

Nemko Korea Co., Ltd.

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FCC and IC EVALUATION REPORT FOR CERTIFICATION

Applicant :**Samsung Electronics Co., Ltd.****129,Samsung-ro, Yeongtong-gu, Suwon-si,****Gyeonggi-do, 16677, Republic of Korea****Attn. : Hongsuk Oh****Dates of Issue : June 18, 2018****Test Report No. : NK-18-R-002****Test Site : Nemko Korea Co., Ltd.****FCC ID
IC****A3LWBW880A
649E-WBW880A****Brand Name****Samsung Electronics Co., Ltd.****Contact Person****Samsung Electronics Co., Ltd.
129,Samsung-ro, Yeongtong-gu, Suwon-si,
Gyeonggi-do, 16677, Republic of Korea
Hongsuk Oh
Telephone No. : 82-31-200-5216****Applied Standard:** FCC 47 CFR Part 15.407 and IC RSS-247 Issue 2**Classification:** Unlicensed National Information Infrastructure (NII)**EUT Type:** Wifi Module

The device bearing the brand name and model specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. The client should not use it to claim product endorsement by TAF or any government agencies. The test results in the report only apply to the tested sample.

I attest to the accuracy of data and all measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

 June. 18. 2018

Tested By : Yonghwan Kim
Engineer

 June 18. 2018

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TABLE OF CONTENTS

1. Scope	4
2. Introduction (Site Description)	5
2.1 Test facility	5
2.2 Accreditation and listing	6
3. Test Conditions & EUT Information	7
3.1 Operation During Test	7
3.1.1 Table of test power setting	7
3.1.2 Table of test channels	7
3.1.3 Antenna information	9
3.1.4 Additional Information Related to Testing	10
3.1.5 Table of test modes	10
3.1.6 Table of actual operating channels	12
3.2 Support Equipment	13
3.3 Setup Drawing	14
3.4 EUT Information	15
4. Summary of Test Results	17
5. Recommendation / Conclusion	18
6. Antenna Requirements	18
7. Description of Test	19
7.1 Conducted Emissions	19
7.2 Radiated Emissions	20
7.3 26 dB Bandwidth and 99% Occupied Bandwidth	21
7.4 6 dB Bandwidth	22
7.5 Maximum Conducted Output Power (average)	23
7.6 Maximum Power Spectral Density (average)	24
7.7 Duty Cycle	25

8. Test Data	26
8.1 Conducted Emissions	26
8.2 Radiated Emissions	28
8.3 26 dB Bandwidth and 99% Occupied Bandwidth	30
8.4 6 dB Modulated Bandwidth – UNII-3 band	92
8.5 Maximum Conducted Output Power (average)	107
8.6 Maximum Power Spectral Density (average)	164
8.7 Radiated Spurious Emissions	222
8.8 Radiated Band Edge	243
9. Test Equipment	258
10. Accuracy of Measurement	259

1. SCOPE

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission under FCC part 15 and IC RSS-247 Issue2.

Responsible Party :	Samsung Electronics Co., Ltd. 129,Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Republic of Korea
Contact Person :	Hongsuk Oh
Manufacturer :	Samsung Electronics Co., Ltd. 129,Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Republic of Korea

- FCC ID: A3LWBW880A
- IC: 649E-WBW880A
- Model: WBW880A
- HVIN: Rev 0
- Brand Name: Samsung Electronics Co., Ltd.
- EUT Type: Wifi Module
- Classification: Unlicensed National Information Infrastructure (NII)
- Applied Standard: FCC 47 CFR Part 15.407 and IC RSS-247 Issue 2
- Test Procedure(s): 789033 D02 General UNII Test Procedures New Rules v02r01 dated December 14, 2017 entitled "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E".
- Dates of Test: January 12, 2018 ~ May 29, 2018
- Place of Tests: Nemko Korea Co., Ltd.

2. INTRODUCTION

2.1 Test facility

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2014), the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013) was used in determining radiated and conducted emissions emanating from **Samsung Electronics Co., Ltd. FCC ID : A3LWBW880A** and **IC : 649E-WBW880A**.

These measurement tests were conducted at **Nemko Korea Co., Ltd. EMC Laboratory**.

The site address 155 & 159, Osan-Ro, Mohyeon- Eup, Cheoin-Gu, Yongin-Si, Gyeonggi-Do 16885 KOREA, REPULIC OF.

The area of Nemko Korea Corporation Ltd. EMC Test Site is located in a mountain area at 80 km (48 miles) southeast and Incheon International Airport (Incheon Airport), 30 km (18miles) south-southeast from central Seoul.

It is located in the valley surrounded by mountains in all directions where ambient radio signal conditions are quiet and a favorable area to measure the radio frequency interference on open field test site for the computing and ISM devices manufactures.

The detailed description of the measurement facility was found to be in compliance with the requirements of ANSI C63.4-2014 according to §2.948.



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Fig. 1. The map above shows the Seoul in Korea vicinity area.

The map also shows Nemko Korea Corporation Ltd. EMC Lab. and Incheon Airport.

2.2 Accreditation and listing

Accreditation type		Accreditation number
	CAB Accreditation for DOC	Designation No. KR0026
	KOLAS Accredited Lab. (Korea Laboratory Accreditation Scheme)	Registration No. 155
	Canada IC Registered site	Site No. 2040E
	VCCI registration site(RE/CE/Telecom CE)	Member No. 2118
	EMC CBTL	-
	KCC(RRL)Designated Lab.	Registration No. KR0026

3. TEST CONDITIONS & EUT INFORMATION

3.1 Operation During Test

The EUT is the CDD, MIMO transceiver which is module supporting the 802.11a/b/g/n/ac mode (802.11a/b/g/n(20,40MHz)/ac(20,40,80MHz) : 2TX/2RX).

The Laptop was used to control the EUT to transmit the wanted TX channel continuously (duty cycle< 98%) by the testing program (QDART) supported by manufacturer.

The operating voltage of EUT was 5 Vdc supplied from a USB port on Laptop PC.

The EUT was tested at the lowest , middle and the highest channels with the maximum output power in accordance with the manufacturer's specifications. The worst data were recorded in the report.

3.1.1 Table of test power setting

Frequency	Mode	Power setting Level
5180 MHz ~ 5240 MHz	All	6.5
5260 MHz ~ 5320 MHz	All	7
5500 MHz ~ 5720 MHz	All	7
5745 MHz ~ 5825 MHz	All	6

3.1.2 Table of test channels

Frequency band	Mode	Test Channel (CH)	Frequency (MHz)
U-NII-1	802.11a,n (20MHz)	36	5180
		44	5220
		48	5240
	802.11n (40MHz)	38	5190
		46	5230
	802.11ac (80MHz)	42	5210

Frequency band	Mode	Test Channel (CH)	Frequency (MHz)
U-NII-2A	802.11a,n (20MHz)	52	5260
		60	5300
		64	5320
	802.11n (40MHz)	54	5270
		62	5310
	802.11ac (80MHz)	58	5290
U-NII-2C	802.11a,n (20MHz)	100	5500
		116	5580
		140	5700
	802.11n (40MHz)	102	5510
		118	5590
		134	5670
	802.11ac (80MHz)	106	5530
		122	5610
Straddle	802.11a,n (20MHz)	144	5720
	802.11n (40MHz)	142	5710
	802.11ac (80MHz)	138	5690
U-NII-3	802.11a,n (20MHz)	149	5745
		157	5785
		165	5825
	802.11n (40MHz)	151	5755
		159	5795
	802.11ac (80MHz)	155	5775

3.1.3 Antenna information:

Frequency band	Mode	Data rate	Antenna TX mode	Support CDD	Support MIMO
5 GHz	802.11a	All	☐ 1TX, ☒ 2TX	☒ Yes, ☐ No	☐ Yes, ☒ No
	802.11n (20 MHz)	MCS 0~7	☐ 1TX, ☒ 2TX	☒ Yes, ☐ No	☐ Yes, ☒ No
		MCS 8~15	☐ 1TX, ☒ 2TX	☐ Yes, ☒ No	☒ Yes, ☐ No
	802.11n (40 MHz)	MCS 0~7	☐ 1TX, ☒ 2TX	☒ Yes, ☐ No	☐ Yes, ☒ No
		MCS 8~15	☐ 1TX, ☒ 2TX	☐ Yes, ☒ No	☒ Yes, ☐ No
	802.11ac (20 MHz)	MCS0NSS1~ MCS8NSS1	☐ 1TX, ☒ 2TX	☒ Yes, ☐ No	☐ Yes, ☒ No
		MCS0NSS2~ MCS8NSS2	☐ 1TX, ☒ 2TX	☐ Yes, ☒ No	☒ Yes, ☐ No
	802.11ac (40 MHz)	MCS0NSS1~ MCS9NSS1	☐ 1TX, ☒ 2TX	☒ Yes, ☐ No	☐ Yes, ☒ No
		MCS0NSS2~ MCS9NSS2	☐ 1TX, ☒ 2TX	☐ Yes, ☒ No	☒ Yes, ☐ No
	802.11ac (80 MHz)	MCS0NSS1~ MCS9NSS1	☐ 1TX, ☒ 2TX	☒ Yes, ☐ No	☐ Yes, ☒ No
		MCS0NSS2~ MCS9NSS2	☐ 1TX, ☒ 2TX	☐ Yes, ☒ No	☒ Yes, ☐ No

Note :

1. CDD mode is Cyclic Delay Diversity mode.
2. For 802.11n(20 MHz), EUT support CDD mode for MCS0~7 and MIMO mode for MCS8~15.
3. For 802.11n(40 MHz), EUT support CDD mode for MCS0~7 and MIMO mode for MCS8~15.
4. For 802.11ac(20 MHz), EUT support CDD mode for MCS0NSS1~MCS8NSS1 and MIMO mode for MCS0NSS2~MCS8NSS2.
5. For 802.11ac(40 MHz), EUT support CDD mode for MCS0NSS1~MCS9NSS1 and MIMO mode for MCS0NSS2~MCS9NSS2.
6. For 802.11ac(80 MHz), EUT support CDD mode for MCS0NSS1~MCS9NSS1 and MIMO mode for MCS0NSS2~MCS9NSS2.
7. CDD mode, $N_{SS}=1$, MIMO mode, $N_{SS}=2$, where N_{SS} = number of spatial streams.
8. MIMO mode means SM-MIMO transmission.

3.1.4 Additional Information Related to Testing

The cable and attenuator loss from 30MHz to 26.5GHz was reflected in spectrum analyzer with correction factor for all conducted testing.

3.1.5 Table of test modes

Test Items	Mode	*Data rate (Mbps)	Test Channel (CH)
Conducted Emissions	802.11ac (80 MHz)	MCS0NSS1	138
Radiated Emissions	802.11n (40 MHz)	MCS0	102
26 dB Bandwidth	802.11a	6	36/44/48 52/60/64 100/116/140 144/149/157/165
	802.11n (20 MHz)	MCS0	
	802.11n (40 MHz)	MCS0	38/46 54/62 102/118/134 142/151/159
	802.11ac (80 MHz)	MCS0NSS1	42/58/106 122/138/155
6 dB Bandwidth	802.11a	6	144/149 157/165
	802.11n (20 MHz)	MCS0	
	802.11n (40 MHz)	MCS0	142/151/159
	802.11ac (80 MHz)	MCS0NSS1	138/155
Maximum conducted Output Power	802.11a	6	36/44/48 52/60/64 100/116/140 144/149/157/165
	802.11n (20 MHz)	MCS0	
	802.11n (40 MHz)	MCS0	38/46 54/62 102/118/134 142/151/159
	802.11ac (80 MHz)	MCS0NSS1	42/58/106 122/138/155

Power Spectral Density	802.11a	6	36/44/48 52/60/64 100/116/140 144/149/157/165
	802.11n (20 MHz)	MCS0	
	802.11n (40 MHz)	MCS0	38/46 54/62 102/118/134 142/151/159
	802.11ac (80 MHz)	MCS0NSS1	42/58/106 122/138/155
Radiated Spurious Emission	802.11a	6	36/44/48 52/60/64 100/116/140 144/149/157/165
	802.11n (20 MHz)	MCS0	
	802.11n (40 MHz)	MCS0	38/46 54/62 102/118/134 142/151/159
	802.11ac (80 MHz)	MCS0NSS1	42/58/106 122/138/155
Radiated Band edge Emission	802.11a	6	36/48 52/64 100/140 144/149/165
	802.11n (20 MHz)	MCS0	
	802.11n (40 MHz)	MCS0	38/46 54/62 102/134 142/151/159
	802.11ac (80 MHz)	MCS0NSS1	42/58/106 122/138/155

Note :

- *The worst data rate was determined by the conducted output power that generates the highest emission performing pre-scan testing in all data rates of each mode.
- Same digital modulation is used by 802.11n and 802.11ac mode.
The worst conducted output powers were generated in 802.11n(20MHz),n(40MHz),ac(80MHz) mode for each bandwidth, therefore the 802.11n(20MHz),n(40MHz),ac(80MHz) mode were chosen as the worst-case for relevant mandatory test requirements.

3.1.6 Table of actual operating channels

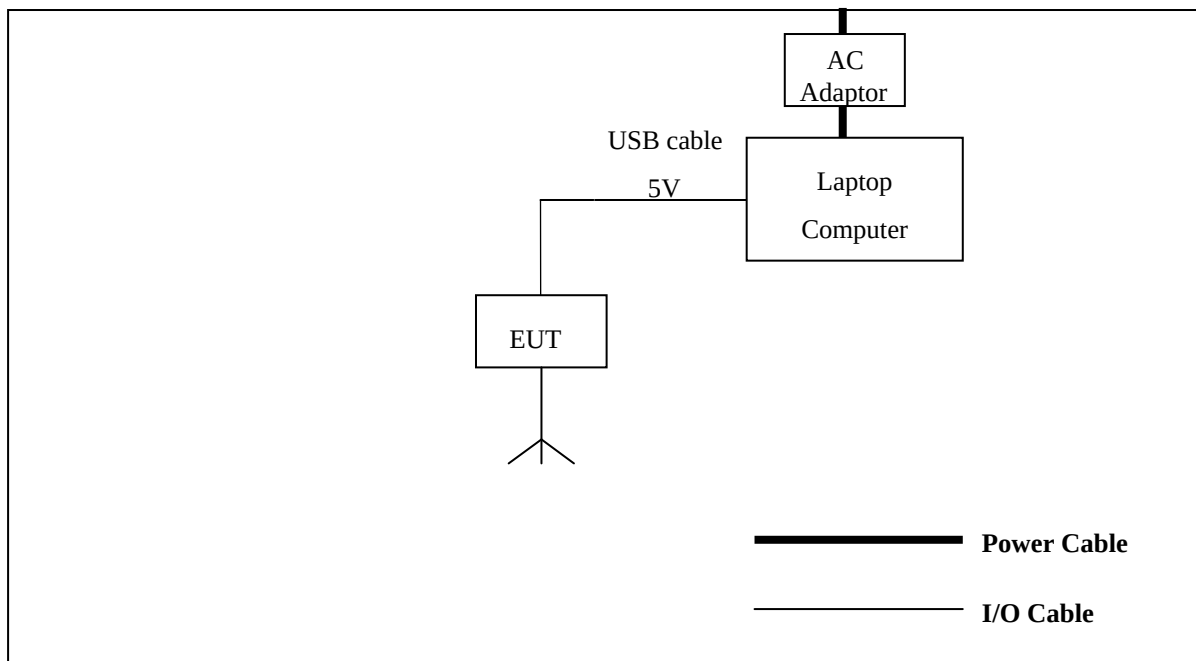
Frequency band	Bandwidth	channel	Frequency (MHz)
UNII-1	20MHz	36	5180
		40	5200
		44	5220
		48	5240
	40MHz	38	5190
		46	5230
	80MHz	42	5210
U-NII-2A	20MHz	52	5260
		56	5280
		60	5300
		64	5320
	40MHz	54	5270
		62	5310
	80MHz	58	5290
U-NII-2C	20MHz	100	5500
		104	5520
		108	5540
		112	5560
		116	5580
		120	5600
		124	5620
		128	5640
		132	5660
		136	5680
		140	5700
	40MHz	102	5510
		110	5550
		118	5590
		126	5630
		134	5670

Frequency band	Bandwidth	channel	Frequency (MHz)
U-NII-2C	80MHz	106	5530
		122	5610
Straddle	20MHz	144	5720
	40MHz	142	5710
	80MHz	138	5690
UNII-3	20MHz	149	5745
		153	5765
		157	5785
		161	5805
		165	5825
	40MHz	151	5755
		159	5795
	80MHz	155	5775

3.2 Support Equipment

EUT	Samsung Electronics Co., Ltd. Model : WBW880A	S/N: N/A
Laptop Computer	Samsung Electronics Co., Ltd. Model : NT-RF510	FCC DOC S/N : ZZVL93EB301801H
AC/DC Adapter	Chicony Power Technology Co., Ltd. Model : A10-090P1A 1.5 m unshielded power cable	FCC DOC S/N : N/A

3.3 Setup Drawing



3.4 EUT Information

The EUT is the **Samsung Electronics Co., Ltd. Wifi Module FCC ID: A3LWBW880A, IC: 649E-WBW880A.**

Specifications:

EUT Type	Wifi Module
Model Name	WBW880A
Brand Name	Samsung Electronics Co., Ltd.
Frequency of Operation	<u>For U-NII-1 Band</u> 802.11a,n,ac(20 MHz): 5180 MHz ~ 5240 MHz 802.11n,ac(40 MHz): 5190 MHz ~ 5230 MHz 802.11ac(80 MHz): 5210 MHz <u>For U-NII-2A Band</u> 802.11a,n,ac(20 MHz): 5260 MHz ~ 5320 MHz 802.11n,ac(40 MHz): 5270 MHz ~ 5310 MHz 802.11ac(80 MHz): 5290 MHz <u>For U-NII-2C Band</u> 802.11a,n,ac(20 MHz): 5500 MHz ~ 5720 MHz 802.11n,ac(40 MHz): 5510 MHz ~ 5710 MHz 802.11ac(80 MHz): 5530 MHz ~ 5690 MHz <u>For U-NII-3 Band</u> 802.11a,n,ac(20 MHz): 5745 MHz ~ 5825 MHz 802.11n,ac(40 MHz): 5755 MHz ~ 5795 MHz 802.11ac(80 MHz): 5775 MHz
Maximum Conducted Output Power	<u>For U-NII-1 Band</u> 802.11a : 6.95 dBm 802.11n(20 MHz) : 6.31 dBm 802.11n(40 MHz) : 6.82 dBm 802.11ac(80 MHz) : 7.53 dBm <u>For U-NII-2A Band</u> 802.11a : 7.35 dBm 802.11n(20 MHz) : 6.94 dBm 802.11n(40 MHz) : 7.63 dBm 802.11ac(80 MHz) : 8.43 dBm <u>For U-NII-2C Band</u> 802.11a : 8.52 dBm 802.11n(20 MHz) : 8.26 dBm 802.11n(40 MHz) : 8.70 dBm 802.11ac(80 MHz) : 8.63 dBm <u>For U-NII-3 Band</u> 802.11a : 6.61 dBm 802.11n(20 MHz) : 6.04 dBm 802.11n(40 MHz) : 6.40 dBm 802.11ac(80 MHz) : 6.68 dBm

FCC Classification	Unlicensed National Information Infrastructure (NII)
Number of Channels	<u>For U-NII-1 Band</u> 802.11a,n,ac(20 MHz): 4ch 802.11n,ac(40 MHz): 2ch 802.11ac(80 MHz): 1ch <u>For U-NII-2A Band</u> 802.11a,n,ac(20 MHz): 4ch 802.11n,ac(40 MHz): 2ch 802.11ac(80 MHz): 1ch <u>For U-NII-2C Band</u> 802.11a,n,ac(20 MHz): 12ch 802.11n,ac(40 MHz): 6ch 802.11ac(80 MHz): 3ch <u>For U-NII-3 Band</u> 802.11a,n,ac(20 MHz): 5ch 802.11n,ac(40 MHz): 2ch 802.11ac(80 MHz): 1ch
Modulations	OFDM(BPSK,QPSK,16QAM,64QAM) for 802.11a,n,ac
Antenna Gain (peak)	<u>For U-NII-1 Band</u> Ant0 : 7.3 dBi, Ant1 : 3.9 dBi <u>For U-NII-2A Band</u> Ant0 : 7.3 dBi, Ant1 : 4.2 dBi <u>For U-NII-2C Band</u> Ant0 : 4.9 dBi, Ant1 : 3.0 dBi <u>For U-NII-3 Band</u> Ant0 : 4.9 dBi, Ant1 : 4.3 dBi
Antenna Setup	802.11a/n(20,40MHz)/ac(20,40,80MHz) : 2TX / 2RX
Voltage	5 Vdc
Temperature Range	-20 ℃ ~ +50 ℃
Size (L x W x H)	About 75 mm x 26 mm x 4 mm
Weight	About 9 g
Remarks	-

4. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specification:

Name of Test	FCC Paragraph No.	IC Paragraph No.	Result	Remark
Conducted Emission	15.207	RSS-GEN Issue 4 8.8	Complies	
Radiated Emission	15.209	RSS-GEN Issue 4 8.9	Complies	
26 dB Spectrum Bandwidth and 99% Occupied bandwidth	15.407(a)	RSS-247 Issue 2 6.2	Complies	
6 dB Bandwidth	15.407(e)	RSS-247 Issue 2 6.2	Complies	
Maximum Conducted Output Power	15.407(a)	RSS-247 Issue 2 6.2	Complies	
Power Spectral Density	15.407(a)	RSS-247 Issue 2 6.2	Complies	
Radiated Spurious Emission	15.407(b)	RSS-247 Issue 2 6.2	Complies	
DFS	15.407(h)	RSS-247 Issue 2 6.3	Complies	
Maximum Permissible Exposure	1.1307(b)	RSS-102 Issue 5	Complies	

5. RECOMMENDATION/CONCLUSION

The data collected shows that the **Samsung Electronics Co., Ltd. Wifi Module FCC ID: A3LWBW880A, IC: 649E-WBW880A** is in compliance with Part 15.407 of the FCC Rule and RSS-247 Issue 2 of the IC Specification.

6. ANTENNA REQUIREMENTS

§15.203 of the FCC Rules part 15 Subpart C

: 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 shall be considered sufficient to comply with the provisions of this section.

The antenna of the **Samsung Electronics Co., Ltd. Wifi Module FCC ID: A3LWBW880A, IC: 649E-WBW880A** is **permanently attached** and there are no provisions for connection to an external antenna. It complies with the requirement of §15.203.

Directional gain was be calculated according to “**662911 D01 Multiple Transmitter Output v02r01**” and would be found at end of average output power and PSD results in this report.

7. DESCRIPTION OF TESTS

7.1 Conducted Emissions

The Line conducted emission test facility is located inside a 4 x 7 x 2.5 meter shielded enclosure. It is manufactured by EM engineering. The shielding effectiveness of the shielded room is in accordance with MIL-STD-285 or NSA 65-6. A 1 m x 1.5 m wooden table 0.8 m height is placed 0.4 m away from the vertical wall and 1.5 m away from the side of wall of the shielded room. Rohde & Schwarz (ESH3-Z5) and (ESH2-Z5) of the 50 ohm/50 μ H Line Impedance Stabilization Network (LISN) are bonded to the shielded room. The EUT is powered from the Rohde & Schwarz LISN (ESH3-Z5) and the support equipment is powered from the Rohde & Schwarz LISN (ESH2-Z5). Power to the LISNs are filtered by high-current high insertion loss Power line filters. The purpose of filter is to attenuate ambient signal interference and this filter is also bonded to shielded enclosure. All electrical cables are shielded by tinned copper zipper tubing with inner diameter of 1 / 2 ". If DC power device, power will be derived from the source power supply it normally will be powered from and this supply lines will be connected to the LISNs, All interconnecting cables more than 1 meter were shortened by non-inductive bundling (serpentine fashion) to a 1 meter length. Sufficient time for EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer to determine the frequency producing the maximum EME from the EUT. The spectrum was scanned from 150 kHz to 30 MHz with 200 msec sweep time. The frequency producing the maximum level was re-examined using the EMI test receiver. (Rohde & Schwarz ESCS30). The detector functions were set to CISPR quasi-peak mode & average mode. The bandwidth of receiver was set to 9 kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission. Each emission was maximized by; switching power lines; varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and of support equipment, and powering the monitor from the floor mounted outlet box and computer aux AC outlet, if applicable; whichever determined the worst case emission. Each EME reported was calibrated using the R&S signal generator.

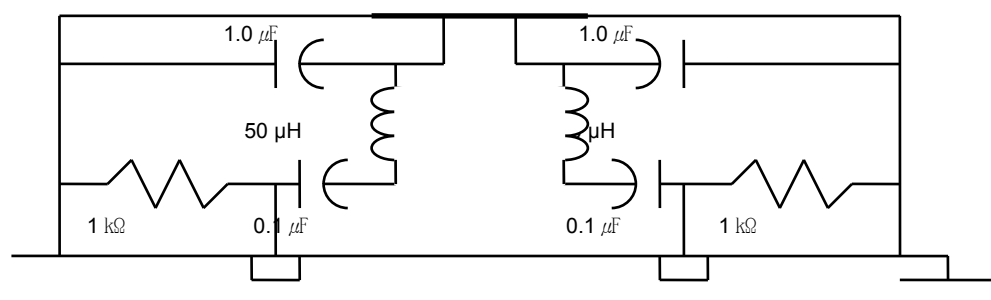


Fig. 2. LISN Schematic Diagram

7.2 Radiated Emissions

The measurement was performed at the test site that is specified in accordance with ANSI C63.10-2013.

The spurious emission was scanned from 9 kHz to 30 MHz using Loop Antenna(Rohde&Schwarz, HFH2-Z2) and 30 to 1000 MHz using Trilog broadband test antenna(Schwarzbeck, VULB 9163). Above 1 GHz, Horn antenna (Schwarzbeck BBHA 9120D: up to 18 GHz, Q-par Angus QSH20S20 : 18 to 26.5 GHz, Q-par Angus QSH22K20 : 26.5 to 40 GHz) was used.

For emissions testing at below 1GHz, The test equipment was placed on turntable with 0.8 m above ground. For emission measurements above 1 GHz, The test equipment was placed on turntable with 1.5 m above ground. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The EUT, cable, wire arrangement and mode of operation that has the highest amplitude relative to the limit was selected. Then, the turn table was rotated from 0° to 360° and an antenna mast was moved from 1 m to 4 m height to maximize the suspected highest amplitude signal. The final maximized level was recorded.

Unwanted emissions in the restricted bands

At frequencies below 1000 MHz, measurements performed using the CISPR quasi-peak detection.

At frequencies above 1000 MHz, measurements performed using the peak and average measurement procedures described in KDB “789033 D02 General UNII Test Procedures New Rules v01r04” in section G)5) and G)6). Peak emission levels was measured by setting the analyzer RBW = 1 MHz, VBW = 3 MHz, Detector = Peak, Trace mode = max hold. Average emission levels was measured using the “Method VB” by setting the analyzer RBW = 1 MHz, VBW = 3 kHz (VBW ≤ RBW/100), Detector = Peak , if the EUT is configured to transmit with duty cycle ≥ 98 percent. When the duty cycle ≤ 98 percent, VBW ≥ 1/T(T = minimum transmission duration over which the transmitter is on) was used, and allow max hold to run for at least 50 times (1/duty cycle) traces.

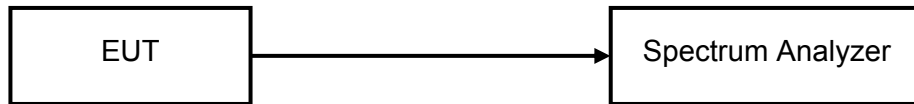
Unwanted emissions outside of the restricted bands

At frequencies below 1000 MHz, measurements performed using the CISPR quasi-peak detection.

At frequencies above 1000 MHz, measurements performed using the peak measurement procedures described in KDB “789033 D02 General UNII Test Procedures New Rules v01r04” in section G)5). Peak emission levels was measured by setting the analyzer RBW = 1 MHz, VBW = 3 MHz, Detector = Peak, Trace mode = max hold. If the transmission is not continuous, the time required for the trace to stabilize will increase by a factor of approximately 1/x, where x is the duty cycle.

7.3 26 dB Bandwidth and 99% Occupied bandwidth

Test Setup



Test Procedure

EUTs 26 dB bandwidth is measured at low, middle, high channels with a spectrum analyzer connected to the antenna terminal while the EUTs operating at its maximum power control level.

The spectrum analyzer setting is as follows.

RBW = approximately 1 % of the emission bandwidth

VBW $\geq$ 3 x RBW

Detector = Peak

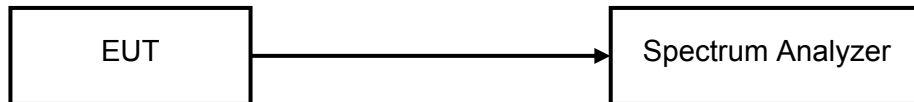
Trace mode = max hold

Sweep = auto couple

The bandwidth measurement function on the spectrum analyzer is used to measure the 26 dB bandwidth and 99% occupied bandwidth.

7.4 6 dB Bandwidth

Test Setup



Test Procedure

EUTs 6 dB bandwidth is measured at low, middle, high channels with a spectrum analyzer connected to the antenna terminal while the EUTs operating at its maximum power control level. The spectrum analyzer setting is as follows.

RBW = 100 kHz

VBW > 3 x RBW

Detector = Peak

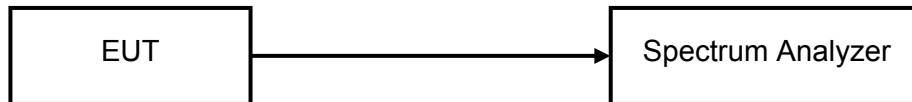
Trace mode = max hold

Sweep = auto couple

The bandwidth measurement function on the spectrum analyzer is used to measure the 6 dB bandwidth.

7.5 Maximum Conducted Output Power (average)

Test Setup



Test Procedure

EUTs Maximum Conducted Output Power (average) is measured at low, middle, high channels with a spectrum analyzer connected to the antenna terminal while the EUTs operating at its maximum power control level.

The spectrum analyzer setting is as follows.

Measure the duty cycle, x , of the transmitter output signal

Span = encompass the EBW of the signal.

RBW = 1 MHz

VBW $\geq$ 3 MHz

Number of points in sweep $\geq 2 \times \text{Span} / \text{RBW}$

Sweep time = auto

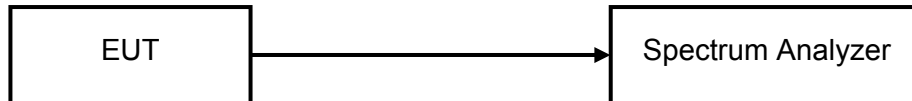
Detector = RMS

Trace average at least 100 traces in power averaging mode.

The band power measurement function on the spectrum analyzer is used to measure the maximum conducted output power.

7.6 Maximum Power Spectral Density (average)

Test Setup



Test Procedure

EUTs Maximum Power Spectral Density (average) is measured at low, middle, high channels with a spectrum analyzer connected to the antenna terminal while the EUTs operating at its maximum power control level.

Measure the duty cycle, x , of the transmitter output signal

The spectrum analyzer setting is as follows.

Span = encompass the EBW of the signal.

RBW = 1 MHz for UNII-1, 2A, 2C band or 500kHz for UNII-3 band

VBW $\geq$ 3 RBW

Number of points in sweep $\geq$ 2 Span / RBW

Sweep time = auto

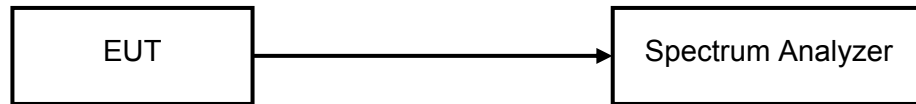
Detector = RMS

Trace average at least 100 traces in power averaging mode

Use the peak search function on the instrument to find the peak of the spectrum.

7.7 Duty Cycle

Test Setup



Test Procedure

EUTs duty cycle are measured at middle channel with a spectrum analyzer connected to the antenna terminal while the EUTs operating at its maximum power control level. The spectrum analyzer setting is as follows.

Center frequency = Center frequency of the transmission

Span = zero

RBW = 8 MHz

VBW = 8 MHz

Detector = peak

Sweep time = at least 3 ms

Sweep mode = Single

The marker function on the spectrum analyzer is used to determine the duty cycle

The results of the duty cycle measurement according to the above test procedure

	Data rate	On time (ms)	On + Off time (ms)	Duty Cycle (%)	Duty Factor (dB)
a mode	6Mbps	2.065	2.243	92.4	0.36
n(20MHz) mode	MCS0	1.924	2.103	91.5	0.39
n(40MHz) mode	MCS0	0.947	1.126	84.1	0.75
ac(80MHz) mode	MCS0	0.464	0.642	72.3	1.41

8. TEST DATA

8.1 Conducted Emissions

FCC §15.207, RSS-Gen Issue 4 8.8

Result

Frequency (MHz)	Level (dB μ V)		*) Factor (dB)	**) Line	Limit (dB μ V)		Margin (dB)	
	Q-Peak	Average			Q-Peak	Average	Q-Peak	Average
0.20	41.1	33.4	10.50	L	63.7	53.7	22.6	20.3
0.52	37.4	26.2	10.60	L	56.0	46.0	18.6	19.8
0.53	37.7	25.3	10.60	L	56.0	46.0	18.3	20.7
0.67	36.6	23.2	10.60	L	56.0	46.0	19.4	22.8
0.74	34.0	27.3	10.60	L	56.0	46.0	22.0	18.7
16.65	30.5	24.8	11.30	L	60.0	50.0	29.5	25.2

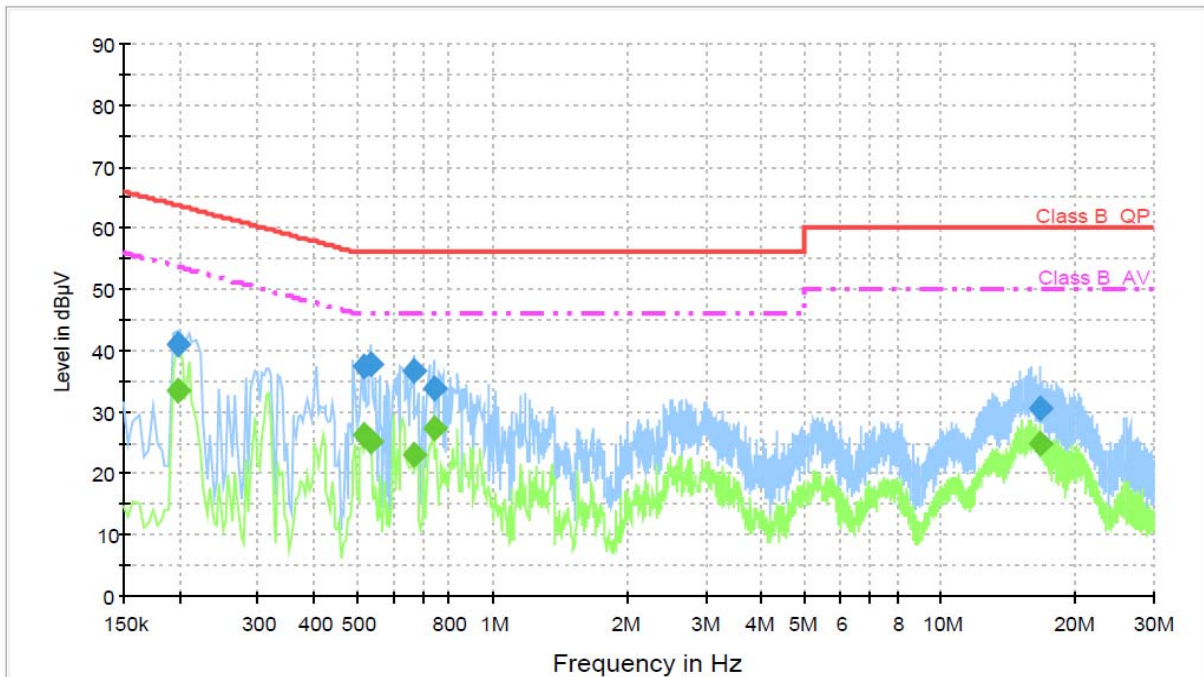
Line Conducted Emissions Tabulated Data

Notes:

1. Measurements using CISPR quasi-peak mode & average mode.
2. All modes of operation were investigated and the worst -case emission are reported. See attached Plots.
3. *) Factor = LISN + Cable Loss
4. **) LINE : L = Line , N = Neutral
5. The limit is on FCC §15.207(a) and IC RSS-Gen Issue 4 8.8

PLOTS OF EMISSIONS

Conducted Emission at the Mains port (Line + Neutral)_ac(80) mode 5690MHz



TEST DATA

8.2 Radiated Emissions

FCC §15.209, IC RSS-Gen Issue 4 8.9

Frequency (MHz)	Reading (dBμV/m)	Pol* (H/V)	Antenna Heights (cm)	Turntable Angles (°)	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
30.92	53.87	V	126	288	-24.8	29.1	40.0	10.9
66.11	62.22	H	295	207	-25.9	36.3	40.0	3.7
74.03	64.06	H	410	194	-27.7	36.4	40.0	3.6
81.90	63.56	H	398	18	-28.0	35.6	40.0	4.4
134.98	59.52	H	170	327	-27.5	32.0	43.5	11.5
422.53	49.92	H	100	283	-18.0	31.9	46.0	14.1

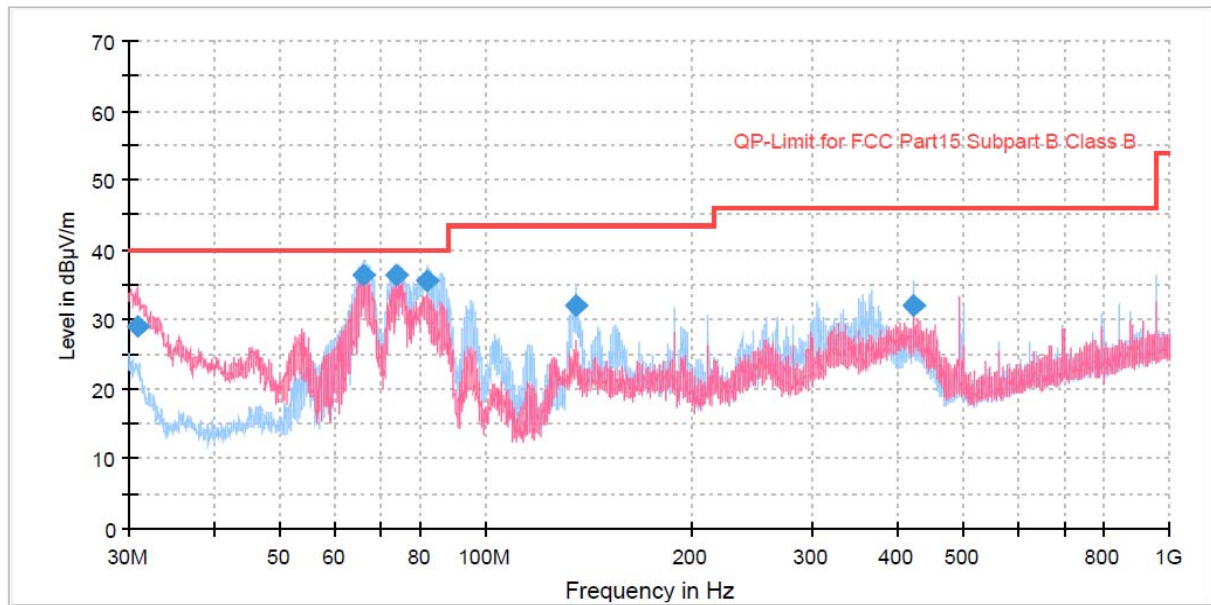
Radiated Measurements at 3meters

Notes:

1. All modes were measured and the worst-case emission was reported.
2. The radiated limits are shown on Figure 3. Above 1 GHz the limit is 500 μV/m.
3. *Pol. H = Horizontal, V = Vertical
4. **AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.
5. Measurements using CISPR quasi-peak mode below 1 GHz.
6. The radiated emissions testing were made by rotating EUT through three orthogonal axes and rotating the receive antenna with horizontal, Vertical polarization. The worst data was recorded.
7. Lowest channel (5510MHz) in n (40MHz) mode is the worst case.
8. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).
9. The limit is on the FCC §15.209 and RSS-Gen Issue4 8.9.

PLOTS OF EMISSIONS

Radiated emission below 1GHz_ n (40MHz) mode_ 5510 MHz



TEST DATA

8.3 26 dB Bandwidth and 99 % Occupied bandwidth

8.3.1 26 dB Bandwidth and 99 % Occupied bandwidth – U-NII-1 band

FCC §15.407(a), RSS-247 Issue 2 6.2

Test Mode : Set to Lowest channel, Middle channel and Highest channel

802.11a mode

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Lowest	5180	20.58	20.49	16.27	16.32
Middle	5220	20.41	20.29	16.30	16.33
Highest	5240	20.52	20.08	16.28	16.32

802.11n (20 MHz) mode

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Lowest	5180	20.58	20.39	17.41	17.41
Middle	5220	20.49	20.60	17.39	17.40
Highest	5240	20.21	20.31	17.40	17.41

802.11n (40 MHz) mode

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Lowest	5190	42.00	41.50	35.83	35.79
Highest	5230	41.84	41.92	35.82	35.80

TEST DATA

802.11ac (80 MHz) mode

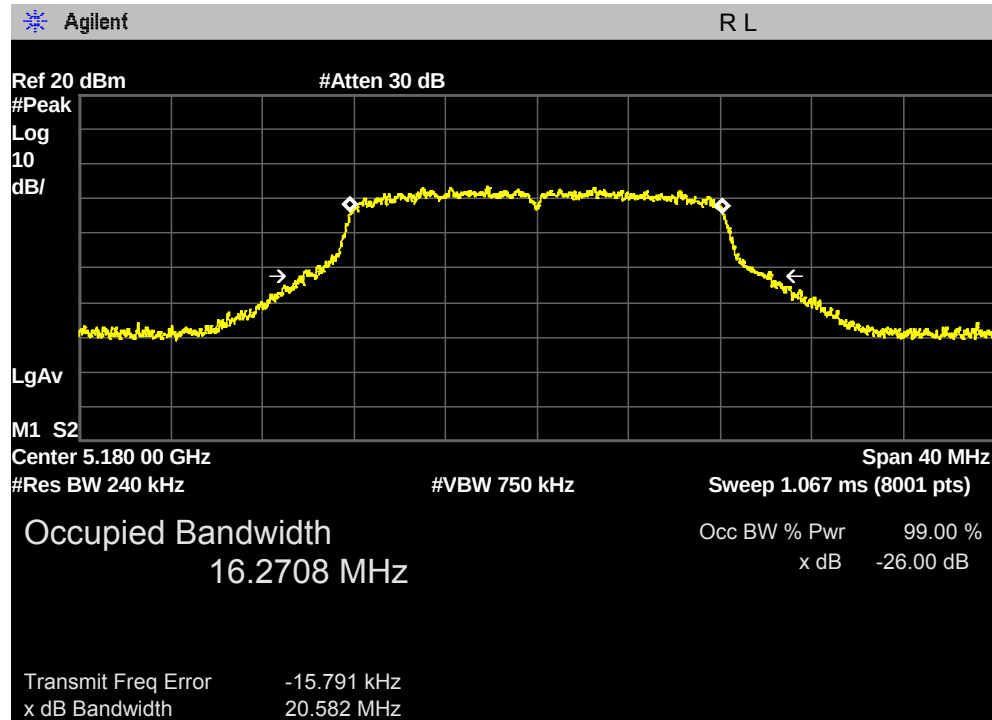
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Middle	5210	82.77	84.25	75.08	74.95

PLOTS OF EMISSIONS

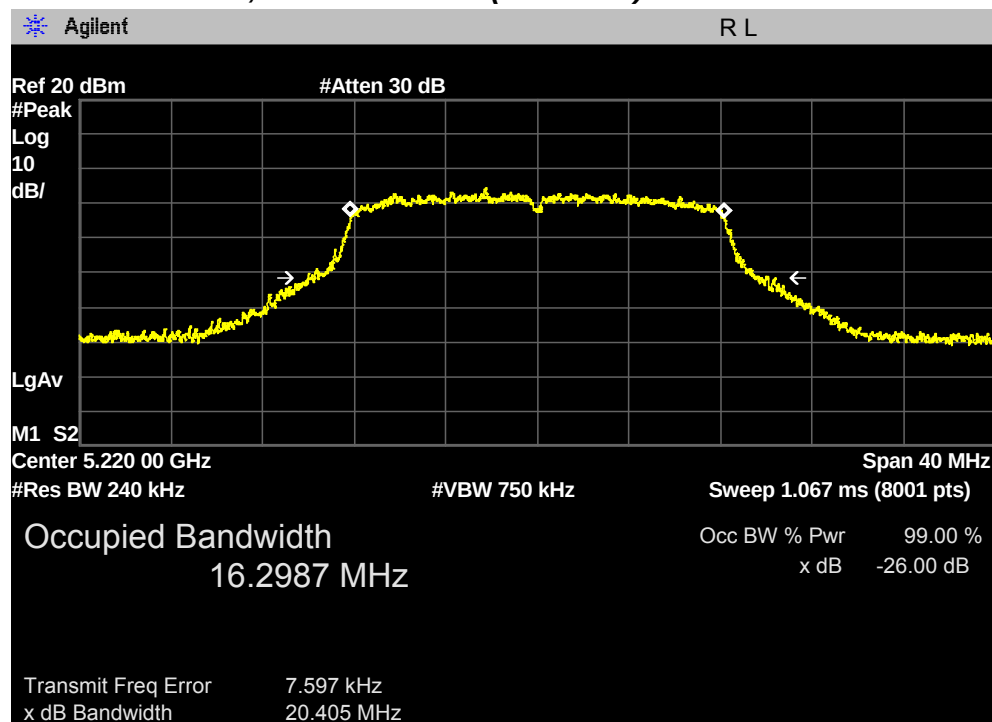
802.11a mode

Chain 0

26 dB Bandwidth, Lowest Channel (5180 MHz)

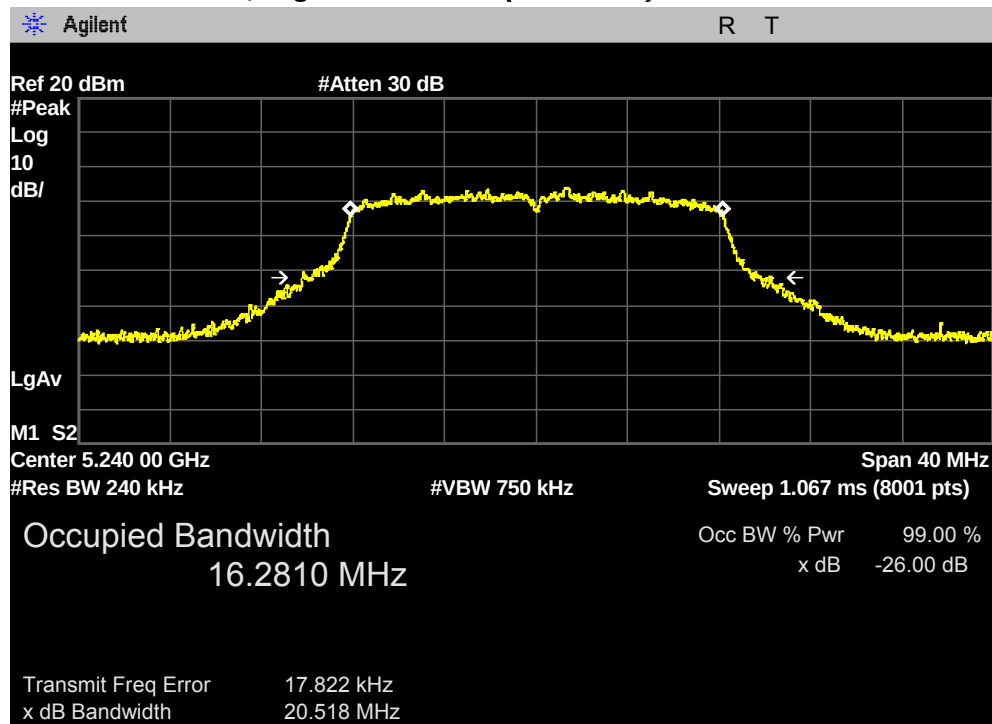


26 dB Bandwidth, Middle Channel (5220 MHz)



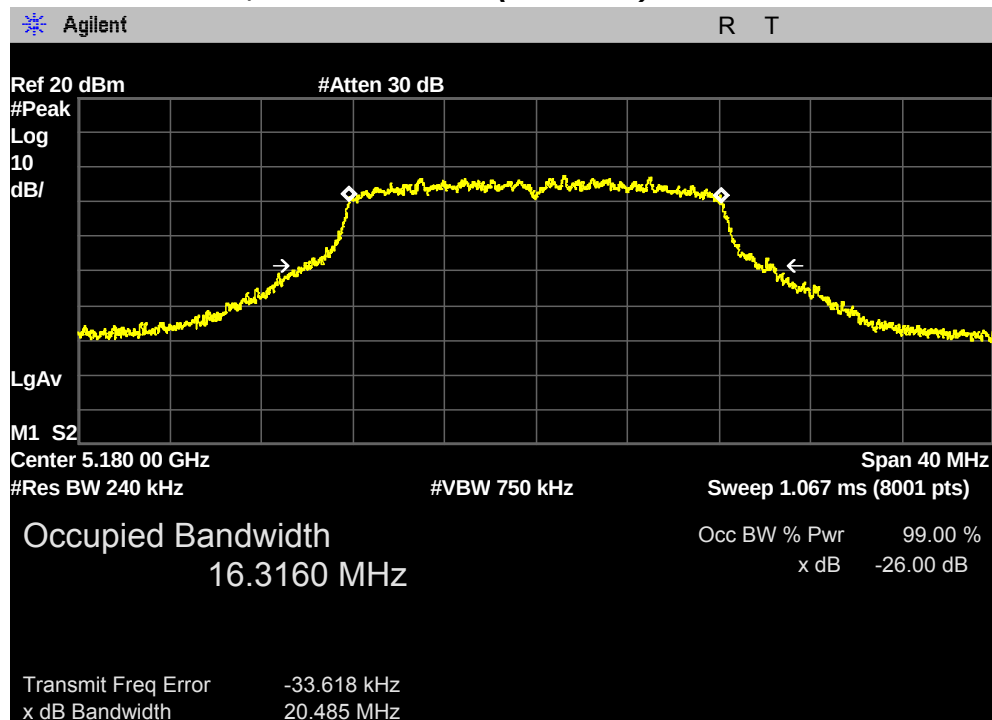
PLOTS OF EMISSIONS

26 dB Bandwidth, Highest Channel (5240 MHz)



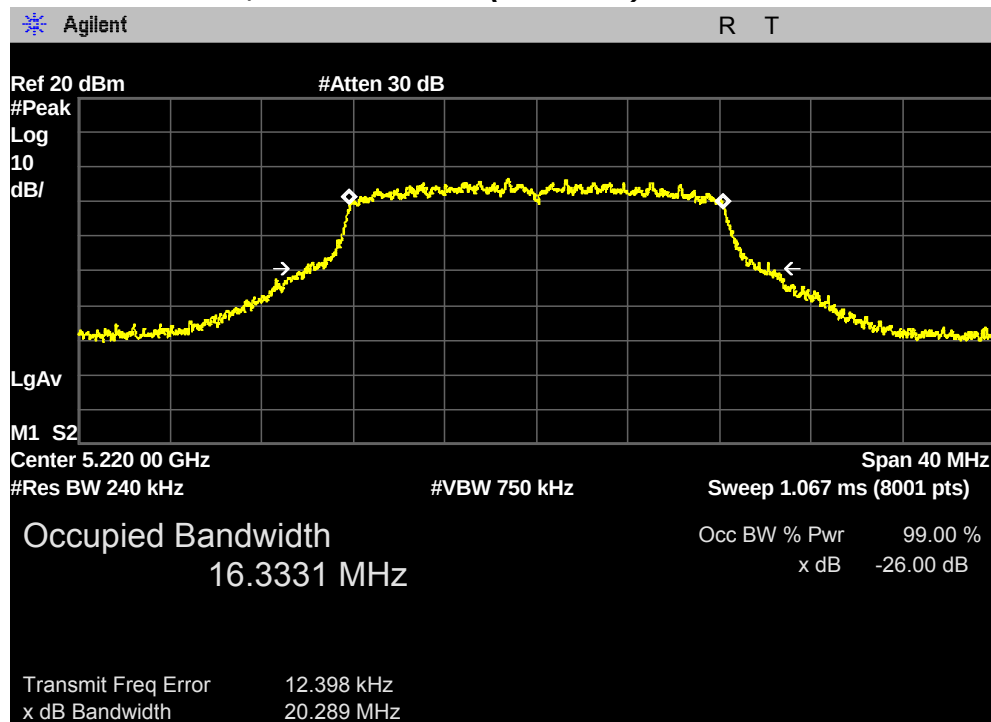
Chain 1

26 dB Bandwidth, Lowest Channel (5180 MHz)

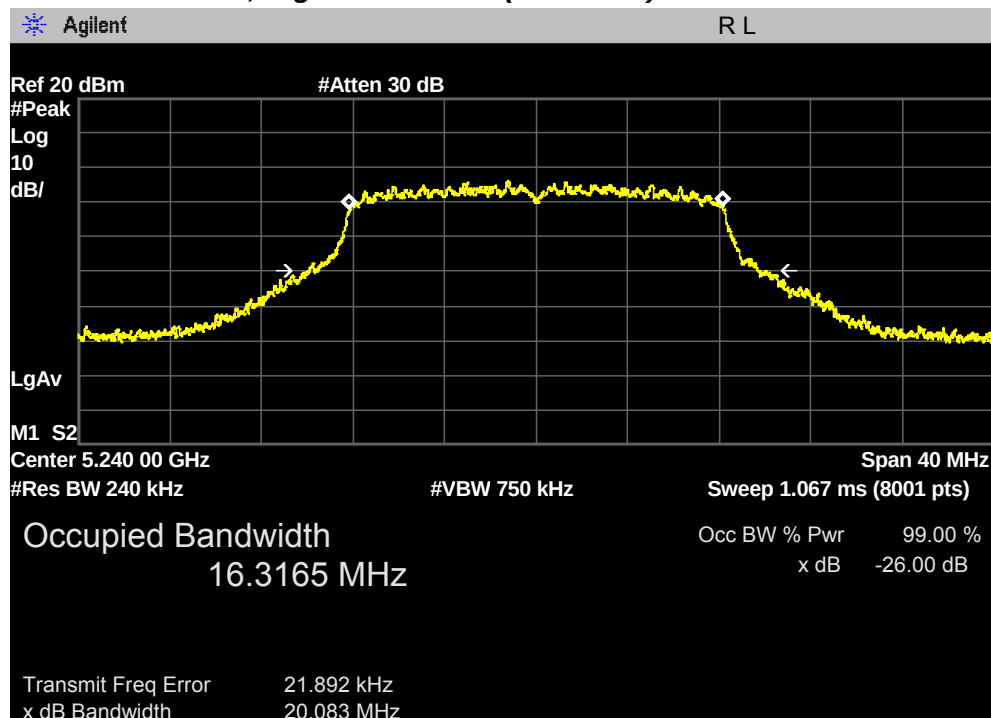


PLOTS OF EMISSIONS

26 dB Bandwidth, Middle Channel (5220 MHz)



26 dB Bandwidth, Highest Channel (5240 MHz)

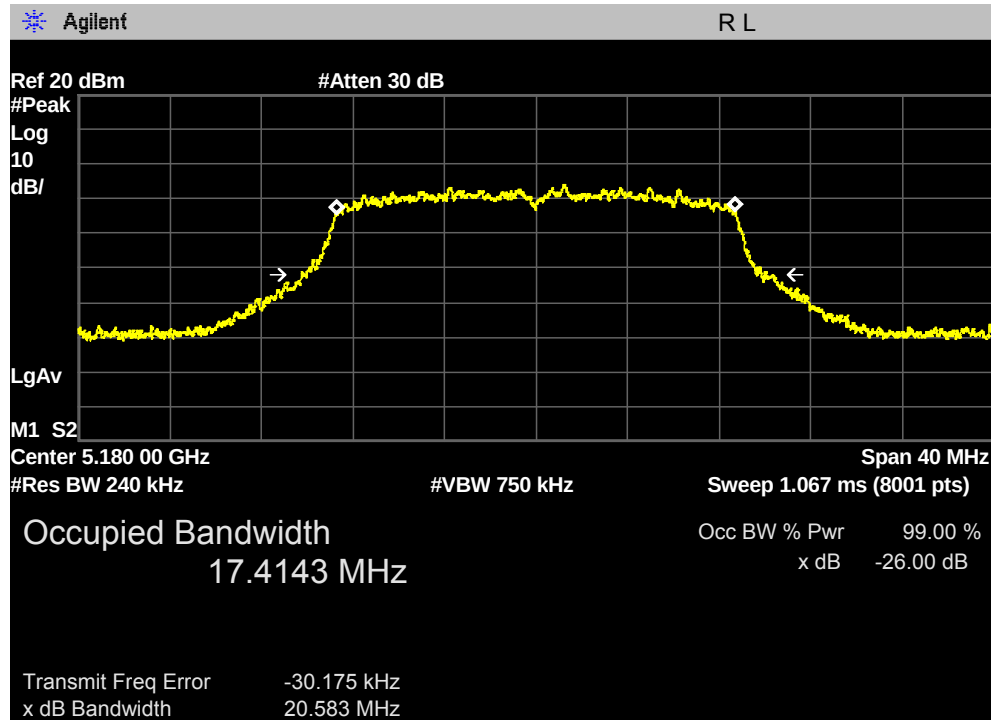


PLOTS OF EMISSIONS

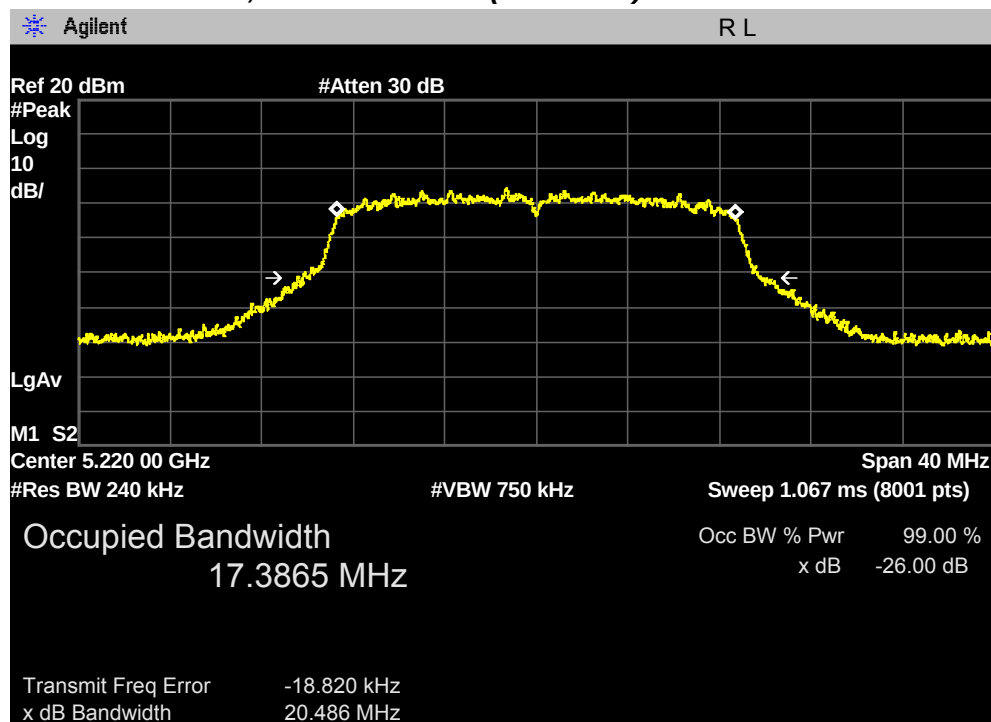
802.11n (20 MHz) mode

Chain 0

26 dB Bandwidth, Lowest Channel (5180 MHz)

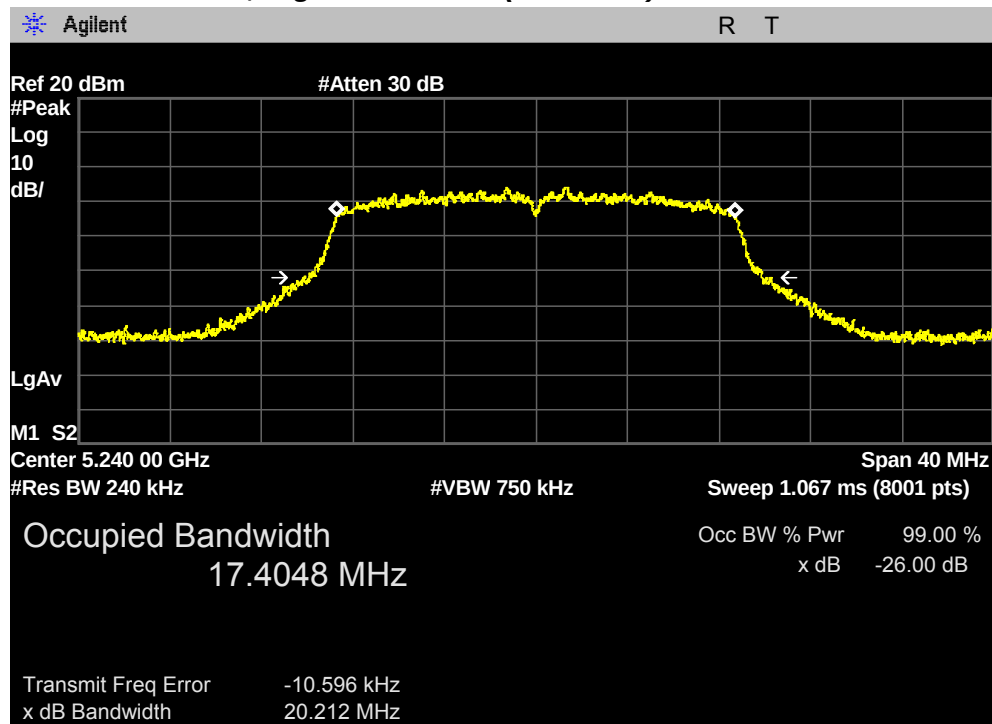


26 dB Bandwidth, Middle Channel (5220 MHz)



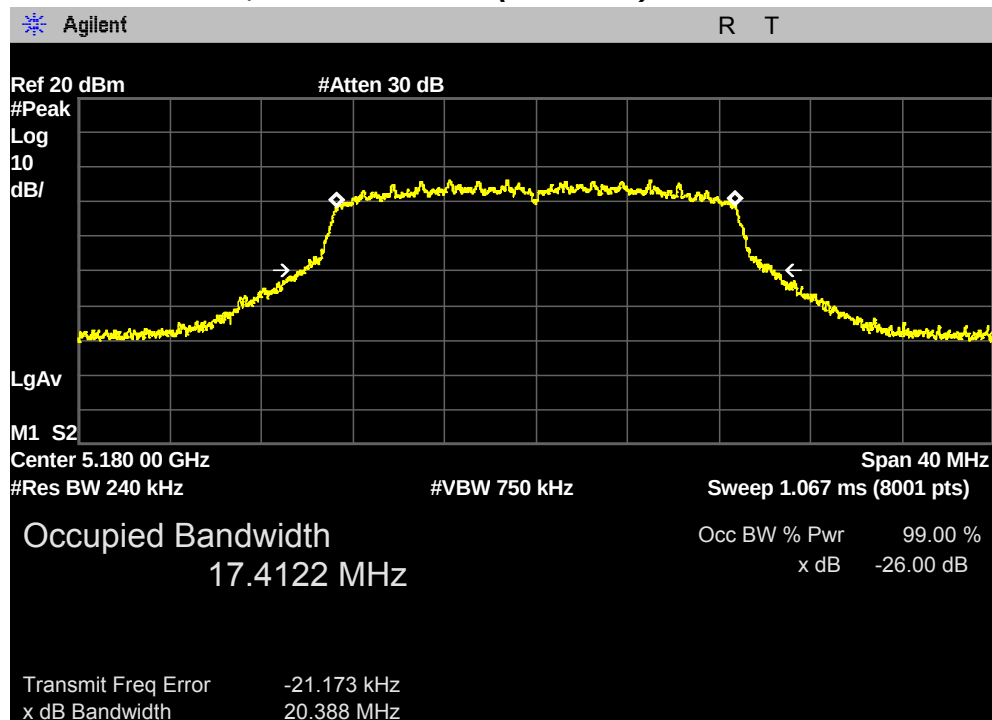
PLOTS OF EMISSIONS

26 dB Bandwidth, Highest Channel (5240 MHz)



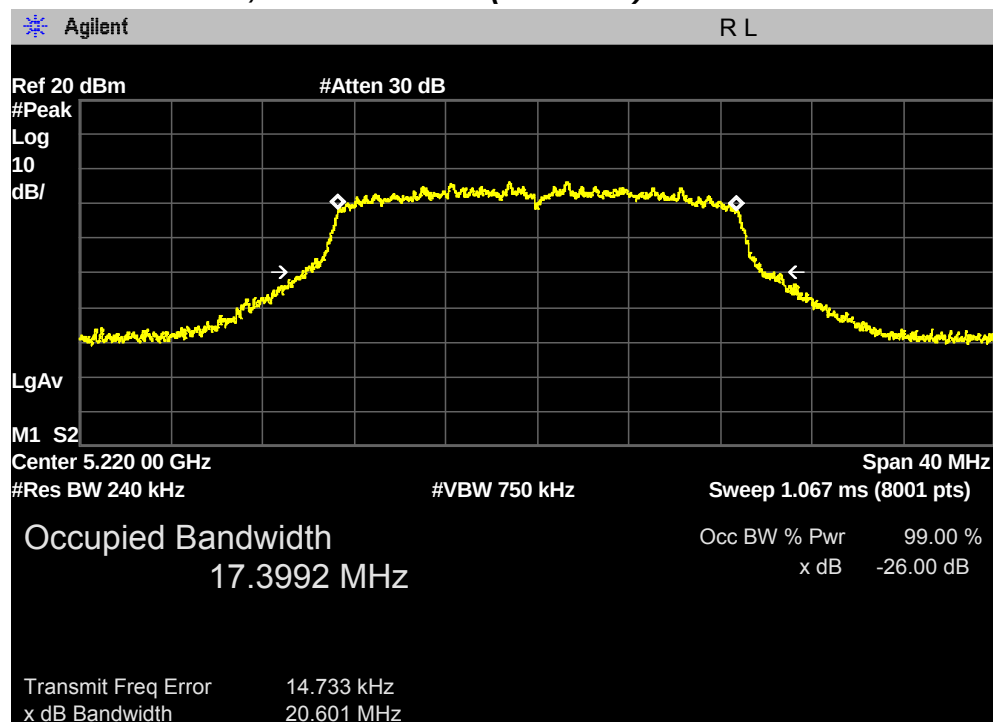
Chain 1

26 dB Bandwidth, Lowest Channel (5180 MHz)

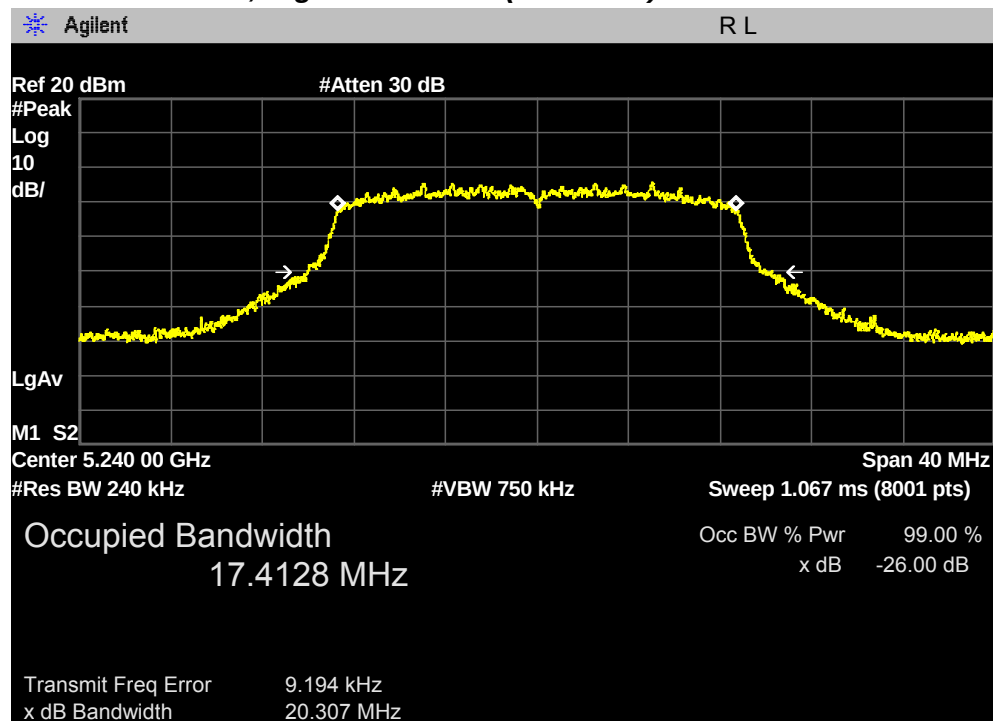


PLOTS OF EMISSIONS

26 dB Bandwidth, Middle Channel (5220 MHz)



26 dB Bandwidth, Highest Channel (5240 MHz)

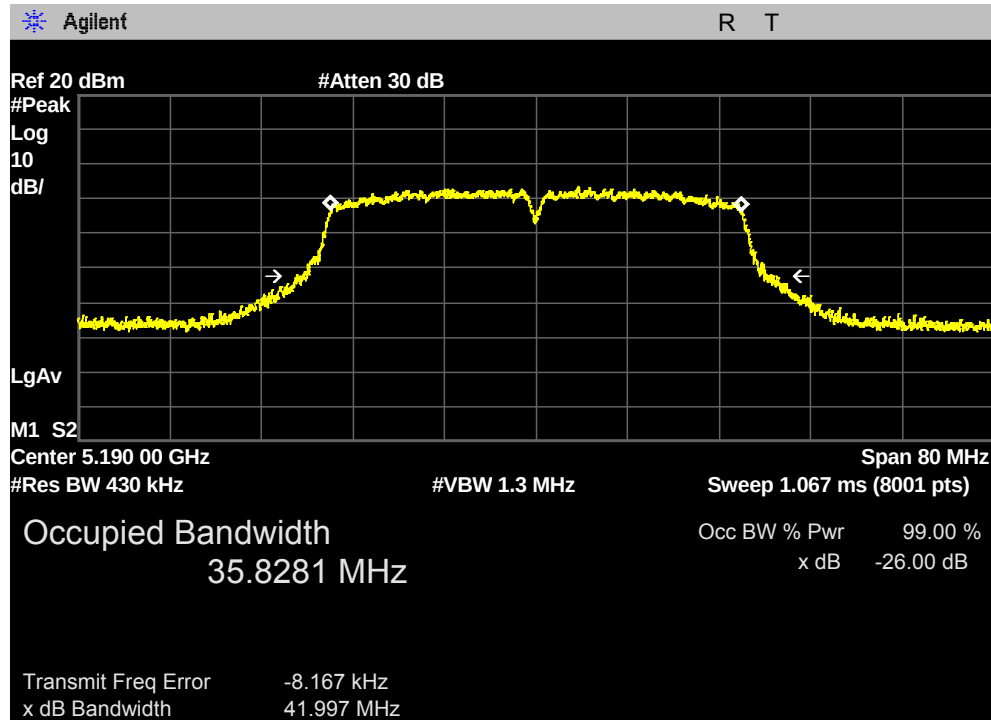


PLOTS OF EMISSIONS

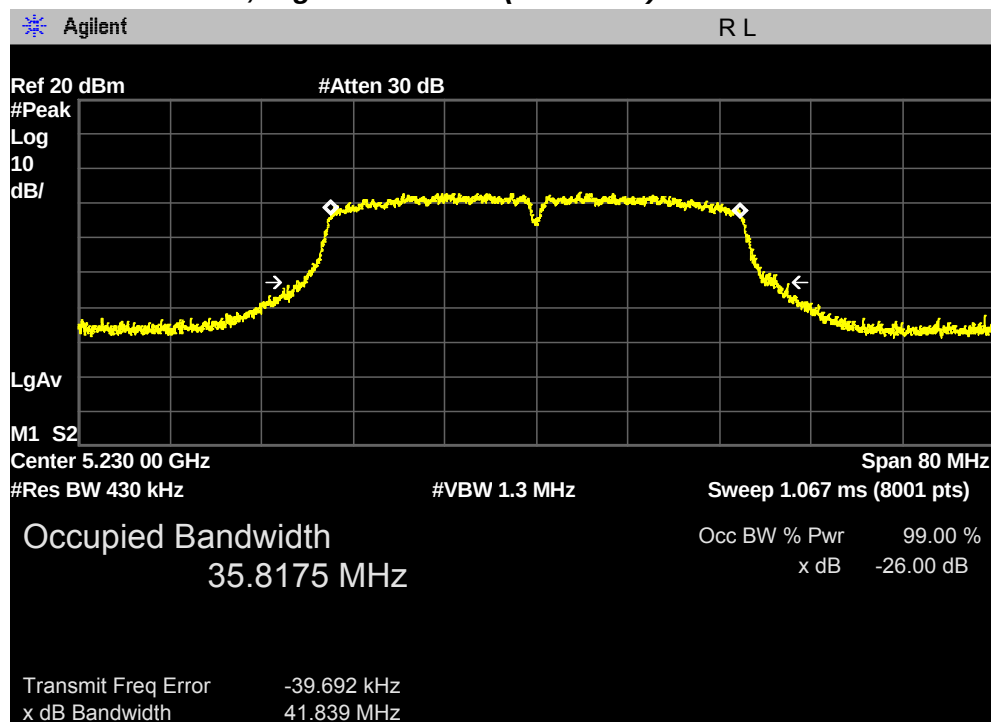
802.11n (40 MHz) mode

Chain 0

26 dB Bandwidth, Lowest Channel (5190 MHz)



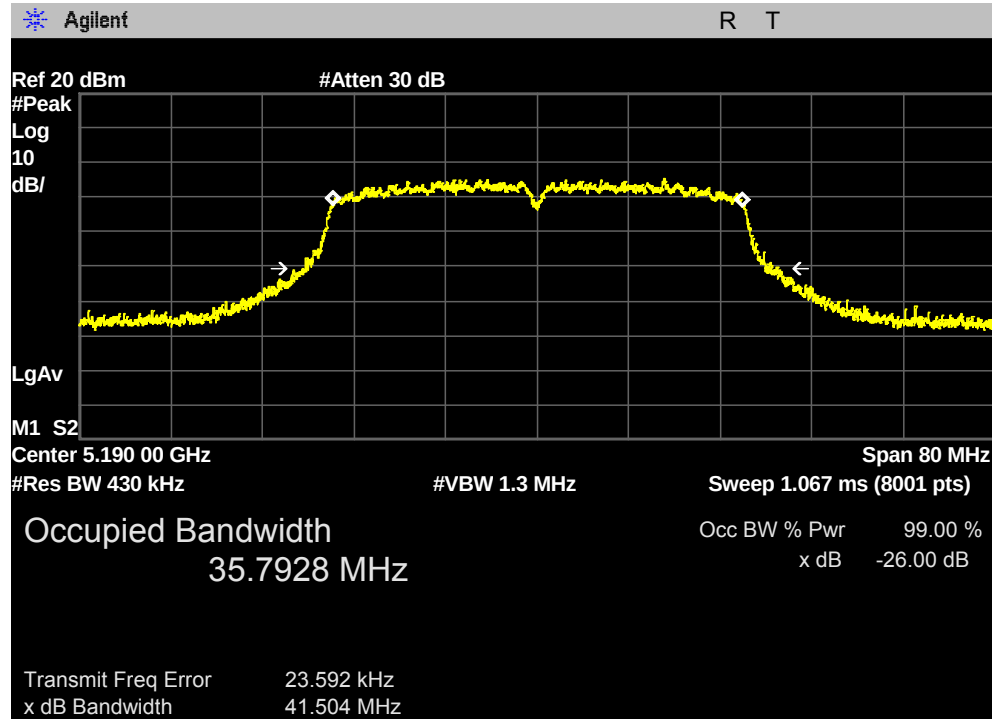
26 dB Bandwidth, Highest Channel (5230 MHz)



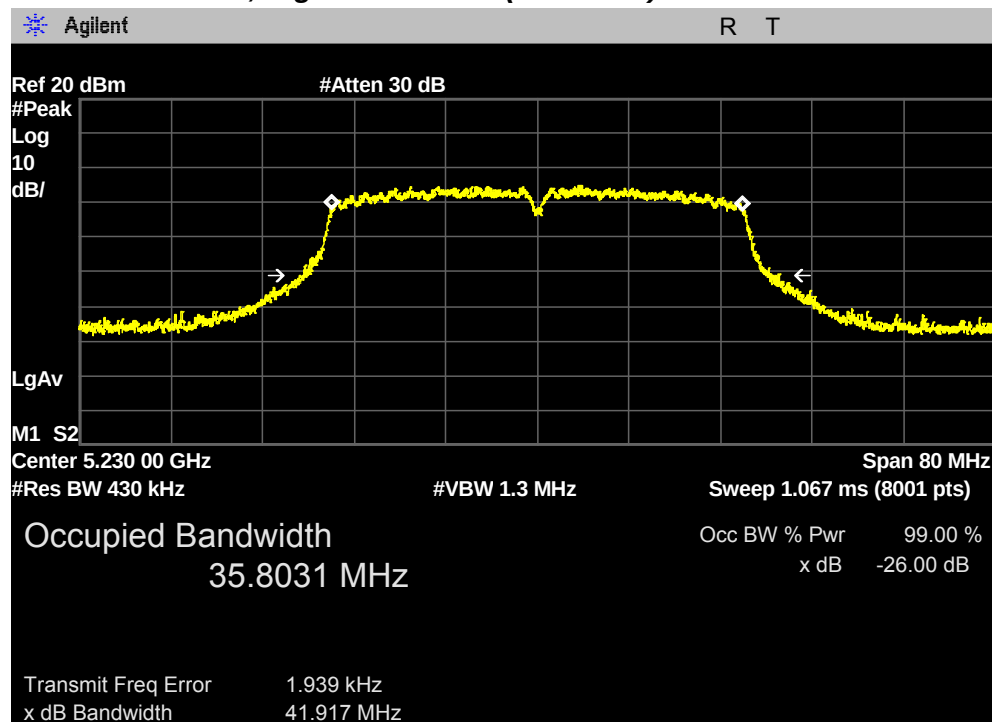
PLOTS OF EMISSIONS

Chain 1

26 dB Bandwidth, Lowest Channel (5190 MHz)



26 dB Bandwidth, Highest Channel (5230 MHz)

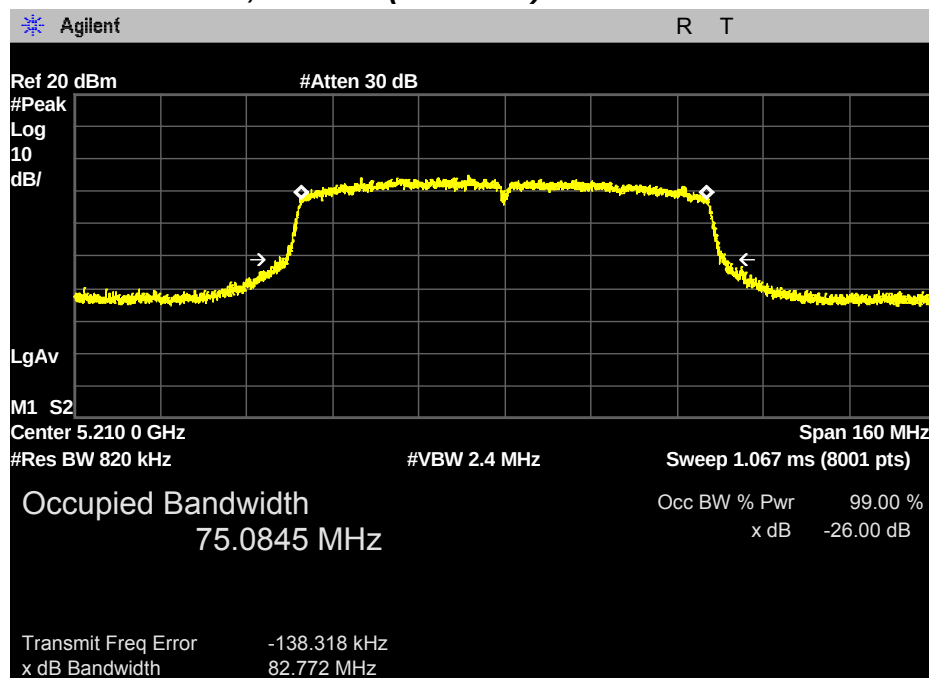


PLOTS OF EMISSIONS

802.11ac (80 MHz) mode

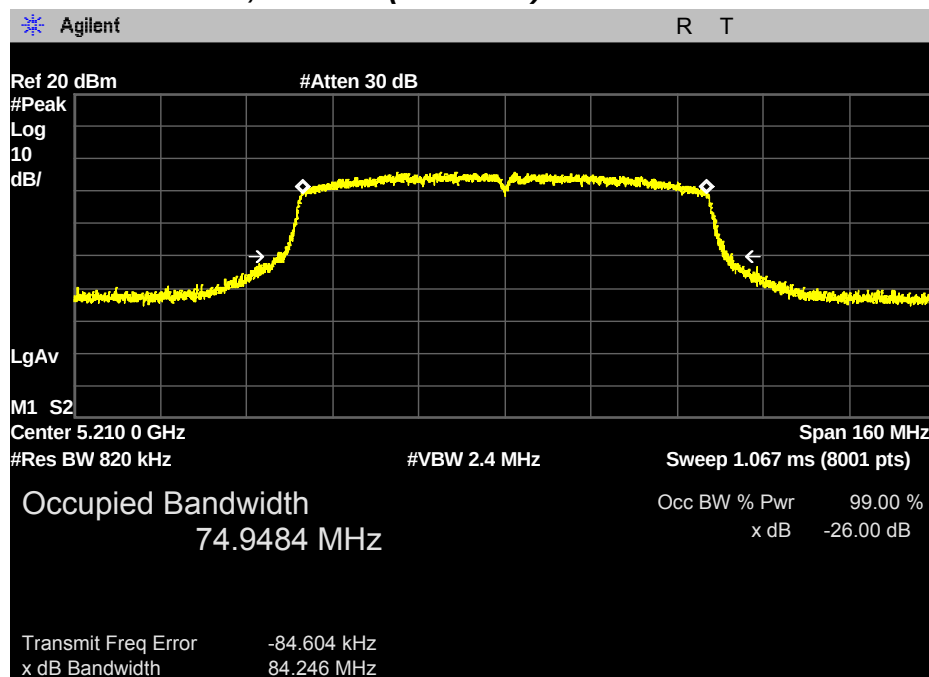
Chain 0

26 dB Bandwidth, Channel (5210 MHz)



Chain 1

26 dB Bandwidth, Channel (5210 MHz)



TEST DATA

8.3.2 26 dB Bandwidth and 99 % Occupied bandwidth – U-NII-2A band

FCC §15.407(a) , RSS-247 Issue 2 6.2

Test Mode : Set to Lowest channel, Middle channel and Highest channel

802.11a mode

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Lowest	5260	20.30	20.63	16.28	16.31
Middle	5300	20.29	20.40	16.28	16.33
Highest	5320	20.34	20.58	16.29	16.30

802.11n (20 MHz) mode

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Lowest	5260	20.51	20.07	17.42	17.41
Middle	5300	20.57	20.51	17.42	17.41
Highest	5320	20.44	20.66	17.43	17.40

802.11n (40 MHz) mode

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Lowest	5270	42.16	41.40	35.85	35.81
Highest	5310	40.87	41.48	35.83	35.81

TEST DATA

802.11ac (80 MHz) mode

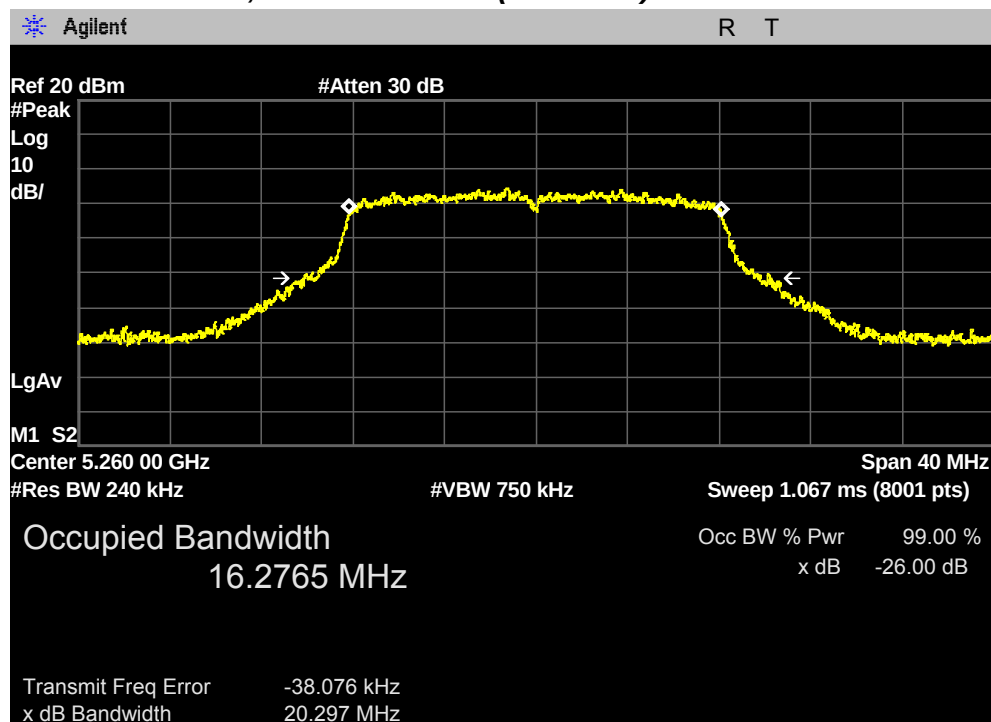
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Middle	5290	84.07	84.18	75.01	74.99

PLOTS OF EMISSIONS

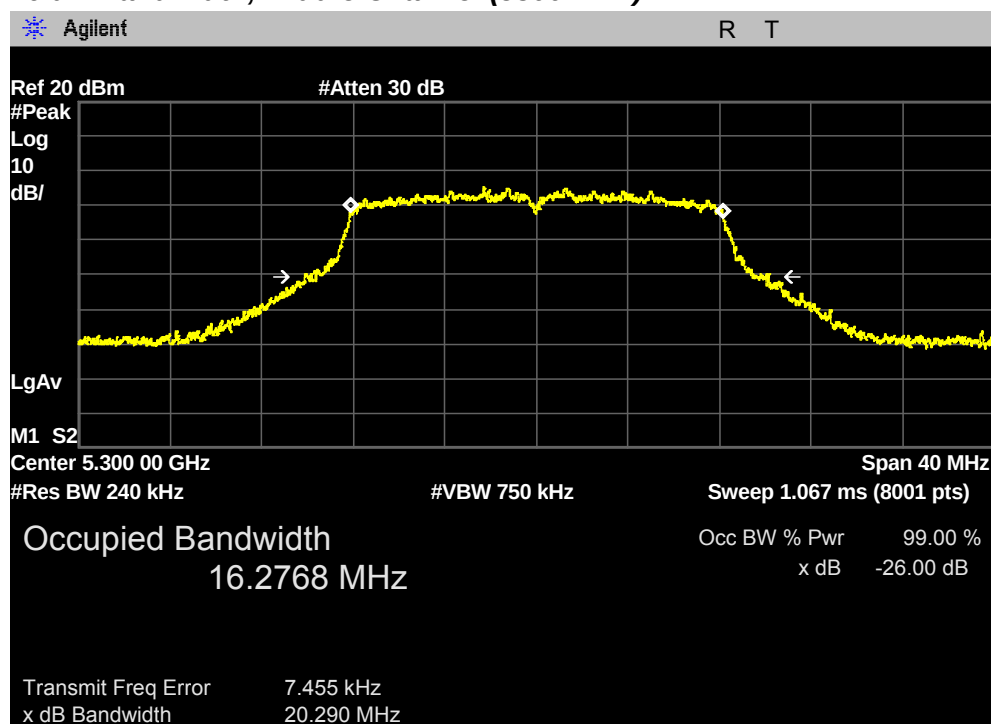
802.11a mode

Chain 0

26 dB Bandwidth, Lowest Channel (5260 MHz)

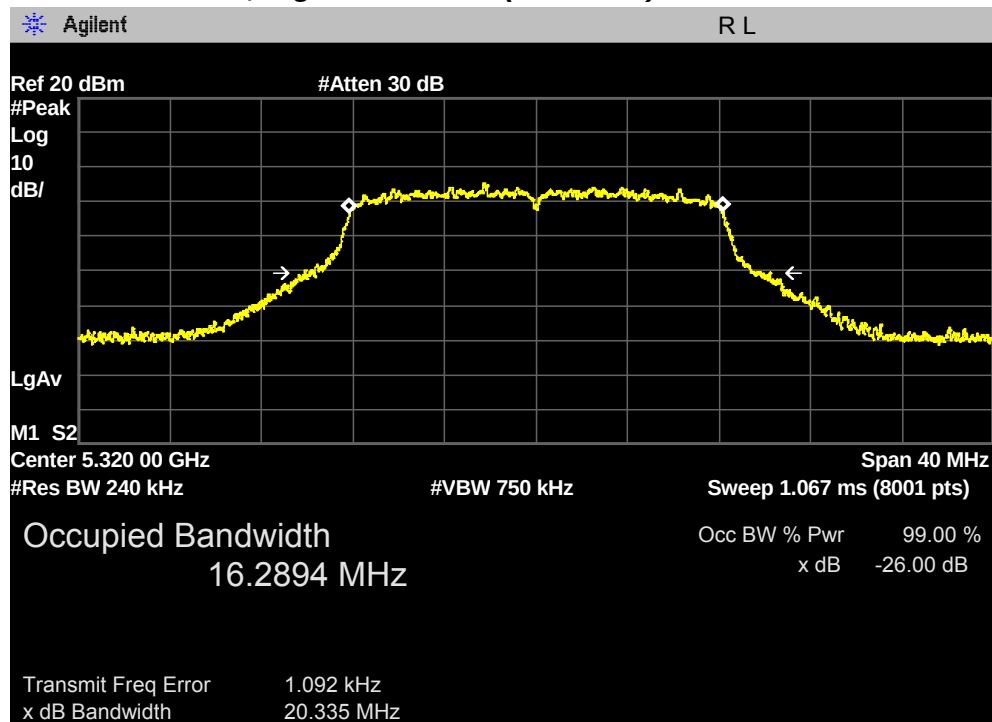


26 dB Bandwidth, Middle Channel (5300 MHz)



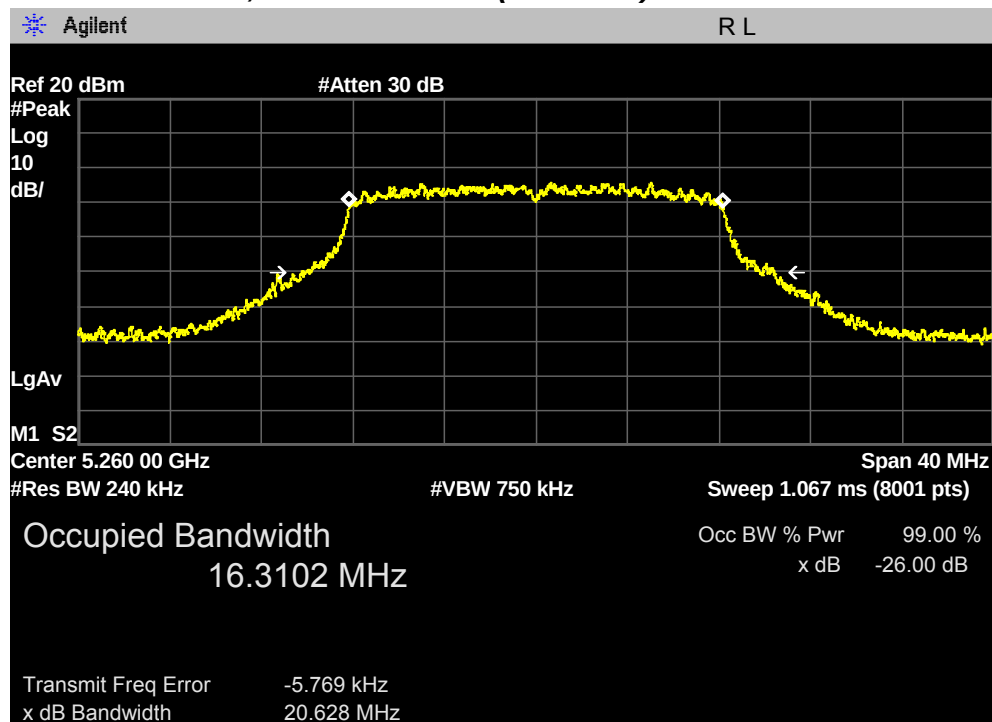
PLOTS OF EMISSIONS

26 dB Bandwidth, Highest Channel (5320 MHz)



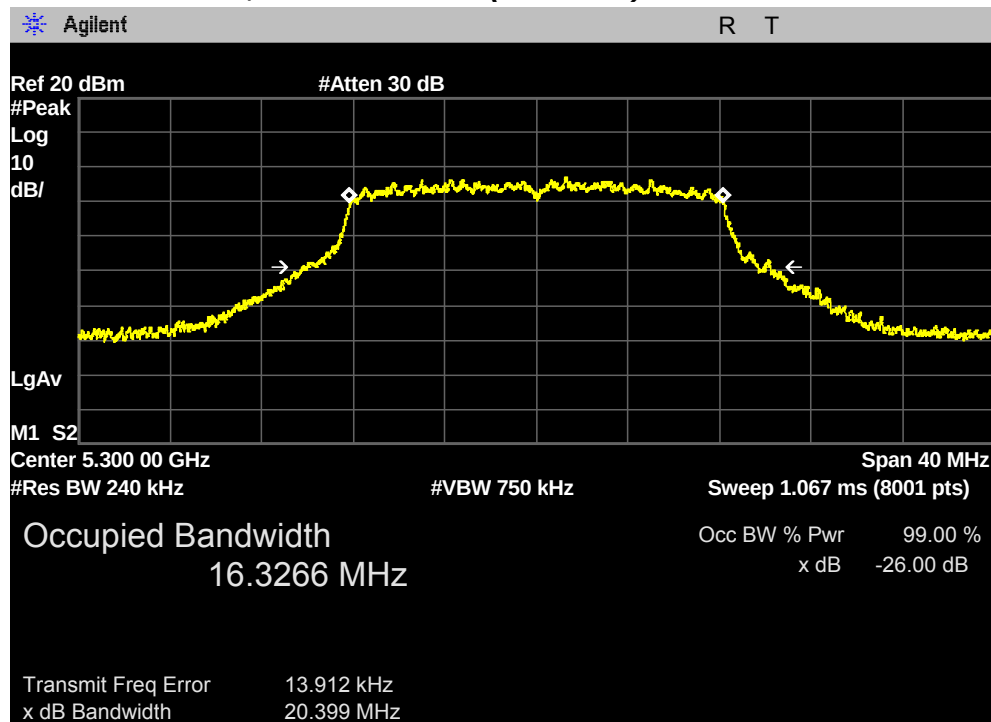
Chain 1

26 dB Bandwidth, Lowest Channel (5260 MHz)

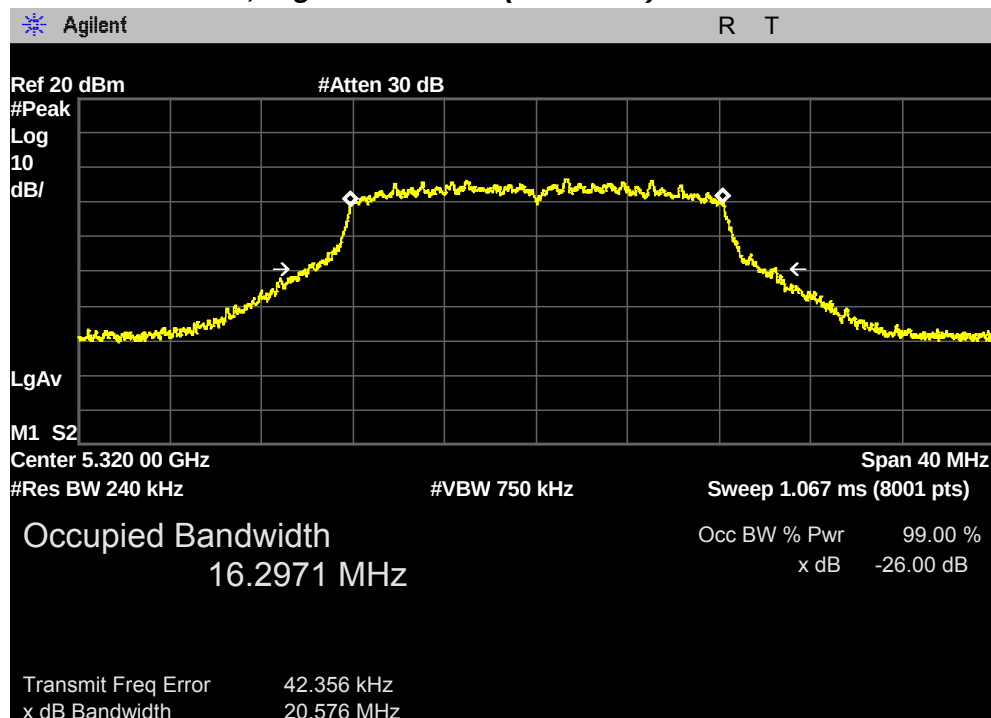


PLOTS OF EMISSIONS

26 dB Bandwidth, Middle Channel (5300 MHz)



26 dB Bandwidth, Highest Channel (5320 MHz)

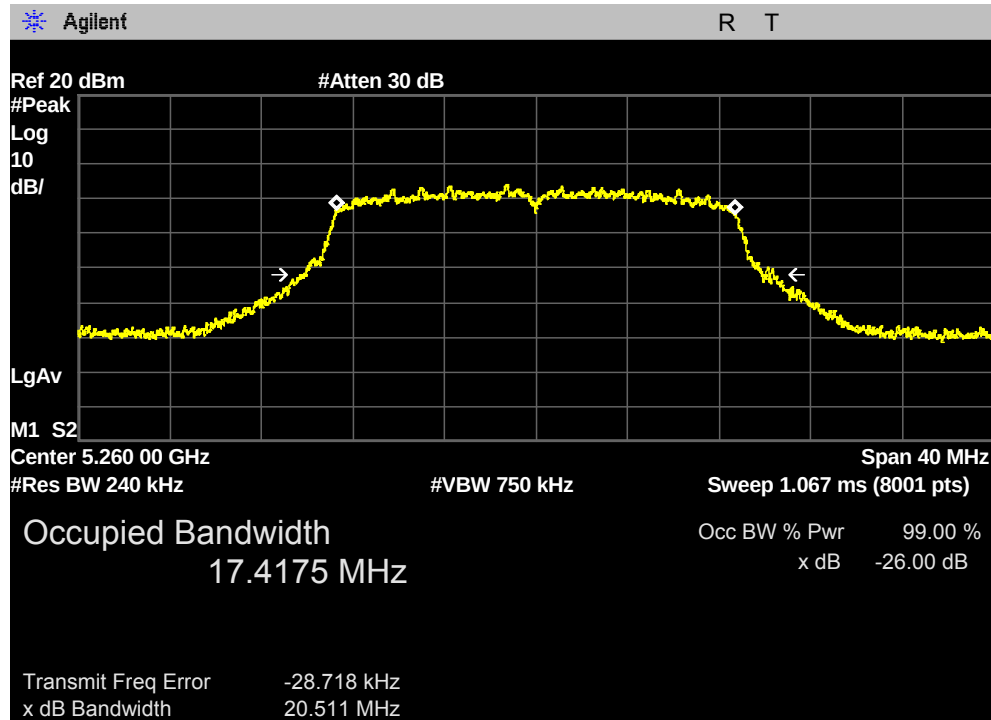


PLOTS OF EMISSIONS

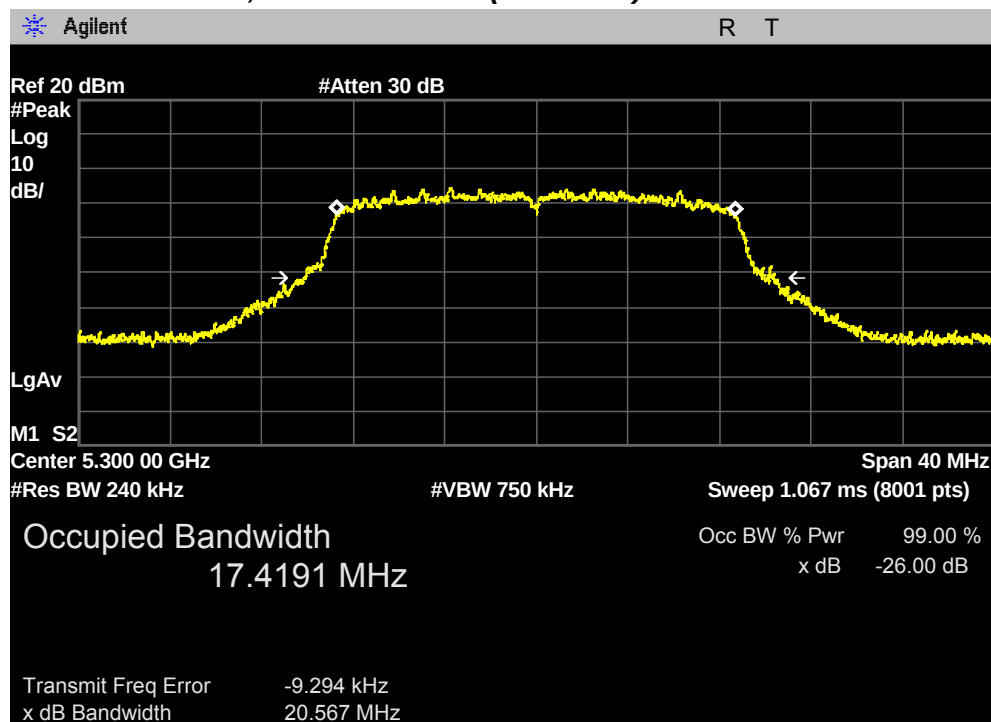
802.11n (20 MHz) mode

Chain 0

26 dB Bandwidth, Lowest Channel (5260 MHz)

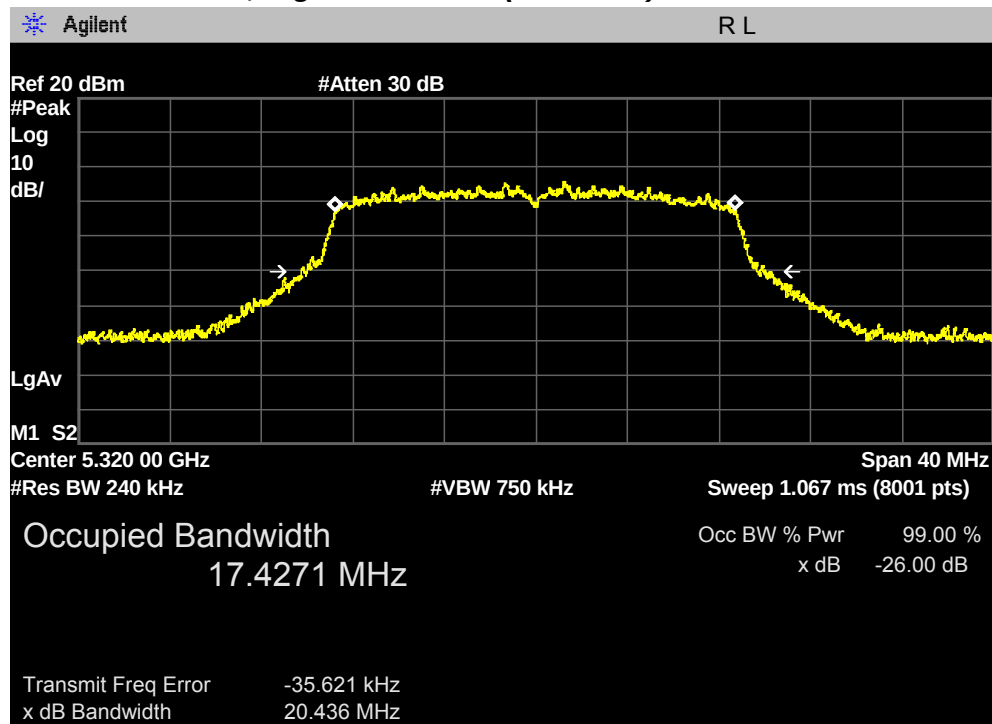


26 dB Bandwidth, Middle Channel (5300 MHz)



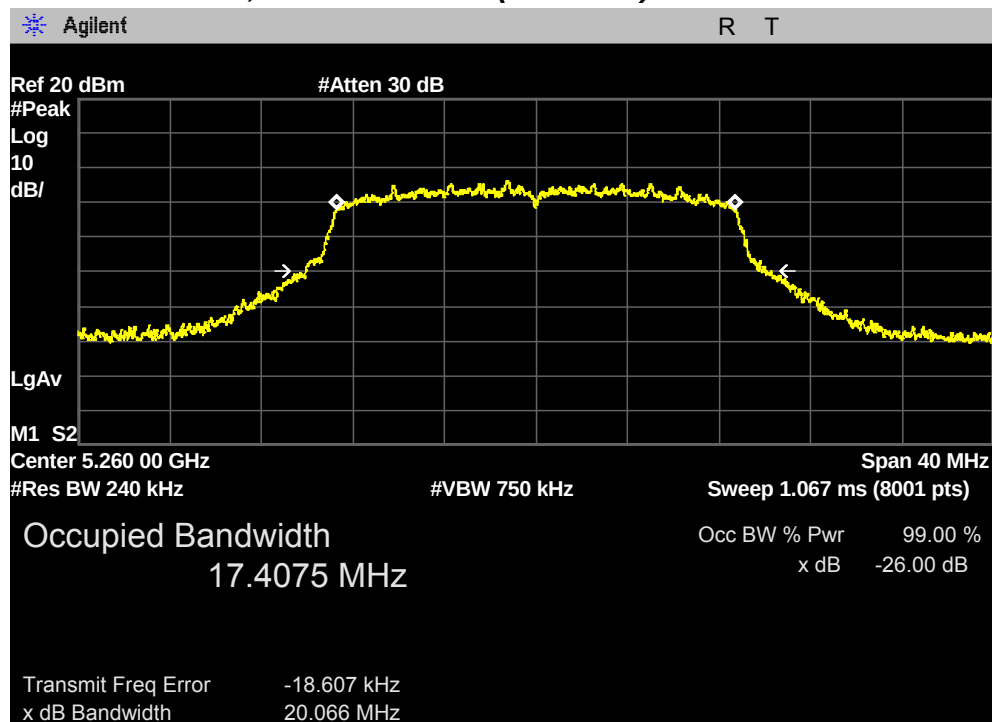
PLOTS OF EMISSIONS

26 dB Bandwidth, Highest Channel (5320 MHz)



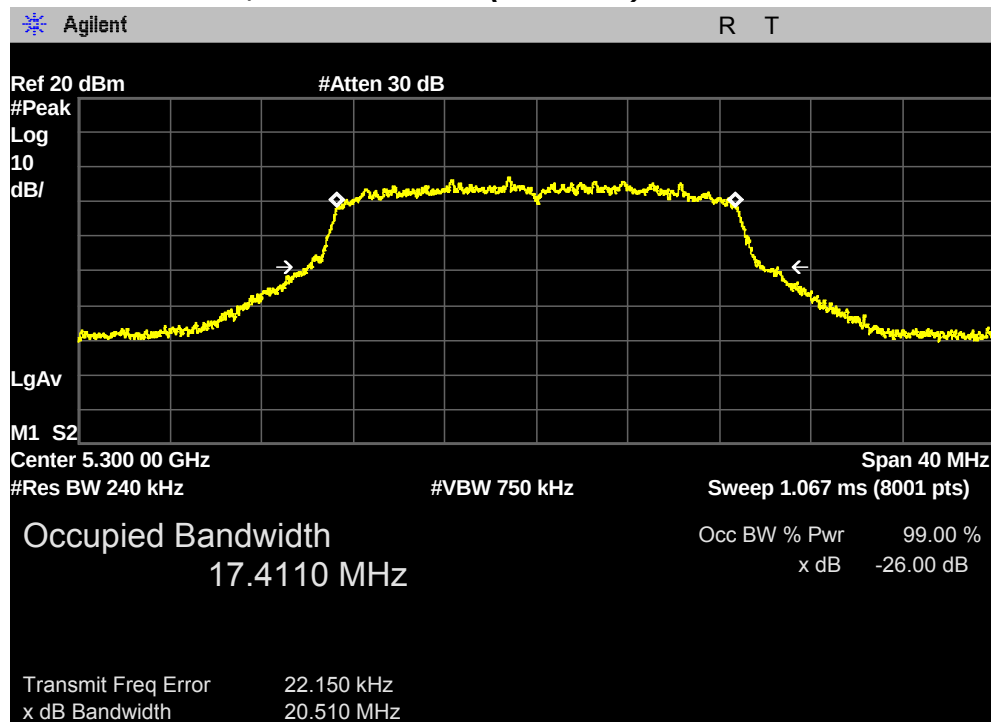
Chain 1

26 dB Bandwidth, Lowest Channel (5260 MHz)

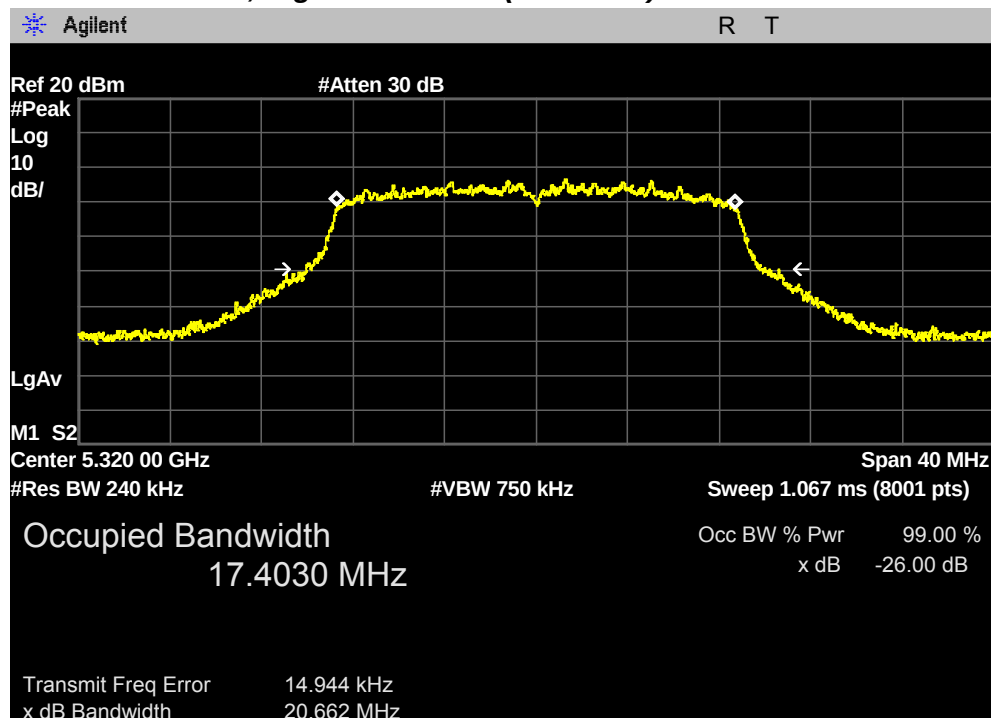


PLOTS OF EMISSIONS

26 dB Bandwidth, Middle Channel (5300 MHz)



26 dB Bandwidth, Highest Channel (5320 MHz)

