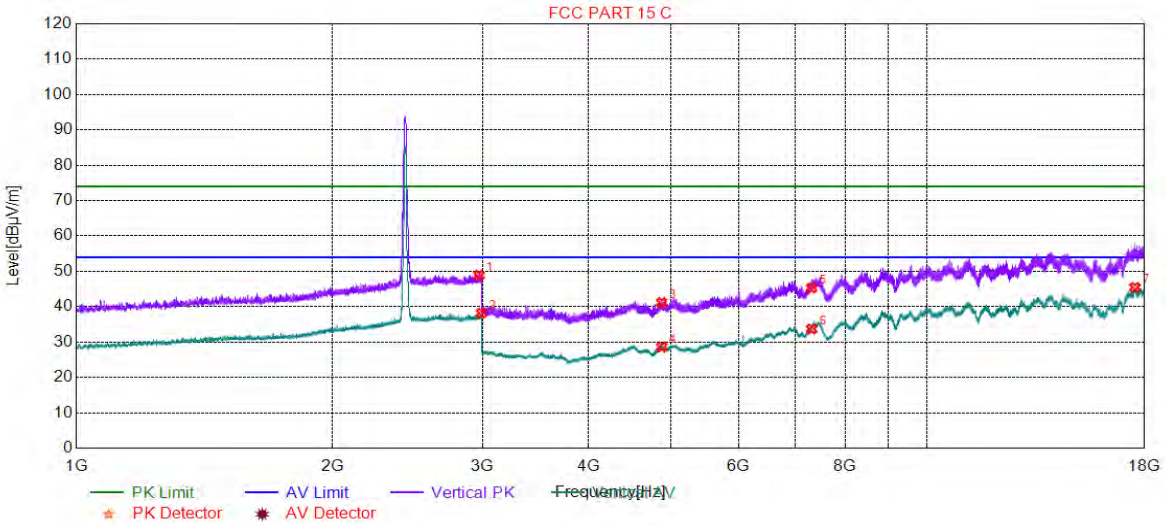
4.9.2.1.8 802.11G_ Middle Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2971.9930	48.90	2.31	74.00	25.10	150	257	Vertical
2	2992.4981	38.17	2.32	54.00	15.83	150	211	Vertical
3	4874.0000	41.17	-19.37	74.00	32.83	150	50	Vertical
4	4874.0000	28.63	-19.37	54.00	25.37	150	131	Vertical
5	7311.0000	45.30	-11.50	74.00	28.70	150	212	Vertical
6	7311.0000	33.70	-11.50	54.00	20.30	150	99	Vertical
7	17535.976	45.47	0.81	54.00	8.53	150	142	Vertical

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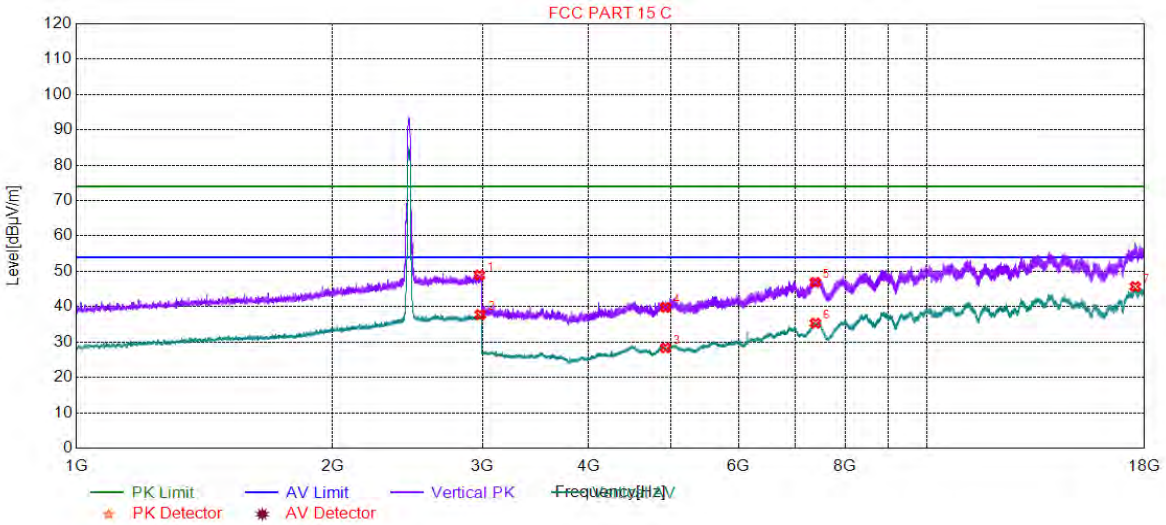
4.9.2.1.9 802.11G_ Highest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2976.4941	48.94	2.31	74.00	25.06	150	199	Vertical
2	2983.4959	37.77	2.32	54.00	16.23	150	335	Vertical
3	4924.0000	28.34	-18.87	54.00	25.66	150	244	Vertical
4	4924.0000	39.80	-18.87	74.00	34.20	150	212	Vertical
5	7386.0000	46.88	-10.72	74.00	27.12	150	18	Vertical
6	7386.0000	35.34	-10.72	54.00	18.66	150	18	Vertical
7	17549.9775	45.69	0.99	54.00	8.31	150	170	Vertical

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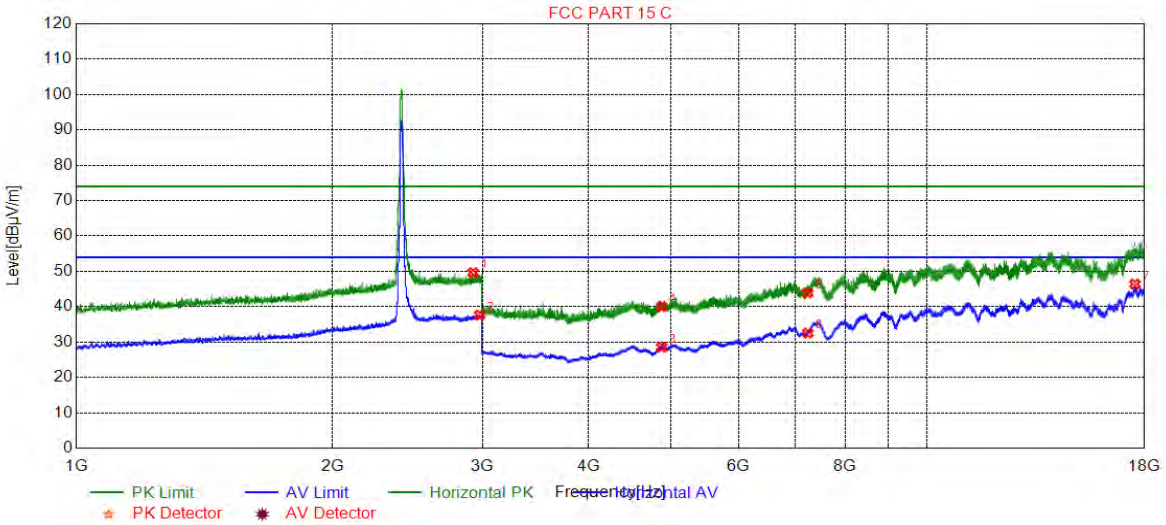
4.9.2.1.10 802.11G_Lowest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2925.9815	49.64	2.28	74.00	24.36	150	236	Horizontal
2	2978.4946	37.64	2.31	54.00	16.36	150	142	Horizontal
3	4874.0000	28.56	-19.37	54.00	25.44	150	131	Horizontal
4	4874.0000	40.03	-19.37	74.00	33.97	150	228	Horizontal
5	7236.0000	43.92	-12.40	74.00	30.08	150	212	Horizontal
6	7236.0000	32.54	-12.40	54.00	21.46	150	244	Horizontal
7	17534.476	46.41	0.79	54.00	7.59	150	78	Horizontal

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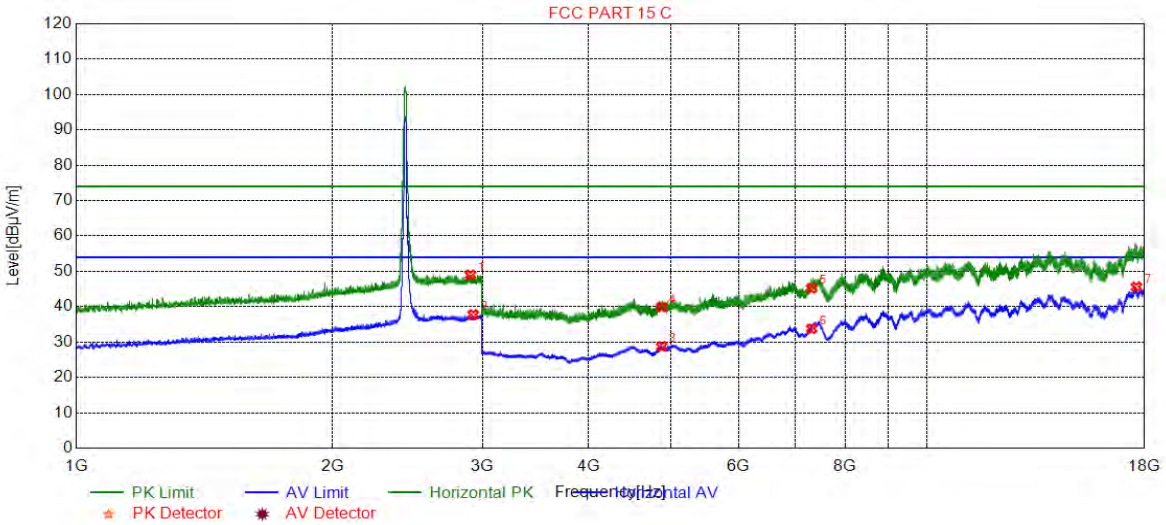
4.9.2.1.11 802.11G_ Middle Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2904.4761	48.98	2.26	74.00	25.02	150	315	Horizontal
2	2925.9815	37.77	2.28	54.00	16.23	150	56	Horizontal
3	4874.0000	28.75	-19.37	54.00	25.25	150	18	Horizontal
4	4874.0000	39.91	-19.37	74.00	34.09	150	358	Horizontal
5	7311.0000	45.21	-11.50	74.00	28.79	150	51	Horizontal
6	7311.0000	33.79	-11.50	54.00	20.21	150	132	Horizontal
7	17607.9804	45.61	1.42	54.00	8.39	150	81	Horizontal

