



## FCC TEST REPORT

<b>Application No:</b>	ZR/2019/90020
<b>Applicant:</b>	Qualcomm Atheros, Inc.
<b>Address of Applicant</b>	1700 Technology Drive, San Jose, CA 95110
<b>Manufacturer:</b>	Qualcomm Atheros, Inc.
<b>Address of Manufacturer:</b>	1700 Technology Drive, San Jose, CA 95110
<b>EUT Description:</b>	2x2 802.11A/B/G/N/AC WiFi + Bluetooth Module
<b>Model No.:</b>	QCNFA324
<b>Trade Mark:</b>	Qualcomm
<b>FCC ID:</b>	PPD-QCNFA324
<b>Standards:</b>	47 CFR FCC Part 2, Subpart J 47 CFR FCC Part 15, Subpart C 47 CFR FCC Part 15, Subpart E KDB 789033 D02 General UNII Test Procedures New Rules v02 FCC KDB 558074 D01 DTS Meas Guidance v0502 KDB 662911 D01 Multiple Transmitter Output v02r01
<b>Test Method</b>	KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02 KDB 905462 D03 Client Without DFS New Rules v01r02 ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices
<b>Date of Receipt:</b>	2019/11/30
<b>Date of Test:</b>	2019/12/1 to 2019/12/16
<b>Date of Issue:</b>	2021/5/11
<b>Test Result:</b>	<b>PASS *</b>

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

Authorized Signature:

Derek Yang  
Wireless Laboratory Manager

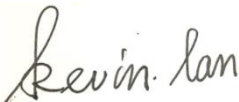



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## 1 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
00		2019/12/16		Original
01		2020/1/6		Modified limit for Unwanted Emissions in the Restricted Bands (Radiated)
02		2021/5/11	Kevin.Lan	1.Add test site Information 2.Modify data conversion error of antenna height 3.Update equipment list

\*This report supersedes our previous report ZR/2019/9002002, issued on 2020/1/6, which is hereby deemed null and void.

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

Remark:

This is to request a Class II permissive change for 2x2 802.11a/b/g/n/ac + Bluetooth Module, Model Name: QCNFA324, FCC ID: PPD-QCNFA324.

The major change filed under this application is:

- The subject approved module is being used in a specific host (portable category configuration, brand name/model: Lenovo/Lenovo CT-X636F).
- Power reduction in order to comply with SAR and RSE requirements.

So only conducted output power and unwanted emissions that fall Out of the Restricted Bands (Radiated), unwanted emissions in the Restricted Bands (Radiated) spot checked, and the data displayed in this report, other data can refer to the original report (Report No.: RF140808E04-1, RF140808E04-3) .



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## 2 Test Summary

Test Item	Band	FCC Rule	Requirements	Test Result	Verdict	Test Lab*
Maximum Conducted Output Power	5150-5250	15.407(a)(1) 15.407(a)(4)	FCC < 250mW (avg during transmission)	Clause 4.1	Pass	A
	5250-5350	15.407(a)(2) 15.407(a)(4)	<MIN{250mW, 11dBm+10*Ig(EBW)} (avg during transmission)			
	5470-5725	15.407(a)(2) 15.407(a)(4)	<MIN{250mW, 11dBm+10*Ig(EBW)} (avg during transmission)			
	5725-5850	15.407(a)(3)	< 1W (avg during transmission)			
Unwanted Emissions that fall Out of the Restricted Bands (Radiated)	5150-5250	15.407(b)(1) 15.407(b)(6) 15.407(b)(7) 15.209	F<1GHz: §15.209/§7.2.5 limit (QP). F≥1GHz & out-restricted: <-27dBm/MHz PK e.i.r.p. (exl. 5.15-5.35 GHz). F≥1GHz & in-restricted: §15.209/§7.2.5 limit (AV&PK).	Clause 4.2	Pass	B
	5250-5350	15.407(b)(2) 15.407(b)(6) 15.407(b)(7) 15.209	F<1GHz: §15.209/§7.2.5 limit (QP). F≥1GHz & out-restricted: <-27dBm/MHz PK e.i.r.p. (exl. 5.25-5.35 GHz). F≥1GHz & in-restricted: §15.209/§7.2.5 limit (AV&PK).			
	5470-5750	15.407(b)(3) 15.407(b)(6) 15.407(b)(7) 15.209	F<1GHz: §15.209/§7.2.5 limit (QP). F≥1GHz & out-restricted: <-27dBm/MHz PK e.i.r.p. (exl. 5.47-5.725 GHz). F≥1GHz & in-restricted: §15.209/§7.2.5 limit (AV&PK).			
	5725-5850	15.407(b)(4) 15.407(b)(6) 15.407(b)(7) 15.209	F<1GHz: §15.209/§7.2.5 limit (QP) F≥1GHz & out-restricted:(QP) a) 27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 dBm/MHz at 5 MHz above or below the band edges; b) 15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges; c) 10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm/MHz at 75 MHz above or			





Test Item	Band	FCC Rule	Requirements	Test Result	Verdict	Test Lab*
			below the band edges; and d) -27 dBm/MHz at frequencies more than 75 MHz above or below the band edges. F≥1GHz & in-restricted: §15.209/§7.2.5 limit (AV&PK).			
Unwanted Emissions in the Restricted Bands (Radiated)	5150-5250 5250-5350 5470-5725 5725-5850	15.209	---	Clause 4.3	Pass	B
Dynamic Frequency Selection	5250-5350 5470-5725	47 CFR Part 15, Subpart E 15.407	Channel Move Time:10 Seconds	Clause 4.4	Pass	A
			Transmission Time: milliseconds + an aggregate of 60 milliseconds over remaining 10 second period.			
			Non-occupancy period: Minimum 30 minutes			

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.





### 3 General Information

#### 3.1 Client Information

Applicant:	Qualcomm Atheros, Inc.
Address of Applicant:	1700 Technology Drive, San Jose, CA 95110
Manufacturer:	Qualcomm Atheros, Inc.
Address of Manufacturer:	1700 Technology Drive, San Jose, CA 95110

#### 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	Adam Liang, 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

#### 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 Branch EMC Laboratory

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

• **Innovation, Science and Economic Development Canada**

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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**

### 3.4 General Description of EUT

EUT Description:		2x2 802.11A/B/G/N/AC WiFi + Bluetooth Module
Model No.:		QCNFA324
Trade Mark:		Qualcomm
Product Description of Host		Portable Tablet Computer
Model No. of Host:		Lenovo CT-X636F
Trade Mark of Host:		Lenovo
Host	Hardware Version:	Google Chrome 79.0.3940.0 (Platform 12601.0.0-19.10.16)
	Software Version:	Lenovo Tablet CT-X636F
IEEE 802.11 WLAN Mode Supported		<input checked="" type="checkbox"/> 802.11a (20 MHz channel bandwidth) ; <input checked="" type="checkbox"/> 802.11n (20 MHz channel bandwidth); <input checked="" type="checkbox"/> 802.11n (40 MHz channel bandwidth); <input checked="" type="checkbox"/> 802.11ac (20 MHz channel bandwidth); <input checked="" type="checkbox"/> 802.11ac (40 MHz channel bandwidth); <input checked="" type="checkbox"/> 802.11ac (80 MHz channel bandwidth); <input type="checkbox"/> 802.11ac (160 MHz channel bandwidth),
Operation Frequency:		IEEE 802.11n(HT20/40)/ ac(HT20/40/80/): 5150MHz to 5250MHz IEEE 802.11n(HT20/40)/ ac(HT20/40/80/160): 5250MHz to 5350MHz IEEE 802.11n(HT20/40)/ ac(HT20/40/80/160): 5470MHz to 5725MHz IEEE 802.11n(HT20/40)/ ac(HT20/40/80): 5725MHz to 5850MHz
Type of Modulation:		OFDM
DFS mode:		<input type="checkbox"/> Master <input type="checkbox"/> Slave with radar detection <input checked="" type="checkbox"/> Slave without radar detection
Sample Type:		<input checked="" type="checkbox"/> Portable Device, <input type="checkbox"/> Module





Antenna Type:	<input type="checkbox"/> External, <input checked="" type="checkbox"/> Integrated
Antenna Ports	<input checked="" type="checkbox"/> Ant 1, <input checked="" type="checkbox"/> Ant 2, <input type="checkbox"/> Ant 3
Smart System	<input checked="" type="checkbox"/> SISO (for 802.11a/n/ac), <input checked="" type="checkbox"/> MIMO (for 802.11n/ac), <input type="checkbox"/> Diversity (for 802.11a) : Tx & Rx
Antenna Gain:	Ant1: -1.2dBi; Ant2: -1.2dBi
Power Supply	<input type="checkbox"/> AC/DC Adapter; <input checked="" type="checkbox"/> Battery ; <input type="checkbox"/> PoE;; <input type="checkbox"/> Other:

**Remark:**

In FCC 15.31, for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table, and the selected channel to perform the test as below:

Frequency Range of Operation Operating Frequency Range (in each Band)	Number of Measurement Frequencies Required	Location of Measurement Frequency in Band of Operation
1 MHz or less	1	centre
1 MHz to 10 MHz	2	1 near high end, 1 near low end
Greater than 10 MHz	3	1 near high end, 1 near centre

**For UNII Band I:**

Mode	Channel	Frequency(MHz)
IEEE 802.11a/n/ac 20MHz	The Lowest channel	5180
	The Middle channel	5200
	The Highest channel	5240
IEEE 802.11n/ac 40MHz	The Lowest channel	5190
	The Highest channel	5230
IEEE 802.11ac 80MHz	The Middle channel	5210

**For UNII Band II-A:**

Mode	Channel	Frequency(MHz)
IEEE 802.11a/n/ac 20MHz	The Lowest channel	5260
	The Middle channel	5280
	The Highest channel	5320
IEEE 802.11n/ac 40MHz	The Lowest channel	5270
	The Highest channel	5310
IEEE 802.11ac 80MHz	The Middle channel	5290

**For UNII Band II-C:**

Mode	Channel	Frequency(MHz)
------	---------	----------------







IEEE 802.11a/n/ac 20MHz	The Lowest channel	5500
	The Middle channel	5580
	The Highest channel	5700
IEEE 802.11n/ac 40MHz	The Lowest channel	5510
	The Middle channel	5500
	The Highest channel	5670
IEEE 802.11ac 80MHz	The Lowest channel	5500
	The Highest channel	5580



For UNII Band III:

Mode	Channel	Frequency(MHz)
IEEE 802.11a/n/ac 20MHz	The Lowest channel	5745
	The Middle channel	5785
	The Highest channel	5825
IEEE 802.11n/ac 40MHz	The Lowest channel	5755
	The Highest channel	5795
IEEE 802.11ac 80MHz	The Middle channel	5775

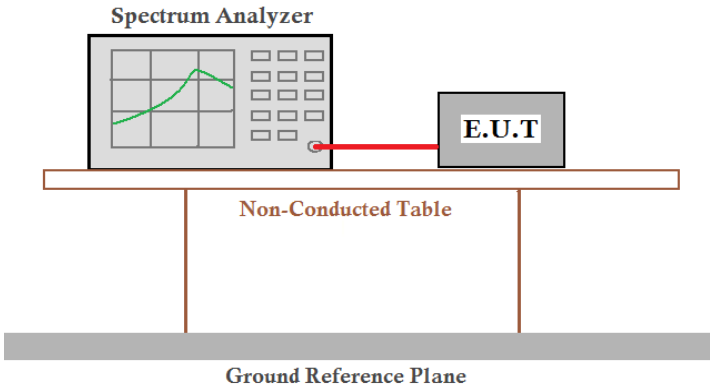
### 3.5 Test Environment and Mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	55 % RH
Atmospheric Pressure:	101.32 KPa
Test mode:	
Transmitting mode:	Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate.



## 4 Test results and Measurement Data

### 4.1 Maximum Conducted Output Power

Test Requirement:	47 CFR Part 15 Section 15.407(a)	
Test Method:	ANSI C63.10: 2013	
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:	<p>Through Pre-scan, find that</p> <p>6Mbps of rate is the worst case of 802.11a;</p> <p>MCS0 of rate is the worst case of 802.11n(HT20);</p> <p>MCS0 of rate is the worst case of 802.11n(HT40);</p> <p>MCS0 of rate is the worst case of 802.11ac(HT20);</p> <p>MCS0 of rate is the worst case of 802.11ac(HT40);</p> <p>MCS0 of rate is the worst case of 802.11ac(HT80)</p> <p>Only the worst case is recorded in the report.</p>	
Limit:	Frequency Band	Limit
	5150-5250MHz	Not exceed 250mW(24dBm)
	5250-5350MHz	The lesser of 250mW(24dBm) or $11 + 10\log B$
	5470-5725MHz	The lesser of 250mW(24dBm) or $11 + 10\log B$
	5725-5850MHz	Not exceed 1W(30dBm)
	*Where B is the 26dB emission bandwidth in MHz	
Test Results:	Pass	



#### 4.1.1 Test Result for SISO

5GHz mode		Channel	Frequency (MHz)	Data Rate(Mbps)	Average Power (dBm)		Verdict
					Ant 1	Ant 2	
802.11a	U-NII-1	36	5180	6	12.41	12.07	Pass
		40	5200		12.09	12.66	Pass
		44	5220		12.23	12.63	Pass
		48	5240		12.59	12.85	Pass
	U-NII-2A	52	5260		12.69	12.93	Pass
		56	5280		12.88	12.97	Pass
		60	5300		12.53	12.89	Pass
		64	5320		12.62	12.94	Pass
	U-NII-2C	100	5500		10.72	10.83	Pass
		104	5520		10.05	10.02	Pass
		108	5540		10.44	10.21	Pass
		112	5560		10.23	10.74	Pass
		116	5580		10.65	10.76	Pass
		120	5600		10.08	10.25	Pass
		124	5620		9.59	10.28	Pass
		128	5640		9.67	10.24	Pass
		132	5660		9.66	10.09	Pass
		136	5680		9.72	10.08	Pass
		140	5700		9.59	10.66	Pass
		144	5720		10.55	10.88	Pass
	U-NII-3	149	5745		10.92	10.68	Pass
		153	5765		10.85	10.59	Pass
		157	5785		10.98	10.78	Pass
		161	5805		10.54	10.46	Pass
		165	5825		10.88	10.71	Pass
802.11n-HT20	U-NII-1	36	5180	MCS0	11.78	12.38	Pass
		40	5200		11.88	12.45	Pass
		44	5220		12.03	12.38	Pass
		48	5240		12.34	11.68	Pass
	U-NII-2A	52	5260		12.44	11.65	Pass
		56	5280		11.73	11.77	Pass
		60	5300		12.42	11.73	Pass
		64	5320		12.08	11.75	Pass
	U-NII-2C	100	5500		10.43	10.91	Pass
		104	5520		10.77	10.67	Pass
		108	5540		10.39	10.01	Pass
		112	5560		10.12	10.43	Pass
		116	5580		10.14	10.75	Pass
		120	5600		10.74	10.98	Pass
		124	5620		10.82	10.01	Pass
		128	5640		10.79	10.85	Pass
		132	5660		10.83	10.78	Pass





	U-NII-3	136	5680		10.98	10.82	Pass
		140	5700		10.69	10.68	Pass
		144	5720		10.34	10.53	Pass
		149	5745		9.89	10.06	Pass
		153	5765		9.51	10.73	Pass
		157	5785		10.68	10.64	Pass
		161	5805		10.47	10.37	Pass
		165	5825		10.04	10.11	Pass
802.11n-HT40	U-NII-1	38	5190	MCS0	10.38	10.18	Pass
		46	5230		11.04	11.38	Pass
	U-NII-2A	54	5270		11.25	11.42	Pass
		62	5310		9.98	10.37	Pass
	U-NII-2C	102	5510		10.25	10.02	Pass
		110	5550		10.01	11.38	Pass
		118	5590		10.77	11.21	Pass
		126	5630		10.56	10.71	Pass
		134	5670		10.55	10.48	Pass
		142	5710		10.16	11.21	Pass
	U-NII-3	151	5755		10.59	10.66	Pass
		159	5795		10.26	11.14	Pass
802.11ac 20M	U-NII-1	36	5180	MCS0	11.71	11.76	Pass
		40	5200		11.74	11.88	Pass
		44	5220		11.88	11.93	Pass
		48	5240		12.26	12.17	Pass
	U-NII-2A	52	5260		11.97	12.15	Pass
		56	5280		12.12	12.25	Pass
		60	5300		11.84	12.17	Pass
		64	5320		11.48	12.21	Pass
	U-NII-2C	100	5500		10.51	10.92	Pass
		104	5520		10.81	10.68	Pass
		108	5540		10.45	10.05	Pass
		112	5560		9.98	10.41	Pass
		116	5580		10.57	10.87	Pass
		120	5600		10.24	10.03	Pass
		124	5620		10.35	10.02	Pass
		128	5640		10.34	10.01	Pass
		132	5660		9.83	10.37	Pass
		136	5680		9.96	10.33	Pass
		140	5700		9.79	10.17	Pass
		144	5720		9.48	9.91	Pass
	U-NII-3	149	5745		10.32	10.51	Pass
		153	5765		9.94	10.23	Pass
		157	5785		10.26	10.08	Pass
		161	5805		10.03	9.85	Pass
		165	5825		9.59	9.59	Pass





802.11ac 40M	U-NII-1	38	5190	MCS0	9.98	10.15	Pass
		46	5230		11.05	10.99	Pass
	U-NII-2A	54	5270		11.17	11.01	Pass
		62	5310		10.47	10.45	Pass
	U-NII-2C	102	5510		10.36	10.65	Pass
		110	5550		9.59	10.94	Pass
		118	5590		10.23	10.73	Pass
		126	5630		10.08	11.31	Pass
		134	5670		9.57	10.99	Pass
		142	5710		10.32	10.79	Pass
	U-NII-3	151	5755		10.63	11.12	Pass
		159	5795		10.34	10.71	Pass
802.11ac 80M	U-NII-1	42	5210	MCS0	9.44	9.26	Pass
	U-NII-2A	58	5290		8.74	9.02	Pass
	U-NII-2C	106	5530		9.17	9.24	Pass
		122	5610		9.32	9.07	Pass
		138	5690		8.89	9.26	Pass
	U-NII-3	155	5775		8.93	9.31	Pass

