



FCC TEST REPORT

Application No.: HR/2020/80004
Applicant: Asiatelco Technologies Inc.
Address of Applicant: 4611 Teller Avenue, Suite 110, Newport Beach, CA 92660, USA
Manufacturer: Asiatelco Technologies Inc.
Address of Manufacturer: 4611 Teller Avenue, Suite 110, Newport Beach, CA 92660, USA
Factory: Shenzhen Saidaxin Technology Limited Company
Address of Factory: 6 th Floor, No.1 Building, Saitu Digital Industry Area, Bulan Road, Buji, Longgang District Shenzhen
EUT Description: 4G Feature Phone
Model No.: FR150
Trade Mark: R3Di
FCC ID: 2AXKS-FR150
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: 2020/8/14
Date of Test: 2020/8/14 to 2020/9/1
Date of Issue: 2021/6/1

Test Result:	PASS *
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* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Derek Yang
Wireless Laboratory Manager



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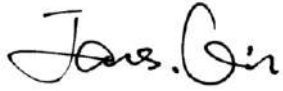
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Shenzhen Branch / 深圳分公司实验室

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1 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2020/9/4		Original
02		2021/6/1	James Qin	1.Add test site Information 2.Modify data conversion error of antenna height 3.Update equipment list

This report supersedes our previous report HR/2020/8000402, issued on 2020-9-4, which is hereby deemed null and void.

Authorized for issue by:	
Prepared By	 (James Qin) / Engineer
Checked By	 (Jim Huang) / Reviewer





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

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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3 General Information

3.1 Client Information

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Address of Manufacturer:	4611 Teller Avenue, Suite 110, Newport Beach, CA 92660, USA
Factory:	Shenzhen Saidaxin Technology Limited Company
Address of Factory:	6 th Floor, No.1 Building, Saitu Digital Industry Area, Bulan Road, Buji, Longgang District Shenzhen

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.

Designation Number: CN1271.



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3.4 General Description of EUT

EUT Description::	4G Feature Phone
Model No.:	FR150
Trade Mark:	R3Di
Hardware Version:	B1
Software Version:	QC28A-FR150-01418_V01-08_07.24.2020_FCC_i-B1
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 $f_c = 2407 \text{ MHz} + N * 5 \text{ MHz}$, where: - f_c = "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:	0.5dBi
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 0.5dBi.	



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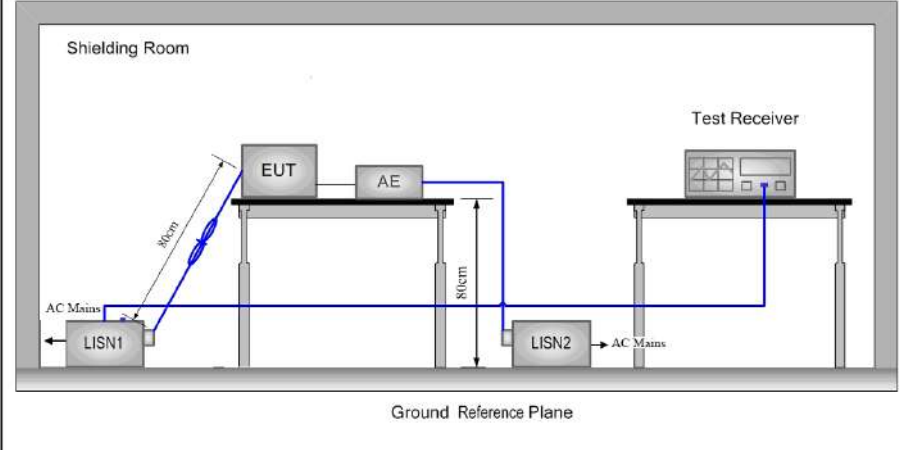
4.2 AC Power Line Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207		
Test Method:	ANSI C63.10: 2013		
Test Frequency Range:	150kHz to 30MHz		
Limit:	Frequency range (MHz)	Limit (dBuV)	
		Quasi-peak	Average
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	5-30	60	50
* Decreases with the logarithm of the frequency.			
Test Procedure:	1) The mains terminal disturbance voltage test was conducted in a shielded room. 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu\text{H} + 5\Omega$ 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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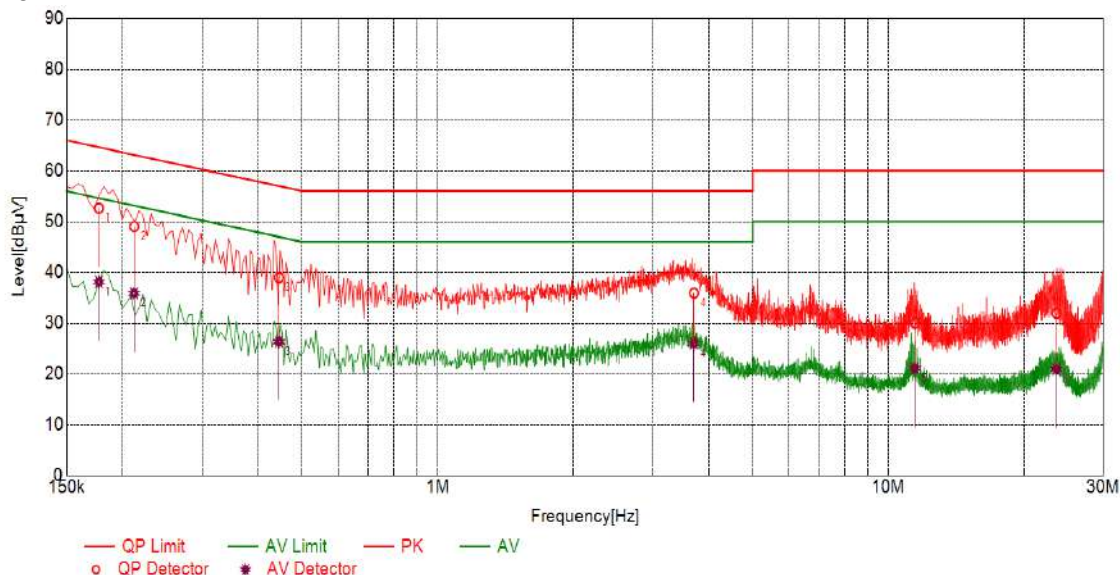
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Measurement Data

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	QP Limit	QP Margin	AV Value	AV Limit	AV Margin	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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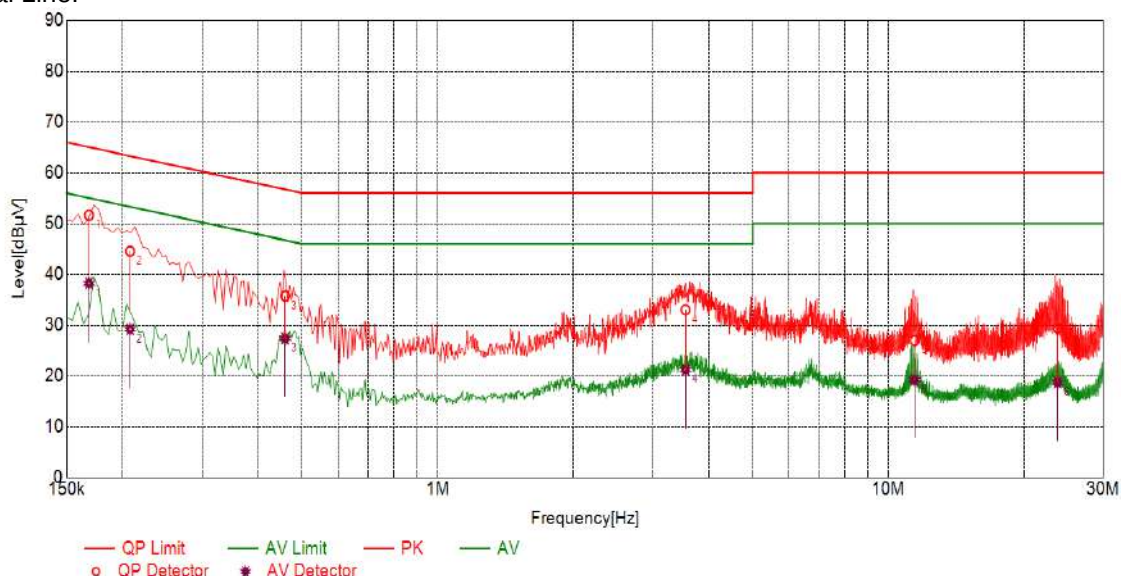
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Neutral Line:



Test Graph

Final Data List									
NO.	Freq. [MHz]	Factor [dB]	QP Value	QP Limit	QP Margin	AV Value	AV Limit	AV Margin	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

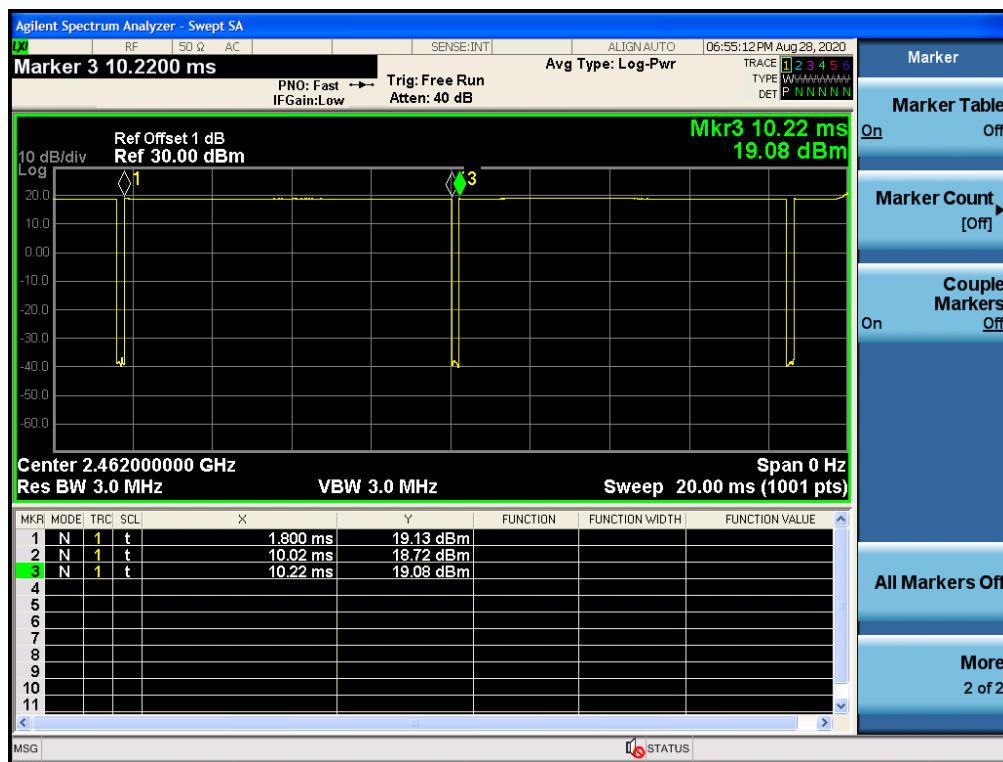
4.3.1 Test Results

Test Mode	TX Freq. [MHz]	Duty cycle [%]
11B	Ant 1: CH1,CH6,CH11	97.62
11G	Ant 1: CH1,CH6,CH11	87.21
11N20	Ant 1: CH1,CH6,CH11	86.68
11N40	Ant 1: CH3,CH6,CH9	76.08

4.3.1 Test Plots

4.3.1.1 ANT1

4.3.1.1.1 11B



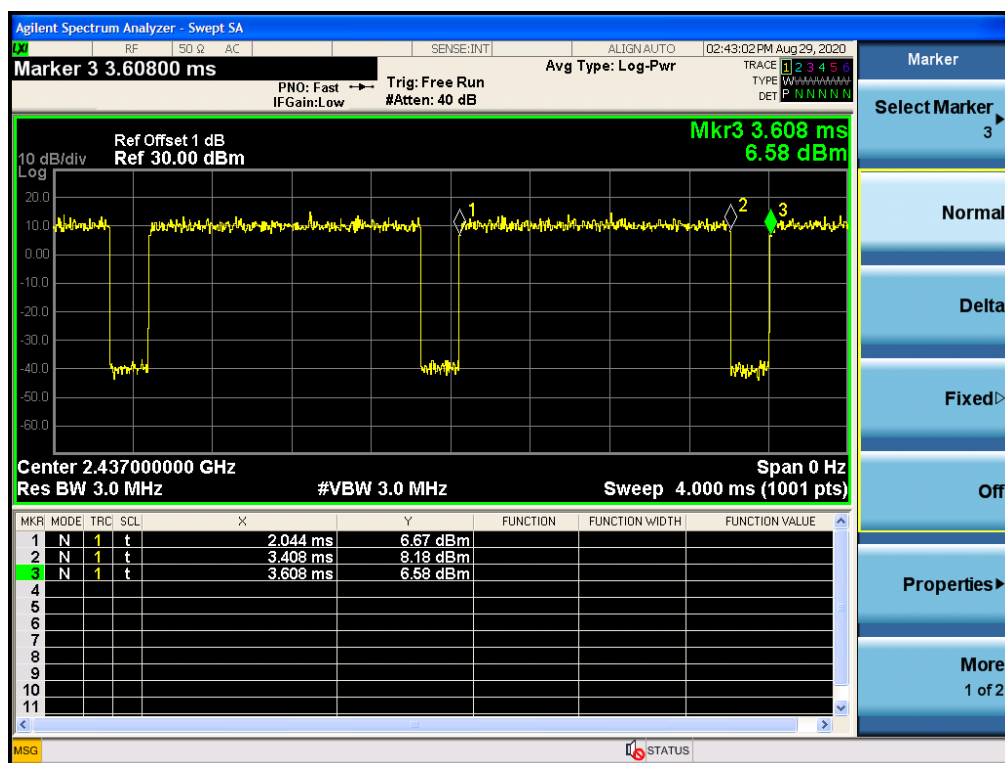
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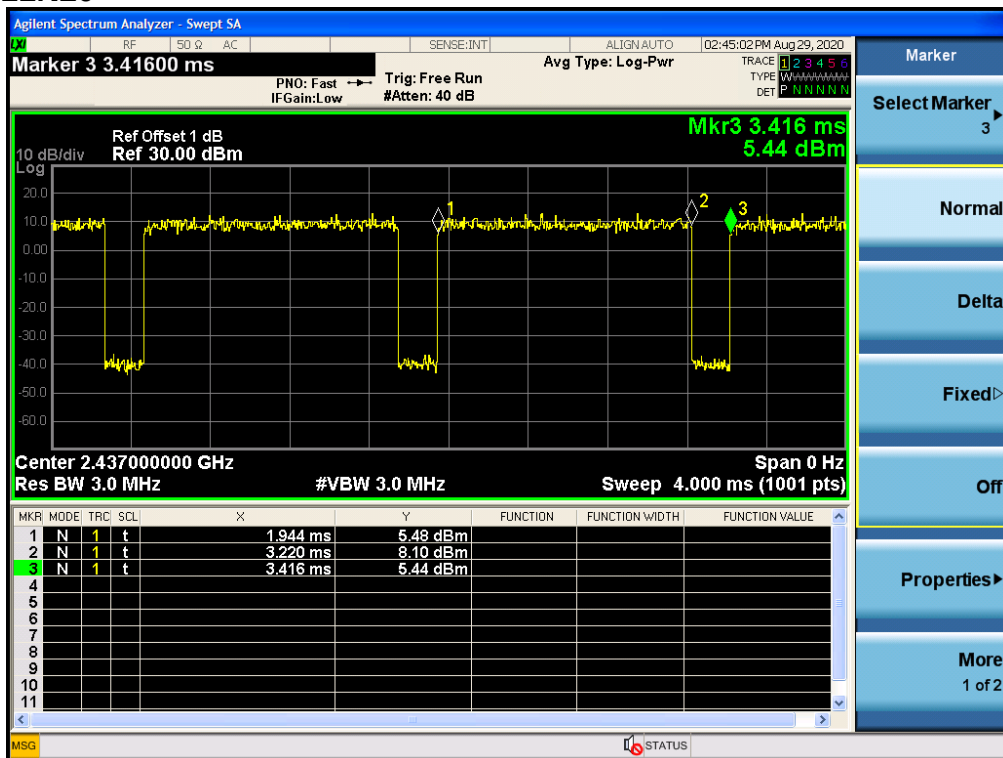
4.3.1.1.2 11G



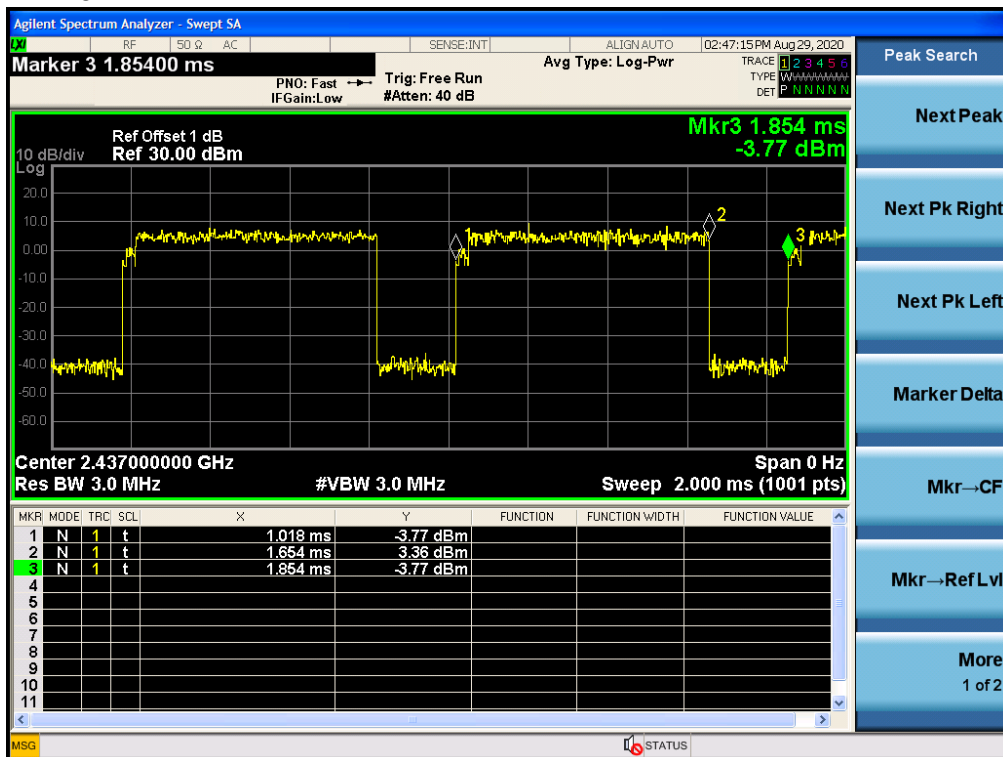
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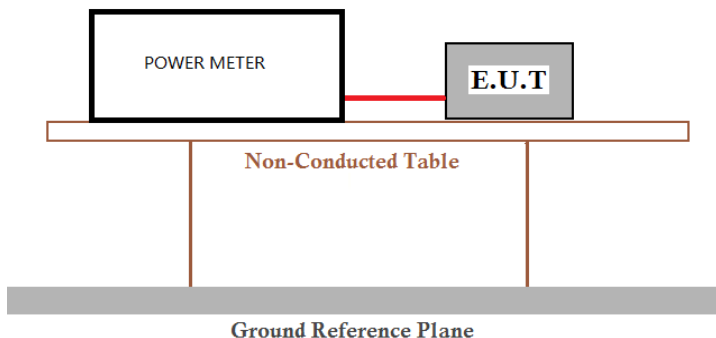
4.3.1.1.3 11N20



4.3.1.1.4 11N40



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:

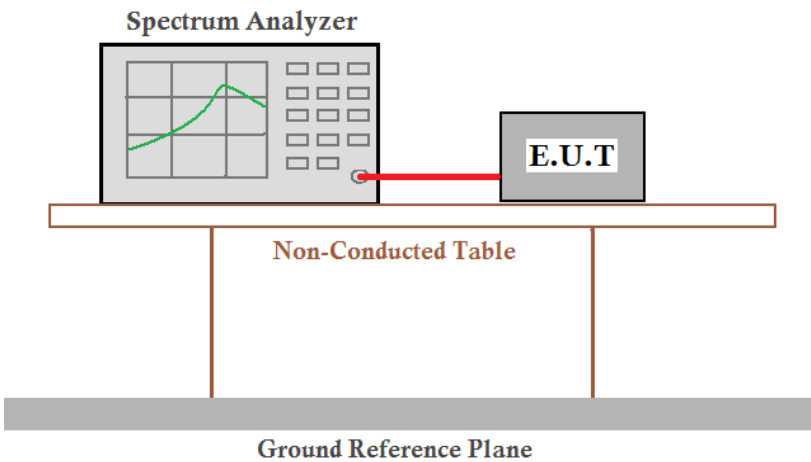
Mode	Test Channel	Peak Output Power (dBm)	Limit (dBm)	Result
802.11B	Lowest	18.01	30.00	Pass
	Middle	18.07	30.00	Pass
	Highest	18.62	30.00	Pass
802.11G	Lowest	12.58	30.00	Pass
	Middle	12.25	30.00	Pass
	Highest	13.04	30.00	Pass
802.11N20	Lowest	11.60	30.00	Pass
	Middle	11.18	30.00	Pass
	Highest	11.96	30.00	Pass
802.11N40	Lowest	10.89	30.00	Pass
	Middle	10.59	30.00	Pass
	Highest	11.00	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	13.78	9.05	≥500	Pass
	Middle	13.59	9.04	≥500	Pass
	Highest	13.74	8.57	≥500	Pass
802.11G	Lowest	17.13	16.37	≥500	Pass
	Middle	17.23	16.39	≥500	Pass
	Highest	17.26	16.36	≥500	Pass
802.11N20	Lowest	18.02	17.56	≥500	Pass
	Middle	18.14	17.61	≥500	Pass
	Highest	18.16	17.58	≥500	Pass
802.11N40	Lowest	36.35	35.15	≥500	Pass
	Middle	36.15	35.51	≥500	Pass
	Highest	36.46	35.35	≥500	Pass



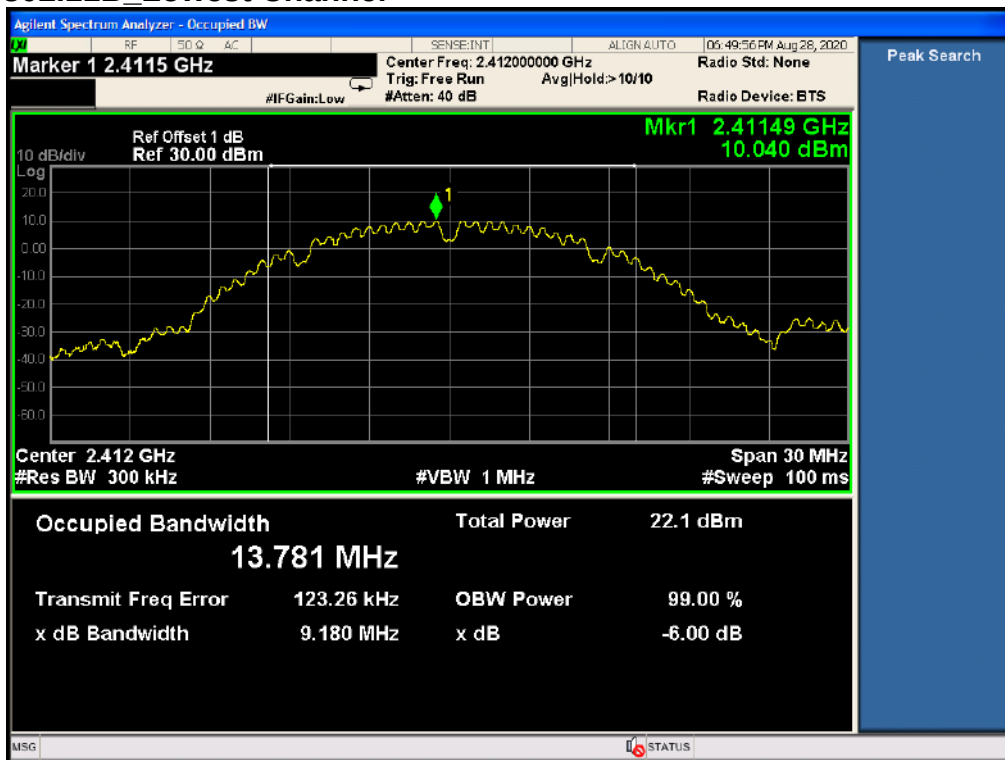
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4.5.2 Test plots

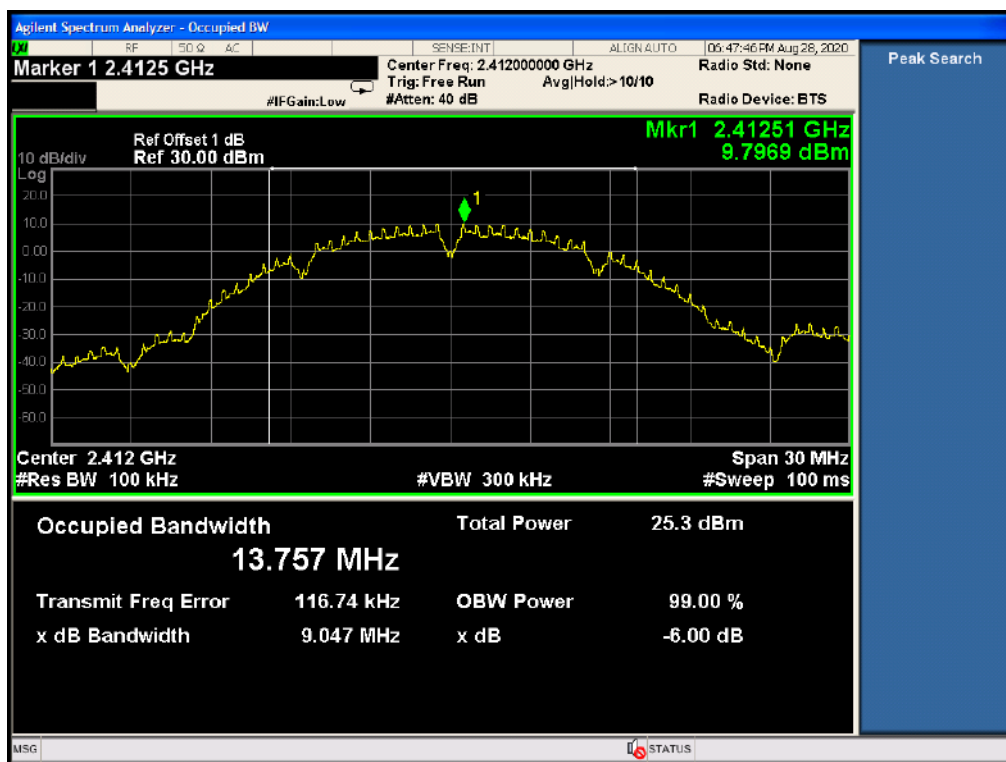
4.5.2.1 ANT1

4.5.2.1.1 802.11B_Lowest Channel



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4.5.2.1.2 802.11B_Middle Channel



