Nemko Korea Co., Ltd.

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FCC EVALUATION REPORT FOR CLASS II PERMISSIVE CHANGE

Applicant :

Samsung Electronics Co., Ltd.
129, Samsung-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, Korea.
(Post code : 16677)
Attn. : Dongwook. Shin

Dates of Issue : May 27, 2016
Test Report No. : NK-16-R-069
Test Site : Nemko Korea Co., Ltd.

FCC ID	**A3LWIDT30Q**
Brand Name	**SAMSUNG**
Contact Person	**Samsung Electronics Co., Ltd.** **129, Samsung-ro, Yeongtong-gu,** **Suwon-si, Gyeonggi-do, Korea, 16677.** **Dongwook. Shin** **Telephone No. : +82-31-200-5698**

Applied Standard: FCC 47 CFR Part 15.407
Classification: Unlicensed National Information Infrastructure TX (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.

May 27. 2016

Tested By : Seungyong Shin
Engineer

May 27. 2016

Reviewed By : Deokha Ryu
Technical Manager

Revision History

Rev.	Issue Date	Revisions	Revised By
00	January 7, 2013	Initial issue (NK-12-R-235)	
01	Sep.11,2013	Enclosure was removed Antenna change (NK-13-R-107)	C2PC
02	May 27,2016	UNII new rule update	C2PC

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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 15.407.

Responsible Party :	Samsung Electronics Co., Ltd.
Contact Person :	Dongwook. Shin
Manufacturer :	Samsung Electronics Co., Ltd. 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea 16677

- FCC ID: A3LWIDT30Q
- Model: WIDT30Q
- Brand Name: SAMSUNG
- EUT Type: WiFi module
- Classification: Unlicensed National Information Infrastructure TX (NII)
- Applied Standard: FCC 47 CFR Part 15.407
- Test Procedure(s): ANSI 63.10-2013, KDB 789033 D02 General UNII Test Procedures New Rules v01r02 dated April 8, 2016 entitled “Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E”.
- Dates of Test: May 11, 2016 ~ May 27, 2016
- 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 : A3LWIDT30Q

These measurement tests were conducted at ***Nemko Korea Co., Ltd. EMC Laboratory*** .
The site address 155 & 159, Osan-Ro, Mohyeon-Myeon, 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.

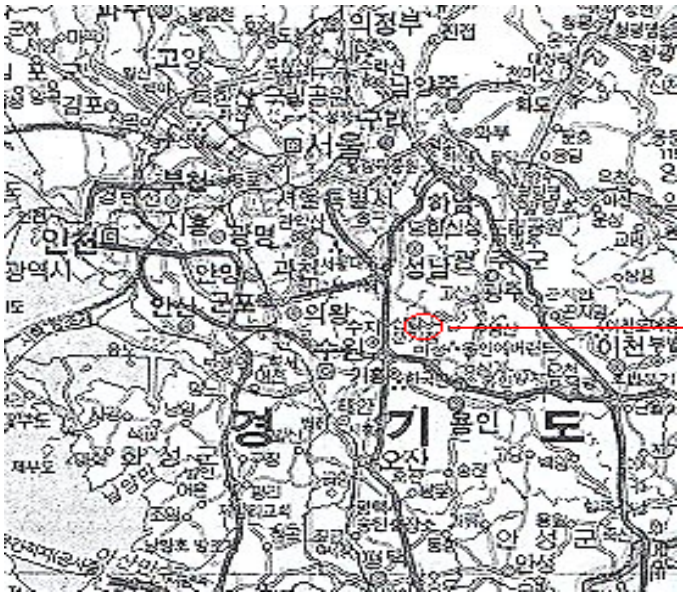

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Fig. 1. The map above shows the Seoul in Korea vicinity area.
The map also shows Nemko Korea Corporation Ltd. EMC Lab. and Incheon Airport.

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
Industry Canada	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 MIMO transceiver which is module supporting the 802.11a/b/g/n mode (802.11a/b/g :1TX/1RX, 802.11n: 2TX/2RX).
During the test, the EUT was connected to laptop PC and then a test program was executed to operate EUT continuously(duty cycle 98%) or constantly(duty cycle < 98%). The operating voltage of EUT was 5 Vdc supplied from a USB port on Laptop PC. The EUT was tested at the lowest channel, middle channel and the highest channel 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 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
U-NII-2A	802.11a,n(20MHz)	52	5260
		56	5280
		64	5320
	802.11n(40MHz)	54	5270
		62	5310
U-NII-2C	802.11a,n(20MHz)	100	5500
		116	5580
		140	5700
	802.11n(40MHz)	102	5510
		110	5550
		134	5670
U-NII-3	802.11a,n(20MHz)	149	5745
		157	5785
		165	5825
	802.11n(40MHz)	151	5755
		159	5795

3.1.2 Table of test modes

Test Items	Mode	Data rate (Mbps)	Test Channel (CH)
Conducted Emissions	802.11n(20 MHz)	MCS0	44
Radiated Emissions	802.11n(20 MHz)	MCS0	44
26 dB Spectrum Bandwidth	802.11a	6	36/44/48 52/56/64 100/116/140 149/157/165
	802.11n(20 MHz)	MCS0	
	802.11n(40 MHz)	MCS0	38/46 54/62 102/110/134 151/159
Maximum Conducted Output Power	802.11a	6	36/44/48 52/56/64 100/116/140 149/157/165
	802.11n(20 MHz)	MCS0	
	802.11n(40 MHz)	MCS0	38/46 54/62 102/110/134 151/159
Power Spectral Density	802.11a	6	36/44/48 52/56/64 100/116/140 149/157/165
	802.11n(20 MHz)	MCS0	
	802.11n(40 MHz)	MCS0	38/46 54/62 102/110/134 151/159
Radiated Spurious Emission, Band edge Emission	802.11a	6	36/44/48 52/56/64 100/116/140 149/157/165
	802.11n(20 MHz)	MCS0	
	802.11n(40 MHz)	MCS0	38/46 54/62 102/110/134 151/159

3.1.3 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
UNII-2A	20MHz	52	5260
		56	5280
		60	5300
		64	5320
	40MHz	54	5270
		62	5310
UNII-2C	20MHz	100	5500
		104	5520
		108	5240
		112	5560
		116	5580
		132	5660
		136	5680
		140	5700
	40MHz	102	5510
		110	5550
		134	5670
UNII-3	20MHz	149	5745
		153	5765
		157	5785
		161	5805
		165	5825
	40MHz	151	5755
		159	5795

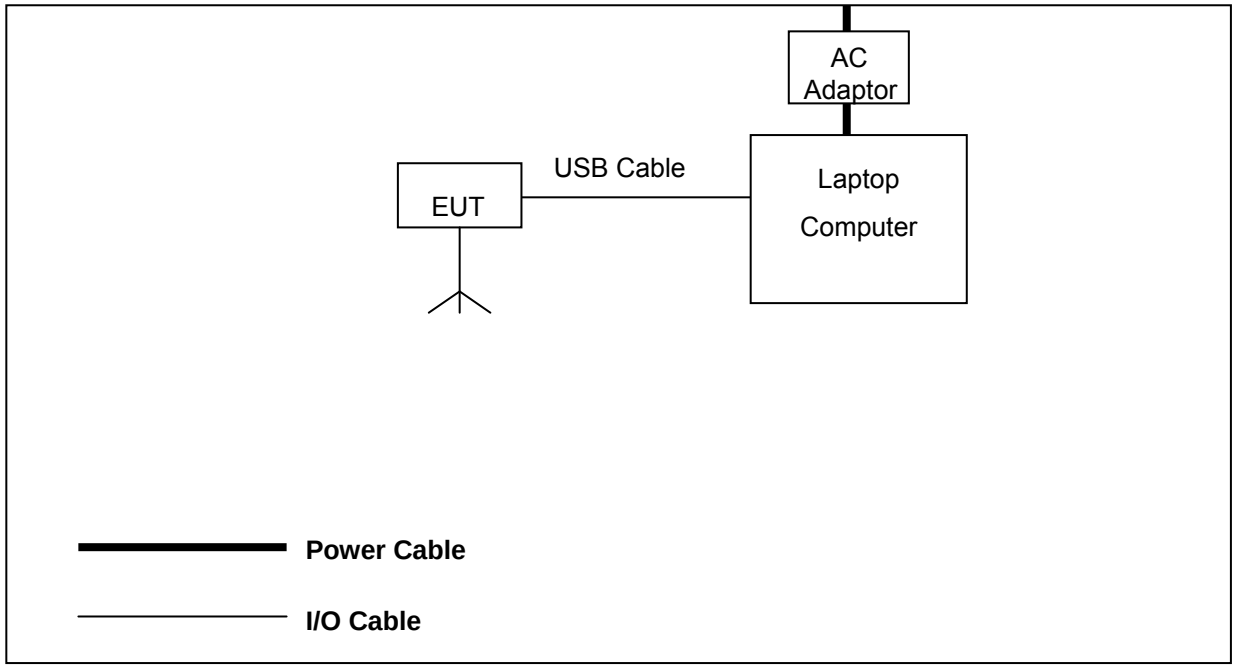
3.1.5. Additional Information Related to Testing

- The cable and attenuator loss from 30MHz to 25GHz was reflected in spectrum analyzer with correction factor for conducted testing in UNII-3 band.
- Printed circuit board, component lay out and frequency bands are the same as previous model.
- There is no change of the EUT in hardware, power setting level and operation.
  Therefore the conducted rawdata in UNII-1,2A,2C band in original report (NK-12-R-235-1) was used in this report.
  And the radiated rawdata in UNII-1,2A,2C band in C2PC report (NK-13-R-107) was used in this report.
  However, all testing in UNII-3 band was retested to show compliance with 15.407 limit of new rule for UNII device.
- For FCC part 15.207,15.209 testing, the data in C2PC report(NK-13-R-107) was used in this report.

3.2 Support Equipment

EUT	Samsung Electronics Co., Ltd. FCC ID: A3LWIDT30Q	S/N: N/A
Laptop Computer	Samsung Electronics Co., Ltd. Model : NT-R55 0.3 m unshielded pin connector cable	FCC DOC S/N : 408L93AP400115W
AC/DC Adapter	Chicony Power Technology Co., Ltd. Model : AD-9019S 1.5 m unshielded power cable	FCC DOC S/N : CNBA4400215ADON81BT01V8

3.3 Setup Drawing



3.4 EUT Information

The EUT is the **Samsung WiFi module FCC ID: A3LWIDT30Q .**

Specifications:

Category	WiFi module
Model Name	WIDT30Q
Brand Name	SAMSUNG
Frequency of Operation	For U-NII-1 Band 802.11a,n(20 MHz): 5180 MHz ~ 5240 MHz 802.11n(40 MHz): 5190 MHz ~ 5230 MHz For U-NII-2A Band 802.11a,n(20 MHz): 5260 MHz ~ 5320 MHz 802.11n(40 MHz): 5270 MHz ~ 5310 MHz For U-NII-2C Band 802.11a,n(20 MHz): 5500 MHz ~ 5700 MHz 802.11n(40 MHz): 5510 MHz ~ 5670 MHz For U-NII-3 Band 802.11a,n(20 MHz): 5725 MHz ~ 5825 MHz 802.11n(40 MHz): 5755 MHz ~ 5795 MHz
Power Output (Conducted)	For U-NII-1 Band 802.11a : 12.89 dBm 802.11n(20 MHz) : 13.42 dBm 802.11n(40 MHz) : 13.33 dBm For U-NII-2A Band 802.11a : 15.12 dBm 802.11n(20 MHz) : 15.22 dBm 802.11n(40 MHz) : 14.44 dBm For U-NII-2C Band 802.11a : 15.40 dBm 802.11n(20 MHz) : 16.17 dBm 802.11n(40 MHz) : 12.56 dBm For U-NII-3 Band 802.11a : 14.53 dBm 802.11n(20 MHz) : 15.81 dBm 802.11n(40 MHz) : 12.38 dBm
Channels	For U-NII-1 Band 802.11a,n(20 MHz) : 4 CH 802.11n(40 MHz): 2 CH For U-NII-2A Band 802.11a,n(20 MHz) : 4 CH 802.11n(40 MHz): 2 CH

	For U-NII-2C Band 802.11a,n(20 MHz) : 11 CH 802.11n(40 MHz): 5 CH For U-NII-3 Band 802.11a,n(20 MHz): 5ch 802.11n(40 MHz): 2ch
Antenna Gain (peak)	For U-NII-1 Band Ant 0 : -2.28 dBi, Ant1 : -7.77 dBi For U-NII-2A band Ant 0 : -2.28 dBi, Ant1 : -4.80 dBi For U-NII-Band 2C Ant 0 : -4.04 dBi, Ant1 : -8.42 dBi For U-NII-Band 3 Ant 0 : -12.82 dBi, Ant1 : -13.15 dBi
Antenna setup	802.11a : 1TX / 1RX 802.11n(20 MHz), 802.11n(40 MHz) : 2TX / 2RX
Modulations	OFDM(BPSK,QPSK,16QAM,64QAM) for 802.11a,g,n
Temperature Range	-20 ℃ ~ +50 ℃
Voltage	5.0 Vdc
Dimensions (D x W x H)	58.00 mm x 31.45 mm X 8.50 mm
Weight	10.7 g
Remarks	-

4. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specification:

Name of Test	FCC Paragraph No.	Result	Remark
Conducted Emission	15.207	Complies	
Radiated Emission	15.209	Complies	
26 dB Spectrum Bandwidth and 99% Occupied bandwidth	15.407(a)	Complies	
6 dB Bandwidth	15.407(e)	Complies	
Maximum Conducted Output Power	15.407(a)	Complies	
Power Spectral Density	15.407(a)	Complies	
Radiated Spurious Emission	15.407(b)	Complies	
Maximum Permissible Exposure	1.1307(b)	Complies	

5. RECOMMENDATION/CONCLUSION

The data collected shows that the **Samsung WiFi module FCC ID: A3LWIDT30Q** is in compliance with Part 15.407 of the FCC Rule.

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 WiFi module FCC ID: A3LWIDT30Q** is **permanently attached** and there are no provisions for connection to an external antenna. It complies with the requirement of §15.203.

According to "**662911 D01 Multiple Transmitter Output v02r01**", if two antennas are unequal antenna gains and transmit signals are correlated, then the **Directional gain = 10 log[($10^{G1/20}$+$10^{G2/20}$)^2/N_{ANT}] dBi**. The directional gain of Samsung WiFi module are **-1.59 dBi** for **UNII-1 Band,** and **-0.44 dBi** for **UNII-2A Band** and **-2.95 dBi** for **UNII-2C Band** and **-9.97 dBi** for **UNII-3 Band**.

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 μH 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 (serpentinefashion) 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.

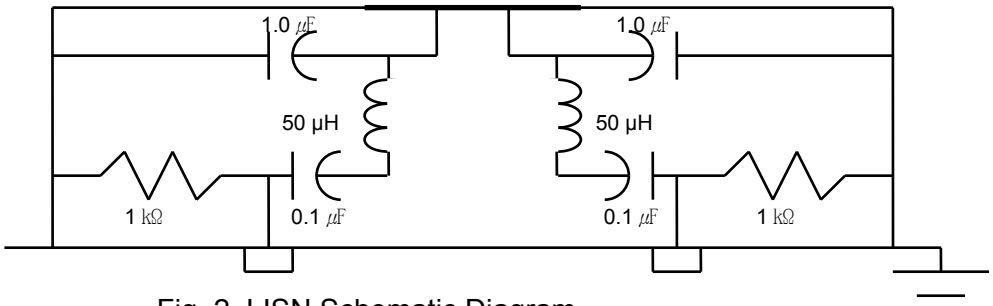


Fig. 2. LISN Schematic Diagram

7.2 Radiated Emissions

The measurement was performed at the test site that is specified in accordance with ANCI 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, QSH22K20: up 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 v01r02”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.

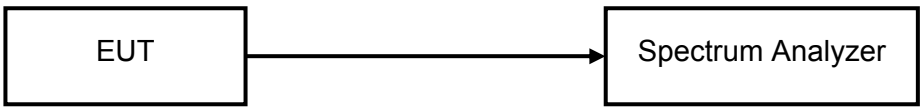
Unwanted emissions outside of the restricted bands

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

At frequencies above 1000 MHz, measurements performed using the peak and average measurement procedures described in KDB “789033 D02 General UNII Test Procedures New Rules v01r02” 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

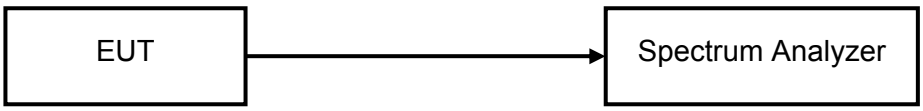


Test Procedure

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 ≥ 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

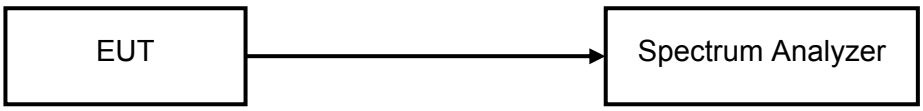


Test Procedure

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

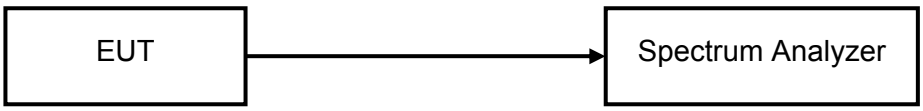


Test Procedure

EUTs Maximum Conducted Output Power 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
Span = encompass the EBW of the signal.
RBW = 1 MHz
VBW ≥ 3 MHz
Number of points in sweep ≥ 2 Span / 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.
Add 10 log(1/x), where x is the duty cycle.

7.6 Maximum Power Spectral Density (average)

Test Setup

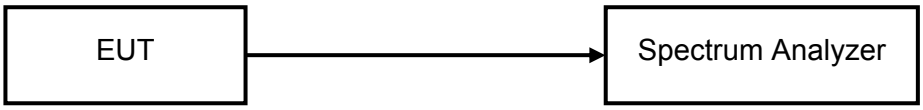


Test Procedure

EUTs Maximum Conducted Output Power 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.
The spectrum analyzer setting is as follows.
Span = encompass the EBW of the signal.
RBW = 1 MHz
VBW ≥ 3 MHz
Number of points in sweep ≥ 2 Span / RBW
Sweep time = auto
Detector = RMS
Trace average at least 100 traces in power averaging mode
The peak search function on the spectrum analyzer is used to find the peak of the spectrum.
Add 10 log(1/x), where x is the duty cycle.

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 2 ms
Trace mode = view
The marker function on the spectrum analyzer is used to determine the duty cycle.

Following is the worst result of the duty cycle measurements according to the above test procedure

UNII-1, 2A, 2C, 3 band

	Data rate	On time (ms)	On + Off time (ms)	Duty Cycle (%)	Duty Factor (dB)
a mode	6Mbps	-	-	100	N.A
n(20MHz) mode	MCS0	-	-	100	N.A
n(40MHz) mode	MCS0	-	-	100	N.A

8. TEST DATA

8.1 Conducted Emissions

FCC §15.207

Frequency (MHz)	Level(dBµV)		*)Factor (dB)	**) Line	Limit(dBµV)		Margin(dB)	
	Q-Peak	Average			Q-Peak	Average	Q-Peak	Average
0.17	55.3	36.1	0.2	L	65.0	55.0	9.7	18.9
0.23	47.2	30.1	0.2	L	62.4	52.4	15.2	22.3
0.29	39.0	21.1	0.2	L	60.5	50.5	21.5	29.4
0.44	36.1	20.9	0.2	N	57.1	47.1	21.0	26.2
0.52	35.8	22.3	0.2	N	56.0	46.0	20.2	23.7
14.51	26.6	22.6	0.9	N	60.0	50.0	33.4	27.4

Line Conducted Emissions Tabulated Data

Note(s):

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 the FCC Part section 15.207(a).

PLOTS OF EMISSIONS

- ***Conducted Emission at the Mains port (Line)***

NEMKO KOREA (NK-13-R-107) 18 Jul 2013 10:23

Conducted Emissions

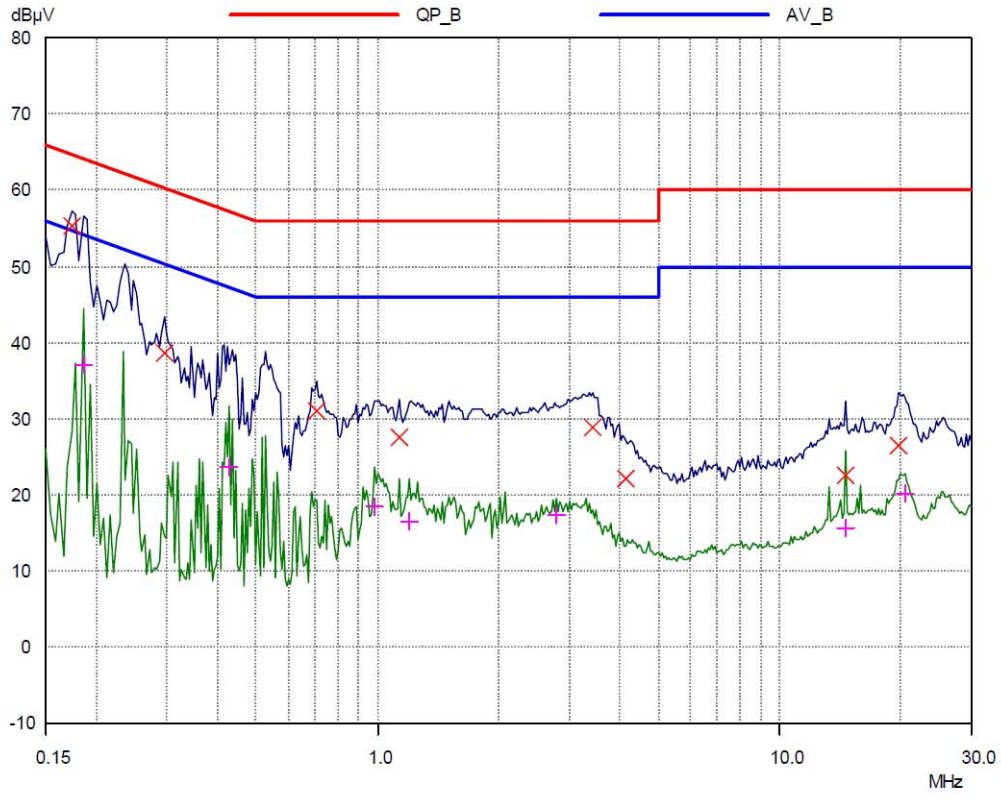
EUT:	Wifi Module
Manuf:	Samsung Electronics
Op Cond:	a.c. 120 V / 60 Hz (802.11n HT20 5500 MHz TX mode)
Operator:	Jinha. Ko
Test Spec:	FCC Part 15.207
Comment:	MODEL : WIDT30Q
	LINE : L1

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	3.9063kHz	9kHz	PK+AV	20msec	20 dB	OFF	60dB

Transducer	No.	Start	Stop	Name
	1	150kHz	30MHz	ESH3_Z5_Line

Final Measurement:		
	Detectors:	X QP / + AV
	Meas Time:	1sec
	Subranges:	8
	Acc Margin:	30 dB



PLOTS OF EMISSIONS

- ***Conducted Emission at the Mains port (Neutral)***

NEMKO KOREA (NK-13-R-107) 18 Jul 2013 10:35

Conducted Emissions

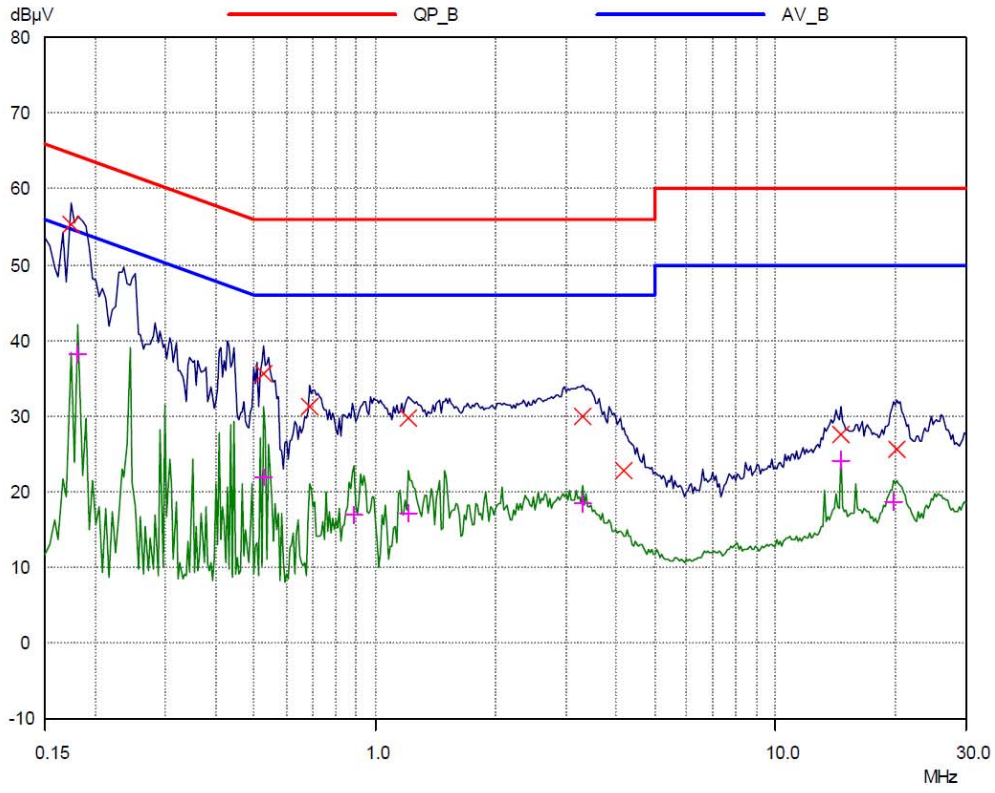
EUT:	Wifi Module
Manuf:	Samsung Electronics
Op Cond:	a.c. 120 V / 60 Hz (802.11n HT20 5500 MHz TX mode)
Operator:	Jinha. Ko
Test Spec:	FCC Part 15.207
Comment:	MODEL : WIDT30Q
	LINE : Neutral

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	3.9063kHz	9kHz	PK+AV	20msec	20 dB	OFF	60dB

Transducer	No.	Start	Stop	Name
	1	150kHz	30MHz	ESH3_Z5_Neutral

Final Measurement:		
	Detectors:	X QP / + AV
	Meas Time:	1sec
	Subranges:	8
	Acc Margin:	30 dB



8.2 Radiated Emissions

FCC §15.209

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)
75.68	50.90	H	340	270	-18.9	32.0	40.0	8.0
80.01	53.60	H	392	90	-20.8	32.8	40.0	7.2
83.73	52.40	H	382	86	-20.8	31.6	40.0	8.4
229.34	51.71	H	150	155	-19.1	32.6	46.0	13.4
240.01	54.91	H	135	197	-19.1	35.8	46.0	10.2
666.14	37.50	V	110	40	-6.5	31.0	46.0	15.0

Radiated Measurements at 3meters

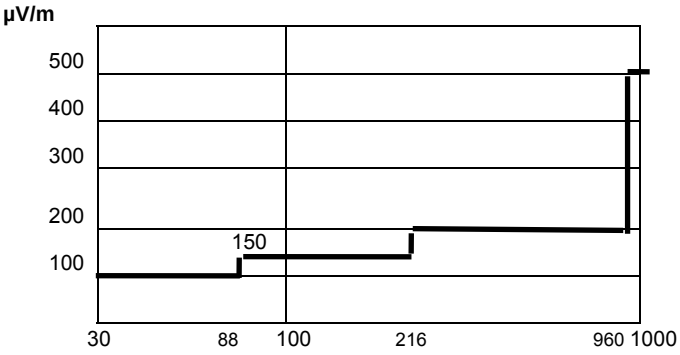


Fig. 3. Limits at 3 meters

Note(s)s:

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.

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. The limit is on the FCC Part section 15.209(a).

8.3 26 dB Bandwidth and 99 % Occupied bandwidth

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

FCC §15.407(a)

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

802.11a mode

Channel	Frequency (MHz)	26 dB Bandiwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Low	5180	22.98	22.94	16.74	16.78
Middle	5200	22.36	22.91	16.71	16.75
High	5240	22.71	22.82	16.73	16.74

802.11n (20 MHz) mode

Channel	Frequency (MHz)	26 dB Bandiwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Low	5180	22.75	22.74	17.81	17.73
Middle	5200	22.51	22.55	17.84	17.78
High	5240	22.80	22.60	17.80	17.77

802.11n (40 MHz) mode

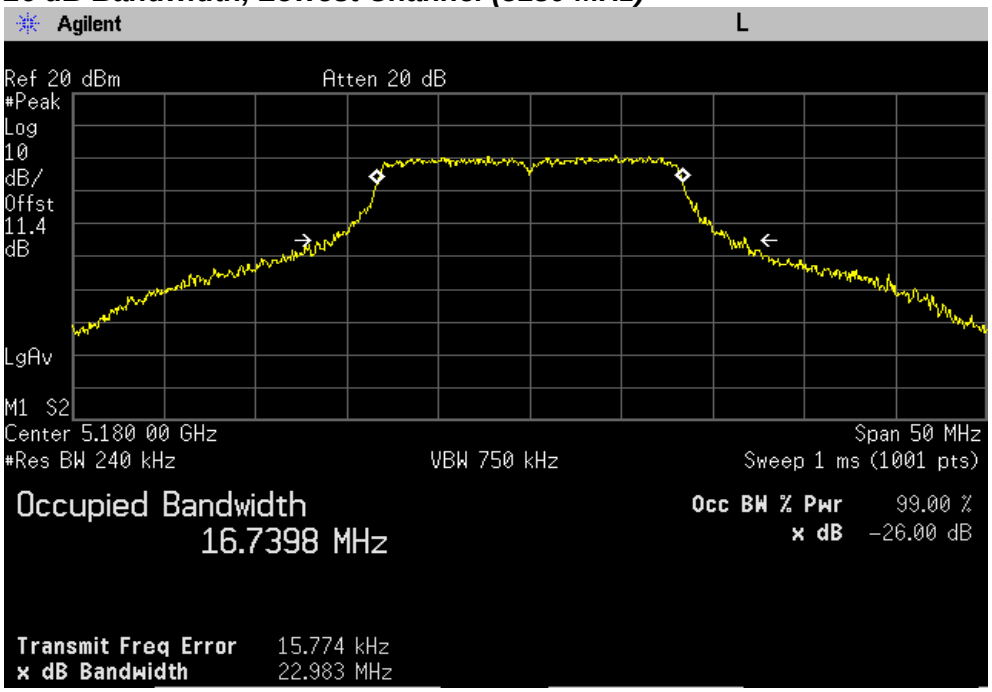
Channel	Frequency (MHz)	26 dB Bandiwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Low	5190	46.55	46.62	36.36	36.46
High	5230	45.85	46.67	36.51	36.45

PLOTS OF EMISSIONS

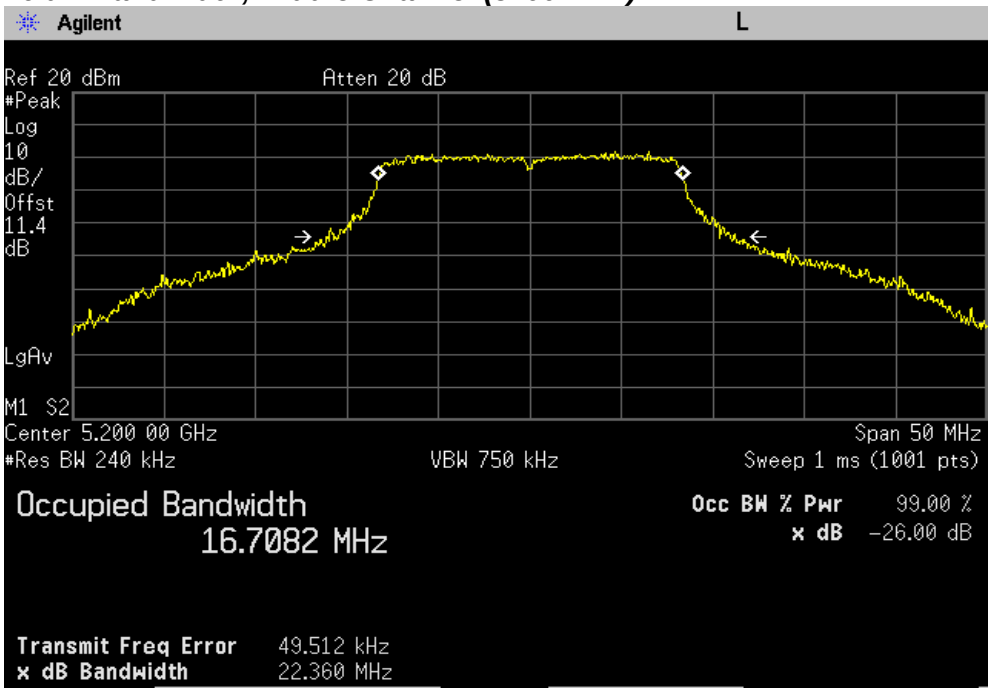
802.11a mode

Chain 0

26 dB Bandwidth, Lowest Channel (5180 MHz)

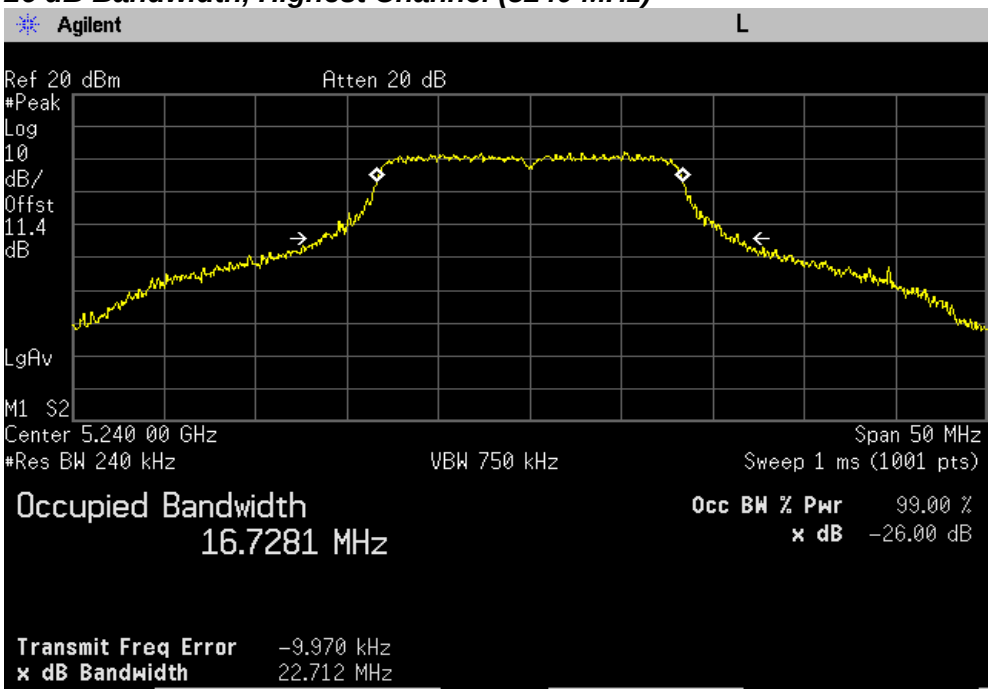


26 dB Bandwidth, Middle Channel (5200 MHz)



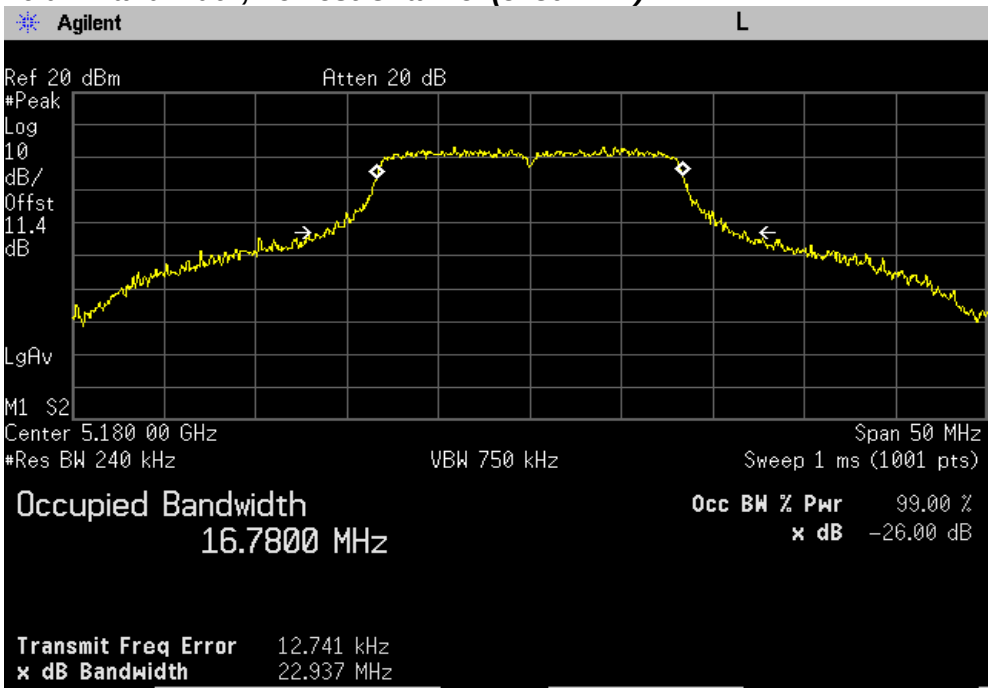
PLOTS OF EMISSIONS

26 dB Bandwidth, Highest Channel (5240 MHz)



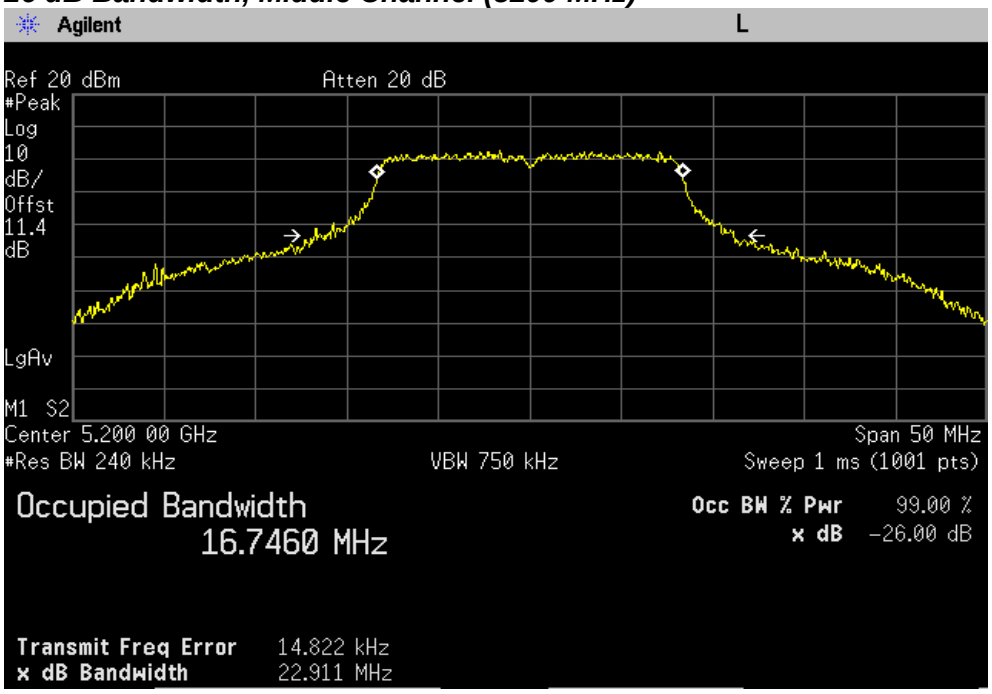
Chain 1

26 dB Bandwidth, Lowest Channel (5180 MHz)

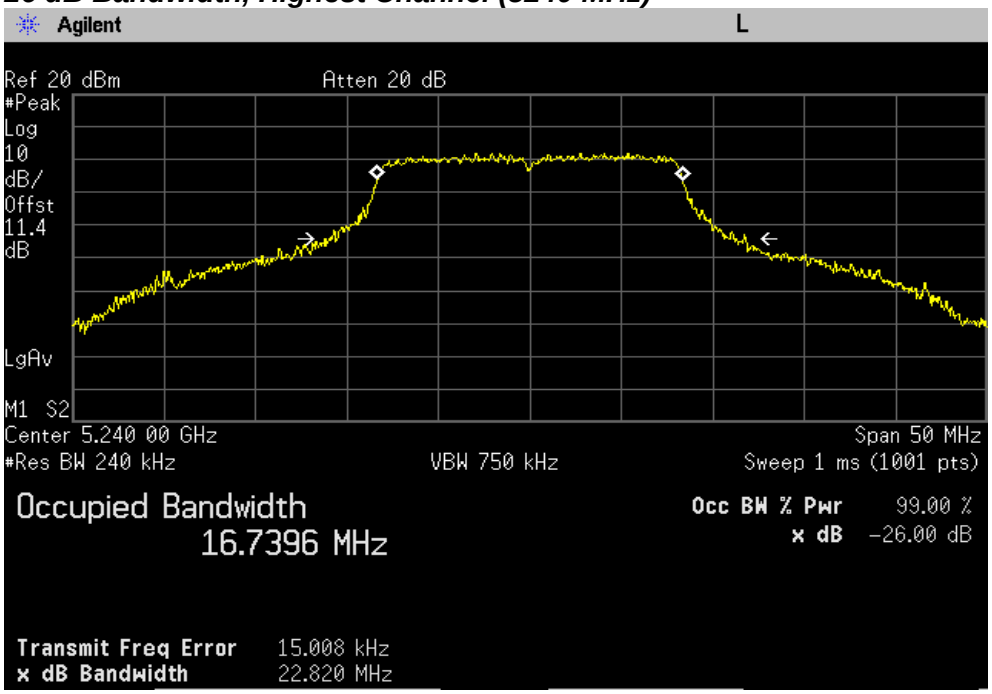


PLOTS OF EMISSIONS

26 dB Bandwidth, Middle Channel (5200 MHz)



26 dB Bandwidth, Highest Channel (5240 MHz)

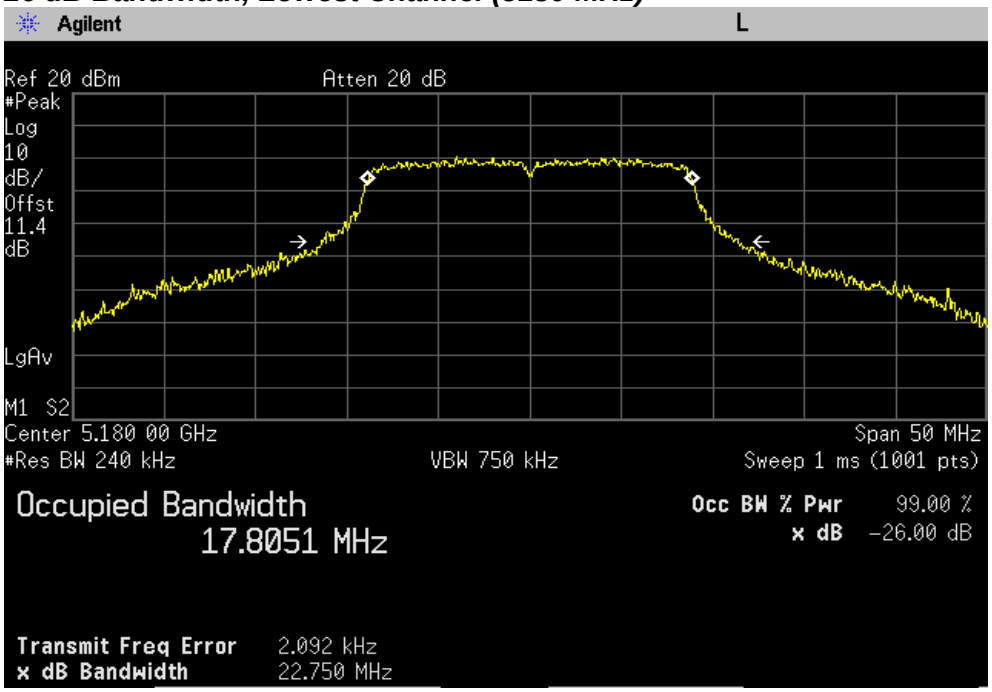


PLOTS OF EMISSIONS

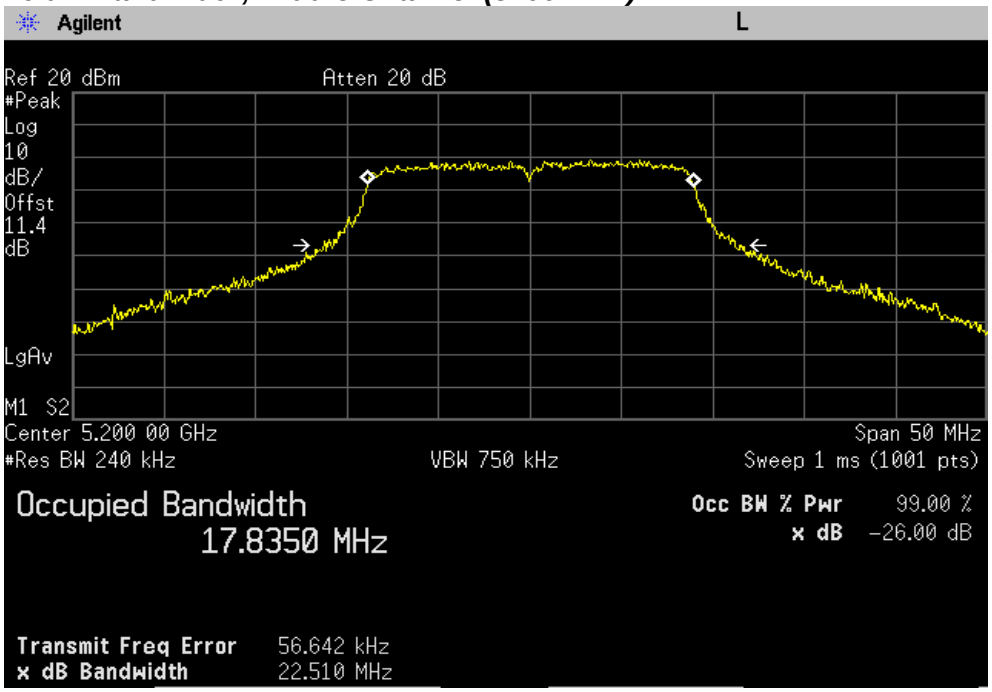
802.11n(20 MHz) mode

Chain 0

26 dB Bandwidth, Lowest Channel (5180 MHz)

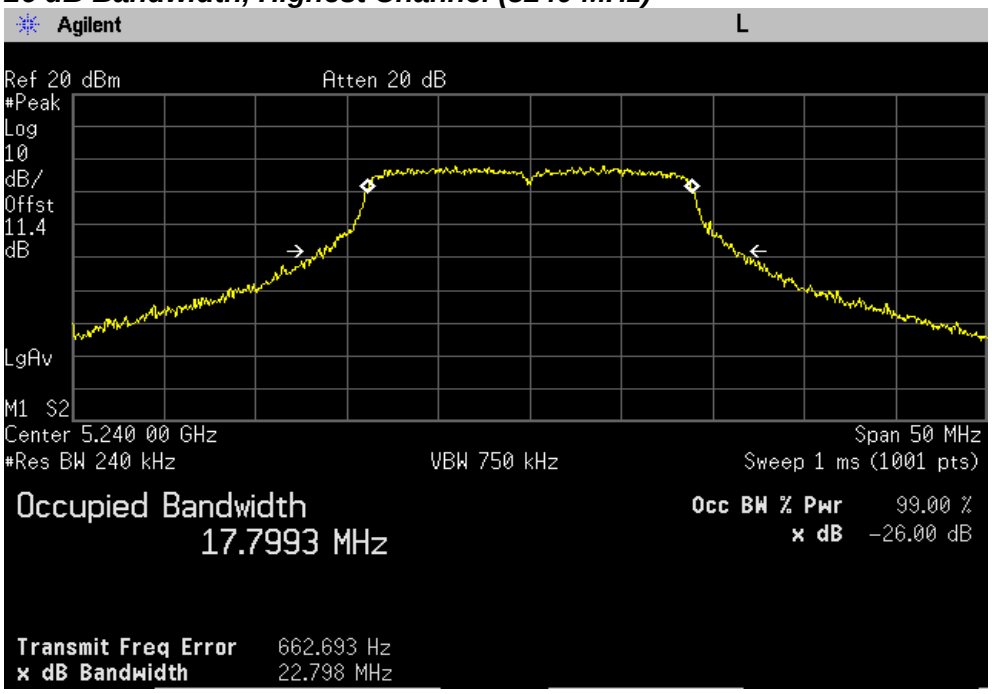


26 dB Bandwidth, Middle Channel (5200 MHz)



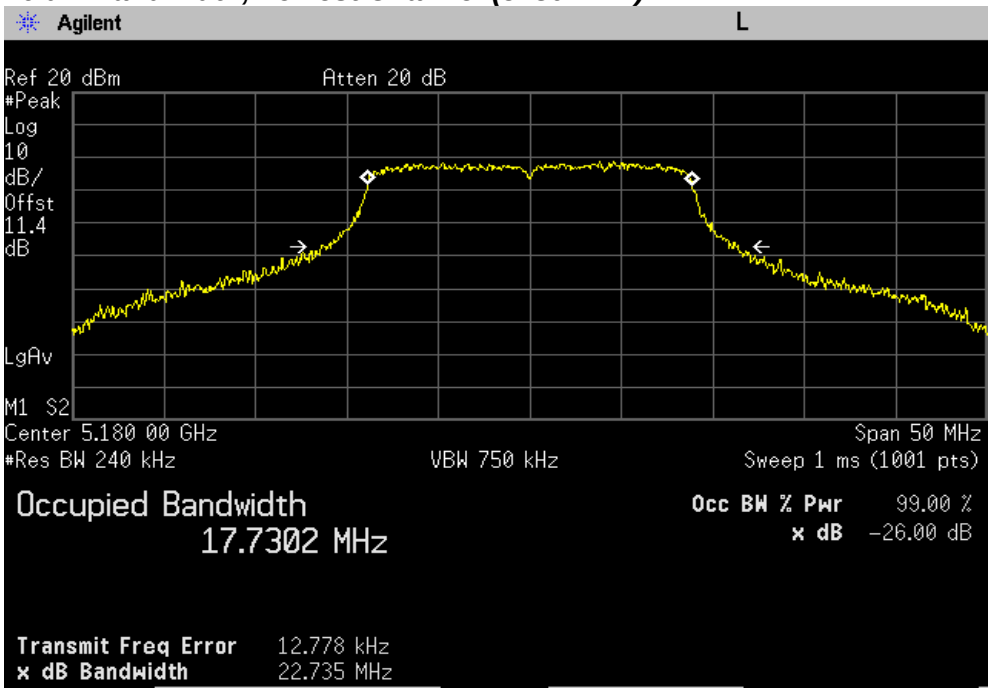
PLOTS OF EMISSIONS

26 dB Bandwidth, Highest Channel (5240 MHz)



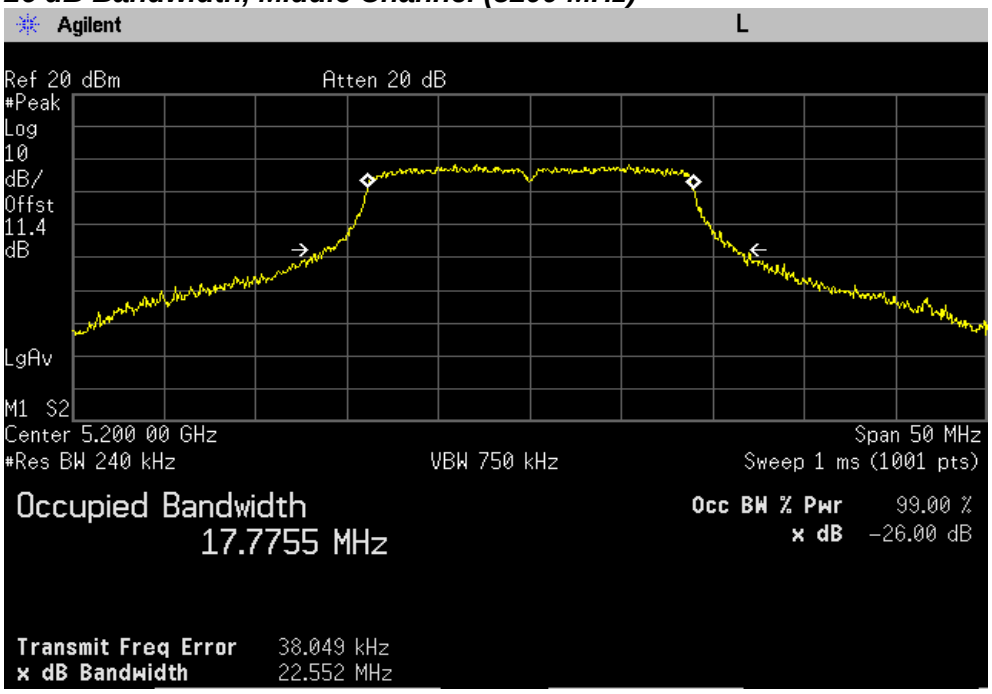
Chain 1

26 dB Bandwidth, Lowest Channel (5180 MHz)

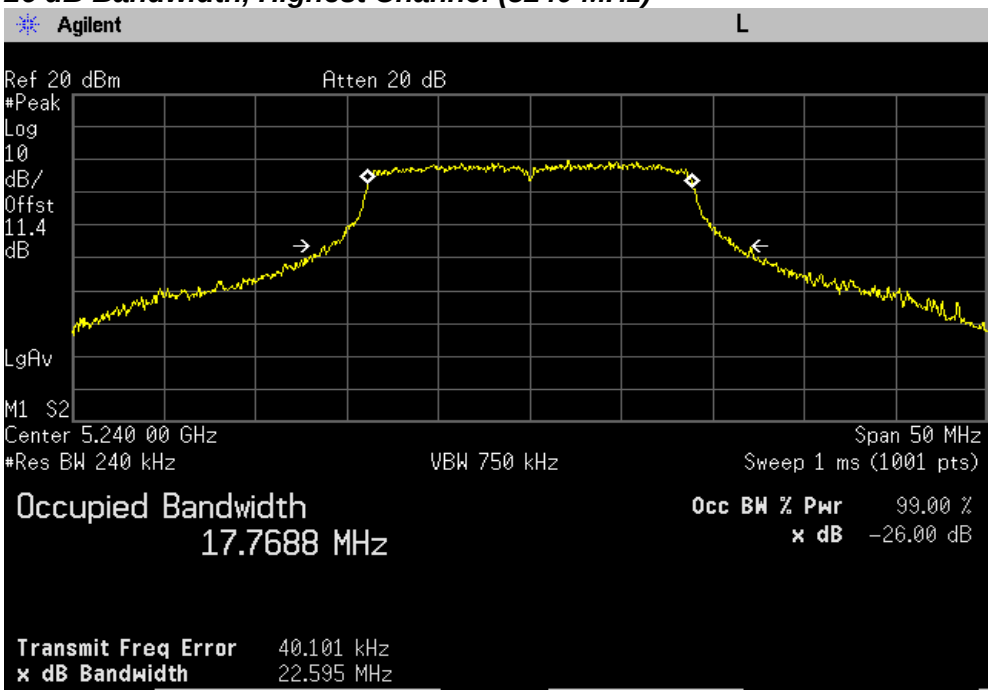


PLOTS OF EMISSIONS

26 dB Bandwidth, Middle Channel (5200 MHz)



26 dB Bandwidth, Highest Channel (5240 MHz)

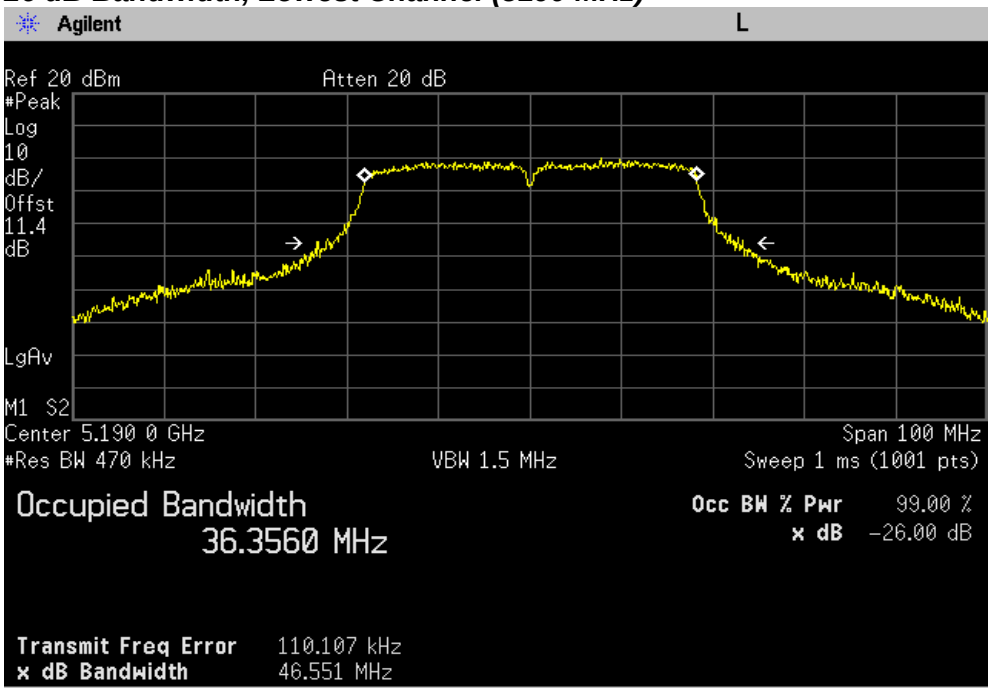


PLOTS OF EMISSIONS

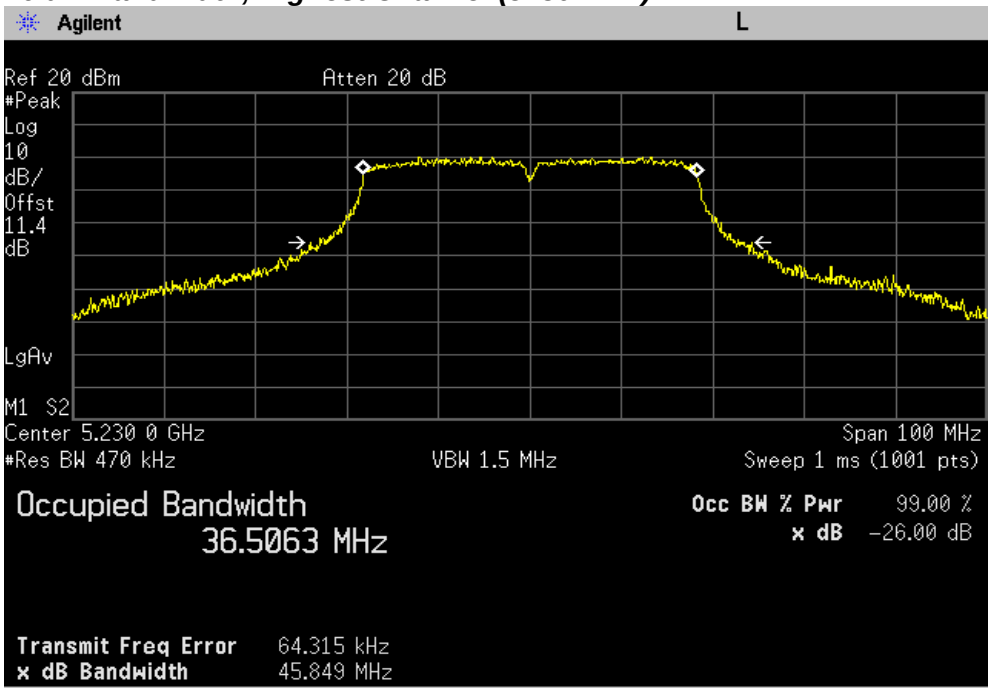
802.11n(40 MHz) mode

Chain 0

26 dB Bandwidth, Lowest Channel (5190 MHz)



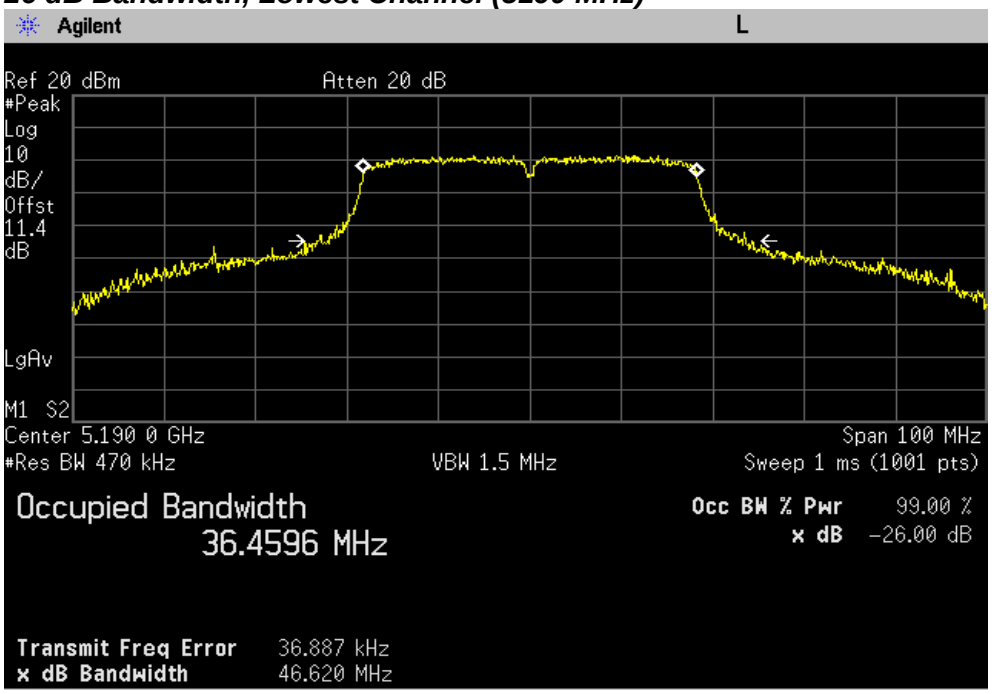
26 dB Bandwidth, Highest Channel (5230 MHz)



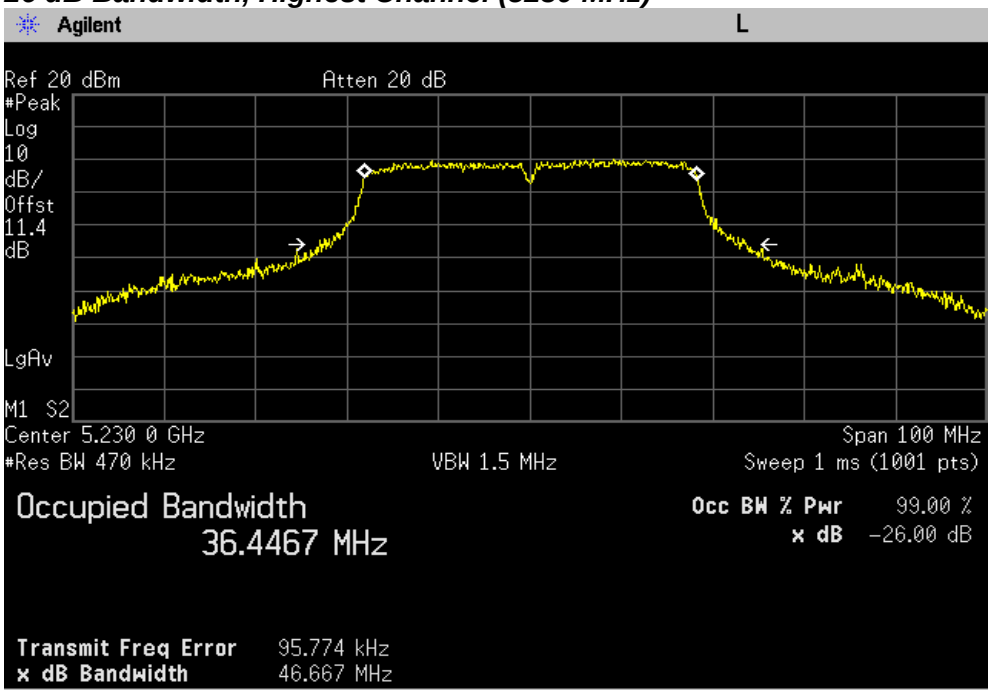
PLOTS OF EMISSIONS

Chain 1

26 dB Bandwidth, Lowest Channel (5190 MHz)



26 dB Bandwidth, Highest Channel (5230 MHz)



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

FCC §15.407(a)

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

802.11a mode

Channel	Frequency (MHz)	26 dB Bandiwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Low	5260	24.57	26.15	17.05	17.04
Middle	5280	25.44	26.94	17.01	17.12
High	5320	24.37	25.92	17.03	17.14

802.11n (20 MHz) mode

Channel	Frequency (MHz)	26 dB Bandiwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Low	5260	24.37	24.98	18.01	17.92
Middle	5280	24.55	24.54	17.97	18.00
High	5320	24.40	25.26	18.03	17.96

802.11n (40 MHz) mode

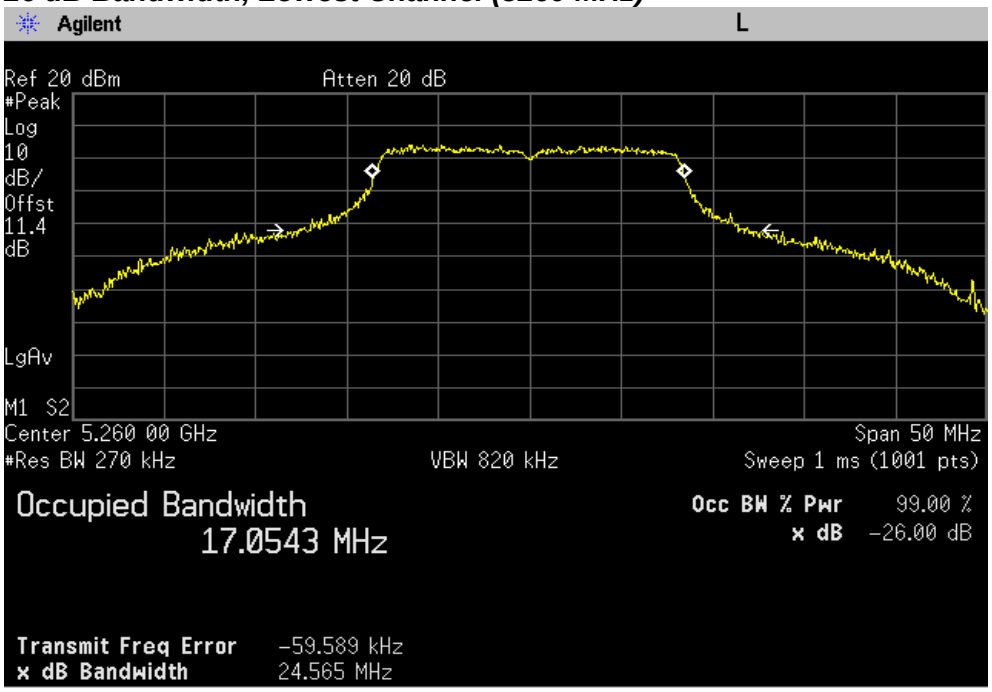
Channel	Frequency (MHz)	26 dB Bandiwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Low	5270	46.92	46.81	36.62	36.49
High	5310	47.22	47.10	36.54	36.62

PLOTS OF EMISSIONS

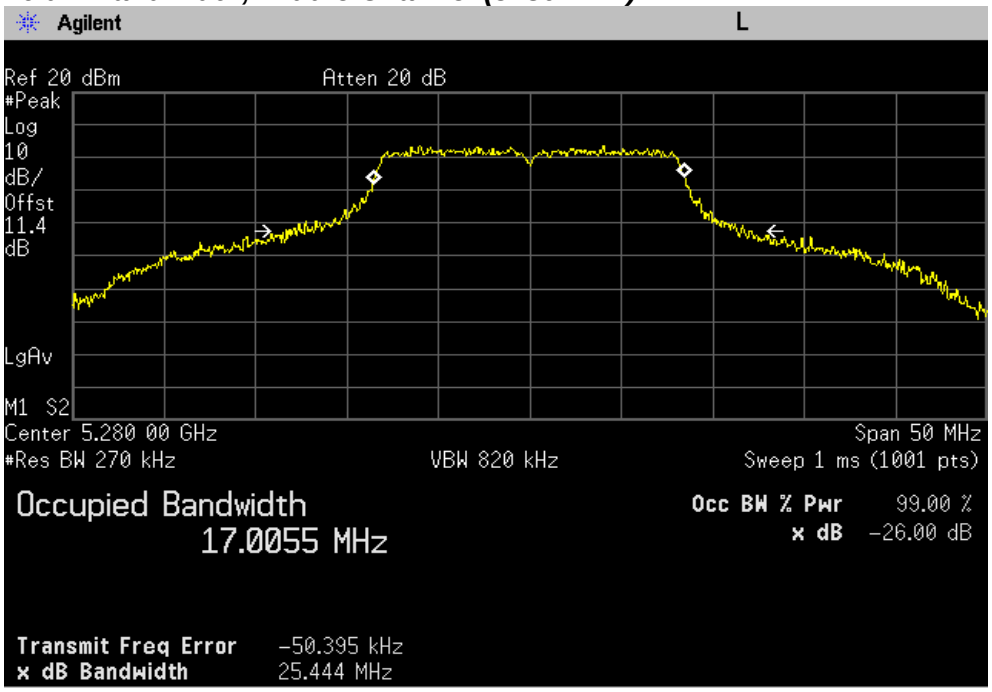
802.11a mode

Chain 0

26 dB Bandwidth, Lowest Channel (5260 MHz)

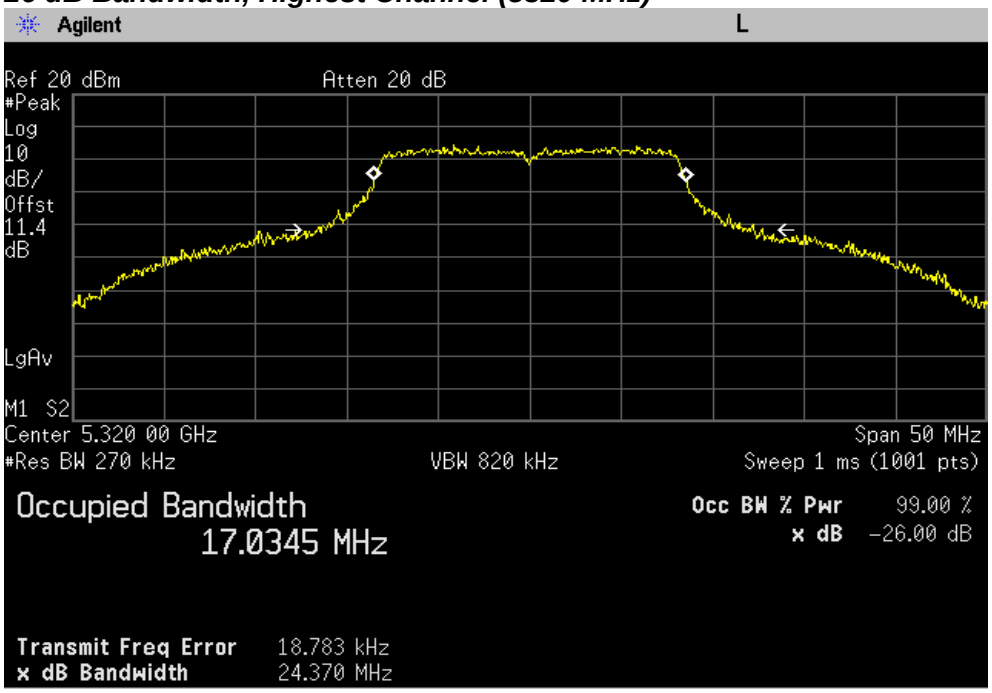


26 dB Bandwidth, Middle Channel (5280 MHz)



