FCC TEST REPORT

Application No:	ZR/2020/40028
Applicant:	Guangdong OPPO Mobile Telecommunications Corp., Ltd.
Address of Applicant:	NO.18 HaiBin Road, Wusha Village, Chang An Town, DongGuan City，GuangDong,China
Manufacturer:	Guangdong OPPO Mobile Telecommunications Corp., Ltd.
Address of Manufacturer	NO.18 HaiBin Road, Wusha Village, Chang An Town, DongGuan City，GuangDong,China
Factory:	Guangdong OPPO Mobile Telecommunications Corp., Ltd.
Address of Factory:	NO.18 HaiBin Road, Wusha Village, Chang An Town, DongGuan City，GuangDong,China
EUT Description:	OPPO Watch
Model No.:	OW19W12
Trade Mark:	OPPO
FCC ID:	R9C-OW19W12
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:	2020/4/20
Date of Test:	2020/4/20 to 2020/5/18
Date of Issue:	2021/4/27
Test Result:	**PASS ***

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

Authorized Signature:

Derek Yang
Wireless Laboratory Manager

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1 Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2020/6/10		Original
02		2021/4/27	Sherlock Fang	1.Add test site Information 2. Modify data conversion error of antenna height 3.Update equipment list

This report supersedes our previous report ZR/2020/4002804, issued on 2020-06-10, which is hereby deemed null and void.

Authorized for issue by:		
Prepared By		Sherlock Fang **(Sherlock Fang) / Engineer**
Checked By		Jim Huang **(Jim Huang) / Reviewer**

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2 Test Summary

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

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

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Contents

1 VERSION **2**

2 TEST SUMMARY **3**

3 GENERAL INFORMATION **5**

3.1 CLIENT INFORMATION 5
3.2 TEST LOCATION 5
3.3 TEST FACILITY 6
3.4 GENERAL DESCRIPTION OF EUT 7
3.5 TEST ENVIRONMENT AND MODE 9
3.6 DESCRIPTION OF SUPPORT UNITS 9

4 TEST RESULTS AND MEASUREMENT DATA **10**

4.1 ANTENNA REQUIREMENT 10
4.2 AC POWER LINE CONDUCTED EMISSIONS 11
4.3 DUTY CYCLE 15
4.3.1 Test Results *15*
4.3.1 Test Plots *15*
4.4 CONDUCTED OUTPUT POWER 18
4.4.1 Test Results *19*
4.5 DTS (6 DB) BANDWIDTH & 99% OCCUPIED BANDWIDTH 20
4.5.1 Test Results *20*
4.5.2 Test plots *21*
4.6 POWER SPECTRAL DENSITY 31
4.6.1 Test Results *31*
4.6.2 Test plots *32*
4.7 BAND-EDGE FOR RF CONDUCTED EMISSIONS 37
4.7.1 Test plots *38*
4.8 RF CONDUCTED SPURIOUS EMISSIONS 42
4.8.1 Test plots *43*
4.9 RADIATED SPURIOUS EMISSIONS 49
4.9.1 Radiated emission below 1GHz *52*
4.9.2 Transmitter emission above 1GHz *54*
4.10 RESTRICTED BANDS AROUND FUNDAMENTAL FREQUENCY 72
4.10.1 ANT1 ..... *74*

5 MEASUREMENT UNCERTAINTY (95% CONFIDENCE LEVELS, K=2) **86**

6 EQUIPMENT LIST **87**

7 PHOTOGRAPHS - EUT CONSTRUCTIONAL DETAILS **89**

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3 General Information

3.1 Client Information

Applicant:	Guangdong OPPO Mobile Telecommunications Corp., Ltd.
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Manufacturer:	Guangdong OPPO Mobile Telecommunications Corp., Ltd.
Address of Manufacturer:	NO.18 HaiBin Road, Wusha Village, Chang An Town, DongGuan City，GuangDong,China
Factory:	Guangdong OPPO Mobile Telecommunications Corp., Ltd.
Address of Factory:	NO.18 HaiBin Road, Wusha Village, Chang An Town, DongGuan City，GuangDong,China

3.2 Test Location

Lab A:

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

Lab B:

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

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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::	OPPO Watch
Model No.:	OW19W12
Trade Mark:	OPPO
Hardware Version:	XE922
Software Version:	Wear OS by Google 2.18
IEEE 802.11 WLAN Mode Supported	☒ 802.11B (20 MHz channel bandwidth), ☒ 802.11G (20 MHz channel bandwidth) ☒ 802.11N (20 MHz channel bandwidth), ☐ 802.11N (40 MHz channel bandwidth)
Operation Frequency:	2400 MHz -2483.5MHz fc = 2407 MHz + N * 5 MHz, where: -fc = “Operating Frequency” in MHz, -N = “Channel Number” with the range from 1 to 11 for the 20 MHz channel bandwidth, or 3 to 9 for the 40 MHz channel bandwidth.
Type of Modulation:	IEEE for 802.11B: DSSS IEEE for 802.11G : OFDM IEEE for 802.11N(HT20) : OFDM
Sample Type:	☒ Portable Device, ☐Module
Antenna Type:	☐ External, ☒ Integrated
Antenna Ports	☒ Ant 1, ☐ Ant 2, ☐ Ant 3
Smart System	☒ SISO (for 802.11B/G/N), ☐ MIMO (for 802.11N): 2 Tx & 2 Rx, ☐ Diversity (for 802.11B/G) : Tx & Rx
Antenna Gain:	-4.0dBi
Power Supply	☒ AC/DC Adapter; ☐ Battery ☐ PoE:; ☐ Other:

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Operation Frequency of each channel (802.11B/G/N HT20)							
Channel	**Frequency**	**Channel**	**Frequency**	**Channel**	**Frequency**	**Channel**	**Frequency**
1	2412MHz	4	2427MHz	7	2442MHz	10	2457MHz
2	2417MHz	5	2432MHz	8	2447MHz	11	2462MHz
3	2422MHz	6	2437MHz	9	2452MHz		

Remark:

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

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

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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 -4dBi.	

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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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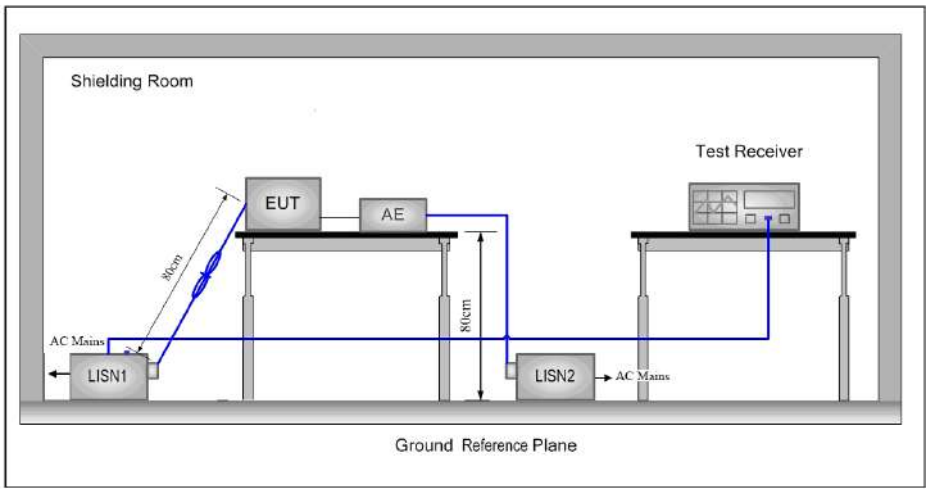
Test Setup:	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates at lowest, middle and highest channel. Charge + Transmitting mode.
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate of 802.11B at lowest channel is the worst case. Charge + Transmitting mode. Only the worst case is recorded in the report.
Instruments Used:	Refer to section 6 for details
Test Results:	Pass

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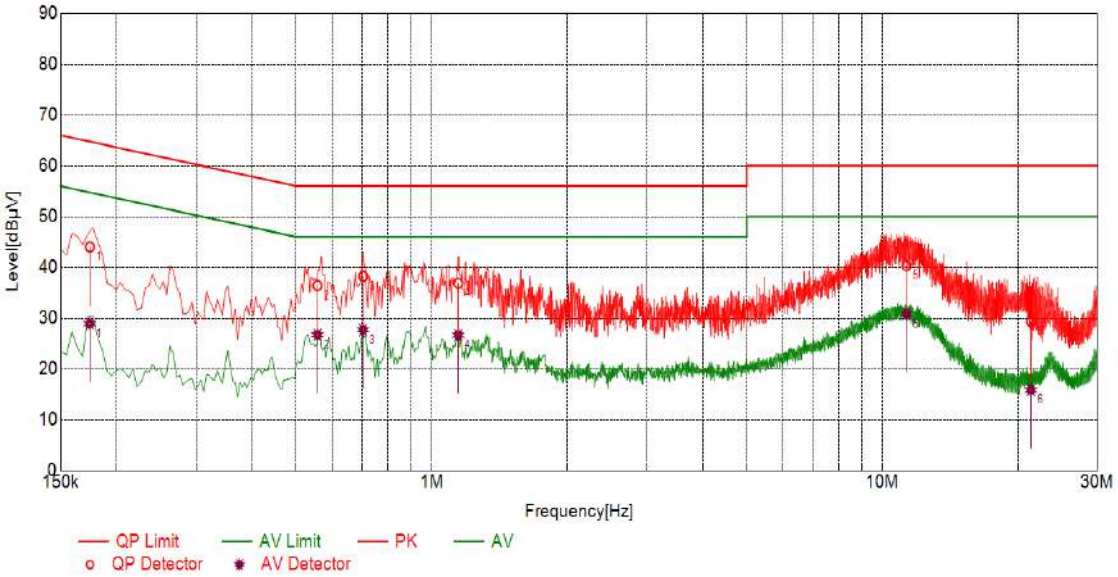
Measurement Data

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	0.1742	10.10	44.00	64.76	20.76	28.90	54.76	25.86	L
2	0.5572	10.10	36.41	56.00	19.59	26.71	46.00	19.29	L
3	0.7043	10.10	38.27	56.00	17.73	27.67	46.00	18.33	L
4	1.1457	10.10	36.88	56.00	19.12	26.63	46.00	19.37	L
5	11.3308	10.10	40.30	60.00	19.70	30.83	50.00	19.17	L
6	21.3707	10.11	29.32	60.00	30.68	15.84	50.00	34.16	L

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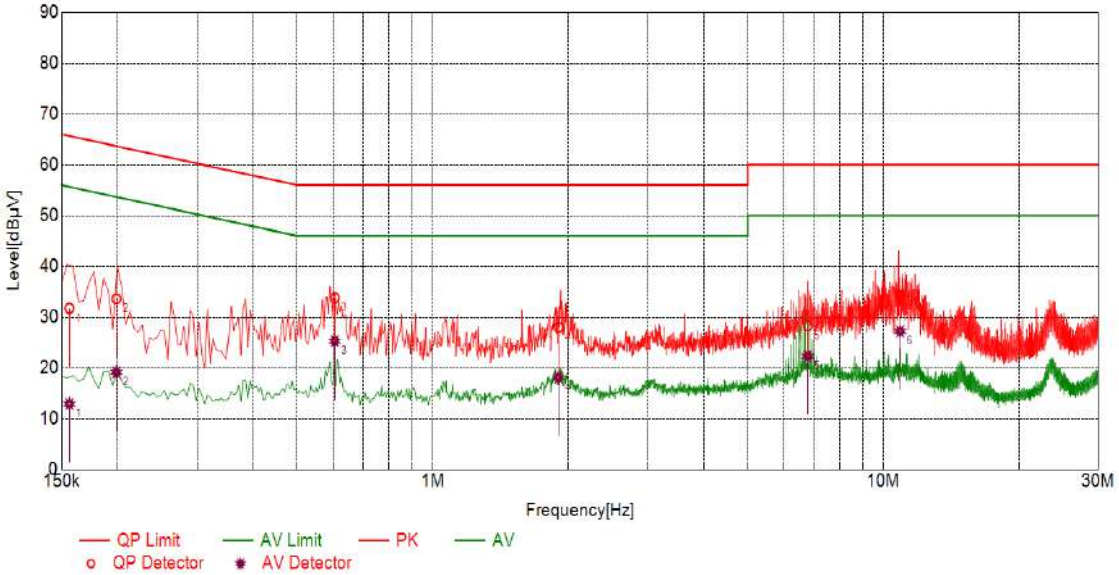
Neutral Line:



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	0.1560	10.10	31.74	65.67	33.93	12.89	55.67	42.78	N
2	0.1986	10.10	33.63	63.67	30.04	19.16	53.67	34.51	N
3	0.6058	10.10	33.83	56.00	22.17	25.32	46.00	20.68	N
4	1.9035	10.10	27.98	56.00	28.02	18.11	46.00	27.89	N
5	6.8046	10.10	28.30	60.00	31.70	22.33	50.00	27.67	N
6	10.9100	10.10	34.21	60.00	25.79	27.21	50.00	22.79	N

Remarks:

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

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

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4.3 Duty Cycle

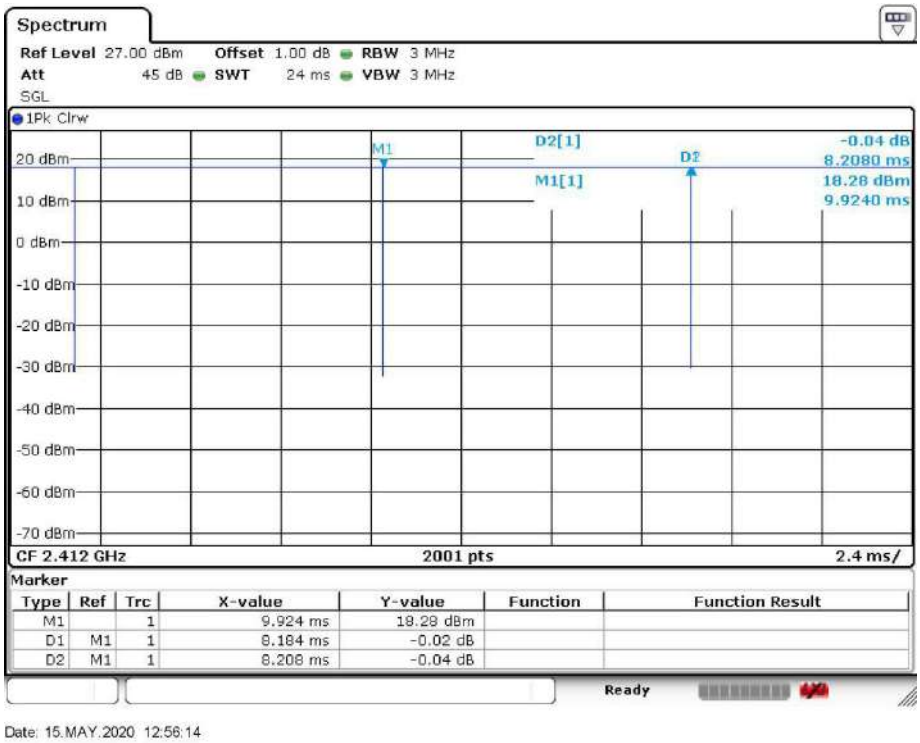
4.3.1 Test Results

Test Mode	TX Freq. [MHz]	Duty cycle [%]
11B	Ant 1: CH1,CH6,CH11	99.71
11G	Ant 1: CH1,CH6,CH11	97.12
11N20	Ant 1: CH1,CH6,CH11	97.83

4.3.1 Test Plots

4.3.1.1 ANT1

4.3.1.1.1 11B



Date: 15.MAY.2020 12:56:14

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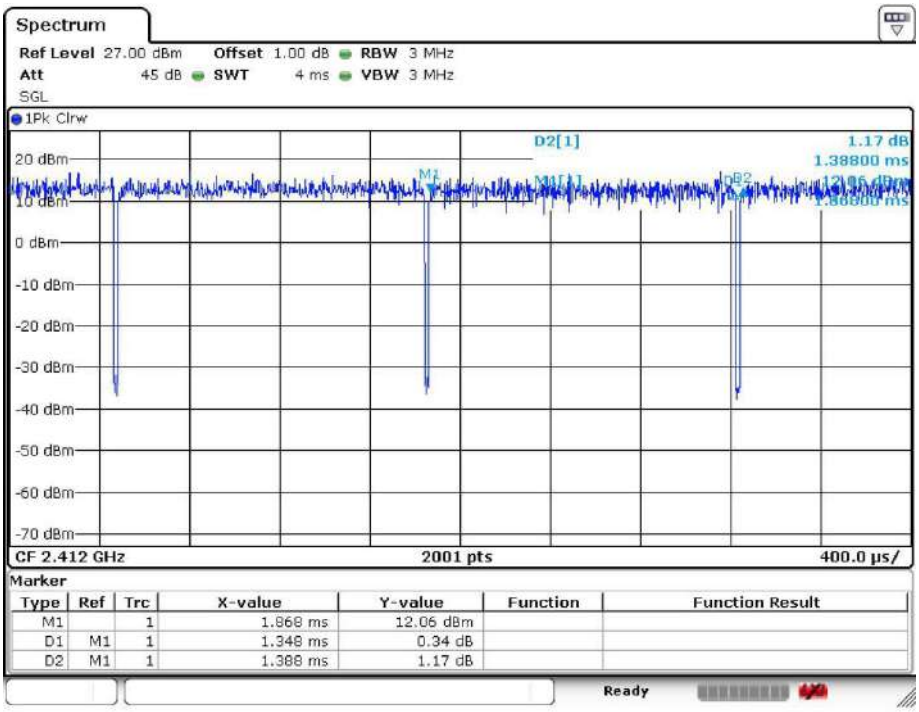
4.3.1.1.2 11G



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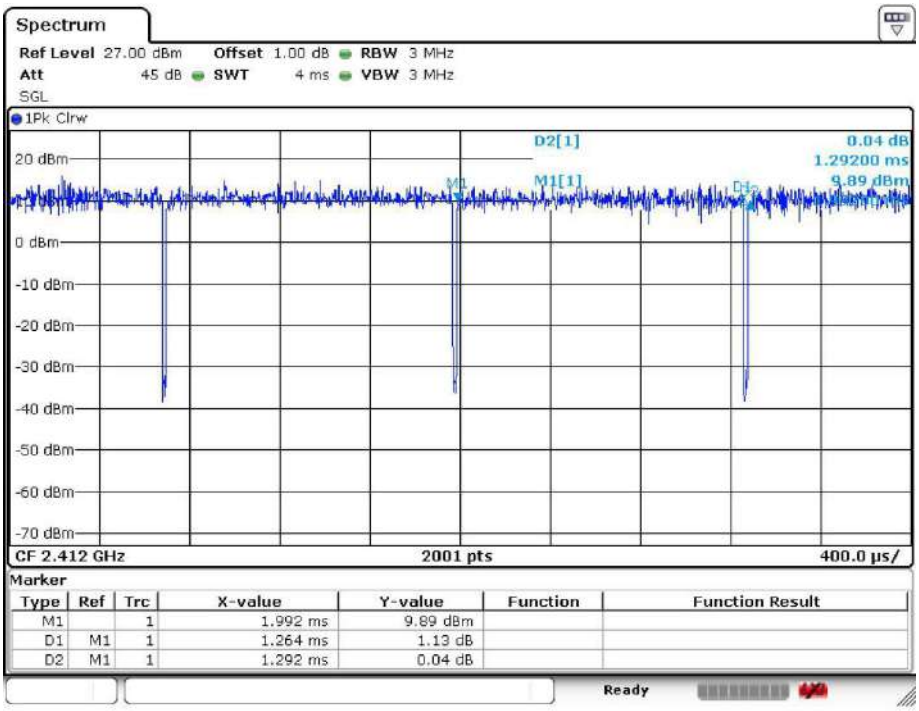
4.3.1.1.3 11N20



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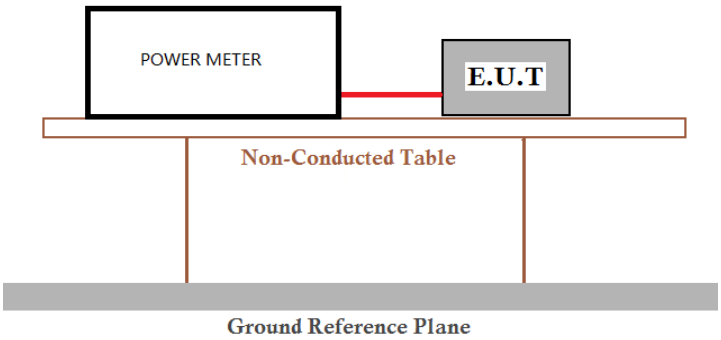
4.4 Conducted Output Power

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

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4.4.1 Test Results

Measurement Data of Average Power:

Mode	Test Channel	Average Output Power (dBm) [Duty Cycle Considered]	Result
802.11B	Lowest	17.98	Report purpose only
	Middle	17.78	Report purpose only
	Highest	18.02	Report purpose only
802.11G	Lowest	16.23	Report purpose only
	Middle	16.06	Report purpose only
	Highest	16.00	Report purpose only
802.11N20	Lowest	14.37	Report purpose only
	Middle	14.26	Report purpose only
	Highest	14.34	Report purpose only

Measurement Data of Peak Power:

Mode	Test Channel	Peak Output Power (dBm)	Limit (dBm)	Result
802.11B	Lowest	20.93	30.00	Pass
	Middle	20.58	30.00	Pass
	Highest	20.88	30.00	Pass
802.11G	Lowest	24.68	30.00	Pass
	Middle	24.51	30.00	Pass
	Highest	24.02	30.00	Pass
802.11N20	Lowest	22.99	30.00	Pass
	Middle	22.64	30.00	Pass
	Highest	22.80	30.00	Pass

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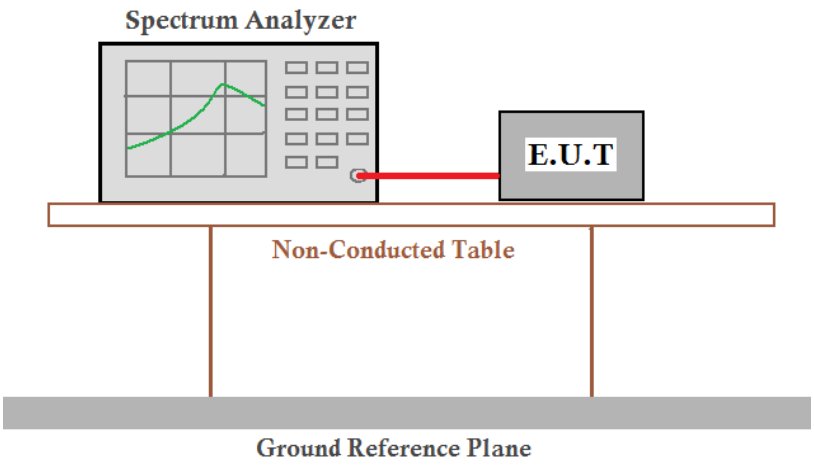
4.5 DTS (6 dB) Bandwidth & 99% Occupied Bandwidth

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 6 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11B; 6Mbps of rate is the worst case of 802.11G; 6.5Mbps of rate is the worst case of 802.11N(HT20);
Limit:	≥ 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	9.44	8.03	≥500	Pass
	Middle	9.41	8.03	≥500	Pass
	Highest	10.08	7.55	≥500	Pass
802.11G	Lowest	16.73	16.38	≥500	Pass
	Middle	16.67	16.41	≥500	Pass
	Highest	16.63	16.45	≥500	Pass
802.11N20	Lowest	17.67	17.58	≥500	Pass
	Middle	17.71	17.63	≥500	Pass
	Highest	17.71	17.58	≥500	Pass

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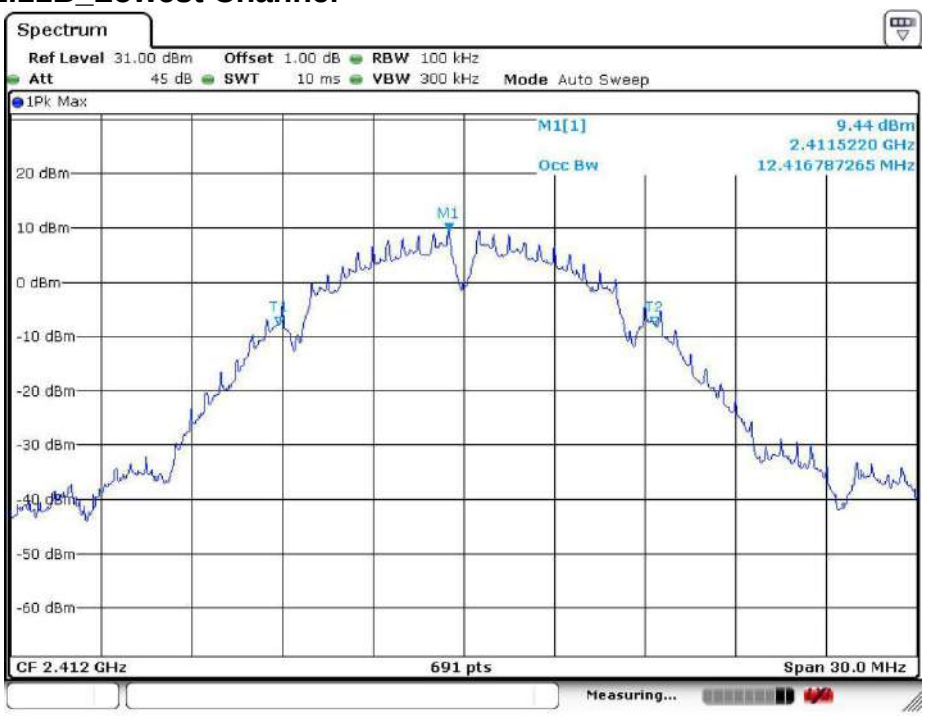
4.5.2 Test plots