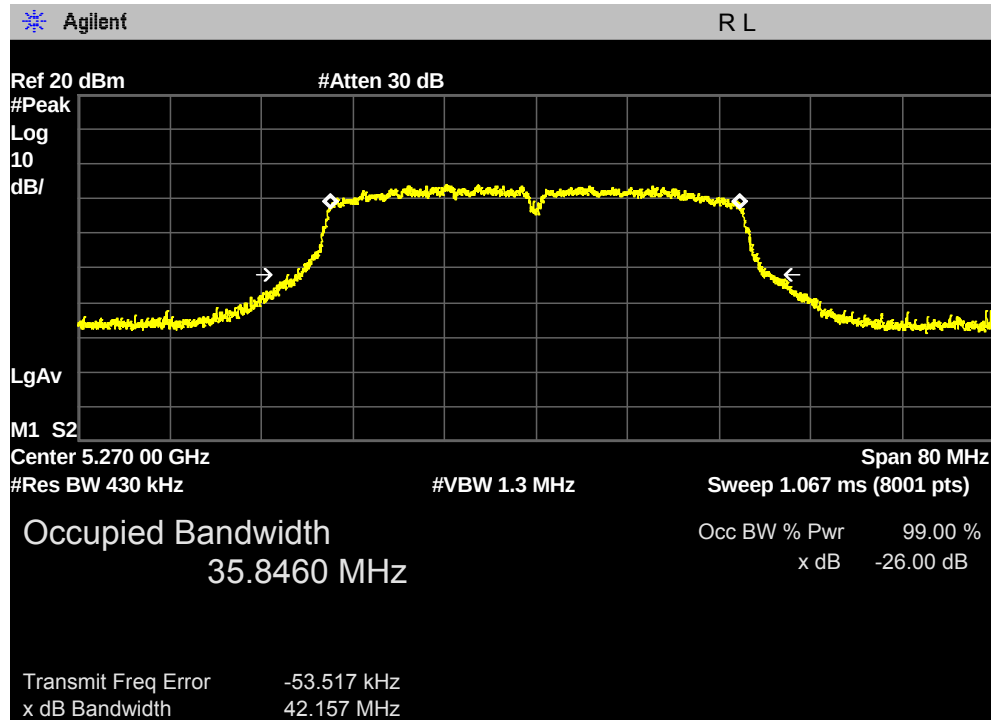


PLOTS OF EMISSIONS

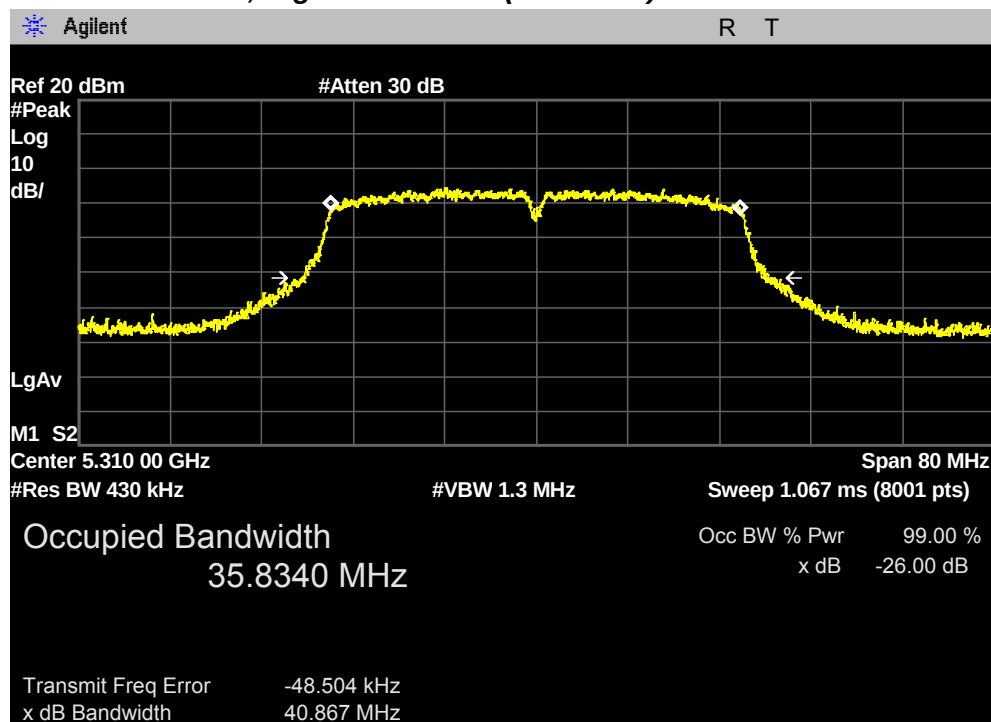
802.11n (40 MHz) mode

Chain 0

26 dB Bandwidth, Lowest Channel (5270 MHz)



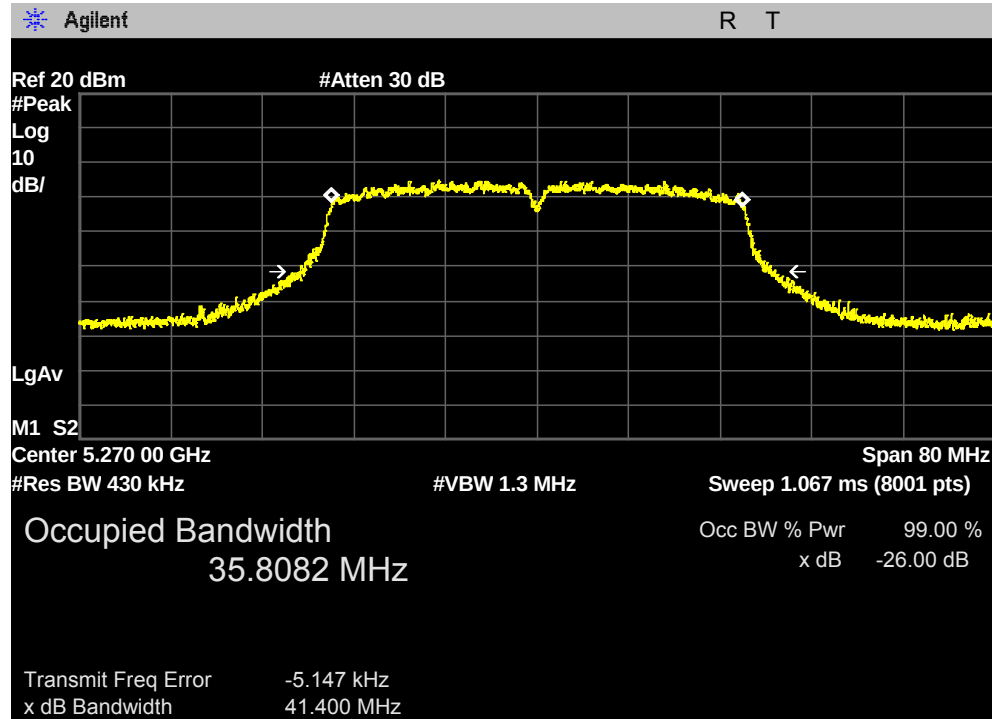
26 dB Bandwidth, Highest Channel (5310 MHz)



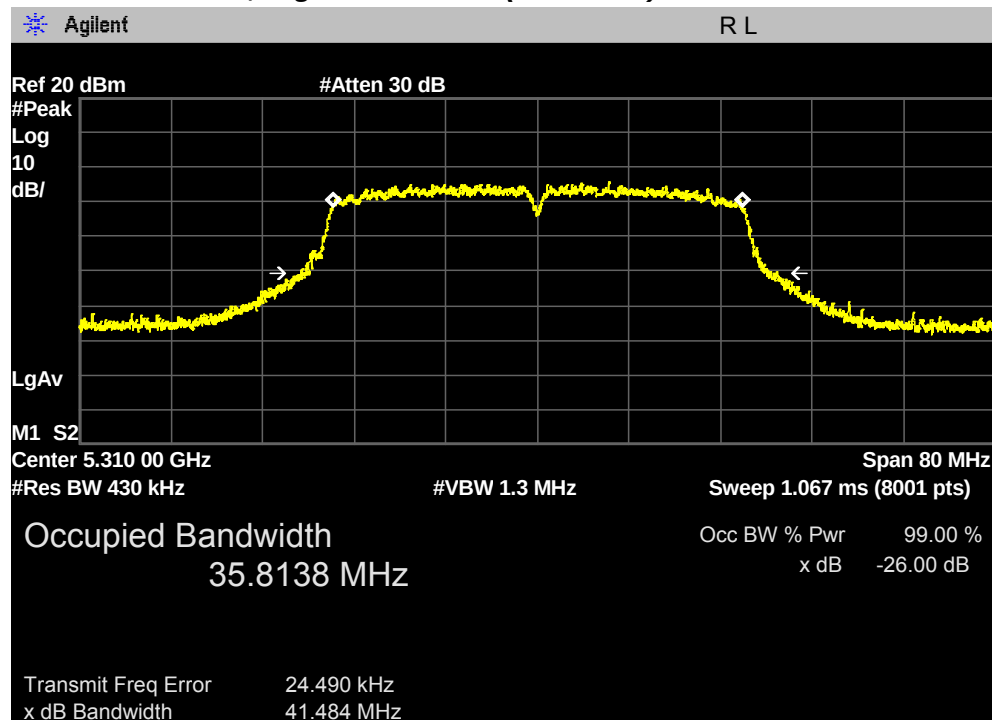
PLOTS OF EMISSIONS

Chain 1

26 dB Bandwidth, Lowest Channel (5270 MHz)



26 dB Bandwidth, Highest Channel (5310 MHz)

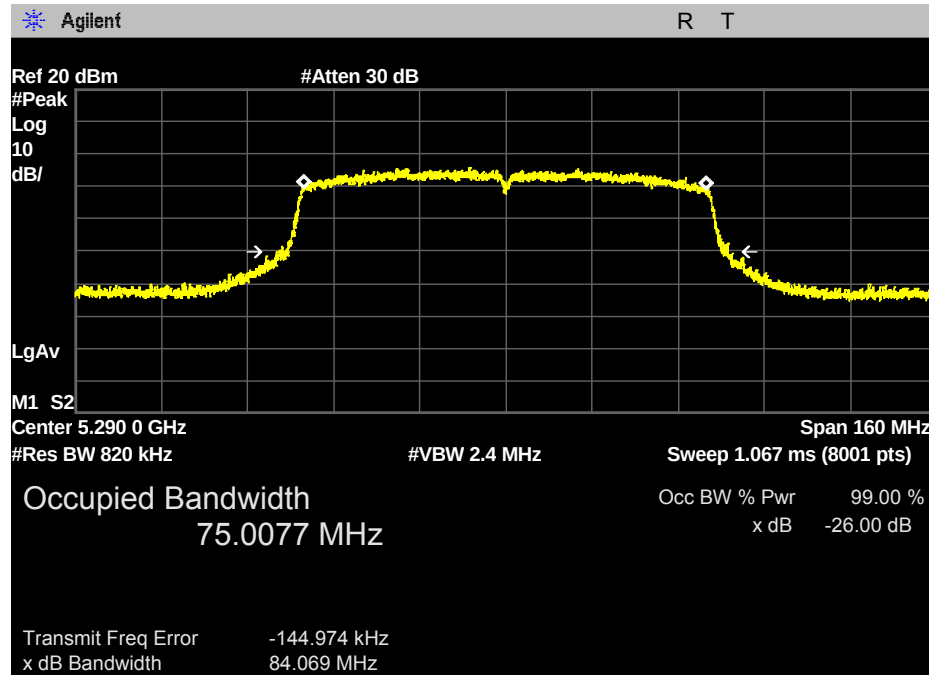


PLOTS OF EMISSIONS

802.11ac (80 MHz) mode

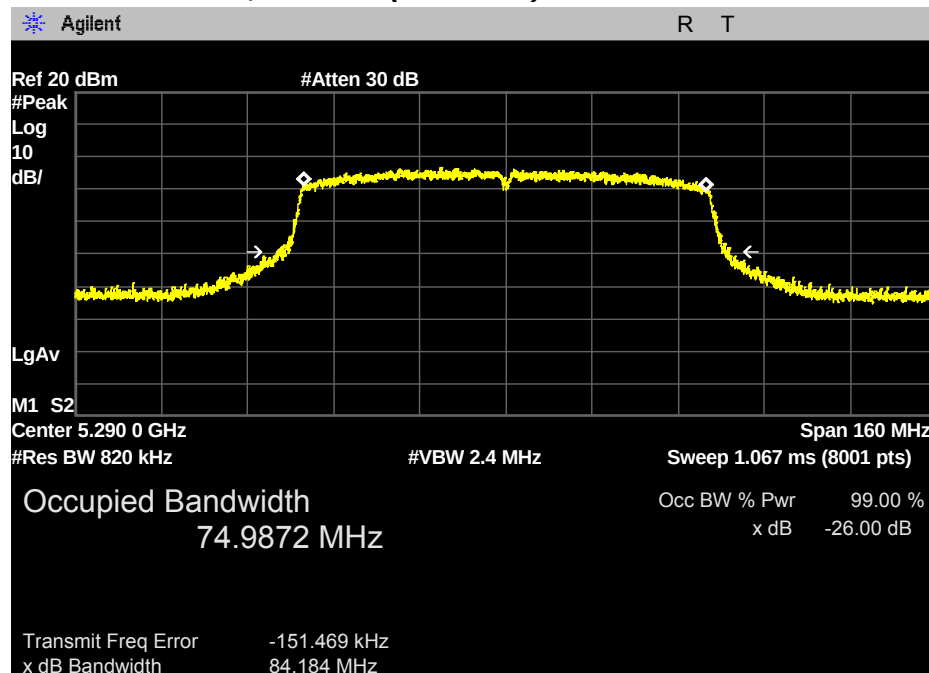
Chain 0

26 dB Bandwidth, Channel (5290 MHz)



Chain 1

26 dB Bandwidth, Channel (5290 MHz)



TEST DATA

8.3.3 26 dB Bandwidth and 99 % Occupied bandwidth – U-NII-2C band

FCC §15.407(a) , RSS-247 Issue 2 6.2

Test Mode : Set to Lowest channel, Middle channel and Highest channel, Straddle channel

802.11a mode

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Lowest	5500	20.37	20.37	16.26	16.30
Middle	5580	20.50	21.13	16.29	16.32
Highest	5700	20.31	20.48	16.28	16.31
Straddle	5720	15.06	15.23	12.88	13.18

802.11n (20 MHz) mode

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Lowest	5500	20.90	20.01	17.41	17.42
Middle	5580	20.66	20.49	17.43	17.42
Highest	5700	20.66	20.74	17.42	17.41
Straddle	5720	15.04	15.06	13.54	13.60

TEST DATA

802.11n (40 MHz) mode

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Lowest	5510	41.42	41.82	35.83	35.75
Middle	5590	41.30	41.50	35.86	35.77
Highest	5670	41.48	41.14	35.81	35.78
Straddle	5710	35.80	35.72	32.88	32.95

802.11ac (80 MHz) mode

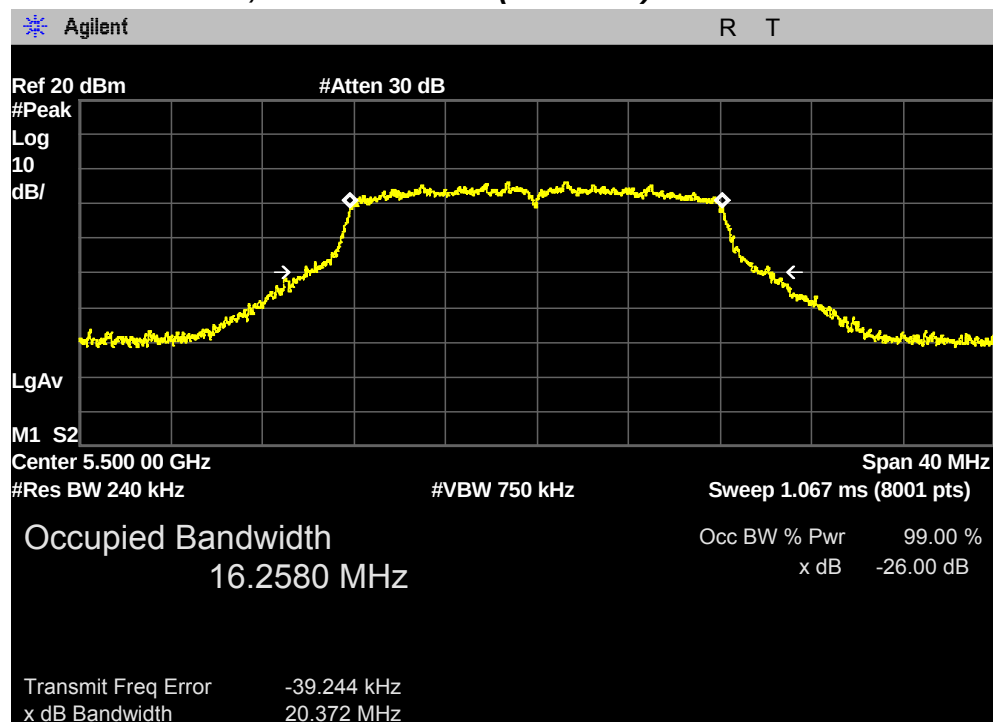
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Lowest	5530	83.83	83.65	75.04	74.95
Highest	5610	83.35	84.54	75.08	75.06
Straddle	5690	76.70	76.80	72.60	72.50

PLOTS OF EMISSIONS

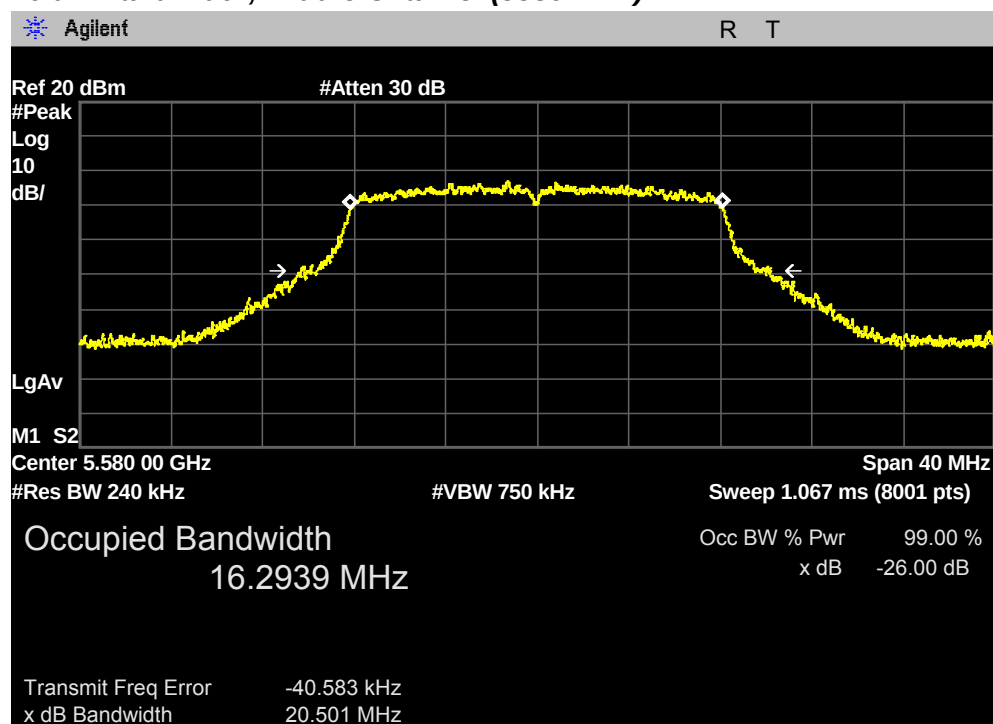
802.11a mode

Chain 0

26 dB Bandwidth, Lowest Channel (5500 MHz)

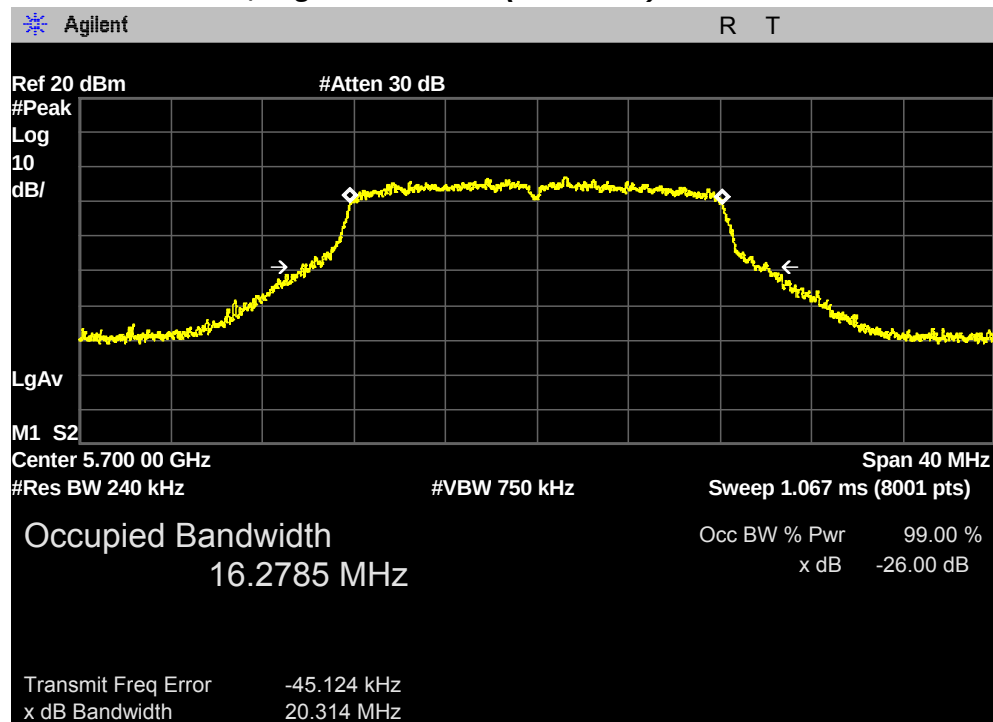


26 dB Bandwidth, Middle Channel (5580 MHz)

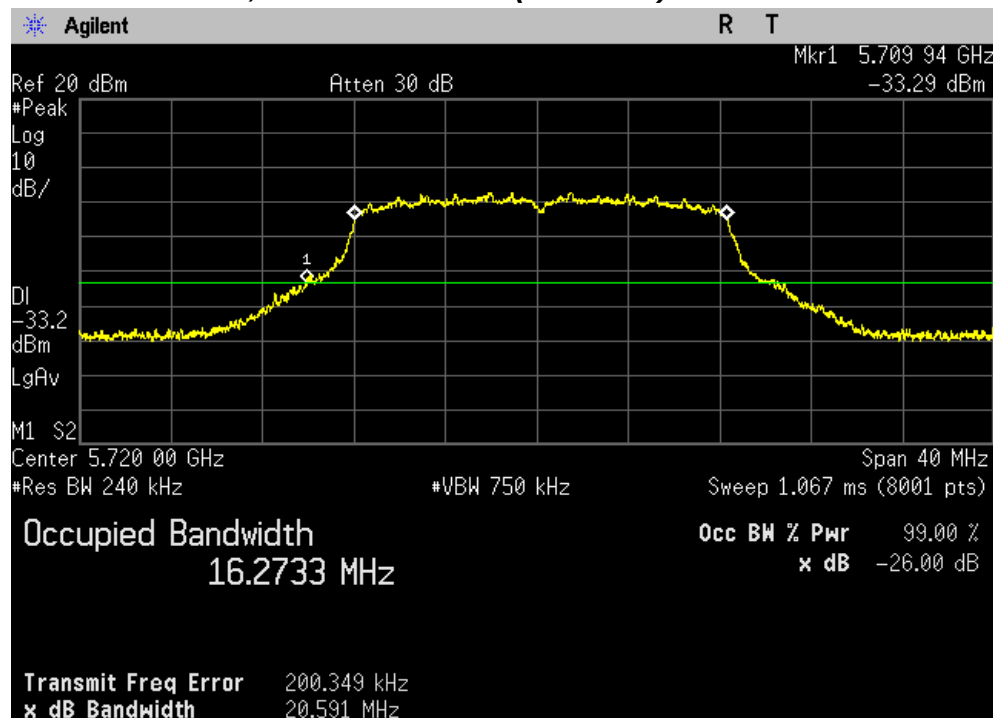


PLOTS OF EMISSIONS

26 dB Bandwidth, Highest Channel (5700 MHz)

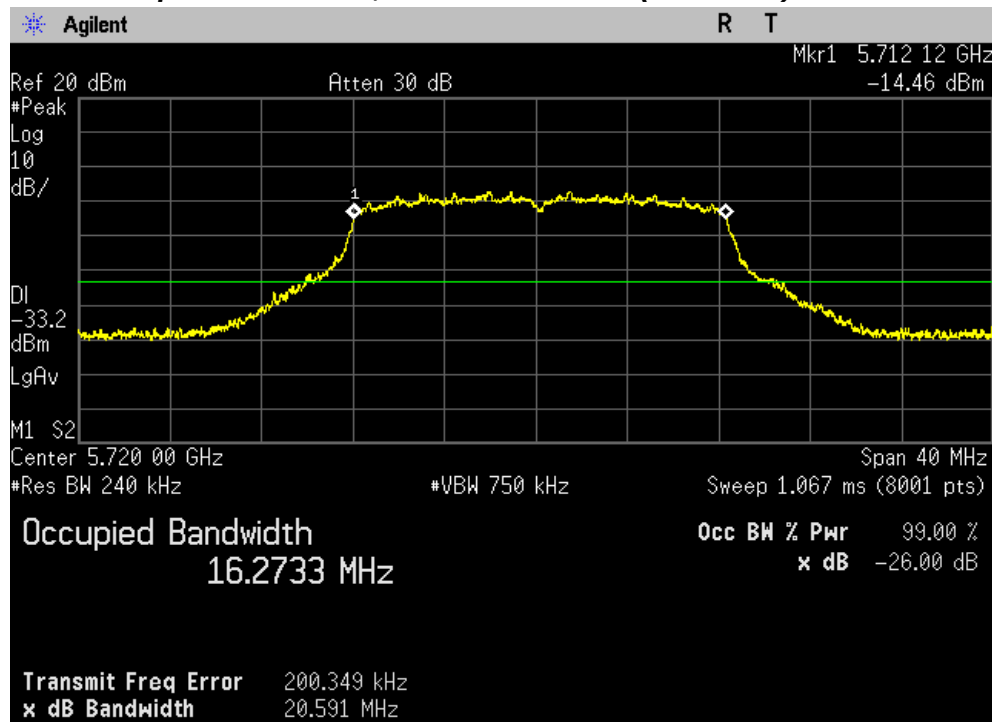


26 dB Bandwidth, Straddle Channel (5720 MHz)



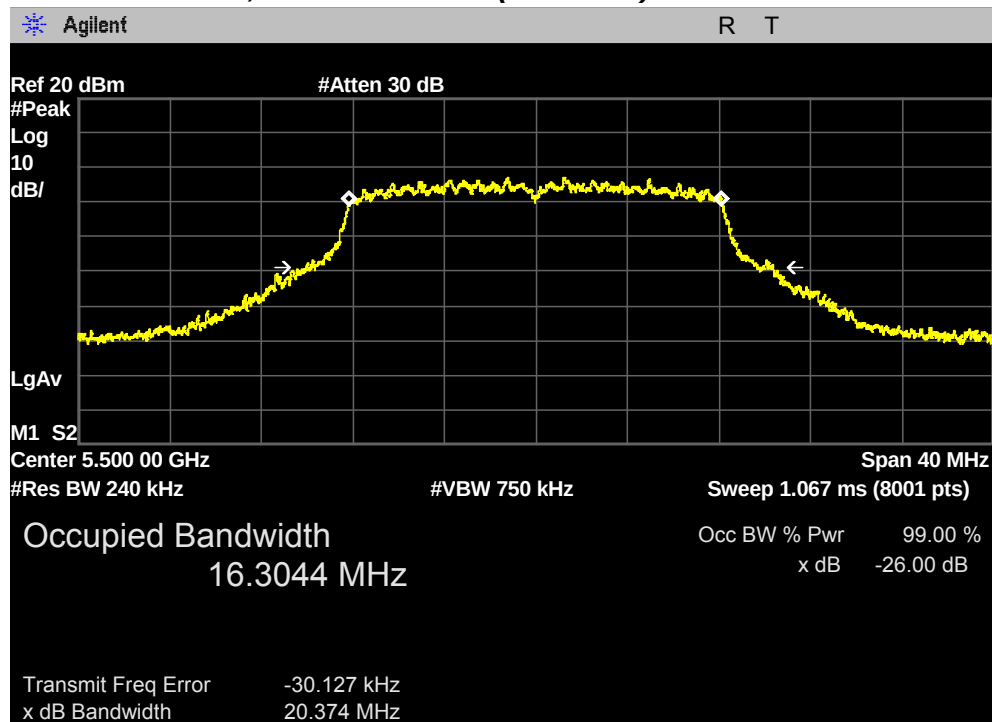
PLOTS OF EMISSIONS

99 % Occupied bandwidth, Straddle Channel (5720 MHz)



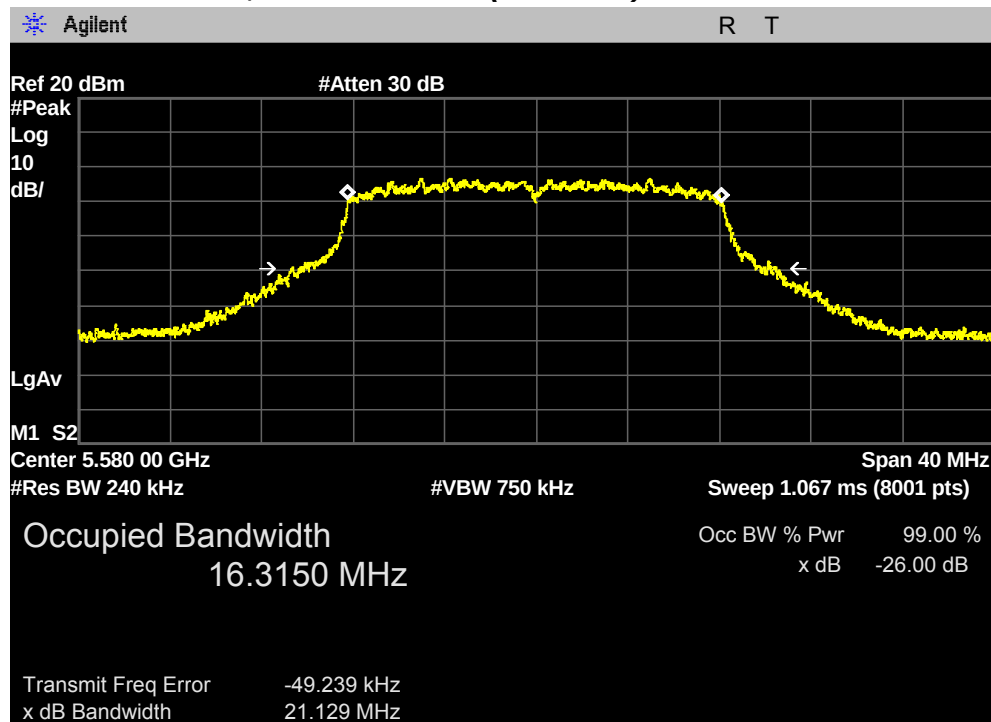
Chain 1

26 dB Bandwidth, Lowest Channel (5500 MHz)

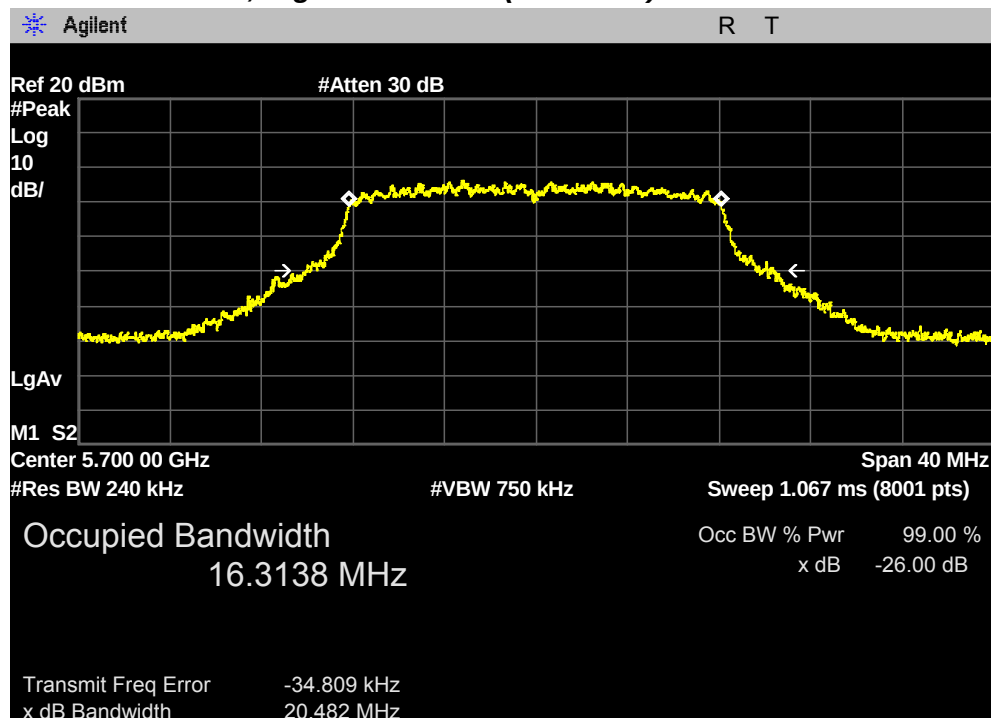


PLOTS OF EMISSIONS

26 dB Bandwidth, Middle Channel (5580 MHz)

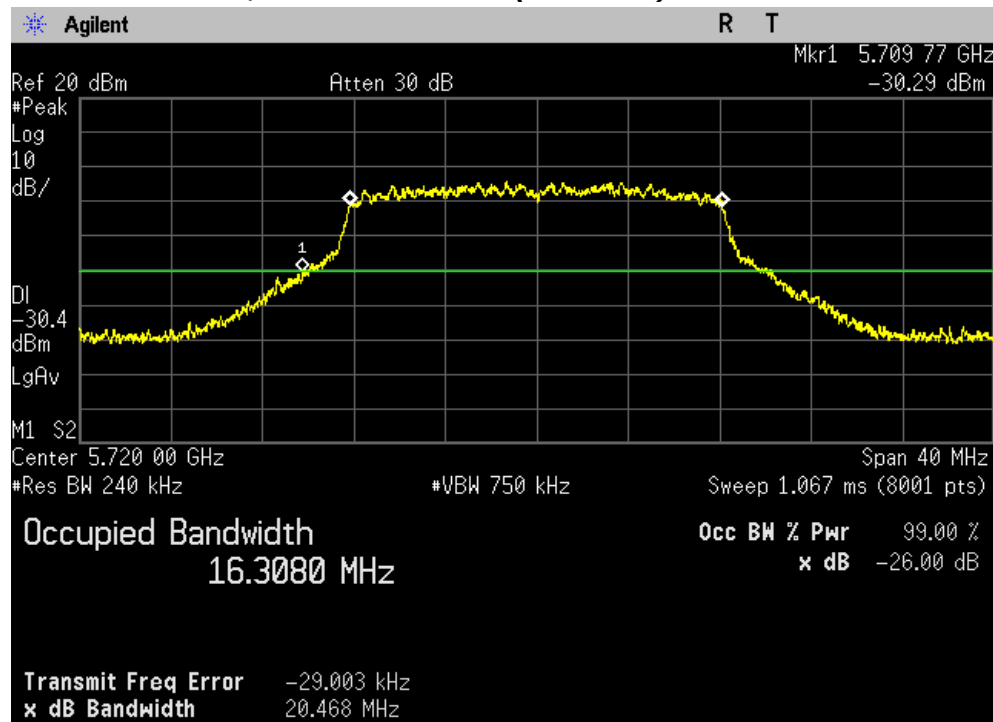


26 dB Bandwidth, Highest Channel (5700 MHz)

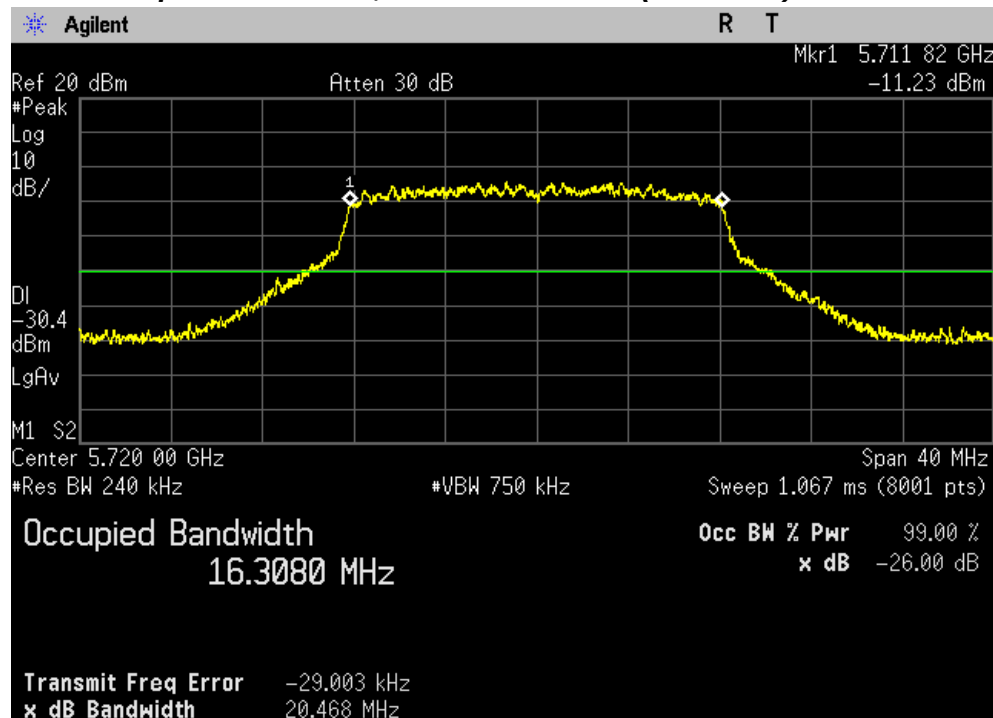


PLOTS OF EMISSIONS

26 dB Bandwidth, Straddle Channel (5720 MHz)



99 % Occupied bandwidth, Straddle Channel (5720 MHz)

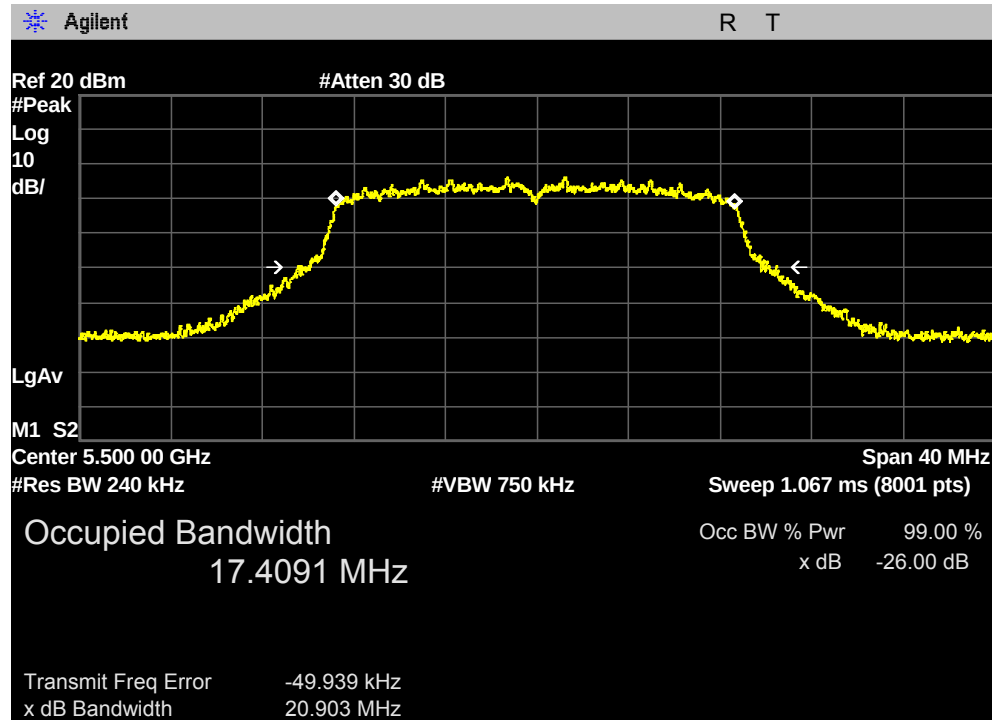


PLOTS OF EMISSIONS

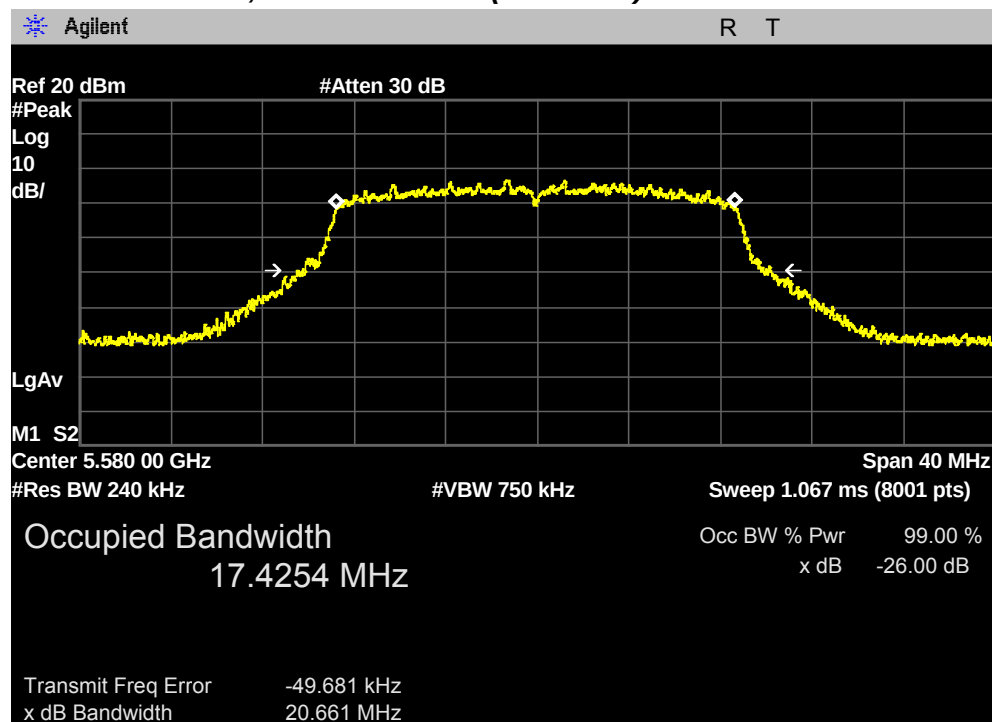
802.11n (20 MHz) mode

Chain 0

26 dB Bandwidth, Lowest Channel (5500 MHz)

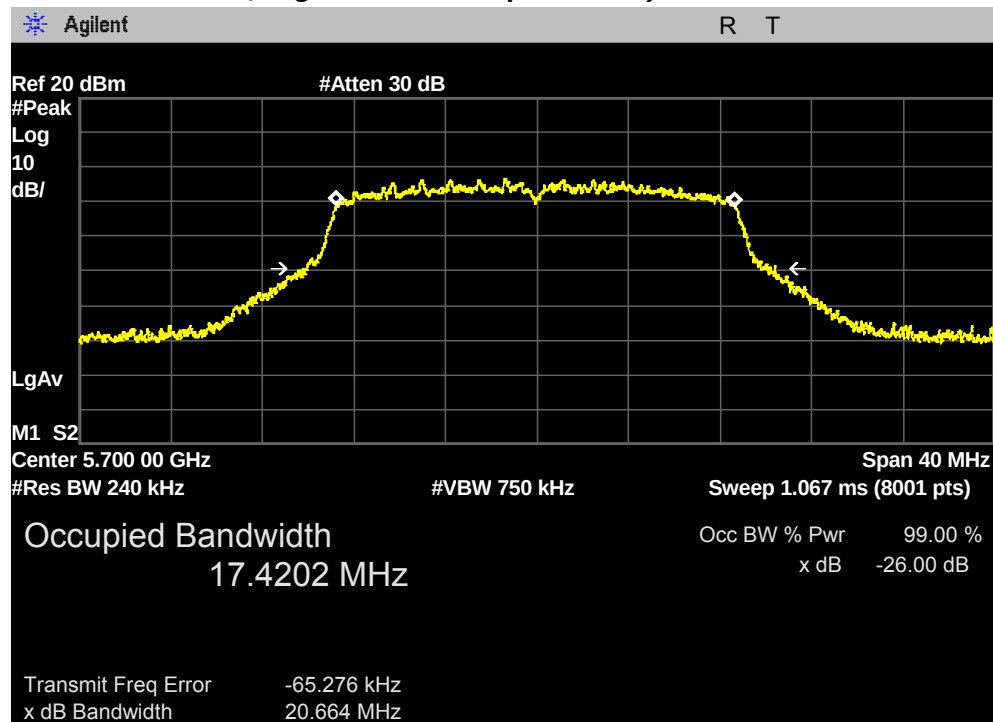


26 dB Bandwidth, Middle Channel (5580 MHz)

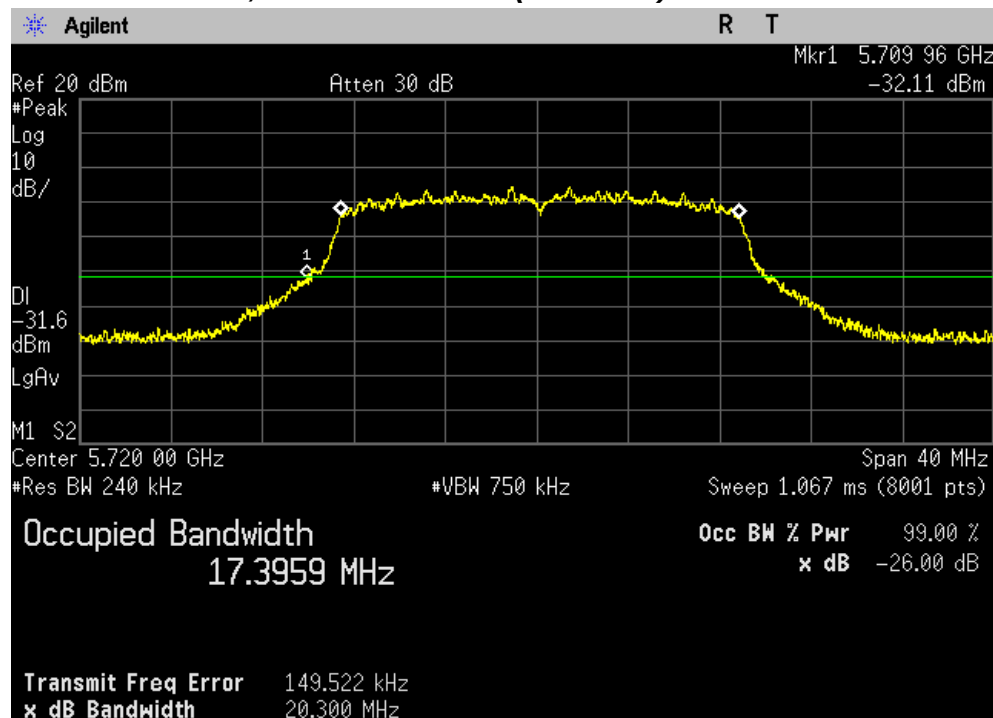


PLOTS OF EMISSIONS

26 dB Bandwidth, Highest Channel (5700 MHz)

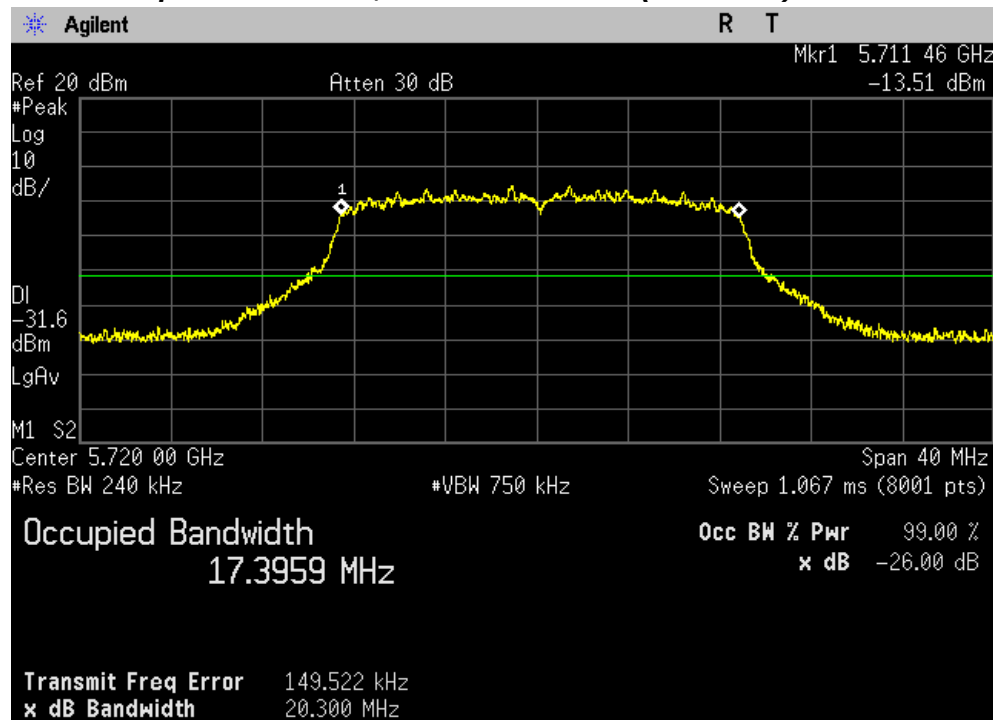


26 dB Bandwidth, Straddle Channel (5720 MHz)



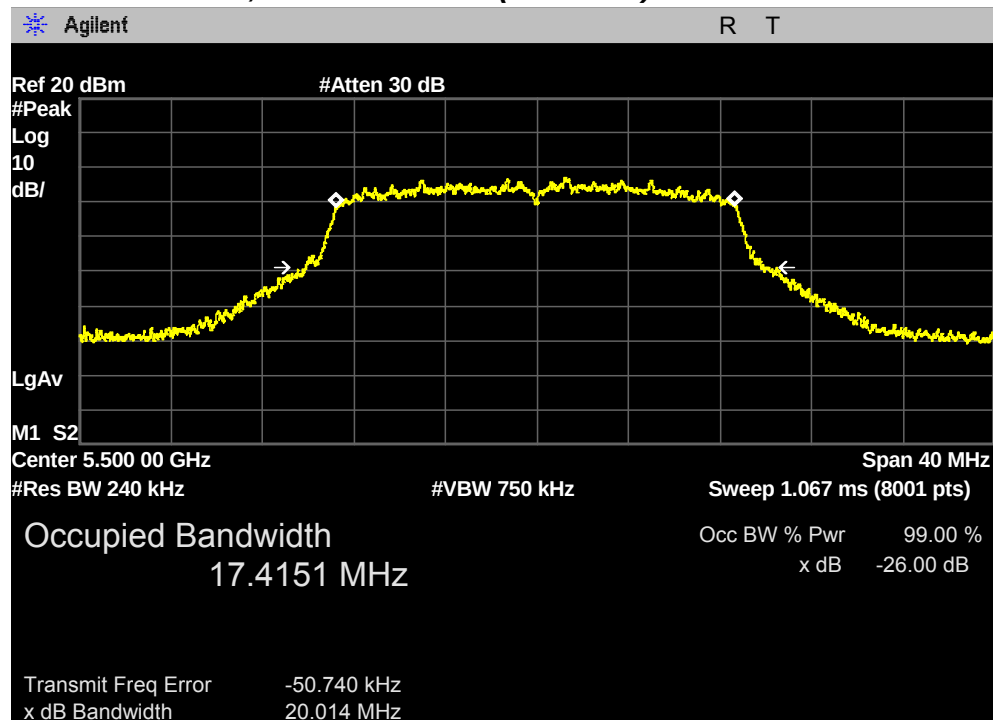
PLOTS OF EMISSIONS

99 % Occupied bandwidth, Straddle Channel (5720 MHz)



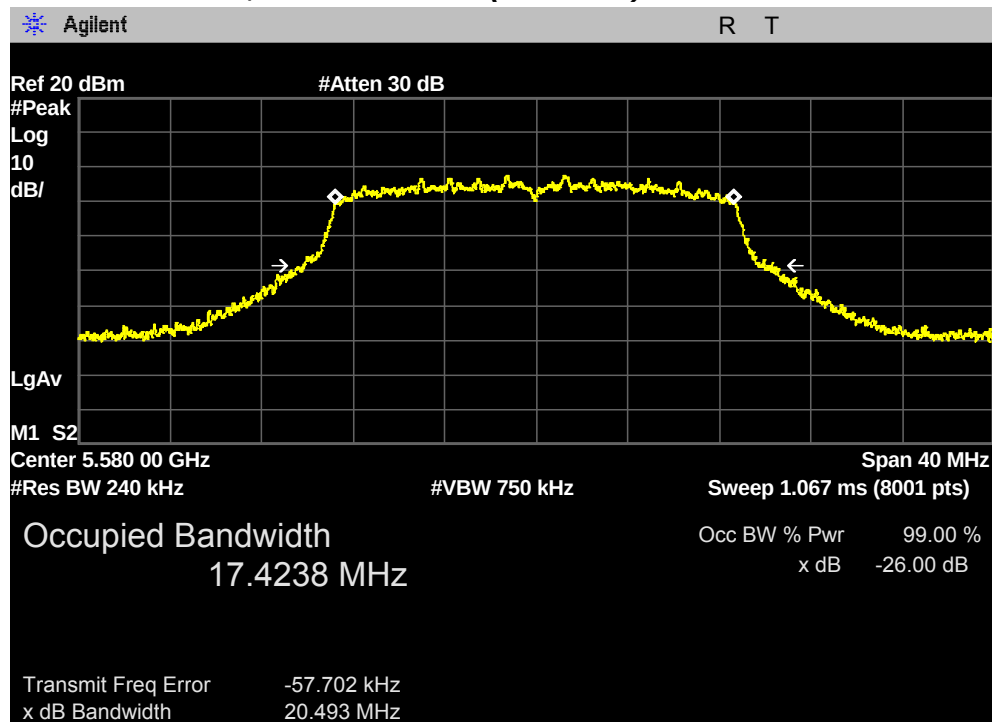
Chain 1

26 dB Bandwidth, Lowest Channel (5500 MHz)

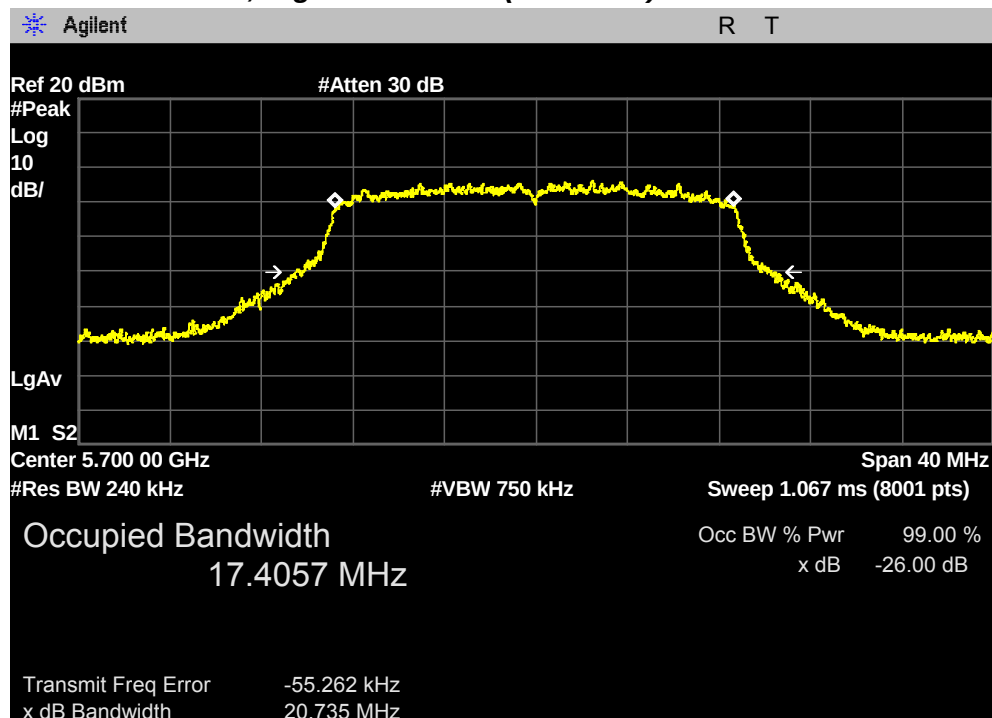


PLOTS OF EMISSIONS

26 dB Bandwidth, Middle Channel (5580 MHz)

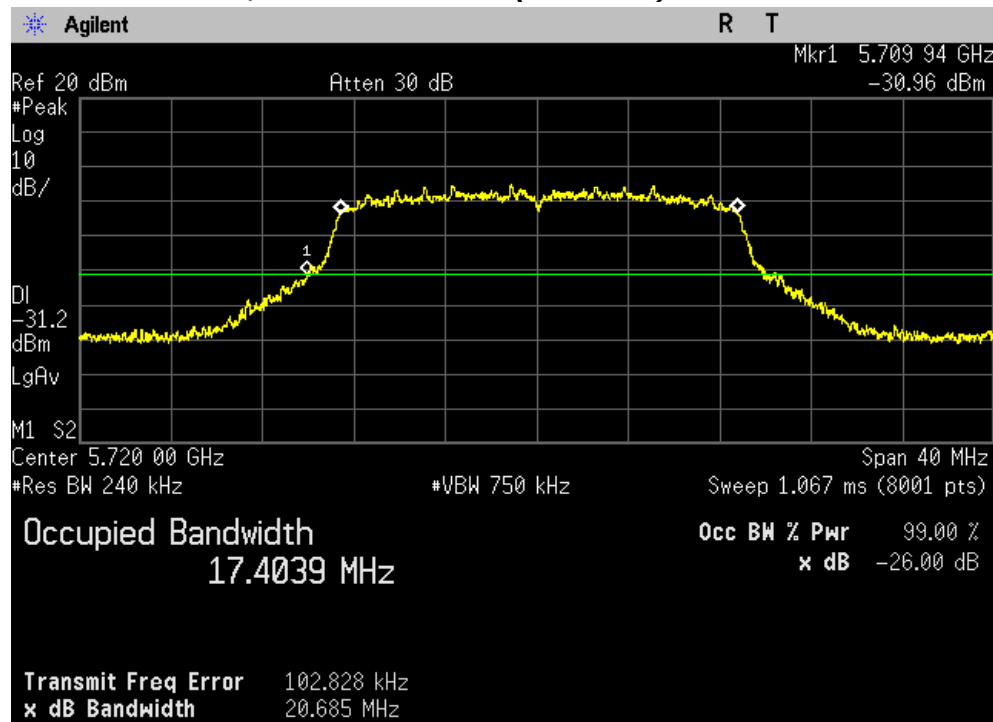


26 dB Bandwidth, Highest Channel (5700 MHz)

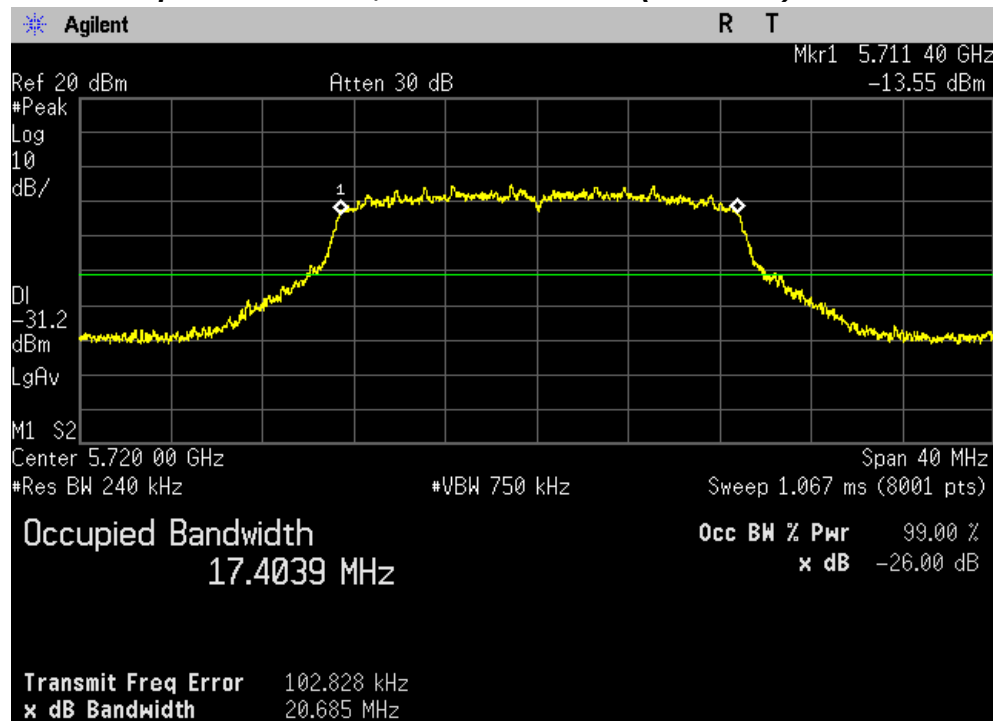


PLOTS OF EMISSIONS

26 dB Bandwidth, Straddle Channel (5720 MHz)



99 % Occupied bandwidth, Straddle Channel (5720 MHz)

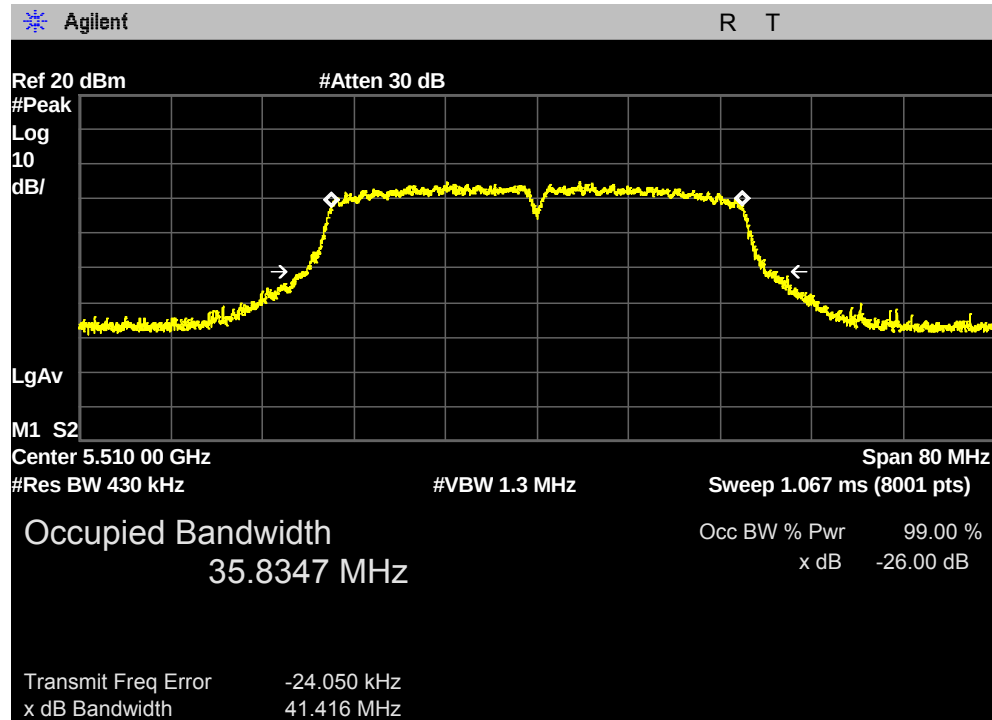


PLOTS OF EMISSIONS

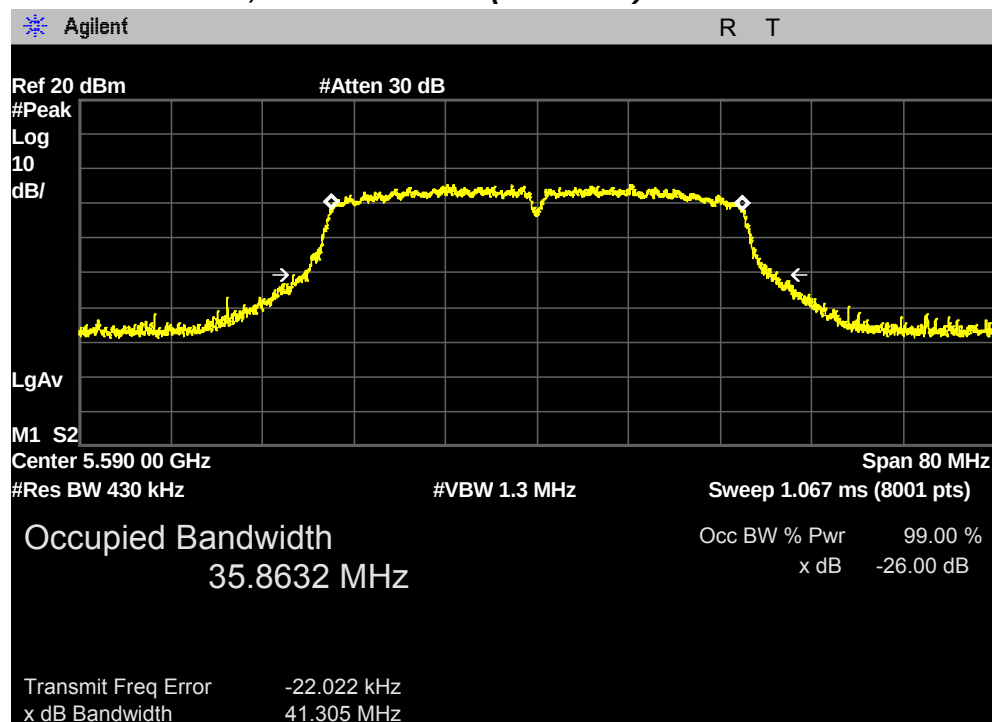
802.11n (40 MHz) mode

Chain 0

26 dB Bandwidth, Lowest Channel (5510 MHz)

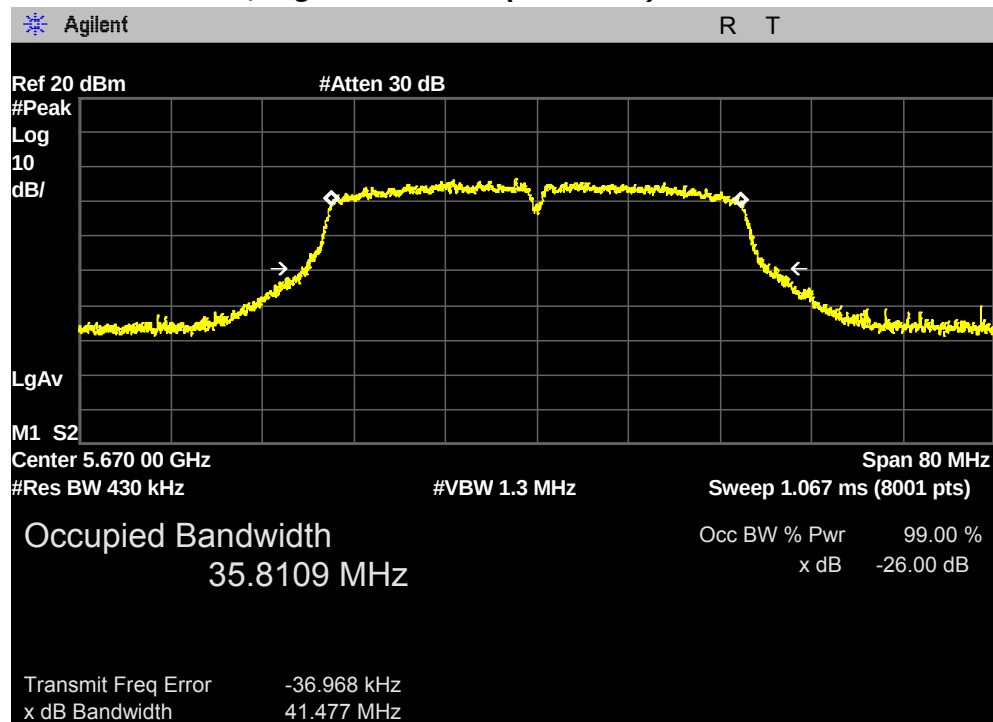


26 dB Bandwidth, Middle Channel (5590 MHz)

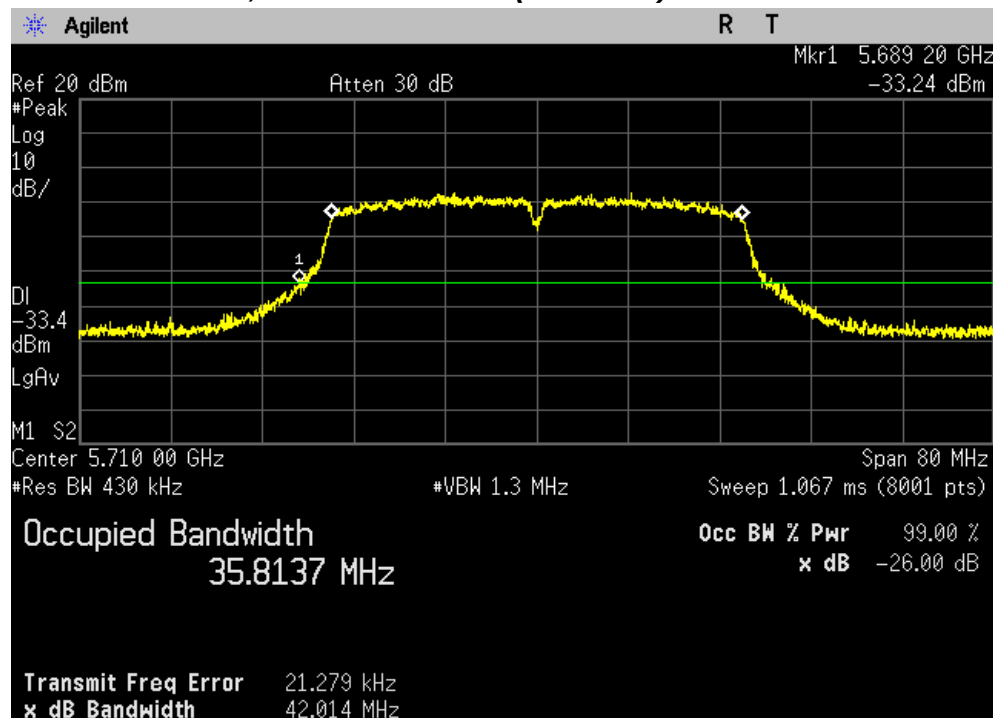


PLOTS OF EMISSIONS

26 dB Bandwidth, Highest Channel (5670 MHz)

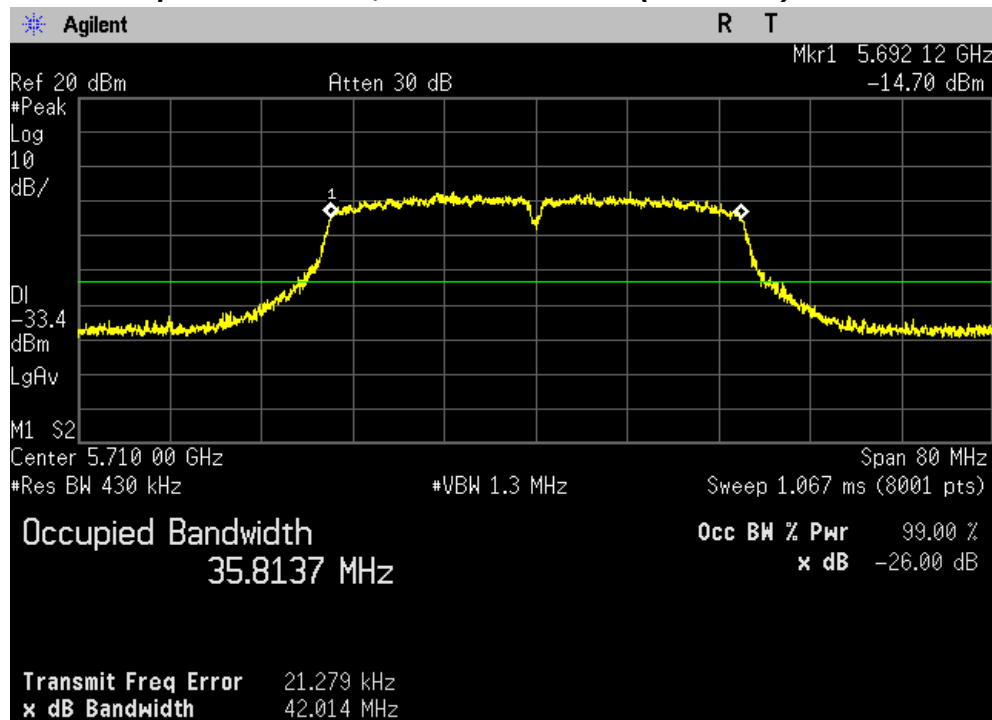


26 dB Bandwidth, Straddle Channel (5710 MHz)



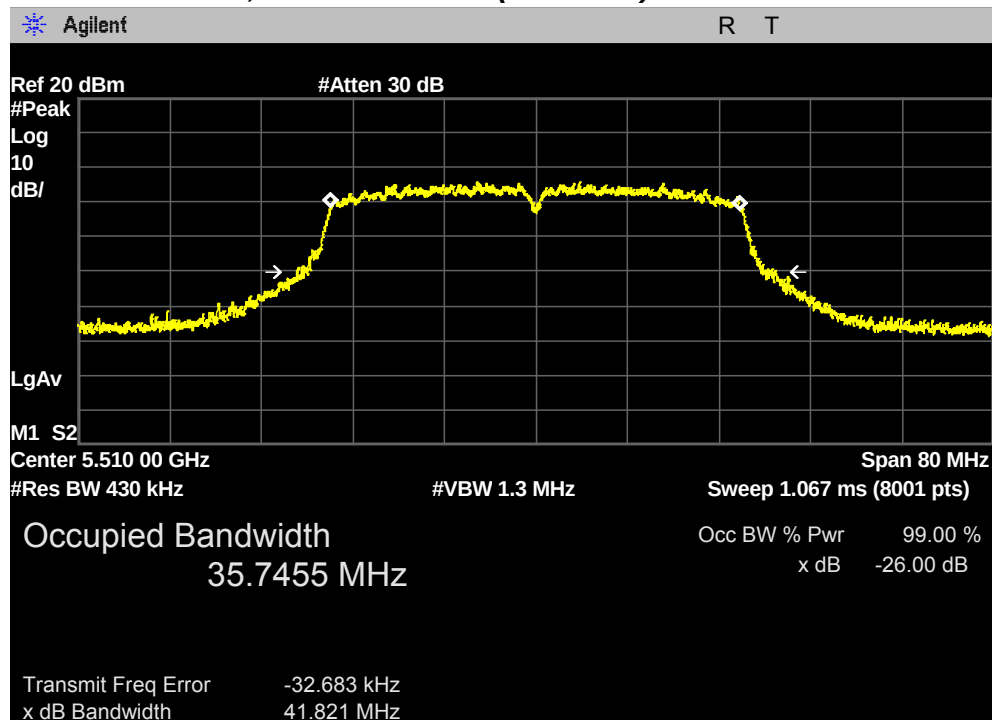
PLOTS OF EMISSIONS

99 % Occupied bandwidth, Straddle Channel (5710 MHz)



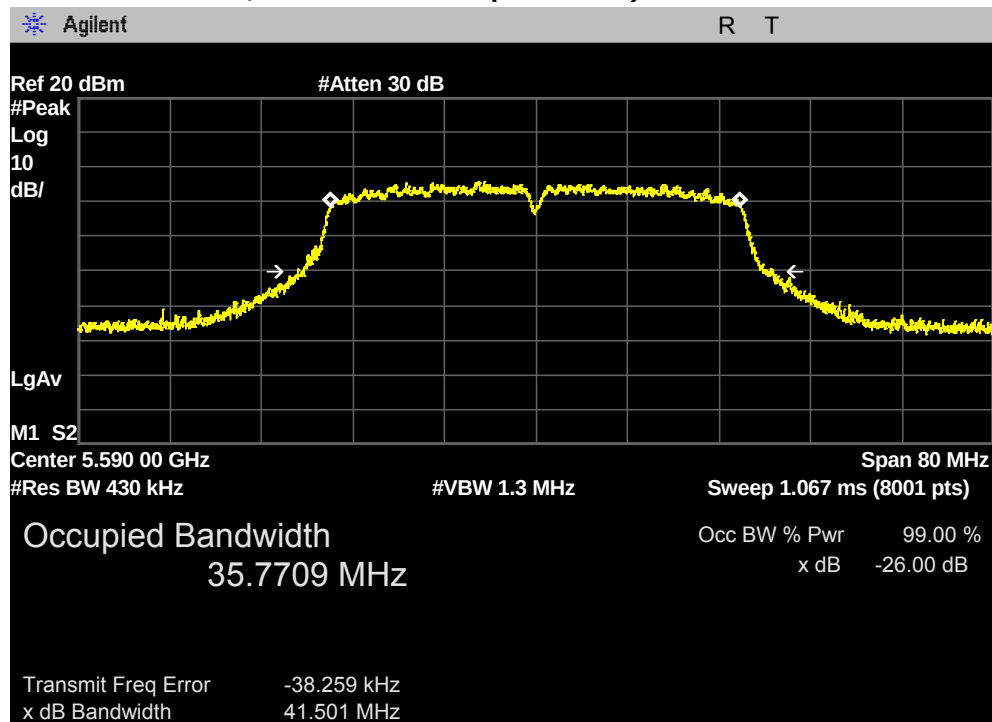
Chain 1

26 dB Bandwidth, Lowest Channel (5510 MHz)

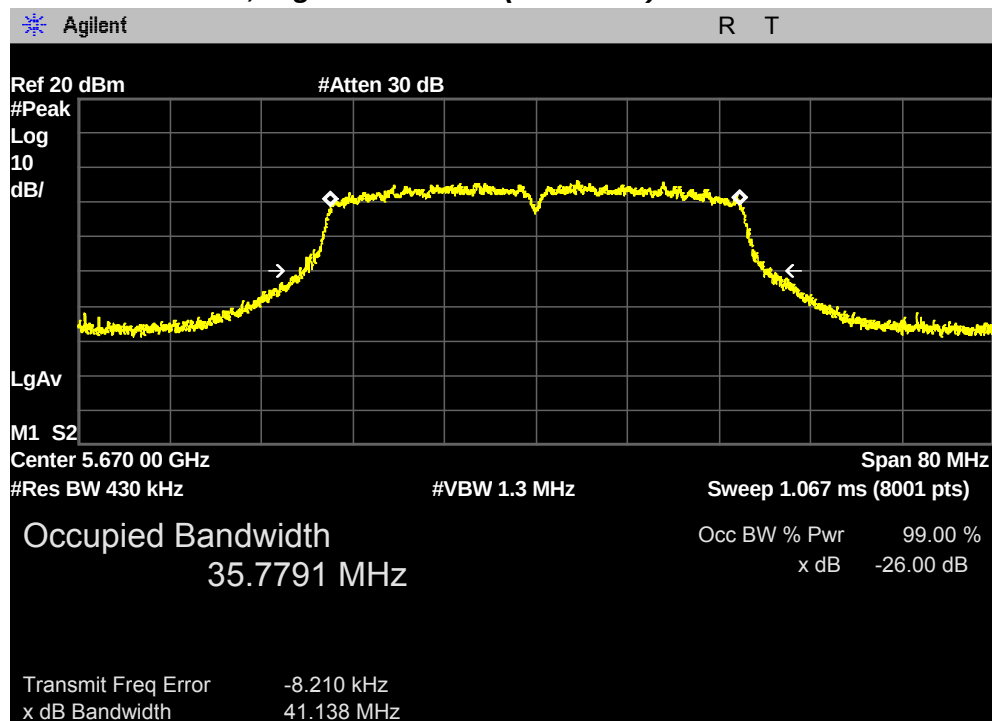


PLOTS OF EMISSIONS

26 dB Bandwidth, Middle Channel (5590 MHz)

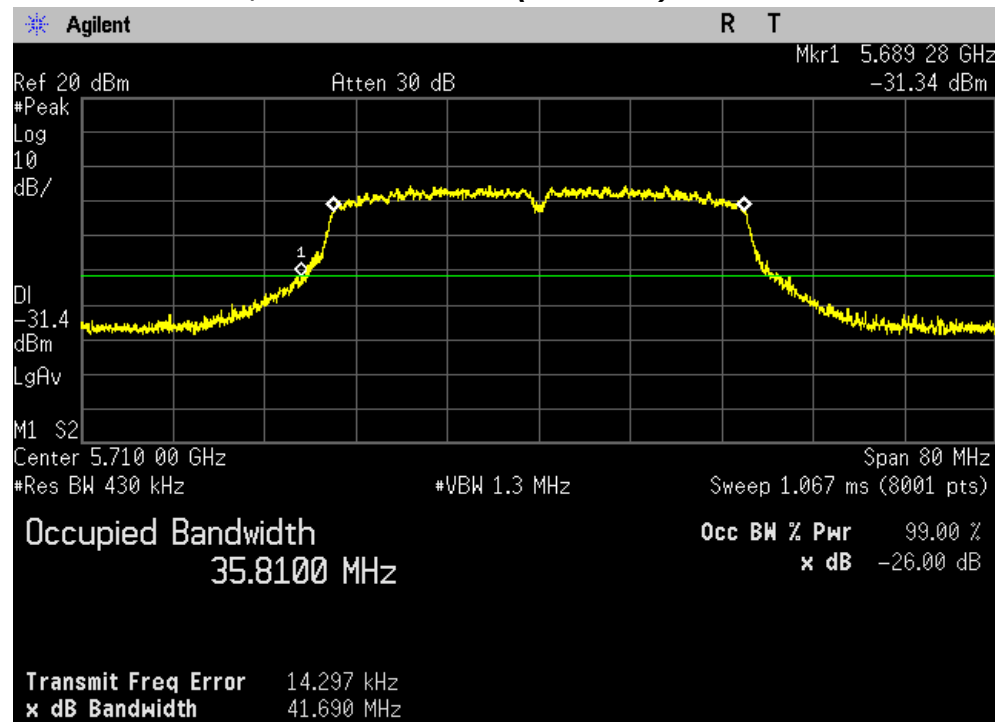


26 dB Bandwidth, Highest Channel (5670 MHz)

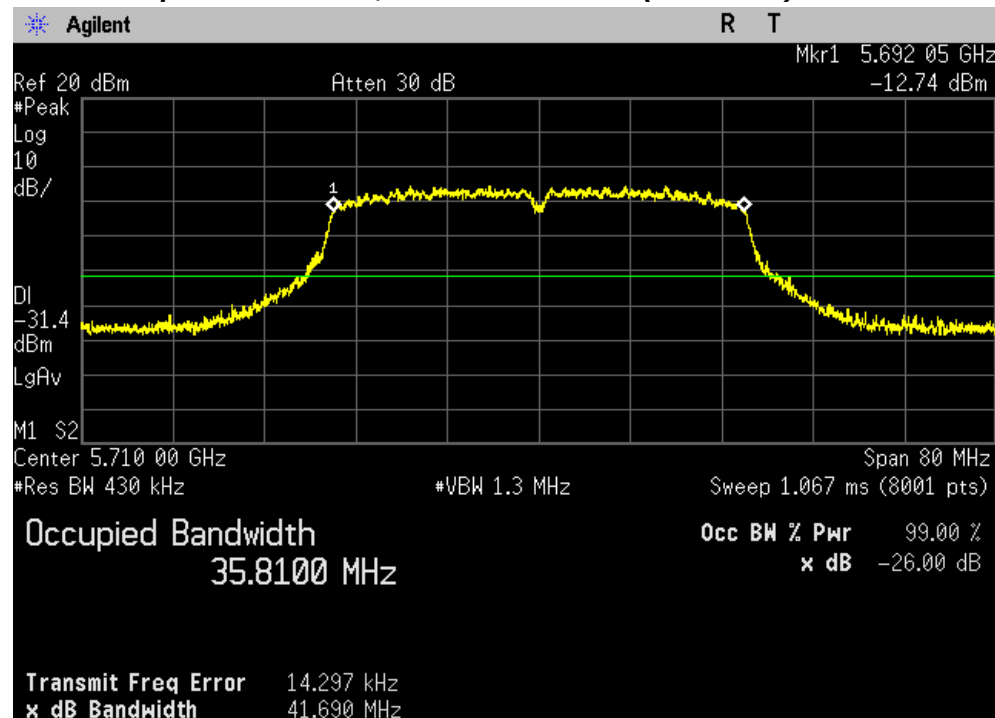


PLOTS OF EMISSIONS

26 dB Bandwidth, Straddle Channel (5710 MHz)



99 % Occupied bandwidth, Straddle Channel (5710 MHz)

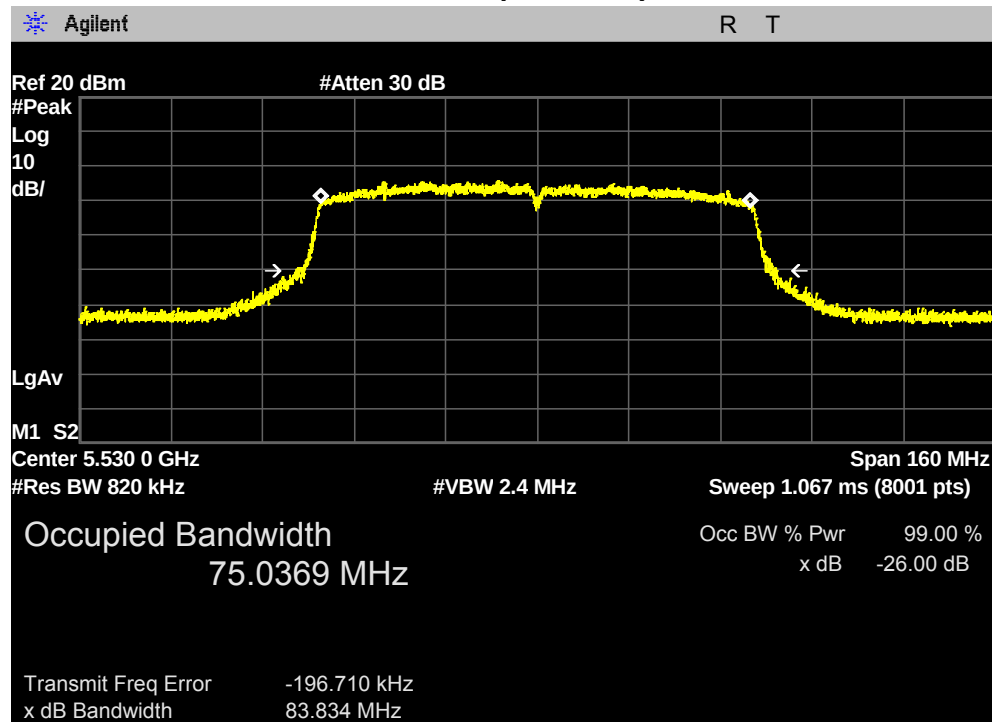


PLOTS OF EMISSIONS

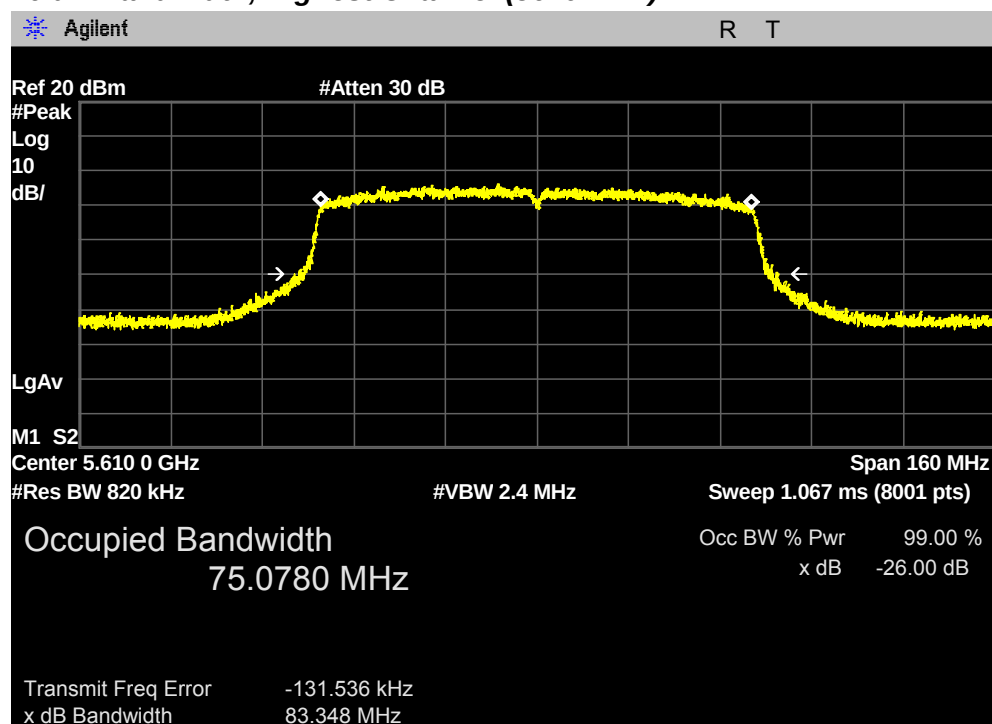
802.11ac (80 MHz) mode

Chain 0

26 dB Bandwidth, Lowest Channel (5530 MHz)

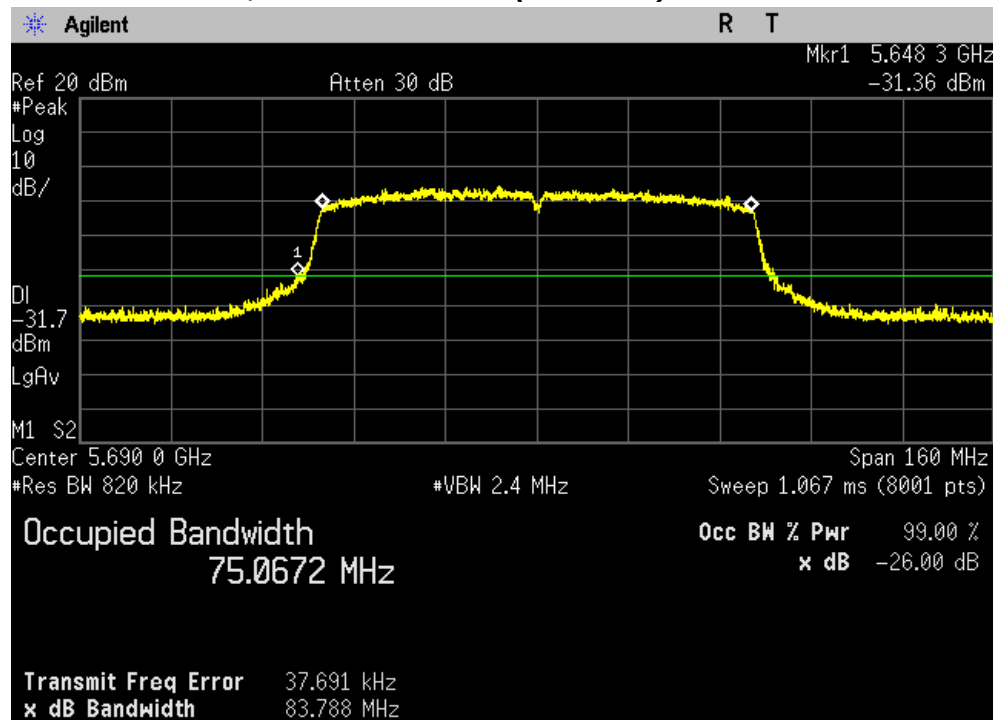


26 dB Bandwidth, Highest Channel (5610 MHz)

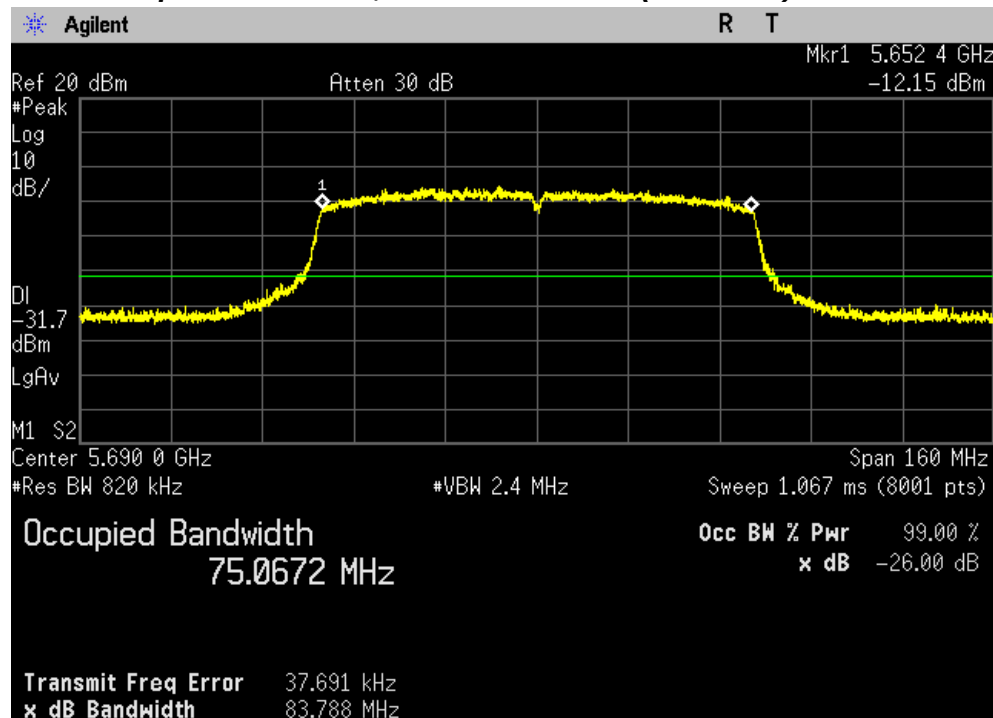


PLOTS OF EMISSIONS

26 dB Bandwidth, Straddle Channel (5690 MHz)



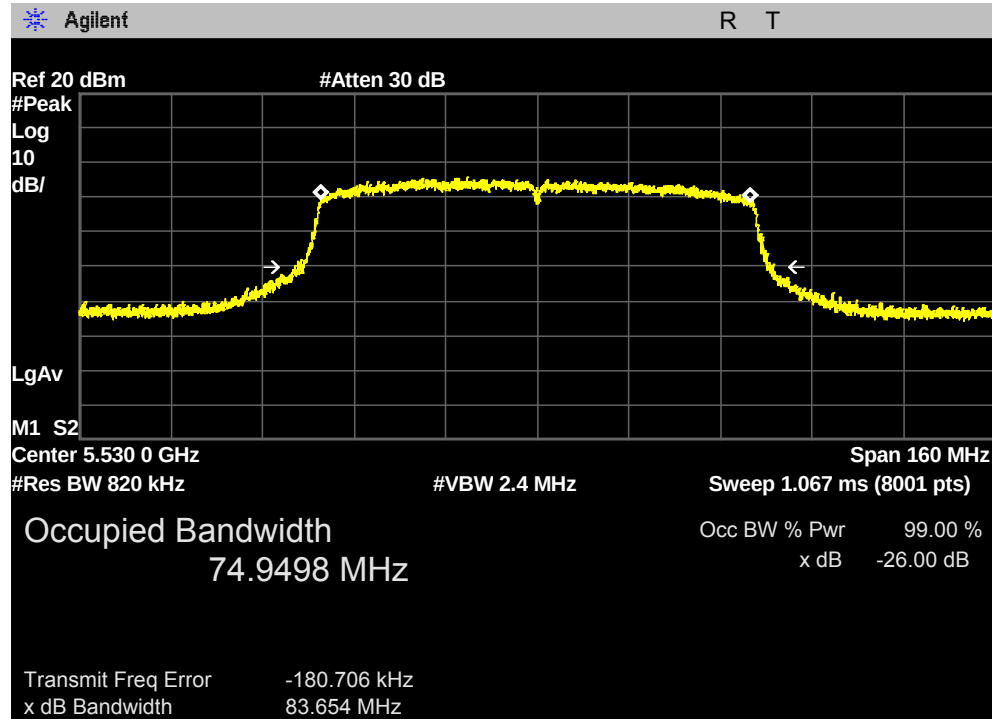
99 % Occupied bandwidth, Straddle Channel (5690 MHz)



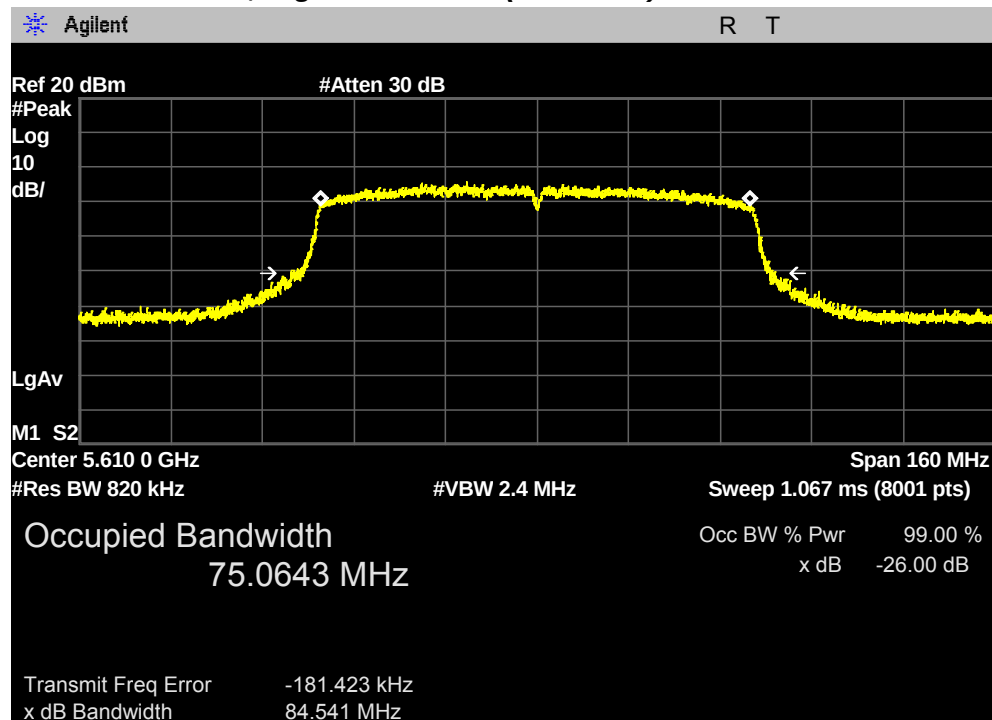
PLOTS OF EMISSIONS

Chain 1

26 dB Bandwidth, Lowest Channel (5530 MHz)

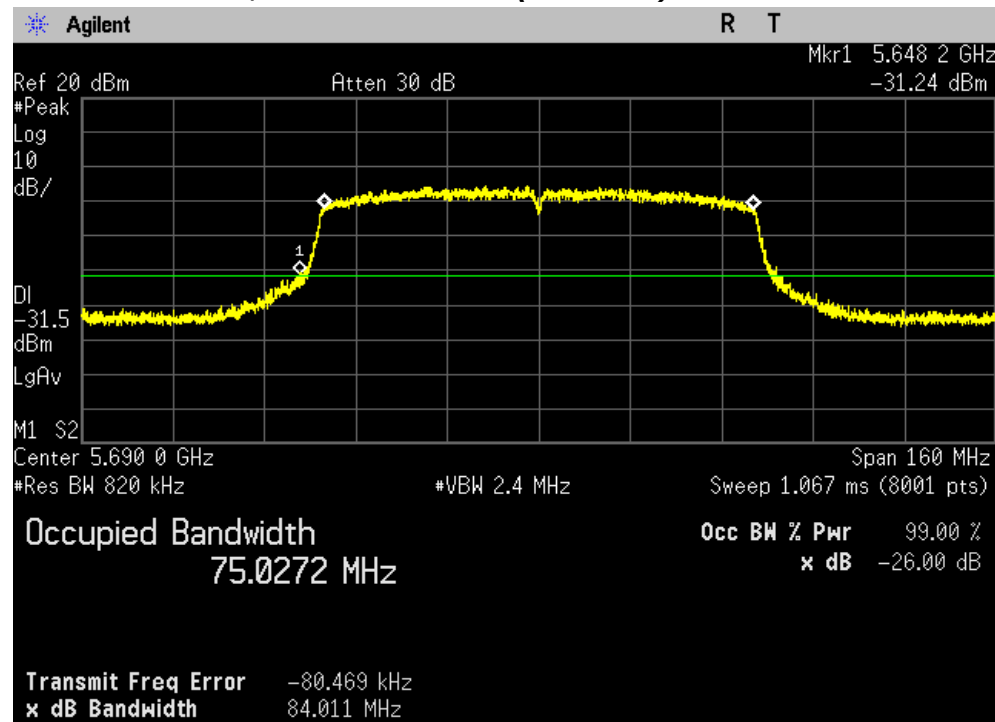


26 dB Bandwidth, Highest Channel (5610 MHz)

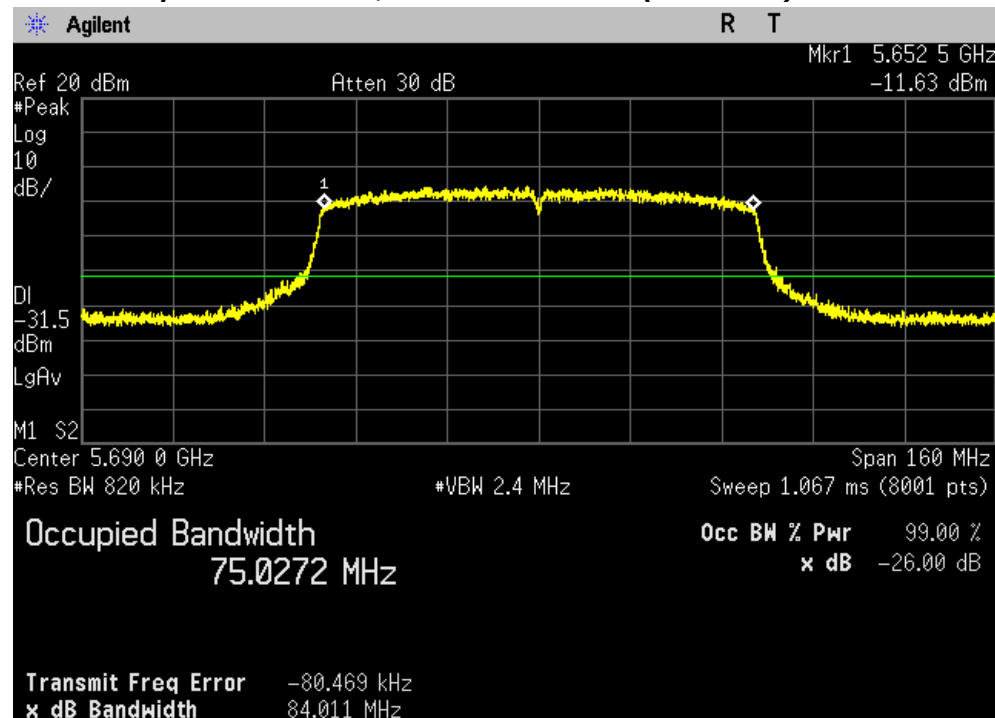


PLOTS OF EMISSIONS

26 dB Bandwidth, Straddle Channel (5690 MHz)



99 % Occupied bandwidth, Straddle Channel (5690 MHz)



TEST DATA

8.3.4 26 dB Bandwidth and 99 % Occupied bandwidth – U-NII-3 band

FCC §15.407(a) , RSS-247 Issue 2 6.2

Test Mode : Set to Straddle channel, Lowest channel, Middle channel and Highest channel

802.11a mode

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Straddle	5720	5.53	5.24	3.39	3.13
Lowest	5745	20.35	20.58	16.30	16.30
Middle	5785	20.56	20.20	16.28	16.28
Highest	5825	20.23	20.61	16.28	16.29

802.11n (20 MHz) mode

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Straddle	5720	5.26	5.63	3.86	3.80
Lowest	5745	20.54	20.35	17.44	17.42
Middle	5785	20.34	20.03	17.41	17.40
Highest	5825	20.50	20.18	17.40	17.40

TEST DATA

802.11n (40 MHz) mode

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Straddle	5710	6.21	5.97	2.93	2.86
Lowest	5755	42.12	41.62	35.83	35.84
Highest	5795	41.38	41.02	35.82	35.80

802.11ac (80 MHz) mode

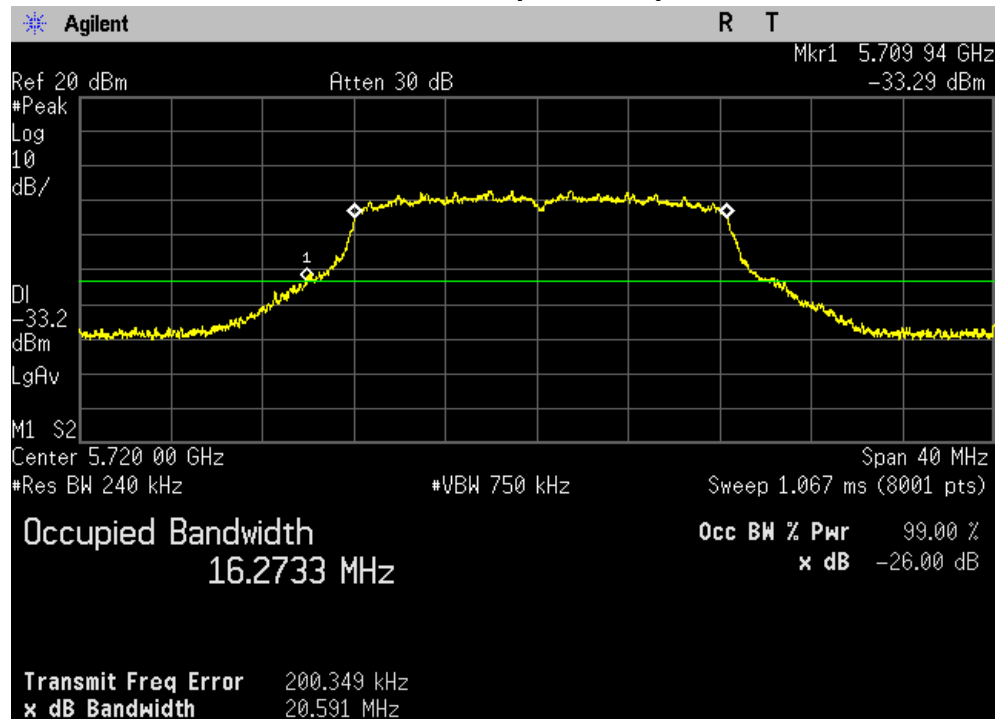
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Straddle	5690	7.09	7.21	2.47	2.53
Middle	5775	84.49	84.09	75.06	75.09

PLOTS OF EMISSIONS

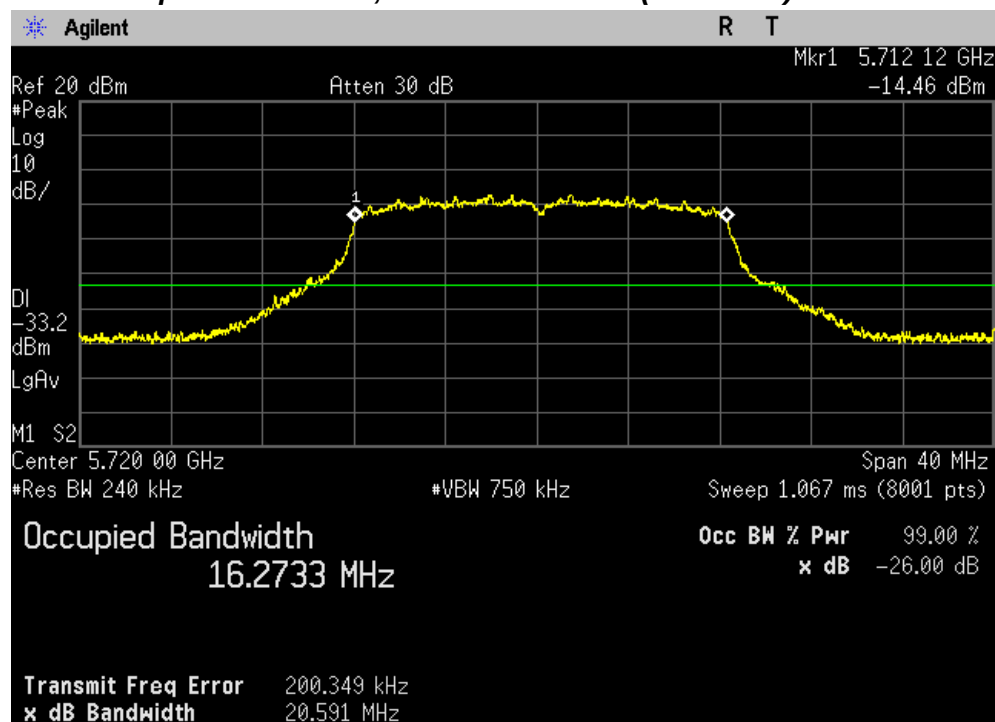
802.11a mode

Chain 0

26 dB Bandwidth, Straddle Channel (5720 MHz)

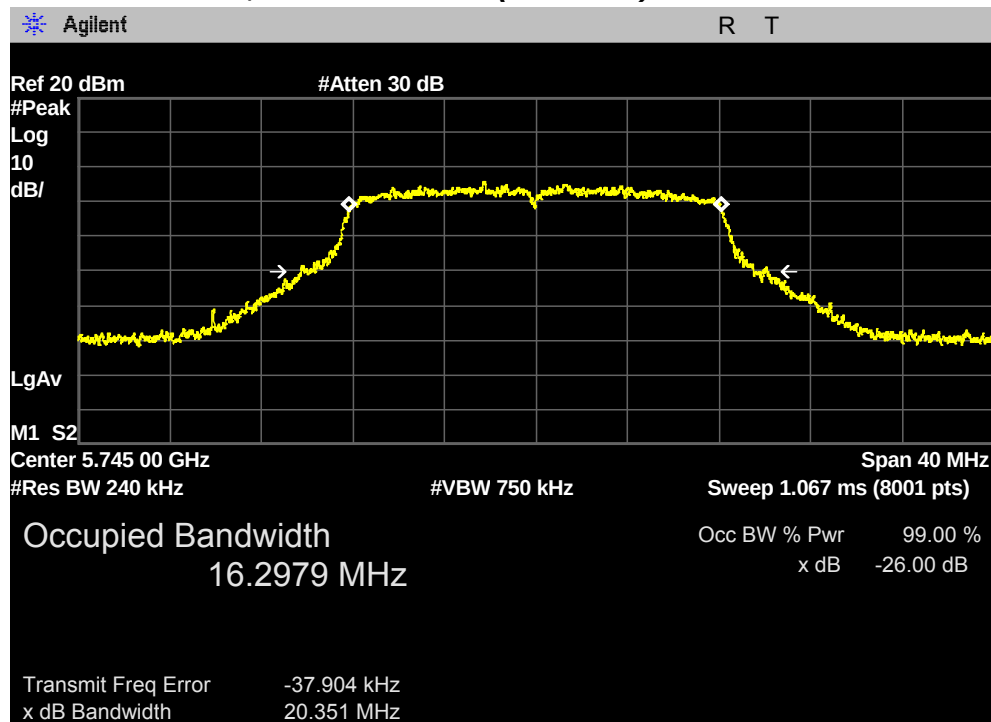


99 % Occupied bandwidth, Straddle Channel (5720 MHz)

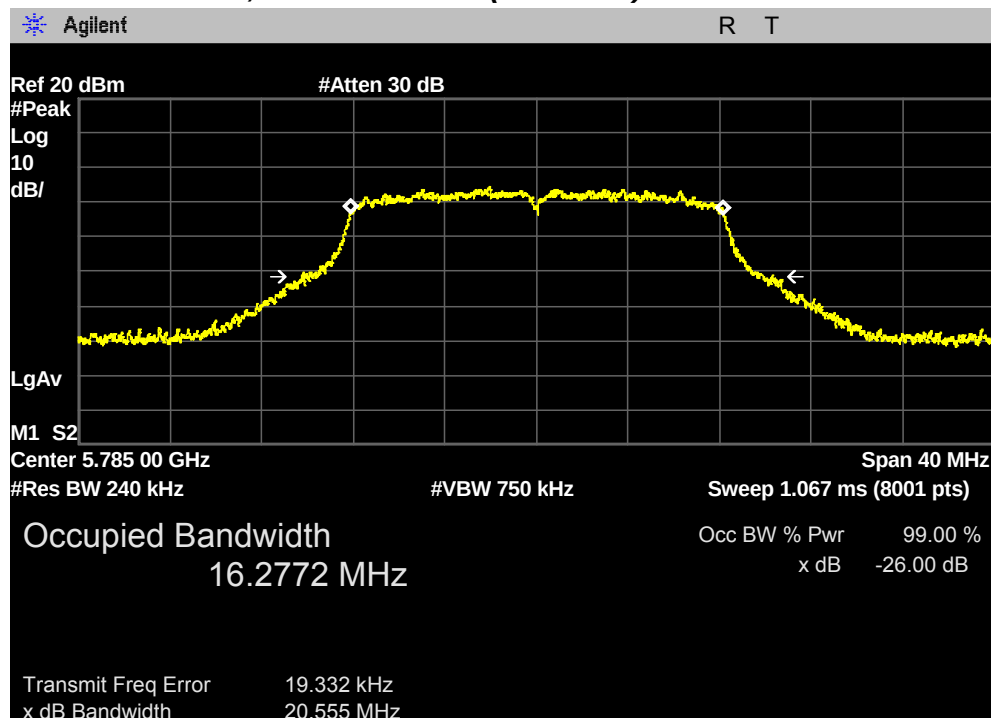


PLOTS OF EMISSIONS

26 dB Bandwidth, Lowest Channel (5745 MHz)

