FCC TEST REPORT

Application No:	ZR/2019/40035
Applicant:	Nauto, Inc.
Address of Applicant	220 Portage Avenue, Palo Alto, California 94306
Manufacturer:	Nauto, Inc.
Address of Manufacturer	220 Portage Avenue, Palo Alto, California 94306
Factory:	DongGuan HeQin Electronic CO.,LTD
Address of Factory	Santun Road,Santun Village PortAvenue,Houjie Town,Dong Guan City,Guang Dong Province,P.R.China
EUT Description:	In-vehicle Camera
Model No.:	Nauto 3
Trade Mark:	Nauto
FCC ID:	2AKJ5-N3
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:	2019/5/10
Date of Test:	2019/5/10to 2019/6/2
Date of Issue:	2019/6/2
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		2019/6/2		Original

Authorized for issue by:				
Tested By		Mike Hu **(Mike Hu) /Project Engineer**		2019/6/2 **Date**
Checked By		David Chen **(David Chen) /Reviewer**		2019/6/2 **Date**

Remark:

There are two configurations of the product, the differences are as follows:

Configuration 1		
Brand (supplier)	**model**	**Description**
Nauto	**Nauto 3**	**UFS(32GB)**: Hynix **LPDDR4X_4GB**: Hynix **PCB Supplier**: Zhuhai Founder PCB Development Co., Ltd.

Configuration 2		
Brand (supplier)	**model**	**Description**

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Nauto	**Nauto 3**	UFS(32GB): Sandisk; LPDDR4X_4GB: Micron; PCB Supplier: RED BOARD LTD

According to the above differences, configuration 1 do Fully test, Configuration 2 spot check

2 Test Summary

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

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3 General Information

3.1 Client Information

Applicant:	Nauto, Inc.
Address of Applicant:	220 Portage Avenue, Palo Alto, California 94306
Manufacturer:	Nauto, Inc.
Address of Manufacturer:	220 Portage Avenue, Palo Alto, California 94306
Factory:	DongGuan HeQin Electronic CO.,LTD
Address of Factory:	Santun Road,Santun Village PortAvenue,Houjie Town,Dong Guan City,Guang Dong Province,P.R.China

3.2 Test Location

Company:	SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch
Address:	No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China
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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::	In-vehicle Camera
Model No.:	Nauto 3
Trade Mark:	Nauto
Hardware Version:	ISN-203014-NAA-000
Software Version:	ZSA191_USERDEBUG_Shipping_D15_201904221052
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
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:	-3.4dBi
Power Supply	☒ DC; ☐ 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 middle frequency, and the highest frequency of channel were selected to perform the test, and the selected

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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 -3.4dBi.	

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4.2 Duty Cycle

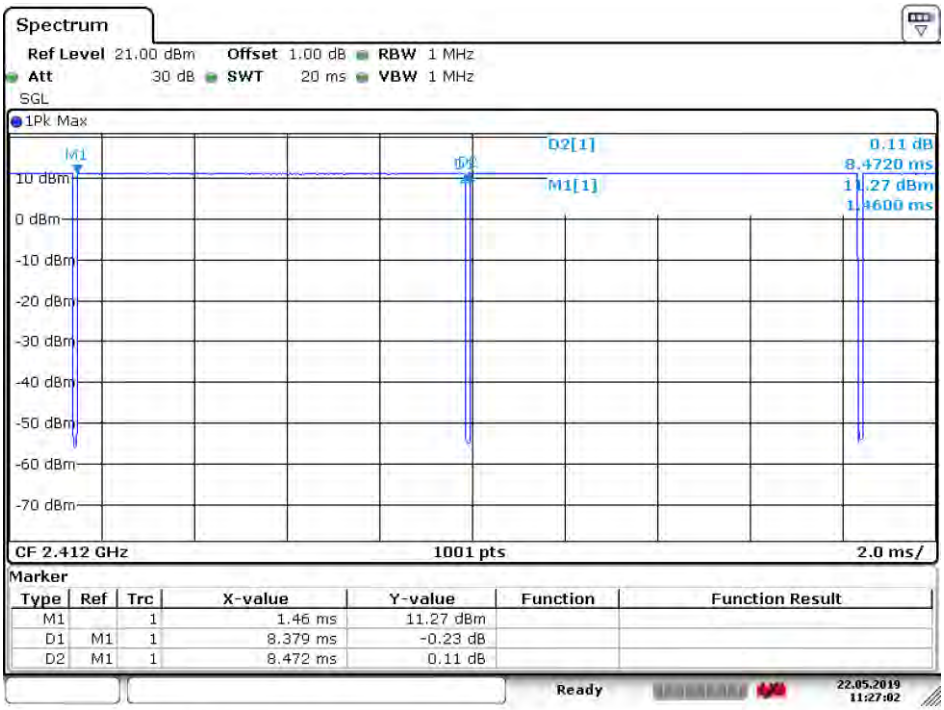
4.2.1 Test Results

Test Mode	TX Freq. [MHz]	Duty cycle [%]
11B	Ant 1: CH1	98.90
11G	Ant 1: CH1	96.23
11N20	Ant 1: CH1	96.04
11N40	Ant 1: CH3	86.32

4.2.1 Test Plots

4.2.1.1 ANT1

4.2.1.1.1 11B



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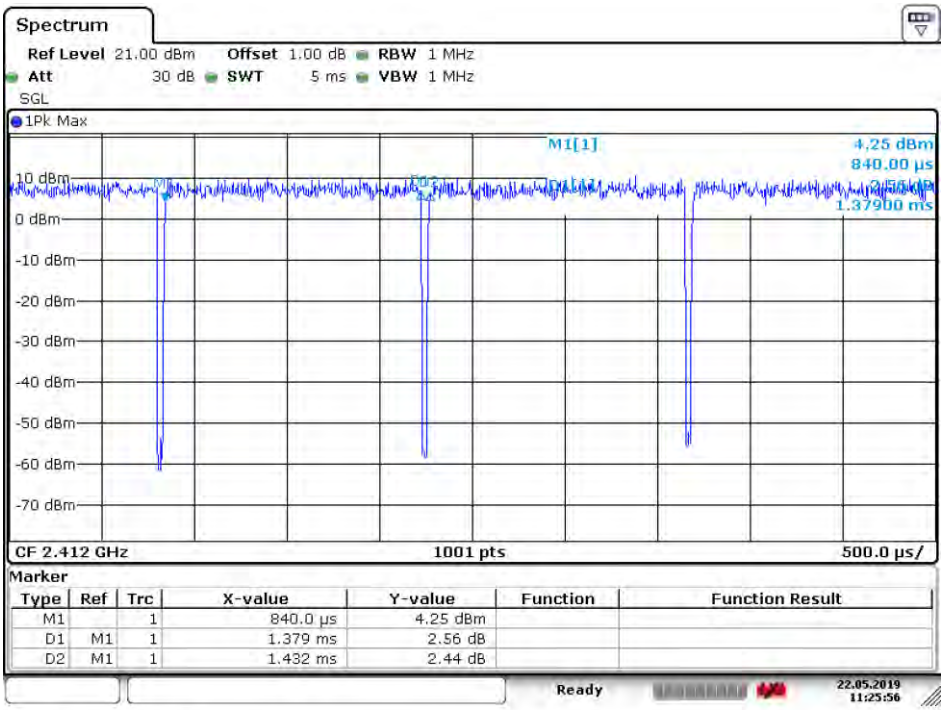
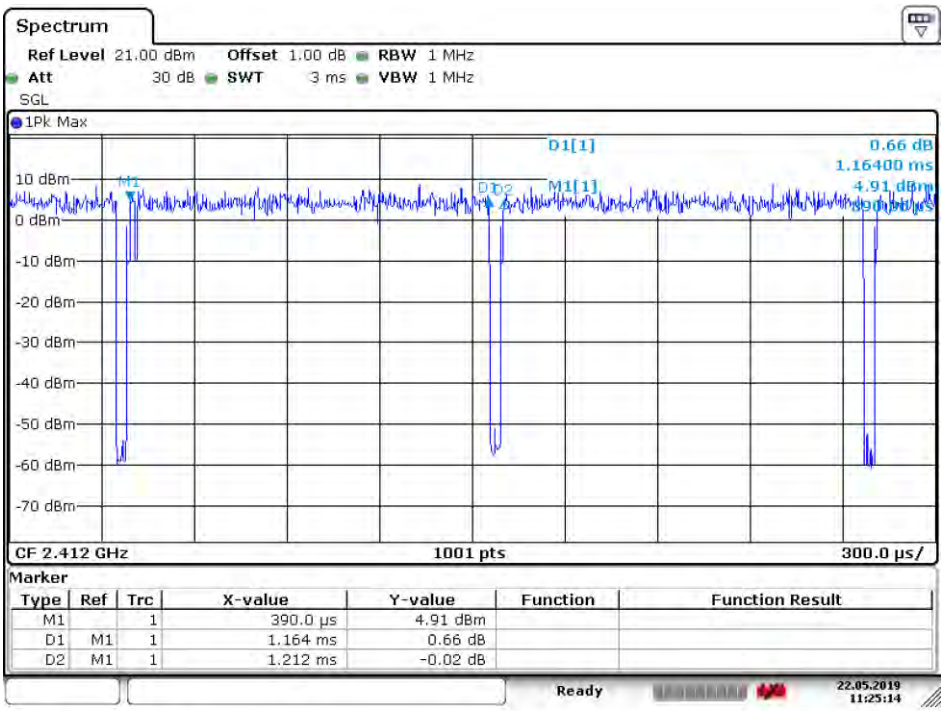
4.2.1.1.2 11G



Date: 22.MAY.2019 11:25:56

4.2.1.1.3 11N20



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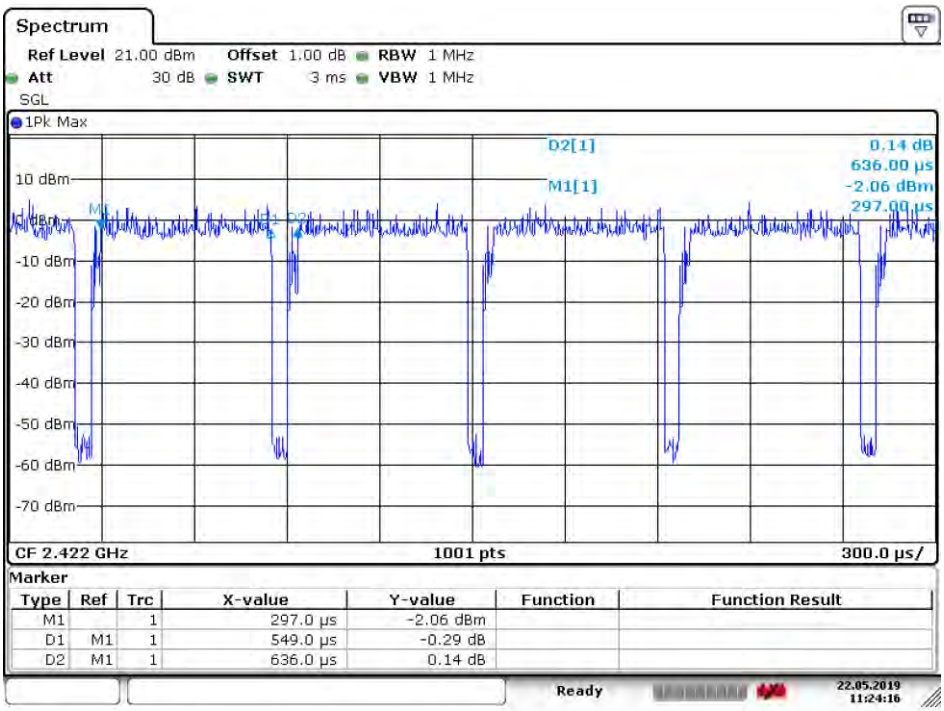
4.2.1.1.4 11N40



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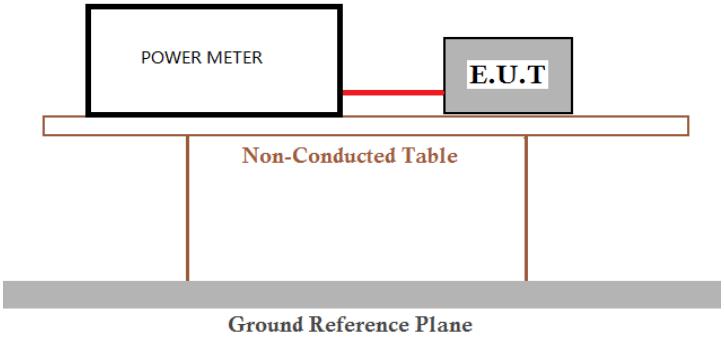
4.3 Conducted Output Power

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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4.3.1 Test Results

Measurement Data of Average Power:

Mode	Test Channel	Ant1	Result
802.11B	Lowest	17.45	Report purpose only
	Middle	17.26	Report purpose only
	Highest	17.20	Report purpose only
802.11G	Lowest	15.16	Report purpose only
	Middle	14.91	Report purpose only
	Highest	14.88	Report purpose only
802.11N20	Lowest	13.14	Report purpose only
	Middle	12.90	Report purpose only
	Highest	12.77	Report purpose only
802.11N40	Lowest	14.23	Report purpose only
	Middle	14.18	Report purpose only
	Highest	14.37	Report purpose only

Measurement Data of Peak Power:

Mode	Test Channel	ANT1	Limit (dBm)	Result
802.11B	Lowest	21.03	30.00	Pass
	Middle	20.85	30.00	Pass
	Highest	20.79	30.00	Pass
802.11G	Lowest	21.93	30.00	Pass
	Middle	21.93	30.00	Pass
	Highest	21.96	30.00	Pass
802.11N20	Lowest	19.95	30.00	Pass
	Middle	20.07	30.00	Pass
	Highest	19.62	30.00	Pass
802.11N40	Lowest	22.22	30.00	Pass
	Middle	22.13	30.00	Pass
	Highest	22.11	30.00	Pass

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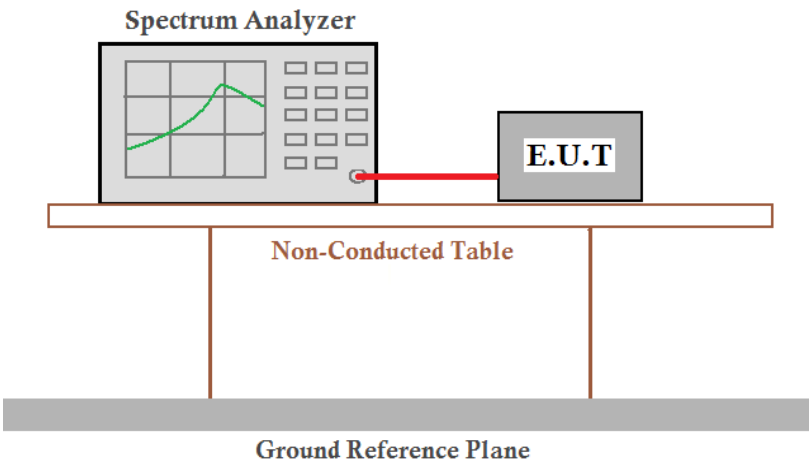
4.4 DTS (6 dB) Bandwidth & 99% Occupied Bandwidth

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

4.4.1 Test Results

Mode	Test Channel	Occupied Bandwidth (MHz)	6dB Emission Bandwidth (MHz)	Limit (kHz)	Result
802.11B	Lowest	13.78	8.59	≥500	Pass
	Middle	13.84	8.59	≥500	Pass
	Highest	13.84	8.55	≥500	Pass
802.11G	Lowest	16.79	15.58	≥500	Pass
	Middle	16.79	15.19	≥500	Pass
	Highest	16.79	15.46	≥500	Pass
802.11N20	Lowest	17.95	15.15	≥500	Pass
	Middle	17.95	15.19	≥500	Pass
	Highest	17.95	16.15	≥500	Pass
802.11N40	Lowest	36.35	36.12	≥500	Pass
	Middle	36.24	35.88	≥500	Pass
	Highest	36.24	35.56	≥500	Pass

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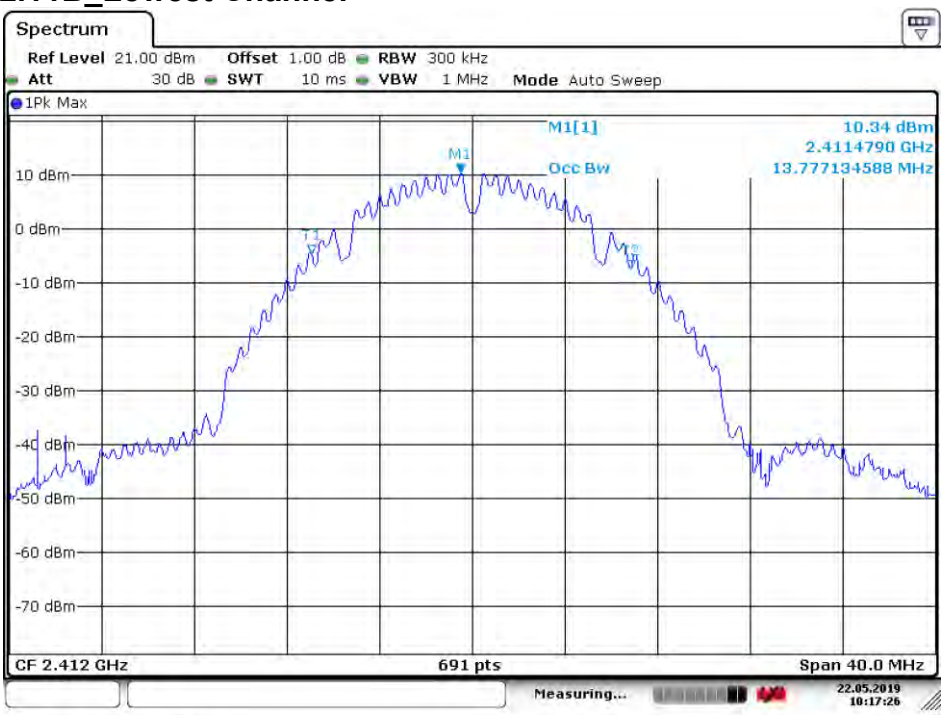
4.4.2 Test plots

4.4.2.1 ANT1

4.4.2.1.1 802.11B_Lowest Channel



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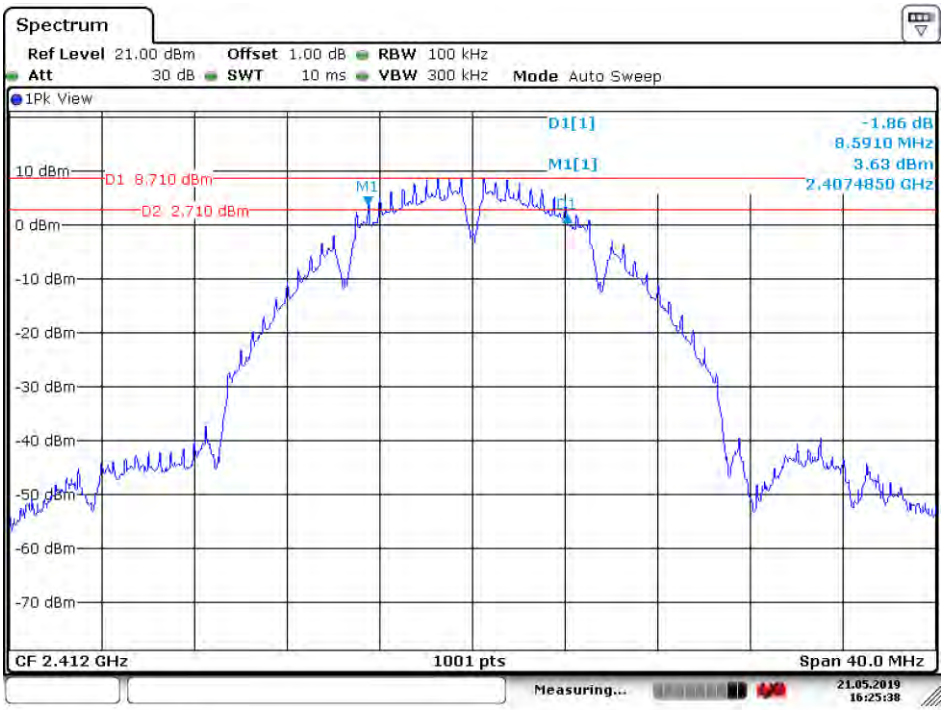

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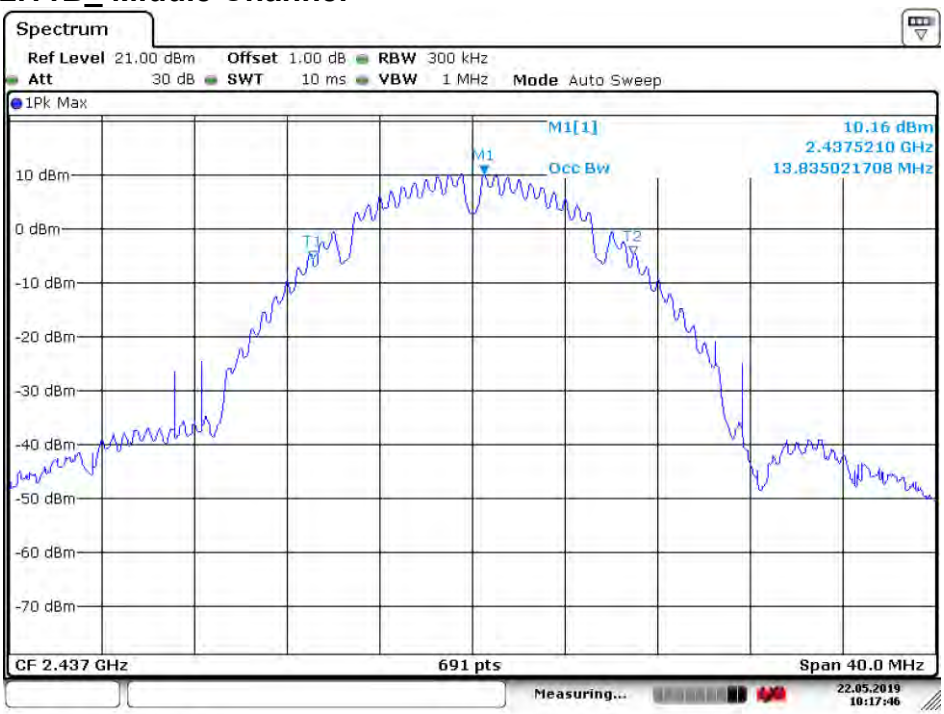
4.4.2.1.2 802.11B_ Middle Channel



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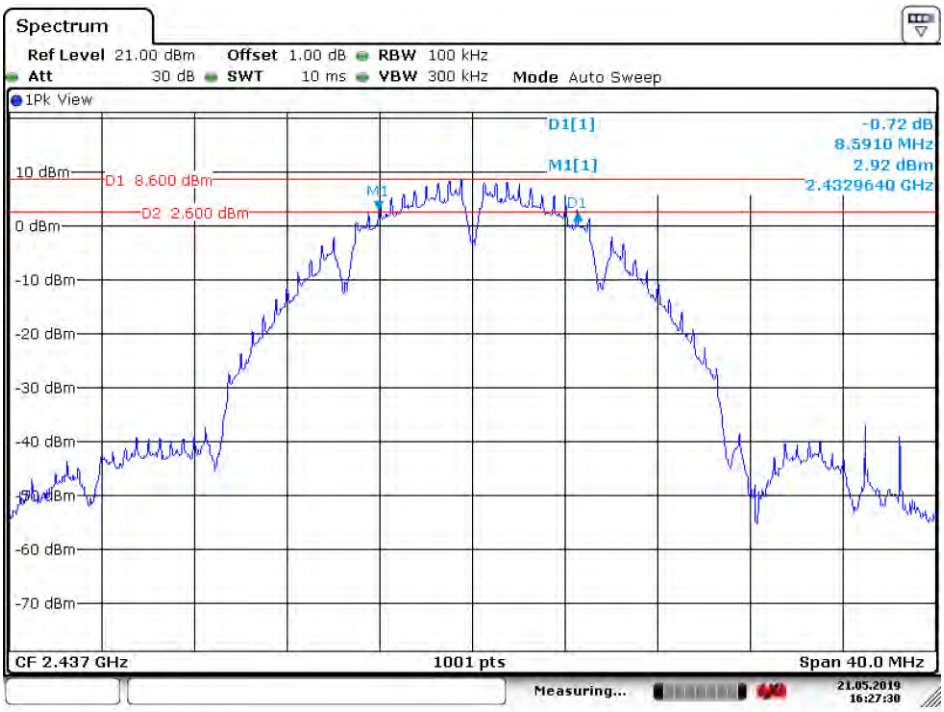

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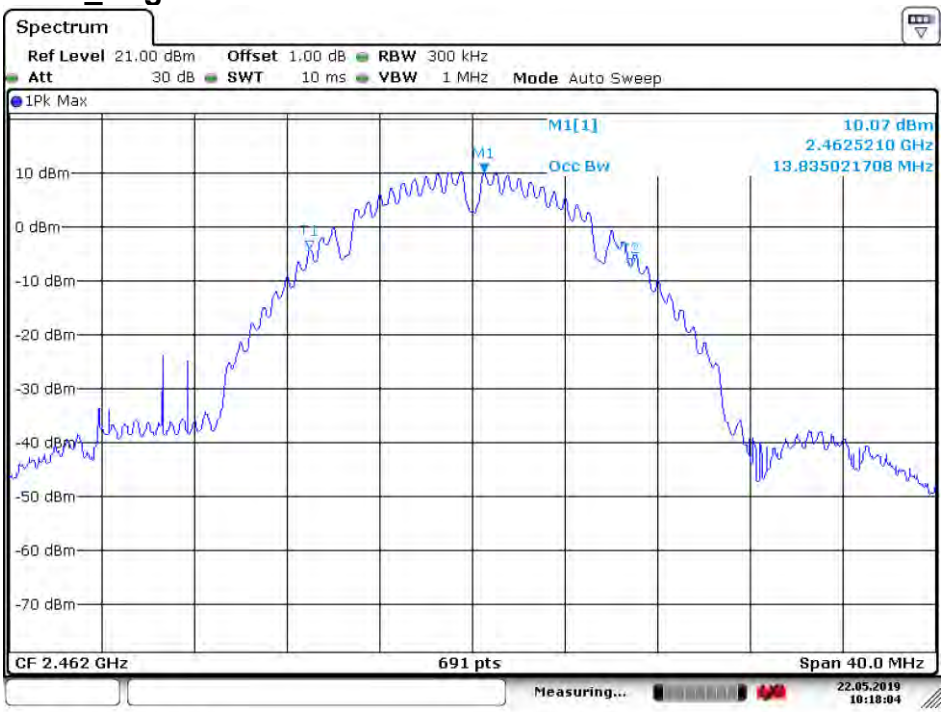
4.4.2.1.3 802.11B_ Highest Channel



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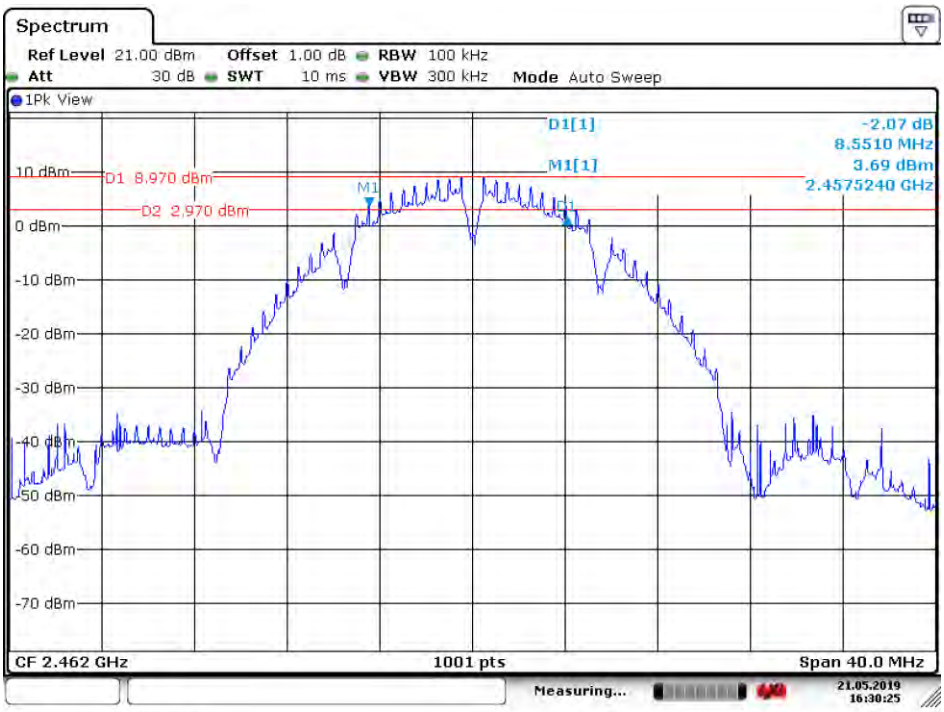

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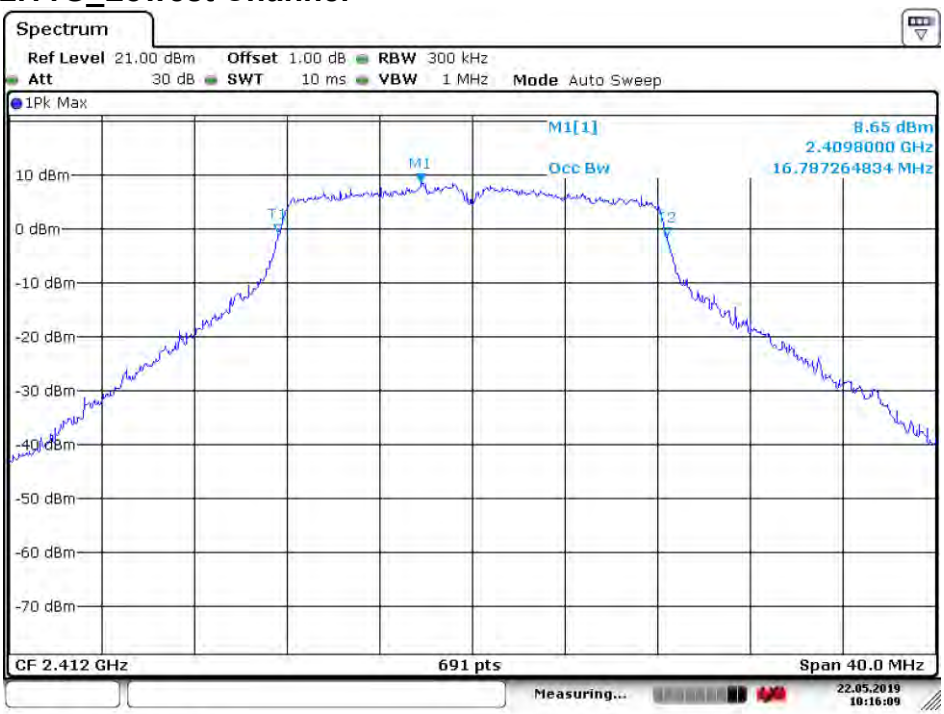
4.4.2.1.4 802.11G_Lowest Channel