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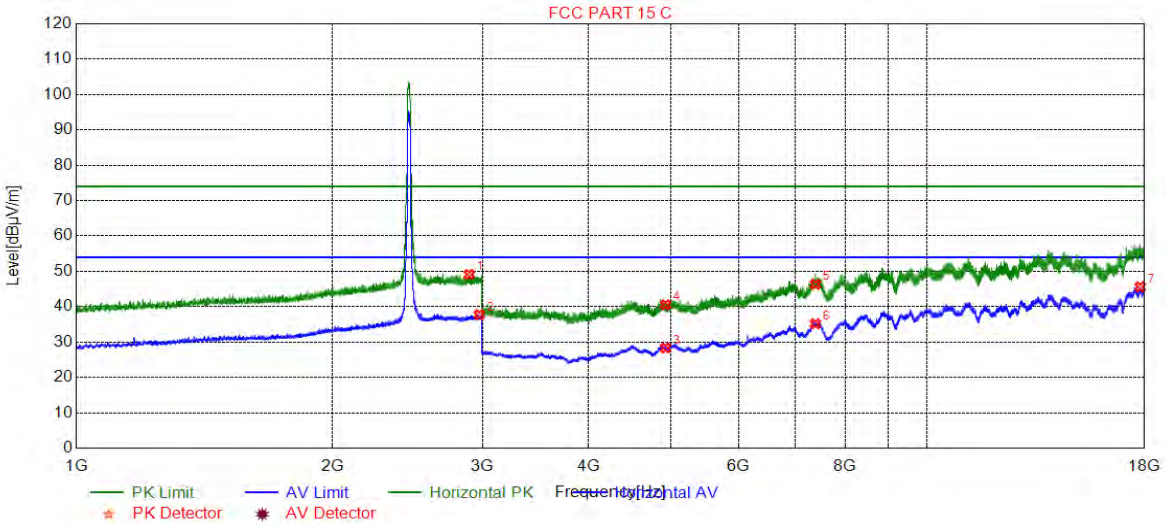
4.9.2.1.12 802.11G_ Highest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2895.9740	49.13	2.26	74.00	24.87	150	191	Horizontal
2	2975.4939	37.75	2.31	54.00	16.25	150	120	Horizontal
3	4924.0000	28.35	-18.87	54.00	25.65	150	301	Horizontal
4	4924.0000	40.56	-18.87	74.00	33.44	150	349	Horizontal
5	7386.0000	46.33	-10.72	74.00	27.67	150	35	Horizontal
6	7386.0000	35.18	-10.72	54.00	18.82	150	220	Horizontal
7	17786.4893	45.62	-0.80	54.00	8.38	150	114	Horizontal

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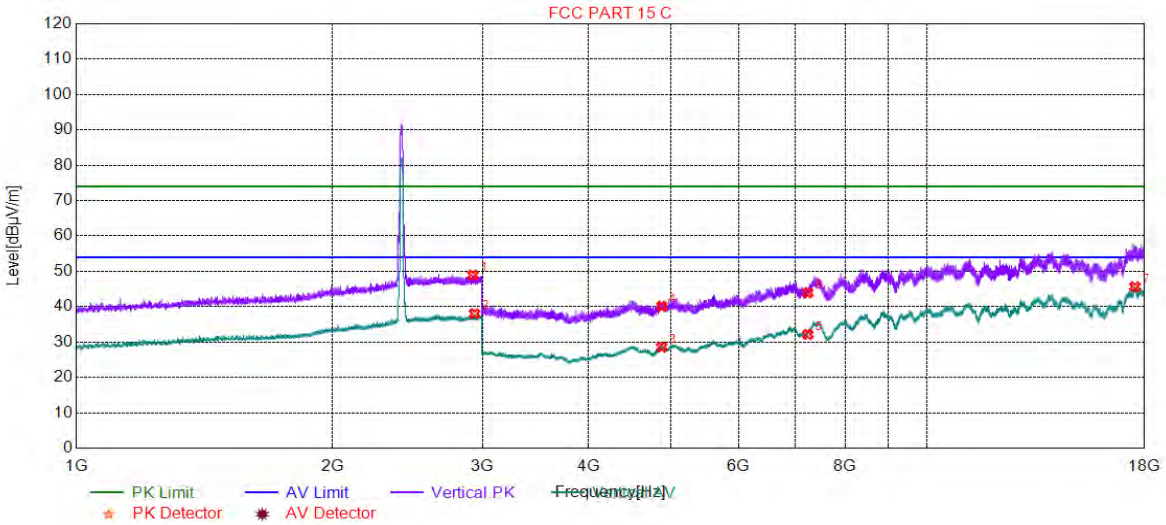
4.9.2.1.13 802.11N20_Lowest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2923.9810	48.95	2.28	74.00	25.05	150	179	Vertical
2	2937.4844	38.03	2.29	54.00	15.97	150	139	Vertical
3	4874.0000	28.59	-19.37	54.00	25.41	150	82	Vertical
4	4874.0000	40.14	-19.37	74.00	33.86	150	18	Vertical
5	7236.0000	32.17	-12.40	54.00	21.83	150	131	Vertical
6	7236.0000	43.97	-12.40	74.00	30.03	150	292	Vertical
7	17534.4767	45.66	0.79	54.00	8.34	150	227	Vertical

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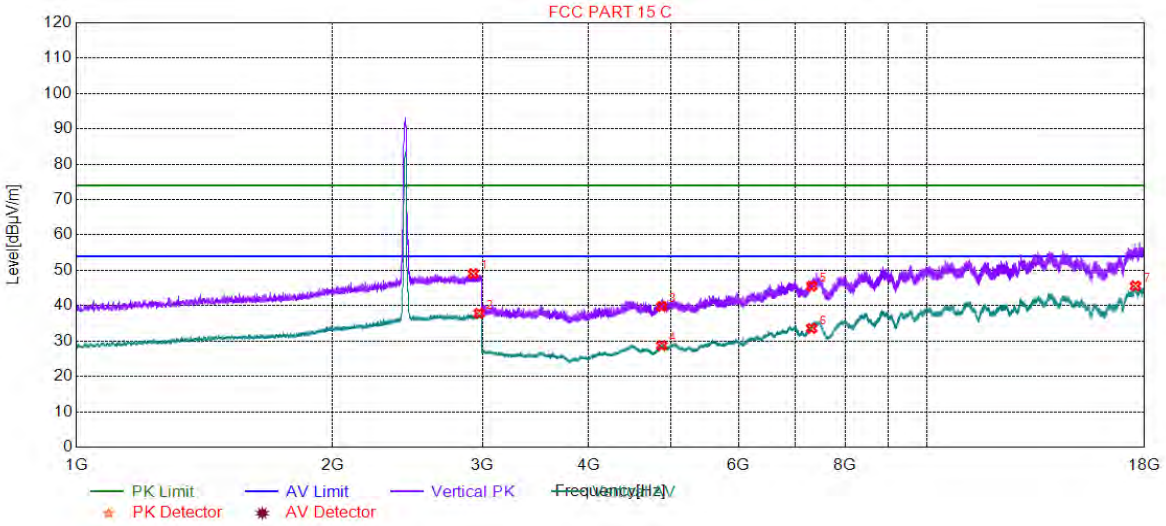
4.9.2.1.14 802.11N20_ Middle Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2926.9817	49.06	2.28	74.00	24.94	150	170	Vertical
2	2972.9932	37.85	2.31	54.00	16.15	150	303	Vertical
3	4874.0000	39.78	-19.37	74.00	34.22	150	34	Vertical
4	4874.0000	28.73	-19.37	54.00	25.27	150	50	Vertical
5	7311.0000	45.54	-11.50	74.00	28.46	150	212	Vertical
6	7311.0000	33.60	-11.50	54.00	20.40	150	293	Vertical
7	17560.4780	45.58	1.12	54.00	8.42	150	285	Vertical

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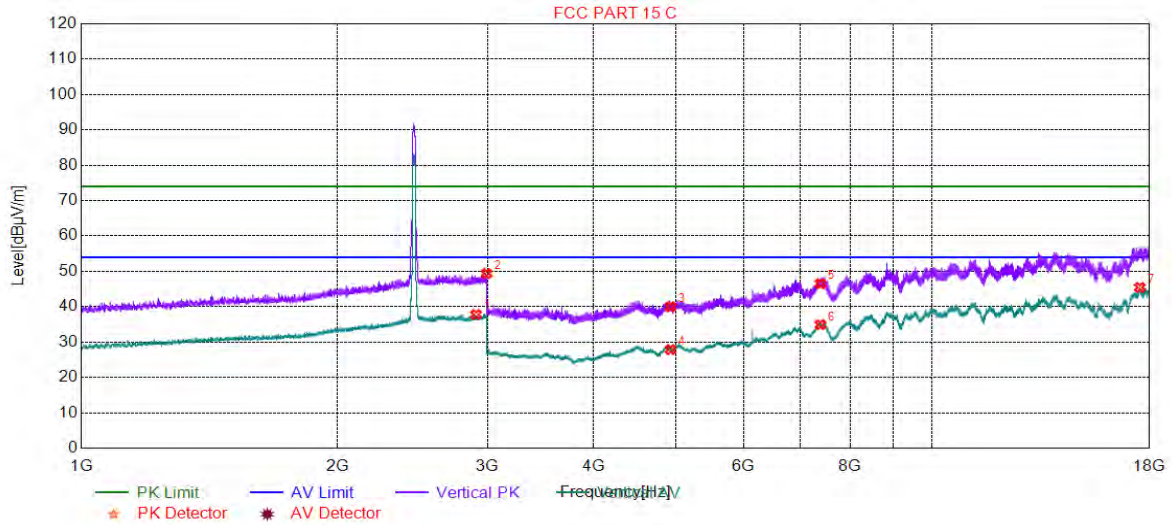
4.9.2.1.15 802.11N20_ Highest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2909.4774	37.79	2.27	54.00	16.21	150	343	Vertical
2	2993.9985	49.40	2.33	74.00	24.60	150	319	Vertical
3	4924.0000	39.98	-18.87	74.00	34.02	150	115	Vertical
4	4924.0000	27.88	-18.87	54.00	26.12	150	211	Vertical
5	7386.0000	46.54	-10.72	74.00	27.46	150	83	Vertical
6	7386.0000	34.92	-10.72	54.00	19.08	150	276	Vertical
7	17530.4765	45.46	0.74	54.00	8.54	150	286	Vertical

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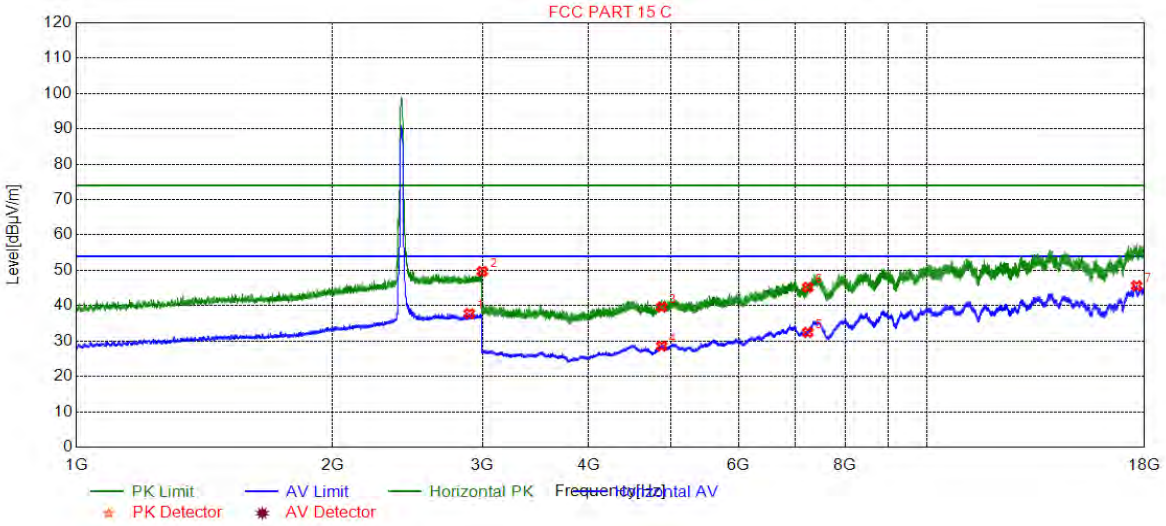
4.9.2.1.16 802.11N20_Lowest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2896.9742	37.76	2.26	54.00	16.24	150	229	Horizontal
2	2998.9998	49.69	2.33	74.00	24.31	150	268	Horizontal
3	4874.0000	39.61	-19.37	74.00	34.39	150	205	Horizontal
4	4874.0000	28.59	-19.37	54.00	25.41	150	52	Horizontal
5	7236.0000	32.46	-12.40	54.00	21.54	150	319	Horizontal
6	7236.0000	45.20	-12.40	74.00	28.80	150	335	Horizontal
7	17619.9810	45.62	1.11	54.00	8.38	150	342	Horizontal

