FCC TEST REPORT

Application No:	ZR/2020/80004
Applicant:	Motorola Mobility LLC
Address of Applicant:	222 W Merchandise Mart Plaza, Suite 1800, Chicago IL 60654, USA
Manufacturer:	Motorola Mobility LLC
Address of Manufacturer	222 W Merchandise Mart Plaza, Suite 1800, Chicago IL 60654, USA
EUT Description:	Mobile Phone
Model No.:	XT2091-3/XT2091-8
Trade Mark:	Motorola/lenovo
FCC ID:	IHDT56ZK2
Standards:	47 CFR FCC Part 2, Subpart J 47 CFR Part 15, Subpart C
Test Method:	KDB558074 D01 15.247 Meas Guidance v05r02 ANSI C63.10 (2013)
Date of Receipt:	2020/9/2
Date of Test:	2020/9/3 to 2020/9/21
Date of Issue:	2021/4/20
Test Result:	**PASS ***

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

Authorized Signature:

Derek Yang

Derek Yang
Wireless Laboratory Manager

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1 Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2020/9/27		Original
02		2021/4/20	Kevin Lan	1.Add test site Information 2.Modify data conversion error of antenna height 3.Update equipment list

Authorized for issue by:		
Prepared By		Kevin. lan **(Kevin.Lan) /Engineer**
Checked By		David Chen **(David Chen) /Reviewer**

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2 Test Summary

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

Remark：All test were performed by Lab A and B.
Parts of test items above were subcontracted to Lab B.
Lab A SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch
Lab B SGS-CSTC STANDARDS TECHNICAL SERVICES (XI 'AN) CO., LTD.

通标标准技术服务有限公司深圳分公司 检验检测专用章 Inspection & Testing Services SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

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3 General Information

3.1 Client Information

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

3.2 Test Location

Lab A:

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

Lab B:

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

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3.3 Test Facility

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

Lab A:

• A2LA (Certificate No. 3816.01)

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

• VCCI

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

• FCC –Designation Number: CN1178

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

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

• Innovation, Science and Economic Development Canada

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

CAB identifier: CN0006.

IC#: 4620C.

Lab B:

A2LA (Certificate No. 4854.01)

SGS-CSTC STANDARDS TECHNICAL SERVICES (XI 'AN) CO., LTD. is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 4854.01.

• FCC –Designation Number: CN1271

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3.4 General Description of EUT

EUT Description::	Mobile Phone
Model No.:	XT2091-3/XT2091-8
Trade Mark:	Motorola/lenovo
Hardware Version:	DVT2
Software Version:	QZC30.Q4-22
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:	-3.2dBi
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 -3.2dBi.	

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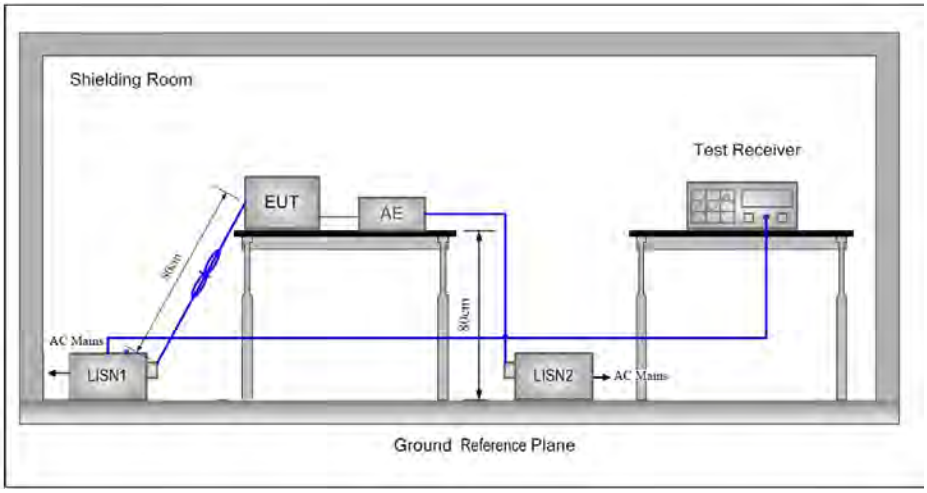
Test Setup:	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates at lowest, middle and highest channel. Charge + Transmitting mode.
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate of 802.11B at lowest channel is the worst case. Charge + Transmitting mode. Only the worst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

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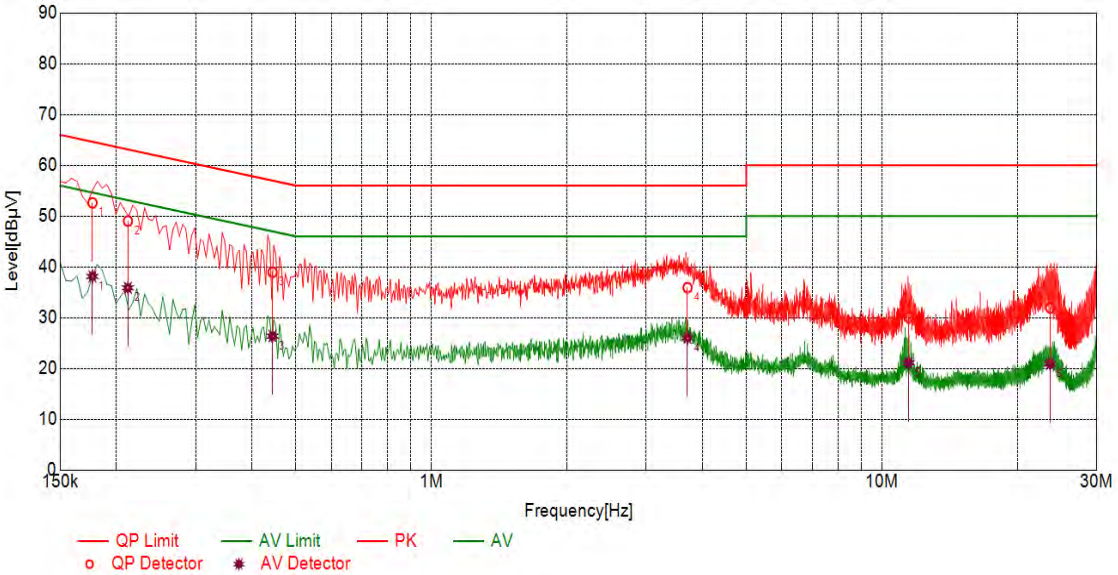
Measurement Data

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:



Test Graph

Final Data List									
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Type
1	0.1770	10.10	52.61	64.63	12.02	38.12	54.63	16.51	L
2	0.2121	10.10	49.02	63.12	14.10	35.87	53.12	17.25	L
3	0.4442	10.10	38.95	56.98	18.03	26.37	46.98	20.61	L
4	3.7043	10.10	35.90	56.00	20.10	26.02	46.00	19.98	L
5	11.4660	10.10	30.06	60.00	29.94	21.13	50.00	28.87	L
6	23.6280	10.11	31.92	60.00	28.08	20.90	50.00	29.10	L

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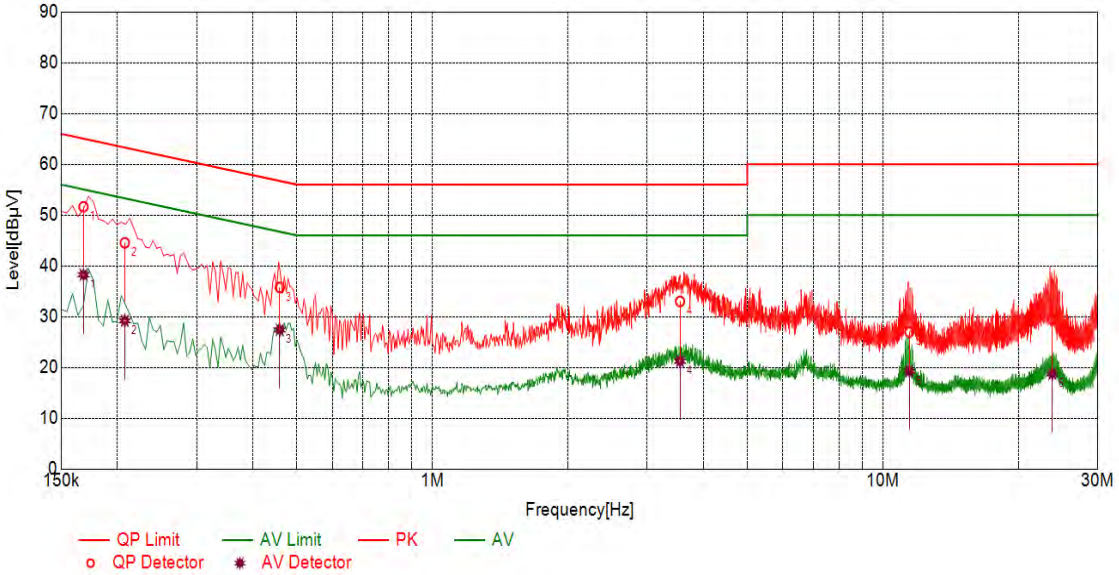
Neutral Line:



Test Graph

Final Data List									
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Type
1	0.1682	10.10	51.63	65.05	13.42	38.25	55.05	16.80	N
2	0.2077	10.10	44.54	63.30	18.76	29.19	53.30	24.11	N
3	0.4587	10.10	35.75	56.72	20.97	27.40	46.72	19.32	N
4	3.5465	10.10	33.02	56.00	22.98	21.22	46.00	24.78	N
5	11.4512	10.10	27.00	60.00	33.00	19.25	50.00	30.75	N
6	23.7777	10.11	29.46	60.00	30.54	18.72	50.00	31.28	N

Remarks:

1. The following Quasi-Peak and Average measurements were performed on the EUT:

2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.

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4.3 Duty Cycle

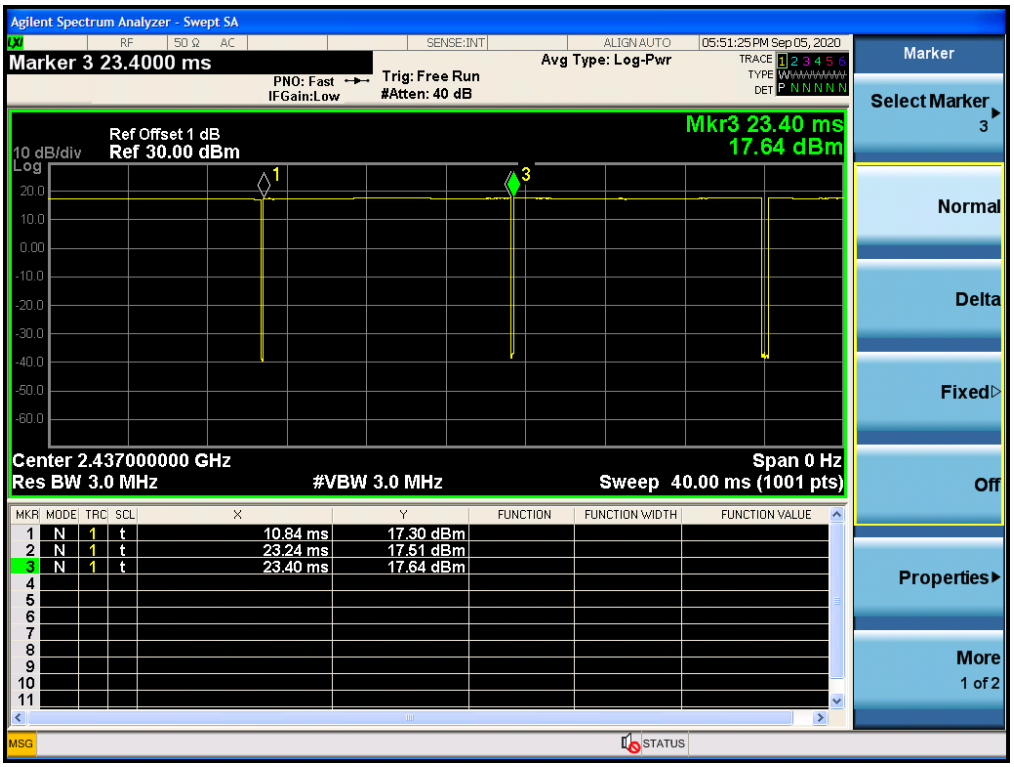
4.3.1 Test Results

Test Mode	TX Freq. [MHz]	Duty cycle [%]
11B	Ant 1: CH1,CH6,CH11	98.73
11G	Ant 1: CH1,CH6,CH11	98.00
11N20	Ant 1: CH1,CH6,CH11	97.87
11N40	Ant 1: CH3,CH6,CH9	94.71

4.3.1 Test Plots

4.3.1.1 ANT1

4.3.1.1.1 11B



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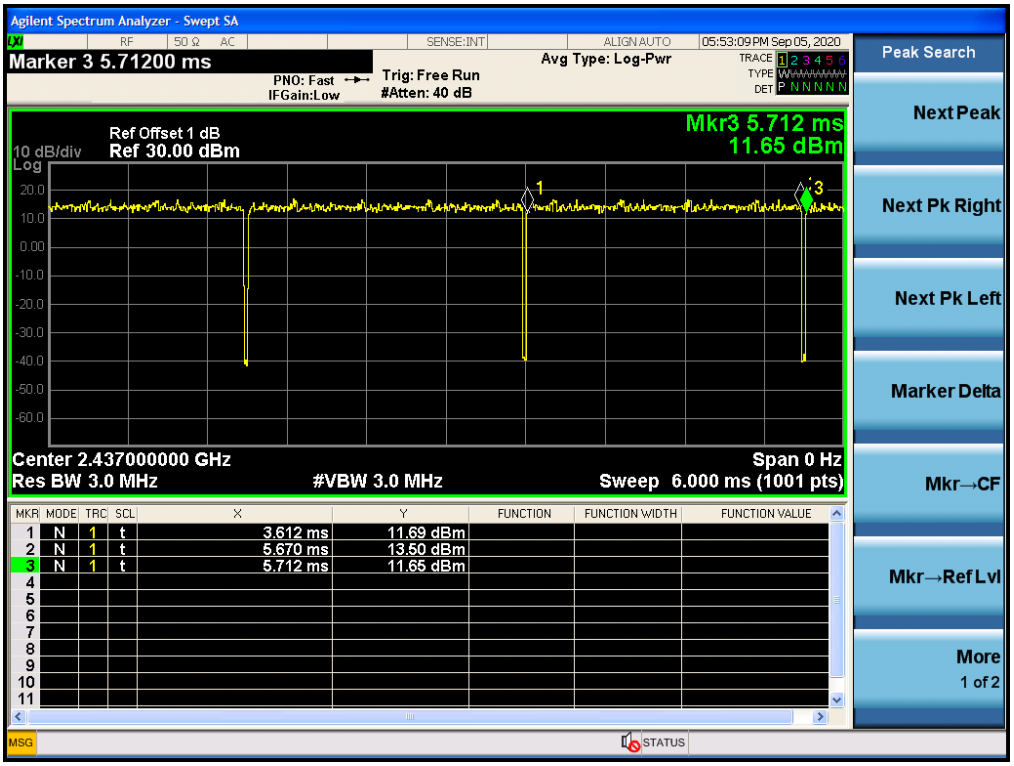
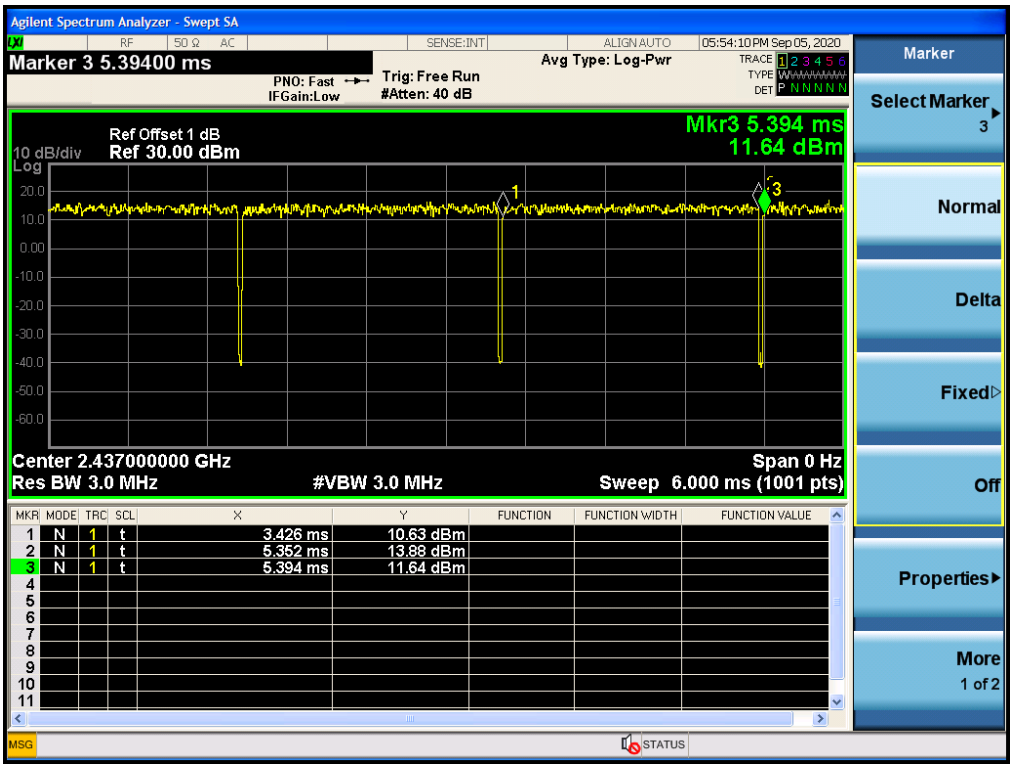
4.3.1.1.2 11G



4.3.1.1.3 11N20



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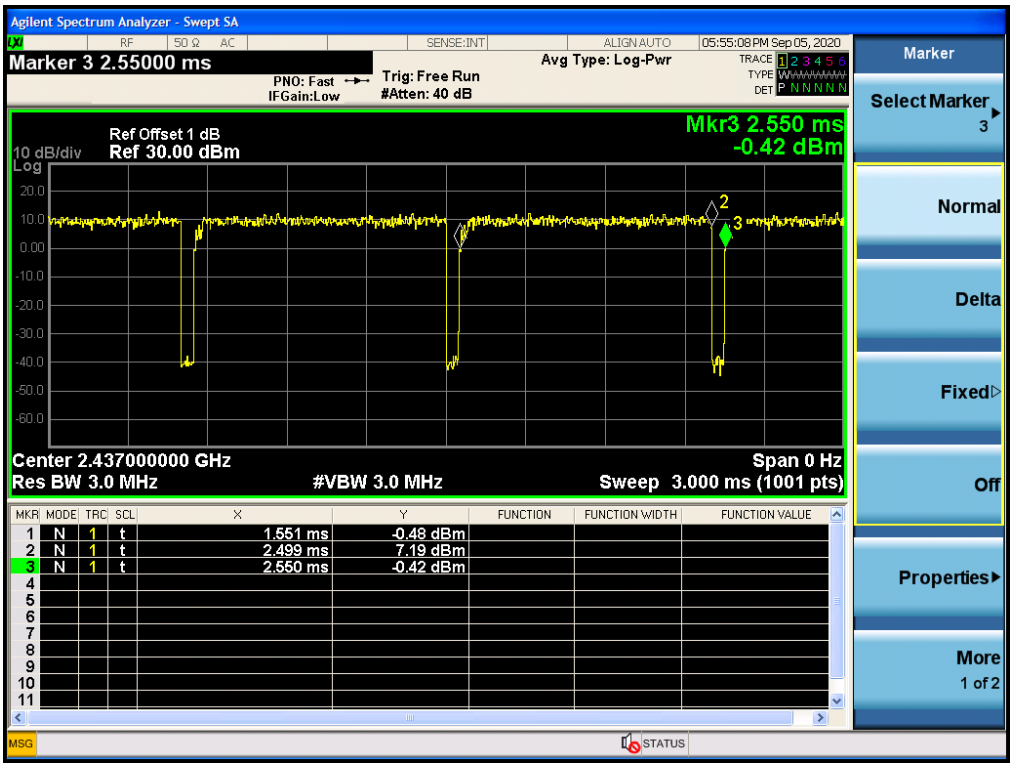
4.3.1.1.4 11N40



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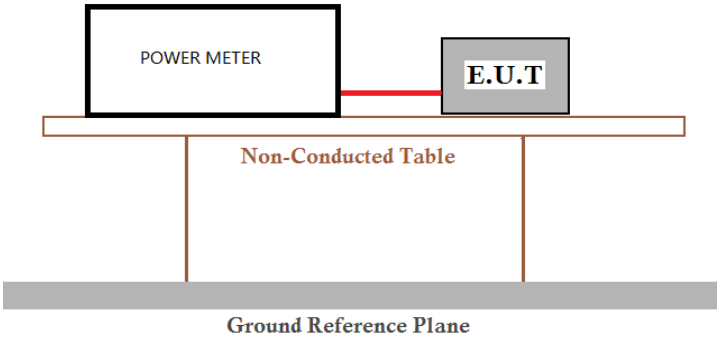
4.4 Conducted Output Power

Test Requirement:	47 CFR Part 15C Section 15.247 (b)(3)
Test Method:	ANSI C63.10 :2013 Section 11.9.1.3
Test Setup:	
Test Instruments:	Refer to section 5.10 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11B; 6Mbps of rate is the worst case of 802.11G ; 6.5Mbps of rate is the worst case of 802.11N(HT20); 13.5Mbps of rate is the worst case of 802.11N(HT40).
Limit:	30dBm
Test Results:	Pass

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4.4.1 Test Results

Measurement Data of Peak Power:

Mode	Test Channel	Peak Output Power (dBm)	Limit (dBm)	Result
802.11B	Lowest	19.34	30.00	Pass
	Middle	19.11	30.00	Pass
	Highest	19.21	30.00	Pass
802.11G	Lowest	14.67	30.00	Pass
	Middle	14.55	30.00	Pass
	Highest	14.36	30.00	Pass
802.11N20	Lowest	14.21	30.00	Pass
	Middle	14.01	30.00	Pass
	Highest	14.31	30.00	Pass
802.11N40	Lowest	14.11	30.00	Pass
	Middle	14.34	30.00	Pass
	Highest	14.11	30.00	Pass

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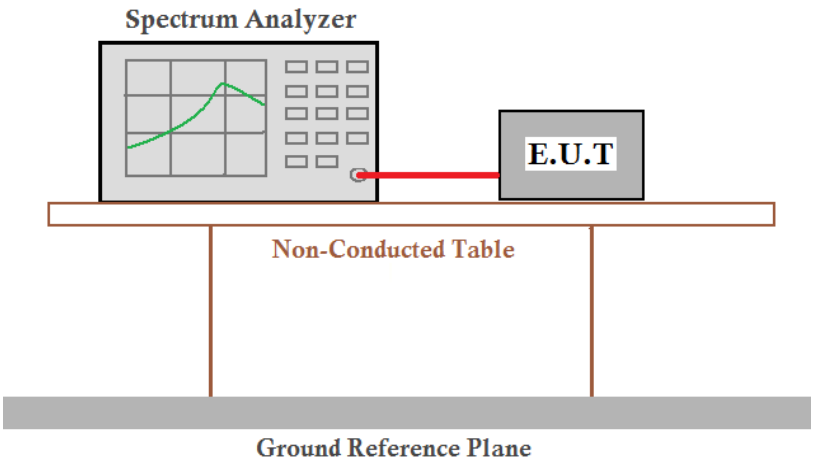
4.5 DTS (6 dB) Bandwidth & 99% Occupied Bandwidth

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	13.94	8.11	≥500	Pass
	Middle	13.70	8.10	≥500	Pass
	Highest	13.82	8.10	≥500	Pass
802.11G	Lowest	16.64	15.35	≥500	Pass
	Middle	16.56	15.15	≥500	Pass
	Highest	16.67	15.45	≥500	Pass
802.11N20	Lowest	17.79	16.80	≥500	Pass
	Middle	17.69	15.03	≥500	Pass
	Highest	17.78	15.98	≥500	Pass
802.11N40	Lowest	36.27	35.19	≥500	Pass
	Middle	36.27	35.21	≥500	Pass
	Highest	36.39	36.34	≥500	Pass

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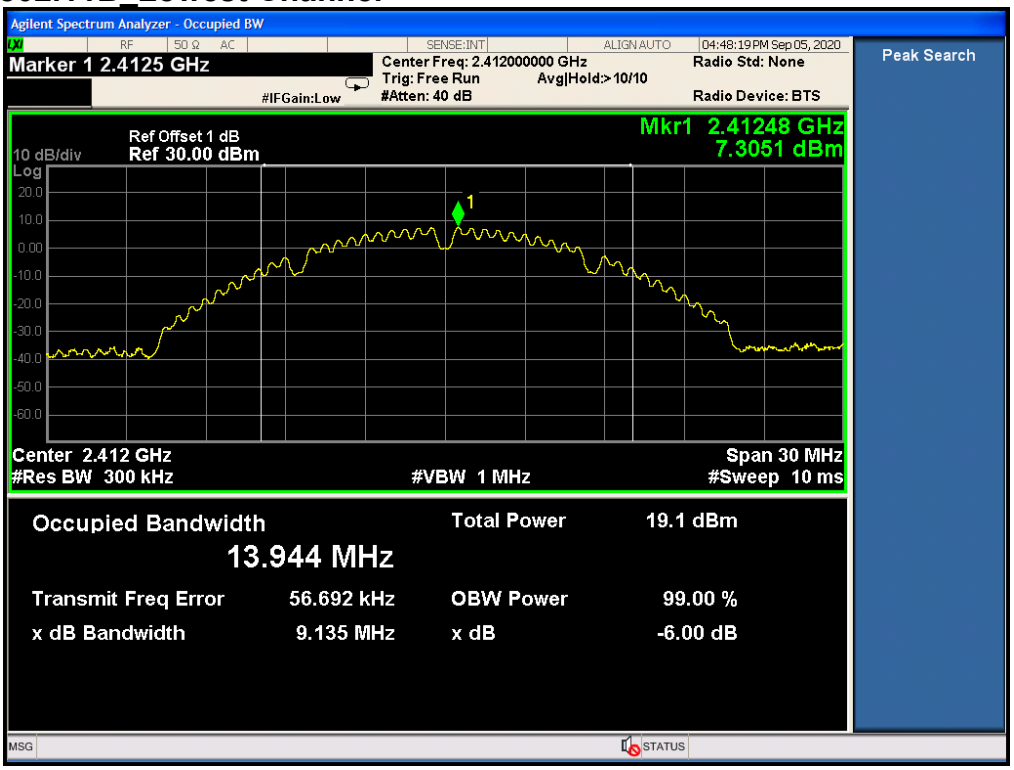
4.5.2 Test plots

4.5.2.1 ANT1

4.5.2.1.1 802.11B_Lowest Channel



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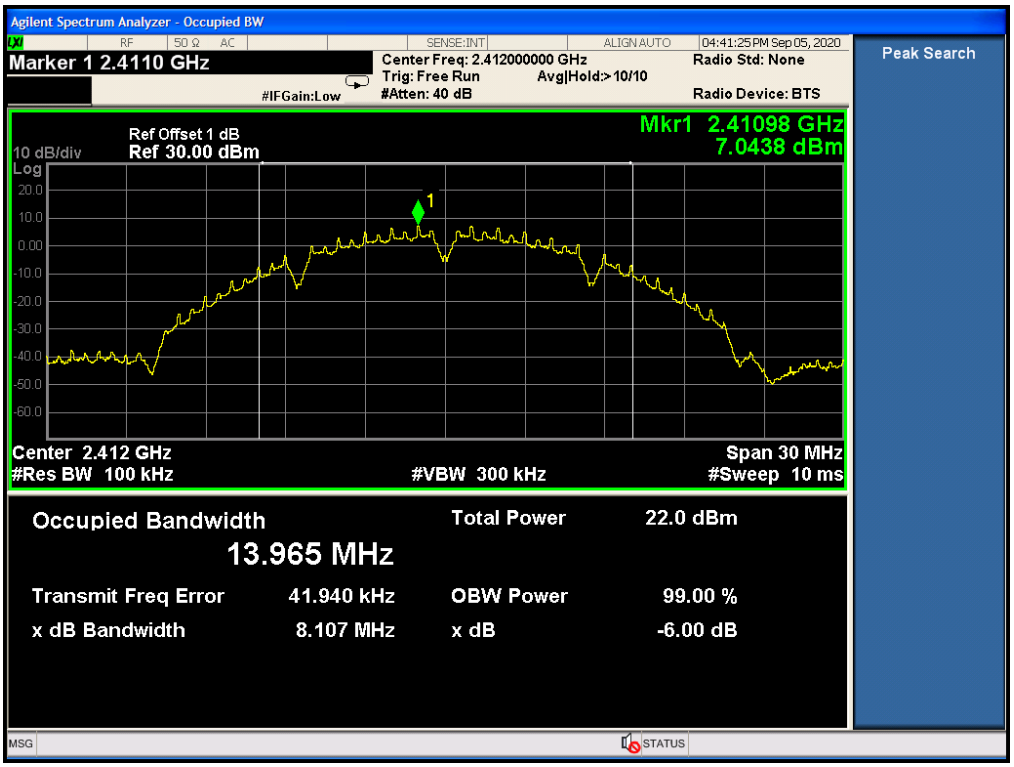

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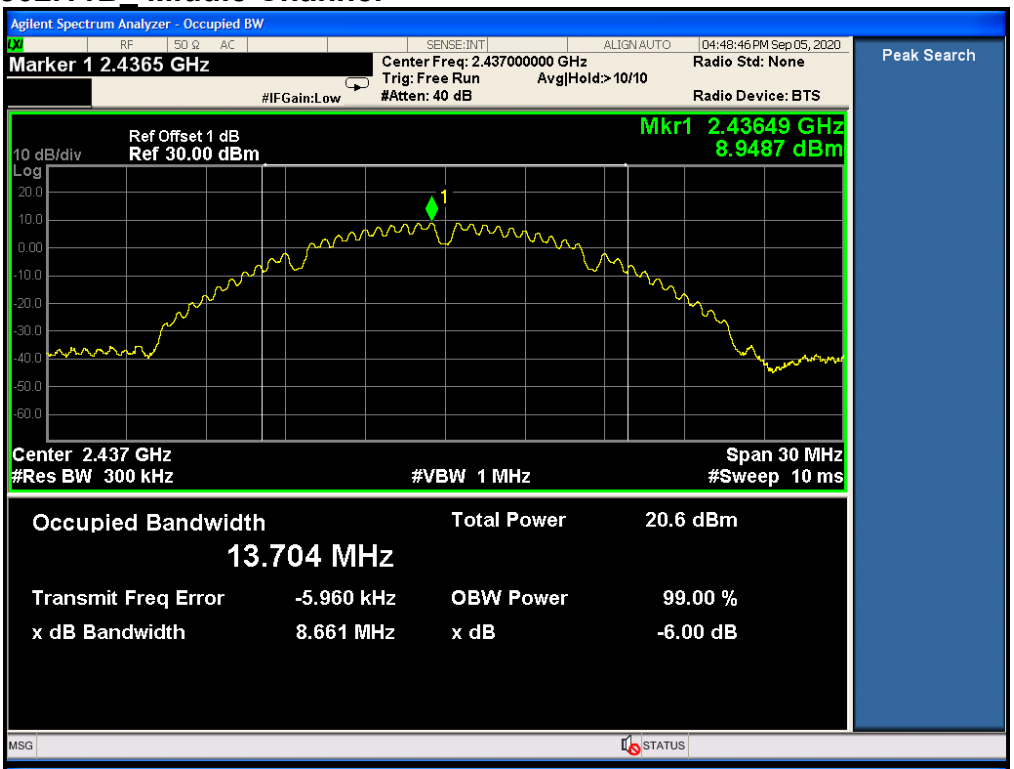
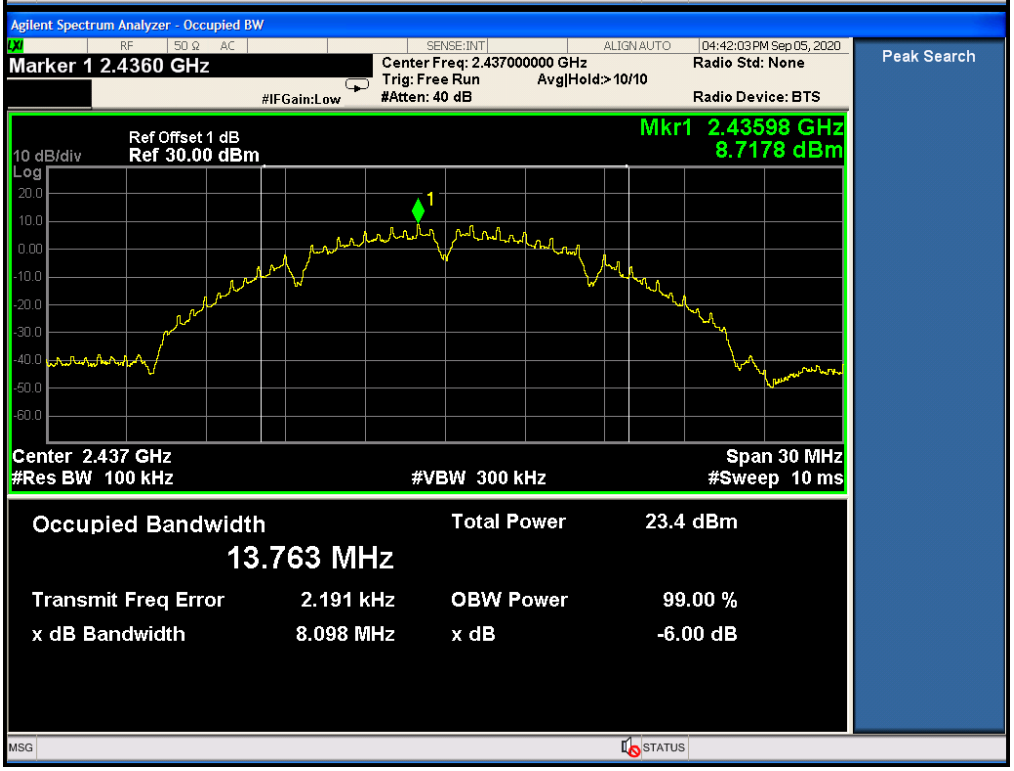
4.5.2.1.2 802.11B_ Middle Channel