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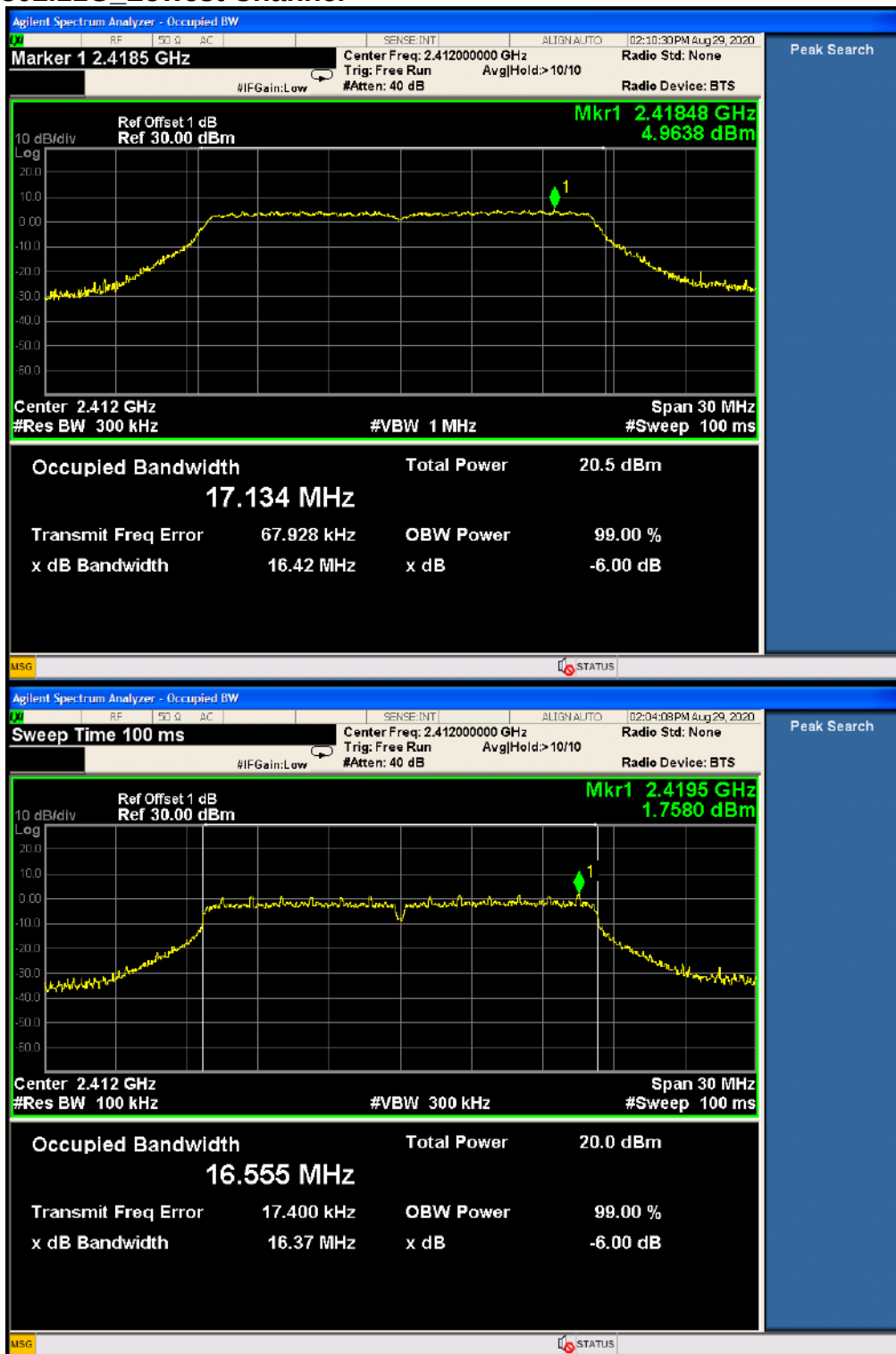
4.5.2.1.3 802.11B_Highest Channel



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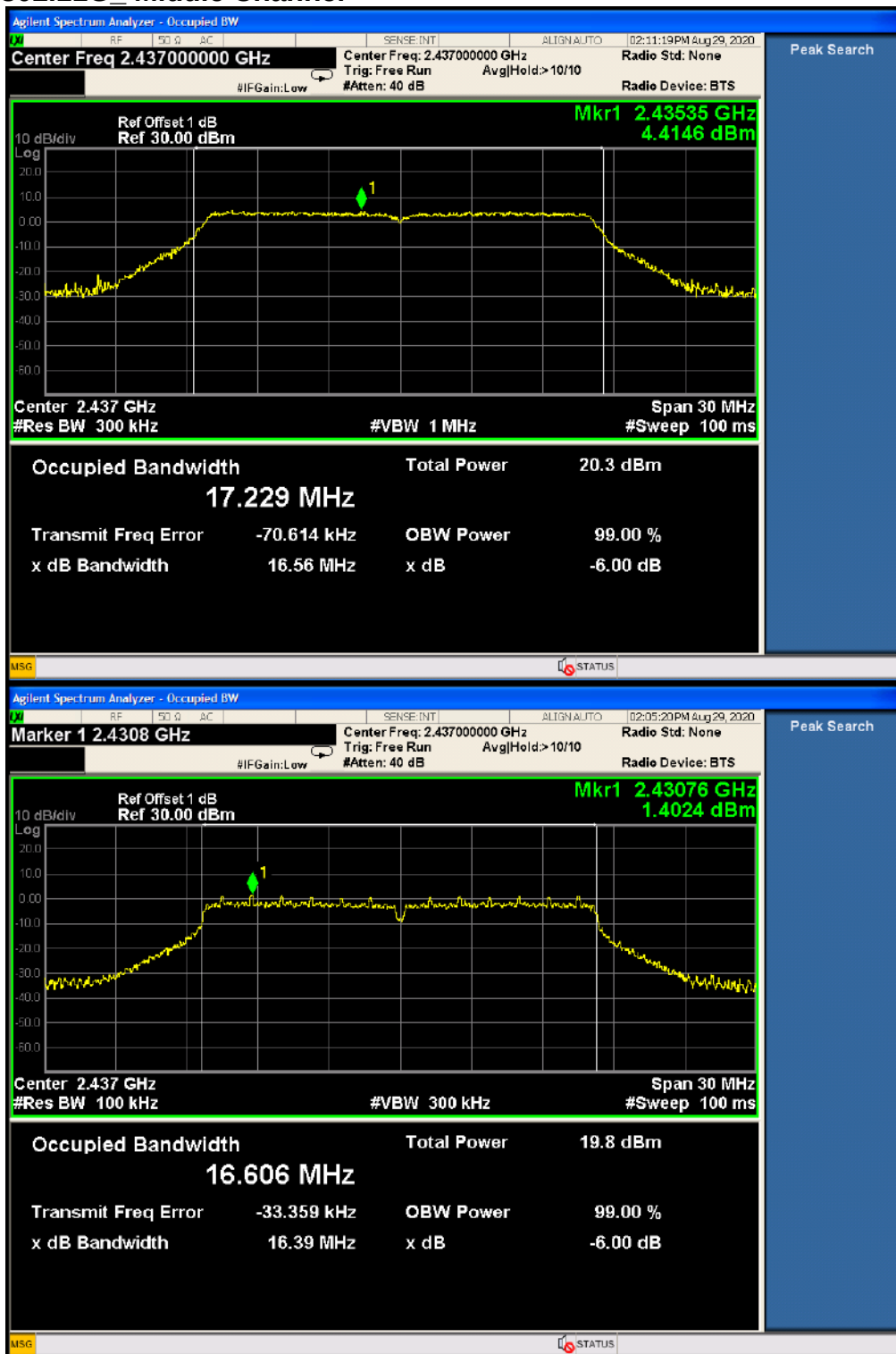
4.5.2.1.4 802.11G Lowest Channel



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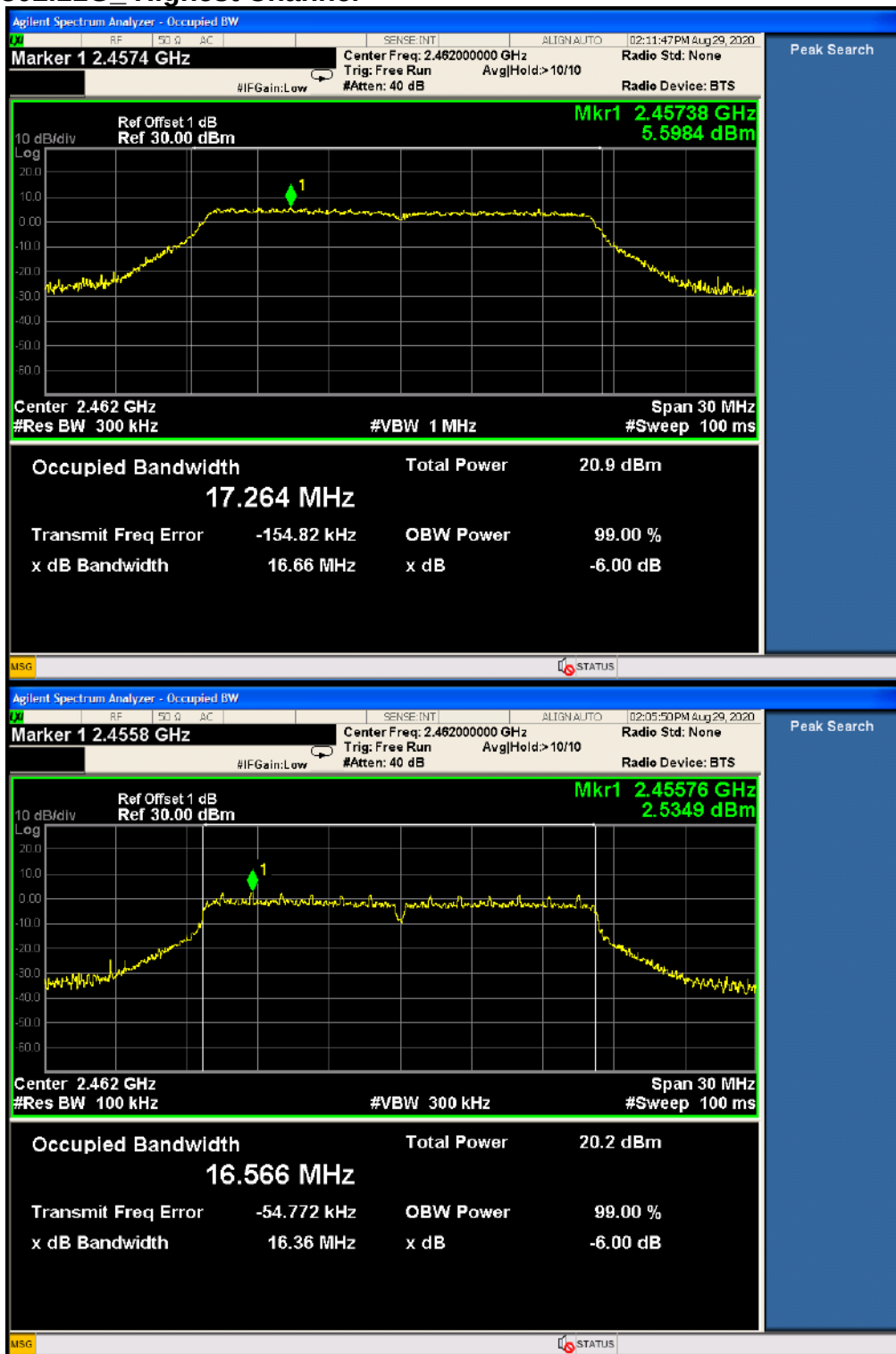
4.5.2.1.5 802.11G_Middle Channel



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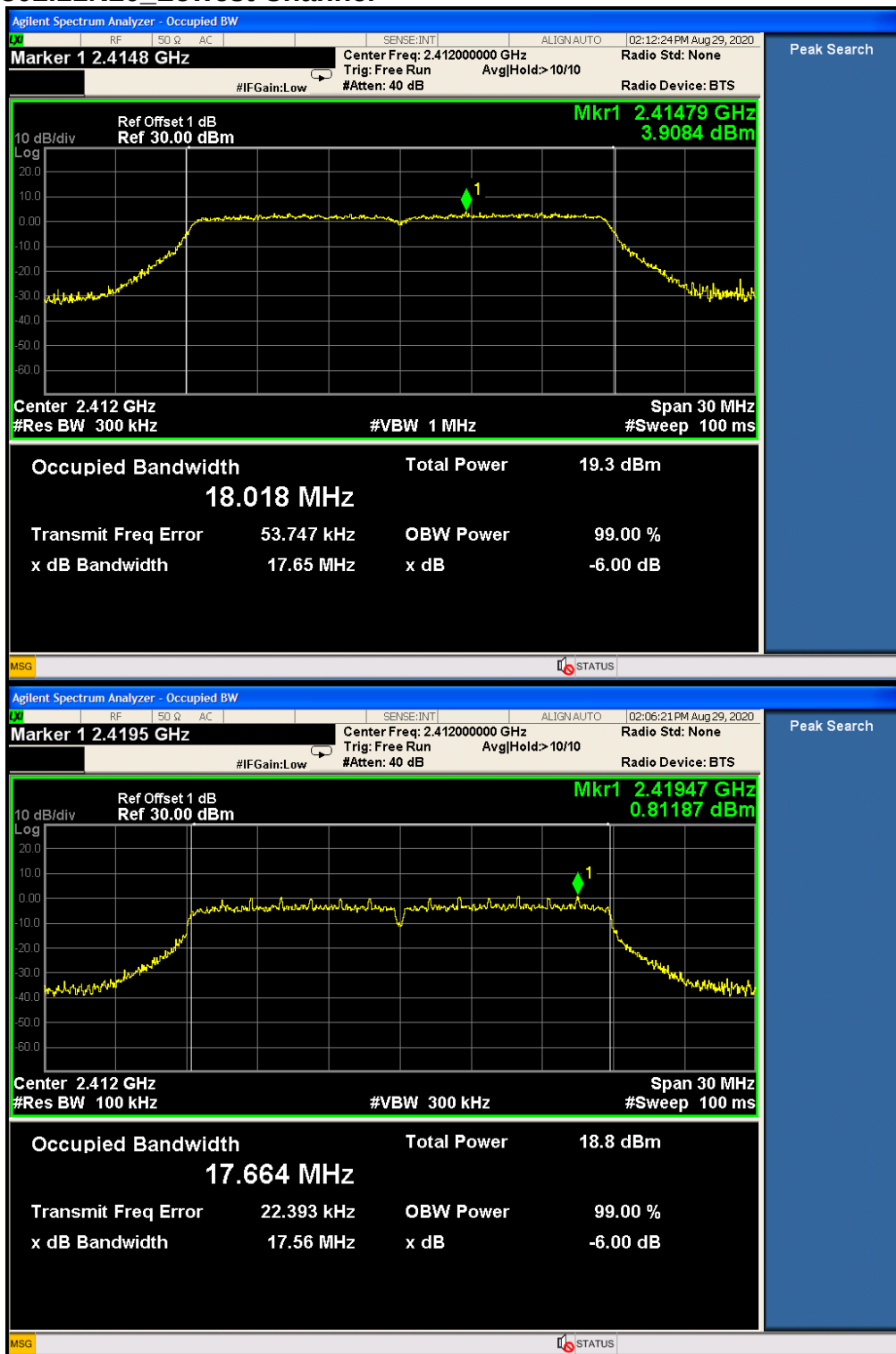
4.5.2.1.6 802.11G_Highest Channel



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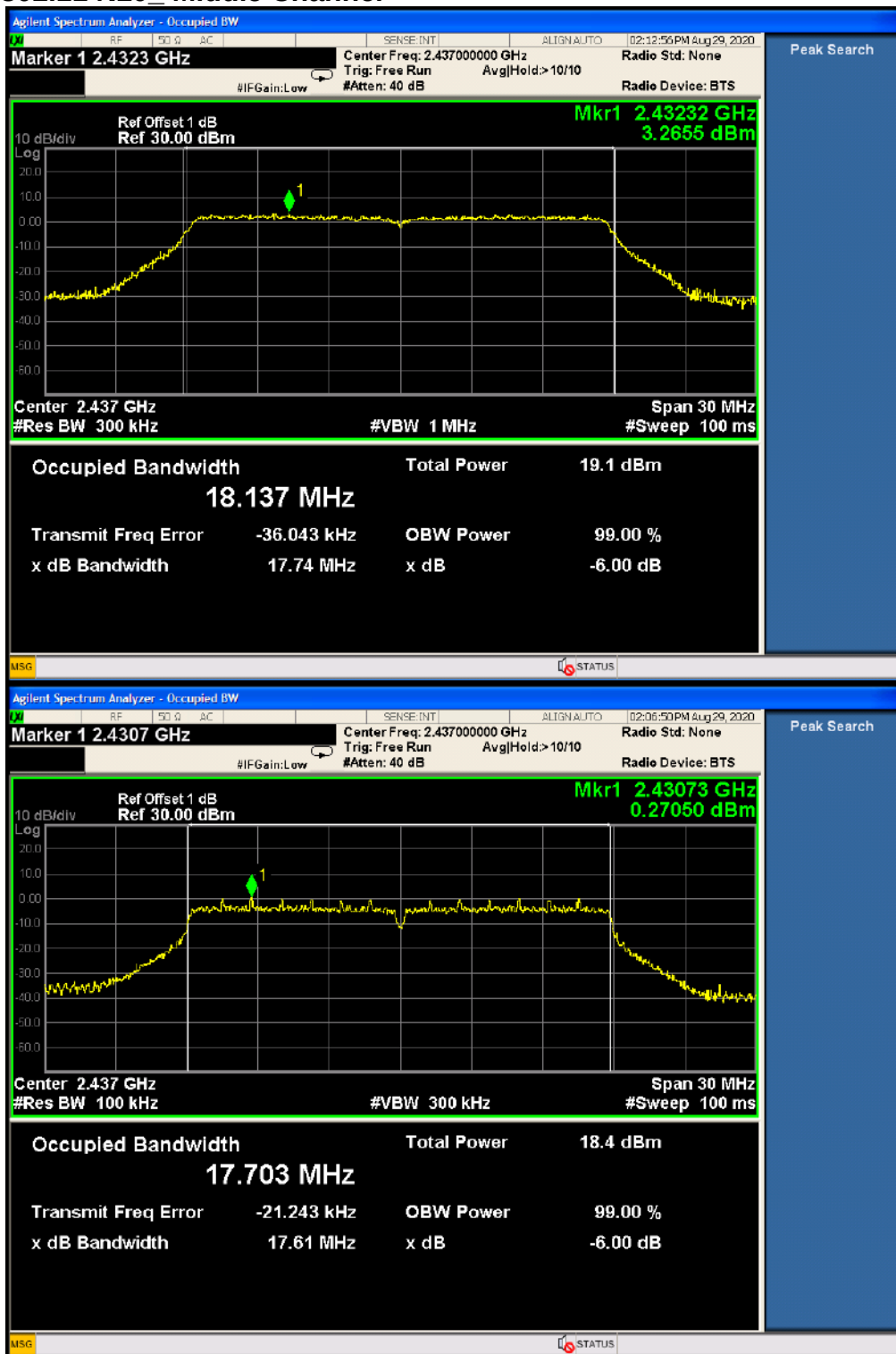
4.5.2.1.7 802.11N20 Lowest Channel



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4.5.2.1.8 802.11 N20 Middle Channel



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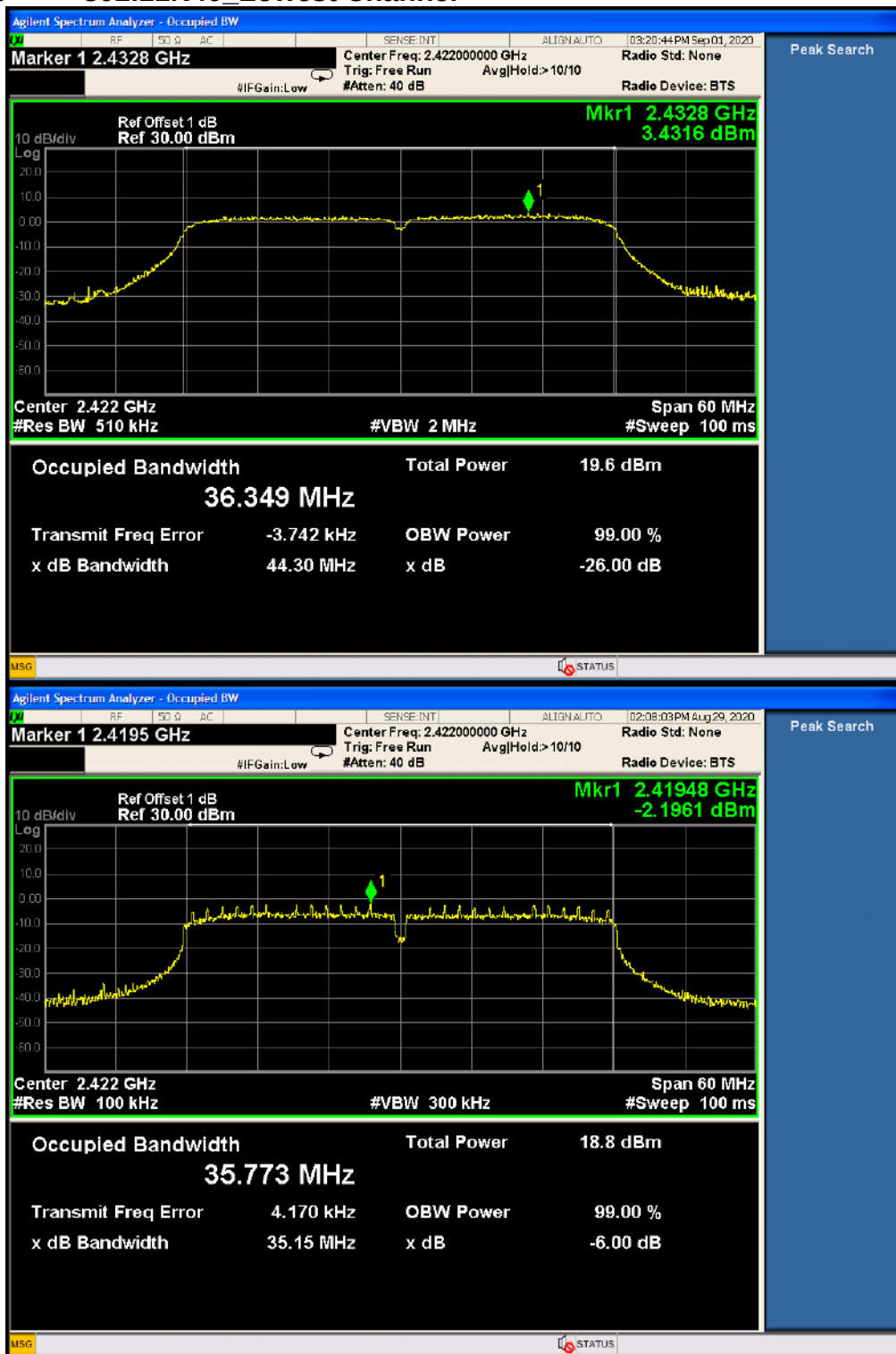
4.5.2.1.9 802.11 N20_Highest Channel



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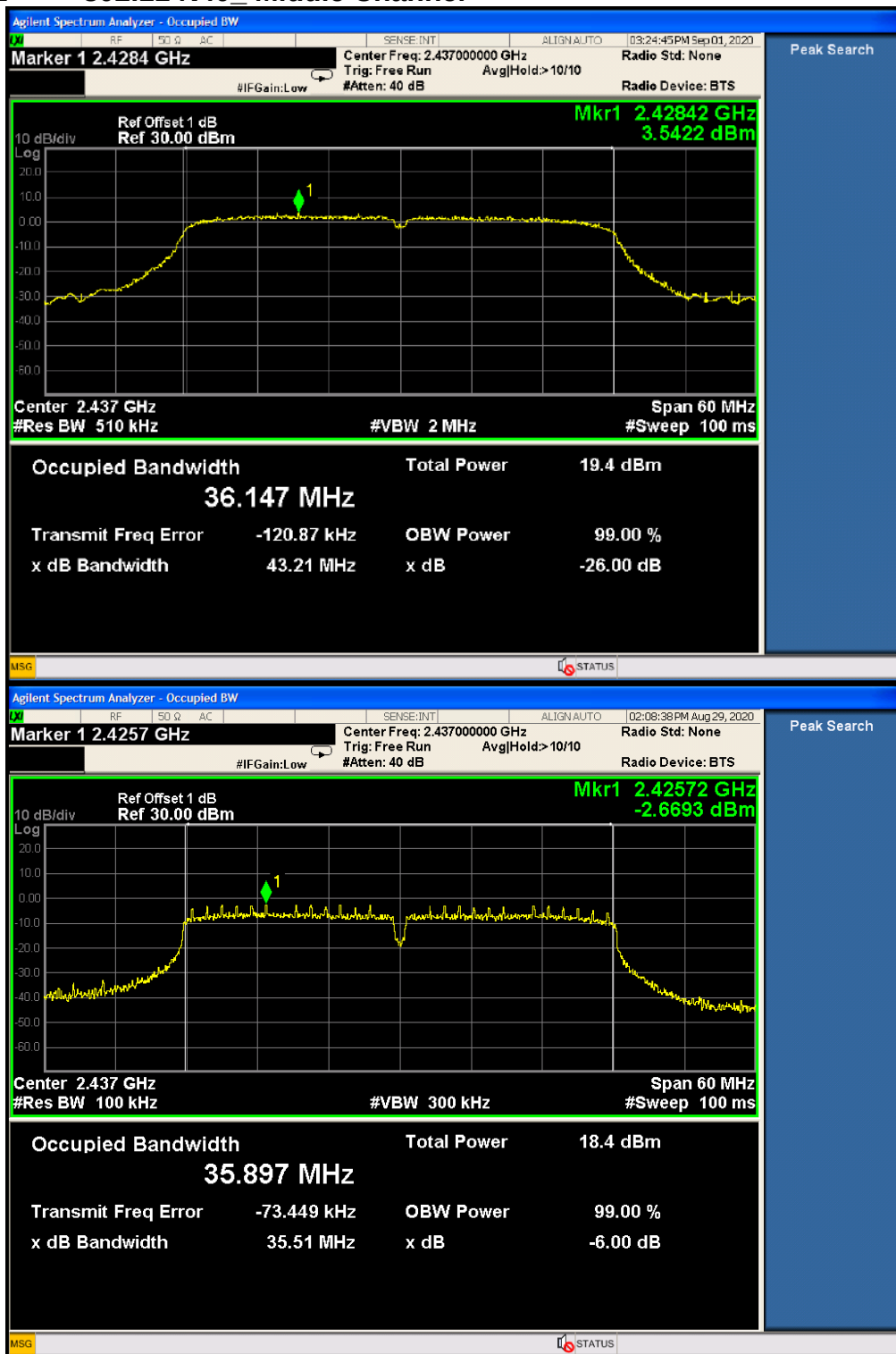
4.5.2.1.10 802.11N40 Lowest Channel



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4.5.2.1.11 802.11 N40_ Middle Channel



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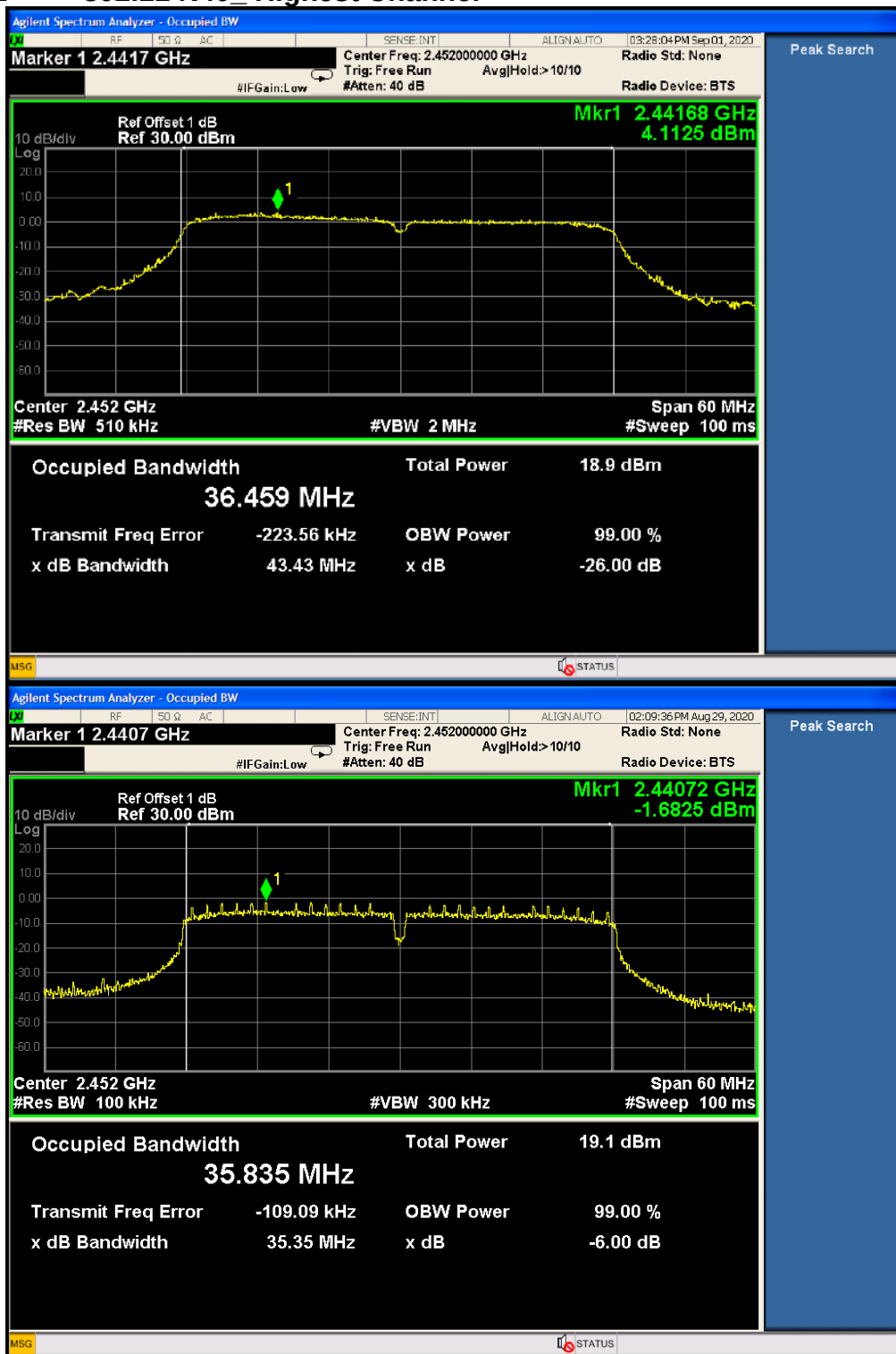
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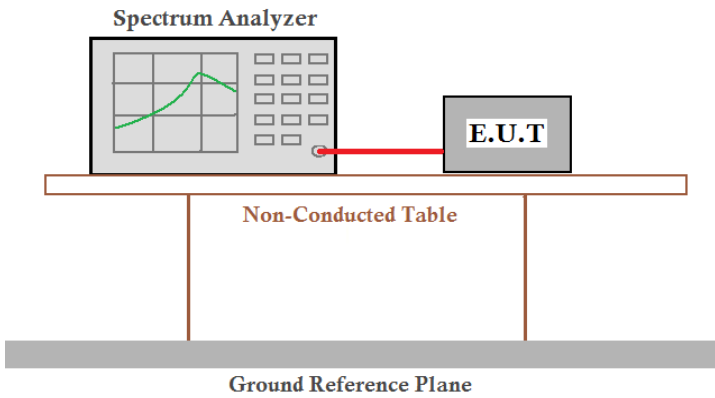
4.5.2.1.12 802.11 N40_ Highest Channel