4.5.2.1 ANT1

4.5.2.1.1 802.11B_Lowest Channel



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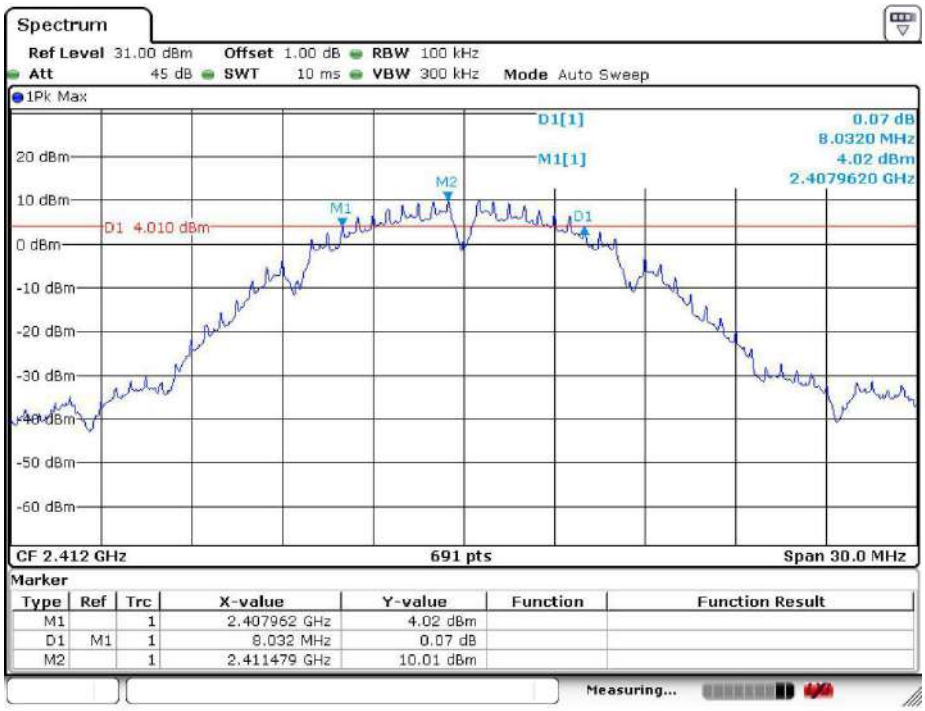

Date: 15.MAY.2020 08:10:36

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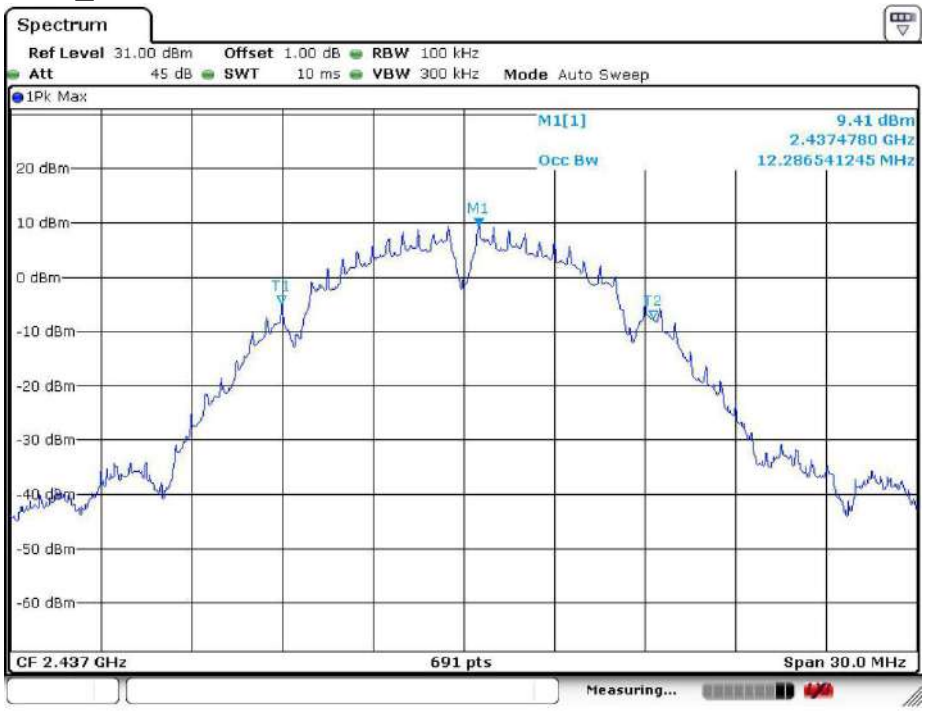
4.5.2.1.2 802.11B_ Middle Channel



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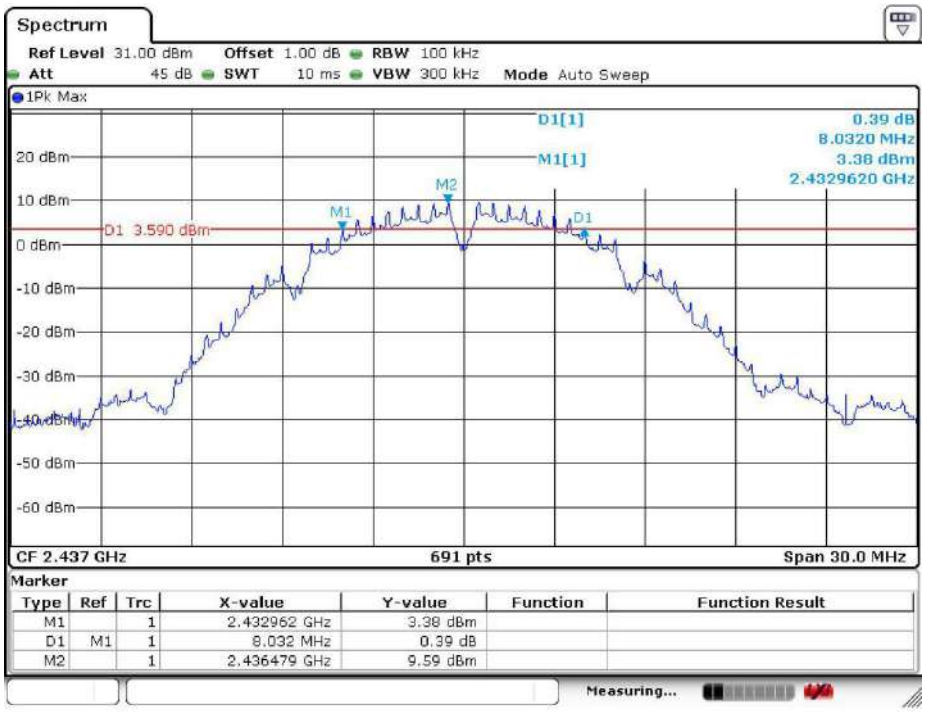

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.432962 GHz	3.38 dBm		
D1	M1	1	8.032 MHz	0.39 dB		
M2		1	2.436479 GHz	9.59 dBm		

Date: 15.MAY.2020 08:20:34

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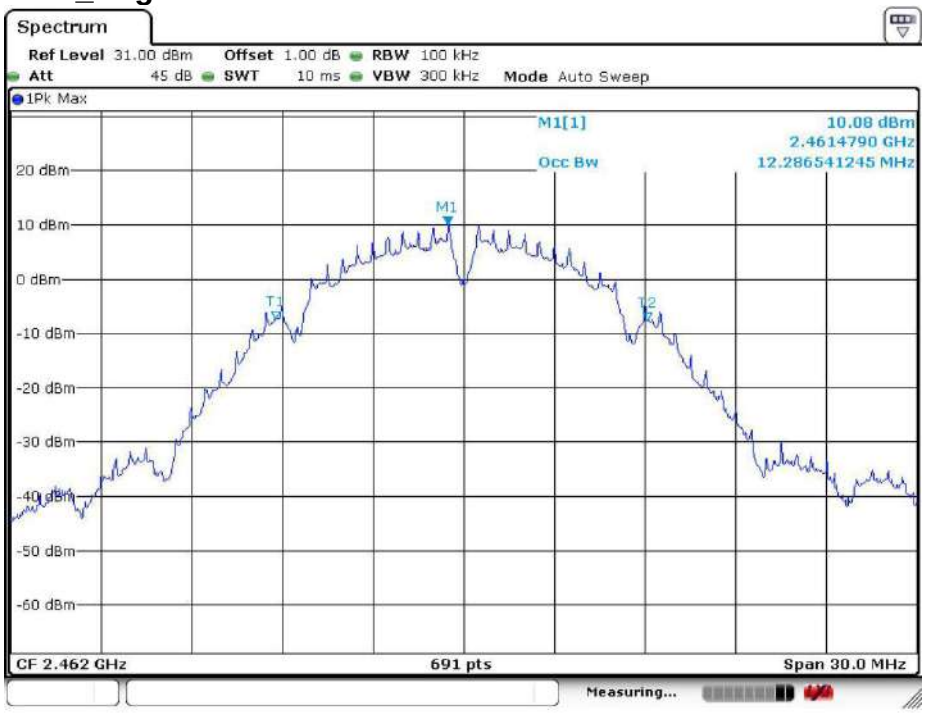
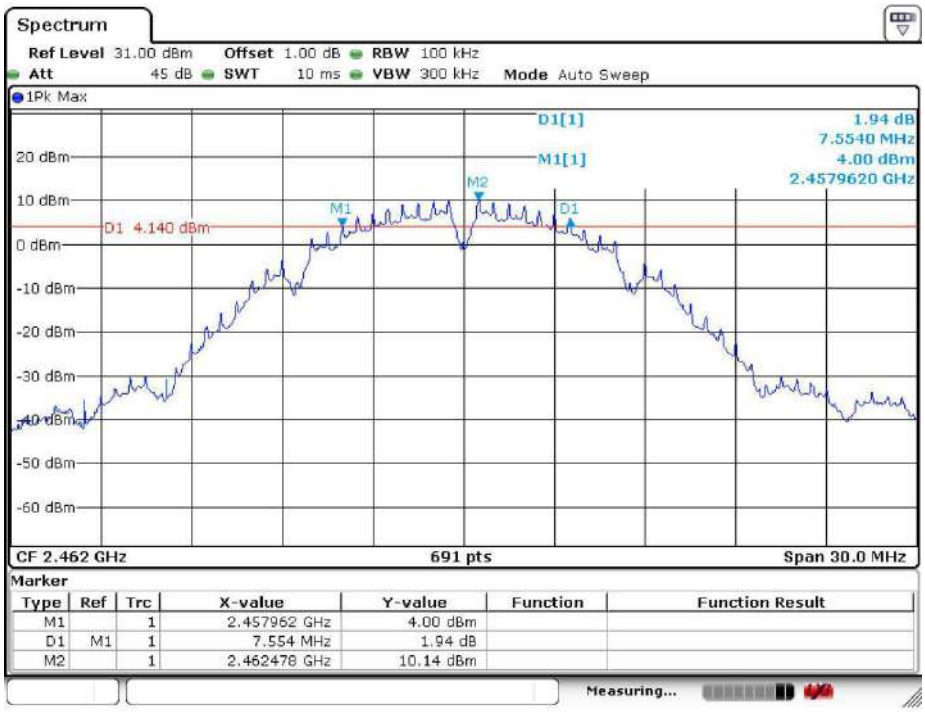
4.5.2.1.3 802.11B_ Highest Channel



Date: 15.MAY.2020 08:21:49



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.457962 GHz	4.00 dBm		
D1	M1	1	7.554 MHz	1.94 dB		
M2		1	2.462478 GHz	10.14 dBm		

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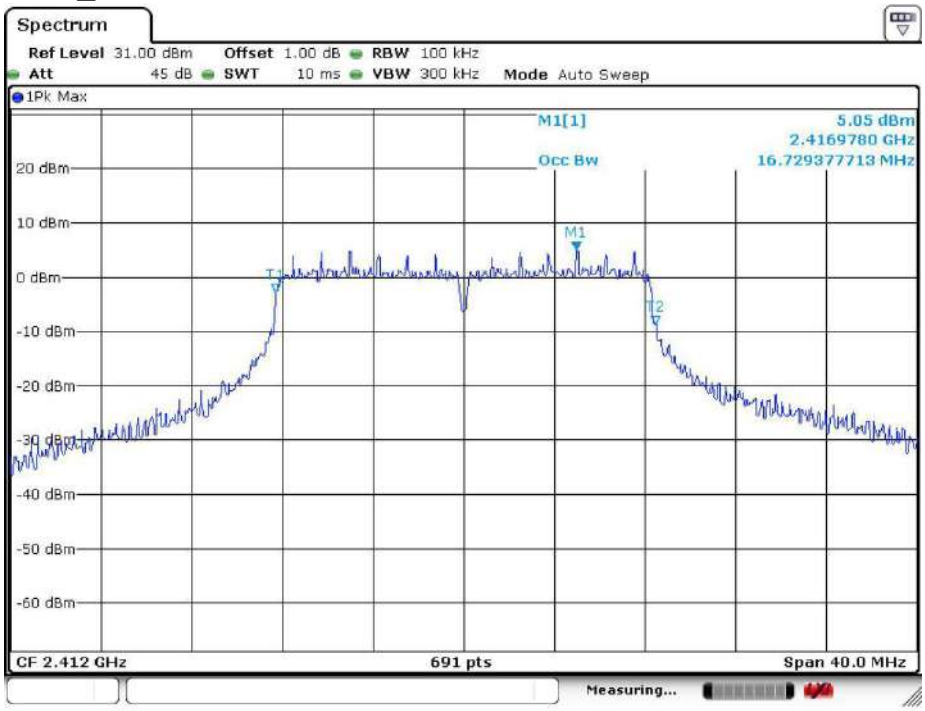
4.5.2.1.4 802.11G_Lowest Channel



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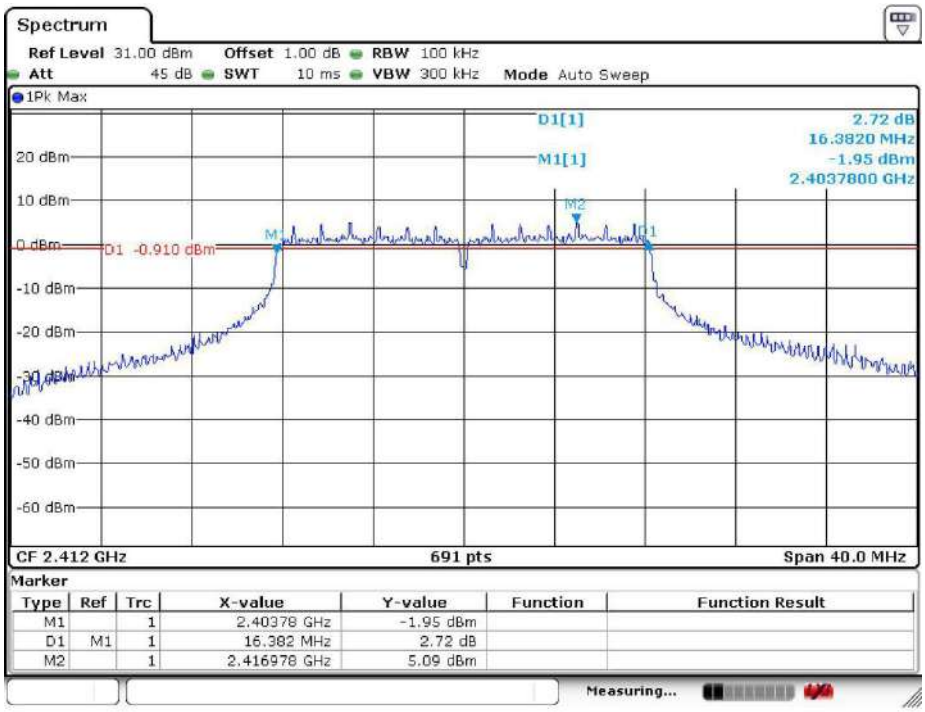

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40378 GHz	-1.95 dBm		
D1	M1	1	16.382 MHz	2.72 dB		
M2		1	2.416978 GHz	5.09 dBm		

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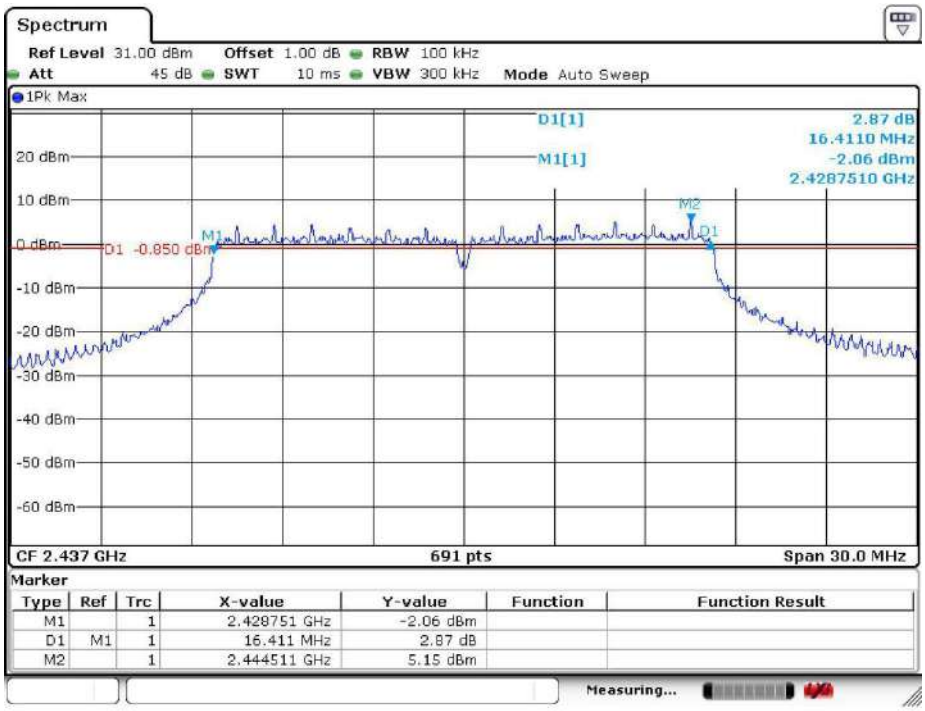
4.5.2.1.5 802.11G_ Middle Channel



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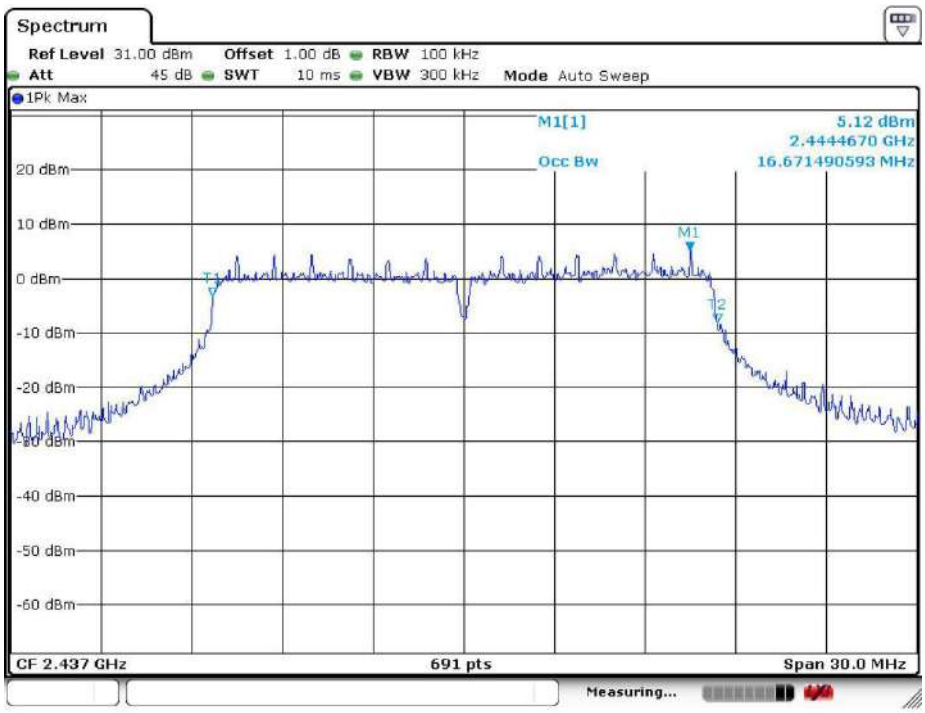

Date: 15.MAY.2020 08:43:03

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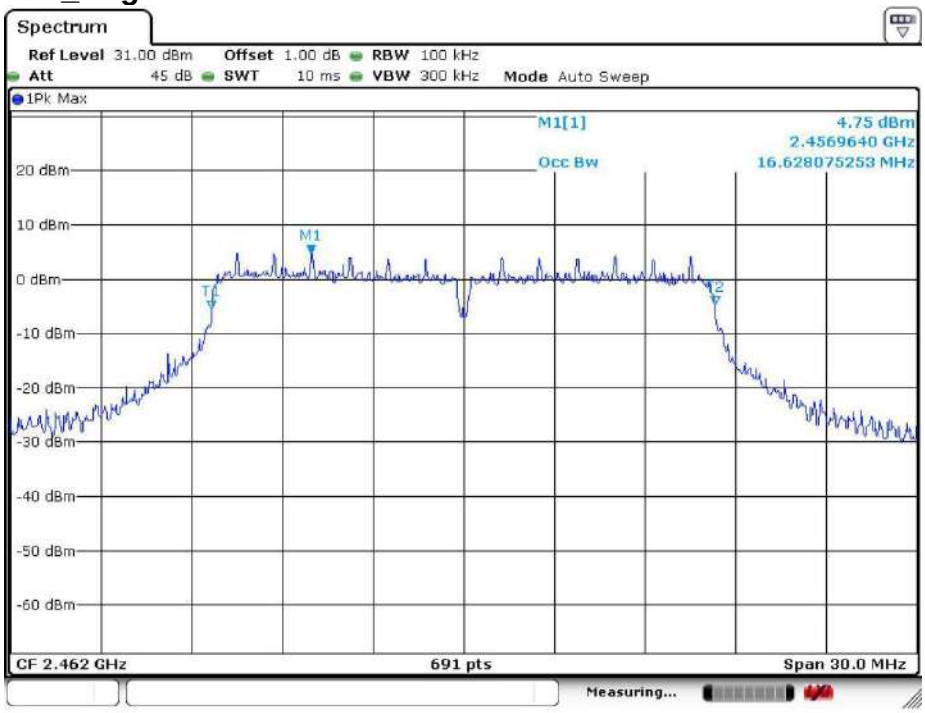
4.5.2.1.6 802.11G_ Highest Channel



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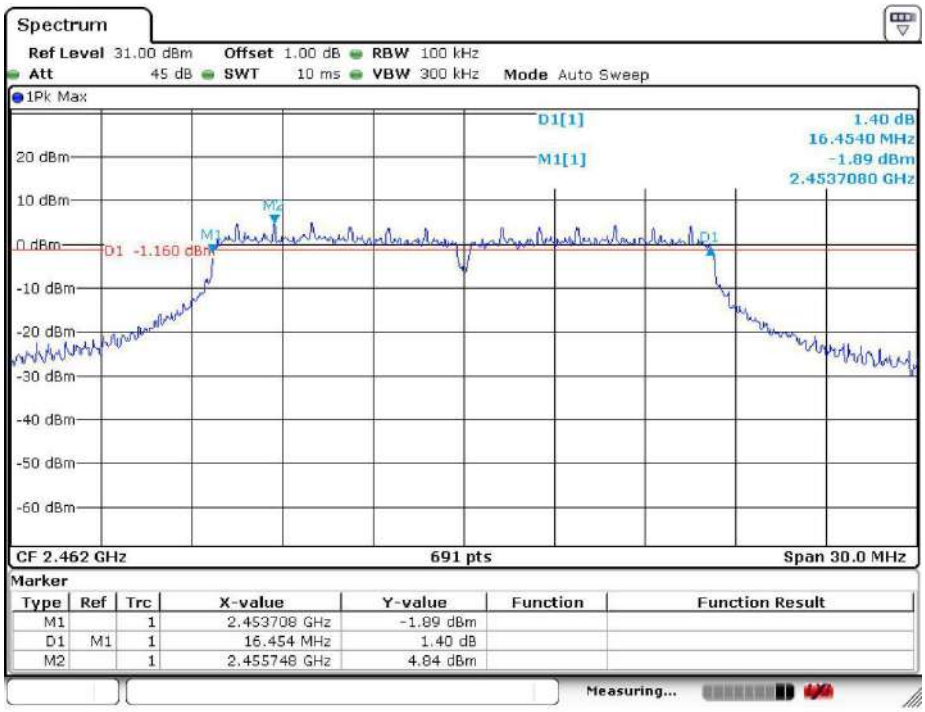

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.453708 GHz	-1.89 dBm		
D1	M1	1	16.454 MHz	1.40 dB		
M2		1	2.455748 GHz	4.84 dBm		

