



FCC TEST REPORT

FCC ID: 2AAD8-U1233

On Behalf of

HAOLIYUAN (SHENZHEN) ELECTRONIC CO., LTD

802.11ac Wireless USB Adapter

Model No.: U1233, WU1200

Prepared for : HAOLIYUAN (SHENZHEN) ELECTRONIC CO., LTD
Address : 3/F, Building A1, Junfeng Industrial Park Yonghe Road,
Fuyong, Bao'an District, Shenzhen, Guangdong, China

Prepared By : Shenzhen Alpha Product Testing Co., Ltd.
Address : Building i, No.2, Lixin Road, Fuyong Street, Bao'an
District, 518103, Shenzhen, Guangdong, China

Report Number : T1905010-C01-R03
Date of Receipt : May 09, 2019
Date of Test : May 09, 2019 - May 17, 2019
Date of Report : May 17, 2019
Version Number : V0

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TEST REPORT DECLARATION



Applicant : HAOLIYUAN (SHENZHEN) ELECTRONIC CO., LTD
 Address : 3/F, Building A1, Junfeng Industrial Park Yonghe Road, Fuyong,
 Bao'an District, Shenzhen, Guangdong, China
 Manufacturer : HAOLIYUAN (SHENZHEN) ELECTRONIC CO., LTD
 Address : 3/F, Building A1, Junfeng Industrial Park Yonghe Road, Fuyong,
 Bao'an District, Shenzhen, Guangdong, China
 EUT Description : 802.11ac Wireless USB Adapter
 (A) Model No. : U1233, WU1200
 (B) Trademark : N/A

Measurement Standard Used:
FCC CFR Title 47 Part 15 Subpart E Section 15.407
ANSI C63.10:2013

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits both conducted and radiated emissions. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After the test, our opinion is that EUT compliance with the requirement of the above standards.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....:	Ella Liang Project Engineer	
Approved by (name + signature).....:	Simple Guan Project Manager	
Date of issue.....	May 17, 2019	

Revision History

Revision	Issue Date	Revisions	Revised By
V0	May 17, 2019	Initial released Issue	Simple Guan

1 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	PASS
AC Power Line Conducted Emission	15.207	PASS
Peak Transmit Power	15.407(a)(1)	PASS
Power Spectral Density	15.407(a)(1)	PASS
Undesirable Emission	15.407(b)(6), 15.205/15.209	PASS
Radiated Emission	15.205/15.209	PASS
Band Edge	15.205	PASS
Frequency Stability	15.407(g)	PASS

Remark:

Pass: The EUT complies with the essential requirements in the standard.

Frequency Stability : The manufacturer stated in the user's manual.

1.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9kHz ~ 30MHz	± 4.34dB	(1)
Radiated Emission	30MHz ~ 1000MHz	± 4.24dB	(1)
Radiated Emission	1GHz ~ 40GHz	± 4.68dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	± 3.45dB	(1)

Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

Remark: Test according to ANSI C63.10:2013

2 General Information

2.1 General Description of EUT

Description	:	802.11ac Wireless USB Adapter
Model Number	:	U1233, WU1200
Diff	:	There is no difference between all the models, except the Appearance industrial design and model number, this report performs the model U1233.
Trademark	:	N/A
Test Voltage	:	DC 5V by SUB Port
Operation frequency	:	802.11a/n(HT20)/ac(HT20): 5180~5240MHz 802.11n(HT40)/ac(HT40): 5190~5230MHz 802.11ac(HT80): 5210MHz 802.11a/n(HT20)/ac(HT20): 20MHz;
Channel separation:	:	802.11n(HT40)/ac(HT40): 40MHz 802.11ac(HT80): 80MHz
Modulation type	:	CCK/OFDM/DBPSK/DAPSK
Antenna Type	:	ANT1: Internal Antenna, Maximum Gain is 2.0dBi ANT2: External Antenna, Maximum Gain is 5.0dBi
Software version	:	1030.28
Hardware version	:	V1.0

2.2 Test mode

Transmitting mode	Keep the EUT in transmitting with modulation. EUT was test with 99% duty cycle at its maximum power control level.
<i>Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.</i>	

Channel	Power level
Lowest	5dBm
Middle	5dBm
Highest	5dBm

2.3 Test Facility

Shenzhen Alpha Product Testing Co., Ltd

Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103, Shenzhen, Guangdong, China

June 21, 2018 File on Federal Communication Commission

Registration Number: 293961

July 25, 2017 Certificated by IC

Registration Number: 12135A

2.4 Accessories of Device (EUT)

Accessories1 : /
 Manufacturer : /
 Model : /
 Power supply : /

2.5 Tested Supporting System Details

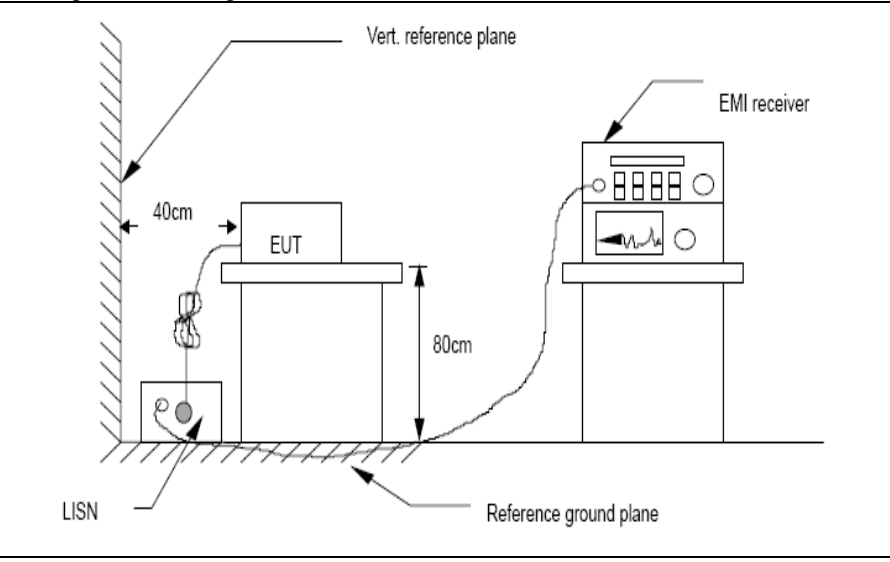
No.	Description	Manufacturer	Model	Serial Number	Certification or DOC
1	Notebook	ACER	ZQT	N/A	DOC

3 Test Instruments list

Equipment	Manufacture	Model No.	Serial No.	Last cal.	Cal Interval
9*6*6 anechoic chamber	CHENYU	9*6*6	N/A	2018.09.21	1Year
Spectrum analyzer	ROHDE&SCHW ARZ	FSU	1166.1660.26	2018.09.21	1Year
Receiver	ROHDE&SCHW ARZ	ESR	1316.3003K03- 102082-Wa	2018.09.21	1Year
Receiver	R&S	ESCI	101165	2018.09.21	1Year
Bilog Antenna	Schwarzbeck	VULB 9168	VULB9168-438	2018.04.13	2Year
Horn Antenna	SCHWARZBEC K	BBHA 9120 D	BBHA 9120 D(1201)	2018.04.13	2Year
Active Loop Antenna	SCHWARZBEC K	FMZB 1519B	00059	2018.09.26	2Year
Cable	Resenberger	N/A	No.1	2018.09.21	1Year
Cable	Resenberger	N/A	No.2	2018.09.21	1Year
Cable	Resenberger	N/A	No.3	2018.09.21	1Year
Pre-amplifier	HP	HP8347A	2834A00455	2018.09.21	1Year
Pre-amplifier	Agilent	8449B	3008A02664	2018.09.21	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	8126466	2018.09.21	1Year
L.I.S.N.#2	ROHDE&SCHW ARZ	ENV216	101043	2018.09.21	1 Year
20db Attenuator	ICPROBING	IATS1	82347	2018.09.21	1 Year
Horn Antenna	A-INFOMW	LB-180100-KF	J211020657	2018.09.21	2 Year
Preamplifier	SKET	LNPA_1840-50	SK2018101801	2018.09.21	1 Year
Power Meter	Agilent	E9300A	MY41496625	2018.09.21	1 Year
Temp. & Humid. Chamber	Weihuang	WHTH-1000-40- 880	100631	2018.9.11	1 Year
Switching Mode Power Supply	JUNKE	JK12010S	20140927-6	2018.09.11	1 Year

4 Test results and Measurement Data

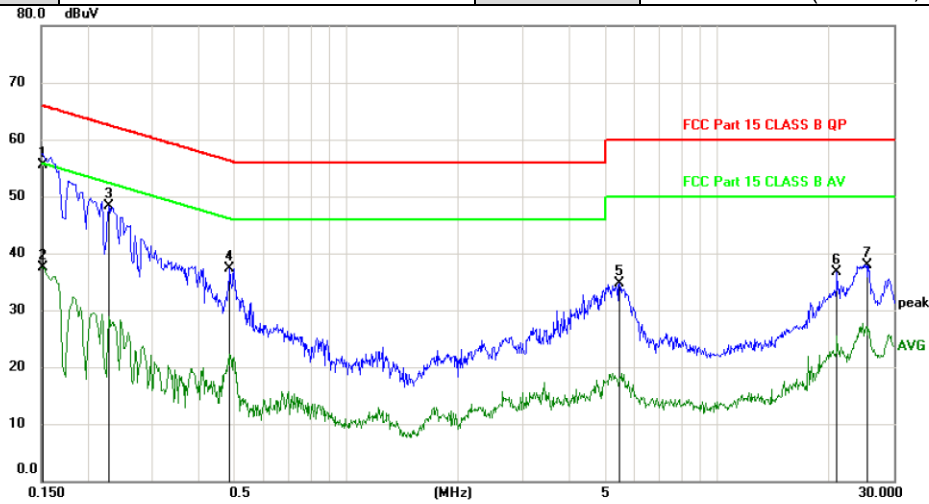
4.1 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207														
Test Method:	ANSI C63.10:2013														
Test Frequency Range:	150KHz to 30MHz														
Class / Severity:	Class B														
Receiver setup:	RBW=9KHz, VBW=30KHz														
Limit:	<table border="1"> <thead> <tr> <th rowspan="2">Frequency range (MHz)</th> <th colspan="2">Limit (dBuV)</th> </tr> <tr> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15-0.5</td> <td>66 to 56*</td> <td>56 to 46*</td> </tr> <tr> <td>0.5-5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5-30</td> <td>60</td> <td>50</td> </tr> </tbody> </table>	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
	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	The E.U.T and simulators are connected to the main power through a line impedance stabilization network(L.I.S.N.). The provide a 50ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs). Both sides of A.C. line are checked for maximum conducted interference. 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.														
Test setup:															
Test results:	Pass														

Measurement Data

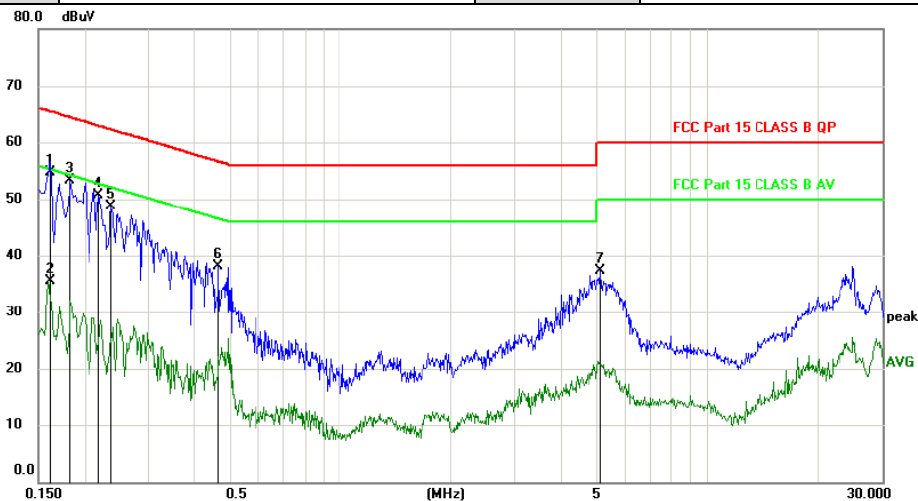
An initial pre-scan was performed on the line and neutral lines with peak detector. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

EUT Description	802.11ac Wireless USB Adapter	Model No.	U1233
Temperature	24°C	Humidity	56%
Pol	Line	Test date	2019/5/17
Test Voltage	AC 120V/60Hz	Test mode	802.11 ac20 (MID CH, ANT1+ANT2)



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measurement dBuV	Limit dBuV	Margin dB	Detector	Comment
1	*	0.1516	45.88	9.63	55.51	65.91	-10.40	QP	
2		0.1516	27.97	9.63	37.60	55.91	-18.31	AVG	
3		0.2280	38.69	9.65	48.34	62.52	-14.18	peak	
4		0.4858	27.60	9.68	37.28	56.24	-18.96	peak	
5		5.4569	24.56	10.08	34.64	60.00	-25.36	peak	
6		21.0505	26.55	10.18	36.73	60.00	-23.27	peak	
7		25.3440	27.61	10.33	37.94	60.00	-22.06	peak	

Pol	Neutral	Test date	2019/5/17
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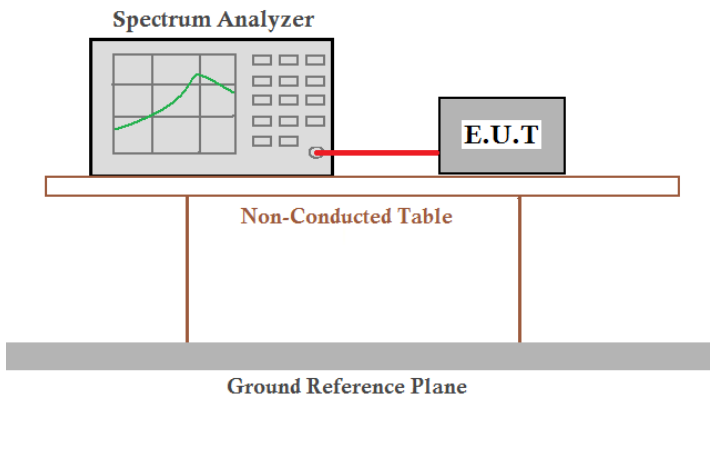


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measurement dBuV	Limit dBuV	Margin dB	Detector	Comment
1	*	0.1620	44.98	9.63	54.61	65.36	-10.75	QP	
2		0.1620	25.83	9.63	35.46	55.36	-19.90	AVG	
3		0.1829	43.72	9.64	53.36	64.35	-10.99	peak	
4		0.2190	41.06	9.65	50.71	62.86	-12.15	peak	
5		0.2368	39.08	9.65	48.73	62.21	-13.48	peak	
6		0.4650	28.37	9.68	38.05	56.60	-18.55	peak	
7		5.1180	27.26	10.06	37.32	60.00	-22.68	peak	

*:Maximum data x:Over limit !:over margin

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

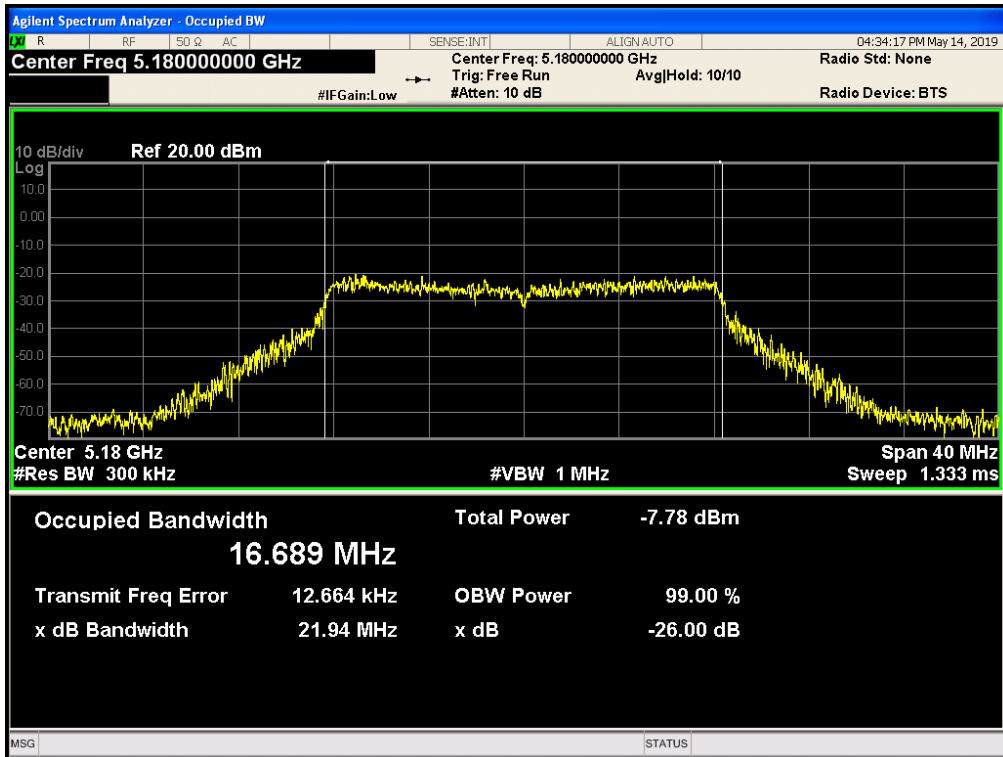
4.2 Emission Bandwidth and 99% Occupied Bandwidth

Test Requirement:	FCC Part15 E Section 15.407
Test Method:	KDB 789033 D02 General UNII Test Procedures New Rules v02r01
Limit:	N/A
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p>
Test procedure:	According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
Test results:	Pass

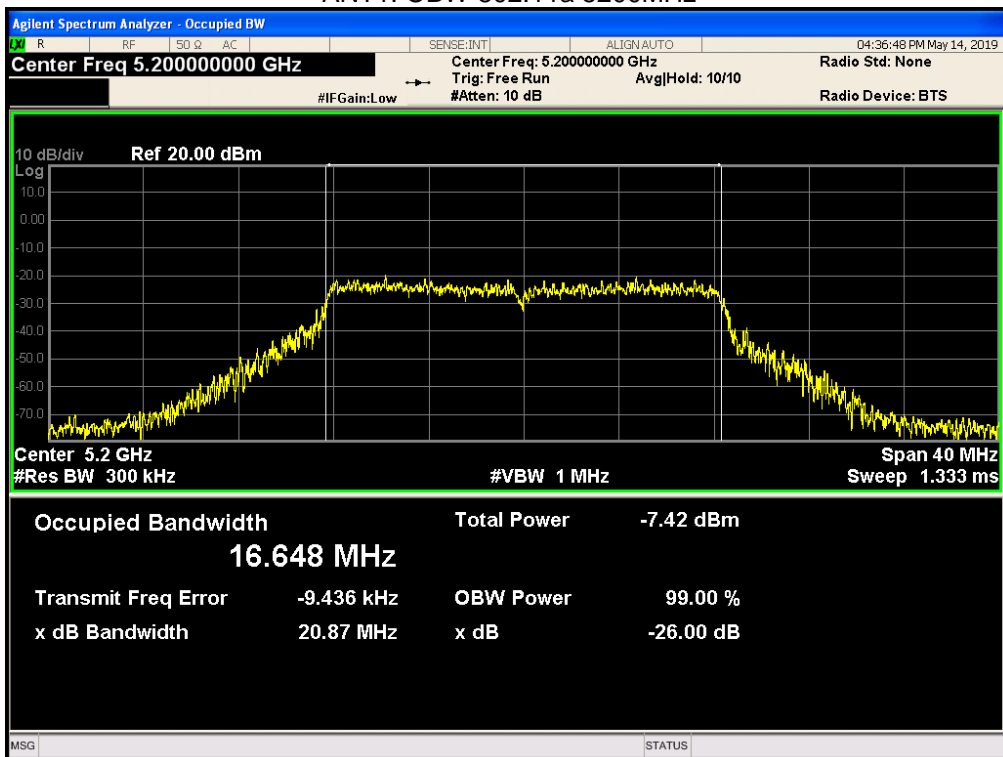
Measurement Data:

Condition	Mode	Frequency (MHz)	99% OBW (MHz)	-26 dB Bandwidth (MHz)	Limit -26 dB Bandwidth (MHz)	Verdict
ANT1	802.11a	5180	16.6887	16.6887	0	Pass
ANT1	802.11a	5200	16.6481	16.6481	0	Pass
ANT1	802.11a	5240	16.7629	16.7629	0	Pass
ANT2	802.11a	5180	16.7994	16.7994	0	Pass
ANT2	802.11a	5200	16.6035	16.6035	0	Pass
ANT2	802.11a	5240	16.7355	16.7355	0	Pass
ANT1	802.11ac20	5180	17.8635	17.8635	0	Pass
ANT1	802.11ac20	5200	17.8717	17.8717	0	Pass
ANT1	802.11ac20	5240	17.8769	17.8769	0	Pass
ANT2	802.11ac20	5180	17.8793	17.8793	0	Pass
ANT2	802.11ac20	5200	17.7785	17.7785	0	Pass
ANT2	802.11ac20	5240	17.8556	17.8556	0	Pass
ANT1	802.11ac40	5190	36.2211	36.2211	0	Pass
ANT1	802.11ac40	5230	36.0886	36.0886	0	Pass
ANT2	802.11ac40	5190	36.2128	36.2128	0	Pass
ANT2	802.11ac40	5230	36.1099	36.1099	0	Pass
ANT1	802.11ac80	5210	75.1897	75.1897	0	Pass
ANT2	802.11ac80	5210	75.176	75.176	0	Pass
ANT1	802.11n(HT20)	5180	17.8154	17.8154	0	Pass
ANT1	802.11n(HT20)	5200	17.8572	17.8572	0	Pass
ANT1	802.11n(HT20)	5240	17.8626	17.8626	0	Pass
ANT2	802.11n(HT20)	5180	17.8675	17.8675	0	Pass
ANT2	802.11n(HT20)	5200	17.7785	17.7785	0	Pass
ANT2	802.11n(HT20)	5240	17.8953	17.8953	0	Pass
ANT1	802.11n(HT40)	5190	36.247	36.247	0	Pass
ANT1	802.11n(HT40)	5230	36.0886	36.0886	0	Pass
ANT2	802.11n(HT40)	5190	36.2016	36.2016	0	Pass
ANT2	802.11n(HT40)	5230	35.9234	35.9234	0	Pass