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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	-4.23	≤8.00	Pass
	Middle	-3.41	≤8.00	Pass
	Highest	-3.71	≤8.00	Pass
802.11G	Lowest	-12.57	≤8.00	Pass
	Middle	-12.88	≤8.00	Pass
	Highest	-11.28	≤8.00	Pass
802.11N20	Lowest	-12.89	≤8.00	Pass
	Middle	-13.26	≤8.00	Pass
	Highest	-12.11	≤8.00	Pass
802.11N40	Lowest	-17.04	≤8.00	Pass
	Middle	-16.36	≤8.00	Pass
	Highest	-16.05	≤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



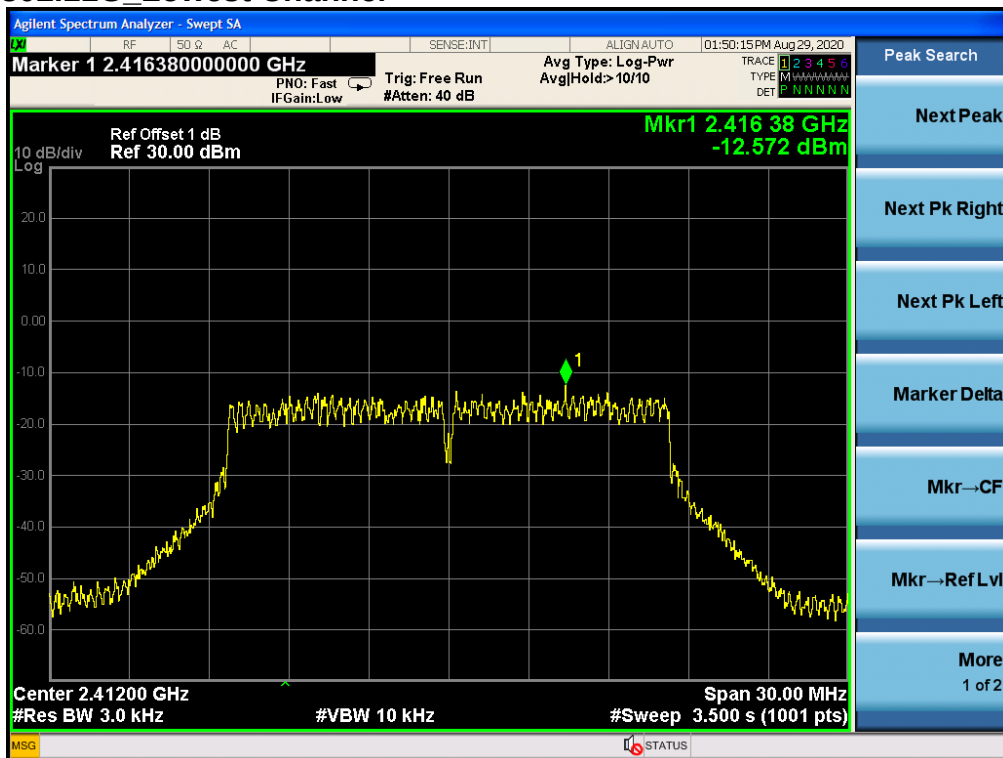
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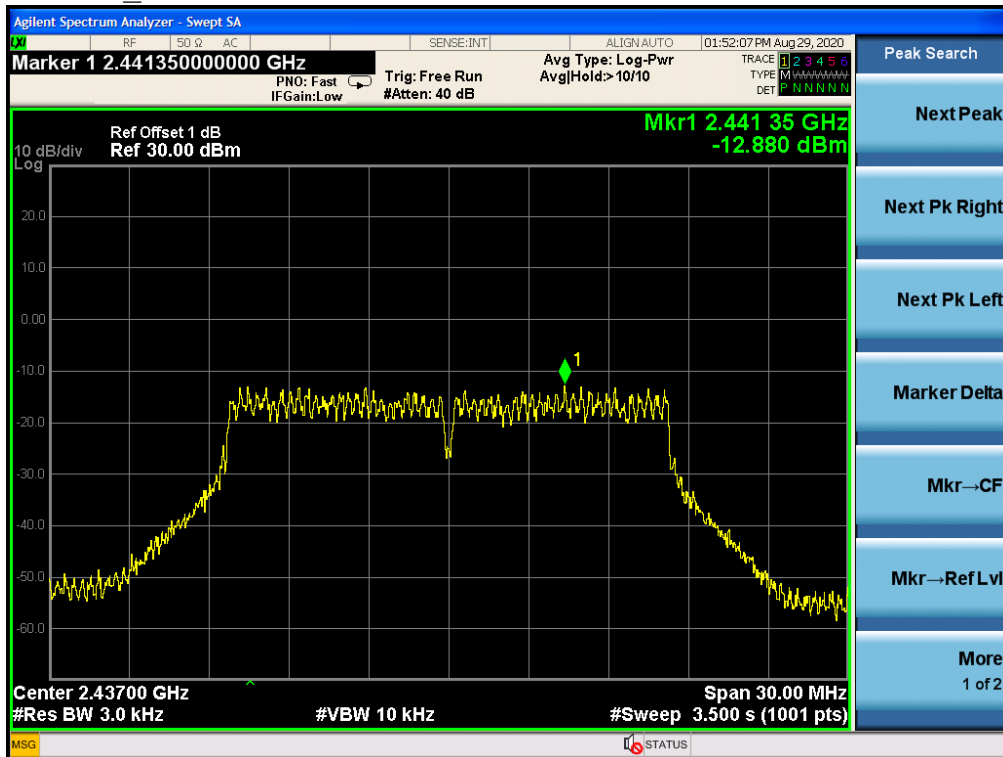
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4.6.2.1.4 802.11G Lowest Channel



4.6.2.1.5 802.11G Middle Channel



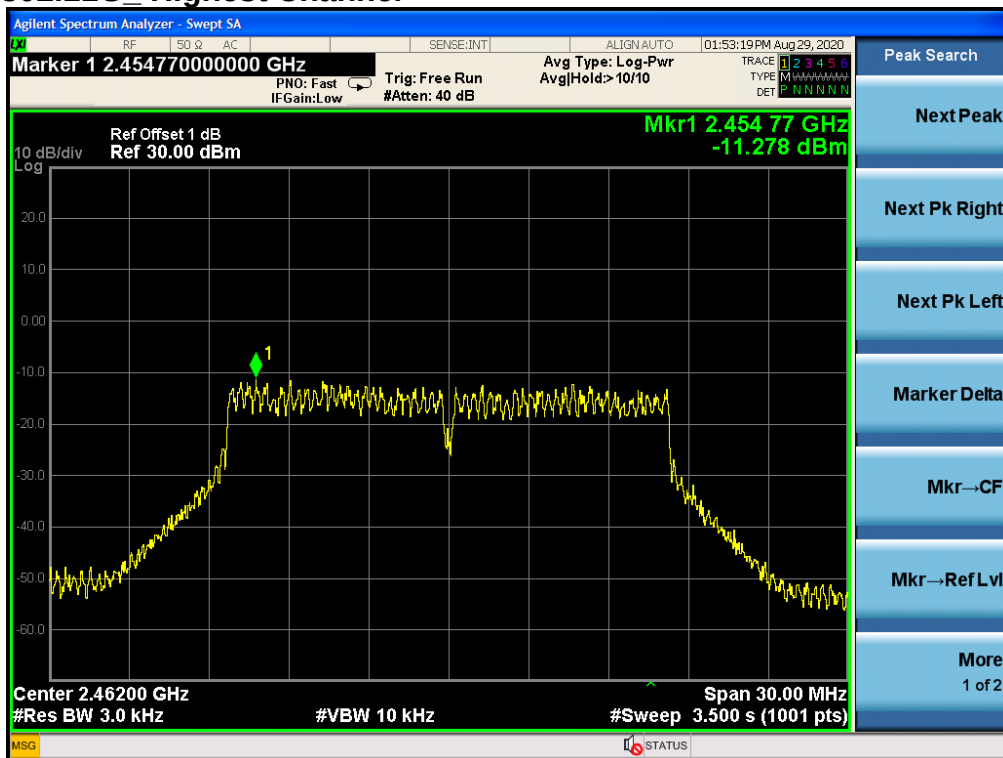
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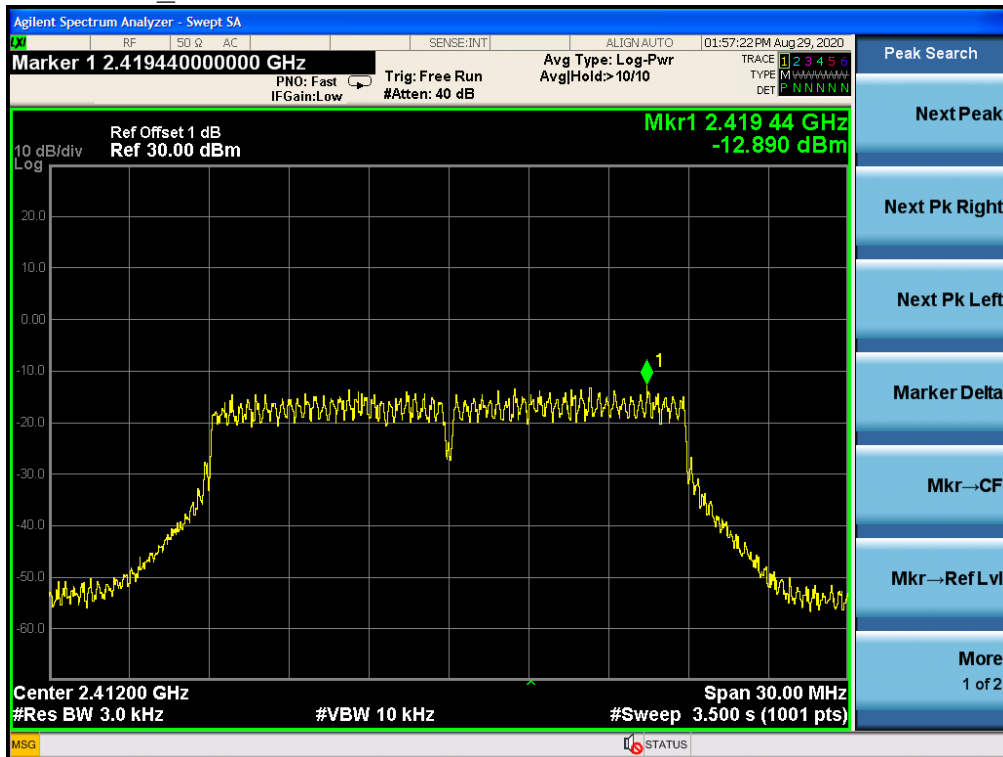
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4.6.2.1.6 802.11G_Highest Channel



4.6.2.1.7 802.11N20_Lowest Channel



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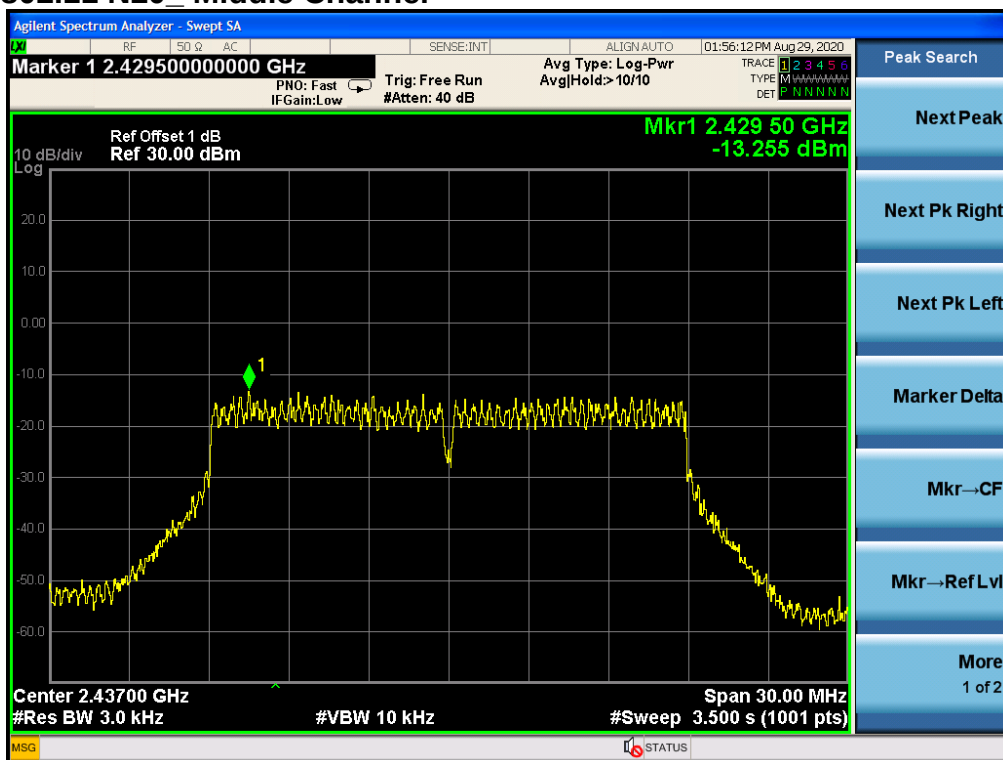
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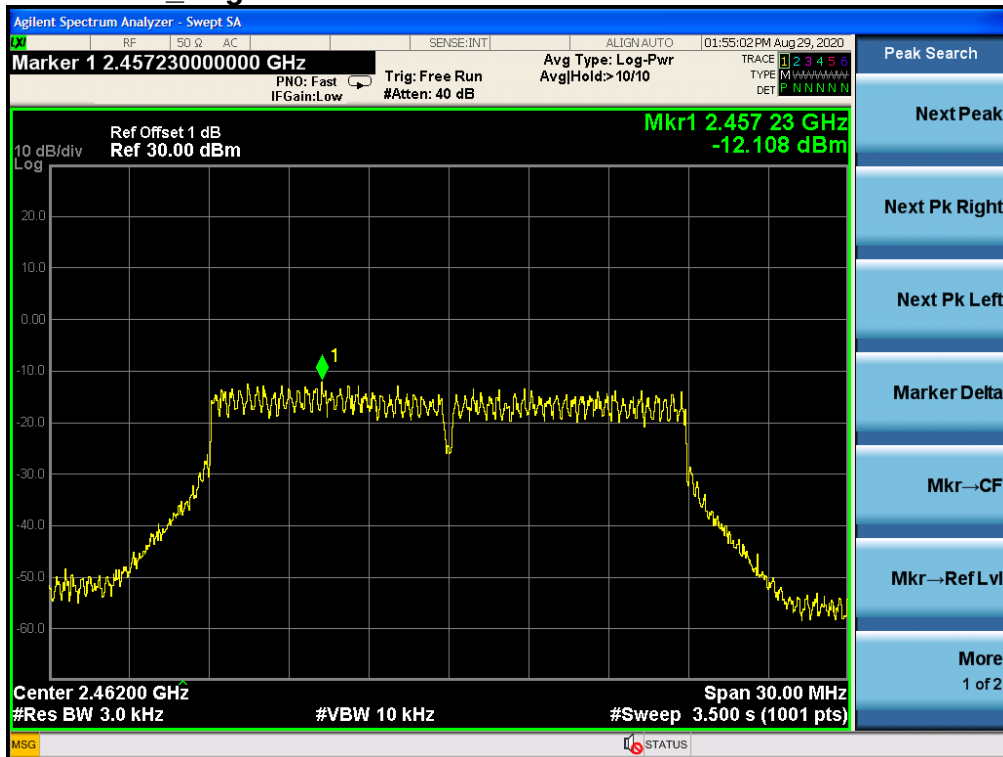
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4.6.2.1.8 802.11 N20_ Middle Channel



4.6.2.1.9 802.11 N20_ Highest Channel



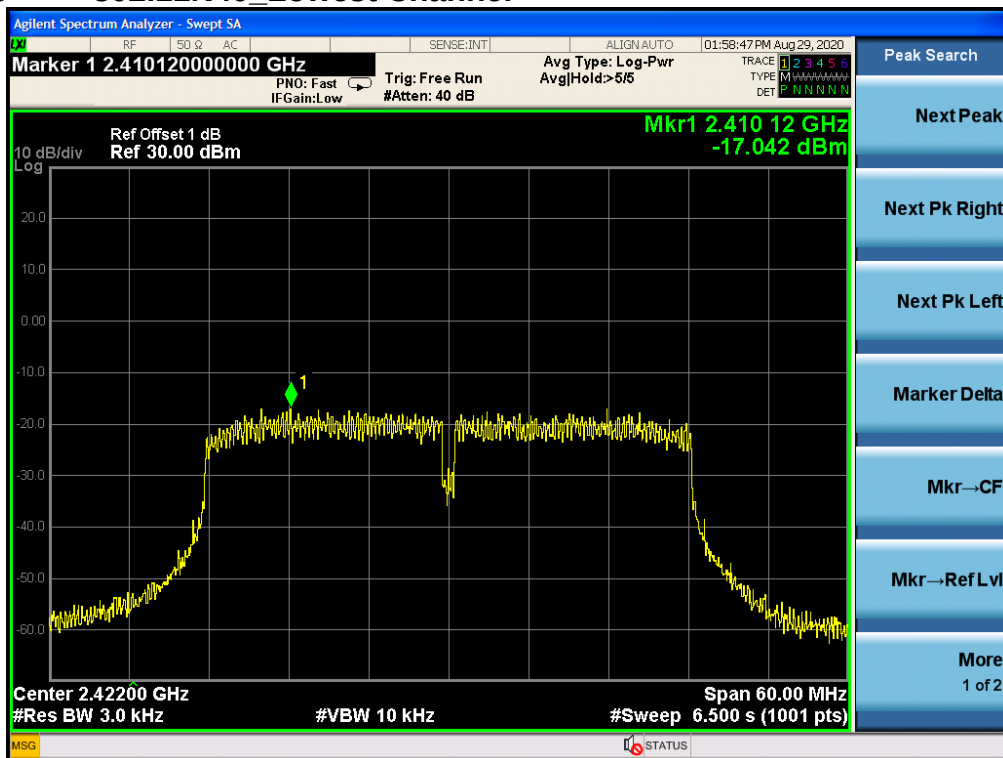
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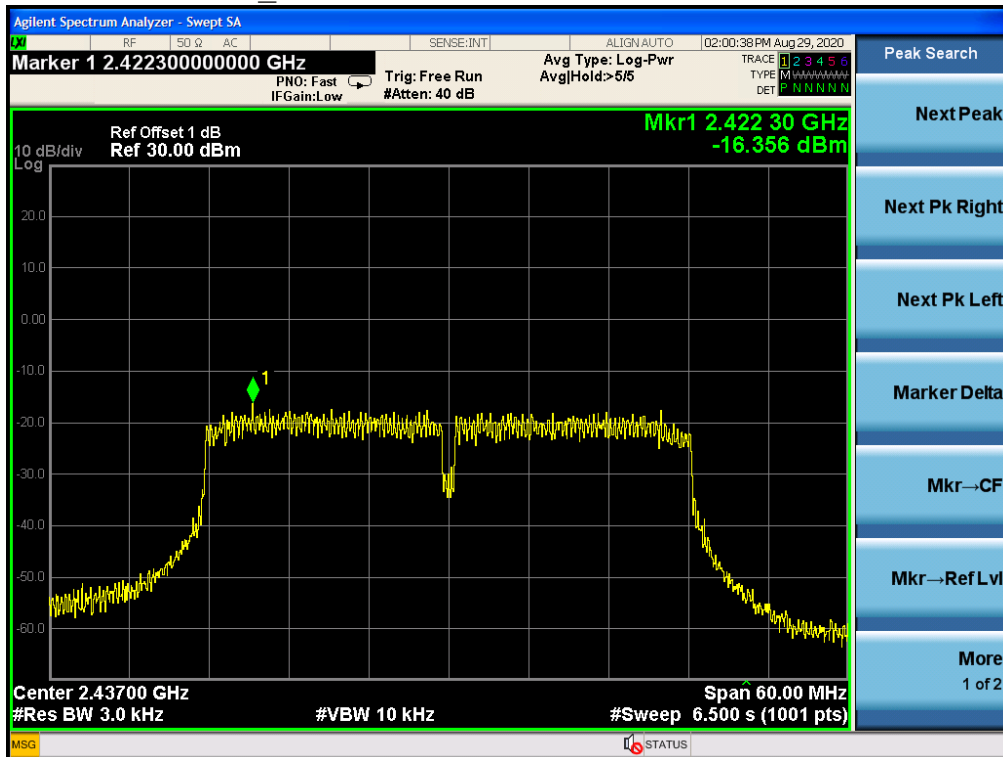
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4.6.2.1.10 802.11N40_Lowest Channel



4.6.2.1.11 802.11 N40_Middle Channel



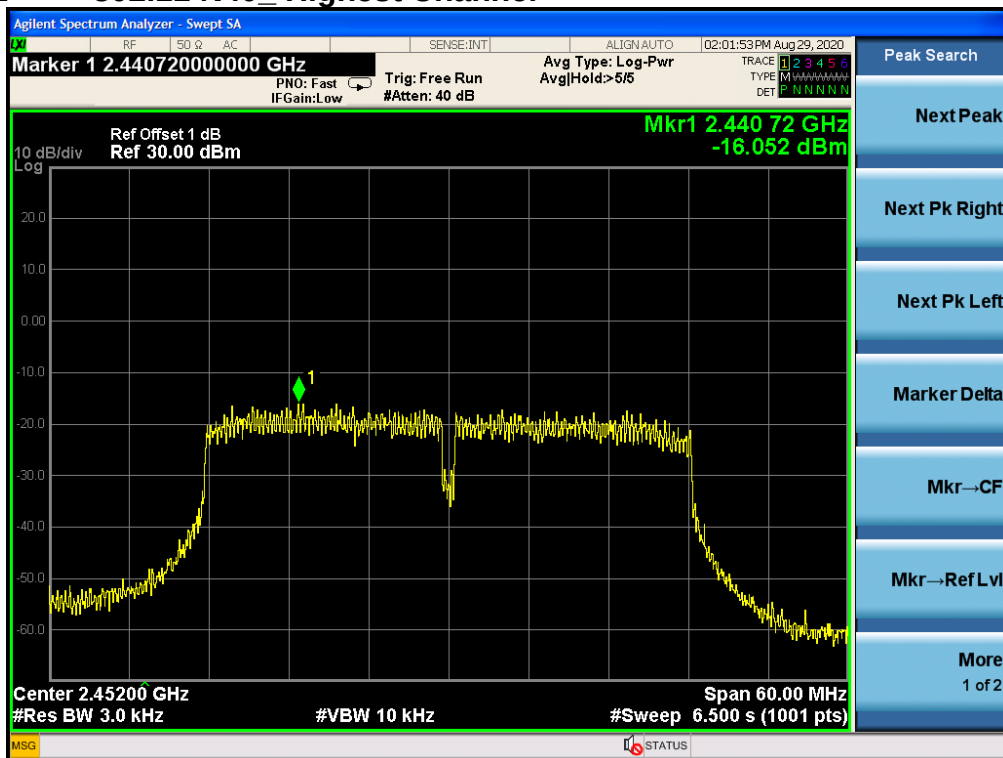
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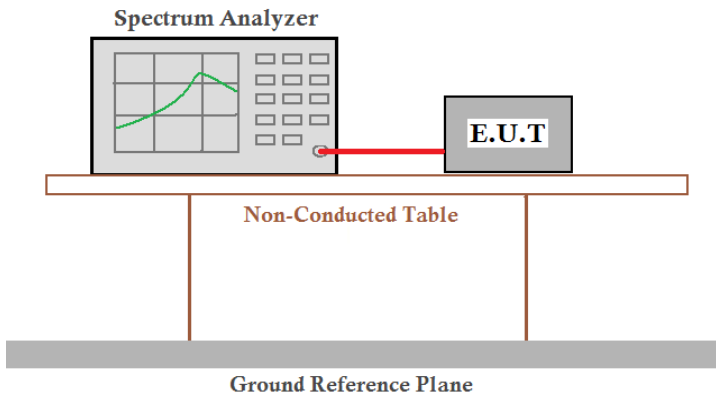
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4.7 Band-edge for RF Conducted Emissions

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



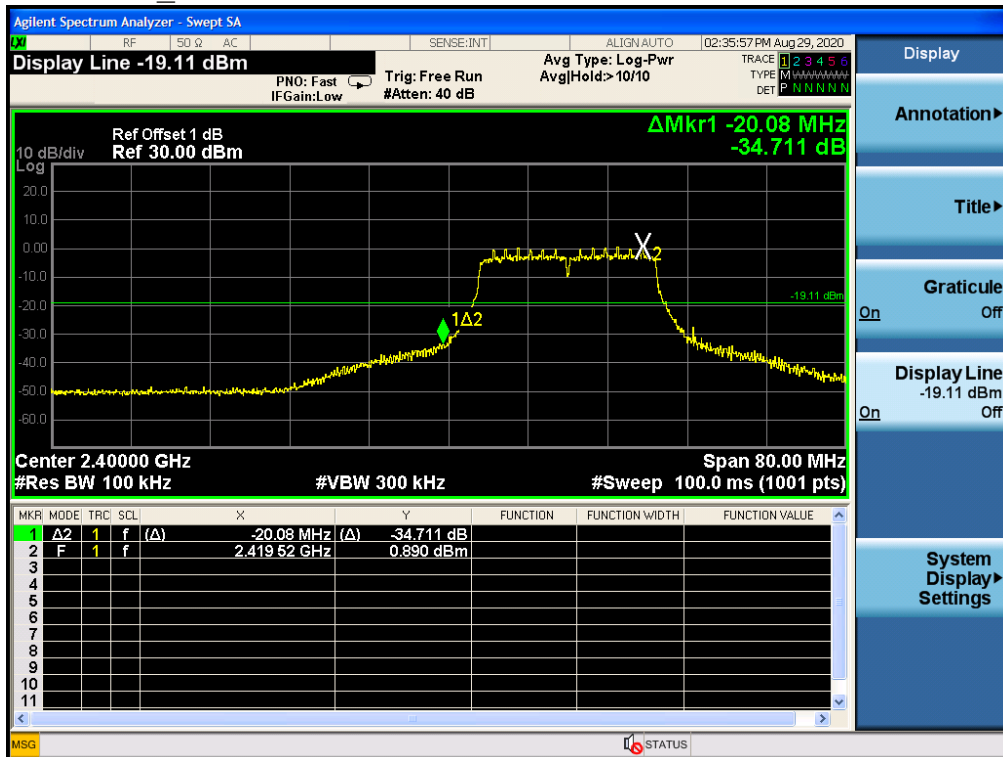
4.7.1.1.3 802.11G_Lowest Channel



4.7.1.1.4 802.11G_Highest Channel



4.7.1.1.5 802.11N20_Lowest Channel



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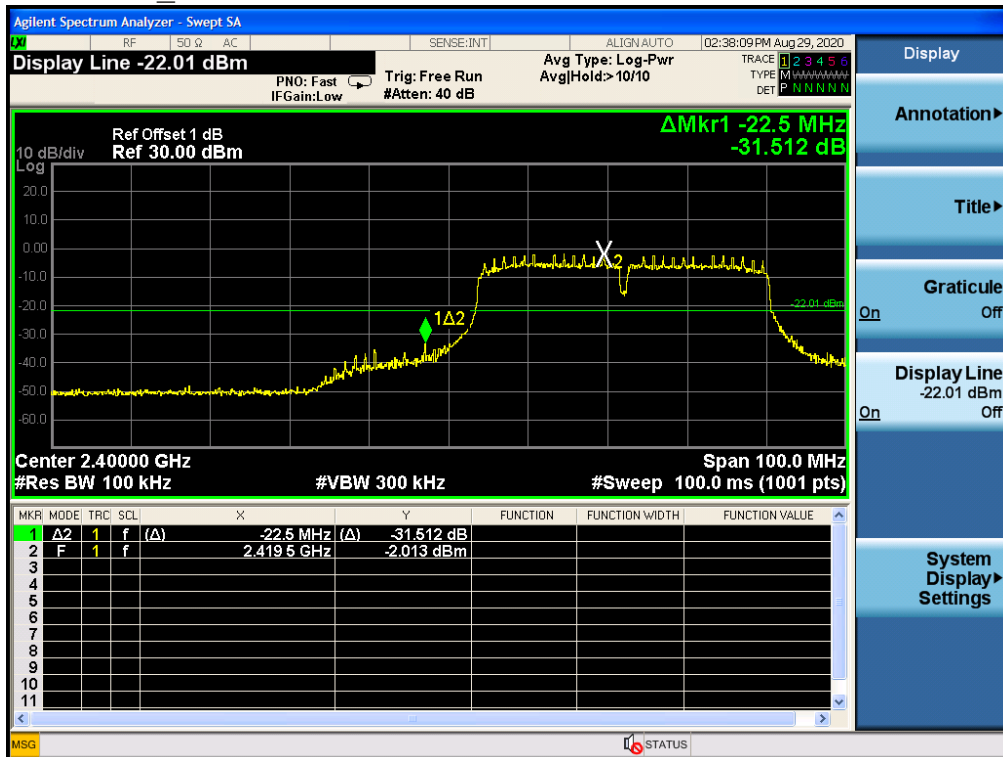
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4.7.1.1.6 802.11 N20_Highest Channel



