

Report No.: ZR/2019/A000304-01
 Rev.: 01
 Page: 1 of 175

TEST REPORT

Application No.: ZR/2019/A0003
Applicant: Sony Mobile Communications INC
Address of Applicant: 4-12-3 Higashi-shinagawa, Shinagawa-ku, Tokyo, 140-0002, Japan
Manufacturer: Sony Mobile Communications INC
Address of Manufacturer: 4-12-3 Higashi-shinagawa, Shinagawa-ku, Tokyo, 140-0002, Japan
EUT Description: GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n, GPS and NFC
Model No.: PM-1291-BV
Trade Mark: Sony
FCC ID: PY7-50352P
Standards: FCC 47 CFR Part 2, Subpart J
 FCC 47 CFR Part 15, Subpart C
Date of Receipt: 2019/10/15
Date of Test: 2019/10/16 to 2019/12/14
 2021/12/20 to 2022/1/10(For Tianjin Dongdian Testing Service Co., Ltd.)
Date of Issue: 2022/5/7

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

Authorized Signature:



Jim Huang



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1 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2022/4/29		Original
02		2022/5/7		Add Note On Section2

Prepared By	 <hr/> (Wick Feng) / Test Supervisor
Checked By	 <hr/> (Daniel Wang) / Reviewer

This report supersedes our previous report **ZR/2019/A000302**, issued on **2019-12-14**, which is hereby deemed null and void.



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2 Test Summary

Test Item	FCC rules No.	Test Method	Test Result	Result	Test Lab ^[1]
Antenna Requirement	15.203/15.247(b)	--	Clause 4.1	PASS	--
AC Power Line Conducted Emission	15.207	ANSI C63.10 2013	Clause 4.2	PASS	B
Duty Cycle	--	--	Clause 4.3	Reporting only	A
Conducted Output Power	15.247 (b)(3)	ANSI C63.10 2013	Clause 4.4	PASS	B
DTS (6 dB) Bandwidth & 99% Occupied Bandwidth	15.247 (a)(2)	ANSI C63.10 2013	Clause 4.5	Reporting only	A
Power Spectral Density	15.247 (e)	ANSI C63.10 2013	Clause 4.6	PASS	A
Band-edge for RF Conducted Emissions	15.247(d)	ANSI C63.10 2013	Clause 4.7	PASS	A
RF Conducted Spurious Emissions	15.247(d)	ANSI C63.10 2013	Clause 4.8	PASS	A
Radiated Spurious Emissions	15.247(d);15.205/15.209	ANSI C63.10 2013	Clause 4.9	PASS	B
Restricted bands around fundamental frequency (Radiated Emission)	15.247(d);15.205/15.209	ANSI C63.10 2013	Clause 4.10	PASS	B

Note^[1]:

Lab A SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

Lab B Tianjin Dongdian Testing Service Co., Ltd.

Test data from lab A is from the original version of this report with measurements made from 2019/10/16 to 2019/12/14. The measurement data for Radiated Emissions, Restricted bands and AC Power line Conducted Emissions is from lab B and was taken from 2021/12/20 to 2022/1/10. This report also includes power verification measurements performed at lab B (refer to section 4.4) to confirm that devices tested at lab B were operating within the expected range of output powers. Refer to section 2 for full details.



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3 General Information

3.1 Details of Client

Applicant:	Sony Mobile Communications INC
Address of Applicant:	4-12-3 Higashi-shinagawa, Shinagawa-ku, Tokyo, 140-0002, Japan
Manufacturer:	Sony Mobile Communications INC
Address of Manufacturer:	4-12-3 Higashi-shinagawa, Shinagawa-ku, Tokyo, 140-0002, Japan

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
Lab B:	
Company:	Tianjin Dongdian Testing Service Co., Ltd.
Address:	Building D-1, No. 19, Weisi Road, Microelectronics Industrial Park, Development Area, Tianjin, China.
Tel:	+86-22-58038033
E-mail:	ddt@dgdtd.com, http://www.ddttest.com
Test engineer:	Sunny Zhang



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3.3 Test Facility

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

Lab A:
<ul style="list-style-type: none"> • 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. • Innovation, Science and Economic Development Canada SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory. CAB identifier: CN0006. IC#: 4620C.
Lab B:
<p>Tianjin Dongdian Testing Service Co., Ltd.</p> <p>Address: Building D-1, No. 19, Weisi Road, Microelectronics Industrial Park Development Area, Tianjin, China., 300385</p> <p>Tel: +86-22-58038033, http://www.ddttest.com, Email: ddt@dgddt.com</p> <p>NVLAP (National Voluntary Laboratory Accreditation Program) CODE: 500036-0</p> <p>CNAS (China National Accreditation Service for Conformity Assessment) CODE: L13402</p> <p>FCC Designation Number: CN5004; FCC Test Firm Registration Number: 368676</p> <p>ISED (Innovation, Science and Economic Development Canada) Company Number: 27768 Conformity Assessment Body Identifier: CN0125</p> <p>VCCI Facility Registration Number: C-20089, T-20093, R-20125, G-20122</p>



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3.4 General Description of EUT

EUT Description:	GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n, GPS and NFC		
Model No.:	PM-1291-BV		
Trade Mark:	Sony		
Hardware Version:	A		
Software Version:	0.96		
Operation Frequency:	802.11b/g/n(HT20):	2412MHz to 2472MHz	
	802.11n(HT40):	2422MHz to 2462MHz	
Modulation Type:	802.11b:	DSSS (DBPSK, DQPSK, CCK)	
	802.11g/n:	OFDM (BPSK, QPSK, 16QAM, 64QAM)	
Number of Channels:	802.11b/g/n(HT20): 13		
	802.11n(HT40): 9		
Channel Spacing:	5MHz		
Smart System:	<input checked="" type="checkbox"/> SISO	802.11b/g/n	
	<input type="checkbox"/> MIMO	CDD: 802.11b/g/n/VHT/ax: Tx & Rx	
		STBC: 802.11n/VHT/ax: Tx & Rx	
		TXBF: 802.11n/VHT/ax: Tx & Rx	
<input type="checkbox"/> Diversity	802.11b/g : Tx & Rx		
Antenna Type:	<input type="checkbox"/> External, <input checked="" type="checkbox"/> Integrated		
Antenna Gain*:	<input checked="" type="checkbox"/> Provided by client		
	-2.33dBi		
RF Cable*:	<input checked="" type="checkbox"/> Provided by client		
	0.5dB(0.6~1GHz)	0.8dB(1.4~2GHz)	1.0dB(2.1~2.7GHz)
	1.5dB(3~4GHz)	1.8dB(4.4~6GHz)	

Note: *Since the above data and/or information is provided by the client relevant results or conclusions of this report are only made for these data and/or information, SGS is not responsible for the authenticity, integrity and results of the data and information and/or the validity of the conclusion.

Remark:

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Operation Frequency of each channel (802.11b/g/n HT20)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2412MHz	4	2427MHz	7	2442MHz	10	2457MHz
2	2417MHz	5	2432MHz	8	2447MHz	11	2462MHz
3	2422MHz	6	2437MHz	9	2452MHz		
Operation Frequency of each channel (802.11n HT40)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
3	2422MHz	6	2437MHz	9	2452MHz		
4	2427MHz	7	2442MHz				
5	2432MHz	8	2447MHz				
Remark: In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:							
Channel	Frequency for 802.11 b/g/n (HT20)			Frequency for 802.11n (HT40)			
The Lowest channel	2412MHz			2422MHz			
The Middle channel	2437MHz			2437MHz			
The Highest channel	2462MHz			2452MHz			



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3.5 Test Environment and Mode

Environment Parameter	86-106 kPa Selected Values During Tests	
Relative Humidity	25-75 % RH Ambient	
Value	Temperature(°C)	Voltage(V)
NTNV	21-25	3.8
Remark: NV: Normal Voltage NT: Normal Temperature		

3.6 Description of Support Units

The EUT has been tested as an independent unit.

3.7 Worst-case configuration and mode

Low data rate was used to test on antenna port conducted tests and radiated spurious emissions since it has the highest maximum power. Following are the worst-case data rates set for test:

Modulation Type	SISO - Data Rate	MIMO - Data Rate
802.11b	1 Mbps	/
802.11g	6 Mbps	/
802.11n (HT 20)	MCS0 (6.5 Mbps)	/
802.11n (HT 40)	MCS0 (13.5 Mbps)	/



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4 Test results and Measurement Data

4.1 Antenna Requirement

Standard requirement:	47 CFR Part 15C Section 15.203 /247(c)
<p>15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</p> <p>15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.</p>	
<p>The antenna is integrated and no consideration of replacement. The best case gain of the antenna is -2.33dBi.</p>	



4.2 AC Power Line Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207		
Test Method:	ANSI C63.10: 2013		
Test Frequency Range:	150kHz to 30MHz		
Receiver Setup:	RBW = 9kHz, VBW = 30kHz		
Limit:	Frequency range (MHz)	Limit (dBuV)	
		Quasi-peak	Average
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	5-30	60	50
	Note 1: * Decreasing linearly with logarithm of frequency. Note 2: The lower limit shall apply at the transition frequencies.		
Test Procedure:	<p>The EUT and Support equipment, if needed, were put placed on a non-metallic table, 80cm above the ground plane.</p> <p>Configuration EUT to simulate typical usage as described in clause 2.4 and test equipment as described in clause 10.2 of this report.</p> <p>All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.</p> <p>All support equipment power received from a second LISN.</p> <p>Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.</p> <p>The Receiver scanned from 150 kHz to 30 MHz for emissions in each of the test modes.</p> <p>During the above scans, the emissions were maximized by cable manipulation.</p> <p>The test mode(s) described in clause 2.4 were scanned during the preliminary test.</p> <p>After the preliminary scan, we found the test mode producing the highest emission level.</p> <p>The EUT configuration and worse cable configuration of the above highest emission levels were recorded for reference of the final test.</p> <p>EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.</p> <p>A scan was taken on both power lines, Neutral and Line, recording at least the six highest emissions.</p> <p>Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.</p> <p>The test data of the worst-case condition(s) was recorded.</p> <p>The bandwidth of test receiver is set at 9 kHz.</p>		

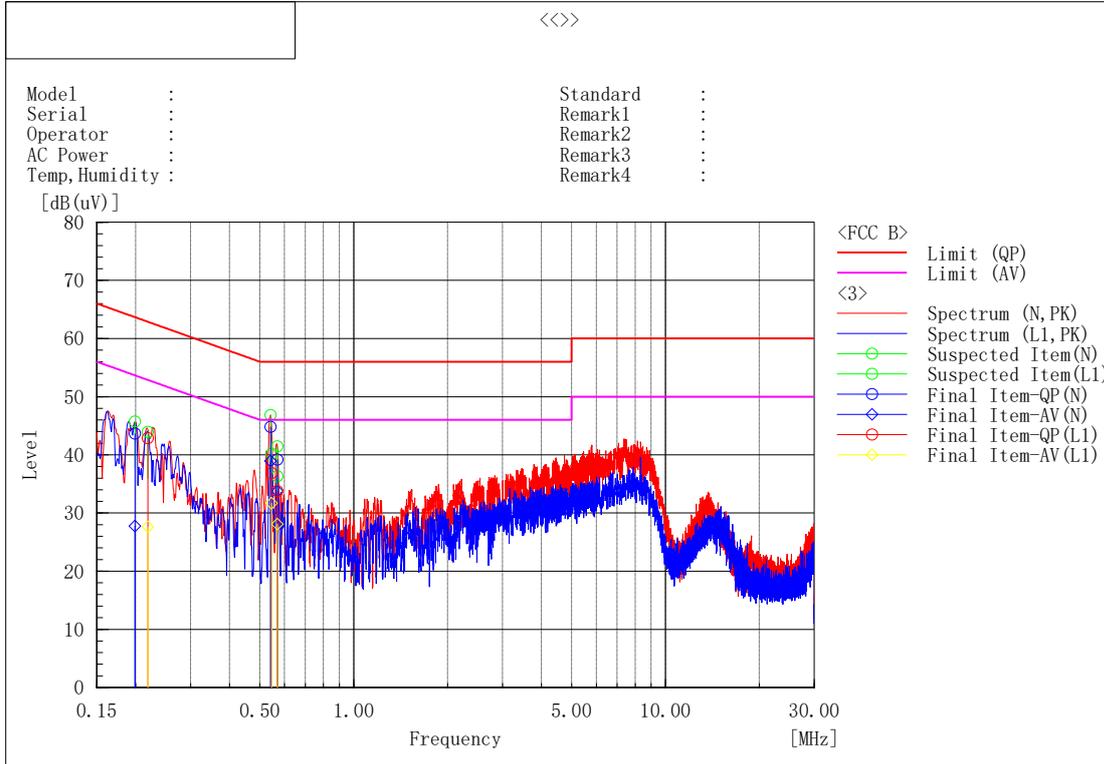


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<p>Test Setup:</p>	
<p>Exploratory Test Mode:</p>	<p>Transmitting with all kind of modulations, data rates at lowest, middle and highest channel. Charge + Transmitting mode.</p>
<p>Final Test Mode:</p>	<p>Refer to section 3.7 for details. Only the worst case is recorded in the report.</p>
<p>Instruments Used:</p>	<p>Refer to section 6 for details.</p>
<p>Test Results:</p>	<p>Pass</p>
<p>Note:</p>	<p>Note1: All emissions not reported below are too low against the prescribed limits. Note2: “-----” means Peak detection; “-----” means Average detection. Note3: According the pre-test, the worst case is transmitting and charging mode.</p>



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Final Result

--- N Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c. f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	0.54129	35.1	29.2	9.7	44.8	38.9	56.0	46.0	11.2	7.1
2	0.19896	33.9	18.0	9.7	43.6	27.7	63.7	53.7	20.1	26.0
3	0.56969	29.5	24.0	9.7	39.2	33.7	56.0	46.0	16.8	12.3

--- L1 Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c. f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	0.54517	27.2	22.0	9.7	36.9	31.7	56.0	46.0	19.1	14.3
2	0.21883	33.1	17.9	9.7	42.8	27.6	62.9	52.9	20.1	25.3
3	0.56936	24.0	18.4	9.7	33.7	28.1	56.0	46.0	22.3	17.9

Note1) Level (Quasi-Peak and/or C/Average) = Meter Reading + Factor

Note2) Line = Polarity of input power (Live or Neutral)

N : Abbreviation of Neutral Polarity, L1 : Abbreviation of Live Polarity,

Note3) Factor = LISN Insertion Loss + Cable Loss

Note4) Margin = Limit – Level (Quasi-Peak and/or C/Average)

Note5) C/Average : Abbreviation of CISPR Average



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4.3 Duty Cycle

The detailed test data see: **Appendix**



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4.4 Conducted Output Power

Test Requirement:	47 CFR Part 15C Section 15.247 (b)(3)
Test Method:	ANSI C63.10 :2013 Section 11.9.1.3
Test Setup:	<pre> graph LR PM[Power Meter] --- EUT[EUT] </pre>
Test Instruments:	Refer to section 6 for details.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Refer to section 3.7 for details.
Limit:	For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
Test procedure:	Connect each EUT's antenna output to power sensor by RF cable and attenuator. Measure the PK output power of each antenna port by power sensor.
Re-Test statement:	The EUT is operating at the same power level with the original testing of SGS-CSTC Standards Technical Services, Co., Ltd. Shenzhen Branch.
Test Results:	Pass



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Test results:

Remark

	The Original Reports	Re-Test Reports
File name:	test report 2.4G WLAN	DDT-B21122006-1E04
Test location:	SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch	Tianjin Dongdian Testing Service Co., Ltd.

Power

Mode	Test Channel	The Original Reports Level [dBm]	Re-Test Reports Level [dBm]	Power level
802.11b	Lowest	19.60	20.03	16.5
	Middle	20.51	20.14	16.5
	Highest	20.42	20.21	16.5
802.11g	Lowest	22.49	21.67	16.5
	Middle	23.05	22.35	16.5
	Highest	22.73	22.17	16.5
802.11n20	Lowest	21.51	21.28	16.5
	Middle	21.98	21.46	16.0
	Highest	21.95	21.09	16.5
802.11n40	Lowest	22.57	21.87	17.5
	Middle	22.63	22.25	16.0
	Highest	22.54	21.96	16.5



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

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(2)
Test Method:	ANSI C63.10: 2013 Section 11.8.1 Option 1
Test Setup:	
Instruments Used:	Refer to section 6 for details.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Refer to section 3.7 for details.
Limit:	≥ 500 kHz
Test Results:	Pass
The detailed test data see: Appendix	



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4.6 Power Spectral Density

Test Requirement:	47 CFR Part 15C Section 15.247 (e)
Test Method:	ANSI C63.10 :2013 Section 11.10.2
Test Setup:	
Test Instruments:	Refer to section 6 for details.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Refer to section 3.7 for details.
Limit:	≤8.00dBm/3kHz
Test Results:	Pass
The detailed test data see: Appendix	



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4.7 Band-edge for RF Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013 Section 11.13
Test Setup:	
Instruments Used:	Refer to section 6 for details.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Refer to section 3.7 for details.
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test Results:	Pass
The detailed test data see: Appendix	



4.8 RF Conducted Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013 Section 11.11
Test Setup:	
Instruments Used:	Refer to section 6 for details.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Refer to section 3.7 for details.
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test Results:	Pass
The detailed test data see: Appendix	



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4.9 Radiated Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205			
Test Method:	ANSI C63.10 :2013 Section 11.12			
Test Site:	Measurement Distance: 3m or 10m (Semi-Anechoic Chamber)			
Test Frequency:	9kHz ~ 25GHz			
Limit:	(1) FCC 15.205 Restricted frequency band			
	MHz	MHz	MHz	GHz
	0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
	¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
	2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
	4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
	4.1772&4.17775	37.5-38.25	1435-1626.5	9.0-9.2
	4.2072&4.20775	73-74.6	1645.5-1646.5	9.3-9.5
	6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
	6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
	6.31175-6.31225	123-138	2200-2300	14.47-14.5
	8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
	8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
	8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
	8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
	12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
	12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
	12.57675-12.57725	322-335.4	3600-4400	(²)
	13.36-13.41			
	¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz. ² Above 38.6			
	(2) FCC 15.209 Limit.			
	FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
			$\mu\text{V}/\text{m}$	$\text{dB}(\mu\text{V})/\text{m}$
	0.009 ~ 0.490	300	2400/F(kHz)	67.6-20log(F)
	0.490 ~ 1.705	30	24000/F(kHz)	87.6-20log(F)
	1.705 ~ 30.0	30	30	29.54
	30 ~ 88	3	100	40.0
	88 ~ 216	3	150	43.5
	216 ~ 960	3	200	46.0
	960 ~ 1000	3	500	54.0
	Above 1000	3	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	
	Note: (1) The emission limits shown in the above table are based on measurements employing a CISPR QP detector except for the frequency bands 9 - 90 kHz, 110 -			



490 kHz and above 1000 MHz, radiated emissions limits in these three bands are based on measurements employing an average detector.

(2) At frequencies below 30 MHz, measurement may be performed at a distance closer than that specified, and the limit at closer measurement distance can be extrapolated by below formula:

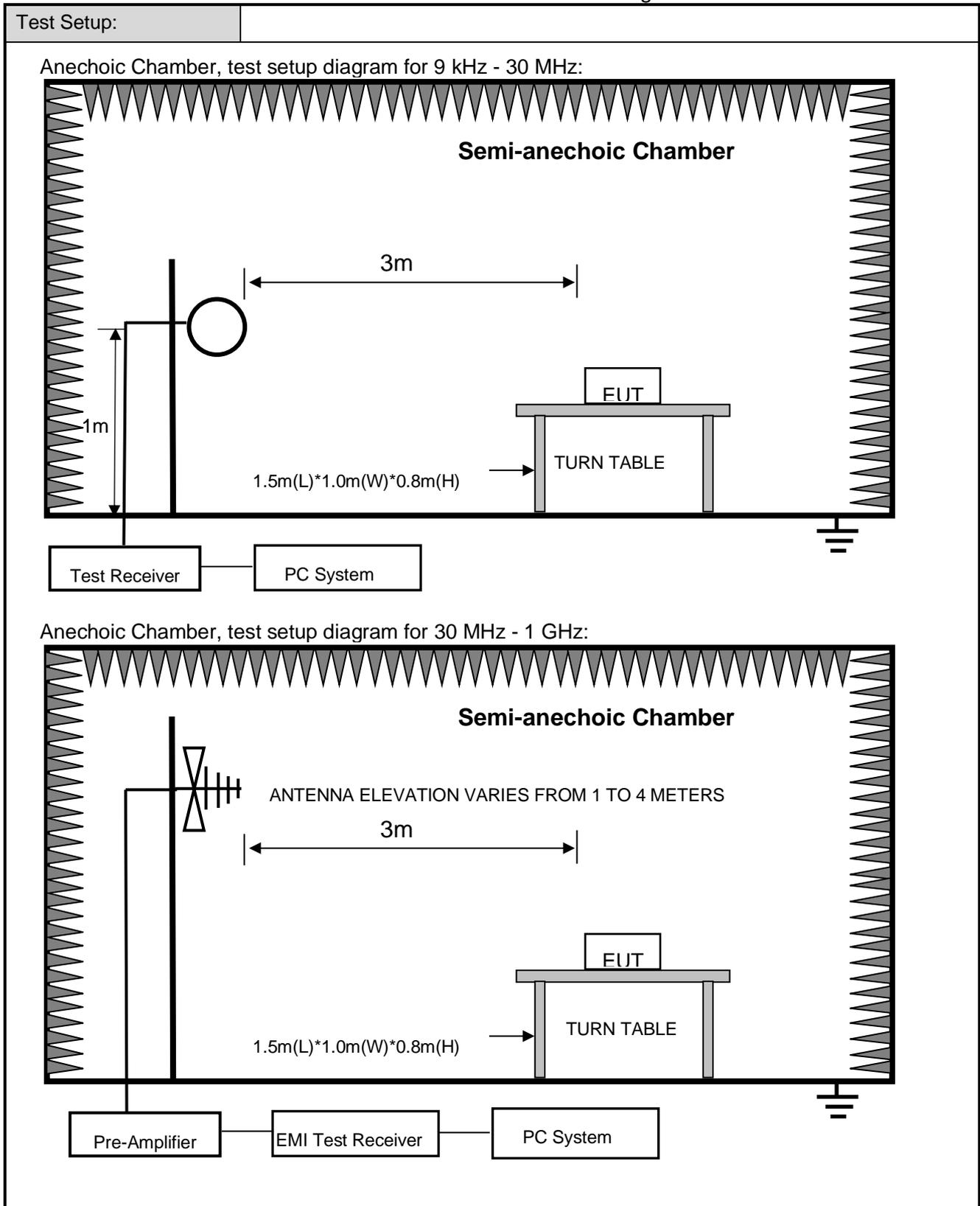
$$\text{Limit}_{3m}(\text{dBuV/m}) = \text{Limit}_{30m}(\text{dBuV/m}) + 40\text{Log}(30m/3m)$$

(3) Limit for this EUT

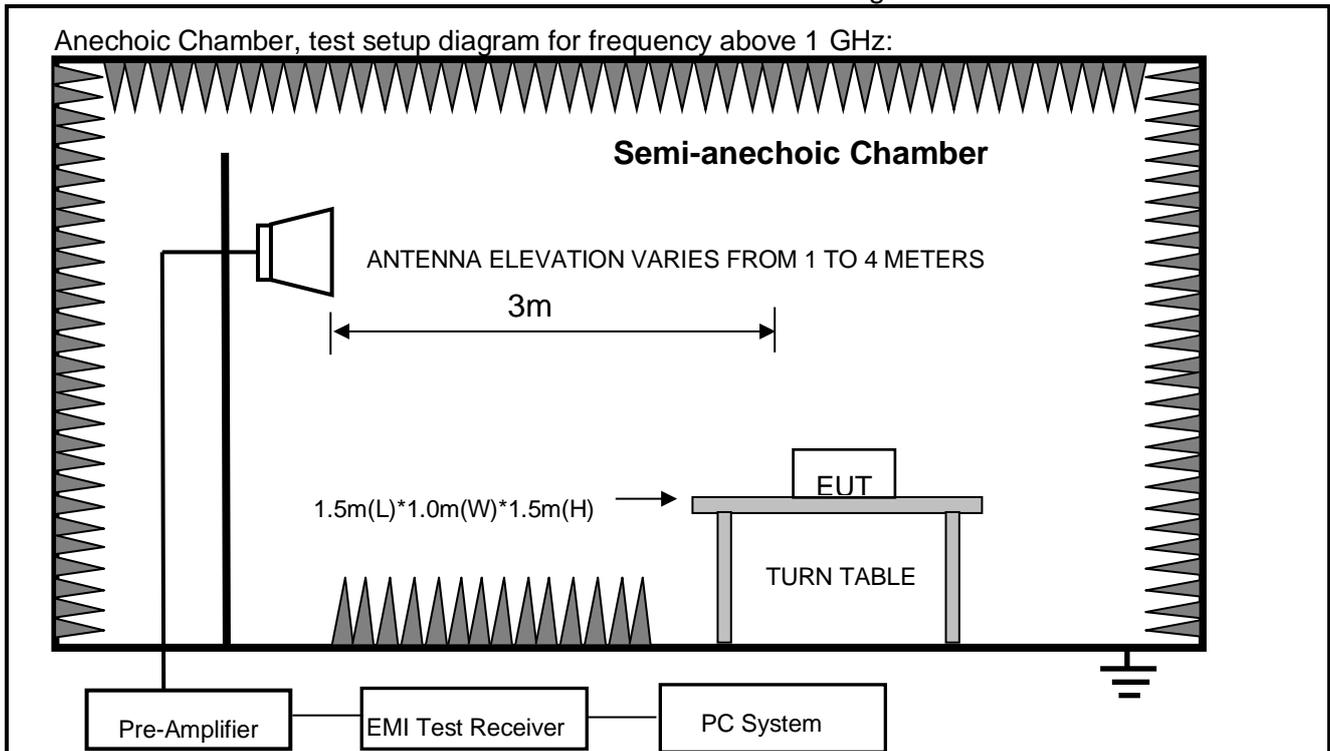
All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20 dB below the fundamental emissions or comply with 15.209 limits.