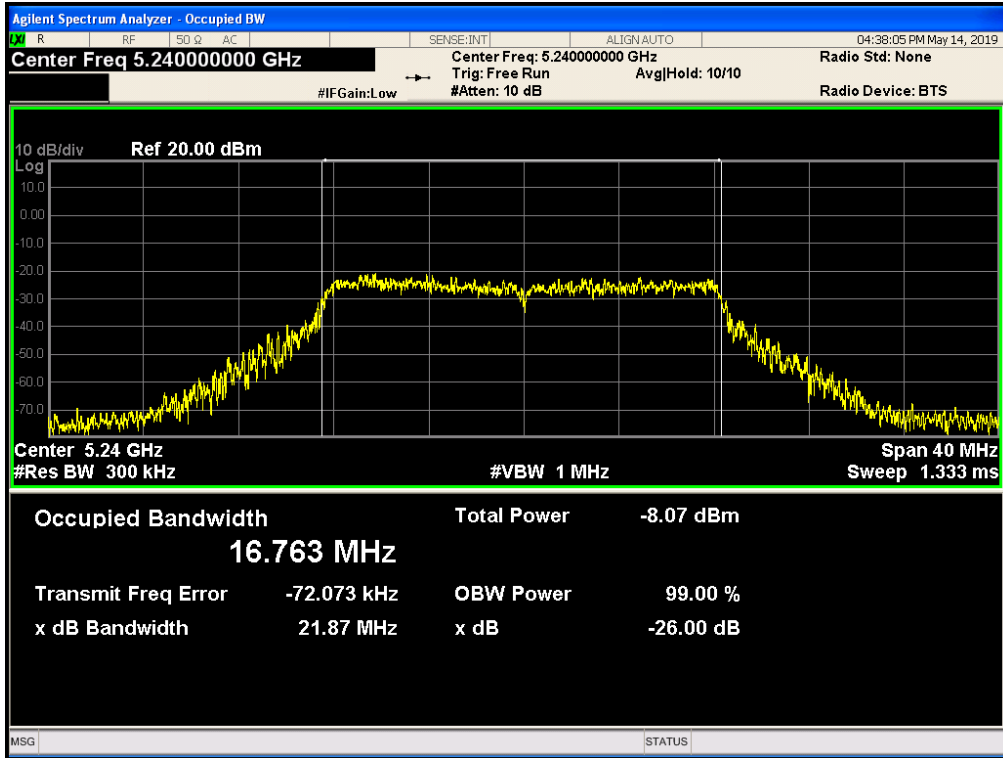
ANT1: OBW 802.11a 5180MHz



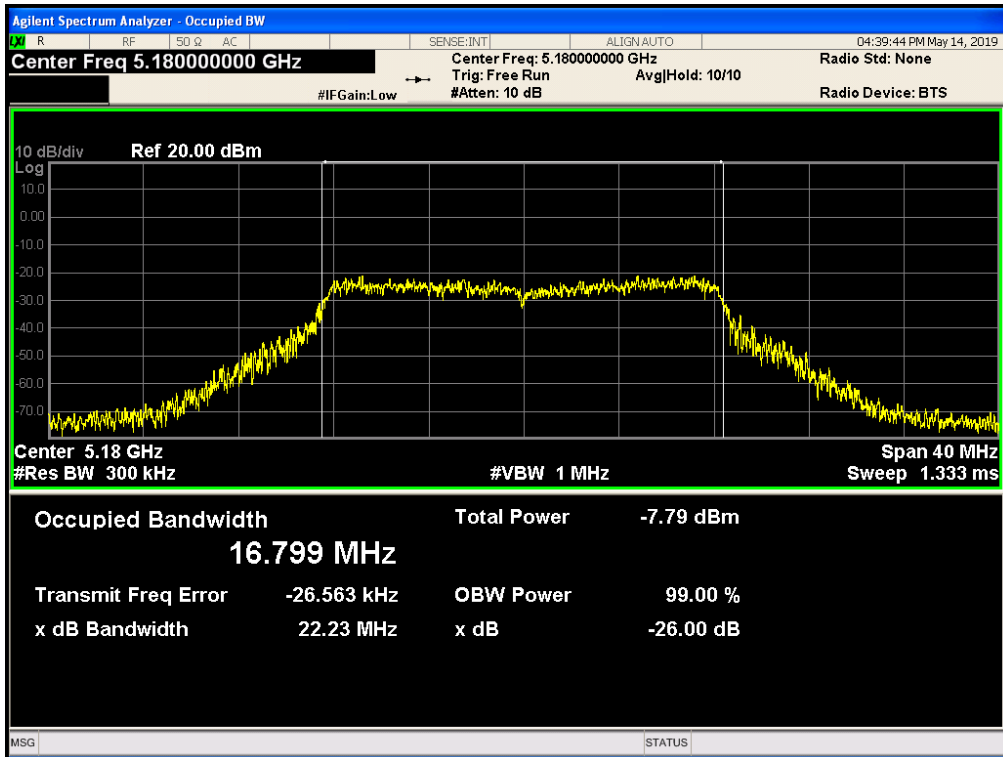
ANT1: OBW 802.11a 5200MHz



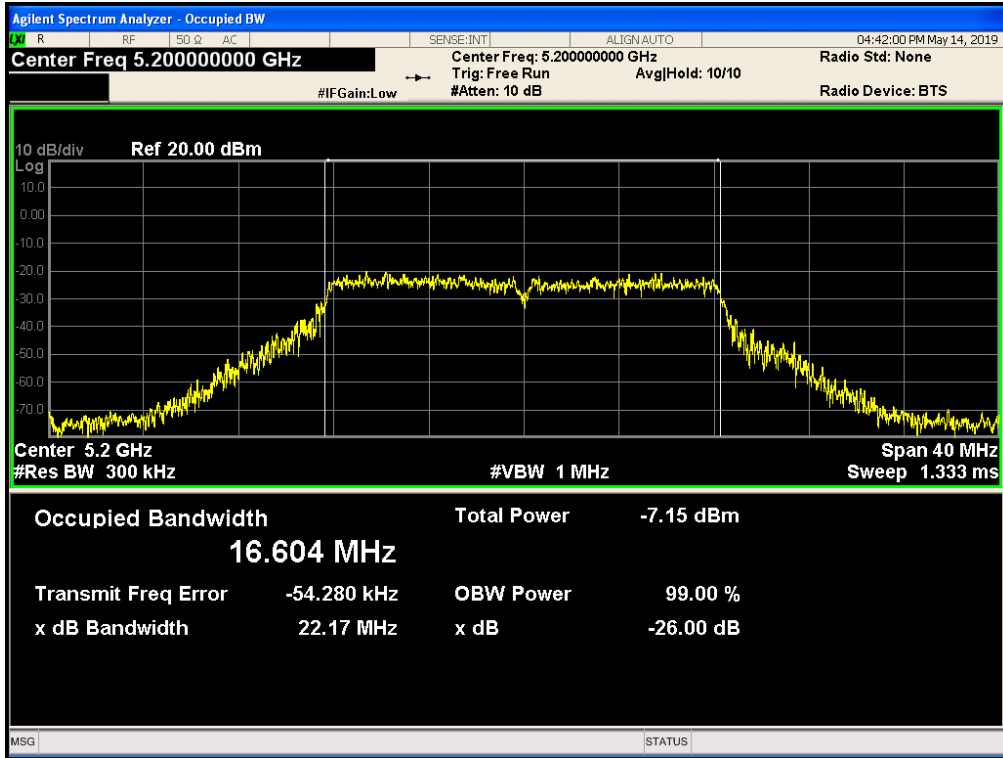
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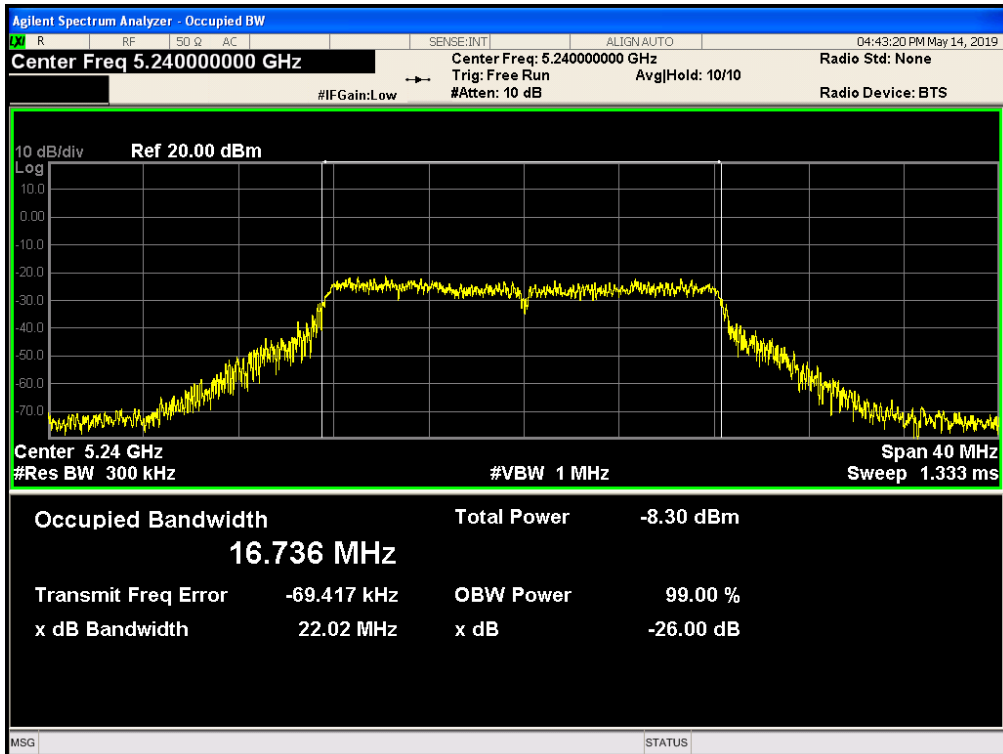
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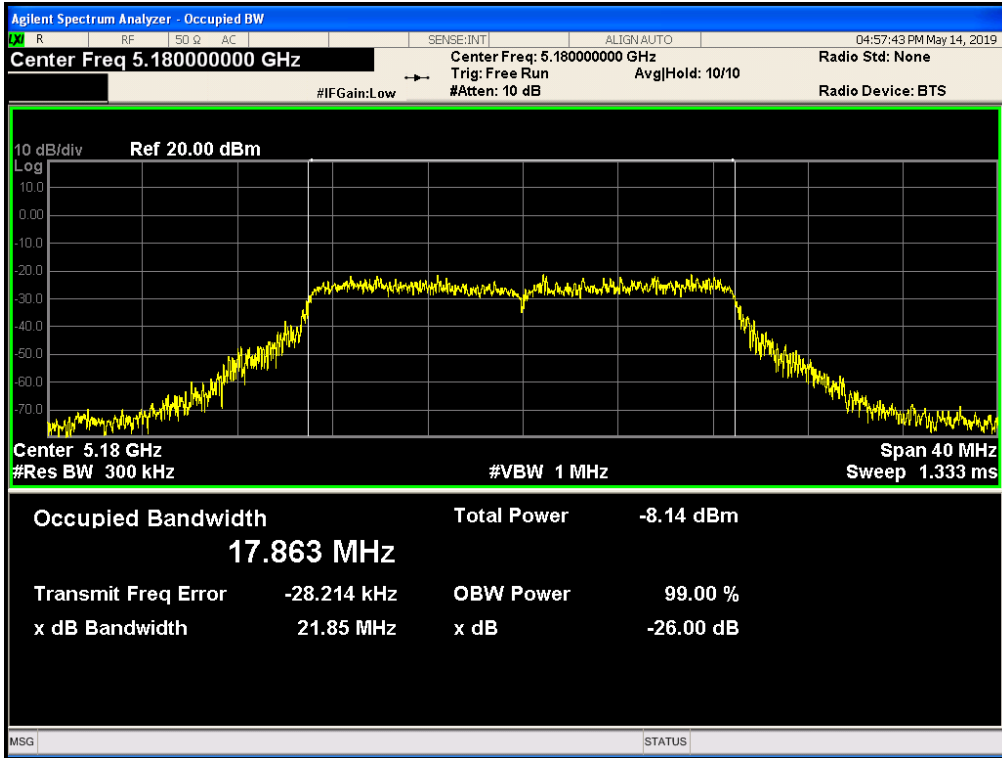
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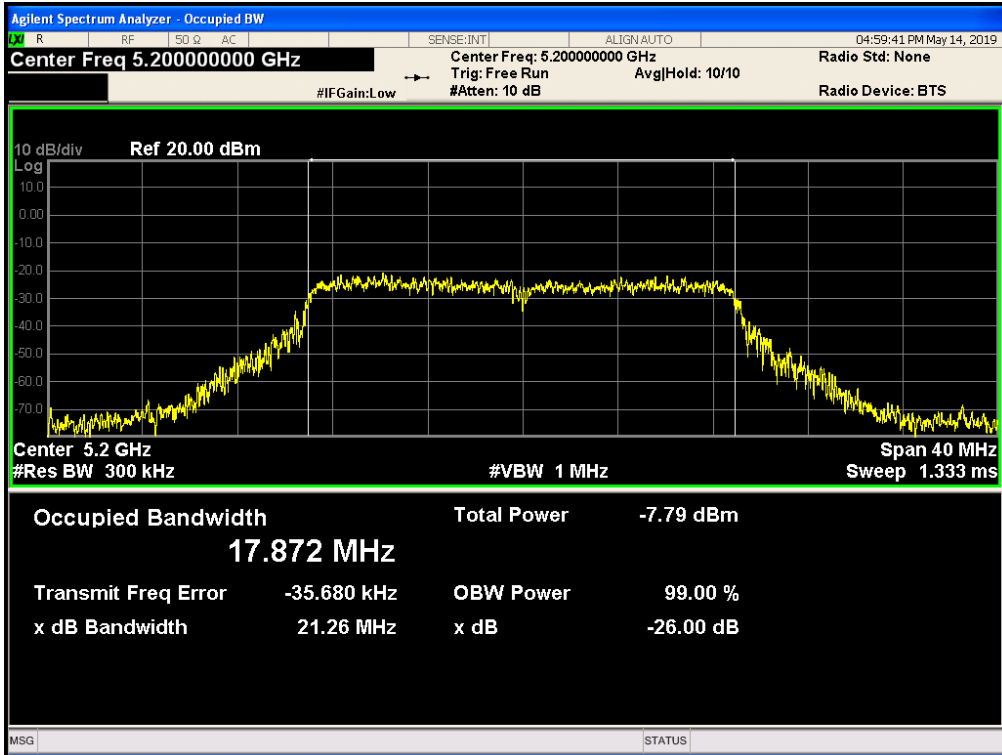
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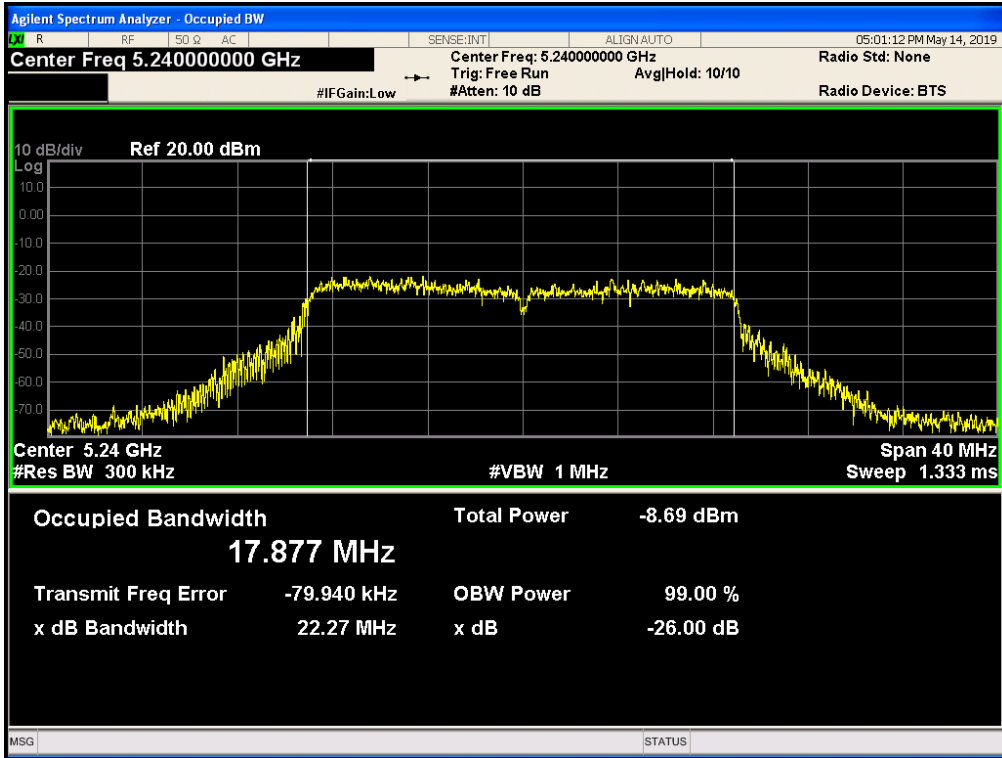
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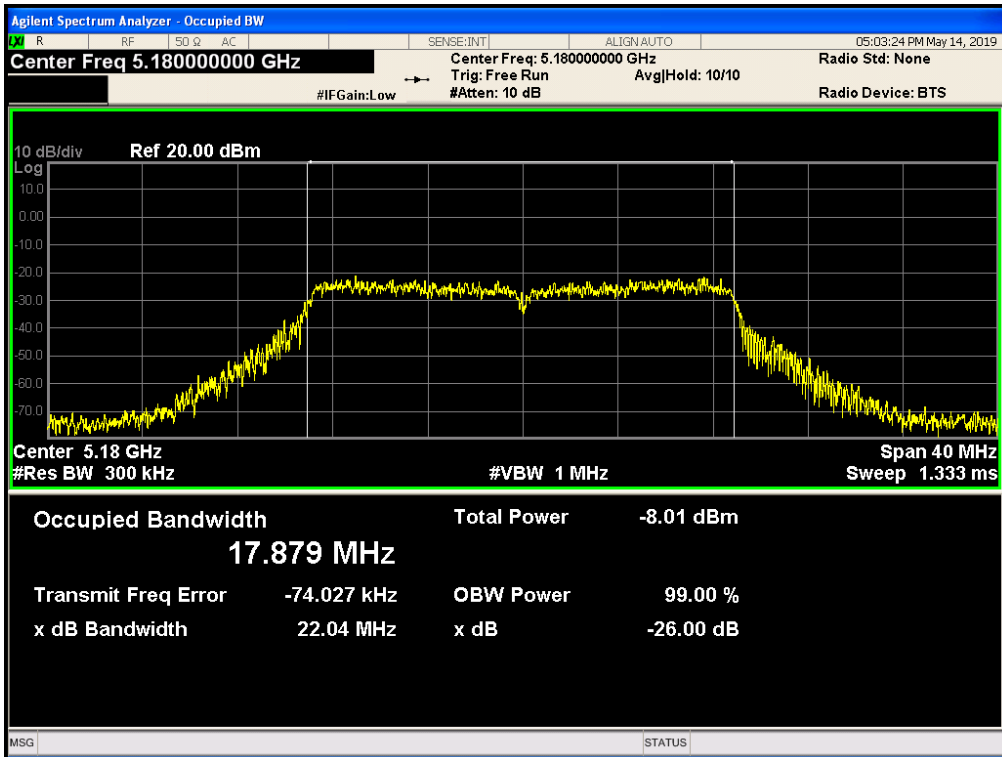
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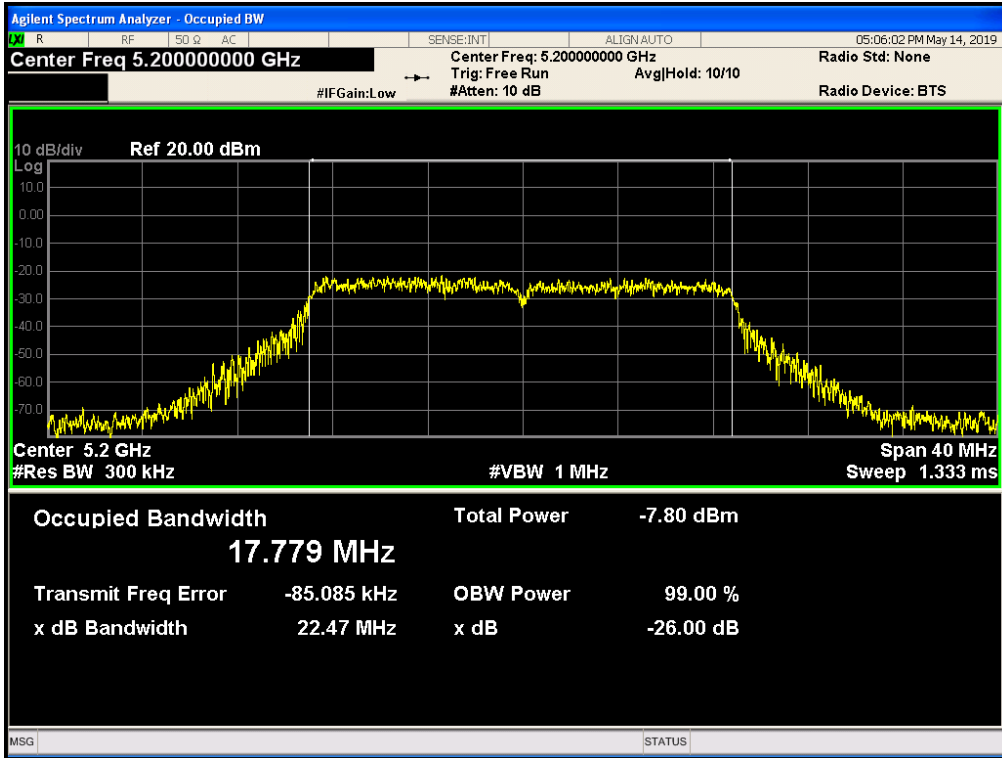
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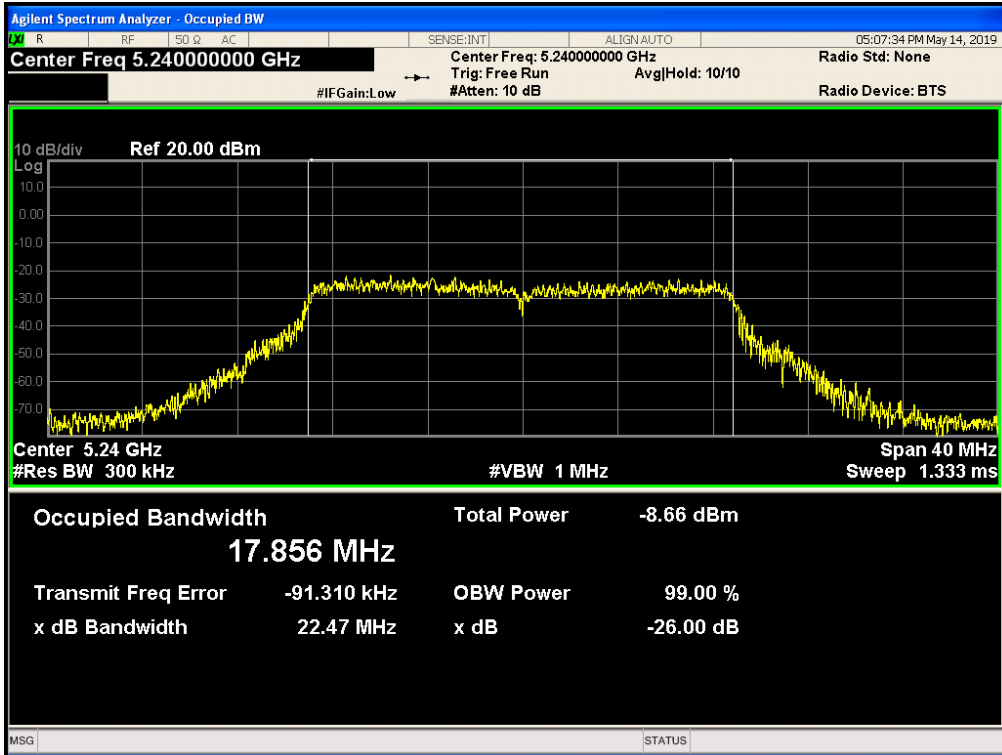
ANT2: OBW 802.11ac20 5180MHz