4.7.1.1.7 802.11N40_Lowest Channel



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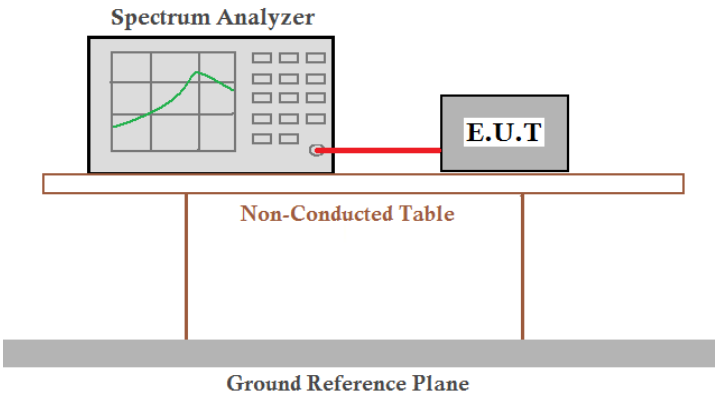
4.7.1.1.8 802.11 N40_ Highest Channel



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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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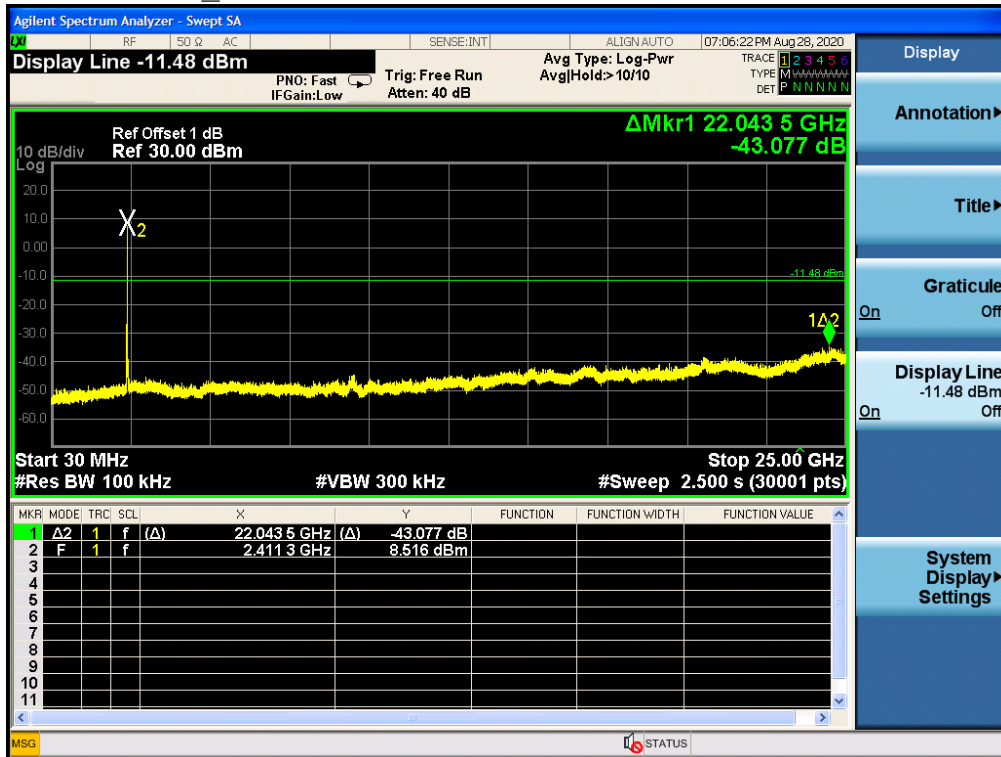
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4.8.1 Test plots

4.8.1.1 ANT1

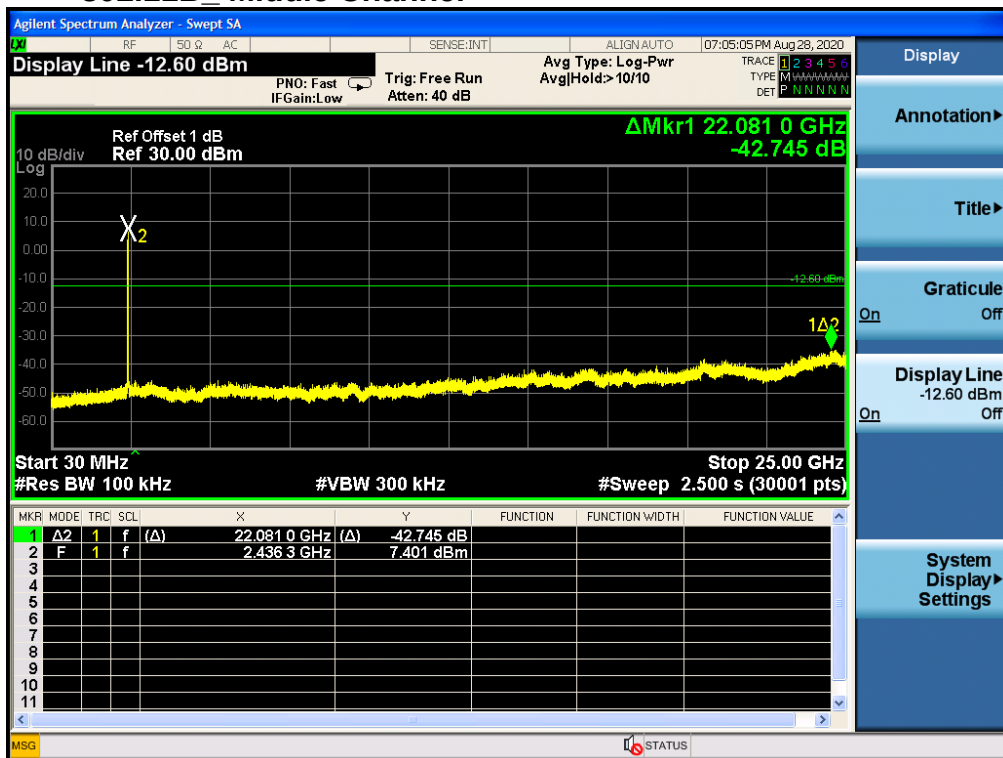
4.8.1.1.1 802.11B Lowest Channel



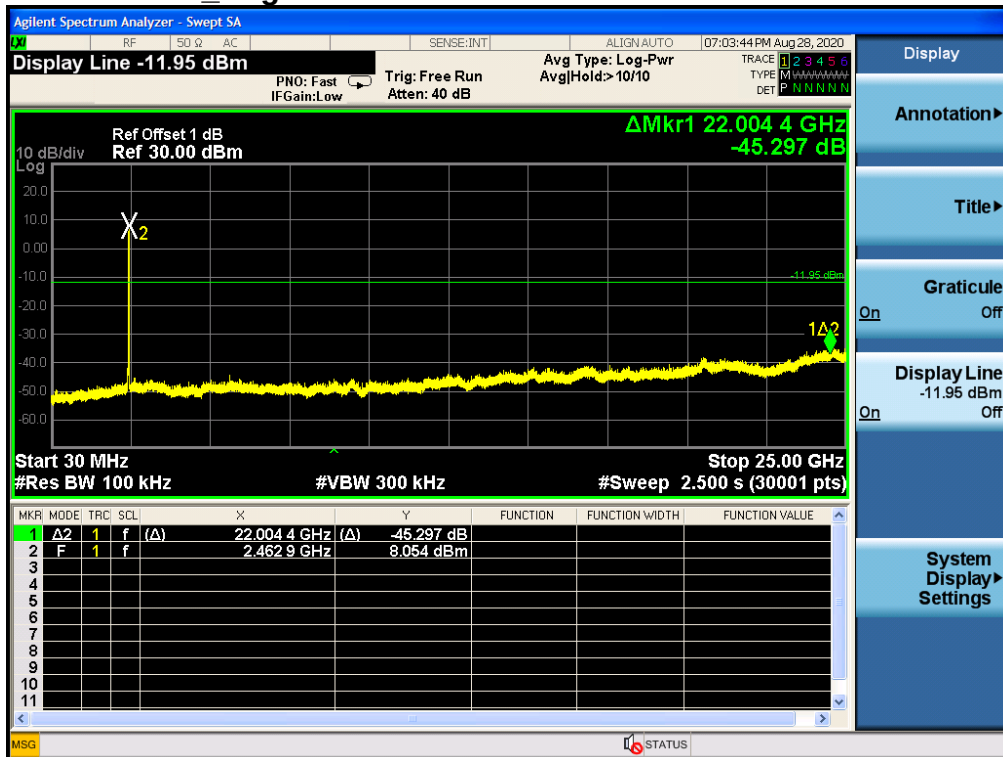
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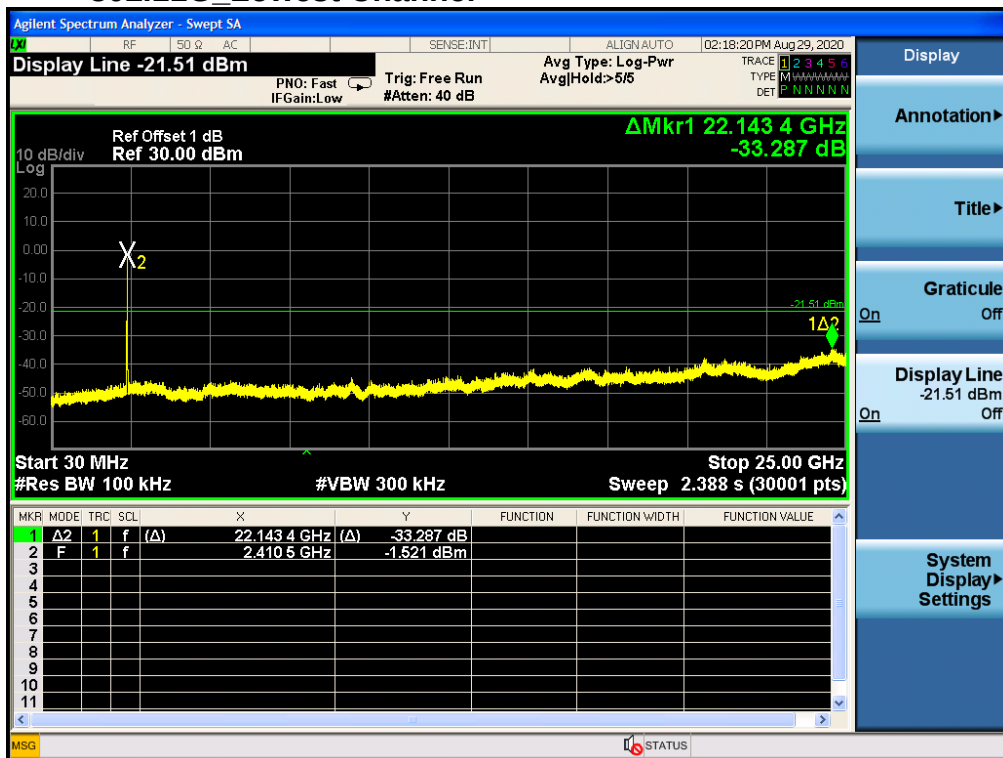
4.8.1.1.2 802.11B_Middle Channel