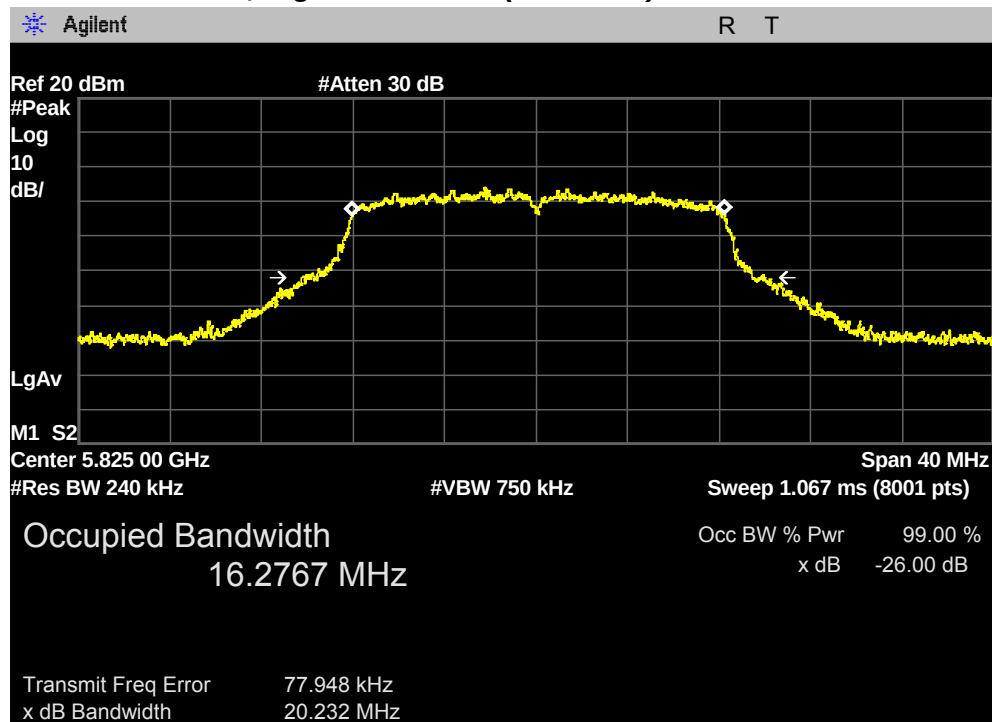


26 dB Bandwidth, Middle Channel (5785 MHz)



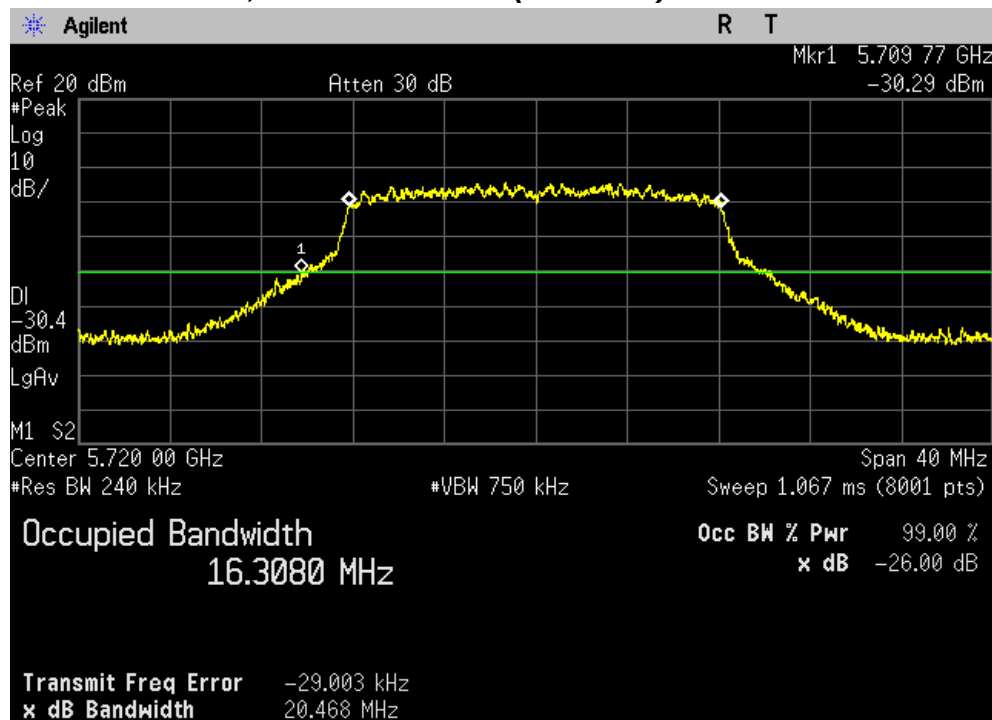
PLOTS OF EMISSIONS

26 dB Bandwidth, Highest Channel (5825 MHz)



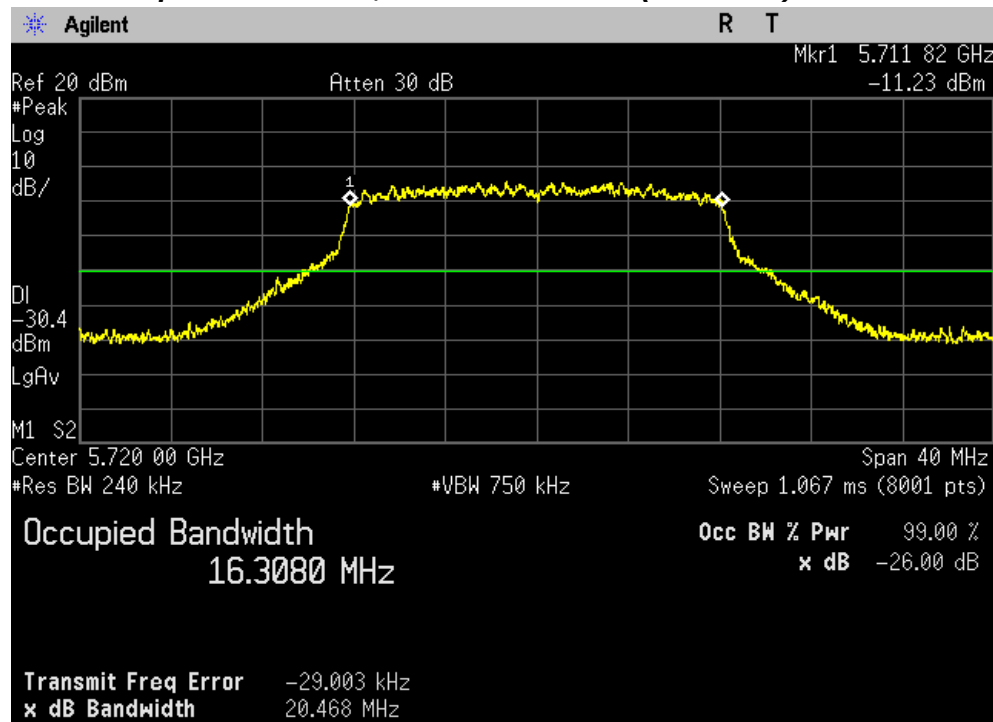
Chain 1

26 dB Bandwidth, Straddle Channel (5720 MHz)

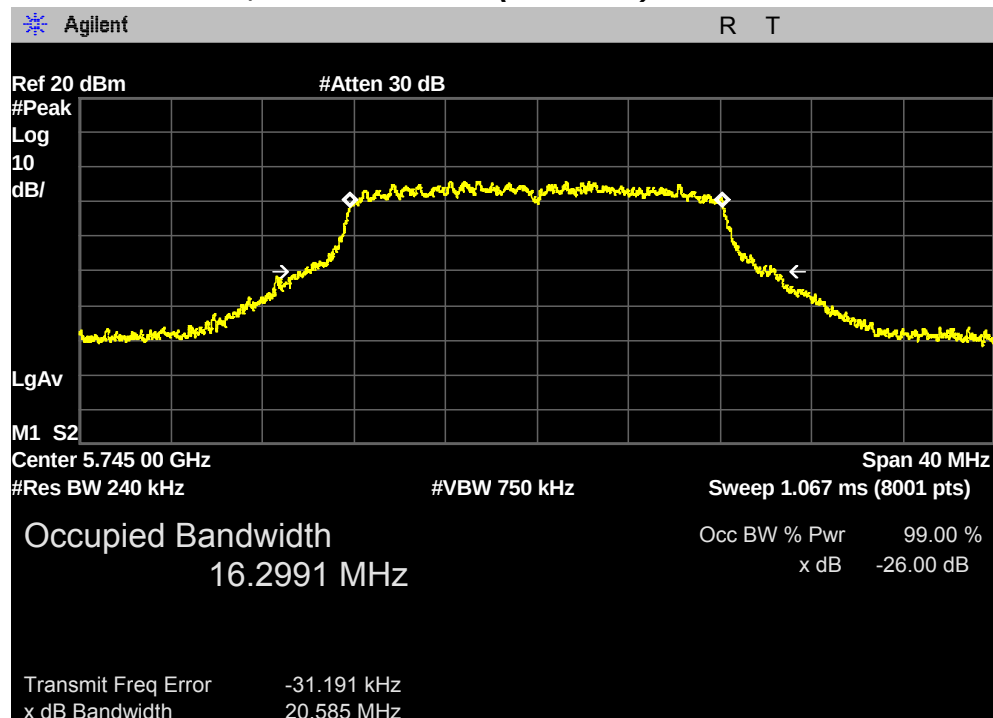


PLOTS OF EMISSIONS

99 % Occupied bandwidth, Straddle Channel (5720 MHz)

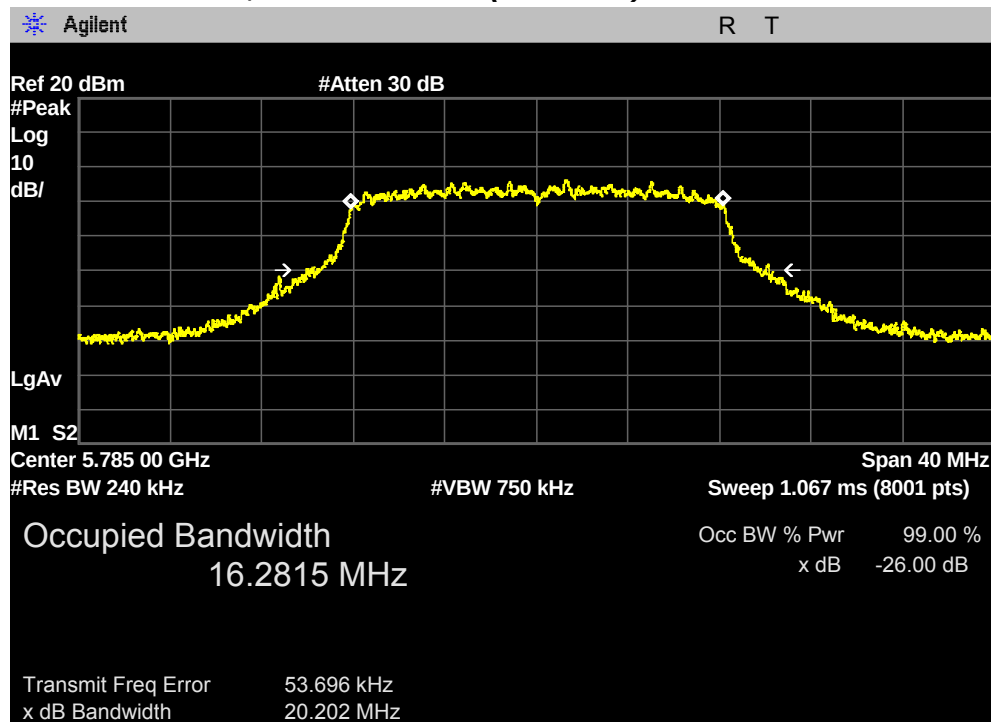


26 dB Bandwidth, Lowest Channel (5745 MHz)

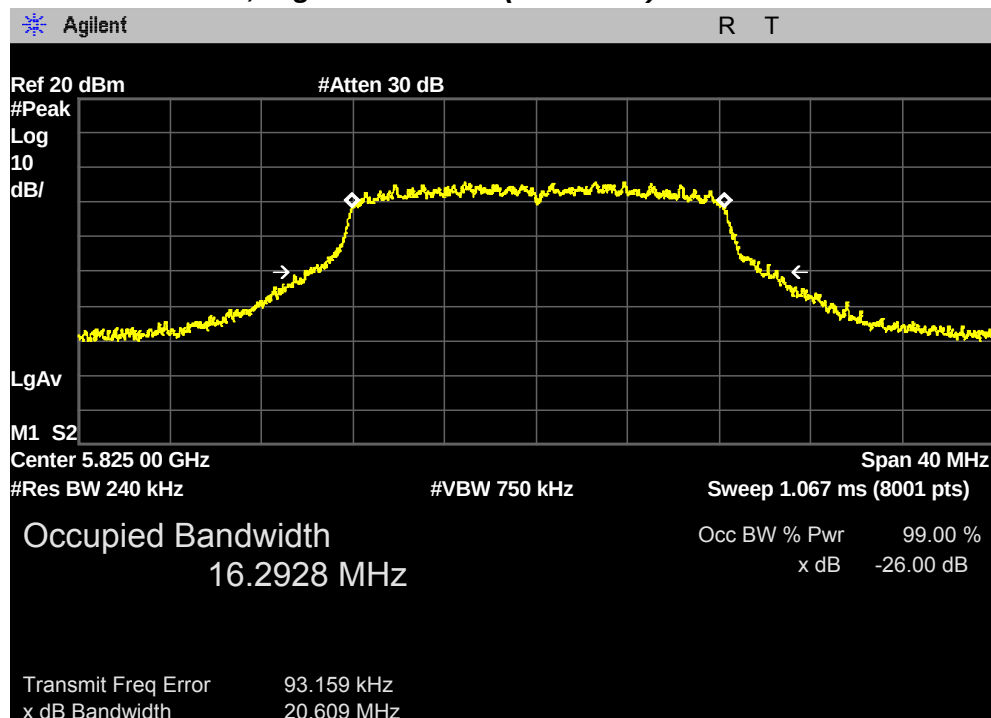


PLOTS OF EMISSIONS

26 dB Bandwidth, Middle Channel (5785 MHz)



26 dB Bandwidth, Highest Channel (5825 MHz)

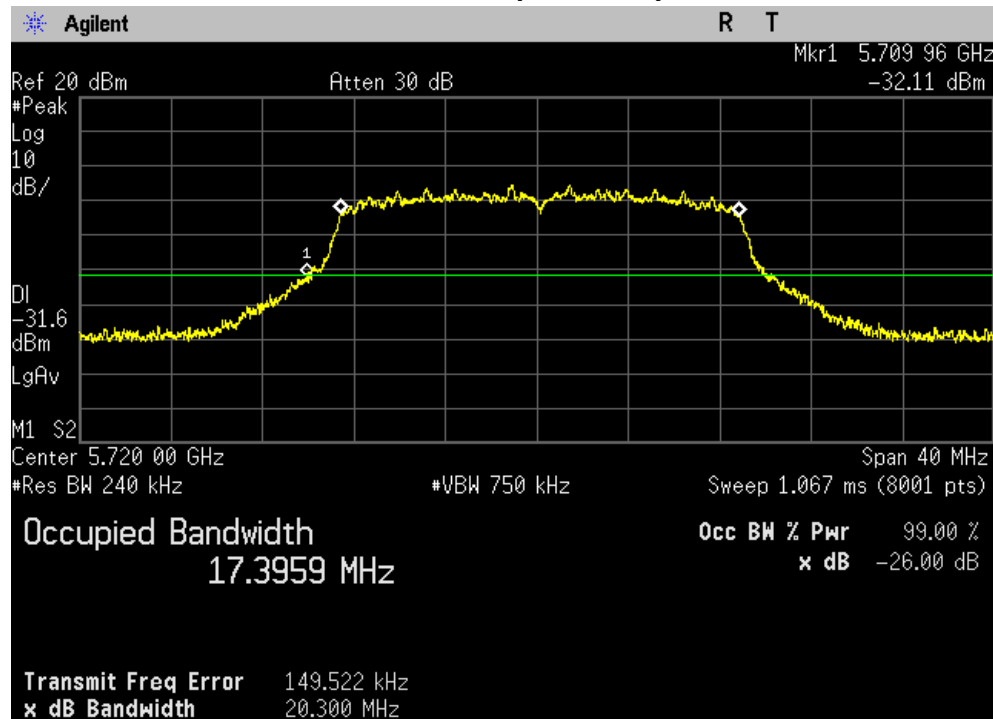


PLOTS OF EMISSIONS

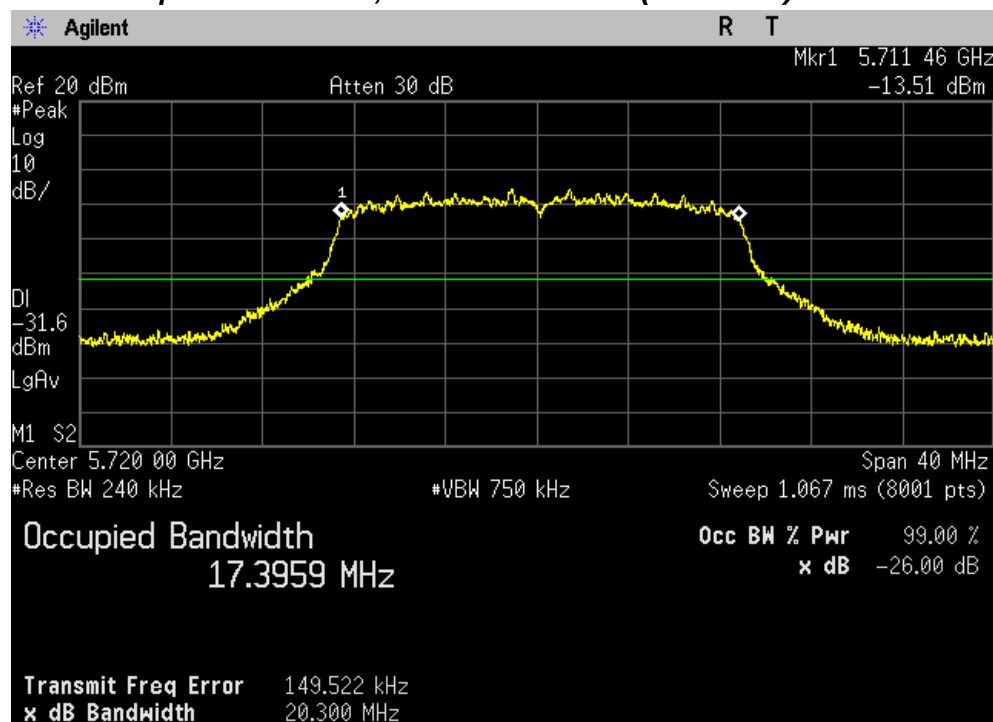
802.11n (20 MHz) mode

Chain 0

26 dB Bandwidth, Straddle Channel (5720 MHz)

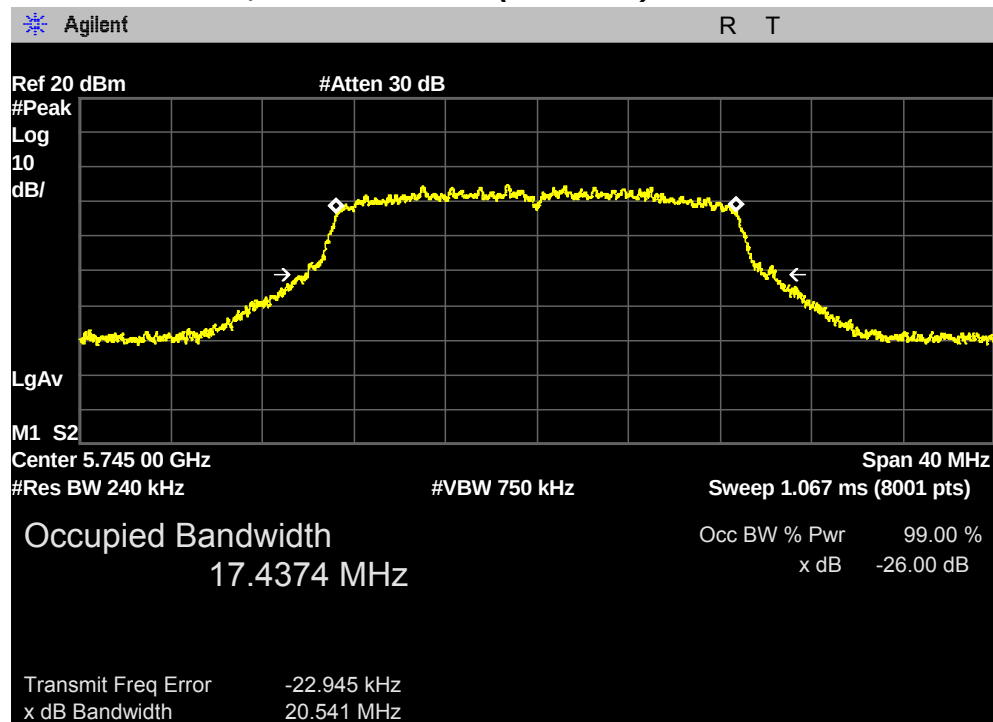


99 % Occupied bandwidth, Straddle Channel (5720 MHz)

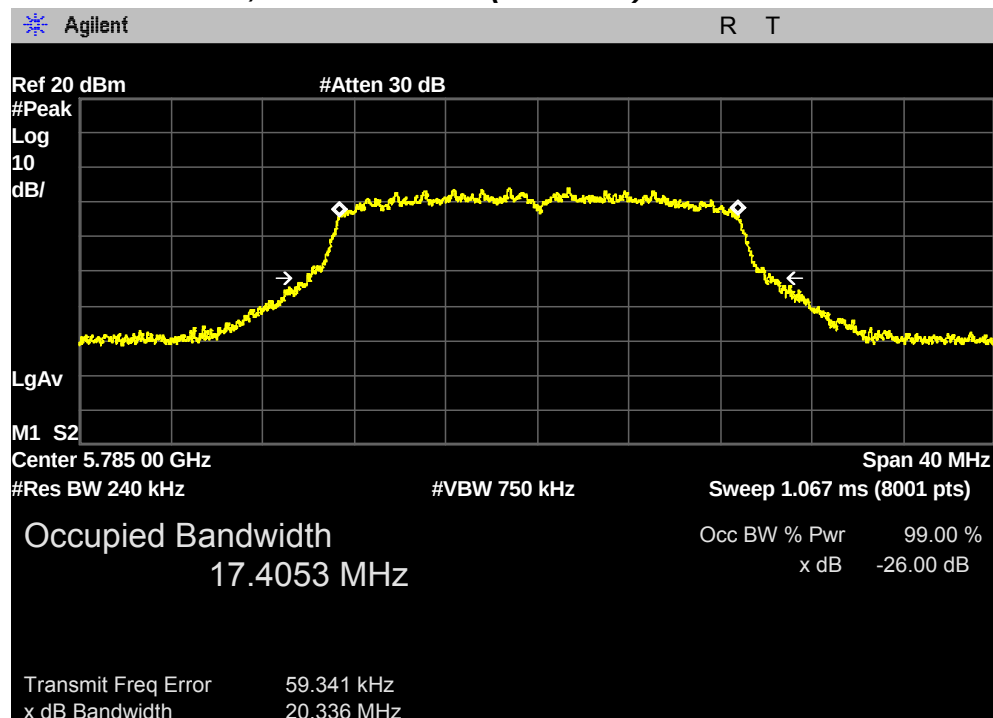


PLOTS OF EMISSIONS

26 dB Bandwidth, Lowest Channel (5745 MHz)

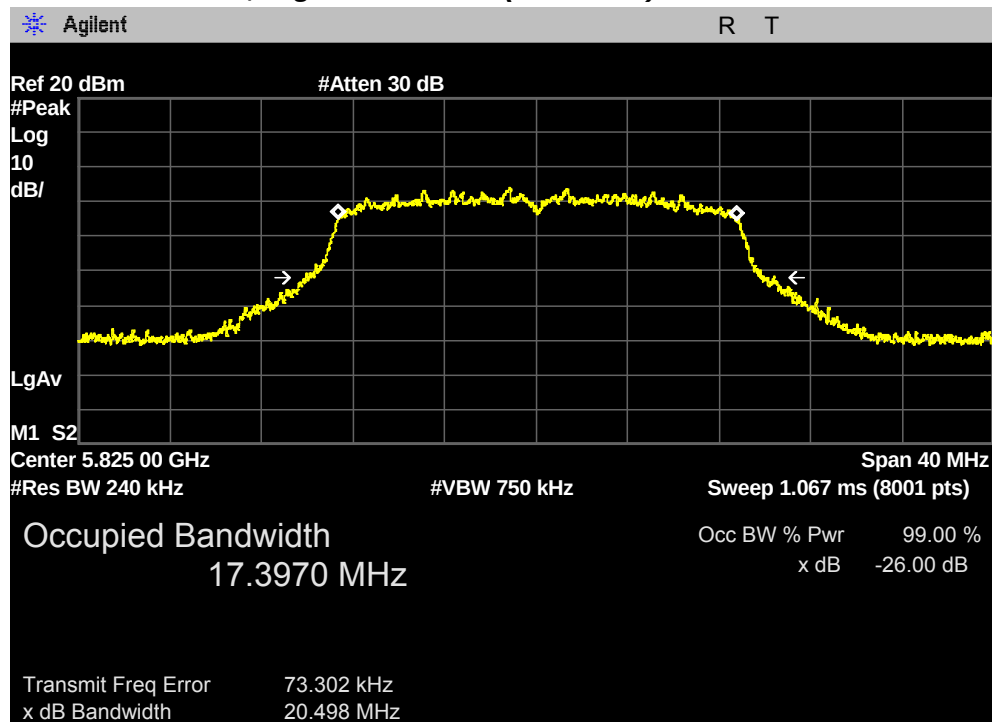


26 dB Bandwidth, Middle Channel (5785 MHz)



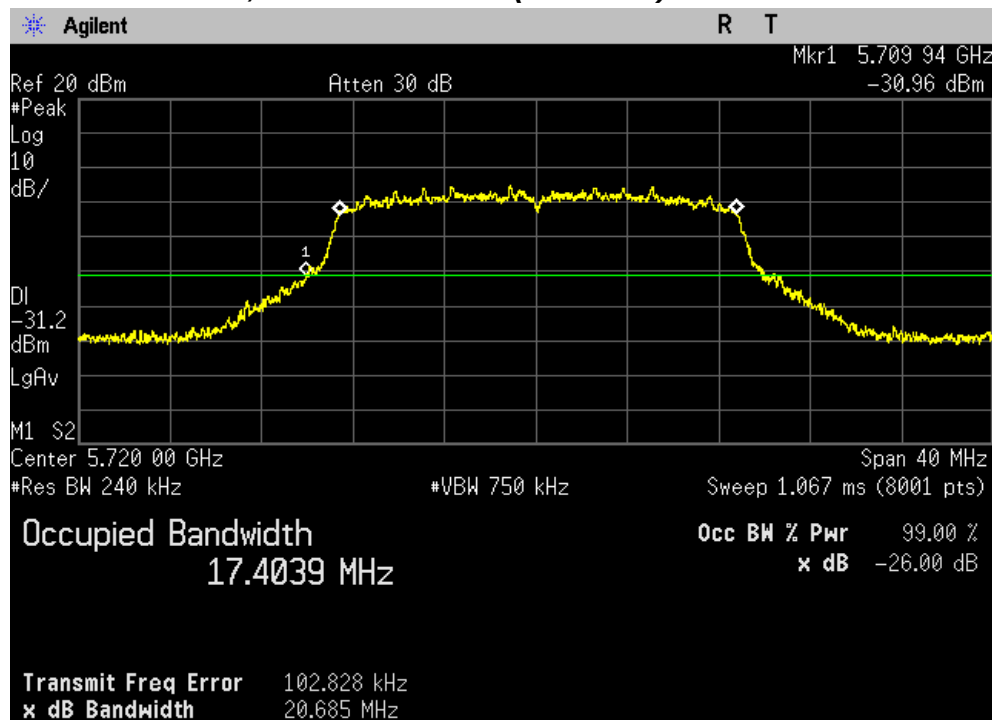
PLOTS OF EMISSIONS

26 dB Bandwidth, Highest Channel (5825 MHz)



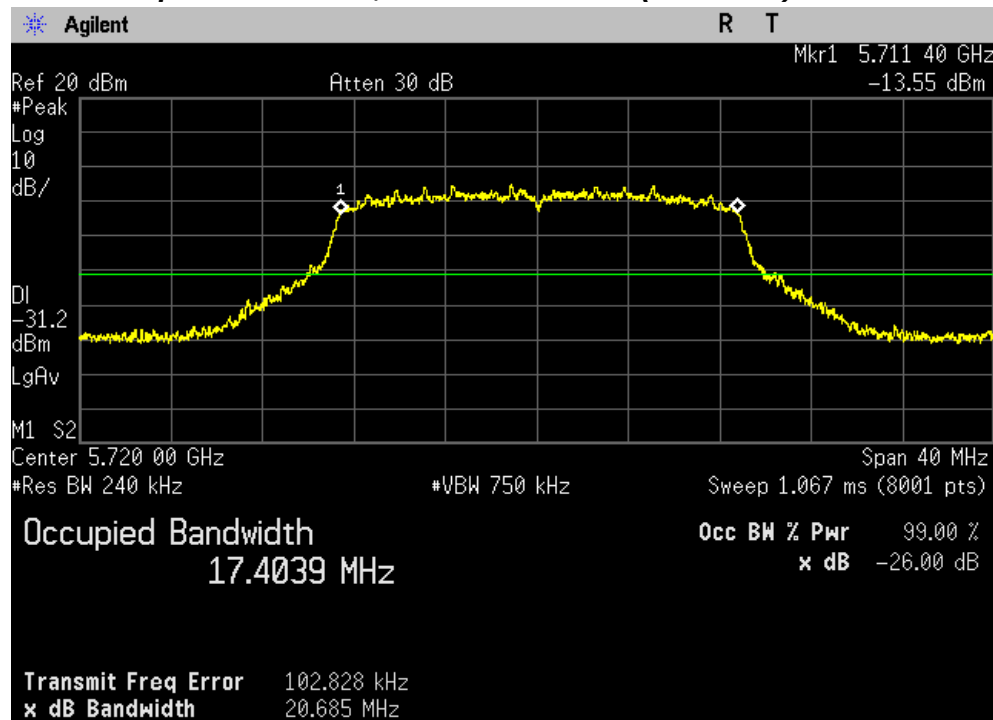
Chain 1

26 dB Bandwidth, Straddle Channel (5720 MHz)

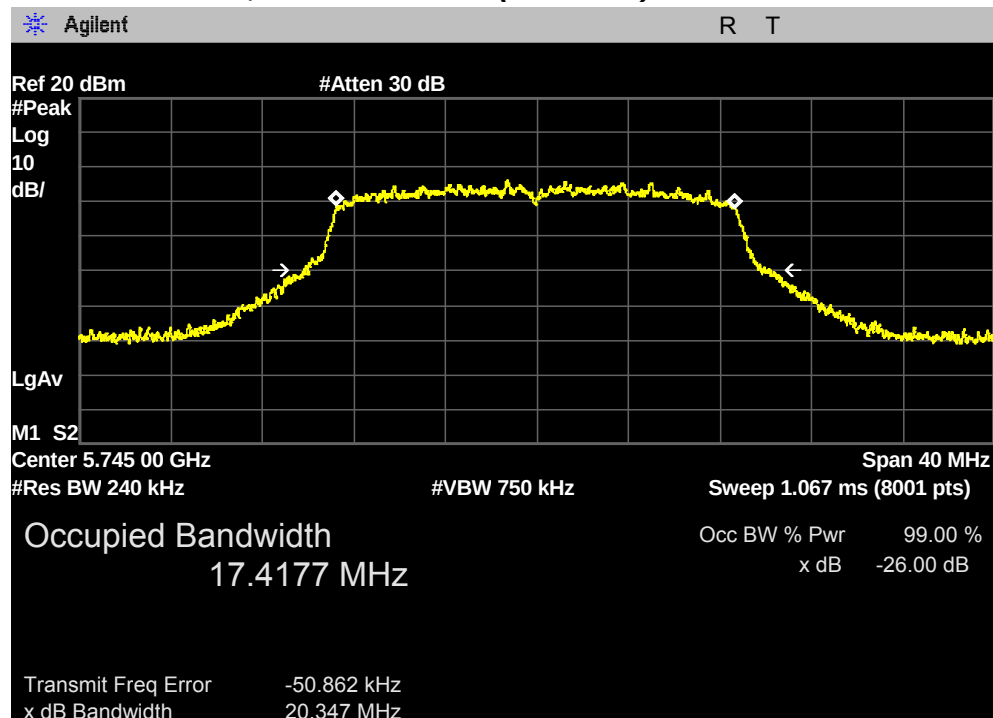


PLOTS OF EMISSIONS

99 % Occupied bandwidth, Straddle Channel (5720 MHz)

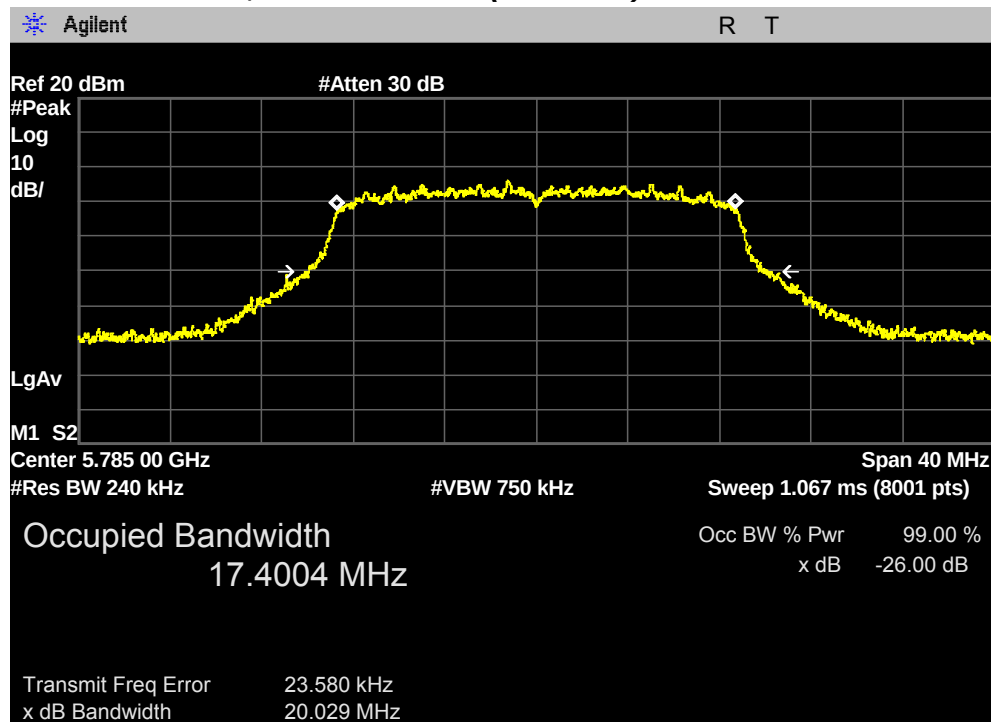


26 dB Bandwidth, Lowest Channel (5745 MHz)

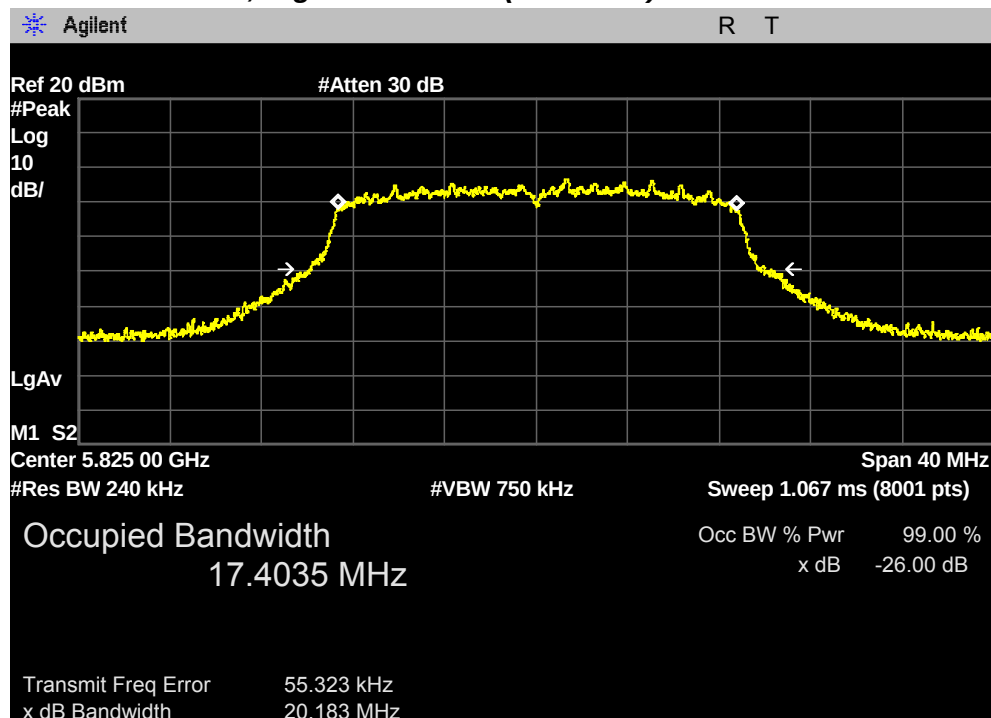


PLOTS OF EMISSIONS

26 dB Bandwidth, Middle Channel (5785 MHz)



26 dB Bandwidth, Highest Channel (5825 MHz)

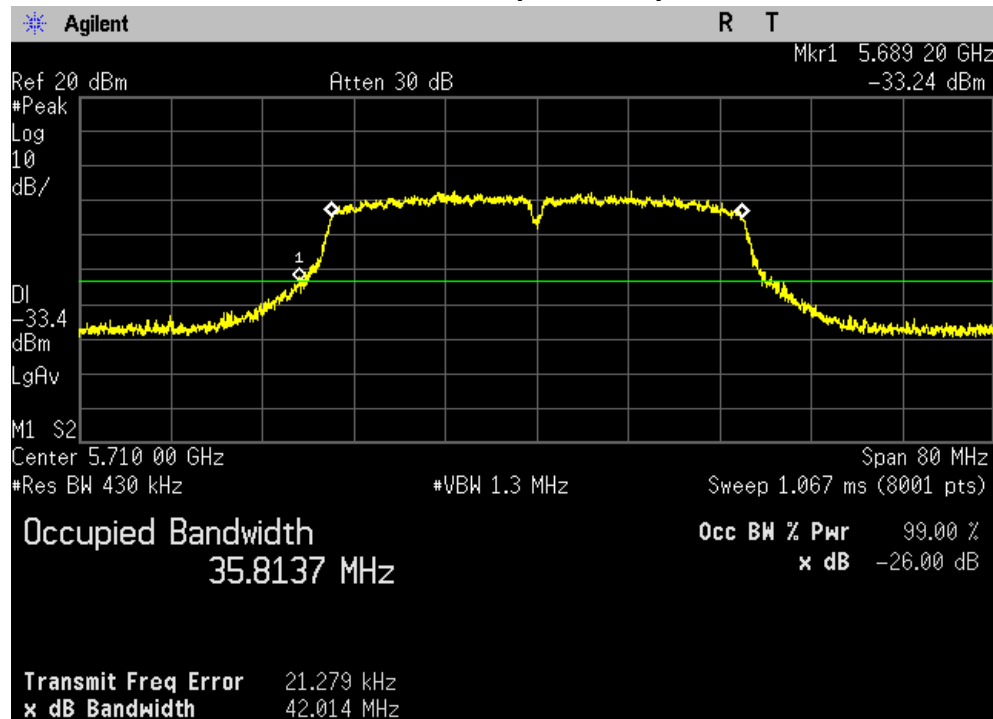


PLOTS OF EMISSIONS

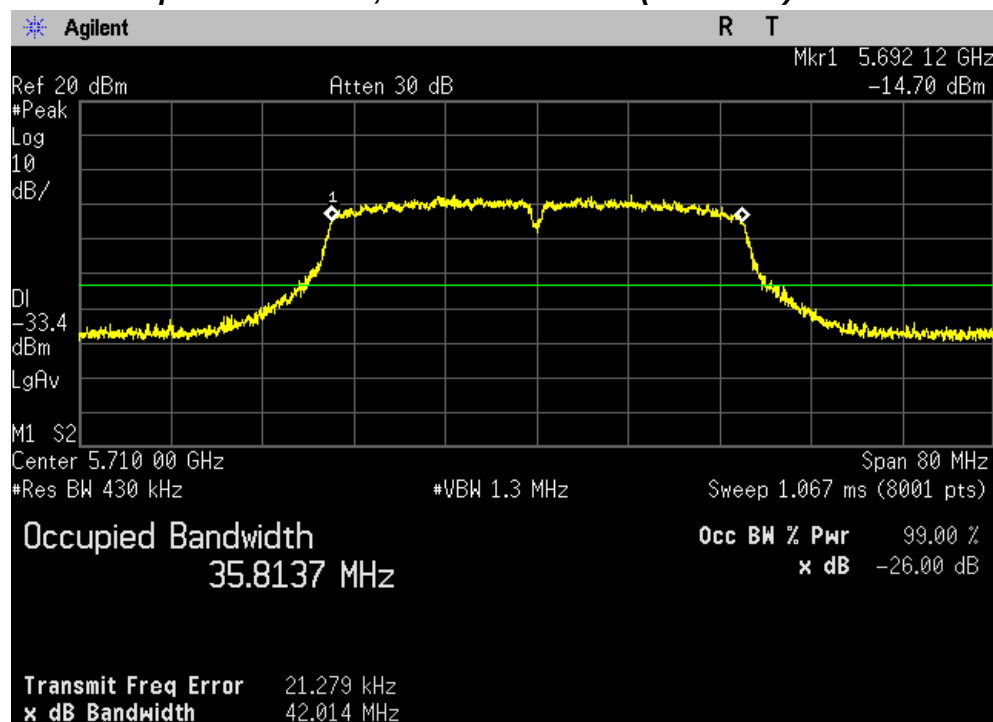
802.11n (40 MHz) mode

Chain 0

26 dB Bandwidth, Straddle Channel (5710 MHz)

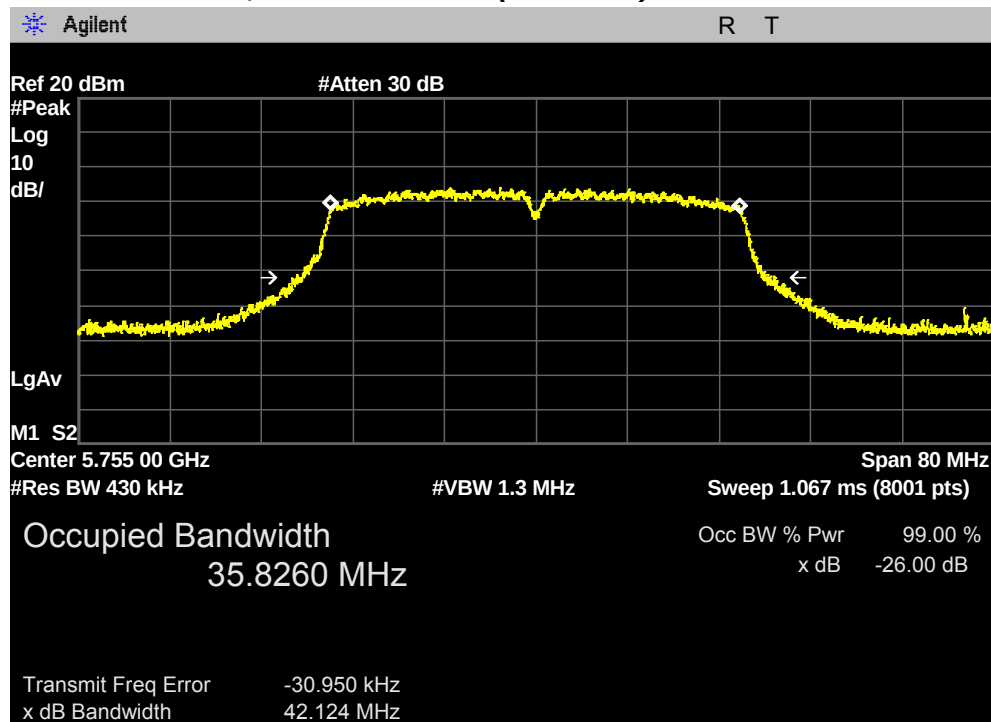


99 % Occupied bandwidth, Straddle Channel (5710 MHz)

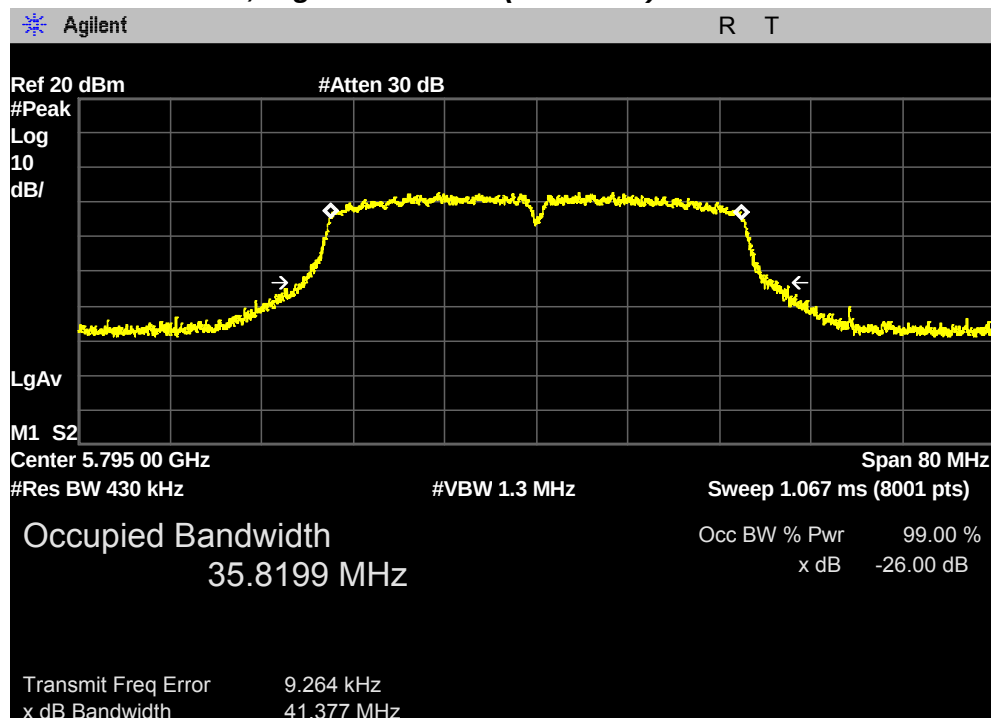


PLOTS OF EMISSIONS

26 dB Bandwidth, Lowest Channel (5755 MHz)



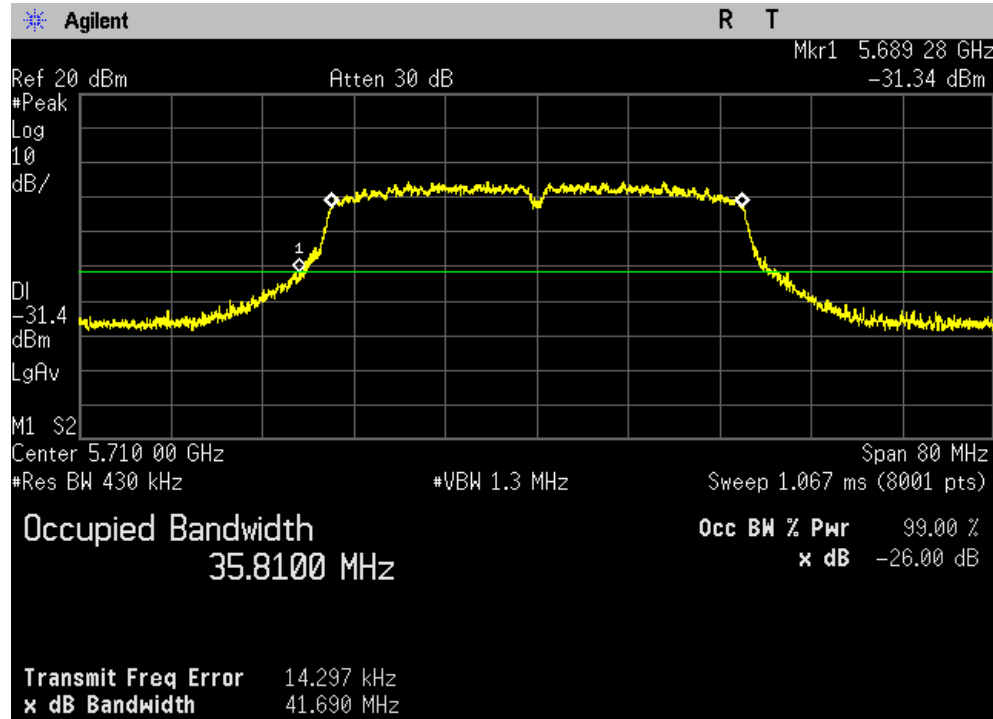
26 dB Bandwidth, Highest Channel (5795 MHz)



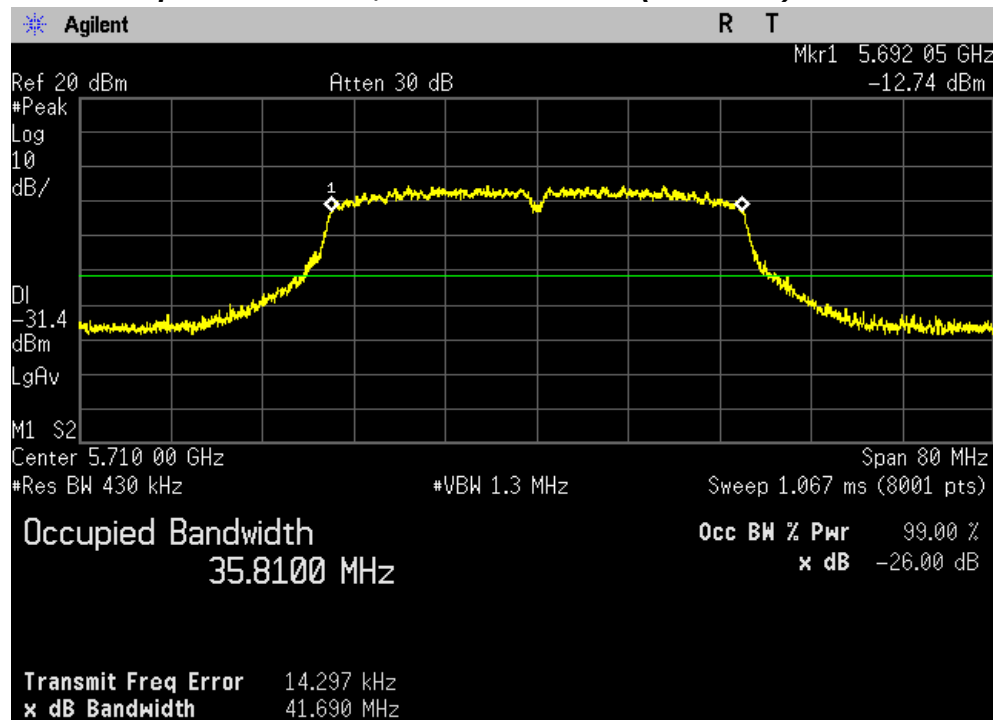
PLOTS OF EMISSIONS

Chain 1

26 dB Bandwidth, Straddle Channel (5710 MHz)

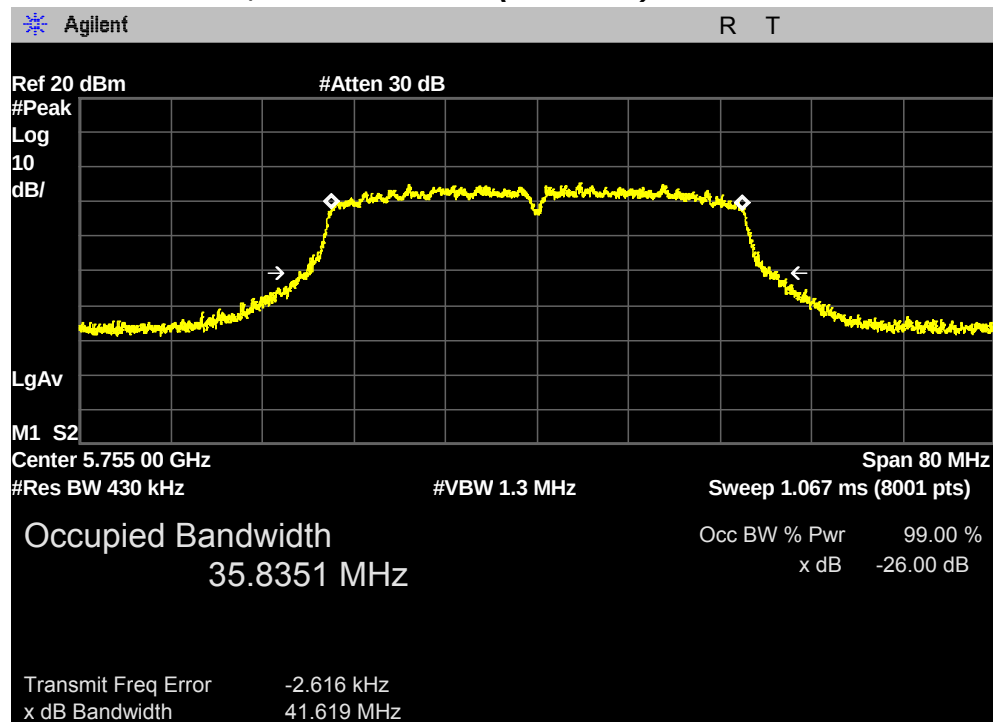


99 % Occupied bandwidth, Straddle Channel (5710 MHz)

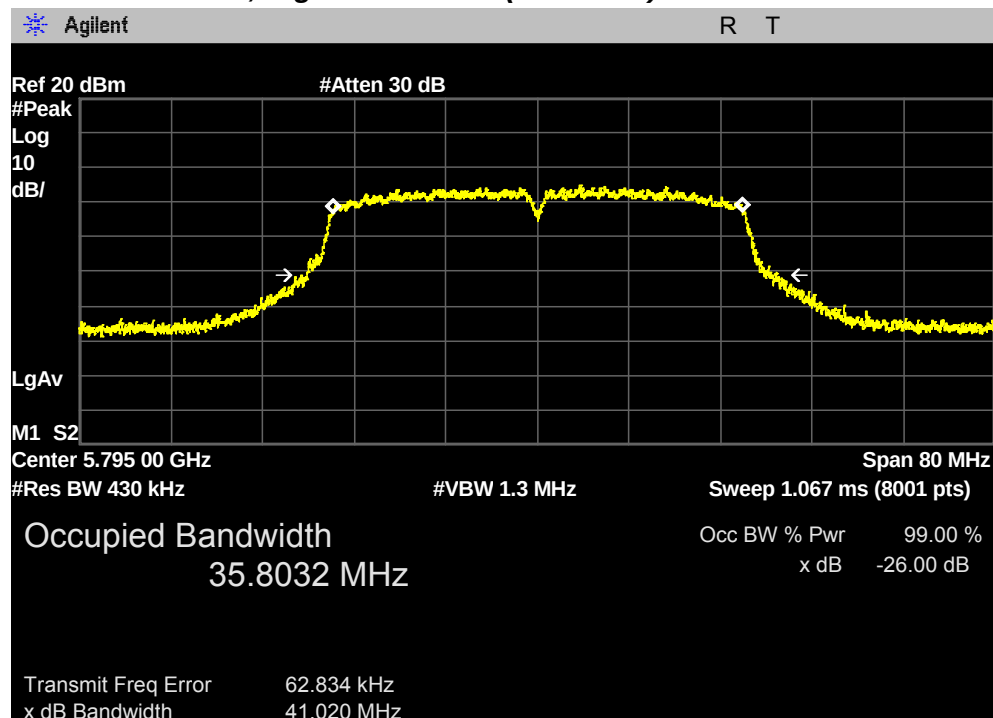


PLOTS OF EMISSIONS

26 dB Bandwidth, Lowest Channel (5755 MHz)



26 dB Bandwidth, Highest Channel (5795 MHz)

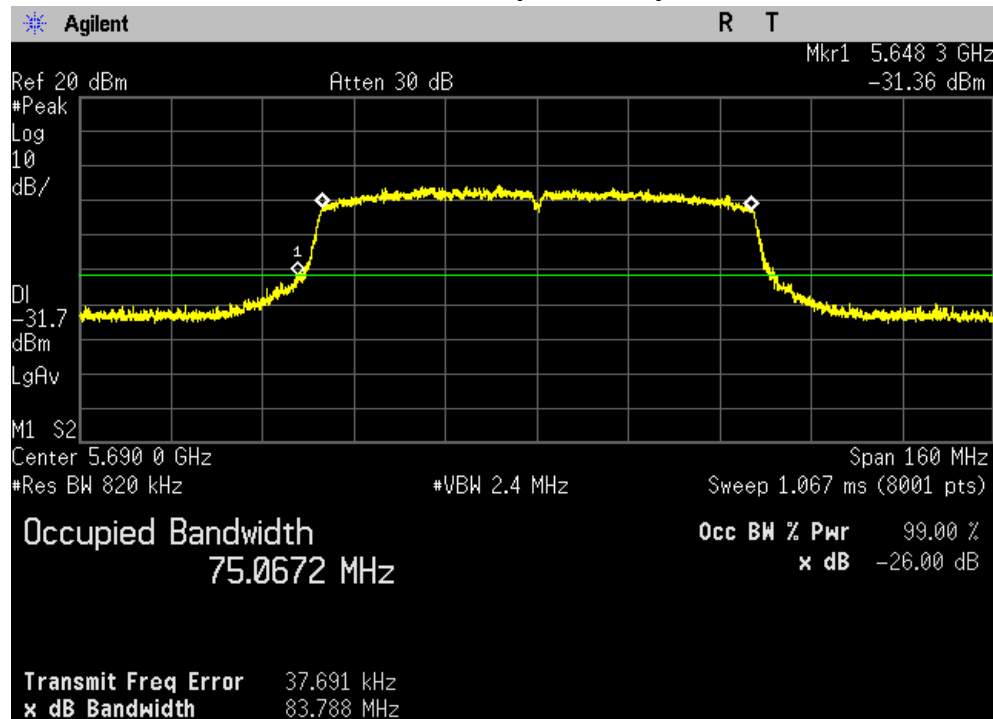


PLOTS OF EMISSIONS

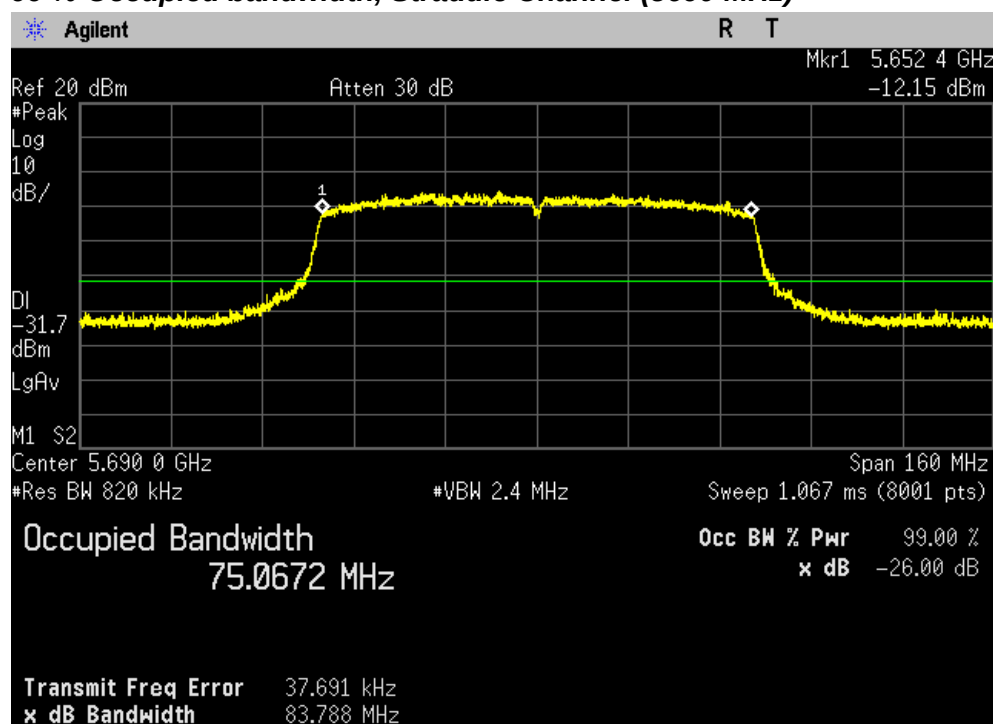
802.11ac (80 MHz) mode

Chain 0

26 dB Bandwidth, Straddle Channel (5690 MHz)

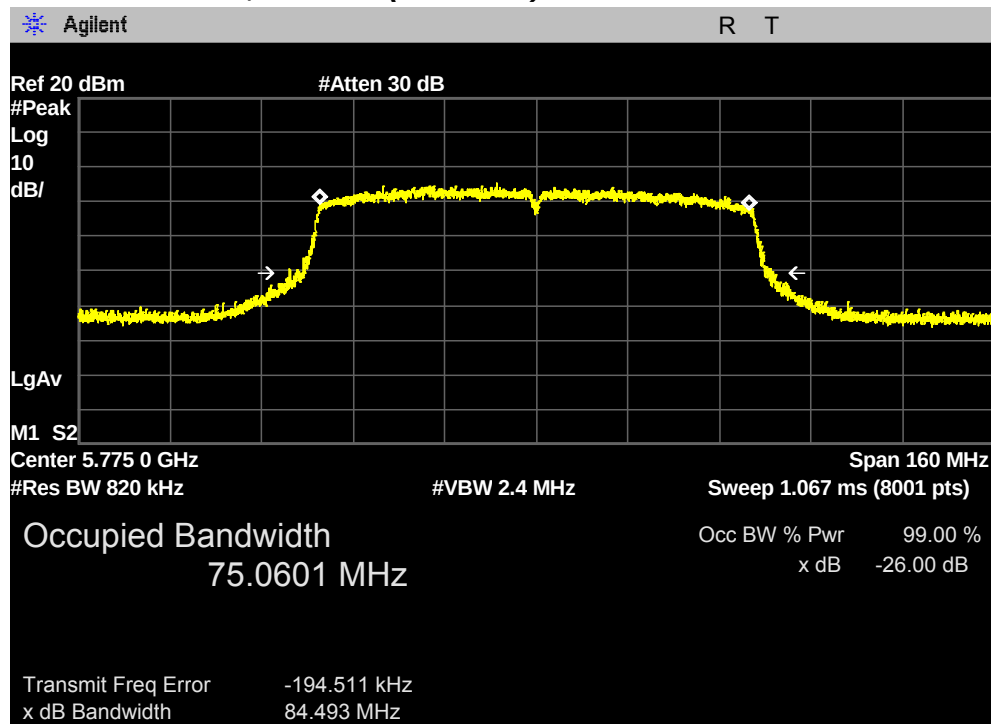


99 % Occupied bandwidth, Straddle Channel (5690 MHz)



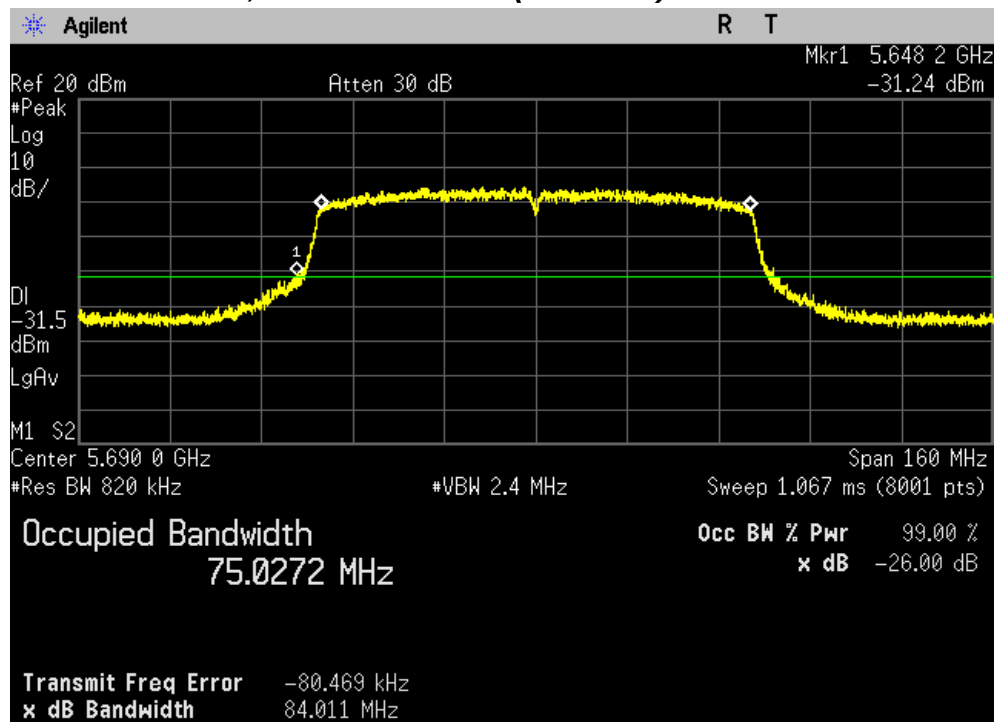
PLOTS OF EMISSIONS

26 dB Bandwidth, Channel (5775 MHz)



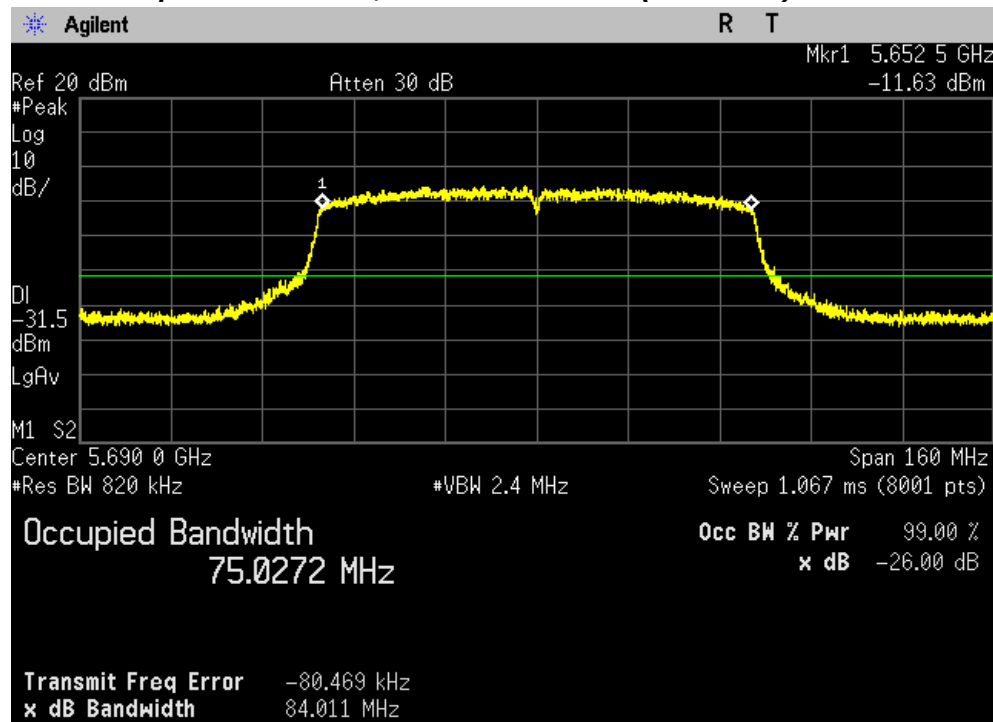
Chain 0

26 dB Bandwidth, Straddle Channel (5690 MHz)

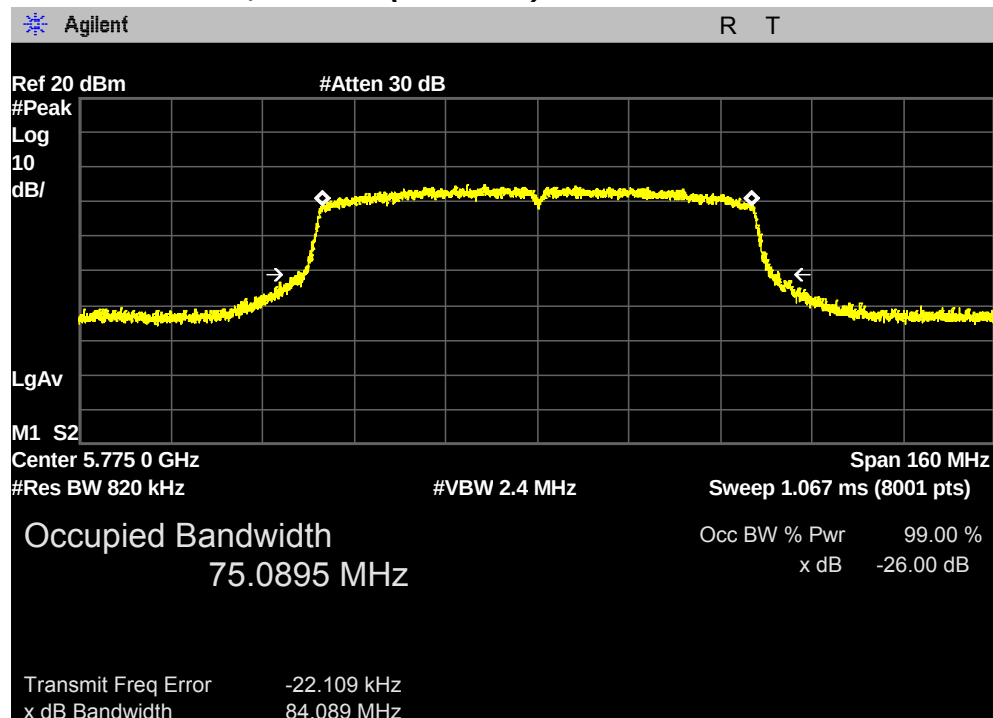


PLOTS OF EMISSIONS

99 % Occupied bandwidth, Straddle Channel (5690 MHz)



26 dB Bandwidth, Channel (5775 MHz)



TEST DATA

8.4 6 dB Bandwidth – UNII-3 band

FCC §15.407(e) , RSS-247 Issue 2 6.2

Test Mode : Set to Straddle channel, Lowest channel, Middle channel and Highest channel

802.11a mode

Channel	Frequency(MHz)	6dB Emission Bandwidth(MHz)		Limit (kHz)
		Chain 0	Chain 1	
Straddle	5720	2.72	2.58	>500
Lowest	5745	14.46	15.07	
Middle	5785	15.15	14.90	
Highest	5825	14.45	15.08	

802.11n (20 MHz) mode

Channel	Frequency(MHz)	6dB Emission Bandwidth(MHz)		Limit (kHz)
		Chain 0	Chain 1	
Straddle	5720	2.78	2.54	>500
Lowest	5745	14.93	15.13	
Middle	5785	14.00	15.12	
Highest	5825	15.12	15.11	

TEST DATA

802.11n (40 MHz) mode

Channel	Frequency(MHz)	6dB Emission Bandwidth(MHz)		Limit (kHz)
		Chain 0	Chain 1	
Straddle	5710	2.49	2.53	>500
Lowest	5755	35.08	35.06	
Highest	5795	35.09	33.87	

802.11ac (80 MHz) mode

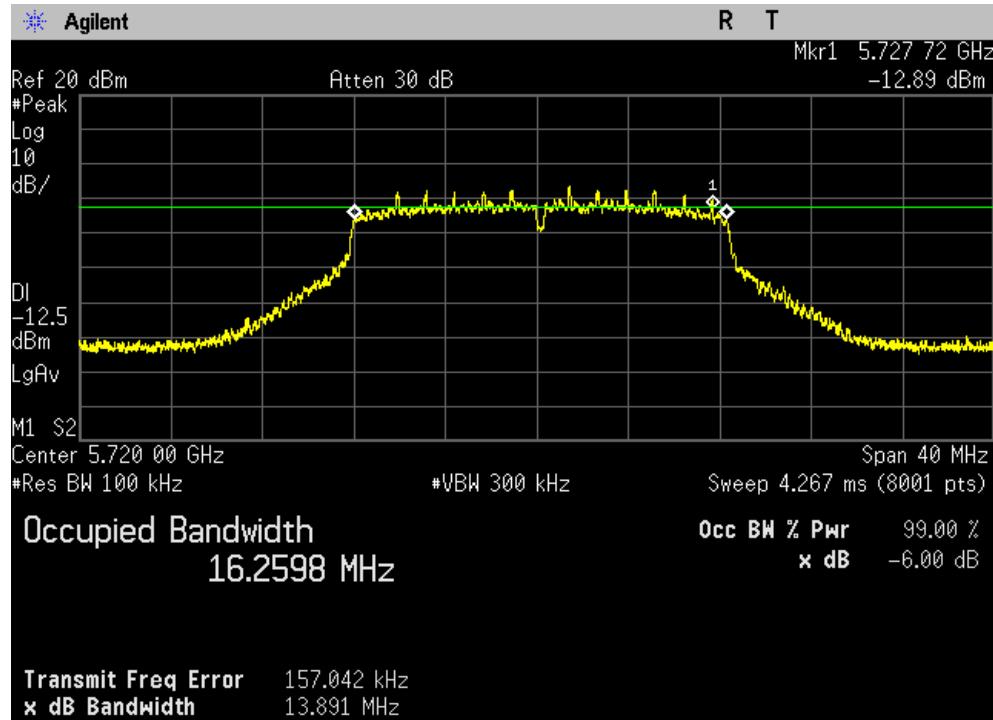
Channel	Frequency(MHz)	6dB Emission Bandwidth(MHz)		Limit (kHz)
		Chain 0	Chain 1	
Straddle	5690	1.30	2.50	>500
Middle	5775	73.84	74.99	

PLOTS OF EMISSIONS

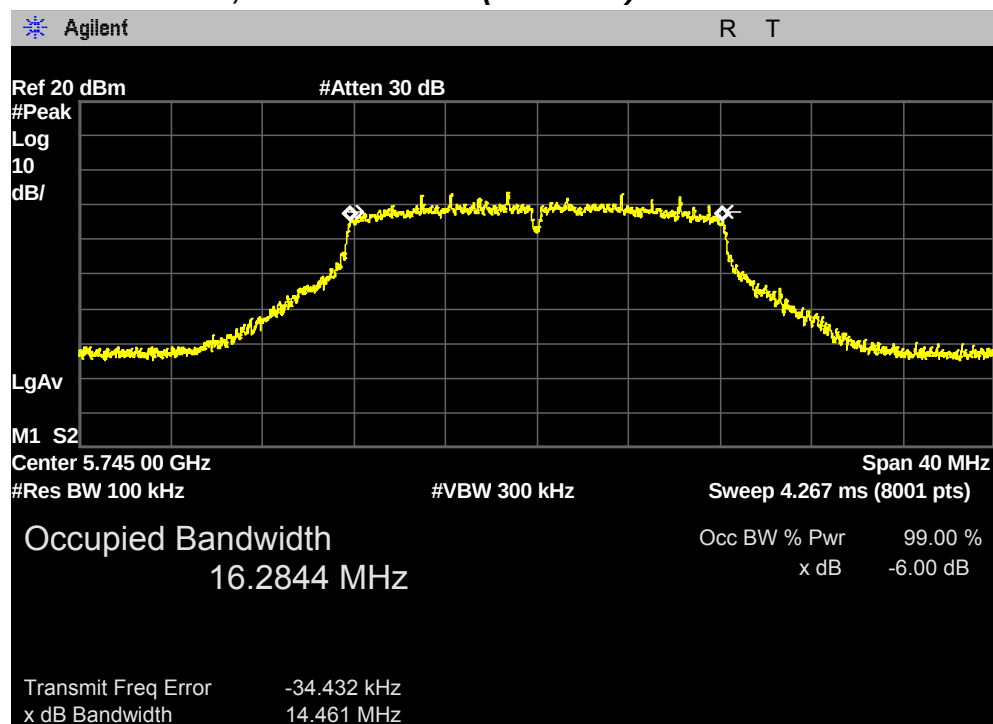
802.11a mode

Chain 0

6 dB Bandwidth, Straddle Channel (5720 MHz)

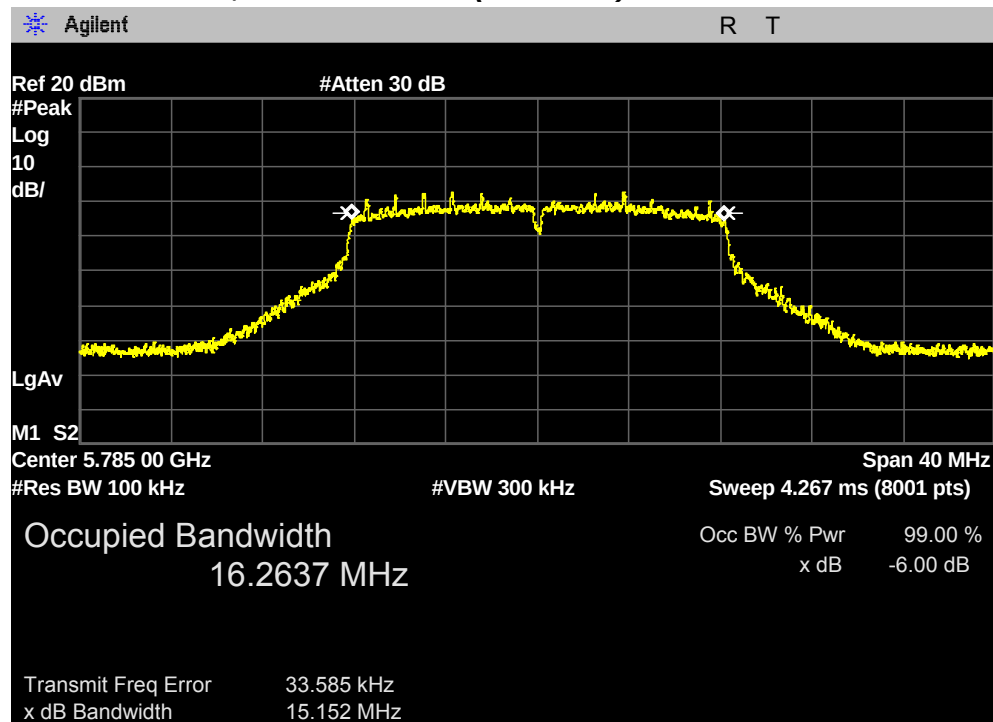


6 dB Bandwidth, Lowest Channel (5745 MHz)

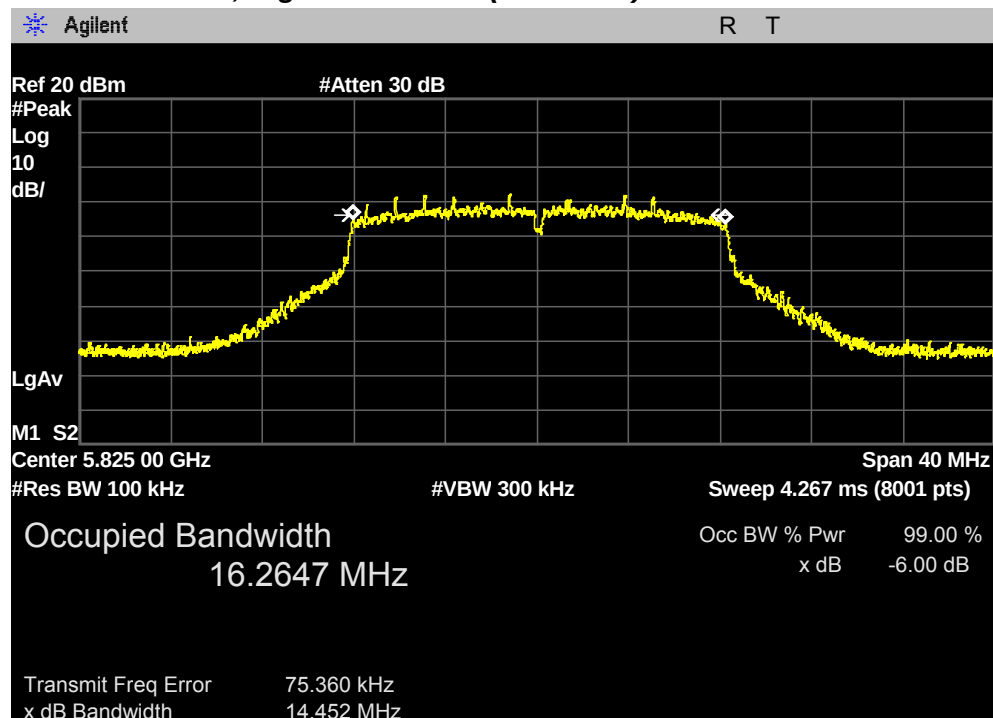


PLOTS OF EMISSIONS

6 dB Bandwidth, Middle Channel (5785 MHz)



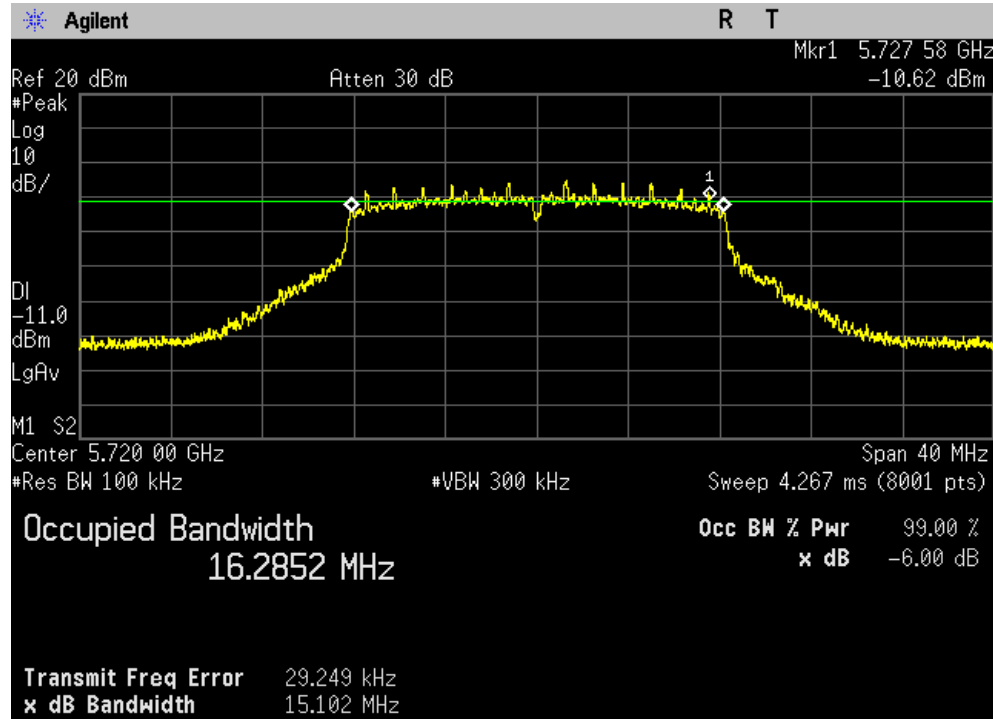
6 dB Bandwidth, Highest Channel (5825 MHz)



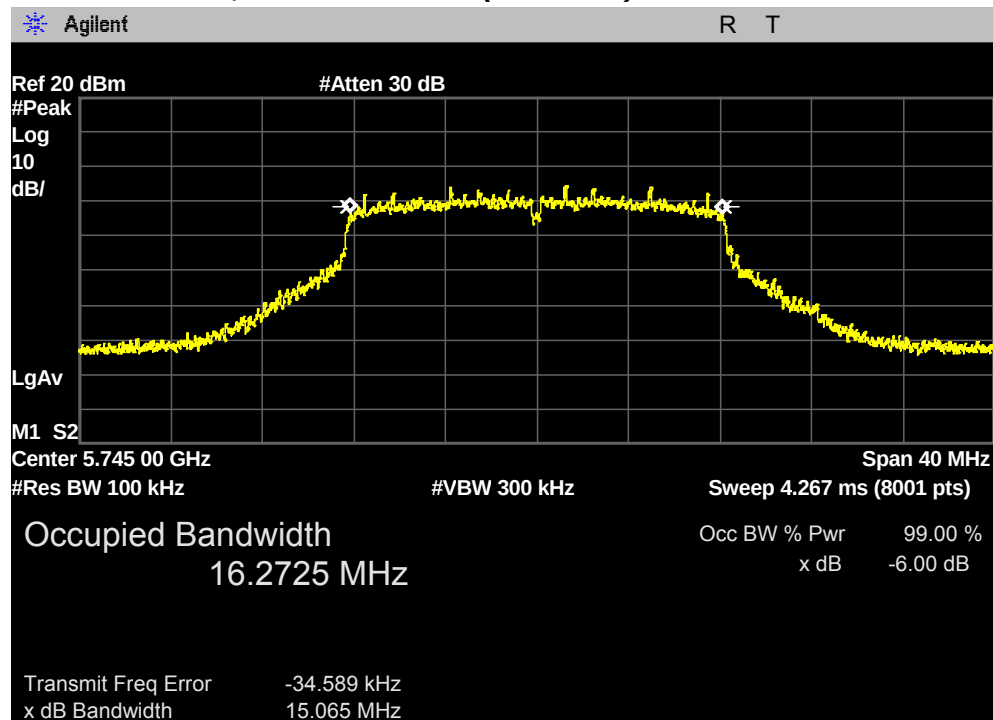
PLOTS OF EMISSIONS

Chain 1

6 dB Bandwidth, Straddle Channel (5720 MHz)

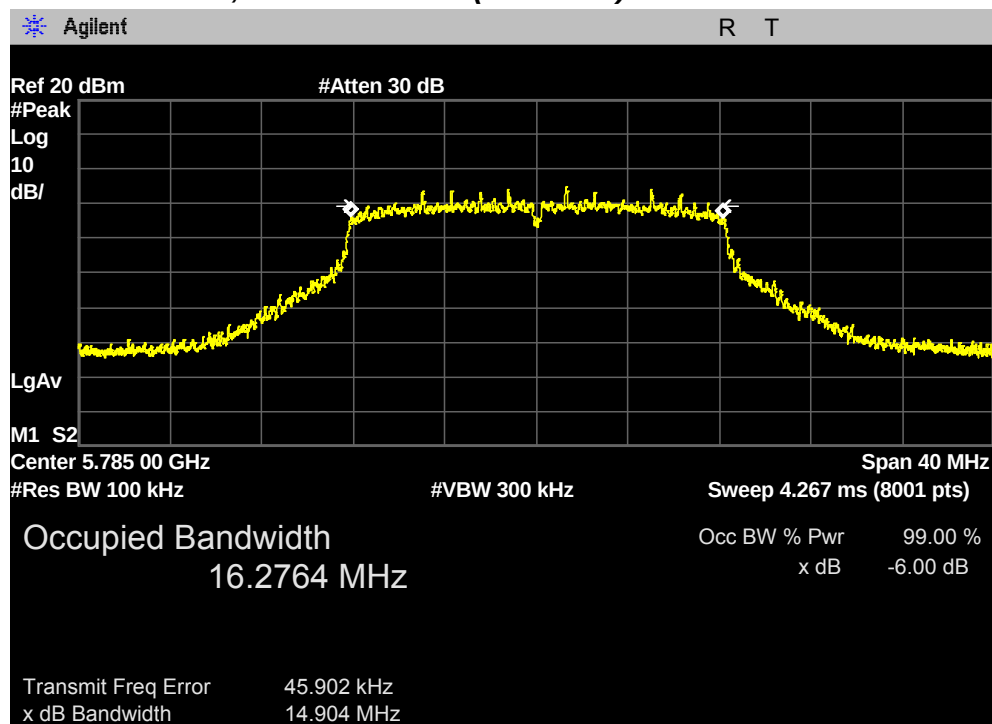


6 dB Bandwidth, Lowest Channel (5745 MHz)

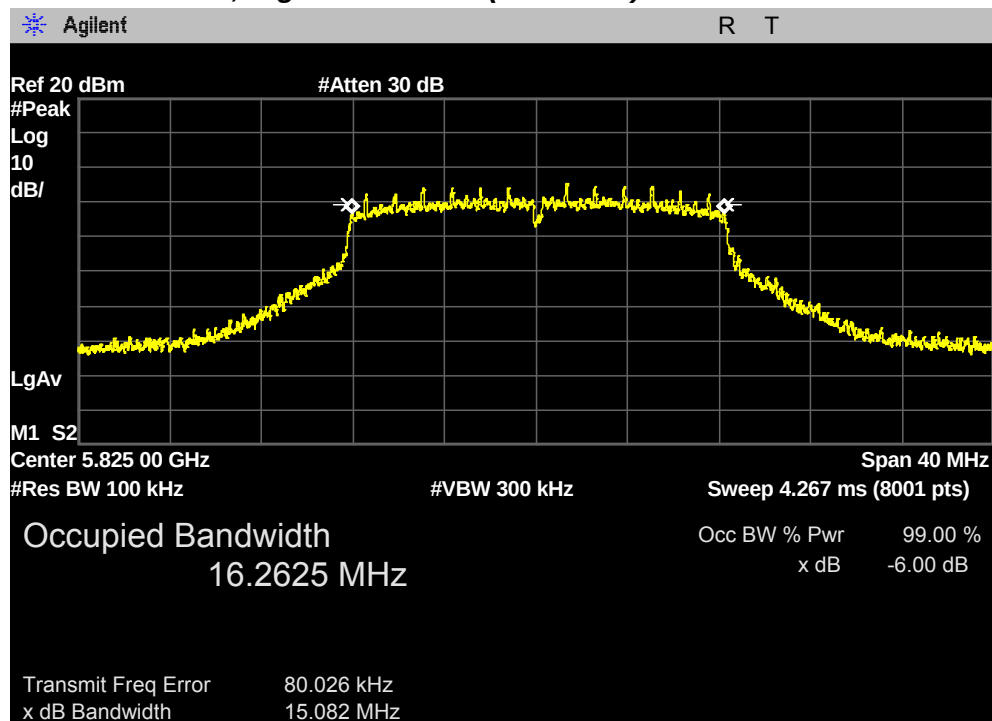


PLOTS OF EMISSIONS

6 dB Bandwidth, Middle Channel (5785 MHz)



6 dB Bandwidth, Highest Channel (5825 MHz)

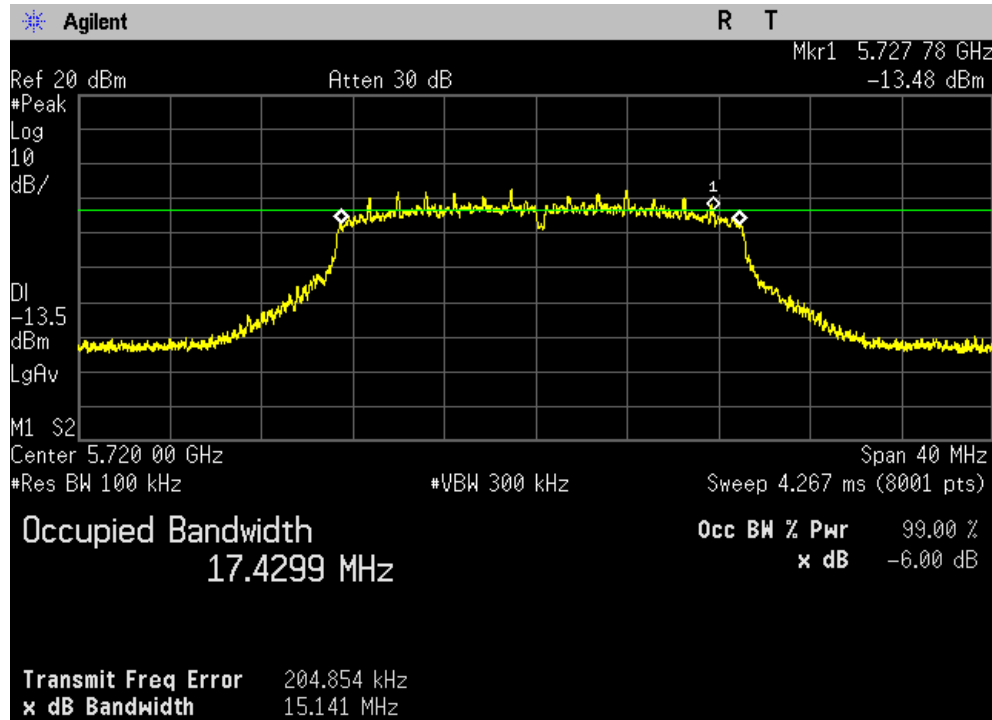


PLOTS OF EMISSIONS

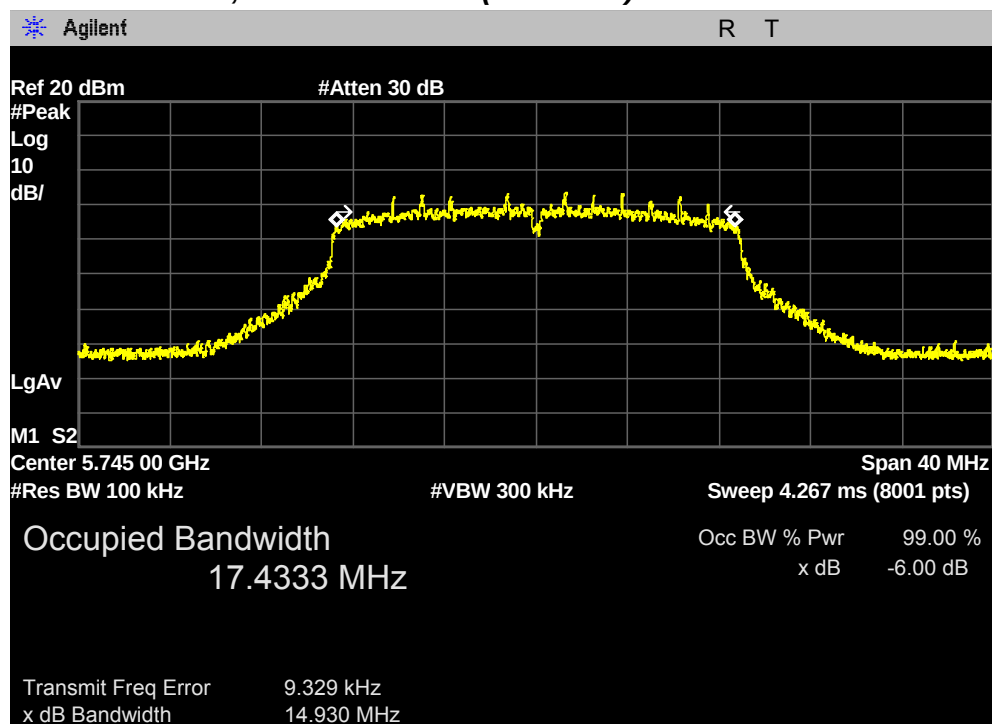
802.11n (20 MHz) mode

Chain 0

6 dB Bandwidth, Straddle Channel (5720 MHz)

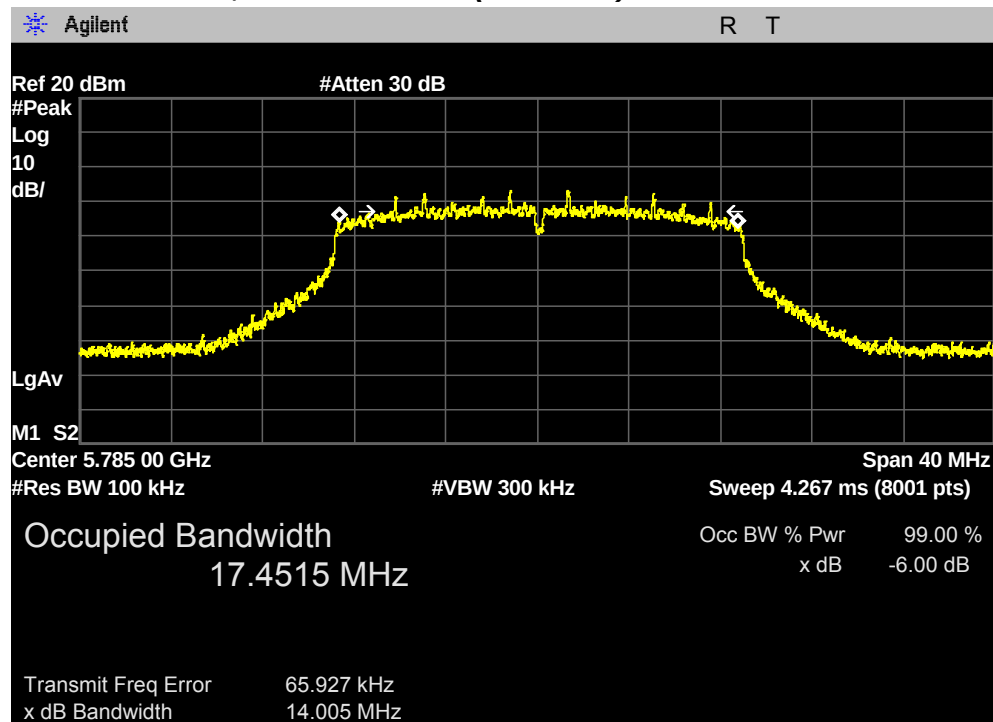


6 dB Bandwidth, Lowest Channel (5745 MHz)

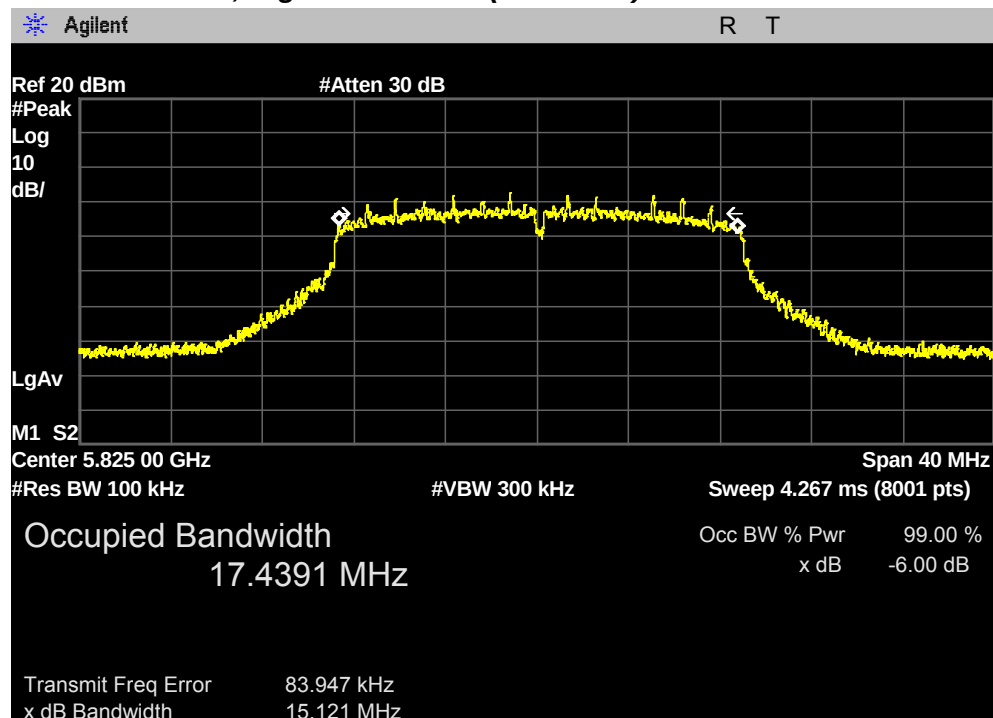


PLOTS OF EMISSIONS

6 dB Bandwidth, Middle Channel (5785 MHz)



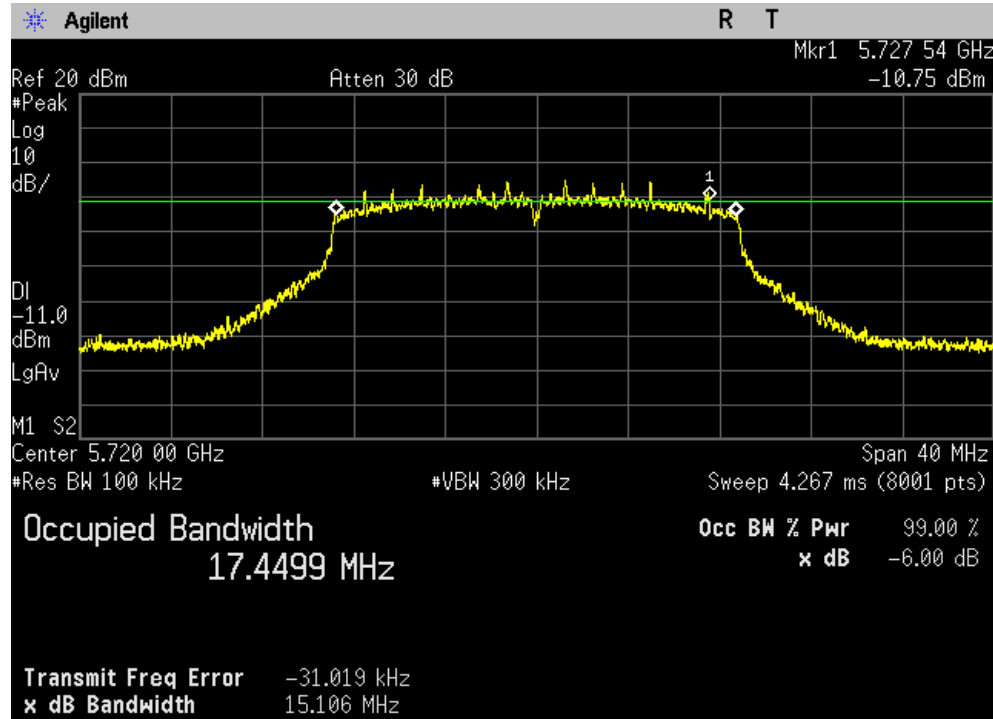
6 dB Bandwidth, Highest Channel (5825 MHz)



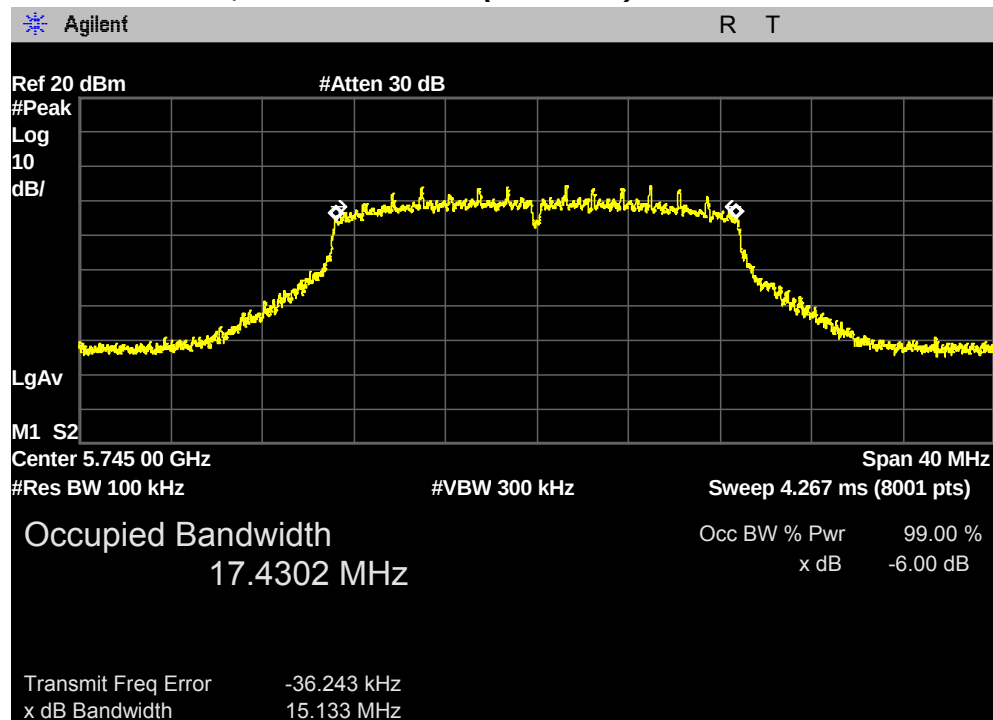
PLOTS OF EMISSIONS

Chain 1

6 dB Bandwidth, Straddle Channel (5720 MHz)

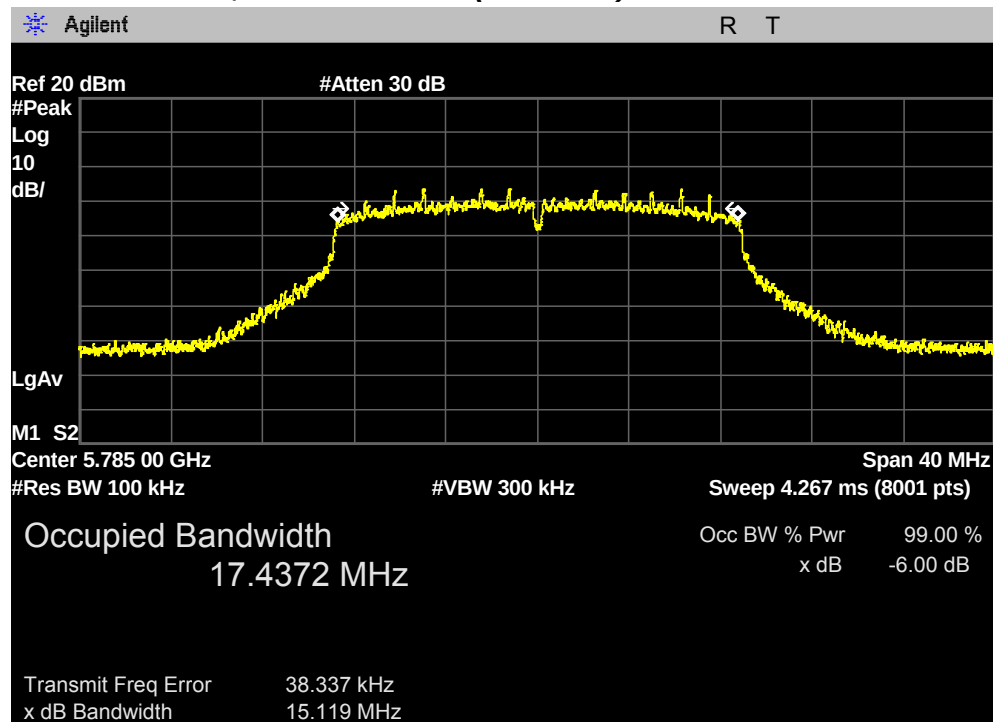


6 dB Bandwidth, Lowest Channel (5745 MHz)

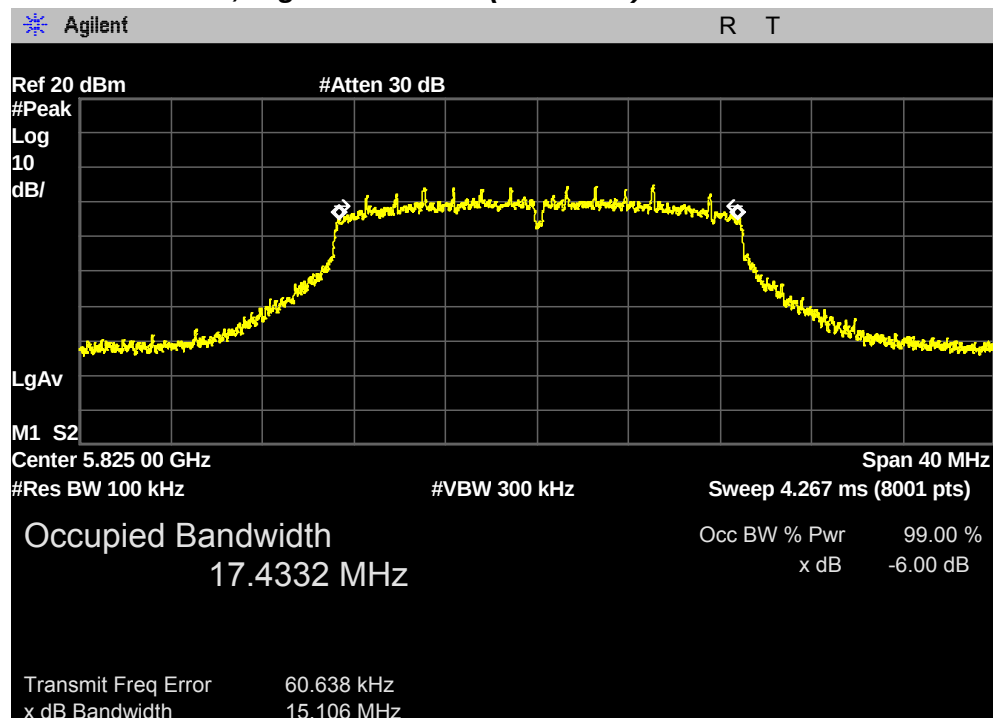


PLOTS OF EMISSIONS

6 dB Bandwidth, Middle Channel (5785 MHz)



6 dB Bandwidth, Highest Channel (5825 MHz)

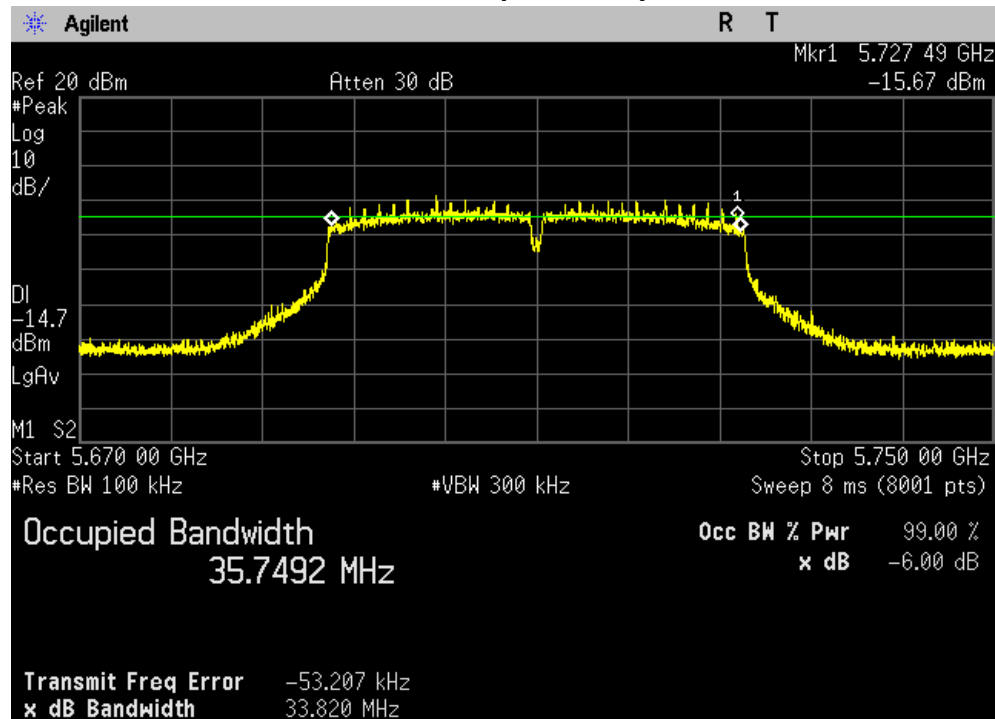


PLOTS OF EMISSIONS

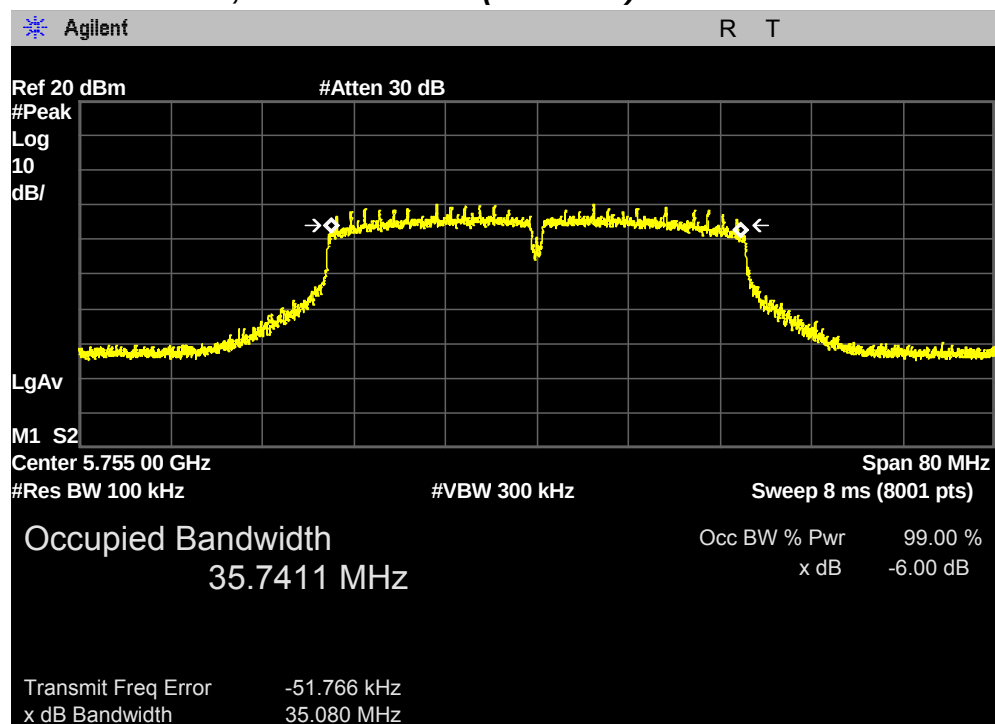
802.11n (40 MHz) mode

Chain 0

6 dB Bandwidth, Straddle Channel (5710 MHz)