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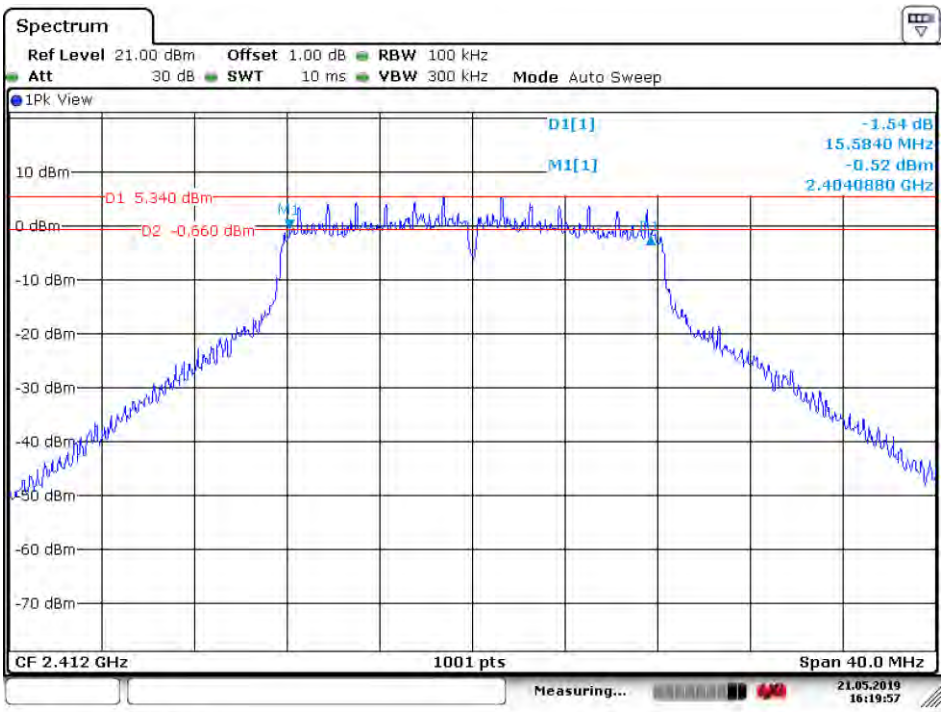

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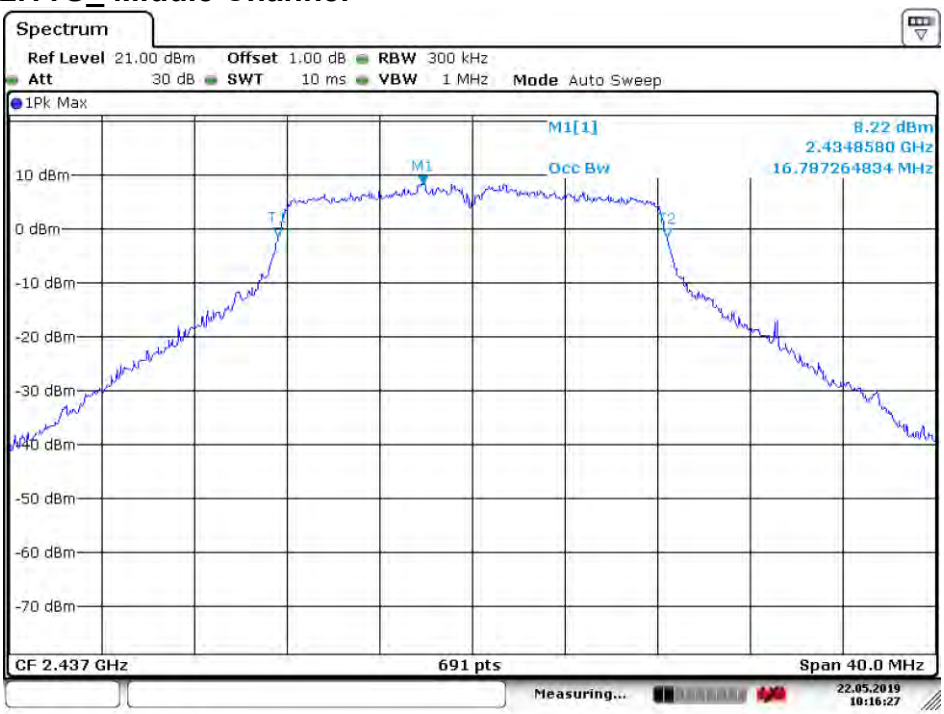
4.4.2.1.5 802.11G_ Middle Channel



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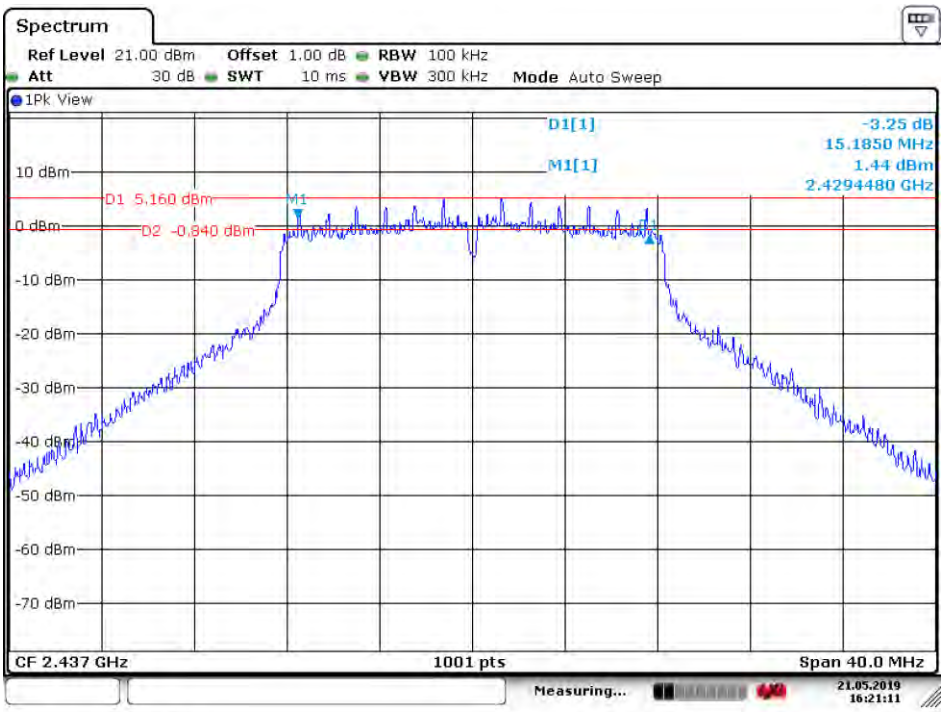

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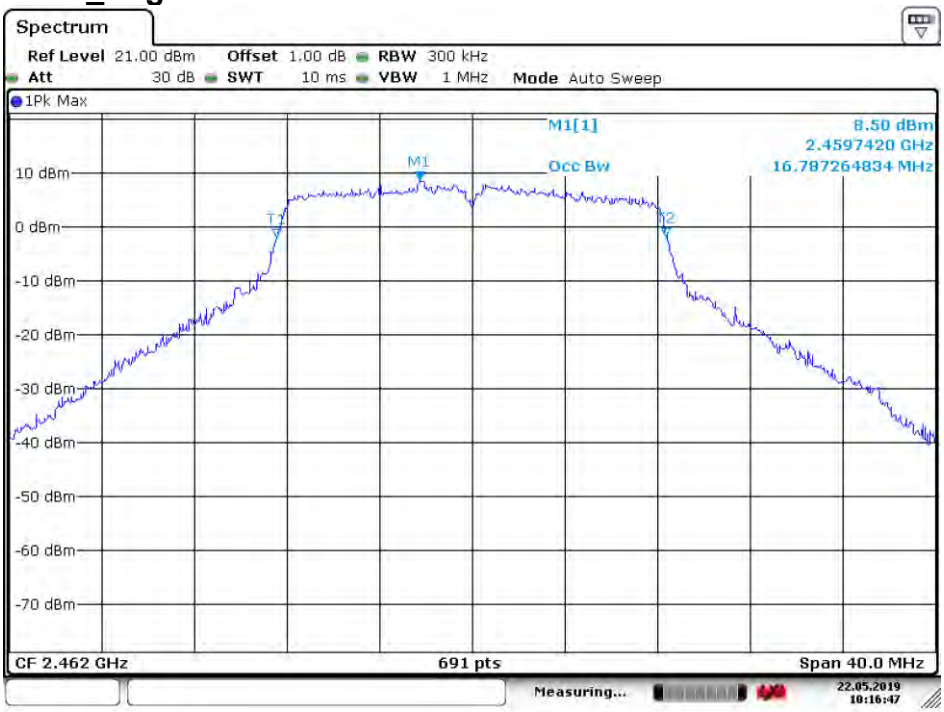
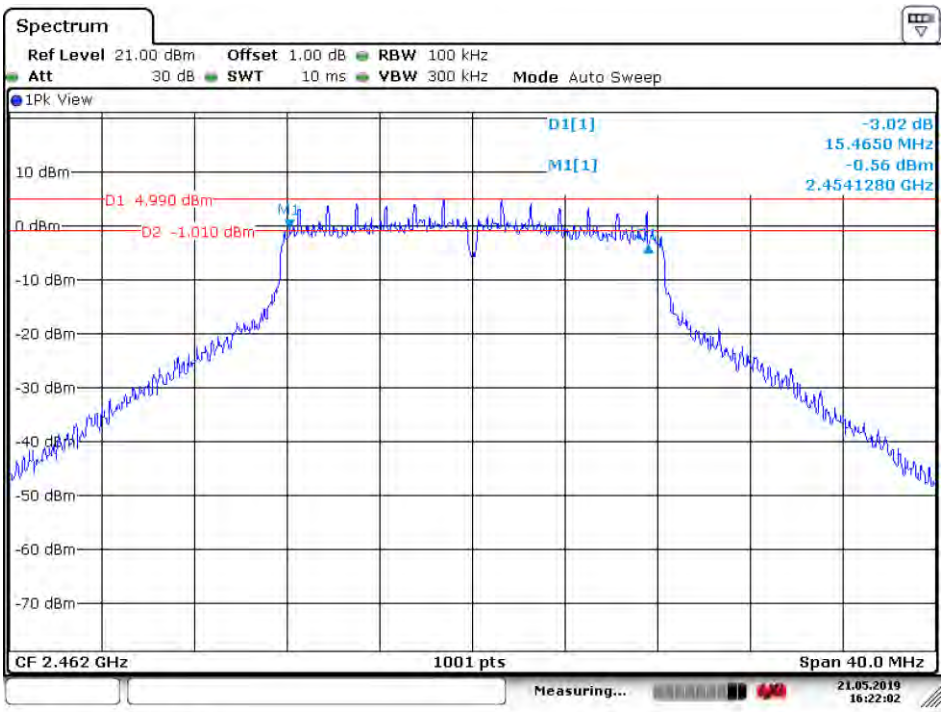
4.4.2.1.6 802.11G_ Highest Channel



Date: 22.MAY.2019 10:16:47



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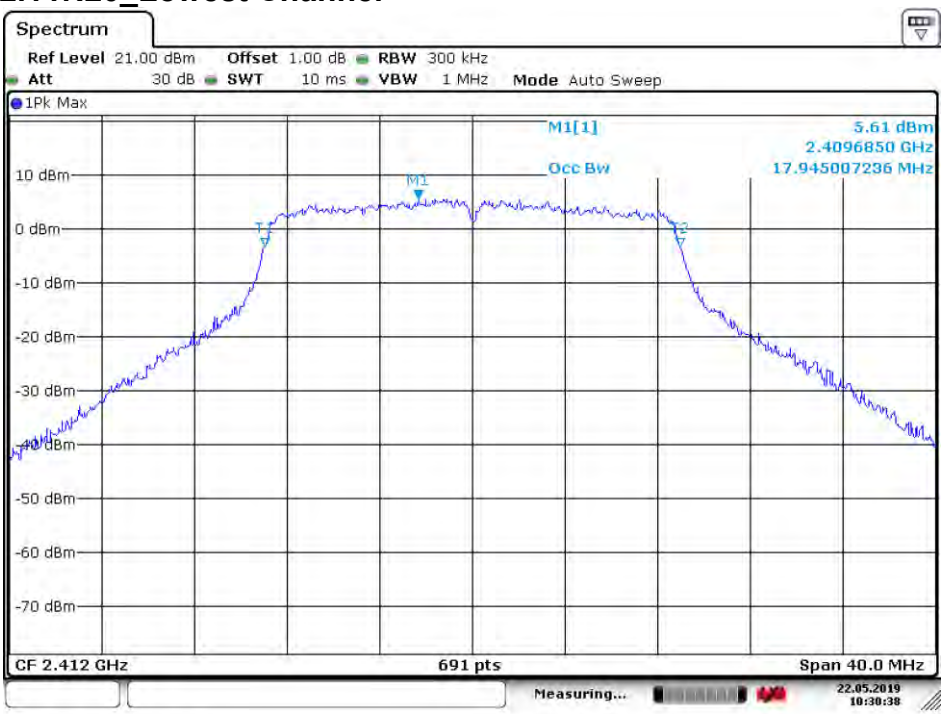
4.4.2.1.7 802.11N20_Lowest Channel



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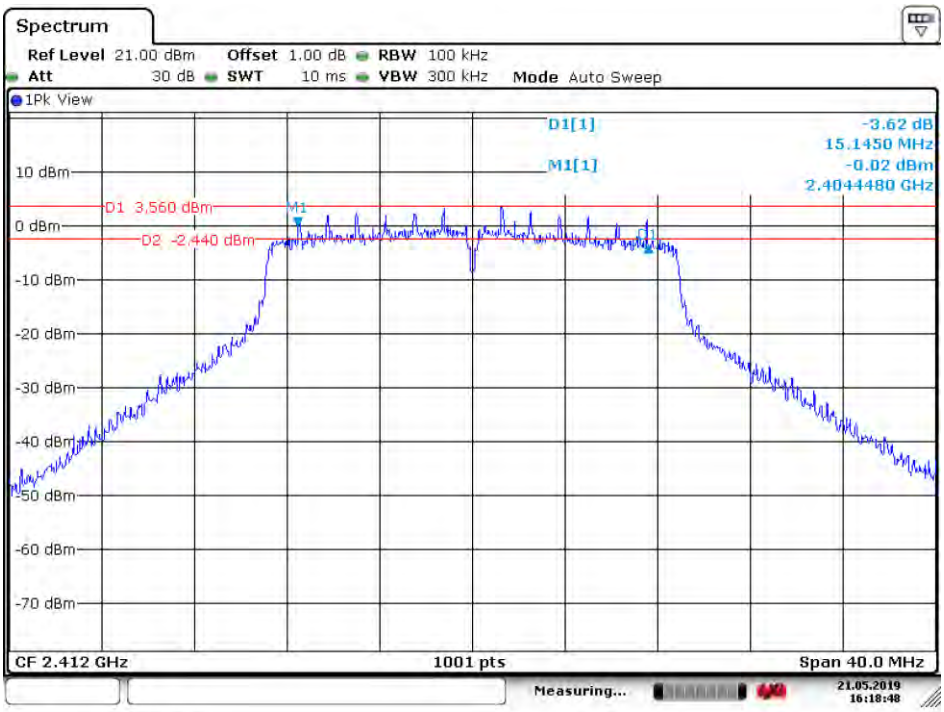

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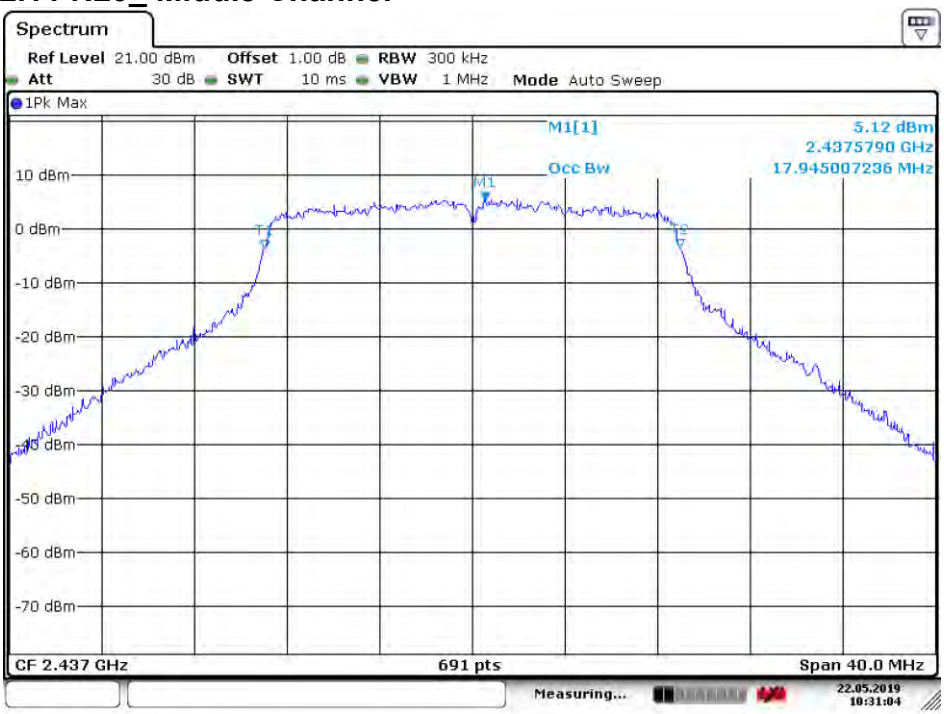
4.4.2.1.8 802.11 N20_ Middle Channel



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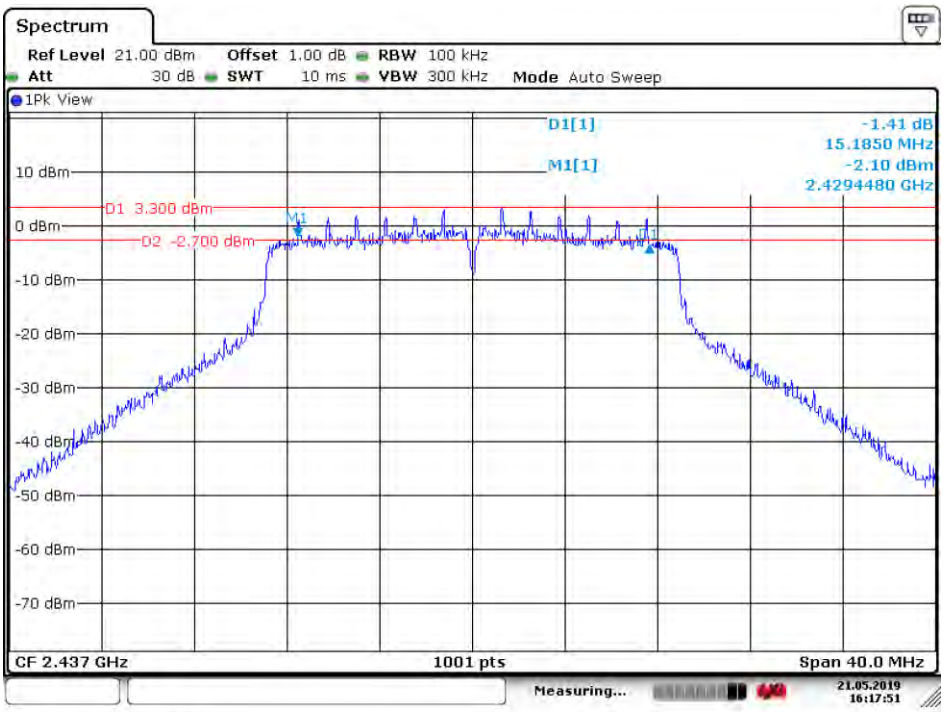

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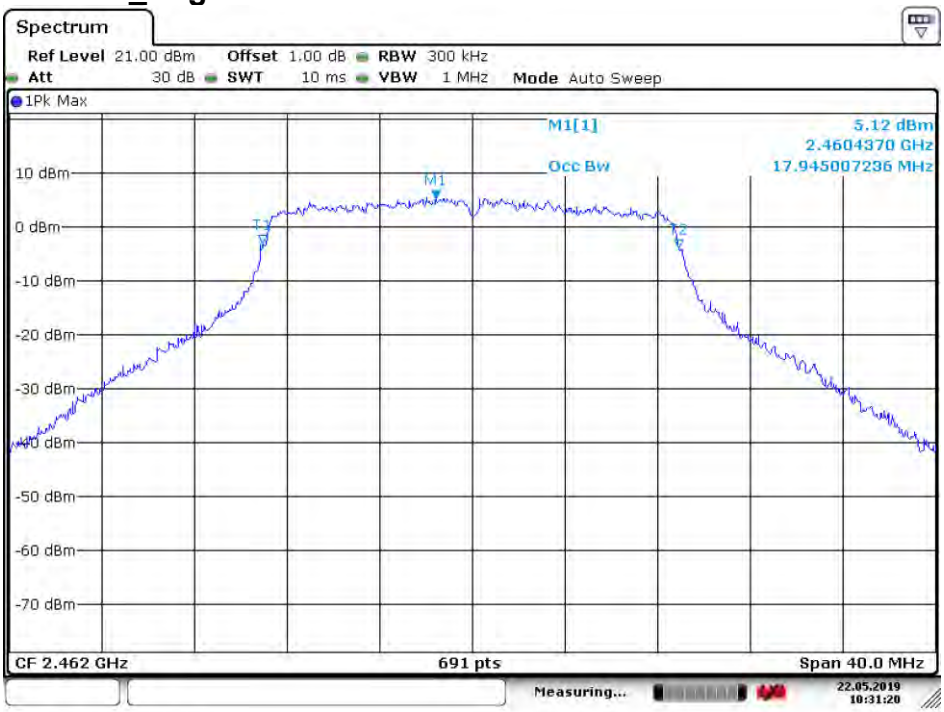
4.4.2.1.9 802.11 N20_ Highest Channel



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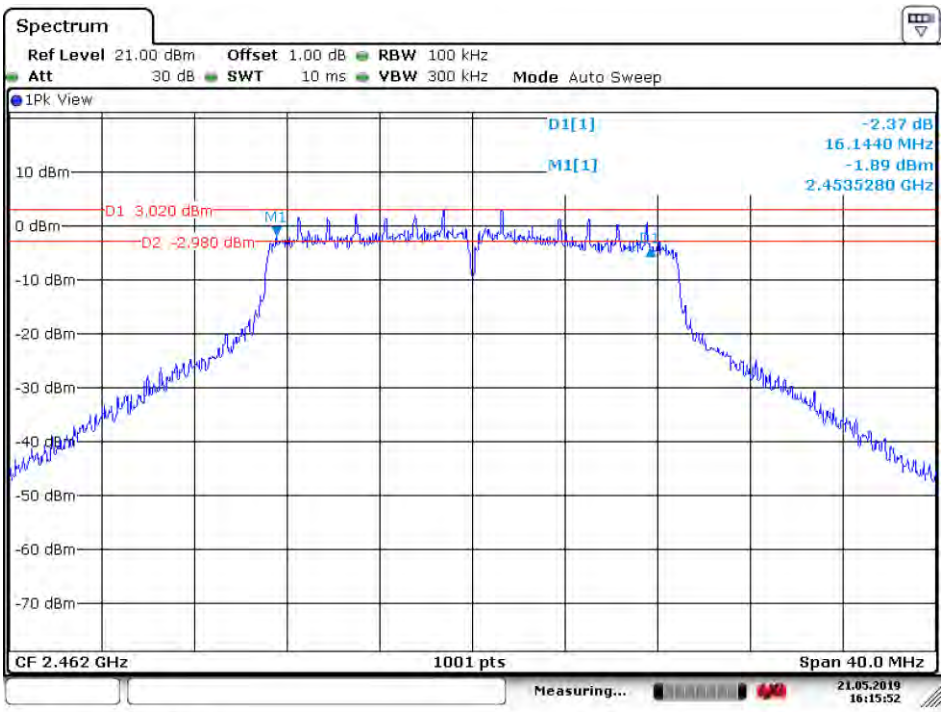

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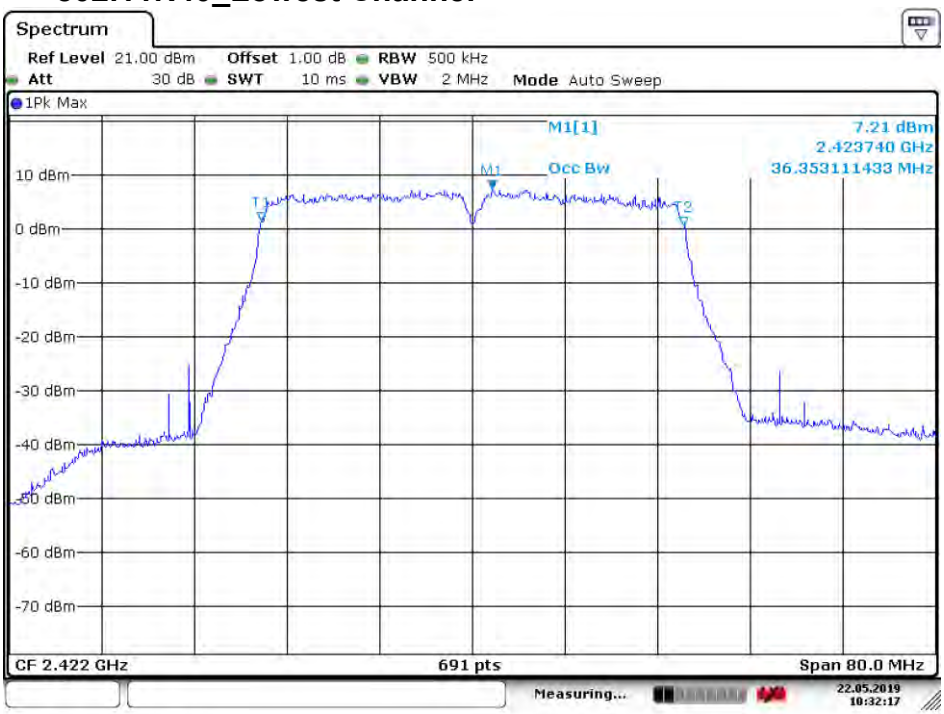
4.4.2.1.10 802.11N40_Lowest Channel



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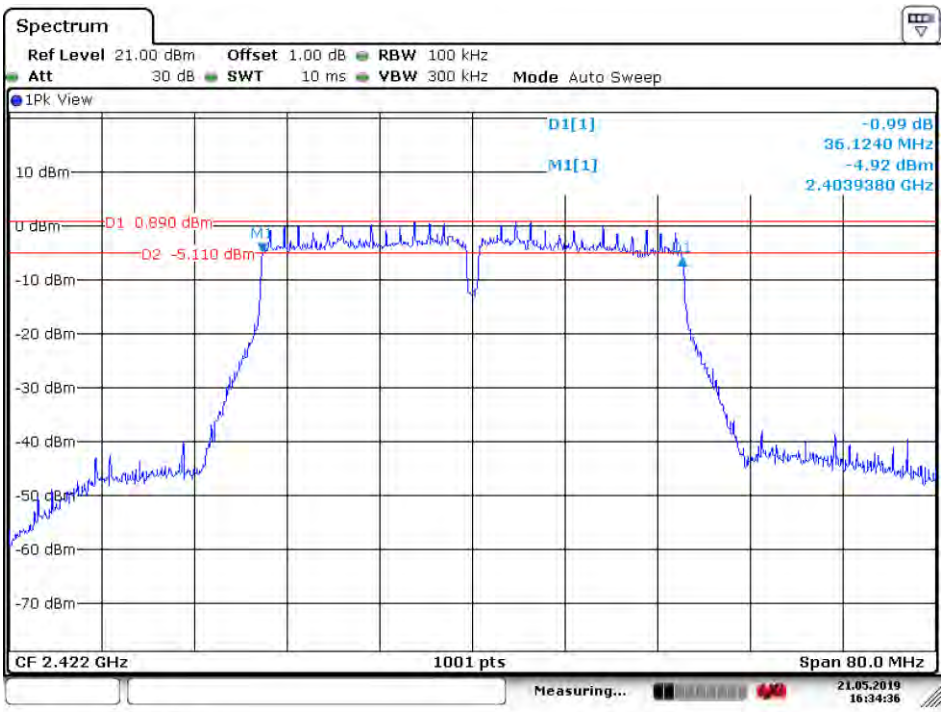

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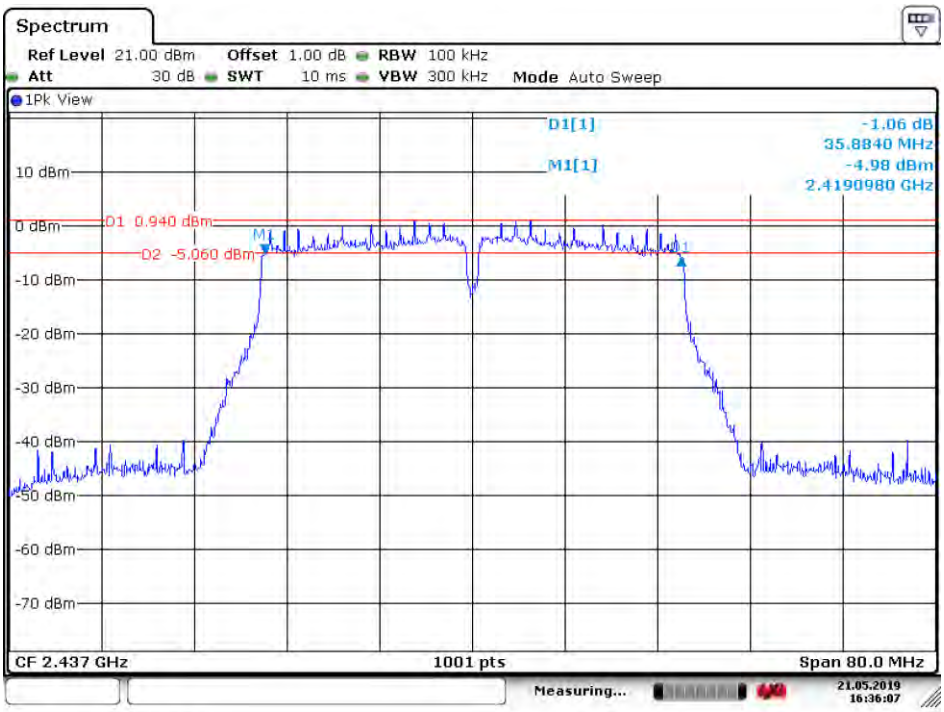
4.4.2.1.11 802.11 N40_ Middle Channel