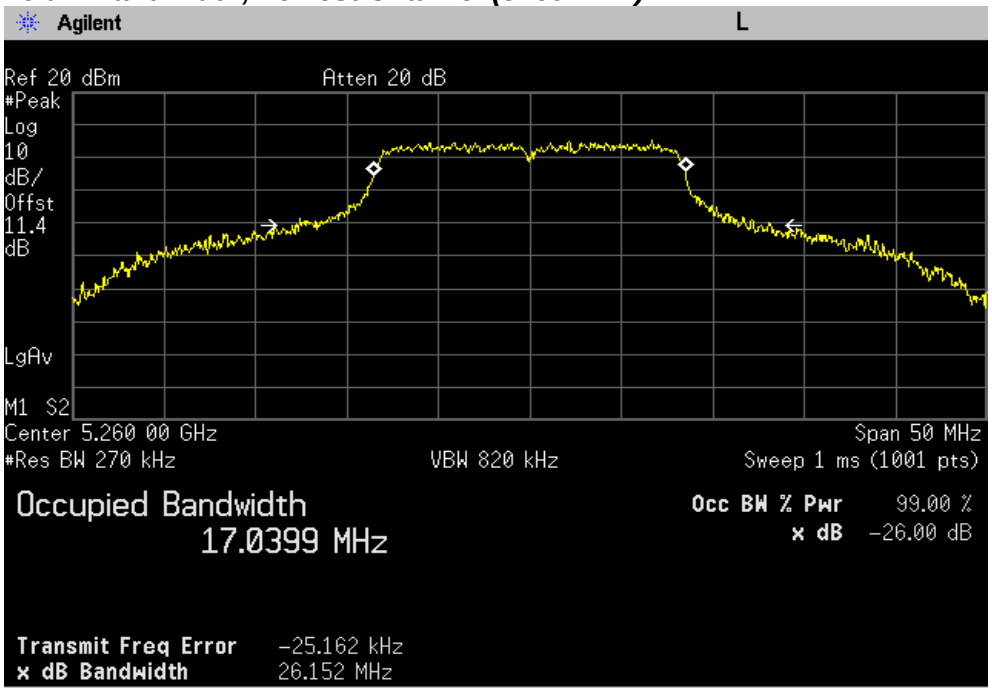
PLOTS OF EMISSIONS

26 dB Bandwidth, Highest Channel (5320 MHz)



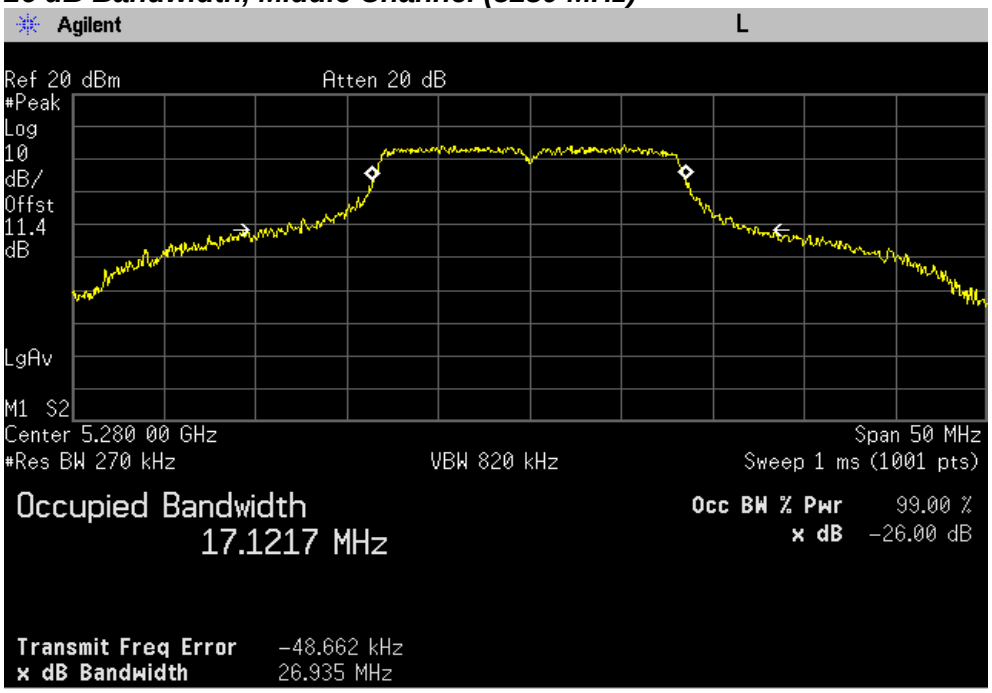
Chain 1

26 dB Bandwidth, Lowest Channel (5260 MHz)

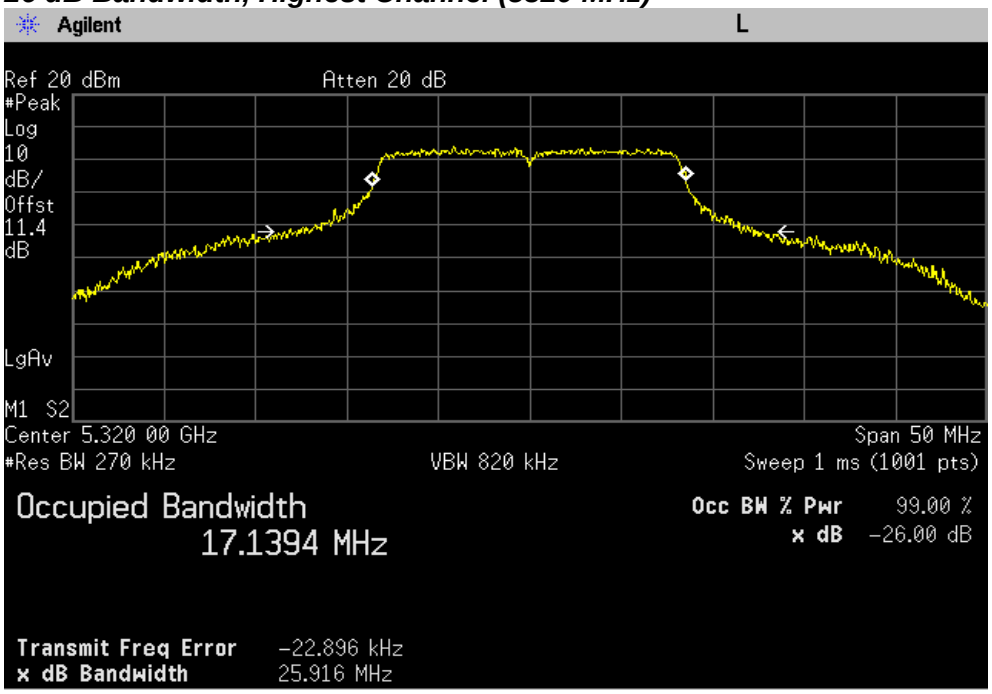


PLOTS OF EMISSIONS

26 dB Bandwidth, Middle Channel (5280 MHz)



26 dB Bandwidth, Highest Channel (5320 MHz)

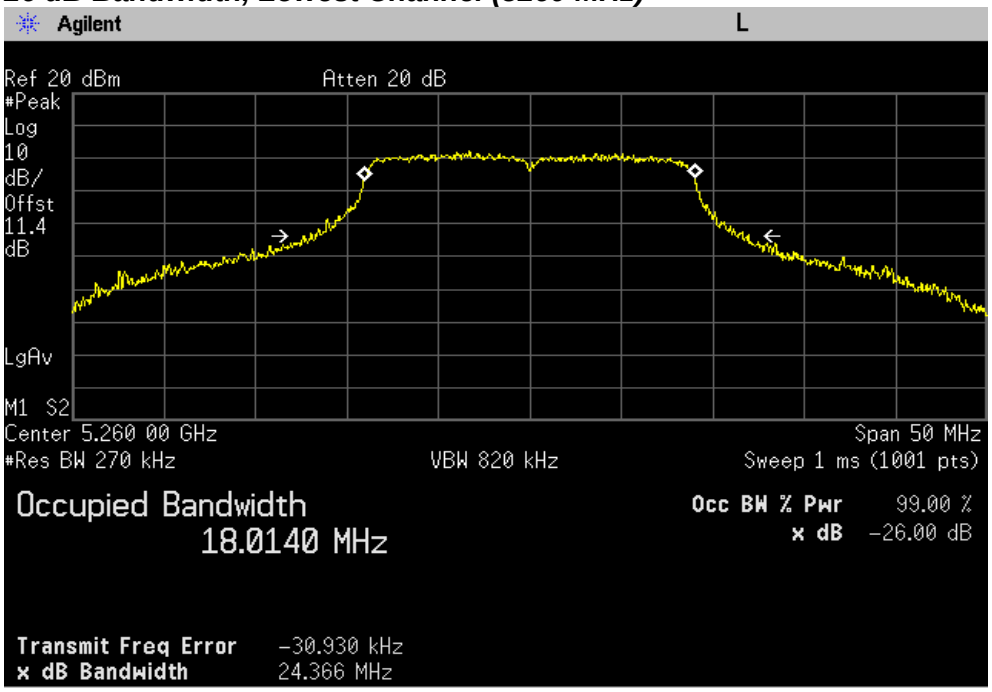


PLOTS OF EMISSIONS

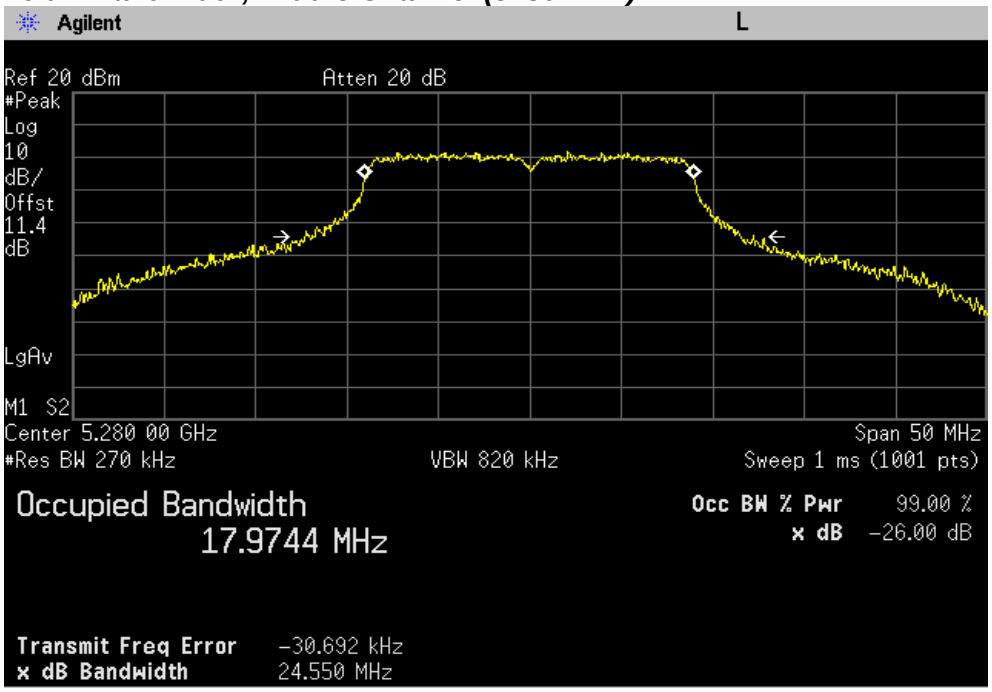
802.11n(20 MHz) mode

Chain 0

26 dB Bandwidth, Lowest Channel (5260 MHz)

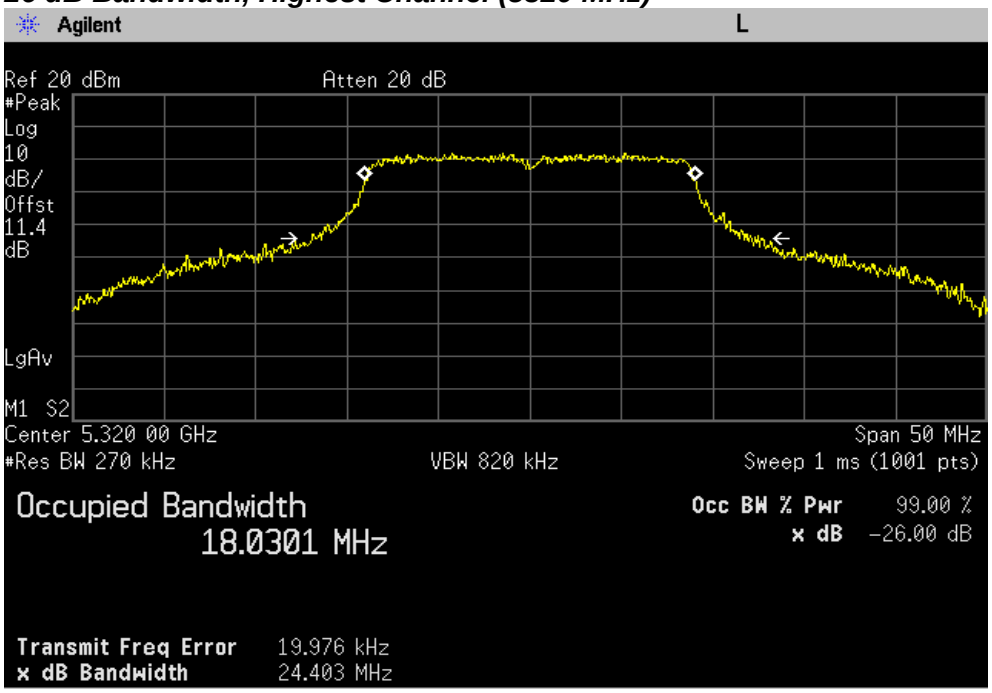


26 dB Bandwidth, Middle Channel (5280 MHz)



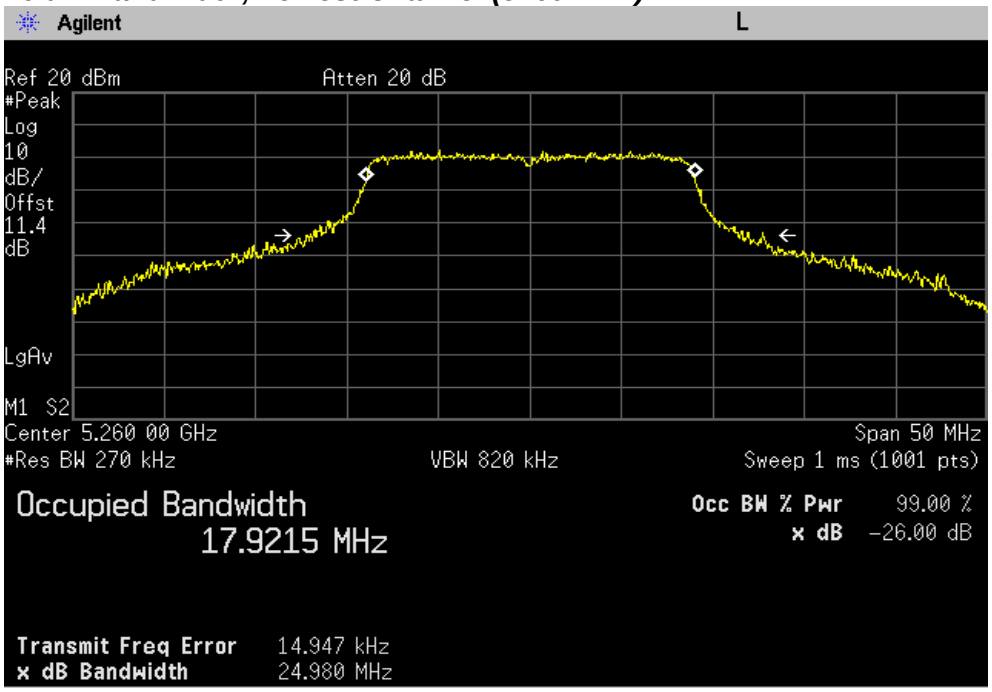
PLOTS OF EMISSIONS

26 dB Bandwidth, Highest Channel (5320 MHz)



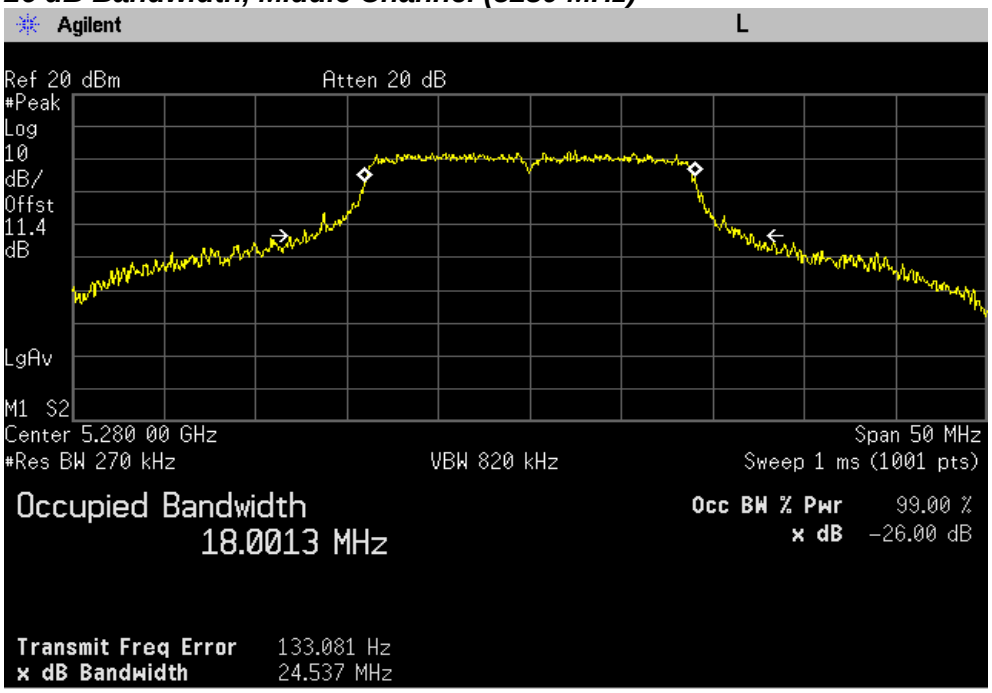
Chain 1

26 dB Bandwidth, Lowest Channel (5260 MHz)

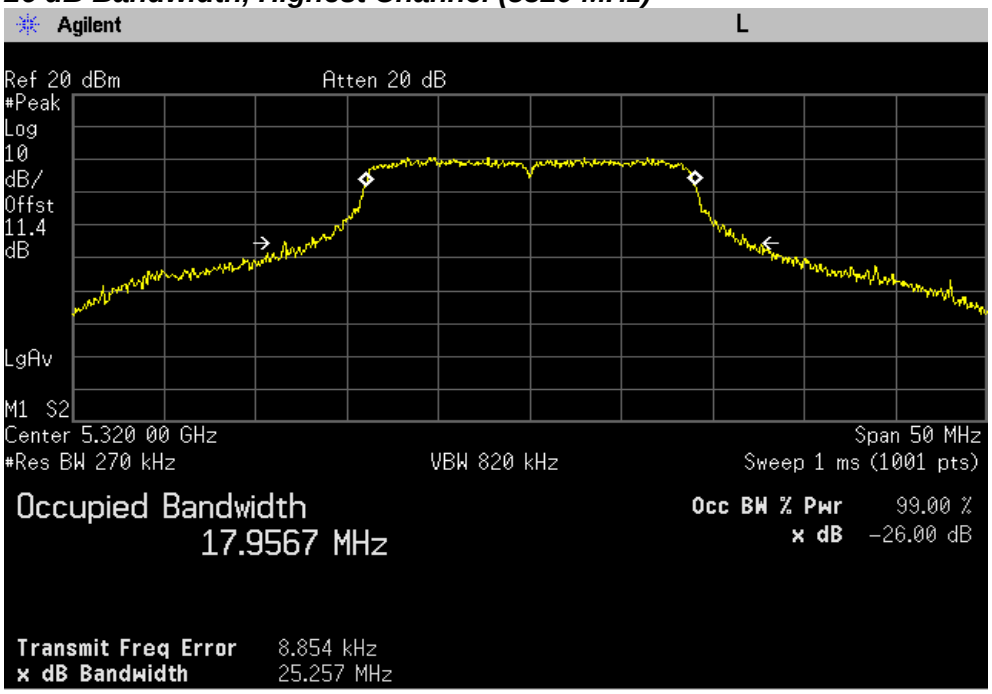


PLOTS OF EMISSIONS

26 dB Bandwidth, Middle Channel (5280 MHz)



26 dB Bandwidth, Highest Channel (5320 MHz)

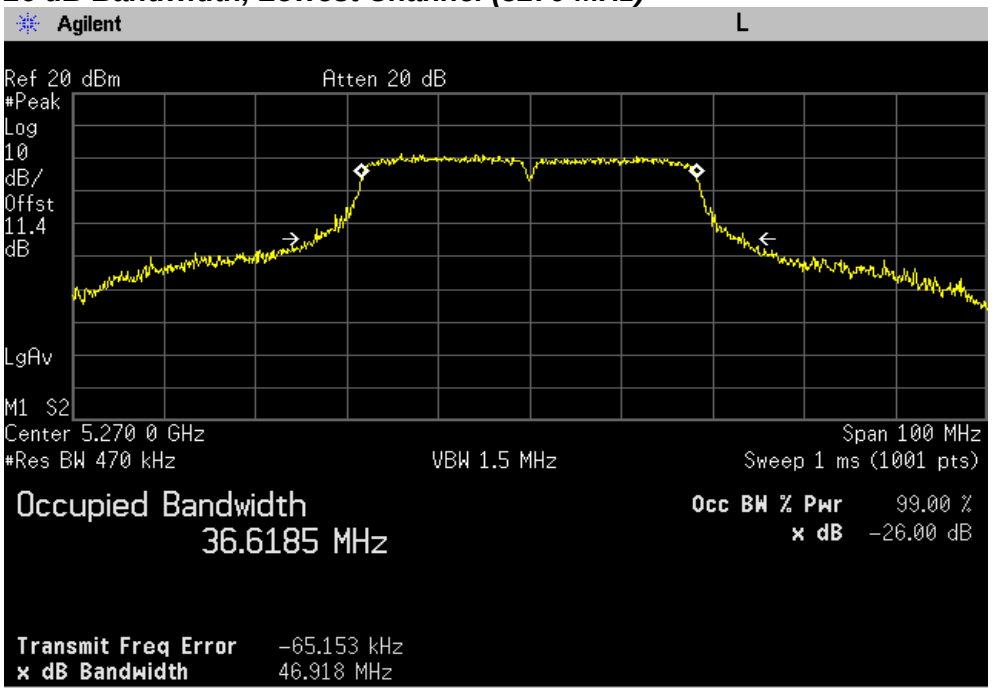


PLOTS OF EMISSIONS

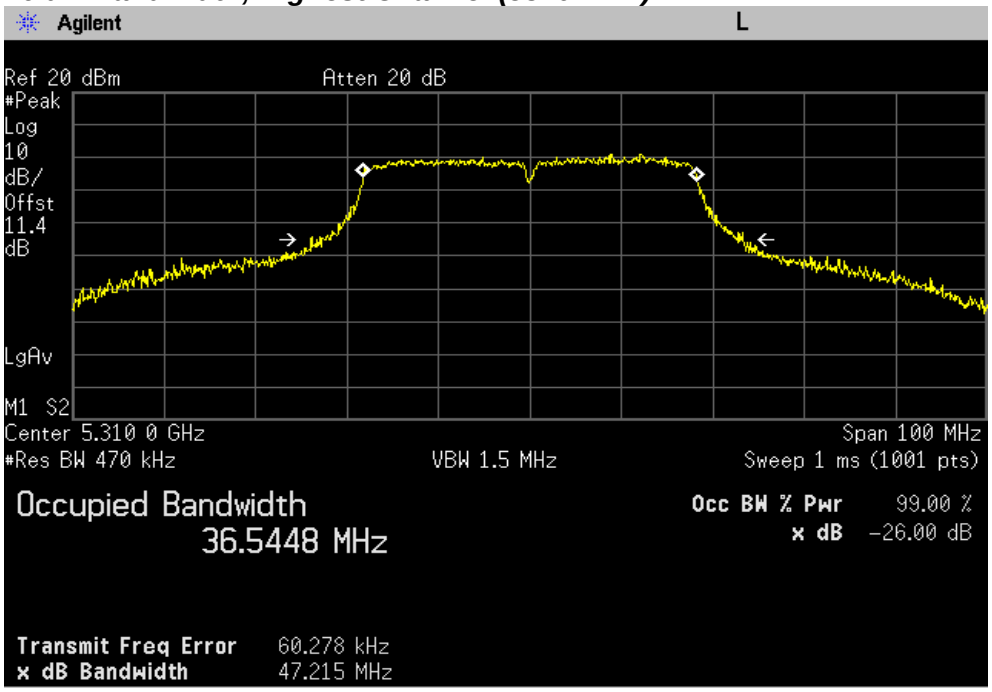
802.11n(40 MHz) mode

Chain 0

26 dB Bandwidth, Lowest Channel (5270 MHz)



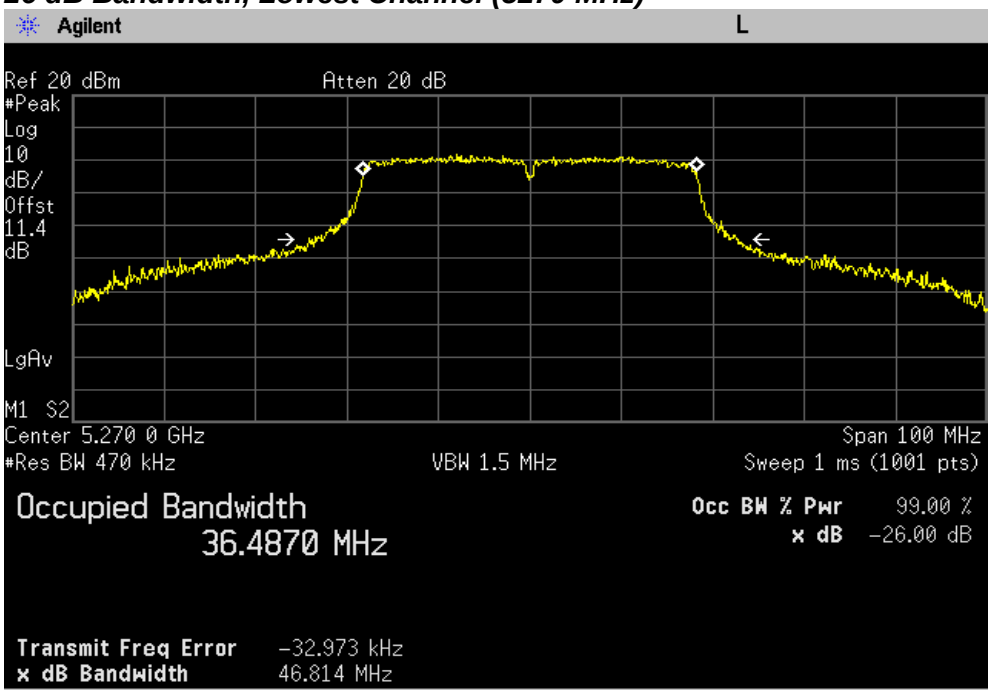
26 dB Bandwidth, Highest Channel (5310 MHz)



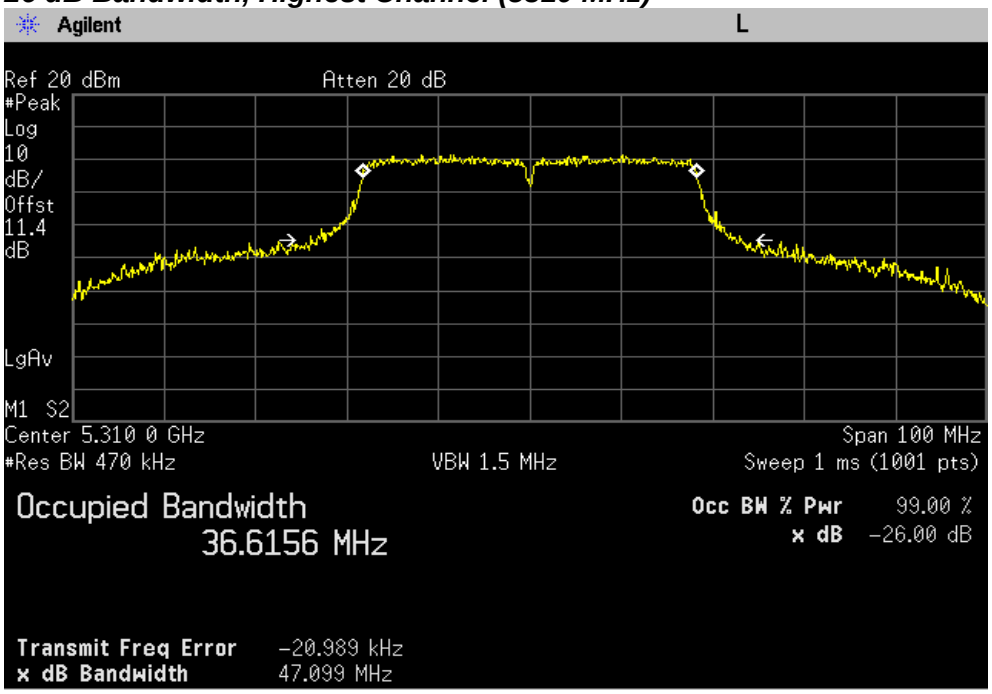
PLOTS OF EMISSIONS

Chain 1

26 dB Bandwidth, Lowest Channel (5270 MHz)



26 dB Bandwidth, Highest Channel (5310 MHz)



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

FCC §15.407(a)

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

802.11a mode

Channel	Frequency (MHz)	26 dB Bandiwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Low	5500	27.46	30.29	17.13	17.47
Middle	5580	27.28	30.03	17.23	17.43
High	5700	27.57	30.29	17.09	17.38

802.11n (20 MHz) mode

Channel	Frequency (MHz)	26 dB Bandiwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Low	5500	25.99	26.43	18.08	17.89
Middle	5580	25.23	26.52	18.05	18.03
High	5700	26.08	26.84	18.02	18.00

802.11n (40 MHz) mode

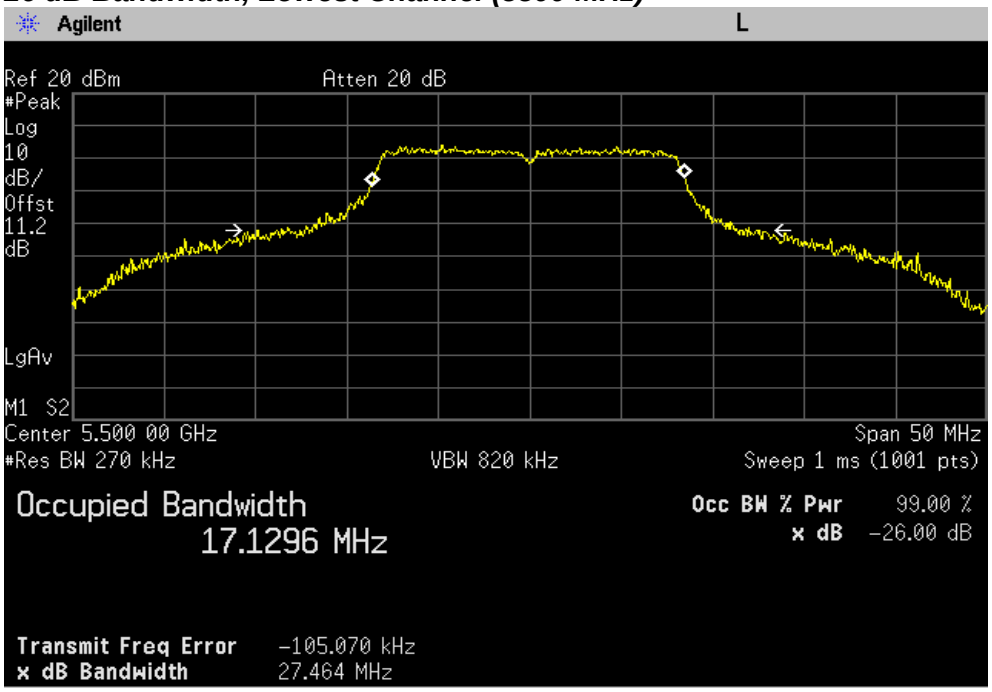
Channel	Frequency (MHz)	26 dB Bandiwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Low	5510	46.79	45.39	36.47	36.46
Middle	5590	45.90	45.71	36.50	36.35
High	5670	46.66	46.81	36.44	36.43

PLOTS OF EMISSIONS

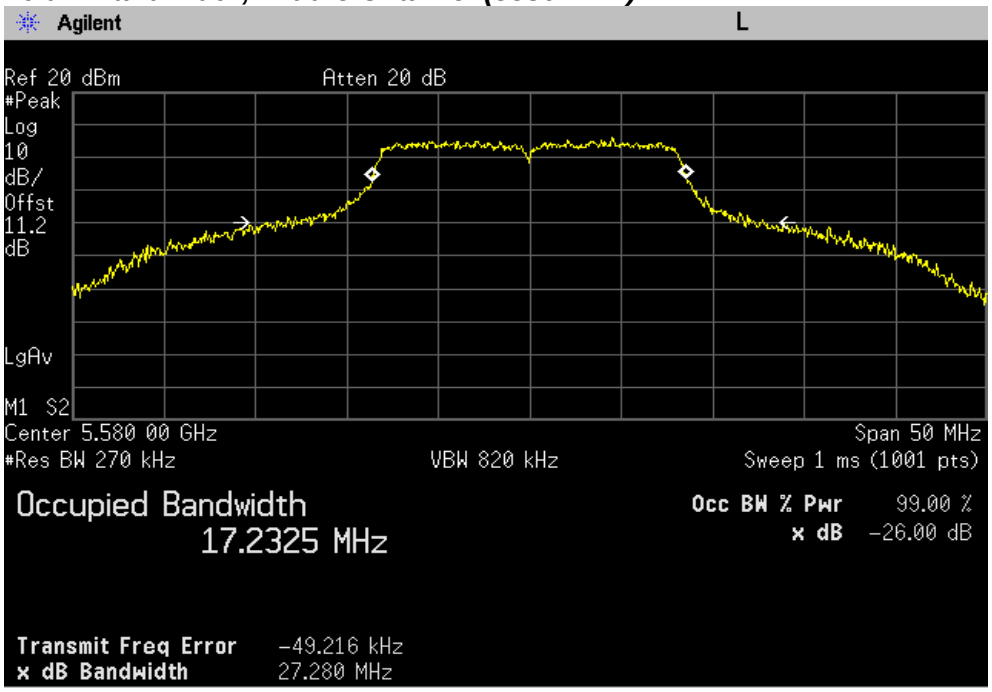
802.11a mode

Chain 0

26 dB Bandwidth, Lowest Channel (5500 MHz)

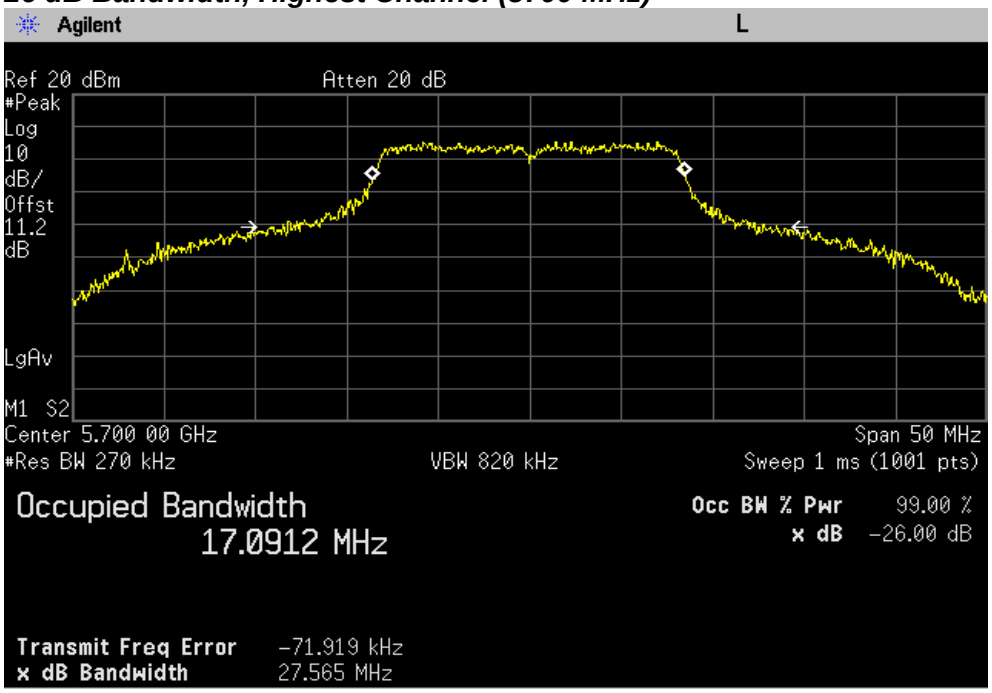


26 dB Bandwidth, Middle Channel (5580 MHz)



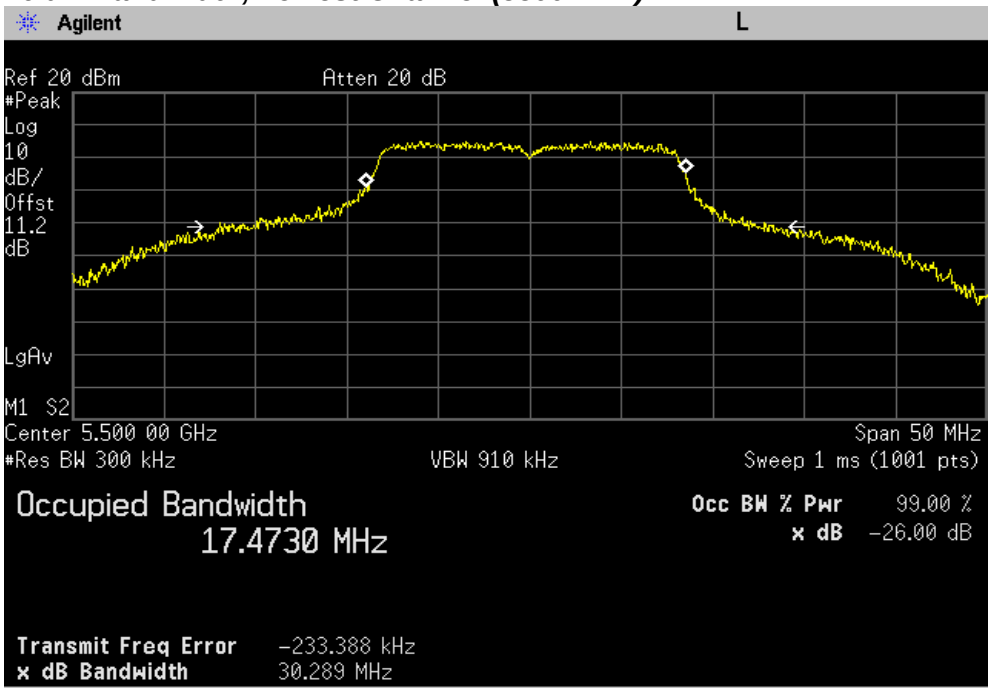
PLOTS OF EMISSIONS

26 dB Bandwidth, Highest Channel (5700 MHz)



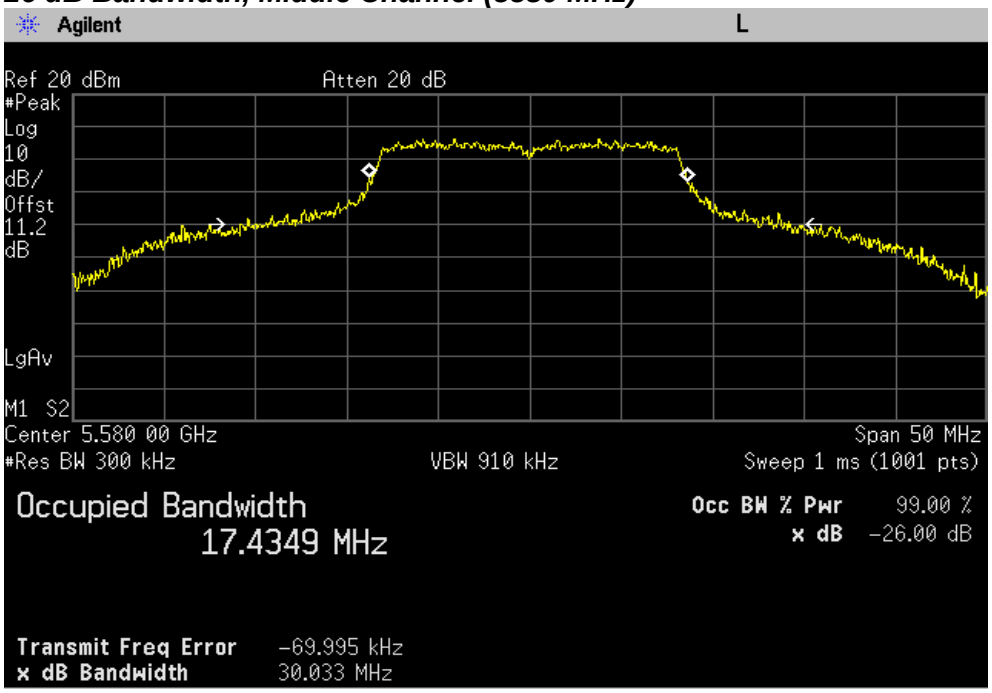
Chain 1

26 dB Bandwidth, Lowest Channel (5500 MHz)

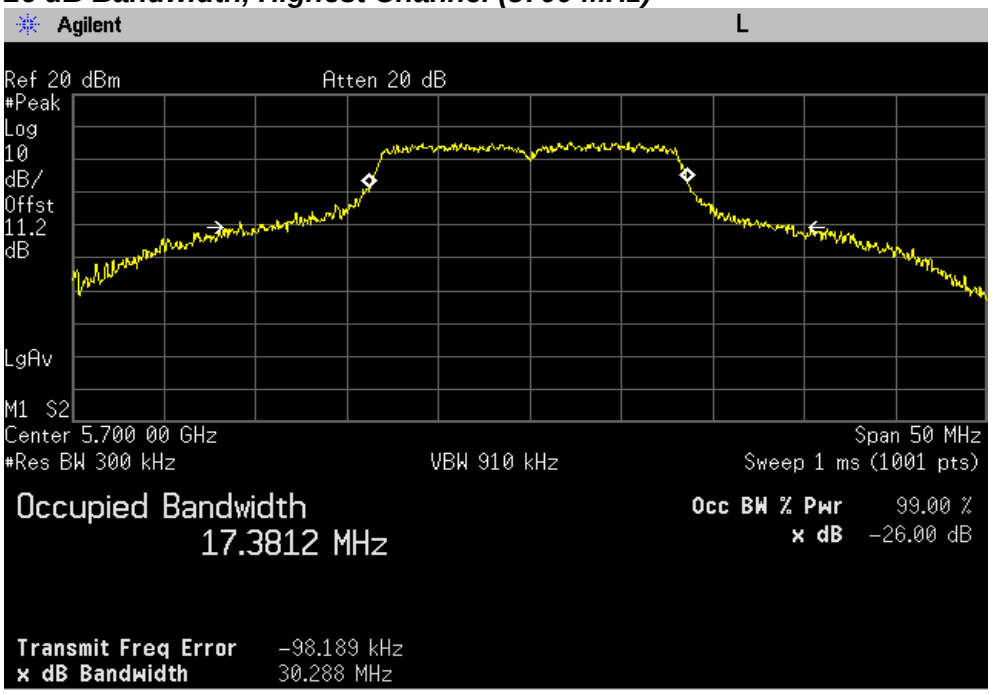


PLOTS OF EMISSIONS

26 dB Bandwidth, Middle Channel (5580 MHz)



26 dB Bandwidth, Highest Channel (5700 MHz)

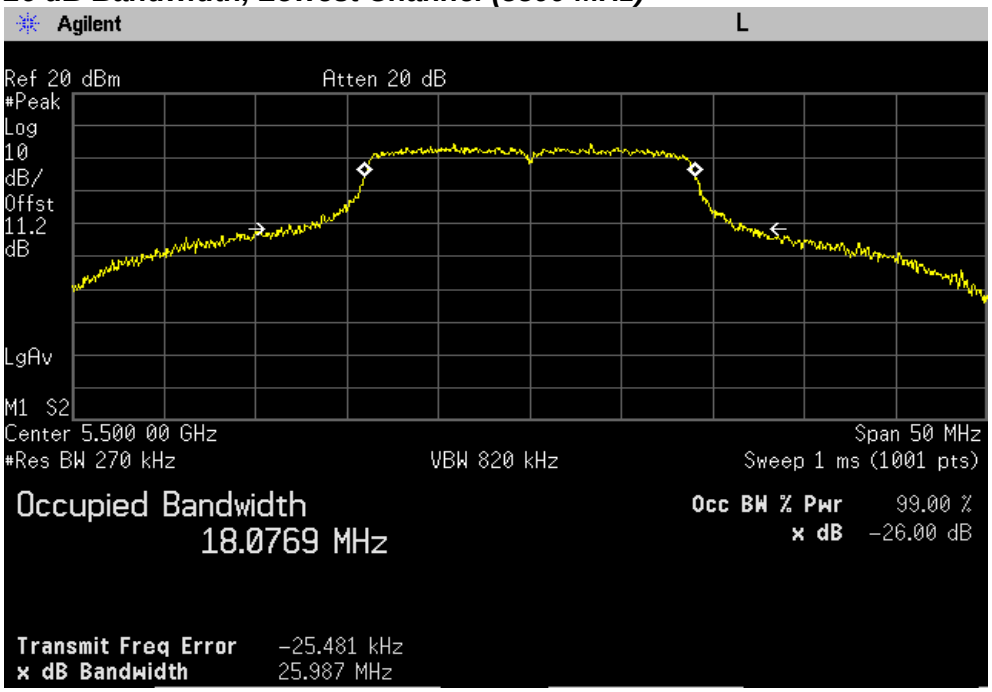


PLOTS OF EMISSIONS

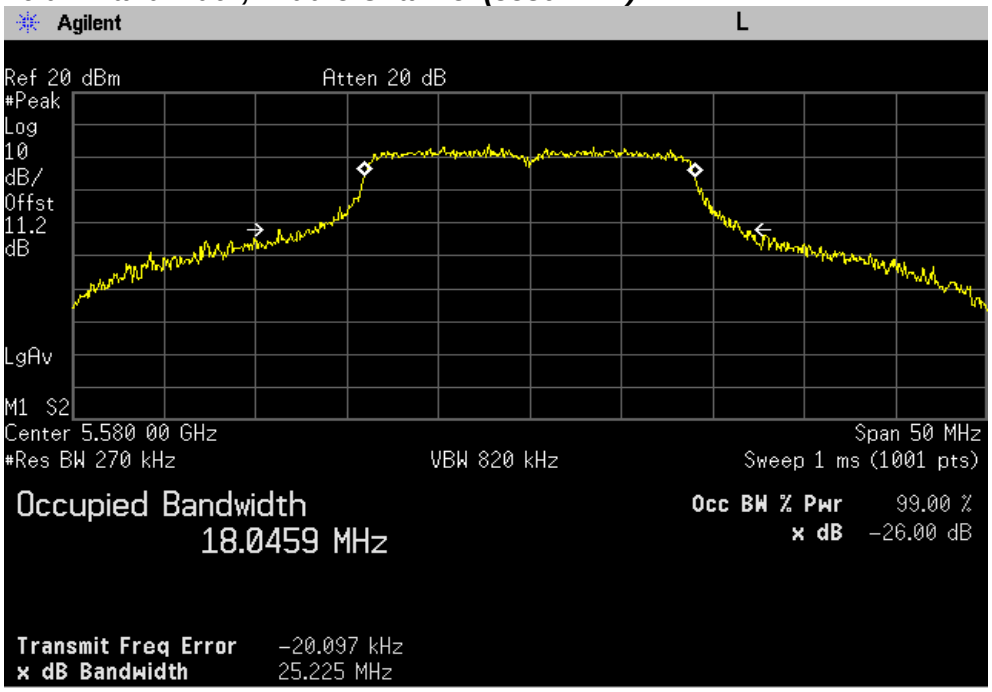
802.11n(20 MHz) mode

Chain 0

26 dB Bandwidth, Lowest Channel (5500 MHz)

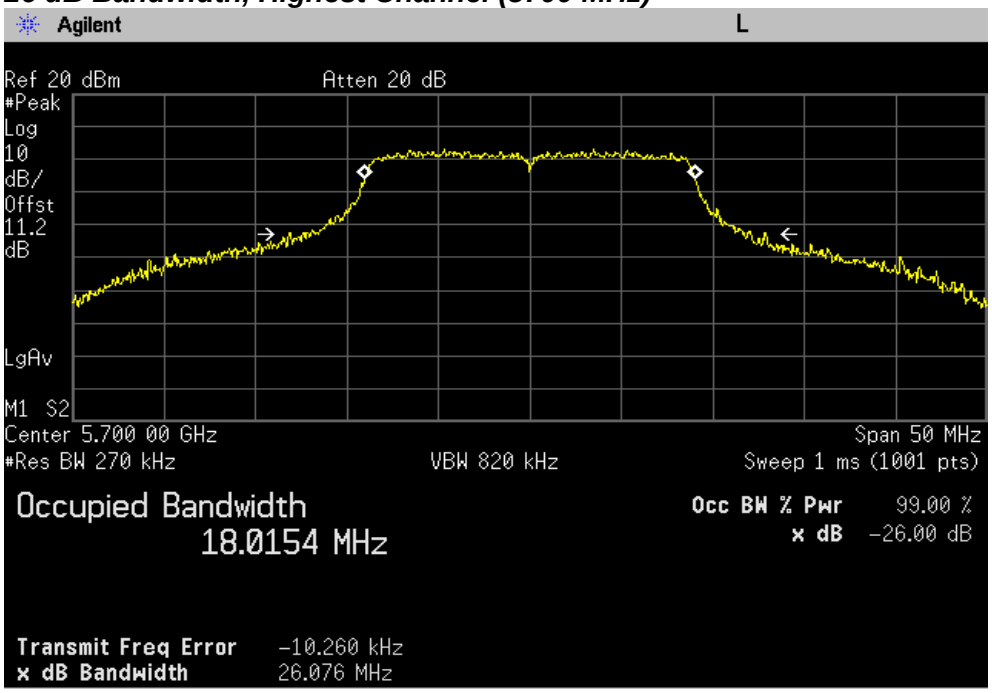


26 dB Bandwidth, Middle Channel (5580 MHz)



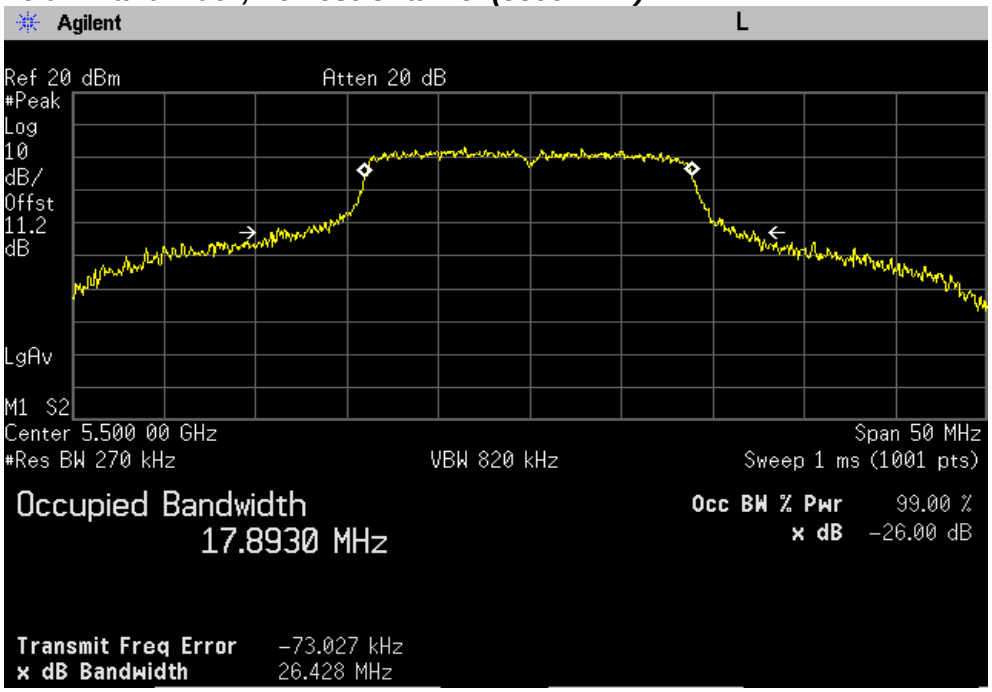
PLOTS OF EMISSIONS

26 dB Bandwidth, Highest Channel (5700 MHz)



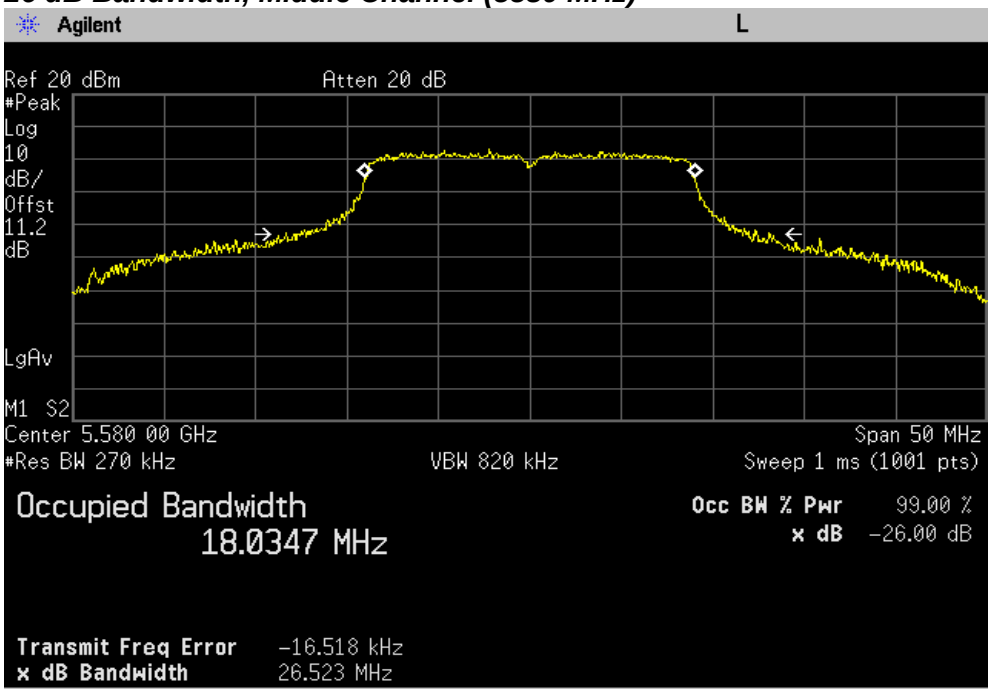
Chain 1

26 dB Bandwidth, Lowest Channel (5500 MHz)

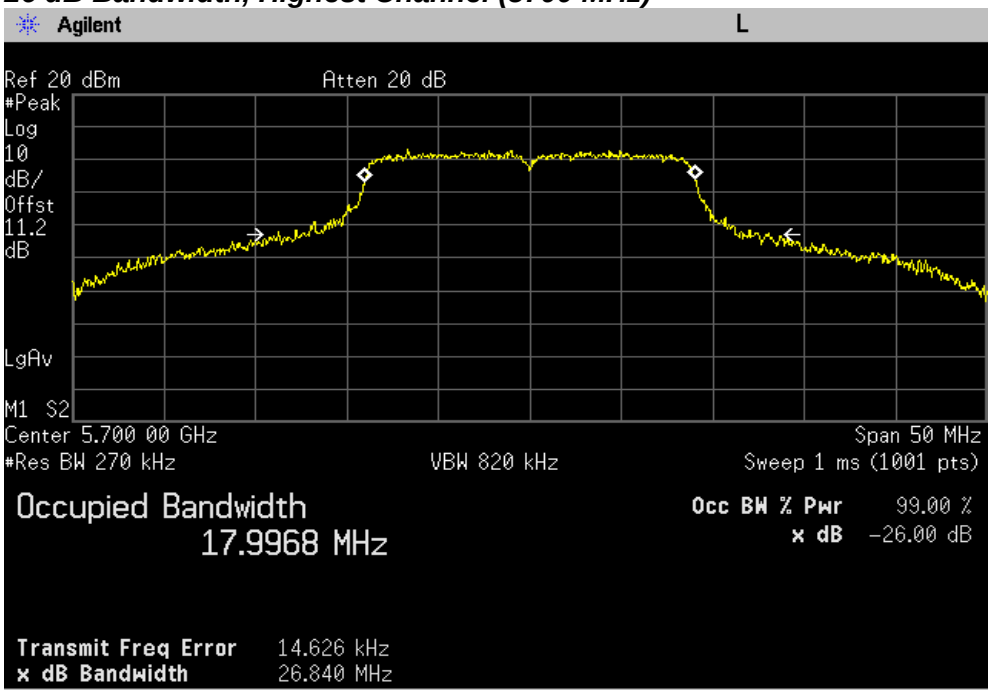


PLOTS OF EMISSIONS

26 dB Bandwidth, Middle Channel (5580 MHz)



26 dB Bandwidth, Highest Channel (5700 MHz)

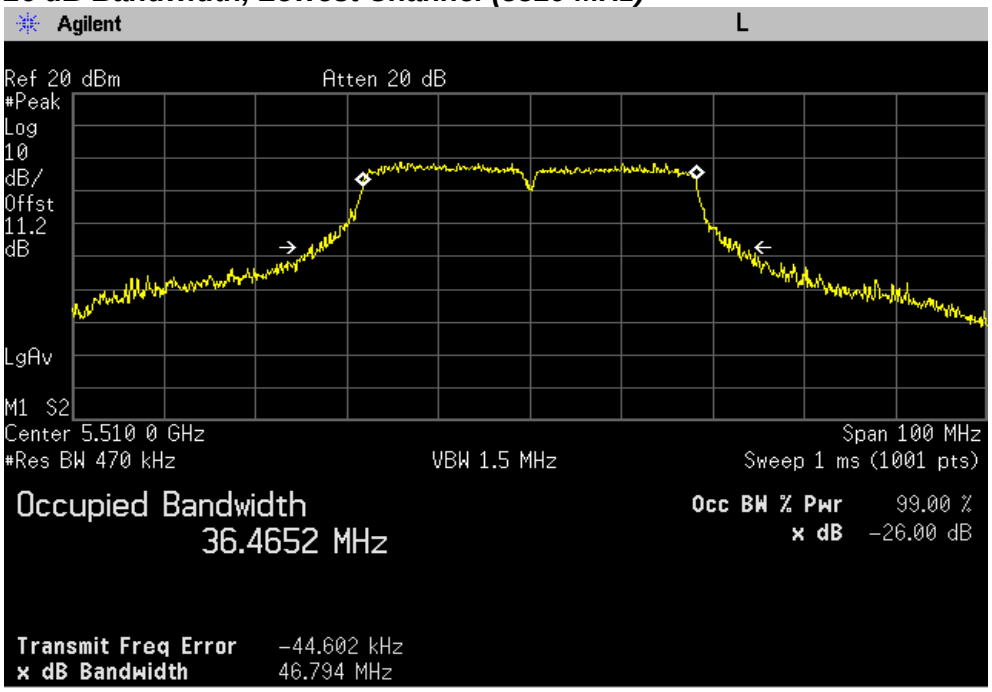


PLOTS OF EMISSIONS

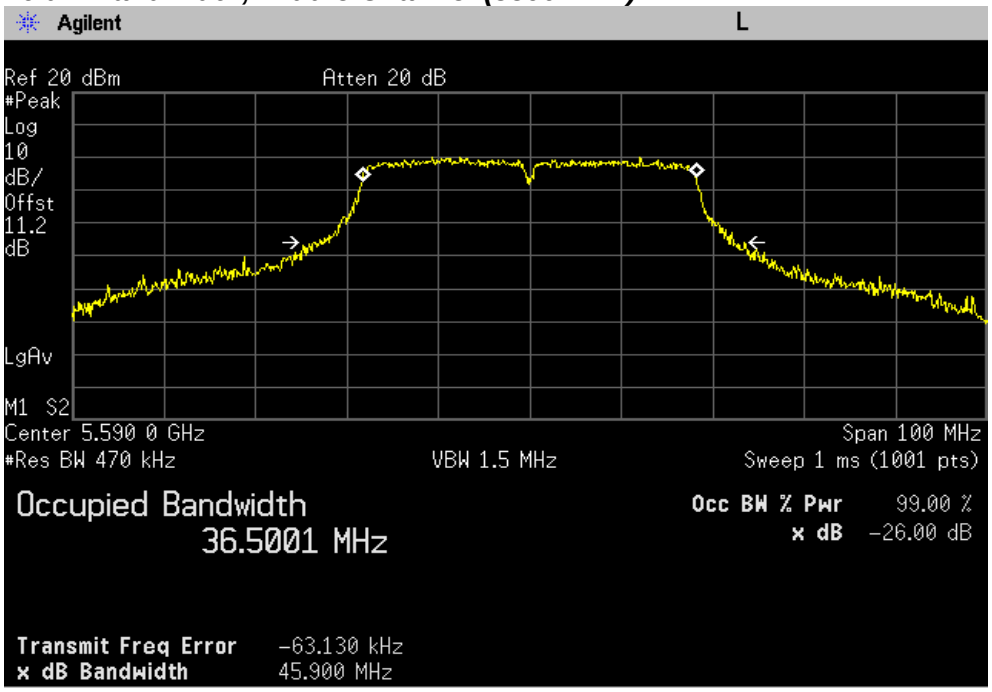
802.11n(40 MHz) mode

Chain 0

26 dB Bandwidth, Lowest Channel (5510 MHz)

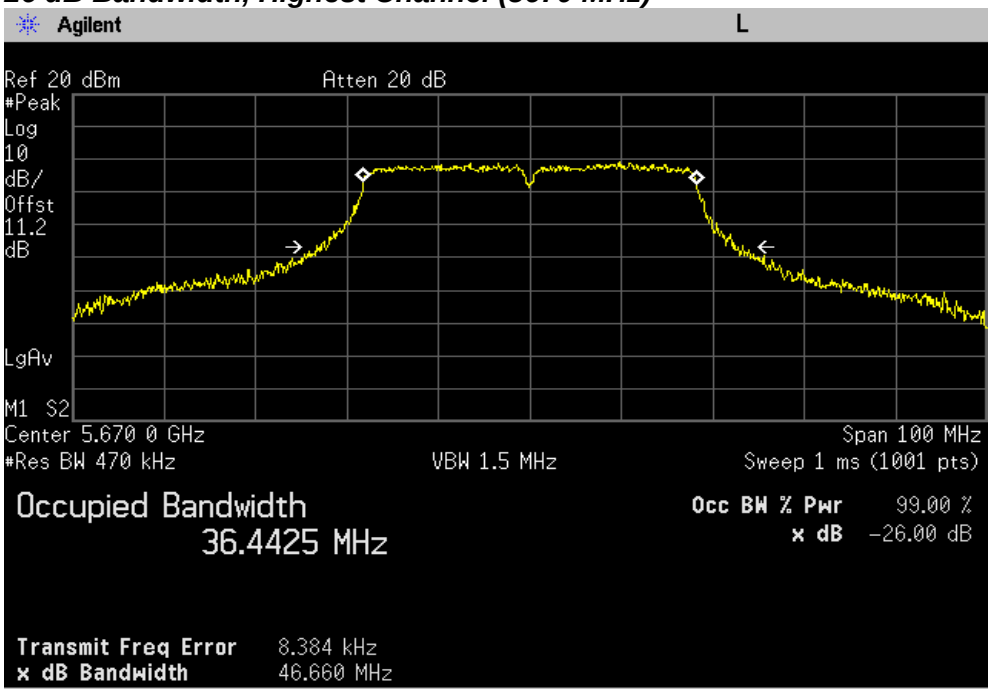


26 dB Bandwidth, Middle Channel (5590 MHz)



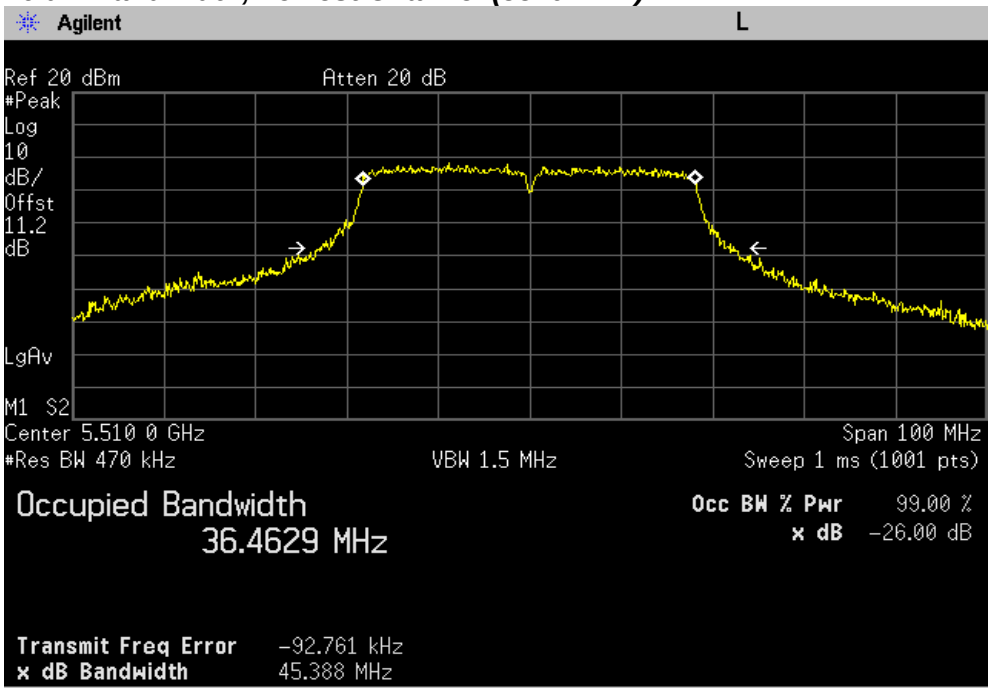
PLOTS OF EMISSIONS

26 dB Bandwidth, Highest Channel (5670 MHz)



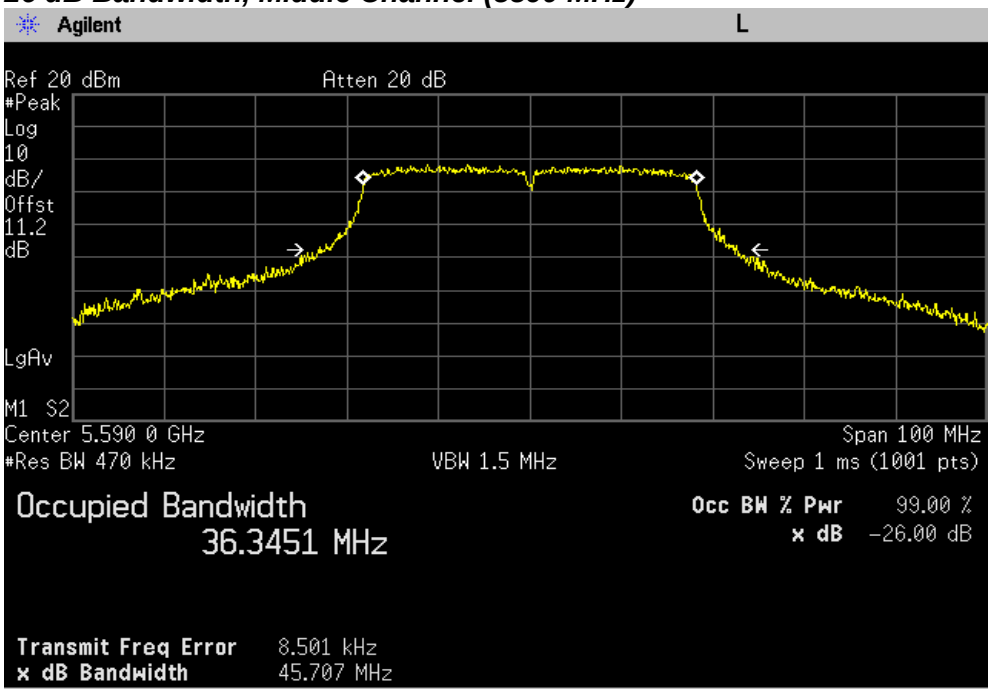
Chain 1

26 dB Bandwidth, Lowest Channel (5510 MHz)

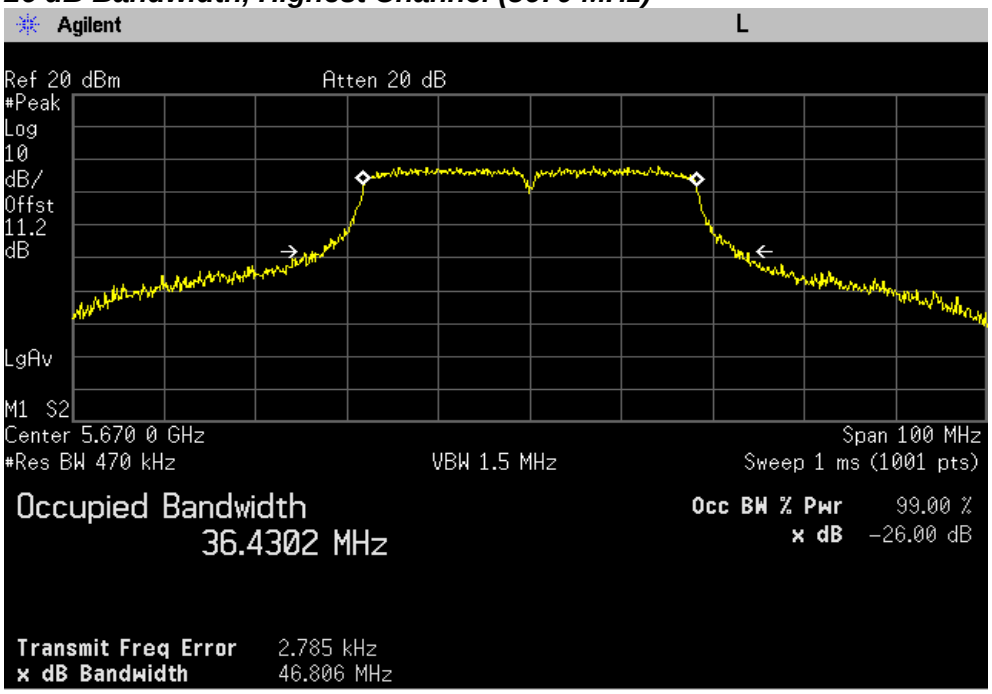


PLOTS OF EMISSIONS

26 dB Bandwidth, Middle Channel (5590 MHz)



26 dB Bandwidth, Highest Channel (5670 MHz)



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

FCC §15.407(a)

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

802.11a mode

Channel	Frequency (MHz)	26 dB Bandiwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Low	5745	23.45	22.84	16.71	16.70
Middle	5785	25.43	23.53	16.74	16.76
High	5825	24.31	22.38	16.78	16.72

802.11n (20 MHz) mode

Channel	Frequency (MHz)	26 dB Bandiwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Low	5745	23.18	24.60	17.86	17.82
Middle	5785	23.34	24.59	17.89	17.84
High	5825	24.00	23.73	17.92	17.85