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Note: For harmonic emissions test an appropriate high pass filter was inserted in the input port of AMP.

Test Procedure:

- (1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber for below 1G and 150 cm above the ground plane inside a fully-anechoic chamber for above 1G.
- (2) Test antenna was located 3 m from the EUT on an adjustable mast, and the antenna used as below table.

Frequency range	Test antenna used	Test antenna distance
30 MHz - 300 MHz	Active Loop antenna	3 m
300 MHz - 1 GHz	Trilog Broadband Antenna	3 m
1 GHz - 18 GHz	Double Ridged Horn Antenna (1 GHz - 18 GHz)	3 m
18 GHz - 40 GHz	Horn Antenna (18 GHz - 40 GHz)	3 m

According ANSI C63.10:2013 clause 6.4.4.2 and 6.5.3, for measurements below 30 MHz, the loop antenna was positioned with its plane vertical from the EUT and rotated about its vertical axis for maximum response at each azimuth position around the EUT. And the loop antenna also is positioned with its plane horizontal at the specified distance from the EUT. The center of the loop is 1 m above the ground. For measurement above 30 MHz, the trilog Broadband Antenna or Horn Antenna was located 3 m from EUT, Measurements were made with the antenna positioned in both the horizontal and vertical planes of Polarization, and the measurement antenna was varied from 1 m to 4 m. in height above the reference ground plane to obtain the maximum signal strength.

- (3) Below pre-scan procedure was first performed in order to find prominent



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	<p>frequency spectrum radiated emissions from 9 kHz to 25 GHz:</p> <p>(a) Scanning the peak frequency spectrum with the antenna specified in step (3), and the EUT was rotated 360 degree, the antenna height was varied from 1 m to 4 m (Except loop antenna, it's fixed 1 m above ground.)</p> <p>(b) Change work frequency or channel of device if practicable.</p> <p>(c) Change modulation type of device if practicable.</p> <p>(d) Change power supply range from 85% to 115% of the rated supply voltage</p> <p>(e) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions.</p> <p>Spectrum frequency from 9 kHz to 25 GHz (tenth harmonic of fundamental frequency) was investigated, and no any obvious emission were detected from 18 GHz to 25 GHz, so below final test was performed with frequency range from 9 kHz to 18 GHz.</p> <p>(4) For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipment and all of the interface cables were changed according to ANSI C63.10:2013 on Radiated Emission test.</p> <p>(5) The emissions from 9 kHz to 1 GHz were measured based on CISPR QP detector except for the frequency bands 9 - 90 kHz, 110 - 490 kHz, for emissions from 9 kHz - 90 kHz, 110 kHz - 490 kHz and above 1 GHz were measured based on average detector, for emissions above 1 GHz, peak emissions also be measured and need comply with Peak limit.</p> <p>(6) The emissions from 9 kHz to 1 GHz, QP or average values were measured with EMI receiver with below RBW.</p> <table border="1" data-bbox="587 1160 1326 1294"> <thead> <tr> <th>Frequency band</th> <th>RBW</th> </tr> </thead> <tbody> <tr> <td>9 kHz - 150 kHz</td> <td>200 Hz</td> </tr> <tr> <td>150 kHz - 30 MHz</td> <td>9 kHz</td> </tr> <tr> <td>30 MHz - 1 GHz</td> <td>120 kHz</td> </tr> </tbody> </table> <p>(7) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1 MHz, VBW is set at 3 MHz for Peak measure; According ANSI C63.10:2013 clause 4.1.4.2.2 procedure for average measure.</p> <p>(8) X axis, Y axis, Z axis are tested, and worse setup X axis is reported.</p>	Frequency band	RBW	9 kHz - 150 kHz	200 Hz	150 kHz - 30 MHz	9 kHz	30 MHz - 1 GHz	120 kHz
Frequency band	RBW								
9 kHz - 150 kHz	200 Hz								
150 kHz - 30 MHz	9 kHz								
30 MHz - 1 GHz	120 kHz								
<p>Exploratory Test Mode:</p>	<p>Transmitting with all kind of modulations, data rates. Charge + Transmitting mode.</p>								
<p>Final Test Mode:</p>	<p>Refer to section 3.7 for details.</p>								
<p>Instruments Used:</p>	<p>Refer to section 6 for details.</p>								
<p>Test Results:</p>	<p>Pass</p>								
<p>Note :</p>	<p>All the emissions except fundamental emission from 9 kHz to 25 GHz were comply with 15.209 limits.</p> <p>Note1: According exploratory test, the emission levels are 20 dB below the limit detected from 9 kHz to 30 MHz and 18 GHz to 25 GHz, so the final test was performed with frequency range from 30 MHz to 18 GHz and recorded in below.</p> <p>Note2: For emissions below 1 GHz, according exploratory explorer test, when change Tx mode and channel, have no distinct influence on emissions level, so for emissions below 1 GHz, the final test was only performed with EUT working in transmitting and charging mode.</p>								





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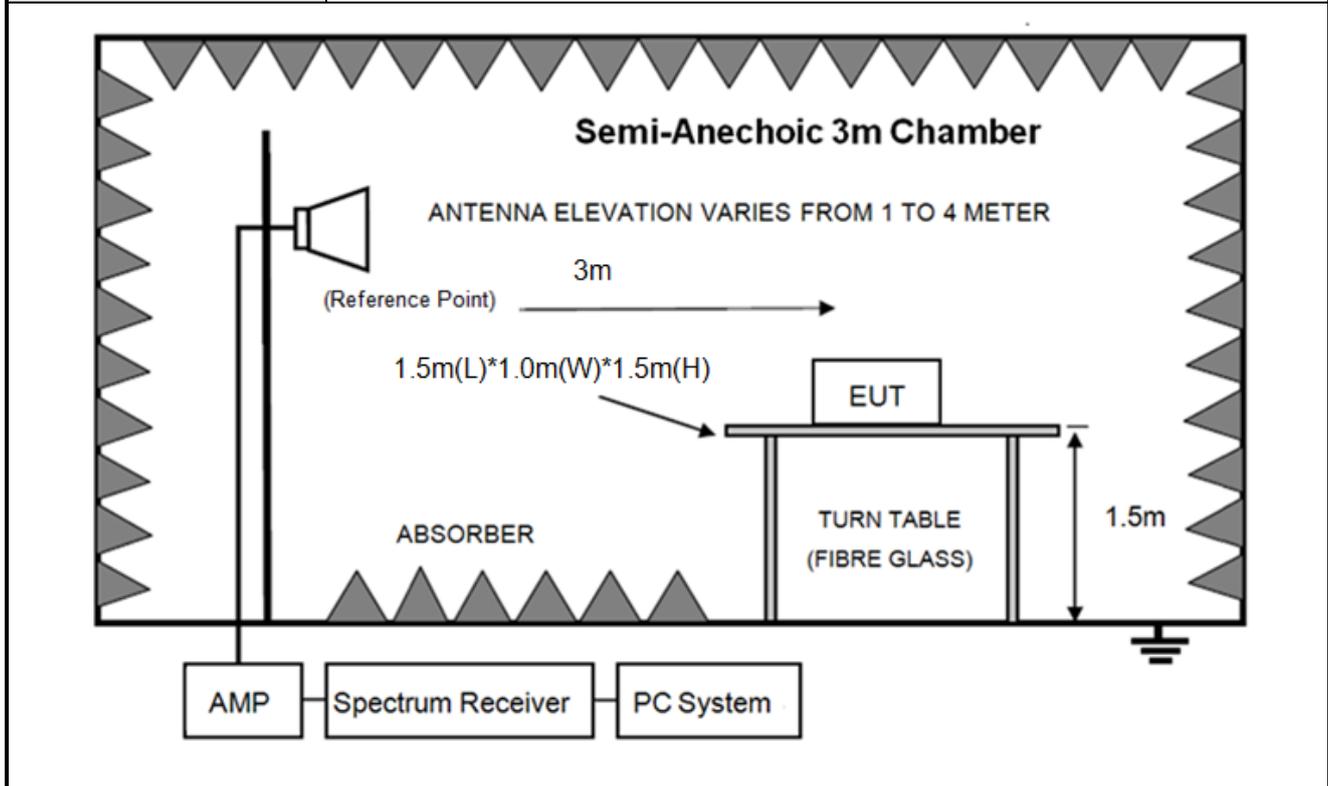
	Note3: For emissions above 1 GHz. If peak results comply with AV limit, AV Result is deemed to comply with AV limit. Scan with all modes, the worst case was recorded in this report.
The detailed test data see: Appendix	



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4.10 Restricted bands around fundamental frequency

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205
Test Method:	ANSI C63.10: 2013 Section 11.12
Test Site:	Measurement Distance: 3m or 10m (Semi-Anechoic Chamber)
Limit:	All restriction band should comply with 15.209, other emission should be at least 20 dB below the fundamental.
Test Setup:	



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Test Procedure:	Same with clause 10.3 except change investigated frequency range from 2310 MHz to 2430 MHz and 2445 MHz to 2550 MHz. Remark: All restriction band have been tested, and only the worst case is shown in report.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Charge + Transmitting mode.
Final Test Mode:	Refer to section 3.7 for details.
Instruments Used:	Refer to section 6 for details.
Test Results:	Pass
The detailed test data see: Appendix	



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

Lab A:

No.	Item	Measurement Uncertainty
1	Total RF power, conducted	±0.75dB
2	RF power density, conducted	±2.84dB
3	Spurious emissions, conducted	±0.75dB

Lab B:

Test Item	Uncertainty
Uncertainty for Radiation Emission Test (30 MHz - 1 GHz)	2.72 dB (Antenna Polarize: V)
	2.72 dB (Antenna Polarize: H)
Uncertainty for Radiation Emission Test (1 GHz - 40 GHz)	2.74 dB (1 - 6 GHz)
	2.72 dB (6 GHz - 18 GHz)
	3.54 dB (18 GHz - 26 GHz)
	4.30 dB (26 GHz - 40 GHz)
Uncertainty for Power Line Conduction Emission Test	3.40 dB (150 kHz - 30 MHz)

Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.



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6 Equipment List

Lab A:

RF conducted					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (yyyy-mm-dd)	Cal. Due date (yyyy-mm-dd)
Signal Analyzer	Rohde & Schwarz	FSV	W025-05	2019/4/9	2020/4/8
Signal Analyzer	Agilent	N9020A	W025-01	2019/6/25	2020/6/24
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2019/7/14	2020/7/13
Humidity/ Temperature Indicator	MingGao	TH101B	W006-05	2019/6/27	2020/6/26



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Lab B:

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
RF Connected Test (MWRFtest system)					
Microwave Signal Generator	R&S	SMF100A	101396	2021/05/25	1 Year
MXG Vector Signal Generator	Agilent	N5182A	MY50143288	2021/03/08	1 Year
EMI Test Receiver	R&S	ESU26	100243	2021/03/03	1 Year
Wideband Radio Communication Tester	R&S	CMW500	158800	2021/05/14	1 Year
Power Detector	MWRFtest	MW100-PSB	MW201203008	2021/03/31	1 Year
DC Power Supply	inSTEK	PSP-2010	EH131319	2021/02/27	1 Year
Test Software	MWRFtest	MTS8310	V03	N/A	N/A
Radiated Emission -10m EMI Chamber					
EXA Signal Analyzer	Keysight	N9010A	MY53281492	2021/03/31	1 Year
Active Loop Antenna	R&S	HFH2-Z2	100269	2021/05/08	1 Year
Double-Ridged Guide Horn Antenna	ETS-LINDGREN	3115	00102808	2021/03/16	1 Year
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	790	2021/04/21	1 Year
Broadband Horn Antenna	TESEQ	BHA 9118	31754	2021/10/12	1 Year
Low noise amplifier	MITEQ	TPA0118-36	0914	2021/02/03	1 Year
EMI Test Receiver	R&S	ESCI	101024	2021/03/03	1 Year
EMI Test Receiver	R&S	ESCI	101030	2021/05/15	1 Year
Bilog Antenna	TESEQ	CBL6112D	29068	2020/10/12	2 Year
Bilog Antenna	TESEQ	CBL6112D	29069	2020/10/12	2 Year
Amplifier	Sonoma	310N	300913	2021/03/03	1 Year
Amplifier	Sonoma	310N	300914	2021/03/03	1 Year
Ant Mast	Innco	MA4000	N/A	N/A	N/A
Ant Mast	Innco	MA4000	N/A	N/A	N/A
Mast Controller	Innco	CO2000	N/A	N/A	N/A
Mast Controller	Innco	CO2000	N/A	N/A	N/A
RF Selector 4CH	TOYO	NS4904N	Selector1	N/A	N/A
RF Selector 4CH	TOYO	NS4904N	Selector2	N/A	N/A
Test software	TOYO	EP5/RSE	Ver 1.9.1	N/A	N/A



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Test software	Audix	E3	V 6.11111b	N/A	N/A
Power Line Conducted Emissions Test					
Test Receiver	R&S	ESCI	101397	2021/03/03	1 Year
LISN	R&S	ENV216	101122	2021/03/31	1 Year
Test software	TOYO	EP5/CE	V 5.4.40	N/A	N/A



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7 Photographs – Setup Photos

Refer to Appendix A.2 WLAN Setup Photos.



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Appendix



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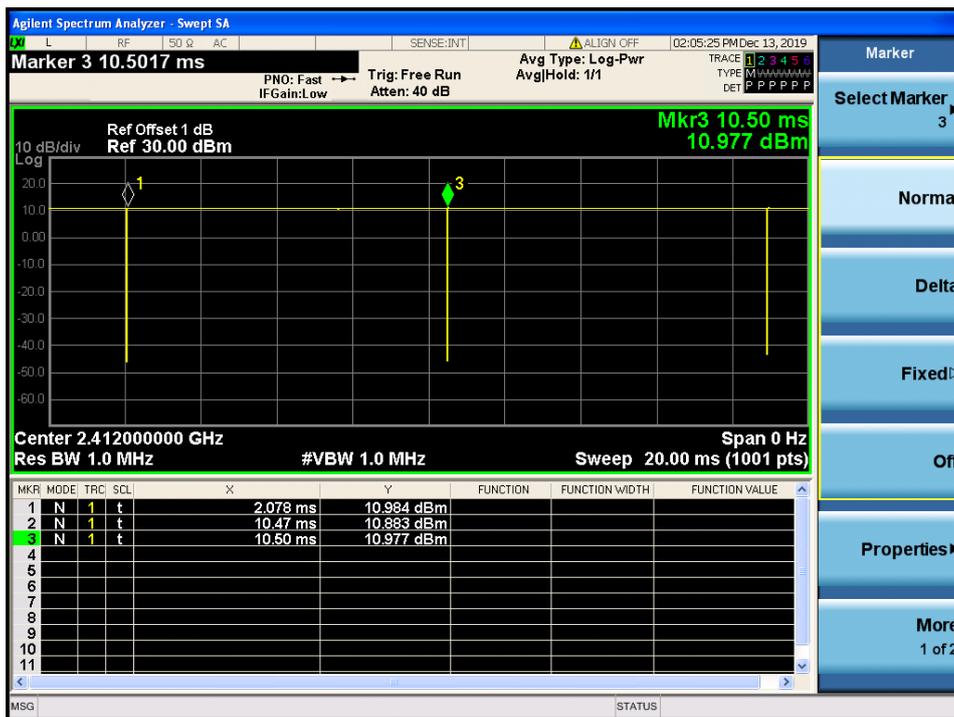
Duty Cycle

Test Results

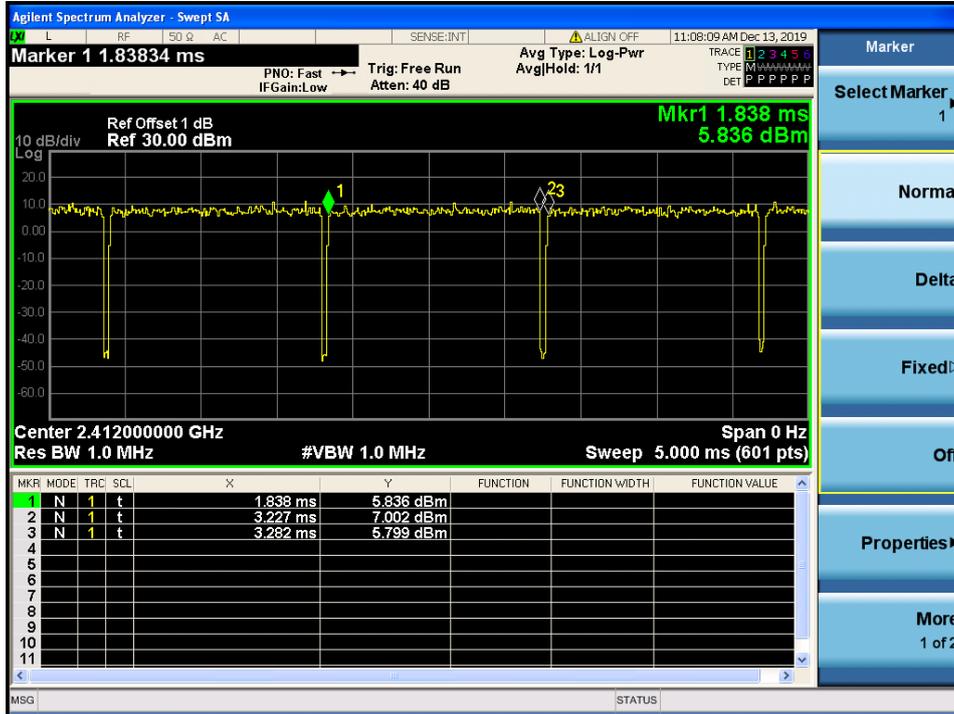
Test Mode	TX Freq. [MHz]	Duty cycle [%]
11B	Ant 1: CH1	99.64
11G	Ant 1: CH1	96.19
11N_20	Ant 1: CH1	96.50
11N_40	Ant 1: CH3	93.22