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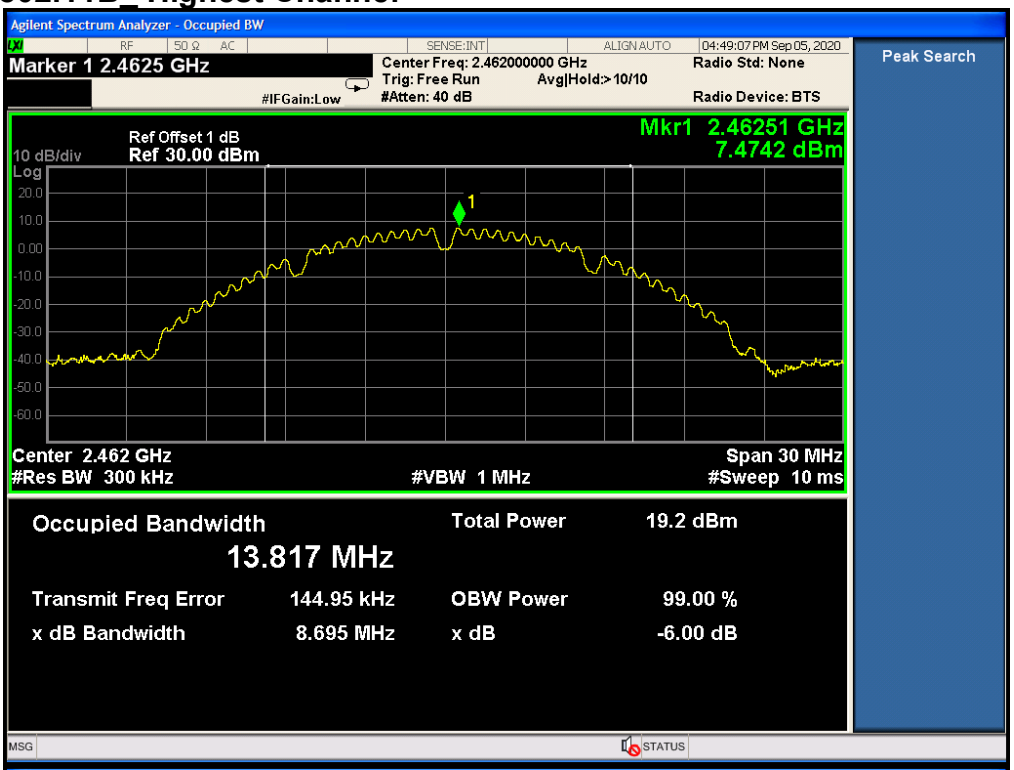
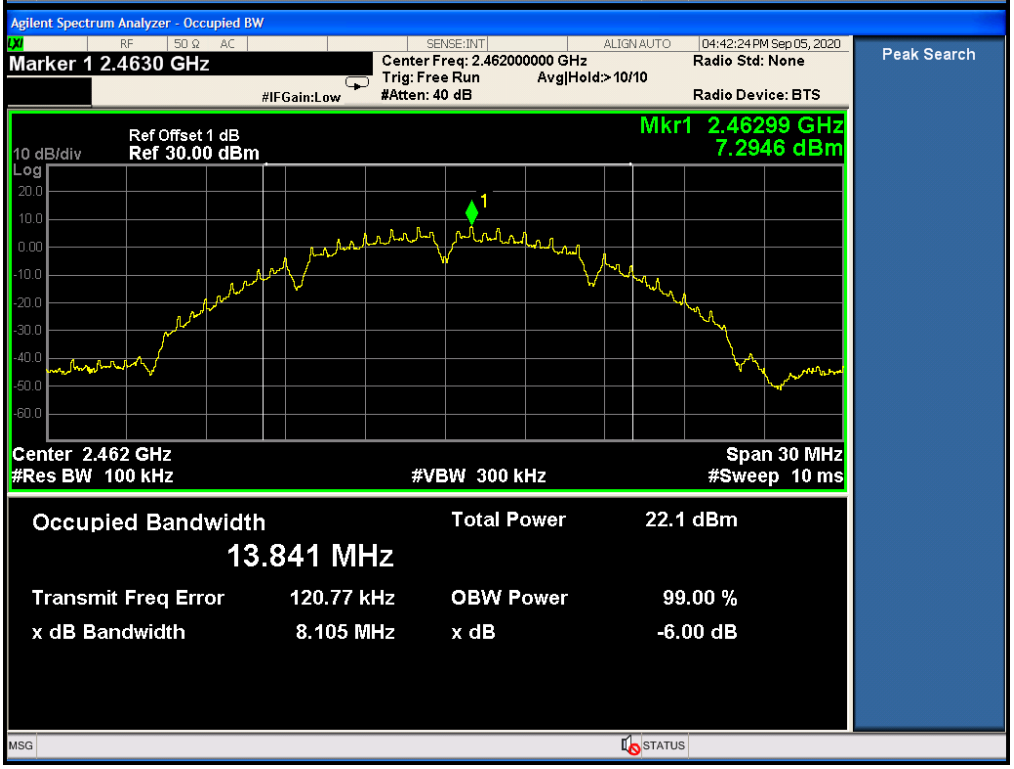
4.5.2.1.3 802.11B_ Highest Channel





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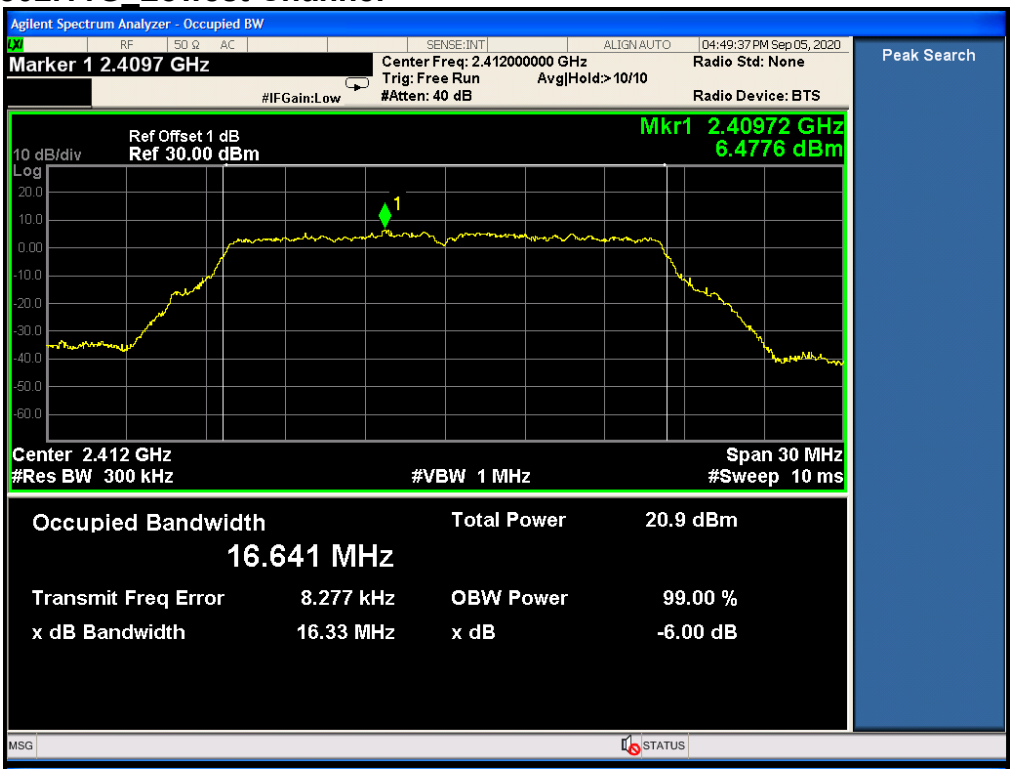
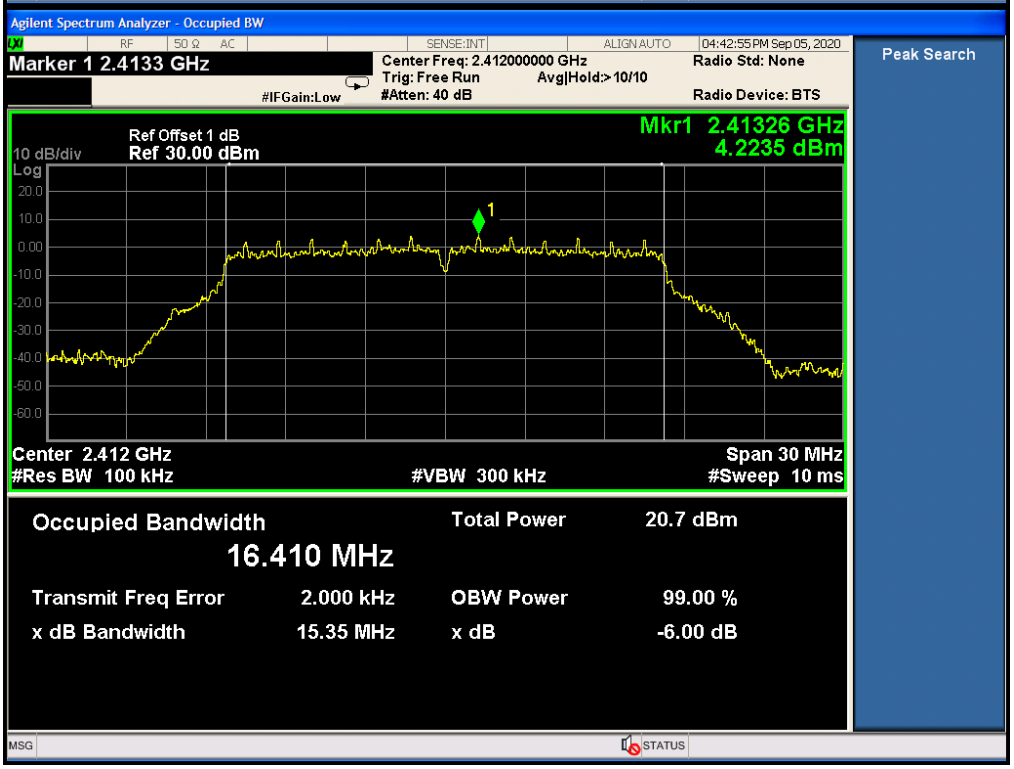
4.5.2.1.4 802.11G_Lowest Channel





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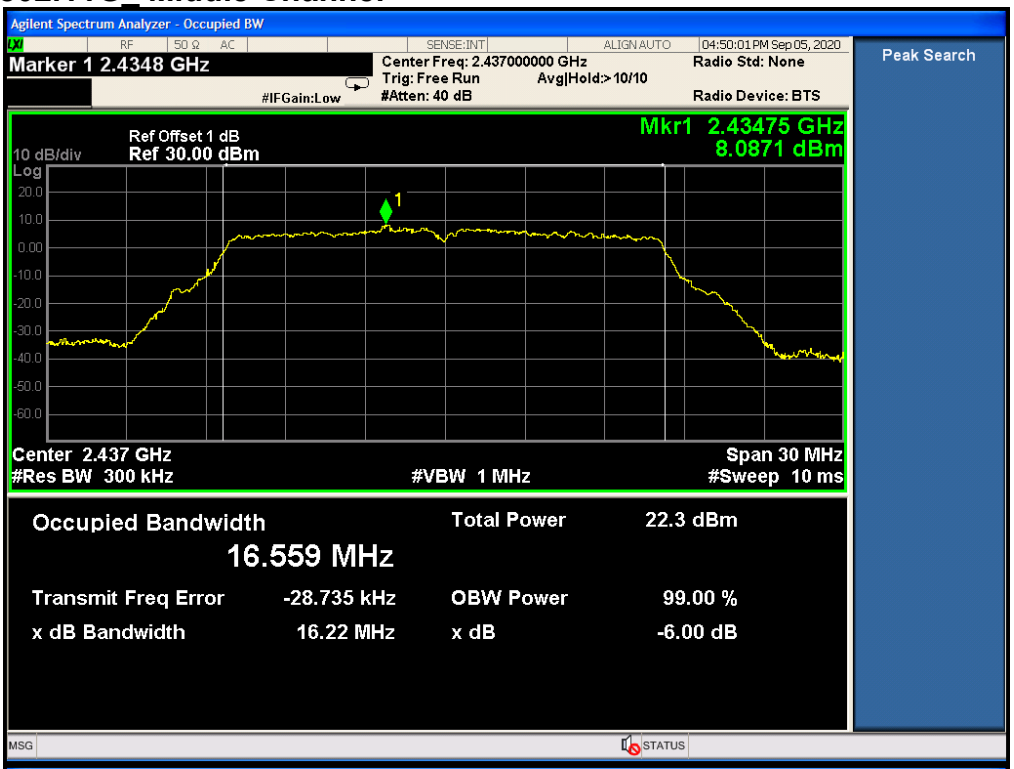
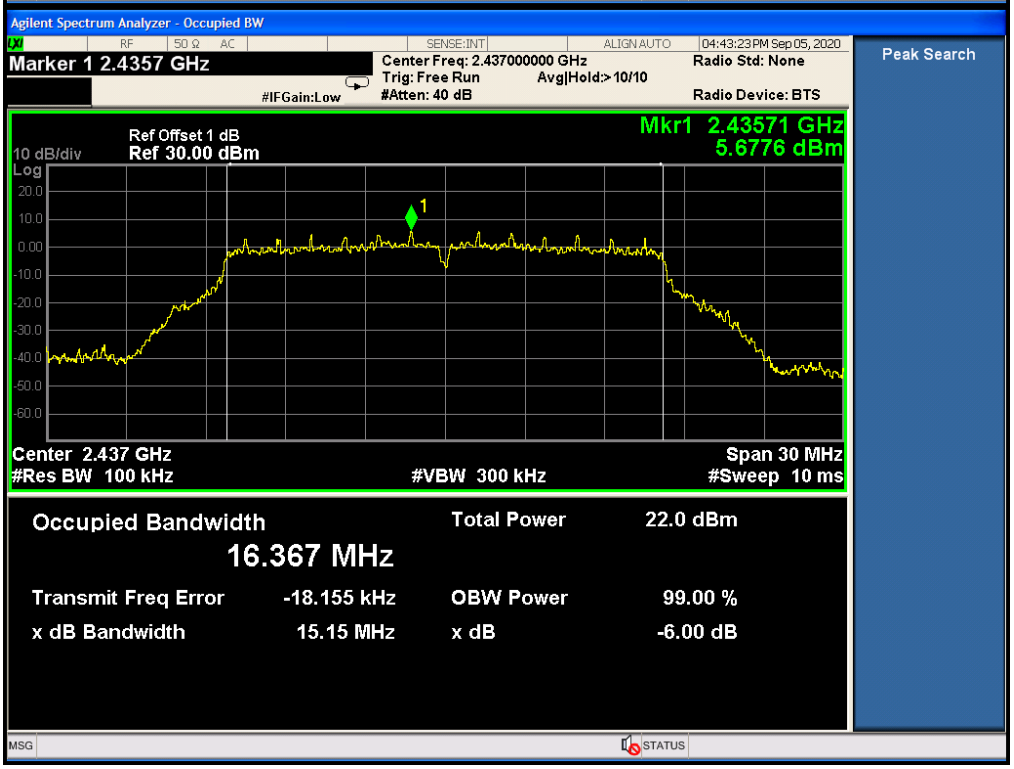
4.5.2.1.5 802.11G_ Middle Channel





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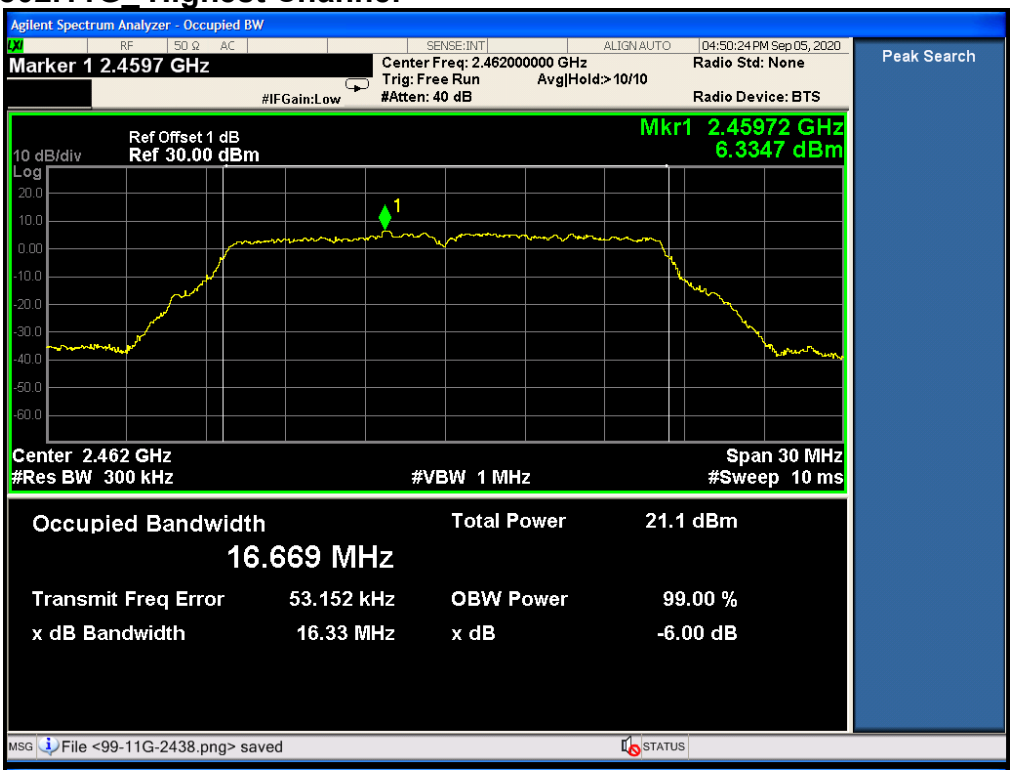
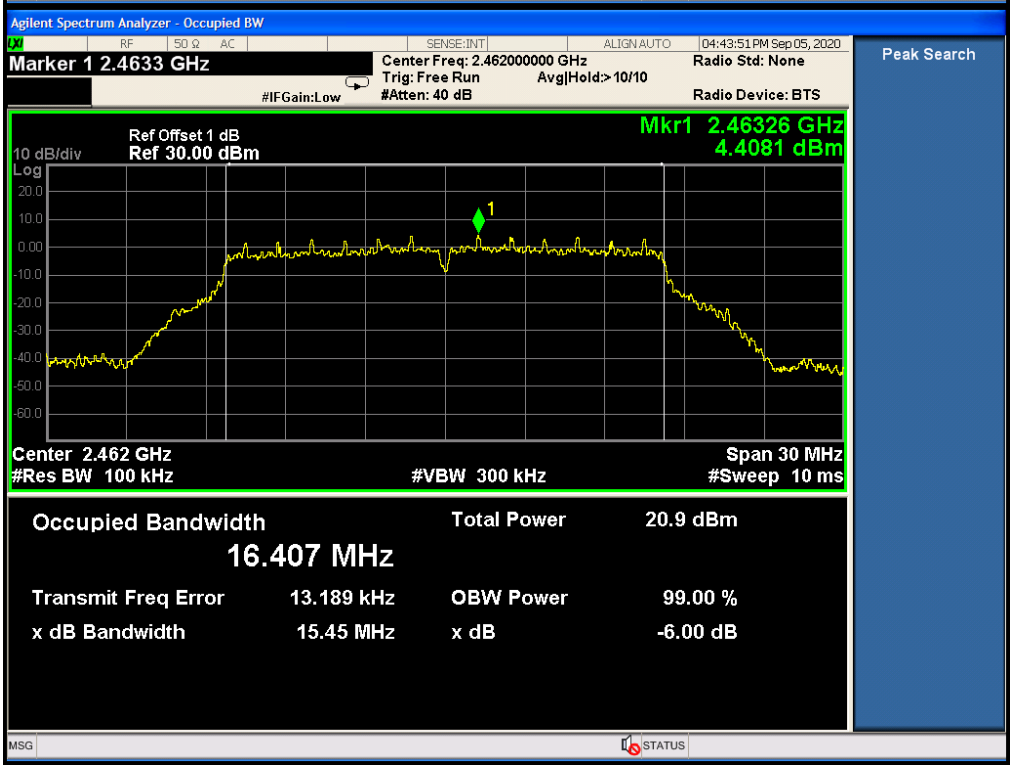
4.5.2.1.6 802.11G_ Highest Channel





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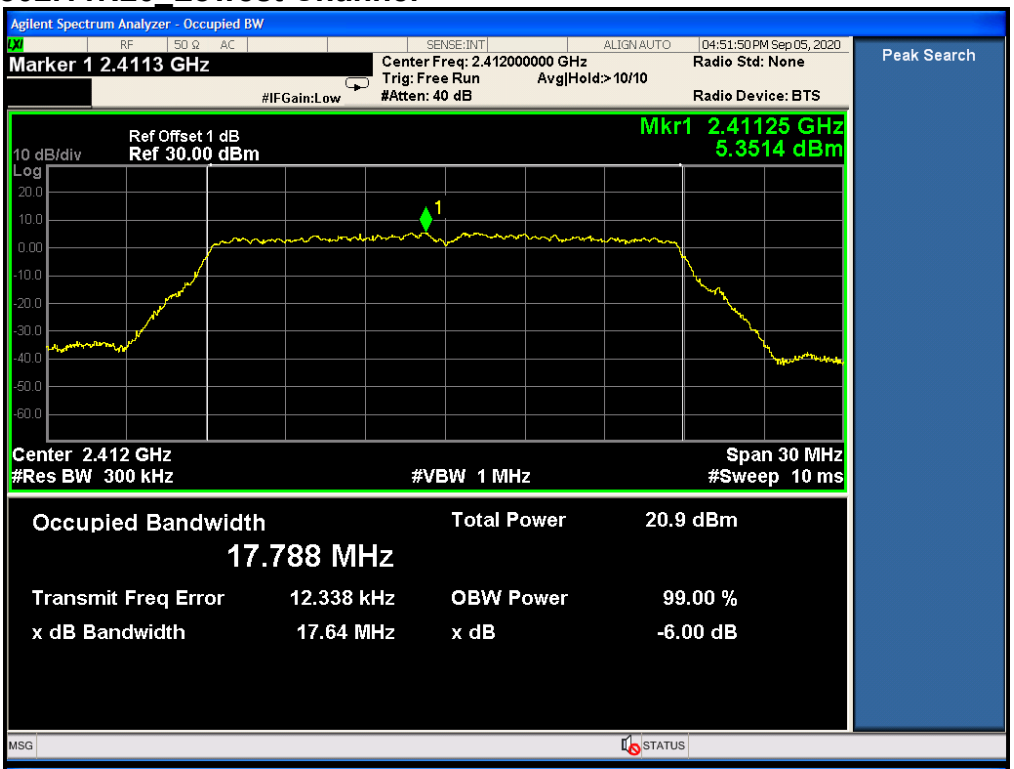
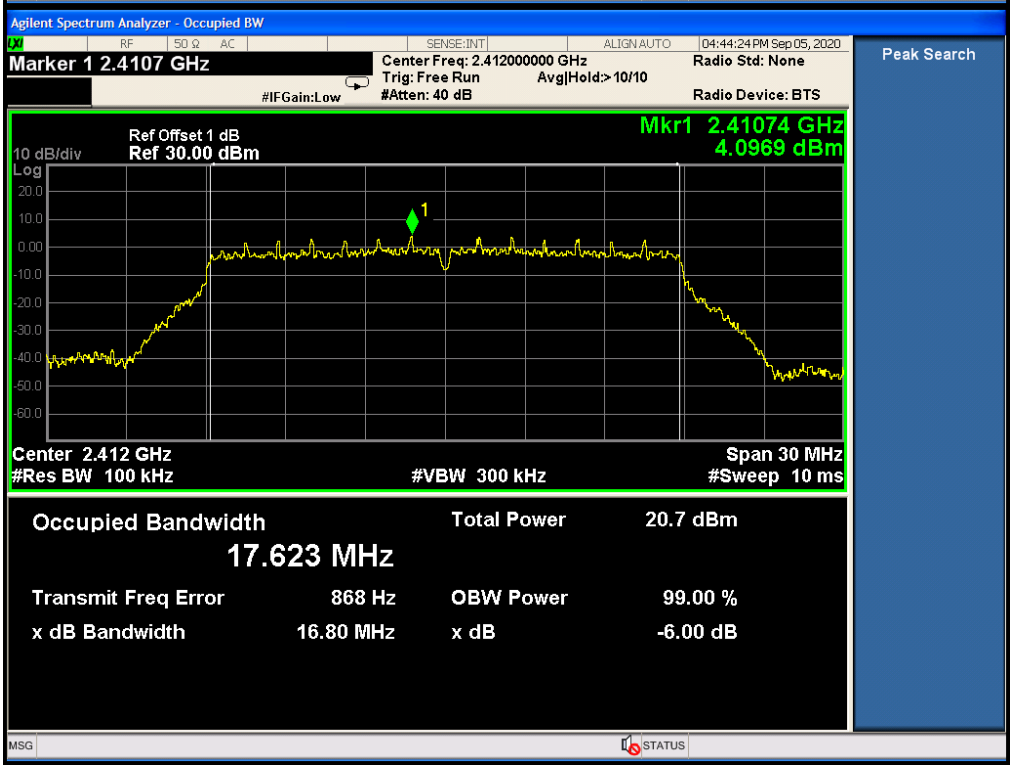
4.5.2.1.7 802.11N20_Lowest Channel





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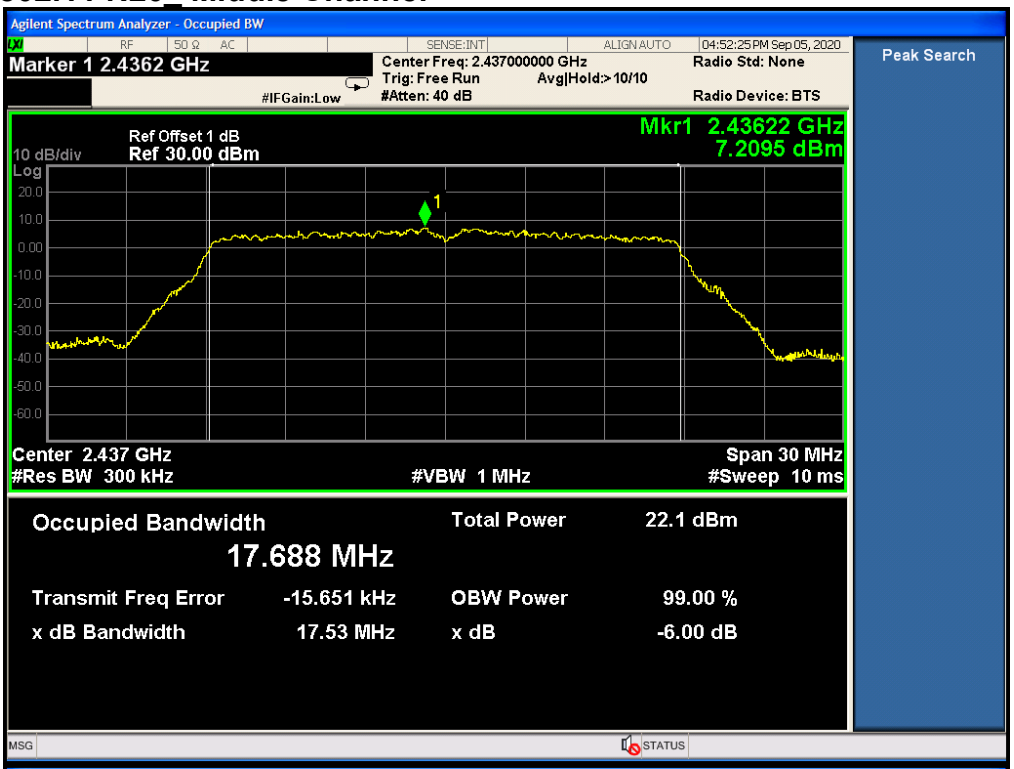
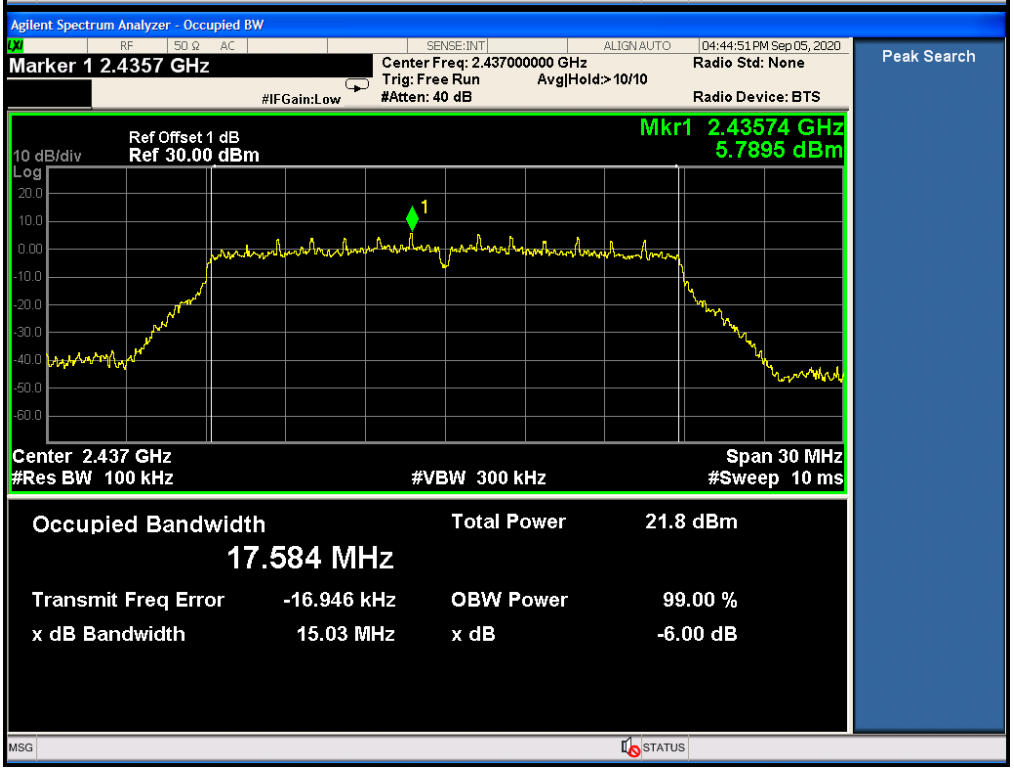
4.5.2.1.8 802.11 N20_ Middle Channel





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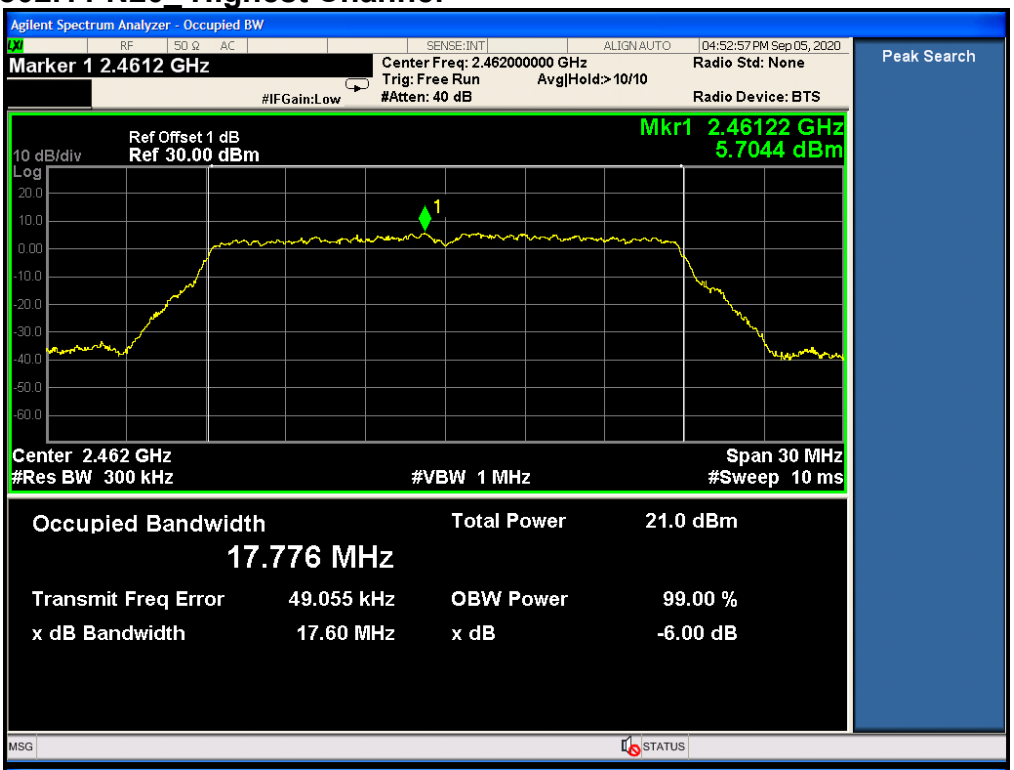
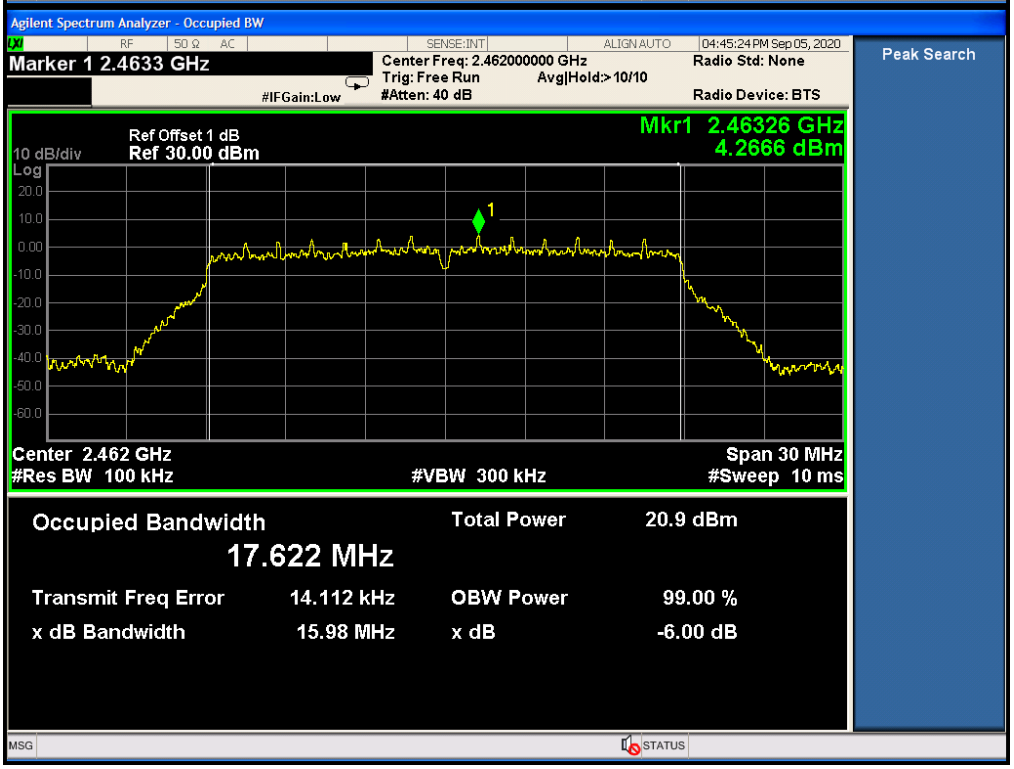
4.5.2.1.9 802.11 N20_ Highest Channel