Date: 22.MAY.2019 10:32:54



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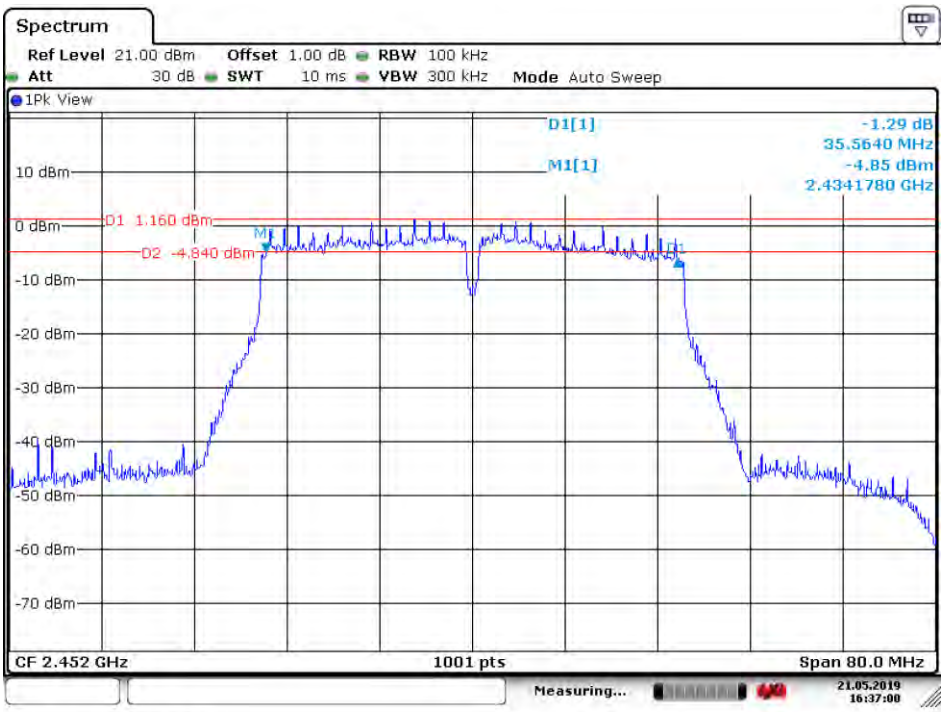
4.4.2.1.12 802.11 N40_ Highest Channel

Date: 22.MAY.2019 10:33:28



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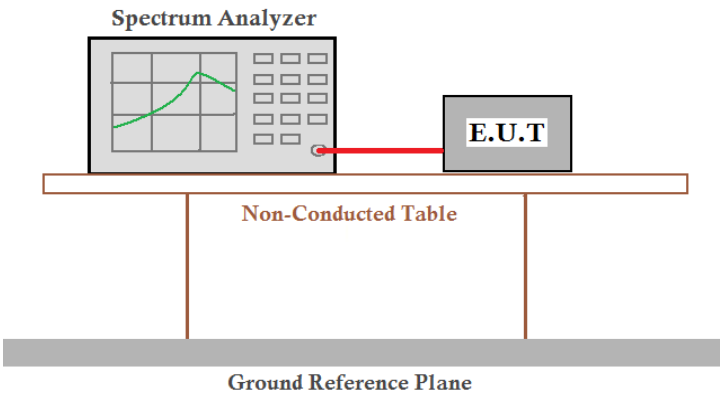
4.5 Power Spectral Density

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

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4.5.1 Test Results

Mode	Test Channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
802.11B	Lowest	-3.17	≤8.00	Pass
	Middle	-3.45	≤8.00	Pass
	Highest	-3.34	≤8.00	Pass
802.11G	Lowest	-9.14	≤8.00	Pass
	Middle	-8.87	≤8.00	Pass
	Highest	-9.42	≤8.00	Pass
802.11N20	Lowest	-10.63	≤8.00	Pass
	Middle	-11.06	≤8.00	Pass
	Highest	-10.48	≤8.00	Pass
802.11N40	Lowest	-12.66	≤8.00	Pass
	Middle	-13.04	≤8.00	Pass
	Highest	-12.58	≤8.00	Pass

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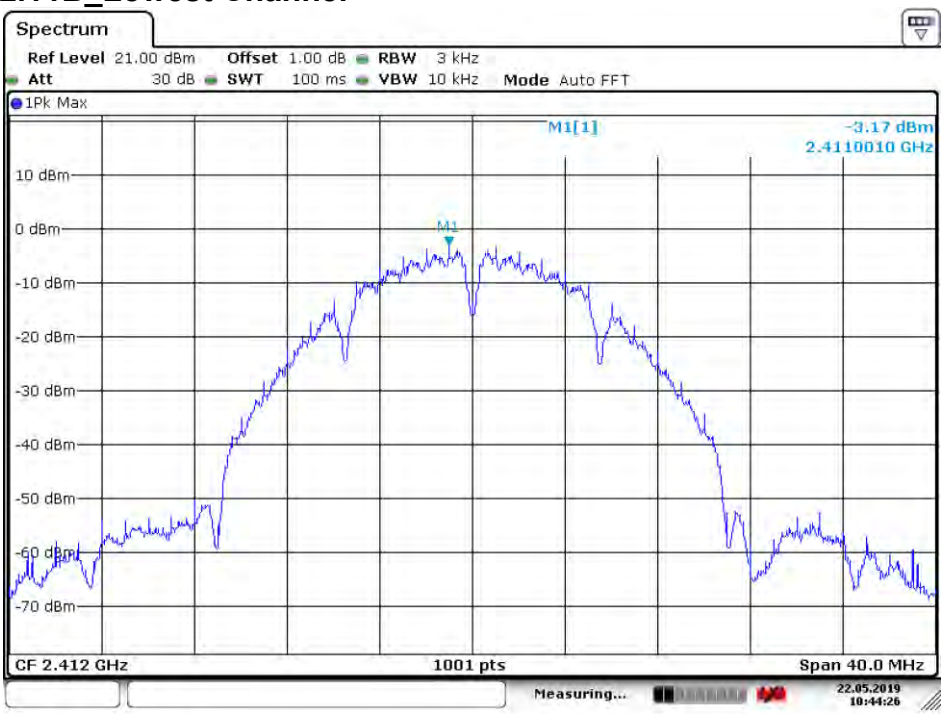
4.5.2 Test plots

4.5.2.1 ANT1

4.5.2.1.1 802.11B_Lowest Channel



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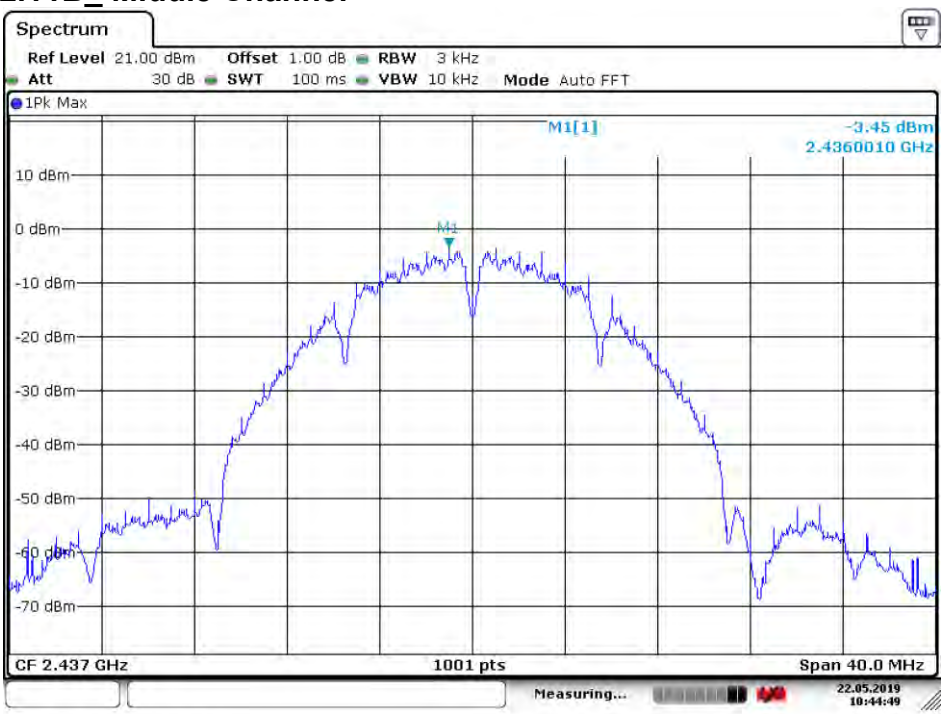
4.5.2.1.2 802.11B_ Middle Channel



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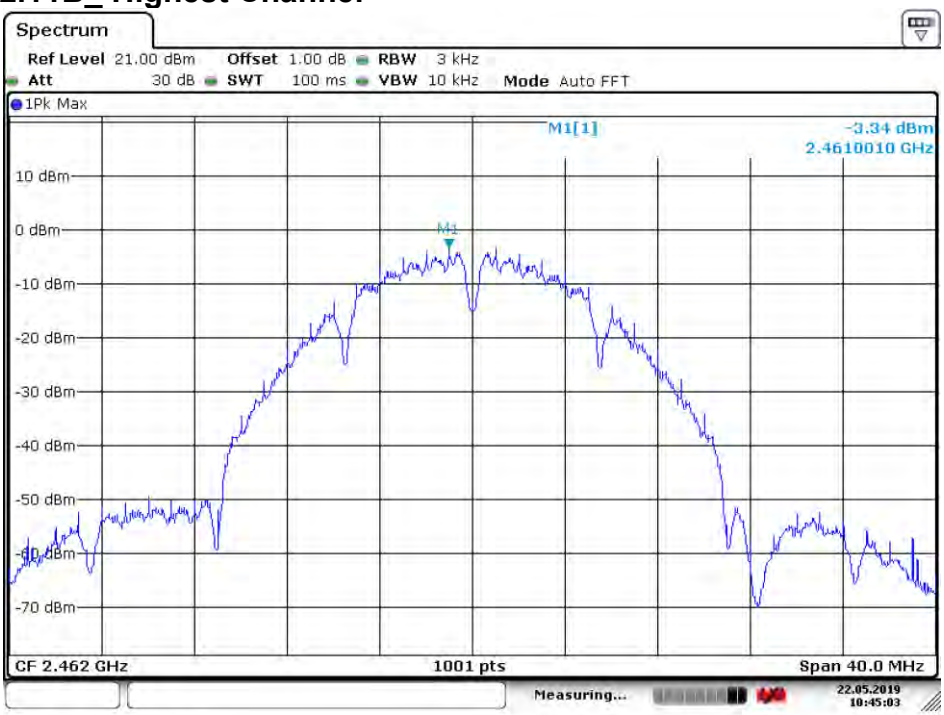
4.5.2.1.3 802.11B_ Highest Channel



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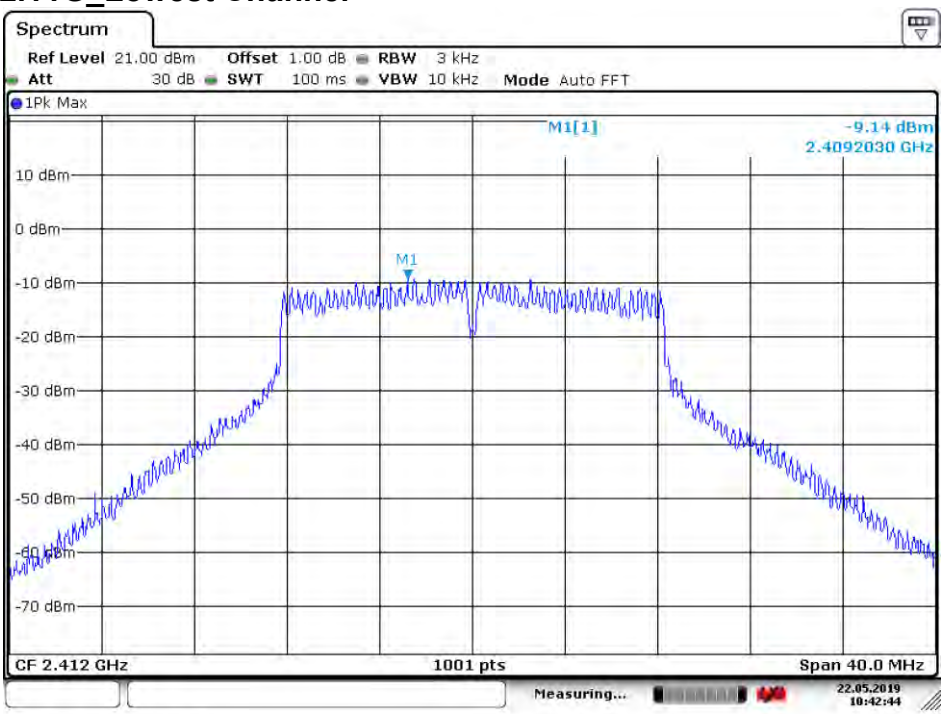
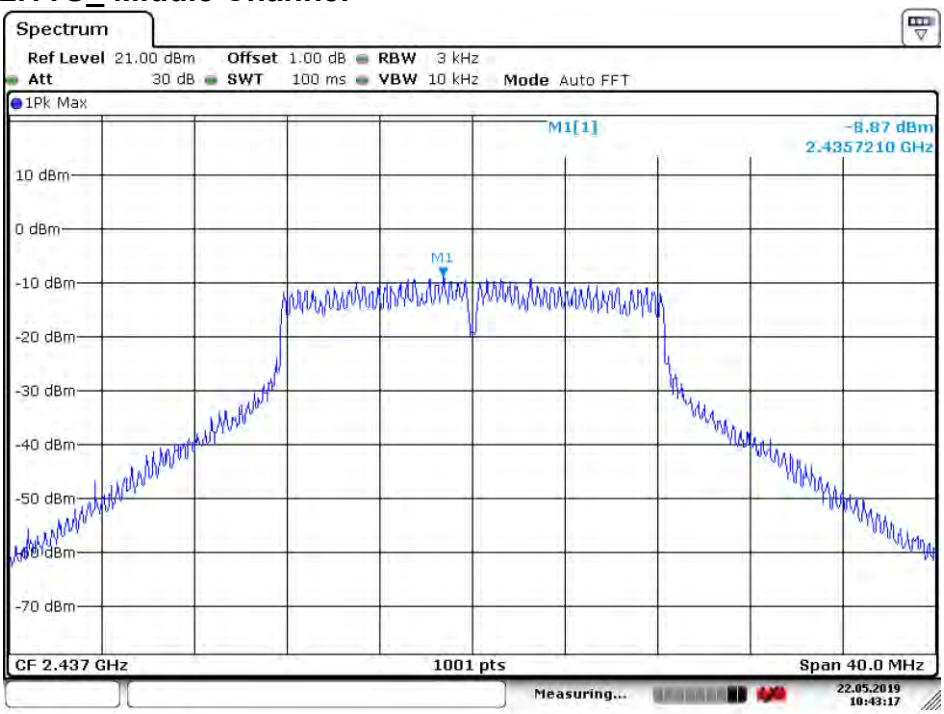
4.5.2.1.4 802.11G_Lowest Channel



Date: 22.MAY.2019 10:42:45

4.5.2.1.5 802.11G_ Middle Channel



Date: 22.MAY.2019 10:43:17

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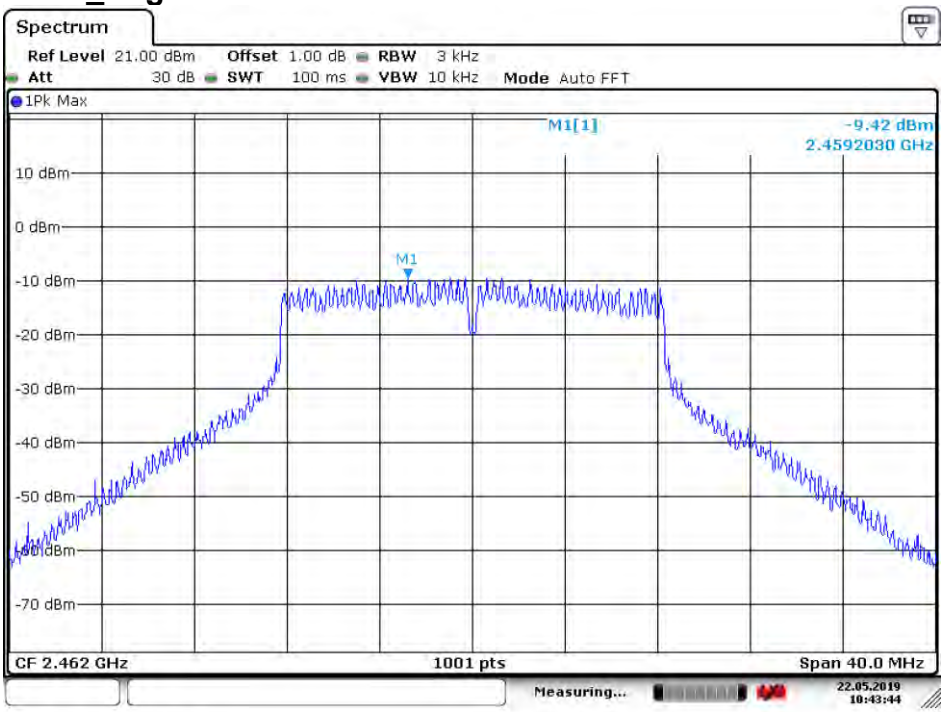
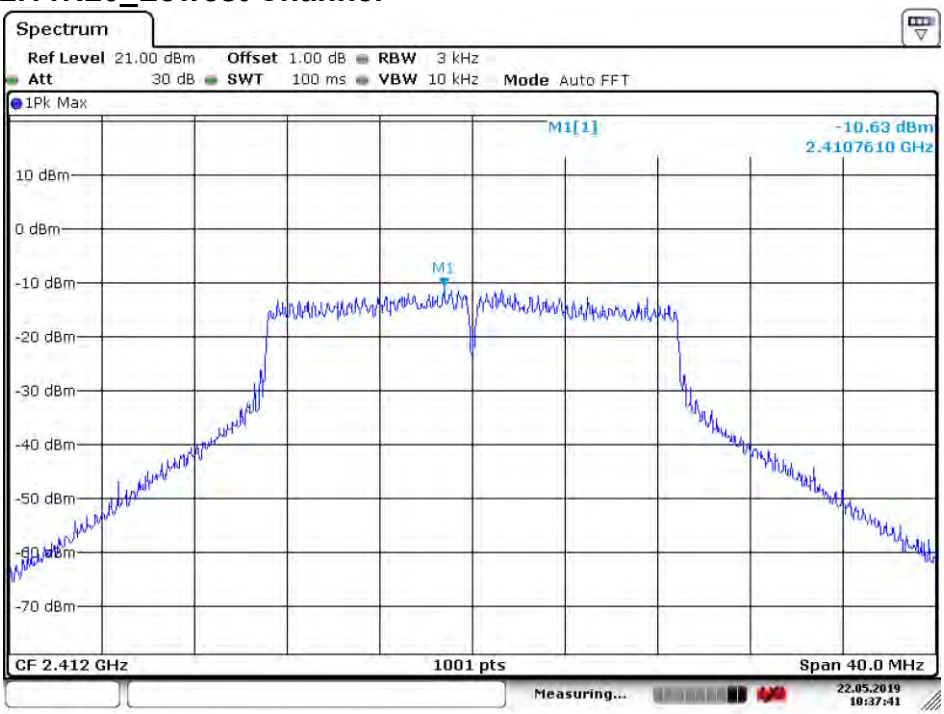
4.5.2.1.6 802.11G_ Highest Channel



Date: 22.MAY.2019 10:43:44

4.5.2.1.7 802.11N20_Lowest Channel



Date: 22.MAY.2019 10:37:41

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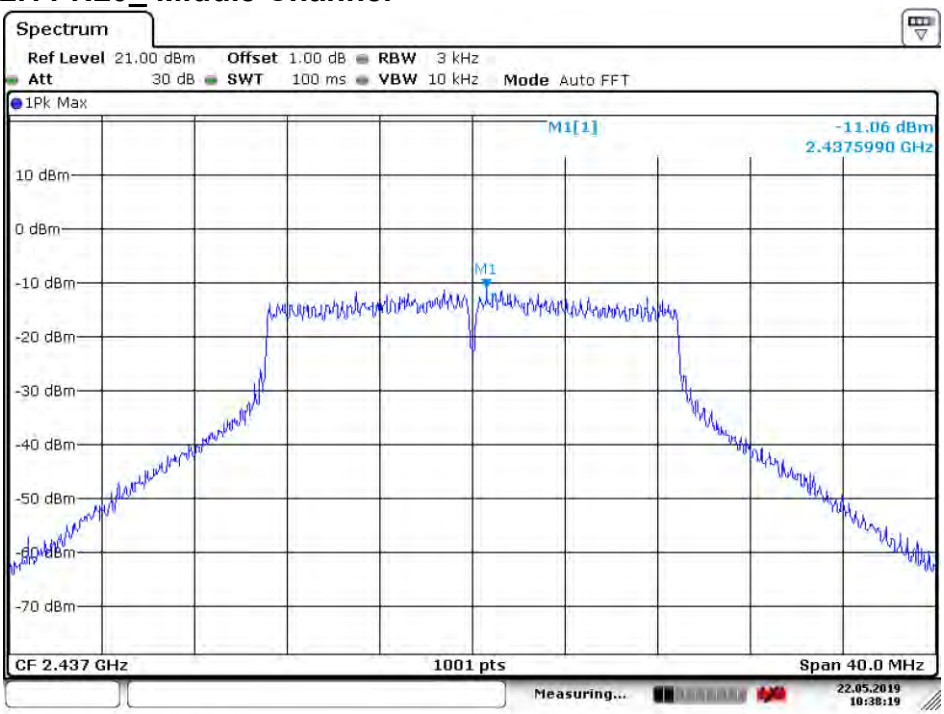
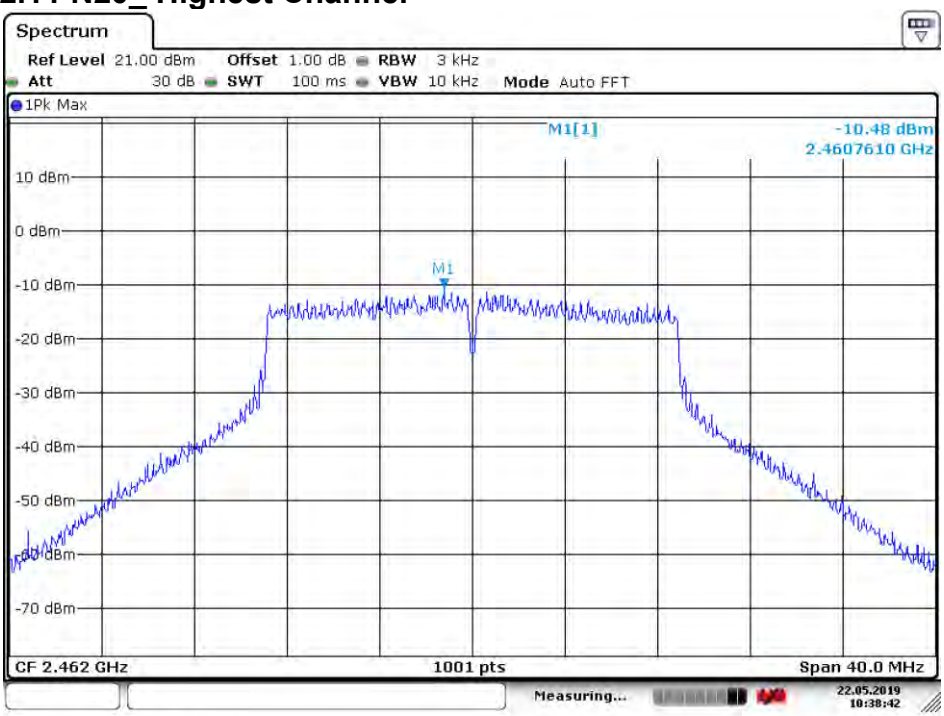
4.5.2.1.8 802.11 N20_ Middle Channel



Date: 22.MAY.2019 10:38:20

4.5.2.1.9 802.11 N20_ Highest Channel



Date: 22.MAY.2019 10:38:42

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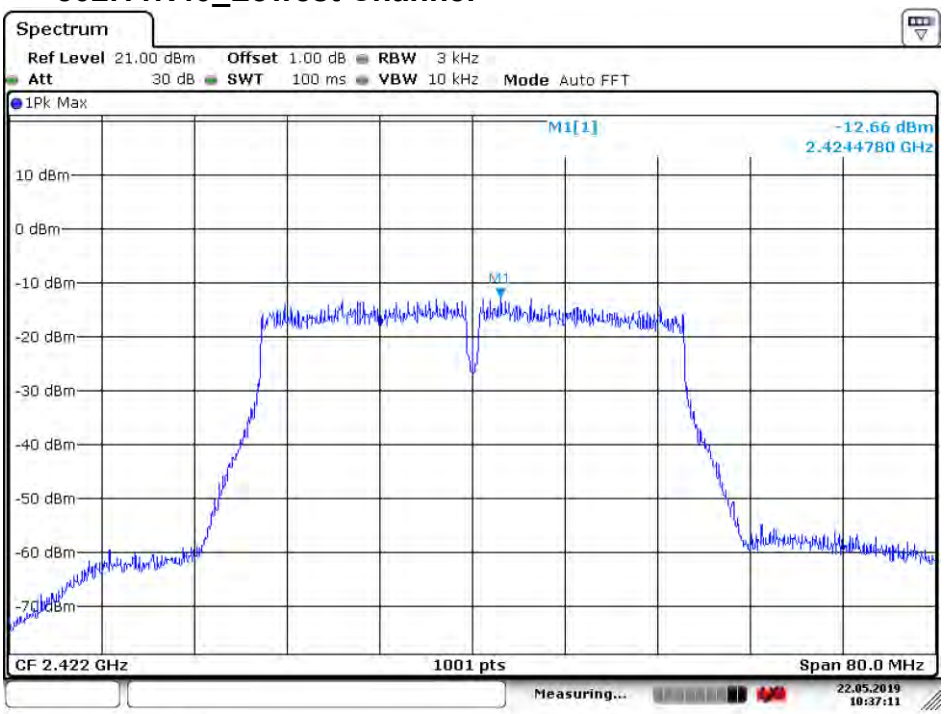
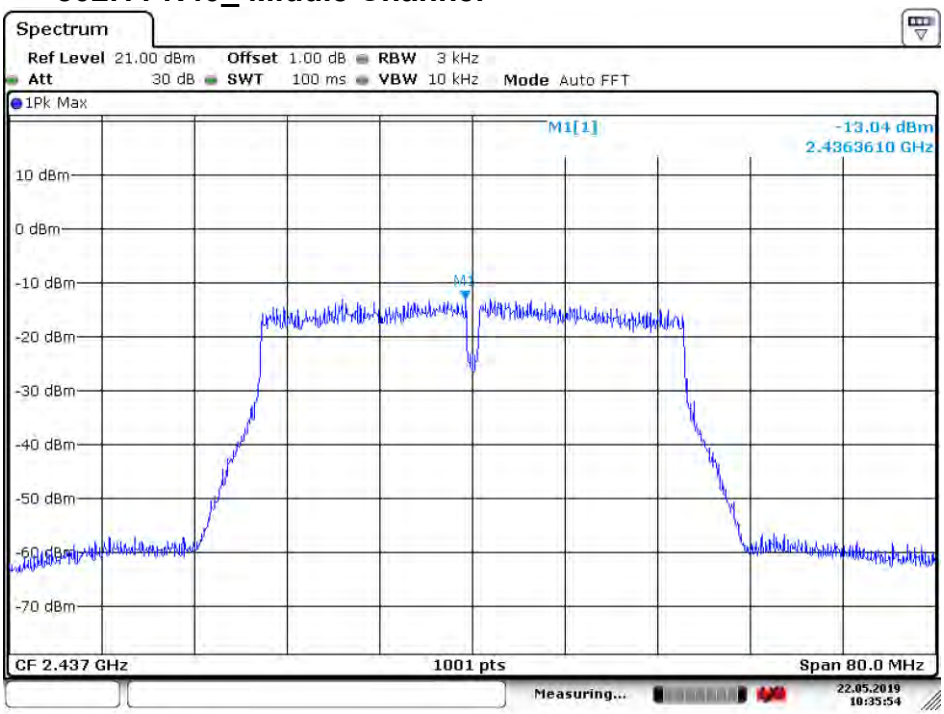
4.5.2.1.10 802.11N40_Lowest Channel



Date: 22.MAY.2019 10:37:12

4.5.2.1.11 802.11 N40_ Middle Channel



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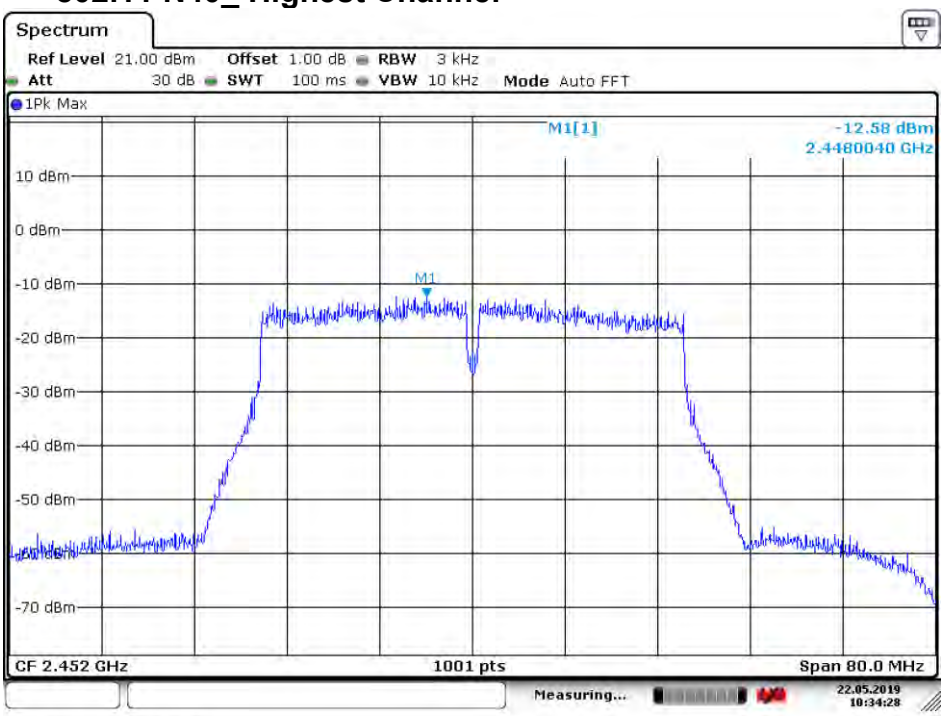
4.5.2.1.12 802.11 N40_ Highest Channel



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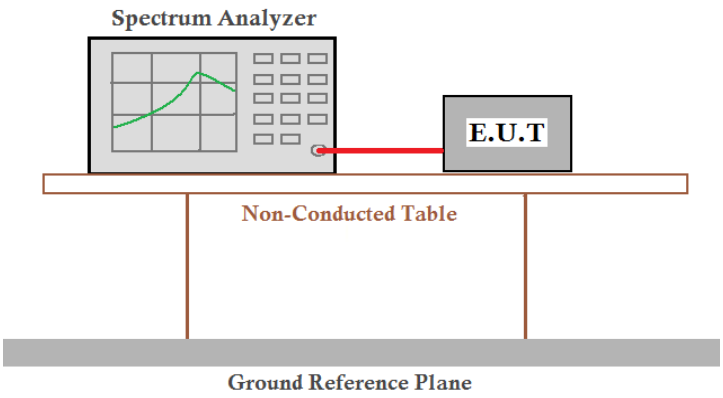
4.6 Band-edge for RF Conducted Emissions