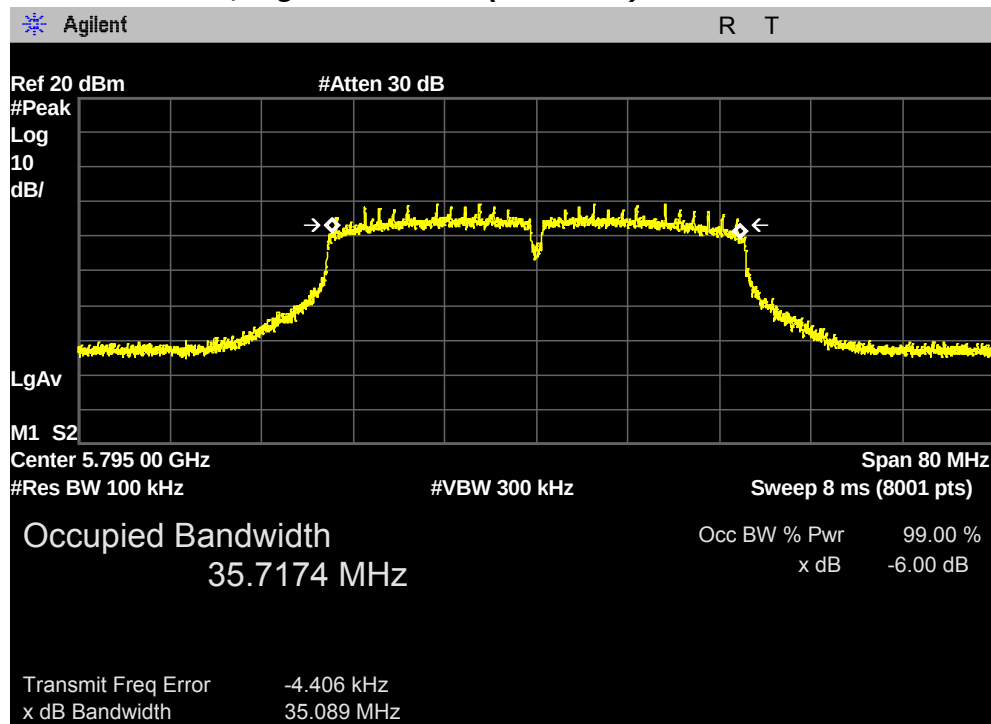


6 dB Bandwidth, Lowest Channel (5755 MHz)



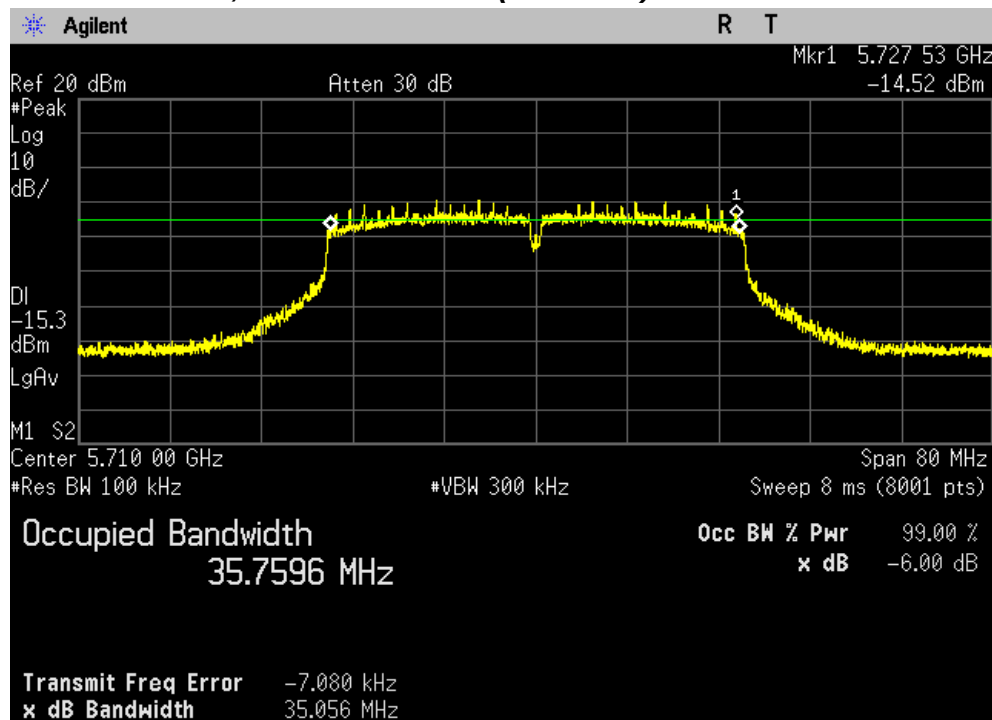
PLOTS OF EMISSIONS

6 dB Bandwidth, Highest Channel (5795 MHz)



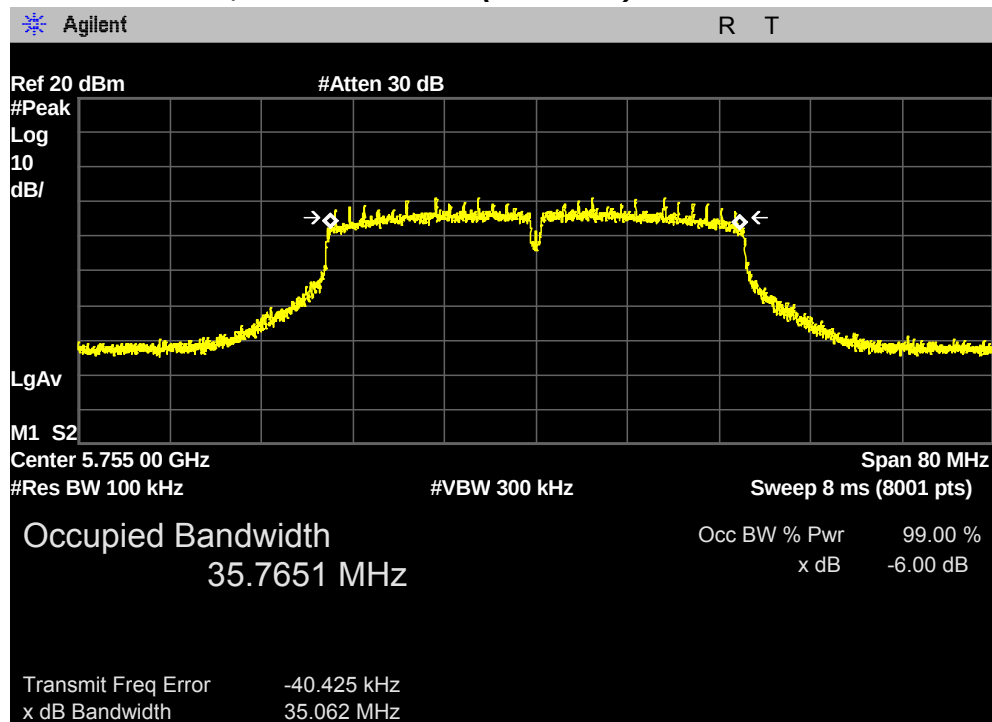
Chain 1

6 dB Bandwidth, Straddle Channel (5710 MHz)

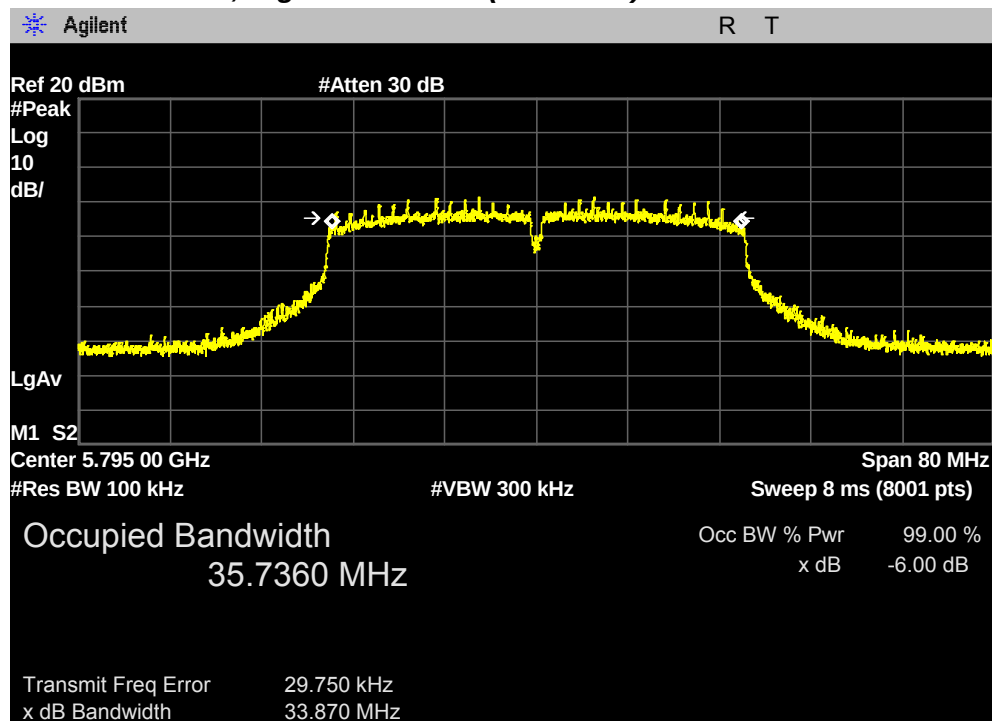


PLOTS OF EMISSIONS

6 dB Bandwidth, Lowest Channel (5755 MHz)



6 dB Bandwidth, Highest Channel (5795 MHz)

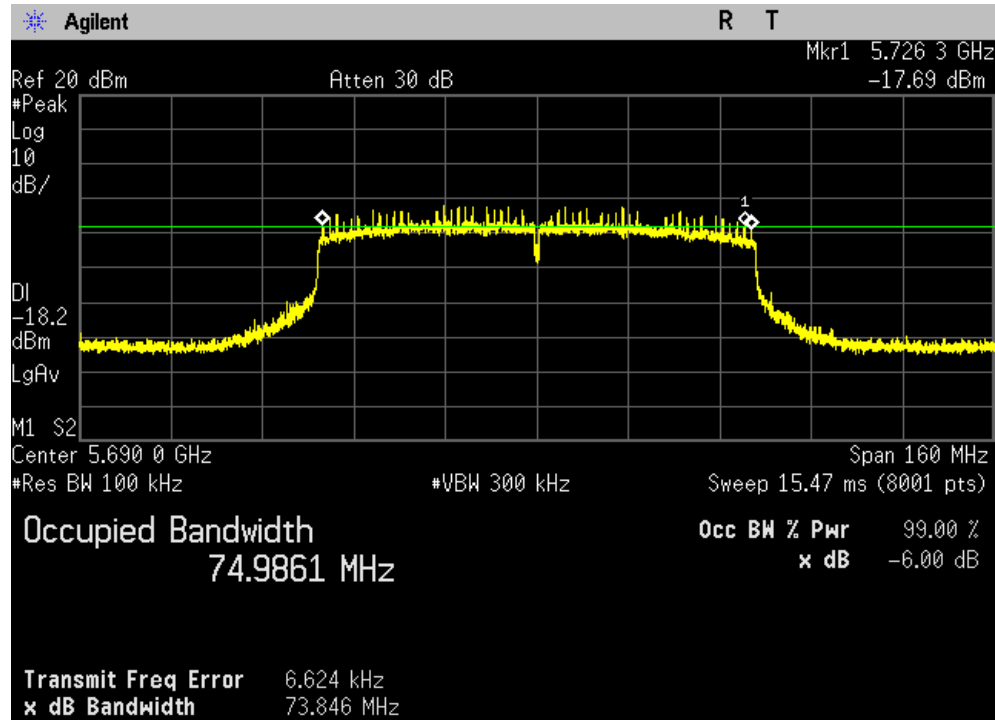


PLOTS OF EMISSIONS

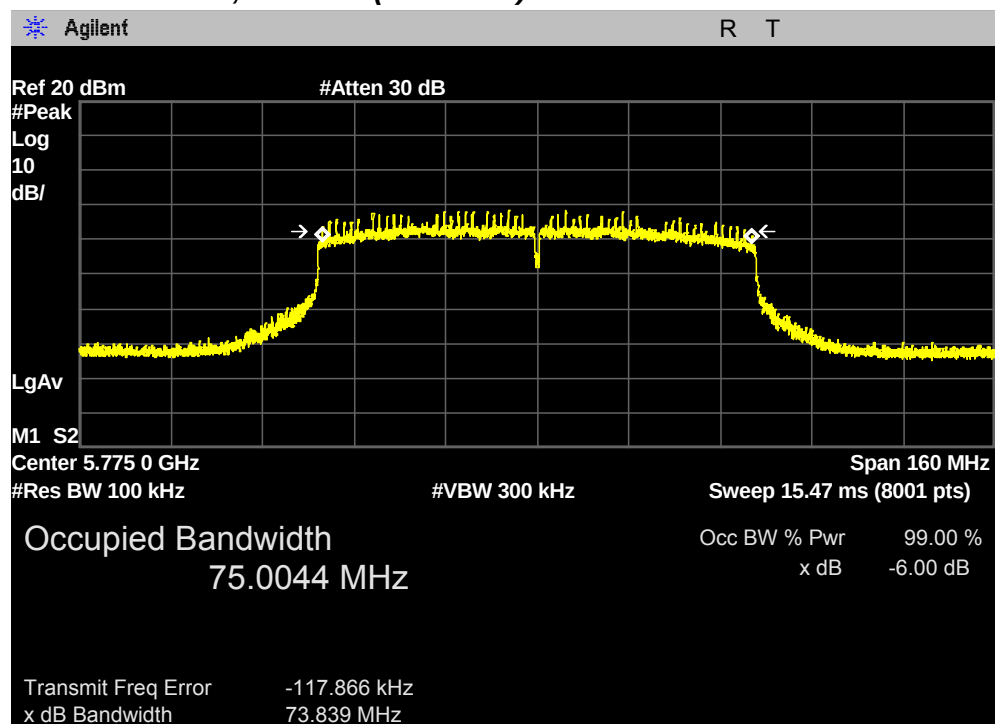
802.11ac (80 MHz) mode

Chain 0

6 dB Bandwidth, Straddle Channel (5690 MHz)



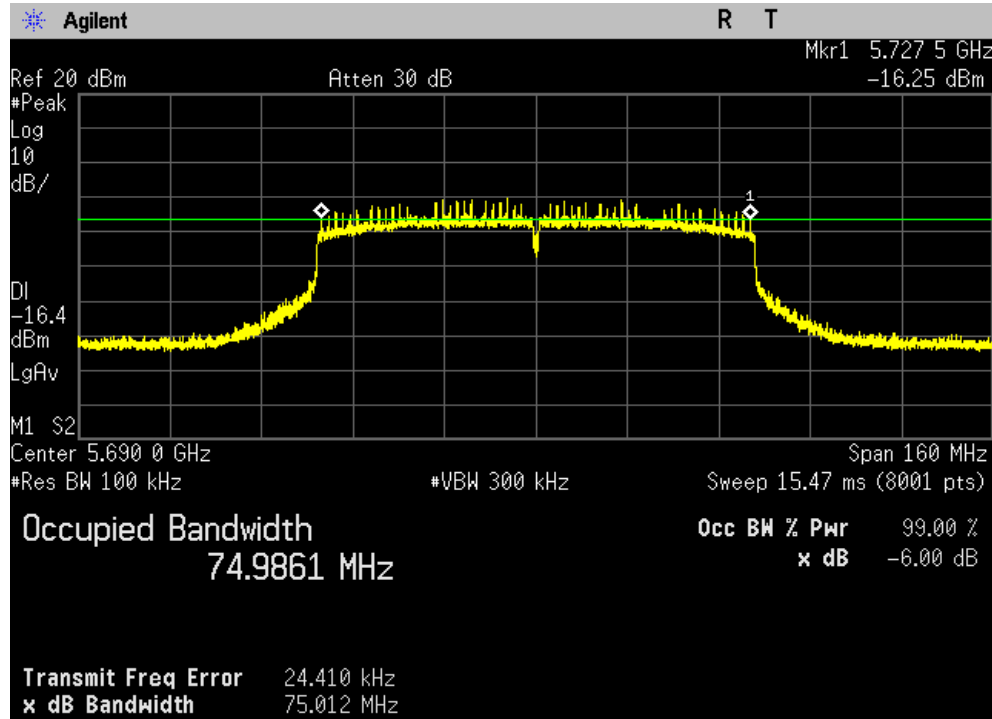
6 dB Bandwidth, Channel (5775 MHz)



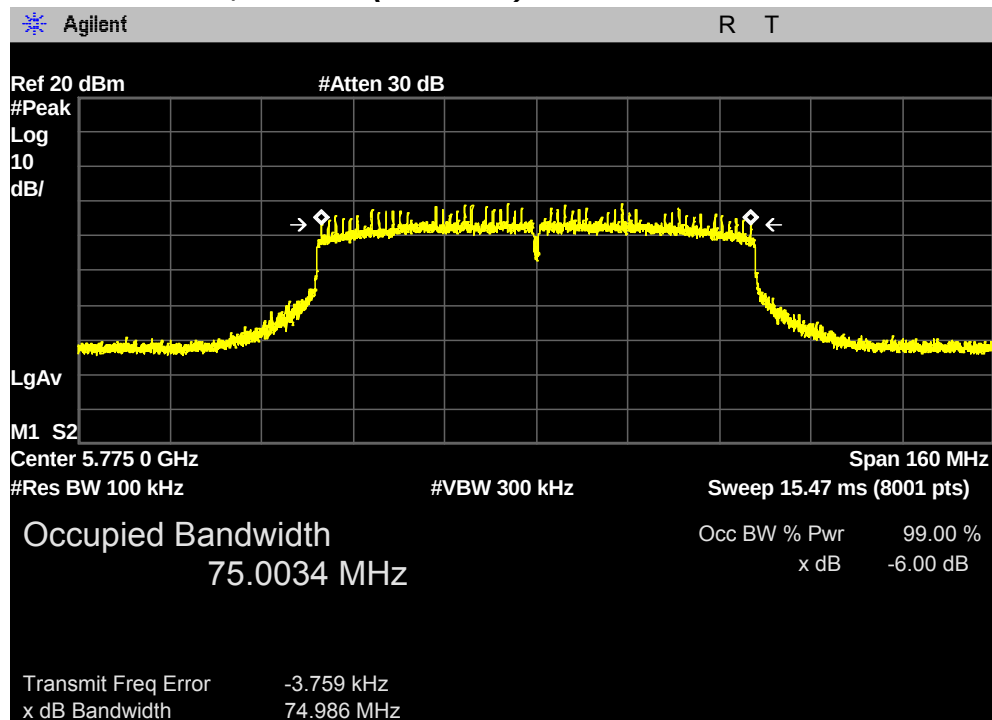
PLOTS OF EMISSIONS

Chain 1

6 dB Bandwidth, Straddle Channel (5690 MHz)



6 dB Bandwidth, Channel (5775 MHz)



TEST DATA

8.5 Maximum Conducted Output Power (average)

8.5.1 Maximum Conducted Output Power – U-NII-1 band

FCC §15.407(a) , RSS-247 Issue 2 6.2

Test Mode : Set to Lowest channel, Middle channel and Highest channel

802.11a mode

Channel	Frequency (MHz)	Measured conducted power (dBm)		Duty Factor (dB)	Maximum Conducted Power (dBm)	FCC Limit (dBm)	E.I.R.P (dBm)	IC E.I.R.P Limit (dBm)
		Chain 0	Chain 1		Total output power			
Lowest	5180	1.62	4.93	0.36	6.95	23.98	14.25	22.11
Middle	5220	1.81	4.29	0.36	6.59	23.98	13.89	22.12
Highest	5240	1.76	3.89	0.36	6.32	23.98	13.62	22.12

802.11n (20MHz) mode

Channel	Frequency (MHz)	Measured conducted power (dBm)		Duty Factor (dB)	Maximum Conducted Power (dBm)	FCC Limit (dBm)	E.I.R.P (dBm)	IC E.I.R.P Limit (dBm)
		Chain 0	Chain 1		Total output power			
Lowest	5180	1.47	3.99	0.39	6.31	23.98	13.61	22.41
Middle	5220	1.77	3.63	0.39	6.20	23.98	13.50	22.40
Highest	5240	1.56	3.50	0.39	6.04	23.98	13.34	22.41

TEST DATA

802.11n (40MHz) mode

Channel	Frequency (MHz)	Measured conducted power (dBm)		Duty Factor (dB)	Maximum Conducted Power (dBm)	FCC Limit (dBm)	E.I.R.P (dBm)	IC E.I.R.P Limit (dBm)
		Chain 0	Chain 1		Total output power			
Lowest	5190	1.99	3.91	0.75	6.82	23.98	14.12	23.01
Highest	5230	2.11	3.77	0.75	6.78	23.98	14.08	23.01

802.11ac (80MHz) mode

Channel	Frequency (MHz)	Measured conducted power (dBm)		Duty Factor (dB)	Maximum Conducted Power (dBm)	FCC Limit (dBm)	E.I.R.P (dBm)	IC E.I.R.P Limit (dBm)
		Chain 0	Chain 1		Total output power			
Middle	5210	2.03	3.97	1.41	7.53	23.98	14.83	23.01

TEST DATA

Note:

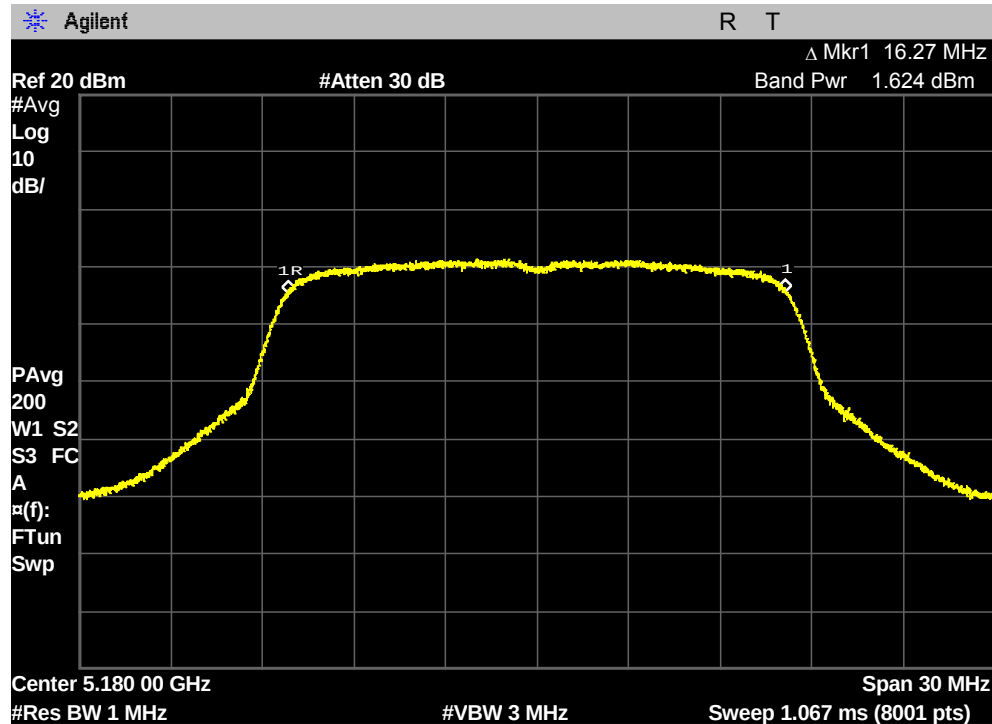
1. Maximum Conducted (average) Power = Measured conducted power + Duty Factor
2. Total output power = $10 \log [10^{\{(Chain\ 0\ Power + duty\ factor)/10\}} + 10^{\{(Chain\ 1\ Power + duty\ factor)/10\}}]$
3. For CDD transmission, directional gain is. **7.3 dBi**
 For MIMO transmission, directional gain is **7.3 dBi**.
 Directional gain was calculated according to KDB662911 D01 Multiple Transmitter Output v02r01.
 For power measurements on IEEE 802.11 devices employing CDD, directional gain is as follows,
Directional gain = G_{ANT} + Array Gain = 7.3 dBi + 0 dB = 7.3 dBi
 Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;
 Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT} ;
 Array Gain = $5 \log(N_{ANT}/N_{SS})$ dB or 3 dB, whichever is less, for 20-MHz channel widths with $N_{ANT} \geq 5$.
 For power measurements on all devices employing MIMO, directional gain is as follows,
Directional gain = G_{ANT} + $10 \log(N_{ANT}/N_{SS})$ dBi, where N_{SS} = the number of independent spatial streams of data and G_{ANT} is the antenna gain in dBi. = 7.3 dBi + $10 \log(2/2)$ dB = 7.3 dBi.
4. E.I.R.P = Maximum conducted Power + Duty Cycle Factor + Antenna gain.
 E.I.R.P was calculated by following equation according to KDB412172 D01 Determining ERP and EIRP v01.
 $E.I.R.P = P_T + G_T - L_C$
 P_T = Peak outputpower (dBm)
 G_T = Gain of the transmitting antenna in dBi, Directional antenna gain is **7.3 dBi**.
 L_C = Signal attenuation in the connecting cable between the transmitter and antenna in dB. This factor of an integral antenna is negligible.
5. IC E.I.R.P Limit = 200 mW or $10 + 10 \log_{10} B$, dBm, whichever power is less.
 B is the 99% emission bandwidth in megahertz.
6. The following equation was used for spectrum offset:
 Spectrum offset (dB) = Attenuator (dB) + Cable Loss (dB) + SMA Type Connector Loss (dB)

PLOTS OF EMISSIONS

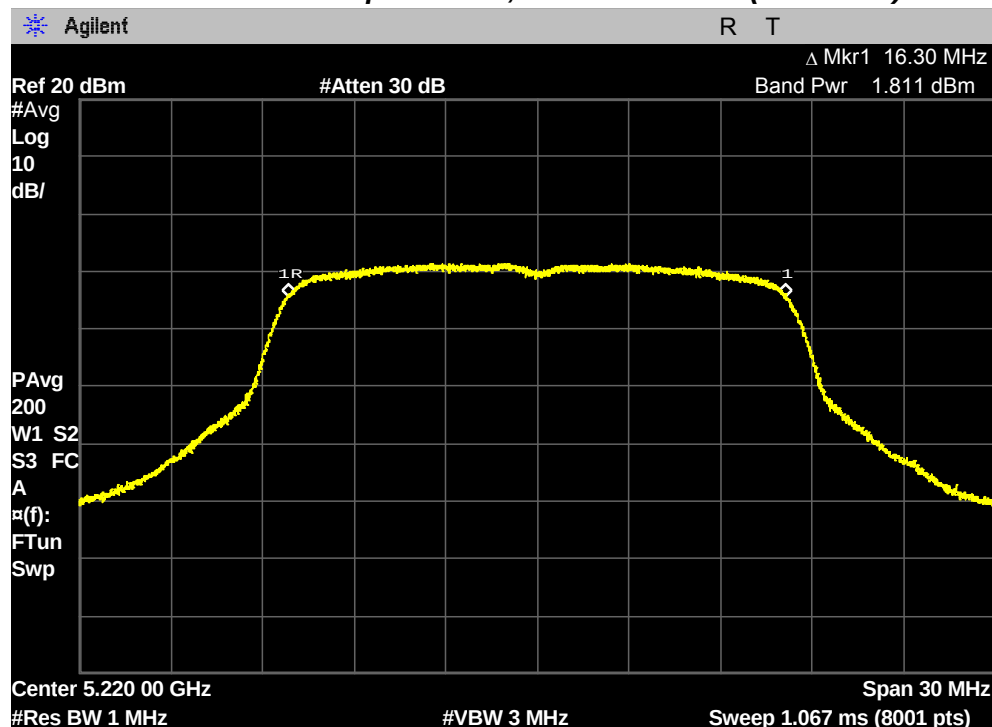
802.11a mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5180 MHz)

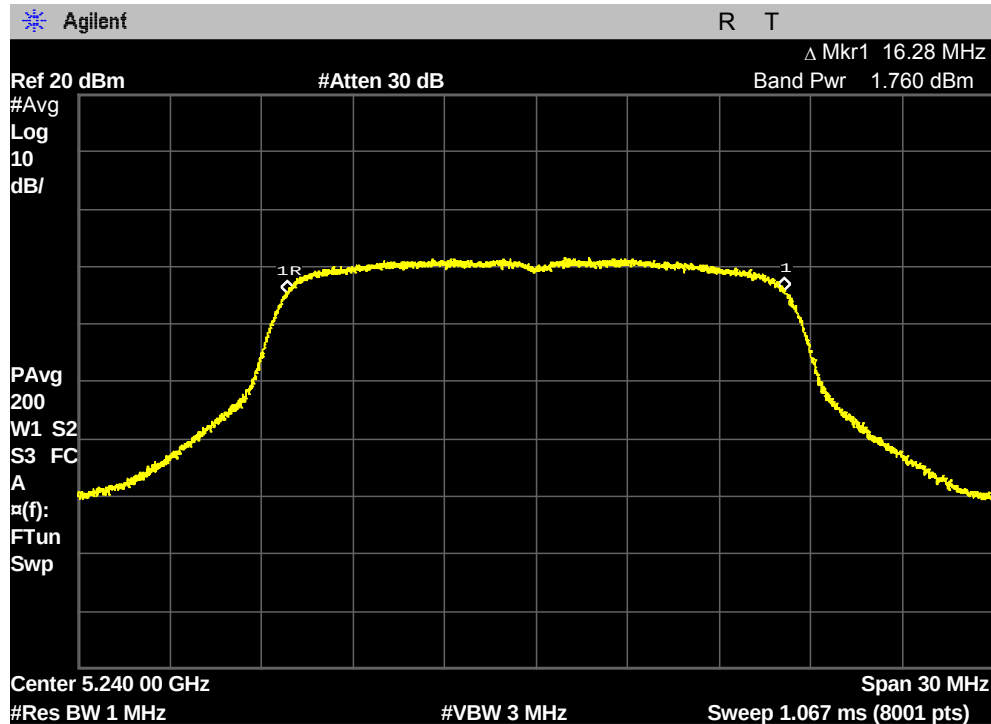


Maximum Conducted Output Power, Middle Channel (5220 MHz)



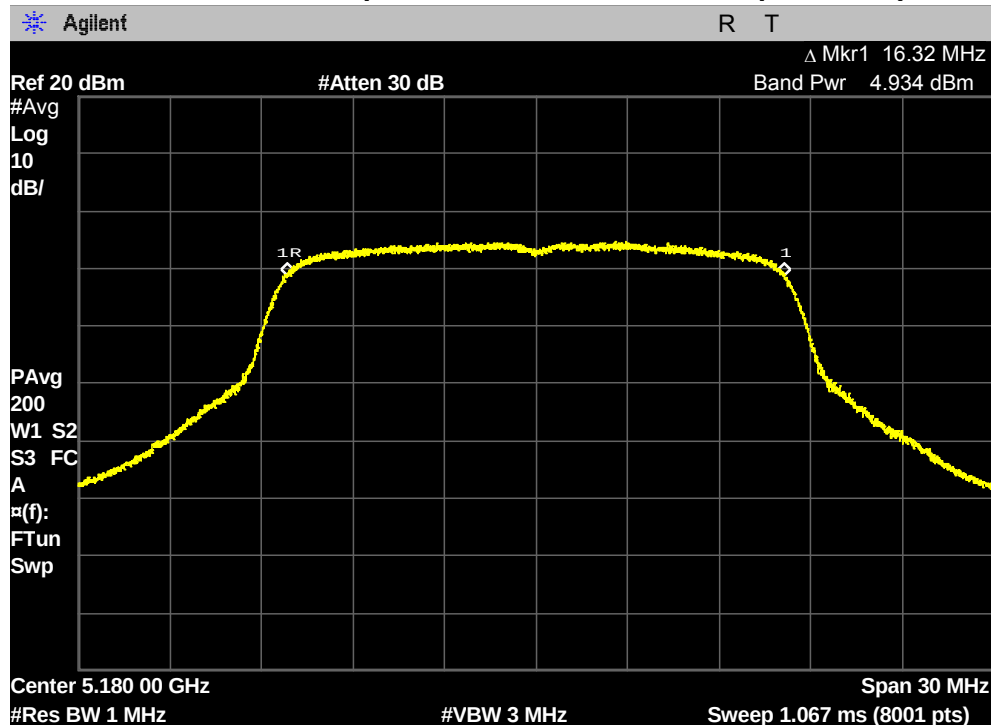
PLOTS OF EMISSIONS

Maximum Conducted Output Power, Highest Channel (5240 MHz)



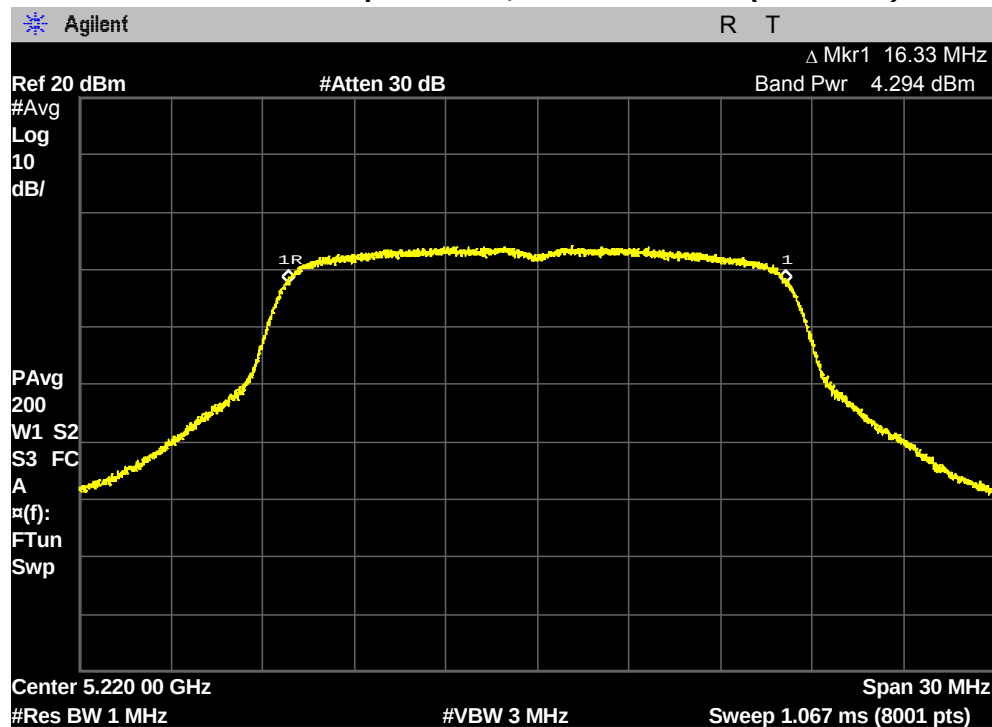
Chain 1

Maximum Conducted Output Power, Lowest Channel (5180 MHz)

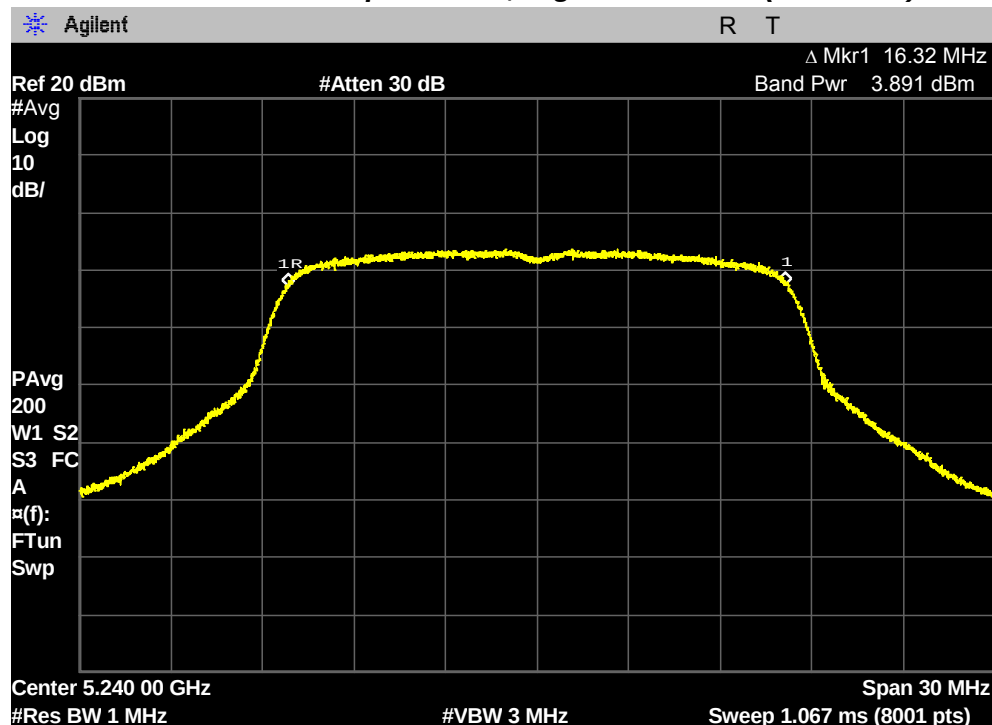


PLOTS OF EMISSIONS

Maximum Conducted Output Power, Middle Channel (5220 MHz)



Maximum Conducted Output Power, Highest Channel (5240 MHz)

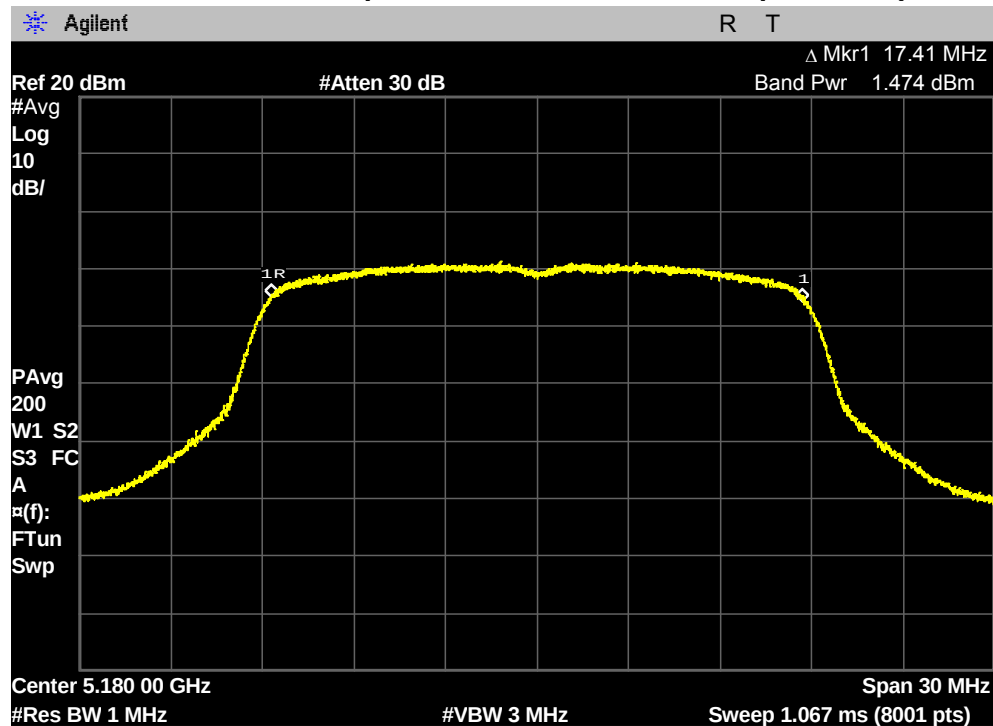


PLOTS OF EMISSIONS

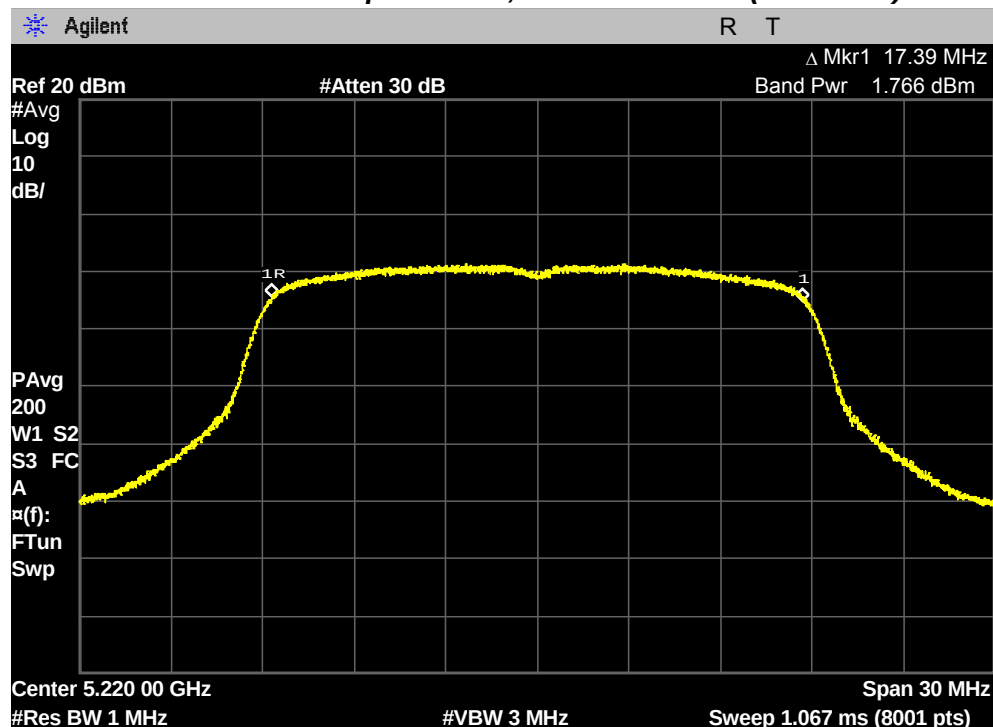
802.11n (20 MHz) mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5180 MHz)

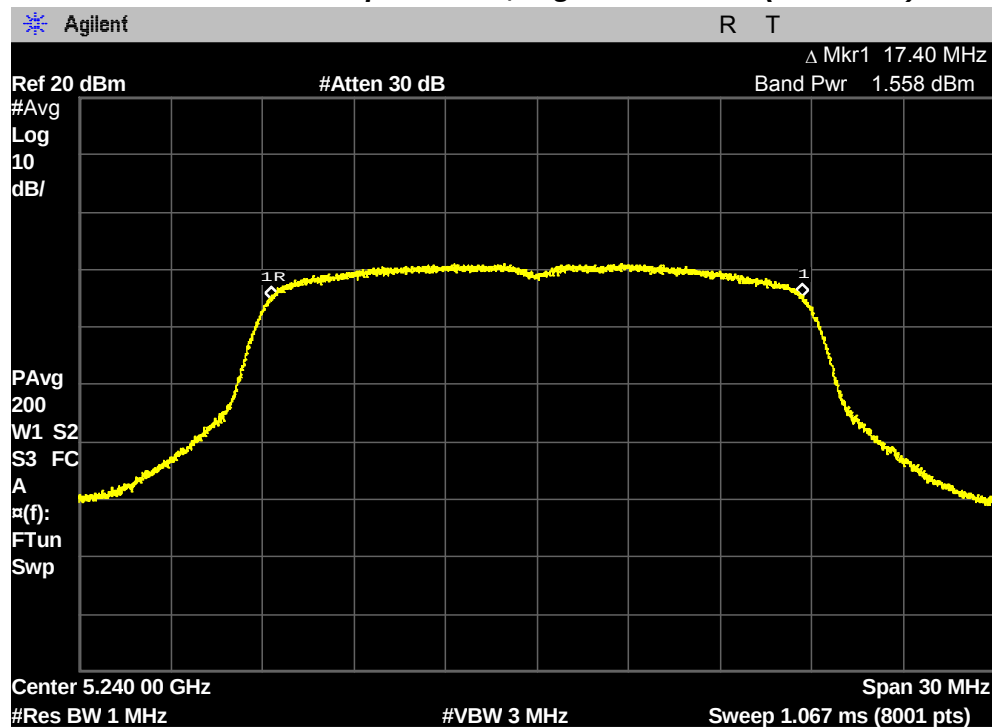


Maximum Conducted Output Power, Middle Channel (5220 MHz)



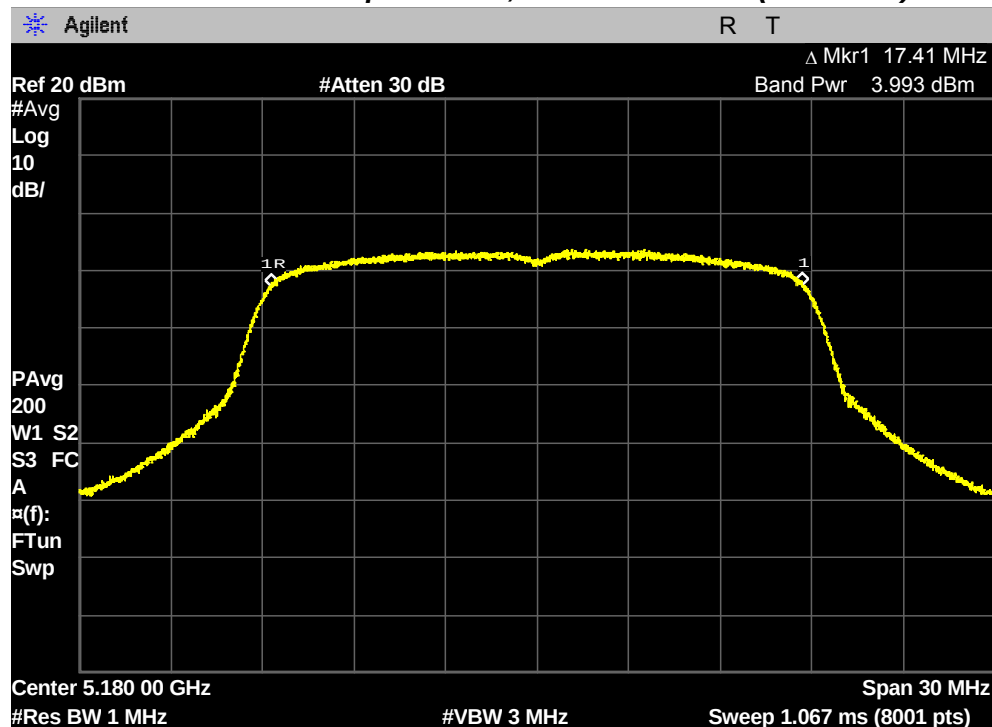
PLOTS OF EMISSIONS

Maximum Conducted Output Power, Highest Channel (5240 MHz)



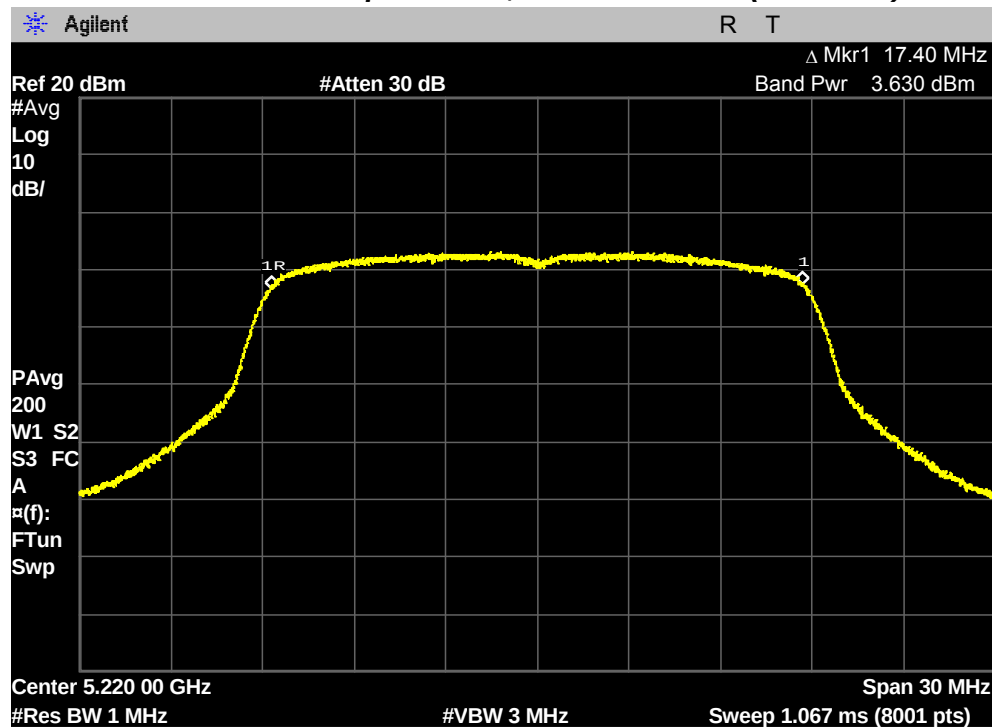
Chain 1

Maximum Conducted Output Power, Lowest Channel (5180 MHz)

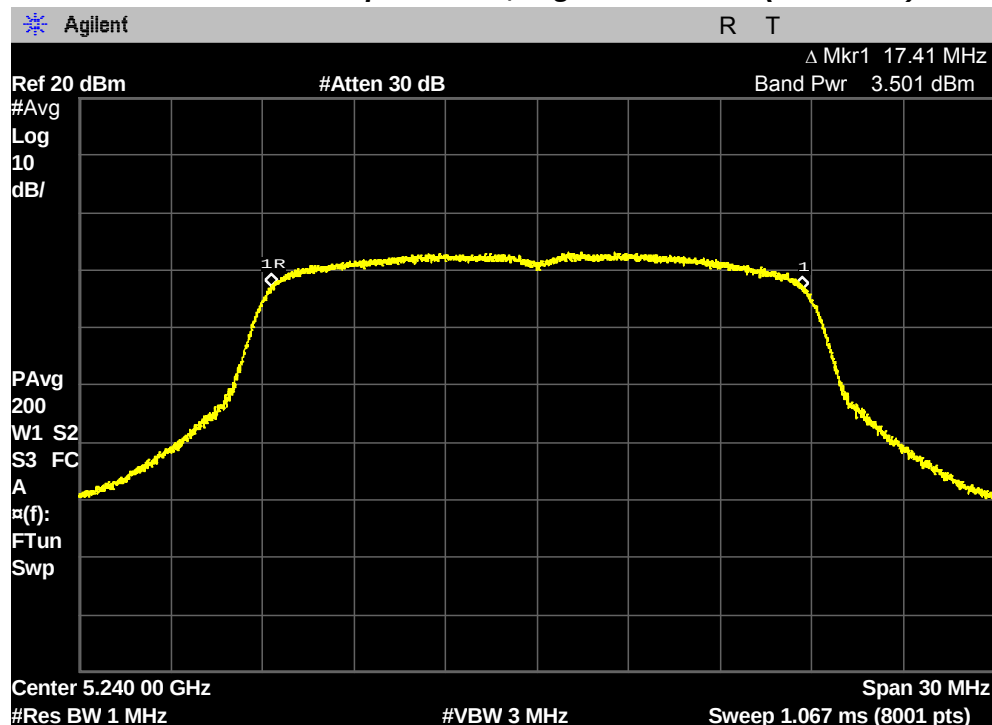


PLOTS OF EMISSIONS

Maximum Conducted Output Power, Middle Channel (5220 MHz)



Maximum Conducted Output Power, Highest Channel (5240 MHz)

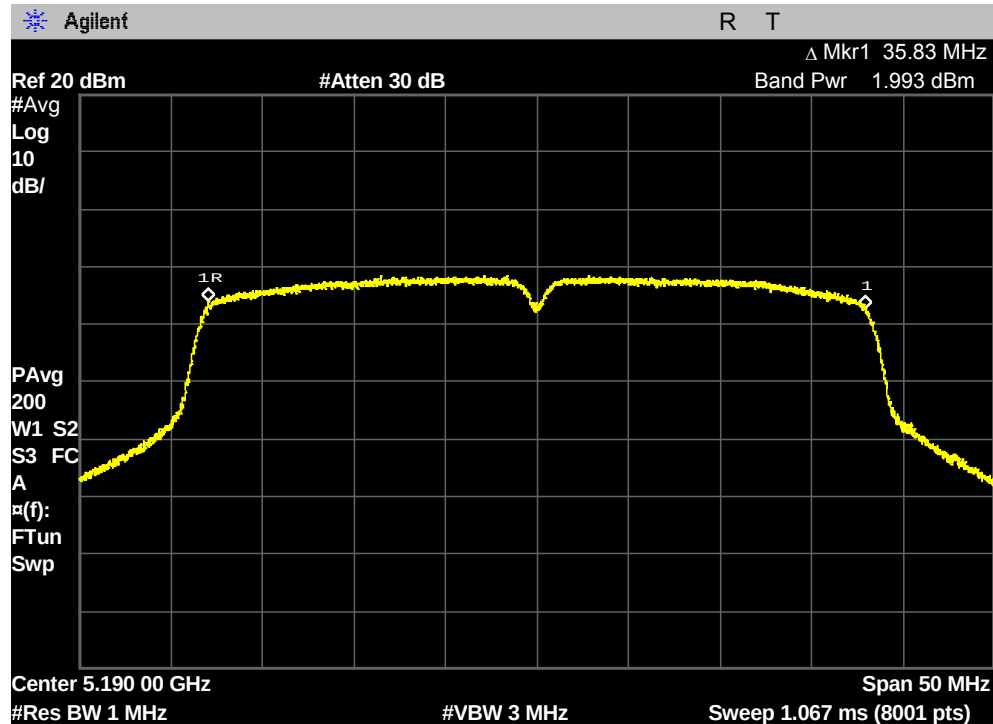


PLOTS OF EMISSIONS

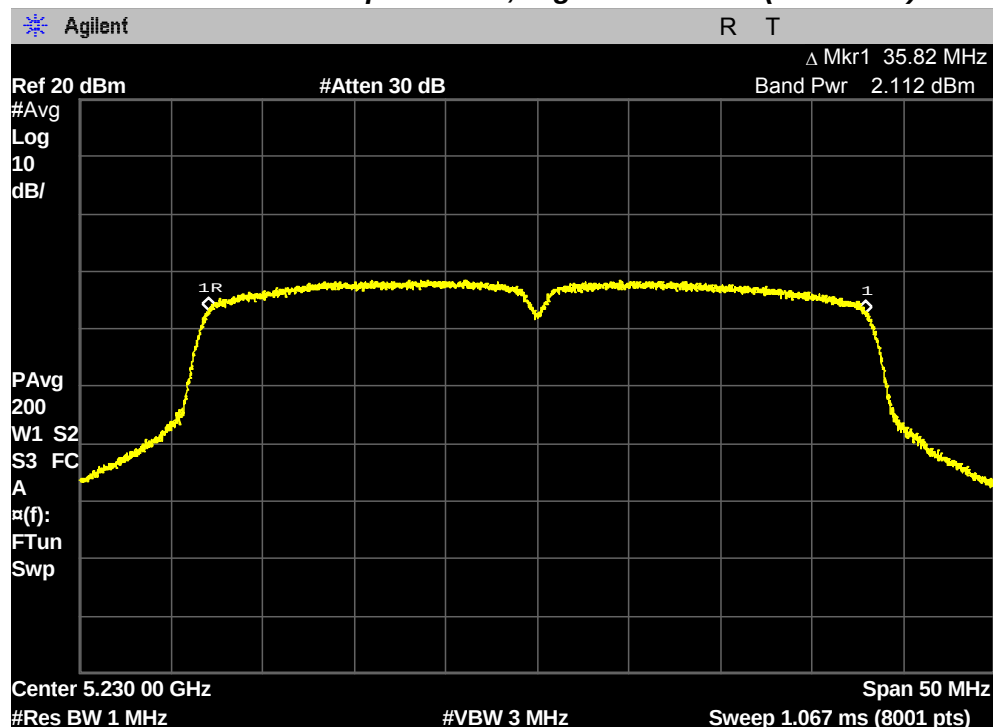
802.11n (40 MHz) mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5190 MHz)



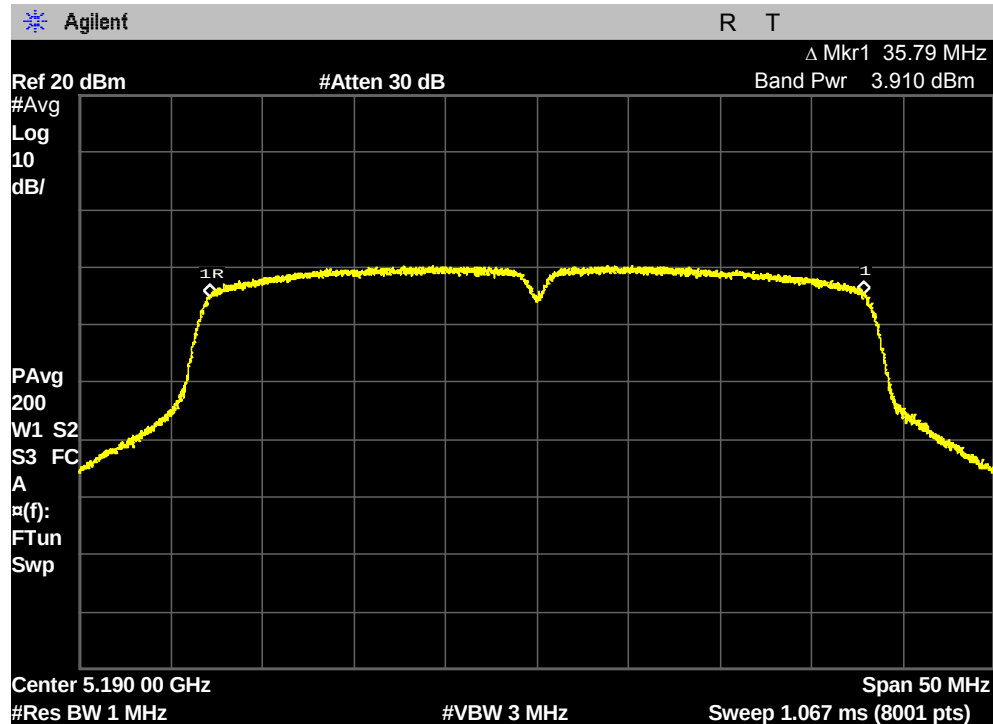
Maximum Conducted Output Power, Highest Channel (5230 MHz)



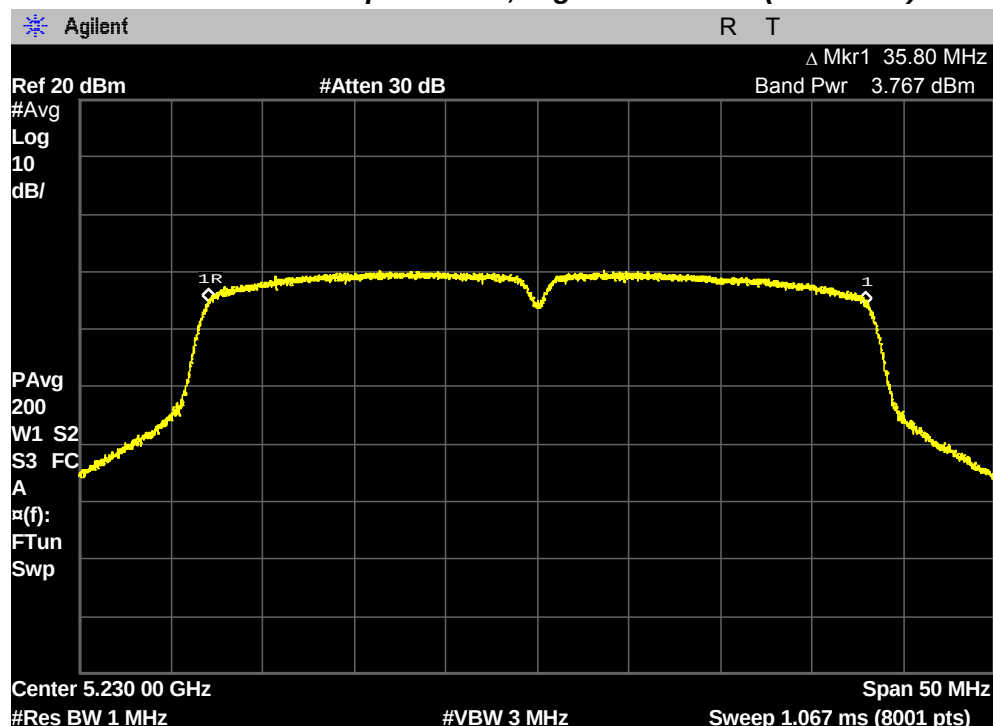
PLOTS OF EMISSIONS

Chain 1

Maximum Conducted Output Power, Lowest Channel (5190 MHz)



Maximum Conducted Output Power, Highest Channel (5230 MHz)

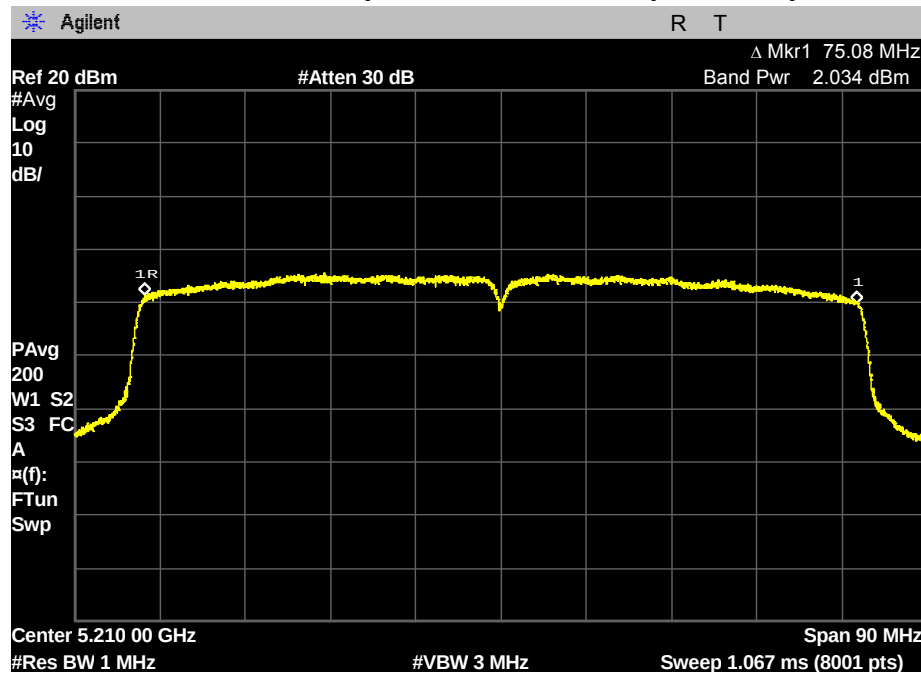


PLOTS OF EMISSIONS

802.11ac (80 MHz) mode

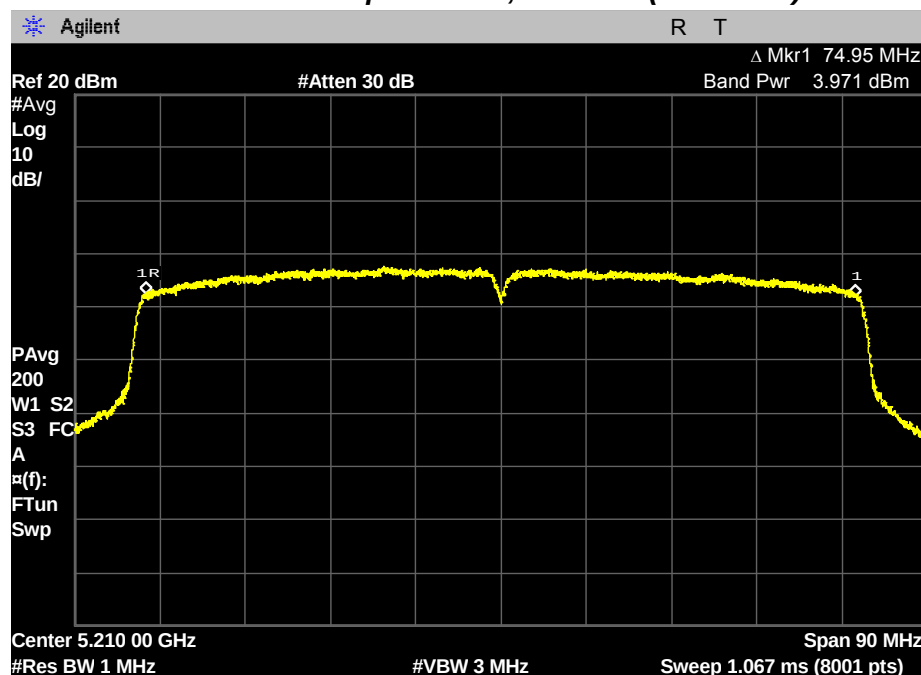
Chain 0

Maximum Conducted Output Power, Channel (5210 MHz)



Chain 1

Maximum Conducted Output Power, Channel (5210 MHz)



TEST DATA

8.5.2 Maximum Conducted Output Power – U-NII-2A band

FCC §15.407(a), RSS-247 Issue 2 6.2

Test Mode : Set to Lowest channel, Middle channel and Highest channel

802.11a mode

Channel	Frequency (MHz)	Measured conducted power (dBm)		Duty Factor (dB)	Maximum Conducted Power (dBm)	FCC Limit (dBm)	E.I.R.P (dBm)	IC E.I.R.P Limit (dBm)
		Chain 0	Chain 1		Total output power			
Lowest	5260	2.39	4.19	0.36	6.75	23.98	14.05	29.12
Middle	5300	2.79	4.92	0.36	7.35	23.98	14.65	29.12
Highest	5320	2.92	4.45	0.36	7.12	23.98	14.42	29.12

802.11n (20MHz) mode

Channel	Frequency (MHz)	Measured conducted power (dBm)		Duty Factor (dB)	Maximum Conducted Power (dBm)	FCC Limit (dBm)	E.I.R.P (dBm)	IC E.I.R.P Limit (dBm)
		Chain 0	Chain 1		Total output power			
Lowest	5260	1.79	3.79	0.39	6.30	23.98	13.60	29.41
Middle	5300	2.39	4.44	0.39	6.94	23.98	14.24	29.41
Highest	5320	2.76	4.15	0.39	6.91	23.98	14.21	29.41

TEST DATA

802.11n (40MHz) mode

Channel	Frequency (MHz)	Measured conducted power (dBm)		Duty Factor (dB)	Maximum Conducted Power (dBm)	FCC Limit (dBm)	E.I.R.P (dBm)	IC E.I.R.P Limit (dBm)
		Chain 0	Chain 1		Total output power			
Lowest	5270	2.47	3.61	0.75	6.84	23.98	14.14	30.00
Highest	5310	3.32	4.36	0.75	7.63	23.98	14.93	30.00

802.11ac (80MHz) mode

Channel	Frequency (MHz)	Measured conducted power (dBm)		Duty Factor (dB)	Maximum Conducted Power (dBm)	FCC Limit (dBm)	E.I.R.P (dBm)	IC E.I.R.P Limit (dBm)
		Chain 0	Chain 1		Total output power			
Middle	5290	3.28	4.63	1.41	8.43	23.98	15.73	30.00

TEST DATA

Note:

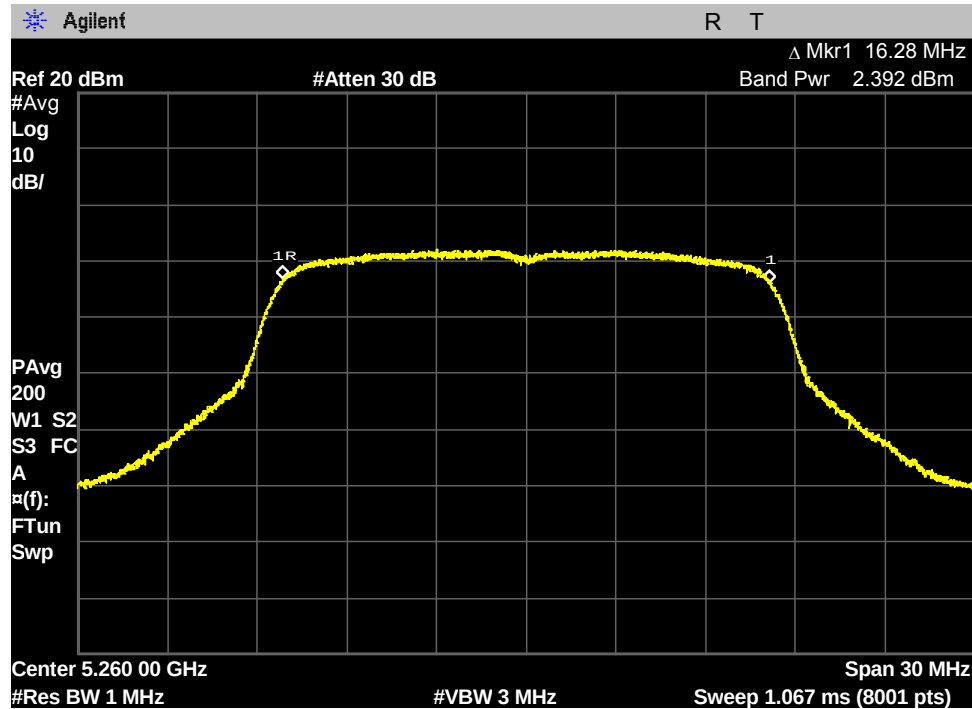
1. Maximum Conducted (average) Power = Measured conducted power + Duty Factor
2. Total output power = $10 \log [10^{\{(Chain\ 0\ Power + duty\ factor)/10\}} + 10^{\{(Chain\ 1\ Power + duty\ factor)/10\}}]$
3. For CDD transmission, directional gain is **7.3 dBi**
 For MIMO transmission, directional gain is **7.3 dBi**.
 Directional gain was calculated according to KDB662911 D01 Multiple Transmitter Output v02r01.
 For power measurements on IEEE 802.11 devices employing CDD, directional gain is as follows,
Directional gain = G_{ANT} + Array Gain = 7.3 dBi + 0 dB = 7.3 dBi
 Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;
 Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT} ;
 Array Gain = $5 \log(N_{ANT}/N_{SS})$ dB or 3 dB, whichever is less, for 20-MHz channel widths with $N_{ANT} \geq 5$.
 For power measurements on all devices employing MIMO, directional gain is as follows,
Directional gain = G_{ANT} + $10 \log(N_{ANT}/N_{SS})$ dBi, where N_{SS} = the number of independent spatial streams of data and G_{ANT} is the antenna gain in dBi. = 7.3 dBi + $10 \log(2/2)$ dB = 7.3 dBi.
4. E.I.R.P = Maximum conducted Power + Duty Cycle Factor + Antenna gain.
 E.I.R.P was calculated by following equation according to KDB412172 D01 Determining ERP and EIRP v01.
 $E.I.R.P = P_T + G_T - L_C$
 P_T = Peak output power (dBm)
 G_T = Gain of the transmitting antenna in dBi, Directional antenna gain is **7.3 dBi**.
 L_C = Signal attenuation in the connecting cable between the transmitter and antenna in dB. This factor of an integral antenna is negligible.
5. FCC conducted output power limit = 250 mW or 11 dBm + $10 \log B$, whichever power is less.
 B is the 26 dB emission bandwidth in megahertz.
6. IC conducted output power limit = 250 mW or 11 dBm + $10 \log B$, whichever power is less.
 B is the 99% emission bandwidth in megahertz,
 IC E.I.R.P Limit = 1.0 W (30dBm) or $17 + 10 \log_{10} B$ dBm, whichever power is less.
 B is the 99% emission bandwidth in megahertz.
7. The following equation was used for spectrum offset:
 Spectrum offset (dB) = Attenuator (dB) + Cable Loss (dB) + SMA Type Connector Loss (dB)
8. A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW (26.99dBm) for FCC and IC requirements.

PLOTS OF EMISSIONS

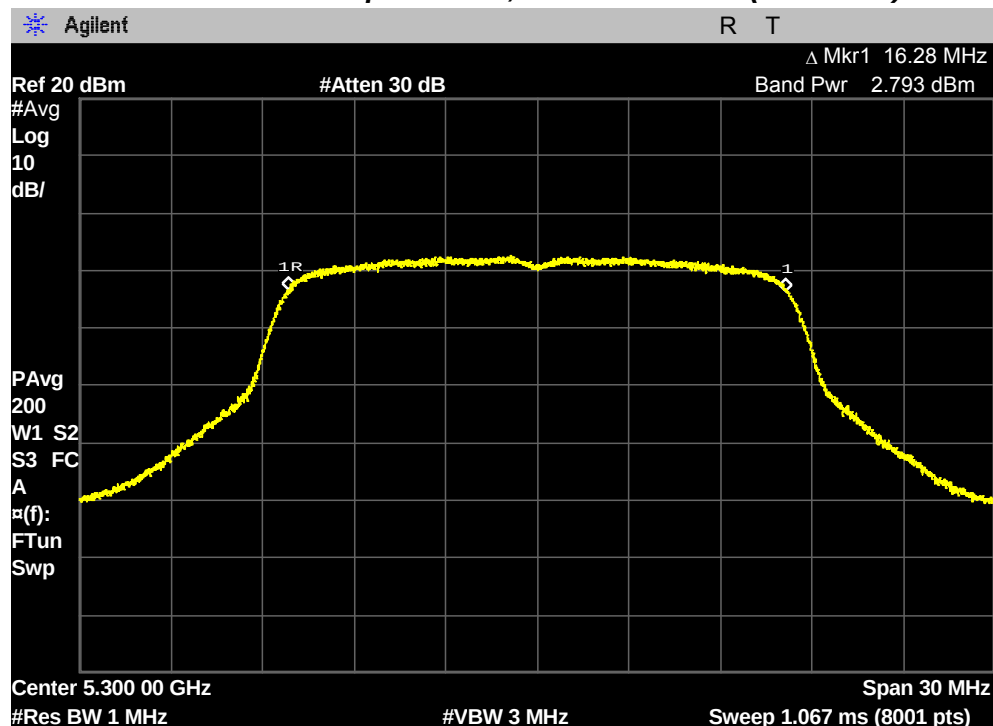
802.11a mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5260 MHz)

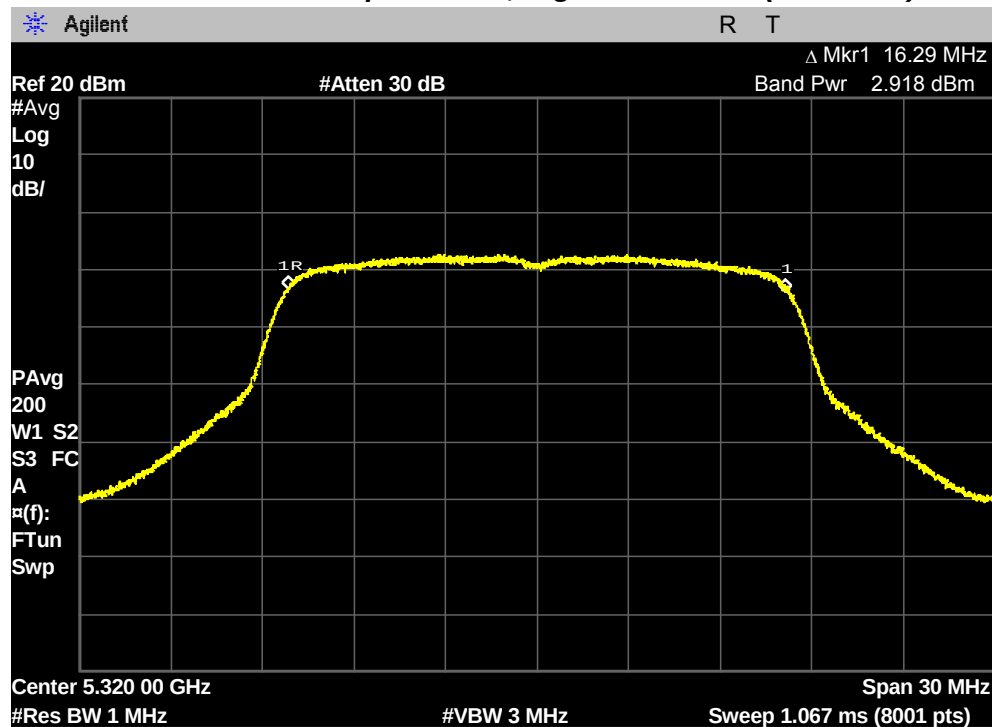


Maximum Conducted Output Power, Middle Channel (5300 MHz)



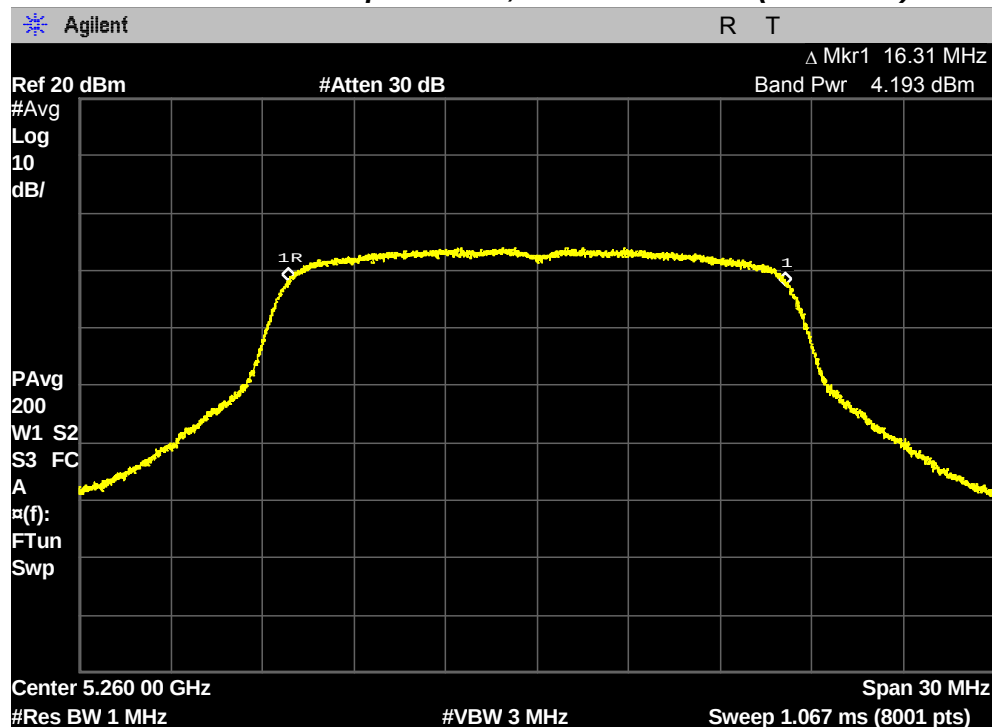
PLOTS OF EMISSIONS

Maximum Conducted Output Power, Highest Channel (5320 MHz)



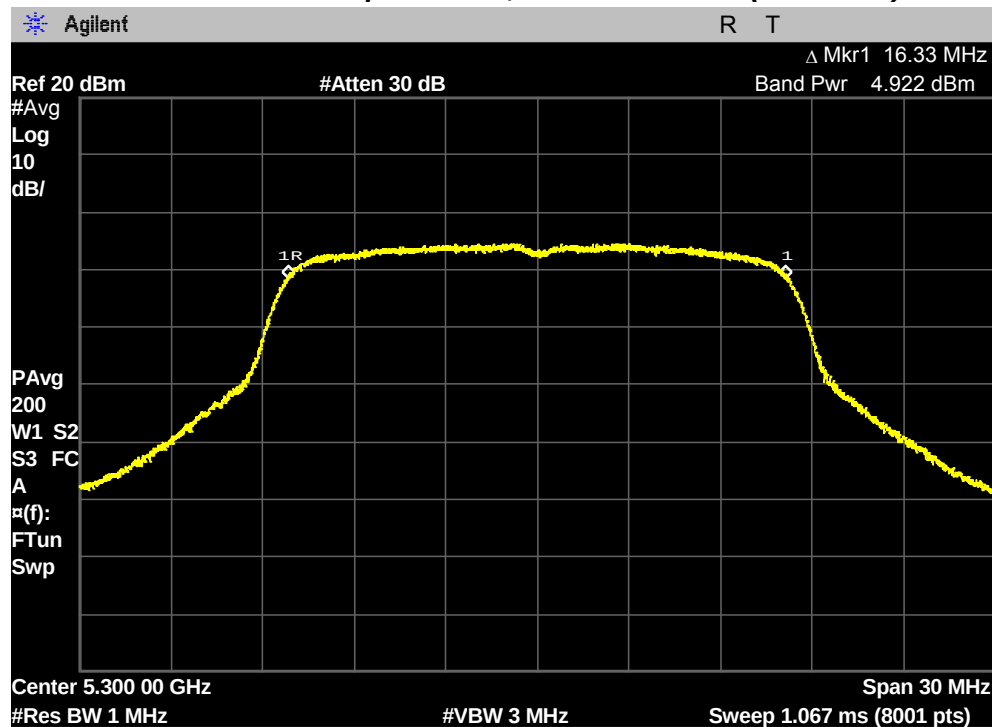
Chain 1

Maximum Conducted Output Power, Lowest Channel (5260 MHz)

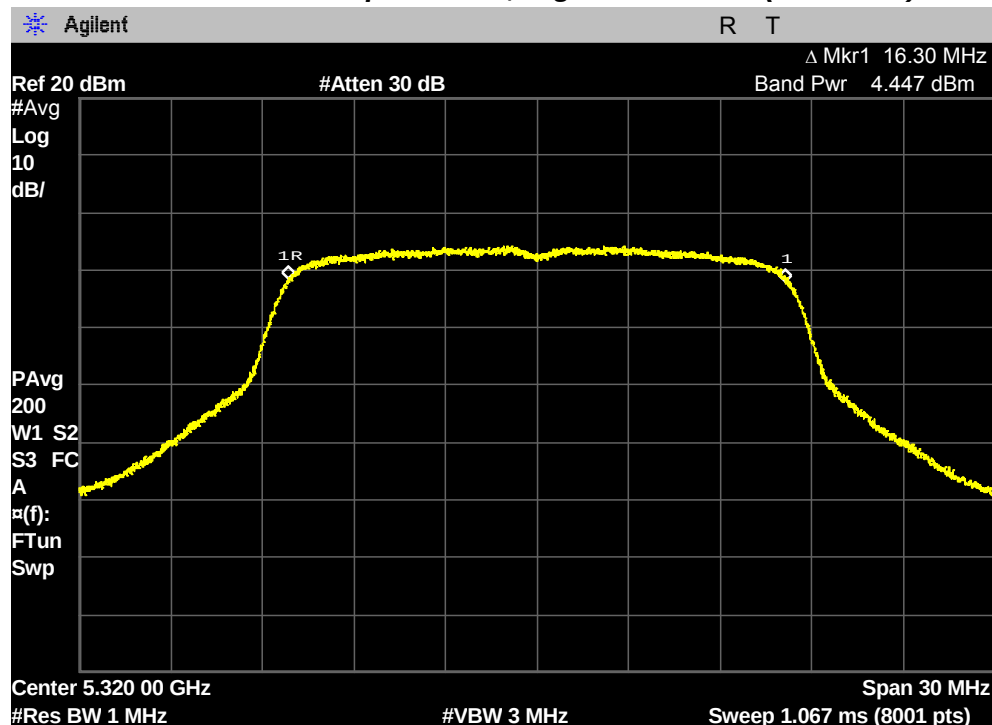


PLOTS OF EMISSIONS

Maximum Conducted Output Power, Middle Channel (5300 MHz)



Maximum Conducted Output Power, Highest Channel (5320 MHz)

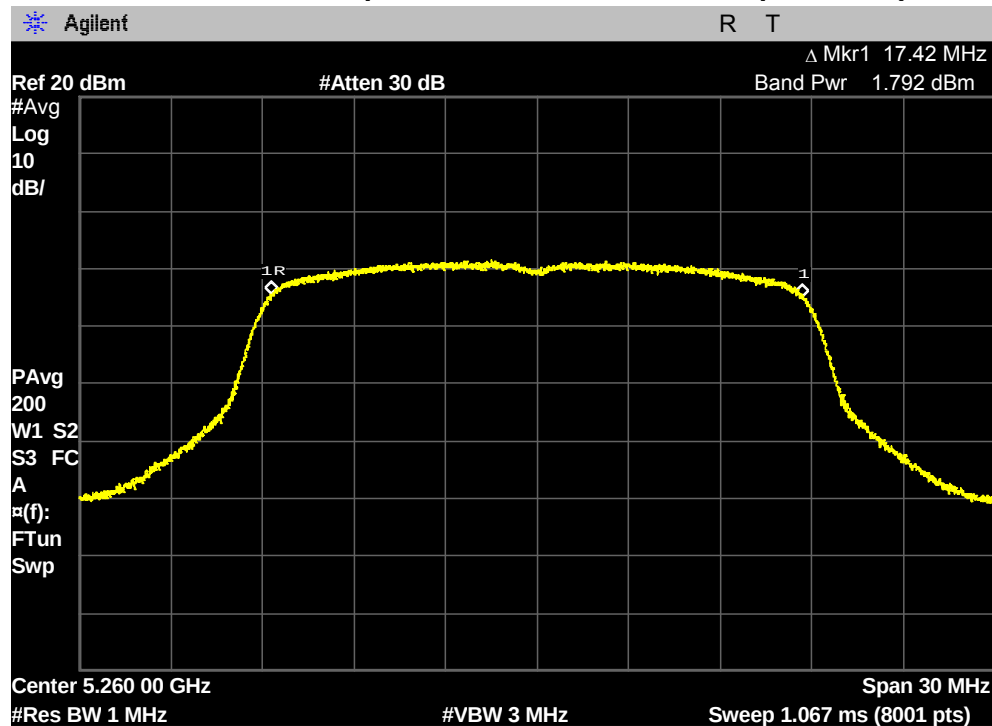


PLOTS OF EMISSIONS

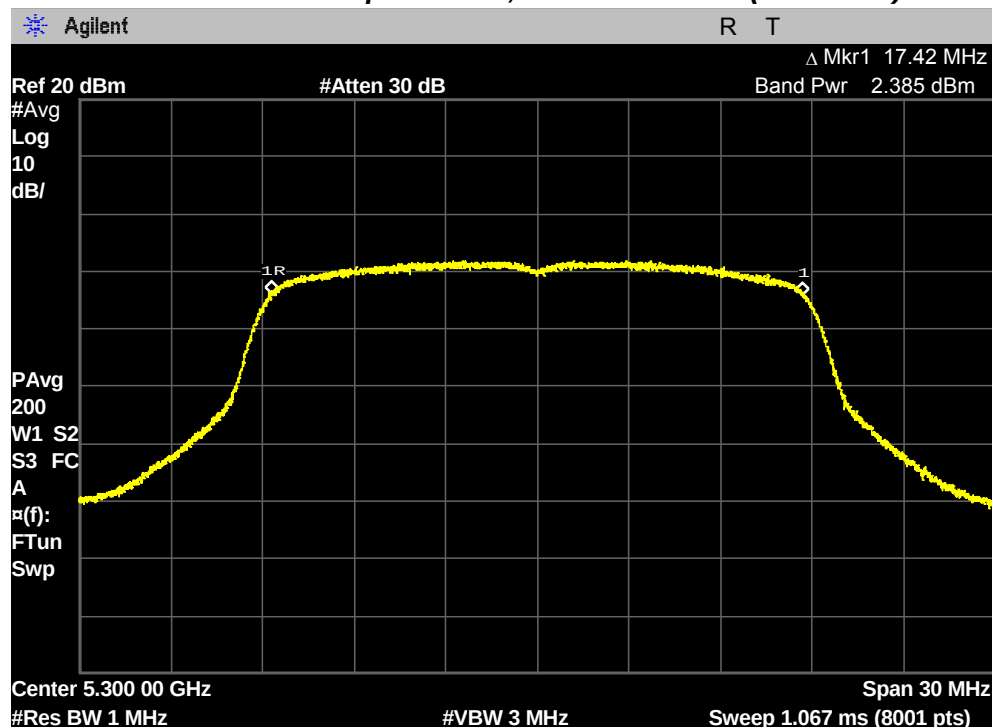
802.11n (20 MHz) mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5260 MHz)

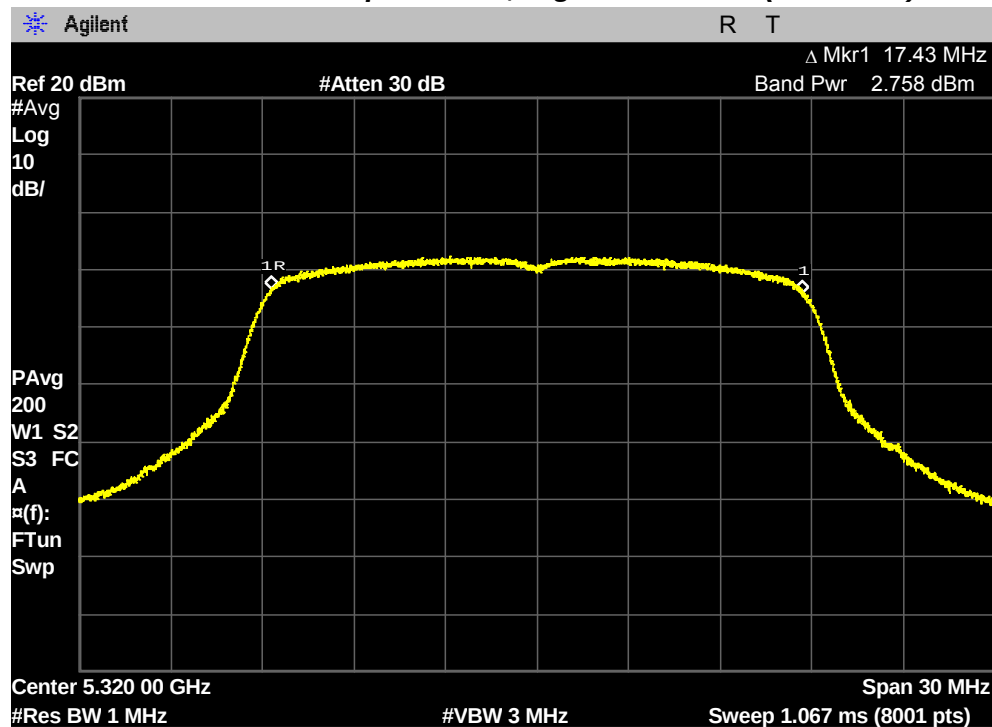


Maximum Conducted Output Power, Middle Channel (5300 MHz)



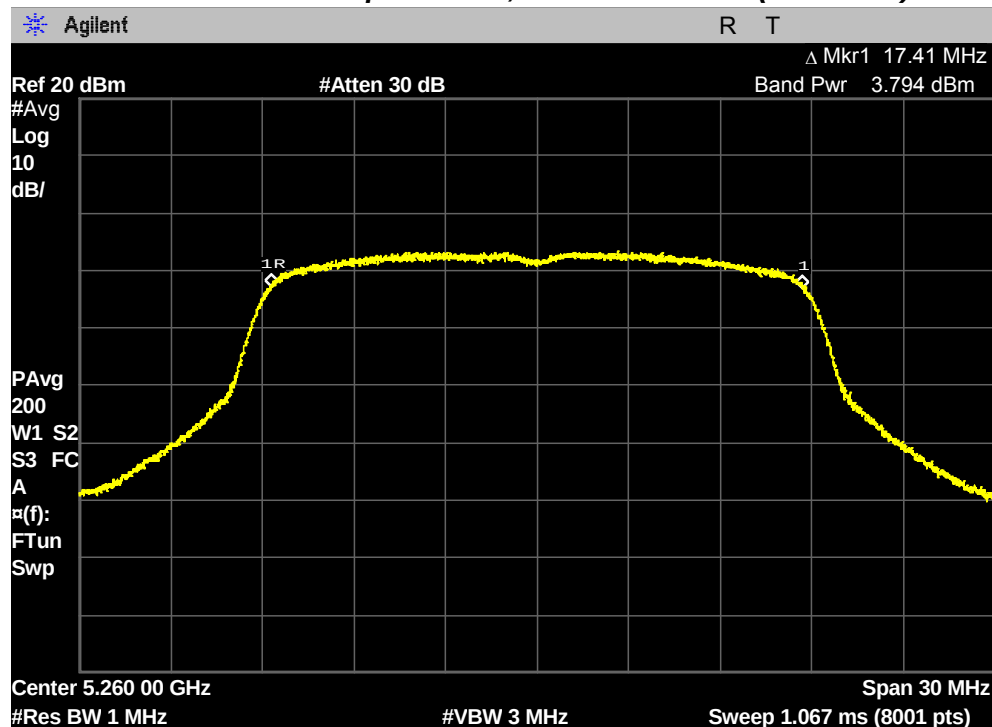
PLOTS OF EMISSIONS

Maximum Conducted Output Power, Highest Channel (5320 MHz)



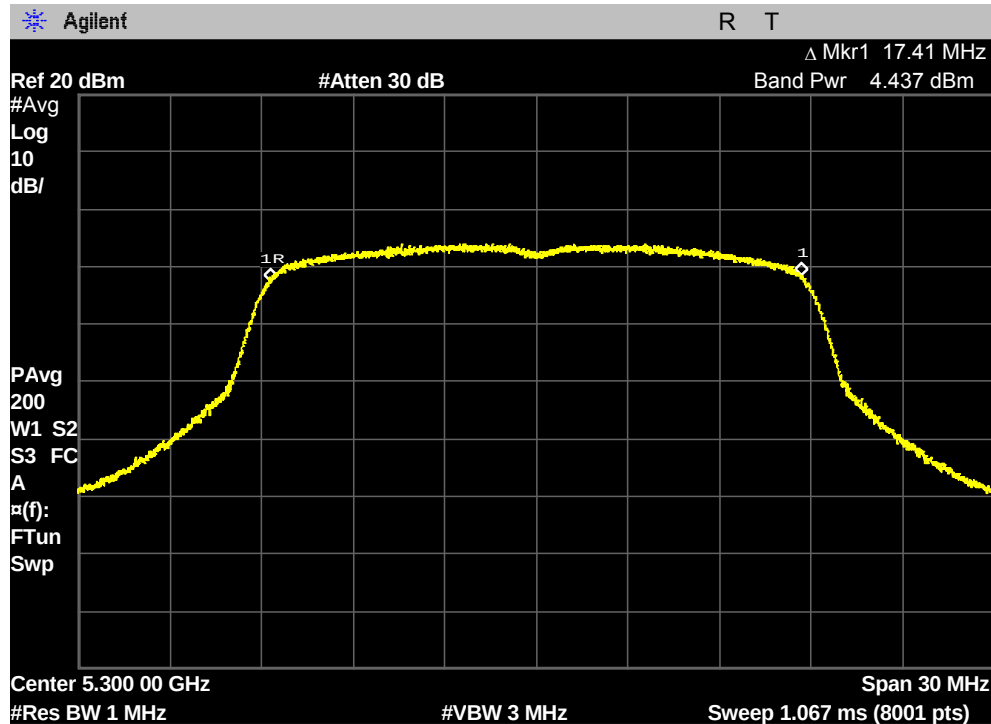
Chain 1

Maximum Conducted Output Power, Lowest Channel (5260 MHz)

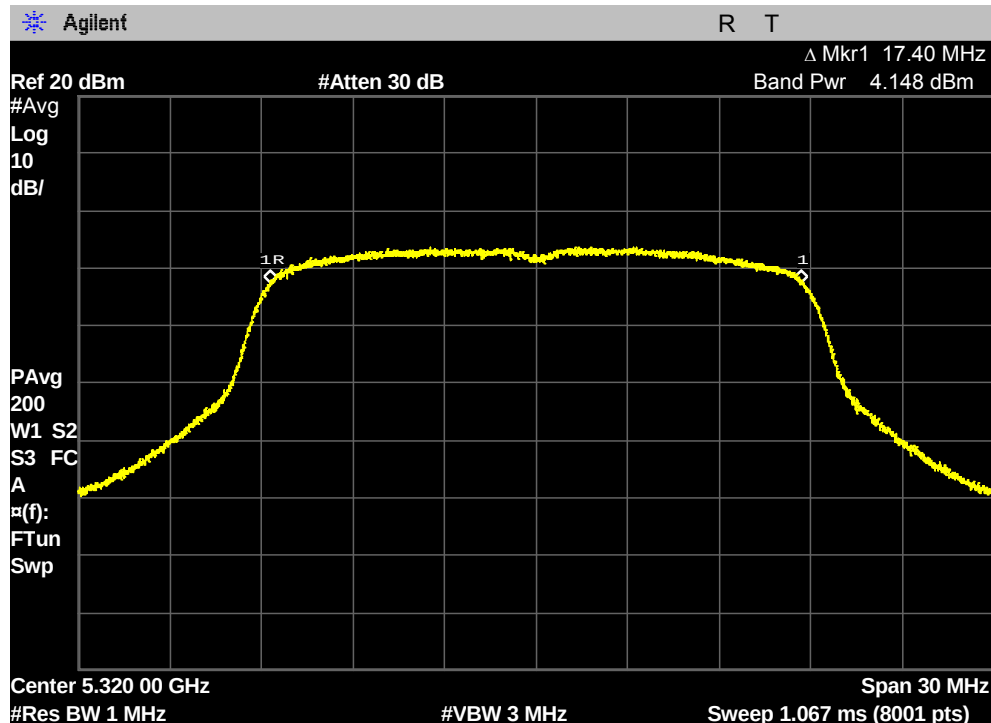


PLOTS OF EMISSIONS

Maximum Conducted Output Power, Middle Channel (5300 MHz)



Maximum Conducted Output Power, Highest Channel (5320 MHz)

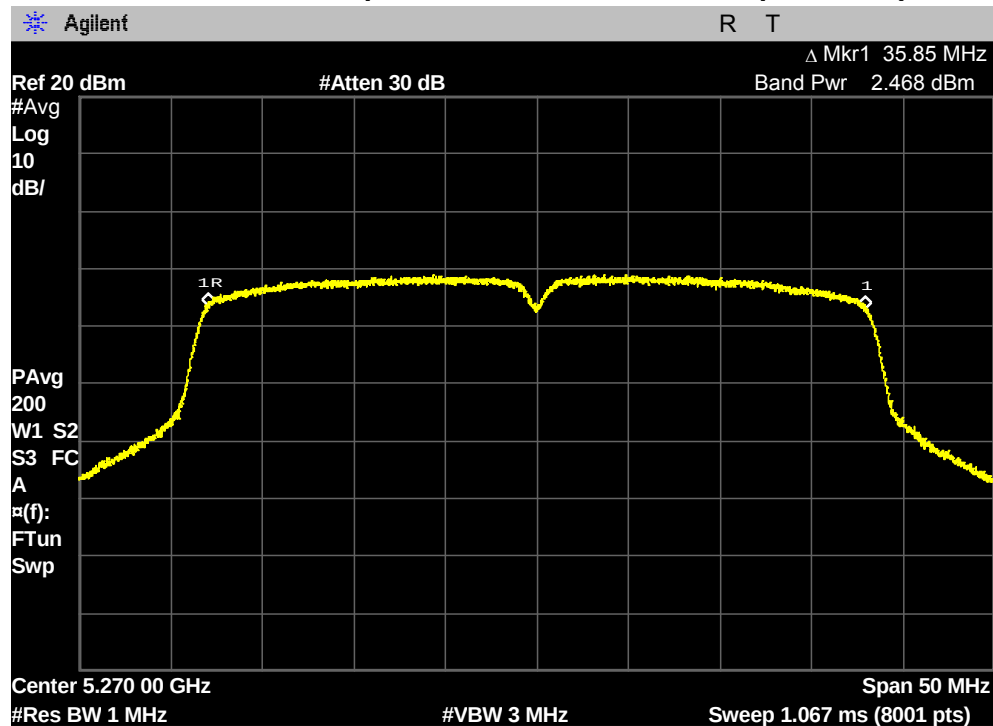


PLOTS OF EMISSIONS

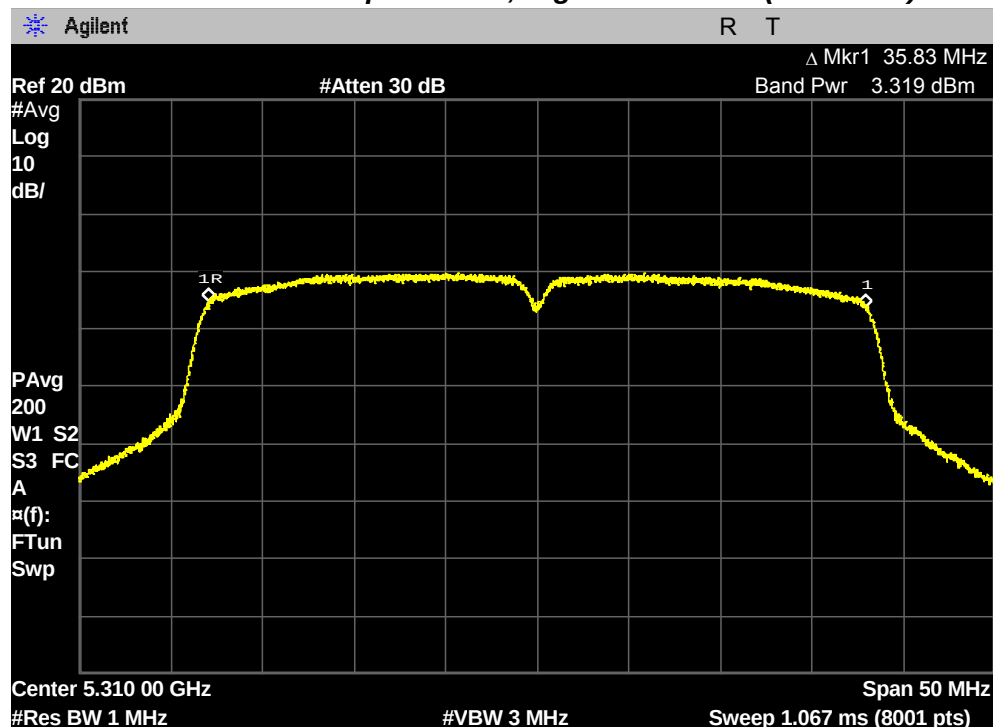
802.11n (40 MHz) mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5270 MHz)



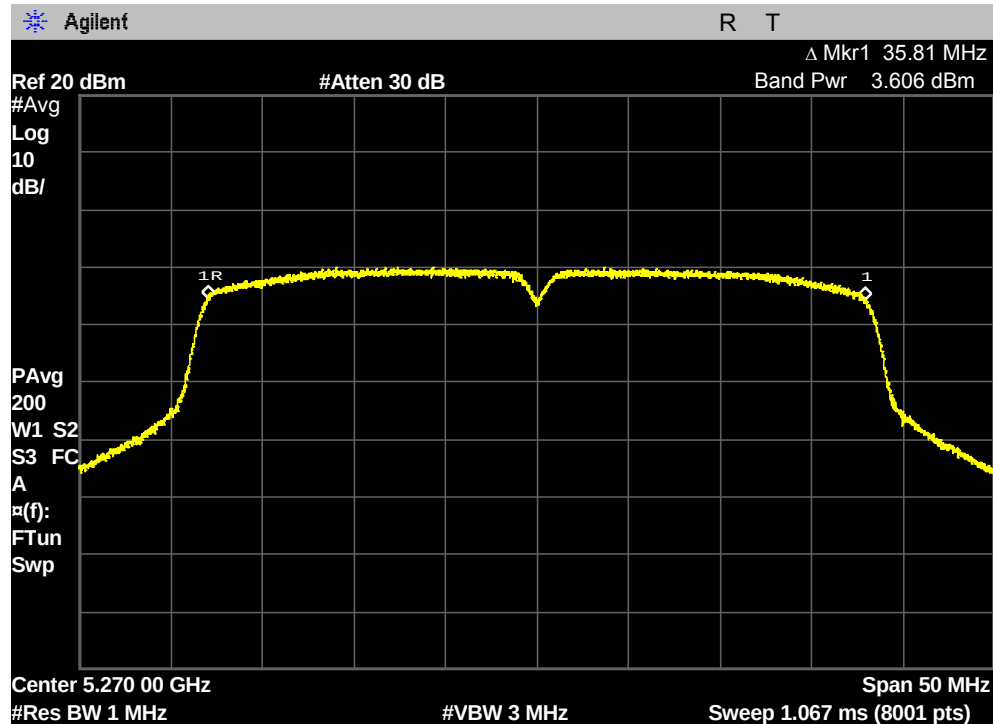
Maximum Conducted Output Power, Highest Channel (5310 MHz)



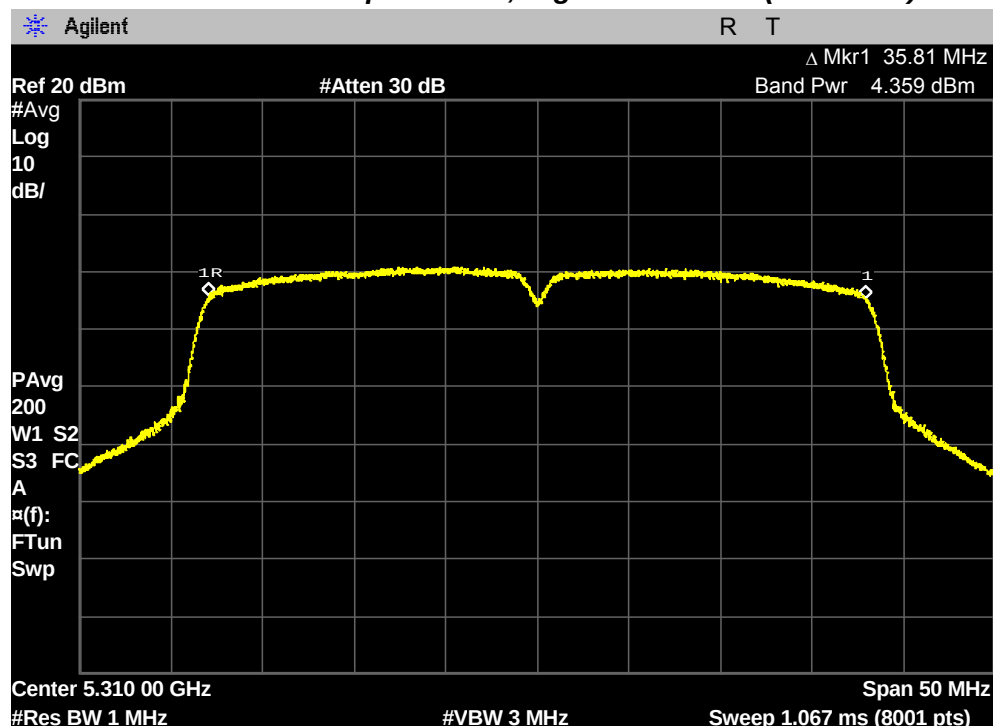
PLOTS OF EMISSIONS

Chain 1

Maximum Conducted Output Power, Lowest Channel (5270 MHz)



Maximum Conducted Output Power, Highest Channel (5310 MHz)

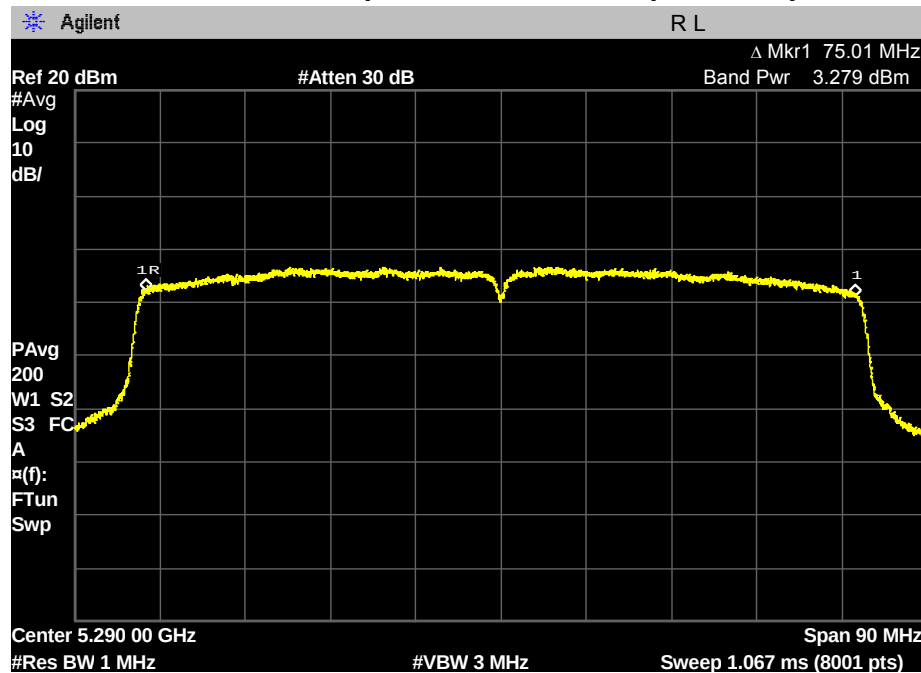


PLOTS OF EMISSIONS

802.11ac (80 MHz) mode

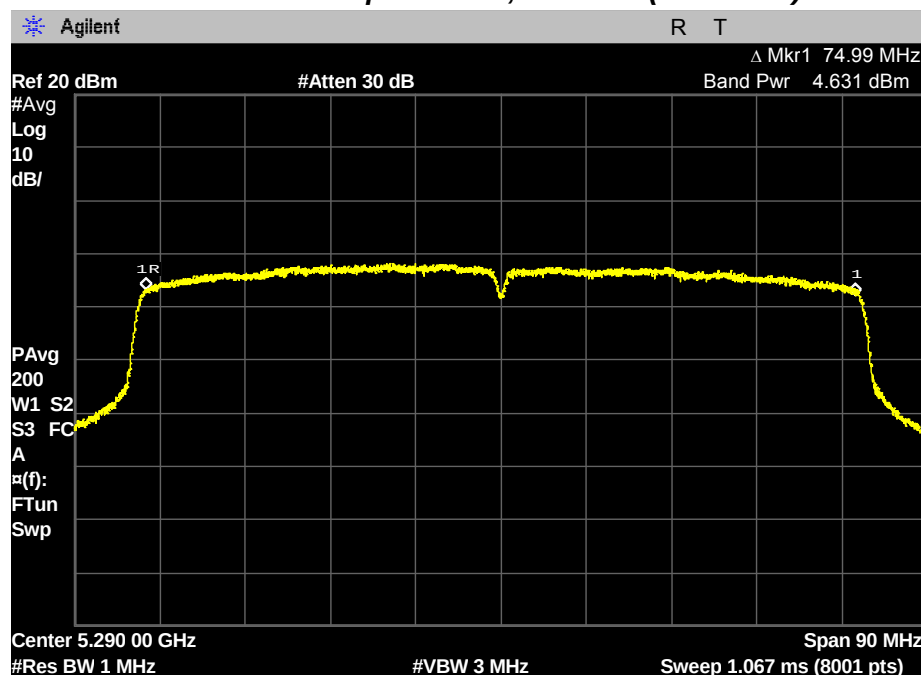
Chain 0

Maximum Conducted Output Power, Channel (5290 MHz)



Chain 1

Maximum Conducted Output Power, Channel (5290 MHz)



TEST DATA

8.5.3 Maximum Conducted Output Power – U-NII-2C band

FCC §15.407(a), RSS-247 Issue 2 6.2

Test Mode : Set to Lowest channel, Middle channel and Highest channel, Straddle channel

802.11a mode

Channel	Frequency (MHz)	Measured conducted power (dBm)		Duty Factor (dB)	Maximum Conducted Power (dBm) Total output power	FCC Limit (dBm)		E.I.R.P (dBm)	IC E.I.R.P Limit (dBm)
		Chain 0	Chain 1			FCC	IC		
Lowest	5500	4.16	4.93	0.36	7.93	23.98	23.11	12.83	29.11
Middle	5580	4.92	5.37	0.36	8.52	23.98	23.12	13.42	29.12
Highest	5700	5.13	4.64	0.36	8.26	23.98	23.12	13.16	29.12
Straddle	5720	4.74	3.56	0.36	7.56	22.78	22.10	12.46	28.10

802.11n (20MHz) mode

Channel	Frequency (MHz)	Measured conducted power (dBm)		Duty Factor (dB)	Maximum Conducted Power (dBm) Total output power	FCC Limit (dBm)		E.I.R.P (dBm)	IC E.I.R.P Limit (dBm)
		Chain 0	Chain 1			FCC	IC		
Lowest	5500	3.74	4.93	0.39	7.78	23.98	23.41	12.68	29.41
Middle	5580	4.48	5.21	0.39	8.26	23.98	23.41	13.16	29.41
Highest	5700	4.58	4.41	0.39	7.90	23.98	23.41	12.80	29.41
Straddle	5720	4.43	4.55	0.39	7.89	22.77	22.32	12.79	28.32

TEST DATA

802.11n (40MHz) mode

Channel	Frequency (MHz)	Measured conducted power (dBm)		Duty Factor (dB)	Maximum Conducted Power (dBm)	FCC Limit (dBm)		E.I.R.P (dBm)	IC E.I.R.P Limit (dBm)
		Chain 0	Chain 1			FCC	IC		
Lowest	5510	3.86	4.68	0.75	8.05	23.98	23.98	12.95	30.00
Middle	5590	4.51	4.67	0.75	8.35	23.98	23.98	13.25	30.00
Highest	5670	5.14	4.72	0.75	8.70	23.98	23.98	13.60	30.00
Straddle	5710	4.17	3.92	0.75	7.81	23.98	23.98	12.71	30.00

802.11ac (80MHz) mode

Channel	Frequency (MHz)	Measured conducted power (dBm)		Duty Factor (dB)	Maximum Conducted Power (dBm)	FCC Limit (dBm)		E.I.R.P (dBm)	IC E.I.R.P Limit (dBm)
		Chain 0	Chain 1			FCC	IC		
Lowest	5530	3.78	4.11	1.41	8.37	23.98	23.98	13.27	30.00
Highest	5610	4.00	3.61	1.41	8.23	23.98	23.98	13.13	30.00
Straddle	5690	4.43	3.98	1.41	8.63	23.98	23.98	13.53	30.00

TEST DATA

Note:

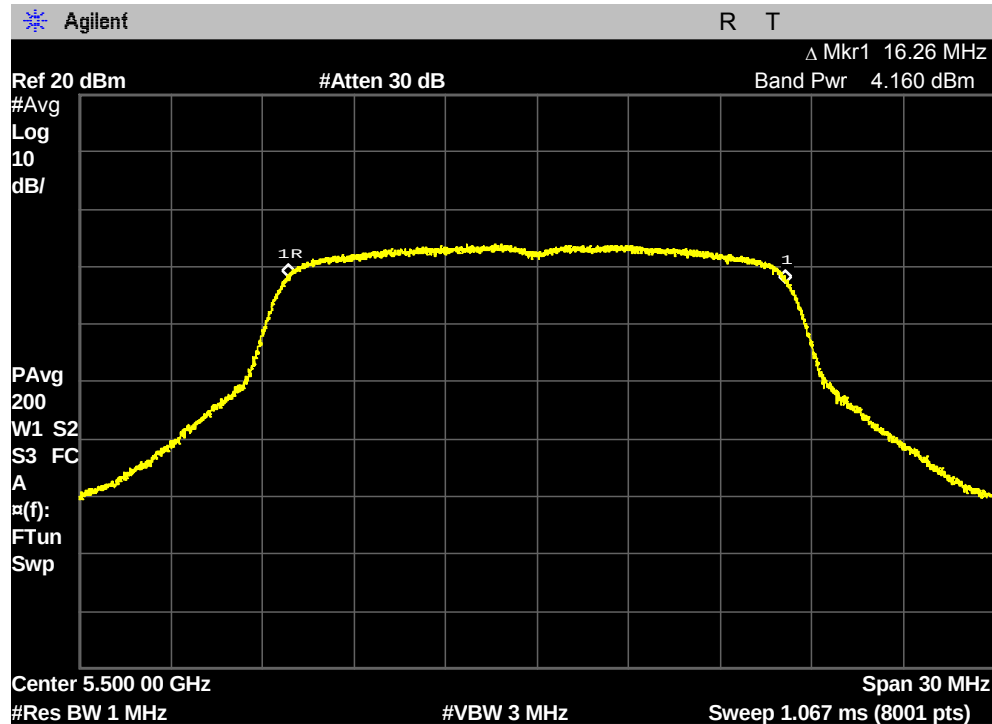
1. Maximum Conducted (average) Power = Measured conducted power + Duty Factor
2. Total output power = $10 \log [10^{\{(Chain\ 0\ Power + duty\ factor)/10\}} + 10^{\{(Chain\ 1\ Power + duty\ factor)/10\}}]$
3. For CDD transmission, directional gain is **4.9 dBi**
 For MIMO transmission, directional gain is **4.9 dBi**.
 Directional gain was calculated according to KDB662911 D01 Multiple Transmitter Output v02r01.
 For power measurements on IEEE 802.11 devices employing CDD, directional gain is as follows,
Directional gain = $G_{ANT} + \text{Array Gain} = 4.9\text{ dBi} + 0\text{ dB} = 4.9\text{ dBi}$
 Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;
 Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT} ;
 Array Gain = $5 \log(N_{ANT}/N_{SS})$ dB or 3 dB, whichever is less, for 20-MHz channel widths with $N_{ANT} \geq 5$.
 For power measurements on all devices employing MIMO, directional gain is as follows,
Directional gain = $G_{ANT} + 10 \log(N_{ANT}/N_{SS})$ dBi, where N_{SS} = the number of independent spatial streams of data and G_{ANT} is the antenna gain in dBi. = $4.9\text{ dBi} + 10 \log(2/2)\text{ dB} = 4.9\text{ dBi}$.
4. E.I.R.P = Maximum conducted Power + Duty Cycle Factor + Antenna gain.
 E.I.R.P was calculated by following equation according to KDB412172 D01 Determining ERP and EIRP v01.
 $E.I.R.P = P_T + G_T - L_C$
 P_T = Peak output power (dBm)
 G_T = Gain of the transmitting antenna in dBi, Directional antenna gain is **4.9 dBi**.
 L_C = Signal attenuation in the connecting cable between the transmitter and antenna in dB. This factor of an integral antenna is negligible.
5. FCC conducted output power limit = 250 mW or 11 dBm + $10 \log B$, whichever power is less.
 B is the 26 dB emission bandwidth in megahertz.
6. IC conducted output power limit = 250 mW or 11 dBm + $10 \log B$, whichever power is less.
 B is the 99% emission bandwidth in megahertz,
 IC E.I.R.P Limit = 1.0 W (30dBm) or $17 + 10 \log_{10} B$ dBm, whichever power is less.
 B is the 99% emission bandwidth in megahertz.
7. The following equation was used for spectrum offset:
 Spectrum offset (dB) = Attenuator (dB) + Cable Loss (dB) + SMA Type Connector Loss (dB)
8. A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW (26.99dBm) for FCC and IC requirements.