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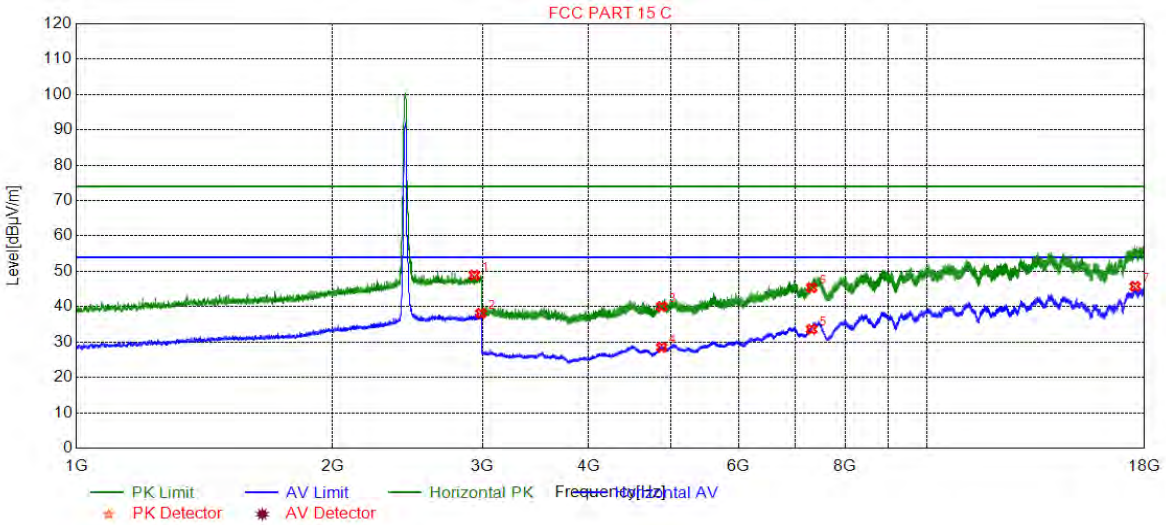
4.9.2.1.17 802.11N20_ Middle Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2934.9837	48.91	2.28	74.00	25.09	150	270	Horizontal
2	2988.4971	38.10	2.32	54.00	15.90	150	340	Horizontal
3	4874.0000	40.05	-19.37	74.00	33.95	150	254	Horizontal
4	4874.0000	28.51	-19.37	54.00	25.49	150	234	Horizontal
5	7311.0000	33.63	-11.50	54.00	20.37	150	132	Horizontal
6	7311.0000	45.37	-11.50	74.00	28.63	150	234	Horizontal
7	17544.9772	45.75	0.93	54.00	8.25	150	198	Horizontal

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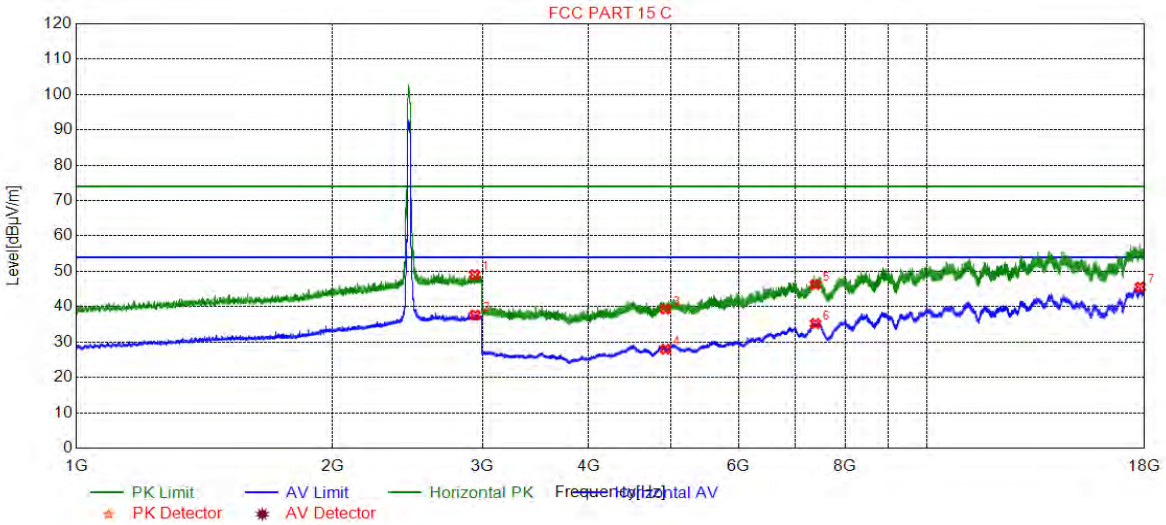
4.9.2.1.18 802.11N20_ Highest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2937.9845	49.05	2.29	74.00	24.95	150	262	Horizontal
2	2940.9852	37.67	2.29	54.00	16.33	150	113	Horizontal
3	4924.0000	39.31	-18.87	74.00	34.69	150	18	Horizontal
4	4924.0000	27.98	-18.87	54.00	26.02	150	356	Horizontal
5	7386.0000	46.26	-10.72	74.00	27.74	150	100	Horizontal
6	7386.0000	35.23	-10.72	54.00	18.77	150	342	Horizontal
7	17785.4893	45.54	-0.80	54.00	8.46	150	2	Horizontal

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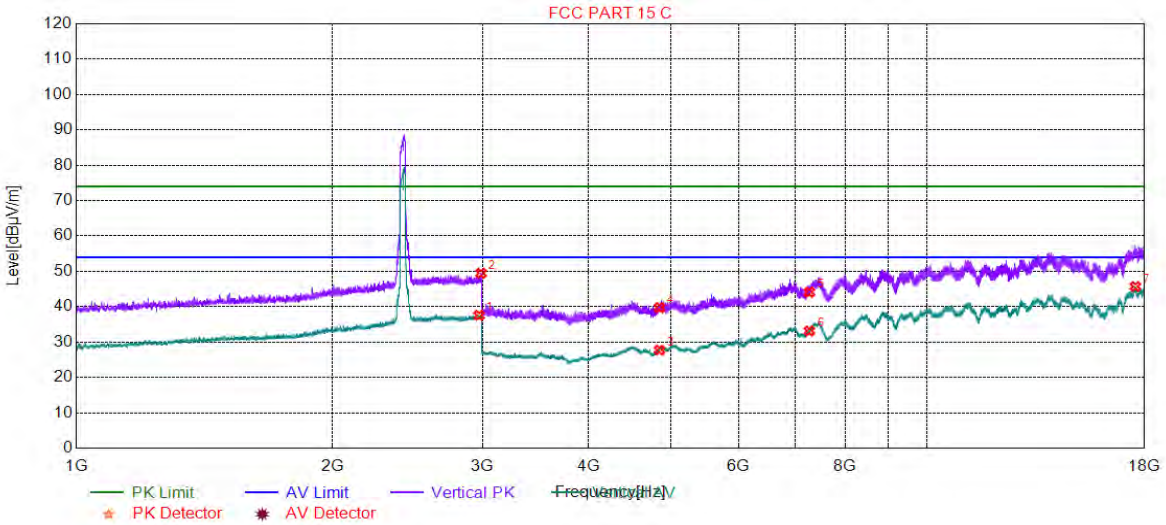
4.9.2.1.19 802.11N40_Lowest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2972.9932	37.56	2.31	54.00	16.44	150	69	Vertical
2	2988.9972	49.47	2.32	74.00	24.53	150	62	Vertical
3	4844.0000	27.73	-19.80	54.00	26.27	150	310	Vertical
4	4844.0000	39.73	-19.80	74.00	34.27	150	34	Vertical
5	7266.0000	44.10	-12.03	74.00	29.90	150	213	Vertical
6	7266.0000	33.14	-12.03	54.00	20.86	150	67	Vertical
7	17552.4776	45.71	1.02	54.00	8.29	150	115	Vertical

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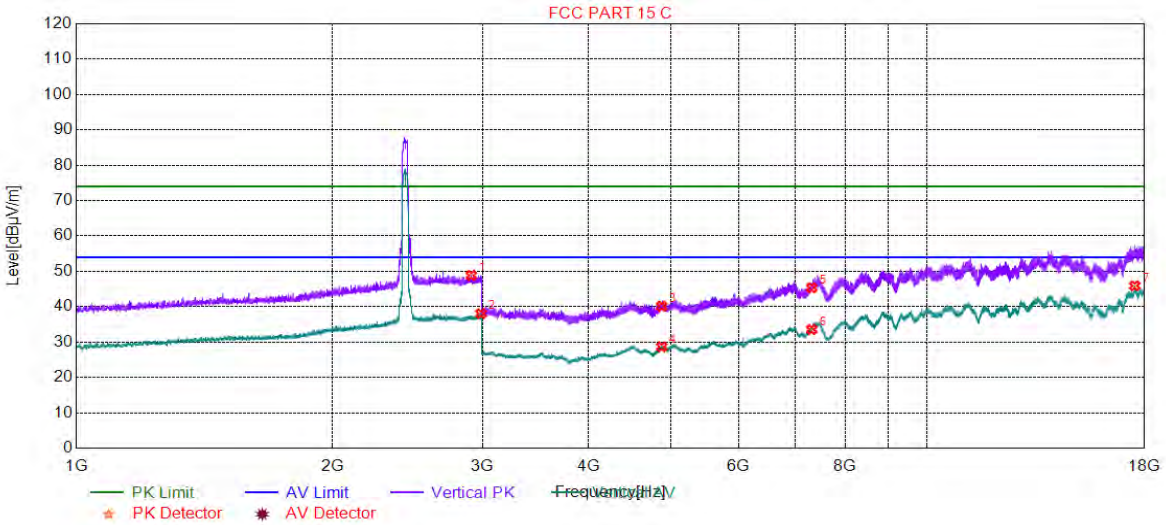
4.9.2.1.20 802.11N40_ Middle Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2911.4779	48.87	2.27	74.00	25.13	150	124	Vertical
2	2988.4971	38.04	2.32	54.00	15.96	150	312	Vertical
3	4874.0000	40.13	-19.37	74.00	33.87	150	51	Vertical
4	4874.0000	28.66	-19.37	54.00	25.34	150	292	Vertical
5	7311.0000	45.34	-11.50	74.00	28.66	150	356	Vertical
6	7311.0000	33.58	-11.50	54.00	20.42	150	292	Vertical
7	17525.4763	45.92	0.68	54.00	8.08	150	114	Vertical