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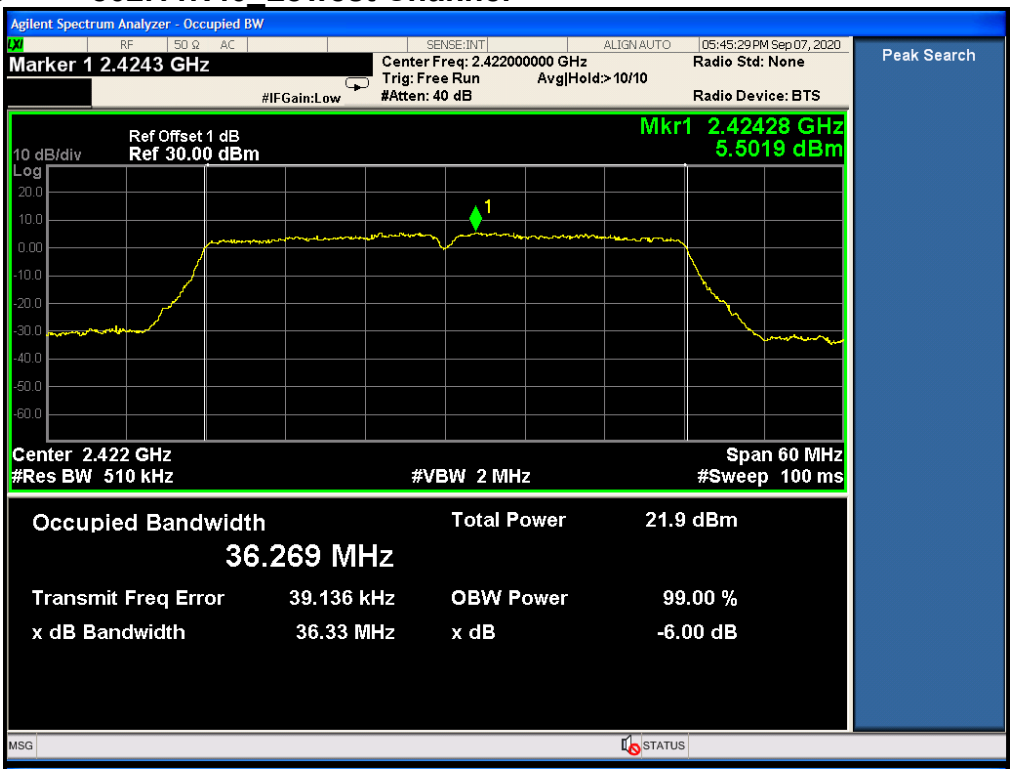
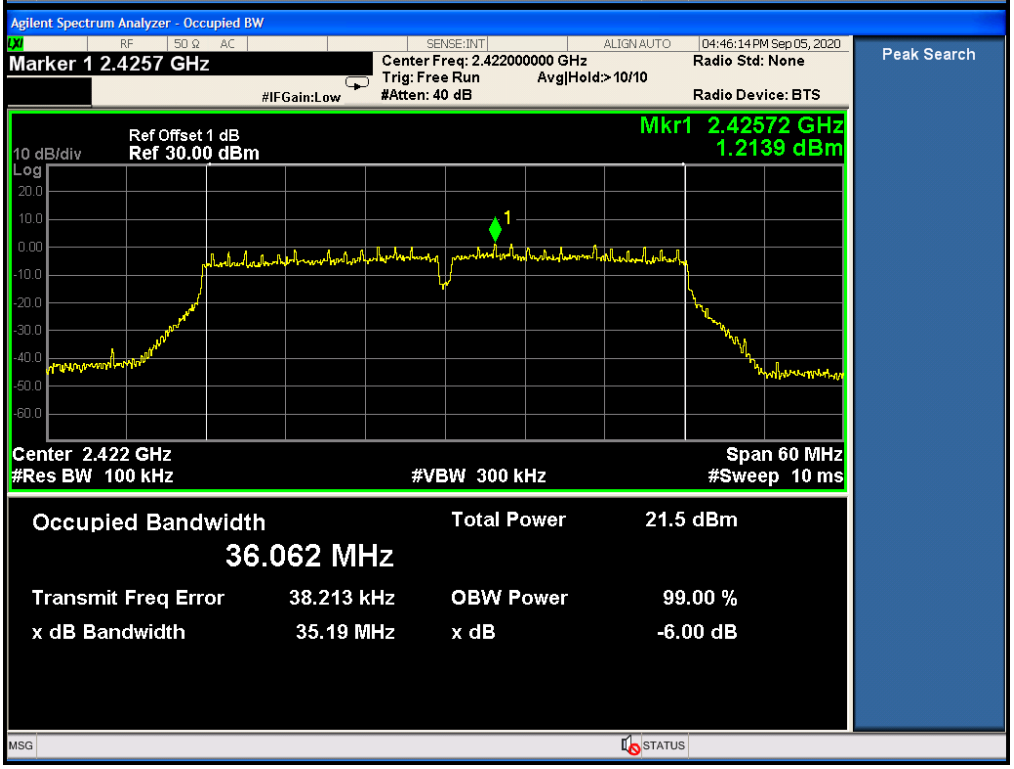
4.5.2.1.10 802.11N40_Lowest Channel





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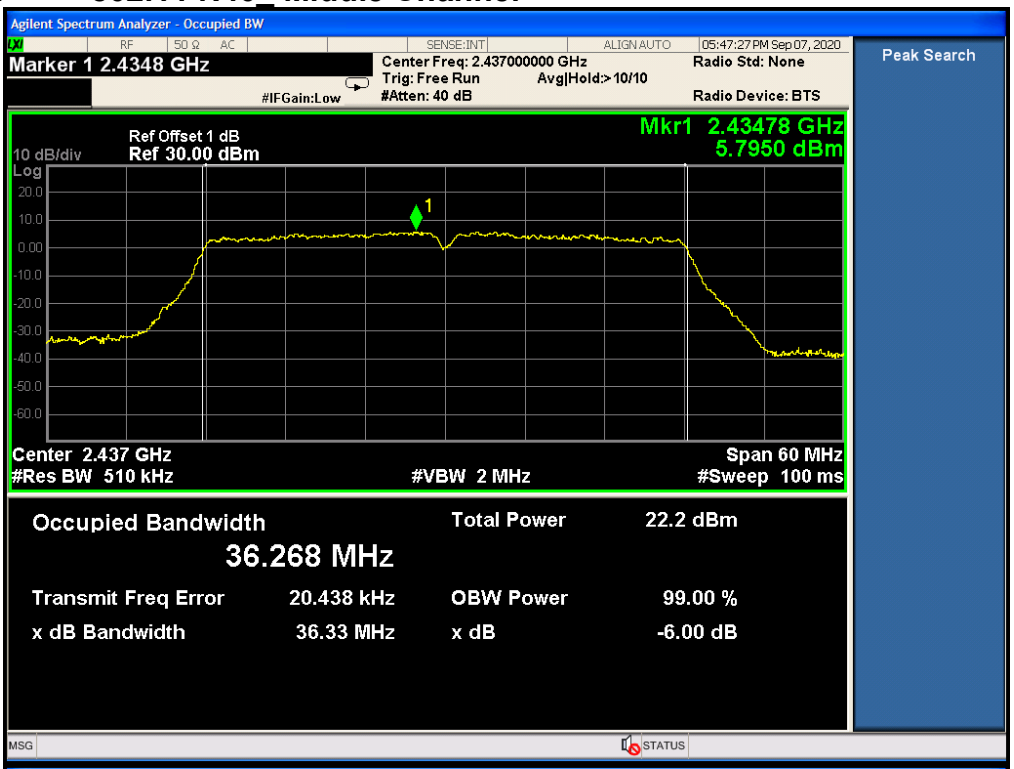
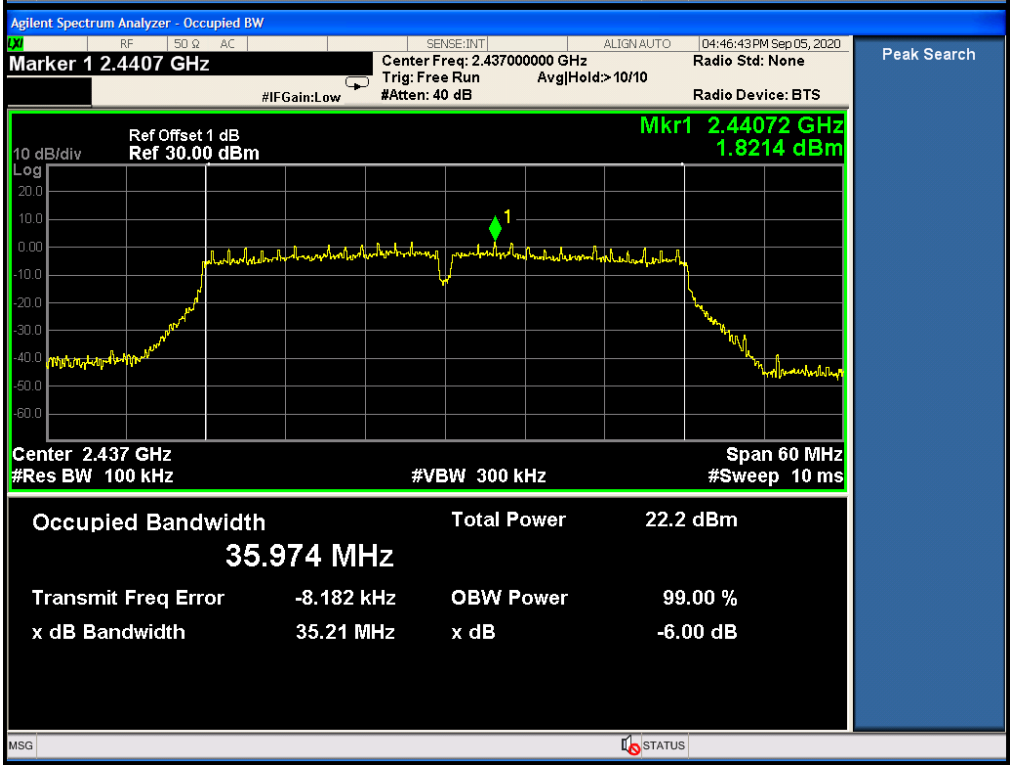
4.5.2.1.11 802.11 N40_ Middle Channel





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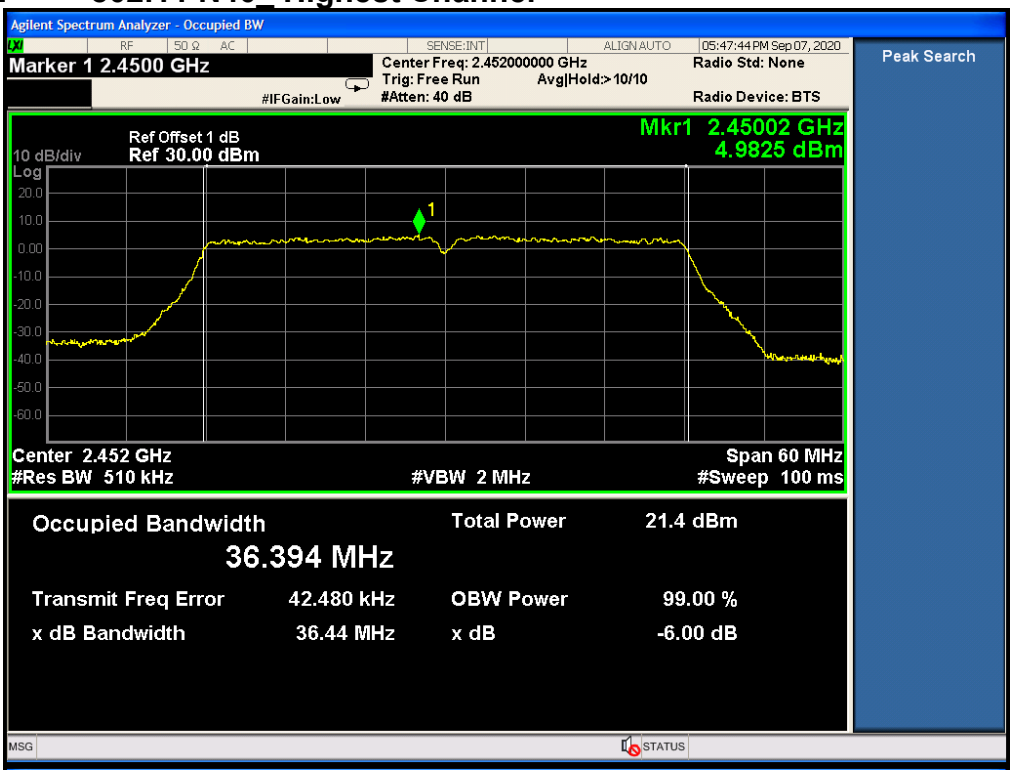
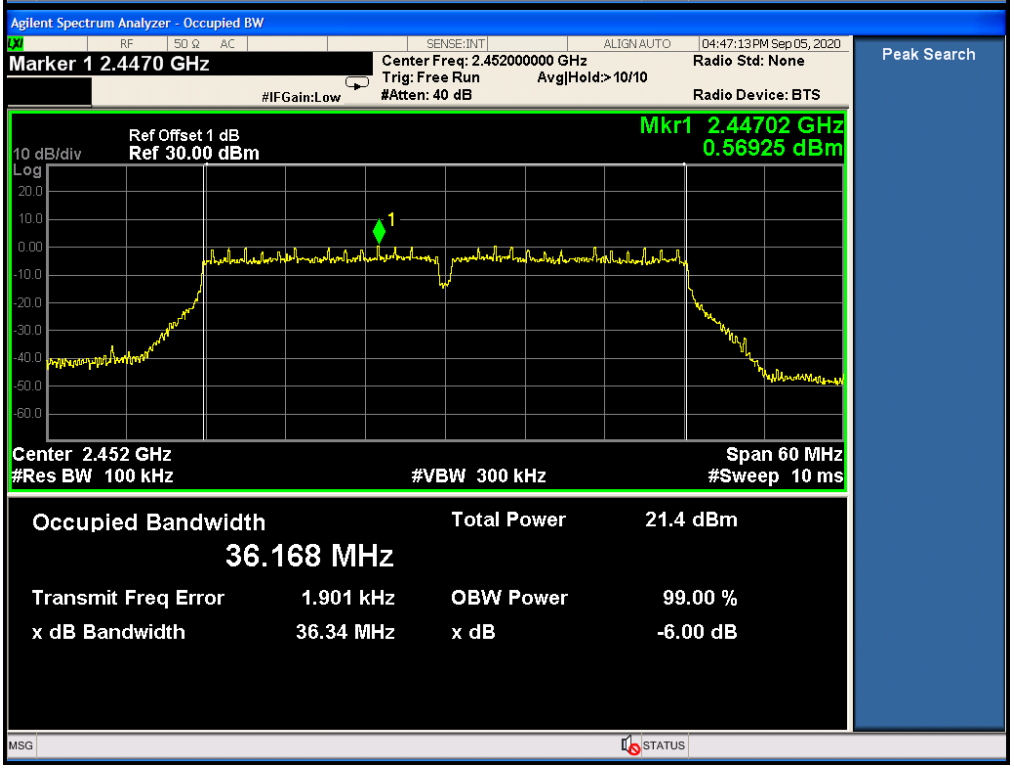
4.5.2.1.12 802.11 N40_ Highest Channel





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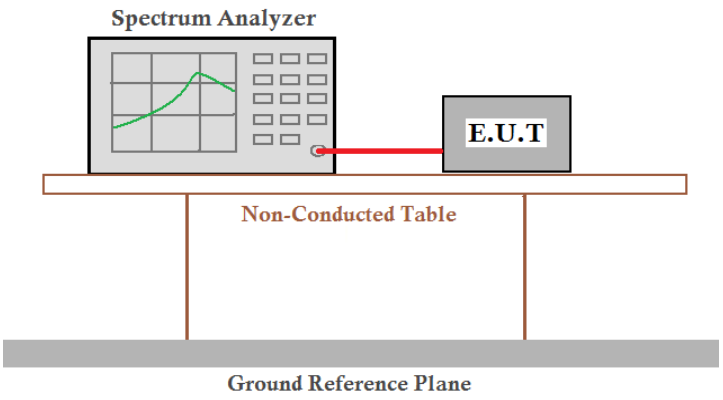
4.6 Power Spectral Density

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	-10.44	≤8.00	Pass
	Middle	-8.08	≤8.00	Pass
	Highest	-10.46	≤8.00	Pass
802.11G	Lowest	-11.81	≤8.00	Pass
	Middle	-10.13	≤8.00	Pass
	Highest	-11.20	≤8.00	Pass
802.11N20	Lowest	-11.81	≤8.00	Pass
	Middle	-11.81	≤8.00	Pass
	Highest	-12.56	≤8.00	Pass
802.11N40	Lowest	-14.82	≤8.00	Pass
	Middle	-13.12	≤8.00	Pass
	Highest	-14.84	≤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

4.6.2.1.3 802.11B_ Highest Channel

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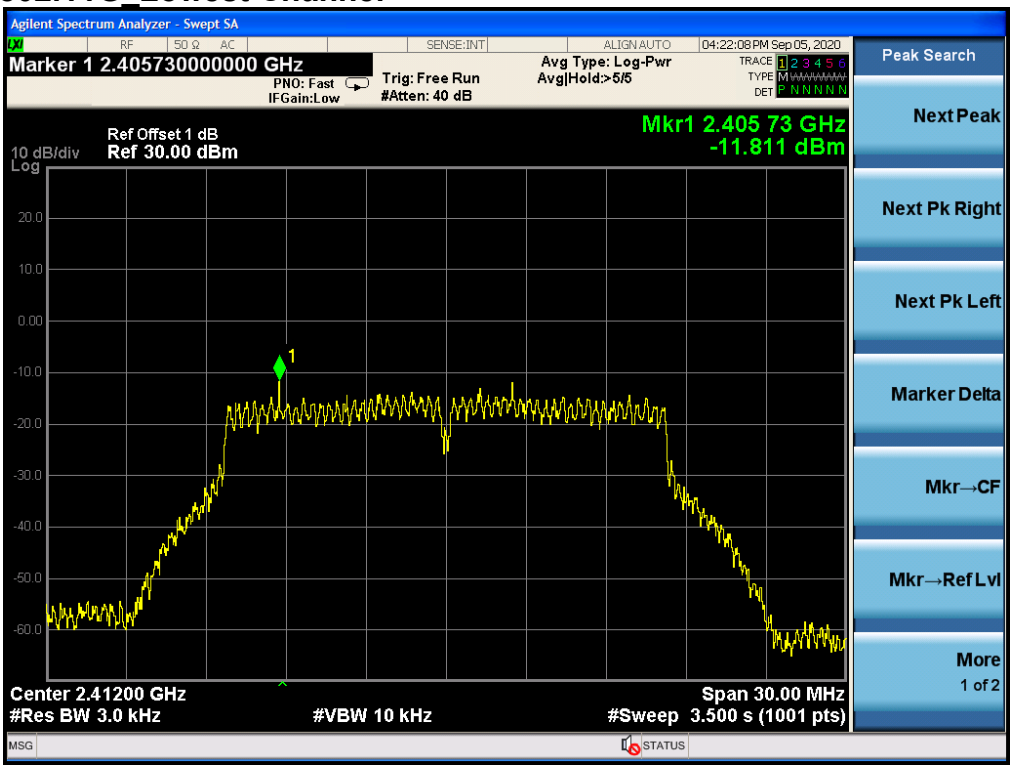
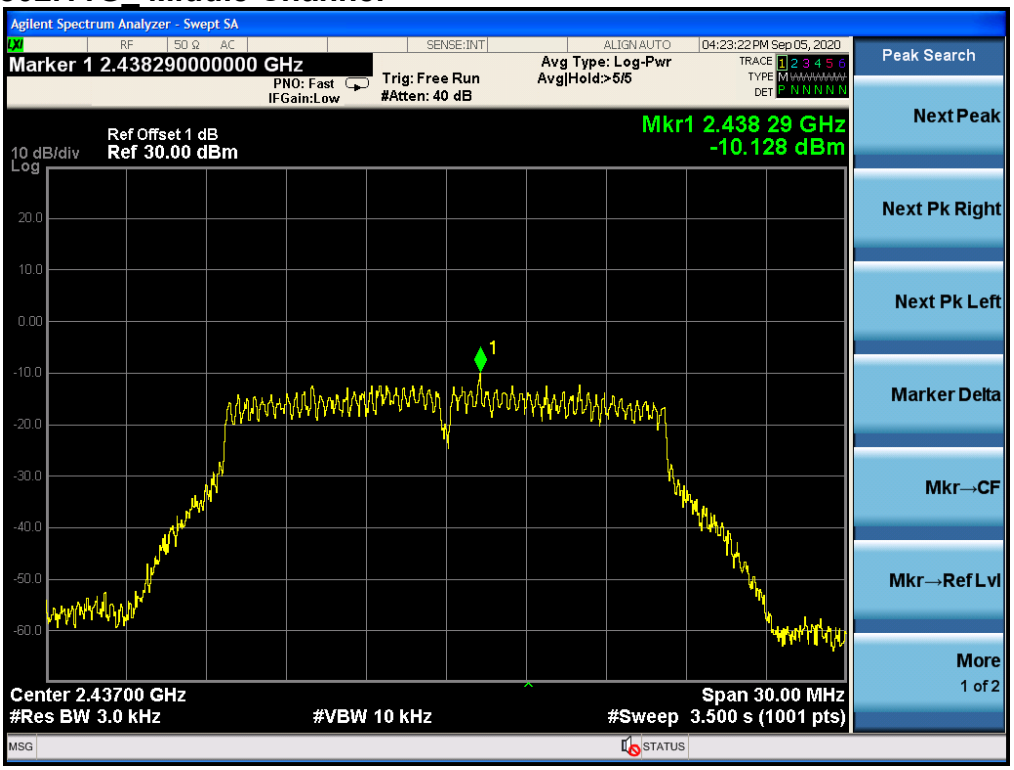
4.6.2.1.4 802.11G_Lowest Channel



4.6.2.1.5 802.11G_ Middle Channel



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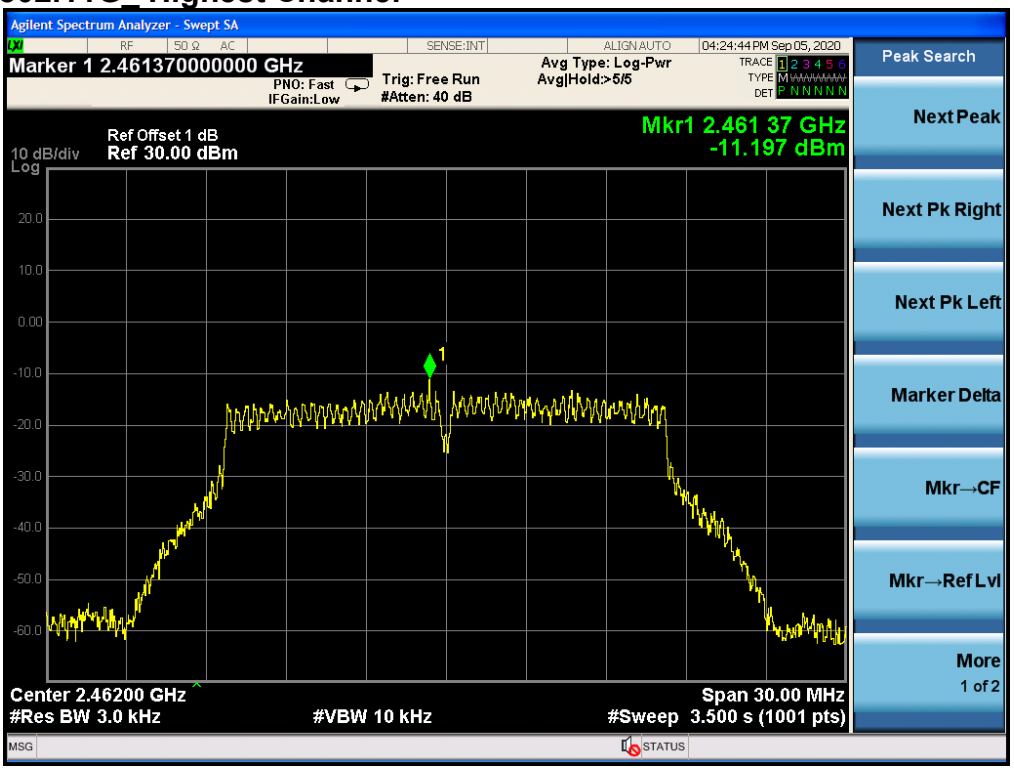
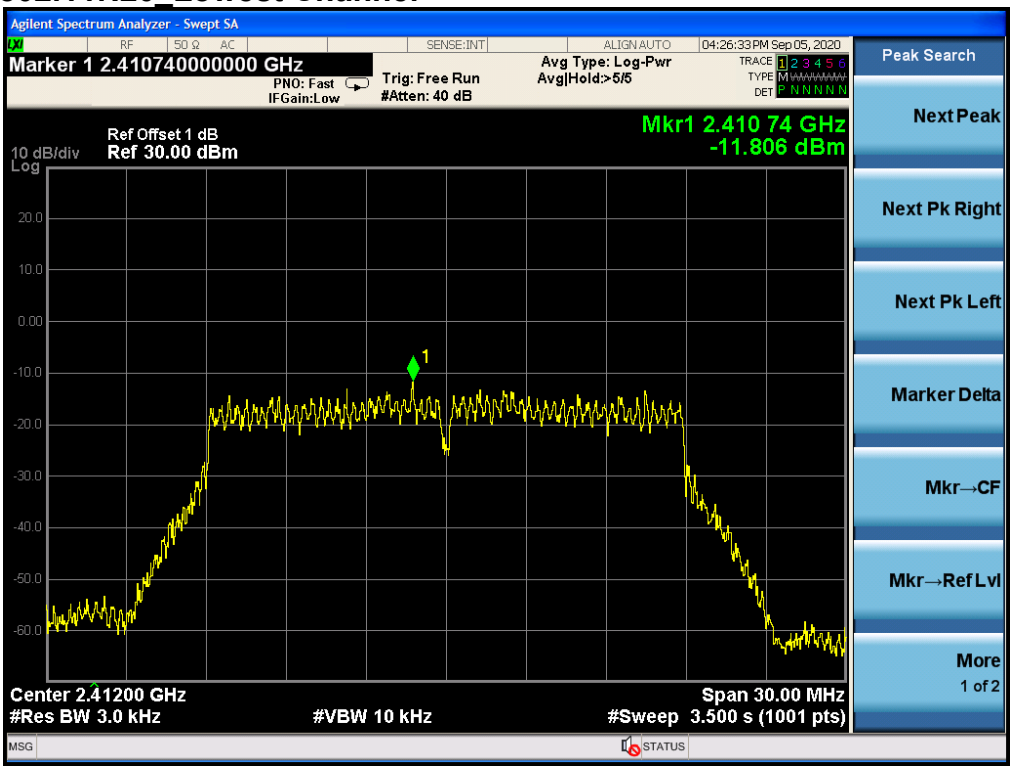
4.6.2.1.6 802.11G_ Highest Channel



4.6.2.1.7 802.11N20_Lowest Channel



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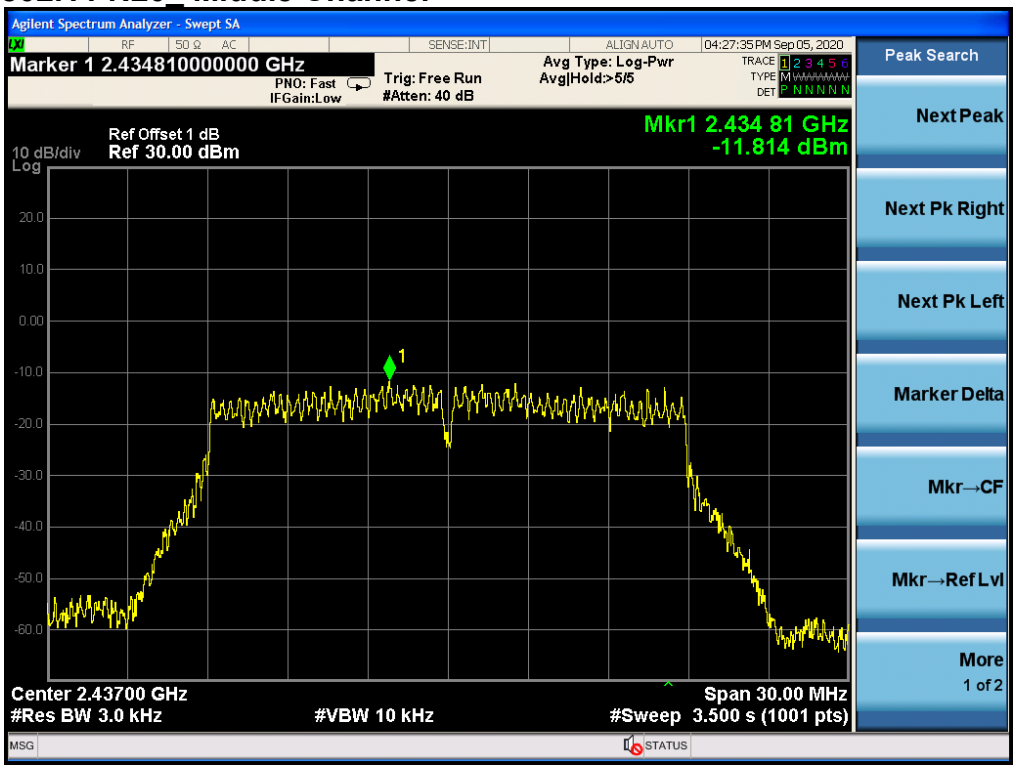
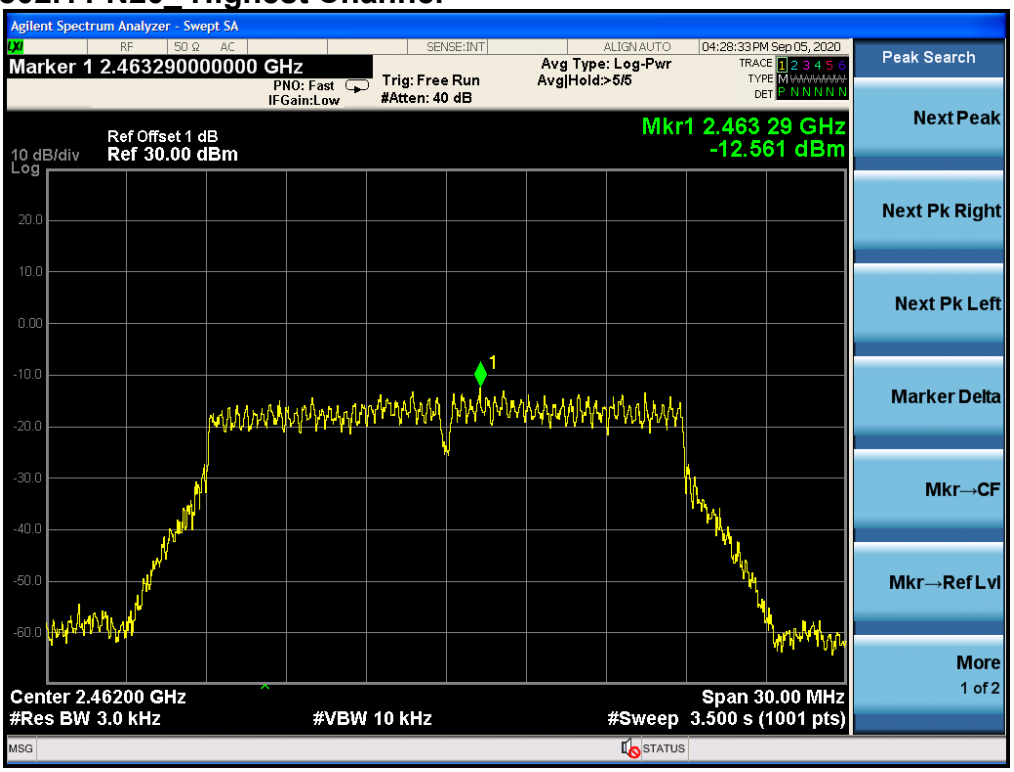
4.6.2.1.8 802.11 N20_ Middle Channel