#### 4.1.2 Test Result for MIMO

5GHz	mode	Channel	Frequency (MHz)	Data Rate(Mbps)	Average Power (dBm)	Verdict
802.11a	U-NII-1	36	5180	6	15.25	Pass
		40	5200		15.39	Pass
		44	5220		15.44	Pass
		48	5240		15.73	Pass
	U-NII-2A	52	5260		15.82	Pass
		56	5280		15.94	Pass
		60	5300		15.72	Pass
		64	5320		15.79	Pass
	U-NII-2C	100	5500		13.79	Pass
		104	5520		13.05	Pass
		108	5540		13.34	Pass
		112	5560		13.50	Pass
		116	5580		13.72	Pass
		120	5600		13.18	Pass
		124	5620		12.96	Pass
		128	5640		12.97	Pass
		132	5660		12.89	Pass
		136	5680		12.91	Pass
		140	5700		13.17	Pass
		144	5720		13.73	Pass
	U-NII-3	149	5745		13.81	Pass
		153	5765		13.73	Pass
		157	5785		13.89	Pass
		161	5805		13.51	Pass



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802.11n- HT20	U-NII-1	165	5825	MCS0	13.81	Pass
		36	5180		15.10	Pass
		40	5200		15.18	Pass
		44	5220		15.22	Pass
		48	5240		15.03	Pass
	U-NII-2A	52	5260		15.07	Pass
		56	5280		14.76	Pass
		60	5300		15.10	Pass
		64	5320		14.93	Pass
	U-NII-2C	100	5500		13.69	Pass
		104	5520		13.73	Pass
		108	5540		13.21	Pass
		112	5560		13.29	Pass
		116	5580		13.47	Pass
		120	5600		13.87	Pass
		124	5620		13.44	Pass
		128	5640		13.83	Pass
		132	5660		13.82	Pass
		136	5680		13.91	Pass
		140	5700		13.70	Pass
		144	5720		13.45	Pass
	U-NII-3	149	5745		12.99	Pass
		153	5765		13.17	Pass
		157	5785		13.67	Pass
		161	5805		13.43	Pass
		165	5825		13.09	Pass
802.11n- HT40	U-NII-1	38	5190	MCS0	13.29	Pass
		46	5230		14.22	Pass
	U-NII-2A	54	5270		14.35	Pass
		62	5310		13.19	Pass
	U-NII-2C	102	5510		13.15	Pass
		110	5550		13.76	Pass
		118	5590		14.01	Pass
		126	5630		13.65	Pass
		134	5670		13.53	Pass
		142	5710		13.73	Pass
	U-NII-3	151	5755		13.64	Pass
		159	5795		13.73	Pass
802.11ac 20M	U-NII-1	36	5180	MCS0	14.75	Pass
		40	5200		14.82	Pass
		44	5220		14.92	Pass
		48	5240		15.23	Pass
	U-NII-2A	52	5260		15.07	Pass
		56	5280		15.20	Pass
		60	5300		15.02	Pass



	U-NII-2C	64	5320		14.87	Pass
		100	5500		13.73	Pass
		104	5520		13.76	Pass
		108	5540		13.26	Pass
		112	5560		13.21	Pass
		116	5580		13.73	Pass
		120	5600		13.15	Pass
		124	5620		13.20	Pass
		128	5640		13.19	Pass
		132	5660		13.12	Pass
		136	5680		13.16	Pass
		140	5700		12.99	Pass
		144	5720		12.71	Pass
	U-NII-3	149	5745		13.43	Pass
		153	5765		13.10	Pass
		157	5785		13.18	Pass
		161	5805		12.95	Pass
		165	5825		12.60	Pass
802.11ac 40M	U-NII-1	38	5190	MCS0	13.08	Pass
		46	5230		14.03	Pass
	U-NII-2A	54	5270		14.10	Pass
		62	5310		13.47	Pass
	U-NII-2C	102	5510		13.52	Pass
		110	5550		13.33	Pass
		118	5590		13.50	Pass
		126	5630		13.75	Pass
		134	5670		13.35	Pass
		142	5710		13.57	Pass
	U-NII-3	151	5755		13.89	Pass
		159	5795		13.54	Pass
802.11ac 80M	U-NII-1	42	5210	MCS0	12.36	Pass
	U-NII-2A	58	5290		11.89	Pass
	U-NII-2C	106	5530		12.22	Pass
		122	5610		12.21	Pass
		138	5690		12.09	Pass
	U-NII-3	155	5775		12.13	Pass





## 4.2 Unwanted Emissions that fall Out of the Restricted Bands (Radiated)

Test Requirement:	47 CFR Part 15 Section 15.407(b)
Test Method:	ANSI C63.10: 2013
Test Site:	Measurement Distance: 3m or 10m (Semi-Anechoic Chamber)
Test Setup:	

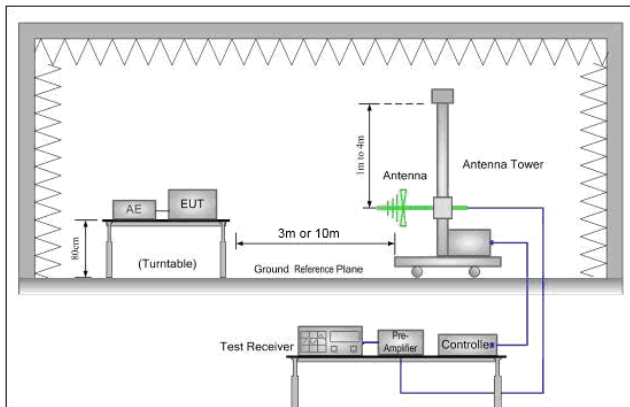


Figure 1. 30MHz to 1GHz

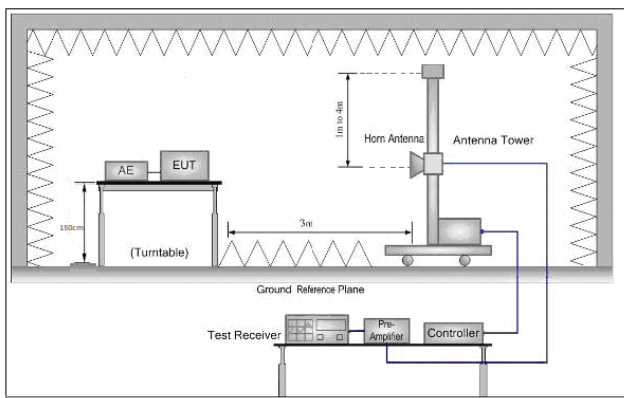


Figure 2. Above 1 GHz

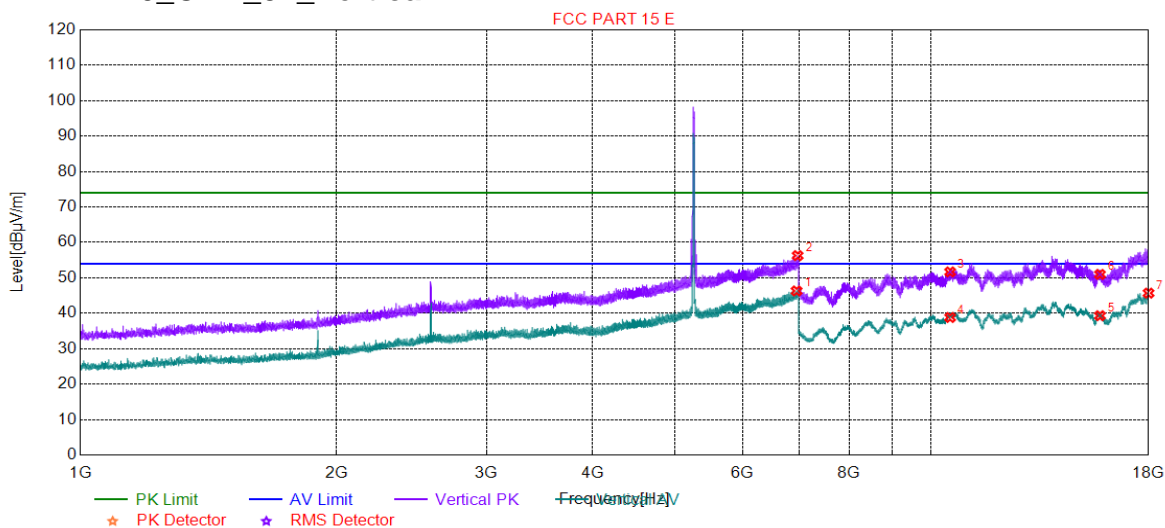
Test Procedure:	<ol style="list-style-type: none"> <li>For below 1GHz test, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.</li> <li>For above 1GHz test, 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.</li> <li>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.</li> <li>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.</li> <li>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.</li> <li>The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li> <li>Test the EUT in the outermost channels.</li> <li>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.</li> <li>Repeat above procedures until all frequencies measured was complete.</li> </ol>
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Exploratory Test Mode:	Transmitting with all kind of modulations, data rates.
Final Test Mode:	Through Pre-scan, find the 6Mbps of rate is the worst case of 802.11a; MCS0 of rate is the worst case of 802.11n(HT20); MCS0 of rate is the worst case of 802.11n(HT40); MCS0 of rate is the worst case of 802.11ac(HT20); MCS0 of rate is the worst case of 802.11ac(HT40); MCS0 of rate is the worst case of 802.11ac(HT80) For below 1GHz, through Pre-scan, find the 1Mbps of rate of 802.11a 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

## 4.2.1 Transmitter emission above 1GHz

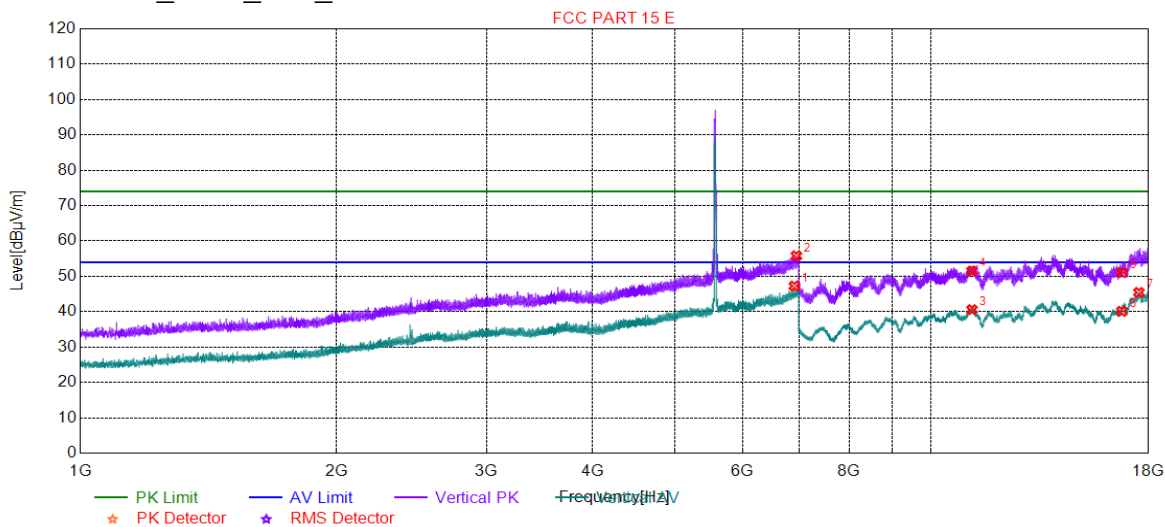
### 4.2.1.1 11A20\_CDD\_52\_Vertical



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	6944.1972	46.31	23.81	54.00	7.69	237	219	AV	Vertical
2	6963.9982	56.28	23.91	74.00	17.72	166	270	PK	Vertical
3	10520.0000	51.68	-4.37	74.00	22.32	256	217	PK	Vertical
4	10520.0000	38.82	-4.37	54.00	15.18	173	217	AV	Vertical
5	15780.0000	39.32	-2.36	54.00	14.68	160	268	AV	Vertical
6	15780.0000	50.97	-2.36	74.00	23.03	270	217	PK	Vertical
7	17997.2499	45.69	-0.37	54.00	8.31	250	217	AV	Vertical



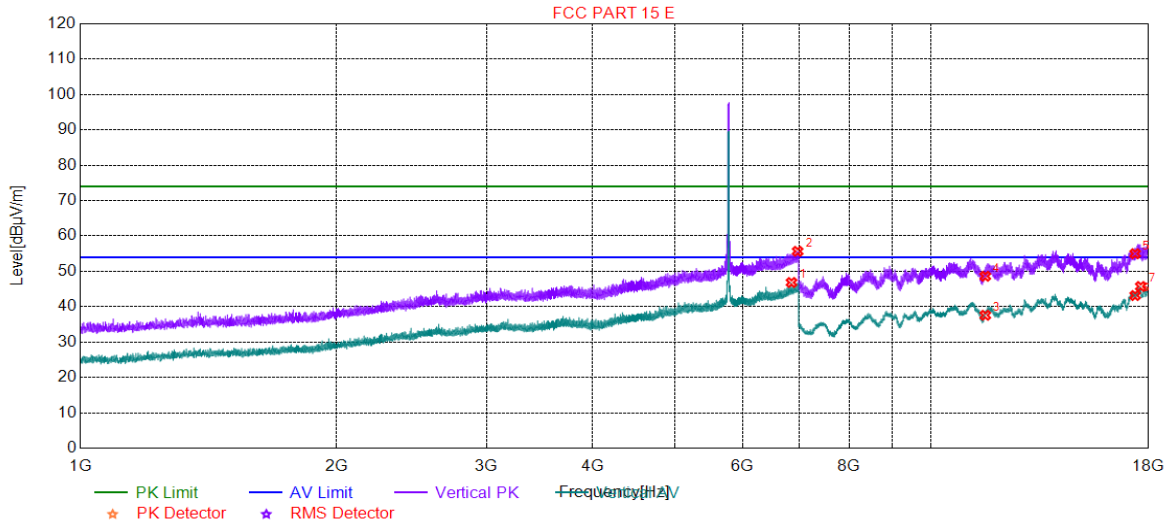
#### 4.2.1.2 11A20\_CDD\_116\_Vertical



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	6903.0952	47.27	23.60	54.00	6.73	289	218	AV	Vertical
2	6940.2970	55.81	23.79	74.00	18.19	239	117	PK	Vertical
3	11160.0000	40.58	-3.43	54.00	13.42	281	359	AV	Vertical
4	11160.0000	51.50	-3.43	74.00	22.50	158	266	PK	Vertical
5	16740.0000	51.09	-3.33	74.00	22.91	190	359	PK	Vertical
6	16740.0000	40.13	-3.33	54.00	13.87	215	316	AV	Vertical
7	17532.4766	45.46	0.77	54.00	8.54	293	359	AV	Vertical



#### 4.2.1.3 11A20\_CDD\_157\_Vertical

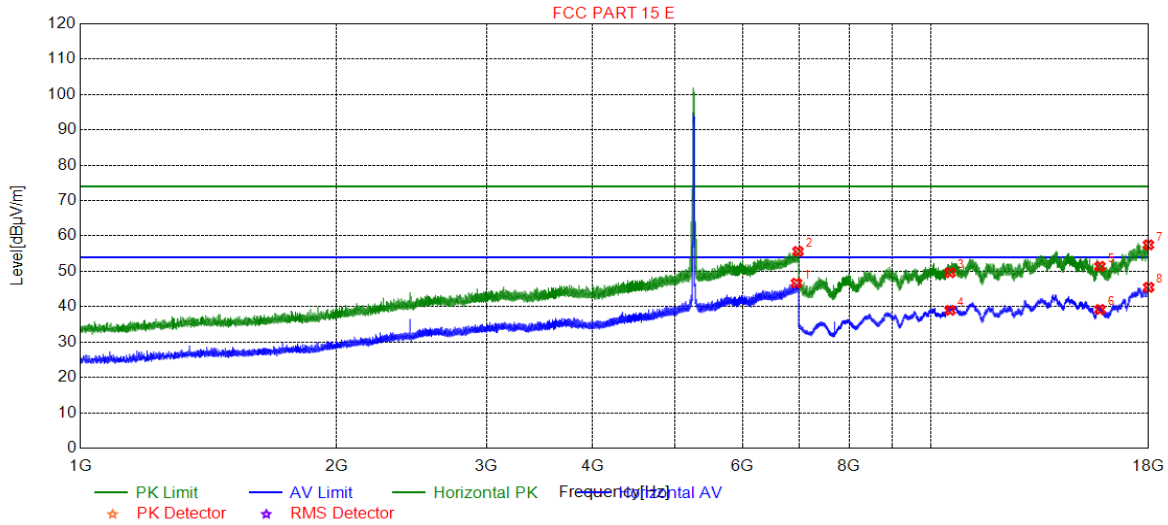


NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	6849.3925	46.85	23.46	54.00	7.15	261	118	AV	Vertical
2	6963.9982	55.66	23.91	74.00	18.34	295	319	PK	Vertical
3	11570.0000	37.58	-3.87	54.00	16.42	245	18	AV	Vertical
4	11570.0000	48.61	-3.87	74.00	25.39	282	217	PK	Vertical
5	17355.0000	54.99	-1.07	74.00	19.01	175	118	PK	Vertical
6	17355.0000	43.16	-1.07	54.00	10.84	208	68	AV	Vertical
7	17622.6811	45.73	1.04	54.00	8.27	232	217	AV	Vertical





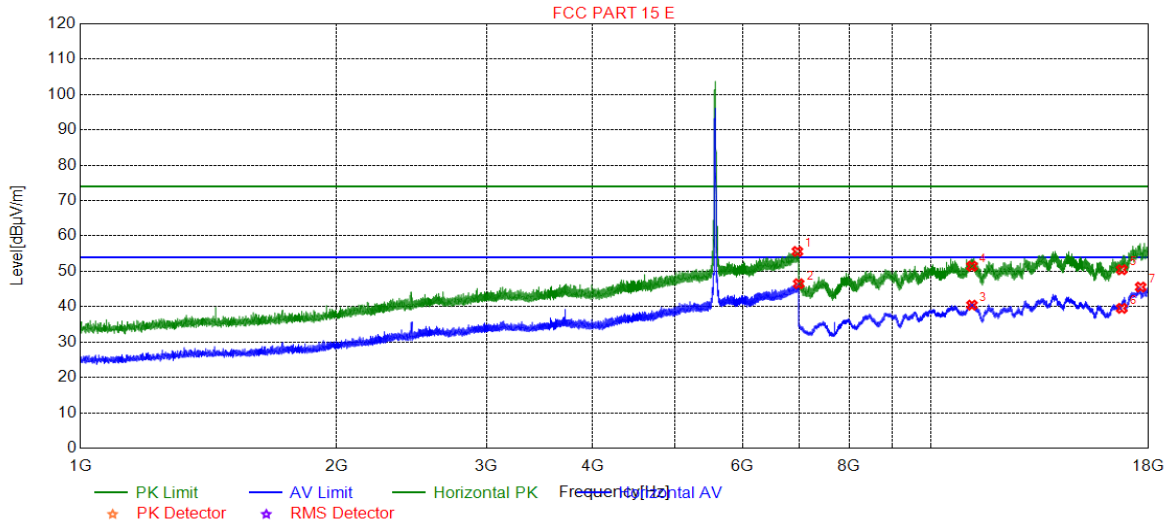
#### 4.2.1.4 11A20\_CDD\_52\_Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	6941.1971	46.67	23.79	54.00	7.33	115	43	AV	Horizontal
2	6970.5985	55.64	23.95	74.00	18.36	242	243	PK	Horizontal
3	10520.0000	49.62	-4.37	74.00	24.38	142	342	PK	Horizontal
4	10520.0000	38.97	-4.37	54.00	15.03	190	1	AV	Horizontal
5	15780.0000	51.42	-2.36	74.00	22.58	186	243	PK	Horizontal
6	15780.0000	39.21	-2.36	54.00	14.79	231	93	AV	Horizontal
7	17990.0995	57.50	-0.43	74.00	16.50	121	44	PK	Horizontal
8	18000.0000	45.48	-0.35	54.00	8.52	142	193	AV	Horizontal