802.11n (40 MHz) mode

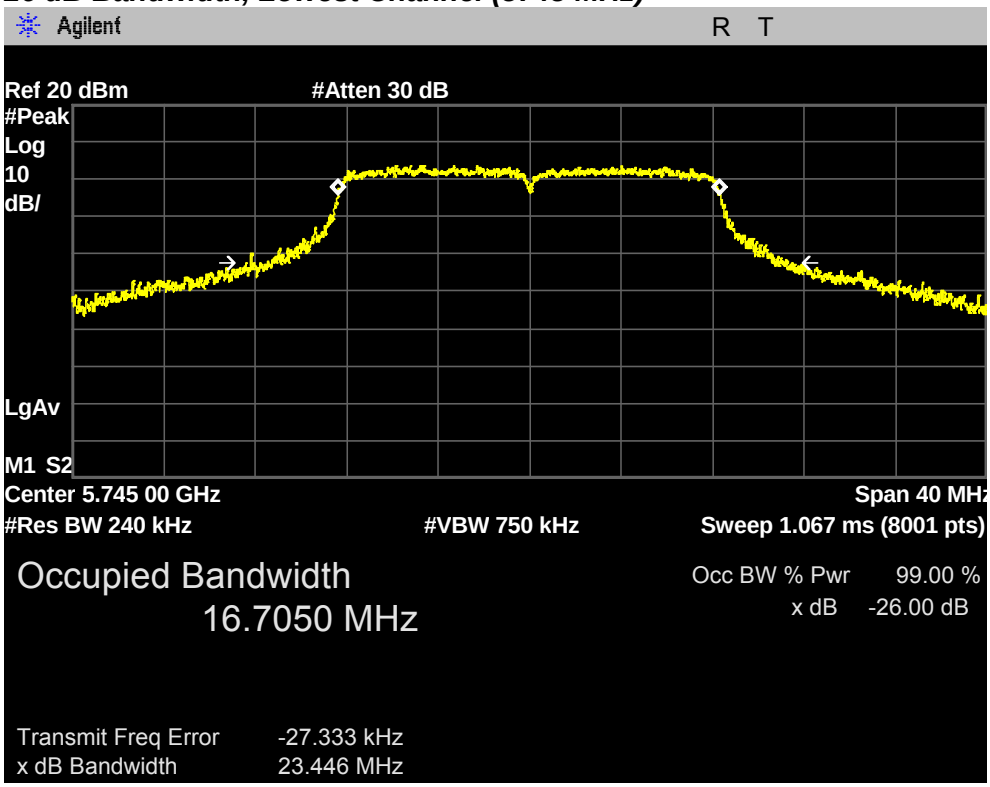
Channel	Frequency (MHz)	26 dB Bandiwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Low	5755	43.62	45.54	36.24	36.32
High	5795	43.72	43.56	36.22	36.28

PLOTS OF EMISSIONS

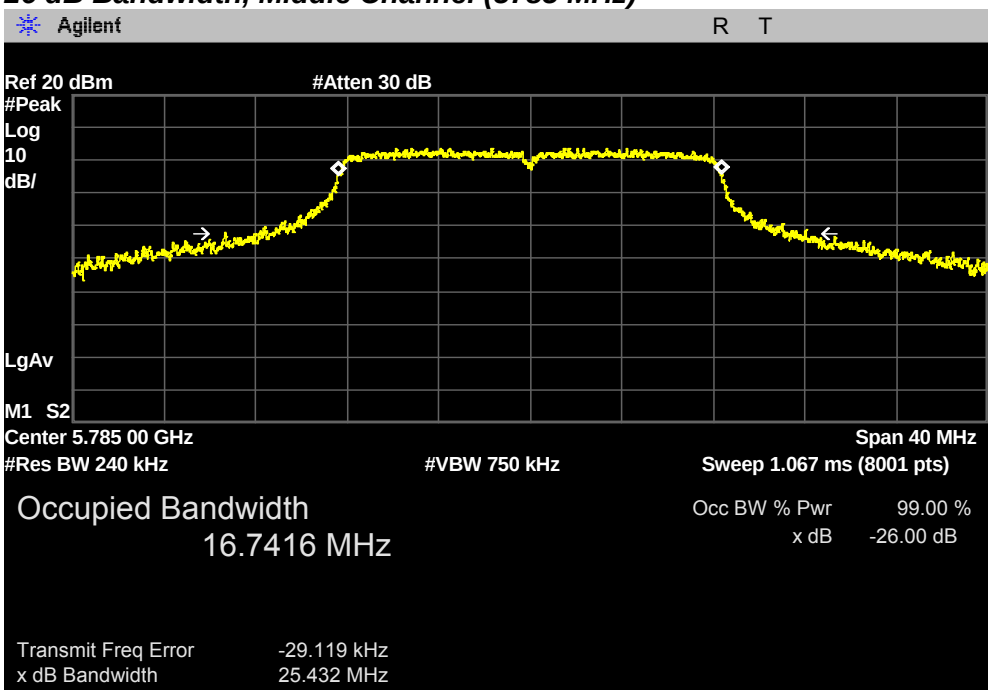
802.11a mode

Chain 0

26 dB Bandwidth, Lowest Channel (5745 MHz)

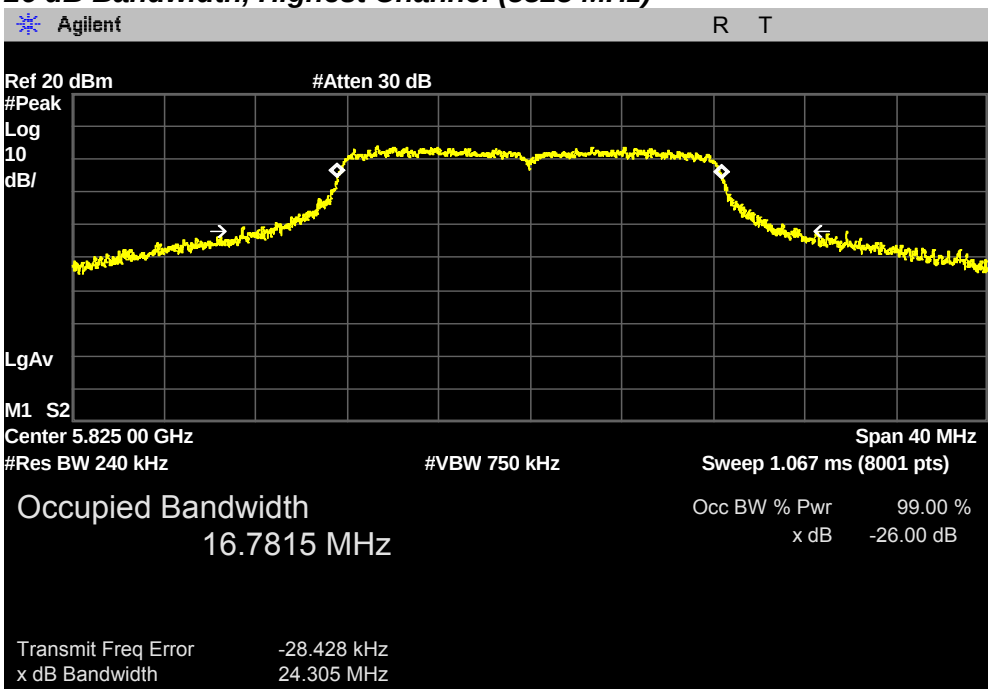


26 dB Bandwidth, Middle Channel (5785 MHz)



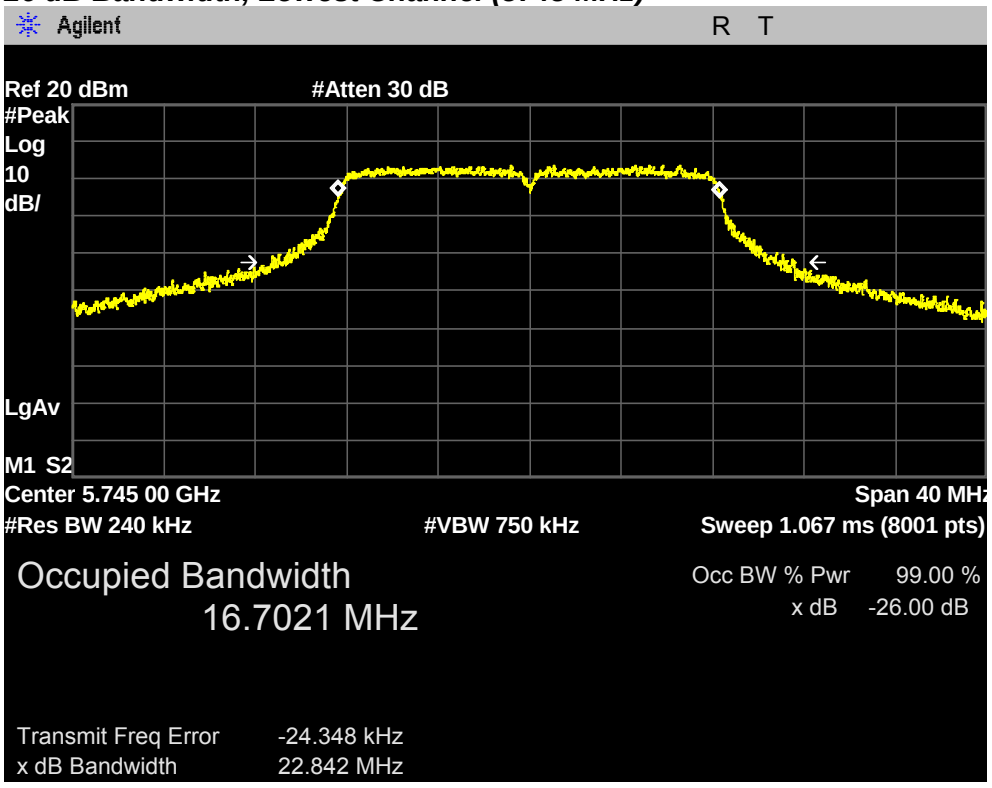
PLOTS OF EMISSIONS

26 dB Bandwidth, Highest Channel (5825 MHz)



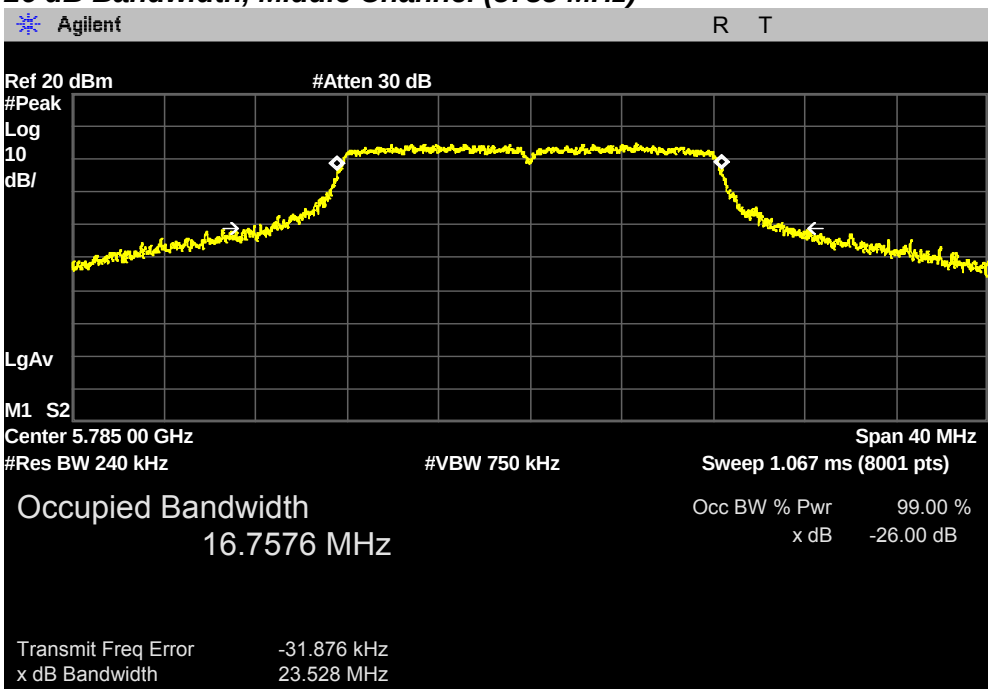
Chain 1

26 dB Bandwidth, Lowest Channel (5745 MHz)

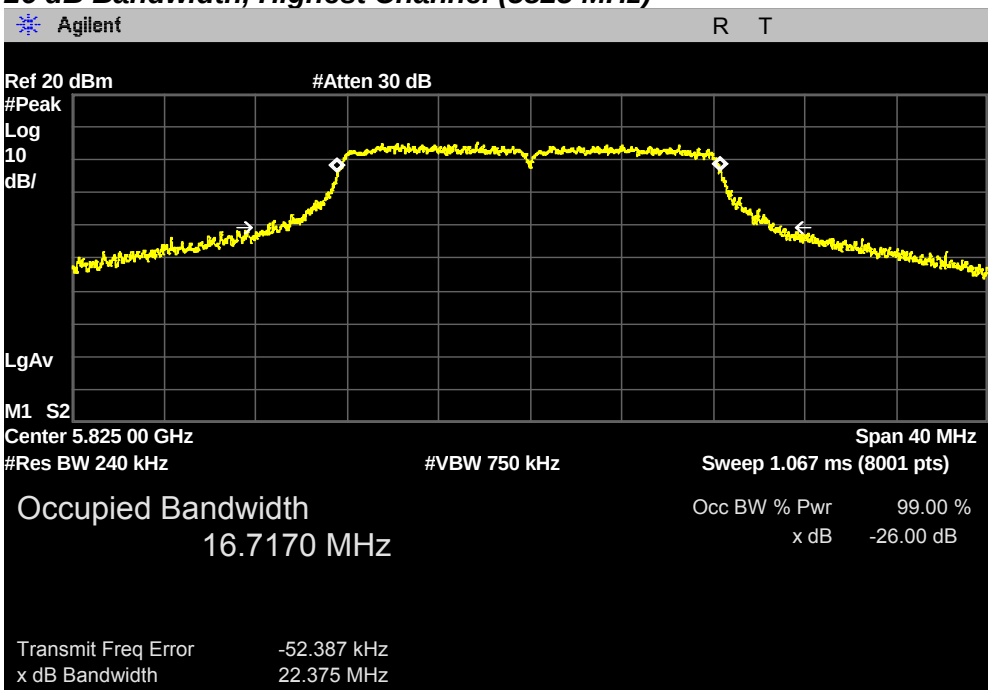


PLOTS OF EMISSIONS

26 dB Bandwidth, Middle Channel (5785 MHz)



26 dB Bandwidth, Highest Channel (5825 MHz)

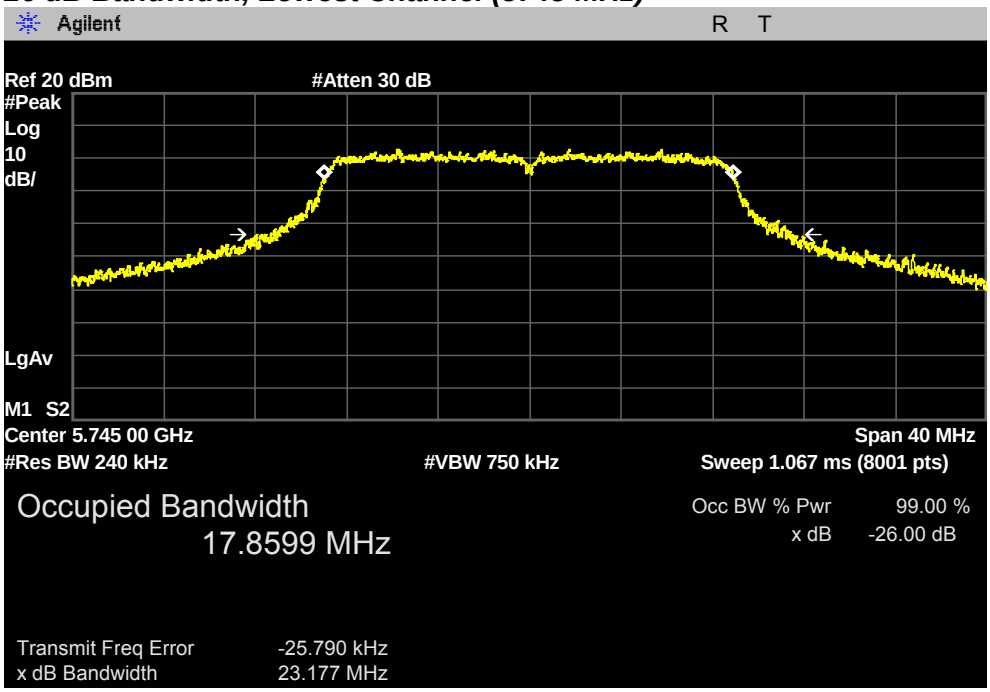


PLOTS OF EMISSIONS

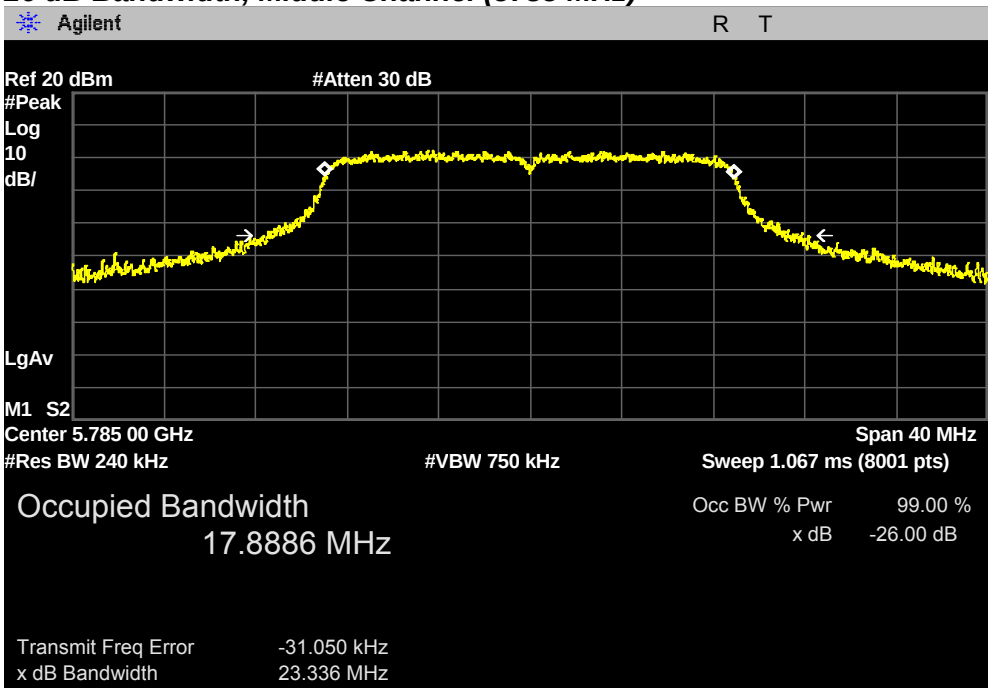
802.11n(20 MHz) mode

Chain 0

26 dB Bandwidth, Lowest Channel (5745 MHz)

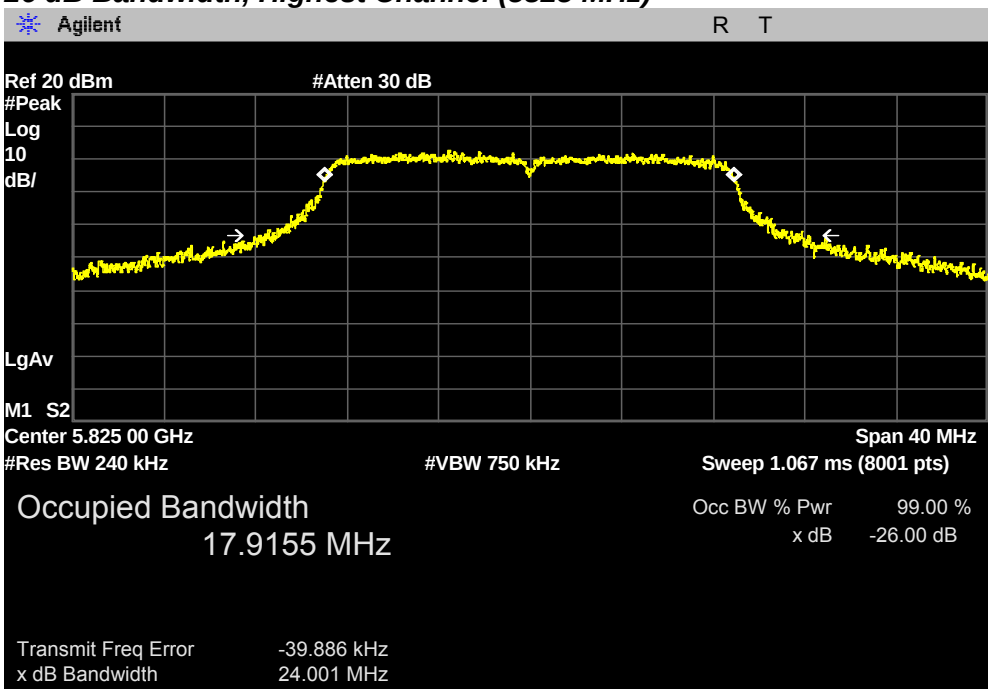


26 dB Bandwidth, Middle Channel (5785 MHz)



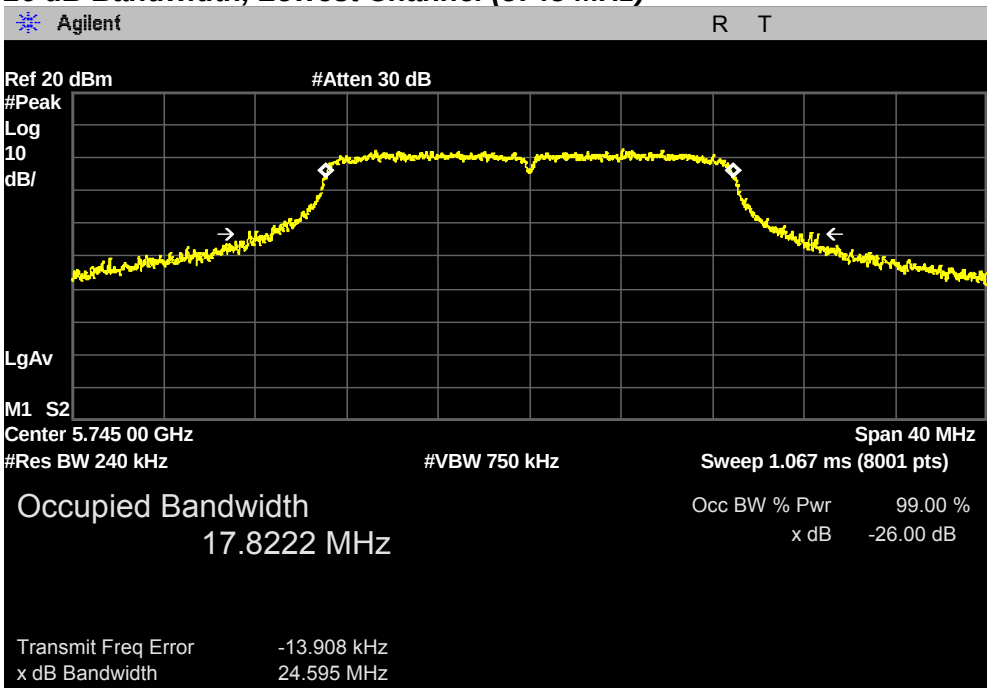
PLOTS OF EMISSIONS

26 dB Bandwidth, Highest Channel (5825 MHz)



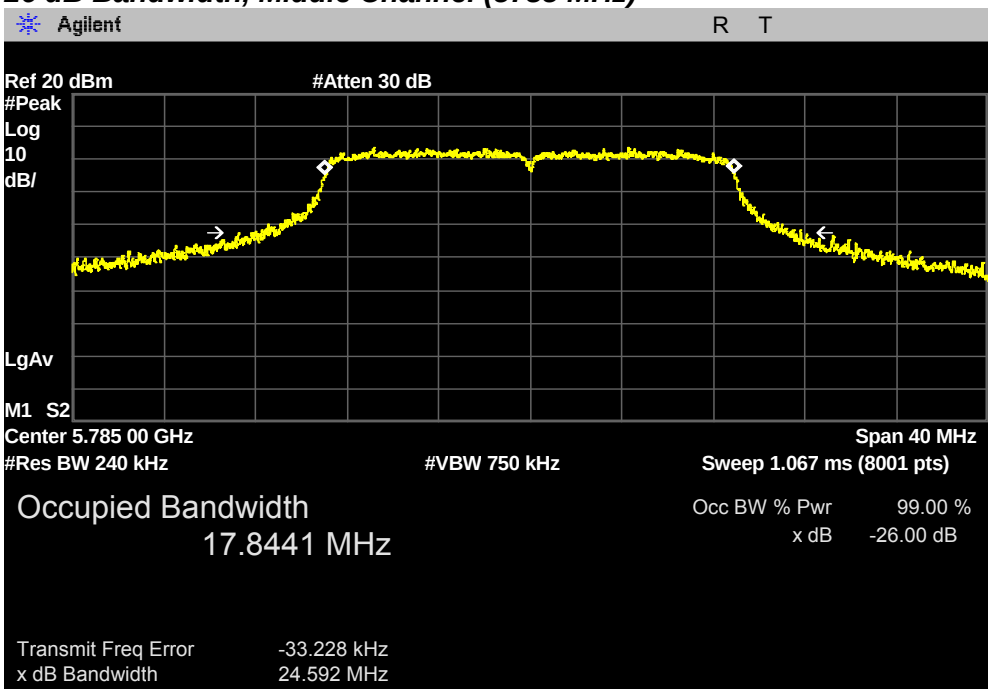
Chain 1

26 dB Bandwidth, Lowest Channel (5745 MHz)

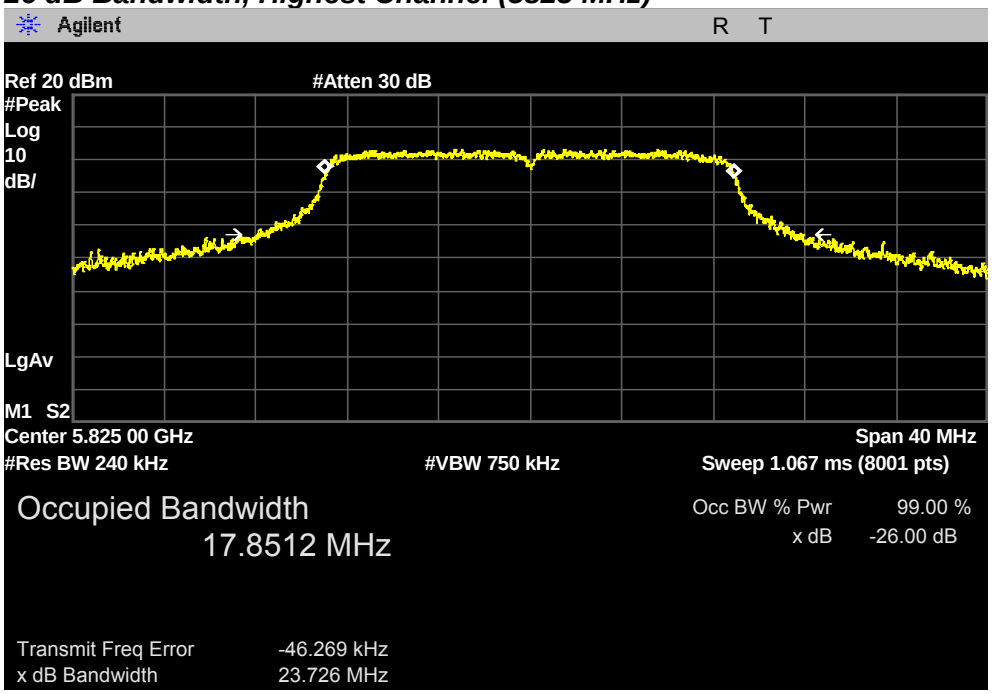


PLOTS OF EMISSIONS

26 dB Bandwidth, Middle Channel (5785 MHz)



26 dB Bandwidth, Highest Channel (5825 MHz)

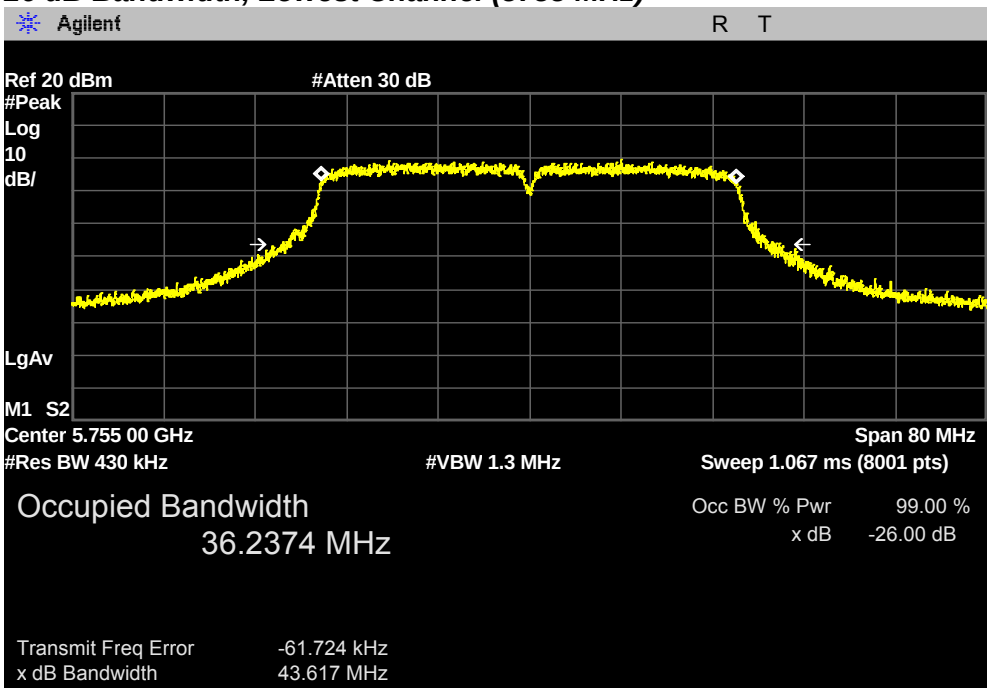


PLOTS OF EMISSIONS

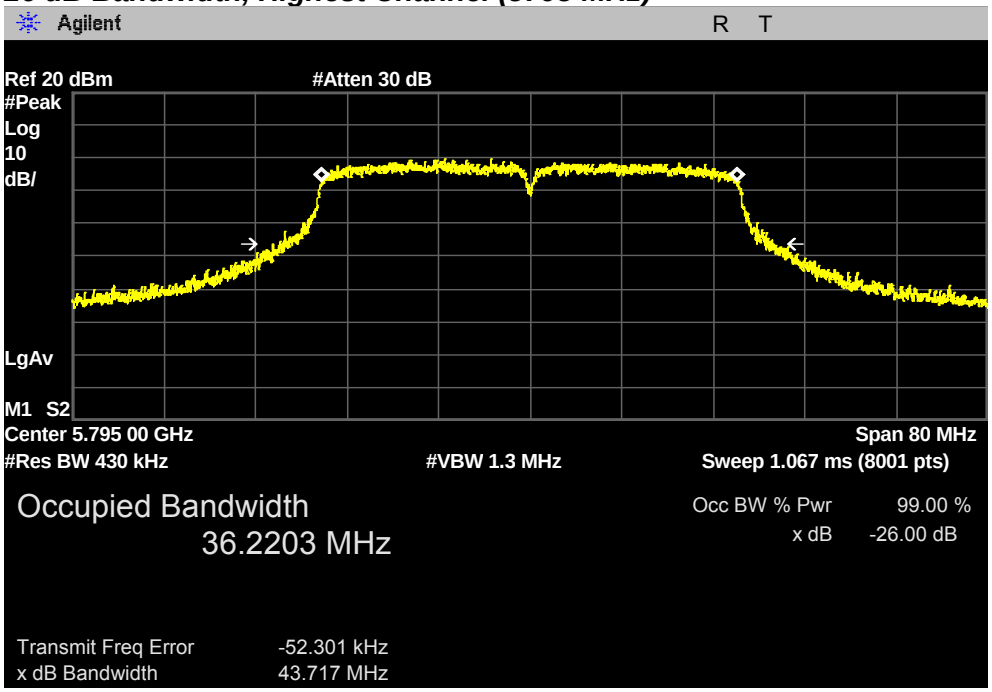
802.11n(40 MHz) mode

Chain 0

26 dB Bandwidth, Lowest Channel (5755 MHz)



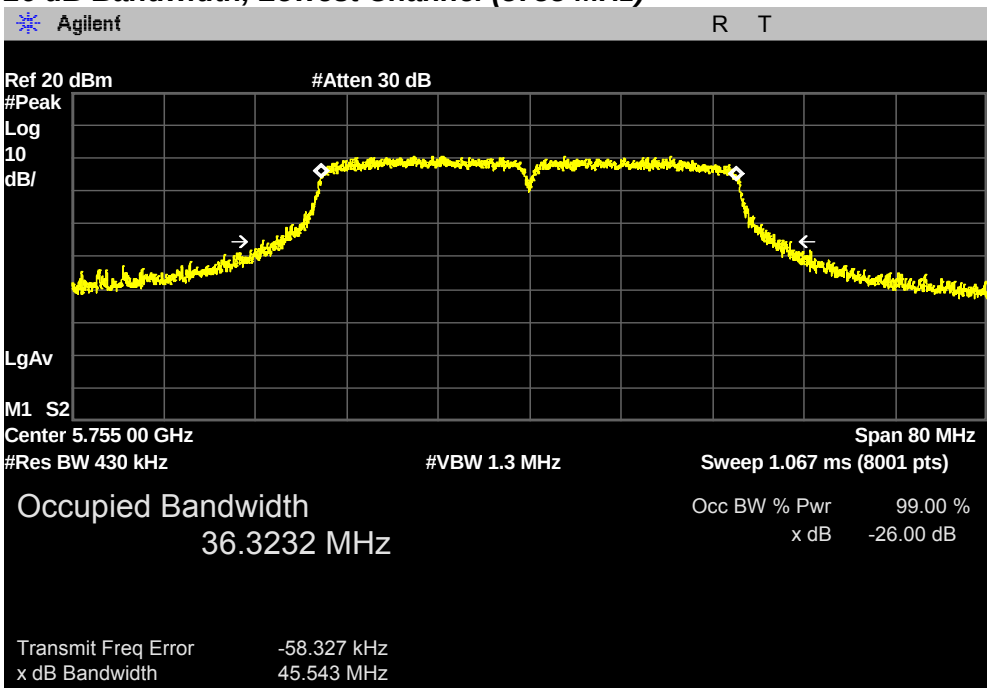
26 dB Bandwidth, Highest Channel (5795 MHz)



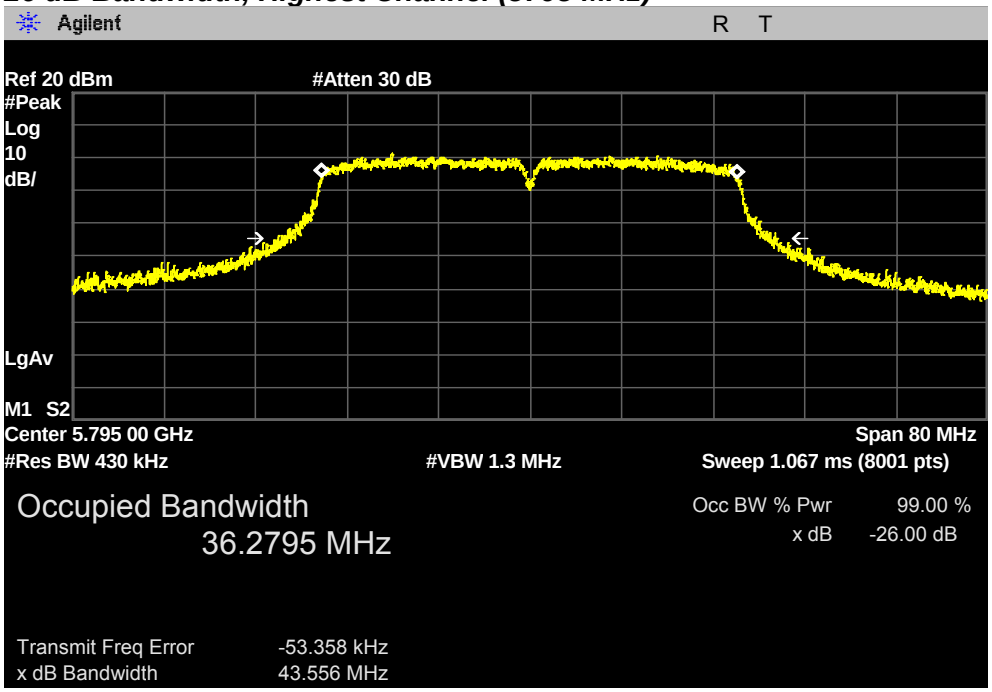
PLOTS OF EMISSIONS

Chain 1

26 dB Bandwidth, Lowest Channel (5755 MHz)



26 dB Bandwidth, Highest Channel (5795 MHz)



8.4 6dB Emission Bandwidth – UNII-3 band

FCC §15.407(e)

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

802.11a mode

Channel	Frequency(MHz)	6dB Emission Bandwidth(MHz)		Limit (kHz)
		Chain 0	Chain 1	
Low	5745	16.49	16.45	>500
Middle	5785	16.52	16.50	
High	5825	16.48	16.53	

802.11n (20 MHz) mode

Channel	Frequency(MHz)	6dB Emission Bandwidth(MHz)		Limit (kHz)
		Chain 0	Chain 1	
Low	5745	17.70	17.75	>500
Middle	5785	17.80	17.71	
High	5825	17.68	17.71	

802.11n (40 MHz) mode

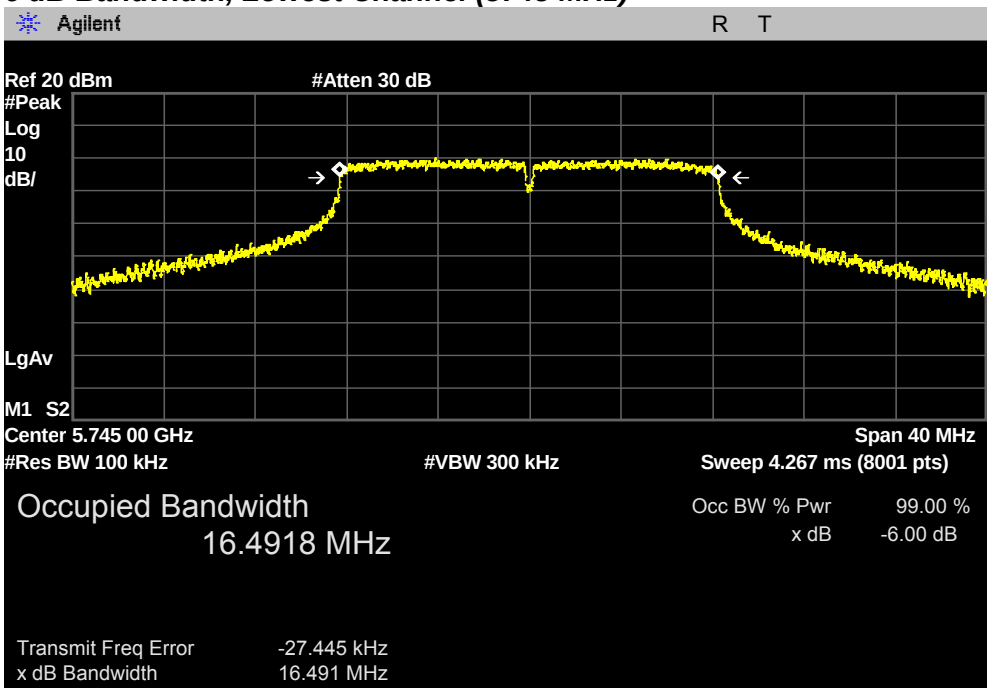
Channel	Frequency(MHz)	6dB Emission Bandwidth(MHz)		Limit (kHz)
		Chain 0	Chain 1	
Low	5755	36.49	36.49	>500
High	5795	36.47	36.47	

PLOTS OF EMISSIONS

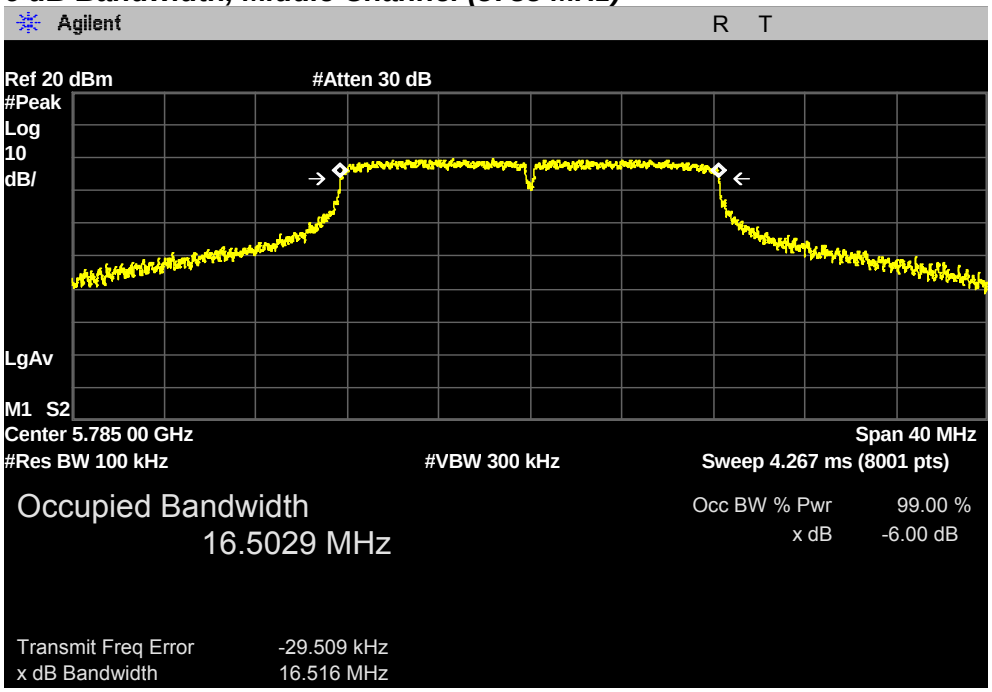
802.11a mode

Chain 0

6 dB Bandwidth, Lowest Channel (5745 MHz)

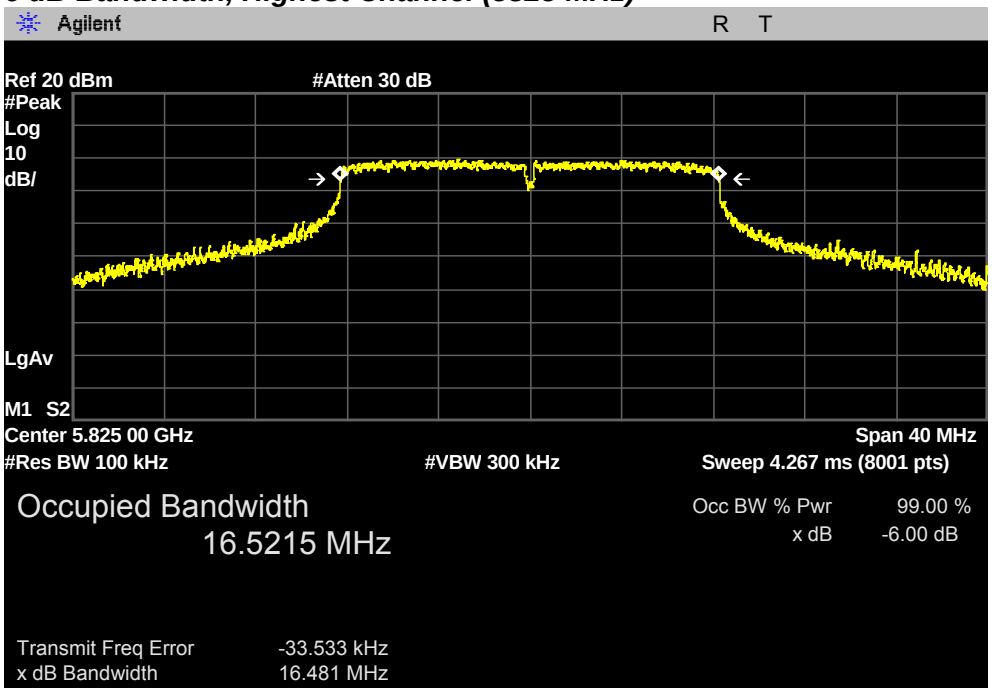


6 dB Bandwidth, Middle Channel (5785 MHz)



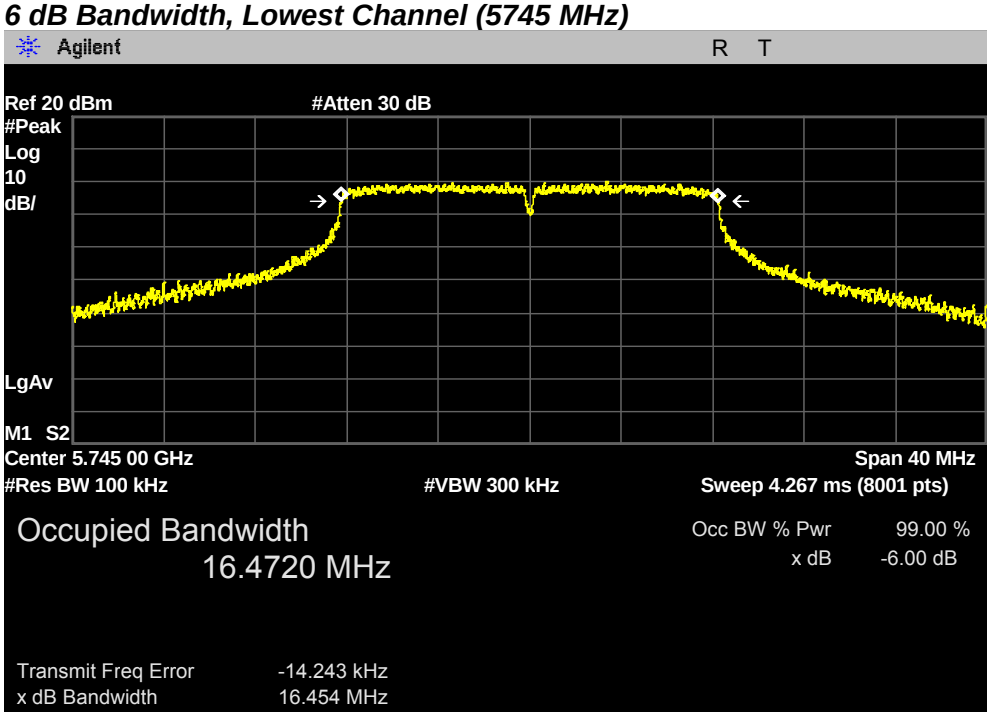
PLOTS OF EMISSIONS

6 dB Bandwidth, Highest Channel (5825 MHz)



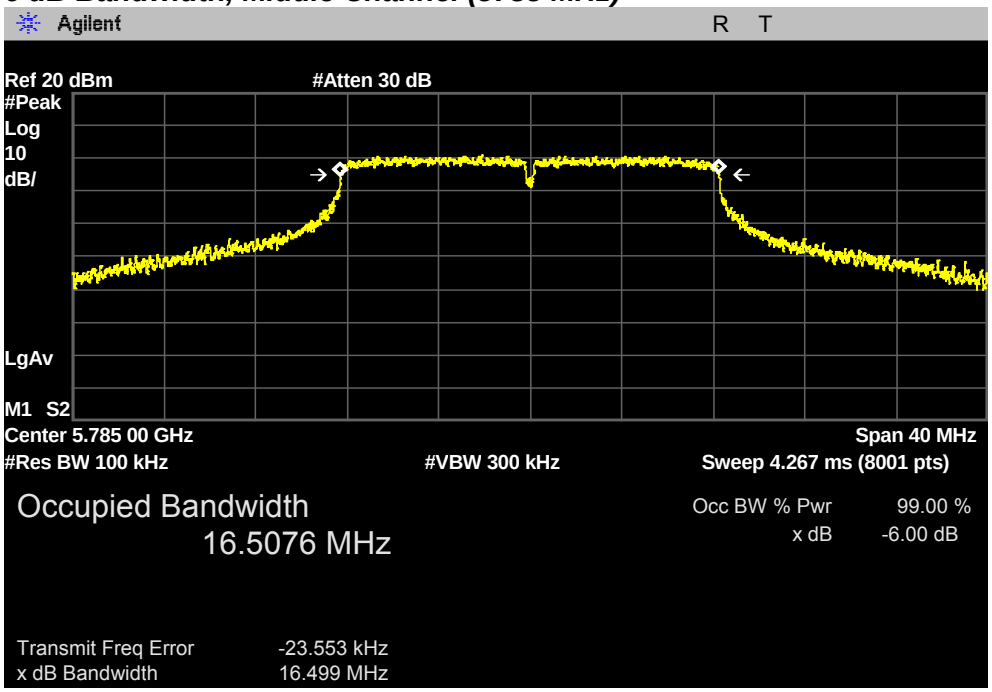
Chain 1

6 dB Bandwidth, Lowest Channel (5745 MHz)

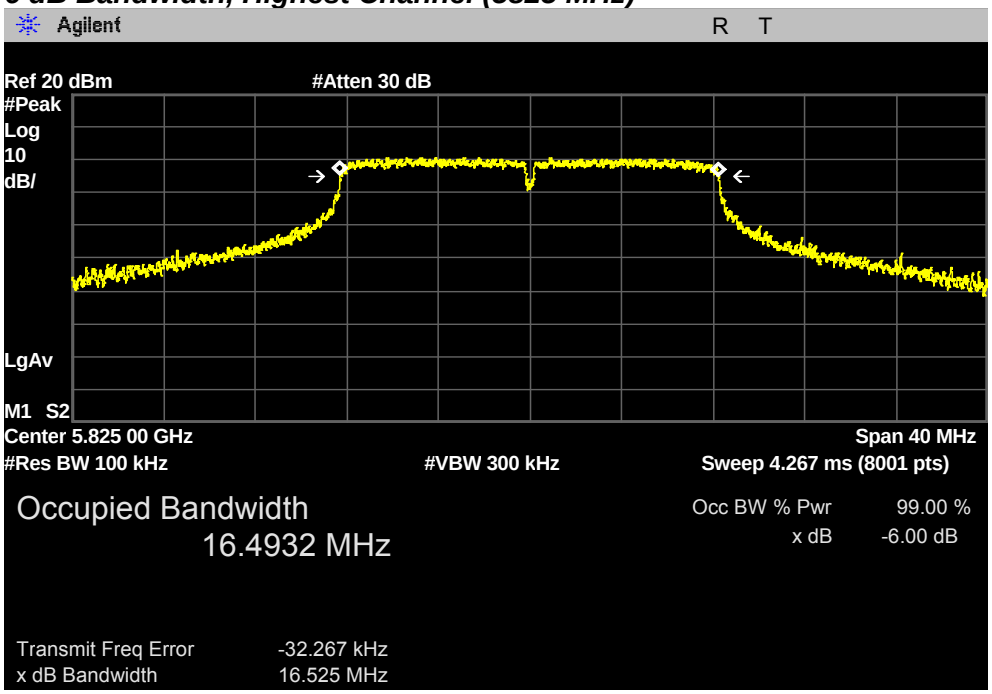


PLOTS OF EMISSIONS

6 dB Bandwidth, Middle Channel (5785 MHz)



6 dB Bandwidth, Highest Channel (5825 MHz)

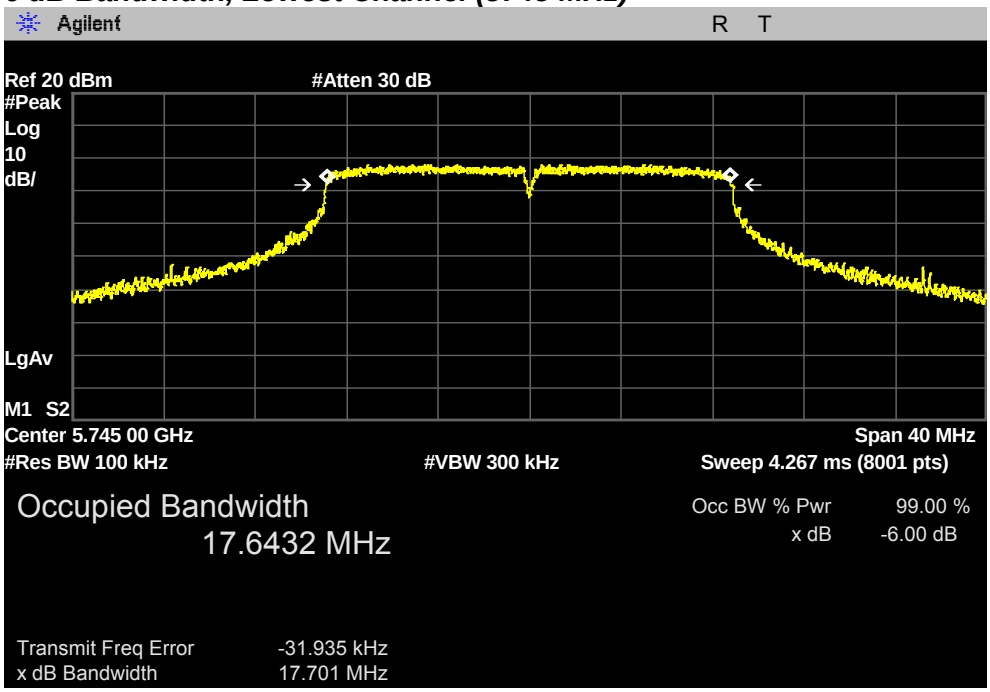


PLOTS OF EMISSIONS

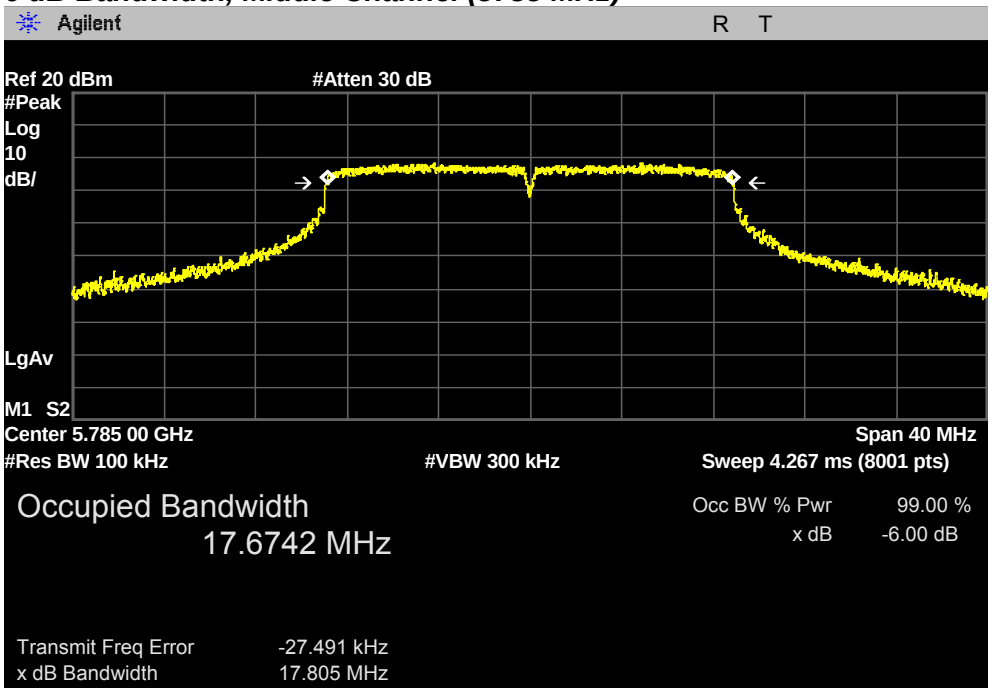
802.11n (20 MHz) mode

Chain 0

6 dB Bandwidth, Lowest Channel (5745 MHz)

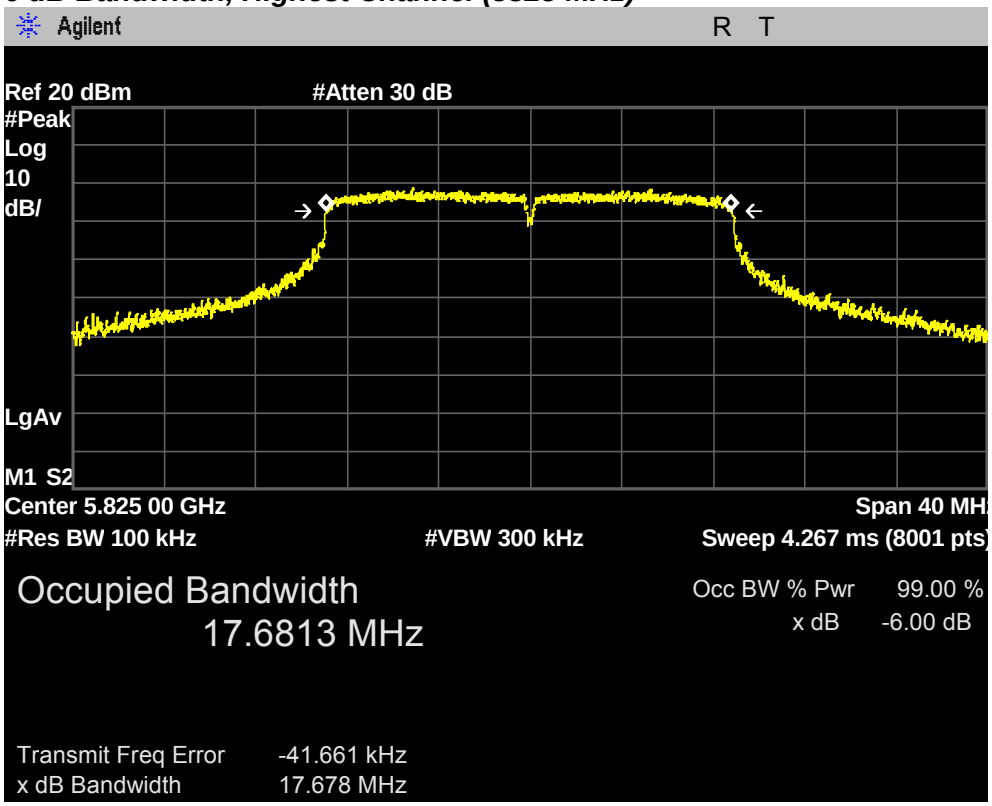


6 dB Bandwidth, Middle Channel (5785 MHz)



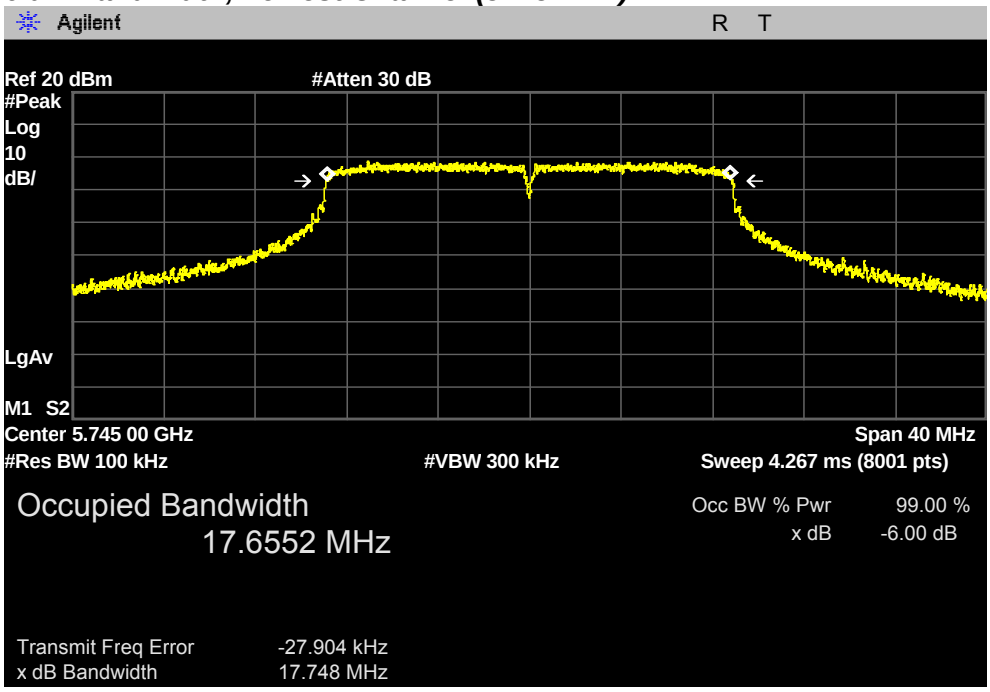
PLOTS OF EMISSIONS

6 dB Bandwidth, Highest Channel (5825 MHz)



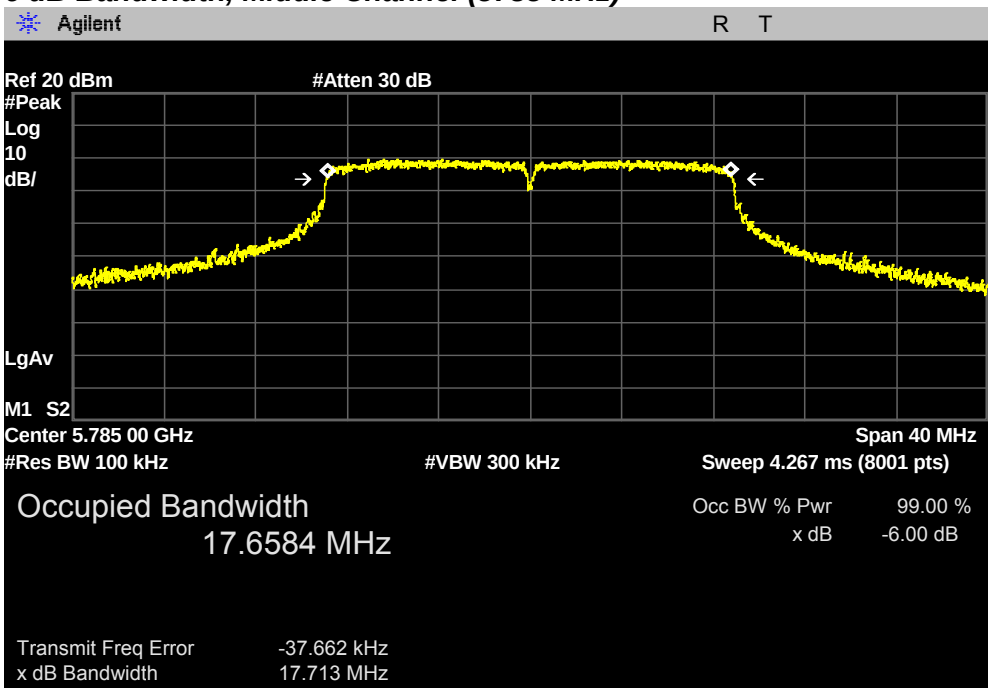
Chain 1

6 dB Bandwidth, Lowest Channel (5745 MHz)

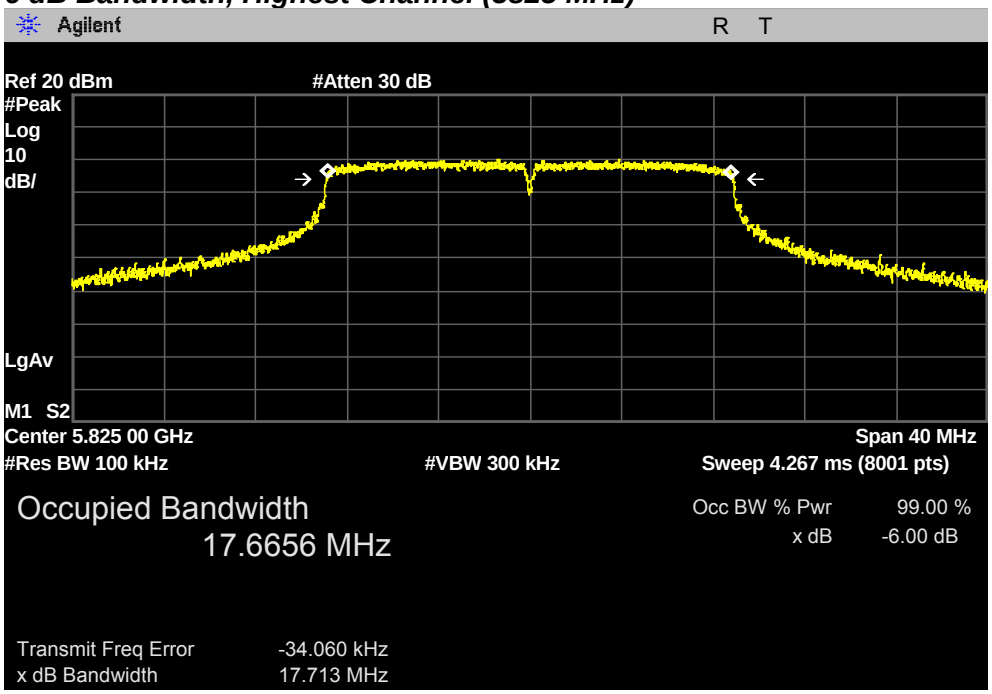


PLOTS OF EMISSIONS

6 dB Bandwidth, Middle Channel (5785 MHz)



6 dB Bandwidth, Highest Channel (5825 MHz)

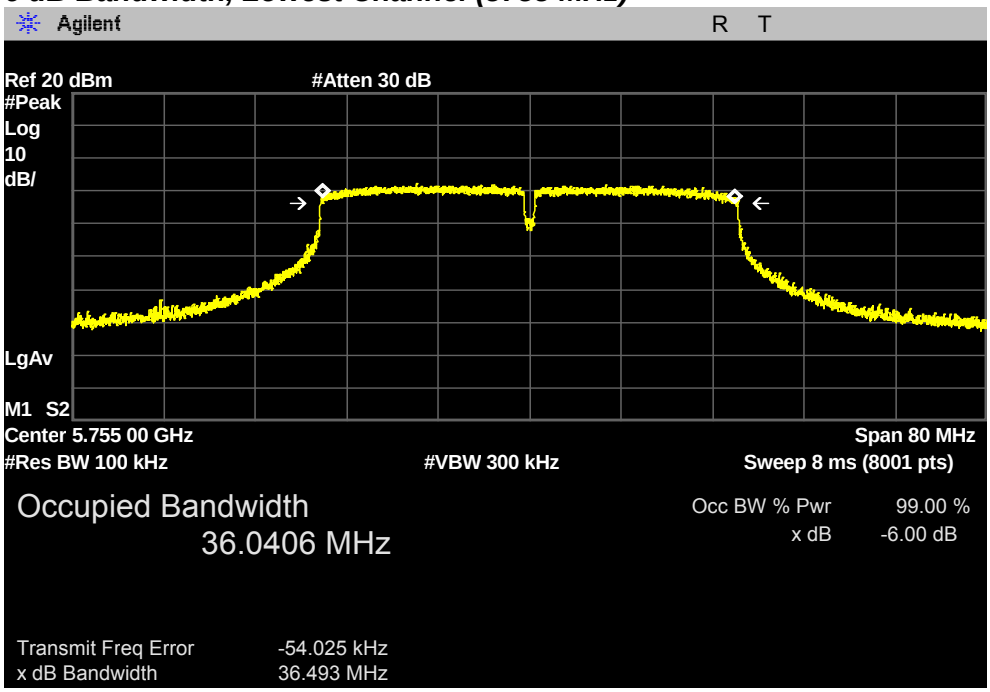


PLOTS OF EMISSIONS

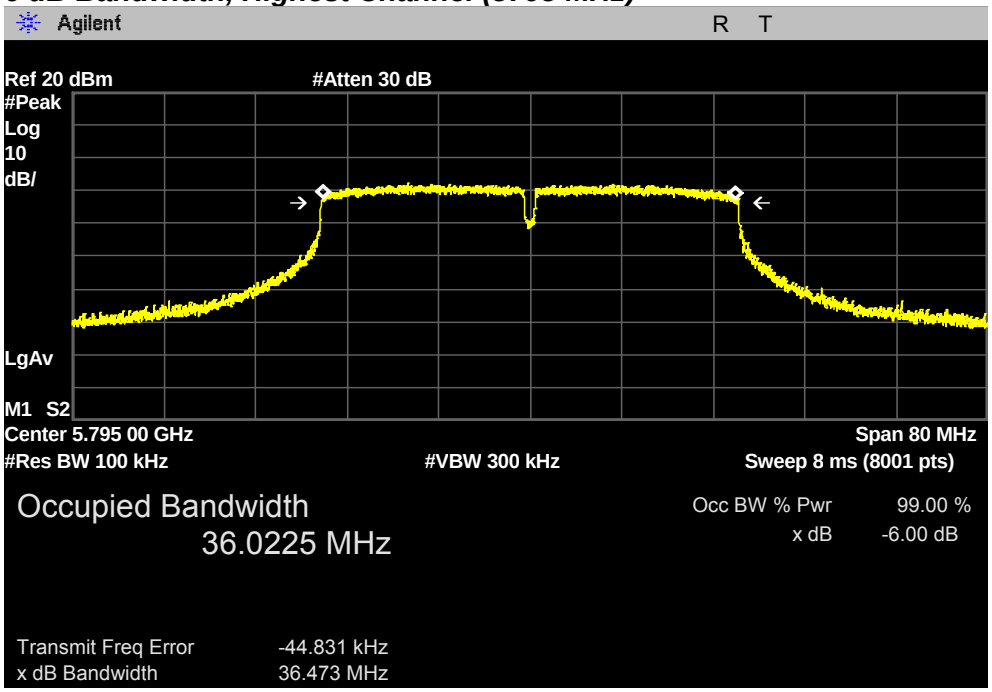
802.11n (40 MHz) mode

Chain 0

6 dB Bandwidth, Lowest Channel (5755 MHz)



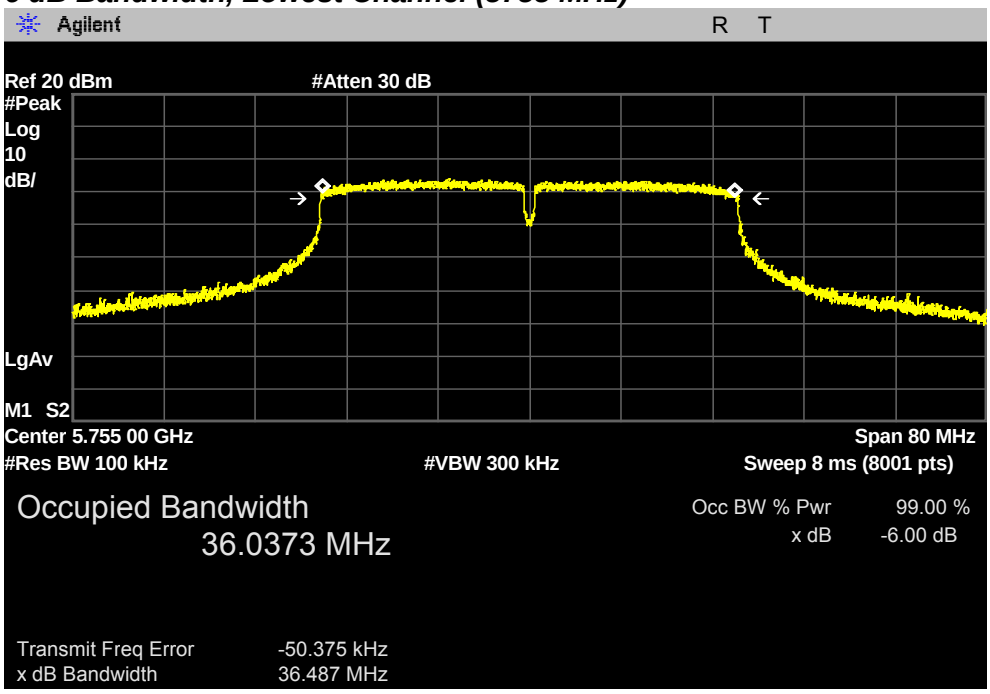
6 dB Bandwidth, Highest Channel (5795 MHz)



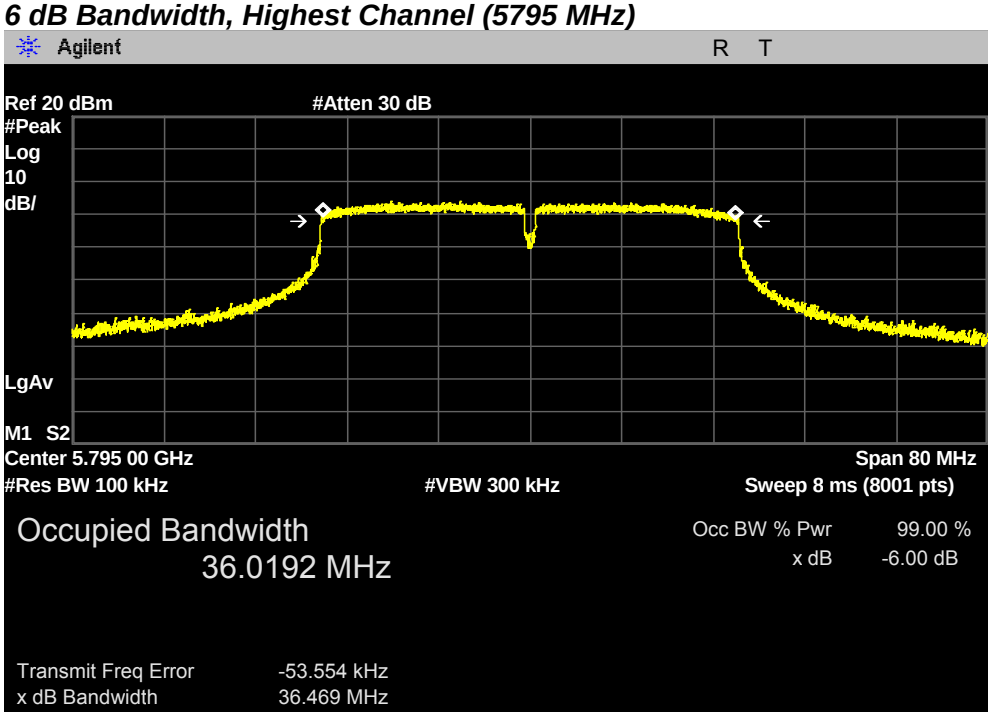
PLOTS OF EMISSIONS

Chain 1

6 dB Bandwidth, Lowest Channel (5755 MHz)