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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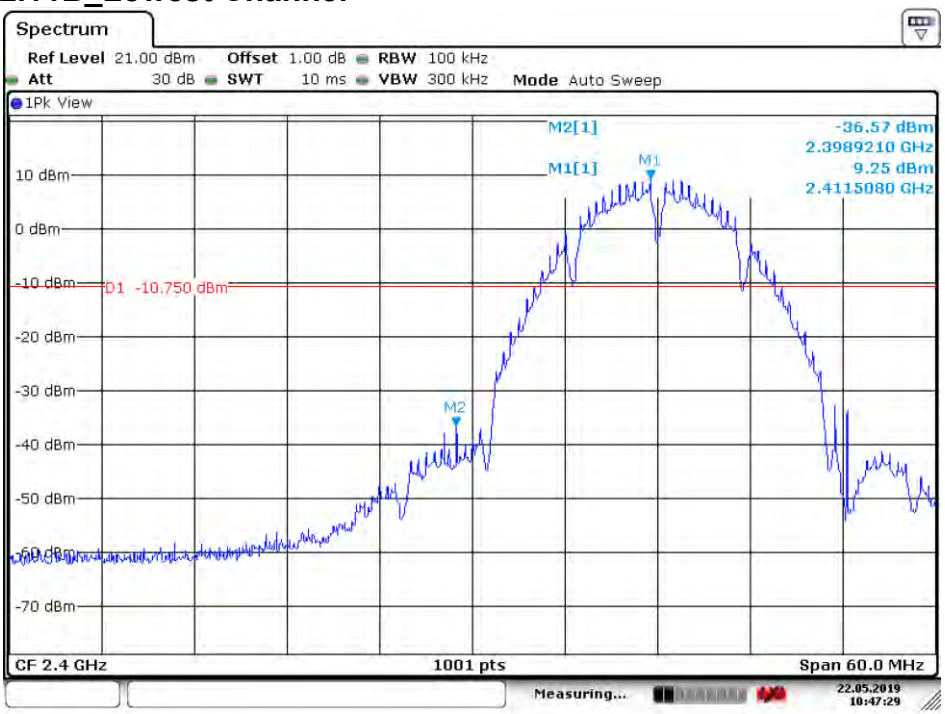
4.6.1 Test plots

4.6.1.1 ANT1

4.6.1.1.1 802.11B_Lowest Channel



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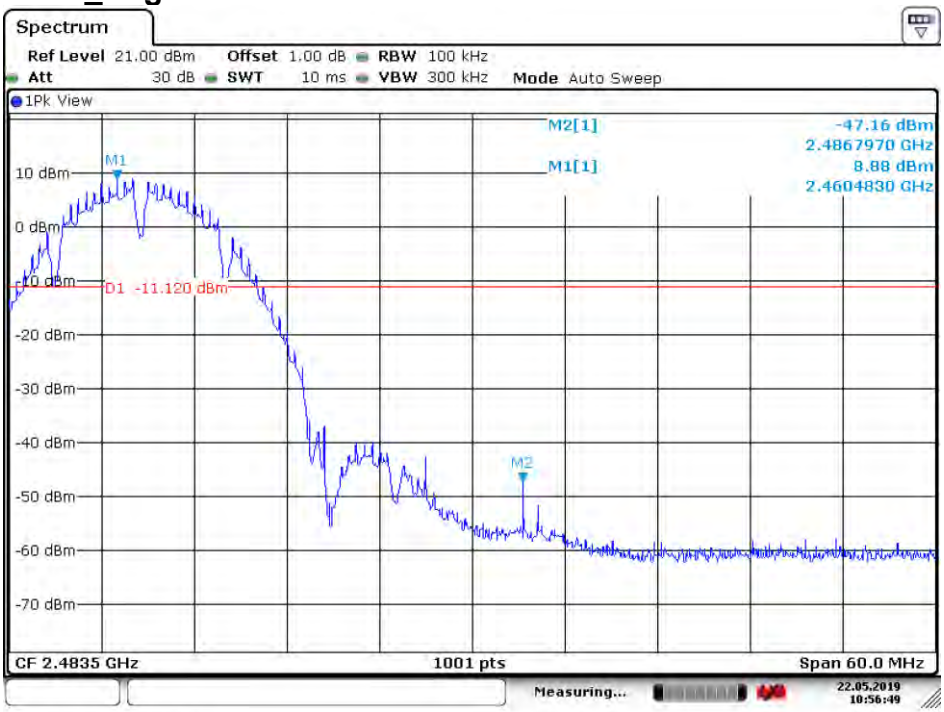
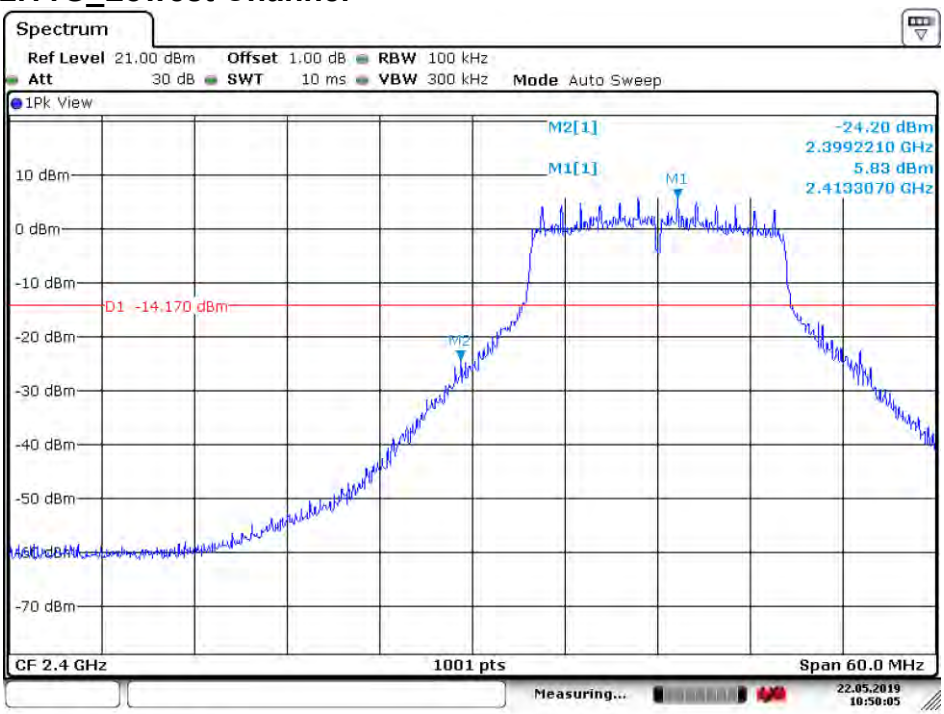
4.6.1.1.2 802.11B_ Highest Channel



Date: 22.MAY.2019 10:56:49

4.6.1.1.3 802.11G_Lowest Channel



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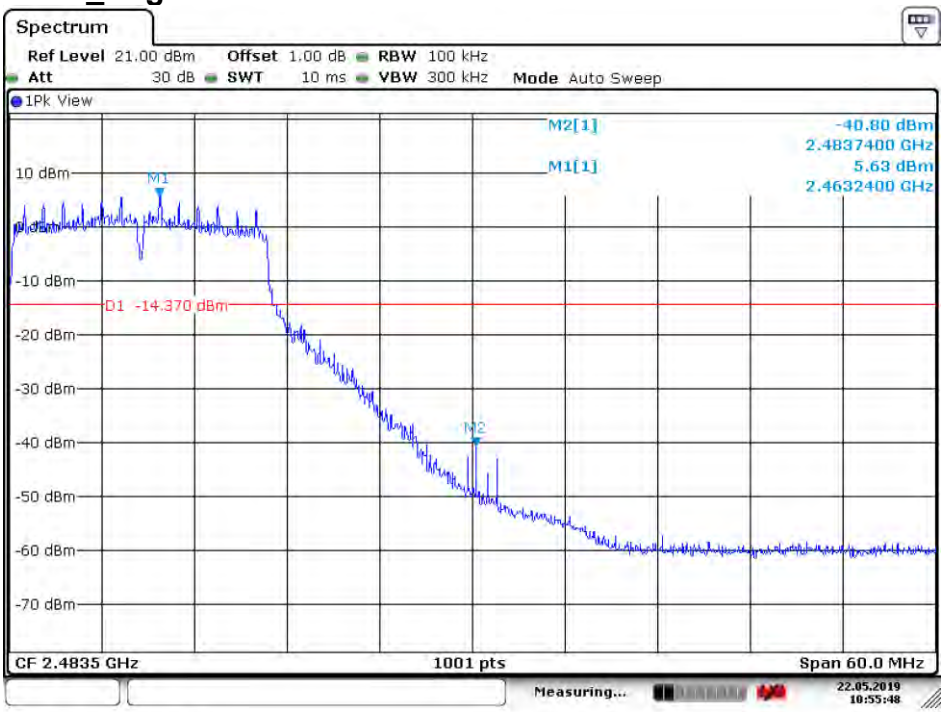
4.6.1.1.4 802.11G_ Highest Channel



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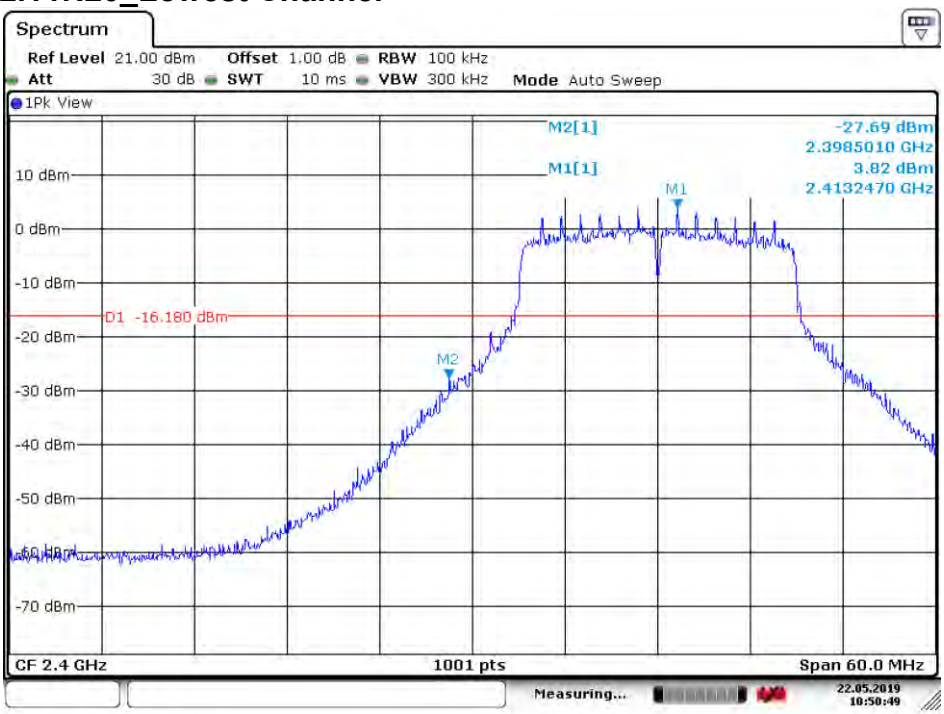
4.6.1.1.5 802.11N20_Lowest Channel



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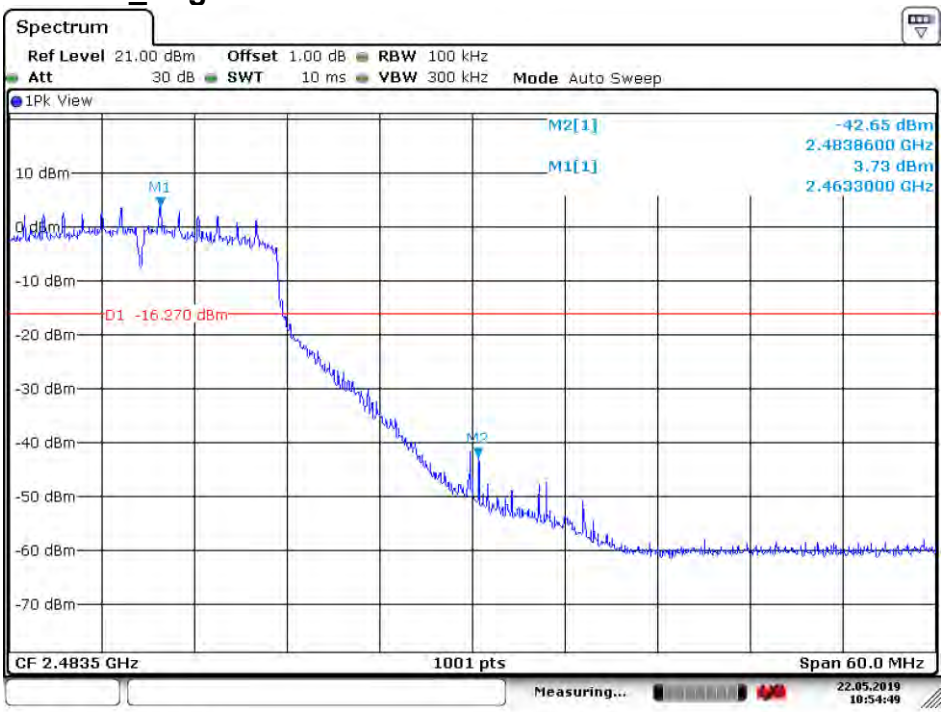
4.6.1.1.6 802.11 N20_ Highest Channel



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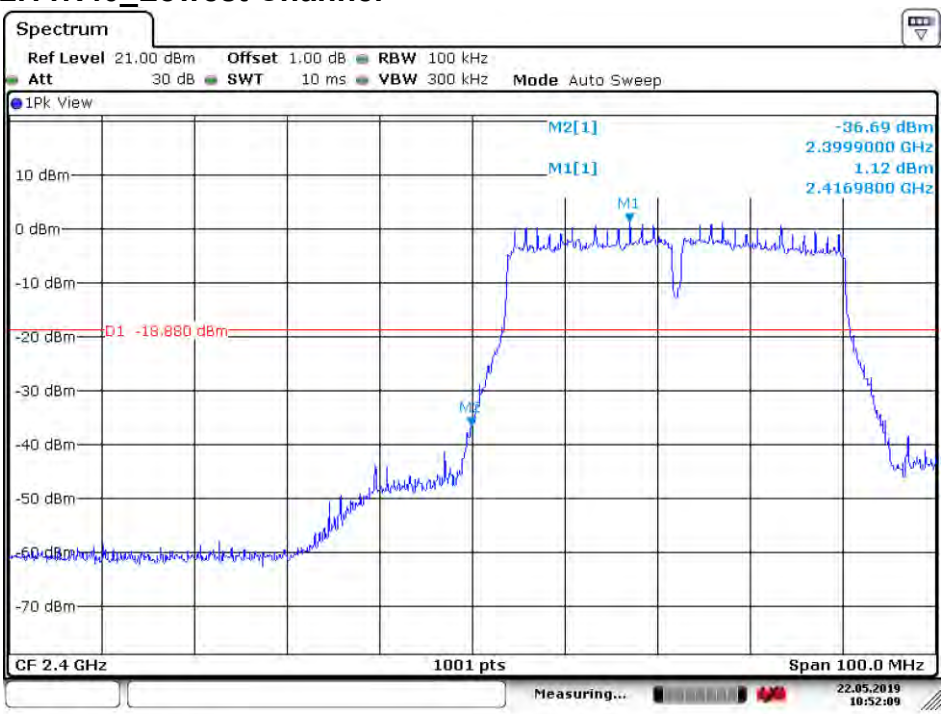
4.6.1.1.7 802.11N40_Lowest Channel



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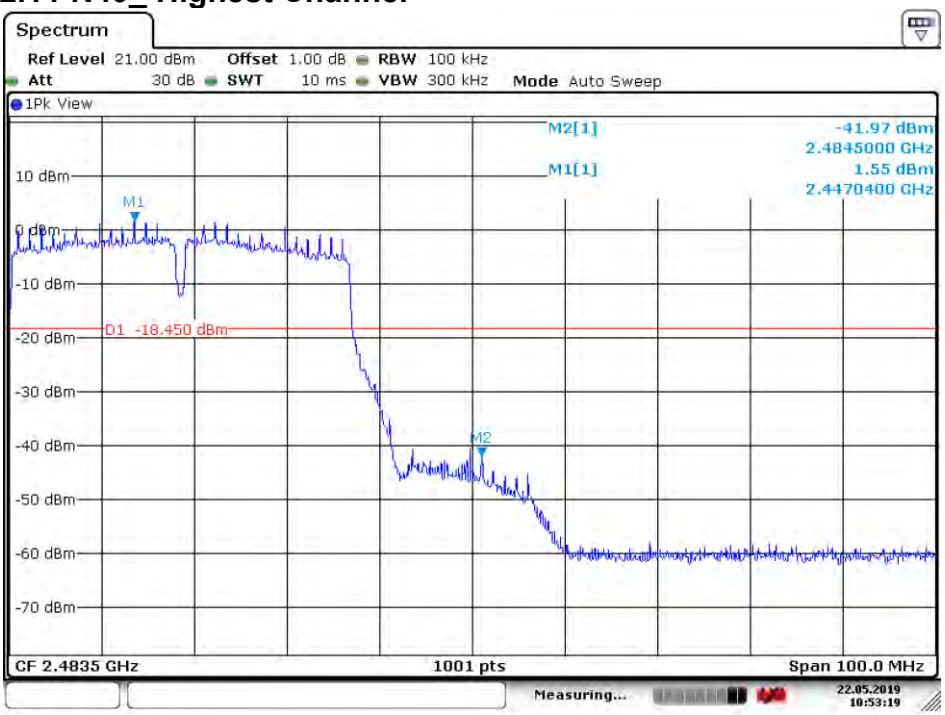
4.6.1.1.8 802.11 N40_ Highest Channel



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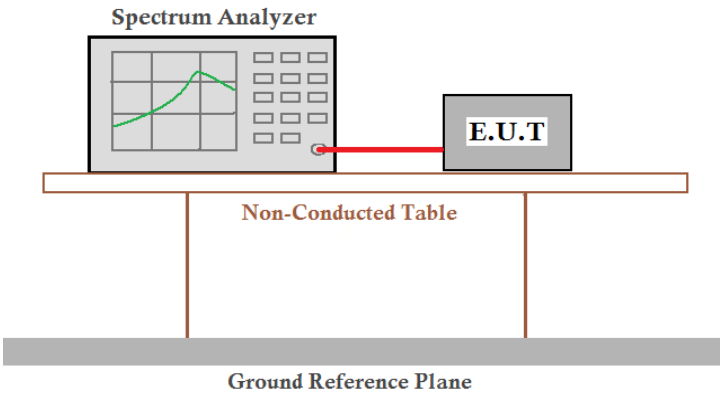
4.7 RF Conducted Spurious Emissions

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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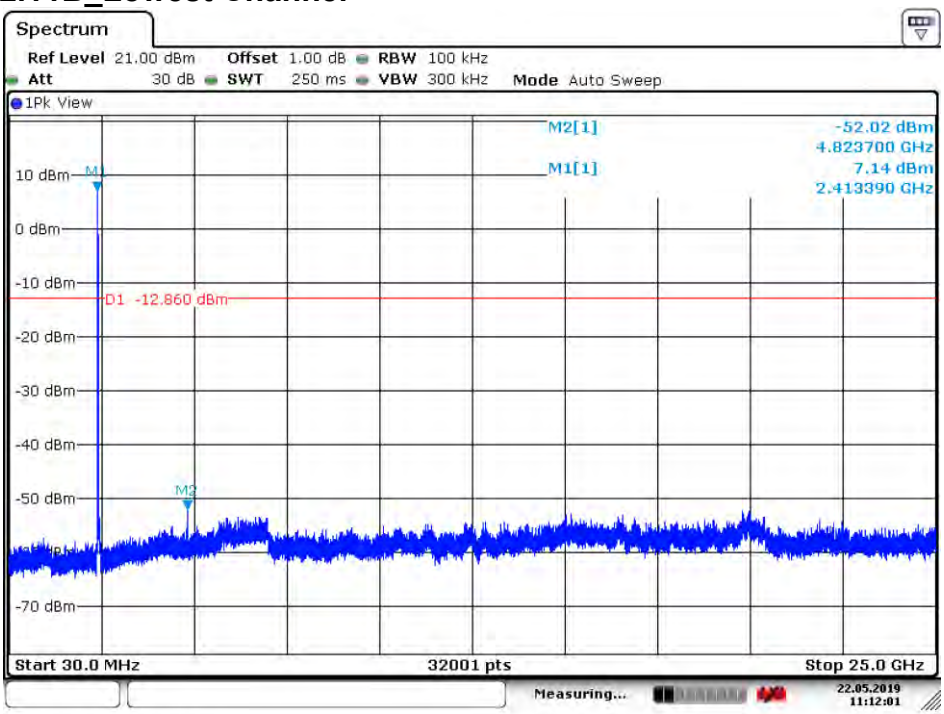
4.7.1 Test plots

4.7.1.1 ANT1

4.7.1.1.1 802.11B_Lowest Channel



Date: 22.MAY.2019 11:12:01

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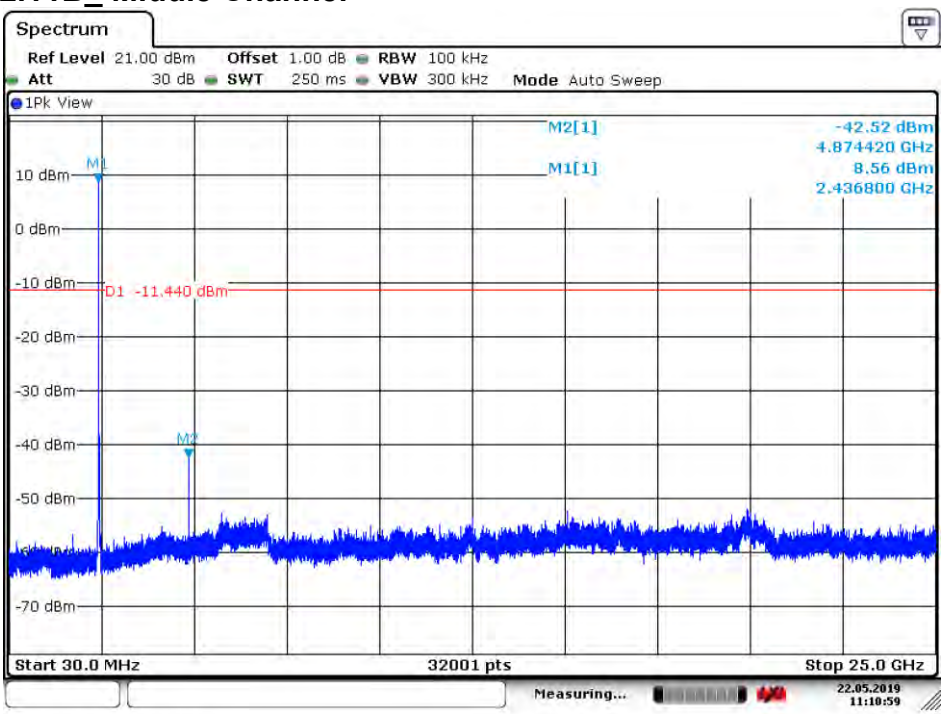
4.7.1.1.2 802.11B_ Middle Channel



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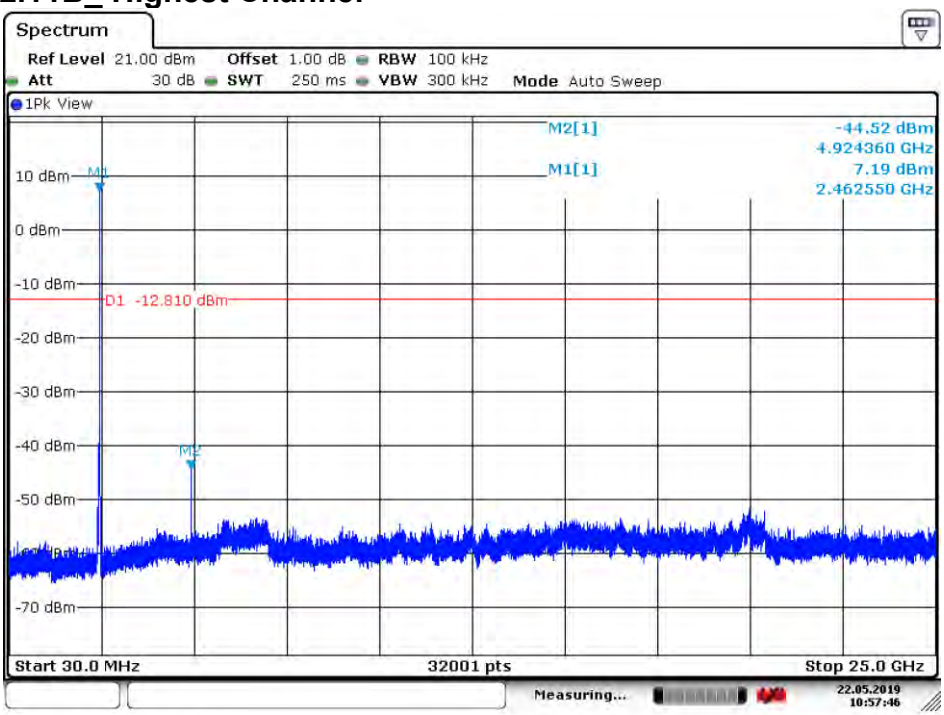
4.7.1.1.3 802.11B_ Highest Channel



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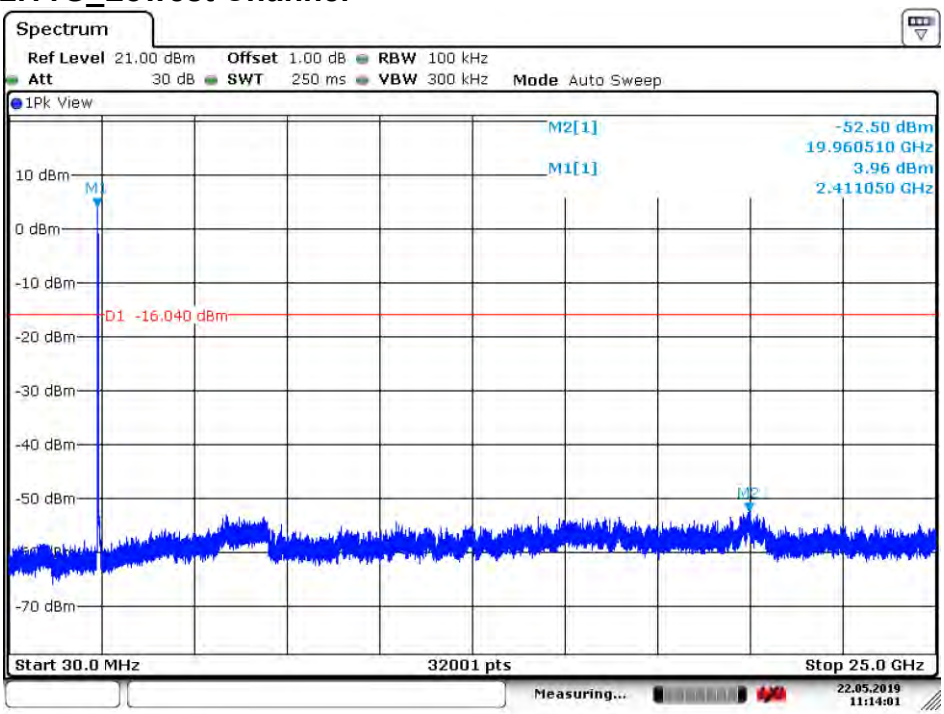
4.7.1.1.4 802.11G_Lowest Channel



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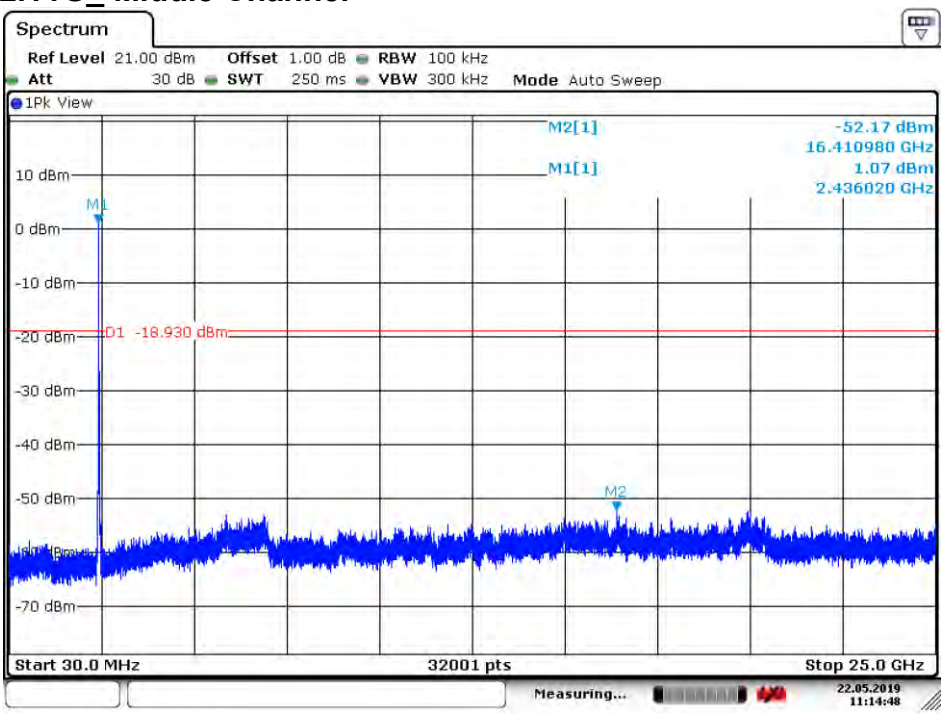
4.7.1.1.5 802.11G_ Middle Channel