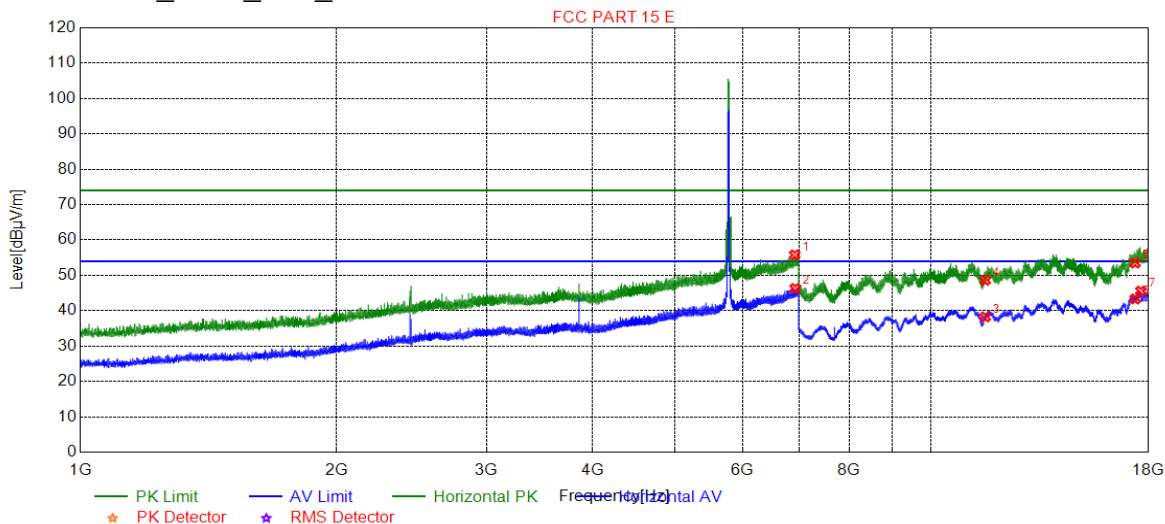
#### 4.2.1.5 11A20\_CDD\_116\_Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	6959.4980	55.62	23.89	74.00	18.38	129	42	PK	Horizontal
2	6983.7992	46.50	24.02	54.00	7.50	103	193	AV	Horizontal
3	11160.0000	40.44	-3.43	54.00	13.56	106	342	AV	Horizontal
4	11160.0000	51.44	-3.43	74.00	22.56	173	42	PK	Horizontal
5	16740.0000	50.47	-3.33	74.00	23.53	239	292	PK	Horizontal
6	16740.0000	39.54	-3.33	54.00	14.46	218	292	AV	Horizontal
7	17615.5308	45.56	1.23	54.00	8.44	237	242	AV	Horizontal



#### 4.2.1.6 11A20\_CDD\_157\_ Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	6908.7954	55.79	23.63	74.00	18.21	146	92	PK	Horizontal
2	6917.4959	46.30	23.67	54.00	7.70	160	242	AV	Horizontal
3	11570.0000	38.26	-3.87	54.00	15.74	209	144	AV	Horizontal
4	11570.0000	48.61	-3.87	74.00	25.39	106	292	PK	Horizontal
5	17355.0000	53.49	-1.07	74.00	20.51	213	94	PK	Horizontal
6	17355.0000	43.32	-1.07	54.00	10.68	227	45	AV	Horizontal
7	17621.5811	45.57	1.07	54.00	8.43	245	45	AV	Horizontal

Remark:

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

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

2) Scan from 9kHz to 40GHz, The disturbance between 9KHz to 30MHz and 18GHz to 40GHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. 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.

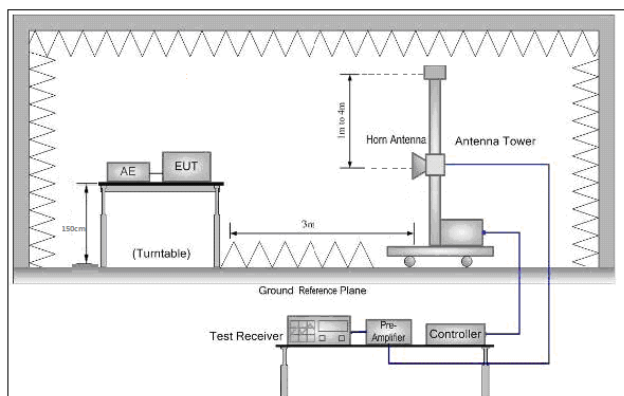
4) All modes have been tested, but only the worst case data displayed in this report.



### 4.3 Unwanted Emissions in the Restricted Bands (Radiated)

Test Requirement:	47 CFR Part 15 Section 15.407(b)		
Test Method:	ANSI C63.10: 2013		
Test Site:	Measurement Distance: 3m (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:			

The diagram illustrates the test setup within a semi-anechoic chamber. The chamber's interior walls are lined with pyramidal absorbers. On the left, a turntable is positioned with an Antenna Element (AE) and Equipment Under Test (EUT) on top. A vertical dimension of 150cm is shown from the turntable to the chamber wall. A horizontal distance of 3m is marked between the turntable and the Antenna Tower. The Antenna Tower is a vertical structure with a Horn Antenna at the top. A vertical dimension of 1m to 4m is shown from the turntable to the Horn Antenna. The ground reference plane is indicated at the base of the chamber. Outside the chamber, a Test Receiver, Pre-Amplifier, and Controller are connected to the Antenna Tower.



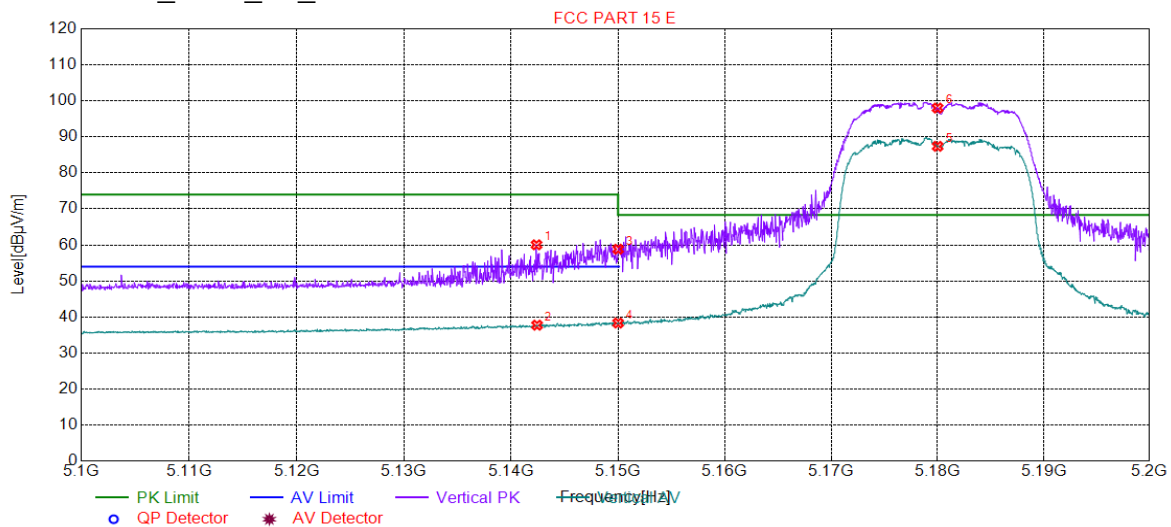


Test Procedure:	<ul style="list-style-type: none"> <li>a. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.</li> <li>b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</li> <li>c. 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.</li> <li>d. 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.</li> <li>e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li> <li>f. 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</li> <li>g. Test the EUT in the outermost channels.</li> <li>h. 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.</li> <li>i. Repeat above procedures until all frequencies measured was complete.</li> </ul>
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates.
Final Test Mode:	<p>Through Pre-scan, find the</p> <p>6Mbps of rate is the worst case of 802.11a;</p> <p>MCS0 of rate is the worst case of 802.11n(HT20);</p> <p>MCS0 of rate is the worst case of 802.11n(HT40);</p> <p>MCS0 of rate is the worst case of 802.11ac(HT20);</p> <p>MCS0 of rate is the worst case of 802.11ac(HT40);</p> <p>MCS0 of rate is the worst case of 802.11ac(HT80);</p> <p>Only the worst case is recorded in the report.</p>
Instruments Used:	Refer to section 5.10 for details
Test Results:	Pass



## 4.3.1 Test plots

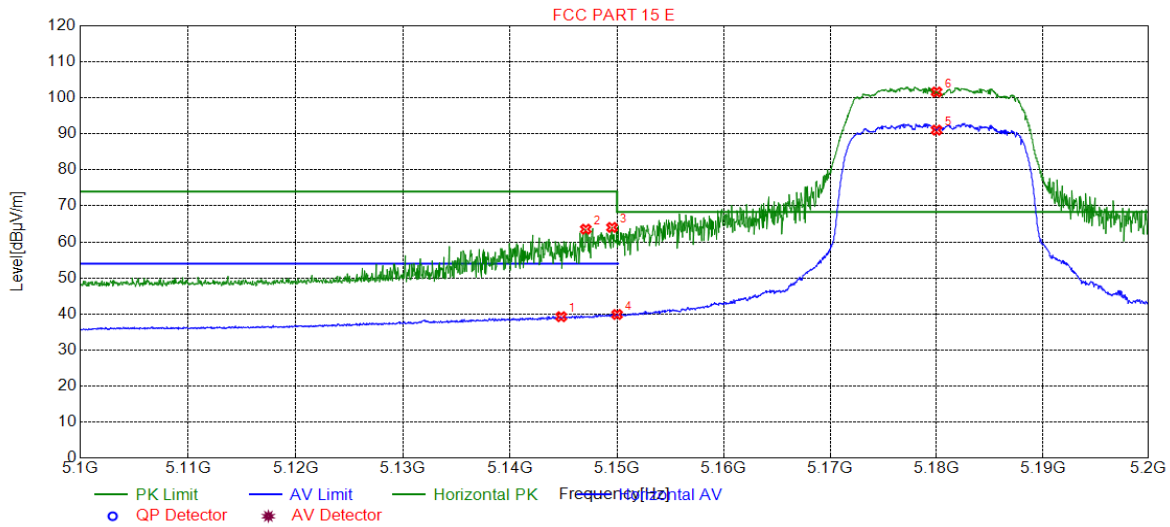
## 4.3.1.1 11A20\_CDD\_36\_Vertical



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5142.3712	60.04	17.90	74.00	13.96	270	161	PK	Vertical
2	5142.4212	37.73	17.90	54.00	16.27	161	156	AV	Vertical
3	5150.0000	58.82	17.92	74.00	15.18	180	74	PK	Vertical
4	5150.0000	38.32	17.92	54.00	15.68	254	161	AV	Vertical
5	5180.0000	87.38	17.98	---	---	270	74	AV	Vertical
6	5180.0000	98.00	17.98	---	---	231	74	PK	Vertical



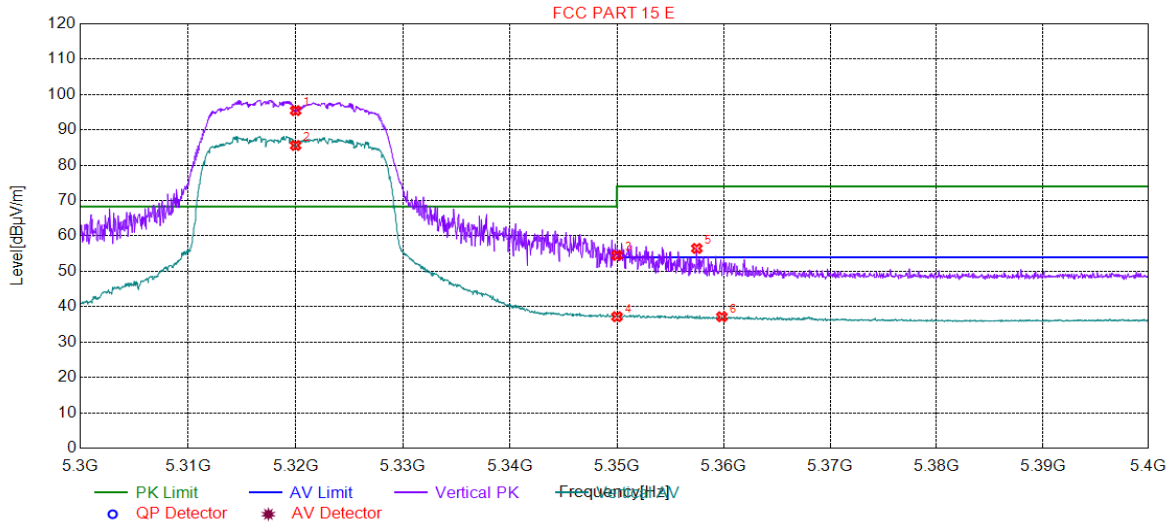
## 4.3.1.2 11A20\_CDD\_36\_Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5144.7724	39.25	17.90	54.00	14.75	182	88	AV	Horizontal
2	5147.0735	63.54	17.91	74.00	10.46	102	99	PK	Horizontal
3	5149.5248	64.03	17.91	74.00	9.97	138	325	PK	Horizontal
4	5150.0000	39.86	17.92	54.00	14.14	243	88	AV	Horizontal
5	5180.0000	91.04	17.98	---	---	213	94	AV	Horizontal
6	5180.0000	101.63	17.98	---	---	113	88	PK	Horizontal



#### 4.3.1.3 11A20\_CDD\_64\_Vertical

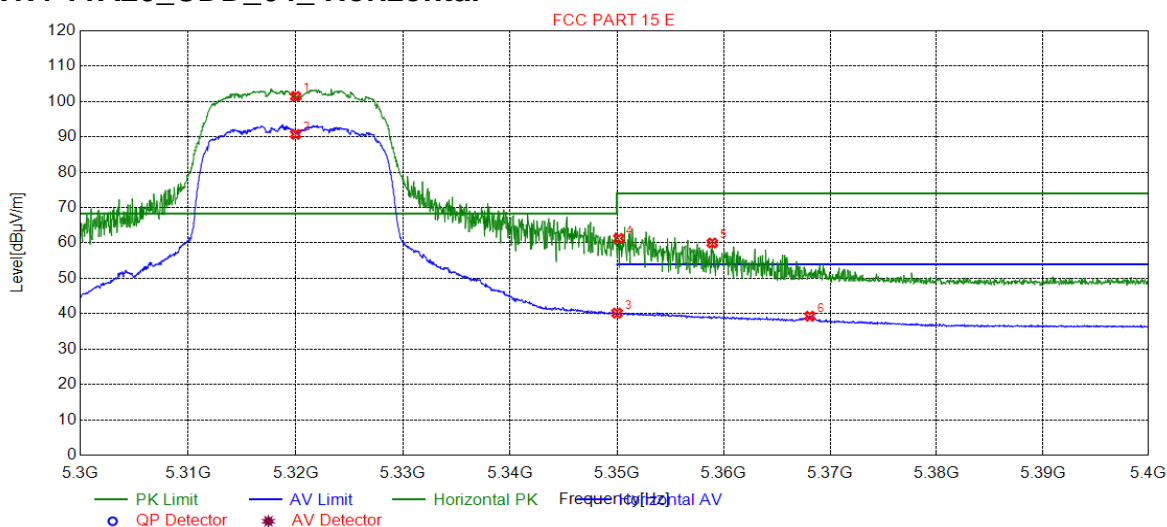


NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5320.0000	95.45	18.33	---	---	216	187	PK	Vertical
2	5320.0000	85.59	18.33	---	---	156	187	AV	Vertical
3	5350.0000	54.50	18.44	74.00	19.50	204	76	PK	Vertical
4	5350.0000	37.18	18.44	54.00	16.82	206	166	AV	Vertical
5	5357.4787	56.48	18.47	74.00	17.52	168	187	PK	Vertical
6	5359.8299	37.16	18.48	54.00	16.84	202	187	AV	Vertical





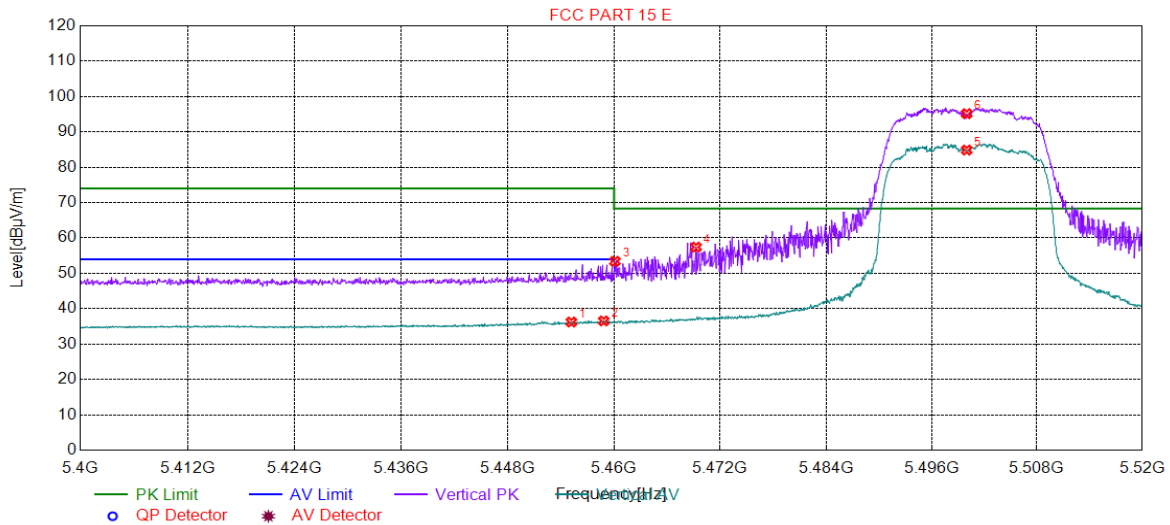
## 4.3.1.4 11A20\_CDD\_64\_Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5320.0000	101.45	18.33	---	---	157	92	PK	Horizontal
2	5320.0000	90.72	18.33	---	---	162	86	AV	Horizontal
3	5350.0000	40.16	18.44	54.00	13.84	108	31	AV	Horizontal
4	5350.1751	61.31	18.44	74.00	12.69	160	45	PK	Horizontal
5	5358.9295	60.00	18.47	74.00	14.00	166	92	PK	Horizontal
6	5368.0840	39.30	18.51	54.00	14.70	220	99	AV	Horizontal