6 dB Bandwidth, Highest Channel (5795 MHz)



8.5 Maximum Conducted Output Power (average)

8.5.1 Maximum Conducted Output Power – UNII-1 band

FCC §15.407(a)

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

802.11a mode

Channel	Frequency (MHz)	Maximum Conducted Power (dBm)		FCC Limit (dBm)
		Chain 0	Chain 1	
Lowest	5180	11.44	12.89	23.98
Middle	5220	11.90	12.36	23.98
Highest	5240	11.83	12.41	23.98

802.11n (20 MHz) mode

Channel	Frequency (MHz)	Measured conducted power (dBm)		Maximum Conducted Power (dBm)	FCC Limit (dBm)
		Chain 0	Chain 1	Total output power	
Lowest	5180	10.10	10.70	13.42	23.98
Middle	5220	10.41	10.38	13.41	23.98
Highest	5240	10.30	10.00	13.16	23.98

802.11n (40 MHz) mode

Channel	Frequency (MHz)	Measured conducted power (dBm)		Maximum Conducted Power (dBm)	FCC Limit (dBm)
		Chain 0	Chain 1	Total output power	
Lowest	5190	10.18	10.46	13.33	23.98
Highest	5230	10.04	10.44	13.25	23.98

Note:

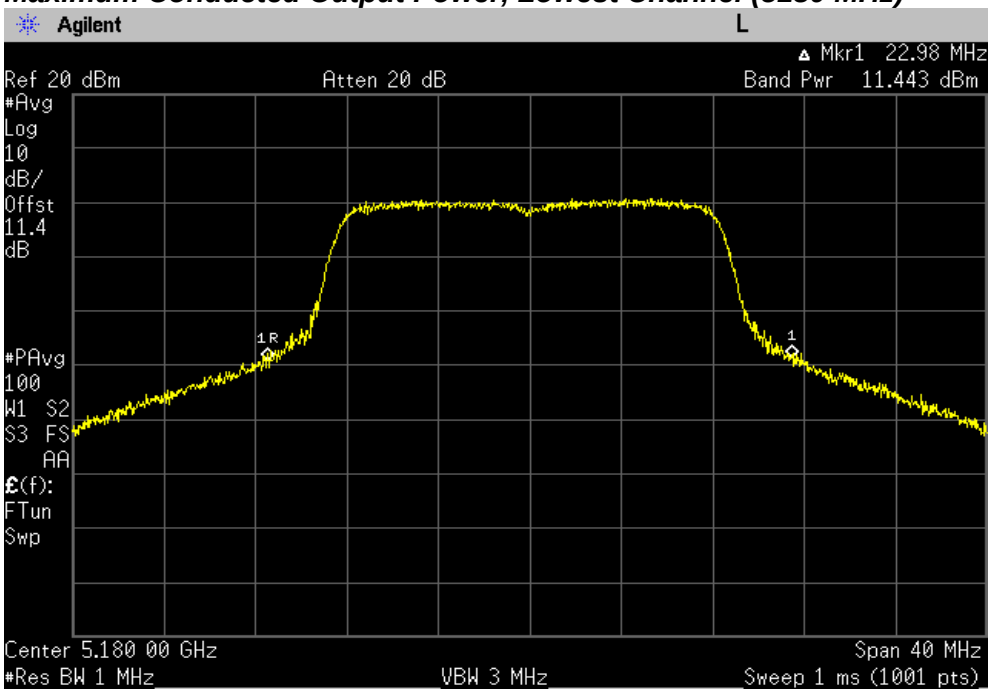
1. *Maximum Conducted (average) Power was measured according to II.E.2.b) Method SA-1 in* ***KDB 789033 D02 General UNII Test Procedures New Rules v01r02***
   Total output power = 10 log [10^{(Chain 0 Power + duty factor)/10} + 10^{(Chain 1 Power + duty factor)/10}]
2. *According to "****662911 D01 Multiple Transmitter Output v02r01****", if two antennas are unequal antenna gains and transmit signals are correlated, then the* ***Directional gain = 10 log[(*** $10^{G1/20}$ ***+*** $10^{G2/20}$ ***)*** ^{2} ***/*** N_{ANT} ***] dBi****. The directional gain of Samsung WiFi module are* ***-1.59 dBi*** *for* ***UNII-1 Band,*** *and* ***-0.44 dBi*** *for* ***UNII-2A Band*** *and* ***-2.95 dBi*** *for* ***UNII-2C Band*** *and* ***-9.97 dBi*** *for* ***UNII-3 Band****.*
3. *The following equation was used for spectrum offset:*
   Spectrum offset (dB) = Attenuator (dB) + Cable Loss (dB) + SMA Type Connector Loss (dB)

PLOT OF TEST DATA

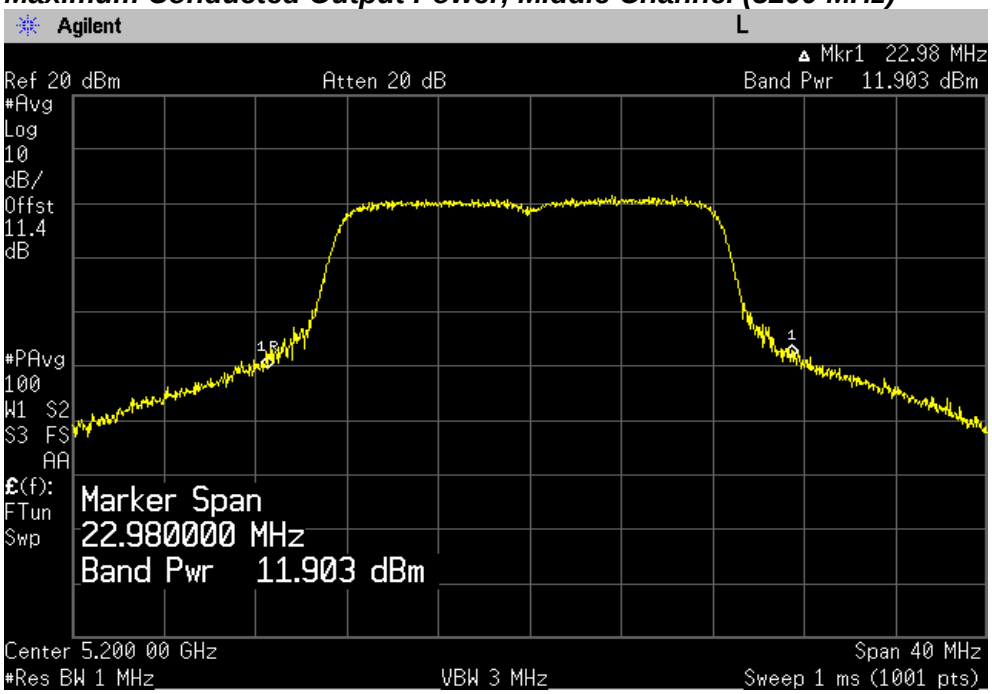
802.11a mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5180 MHz)

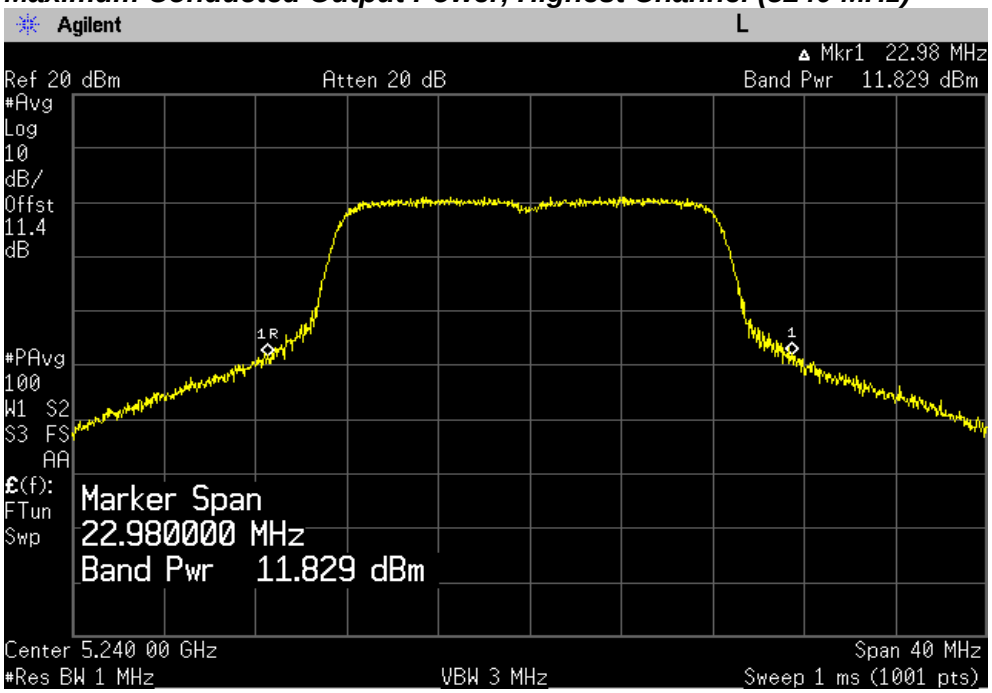


Maximum Conducted Output Power, Middle Channel (5200 MHz)



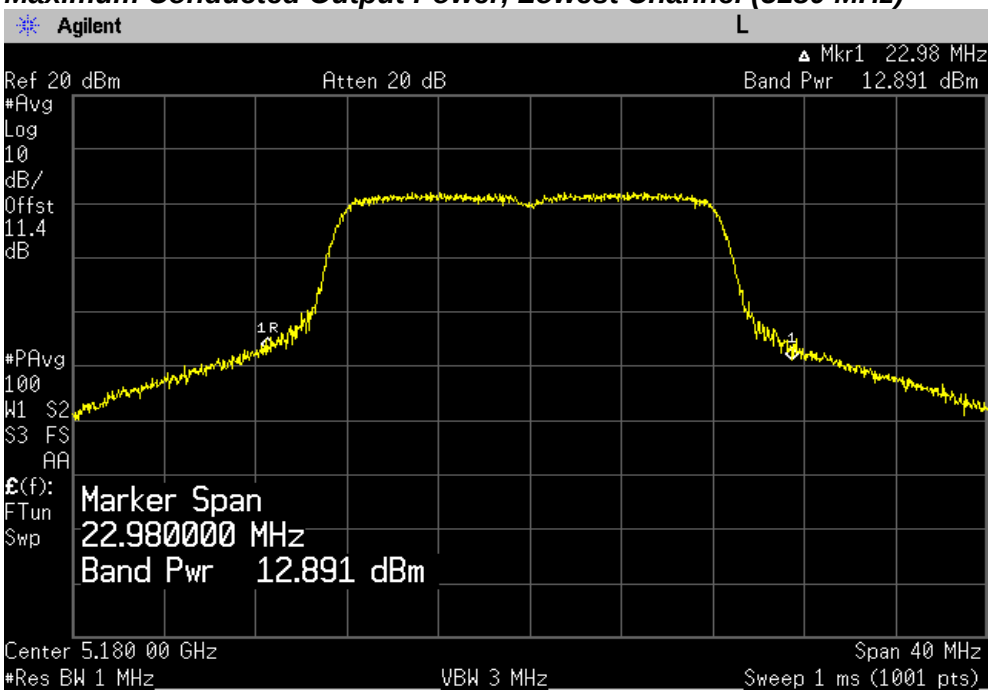
PLOT OF TEST DATA

Maximum Conducted Output Power, Highest Channel (5240 MHz)



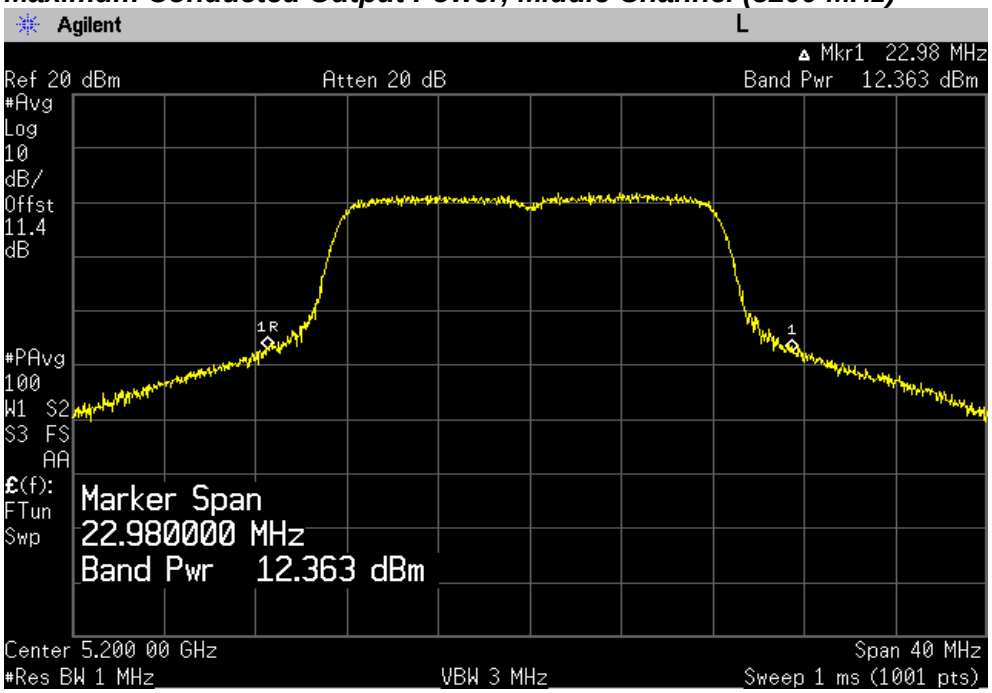
Chain 1

Maximum Conducted Output Power, Lowest Channel (5180 MHz)

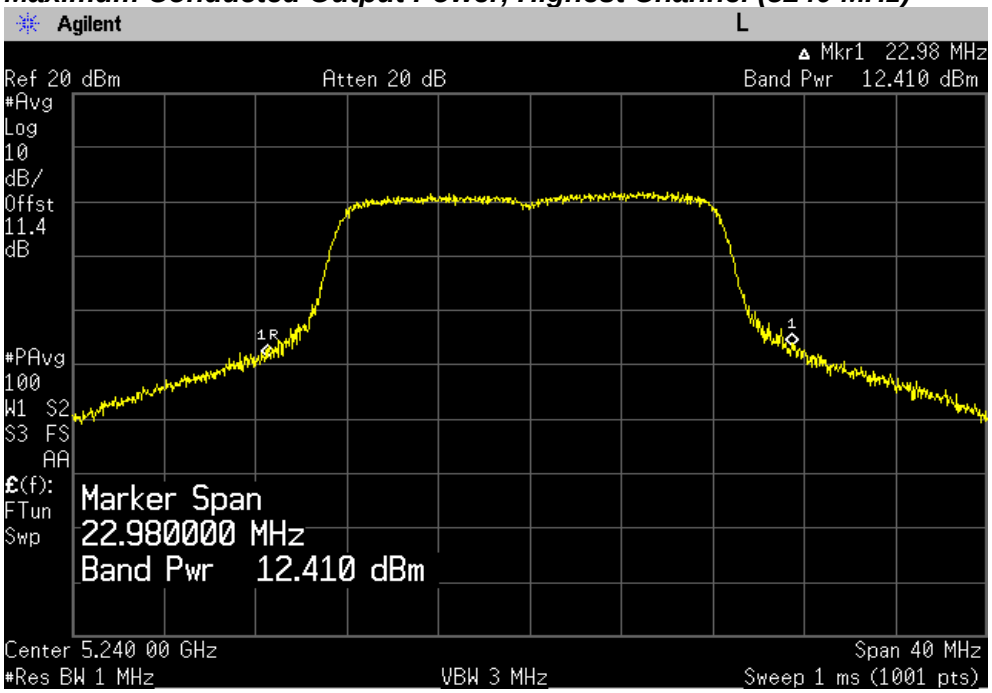


PLOT OF TEST DATA

Maximum Conducted Output Power, Middle Channel (5200 MHz)



Maximum Conducted Output Power, Highest Channel (5240 MHz)

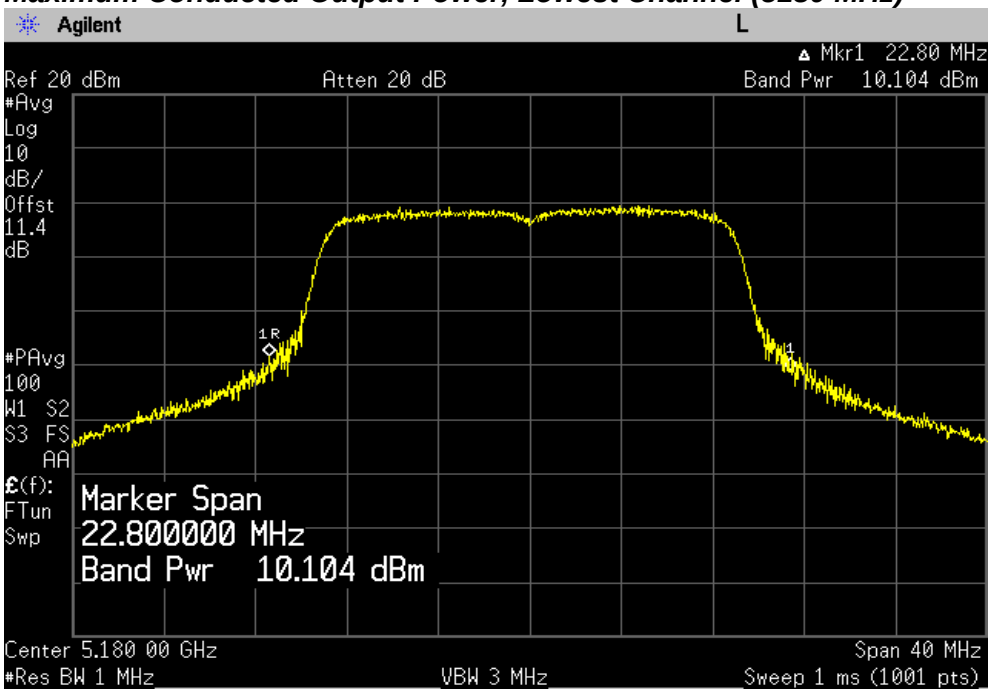


PLOT OF TEST DATA

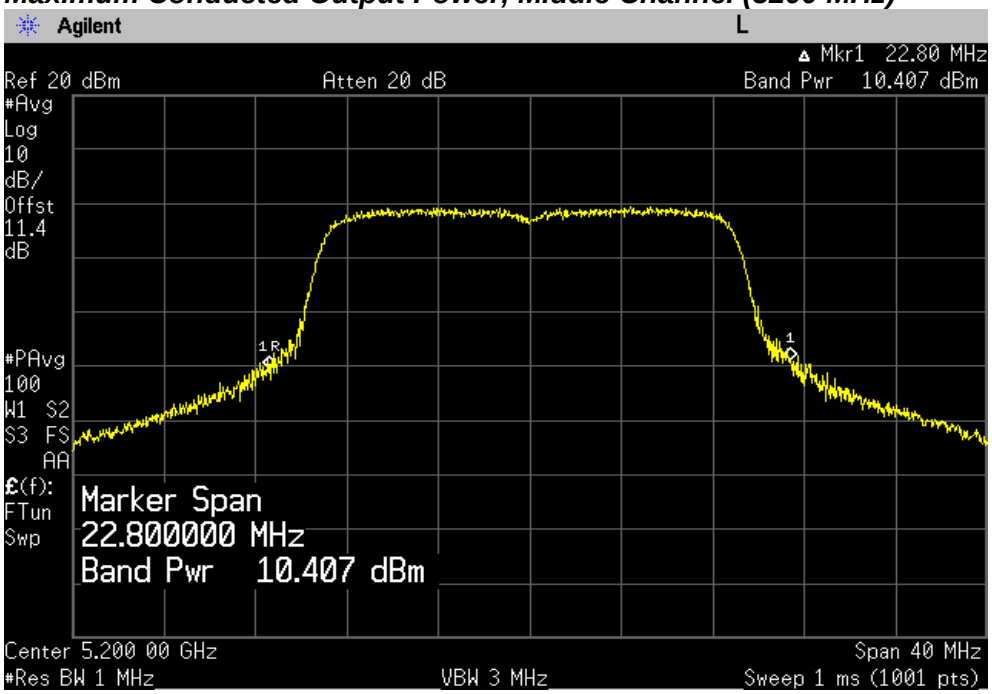
802.11n(20 MHz) mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5180 MHz)

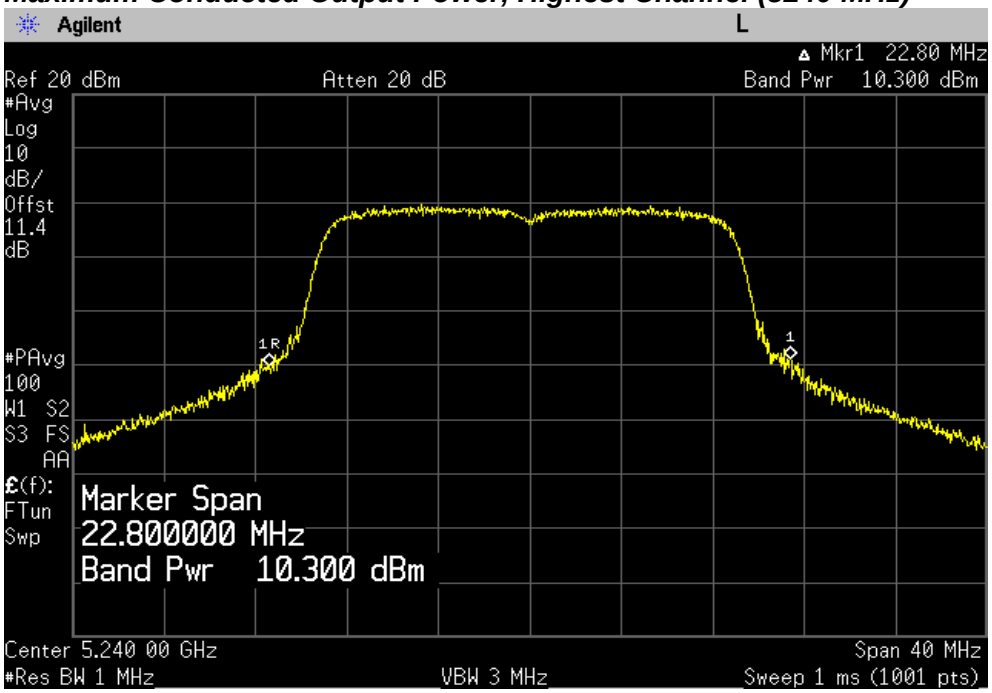


Maximum Conducted Output Power, Middle Channel (5200 MHz)



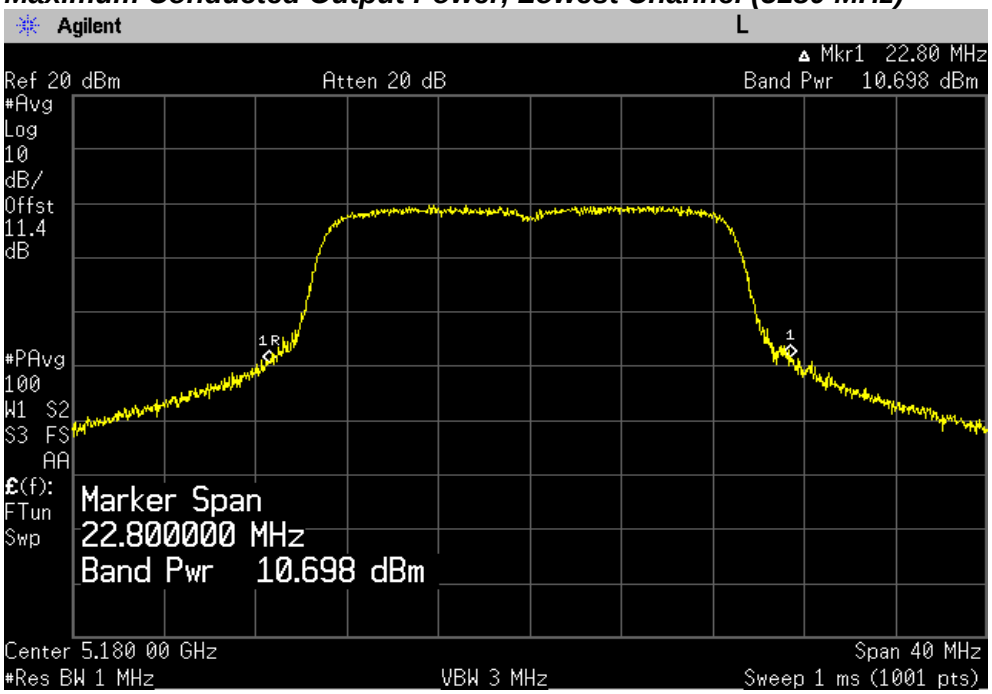
PLOT OF TEST DATA

Maximum Conducted Output Power, Highest Channel (5240 MHz)



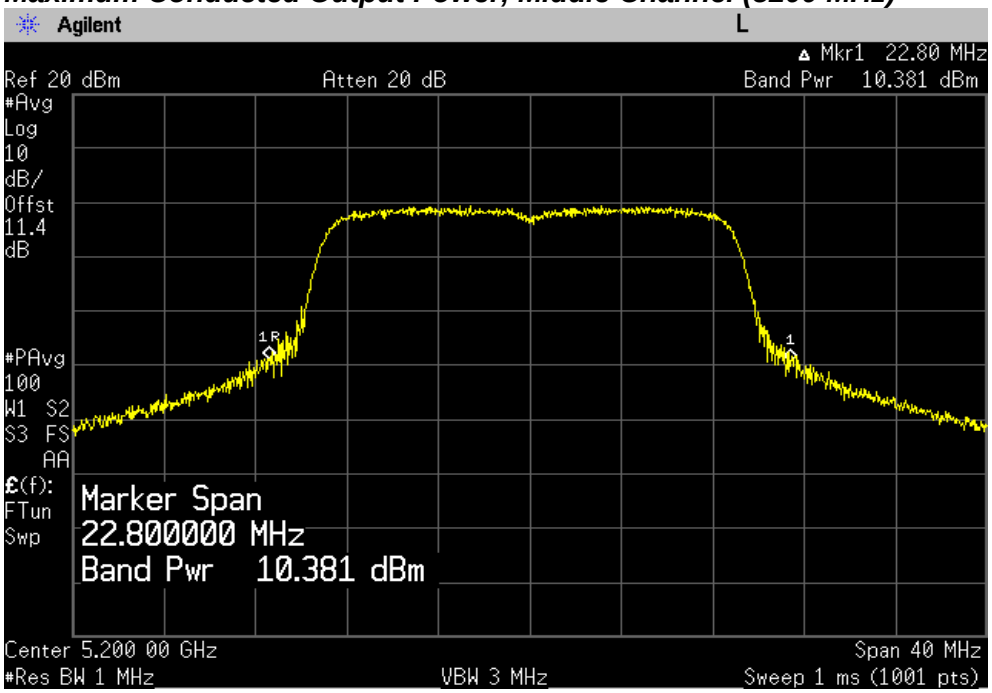
Chain 1

Maximum Conducted Output Power, Lowest Channel (5180 MHz)

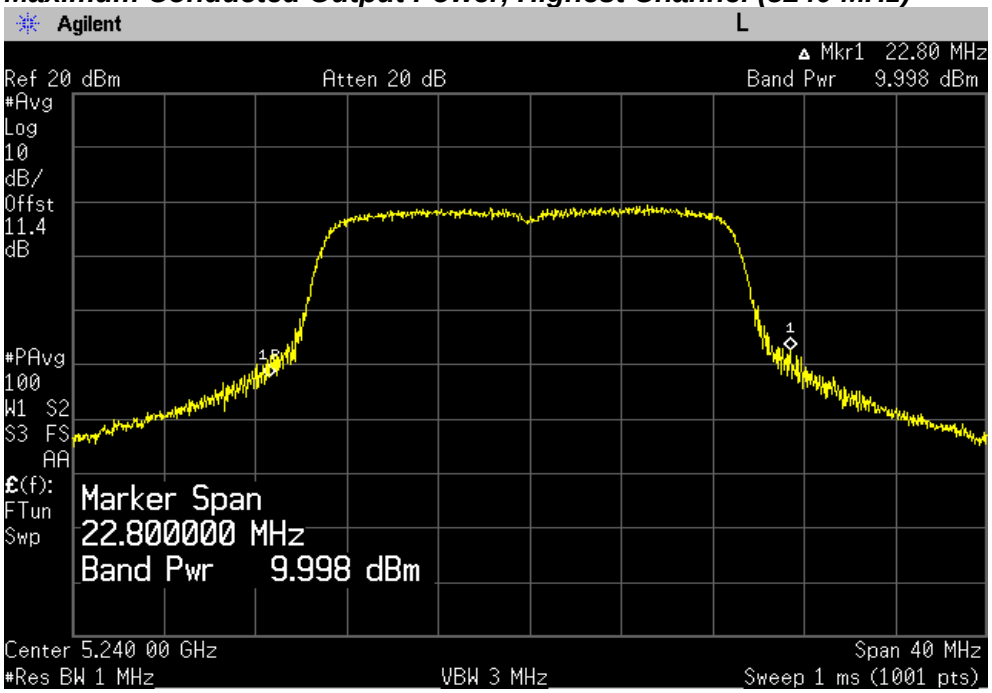


PLOT OF TEST DATA

Maximum Conducted Output Power, Middle Channel (5200 MHz)



Maximum Conducted Output Power, Highest Channel (5240 MHz)

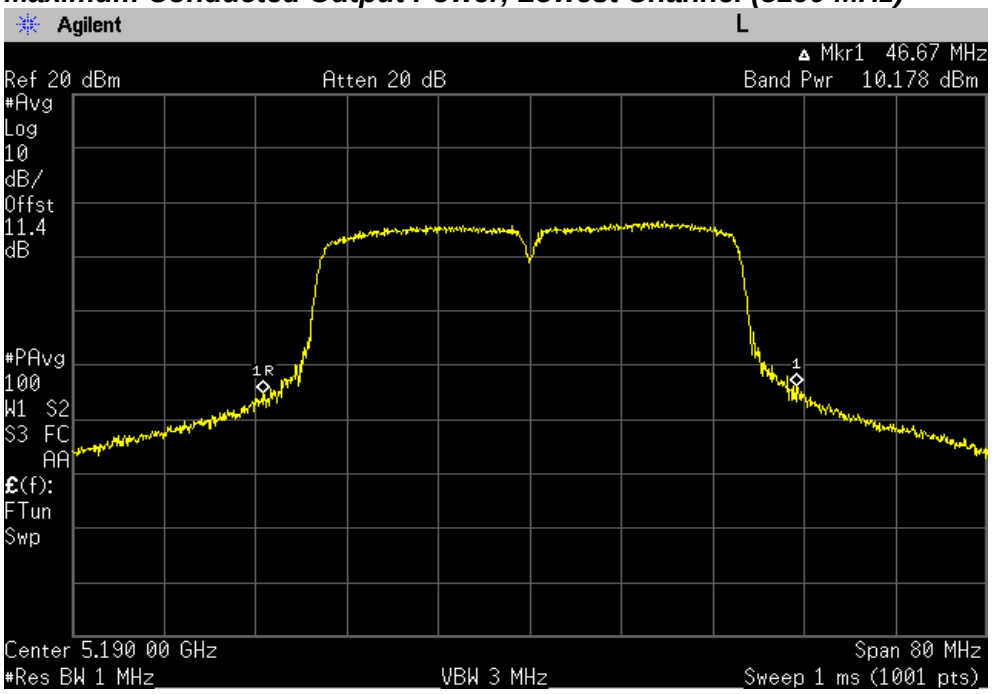


PLOT OF TEST DATA

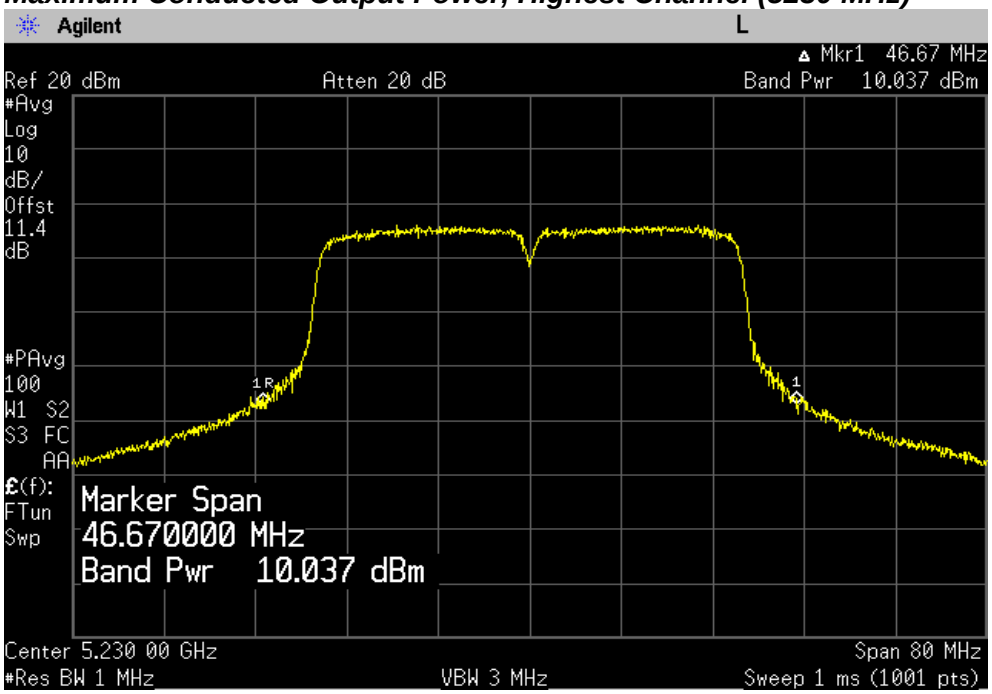
802.11n(40 MHz) mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5190 MHz)



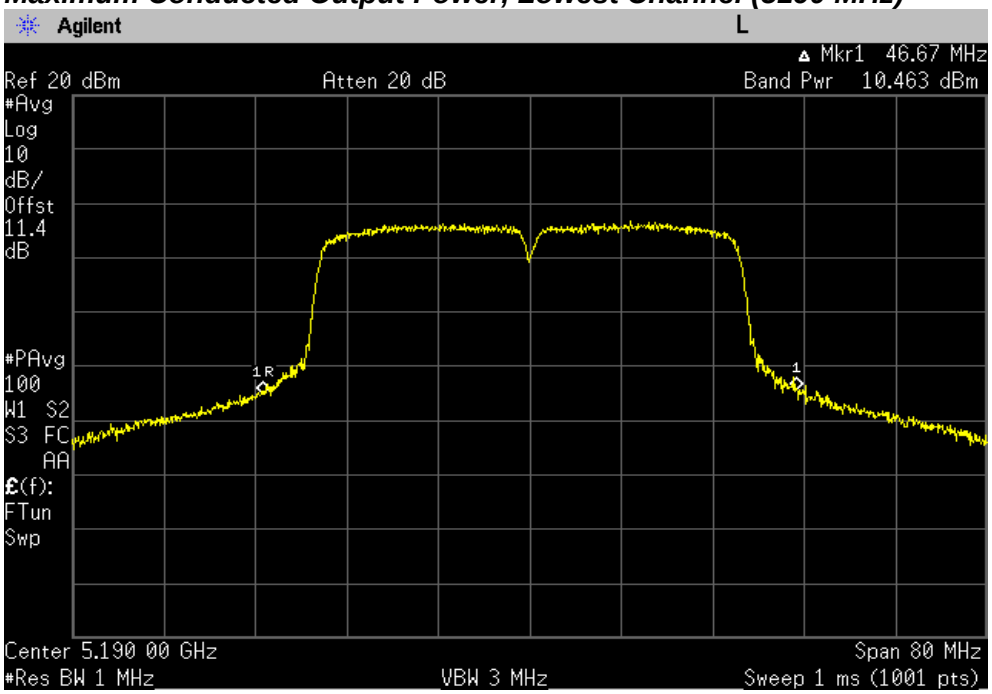
Maximum Conducted Output Power, Highest Channel (5230 MHz)



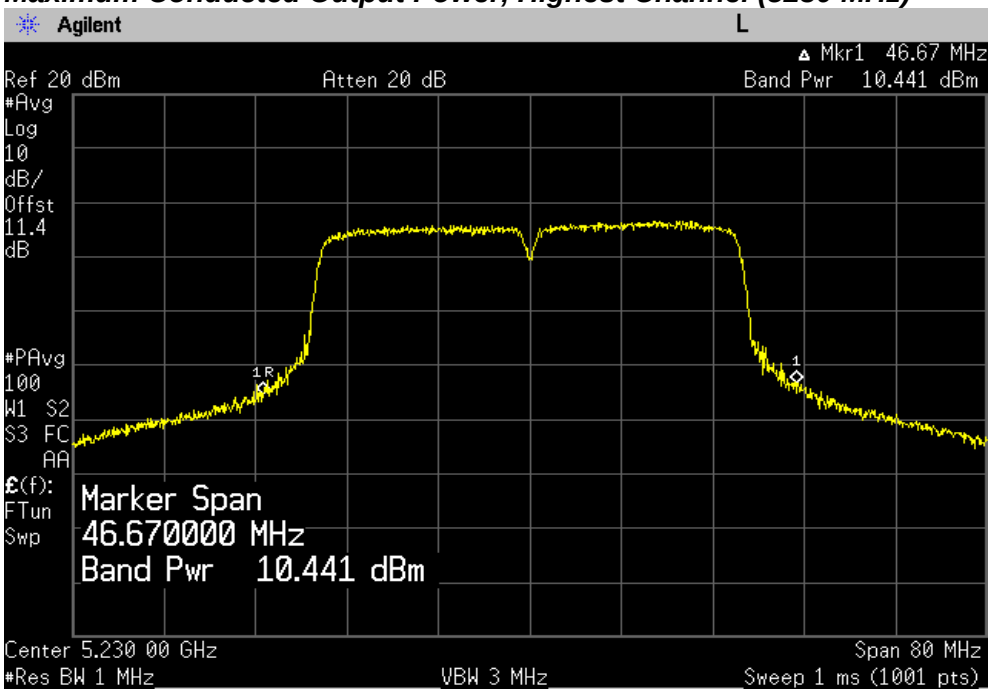
PLOT OF TEST DATA

Chain 1

Maximum Conducted Output Power, Lowest Channel (5190 MHz)



Maximum Conducted Output Power, Highest Channel (5230 MHz)



8.5.2 Maximum Conducted Output Power (average) – UNII-2A band

FCC §15.407(a)

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

802.11a mode

Channel	Frequency (MHz)	Maximum Conducted Power (dBm)		Conducted Limit (dBm)
		Chain 0	Chain 1	
Lowest	5260	14.46	15.12	23.98
Middle	5280	13.95	14.74	23.98
Highest	5320	13.91	13.92	23.98

802.11n (20 MHz) mode

Channel	Frequency (MHz)	Measured conducted power (dBm)		Maximum Conducted Power (dBm)	Conducted Limit (dBm)
		Chain 0	Chain 1	Total output power	
Lowest	5260	12.05	12.36	15.22	23.98
Middle	5280	11.80	11.92	14.87	23.98
Highest	5320	11.09	11.35	14.23	23.98

802.11n (40 MHz) mode

Channel	Frequency (MHz)	Measured conducted power (dBm)		Maximum Conducted Power (dBm)	Conducted Limit (dBm)
		Chain 0	Chain 1	Total output power	FCC
Lowest	5270	11.41	11.45	14.44	23.98
Highest	5310	10.69	10.75	13.73	23.98

TEST DATA

Note:

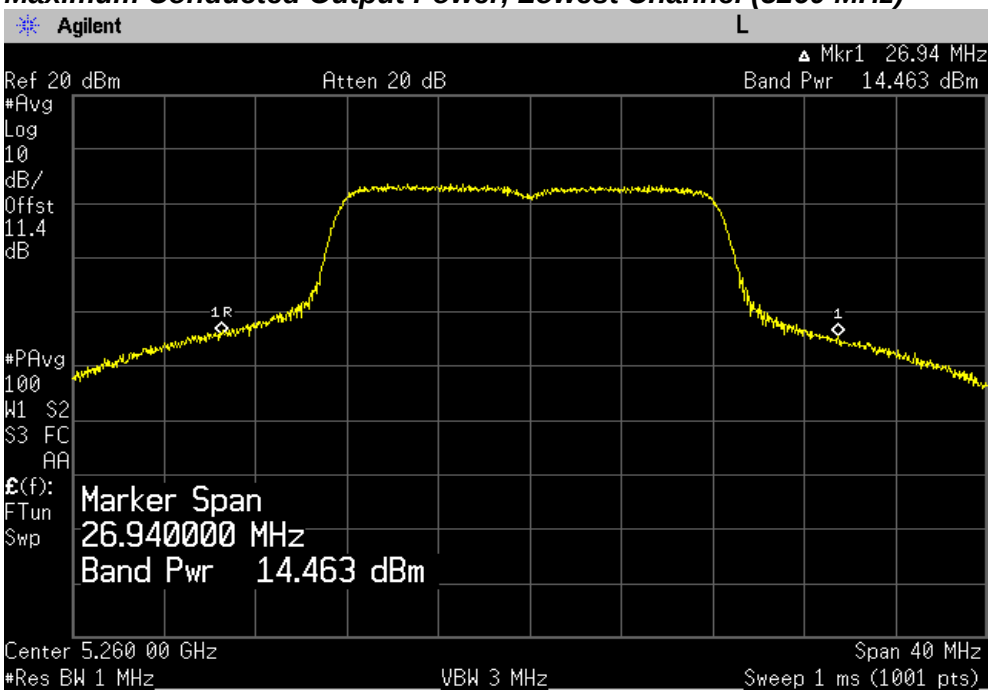
1. *Maximum Conducted (average) Power was measured according to II.E.2.b) Method SA-1 in* ***KDB 789033 D02 General UNII Test Procedures New Rules v01r02***
   Total output power = 10 log [10^{(Chain 0 Power + duty factor)/10} + 10^{(Chain 1 Power + duty factor)/10}]
2. *According to "****662911 D01 Multiple Transmitter Output v02r01****", if two antennas are unequal antenna gains and transmit signals are correlated, then the* ***Directional gain = 10 log[(10$^{G1/20}$+10$^{G2/20}$)^2/N_{ANT}] dBi****. The directional gain of Samsung WiFi module are* ***-1.59 dBi*** *for* ***UNII-1 Band,*** *and* ***-0.44 dBi*** *for* ***UNII-2A Band*** *and* ***-2.95 dBi*** *for* ***UNII-2C Band*** *and* ***-9.97 dBi*** *for* ***UNII-3 Band****.*
3. *The following equation was used for spectrum offset:*
   Spectrum offset (dB) = Attenuator (dB) + Cable Loss (dB) + SMA Type Connector Loss (dB)
4. *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.*

PLOT OF TEST DATA

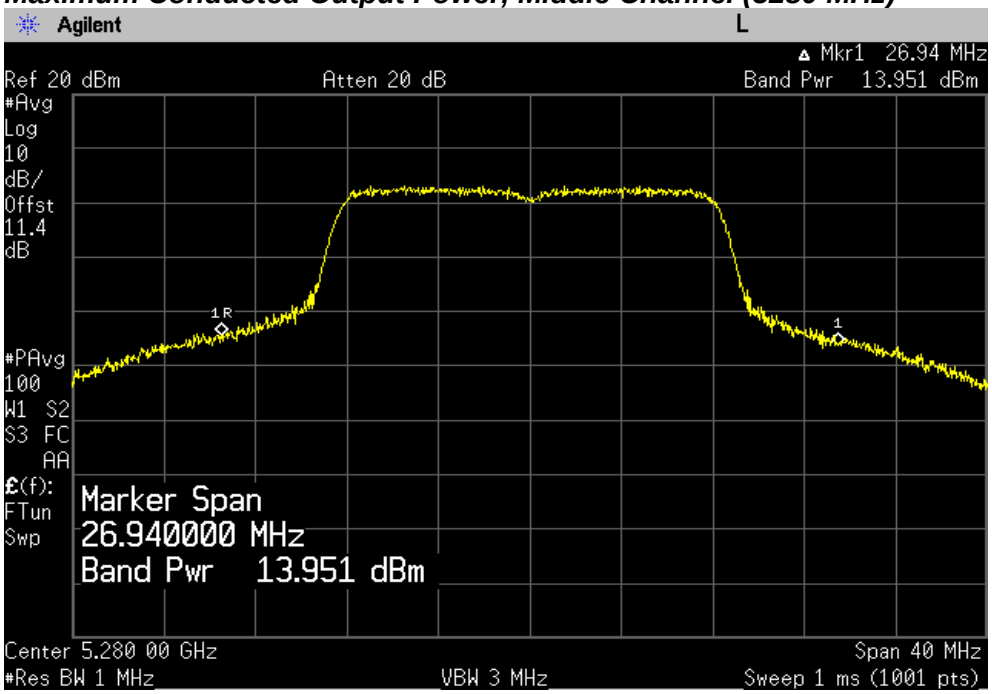
802.11a mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5260 MHz)

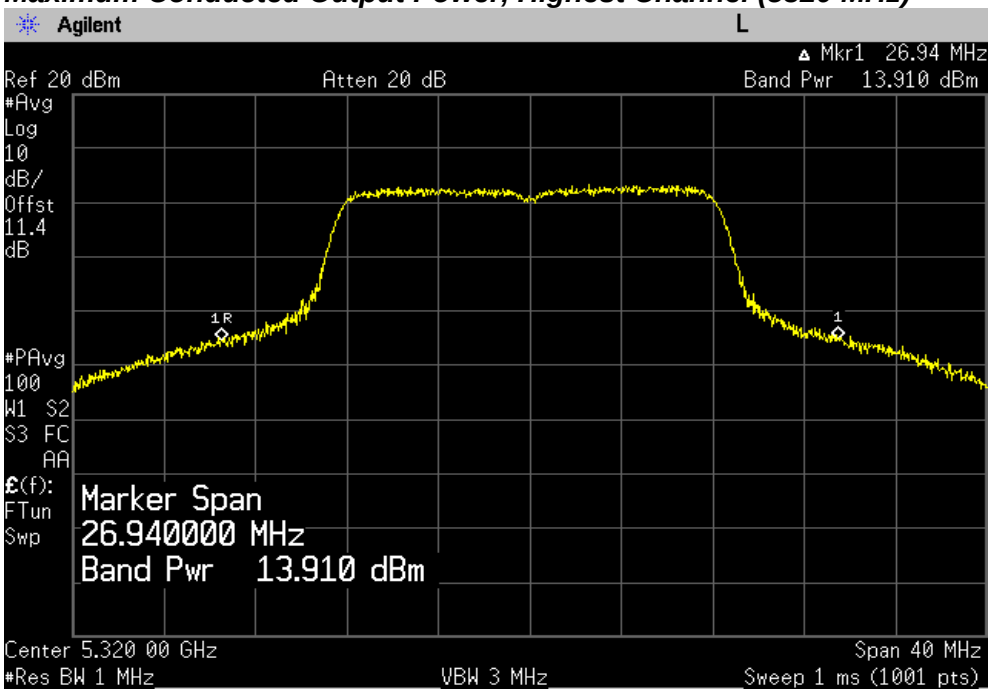


Maximum Conducted Output Power, Middle Channel (5280 MHz)



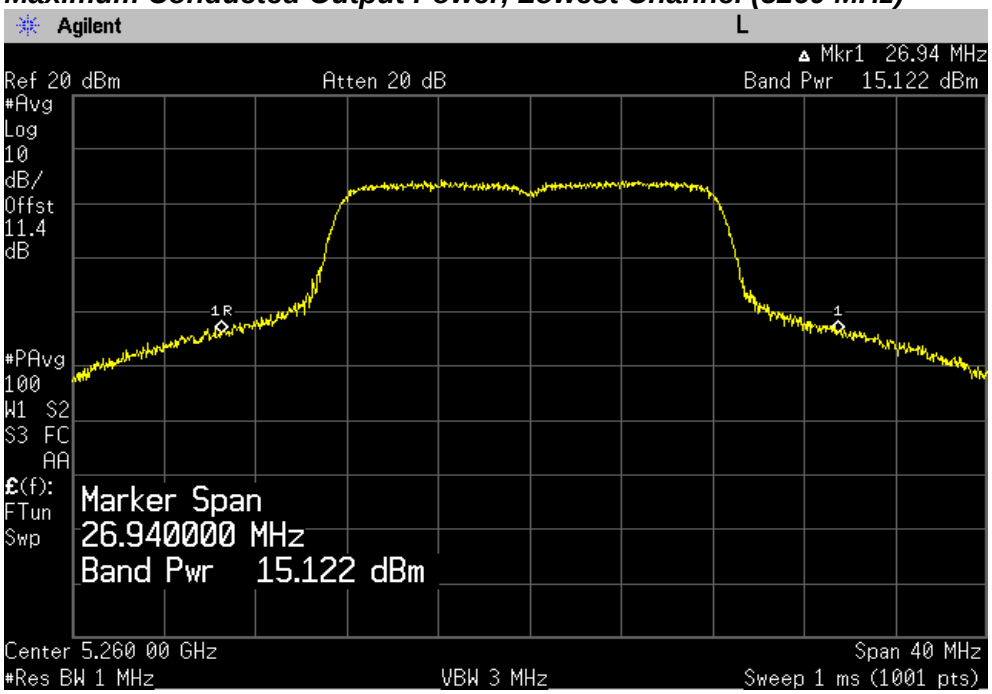
PLOT OF TEST DATA

Maximum Conducted Output Power, Highest Channel (5320 MHz)



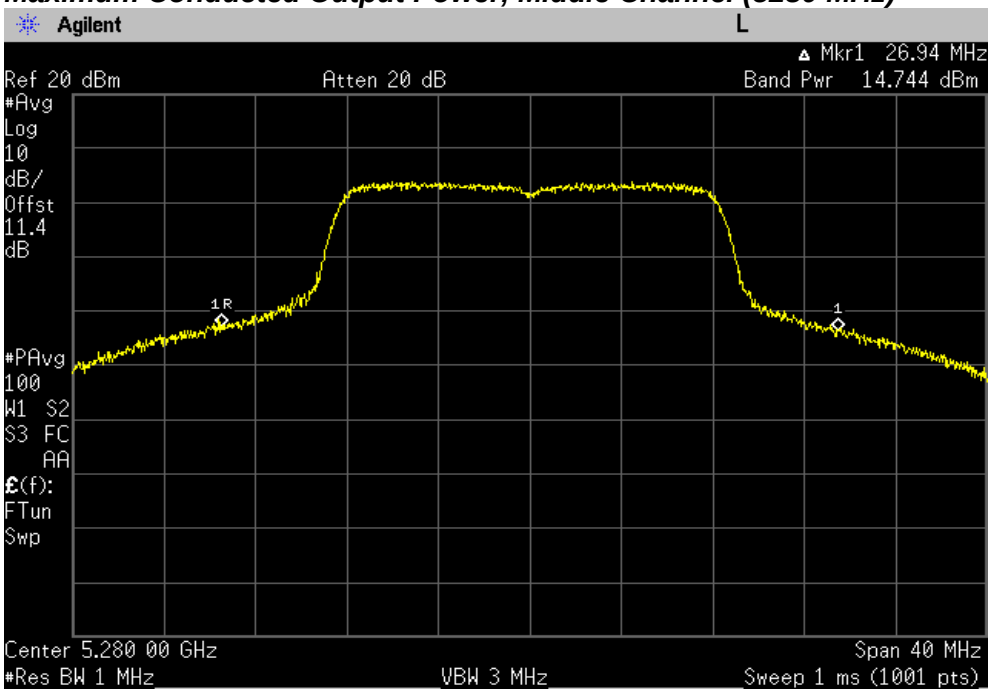
Chain 1

Maximum Conducted Output Power, Lowest Channel (5260 MHz)

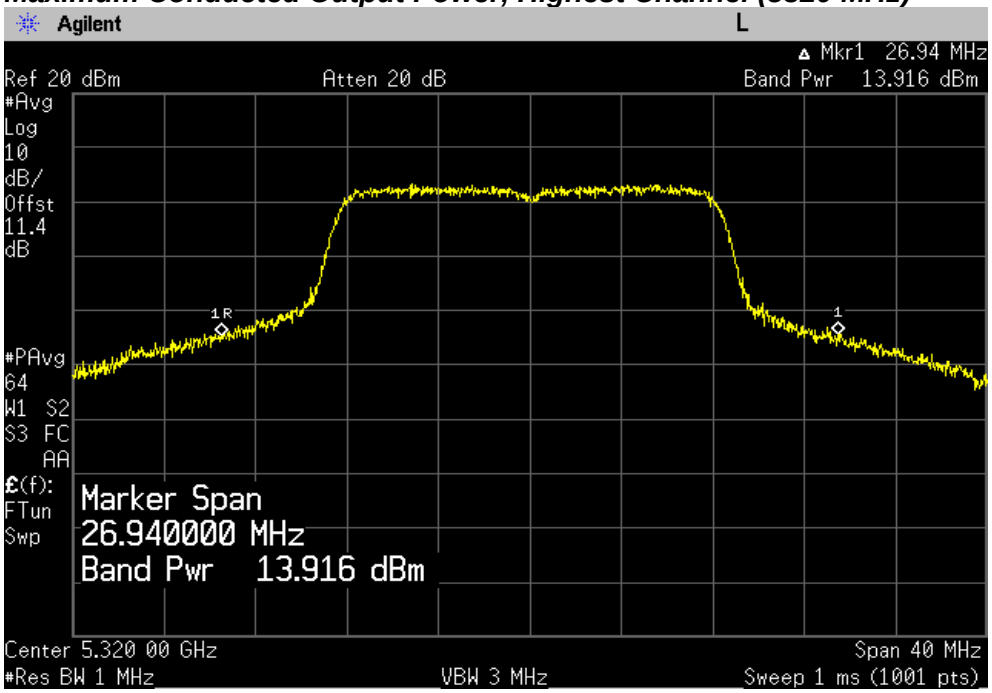


PLOT OF TEST DATA

Maximum Conducted Output Power, Middle Channel (5280 MHz)



Maximum Conducted Output Power, Highest Channel (5320 MHz)

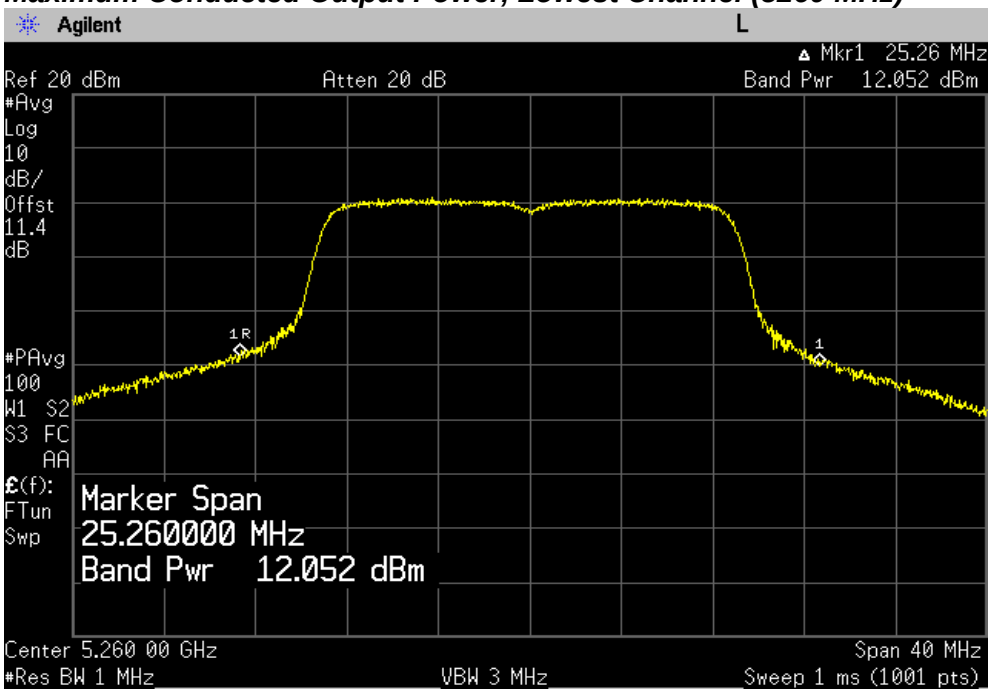


PLOT OF TEST DATA

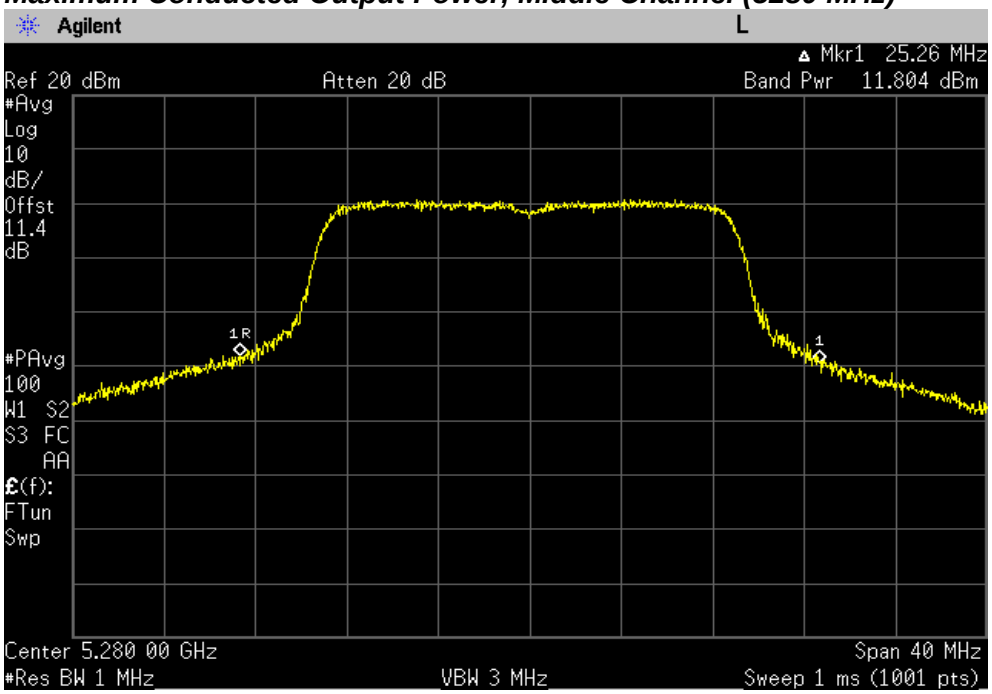
802.11n(20 MHz) mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5260 MHz)

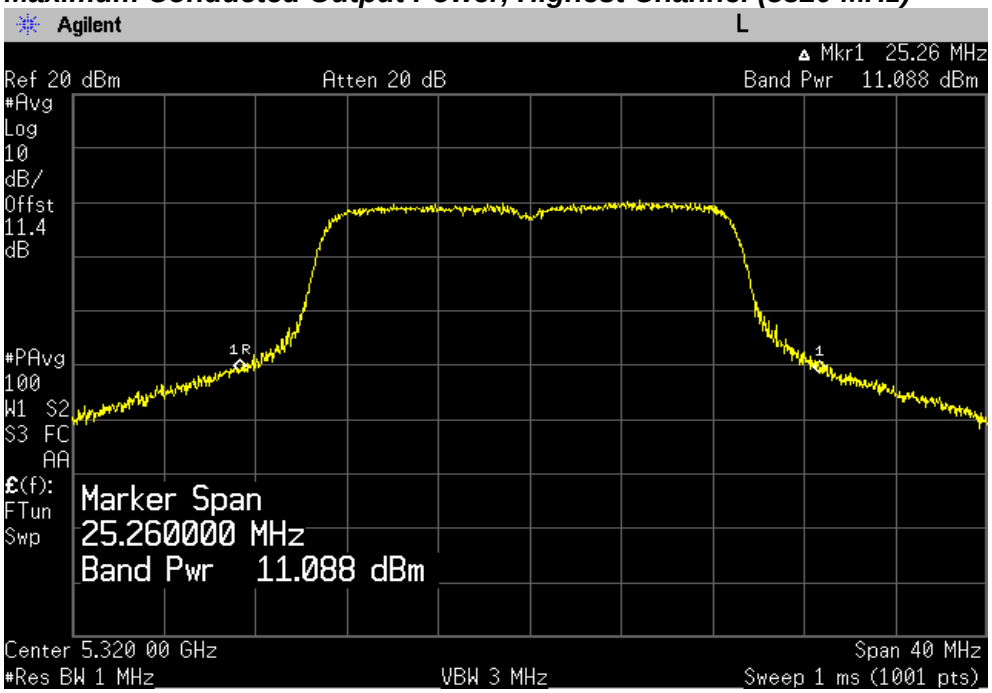


Maximum Conducted Output Power, Middle Channel (5280 MHz)



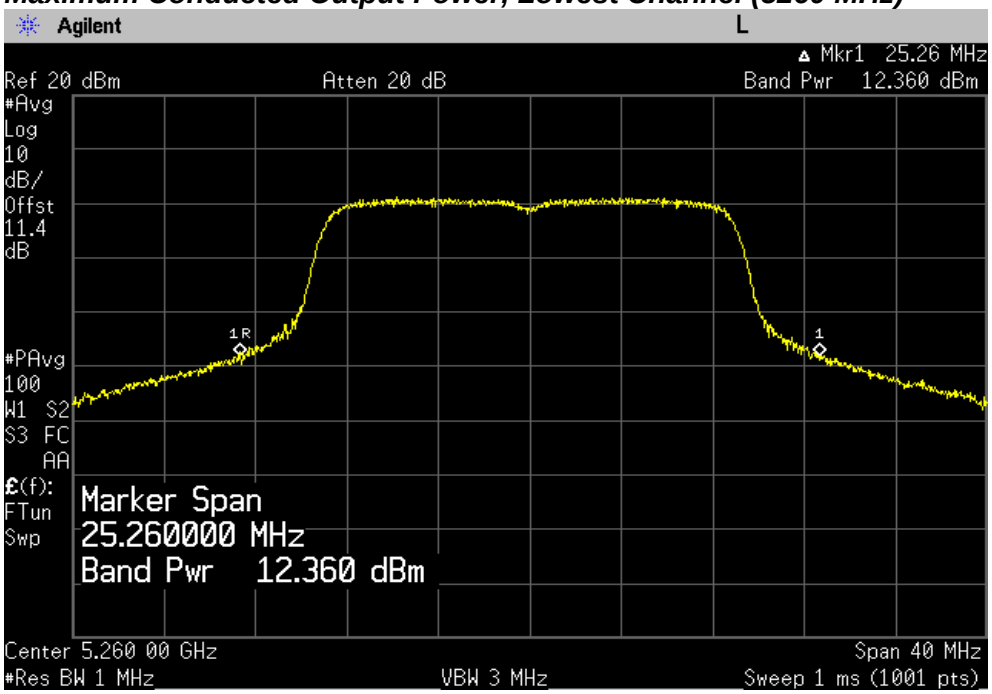
PLOT OF TEST DATA

Maximum Conducted Output Power, Highest Channel (5320 MHz)



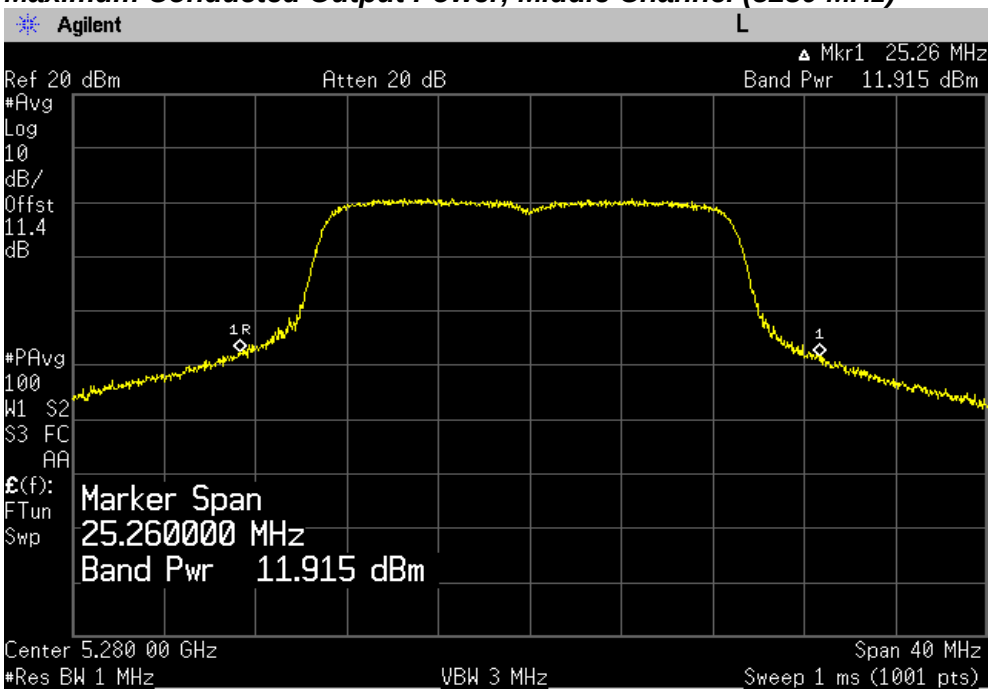
Chain 1

Maximum Conducted Output Power, Lowest Channel (5260 MHz)

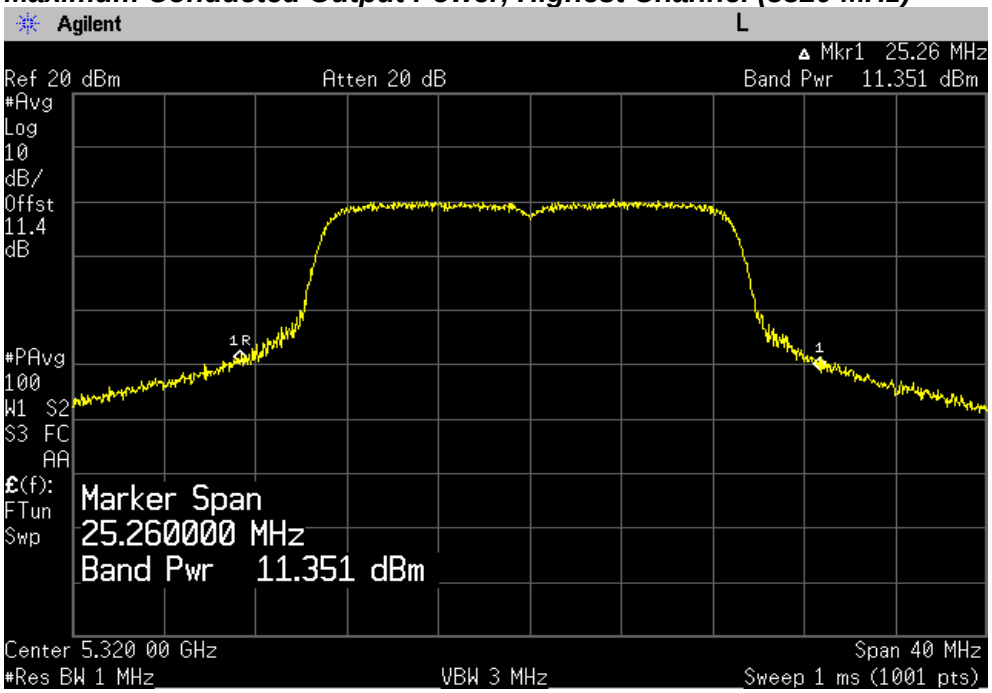


PLOT OF TEST DATA

Maximum Conducted Output Power, Middle Channel (5280 MHz)



Maximum Conducted Output Power, Highest Channel (5320 MHz)

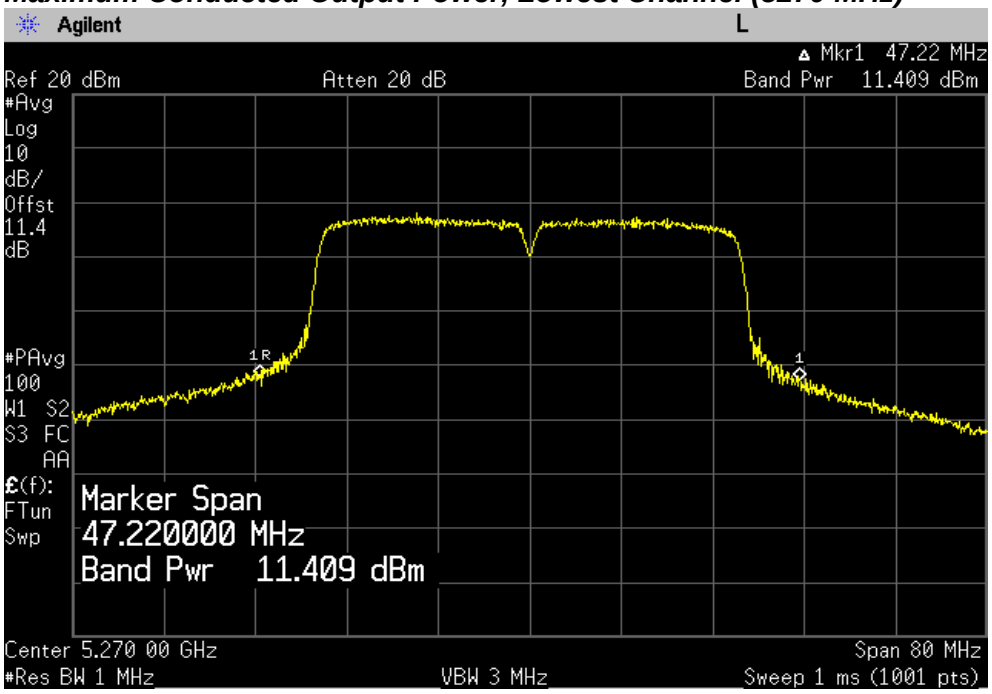


PLOT OF TEST DATA

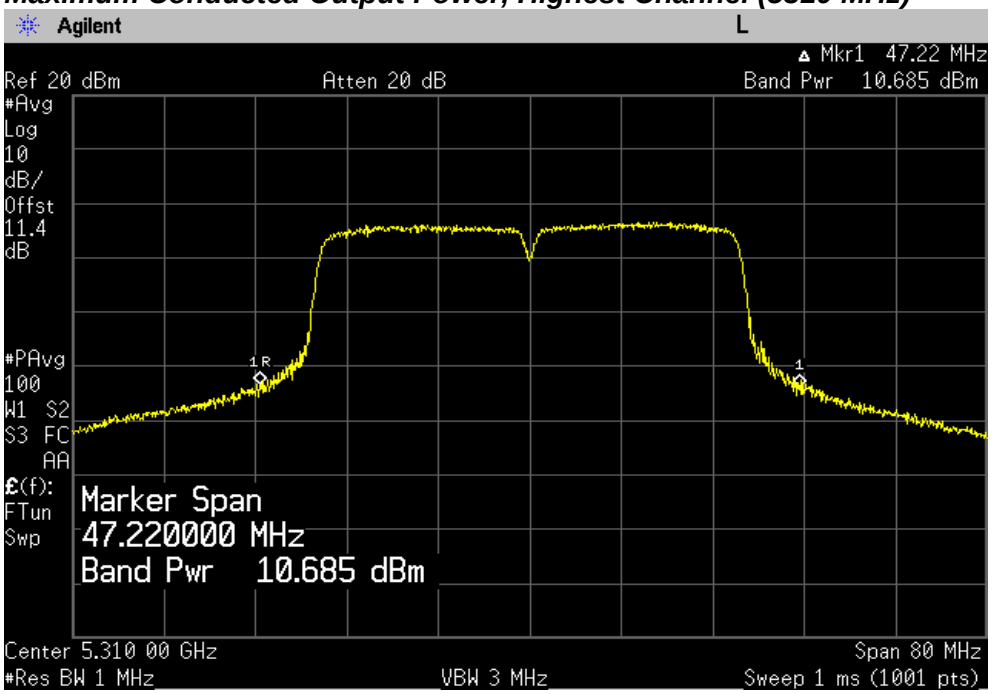
802.11n(40 MHz) mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5270 MHz)