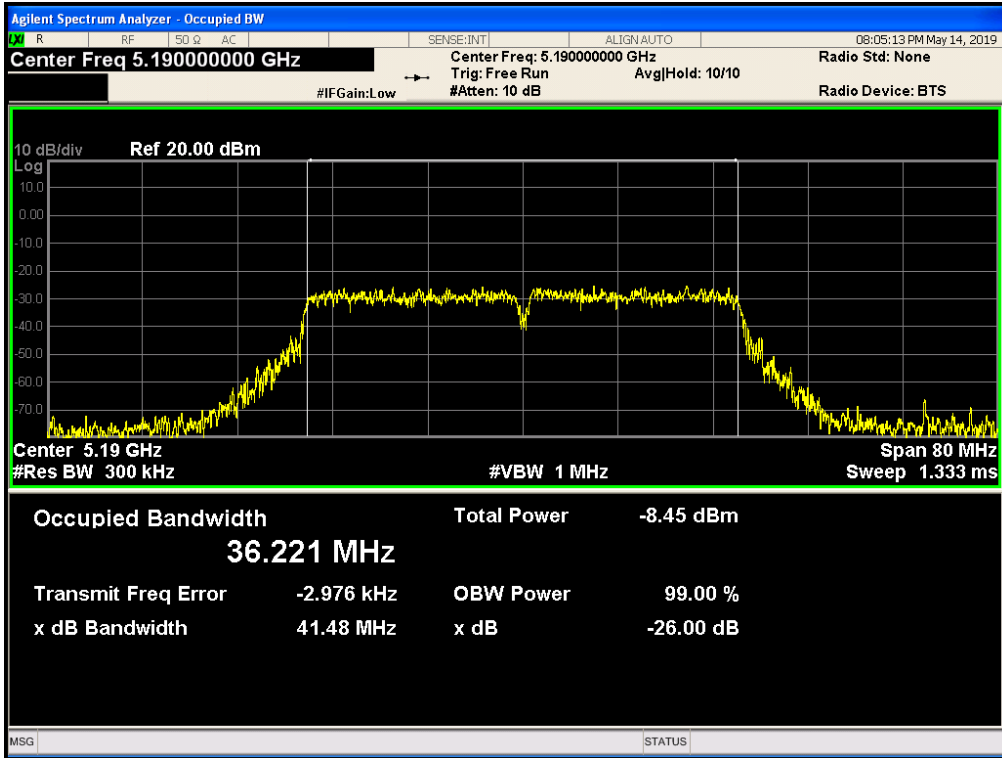
ANT2: OBW 802.11ac20 5200MHz



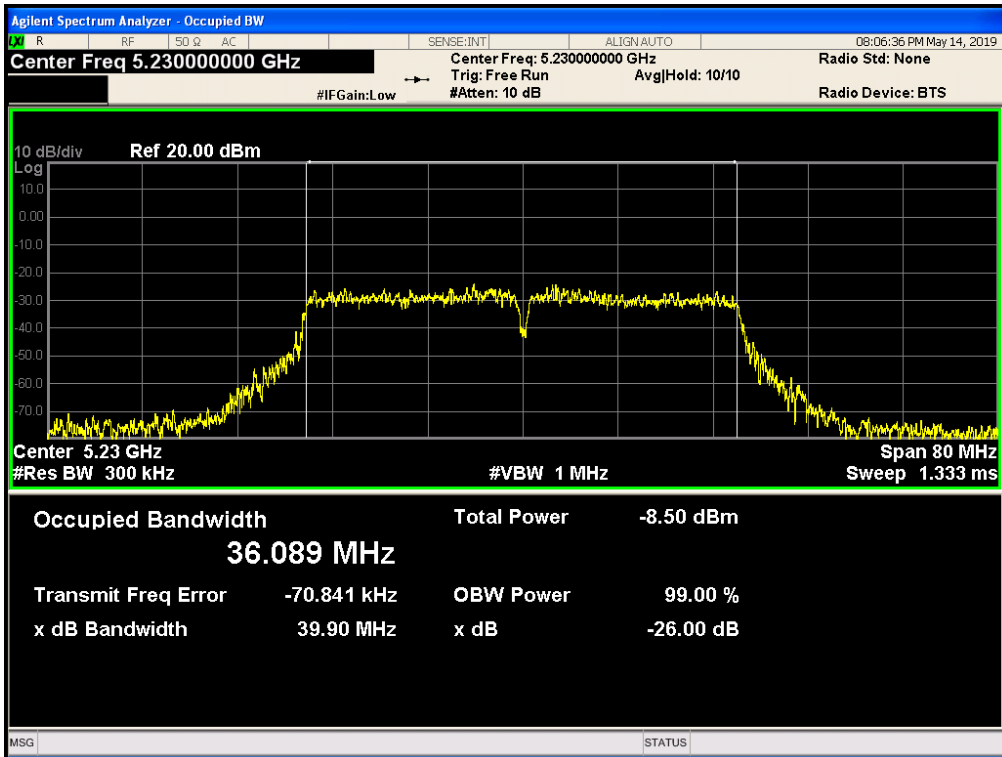
ANT2: OBW 802.11ac20 5240MHz



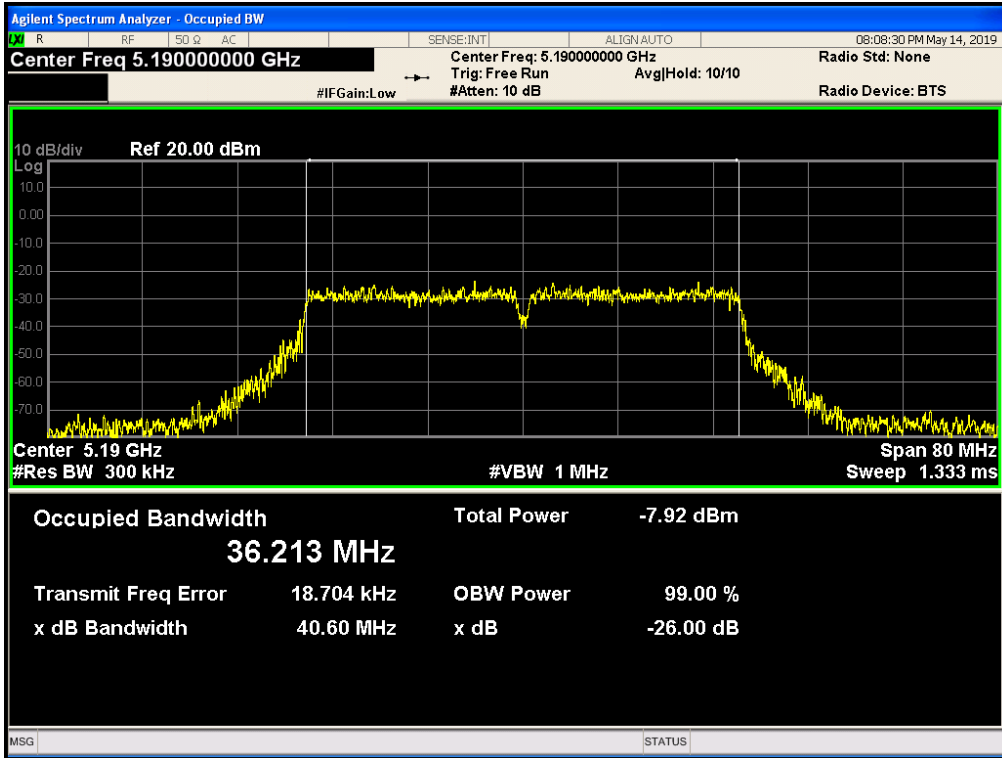
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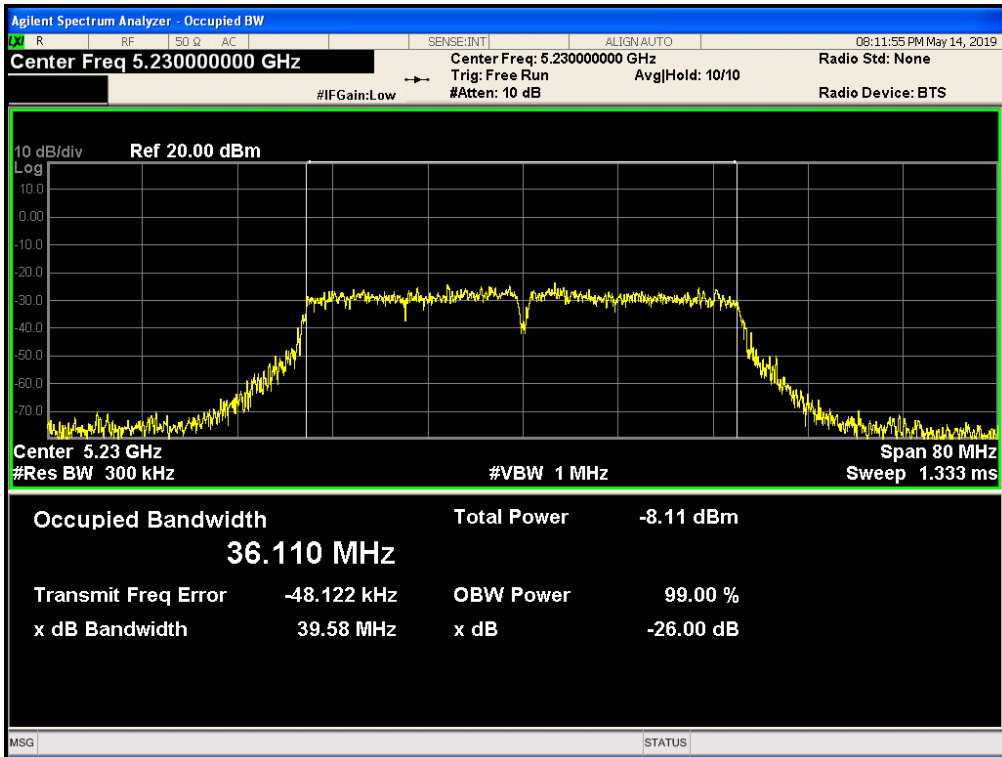
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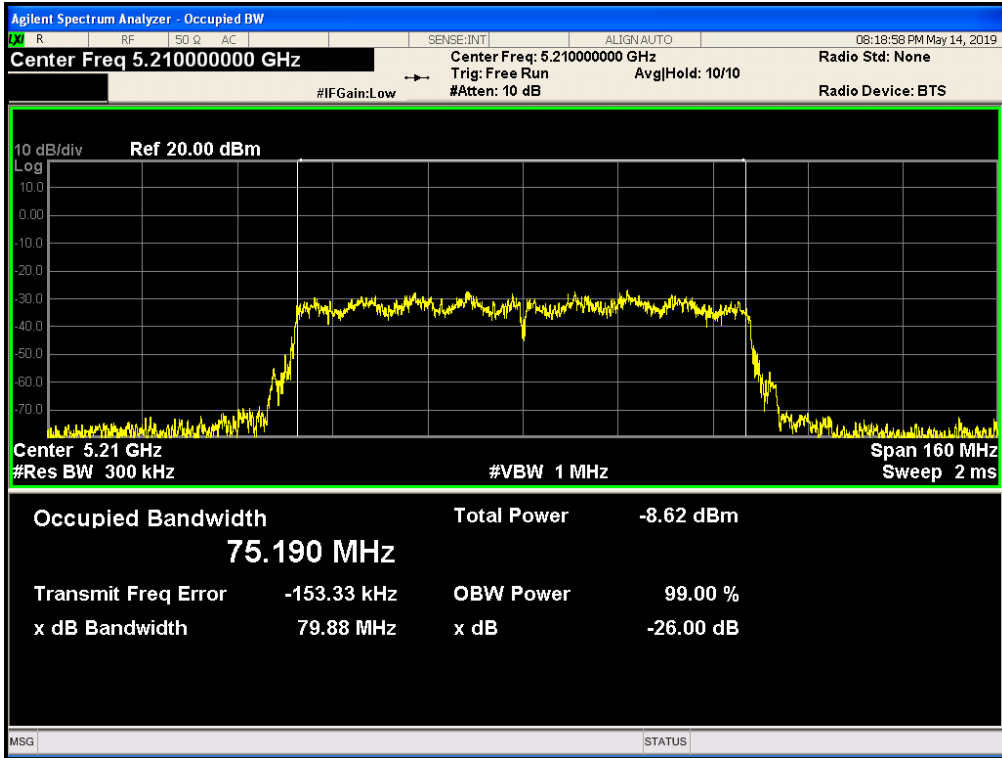
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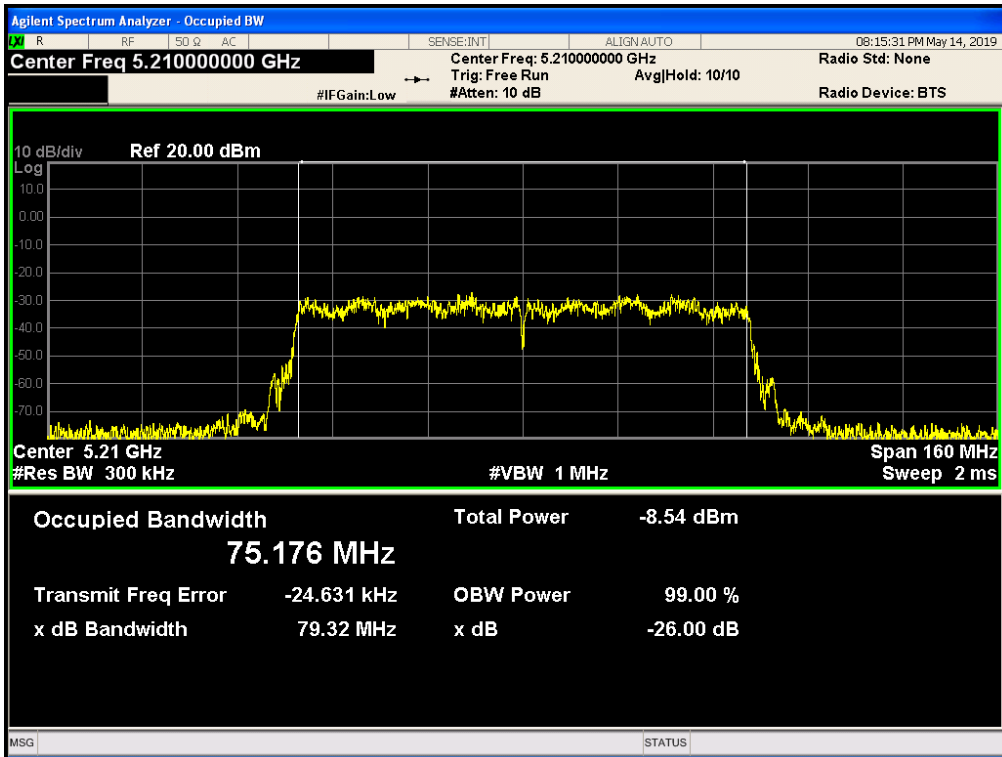
ANT2: OBW 802.11ac40 5230MHz



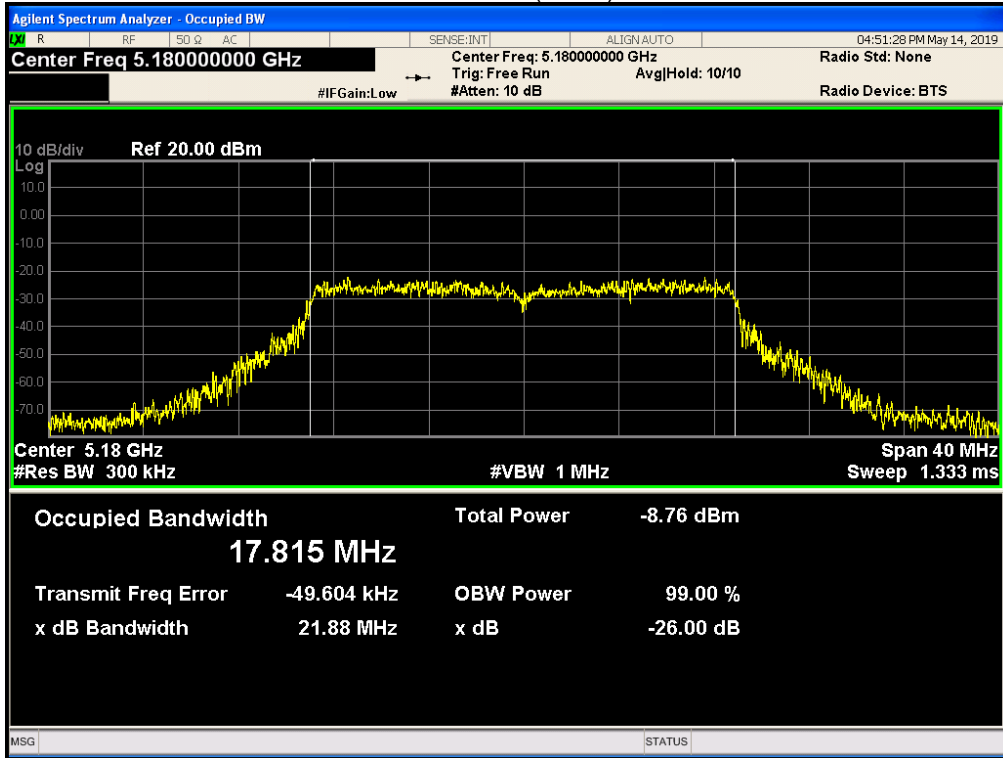
ANT1: OBW 802.11ac80 5210MHz



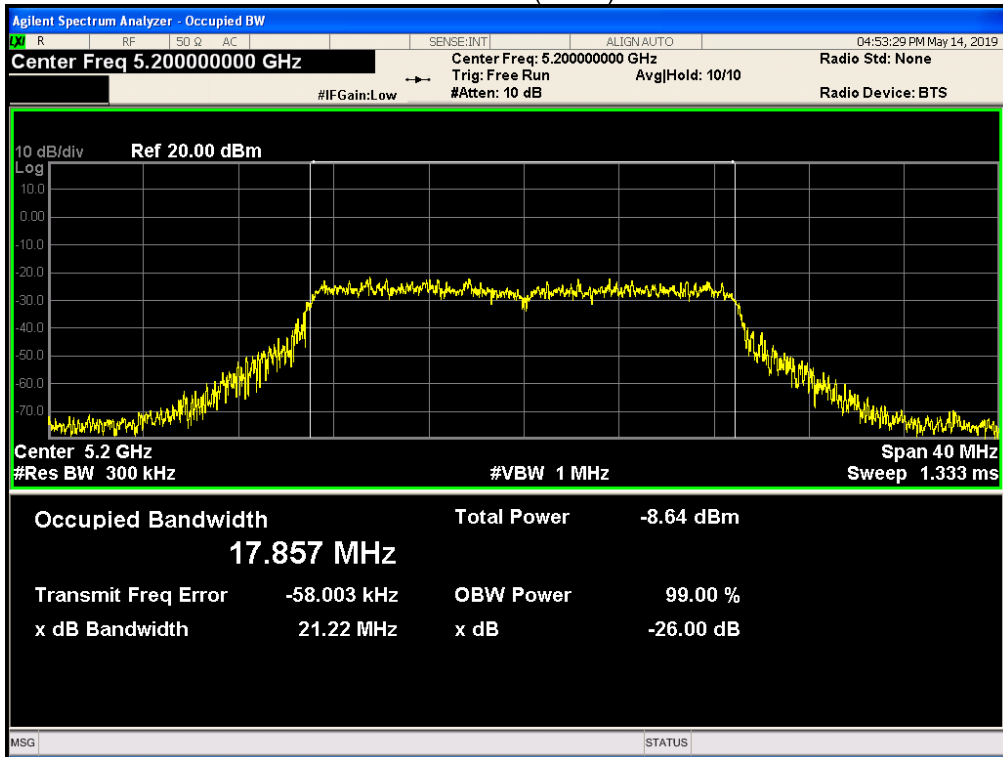
ANT2: OBW 802.11ac80 5210MHz



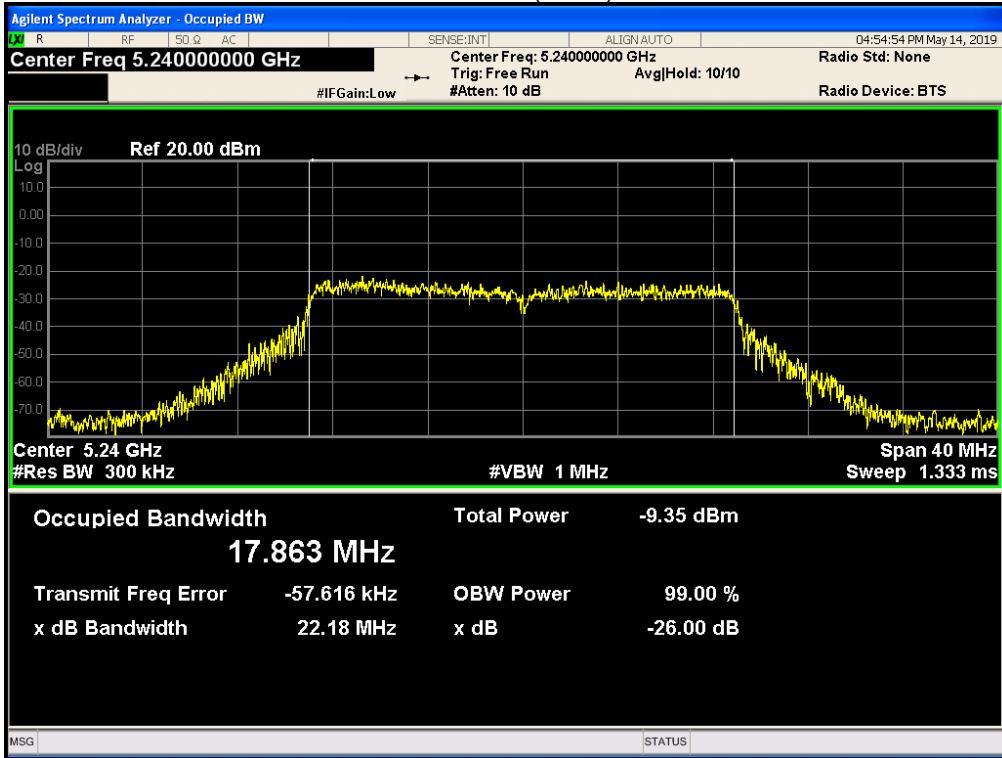
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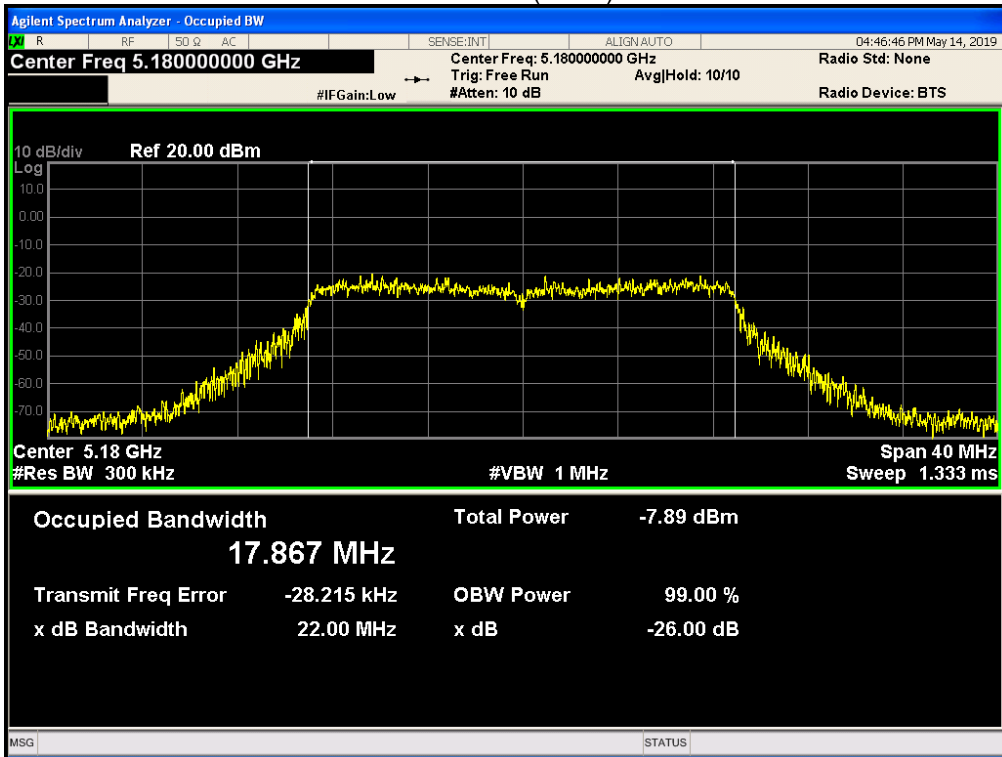
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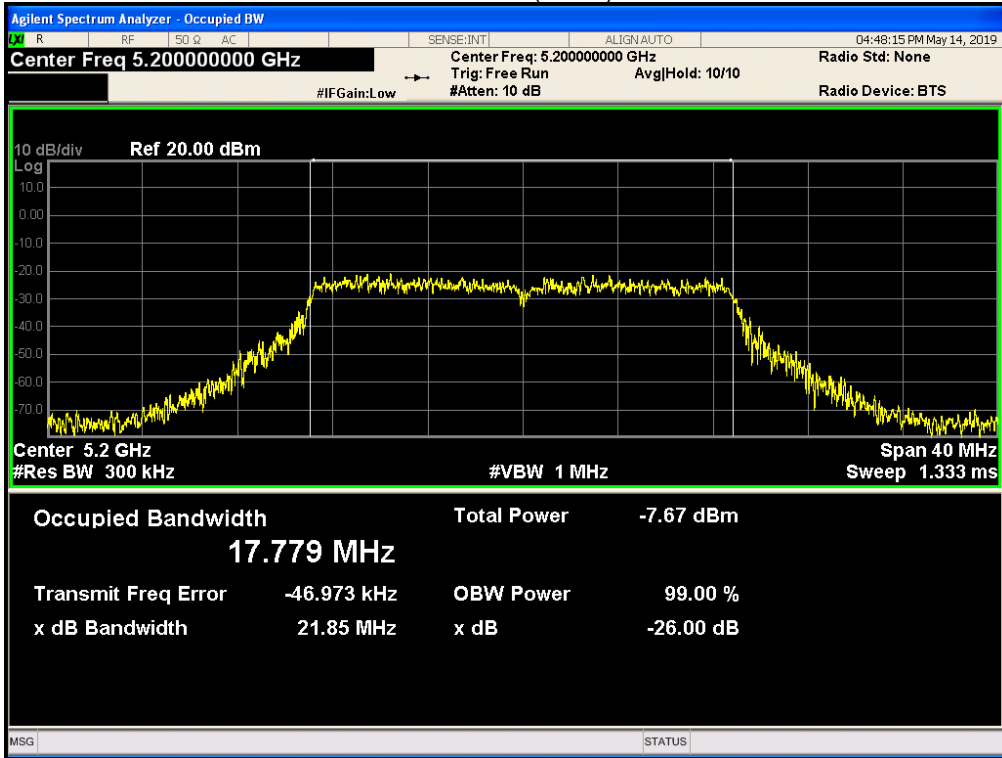
ANT1: OBW 802.11n(HT20) 5240MHz



