Nemko Korea Co., Ltd.

155 & 159, Osan-Ro, Mohyeon-Myeon, Cheoin-Gu, Yongin-Si, Gyeonggi-Do 449-852 KOREA, REPUBLIC OF
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FCC EVALUATION REPORT FOR CERTIFICATION

Applicant :

Samsung Electronics Co., Ltd.
129, Samsung-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, Korea.
(Post code : 443-742)
Attn. : Mr. Jaywoo. Lee

Dates of Issue : June 13, 2013
Test Report No. : NK-13-R-083-2
Test Site : Nemko Korea Co., Ltd.

FCC ID	**A3LHR44**
Brand Name	**SAMSUNG**
Contact Person	**Samsung Electronics Co., Ltd.** **129, Samsung-ro, Yeongtong-gu,** **Suwon-si, Gyeonggi-do, Korea, 443-742.** **Mr. Jaywoo. Lee** **Telephone No. : +82-31-277-2569**

Applied Standard:	FCC 47 CFR Part 15.407
Classification:	Unlicensed National Information Infrastructure (UNII)
EUT Type:	Set-top box

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 C63.4-2003, ANSI C63.10-2009. 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.

Jun. 13, 2013
Tested By : Jin-ha Ko
Engineer

Jun 13. 2013
Reviewed By : Deokha Ryu
Technical Manager

TABLE OF CONTENTS

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 :	Mr. Jaywoo. Lee
Manufacturer :	Samsung Electronics Co., Ltd. 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea 443-742

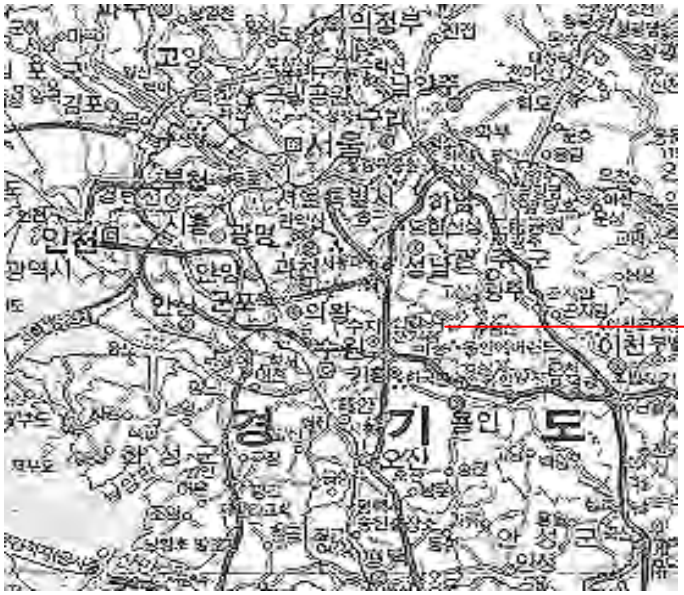
- FCC ID: A3LHR44
- Model: HR44-200
- Brand Name: SAMSUNG
- EUT Type: Set-top box
- Ports: Satellite antenna in x 1, Component video out x 1
Audio out L/R x 1, Coaxial out x 1, Optical x 1,
HDMI x 1, Ethernet x 1, USB x 2, eSATA x 1,
RJ-11 x 1, d.c. power in x 1
- Classification: Unlicensed National Information Infrastructure (UNII)
- Applied Standard: FCC 47 CFR Part 15.407
- Test Procedure(s): ANSI C63.4-2003, ANSI C63.10-2009 and FCC guidance of 789033 D01 v01r03
- Dates of Test: April 06, 2013 ~ June 9, 2013
- 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 C63.4-2003), the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2009) was used in determining radiated and conducted emissions emanating from **Samsung Electronics Co., Ltd**. **FCC ID : A3LHR44**.

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 449-852 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 §2.948 according to ANSI C63.4 2003.



Nemko Korea Co., Ltd.
EMC Lab.
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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
FC	FCC part 15/18 Filing site	Registration No. 97992
	CAB Accreditation for DOC	Designation No. KR0026
KOLAS	KOLAS Accredited Lab. (Korea Laboratory Accreditation Scheme)	Registration No. 155
Industry Canada	Canada IC Registered site	Site No. 2040E
VCCI	VCCI registration site(RE/CE/Telecom CE)	Member No. 2118
IECEE CB SCHEME	EMC CBTL	-
방송통신위원회	KCC(RRL)Designated Lab.	Registration No. KR0026
	SASO registered Lab and Certification Body	Registration No. 2008-15

3. TEST CONDITIONS & EUT INFORMATION

3.1 Operation During Test

The EUT contains a MIMO transceiver which is support 802.11a/b/g/n mode (802.11a/b/g/n: 2TX/2RX). The EUT was connected to laptop PC and then a test program was executed to operate EUT continuously. After the setting of the EUT, the laptop PC was removed from test area.
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. During the test, the EUT was operating with a duty cycle 100 %.

3.1.1 Table of test channels

Frequency band	Mode	Test Channel (CH)	Frequency (MHz)	Power Level
Band I	802.11a	36	5180	12
		40	5200	12
		48	5240	12
	802.11n	36	5180	12
		40	5200	12
		48	5240	12
Band II	802.11a	52	5260	18
		56	5280	18
		64	5320	14
	802.11n	52	5260	17
		56	5280	17
		64	5320	14
Band III	802.11a	100	5500	14
		116	5580	18
		140	5700	14
	802.11n	100	5500	14
		116	5580	17
		140	5700	14

3.1.2 Table of test modes

Test Items	Mode	Data rate	Test Channel (CH)
Conducted Emissions	802.11n	MCS0	56
Radiated Emissions	802.11n	MCS0	56
26 dB Spectrum Bandwidth	802.11a	6 Mbps	36/40/48 52/56/64 100/116/140
	802.11n	MCS0	36/40/48 52/56/64 100/116/140
Maximum Conducted Output Power	802.11a	6 Mbps ~ 54 Mbps	36/40/48 52/56/64 100/116/140
	802.11n	MCS0 ~ MCS15	36/40/48 52/56/64 100/116/140
Power Spectral Density	802.11a	6 Mbps	36/40/48 52/56/64 100/116/140
	802.11n	MCS0	36/40/48 52/56/64 100/116/140
Peak Excursion Measurement	802.11a	6 Mbps	40/56/116
	802.11n	MCS0	40/56/116
Frequency Stability	-	-	40/56/116
Radiated Spurious Emissions, Band edge Emissions	802.11a	6 Mbps	36/40/48 52/56/64 100/116/140
	802.11n	MCS0	36/40/48 52/56/64 100/116/140

3.1.3 Antenna information:

Frequency band	Mode	Antenna TX mode	Support MIMO
5 GHz	802.11a	☐ 1TX, ■ 2TX	■ Yes, ☐ No
	802.11n	☐ 1TX, ■ 2TX	■ Yes, ☐ No

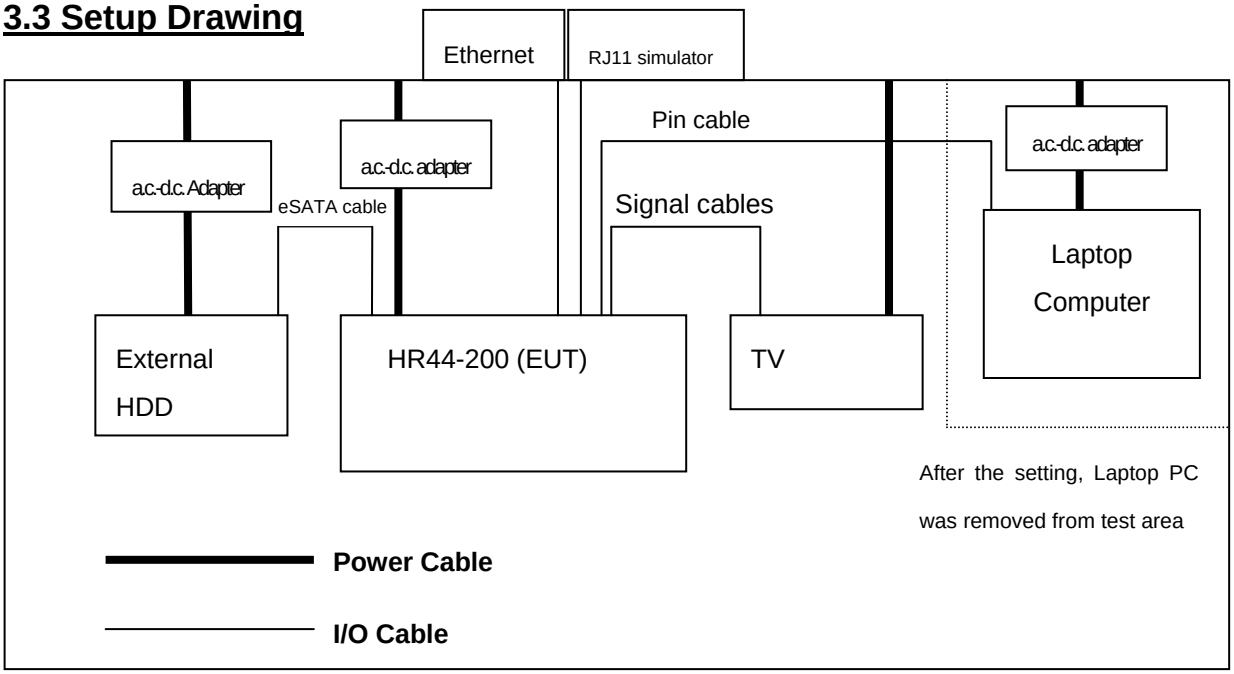
Note(s) :

The EUT support both chains transmit and receive simultaneously for 802.11a/n mode.
It does not support SISO mode.

3.2 Support Equipment

EUT	Samsung Electronics Co., Ltd. Model: HR44-200 FCC ID: A3LHR44 1.2 m Unshielded RJ-11 cable 1.5 m Unshielded Ethernet cable 1.2 m Shielded Coaxial cable 1.2 m Shielded Composite video cable	S/N: C33BB3BF300005
a.c.-d.c. Adapter	LiteOn Technology Corp. Model: EPS44R0-08	S/N: LA13A124301112
TV	Samsung Electronics Co., Ltd. Model: EL23KO 1.2 m Shielded Component video cable 1.2 m Shielded Audio cable 1.5 m Shielded HDMI cable 1.2 m Unshielded power cable	S/N: ZPXNH1KB20448V
External HDD	HGST Singapore, Pte, Ltd. Model:0G00199 1.0 m Shielded eSATA cable	S/N: YHH8JD5A
a.c.-d.c. Adapter	Asian Power Devices Inc. Model: WA-24E12FU 1.5 m Unshielded power cable	S/N: Y538311921001700900
Laptop Computer	Samsung Electronics Co., Ltd. Model : NT-R55 1.0 m unshielded pin connector cable	FCC DOC S/N : 408L93AP400115W
a.c.-d.c. 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 Set-top box FCC ID: A3LHR44**.

Specifications:

Category	Set-top box
Model Name	HR44-200
Brand Name	SAMSUNG
Frequency of Operation	For Band I 802.11a,n: 5180 MHz ~ 5240 MHz For Band II 802.11a,n: 5260 MHz ~ 5320 MHz For Band III 802.11a,n: 5500 MHz ~ 5700 MHz
Power Output (Conducted)	For Band I 802.11a : 13.65 dBm 802.11n : 13.64 dBm For Band II 802.11a : 19.73 dBm 802.11n : 18.51 dBm For Band III 802.11a : 18.53 dBm 802.11n : 17.52 dBm
Channels	For Band I 802.11a, n : 4 CH For Band II 802.11a, n : 4 CH For Band III 802.11a, n : 11 CH
Antenna Gain (peak)	For Band I and II Ant 0 : 3.79 dBi, Ant1 : 3.79 dBi For Band III Ant 0 : 4.42 dBi, Ant1 : 3.50 dBi
Antenna setup	802.11a/n : 2TX / 2RX
Modulations	OFDM(BPSK,QPSK,16QAM,64QAM) for 802.11a,g,n
Temperature Range	-20 ℃ ~ +60 ℃
Voltage	120 Vac

Dimensions (W x D x H)	333 mm x 246 mm x 46 mm
Weight	2 kg
Remarks	-

IEEE 802.11n specification :

MCS Index	Spatial Streams	Modulation Type	Coding Rate	Data Rate Mb/s	
				20 MHz	
				800ns GI	400ns GI
0	1	BPSK	1/2	6.5	7.2
1	1	QPSK	1/2	13.0	14.4
2	1	QPSK	3/4	19.5	21.7
3	1	16-QAM	1/2	26.0	28.9
4	1	16-QAM	3/4	39.0	43.3
5	1	64-QAM	2/3	52.0	57.8
6	1	64-QAM	3/4	58.5	65.0
7	1	64-QAM	5/6	65.0	72.2
8	2	BPSK	1/2	13.0	14.4
9	2	QPSK	1/2	26.0	28.9
10	2	QPSK	3/4	39.0	43.3
11	2	16-QAM	1/2	52.0	57.8
12	2	16-QAM	3/4	78.0	86.7
13	2	64-QAM	2/3	104.0	115.6
14	2	64-QAM	3/4	117.0	130.0
15	2	64-QAM	5/6	130.0	144.4

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	15.407(a)	Complies	
Maximum Conducted Output Power	15.407(a)	Complies	
Power Spectral Density	15.407(a)	Complies	
Peak Excursion Measurement	15.407(a)	Complies	
Radiated Spurious Emission	15.407(b)	Complies	
Frequency Stability	15.407(g)	Complies	
Maximum Permissible Exposure	1.1307(b)	Complies	

5. RECOMMENDATION/CONCLUSION

The data collected shows that the **Samsung Set-top box FCC ID: A3LHR44** is in compliance with Part 15.407 of the FCC Rule of the IC Specification.

6. ANTENNA REQUIREMENTS

§15.203 of the FCC Rules part 15 Subpart C

: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

The antenna of the **Samsung Set-top box FCC ID: A3LHR44** is **permanently attached** and there are no provisions for connection to an external antenna. It complies with the requirement of §15.203.

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.

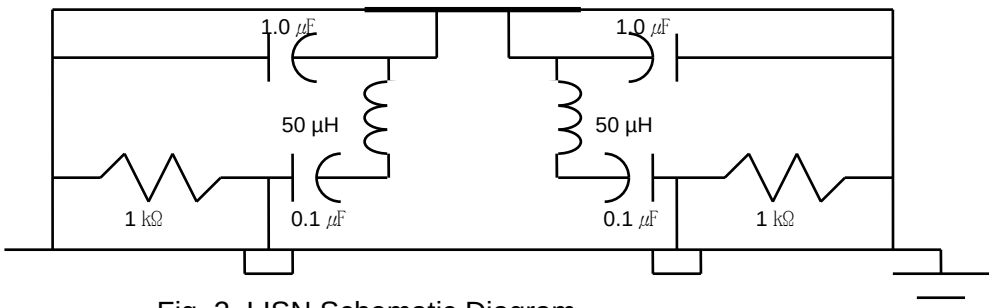


Fig. 2. LISN Schematic Diagram

7.2 Radiated Emissions

The measurement was performed at the test site that is specified in accordance with ANSI C63.4-2003 and ANCI C63.10-2009.

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 9168). 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.

The test equipment was placed on turntable with 0.8 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 D01 General UNII Test Procedures v01r03”in section H)5) and H)6). Peak emission levels was measured by setting the analyzer RBW = 1 MHz, VBW ≥ 3 MHz, Detector = Peak, Sweep time = auto, Trace mode = max hold. Average emission levels was measured using the “Method VB” by setting the analyzer RBW = 1 MHz, VBW = 10 kHz (VBW ≤ RBW/100), Detector = Peak if, 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.

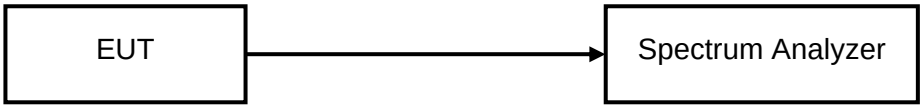
Unwanted emissions outside of the restricted bands

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 D01 General UNII Test Procedures v01r03”in section H)5). Peak emission levels was measured by setting the analyzer RBW = 1 MHz, VBW = 3 MHz, Detector = Peak, Sweep time = auto, Trace mode = max hold.