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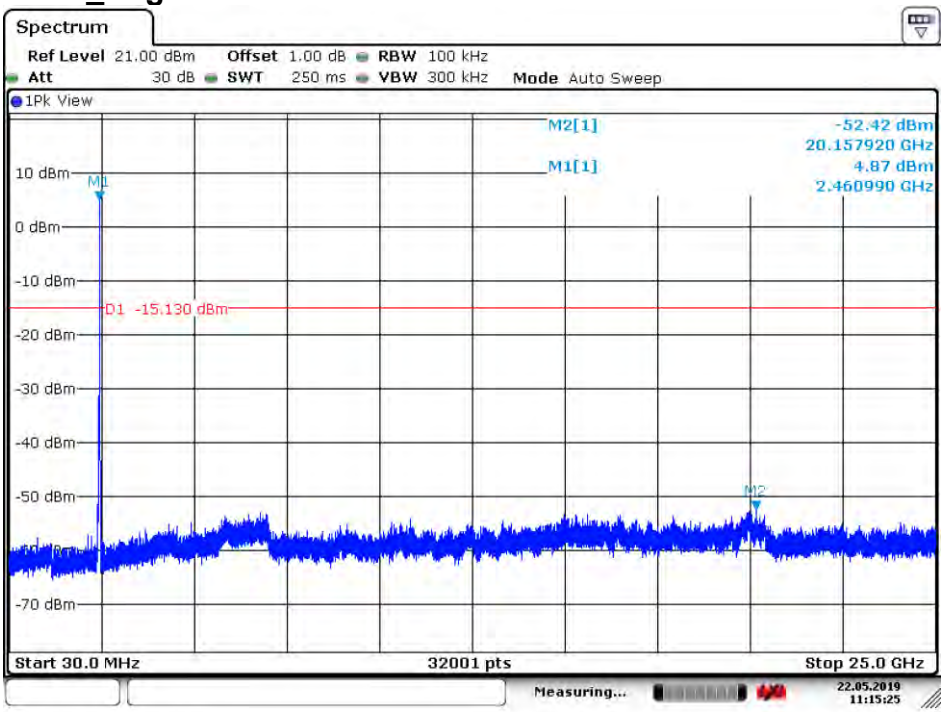
4.7.1.1.6 802.11G_ Highest Channel



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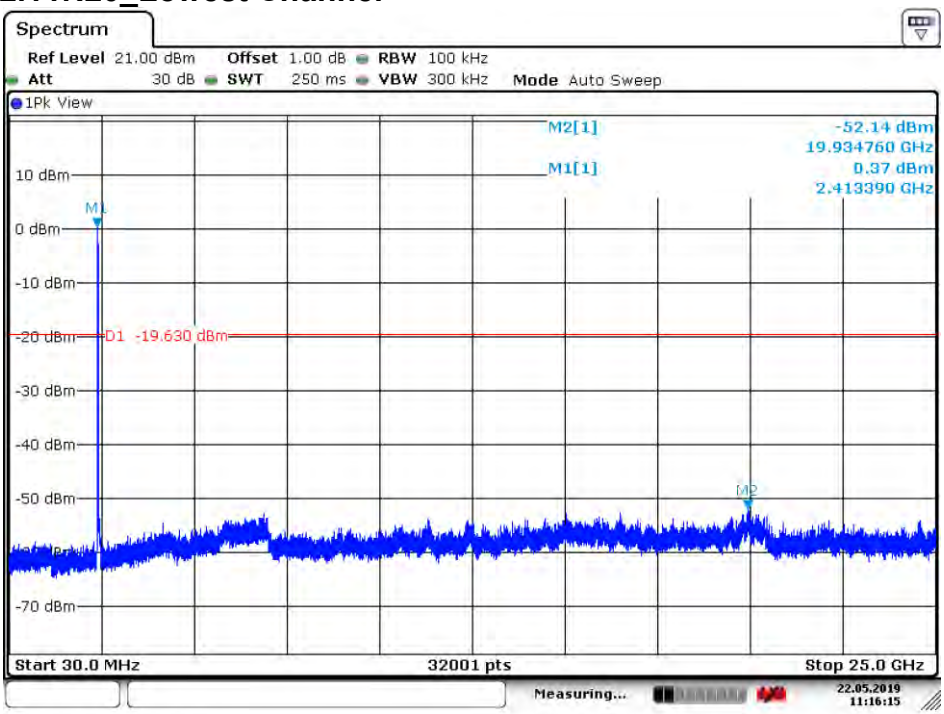
4.7.1.1.7 802.11N20_Lowest Channel



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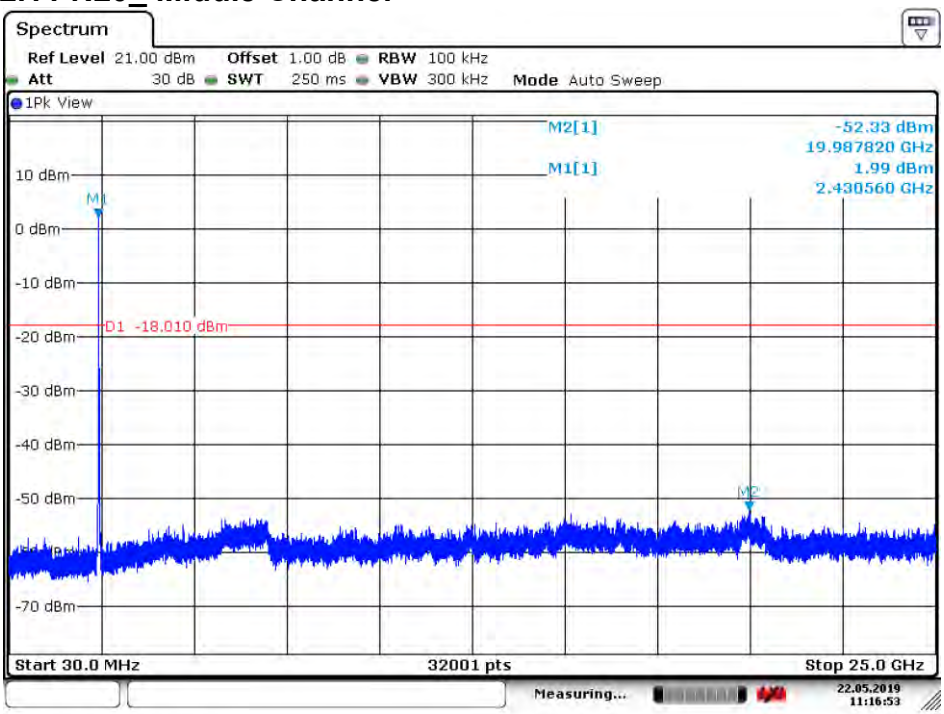
4.7.1.1.8 802.11 N20_ Middle Channel



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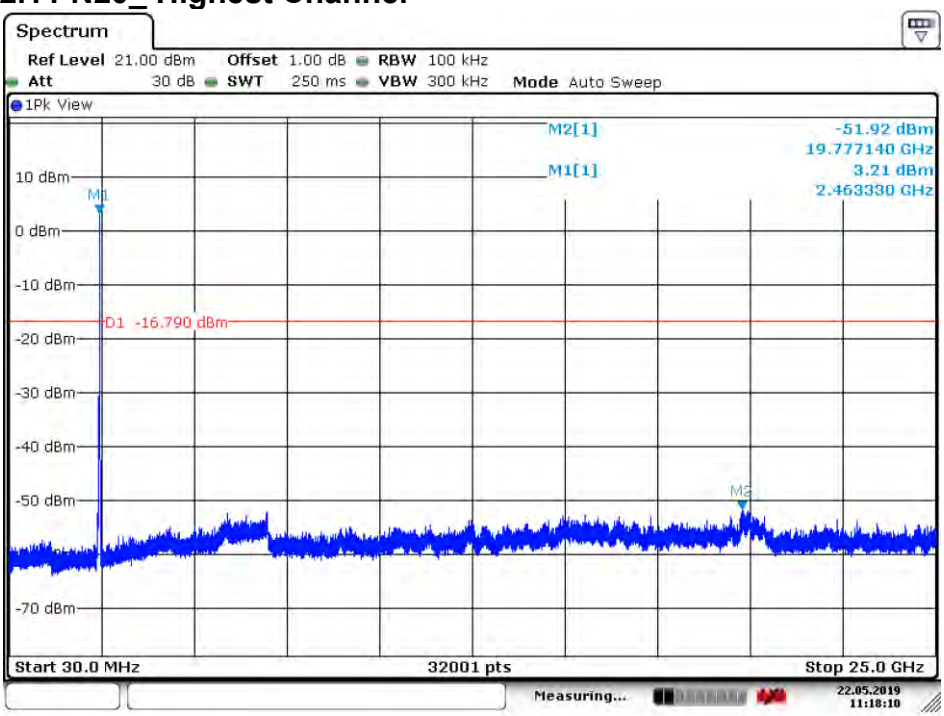
4.7.1.1.9 802.11 N20_ Highest Channel



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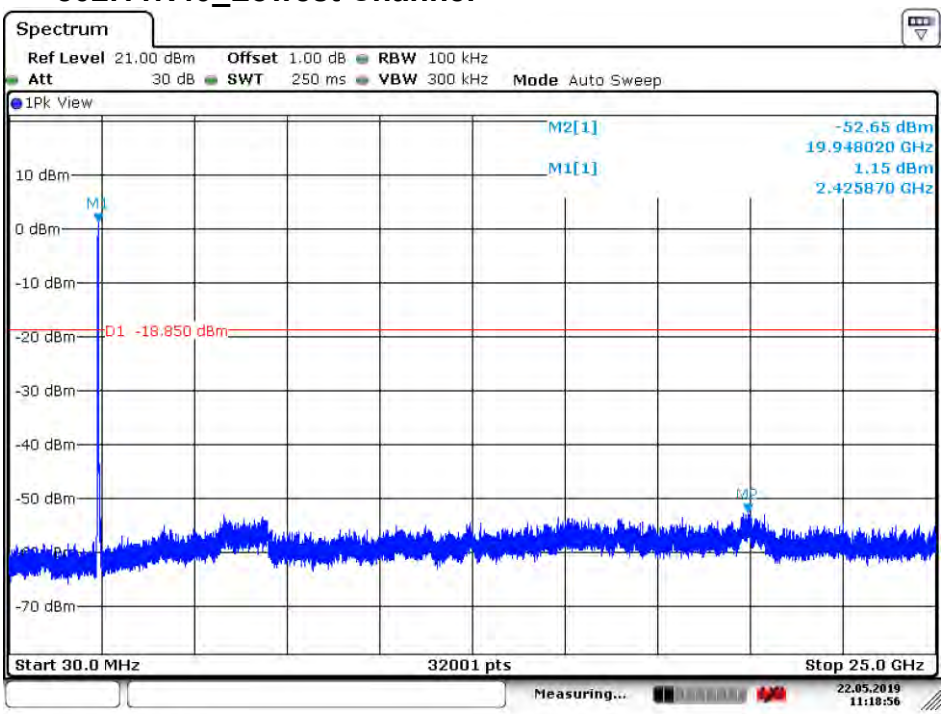
4.7.1.1.10 802.11N40_Lowest Channel



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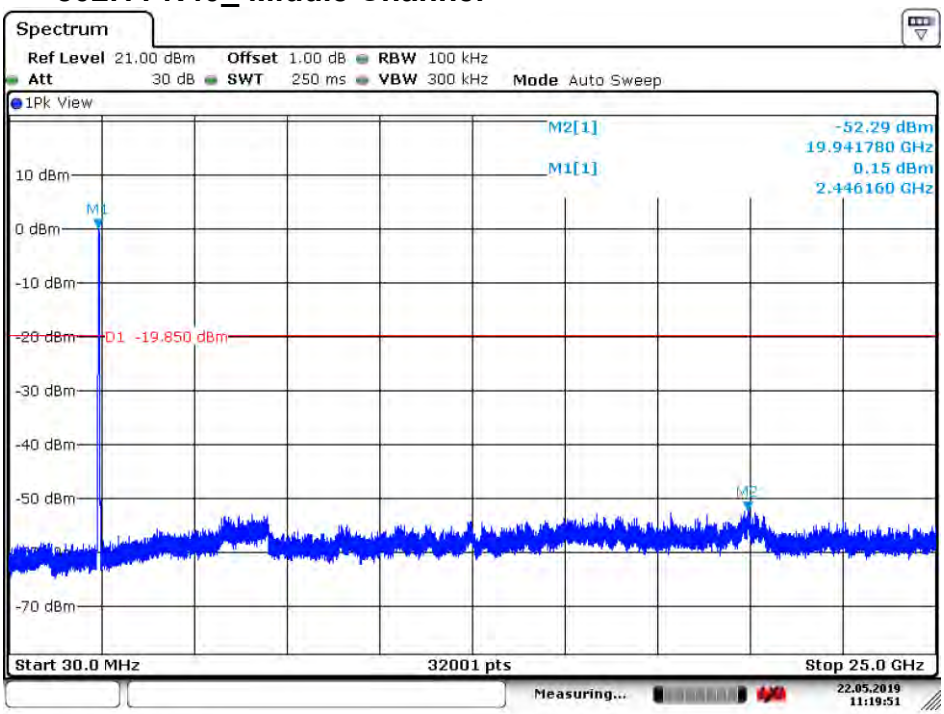
4.7.1.1.11 802.11 N40_ Middle Channel



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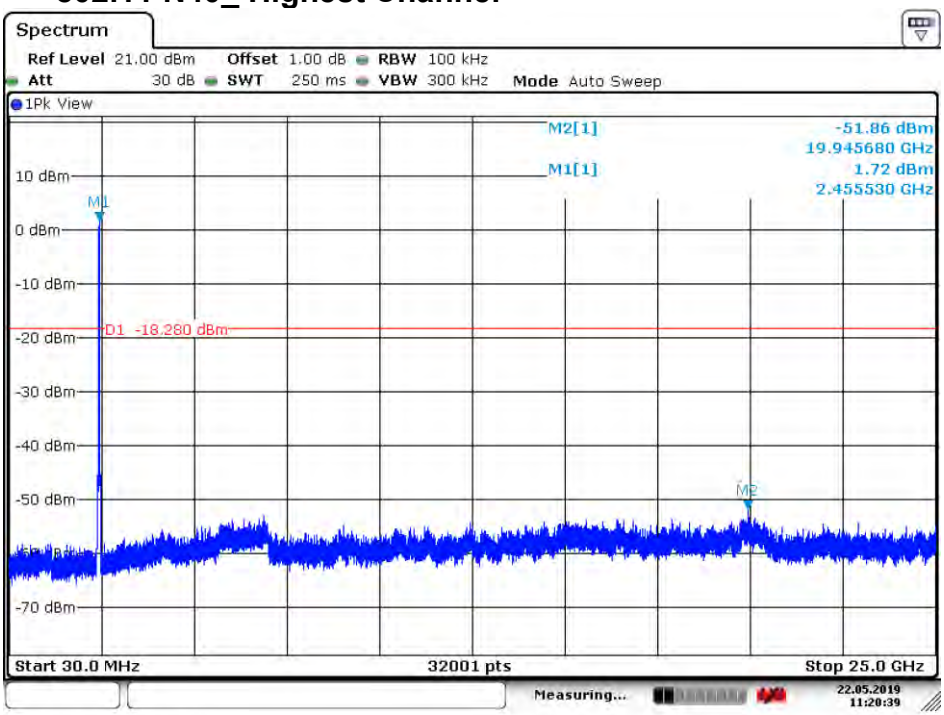
4.7.1.1.12 802.11 N40_ Highest Channel



Date: 22.MAY.2019 11:20:40

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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4.8 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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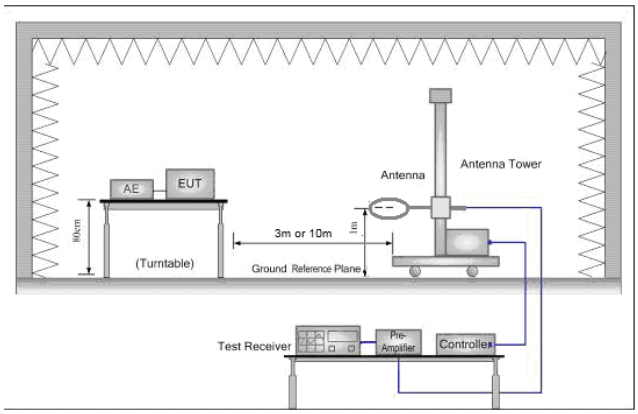

Figure 1. Below 30MHz

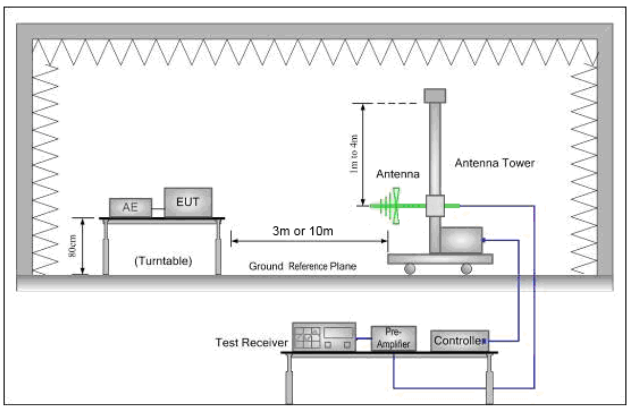

Figure 2. 30MHz to 1GHz

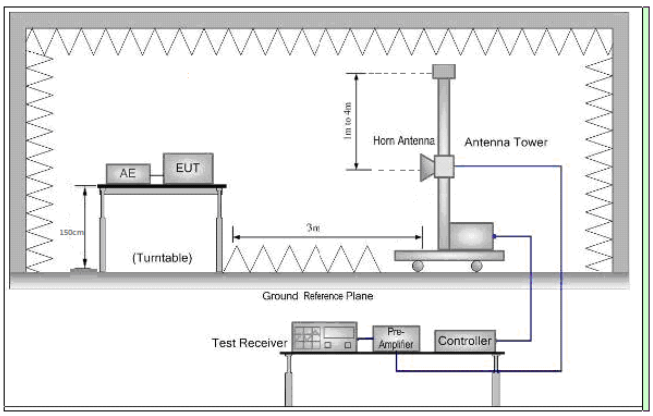

Figure 3. Above 1 GHz

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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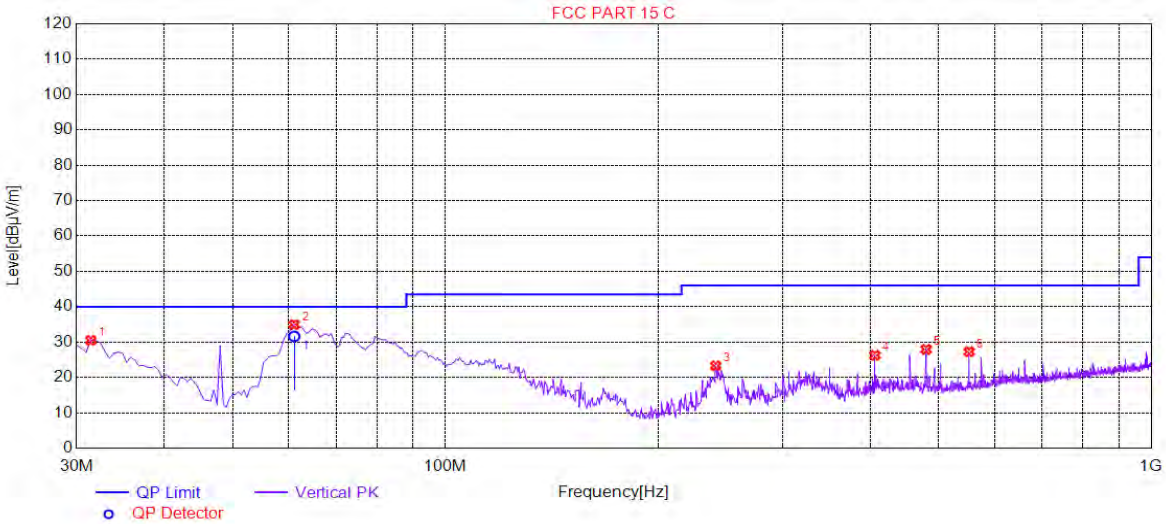
4.8.1 Radiated emission below 1GHz

4.8.1.1 Charge + Transmitting, Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	31.4557	30.47	-32.82	40.00	9.53	100	210	Vertical
2	61.0555	34.93	-31.91	40.00	5.07	100	160	Vertical
3	241.565	23.29	-29.55	46.00	22.71	100	182	Vertical
4	406.063	26.28	-24.80	46.00	19.72	100	166	Vertical
5	479.819	27.95	-23.22	46.00	18.05	200	152	Vertical
6	552.121	27.28	-21.39	46.00	18.72	100	16	Vertical

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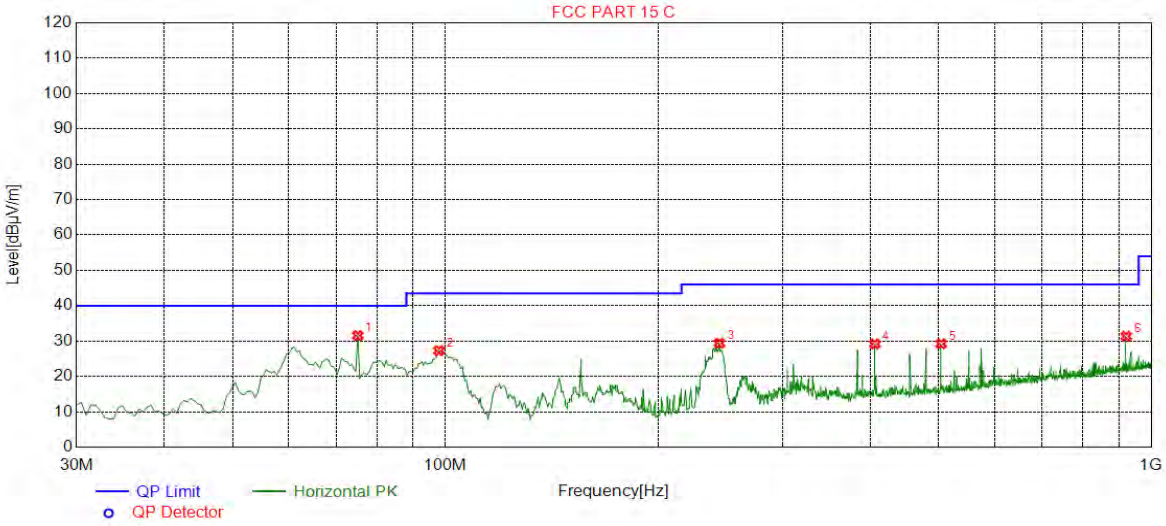
4.8.1.2 Charge + Transmitting, Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	75.1276	31.54	-35.04	40.00	8.46	200	20	Horizontal
2	97.9340	27.29	-32.04	43.50	16.21	200	113	Horizontal
3	244.477	29.39	-29.45	46.00	16.61	100	286	Horizontal
4	406.063	29.19	-24.80	46.00	16.81	100	232	Horizontal
5	504.082	29.23	-22.57	46.00	16.77	200	270	Horizontal
6	921.875	31.35	-14.90	46.00	14.65	100	326	Horizontal

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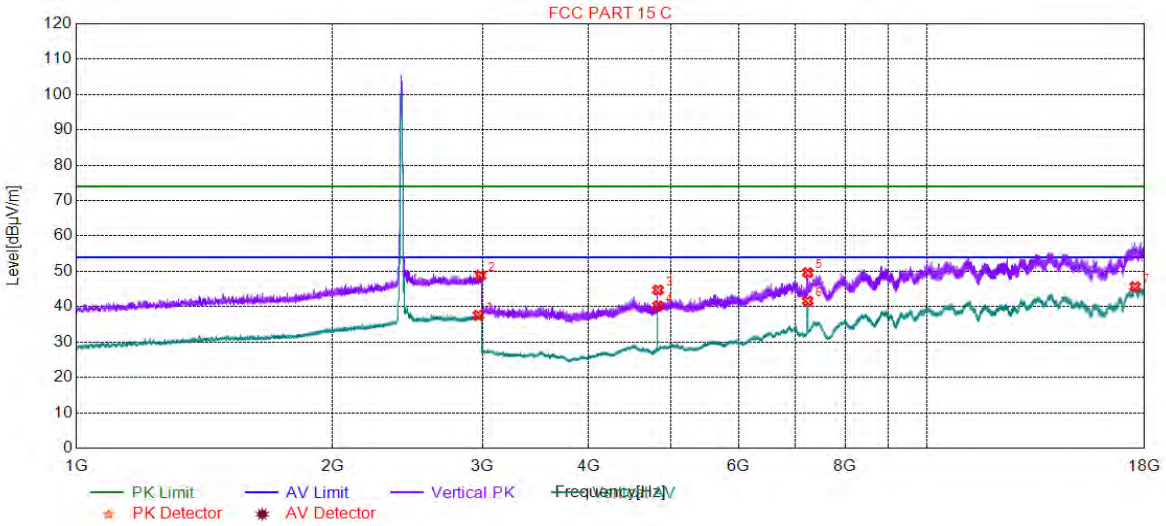
4.8.2 Transmitter emission above 1GHz

4.8.2.1 ANT1

4.8.2.1.1 802.11B_Lowest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2967.49	37.58	2.31	54.00	16.42	150	211	Vertical
2	2984.49	48.87	2.32	74.00	25.13	150	234	Vertical
3	4824.18	44.71	-20.09	74.00	29.29	150	210	Vertical
4	4824.68	40.22	-20.08	54.00	13.78	150	98	Vertical
5	7234.92	49.64	-12.41	74.00	24.36	150	130	Vertical
6	7235.42	41.62	-12.41	54.00	12.38	150	130	Vertical
7	17539.9	45.62	0.86	54.00	8.38	150	342	Vertical

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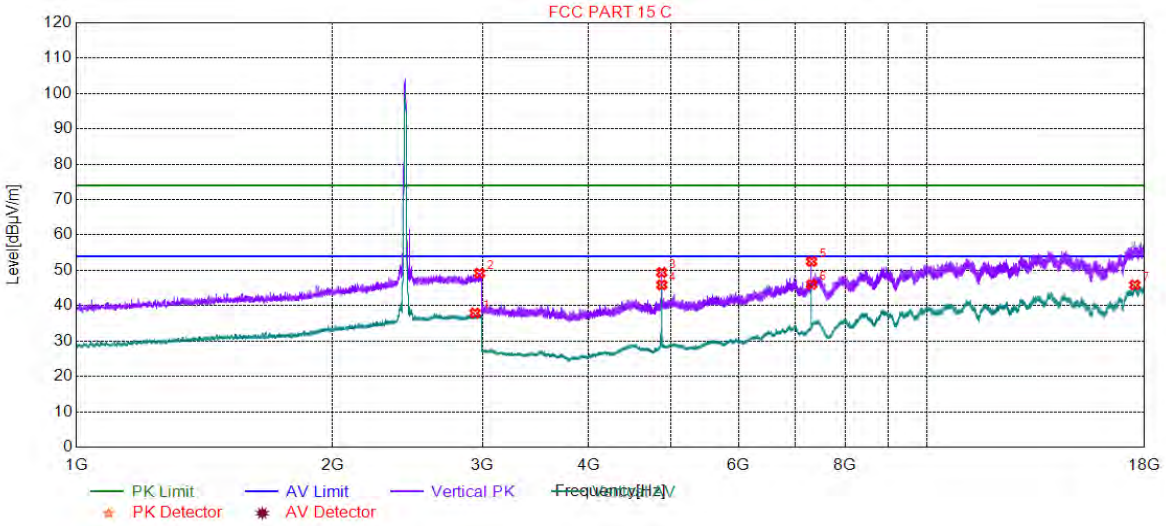
4.8.2.1.2 802.11B_ Middle Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2940.98	37.92	2.29	54.00	16.08	150	158	Vertical
2	2976.99	49.21	2.31	74.00	24.79	150	343	Vertical
3	4873.68	49.40	-19.38	74.00	24.60	150	338	Vertical
4	4874.68	45.88	-19.36	54.00	8.12	150	322	Vertical
5	7309.93	52.51	-11.52	74.00	21.49	150	18	Vertical
6	7312.43	46.00	-11.49	54.00	8.00	150	18	Vertical
7	17533.4	45.88	0.78	54.00	8.12	150	342	Vertical

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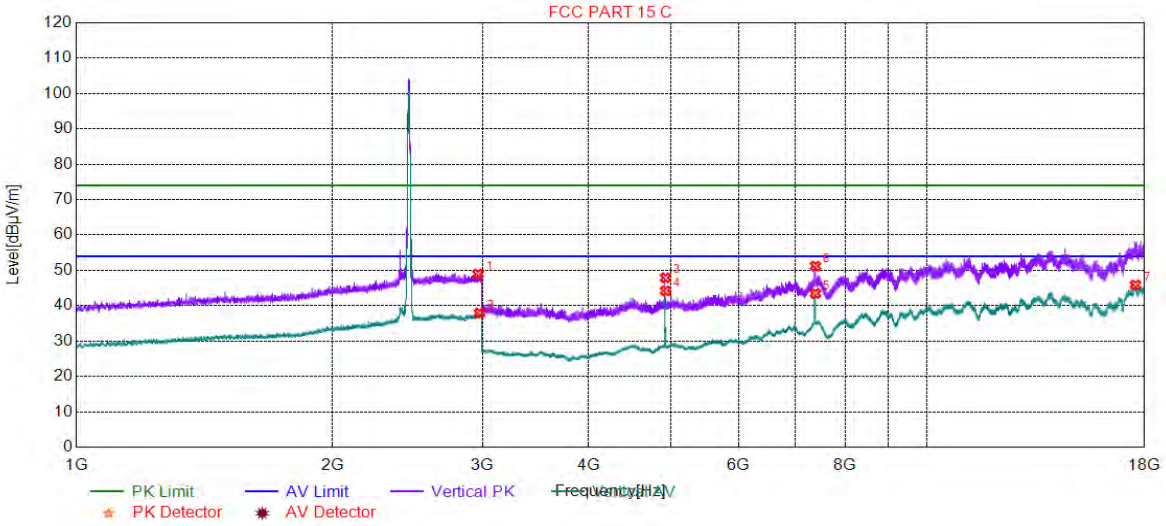
4.8.2.1.3 802.11B_ Highest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2964.99	48.96	2.31	74.00	25.04	150	343	Vertical
2	2975.99	37.93	2.31	54.00	16.07	150	72	Vertical
3	4923.69	47.92	-18.87	74.00	26.08	150	338	Vertical
4	4924.69	44.21	-18.86	54.00	9.79	150	322	Vertical
5	7385.93	43.47	-10.73	54.00	10.53	150	130	Vertical
6	7386.93	51.20	-10.72	74.00	22.80	150	18	Vertical
7	17555.9	45.90	1.07	54.00	8.10	150	201	Vertical

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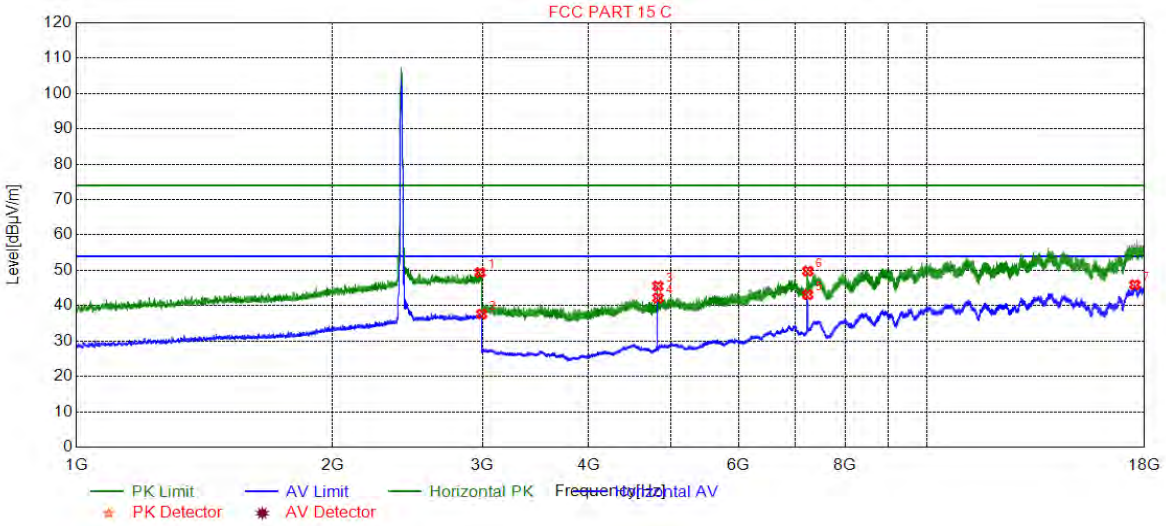
4.8.2.1.4 802.11B_Lowest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2981.49	49.38	2.32	74.00	24.62	150	232	Horizontal
2	2994.49	37.63	2.33	54.00	16.37	150	344	Horizontal
3	4824.18	45.56	-20.09	74.00	28.44	150	114	Horizontal
4	4824.68	42.20	-20.08	54.00	11.80	150	114	Horizontal
5	7235.42	43.10	-12.41	54.00	10.90	150	18	Horizontal
6	7237.42	49.79	-12.38	74.00	24.21	150	18	Horizontal
7	17530.9	45.92	0.75	54.00	8.08	150	285	Horizontal