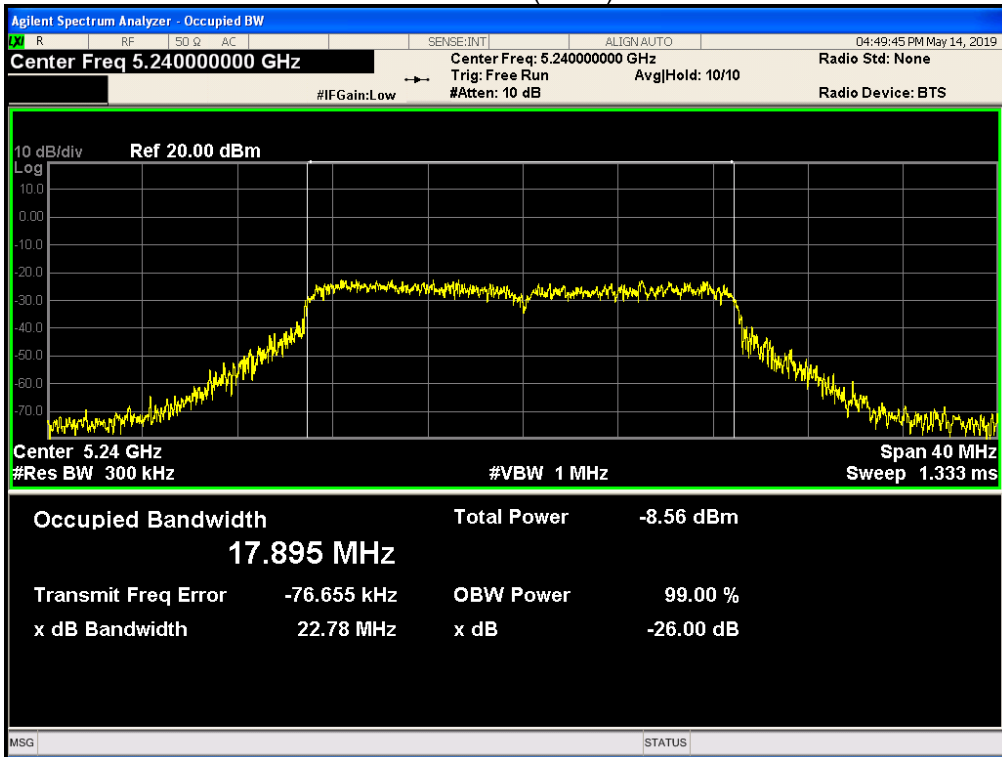
ANT2: OBW 802.11n(HT20) 5180MHz



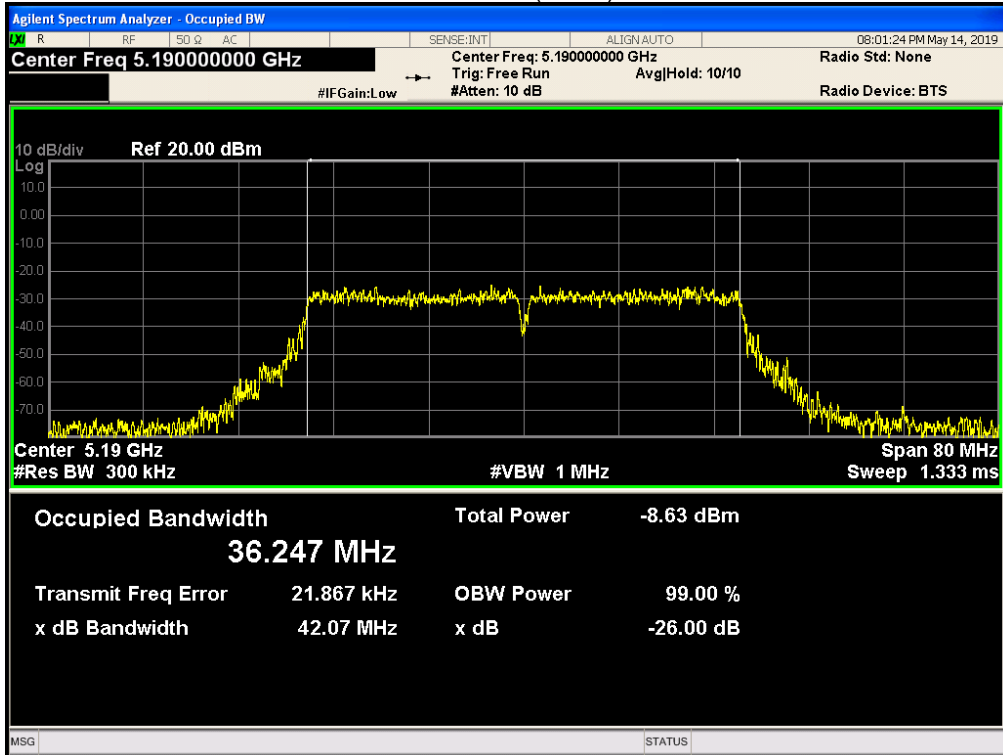
ANT2: OBW 802.11n(HT20) 5200MHz



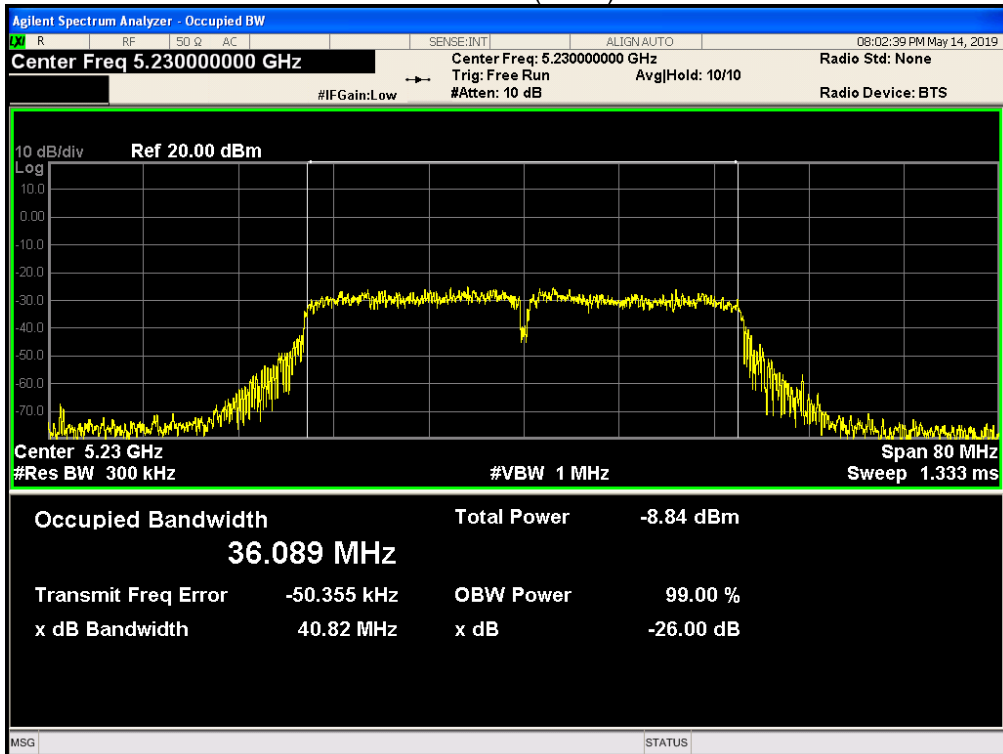
ANT2: OBW 802.11n(HT20) 5240MHz



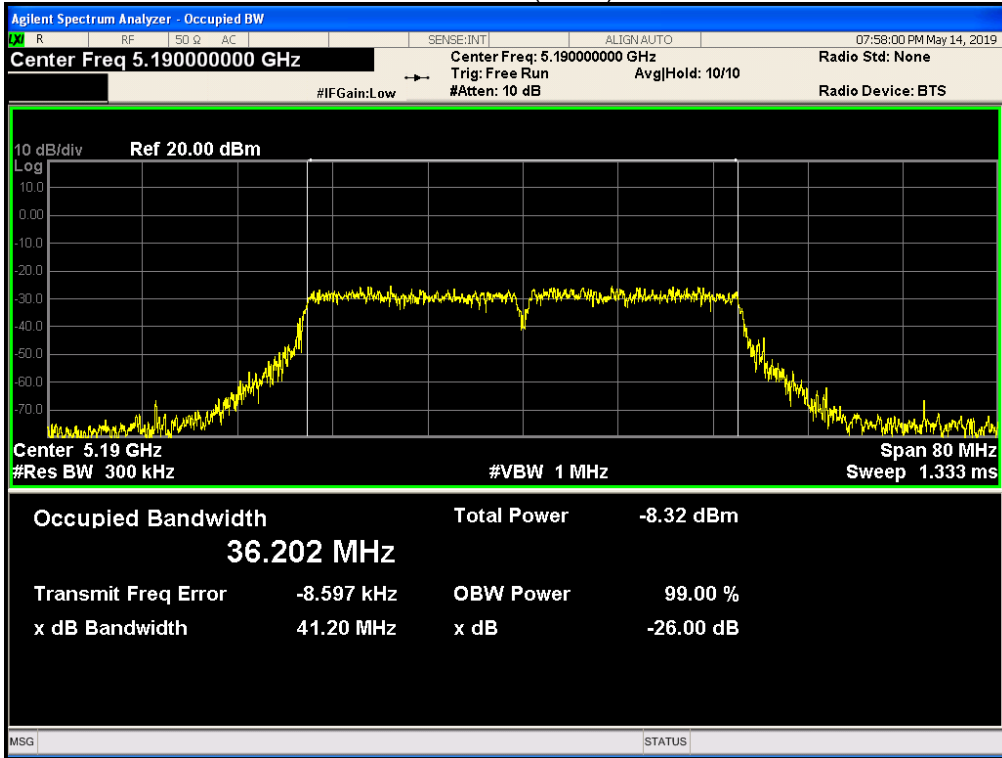
ANT1: OBW 802.11n(HT40) 5190MHz



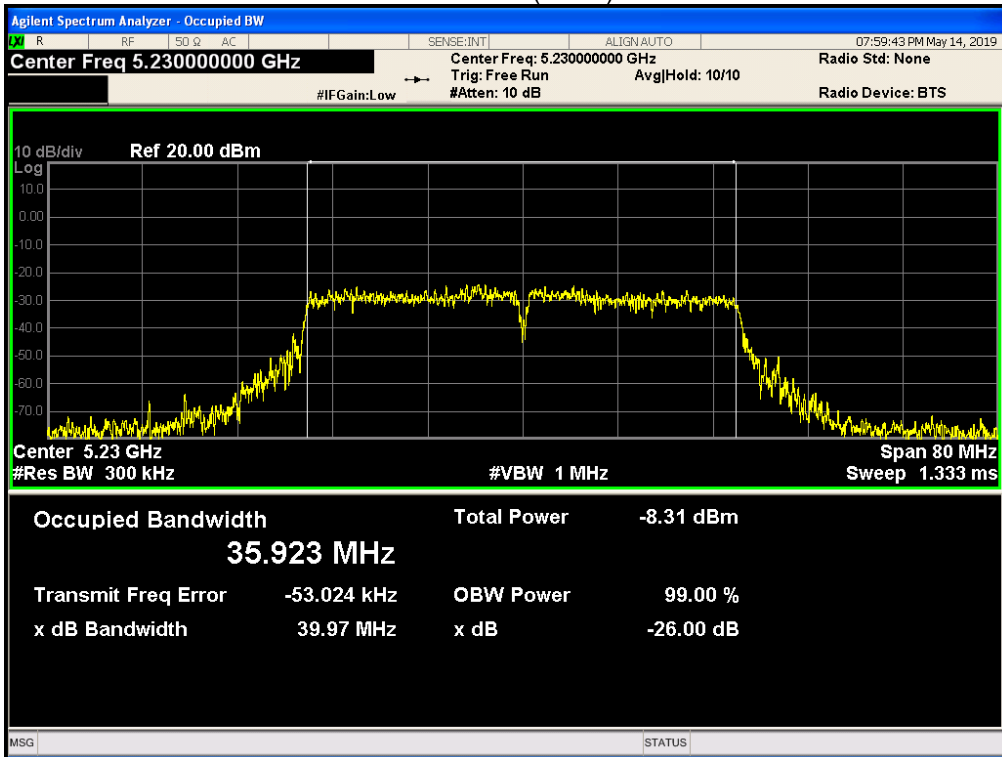
ANT1: OBW 802.11n(HT40) 5230MHz



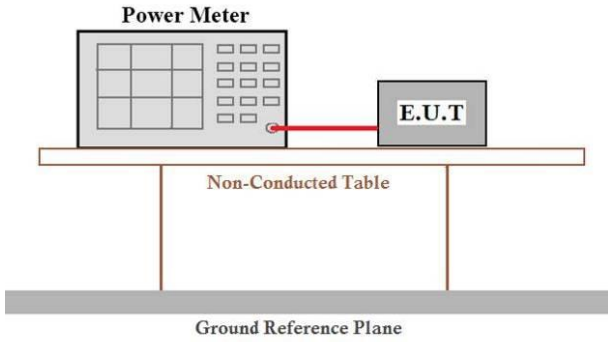
ANT2: OBW 802.11n(HT40) 5190MHz



ANT2: OBW 802.11n(HT40) 5230MHz



4.3 Peak Transmit Power

Test Requirement:	FCC Part15 E Section 15.407
Test Method:	KDB 789033 D02 General UNII Test Procedures New Rules v02r01
Limit:	For the band 5.15-5.25GHz, 5.25-5.35GHz, 5.47-5.725GHz, the maximum conducted output power over the frequency bands of operation shall not exceed 250mW. For the band 5.725-5.85GHz, the maximum conducted output power over the frequency bands of operation shall not exceed 1W.
Test setup:	 <p>The diagram illustrates the test setup. A Power Meter is connected to an E.U.T. (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table, which is supported by two legs. Below the table is a Ground Reference Plane.</p>
Test procedure:	<p>Measurement using an RF average power meter</p> <p>(i) Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied</p> <p>a) The EUT is configured to transmit continuously or to transmit with a constant duty cycle.</p> <p>b) At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.</p> <p>c) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.</p> <p>(ii) If the transmitter does not transmit continuously, measure the duty cycle, x, of the transmitter output signal as described in section B).</p> <p>(iii) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.</p> <p>(iv) Adjust the measurement in dBm by adding $10 \log(1/x)$ where x is the duty cycle (e.g., $10 \log(1/0.25)$ if the duty cycle is 25 percent).</p>
Test results:	Pass

Measurement Data

Condition	Mode	Frequency (MHz)	Conducted Power (dBm)	Duty Factor (dB)	Total Power (dBm)	Limit (dBm)	Verdict
ANT1	802.11a	5180	2.74	0.13	2.87	24	Pass
ANT1	802.11a	5200	3.074	0.13	3.204	24	Pass
ANT1	802.11a	5240	2.321	0.13	2.451	24	Pass
ANT2	802.11a	5180	2.702	0.13	2.832	24	Pass
ANT2	802.11a	5200	3.025	0.13	3.155	24	Pass
ANT2	802.11a	5240	2.463	0.13	2.593	24	Pass

Mode	Frequency (MHz)	Conducted Power (dBm)		Duty Factor (dB)	Total Power (dBm)	Limit (dBm)	Verdict
		ANT1	ANT2				
802.11ac20	5180	2.091	2.387	0.14	5.39	23.36	Pass
802.11ac20	5200	2.582	2.526	0.14	5.70	23.36	Pass
802.11ac20	5240	1.836	1.858	0.14	5.00	23.36	Pass
802.11ac40	5190	1.731	2.311	0.27	5.31	23.36	Pass
802.11ac40	5230	1.656	2.245	0.27	5.24	23.36	Pass
802.11ac80	5210	1.454	1.482	0.53	5.01	23.36	Pass
802.11n(HT20)	5180	1.611	2.624	0.14	5.30	23.36	Pass
802.11n(HT20)	5200	1.659	2.485	0.14	5.24	23.36	Pass
802.11n(HT20)	5240	1.077	2.298	0.14	4.88	23.36	Pass
802.11n(HT40)	5190	1.63	2.183	0.27	5.20	23.36	Pass
802.11n(HT40)	5230	1.632	1.933	0.27	5.07	23.36	Pass

Note:

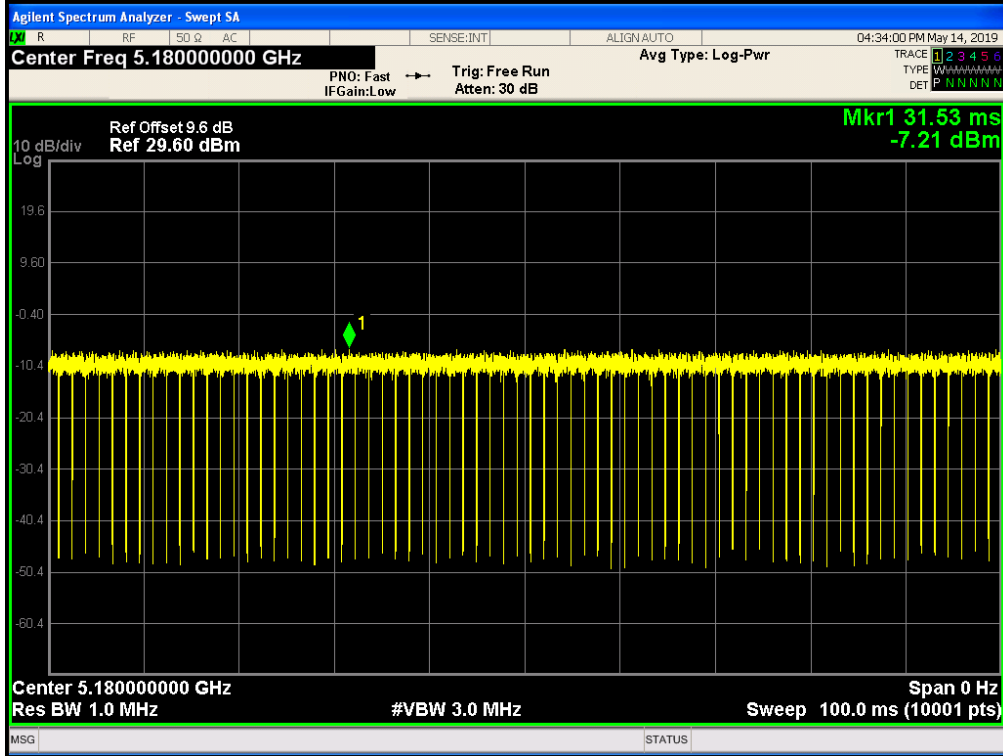
1, As Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / N_{ANT}]$ dBi=6.64>6dBi, so limit=24-(6.64-6.00)=23.36dBm.