7.3 26 dB Bandwidth and 99% Occupied bandwidth

Test Setup



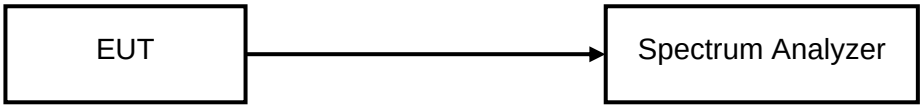
Test Procedure

1) 26 dB bandwidth
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 > RBW
Detector = Peak
Trace mode = max hold
The bandwidth measurement function on the spectrum analyzer is used to measure the 26 dB bandwidth and 99% occupied bandwidth.

2) 99 % Bandwidth
EUTs 99 % 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.
Span = 1.5 times to 5.0 times the OBW
RBW = 1 % to 5 % of the OBW
VBW > 3 x RBW
Detector = Peak
Trace mode = max hold
The bandwidth measurement function on the spectrum analyzer is used to measure 99% occupied bandwidth.

7.4 Maximum Conducted Output Power

Test Setup

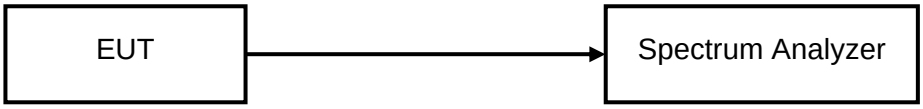


Test Procedure

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.
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.

7.5 Peak Power Spectral Density

Test Setup



Test Procedure

EUTs Peak Power Spectral Density 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 = 1 MHz

VBW ≥ 3 MHz

Number of points in sweep ≥ 2 Span / RBW

Sweep time = auto

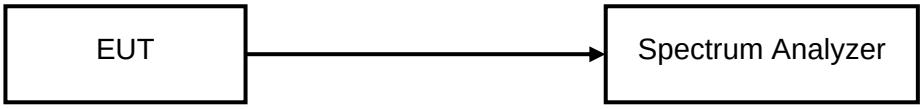
Detector = RMS

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.

7.6 Peak Excursion Measurement

Test Setup



Test Procedure

EUTs Peak Excursion is 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.

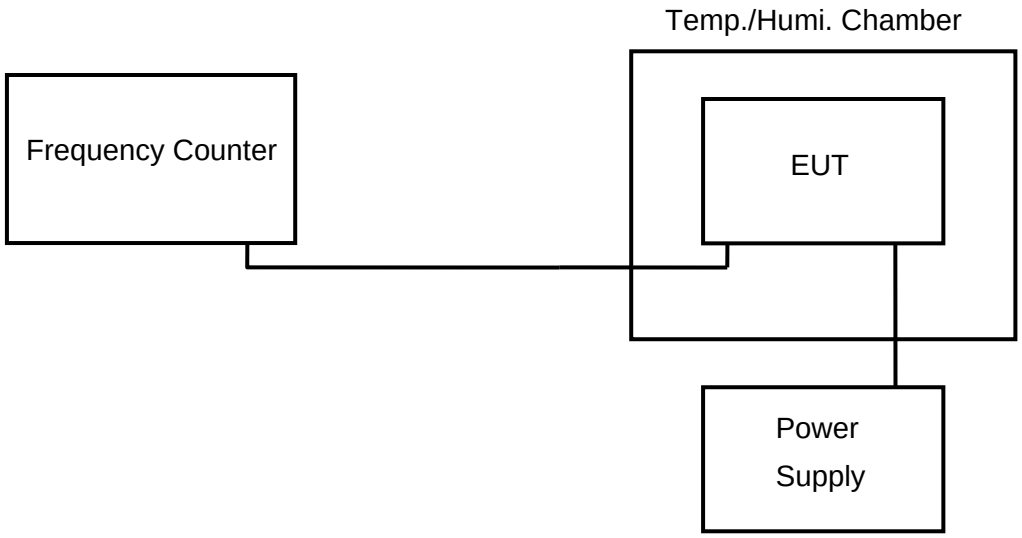
Trace 1)
RBW = 1 MHz
VBW ≥ 3 MHz
Detector = peak
Trace mode = max-hold
The sweeps is set to continue until the trace stabilizes.
The peak search function on the spectrum analyzer is used to find the peak of the spectrum.

Trace 2)
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 ratio of the maximum of the peak max hold spectrum to the PPSD is computed.

7.7 Frequency Stability

Test Set-up:

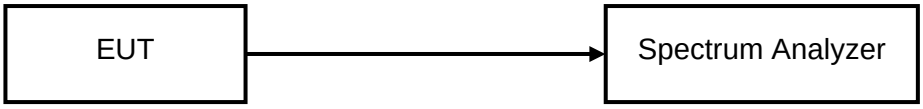


Test Procedure

EUTs Frequency Stability is measured at center channel with a Frequency Counter connected to the antenna terminal while the EUTs operating at its non-modulated signal.
fc is declaring of channel frequency. Then the frequency error formula is (fc - f) / fc x 10^6 ppm.
The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value. Extreme temperature rule is - 20 ℃ ~ 60 ℃.

7.8 Duty Cycle

Test Setup



Test Procedure

EUTs duty cycle are measured at middle 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 = 10 ms
Trace mode = view
The marker function on the spectrum analyzer is used to determine the duty cycle.

According to the KDB 789033 v01r03, the zero-span measurement method shall be used while RBW and VBW are > 50/*T*. Since *T* is fully larger than 50 microseconds, the zero-span measurement method was used.

Following the result of the duty cycle measurement according to the above test procedure, the duty cycles of 802.11a/n mode were 100 %.

8. TEST DATA

8.1 Conducted Emissions

FCC §15.207

Frequency (MHz)	* Level(dBμV)		** Line	Limit(dBμV)		Margin(dB)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.15	50.1	39.0	N	66.0	56.0	15.9	17.0
0.18	44.2	31.6	L	64.5	54.5	20.3	22.9
0.26	42.2	34.2	L	61.4	51.4	19.2	17.2
0.32	45.2	40.5	L	59.7	49.7	14.5	9.2
0.36	38.2	32.1	N	58.7	48.7	20.5	16.6
0.50	33.3	28.1	N	56.0	46.0	22.7	17.9

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. * Correction factor was included to test level (dBuV)*

*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-083) 19 Apr 2013 21:43

Conducted Emissions

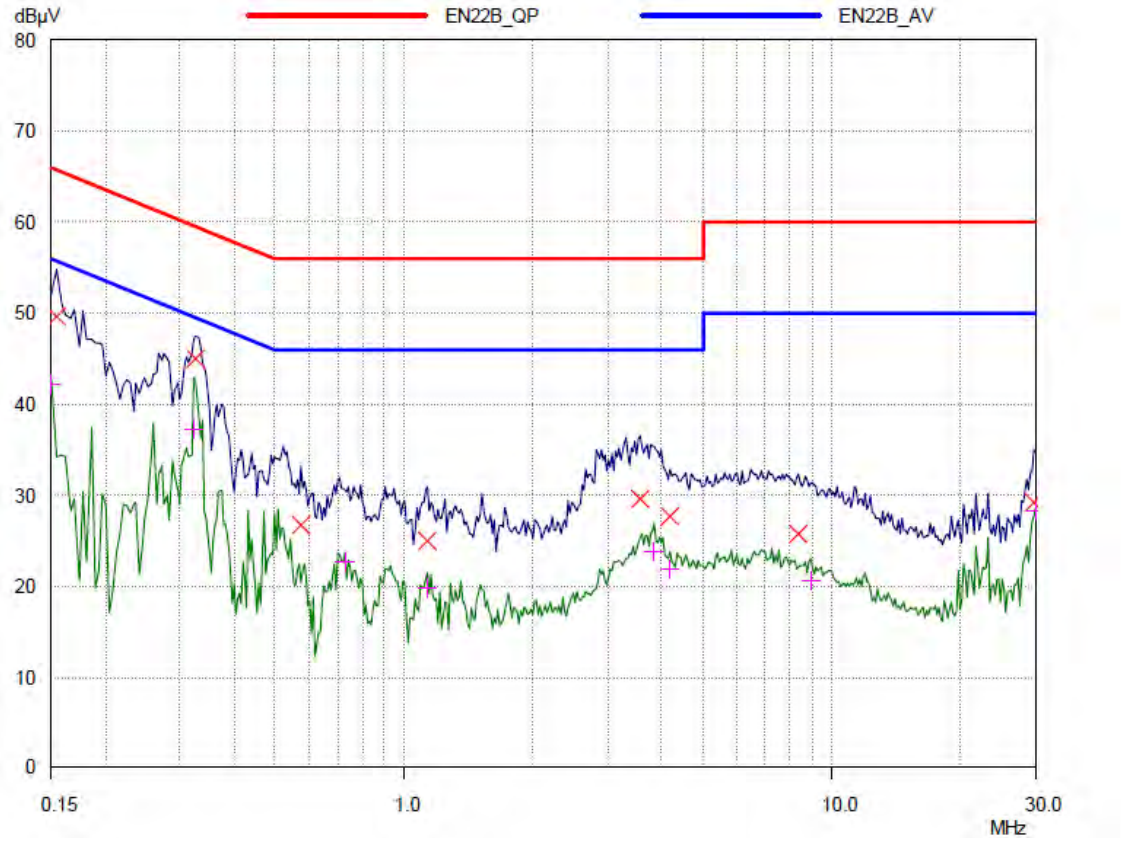
EUT:	Set-top box
Manuf:	Samsung Electronics
Op Cond:	a.c. 120 V, 60 Hz (802.11n HT20 ch56, MIMO)
Operator:	Jinha. KO
Test Spec:	FCC Part 15.207
Comment:	MODEL : HR44-200
	LINE : L1

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-083) 19 Apr 2013 21:52

Conducted Emissions

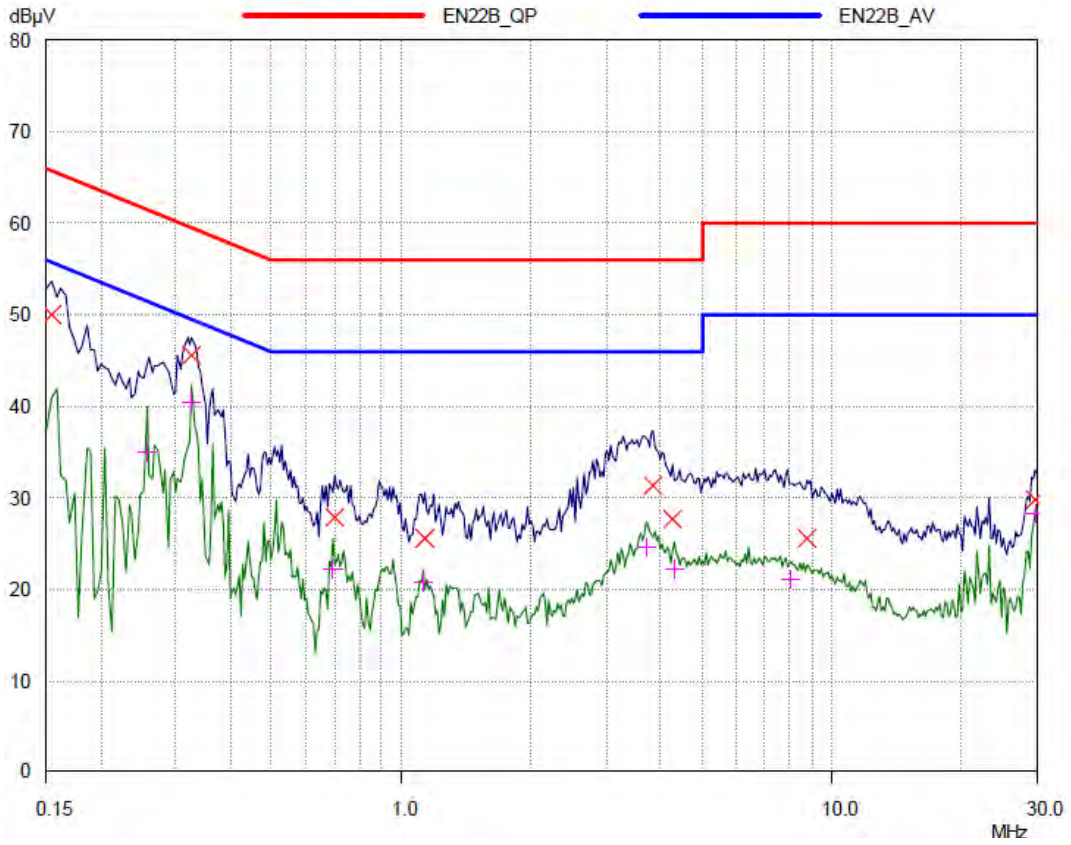
EUT:	Set-top box
Manuf:	Samsung Electronics
Op Cond:	a.c. 120 V, 60 Hz (802.11n HT20 ch56, MIMO)
Operator:	Jinha. KO
Test Spec:	FCC Part 15.207
Comment:	MODEL : HR44-200
	LINE : Neutral

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)
122.22	49.11	V	102	320	-19.9	29.2	43.5	14.3
214.90	58.71	H	160	73	-19.1	39.6	43.5	3.9
324.00	43.00	H	145	65	-13.6	29.4	46.0	16.6
399.93	48.00	H	101	352	-13.6	34.4	46.0	11.6
833.00	41.47	V	101	40	-3.4	38.1	46.0	7.9
899.78	43.17	V	100	313	-3.4	39.8	46.0	6.2

Radiated Measurements at 3meters

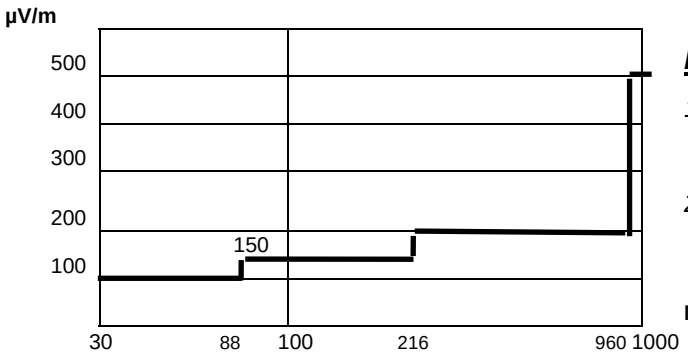


Fig. 3. Limits at 3 meters

Note(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 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 – Band I

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	22.60	22.35	16.78	16.73
Middle	5200	22.47	22.51	16.78	16.73
High	5240	22.70	22.99	16.81	16.72

802.11n mode

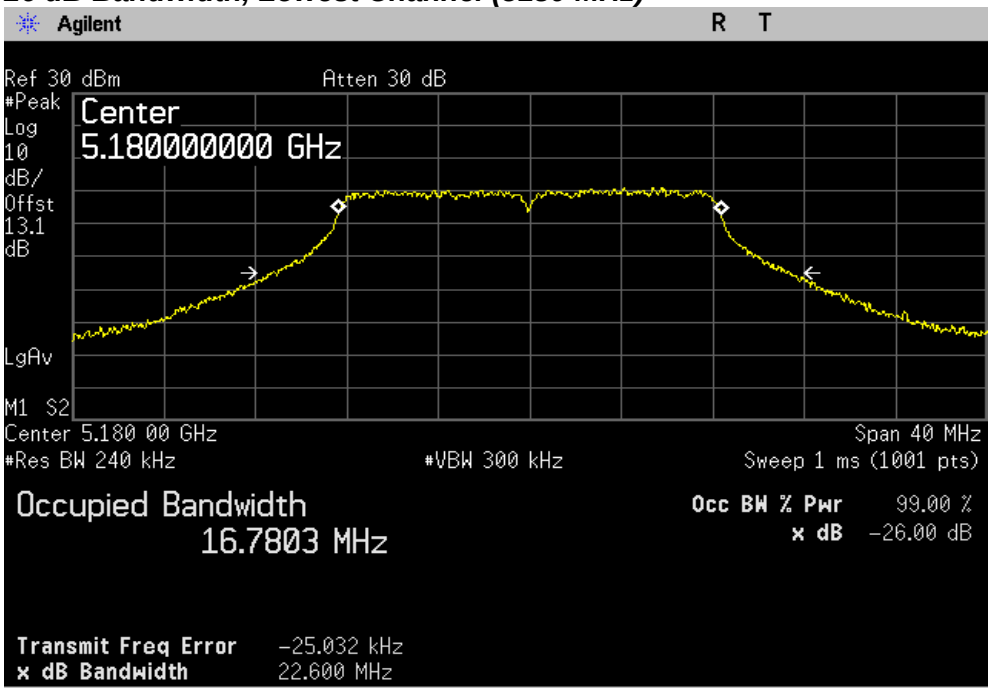
Channel	Frequency (MHz)	26 dB Bandiwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Low	5180	23.92	22.63	17.87	17.83
Middle	5200	23.61	22.68	17.85	17.81
High	5240	23.80	22.69	17.89	17.82