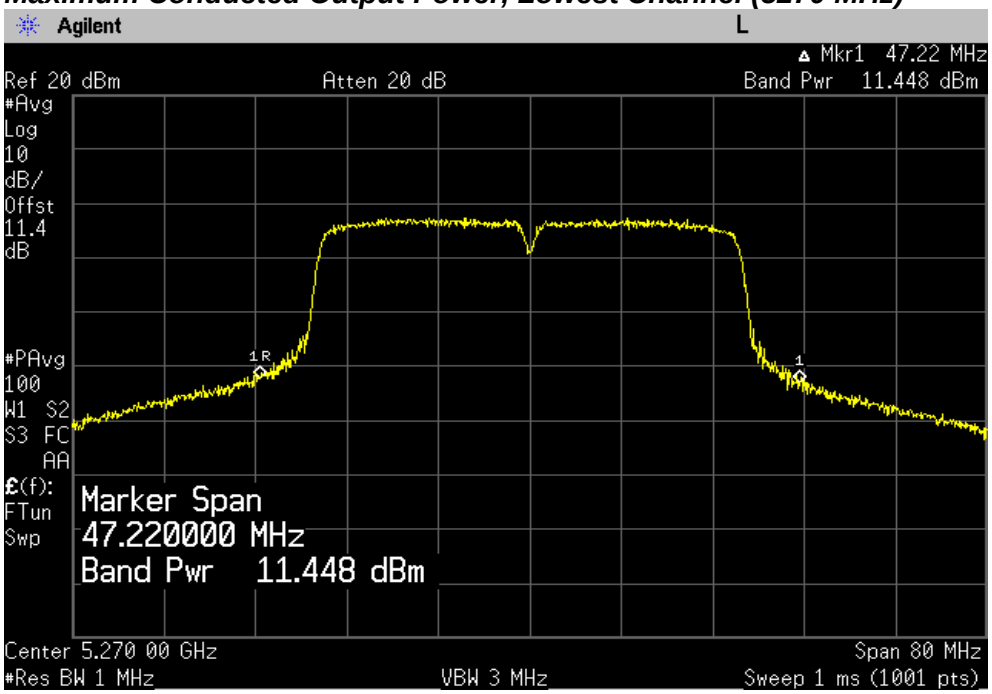
Maximum Conducted Output Power, Highest Channel (5310 MHz)



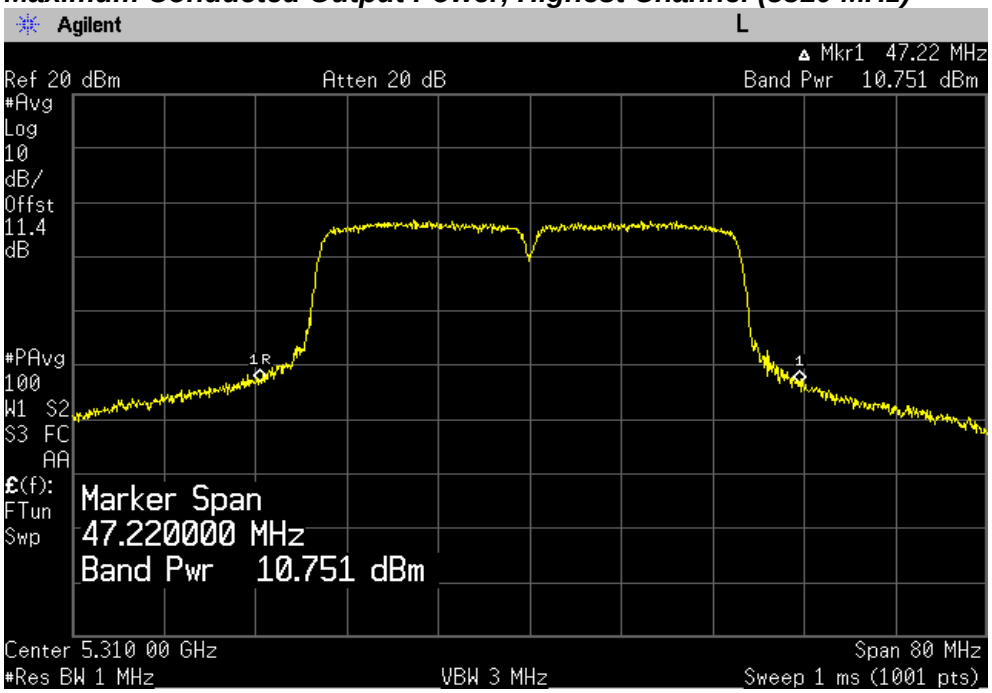
PLOT OF TEST DATA

Chain 1

Maximum Conducted Output Power, Lowest Channel (5270 MHz)



Maximum Conducted Output Power, Highest Channel (5310 MHz)



8.5.3 Maximum Conducted Output Power (average) – UNII-2C band

FCC §15.407(a)

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

802.11a mode

Channel	Frequency (MHz)	Maximum Conducted Power (dBm)		Conducted Limit (dBm)
		Chain 0	Chain 1	
Lowest	5500	13.77	14.35	23.98
Middle	5580	15.12	15.25	23.98
Highest	5700	15.40	15.08	23.98

802.11n (20 MHz) mode

Channel	Frequency (MHz)	Measured conducted power (dBm)		Maximum Conducted Power (dBm)	Conducted Limit (dBm)
		Chain 0	Chain 1	Total output power	
Lowest	5500	12.26	12.34	15.31	23.98
Middle	5580	13.54	12.62	16.11	23.98
Highest	5700	13.82	12.37	16.17	23.98

802.11n (40 MHz) mode

Channel	Frequency (MHz)	Measured conducted power (dBm)		Maximum Conducted Power (dBm)	Conducted Limit (dBm)
		Chain 0	Chain 1	Total output power	
Lowest	5510	8.71	8.25	11.50	23.98
Middle	5550	9.82	9.26	12.56	23.98
Highest	5670	9.87	9.03	12.48	23.98

TEST DATA

Note:

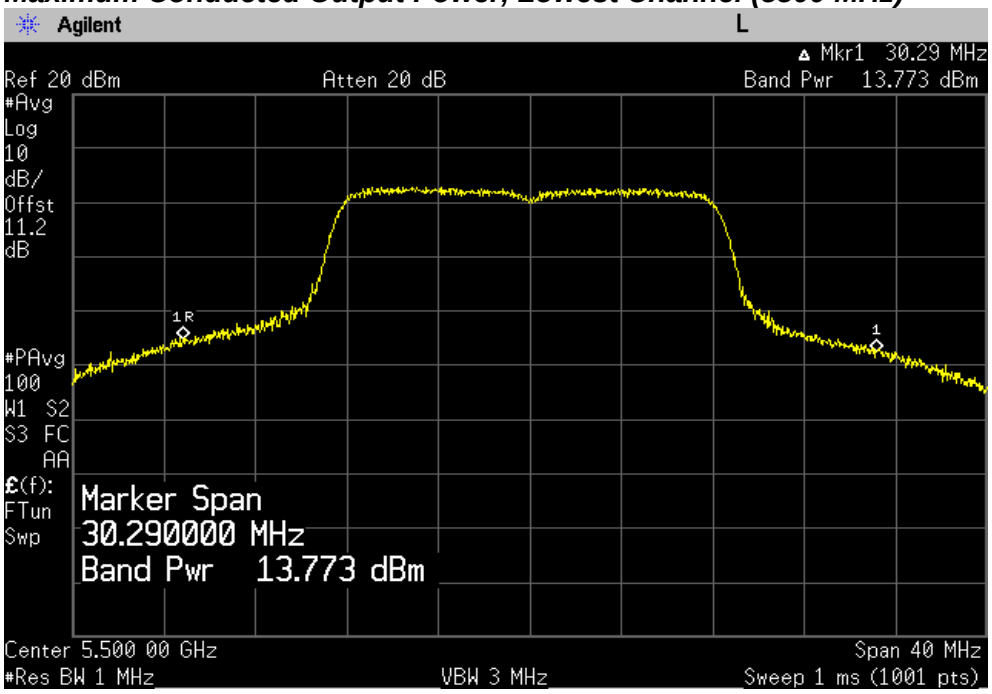
1. *Maximum Conducted (average) Power was measured according to II.E.2.b) Method SA-1 in* ***KDB 789033 D02 General UNII Test Procedures New Rules v01r02***
   Total output power = 10 log [10^{(Chain 0 Power + duty factor)/10} + 10^{(Chain 1 Power + duty factor)/10}]
2. *According to "****662911 D01 Multiple Transmitter Output v02r01****", if two antennas are unequal antenna gains and transmit signals are correlated, then the* ***Directional gain = 10 log[(10$^{G1/20}$+10$^{G2/20}$)^2/N_{ANT}] dBi****. The directional gain of Samsung WiFi module are* ***-1.59 dBi*** *for* ***UNII-1 Band,*** *and* ***-0.44 dBi*** *for* ***UNII-2A Band*** *and* ***-2.95 dBi*** *for* ***UNII-2C Band*** *and* ***-9.97 dBi*** *for* ***UNII-3 Band****.*
3. *The following equation was used for spectrum offset:*
   Spectrum offset (dB) = Attenuator (dB) + Cable Loss (dB) + SMA Type Connector Loss (dB)
4. *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.*

PLOT OF TEST DATA

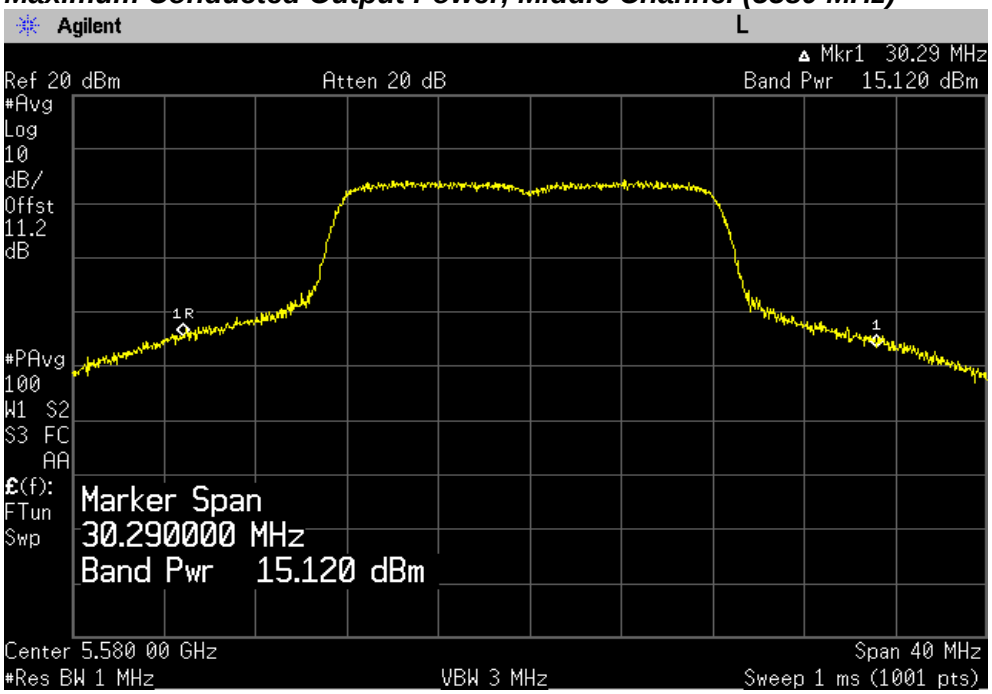
802.11a mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5500 MHz)

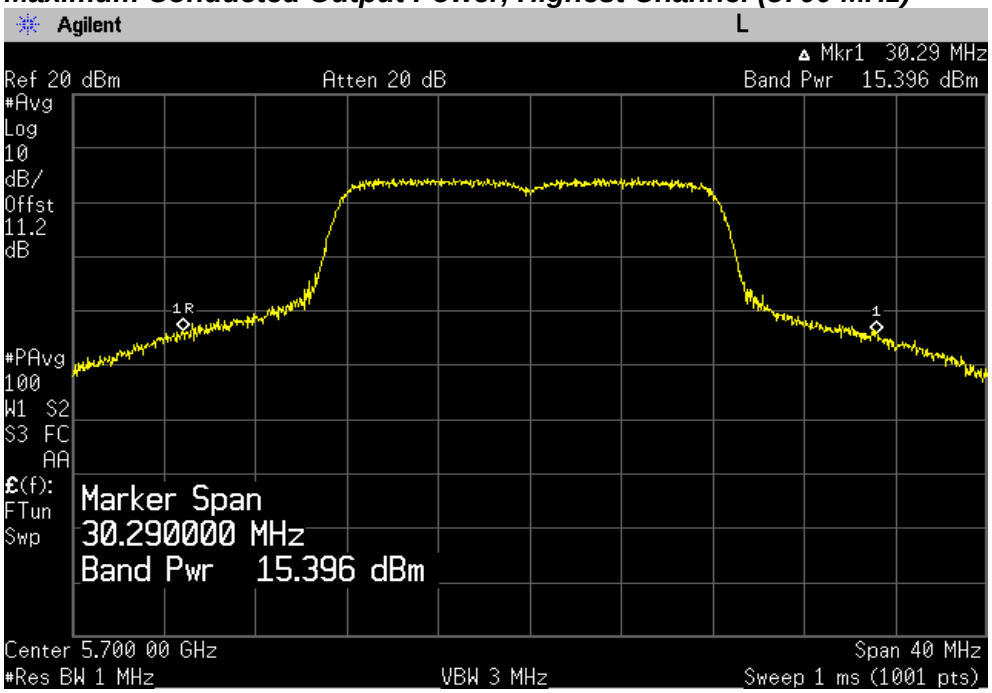


Maximum Conducted Output Power, Middle Channel (5580 MHz)



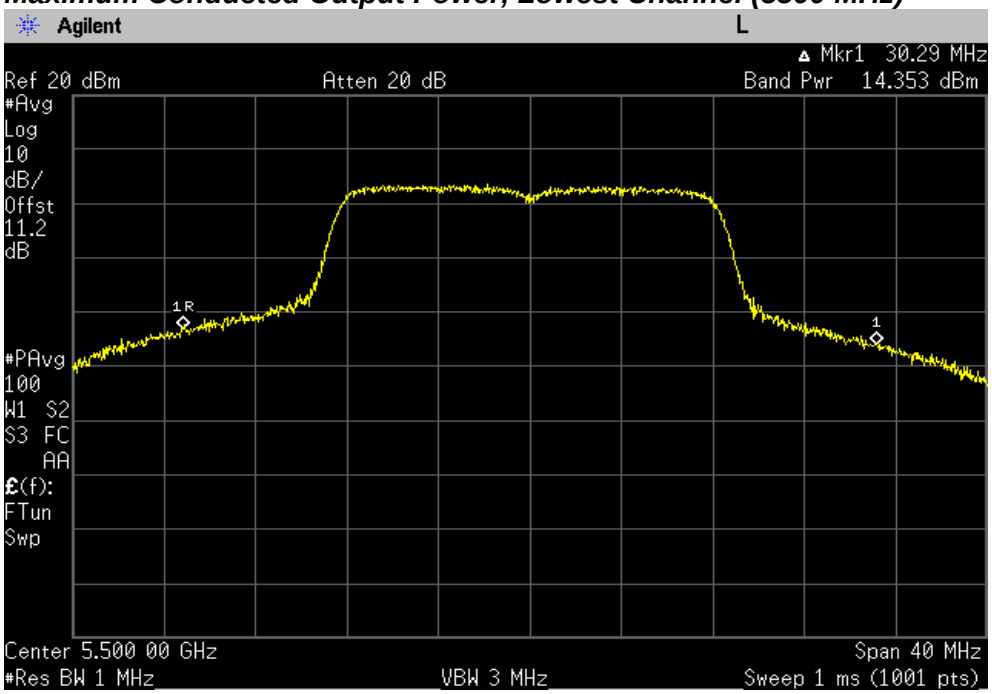
PLOT OF TEST DATA

Maximum Conducted Output Power, Highest Channel (5700 MHz)



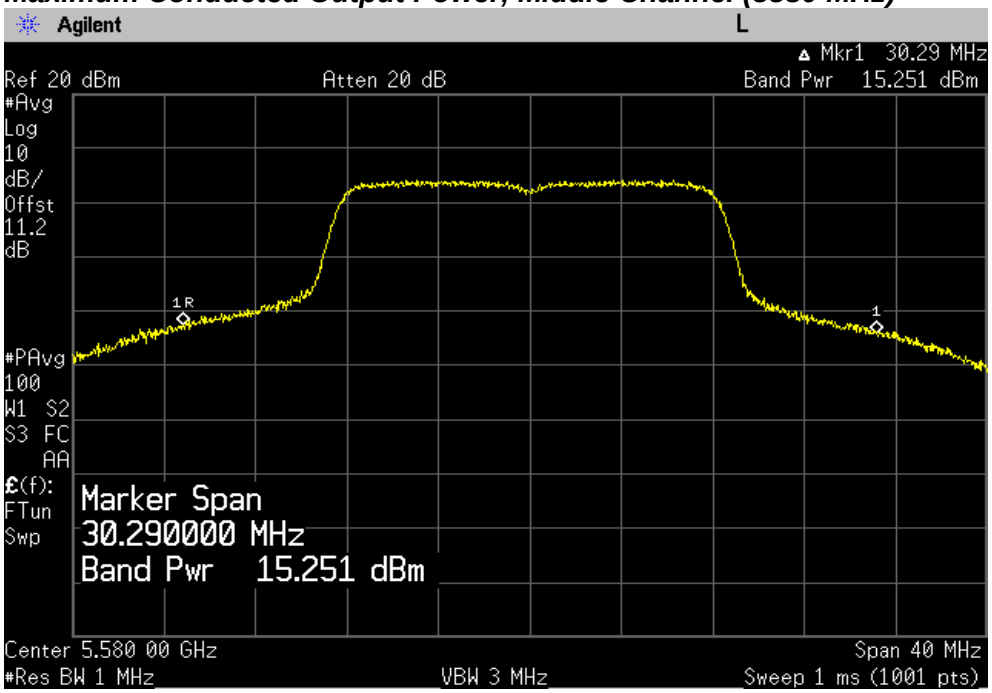
Chain 1

Maximum Conducted Output Power, Lowest Channel (5500 MHz)

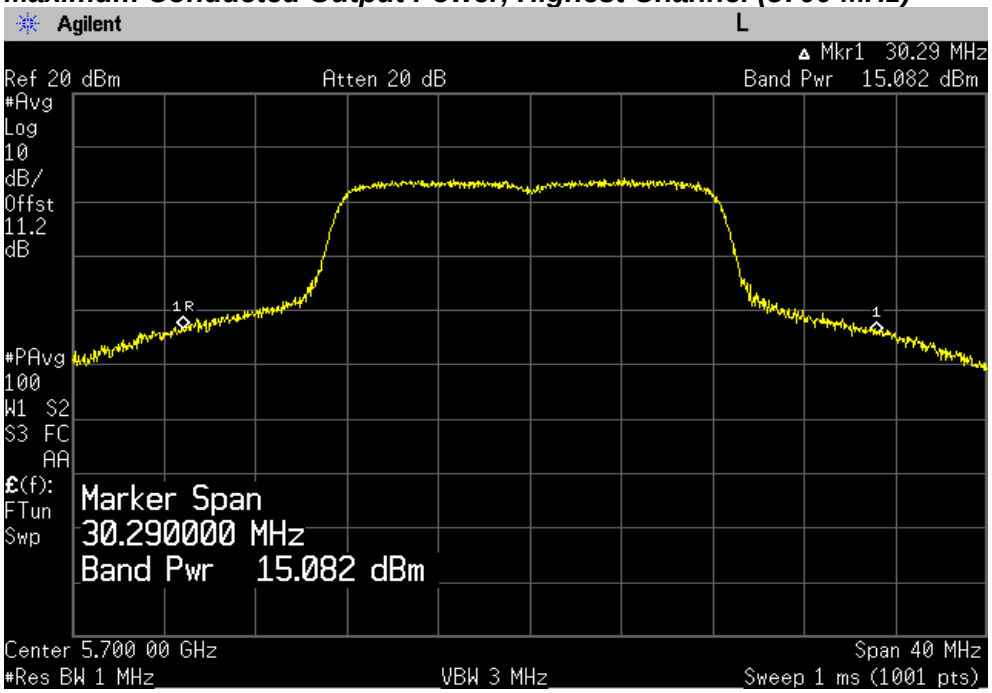


PLOT OF TEST DATA

Maximum Conducted Output Power, Middle Channel (5580 MHz)



Maximum Conducted Output Power, Highest Channel (5700 MHz)

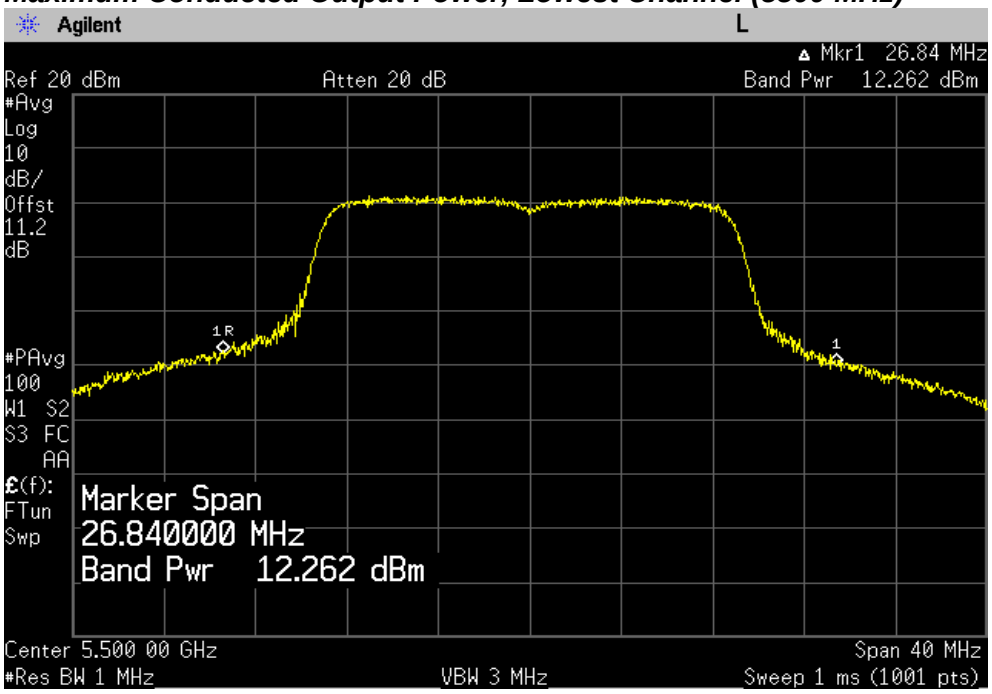


PLOT OF TEST DATA

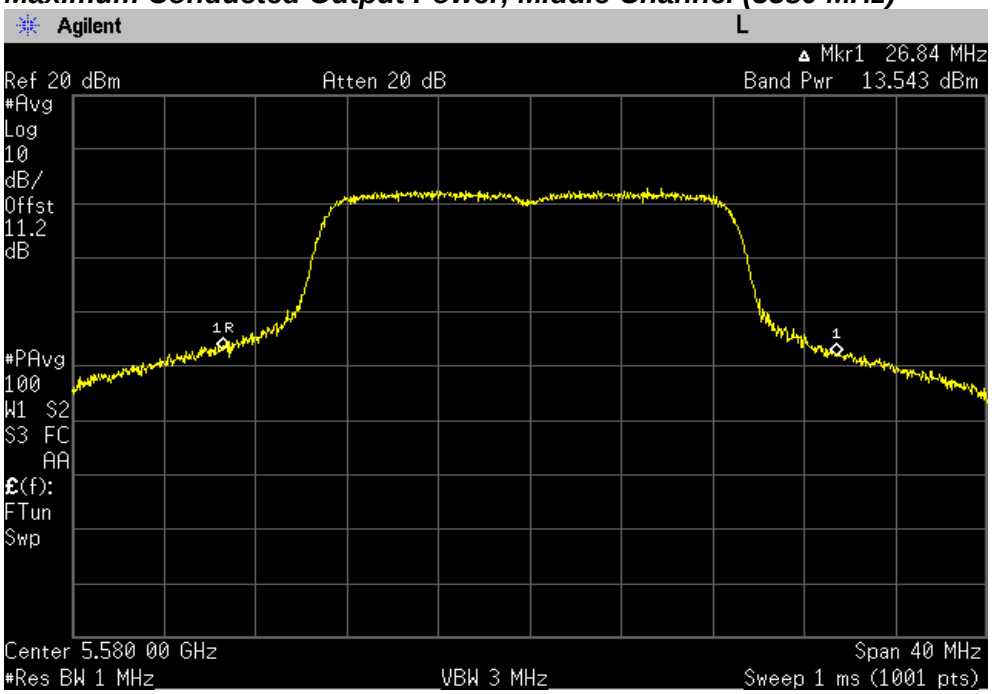
802.11n(20 MHz) mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5500 MHz)

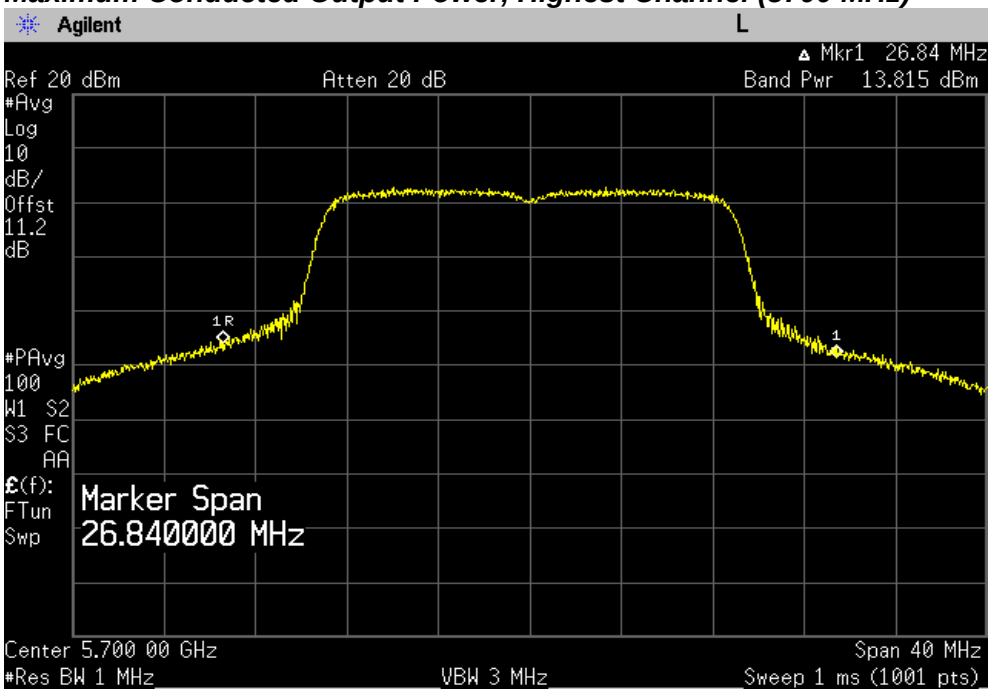


Maximum Conducted Output Power, Middle Channel (5580 MHz)



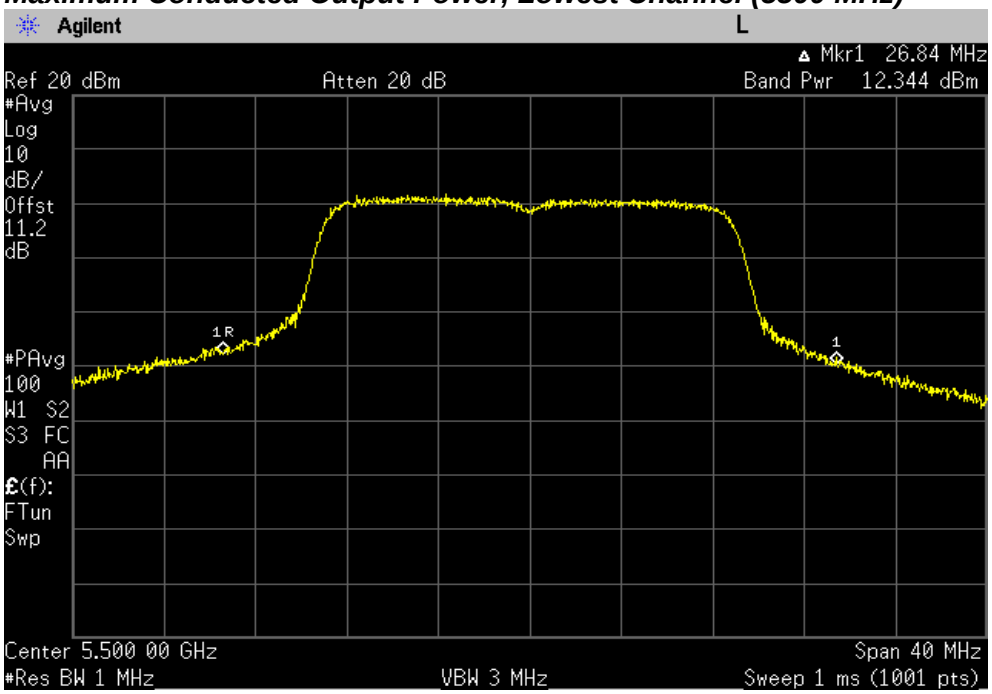
PLOT OF TEST DATA

Maximum Conducted Output Power, Highest Channel (5700 MHz)



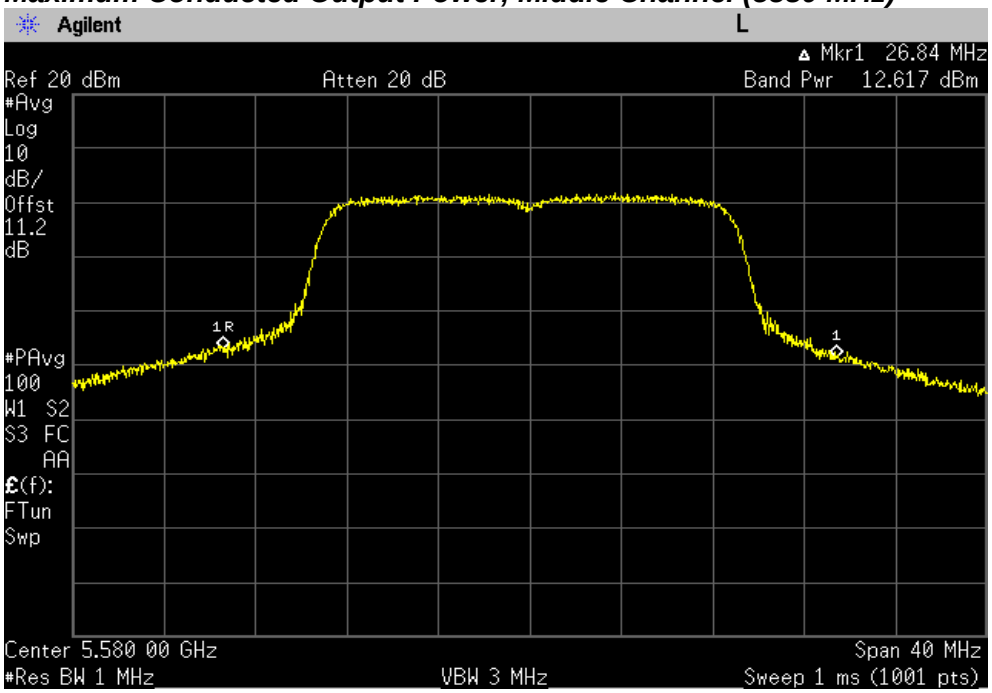
Chain 1

Maximum Conducted Output Power, Lowest Channel (5500 MHz)

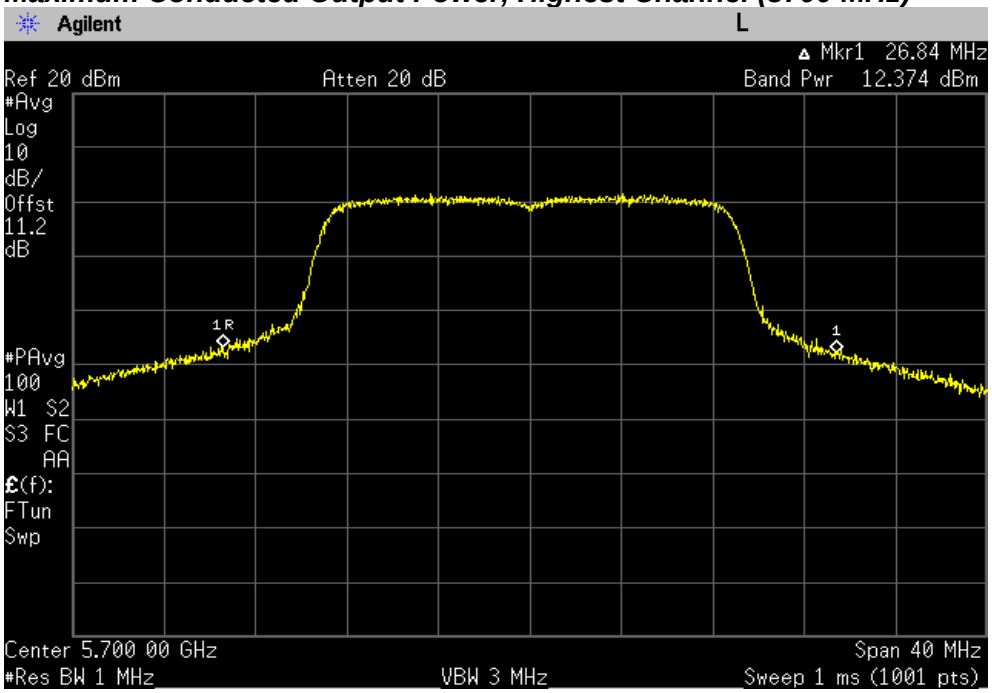


PLOT OF TEST DATA

Maximum Conducted Output Power, Middle Channel (5580 MHz)



Maximum Conducted Output Power, Highest Channel (5700 MHz)

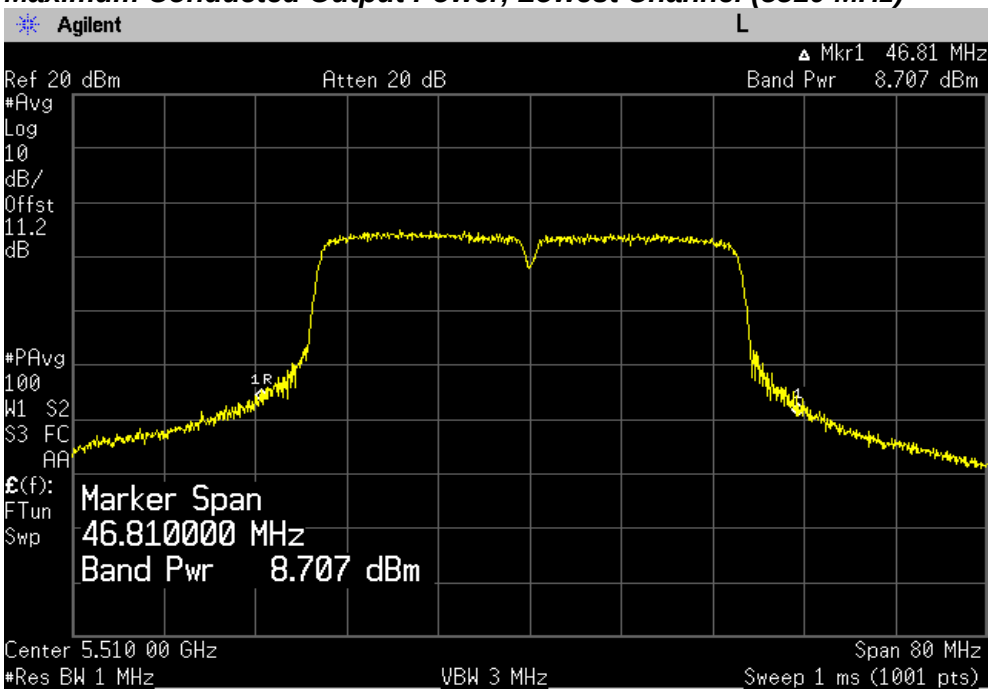


PLOT OF TEST DATA

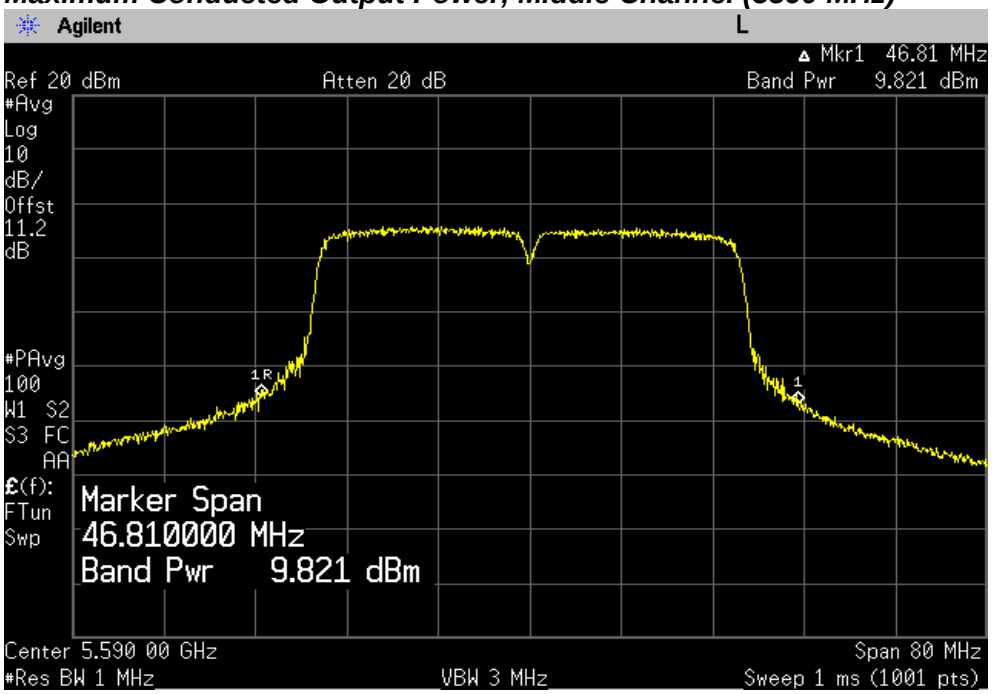
802.11n(40 MHz) mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5510 MHz)

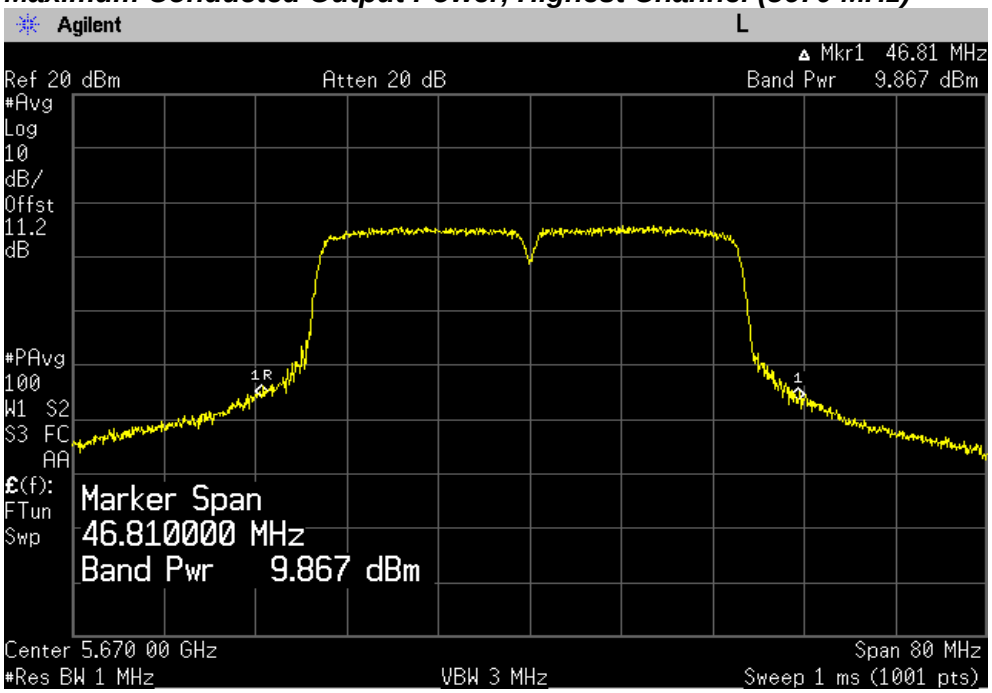


Maximum Conducted Output Power, Middle Channel (5590 MHz)



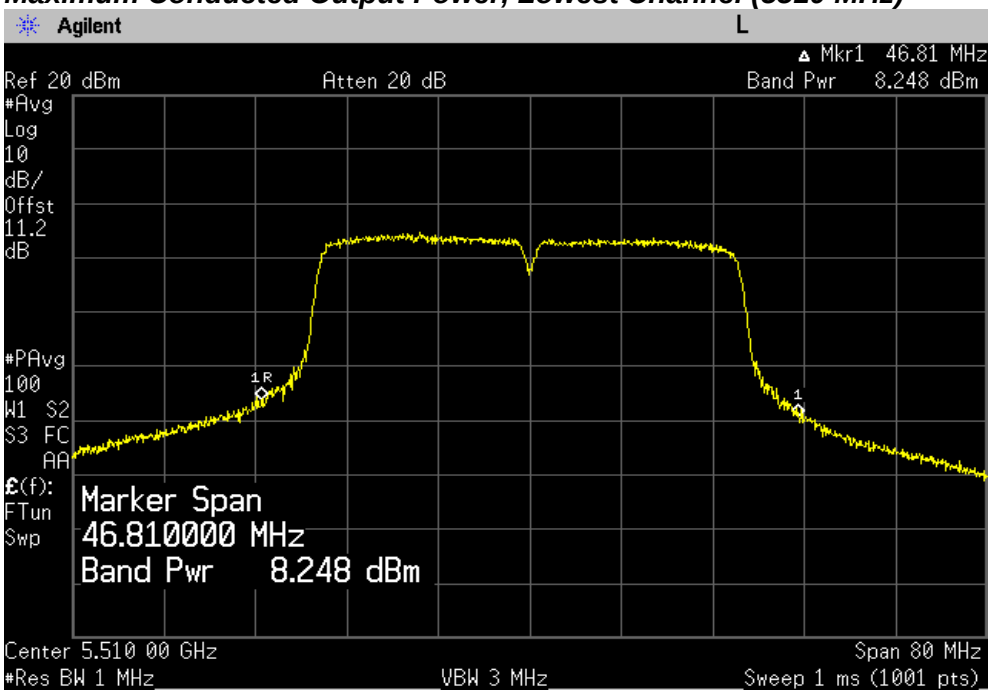
PLOT OF TEST DATA

Maximum Conducted Output Power, Highest Channel (5670 MHz)



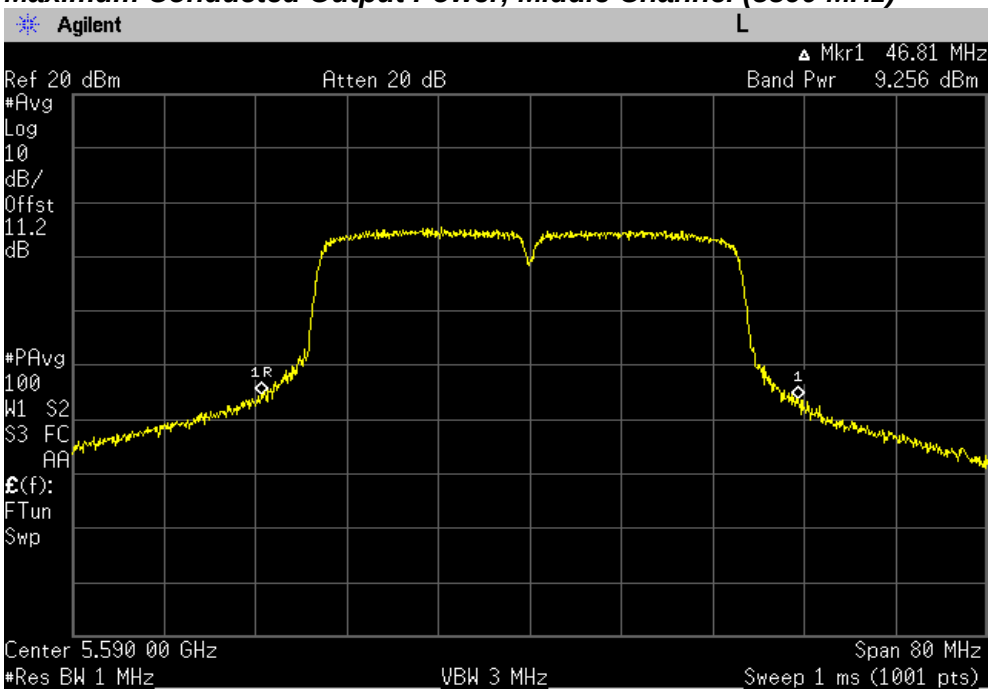
Chain 1

Maximum Conducted Output Power, Lowest Channel (5510 MHz)

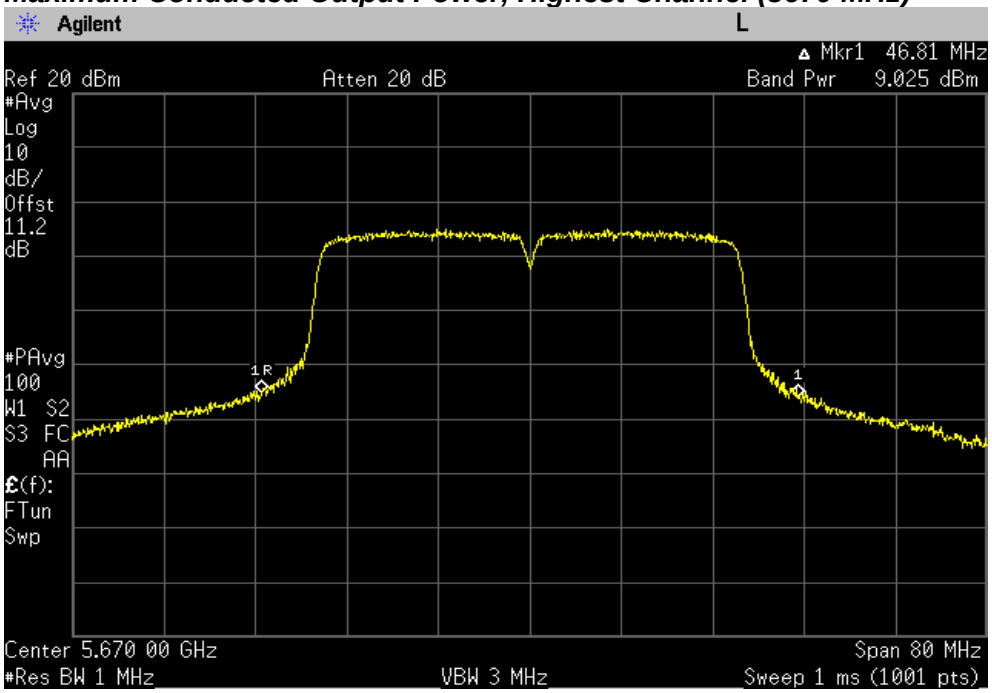


PLOT OF TEST DATA

Maximum Conducted Output Power, Middle Channel (5590 MHz)



Maximum Conducted Output Power, Highest Channel (5670 MHz)



8.5.4 Maximum Conducted Output Power (average) – UNII-3 band

FCC §15.407(a), RSS-247 Issue 1, 6.2

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

802.11a mode

Channel	Frequency (MHz)	Maximum Conducted Power (dBm)		Conducted Limit (dBm)
		Chain 0	Chain 1	
Lowest	5745	13.57	13.23	30.00
Middle	5785	13.49	14.53	30.00
Highest	5825	13.39	14.52	30.00

802.11n (20 MHz) mode

Channel	Frequency (MHz)	Measured conducted power (dBm)		Maximum Conducted Power (dBm)	Conducted Limit (dBm)
		Chain 0	Chain 1	Total output power	
Lowest	5745	11.60	12.01	14.82	30.00
Middle	5785	11.97	13.31	15.70	30.00
Highest	5825	11.87	13.57	15.81	30.00

802.11n (40 MHz) mode

Channel	Frequency (MHz)	Measured conducted power (dBm)		Maximum Conducted Power (dBm)	Conducted Limit (dBm)
		Chain 0	Chain 1	Total output power	FCC
Lowest	5755	8.42	10.09	12.35	30.00
Highest	5795	8.39	10.17	12.38	30.00

TEST DATA

Note:

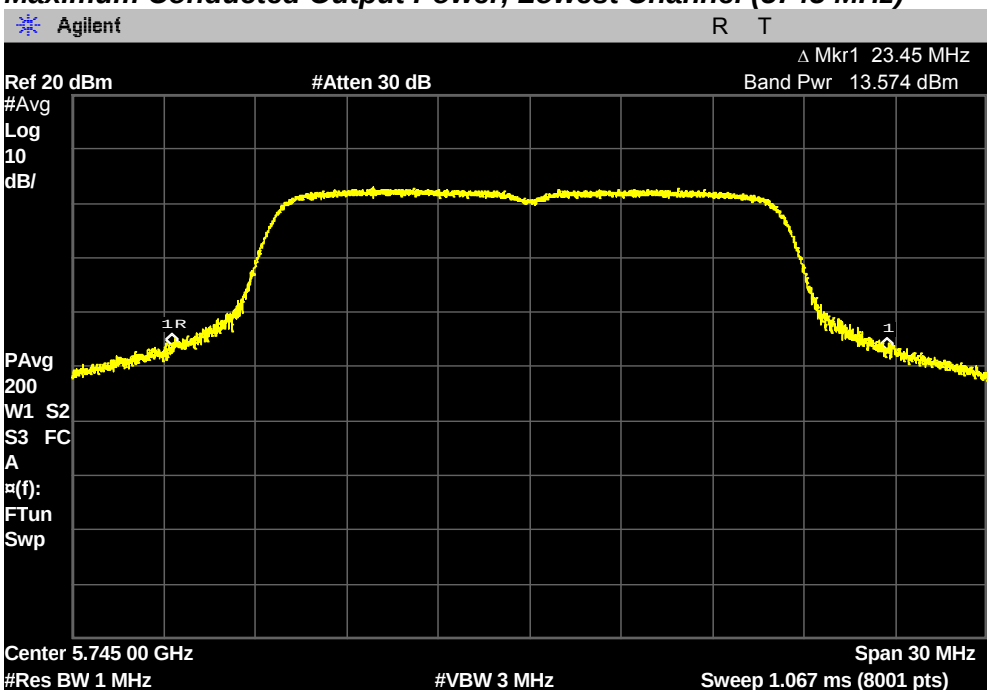
1. *Maximum Conducted (average) Power was measured according to II.E.2.b) Method SA-1 in* ***KDB 789033 D02 General UNII Test Procedures New Rules v01r02***
   Total output power = 10 log [10^{(Chain 0 Power + duty factor)/10} + 10^{(Chain 1 Power + duty factor)/10}]
2. *According to "****662911 D01 Multiple Transmitter Output v02r01****", if two antennas are unequal antenna gains and transmit signals are correlated, then the* ***Directional gain = 10 log[(*** $10^{G1/20}$ ***+*** $10^{G2/20}$ ***)*** ^{2} ***/*** N_{ANT} ***] dBi****. The directional gain of Samsung WiFi module are* ***-1.59 dBi*** *for* ***UNII-1 Band,*** *and* ***-0.44 dBi*** *for* ***UNII-2A Band*** *and* ***-2.95 dBi*** *for* ***UNII-2C Band*** *and* ***-9.97 dBi*** *for* ***UNII-3 Band****.*
3. *The following equation was used for spectrum offset:*
   Spectrum offset (dB) = Attenuator (dB) + Cable Loss (dB) + SMA Type Connector Loss (dB)

PLOT OF TEST DATA

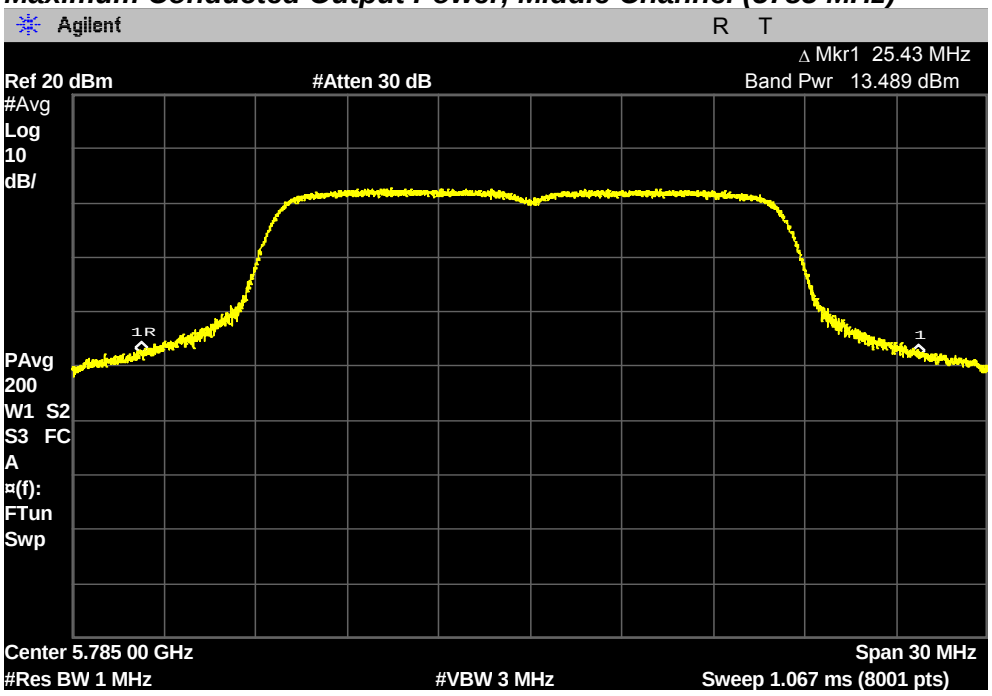
802.11a mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5745 MHz)

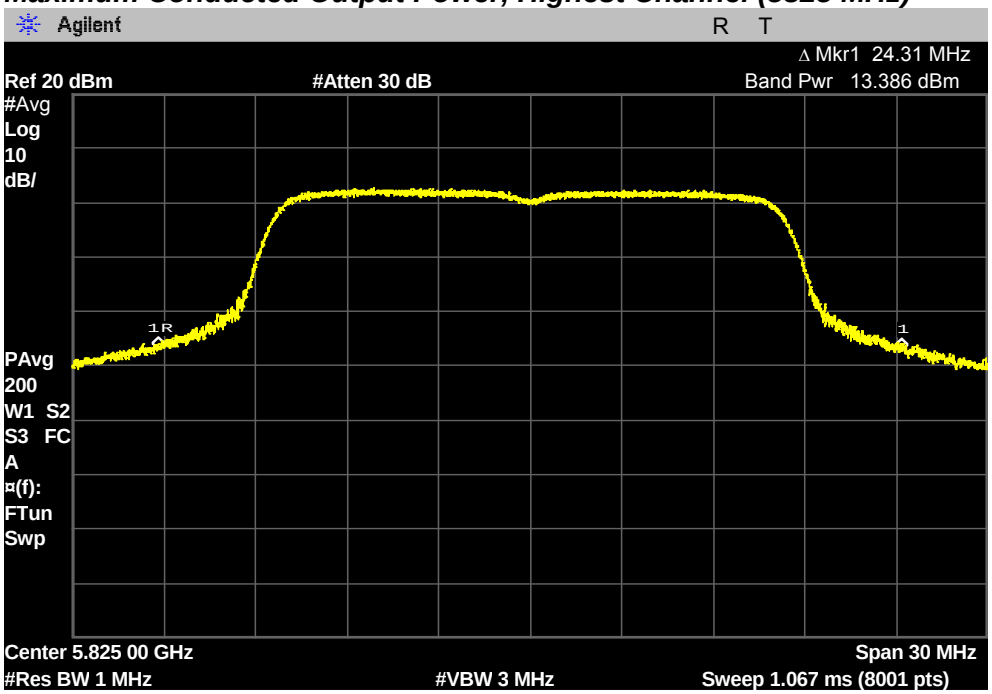


Maximum Conducted Output Power, Middle Channel (5785 MHz)



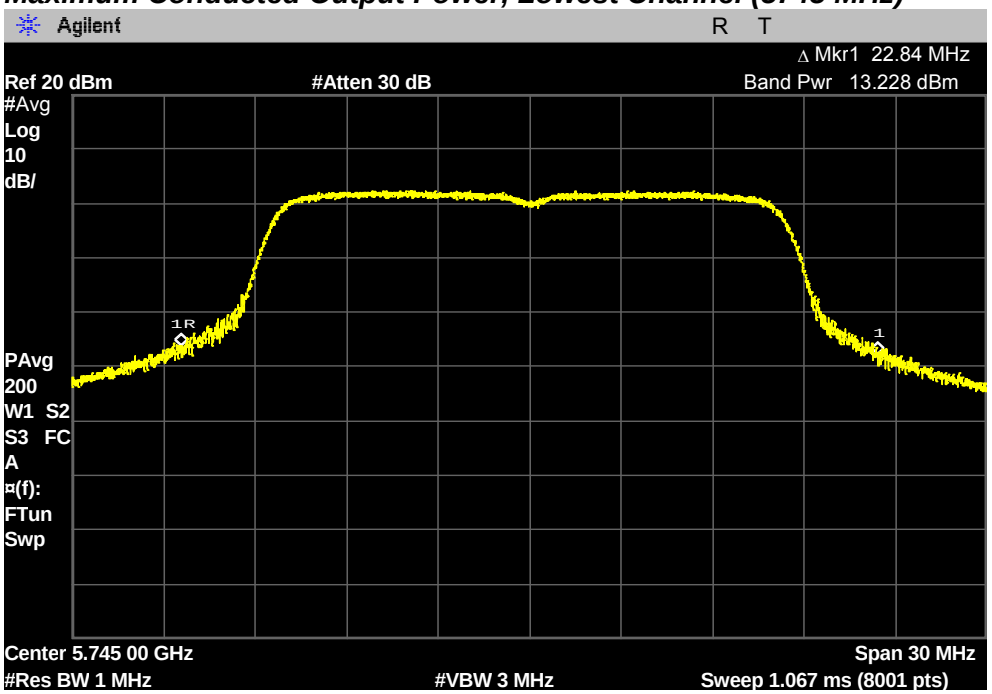
PLOT OF TEST DATA

Maximum Conducted Output Power, Highest Channel (5825 MHz)



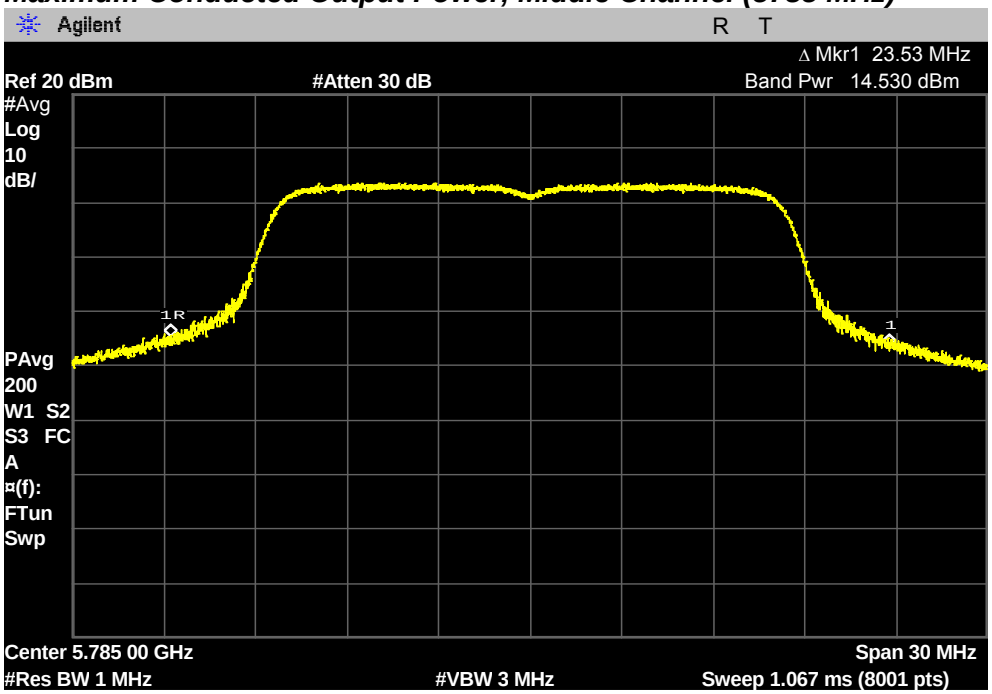
Chain 1

Maximum Conducted Output Power, Lowest Channel (5745 MHz)

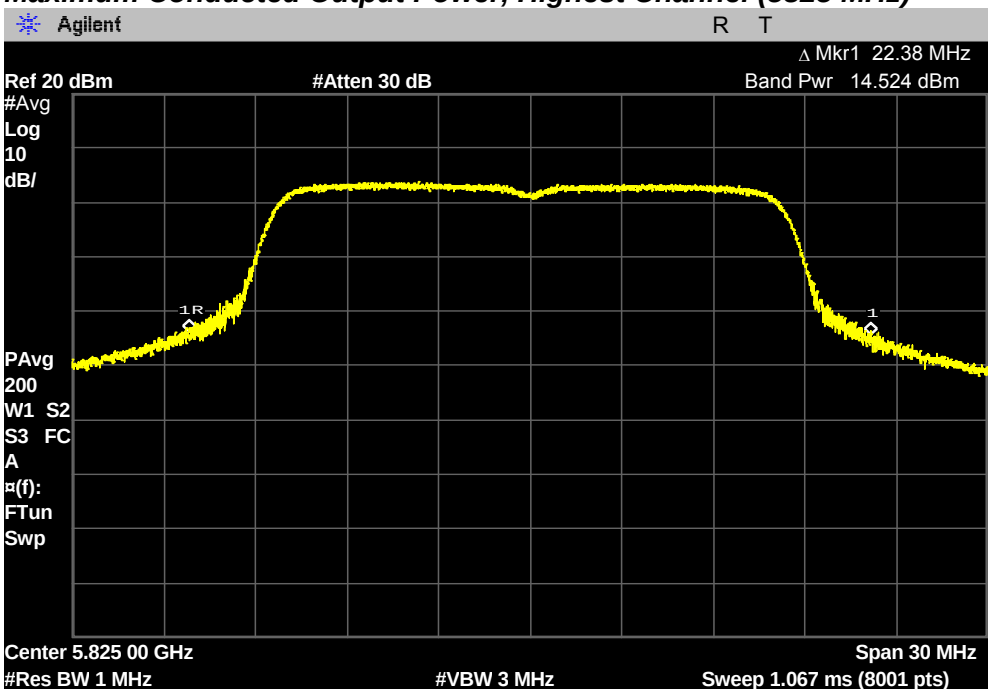


PLOT OF TEST DATA

Maximum Conducted Output Power, Middle Channel (5785 MHz)



Maximum Conducted Output Power, Highest Channel (5825 MHz)

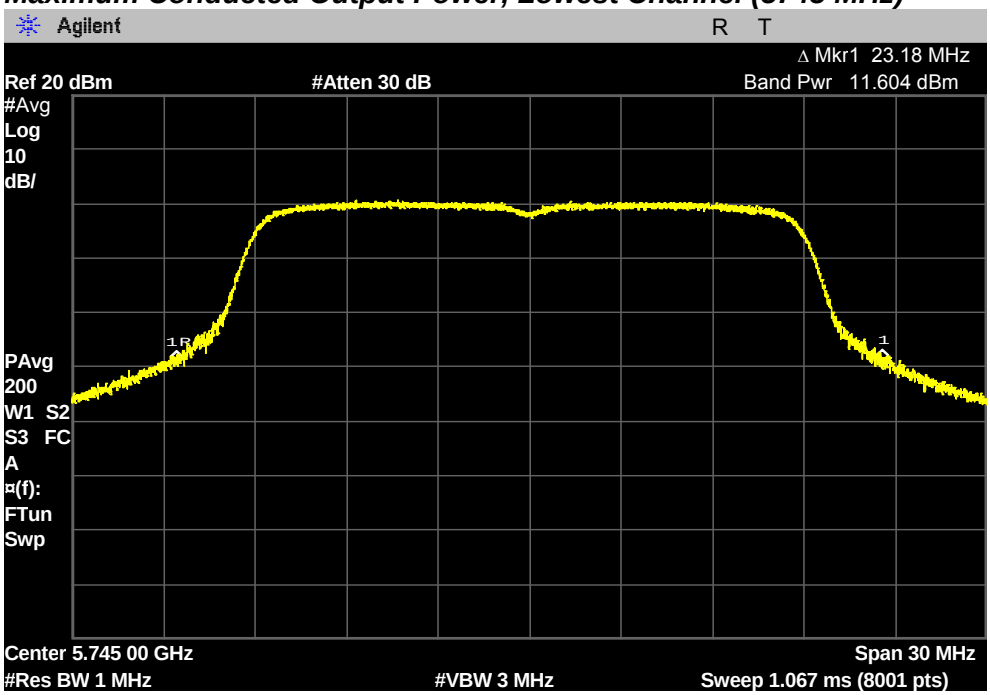


PLOT OF TEST DATA

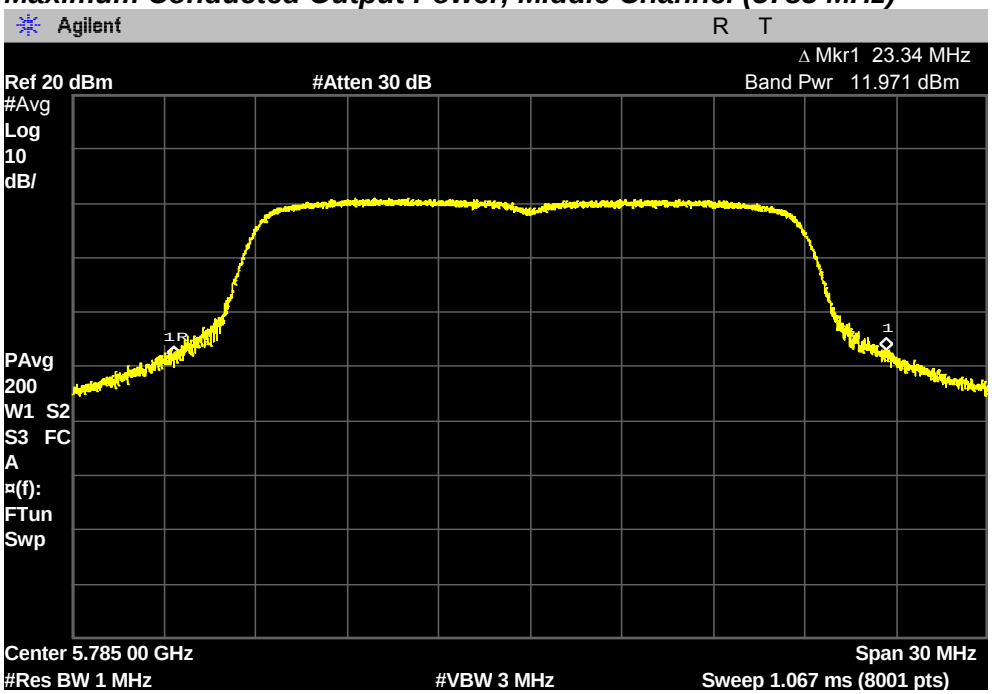
802.11n(20 MHz) mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5745 MHz)

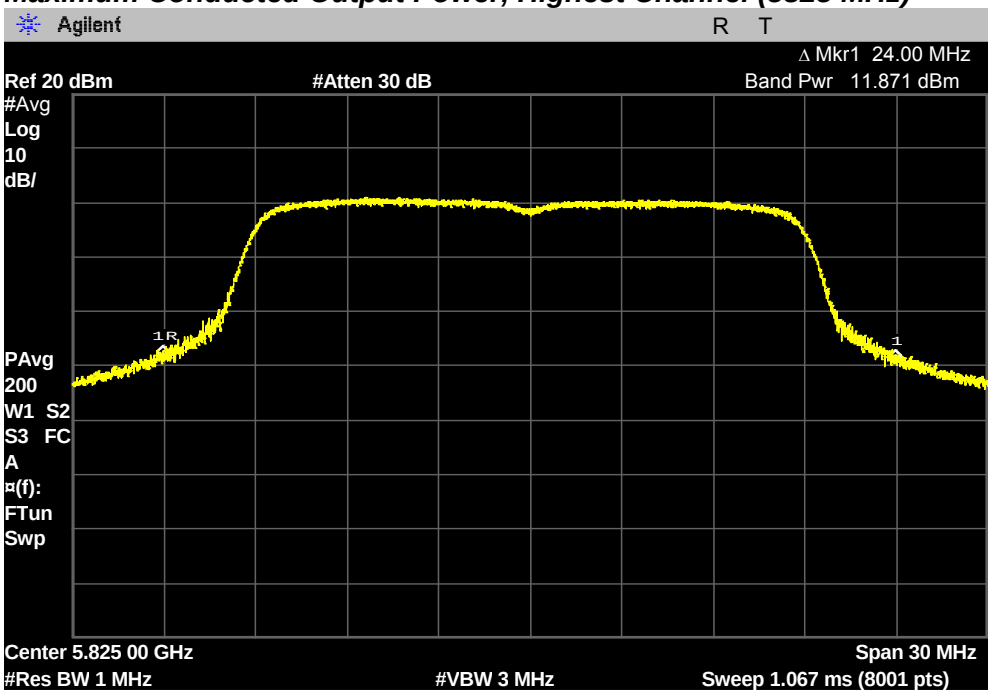


Maximum Conducted Output Power, Middle Channel (5785 MHz)



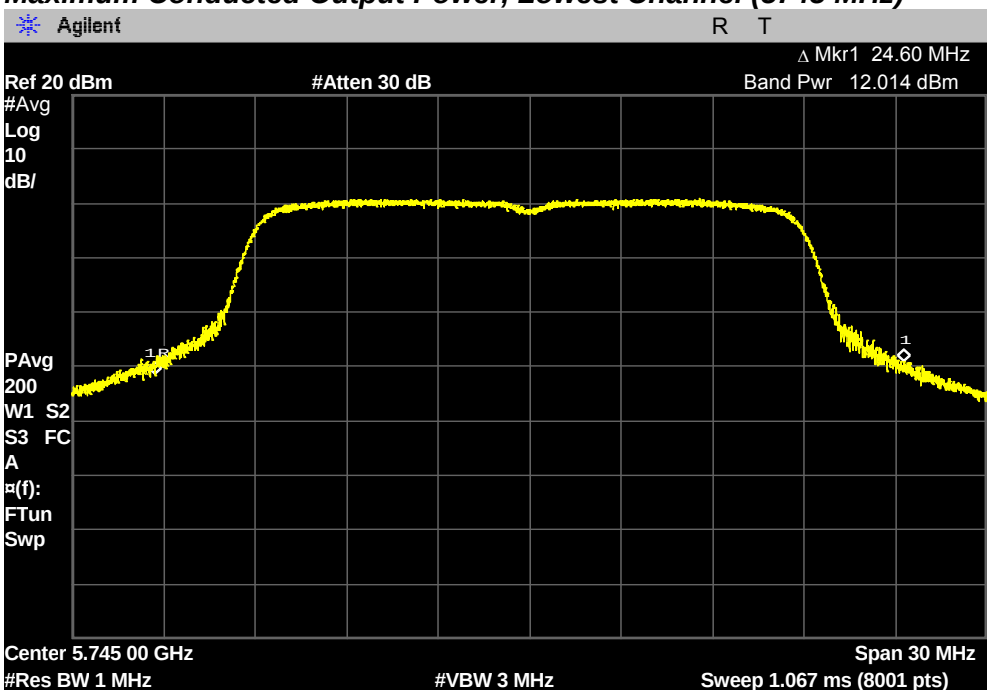
PLOT OF TEST DATA

Maximum Conducted Output Power, Highest Channel (5825 MHz)