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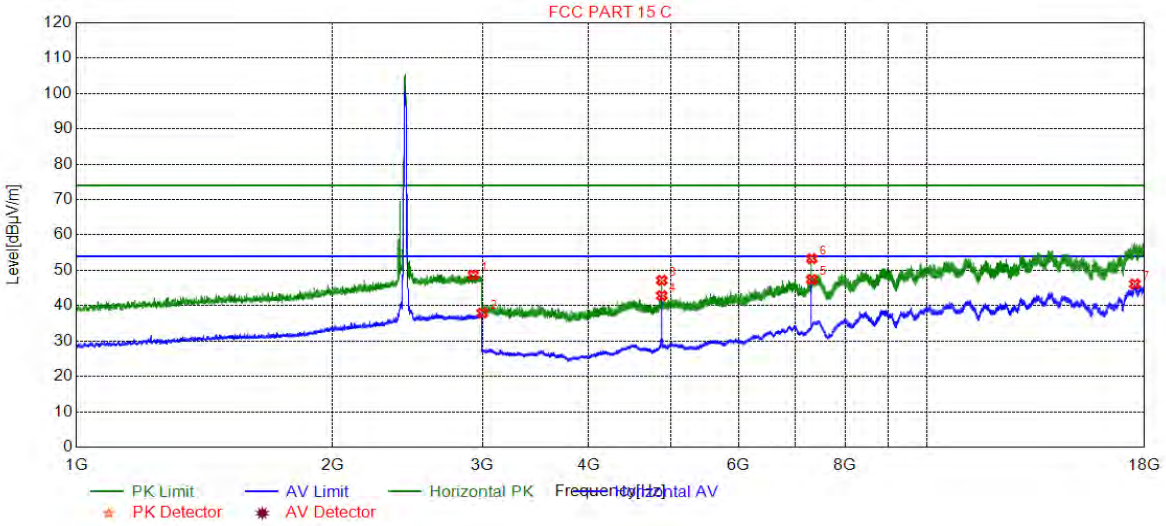
4.8.2.1.5 802.11B_ Middle Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2926.48	48.72	2.28	74.00	25.28	150	313	Horizontal
2	2998.99	37.92	2.33	54.00	16.08	150	172	Horizontal
3	4874.18	47.17	-19.37	74.00	26.83	150	131	Horizontal
4	4874.68	42.84	-19.36	54.00	11.16	150	114	Horizontal
5	7312.43	47.41	-11.49	54.00	6.59	150	18	Horizontal
6	7312.43	53.31	-11.49	74.00	20.69	150	35	Horizontal
7	17528.4	46.14	0.71	54.00	7.86	150	60	Horizontal

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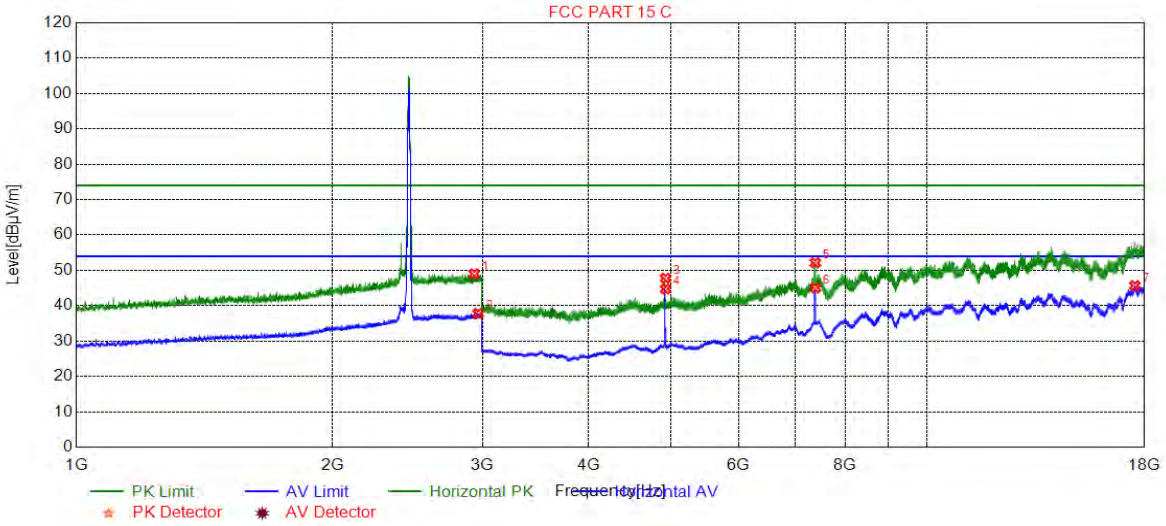
4.8.2.1.6 802.11B_ Highest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2934.98	49.00	2.28	74.00	25.00	150	234	Horizontal
2	2965.49	37.83	2.31	54.00	16.17	150	87	Horizontal
3	4924.19	47.80	-18.87	74.00	26.20	150	114	Horizontal
4	4924.69	44.73	-18.86	54.00	9.27	150	114	Horizontal
5	7384.43	52.15	-10.74	74.00	21.85	150	18	Horizontal
6	7385.93	45.05	-10.73	54.00	8.95	150	18	Horizontal
7	17531.9	45.68	0.76	54.00	8.32	150	314	Horizontal

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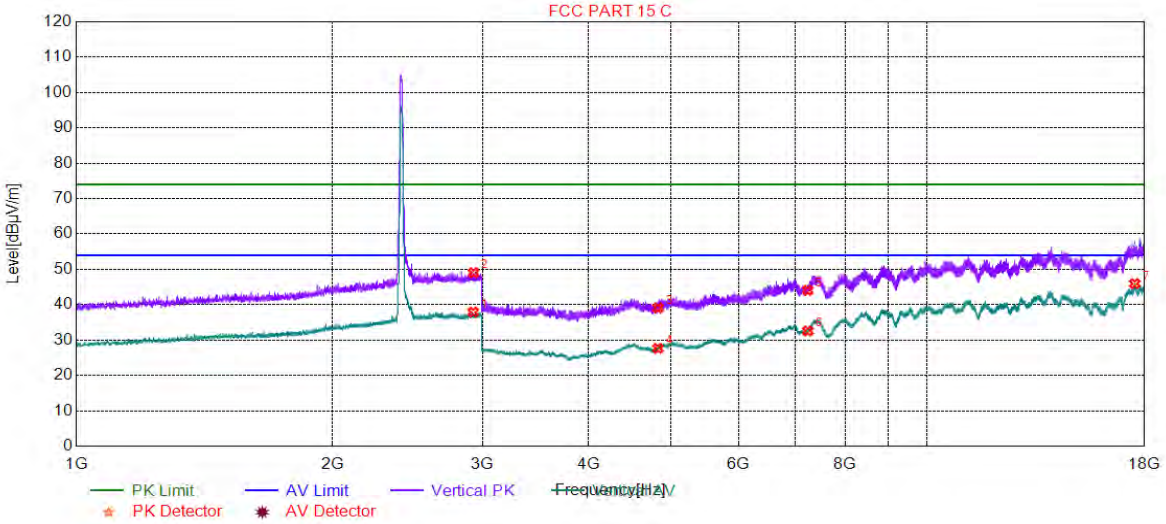
4.8.2.1.7 802.11G_Lowest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2925.98	37.91	2.28	54.00	16.09	150	32	Vertical
2	2929.48	49.04	2.28	74.00	24.96	150	296	Vertical
3	4824.00	39.09	-20.09	74.00	34.91	150	275	Vertical
4	4824.00	27.64	-20.09	54.00	26.36	150	259	Vertical
5	7236.00	44.06	-12.40	74.00	29.94	150	355	Vertical
6	7236.00	32.58	-12.40	54.00	21.42	150	34	Vertical
7	17526.4	45.97	0.69	54.00	8.03	150	116	Vertical

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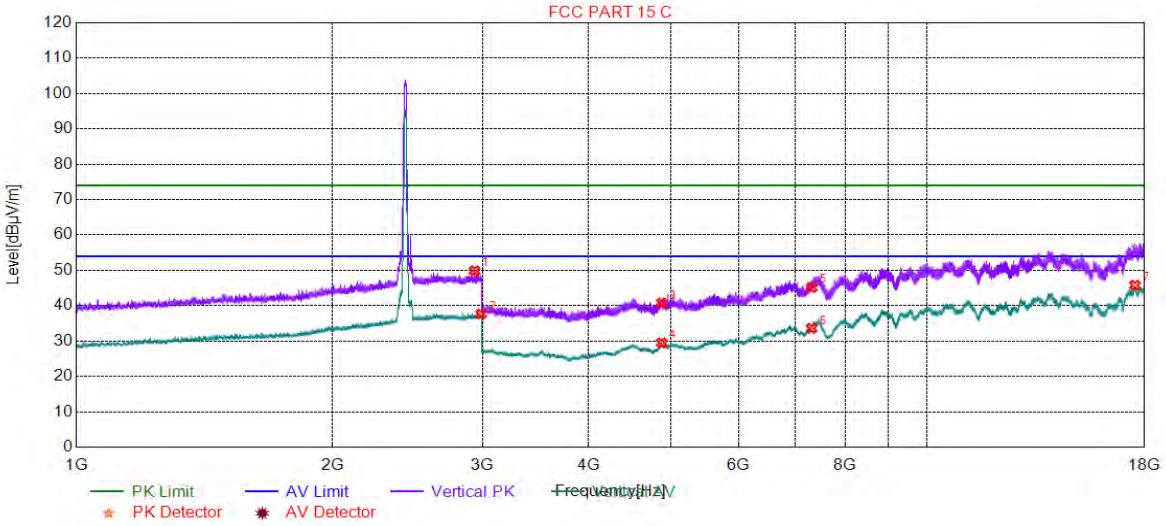
4.8.2.1.8 802.11G_ Middle Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2936.98	49.89	2.29	74.00	24.11	150	328	Vertical
2	2989.99	37.65	2.32	54.00	16.35	150	312	Vertical
3	4874.00	40.76	-19.37	74.00	33.24	150	305	Vertical
4	4874.00	29.52	-19.37	54.00	24.48	150	322	Vertical
5	7311.00	45.18	-11.50	74.00	28.82	150	289	Vertical
6	7311.00	33.60	-11.50	54.00	20.40	150	225	Vertical
7	17535.9	45.79	0.81	54.00	8.21	150	200	Vertical

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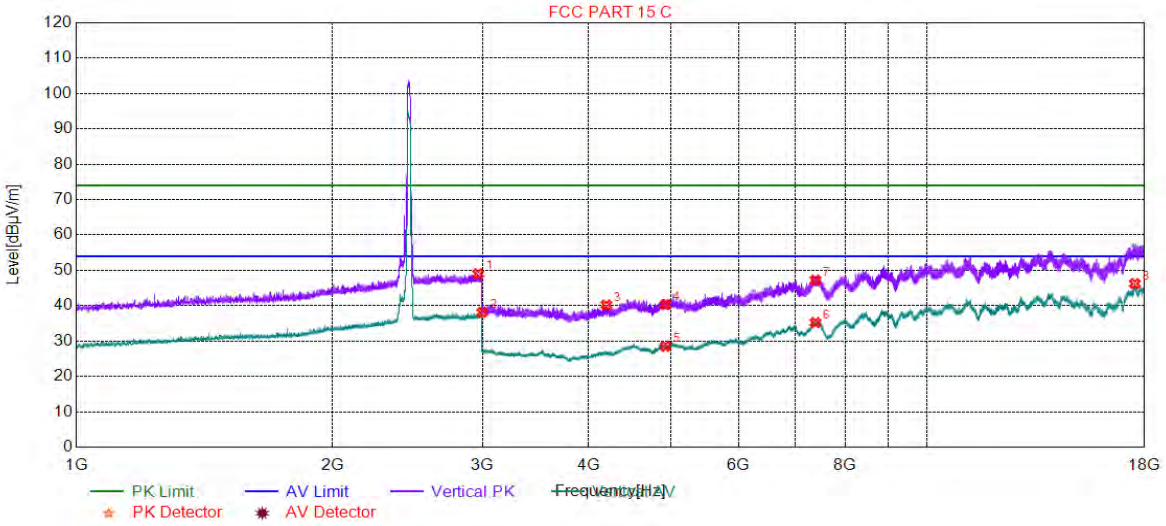
4.8.2.1.9 802.11G_ Highest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2965.99	49.02	2.31	74.00	24.98	150	147	Vertical
2	2998.49	38.13	2.33	54.00	15.87	150	70	Vertical
3	4195.61	40.19	-21.71	74.00	33.81	150	273	Vertical
4	4924.00	40.30	-18.87	74.00	33.70	150	337	Vertical
5	4924.00	28.53	-18.87	54.00	25.47	150	18	Vertical
6	7386.00	35.21	-10.72	54.00	18.79	150	273	Vertical
7	7386.00	47.24	-10.72	74.00	26.76	150	257	Vertical
8	17530.9	46.24	0.75	54.00	7.76	150	145	Vertical

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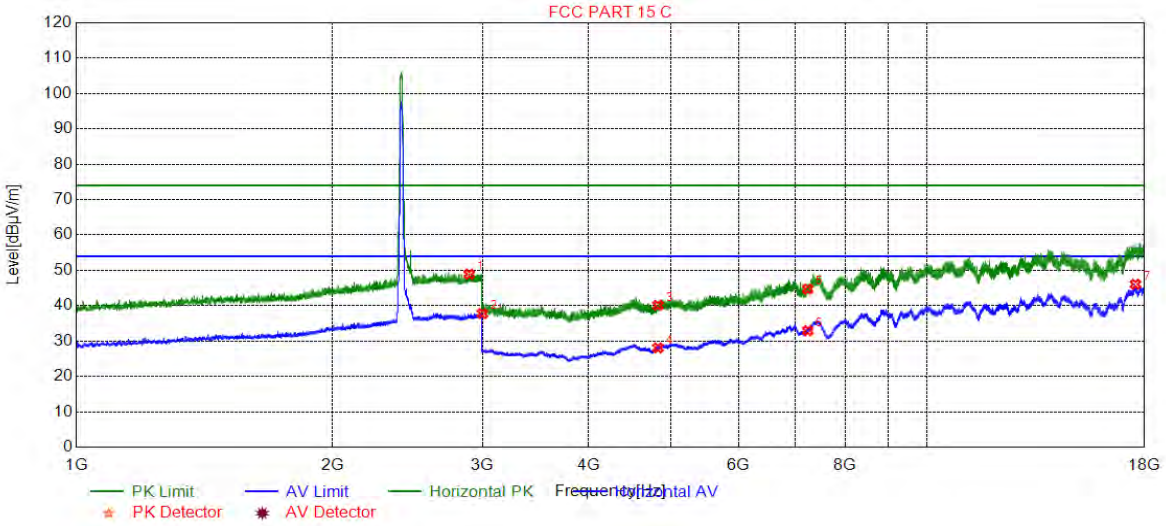
4.8.2.1.10 802.11G_Lowest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2895.97	48.92	2.26	74.00	25.08	150	165	Horizontal
2	3000.00	37.79	2.33	54.00	16.21	150	71	Horizontal
3	4824.00	40.09	-20.09	74.00	33.91	150	130	Horizontal
4	4824.00	28.08	-20.09	54.00	25.92	150	114	Horizontal
5	7236.00	44.69	-12.40	74.00	29.31	150	34	Horizontal
6	7236.00	32.92	-12.40	54.00	21.08	150	18	Horizontal
7	17558.4	46.08	1.10	54.00	7.92	150	285	Horizontal

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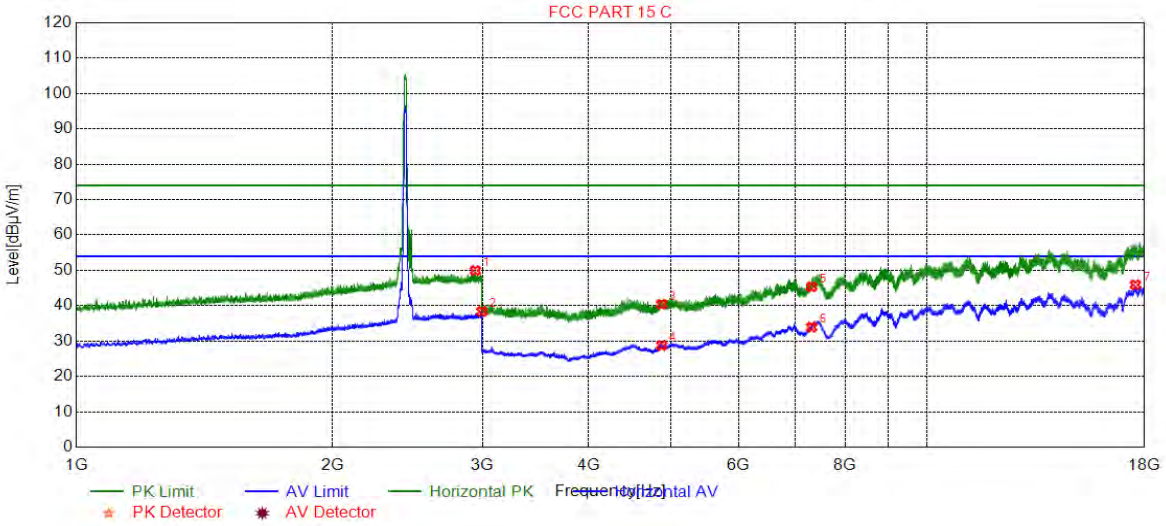
4.8.2.1.11 802.11G_ Middle Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2943.48	49.93	2.29	74.00	24.07	150	334	Horizontal
2	2996.99	38.36	2.33	54.00	15.64	150	342	Horizontal
3	4874.00	40.42	-19.37	74.00	33.58	150	338	Horizontal
4	4874.00	28.76	-19.37	54.00	25.24	150	291	Horizontal
5	7311.00	45.36	-11.50	74.00	28.64	150	259	Horizontal
6	7311.00	33.96	-11.50	54.00	20.04	150	210	Horizontal
7	17556.9	45.91	1.08	54.00	8.09	150	313	Horizontal

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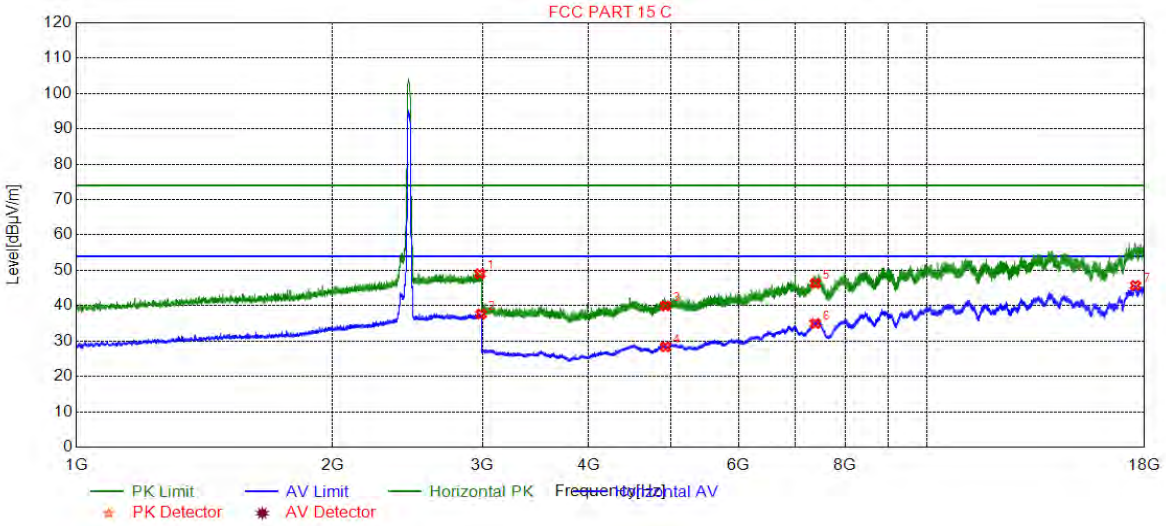
4.8.2.1.12 802.11G_ Highest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2980.99	49.02	2.32	74.00	24.98	150	172	Horizontal
2	2989.49	37.63	2.32	54.00	16.37	150	17	Horizontal
3	4924.00	39.95	-18.87	74.00	34.05	150	66	Horizontal
4	4924.00	28.37	-18.87	54.00	25.63	150	292	Horizontal
5	7386.00	46.32	-10.72	74.00	27.68	150	324	Horizontal
6	7386.00	34.97	-10.72	54.00	19.03	150	34	Horizontal
7	17558.9	45.71	1.10	54.00	8.29	150	5	Horizontal

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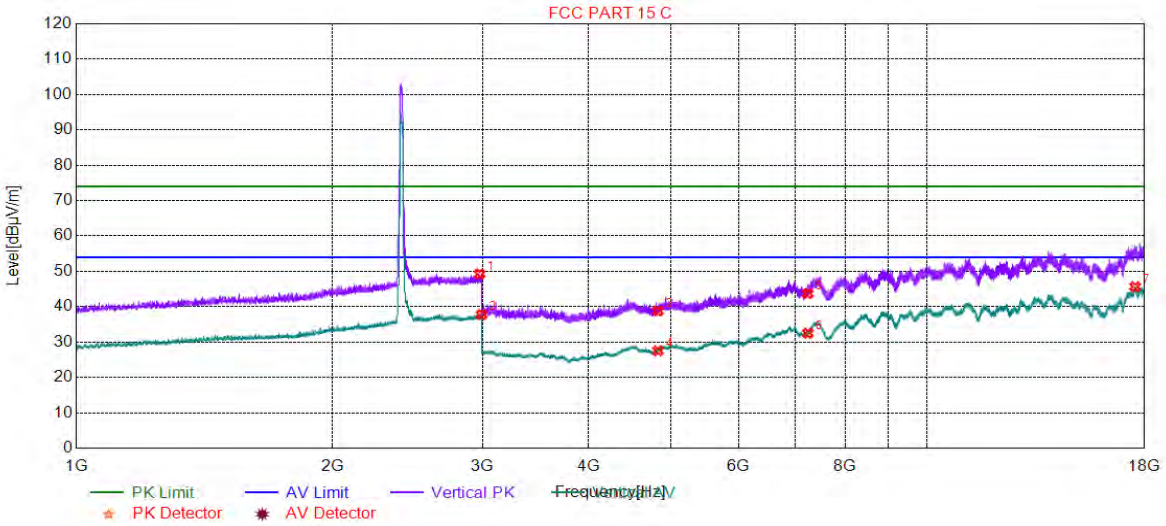
4.8.2.1.13 802.11N20_Lowest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2977.99	49.27	2.31	74.00	24.73	150	64	Vertical
2	2993.99	37.77	2.33	54.00	16.23	150	289	Vertical
3	4824.00	38.78	-20.09	74.00	35.22	150	290	Vertical
4	4824.00	27.53	-20.09	54.00	26.47	150	258	Vertical
5	7236.00	43.74	-12.40	74.00	30.26	150	50	Vertical
6	7236.00	32.50	-12.40	54.00	21.50	150	162	Vertical
7	17543.9	45.65	0.91	54.00	8.35	150	342	Vertical

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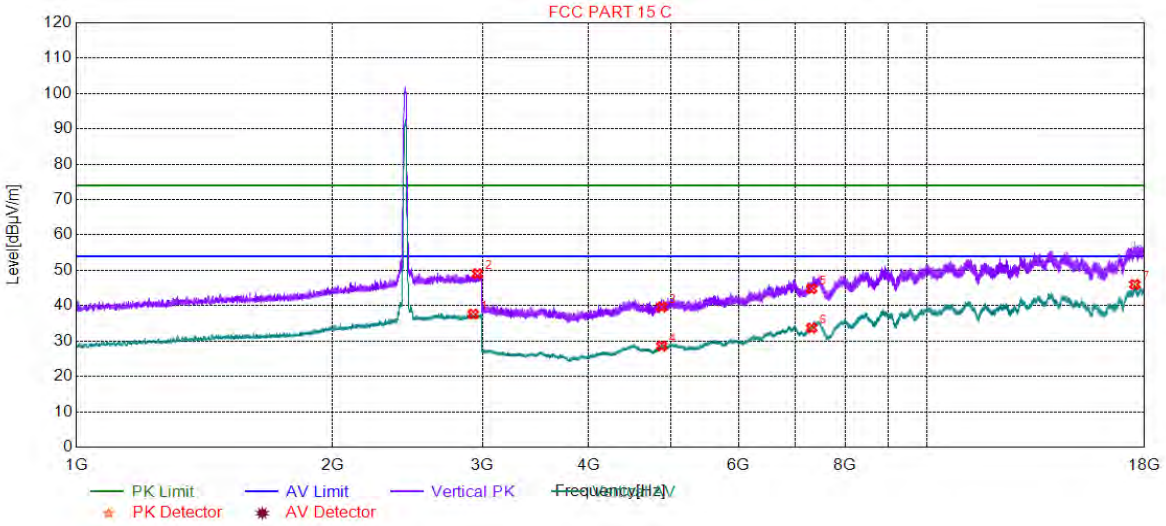
4.8.2.1.14 802.11N20_ Middle Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2925.98	37.62	2.28	54.00	16.38	150	101	Vertical
2	2959.99	49.06	2.30	74.00	24.94	150	55	Vertical
3	4874.00	39.64	-19.37	74.00	34.36	150	99	Vertical
4	4874.00	28.61	-19.37	54.00	25.39	150	34	Vertical
5	7311.00	44.81	-11.50	74.00	29.19	150	227	Vertical
6	7311.00	33.69	-11.50	54.00	20.31	150	275	Vertical
7	17530.4	46.02	0.74	54.00	7.98	150	200	Vertical

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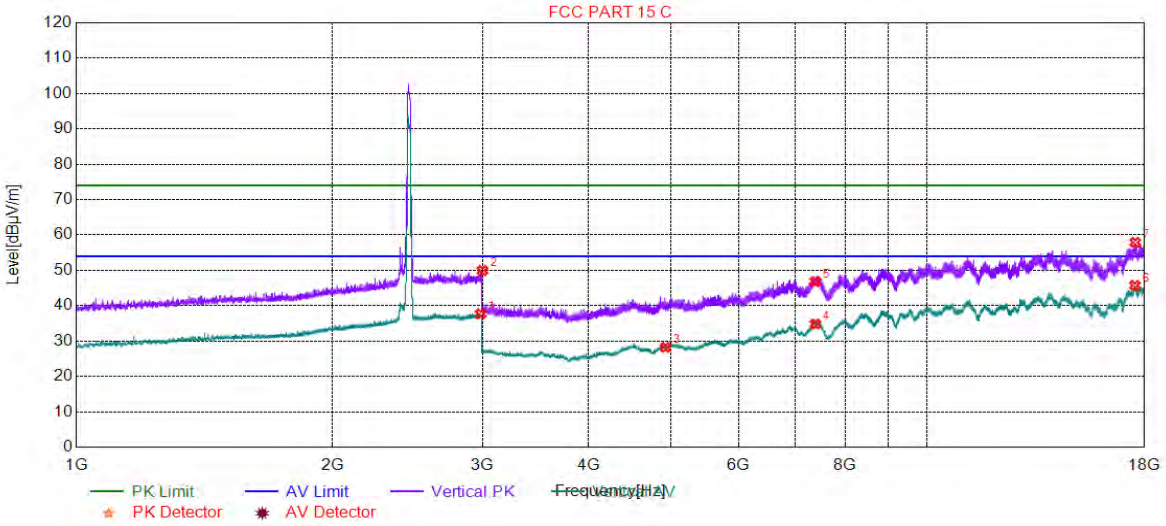
4.8.2.1.15 802.11N20_ Highest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2986.49	37.71	2.32	54.00	16.29	150	195	Vertical
2	3000.00	49.93	2.33	74.00	24.07	150	0	Vertical
3	4924.00	28.21	-18.87	54.00	25.79	150	193	Vertical
4	7386.00	34.82	-10.72	54.00	19.18	150	66	Vertical
5	7386.00	46.80	-10.72	74.00	27.20	150	114	Vertical
6	17531.9	45.71	0.76	54.00	8.29	150	31	Vertical
7	17551.4	57.90	1.01	74.00	16.10	150	285	Vertical

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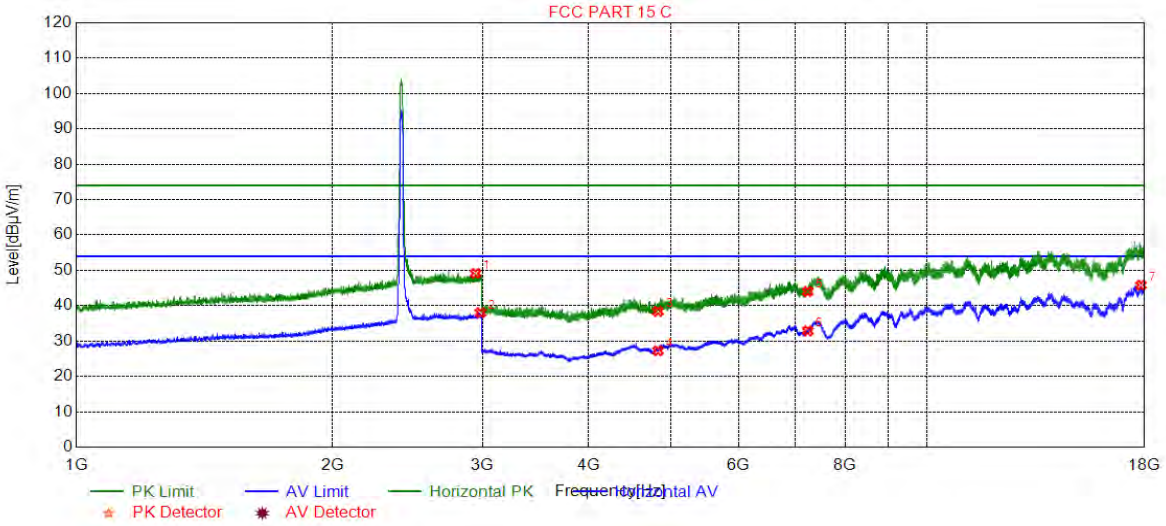
4.8.2.1.16 802.11N20_Lowest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2945.98	49.15	2.29	74.00	24.85	150	143	Horizontal
2	2984.49	38.00	2.32	54.00	16.00	150	268	Horizontal
3	4824.00	38.40	-20.09	74.00	35.60	150	360	Horizontal
4	4824.00	27.26	-20.09	54.00	26.74	150	18	Horizontal
5	7236.00	44.02	-12.40	74.00	29.98	150	114	Horizontal
6	7236.00	32.89	-12.40	54.00	21.11	150	360	Horizontal
7	17825.4	45.80	-0.86	54.00	8.20	150	201	Horizontal