PLOTS OF EMISSIONS

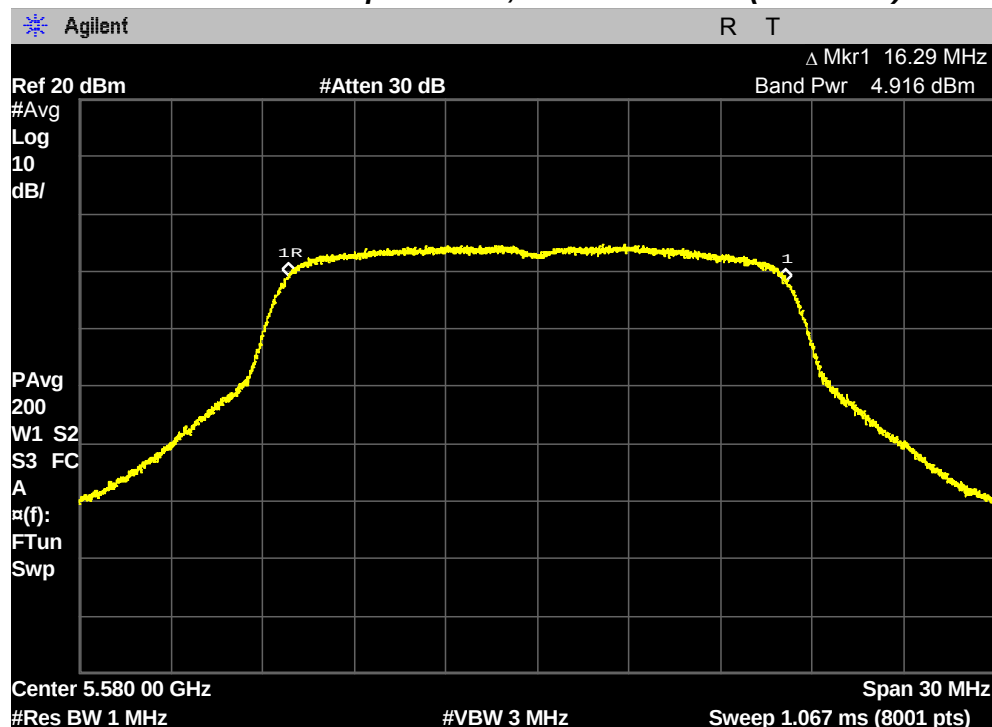
802.11a mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5500 MHz)

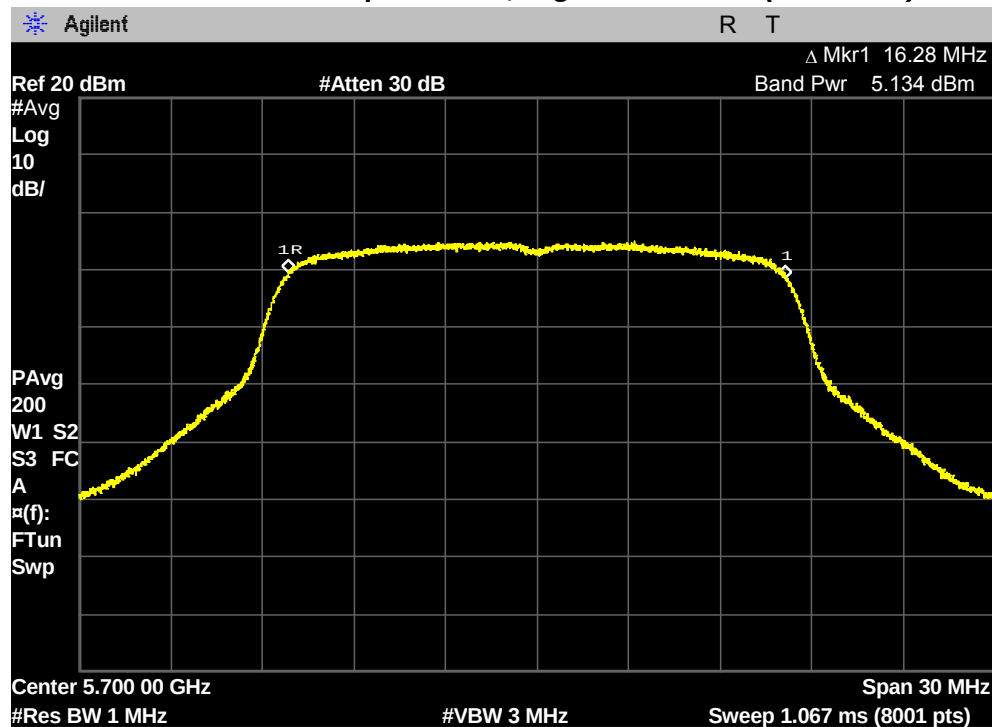


Maximum Conducted Output Power, Middle Channel (5580 MHz)

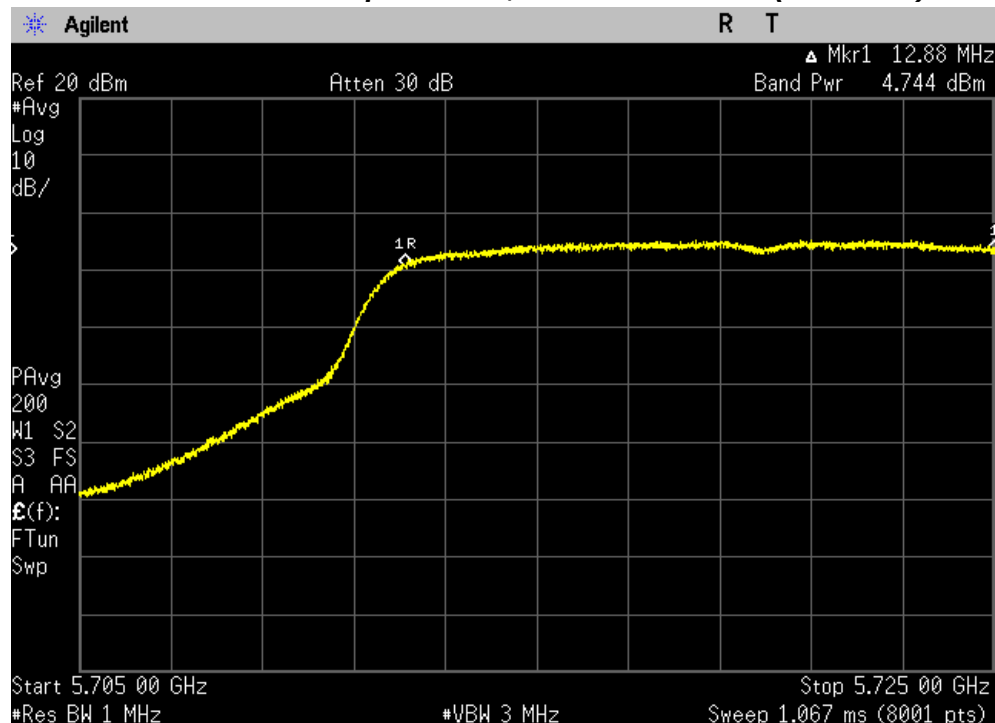


PLOTS OF EMISSIONS

Maximum Conducted Output Power, Highest Channel (5700 MHz)



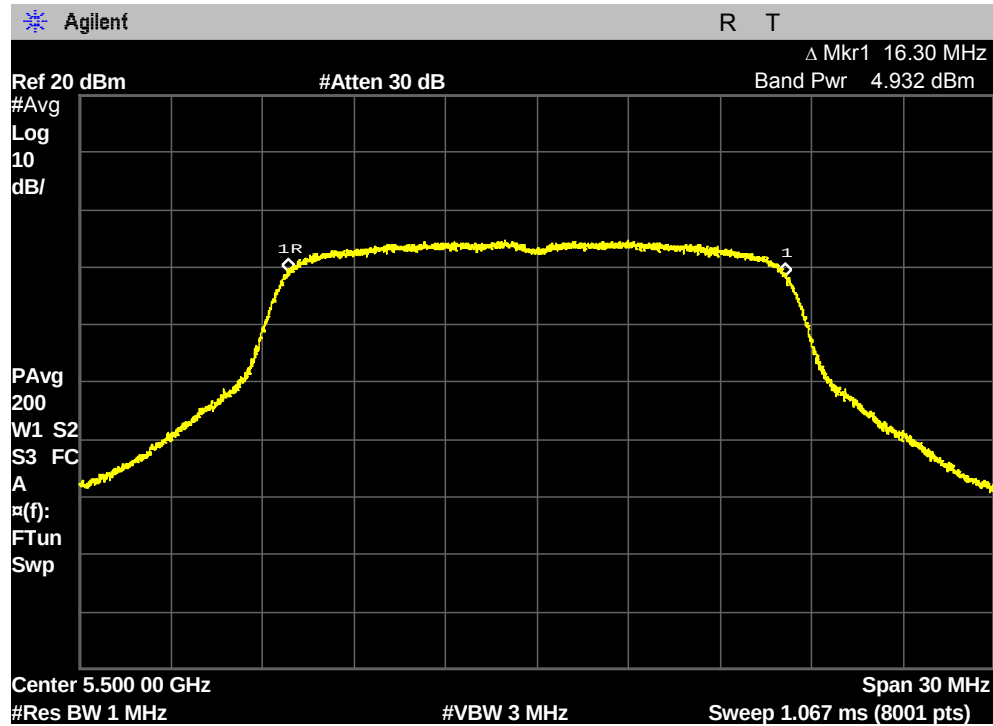
Maximum Conducted Output Power, Straddle Channel (5720 MHz)



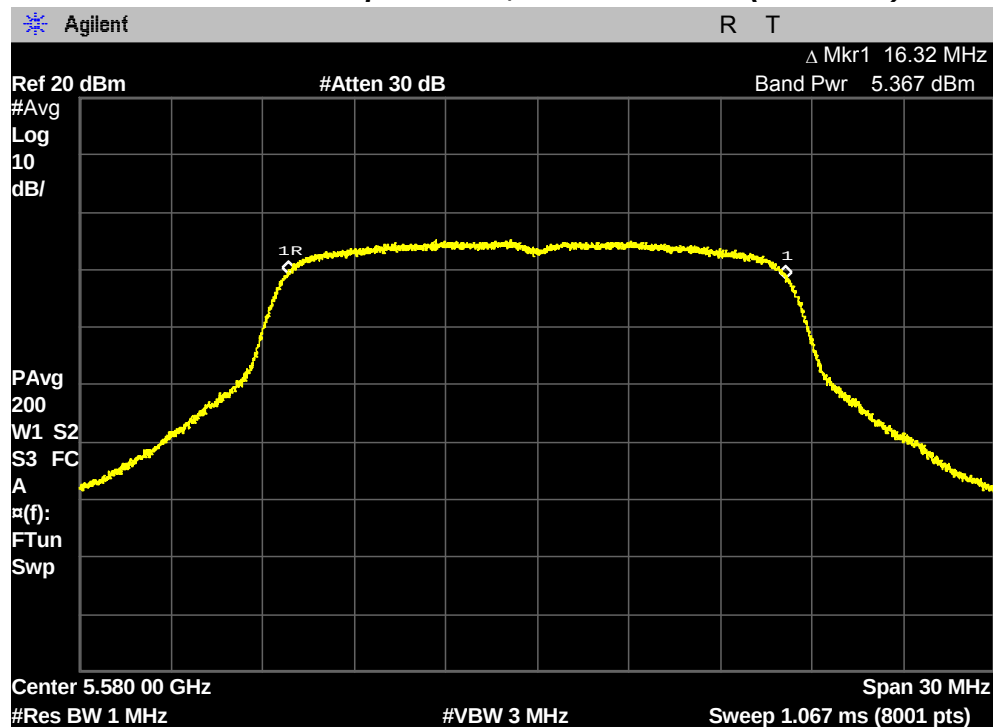
PLOTS OF EMISSIONS

Chain 1

Maximum Conducted Output Power, Lowest Channel (5500 MHz)

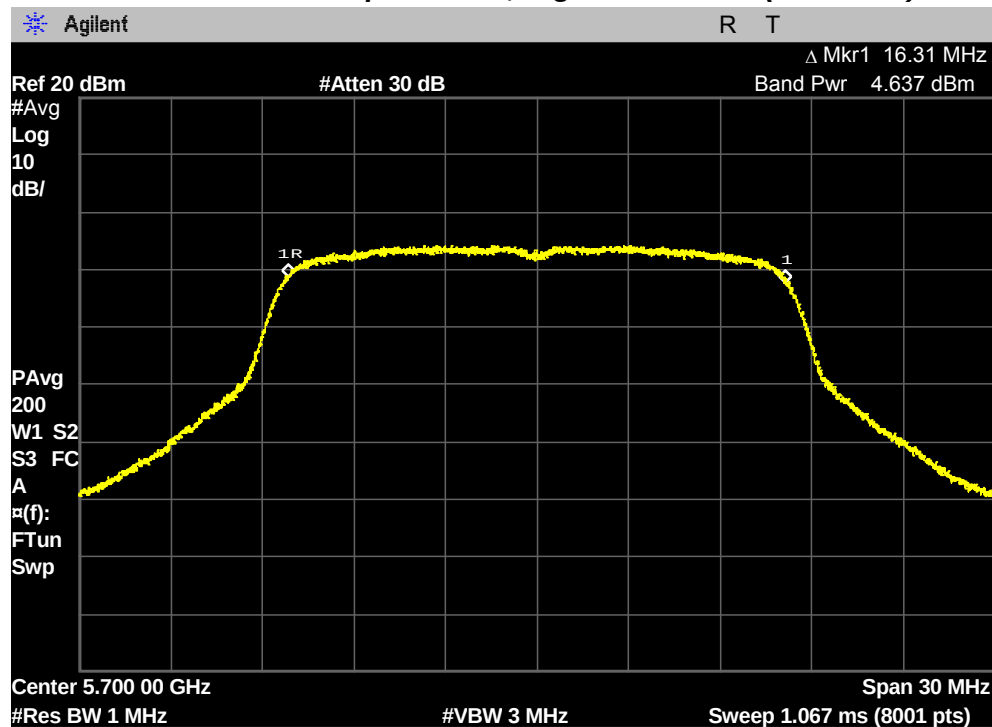


Maximum Conducted Output Power, Middle Channel (5580 MHz)

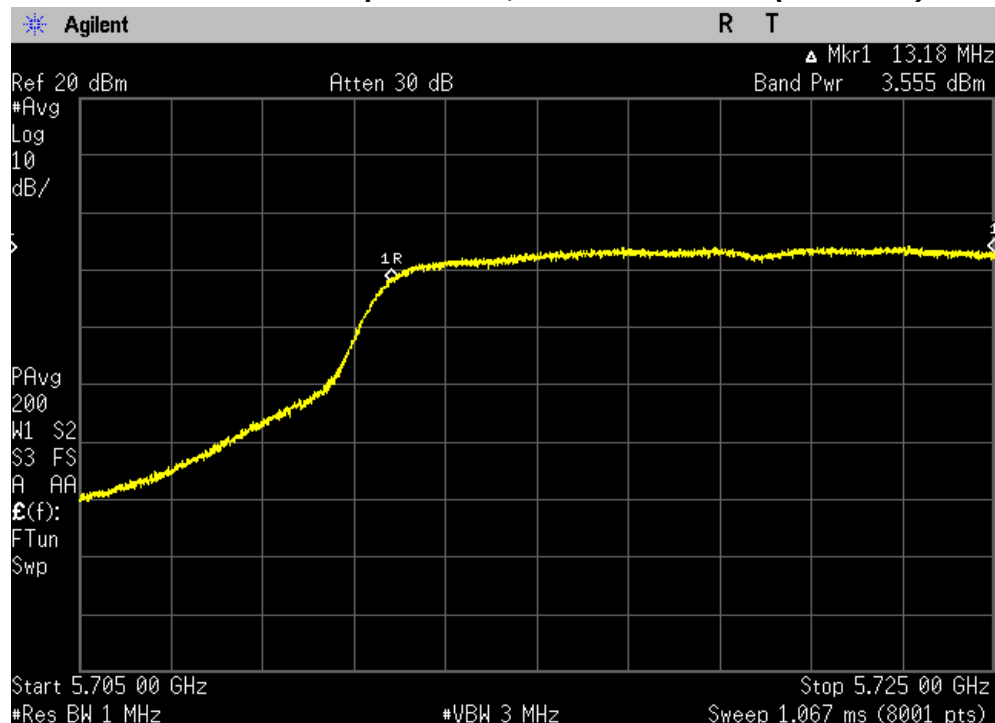


PLOTS OF EMISSIONS

Maximum Conducted Output Power, Highest Channel (5700 MHz)



Maximum Conducted Output Power, Straddle Channel (5720 MHz)

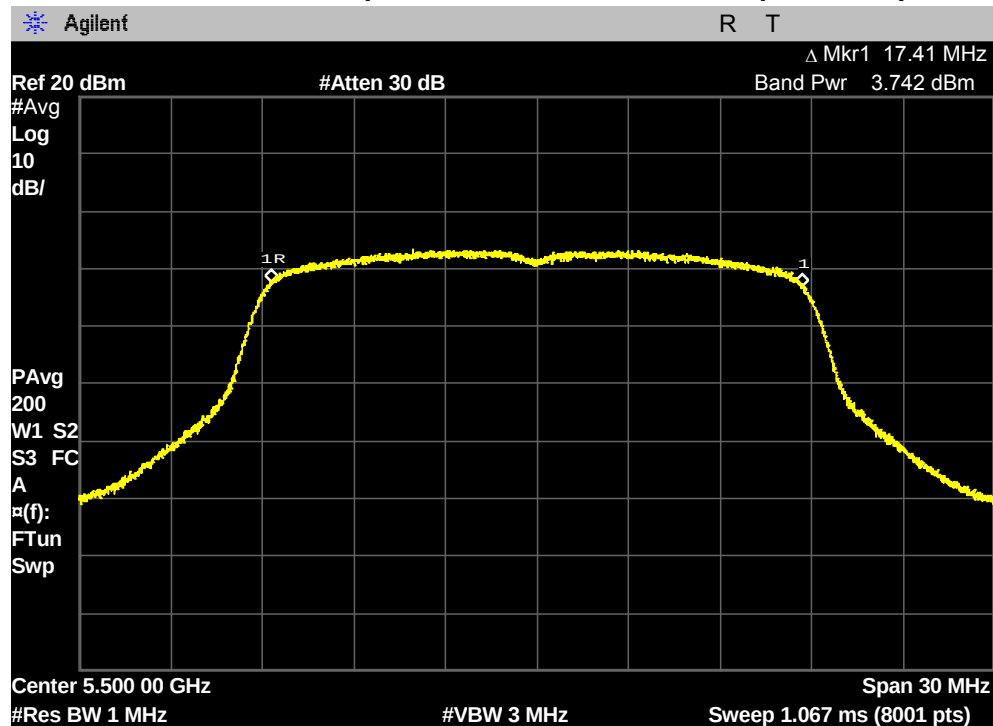


PLOTS OF EMISSIONS

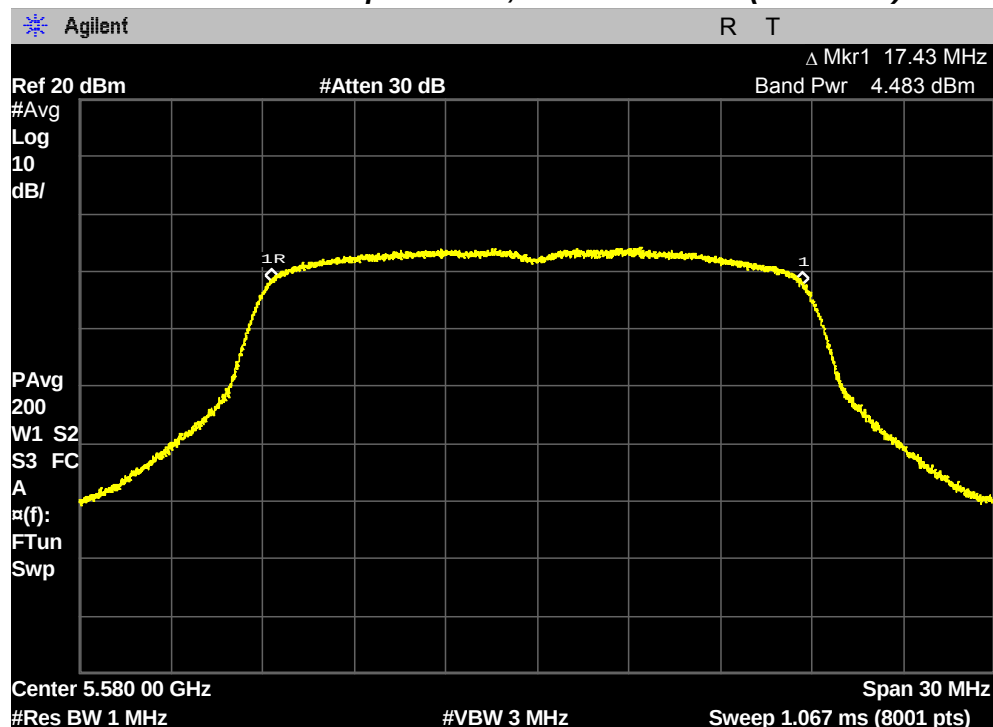
802.11n (20 MHz) mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5500 MHz)

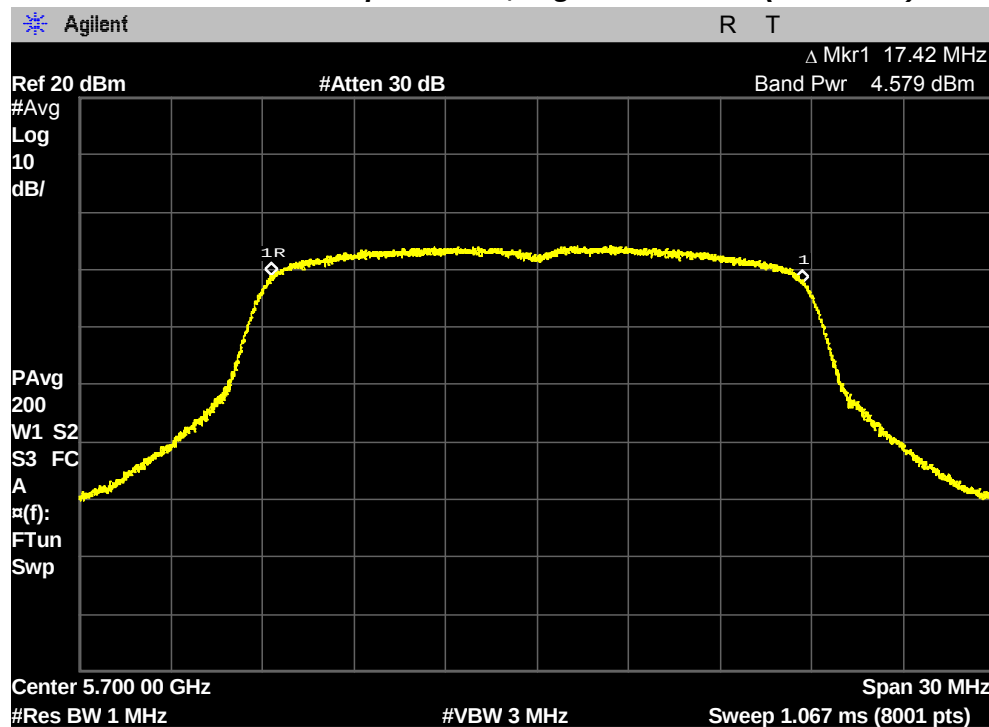


Maximum Conducted Output Power, Middle Channel (5580 MHz)

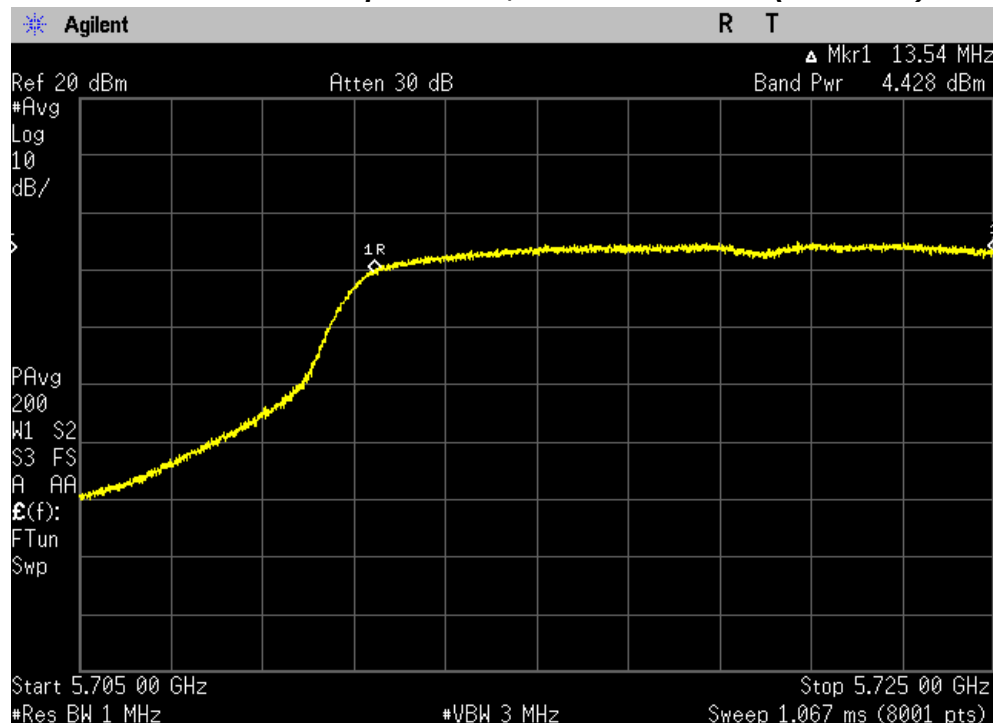


PLOTS OF EMISSIONS

Maximum Conducted Output Power, Highest Channel (5700 MHz)



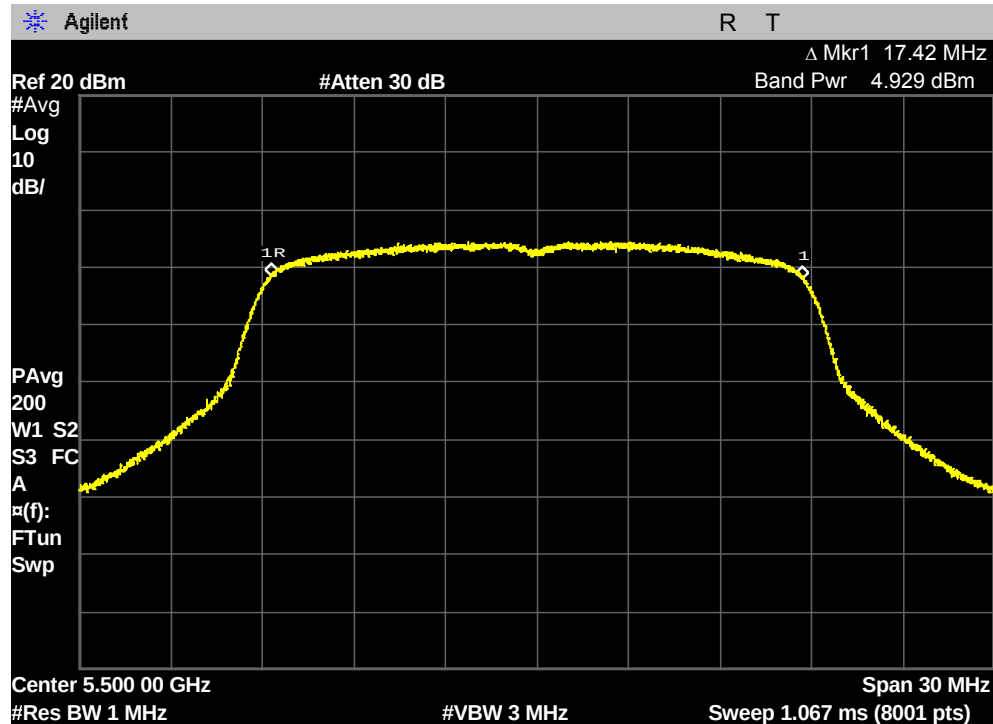
Maximum Conducted Output Power, Straddle Channel (5720 MHz)



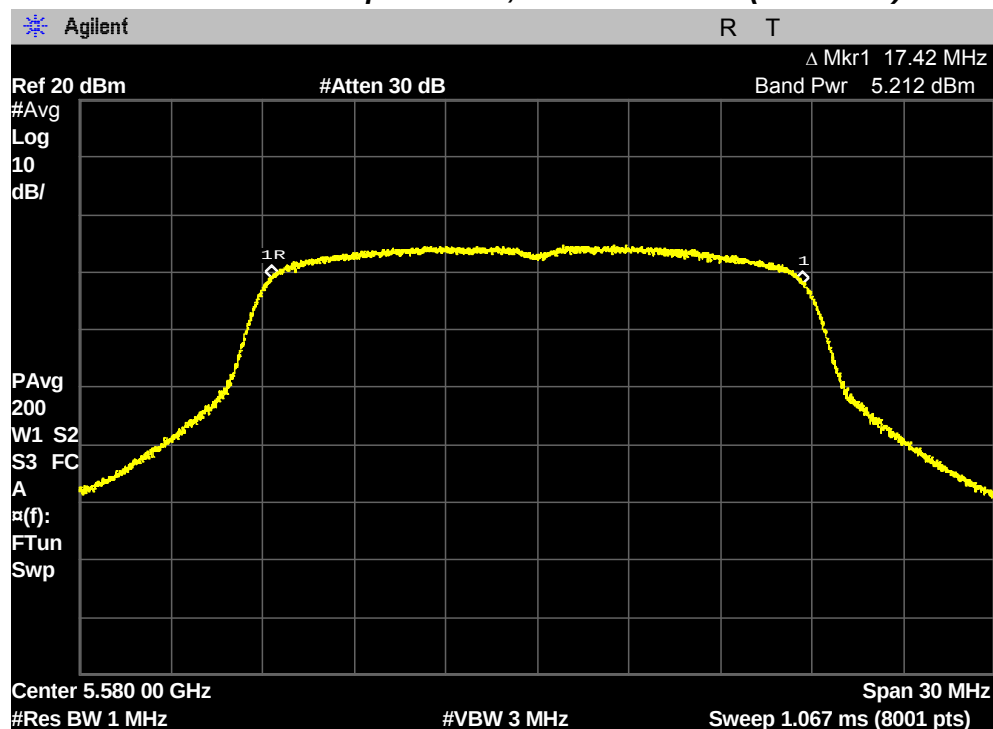
PLOTS OF EMISSIONS

Chain 1

Maximum Conducted Output Power, Lowest Channel (5500 MHz)

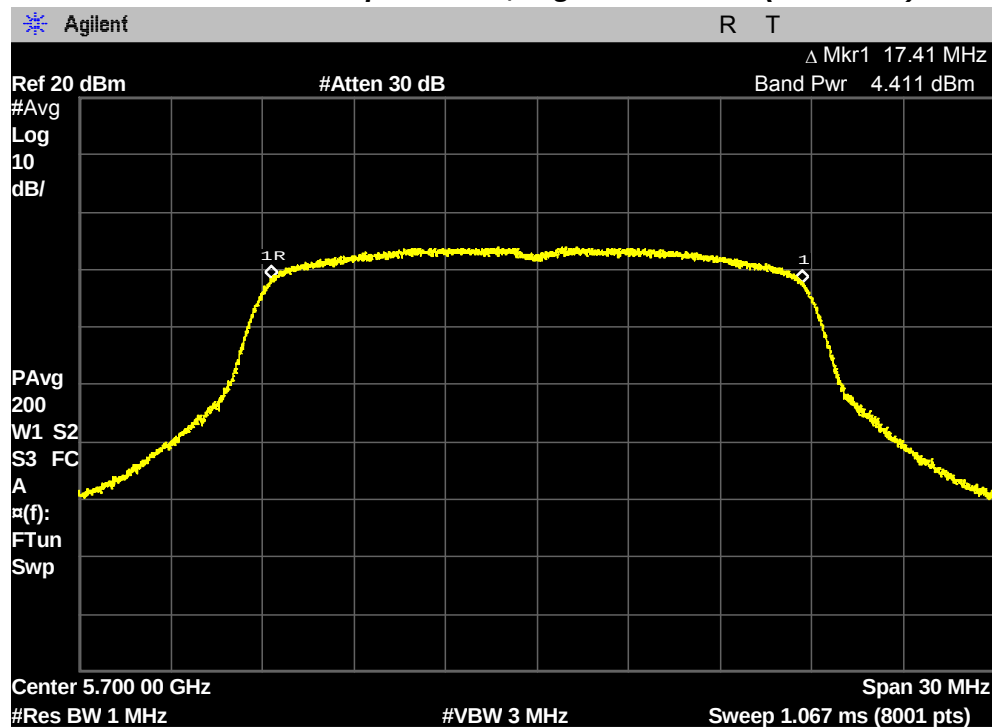


Maximum Conducted Output Power, Middle Channel (5580 MHz)

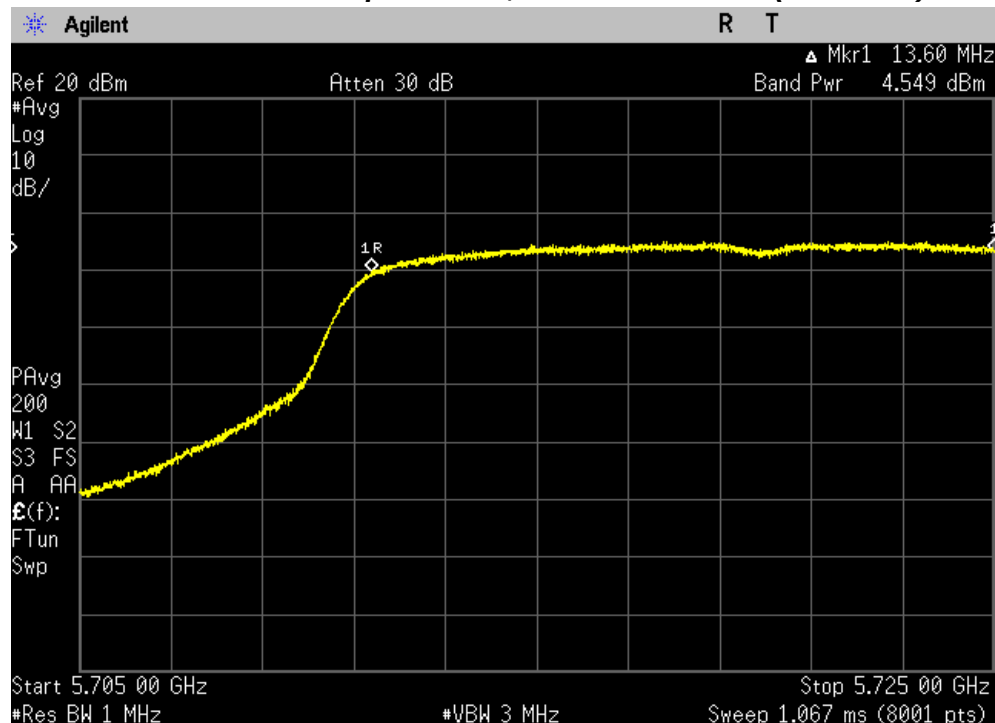


PLOTS OF EMISSIONS

Maximum Conducted Output Power, Highest Channel (5700 MHz)



Maximum Conducted Output Power, Straddle Channel (5720 MHz)

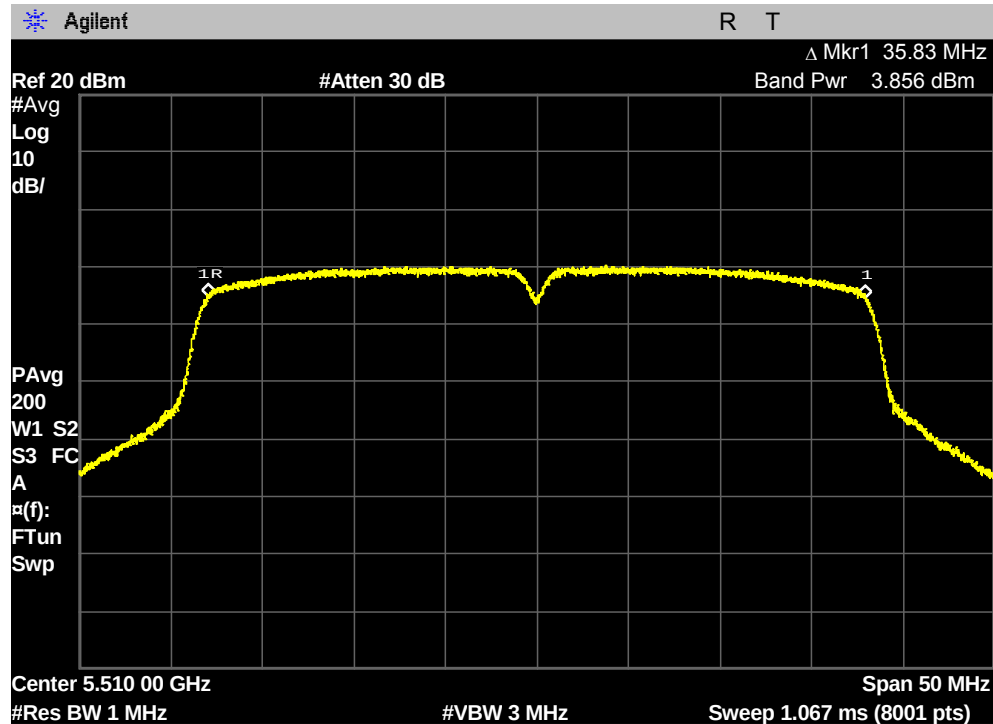


PLOTS OF EMISSIONS

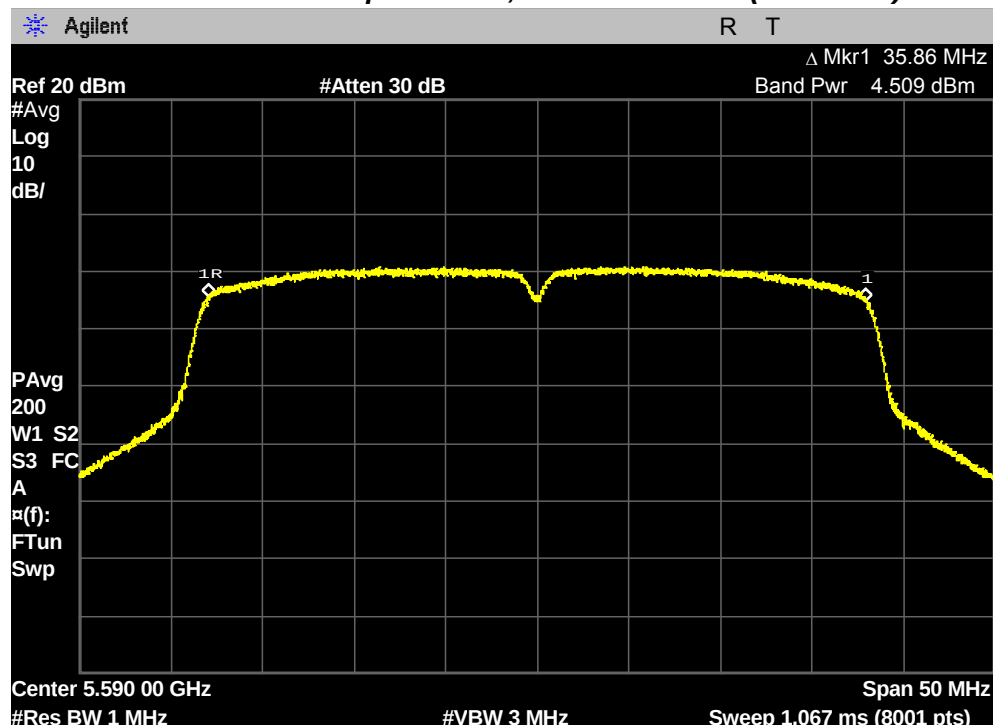
802.11n (40 MHz) mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5510 MHz)

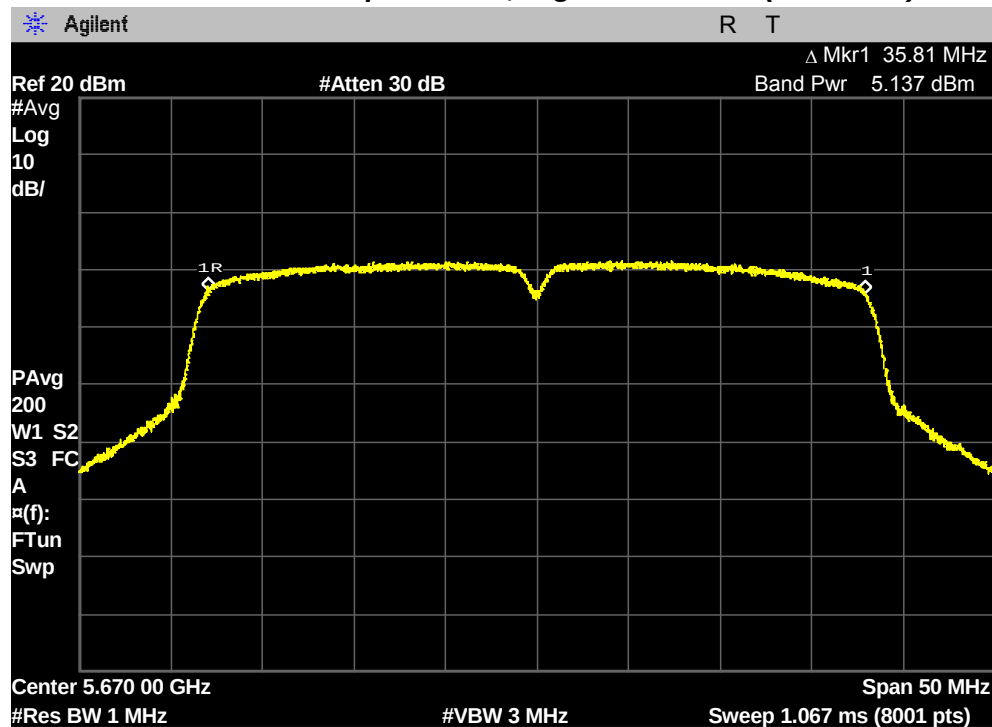


Maximum Conducted Output Power, Middle Channel (5590 MHz)

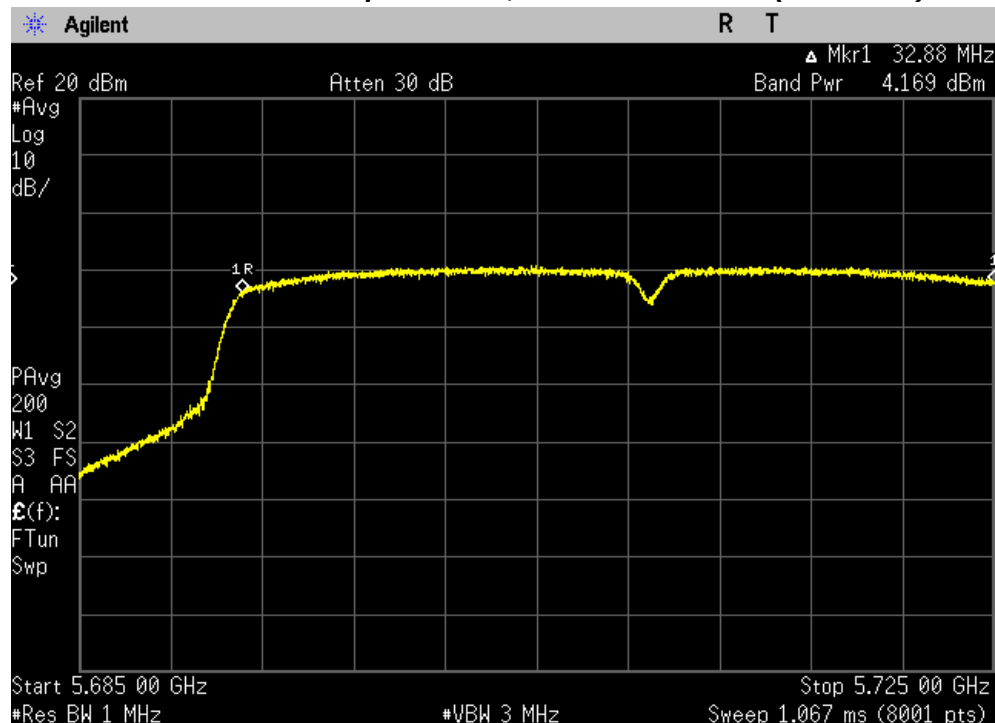


PLOTS OF EMISSIONS

Maximum Conducted Output Power, Highest Channel (5670 MHz)



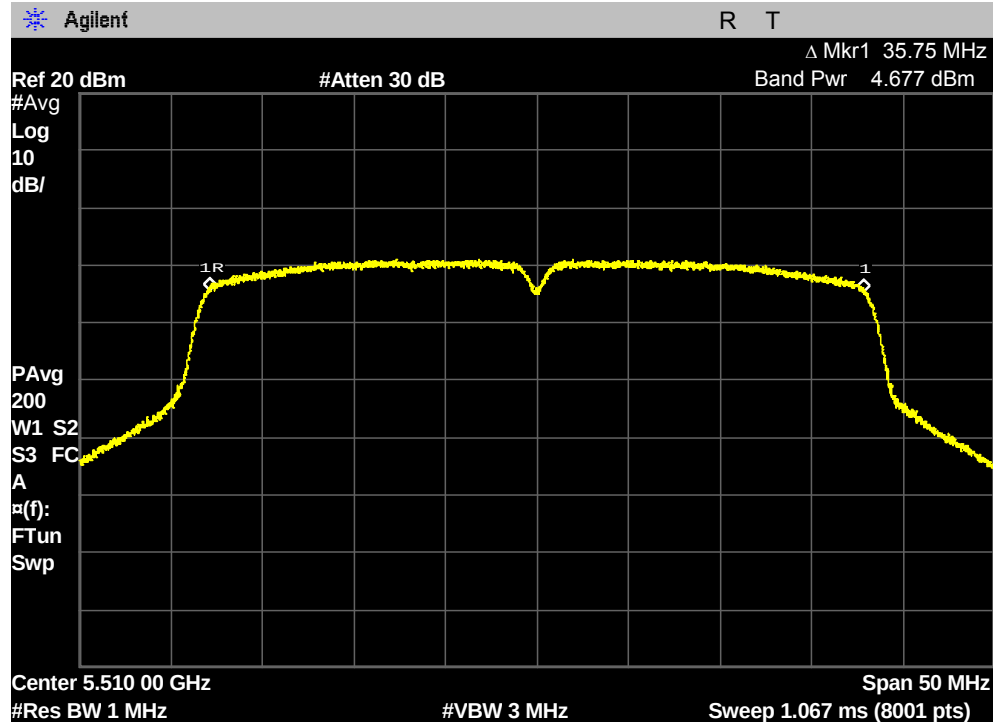
Maximum Conducted Output Power, Straddle Channel (5710 MHz)



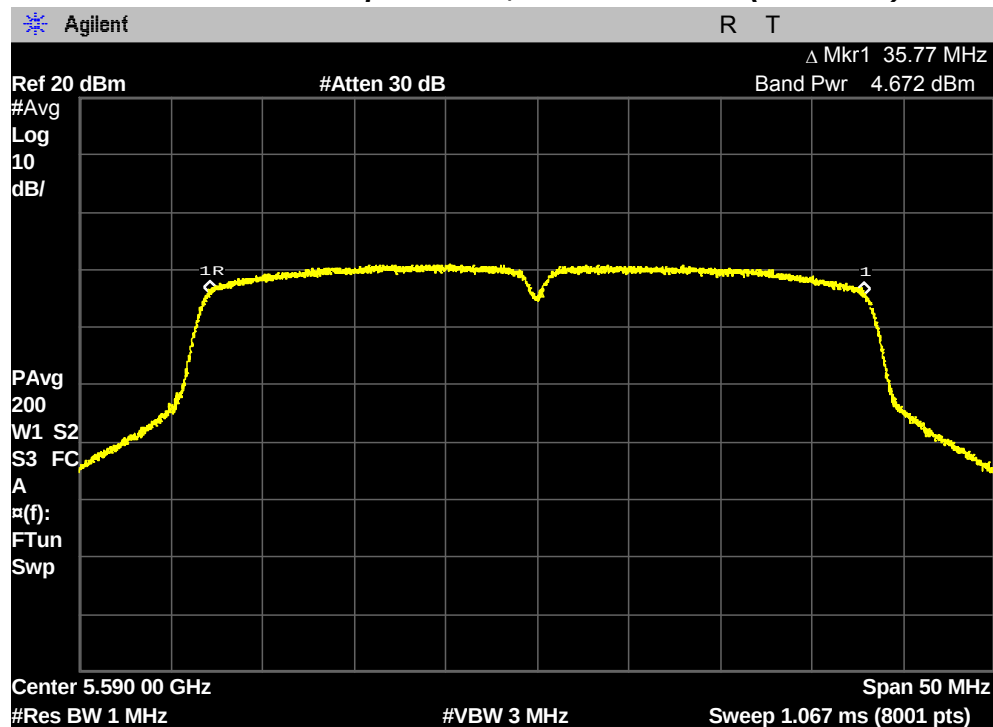
PLOTS OF EMISSIONS

Chain 1

Maximum Conducted Output Power, Lowest Channel (5510 MHz)

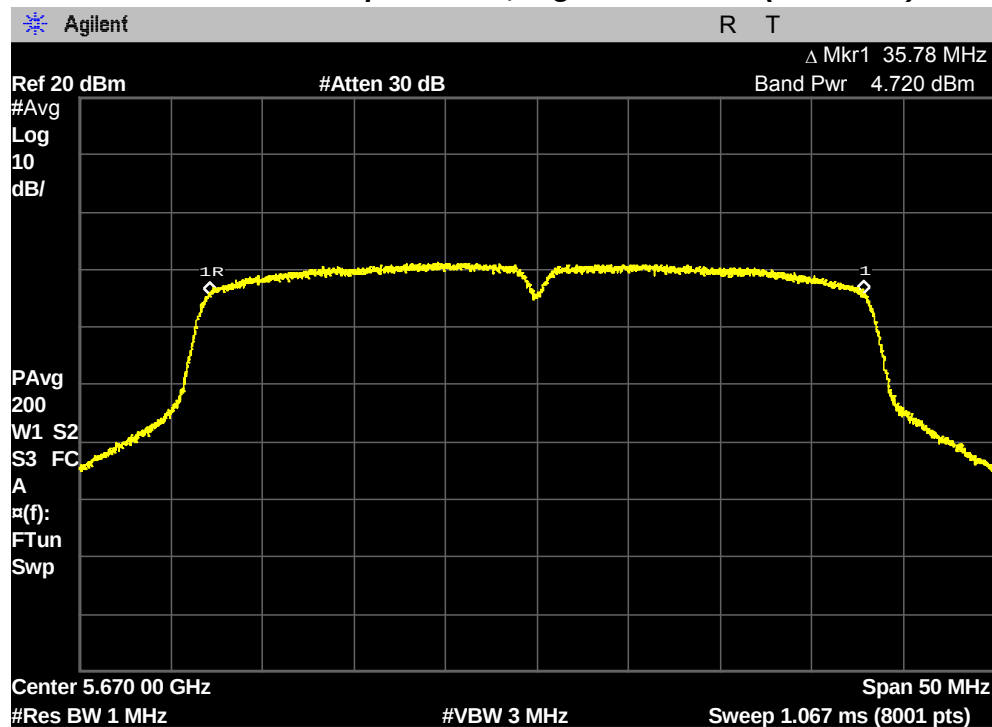


Maximum Conducted Output Power, Middle Channel (5590 MHz)

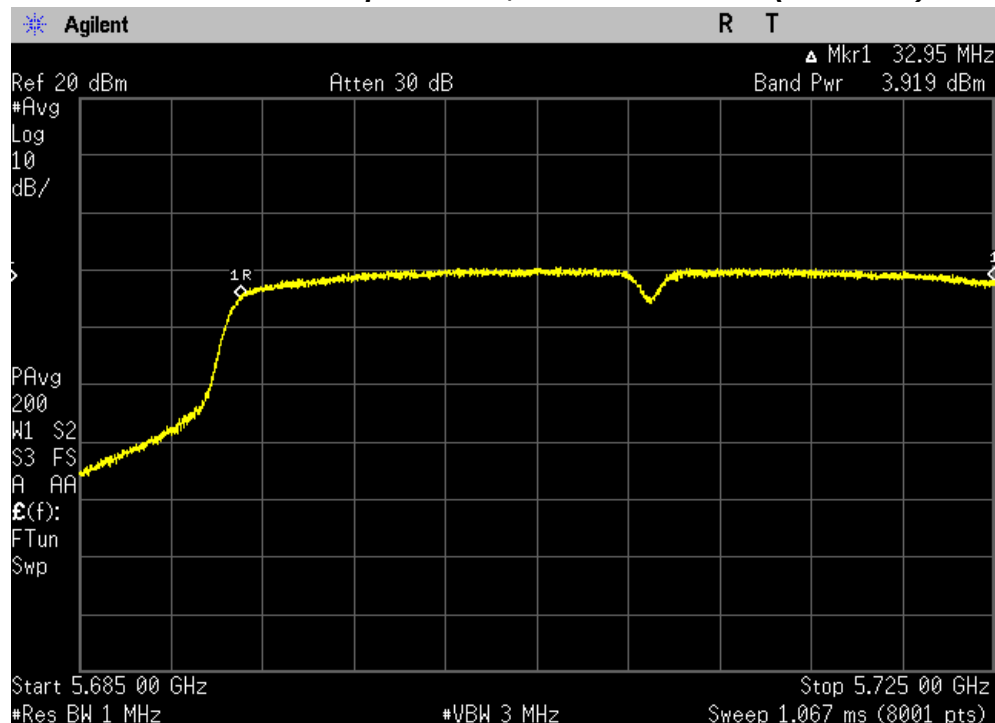


PLOTS OF EMISSIONS

Maximum Conducted Output Power, Highest Channel (5670 MHz)



Maximum Conducted Output Power, Straddle Channel (5710 MHz)

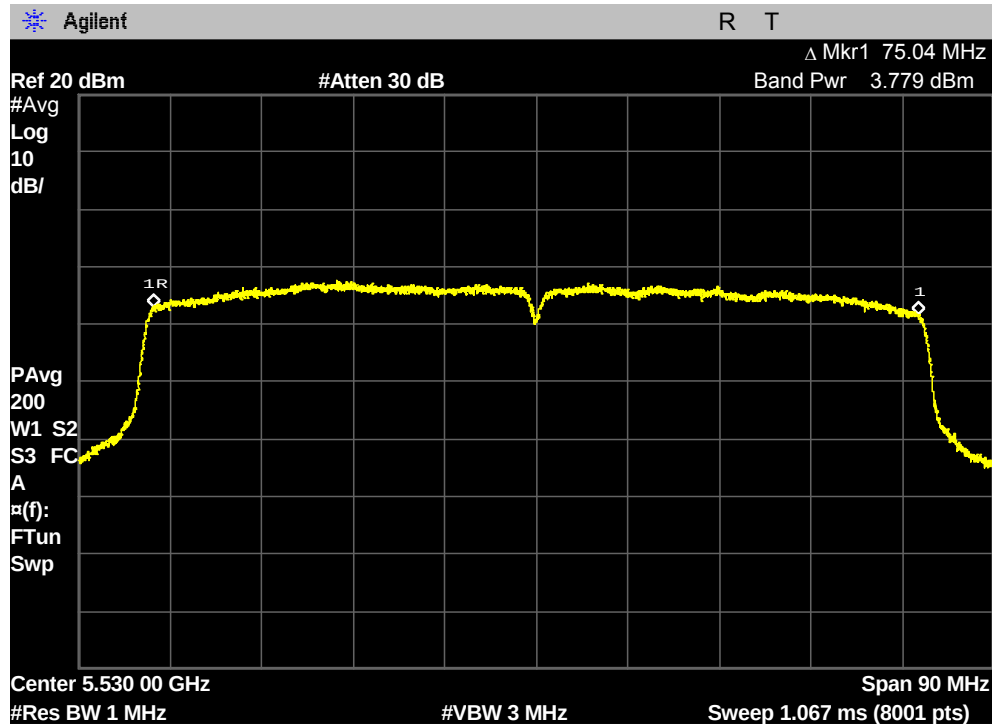


PLOTS OF EMISSIONS

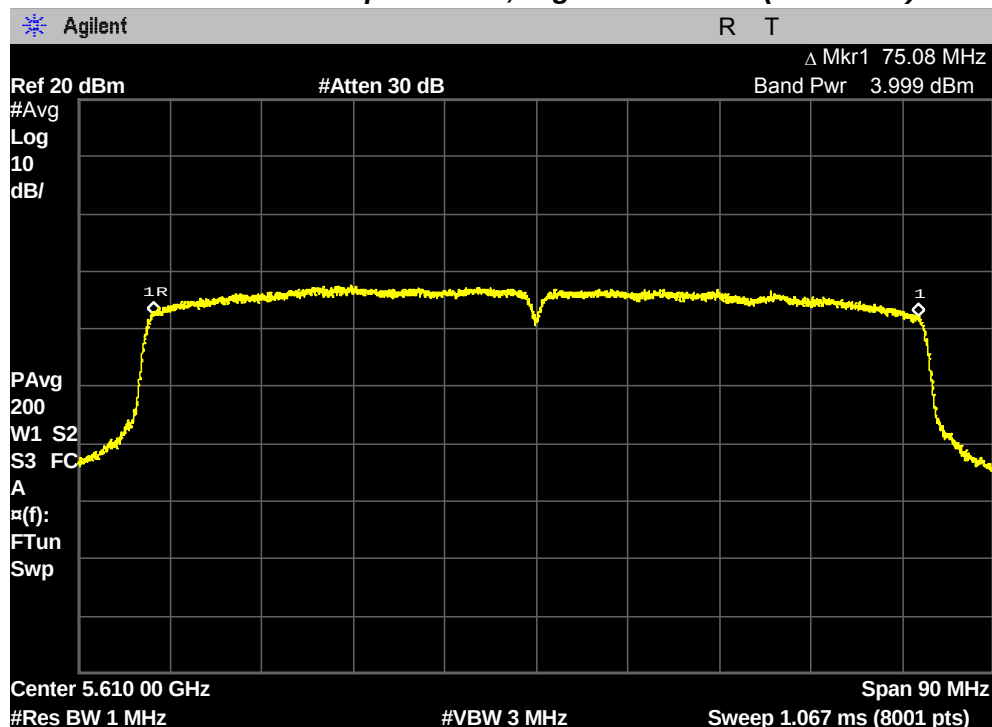
802.11ac (80 MHz) mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5530 MHz)

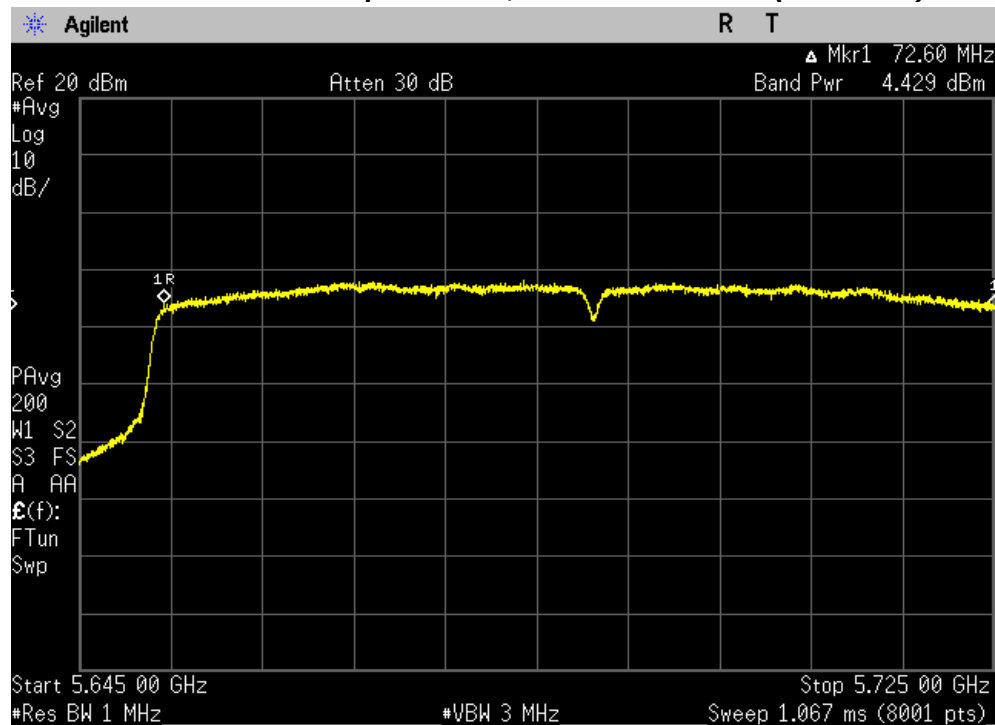


Maximum Conducted Output Power, Highest Channel (5610 MHz)



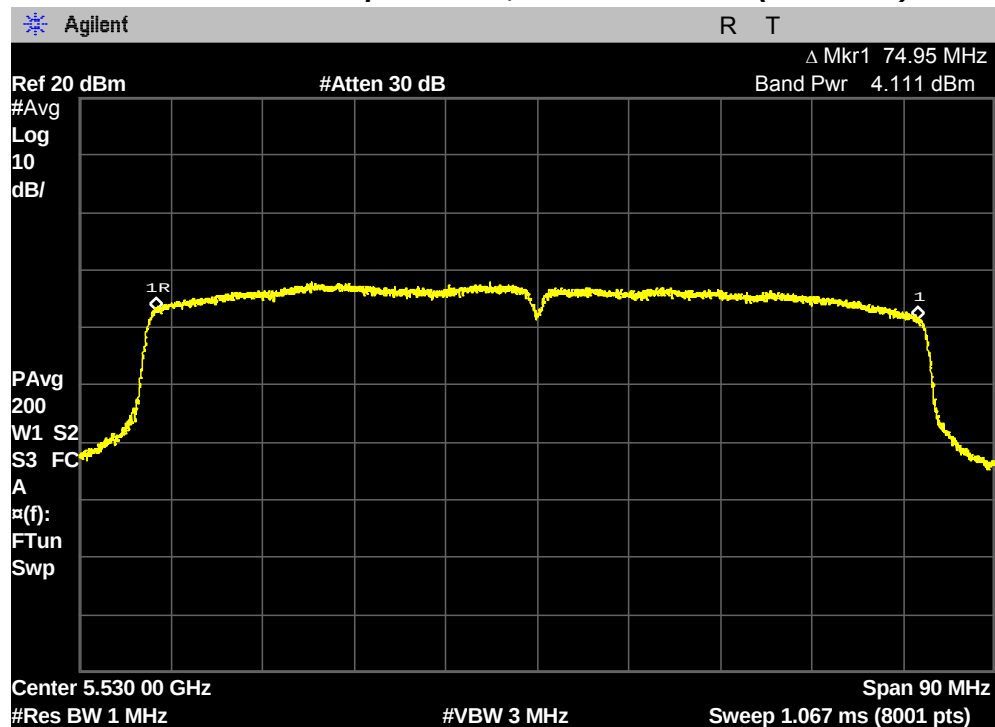
PLOTS OF EMISSIONS

Maximum Conducted Output Power, Straddle Channel (5690 MHz)



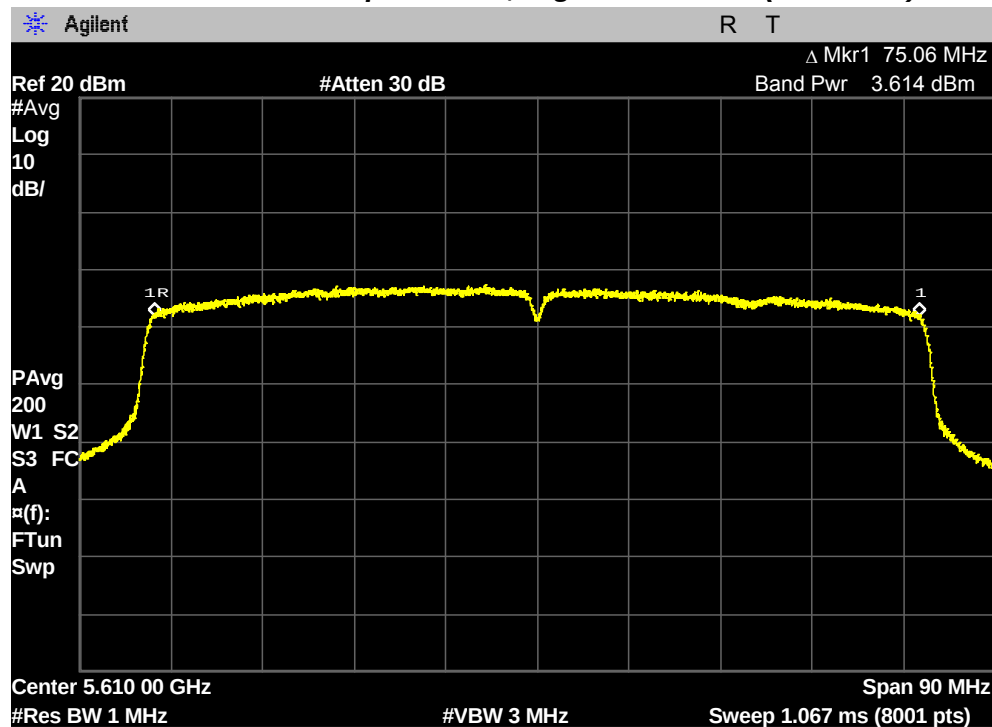
Chain 1

Maximum Conducted Output Power, Lowest Channel (5530 MHz)

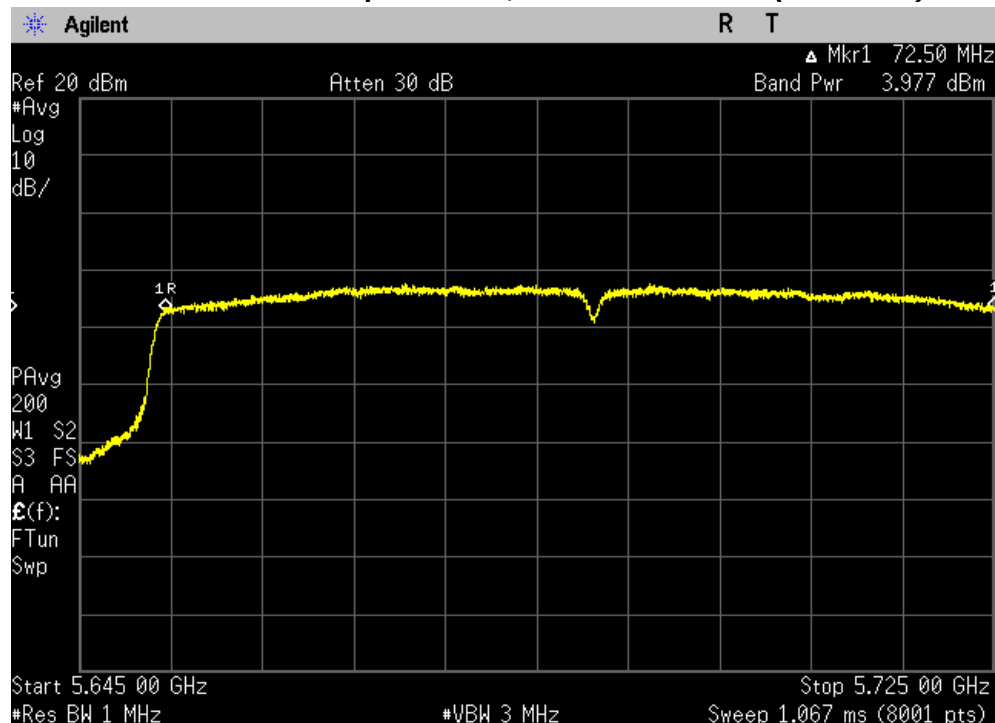


PLOTS OF EMISSIONS

Maximum Conducted Output Power, Highest Channel (5610 MHz)



Maximum Conducted Output Power, Straddle Channel (5690 MHz)



TEST DATA

8.5.4 Maximum Conducted Output Power – U-NII-3 band

FCC §15.407(a), RSS-247 Issue 2 6.2

Test Mode : Set to Straddle channel, Lowest channel, Middle channel and Highest channel

802.11a mode

Channel	Frequency (MHz)	Measured conducted power (dBm)		Duty Factor (dB)	Maximum Conducted Power (dBm)	Conducted Limit (dBm)	
		Chain 0	Chain 1		Total output power	FCC	IC
Straddle	5720	-4.36	-4.08	0.36	-0.85	30.00	
Lowest	5745	2.83	3.62	0.36	6.61	30.00	
Middle	5785	2.31	3.48	0.36	6.30	30.00	
Highest	5825	1.60	3.96	0.36	6.31	30.00	

802.11n (20MHz) mode

Channel	Frequency (MHz)	Measured conducted power (dBm)		Duty Factor (dB)	Maximum Conducted Power (dBm)	Conducted Limit (dBm)	
		Chain 0	Chain 1		Total output power	FCC	IC
Straddle	5720	-5.14	-4.70	0.39	-1.51	30.00	
Lowest	5745	1.88	3.28	0.39	6.04	30.00	
Middle	5785	1.60	3.22	0.39	5.89	30.00	
Highest	5825	1.11	3.63	0.39	5.95	30.00	

TEST DATA

802.11n (40MHz) mode

Channel	Frequency (MHz)	Measured conducted power (dBm)		Duty Factor (dB)	Maximum Conducted Power (dBm)	Conducted Limit (dBm)	
		Chain 0	Chain 1		Total output power	FCC	IC
Straddle	5710	-10.90	-9.38	0.75	-6.31	30.00	
Lowest	5755	2.22	3.02	0.75	6.40	30.00	
Highest	5795	1.57	3.33	0.75	6.30	30.00	

802.11ac (80MHz) mode

Channel	Frequency (MHz)	Measured conducted power (dBm)		Duty Factor (dB)	Maximum Conducted Power (dBm)	Conducted Limit (dBm)	
		Chain 0	Chain 1		Total output power	FCC	IC
Straddle	5690	-14.19	-15.28	1.41	-10.28	30.00	
Middle	5775	2.06	2.45	1.41	6.68	30.00	

Note:

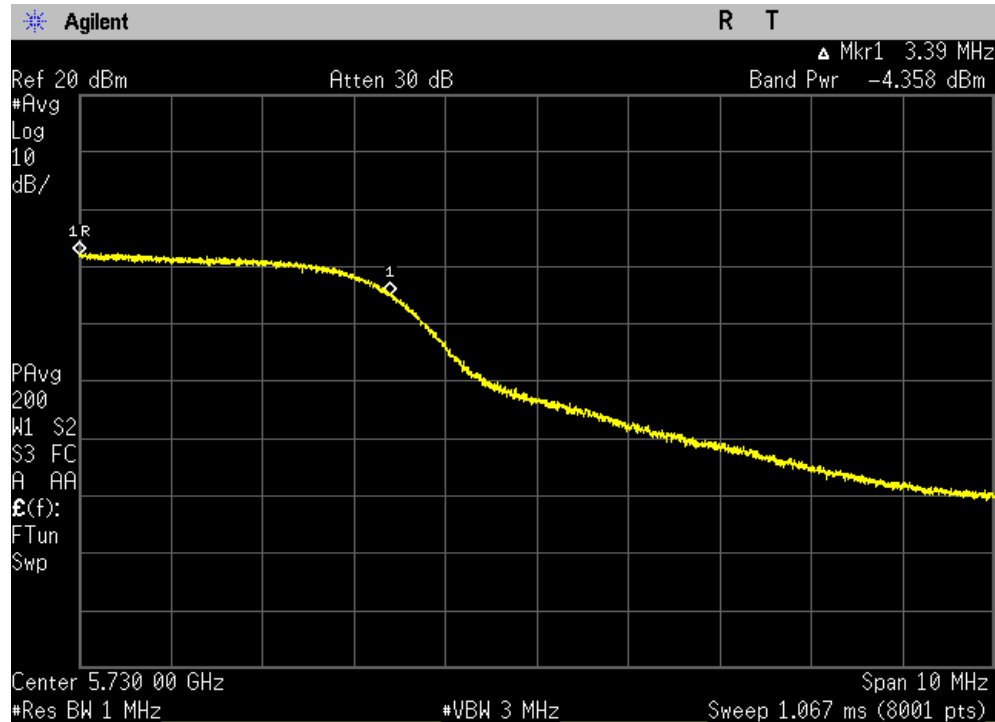
- Maximum Conducted (average) Power = Measured conducted power + Duty Factor
- Total output power = $10 \log [10^{\{(Chain\ 0\ Power + duty\ factor)/10\}} + 10^{\{(Chain\ 1\ Power + duty\ factor)/10\}}]$
- For CDD transmission, directional gain is. **4.9 dBi**
For MIMO transmission, directional gain is **4.9 dBi**.
Directional gain was calculated according to KDB662911 D01 Multiple Transmitter Output v02r01.
For power measurements on IEEE 802.11 devices employing CDD, directional gain is as follows,
Directional gain = $G_{ANT} + Array\ Gain = 4.9\ dBi + 0\ dB = 4.9\ dBi$
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;
Array Gain = 0 dB (i.e., no array gain) for channel widths $\geq 40\ MHz$ for any N_{ANT} ;
Array Gain = $5 \log(N_{ANT}/N_{SS})\ dB$ or 3 dB, whichever is less, for 20-MHz channel widths with $N_{ANT} \geq 5$.
For power measurements on all devices employing MIMO, directional gain is as follows,
Directional gain = $G_{ANT} + 10 \log(N_{ANT}/N_{SS})\ dBi$, where N_{SS} = the number of independent spatial streams of data and G_{ANT} is the antenna gain in dBi. = $4.9\ dBi + 10 \log(2/2)\ dB = 4.9\ dBi$.
- The following equation was used for spectrum offset:
Spectrum offset (dB) = Attenuator (dB) + Cable Loss (dB) + SMA Type Connector Loss (dB)

PLOTS OF EMISSIONS

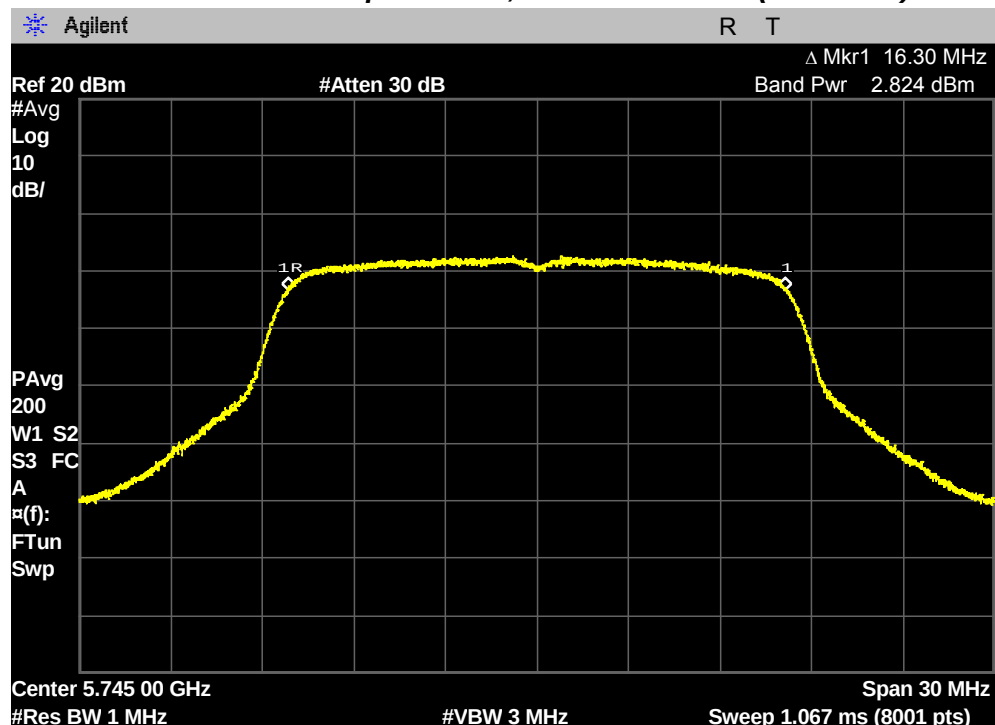
802.11a mode

Chain 0

Maximum Conducted Output Power, Straddle Channel (5720 MHz)

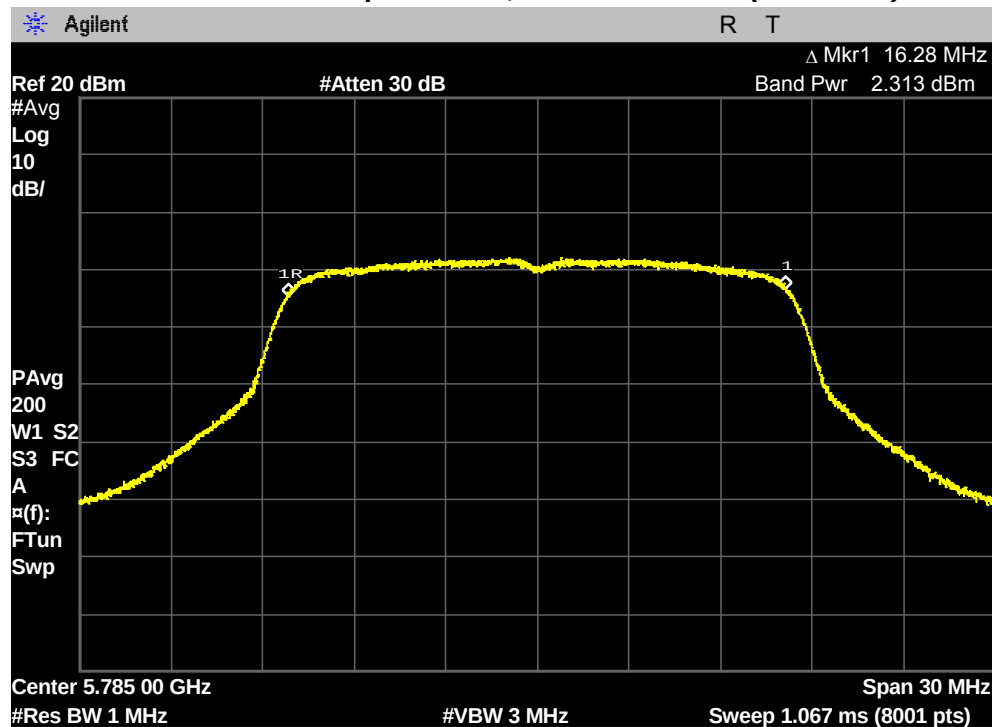


Maximum Conducted Output Power, Lowest Channel (5745 MHz)

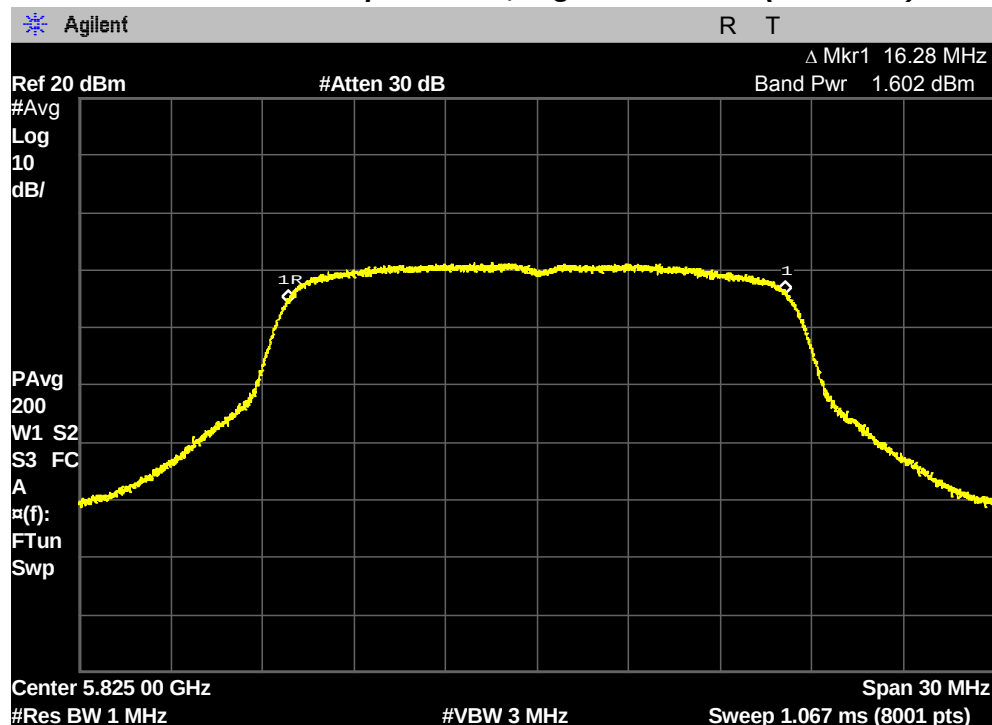


PLOTS OF EMISSIONS

Maximum Conducted Output Power, Middle Channel (5785 MHz)



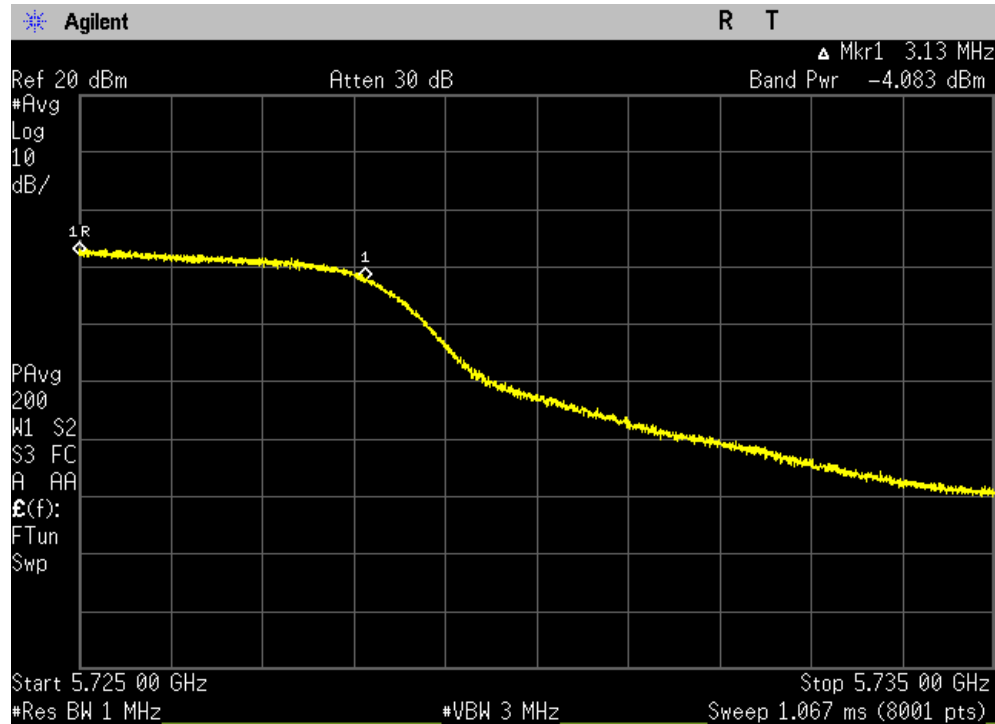
Maximum Conducted Output Power, Highest Channel (5825 MHz)



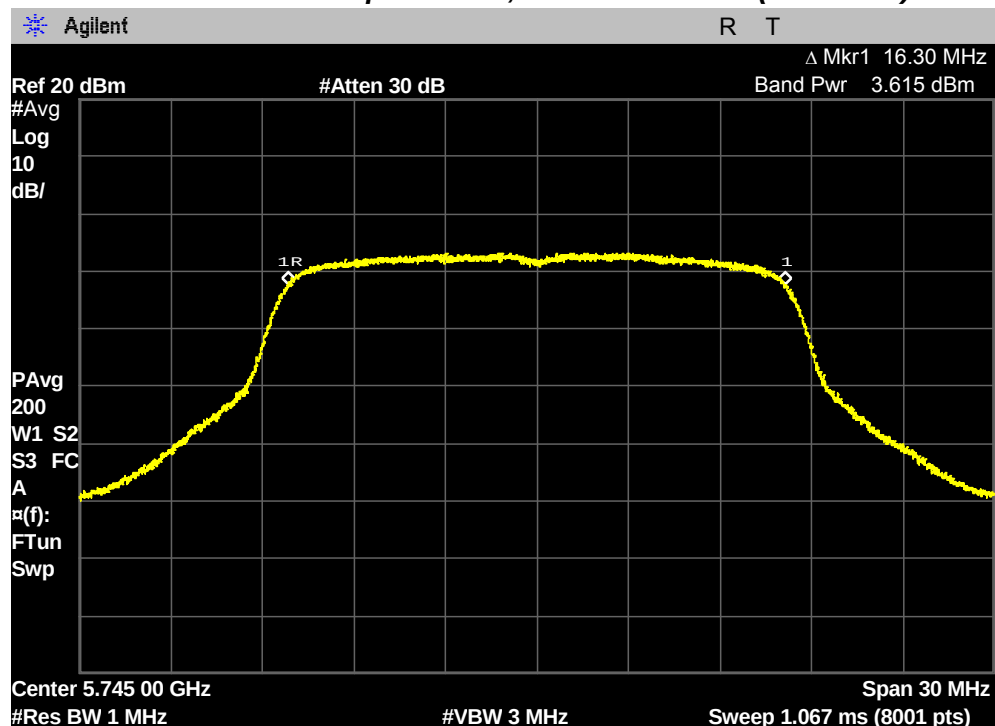
PLOTS OF EMISSIONS

Chain 1

Maximum Conducted Output Power, Straddle Channel (5720 MHz)

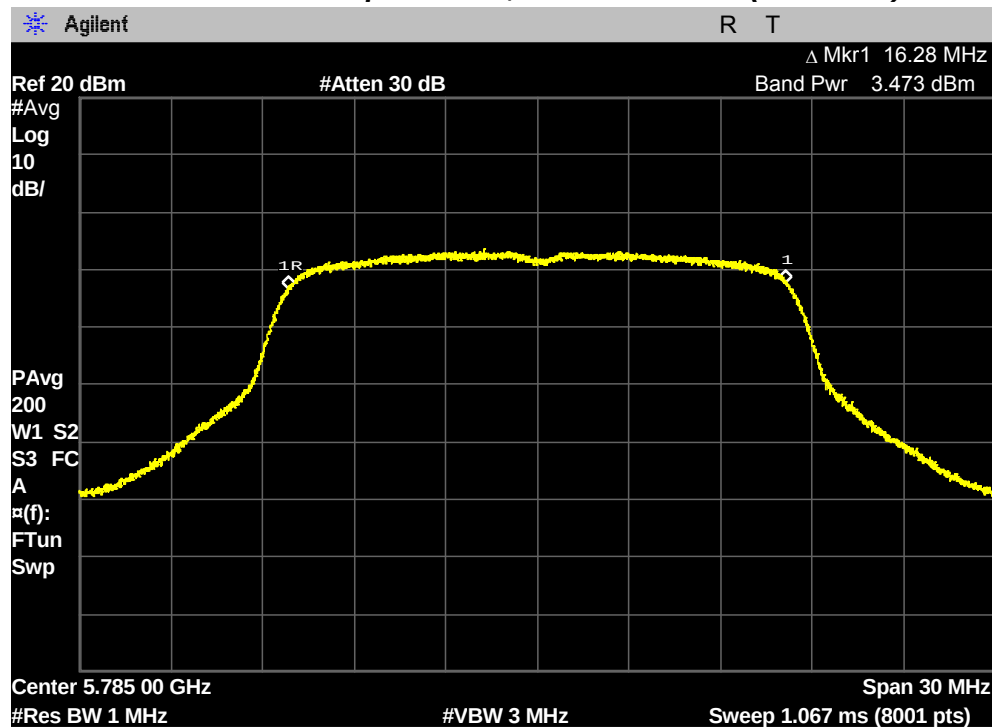


Maximum Conducted Output Power, Lowest Channel (5745 MHz)

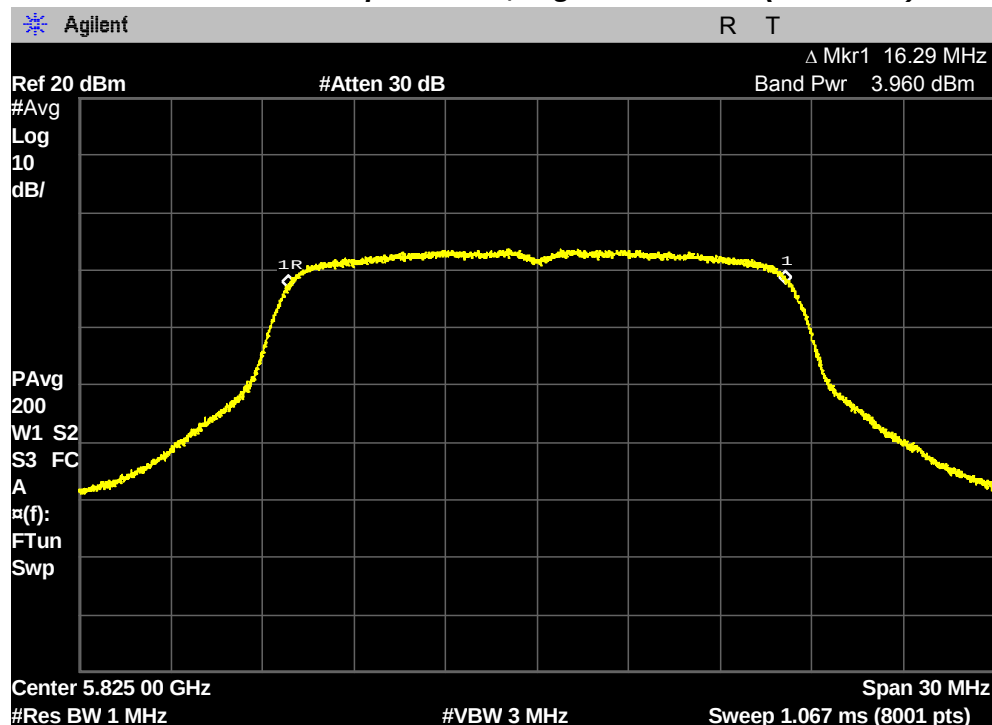


PLOTS OF EMISSIONS

Maximum Conducted Output Power, Middle Channel (5785 MHz)



Maximum Conducted Output Power, Highest Channel (5825 MHz)

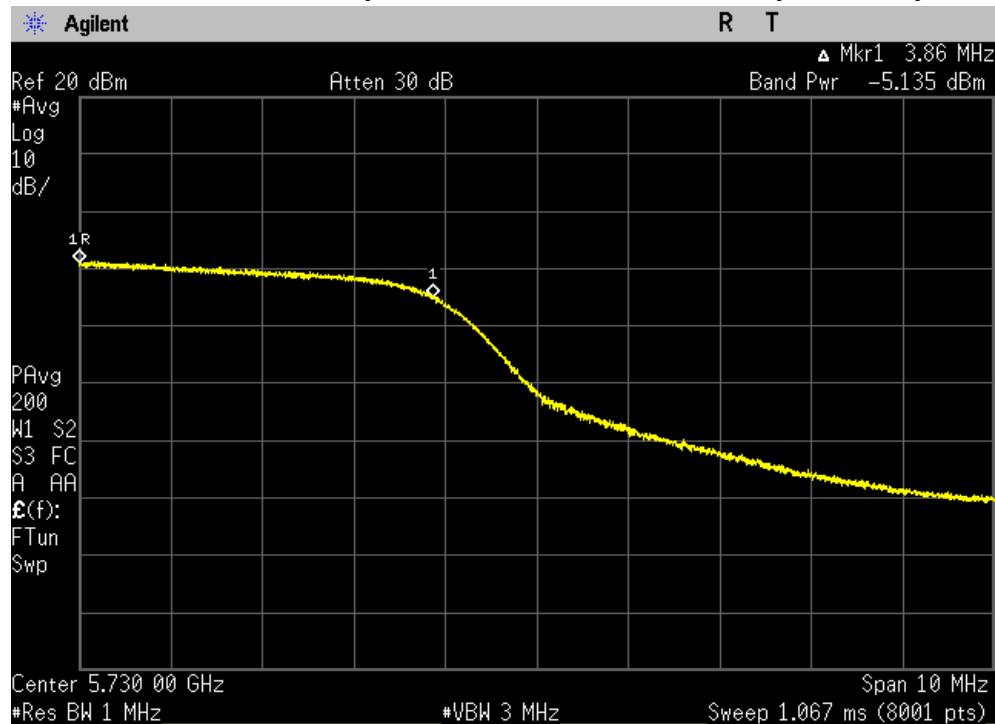


PLOTS OF EMISSIONS

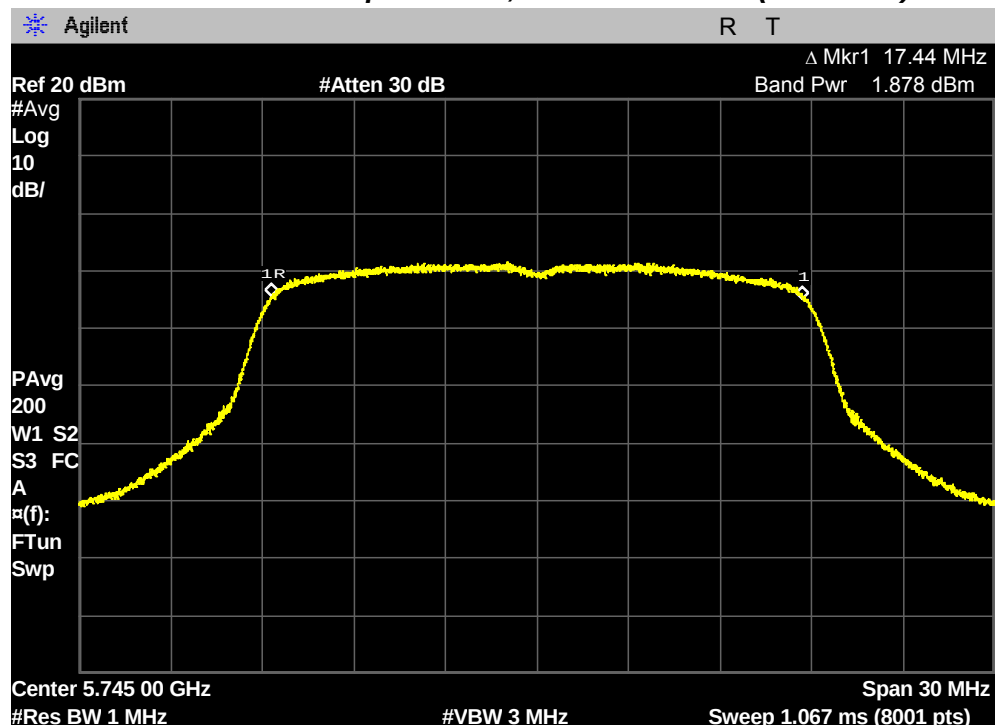
802.11n (20 MHz) mode

Chain 0

Maximum Conducted Output Power, Straddle Channel (5720 MHz)

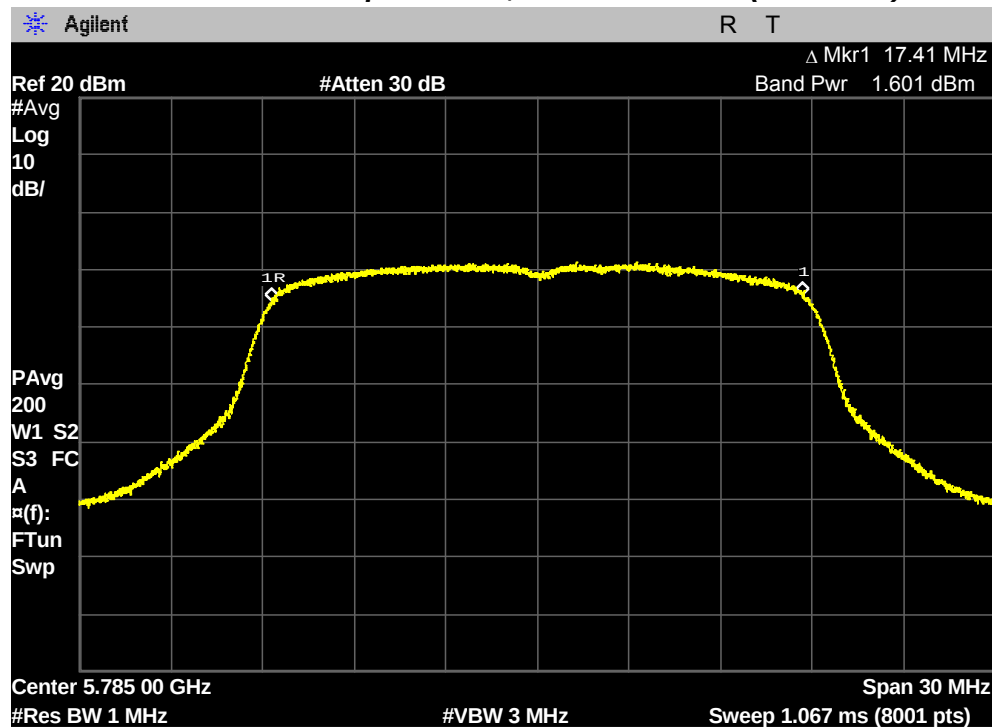


Maximum Conducted Output Power, Lowest Channel (5745 MHz)

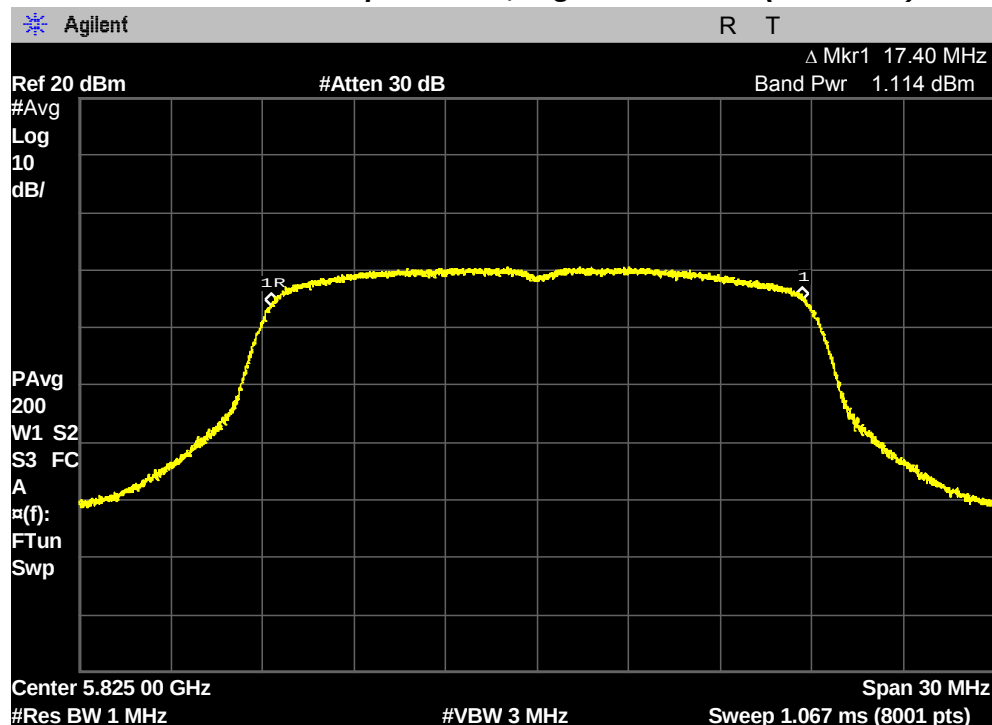


PLOTS OF EMISSIONS

Maximum Conducted Output Power, Middle Channel (5785 MHz)



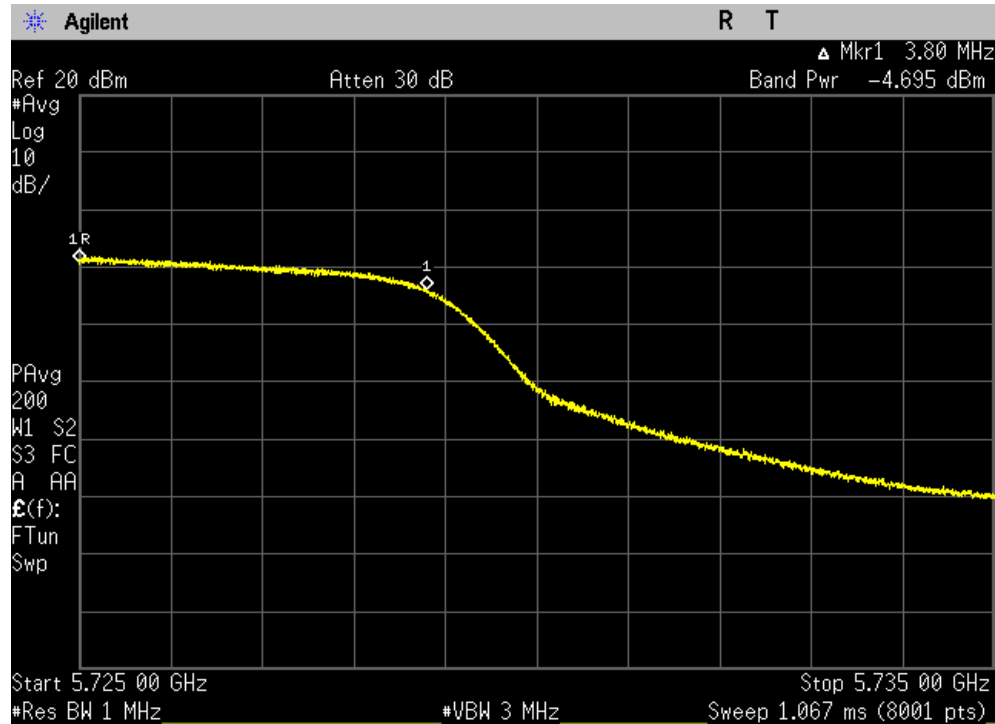
Maximum Conducted Output Power, Highest Channel (5825 MHz)



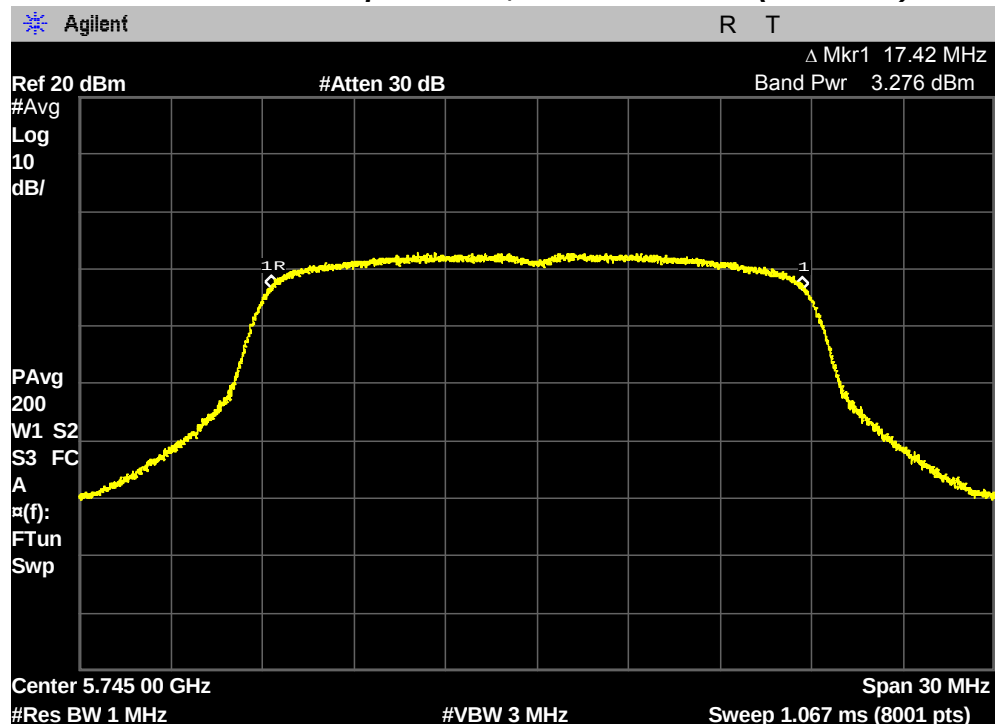
PLOTS OF EMISSIONS

Chain 1

Maximum Conducted Output Power, Straddle Channel (5720 MHz)

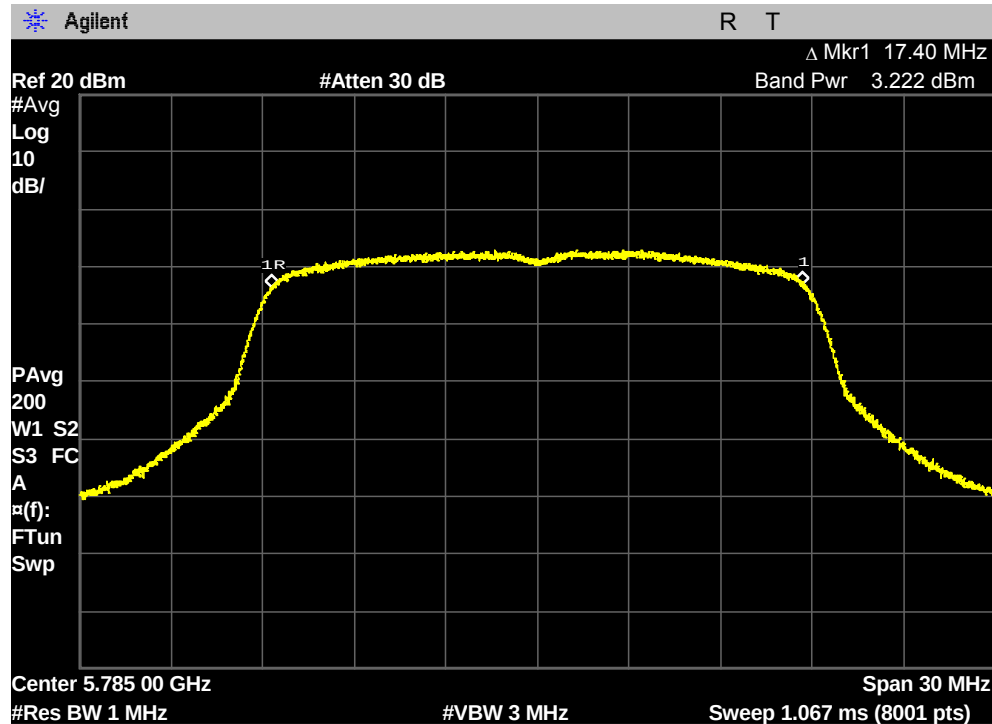


Maximum Conducted Output Power, Lowest Channel (5745 MHz)

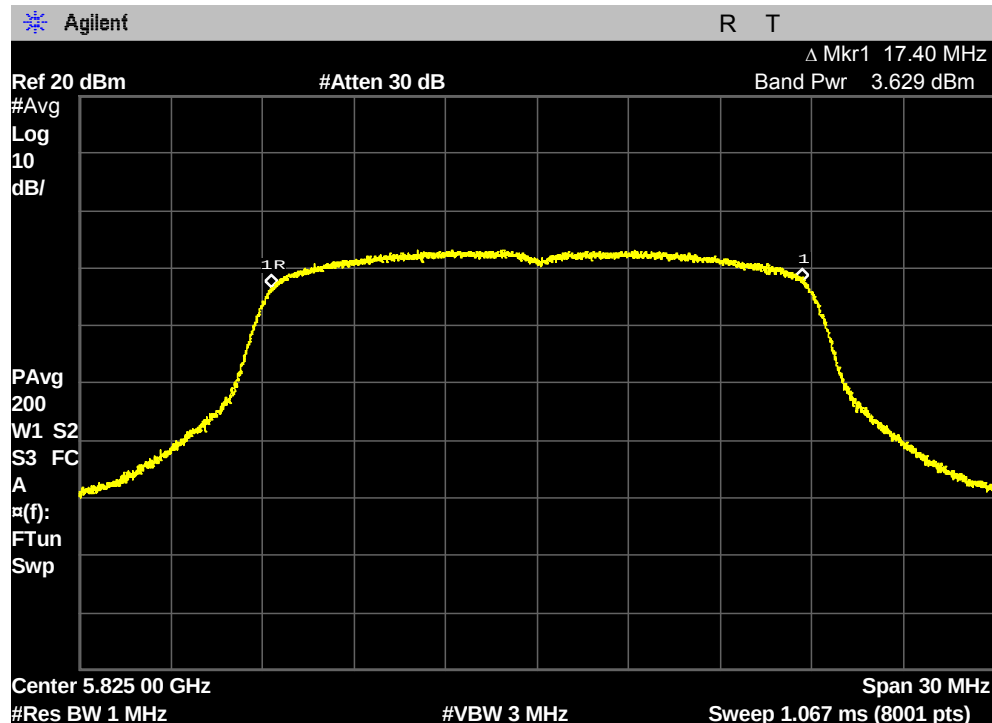


PLOTS OF EMISSIONS

Maximum Conducted Output Power, Middle Channel (5785 MHz)