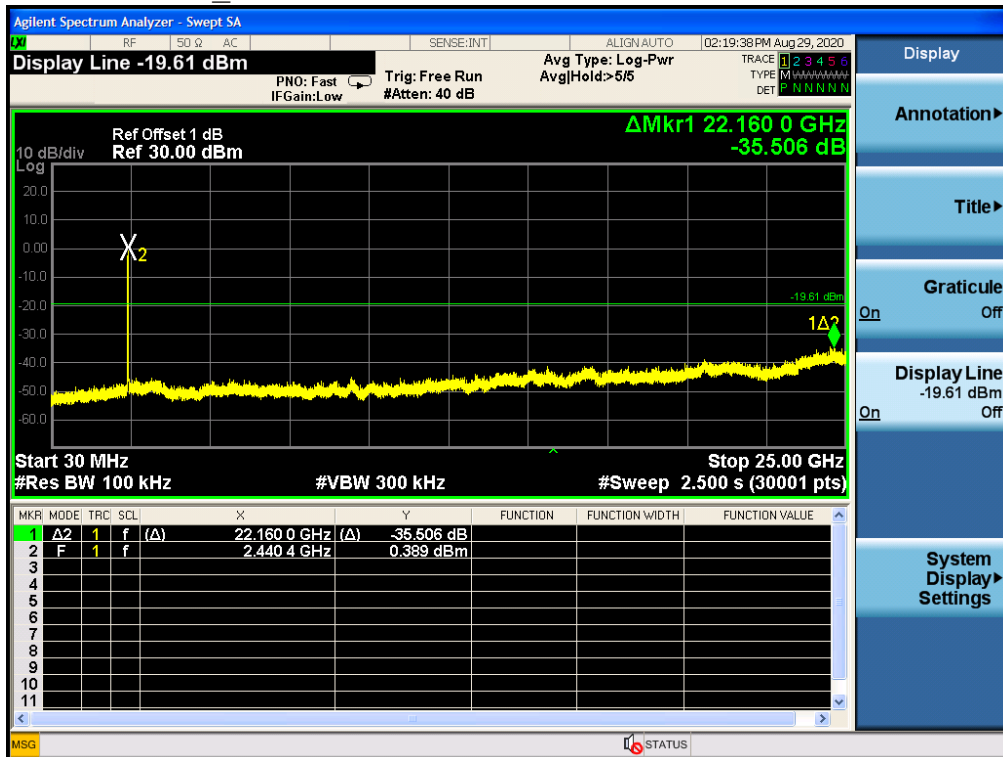
4.8.1.1.3 802.11B_Highest Channel



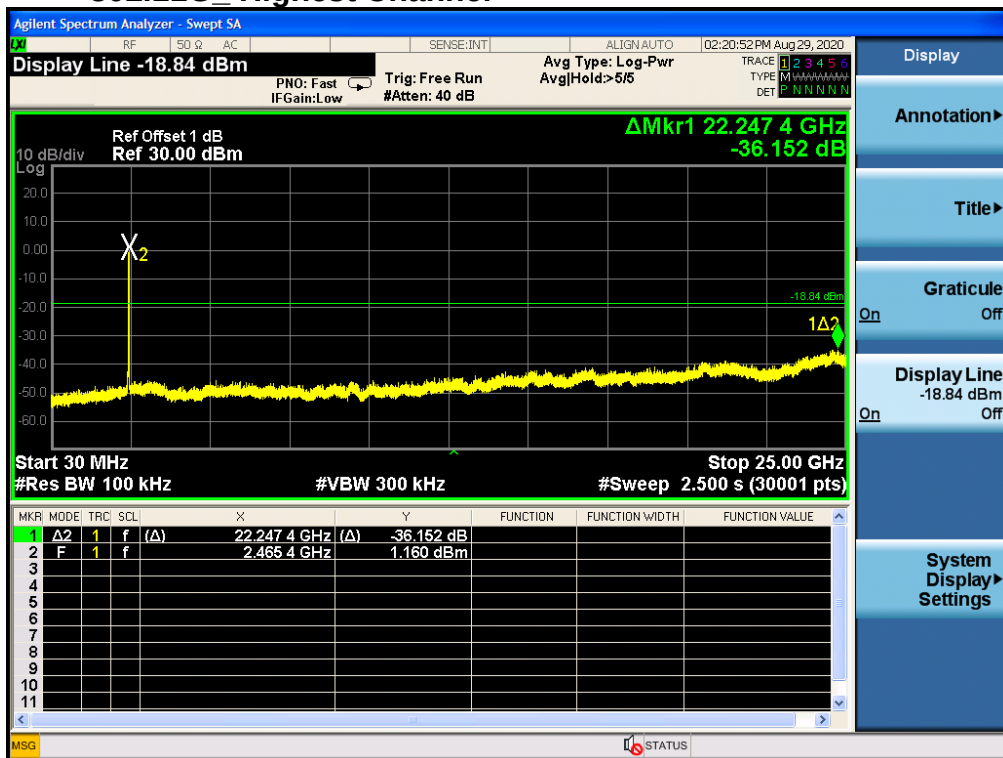
4.8.1.1.4 802.11G Lowest Channel



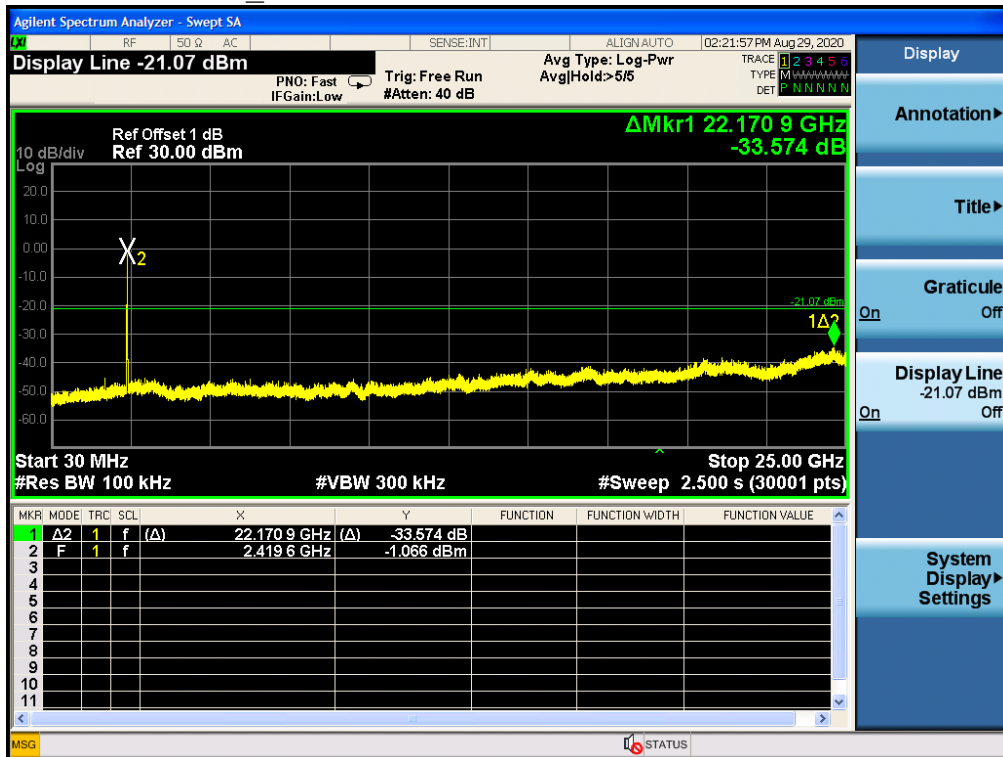
4.8.1.1.5 802.11G Middle Channel



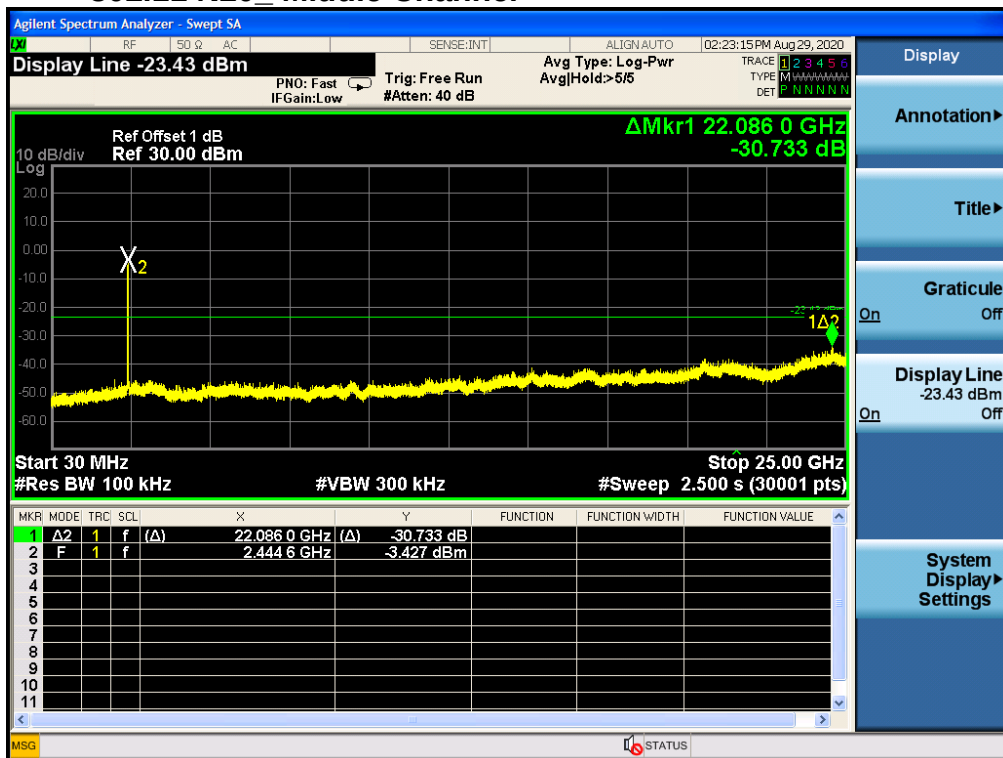
4.8.1.1.6 802.11G_Highest Channel



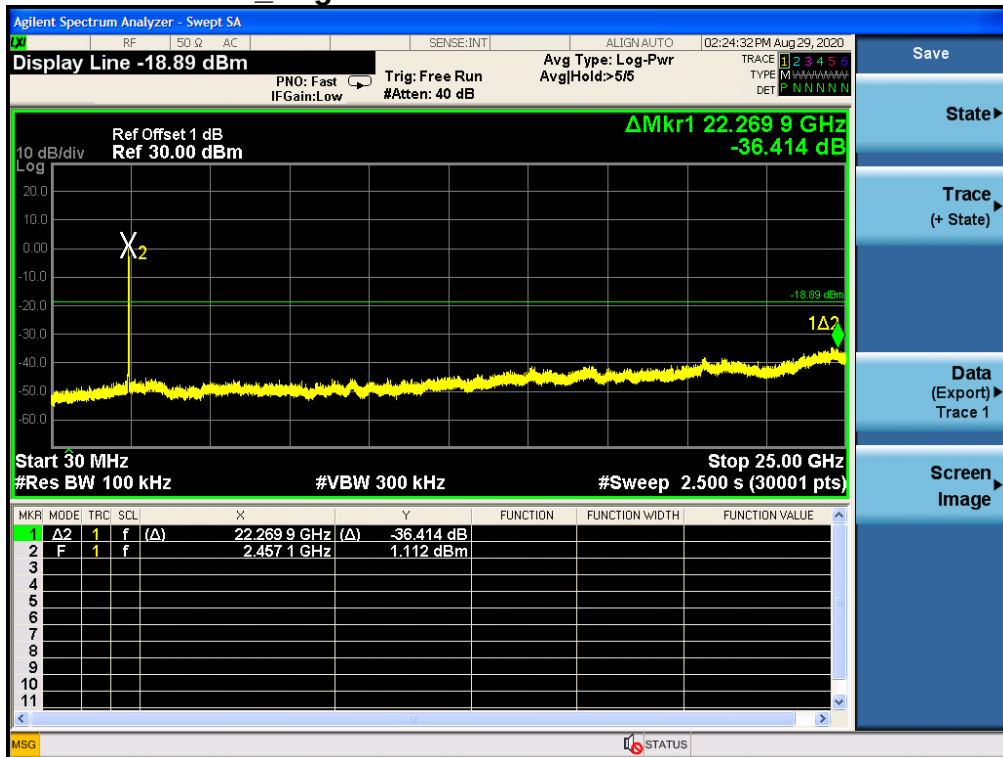
4.8.1.1.7 802.11N20_Lowest Channel



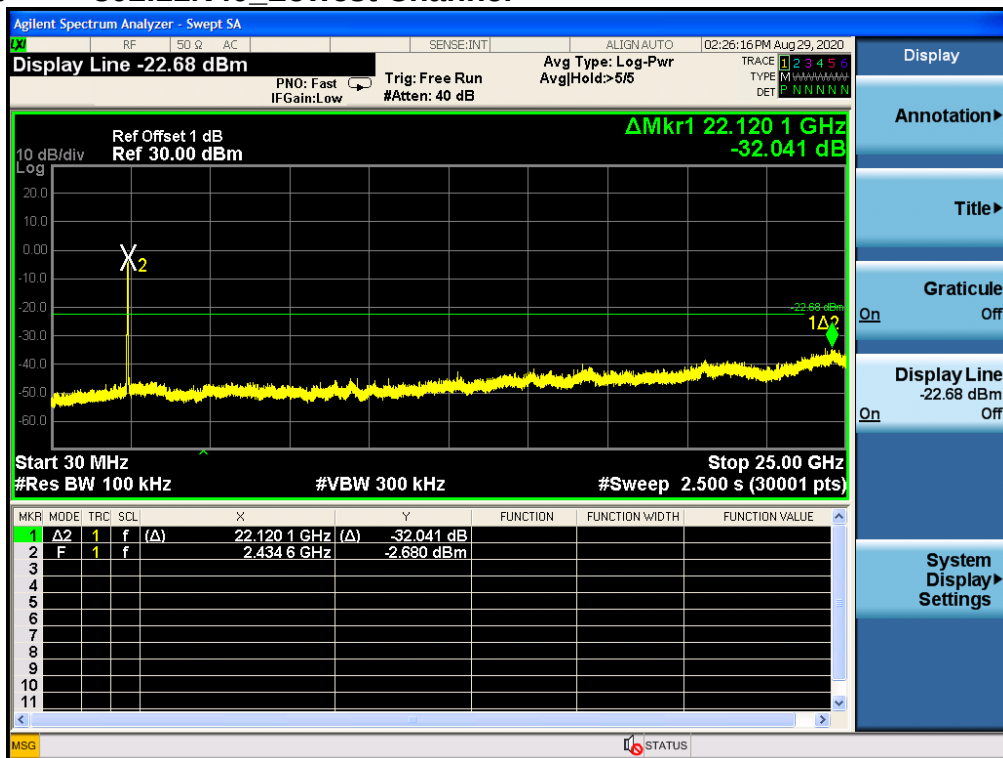
4.8.1.1.8 802.11 N20 Middle Channel



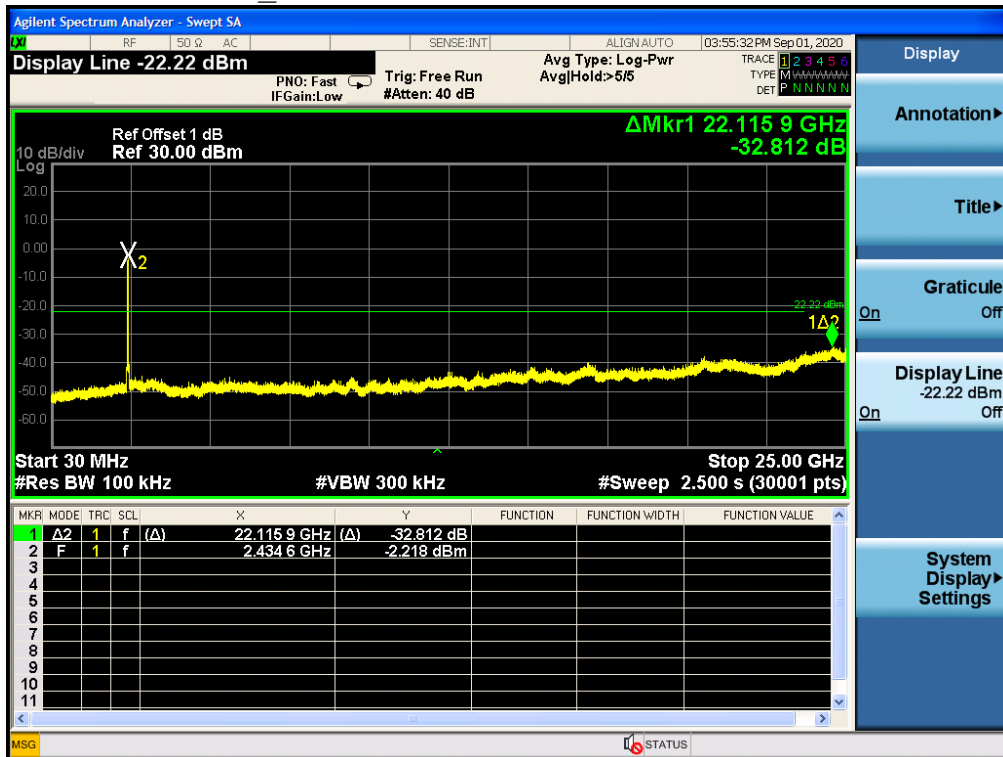
4.8.1.1.9 802.11 N20 Highest Channel



4.8.1.1.10 802.11N40_Lowest Channel

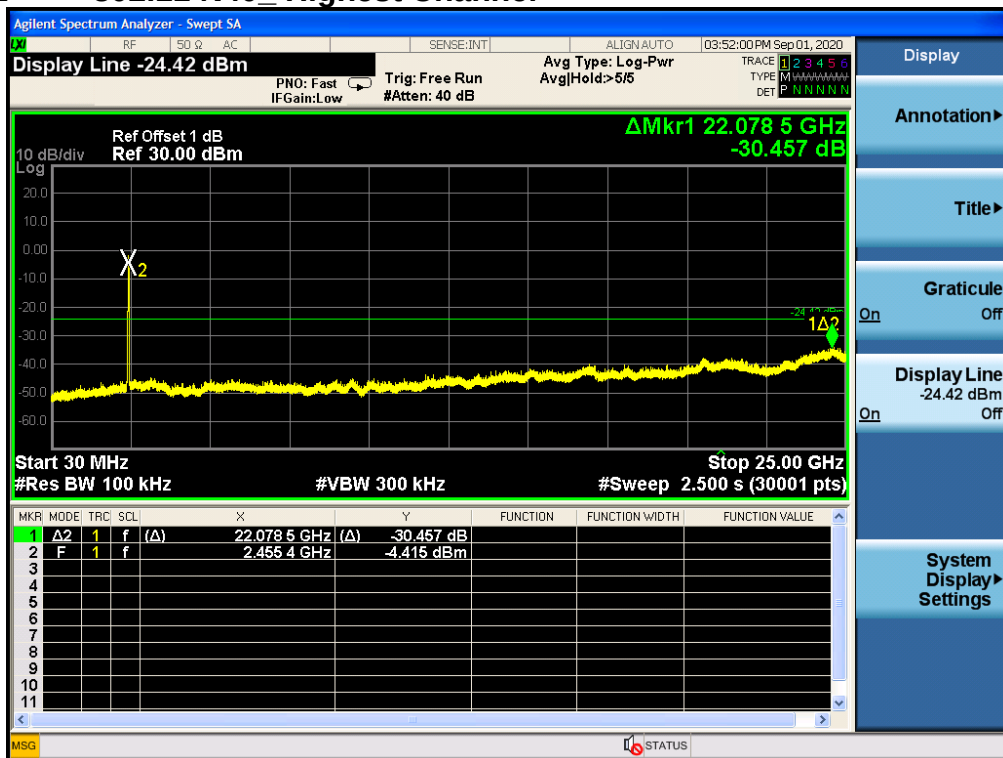


4.8.1.1.11 802.11 N40_Middle Channel





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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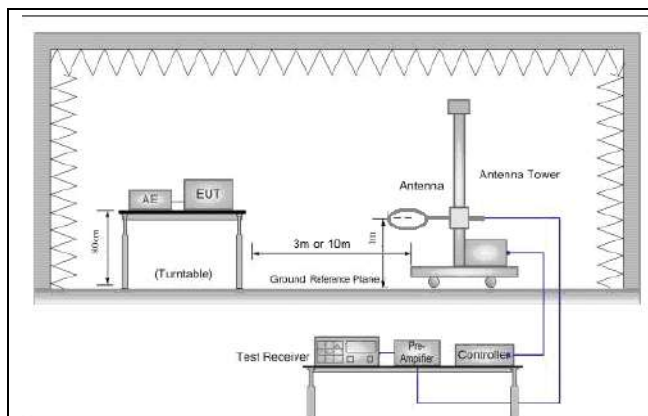


Figure 1. Below 30MHz

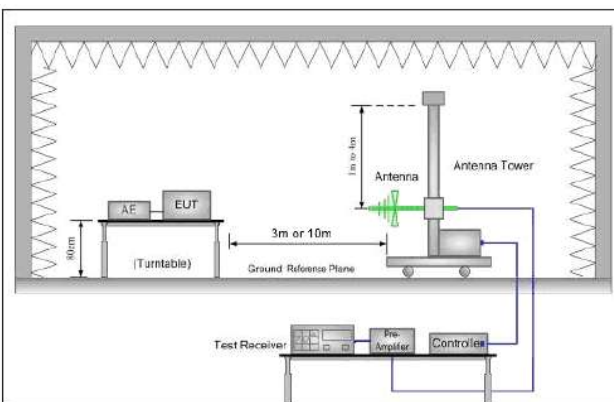


Figure 2. 30MHz to 1GHz

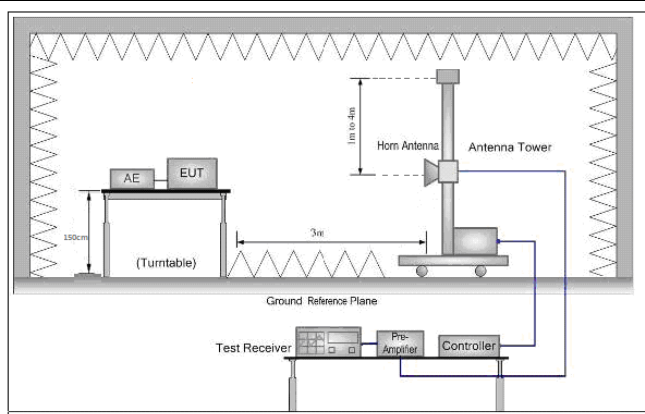


Figure 3. Above 1 GHz

Test Procedure:

- 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 chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- 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 chamber. The table was rotated 360 degrees to determine the position of the highest radiation
- 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.
- 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.
- Use the following spectrum analyzer settings:
 - Span shall wide enough to fully capture the emission being measured;
 - Set RBW=100 kHz for $f < 1$ GHz, RBW=1MHz for $f > 1$ GHz ; VBW $\geq$ RBW; Sweep = auto;
Detector function = peak; Trace = max hold for peak
 - For average measurement: use duty cycle correction factor method per 15.35(c).

Duty cycle = On time/100 milliseconds



	On time = $N_1 * L_1 + N_2 * L_2 + \dots + N_{n-1} * L_{n-1} + N_n * L_n$ Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc. Average Emission Level = Peak Emission Level + $20 \cdot \log(\text{Duty cycl}$ 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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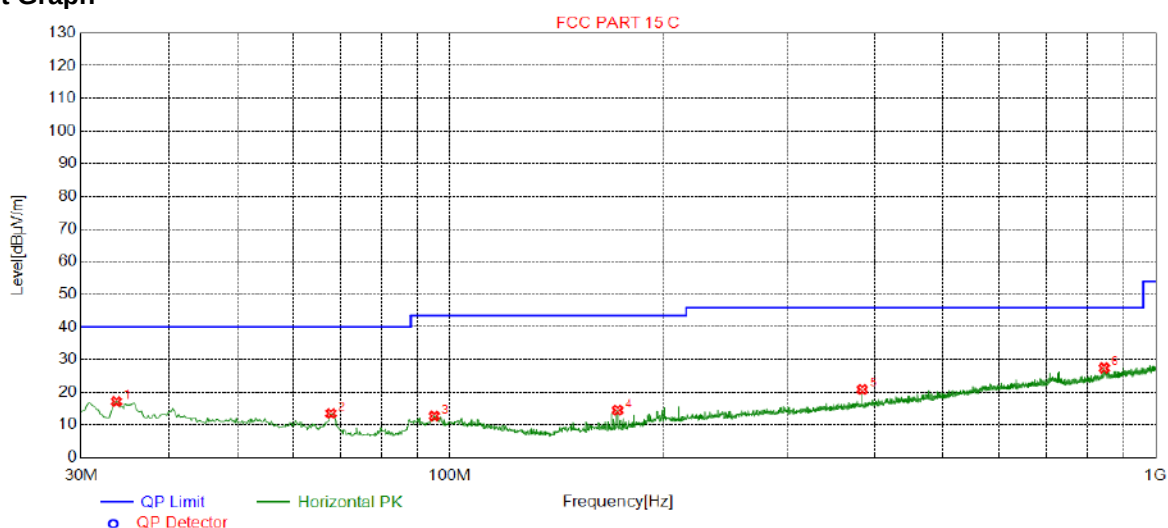
4.1 Radiated Spurious Emissions

4.1.1 Radiated emission below 1GHz

4.1.1.1 Charge + Transmitting

Project Information			
Mode:	2.4G WIFI	State:	
Environment:	Temp: 25℃; Humi:60%	Engineer:	

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	33.6867	17.22	-29.99	40.00	22.78	188	273	Horizontal
2	67.8376	13.54	-33.86	40.00	26.46	215	260	Horizontal
3	95.0030	12.73	-32.89	43.50	30.77	219	88	Horizontal
4	172.812	14.53	-33.83	43.50	28.97	227	47	Horizontal
5	383.926	20.85	-25.95	46.00	25.15	218	333	Horizontal
6	845.157	27.49	-16.97	46.00	18.51	117	72	Horizontal

Final Data List



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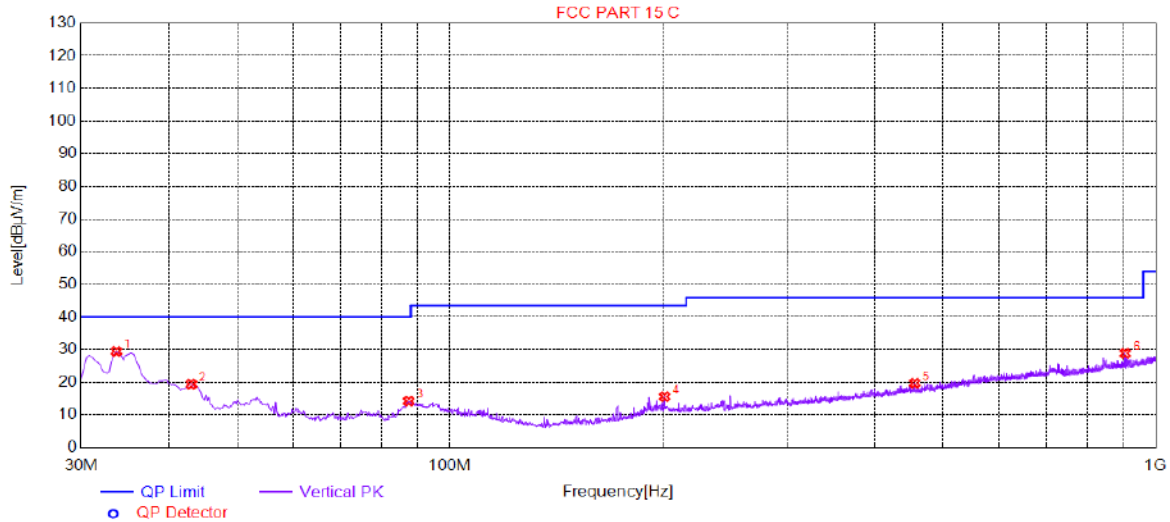
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Project Information			
Mode:	2.4G WIFI	State:	
Environment:	Temp: 25°C; Humi:60%	Engineer:	

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	33.6867	29.48	-29.99	40.00	10.52	330	14	Vertical
2	43.0006	19.43	-29.59	40.00	20.57	289	277	Vertical
3	87.4355	14.26	-34.34	40.00	25.74	241	63	Vertical
4	201.530	15.64	-31.15	43.50	27.86	166	230	Vertical
5	455.721	19.73	-24.29	46.00	26.27	274	179	Vertical
6	905.309	28.88	-15.97	46.00	17.12	113	341	Vertical

Final Data List



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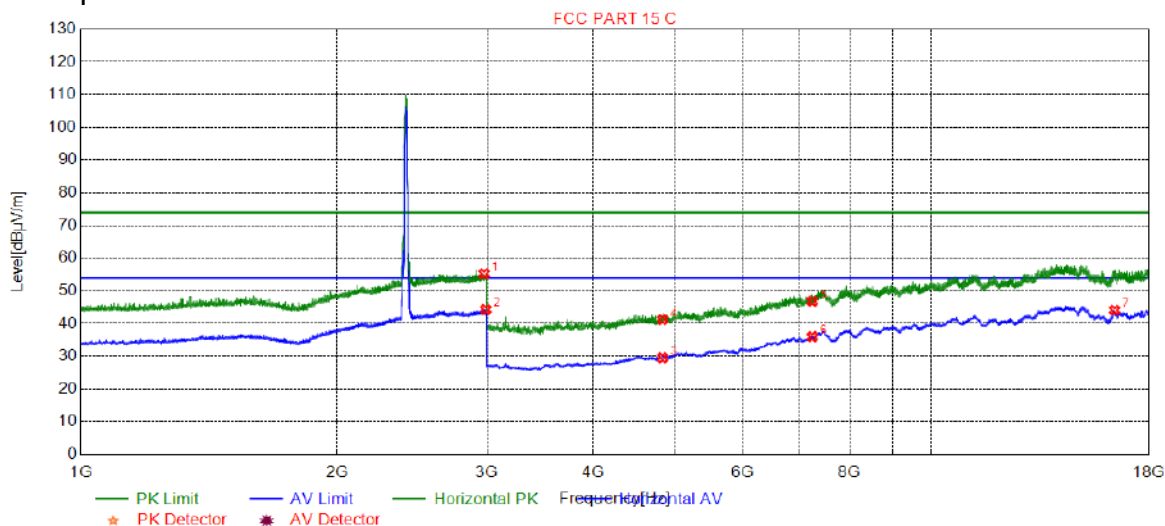
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4.1.2 Transmitter emission above 1GHz

4.1.2.1 802.11B_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	2977.49	55.27	9.55	74.00	18.73	183	208	Horizontal
2	2990.49	44.35	9.49	54.00	9.65	164	153	Horizontal
3	4824.00	29.58	-18.21	54.00	24.42	285	44	Horizontal
4	4824.00	41.28	-18.21	74.00	32.72	134	206	Horizontal
5	7236.00	46.86	-9.76	74.00	27.14	119	44	Horizontal
6	7236.00	36.01	-9.76	54.00	17.99	241	315	Horizontal
7	16393.3	44.17	-1.09	54.00	9.83	276	0	Horizontal

Final Data List

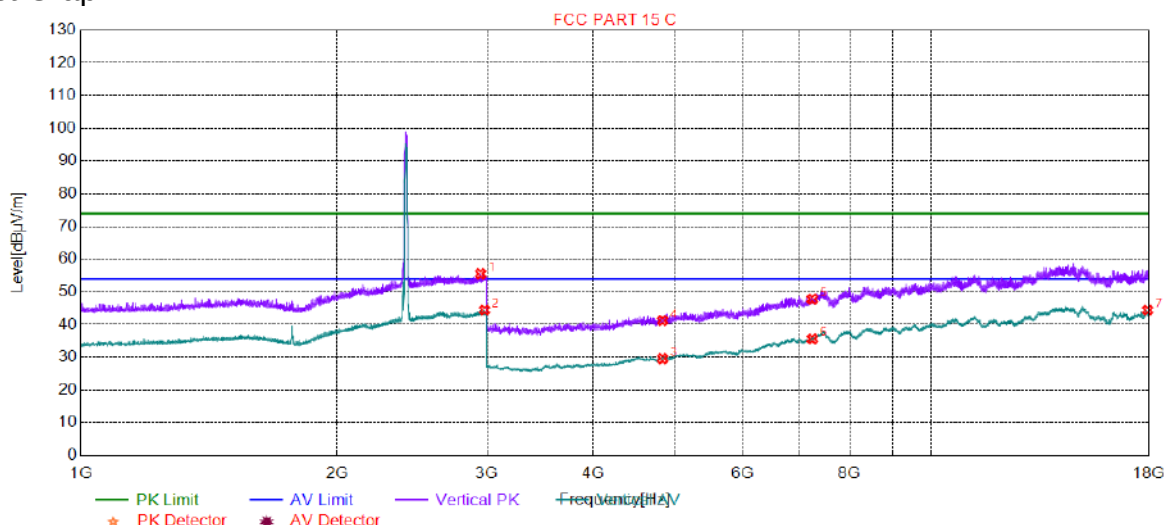


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4.1.2.2 802.11B_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2948.48	55.55	9.66	74.00	18.45	332	328	Vertical
2	2980.99	44.51	9.54	54.00	9.49	249	152	Vertical
3	4824.00	29.61	-18.21	54.00	24.39	256	208	Vertical
4	4824.00	41.26	-18.21	74.00	32.74	264	128	Vertical
5	7236.00	47.81	-9.76	74.00	26.19	287	155	Vertical
6	7236.00	35.67	-9.76	54.00	18.33	246	290	Vertical
7	17929.4	44.48	-1.30	54.00	9.52	312	344	Vertical

Final Data List



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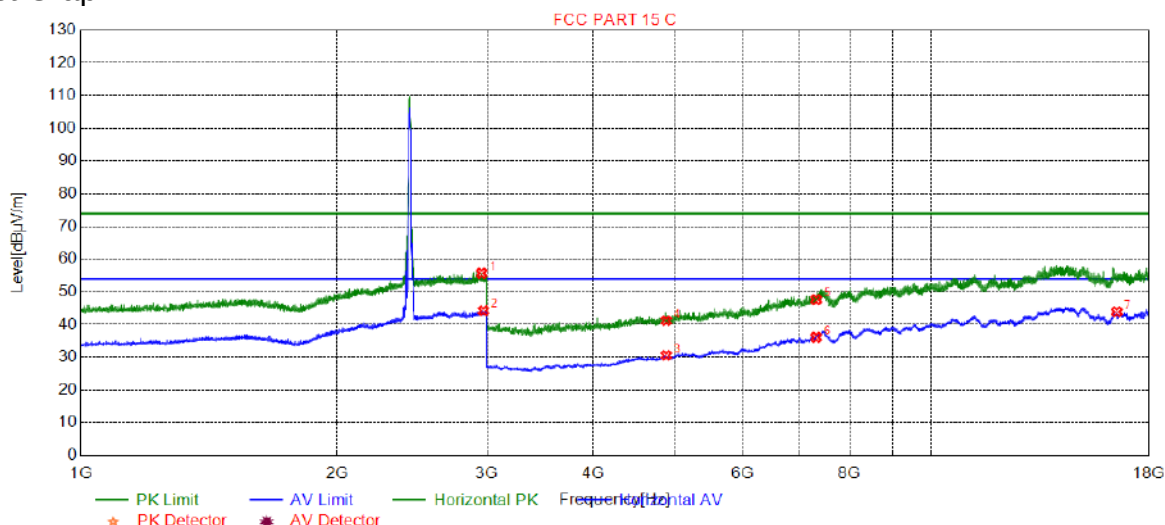
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4.1.2.3 802.11B_Channel 6

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2956.98	55.73	9.65	74.00	18.27	116	141	Horizontal
2	2972.49	44.29	9.58	54.00	9.71	157	356	Horizontal
3	4874.00	30.59	-17.99	54.00	23.41	124	0	Horizontal
4	4874.00	41.21	-17.99	74.00	32.79	168	68	Horizontal
5	7311.00	47.66	-9.59	74.00	26.34	294	232	Horizontal
6	7311.00	36.14	-9.59	54.00	17.86	256	232	Horizontal
7	16492.3	43.95	-0.70	54.00	10.05	247	205	Horizontal

Final Data List



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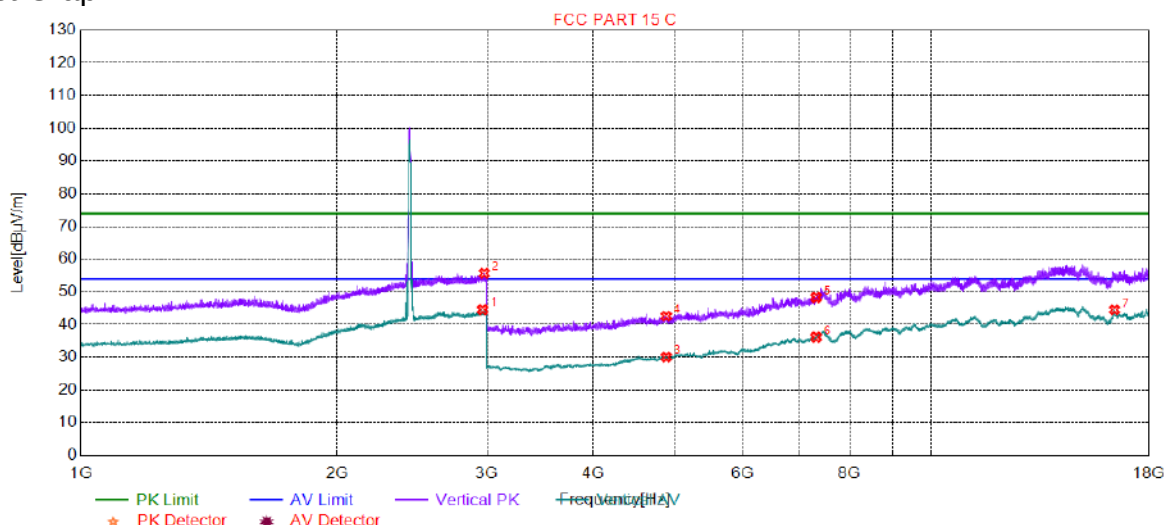
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4.1.2.4 802.11B_Channel 6

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2965.49	44.61	9.61	54.00	9.39	320	301	Vertical
2	2978.99	55.71	9.55	74.00	18.29	214	138	Vertical
3	4874.00	30.07	-17.99	54.00	23.93	256	72	Vertical
4	4874.00	42.61	-17.99	74.00	31.39	256	18	Vertical
5	7311.00	48.32	-9.59	74.00	25.68	117	99	Vertical
6	7311.00	36.19	-9.59	54.00	17.81	164	72	Vertical
7	16390.3	44.58	-1.08	54.00	9.42	258	262	Vertical

Final Data List



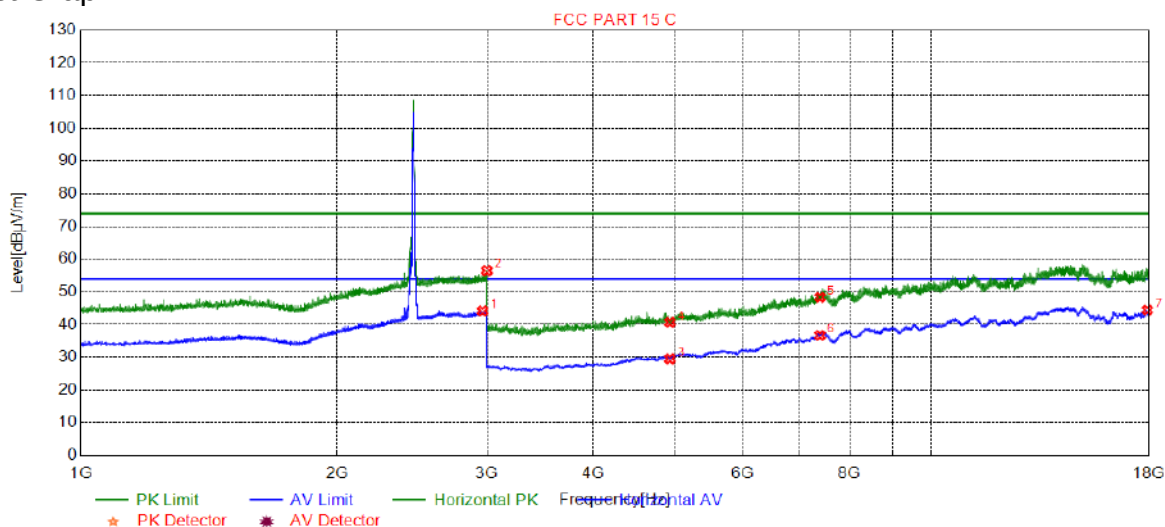
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4.1.2.5 802.11B_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2964.99	44.21	9.61	54.00	9.79	194	18	Horizontal
2	3000.00	56.52	9.45	74.00	17.48	166	100	Horizontal
3	4924.00	29.54	-17.71	54.00	24.46	127	206	Horizontal
4	4924.00	40.70	-17.71	74.00	33.30	365	342	Horizontal
5	7386.00	48.35	-9.20	74.00	25.65	224	233	Horizontal
6	7386.00	36.70	-9.20	54.00	17.30	284	0	Horizontal
7	17917.4	44.50	-1.30	54.00	9.50	255	16	Horizontal

Final Data List



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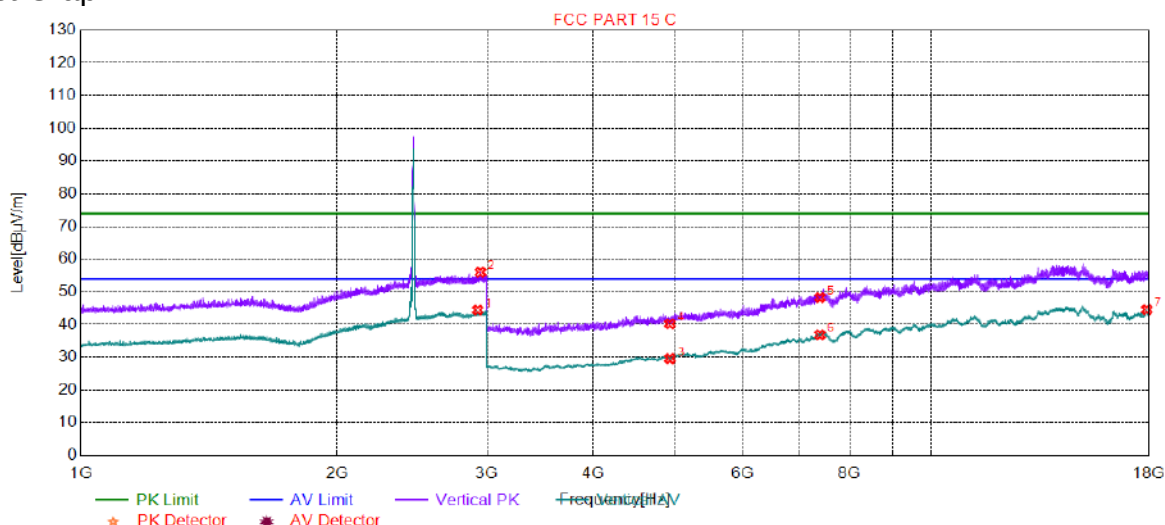
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4.1.2.6 802.11B_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2926.98	44.51	9.43	54.00	9.49	136	342	Vertical
2	2947.48	56.02	9.65	74.00	17.98	254	138	Vertical
3	4924.00	29.62	-17.71	54.00	24.38	229	155	Vertical
4	4924.00	40.25	-17.71	74.00	33.75	288	100	Vertical
5	7386.00	48.28	-9.20	74.00	25.72	247	209	Vertical
6	7386.00	36.89	-9.20	54.00	17.11	322	18	Vertical
7	17891.9	44.63	-1.42	54.00	9.37	166	345	Vertical

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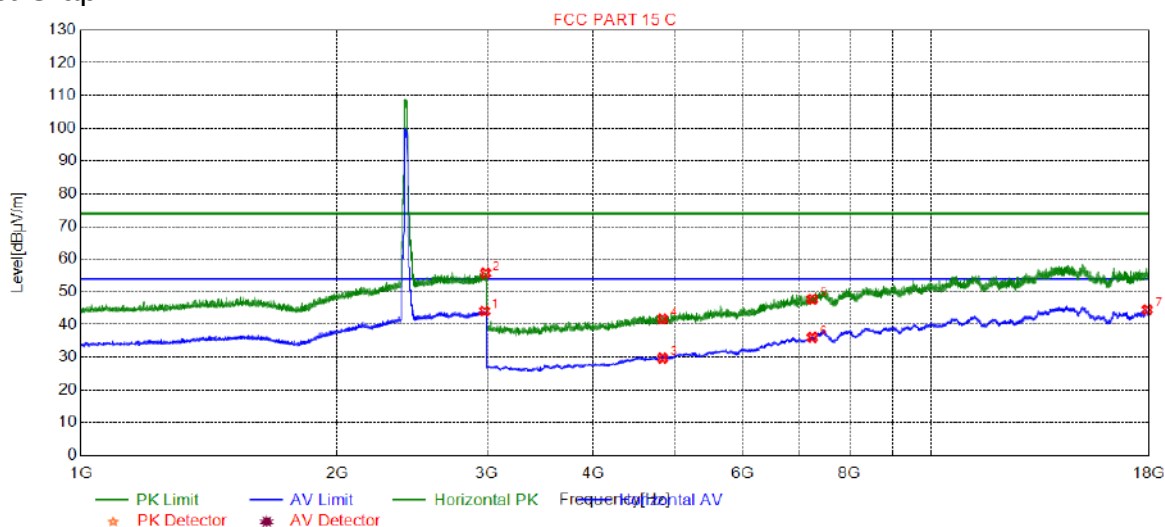
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4.1.2.7 802.11G_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2980.99	44.17	9.54	54.00	9.83	214	18	Horizontal
2	2988.99	55.74	9.50	74.00	18.26	265	45	Horizontal
3	4824.00	29.78	-18.21	54.00	24.22	198	70	Horizontal
4	4824.00	41.74	-18.21	74.00	32.26	287	124	Horizontal
5	7236.00	47.77	-9.76	74.00	26.23	254	42	Horizontal
6	7236.00	36.12	-9.76	54.00	17.88	269	205	Horizontal
7	17912.9	44.61	-1.31	54.00	9.39	147	0	Horizontal