PLOTS OF EMISSIONS

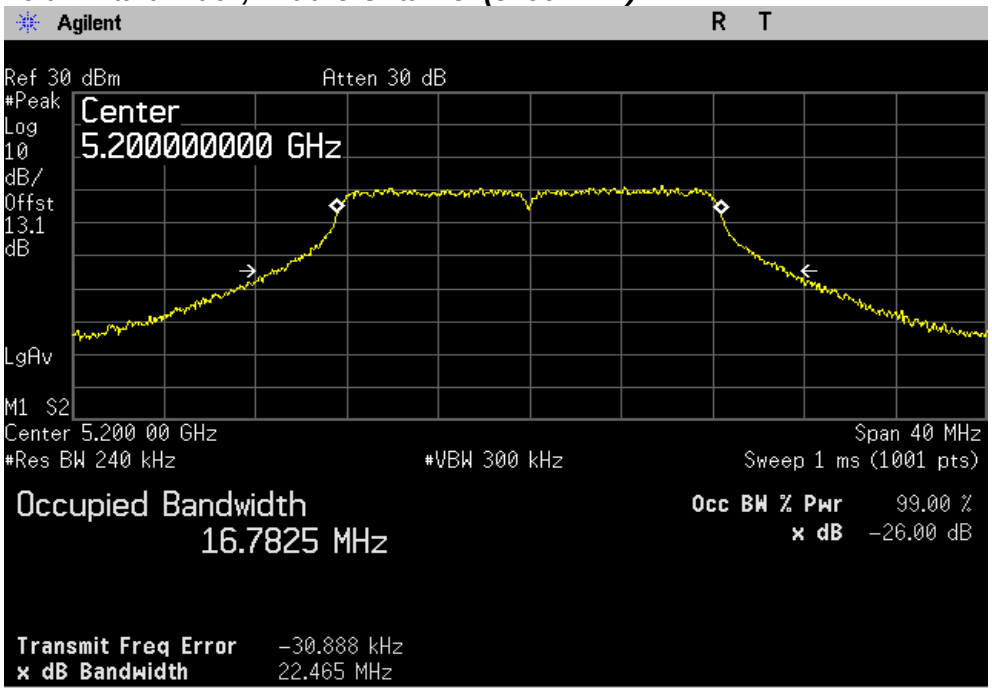
802.11a mode

Chain 0

26 dB Bandwidth, Lowest Channel (5180 MHz)

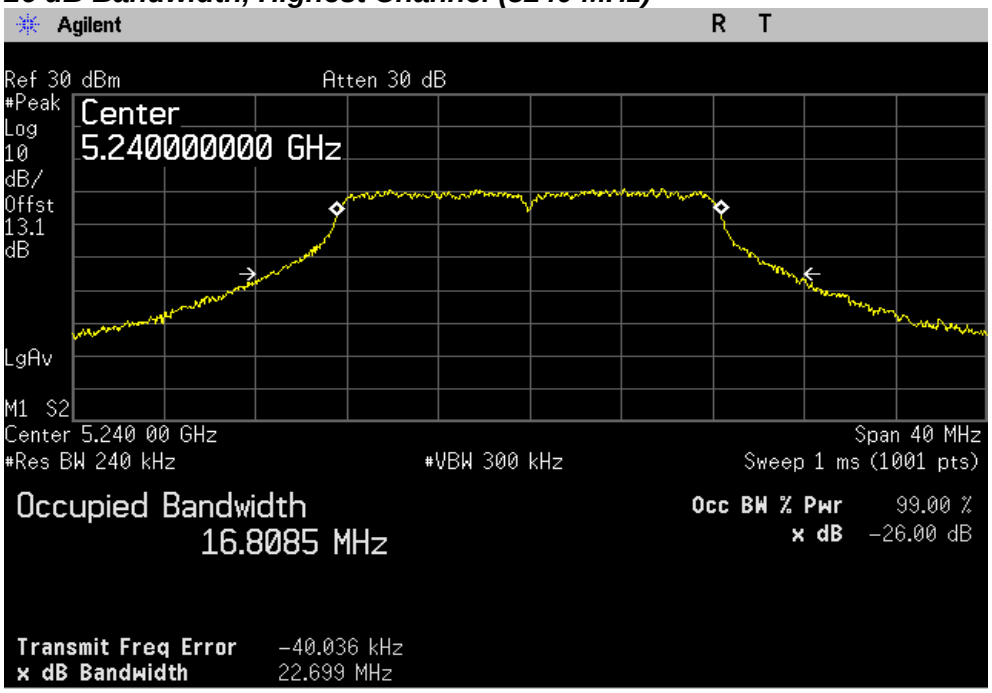


26 dB Bandwidth, Middle Channel (5200 MHz)



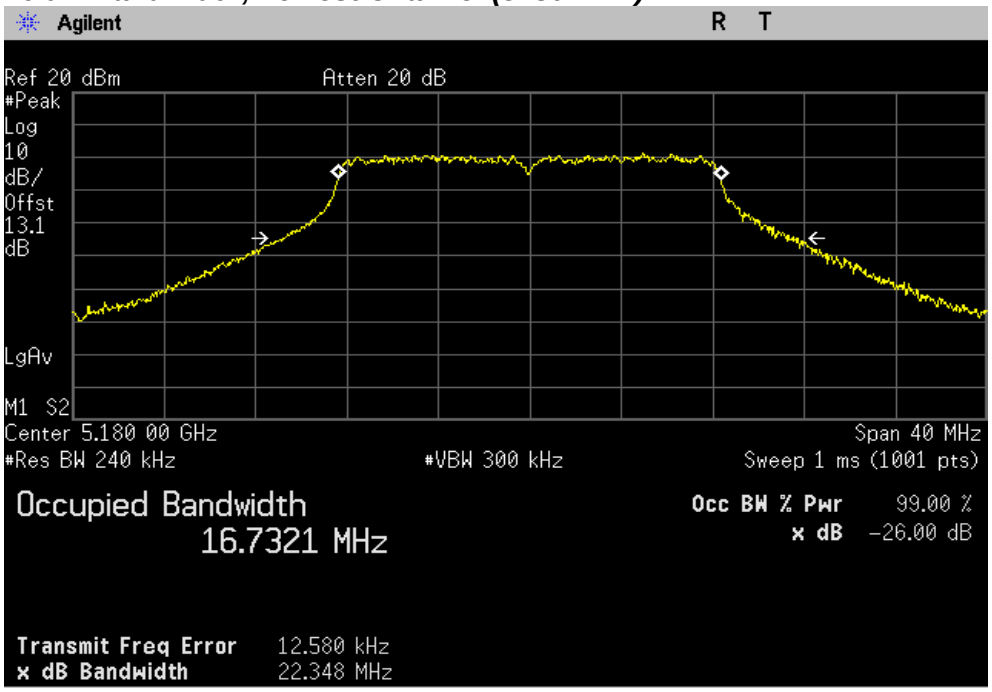
PLOTS OF EMISSIONS

26 dB Bandwidth, Highest Channel (5240 MHz)



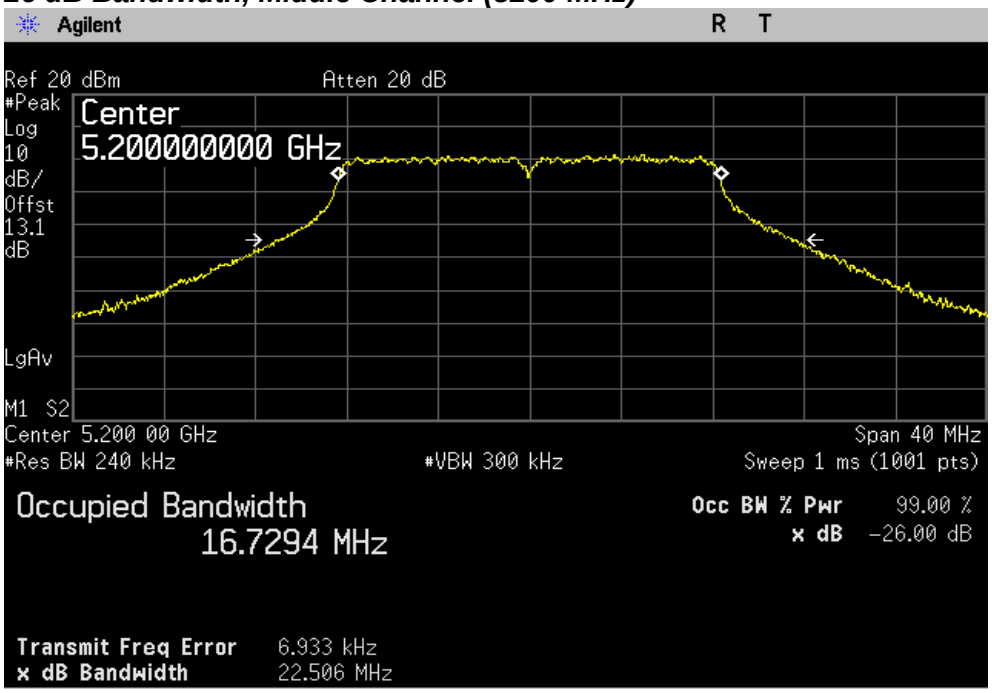
<u>Chain 1</u>

26 dB Bandwidth, Lowest Channel (5180 MHz)

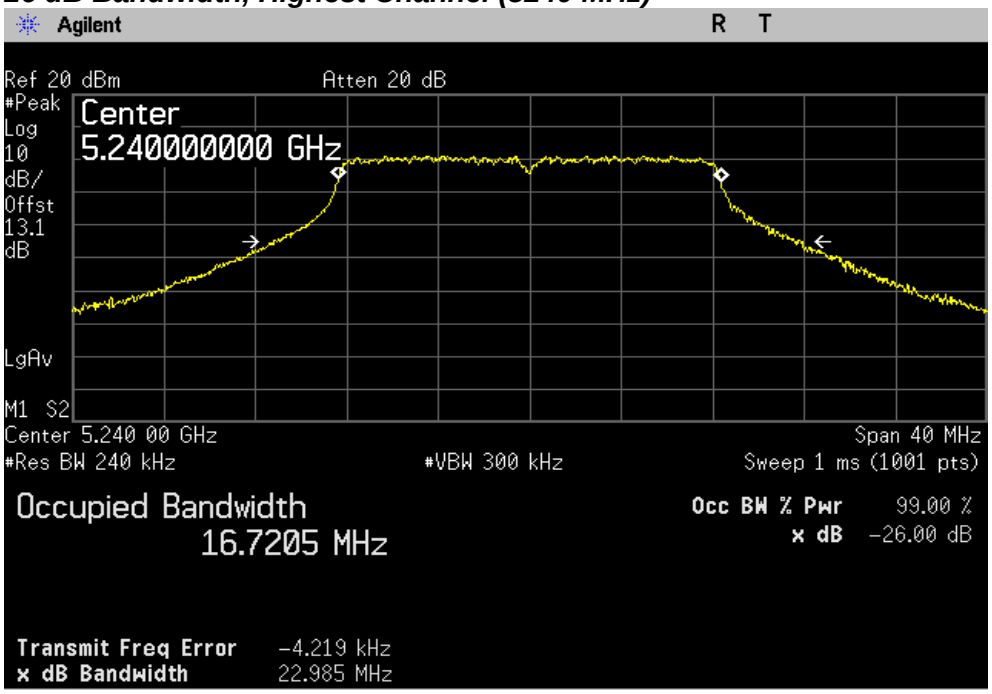


PLOTS OF EMISSIONS

26 dB Bandwidth, Middle Channel (5200 MHz)



26 dB Bandwidth, Highest Channel (5240 MHz)

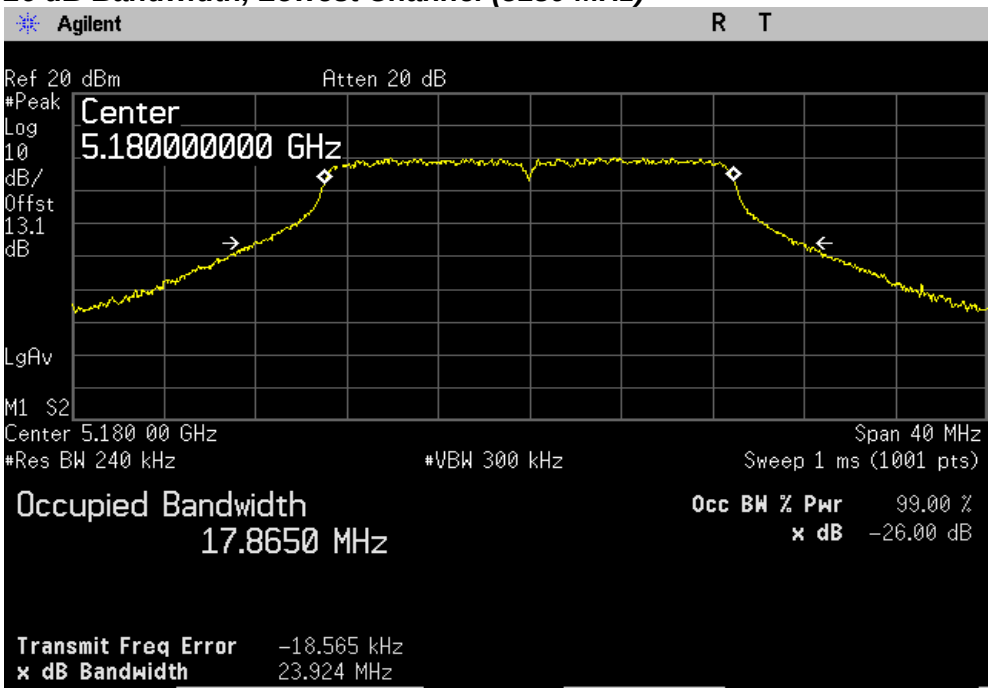


PLOTS OF EMISSIONS

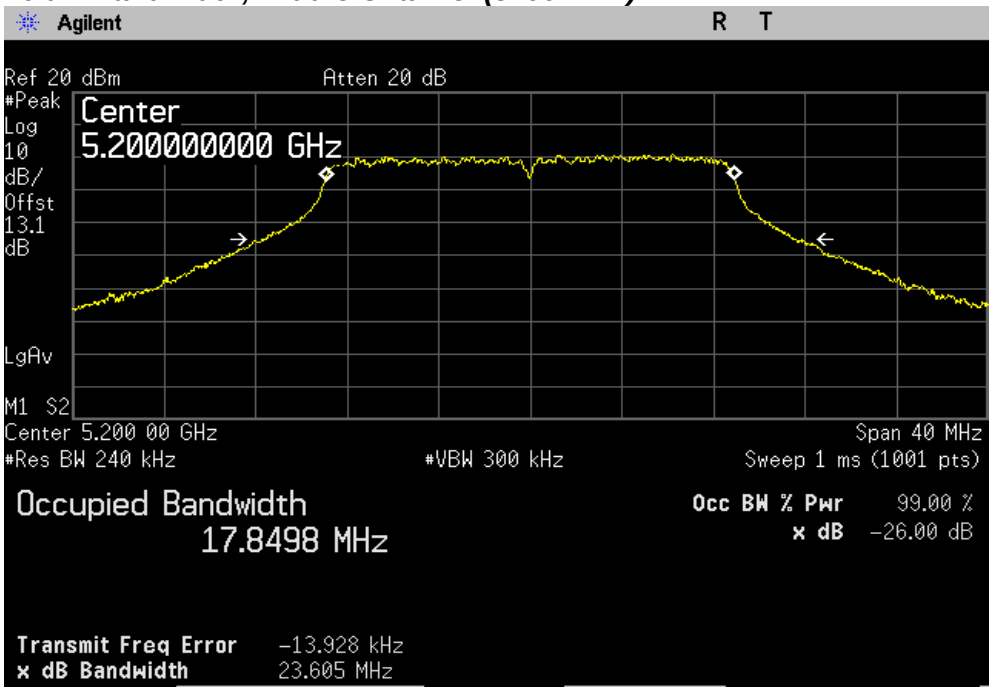
802.11n mode

Chain 0

26 dB Bandwidth, Lowest Channel (5180 MHz)