Date: 15.MAY.2020 08:37:30

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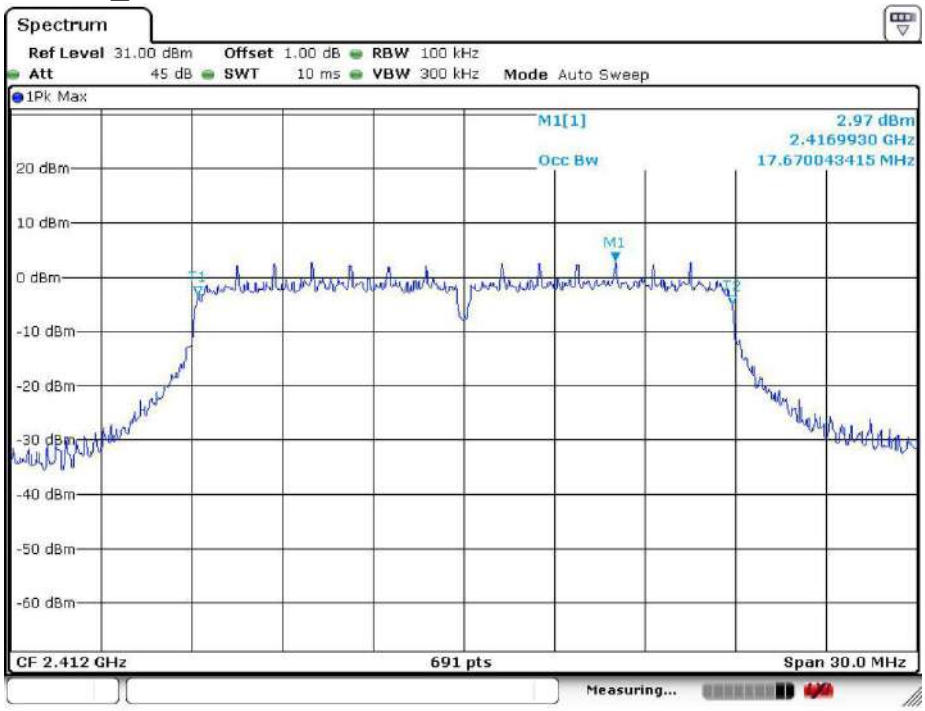
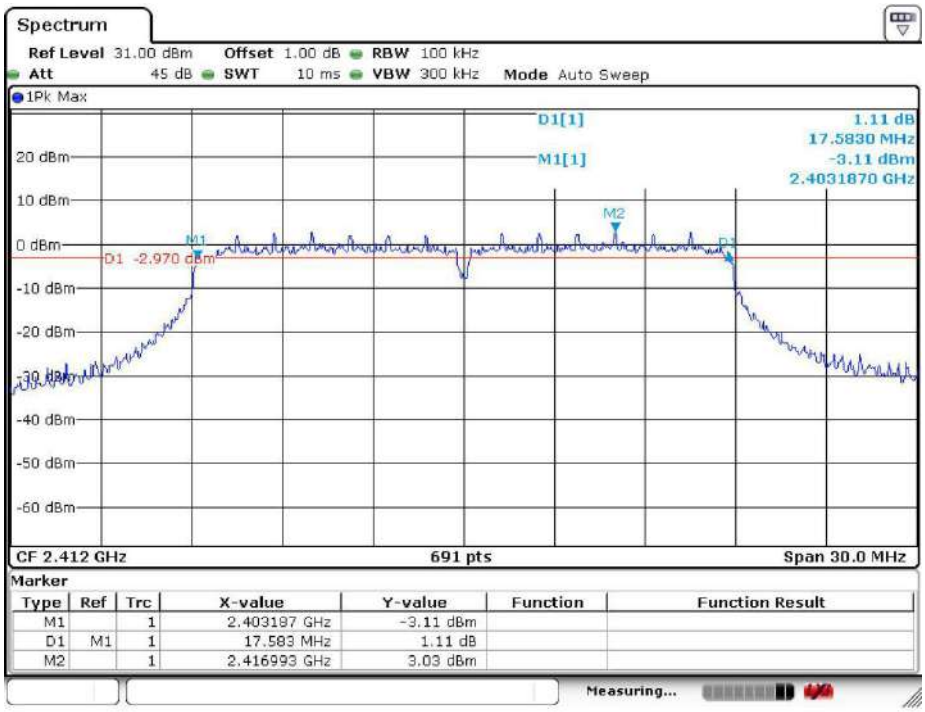
4.5.2.1.7 802.11N20_Lowest Channel



Date: 15.MAY.2020 08:48:37



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.403197 GHz	-3.11 dBm		
D1	M1	1	17.583 MHz	1.11 dB		
M2		1	2.416993 GHz	3.03 dBm		

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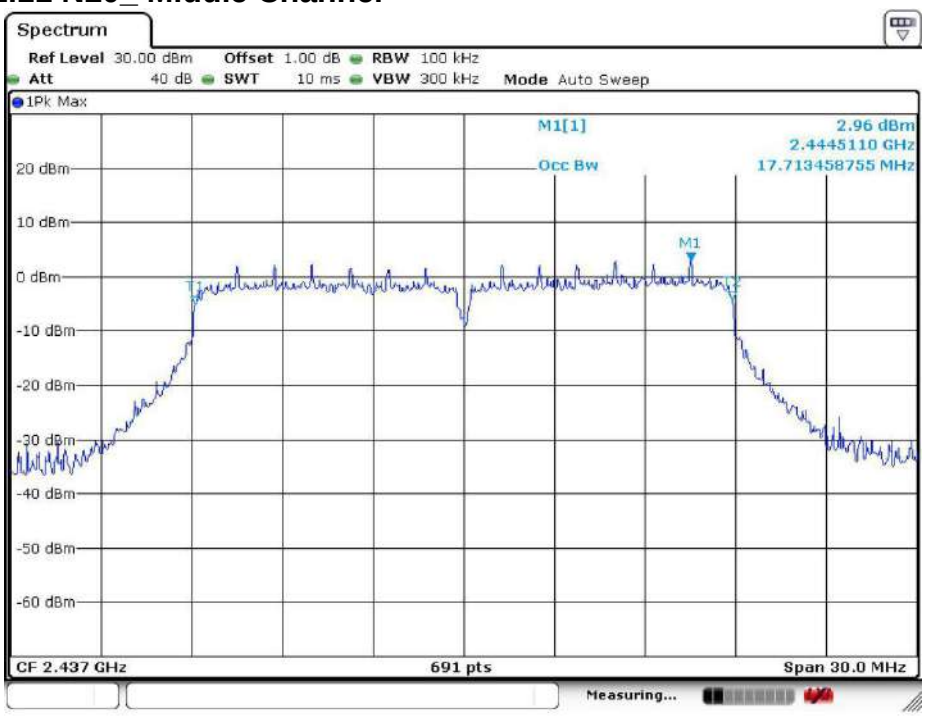
4.5.2.1.8 802.11 N20_ Middle Channel



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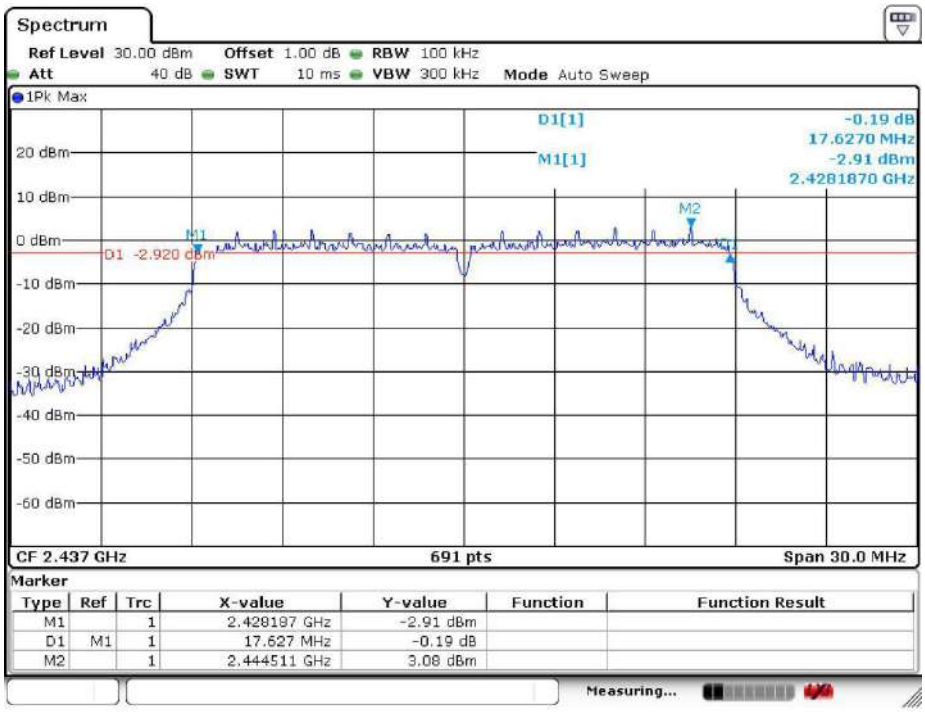

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.428197 GHz	-2.91 dBm		
D1	M1	1	17.627 MHz	-0.19 dB		
M2		1	2.444511 GHz	3.08 dBm		

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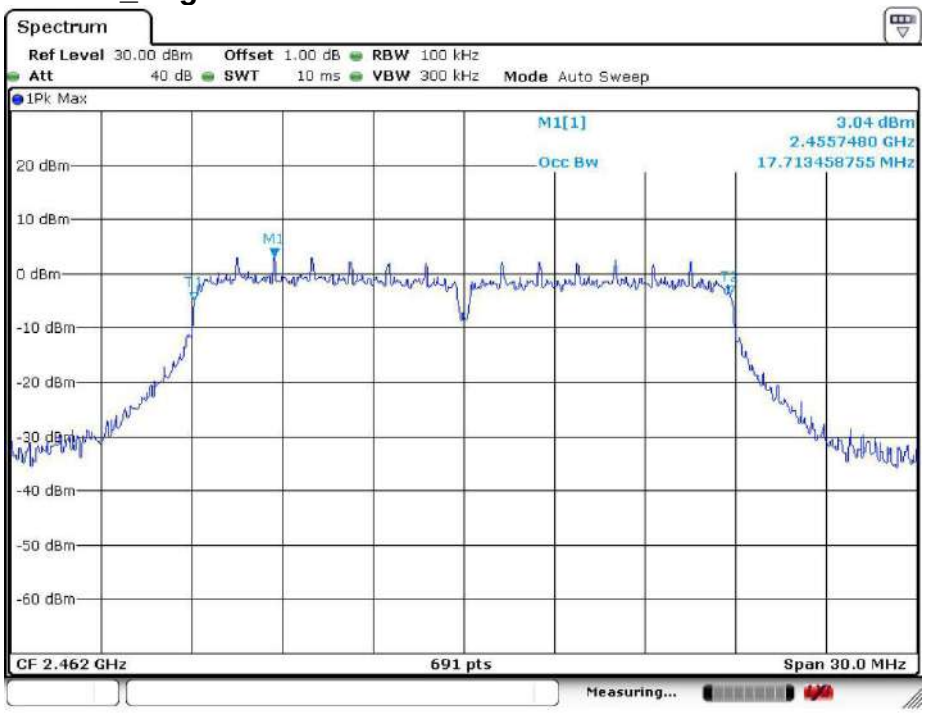
4.5.2.1.9 802.11 N20_ Highest Channel



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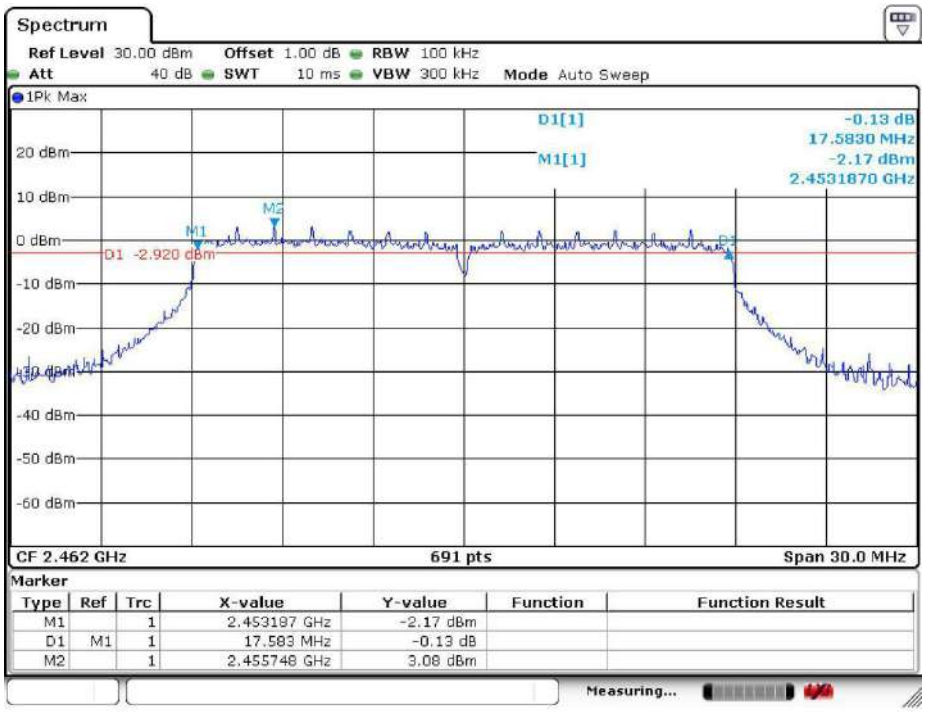

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.453197 GHz	-2.17 dBm		
D1	M1	1	17.583 MHz	-0.13 dB		
M2		1	2.455748 GHz	3.08 dBm		

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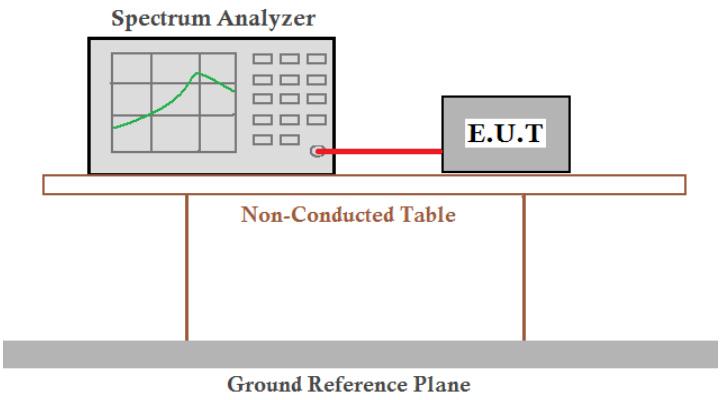
4.6 Power Spectral Density

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

4.6.1 Test Results

Mode	Test Channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
802.11B	Lowest	-2.38	≤8.00	Pass
	Middle	-2.96	≤8.00	Pass
	Highest	-2.83	≤8.00	Pass
802.11G	Lowest	-7.59	≤8.00	Pass
	Middle	-6.44	≤8.00	Pass
	Highest	-7.16	≤8.00	Pass
802.11N20	Lowest	-9.98	≤8.00	Pass
	Middle	-9.11	≤8.00	Pass
	Highest	-9.37	≤8.00	Pass

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4.6.2 Test plots

4.6.2.1 ANT1

4.6.2.1.1 802.11B_Lowest Channel

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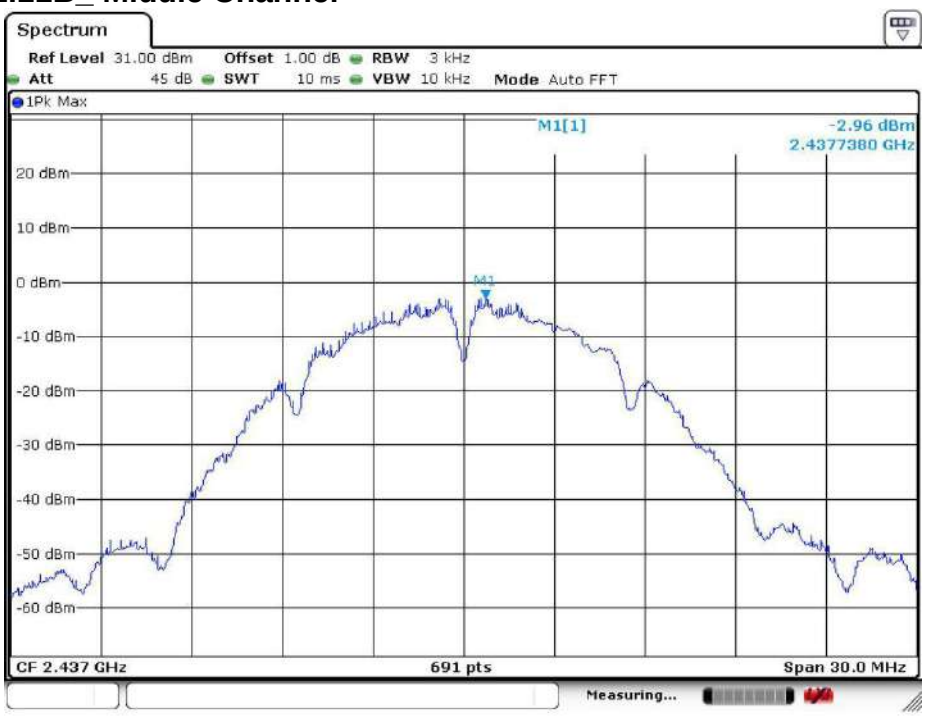
4.6.2.1.2 802.11B_ Middle Channel



Date: 15.MAY.2020 08:20:49

4.6.2.1.3 802.11B_ Highest Channel

Date: 15.MAY.2020 08:21:33

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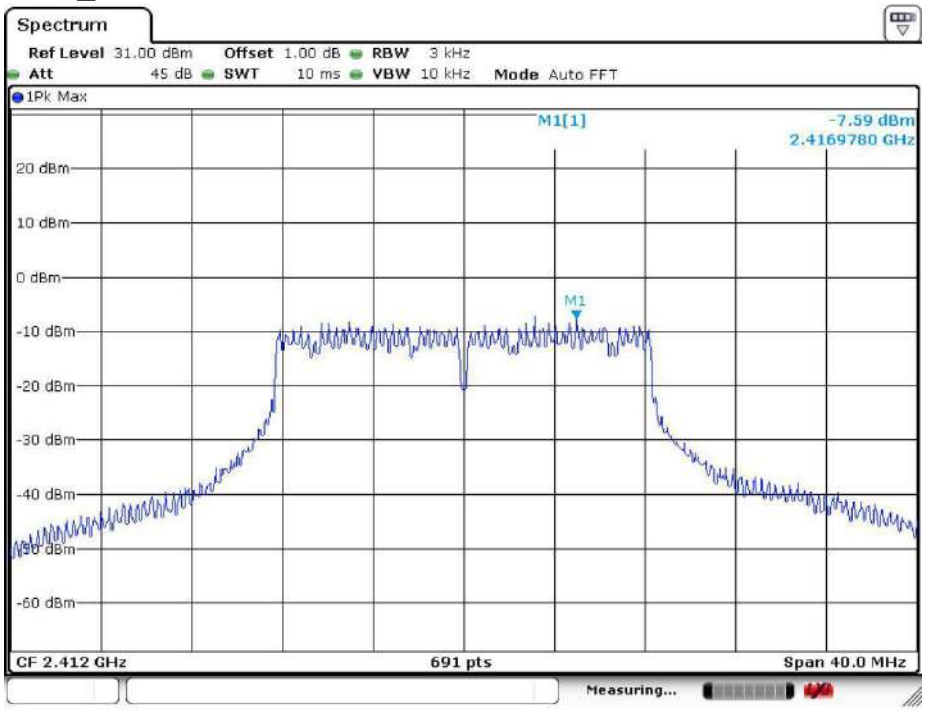
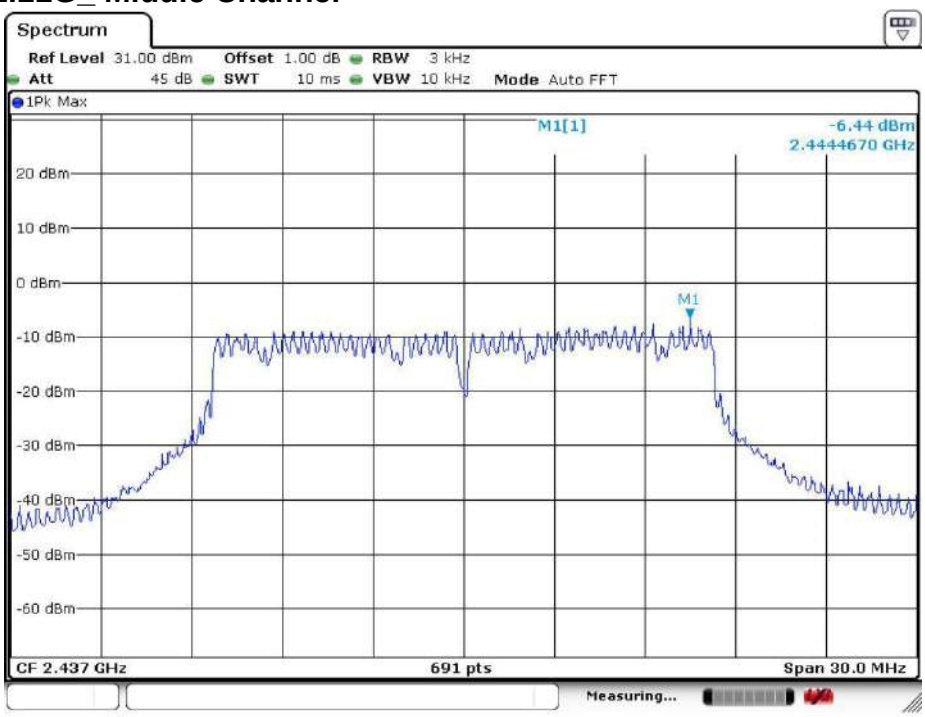
4.6.2.1.4 802.11G_Lowest Channel



Date: 15.MAY.2020 08:31:27

4.6.2.1.5 802.11G_ Middle Channel



Date: 15.MAY.2020 08:45:08

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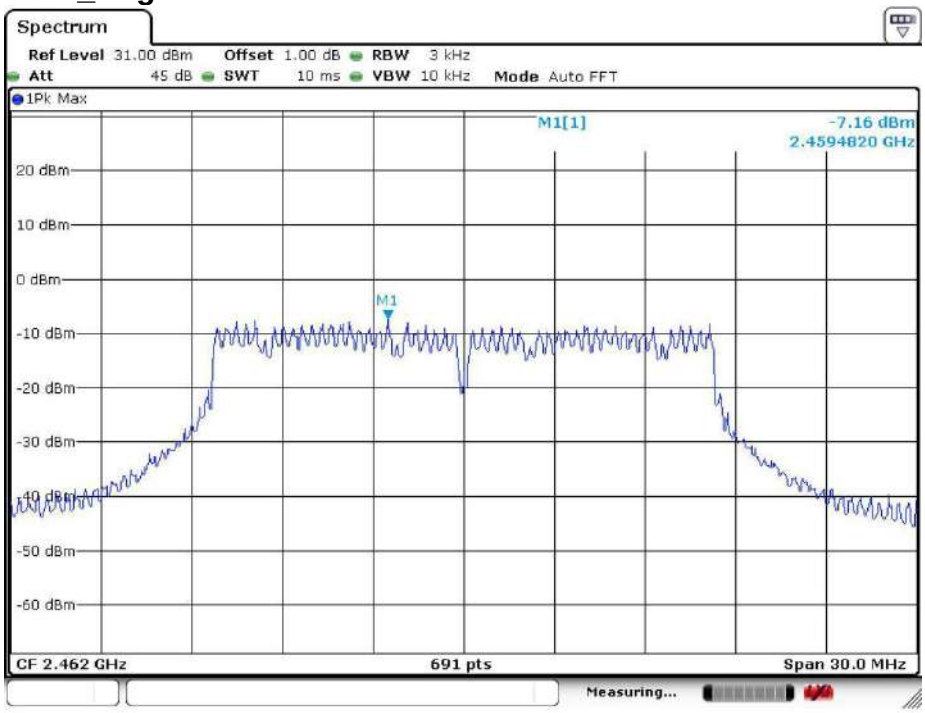
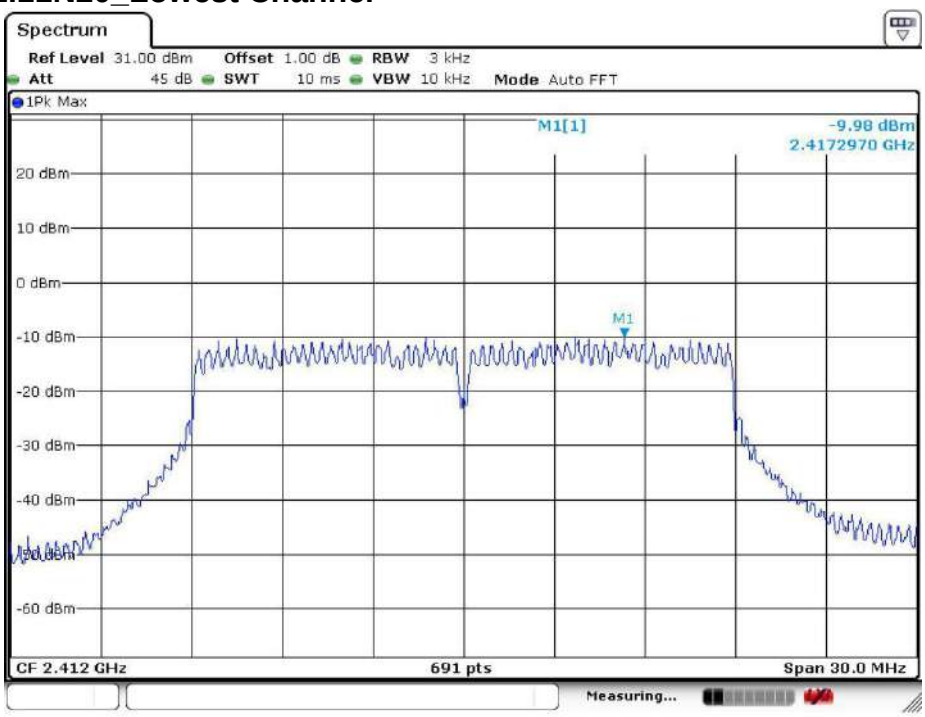
4.6.2.1.6 802.11G_ Highest Channel