Test Plots

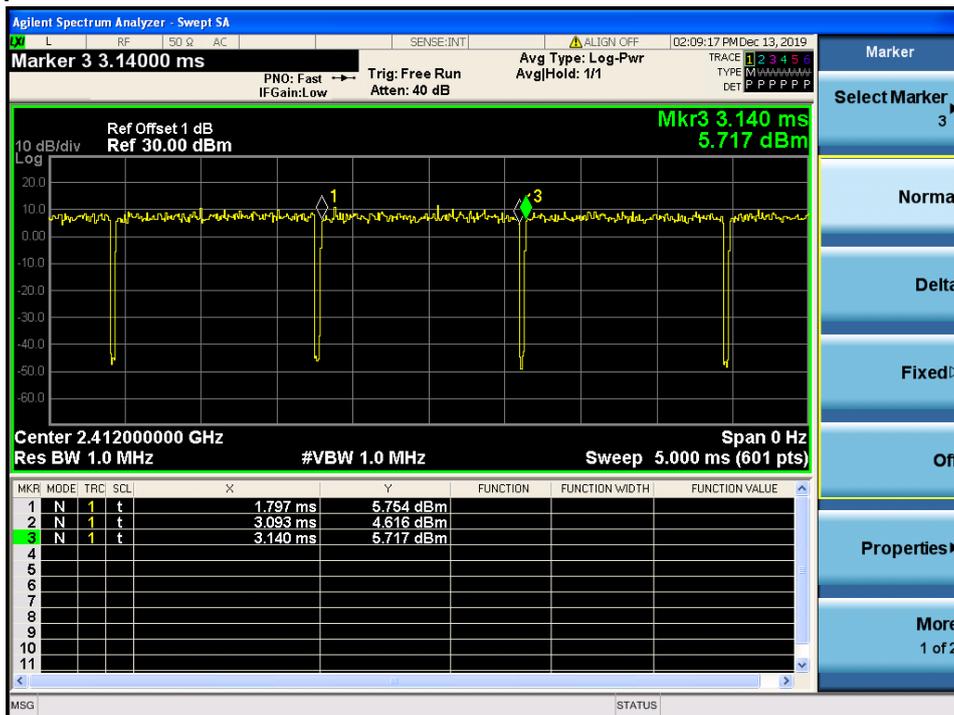
11B @Ant 1



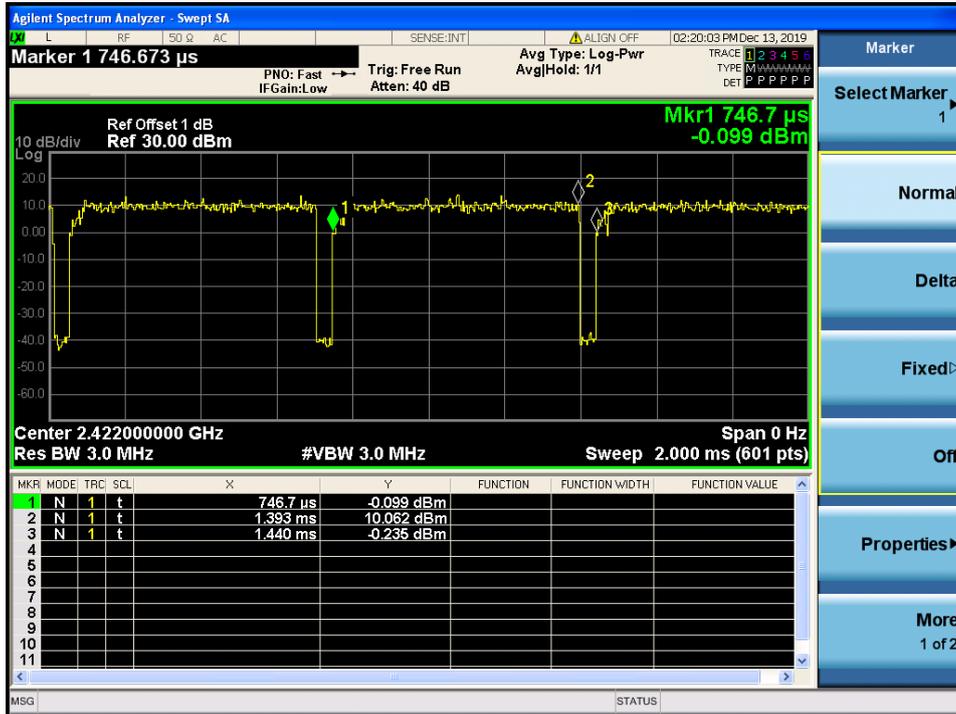
11G@Ant 1



11N20@Ant 1



11N40@Ant 1



DTS (6 dB) Bandwidth & 99% Occupied Bandwidth

Test Results

Mode	Test Channel	Occupied Bandwidth (MHz)	6dB Emission Bandwidth (MHz)	Limit (kHz)	Result
802.11B	Lowest	13.155	8.570	≥500	Pass
	Middle	12.806	8.103	≥500	Pass
	Highest	13.090	8.062	≥500	Pass
802.11G	Lowest	16.612	16.110	≥500	Pass
	Middle	16.439	15.130	≥500	Pass
	Highest	16.602	15.470	≥500	Pass
802.11N20	Lowest	17.724	16.110	≥500	Pass
	Middle	17.584	15.130	≥500	Pass
	Highest	17.732	16.930	≥500	Pass
802.11N40	Lowest	36.333	35.260	≥500	Pass
	Middle	35.882	33.850	≥500	Pass
	Highest	36.078	35.170	≥500	Pass



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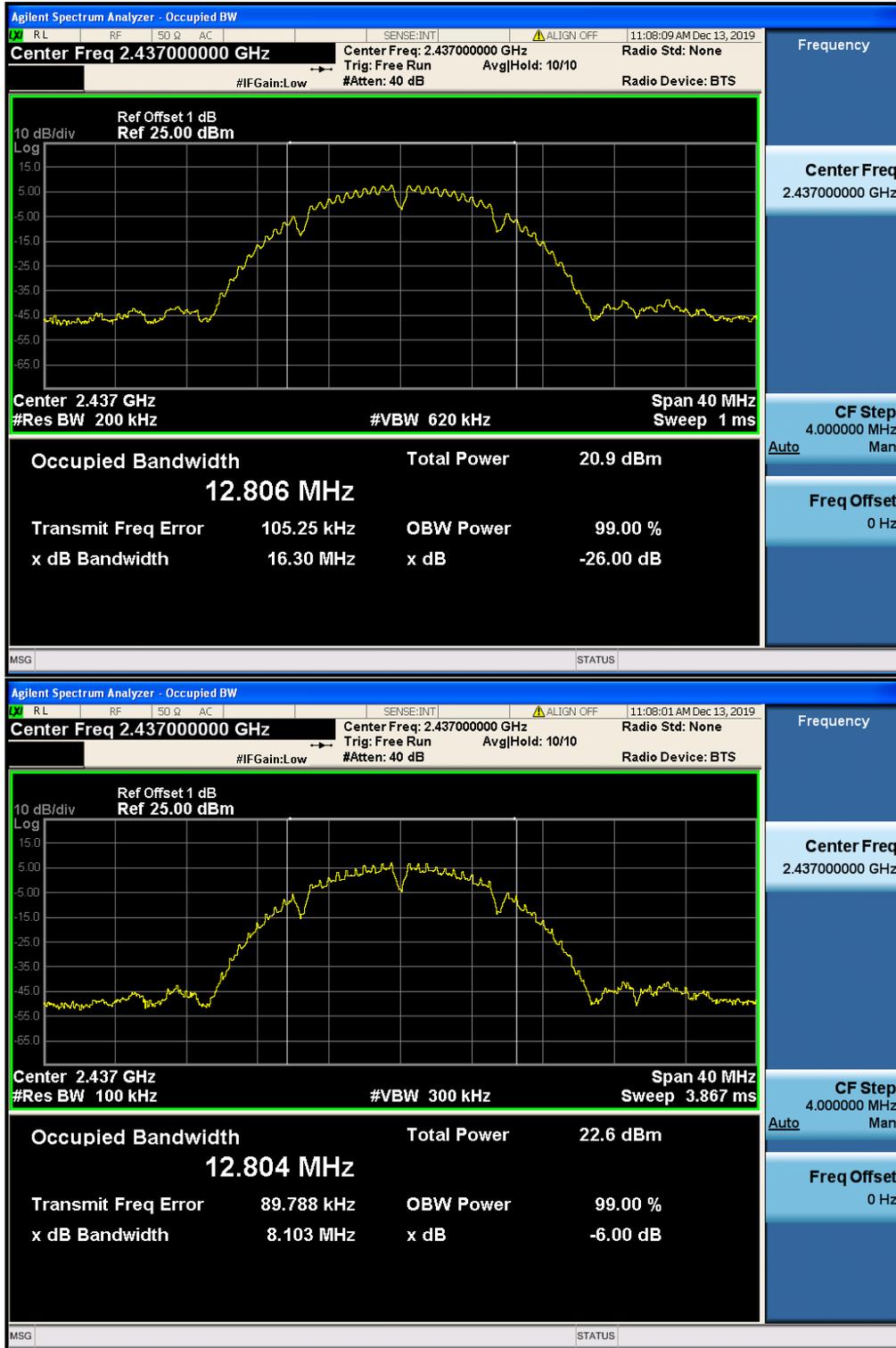
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Test plots