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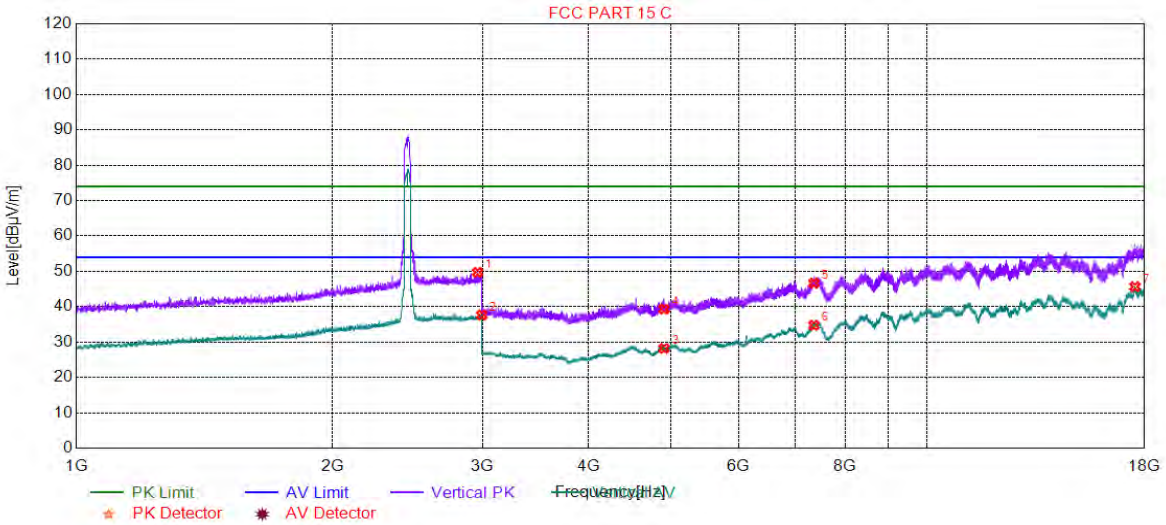
4.9.2.1.21 802.11N40_ Highest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2961.9905	49.71	2.30	74.00	24.29	150	109	Vertical
2	2995.4989	37.65	2.33	54.00	16.35	150	124	Vertical
3	4904.0000	28.21	-18.98	54.00	25.79	150	356	Vertical
4	4904.0000	39.31	-18.98	74.00	34.69	150	67	Vertical
5	7356.0000	46.68	-11.03	74.00	27.32	150	356	Vertical
6	7356.0000	34.74	-11.03	54.00	19.26	150	277	Vertical
7	17536.9768	45.66	0.82	54.00	8.34	150	313	Vertical

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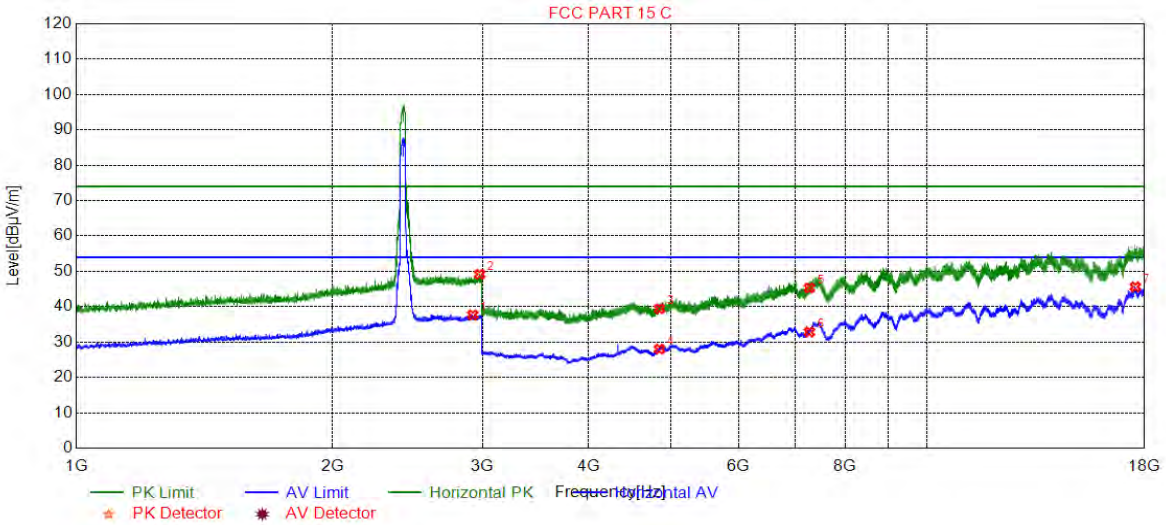
4.9.2.1.22 802.11N40_Lowest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2921.9805	37.71	2.28	54.00	16.29	150	269	Horizontal
2	2978.9947	49.19	2.32	74.00	24.81	150	230	Horizontal
3	4844.0000	39.43	-19.80	74.00	34.57	150	34	Horizontal
4	4844.0000	28.02	-19.80	54.00	25.98	150	312	Horizontal
5	7266.0000	45.29	-12.03	74.00	28.71	150	105	Horizontal
6	7266.0000	32.87	-12.03	54.00	21.13	150	261	Horizontal
7	17550.9775	45.62	1.00	54.00	8.38	150	141	Horizontal

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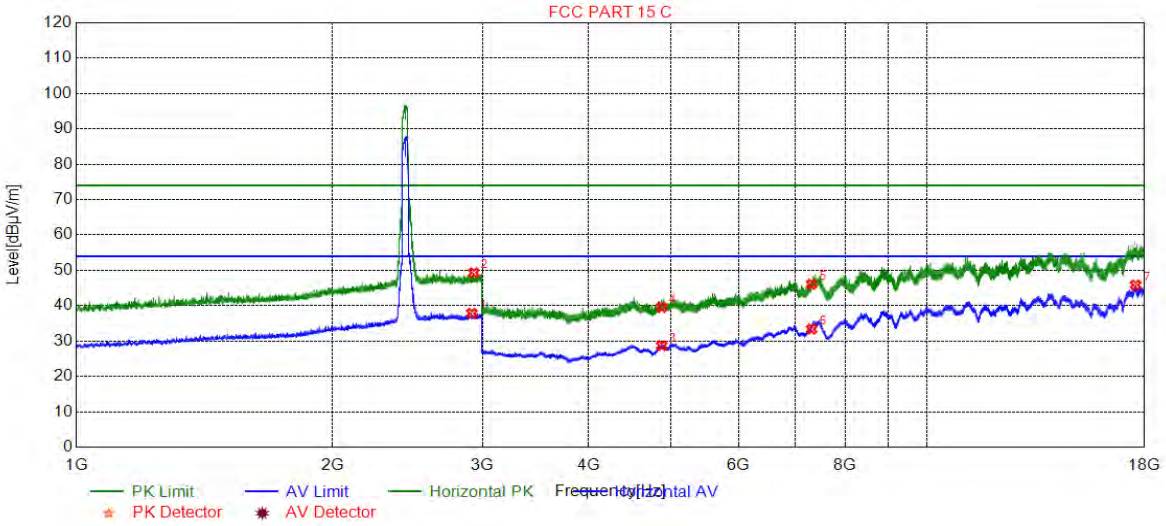
4.9.2.1.23 802.11N40_ Middle Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2915.9790	37.86	2.27	54.00	16.14	150	17	Horizontal
2	2930.9827	49.32	2.28	74.00	24.68	150	17	Horizontal
3	4874.0000	28.69	-19.37	54.00	25.31	150	18	Horizontal
4	4874.0000	39.56	-19.37	74.00	34.44	150	244	Horizontal
5	7311.0000	46.08	-11.50	74.00	27.92	150	324	Horizontal
6	7311.0000	33.40	-11.50	54.00	20.60	150	83	Horizontal
7	17566.9783	45.86	1.21	54.00	8.14	150	196	Horizontal

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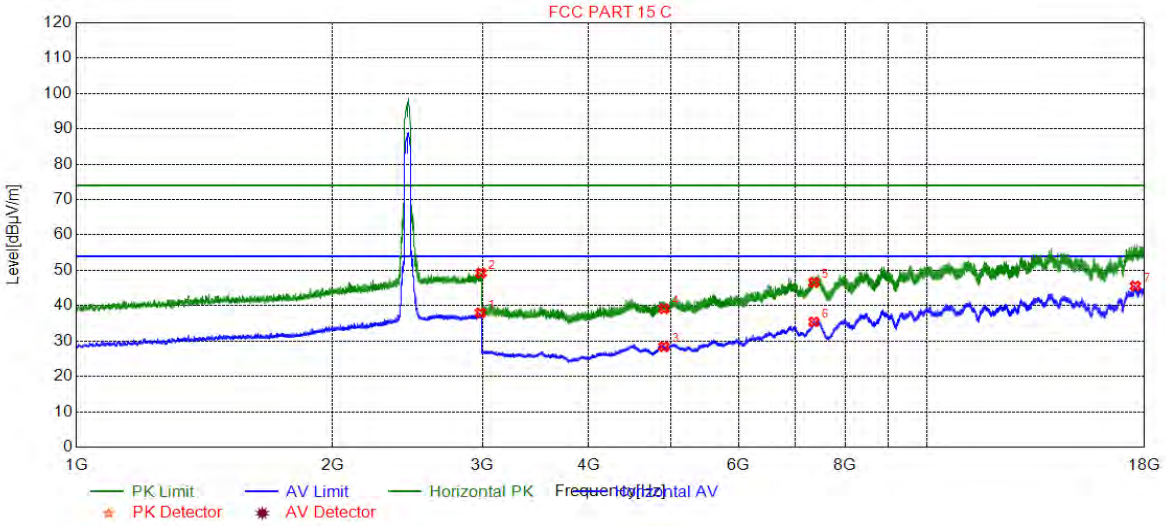
4.9.2.1.24 802.11N40_ Highest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2983.9960	37.96	2.32	54.00	16.04	150	190	Horizontal
2	2987.9970	49.24	2.32	74.00	24.76	150	136	Horizontal
3	4904.0000	28.44	-18.98	54.00	25.56	150	116	Horizontal
4	4904.0000	39.13	-18.98	74.00	34.87	150	99	Horizontal
5	7356.0000	46.57	-11.03	74.00	27.43	150	164	Horizontal
6	7356.0000	35.40	-11.03	54.00	18.60	150	260	Horizontal
7	17553.9777	45.56	1.04	54.00	8.44	150	52	Horizontal

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:			