2, Sum Power = Measured Power + Duty Factor

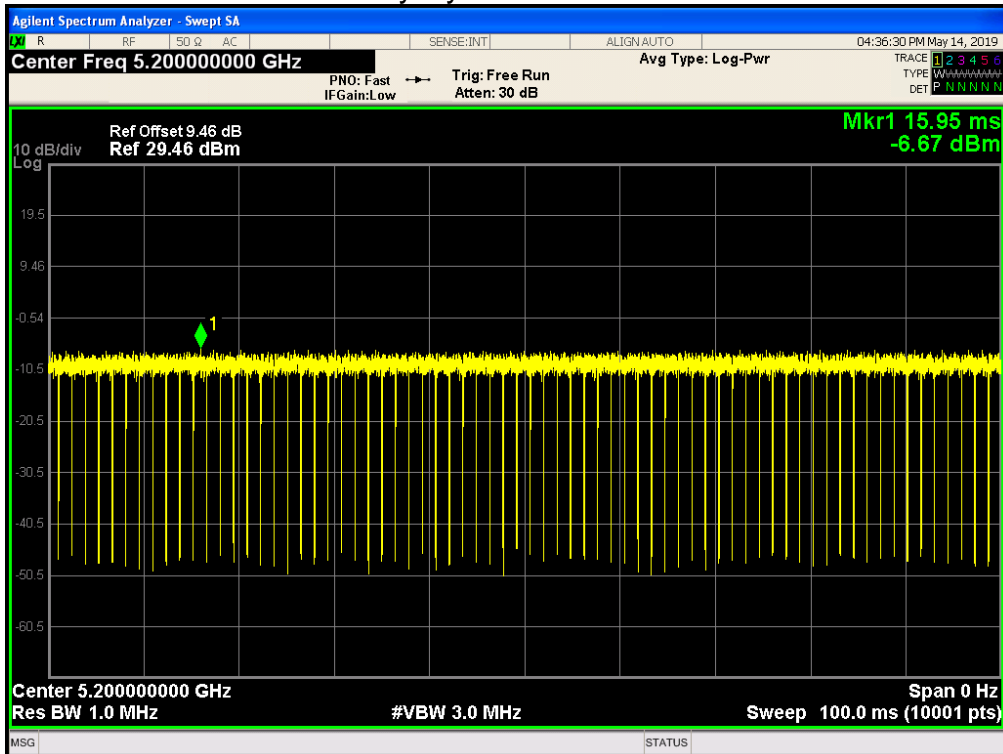
Duty Cycle:

Condition	Mode	Frequency (MHz)	Duty Cycle (%)	Correction Factor (dB)
ANT1	802.11a	5180	97.08	0.13
ANT1	802.11a	5200	97.09	0.13
ANT1	802.11a	5240	97.05	0.13
ANT2	802.11a	5180	97.03	0.13
ANT2	802.11a	5200	97.04	0.13
ANT2	802.11a	5240	97.08	0.13
ANT1	802.11ac20	5180	96.8	0.14
ANT1	802.11ac20	5200	96.91	0.14
ANT1	802.11ac20	5240	96.87	0.14
ANT2	802.11ac20	5180	96.9	0.14
ANT2	802.11ac20	5200	96.87	0.14
ANT2	802.11ac20	5240	96.77	0.14
ANT1	802.11ac40	5190	93.93	0.27
ANT1	802.11ac40	5230	93.94	0.27
ANT2	802.11ac40	5190	93.95	0.27
ANT2	802.11ac40	5230	93.93	0.27
ANT1	802.11ac80	5210	88.45	0.53
ANT2	802.11ac80	5210	88.44	0.53
ANT1	802.11n(HT20)	5180	96.85	0.14
ANT1	802.11n(HT20)	5200	96.82	0.14
ANT1	802.11n(HT20)	5240	96.88	0.14
ANT2	802.11n(HT20)	5180	96.88	0.14
ANT2	802.11n(HT20)	5200	96.87	0.14
ANT2	802.11n(HT20)	5240	96.88	0.14
ANT1	802.11n(HT40)	5190	93.91	0.27
ANT1	802.11n(HT40)	5230	93.94	0.27
ANT2	802.11n(HT40)	5190	93.88	0.27
ANT2	802.11n(HT40)	5230	93.93	0.27