Maximum Conducted Output Power, Highest Channel (5825 MHz)

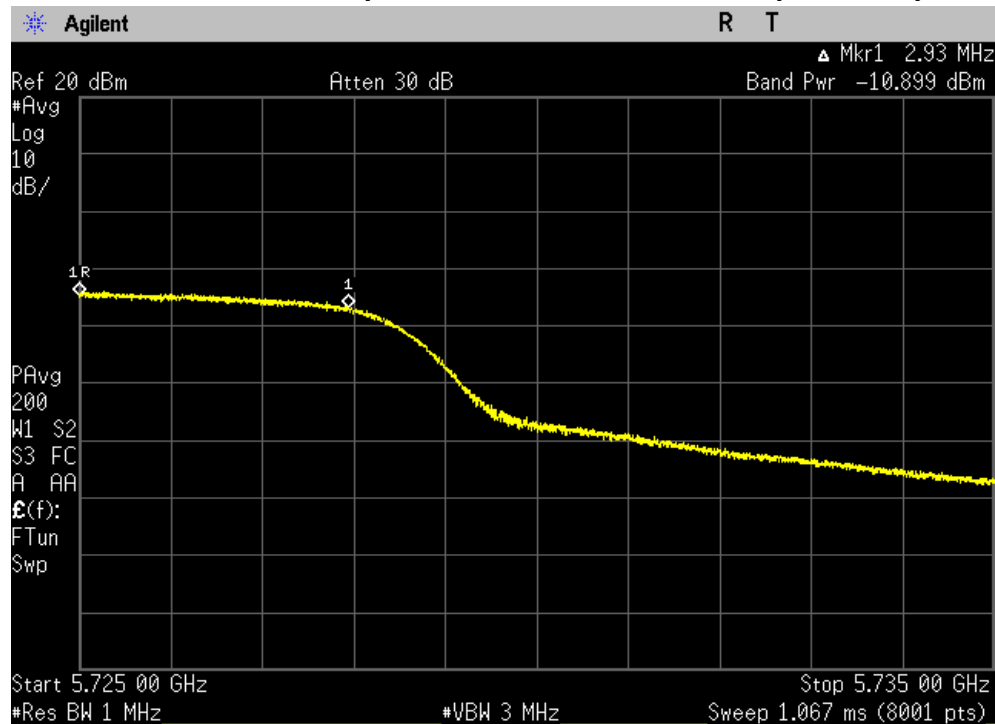


PLOTS OF EMISSIONS

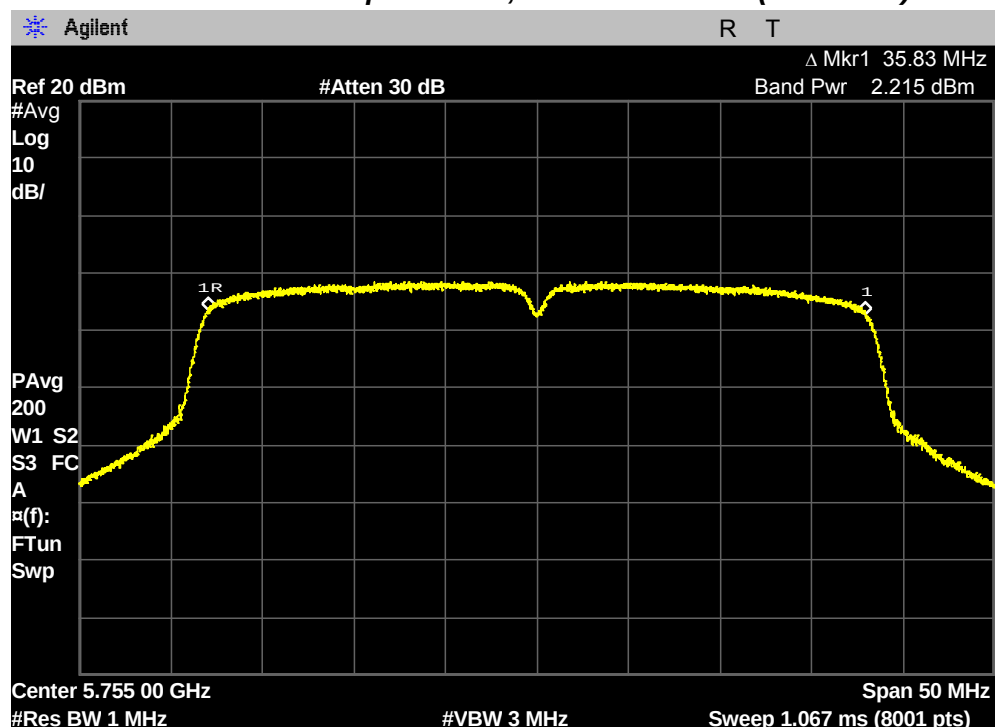
802.11n (40 MHz) mode

Chain 0

Maximum Conducted Output Power, Straddle Channel (5710 MHz)

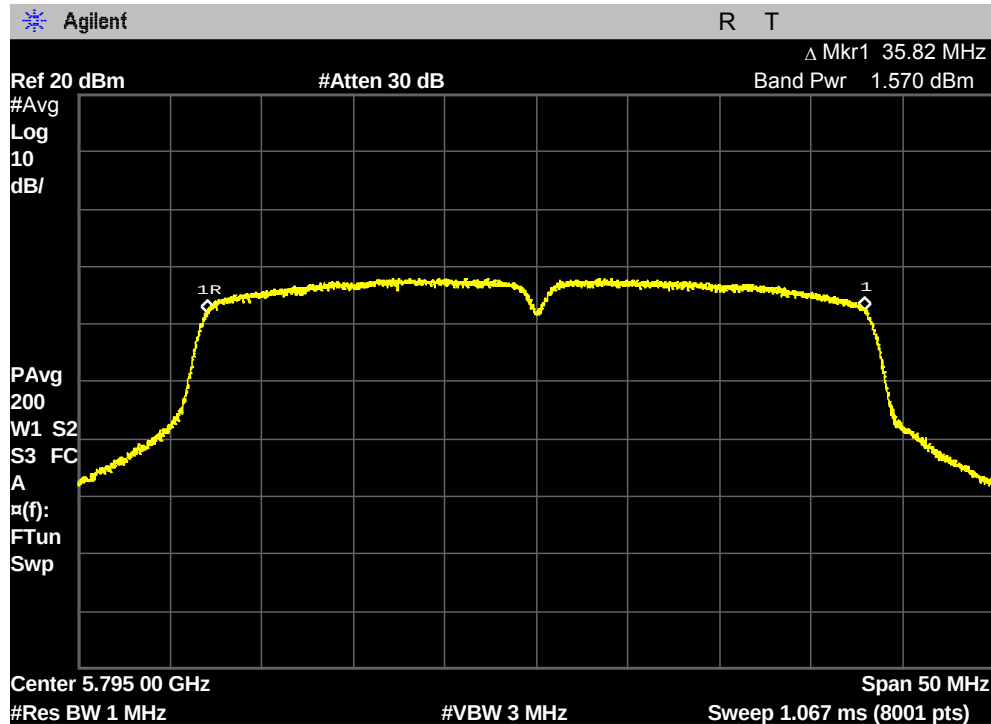


Maximum Conducted Output Power, Lowest Channel (5755 MHz)



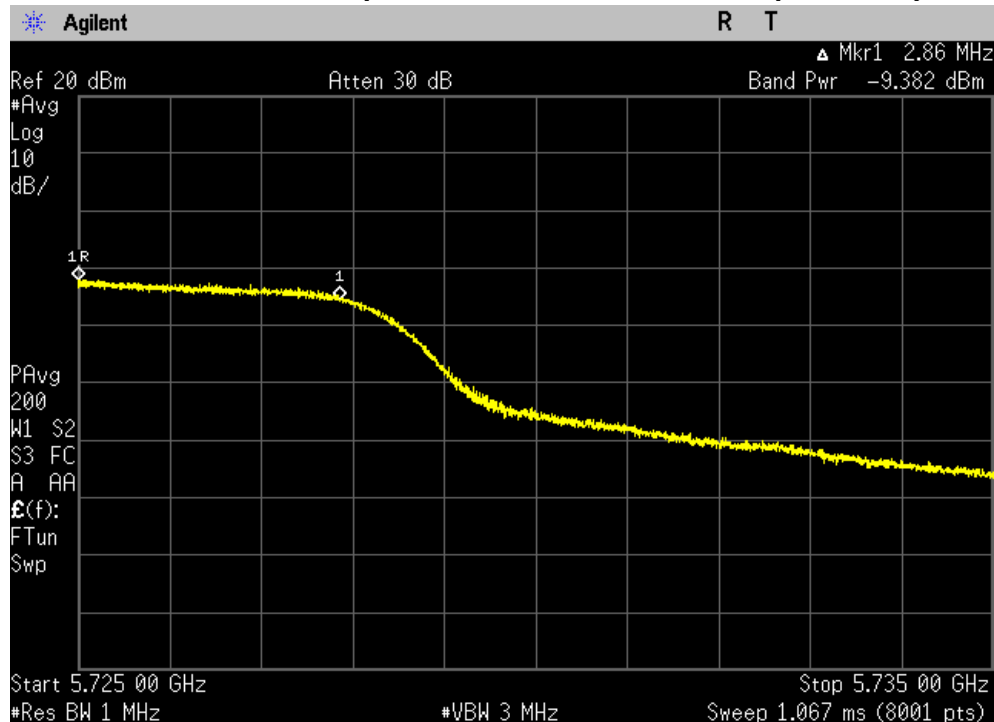
PLOTS OF EMISSIONS

Maximum Conducted Output Power, Highest Channel (5795 MHz)



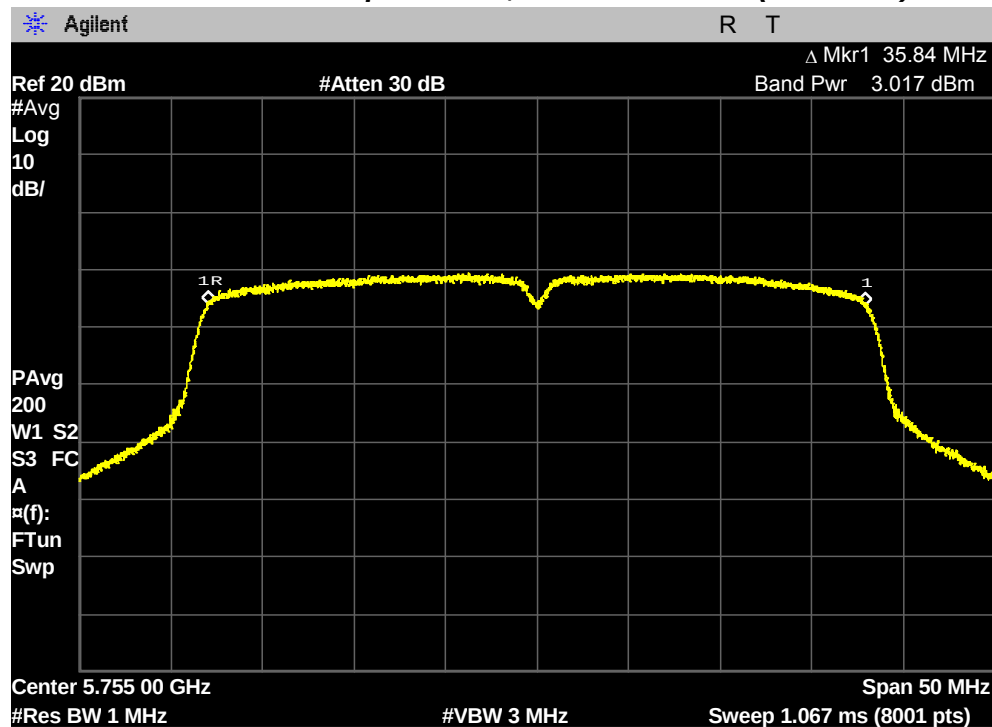
Chain 1

Maximum Conducted Output Power, Straddle Channel (5710 MHz)

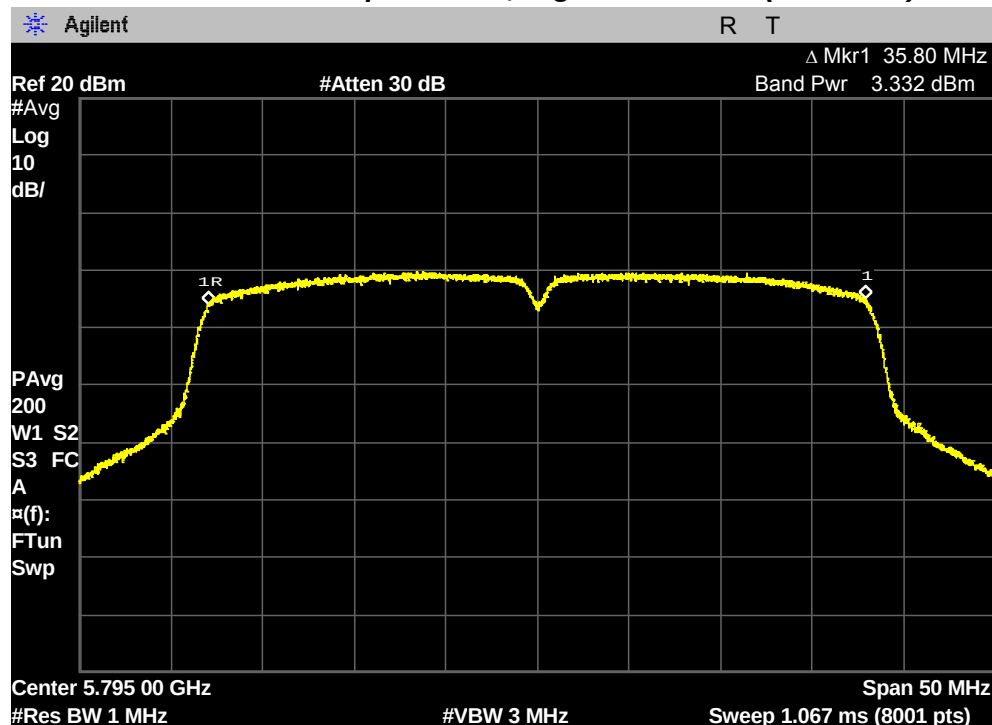


PLOTS OF EMISSIONS

Maximum Conducted Output Power, Lowest Channel (5755 MHz)



Maximum Conducted Output Power, Highest Channel (5795 MHz)

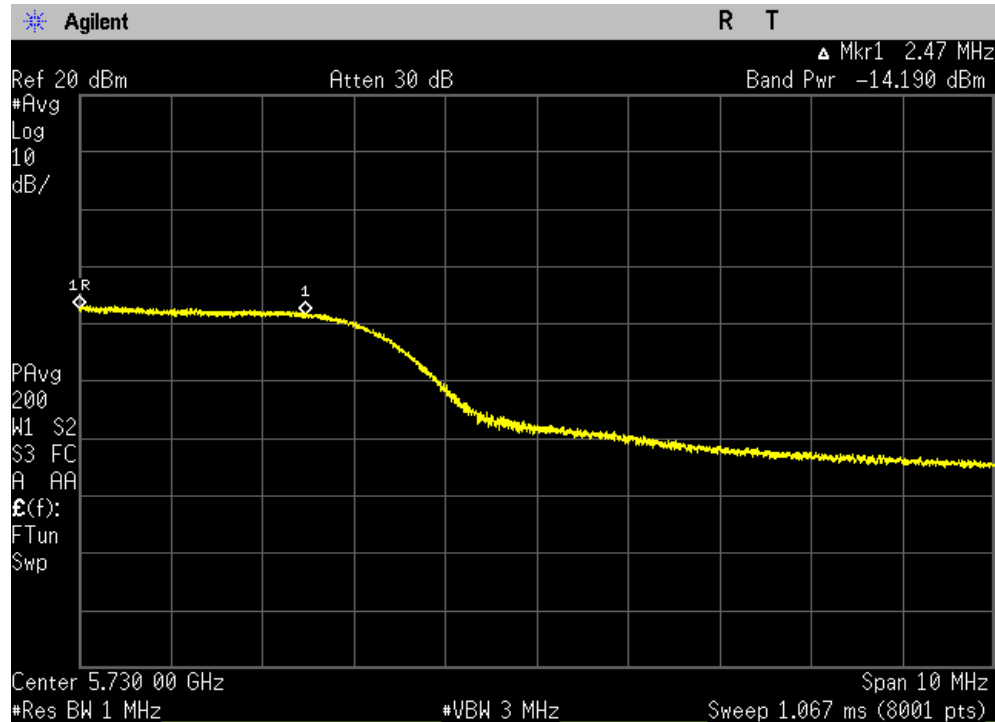


PLOTS OF EMISSIONS

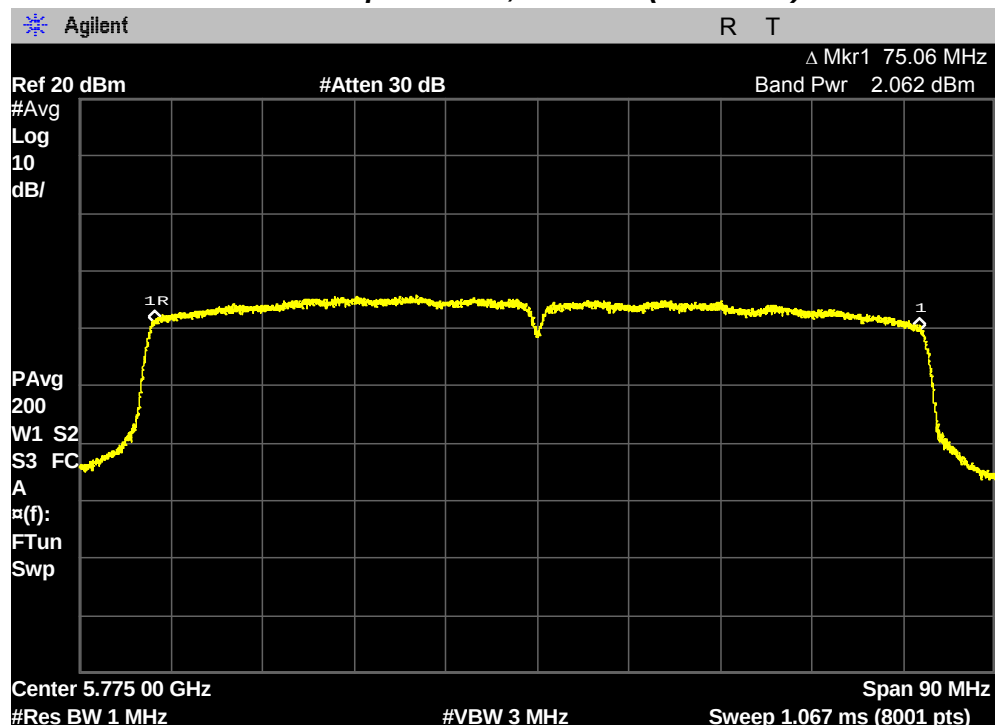
802.11ac (80 MHz) mode

Chain 0

Maximum Conducted Output Power, Straddle Channel (5690 MHz)



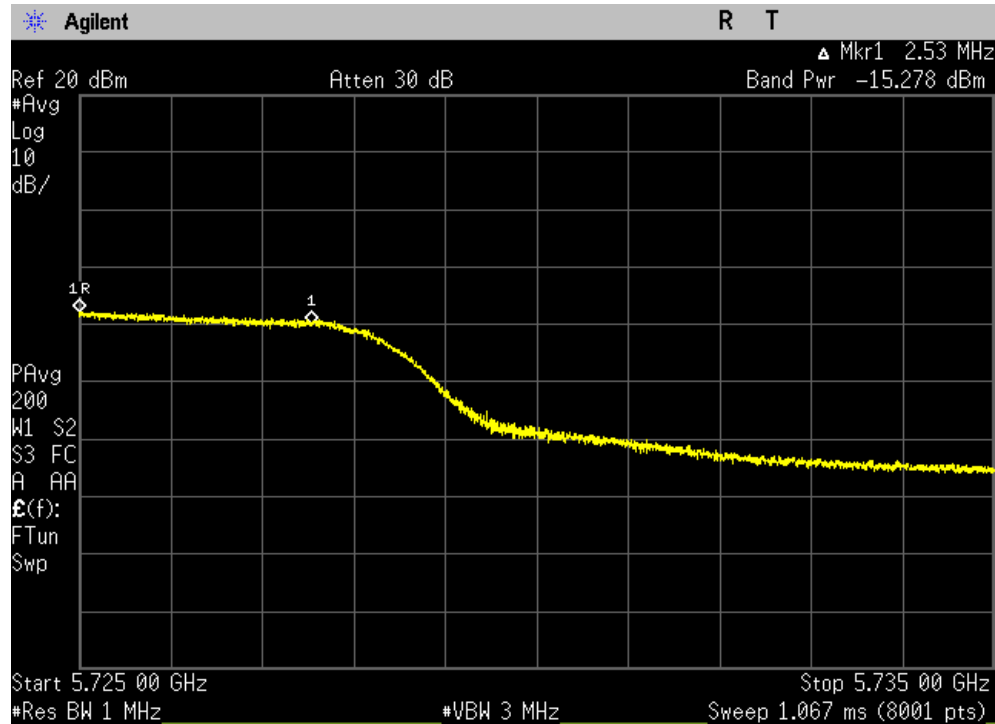
Maximum Conducted Output Power, Channel (5775 MHz)



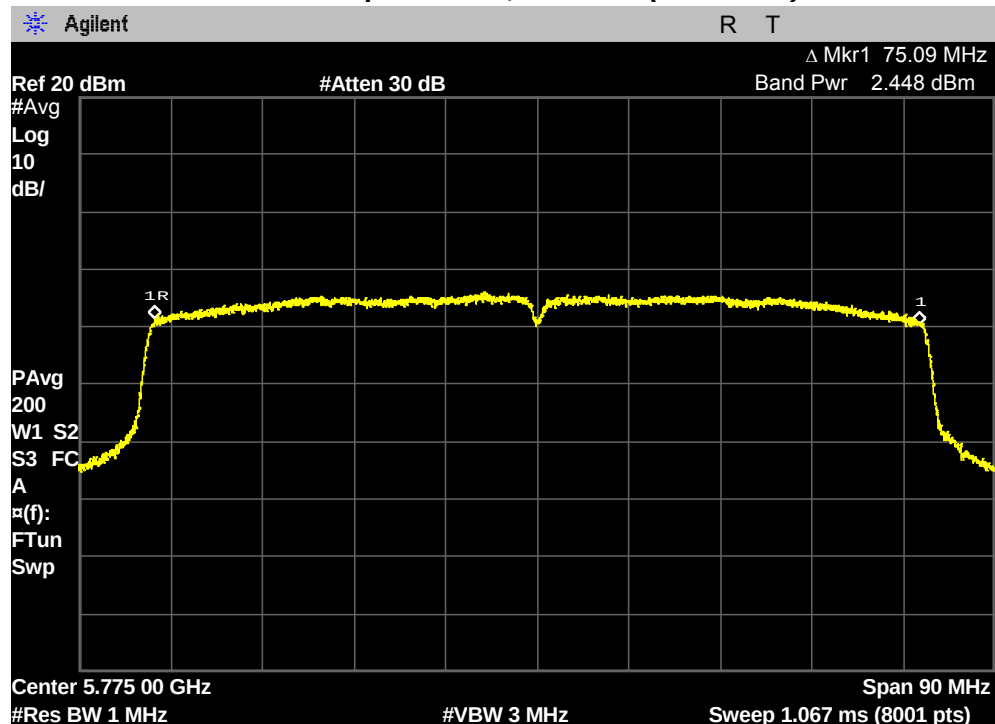
PLOTS OF EMISSIONS

Chain 1

Maximum Conducted Output Power, Straddle Channel (5690 MHz)



Maximum Conducted Output Power, Channel (5775 MHz)



TEST DATA

8.6 Maximum Power Spectral Density (average)

8.6.1 Maximum Power Spectral Density – U-NII-1 band

FCC §15.407(a), RSS-247 Issue 2 6.2

Test Mode : Set to Lowest channel, Middle channel and Highest channel

802.11a mode

Channel	Frequency (MHz)	Measured PSD (dBm)		Duty Factor (dB)	Maximum PSD (dBm)	FCC Limit (dBm/ MHz)	E.I.R.P (dBm)	IC E.I.R.P Limit (dBm/ MHz)
		Chain 0	Chain 1		Total output power			
Lowest	5180	-8.64	-5.12	0.36	-3.16	6.69	4.14	10.00
Middle	5220	-8.52	-6.08	0.36	-3.76	6.69	3.54	10.00
Highest	5240	-8.36	-6.39	0.36	-3.89	6.69	3.41	10.00

802.11n (20MHz) mode

Channel	Frequency (MHz)	Measured PSD (dBm)		Duty Factor (dB)	Maximum PSD (dBm)	FCC Limit (dBm/ MHz)	E.I.R.P (dBm)	IC E.I.R.P Limit (dBm/ MHz)
		Chain 0	Chain 1		Total output power			
Lowest	5180	-8.95	-6.41	0.39	-4.10	6.69	3.20	10.00
Middle	5220	-8.62	-6.94	0.39	-4.30	6.69	3.00	10.00
Highest	5240	-8.65	-6.83	0.39	-4.25	6.69	3.05	10.00

TEST DATA

802.11n (40MHz) mode

Channel	Frequency (MHz)	Measured PSD (dBm)		Duty Factor (dB)	Maximum PSD (dBm)	FCC Limit (dBm/ MHz)	E.I.R.P (dBm)	IC E.I.R.P Limit (dBm/ MHz)
		Chain 0	Chain 1					
Lowest	5190	-11.32	-9.65	0.75	-6.64	6.69	0.66	10.00
Highest	5230	-11.31	-9.96	0.75	-6.82	6.69	0.48	10.00

802.11ac (80MHz) mode

Channel	Frequency (MHz)	Measured PSD (dBm)		Duty Factor (dB)	Maximum PSD (dBm)	FCC Limit (dBm/ MHz)	E.I.R.P (dBm)	IC E.I.R.P Limit (dBm/ MHz)
		Chain 0	Chain 1					
	5210	-14.25	-12.52	1.41	-8.88	6.69	-1.58	10.00

TEST DATA

Note:

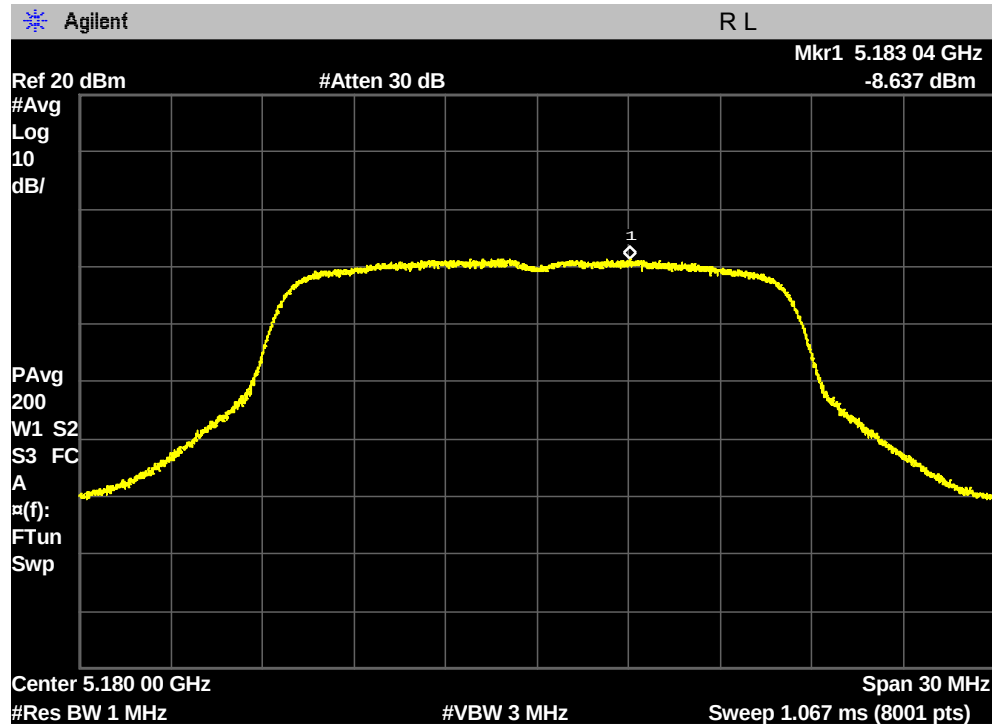
1. Maximum Conducted (average) Power = Measured conducted power + Duty Factor
2. Total output power = $10 \log [10^{\{(Chain\ 0\ Power + duty\ factor)/10\}} + 10^{\{(Chain\ 1\ Power + duty\ factor)/10\}}]$
3. For CDD transmission, directional gain is. **10.31 dBi**
For MIMO transmission, directional gain is **7.3 dBi**.
Directional gain was calculated according to KDB662911 D01 Multiple Transmitter Output v02r01.
For power spectral density (PSD) measurements on all devices employing CDD, directional gain is as follows,
Directional gain = $G_{ANT} + 10 \log(N_{ANT}/N_{SS})$ dBi, where N_{SS} = the number of independent spatial streams of data and G_{ANT} is the antenna gain in dBi. = 7.3 dBi + $10 \log(2/1)$ dB = 10.31 dBi.
For CDD mode of this device, $N_{SS}=1$.
For power spectral density (PSD) measurements on all devices employing MIMO, directional gain is as follows,
Directional gain = $G_{ANT} + 10 \log(N_{ANT}/N_{SS})$ dBi, where N_{SS} = the number of independent spatial streams of data and G_{ANT} is the antenna gain in dBi. = 7.3 dBi + $10 \log(2/2)$ dB = 7.3 dBi.
For this device, MIMO mode means SM-MIMO(Spatial Multiplexing) transmission and $N_{SS}=2$.
4. For FCC PSD Limit, If transmitting antennas of directional gain greater than 6 dBi was used, maximum power spectral density was reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
5. Power Spectral Density(PSD) was measured by same method with conducted output power according to II.F.1 in KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
6. The following equation was used for spectrum offset:
Spectrum offset (dB) = Attenuator (dB) + Cable Loss (dB) + SMA Type Connector Loss (dB)

PLOTS OF EMISSIONS

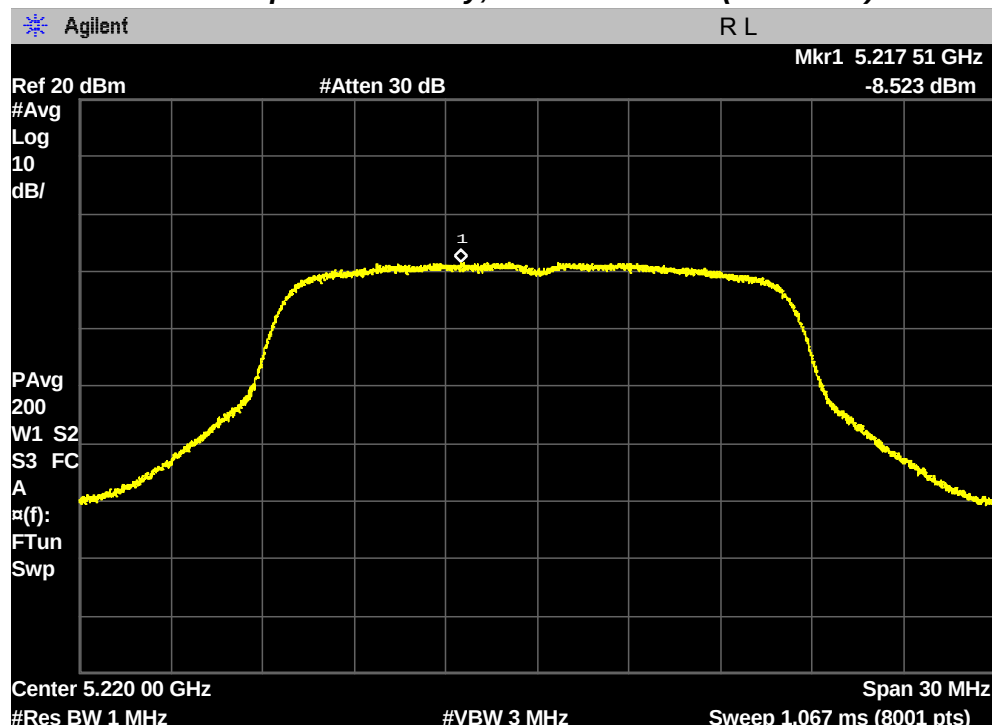
802.11a mode

Chain 0

Maximum Power Spectral Density, Lowest Channel (5180 MHz)

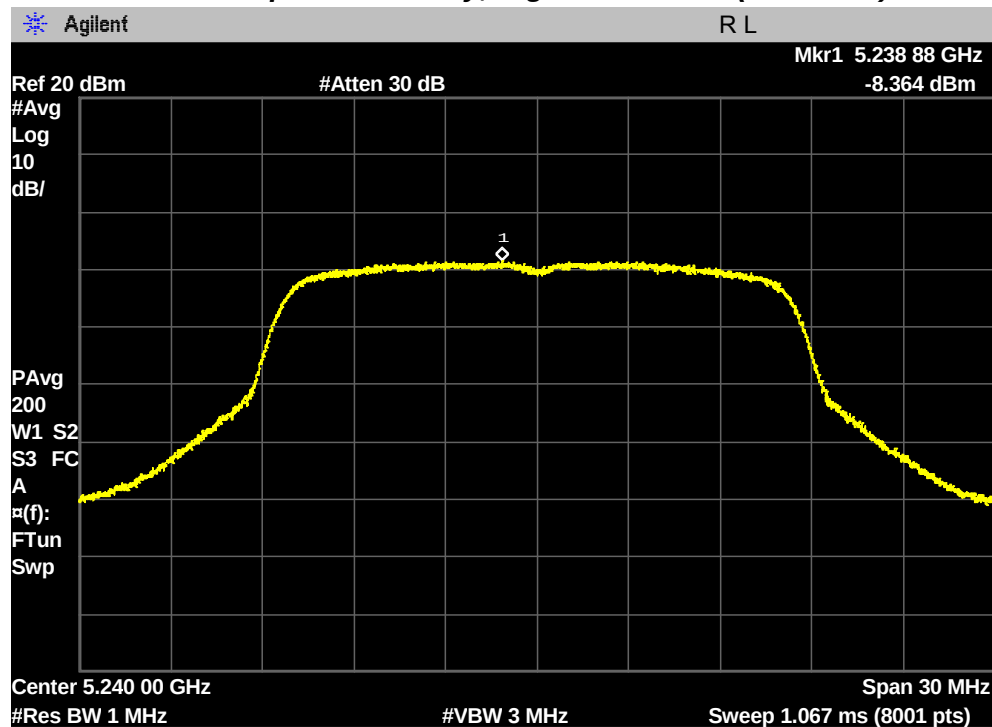


Maximum Power Spectral Density, Middle Channel (5220 MHz)



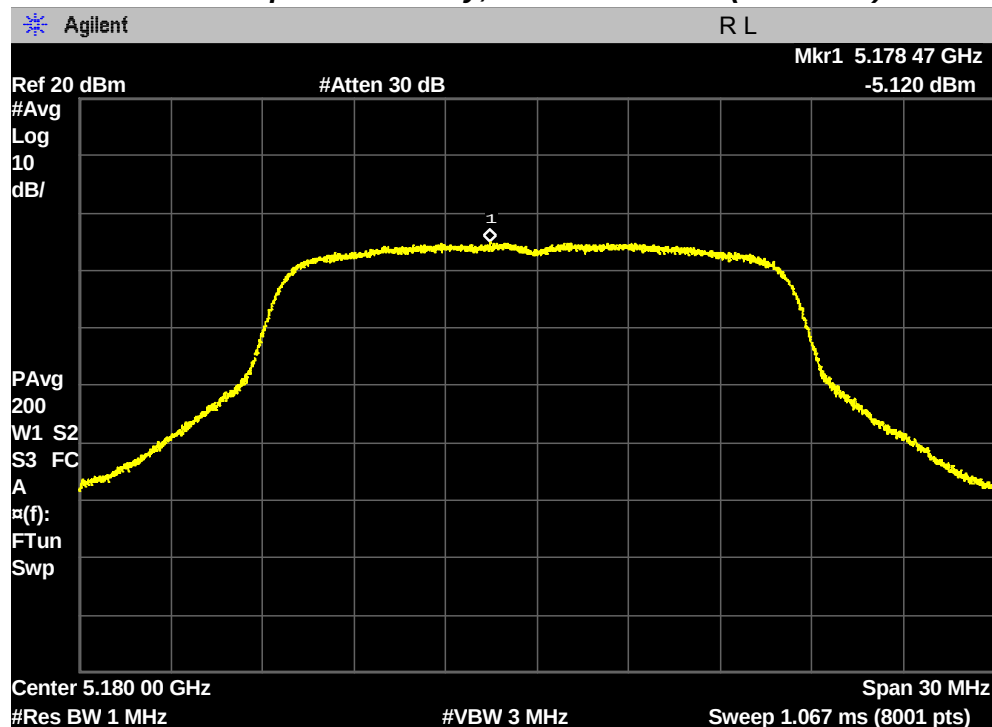
PLOTS OF EMISSIONS

Maximum Power Spectral Density, Highest Channel (5240 MHz)



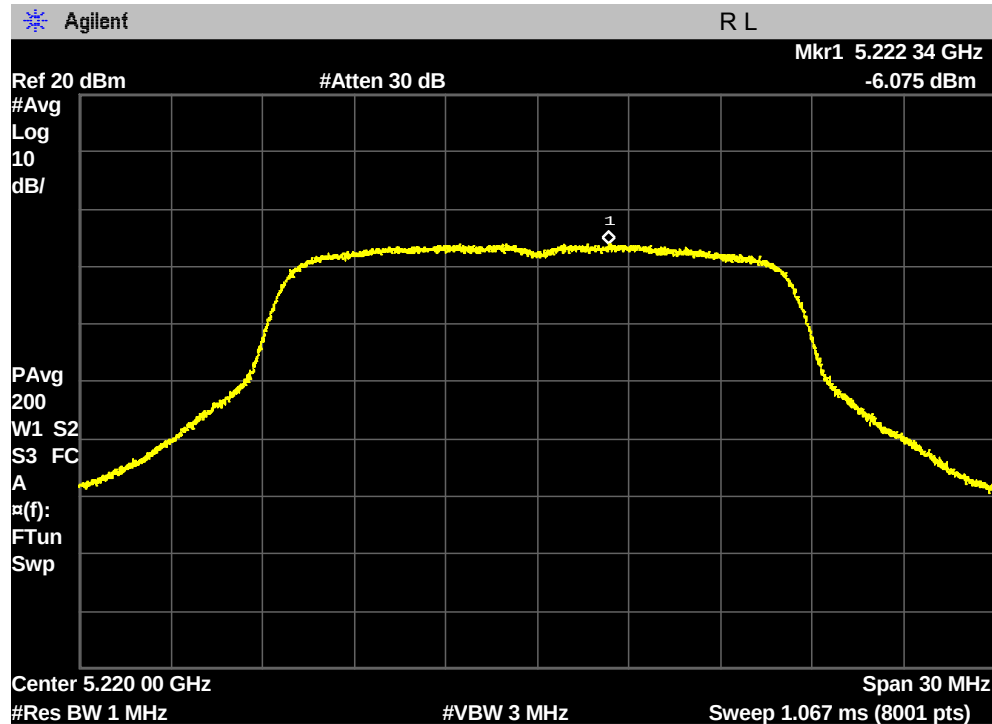
Chain 1

Maximum Power Spectral Density, Lowest Channel (5180 MHz)

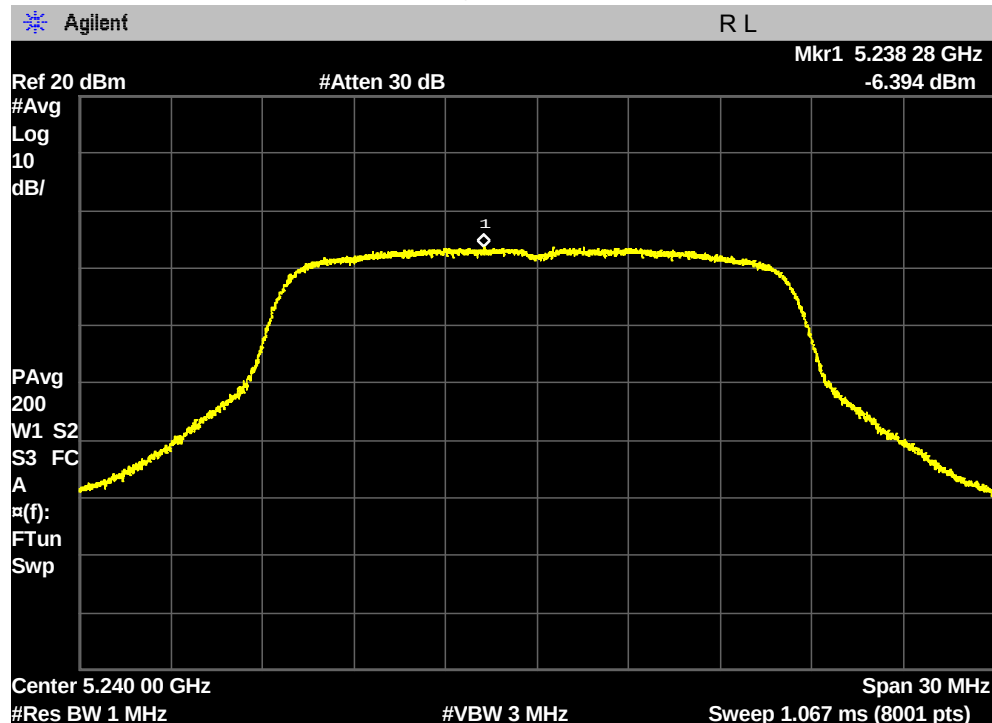


PLOTS OF EMISSIONS

Maximum Power Spectral Density, Middle Channel (5220 MHz)



Maximum Power Spectral Density, Highest Channel (5240 MHz)

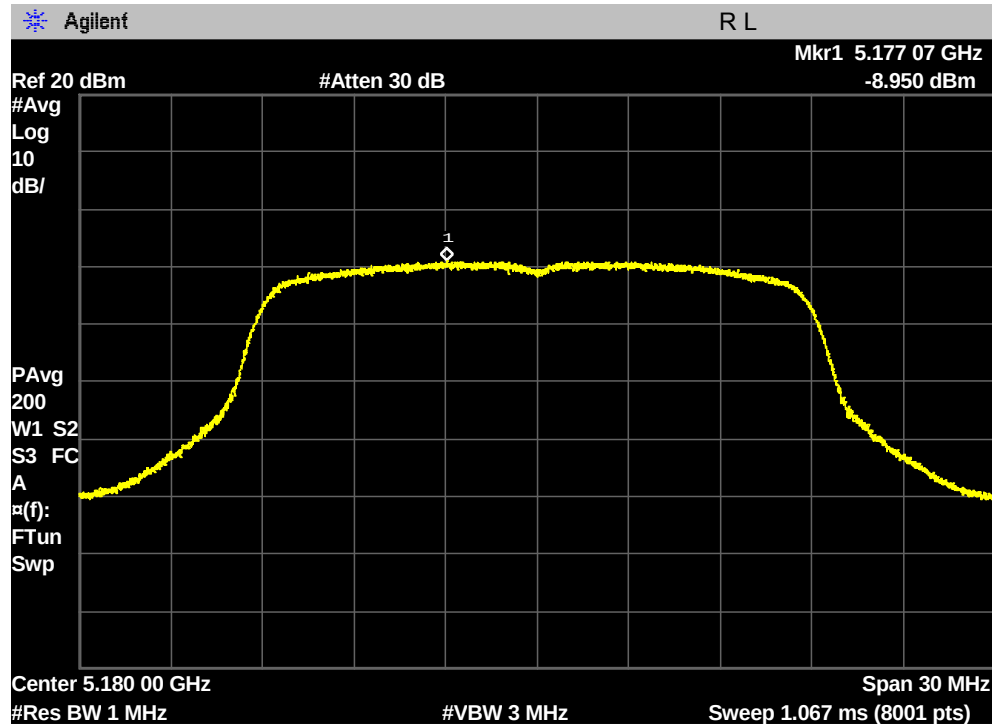


PLOTS OF EMISSIONS

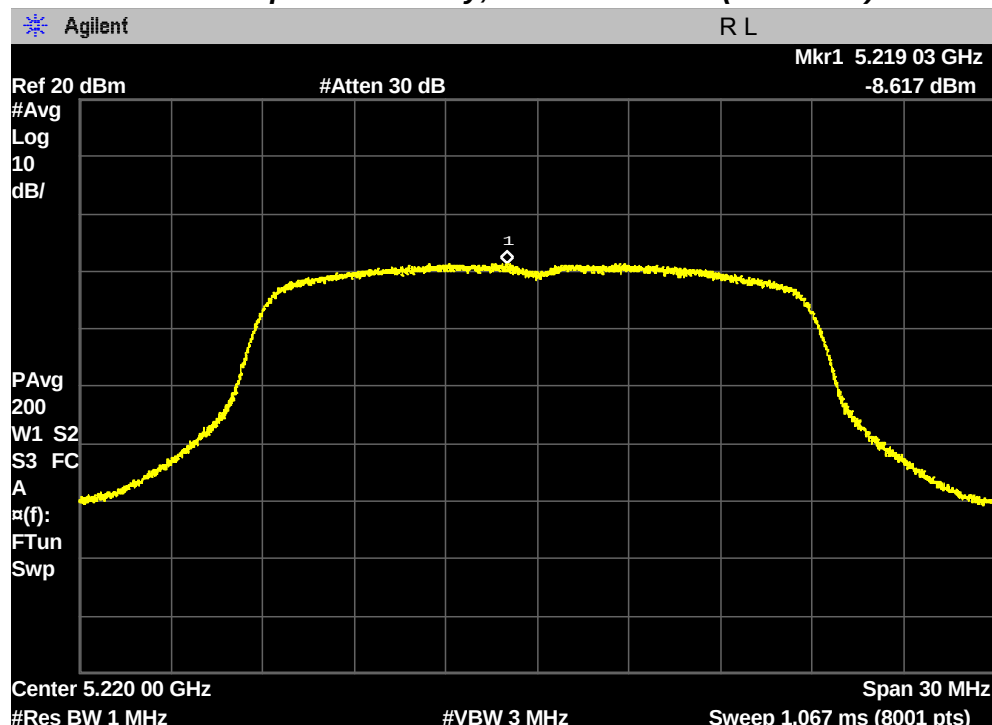
802.11n (20 MHz) mode

Chain 0

Maximum Power Spectral Density, Lowest Channel (5180 MHz)

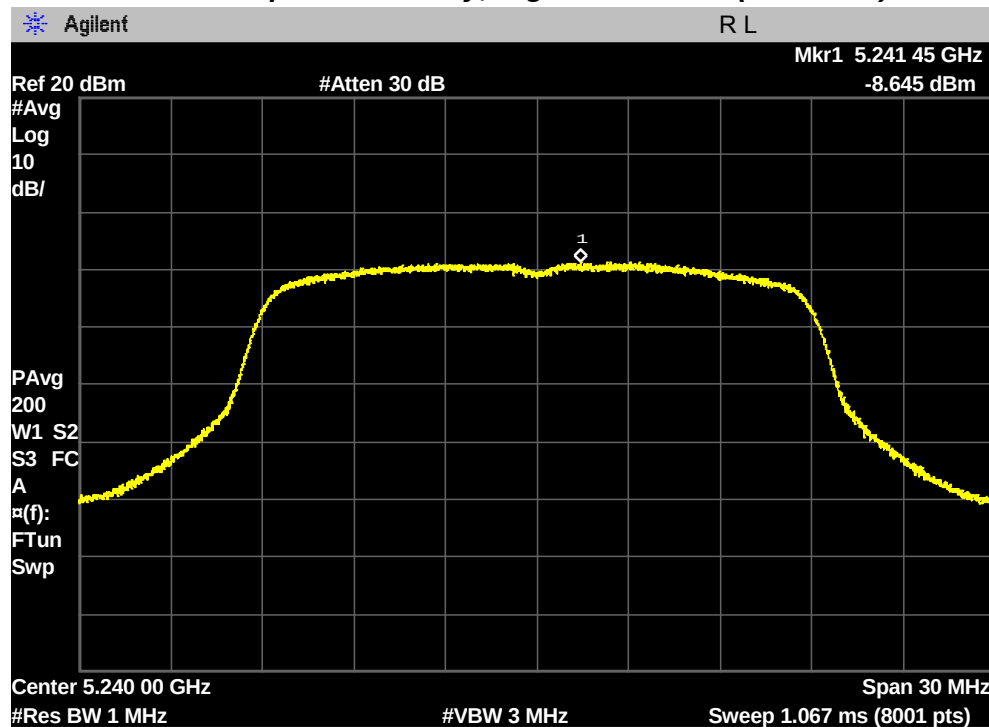


Maximum Power Spectral Density, Middle Channel (5220 MHz)



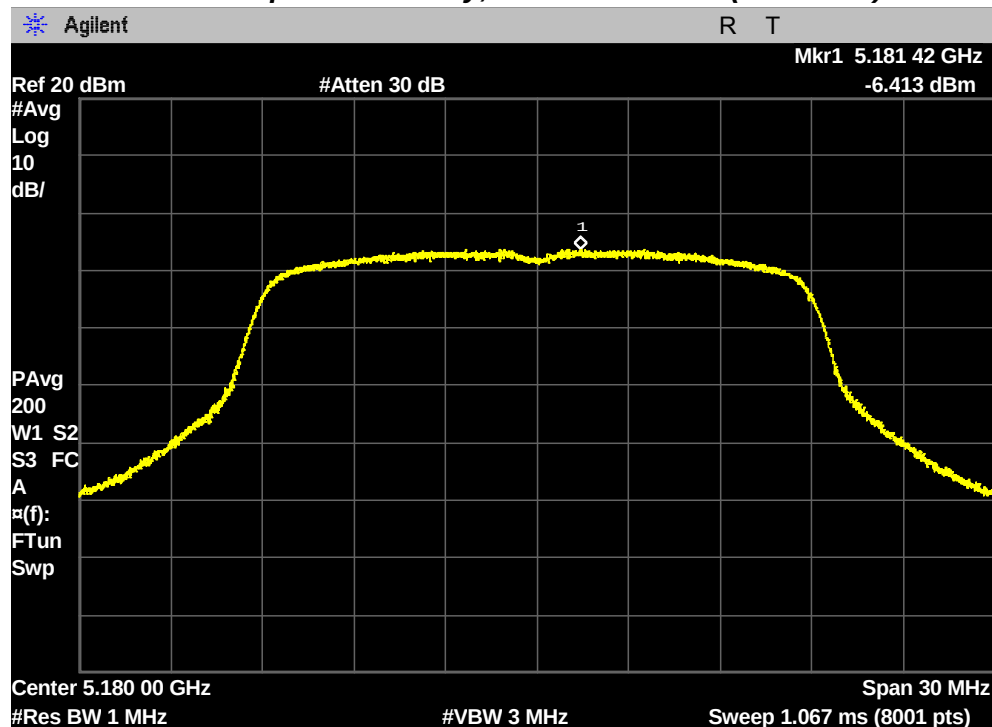
PLOTS OF EMISSIONS

Maximum Power Spectral Density, Highest Channel (5240 MHz)



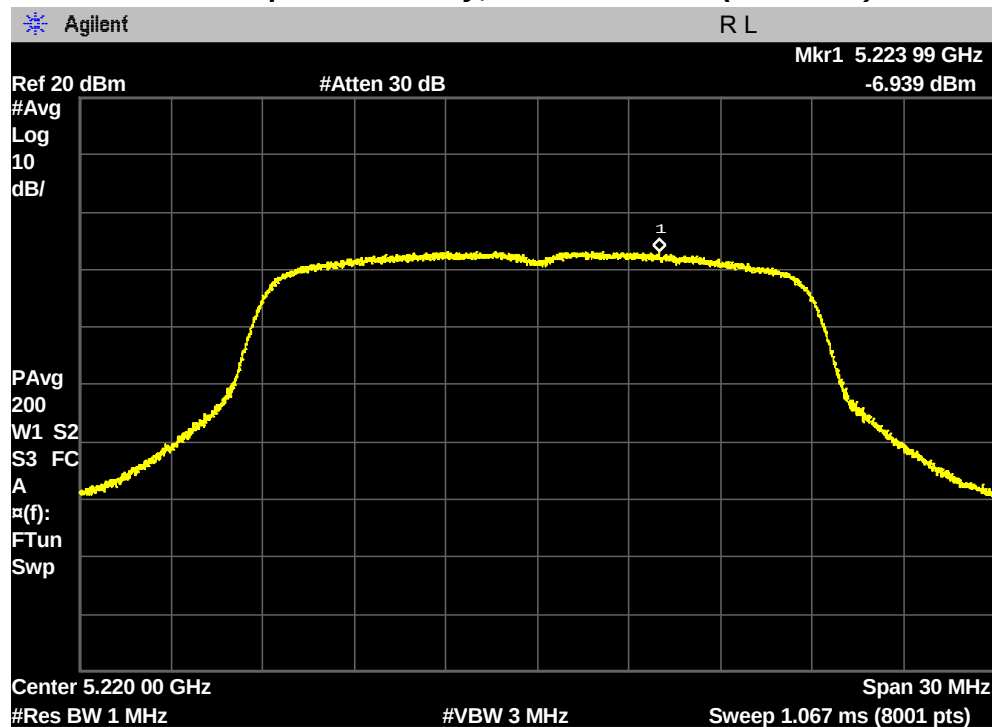
Chain 1

Maximum Power Spectral Density, Lowest Channel (5180 MHz)

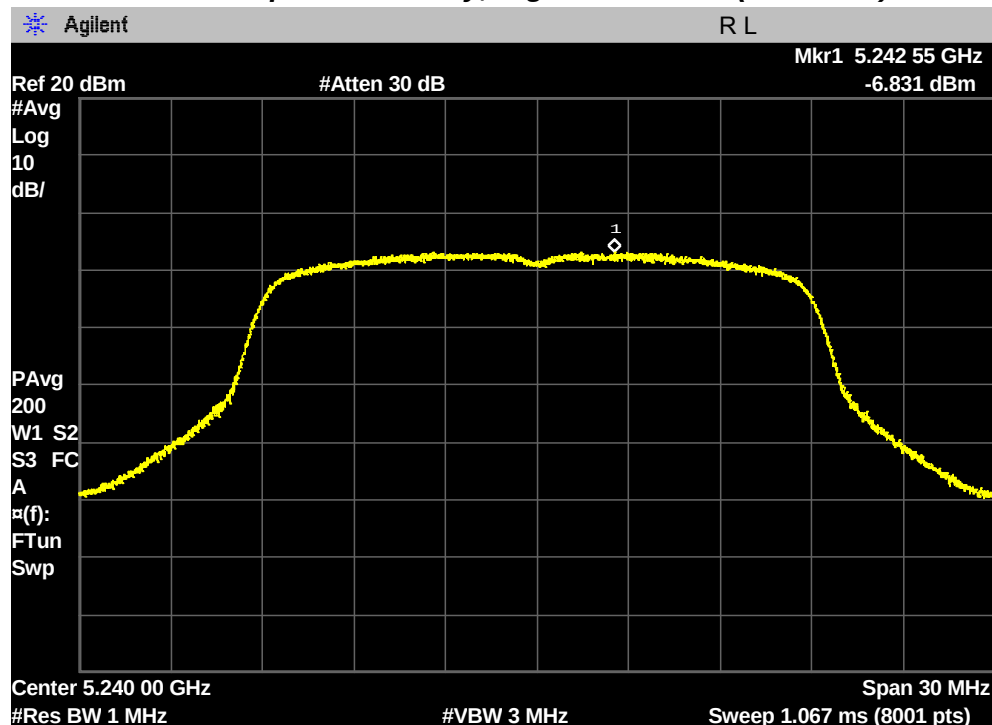


PLOTS OF EMISSIONS

Maximum Power Spectral Density, Middle Channel (5220 MHz)



Maximum Power Spectral Density, Highest Channel (5240 MHz)

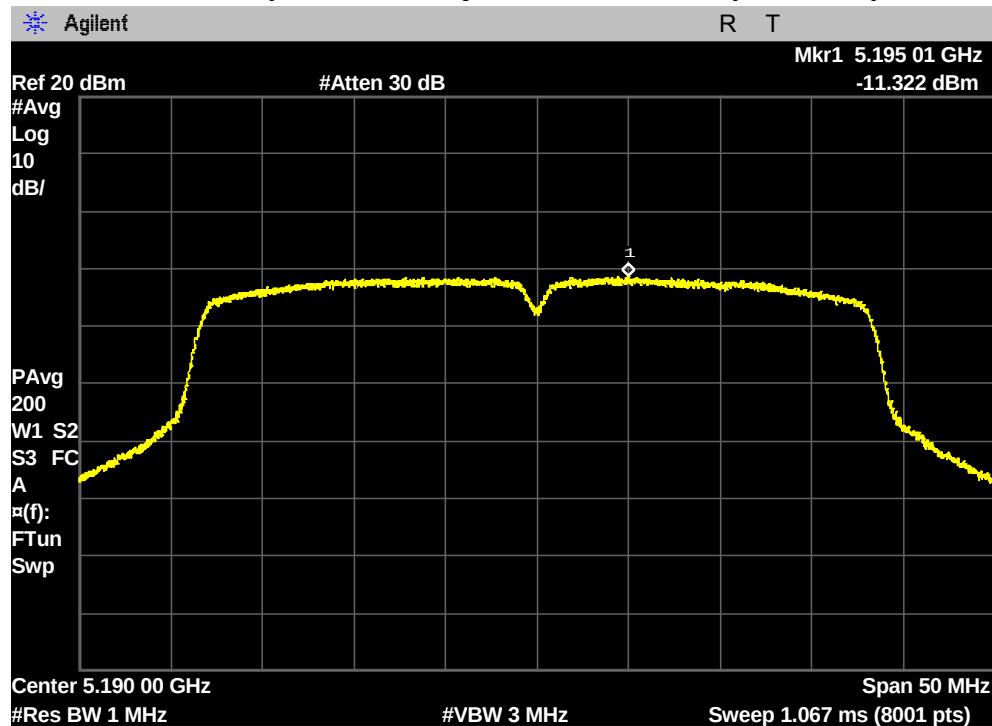


PLOTS OF EMISSIONS

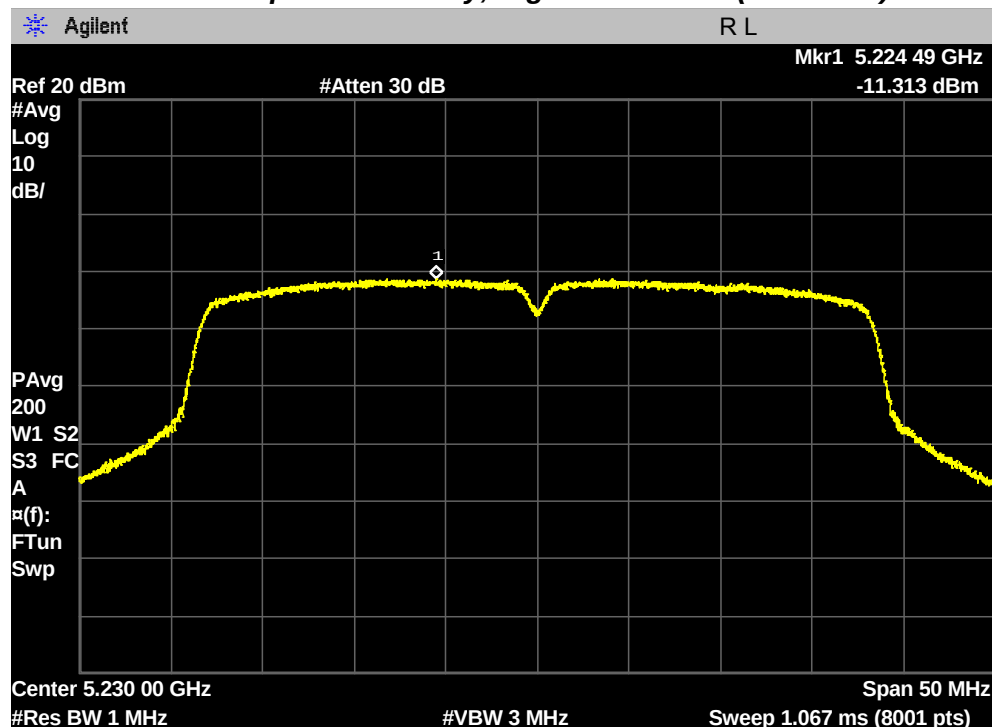
802.11n (40 MHz) mode

Chain 0

Maximum Power Spectral Density, Lowest Channel (5190 MHz)



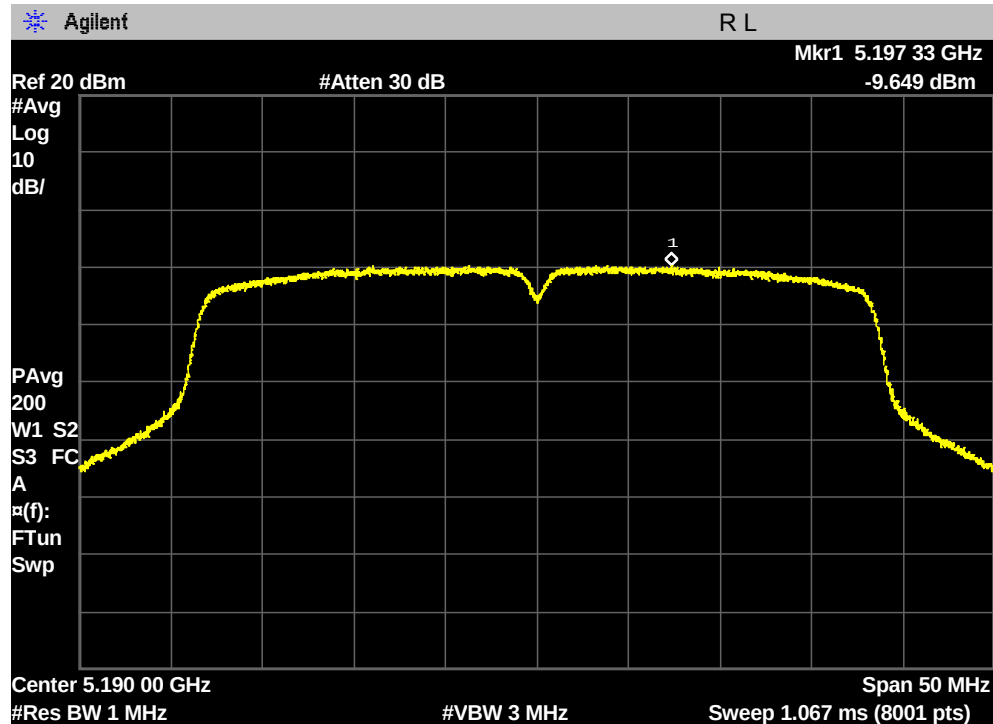
Maximum Power Spectral Density, Highest Channel (5230 MHz)



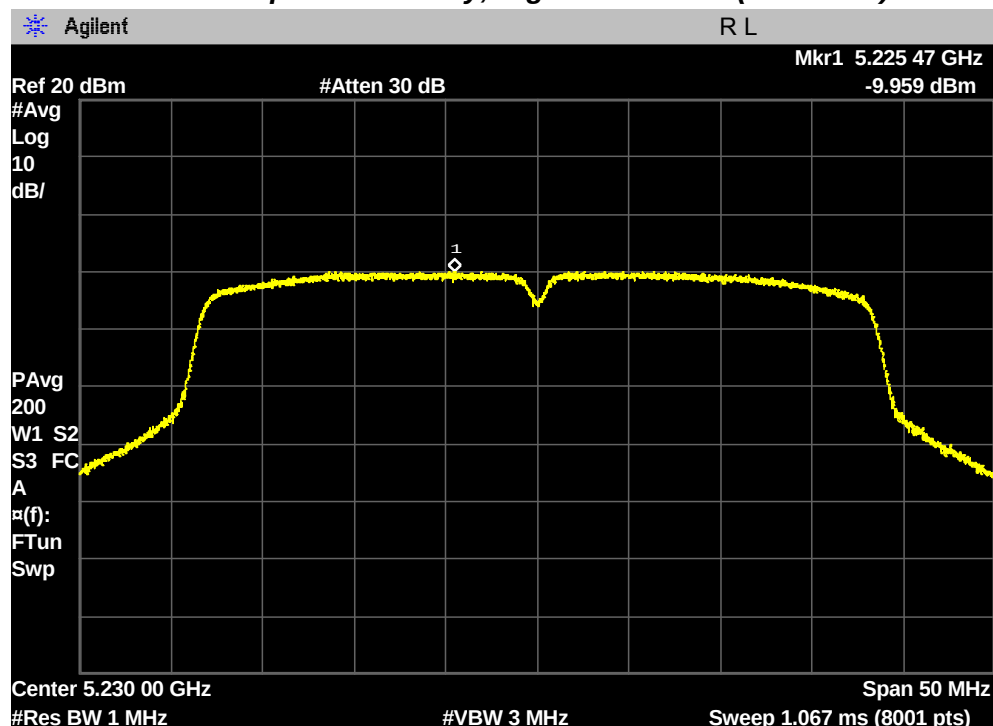
PLOTS OF EMISSIONS

Chain 1

Maximum Power Spectral Density, Lowest Channel (5190 MHz)



Maximum Power Spectral Density, Highest Channel (5230 MHz)

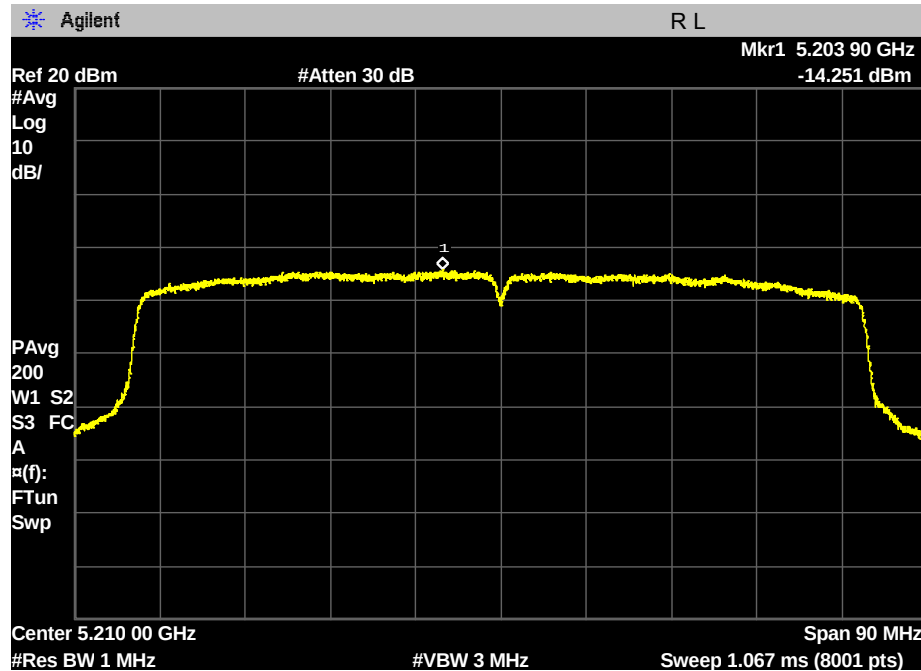


PLOTS OF EMISSIONS

802.11ac (80 MHz) mode

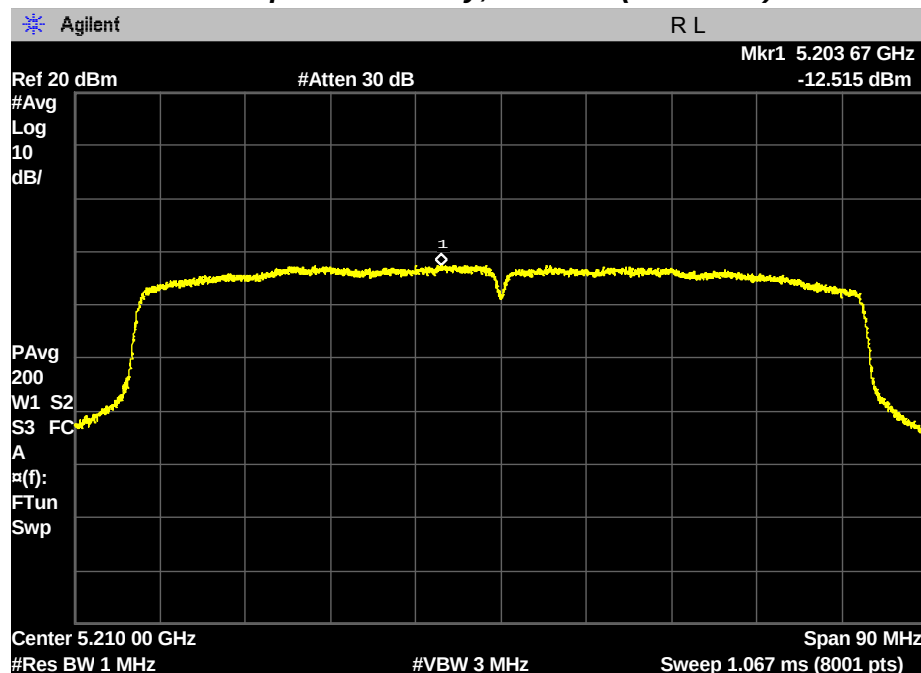
Chain 0

Maximum Power Spectral Density, Channel (5210 MHz)



Chain 1

Maximum Power Spectral Density, Channel (5210 MHz)



TEST DATA

8.6.2 Maximum Power Spectral Density – U-NII-2A band

FCC §15.407(a), RSS-247 Issue 2 6.2

Test Mode : Set to Lowest channel, Middle channel and Highest channel

802.11a mode

Channel	Frequency (MHz)	Measured PSD (dBm)		Duty Factor (dB)	Maximum PSD (dBm)	FCC Limit (dBm/ MHz)	IC Limit (dBm/ MHz)
		Chain 0	Chain 1		Total output power		
Lowest	5260	-7.85	-6.10	0.36	-3.52	6.69	11.00
Middle	5300	-7.33	-5.29	0.36	-2.82	6.69	11.00
Highest	5320	-7.37	-5.88	0.36	-3.19	6.69	11.00

802.11n (20MHz) mode

Channel	Frequency (MHz)	Measured PSD (dBm)		Duty Factor (dB)	Maximum PSD (dBm)	FCC Limit (dBm/ MHz)	IC Limit (dBm/ MHz)
		Chain 0	Chain 1		Total output power		
Lowest	5260	-8.72	-6.67	0.39	-4.17	6.69	11.00
Middle	5300	-7.94	-6.11	0.39	-3.53	6.69	11.00
Highest	5320	-7.58	-6.17	0.39	-3.42	6.69	11.00

TEST DATA

802.11n (40MHz) mode

Channel	Frequency (MHz)	Measured PSD (dBm)		Duty Factor (dB)	Maximum PSD (dBm)	FCC Limit (dBm/ MHz)	IC Limit (dBm/ MHz)
		Chain 0	Chain 1		Total output power		
Lowest	5270	-10.92	-9.90	0.75	-6.62	6.69	11.00
Highest	5310	-10.22	-9.11	0.75	-5.87	6.69	11.00

802.11ac (80MHz) mode

Channel	Frequency (MHz)	Measured PSD (dBm)		Duty Factor (dB)	Maximum PSD (dBm)	FCC Limit (dBm/ MHz)	IC Limit (dBm/ MHz)
		Chain 0	Chain 1		Total output power		
Middle	5290	-13.18	-11.98	1.41	-8.12	6.69	11.00

TEST DATA

Note:

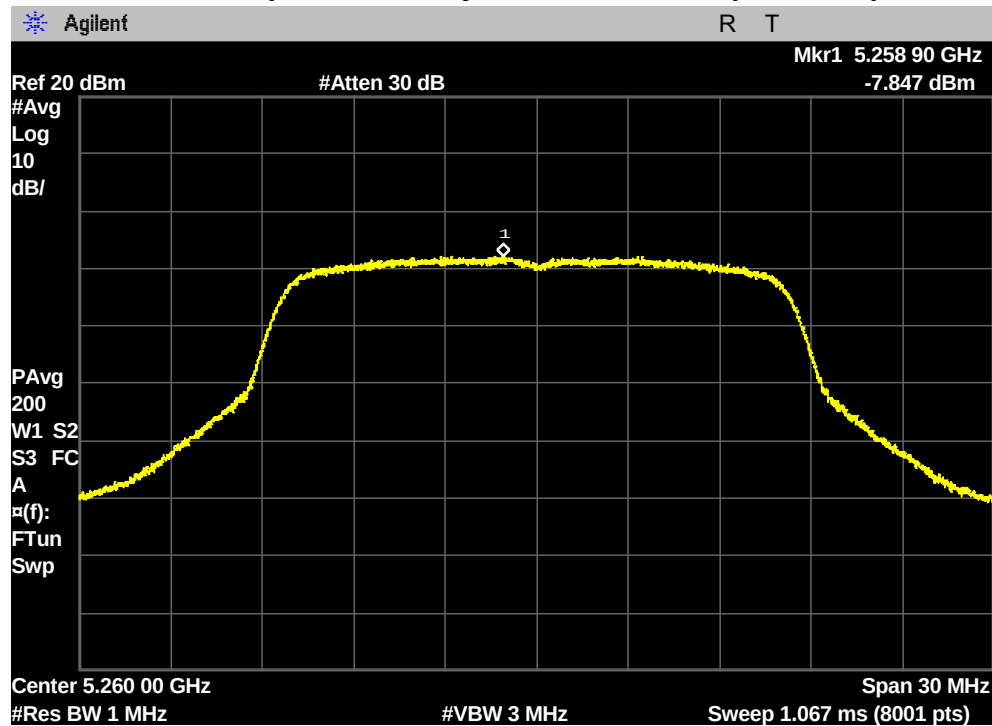
1. Maximum Conducted (average) Power = Measured conducted power + Duty Factor
2. Total output power = $10 \log [10^{\{(Chain\ 0\ Power + duty\ factor)/10\}} + 10^{\{(Chain\ 1\ Power + duty\ factor)/10\}}]$
3. For CDD transmission, directional gain is. **10.31 dBi**
For MIMO transmission, directional gain is **7.3 dBi**.
Directional gain was calculated according to KDB662911 D01 Multiple Transmitter Output v02r01.
For power spectral density (PSD) measurements on all devices employing CDD, directional gain is as follows,
Directional gain = $G_{ANT} + 10 \log(N_{ANT}/N_{SS})$ dBi, where N_{SS} = the number of independent spatial streams of data and G_{ANT} is the antenna gain in dBi. = 7.3 dBi + $10 \log(2/1)$ dB = 10.31 dBi.
For CDD mode of this device, $N_{SS}=1$.
For power spectral density (PSD) measurements on all devices employing MIMO, directional gain is as follows,
Directional gain = $G_{ANT} + 10 \log(N_{ANT}/N_{SS})$ dBi, where N_{SS} = the number of independent spatial streams of data and G_{ANT} is the antenna gain in dBi. = 7.3 dBi + $10 \log(2/2)$ dB = 7.3 dBi.
For this device, MIMO mode means SM-MIMO(Spatial Multiplexing) transmission and $N_{SS}=2$.
4. For FCC PSD Limit, If transmitting antennas of directional gain greater than 6 dBi was used, maximum power spectral density was reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
5. Power Spectral Density(PSD) was measured by same method with conducted output power according to II.F.1 in KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
6. The following equation was used for spectrum offset:
Spectrum offset (dB) = Attenuator (dB) + Cable Loss (dB) + SMA Type Connector Loss (dB)

PLOTS OF EMISSIONS

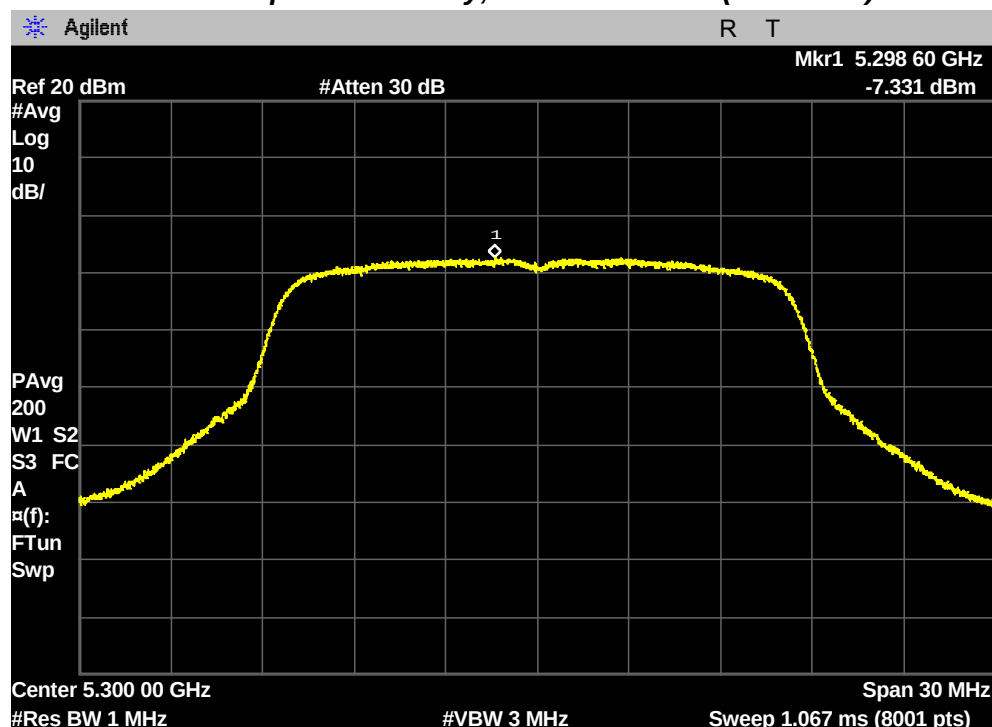
802.11a mode

Chain 0

Maximum Power Spectral Density, Lowest Channel (5260 MHz)

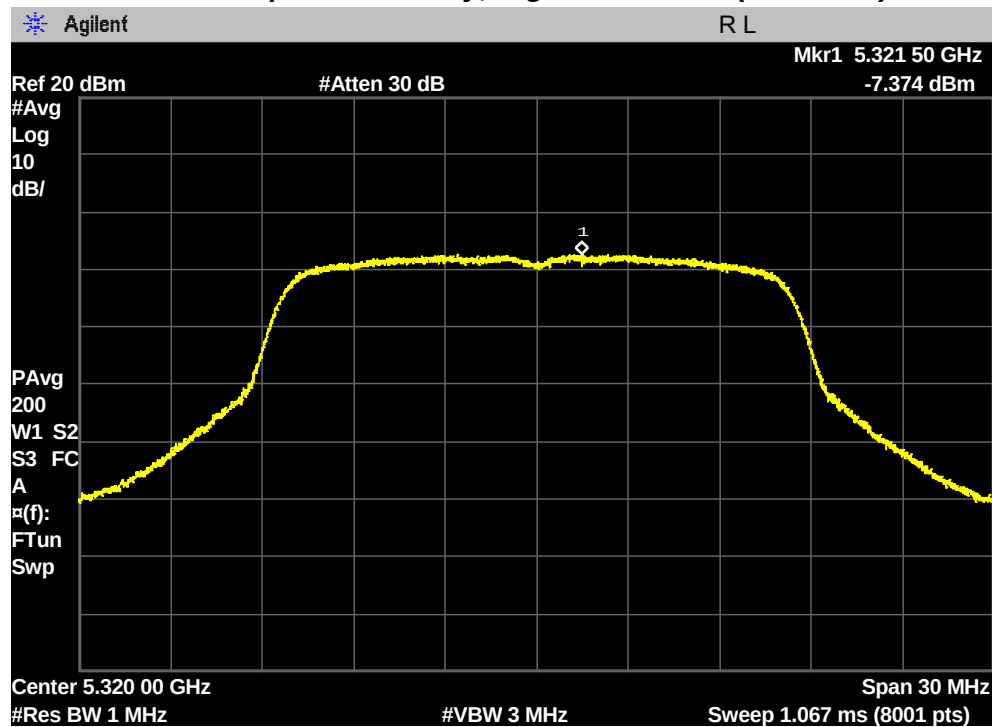


Maximum Power Spectral Density, Middle Channel (5300 MHz)



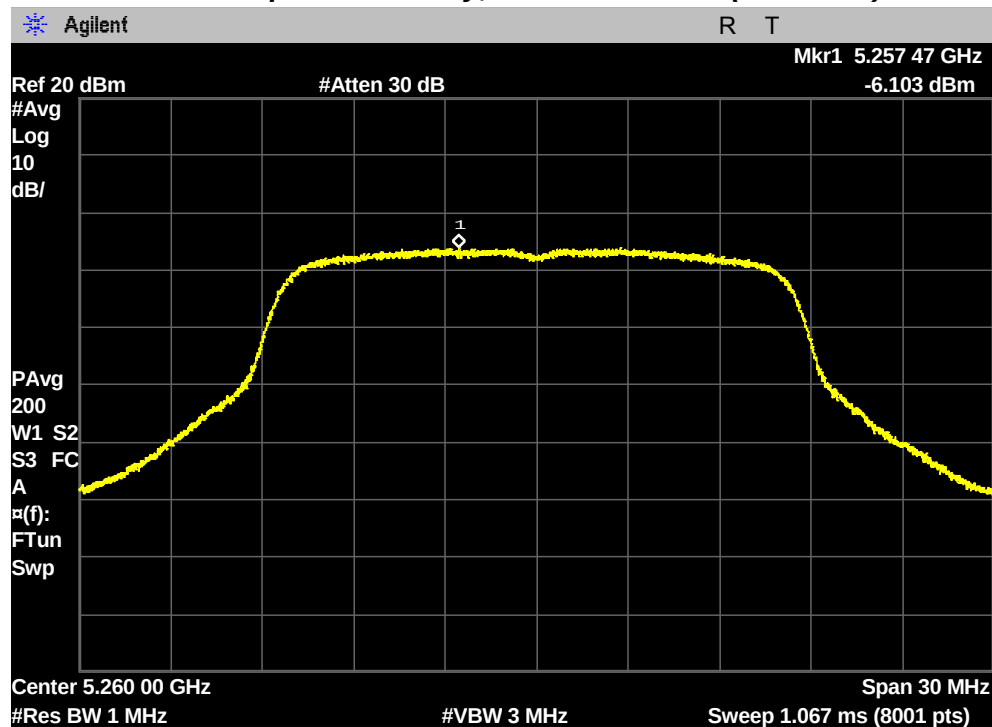
PLOTS OF EMISSIONS

Maximum Power Spectral Density, Highest Channel (5320 MHz)



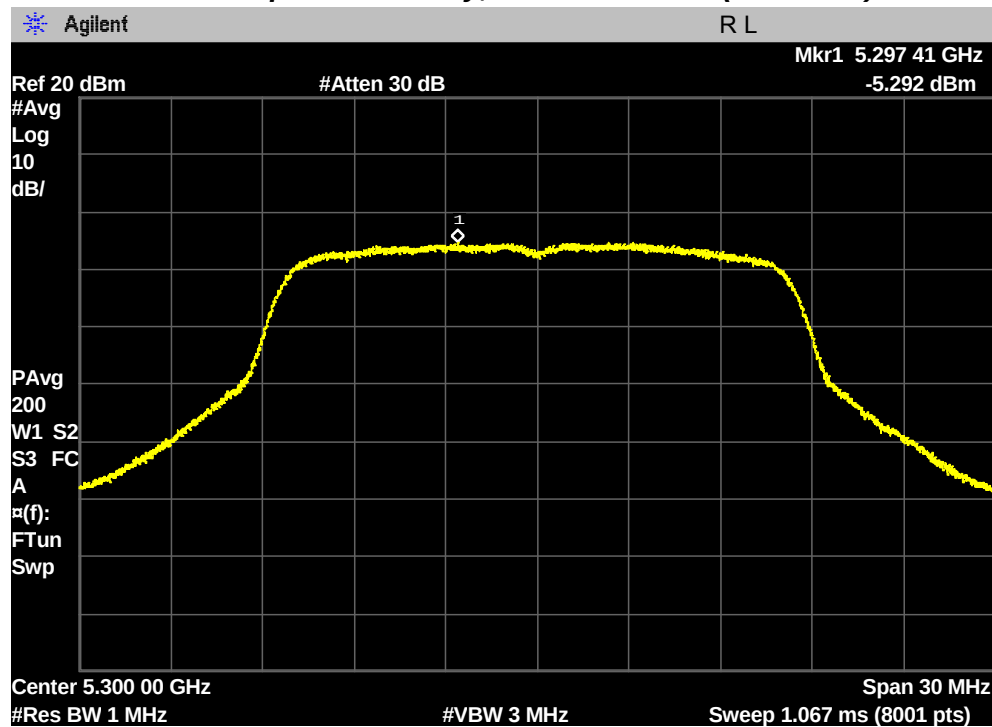
Chain 1

Maximum Power Spectral Density, Lowest Channel (5260 MHz)

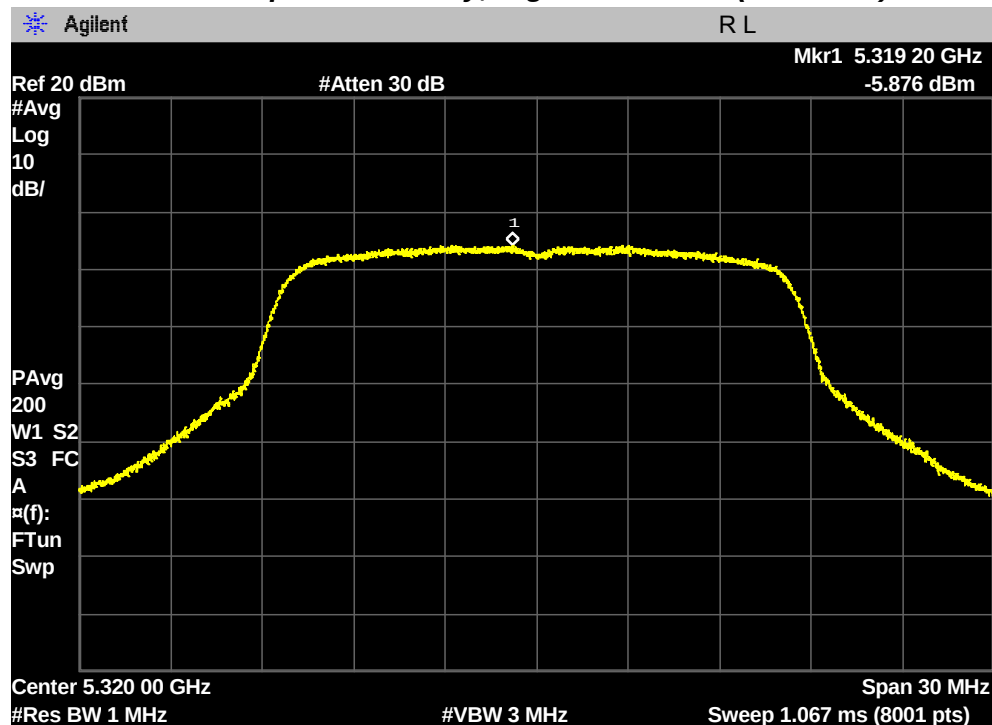


PLOTS OF EMISSIONS

Maximum Power Spectral Density, Middle Channel (5300 MHz)



Maximum Power Spectral Density, Highest Channel (5320 MHz)

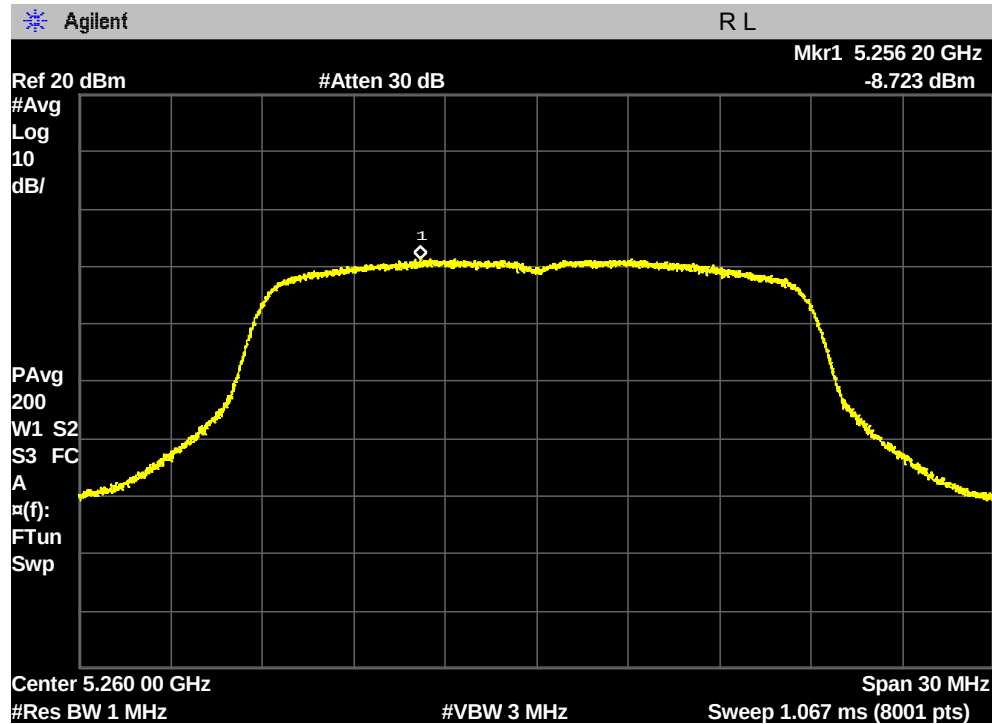


PLOTS OF EMISSIONS

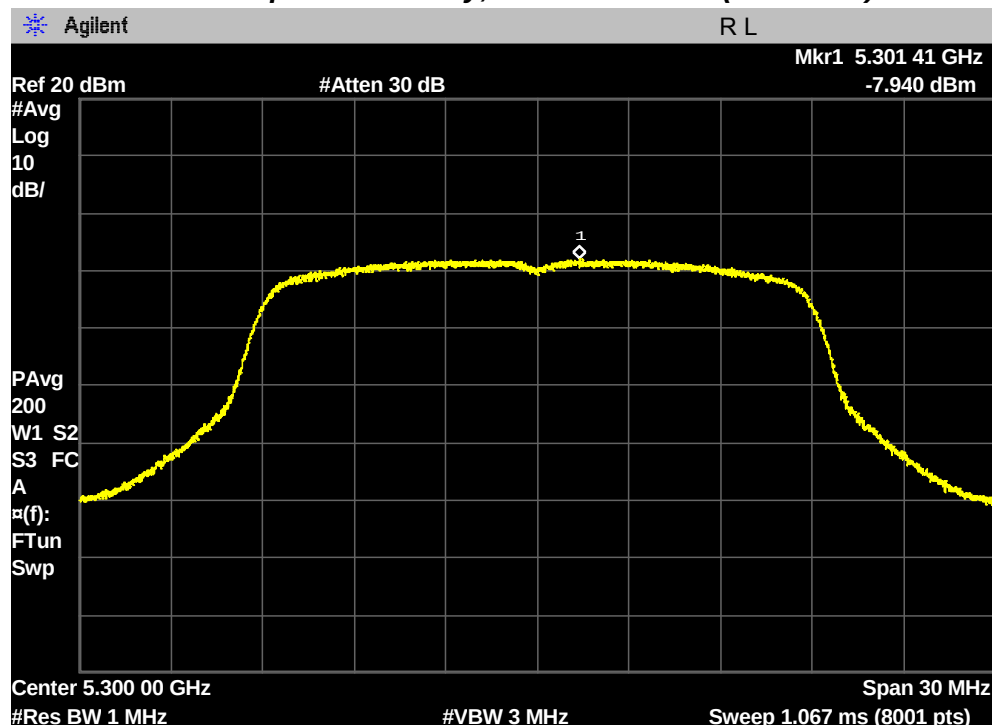
802.11n (20 MHz) mode

Chain 0

Maximum Power Spectral Density, Lowest Channel (5260 MHz)

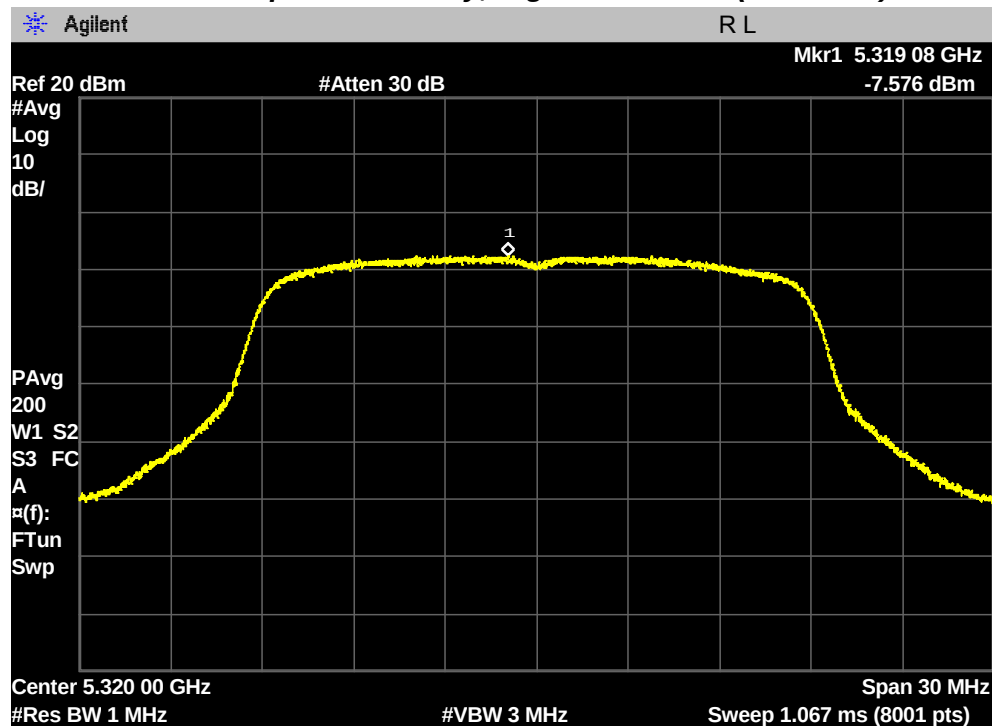


Maximum Power Spectral Density, Middle Channel (5300 MHz)



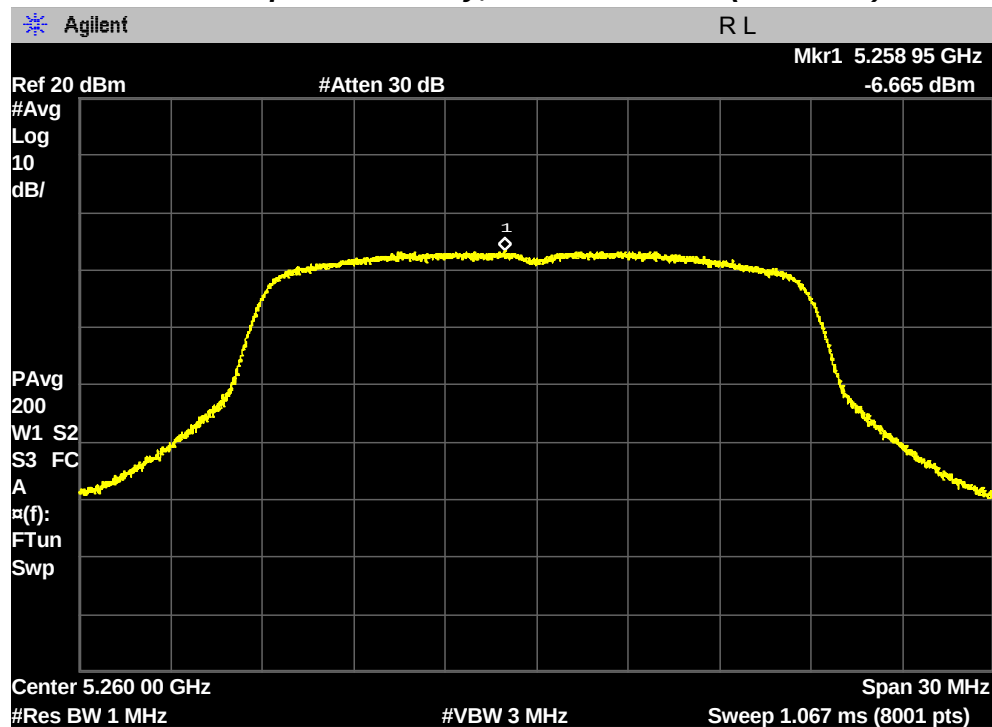
PLOTS OF EMISSIONS

Maximum Power Spectral Density, Highest Channel (5320 MHz)



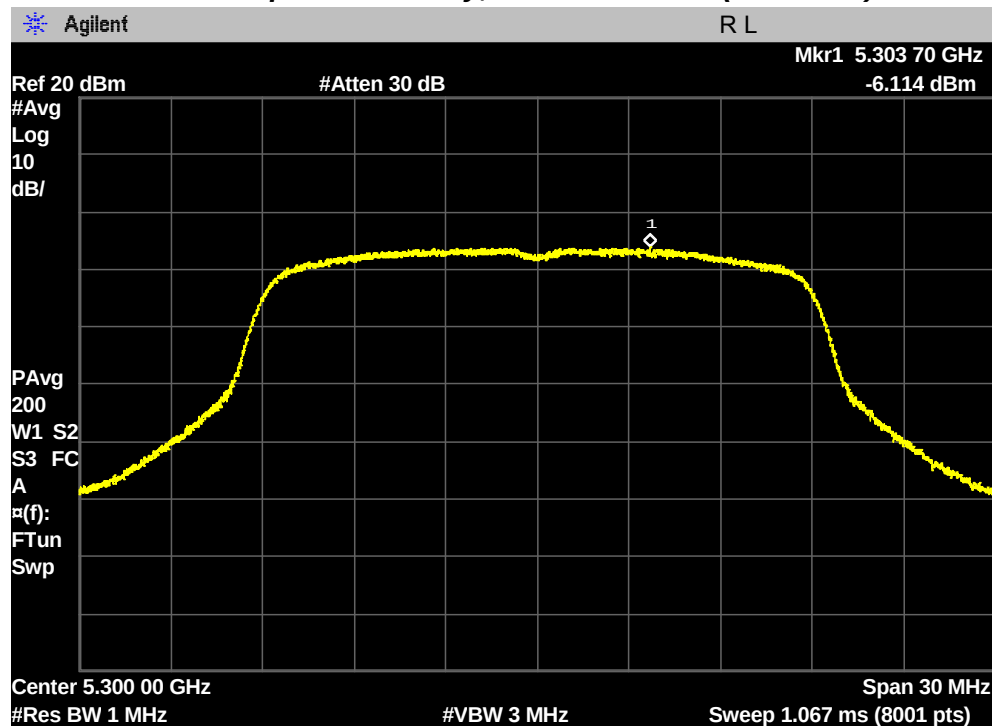
Chain 1

Maximum Power Spectral Density, Lowest Channel (5260 MHz)

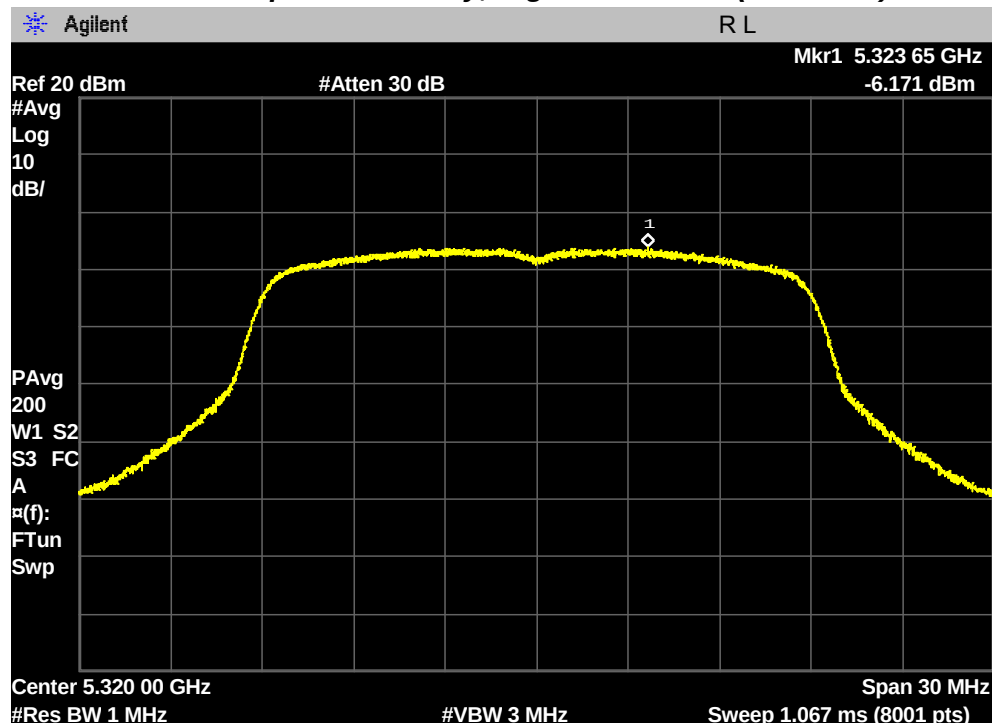


PLOTS OF EMISSIONS

Maximum Power Spectral Density, Middle Channel (5300 MHz)



Maximum Power Spectral Density, Highest Channel (5320 MHz)

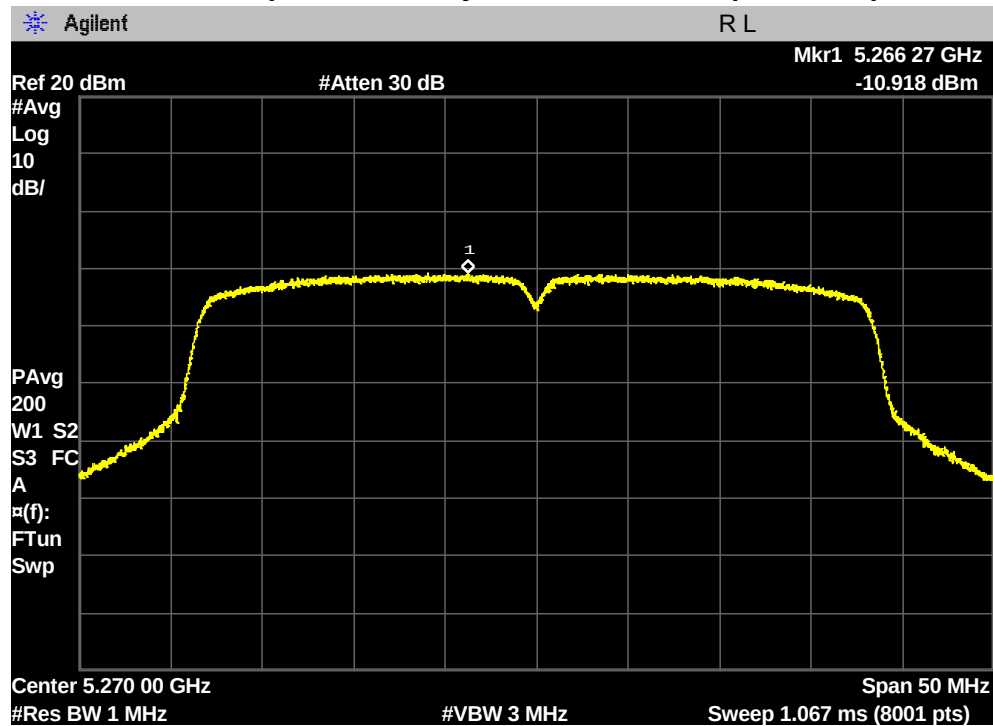


PLOTS OF EMISSIONS

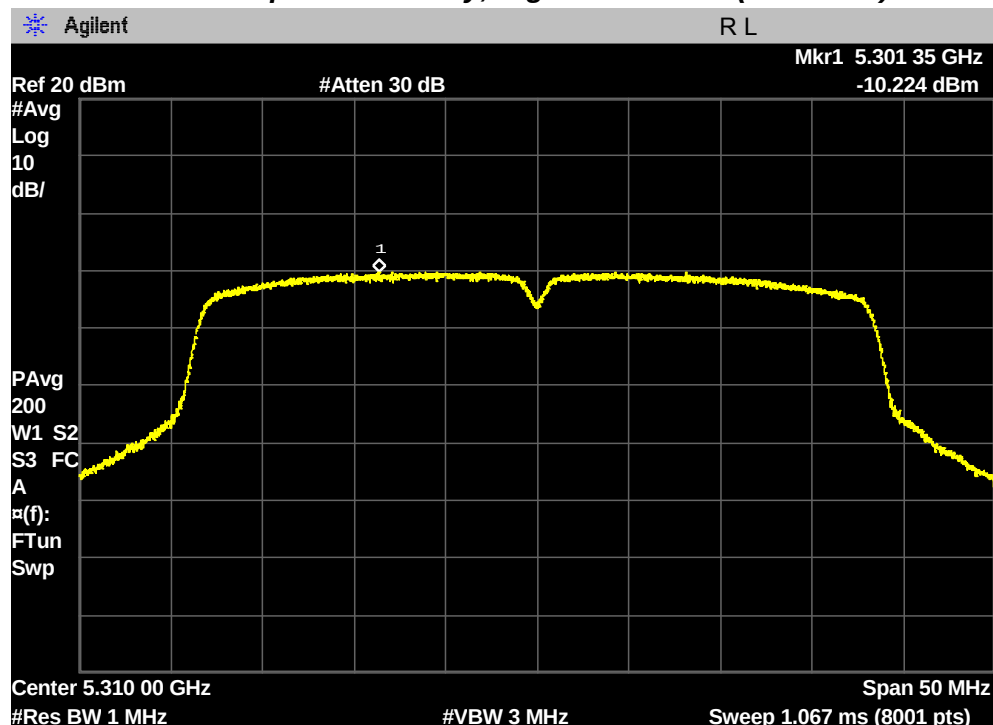
802.11n (40 MHz) mode

Chain 0

Maximum Power Spectral Density, Lowest Channel (5270 MHz)



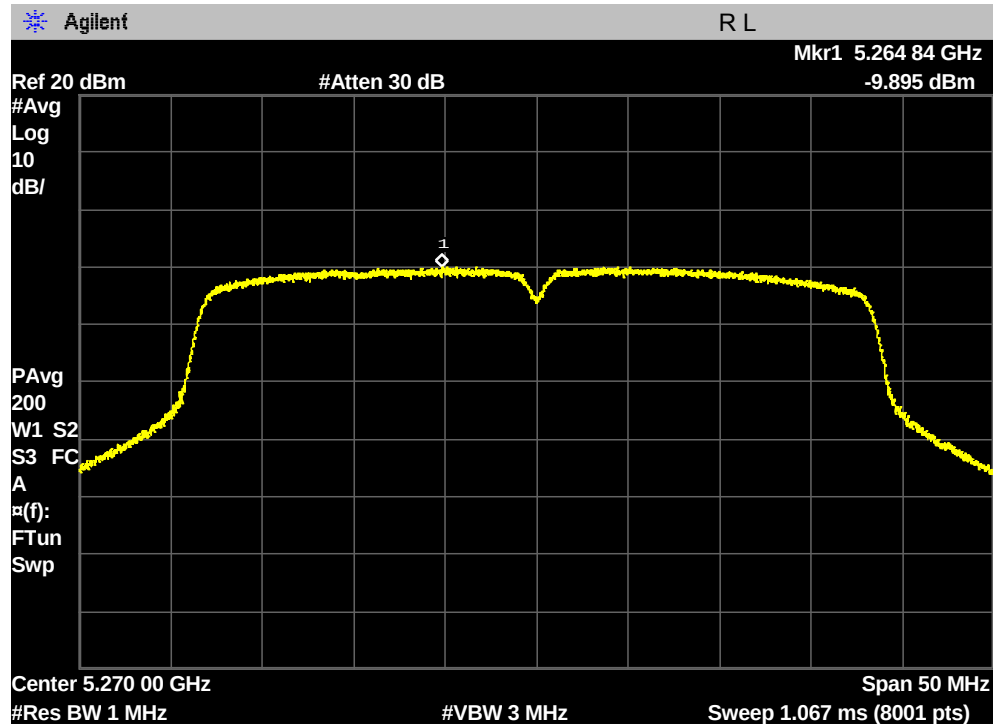
Maximum Power Spectral Density, Highest Channel (5310 MHz)



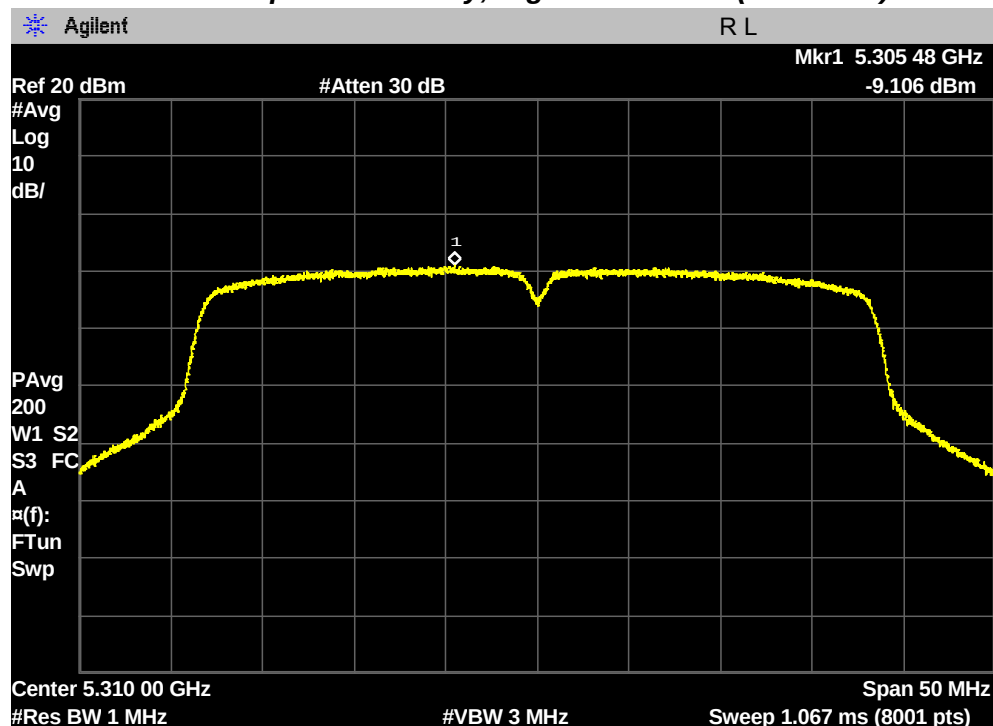
PLOTS OF EMISSIONS

Chain 1

Maximum Power Spectral Density, Lowest Channel (5270 MHz)



Maximum Power Spectral Density, Highest Channel (5310 MHz)