Final Data List

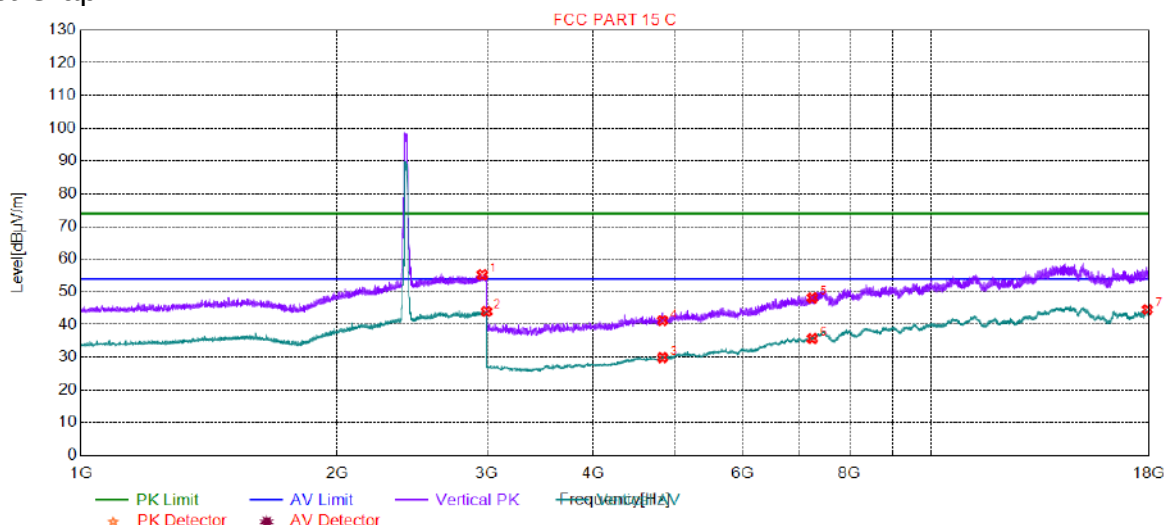


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4.1.2.8 802.11G_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2962.99	55.28	9.62	74.00	18.72	155	246	Vertical
2	2996.99	44.07	9.46	54.00	9.93	215	205	Vertical
3	4824.00	29.94	-18.21	54.00	24.06	366	154	Vertical
4	4824.00	41.26	-18.21	74.00	32.74	265	45	Vertical
5	7236.00	48.20	-9.76	74.00	25.80	293	290	Vertical
6	7236.00	35.78	-9.76	54.00	18.22	396	360	Vertical
7	17917.4	44.65	-1.30	54.00	9.35	366	344	Vertical

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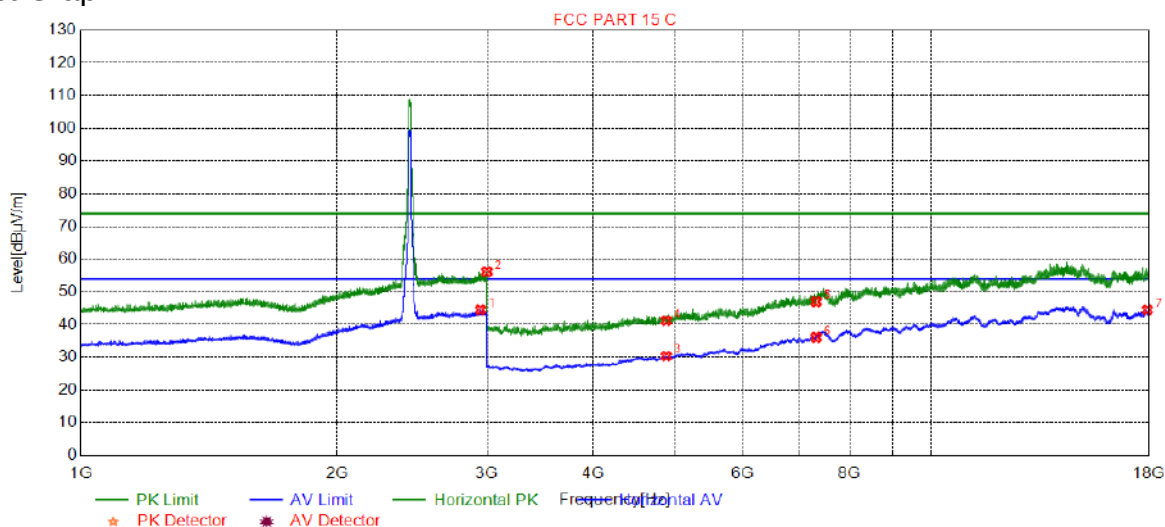
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4.1.2.9 802.11G_Channel 6

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2947.98	44.58	9.66	54.00	9.42	124	259	Horizontal
2	3000.00	56.18	9.45	74.00	17.82	275	259	Horizontal
3	4874.00	30.35	-17.99	54.00	23.65	164	342	Horizontal
4	4874.00	41.20	-17.99	74.00	32.80	325	260	Horizontal
5	7311.00	47.02	-9.59	74.00	26.98	154	178	Horizontal
6	7311.00	36.12	-9.59	54.00	17.88	169	287	Horizontal
7	17917.4	44.57	-1.30	54.00	9.43	244	287	Horizontal

Final Data List

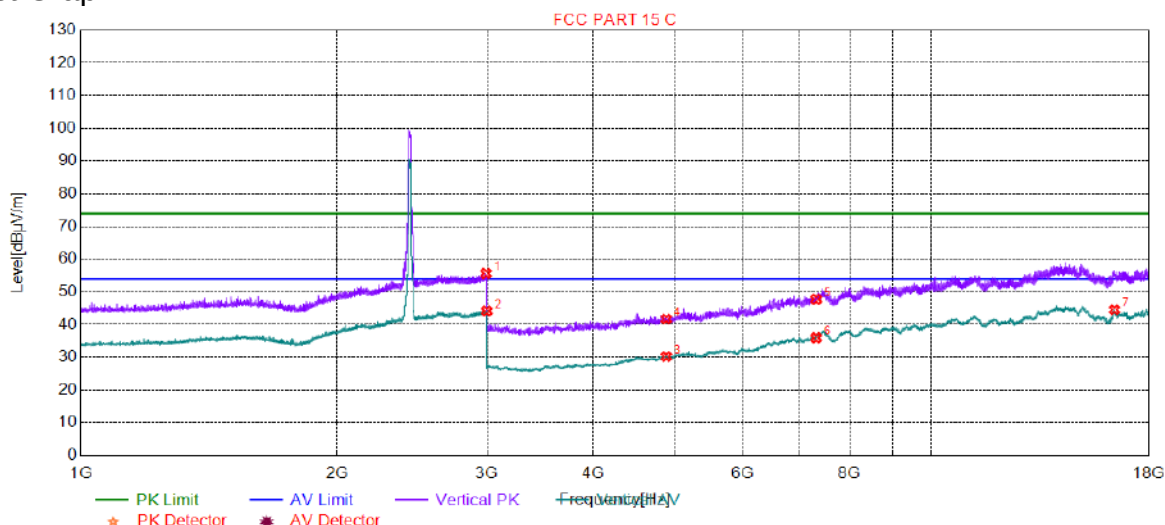


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4.1.2.10 802.11G_Channel 6

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2992.49	55.65	9.48	74.00	18.35	332	248	Vertical
2	2998.99	44.19	9.45	54.00	9.81	154	248	Vertical
3	4874.00	30.23	-17.99	54.00	23.77	265	45	Vertical
4	4874.00	41.72	-17.99	74.00	32.28	254	208	Vertical
5	7311.00	47.75	-9.59	74.00	26.25	221	18	Vertical
6	7311.00	35.98	-9.59	54.00	18.02	329	319	Vertical
7	16388.8	44.59	-1.08	54.00	9.41	228	180	Vertical

Final Data List

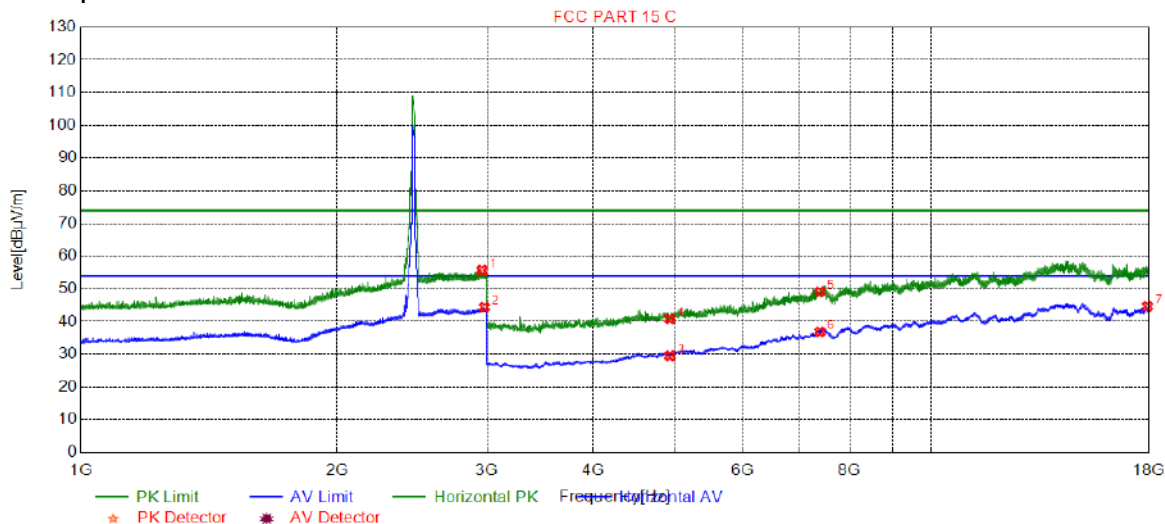


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4.1.2.11 802.11G_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2960.49	55.68	9.63	74.00	18.32	337	342	Horizontal
2	2979.99	44.46	9.54	54.00	9.54	264	16	Horizontal
3	4924.00	29.59	-17.71	54.00	24.41	246	314	Horizontal
4	4924.00	40.86	-17.71	74.00	33.14	168	43	Horizontal
5	7386.00	49.13	-9.20	74.00	24.87	245	233	Horizontal
6	7386.00	36.87	-9.20	54.00	17.13	165	98	Horizontal
7	17923.4	44.72	-1.30	54.00	9.28	252	16	Horizontal

Final Data List



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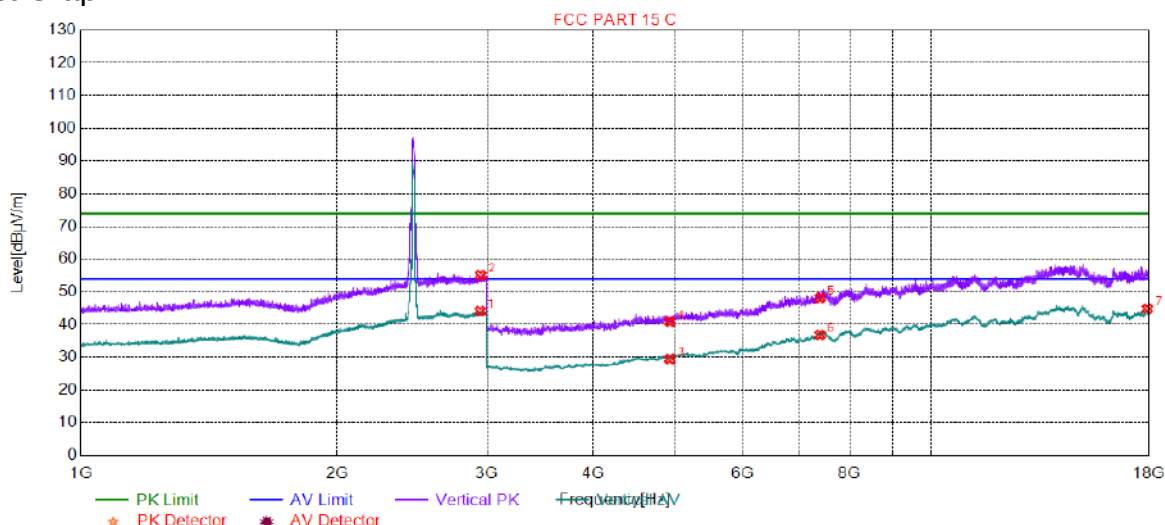
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4.1.2.12 802.11G_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2944.98	44.19	9.63	54.00	9.81	295	264	Vertical
2	2948.98	55.10	9.67	74.00	18.90	124	113	Vertical
3	4924.00	29.50	-17.71	54.00	24.50	326	180	Vertical
4	4924.00	40.90	-17.71	74.00	33.10	254	100	Vertical
5	7386.00	48.16	-9.20	74.00	25.84	229	72	Vertical
6	7386.00	36.86	-9.20	54.00	17.14	333	45	Vertical
7	17920.4	44.89	-1.30	54.00	9.11	257	360	Vertical

Final Data List



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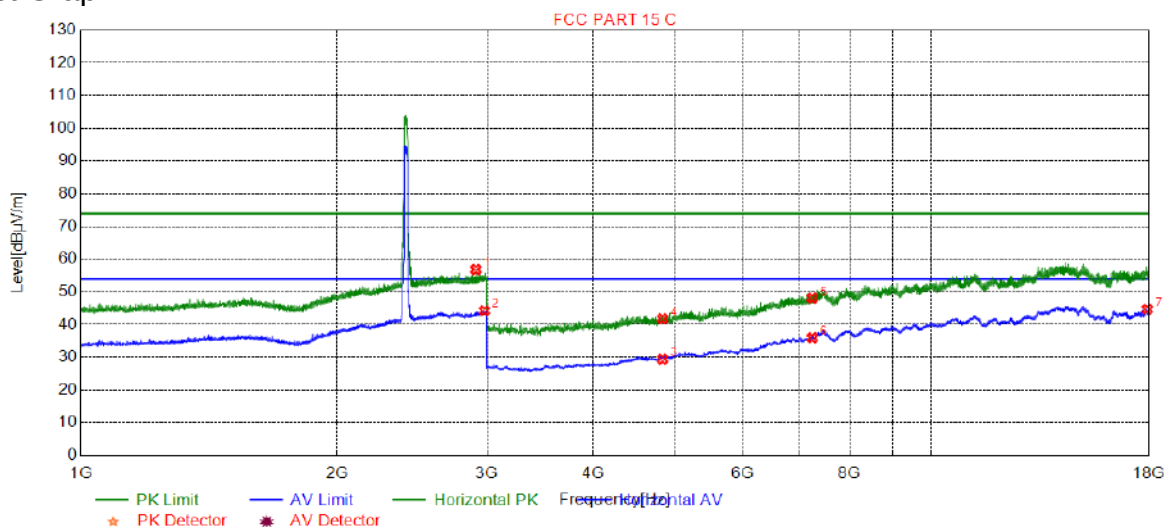
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4.1.2.13 802.11N20_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2911.97	56.84	9.27	74.00	17.16	224	70	Horizontal
2	2980.49	44.29	9.54	54.00	9.71	259	302	Horizontal
3	4824.00	29.46	-18.21	54.00	24.54	247	261	Horizontal
4	4824.00	41.81	-18.21	74.00	32.19	252	342	Horizontal
5	7236.00	48.14	-9.76	74.00	25.86	163	97	Horizontal
6	7236.00	35.98	-9.76	54.00	18.02	128	314	Horizontal
7	17915.9	44.76	-1.31	54.00	9.24	159	287	Horizontal

Final Data List

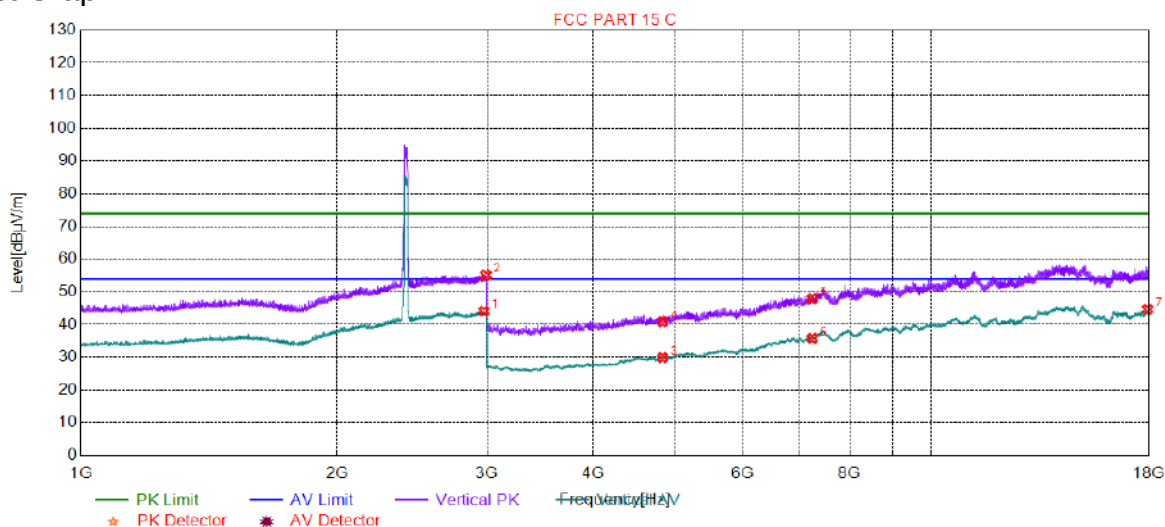


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4.1.2.14 802.11N20_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2976.49	44.16	9.56	54.00	9.84	111	208	Vertical
2	2990.99	55.18	9.49	74.00	18.82	255	112	Vertical
3	4824.00	29.95	-18.21	54.00	24.05	265	209	Vertical
4	4824.00	40.87	-18.21	74.00	33.13	249	18	Vertical
5	7236.00	47.98	-9.76	74.00	26.02	158	291	Vertical
6	7236.00	35.83	-9.76	54.00	18.17	167	127	Vertical
7	17930.9	44.74	-1.30	54.00	9.26	128	360	Vertical

Final Data List



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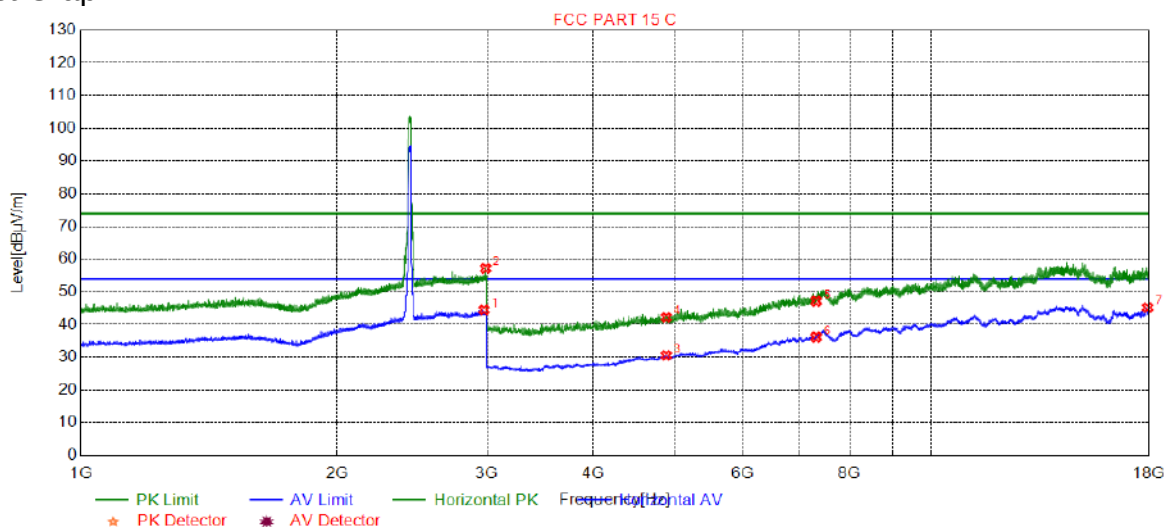
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4.1.2.15 802.11N20_Channel 6

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2976.99	44.55	9.56	54.00	9.45	221	288	Horizontal
2	2989.49	57.18	9.50	74.00	16.82	265	138	Horizontal
3	4874.00	30.58	-17.99	54.00	23.42	264	96	Horizontal
4	4874.00	42.24	-17.99	74.00	31.76	247	314	Horizontal
5	7311.00	47.20	-9.59	74.00	26.80	256	342	Horizontal
6	7311.00	36.20	-9.59	54.00	17.80	183	42	Horizontal
7	17929.4	45.25	-1.30	54.00	8.75	232	42	Horizontal

Final Data List

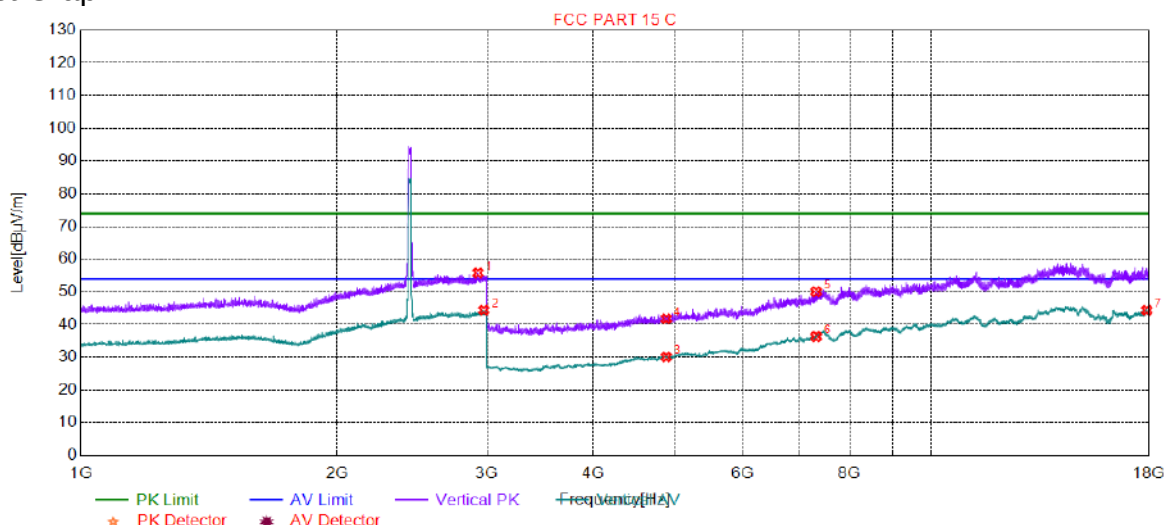


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4.1.2.16 802.11N20_Channel 6

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2928.98	55.81	9.45	74.00	18.19	138	98	Vertical
2	2975.49	44.47	9.56	54.00	9.53	265	152	Vertical
3	4874.00	30.10	-17.99	54.00	23.90	322	210	Vertical
4	4874.00	41.83	-17.99	74.00	32.17	224	18	Vertical
5	7311.00	50.07	-9.59	74.00	23.93	331	73	Vertical
6	7311.00	36.35	-9.59	54.00	17.65	258	73	Vertical
7	17887.4	44.43	-1.48	54.00	9.57	146	210	Vertical

Final Data List



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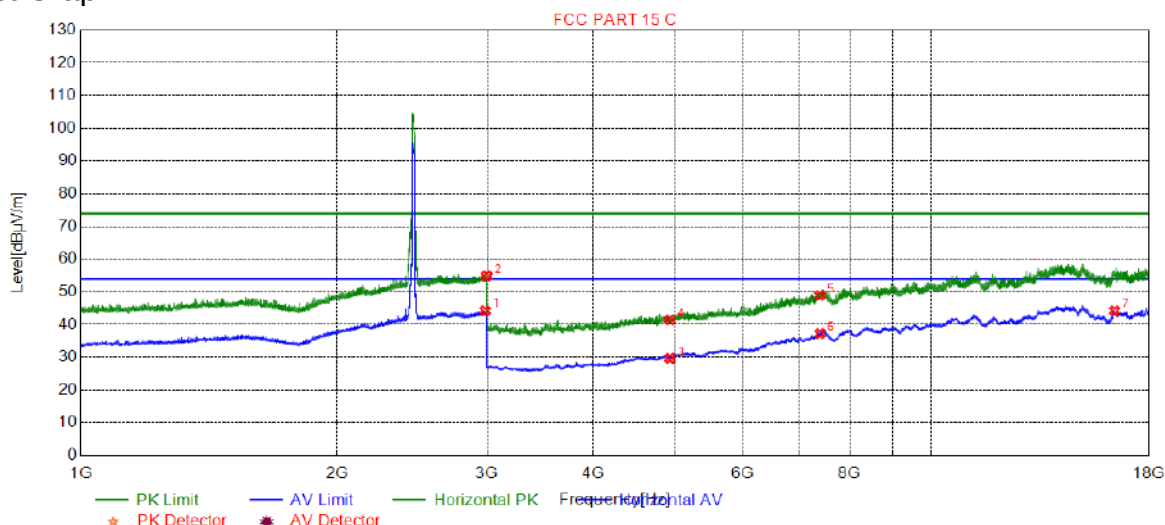
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4.1.2.17 802.11N20_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2985.99	44.29	9.51	54.00	9.71	245	158	Horizontal
2	2998.49	54.87	9.46	74.00	19.13	165	20	Horizontal
3	4924.00	29.70	-17.71	54.00	24.30	329	207	Horizontal
4	4924.00	41.49	-17.71	74.00	32.51	211	72	Horizontal
5	7386.00	48.92	-9.20	74.00	25.08	294	18	Horizontal
6	7386.00	37.24	-9.20	54.00	16.76	158	18	Horizontal
7	16393.3	44.30	-1.09	54.00	9.70	157	342	Horizontal

Final Data List



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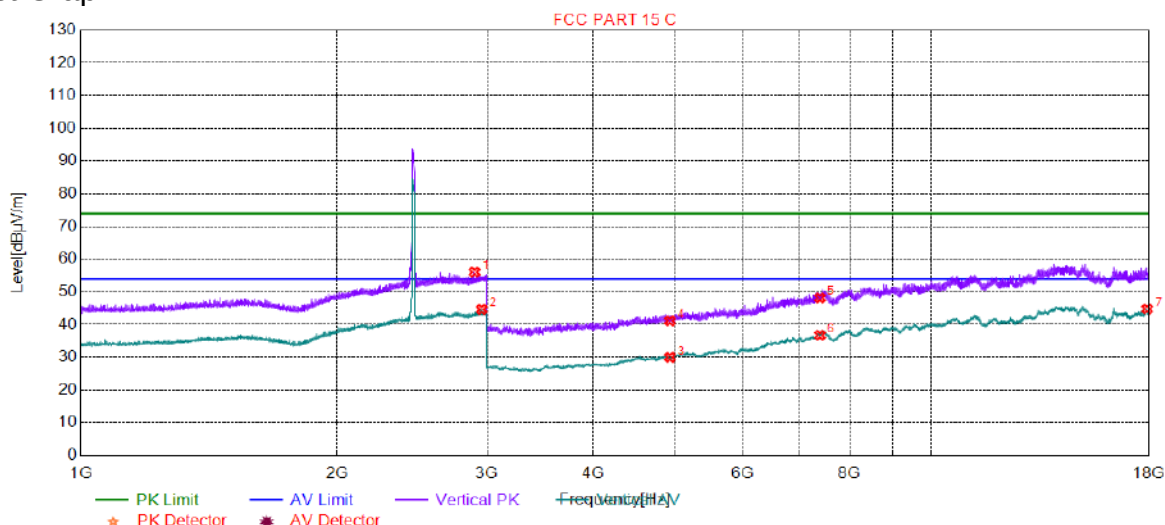
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4.1.2.18 802.11N20_Channel 11

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2900.97	56.07	9.15	74.00	17.93	197	140	Vertical
2	2957.98	44.71	9.64	54.00	9.29	254	167	Vertical
3	4924.00	30.01	-17.71	54.00	23.99	219	154	Vertical
4	4924.00	41.17	-17.71	74.00	32.83	254	46	Vertical
5	7386.00	48.18	-9.20	74.00	25.82	225	18	Vertical
6	7386.00	36.75	-9.20	54.00	17.25	154	345	Vertical
7	17908.4	44.85	-1.31	54.00	9.15	337	345	Vertical