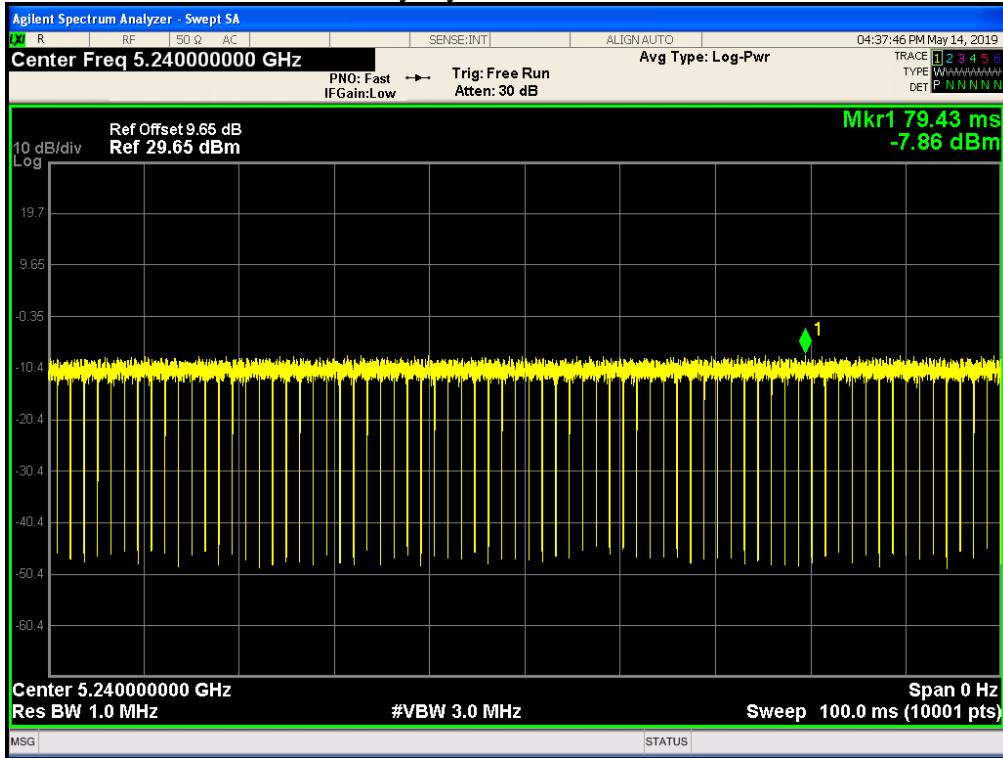
ANT1: Duty Cycle 802.11a 5180MHz



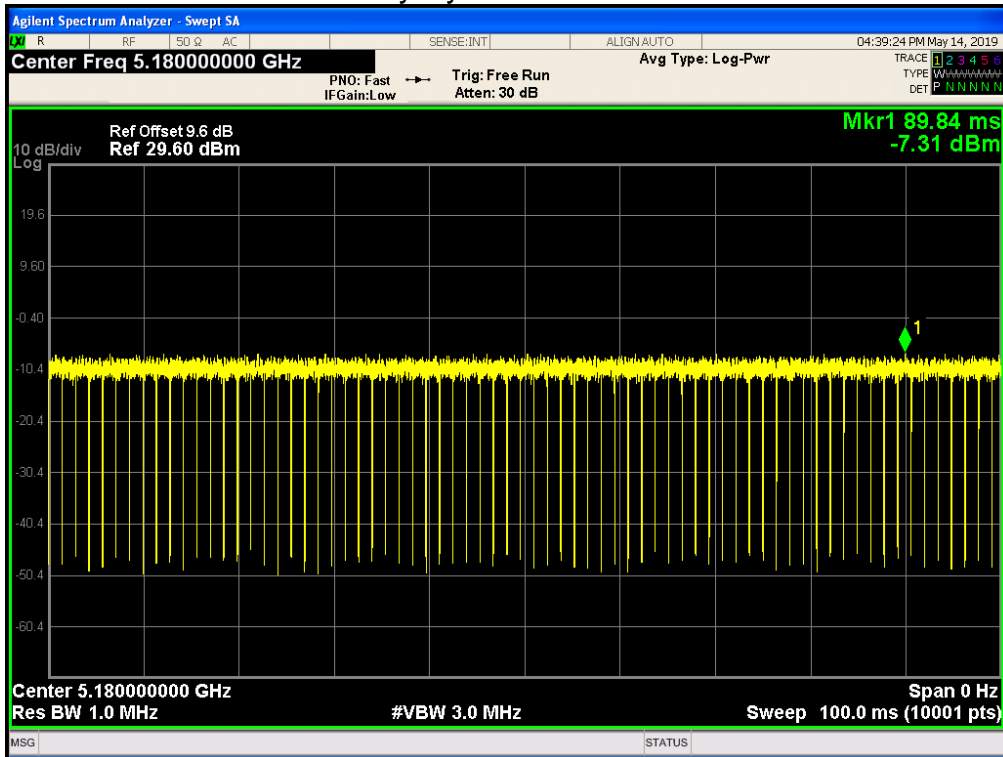
ANT1: Duty Cycle 802.11a 5200MHz



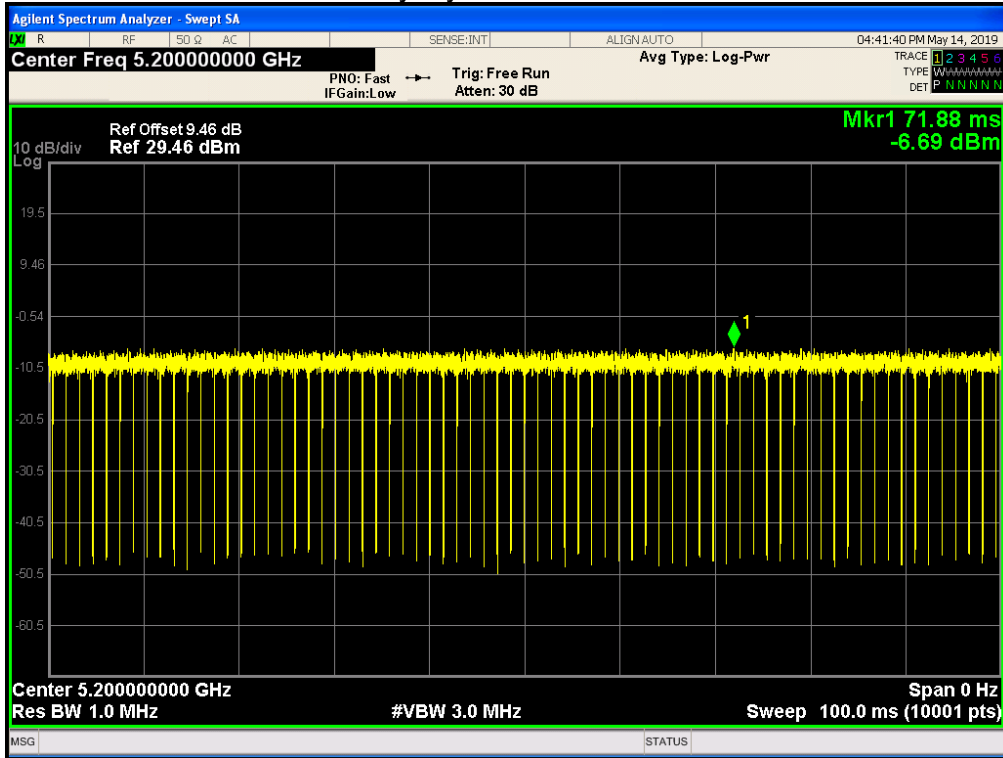
ANT1: Duty Cycle 802.11a 5240MHz



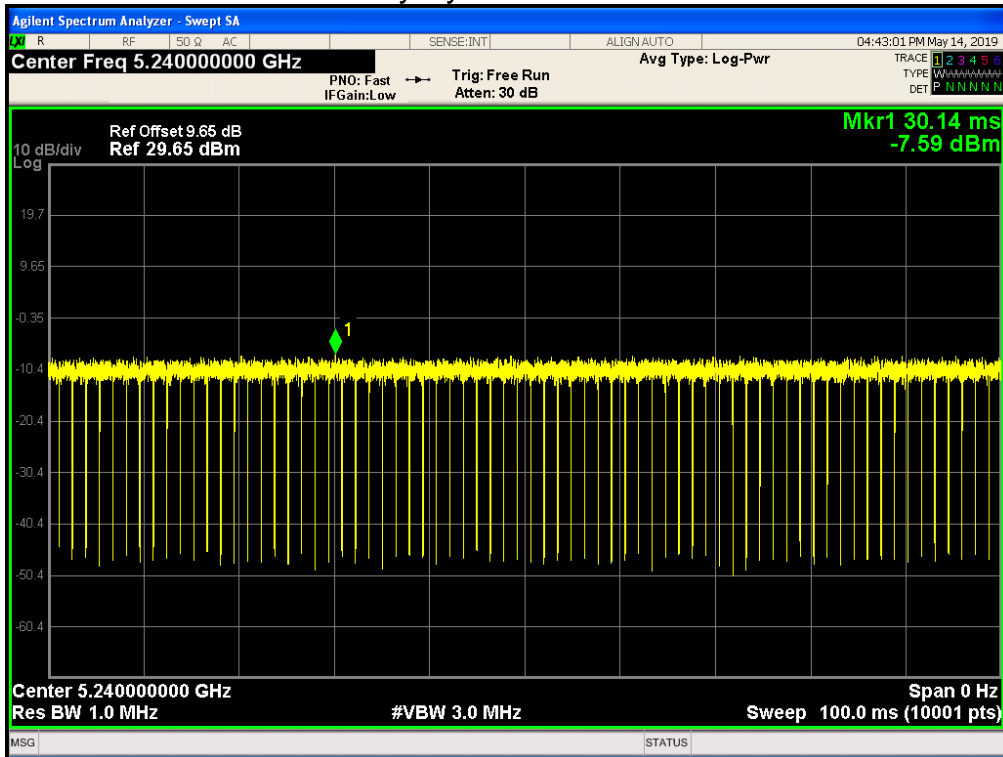
ANT2: Duty Cycle 802.11a 5180MHz



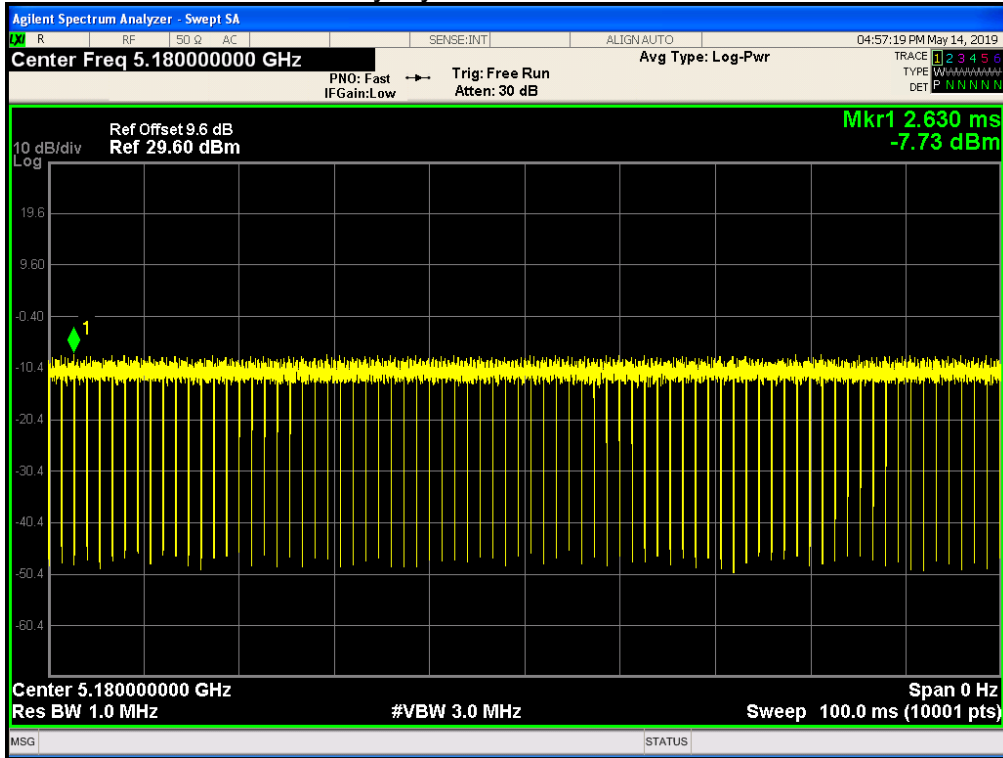
ANT2: Duty Cycle 802.11a 5200MHz



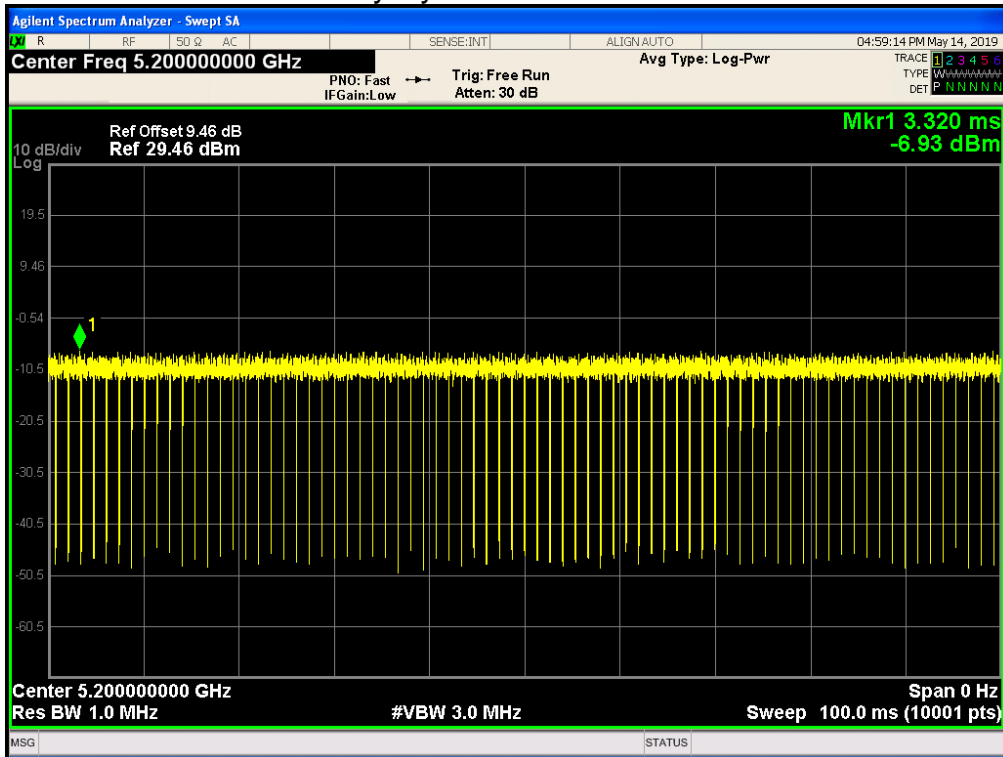
ANT2: Duty Cycle 802.11a 5240MHz



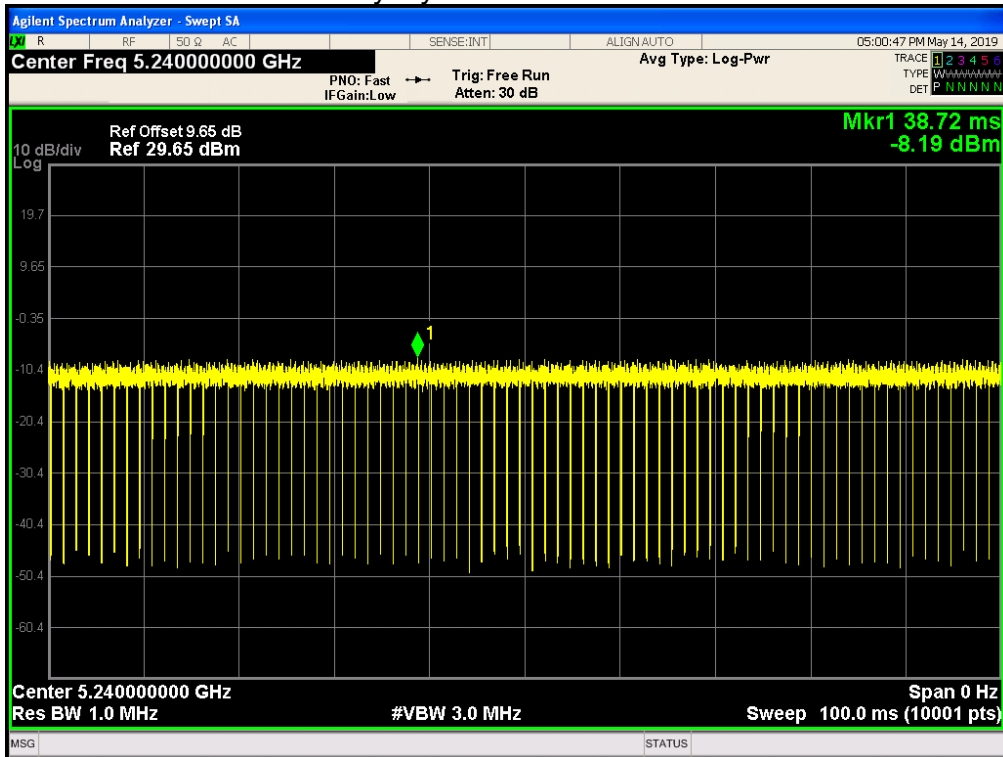
ANT1: Duty Cycle 802.11ac20 5180MHz



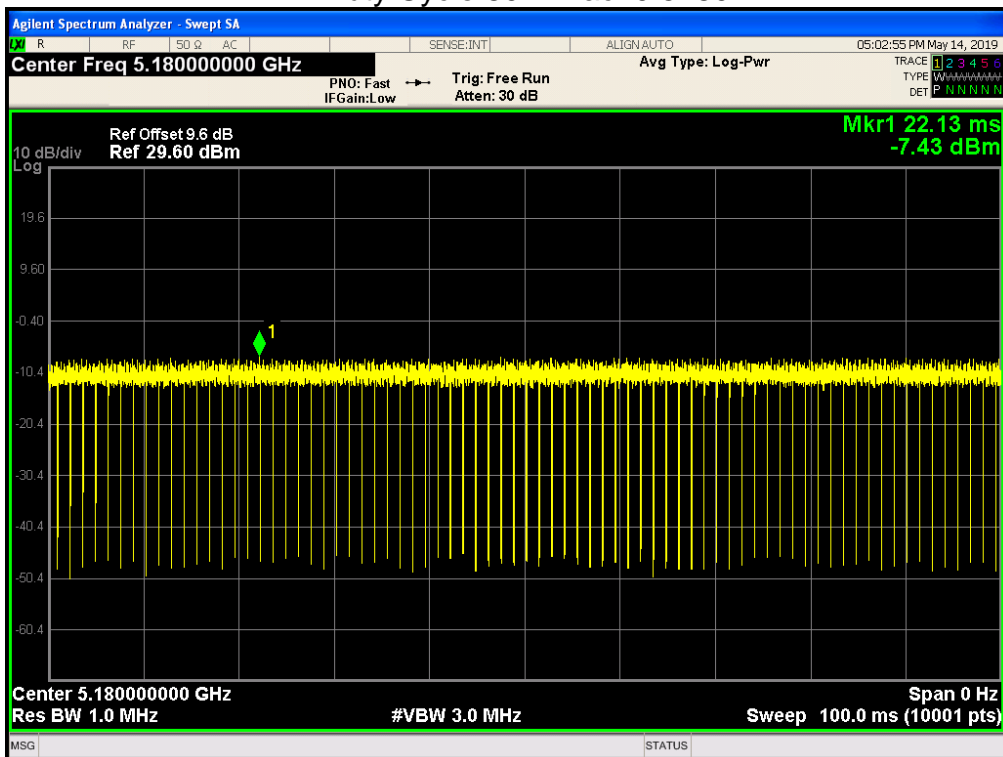
ANT1: Duty Cycle 802.11ac20 5200MHz



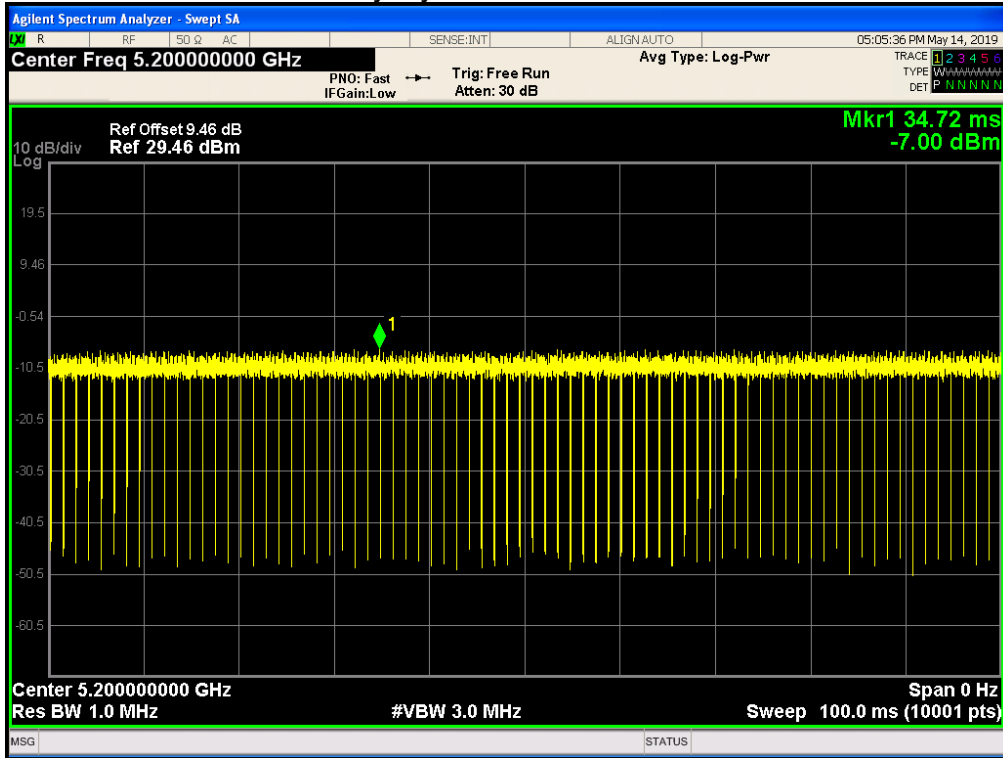
ANT1: Duty Cycle 802.11ac20 5240MHz



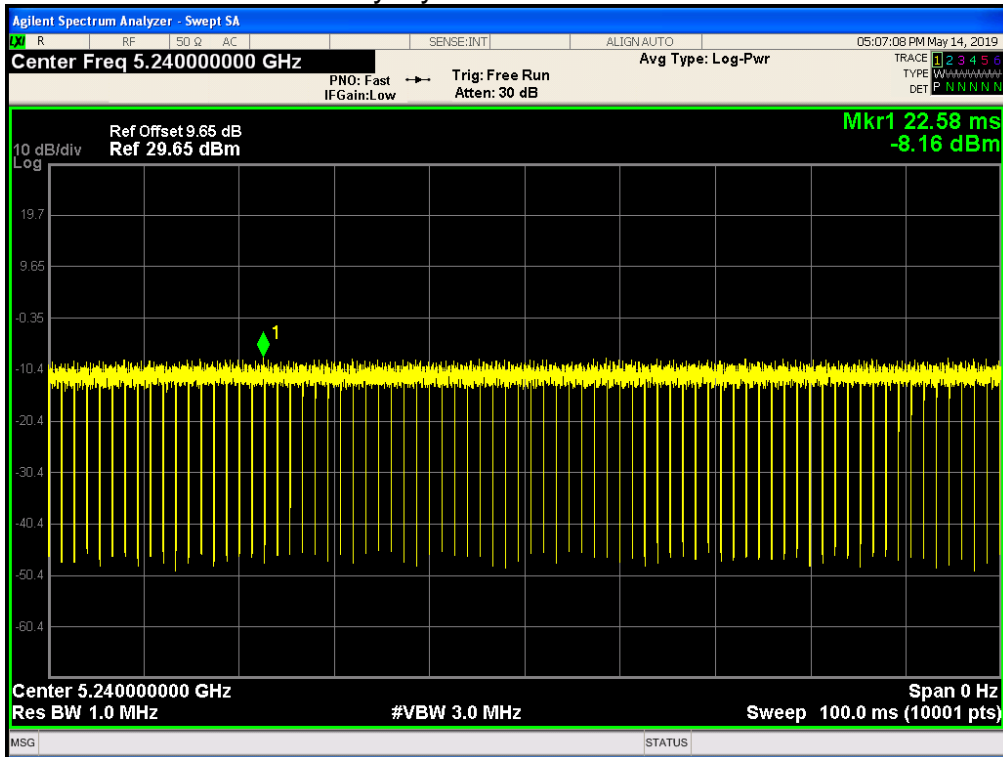
ANT2: Duty Cycle 802.11ac20 5180MHz



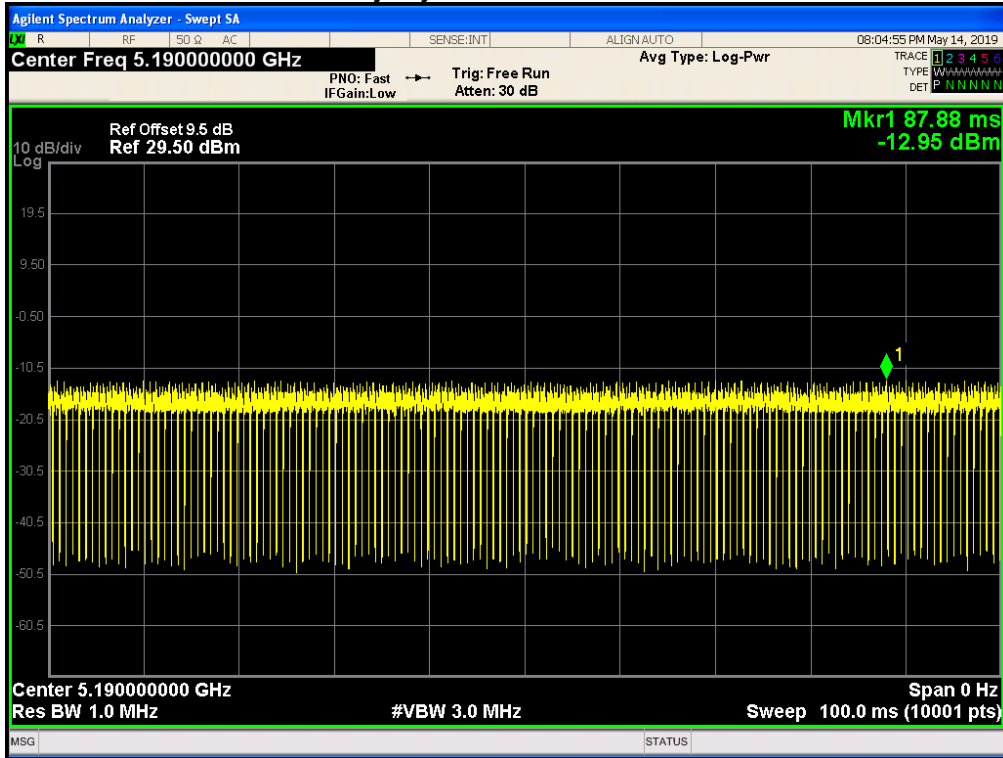
ANT2: Duty Cycle 802.11ac20 5200MHz



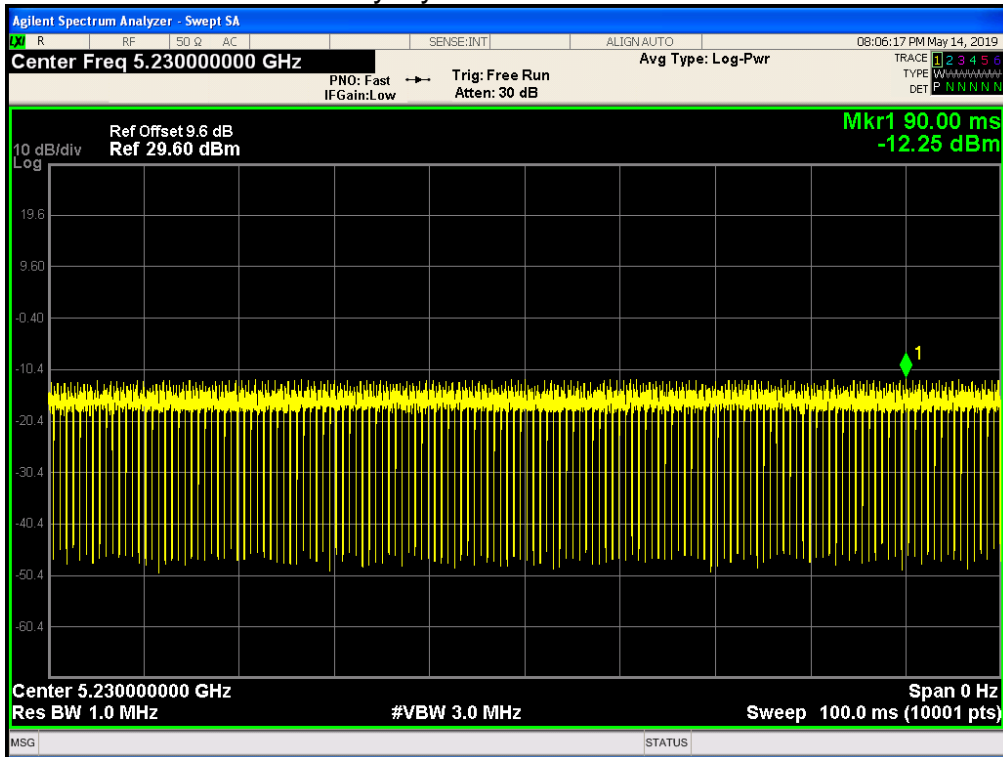
ANT2: Duty Cycle 802.11ac20 5240MHz



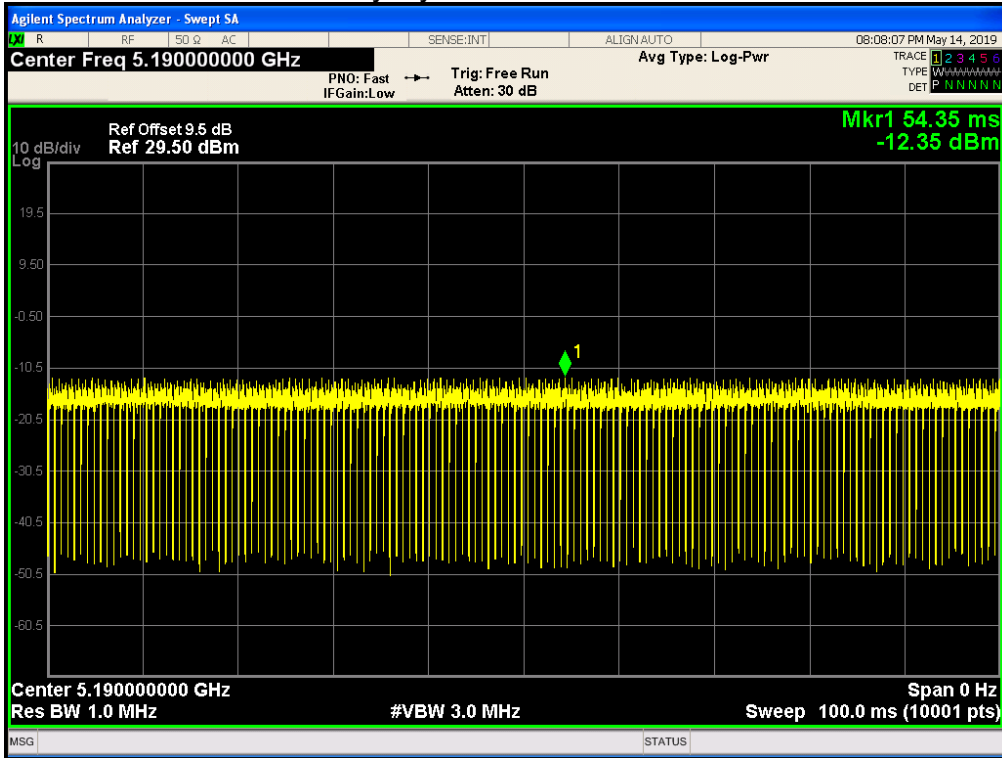
ANT1: Duty Cycle 802.11ac40 5190MHz



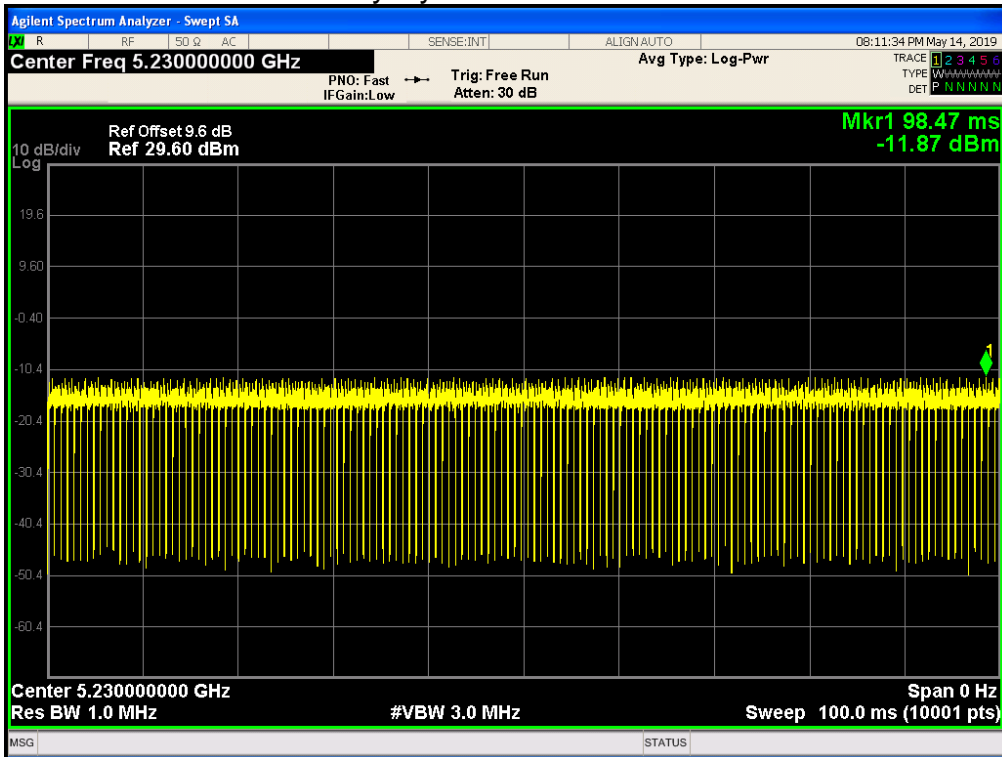
ANT1: Duty Cycle 802.11ac40 5230MHz



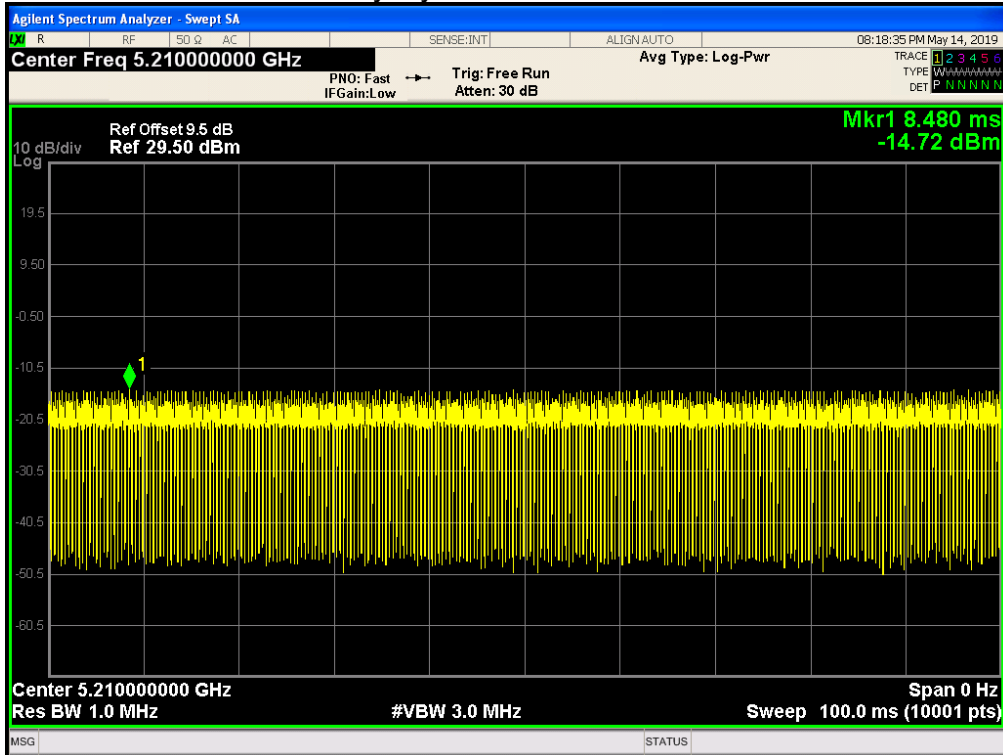
ANT2: Duty Cycle 802.11ac40 5190MHz



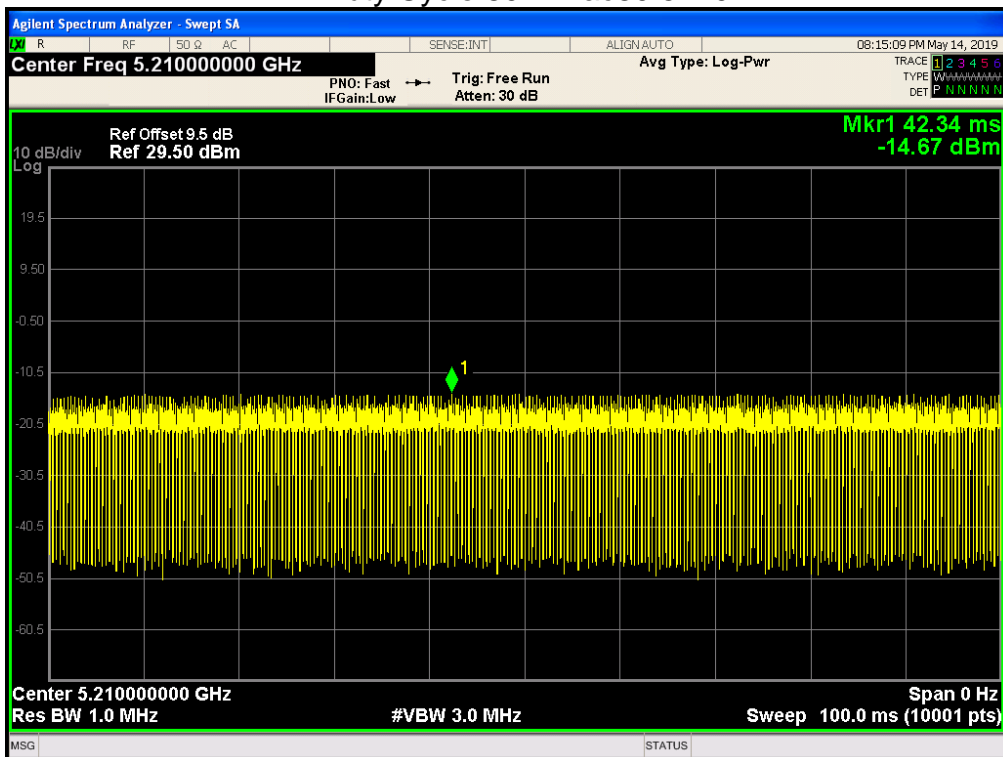
ANT2: Duty Cycle 802.11ac40 5230MHz



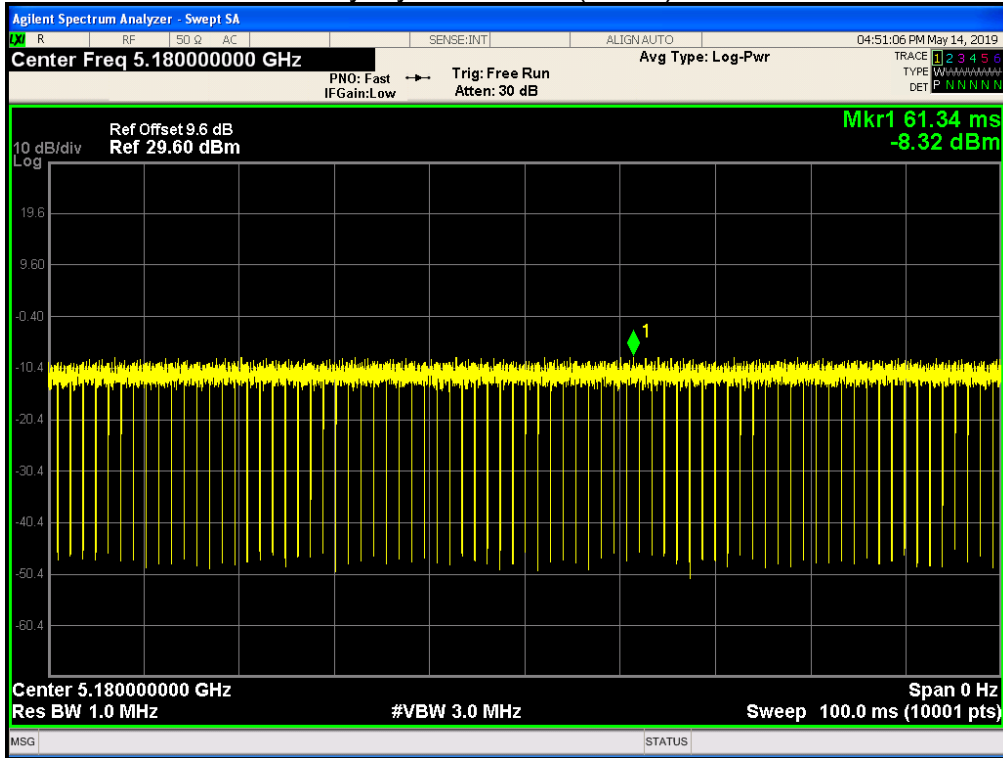
ANT1: Duty Cycle 802.11ac80 5210MHz



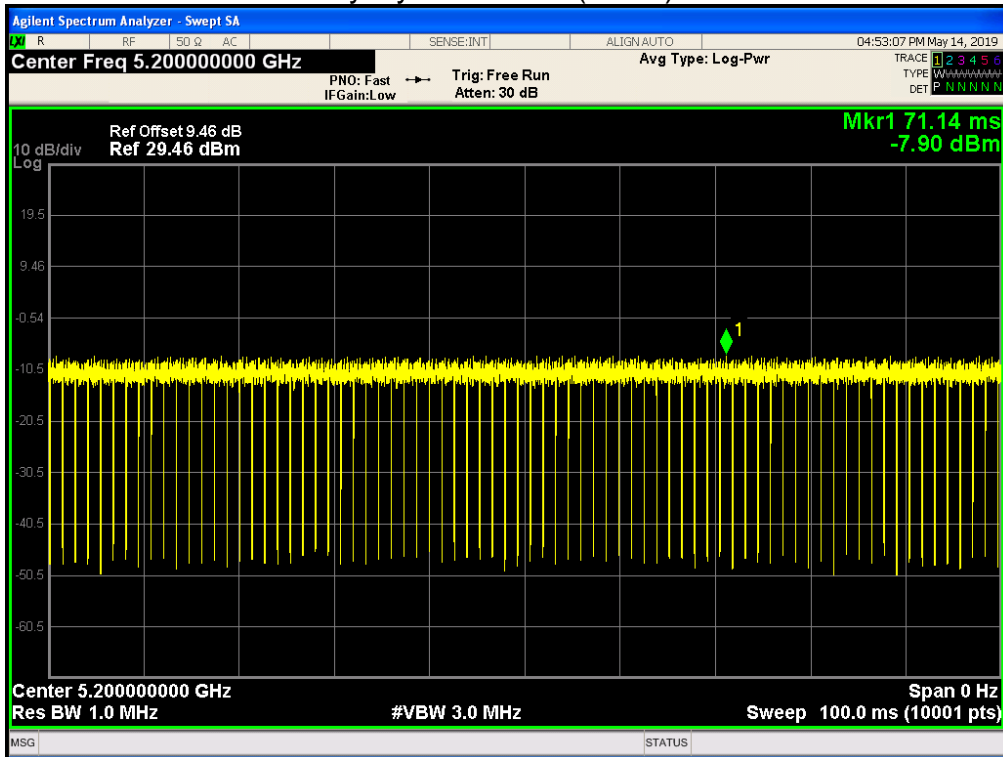
ANT2: Duty Cycle 802.11ac80 5210MHz



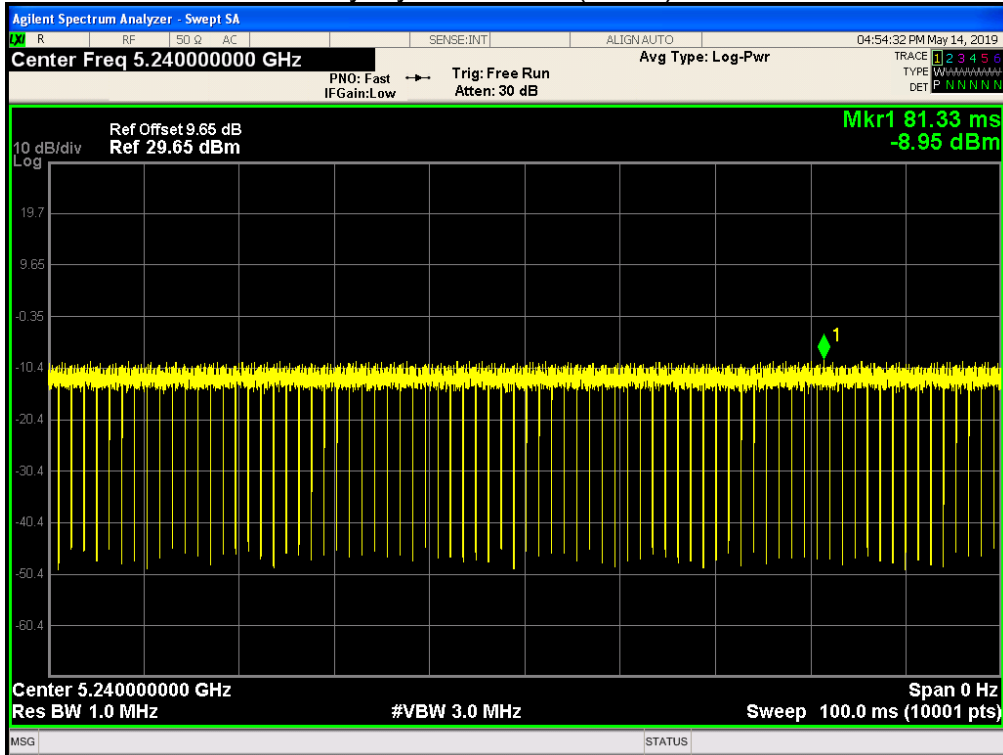
ANT1: Duty Cycle 802.11n(HT20) 5180MHz



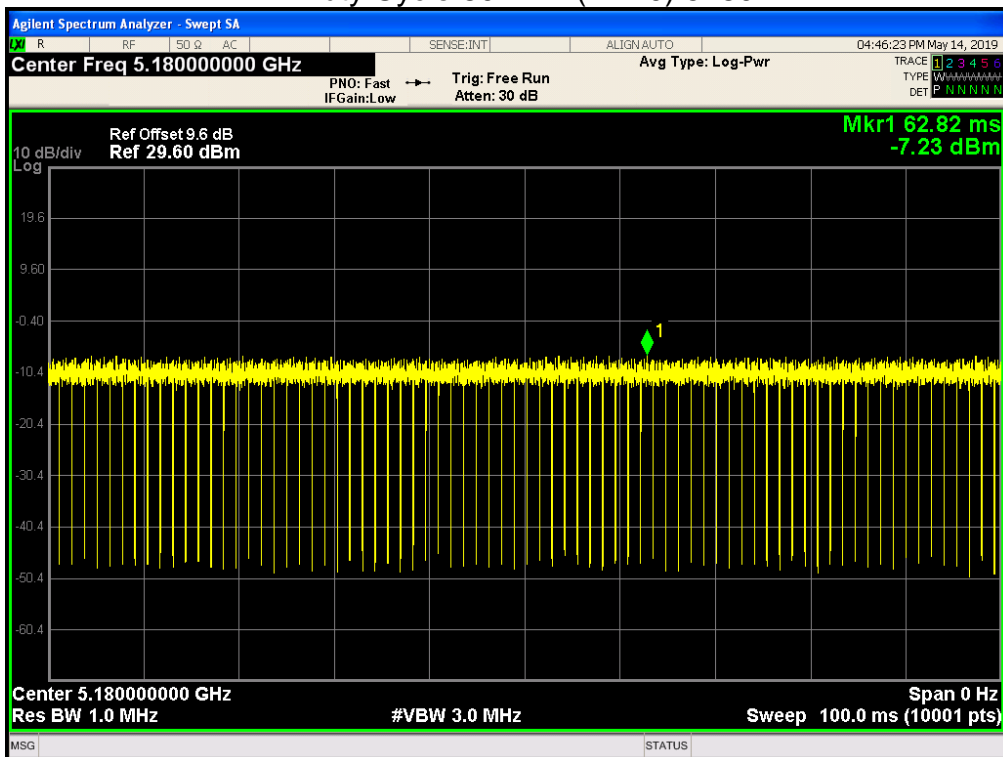
ANT1: Duty Cycle 802.11n(HT20) 5200MHz



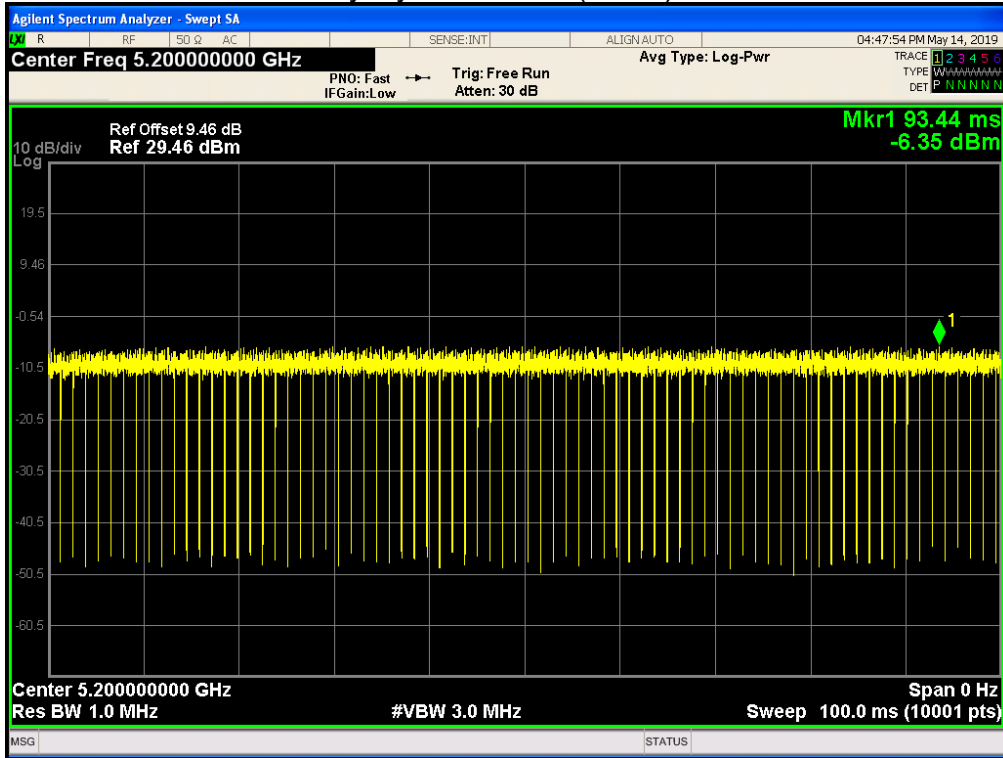
ANT1: Duty Cycle 802.11n(HT20) 5240MHz



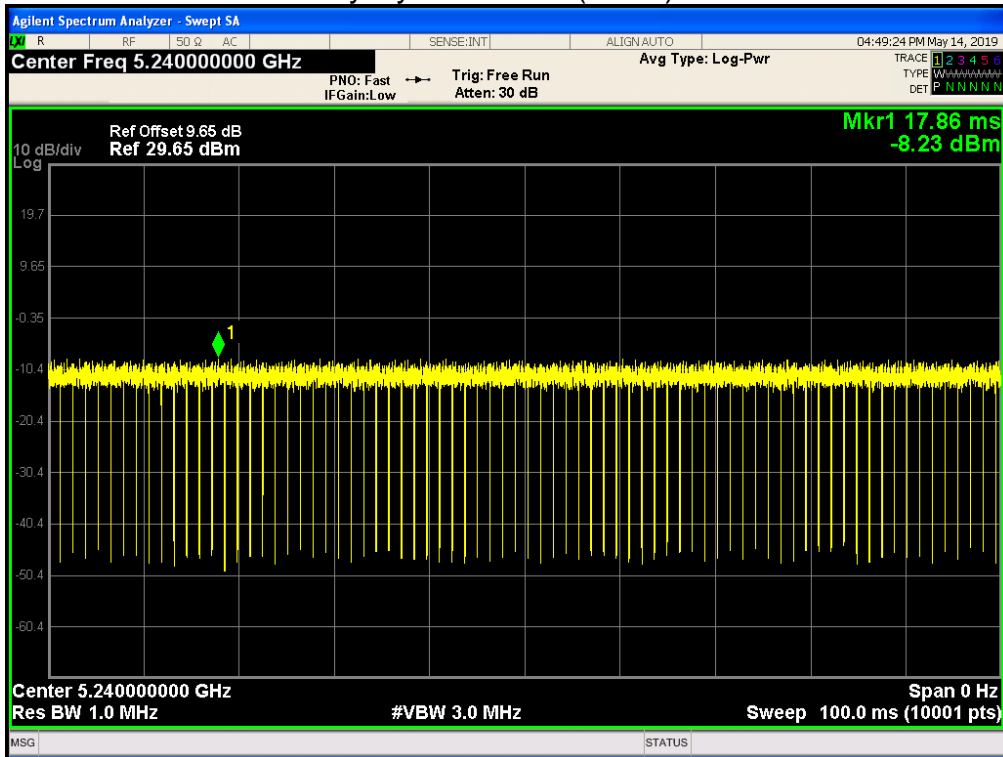
ANT2: Duty Cycle 802.11n(HT20) 5180MHz



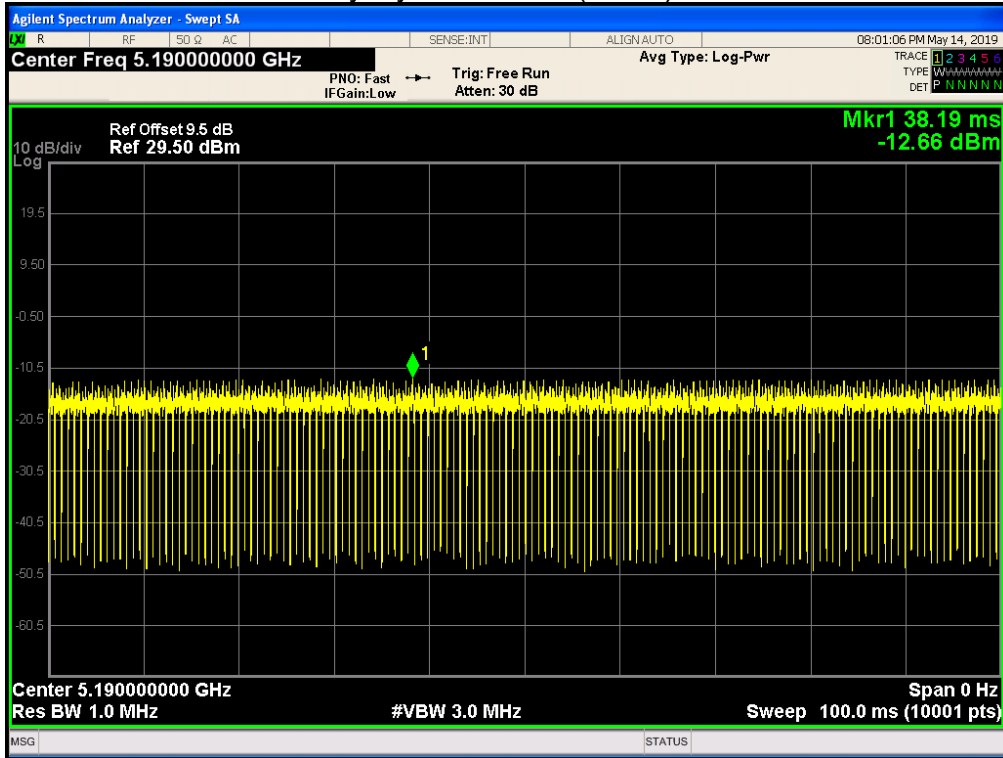
ANT2: Duty Cycle 802.11n(HT20) 5200MHz