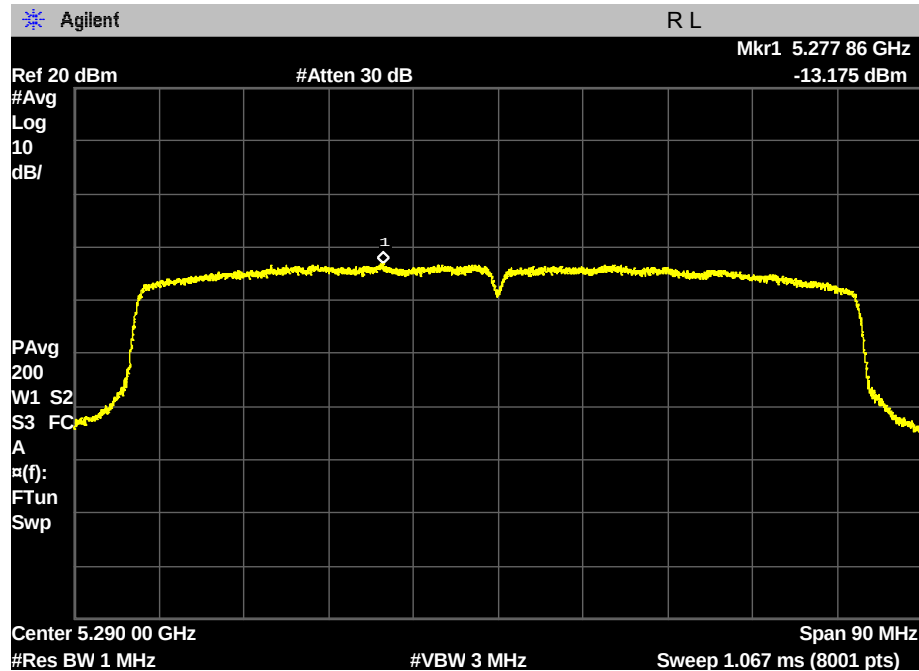


PLOTS OF EMISSIONS

802.11ac (80 MHz) mode

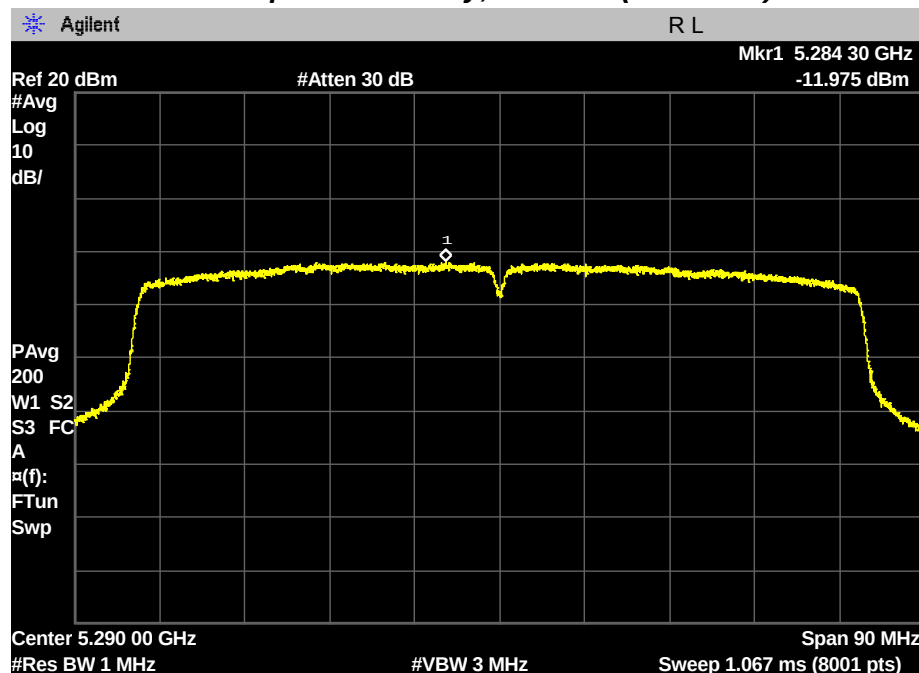
Chain 0

Maximum Power Spectral Density, Channel (5290 MHz)



Chain 1

Maximum Power Spectral Density, Channel (5290 MHz)



TEST DATA

8.6.3 Maximum Power Spectral Density – U-NII-2C band

FCC §15.407(a), RSS-247 Issue 2 6.2

Test Mode : Set to Lowest channel, Middle channel and Highest channel, Straddle channel

802.11a mode

Channel	Frequency (MHz)	Measured PSD (dBm)		Duty Factor (dB)	Maximum PSD (dBm)	FCC Limit (dBm/ MHz)	IC Limit (dBm/ MHz)
		Chain 0	Chain 1		Total output power		
Lowest	5500	-6.11	-5.50	0.36	-2.42	9.09	11.00
Middle	5580	-5.29	-5.14	0.36	-1.84	9.09	11.00
Highest	5700	-5.25	-5.71	0.36	-2.10	9.09	11.00
Straddle	5720	-4.30	-5.65	0.36	-1.55	9.09	11.00

802.11n (20MHz) mode

Channel	Frequency (MHz)	Measured PSD (dBm)		Duty Factor (dB)	Maximum PSD (dBm)	FCC Limit (dBm/ MHz)	IC Limit (dBm/ MHz)
		Chain 0	Chain 1		Total output power		
Lowest	5500	-6.86	-5.66	0.39	-2.82	9.09	11.00
Middle	5580	-5.93	-5.08	0.39	-2.08	9.09	11.00
Highest	5700	-5.71	-6.01	0.39	-2.46	9.09	11.00
Straddle	5720	-5.22	-5.11	0.39	-1.76	9.09	11.00

TEST DATA

802.11n (40MHz) mode

Channel	Frequency (MHz)	Measured PSD (dBm)		Duty Factor (dB)	Maximum PSD (dBm)	FCC Limit (dBm/ MHz)	IC Limit (dBm/ MHz)
		Chain 0	Chain 1		Total output power		
Lowest	5510	-9.67	-8.90	0.75	-5.51	9.09	11.00
Middle	5590	-8.93	-9.10	0.75	-5.25	9.09	11.00
Highest	5670	-8.15	-8.75	0.75	-4.68	9.09	11.00
Straddle	5710	-9.04	-9.66	0.75	-5.58	9.09	11.00

802.11ac (80MHz) mode

Channel	Frequency (MHz)	Measured PSD (dBm)		Duty Factor (dB)	Maximum PSD (dBm)	FCC Limit (dBm/ MHz)	IC Limit (dBm/ MHz)
		Chain 0	Chain 1		Total output power		
Lowest	5530	-12.87	-12.43	1.41	-8.22	9.09	11.00
Highest	5610	-12.85	-12.86	1.41	-8.43	9.09	11.00
Straddle	5690	-11.97	-12.68	1.41	-7.89	9.09	11.00

TEST DATA

Note:

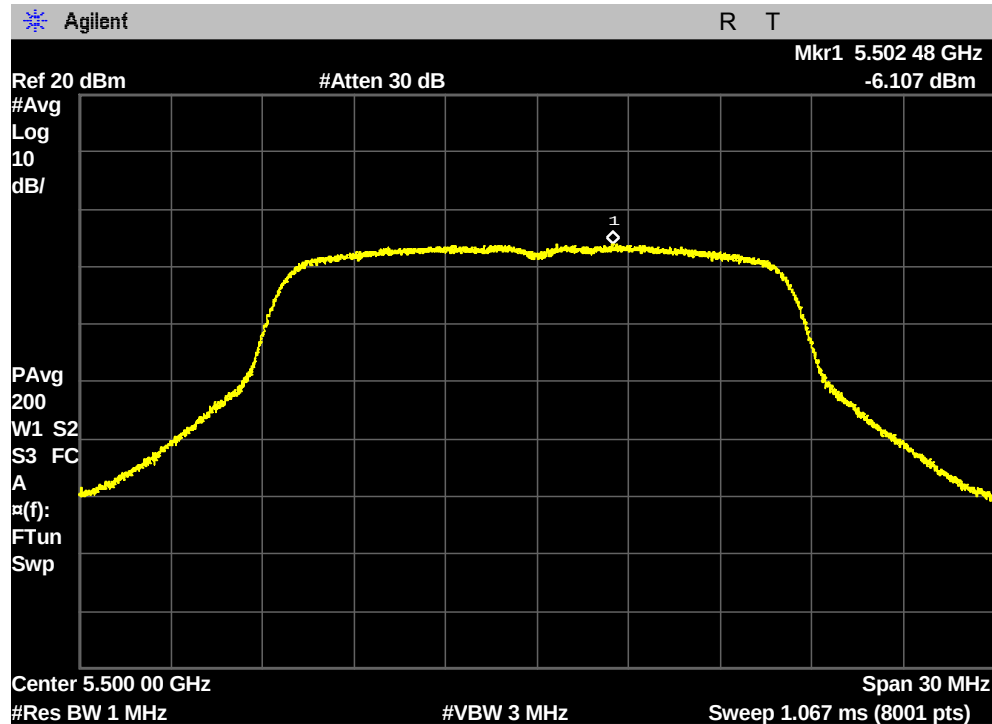
1. Maximum Conducted (average) Power = Measured conducted power + Duty Factor
2. Total output power = $10 \log [10^{\{(Chain\ 0\ Power + duty\ factor)/10\}} + 10^{\{(Chain\ 1\ Power + duty\ factor)/10\}}]$
3. For CDD transmission, directional gain is. **7.91 dBi**
 For MIMO transmission, directional gain is **4.9 dBi**.
 Directional gain was calculated according to KDB662911 D01 Multiple Transmitter Output v02r01.
 For power spectral density (PSD) measurements on all devices employing CDD, directional gain is as follows,
Directional gain = $G_{ANT} + 10 \log(N_{ANT}/N_{SS})$ dBi, where N_{SS} = the number of independent spatial streams of data and G_{ANT} is the antenna gain in dBi. = 4.9 dBi + $10 \log(2/1)$ dB = 7.91 dBi.
 For CDD mode of this device, $N_{SS}=1$.
 For power spectral density (PSD) measurements on all devices employing MIMO, directional gain is as follows,
Directional gain = $G_{ANT} + 10 \log(N_{ANT}/N_{SS})$ dBi, where N_{SS} = the number of independent spatial streams of data and G_{ANT} is the antenna gain in dBi. = 4.9 dBi + $10 \log(2/2)$ dB = 4.9 dBi.
 For this device, MIMO mode means SM-MIMO(Spatial Multiplexing) transmission and $N_{SS}=2$.
4. For FCC PSD Limit, If transmitting antennas of directional gain greater than 6 dBi was used, maximum power spectral density was reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
5. Power Spectral Density(PSD) was measured by same method with conducted output power according to II.F.1 in KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
6. The following equation was used for spectrum offset:
 Spectrum offset (dB) = Attenuator (dB) + Cable Loss (dB) + SMA Type Connector Loss (dB)

PLOTS OF EMISSIONS

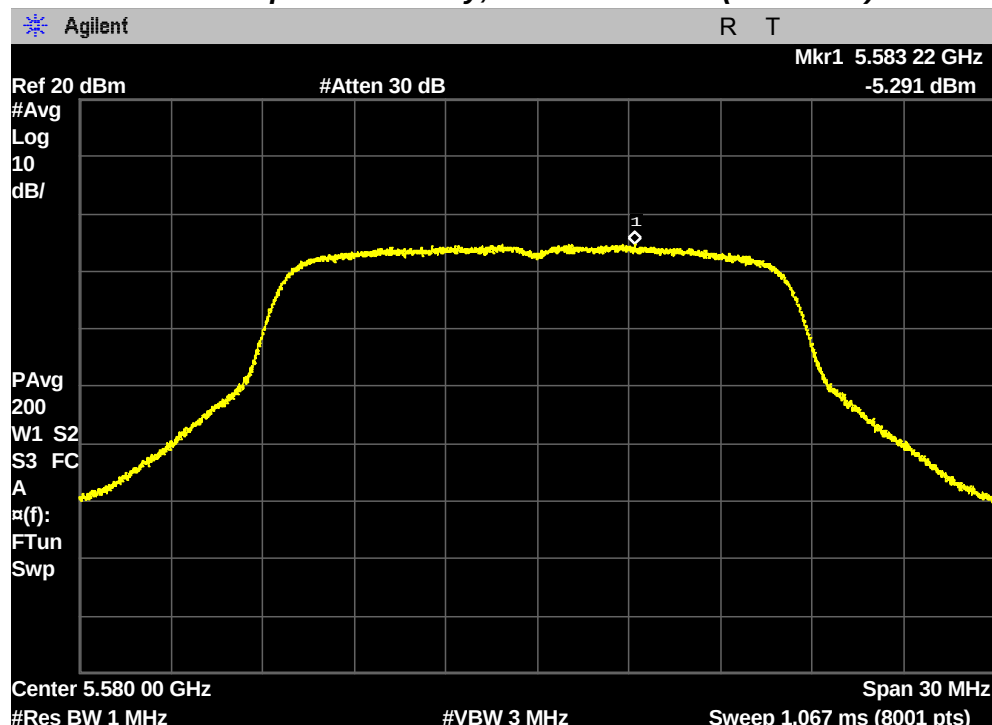
802.11a mode

Chain 0

Maximum Power Spectral Density, Lowest Channel (5500 MHz)

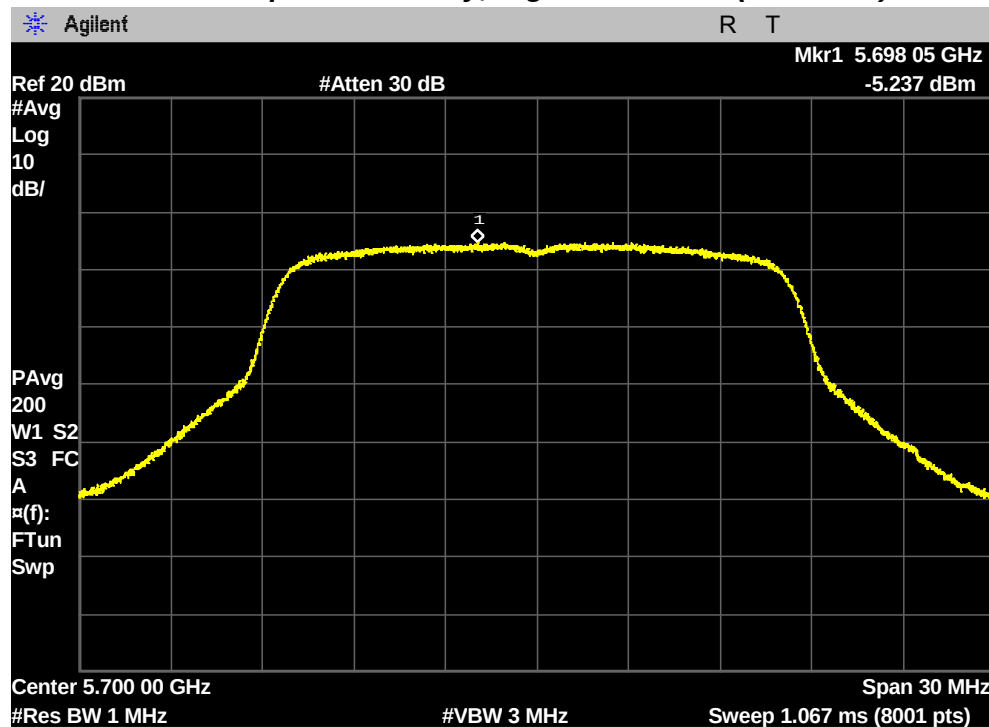


Maximum Power Spectral Density, Middle Channel (5580 MHz)

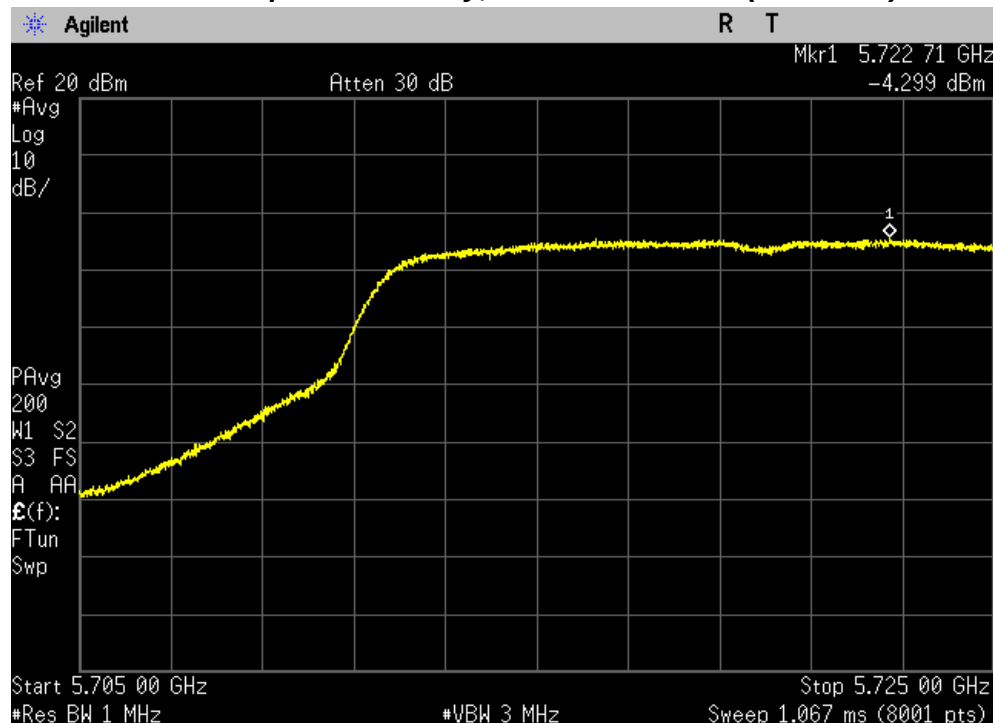


PLOTS OF EMISSIONS

Maximum Power Spectral Density, Highest Channel (5700 MHz)



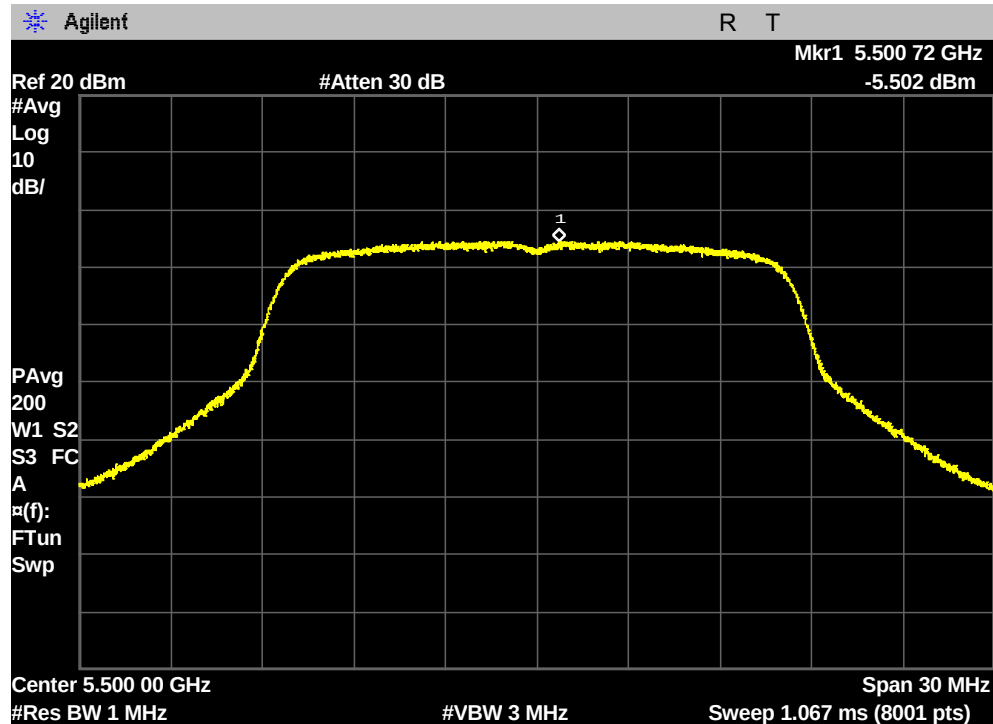
Maximum Power Spectral Density, Straddle Channel (5720 MHz)



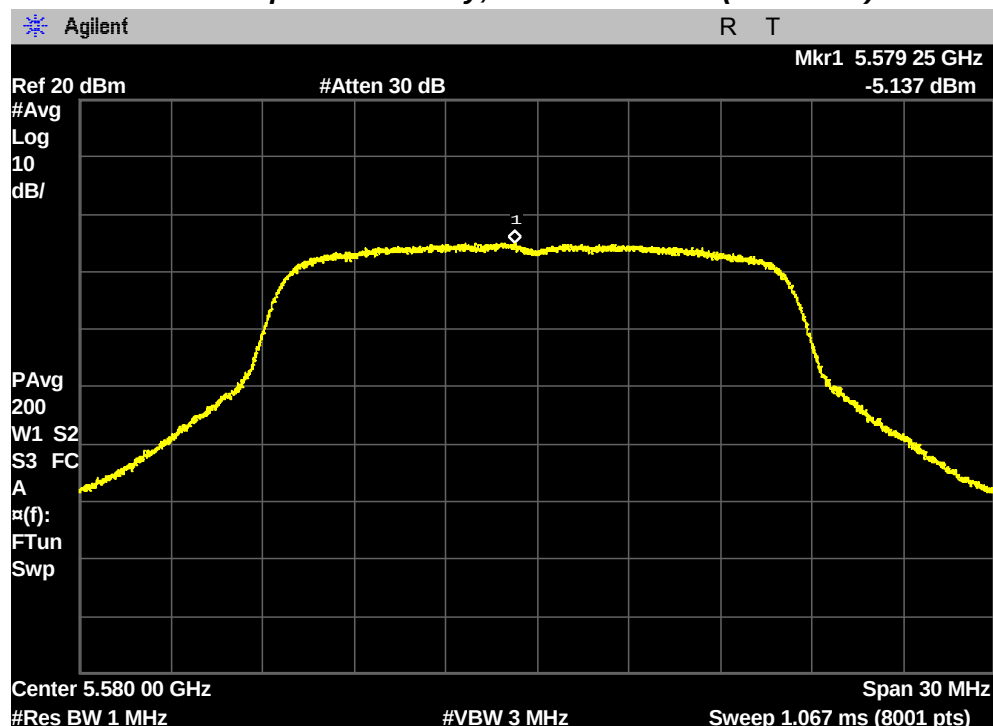
PLOTS OF EMISSIONS

Chain 1

Maximum Power Spectral Density, Lowest Channel (5500 MHz)

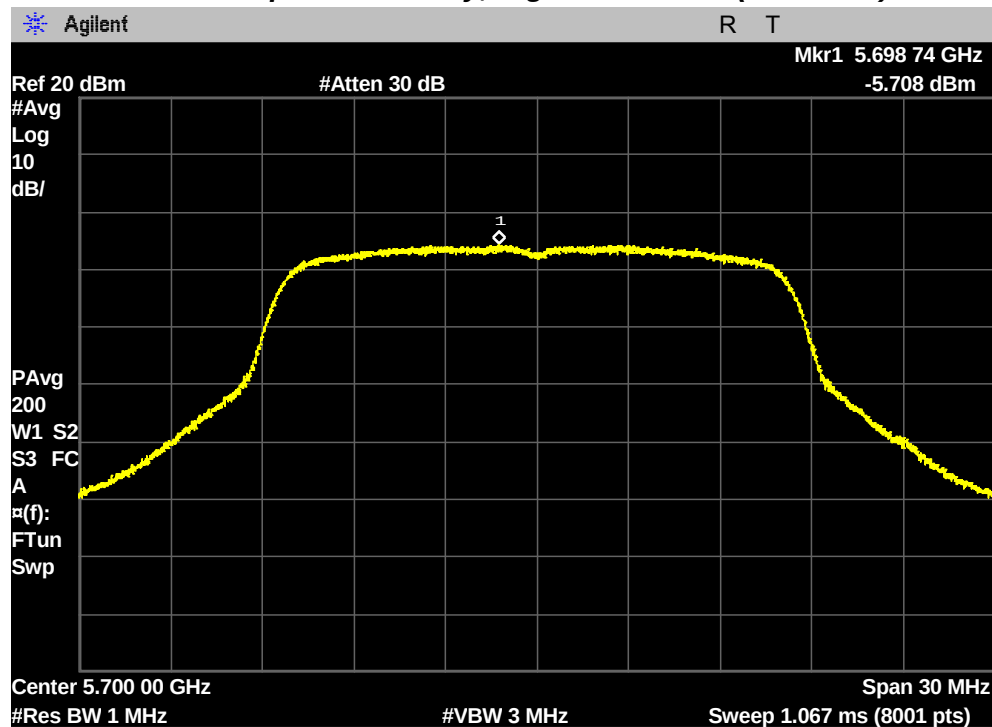


Maximum Power Spectral Density, Middle Channel (5580 MHz)

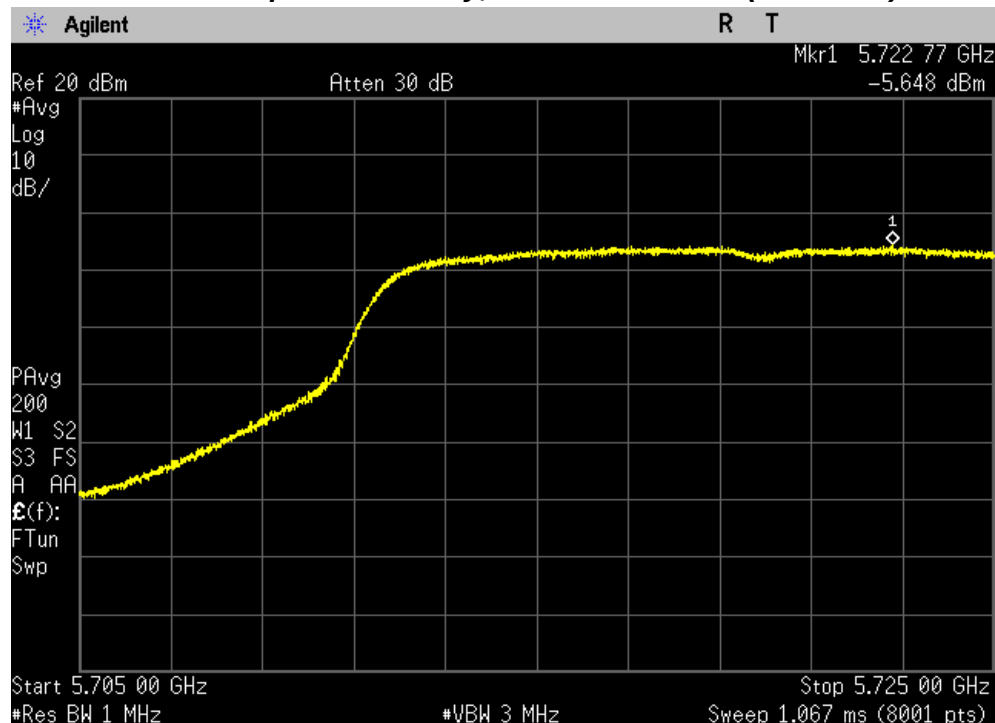


PLOTS OF EMISSIONS

Maximum Power Spectral Density, Highest Channel (5700 MHz)



Maximum Power Spectral Density, Straddle Channel (5720 MHz)

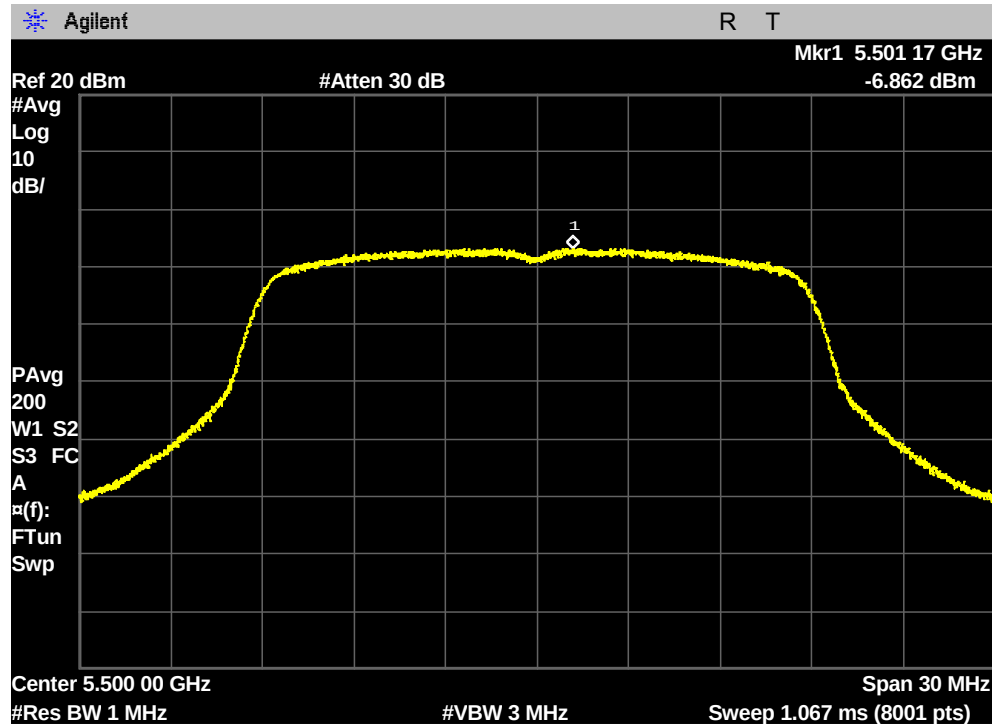


PLOTS OF EMISSIONS

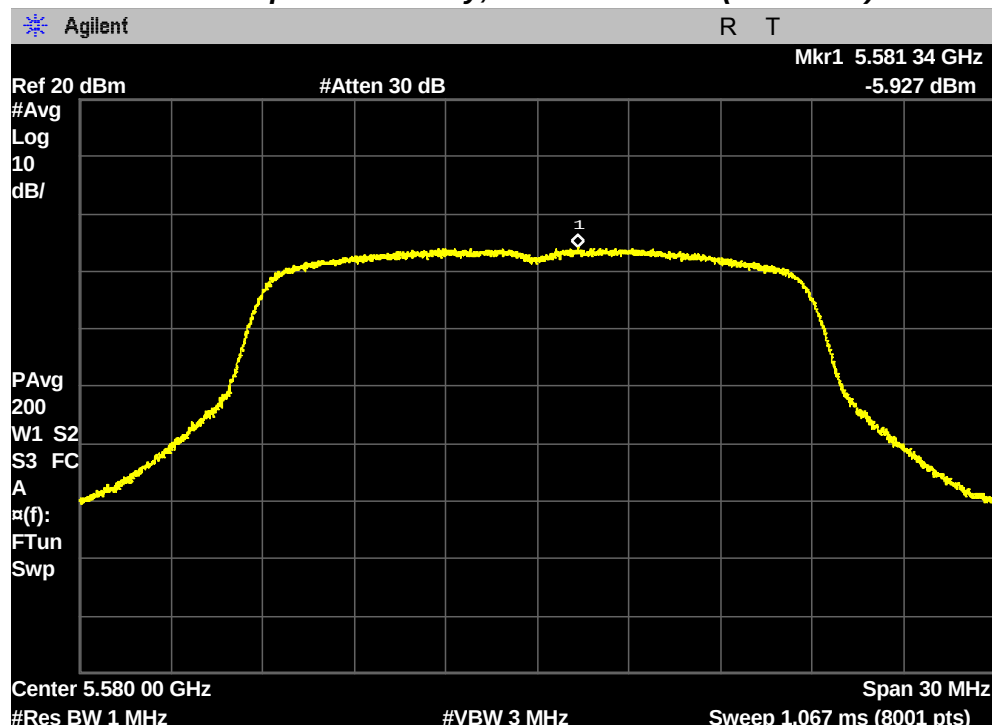
802.11n (20 MHz) mode

Chain 0

Maximum Power Spectral Density, Lowest Channel (5500 MHz)

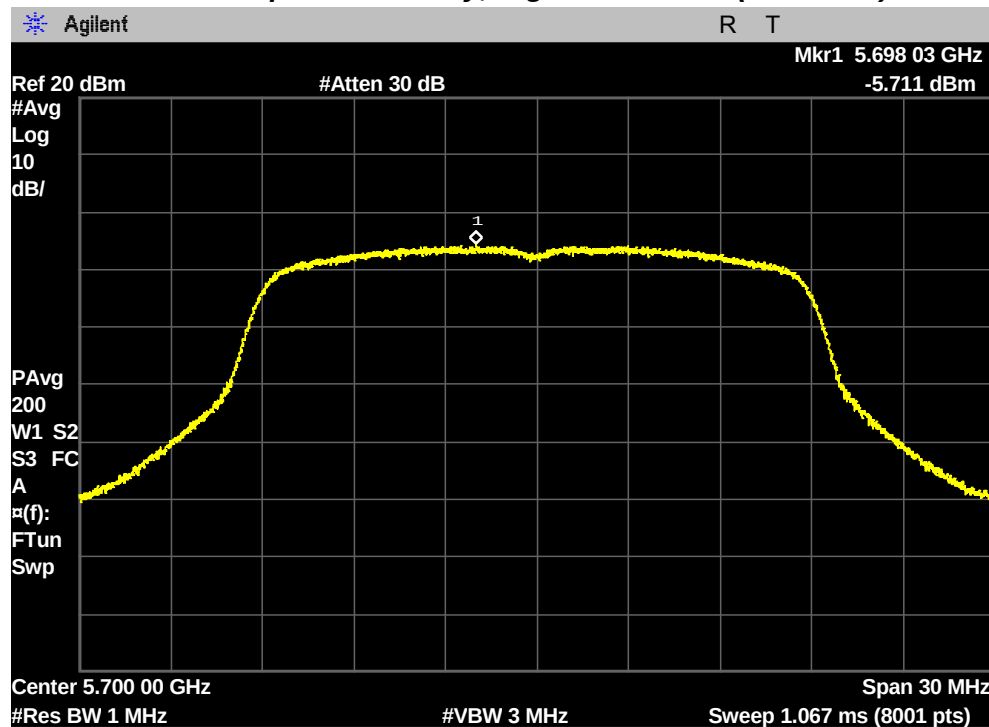


Maximum Power Spectral Density, Middle Channel (5580 MHz)

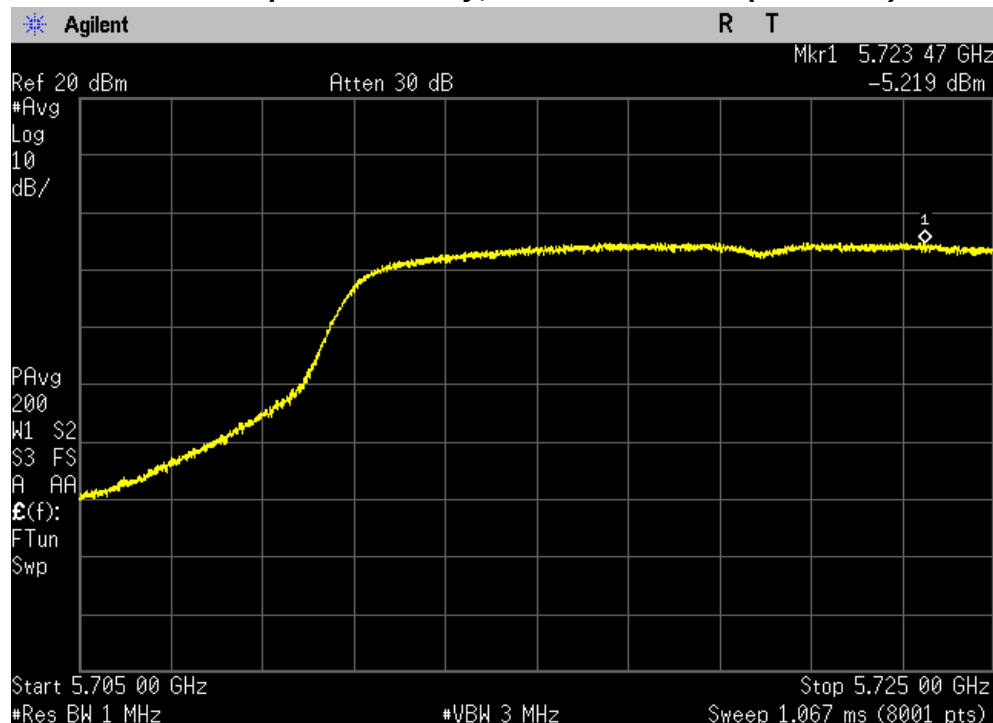


PLOTS OF EMISSIONS

Maximum Power Spectral Density, Highest Channel (5700 MHz)



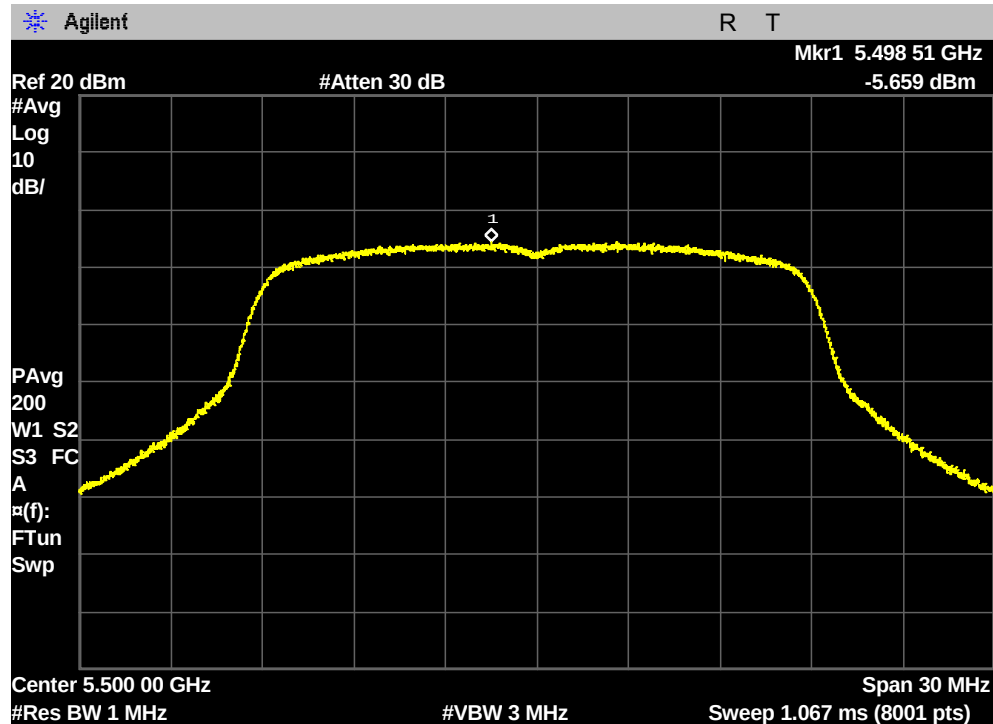
Maximum Power Spectral Density, Straddle Channel (5720 MHz)



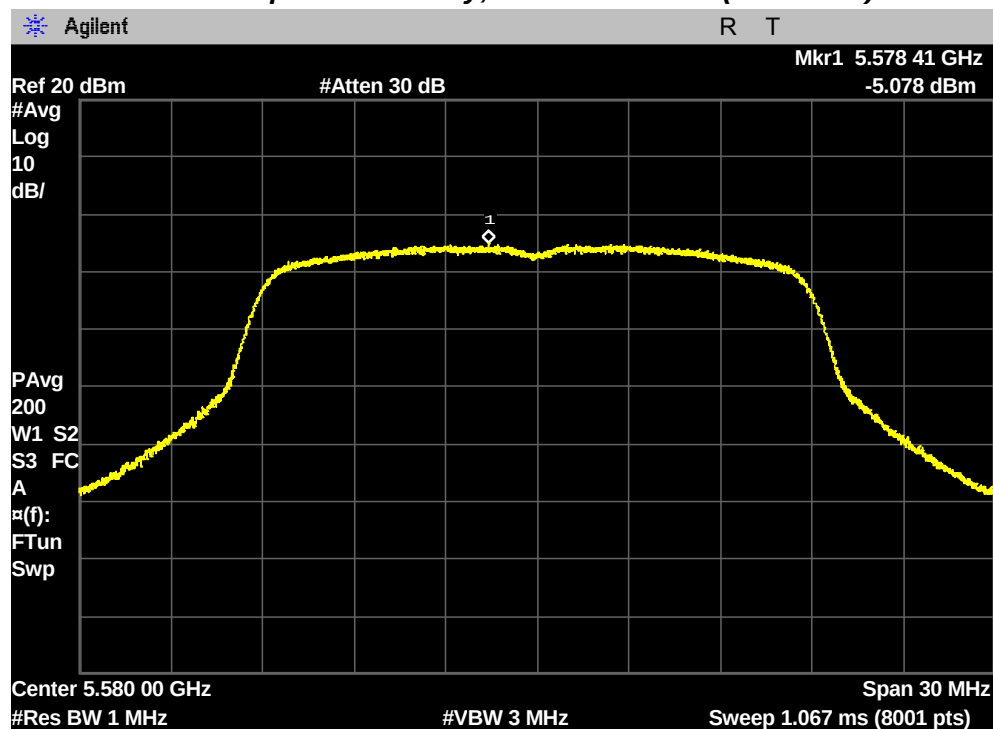
PLOTS OF EMISSIONS

Chain 1

Maximum Power Spectral Density, Lowest Channel (5500 MHz)

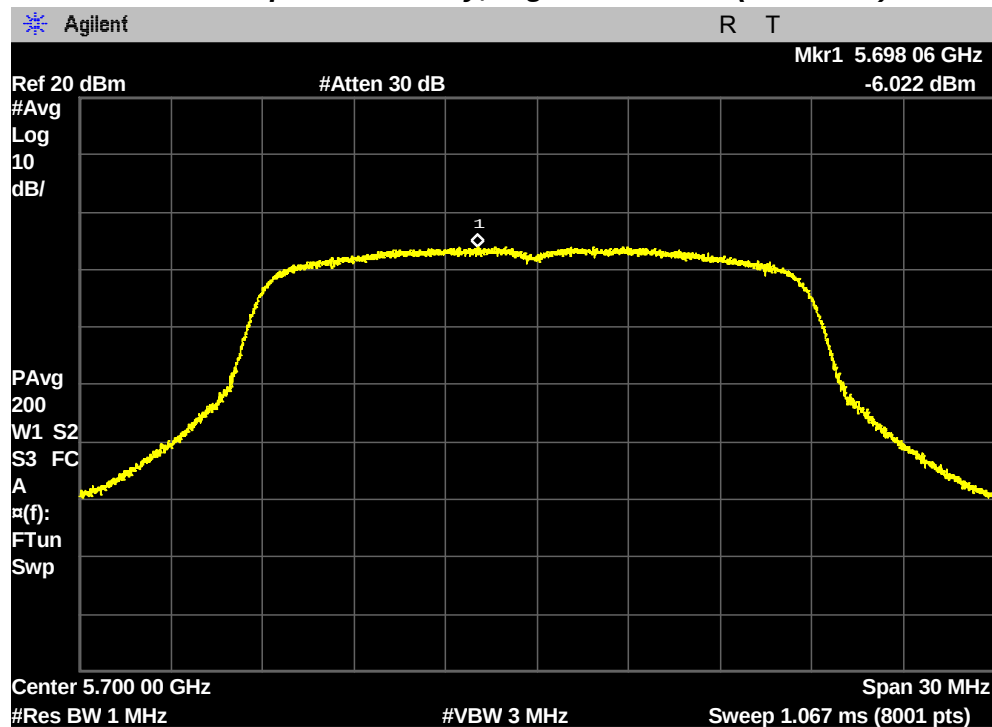


Maximum Power Spectral Density, Middle Channel (5580 MHz)

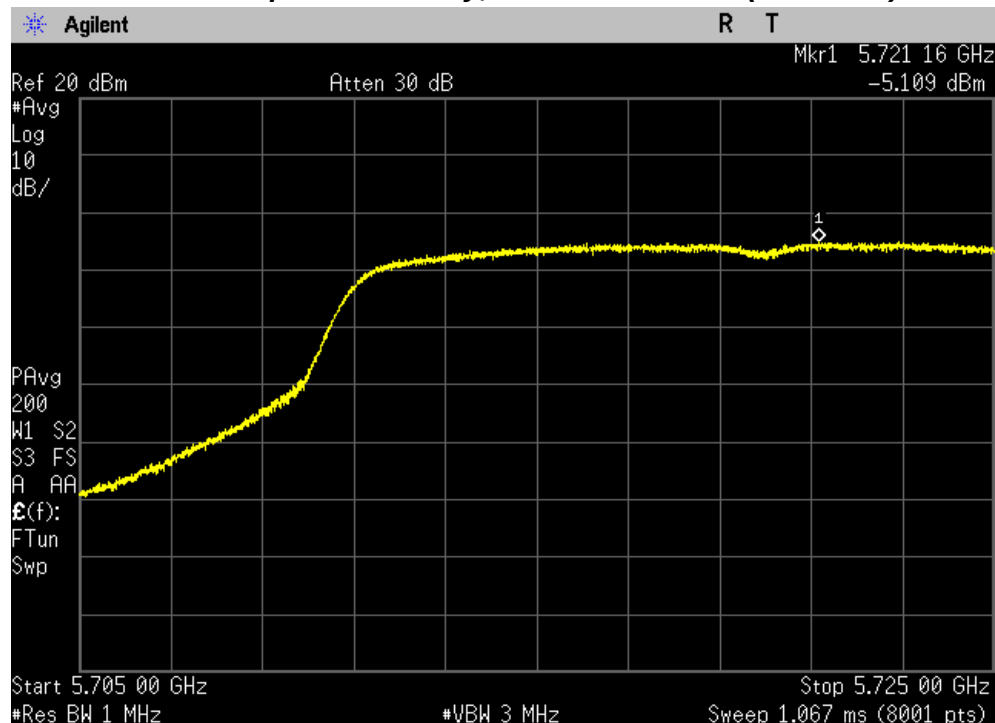


PLOTS OF EMISSIONS

Maximum Power Spectral Density, Highest Channel (5700 MHz)



Maximum Power Spectral Density, Straddle Channel (5720 MHz)

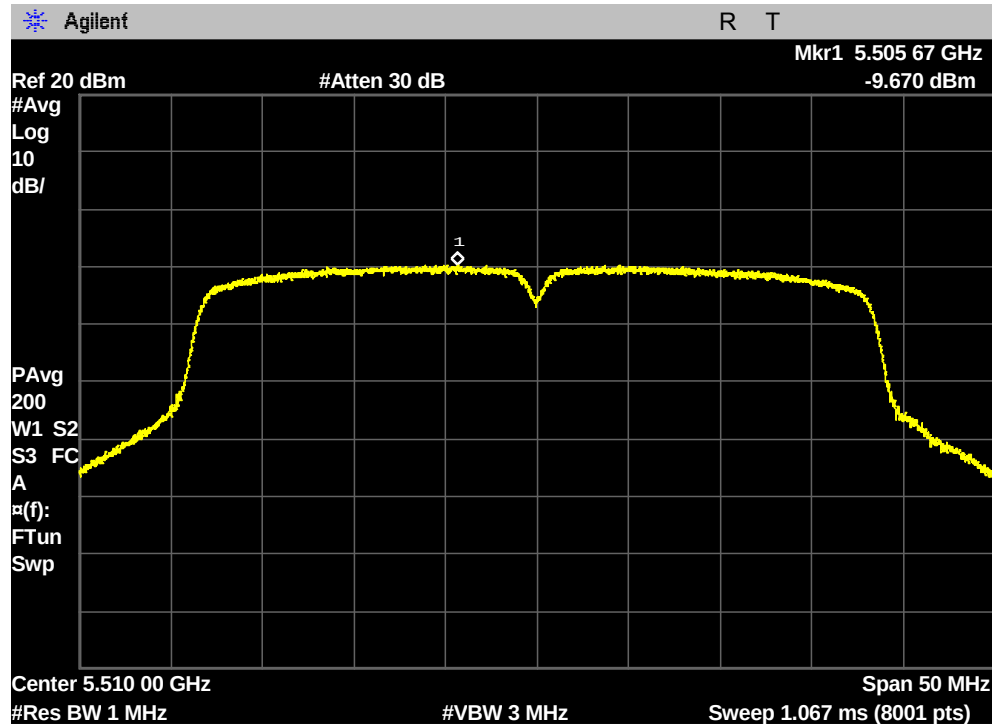


PLOTS OF EMISSIONS

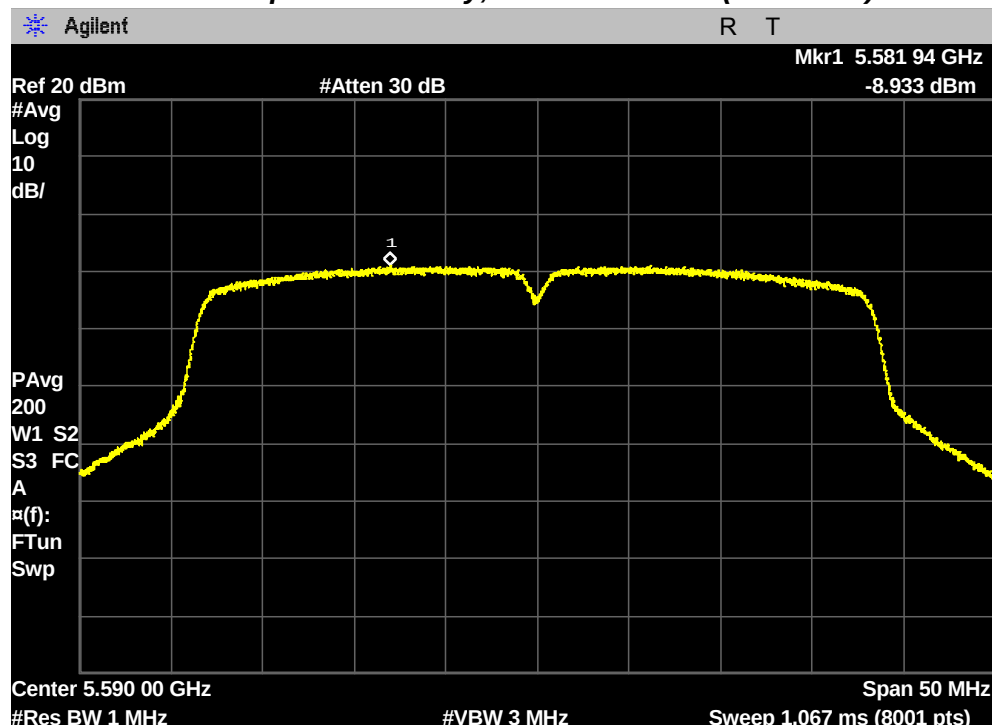
802.11n (40 MHz) mode

Chain 0

Maximum Power Spectral Density, Lowest Channel (5510 MHz)

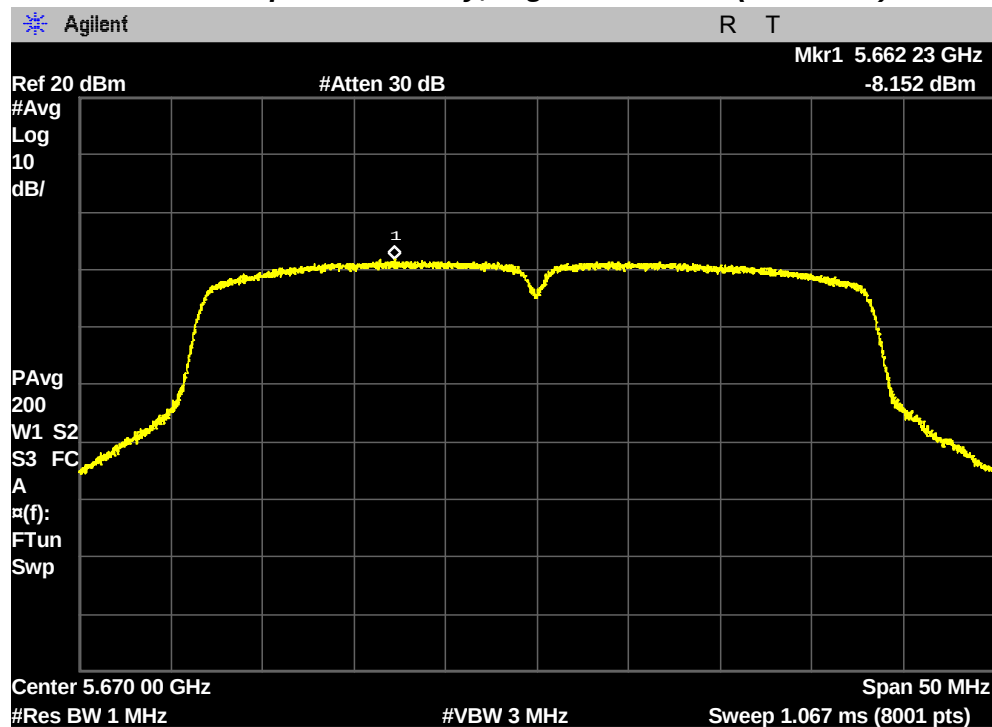


Maximum Power Spectral Density, Middle Channel (5590 MHz)

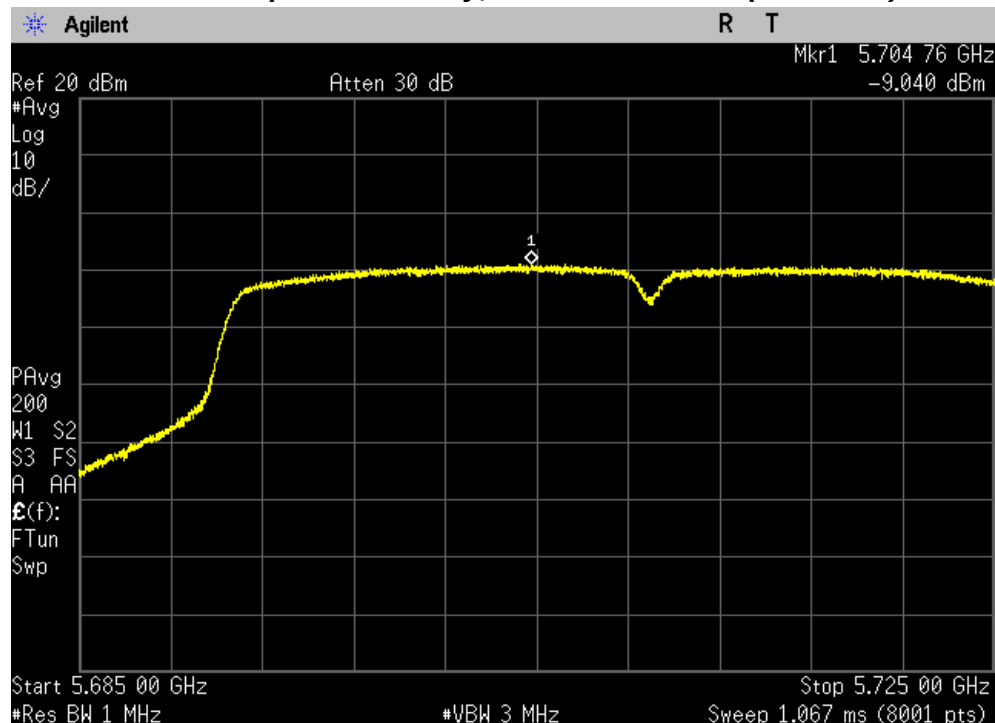


PLOTS OF EMISSIONS

Maximum Power Spectral Density, Highest Channel (5670 MHz)



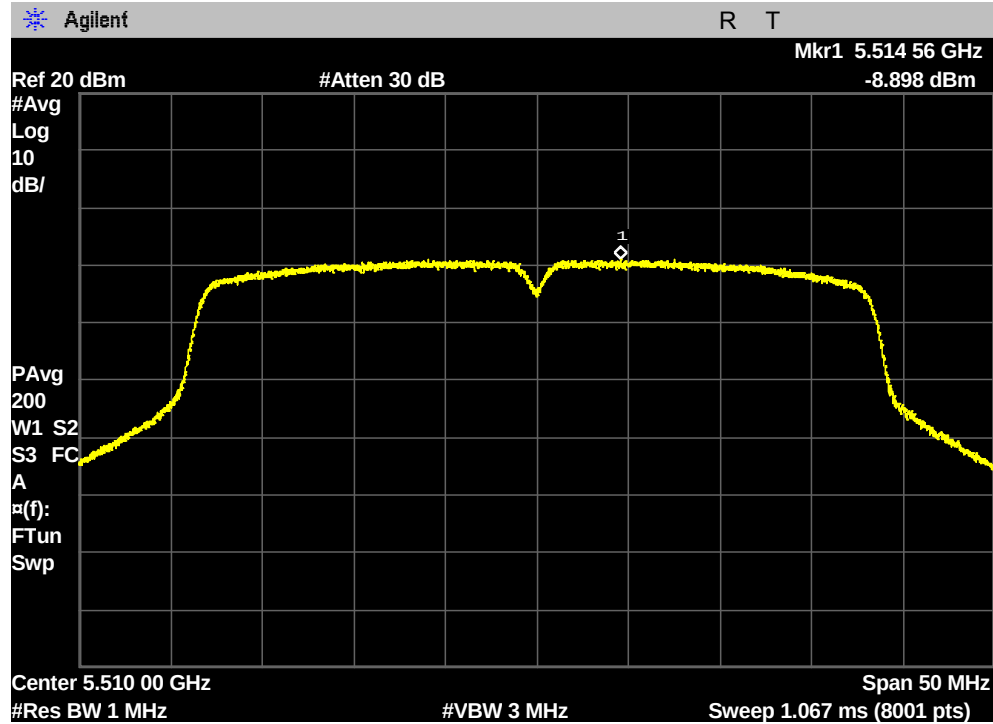
Maximum Power Spectral Density, Straddle Channel (5710 MHz)



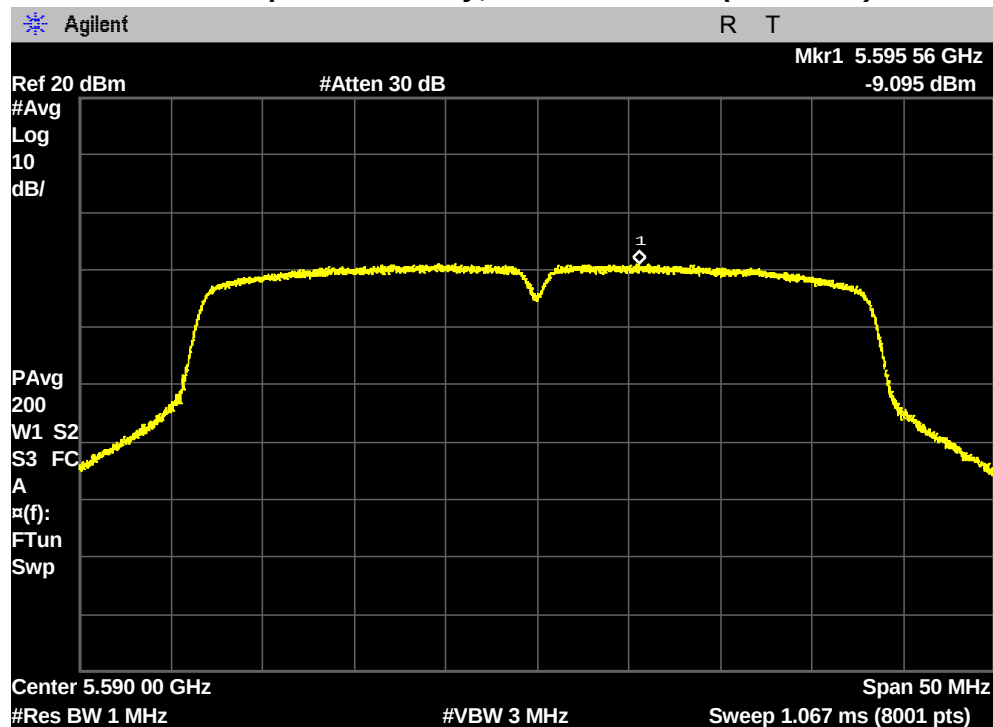
PLOTS OF EMISSIONS

Chain 1

Maximum Power Spectral Density, Lowest Channel (5510 MHz)

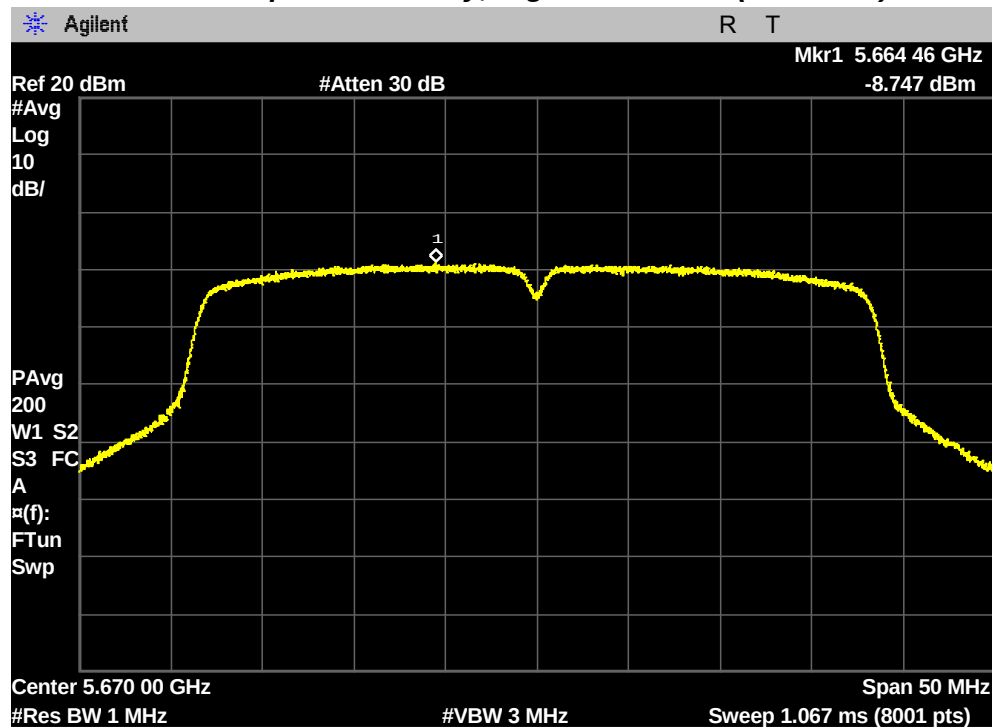


Maximum Power Spectral Density, Middle Channel (5590 MHz)

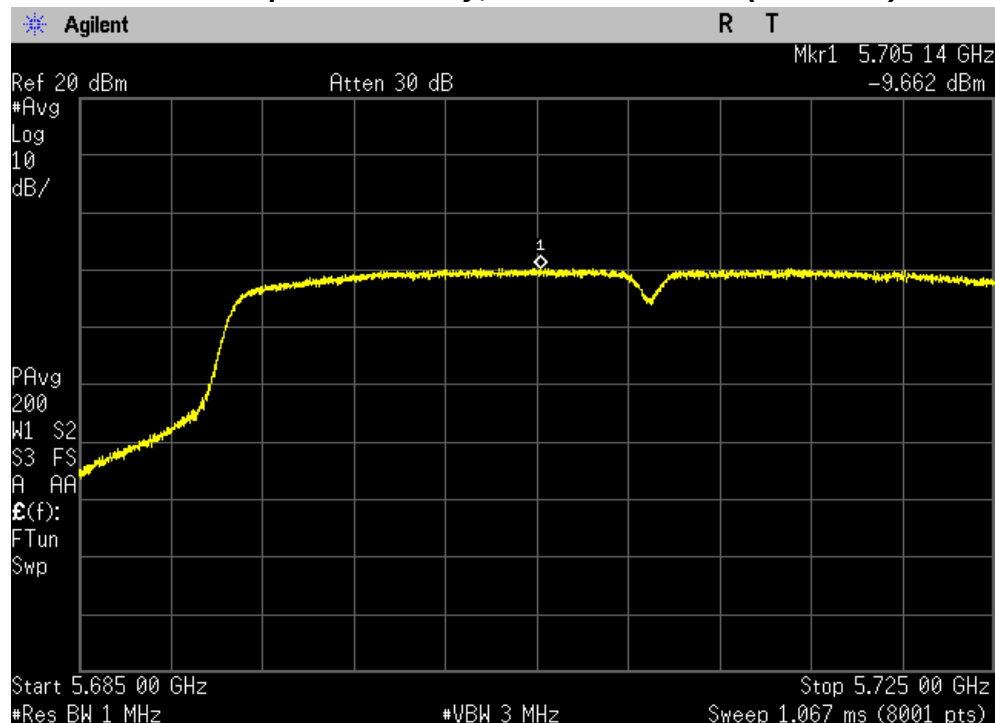


PLOTS OF EMISSIONS

Maximum Power Spectral Density, Highest Channel (5670 MHz)



Maximum Power Spectral Density, Straddle Channel (5710 MHz)

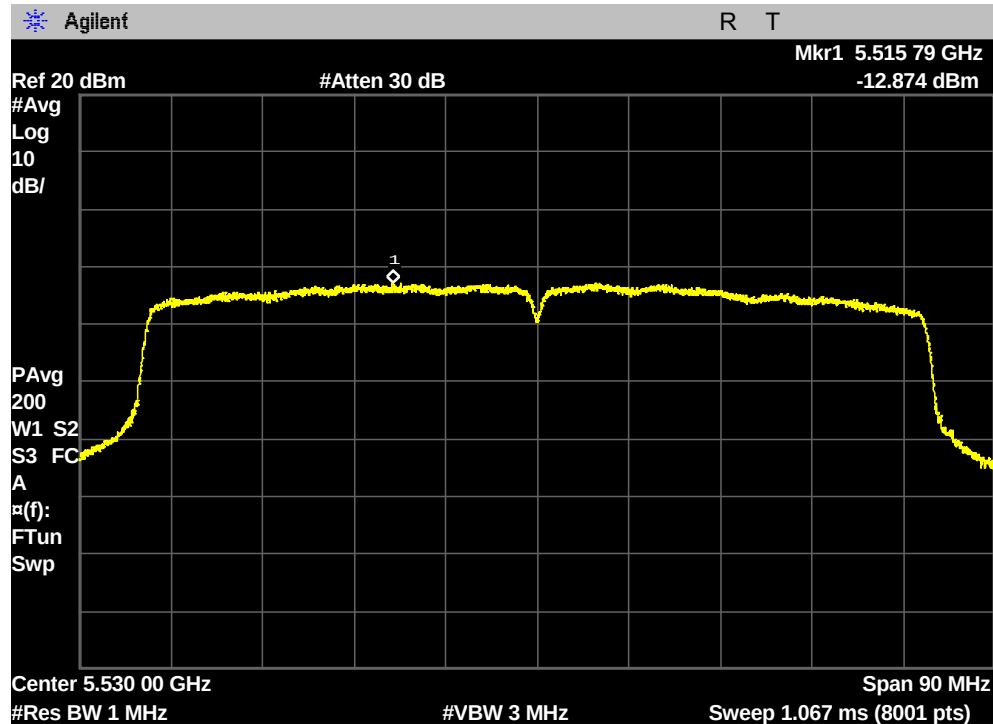


PLOTS OF EMISSIONS

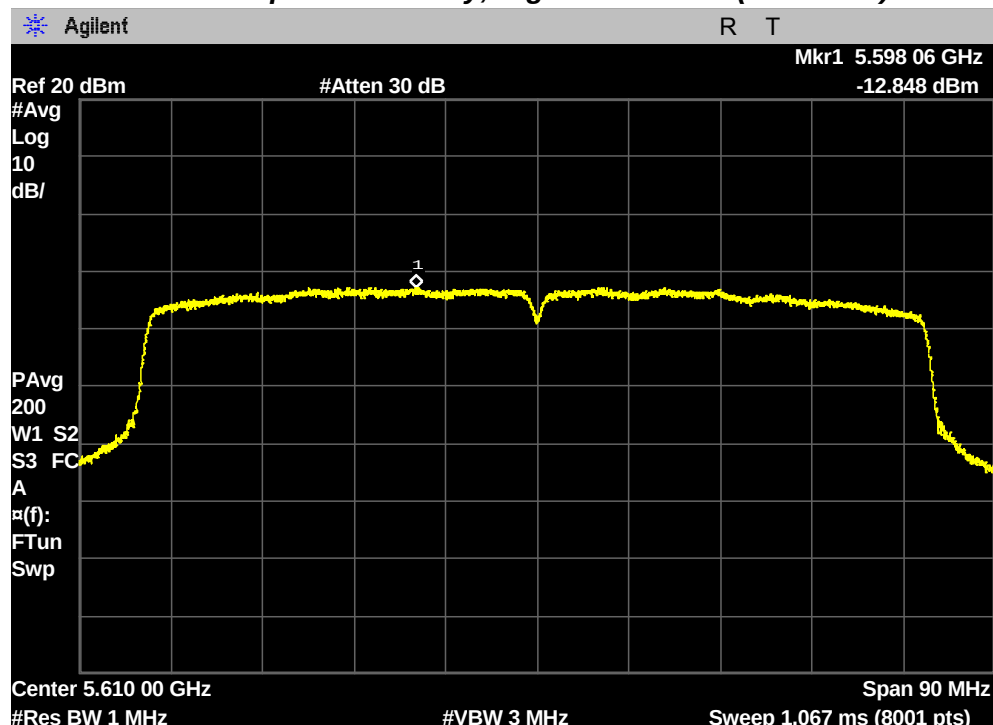
802.11ac (80 MHz) mode

Chain 0

Maximum Power Spectral Density, Lowest Channel (5530 MHz)

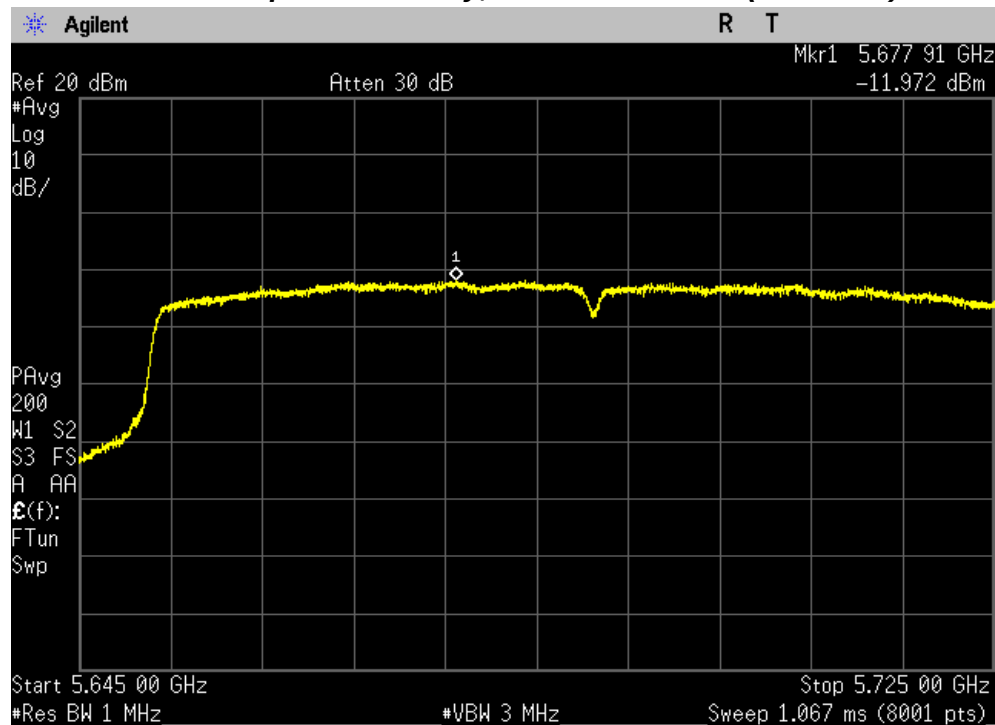


Maximum Power Spectral Density, Highest Channel (5610 MHz)



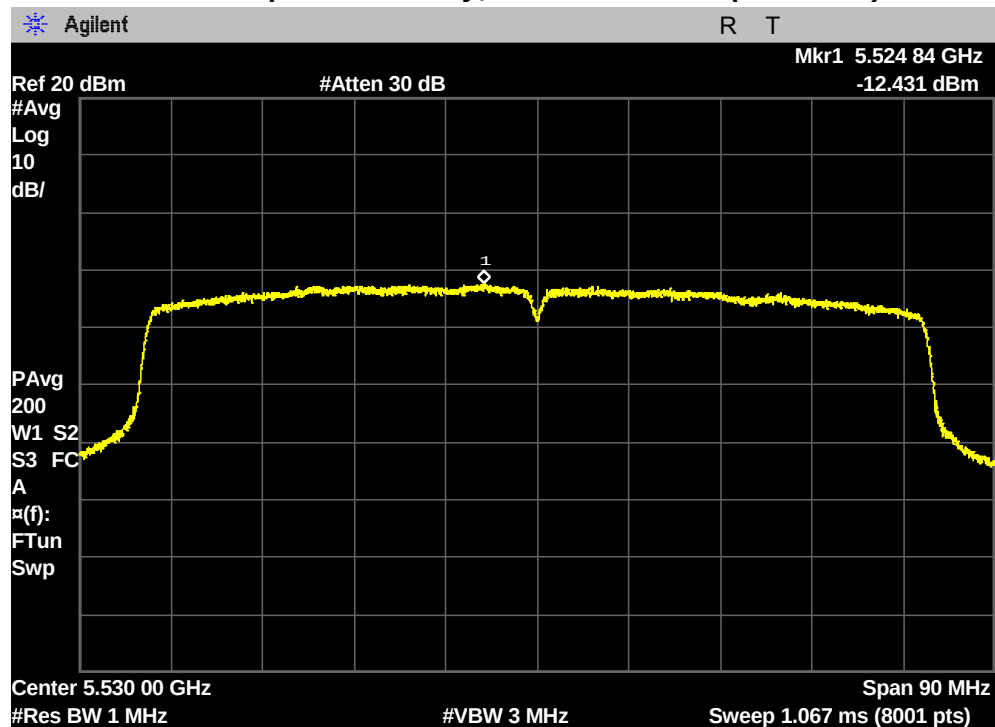
PLOTS OF EMISSIONS

Maximum Power Spectral Density, Straddle Channel (5690 MHz)



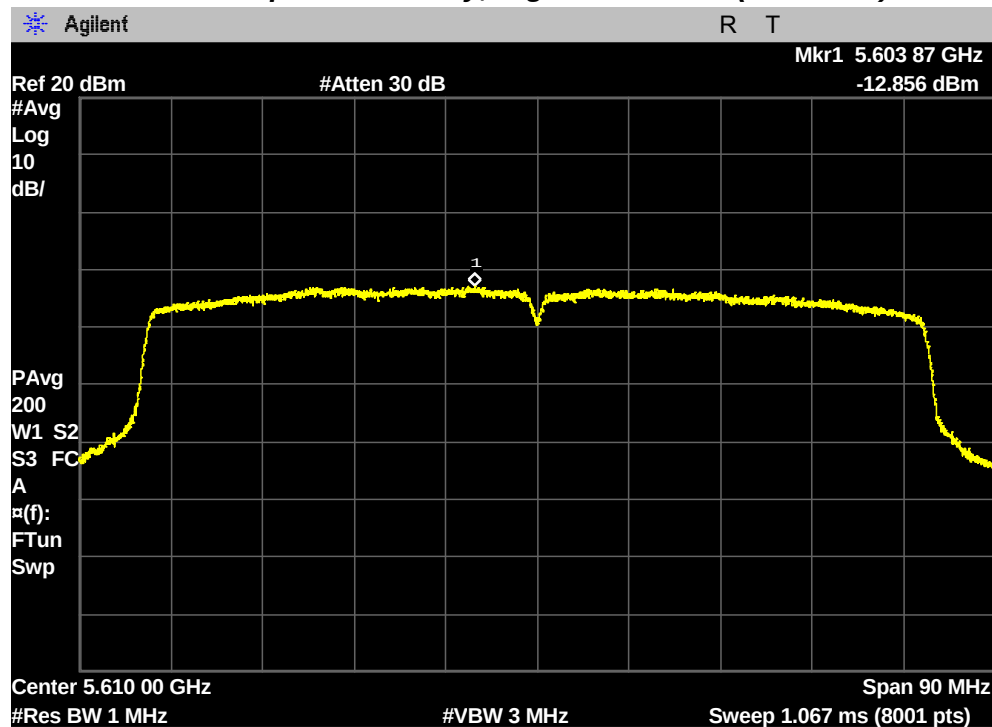
Chain 1

Maximum Power Spectral Density, Lowest Channel (5530 MHz)

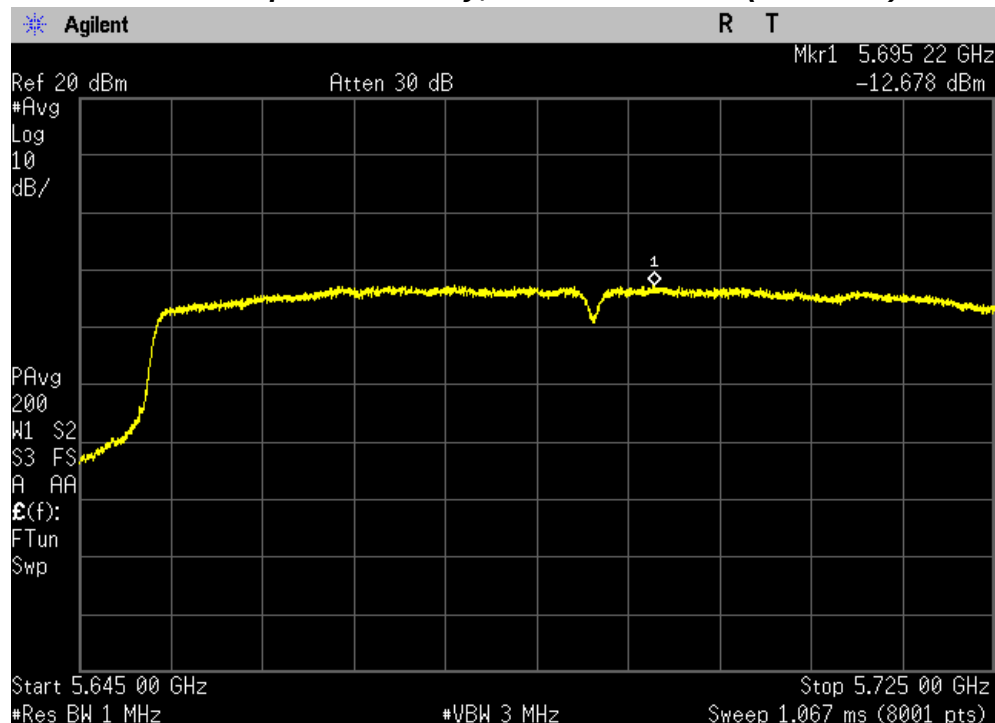


PLOTS OF EMISSIONS

Maximum Power Spectral Density, Highest Channel (5610 MHz)



Maximum Power Spectral Density, Straddle Channel (5690 MHz)



TEST DATA

8.6.4 Maximum Power Spectral Density – U-NII-3 band

FCC §15.407(a), RSS-247 Issue 2 6.2

Test Mode : Set to Straddle channel, Lowest channel, Middle channel and Highest channel

802.11a mode

Channel	Frequency (MHz)	Measured PSD (dBm)		Duty Factor (dB)	Maximum PSD (dBm)	FCC Limit (dBm/500kHz)	IC Limit (dBm/500kHz)
		Chain 0	Chain 1		Total output power		
Straddle	5720	-12.42	-9.70	0.36	-7.48	28.09	28.09
Lowest	5745	-10.09	-9.34	0.36	-6.33	28.09	28.09
Middle	5785	-10.73	-9.57	0.36	-6.74	28.09	28.09
Highest	5825	-11.35	-9.04	0.36	-6.67	28.09	28.09

802.11n (20MHz) mode

Channel	Frequency (MHz)	Measured PSD (dBm)		Duty Factor (dB)	Maximum PSD (dBm)	FCC Limit (dBm/500kHz)	IC Limit (dBm/500kHz)
		Chain 0	Chain 1		Total output power		
Straddle	5720	-12.26	-11.07	0.39	-8.22	28.09	28.09
Lowest	5745	-10.84	-9.75	0.39	-6.86	28.09	28.09
Middle	5785	-11.74	-9.82	0.39	-7.27	28.09	28.09
Highest	5825	-12.20	-9.74	0.39	-7.40	28.09	28.09

TEST DATA

802.11n (40MHz) mode

Channel	Frequency (MHz)	Measured PSD (dBm)		Duty Factor (dB)	Maximum PSD (dBm)	FCC Limit (dBm/500kHz)	IC Limit (dBm/500kHz)
		Chain 0	Chain 1		Total output power		
Straddle	5710	-18.04	-16.28	0.75	-13.31	28.09	28.09
Lowest	5755	-13.87	-13.20	0.75	-9.76	28.09	28.09
Highest	5795	-14.82	-13.17	0.75	-10.16	28.09	28.09

802.11ac (80MHz) mode

Channel	Frequency (MHz)	Measured PSD (dBm)		Duty Factor (dB)	Maximum PSD (dBm)	FCC Limit (dBm/500kHz)	IC Limit (dBm/500kHz)
		Chain 0	Chain 1		Total output power		
Straddle	5690	-20.08	-20.01	1.41	-15.62	28.09	28.09
Middle	5775	-17.09	-16.69	1.41	-12.47	28.09	28.09

TEST DATA

Note:

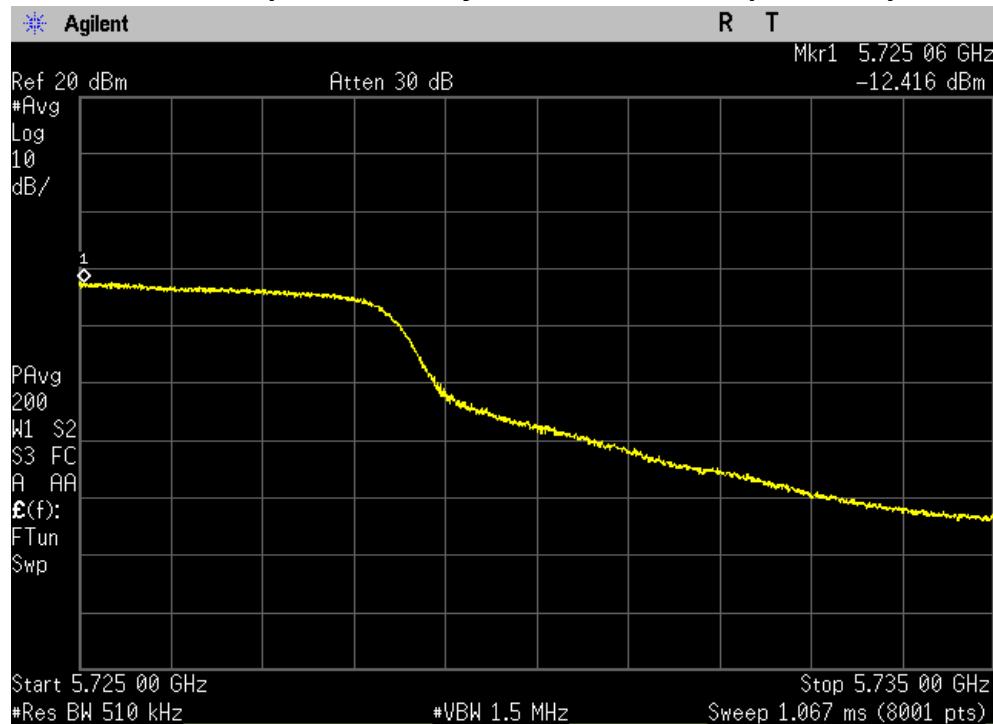
1. Maximum Conducted (average) Power = Measured conducted power + Duty Factor
2. Total output power = $10 \log [10^{\{(Chain\ 0\ Power + duty\ factor)/10\}} + 10^{\{(Chain\ 1\ Power + duty\ factor)/10\}}]$
3. For CDD transmission, directional gain is. **7.91 dBi**
For MIMO transmission, directional gain is **4.9 dBi**.
Directional gain was calculated according to KDB662911 D01 Multiple Transmitter Output v02r01.
For power spectral density (PSD) measurements on all devices employing CDD, directional gain is as follows,
Directional gain = $G_{ANT} + 10 \log(N_{ANT}/N_{SS})$ dBi, where N_{SS} = the number of independent spatial streams of data and G_{ANT} is the antenna gain in dBi. = 4.9 dBi + $10 \log(2/1)$ dB = 7.91 dBi.
For CDD mode of this device, $N_{SS}=1$.
For power spectral density (PSD) measurements on all devices employing MIMO, directional gain is as follows,
Directional gain = $G_{ANT} + 10 \log(N_{ANT}/N_{SS})$ dBi, where N_{SS} = the number of independent spatial streams of data and G_{ANT} is the antenna gain in dBi. = 4.9 dBi + $10 \log(2/2)$ dB = 4.9 dBi.
For this device, MIMO mode means SM-MIMO(Spatial Multiplexing) transmission and $N_{SS}=2$.
4. For FCC and IC PSD Limit, If transmitting antennas of directional gain greater than 6 dBi was used, maximum power spectral density was reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
5. Power Spectral Density(PSD) was measured by same method with conducted output power according to II.F.1 in KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
6. The following equation was used for spectrum offset:
Spectrum offset (dB) = Attenuator (dB) + Cable Loss (dB) + SMA Type Connector Loss (dB)

PLOTS OF EMISSIONS

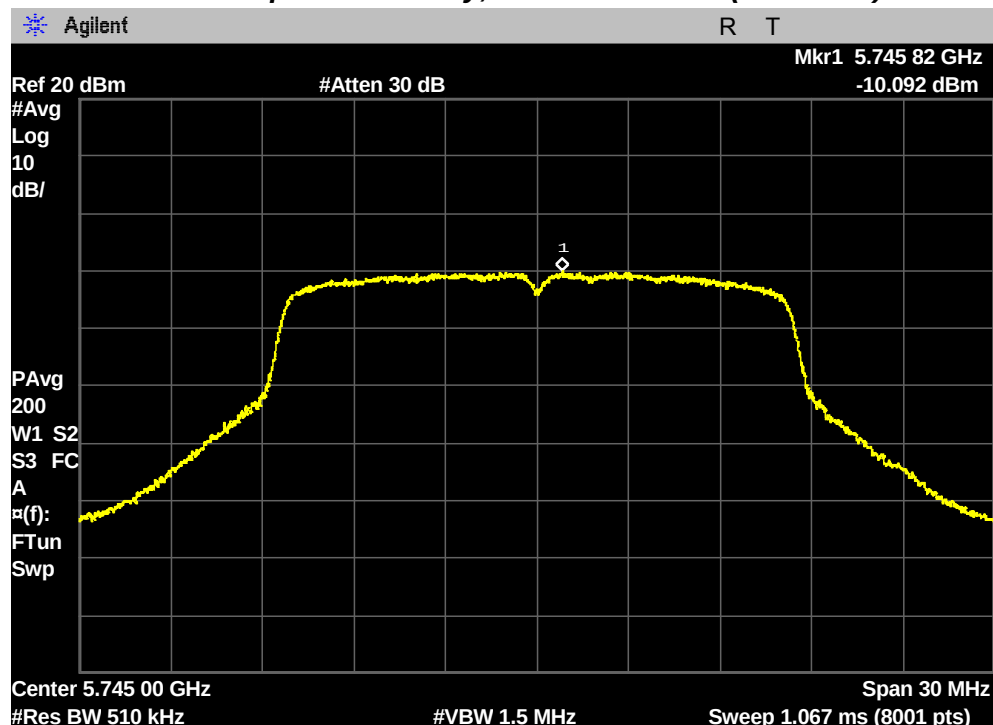
802.11a mode

Chain 0

Maximum Power Spectral Density, Straddle Channel (5720 MHz)

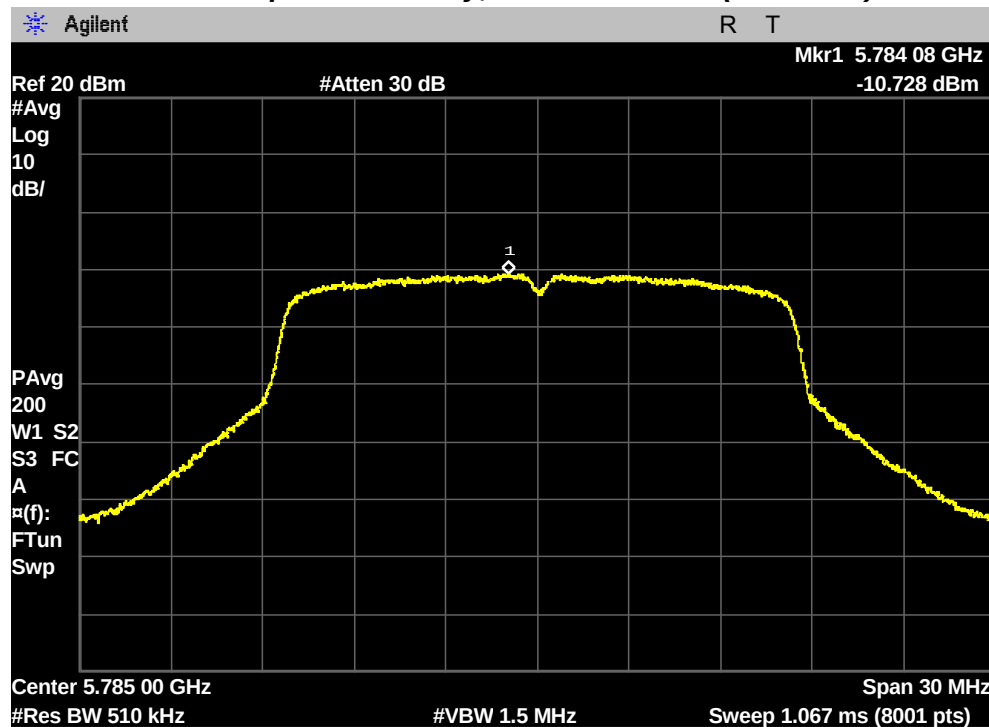


Maximum Power Spectral Density, Lowest Channel (5745 MHz)

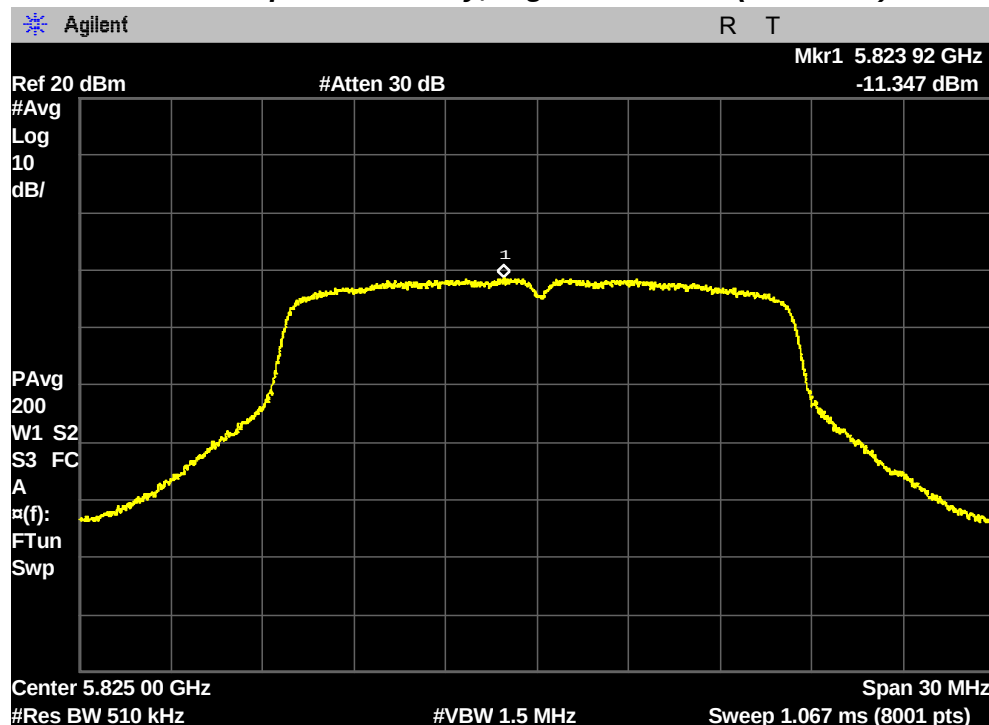


PLOTS OF EMISSIONS

Maximum Power Spectral Density, Middle Channel (5785 MHz)



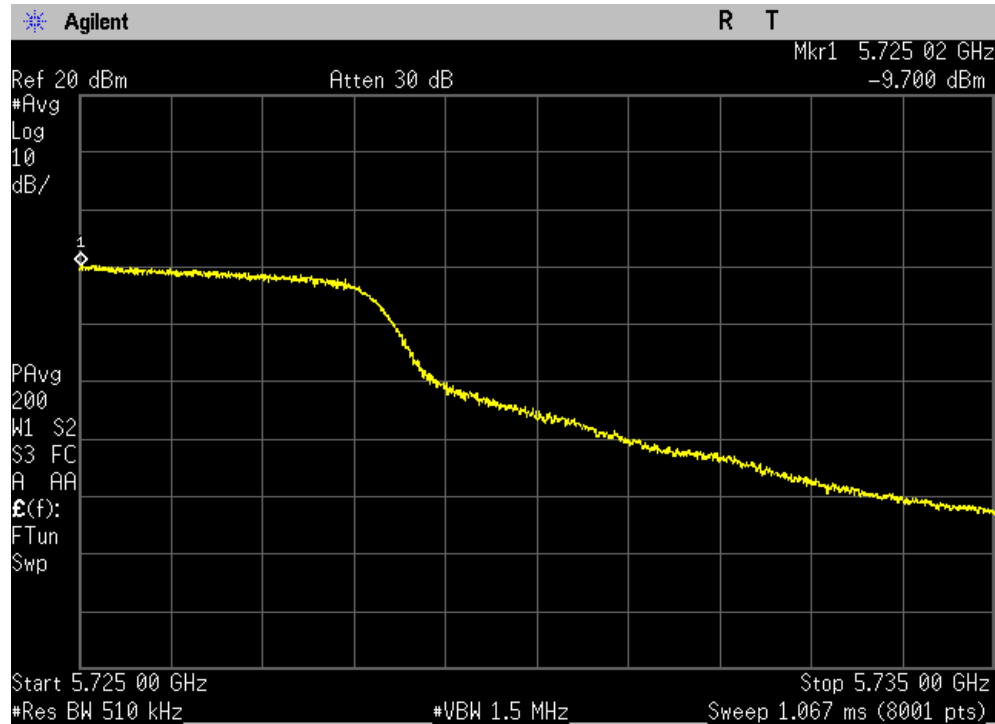
Maximum Power Spectral Density, Highest Channel (5825 MHz)



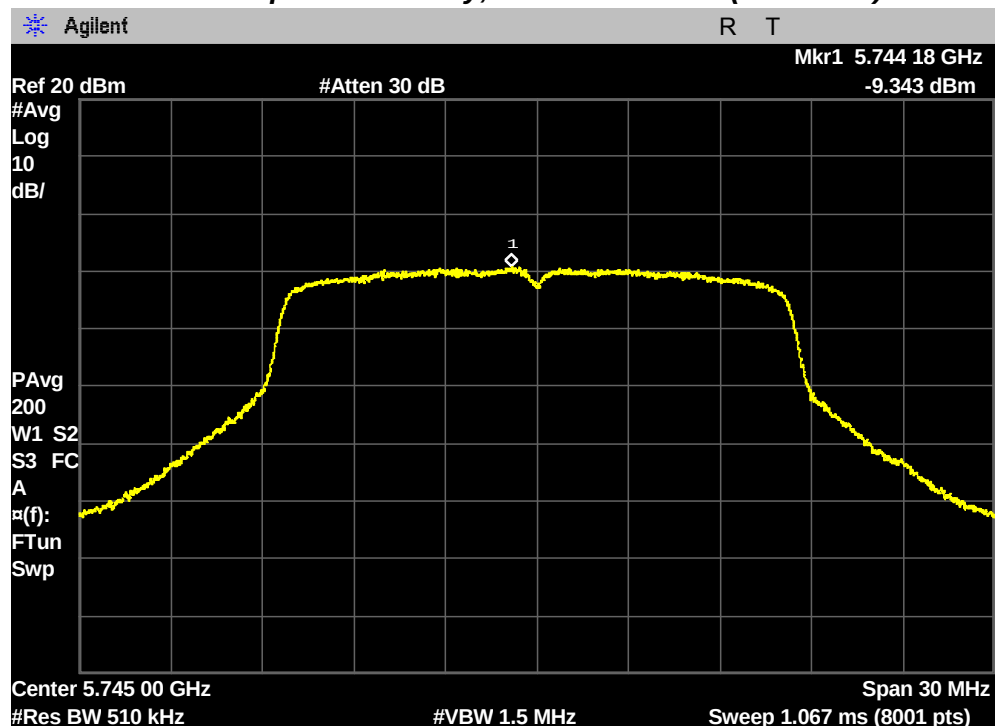
PLOTS OF EMISSIONS

Chain 1

Maximum Power Spectral Density, Straddle Channel (5720 MHz)

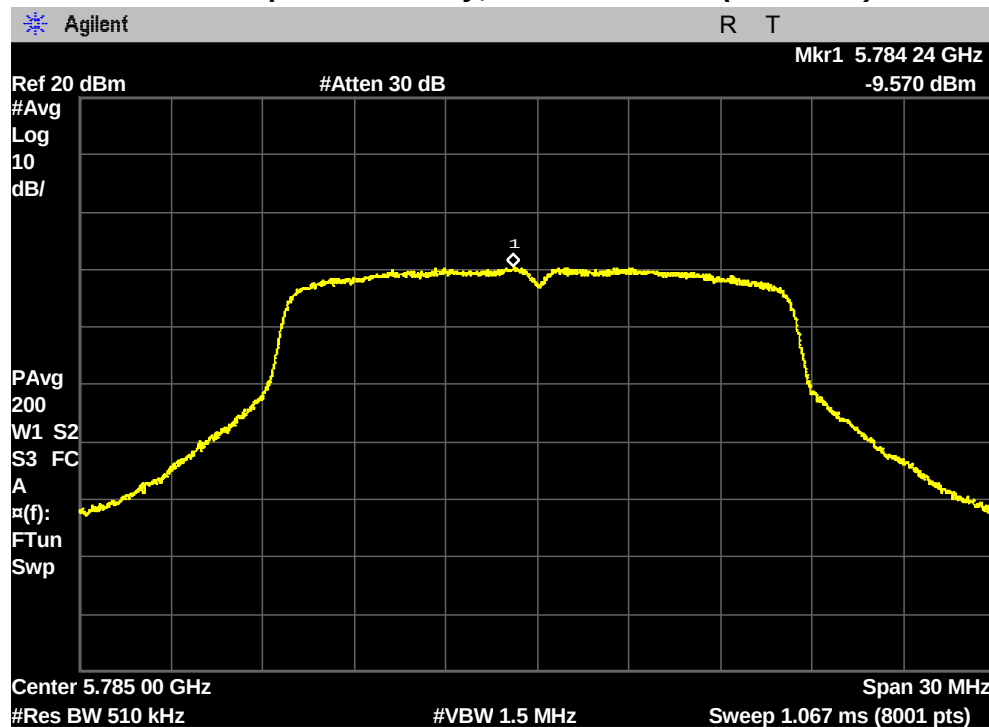


Maximum Power Spectral Density, Lowest Channel (5745 MHz)

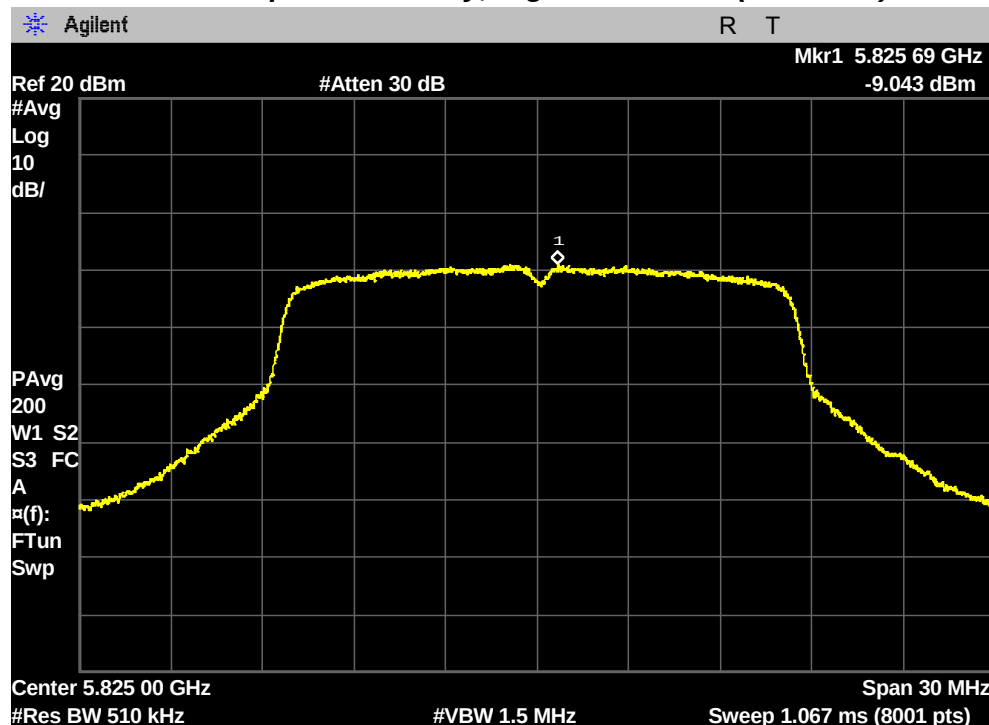


PLOTS OF EMISSIONS

Maximum Power Spectral Density, Middle Channel (5785 MHz)



Maximum Power Spectral Density, Highest Channel (5825 MHz)

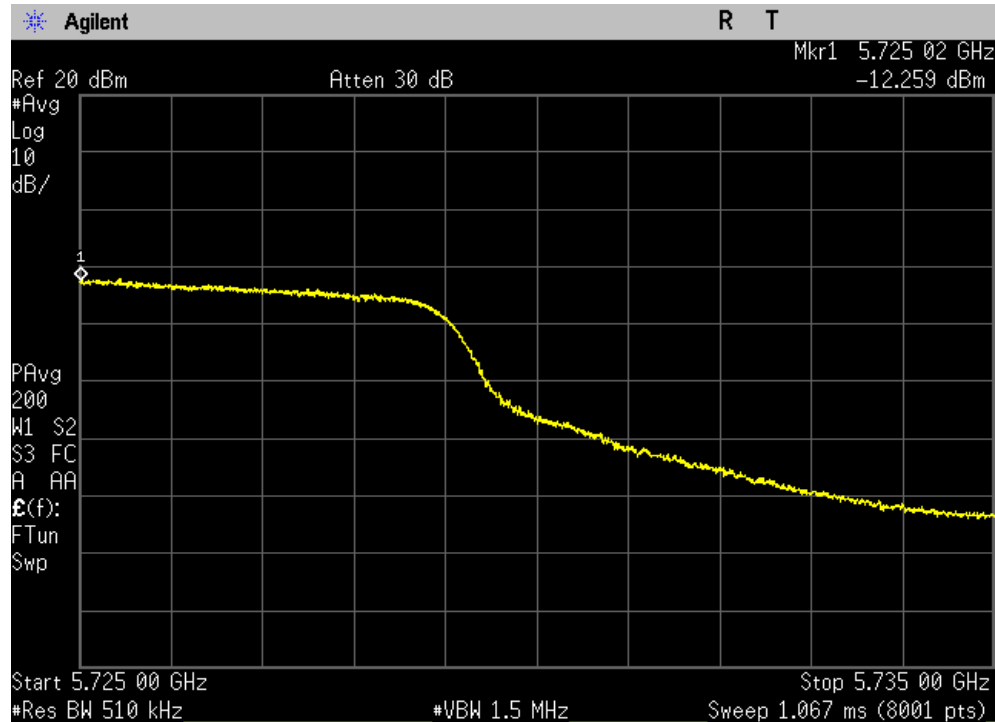


PLOTS OF EMISSIONS

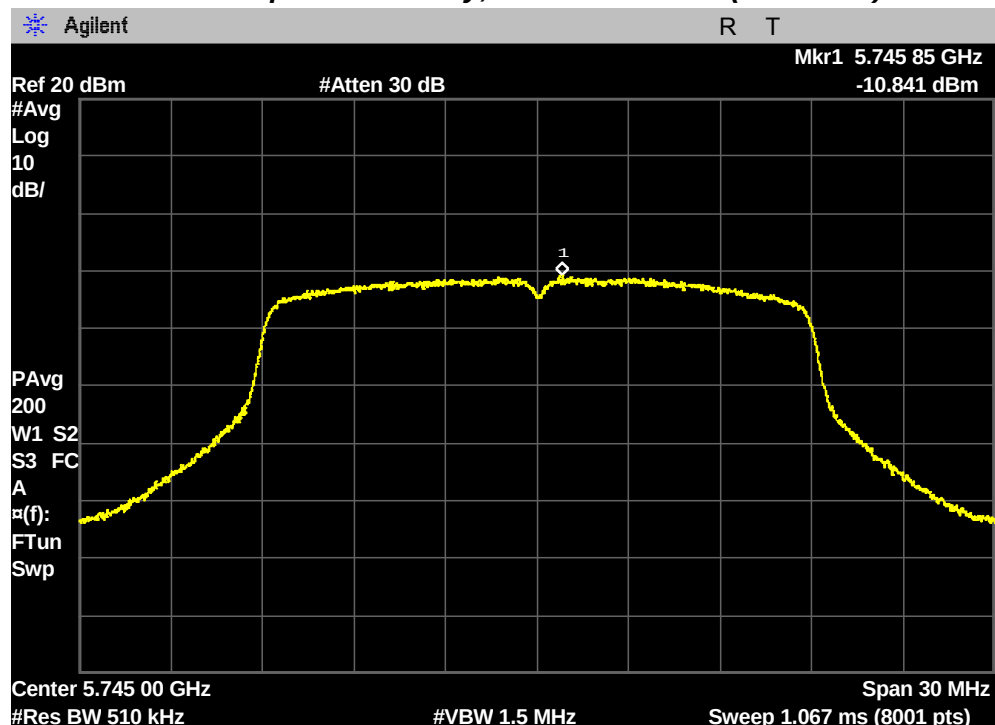
802.11n (20 MHz) mode

Chain 0

Maximum Power Spectral Density, Straddle Channel (5720 MHz)

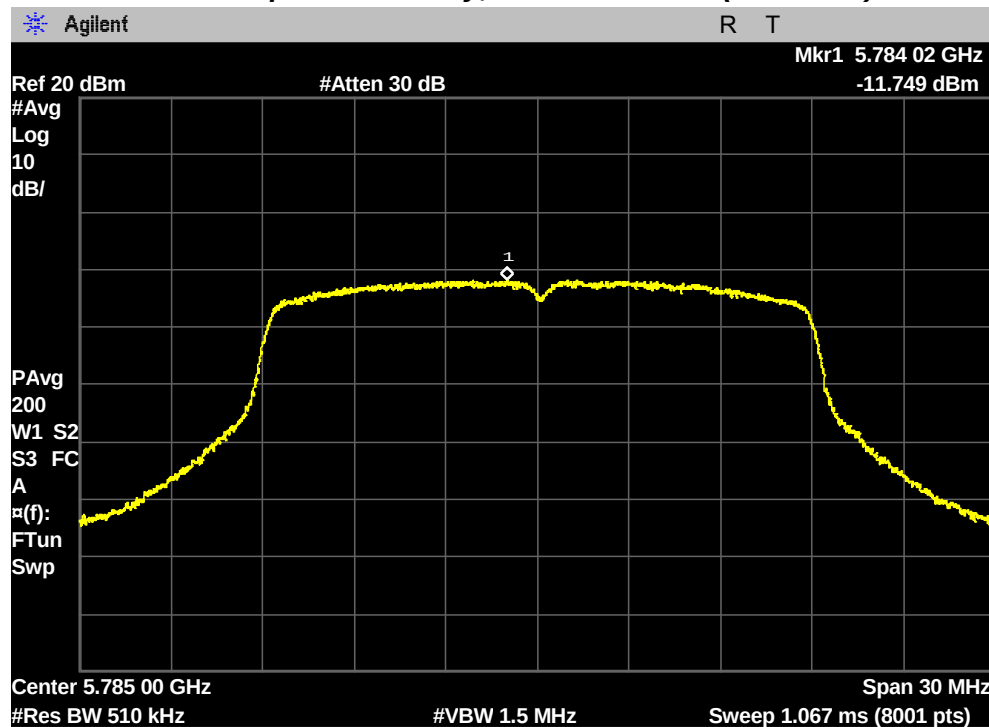


Maximum Power Spectral Density, Lowest Channel (5745 MHz)

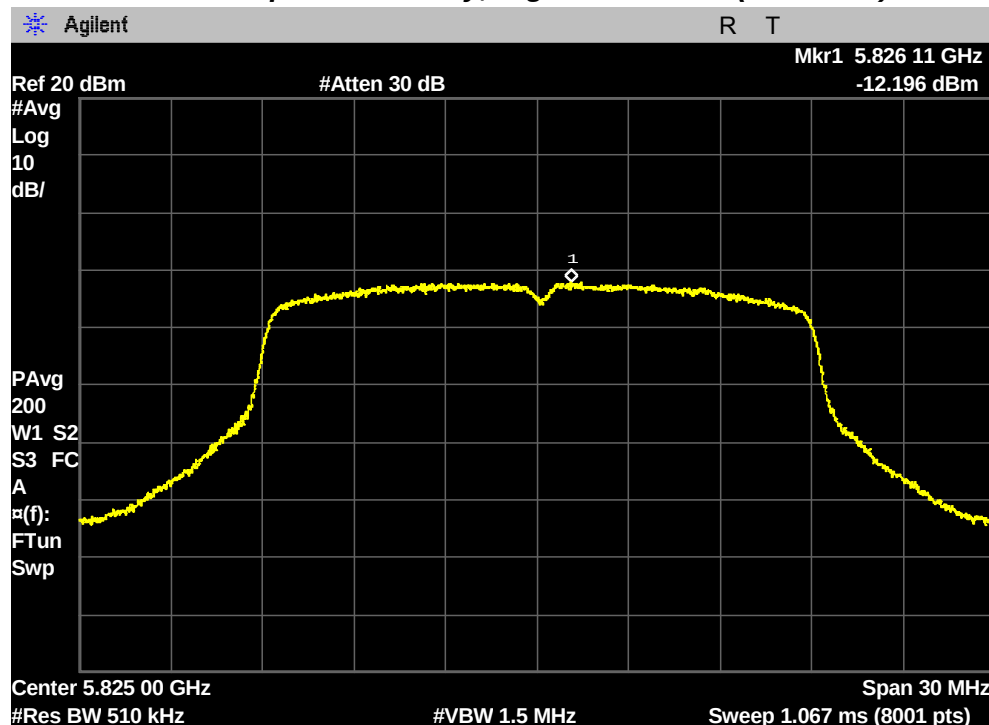


PLOTS OF EMISSIONS

Maximum Power Spectral Density, Middle Channel (5785 MHz)



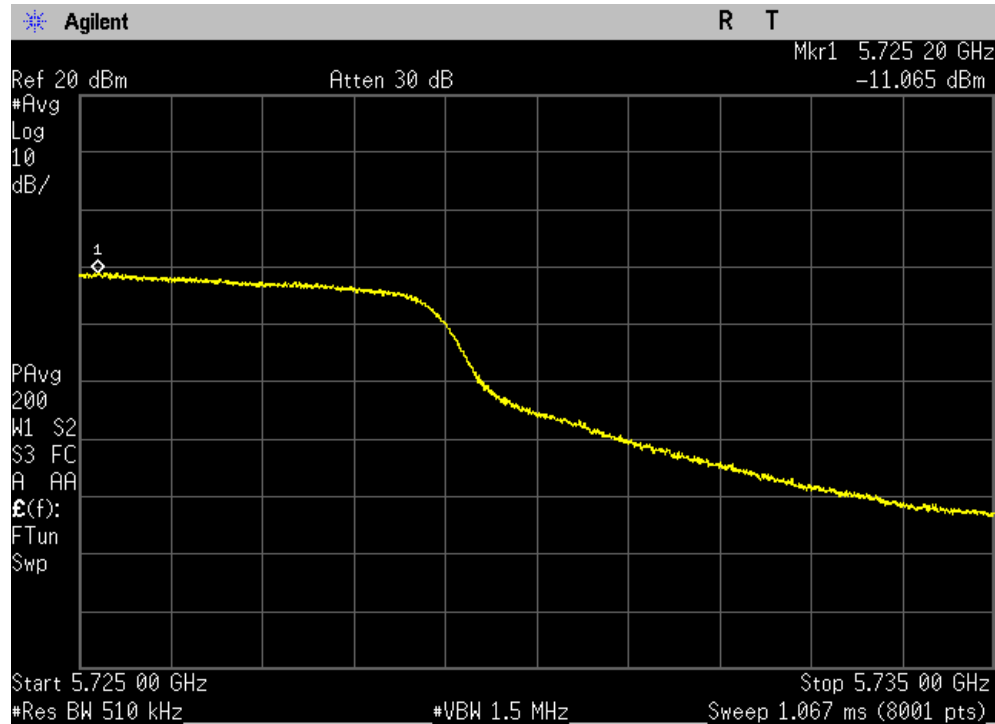
Maximum Power Spectral Density, Highest Channel (5825 MHz)



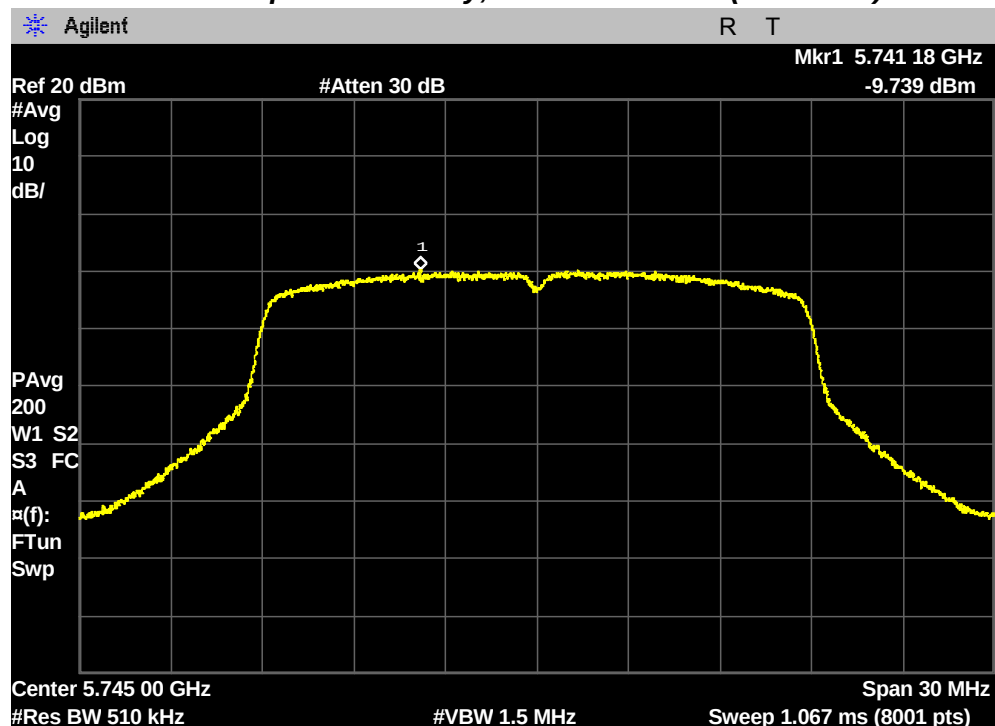
PLOTS OF EMISSIONS

Chain 1

Maximum Power Spectral Density, Straddle Channel (5720 MHz)