4.6.2.1.9 802.11 N20_ Highest Channel



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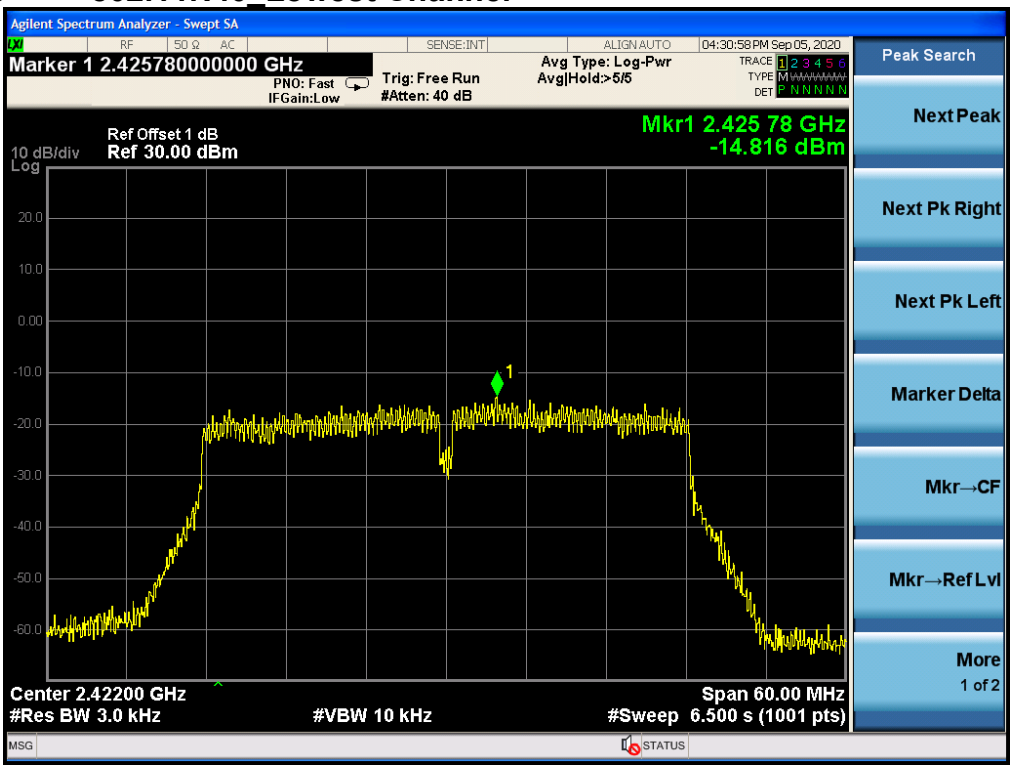
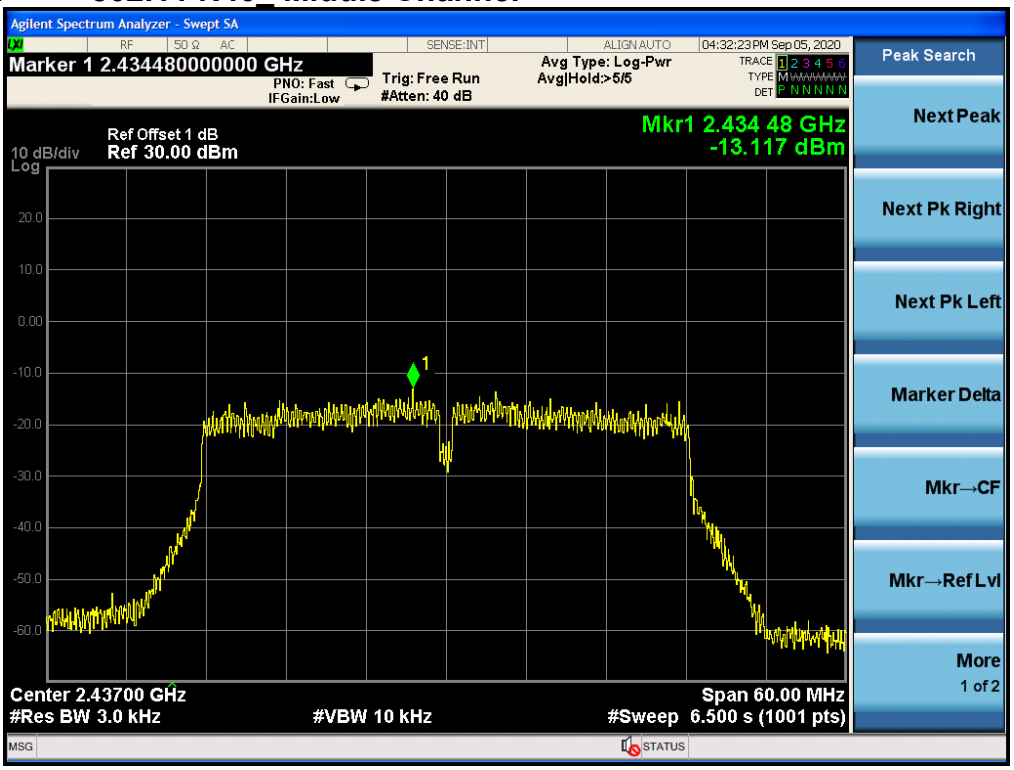
4.6.2.1.10 802.11N40_Lowest Channel



4.6.2.1.11 802.11 N40_ Middle Channel



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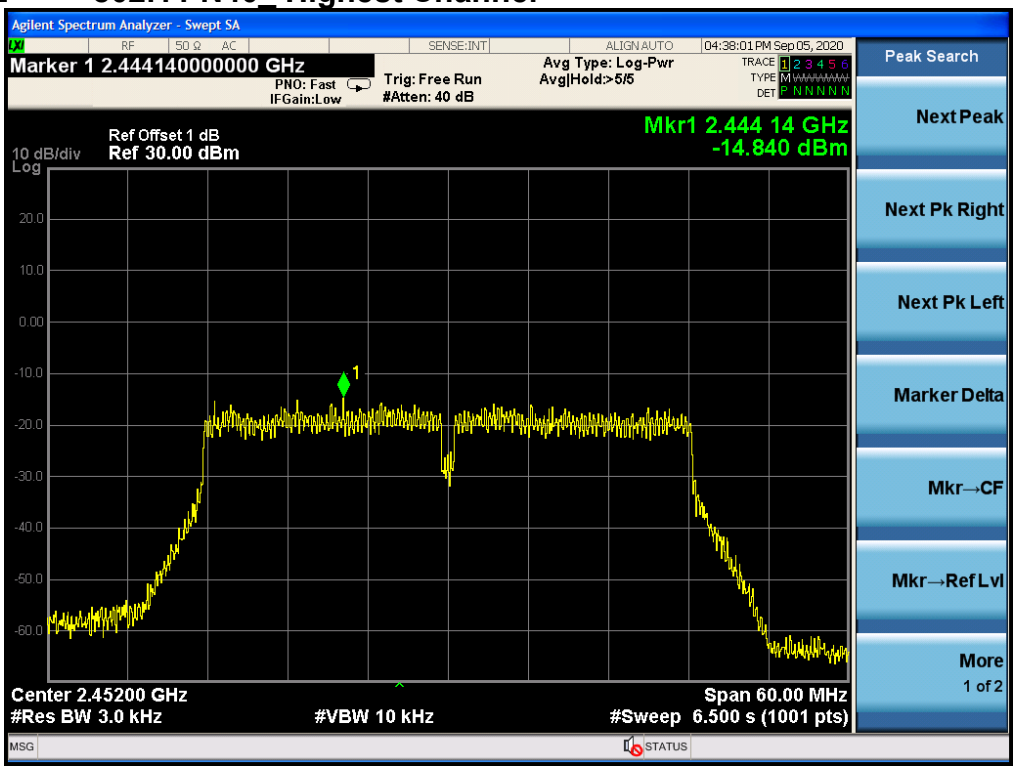
4.6.2.1.12 802.11 N40_ Highest Channel



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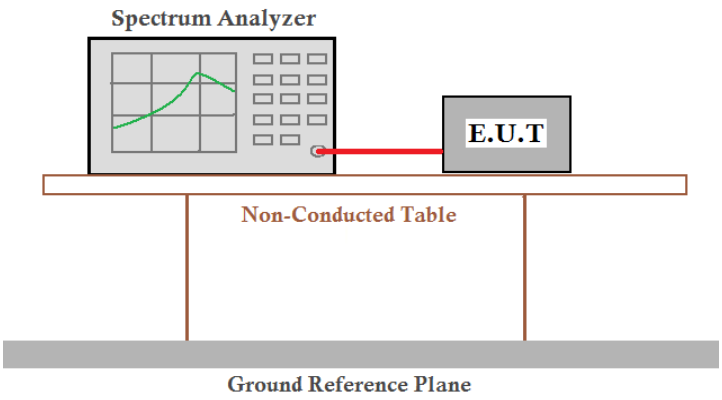
4.7 Band-edge for RF Conducted Emissions

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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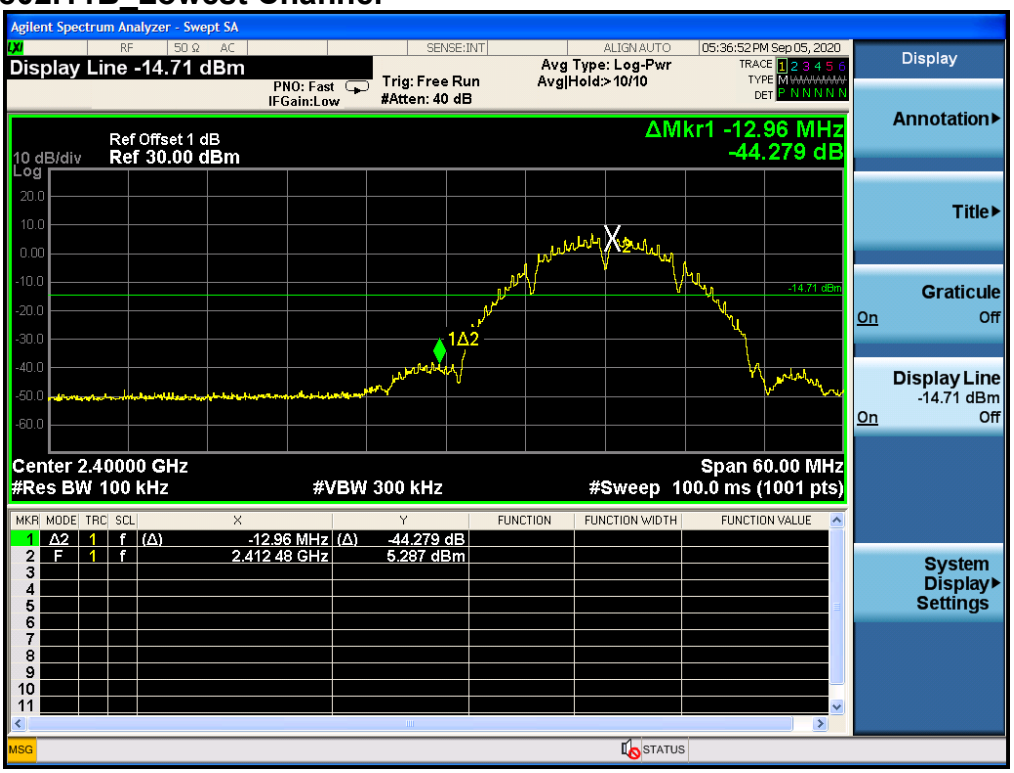
4.7.1 Test plots

4.7.1.1 ANT1

4.7.1.1.1 802.11B_Lowest Channel



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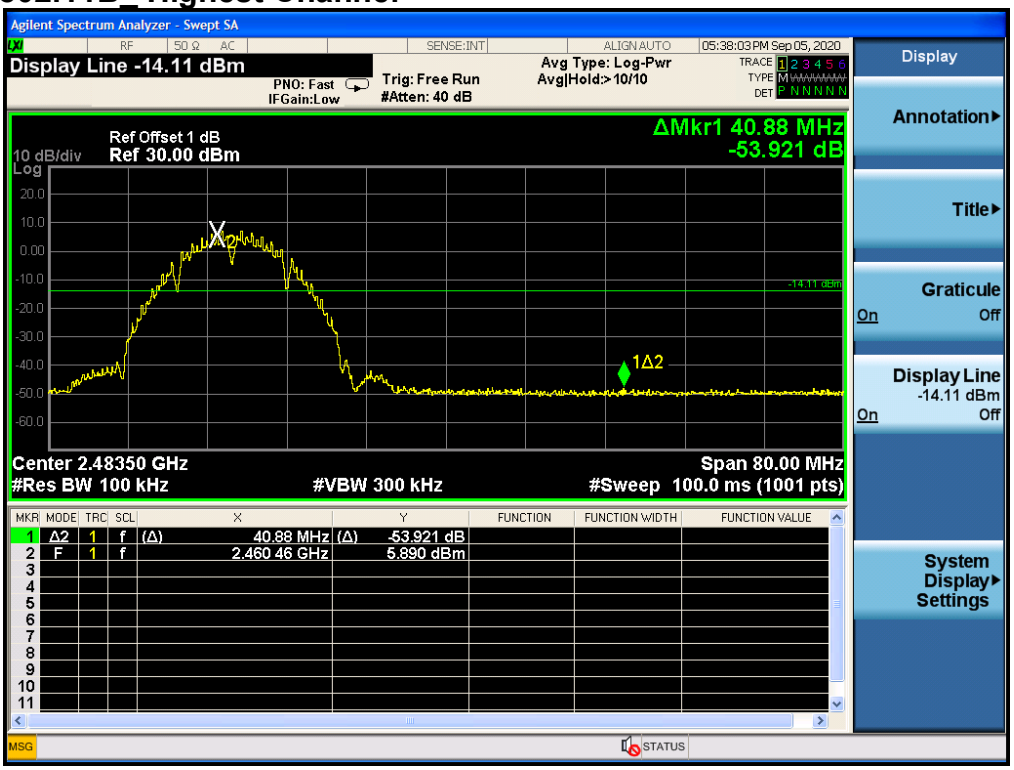
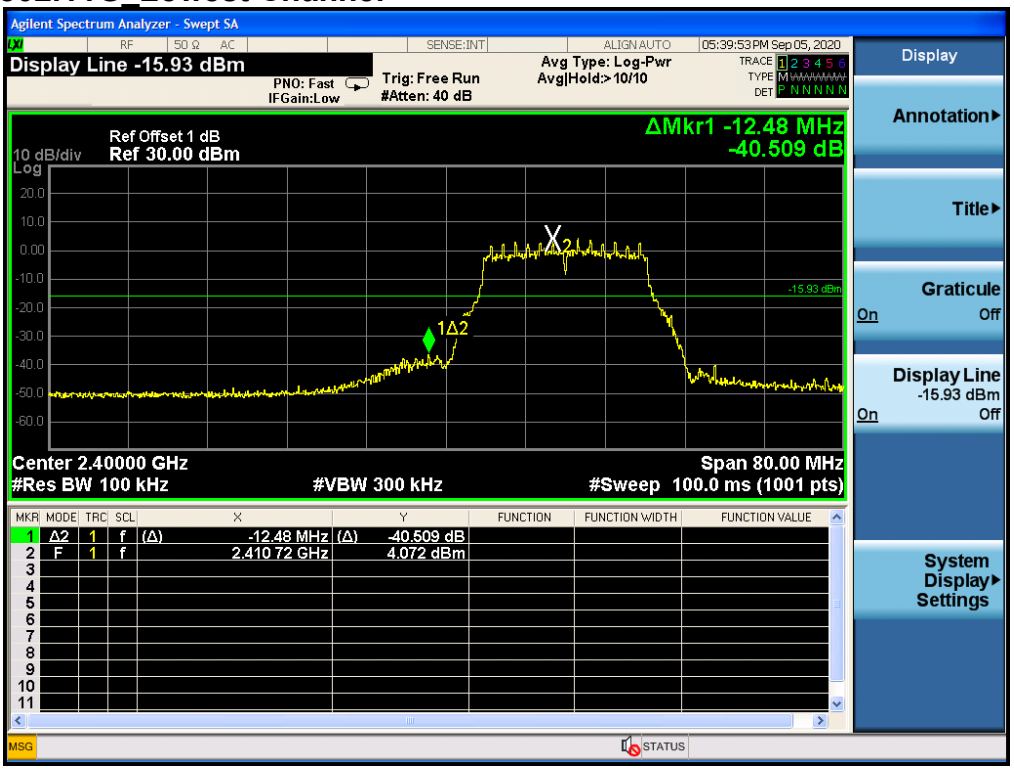
4.7.1.1.2 802.11B_ Highest Channel



4.7.1.1.3 802.11G_Lowest Channel



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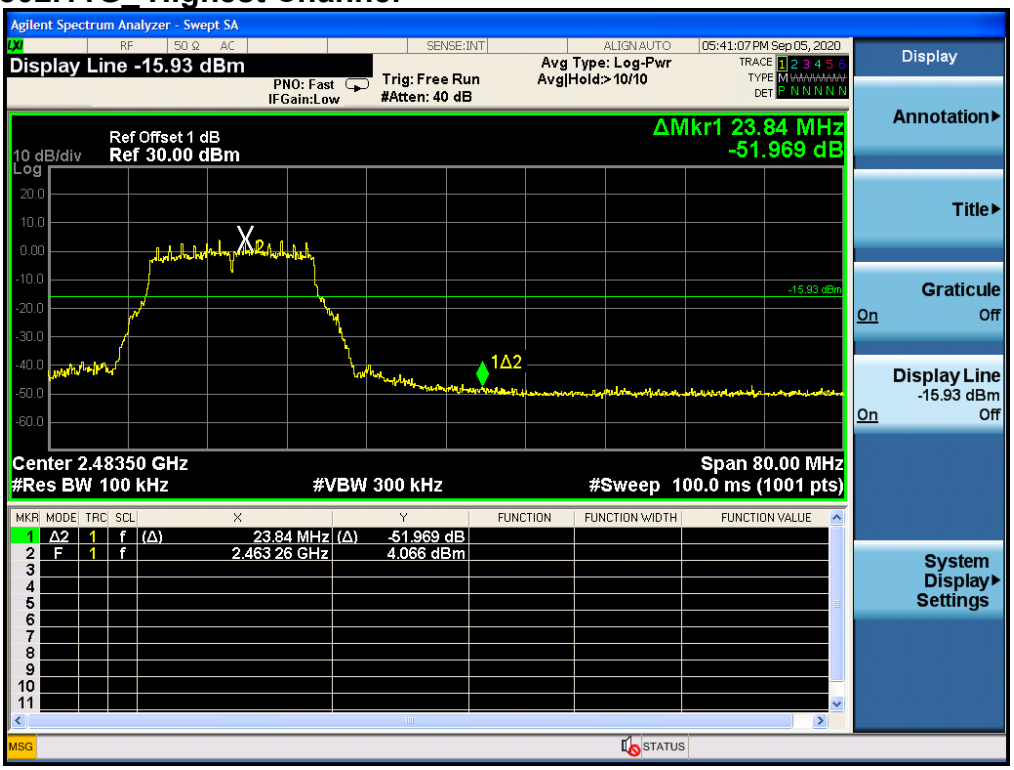
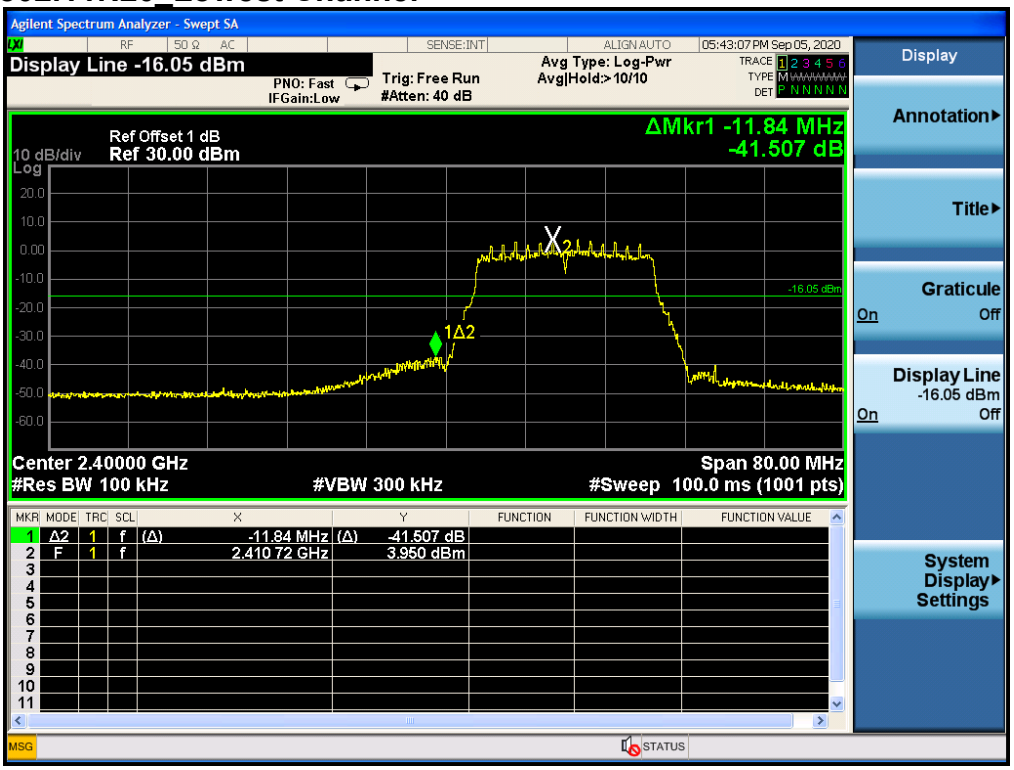
4.7.1.1.4 802.11G_ Highest Channel



4.7.1.1.5 802.11N20_Lowest Channel



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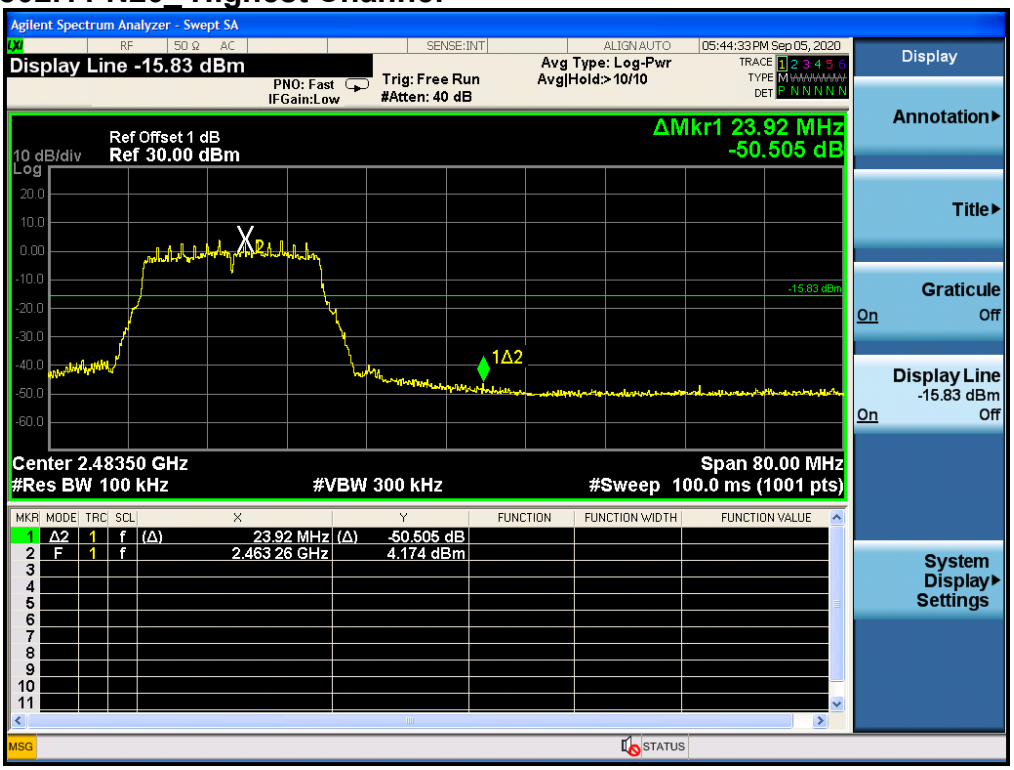
4.7.1.1.6 802.11 N20_ Highest Channel



4.7.1.1.7 802.11N40_Lowest Channel

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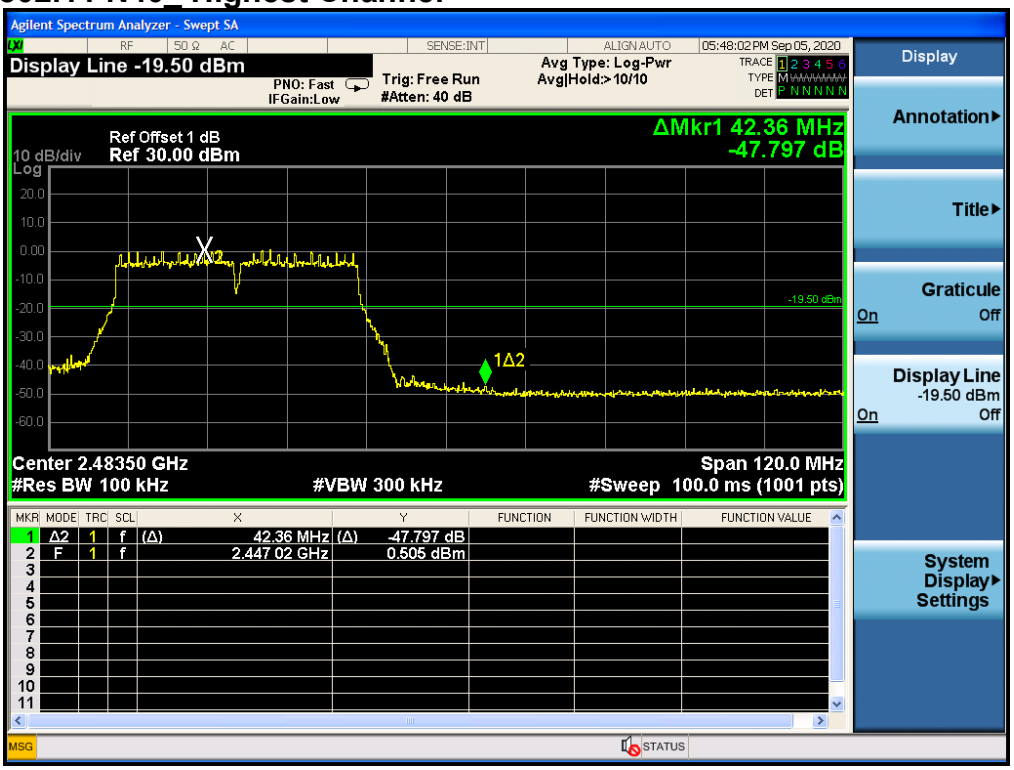
4.7.1.1.8 802.11 N40_ Highest Channel



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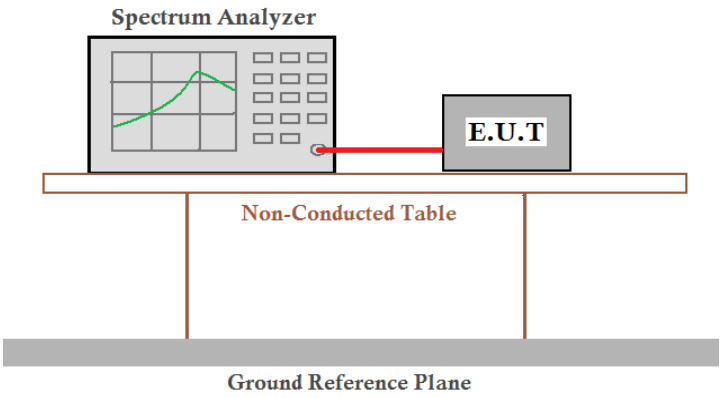
4.8 RF Conducted Spurious Emissions

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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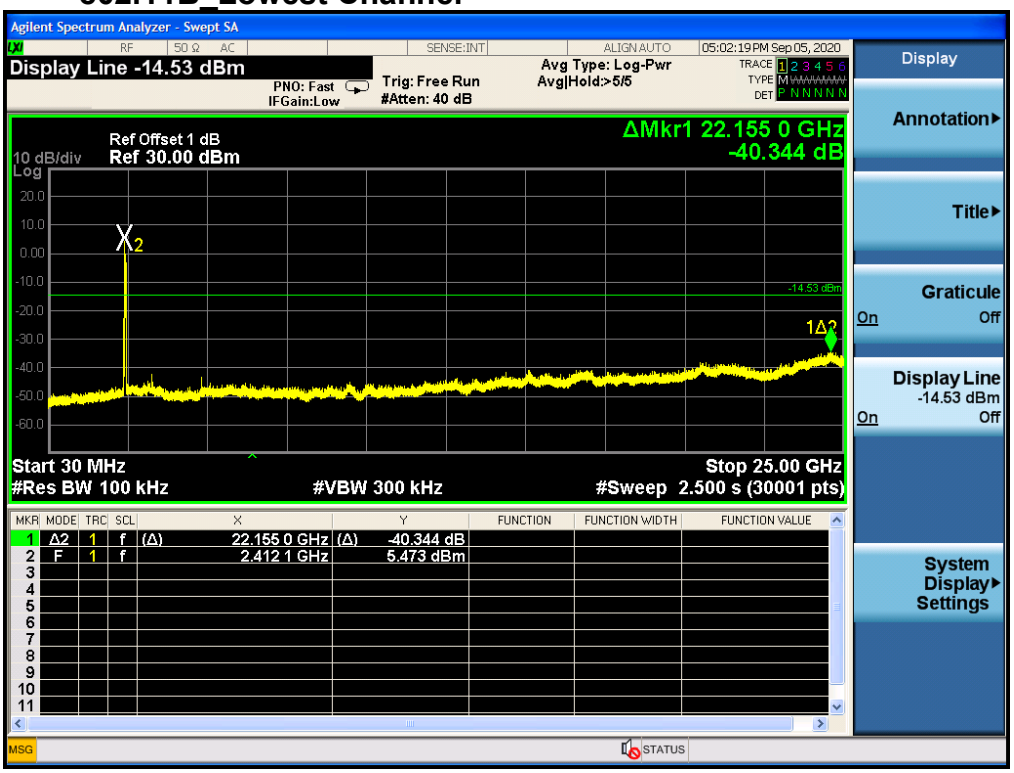
4.8.1 Test plots

4.8.1.1 ANT1

4.8.1.1.1 802.11B_Lowest Channel



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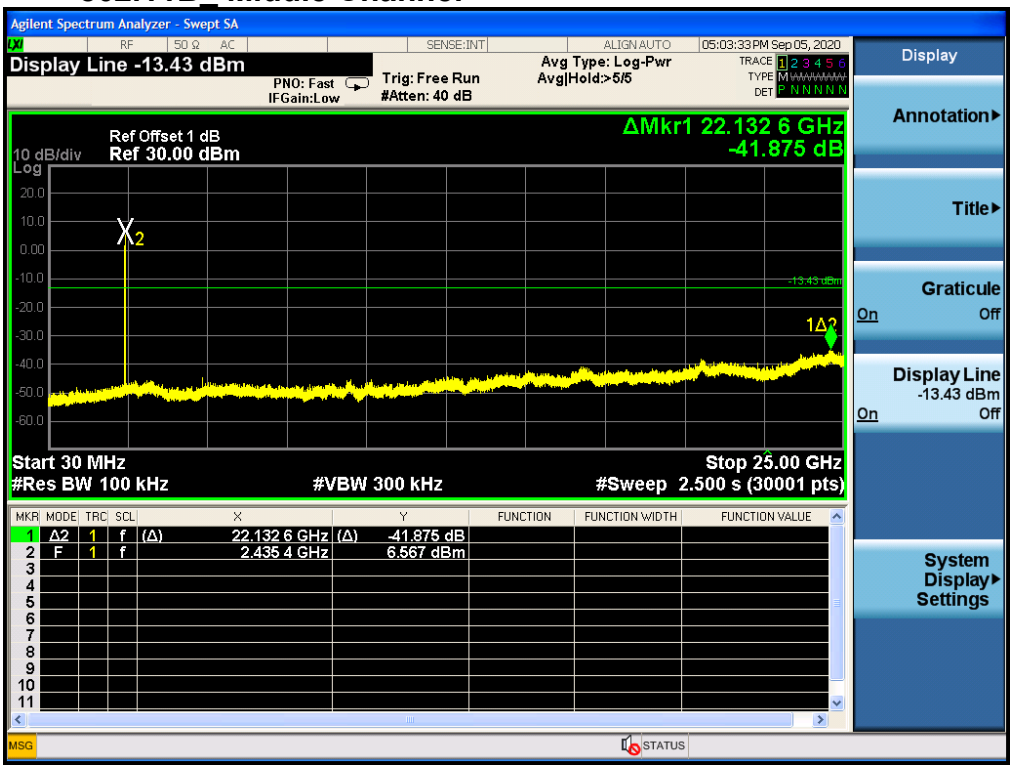
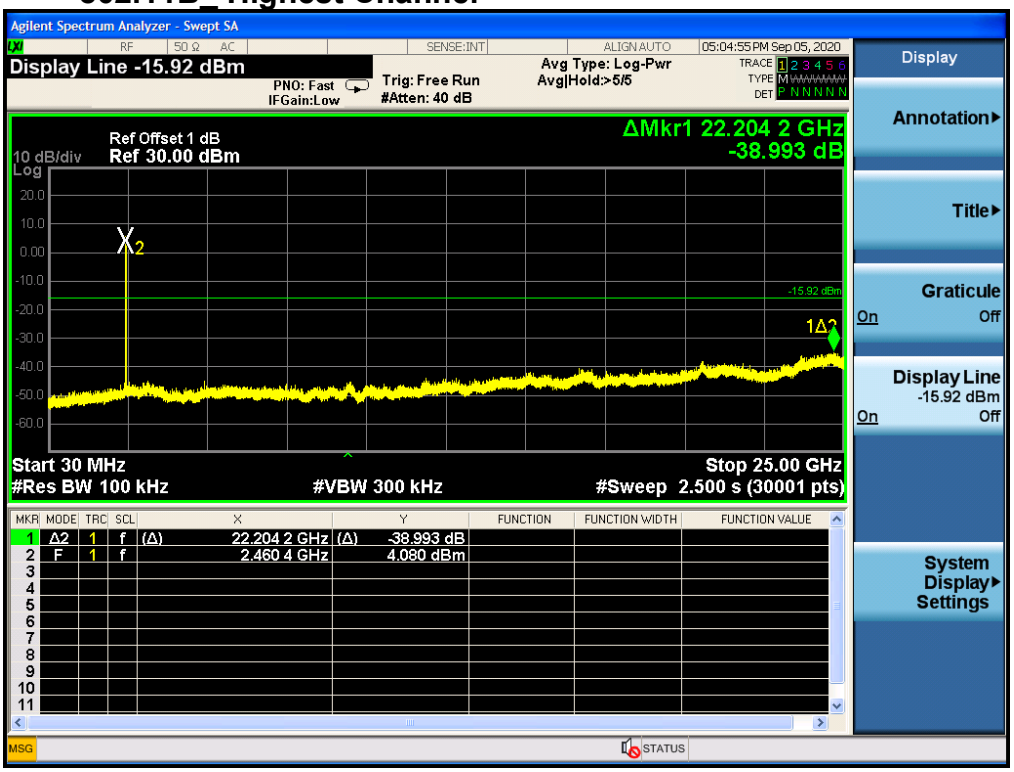
4.8.1.1.2 802.11B_ Middle Channel