Date: 15.MAY.2020 08:37:57

4.6.2.1.7 802.11N20_Lowest Channel



Date: 15.MAY.2020 08:48:56

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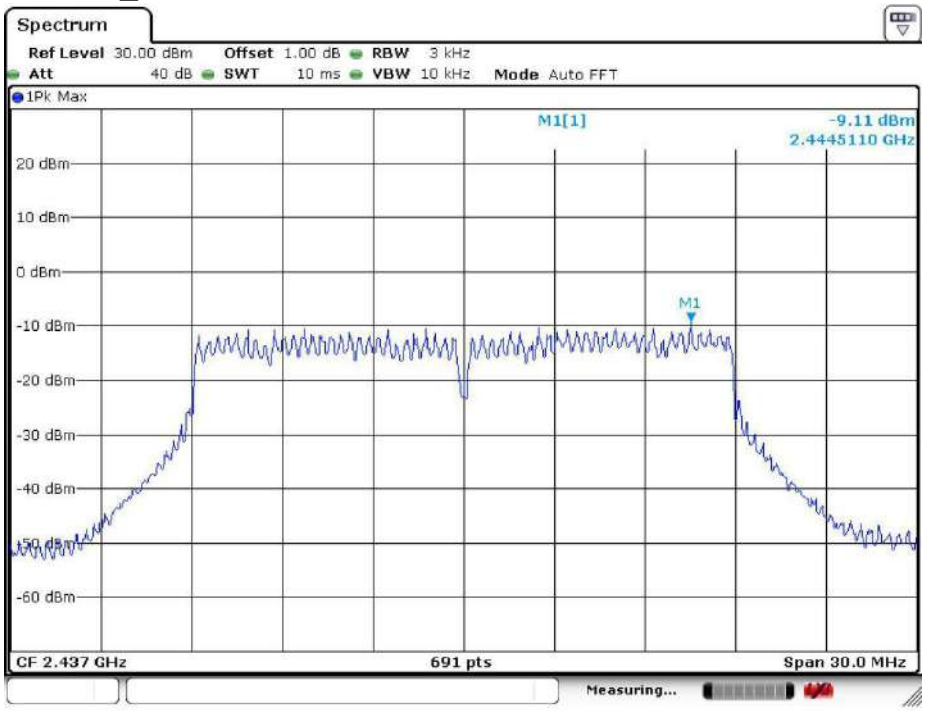
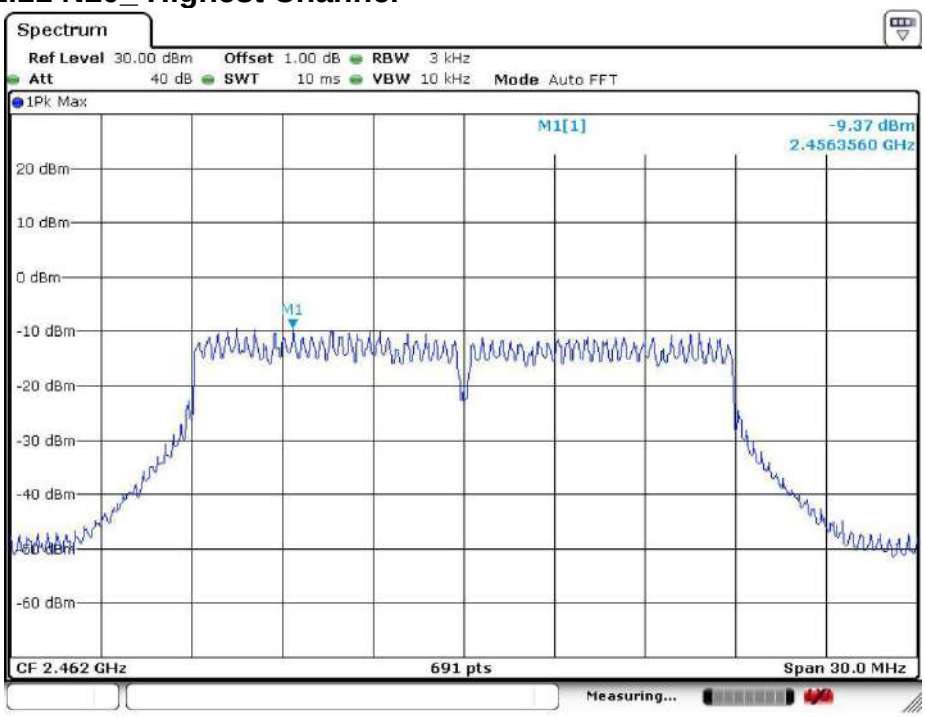
4.6.2.1.8 802.11 N20_ Middle Channel



Date: 15.MAY.2020 12:08:53

4.6.2.1.9 802.11 N20_ Highest Channel



Date: 15.MAY.2020 12:19:06

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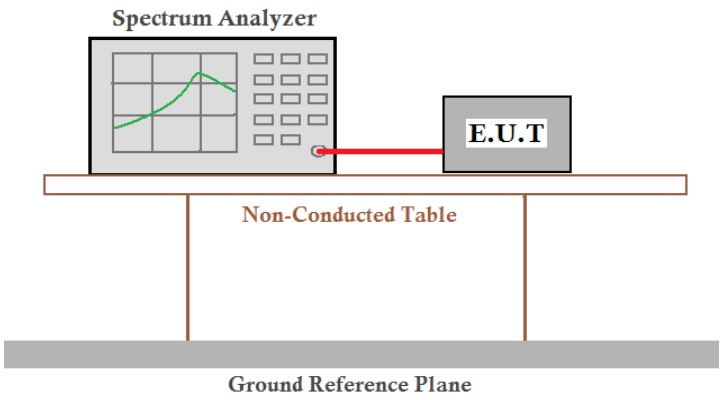
4.7 Band-edge for RF Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013 Section 11.13
Test Setup:	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11B; 6Mbps of rate is the worst case of 802.11G ; 6.5Mbps of rate is the worst case of 802.11N(HT20) ;
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Instruments Used:	Refer to section 6 for details
Test Results:	Pass

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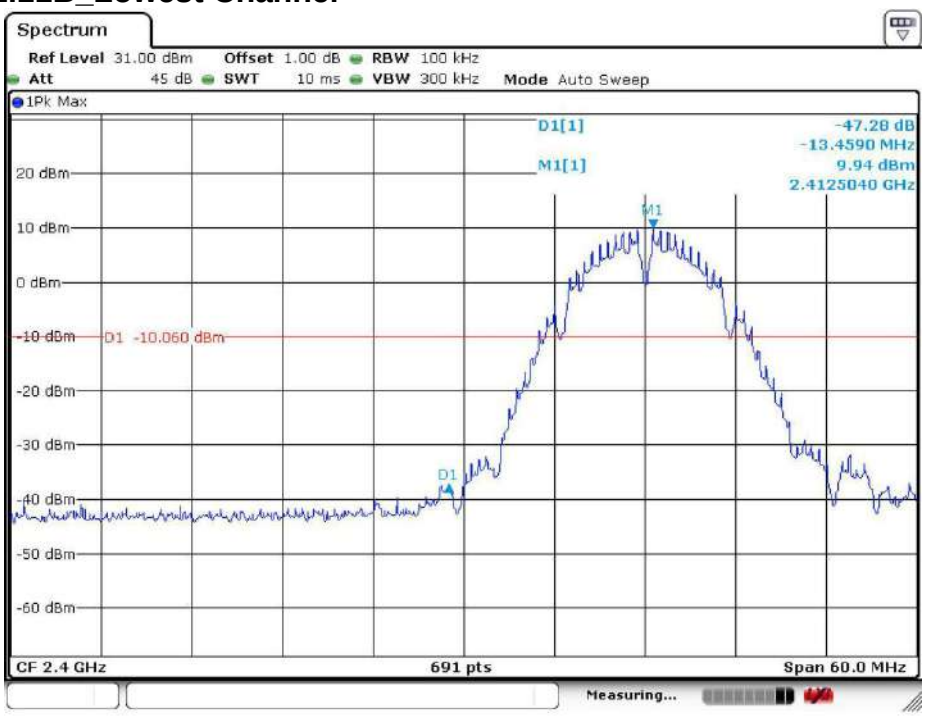
4.7.1 Test plots

4.7.1.1 ANT1

4.7.1.1.1 802.11B_Lowest Channel



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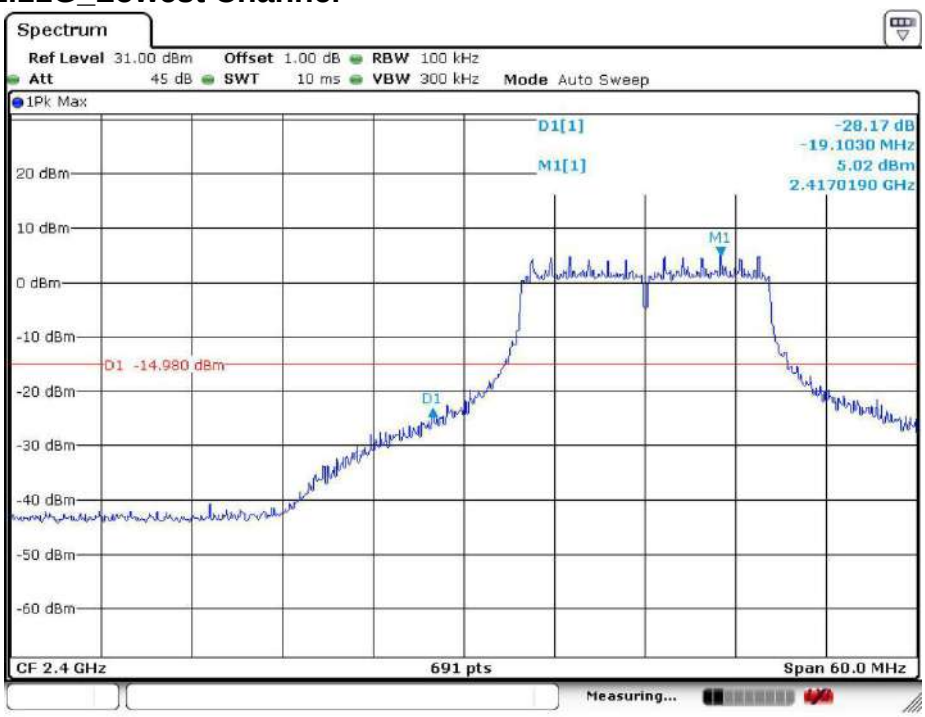
4.7.1.1.2 802.11B_ Highest Channel

Date: 15.MAY.2020 08:24:29

4.7.1.1.3 802.11G_Lowest Channel



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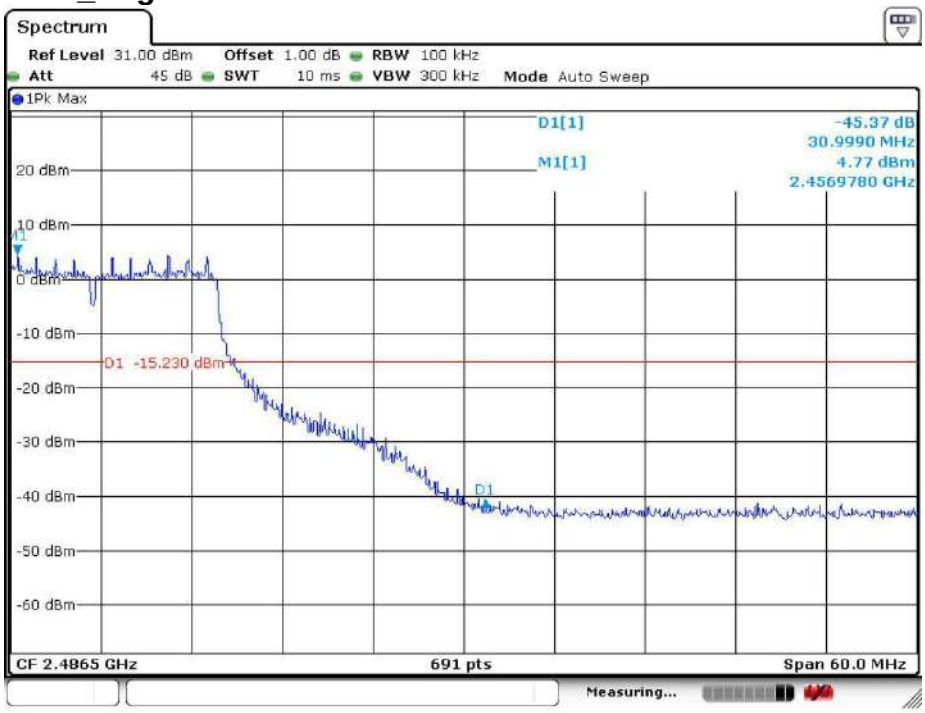
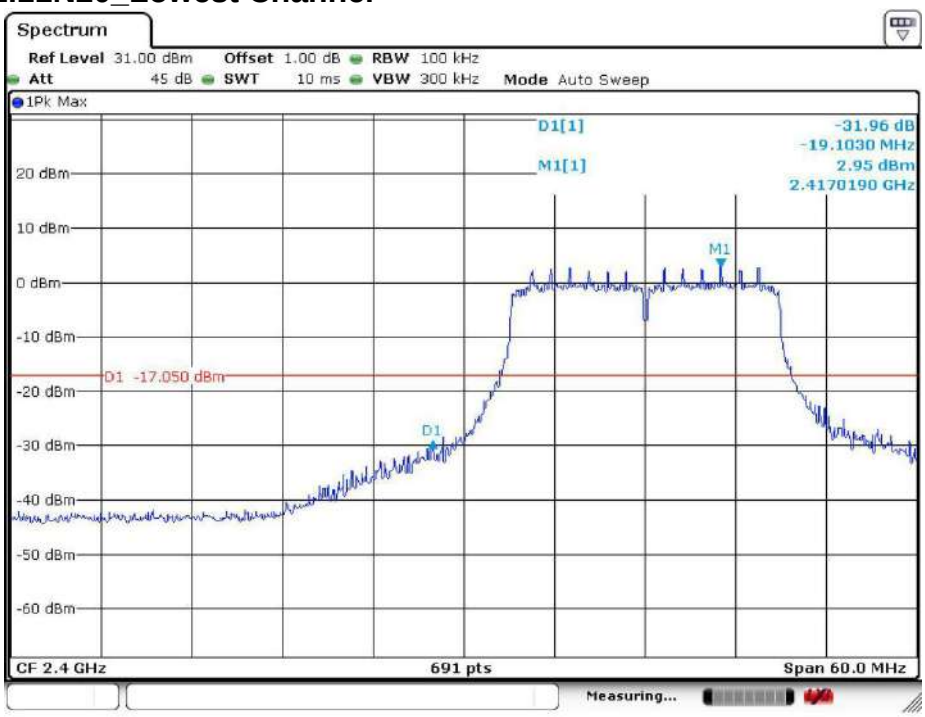
4.7.1.1.4 802.11G_ Highest Channel



Date: 15.MAY.2020 08:38:46

4.7.1.1.5 802.11N20_Lowest Channel



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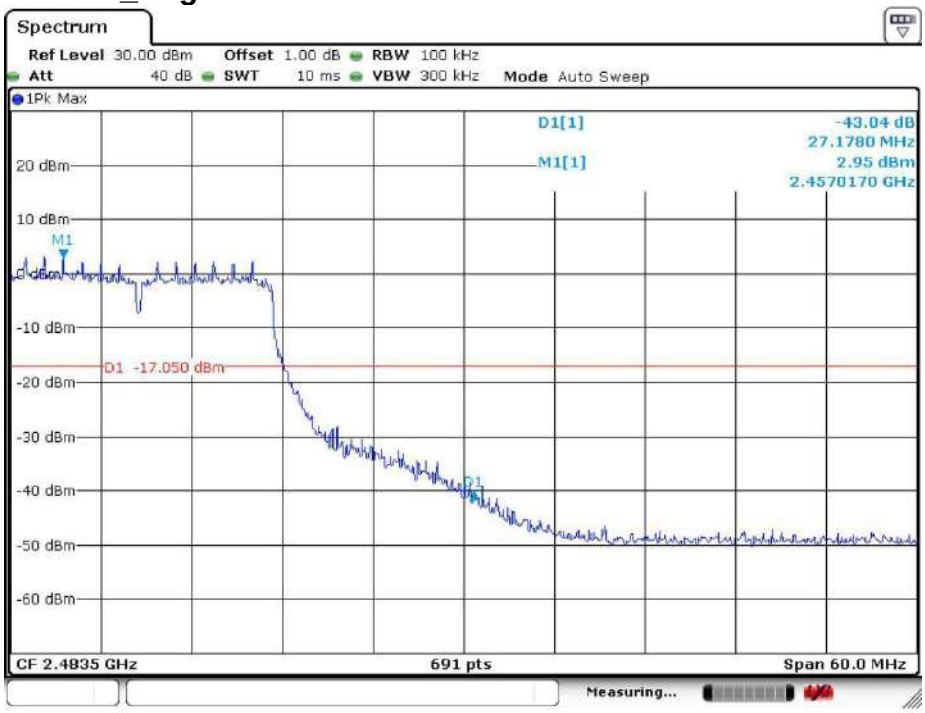
4.7.1.1.6 802.11 N20_ Highest Channel



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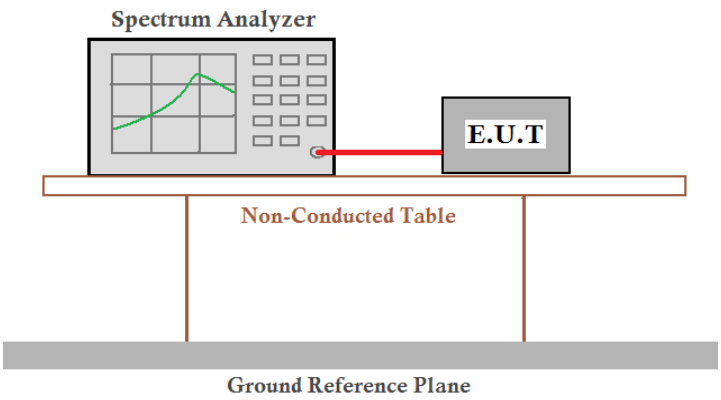
4.8 RF Conducted Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013 Section 11.11
Test Setup:	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11B; 6Mbps of rate is the worst case of 802.11G; 6.5Mbps of rate is the worst case of 802.11N(HT20);
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 6 for details
Test Results:	Pass

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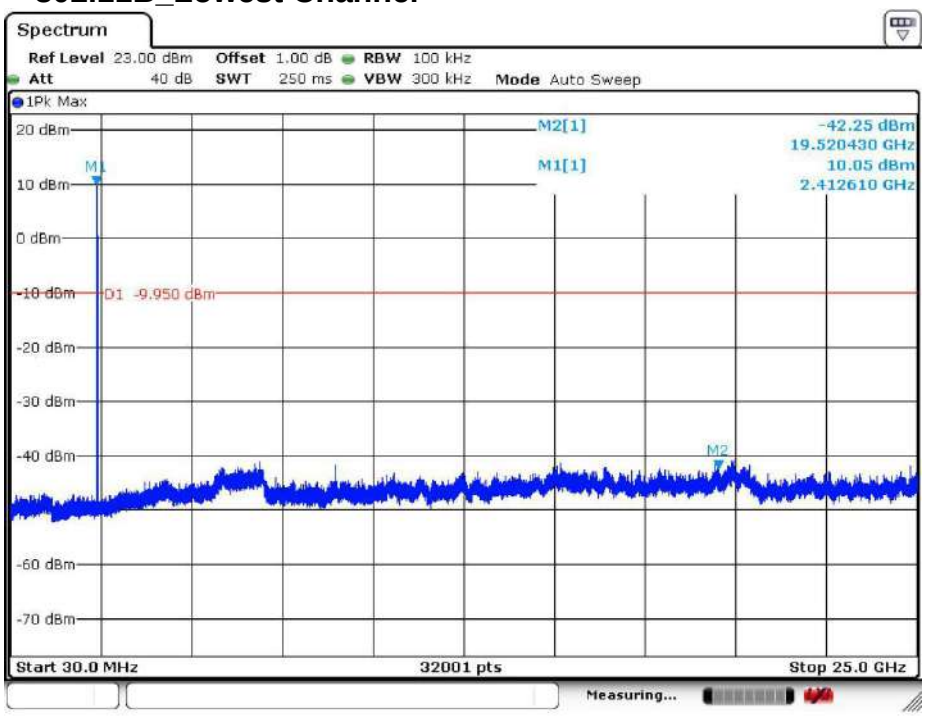
4.8.1 Test plots

4.8.1.1 ANT1

4.8.1.1.1 802.11B_Lowest Channel



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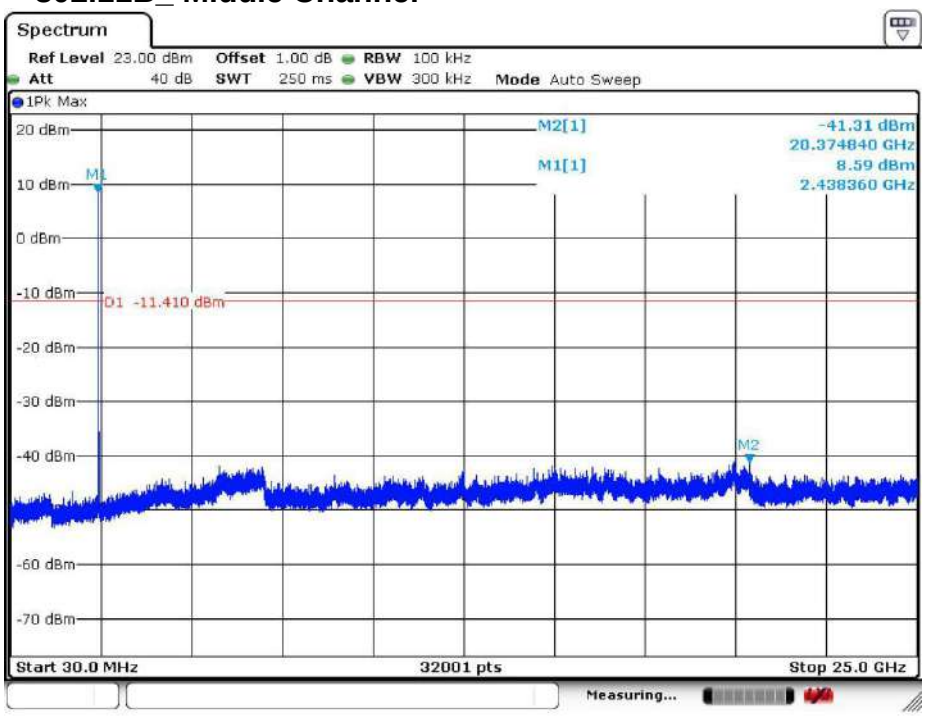
4.8.1.1.2 802.11B_ Middle Channel



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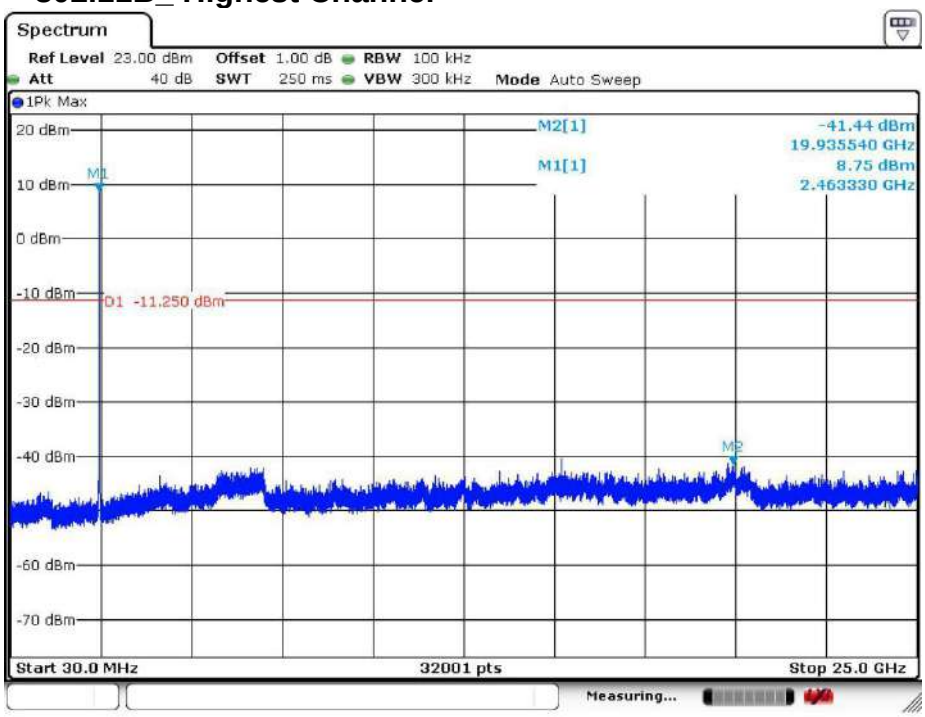
4.8.1.1.3 802.11B_ Highest Channel