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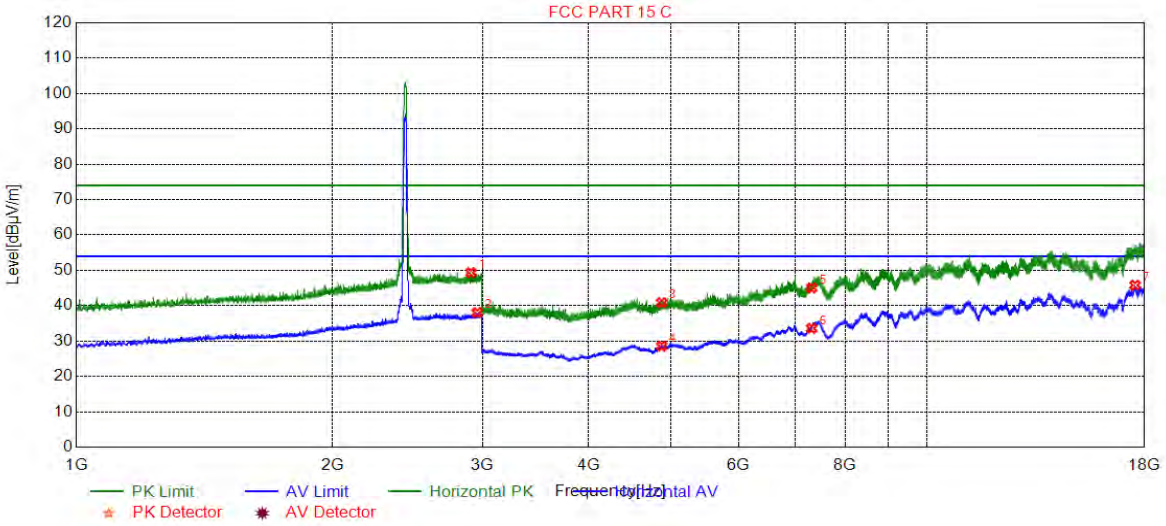
4.8.2.1.17 802.11N20_ Middle Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2907.97	49.35	2.27	74.00	24.65	150	281	Horizontal
2	2957.98	38.05	2.30	54.00	15.95	150	328	Horizontal
3	4874.00	40.84	-19.37	74.00	33.16	150	114	Horizontal
4	4874.00	28.57	-19.37	54.00	25.43	150	194	Horizontal
5	7311.00	45.05	-11.50	74.00	28.95	150	354	Horizontal
6	7311.00	33.61	-11.50	54.00	20.39	150	323	Horizontal
7	17541.4	45.80	0.88	54.00	8.20	150	31	Horizontal

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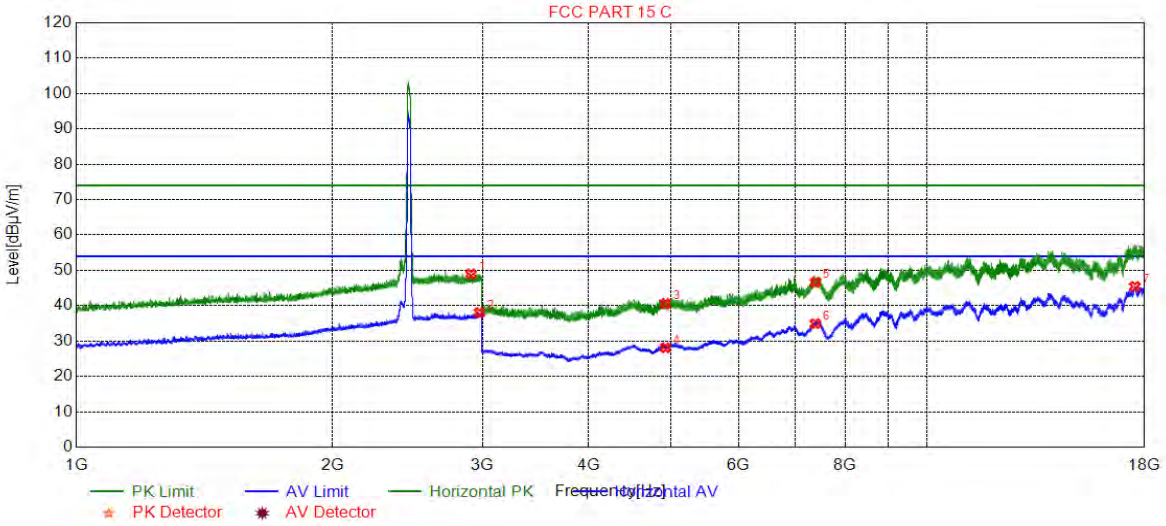
4.8.2.1.18 802.11N20_ Highest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2908.97	48.95	2.27	74.00	25.05	150	219	Horizontal
2	2975.49	38.02	2.31	54.00	15.98	150	149	Horizontal
3	4924.00	40.59	-18.87	74.00	33.41	150	163	Horizontal
4	4924.00	28.13	-18.87	54.00	25.87	150	82	Horizontal
5	7386.00	46.60	-10.72	74.00	27.40	150	82	Horizontal
6	7386.00	34.94	-10.72	54.00	19.06	150	276	Horizontal
7	17532.9	45.43	0.77	54.00	8.57	150	229	Horizontal

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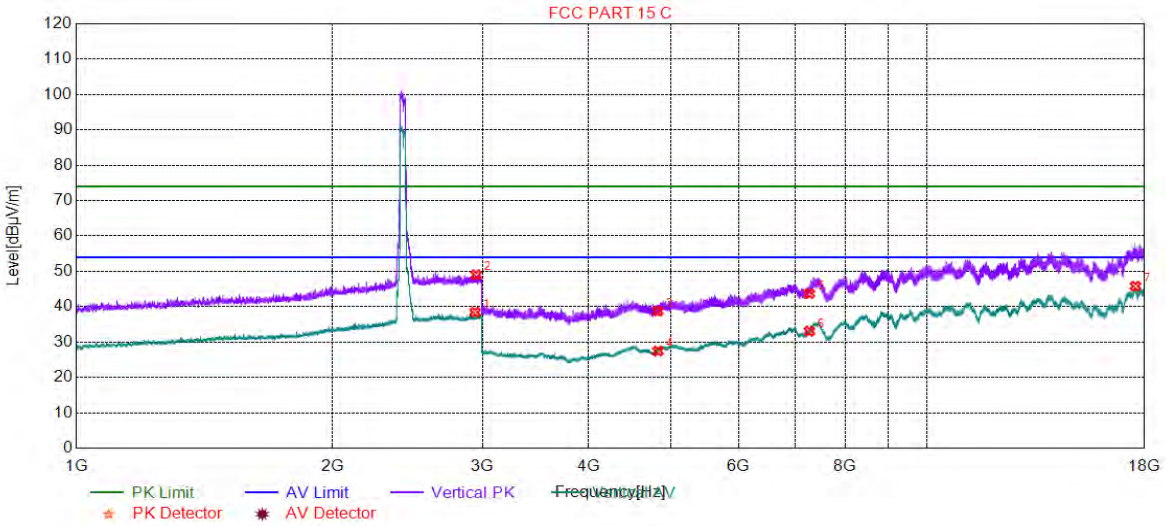
4.8.2.1.19 802.11N40_Lowest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2940.98	38.44	2.29	54.00	15.56	150	227	Vertical
2	2949.98	49.01	2.29	74.00	24.99	150	188	Vertical
3	4824.00	38.72	-20.09	74.00	35.28	150	18	Vertical
4	4824.00	27.46	-20.09	54.00	26.54	150	179	Vertical
5	7266.00	43.70	-12.03	74.00	30.30	150	212	Vertical
6	7266.00	33.08	-12.03	54.00	20.92	150	114	Vertical
7	17558.4	45.81	1.10	54.00	8.19	150	286	Vertical

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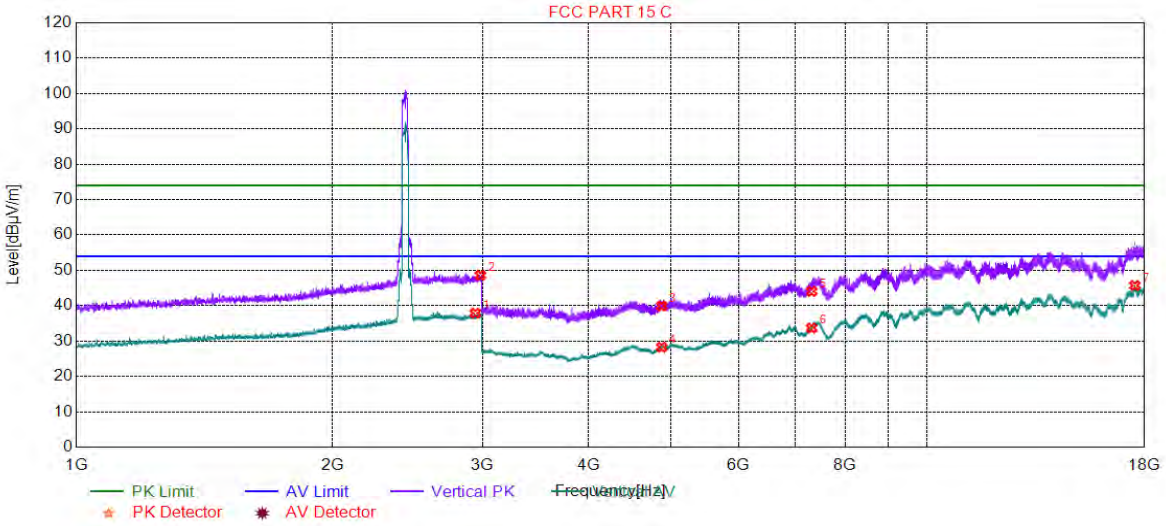
4.8.2.1.20 802.11N40_ Middle Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2942.98	37.91	2.29	54.00	16.09	150	211	Vertical
2	2983.99	48.59	2.32	74.00	25.41	150	0	Vertical
3	4874.00	39.90	-19.37	74.00	34.10	150	146	Vertical
4	4874.00	28.27	-19.37	54.00	25.73	150	18	Vertical
5	7311.00	44.06	-11.50	74.00	29.94	150	162	Vertical
6	7311.00	33.68	-11.50	54.00	20.32	150	306	Vertical
7	17530.9	45.70	0.75	54.00	8.30	150	31	Vertical

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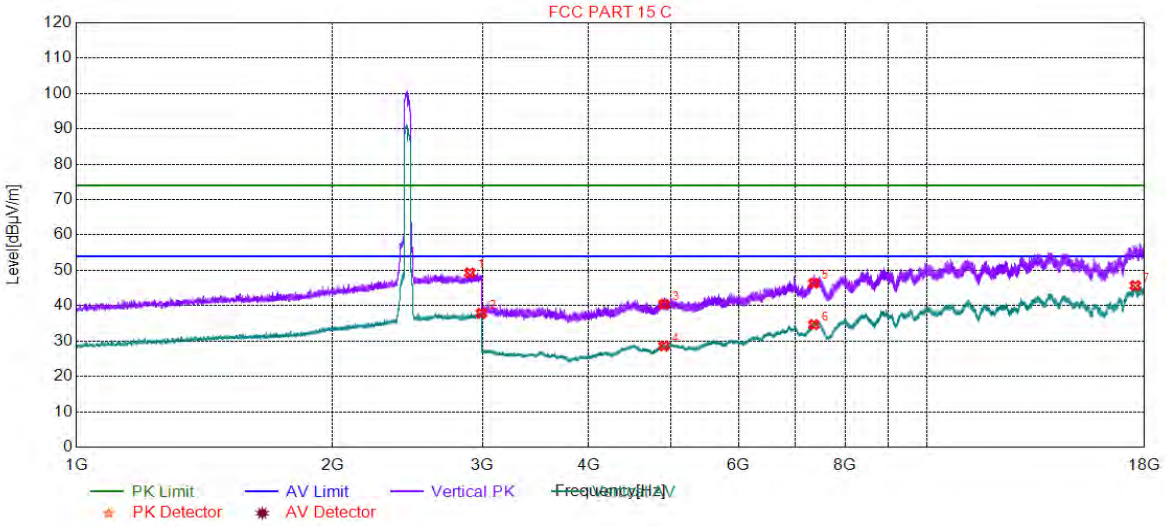
4.8.2.1.21 802.11N40_ Highest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2899.97	49.29	2.26	74.00	24.71	150	343	Vertical
2	2992.49	37.84	2.32	54.00	16.16	150	265	Vertical
3	4904.00	40.44	-18.98	74.00	33.56	150	322	Vertical
4	4904.00	28.64	-18.98	54.00	25.36	150	226	Vertical
5	7356.00	46.36	-11.03	74.00	27.64	150	194	Vertical
6	7356.00	34.65	-11.03	54.00	19.35	150	162	Vertical
7	17550.9	45.67	1.00	54.00	8.33	150	314	Vertical

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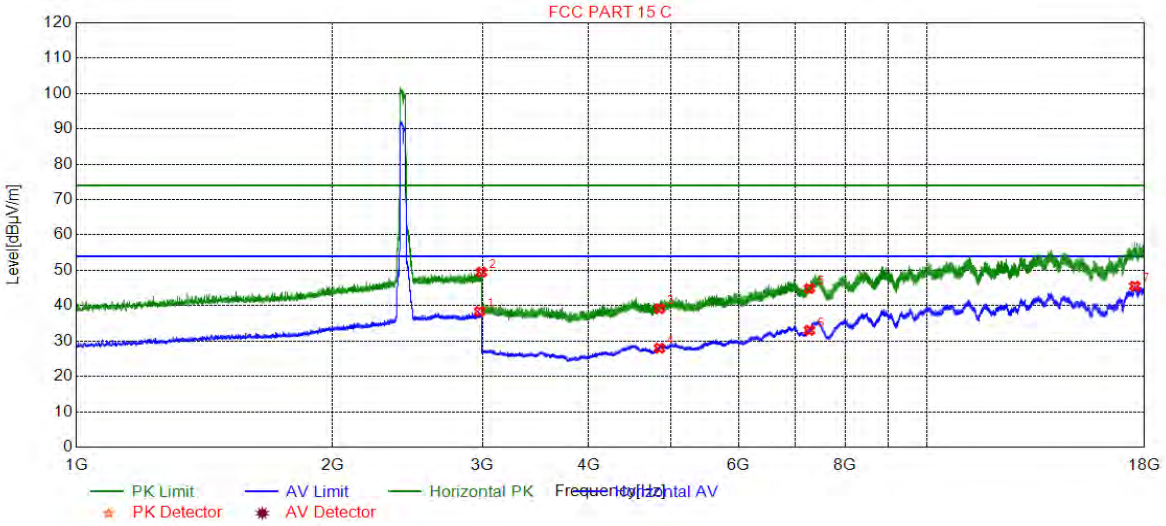
4.8.2.1.22 802.11N40_Lowest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2976.99	38.39	2.31	54.00	15.61	150	80	Horizontal
2	2992.49	49.47	2.32	74.00	24.53	150	150	Horizontal
3	4844.00	39.16	-19.80	74.00	34.84	150	228	Horizontal
4	4844.00	27.99	-19.80	54.00	26.01	150	18	Horizontal
5	7266.00	44.88	-12.03	74.00	29.12	150	18	Horizontal
6	7266.00	33.05	-12.03	54.00	20.95	150	98	Horizontal
7	17530.9	45.52	0.75	54.00	8.48	150	3	Horizontal

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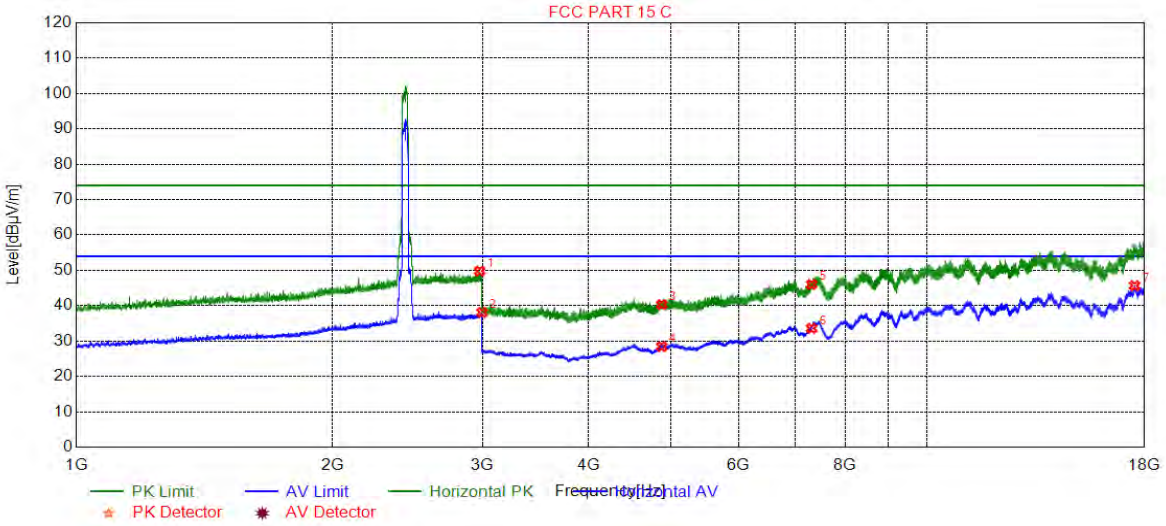
4.8.2.1.23 802.11N40_ Middle Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2977.99	49.80	2.31	74.00	24.20	150	207	Horizontal
2	2996.99	38.06	2.33	54.00	15.94	150	44	Horizontal
3	4874.00	40.33	-19.37	74.00	33.67	150	18	Horizontal
4	4874.00	28.45	-19.37	54.00	25.55	150	339	Horizontal
5	7311.00	46.02	-11.50	74.00	27.98	150	98	Horizontal
6	7311.00	33.60	-11.50	54.00	20.40	150	210	Horizontal
7	17518.9	45.65	0.59	54.00	8.35	150	200	Horizontal

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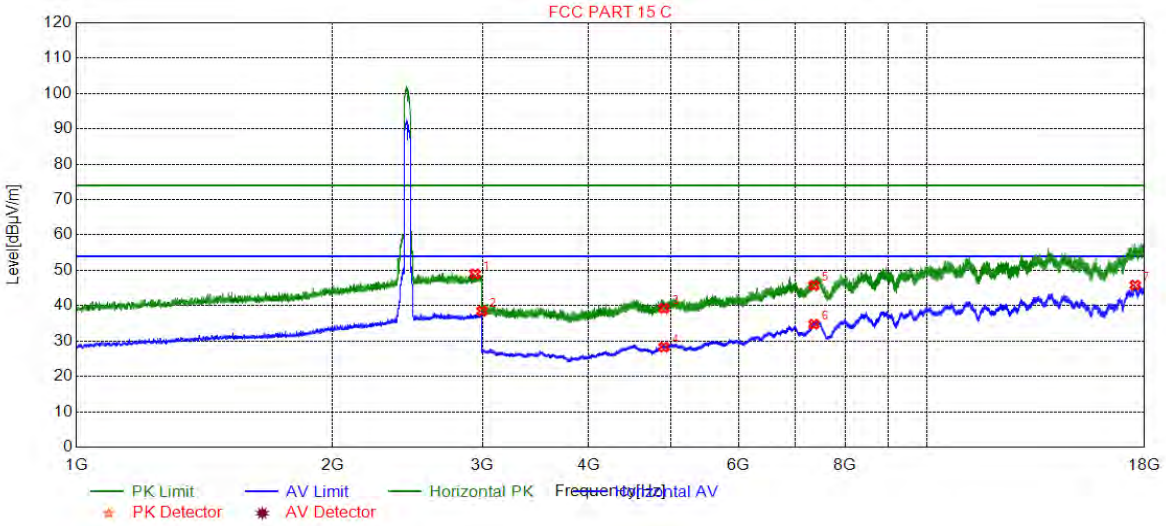
4.8.2.1.24 802.11N40_ Highest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2940.98	48.98	2.29	74.00	25.02	150	188	Horizontal
2	2996.99	38.49	2.33	54.00	15.51	150	288	Horizontal
3	4904.00	39.23	-18.98	74.00	34.77	150	50	Horizontal
4	4904.00	28.29	-18.98	54.00	25.71	150	83	Horizontal
5	7356.00	45.72	-11.03	74.00	28.28	150	355	Horizontal
6	7356.00	34.77	-11.03	54.00	19.23	150	211	Horizontal
7	17546.4	45.82	0.94	54.00	8.18	150	116	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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4.9 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:			

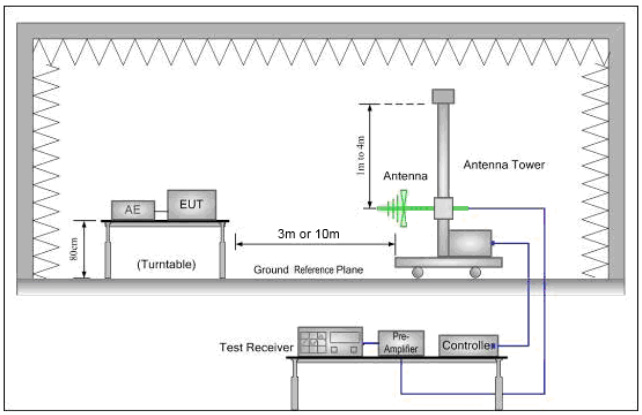

Figure 1. 30MHz to 1GHz

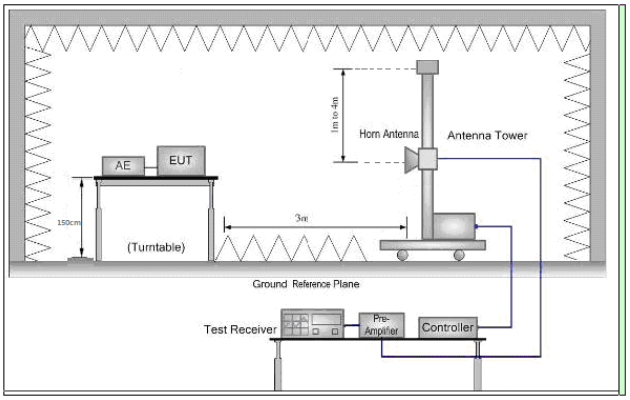

Figure 2. Above 1 GHz

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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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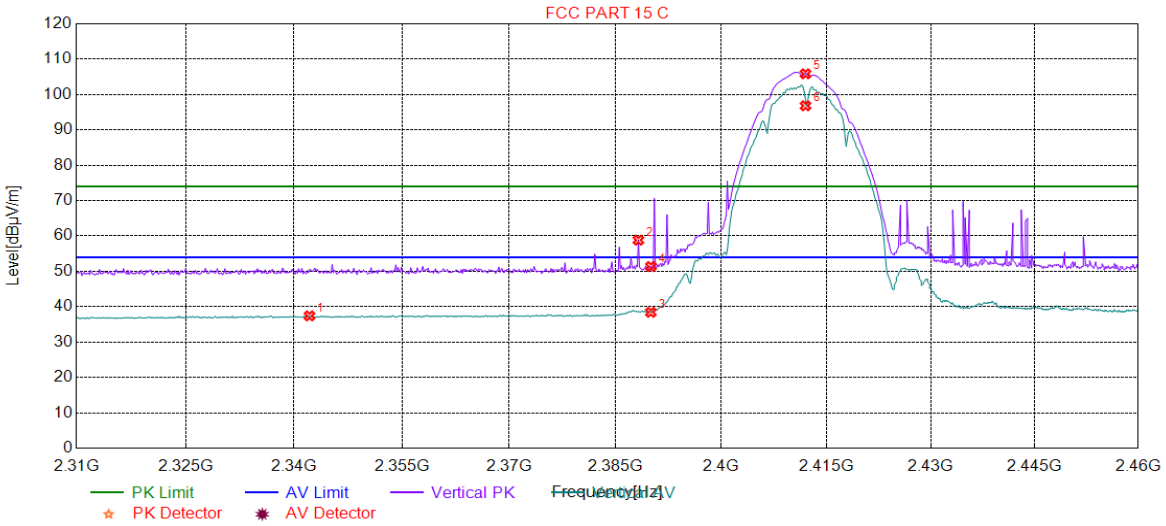
Test plot as follows:

4.9.1 ANT1

4.9.1.1 802.11B_Lowest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2342.13	37.42	1.04	54.00	16.58	150	288	Vertical
2	2388.22	58.83	1.24	74.00	15.17	150	17	Vertical
3	2390.00	38.42	1.25	54.00	15.58	150	107	Vertical
4	2390.00	51.38	1.25	74.00	22.62	150	114	Vertical
5	2412.00	105.85	1.32	74.00	-31.85	150	98	Vertical
6	2412.00	96.81	1.32	54.00	-42.81	150	98	Vertical

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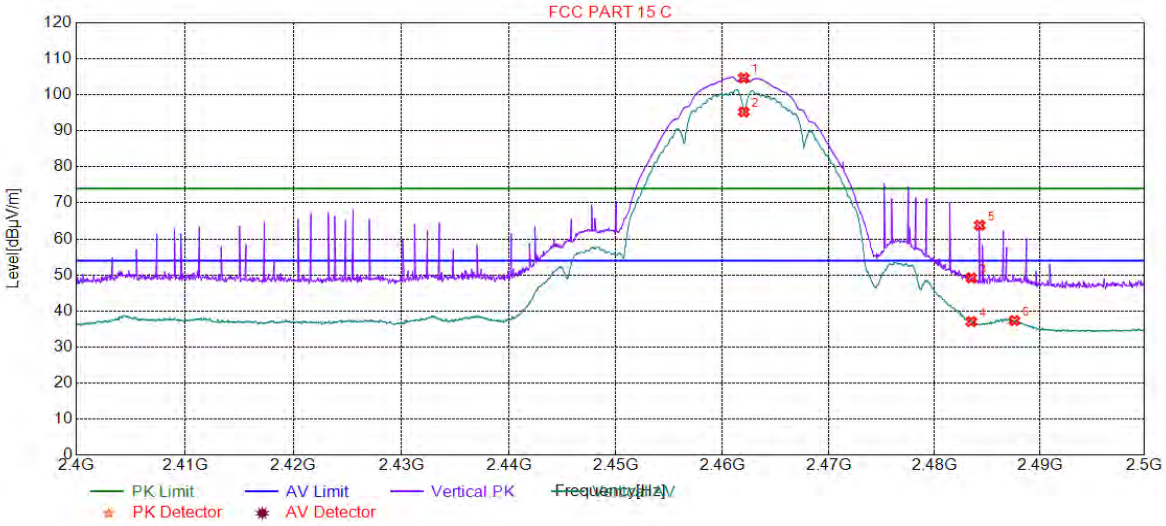
4.9.1.2 802.11B_ Highest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	104.68	1.46	74.00	-30.68	150	117	Vertical
2	2462.00	95.26	1.46	54.00	-41.26	150	121	Vertical
3	2483.50	49.18	1.52	74.00	24.82	150	117	Vertical
4	2483.50	37.07	1.52	54.00	16.93	150	117	Vertical
5	2484.29	63.78	1.53	74.00	10.22	150	71	Vertical
6	2487.59	37.34	1.54	54.00	16.66	150	133	Vertical

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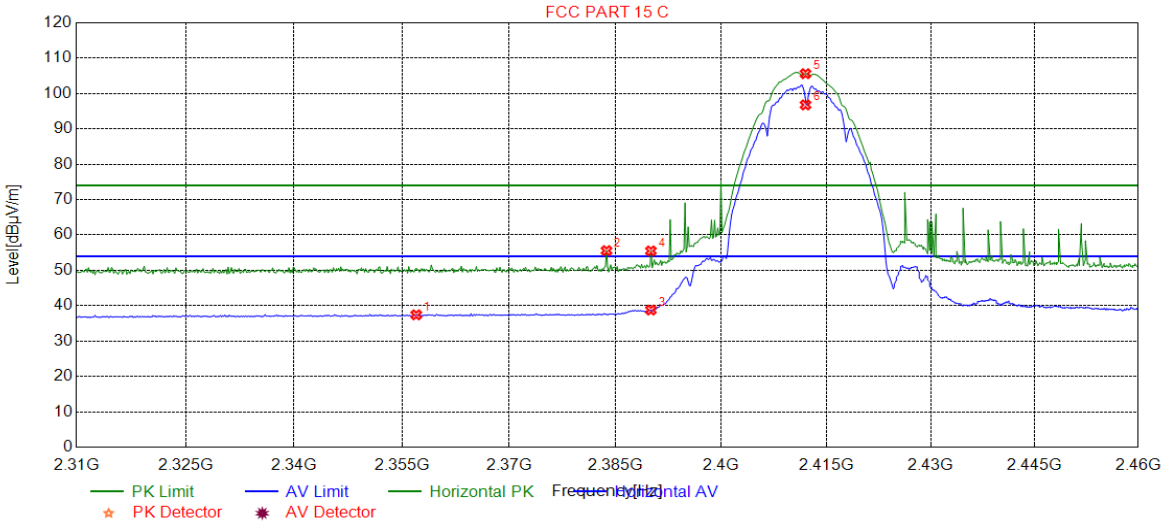
4.9.1.3 802.11B_Lowest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2356.99	37.42	1.10	54.00	16.58	150	120	Horizontal
2	2383.72	55.57	1.22	74.00	18.43	150	343	Horizontal
3	2390.00	38.79	1.25	54.00	15.21	150	337	Horizontal
4	2390.00	55.50	1.25	74.00	18.50	150	260	Horizontal
5	2412.00	105.61	1.32	74.00	-31.61	150	14	Horizontal
6	2412.00	96.78	1.32	54.00	-42.78	150	14	Horizontal