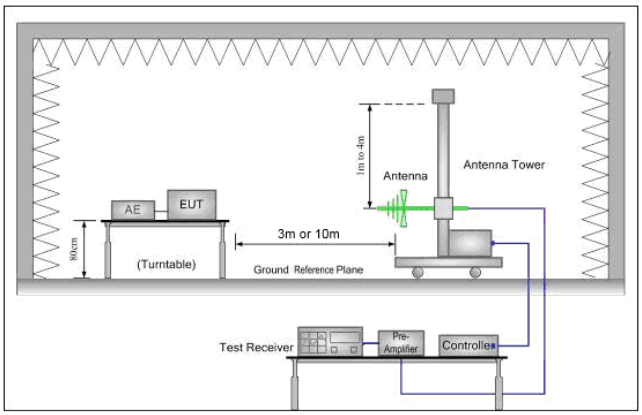

Figure 1. 30MHz to 1GHz

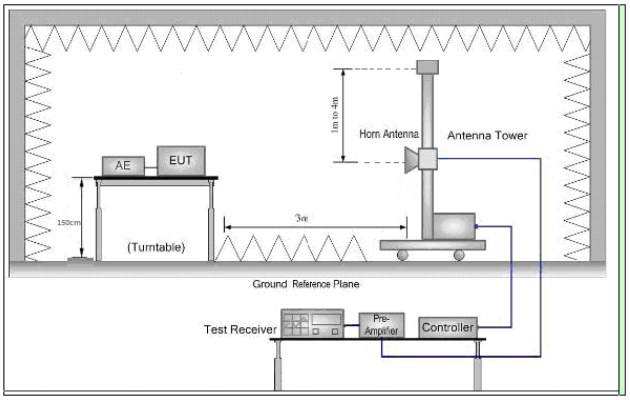

Figure 2. Above 1 GHz

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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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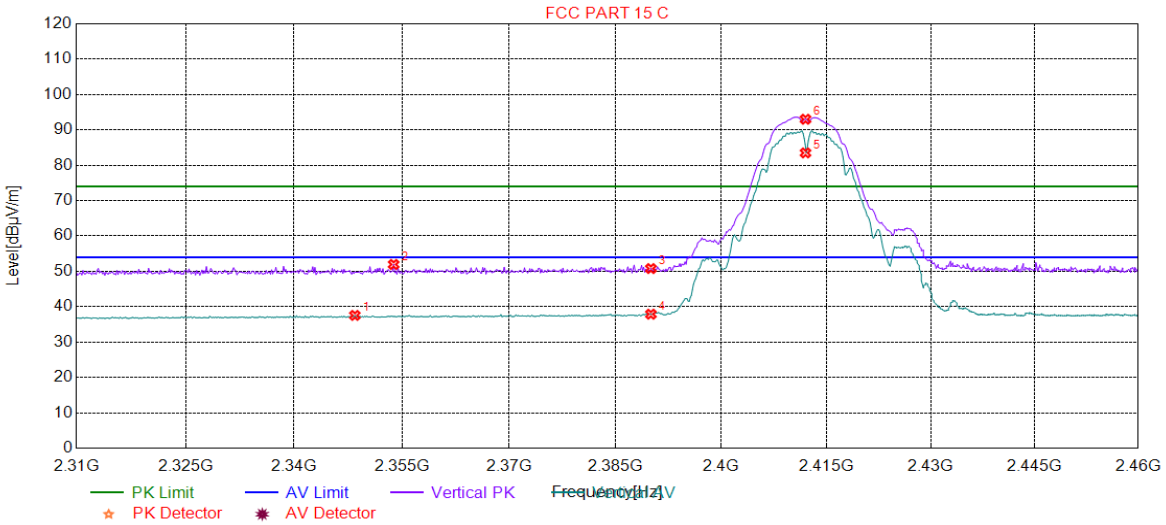
Test plot as follows:

4.10.1 ANT1

4.10.1.1 802.11B_Lowest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2348.43	37.55	1.06	54.00	16.45	150	41	Vertical
2	2353.84	51.95	1.09	74.00	22.05	150	250	Vertical
3	2390.00	50.79	1.25	74.00	23.21	150	282	Vertical
4	2390.00	37.89	1.25	54.00	16.11	150	211	Vertical
5	2412.00	83.49	1.32	54.00	-29.49	150	240	Vertical
6	2412.00	93.01	1.32	74.00	-19.01	150	240	Vertical

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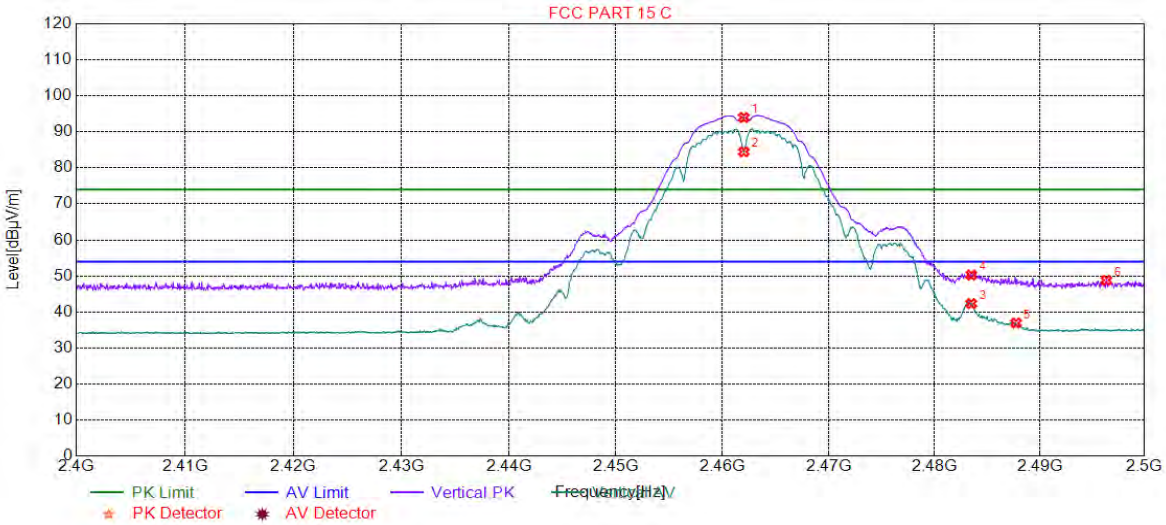
4.10.1.2 802.11B_ Highest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	93.97	1.46	74.00	-19.97	150	294	Vertical
2	2462.00	84.46	1.46	54.00	-30.46	150	297	Vertical
3	2483.50	42.31	1.52	54.00	11.69	150	297	Vertical
4	2483.50	50.25	1.52	74.00	23.75	150	297	Vertical
5	2487.74	36.95	1.54	54.00	17.05	150	294	Vertical
6	2496.34	48.79	1.56	74.00	25.21	150	189	Vertical

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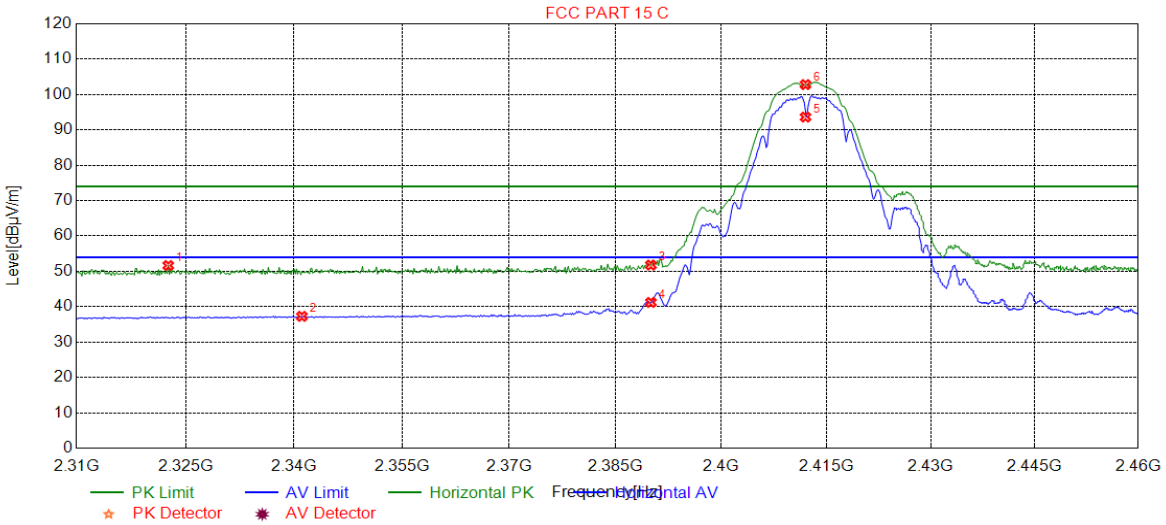
4.10.1.3 802.11B_Lowest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2322.61	51.65	0.95	74.00	22.35	150	329	Horizontal
2	2341.08	37.28	1.03	54.00	16.72	150	224	Horizontal
3	2390.00	51.78	1.25	74.00	22.22	150	215	Horizontal
4	2390.00	41.22	1.25	54.00	12.78	150	215	Horizontal
5	2412.00	93.62	1.32	54.00	-39.62	150	215	Horizontal
6	2412.00	102.81	1.32	74.00	-28.81	150	215	Horizontal

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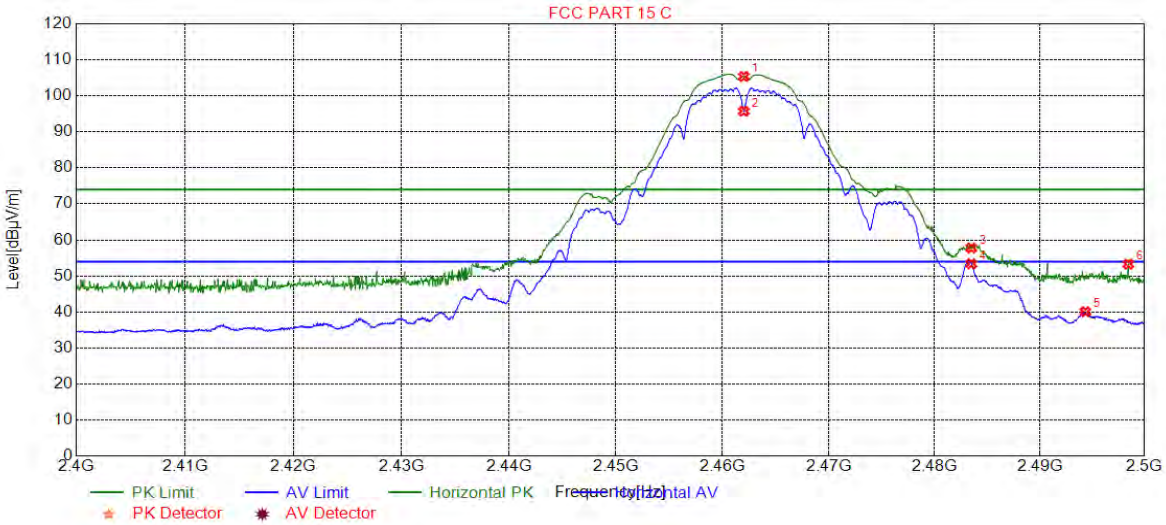
4.10.1.4 802.11B_ Highest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	105.37	1.46	74.00	-31.37	150	220	Horizontal
2	2462.00	95.73	1.46	54.00	-41.73	150	220	Horizontal
3	2483.50	57.76	1.52	74.00	16.24	150	216	Horizontal
4	2483.50	53.38	1.52	54.00	0.62	150	216	Horizontal
5	2494.34	40.08	1.55	54.00	13.92	150	213	Horizontal
6	2498.44	53.29	1.57	74.00	20.71	150	284	Horizontal