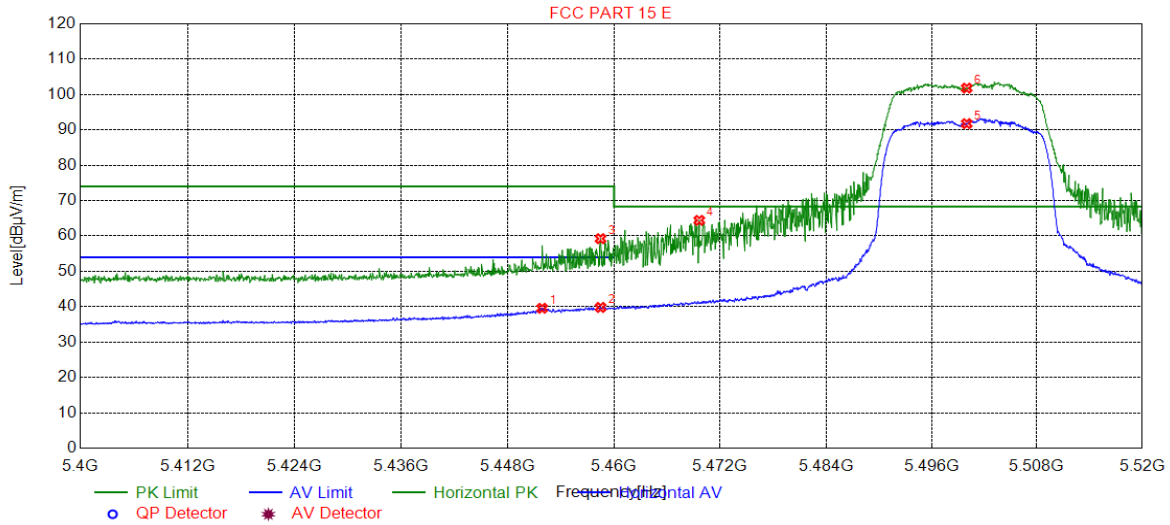
## 4.3.1.5 11A20\_CDD\_100\_Veritical



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5455.1676	36.24	18.54	54.00	17.76	242	190	AV	Vertical
2	5458.8294	36.55	18.54	54.00	17.45	251	190	AV	Vertical
3	5460.0900	53.41	18.53	68.30	14.89	158	201	PK	Vertical
4	5469.2746	57.43	18.52	68.30	10.87	291	190	PK	Vertical
5	5500.0000	84.86	18.47	---	---	158	173	AV	Vertical
6	5500.0000	95.15	18.47	---	---	194	173	PK	Vertical



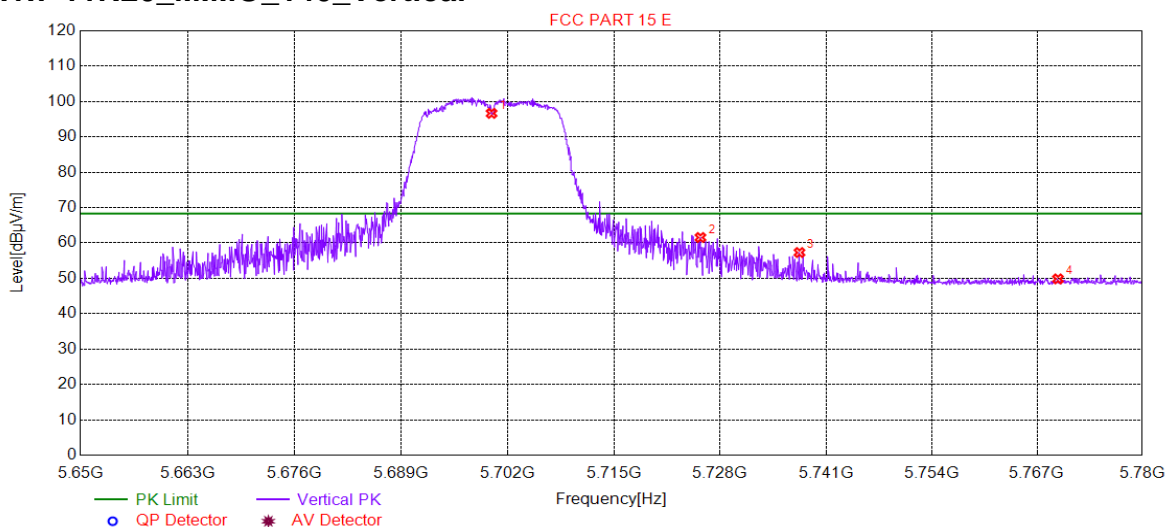
#### 4.3.1.6 11A20\_CDD\_100\_Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5451.8659	39.56	18.55	54.00	14.44	222	38	AV	Horizontal
2	5458.4692	39.80	18.54	54.00	14.20	221	38	AV	Horizontal
3	5458.4692	59.24	18.54	74.00	14.76	192	44	PK	Horizontal
4	5469.6348	64.42	18.52	68.30	3.88	127	38	PK	Horizontal
5	5500.0000	91.77	18.47	---	---	248	44	AV	Horizontal
6	5500.0000	101.82	18.47	---	---	160	44	PK	Horizontal



#### 4.3.1.7 11N20\_MIMO\_140\_Vertical

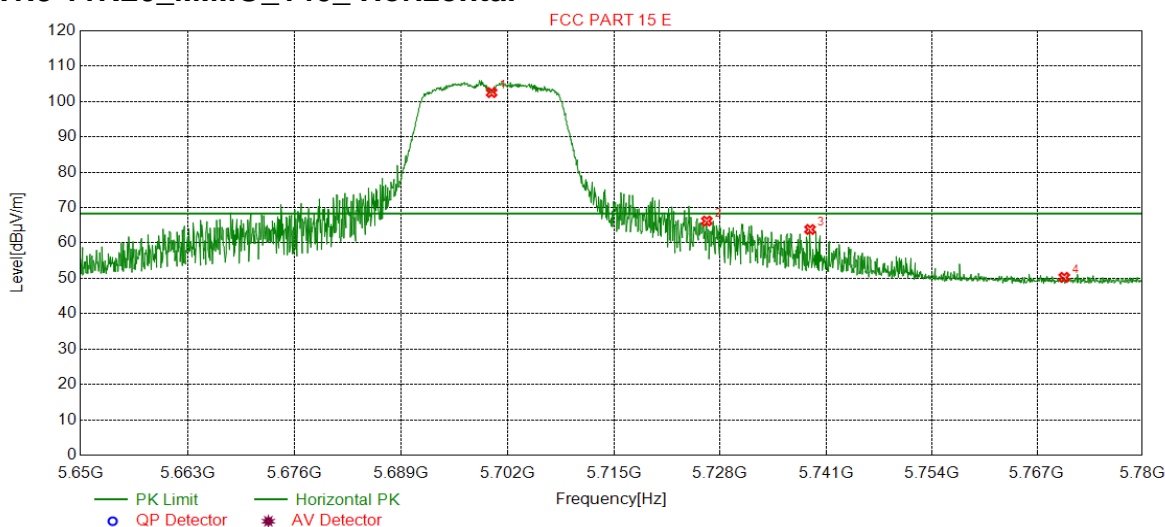


NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5700.0000	96.65	19.17	---	---	164	157	PK	Vertical
2	5725.5678	61.55	19.34	68.30	6.75	286	162	PK	Vertical
3	5737.7289	57.30	19.42	68.30	11.00	285	152	PK	Vertical
4	5769.5948	49.84	19.64	68.30	18.46	284	148	PK	Vertical





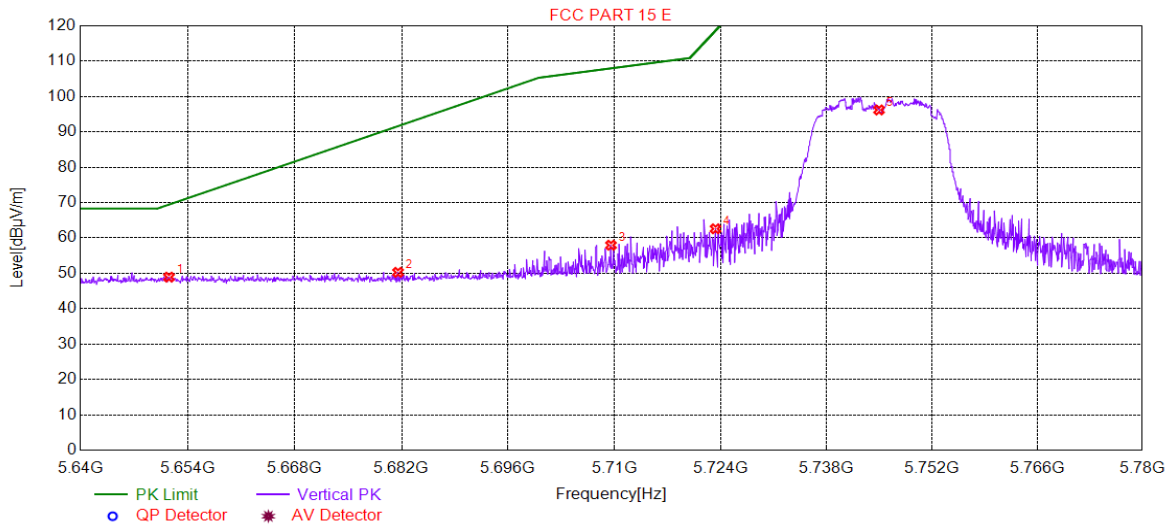
#### 4.3.1.8 11N20\_MIMO\_140\_Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5700.0000	102.52	19.17	---	---	192	12	PK	Horizontal
2	5726.3482	65.22	19.35	68.30	3.08	189	26	PK	Horizontal
3	5739.0295	63.82	19.43	68.30	4.48	148	17	PK	Horizontal
4	5770.3752	50.29	19.64	68.30	18.01	245	31	PK	Horizontal



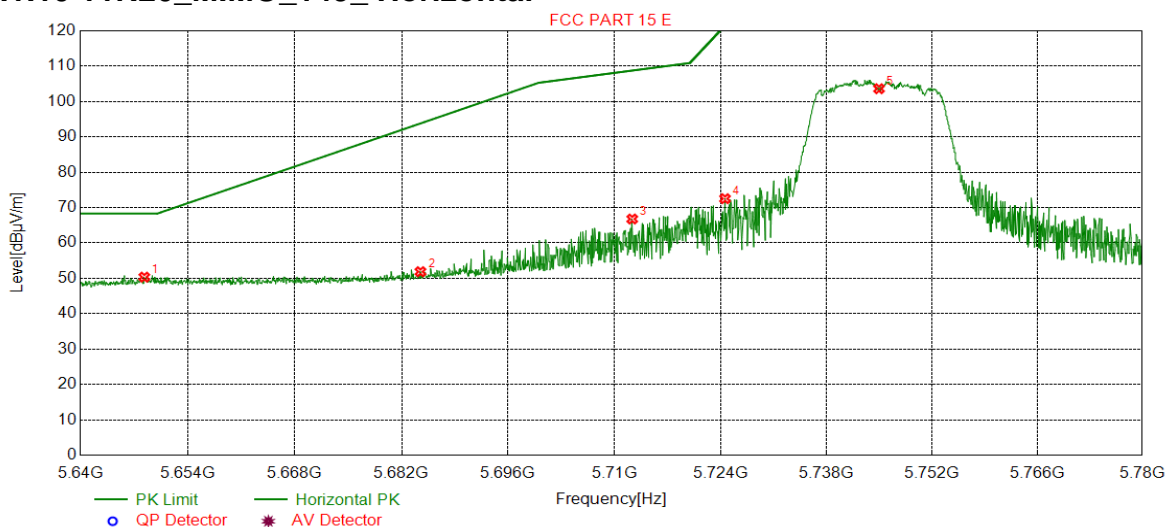
#### 4.3.1.9 11N20\_MIMO\_149\_Vertical



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5651.5558	48.94	18.79	69.45	20.51	296	47	PK	Vertical
2	5681.5308	50.29	19.03	91.63	41.34	298	89	PK	Vertical
3	5709.5448	57.96	19.23	107.97	50.01	233	16	PK	Vertical
4	5723.3417	62.60	19.33	118.52	55.92	173	163	PK	Vertical
5	5745.0000	96.20	19.47	---	---	159	149	PK	Vertical



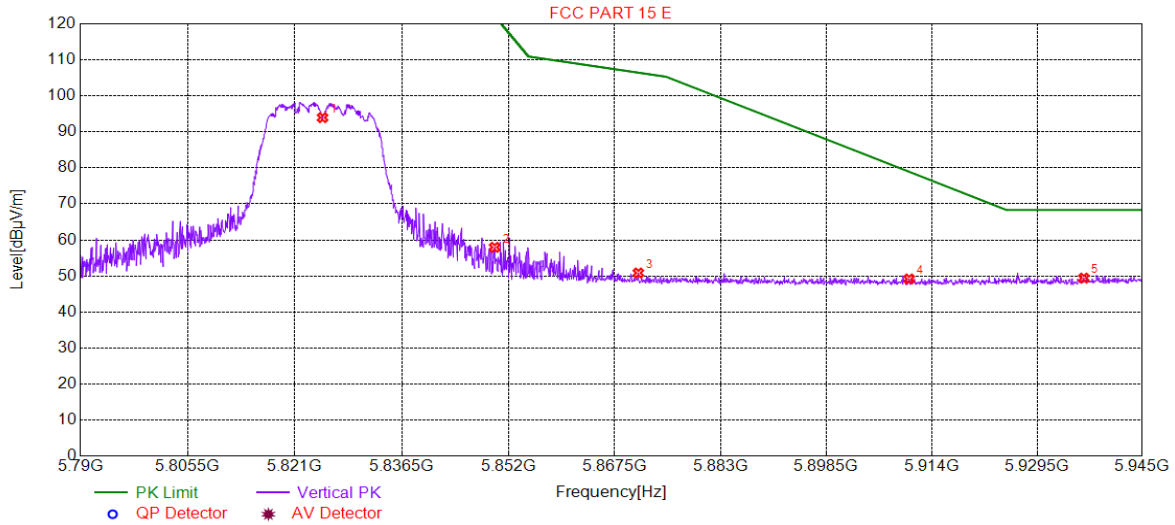
#### 4.3.1.10 11N20\_MIMO\_149\_Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5648.3342	50.35	18.77	68.30	17.95	192	344	PK	Horizontal
2	5684.4722	51.88	19.05	93.81	41.93	187	18	PK	Horizontal
3	5712.3462	66.78	19.25	108.76	41.98	103	37	PK	Horizontal
4	5724.6023	72.53	19.33	121.39	48.86	164	9	PK	Horizontal
5	5745.0000	103.62	19.47	---	---	248	13	PK	Horizontal



#### 4.3.1.11 11N20\_MIMO\_165\_Vertical

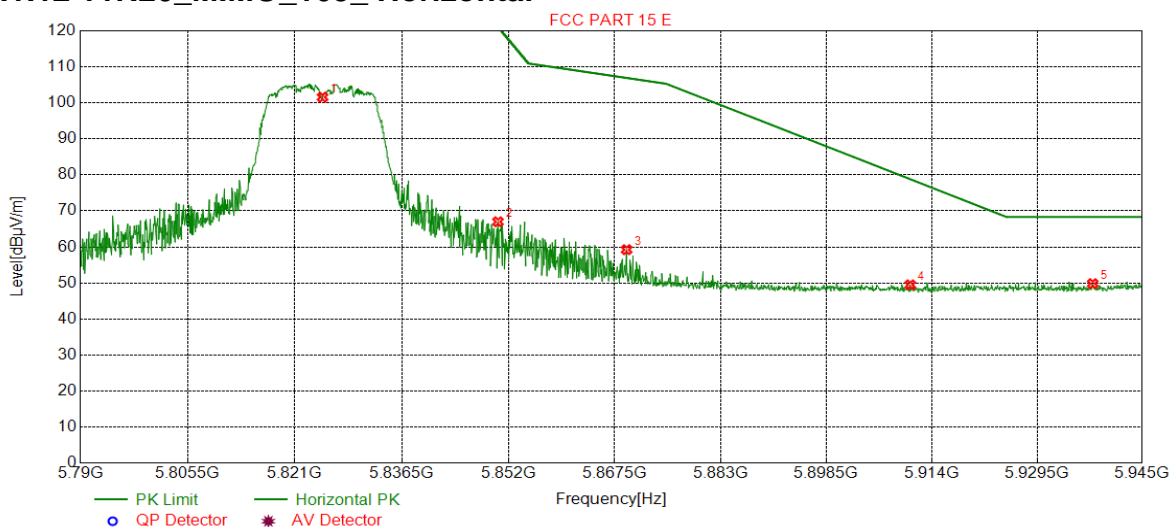


NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5825.0000	93.95	19.79	---	---	165	139	PK	Vertical
2	5850.0000	57.95	19.74	122.27	64.32	238	126	PK	Vertical
3	5870.9505	50.83	19.70	106.43	55.60	151	149	PK	Vertical
4	5910.6503	49.18	19.73	78.92	29.74	201	222	PK	Vertical
5	5936.3932	49.41	19.95	68.30	18.89	226	241	PK	Vertical