4.8.1.1.3 802.11B_ Highest Channel



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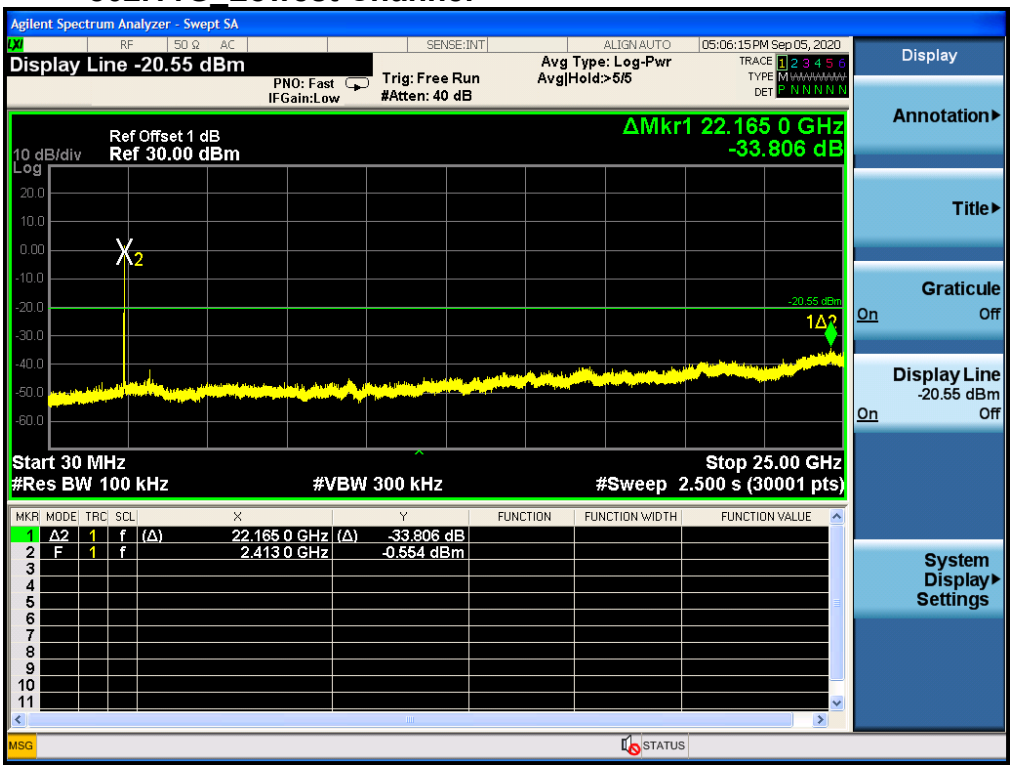
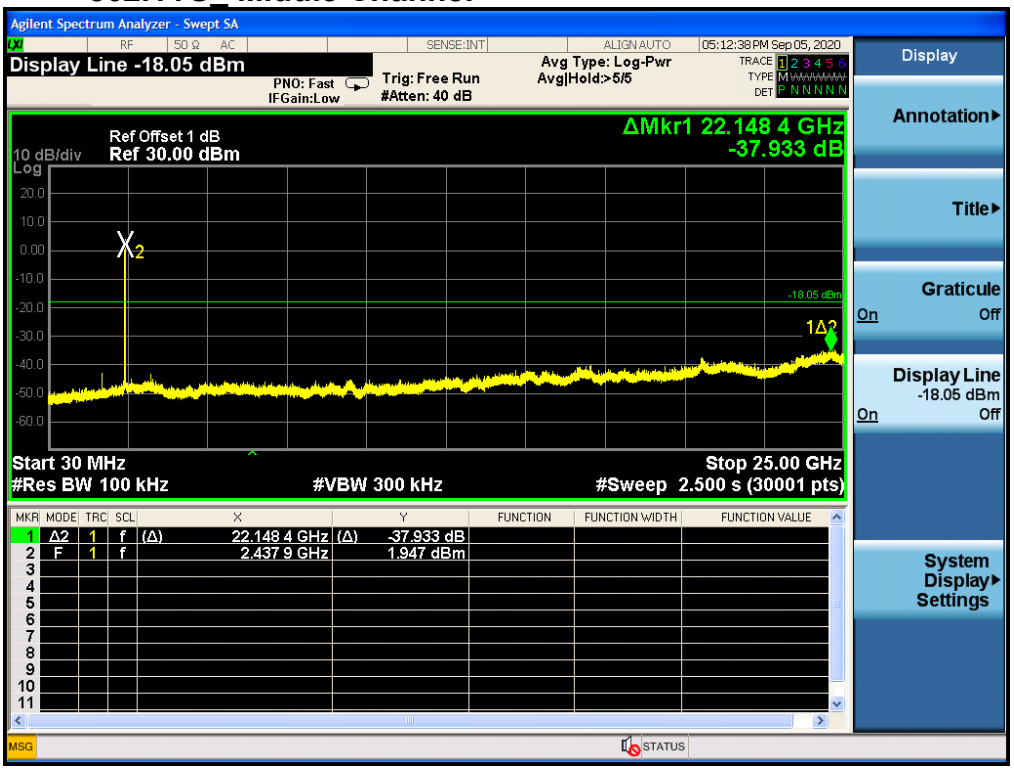
4.8.1.1.4 802.11G_Lowest Channel



4.8.1.1.5 802.11G_ Middle Channel



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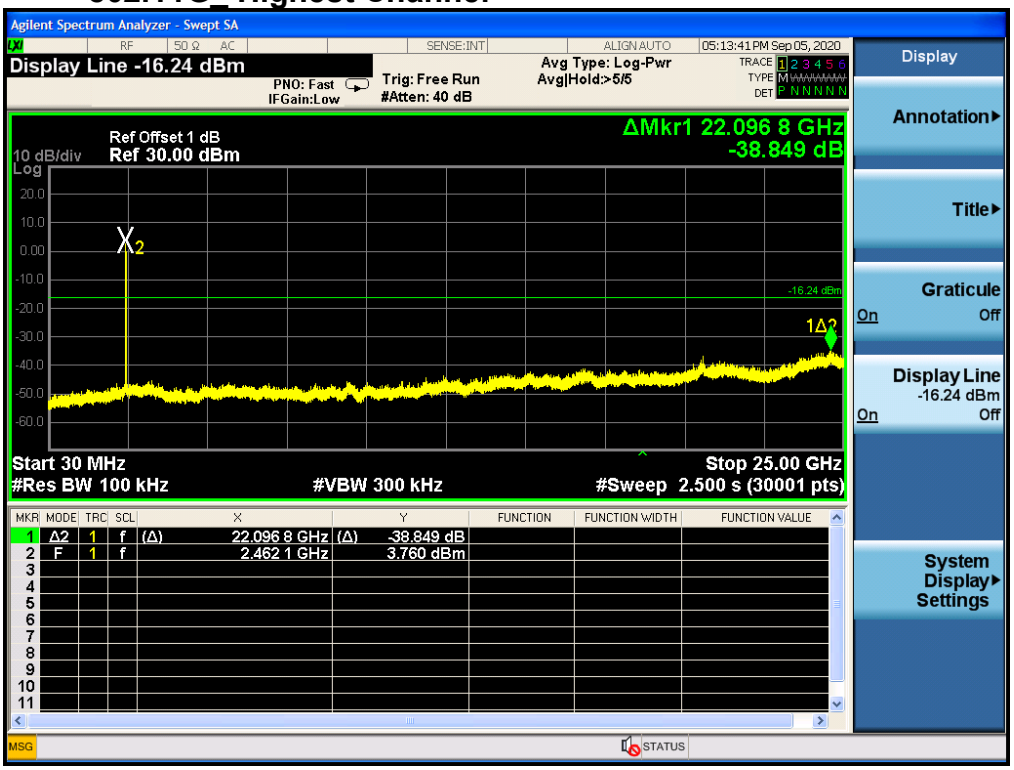
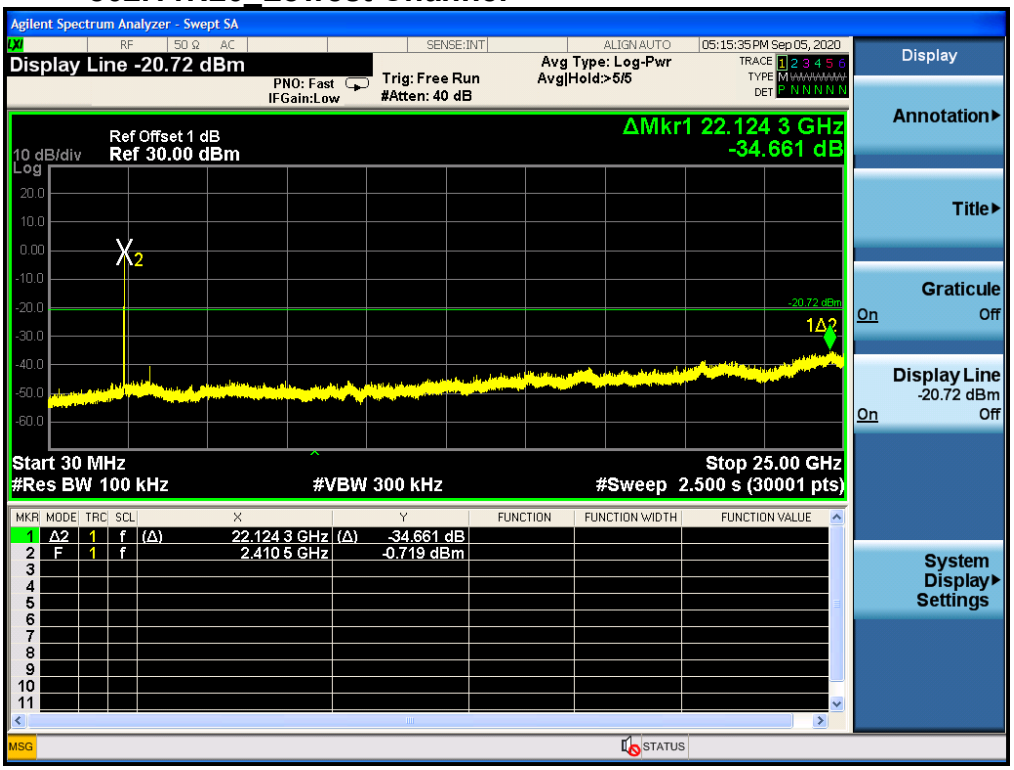
4.8.1.1.6 802.11G_ Highest Channel



4.8.1.1.7 802.11N20_Lowest Channel



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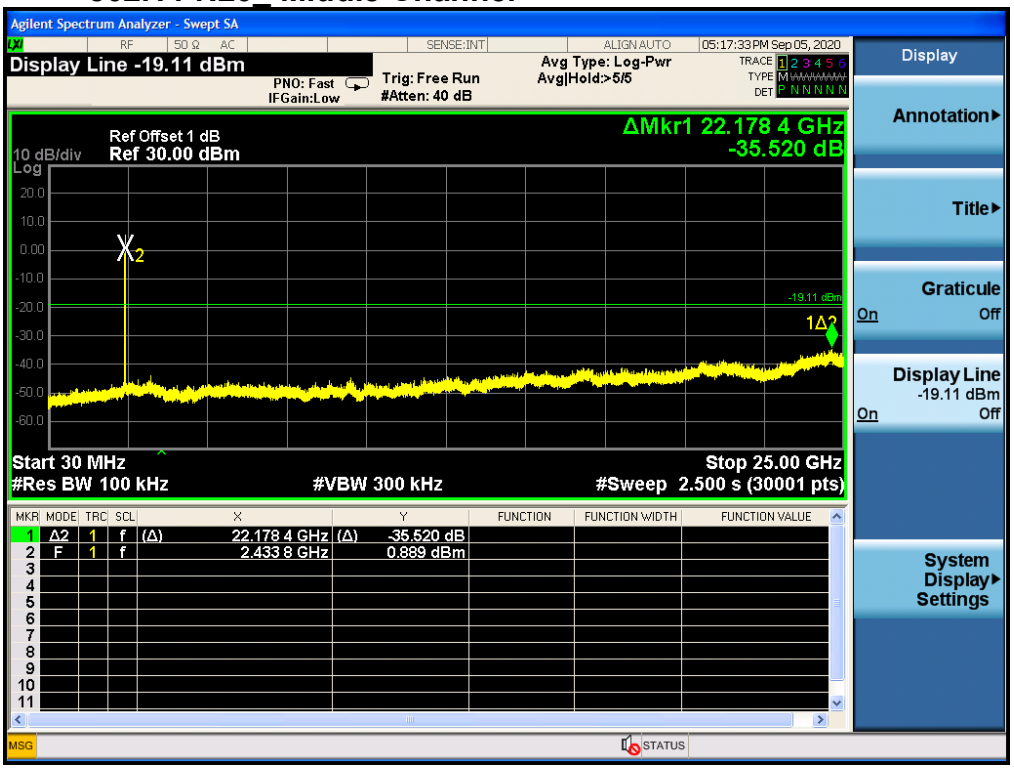
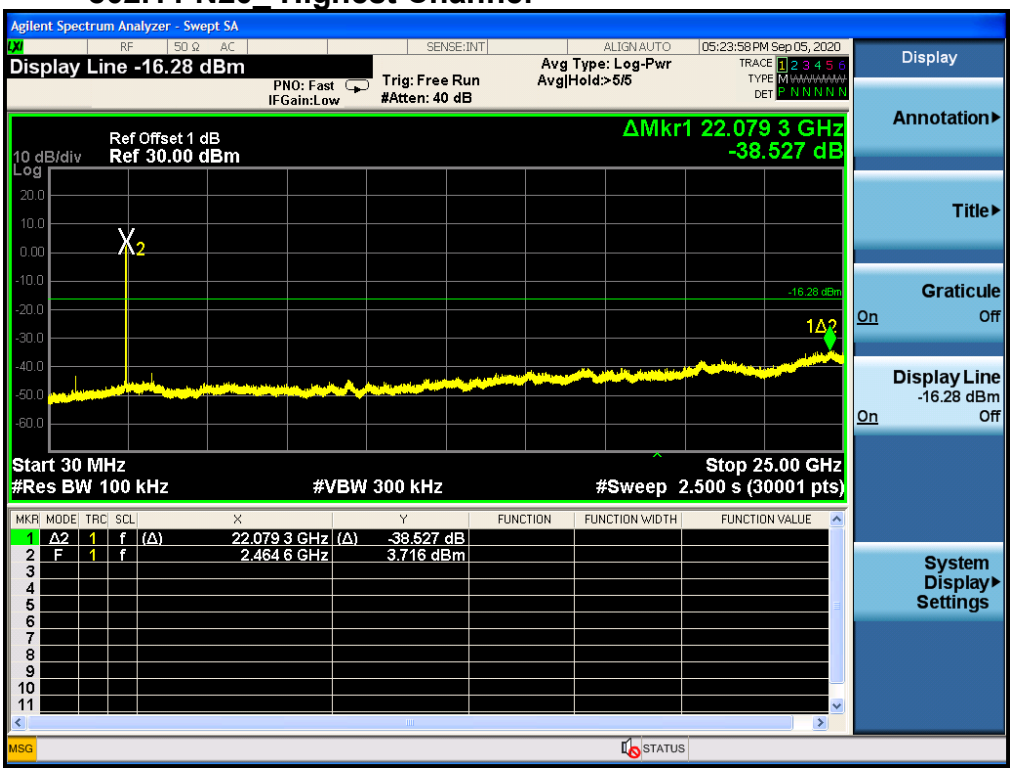
4.8.1.1.8 802.11 N20_ Middle Channel



4.8.1.1.9 802.11 N20_ Highest Channel



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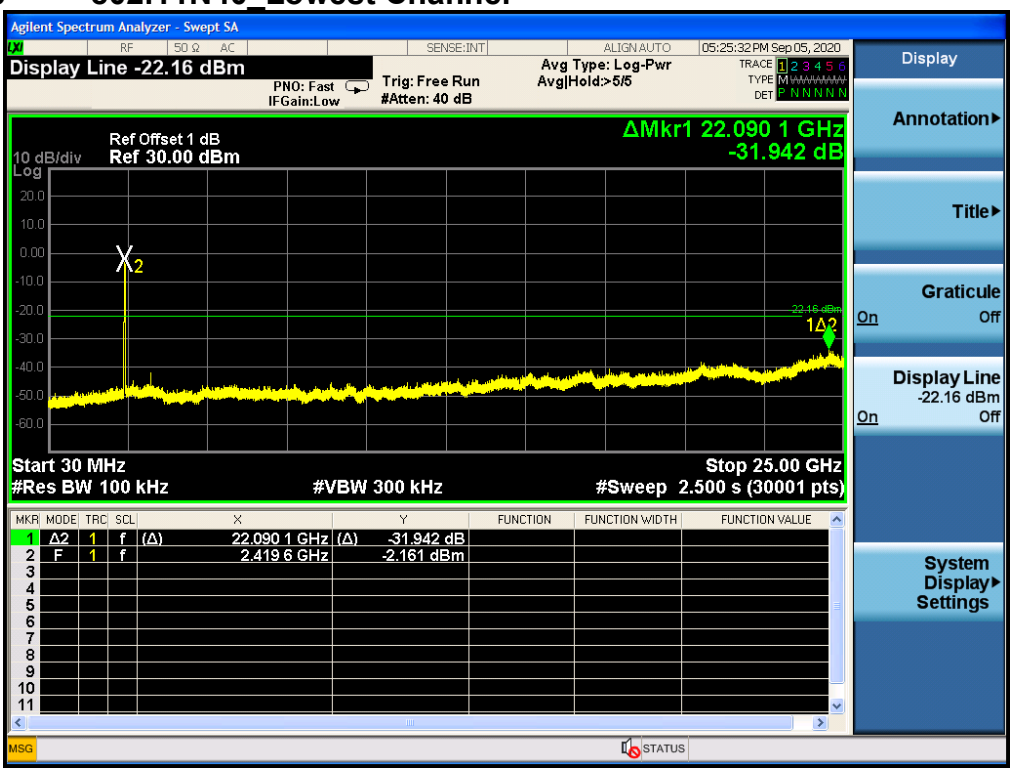
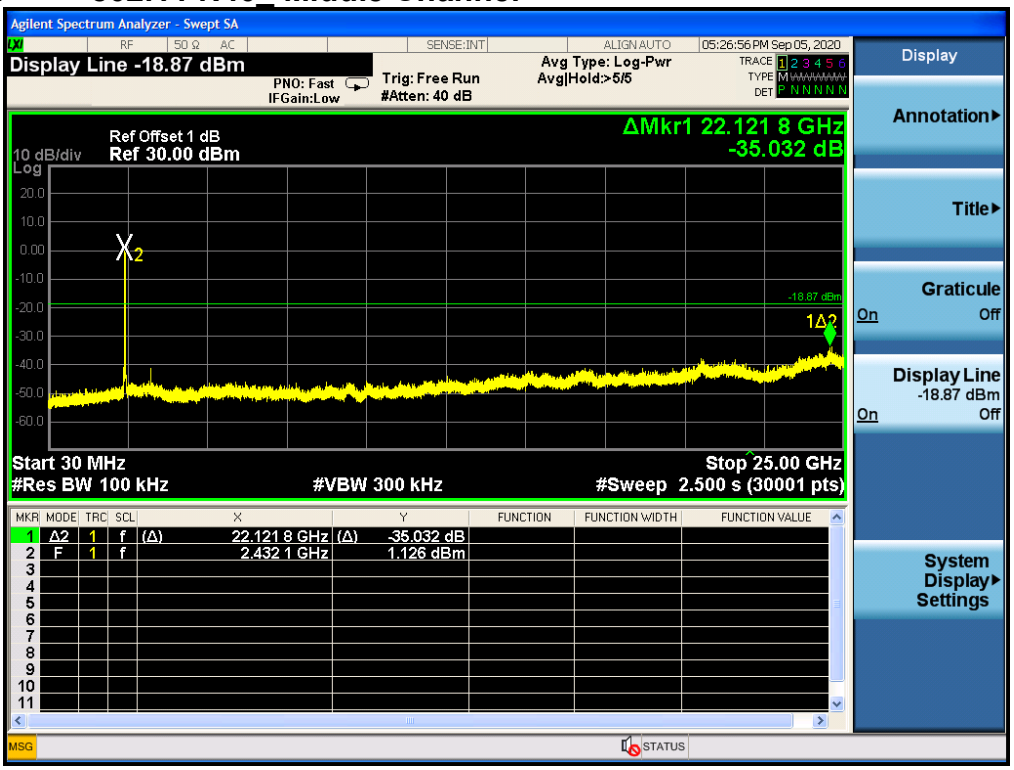
4.8.1.1.10 802.11N40_Lowest Channel



4.8.1.1.11 802.11 N40_ Middle Channel



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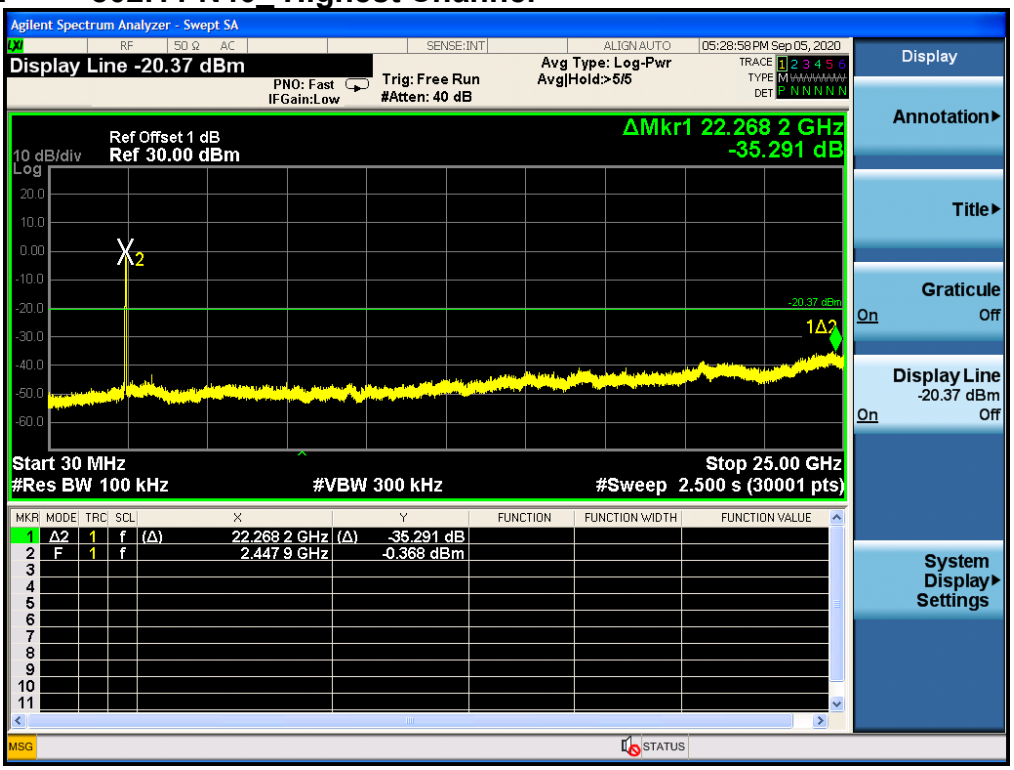
4.8.1.1.12 802.11 N40_ Highest Channel



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 or 10m (Semi-Anechoic Chamber)				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
	0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
	0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
	0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
	0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	100 kHz	300kHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz	Average
Limit:	Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz-88MHz	100	40.0	Quasi-peak	3
	88MHz-216MHz	150	43.5	Quasi-peak	3
	216MHz-960MHz	200	46.0	Quasi-peak	3
	960MHz-1GHz	500	54.0	Quasi-peak	3
	Above 1GHz	500	54.0	Average	3
	Remark: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.				

Test Setup:	

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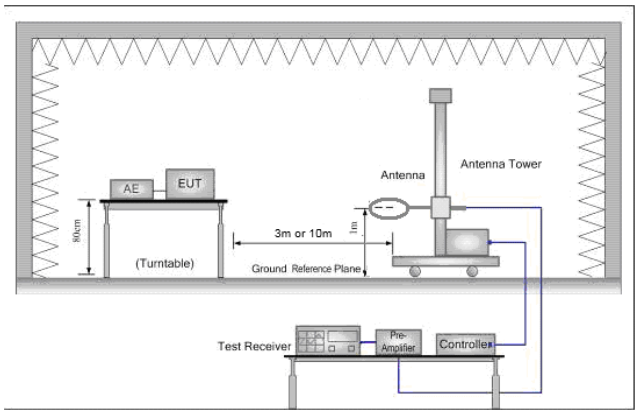

Figure 1. Below 30MHz

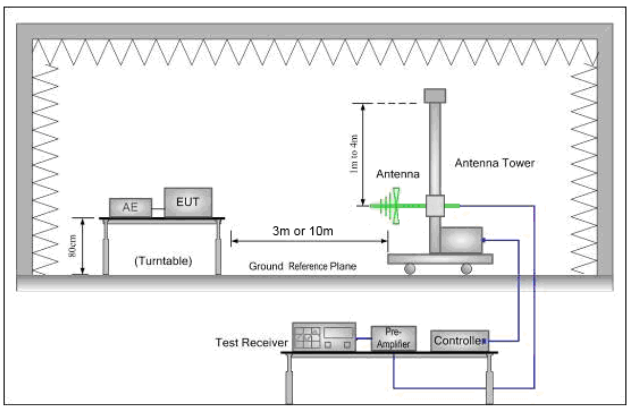

Figure 2. 30MHz to 1GHz

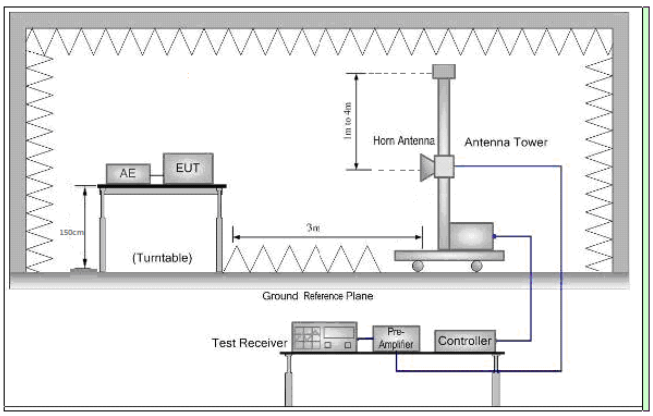

Figure 3. Above 1 GHz

Test Procedure:	a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. e. Use the following spectrum analyzer settings: (1) Span shall wide enough to fully capture the emission being measured; (2) Set RBW=100 kHz for f < 1 GHz, RBW=1MHz for f>1GHz ; VBW ⩾ RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak (3) For average measurement: use duty cycle correction factor method per 15.35(c). Duty cycle = On time/100 milliseconds

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	On time = N 1 *L 1 +N 2 *L 2 +...+N n-1 *LN n-1 +N n *L n Where N 1 is number of type 1 pulses, L 1 is length of type 1 pulses, etc. Average Emission Level = Peak Emission Level + 20*log(Duty cycl f. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters(for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. g. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. h. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. i. Test the EUT in the lowest channel, the middle channel ,the Highest channel j. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, And found the X axis positioning which it is worse case. k. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Charge + Transmitting mode.
Final Test Mode:	Pretest the EUT at Charge + Transmitting mode. Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11B; 6Mbps of rate is the worst case of 802.11G; 6.5Mbps of rate is the worst case of 802.11N(HT20); 13.5Mbps of rate is the worst case of 802.11N(HT40) For below 1GHz, through Pre-scan, find the 1Mbps of rate of 802.11B at lowest channel is the worst case. Only the worst case is recorded in the report.
Instruments Used:	Refer to section 5.10 for details
Test Results:	Pass

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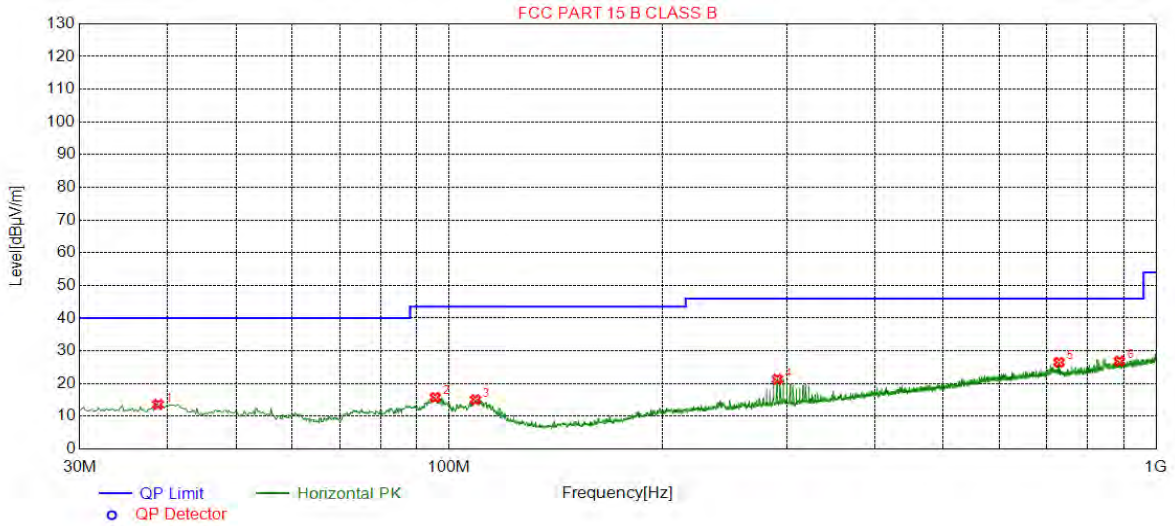
4.9.1 Radiated emission below 1GHz

4.9.1.1 Charge + Transmitting, Vertical

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	38.7317	13.64	-28.75	40.00	26.36	148	229	Horizontal
2	95.5851	15.80	-32.79	43.50	27.70	220	329	Horizontal
3	108.973	15.09	-32.00	43.50	28.41	166	346	Horizontal
4	291.176	21.37	-28.60	46.00	24.63	188	267	Horizontal
5	729.121	26.52	-18.82	46.00	19.48	190	360	Horizontal
6	887.263	26.86	-16.25	46.00	19.14	215	144	Horizontal

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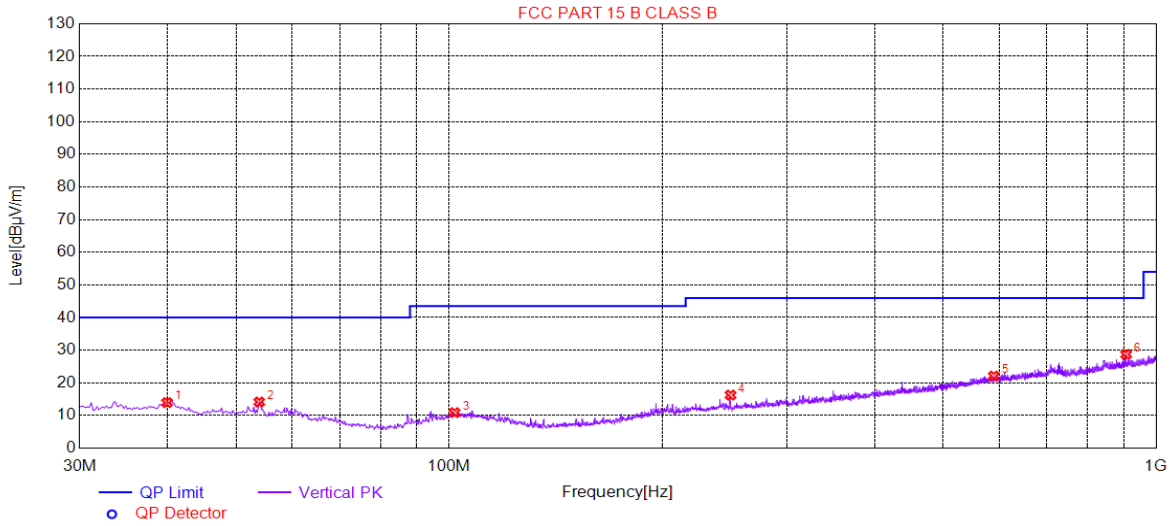
Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	39.8960	13.96	-28.37	40.00	26.04	193	72	Vertical
2	53.8668	14.15	-30.95	40.00	25.85	233	292	Vertical
3	101.794	10.90	-32.00	43.50	32.60	258	232	Vertical
4	250.040	16.28	-29.66	46.00	29.72	211	31	Vertical
5	589.413	22.11	-20.93	46.00	23.89	264	22	Vertical
6	907.055	28.73	-15.95	46.00	17.27	263	14	Vertical

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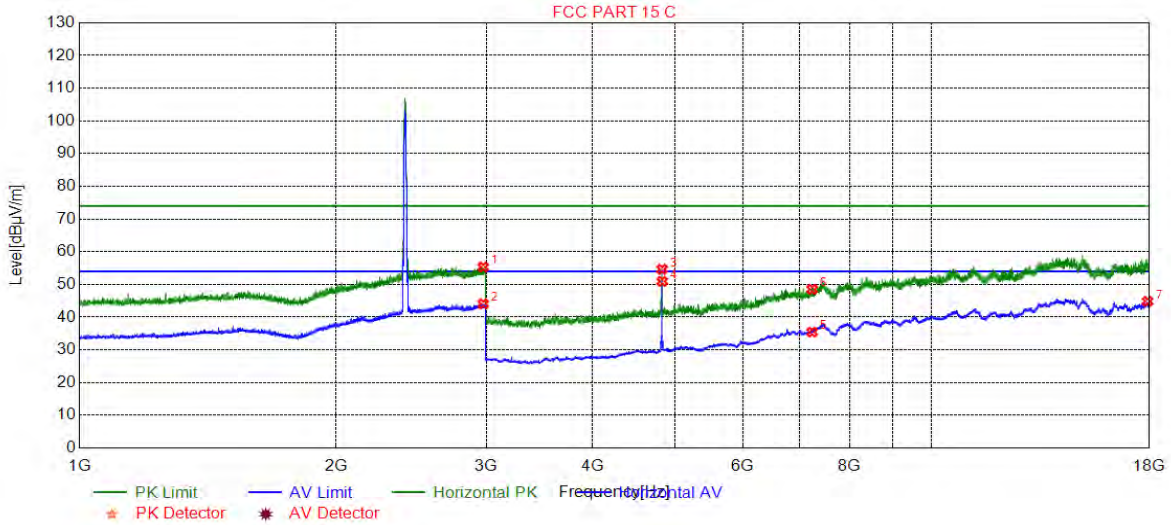
4.9.2 Transmitter emission above 1GHz

4.9.2.1 802.11B_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2975.99	55.30	9.56	74.00	18.70	116	2	Horizontal
2	2975.99	44.09	9.56	54.00	9.91	162	26	Horizontal
3	4824.00	54.66	-18.21	74.00	19.34	155	181	Horizontal
4	4825.68	50.98	-18.21	54.00	3.02	179	154	Horizontal
5	7236.00	35.47	-9.76	54.00	18.53	163	208	Horizontal
6	7236.00	48.54	-9.76	74.00	25.46	138	126	Horizontal
7	17906.9	44.84	-1.31	54.00	9.16	224	235	Horizontal