802.11B_Lowest Channel



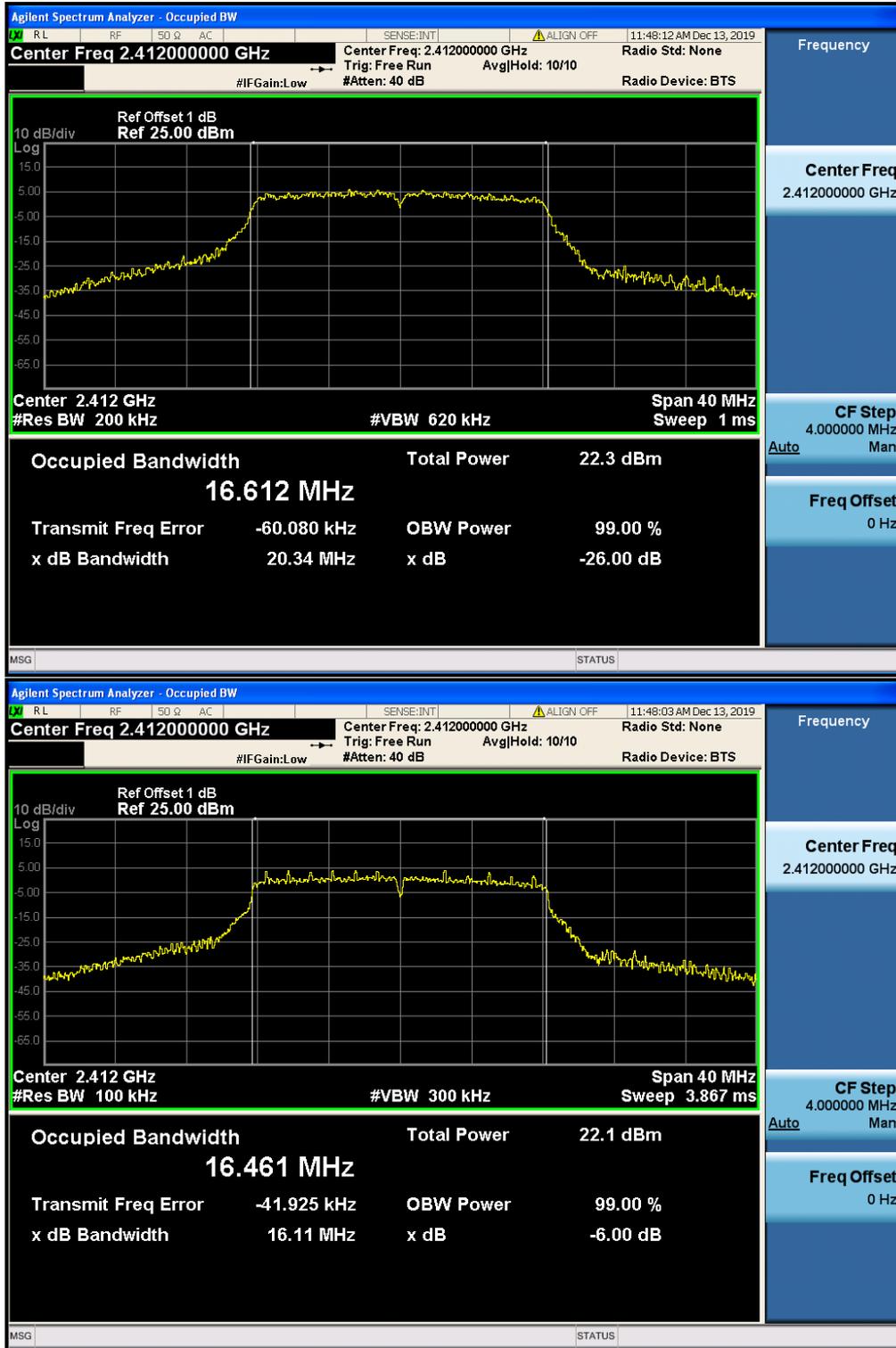
802.11B Middle Channel



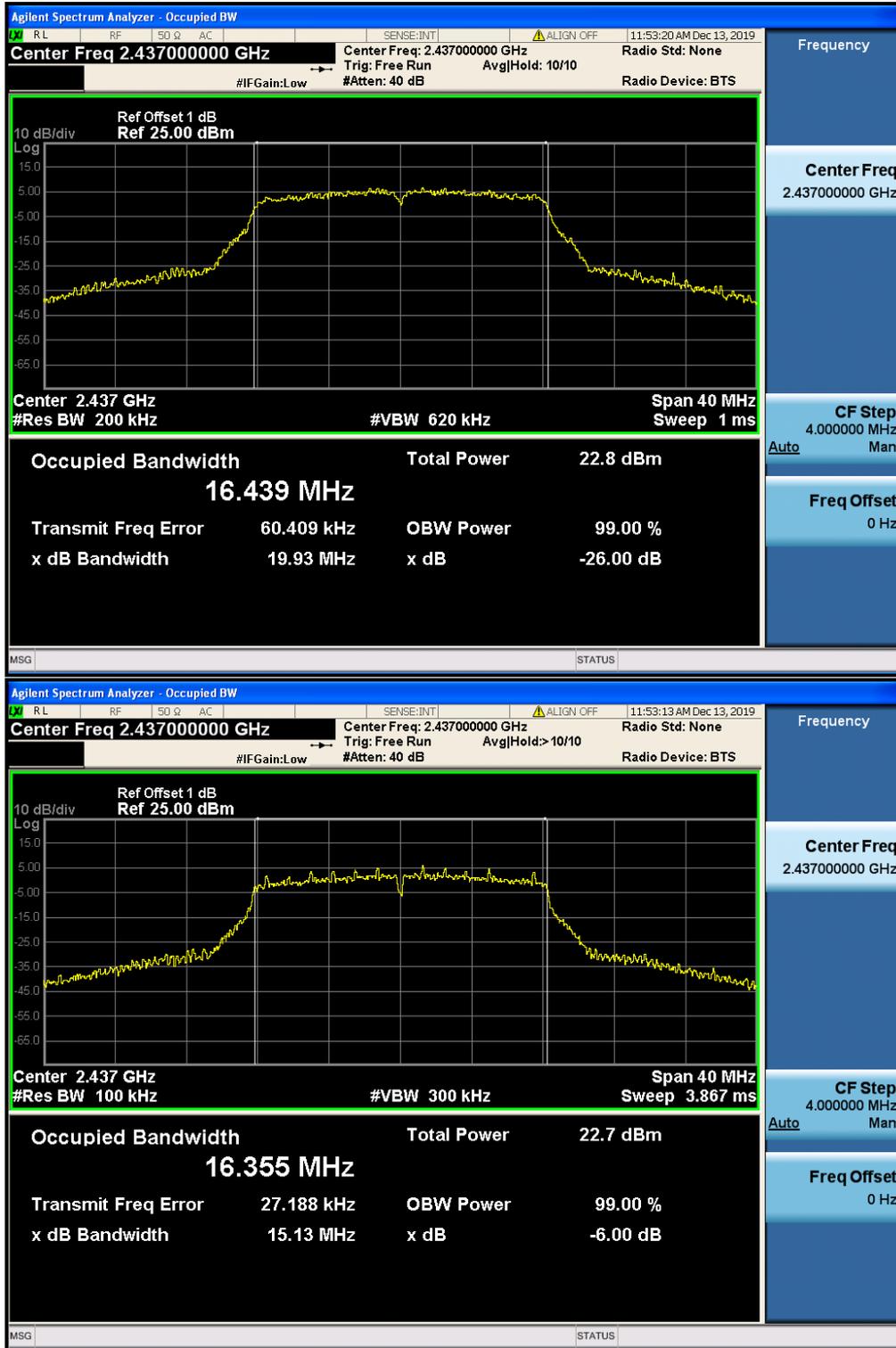
802.11B_Highest Channel



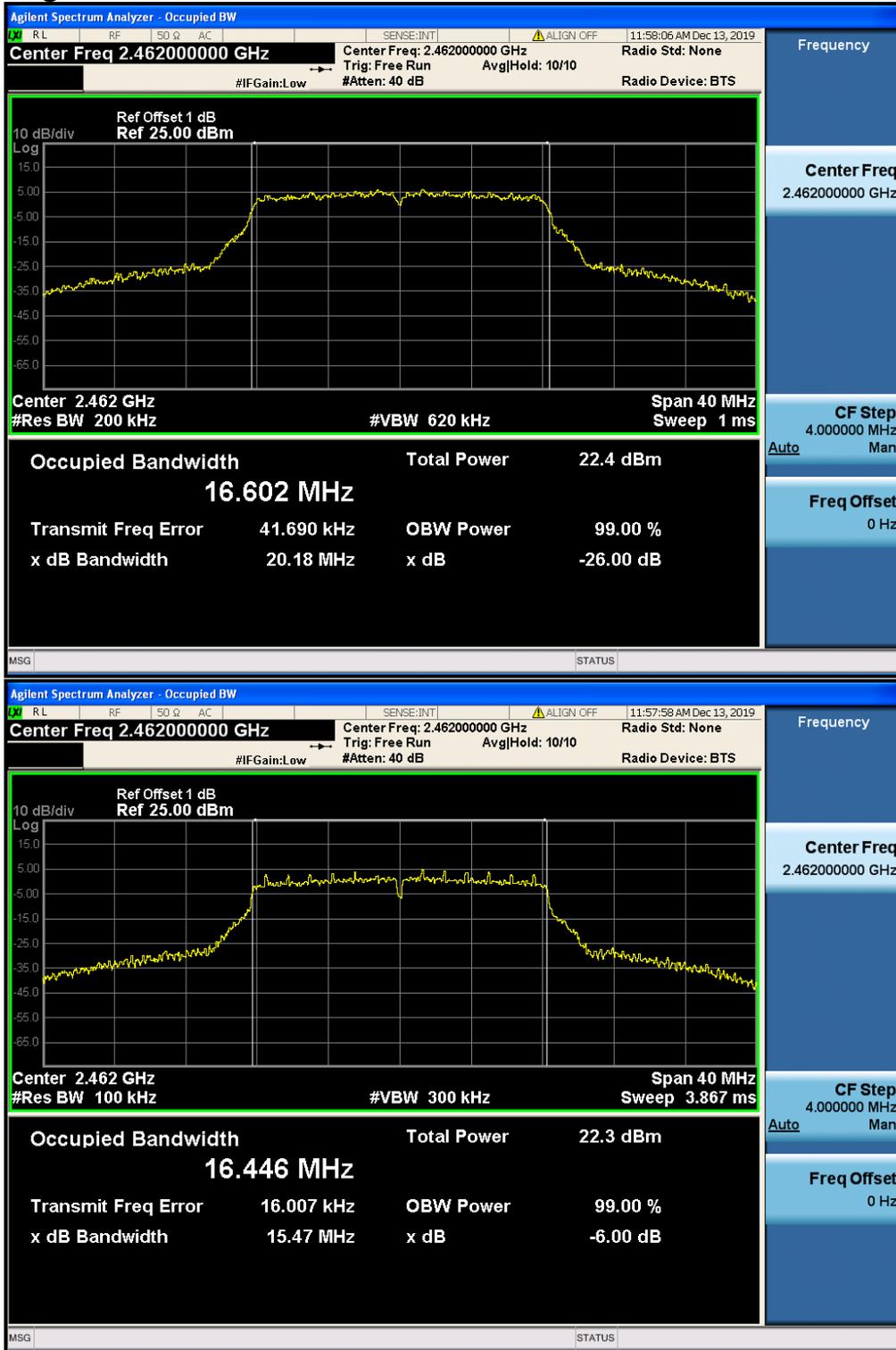
802.11G Lowest Channel



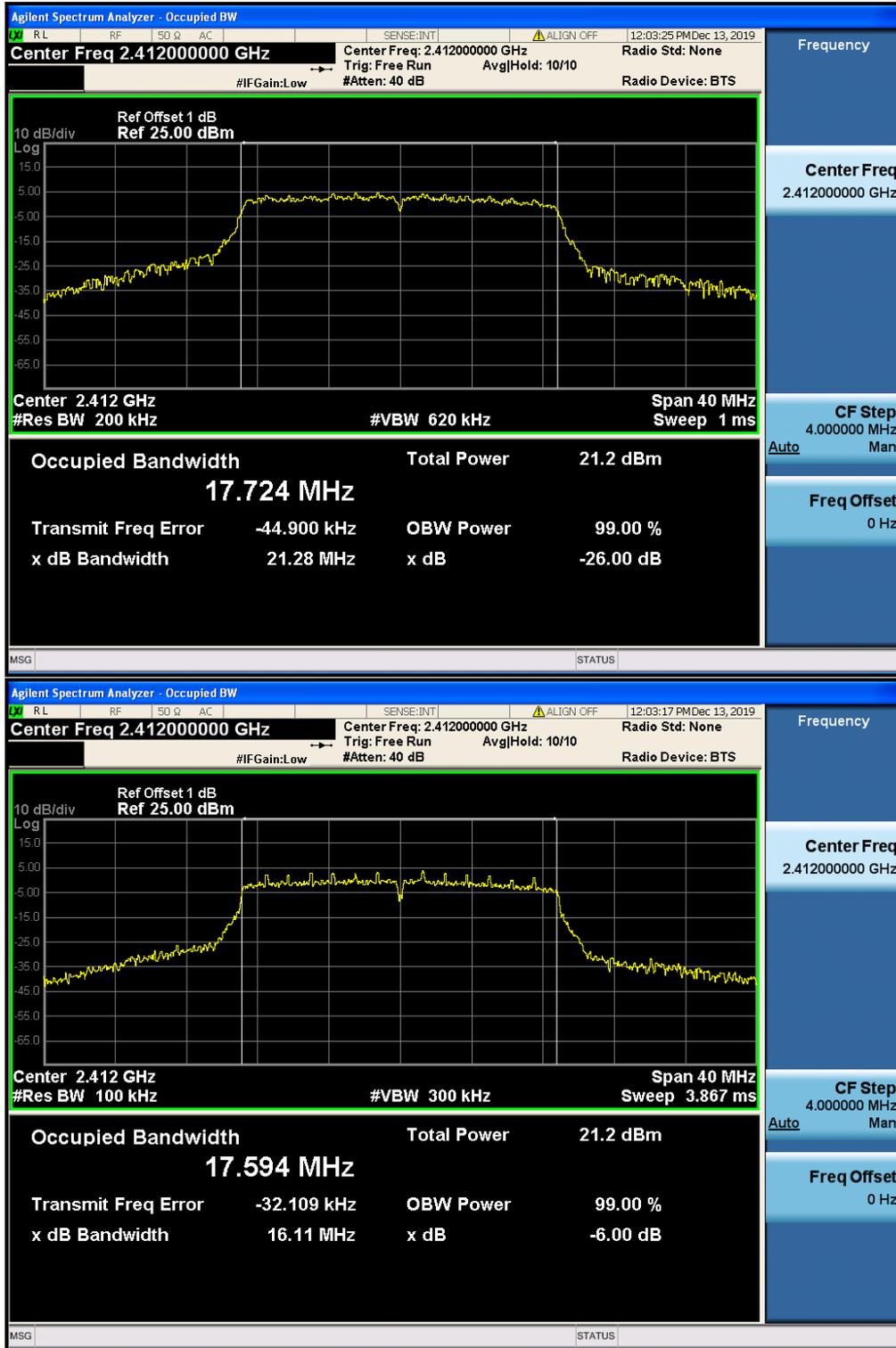
802.11G Middle Channel



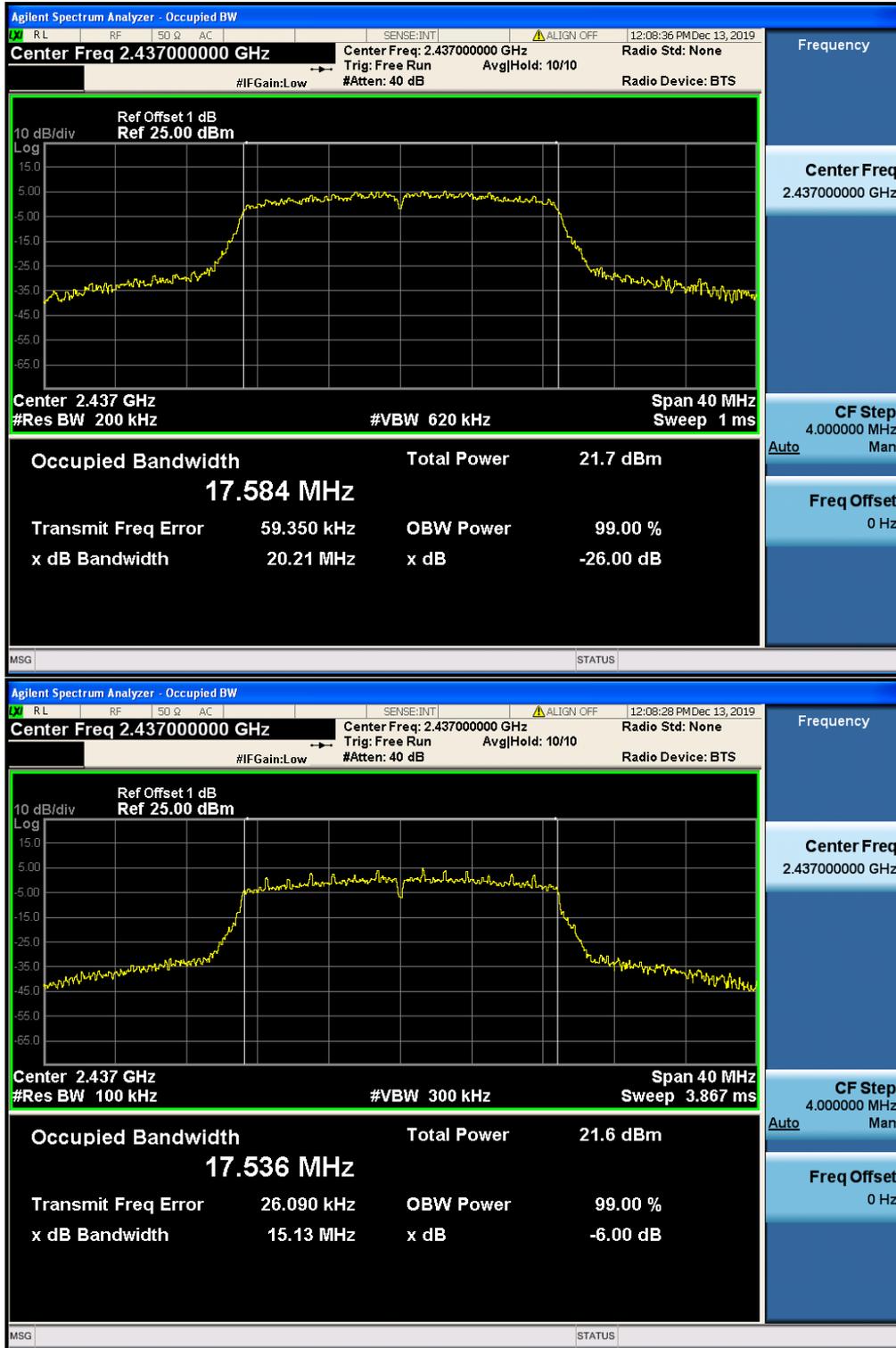
802.11G_Highest Channel



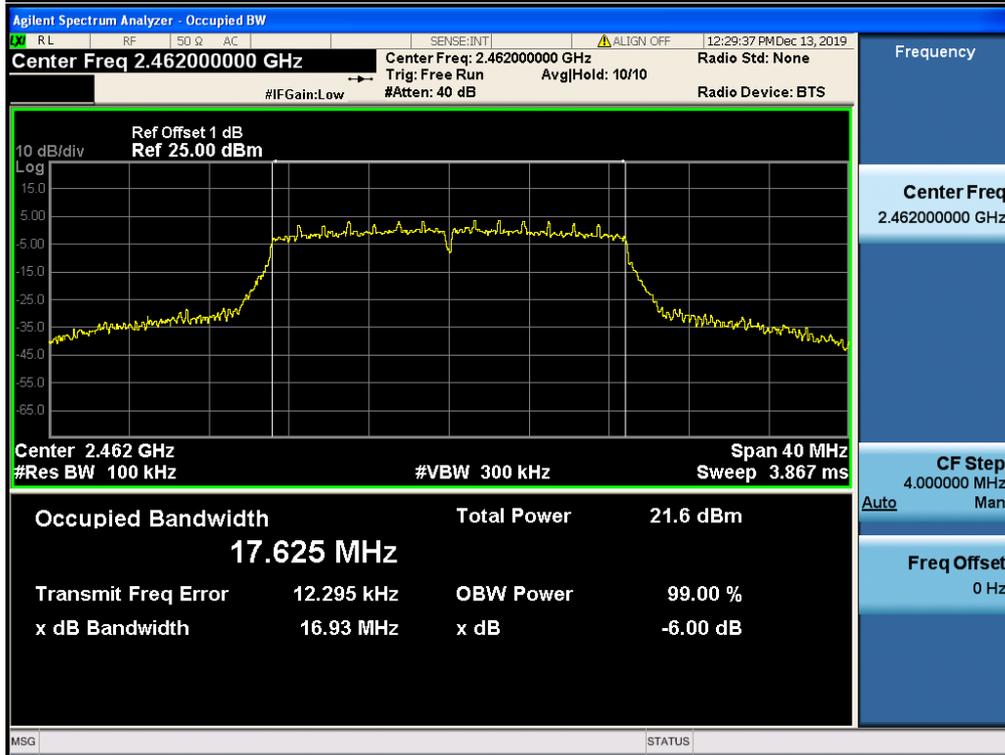
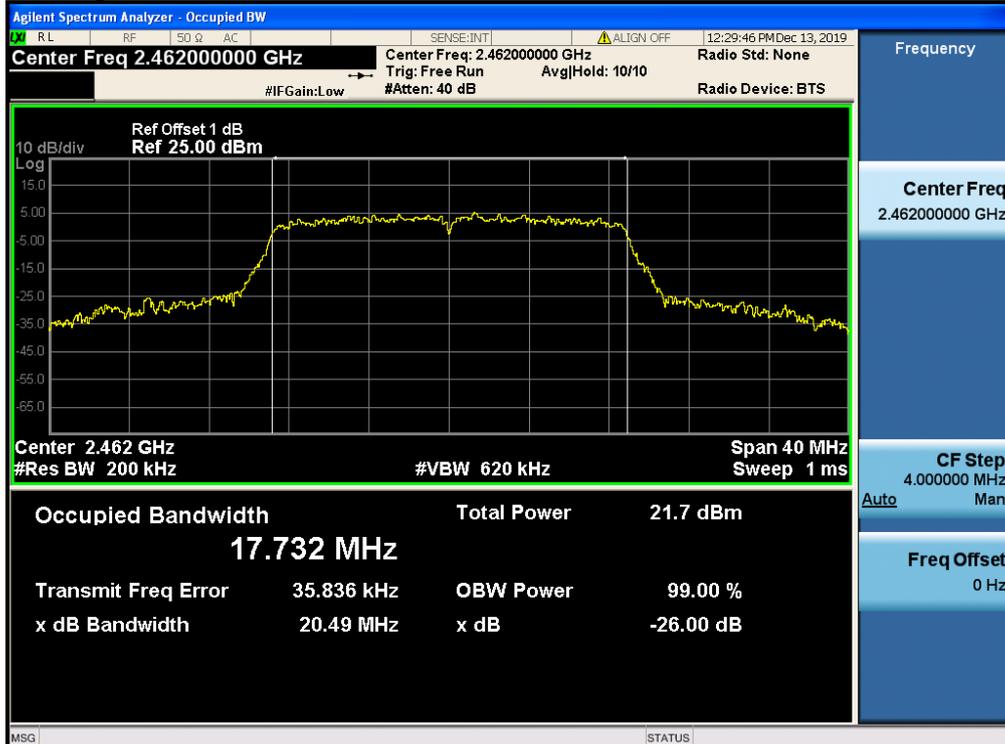
802.11N20_Lowest Channel



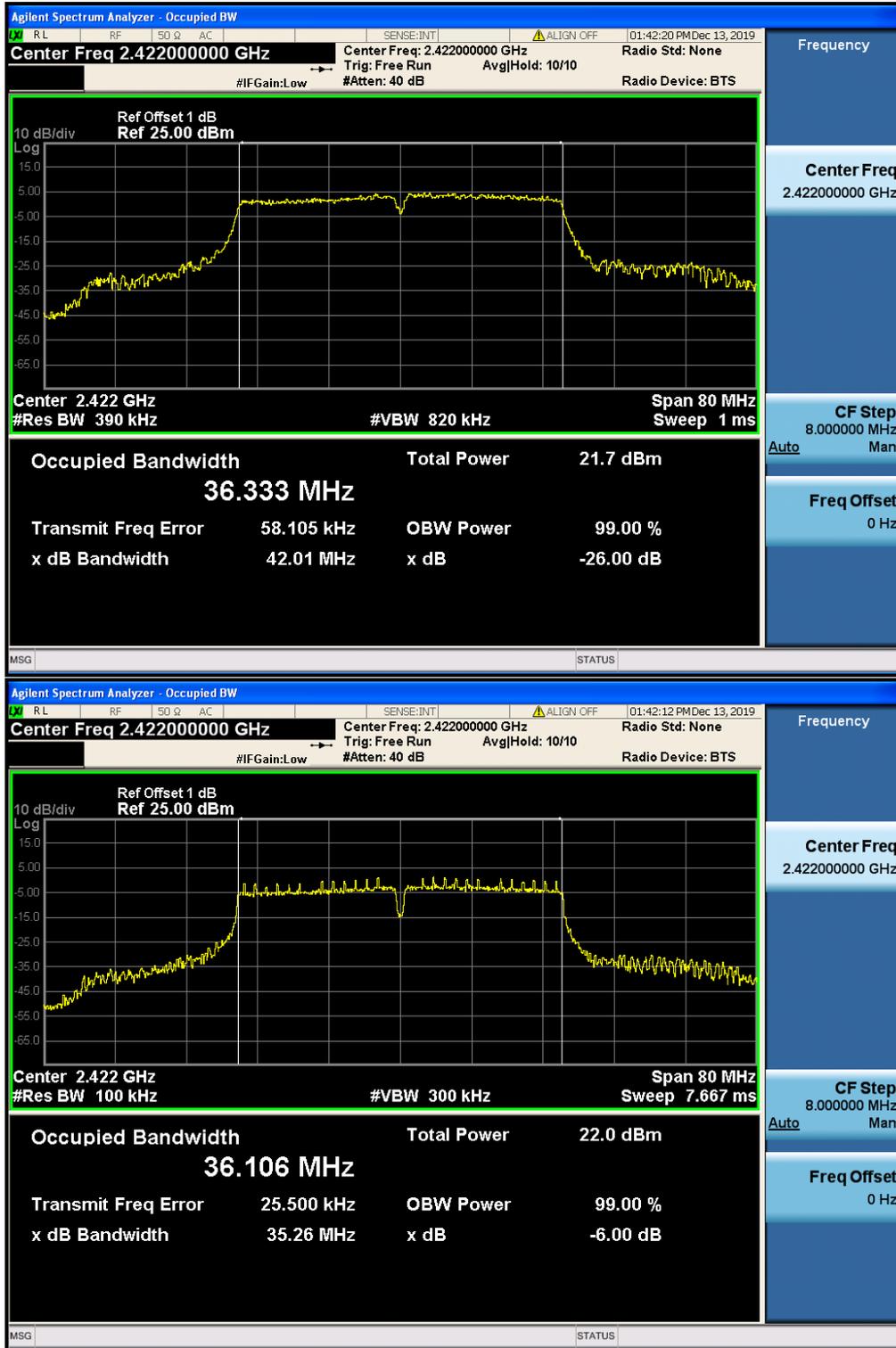
802.11 N20_Middle Channel



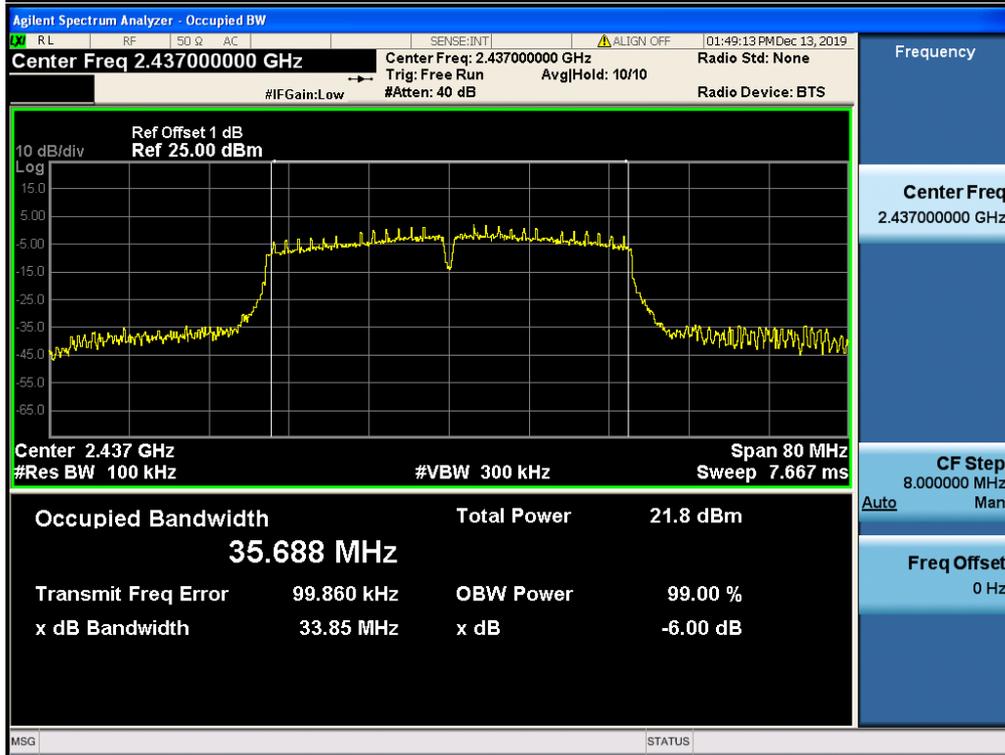
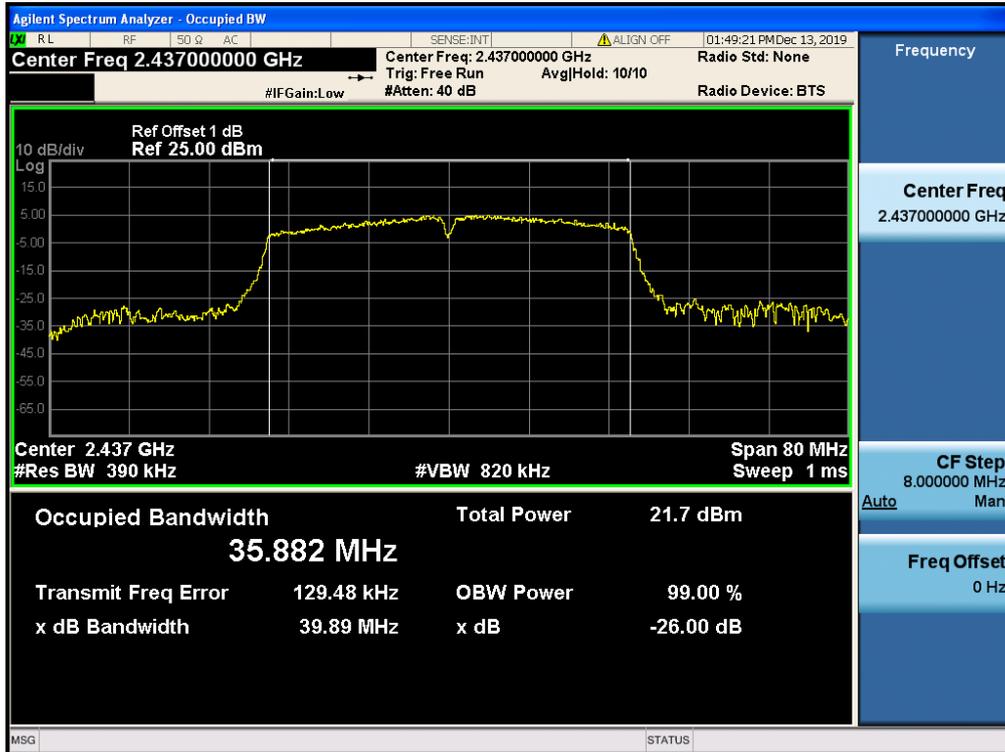
802.11 N20_Highest Channel



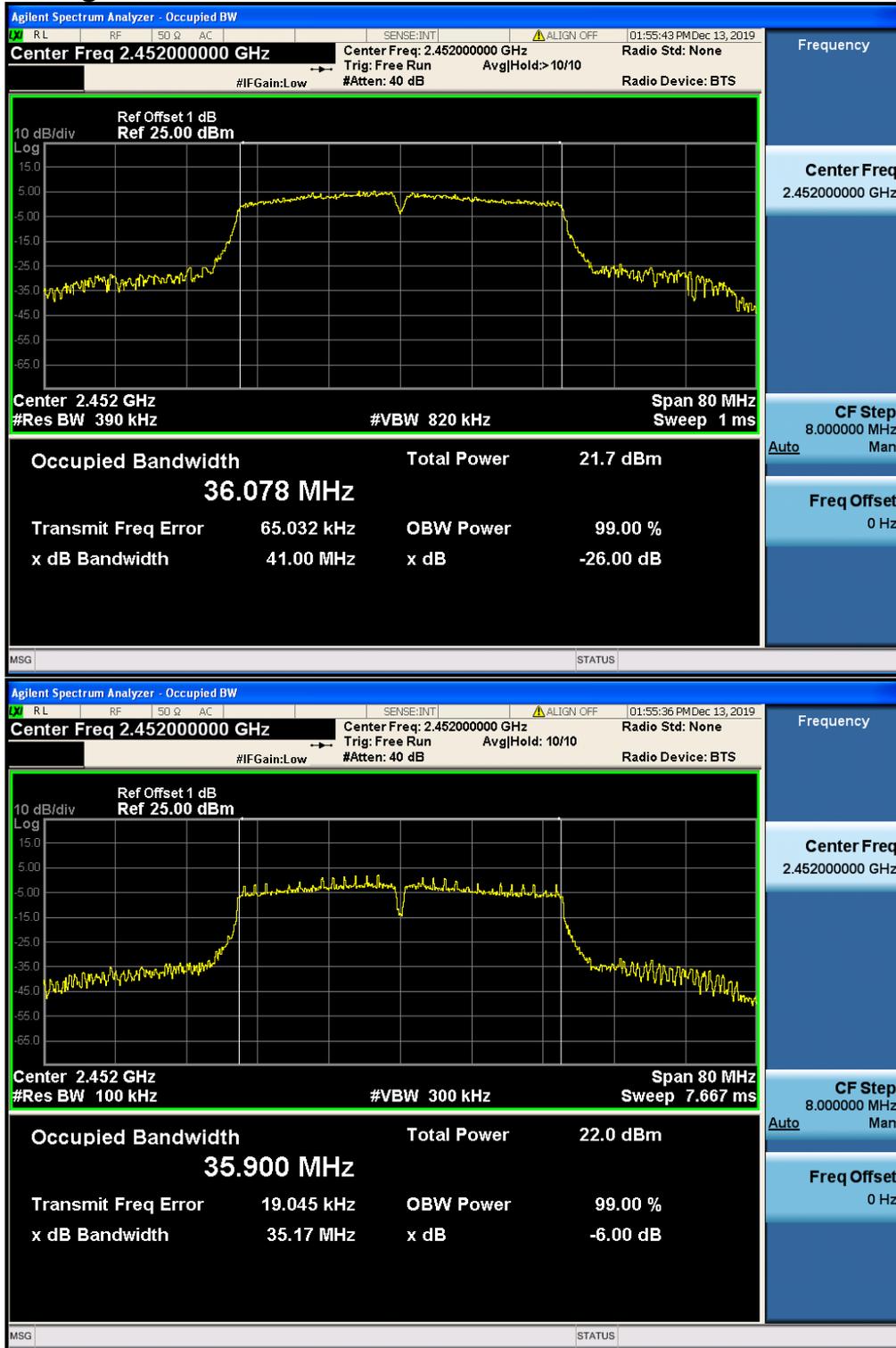
802.11N40_Lowest Channel



802.11 N40_Middle Channel



802.11 N40_Highest Channel



Power Spectral Density

Test Results

Mode	Test Channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
802.11B	Lowest	-8.206	≤8.00	Pass
	Middle	-6.002	≤8.00	Pass
	Highest	-5.881	≤8.00	Pass
802.11G	Lowest	-9.535	≤8.00	Pass
	Middle	-8.026	≤8.00	Pass
	Highest	-9.093	≤8.00	Pass
802.11N20	Lowest	-10.912	≤8.00	Pass
	Middle	-9.724	≤8.00	Pass
	Highest	-10.660	≤8.00	Pass
802.11N40	Lowest	-13.406	≤8.00	Pass
	Middle	-12.093	≤8.00	Pass
	Highest	-12.811	≤8.00	Pass