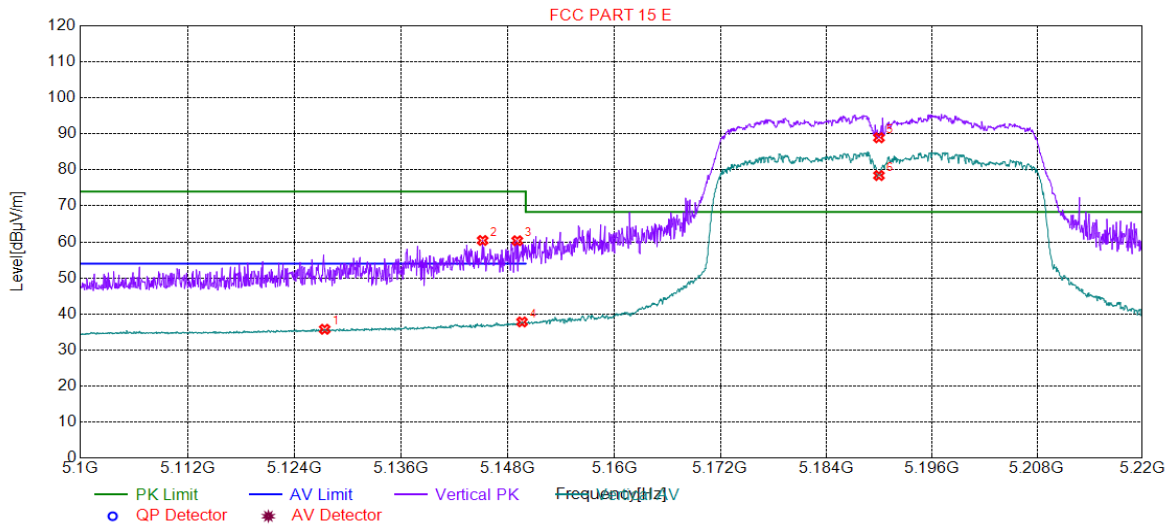
## 4.3.1.12 11N20\_MIMO\_165\_Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5825.0000	101.57	19.79	---	---	245	23	PK	Horizontal
2	5850.4802	67.00	19.74	121.21	54.21	206	2	PK	Horizontal
3	5869.2446	59.24	19.70	106.91	47.67	134	9	PK	Horizontal
4	5910.8054	49.48	19.73	78.80	29.32	133	331	PK	Horizontal
5	5937.7114	49.82	19.96	68.30	18.48	155	331	PK	Horizontal



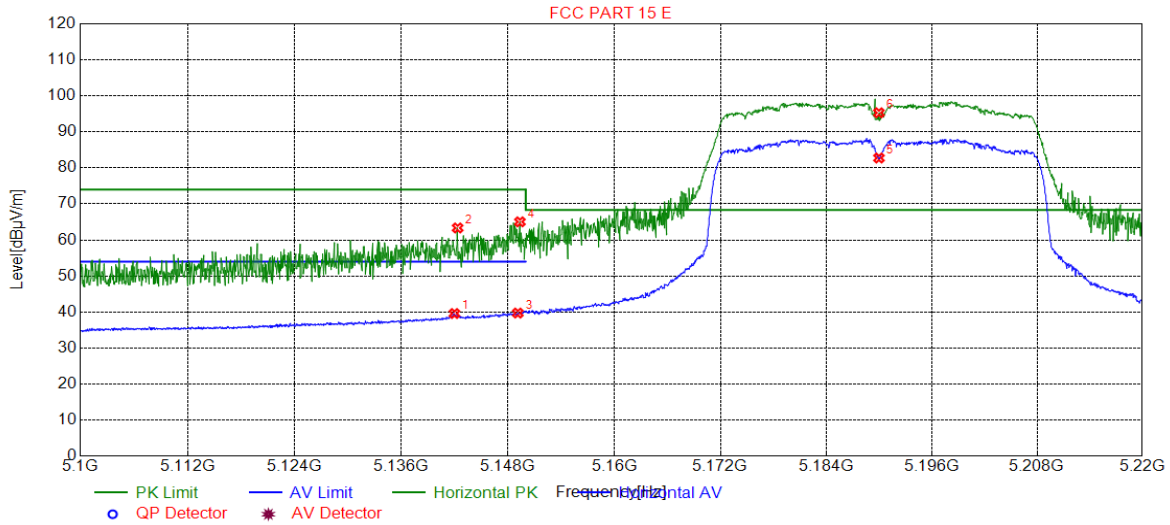
#### 4.3.1.13 11N40\_MIMO\_38\_Vertical



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5127.3737	35.76	17.86	54.00	18.24	229	159	AV	Vertical
2	5145.1426	60.41	17.90	74.00	13.59	252	159	PK	Vertical
3	5149.0445	60.34	17.91	74.00	13.66	246	159	PK	Vertical
4	5149.5848	37.80	17.91	54.00	16.20	223	159	AV	Vertical
5	5190.0000	88.92	18.01	---	---	224	72	PK	Vertical
6	5190.0000	78.44	18.01	---	---	281	236	AV	Vertical



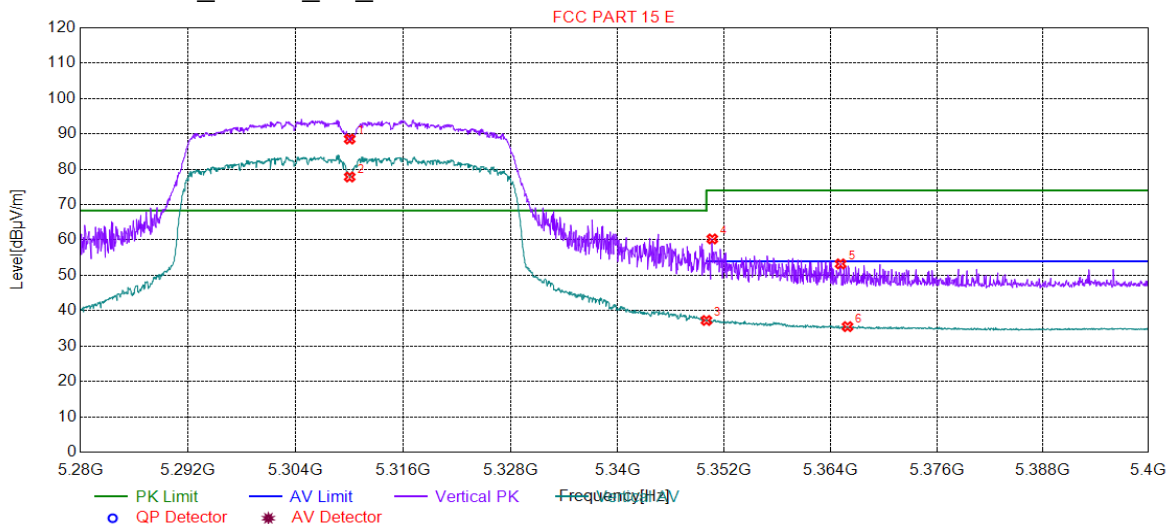
#### 4.3.1.14 11N40\_MIMO\_38\_Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5141.9610	39.58	17.90	54.00	14.42	235	75	AV	Horizontal
2	5142.3212	63.33	17.90	74.00	10.67	124	330	PK	Horizontal
3	5149.1046	39.70	17.91	54.00	14.30	202	102	AV	Horizontal
4	5149.3447	65.03	17.91	74.00	8.97	208	341	PK	Horizontal
5	5190.0000	82.75	18.01	---	---	229	96	AV	Horizontal
6	5190.0000	95.30	18.01	---	---	131	108	PK	Horizontal



#### 4.3.1.15 11AC40\_MIMO\_62\_Vertical

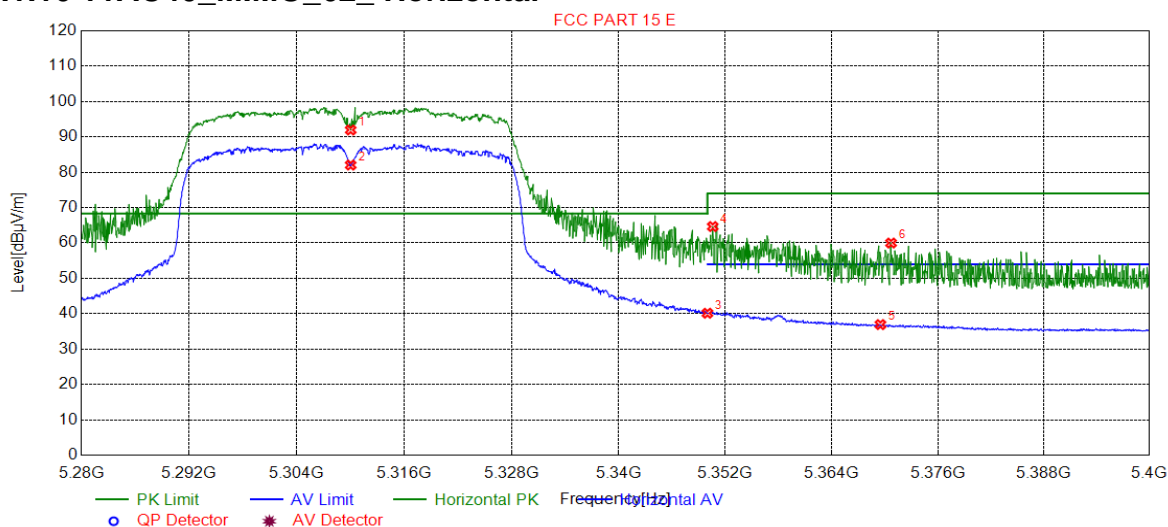


NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5310.0000	88.54	18.29	---	---	221	70	PK	Vertical
2	5310.0000	77.82	18.29	---	---	205	70	AV	Vertical
3	5350.0000	37.24	18.44	54.00	16.76	163	77	AV	Vertical
4	5350.6553	60.30	18.44	74.00	13.70	281	160	PK	Vertical
5	5365.1226	53.24	18.50	74.00	20.76	171	183	PK	Vertical
6	5365.9030	35.51	18.50	54.00	18.49	252	183	AV	Vertical





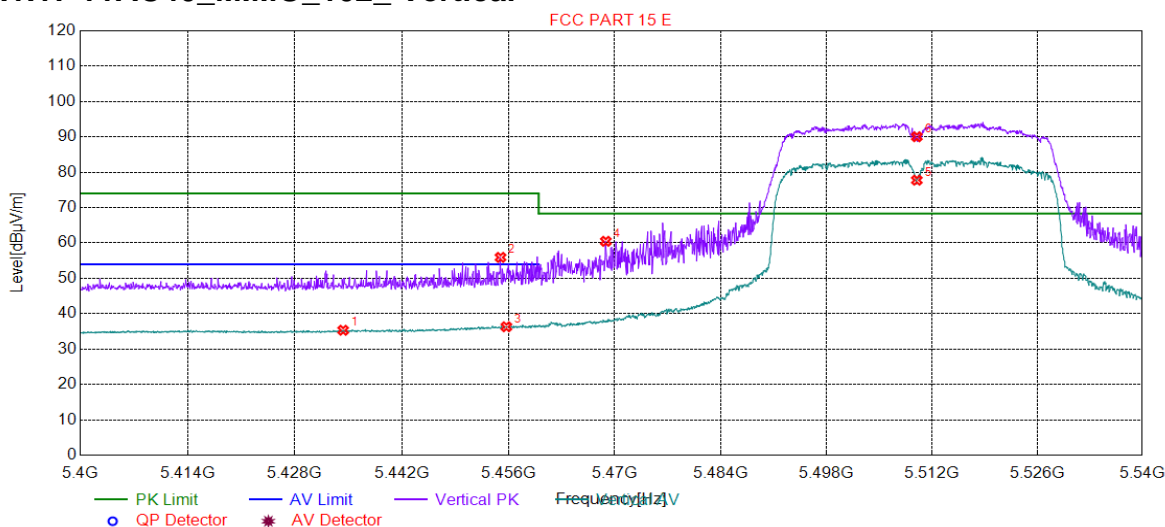
#### 4.3.1.16 11AC40\_MIMO\_62\_Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5310.00	91.95	18.29	---	---	223	86	PK	Horizontal
2	5310.00	82.03	18.29	---	---	136	93	AV	Horizontal
3	5350.00	40.14	18.44	54.00	13.86	236	44	AV	Horizontal
4	5350.59	64.65	18.44	74.00	9.35	151	106	PK	Horizontal
5	5369.50	36.93	18.51	54.00	17.07	145	30	AV	Horizontal
6	5370.70	59.99	18.52	74.00	14.01	144	30	PK	Horizontal



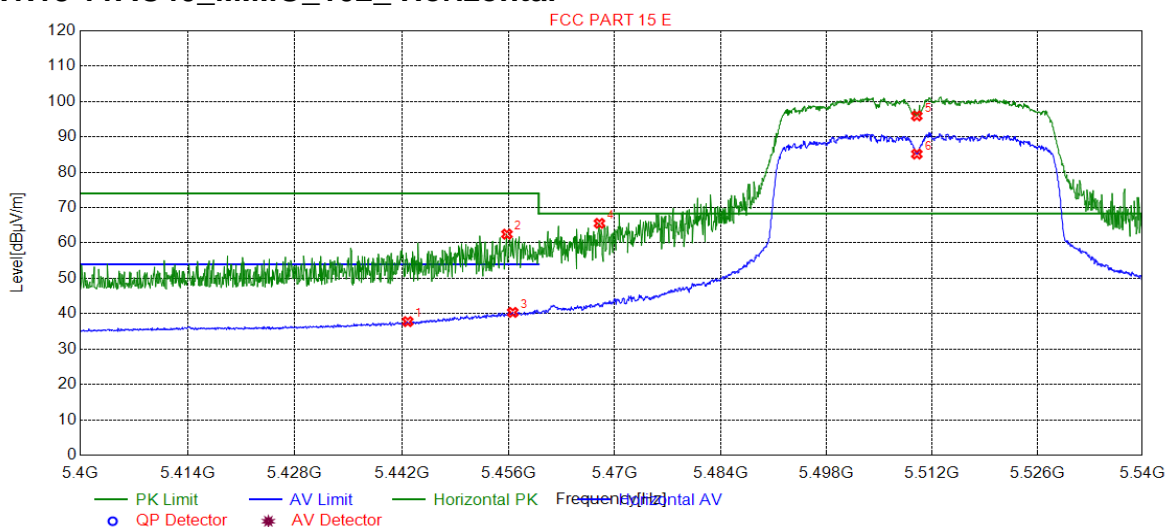
## 4.3.1.17 11AC40\_MIMO\_102\_Vertical



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5434.31	35.33	18.58	54.00	18.67	204	187	AV	Vertical
2	5454.97	55.93	18.54	74.00	18.07	229	71	PK	Vertical
3	5455.74	36.32	18.54	54.00	17.68	163	187	AV	Vertical
4	5468.84	60.48	18.52	68.30	7.82	195	207	PK	Vertical
5	5510.00	77.76	18.46	---	---	175	57	AV	Vertical
6	5510.00	90.04	18.46	---	---	268	180	PK	Vertical



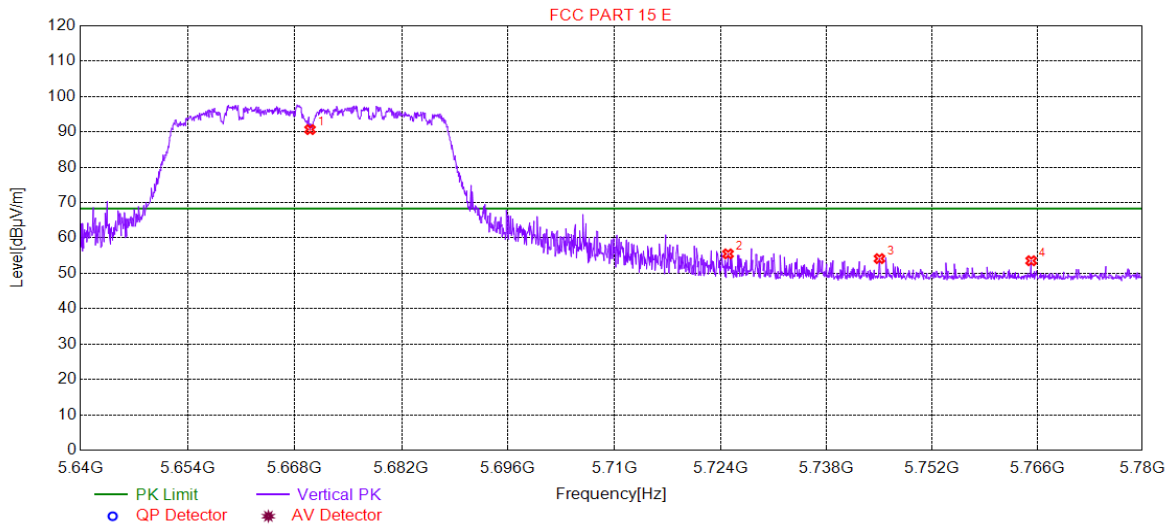
#### 4.3.1.18 11AC40\_MIMO\_102\_Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5442.7914	37.77	18.56	54.00	16.23	119	38	AV	Horizontal
2	5455.8179	62.49	18.54	74.00	11.51	228	31	PK	Horizontal
3	5456.5883	40.38	18.54	54.00	13.62	138	38	AV	Horizontal
4	5468.0040	65.25	18.52	68.30	3.05	162	24	PK	Horizontal
5	5510.0000	95.93	18.46	---	---	247	17	PK	Horizontal
6	5510.0000	85.15	18.46	---	---	197	38	AV	Horizontal