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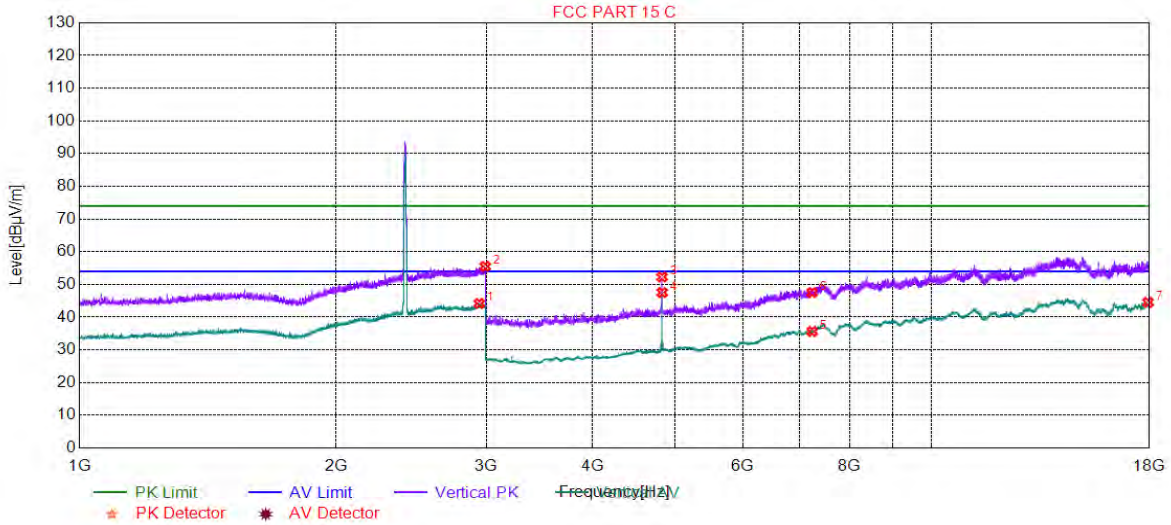
4.9.2.2 802.11B_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2943.98	44.21	9.62	54.00	9.79	218	72	Vertical
2	2991.99	55.54	9.49	74.00	18.46	286	236	Vertical
3	4824.00	52.30	-18.21	74.00	21.70	252	124	Vertical
4	4825.68	47.55	-18.21	54.00	6.45	252	124	Vertical
5	7236.00	35.64	-9.76	54.00	18.36	213	234	Vertical
6	7236.00	47.52	-9.76	74.00	26.48	163	315	Vertical
7	17926.4	44.54	-1.30	54.00	9.46	222	234	Vertical

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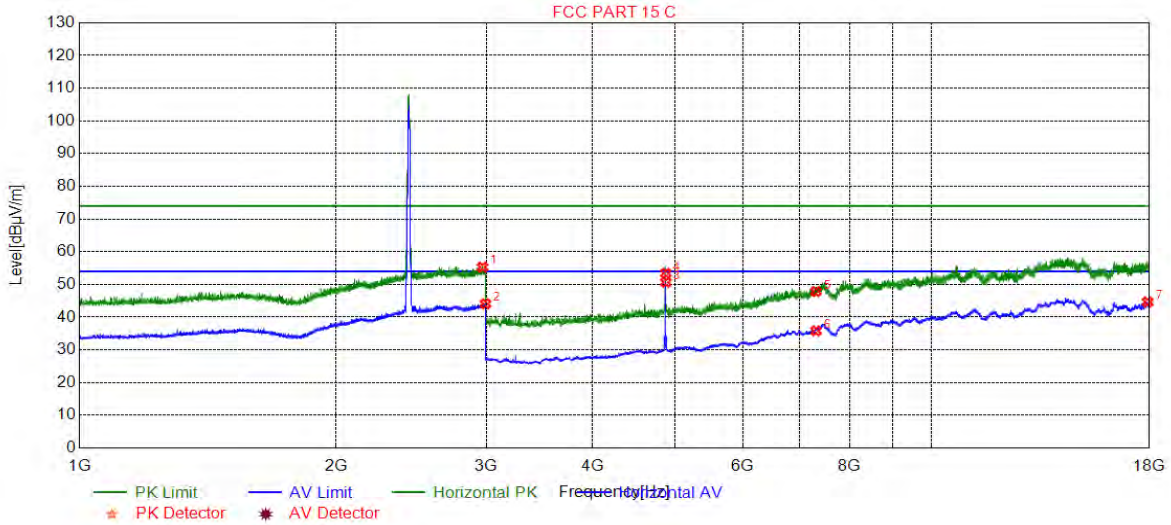
4.9.2.3 802.11B_Channel 6

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2969.99	55.30	9.59	74.00	18.70	209	329	Horizontal
2	2994.99	44.10	9.47	54.00	9.90	184	342	Horizontal
3	4874.00	50.68	-17.99	54.00	3.32	124	18	Horizontal
4	4874.00	53.44	-17.99	74.00	20.56	234	45	Horizontal
5	7311.00	47.84	-9.59	74.00	26.16	183	342	Horizontal
6	7311.00	35.81	-9.59	54.00	18.19	140	234	Horizontal
7	17911.4	44.66	-1.31	54.00	9.34	163	261	Horizontal

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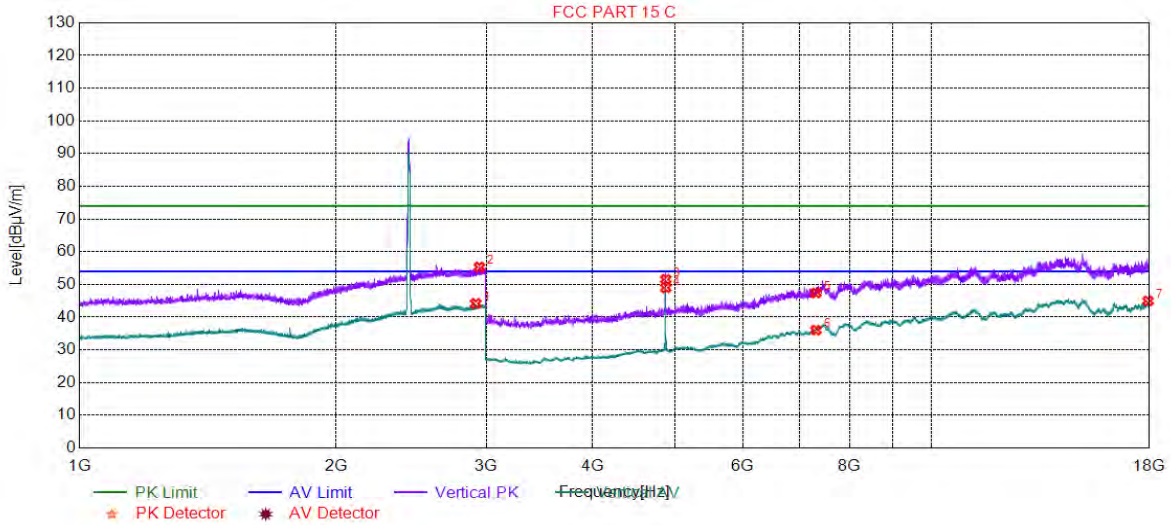
4.9.2.4 802.11B_Channel 6

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2916.47	44.18	9.32	54.00	9.82	224	345	Vertical
2	2944.98	55.31	9.63	74.00	18.69	214	127	Vertical
3	4874.00	51.58	-17.99	74.00	22.42	234	123	Vertical
4	4874.00	48.98	-17.99	54.00	5.02	159	123	Vertical
5	7311.00	47.40	-9.59	74.00	26.60	282	342	Vertical
6	7311.00	36.04	-9.59	54.00	17.96	271	178	Vertical
7	17930.9	44.98	-1.30	54.00	9.02	288	96	Vertical

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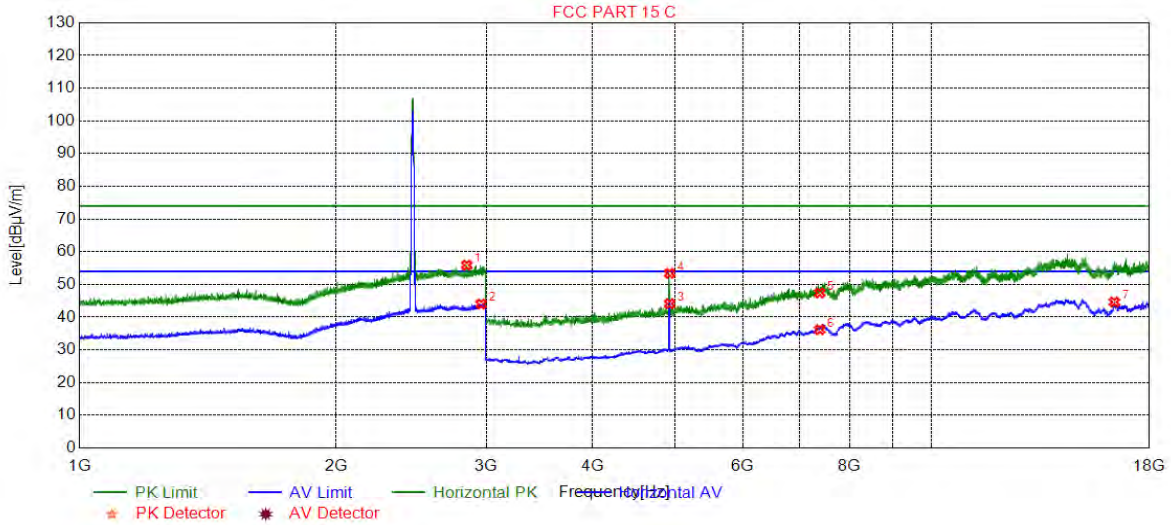
4.9.2.5 802.11B_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2846.46	55.90	9.22	74.00	18.10	162	247	Horizontal
2	2958.48	44.01	9.64	54.00	9.99	231	233	Horizontal
3	4924.00	44.12	-17.71	54.00	9.88	232	18	Horizontal
4	4924.00	53.42	-17.71	74.00	20.58	198	45	Horizontal
5	7386.00	47.42	-9.20	74.00	26.58	130	264	Horizontal
6	7386.00	36.20	-9.20	54.00	17.80	186	291	Horizontal
7	16370.8	44.63	-1.00	54.00	9.37	215	181	Horizontal

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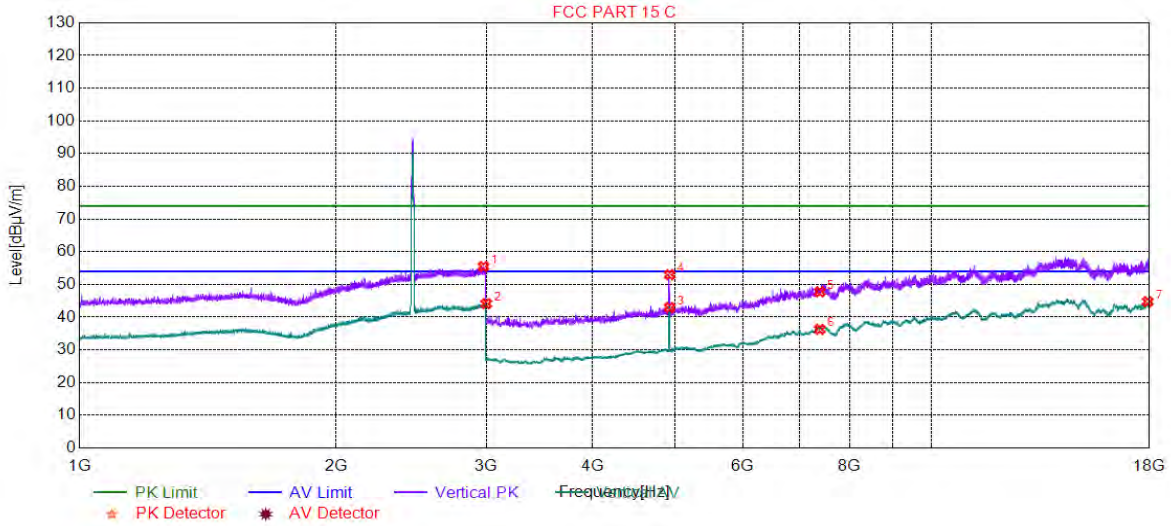
4.9.2.6 802.11B_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2978.49	55.48	9.55	74.00	18.52	185	194	Vertical
2	3000.00	44.12	9.45	54.00	9.88	293	290	Vertical
3	4924.00	42.96	-17.71	54.00	11.04	262	121	Vertical
4	4924.00	52.98	-17.71	74.00	21.02	260	121	Vertical
5	7386.00	47.75	-9.20	74.00	26.25	214	12	Vertical
6	7386.00	36.28	-9.20	54.00	17.72	205	176	Vertical
7	17912.9	44.76	-1.31	54.00	9.24	226	12	Vertical

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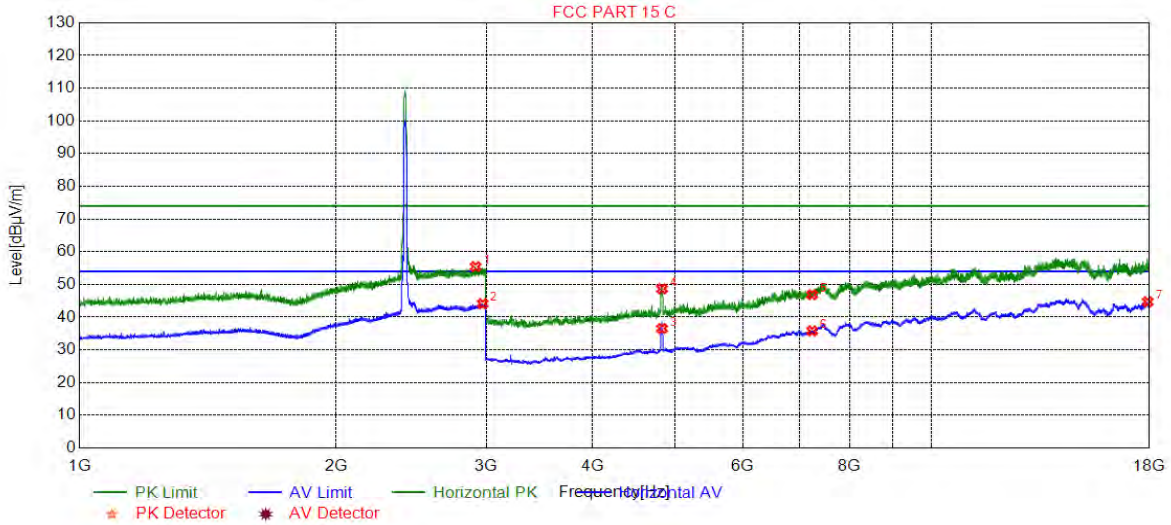
4.9.2.7 802.11G_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2915.47	55.43	9.31	74.00	18.57	153	40	Horizontal
2	2971.49	44.10	9.58	54.00	9.90	164	287	Horizontal
3	4824.00	36.52	-18.21	54.00	17.48	210	360	Horizontal
4	4824.00	48.70	-18.21	74.00	25.30	178	180	Horizontal
5	7236.00	46.87	-9.76	74.00	27.13	162	180	Horizontal
6	7236.00	35.81	-9.76	54.00	18.19	236	71	Horizontal
7	17912.9	44.70	-1.31	54.00	9.30	173	262	Horizontal

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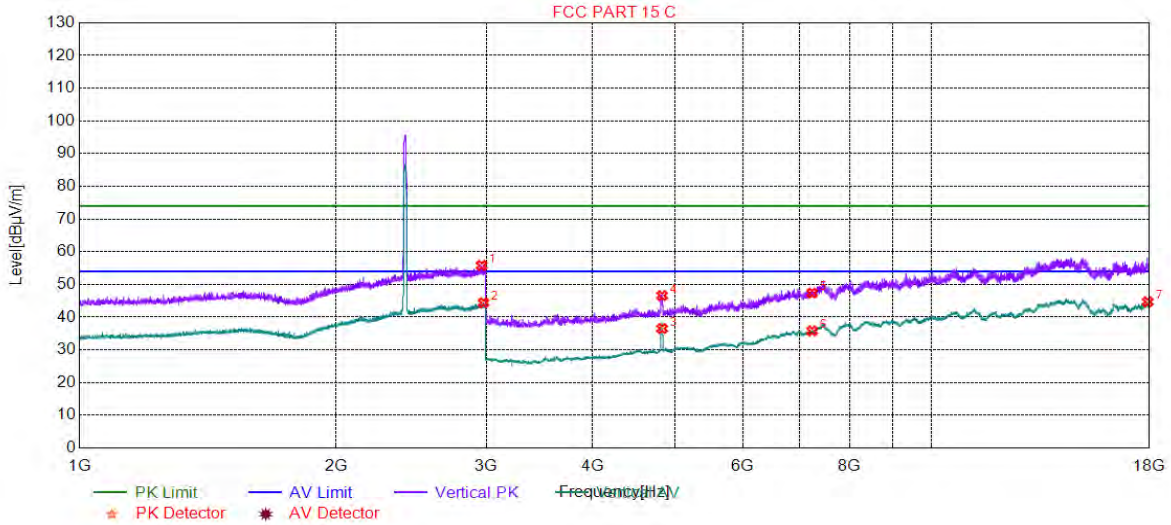
4.9.2.8 802.11G_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2963.99	55.82	9.62	74.00	18.18	194	345	Vertical
2	2978.49	44.43	9.55	54.00	9.57	246	127	Vertical
3	4824.00	36.52	-18.21	54.00	17.48	186	360	Horizontal
4	4824.00	46.59	-18.21	74.00	27.41	276	120	Vertical
5	7236.00	47.38	-9.76	74.00	26.62	260	234	Vertical
6	7236.00	35.81	-9.76	54.00	18.19	195	71	Horizontal
7	17912.9	44.70	-1.31	54.00	9.30	226	262	Horizontal

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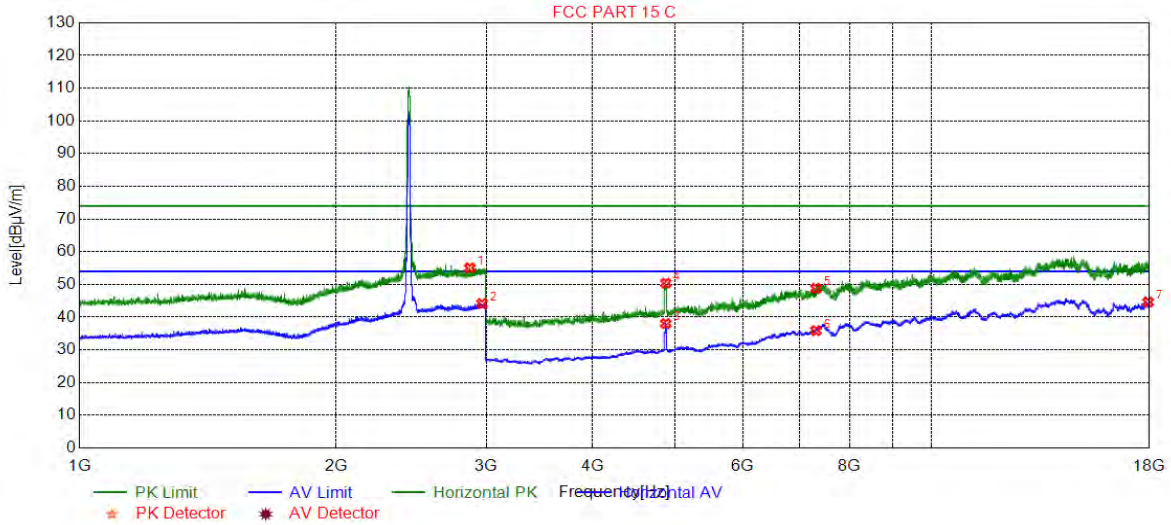
4.9.2.9 802.11G_Channel 6

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2869.96	55.08	9.20	74.00	18.92	101	288	Horizontal
2	2965.99	44.15	9.61	54.00	9.85	136	84	Horizontal
3	4874.00	38.06	-17.99	54.00	15.94	160	360	Horizontal
4	4874.00	50.40	-17.99	74.00	23.60	131	45	Horizontal
5	7311.00	48.81	-9.59	74.00	25.19	189	127	Horizontal
6	7311.00	35.88	-9.59	54.00	18.12	129	344	Horizontal
7	17930.9	44.63	-1.30	54.00	9.37	182	45	Horizontal

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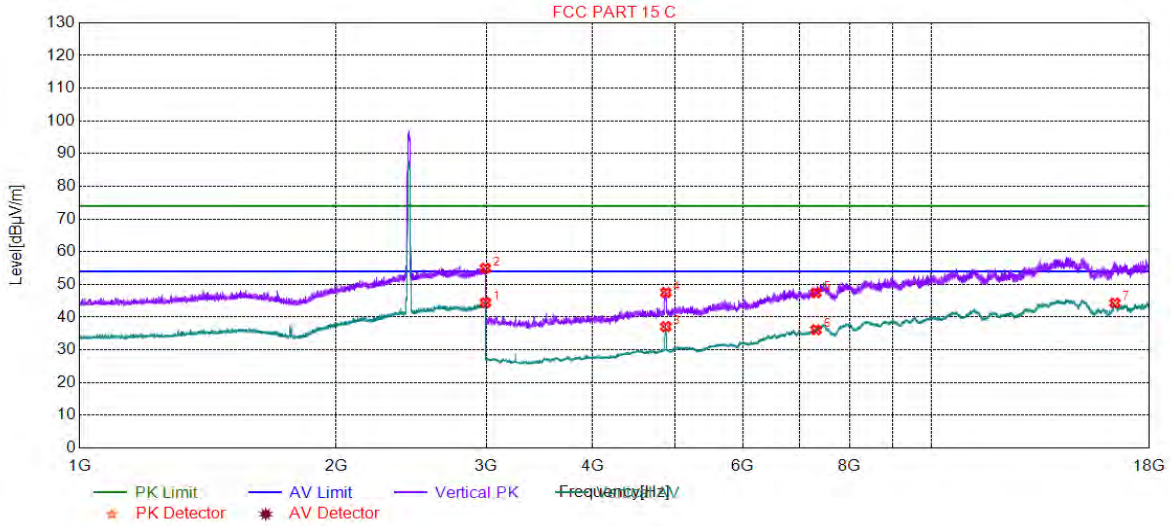
4.9.2.10 802.11G_Channel 6

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2993.99	44.45	9.48	54.00	9.55	292	127	Vertical
2	2994.49	54.97	9.48	74.00	19.03	261	182	Vertical
3	4874.00	37.10	-17.99	54.00	16.90	273	124	Vertical
4	4874.00	47.55	-17.99	74.00	26.45	152	124	Vertical
5	7311.00	47.46	-9.59	74.00	26.54	180	288	Vertical
6	7311.00	36.16	-9.59	54.00	17.84	206	179	Vertical
7	16396.3	44.35	-1.11	54.00	9.65	272	342	Vertical

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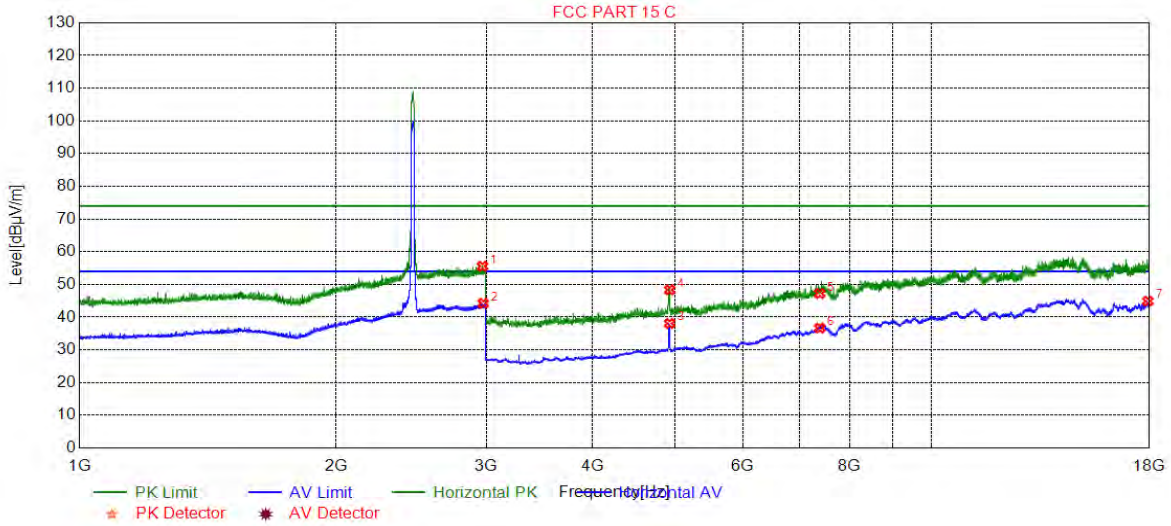
4.9.2.11 802.11G_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2969.99	55.57	9.59	74.00	18.43	139	3	Horizontal
2	2976.49	44.22	9.56	54.00	9.78	190	329	Horizontal
3	4924.00	38.10	-17.71	54.00	15.90	197	18	Horizontal
4	4924.00	48.37	-17.71	74.00	25.63	158	45	Horizontal
5	7386.00	47.25	-9.20	74.00	26.75	169	263	Horizontal
6	7386.00	36.68	-9.20	54.00	17.32	116	18	Horizontal
7	17920.4	44.92	-1.30	54.00	9.08	213	318	Horizontal

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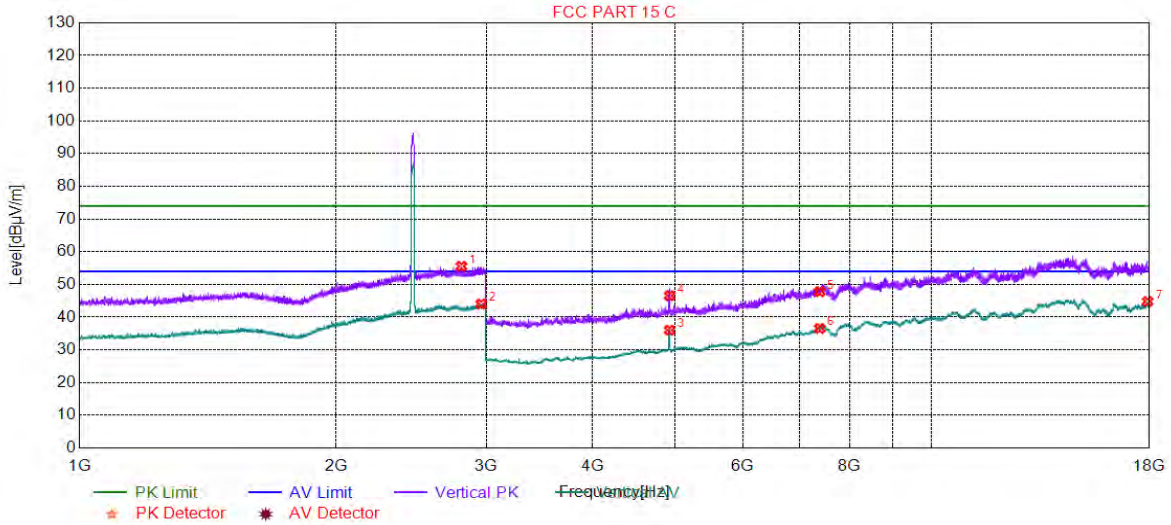
4.9.2.12 802.11G_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2805.95	55.56	9.01	74.00	18.44	179	168	Vertical
2	2958.98	44.05	9.64	54.00	9.95	247	128	Vertical
3	4924.00	36.05	-17.71	54.00	17.95	199	125	Vertical
4	4924.00	46.55	-17.71	74.00	27.45	263	98	Vertical
5	7386.00	47.81	-9.20	74.00	26.19	261	70	Vertical
6	7386.00	36.56	-9.20	54.00	17.44	288	315	Vertical
7	17909.9	44.79	-1.31	54.00	9.21	265	98	Vertical

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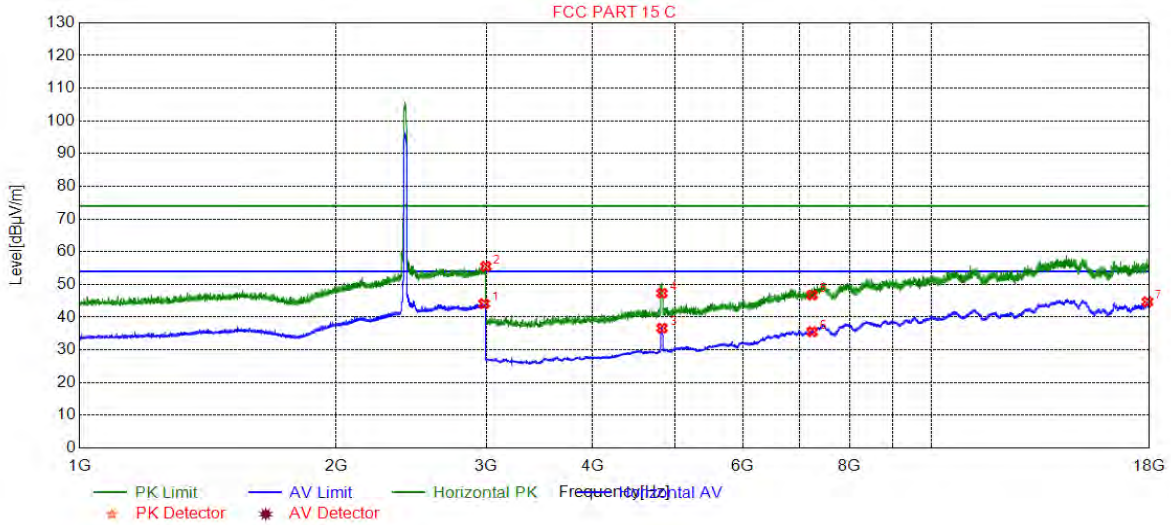
4.9.2.13 802.11N20_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2982.99	44.12	9.53	54.00	9.88	136	124	Horizontal
2	2996.49	55.52	9.47	74.00	18.48	130	342	Horizontal
3	4824.00	36.64	-18.21	54.00	17.36	145	152	Horizontal
4	4824.00	47.31	-18.21	74.00	26.69	203	360	Horizontal
5	7236.00	46.77	-9.76	74.00	27.23	105	126	Horizontal
6	7236.00	35.58	-9.76	54.00	18.42	128	44	Horizontal
7	17900.9	44.69	-1.31	54.00	9.31	205	207	Horizontal

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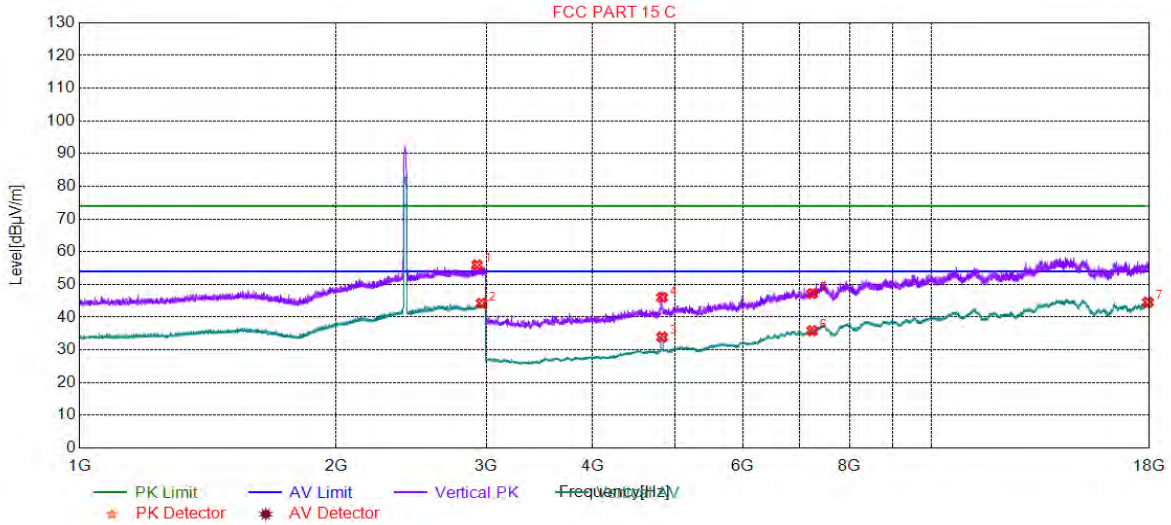
4.9.2.14 802.11N20_Channel 1

Test Graph



Suspected List

Suspected List								
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1	2926.48	55.98	9.43	74.00	18.02	156	206	Vertical
2	2962.49	44.28	9.62	54.00	9.72	293	220	Vertical
3	4824.00	33.94	-18.21	54.00	20.06	155	124	Vertical
4	4824.00	46.06	-18.21	74.00	27.94	163	96	Vertical
5	7236.00	47.21	-9.76	74.00	26.79	224	0	Vertical
6	7236.00	35.86	-9.76	54.00	18.14	154	124	Vertical
7	17924.9	44.59	-1.30	54.00	9.41	227	42	Vertical

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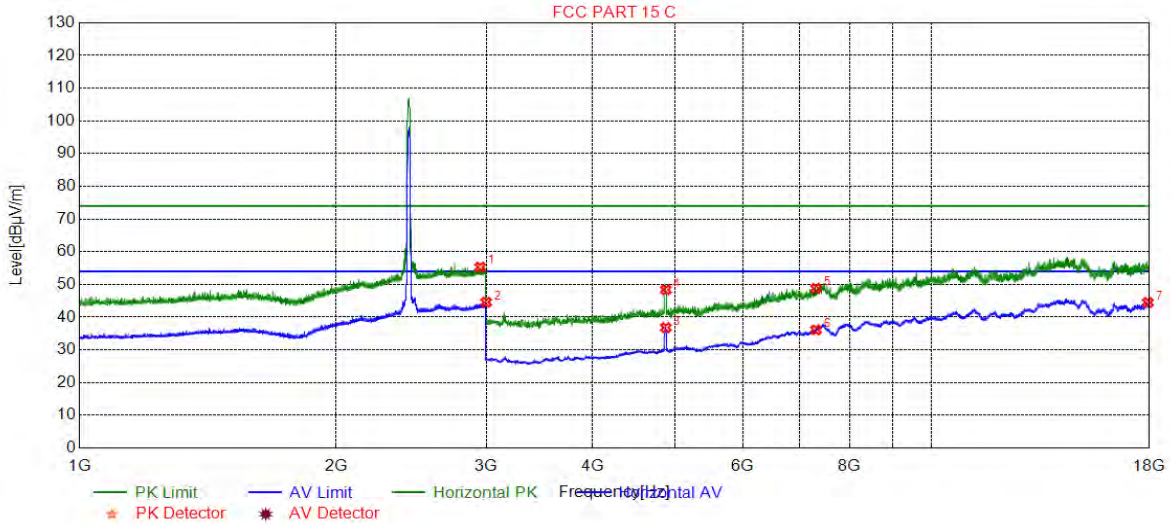
4.9.2.15 802.11N20_Channel 6