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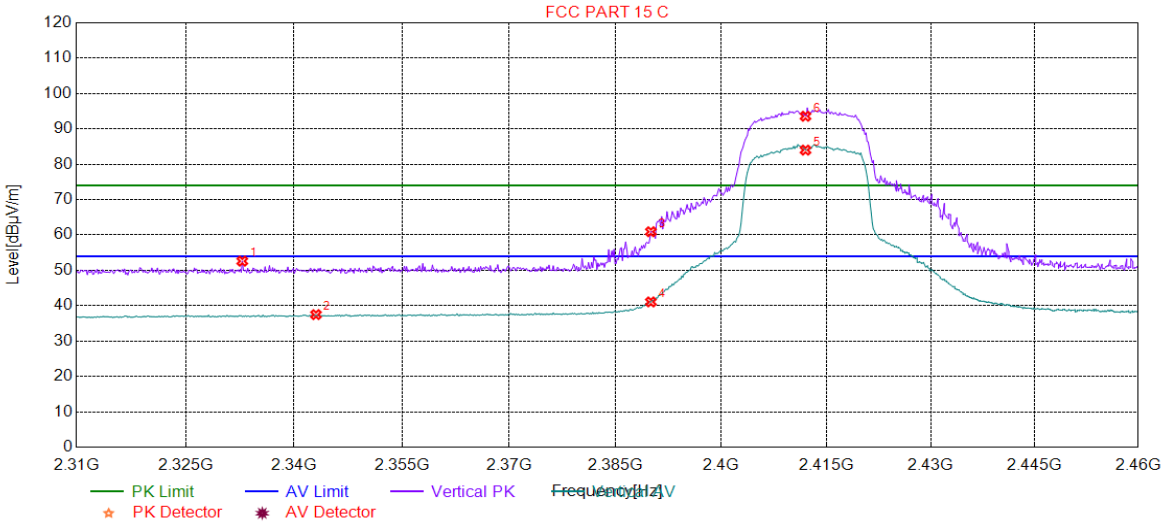
4.10.1.5 802.11G_Lowest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2332.82	52.60	0.99	74.00	21.40	150	2	Vertical
2	2343.03	37.49	1.04	54.00	16.51	150	237	Vertical
3	2390.00	60.92	1.25	74.00	13.08	150	206	Vertical
4	2390.00	41.07	1.25	54.00	12.93	150	52	Vertical
5	2412.00	84.00	1.32	54.00	-30.00	150	267	Vertical
6	2412.00	93.57	1.32	74.00	-19.57	150	36	Vertical

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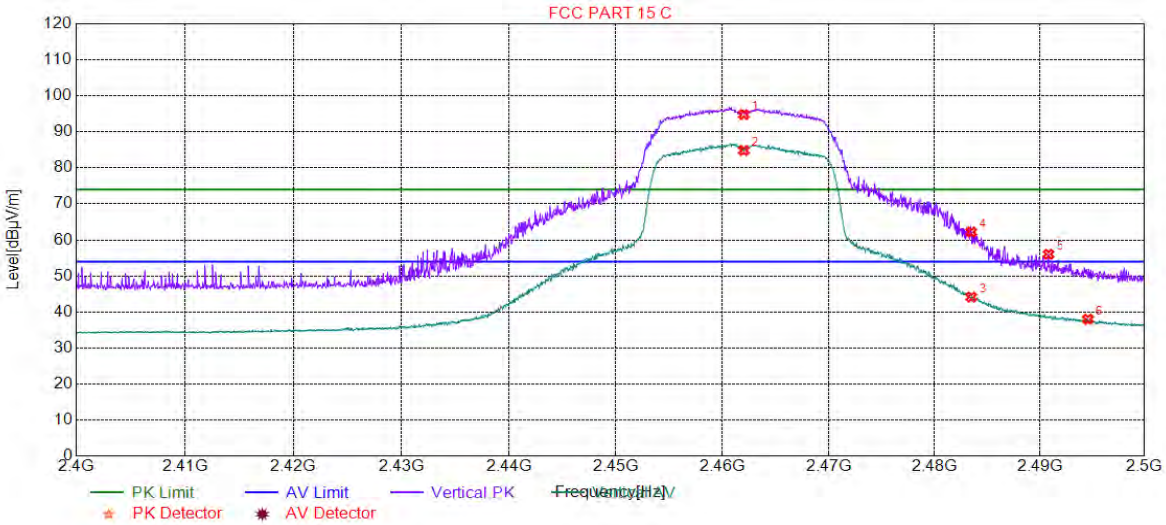
4.10.1.6 802.11G_ Highest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	94.82	1.46	74.00	-20.82	150	40	Vertical
2	2462.00	84.82	1.46	54.00	-30.82	150	44	Vertical
3	2483.50	44.15	1.52	54.00	9.85	150	40	Vertical
4	2483.50	62.17	1.52	74.00	11.83	150	40	Vertical
5	2490.84	56.03	1.54	74.00	17.97	150	278	Vertical
6	2494.59	38.00	1.55	54.00	16.00	150	44	Vertical

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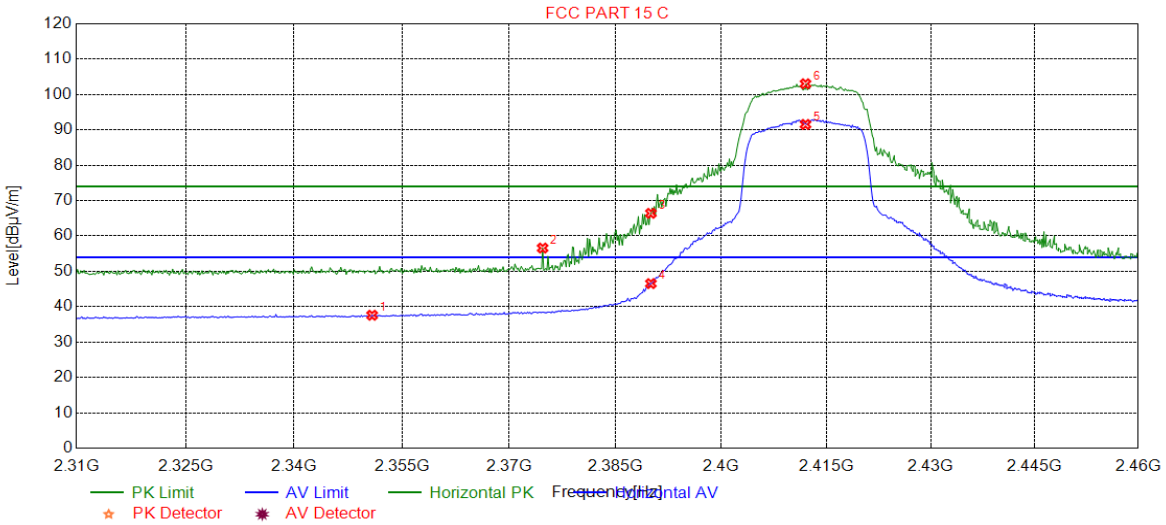
4.10.1.7 802.11G_Lowest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2350.84	37.59	1.07	54.00	16.41	150	243	Horizontal
2	2374.71	56.58	1.18	74.00	17.42	150	268	Horizontal
3	2390.00	66.41	1.25	74.00	7.59	150	206	Horizontal
4	2390.00	46.54	1.25	54.00	7.46	150	210	Horizontal
5	2412.00	91.55	1.32	54.00	-37.55	150	206	Horizontal
6	2412.00	103.05	1.32	74.00	-29.05	150	203	Horizontal

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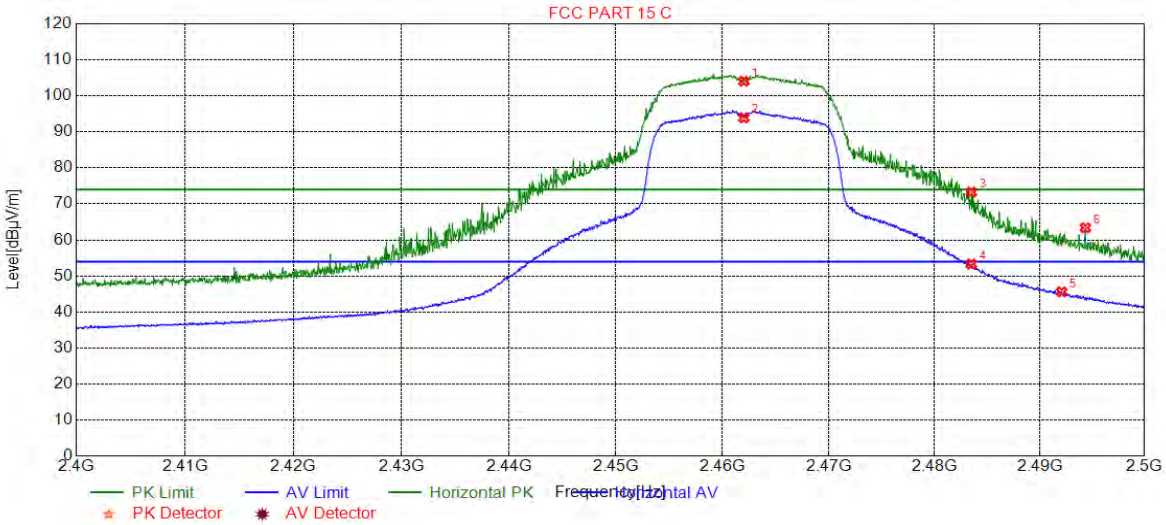
4.10.1.8 802.11G_ Highest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	104.05	1.46	74.00	-30.05	150	216	Horizontal
2	2462.00	93.89	1.46	54.00	-39.89	150	212	Horizontal
3	2483.50	73.30	1.52	74.00	0.70	150	231	Horizontal
4	2483.50	53.30	1.52	54.00	0.70	150	216	Horizontal
5	2492.09	45.59	1.55	54.00	8.41	150	216	Horizontal
6	2494.34	63.37	1.55	74.00	10.63	150	220	Horizontal