## 4.3.1.19 11AC40\_MIMO\_134\_Vertical

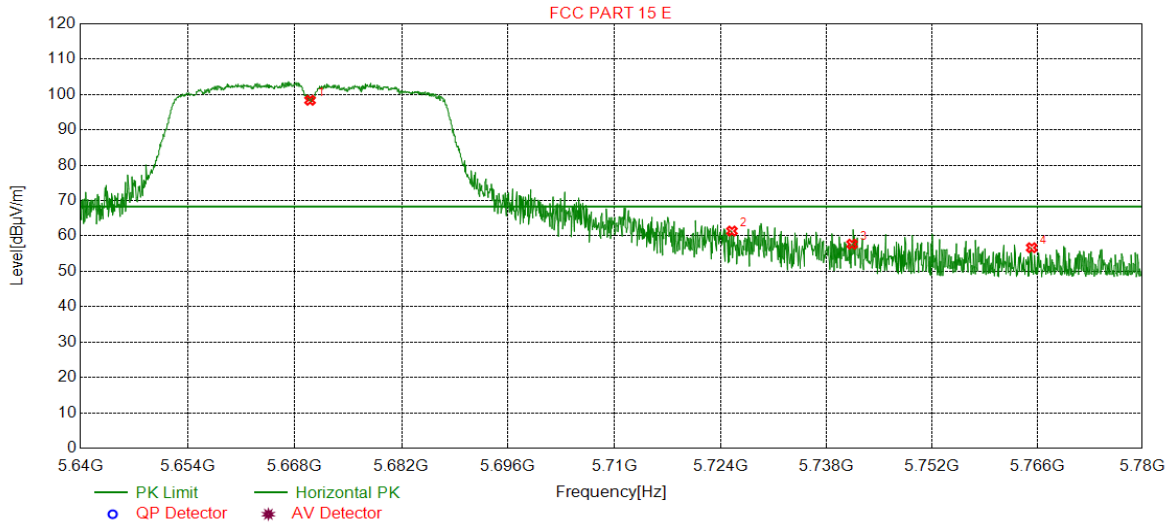


NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5670.0000	90.65	18.94	---	---	161	152	PK	Vertical
2	5725.0000	55.51	19.34	68.30	12.79	175	152	PK	Vertical
3	5745.0525	54.17	19.47	68.30	14.13	175	139	PK	Vertical
4	5765.2226	53.56	19.61	68.30	14.74	198	152	PK	Vertical





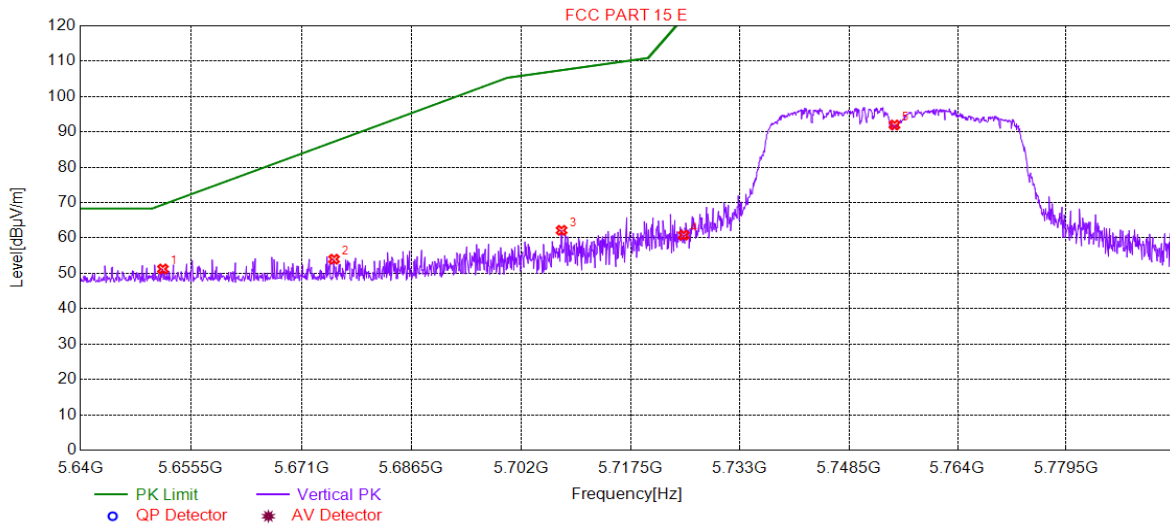
#### 4.3.1.20 11AC40\_MIMO\_134\_Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5670.0000	98.37	18.94	---	---	245	32	PK	Horizontal
2	5725.5128	61.39	19.34	68.30	6.91	225	344	PK	Horizontal
3	5741.4107	57.69	19.45	68.30	10.61	194	2	PK	Horizontal
4	5765.2926	56.68	19.61	68.30	11.62	100	344	PK	Horizontal



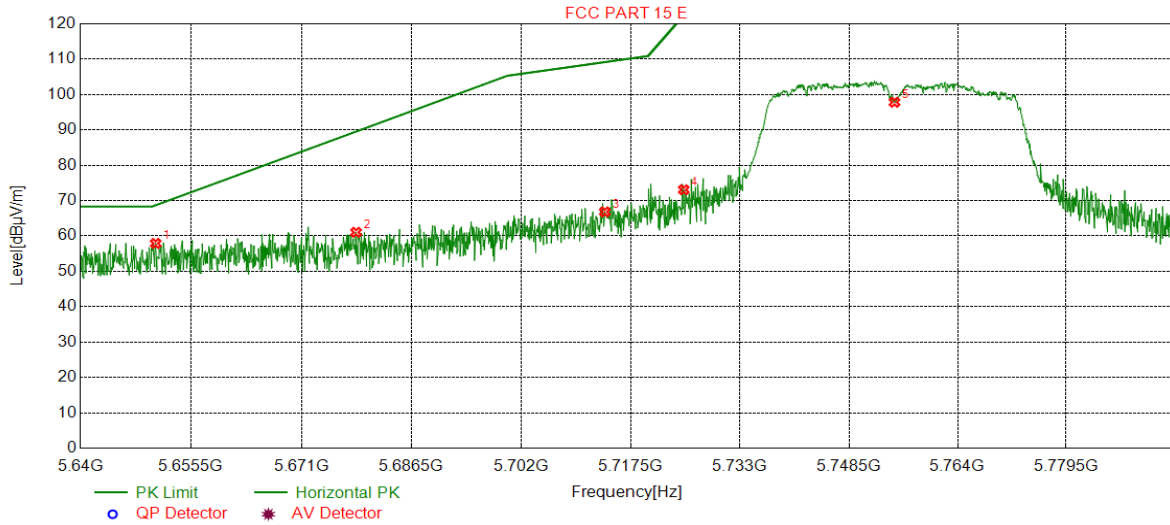
## 4.3.1.21 11AC40\_MIMO\_151\_Vertical



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5651.5533	51.23	18.79	69.45	18.22	196	158	PK	Vertical
2	5675.5903	54.00	18.98	87.24	33.24	163	153	PK	Vertical
3	5707.6913	62.16	19.22	107.45	45.29	297	144	PK	Vertical
4	5725.0000	60.80	19.34	---	---	272	29	PK	Vertical
5	5755.0000	91.95	19.54	---	---	287	153	PK	Vertical



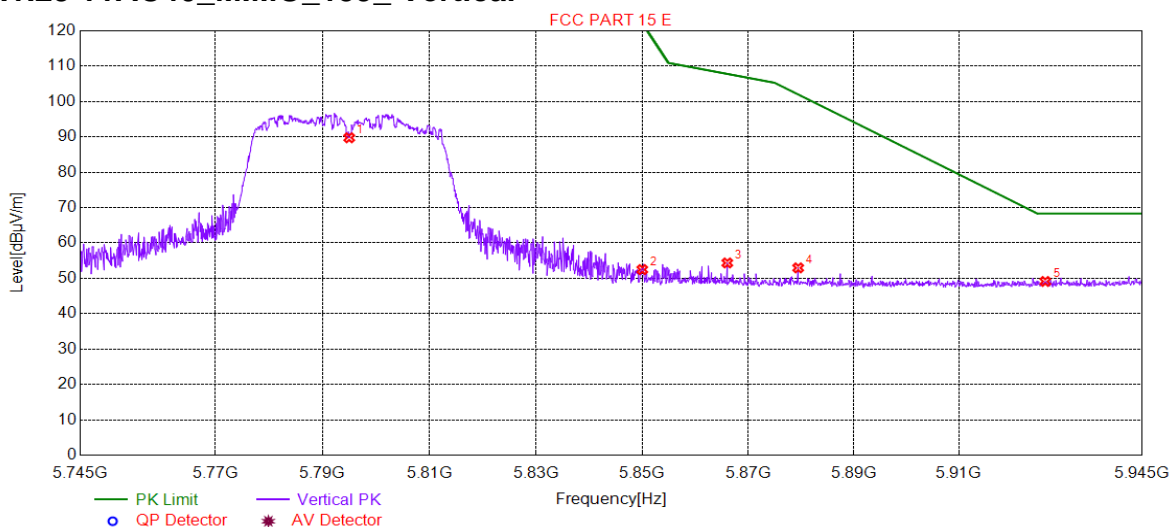
#### 4.3.1.22 11AC40\_MIMO\_151\_Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5650.5453	57.91	18.78	68.70	10.79	188	344	PK	Horizontal
2	5678.6918	61.04	19.00	89.53	28.49	237	344	PK	Horizontal
3	5713.8169	66.82	19.26	109.17	42.35	162	344	PK	Horizontal
4	5725.0000	73.08	19.34	---	---	189	26	PK	Horizontal
5	5755.0000	97.81	19.54	---	---	110	22	PK	Horizontal



## 4.3.1.23 11AC40\_MIMO\_159\_Vertical

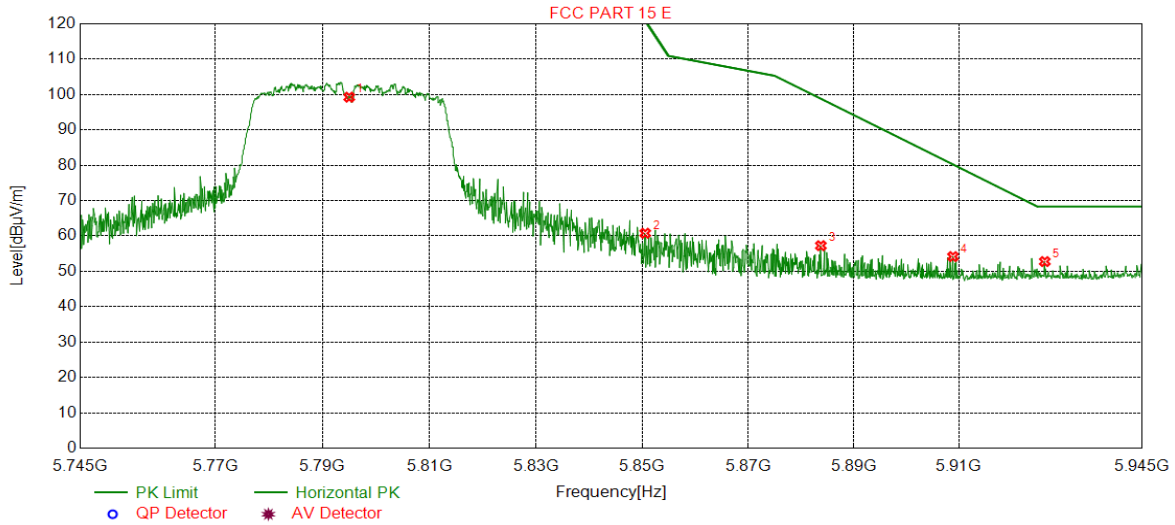


NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5795.0000	89.75	19.81	---	---	156	191	PK	Vertical
2	5850.0000	52.48	19.74	122.18	69.70	184	121	PK	Vertical
3	5866.0605	54.36	19.71	107.80	53.44	151	149	PK	Vertical
4	5879.4672	52.96	19.68	101.99	49.03	269	149	PK	Vertical
5	5926.4907	49.13	19.86	68.30	19.17	275	256	PK	Vertical





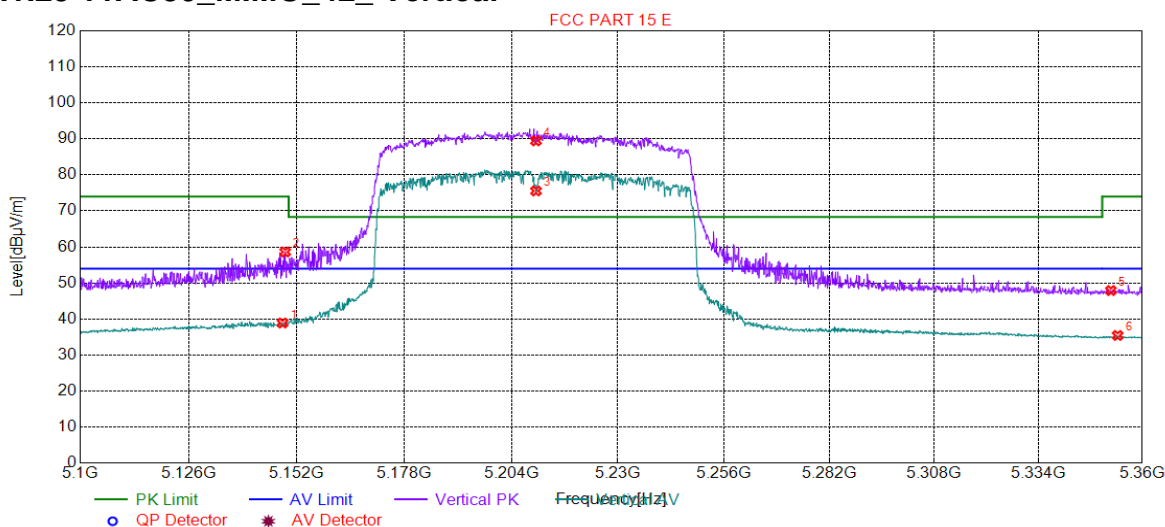
#### 4.3.1.24 11AC40\_MIMO\_159\_Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5795.0000	99.25	19.81	---	---	231	17	PK	Horizontal
2	5850.5528	60.78	19.74	121.04	60.26	161	13	PK	Horizontal
3	5883.7694	57.26	19.67	98.81	41.55	172	26	PK	Horizontal
4	5908.8819	54.18	19.71	80.23	26.05	228	50	PK	Horizontal
5	5926.3907	52.77	19.86	68.30	15.53	230	17	PK	Horizontal



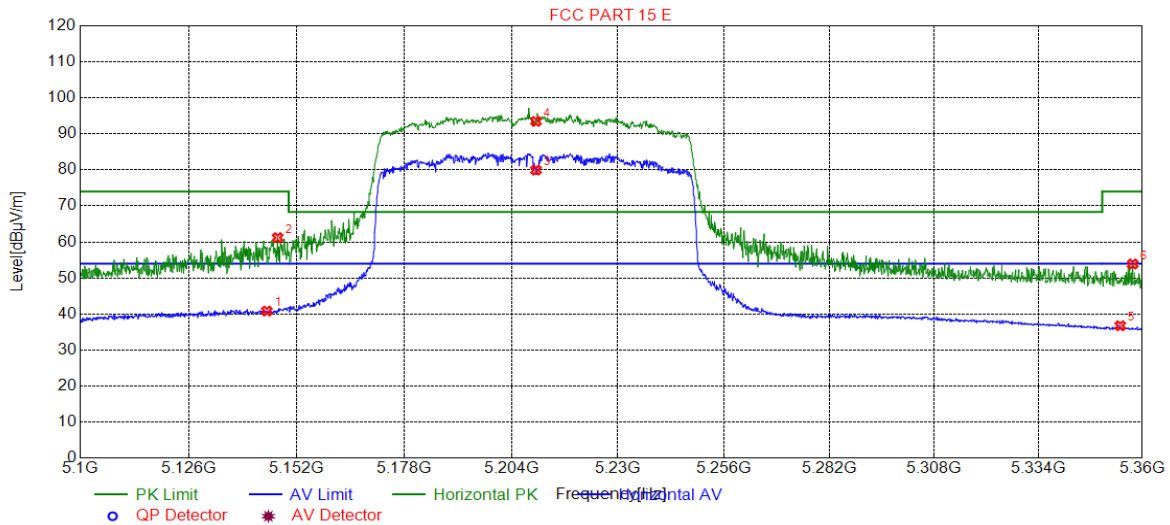
## 4.3.1.25 11AC80\_MIMO\_42\_Vertical



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5148.5143	38.89	17.91	54.00	15.11	276	70	AV	Vertical
2	5149.1646	58.61	17.91	74.00	15.39	171	181	PK	Vertical
3	5210.0000	75.55	18.05	---	---	213	241	AV	Vertical
4	5210.0000	89.46	18.05	---	---	293	98	PK	Vertical
5	5352.1961	47.90	18.45	74.00	26.10	297	351	PK	Vertical
6	5353.8869	35.43	18.45	54.00	18.57	201	255	AV	Vertical



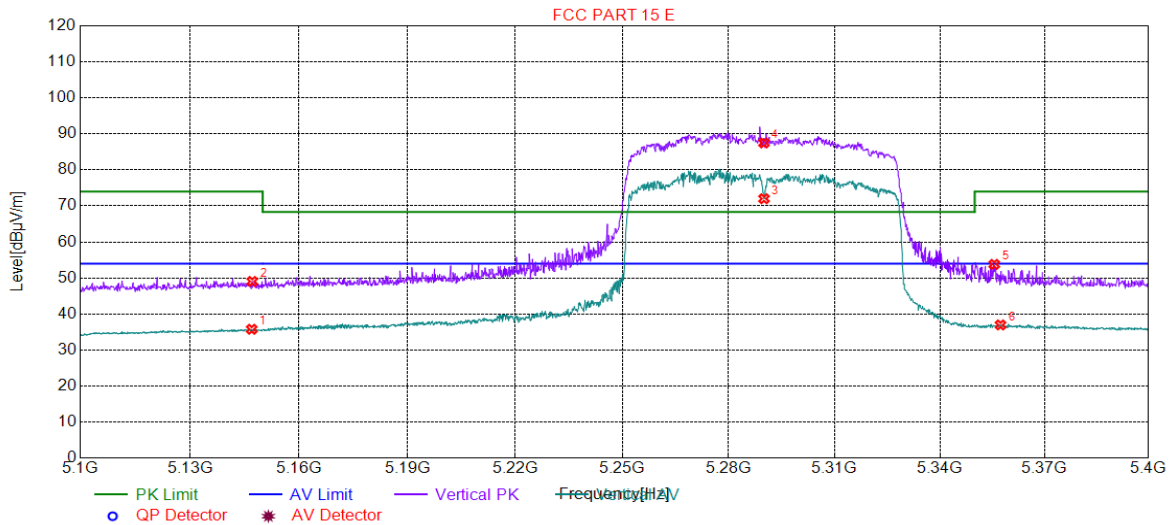
## 4.3.1.26 11AC80\_MIMO\_42\_Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5144.7424	40.81	17.90	54.00	13.19	165	338	AV	Horizontal
2	5147.3437	61.18	17.91	74.00	12.82	195	331	PK	Horizontal
3	5210.0000	79.95	18.05	---	---	199	104	AV	Horizontal
4	5210.0000	93.46	18.05	---	---	179	111	PK	Horizontal
5	5354.5373	36.74	18.46	54.00	17.26	175	36	AV	Horizontal
6	5357.6588	53.88	18.47	74.00	20.12	205	29	PK	Horizontal