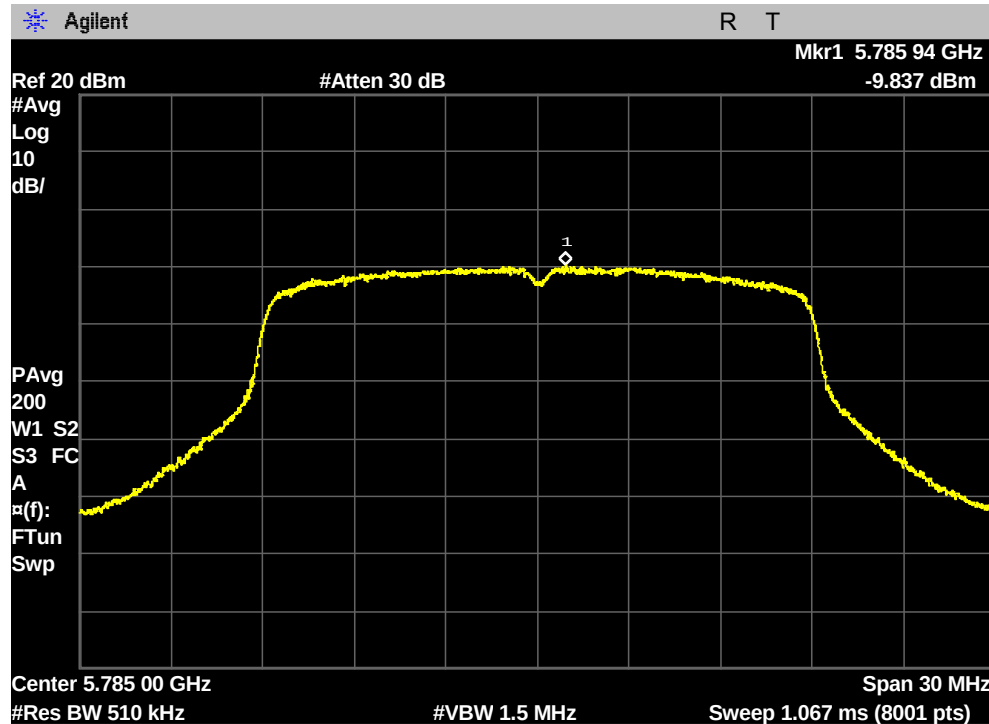


Maximum Power Spectral Density, Lowest Channel (5745 MHz)

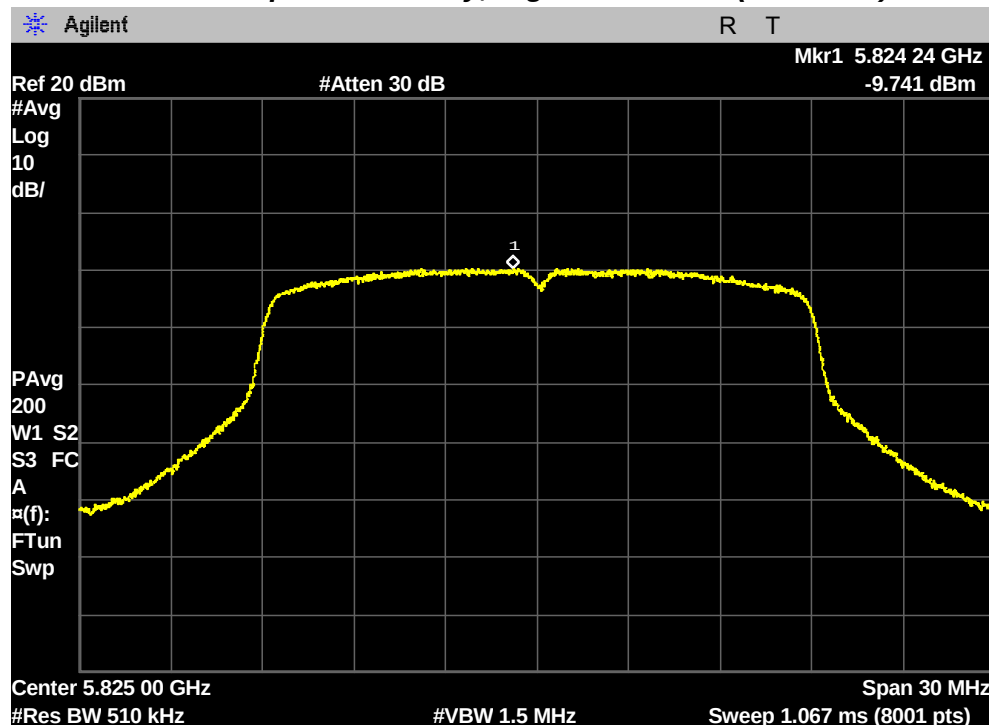


PLOTS OF EMISSIONS

Maximum Power Spectral Density, Middle Channel (5785 MHz)



Maximum Power Spectral Density, Highest Channel (5825 MHz)

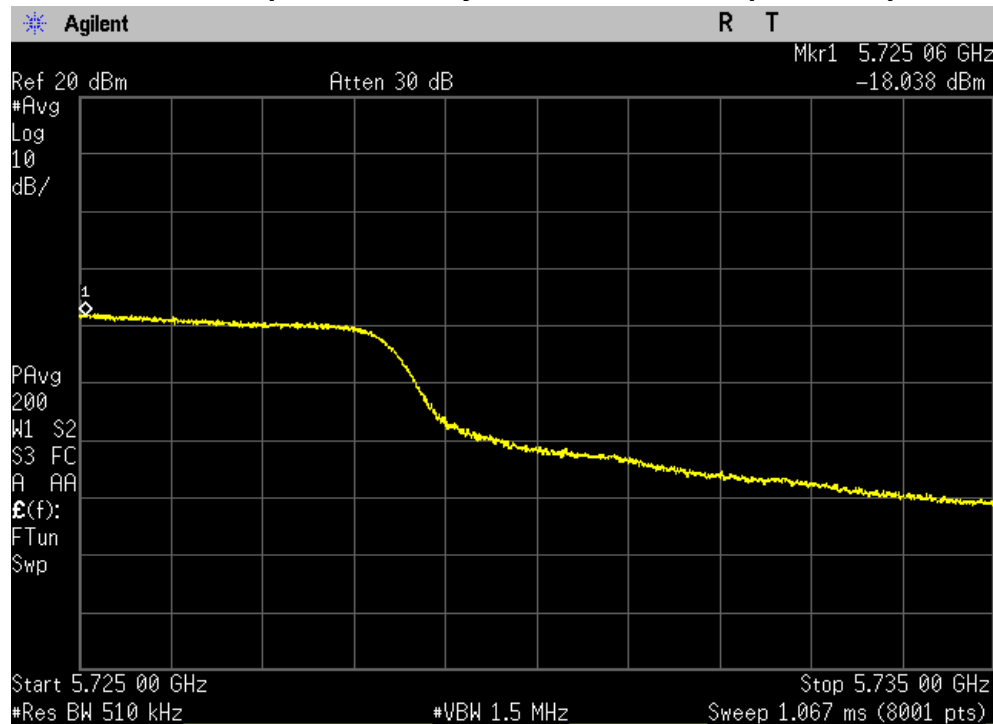


PLOTS OF EMISSIONS

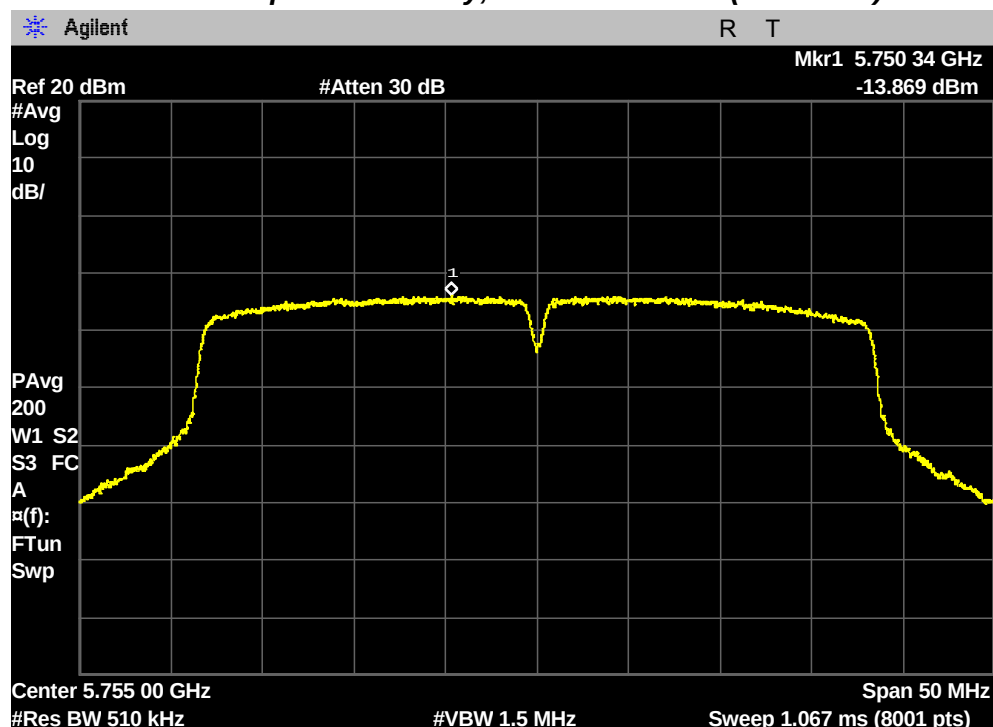
802.11n (40 MHz) mode

Chain 0

Maximum Power Spectral Density, Straddle Channel (5710 MHz)

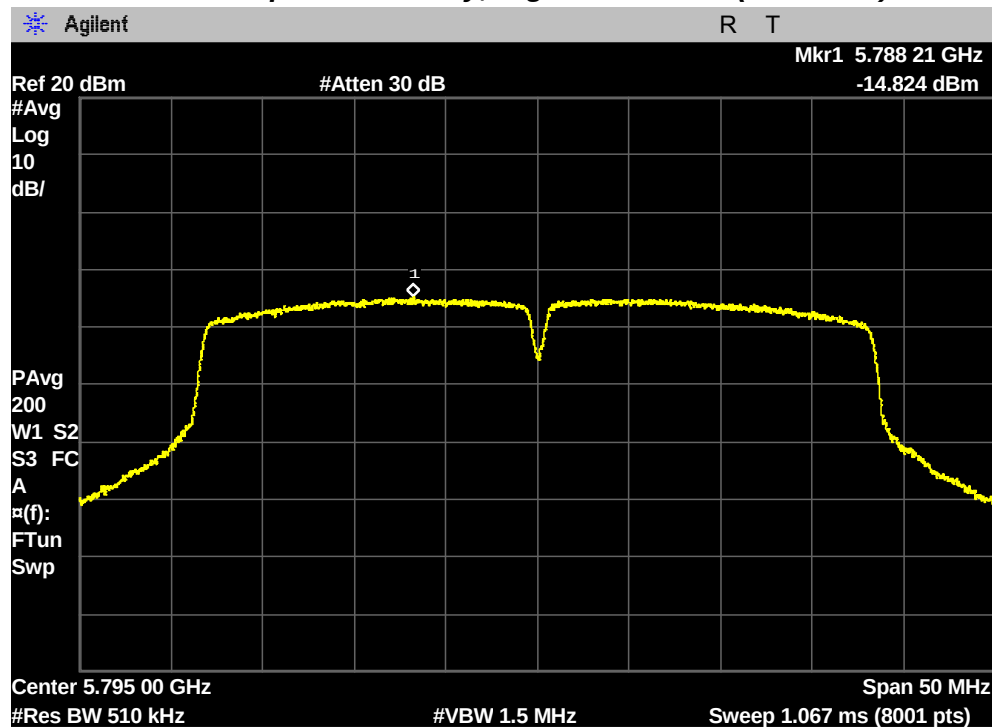


Maximum Power Spectral Density, Lowest Channel (5755 MHz)



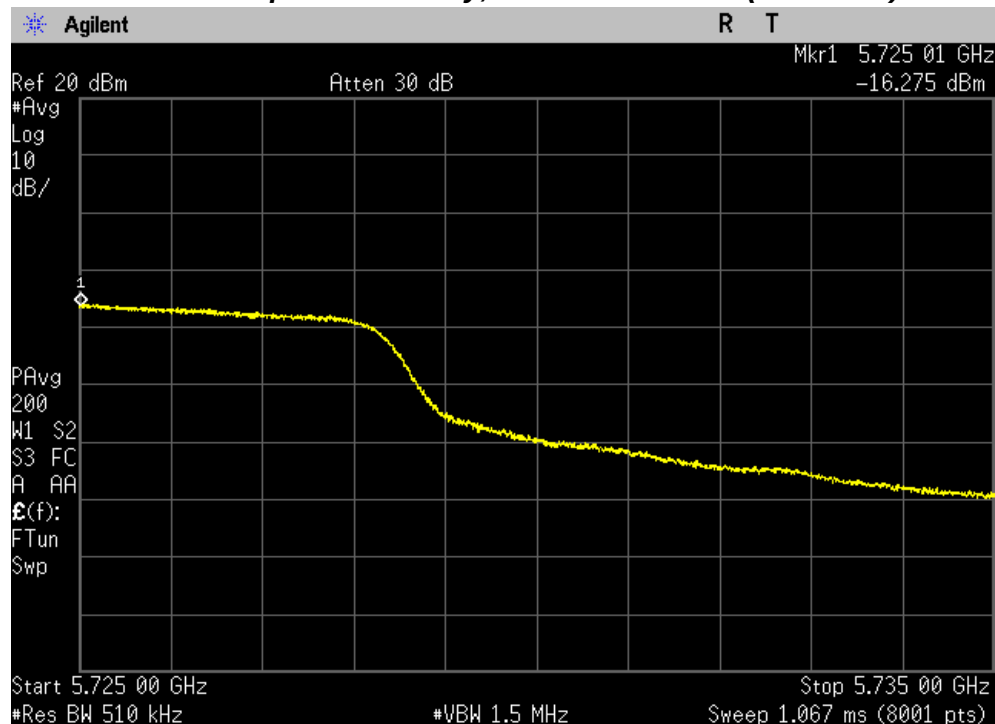
PLOTS OF EMISSIONS

Maximum Power Spectral Density, Highest Channel (5795 MHz)



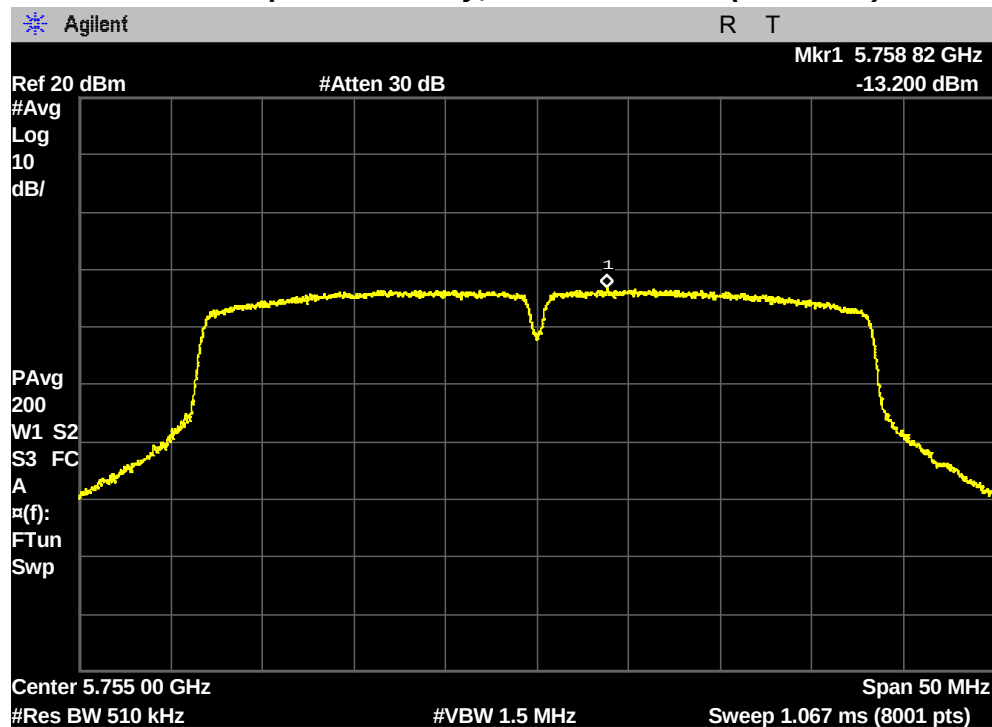
Chain 1

Maximum Power Spectral Density, Straddle Channel (5710 MHz)

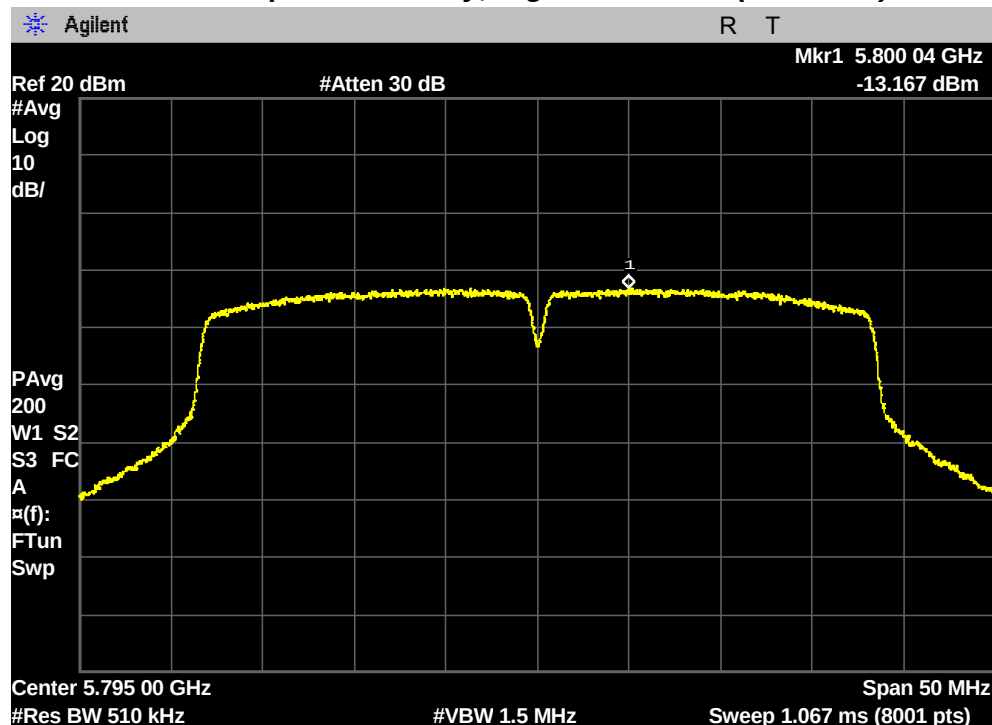


PLOTS OF EMISSIONS

Maximum Power Spectral Density, Lowest Channel (5755 MHz)



Maximum Power Spectral Density, Highest Channel (5795 MHz)

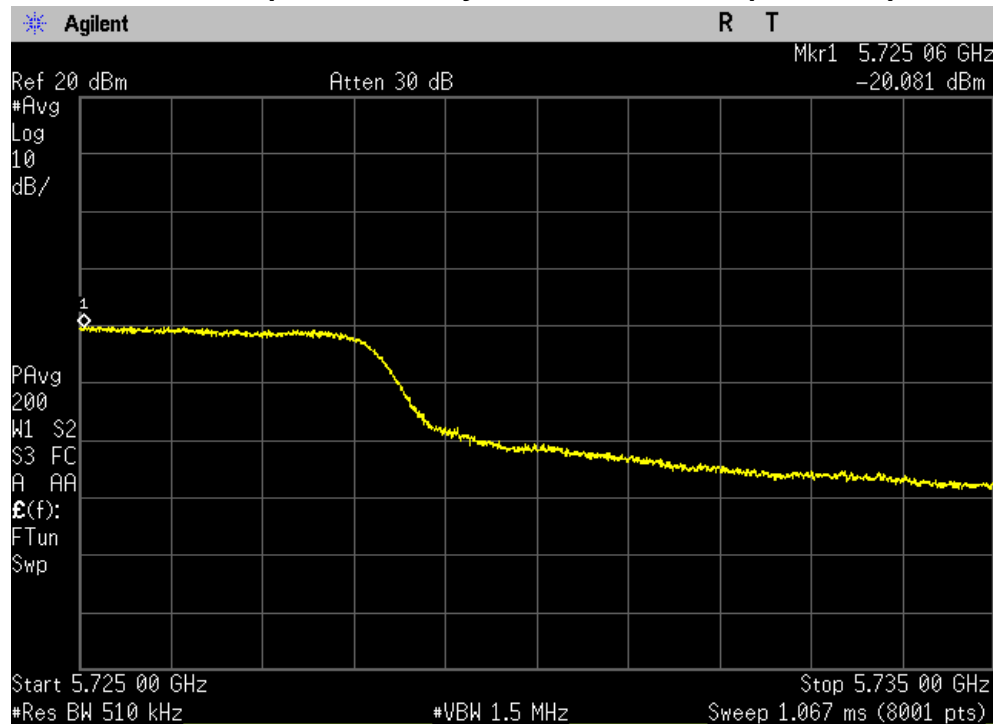


PLOTS OF EMISSIONS

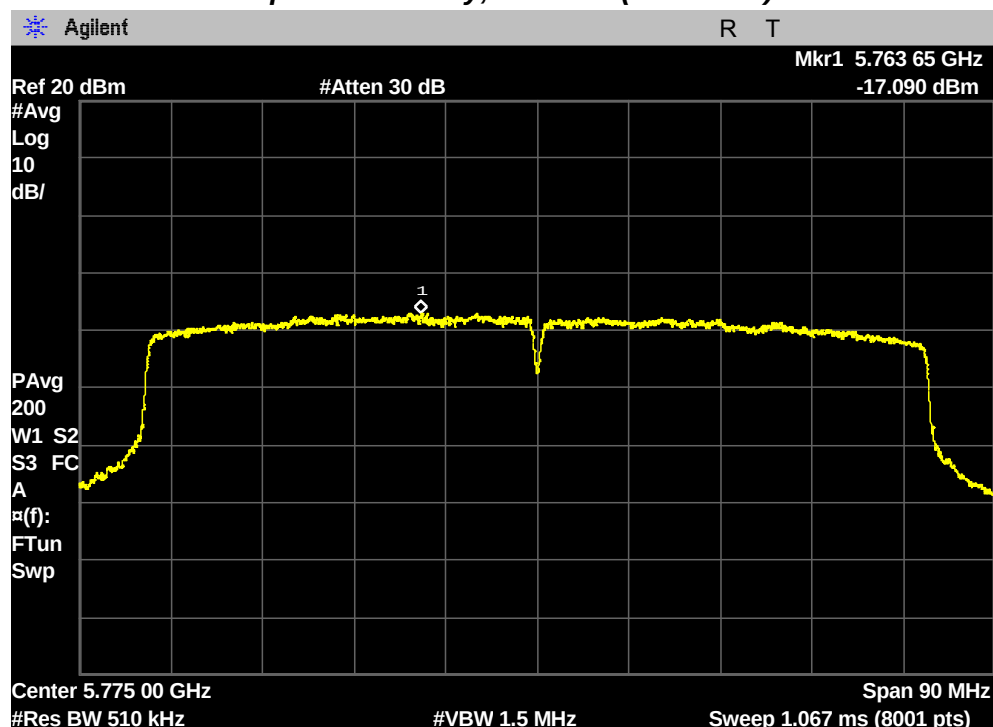
802.11ac (80 MHz) mode

Chain 0

Maximum Power Spectral Density, Straddle Channel (5690 MHz)



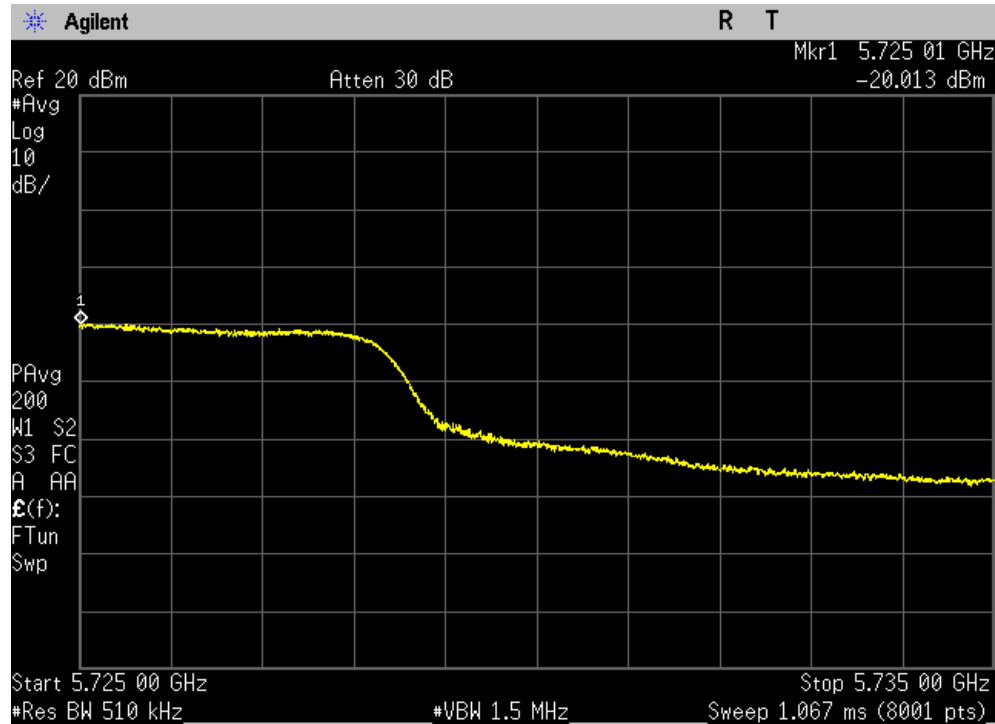
Maximum Power Spectral Density, Channel (5775 MHz)



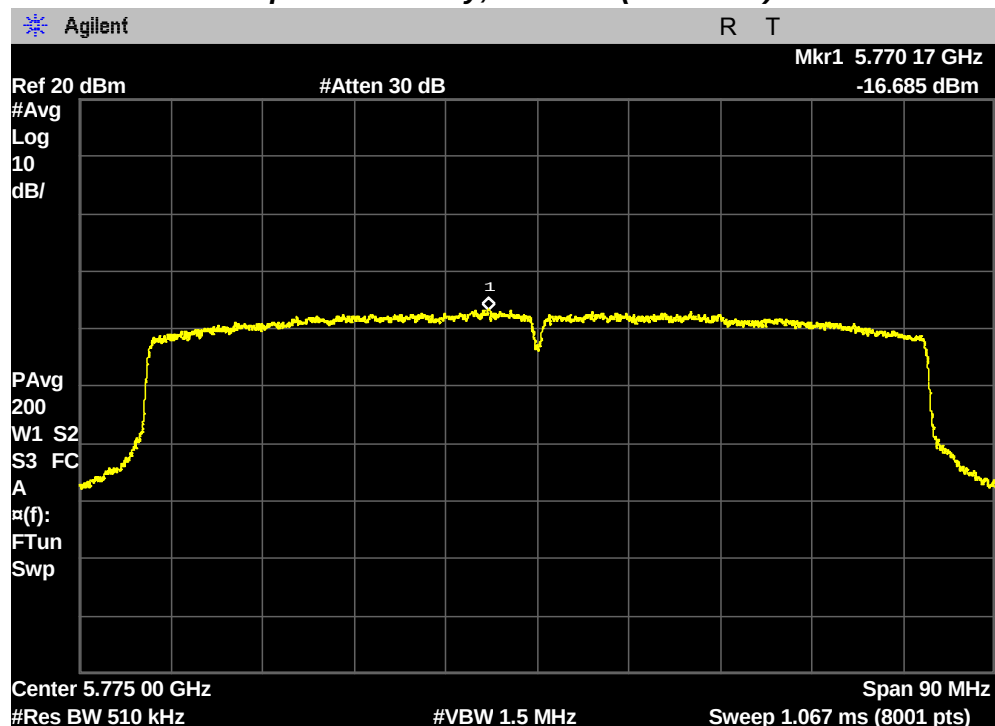
PLOTS OF EMISSIONS

Chain 1

Maximum Power Spectral Density, Straddle Channel (5690 MHz)



Maximum Power Spectral Density, Channel (5775 MHz)



TEST DATA

8.7 Radiated Spurious Emissions

8.7.1 Radiated Spurious Emissions – U-NII-1 band

FCC §15.407(b), RSS-247 Issue 2 6.2

Test Mode : Set to Lowest channel, Middle channel and Highest channel

802.11a mode

Lowest Channel (5180 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4985.00	50.2	V	peak	-0.4	49.8	68.2	18.4

Middle Channel (5220 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4996.00	50.9	V	peak	-0.3	50.6	68.2	17.6

Highest Channel (5240 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1516.00	61.9	V	peak	-11.8	50.1	68.2	18.1
4990.50	49.4	V	peak	-0.3	49.1	68.2	19.1

TEST DATA

802.11n (20 MHz) mode

Lowest Channel (5180 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4992.00	51.8	V	peak	-0.3	51.5	68.2	16.7

Middle Channel (5220 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1513.00	61.5	V	peak	-11.9	49.6	68.2	18.6
4984.50	50.0	V	peak	-0.4	49.6	68.2	18.6

Highest Channel (5240 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1555.00	63.3	V	peak	-11.8	51.5	68.2	16.7
4993.00	49.5	V	peak	-0.3	49.2	68.2	19.0

802.11n (40 MHz) mode

Lowest Channel (5190 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1497.50	61.5	H	peak	-11.9	49.6	68.2	18.6
5083.00	52.4	V	peak	-0.1	52.3	68.2	15.9

TEST DATA

Highest Channel (5230 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1501.00	61.2	V	peak	-11.9	49.3	68.2	18.9
5126.50	35.0	V	peak	-0.2	53.1	68.2	15.1

802.11ac (80 MHz) mode

Channel (5210 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1526.50	62.1	V	peak	-11.8	50.3	68.2	17.9
4984.50	49.8	V	peak	-0.4	49.4	68.2	18.8

Note:

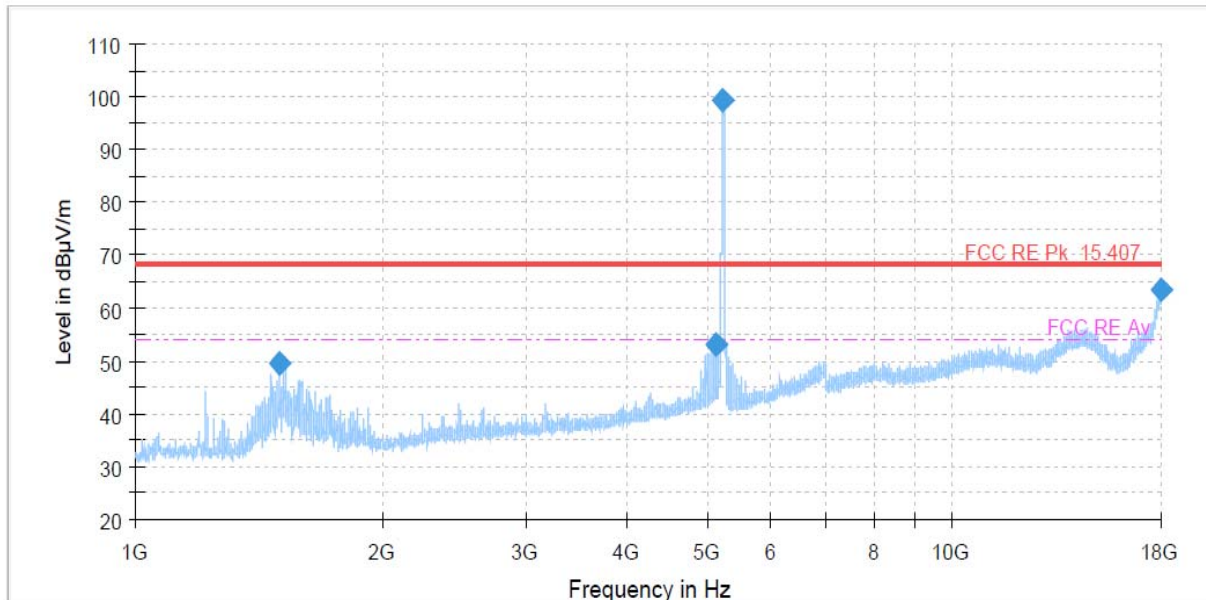
- *Pol. H = Horizontal V = Vertical
- **AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.
- At frequencies above 1 GHz, peak emissions were measured using RBW = 1 MHz, VBW = 3 MHz, Detector = Peak.
- As the EUT was configured to transmit with duty cycles < 98 percent, at frequencies above 1 GHz, average emission levels were measured using the "Method VB" by setting the analyzer RBW = 1 MHz, VBW = 3 kHz (VBW ≥ 1/T), Detector = Peak.
- The spectrum is measured from 9 kHz to 10th harmonic and the worst-case emissions are reported.
No significant emissions were found beyond the Second harmonic for this device.
- ***For outside of the restricted band, the peak limit is applied according to Part 15.407(b) and RSS-247 Issue2 6.2.
Peak limit is 68.2 dBμV/m. ($E[dBμV/m] = EIRP[dBm/MHz] + 95.2 = 68.2 \text{ dBμV/m}$, for $EIPR[dBm/MHz] = -27\text{dBm}$.)
- For restricted band, the peak limit is 68.2 dBμV/m, the average limit is 54 dBμV/m per FCC §15.209 and RSS-Gen Issue5 8.9.
- Highest channel(5230MHz) in n (40MHz) mode was the worst channel with respect to spurious emission.
- The radiated emissions testing were made by rotating EUT through three orthogonal axes and rotating the receive antenna with horizontal, Vertical polarization. The worst data was recorded.
- At frequencies above 1 GHz, EUT was placed at a height of 1.5m above the floor on a support according to ANSI 63.10-2013.

PLOTS OF EMISSIONS

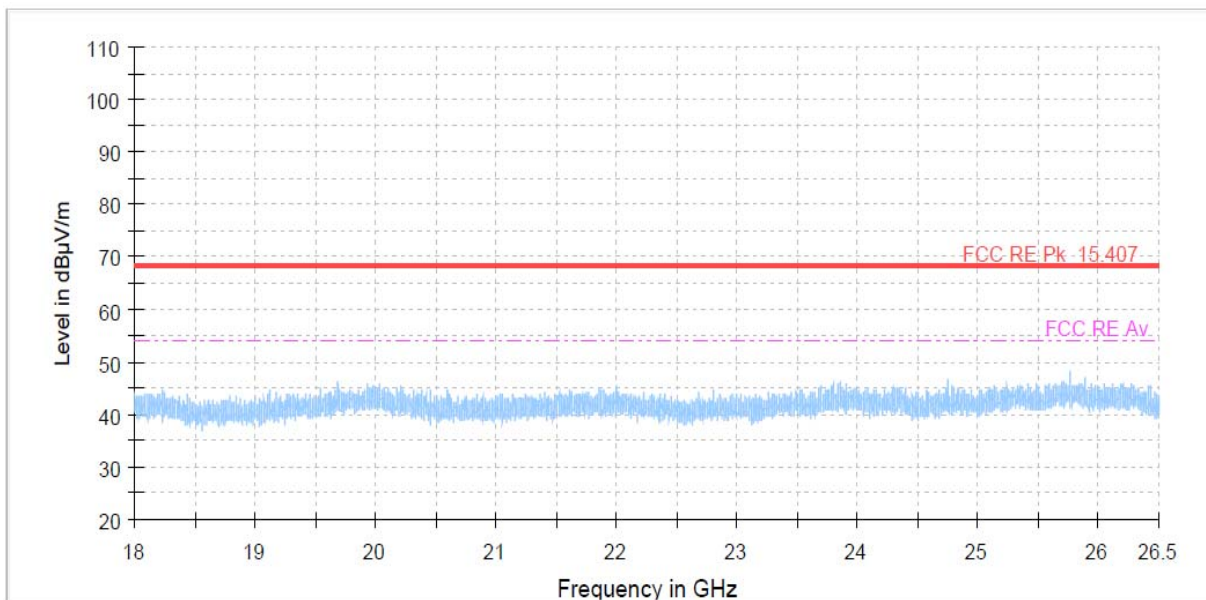
Worst Case

802.11n (40MHz) mode

Highest channel : 1 GHz to 18 GHz_Peak

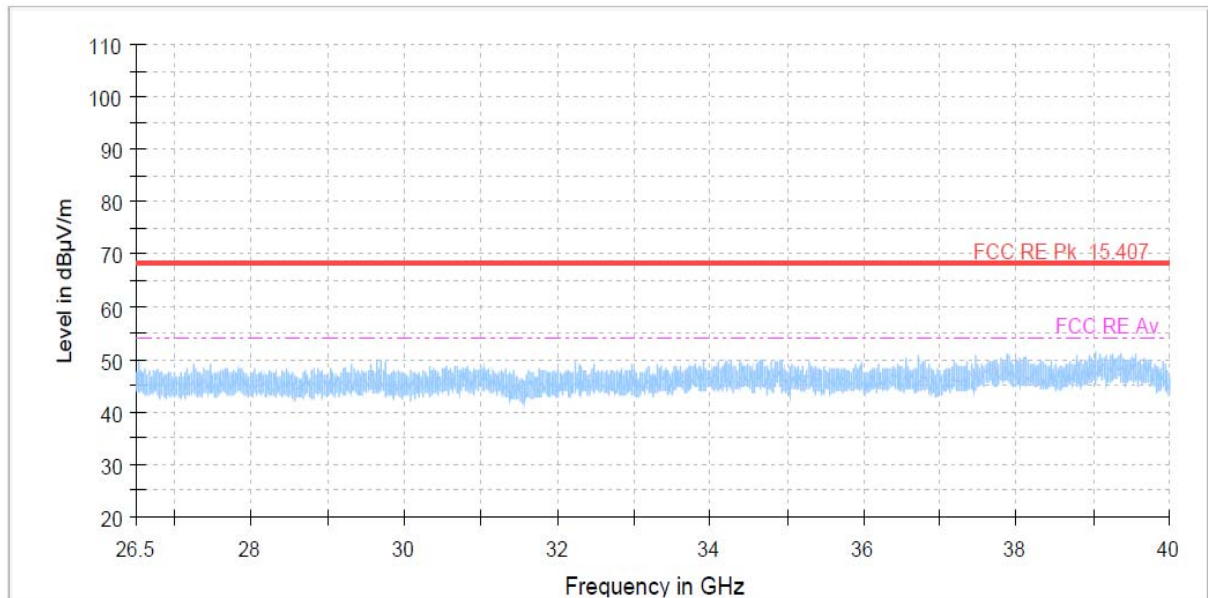


Highest channel : 18 GHz to 26.5 GHz_Peak



PLOTS OF EMISSIONS

Highest channel : 26.5 GHz to 40 GHz_Peak



TEST DATA

8.7.2 Radiated Spurious Emissions – U-NII-2A band

FCC §15.407(b) , RSS-247 Issue 2 6.2

Test Mode : Set to Lowest channel, Middle channel and Highest channel

802.11a mode

Lowest Channel (5260 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4987.50	50.4	V	peak	-0.4	50.0	68.2	18.2

Middle Channel (5300 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1551.50	61.6	V	peak	-11.8	49.8	68.2	18.4
4997.00	50.4	V	peak	-0.3	50.1	68.2	18.1

Highest Channel (5320 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1518.00	62.6	V	peak	-11.8	50.8	68.2	17.4
4990.50	51.5	V	peak	-0.3	51.2	68.2	17.0

TEST DATA

802.11n (20 MHz) mode

Lowest Channel (5260 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4993.00	50.0	V	peak	-0.3	49.7	68.2	18.5

Middle Channel (5300 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1244.50***	63.9	H	peak	-11.8	52.1	68.2	16.1
4995.00	50.3	V	peak	-0.3	50.0	68.2	18.2

Highest Channel (5320 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1548.00	62.0	V	peak	-11.8	50.2	68.2	18.0
4986.50	51.3	V	peak	-0.4	50.9	68.2	17.3

802.11n (40 MHz) mode

Lowest Channel (5270 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5499.50	52.4	H	peak	0.2	52.6	68.2	15.6

TEST DATA

Highest Channel (5310 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5381.00	52.6	V	peak	0.1	52.7	68.2	15.5

802.11ac (80 MHz) mode

Channel (5290 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1515.00	63.1	V	peak	-11.9	51.2	68.2	17.0

Note:

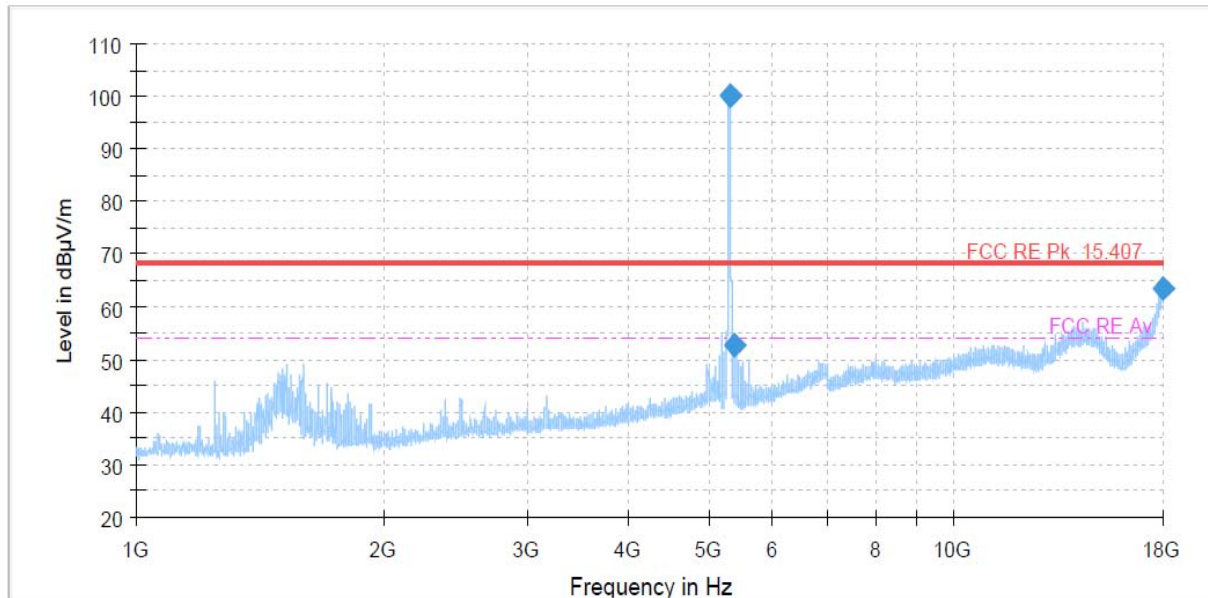
- *Pol. H = Horizontal V = Vertical
- **AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.
- At frequencies above 1 GHz, peak emissions were measured using RBW = 1 MHz, VBW = 3 MHz, Detector = Peak.
- As the EUT was configured to transmit with duty cycles < 98 percent, at frequencies above 1 GHz, average emission levels were measured using the "Method VB" by setting the analyzer RBW = 1 MHz, VBW = 3 kHz (VBW ≥ 1/T), Detector = Peak.
- The spectrum is measured from 9 kHz to 10th harmonic and the worst-case emissions are reported. No significant emissions were found beyond the Second harmonic for this device.
- ***For outside of the restricted band, the peak limit is applied according to Part 15.407(b) and RSS-247 Issue2 6.2.
Peak limit is 68.2 dBμV/m. ($E[dBμV/m] = EIRP[dBm/MHz] + 95.2 = 68.2 \text{ dBμV/m}$, for $EIPR[dBm/MHz] = -27dBm$.)
- For restricted band, the peak limit is 68.2 dBμV/m, the average limit is 54 dBμV/m per FCC §15.209 and RSS-Gen Issue5 8.9.
- Highest channel(5310MHz) in n (40MHz) mode was the worst channel with respect to spurious emission.
- The radiated emissions testing were made by rotating EUT through three orthogonal axes and rotating the receive antenna with horizontal, Vertical polarization. The worst data was recorded.
- At frequencies above 1 GHz, EUT was placed at a height of 1.5m above the floor on a support according to ANSI 63.10-2013.

PLOTS OF EMISSIONS

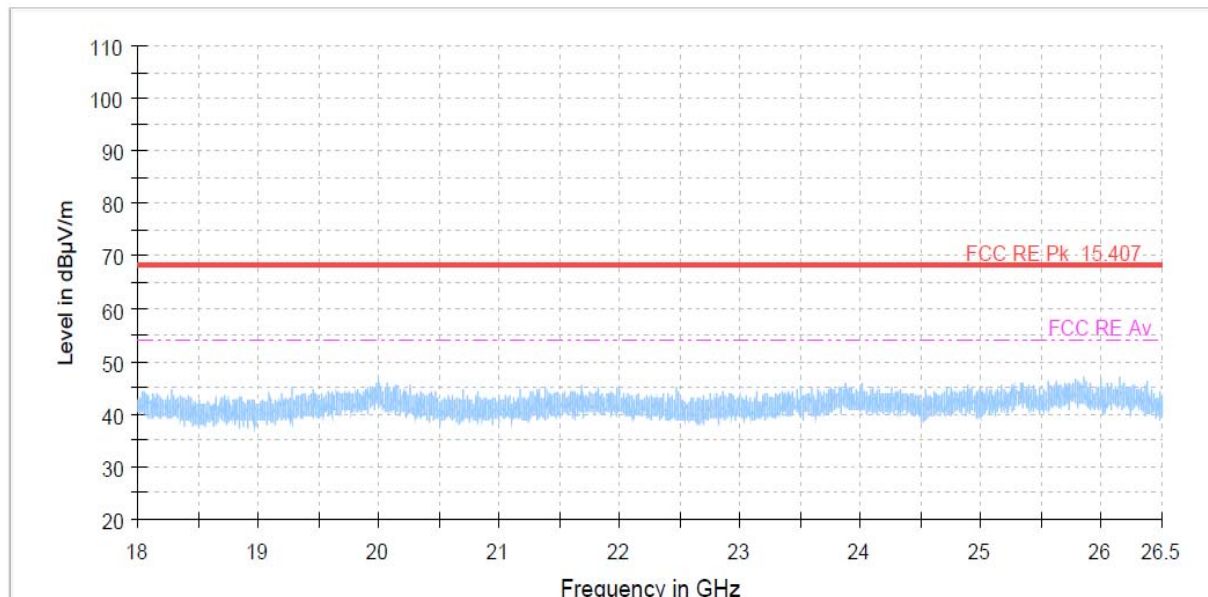
Worst Case

802.11n (40MHz) mode

Highest channel : 1 GHz to 18 GHz_Peak

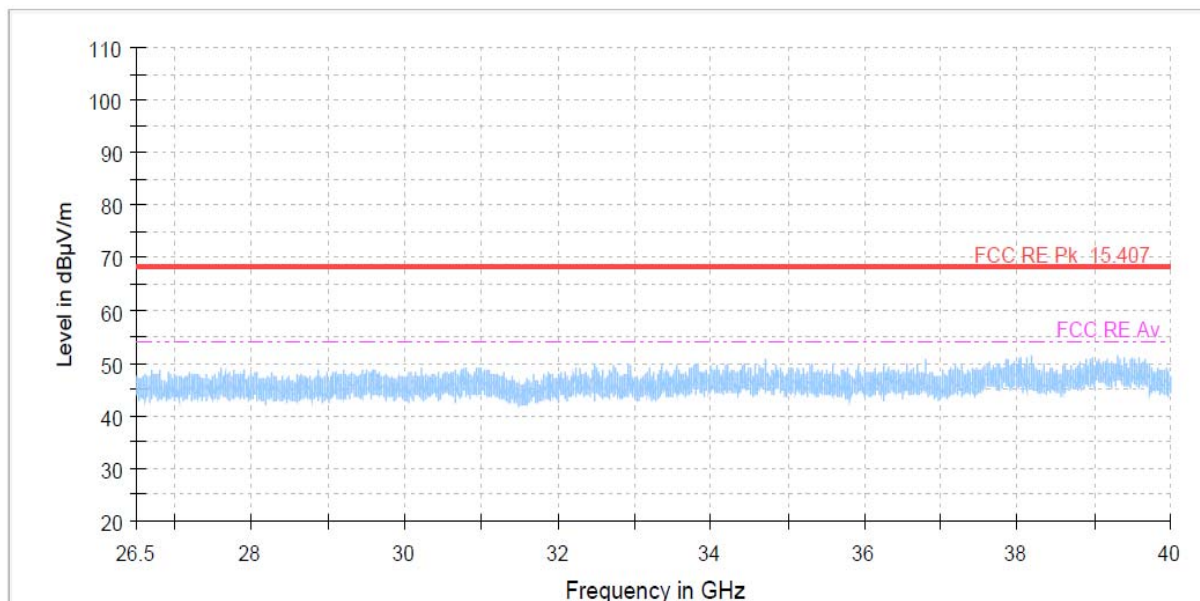


Highest channel : 18 GHz to 26.5 GHz_Peak



PLOTS OF EMISSIONS

Highest channel : 26.5 GHz to 40 GHz_Peak



TEST DATA

8.7.3 Radiated Spurious Emissions – U-NII-2C band

FCC §15.407(b) , RSS-247 Issue 2 6.2

Test Mode : Set to Lowest channel, Middle channel and Highest channel, Straddle channel

802.11a mode

Lowest Channel (5500 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1498.50	61.8	H	peak	-11.9	49.9	68.2	18.3

Middle Channel (5580 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4983.00	49.0	V	peak	-0.4	48.6	68.2	19.6

Highest Channel (5700 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1494.00	63.4	V	peak	-11.9	51.5	68.2	16.7

Straddle Channel (5720 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1701.00	62.0	V	peak	-11.4	50.6	68.2	17.6

TEST DATA

802.11n (20 MHz) mode

Lowest Channel (5500 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4996.50	49.8	V	peak	-0.3	49.5	68.2	18.7

Middle Channel (5580 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4981.50	49.4	V	peak	-0.4	49.0	68.2	19.2

Highest Channel (5700 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4992.00	50.1	V	peak	-0.3	49.8	68.2	18.4

Straddle Channel (5720 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1564.50	62.4	V	peak	-11.7	50.7	68.2	17.5
4984.50	51.2	V	peak	-0.4	50.8	68.2	17.4

802.11n (40 MHz) mode

Lowest Channel (5510 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1548.00	63.4	V	peak	-11.8	51.6	68.2	16.6
5399.00	53.2	H	peak	0.2	53.4	68.2	14.8

TEST DATA

Middle Channel (5590 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5451.00	51.2	V	peak	0.2	51.4	68.2	16.8

Highest Channel (5670 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4994.50	50.0	V	peak	-0.3	49.7	68.2	18.5

Straddle Channel (5710 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4983.00	50.4	V	peak	-0.4	50.0	68.2	18.2

802.11ac (80 MHz) mode

Lowest Channel (5530 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1545.50	61.9	V	peak	-11.8	50.1	68.2	18.1
4992.00	50.9	V	peak	-0.3	50.6	68.2	17.6

Highest Channel (5610 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1500.00	62.2	V	peak	-11.9	50.3	68.2	17.9

TEST DATA

Straddle Channel (5690 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4996.50	51.5	V	peak	-0.3	51.2	68.2	17.0

Note:

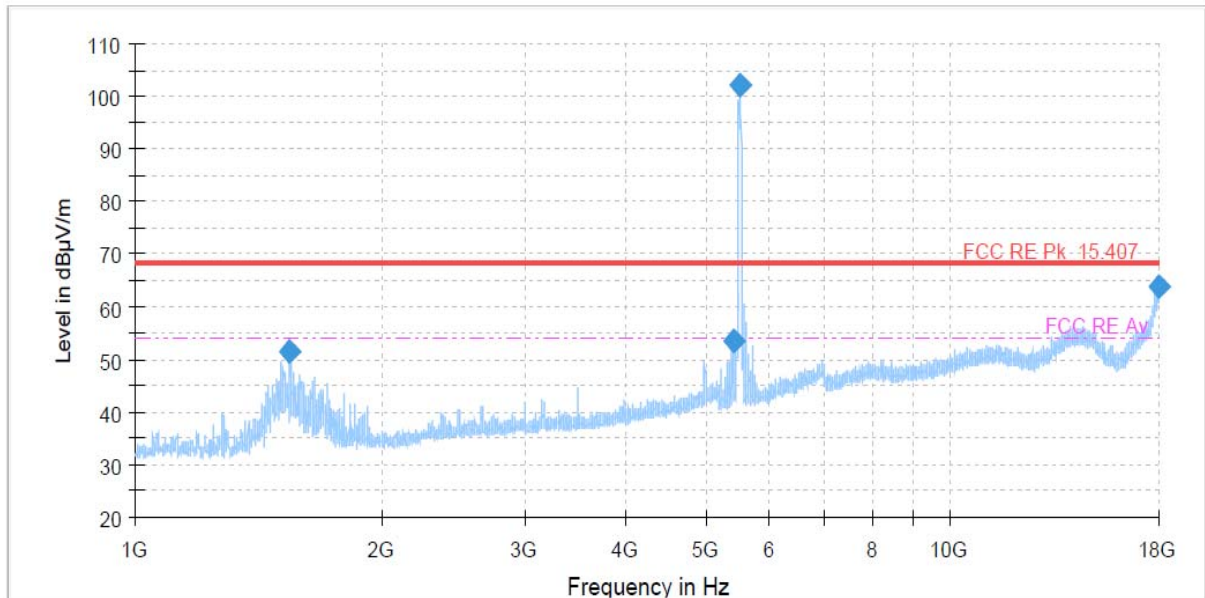
- *Pol. H = Horizontal V = Vertical
- **AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.
- At frequencies above 1 GHz, peak emissions were measured using RBW = 1 MHz, VBW = 3 MHz, Detector = Peak.
- As the EUT was configured to transmit with duty cycles < 98 percent, at frequencies above 1 GHz, average emission levels were measured using the "Method VB" by setting the analyzer RBW = 1 MHz, VBW = 3 kHz (VBW ≥ 1/T), Detector = Peak.
- The spectrum is measured from 9 kHz to 10th harmonic and the worst-case emissions are reported.
No significant emissions were found beyond the Second harmonic for this device.
- ***For outside of the restricted band, the peak limit is applied according to Part 15.407(b) and RSS-247 Issue2 6.2.
Peak limit is 68.2 dBμV/m. ($E[\text{dB}\mu\text{V}/\text{m}] = \text{EIRP}[\text{dBm}/\text{MHz}] + 95.2 = 68.2 \text{ dB}\mu\text{V}/\text{m}$, for $\text{EIPR}[\text{dBm}/\text{MHz}] = -27\text{dBm}$.)
- For restricted band, the peak limit is 68.2 dBμV/m, the average limit is 54 dBμV/m per FCC §15.209 and RSS-Gen Issue5 8.9.
- Lowest channel(5510MHz) in n (40MHz) mode was the worst channel with respect to spurious emission.
- The radiated emissions testing were made by rotating EUT through three orthogonal axes and rotating the receive antenna with horizontal, Vertical polarization. The worst data was recorded.
- At frequencies above 1 GHz, EUT was placed at a height of 1.5m above the floor on a support according to ANSI 63.10-2013.

PLOTS OF EMISSIONS

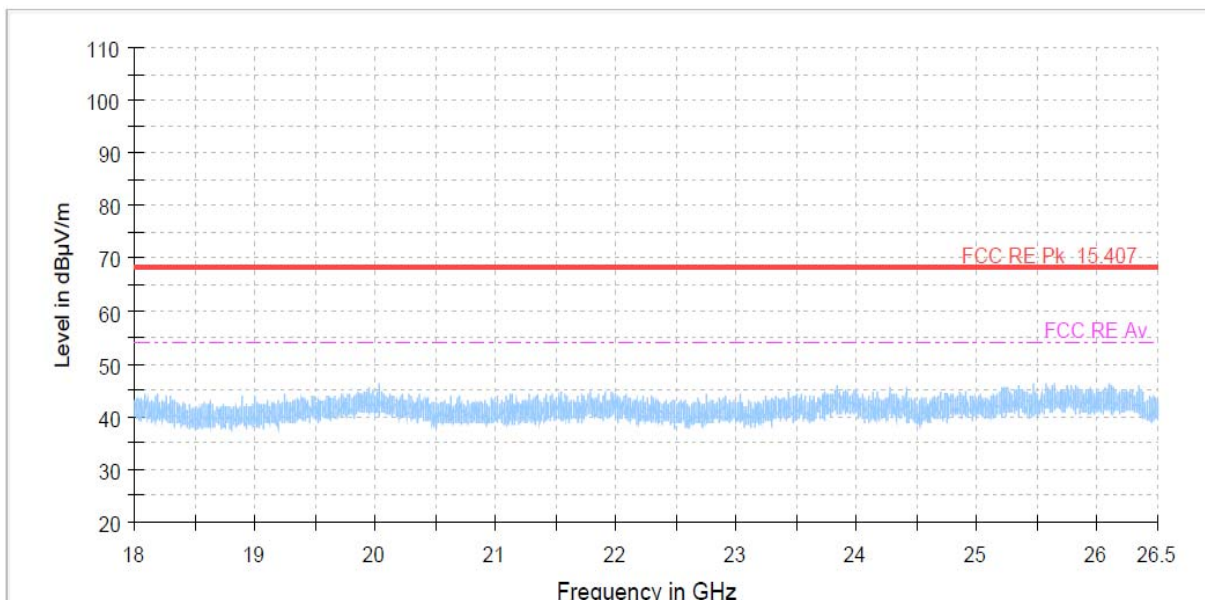
Worst Case

802.11n (40MHz) mode

Lowest channel : 1 GHz to 18 GHz_Peak

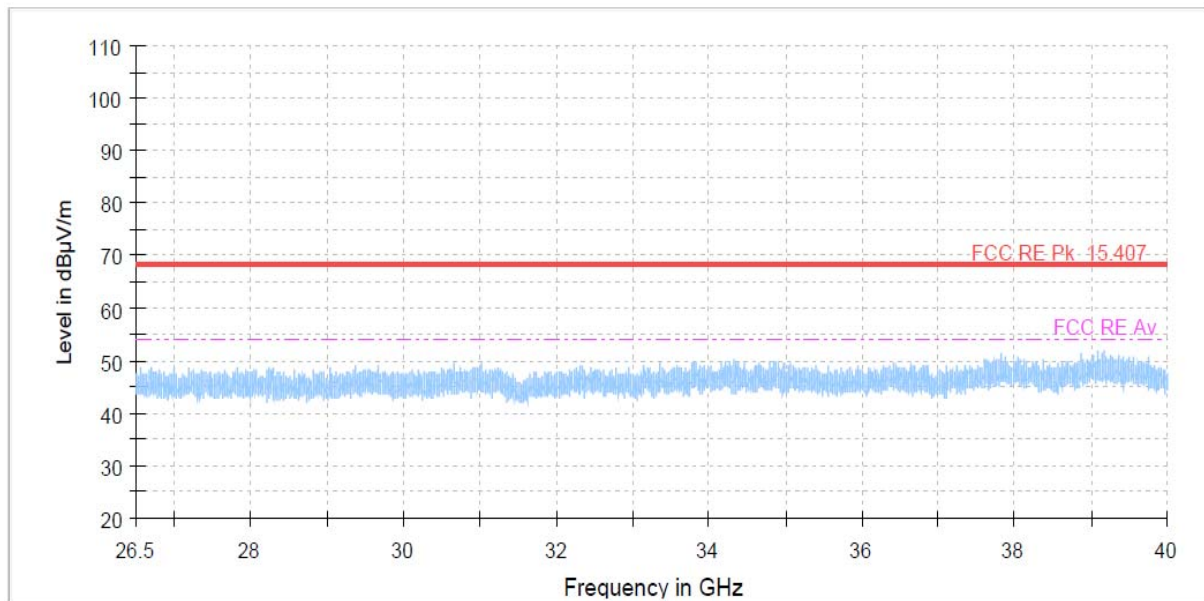


Lowest channel : 18 GHz to 26.5 GHz_Peak



PLOTS OF EMISSIONS

Lowest channel : 26.5 GHz to 40 GHz_Peak



TEST DATA

8.7.4 Radiated Spurious Emissions – U-NII-3 band

FCC §15.407(b) , RSS-247 Issue 2 6.2

Test Mode : Set to Lowest channel, Middle channel and Highest channel

802.11a mode

Lowest Channel (5745 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1518.00	62.1	V	peak	-11.8	50.3	68.2	17.9
4987.00	50.4	V	peak	-0.4	50.0	68.2	18.2

Middle Channel (5785 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1556.00	61.5	V	peak	-11.8	49.7	68.2	18.5
4993.00	50.1	V	peak	-0.3	49.8	68.2	18.4

Highest Channel (5825 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4988.00	49.5	V	peak	-0.4	49.1	68.2	19.1

TEST DATA

802.11n (20 MHz) mode

Lowest Channel (5745 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1495.50	62.6	V	peak	-11.9	50.7	68.2	17.5

Middle Channel (5785 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1551.00	61.8	V	peak	-11.8	50.0	68.2	18.2

Highest Channel (5825 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4993.00	50.5	V	peak	-0.3	50.2	68.2	18.0

802.11n (40 MHz) mode

Lowest Channel (5755 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4993.50	49.1	V	peak	-0.3	48.8	68.2	19.4

Highest Channel (5795 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4995.00	49.6	V	peak	-0.3	49.3	68.2	18.9

TEST DATA

802.11ac (80 MHz) mode

Channel (5775 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4991.50	49.7	V	peak	-0.3	49.4	68.2	18.8

Note:

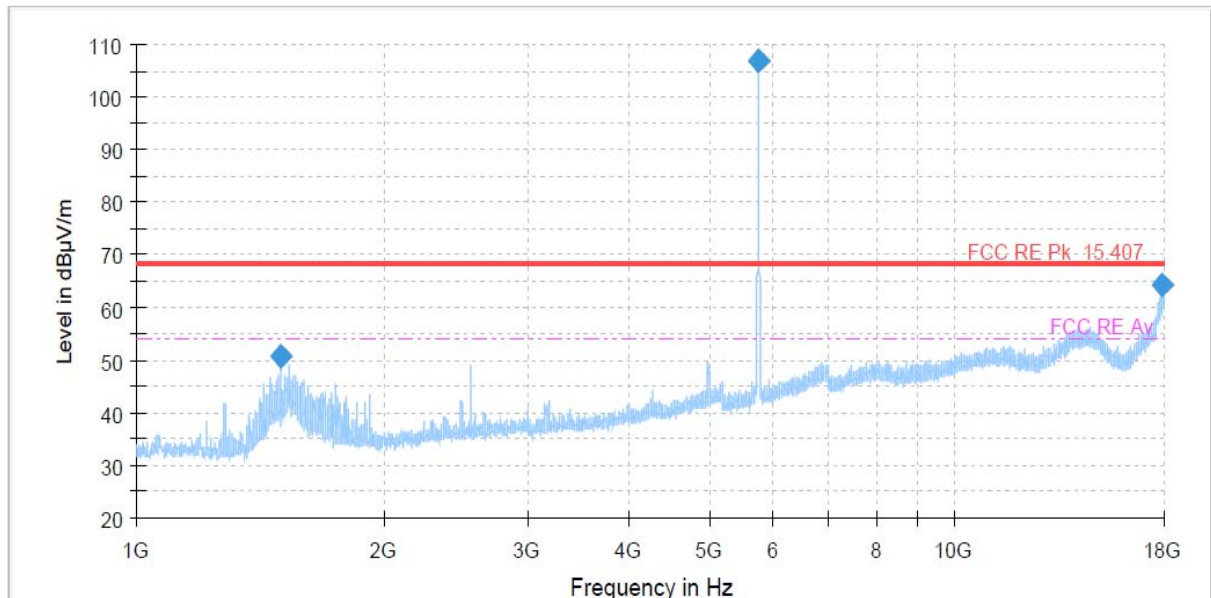
- *Pol. H = Horizontal V = Vertical
- **AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.
- At frequencies above 1 GHz, peak emissions were measured using RBW = 1 MHz, VBW = 3 MHz, Detector = Peak.
- As the EUT was configured to transmit with duty cycles < 98 percent, at frequencies above 1 GHz, average emission levels were measured using the "Method VB" by setting the analyzer RBW = 1 MHz, VBW = 3 kHz (VBW ≥ 1/T), Detector = Peak.
- The spectrum is measured from 9 kHz to 10th harmonic and the worst-case emissions are reported. No significant emissions were found beyond the Second harmonic for this device.
- ***For outside of the restricted band, the peak limit is applied according to Part 15.407(b) and RSS-247 Issue2 6.2.
Peak limit is 68.2 dBμV/m. ($E[\text{dB}\mu\text{V}/\text{m}] = \text{EIRP}[\text{dBm}/\text{MHz}] + 95.2 = 68.2 \text{ dB}\mu\text{V}/\text{m}$, for $\text{EIRP}[\text{dBm}/\text{MHz}] = -27\text{dBm}$.)
- For restricted band, the peak limit is 68.2 dBμV/m, the average limit is 54 dBμV/m per FCC §15.209 and RSS-Gen Issue5 8.9.
- Lowest channel(5745MHz) in n (20MHz) mode was the worst channel with respect to spurious emission.
- The radiated emissions testing were made by rotating EUT through three orthogonal axes and rotating the receive antenna with horizontal, Vertical polarization. The worst data was recorded.
- At frequencies above 1 GHz, EUT was placed at a height of 1.5m above the floor on a support according to ANSI 63.10-2013.

PLOTS OF EMISSIONS

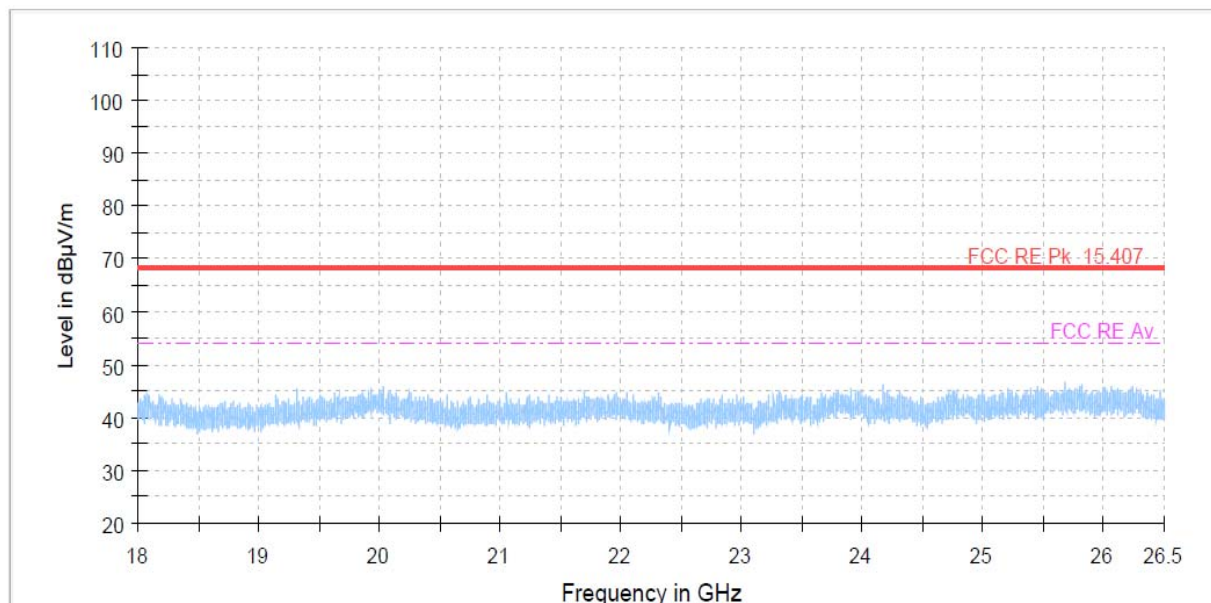
Worst Case

802.11n (20MHz) mode

Lowest channel : 1 GHz to 18 GHz_Peak

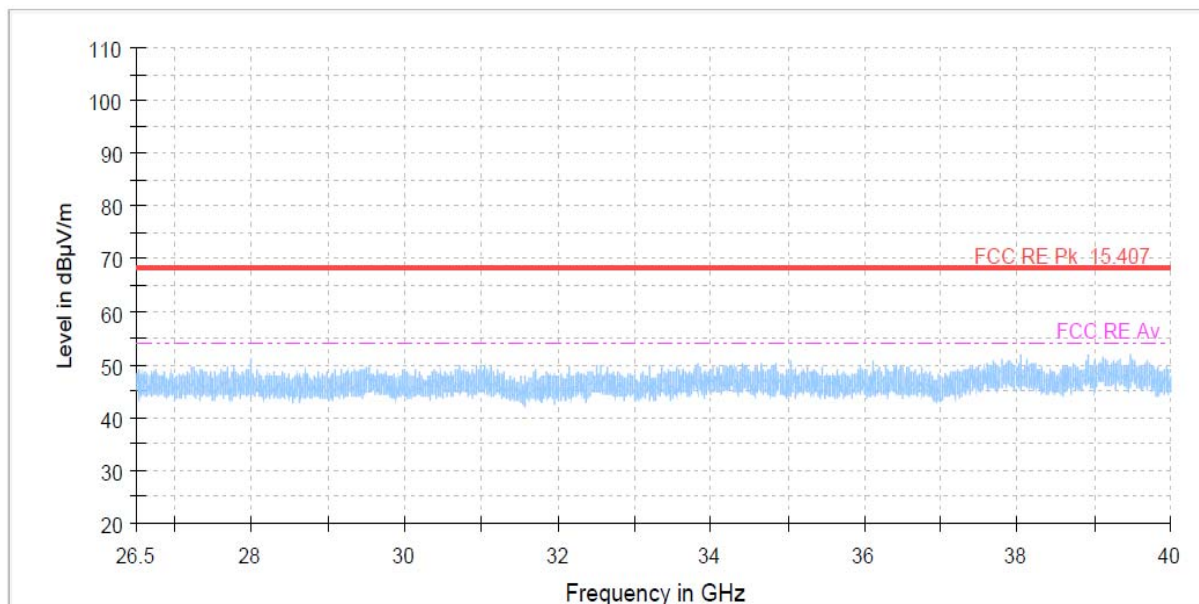


Lowest channel : 18 GHz to 26.5 GHz_Peak



PLOTS OF EMISSIONS

Lowest channel : 26.5 GHz to 40 GHz_Peak



TEST DATA

8.8 Radiated Band Edge

8.8.1 Radiated Band Edge – U-NII-1 band and UNII-2A band

FCC §15.407(b) , RSS-247 Issue 2 6.2

Test Mode : Set to Lowest channel and Highest channel

802.11a mode

Lowest Channel (5180 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5147.52***	48.5	V	peak	-0.2	48.3	68.2	19.9
5150.00***	46.8	V	peak	-0.2	46.6	68.2	21.6

Highest Channel (5320 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5350.00***	46.7	V	peak	0.0	46.7	68.2	21.5
5350.67***	48.5	V	peak	0.0	48.5	68.2	19.7

802.11n (20 MHz) mode

Lowest Channel (5190 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5144.01***	48.8	V	peak	-0.2	48.6	68.2	19.6
5150.00***	47.0	V	peak	-0.2	46.8	68.2	21.4

TEST DATA

Highest Channel (5320 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5350.00***	48.1	V	peak	0.0	48.1	68.2	20.1

802.11n (40 MHz) mode

Lowest Channel (5190 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5130.51	58.5	V	peak	-0.2	58.3	68.2	9.9
5130.51	36.8	V	average	-0.2	36.6	54.0	17.4
5142.75	60.0	V	peak	-0.2	59.8	68.2	8.4
5142.75	43.4	V	average	-0.2	43.2	54.0	10.8
5150.00	52.9	V	peak	-0.2	52.7	68.2	15.5
5150.00	49.8	V	average	-0.2	49.6	54.0	4.4

Highest Channel (5310 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5350.00	54.1	V	peak	0.0	54.1	68.2	14.1
5350.00	46.2	V	average	0.0	46.2	54.0	7.8
5374.19	58.6	V	peak	0.1	58.7	68.2	9.5
5374.19	35.0	V	average	0.1	35.1	54.0	18.9
5377.27	60.1	V	peak	0.1	60.2	68.2	8.0
5377.27	34.9	V	average	0.1	35.0	54.0	19.0

TEST DATA

802.11ac (80 MHz) mode

Lowest Channel (5210 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5142.21	62.8	V	peak	-0.2	62.6	68.2	5.6
5142.21	49.2	V	average	-0.2	49.0	54.0	5.0
5150.00	62.6	V	peak	-0.2	62.4	68.2	5.8
5150.00	51.4	V	average	-0.2	51.2	54.0	2.8

Highest Channel (5290 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5350.00	54.6	V	peak	0.0	54.6	68.2	13.6
5350.00	44.3	V	average	0.0	44.3	54.0	9.7
5351.23	55.5	V	peak	0.0	55.5	68.2	12.7
5351.23	44.8	V	average	0.0	44.8	54.0	9.2

TEST DATA

8.8.2 Radiated Band Edge – UNII-2C band

FCC §15.407(b) , RSS-247 Issue 2 6.2

Test Mode : Set to Lowest channel and Highest channel, Straddle channel

802.11a mode

Lowest Channel (5500 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5460.00***	47.4	V	peak	0.2	47.6	68.2	20.6

Highest Channel (5700 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5725.00	46.4	H	peak	0.8	47.2	68.2	21.0
5728.27	48.0	H	peak	0.8	48.8	68.2	19.4

Straddle Channel (5720 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5459.12***	44.4	H	peak	0.2	44.6	68.2	23.6
5460.00***	42.4	V	peak	0.2	42.6	68.2	25.6
5850.00	44.0	V	peak	1.0	45.0	68.2	23.2
5857.51	44.9	H	peak	1.0	45.9	68.2	22.3

TEST DATA

802.11n (20 MHz) mode

Lowest Channel (5500 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5460.00***	48.7	V	peak	0.2	48.9	68.2	19.3

Highest Channel (5700 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5725.00	51.3	V	peak	0.8	52.1	68.2	16.1

Straddle Channel (5720 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5452.91***	45.4	V	peak	0.2	45.6	68.2	22.6
5460.00***	42.6	H	peak	0.2	42.8	68.2	25.4
5850.00	44.3	V	peak	1.0	45.3	68.2	23.0
5872.01	45.7	V	peak	1.1	46.8	68.2	21.4

802.11n (40 MHz) mode

Lowest Channel (5510 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5460.00	58.0	V	peak	0.2	58.2	68.2	10.0
5460.00	38.3	V	average	0.2	38.5	54.0	15.5

TEST DATA

Highest Channel (5670 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5725.00	60.8	V	peak	0.8	61.6	68.2	6.6

Straddle Channel (5710 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5439.51***	46.1	V	peak	0.2	46.3	68.2	21.9
5460.00***	42.4	H	peak	0.2	42.6	68.2	25.6
5850.00	43.5	V	peak	1.0	44.5	68.2	23.7
5870.17	44.9	V	peak	1.1	46.0	68.2	22.2

802.11ac (80 MHz) mode

Lowest Channel (5530 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5460.00	58.7	H	peak	0.2	58.9	68.2	9.3
5460.00	47.6	H	average	0.2	47.8	54.0	6.2

Highest Channel (5610 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5442.29***	49.1	V	peak	0.2	49.3	68.2	18.9
5460.00***	46.2	H	peak	0.2	46.4	68.2	21.8
5725.00	44.8	V	peak	0.8	45.6	68.2	22.6
5733.61	46.2	H	peak	0.8	47.0	68.2	21.2

TEST DATA

Straddle Channel (5690 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5433.60***	44.5	H	peak	0.2	44.7	68.2	23.5
5460.00***	42.3	H	peak	0.2	42.5	68.2	25.7
5850.00	43.6	H	peak	1.0	44.6	68.2	23.6
5875.38	45.4	V	peak	1.1	46.5	68.2	21.7

TEST DATA

8.8.3 Radiated Band Edge – U-NII-3 band

FCC §15.407(b) , RSS-247 Issue 2 6.2

Test Mode : Set to Lowest channel and Highest channel

802.11a mode

Lowest Channel (5745 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5725.00	62.9	H	peak	0.8	63.7	122.2	58.5

Highest Channel (5825 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5850.00	51.9	H	peak	1.0	52.9	122.2	69.3

802.11n (20 MHz) mode

Lowest Channel (5745 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5725.00	65.7	H	peak	0.8	66.5	122.2	55.7

Highest Channel (5825 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5850.00	55.1	H	peak	1.0	56.1	122.2	66.1

TEST DATA

802.11n (40 MHz) mode

Lowest Channel (5755 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5725.00	65.6	V	peak	0.8	66.4	122.2	55.8

Highest Channel (5795 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5850.00	50.4	V	peak	1.0	51.4	122.2	70.9
5851.74	56.4	H	peak	1.0	57.4	118.2	60.8

802.11ac (80 MHz) mode

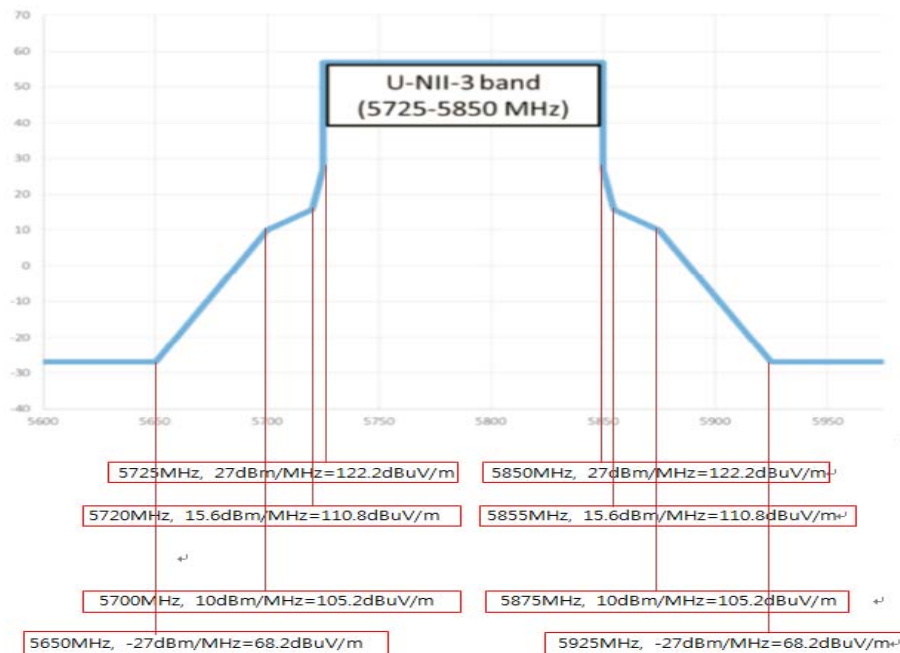
Channel (5775 MHz)

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5725.00	68.1	H	peak	0.8	68.9	122.2	53.3
5850.00	57.2	H	peak	1.0	58.2	122.2	64.0

TEST DATA

Note:

- *Pol. H = Horizontal V = Vertical
- **AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.
- ***Average measurement was not performed because peak-detected emission complies with the average limit.
- At frequencies above 1 GHz, peak emissions were measured using RBW = 1 MHz, VBW = 3 MHz, Detector = Peak.
- As the EUT was configured to transmit with duty cycles < 98 percent, at frequencies above 1 GHz, average emission levels were measured using the "Method VB" by setting the analyzer RBW = 1 MHz, VBW = 3kHz (VBW ≥ 1/T), Detector = Peak.
- The radiated emissions testing were made by rotating EUT through three orthogonal axes and rotating the receive antenna with horizontal, Vertical polarization. The worst data was recorded.
- At frequencies above 1 GHz, EUT was placed at a height of 1.5m above the floor on a support according to ANSI 63.10-2013.
- Lowest channel (5210MHz) in ac (80MHz) mode for UNII-1 band, Highest channel (5310MHz) in n (40MHz) mode for UNII-2A band, Lowest channel (5530MHz) in ac (80MHz) mode and Straddle channel (5720MHz) in n (20MHz) mode for UNII-2C band, Lowest channel (5745MHz) in n (20MHz) mode for UNII-3 band were the worst channels in each band.
- For restricted band, the peak limit is 68.2 dBμV/m, the average limit is 54 dBμV/m per FCC §15.209 and RSS-Gen Issue5 8.9.
- For outside of the restricted band, the peak limit is applied according to Part 15.407(b) and RSS-247 issue2 6.2.
For UNII-1 band, peak limit is 68.2 dBμV/m. ($E[\text{dB}\mu\text{V}/\text{m}] = \text{EIRP}[\text{dBm}/\text{MHz}] + 95.2 = 68.2 \text{ dB}\mu\text{V}/\text{m}$, for $\text{EIRP}[\text{dBm}/\text{MHz}] = -27\text{dBm}$.)
For UNII 3 band, the peak limit of bandedge to 75MHz above or below bandedge is specified in 15.407(b)(4)(i) and RSS-247 Issue2 6.2.4.2 as below.



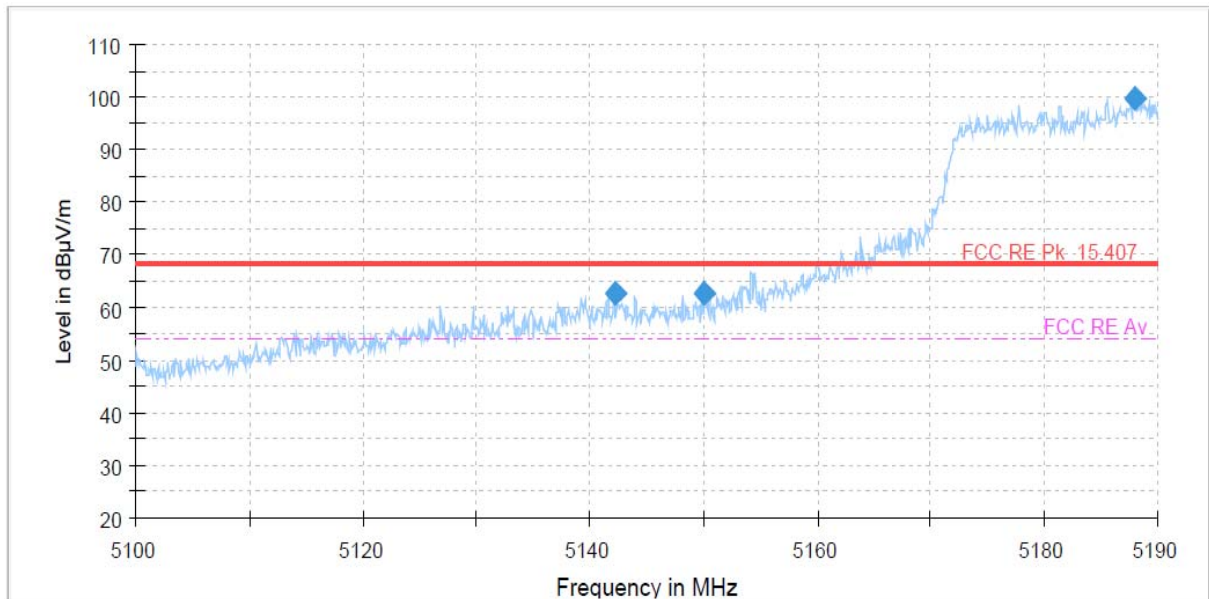
PLOTS OF EMISSIONS

Worst Case

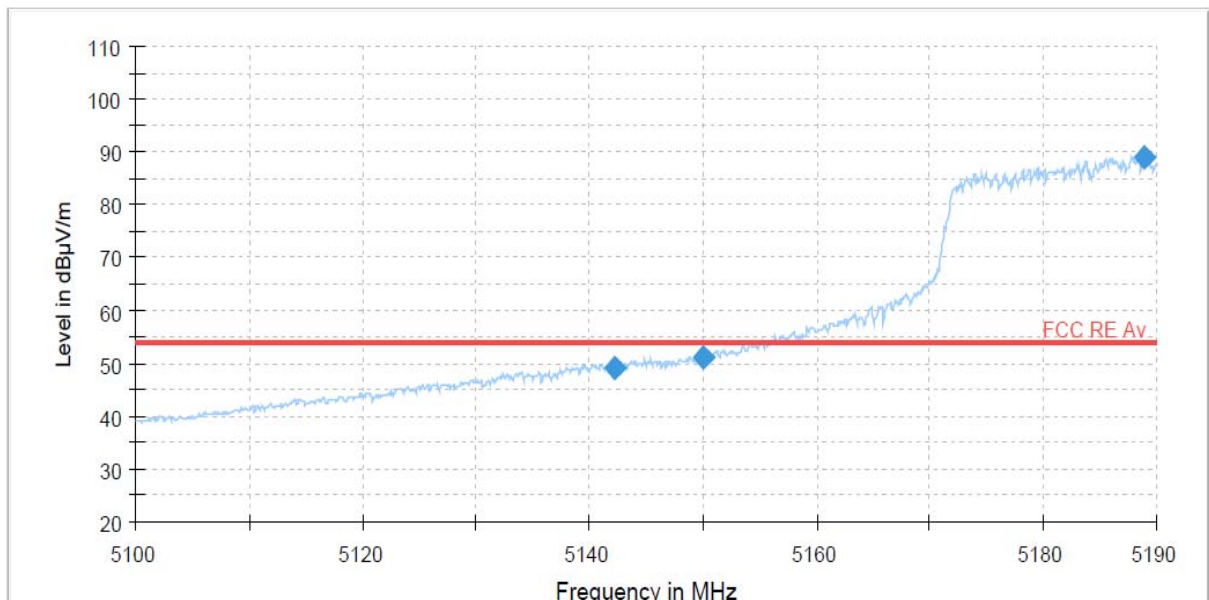
Radiated Band Edge – U-NII-1 band

802.11ac (80MHz) mode

Lowest channel (5210 MHz) _Peak



Lowest channel (5210 MHz) _Average

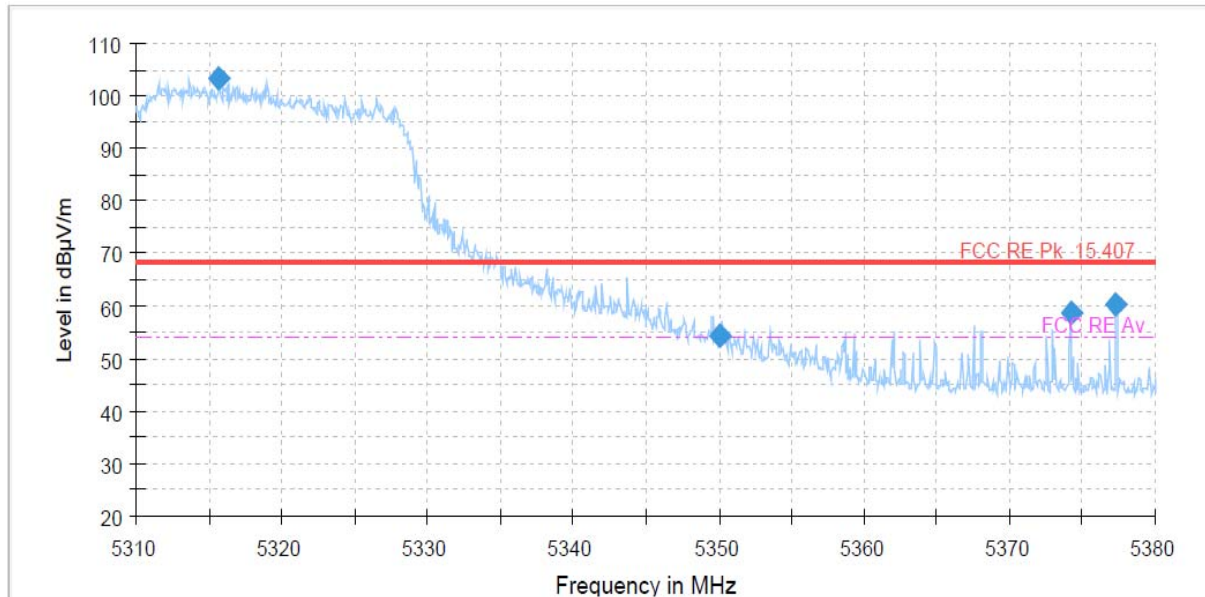


PLOTS OF EMISSIONS

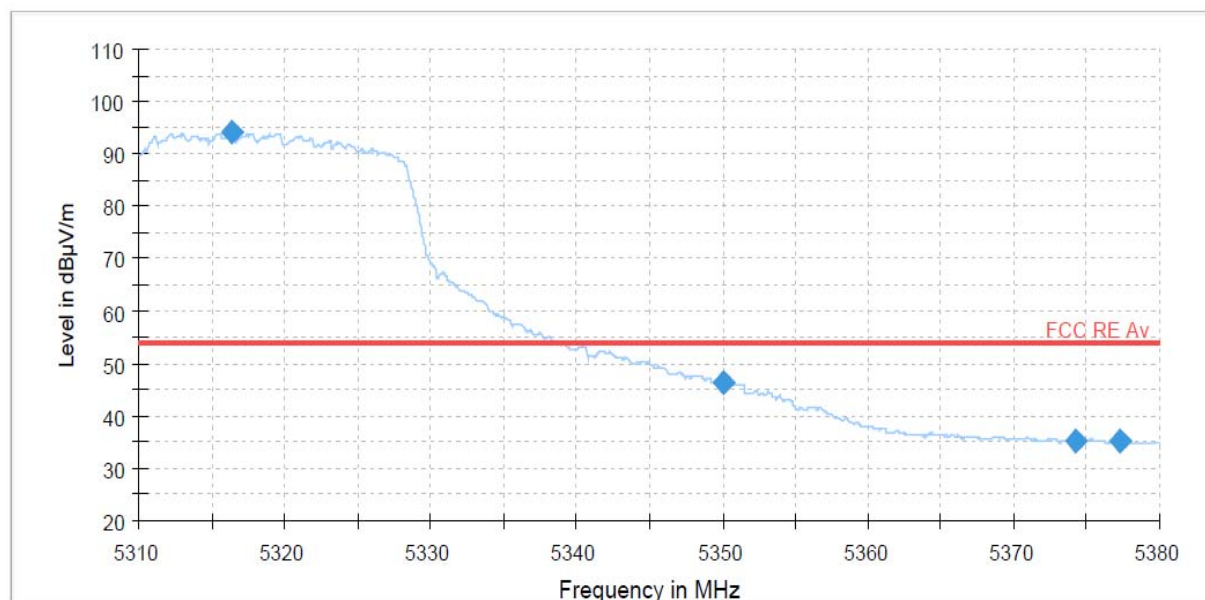
Radiated Band Edge – U-NII-2A band

802.11n (40MHz) mode

Highest channel (5310 MHz) _Peak



Highest channel (5310 MHz) _Average

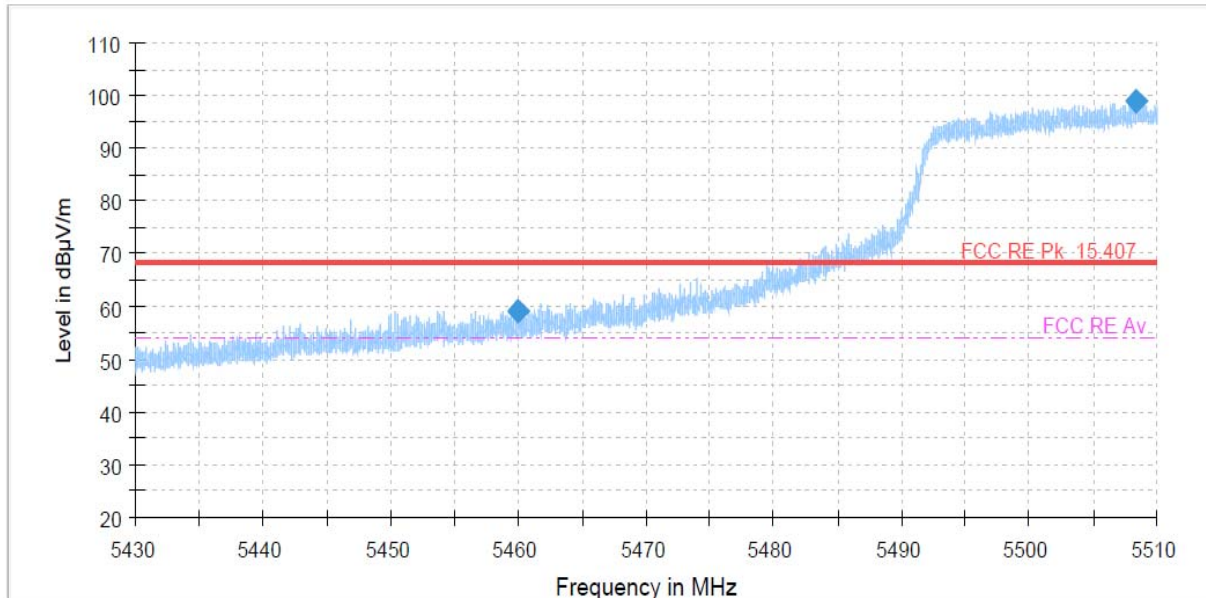


PLOTS OF EMISSIONS

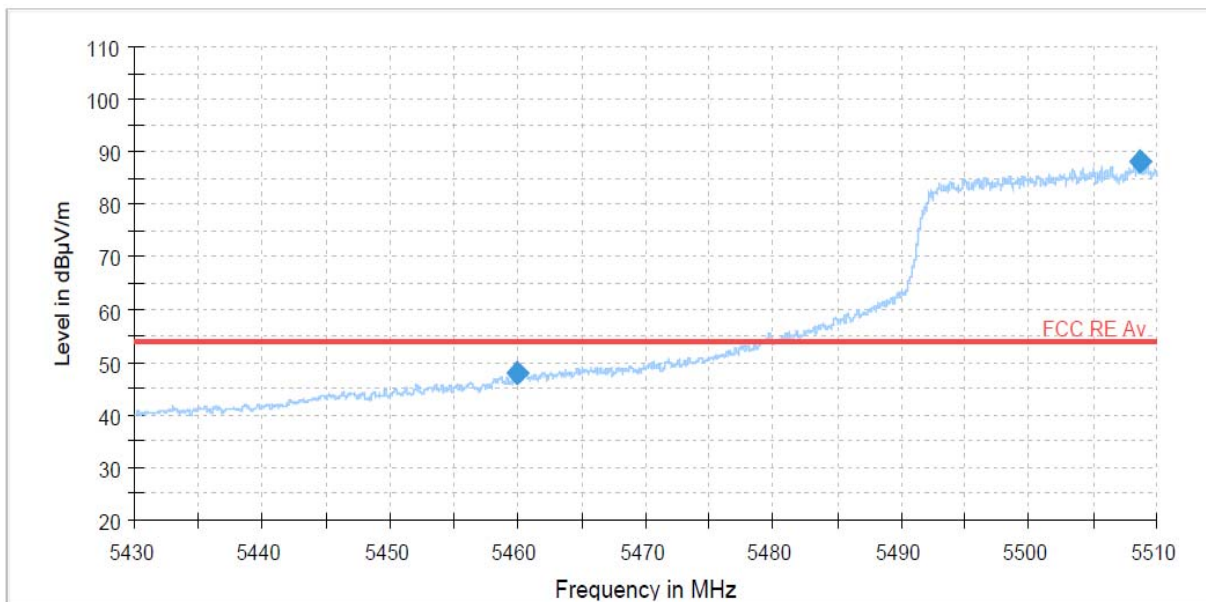
Radiated Band Edge – U-NII-2C band

802.11ac (80MHz) mode

Lowest channel (5530 MHz) _Peak



Lowest channel (5530 MHz) _Average

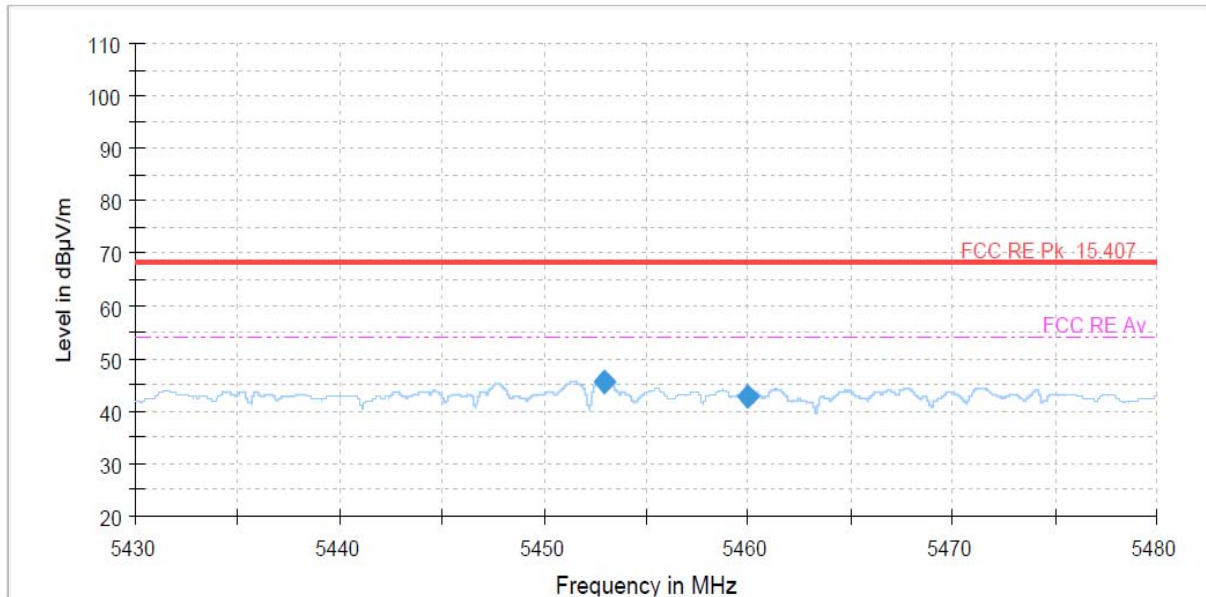


PLOTS OF EMISSIONS

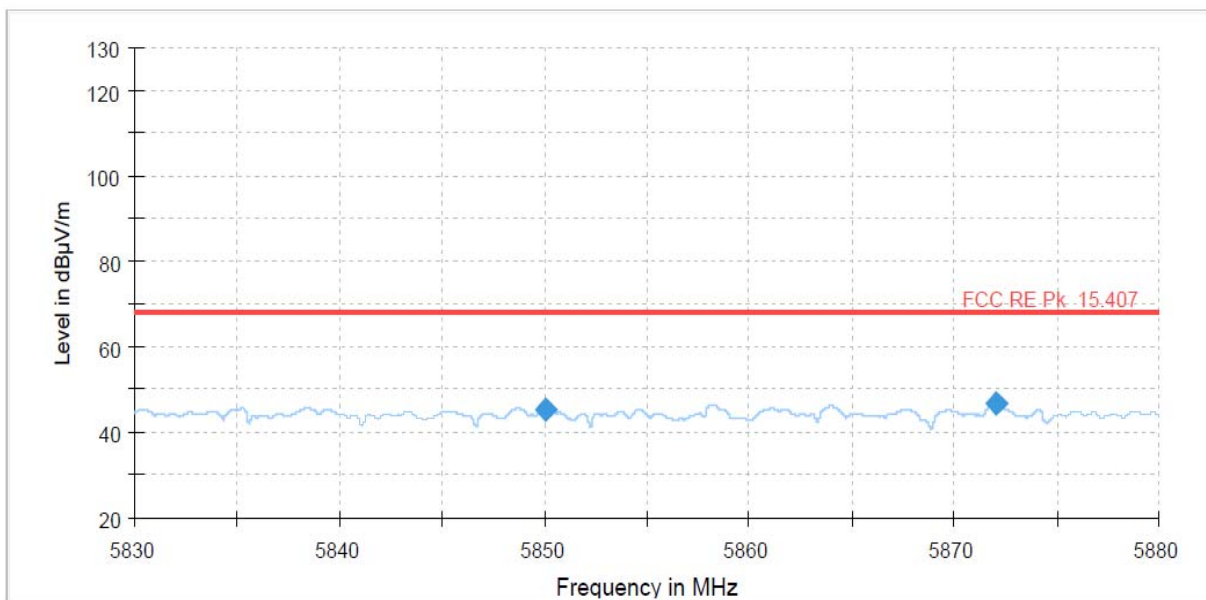
Radiated Band Edge – U-NII-2C band

802.11n (20MHz) mode

Straddle channel (5720 MHz) _Peak



Straddle channel (5720 MHz) _Peak

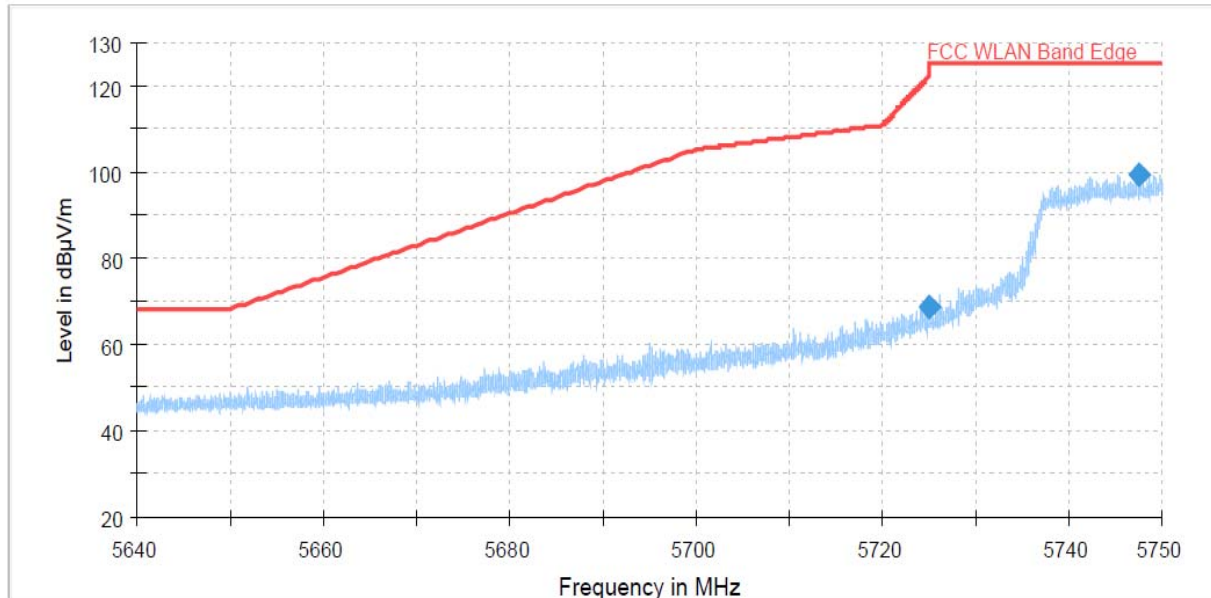


PLOTS OF EMISSIONS

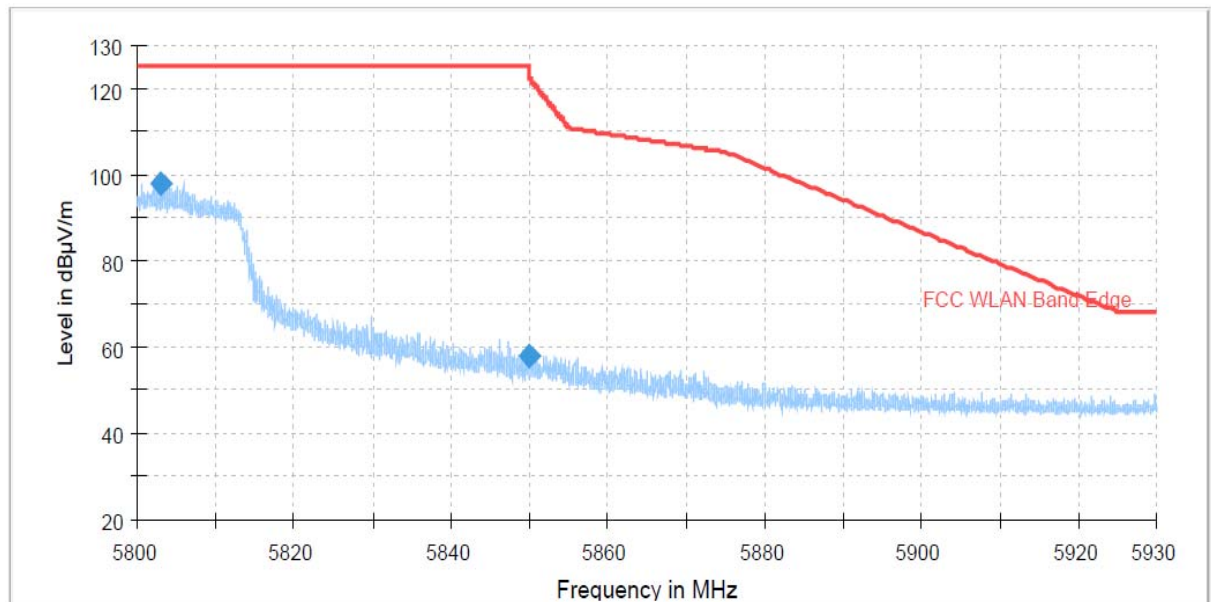
Radiated Band Edge – U-NII-3 band

802.11ac mode(80MHz)

Middle channel Lower (5775 MHz) _Peak



Middle channel Upper (5775 MHz) _Peak



9. TEST EQUIPMENT

No.	Instrument	Manufacturer	Model	Serial No.	Calibration Date	Calibration Interval
1	*Test Receiver	R & S	ESU 40	100202	May. 24 2018	1 year
2	*Test Receiver	R & S	ESCS30	100302	Oct. 12 2017	1 year
3	*Attenuator	PASTERNAK	PE7395-10	1441-1	Jul. 13 2017	1 year
4	*Attenuator	FAIRVIEW	SA3N5W-06	N/A	Oct. 10 2017	1 year
5	*Attenuator	FAIRVIEW	SA3N5W-10	N/A	Apr. 04 2018	1 year
6	*Attenuator	Agilent	8491B	57773	Oct. 12 2017	1 year
7	*Amplifier	R & S	SCU 01	10029	Apr. 02 2018	1 year
8	*Amplifier	R & S	SCU18F	180025	Apr. 02 2018	1 year
9	*Amplifier	R & S	SCU26	10011	Jul. 13 2017	1 year
10	*Amplifier	R & S	SCU40	100380	Jul. 13 2017	1 year
11	Vector Signal Generator	R & S	SMBV100A	257152	Oct. 12 2017	1 year
12	Spectrum Analyzer	R & S	FSW43	100732	Apr. 02 2018	1 year
13	*Spectrum Analyzer	Agilent	E4440A	MY44303257	Oct. 13 2017	1 year
14	*Spectrum Analyzer	R & S	FSW43	104084	Apr. 02 2018	1 year
15	*Loop Antenna	R & S	HFH2-Z2	100279	Feb. 13 2017	2 year
16	*Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-508	Feb. 13 2017	2 year
17	*Horn Antenna	Q-par Angus	QSH20S20	8179	Aug. 01 2017	2 year
18	*Horn Antenna	Q-par Angus	QSH22K20	8180	Aug. 02 2017	2 year
19	*Trilog-Broadband Antenna	SCHWARZBECK	VULB 9163	946	May. 18 2017	2 year
20	*LISN	R & S	ESH3-Z5	833874/006	Oct. 12 2017	1 year
21	ESH2-Z5 Artificial Mains Network	R & S	ESH2-Z5	100227	Apr. 03 2018	1 year
22	*Position Controller	INNCO	CO2000	12480406/L	N/A	N/A
23	*Controller	INNCO	CO3000	CO3000/937/38330516/L	N/A	N/A
24	*Turn Table	INNCO	DS1200S	N/A	N/A	N/A
25	*Turn Table	INNCO	DT2000-2t	N/A	N/A	N/A
26	*Antenna Mast	INNCO	MA4000	N/A	N/A	N/A
27	*TILT Antenna Mast	INNCO	MA4640-XP-EP	N/A	N/A	N/A
28	*Open Switch And Control Unit	R & S	OSP-120	100081	N/A	N/A
29	*Open Switch And Control Unit	R & S	OSP-120	101766	N/A	N/A
30	*Shielded Room	Seo-Young EMC	N/A	N/A	N/A	N/A
31	*Anechoic Chamber	Seo-Young EMC	N/A	N/A	N/A	N/A
32	*WiFi Filter Bank	R & S	U083	N/A	N/A	N/A
33	*WiFi Filter Bank	R & S	U082	N/A	N/A	N/A

*) Test equipment used during the test

10. ACCURACY OF MEASUREMENT

The Measurement Uncertainties stated were calculated in accordance with the requirements of measurement uncertainty contained in CISPR 16-4-2 with the confidence level of 95%

1. Conducted Uncertainty Calculation

Source of Uncertainty	X_i	Uncertainty of X_i		Coverage factor k	$u(X_i)$ (dB)	C_i	$C_i u(X_i)$ (dB)
		Value (dB)	Probability Distribution				
Receiver reading	RI	± 0.1	normal 1	1.000	0.1	1	0.1
Attenuation AMN-Receiver	LC	± 0.08	normal 2	2.000	0.04	1	0.04
AMN Voltage division factor	$LAMN$	± 0.8	normal 2	2.000	0.4	1	0.4
Sine wave voltage	$dVSW$	± 2.00	normal 2	2.000	1.00	1	1.00
Pulse amplitude response	$dVPA$	± 1.50	rectangular	1.732	0.87	1	0.87
Pulse repetition rate response	$dVPR$	± 1.50	rectangular	1.732	0.87	1	0.87
Noise floor proximity	$dVNF$	± 0.00	-	-	0.00	1	0.00
AMN Impedance	dZ	± 1.80	triangular	2.449	0.73	1	0.73
Ⓐ Mismatch	M	+ 0.70	U-Shaped	1.414	0.49	1	0.49
Ⓑ Mismatch	M	- 0.80	U-Shaped	1.414	- 0.56	1	- 0.56
Measurement System Repeatability	RS	0.05	normal 1	1.000	0.05	1	0.05
Remark	Ⓐ: AMN-Receiver Mismatch : + Ⓑ: AMN-Receiver Mismatch : -						
Combined Standard Uncertainty	Normal			± 1.88			
Expanded Uncertainty U	Normal ($k = 2$)			± 3.76			

2. Radiation Uncertainty Calculation

Source of Uncertainty	X_i	Uncertainty of X_i		Coverage factor k	$u(X_i)$ (dB)	C_i	$C_i u(X_i)$ (dB)
		Value (dB)	Probability Distribution				
Measurement System Repeatability	RS	0.34	normal 1	1.00	0.34	1	0.34
Receiver reading	Ri	± 0.02	normal 2	2.00	0.01	1	0.01
Sine wave voltage	dVsw	± 0.17	normal 2	2.00	0.09	1	0.09
Pulse amplitude response	dVpa	± 0.92	normal 2	2.00	0.46	1	0.46
Pulse repetition rate response	dVpr	± 0.35	normal 2	2.00	0.18	1	0.18
Noise floor proximity	dVnf	± 0.50	normal 2	2.00	0.25	1	0.25
Antenna Factor Calibration	AF	± 2.00	rectangular	$\sqrt{3}$	1.15	1	1.15
Cable Loss	CL	± 1.00	normal 2	2.00	0.50	1	0.50
Antenna Directivity	AD	± 0.00	rectangular	$\sqrt{3}$	0.00	1	0.00
Antenna Factor Height Dependence	AH	± 2.00	rectangular	$\sqrt{3}$	1.15	1	1.15
Antenna Phase Centre Variation	AP	± 0.20	rectangular	$\sqrt{3}$	0.12	1	0.12
Antenna Factor Frequency Interpolation	Ai	± 0.25	rectangular	$\sqrt{3}$	0.14	1	0.14
Site Imperfections	Si	± 4.00	triangular	$\sqrt{6}$	1.63	1	1.63
Measurement Distance Variation	DV	± 0.60	rectangular	$\sqrt{3}$	0.35	1	0.35
Antenna Balance	Dbal	± 0.90	rectangular	$\sqrt{3}$	0.52	1	0.52
Cross Polarisation	DCross	± 0.00	rectangular	$\sqrt{3}$	0.00	1	0.18
Mismatch	M	+ 0.98 - 1.11	U-Shaped	$\sqrt{2}$	0.74	1	0.74
EUT Volume Diameter	Vd	0.33	normal 1	1.00	0.33	1	0.11
Remark							
Combined Standard Uncertainty	Normal						
Expanded Uncertainty U	Normal ($k = 2$)						