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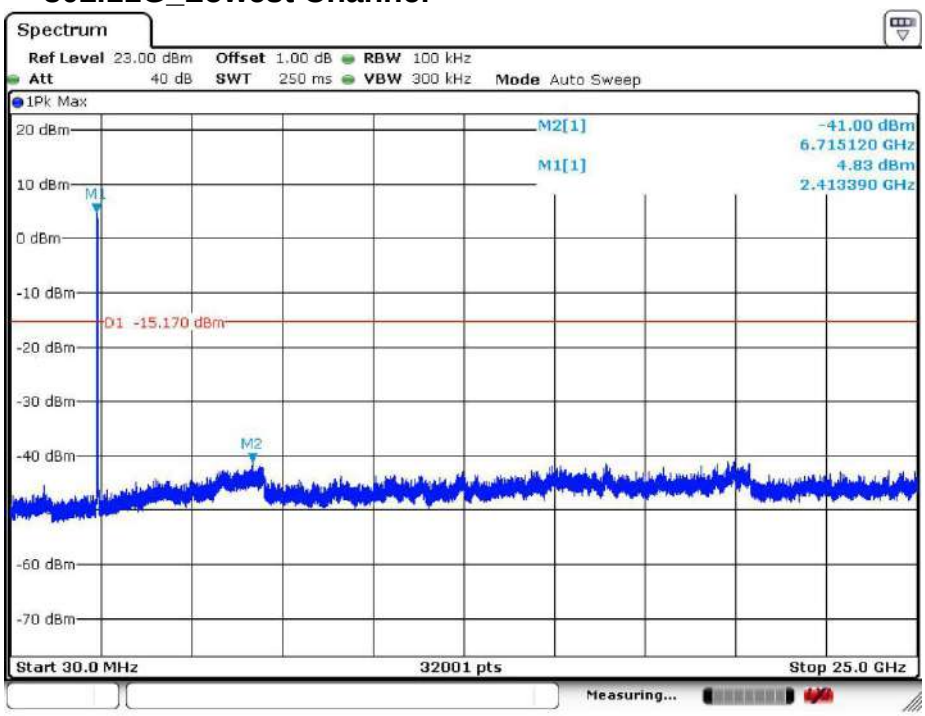
4.8.1.1.4 802.11G_Lowest Channel



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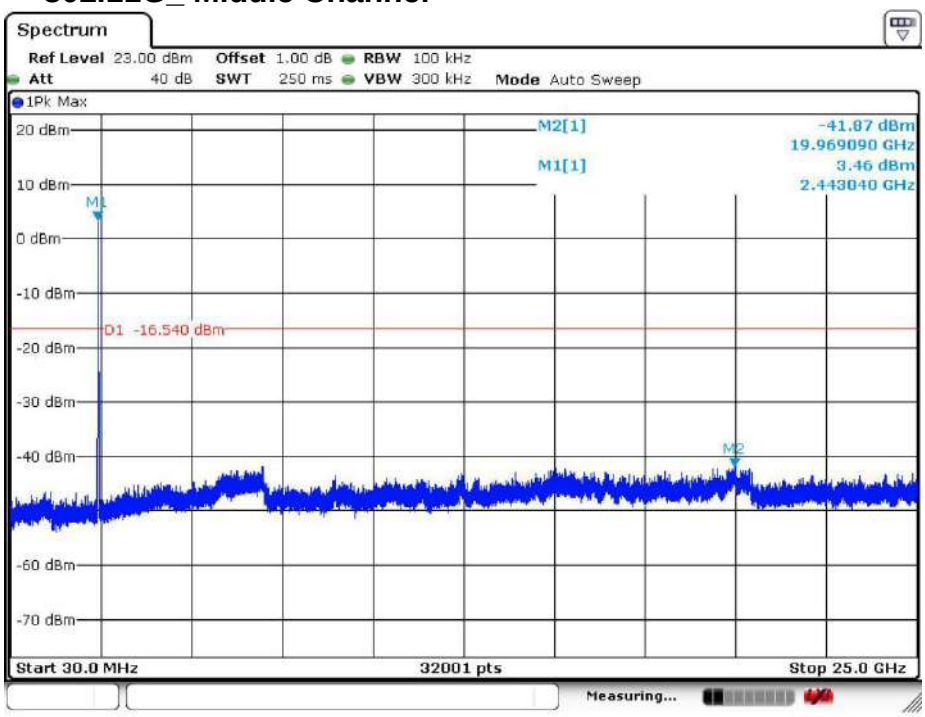
4.8.1.1.5 802.11G_ Middle Channel



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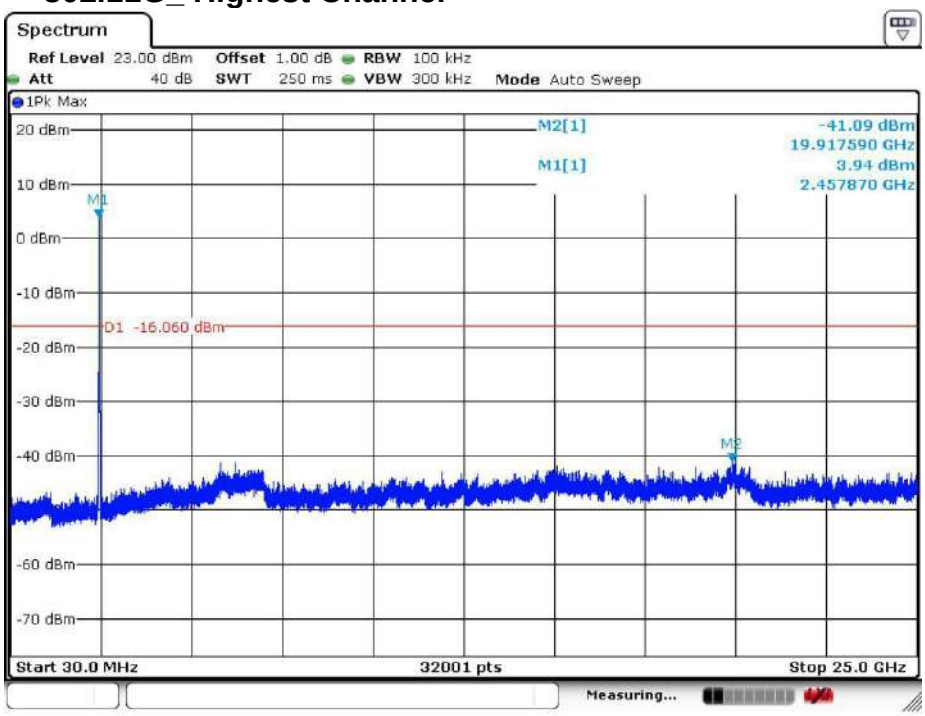
4.8.1.1.6 802.11G_ Highest Channel



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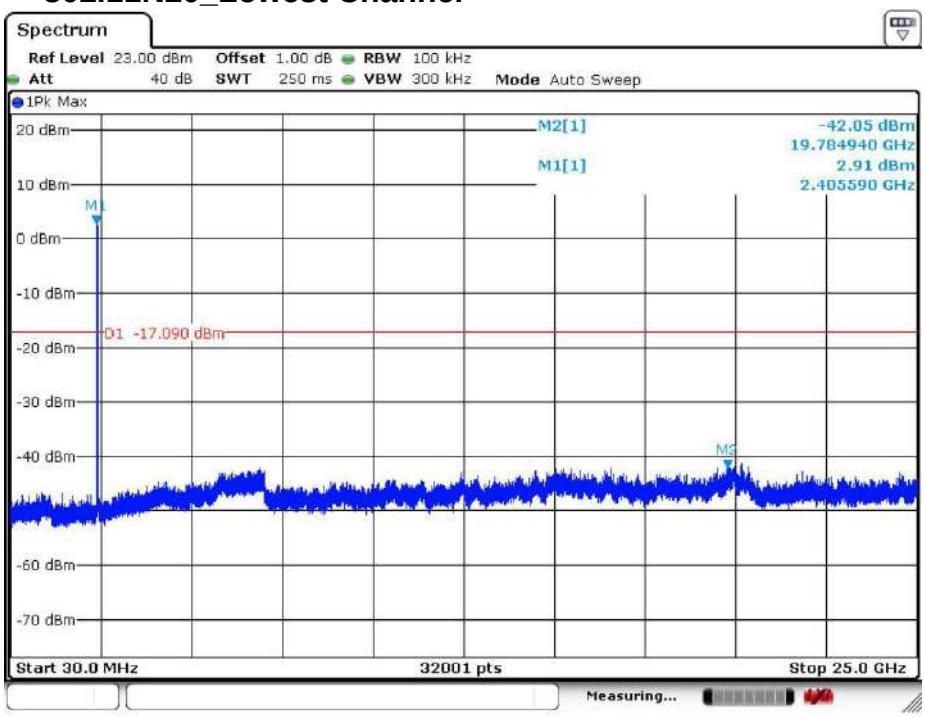
4.8.1.1.7 802.11N20_Lowest Channel



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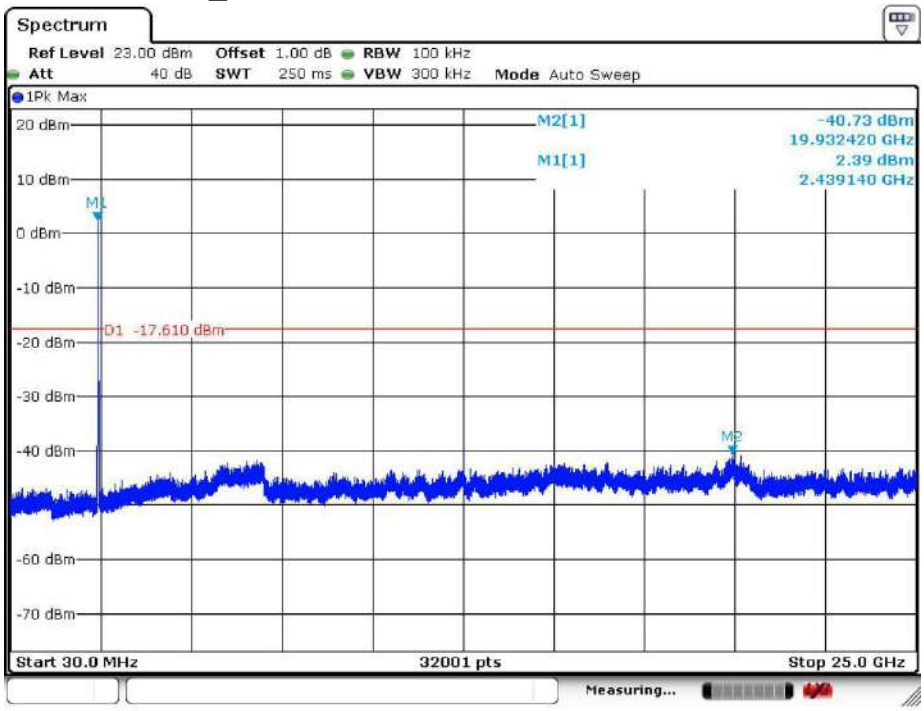
4.8.1.1.8 802.11 N20_ Middle Channel



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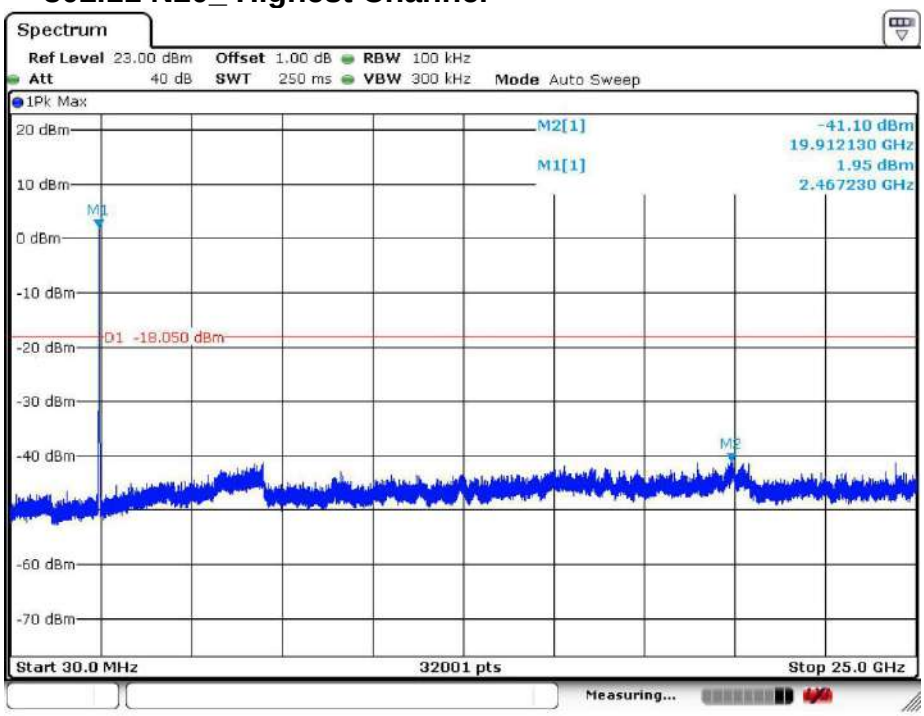
4.8.1.1.9 802.11 N20_ Highest Channel



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Remark:

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

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4.9 Radiated Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205				
Test Method:	ANSI C63.10 :2013 Section 11.12				
Test Site:	Measurement Distance: 3m 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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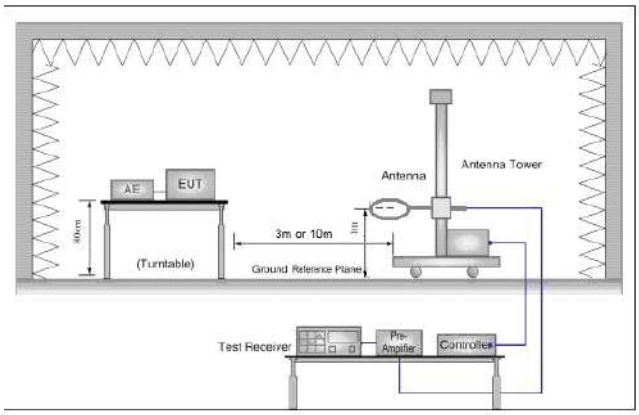

Figure 1. Below 30MHz

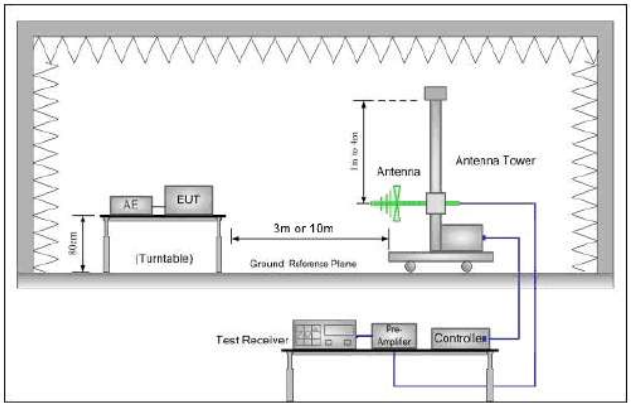

Figure 2. 30MHz to 1GHz

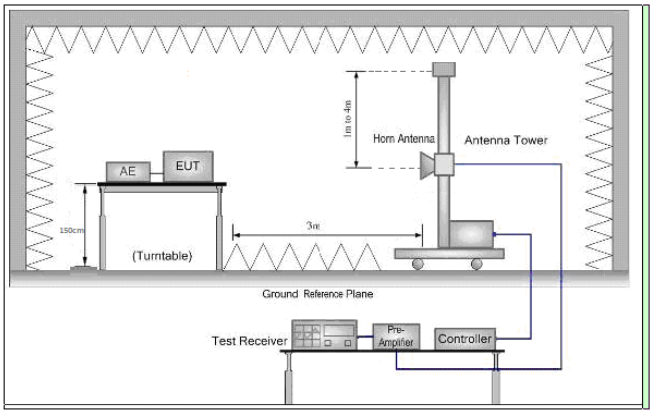

Figure 3. Above 1 GHz

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); 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 6 for details
Test Results:	Pass

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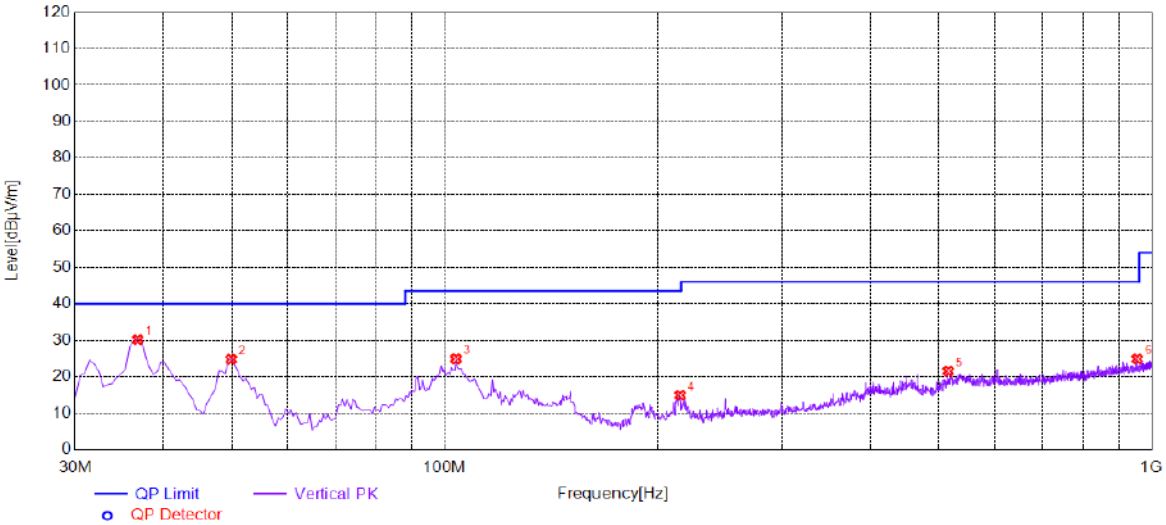
4.9.1 Radiated emission below 1GHz

4.9.1.1 Charge + Transmitting, Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	36.7934	30.16	-32.19	40.00	9.84	294	26	Vertical
2	49.8949	24.79	-30.18	40.00	15.21	234	335	Vertical
3	103.756	24.88	-31.68	43.50	18.62	213	88	Vertical
4	215.362	14.92	-30.46	43.50	28.58	262	326	Vertical
5	515.727	21.52	-22.29	46.00	24.48	150	179	Vertical
6	954.387	24.88	-14.42	46.00	21.12	204	257	Vertical

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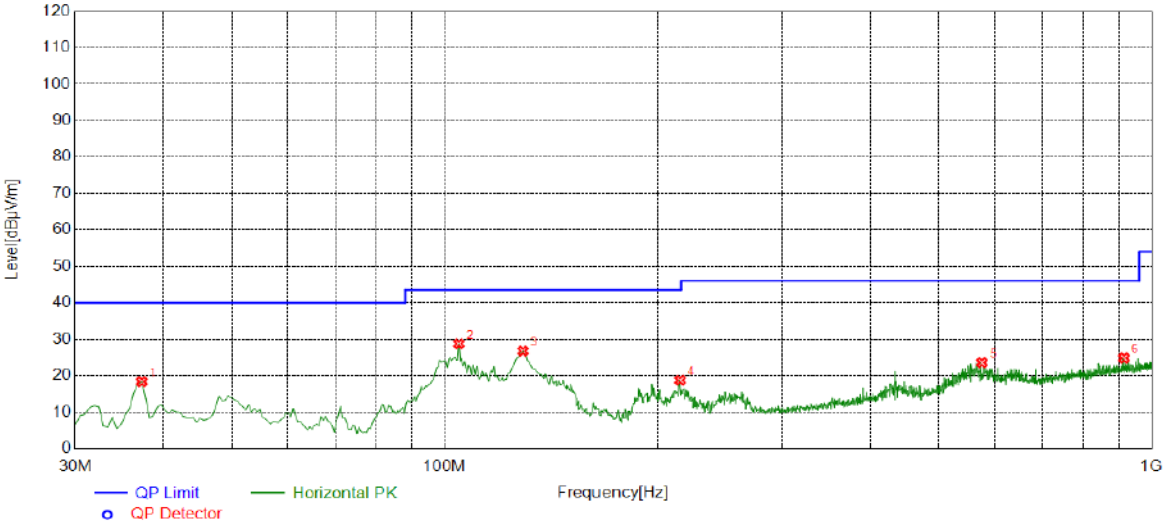
4.9.1.2 Charge + Transmitting, Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	37.2786	18.33	-32.03	40.00	21.67	105	242	Horizontal
2	104.727	28.73	-31.68	43.50	14.77	114	263	Horizontal
3	128.989	26.74	-34.63	43.50	16.76	204	16	Horizontal
4	215.362	18.71	-30.46	43.50	24.79	237	236	Horizontal
5	575.412	23.61	-20.75	46.00	22.39	136	16	Horizontal
6	914.112	24.85	-15.02	46.00	21.15	227	109	Horizontal

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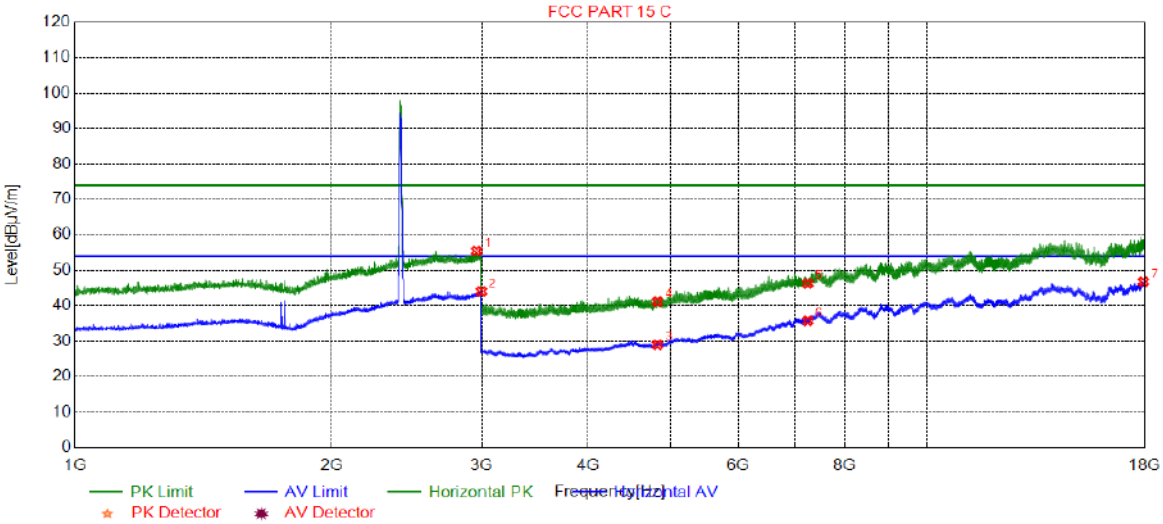
4.9.2 Transmitter emission above 1GHz

4.9.2.1 ANT1

4.9.2.1.1 802.11B_Lowest Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2958.48	55.45	9.64	74.00	18.55	240	193	Horizontal
2	2997.99	44.05	9.46	54.00	9.95	206	110	Horizontal
3	4824.00	28.97	-18.21	54.00	25.03	150	0	Horizontal
4	4824.00	41.19	-18.21	74.00	32.81	236	43	Horizontal
5	7236.00	46.28	-9.99	74.00	27.72	241	168	Horizontal
6	7236.00	35.73	-9.99	54.00	18.27	152	360	Horizontal
7	17919.6	46.78	0.70	54.00	7.22	152	18	Horizontal