## 4.3.1.27 11AC80\_MIMO\_58\_Vertical

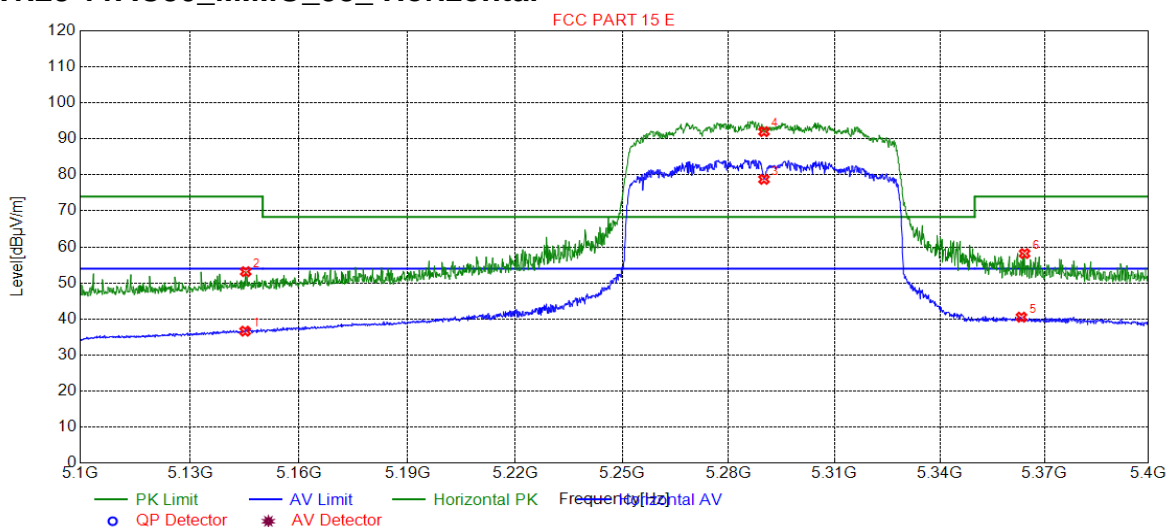


NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5146.9735	35.76	17.91	54.00	18.24	233	57	AV	Vertical
2	5147.1236	49.04	17.91	74.00	24.96	239	64	PK	Vertical
3	5290.0000	72.00	18.23	---	---	288	147	AV	Vertical
4	5290.0000	87.48	18.23	---	---	217	64	PK	Vertical
5	5355.5778	53.78	18.46	74.00	20.22	236	195	PK	Vertical
6	5357.3787	36.96	18.47	54.00	17.04	169	71	AV	Vertical





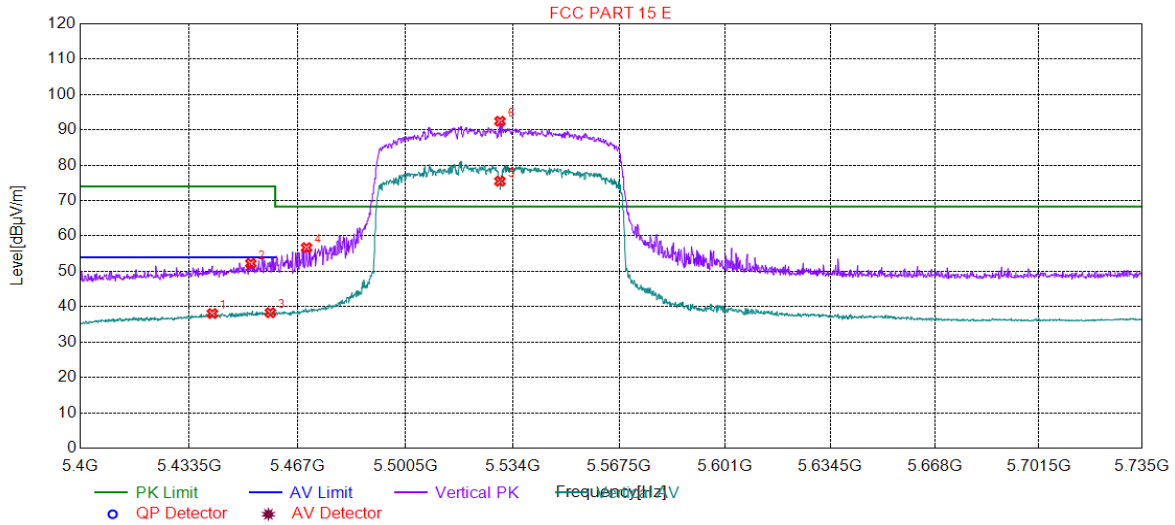
## 4.3.1.28 11AC80\_MIMO\_58\_Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5145.1726	36.62	17.90	54.00	17.38	121	331	AV	Horizontal
2	5145.3227	53.14	17.90	74.00	20.86	206	338	PK	Horizontal
3	5290.0000	78.77	18.23	---	---	248	97	AV	Horizontal
4	5290.0000	92.00	18.23	---	---	249	20	PK	Horizontal
5	5363.3817	40.51	18.49	54.00	13.49	129	104	AV	Horizontal
6	5364.2821	58.17	18.49	74.00	15.83	133	97	PK	Horizontal



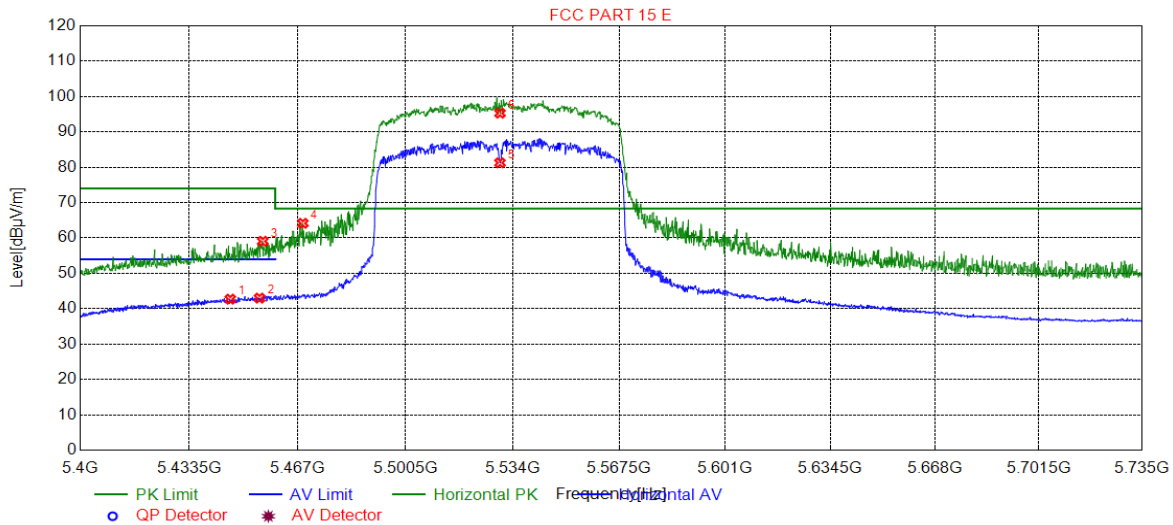
#### 4.3.1.29 11AC80\_MIMO\_106\_Vertical



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5440.5553	38.07	18.57	54.00	15.93	206	180	AV	Vertical
2	5452.4537	52.25	18.55	74.00	21.75	292	16	PK	Vertical
3	5458.4867	38.32	18.54	54.00	15.68	180	63	AV	Vertical
4	5469.7149	56.71	18.52	68.30	11.59	265	180	PK	Vertical
5	5530.0000	75.48	18.45	---	---	243	194	AV	Vertical
6	5530.0000	92.45	18.45	---	---	198	194	PK	Vertical



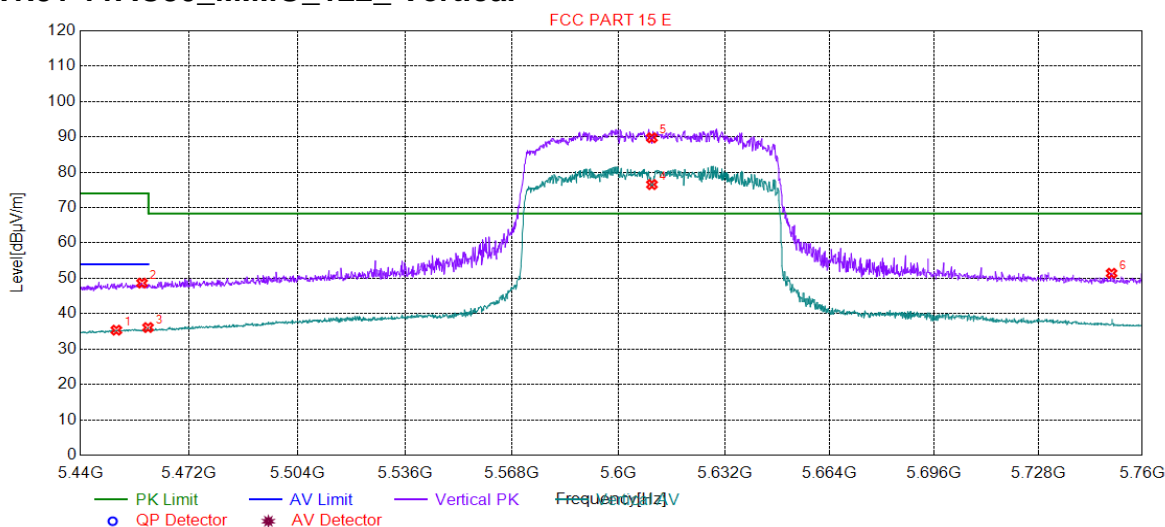
## 4.3.1.30 11AC80\_MIMO\_106\_Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5446.0855	42.71	18.56	54.00	11.29	227	42	AV	Horizontal
2	5455.1351	43.00	18.54	54.00	11.00	124	42	PK	Horizontal
3	5456.1406	59.07	18.54	74.00	14.93	137	35	AV	Horizontal
4	5468.5418	64.16	18.52	68.30	4.14	123	89	PK	Horizontal
5	5530.0000	81.25	18.45	---	---	130	29	AV	Horizontal
6	5530.0000	95.30	18.45	---	---	170	35	PK	Horizontal



## 4.3.1.31 11AC80\_MIMO\_122\_Vertical

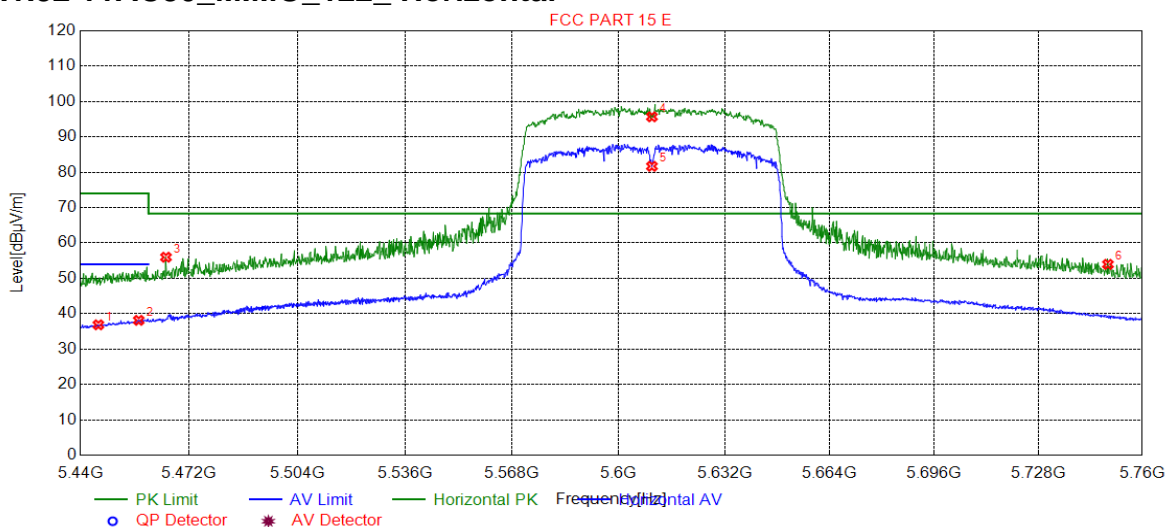


NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5450.5653	35.35	18.55	54.00	18.65	230	180	AV	Vertical
2	5458.0890	48.66	18.54	74.00	25.34	226	201	PK	Vertical
3	5459.8499	36.10	18.53	54.00	17.90	225	64	AV	Vertical
4	5610.0000	76.52	18.47	---	---	266	153	AV	Vertical
5	5610.0000	89.74	18.47	---	---	236	180	AV	Vertical
6	5750.5553	51.44	19.51	68.30	16.86	286	29	PK	Vertical





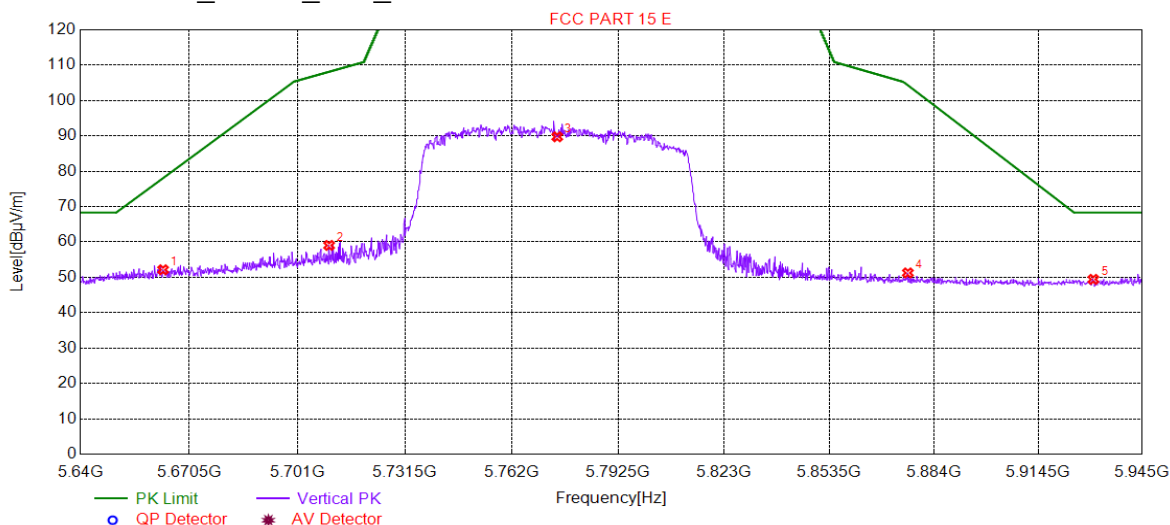
## 4.3.1.32 11AC80\_MIMO\_122\_Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5445.2826	36.86	18.56	54.00	17.14	190	42	AV	Horizontal
2	5457.1286	38.13	18.54	54.00	15.87	133	42	AV	Horizontal
3	5465.1326	55.98	18.53	68.30	12.32	175	42	PK	Horizontal
4	5610.0000	95.68	18.47	---	---	110	2	PK	Horizontal
5	5610.0000	81.68	18.47	---	---	107	8	AV	Horizontal
6	5749.4347	53.96	19.50	68.30	14.34	232	344	PK	Horizontal



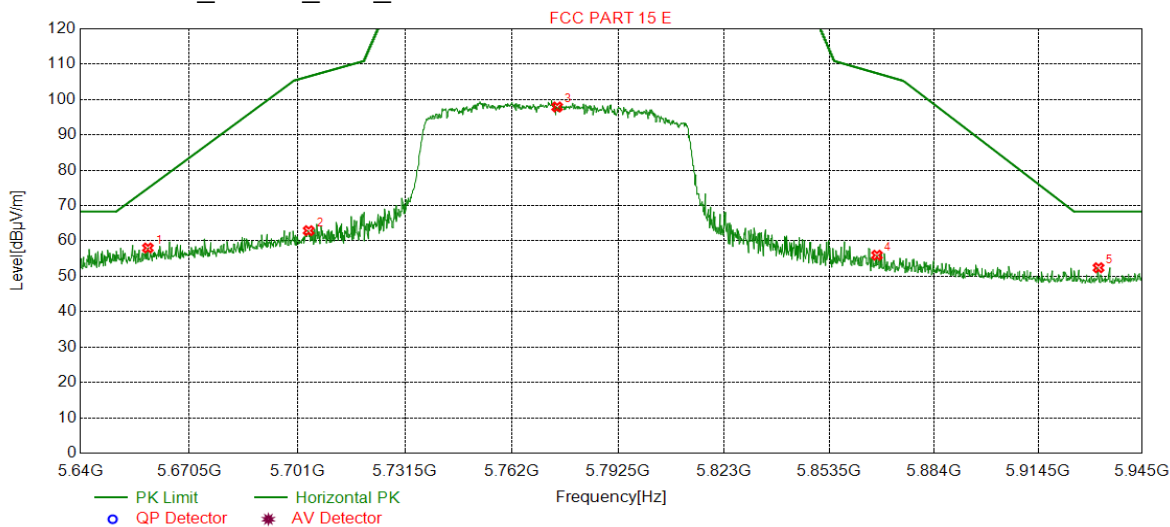
## 4.3.1.33 11AC80\_MIMO\_155\_Vertical



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5663.1916	52.15	18.88	78.06	25.91	195	167	PK	Vertical
2	5710.0325	59.04	19.24	108.11	49.07	185	154	PK	Vertical
3	5775.0000	89.74	19.67	---	---	207	260	PK	Vertical
4	5876.3407	51.26	19.69	104.31	53.05	259	154	PK	Vertical
5	5930.6578	49.43	19.90	68.30	18.87	154	213	PK	Vertical



## 4.3.1.34 11AC80\_MIMO\_155\_Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	5658.9195	58.03	18.85	74.90	16.87	163	26	PK	Horizontal
2	5704.2346	62.91	19.20	106.49	43.58	189	1	PK	Horizontal
3	5775.0000	97.89	19.67	---	---	144	22	PK	Horizontal
4	5867.3387	55.98	19.71	107.45	51.47	216	22	PK	Horizontal
5	5932.1836	52.43	19.91	68.30	15.87	185	81	PK	Horizontal

## Remark:

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

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

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



## 4.4 Dynamic Frequency Selection

### 4.4.1 DFS Overview

**Table 1: Applicability of DFS Requirements Prior to Use of a Channel**

Requirement	Operational Mode		
	Master	Client Without Radar Detection	Client With Radar Detection
<i>Non-Occupancy Period</i>	Yes	Not required	Yes
<i>DFS Detection Threshold</i>	Yes	Not required	Yes
<i>Channel Availability Check Time</i>	Yes	Not required	Not required
<i>U-NII Detection Bandwidth</i>	Yes	Not required	Yes

**Table 2: Applicability of DFS requirements during normal operation**

Requirement	Operational Mode	
	Master Device or Client with Radar Detection	Client Without Radar Detection
<i>DFS Detection Threshold</i>	Yes	Not required
<i>Channel Closing Transmission Time</i>	Yes	Yes
<i>Channel Move Time</i>	Yes	Yes
<i>U-NII Detection Bandwidth</i>	Yes	Not required
<b>Additional requirements for devices with multiple bandwidth modes</b>	<b>Master Device or Client with Radar Detection</b>	<b>Client Without Radar Detection</b>
<i>U-NII Detection Bandwidth and Statistical Performance Check</i>	All BW modes must be tested	Not required
<i>Channel Move Time and Channel Closing Transmission Time</i>	Test using widest BW mode available	Test using the widest BW mode available for the link
<i>All other tests</i>	Any single BW mode	Not required
<b>Note:</b> Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.		