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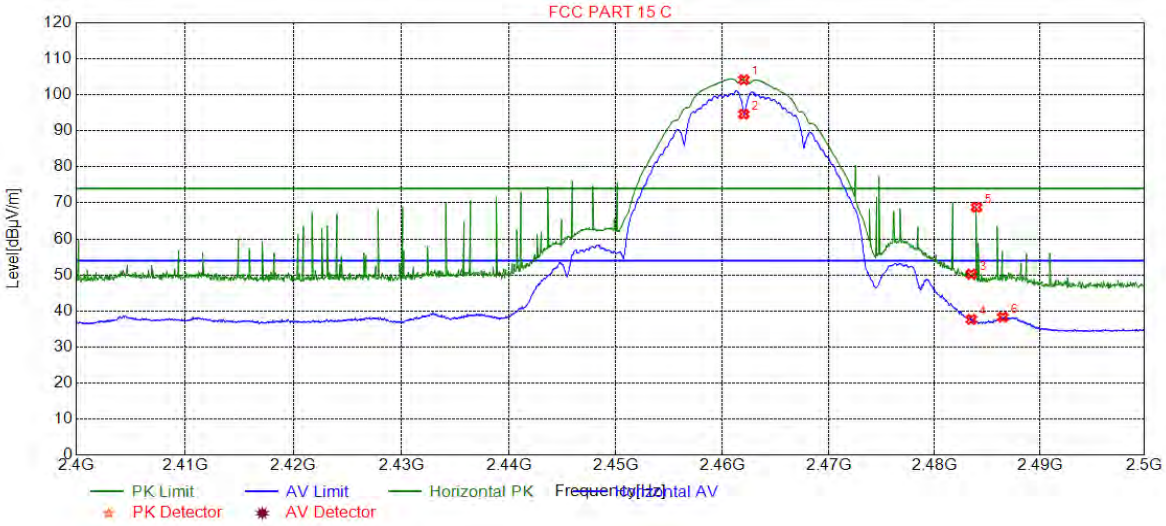
4.9.1.4 802.11B_ Highest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	104.17	1.46	74.00	-30.17	150	354	Horizontal
2	2462.00	94.64	1.46	54.00	-40.64	150	354	Horizontal
3	2483.50	50.20	1.52	74.00	23.80	150	354	Horizontal
4	2483.50	37.67	1.52	54.00	16.33	150	357	Horizontal
5	2483.99	68.79	1.53	74.00	5.21	150	33	Horizontal
6	2486.49	38.31	1.53	54.00	15.69	150	360	Horizontal

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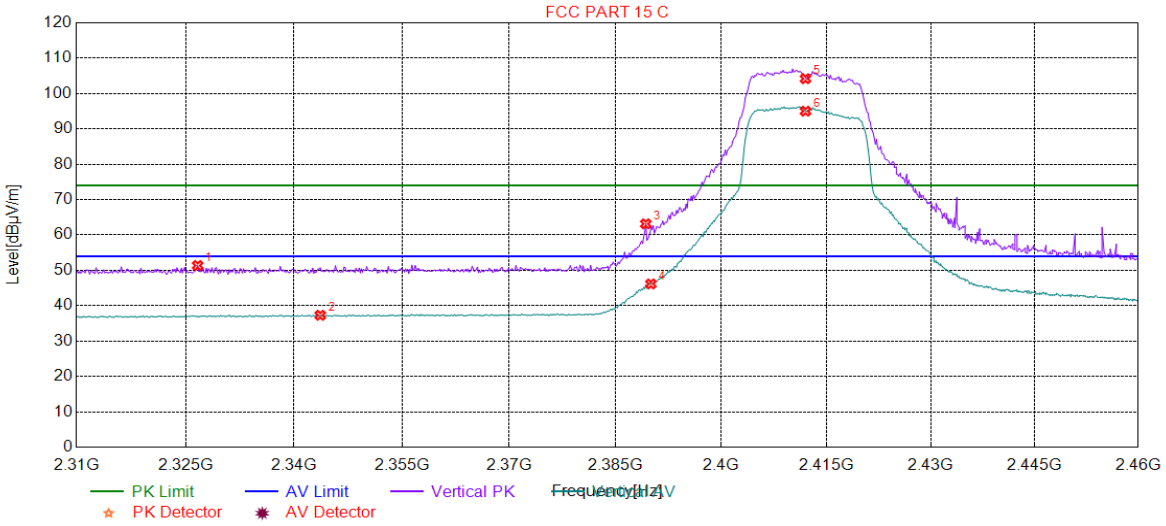
4.9.1.5 802.11G_Lowest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2326.66	51.37	0.97	74.00	22.63	150	40	Vertical
2	2343.63	37.30	1.04	54.00	16.70	150	247	Vertical
3	2389.27	63.15	1.24	74.00	10.85	150	117	Vertical
4	2390.00	46.17	1.25	54.00	7.83	150	114	Vertical
5	2412.00	104.19	1.32	74.00	-30.19	150	117	Vertical
6	2412.00	95.01	1.32	54.00	-41.01	150	124	Vertical

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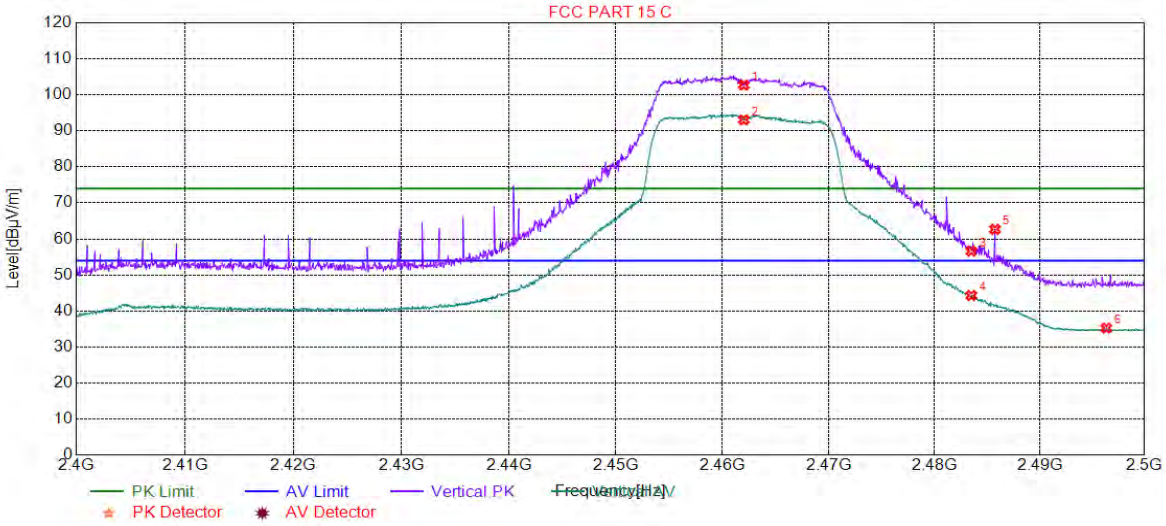
4.9.1.6 802.11G_ Highest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	102.70	1.46	74.00	-28.70	150	116	Vertical
2	2462.00	93.04	1.46	54.00	-39.04	150	124	Vertical
3	2483.50	56.62	1.52	74.00	17.38	150	120	Vertical
4	2483.50	44.30	1.52	54.00	9.70	150	124	Vertical
5	2485.74	62.67	1.53	74.00	11.33	150	143	Vertical
6	2496.34	35.24	1.56	54.00	18.76	150	192	Vertical

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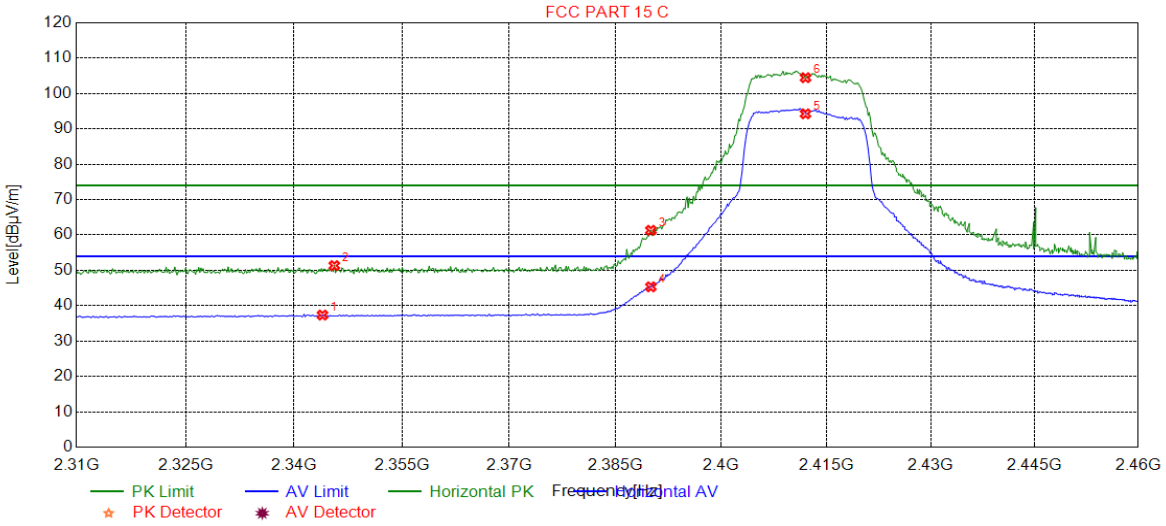
4.9.1.7 802.11G_Lowest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2343.93	37.36	1.04	54.00	16.64	150	194	Horizontal
2	2345.58	51.34	1.05	74.00	22.66	150	324	Horizontal
3	2390.00	61.32	1.25	74.00	12.68	150	20	Horizontal
4	2390.00	45.34	1.25	54.00	8.66	150	98	Horizontal
5	2412.00	94.27	1.32	54.00	-40.27	150	14	Horizontal
6	2412.00	104.48	1.32	74.00	-30.48	150	360	Horizontal

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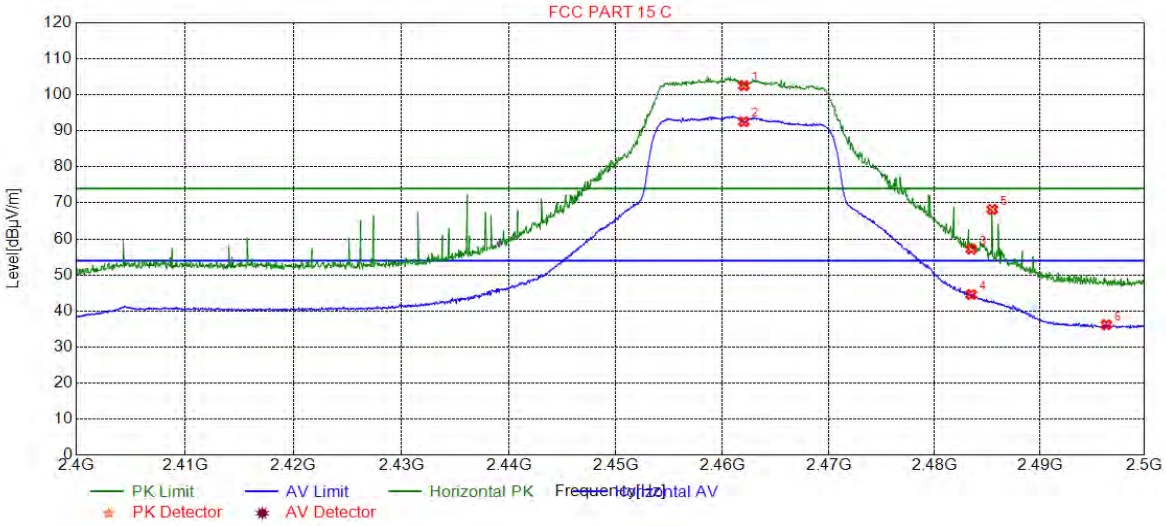
4.9.1.8 802.11G_ Highest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	102.54	1.46	74.00	-28.54	150	359	Horizontal
2	2462.00	92.55	1.46	54.00	-38.55	150	350	Horizontal
3	2483.50	57.17	1.52	74.00	16.83	150	359	Horizontal
4	2483.50	44.57	1.52	54.00	9.43	150	342	Horizontal
5	2485.49	68.17	1.53	74.00	5.83	150	30	Horizontal
6	2496.34	36.18	1.56	54.00	17.82	150	68	Horizontal

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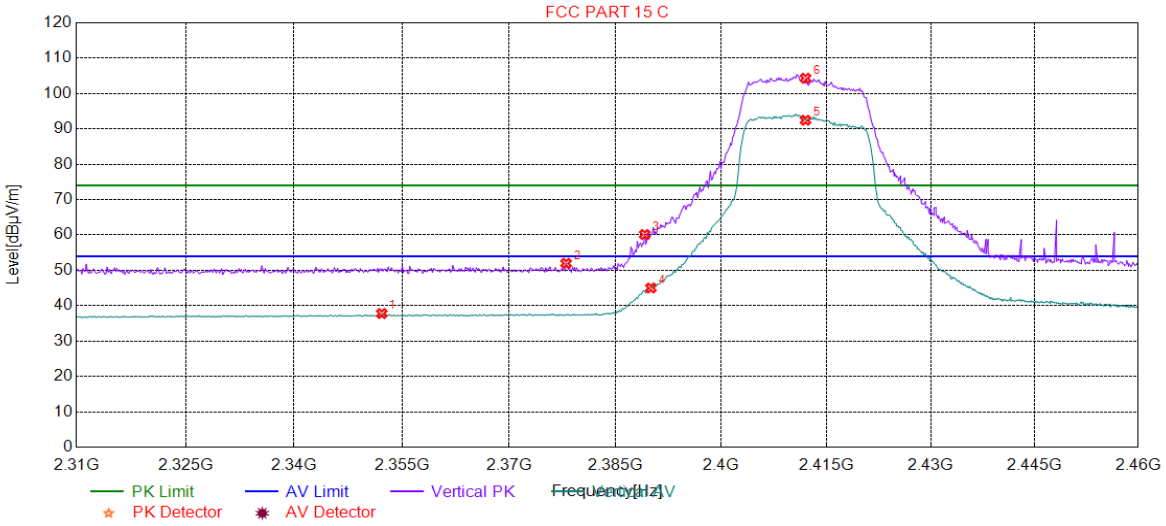
4.9.1.9 802.11N20_Lowest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2352.19	37.79	1.08	54.00	16.21	150	14	Vertical
2	2378.01	51.99	1.19	74.00	22.01	150	64	Vertical
3	2389.12	60.14	1.24	74.00	13.86	150	120	Vertical
4	2390.00	45.01	1.25	54.00	8.99	150	122	Vertical
5	2412.00	92.45	1.32	54.00	-38.45	150	122	Vertical
6	2412.00	104.33	1.32	74.00	-30.33	150	126	Vertical

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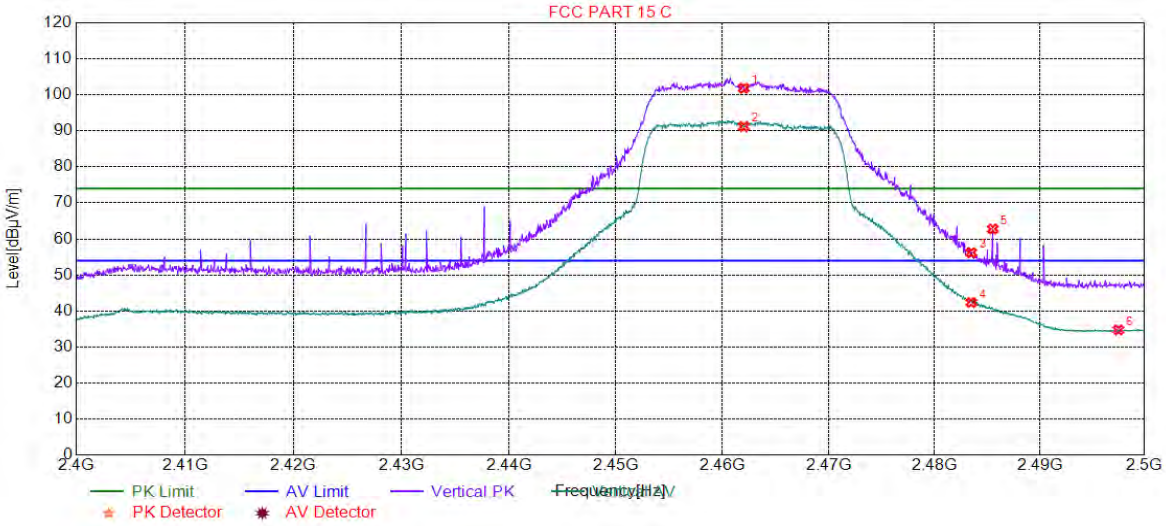
4.9.1.10 802.11N20_ Highest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	101.84	1.46	74.00	-27.84	150	128	Vertical
2	2462.00	91.20	1.46	54.00	-37.20	150	121	Vertical
3	2483.50	56.21	1.52	74.00	17.79	150	117	Vertical
4	2483.50	42.35	1.52	54.00	11.65	150	125	Vertical
5	2485.54	62.76	1.53	74.00	11.24	150	259	Vertical
6	2497.49	34.74	1.56	54.00	19.26	150	117	Vertical

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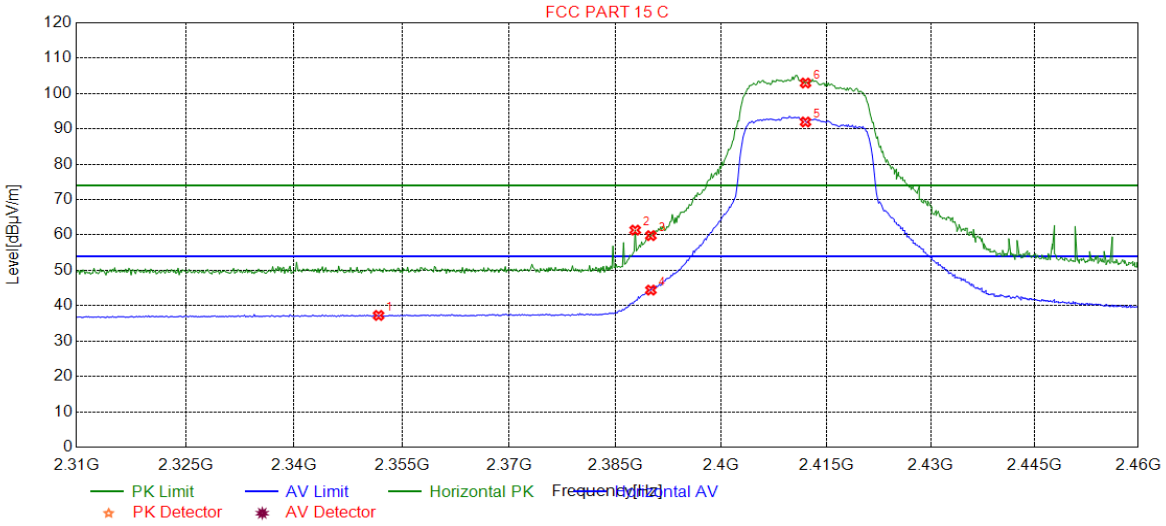
4.9.1.11 802.11N20_Lowest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2351.74	37.25	1.08	54.00	16.75	150	298	Horizontal
2	2387.77	61.38	1.24	74.00	12.62	150	348	Horizontal
3	2390.00	59.82	1.25	74.00	14.18	150	106	Horizontal
4	2390.00	44.42	1.25	54.00	9.58	150	351	Horizontal
5	2412.00	91.95	1.32	54.00	-37.95	150	14	Horizontal
6	2412.00	102.97	1.32	74.00	-28.97	150	345	Horizontal

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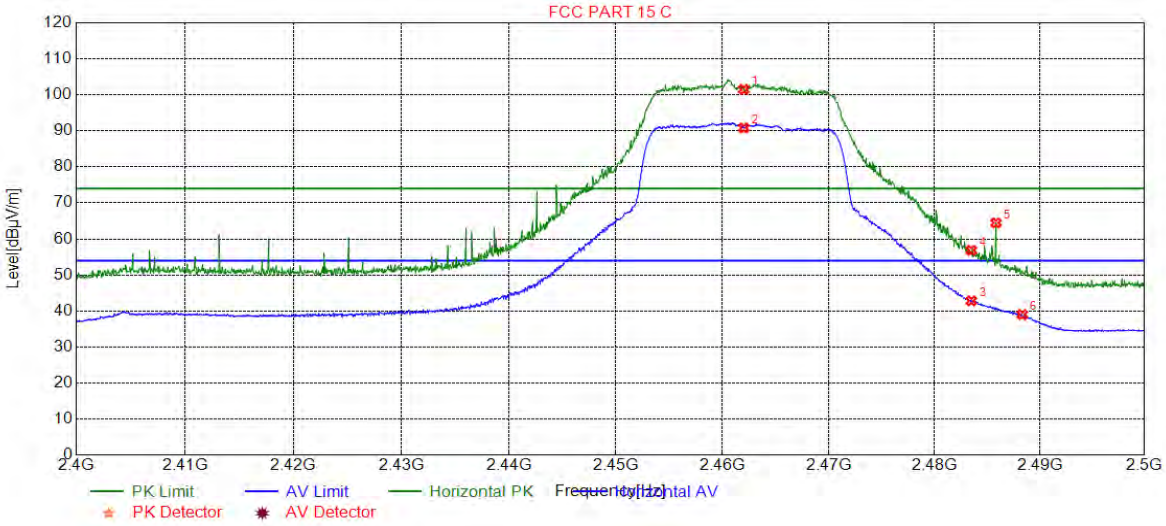
4.9.1.12 802.11N20_ Highest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	101.49	1.46	74.00	-27.49	150	97	Horizontal
2	2462.00	90.79	1.46	54.00	-36.79	150	352	Horizontal
3	2483.50	42.81	1.52	54.00	11.19	150	356	Horizontal
4	2483.50	56.85	1.52	74.00	17.15	150	356	Horizontal
5	2485.84	64.45	1.53	74.00	9.55	150	333	Horizontal
6	2488.34	38.99	1.54	54.00	15.01	150	356	Horizontal

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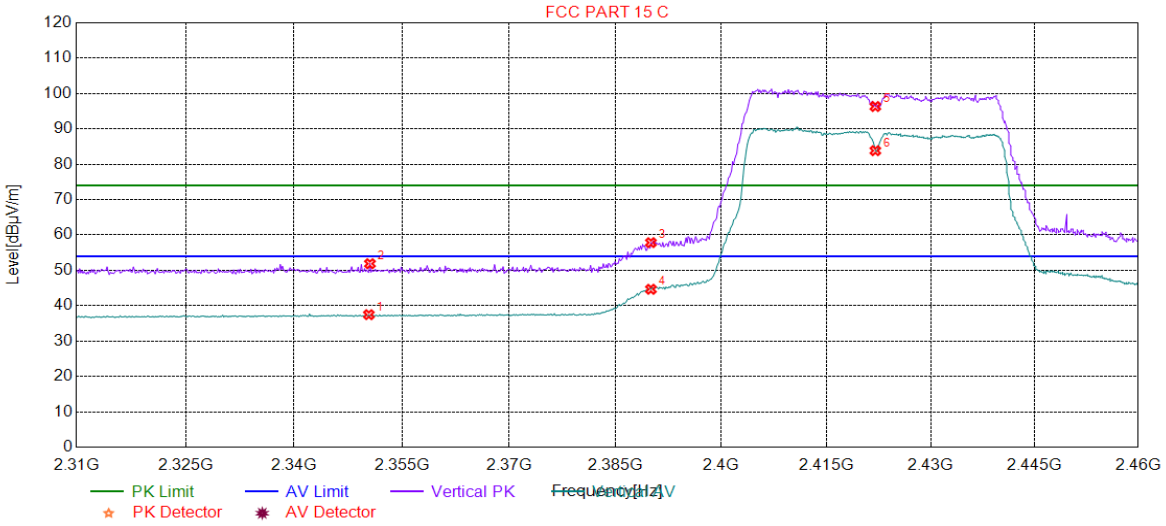
4.9.1.13 802.11N40_Lowest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2350.39	37.47	1.07	54.00	16.53	150	150	Vertical
2	2350.54	51.88	1.07	74.00	22.12	150	96	Vertical
3	2390.00	57.84	1.25	74.00	16.16	150	123	Vertical
4	2390.00	44.65	1.25	54.00	9.35	150	129	Vertical
5	2422.00	96.33	1.35	74.00	-22.33	150	280	Vertical
6	2422.00	83.84	1.35	54.00	-29.84	150	283	Vertical

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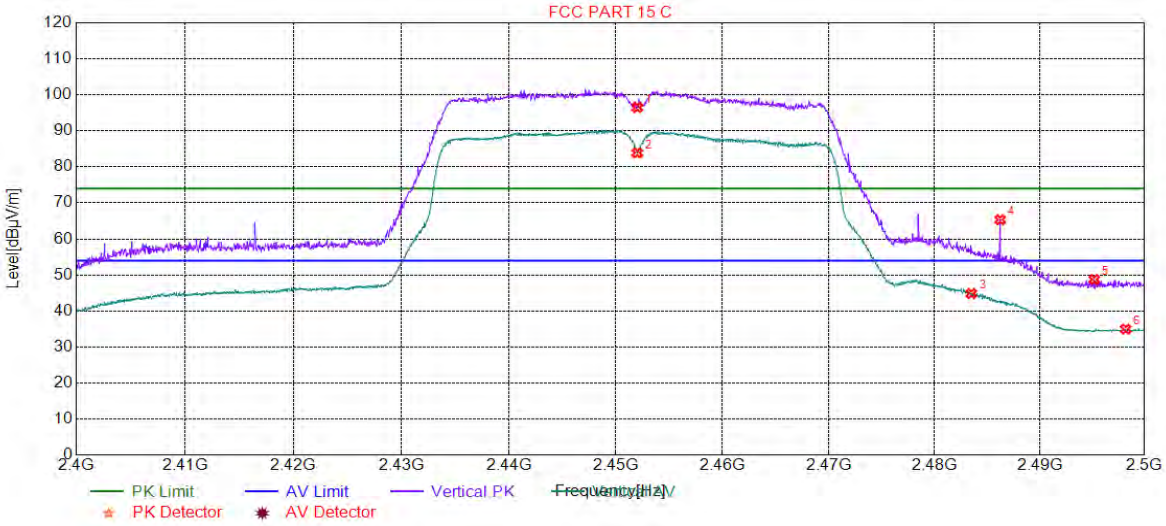
4.9.1.14 802.11N40_ Highest Channel_ Vertical



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2452.00	96.50	1.44	74.00	-22.50	150	296	Vertical
2	2452.00	83.87	1.44	54.00	-29.87	150	282	Vertical
3	2483.50	44.85	1.52	54.00	9.15	150	128	Vertical
4	2486.24	65.33	1.53	74.00	8.67	150	274	Vertical
5	2495.19	48.76	1.56	74.00	25.24	150	50	Vertical
6	2498.19	34.98	1.56	54.00	19.02	150	282	Vertical

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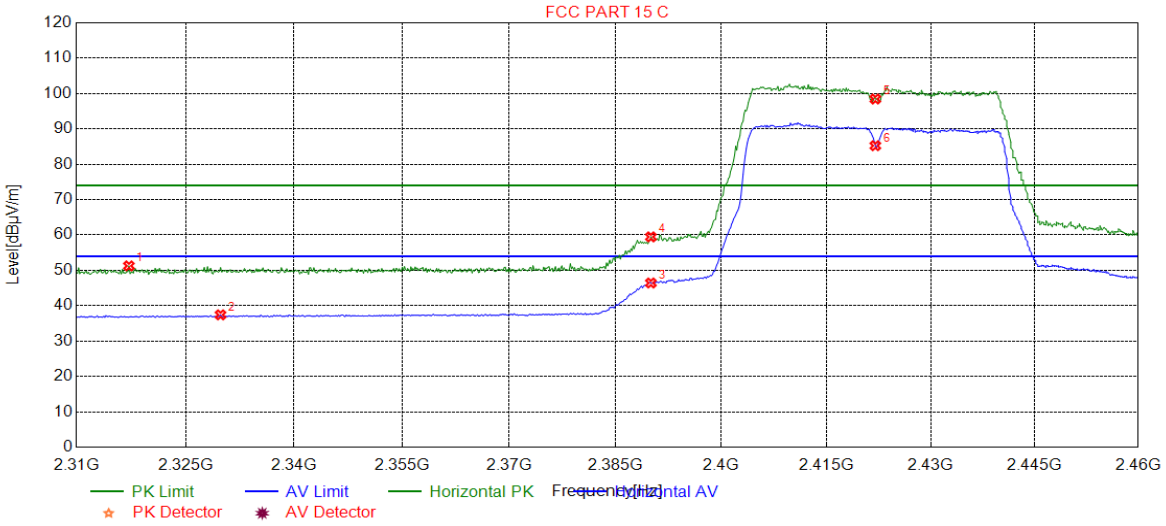
4.9.1.15 802.11N40_Lowest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2317.20	51.26	0.93	74.00	22.74	150	288	Horizontal
2	2329.81	37.42	0.98	54.00	16.58	150	95	Horizontal
3	2390.00	46.43	1.25	54.00	7.57	150	14	Horizontal
4	2390.00	59.47	1.25	74.00	14.53	150	14	Horizontal
5	2422.00	98.45	1.35	74.00	-24.45	150	121	Horizontal
6	2422.00	85.24	1.35	54.00	-31.24	150	110	Horizontal

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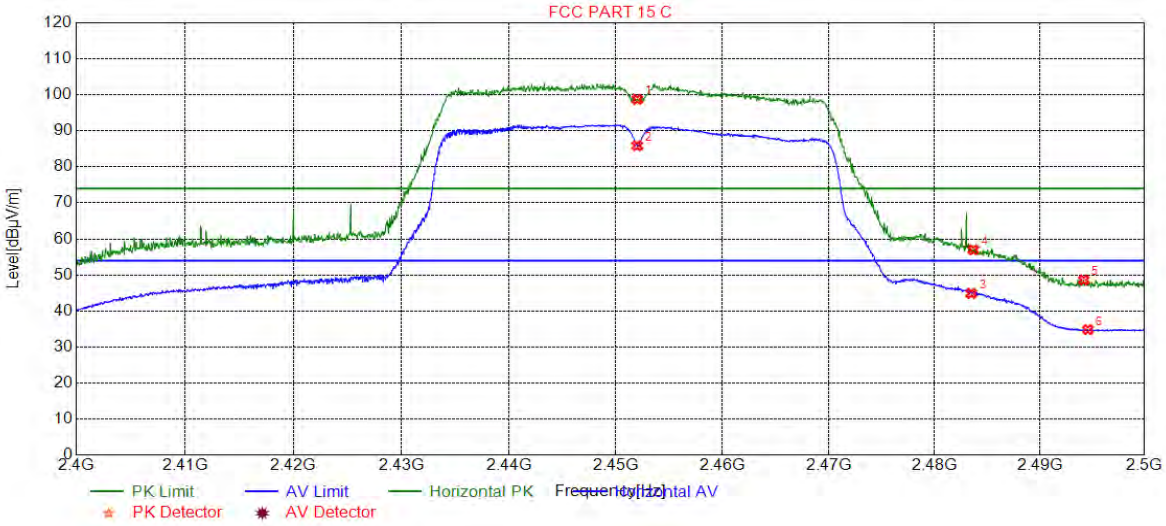
4.9.1.16 802.11N40_ Highest Channel_ Horizontal



Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2452.00	98.73	1.44	74.00	-24.73	150	14	Horizontal
2	2452.00	85.88	1.44	54.00	-31.88	150	355	Horizontal
3	2483.50	44.87	1.52	54.00	9.13	150	14	Horizontal
4	2483.69	56.97	1.52	74.00	17.03	150	351	Horizontal
5	2494.19	48.61	1.55	74.00	25.39	150	320	Horizontal
6	2494.59	34.83	1.55	54.00	19.17	150	40	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/2019/40035.

The End

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