Final Data List



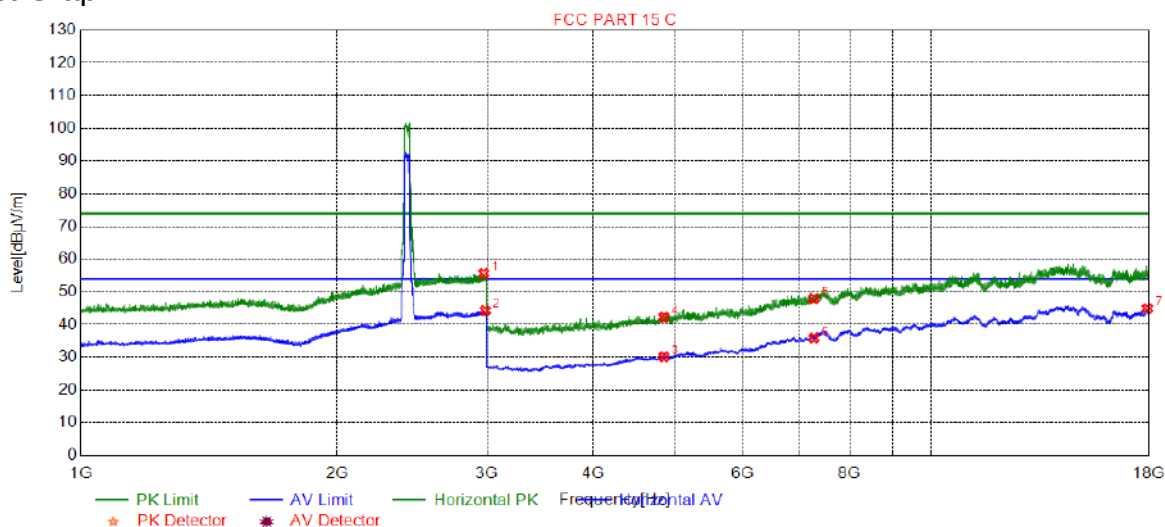
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4.1.2.19 802.11N40_Channel 3

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2974.49	55.66	9.57	74.00	18.34	166	301	Horizontal
2	2985.99	44.35	9.51	54.00	9.65	253	221	Horizontal
3	4844.00	30.15	-18.12	54.00	23.85	268	180	Horizontal
4	4844.00	42.31	-18.12	74.00	31.69	139	100	Horizontal
5	7266.00	47.95	-9.71	74.00	26.05	183	126	Horizontal
6	7266.00	35.91	-9.71	54.00	18.09	173	46	Horizontal
7	17921.9	44.99	-1.30	54.00	9.01	151	0	Horizontal

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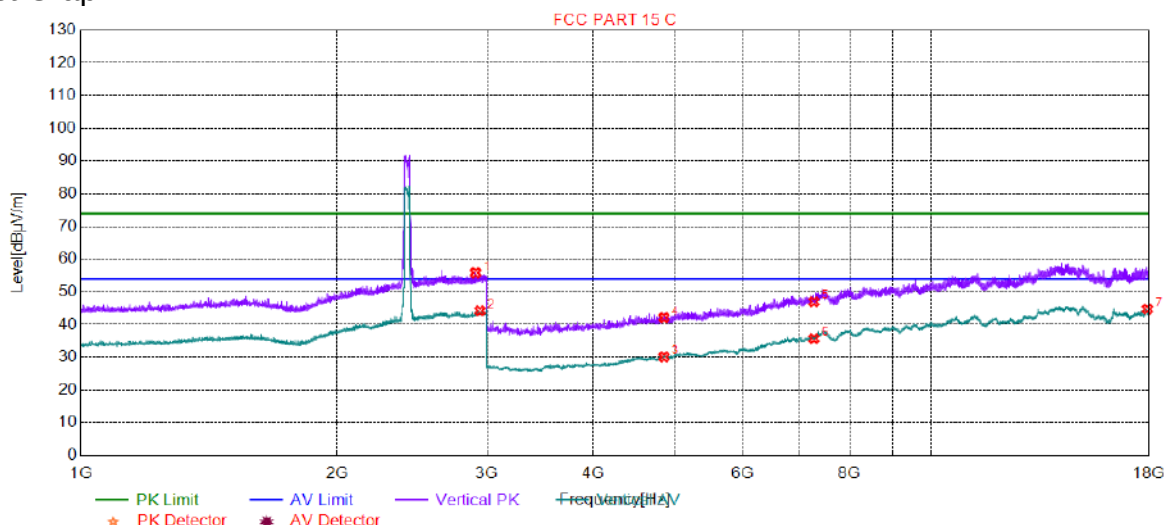
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4.1.2.20 802.11N40_Channel 3

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2909.97	55.85	9.25	74.00	18.15	339	264	Vertical
2	2943.48	44.27	9.61	54.00	9.73	257	346	Vertical
3	4844.00	30.13	-18.12	54.00	23.87	245	72	Vertical
4	4844.00	42.17	-18.12	74.00	31.83	258	18	Vertical
5	7266.00	47.01	-9.71	74.00	26.99	366	290	Vertical
6	7266.00	35.75	-9.71	54.00	18.25	242	236	Vertical
7	17918.9	44.81	-1.30	54.00	9.19	165	72	Vertical

Final Data List



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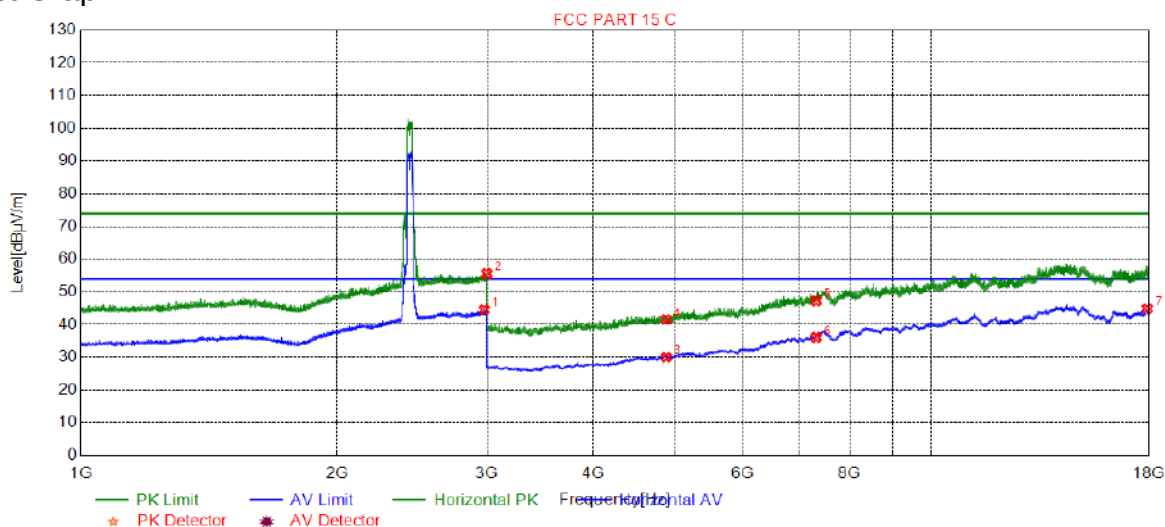
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4.1.2.21 802.11N40_Channel 6

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2978.99	44.63	9.55	54.00	9.37	276	180	Horizontal
2	3000.00	55.60	9.45	74.00	18.40	258	302	Horizontal
3	4874.00	30.04	-17.99	54.00	23.96	124	97	Horizontal
4	4874.00	41.61	-17.99	74.00	32.39	339	152	Horizontal
5	7311.00	47.28	-9.59	74.00	26.72	215	289	Horizontal
6	7311.00	36.10	-9.59	54.00	17.90	125	234	Horizontal
7	17914.4	44.95	-1.31	54.00	9.05	152	342	Horizontal

Final Data List

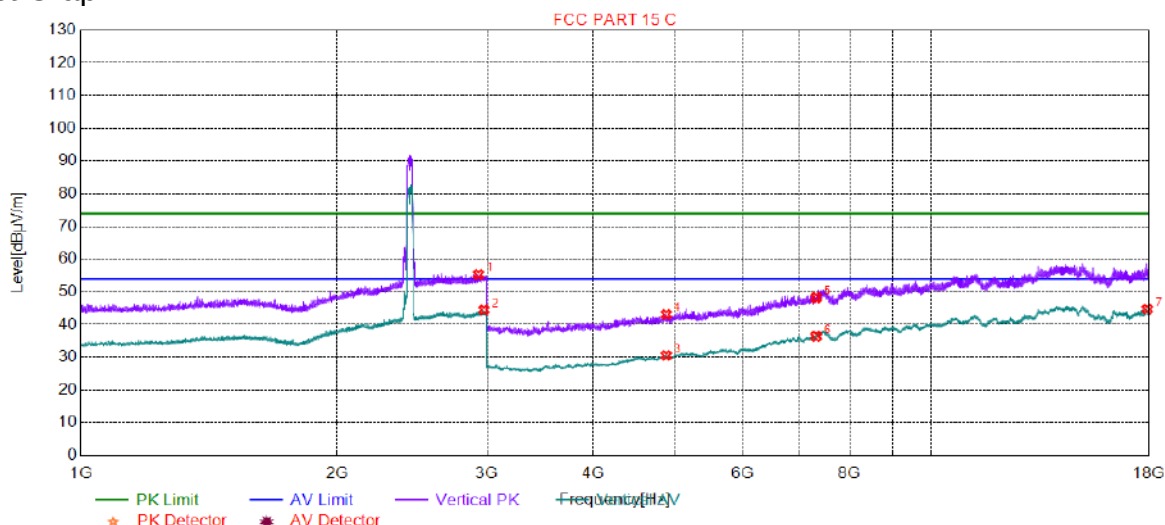


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4.1.2.22 802.11N40_Channel 6

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2932.48	55.35	9.49	74.00	18.65	171	344	Vertical
2	2976.49	44.57	9.56	54.00	9.43	154	235	Vertical
3	4874.00	30.57	-17.99	54.00	23.43	161	45	Vertical
4	4874.00	43.16	-17.99	74.00	30.84	127	99	Vertical
5	7311.00	48.27	-9.59	74.00	25.73	322	153	Vertical
6	7311.00	36.43	-9.59	54.00	17.57	253	153	Vertical
7	17914.4	44.78	-1.31	54.00	9.22	291	236	Vertical

Final Data List



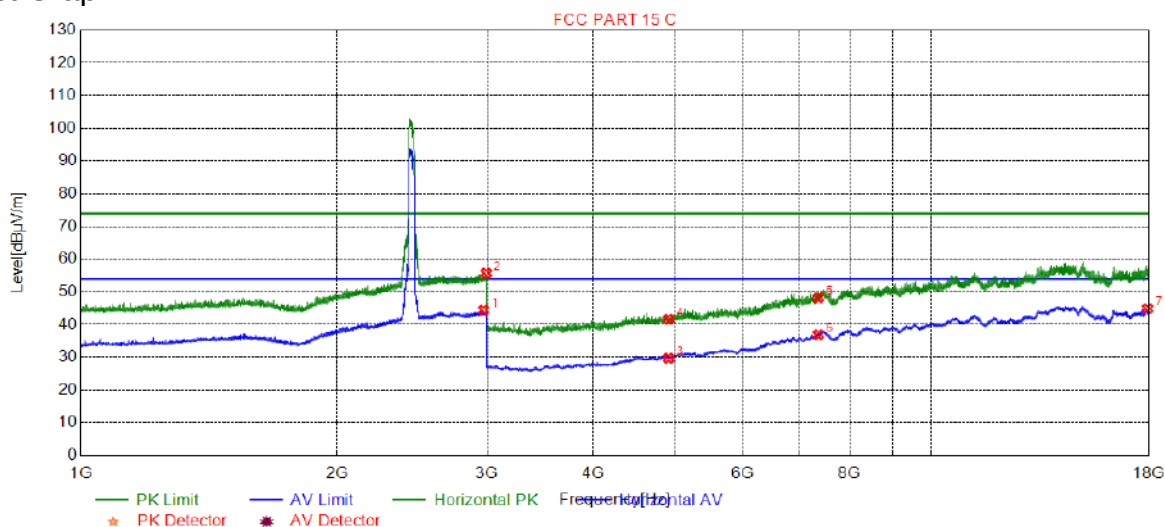
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4.1.2.23 802.11N40_Channel 9

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2973.99	44.53	9.57	54.00	9.47	176	44	Horizontal
2	2994.49	55.74	9.48	74.00	18.26	154	98	Horizontal
3	4904.00	29.76	-17.84	54.00	24.24	151	315	Horizontal
4	4904.00	41.67	-17.84	74.00	32.33	245	72	Horizontal
5	7356.00	48.25	-9.36	74.00	25.75	167	288	Horizontal
6	7356.00	36.93	-9.36	54.00	17.07	241	315	Horizontal
7	17932.4	44.97	-1.30	54.00	9.03	259	72	Horizontal

Final Data List

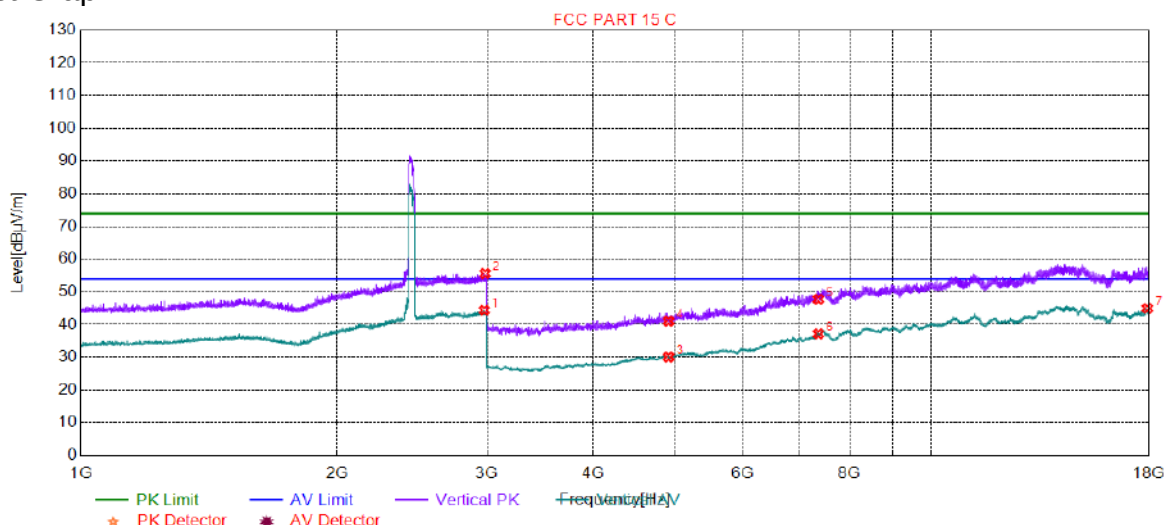


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4.1.2.24 802.11N40_Channel 9

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2978.99	44.45	9.55	54.00	9.55	153	167	Vertical
2	2985.49	55.64	9.52	74.00	18.36	122	18	Vertical
3	4904.00	30.09	-17.84	54.00	23.91	262	181	Vertical
4	4904.00	41.06	-17.84	74.00	32.94	167	318	Vertical
5	7356.00	47.76	-9.36	74.00	26.24	277	290	Vertical
6	7356.00	37.18	-9.36	54.00	16.82	271	181	Vertical
7	17917.4	45.03	-1.30	54.00	8.97	164	153	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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4.2 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:			

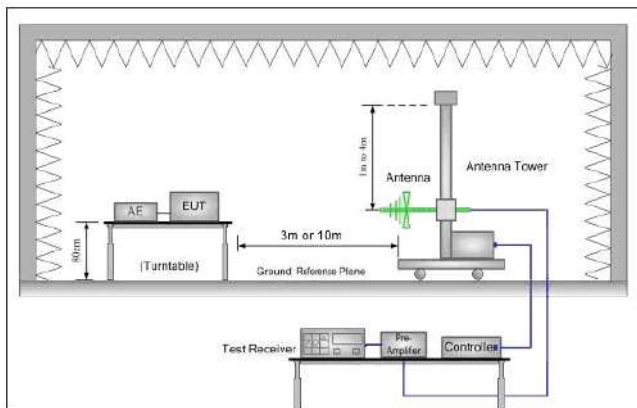


Figure 1. 30MHz to 1GHz

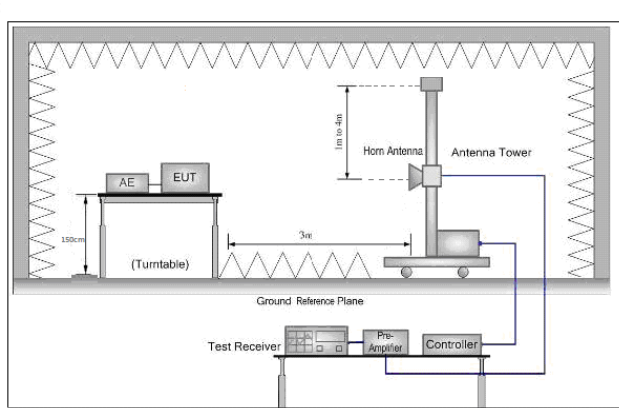


Figure 2. Above 1 GHz



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



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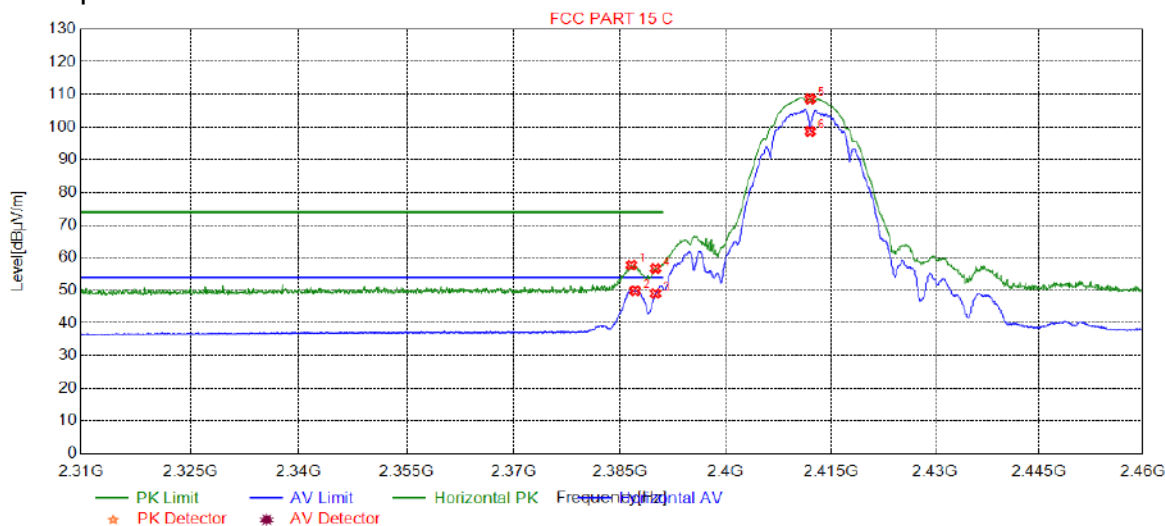


Test plot as follows:

4.1 Restricted bands around fundamental frequency

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	2386.61	57.74	7.77	74.00	16.26	154	288	Horizontal
2	2387.13	49.90	7.77	54.00	4.10	164	305	Horizontal
3	2390.00	49.04	7.77	54.00	4.96	253	291	Horizontal
4	2390.00	56.70	7.77	74.00	17.30	119	301	Horizontal
5	2412.00	108.65	7.81	0.00	-108.65	228	223	Horizontal
6	2412.00	98.72	7.81	0.00	-98.72	193	282	Horizontal

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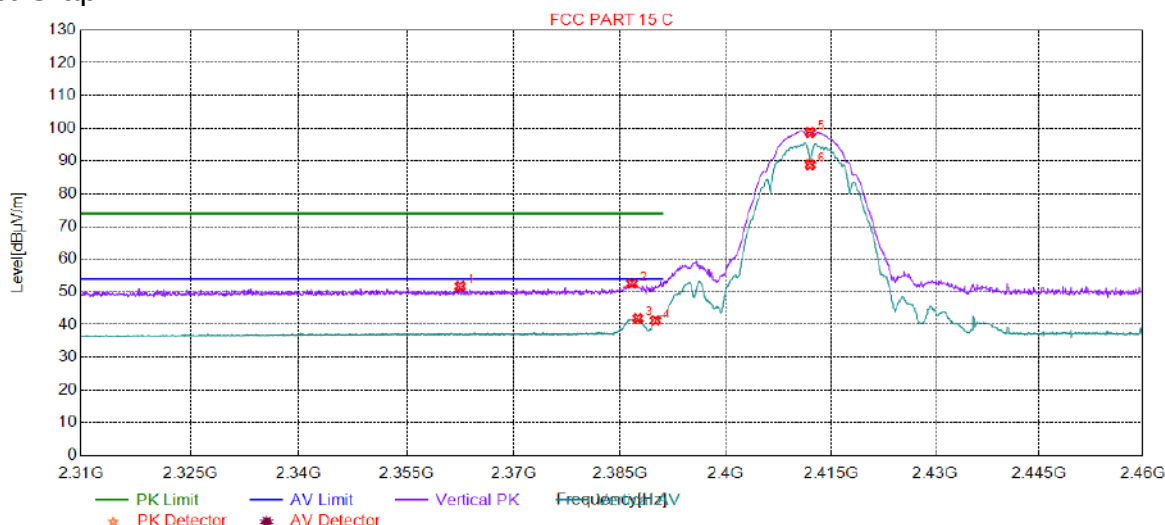
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4.1.1.1 802.11B_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2362.52	51.75	7.80	74.00	22.25	188	322	Vertical
2	2386.68	52.57	7.77	74.00	21.43	192	306	Vertical
3	2387.51	41.94	7.77	54.00	12.06	178	300	Vertical
4	2390.00	41.30	7.77	54.00	12.70	152	285	Vertical
5	2412.00	98.80	7.81	0.00	-98.80	133	263	Vertical
6	2412.00	88.92	7.81	0.00	-88.92	188	291	Vertical

Final Data List



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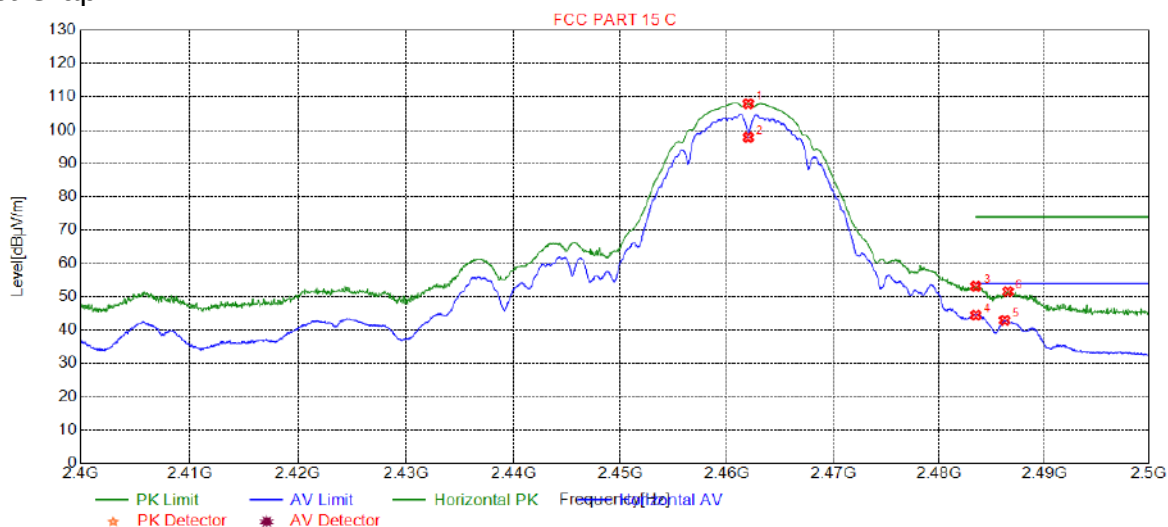
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4.1.1.2 802.11B_Channel 11

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	107.98	7.98	0.00	-107.98	154	271	Horizontal
2	2462.00	97.87	7.98	0.00	-97.87	192	299	Horizontal
3	2483.50	53.17	8.01	74.00	20.83	273	266	Horizontal
4	2483.50	44.50	8.01	54.00	9.50	219	286	Horizontal
5	2486.24	42.96	8.01	54.00	11.04	257	258	Horizontal
6	2486.54	51.56	8.01	74.00	22.44	199	282	Horizontal

Final Data List



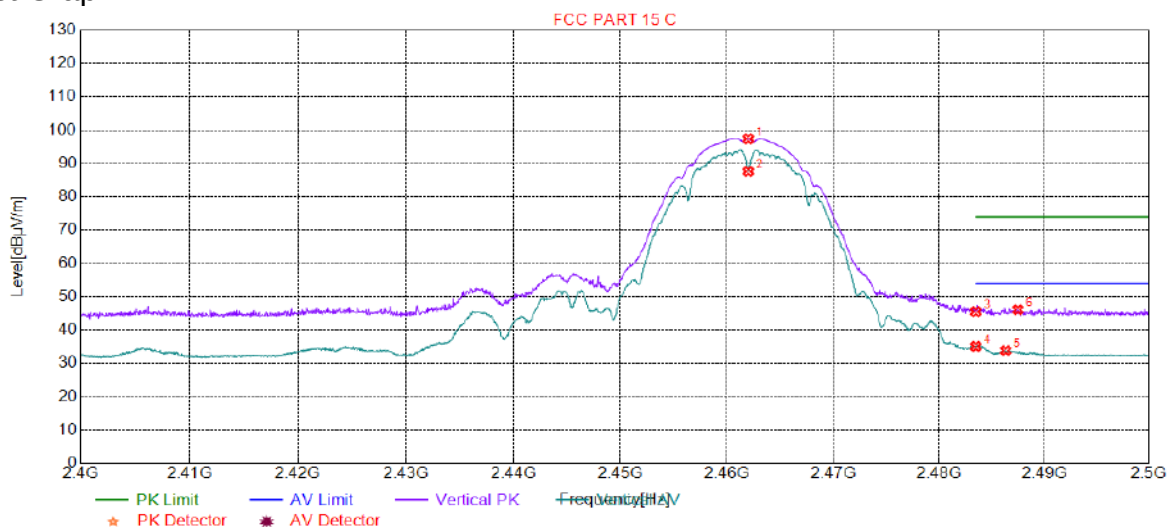
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4.1.1.3 802.11B_Channel 11

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	97.44	7.98	0.00	-97.44	186	315	Vertical
2	2462.00	87.65	7.98	0.00	-87.65	199	298	Vertical
3	2483.50	45.55	8.01	74.00	28.45	267	336	Vertical
4	2483.50	35.10	8.01	54.00	18.90	392	298	Vertical
5	2486.34	33.85	8.01	54.00	20.15	182	331	Vertical
6	2487.49	46.16	8.01	74.00	27.84	391	288	Vertical

Final Data List



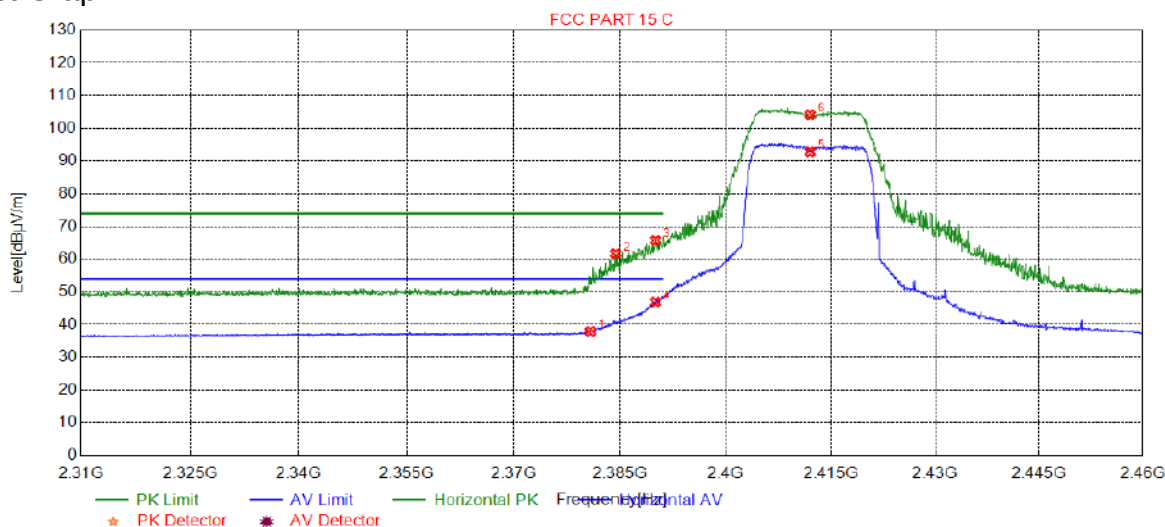
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4.1.1.4 802.11G_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2380.83	37.90	7.78	54.00	16.10	157	278	Horizontal
2	2384.36	61.74	7.78	74.00	12.26	139	284	Horizontal
3	2390.00	65.75	7.77	74.00	8.25	248	314	Horizontal
4	2390.00	46.92	7.77	54.00	7.08	218	233	Horizontal
5	2412.00	92.84	7.81	0.00	-92.84	229	273	Horizontal
6	2412.00	104.17	7.81	0.00	-104.17	192	267	Horizontal