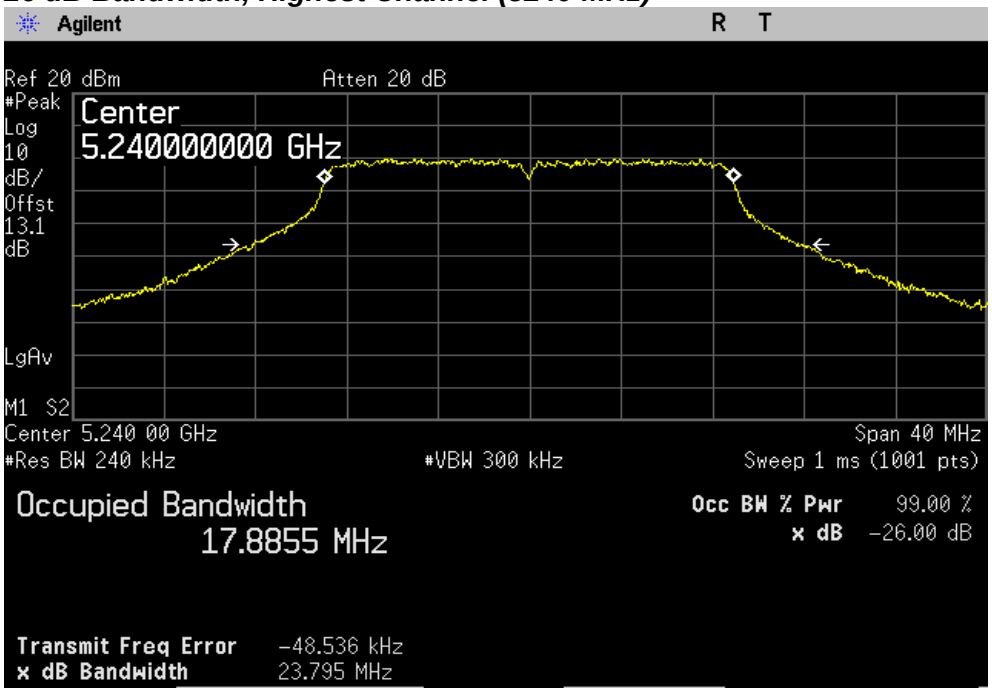


26 dB Bandwidth, Middle Channel (5200 MHz)



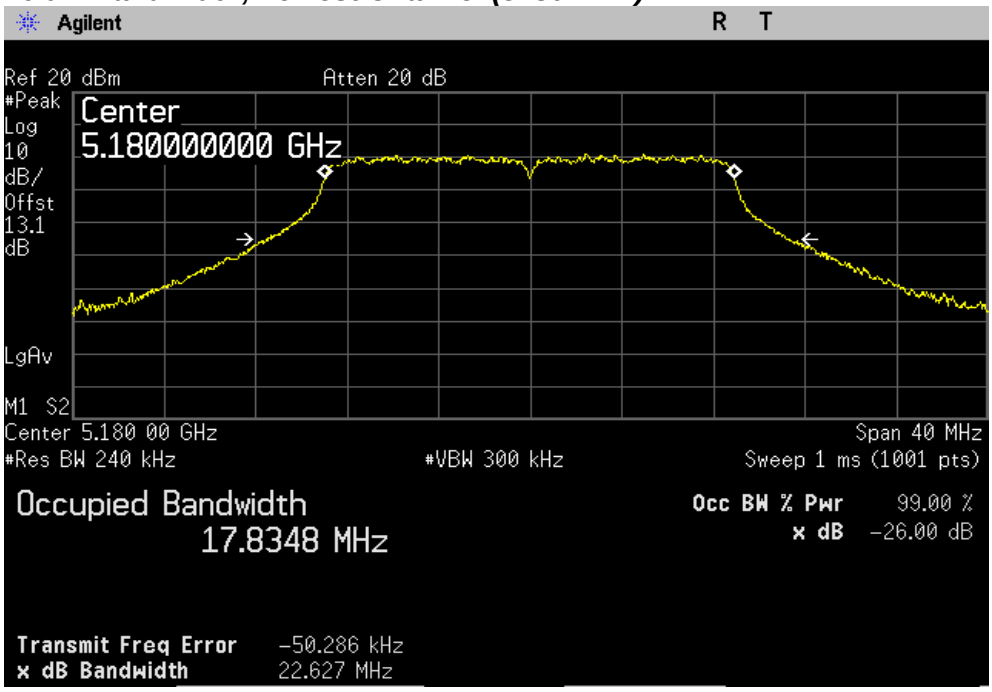
PLOTS OF EMISSIONS

26 dB Bandwidth, Highest Channel (5240 MHz)



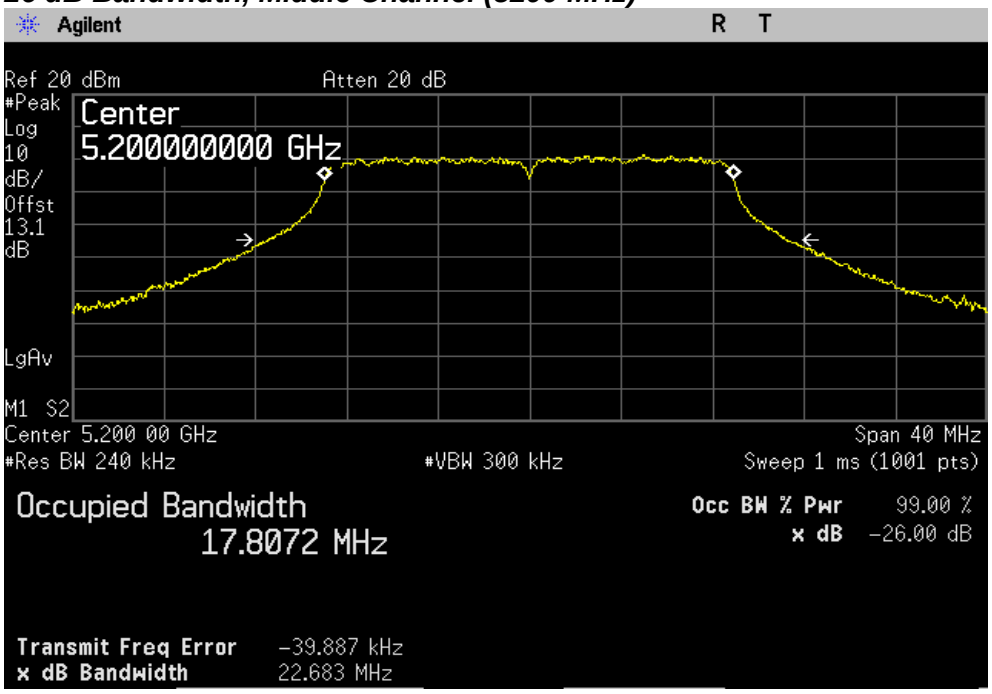
Chain 1

26 dB Bandwidth, Lowest Channel (5180 MHz)

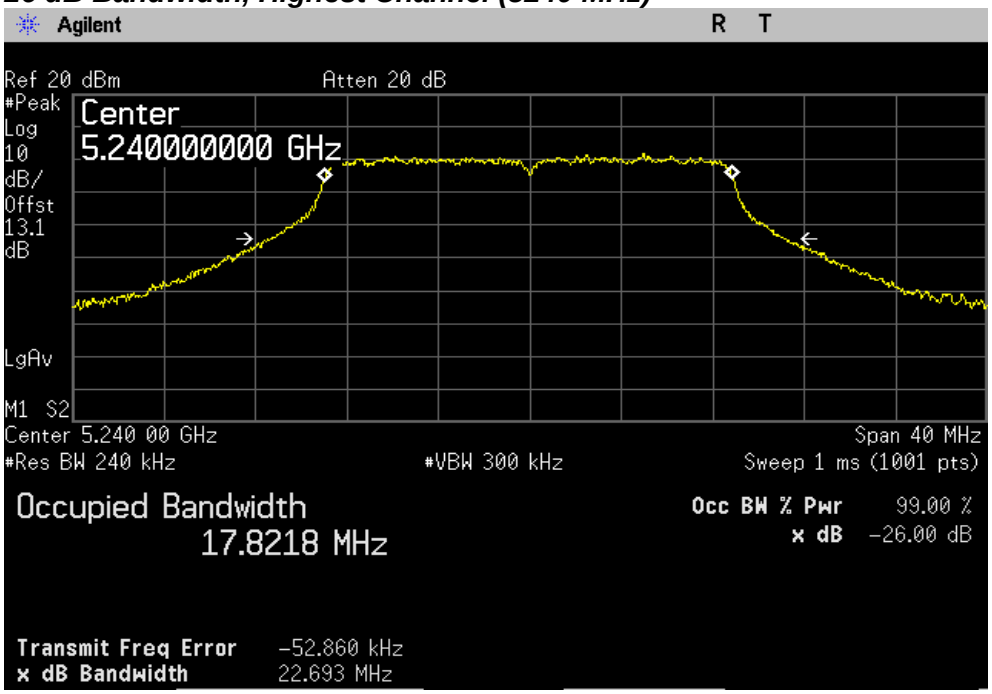


PLOTS OF EMISSIONS

26 dB Bandwidth, Middle Channel (5200 MHz)



26 dB Bandwidth, Highest Channel (5240 MHz)



8.3.2 26 dB Bandwidth and 99 % Occupied bandwidth – Band II

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	22.55	23.00	16.83	16.76
Middle	5280	22.09	22.99	16.79	16.76
High	5320	22.35	22.78	16.79	16.75

802.11n mode

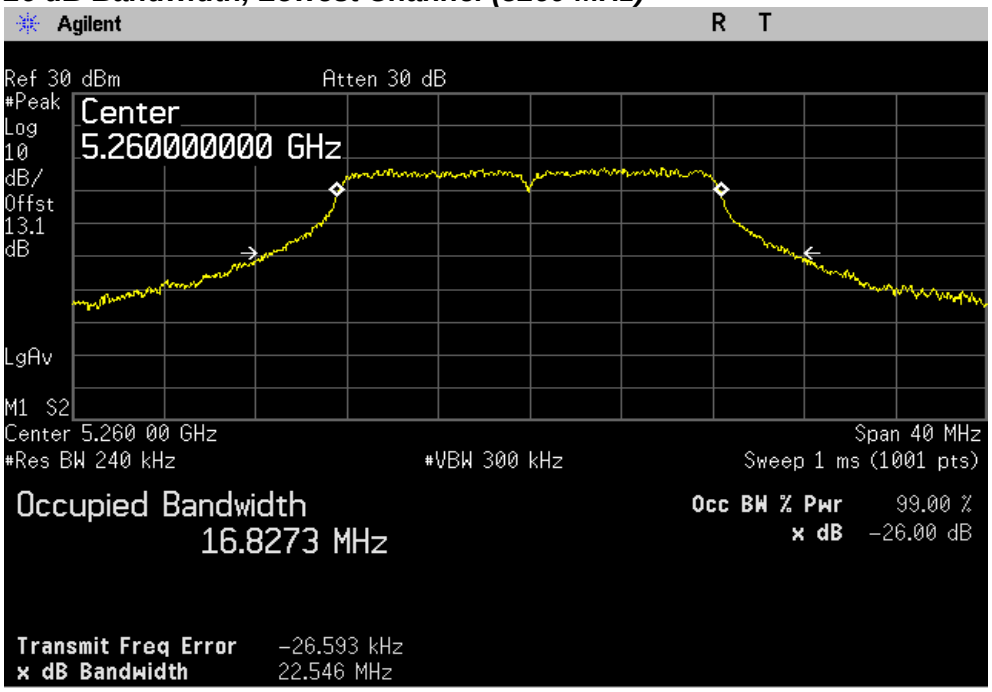
Channel	Frequency (MHz)	26 dB Bandiwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Low	5260	23.72	22.97	17.89	17.85
Middle	5280	23.50	22.67	17.86	17.84
High	5320	23.76	22.72	17.87	17.85

PLOTS OF EMISSIONS

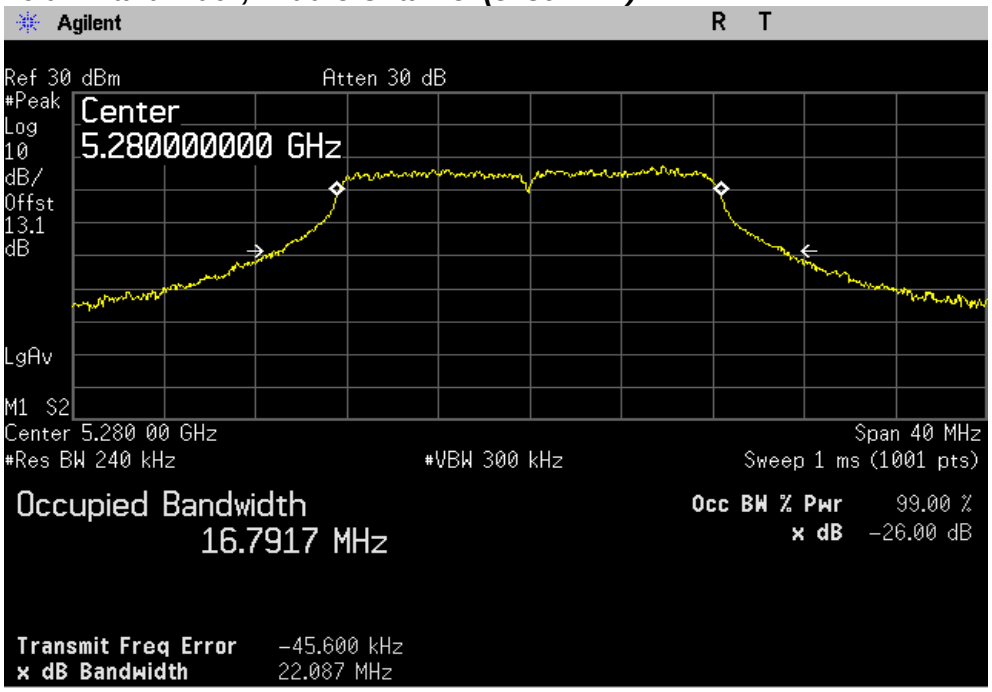
802.11a mode

Chain 0

26 dB Bandwidth, Lowest Channel (5260 MHz)

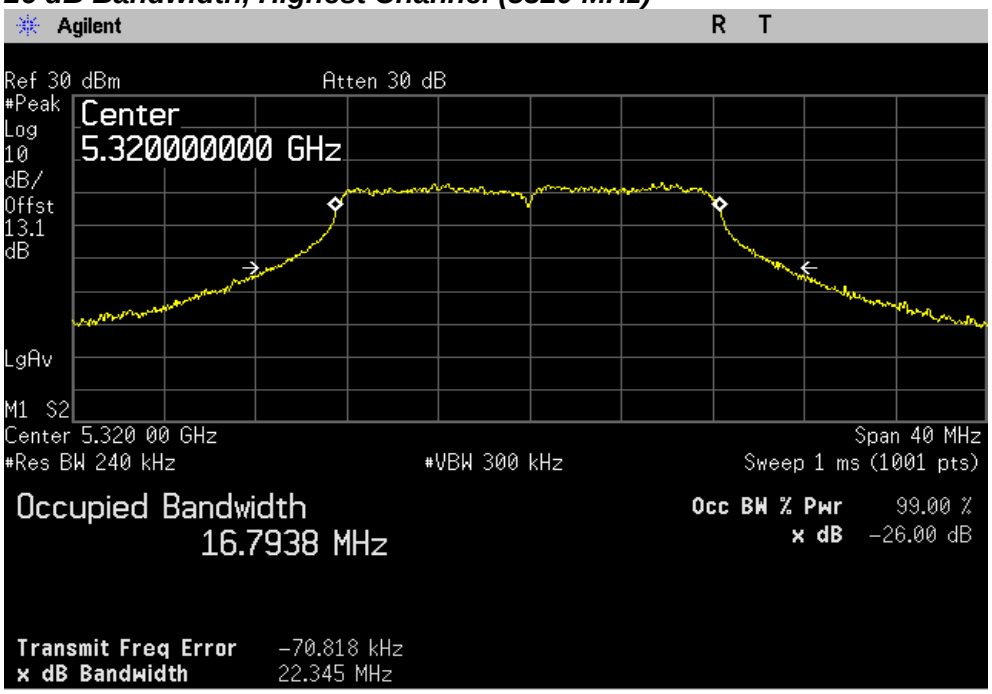


26 dB Bandwidth, Middle Channel (5280 MHz)