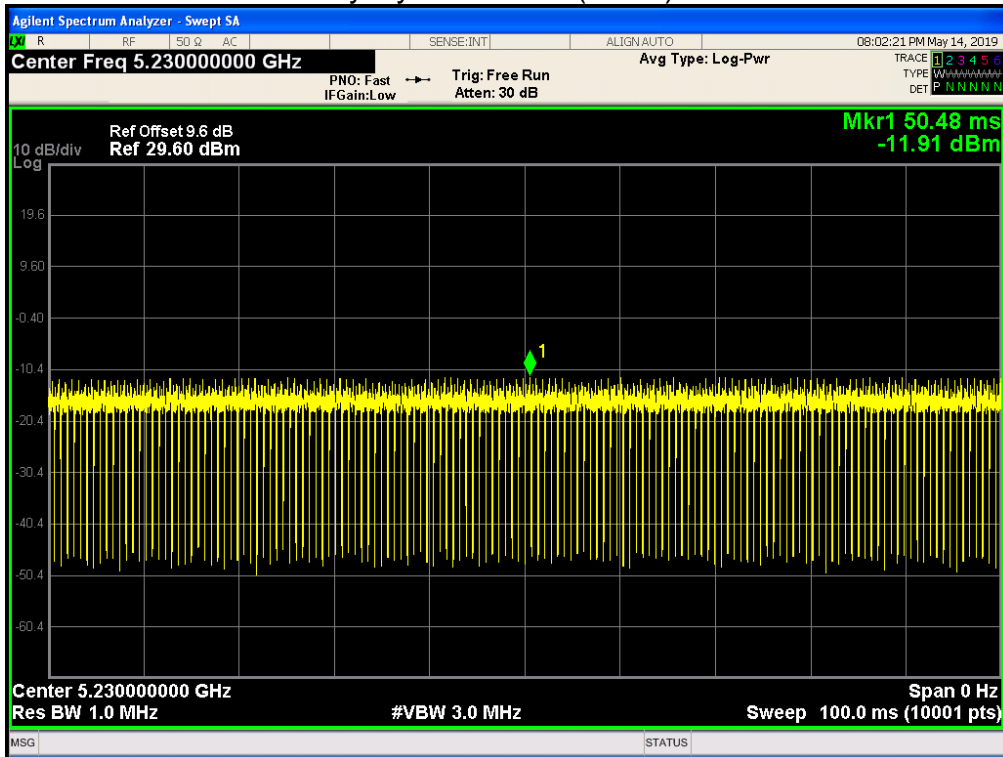
ANT2: Duty Cycle 802.11n(HT20) 5240MHz



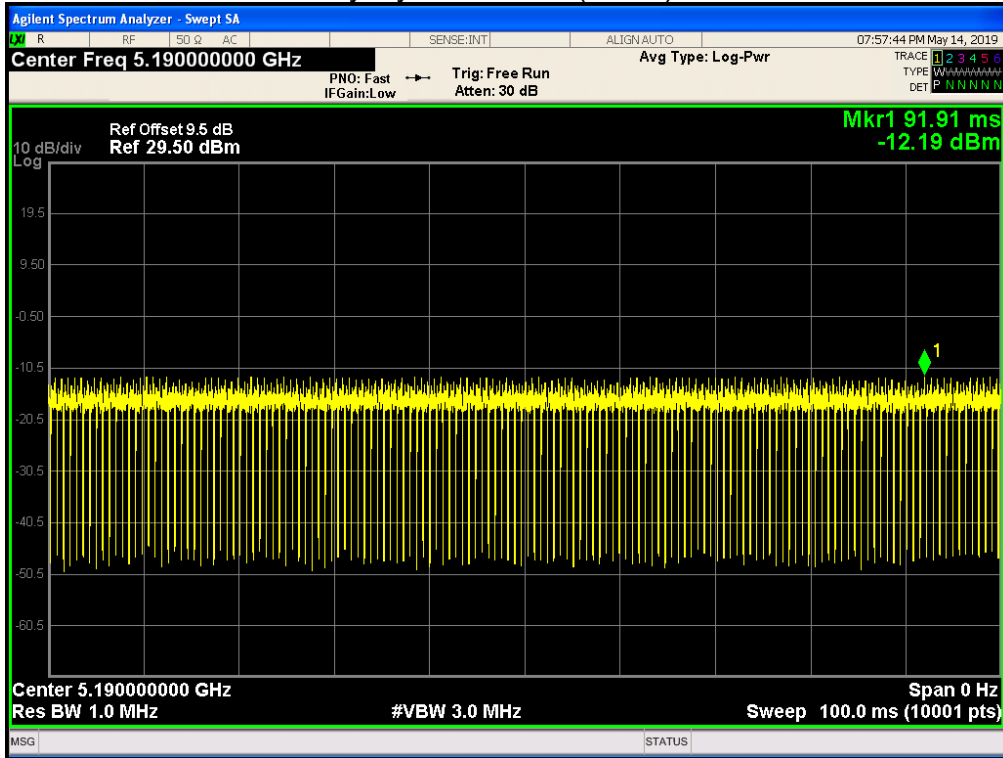
ANT1: Duty Cycle 802.11n(HT40) 5190MHz



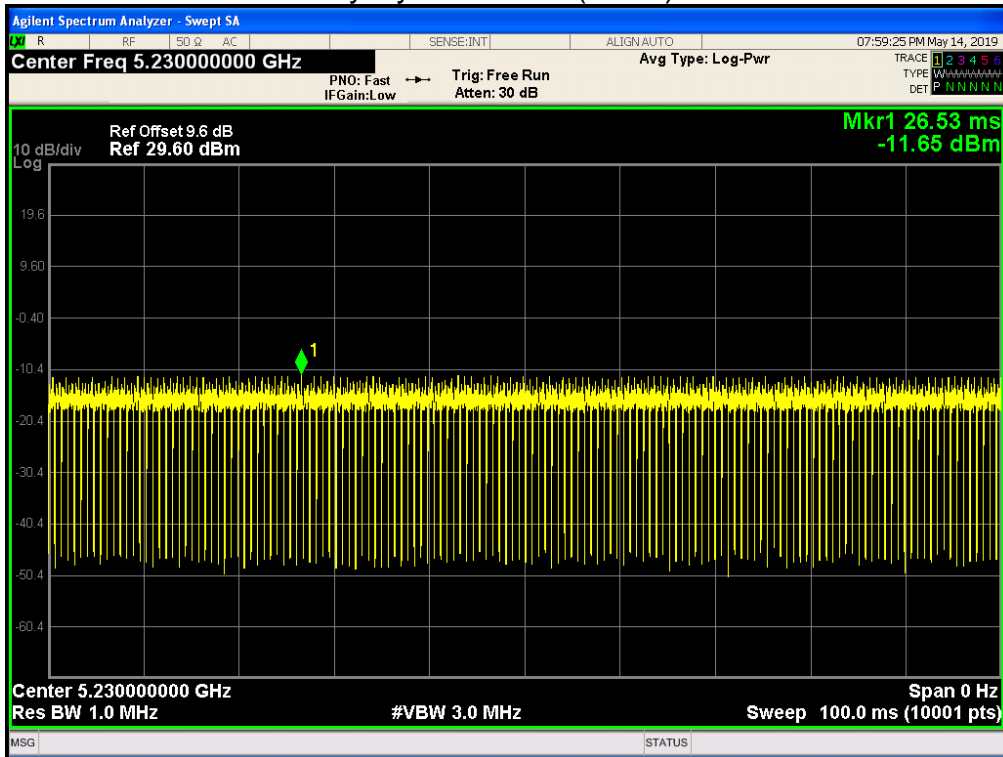
ANT1: Duty Cycle 802.11n(HT40) 5230MHz



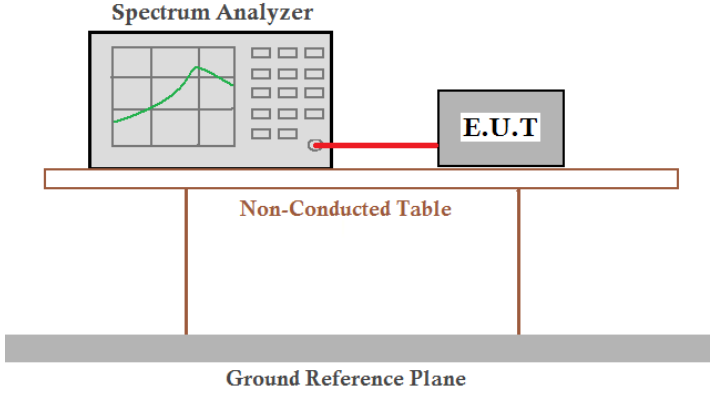
ANT2: Duty Cycle 802.11n(HT40) 5190MHz



ANT2: Duty Cycle 802.11n(HT40) 5230MHz



4.4 Power Spectral Density

Test Requirement:	FCC Part15 E Section 15.407
Test Method:	KDB 789033 D02 General UNII Test Procedures New Rules v02r01
Limit:	$\leq 11.00\text{dBm/MHz}$ for 5150MHz-5250MHz, 5250-5350MHz and 5470-5725 MHz $\leq 30.00\text{dBm/500KHz}$ for 5725MHz-5850MHz
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table, which is supported by two vertical legs. Below the table is a Ground Reference Plane.</p>
Test procedure:	<ol style="list-style-type: none"> 1) Create an average power spectrum for the EUT operating mode being tested by following the instructions in section E)2) for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, "Compute power...". 2) Use the peak search function on the instrument to find the peak of the spectrum. 3) Make the following adjustments to the peak value of the spectrum, if applicable: <ol style="list-style-type: none"> a) If Method SA-2 or SA-2 Alternative was used, add $10 \log(1/x)$, where x is the duty cycle, to the peak of the spectrum. b) If Method SA-3 Alternative was used and the linear mode was used in step E)2)g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging. 4) The result is the PSD.
Test results:	Pass

Measurement Data

Antenna	Mode	Frequency (MHz)	Max PSD (dBm)	Limit (dBm)	Verdict
ANT1	802.11a	5180	-4.643	11	Pass
ANT1	802.11a	5200	-4.096	11	Pass
ANT1	802.11a	5240	-4.325	11	Pass
ANT2	802.11a	5180	-4.581	11	Pass
ANT2	802.11a	5200	-3.865	11	Pass
ANT2	802.11a	5240	-4.465	11	Pass