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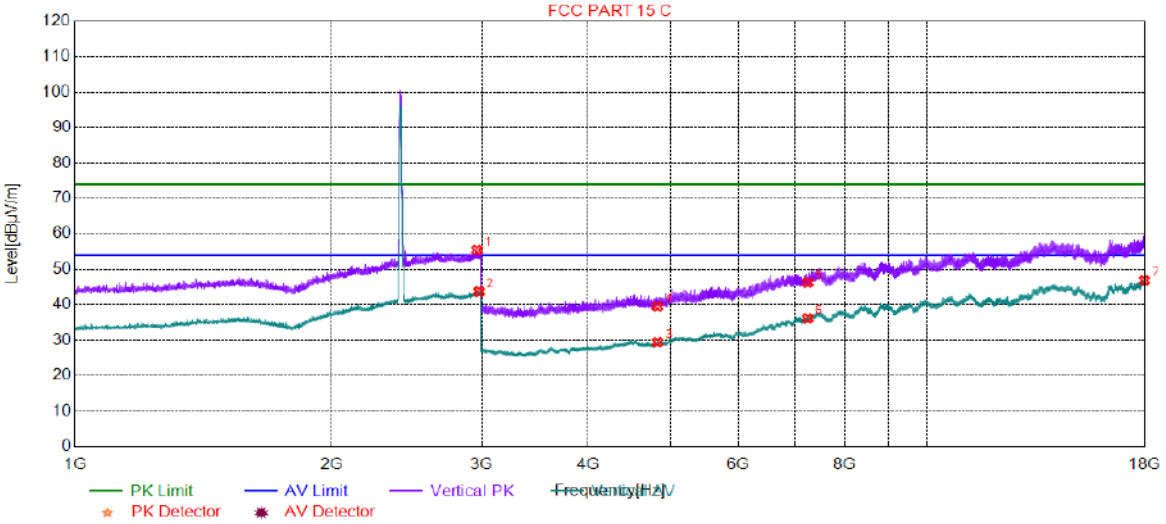
4.9.2.1.2 802.11B_Lowest Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2960.99	55.45	9.63	74.00	18.55	279	113	Vertical
2	2978.49	43.71	9.55	54.00	10.29	289	154	Vertical
3	4824.00	29.43	-18.21	54.00	24.57	166	316	Vertical
4	4824.00	39.51	-18.21	74.00	34.49	259	0	Vertical
5	7236.00	46.24	-9.99	74.00	27.76	235	269	Vertical
6	7236.00	36.12	-9.99	54.00	17.88	288	269	Vertical
7	17963.6	46.88	0.71	54.00	7.12	255	318	Vertical

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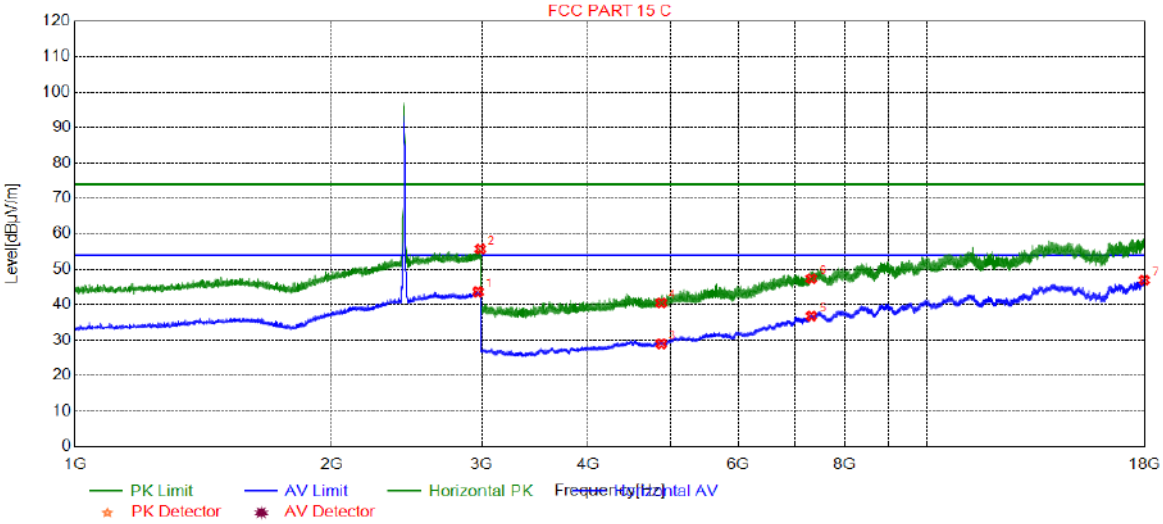
4.9.2.1.3 802.11B_ Middle Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2969.49	43.64	9.59	54.00	10.36	150	201	Horizontal
2	2989.49	55.74	9.50	74.00	18.26	150	242	Horizontal
3	4874.00	28.97	-17.99	54.00	25.03	150	162	Horizontal
4	4874.00	40.53	-17.99	74.00	33.47	150	101	Horizontal
5	7311.00	36.79	-9.74	54.00	17.21	150	222	Horizontal
6	7311.00	47.36	-9.74	74.00	26.64	150	140	Horizontal
7	17959.2	46.96	0.71	54.00	7.04	150	236	Horizontal

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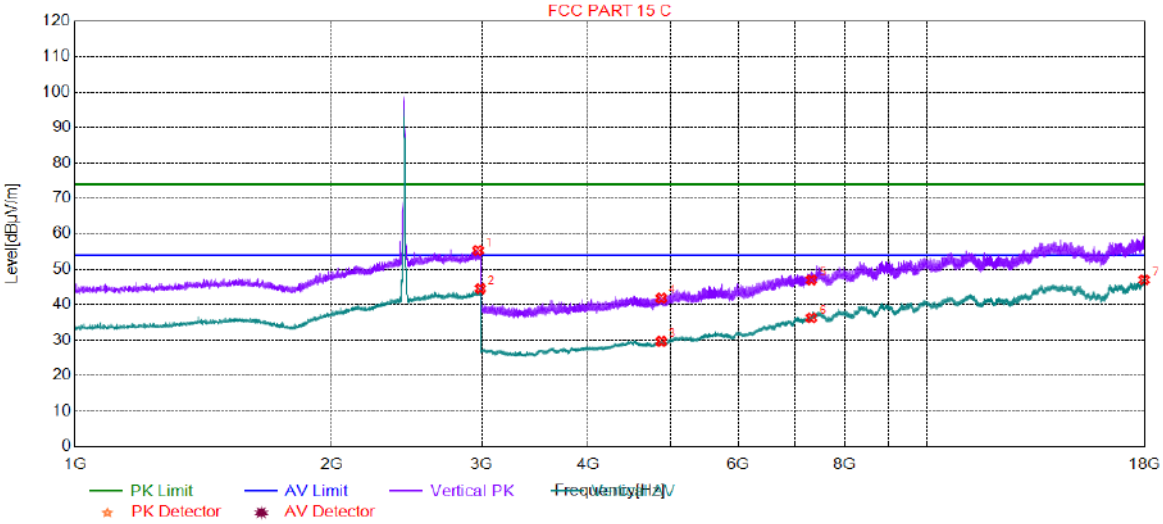
4.9.2.1.4 802.11B_ Middle Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2969.49	55.31	9.59	74.00	18.69	251	102	Vertical
2	2989.49	44.56	9.50	54.00	9.44	154	319	Vertical
3	4874.00	29.66	-17.99	54.00	24.34	168	179	Vertical
4	4874.00	41.90	-17.99	74.00	32.10	223	342	Vertical
5	7311.00	47.00	-9.74	74.00	27.00	283	68	Vertical
6	7311.00	36.27	-9.74	54.00	17.73	183	267	Vertical
7	17956.5	47.04	0.71	54.00	6.96	189	317	Vertical

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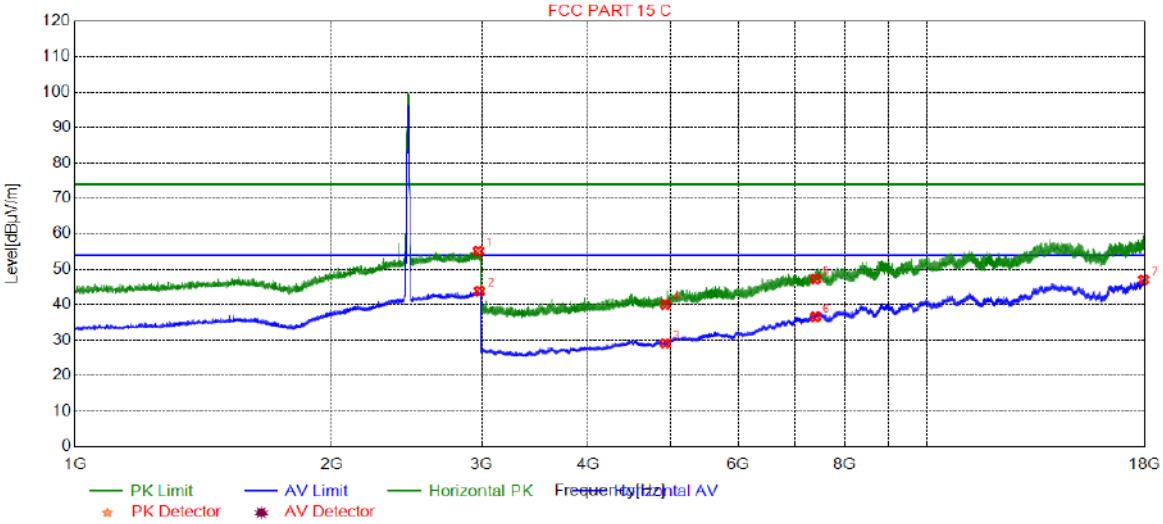
4.9.2.1.5 802.11B_ Highest Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2971.99	55.15	9.58	74.00	18.85	143	0	Horizontal
2	2981.49	43.82	9.54	54.00	10.18	220	192	Horizontal
3	4924.00	29.06	-17.72	54.00	24.94	190	68	Horizontal
4	4924.00	40.06	-17.72	74.00	33.94	177	68	Horizontal
5	7386.00	47.24	-9.55	74.00	26.76	194	216	Horizontal
6	7386.00	36.56	-9.55	54.00	17.44	153	68	Horizontal
7	17932.3	47.08	0.70	54.00	6.92	229	316	Horizontal

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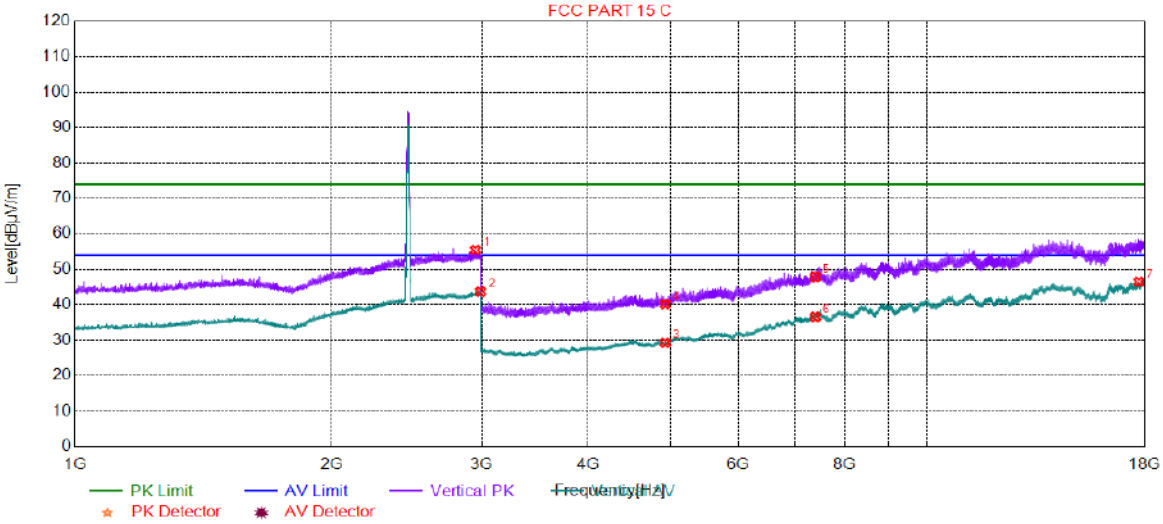
4.9.2.1.6 802.11B_ Highest Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2949.48	55.47	9.67	74.00	18.53	205	181	Vertical
2	2990.99	43.72	9.49	54.00	10.28	249	304	Vertical
3	4924.00	29.28	-17.72	54.00	24.72	295	41	Vertical
4	4924.00	40.17	-17.72	74.00	33.83	203	232	Vertical
5	7386.00	47.87	-9.55	74.00	26.13	252	118	Vertical
6	7386.00	36.53	-9.55	54.00	17.47	158	18	Vertical
7	17701.3	46.49	1.33	54.00	7.51	274	218	Vertical

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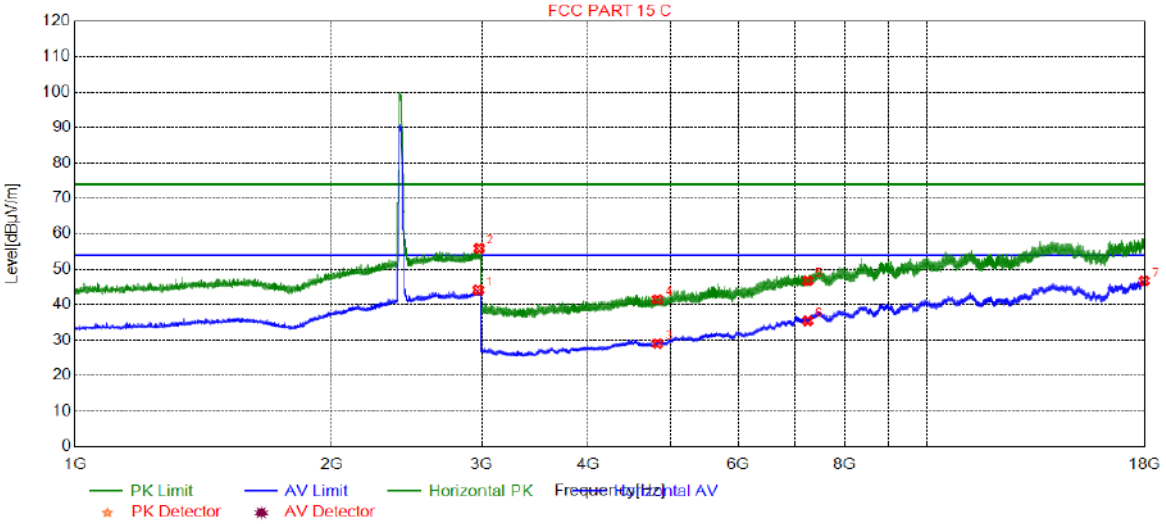
4.9.2.1.7 802.11G_Lowest Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2970.99	44.18	9.58	54.00	9.82	222	342	Horizontal
2	2979.49	55.92	9.54	74.00	18.08	153	247	Horizontal
3	4824.00	29.03	-18.21	54.00	24.97	127	315	Horizontal
4	4824.00	41.51	-18.21	74.00	32.49	207	0	Horizontal
5	7236.00	46.75	-9.99	74.00	27.25	208	317	Horizontal
6	7236.00	35.45	-9.99	54.00	18.55	107	67	Horizontal
7	17955.4	46.75	0.71	54.00	7.25	137	18	Horizontal

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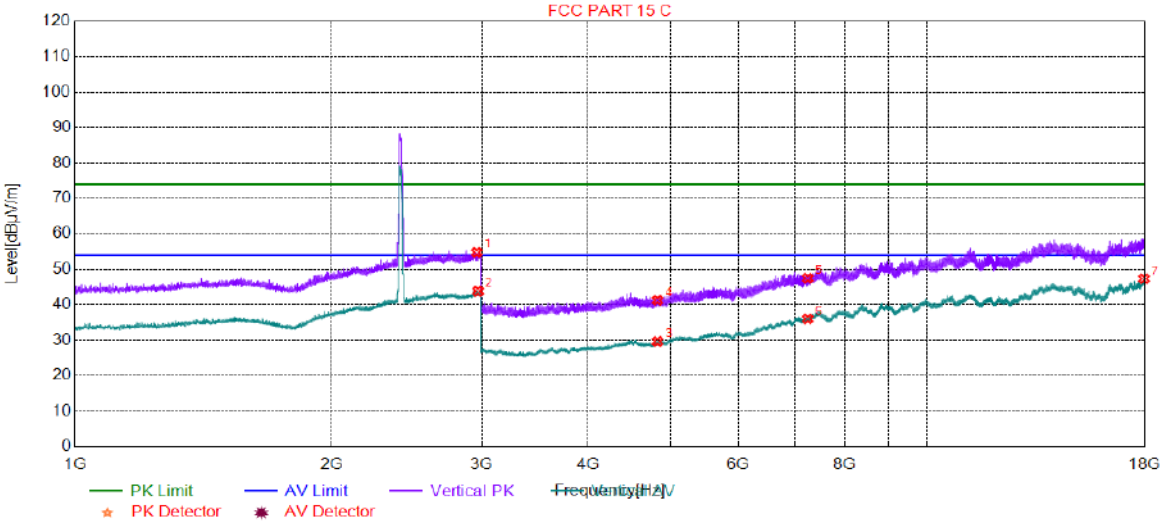
4.9.2.1.8 802.11G_Lowest Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2959.48	54.78	9.64	74.00	19.22	255	99	Vertical
2	2969.49	43.83	9.59	54.00	10.17	165	236	Vertical
3	4824.00	29.63	-18.21	54.00	24.37	268	179	Vertical
4	4824.00	41.30	-18.21	74.00	32.70	221	15	Vertical
5	7236.00	47.48	-9.99	74.00	26.52	210	18	Vertical
6	7236.00	35.99	-9.99	54.00	18.01	277	218	Vertical
7	17949.3	47.35	0.70	54.00	6.65	199	360	Vertical

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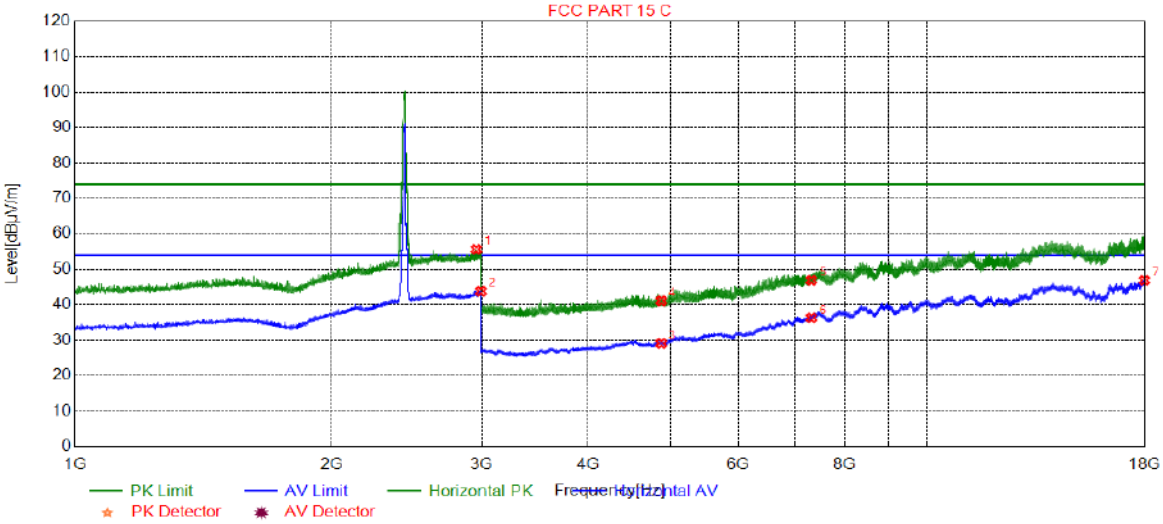
4.9.2.1.9 802.11G_ Middle Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2956.48	55.63	9.65	74.00	18.37	238	72	Horizontal
2	2994.49	43.82	9.48	54.00	10.18	206	58	Horizontal
3	4874.00	29.11	-17.99	54.00	24.89	239	206	Horizontal
4	4874.00	41.16	-17.99	74.00	32.84	151	206	Horizontal
5	7311.00	46.90	-9.74	74.00	27.10	168	267	Horizontal
6	7311.00	36.29	-9.74	54.00	17.71	167	267	Horizontal
7	17965.3	46.90	0.71	54.00	7.10	178	217	Horizontal

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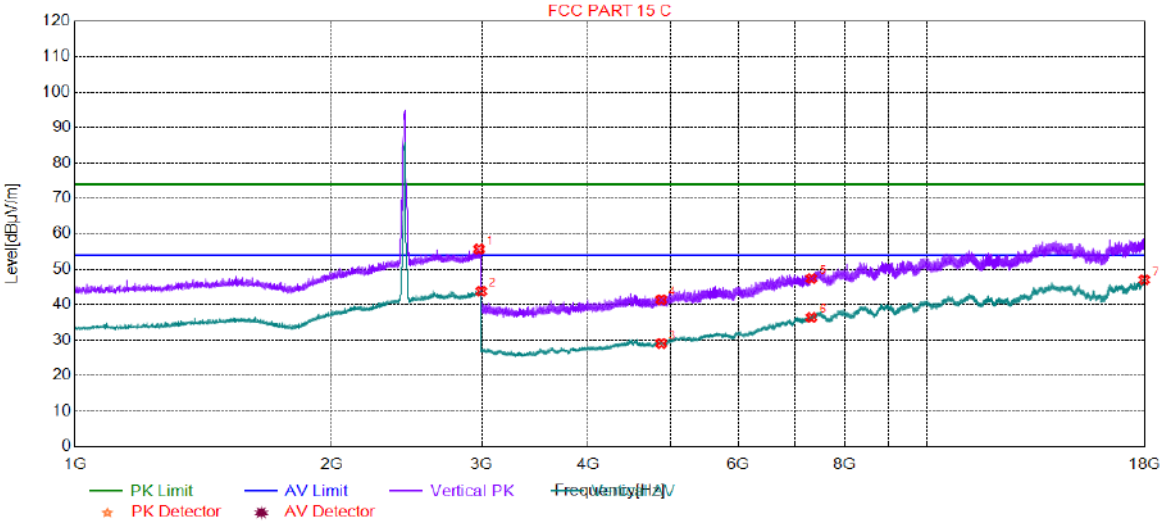
4.9.2.1.10 802.11G_ Middle Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2978.49	55.71	9.55	74.00	18.29	206	27	Vertical
2	2996.99	43.81	9.46	54.00	10.19	241	27	Vertical
3	4874.00	29.08	-17.99	54.00	24.92	179	0	Vertical
4	4874.00	41.45	-17.99	74.00	32.55	160	41	Vertical
5	7311.00	47.40	-9.74	74.00	26.60	266	68	Vertical
6	7311.00	36.38	-9.74	54.00	17.62	158	118	Vertical
7	17962.0	47.06	0.71	54.00	6.94	168	360	Vertical

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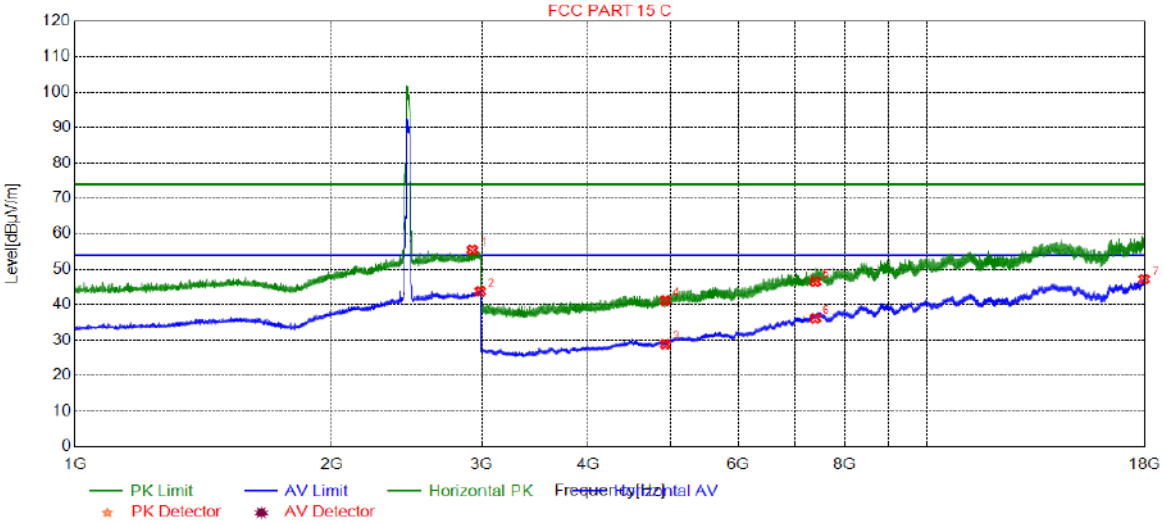
4.9.2.1.11 802.11G_ Highest Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2925.48	55.46	9.42	74.00	18.54	213	18	Horizontal
2	2988.99	43.79	9.50	54.00	10.21	114	155	Horizontal
3	4924.00	28.83	-17.72	54.00	25.17	176	124	Horizontal
4	4924.00	41.21	-17.72	74.00	32.79	242	287	Horizontal
5	7386.00	46.52	-9.55	74.00	27.48	216	317	Horizontal
6	7386.00	36.14	-9.55	54.00	17.86	202	118	Horizontal
7	17954.8	47.25	0.71	54.00	6.75	201	118	Horizontal