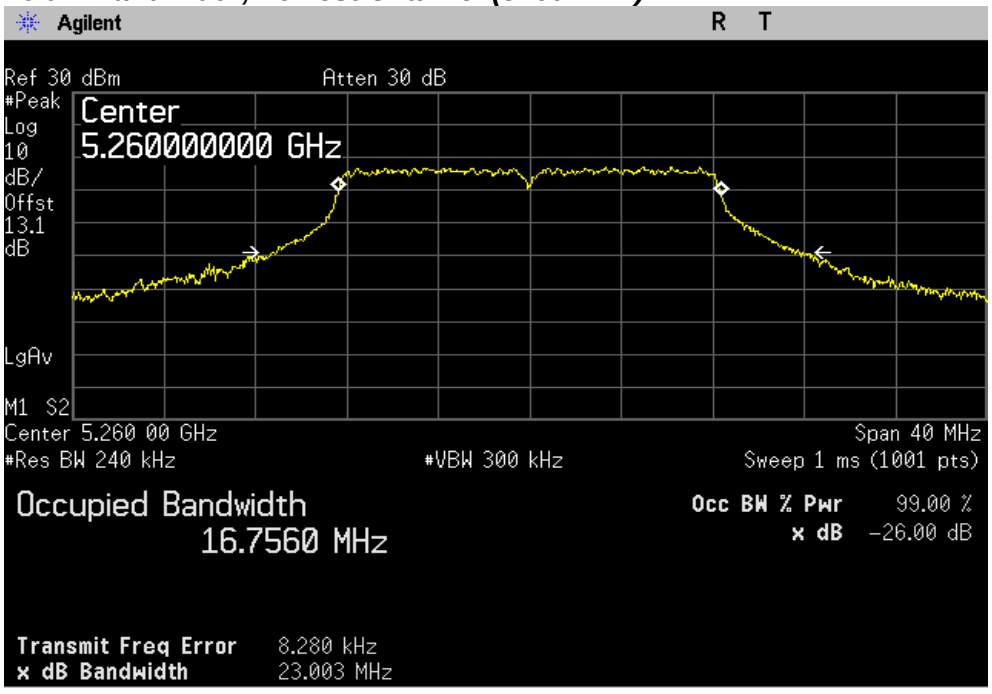
PLOTS OF EMISSIONS

26 dB Bandwidth, Highest Channel (5320 MHz)



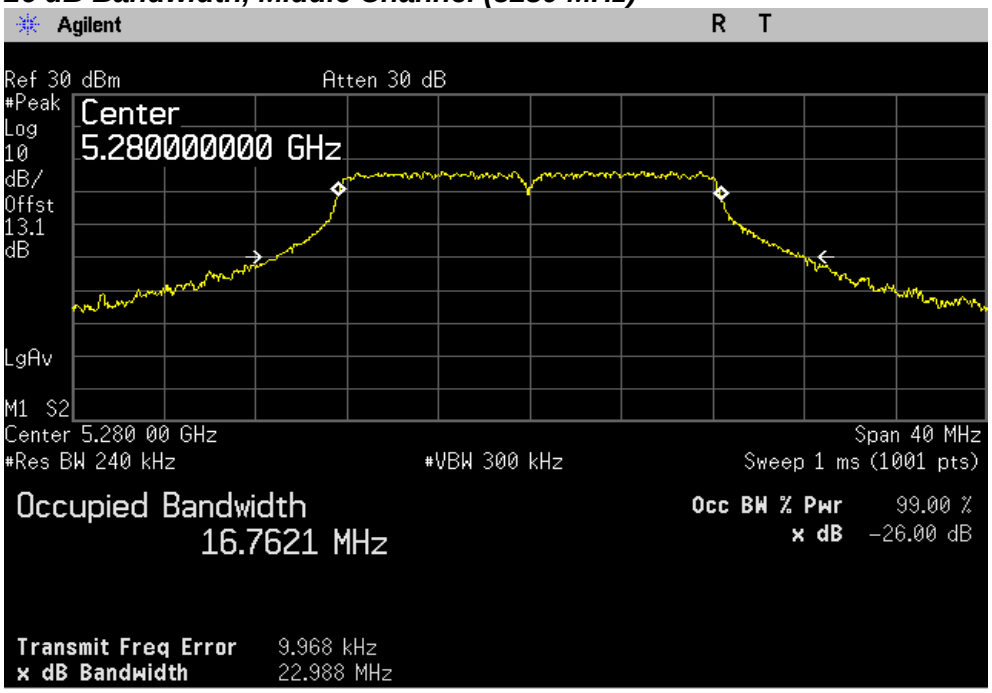
Chain 1

26 dB Bandwidth, Lowest Channel (5260 MHz)

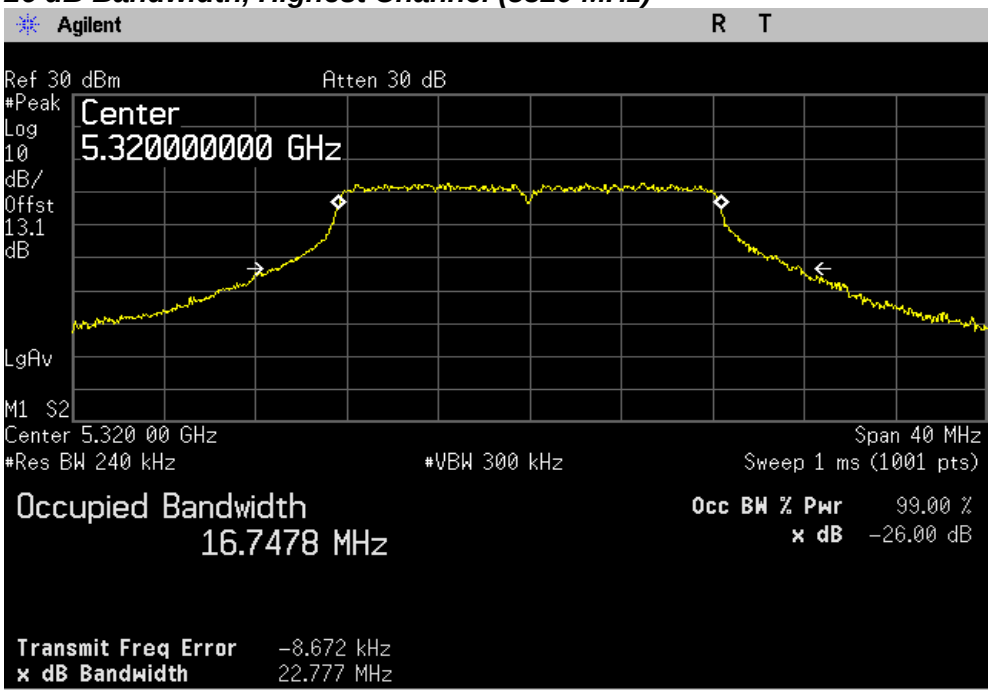


PLOTS OF EMISSIONS

26 dB Bandwidth, Middle Channel (5280 MHz)



26 dB Bandwidth, Highest Channel (5320 MHz)

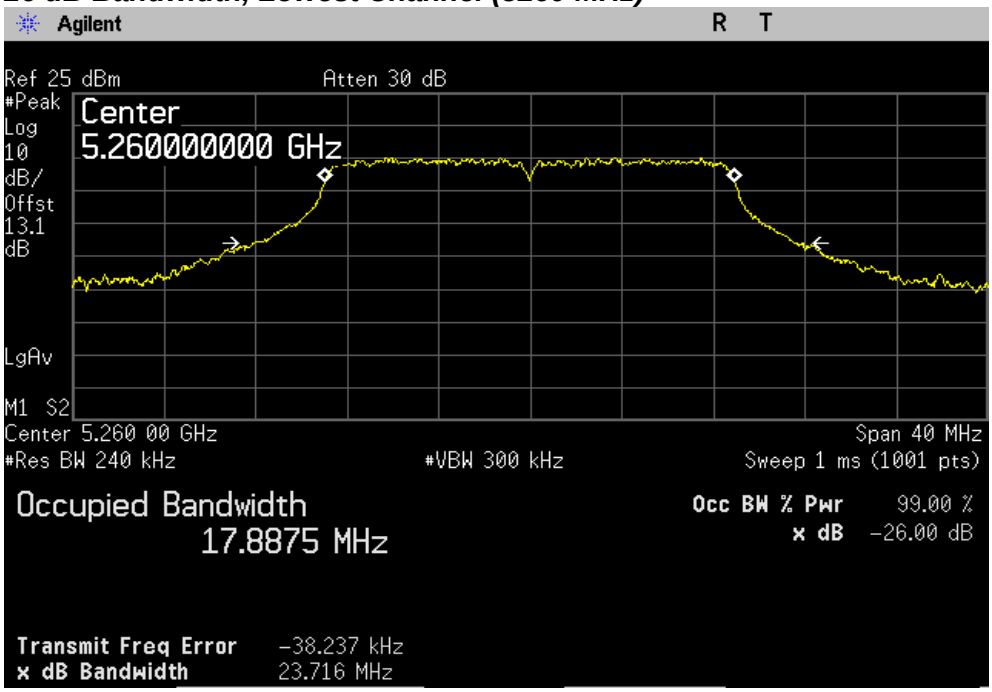


PLOTS OF EMISSIONS

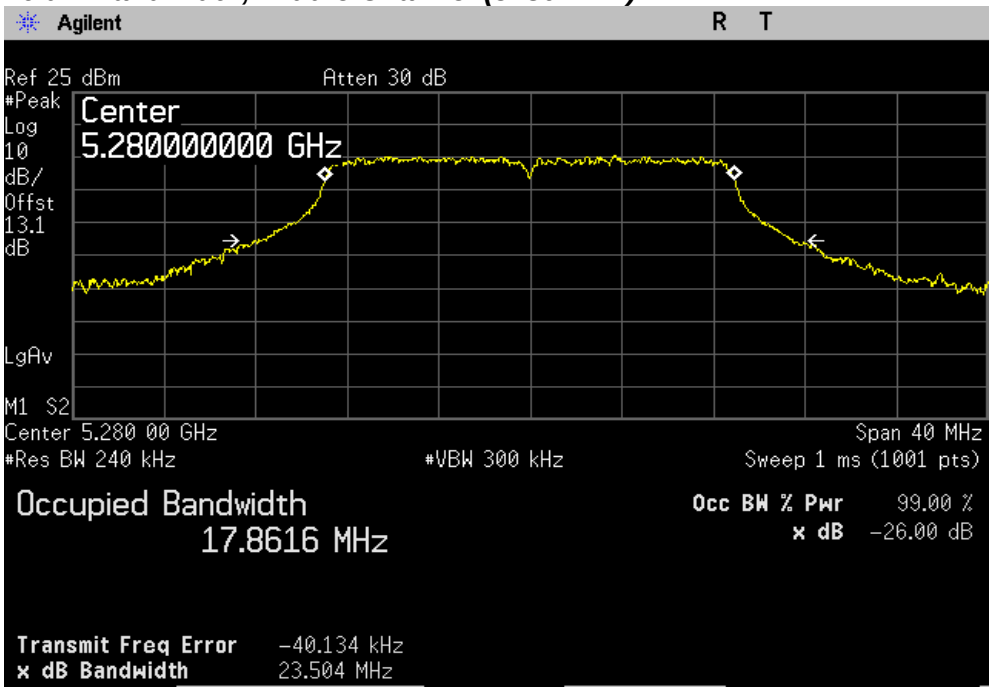
802.11n mode

Chain 0

26 dB Bandwidth, Lowest Channel (5260 MHz)

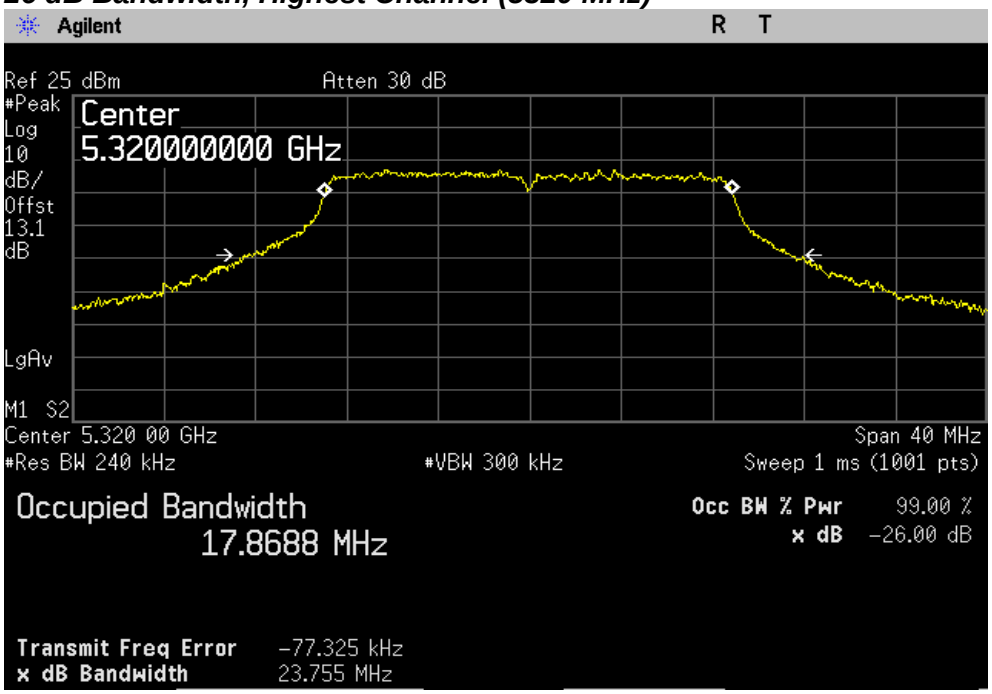


26 dB Bandwidth, Middle Channel (5280 MHz)



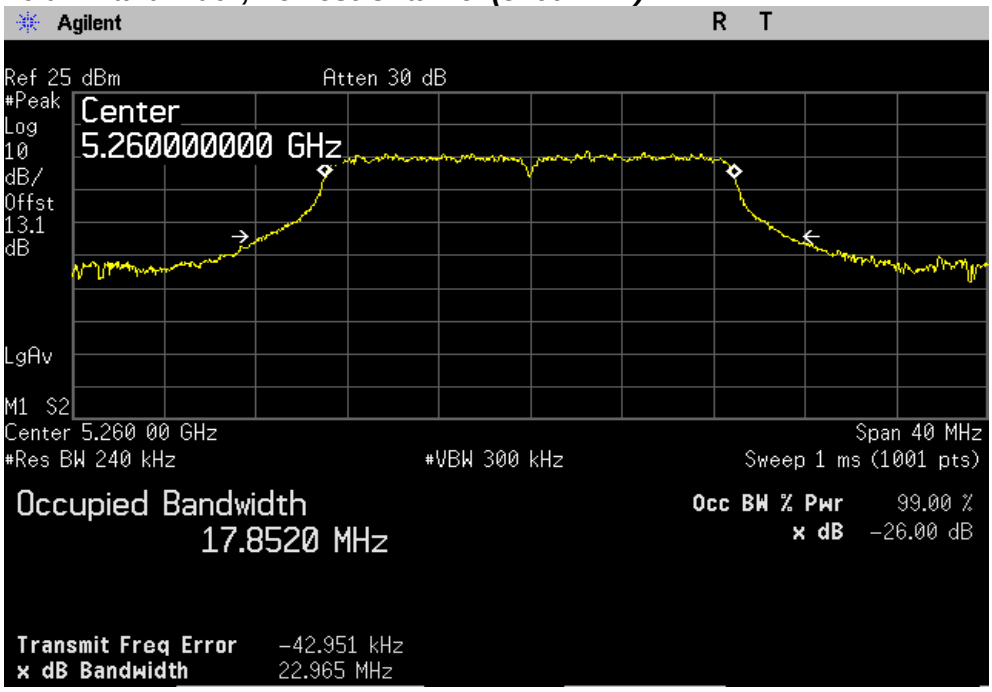
PLOTS OF EMISSIONS

26 dB Bandwidth, Highest Channel (5320 MHz)