Test Graph



Suspected List

Suspected List								
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1	2951.48	55.31	9.67	74.00	18.69	108	69	Horizontal
2	2999.49	44.56	9.45	54.00	9.44	148	274	Horizontal
3	4874.00	36.81	-17.99	54.00	17.19	168	18	Horizontal
4	4874.00	48.37	-17.99	74.00	25.63	204	44	Horizontal
5	7311.00	48.81	-9.59	74.00	25.19	111	18	Horizontal
6	7311.00	36.12	-9.59	54.00	17.88	147	44	Horizontal
7	17921.9	44.50	-1.30	54.00	9.50	162	315	Horizontal

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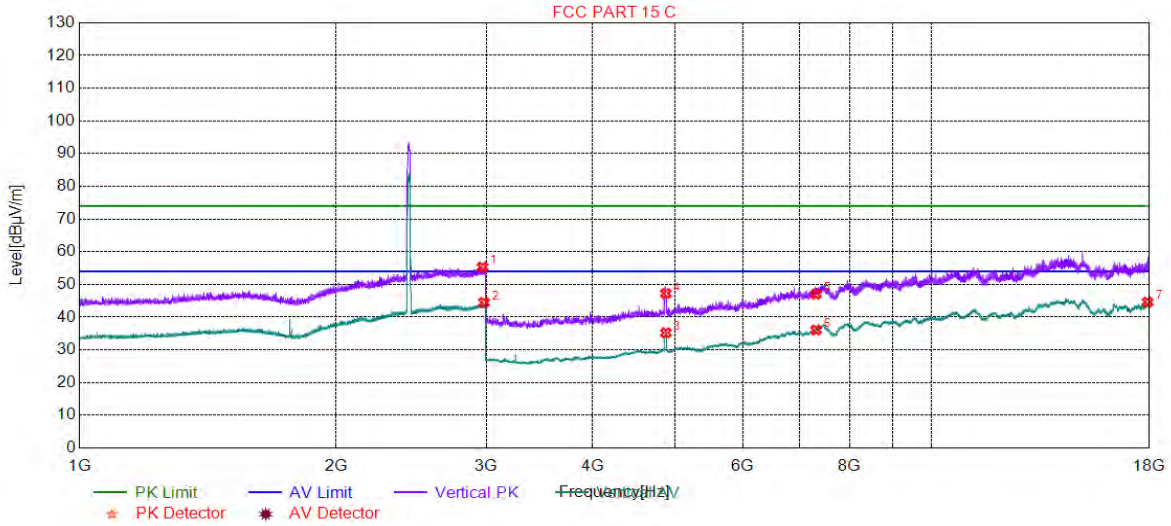
4.9.2.16 802.11N20_Channel 6

Test Graph



Suspected List

Suspected List								
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1	2969.99	55.30	9.59	74.00	18.70	175	45	Vertical
2	2982.49	44.52	9.53	54.00	9.48	229	45	Vertical
3	4874.00	35.24	-17.99	54.00	18.76	238	125	Vertical
4	4874.00	47.25	-17.99	74.00	26.75	204	98	Vertical
5	7311.00	47.06	-9.59	74.00	26.94	299	0	Vertical
6	7311.00	36.09	-9.59	54.00	17.91	159	0	Vertical
7	17909.9	44.62	-1.31	54.00	9.38	182	71	Vertical

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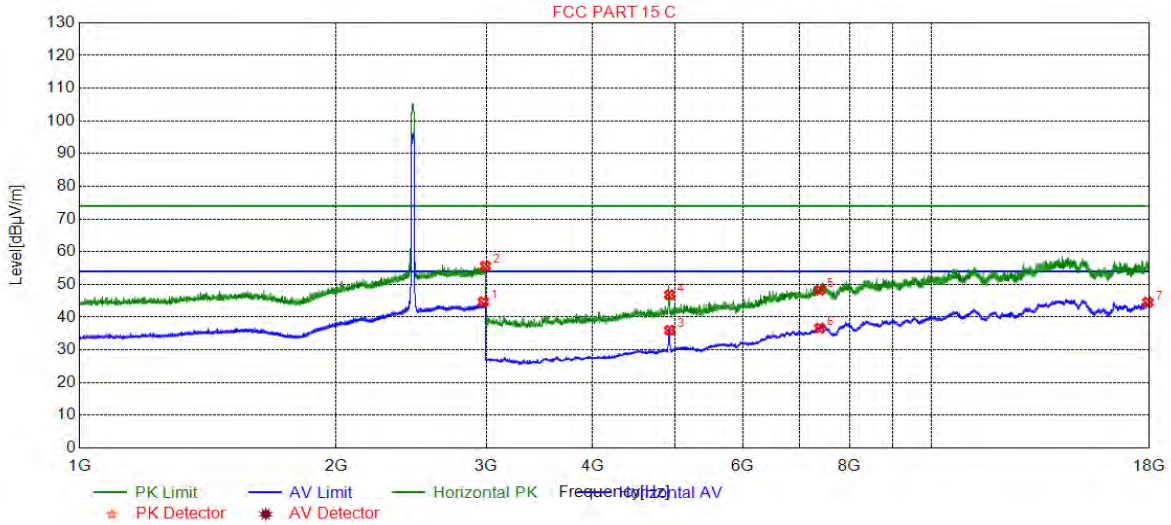
4.9.2.17 802.11N20_Channel 11

Test Graph



Suspected List

Suspected List								
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1	2976.49	44.73	9.56	54.00	9.27	246	138	Horizontal
2	2993.99	55.62	9.48	74.00	18.38	175	328	Horizontal
3	4924.00	36.04	-17.71	54.00	17.96	224	18	Horizontal
4	4924.00	46.86	-17.71	74.00	27.14	143	18	Horizontal
5	7386.00	48.28	-9.20	74.00	25.72	189	344	Horizontal
6	7386.00	36.67	-9.20	54.00	17.33	248	45	Horizontal
7	17917.4	44.58	-1.30	54.00	9.42	184	180	Horizontal

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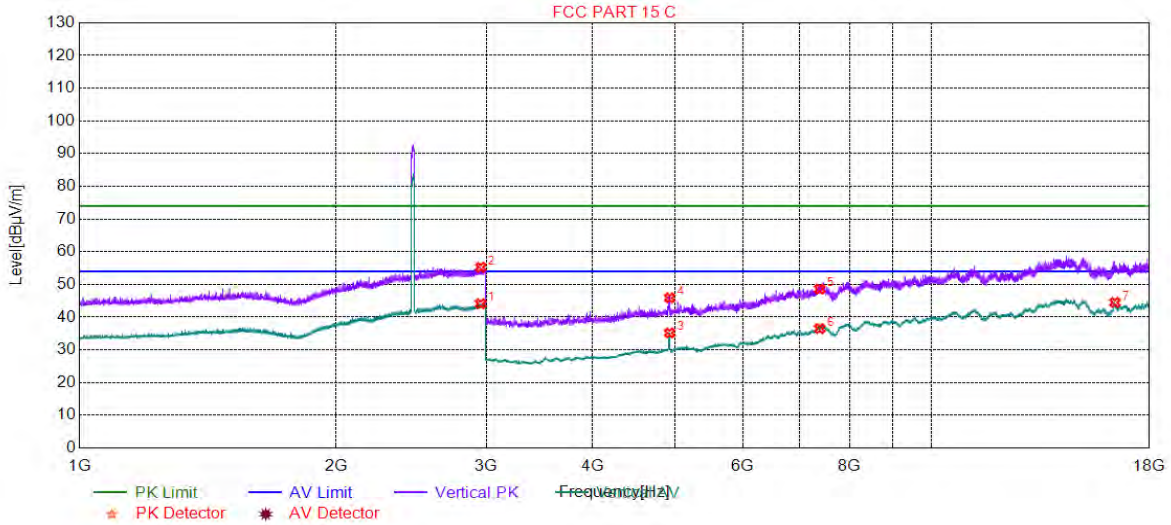
4.9.2.18 802.11N20_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2954.48	44.11	9.66	54.00	9.89	270	197	Vertical
2	2955.98	55.27	9.65	74.00	18.73	255	320	Vertical
3	4924.00	35.20	-17.71	54.00	18.80	265	122	Vertical
4	4924.00	45.92	-17.71	74.00	28.08	289	122	Vertical
5	7386.00	48.63	-9.20	74.00	25.37	182	177	Vertical
6	7386.00	36.50	-9.20	54.00	17.50	253	40	Vertical
7	16394.8	44.52	-1.10	54.00	9.48	262	150	Vertical

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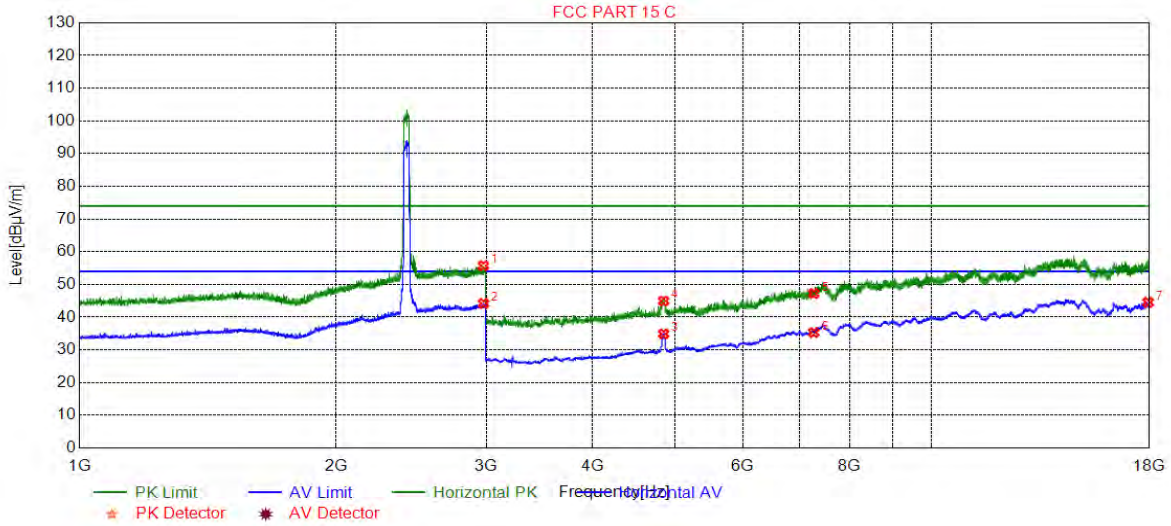
4.9.2.19 802.11N40_Channel 3

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2977.49	55.76	9.55	74.00	18.24	105	192	Horizontal
2	2978.49	44.21	9.55	54.00	9.79	173	0	Horizontal
3	4844.00	34.91	-18.12	54.00	19.09	223	155	Horizontal
4	4844.00	44.96	-18.12	74.00	29.04	111	46	Horizontal
5	7266.00	47.23	-9.71	74.00	26.77	128	155	Horizontal
6	7266.00	35.30	-9.71	54.00	18.70	170	155	Horizontal
7	17930.9	44.55	-1.30	54.00	9.45	221	18	Horizontal

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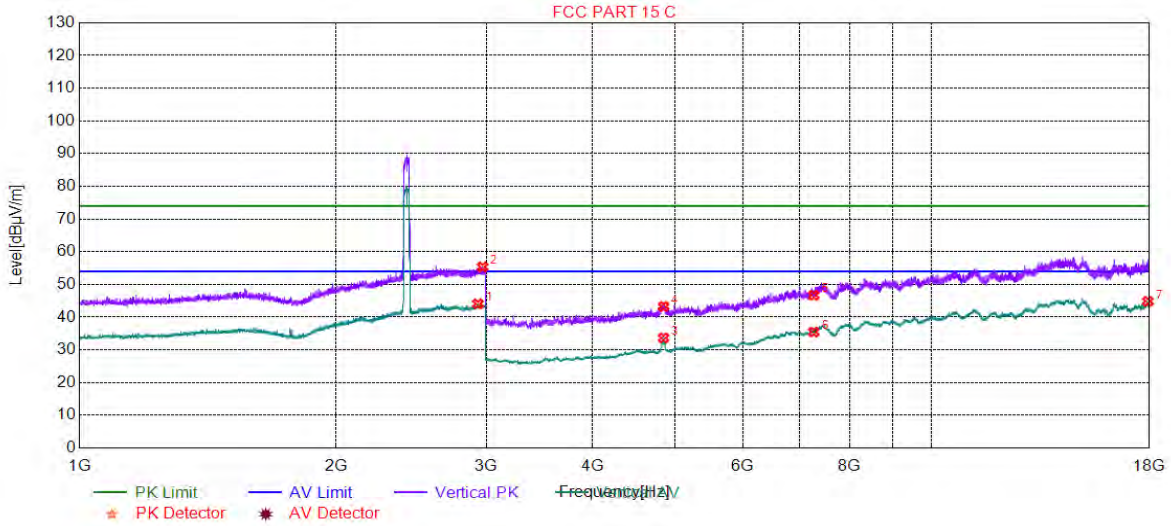
4.9.2.20 802.11N40_Channel 3

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2933.98	44.08	9.51	54.00	9.92	206	319	Vertical
2	2969.99	55.38	9.59	74.00	18.62	219	59	Vertical
3	4844.00	33.67	-18.12	54.00	20.33	175	125	Vertical
4	4844.00	43.27	-18.12	74.00	30.73	232	98	Vertical
5	7266.00	46.71	-9.71	74.00	27.29	276	180	Vertical
6	7266.00	35.47	-9.71	54.00	18.53	222	44	Vertical
7	17918.9	44.85	-1.30	54.00	9.15	278	261	Vertical

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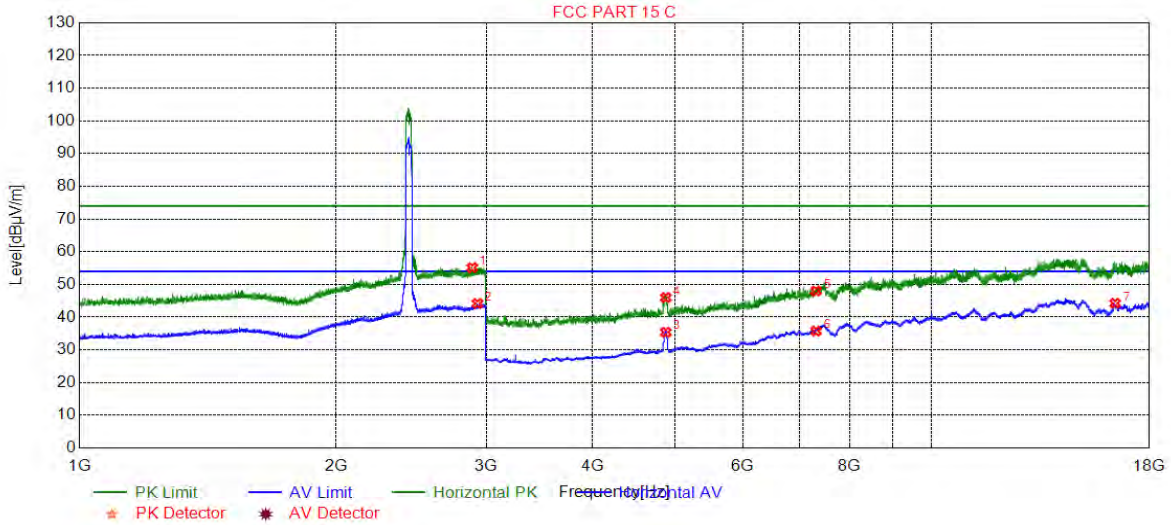
4.9.2.21 802.11N40_Channel 6

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2888.47	55.14	9.16	74.00	18.86	140	208	Horizontal
2	2930.48	44.18	9.47	54.00	9.82	212	220	Horizontal
3	4874.00	35.39	-17.99	54.00	18.61	122	153	Horizontal
4	4874.00	46.00	-17.99	74.00	28.00	194	71	Horizontal
5	7311.00	48.02	-9.59	74.00	25.98	193	317	Horizontal
6	7311.00	35.77	-9.59	54.00	18.23	233	181	Horizontal
7	16403.8	44.26	-1.10	54.00	9.74	103	18	Horizontal

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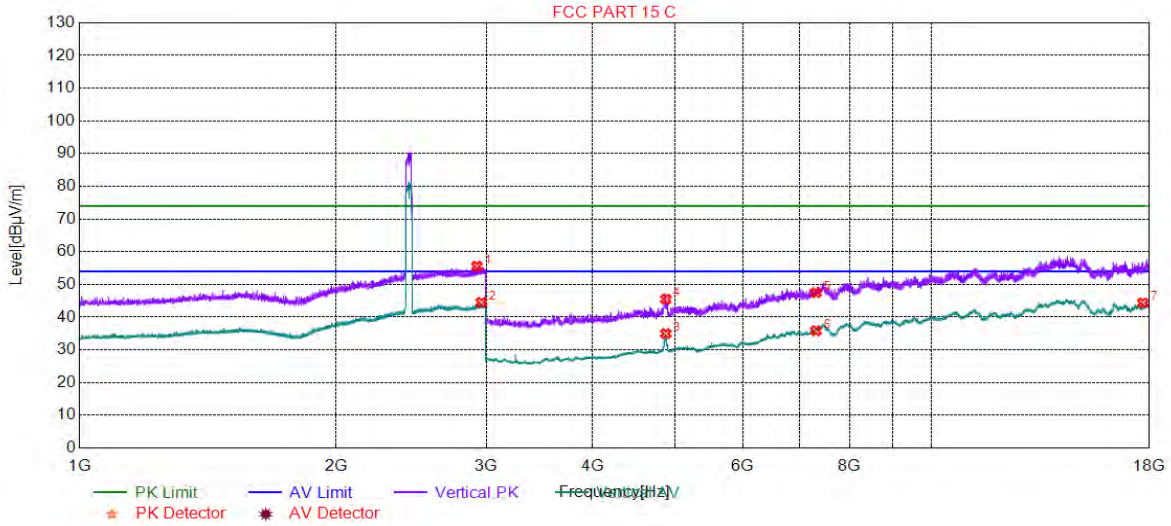
4.9.2.22 802.11N40_Channel 6

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2925.48	55.58	9.42	74.00	18.42	150	140	Vertical
2	2960.99	44.51	9.63	54.00	9.49	160	113	Vertical
3	4874.00	35.00	-17.99	54.00	19.00	274	123	Vertical
4	4874.00	45.48	-17.99	74.00	28.52	157	123	Vertical
5	7311.00	47.48	-9.59	74.00	26.52	223	96	Vertical
6	7311.00	35.85	-9.59	54.00	18.15	286	178	Vertical
7	17683.4	44.39	-0.65	54.00	9.61	204	14	Vertical

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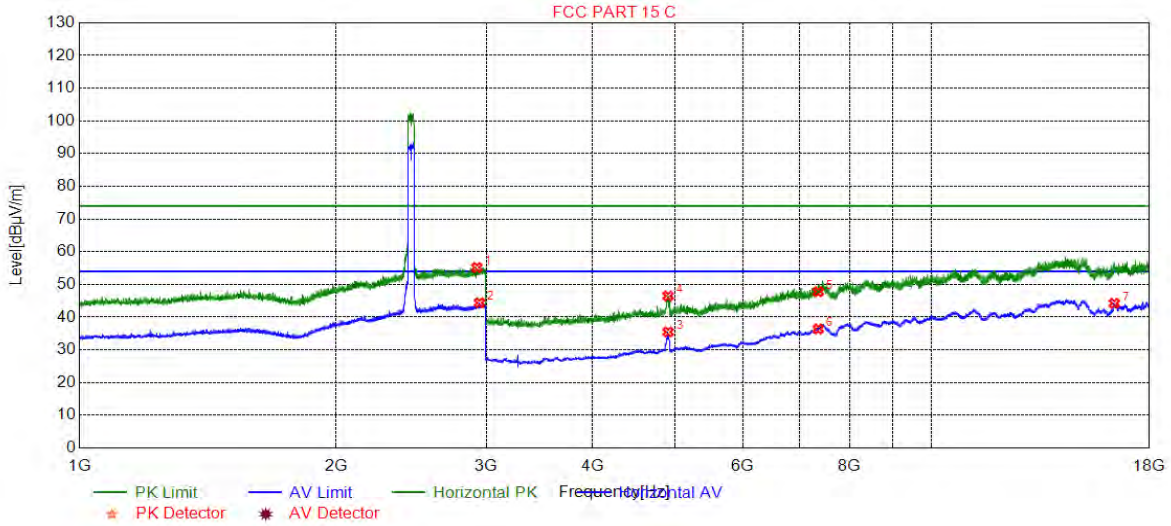
4.9.2.23 802.11N40_Channel 9

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2924.98	55.20	9.41	74.00	18.80	149	3	Horizontal
2	2946.48	44.40	9.64	54.00	9.60	143	151	Horizontal
3	4904.00	35.50	-17.84	54.00	18.50	136	18	Horizontal
4	4904.00	46.48	-17.84	74.00	27.52	249	45	Horizontal
5	7356.00	47.78	-9.36	74.00	26.22	120	344	Horizontal
6	7356.00	36.39	-9.36	54.00	17.61	108	45	Horizontal
7	16366.3	44.23	-0.99	54.00	9.77	249	18	Horizontal

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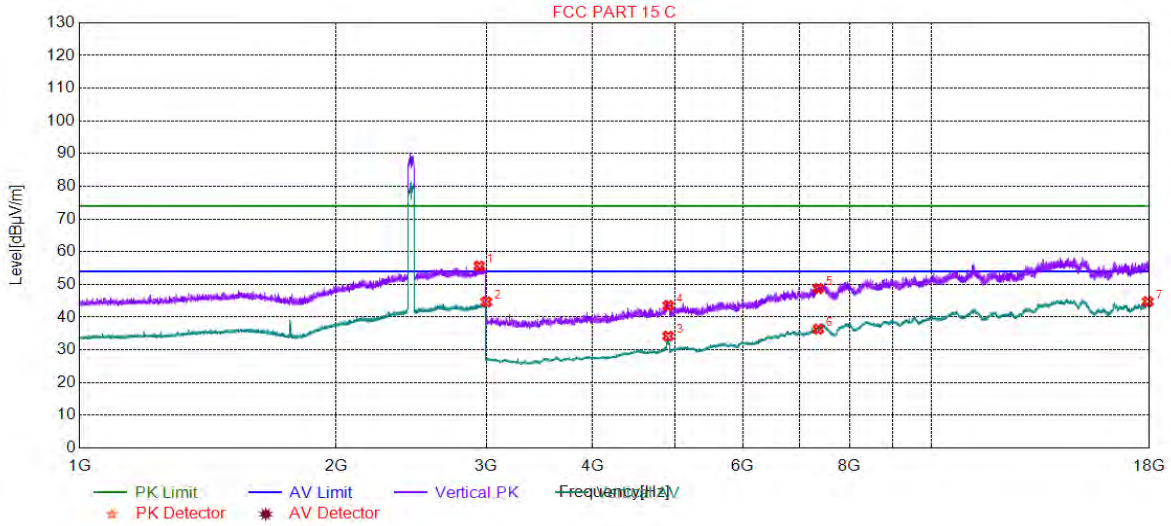
4.9.2.24 802.11N40_Channel 9

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2943.98	55.65	9.62	74.00	18.35	262	190	Vertical
2	3000.00	44.69	9.45	54.00	9.31	259	300	Vertical
3	4904.00	34.21	-17.84	54.00	19.79	255	125	Vertical
4	4904.00	43.52	-17.84	74.00	30.48	251	98	Vertical
5	7356.00	48.76	-9.36	74.00	25.24	261	16	Vertical
6	7356.00	36.36	-9.36	54.00	17.64	225	288	Vertical
7	17911.4	44.75	-1.31	54.00	9.25	244	70	Vertical

Final Data List

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

   Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

2) Scan from 9kHz to 25GHz, the disturbance between 9KHz to 30MHz and 18GHz to 25GHz was very low, and the above harmonics were the highest point could be found when testing, The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

3）As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.

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

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4.10 Restricted bands around fundamental frequency

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205		
Test Method:	ANSI C63.10: 2013 Section 11.12		
Test Site:	Measurement Distance: 3m or 10m (Semi-Anechoic Chamber)		
Limit:	Frequency	Limit (dBuV/m @3m)	Remark
	30MHz-88MHz	40.0	Quasi-peak Value
	88MHz-216MHz	43.5	Quasi-peak Value
	216MHz-960MHz	46.0	Quasi-peak Value
	960MHz-1GHz	54.0	Quasi-peak Value
	Above 1GHz	54.0	Average Value
		74.0	Peak Value
Test Setup:			

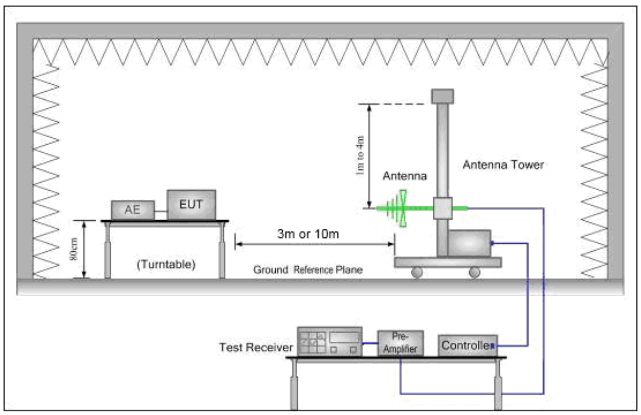

Figure 1. 30MHz to 1GHz

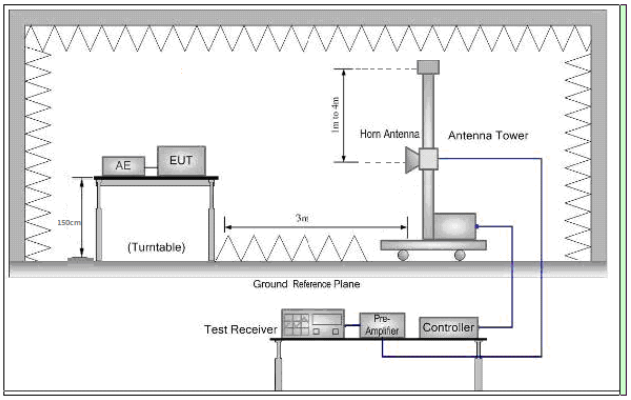

Figure 2. Above 1 GHz

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Test Procedure:	a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. g. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel h. Test the EUT in the lowest channel , the Highest channel i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode,And found the X axis positioning which it is worse case. j. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Charge + Transmitting mode.
Final Test Mode:	Pretest the EUT at Charge +Transmitting mode. Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11B; 6Mbps of rate is the worst case of 802.11G ; 6.5Mbps of rate is the worst case of 802.11N(HT20); 13.5Mbps of rate is the worst case of 802.11N(HT40). Only the worst case is recorded in the report.
Instruments Used:	Refer to section 5.10 for details
Test Results:	Pass

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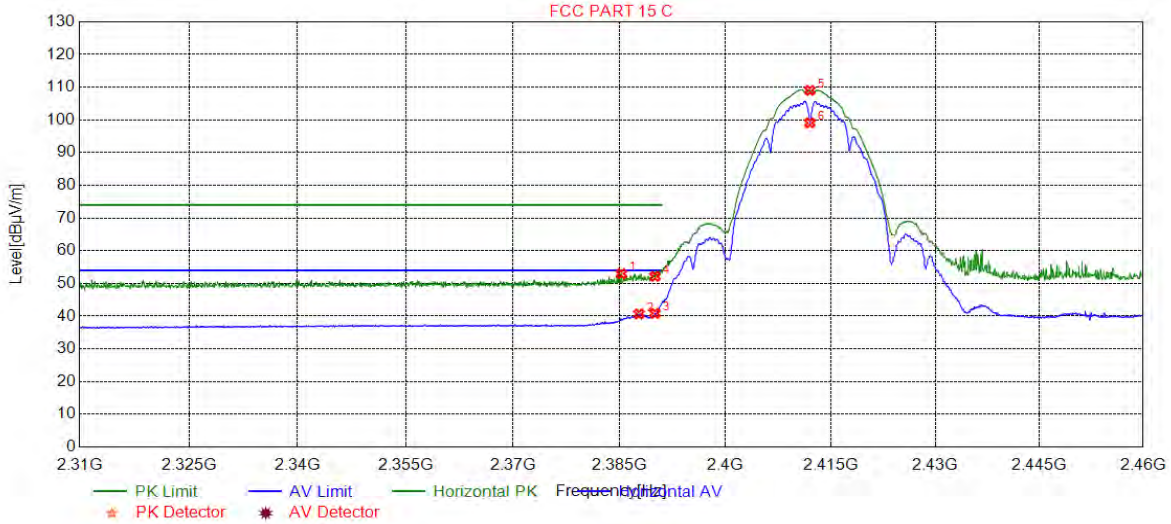
4.10.1 Test plot ANT1

4.10.1.1 802.11B_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2385.26	52.99	7.77	74.00	21.01	131	231	Horizontal
2	2387.73	40.68	7.77	54.00	13.32	197	226	Horizontal
3	2390.00	40.88	7.77	54.00	13.12	134	220	Horizontal
4	2390.00	52.19	7.77	74.00	21.81	200	231	Horizontal
5	2412.00	109.04	7.81	0.00	-109.04	184	226	Horizontal
6	2412.00	99.12	7.81	0.00	-99.12	222	220	Horizontal

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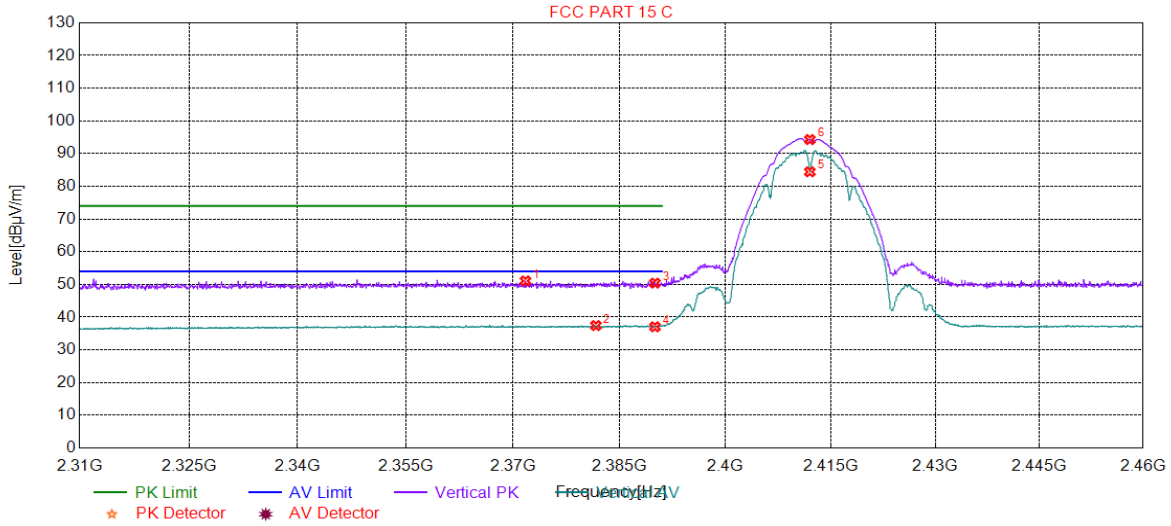
4.10.1.2 802.11B_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2371.75	51.09	7.79	74.00	22.91	240	4	Vertical
2	2381.66	37.44	7.78	54.00	16.56	255	26	Vertical
3	2390.00	50.43	7.77	74.00	23.57	278	186	Vertical
4	2390.00	37.06	7.77	54.00	16.94	240	92	Vertical
5	2412.00	84.45	7.81	0.00	-84.45	240	169	Vertical
6	2412.00	94.31	7.81	0.00	-94.31	254	169	Vertical

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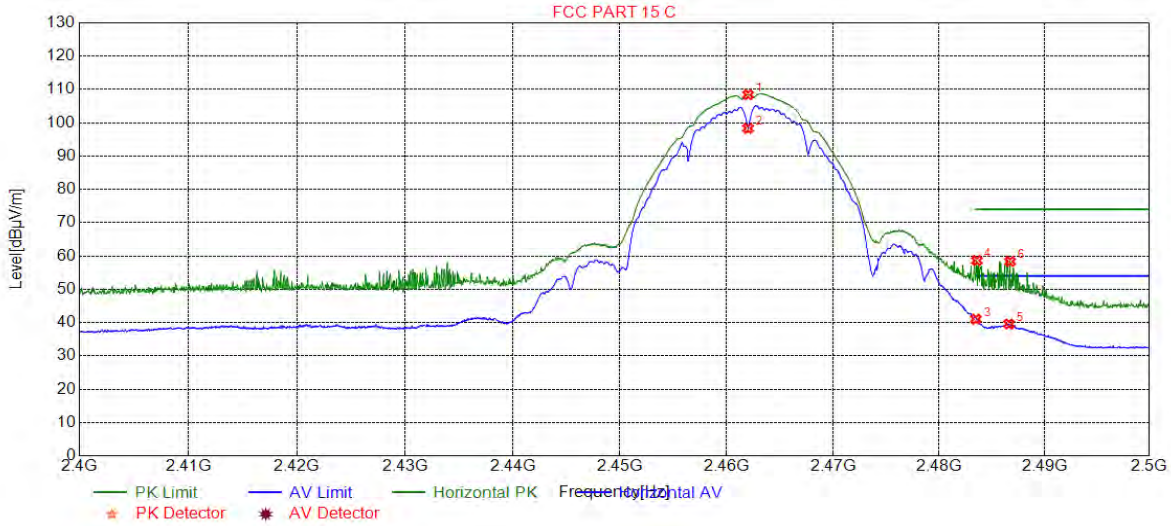
4.10.1.3 802.11B_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	108.41	7.98	0.00	-108.41	208	239	Horizontal
2	2462.00	98.32	7.98	0.00	-98.32	225	233	Horizontal
3	2483.50	41.07	8.01	54.00	12.93	182	228	Horizontal
4	2483.59	58.64	8.01	74.00	15.36	195	216	Horizontal
5	2486.64	39.61	8.01	54.00	14.39	198	228	Horizontal
6	2486.74	58.37	8.01	74.00	15.63	220	272	Horizontal