Final Data List



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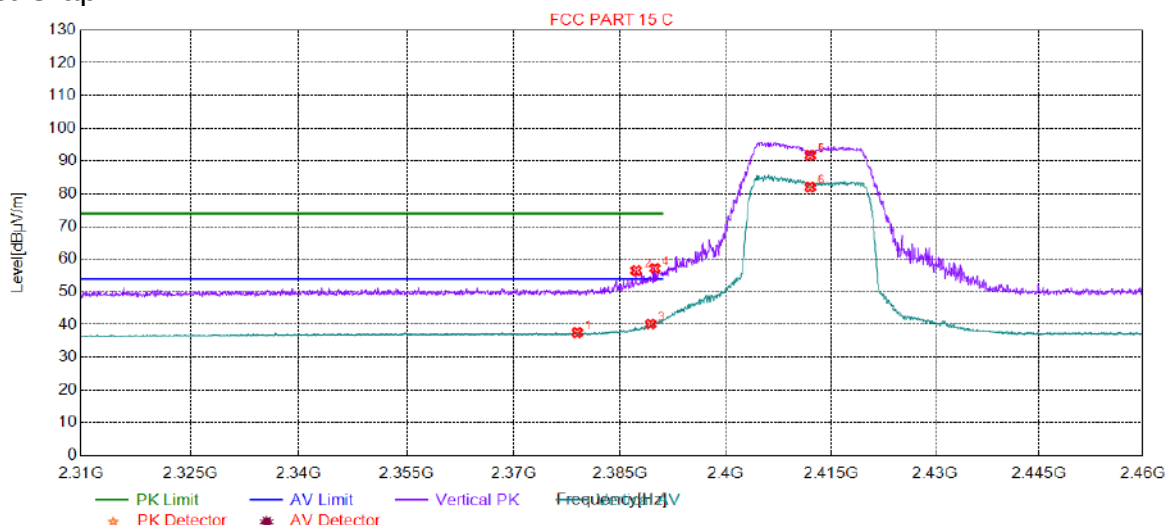
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4.1.1.5 802.11G_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2378.95	37.56	7.78	54.00	16.44	309	26	Vertical
2	2387.28	56.54	7.77	74.00	17.46	350	315	Vertical
3	2389.31	40.19	7.77	54.00	13.81	175	320	Vertical
4	2389.91	57.20	7.77	74.00	16.80	249	288	Vertical
5	2412.00	91.76	7.81	0.00	-91.76	329	287	Vertical
6	2412.00	82.06	7.81	0.00	-82.06	241	302	Vertical

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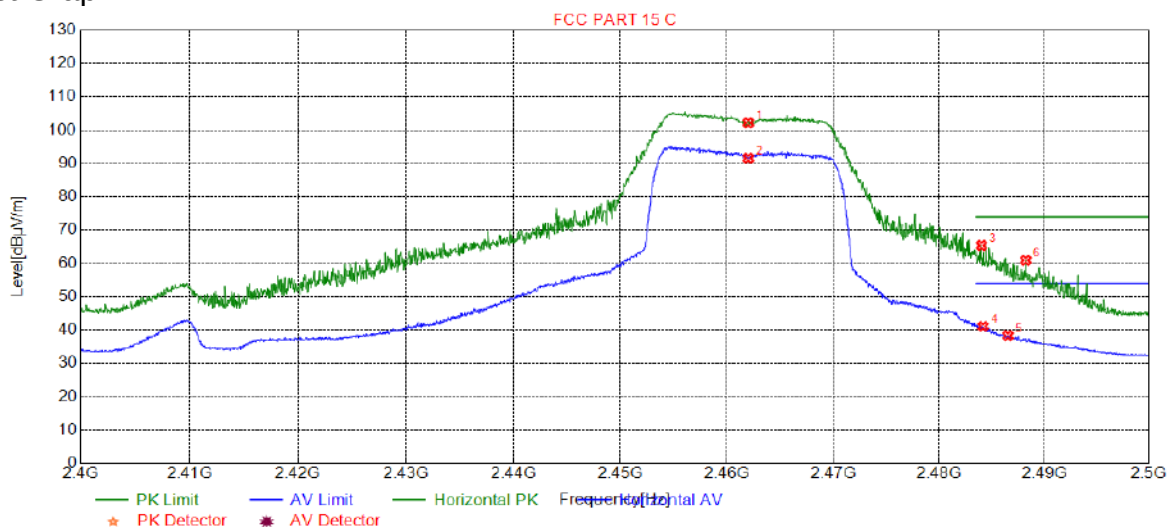
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4.1.1.6 802.11G_Channel 11

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	102.24	7.98	0.00	-102.24	199	265	Horizontal
2	2462.00	91.61	7.98	0.00	-91.61	248	276	Horizontal
3	2484.04	65.41	8.01	74.00	8.59	218	281	Horizontal
4	2484.19	41.10	8.01	54.00	12.90	176	198	Horizontal
5	2486.54	38.34	8.01	54.00	15.66	347	270	Horizontal
6	2488.24	60.99	8.02	74.00	13.01	218	303	Horizontal

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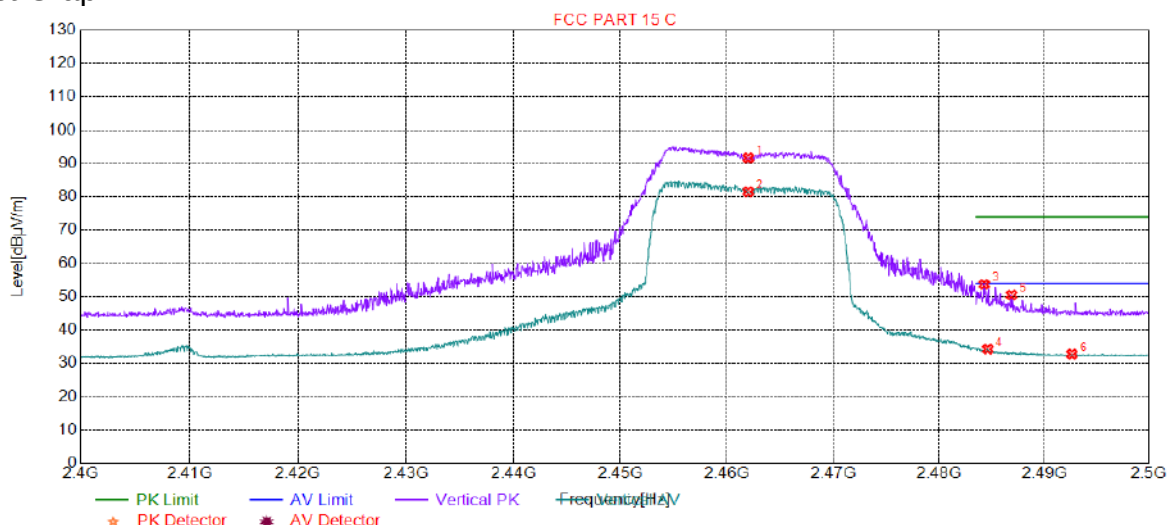
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4.1.1.7 802.11G_Channel 11

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	91.72	7.98	0.00	-91.72	188	315	Vertical
2	2462.00	81.57	7.98	0.00	-81.57	219	304	Vertical
3	2484.29	53.78	8.01	74.00	20.22	392	341	Vertical
4	2484.64	34.31	8.01	54.00	19.69	152	295	Vertical
5	2486.89	50.55	8.01	74.00	23.45	390	288	Vertical
6	2492.64	32.79	8.02	54.00	21.21	292	309	Vertical

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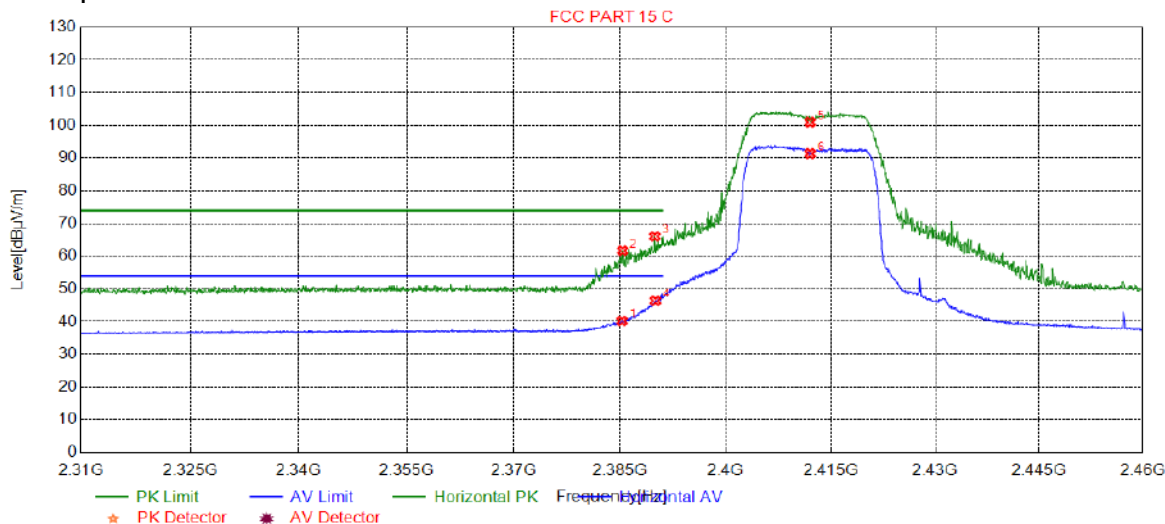
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4.1.1.8 802.11N20_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2385.26	40.19	7.77	54.00	13.81	187	273	Horizontal
2	2385.33	61.71	7.77	74.00	12.29	222	311	Horizontal
3	2389.91	66.05	7.77	74.00	7.95	276	278	Horizontal
4	2389.99	46.41	7.77	54.00	7.59	216	161	Horizontal
5	2412.00	100.99	7.81	0.00	-100.99	324	268	Horizontal
6	2412.00	91.41	7.81	0.00	-91.41	292	255	Horizontal

Final Data List



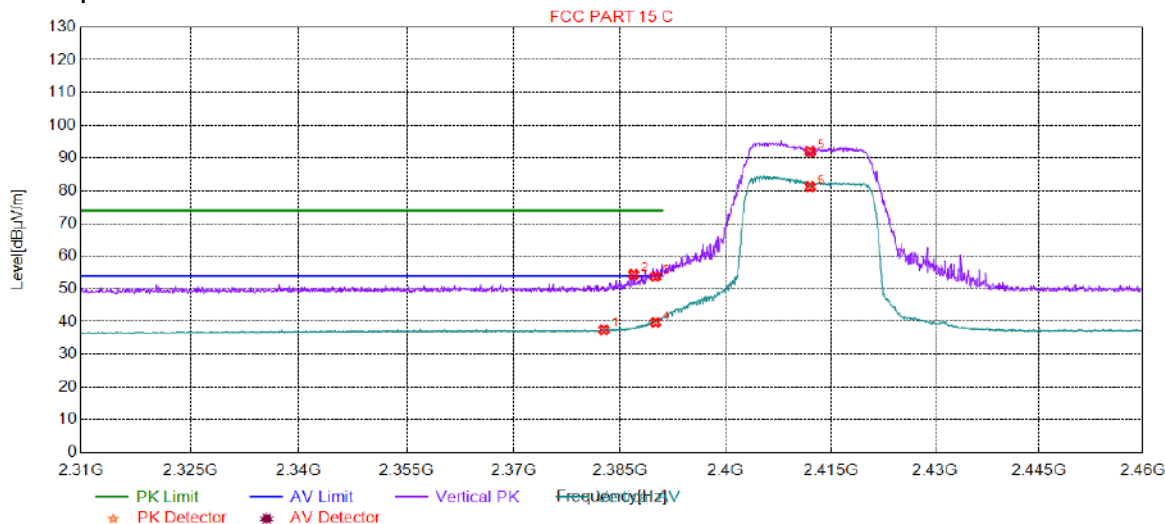
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4.1.1.9 802.11N20_Channel 1

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2382.71	37.48	7.78	54.00	16.52	189	293	Vertical
2	2386.91	54.41	7.77	74.00	19.59	364	315	Vertical
3	2390.00	53.80	7.77	74.00	20.20	294	356	Vertical
4	2390.00	39.74	7.77	54.00	14.26	339	327	Vertical
5	2412.00	91.97	7.81	0.00	-91.97	289	293	Vertical
6	2412.00	81.28	7.81	0.00	-81.28	245	301	Vertical

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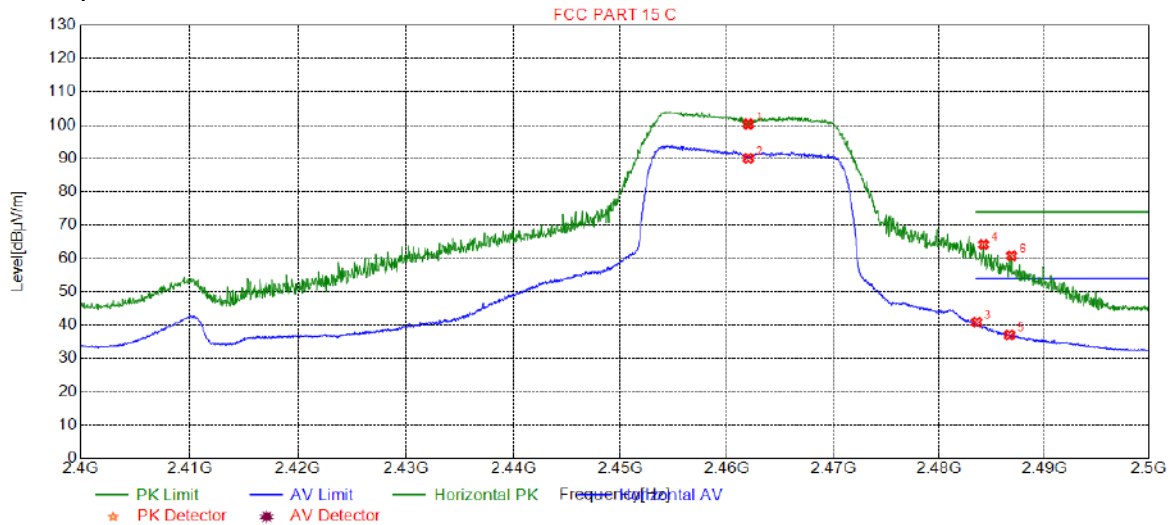
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4.1.1.10 802.11N20_Channel 11

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	100.36	7.98	0.00	-100.36	238	298	Horizontal
2	2462.00	90.08	7.98	0.00	-90.08	219	254	Horizontal
3	2483.59	40.85	8.01	54.00	13.15	222	238	Horizontal
4	2484.24	64.21	8.01	74.00	9.79	156	315	Horizontal
5	2486.69	37.07	8.01	54.00	16.93	247	279	Horizontal
6	2486.89	60.81	8.01	74.00	13.19	256	243	Horizontal

Final Data List



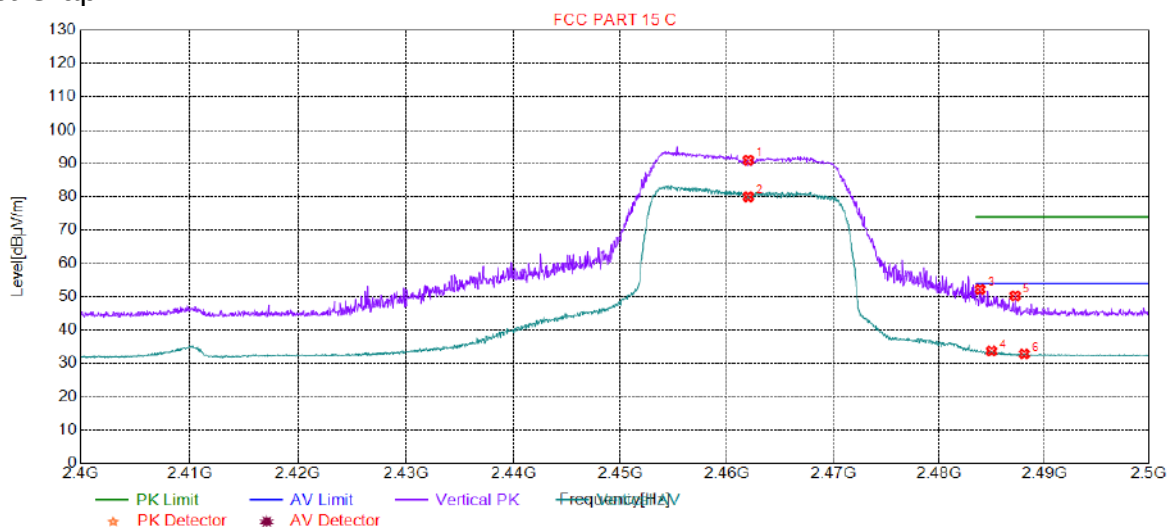
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4.1.1.11 802.11N20_Channel 11

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	91.05	7.98	0.00	-91.05	155	312	Vertical
2	2462.00	80.02	7.98	0.00	-80.02	293	351	Vertical
3	2483.89	52.24	8.01	74.00	21.76	248	334	Vertical
4	2484.99	33.73	8.01	54.00	20.27	265	298	Vertical
5	2487.24	50.26	8.01	74.00	23.74	227	179	Vertical
6	2488.09	32.84	8.02	54.00	21.16	138	281	Vertical

Final Data List

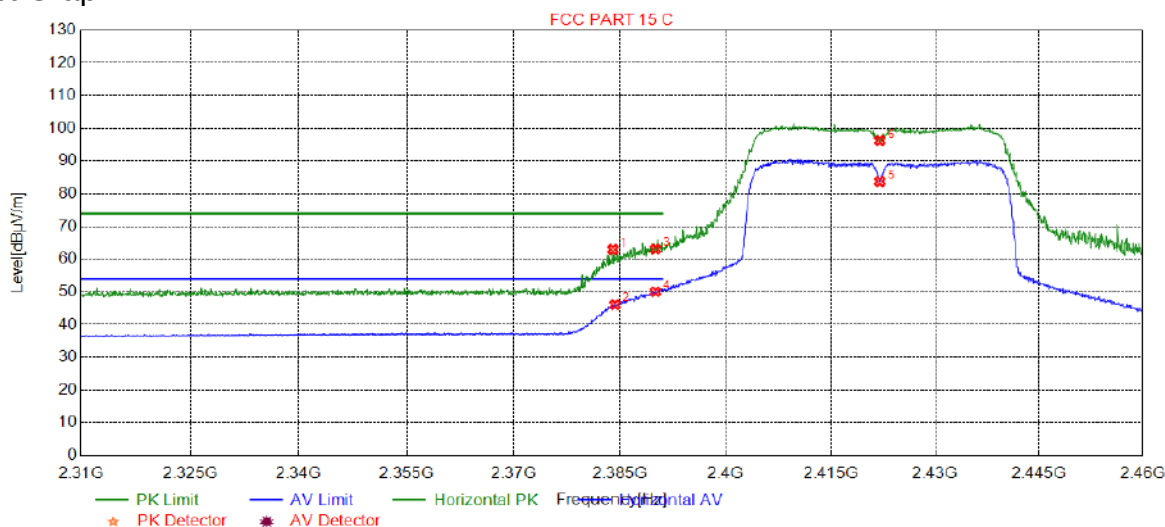


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4.1.1.12 802.11N40_Channel 3

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2383.98	63.00	7.78	74.00	11.00	155	292	Horizontal
2	2384.28	46.11	7.78	54.00	7.89	238	269	Horizontal
3	2390.00	63.13	7.77	74.00	10.87	147	270	Horizontal
4	2390.00	50.06	7.77	54.00	3.94	128	297	Horizontal
5	2422.00	83.75	7.85	0.00	-83.75	281	286	Horizontal
6	2422.00	96.28	7.85	0.00	-96.28	154	253	Horizontal

Final Data List



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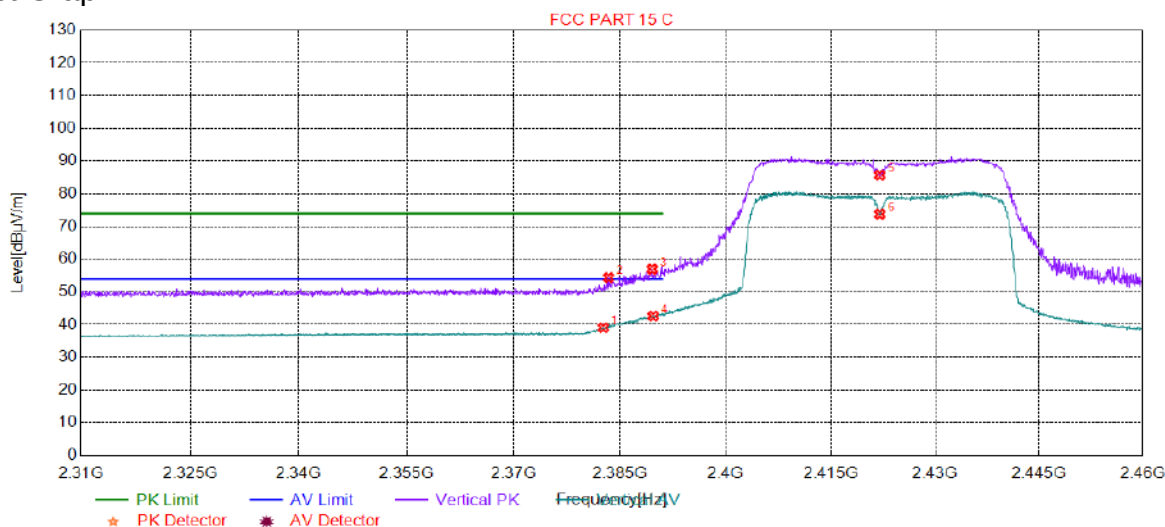
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4.1.1.13 802.11N40_Channel 3

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2382.63	39.04	7.78	54.00	14.96	111	341	Vertical
2	2383.38	54.40	7.78	74.00	19.60	229	330	Vertical
3	2389.53	56.97	7.77	74.00	17.03	167	273	Vertical
4	2389.68	42.64	7.77	54.00	11.36	381	325	Vertical
5	2422.00	85.70	7.85	0.00	-85.70	337	281	Vertical
6	2422.00	73.79	7.85	0.00	-73.79	293	276	Vertical

Final Data List



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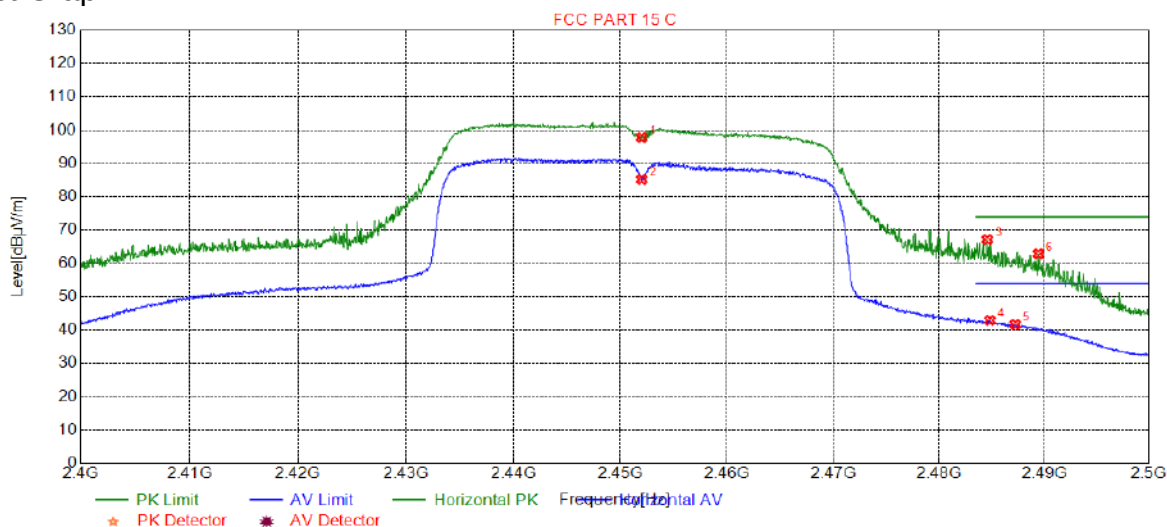
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4.1.1.14 802.11N40_Channel 9

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	97.82	7.97	0.00	-97.82	128	270	Horizontal
2	2452.00	85.22	7.97	0.00	-85.22	292	292	Horizontal
3	2484.59	67.17	8.01	74.00	6.83	277	303	Horizontal
4	2484.84	42.94	8.01	54.00	11.06	268	372	Horizontal
5	2487.24	41.71	8.01	54.00	12.29	224	352	Horizontal
6	2489.44	62.93	8.02	74.00	11.07	238	334	Horizontal

Final Data List



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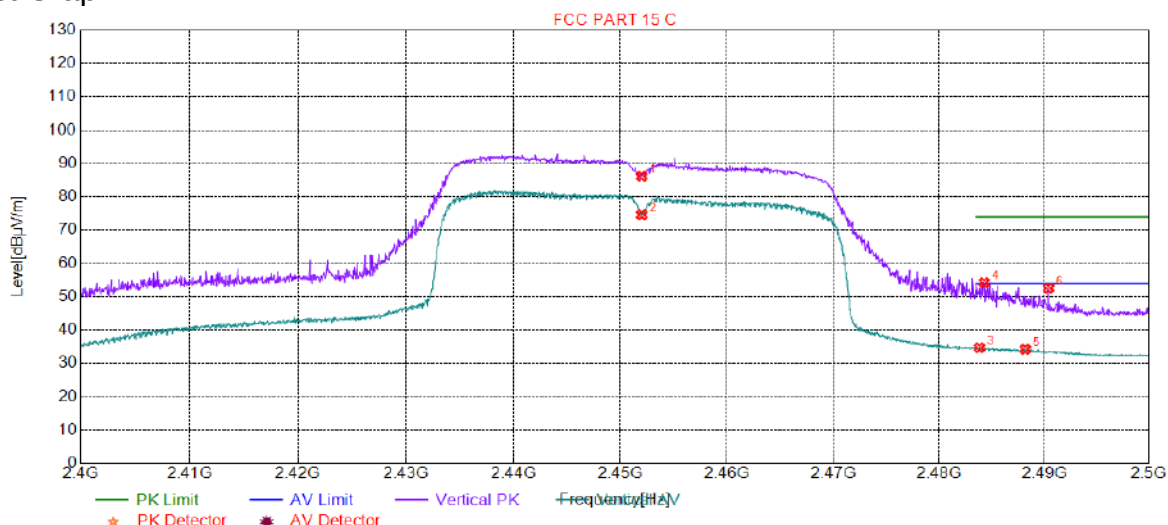
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4.1.1.15 802.11N40_Channel 9

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	86.19	7.97	0.00	-86.19	309	282	Vertical
2	2452.00	74.64	7.97	0.00	-74.64	324	320	Vertical
3	2483.84	34.73	8.01	54.00	19.27	265	283	Vertical
4	2484.29	54.32	8.01	74.00	19.68	291	341	Vertical
5	2488.19	34.27	8.02	54.00	19.73	246	314	Vertical
6	2490.39	52.61	8.02	74.00	21.39	267	325	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	$\pm 0.75\text{dB}$
2	RF power density, conducted	$\pm 2.84\text{dB}$
3	Spurious emissions, conducted	$\pm 0.75\text{dB}$
4	Temperature test	$\pm 1^{\circ}\text{C}$
5	Humidity test	$\pm 3\%$
6	DC and low frequency voltages	$\pm 0.5\%$

Lab B:

No.	Item	Measurement Uncertainty
1	Conduction Emission	$\pm 3.0\text{dB}$ (150kHz to 30MHz)
2	Radiated Emission	$\pm 4.8\text{dB}$ (Below 1GHz)
		$\pm 4.8\text{dB}$ (1GHz to 6GHz)
		$\pm 4.5\text{dB}$ (6GHz to 18GHz)
		$\pm 5.02\text{dB}$ (Above 18GHz)



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6 Equipment List

RF conducted test					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date	Cal.Duedate
				(yyyy-mm-dd)	(yyyy-mm-dd)
DC Power Supply	Agilent Technologies Inc	66311B	W009-09	2020/7/15	2021/7/15
Signal Analyzer	Agilent	N9020A	W026-08	2020/6/11	2021/6/10
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 HR/2020/80004.

The End



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