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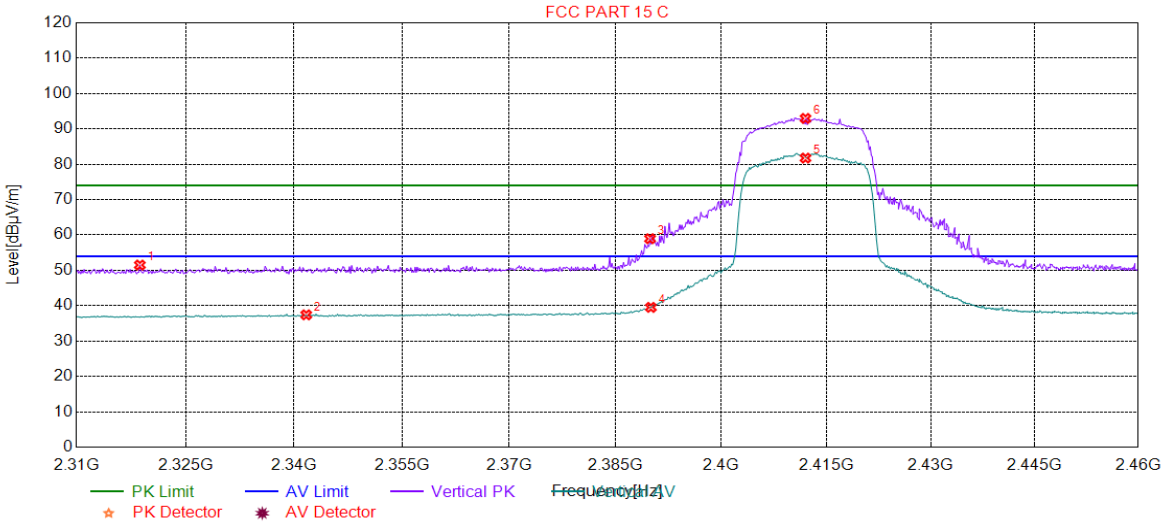
4.10.1.9 802.11N20_Lowest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2318.70	51.50	0.93	74.00	22.50	150	319	Vertical
2	2341.68	37.42	1.03	54.00	16.58	150	250	Vertical
3	2389.87	58.95	1.25	74.00	15.05	150	346	Vertical
4	2390.00	39.53	1.25	54.00	14.47	150	210	Vertical
5	2412.00	81.74	1.32	54.00	-27.74	150	240	Vertical
6	2412.00	92.96	1.32	74.00	-18.96	150	240	Vertical

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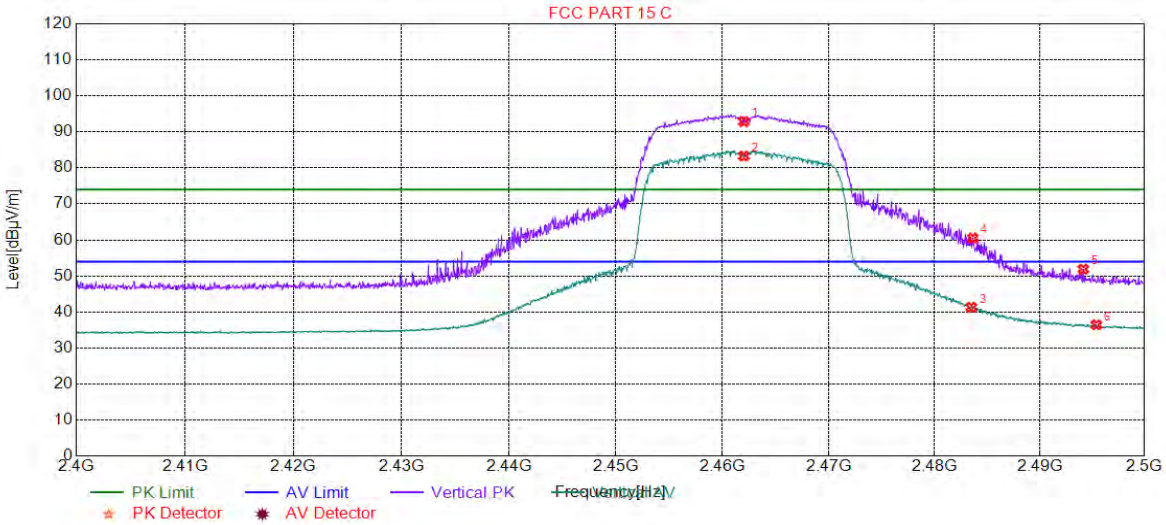
4.10.1.10 802.11N20_ Highest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	92.86	1.46	74.00	-18.86	150	129	Vertical
2	2462.00	83.27	1.46	54.00	-29.27	150	129	Vertical
3	2483.50	41.30	1.52	54.00	12.70	150	129	Vertical
4	2483.64	60.51	1.52	74.00	13.49	150	129	Vertical
5	2494.14	51.89	1.55	74.00	22.11	150	129	Vertical
6	2495.39	36.44	1.56	54.00	17.56	150	129	Vertical

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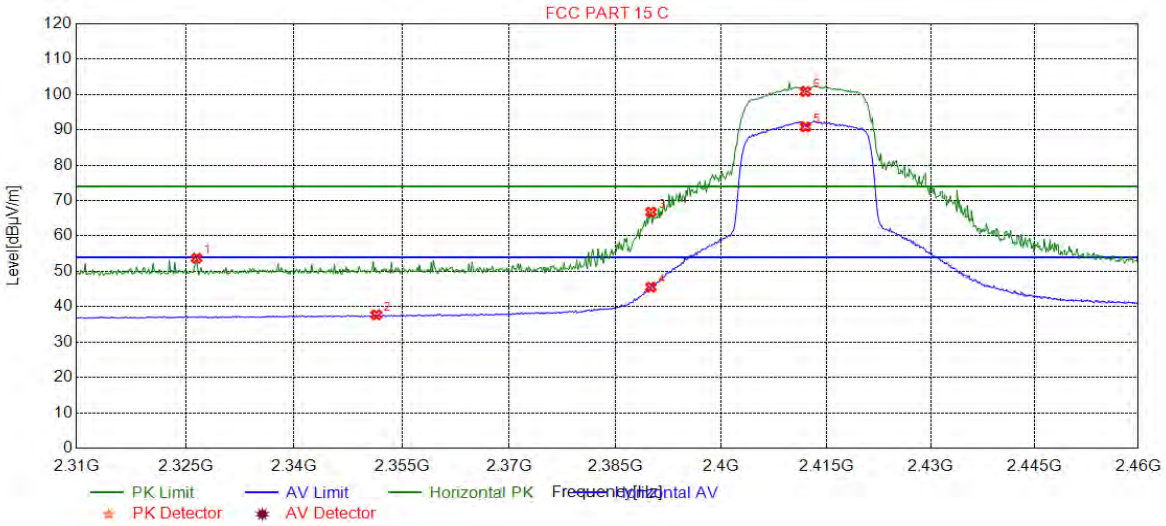
4.10.1.11 802.11N20_Lowest Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2326.51	53.72	0.97	74.00	20.28	150	109	Horizontal
2	2351.44	37.69	1.08	54.00	16.31	150	218	Horizontal
3	2390.00	66.76	1.25	74.00	7.24	150	224	Horizontal
4	2390.00	45.54	1.25	54.00	8.46	150	218	Horizontal
5	2412.00	90.86	1.32	54.00	-36.86	150	218	Horizontal
6	2412.00	100.85	1.32	74.00	-26.85	150	218	Horizontal

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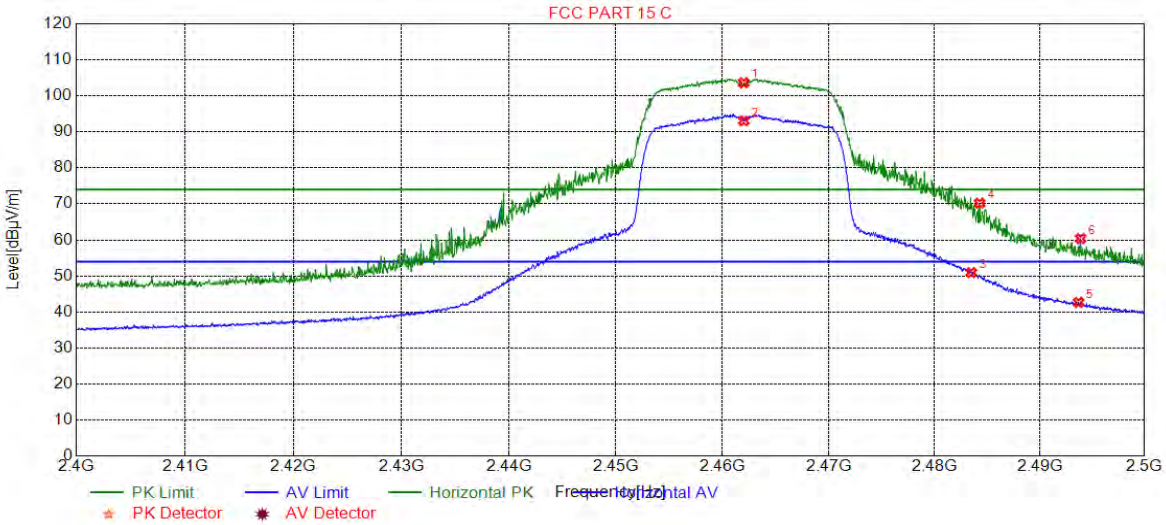
4.10.1.12 802.11N20_ Highest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	103.61	1.46	74.00	-29.61	150	222	Horizontal
2	2462.00	93.06	1.46	54.00	-39.06	150	219	Horizontal
3	2483.50	50.93	1.52	54.00	3.07	150	219	Horizontal
4	2484.29	70.19	1.53	74.00	3.81	150	226	Horizontal
5	2493.69	42.66	1.55	54.00	11.34	150	222	Horizontal
6	2493.89	60.37	1.55	74.00	13.63	150	222	Horizontal

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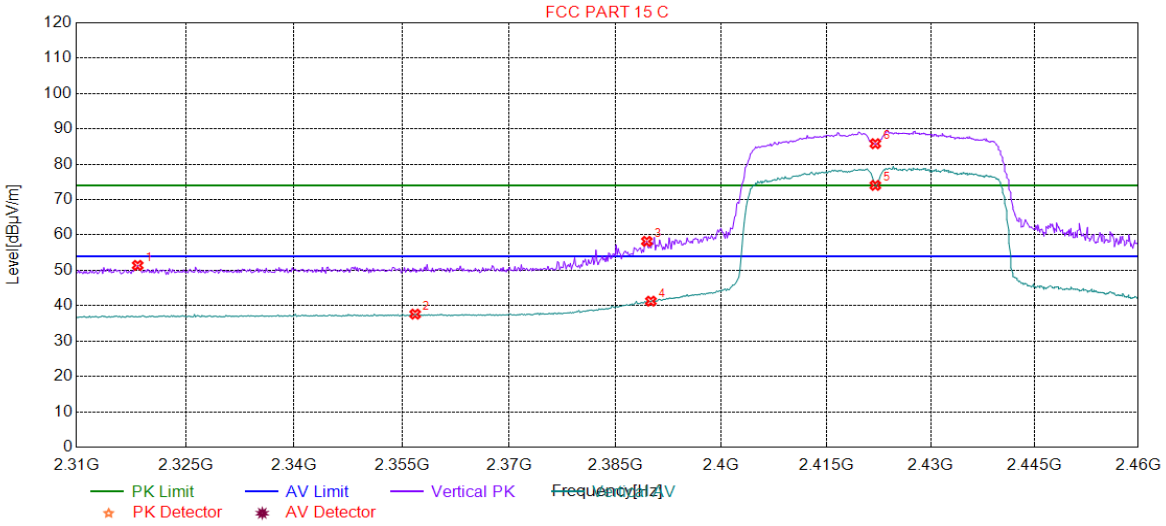
4.10.1.13 802.11N40_Lowest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2318.40	51.42	0.93	74.00	22.58	150	346	Vertical
2	2356.84	37.63	1.10	54.00	16.37	150	152	Vertical
3	2389.42	58.21	1.24	74.00	15.79	150	5	Vertical
4	2390.00	41.29	1.25	54.00	12.71	150	346	Vertical
5	2422.00	74.02	1.35	54.00	-20.02	150	208	Vertical
6	2422.00	85.82	1.35	74.00	-11.82	150	204	Vertical