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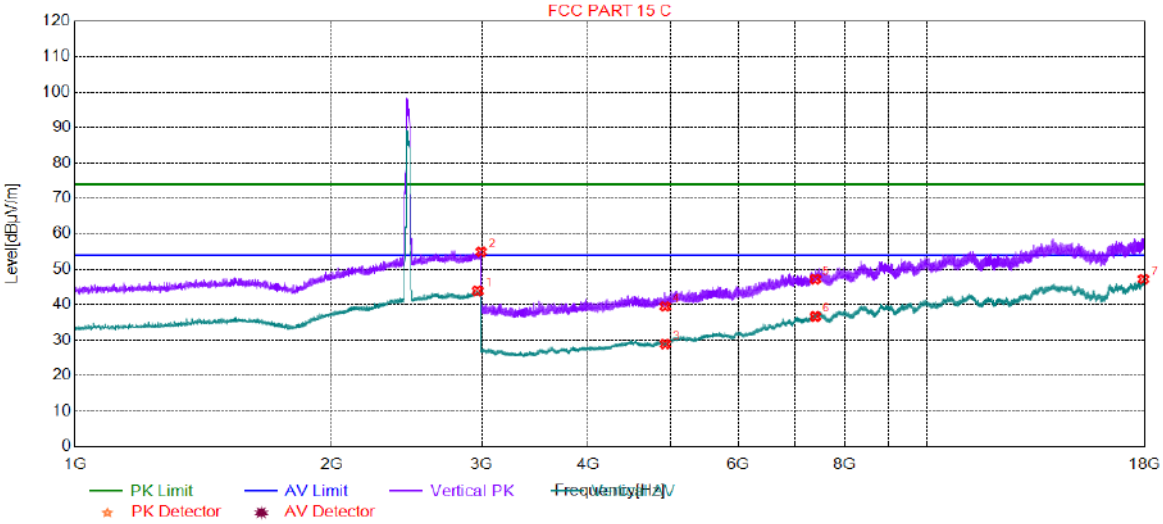
4.9.2.1.12 802.11G_ Highest Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2965.49	43.91	9.61	54.00	10.09	168	28	Vertical
2	2995.99	54.95	9.47	74.00	19.05	288	261	Vertical
3	4924.00	28.91	-17.72	54.00	25.09	219	16	Vertical
4	4924.00	39.54	-17.72	74.00	34.46	285	260	Vertical
5	7386.00	47.23	-9.55	74.00	26.77	183	318	Vertical
6	7386.00	36.67	-9.55	54.00	17.33	243	219	Vertical
7	17927.9	47.25	0.70	54.00	6.75	297	18	Vertical

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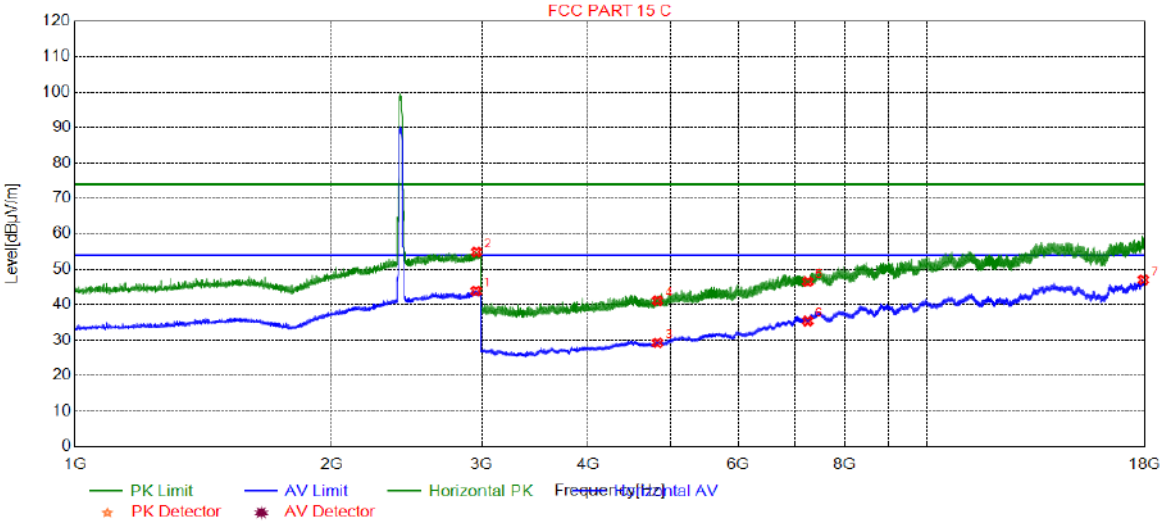
4.9.2.1.13 802.11N20_Lowest Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2954.98	43.86	9.66	54.00	10.14	169	179	Horizontal
2	2957.48	54.90	9.65	74.00	19.10	106	125	Horizontal
3	4824.00	29.25	-18.21	54.00	24.75	113	260	Horizontal
4	4824.00	41.18	-18.21	74.00	32.82	120	124	Horizontal
5	7236.00	46.52	-9.99	74.00	27.48	122	269	Horizontal
6	7236.00	35.40	-9.99	54.00	18.60	113	118	Horizontal
7	17921.3	47.05	0.70	54.00	6.95	146	118	Horizontal

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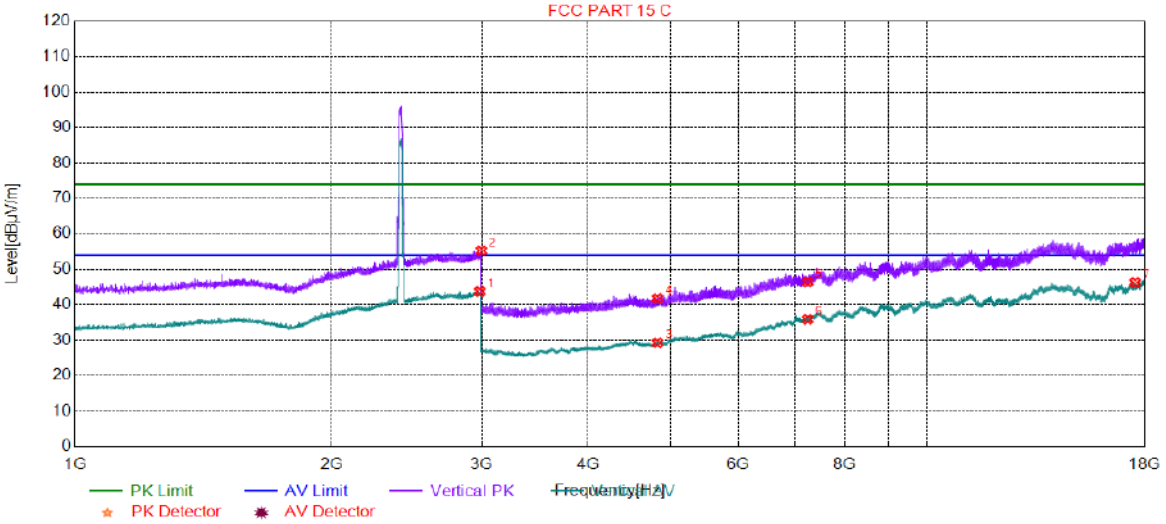
4.9.2.1.14 802.11N20_Lowest Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2984.99	43.76	9.52	54.00	10.24	192	342	Vertical
2	2997.49	55.26	9.46	74.00	18.74	150	84	Vertical
3	4824.00	29.27	-18.21	54.00	24.73	264	206	Vertical
4	4824.00	41.81	-18.21	74.00	32.19	181	0	Vertical
5	7236.00	46.39	-9.99	74.00	27.61	160	319	Vertical
6	7236.00	35.87	-9.99	54.00	18.13	286	268	Vertical
7	17529.1	46.28	1.03	54.00	7.72	213	319	Vertical

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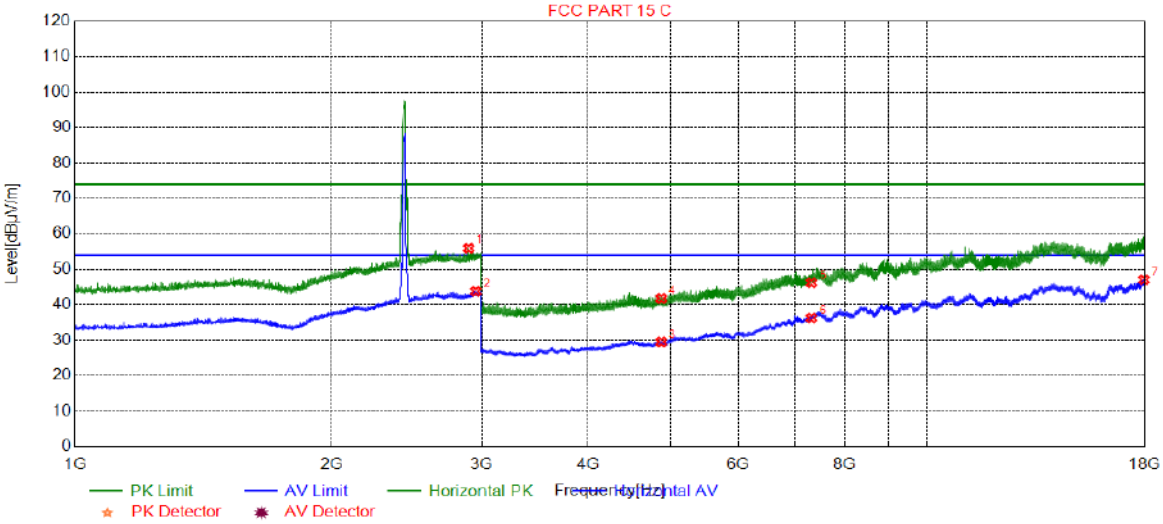
4.9.2.1.15 802.11N20_ Middle Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2896.97	55.95	9.15	74.00	18.05	241	168	Horizontal
2	2952.48	43.79	9.67	54.00	10.21	225	250	Horizontal
3	4874.00	29.48	-17.99	54.00	24.52	152	42	Horizontal
4	4874.00	41.80	-17.99	74.00	32.20	228	69	Horizontal
5	7311.00	46.21	-9.74	74.00	27.79	122	359	Horizontal
6	7311.00	36.23	-9.74	54.00	17.77	196	167	Horizontal
7	17946.6	47.05	0.70	54.00	6.95	193	316	Horizontal

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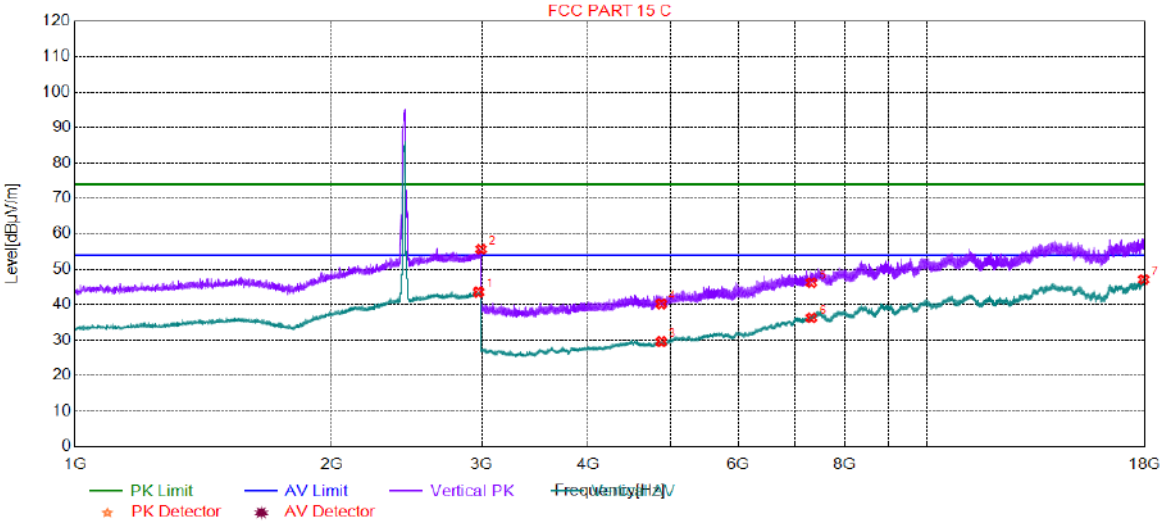
4.9.2.1.16 802.11N20_ Middle Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2973.99	43.58	9.57	54.00	10.42	161	193	Vertical
2	2994.99	55.68	9.47	74.00	18.32	172	138	Vertical
3	4874.00	29.59	-17.99	54.00	24.41	250	98	Vertical
4	4874.00	40.26	-17.99	74.00	33.74	227	288	Vertical
5	7311.00	46.22	-9.74	74.00	27.78	227	268	Vertical
6	7311.00	36.28	-9.74	54.00	17.72	194	168	Vertical
7	17935.6	47.14	0.70	54.00	6.86	249	360	Vertical

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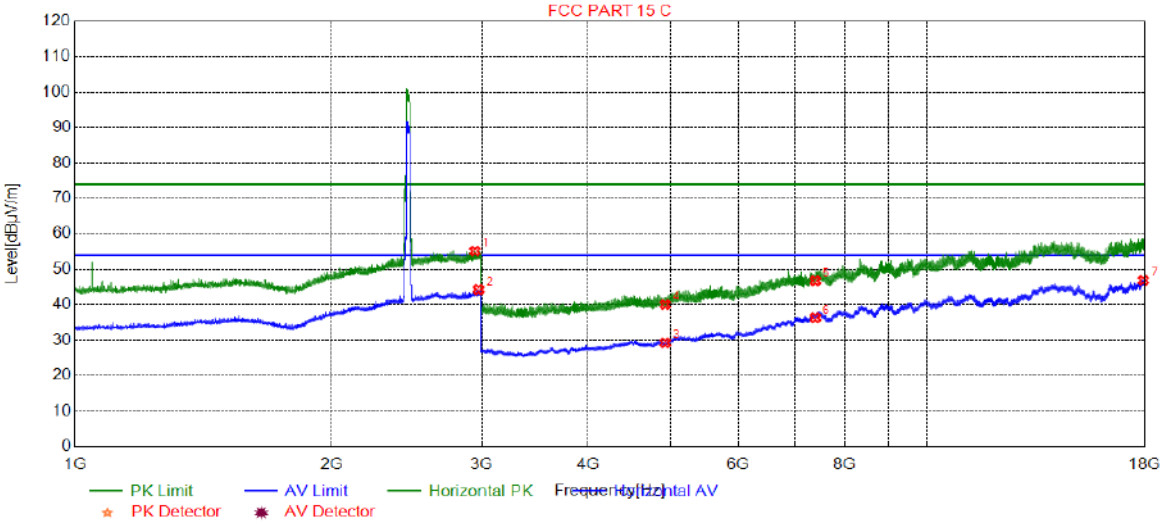
4.9.2.1.17 802.11N20_ Highest Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2945.98	55.13	9.64	74.00	18.87	125	31	Horizontal
2	2974.49	44.28	9.57	54.00	9.72	107	333	Horizontal
3	4924.00	29.25	-17.72	54.00	24.75	179	261	Horizontal
4	4924.00	40.07	-17.72	74.00	33.93	195	342	Horizontal
5	7386.00	46.76	-9.55	74.00	27.24	113	318	Horizontal
6	7386.00	36.30	-9.55	54.00	17.70	169	360	Horizontal
7	17918.0	46.90	0.70	54.00	7.10	163	218	Horizontal

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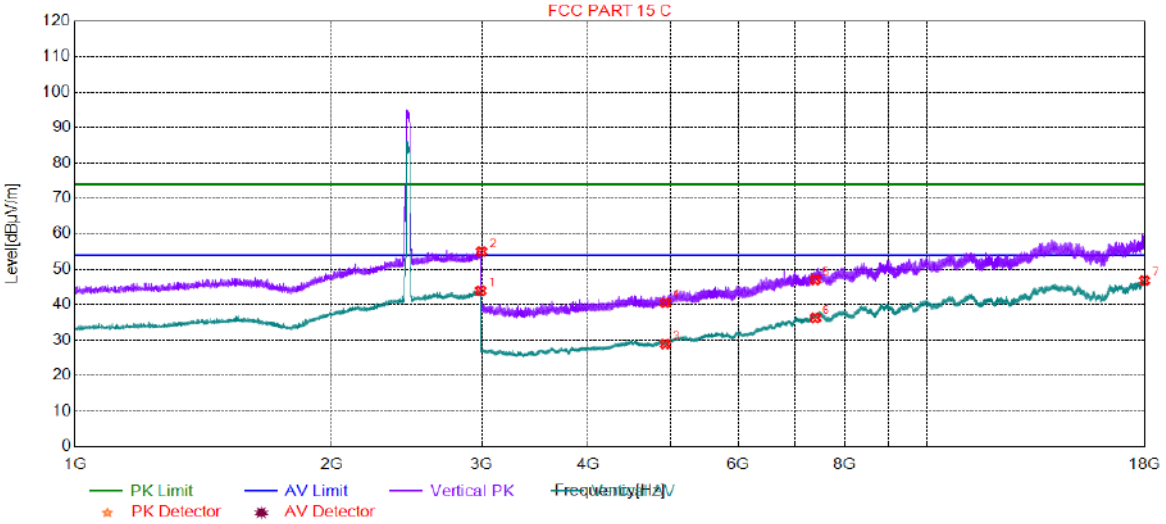
4.9.2.1.18 802.11N20_ Highest Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2991.49	43.96	9.49	54.00	10.04	231	302	Vertical
2	2998.99	55.04	9.45	74.00	18.96	228	137	Vertical
3	4924.00	28.89	-17.72	54.00	25.11	239	41	Vertical
4	4924.00	40.57	-17.72	74.00	33.43	262	151	Vertical
5	7386.00	47.05	-9.55	74.00	26.95	272	168	Vertical
6	7386.00	36.25	-9.55	54.00	17.75	185	118	Vertical
7	17969.7	46.84	0.71	54.00	7.16	232	68	Vertical

Remark:

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

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

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

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

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

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4.10 Restricted bands around fundamental frequency

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

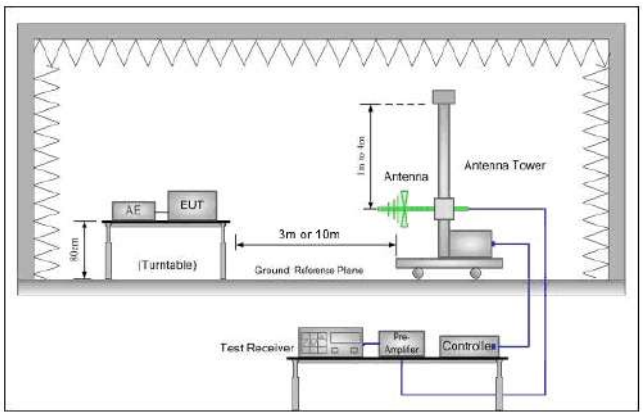

Figure 1. 30MHz to 1GHz

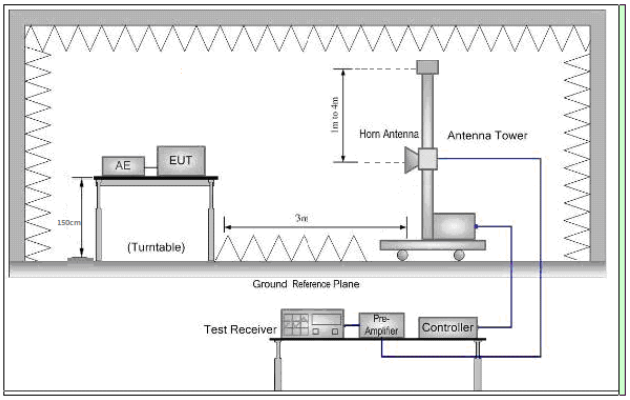

Figure 2. Above 1 GHz

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

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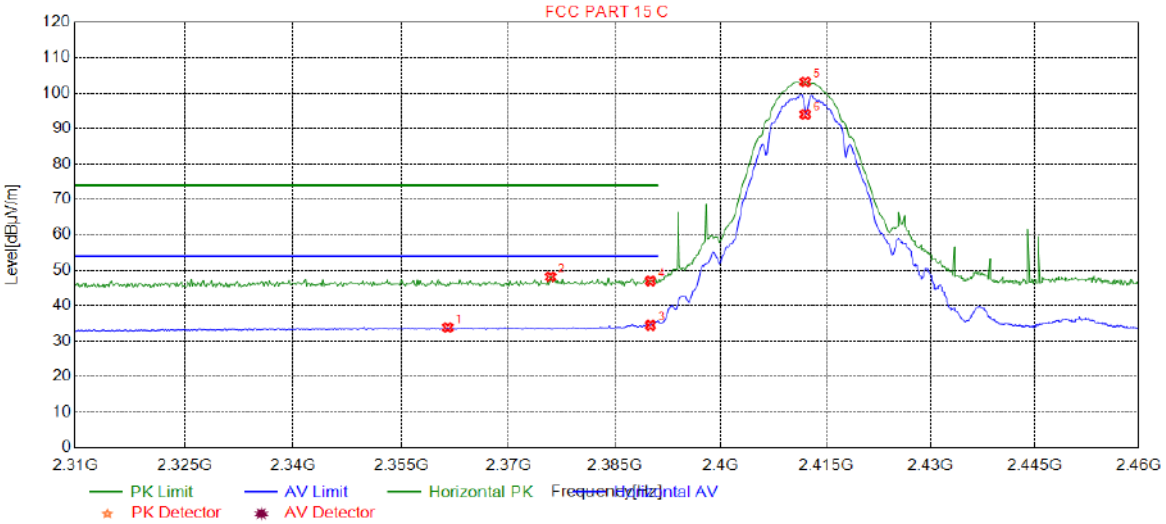
Test plot as follows:

4.10.1 ANT1

4.10.1.1 802.11B_Lowest Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2361.50	33.85	7.80	54.00	20.15	189	26	Horizontal
2	2375.91	48.18	7.78	74.00	25.82	102	337	Horizontal
3	2390.00	34.48	7.77	54.00	19.52	185	187	Horizontal
4	2390.00	47.00	7.77	74.00	27.00	115	191	Horizontal
5	2412.00	103.15	7.81	0.00	-103.15	101	191	Horizontal
6	2412.00	94.00	7.81	0.00	-94.00	132	187	Horizontal

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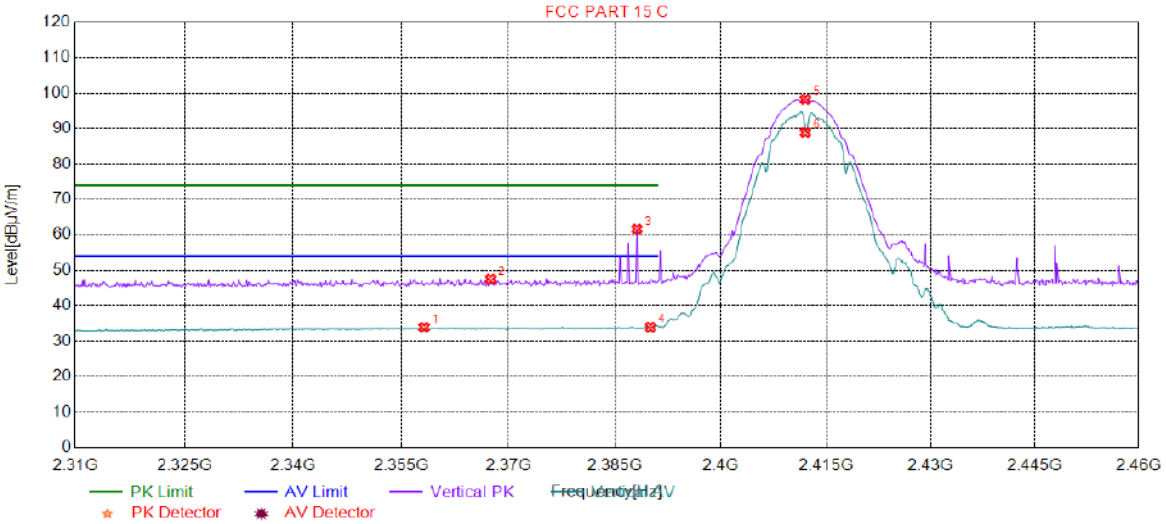
4.10.1.2 802.11B_Lowest Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2358.19	33.90	7.80	54.00	20.10	212	240	Vertical
2	2367.50	47.54	7.79	74.00	26.46	168	210	Vertical
3	2388.07	61.63	7.77	74.00	12.37	280	346	Vertical
4	2390.00	33.93	7.77	54.00	20.07	226	236	Vertical
5	2412.00	98.22	7.81	0.00	-98.22	196	84	Vertical
6	2412.00	88.89	7.81	0.00	-88.89	264	88	Vertical

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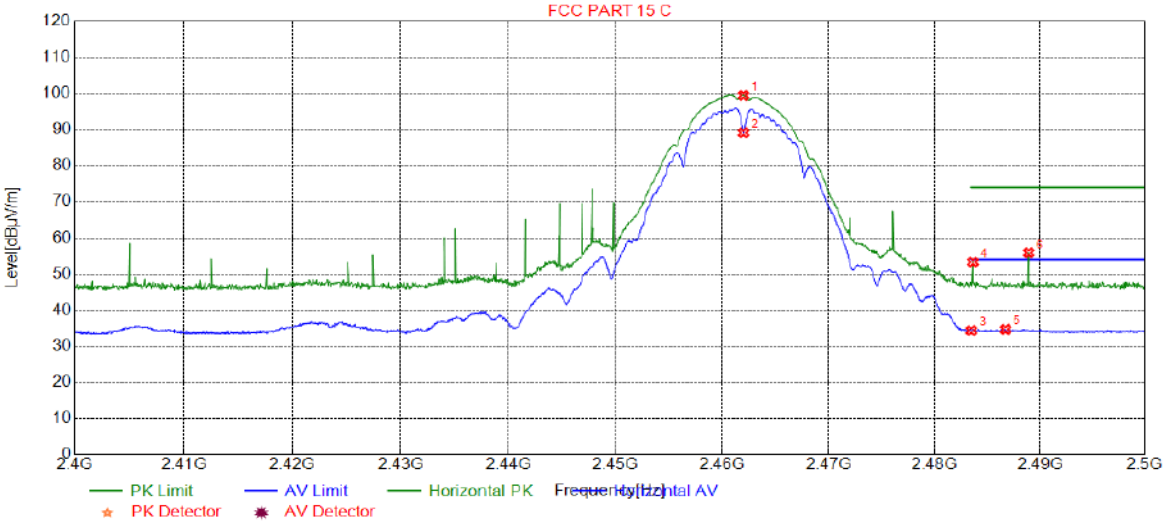
4.10.1.3 802.11B_ Highest Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	99.47	7.98	0.00	-99.47	163	52	Horizontal
2	2462.00	89.11	7.98	0.00	-89.11	193	52	Horizontal
3	2483.50	34.32	8.01	54.00	19.68	169	58	Horizontal
4	2483.64	53.29	8.01	74.00	20.71	164	330	Horizontal
5	2486.74	34.64	8.01	54.00	19.36	141	48	Horizontal
6	2488.94	55.87	8.02	74.00	18.13	149	314	Horizontal