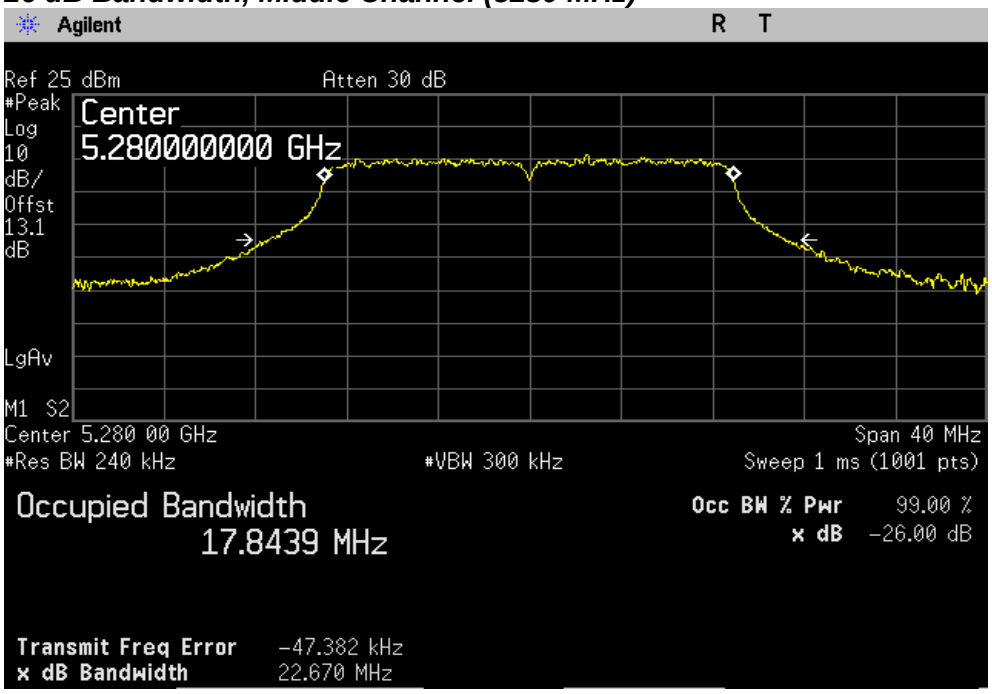
Chain 1

26 dB Bandwidth, Lowest Channel (5260 MHz)

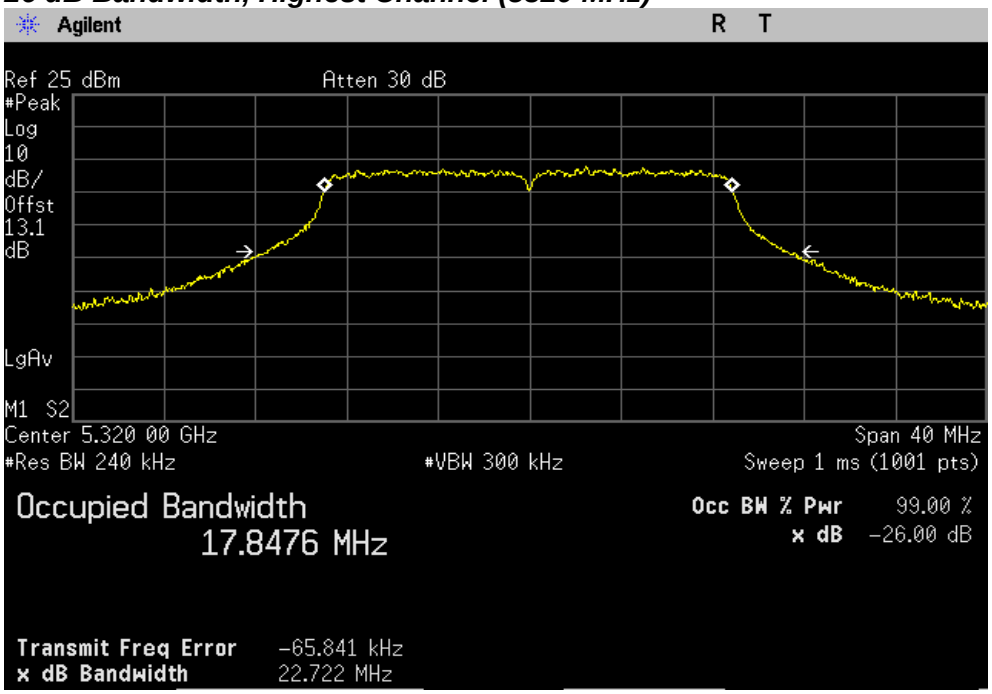


PLOTS OF EMISSIONS

26 dB Bandwidth, Middle Channel (5280 MHz)



26 dB Bandwidth, Highest Channel (5320 MHz)



8.3.3 26 dB Bandwidth and 99 % Occupied bandwidth – Band III

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	22.68	22.79	16.82	16.71
Middle	5580	22.80	22.64	16.86	16.69
High	5700	22.25	22.56	16.72	16.71

802.11n mode

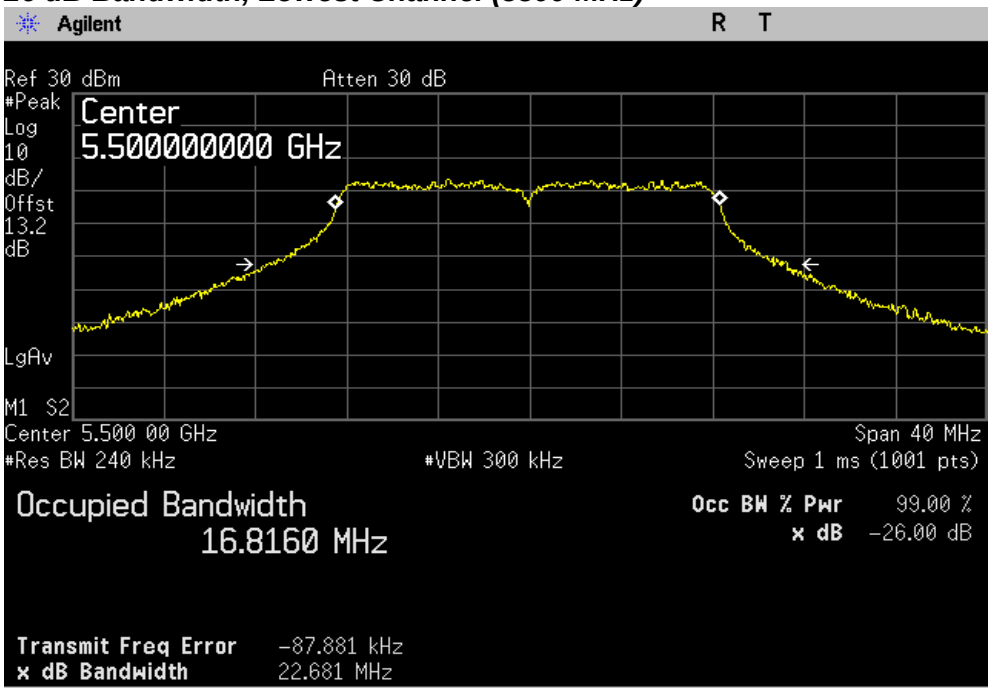
Channel	Frequency (MHz)	26 dB Bandiwidth (MHz)		99% Occupied Bandwidth (MHz)	
		Chain 0	Chain 1	Chain 0	Chain 1
Low	5500	23.68	22.79	17.91	17.84
Middle	5580	23.19	22.70	17.77	17.81
High	5700	22.91	22.81	17.74	17.83

PLOTS OF EMISSIONS

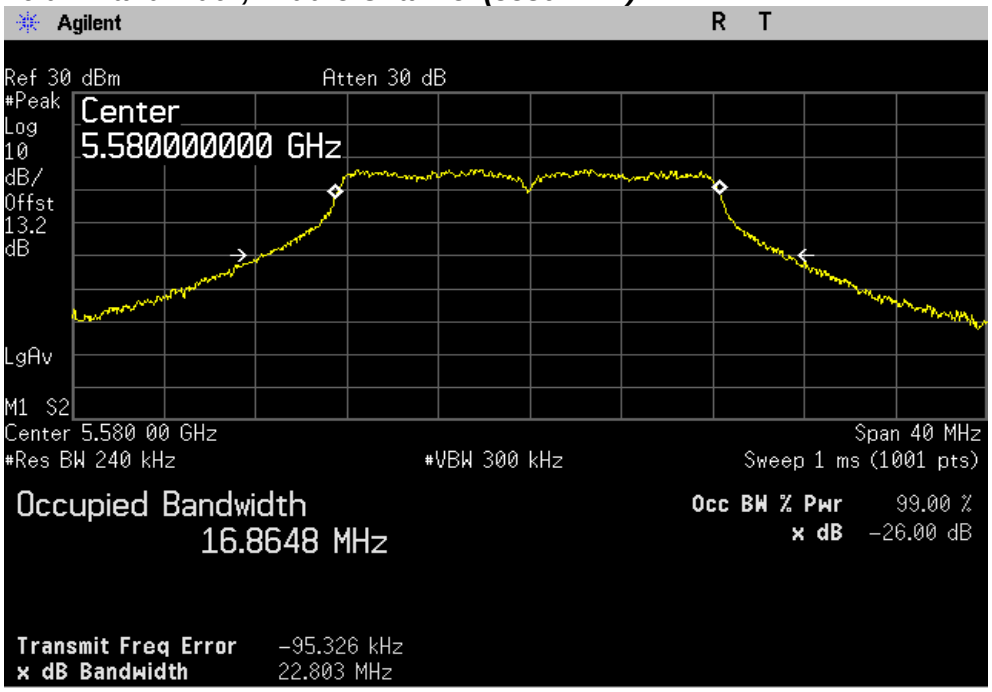
802.11a mode

Chain 0

26 dB Bandwidth, Lowest Channel (5500 MHz)

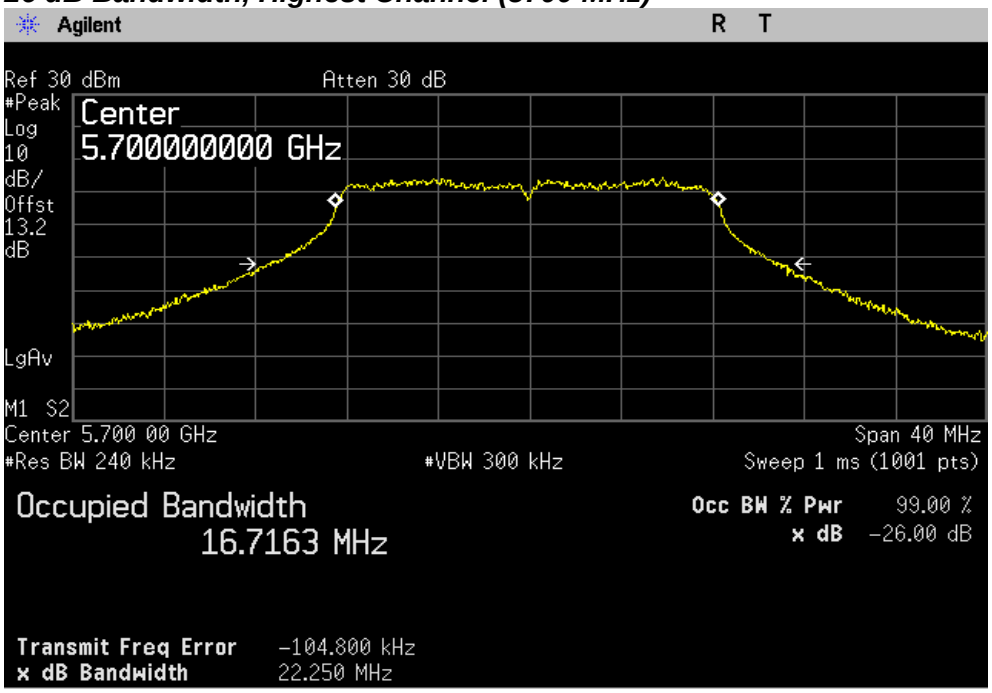


26 dB Bandwidth, Middle Channel (5580 MHz)



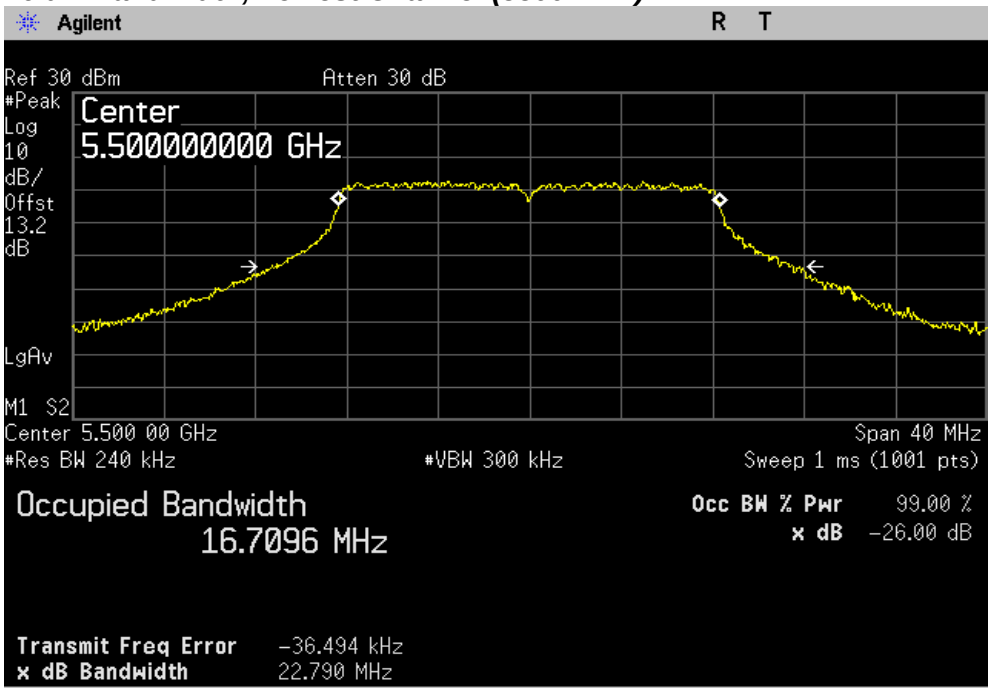
PLOTS OF EMISSIONS

26 dB Bandwidth, Highest Channel (5700 MHz)



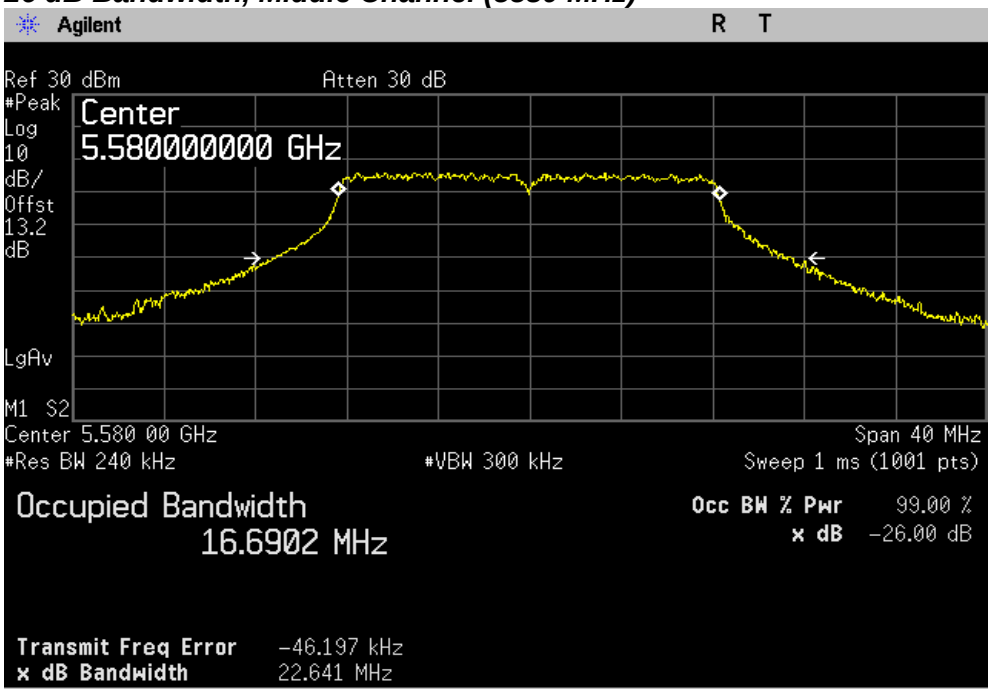
Chain 1

26 dB Bandwidth, Lowest Channel (5500 MHz)