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Test plots

802.11B_Lowest Channel



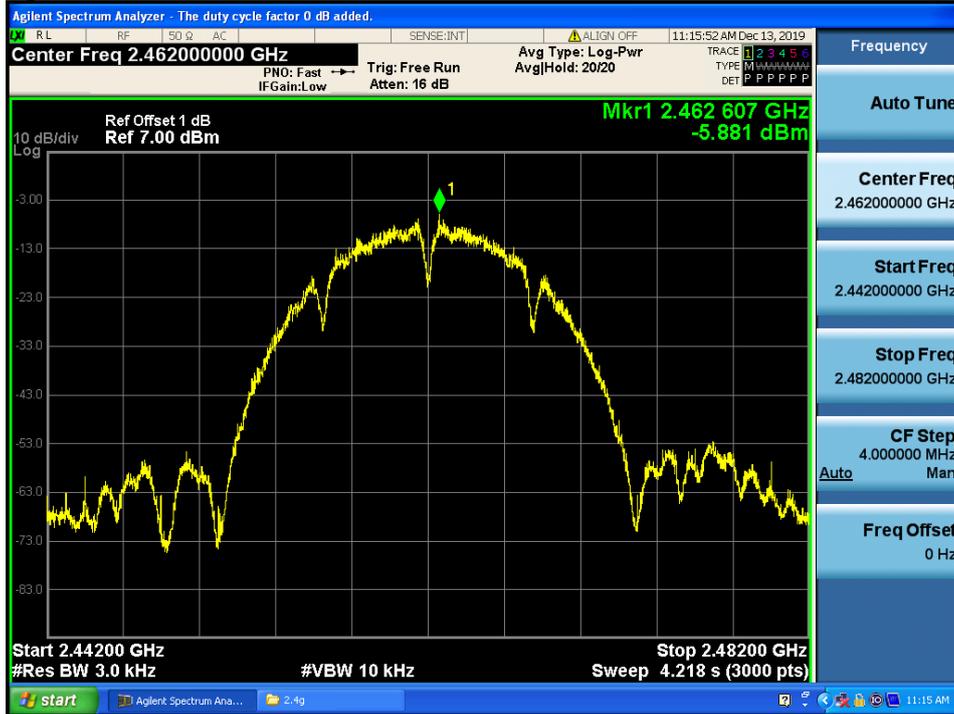
802.11B_Middle Channel



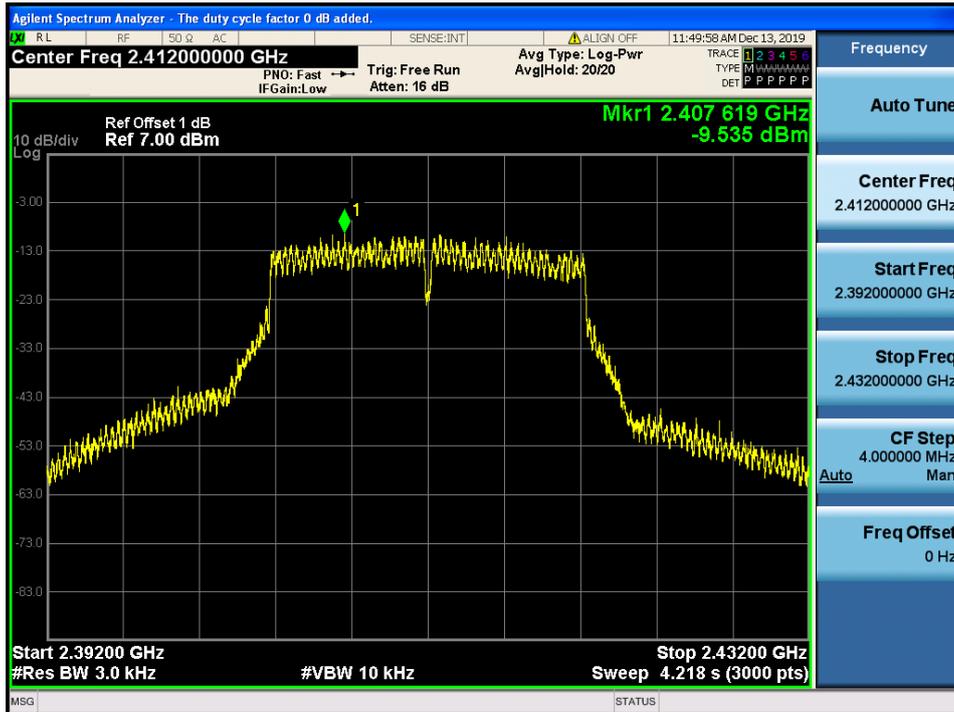
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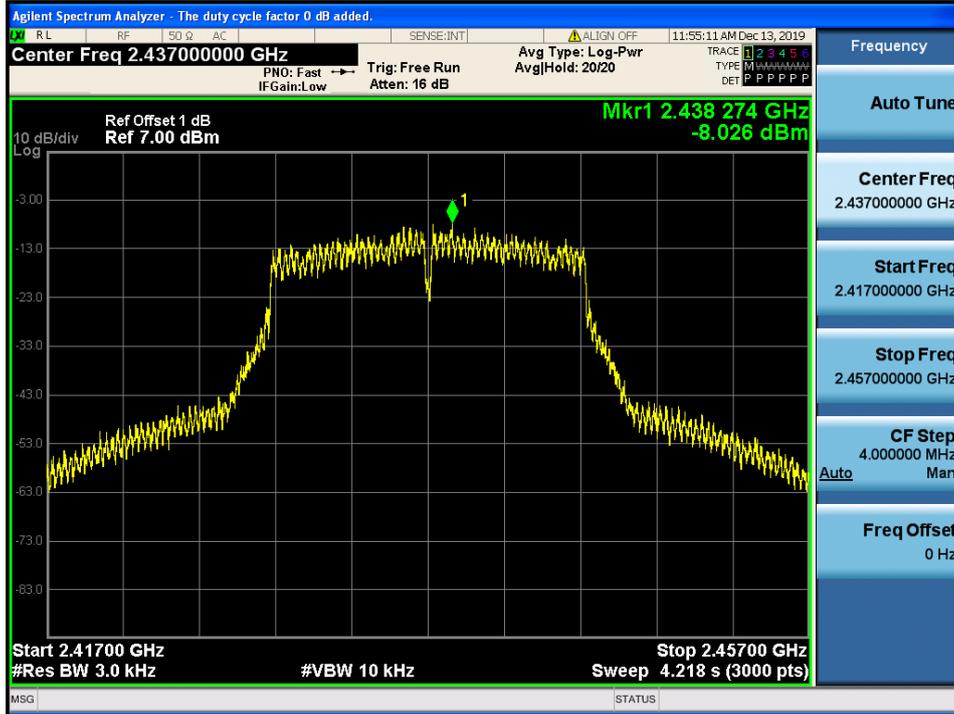
802.11B_Highest Channel



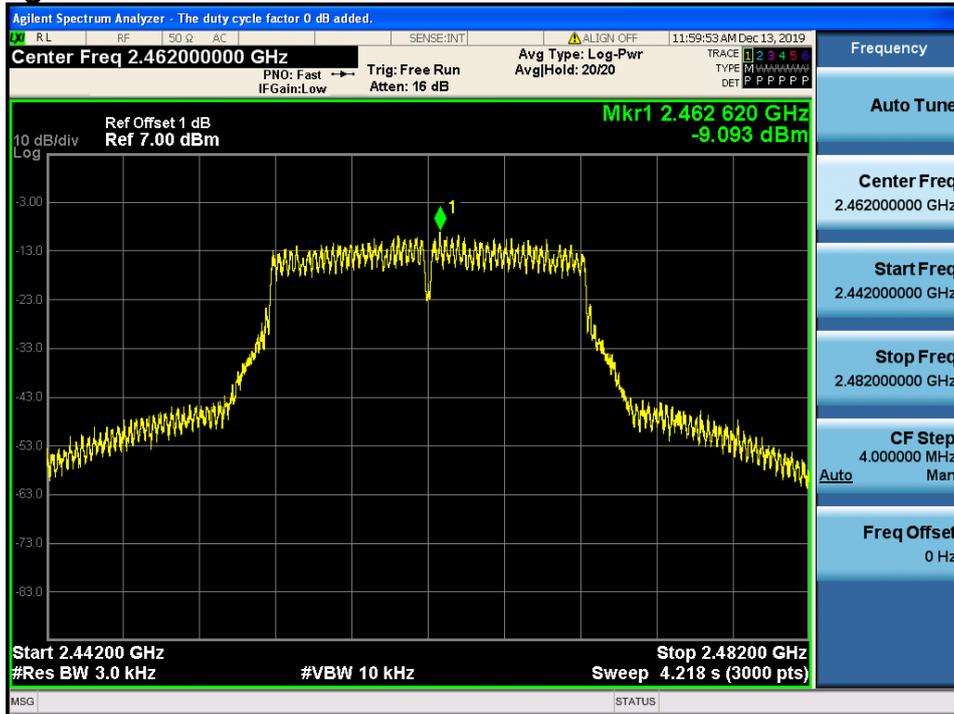
802.11G_Lowest Channel



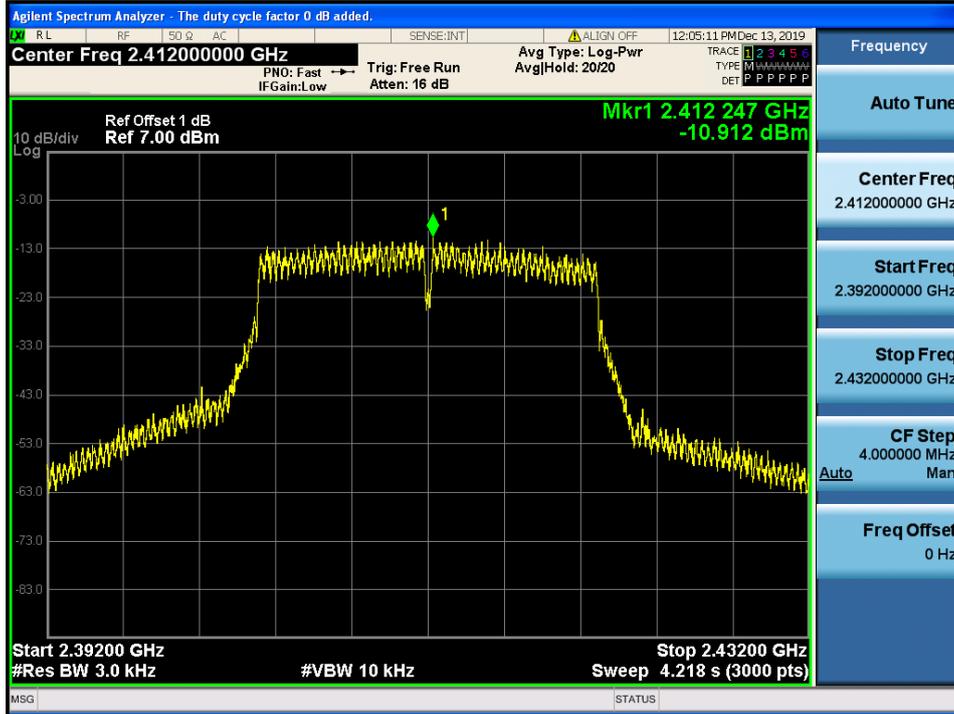
802.11G_ Middle Channel



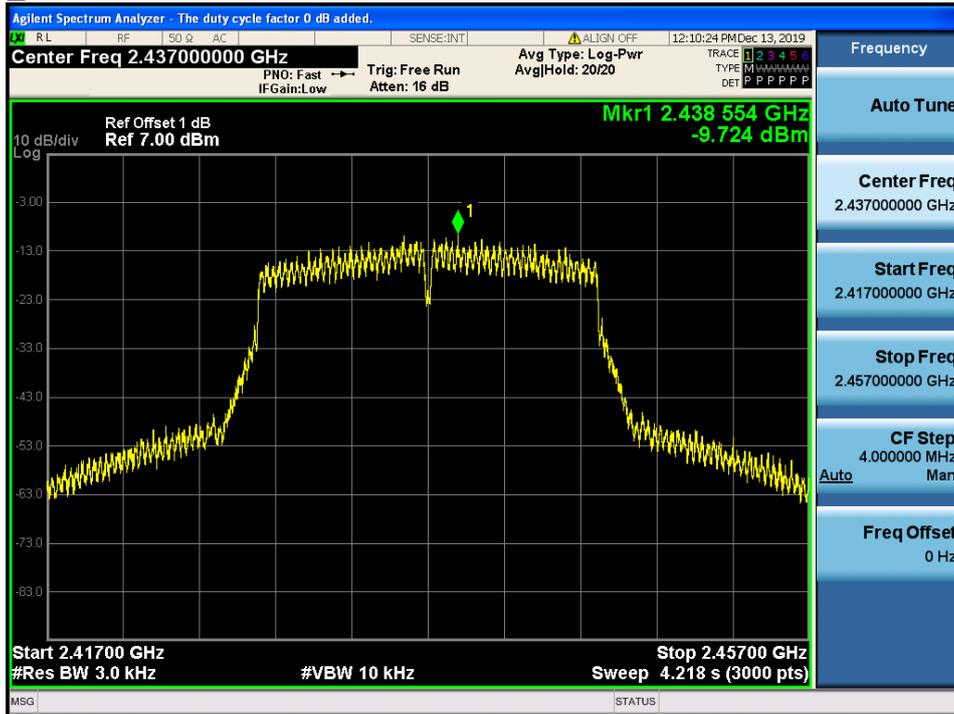
802.11G_ Highest Channel



802.11N20 Lowest Channel



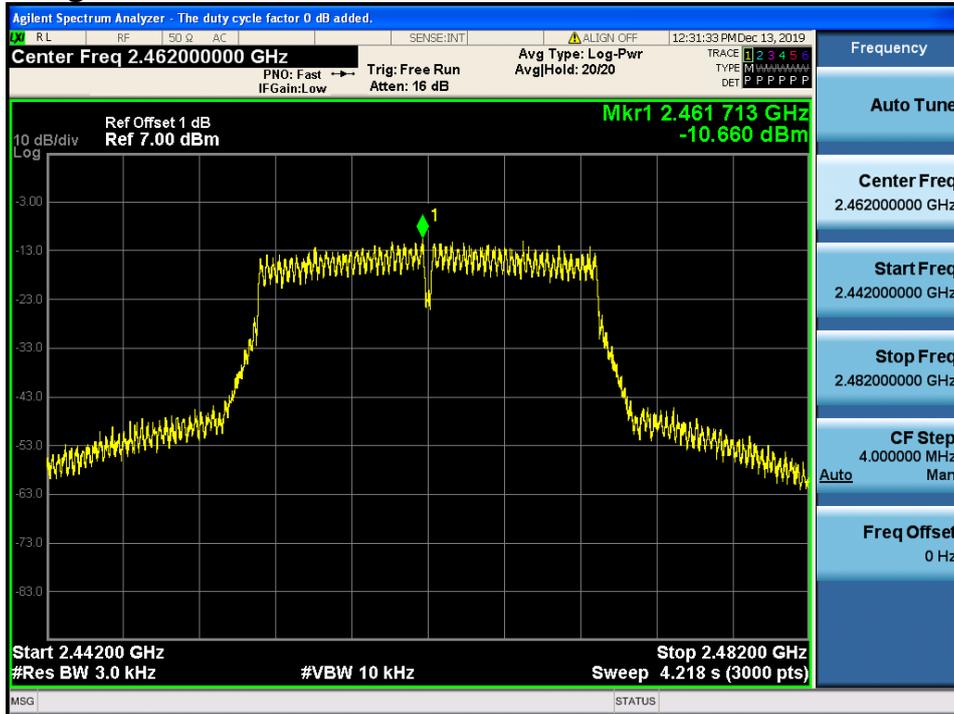
802.11 N20 Middle Channel



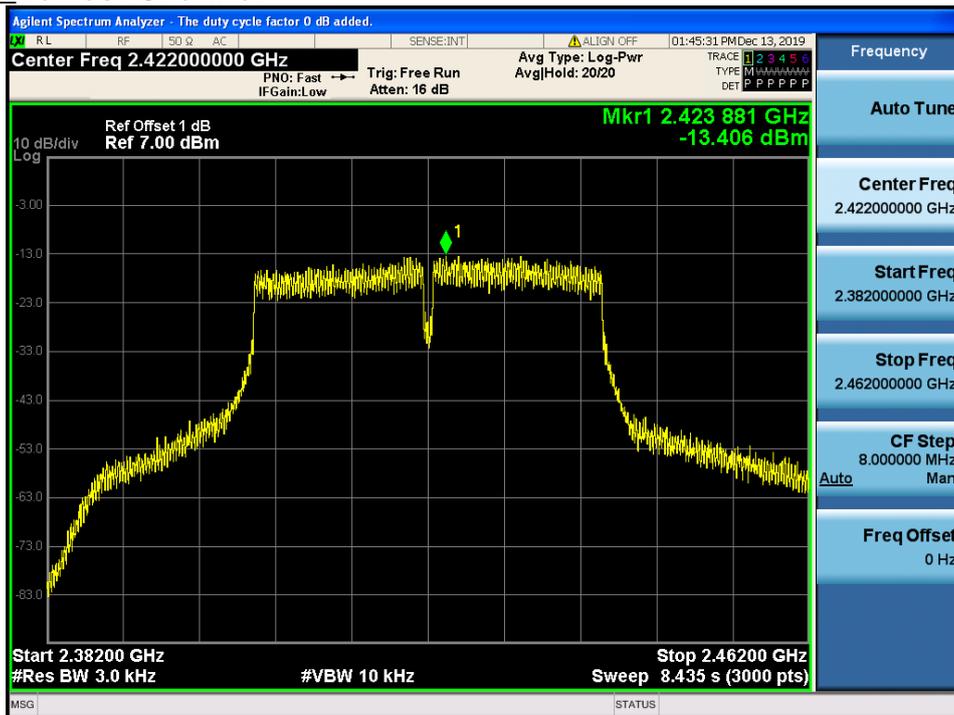
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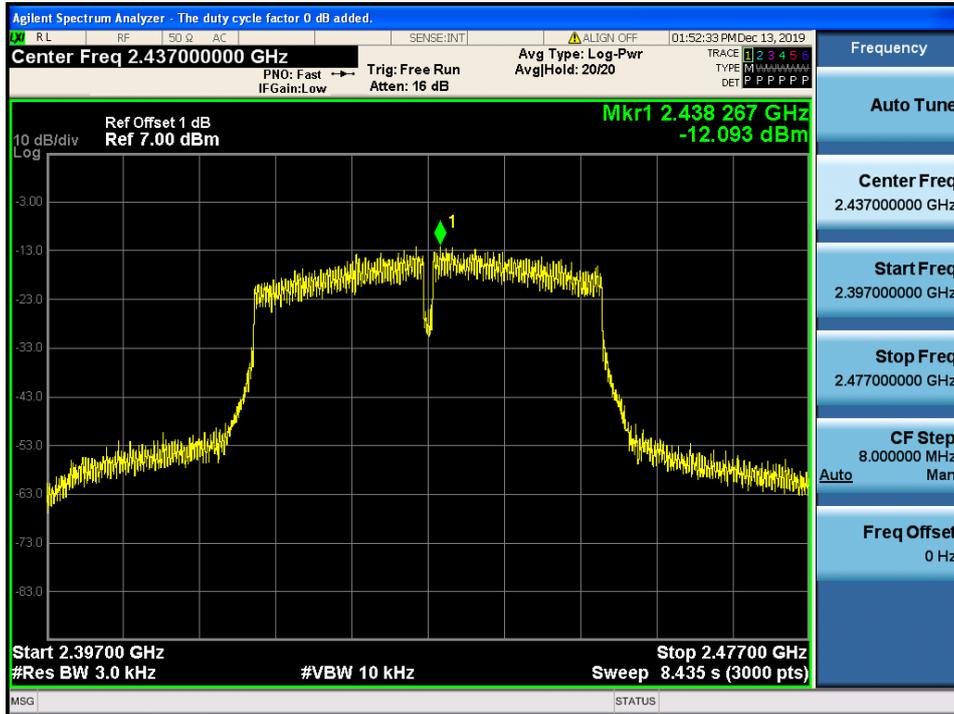
802.11 N20_Highest Channel