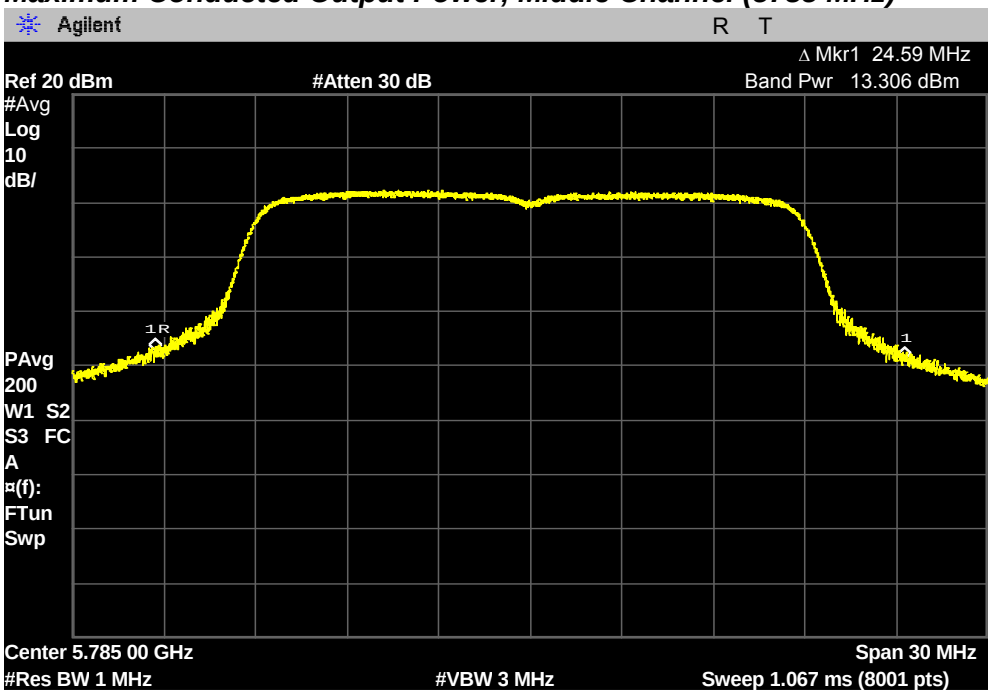
Chain 1

Maximum Conducted Output Power, Lowest Channel (5745 MHz)

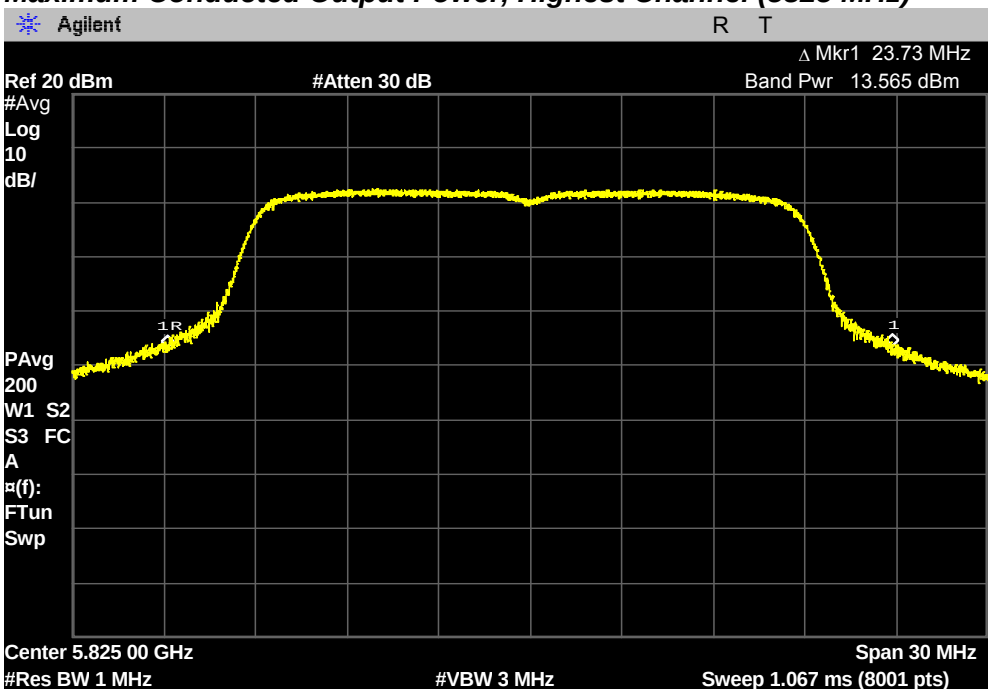


PLOT OF TEST DATA

Maximum Conducted Output Power, Middle Channel (5785 MHz)



Maximum Conducted Output Power, Highest Channel (5825 MHz)

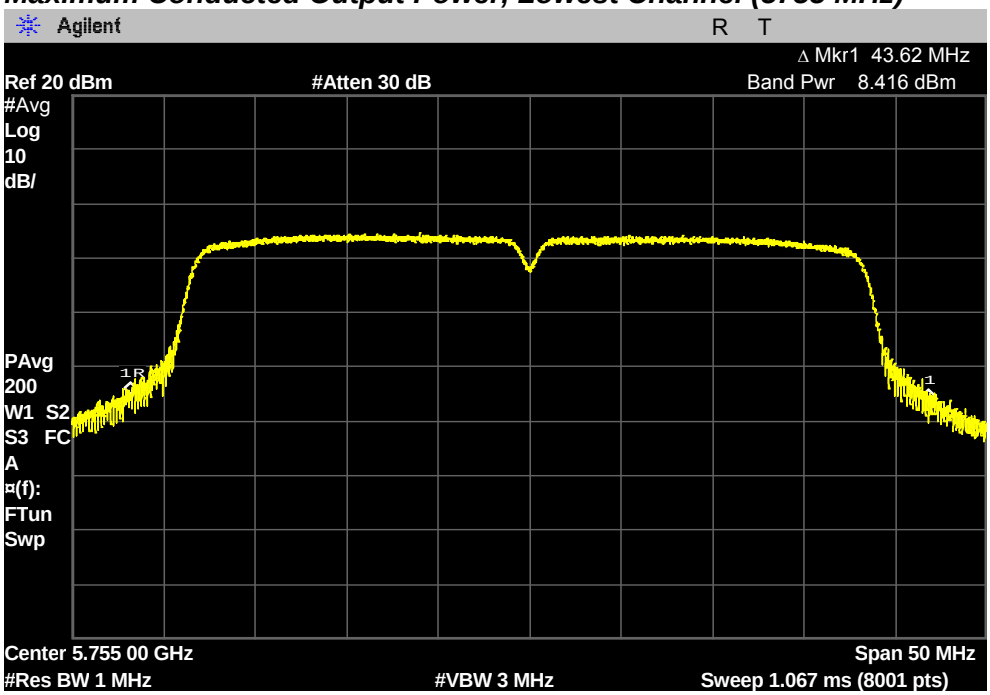


PLOT OF TEST DATA

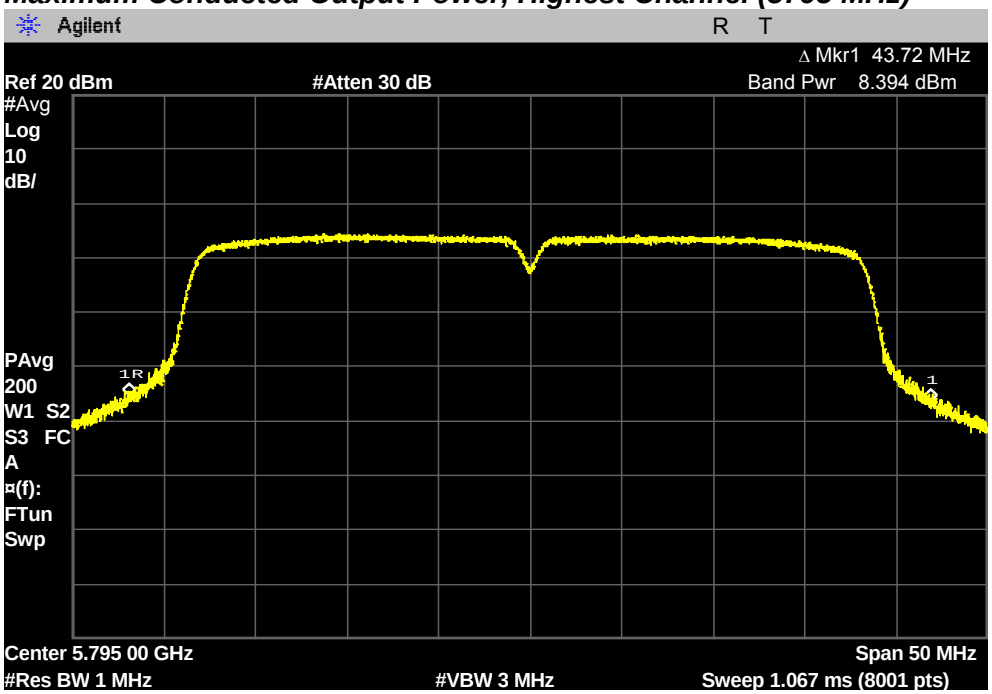
802.11n(40 MHz) mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5755 MHz)



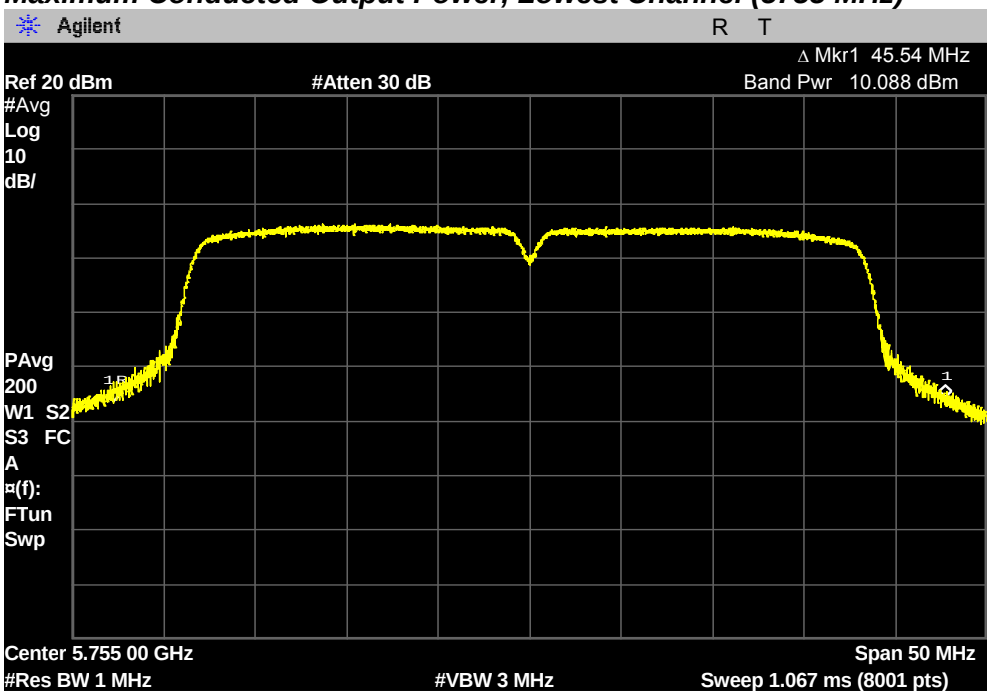
Maximum Conducted Output Power, Highest Channel (5795 MHz)



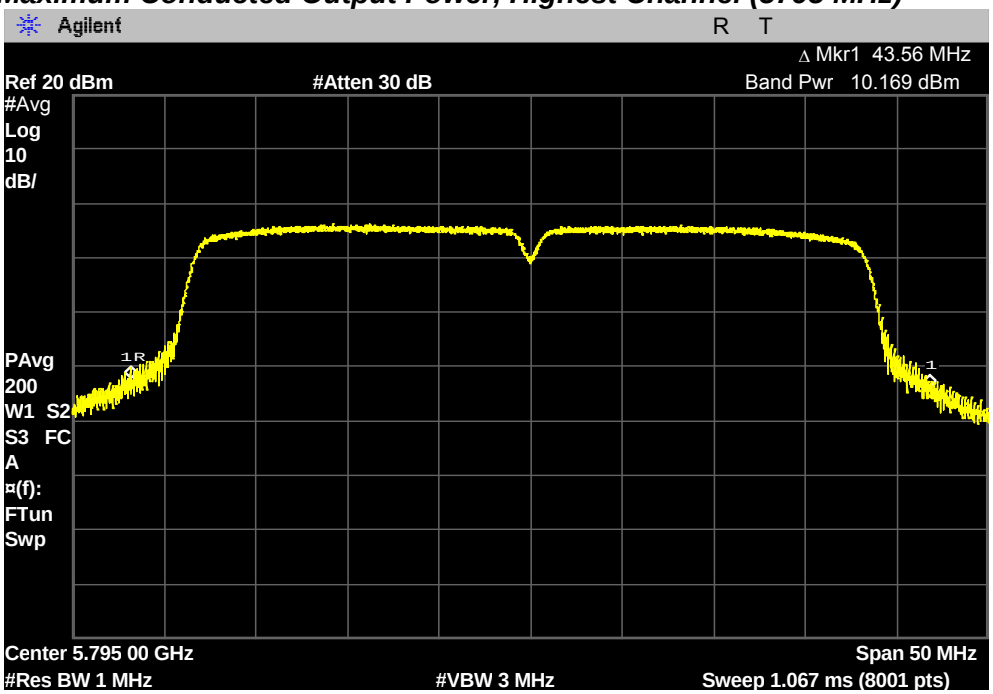
PLOT OF TEST DATA

Chain 1

Maximum Conducted Output Power, Lowest Channel (5755 MHz)



Maximum Conducted Output Power, Highest Channel (5795 MHz)



8.6 Maximum Power Spectral Density

8.6.1 Maximum Power Spectral Density – UNII-1 band

FCC §15.407(a)

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

802.11a mode

Frequency (MHz)	Maximum PSD (dBm)		FCC Limit (dBm/ MHz)
	Chain 0	Chain 1	
5180	0.97	2.32	11.00
5200	1.24	1.82	11.00
5240	1.18	2.23	11.00

802.11n (20 MHz) mode

Channel	Frequency (MHz)	Measured PSD (dBm)		*Maximum PSD (dBm)	FCC Limit (dBm/MHz)
		Chain 0	Chain 1	Total output power	
Lowest	5180	-1.77	-0.63	1.85	11.00
Middle	5200	-0.56	-0.97	2.25	11.00
Highest	5240	-0.47	-0.84	2.36	11.00

802.11n (40 MHz) mode

Channel	Frequency (MHz)	Measured PSD (dBm)		Maximum PSD (dBm)	FCC Limit (dBm)
		Chain 0	Chain 1	Total output power	
Lowest	5190	-1.88	-2.28	0.93	11.00
Highest	5230	-2.22	-2.08	0.86	11.00

Note:

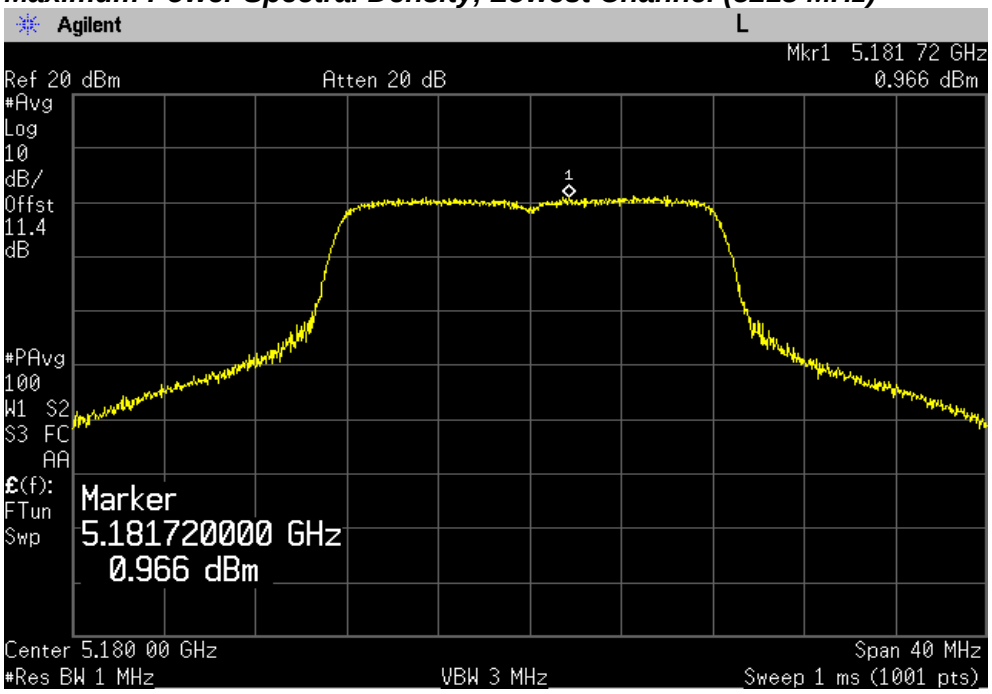
1. *Power Spectral Density(PSD) was measured by same method with conducted output power according to II.F.1 in* ***KDB 789033 D02 General UNII Test Procedures New Rules v01r02***
2. *Total output power = 10 log [10^{(Chain 0 Power + duty factor)/10} + 10^{(Chain 1 Power + duty factor)/10}]*
3. *According to "****662911 D01 Multiple Transmitter Output v02r01****", if two antennas are unequal antenna gains and transmit signals are correlated, then the* ***Directional gain = 10 log[(10$^{G1/20}$+10$^{G2/20}$)^2/N_{ANT}] dBi****. The directional gain of Samsung WiFi module are* ***-1.59 dBi*** *for* ***UNII-1 Band,*** *and* ***-0.44 dBi*** *for* ***UNII-2A Band*** *and* ***-2.95 dBi*** *for* ***UNII-2C Band*** *and* ***-9.97 dBi*** *for* ***UNII-3 Band****.*
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. *The following equation was used for spectrum offset:*
   Spectrum offset (dB) = Attenuator (dB) + Cable Loss (dB) + SMA Type Connector Loss (dB)

PLOT OF TEST DATA

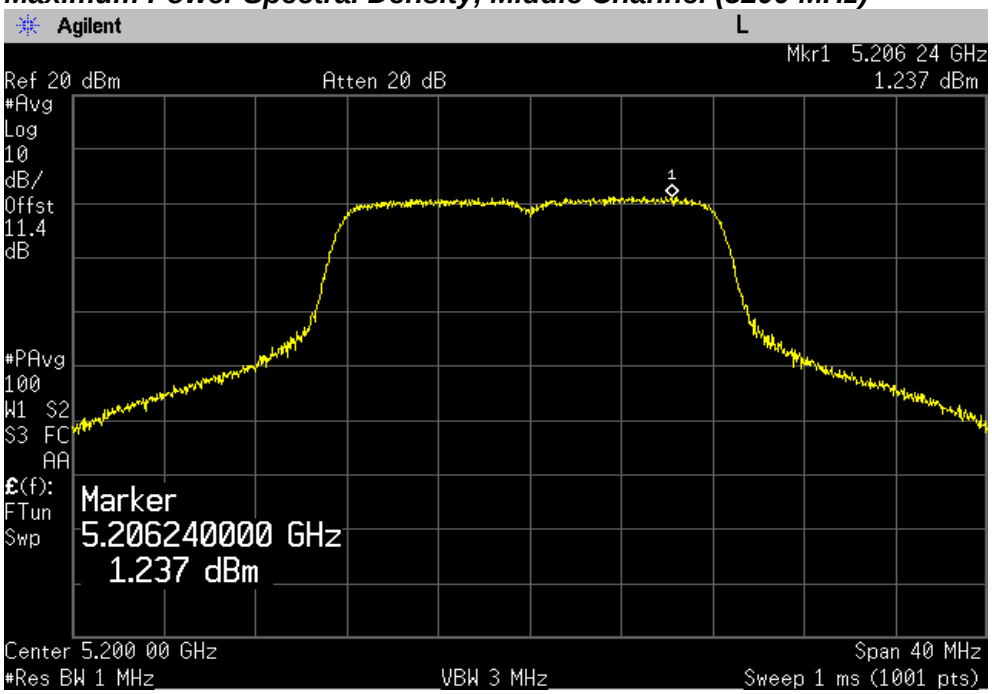
802.11a mode

Chain 0

Maximum Power Spectral Density, Lowest Channel (5218 MHz)

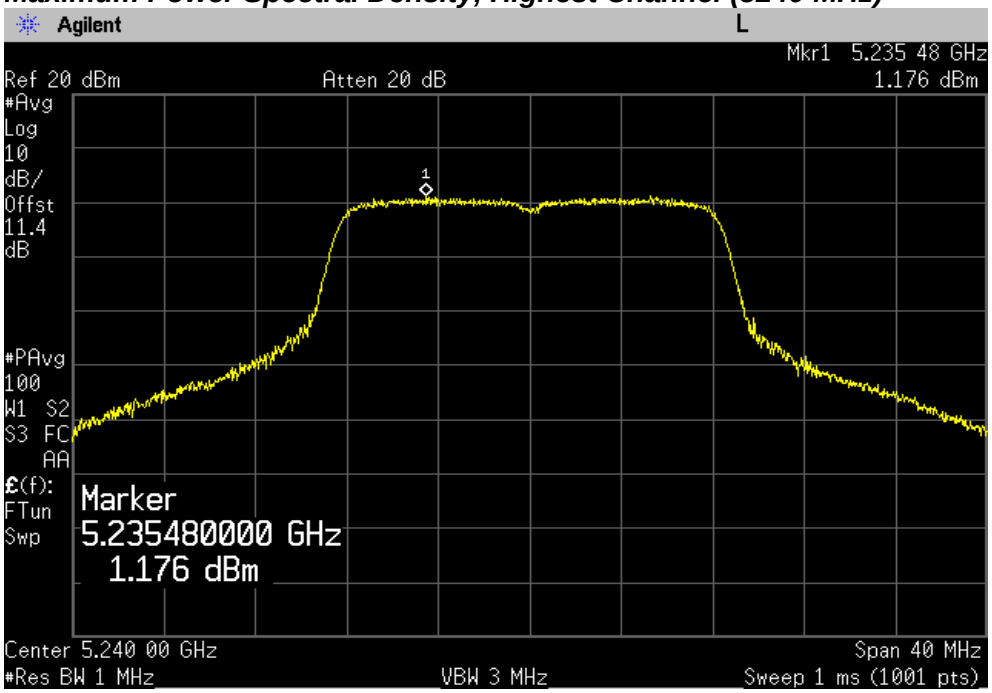


Maximum Power Spectral Density, Middle Channel (5200 MHz)



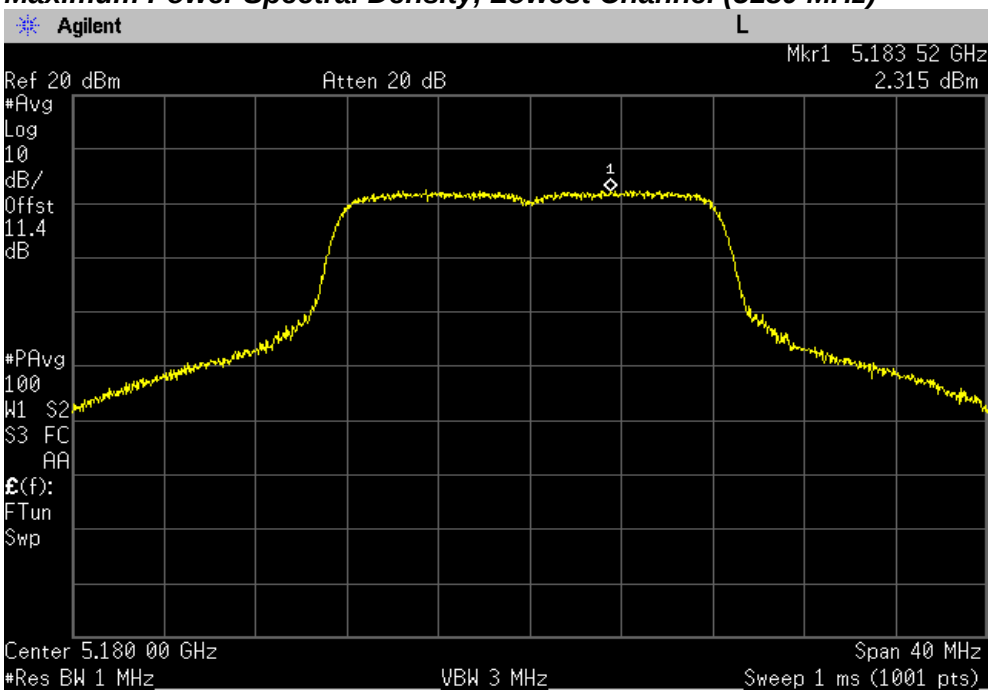
PLOT OF TEST DATA

Maximum Power Spectral Density, Highest Channel (5240 MHz)



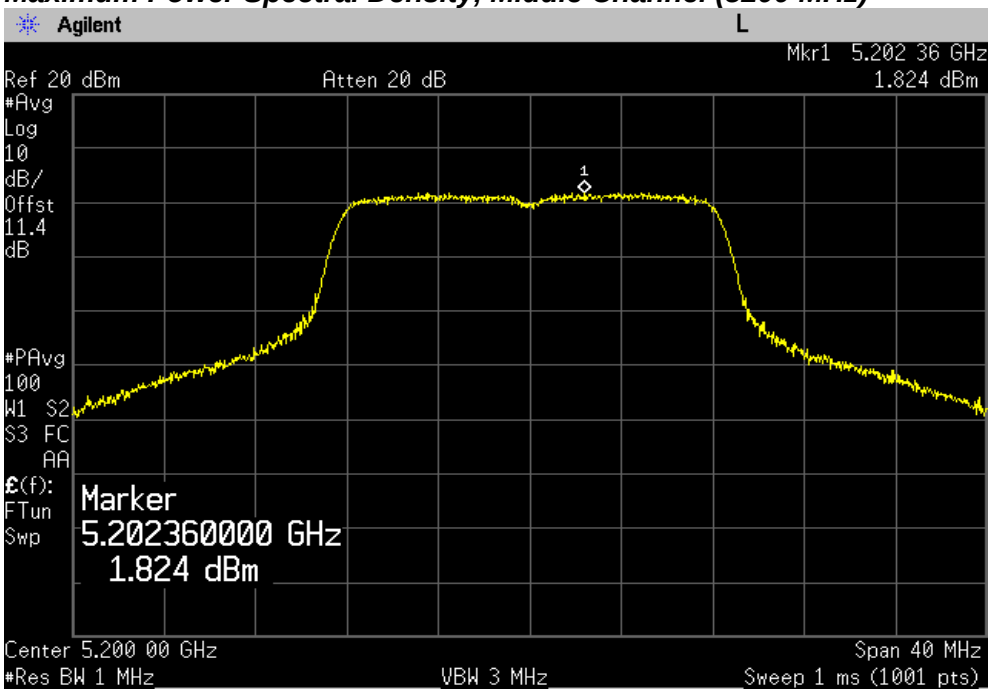
Chain 1

Maximum Power Spectral Density, Lowest Channel (5180 MHz)

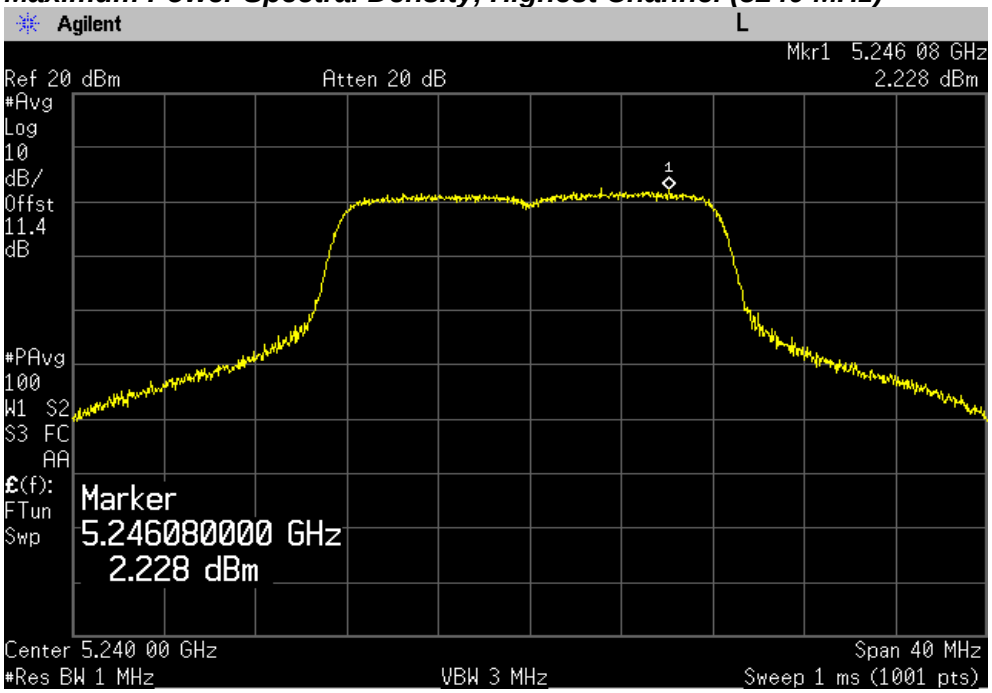


PLOT OF TEST DATA

Maximum Power Spectral Density, Middle Channel (5200 MHz)



Maximum Power Spectral Density, Highest Channel (5240 MHz)

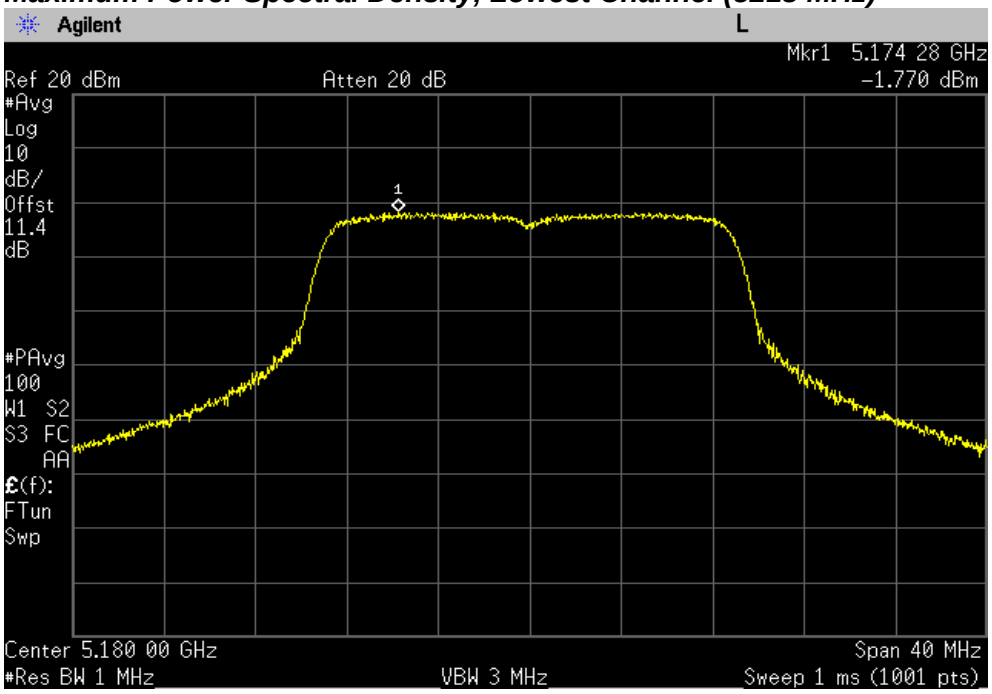


PLOT OF TEST DATA

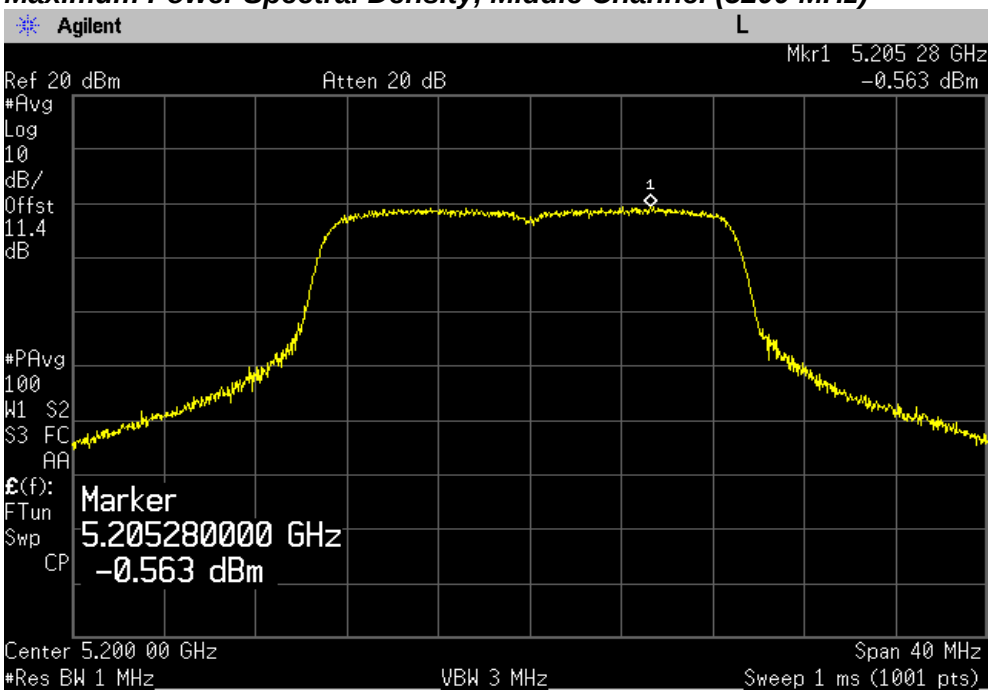
802.11n(20 MHz) mode

Chain 0

Maximum Power Spectral Density, Lowest Channel (5218 MHz)

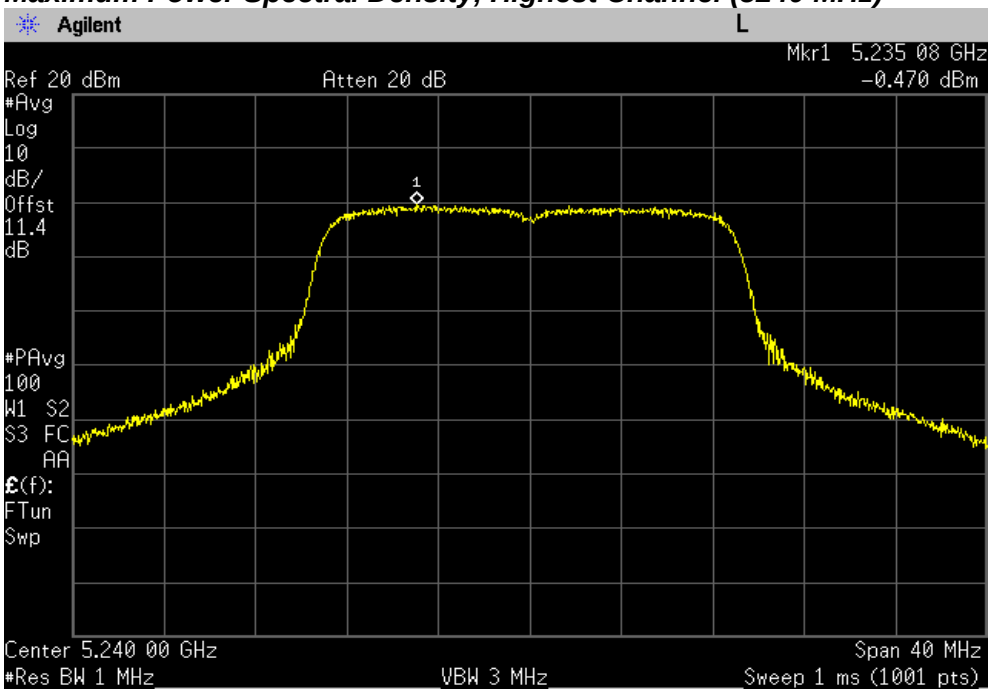


Maximum Power Spectral Density, Middle Channel (5200 MHz)



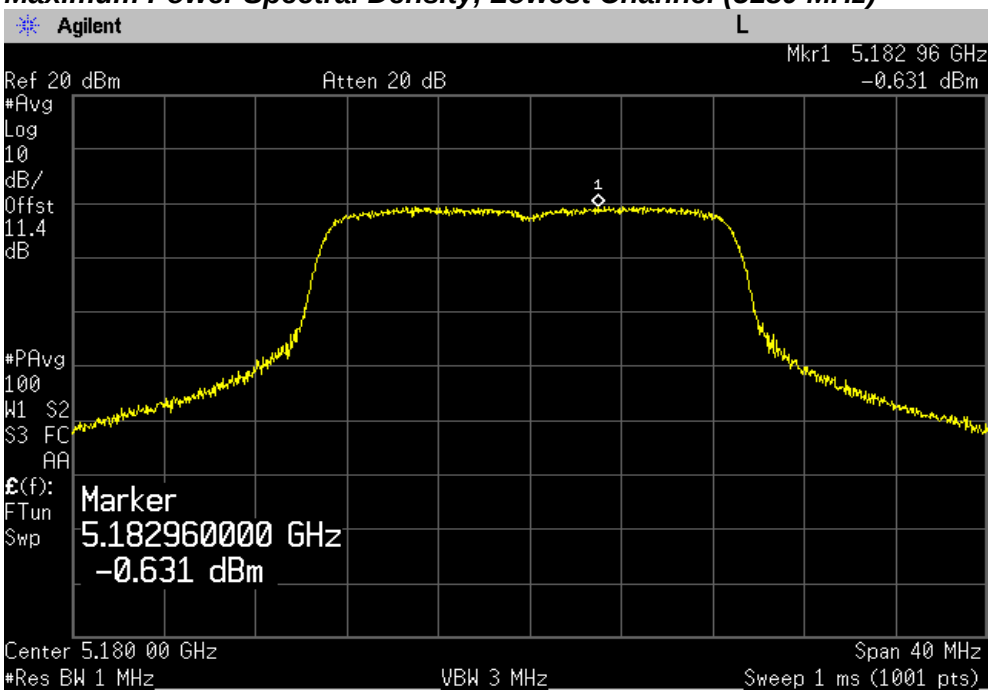
PLOT OF TEST DATA

Maximum Power Spectral Density, Highest Channel (5240 MHz)



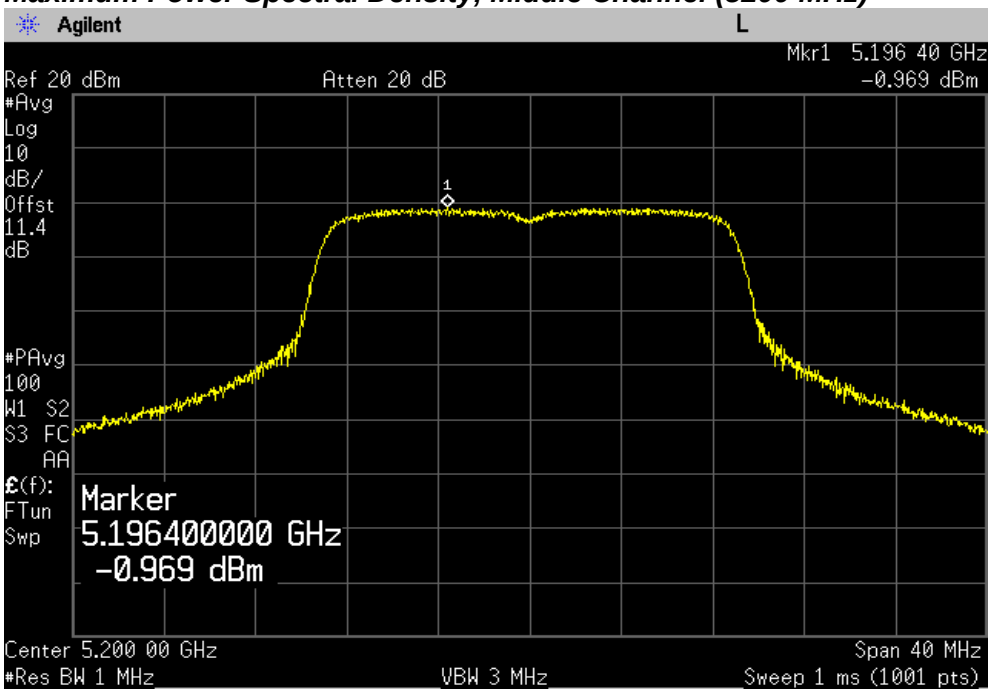
Chain 1

Maximum Power Spectral Density, Lowest Channel (5180 MHz)

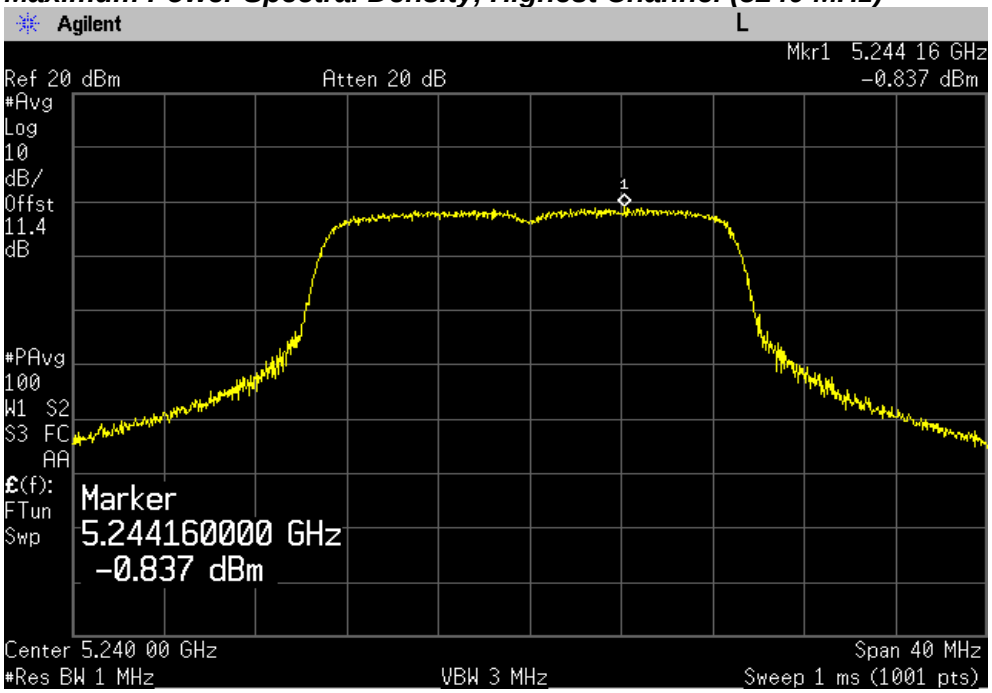


PLOT OF TEST DATA

Maximum Power Spectral Density, Middle Channel (5200 MHz)



Maximum Power Spectral Density, Highest Channel (5240 MHz)

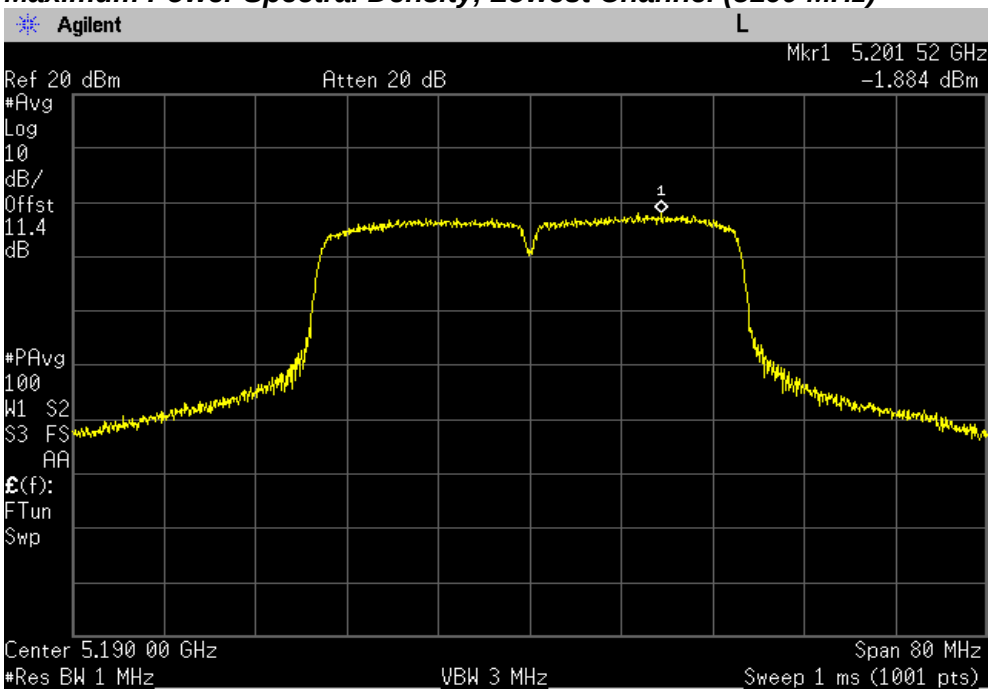


PLOT OF TEST DATA

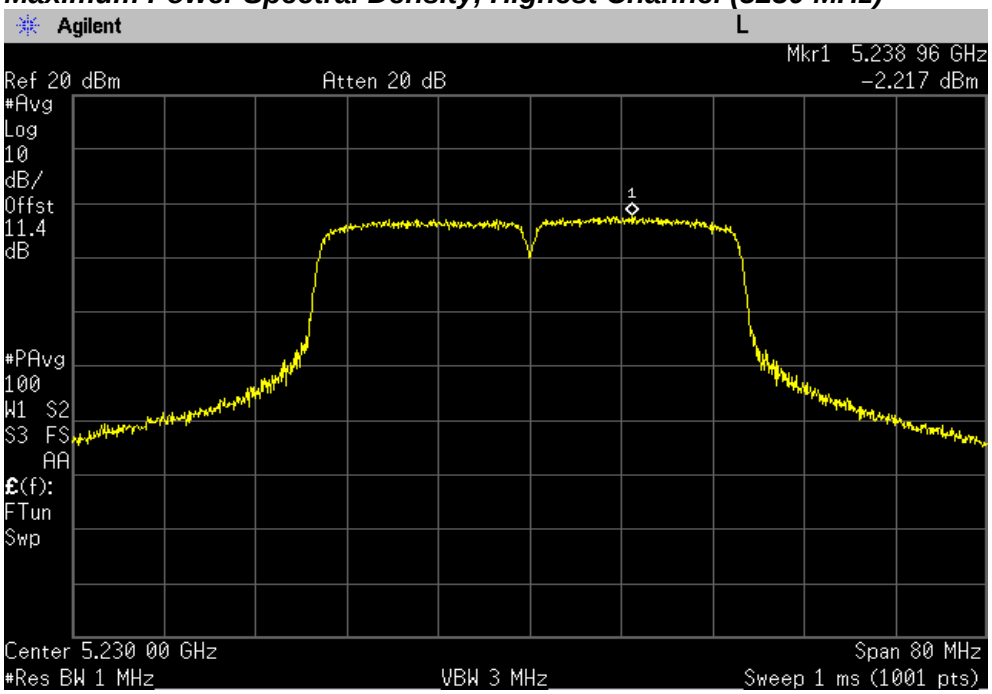
802.11n(40 MHz) mode

Chain 0

Maximum Power Spectral Density, Lowest Channel (5190 MHz)



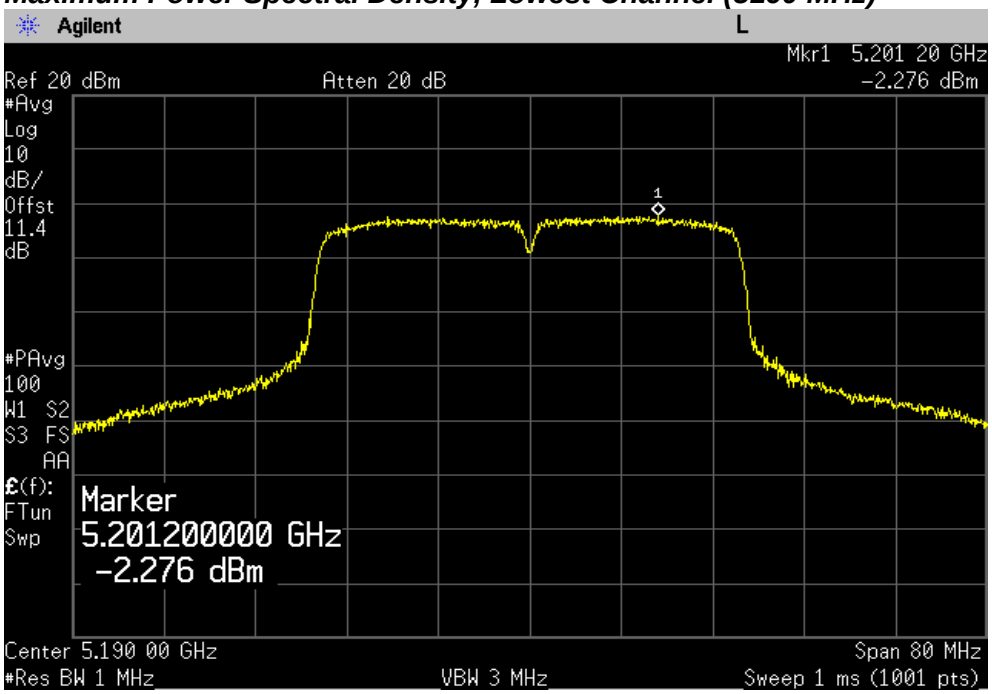
Maximum Power Spectral Density, Highest Channel (5230 MHz)



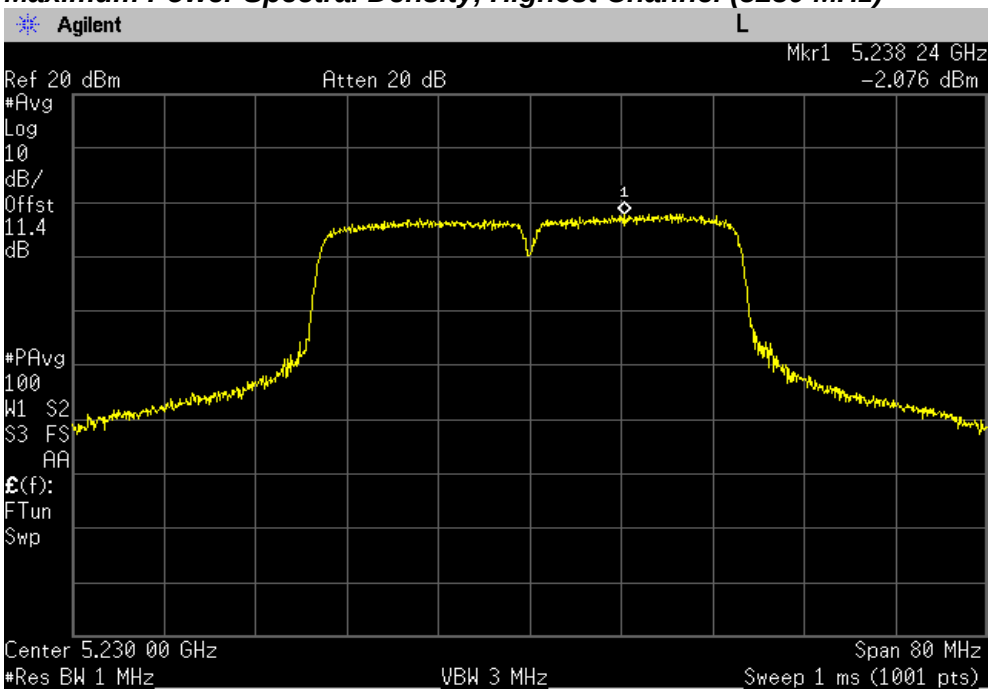
PLOT OF TEST DATA

Chain 1

Maximum Power Spectral Density, Lowest Channel (5190 MHz)



Maximum Power Spectral Density, Highest Channel (5230 MHz)



8.6.2 Maximum Power Spectral Density – UNII-2A band

FCC §15.407(a)

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

802.11a mode

Channel	Frequency (MHz)	Maximum PSD (dBm)		FCC Limit (dBm/ MHz)
		Chain 0	Chain 1	
Lowest	5260	4.71	5.21	11.00
Middle	5300	3.93	4.59	11.00
Highest	5320	3.97	3.84	11.00

802.11n (20 MHz) mode

Channel	Frequency (MHz)	Measured PSD (dBm)		Maximum PSD (dBm)	FCC Limit (dBm/MHz)
		Chain 0	Chain 1	Total output power	
Lowest	5260	2.72	3.40	6.08	11.00
Middle	5300	2.05	2.69	5.39	11.00
Highest	5320	2.32	1.65	5.01	11.00

TEST DATA

802.11n (40 MHz) mode

Channel	Frequency (MHz)	Measured PSD (dBm)		Maximum PSD (dBm)	FCC Limit (dBm/MHz)
		Chain 0	Chain 1	Total output power	
Lowest	5270	-0.51	0.30	2.92	11.00
Highest	5310	-1.05	-0.99	1.99	11.00

Note:

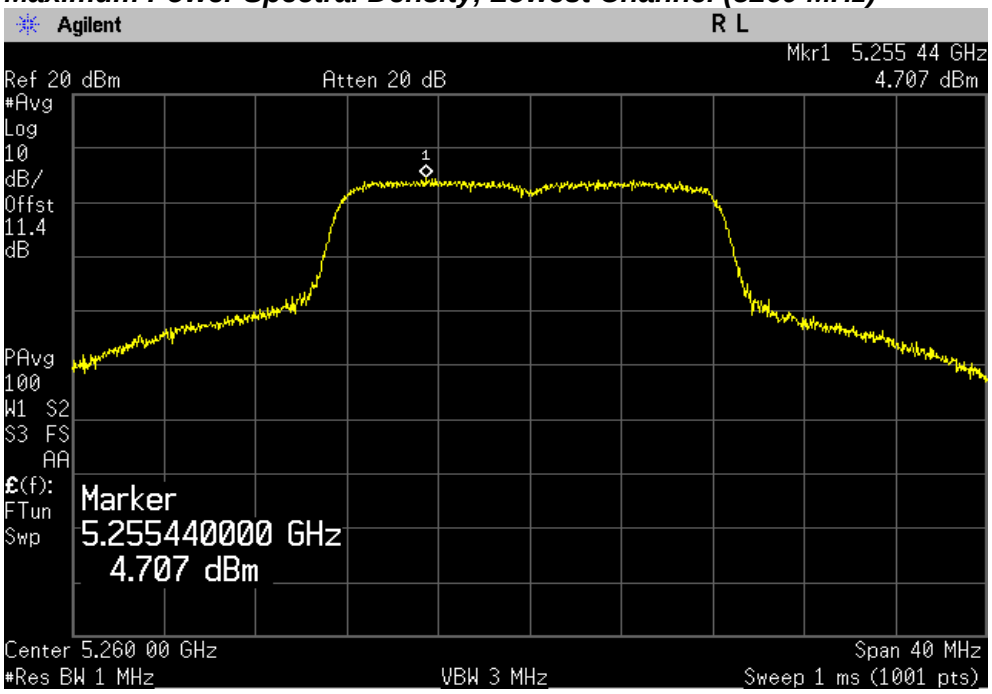
1. *Power Spectral Density(PSD) was measured by same method with conducted output power according to II.F.1 in* ***KDB 789033 D02 General UNII Test Procedures New Rules v01r02***
2. *Total output power = 10 log [10^{(Chain 0 Power + duty factor)/10} + 10^{(Chain 1 Power + duty factor)/10}]*
3. *According to "****662911 D01 Multiple Transmitter Output v02r01****", if two antennas are unequal antenna gains and transmit signals are correlated, then the* ***Directional gain = 10 log[($10^{G1/20}$+$10^{G2/20}$)^2/N_{ANT}] dBi****. The directional gain of Samsung WiFi module are* ***-1.59 dBi*** *for* ***UNII-1 Band,*** *and* ***-0.44 dBi*** *for* ***UNII-2A Band*** *and* ***-2.95 dBi*** *for* ***UNII-2C Band*** *and* ***-9.97 dBi*** *for* ***UNII-3 Band****.*
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. *The following equation was used for spectrum offset:*
   Spectrum offset (dB) = Attenuator (dB) + Cable Loss (dB) + SMA Type Connector Loss (dB)

PLOT OF TEST DATA

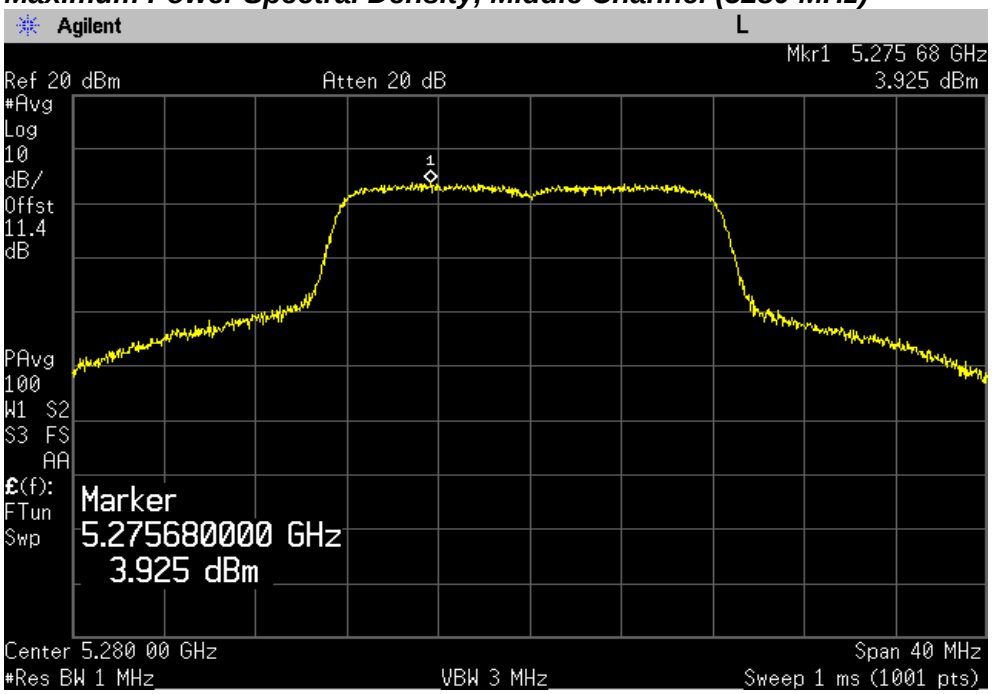
802.11a mode

Chain 0

Maximum Power Spectral Density, Lowest Channel (5260 MHz)

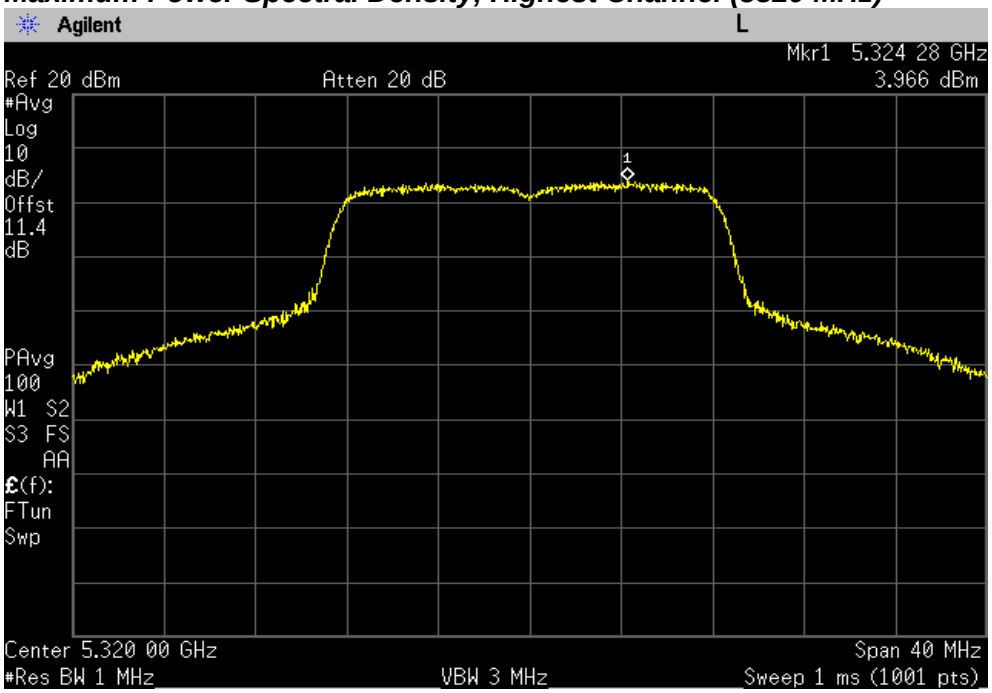


Maximum Power Spectral Density, Middle Channel (5280 MHz)



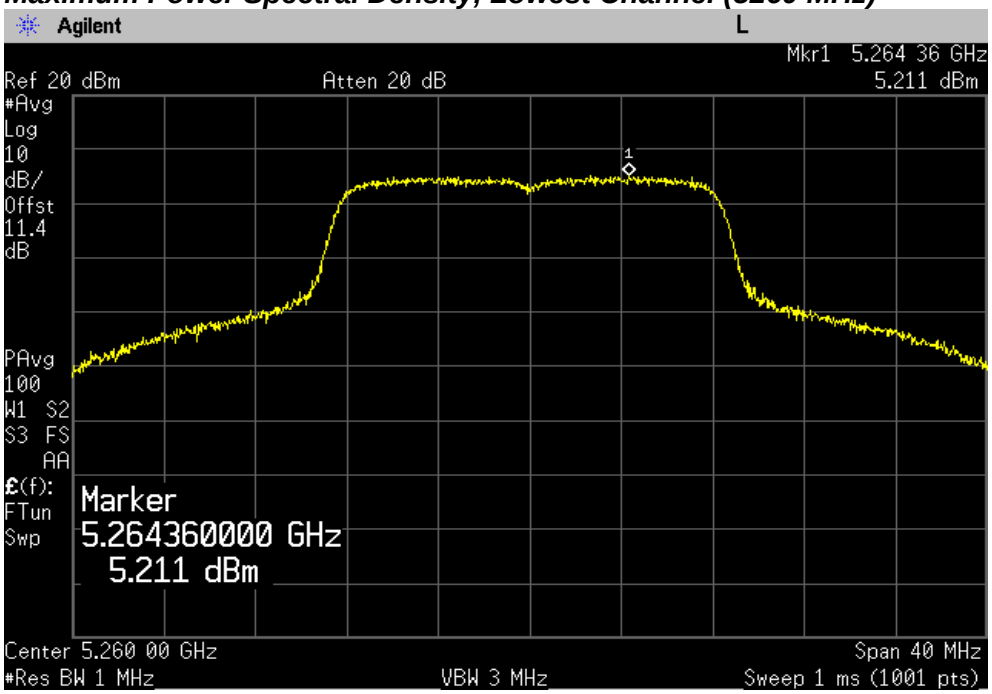
PLOT OF TEST DATA

Maximum Power Spectral Density, Highest Channel (5320 MHz)



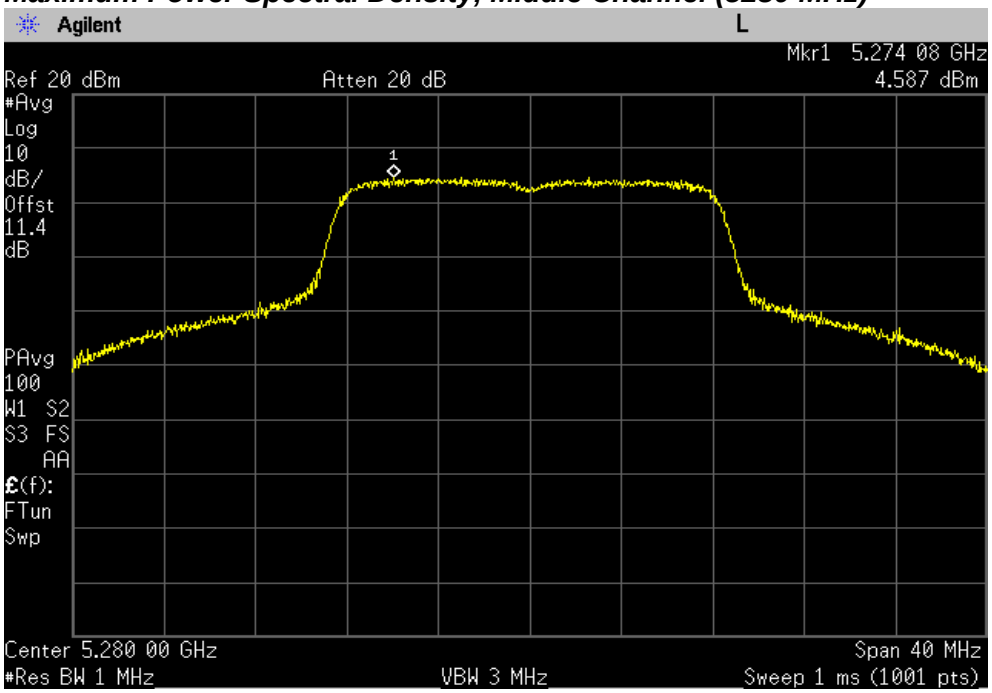
Chain 1

Maximum Power Spectral Density, Lowest Channel (5260 MHz)

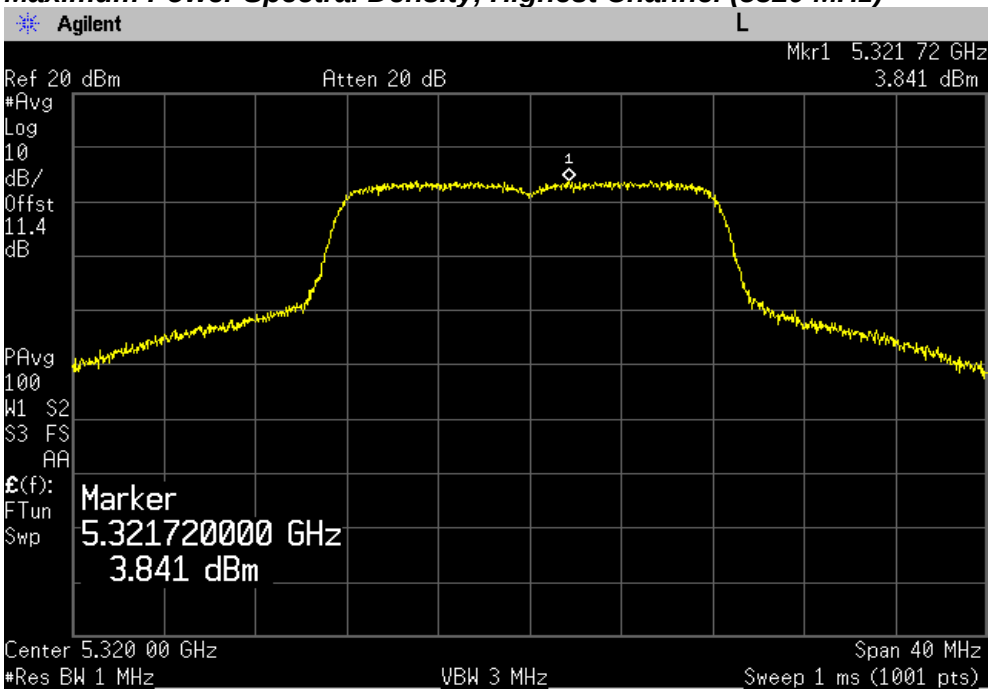


PLOT OF TEST DATA

Maximum Power Spectral Density, Middle Channel (5280 MHz)



Maximum Power Spectral Density, Highest Channel (5320 MHz)

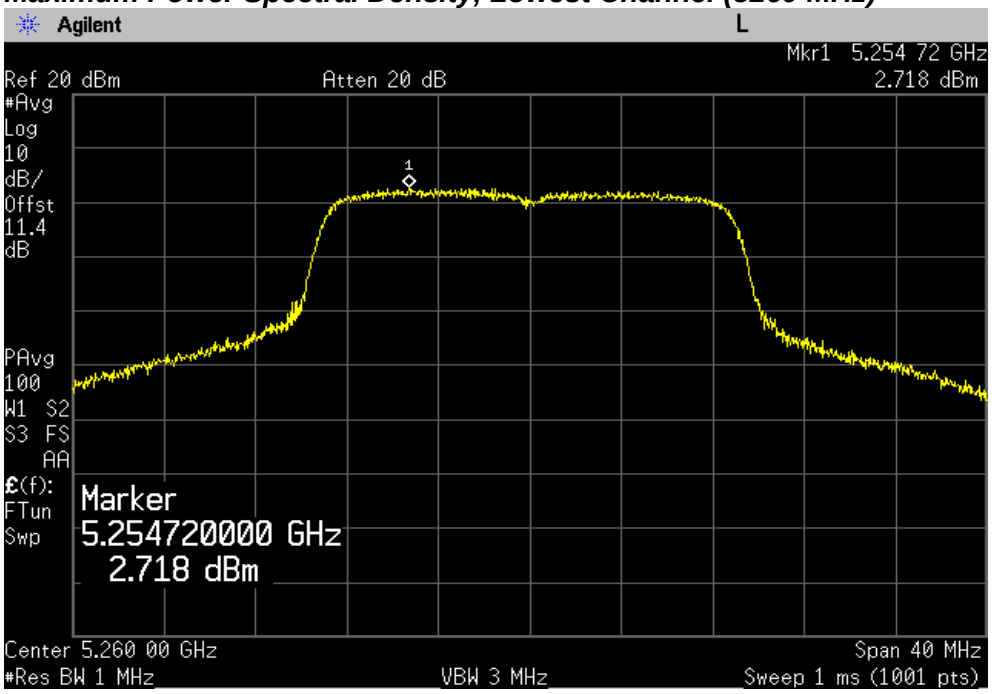


PLOT OF TEST DATA

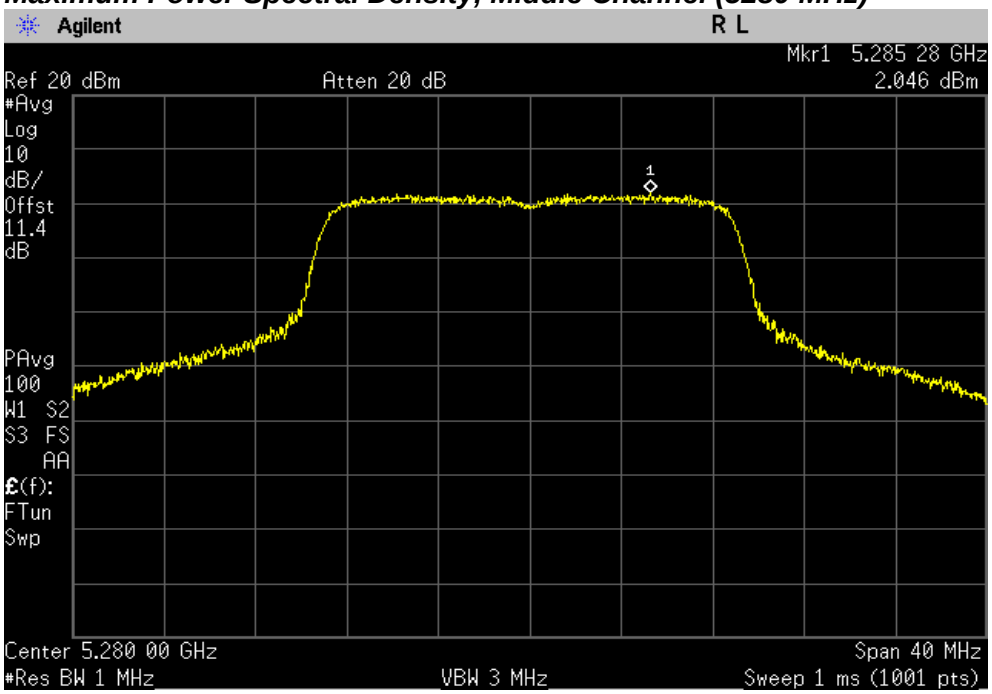
802.11n(20 MHz) mode

Chain 0

Maximum Power Spectral Density, Lowest Channel (5260 MHz)