#### 4.4.2 DFS Detection Thresholds

**Table 3: DFS Detection Thresholds for Master Devices and Client Devices with Radar Detection**

Maximum Transmit Power	Value (See Notes 1, 2, and 3)
EIRP $\geq$ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm
<p><b>Note 1:</b> This is the level at the input of the receiver assuming a 0 dBi receive antenna.</p> <p><b>Note 2:</b> Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.</p> <p><b>Note3:</b> EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.</p>	

#### 4.4.3 Response Requirements

**Table 4: DFS Response Requirement Values**

Parameter	Value
<i>Non-occupancy period</i>	Minimum 30 minutes
<i>Channel Availability Check Time</i>	60 seconds
<i>Channel Move Time</i>	10 seconds See Note 1.
<i>Channel Closing Transmission Time</i>	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
<i>U-NII Detection Bandwidth</i>	Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.
<p><b>Note 1:</b> <i>Channel Move Time</i> and the <i>Channel Closing Transmission Time</i> should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.</p> <p><b>Note 2:</b> The <i>Channel Closing Transmission Time</i> is comprised of 200 milliseconds starting at the beginning of the <i>Channel Move Time</i> plus any additional intermittent control signals required to facilitate a <i>Channel</i> move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.</p> <p><b>Note 3:</b> During the <i>U-NII Detection Bandwidth</i> detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.</p>	

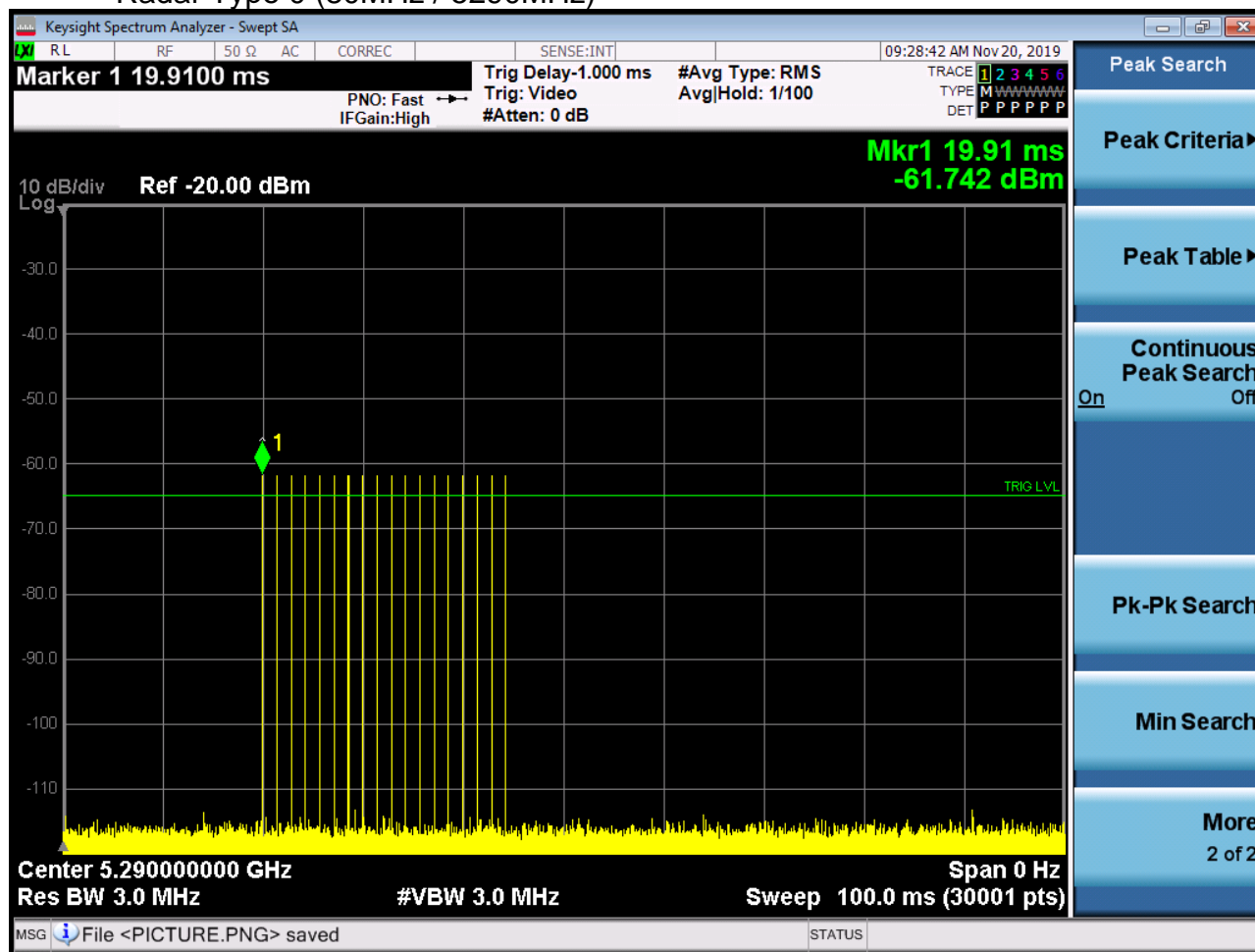


#### 4.4.4 Test plots

Remark: Only the data of Ant.1 is recorded.

##### 4.4.4.1 Radar Waveform Calibration Result

Radar Type 0 (80MHz / 5290MHz)

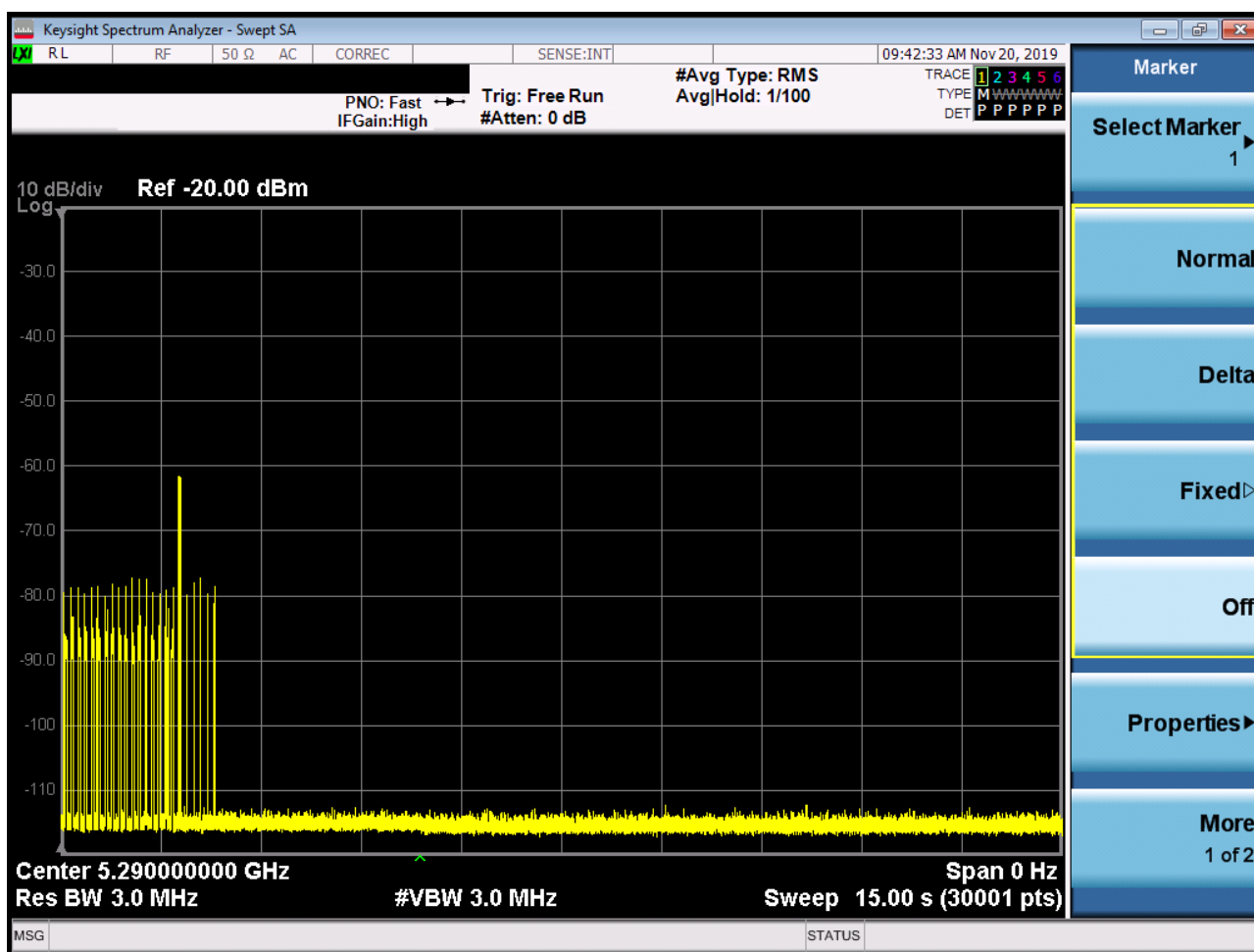


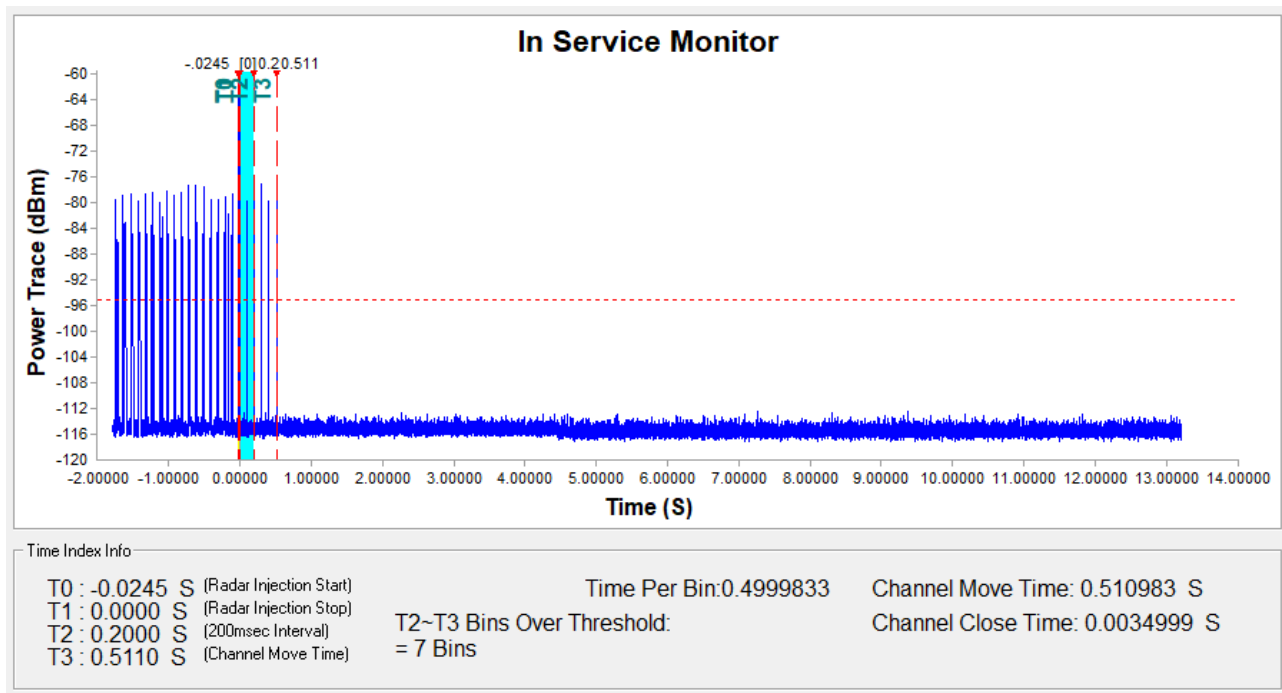
#### 4.4.5 Test Data:

BW/Channel	Test Item	Test Result	Limit	Results
80MHz / 5290MHz	Channel Move Time	0.511s	<10s	Pass
	Channel Closing Transmission Time	3.499ms	<60ms	Pass

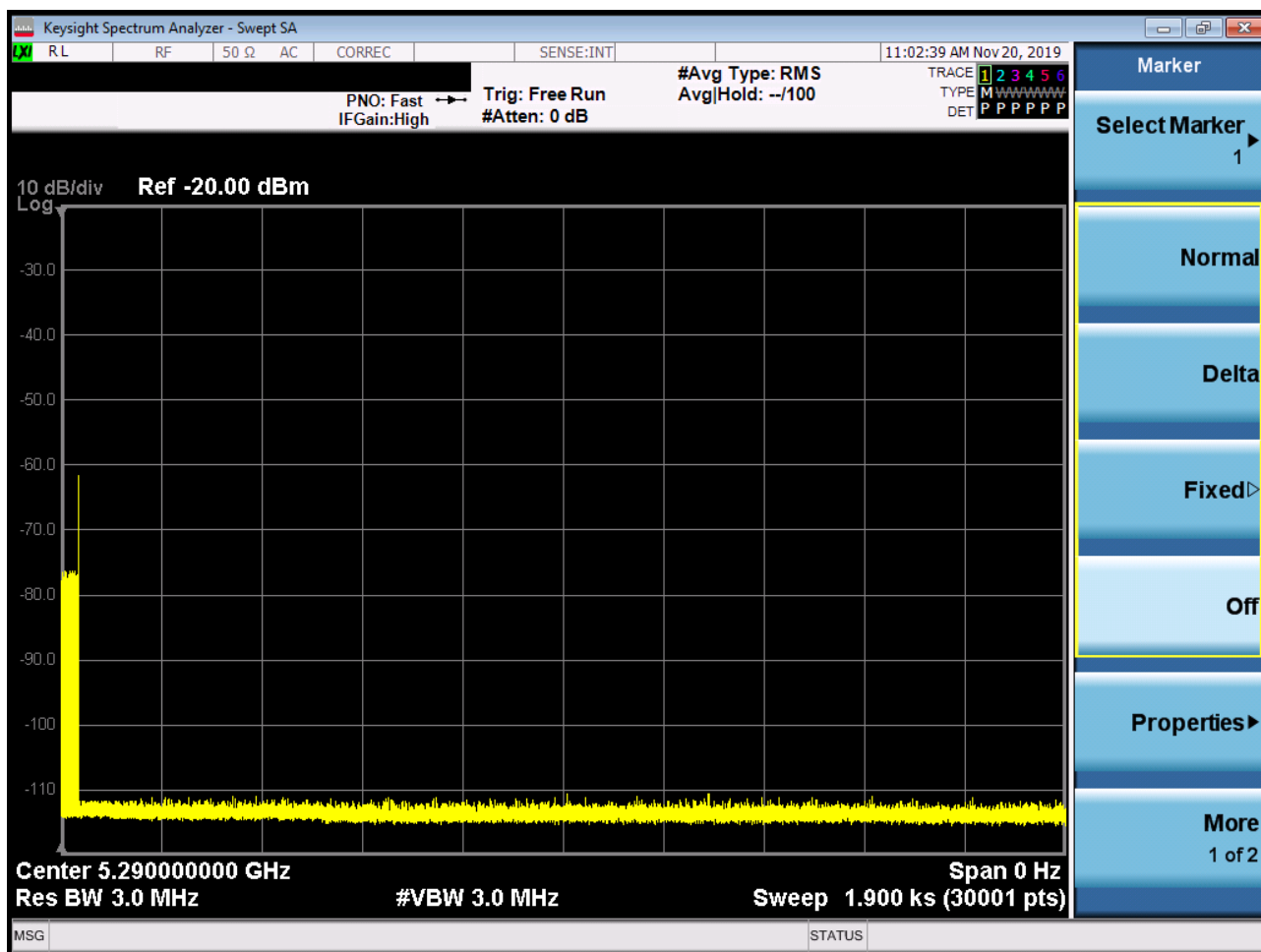
#### 4.4.5.1 Test plots

#### 4.4.5.1.1 Test Bandwidth/Channel= 80MHz / 5290MHz









## 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)



## 6 Equipment List

RF conducted test					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (yyyy-mm-dd)	Cal. Due date (yyyy-mm-dd)
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2019/7/14	2020/7/14
Signal Analyzer	Rohde & Schwarz	FSV	W025-05	2019/3/2	2020/3/1
Coaxial Cable	SGS	N/A	SEM031-01	2019/6/12	2020/6/11
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2019/7/14	2020/7/14
Temperature Chamber	GIANT FORCE	ICT-150-40-CP-AR	W027-03	2018/11/27	2019/11/27
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2019/7/14	2020/7/14
Master Device	Linksys pte.Ltd	WRT32X	FCC ID:Q87-WRT3200ACM IC ID:3839A-WRT3200ACM	N/A	N/A

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	2018-12-16	2019-12-15
				2019-12-06	2020-12-05
Measurement Software	Tonscend	TS+ CE V2.5	XAW02-05-02	NCR	NCR



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	2019-06-27	2020-06-26
Spectrum Analyzer	Keysight	N9020B	XAW01-11-03	2019-06-28	2020-06-27
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	2018-12-10	2019-12-09
				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	2018-12-16	2019-12-15
				2019-12-06	2020-12-05
Measurement Software	Tonscend	TS+ RSE V3.0.0.2	XAW02-05-01	NCR	NCR

## 7 Photographs - EUT Test Setup Details

Refer to Appendix A - Photographs of Set-Up for ZR/2019/90020.

The End