802.11N40_Lowest Channel



802.11 N40 Middle Channel



802.11 N40 Highest Channel



Band-edge for RF Conducted Emissions

Test plots

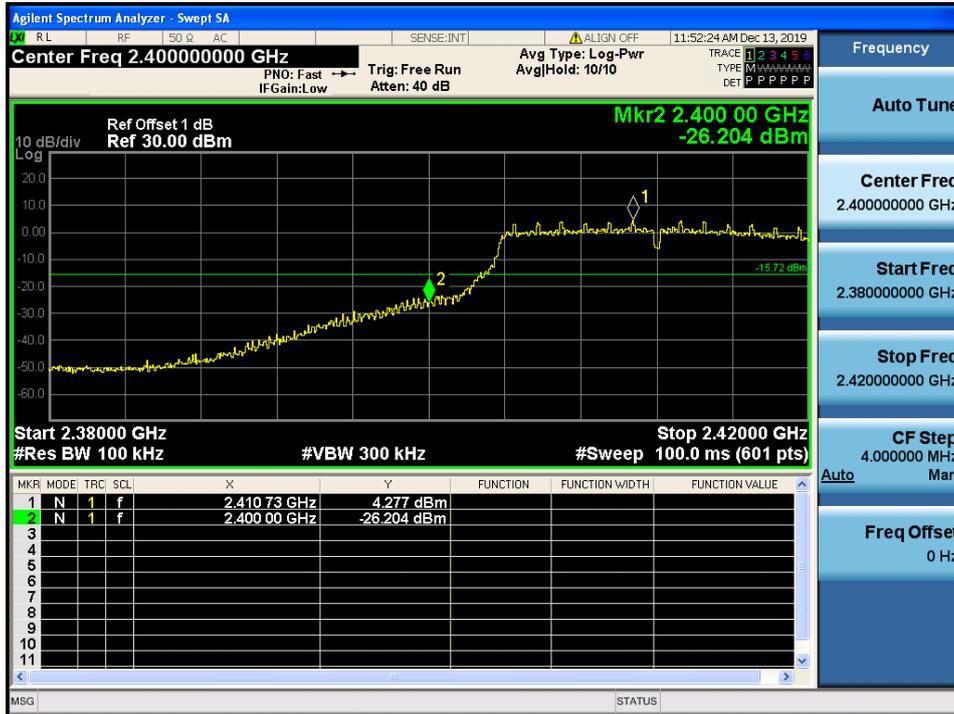
802.11B_Lowest Channel



802.11B_Highest Channel



802.11G_Lowest Channel



802.11G_Highest Channel



802.11N20_Lowest Channel



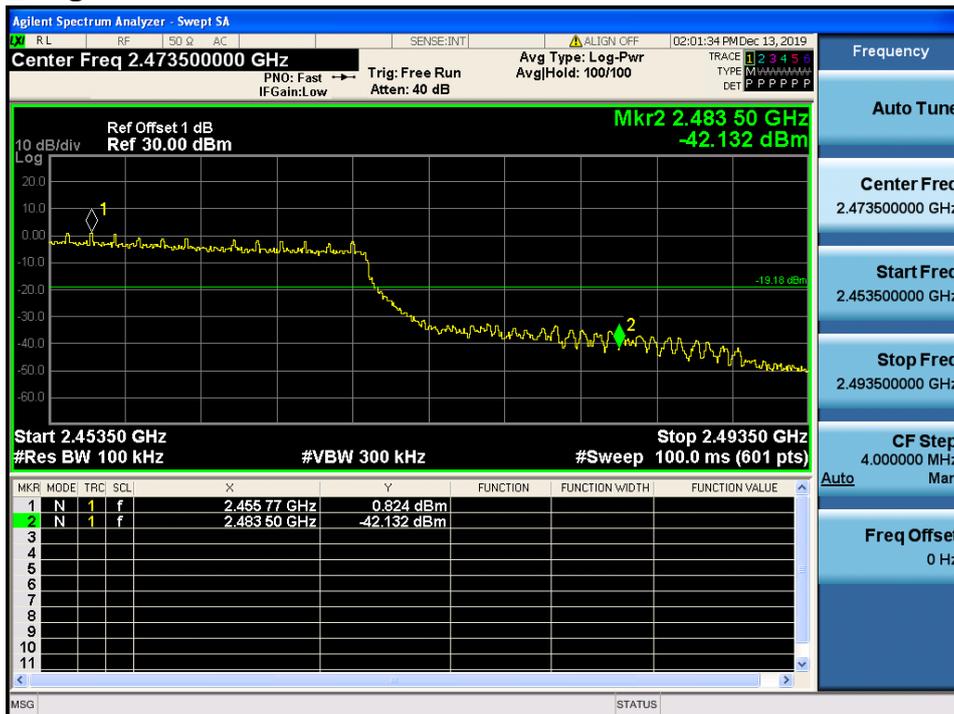
802.11 N20_Highest Channel



802.11N40_Lowest Channel



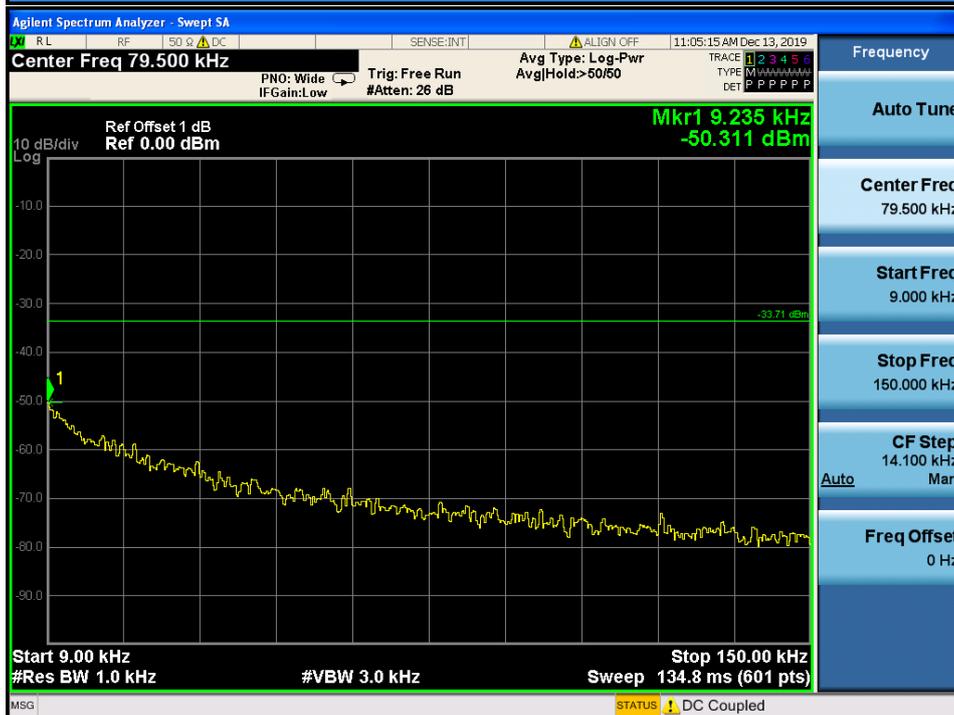
802.11 N40_Highest Channel



RF Conducted Spurious Emissions

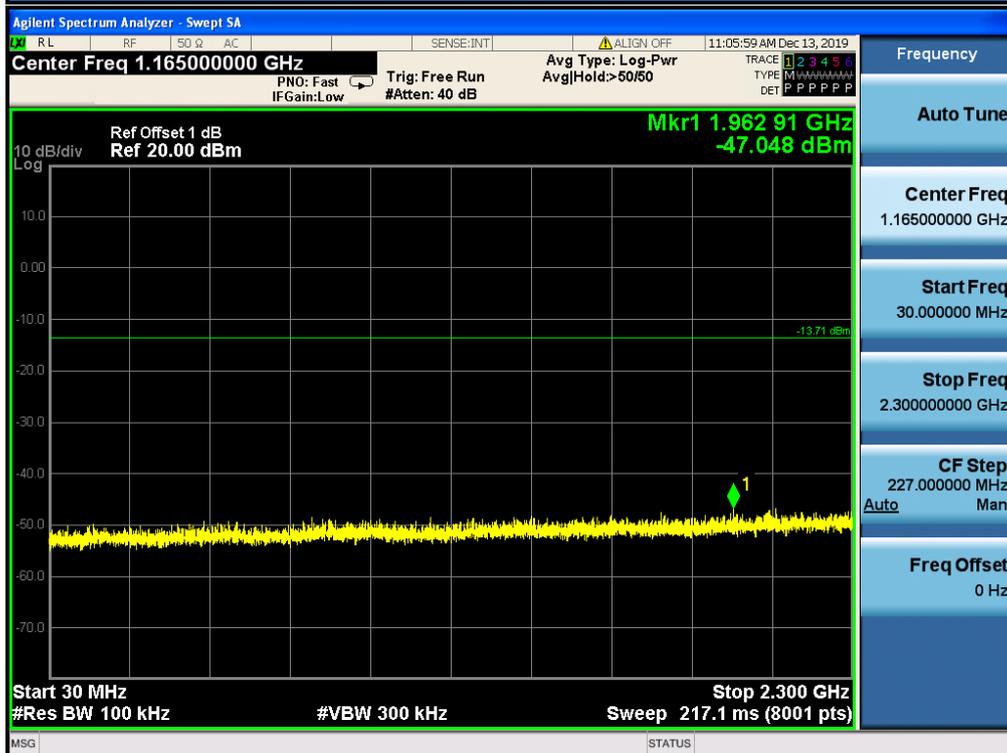
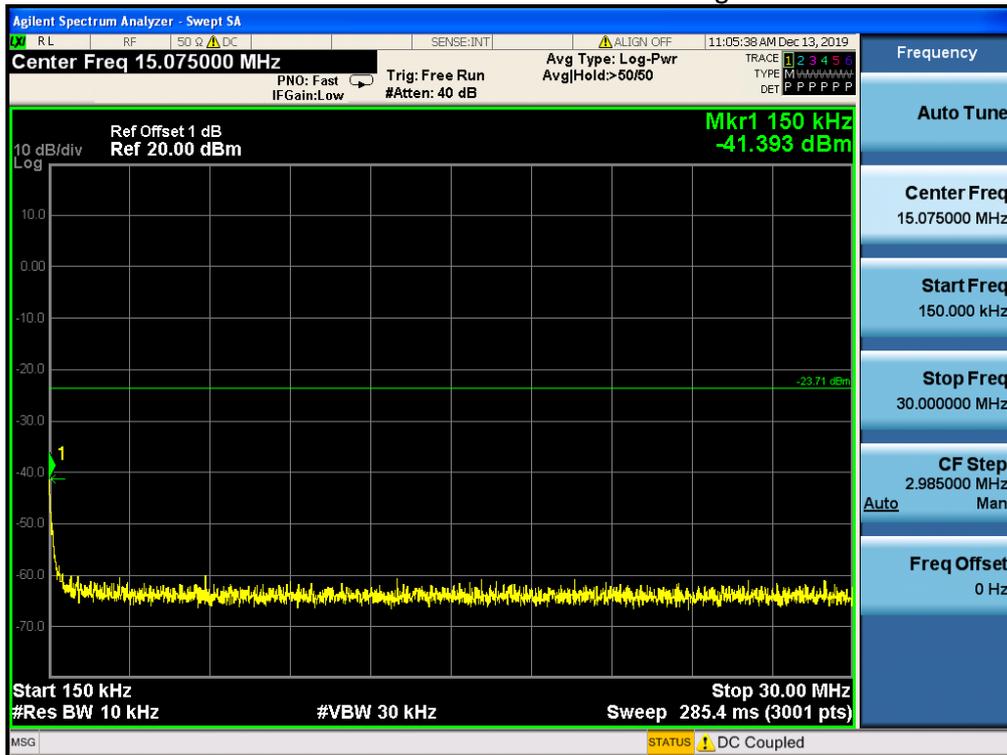
Test plots

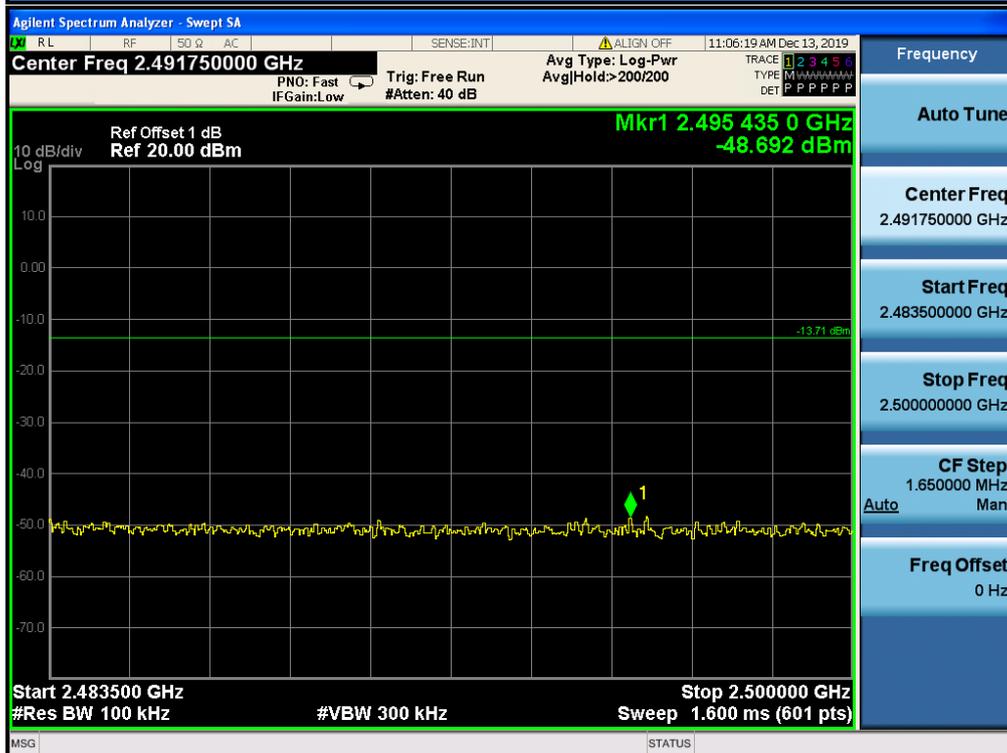
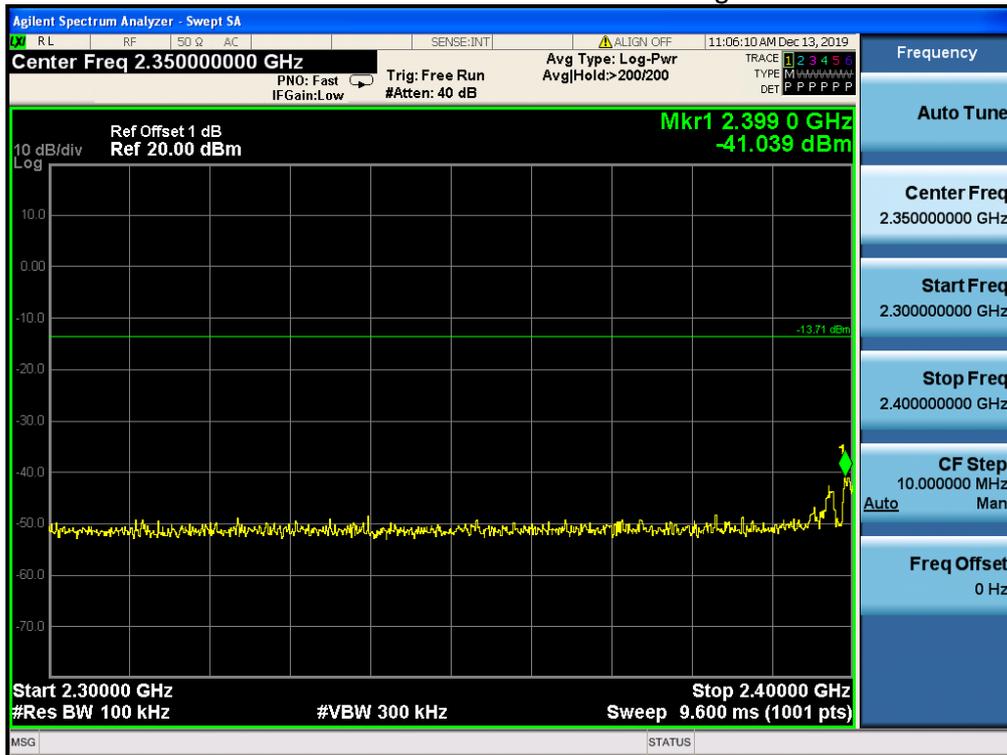
802.11B_Lowest Channel

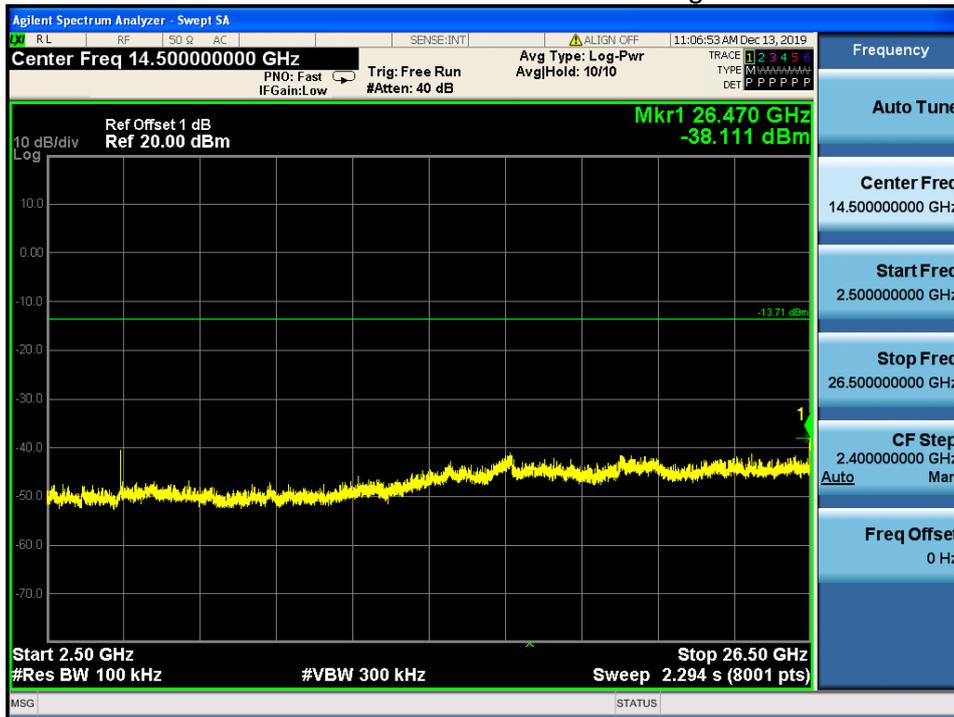


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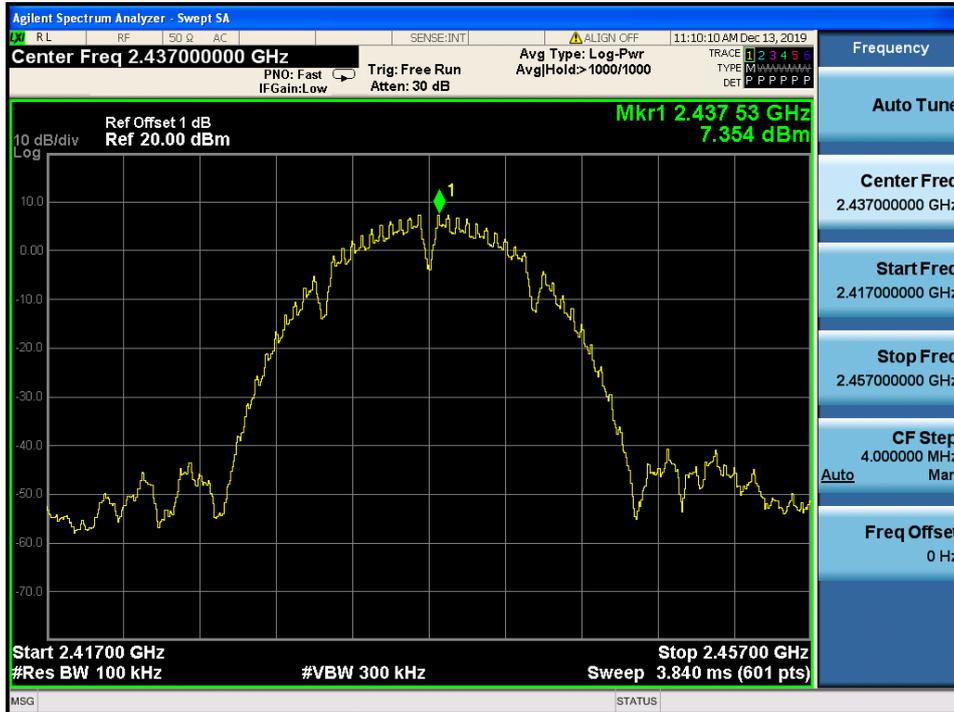
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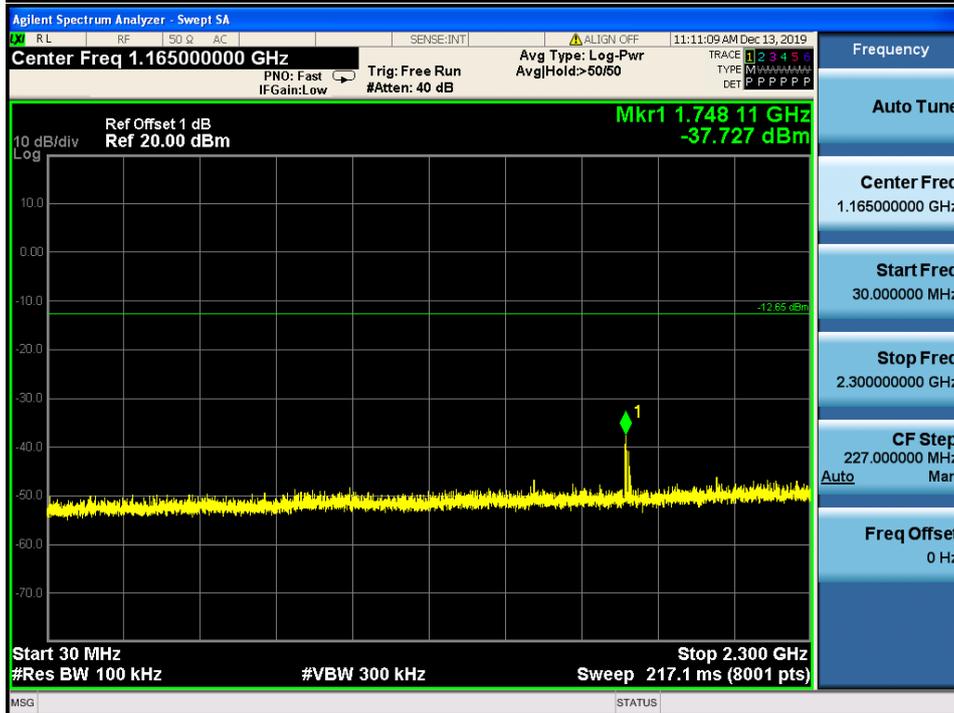
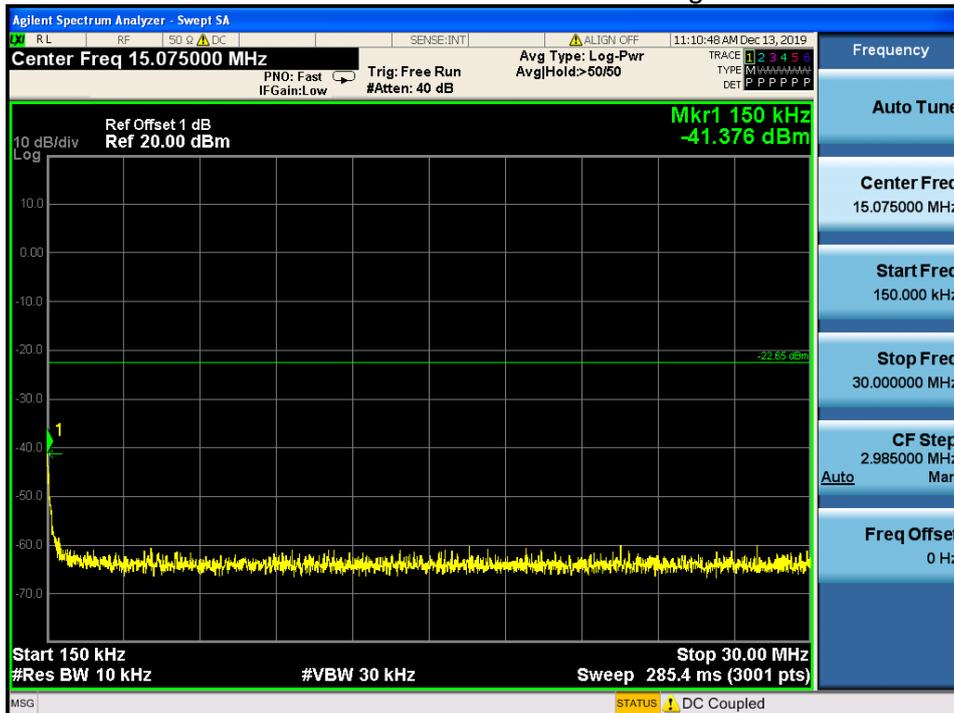