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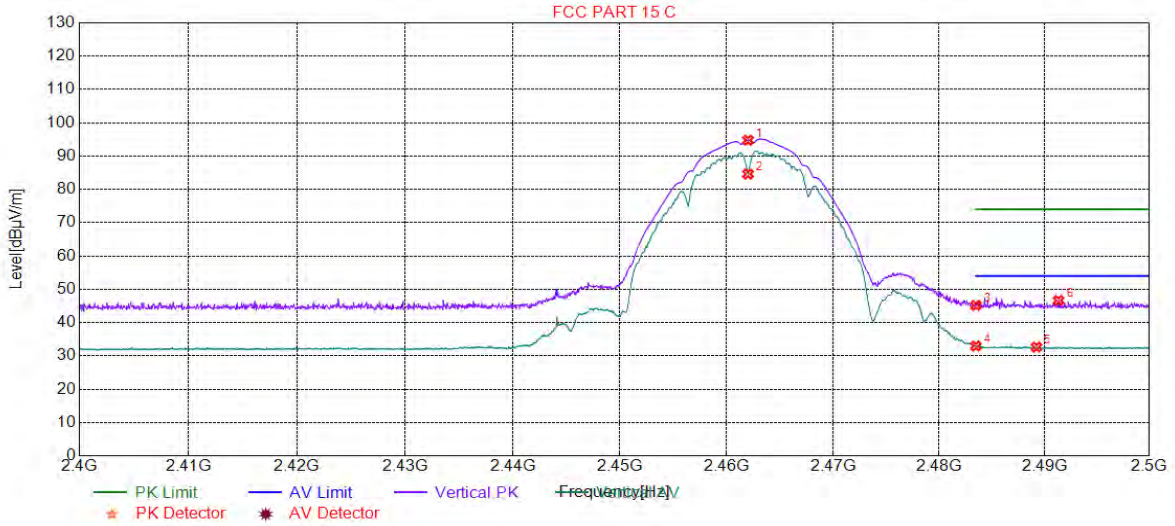
4.10.1.4 802.11B_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	94.78	7.98	0.00	-94.78	258	174	Vertical
2	2462.00	84.61	7.98	0.00	-84.61	180	174	Vertical
3	2483.50	45.19	8.01	74.00	28.81	289	325	Vertical
4	2483.50	32.99	8.01	54.00	21.01	161	206	Vertical
5	2489.24	32.68	8.02	54.00	21.32	169	217	Vertical
6	2491.34	46.68	8.02	74.00	27.32	231	304	Vertical

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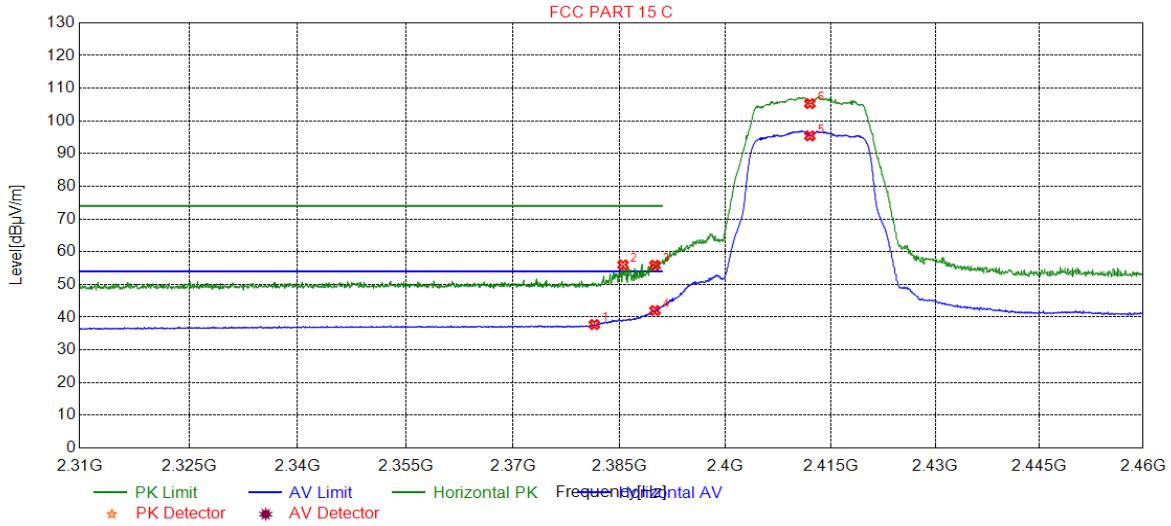
4.10.1.5 802.11G_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2381.43	37.76	7.78	54.00	16.24	102	232	Horizontal
2	2385.48	56.01	7.77	74.00	17.99	247	226	Horizontal
3	2390.00	55.91	7.77	74.00	18.09	209	232	Horizontal
4	2390.00	42.04	7.77	54.00	11.96	100	226	Horizontal
5	2412.00	95.44	7.81	0.00	-95.44	169	221	Horizontal
6	2412.00	105.31	7.81	0.00	-105.31	212	226	Horizontal

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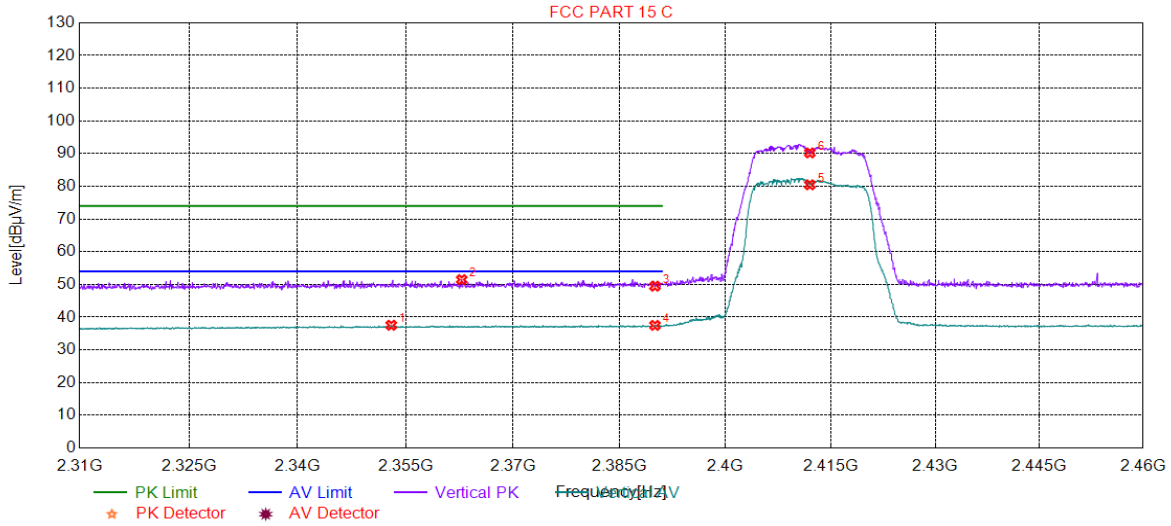
4.10.1.6 802.11G_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2352.99	37.54	7.81	54.00	16.46	165	78	Vertical
2	2362.82	51.49	7.80	74.00	22.51	228	187	Vertical
3	2390.00	49.49	7.77	74.00	24.51	269	127	Vertical
4	2390.00	37.50	7.77	54.00	16.50	243	336	Vertical
5	2412.00	80.48	7.81	0.00	-80.48	224	346	Vertical
6	2412.00	90.23	7.81	0.00	-90.23	205	341	Vertical

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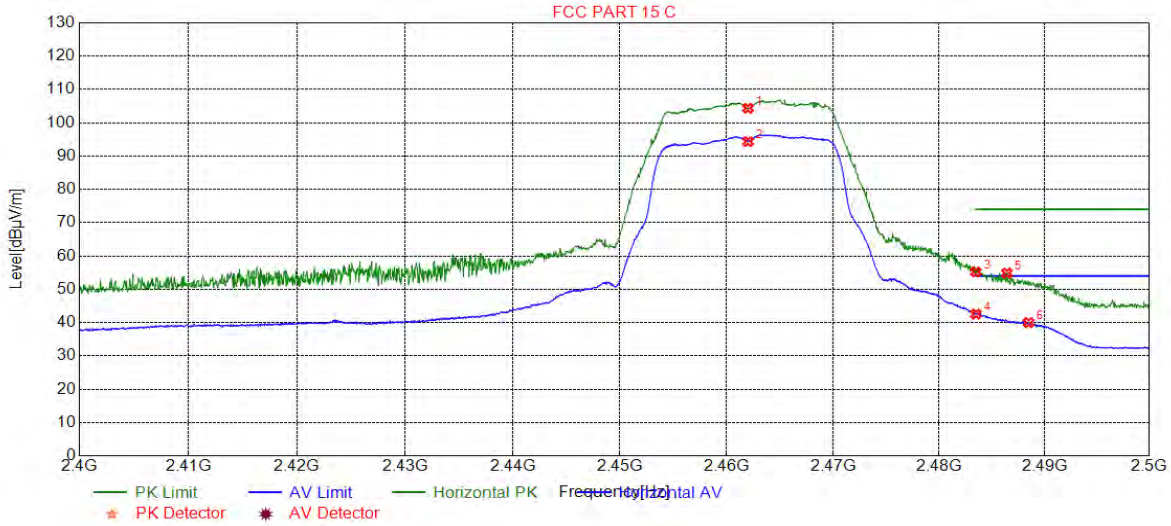
4.10.1.7 802.11G_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	104.37	7.98	0.00	-104.37	127	236	Horizontal
2	2462.00	94.35	7.98	0.00	-94.35	191	231	Horizontal
3	2483.50	55.25	8.01	74.00	18.75	165	226	Horizontal
4	2483.50	42.60	8.01	54.00	11.40	124	209	Horizontal
5	2486.44	54.88	8.01	74.00	19.12	155	231	Horizontal
6	2488.49	40.02	8.02	54.00	13.98	198	215	Horizontal

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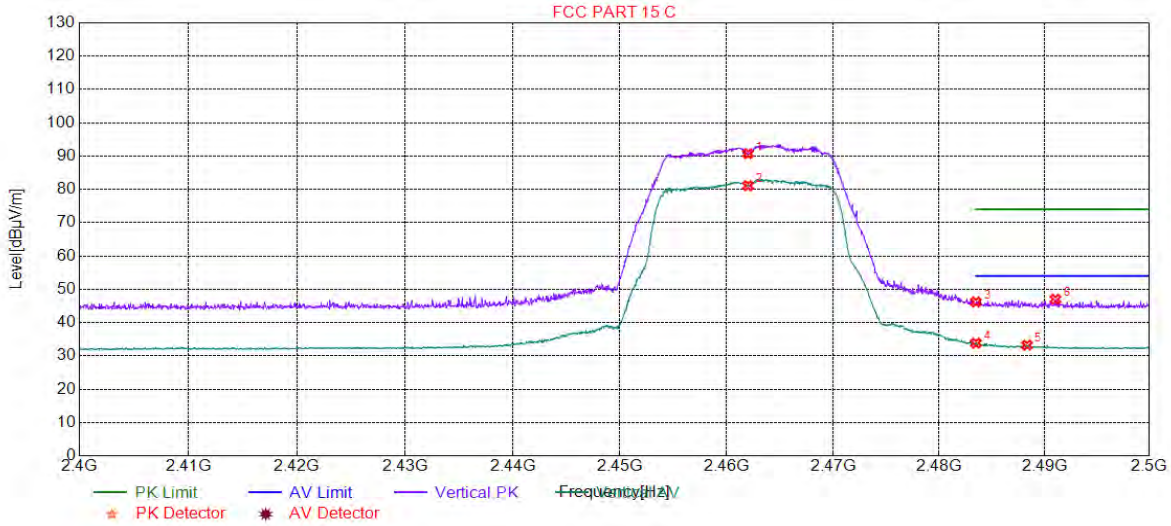
4.10.1.8 802.11G_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	90.72	7.98	0.00	-90.72	260	173	Vertical
2	2462.00	81.12	7.98	0.00	-81.12	203	173	Vertical
3	2483.50	46.23	8.01	74.00	27.77	170	178	Vertical
4	2483.50	33.85	8.01	54.00	20.15	152	222	Vertical
5	2488.34	33.25	8.02	54.00	20.75	152	205	Vertical
6	2491.04	47.04	8.02	74.00	26.96	184	233	Vertical

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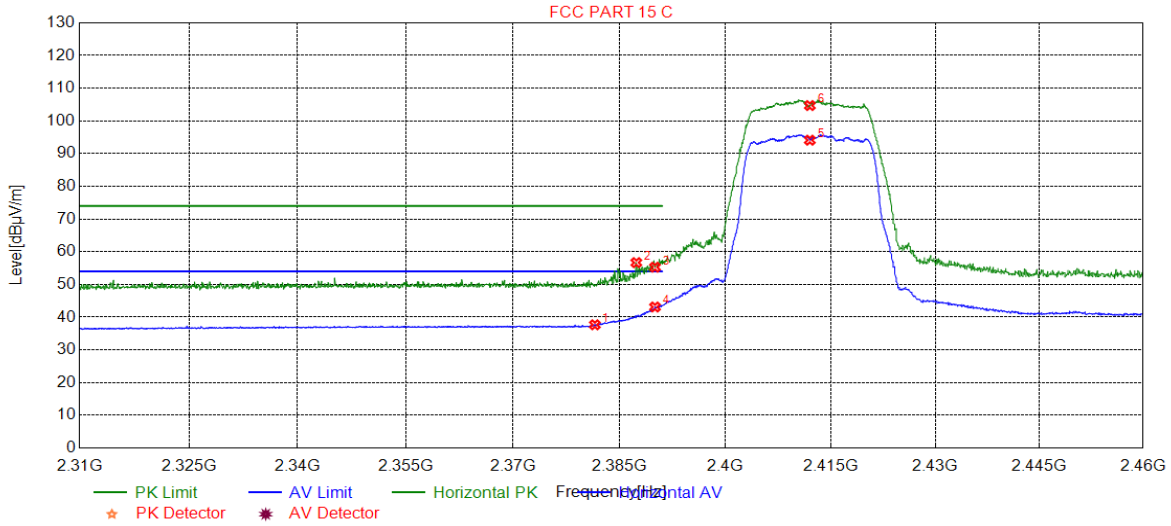
4.10.1.9 802.11N20_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2381.51	37.68	7.78	54.00	16.32	196	250	Horizontal
2	2387.36	56.69	7.77	74.00	17.31	221	222	Horizontal
3	2390.00	55.28	7.77	74.00	18.72	134	222	Horizontal
4	2390.00	43.12	7.77	54.00	10.88	121	222	Horizontal
5	2412.00	94.12	7.81	0.00	-94.12	109	217	Horizontal
6	2412.00	104.71	7.81	0.00	-104.71	181	234	Horizontal

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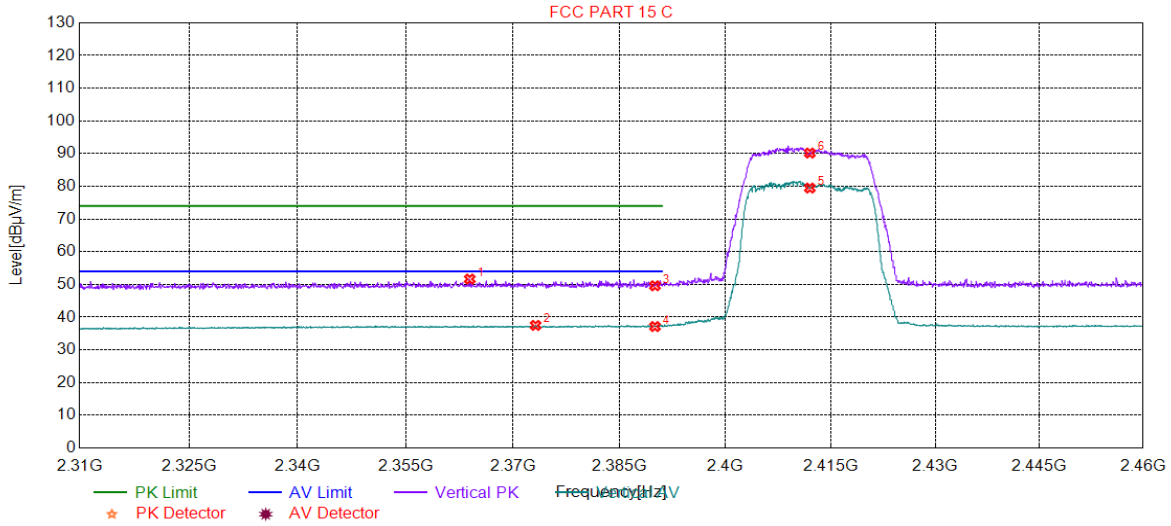
4.10.1.10 802.11N20_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2363.95	51.65	7.80	74.00	22.35	249	111	Vertical
2	2373.18	37.50	7.79	54.00	16.50	158	122	Vertical
3	2390.00	49.61	7.77	74.00	24.39	161	216	Vertical
4	2390.00	37.14	7.77	54.00	16.86	194	205	Vertical
5	2412.00	79.48	7.81	0.00	-79.48	229	172	Vertical
6	2412.00	90.18	7.81	0.00	-90.18	250	172	Vertical

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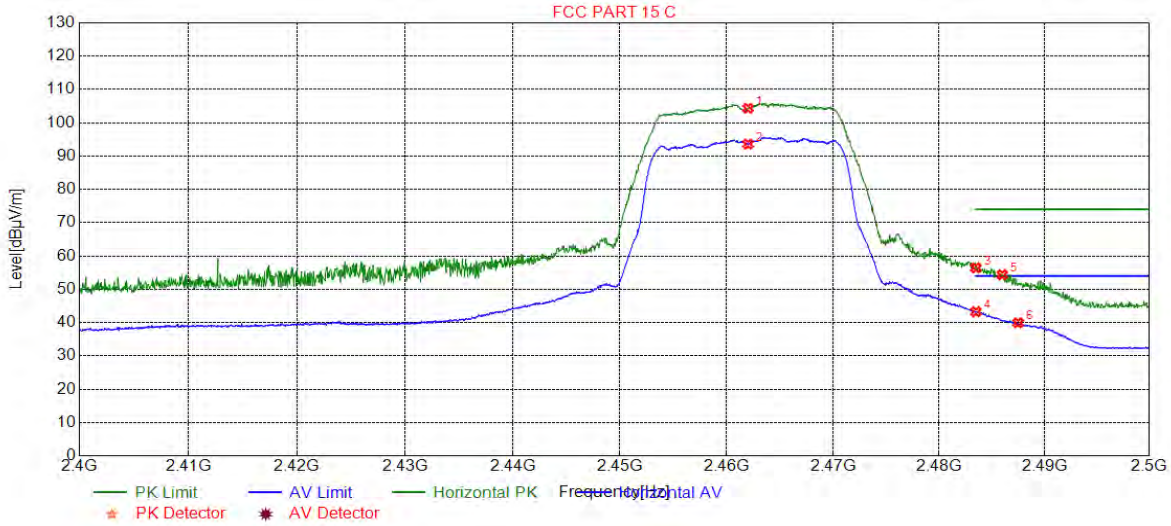
4.10.1.11 802.11N20_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	104.37	7.98	0.00	-104.37	190	232	Horizontal
2	2462.00	93.60	7.98	0.00	-93.60	209	232	Horizontal
3	2483.50	56.48	8.01	74.00	17.52	103	232	Horizontal
4	2483.50	43.29	8.01	54.00	10.71	151	215	Horizontal
5	2485.99	54.39	8.01	74.00	19.61	152	243	Horizontal
6	2487.49	39.96	8.01	54.00	14.04	121	226	Horizontal

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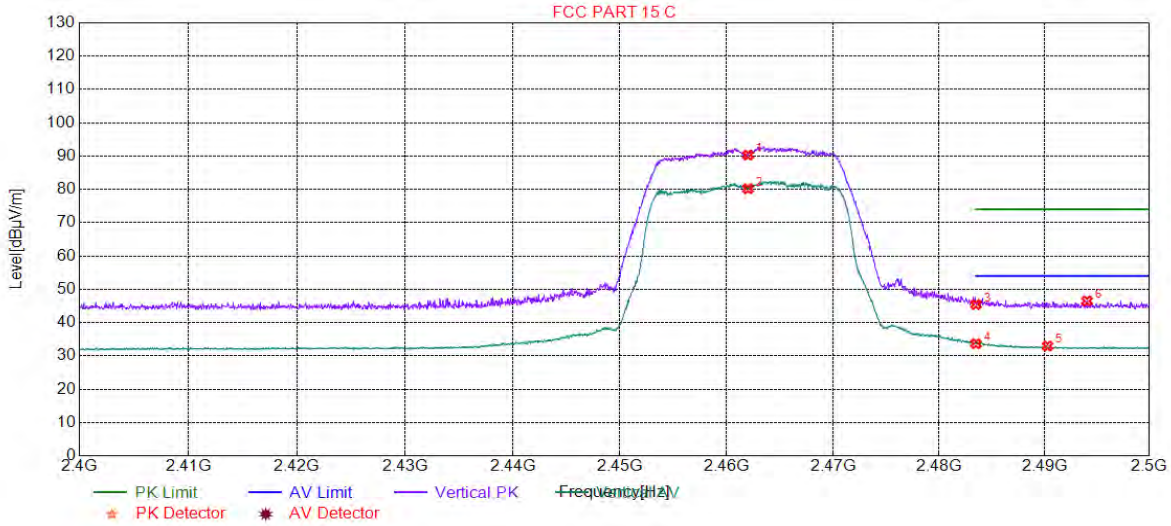
4.10.1.12 802.11N20_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	90.30	7.98	0.00	-90.30	289	166	Vertical
2	2462.00	80.19	7.98	0.00	-80.19	267	172	Vertical
3	2483.50	45.43	8.01	74.00	28.57	207	216	Vertical
4	2483.50	33.69	8.01	54.00	20.31	156	222	Vertical
5	2490.29	33.00	8.02	54.00	21.00	236	205	Vertical
6	2494.04	46.54	8.02	74.00	27.46	196	266	Vertical

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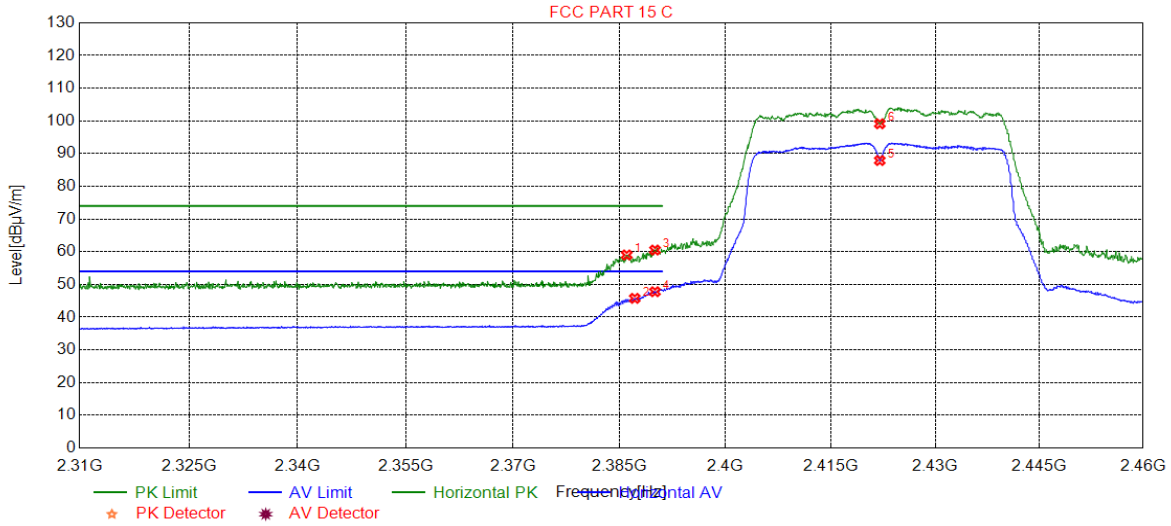
4.10.1.13 802.11N40_Channel 3

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2386.01	59.03	7.77	74.00	14.97	112	228	Horizontal
2	2387.13	45.77	7.77	54.00	8.23	198	222	Horizontal
3	2390.00	60.54	7.77	74.00	13.46	103	217	Horizontal
4	2390.00	47.79	7.77	54.00	6.21	155	222	Horizontal
5	2422.00	87.90	7.85	0.00	-87.90	138	222	Horizontal
6	2422.00	99.14	7.85	0.00	-99.14	227	217	Horizontal

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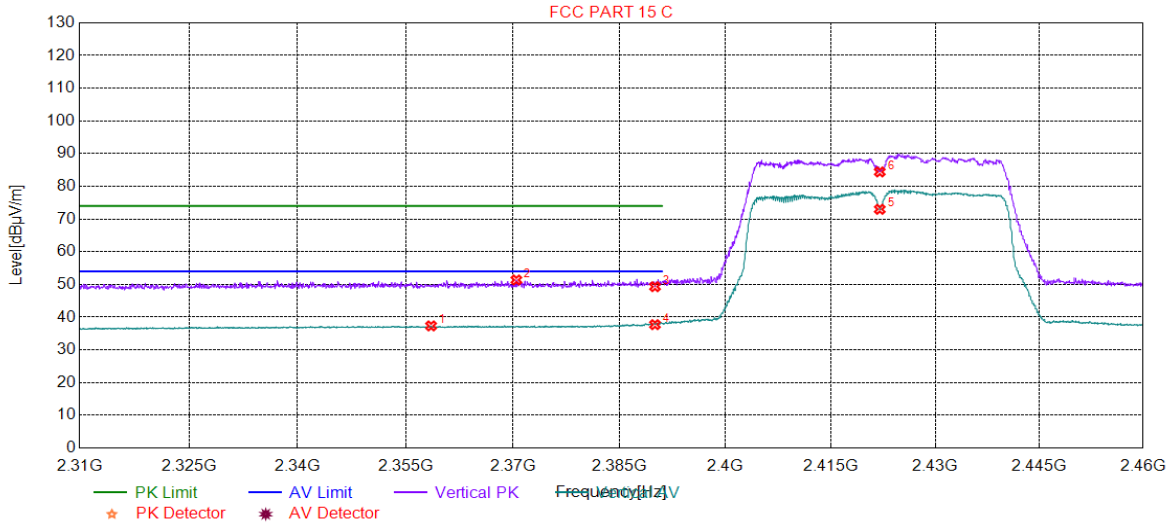
4.10.1.14 802.11N40_Channel 3

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2358.54	37.34	7.80	54.00	16.66	183	294	Vertical
2	2370.48	51.39	7.79	74.00	22.61	207	201	Vertical
3	2390.00	49.32	7.77	74.00	24.68	190	168	Vertical
4	2390.00	37.72	7.77	54.00	16.28	245	346	Vertical
5	2422.00	72.99	7.85	0.00	-72.99	209	271	Vertical
6	2422.00	84.42	7.85	0.00	-84.42	214	168	Vertical

Final Data List

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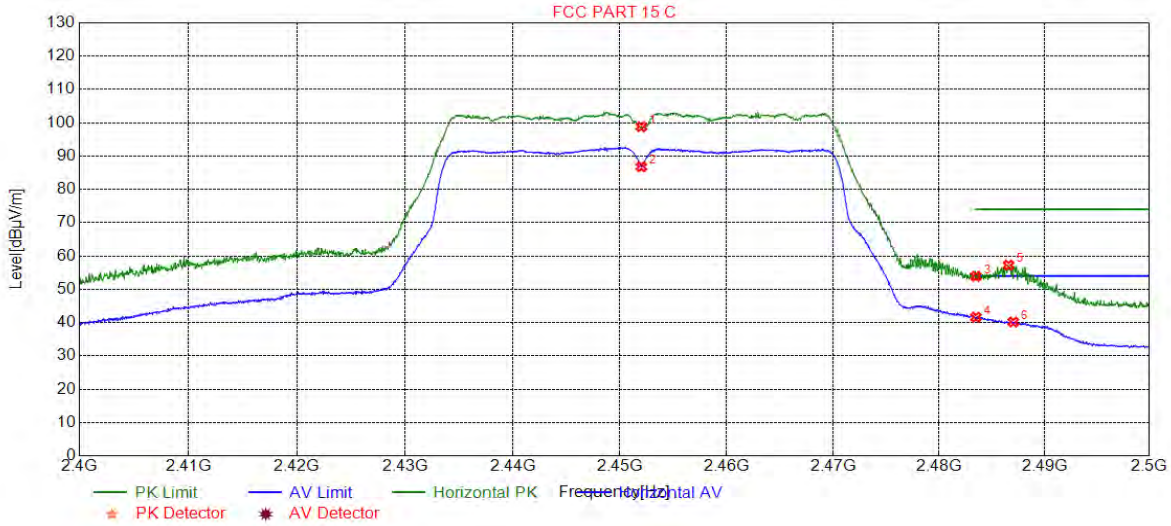
4.10.1.15 802.11N40_Channel 9

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2452.00	98.80	7.97	0.00	-98.80	105	217	Horizontal
2	2452.00	86.80	7.97	0.00	-86.80	116	234	Horizontal
3	2483.50	53.90	8.01	74.00	20.10	195	217	Horizontal
4	2483.50	41.64	8.01	54.00	12.36	139	228	Horizontal
5	2486.59	57.26	8.01	74.00	16.74	159	228	Horizontal
6	2487.04	40.21	8.01	54.00	13.79	133	228	Horizontal

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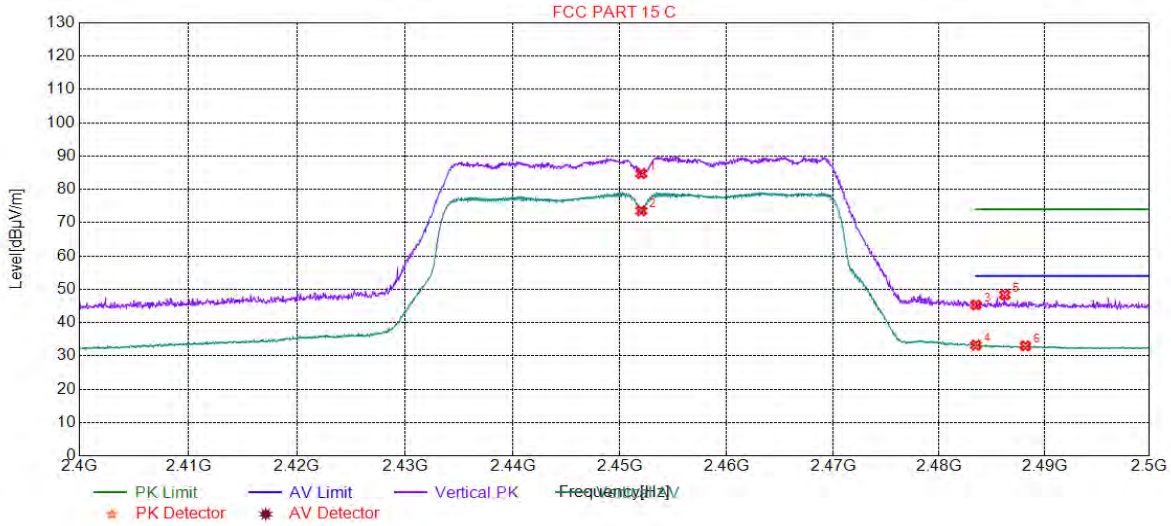
4.10.1.16 802.11N40_Channel 9

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2452.00	84.76	7.97	0.00	-84.76	232	172	Vertical
2	2452.00	73.60	7.97	0.00	-73.60	178	205	Vertical
3	2483.50	45.32	8.01	74.00	28.68	250	282	Vertical
4	2483.50	33.25	8.01	54.00	20.75	276	172	Vertical
5	2486.24	48.34	8.01	74.00	25.66	204	216	Vertical
6	2488.19	33.04	8.02	54.00	20.96	229	347	Vertical

Final Data List

Remark:
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor
All Modes have been tested, but only the worst case data displayed in this report.

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

Lab A:

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

Lab B:

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

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6 Equipment List

RF conducted test					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy-mm-dd)	Cal.Duedate (yyyy-mm-dd)
DC Power Supply	Agilent Technologies Inc	66311B	W009-09	2020/7/15	2021/7/15
Signal Analyzer	Rohde & Schwarz	FSV	W025-05	2020/1/3	2021/1/2
Coaxial Cable	SGS	N/A	SEM031-01	2020/6/12	2021/6/11
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2020/7/14	2021/7/14
Temperature Chamber	GIANT FORCE	ICT-150-40-CP-AR	W027-03	2019/10/27	2020/10/27
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2020/7/14	2021/7/14

CE Test System					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Shielding Room	Brilliant-emc	N/A	XAW03-35-01	2019-09-11	2022-09-10
Test receiver	ROHDE&SCHWARZ	ESR	XAW01-08-05	2020-04-12	2021-04-11
Artificial network	ROHDE&SCHWARZ	ENV216	XAW01-04-01	2020-08-04	2021-08-03
Temperature and humidity meter	MingGao	TH101B	XAW01-01-01	2019-12-06	2020-12-05
Measurement Software	Tonscend	TS+ CE V2.5	XAW02-05-02	NCR	NCR

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RSE Test System					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Semi-Anechoic Chamber	Brilliant-emc	N/A	XAW03-35-01	2019-09-11	2022-09-10
MXA signal analyzer	Keysight	N9020A	XAW01-06-01	2020-04-02	2021-04-01
Test receiver	ROHDE&SCHWARZ	ESR	XAW01-08-05	2020-04-12	2021-04-11
Receiving antenna (30MHz-3GHz)	Schwarzbeck	VULB 9163	XAW01-09-01	2019-10-13	2021-10-12
Receiving antenna (1GHz~18GHz)	Schwarzbeck	BBHA 9120D	XAW01-09-02	2019-10-13	2021-10-12
Receiving antenna (15GHz~40GHz)	Schwarzbeck	BBHA 9170	XAW01-09-03	2019-10-13	2021-10-12
Directional antenna rack controller	Max-Full	MF-7802BS	XAW03-03-01	NCR	NCR
High-speed antenna rack controller	Max-Full	MF-7802	XAW03-04-01	NCR	NCR
Filter bank	Tonscend	JS0806-F	XAW03-05-01	NCR	NCR
Filter bank	Tonscend	JS0806s	XAW03-05-02	NCR	NCR
Amplifier	Tonscend	TAP00903040	XAW01-41-01	2019-11-18	2020-11-17
Amplifier	Tonscend	TAP01018048	XAW01-41-02	2019-11-18	2020-11-17
Amplifier	Tonscend	TAP18040048	XAW01-41-03	2019-12-03	2020-12-02
Amplifier	Shanghai Steed	YX28980930	XAW01-41-06	2019-11-18	2020-11-17
Temperature and humidity meter	MingGao	TH101B	XAW01-01-01	2019-12-06	2020-12-05
Measurement Software	Tonscend	TS+ RSE V3.0.0.2	XAW02-05-01	NCR	NCR

7 Photographs - EUT Constructional Details

Refer to Appendix A - Photographs of Set-up for ZR/2020/80004.

The End

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