Mode	Frequency (MHz)	Max PSD (dBm)		Sum PSD (dBm/MHz)	Limit (dBm)	Verdict
		ANT1	ANT2			
802.11ac20	5180	-5.472	-5.302	-2.38	10.36	Pass
802.11ac20	5200	-5.076	-5.058	-2.06	10.36	Pass
802.11ac20	5240	-5.093	-5.045	-2.06	10.36	Pass
802.11ac40	5190	-8.854	-8.6	-5.71	10.36	Pass
802.11ac40	5230	-7.991	-7.767	-4.87	10.36	Pass
802.11ac80	5210	-11.088	-11.2	-8.13	10.36	Pass
802.11n(HT20)	5180	-6.103	-4.96	-2.48	10.36	Pass
802.11n(HT20)	5200	-5.691	-5.058	-2.35	10.36	Pass
802.11n(HT20)	5240	-5.752	-5.398	-2.56	10.36	Pass
802.11n(HT40)	5190	-8.494	-8.714	-5.59	10.36	Pass
802.11n(HT40)	5230	-8.729	-7.85	-5.26	10.36	Pass

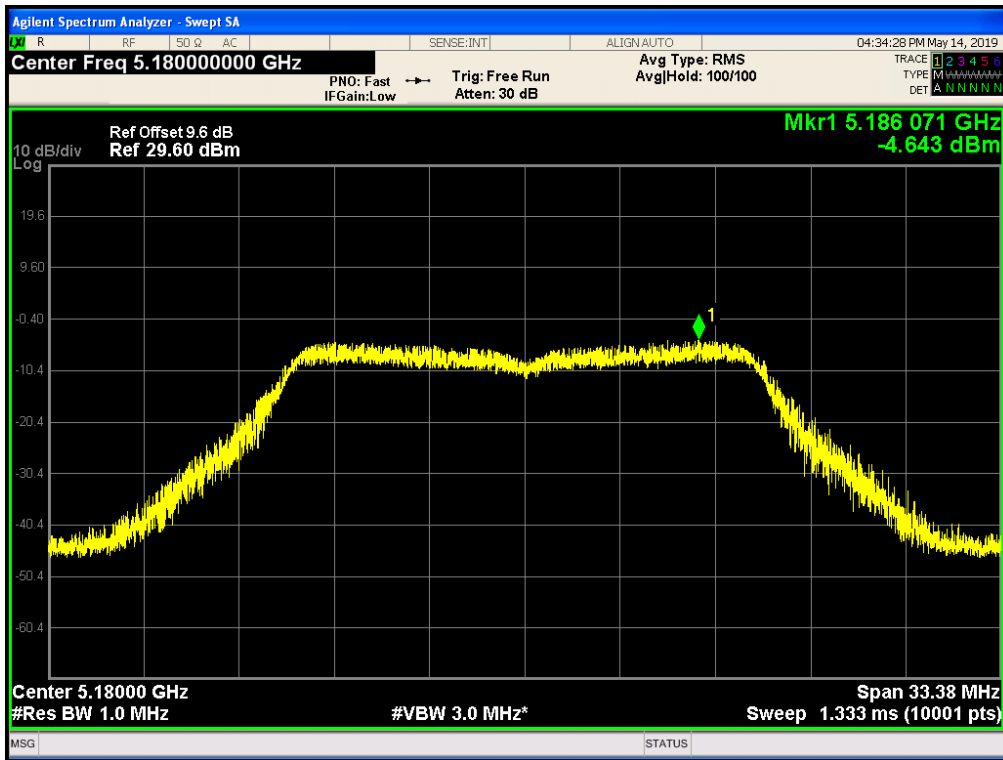
Note:

1, As Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / N_{ANT}]$ dBi=6.64>6dBi,

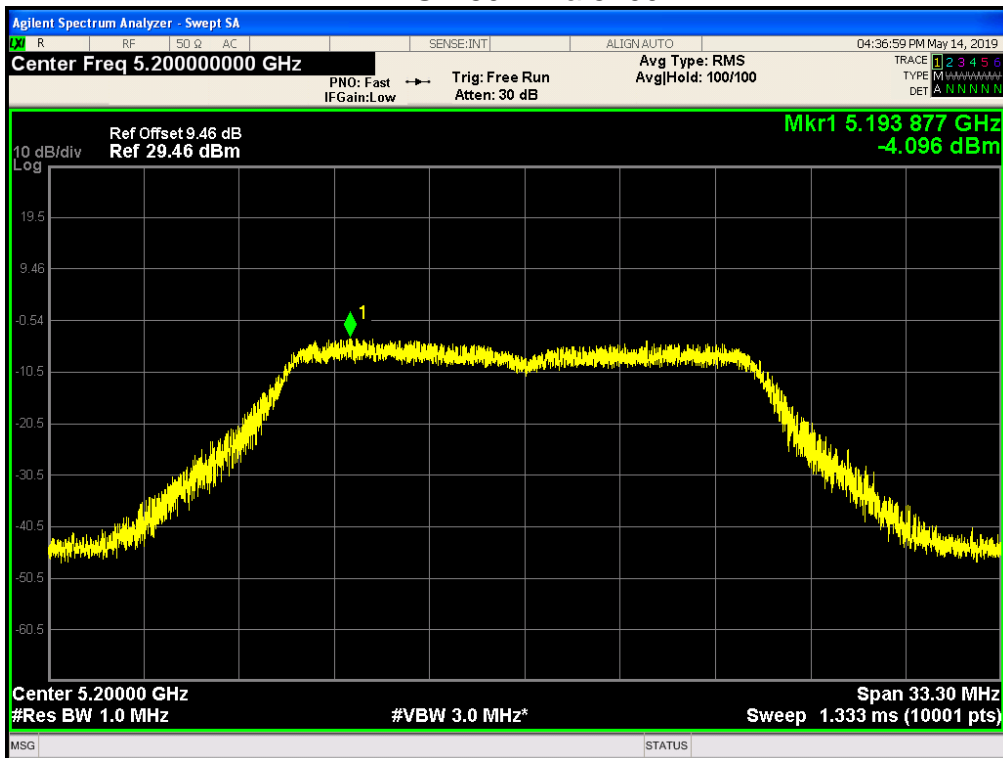
so limit=11-(6.64-6.00)=10.36dBm/1MHz.

Test plots as followed:

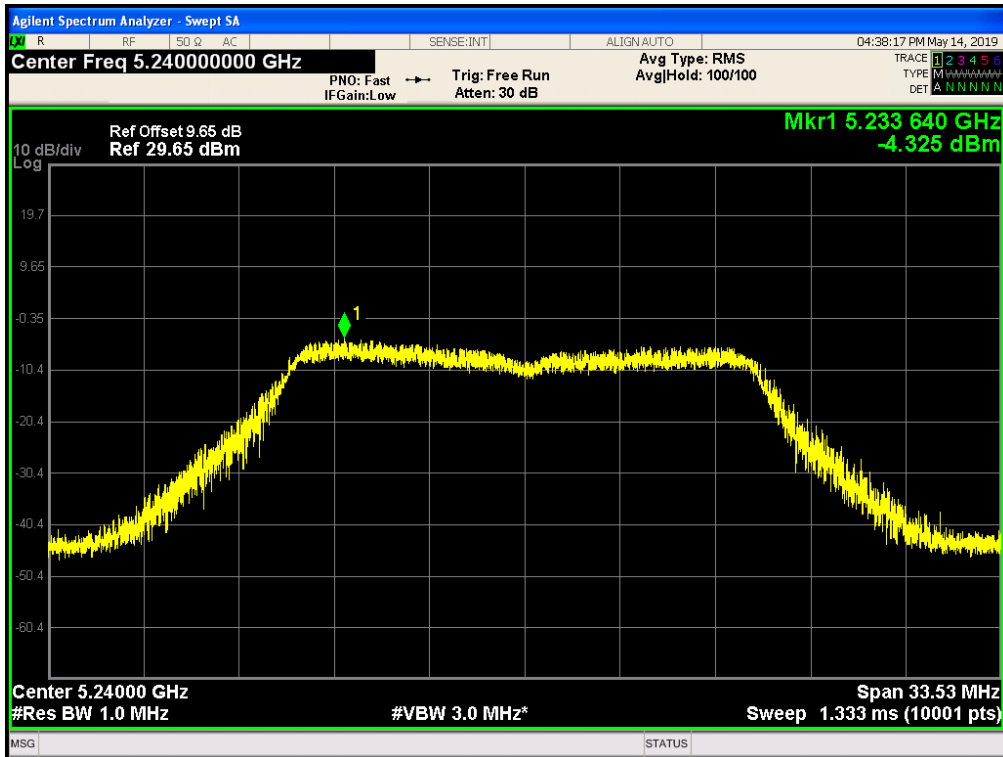
ANT1: PSD 802.11a 5180MHz



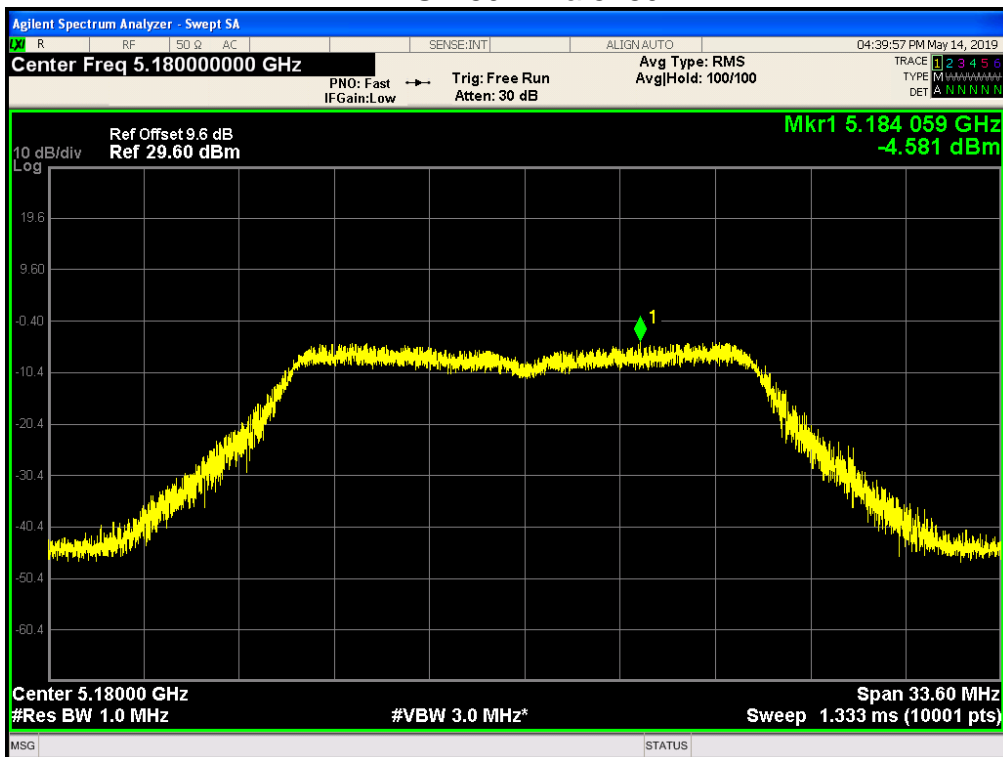
ANT1: PSD 802.11a 5200MHz



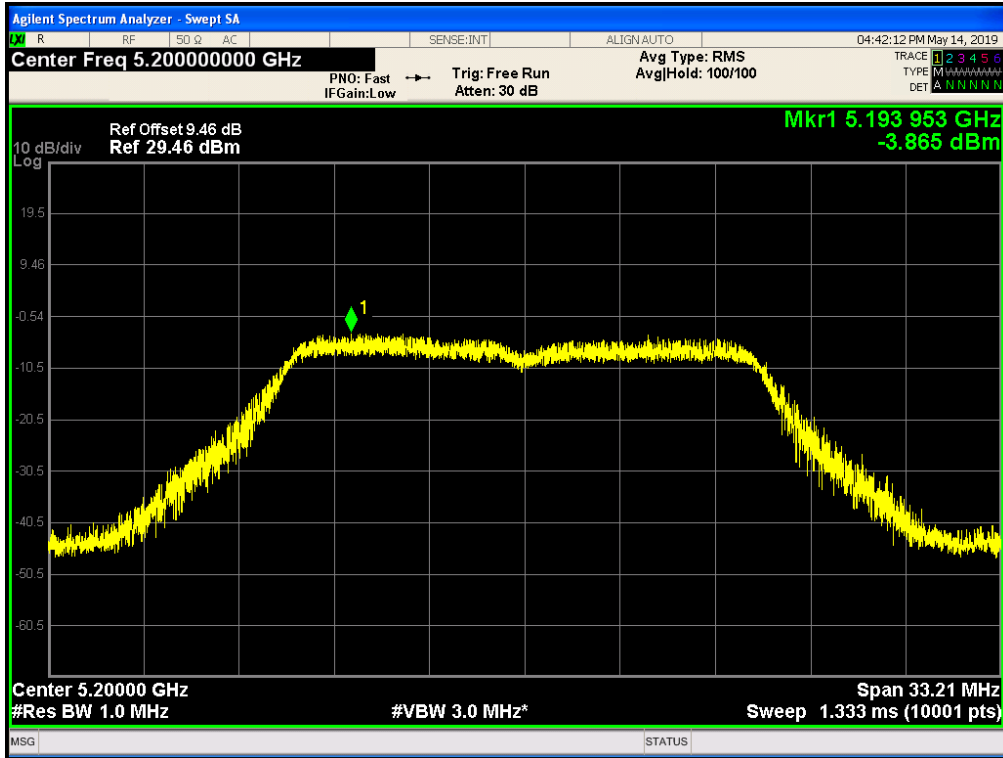
ANT1: PSD 802.11a 5240MHz



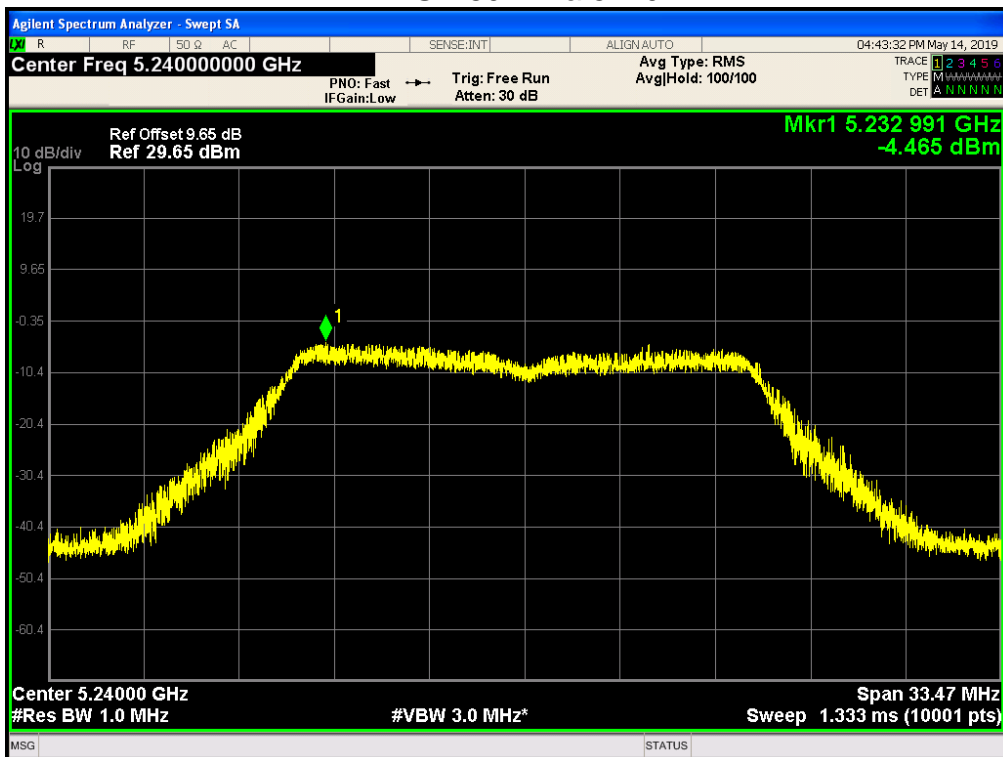
ANT2: PSD 802.11a 5180MHz



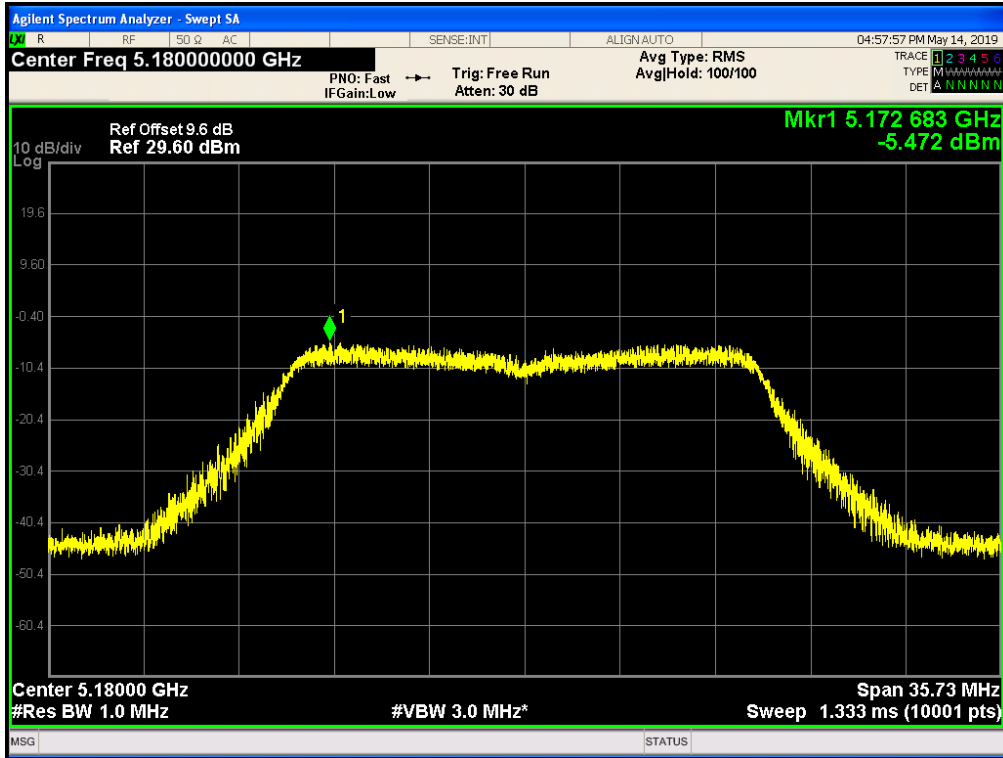
ANT2: PSD 802.11a 5200MHz



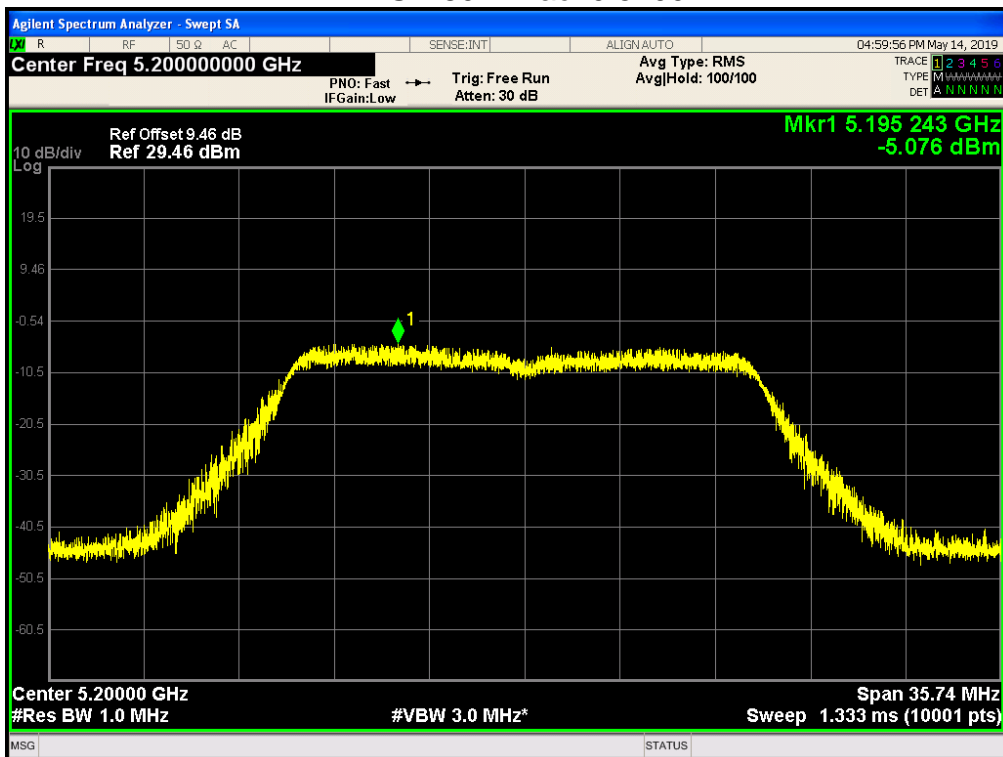
ANT2: PSD 802.11a 5240MHz



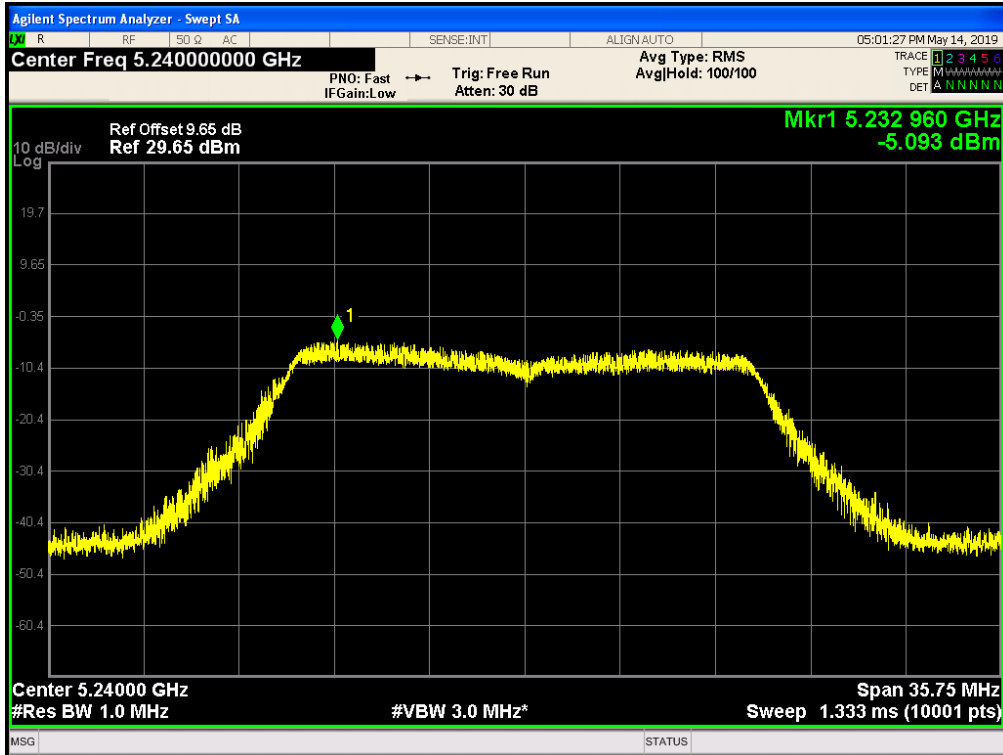
ANT1: PSD 802.11ac20 5180MHz



ANT1: PSD 802.11ac20 5200MHz



ANT1: PSD 802.11ac20 5240MHz



ANT2: PSD 802.11ac20 5180MHz