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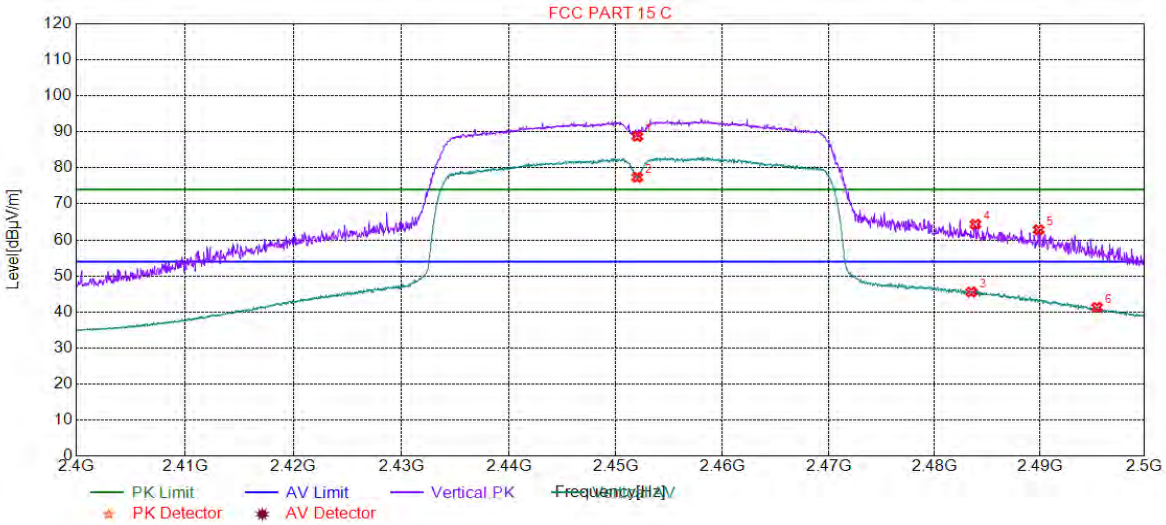
4.10.1.14 802.11N40_ Highest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2452.00	88.71	1.44	74.00	-14.71	150	303	Vertical
2	2452.00	77.38	1.44	54.00	-23.38	150	299	Vertical
3	2483.50	45.55	1.52	54.00	8.45	150	295	Vertical
4	2483.89	64.34	1.52	74.00	9.66	150	299	Vertical
5	2489.89	62.81	1.54	74.00	11.19	150	268	Vertical
6	2495.44	41.31	1.56	54.00	12.69	150	295	Vertical

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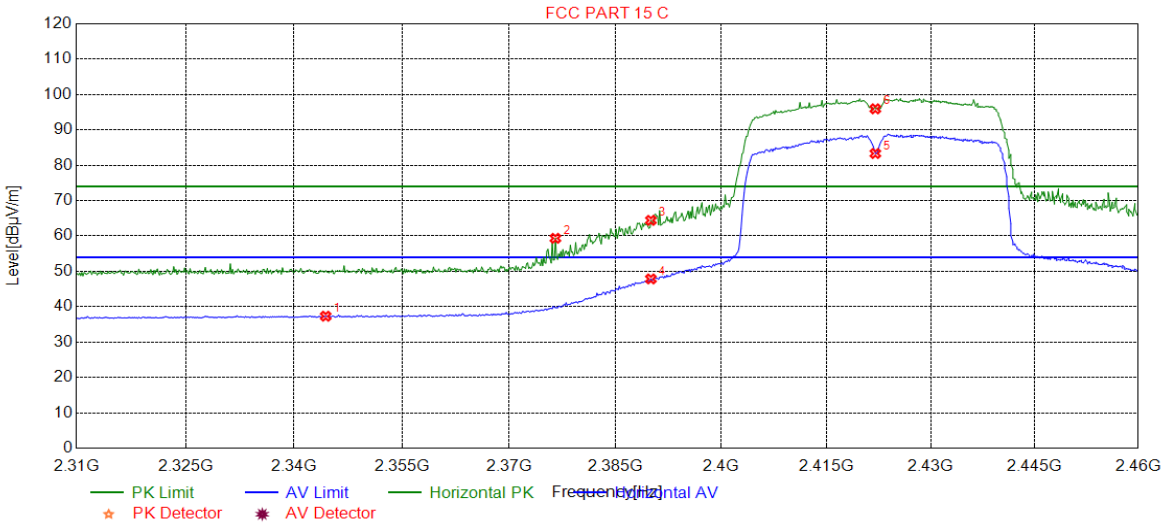
4.10.1.15 802.11N40_Lowest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2344.38	37.32	1.05	54.00	16.68	150	138	Horizontal
2	2376.51	59.35	1.19	74.00	14.65	150	212	Horizontal
3	2390.00	64.42	1.25	74.00	9.58	150	212	Horizontal
4	2390.00	47.86	1.25	54.00	6.14	150	218	Horizontal
5	2422.00	83.32	1.35	54.00	-29.32	150	222	Horizontal
6	2422.00	95.96	1.35	74.00	-21.96	150	222	Horizontal

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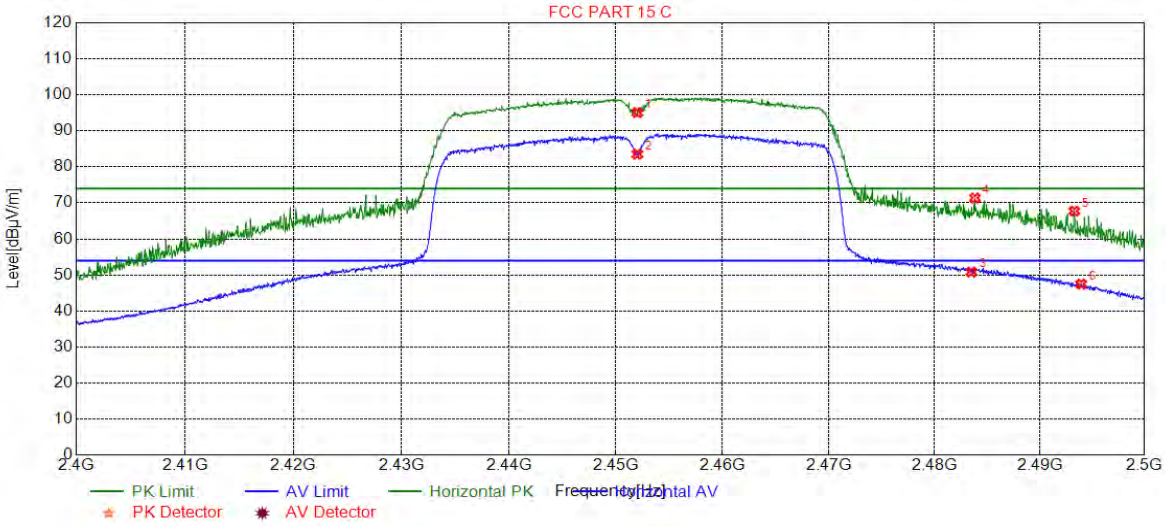
4.10.1.16 802.11N40_ Highest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2452.00	95.08	1.44	74.00	-21.08	150	211	Horizontal
2	2452.00	83.53	1.44	54.00	-29.53	150	226	Horizontal
3	2483.50	50.82	1.52	54.00	3.18	150	222	Horizontal
4	2483.84	71.35	1.52	74.00	2.65	150	222	Horizontal
5	2493.29	67.72	1.55	74.00	6.28	150	211	Horizontal
6	2493.94	47.48	1.55	54.00	6.52	150	226	Horizontal

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	2017/5/10	2020/5/9
LISN	Rohde & Schwarz	ENV216	SEM007-01	2018/9/2	2019/9/2
LISN	ETS-LINDGREN	Feb-16	SEM007-02	2019/3/2	2020/3/1
Measurement Software	AUDIX	e3 V5.4.1221d	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM024-01	2018/7/12	2019/7/11
2 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T2-02	EMC0122	2019/2/11	2020/2/10
EMI Test Receiver	Rohde & Schwarz	ESCI	SEM004-02	2019/3/2	2020/3/1

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	2018/9/15	2019/9/15
Signal Analyzer	Rohde & Schwarz	FSV	W025-05	2019/1/13	2020/1/12
Coaxial Cable	SGS	N/A	SEM031-01	2018/7/13	2019/7/12
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2018/9/2	2019/9/2
Temperature Chamber	GIANT FORCE	ICT-150-40-CP-AR	W027-03	2018/11/27	2019/11/27
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2018/9/2	2019/9/2

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	2017/8/5	2020/8/4
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2018/7/12	2019/7/11
MXE EMI Receiver (20Hz-8.4GHz)	Agilent Technologies	N9038A	SEM004-05	2018/9/2	2019/9/2
BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEM003-01	2017/6/27	2020/6/26
Pre-amplifier (0.1-1.3GHz)	Agilent Technologies	8447D	SEM005-01	2019/3/2	2020/3/1

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	2018/7/12	2019/7/11
EXA Signal Analyzer (10Hz-26.5GHz)	Agilent Technologies Inc	N9010A	SEM004-09	2019/4/12	2020/4/11
BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-01	2017/6/27	2020/6/26
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	2018/9/2	2019/9/2
Low Noise Amplifier(100MHz-18GHz)	Black Diamond Series	BDLNA-0118-352810	SEM005-05	2018/9/27	2019/9/27
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	2019/3/2	2020/3/1
Band filter	N/A	N/A	SEM023-01	N/A	N/A

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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	2019/3/2	2020/3/1
Trilog-Broadband Antenna(25M-2GHz)	Schwarzbeck	VULB9168	SEM003-18	2016/6/29	2019/6/28
Pre-amplifier (9k-1GHz)	Sonoma	310N	SEM005-03	2019/4/12	2020/4/11
Loop Antenna (9kHz-30MHz)	ETS-Lindgren	6502	SEM003-08	2017/8/22	2020/8/21
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM029-01	2018/7/12	2019/7/11

7 Photographs - EUT Constructional Details

Refer to Appendix A - Photographs of EUT Constructional Details for ZR/2019/50026.

The End

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