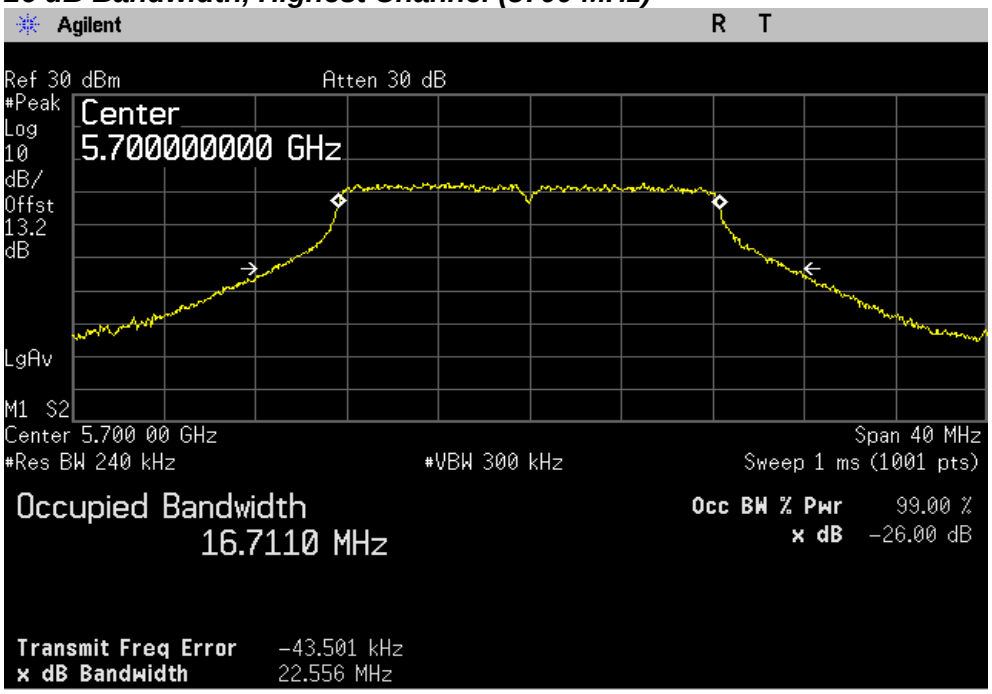


PLOTS OF EMISSIONS

26 dB Bandwidth, Middle Channel (5580 MHz)



26 dB Bandwidth, Highest Channel (5700 MHz)

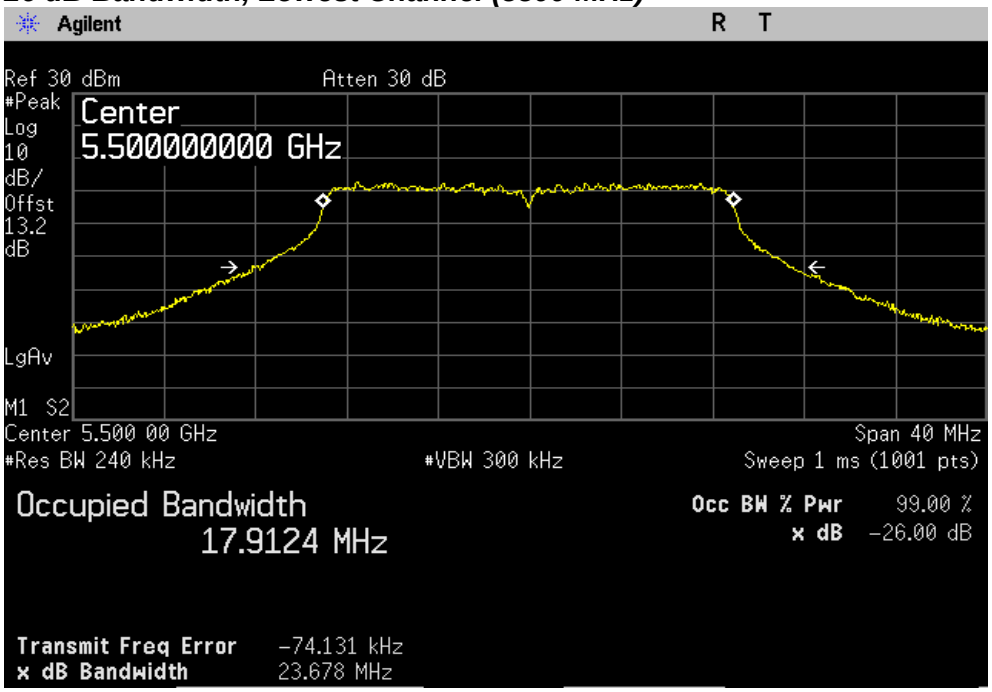


PLOTS OF EMISSIONS

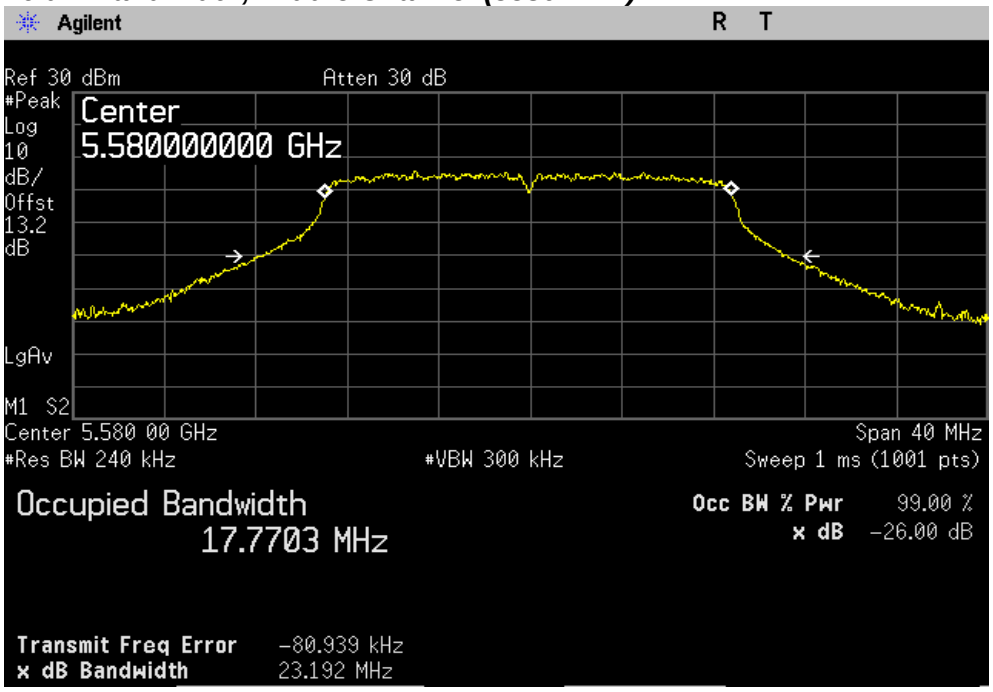
802.11n mode

Chain 0

26 dB Bandwidth, Lowest Channel (5500 MHz)

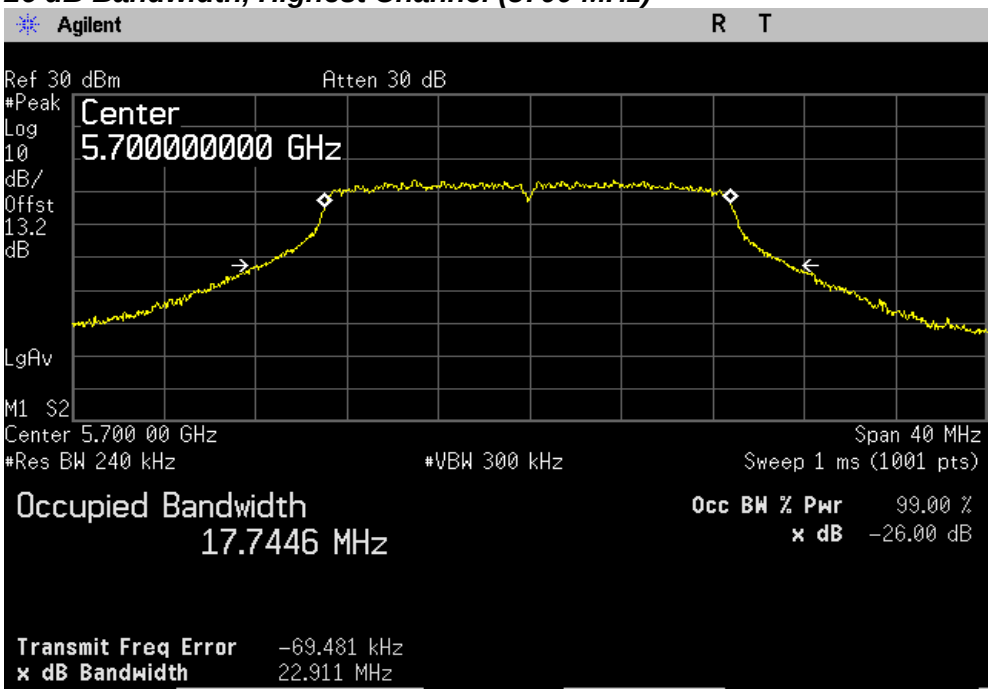


26 dB Bandwidth, Middle Channel (5580 MHz)



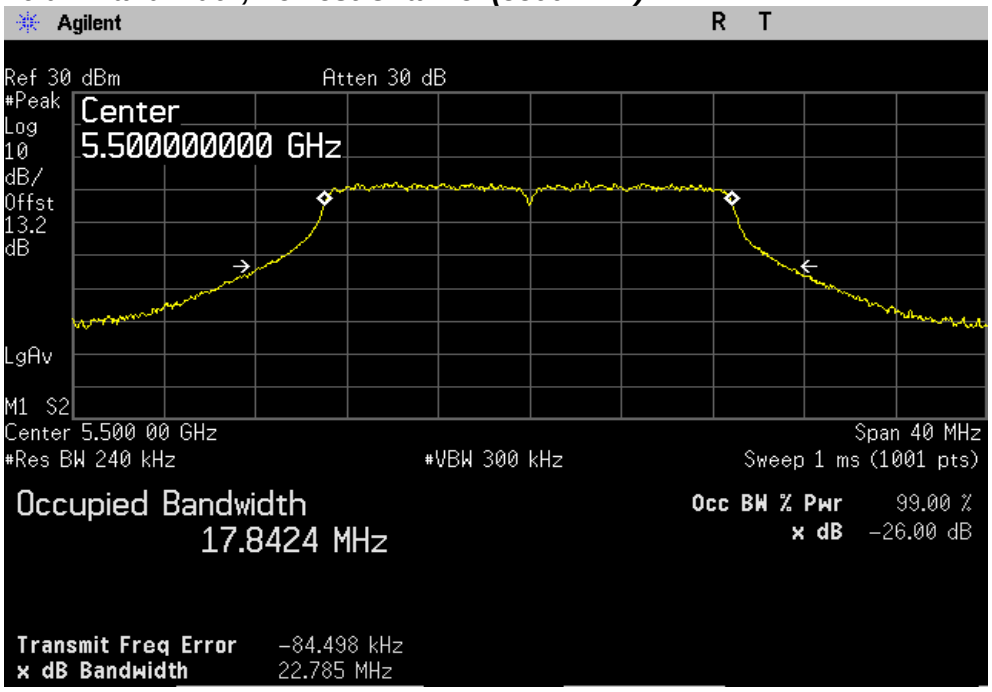
PLOTS OF EMISSIONS

26 dB Bandwidth, Highest Channel (5700 MHz)



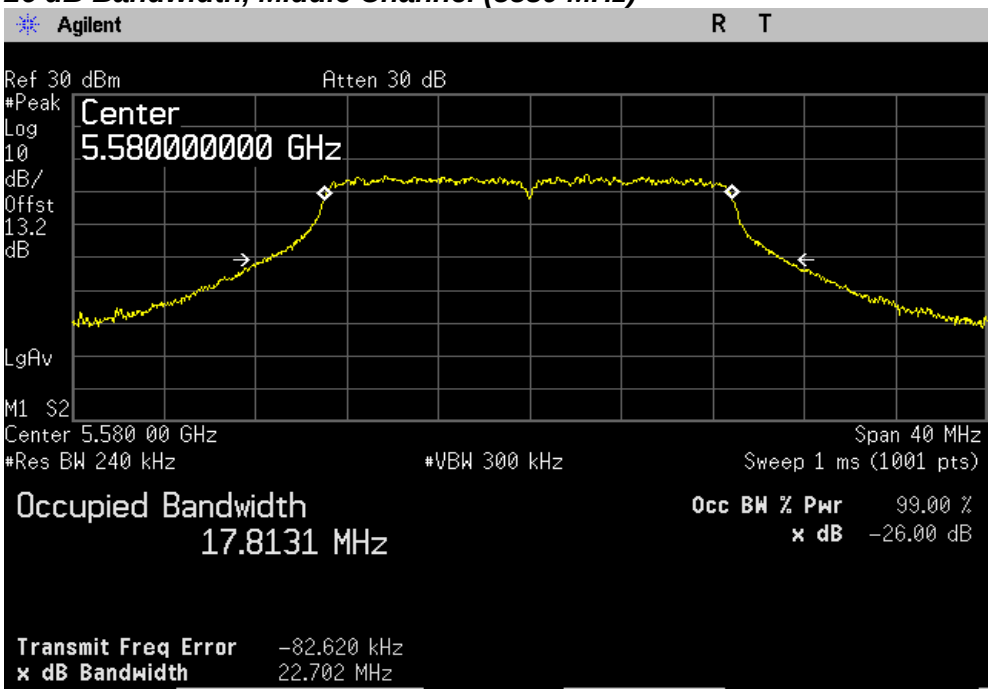
Chain 1

26 dB Bandwidth, Lowest Channel (5500 MHz)

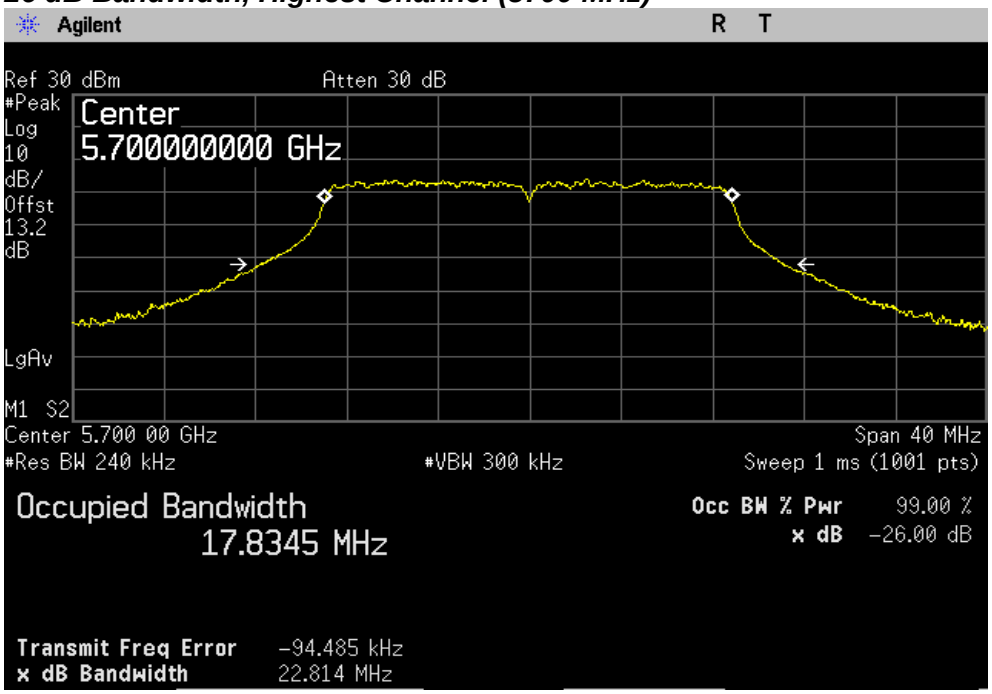


PLOTS OF EMISSIONS

26 dB Bandwidth, Middle Channel (5580 MHz)



26 dB Bandwidth, Highest Channel (5700 MHz)



8.4 Maximum Conducted Output Power

8.4.1 Maximum Conducted Output Power – Band I

FCC §15.407(a)

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

802.11a mode

Frequency (MHz)	Data rate (Mbps)	Conducted Output Power (dBm)		[1)]Total Output Power (dBm)	[2)]Limit (dBm)	Margin (dB)
		Chain 0	Chain 1			
5180	6	9.92	10.74	13.36	16.20	2.84
	9	9.90	10.75	13.36	16.20	2.84
	12	9.90	10.68	13.32	16.20	2.88
	18	9.50	10.68	13.14	16.20	3.06
	24	9.57	10.66	13.16	16.20	3.04
	36	9.54	10.18	12.88	16.20	3.32
	48	9.57	10.28	12.95	16.20	3.25
	54	9.54	10.29	12.94	16.20	3.26
5200	6	10.29	10.81	13.57	16.20	2.63
	9	10.25	10.80	13.54	16.20	2.66
	12	10.13	10.73	13.45	16.20	2.75
	18	9.68	10.80	13.29	16.20	2.91
	24	9.84	10.34	13.11	16.20	3.09
	36	9.73	10.33	13.05	16.20	3.15
	48	9.64	10.34	13.01	16.20	3.19
	54	9.63	10.42	13.05	16.20	3.15
5240	6	10.17	11.06	13.65	16.20	2.55
	9	10.05	11.05	13.59	16.20	2.61
	12	9.90	11.03	13.51	16.20	2.69
	18	9.76	11.07	13.47	16.20	2.73
	24	9.73	11.05	13.45	16.20	2.75
	36	9.70	11.04	13.43	16.20	2.77
	48	9.81	11.02	13.47	16.20	2.73
	54	9.74	11.01	13.43	16.20	2.77