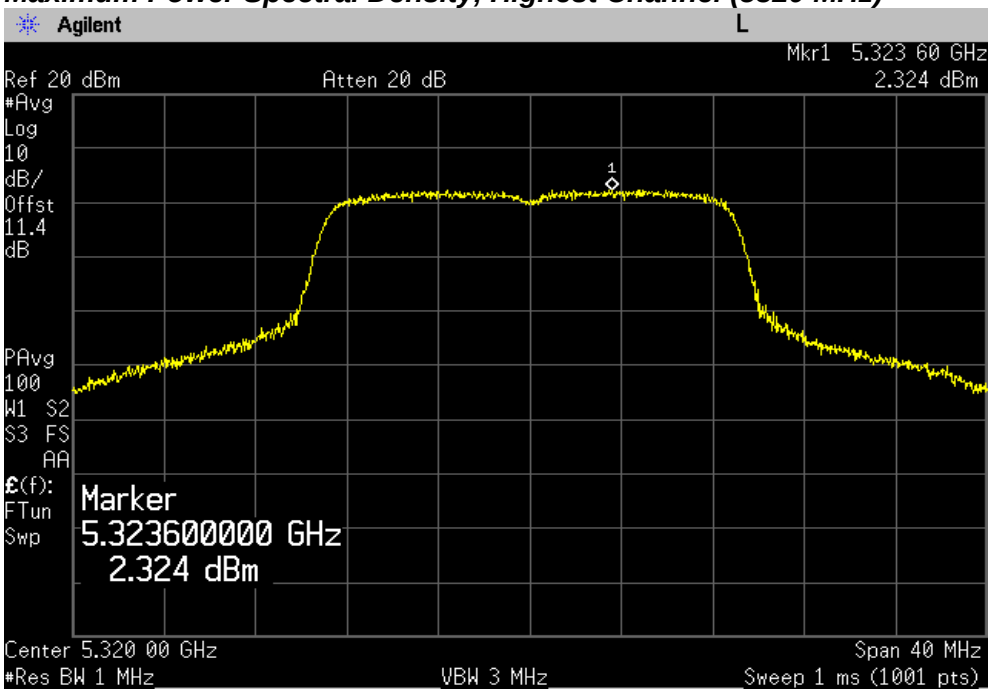


Maximum Power Spectral Density, Middle Channel (5280 MHz)



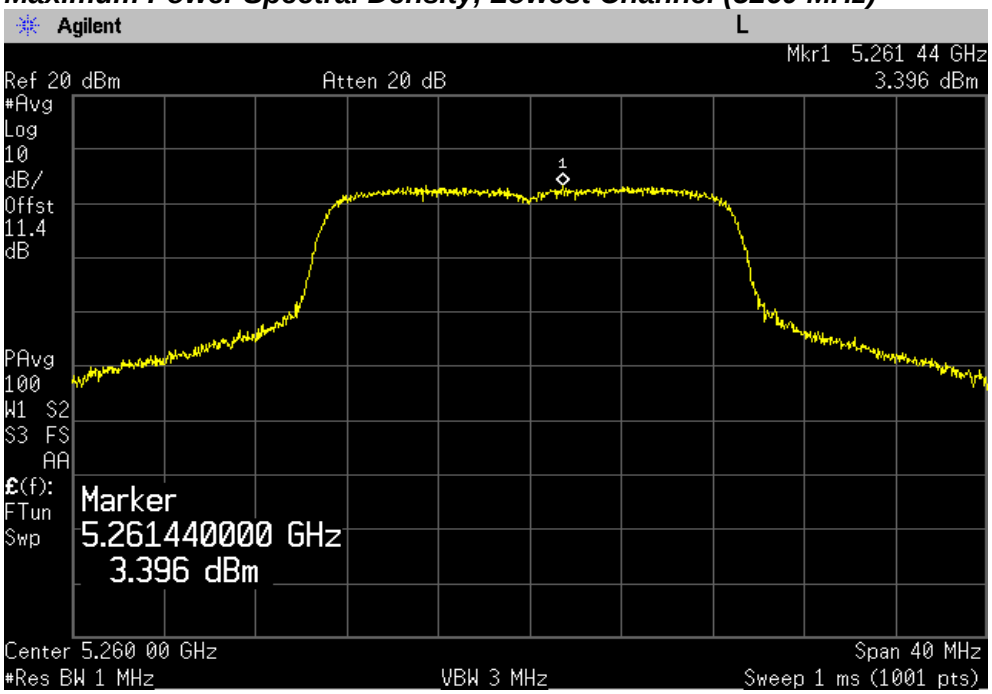
PLOT OF TEST DATA

Maximum Power Spectral Density, Highest Channel (5320 MHz)



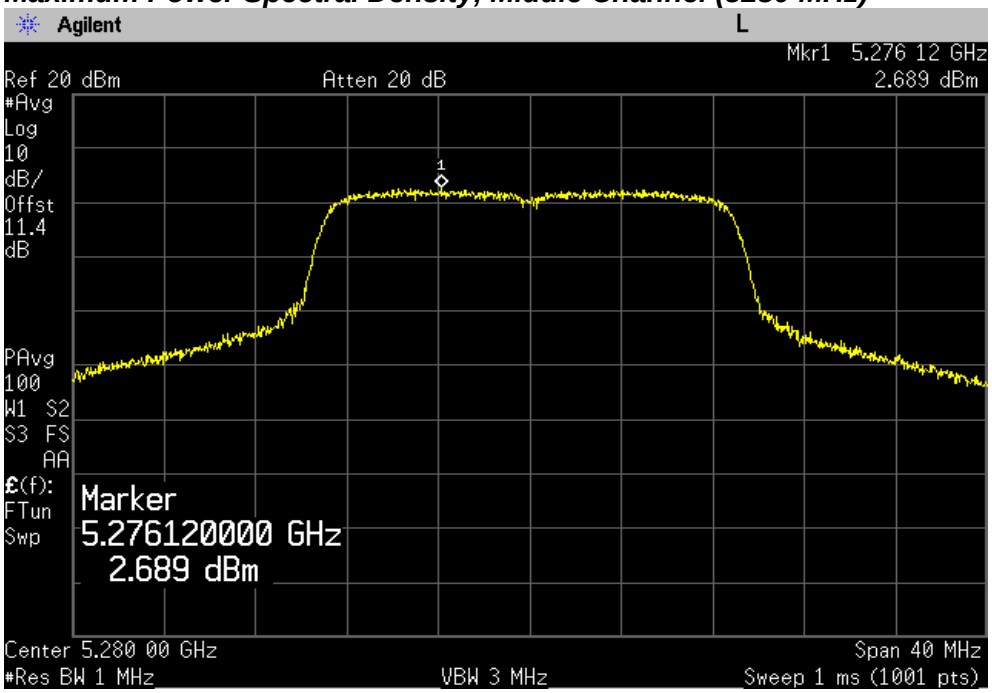
Chain 1

Maximum Power Spectral Density, Lowest Channel (5260 MHz)

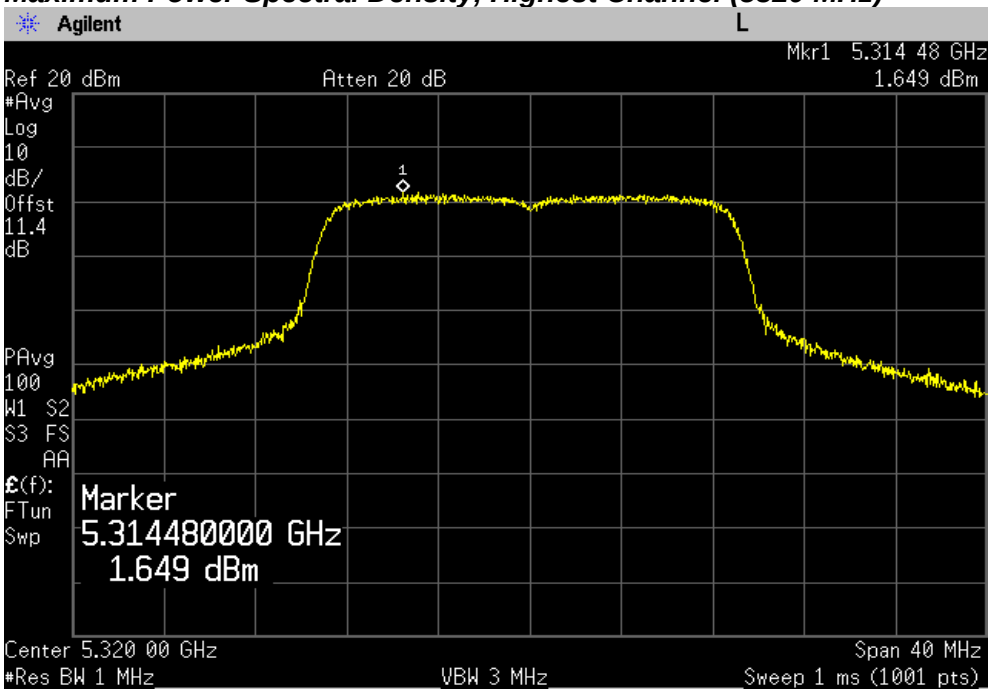


PLOT OF TEST DATA

Maximum Power Spectral Density, Middle Channel (5280 MHz)



Maximum Power Spectral Density, Highest Channel (5320 MHz)

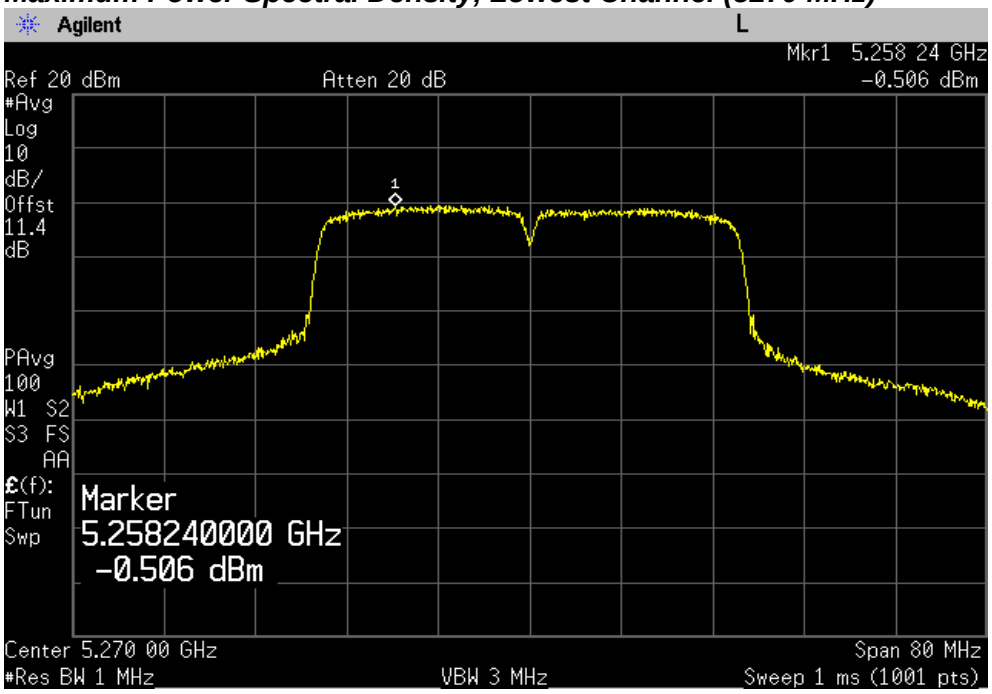


PLOT OF TEST DATA

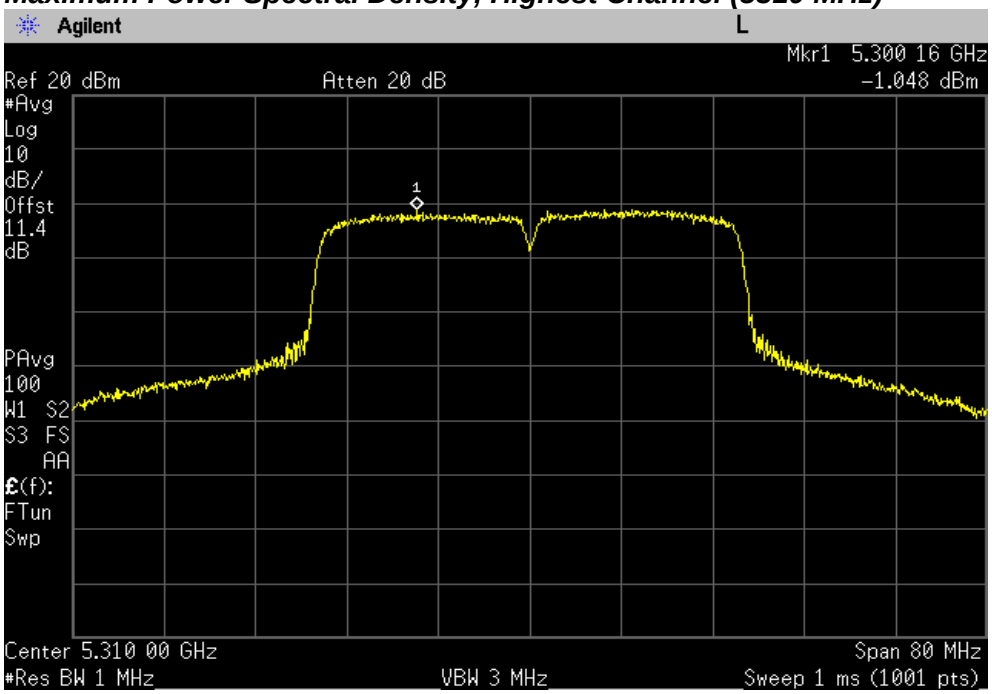
802.11n(40 MHz) mode

Chain 0

Maximum Power Spectral Density, Lowest Channel (5270 MHz)



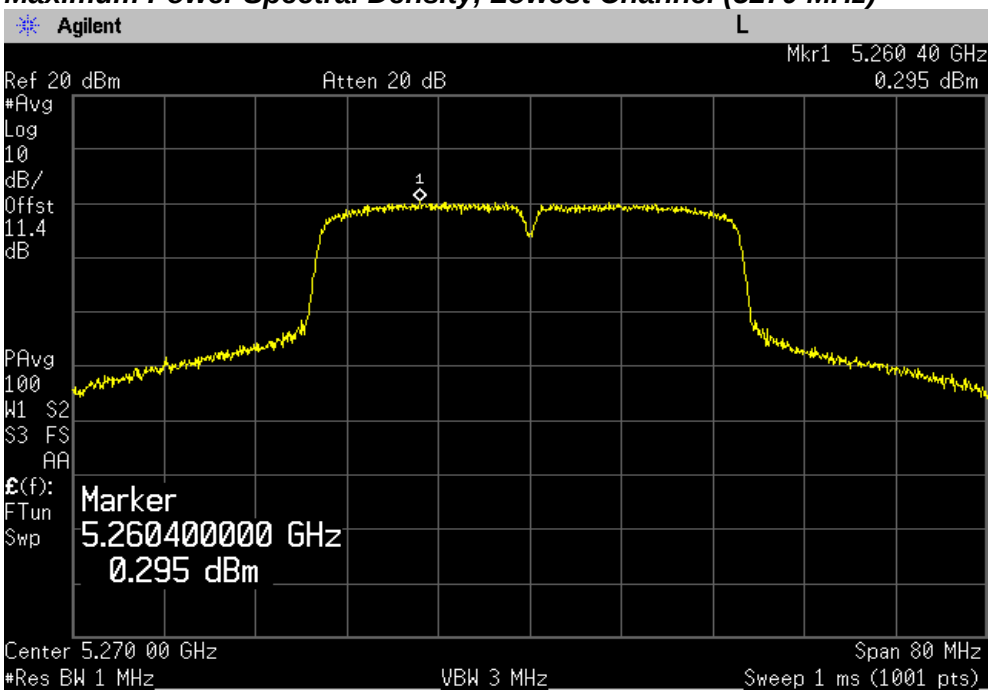
Maximum Power Spectral Density, Highest Channel (5310 MHz)



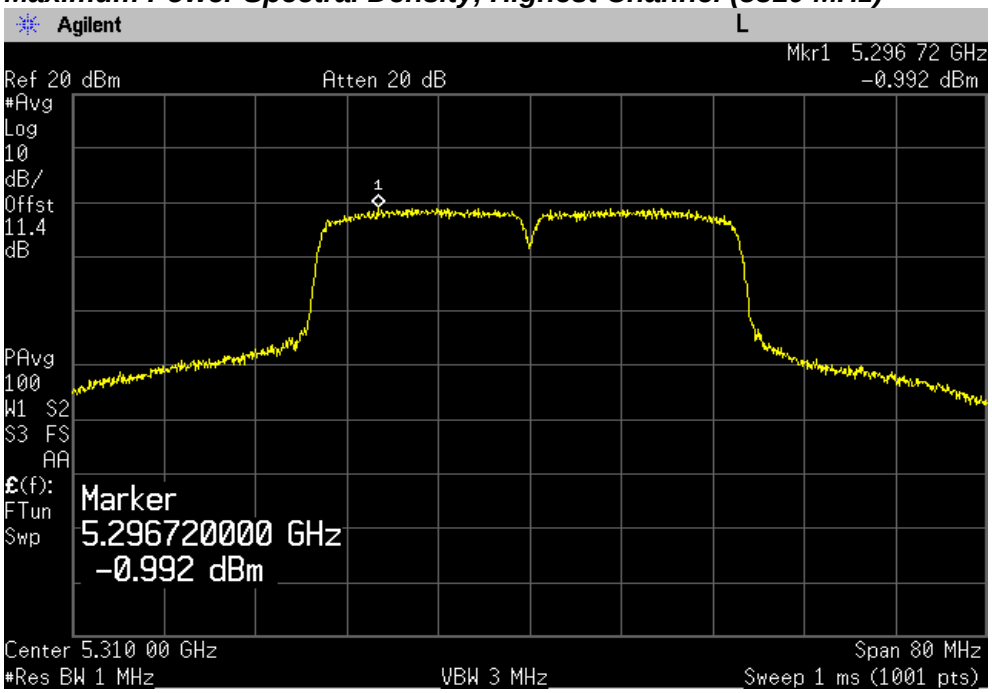
PLOT OF TEST DATA

Chain 1

Maximum Power Spectral Density, Lowest Channel (5270 MHz)



Maximum Power Spectral Density, Highest Channel (5310 MHz)



8.6.3 Maximum Power Spectral Density (average) – UNII-2C band

FCC §15.407(a)

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

802.11a mode

Channel	Frequency (MHz)	Maximum PSD (dBm)		FCC Limit (dBm/ MHz)
		Chain 0	Chain 1	
Lowest	5500	4.00	3.72	11.00
Middle	5580	4.81	5.24	11.00
Highest	5700	4.65	5.36	11.00

802.11n (20 MHz) mode

Channel	Frequency (MHz)	Measured PSD (dBm)		Maximum PSD (dBm)	FCC Limit (dBm/MHz)
		Chain 0	Chain 1	Total output power	
Lowest	5500	2.54	1.87	5.23	11.00
Middle	5580	4.01	2.97	6.53	11.00
Highest	5700	4.31	2.61	6.55	11.00

802.11n (40 MHz) mode

Channel	Frequency (MHz)	Measured PSD (dBm)		Maximum PSD (dBm)	FCC Limit (dBm/MHz)
		Chain 0	Chain 1	Total output power	
Lowest	5510	-3.89	-4.29	-1.08	11.00
Middle	5550	-3.04	-3.60	-0.30	11.00
Highest	5670	-3.11	-4.20	-0.61	11.00

Note:

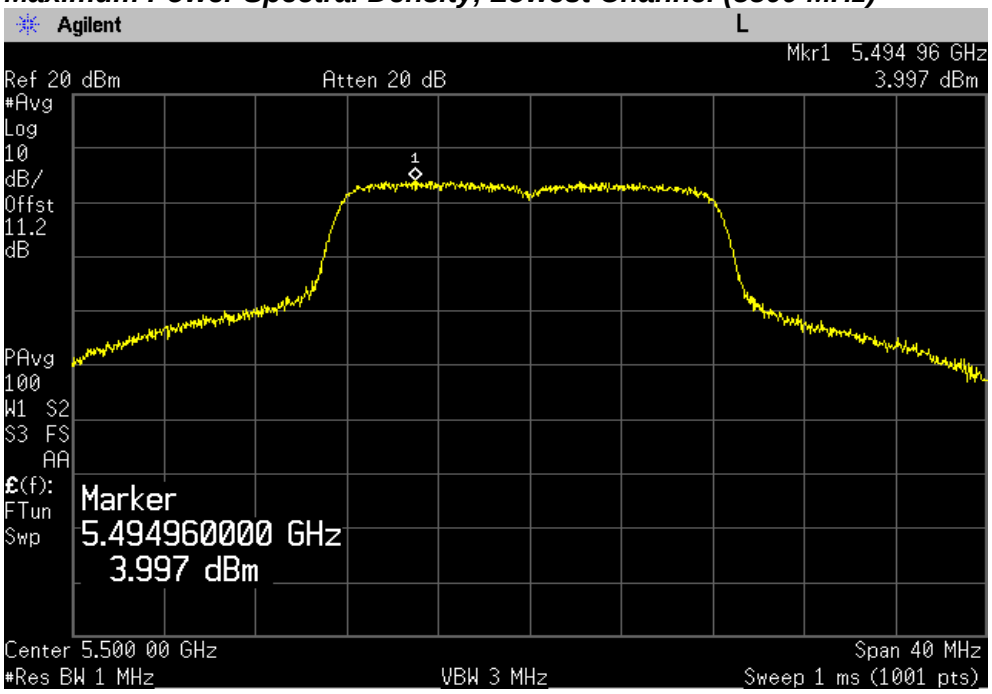
1. *Power Spectral Density(PSD) was measured by same method with conducted output power according to II.F.1 in* ***KDB 789033 D02 General UNII Test Procedures New Rules v01r02***
2. *Total output power = 10 log [10^{(Chain 0 Power + duty factor)/10} + 10^{(Chain 1 Power + duty factor)/10}]*
3. *According to "****662911 D01 Multiple Transmitter Output v02r01****", if two antennas are unequal antenna gains and transmit signals are correlated, then the* ***Directional gain = 10 log[($10^{G1/20}$+$10^{G2/20}$)^2/N_{ANT}] dBi****. The directional gain of Samsung WiFi module are* ***-1.59 dBi*** *for* ***UNII-1 Band,*** *and* ***-0.44 dBi*** *for* ***UNII-2A Band*** *and* ***-2.95 dBi*** *for* ***UNII-2C Band*** *and* ***-9.97 dBi*** *for* ***UNII-3 Band****.*
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. *The following equation was used for spectrum offset:*
   Spectrum offset (dB) = Attenuator (dB) + Cable Loss (dB) + SMA Type Connector Loss (dB)

PLOT OF TEST DATA

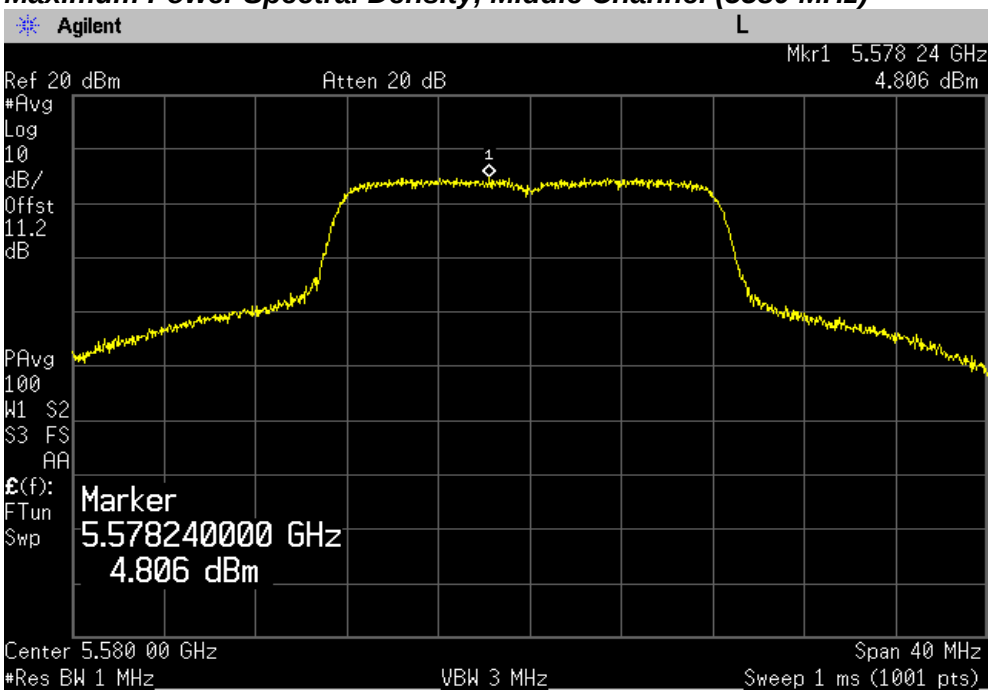
802.11a mode

Chain 0

Maximum Power Spectral Density, Lowest Channel (5500 MHz)

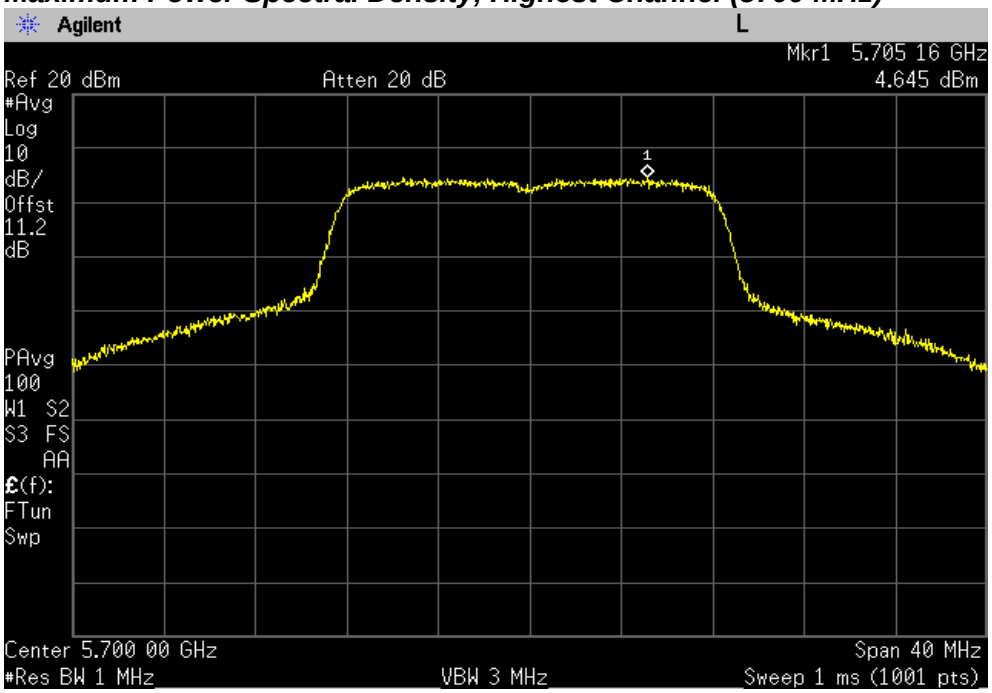


Maximum Power Spectral Density, Middle Channel (5580 MHz)



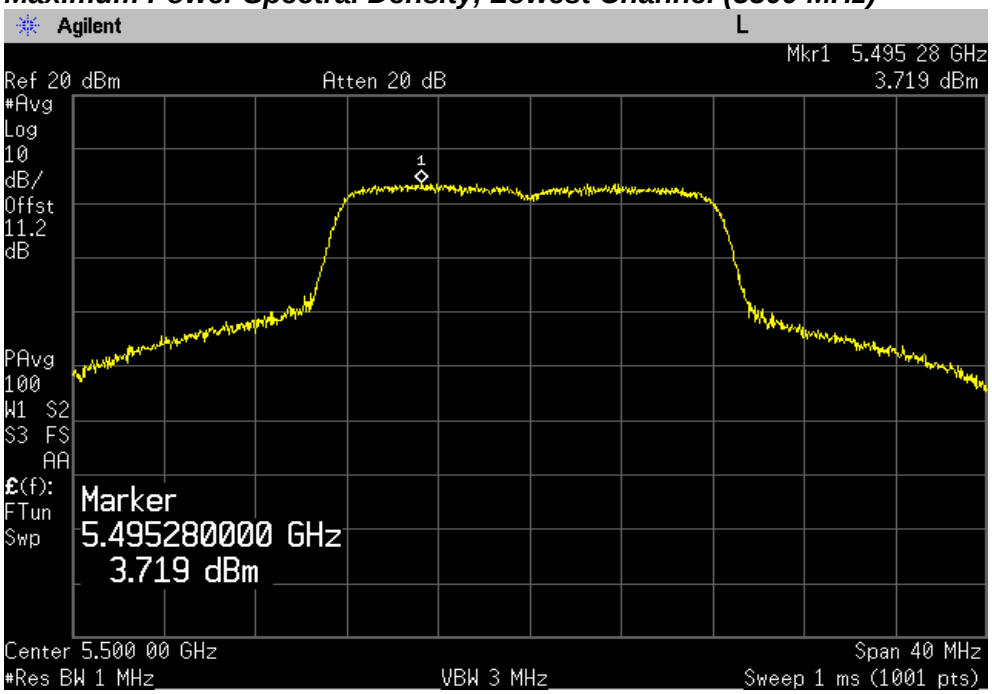
PLOT OF TEST DATA

Maximum Power Spectral Density, Highest Channel (5700 MHz)



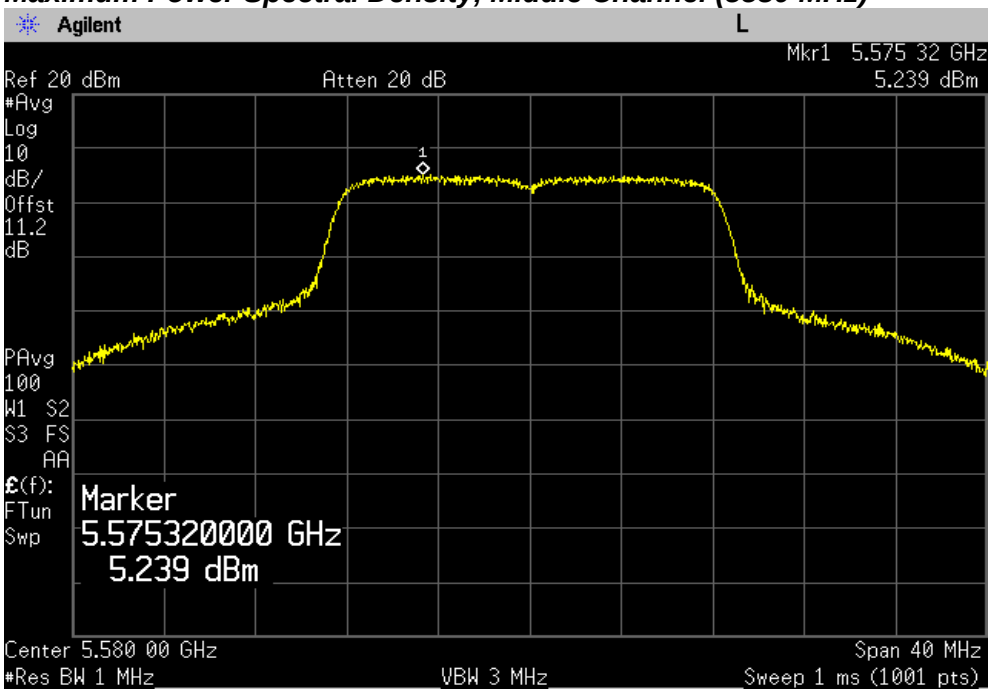
Chain 1

Maximum Power Spectral Density, Lowest Channel (5500 MHz)

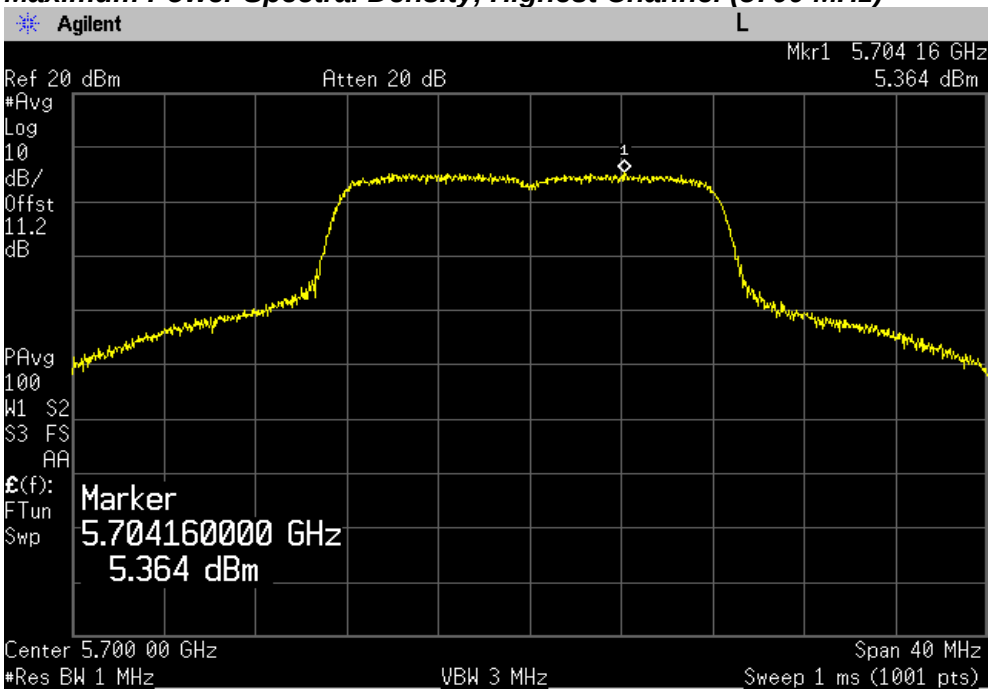


PLOT OF TEST DATA

Maximum Power Spectral Density, Middle Channel (5580 MHz)



Maximum Power Spectral Density, Highest Channel (5700 MHz)

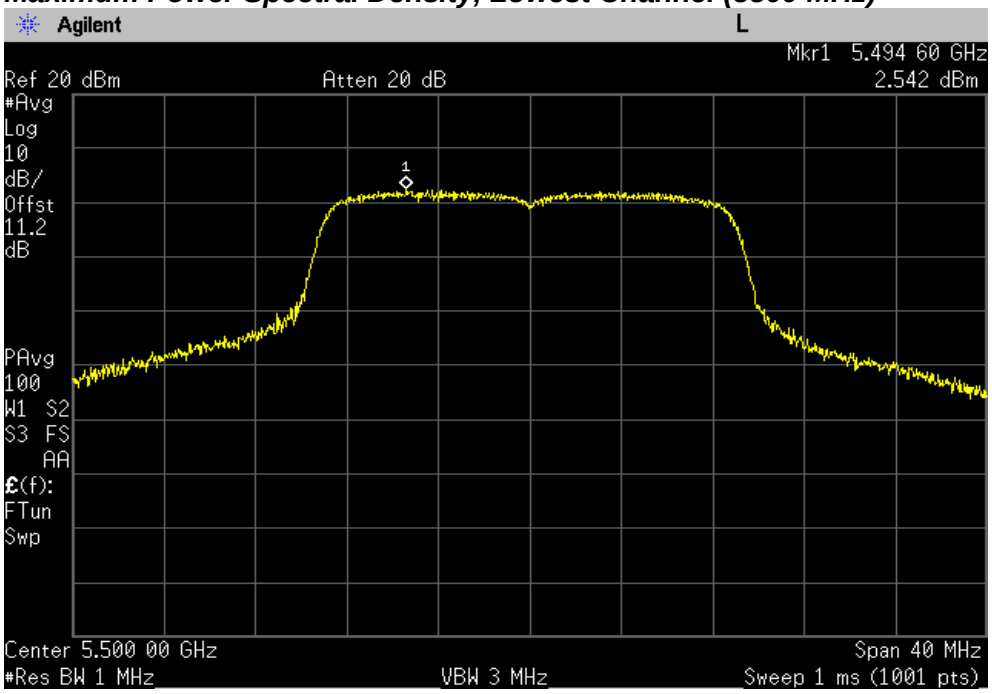


PLOT OF TEST DATA

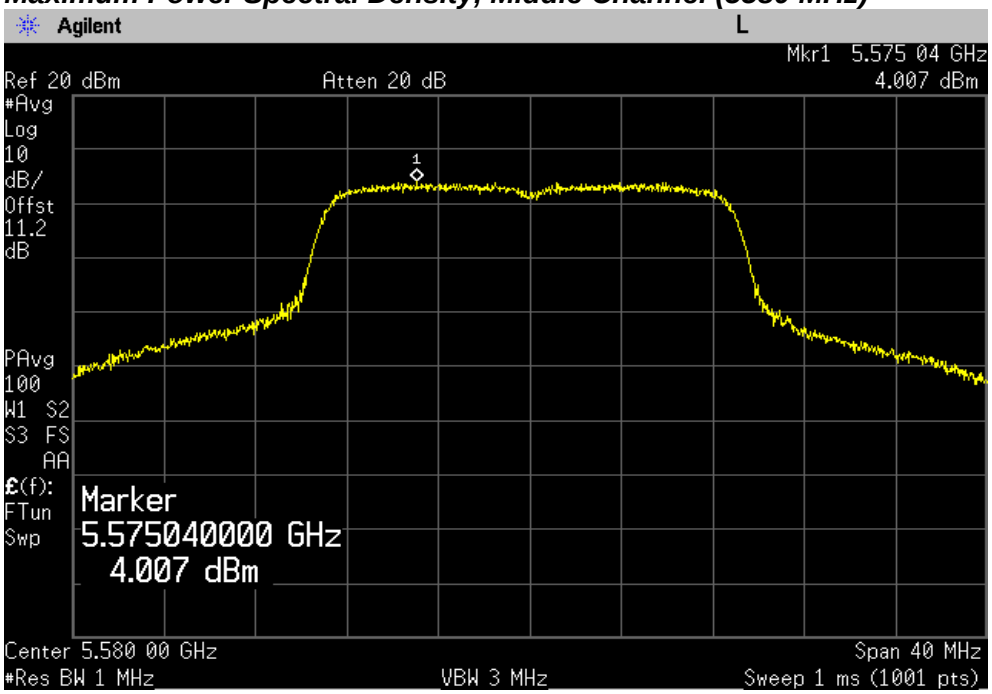
802.11n(20 MHz) mode

Chain 0

Maximum Power Spectral Density, Lowest Channel (5500 MHz)

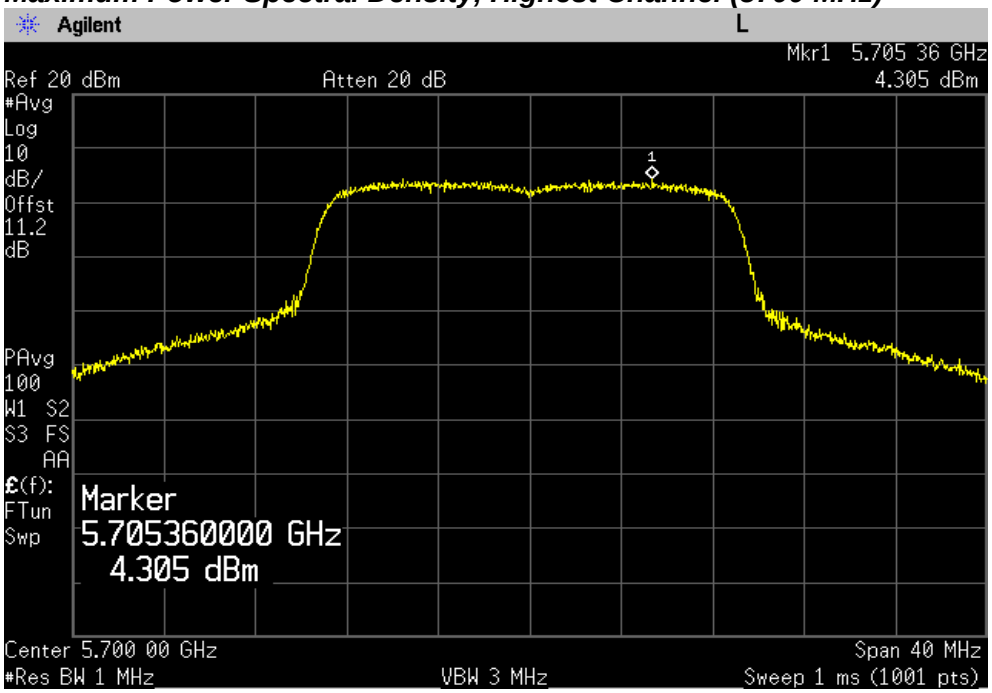


Maximum Power Spectral Density, Middle Channel (5580 MHz)



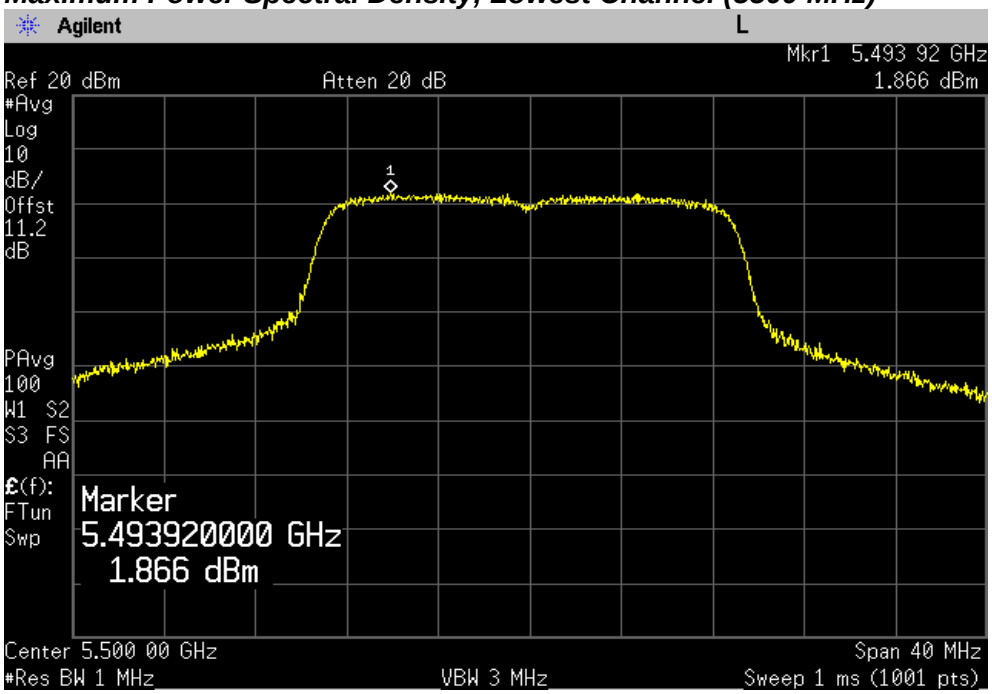
PLOT OF TEST DATA

Maximum Power Spectral Density, Highest Channel (5700 MHz)



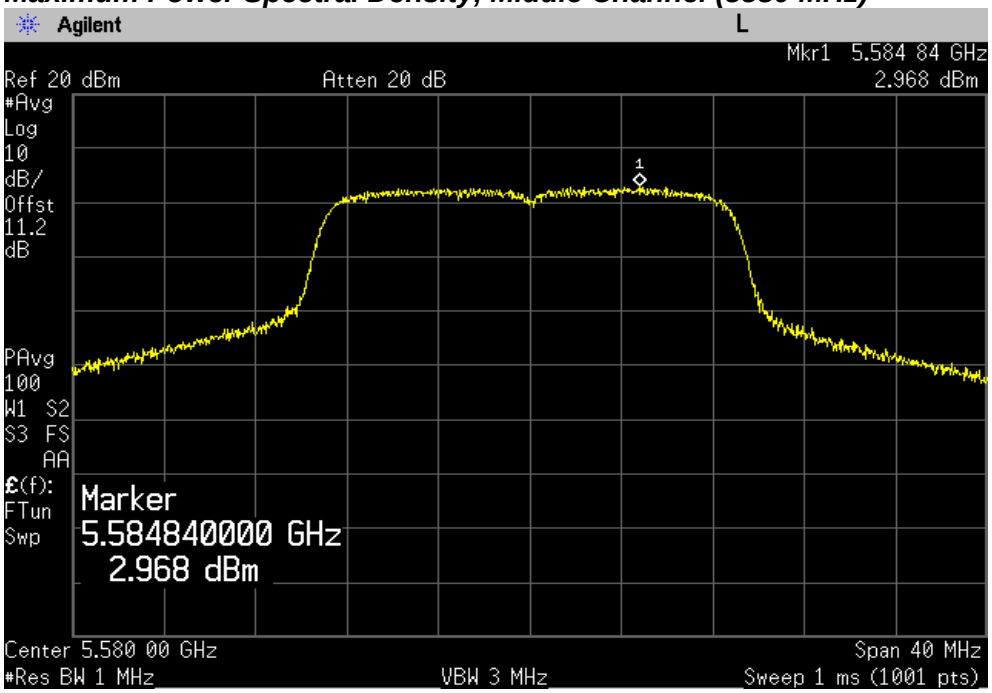
Chain 1

Maximum Power Spectral Density, Lowest Channel (5500 MHz)

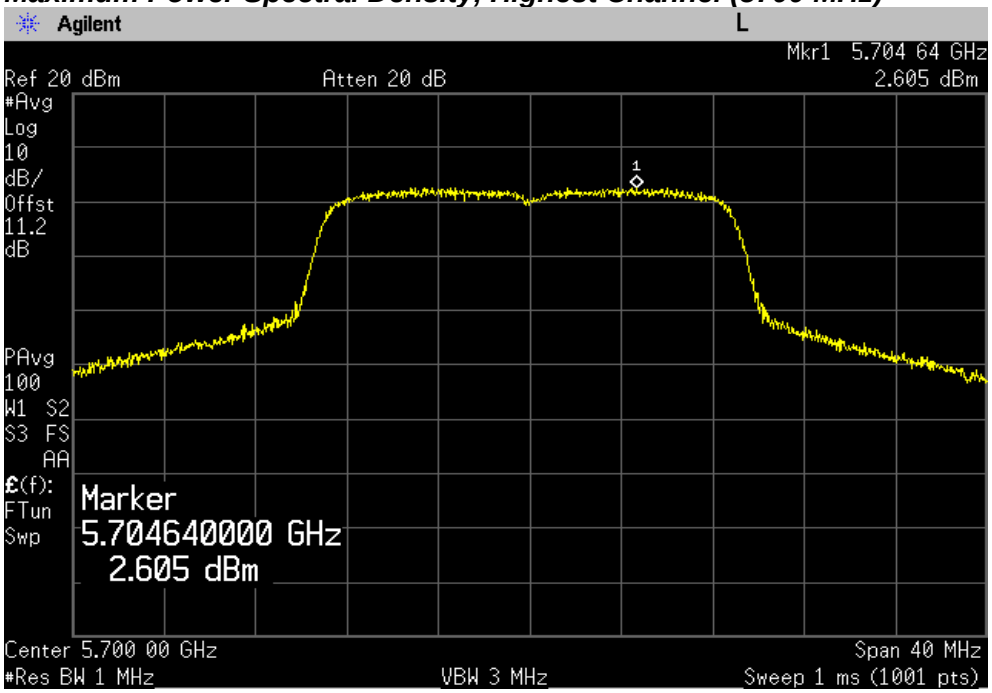


PLOT OF TEST DATA

Maximum Power Spectral Density, Middle Channel (5580 MHz)



Maximum Power Spectral Density, Highest Channel (5700 MHz)

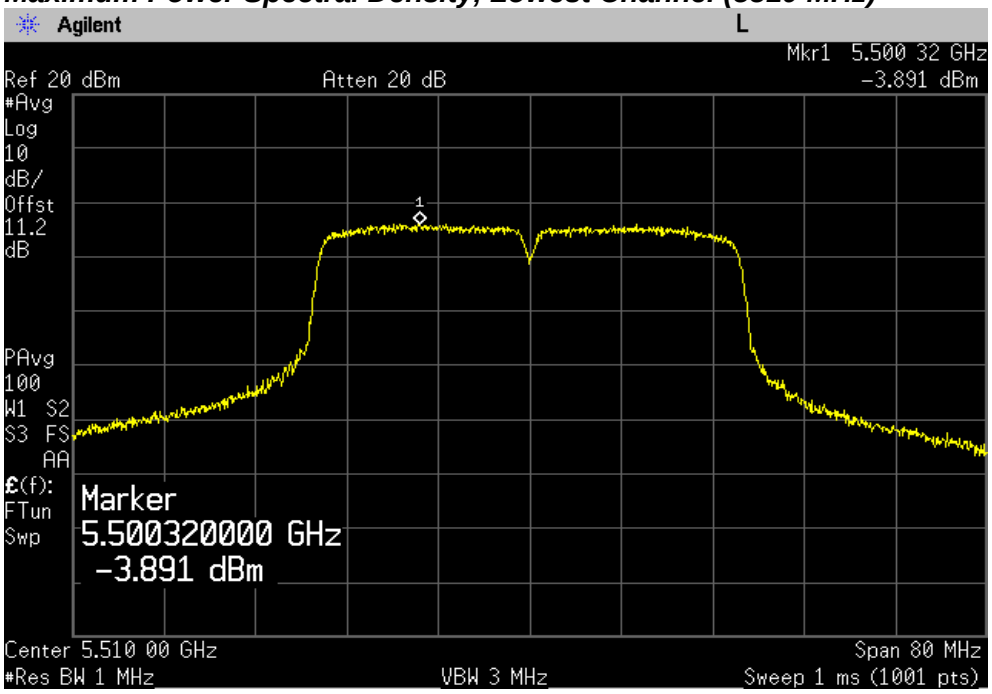


PLOT OF TEST DATA

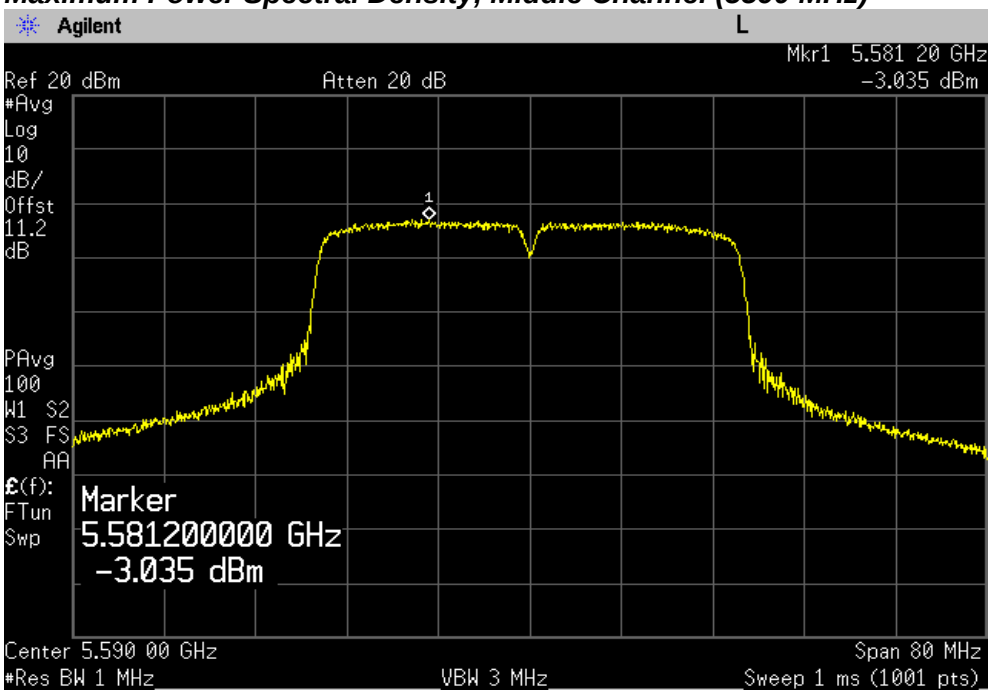
802.11n(40 MHz) mode

Chain 0

Maximum Power Spectral Density, Lowest Channel (5510 MHz)

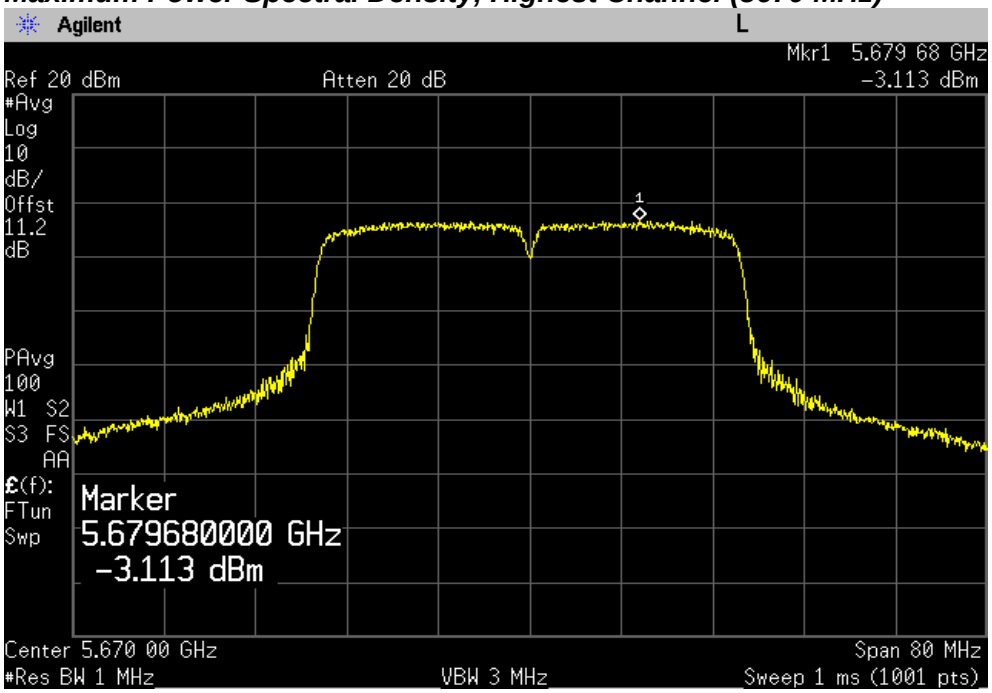


Maximum Power Spectral Density, Middle Channel (5590 MHz)



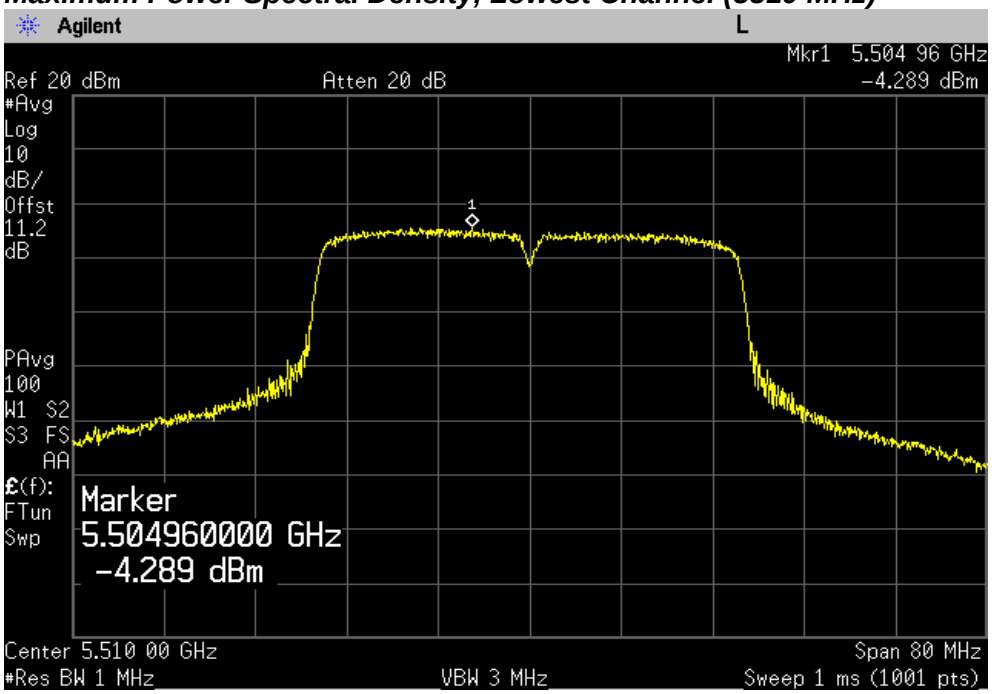
PLOT OF TEST DATA

Maximum Power Spectral Density, Highest Channel (5670 MHz)



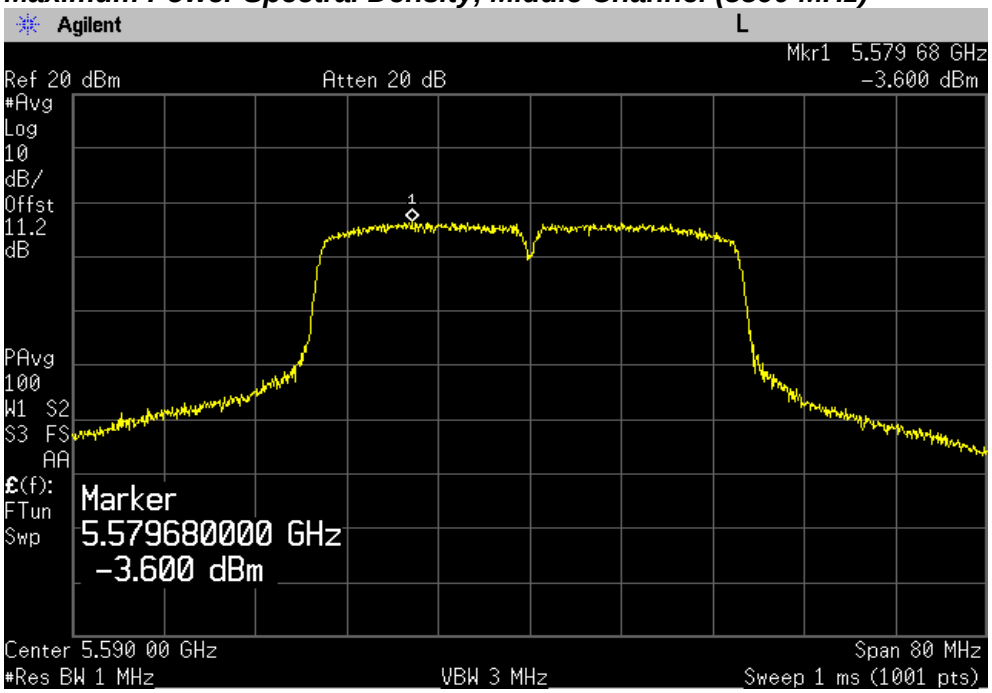
Chain 1

Maximum Power Spectral Density, Lowest Channel (5510 MHz)

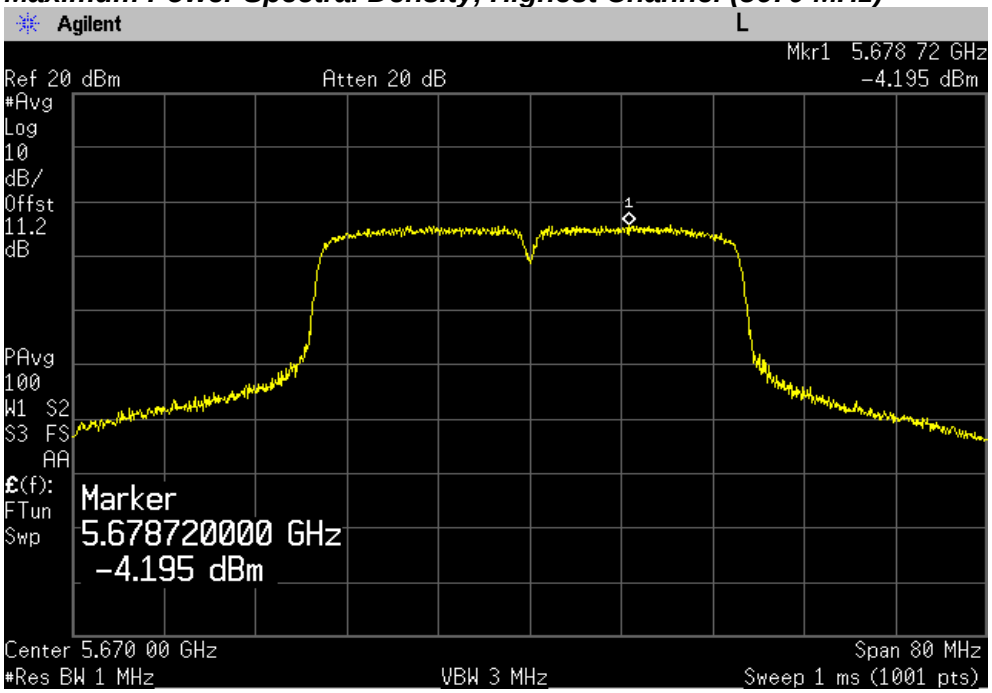


PLOT OF TEST DATA

Maximum Power Spectral Density, Middle Channel (5590 MHz)



Maximum Power Spectral Density, Highest Channel (5670 MHz)



8.6.4 Maximum Power Spectral Density – UNII-3 band

FCC §15.407(a)

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

802.11a mode

Channel	Frequency (MHz)	Maximum PSD (dBm)		FCC Limit (dBm/ 500kHz)
		Chain 0	Chain 1	
Lowest	5745	-0.17	-0.54	30.00
Middle	5785	-0.30	0.64	30.00
Highest	5825	-0.27	0.68	30.00

802.11n (20 MHz) mode

Channel	Frequency (MHz)	Measured PSD (dBm)		Maximum PSD (dBm)	FCC Limit (dBm/ 500kHz)
		Chain 0	Chain 1	Total output power	
Lowest	5745	-2.16	-1.91	0.98	30.00
Middle	5785	-2.04	-0.52	1.80	30.00
Highest	5825	-2.08	-0.22	1.96	30.00

802.11n (40 MHz) mode

Channel	Frequency (MHz)	Measured PSD (dBm)		Maximum PSD (dBm)	FCC Limit (dBm/500kHz)
		Chain 0	Chain 1	Total output power	
Lowest	5755	-8.49	-6.76	-4.53	30.00
Highest	5795	-8.64	-6.63	-4.51	30.00

TEST DATA

Note:

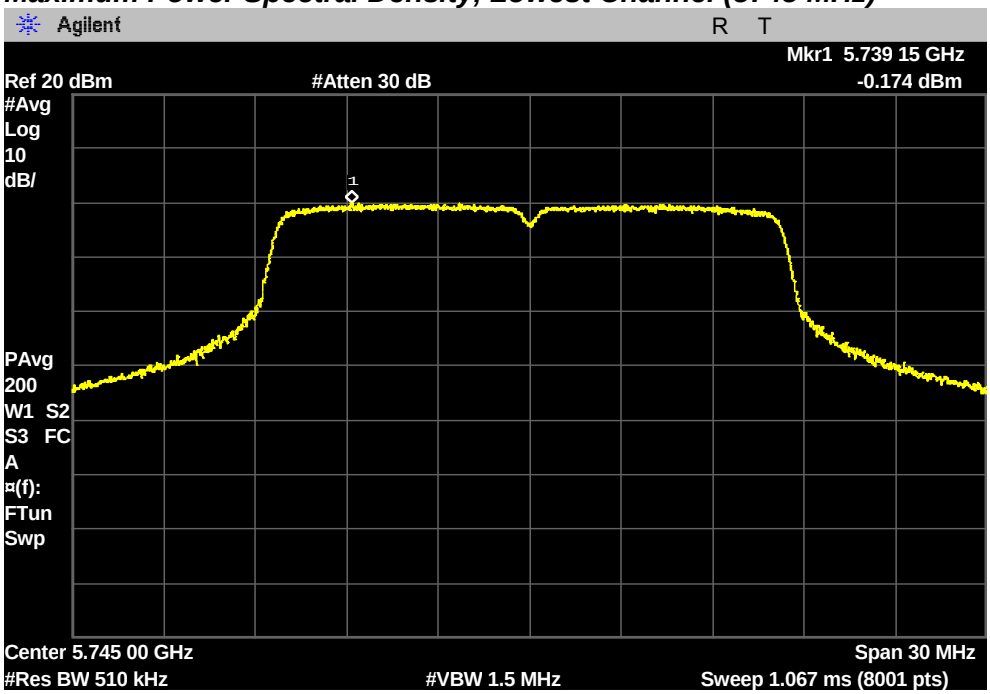
1. *Power Spectral Density(PSD) was measured by same method with conducted output power according to II.F.1 in* ***KDB 789033 D02 General UNII Test Procedures New Rules v01r02***
   Total output power = 10 log [10^{(Chain 0 Power + duty factor)/10} + 10^{(Chain 1 Power + duty factor)/10}]
2. *According to "****662911 D01 Multiple Transmitter Output v02r01****", if two antennas are unequal antenna gains and transmit signals are correlated, then the* ***Directional gain = 10 log[(10$^{G1/20}$+10$^{G2/20}$)^2/N_{ANT}] dBi****. The directional gain of Samsung WiFi module are* ***-1.59 dBi*** *for* ***UNII-1 Band,*** *and* ***-0.44 dBi*** *for* ***UNII-2A Band*** *and* ***-2.95 dBi*** *for* ***UNII-2C Band*** *and* ***-9.97 dBi*** *for* ***UNII-3 Band****.*
3. *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.*
4. *The following equation was used for spectrum offset:*
   Spectrum offset (dB) = Attenuator (dB) + Cable Loss (dB) + SMA Type Connector Loss (dB)

PLOT OF TEST DATA

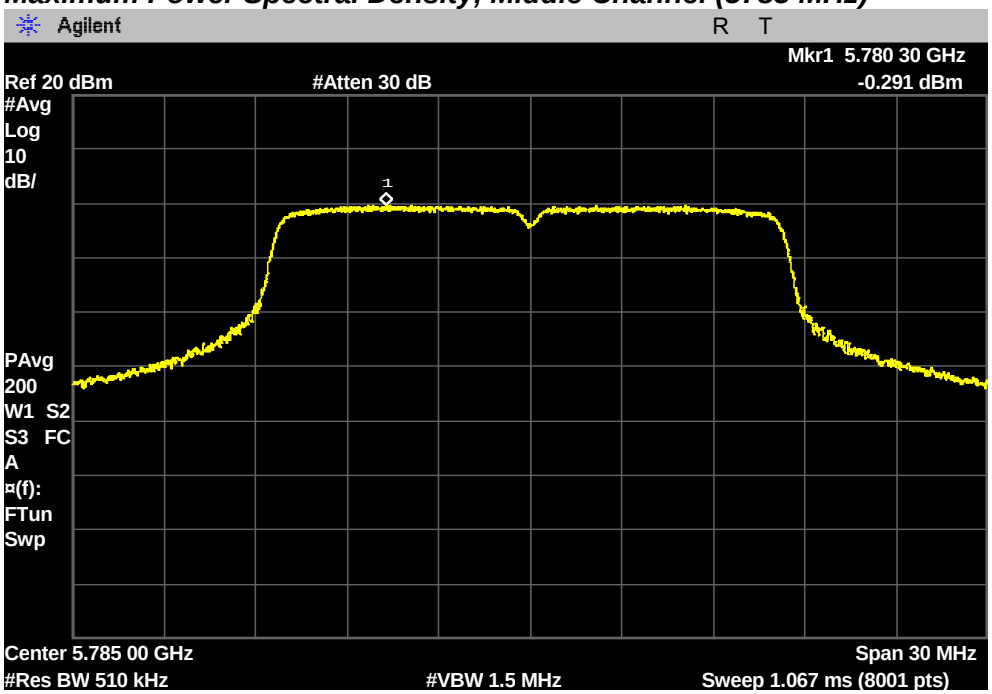
802.11a mode

Chain 0

Maximum Power Spectral Density, Lowest Channel (5745 MHz)

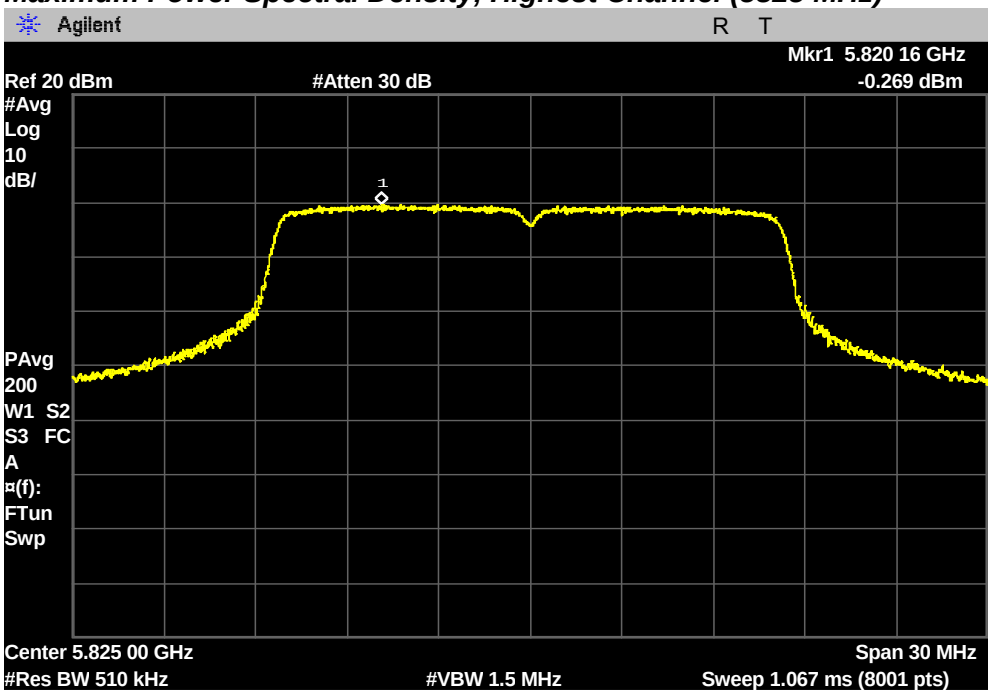


Maximum Power Spectral Density, Middle Channel (5785 MHz)



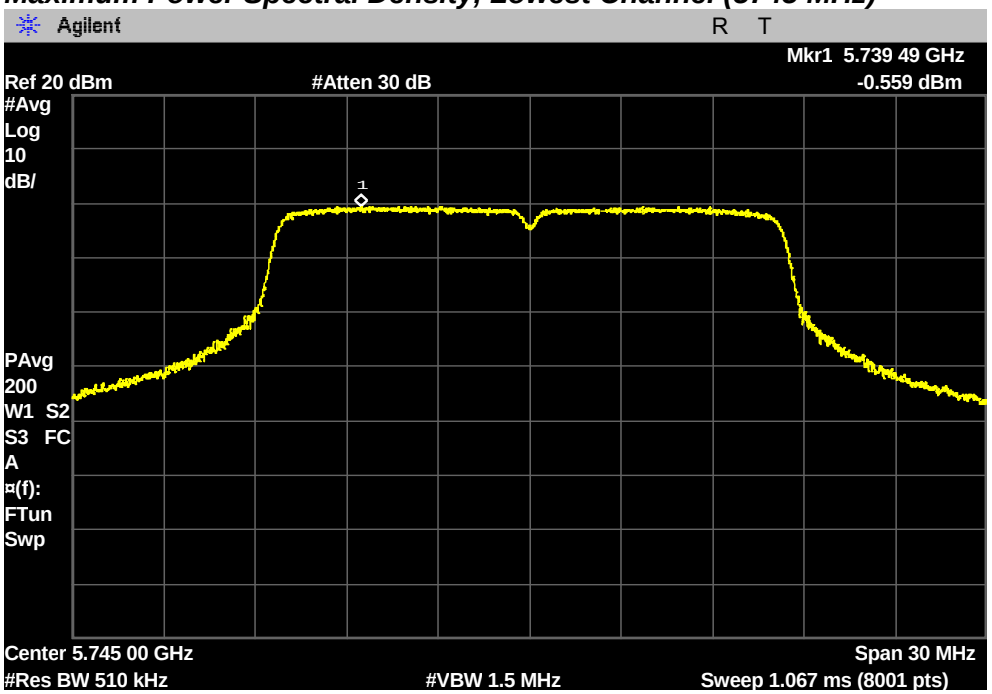
PLOT OF TEST DATA

Maximum Power Spectral Density, Highest Channel (5825 MHz)