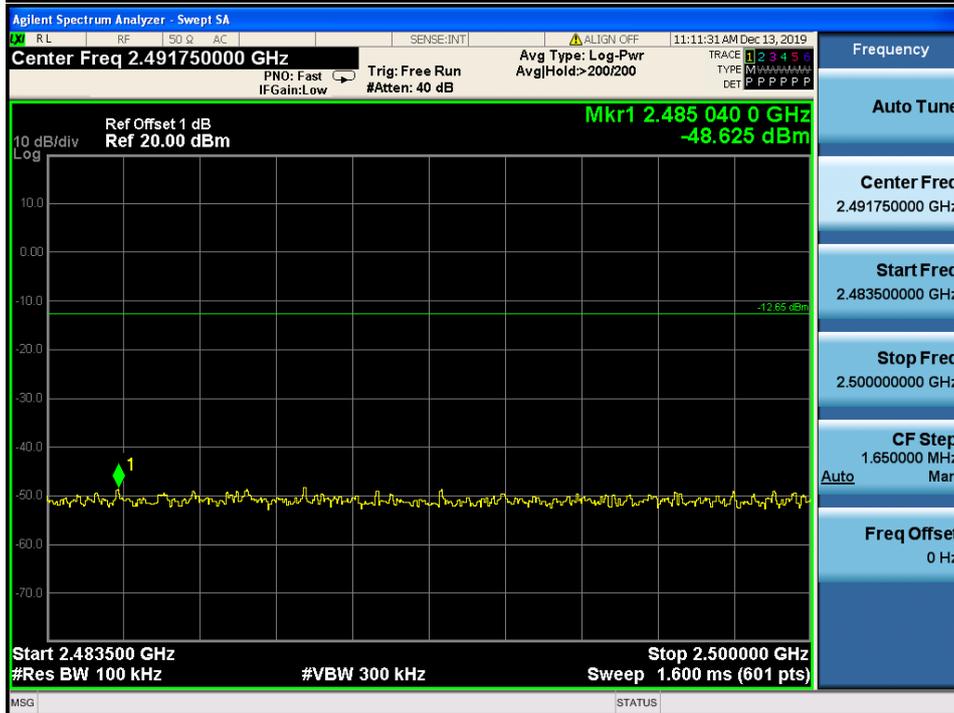
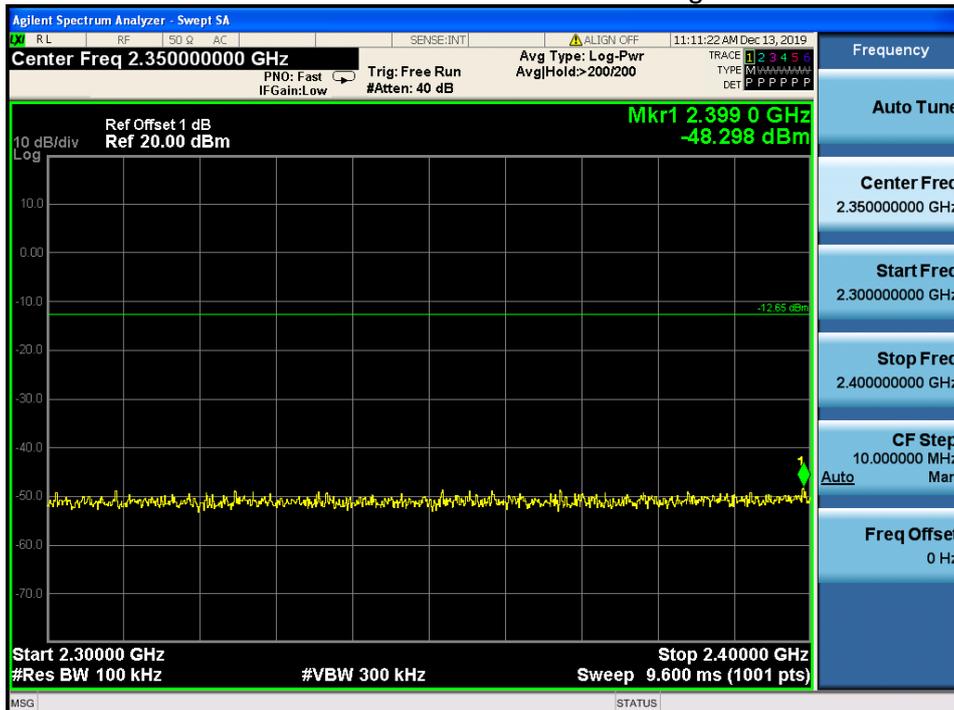
802.11B_ Middle Channel



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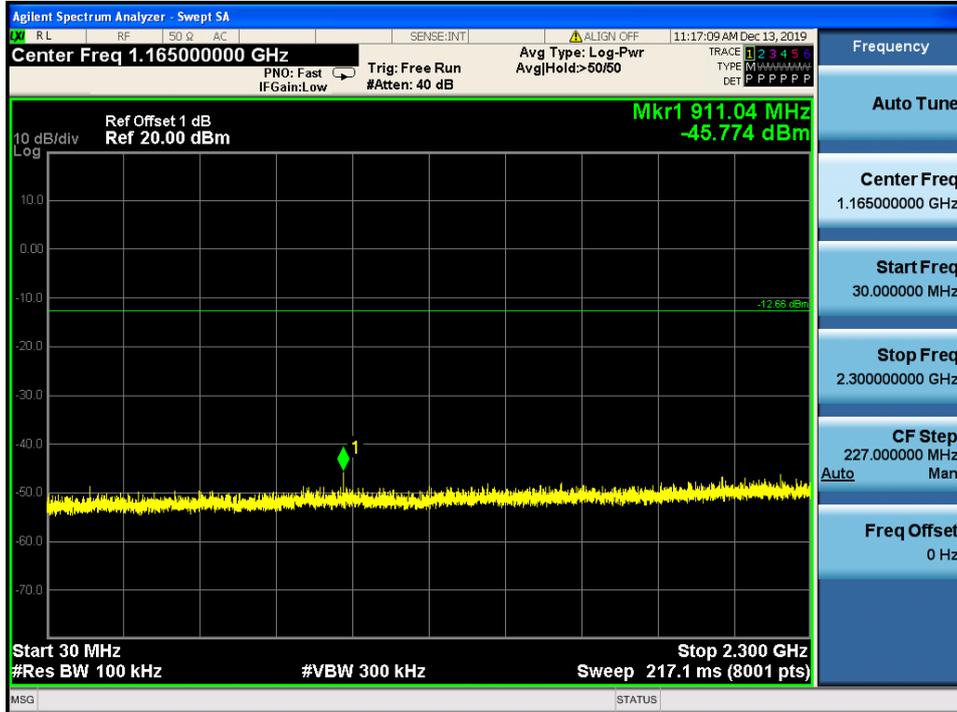
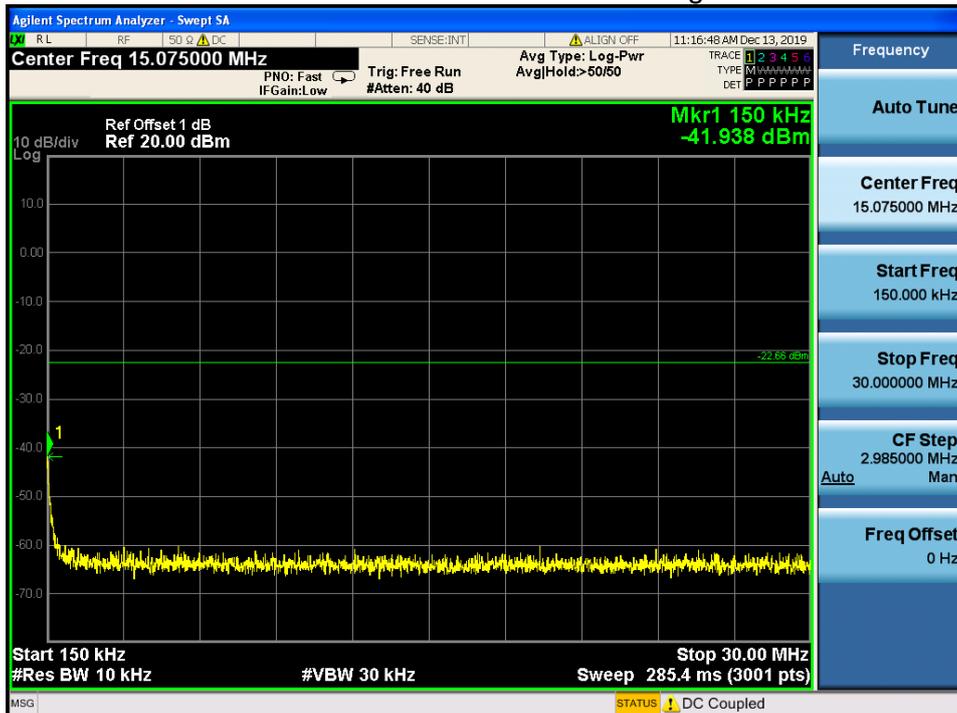


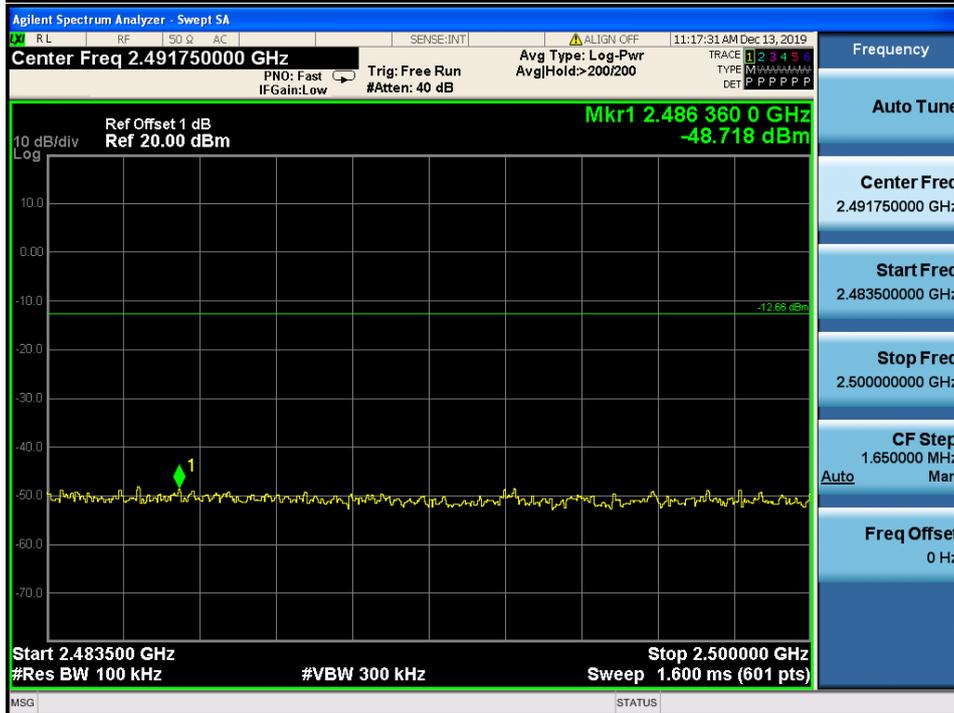
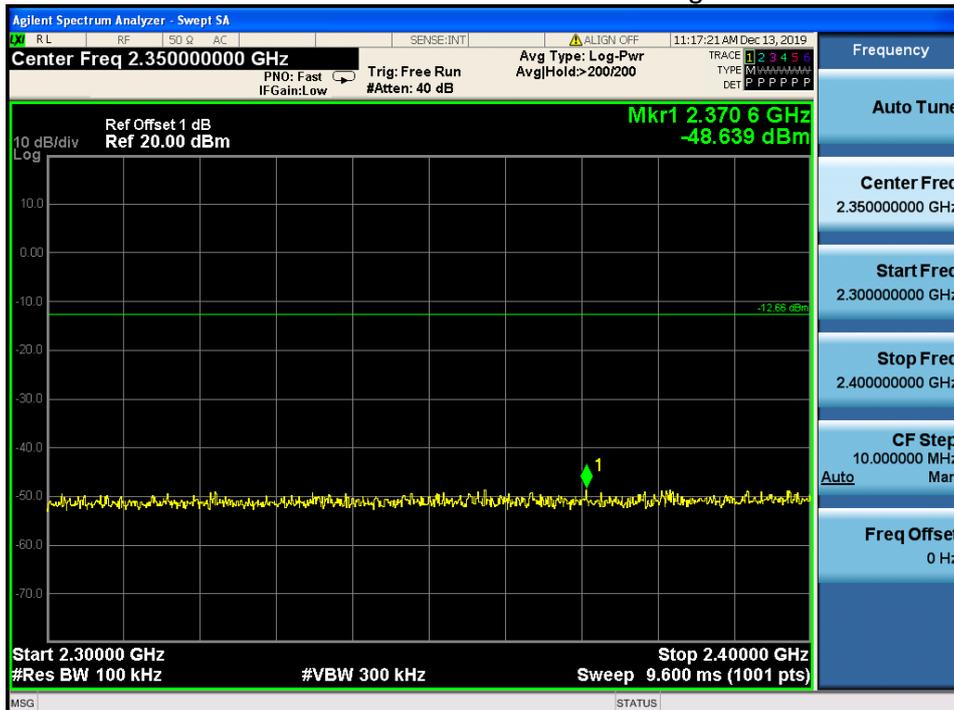


802.11B_ Highest Channel



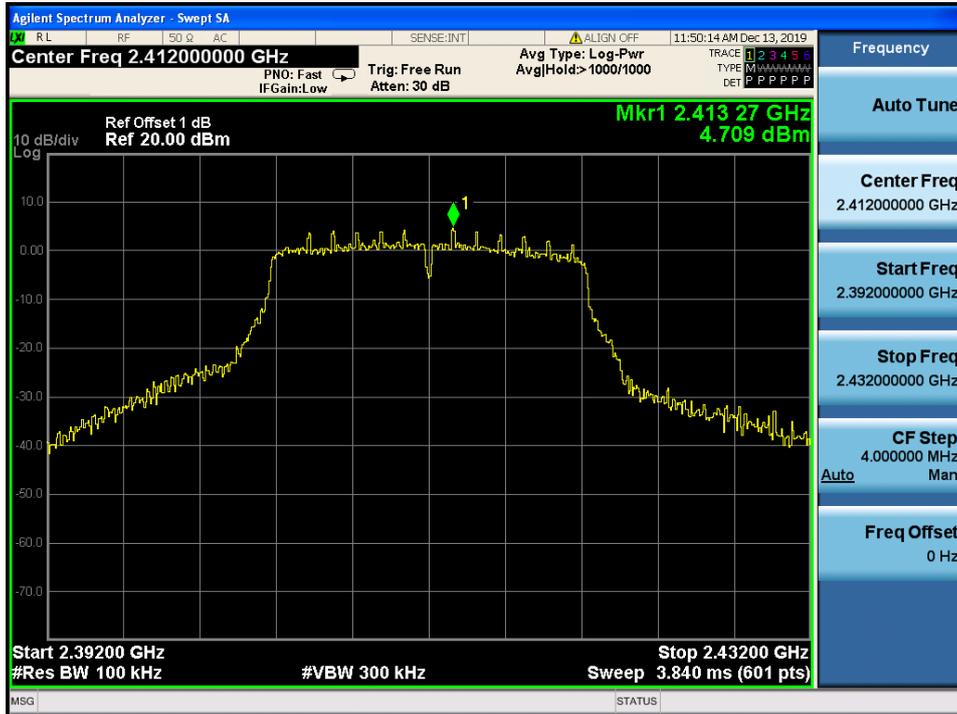
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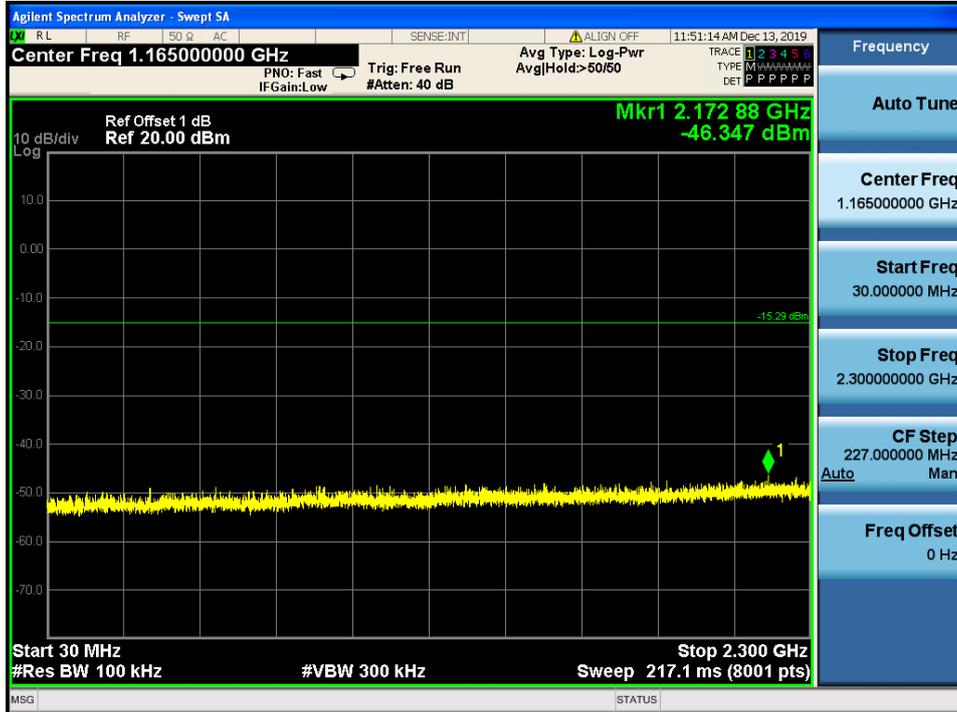
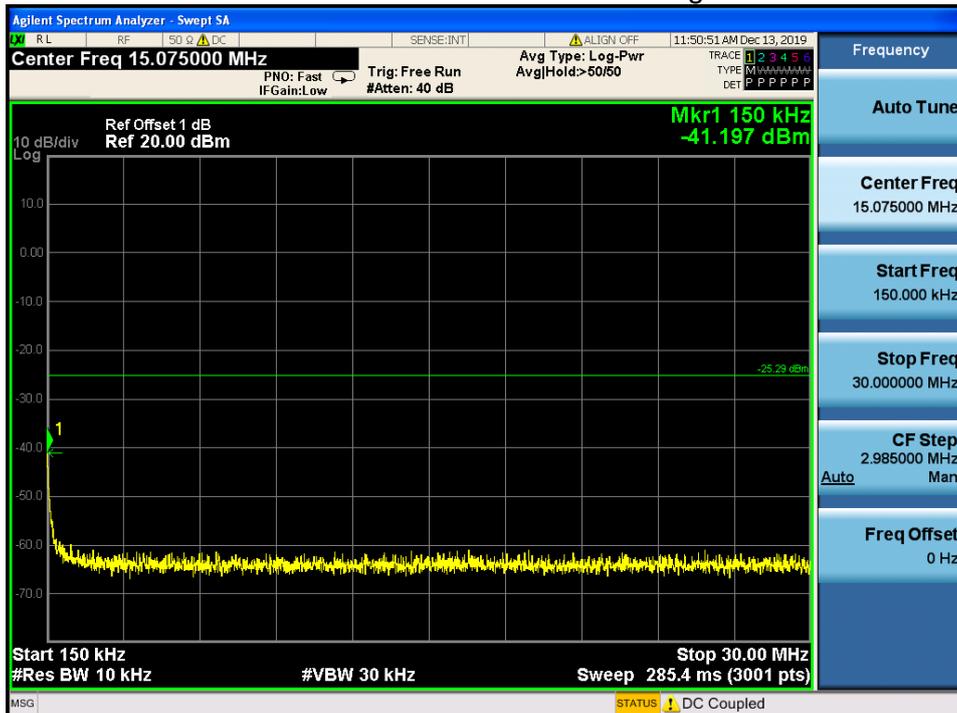