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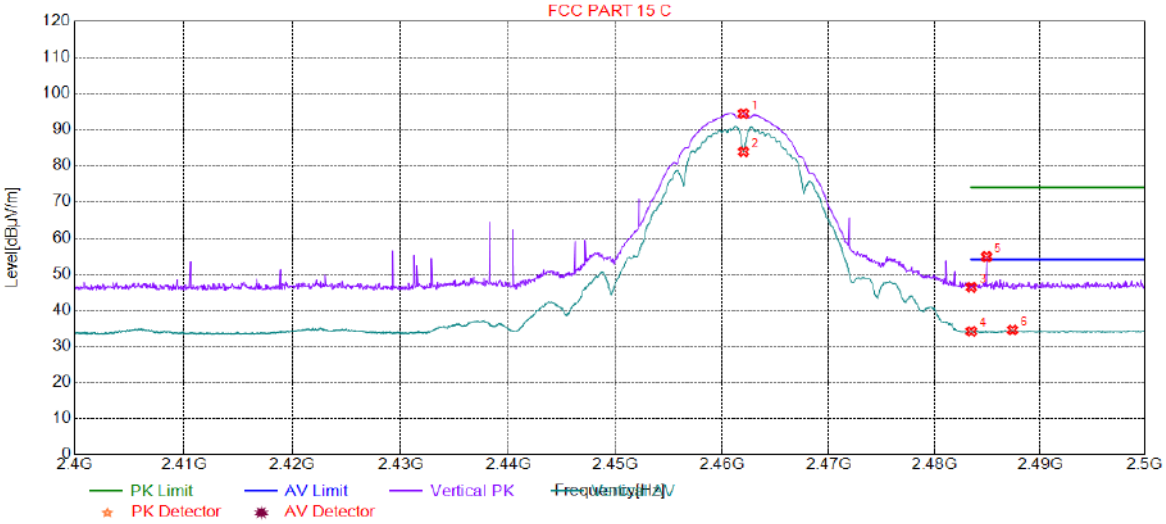
4.10.1.4 802.11B_ Highest Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	94.41	7.98	0.00	-94.41	271	318	Vertical
2	2462.00	83.89	7.98	0.00	-83.89	207	312	Vertical
3	2483.50	46.29	8.01	74.00	27.71	242	224	Vertical
4	2483.50	34.11	8.01	54.00	19.89	242	153	Vertical
5	2484.94	54.77	8.01	74.00	19.23	153	306	Vertical
6	2487.39	34.52	8.01	54.00	19.48	241	323	Vertical

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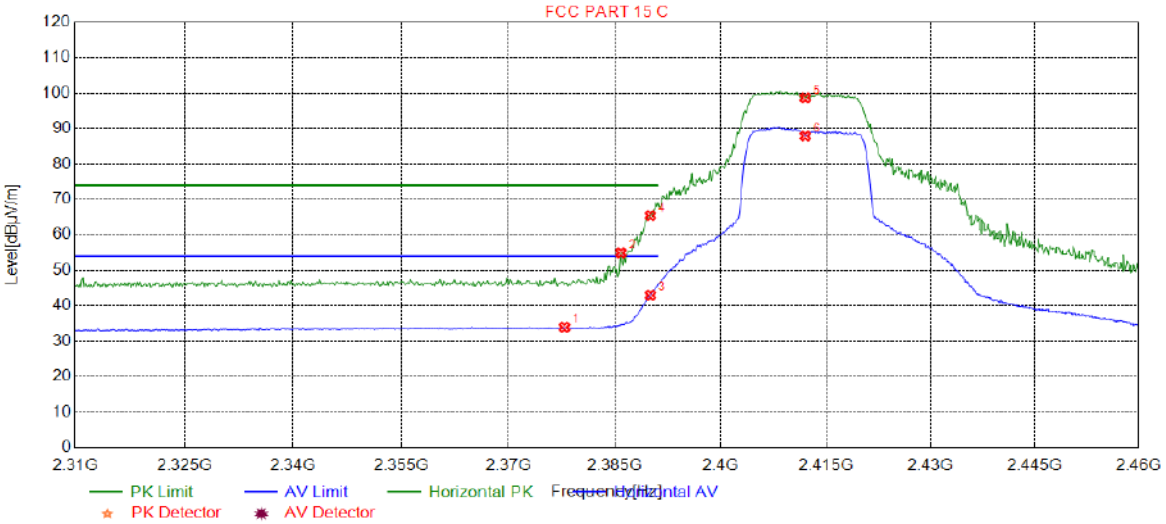
4.10.1.5 802.11G_Lowest Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2377.86	33.92	7.78	54.00	20.08	168	187	Horizontal
2	2385.82	54.92	7.77	74.00	19.08	176	60	Horizontal
3	2390.00	42.97	7.77	54.00	11.03	196	60	Horizontal
4	2390.00	65.46	7.77	74.00	8.54	204	38	Horizontal
5	2412.00	98.67	7.81	0.00	-98.67	237	51	Horizontal
6	2412.00	87.91	7.81	0.00	-87.91	130	46	Horizontal

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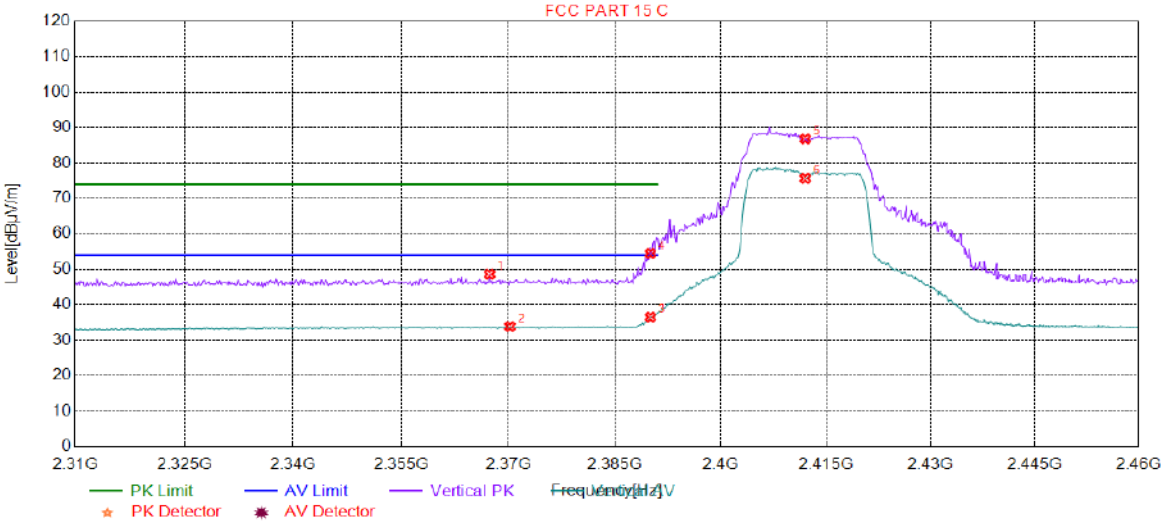
4.10.1.6 802.11G_Lowest Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2367.35	48.63	7.79	74.00	25.37	219	58	Vertical
2	2370.21	33.84	7.79	54.00	20.16	200	313	Vertical
3	2390.00	36.46	7.77	54.00	17.54	250	235	Vertical
4	2390.00	54.46	7.77	74.00	19.54	196	235	Vertical
5	2412.00	86.80	7.81	0.00	-86.80	297	235	Vertical
6	2412.00	75.69	7.81	0.00	-75.69	153	235	Vertical

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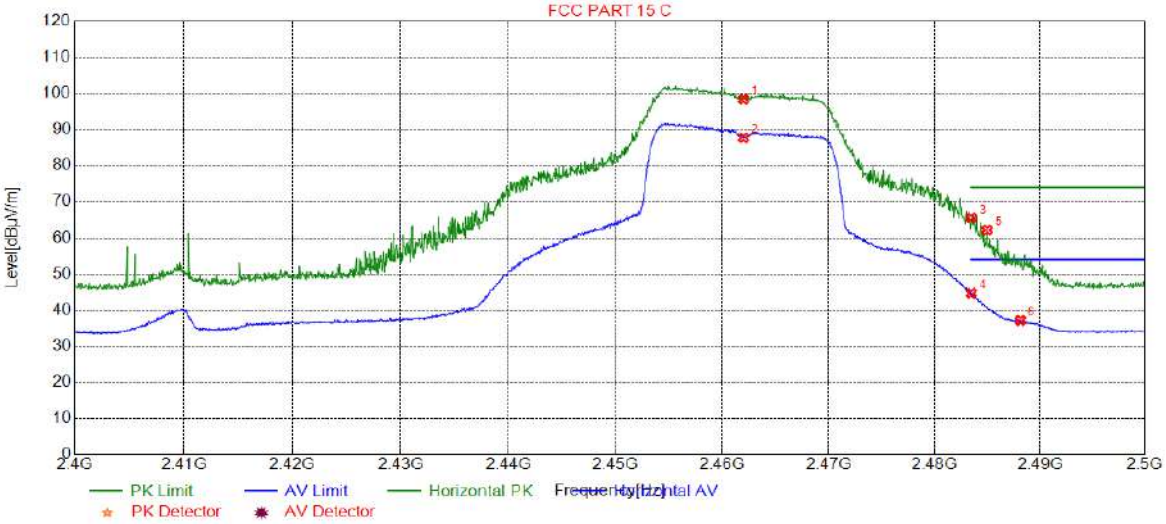
4.10.1.7 802.11G_ Highest Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	98.42	7.98	0.00	-98.42	231	196	Horizontal
2	2462.00	87.69	7.98	0.00	-87.69	211	191	Horizontal
3	2483.50	65.57	8.01	74.00	8.43	207	359	Horizontal
4	2483.50	44.64	8.01	54.00	9.36	206	191	Horizontal
5	2484.99	62.13	8.01	74.00	11.87	125	356	Horizontal
6	2488.14	37.13	8.02	54.00	16.87	192	191	Horizontal

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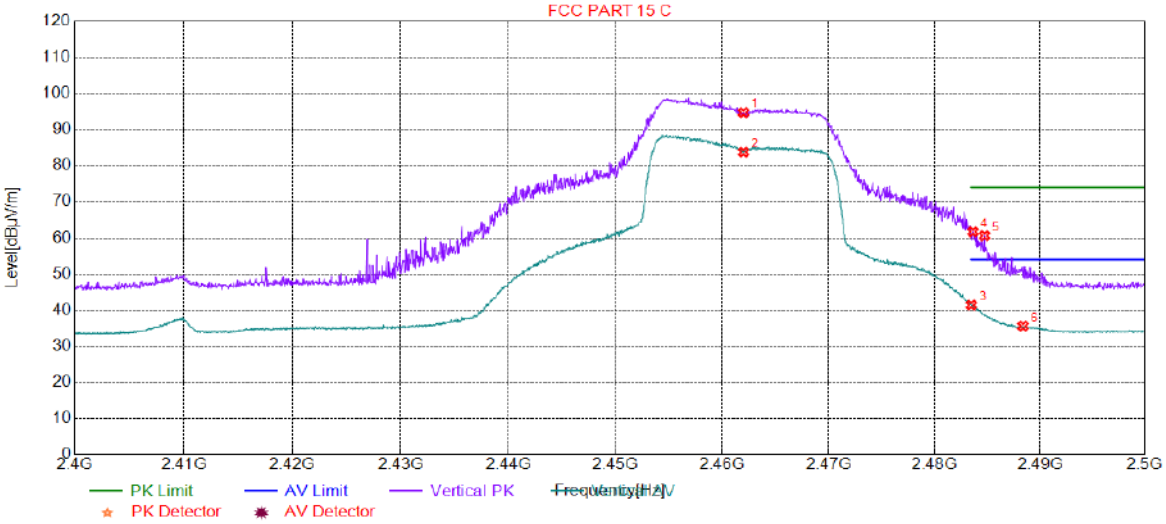
4.10.1.8 802.11G_ Highest Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	94.69	7.98	0.00	-94.69	217	199	Vertical
2	2462.00	83.77	7.98	0.00	-83.77	239	204	Vertical
3	2483.50	41.41	8.01	54.00	12.59	171	177	Vertical
4	2483.64	61.67	8.01	74.00	12.33	277	199	Vertical
5	2484.74	60.59	8.01	74.00	13.41	265	182	Vertical
6	2488.39	35.54	8.02	54.00	18.46	178	171	Vertical

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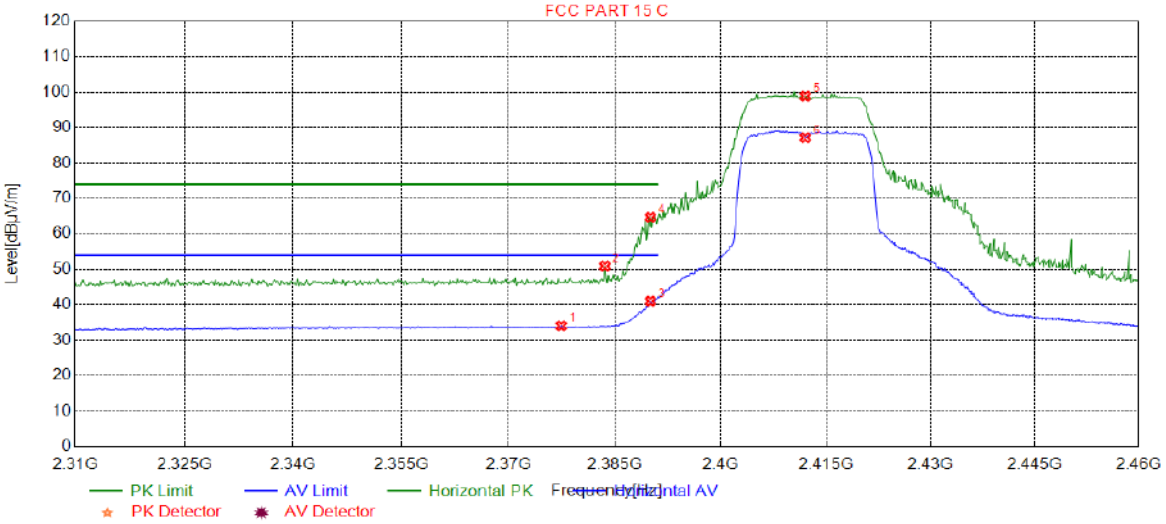
4.10.1.9 802.11N20_ Lowest Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2377.41	34.06	7.78	54.00	19.94	155	225	Horizontal
2	2383.57	50.91	7.78	74.00	23.09	215	329	Horizontal
3	2390.00	41.04	7.77	54.00	12.96	107	14	Horizontal
4	2390.00	64.69	7.77	74.00	9.31	179	176	Horizontal
5	2412.00	98.89	7.81	0.00	-98.89	155	14	Horizontal
6	2412.00	87.15	7.81	0.00	-87.15	137	14	Horizontal

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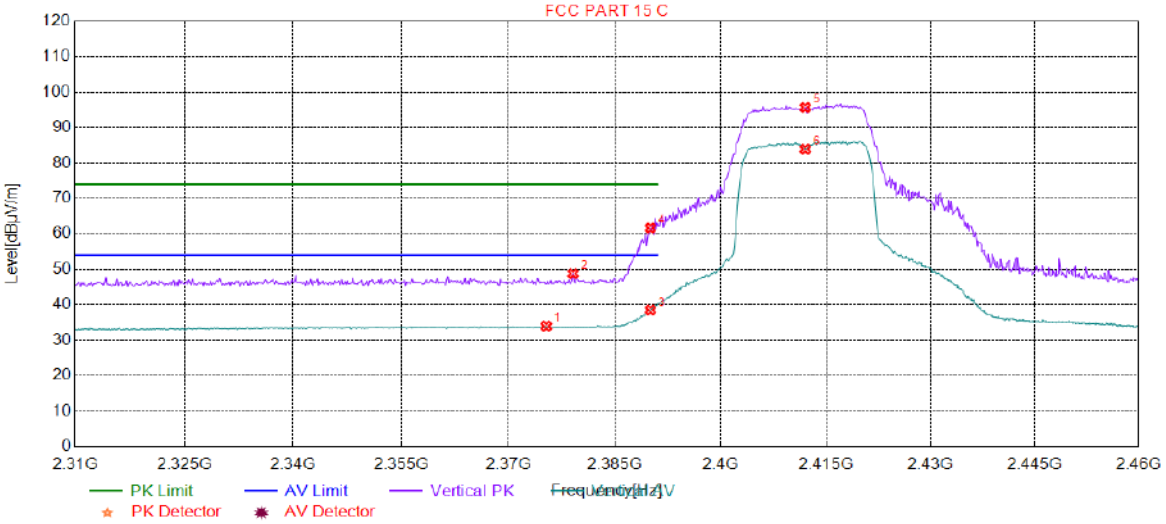
4.10.1.10 802.11N20_Lowest Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2375.31	33.94	7.78	54.00	20.06	192	14	Vertical
2	2379.06	48.79	7.78	74.00	25.21	207	0	Vertical
3	2390.00	38.52	7.77	54.00	15.48	294	148	Vertical
4	2390.00	61.64	7.77	74.00	12.36	241	190	Vertical
5	2412.00	95.68	7.81	0.00	-95.68	165	186	Vertical
6	2412.00	83.93	7.81	0.00	-83.93	275	190	Vertical

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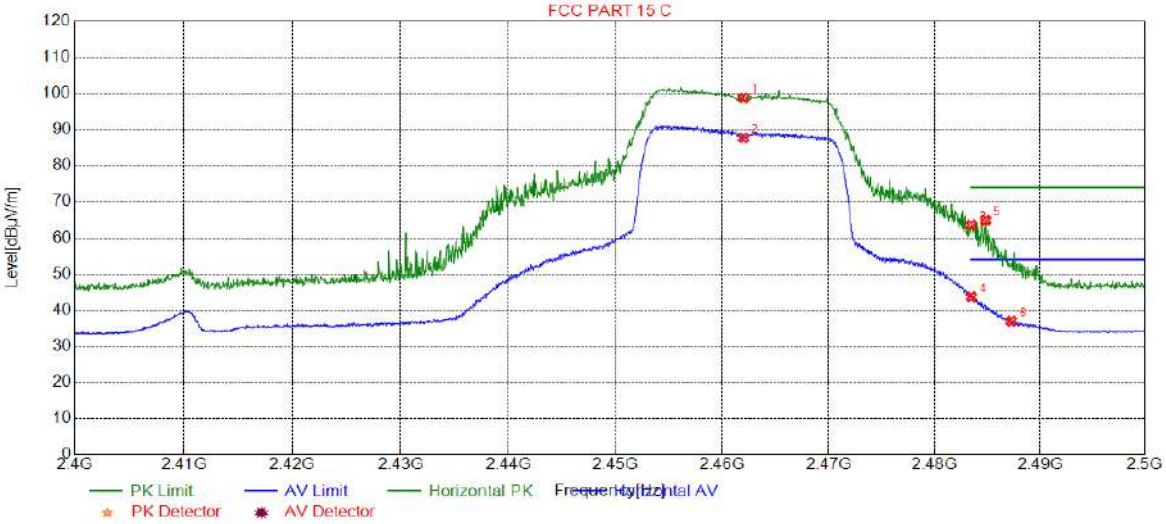
4.10.1.11 802.11N20_ Highest Channel_ Horizontal



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	98.77	7.98	0.00	-98.77	148	182	Horizontal
2	2462.00	87.68	7.98	0.00	-87.68	187	177	Horizontal
3	2483.50	63.54	8.01	74.00	10.46	152	182	Horizontal
4	2483.50	43.66	8.01	54.00	10.34	126	182	Horizontal
5	2484.84	64.89	8.01	74.00	9.11	126	182	Horizontal
6	2487.29	36.90	8.01	54.00	17.10	127	182	Horizontal

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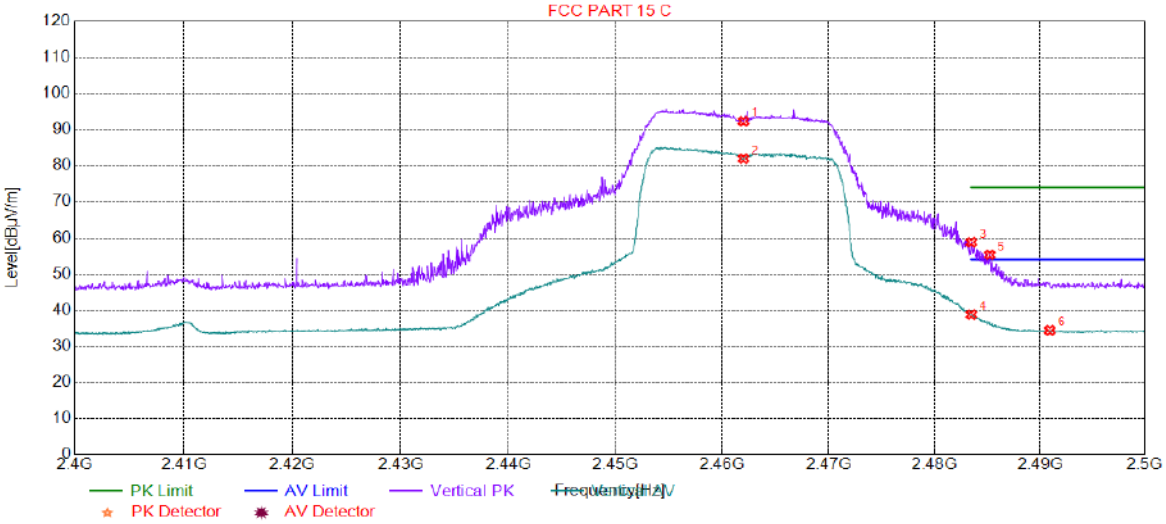
4.10.1.12 802.11N20_ Highest Channel_ Vertical



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2462.00	92.32	7.98	0.00	-92.32	183	336	Vertical
2	2462.00	81.95	7.98	0.00	-81.95	166	341	Vertical
3	2483.50	58.81	8.01	74.00	15.19	282	171	Vertical
4	2483.50	38.72	8.01	54.00	15.28	198	336	Vertical
5	2485.24	55.29	8.01	74.00	18.71	256	325	Vertical
6	2490.94	34.38	8.02	54.00	19.62	175	331	Vertical

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

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

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

Lab A:

No.	Item	Measurement Uncertainty
1	Total RF power, conducted	±0.41dB
2	RF power density, conducted	±1.96dB
3	Spurious emissions, conducted	±0.41dB
4	Radio Frequency	$\pm 7.10 \times 10^{-8}$
5	Duty Cycle	±0.49%
6	Occupied Bandwidth	±0.2%

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 Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal. Date (yyyy-mm-dd)**	**Cal. Due date (yyyy-mm-dd)**
Signal Analyzer	Rohde & Schwarz	FSV	W025-05	2020/4/16	2021/4/15
DC Power Supply	Rohde & Schwarz	HMP2020	W009-08	2019/11/21	2020/11/20
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2019/7/14	2020/7/13
Humidity/ Temperature Indicator	Minggao	TH101B	W006-05	2019/6/27	2020/6/26

CE Test System					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Shielding Room	Brilliant-emc	N/A	XAW03-35-01	2019-09-11	2022-09-10
Test receiver	ROHDE&SCHWARZ	ESR	XAW01-08-01	2019-09-07	2020-09-06
Artificial network	ROHDE&SCHWARZ	ENV216	XAW01-04-01	2019-07-16	2020-07-15
Temperature and humidity meter	MingGao	TH101B	XAW01-01-01	2019-12-06	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	XAW01-08-01	2019-09-07	2020-09-06
Receiving antenna (30MHz-3GHz)	Schwarzbeck	VULB 9163	XAW01-09-01	2019-10-13	2021-10-12
Receiving antenna (1GHz~18GHz)	Schwarzbeck	BBHA 9120D	XAW01-09-02	2019-10-13	2021-10-12
Receiving antenna (15GHz~40GHz)	Schwarzbeck	BBHA 9170	XAW01-09-03	2019-10-13	2021-10-12
Directional antenna rack controller	Max-Full	MF-7802BS	XAW03-03-01	NCR	NCR
High-speed antenna rack controller	Max-Full	MF-7802	XAW03-04-01	NCR	NCR
Filter bank	Tonscend	JS0806-F	XAW03-05-01	NCR	NCR
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

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7 Photographs - EUT Constructional Details

Refer to Appendix A - Photographs of Set-Up for ZR/2020/40028.

The End

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