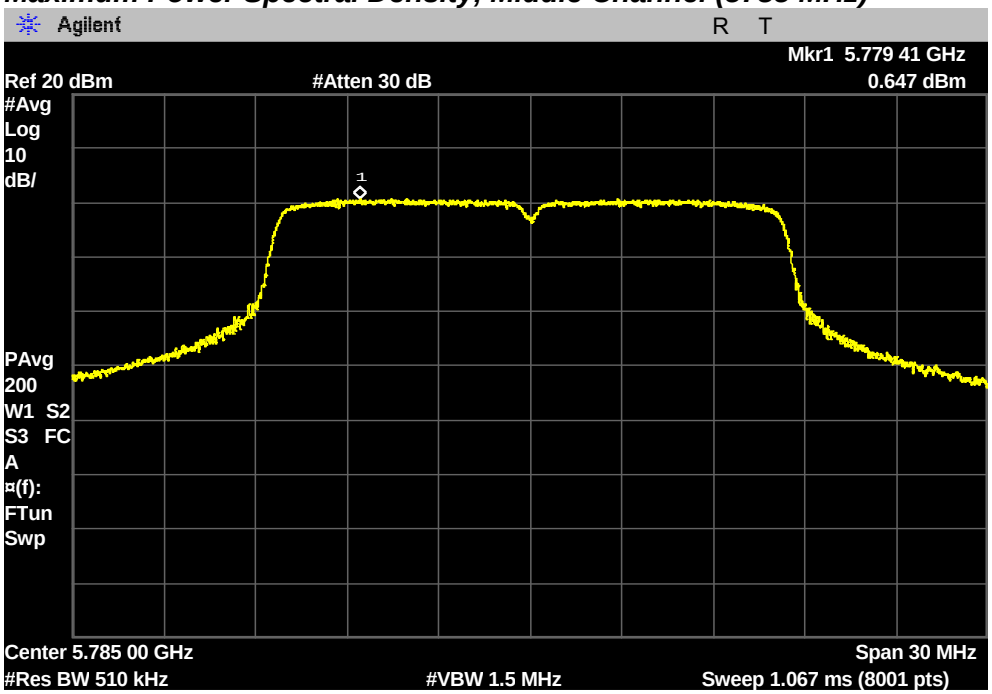
Chain 1

Maximum Power Spectral Density, Lowest Channel (5745 MHz)

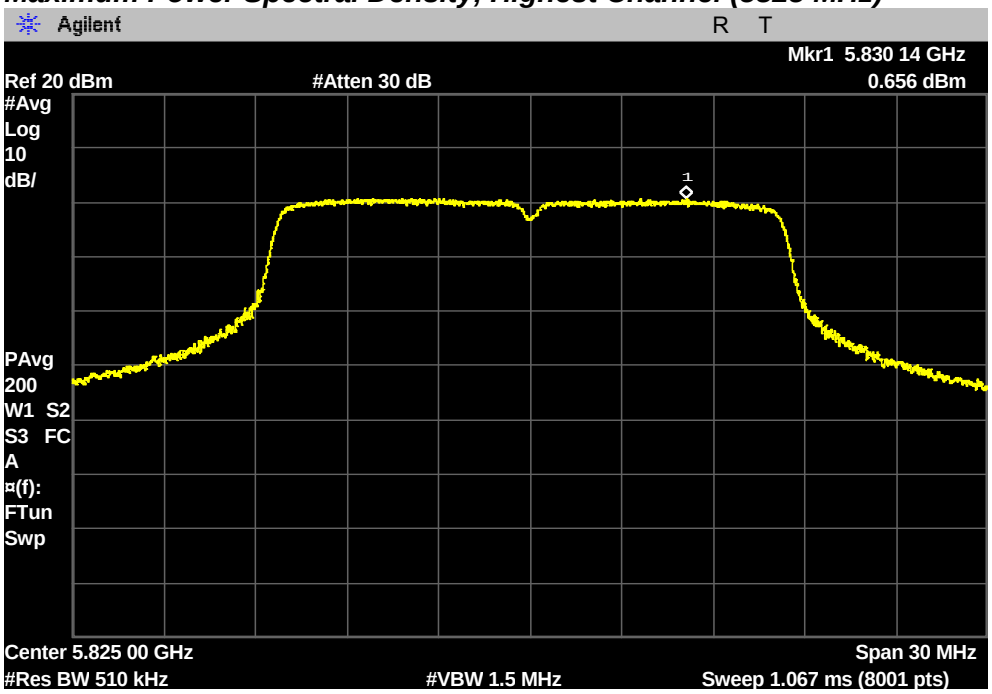


PLOT OF TEST DATA

Maximum Power Spectral Density, Middle Channel (5785 MHz)



Maximum Power Spectral Density, Highest Channel (5825 MHz)

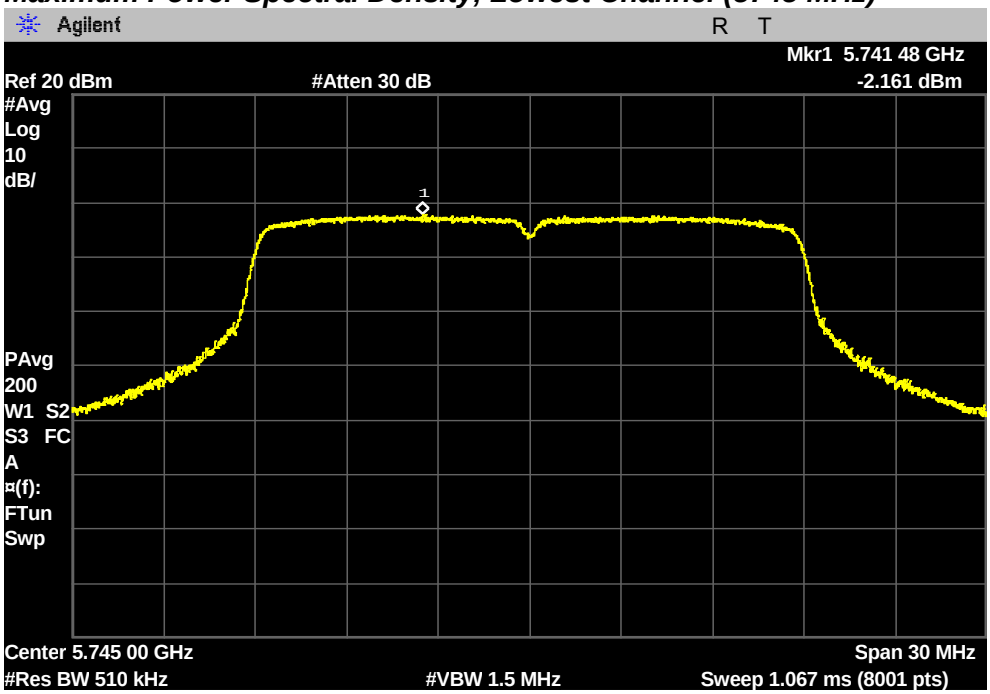


PLOT OF TEST DATA

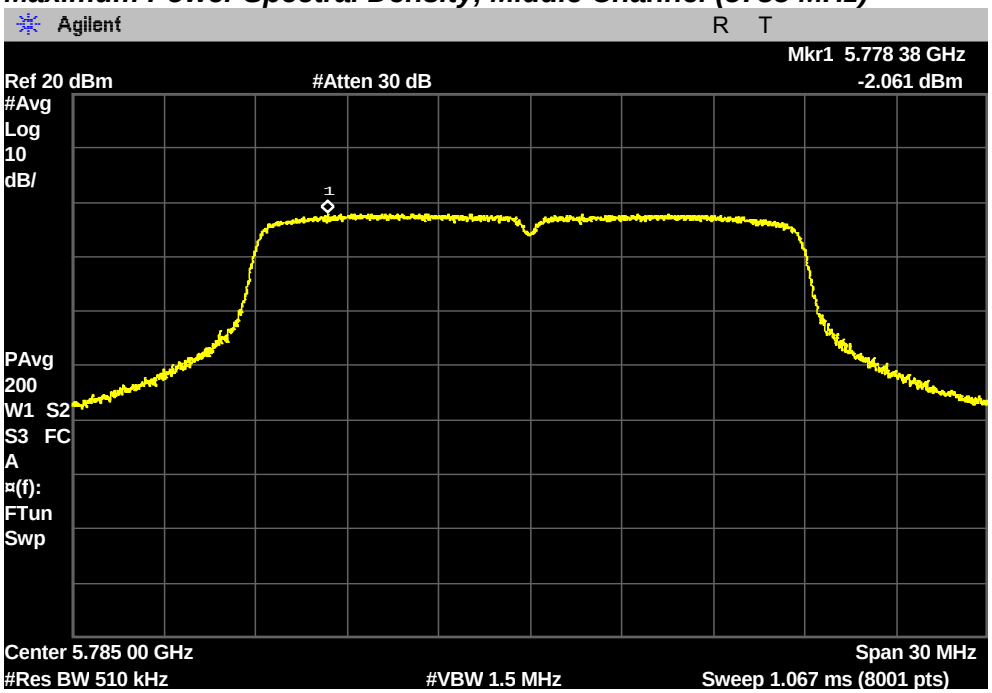
802.11n(20 MHz) mode

Chain 0

Maximum Power Spectral Density, Lowest Channel (5745 MHz)

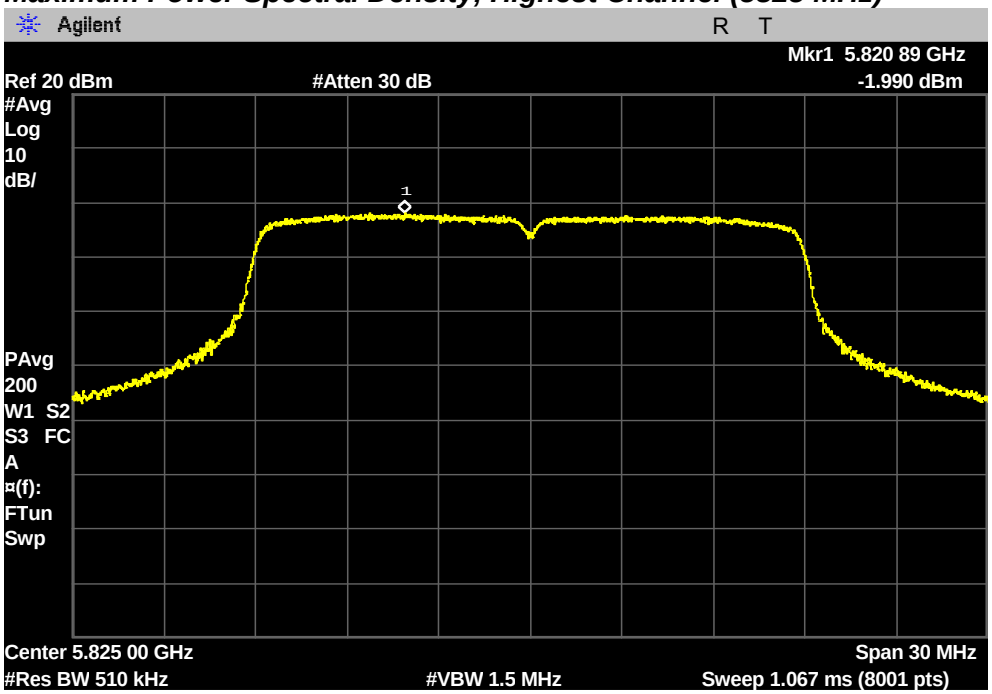


Maximum Power Spectral Density, Middle Channel (5785 MHz)



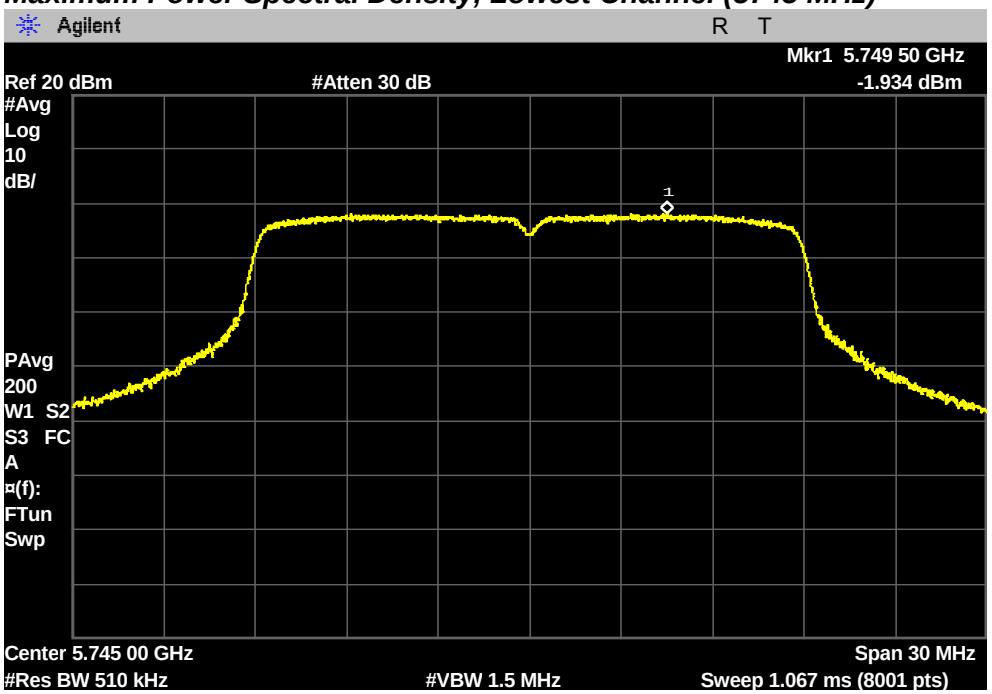
PLOT OF TEST DATA

Maximum Power Spectral Density, Highest Channel (5825 MHz)



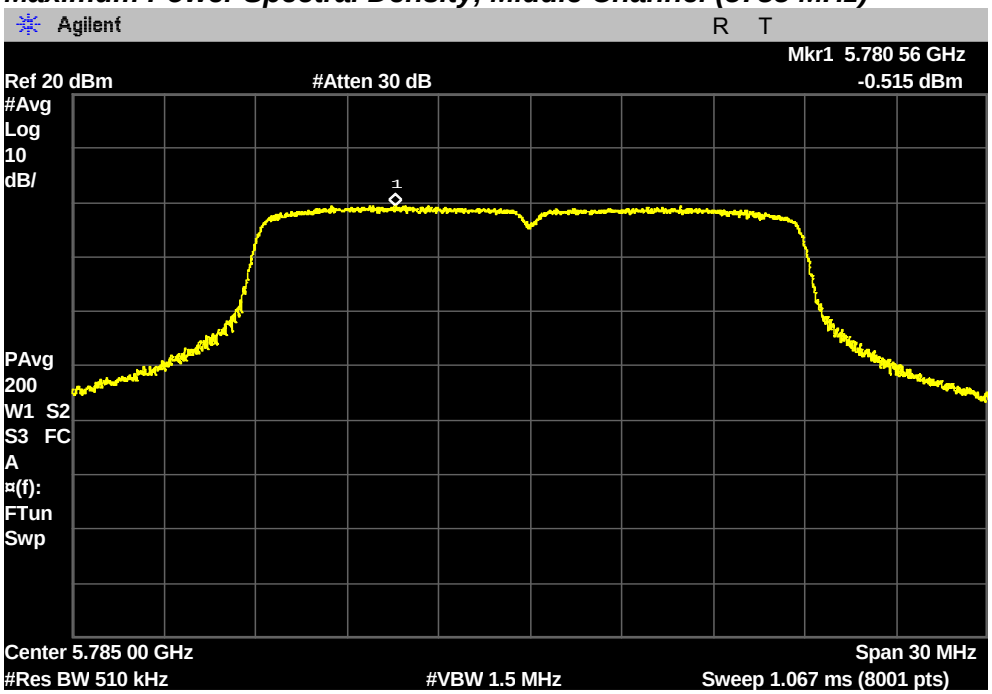
Chain 1

Maximum Power Spectral Density, Lowest Channel (5745 MHz)

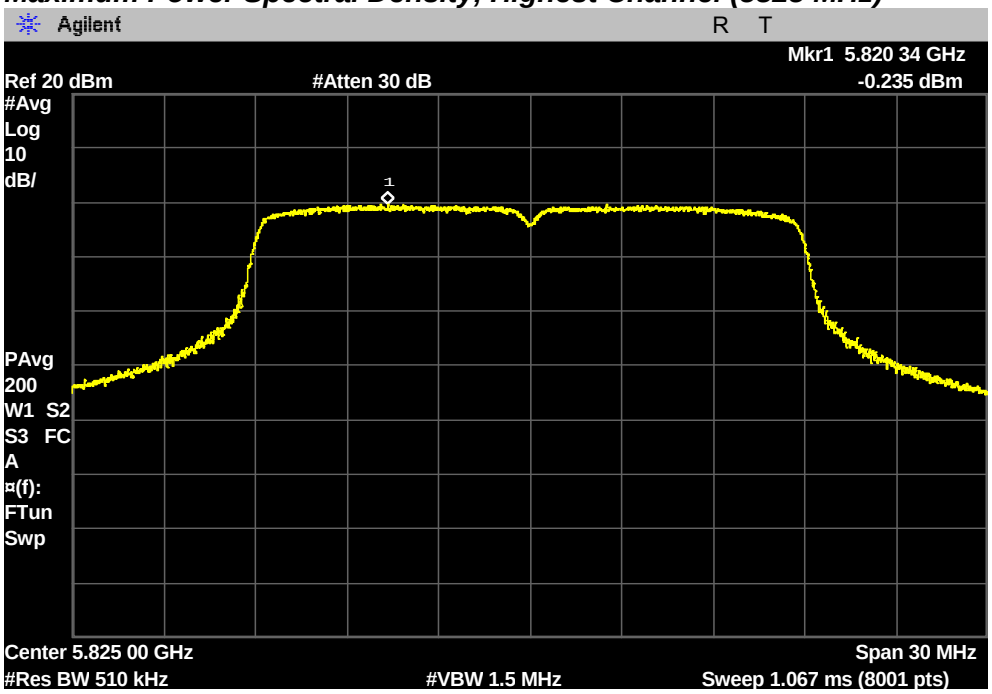


PLOT OF TEST DATA

Maximum Power Spectral Density, Middle Channel (5785 MHz)



Maximum Power Spectral Density, Highest Channel (5825 MHz)

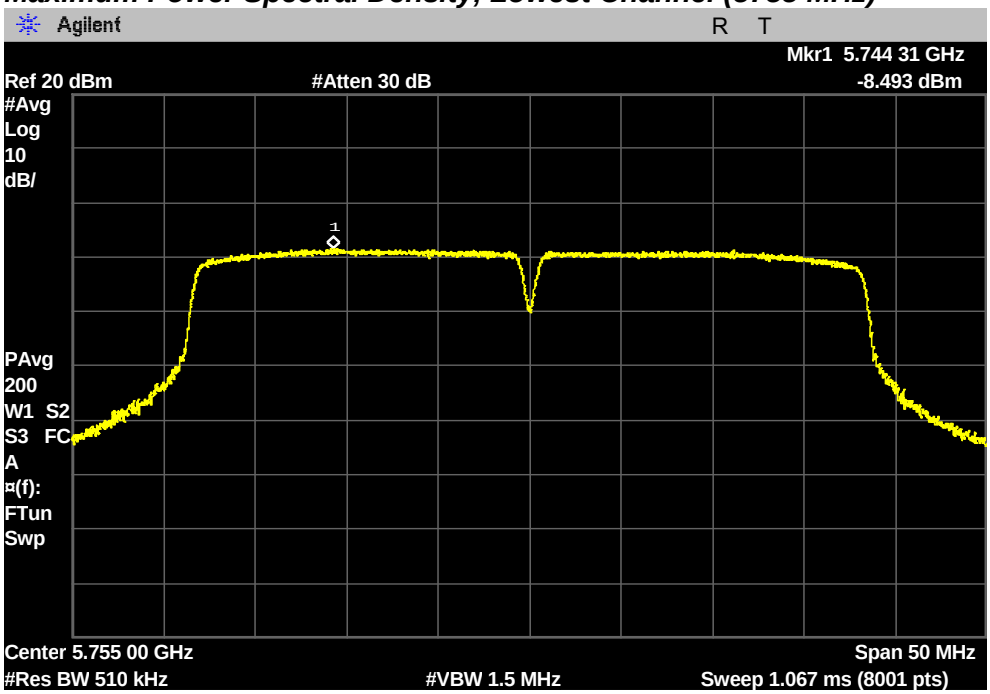


PLOT OF TEST DATA

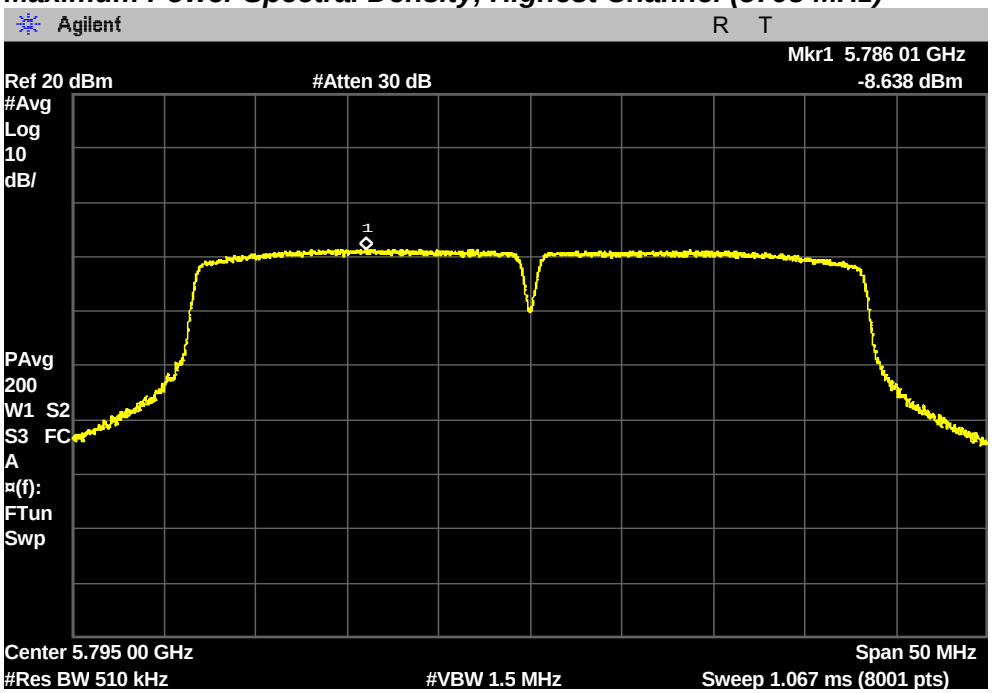
802.11n(40 MHz) mode

Chain 0

Maximum Power Spectral Density, Lowest Channel (5755 MHz)



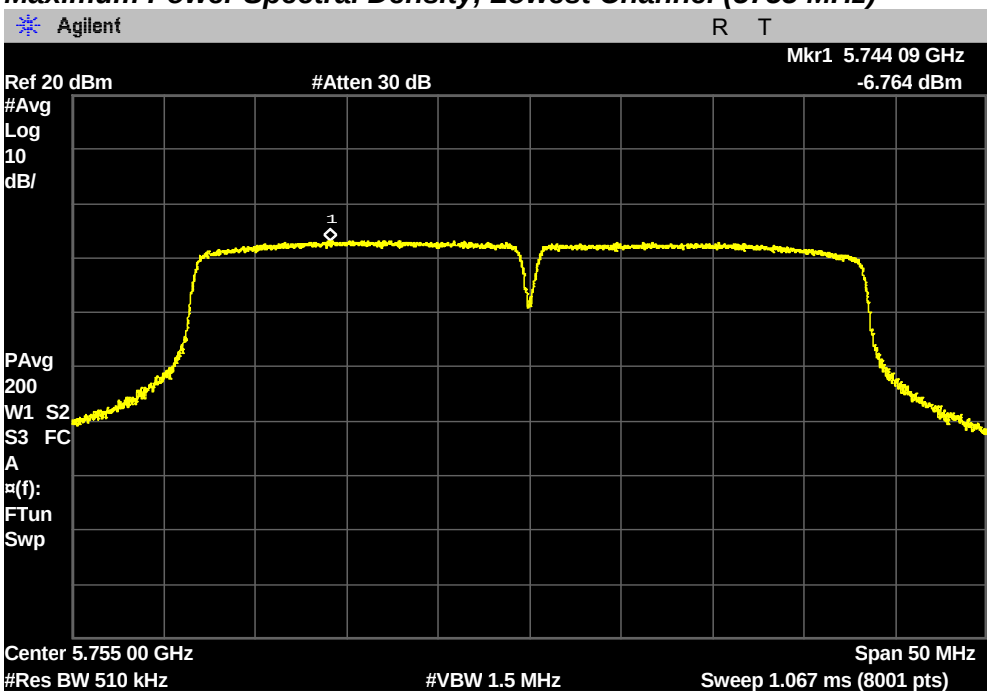
Maximum Power Spectral Density, Highest Channel (5795 MHz)



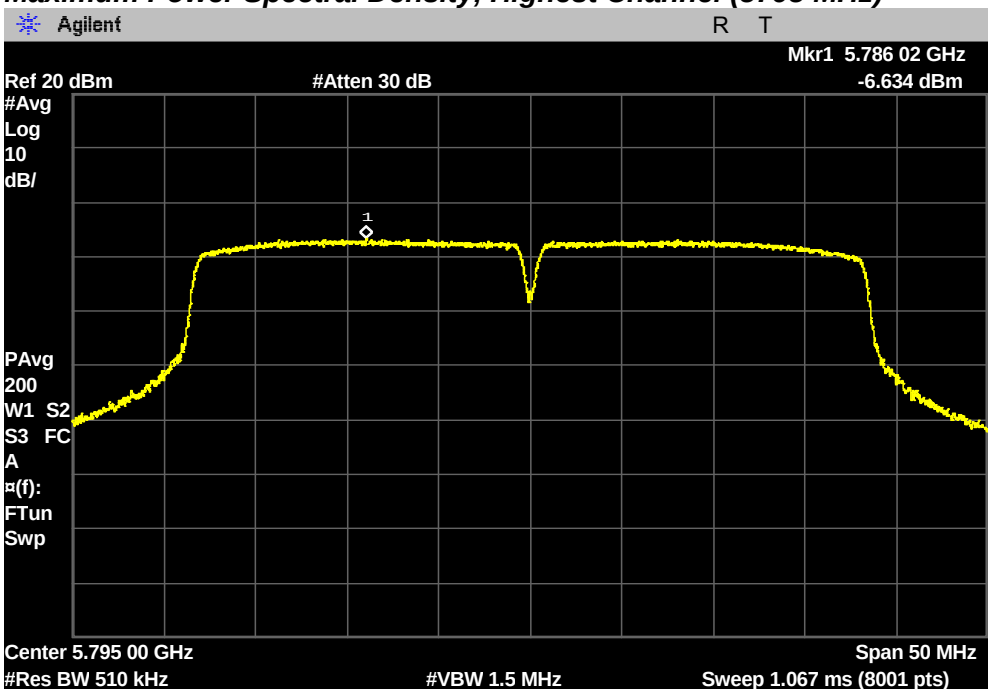
PLOT OF TEST DATA

Chain 1

Maximum Power Spectral Density, Lowest Channel (5755 MHz)



Maximum Power Spectral Density, Highest Channel (5795 MHz)



8.7 Radiated Spurious Emissions

8.7.1 Radiated Spurious Emissions – UNII-1 band

FCC §15.407(b)

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

802.11a mode

Chain 0

Lowest Channel (5180 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
10.36	57.54	H	peak	2.55	-9.54	50.55	68.2	17.65
15.54	62.31	H	peak	2.21	-9.54	54.98	74.0	19.02
15.54	45.24	H	average	2.21	-9.54	37.91	54.0	16.09

Middle Channel (5200 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
10.40	57.41	H	peak	2.59	-9.54	50.46	68.2	17.74
15.60	62.52	H	peak	1.91	-9.54	54.89	74.0	19.11
15.60	45.26	V	average	1.91	-9.54	37.63	54.0	16.37

Highest Channel (5240 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
10.48	56.65	V	peak	3.08	-9.54	50.19	68.2	18.01
15.72	58.20	V	peak	1.92	-9.54	50.58	74.0	23.42
15.72	42.35	H	average	1.92	-9.54	34.73	54.0	19.27

TEST DATA

802.11a mode

Chain 1

Lowest Channel (5180 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
10.36	62.17	V	peak	2.55	-9.54	55.18	68.2	13.02
15.54	57.88	H	peak	2.21	-9.54	50.55	74.0	23.45
15.54	42.02	H	average	2.21	-9.54	34.69	54.0	19.31

Middle Channel (5200 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
10.40	60.06	V	peak	2.59	-9.54	53.11	68.2	15.09
15.60	57.97	H	peak	1.91	-9.54	50.34	74.0	23.66
15.60	41.43	H	average	1.91	-9.54	33.80	54.0	20.20

Highest Channel (5240 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
10.48	56.45	V	peak	3.08	-9.54	49.99	68.2	18.21
15.72	56.29	H	peak	1.92	-9.54	48.67	74.0	25.33
15.72	39.64	H	average	1.92	-9.54	32.02	54.0	21.98

TEST DATA

802.11n(20 MHz) mode

Chain 0 + Chain 1

Lowest Channel (5180 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
10.36	55.14	V	peak	2.55	-9.54	48.15	68.2	20.05
15.54	55.34	H	peak	2.21	-9.54	48.01	74.0	25.99
15.54	40.12	H	average	2.21	-9.54	32.79	54.0	21.21

Middle Channel (5200 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
10.40	52.80	V	peak	2.59	-9.54	45.85	68.2	22.35
15.60	54.36	H	peak	1.91	-9.54	46.73	74.0	27.27
15.60	39.75	H	average	1.91	-9.54	32.12	54.0	21.88

Highest Channel (5240 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
10.48	51.96	V	peak	3.08	-9.54	45.50	68.2	22.70
15.72	53.31	V	peak	1.92	-9.54	45.69	74.0	28.31
15.72	39.39	H	average	1.92	-9.54	31.77	54.0	22.23

802.11n(40 MHz) mode

Chain 0 + Chain 1

Lowest Channel (5190 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
10.38	52.80	V	peak	2.86	-9.54	46.12	68.2	22.08
15.57	54.75	V	peak	2.27	-9.54	47.48	74.0	26.52
15.57	39.27	V	average	2.27	-9.54	32.00	54.0	22.00

Highest Channel (5230 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
10.46	50.11	H	peak	3.09	-9.54	43.66	68.2	24.54
15.69	53.25	V	peak	1.54	-9.54	45.25	74.0	28.75
15.69	38.66	V	average	1.54	-9.54	30.66	54.0	23.34

Note:

*1. *Pol. H = Horizontal V = Vertical*

*2. **AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.*

*3. ***Distance factor = 20 log (test distance/specific distance) = 20 log (1 / 3)*

4. Other spurious are under 20 dB below Fundamental.

5. The radiated emissions testing were made by rotating through three orthogonal axes. The worst date was recorded.

6. At frequencies above 1 GHz, peak emissions were measured using RBW = 1 MHz, VBW = 3 MHz, Detector = Peak.

7. 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 = 300 Hz (VBW ≤ RBW/100), Detector = Peak.

8. The spectrum is measured from 9 kHz to 10th harmonic and the worst-case emissions are reported. No significant emissions were found beyond the third harmonic for this device.

9. The peak limit of non-restricted band is -27 dBm/MHz can be converted 68.2 dBµV/m per KDB789033.

10. For non-restricted band, the peak limit is 68.2 dBµV/m.

11. For restricted band, the peak limit is 74 dBµV/m and the average limit is 54 dBµV/m per § 15.209.

8.7.2 Radiated Spurious Emissions – UNII-2A band

FCC §15.407(b)

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

802.11a mode

Chain 0

Lowest Channel (5260 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
10.52	57.32	V	peak	2.62	-9.54	50.40	68.2	17.80
15.78	58.44	H	peak	2.53	-9.54	51.43	74.0	22.57
15.78	41.79	H	average	2.53	-9.54	34.78	54.0	19.22

Middle Channel (5280 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
10.56	59.37	V	peak	3.13	-9.54	52.96	68.2	15.24
15.84	58.79	H	peak	2.80	-9.54	52.05	74.0	21.95
15.84	42.30	H	average	2.80	-9.54	35.56	54.0	18.44

Highest Channel (5320 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
10.64	59.24	V	peak	3.46	-9.54	53.16	74.0	20.84
10.64	44.20	V	average	3.46	-9.54	38.12	54.0	15.88
15.96	58.94	H	peak	1.13	-9.54	50.53	74.0	23.47
15.96	42.64	H	average	1.13	-9.54	34.23	54.0	19.77

802.11a mode

Chain 1

Lowest Channel (5260 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
10.52	52.98	V	peak	2.62	-9.54	46.06	68.2	22.14
15.78	54.72	H	peak	2.53	-9.54	47.71	74.0	26.29
15.78	39.07	H	average	2.53	-9.54	32.06	54.0	21.94

Middle Channel (5280 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
10.56	51.81	V	peak	3.13	-9.54	45.40	68.2	22.80
15.84	54.51	H	peak	2.80	-9.54	47.77	74.0	26.23
15.84	39.03	H	average	2.80	-9.54	32.29	54.0	21.71

Highest Channel (5320 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
10.64	49.31	V	peak	3.46	-9.54	43.23	74.0	30.77
10.64	34.82	H	average	3.46	-9.54	28.74	54.0	25.26
15.96	56.91	H	peak	1.13	-9.54	48.50	74.0	25.50
15.96	40.49	H	average	1.13	-9.54	32.08	54.0	21.92

802.11n(20 MHz) mode

Chain 0 + Chain 1

Lowest Channel (5260 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
10.52	50.62	V	peak	2.62	-9.54	43.70	68.2	24.50
15.78	52.80	H	peak	2.53	-9.54	45.79	74.0	28.21
15.78	38.55	H	average	2.53	-9.54	31.54	54.0	22.46

Middle Channel (5280 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
10.56	51.87	V	peak	3.13	-9.54	45.46	68.2	22.74
15.84	53.31	H	peak	2.80	-9.54	46.57	74.0	27.43
15.84	38.40	H	average	2.80	-9.54	31.66	54.0	22.34

Highest Channel (5320 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
10.64	51.07	H	peak	3.46	-9.54	44.99	74.0	29.01
10.64	36.47	H	average	3.46	-9.54	30.39	54.0	23.61
15.96	53.70	H	peak	1.13	-9.54	45.29	74.0	28.71
15.96	38.50	H	average	1.13	-9.54	30.09	54.0	23.91

802.11n(40 MHz) mode

Chain 0 + Chain 1

Lowest Channel (5270 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
10.54	49.15	V	peak	3.31	-9.54	42.92	68.2	25.28
15.81	52.53	H	peak	2.68	-9.54	45.67	74.0	28.33
15.81	38.42	H	average	2.63	-9.54	31.51	54.0	22.49

Highest Channel (5310 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
10.62	48.81	H	peak	3.78	-9.54	43.05	74.0	30.95
10.62	35.79	V	average	3.78	-9.54	30.03	54.0	23.97
15.93	52.50	V	peak	1.75	-9.54	44.71	74.0	29.29
15.93	37.92	V	average	1.75	-9.54	30.13	54.0	23.87

Note:

*1. *Pol. H = Horizontal V = Vertical*

*2. **AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.*

*3. ***Distance factor = 20 log (test distance/specific distance) = 20 log (1 / 3)*

4. Other spurious are under 20 dB below Fundamental.

5. The radiated emissions testing were made by rotating through three orthogonal axes. The worst date was recorded.

6. At frequencies above 1 GHz, peak emissions were measured using RBW = 1 MHz, VBW = 3 MHz, Detector = Peak.

7. 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 = 300 Hz (VBW ≤ RBW/100), Detector = Peak.

8. The spectrum is measured from 9 kHz to 10th harmonic and the worst-case emissions are reported. No significant emissions were found beyond the third harmonic for this device.

9. The peak limit of non-restricted band is -27 dBm/MHz can be converted 68.2 dBµV/m per KDB789033.

10. For non-restricted band, the peak limit is 68.2 dBµV/m.

11. For restricted band, the peak limit is 74 dBµV/m and the average limit is 54 dBµV/m per § 15.209.

8.7.3 Radiated Spurious Emissions – UNII-2C band

FCC §15.407(b)

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

802.11a mode

Chain 0

Lowest Channel (5500 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11.00	56.80	V	peak	4.32	-9.54	51.58	74.0	22.42
11.00	42.52	V	average	4.32	-9.54	37.30	54.0	16.70
16.50	58.57	V	peak	2.90	-9.54	51.93	68.2	16.27

Middle Channel (5580 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11.16	56.71	V	peak	3.04	-9.54	50.21	74.0	23.79
11.16	40.55	V	average	3.04	-9.54	34.05	54.0	19.95
16.74	60.65	V	peak	3.75	-9.54	54.86	68.2	13.34

Highest Channel (5700 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11.40	64.91	V	peak	2.89	-9.54	58.26	74.0	15.74
11.40	47.12	V	average	2.89	-9.54	40.47	54.0	13.53
17.10	58.92	V	peak	4.24	-9.54	53.62	68.2	14.58

TEST DATA

802.11a mode

Chain 1

Lowest Channel (5500 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11.00	52.45	V	peak	4.32	-9.54	47.23	74.0	26.77
11.00	37.32	V	average	4.32	-9.54	32.10	54.0	21.90
16.50	65.39	H	peak	2.90	-9.54	58.75	68.2	9.45

Middle Channel (5580 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11.16	52.73	V	peak	3.04	-9.54	46.23	74.0	27.77
11.16	38.97	V	average	3.04	-9.54	32.47	54.0	21.53
16.74	65.75	H	peak	3.75	-9.54	59.96	68.2	8.24

Highest Channel (5700 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11.40	55.10	V	peak	2.89	-9.54	48.45	74.0	25.55
11.40	39.33	V	average	2.89	-9.54	32.68	54.0	21.32
17.10	63.18	H	peak	4.24	-9.54	57.88	68.2	10.32

802.11n(20 MHz) mode

Chain 0 + Chain 1

Lowest Channel (5500 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11.00	50.61	V	peak	4.32	-9.54	45.39	74.0	28.61
11.00	37.44	V	average	4.32	-9.54	32.22	54.0	21.78
16.50	56.63	H	peak	2.90	-9.54	49.99	68.2	18.21

Middle Channel (5580 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11.16	51.27	V	peak	3.04	-9.54	44.77	74.0	29.23
11.16	36.08	H	average	3.04	-9.54	29.58	54.0	24.42
16.74	57.33	H	peak	3.75	-9.54	51.54	68.2	16.66

Highest Channel (5700 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11.40	57.33	V	peak	2.89	-9.54	50.68	74.0	23.32
11.40	42.03	V	average	2.89	-9.54	35.38	54.0	18.62
17.10	56.91	H	peak	4.24	-9.54	51.61	68.2	16.59

802.11n(40 MHz) mode

Chain 0 + Chain 1

Lowest Channel (5510 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11.02	48.27	V	peak	4.55	-9.54	43.28	74.0	30.72
11.02	34.42	H	average	4.55	-9.54	29.43	54.0	24.57
16.53	54.28	H	peak	3.19	-9.54	47.93	68.2	20.27

Middle Channel (5590 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11.18	49.74	H	peak	3.05	-9.54	43.25	74.0	30.75
11.18	36.08	V	average	3.05	-9.54	29.59	54.0	24.41
16.77	53.63	H	peak	3.90	-9.54	47.99	68.2	20.21

Highest Channel (5670 MHz)

Frequency (GHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11.34	51.45	V	peak	2.91	-9.54	44.82	74.0	29.18
11.34	38.05	V	average	2.91	-9.54	31.42	54.0	22.58
17.01	55.33	H	peak	4.62	-9.54	50.41	68.2	17.79

Note:

*1. *Pol. H = Horizontal V = Vertical*

*2. **AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.*

*3. ***Distance factor = 20 log (test distance/specific distance) = 20 log (1 / 3)*

4. Other spurious are under 20 dB below Fundamental.

5. The radiated emissions testing were made by rotating through three orthogonal axes.
The worst date was recorded.

6. At frequencies above 1 GHz, peak emissions were measured using RBW = 1 MHz, VBW = 3 MHz, Detector = Peak.
7. 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 = 300 Hz (VBW ≤ RBW/100), Detector = Peak.
8. The spectrum is measured from 9 kHz to 10^{th} harmonic and the worst-case emissions are reported. No significant emissions were found beyond the third harmonic for this device.
9. The peak limit of non-restricted band is -27 dBm/MHz can be converted 68.2 dBμV/m per KDB789033.
10. For non-restricted band, the peak limit is 68.2 dBμV/m.
11. For restricted band, the peak limit is 74 dBμV/m and the average limit is 54 dBμV/m per § 15.209.

8.7.4 Radiated Spurious Emissions – UNII-3 band

FCC §15.407(b)

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

802.11a mode

Chain 0

Lowest Channel (5745 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result*** (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11486.88	49.6	V	peak	5.8	55.4	74.0	18.6
11490.24	37.5	V	average	5.8	43.3	54.0	10.7

Middle Channel (5785 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11568.75	49.1	V	peak	5.9	55.0	74.0	19.0
11569.77	38.2	V	average	5.9	44.1	54.0	9.9

Highest Channel (5825 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11648.75	50.2	V	peak	5.6	55.8	74.0	18.2
11649.74	36.6	V	average	5.6	42.2	54.0	11.8

Chain 1

Lowest Channel (5745 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11486.88	46.4	V	peak	5.8	52.2	74.0	21.8
11490.32	37.6	V	average	5.8	43.4	54.0	10.6
17233.75	47.8	H	peak	8.7	56.5	68.2	11.7

Middle Channel (5785 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result*** (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11568.75	48.9	V	peak	5.9	54.8	74.0	19.2
11571.71	36.4	V	average	5.9	42.3	54.0	11.7
17345.63	46.8	V	peak	9.9	56.7	68.2	11.5

Highest Channel (5825 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result*** (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11653.13	49.9	V	peak	5.6	55.5	74.0	18.5
11650.20	39.3	V	average	5.6	44.9	54.0	9.1

802.11n(20MHz) mode

Chain 0 + Chain 1

Lowest Channel (5745 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11492.50	48.6	V	peak	5.8	54.4	74.0	19.6
11490.00	38.0	V	average	5.8	43.8	54.0	10.2
17241.25	46.8	H	peak	8.8	55.6	68.2	12.6

Middle Channel (5785 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11568.13	48.7	V	peak	5.9	54.6	74.0	19.4
11566.09	37.8	V	average	5.9	43.7	54.0	10.3

Highest Channel (5825 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result*** (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11645.00	49.6	V	peak	5.6	55.2	74.0	18.8
11645.86	35.3	V	average	5.6	40.9	54.0	13.1

802.11n(40MHz) mode

Chain 0 + Chain 1

Lowest Channel (5755 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11512.50	48.7	V	peak	5.8	54.5	74.0	19.5
11511.83	37.4	V	average	5.8	43.2	54.0	10.8

Highest Channel (5795 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
11590.63	49.0	V	peak	5.9	54.9	74.0	19.1
11584.00	38.4	V	average	5.9	44.3	54.0	9.7

TEST DATA

Note:

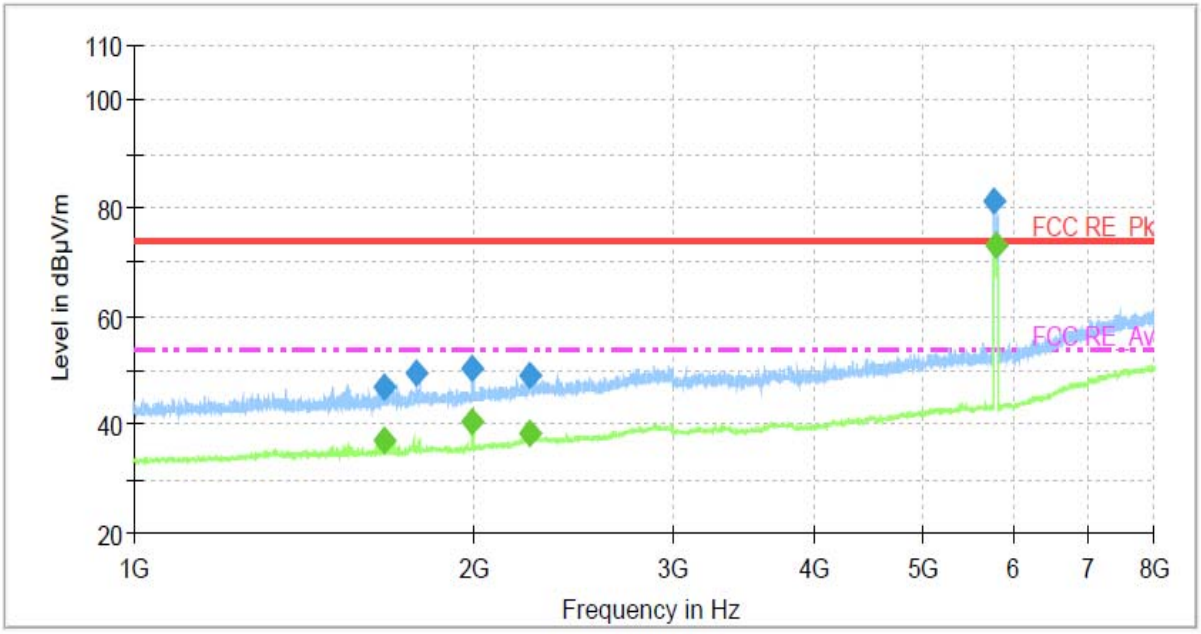
1. *Pol. H = Horizontal V = Vertical
2. **AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.
3. ***The results were measured in restricted band. However average measurements were not performed since the peak measurements satisfied the average limit(54dBuV/m) of FCC §15.209.
4. At frequencies above 1 GHz, peak emissions were measured using RBW = 1 MHz, VBW = 3 MHz, Detector = Peak.
5. 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.
6. The spectrum is measured from 9 kHz to 10^{th} harmonic and the worst-case emissions are reported. No significant emissions were found beyond the third harmonic and 26.5GHz for this device.
7. For outside of the restricted band, the peak limit is 68.2 dBμV/m. (E[dBμV/m] = EIRP[dBm] + 95.2 = 68.2 dBuV/m, for EIPR[dBm] = -27dBm.)
8. For restricted band, the peak limit is 74 dBμV/m, the average limit is 54 dBμV/m per FCC §15.209
9. n(40MHz) mode, highest channel(5795MHz) was the worst case.
10. 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.
11. 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

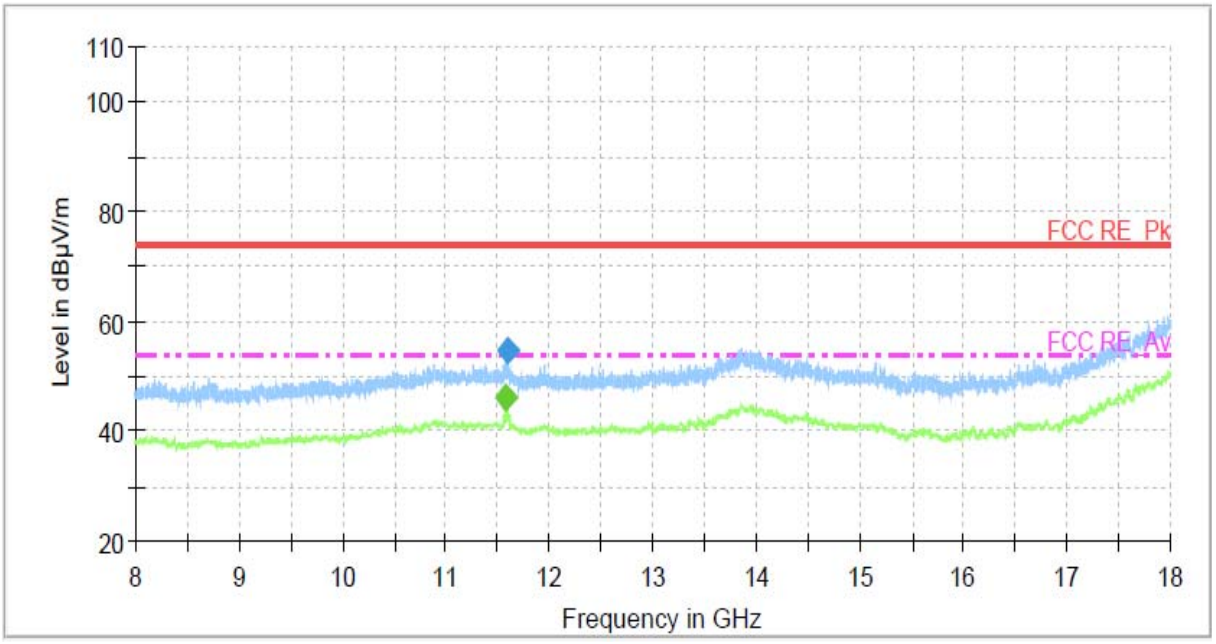
Worst Case

n(40MHz) mode

Highest channel : 1 GHz to 8 GHz

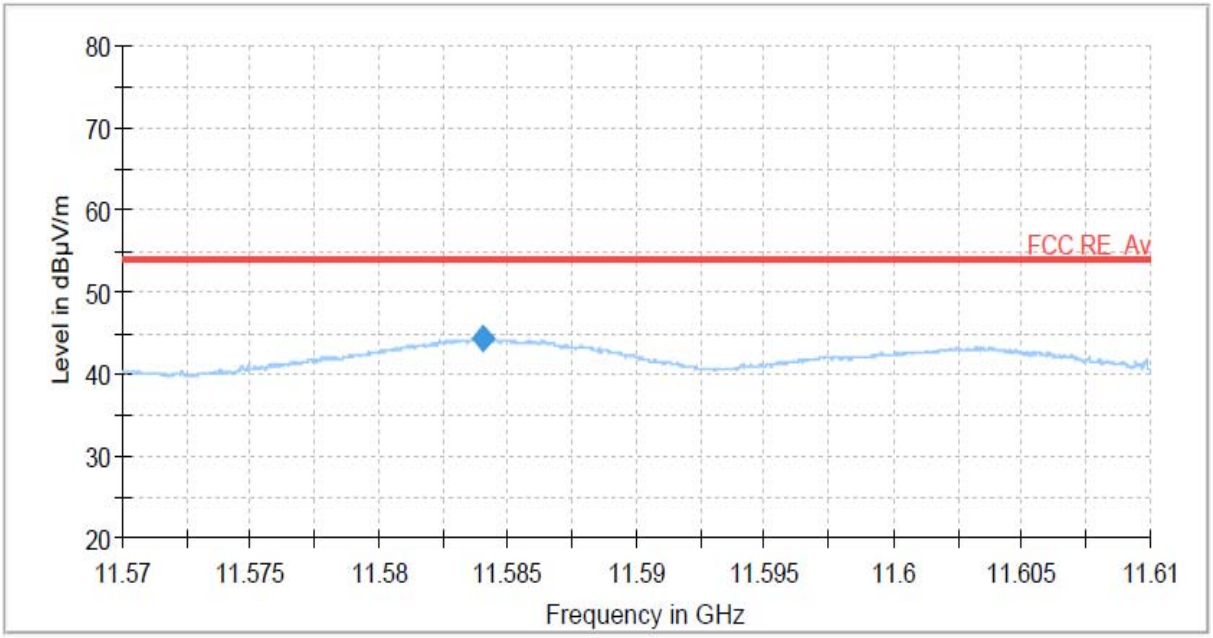


Highest channel : 8 GHz to 18 GHz (2nd harmonic)_Pk

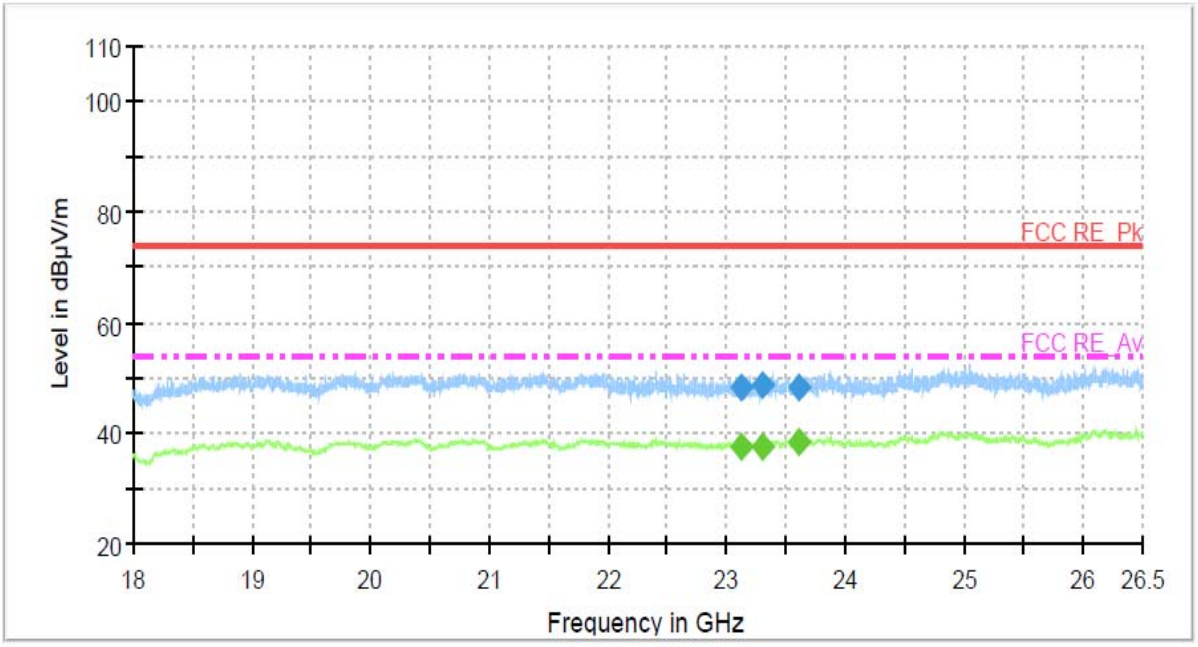


PLOTS OF EMISSIONS

Highest channel : 8 GHz to 18 GHz (2nd harmonic)_Av

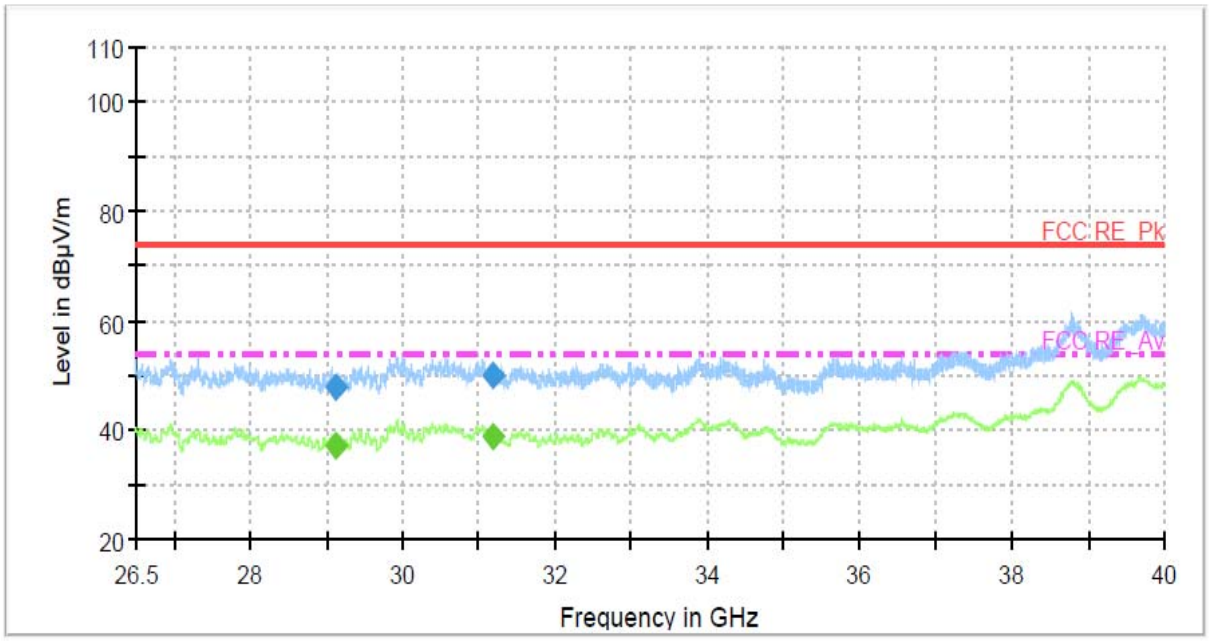


Highest channel : 18 GHz to 26.5 GHz



PLOTS OF EMISSIONS

Highest channel : 26.5 GHz to 40 GHz



8.8 Radiated Band Edge

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

FCC §15.407(b)

Test Mode : Set to Lowest channel and Highest channel

802.11a mode

Chain 0

Lowest Channel (5180 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5148.35	52.10	V	peak	9.60	61.70	74.0	12.30
5148.35	38.20	V	average	9.60	47.80	54.0	6.20

Highest Channel (5320 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5350.22	55.50	V	peak	9.80	65.30	74.0	8.70
5350.22	37.70	V	average	9.80	47.50	54.0	6.50

Chain 1

Lowest Channel (5180 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5147.85	52.00	H	peak	9.60	61.60	74.0	12.40
5147.85	36.50	H	average	9.60	46.10	54.0	7.90

Highest Channel (5320 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5350.41	44.70	V	peak	9.80	54.50	74.0	19.50
5350.41	35.10	V	average	9.80	44.90	54.0	9.10

802.11n(20 MHz) mode

Chain 0 + Chain 1

Lowest Channel (5180 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5149.92	42.90	H	peak	9.60	52.50	74.0	21.50
5149.92	33.50	H	average	9.60	43.10	54.0	10.90

Highest Channel (5320 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5351.93	46.00	V	peak	9.80	55.80	74.0	18.20
5351.93	34.80	V	average	9.80	44.60	54.0	9.40

802.11n(40 MHz) mode

Chain 0 + Chain 1

Lowest Channel (5190 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5149.27	58.80	H	peak	9.60	68.40	74.0	5.60
5149.27	41.00	H	average	9.60	50.60	54.0	3.40

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)
5351.14	49.50	H	peak	9.80	59.30	74.0	14.70
5351.14	36.70	H	average	9.80	46.50	54.0	7.50

Note:

*1. *Pol. H = Horizontal V = Vertical*

*2. **AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.*

3. The radiated emissions testing were made by rotating through three orthogonal axes. The worst date was recorded.

4. At frequencies above 1 GHz, peak emissions were measured using RBW = 1 MHz, VBW = 3 MHz, Detector = Peak.

5. 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 = 300 Hz (VBW ≤ RBW/100), Detector = Peak.

6. For non-restricted band, the peak limit is 68.2 dBµV/m.

7. For restricted band, the peak limit is 74 dBµV/m, the average limit is 54 dBµV/m per FCC §15.209.

8.8.2 Radiated Band Edge – UNII-2C band

FCC §15.407(b)

Test Mode : Set to Lowest channel and Highest channel

802.11a mode

Chain 0

Lowest Channel (5500 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5459.66	47.90	V	peak	10.20	58.10	74.0	15.90
5459.66	35.10	V	average	10.20	45.30	54.0	8.70
5469.34	54.40	V	peak	10.20	64.60	68.2	3.60

Highest Channel (5700 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5725.56	52.00	V	peak	10.40	62.40	68.2	5.80

Chain 1

Lowest Channel (5500 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5459.96	45.45	H	peak	10.20	55.65	74.0	18.35
5459.96	34.60	H	average	10.20	44.80	54.0	9.20
5469.20	56.80	H	peak	10.20	67.00	68.2	1.20

Highest Channel (5700 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5725.82	56.50	H	peak	10.40	66.90	68.2	1.30

TEST DATA

802.11n(20 MHz) mode

Chain 0 + Chain 1

Lowest Channel (5500 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5459.97	44.08	H	peak	10.20	54.28	74.0	19.72
5459.97	34.90	H	average	10.20	45.10	54.0	8.90
5469.37	47.50	H	peak	10.20	57.70	68.2	10.50

Highest Channel (5700 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5725.64	54.10	H	peak	10.40	64.50	68.2	3.70

802.11n(40 MHz) mode

Chain 0 + Chain 1

Lowest Channel (5510 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5459.95	47.52	V	peak	10.20	57.72	74.0	16.28
5459.95	35.40	V	average	10.20	45.60	54.0	8.40
5469.97	55.20	V	peak	10.20	65.40	68.2	2.80

Highest Channel (5670 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5725.78	47.70	V	peak	10.40	58.10	68.2	10.10

TEST DATA

Note:

1. *Pol. H = Horizontal V = Vertical
2. **AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.
3. The radiated emissions testing were made by rotating through three orthogonal axes. The worst date was recorded.
4. At frequencies above 1 GHz, peak emissions were measured using RBW = 1 MHz, VBW = 3 MHz, Detector = Peak.
5. 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 = 300 Hz (VBW ≤ RBW/100), Detector = Peak.
6. For non-restricted band, the peak limit is 68.2 dBμV/m.
7. For restricted band, the peak limit is 74 dBμV/m, the average limit is 54 dBμV/m per FCC §15.209.

8.8.3 Radiated Band Edge – UNII-3 band

FCC §15.407(b)

Test Mode : Set to Lowest channel and Highest channel

802.11a mode

Chain 0

Lowest Channel (5745 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit*** (dBµV/m)	Margin (dB)
5724.31	58.50	V	peak	11.00	69.50	78.2	8.70
5725.00	58.10	V	peak	11.00	69.10	78.2	9.10

Highehst 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	42.80	V	peak	11.40	54.20	78.2	24.00

Chain 1

Lowest Channel (5745 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit*** (dBµV/m)	Margin (dB)
5724.48	46.70	H	peak	11.00	57.70	78.2	20.50
5725.00	45.60	H	peak	11.00	56.60	78.2	21.60

Highehst 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	42.50	V	peak	11.40	53.90	78.2	24.30

802.11n(20MHz) mode

Chain 0 + Chain 1

Lowest Channel (5745 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit*** (dBµV/m)	Margin (dB)
5724.11	56.80	V	peak	11.00	67.80	78.2	10.40
5725.00	56.00	V	peak	11.00	67.00	78.2	11.20

Highehst 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	43.10	V	peak	11.40	54.50	78.2	23.70

802.11n(40MHz) mode

Chain 0 + Chain 1

Lowest Channel (5755 MHz)

Frequency (MHz)	Reading (dBµV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBµV/m)	Limit*** (dBµV/m)	Margin (dB)
5713.86	51.10	H	peak	11.00	62.10	68.2	6.10
5723.57	56.00	H	peak	11.00	67.00	78.2	11.20
5725.00	55.00	H	peak	11.00	66.00	78.2	12.20

Highehst 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	42.80	H	peak	11.40	54.20	78.2	24.00

TEST DATA

Note:

1. *Pol. H = Horizontal V = Vertical
2. **AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.
3. All modes of operation and all lowest, highest channels were investigated and the worst -case emissions in each band are reported.
4. At frequencies above 1 GHz, peak emissions were measured using RBW = 1 MHz, VBW = 3 MHz, Detector = Peak.
5. 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.
6. For outside of the restricted band, the peak limit is 68.2 dBμV/m. (E[dBμV/m] = EIRP[dBm] + 95.2 = 68.2 dBuV/m, for EIPR[dBm] = -27dBm.)

   ***For 5.725-5.85 GHz band, All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.
   peak limit is 78.2 dBμV/m. (E[dBμV/m] = EIRP[dBm] + 95.2 = 78.2 dBuV/m, for EIPR[dBm] = -17dBm.)
   peak limit is 68.2 dBμV/m. (E[dBμV/m] = EIRP[dBm] + 95.2 = 68.2 dBuV/m, for EIPR[dBm] = -27dBm.)
7. For restricted band, the peak limit is 74 dBμV/m, the average limit is 54 dBμV/m per FCC §15.209
8. 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.
9. 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

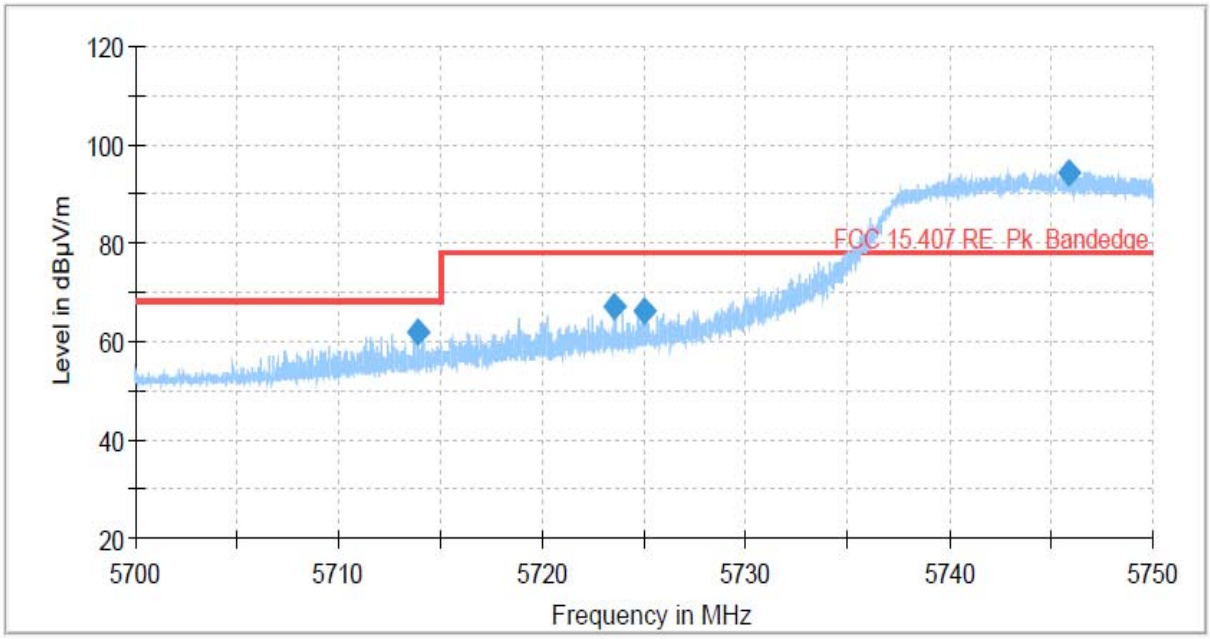
Worst Case

Radiated Band Edge – UNII-3

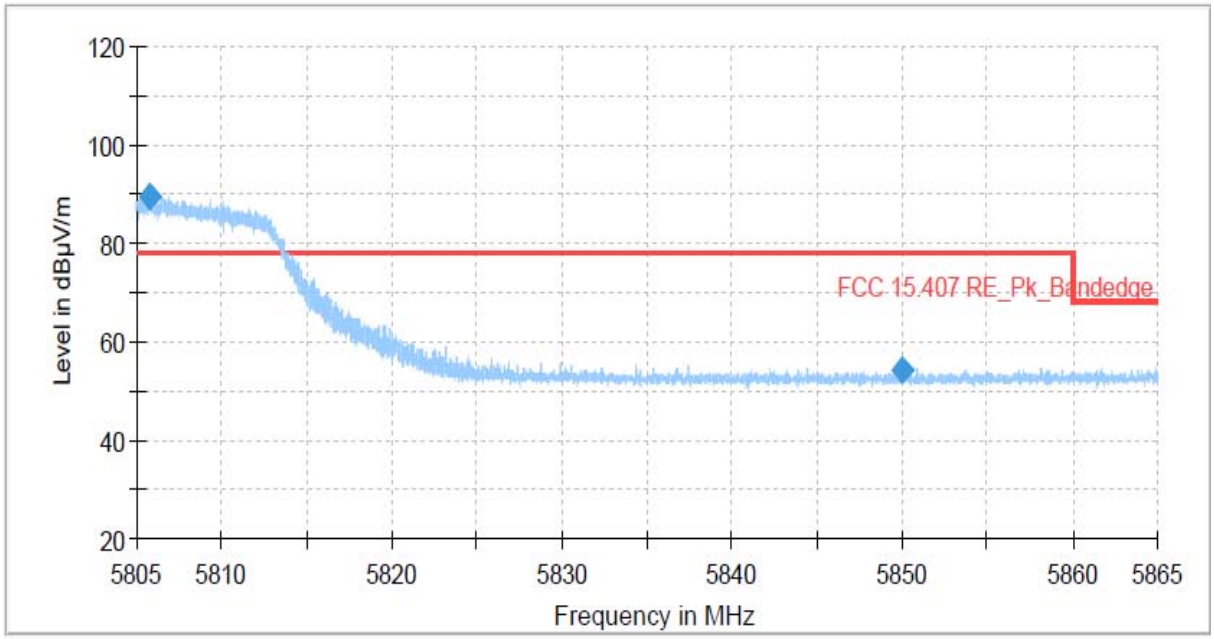
802.11n(40MHz) mode

Chain 0 + Chain 1

Lowest Channel (5755 MHz)_PK



Highest Channel (5795 MHz)_PK



9. TEST EQUIPMENT

No.	Instrument	Manufacturer	Model	Serial No.	Calibration Date	Calibration Interval
1	*Test Receiver	R & S	ESU 40	100202	Apr. 04 2016	1 year
2	*Test Receiver	R & S	ESCS30	100302	Oct. 06 2015	1 year
3	*Attenuator	PASTERNACK	PE7395-10	1441	Jan. 19 2016	1 year
4	*Attenuator	FAIRVIEW	SA3N5W-06	N/A	Apr. 04 2016	1 year
5	*Attenuator	FAIRVIEW	SA3N5W-10	N/A	Apr. 04 2016	1 year
6	*Attenuator	WEINSCHEL	56-10	58765	Oct. 02 2015	1 year
7	*Amplifier	R & S	SCU 01	10030	Apr. 04 2016	1 year
8	*Amplifier	R & S	SCU18	10065	Apr. 04 2016	1 year
9	*Amplifier	R & S	SCU26	10011	Jul. 17 2015	1 year
10	*Amplifier	R & S	SCU40	10008	Aug. 10 2015	1 year
11	*Pre Amplifier	HP	8449B	3008A00107	Jan. 07 2016	1 year
12	Spectrum Analyzer	R & S	FSW43	100732	Apr. 05 2016	1 year
13	*Spectrum Analyzer	Agilent	E4440A	MY44022567	Oct. 15 2015	1 year
14	*Spectrum Analyzer	R&S	FSP40	100361	Jul. 16 2015	1 year
15	DC Power Supply	HP	6574A	US36340190	Jul. 17 2015	1 year
16	*Loop Antenna	R & S	HFH2-Z2	100279	Feb. 22 2016	2 year
17	Wideband Power Sensor	R & S	NRP-Z81	100634	Jul. 17 2015	1 year
18	*Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-474	Sep. 01 2014	2 year
19	*Horn Antenna	Q-par Angus	QSH20S20	8179	Apr. 30 2015	2 year
20	*Horn Antenna	Q-par Angus	QSH22K20	8180	Apr. 30 2015	2 year
21	*Trilog-Broadband Antenna	SCHWARZBECK	VULB 9163	9163-423	Nov. 04 2015	2 year
22	*LISN	R & S	ESH3-Z5	833874/006	Oct. 06 2015	1 year
23	*Controller	INNCO	CO2000-G	CO2000/562/23890210/L	N/A	N/A
24	*Turn Table	INNCO	DT3000-3T	N/A	N/A	N/A
25	*Antenna Mast	INNCO	MA4000-EP	N/A	N/A	N/A
26	*Open Switch And Control Unit	R & S	OSP-120	100015	N/A	N/A
27	*Anechoic Chamber	Seo-Young EMC	N/A	N/A	N/A	N/A
28	*Position Controller	INNCO	CO2000	12480406/L	N/A	N/A
29	*Turn Table	INNCO	DS1200S	N/A	N/A	N/A
30	*Antenna Mast	INNCO	MA4000	N/A	N/A	N/A
31	*Anechoic Chamber	Seo-Young EMC	N/A	N/A	N/A	N/A
32	Shielded Room	Seo-Young EMC	N/A	N/A	N/A	N/A
33	*Open Switch And Control Unit	R & S	OSP-120	100081	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	Xi	Uncertainty of Xi		Coverage factor k	u(Xi) (dB)	Ci	Ci u(Xi) (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			
Expended Uncertainty U	Normal (k = 2)			± 3.76			

2. Radiation Uncertainty Calculation

Source of Uncertainty	Xi	Uncertainty of Xi		Coverage factor k	u(Xi) (dB)	Ci	Ci u(Xi) (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						
Expended Uncertainty U	Normal (k = 2)						