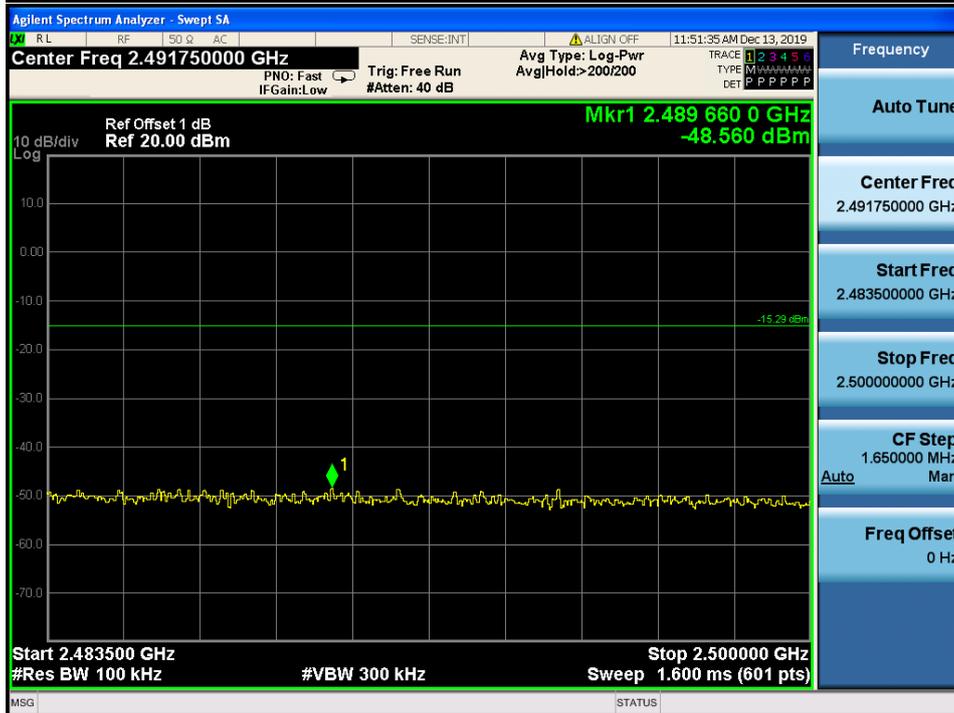




802.11G_Lowest Channel

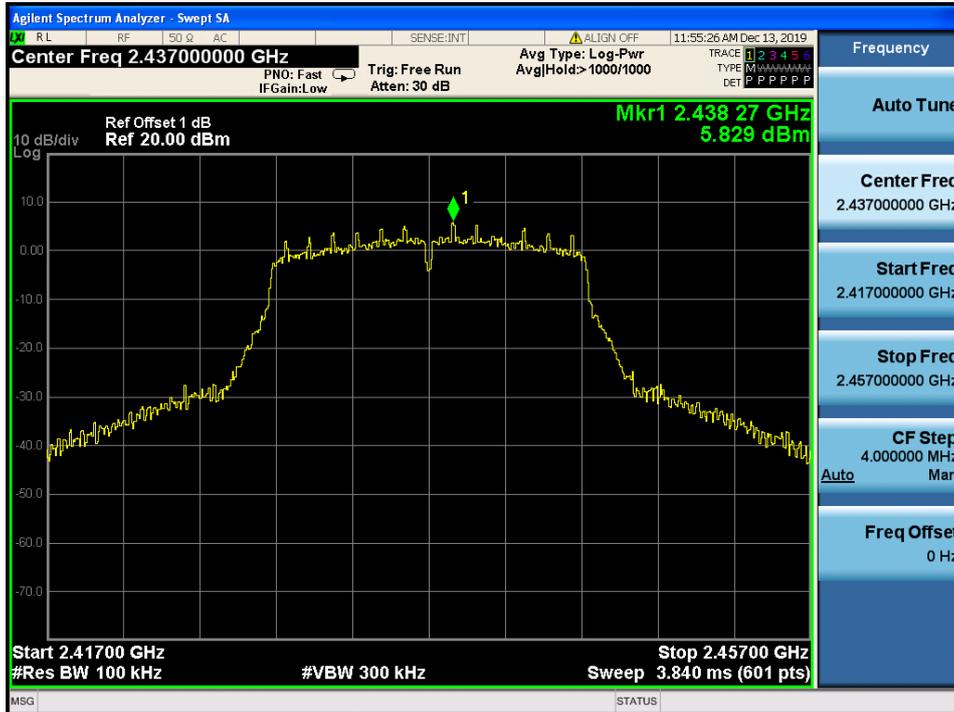


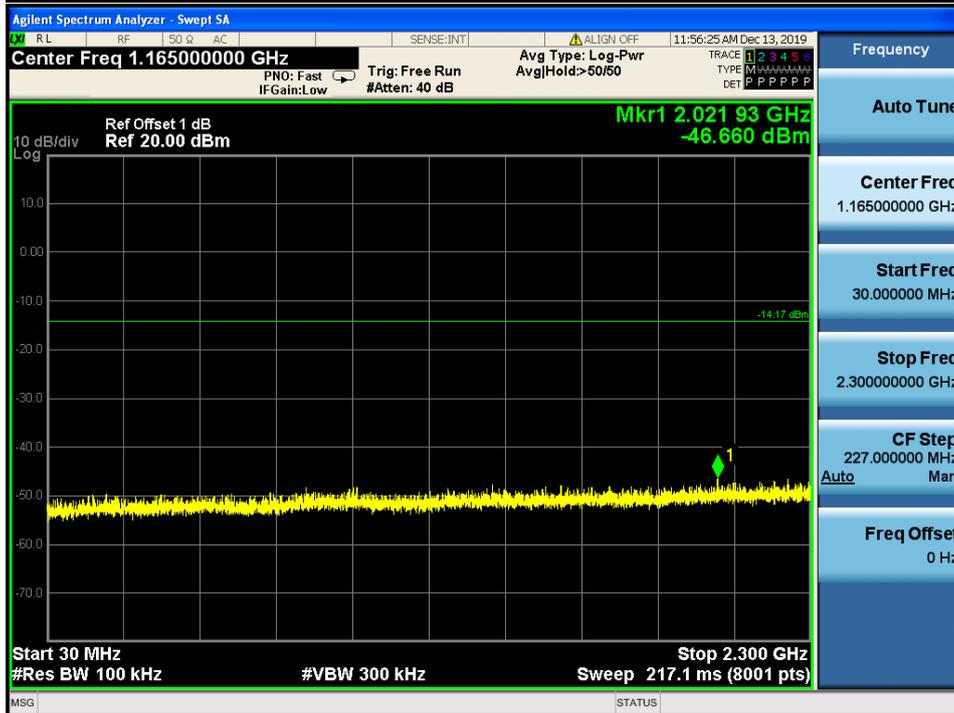
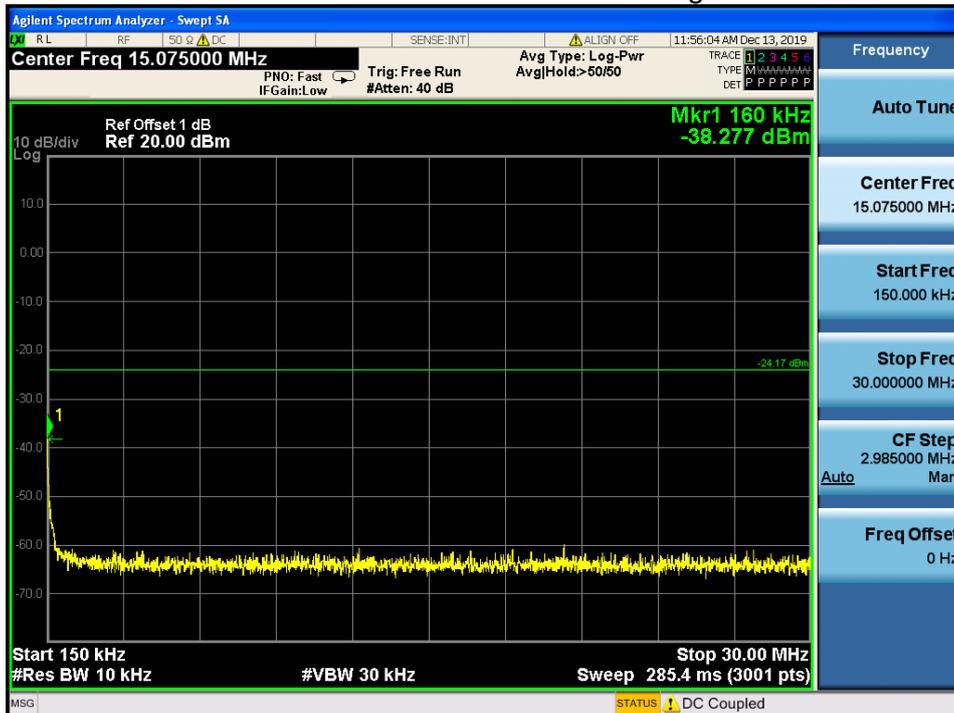


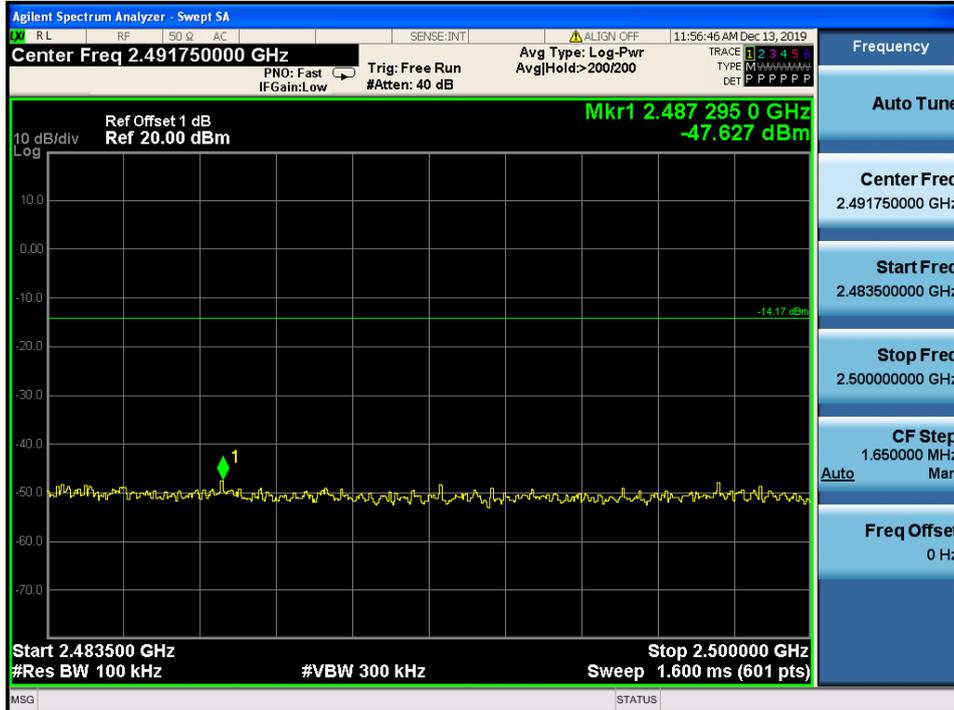
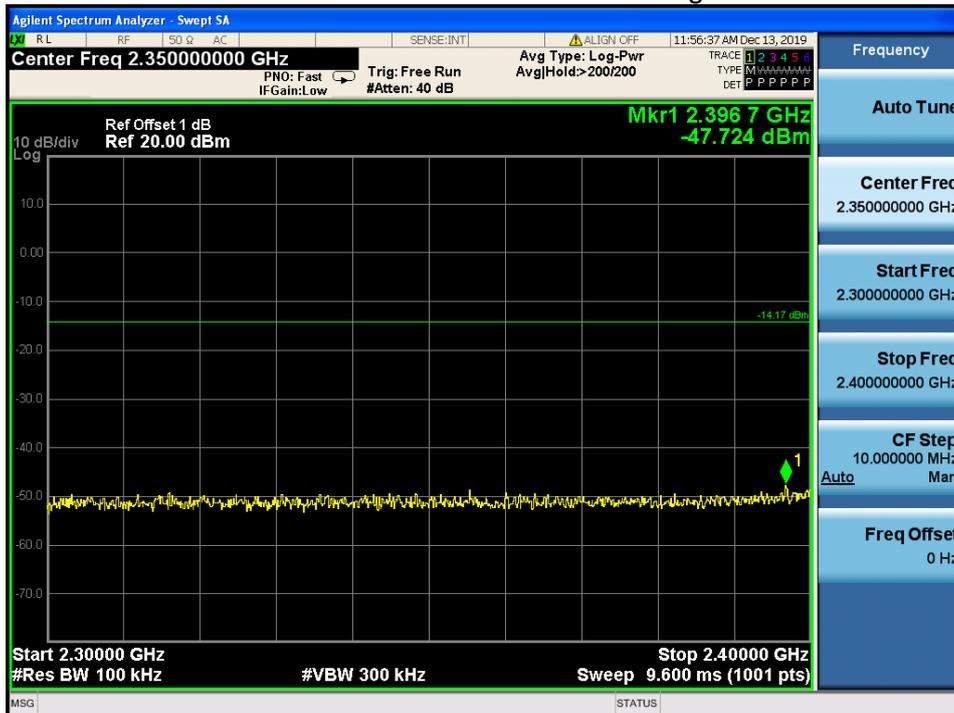


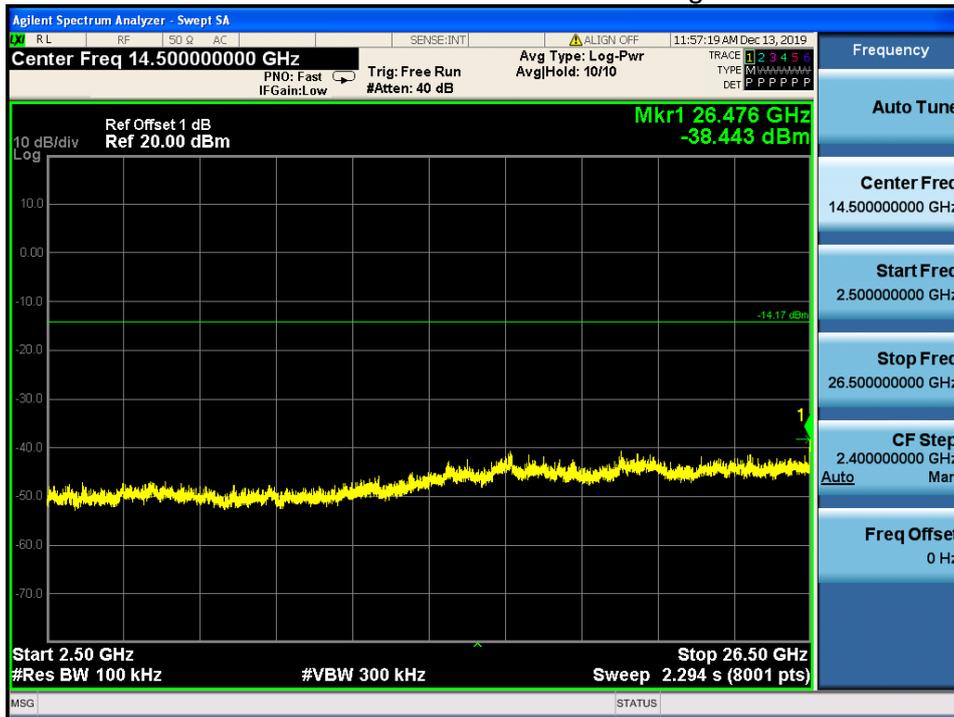


802.11G_Middle Channel

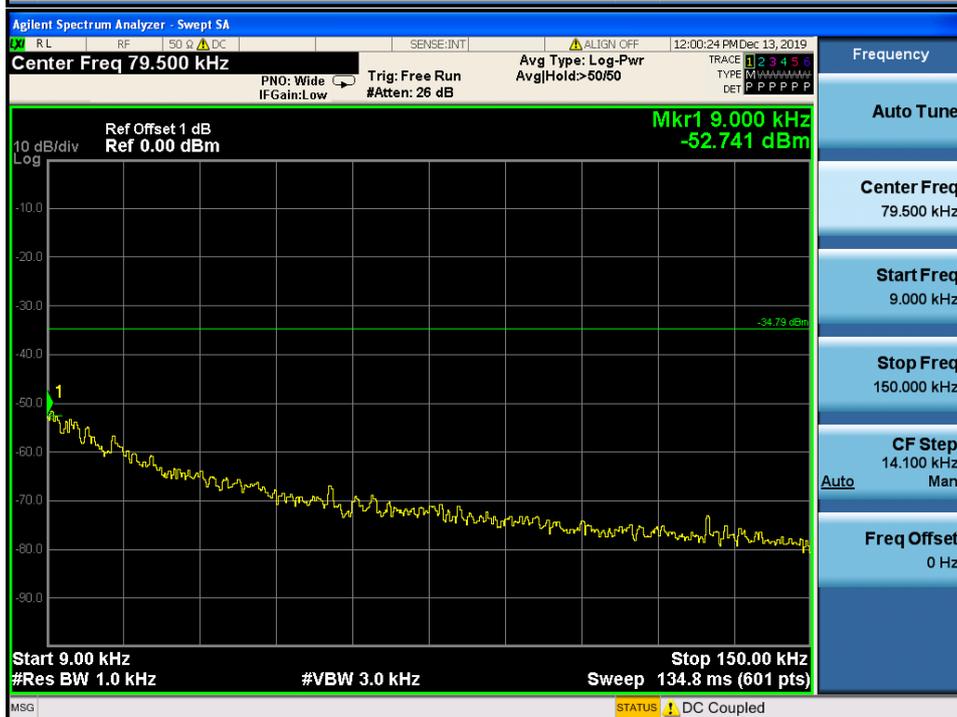




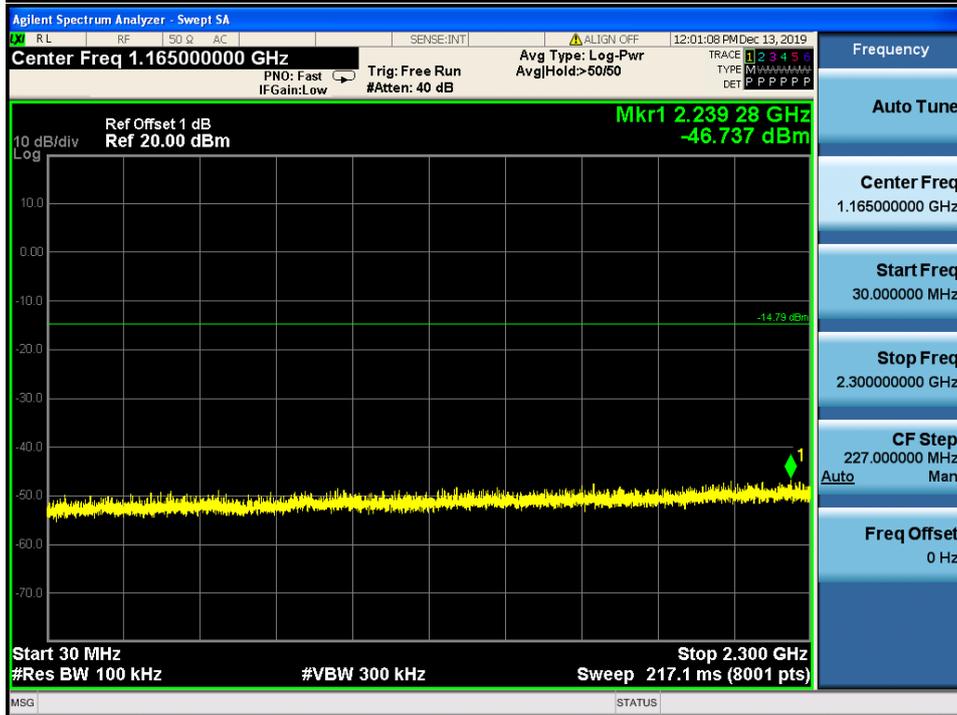
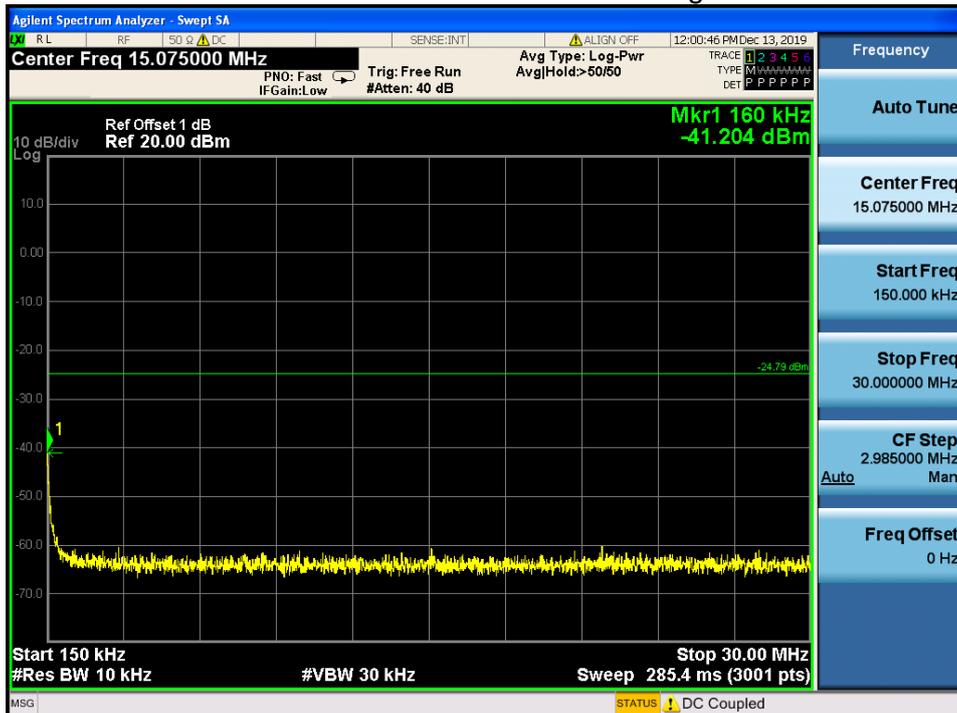


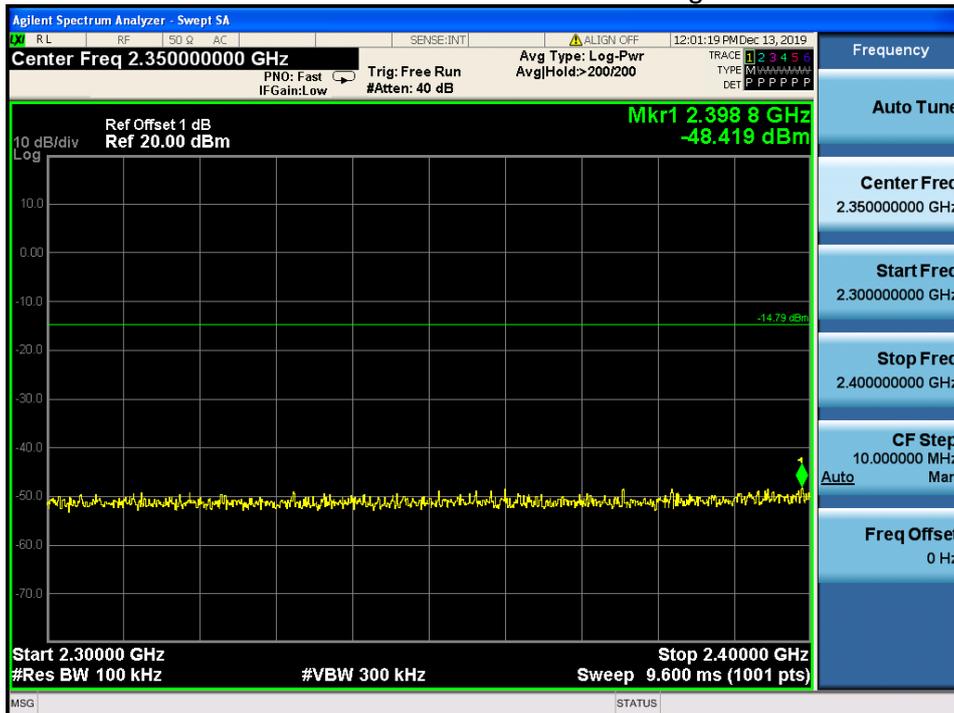


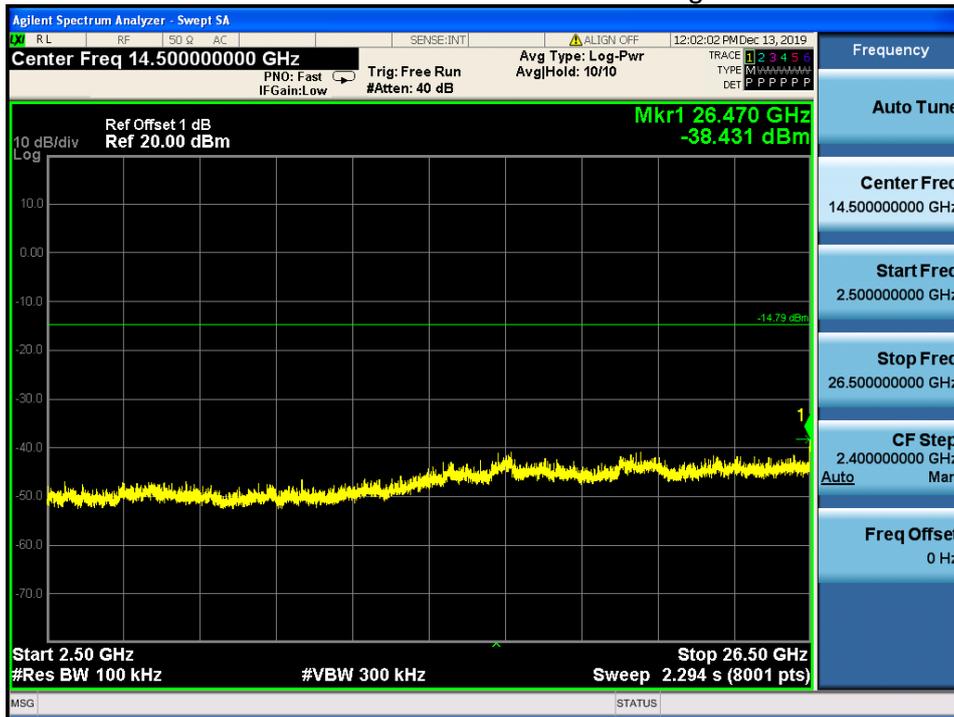
802.11G_Highest Channel



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