802.11n mode

Frequency (MHz)	Data rate	Conducted Output Power (dBm)		[1)]Total Output Power (dBm)	[2)]Limit (dBm)	Margin (dB)
		Chain 0	Chain 1			
5180	MCS0	9.97	10.73	13.38	16.20	2.82
	MCS1	9.81	10.71	13.29	16.20	2.91
	MCS2	9.58	10.72	13.20	16.20	3.00
	MCS3	9.60	10.72	13.21	16.20	2.99
	MCS4	9.57	10.64	13.15	16.20	3.05
	MCS5	9.47	10.55	13.05	16.20	3.15
	MCS6	9.37	10.60	13.04	16.20	3.16
	MCS7	9.41	10.62	13.07	16.20	3.13
	MCS8	9.78	10.60	13.22	16.20	2.98
	MCS9	9.76	10.61	13.22	16.20	2.98
	MCS10	9.33	10.65	13.05	16.20	3.15
	MCS11	9.57	10.64	13.15	16.20	3.05
	MCS12	9.58	10.65	13.16	16.20	3.04
	MCS13	9.64	10.33	13.01	16.20	3.19
	MCS14	9.27	10.26	12.80	16.20	3.40
	MCS15	9.27	10.26	12.80	16.20	3.40
5200	MCS0	10.00	10.70	13.37	16.20	2.83
	MCS1	9.91	10.43	13.19	16.20	3.01
	MCS2	9.85	10.49	13.19	16.20	3.01
	MCS3	9.88	10.46	13.19	16.20	3.01
	MCS4	9.90	10.39	13.16	16.20	3.04
	MCS5	9.83	10.33	13.10	16.20	3.10
	MCS6	9.84	10.32	13.10	16.20	3.10
	MCS7	9.76	10.30	13.05	16.20	3.15
	MCS8	9.79	10.68	13.27	16.20	2.93
	MCS9	9.80	10.69	13.28	16.20	2.92
	MCS10	9.84	10.67	13.29	16.20	2.91
	MCS11	9.83	10.72	13.31	16.20	2.89
	MCS12	9.86	10.65	13.28	16.20	2.92
	MCS13	9.69	10.15	12.94	16.20	3.26
	MCS14	9.76	10.14	12.96	16.20	3.24
	MCS15	9.80	10.17	13.00	16.20	3.20
5240	MCS0	9.95	11.22	13.64	16.20	2.56
	MCS1	9.80	10.77	13.32	16.20	2.88
	MCS2	9.87	11.22	13.61	16.20	2.59
	MCS3	9.84	10.65	13.27	16.20	2.93
	MCS4	9.76	11.00	13.43	16.20	2.77
	MCS5	9.89	11.00	13.49	16.20	2.71
	MCS6	9.81	10.58	13.22	16.20	2.98
	MCS7	9.75	11.05	13.46	16.20	2.74
	MCS8	9.98	11.01	13.54	16.20	2.66
	MCS9	9.99	11.00	13.53	16.20	2.67
	MCS10	9.46	10.98	13.30	16.20	2.90
	MCS11	9.52	10.86	13.25	16.20	2.95
	MCS12	9.55	10.86	13.26	16.20	2.94
	MCS13	9.51	10.91	13.28	16.20	2.92
	MCS14	9.56	10.71	13.18	16.20	3.02
	MCS15	9.55	10.72	13.18	16.20	3.02

Note(s):

The following equation was used for spectrum offset:

Spectrum offset (dB) = Attenuator (dB) + Cable Loss (dB) + SMA Type Connector Loss (dB)

1) Total Peak power = 10 log [10^(Chain 0 Power/10) + 10^(Chain 1 Power/10)]

*For the band 5.15~5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of **50 mW(17 dBm)** or 4 dBm + 10log(26 dB Bandwidth)*

= 4 dBm + 10log(23.92) = 17.79 dBm

The maximum conducted output limit is 17 dBm.

2) As the directional gain is 6.80 dBi, the Maximum conducted output power limit 17 dBm should be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Therefore, the Maximum conducted output power limit is 16.2 dBm.

According to the KDB 662911 D01 v01r02, the directional gain of the correlated signal for the output power is as in the following table.

Frequency Band	Antenna G1 (dBi)	Antenna G2 (dBi)	3)Directional gain for CCD mode (dBi)	4)Directional gain for correlated signal (dBi)	Antenna limit (dBi)
Band I	3.79	3.79	3.79	6.80	6.00

3) Directional gain for CCD mode (correlated signal) = G_{ANT} + 0 dB for N_{ANT} = 2

4) Directional gain for the correlated signal with equal antenna gains, with equal transmit powers

= G_{ANT} + 10 log(N_{ANT}) dBi for G_{ANT} = 3.79 and N_{ANT} = 2

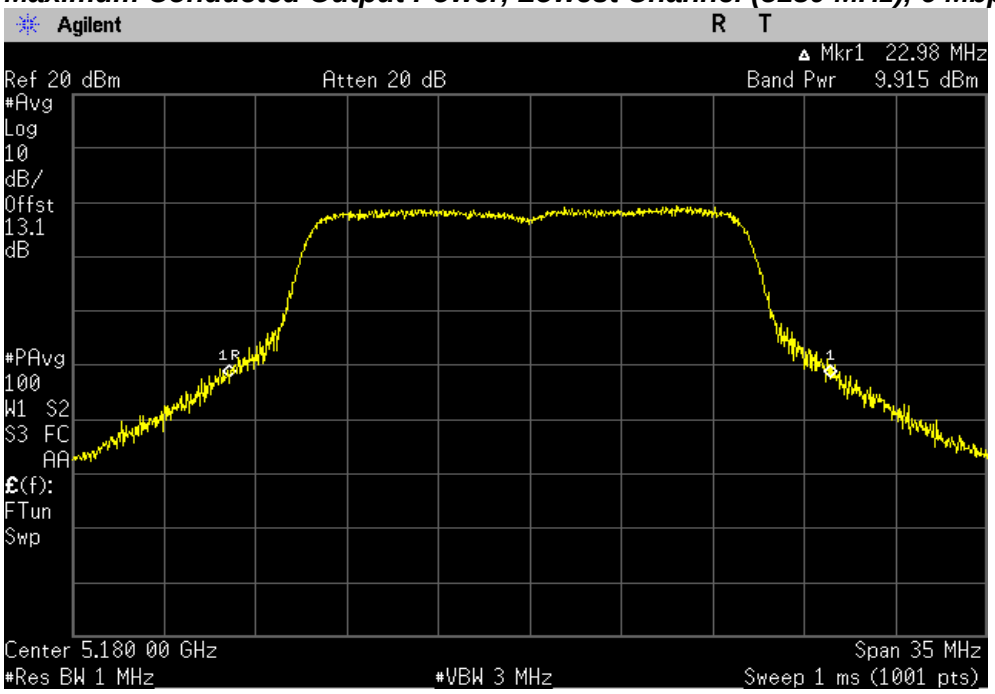
The maximum directional gain is 6.80 dBi.

PLOT OF TEST DATA

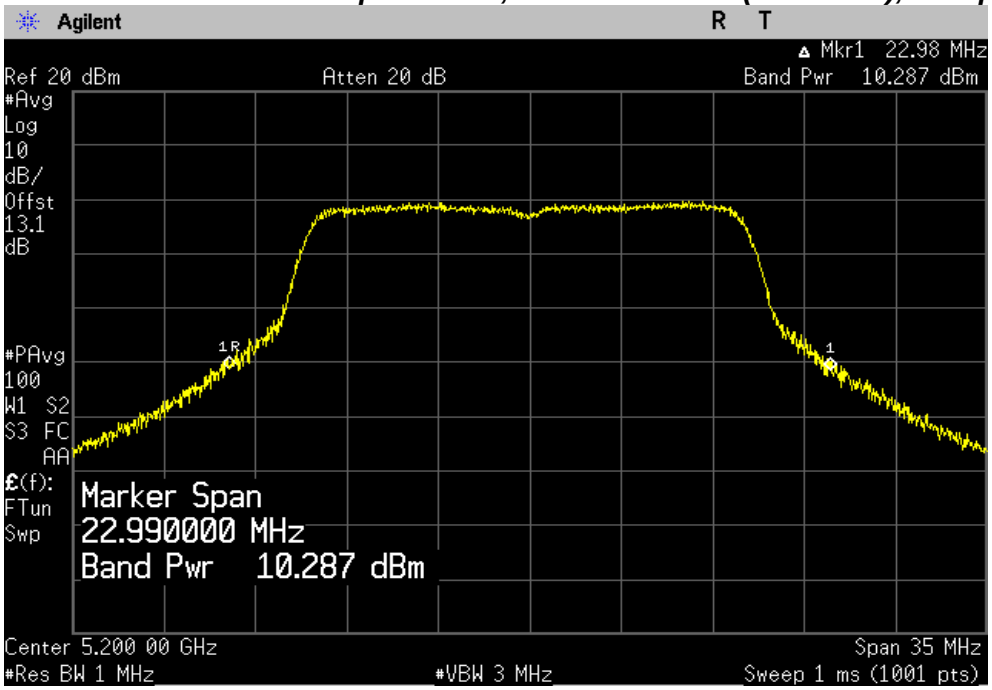
802.11a mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5180 MHz), 6 Mbps data rate

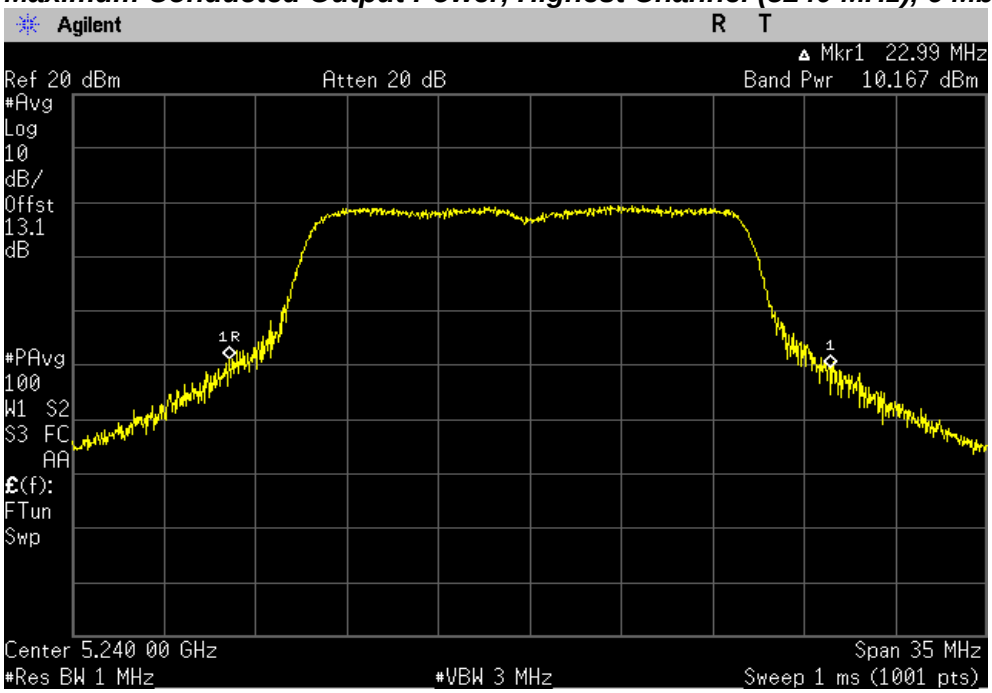


Maximum Conducted Output Power, Middle Channel (5200 MHz), 6 Mbps data rate



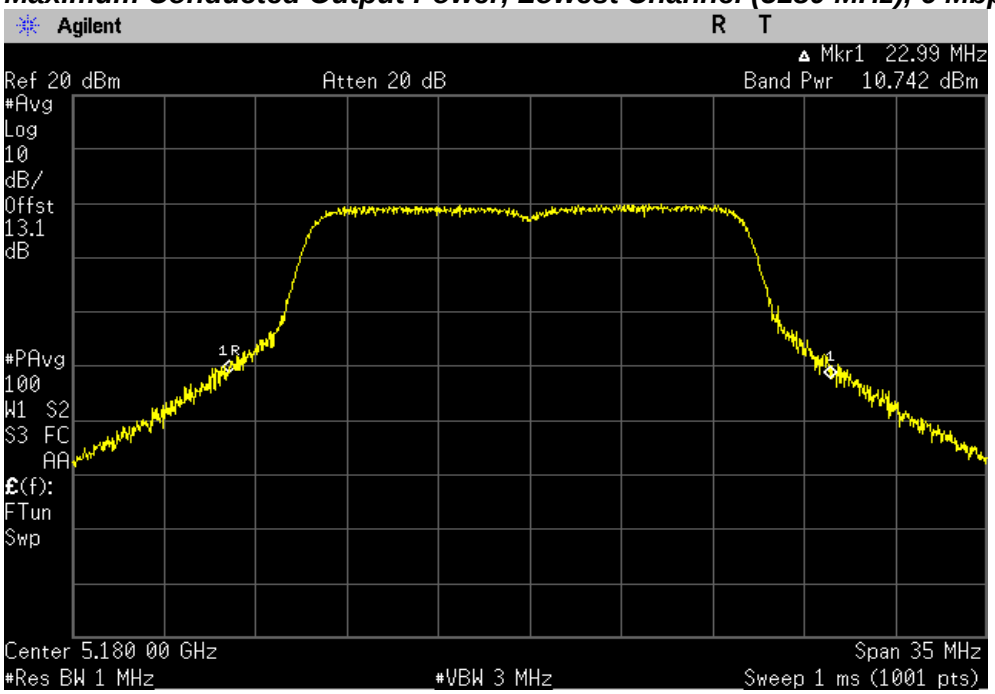
PLOTS OF EMISSIONS

Maximum Conducted Output Power, Highest Channel (5240 MHz), 6 Mbps data rate



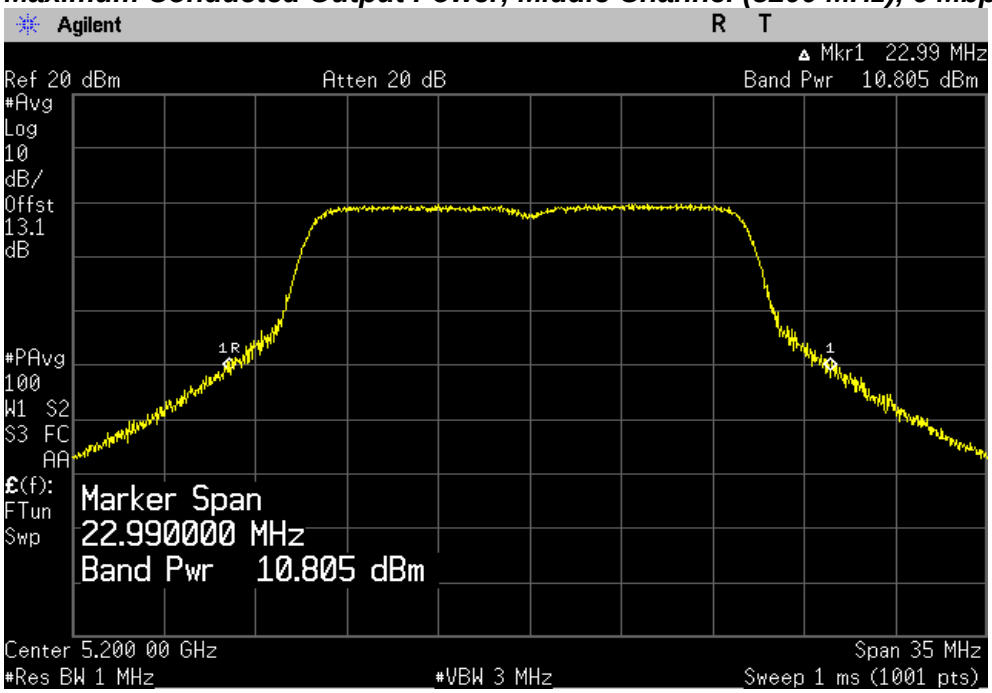
Chain 1

Maximum Conducted Output Power, Lowest Channel (5180 MHz), 6 Mbps data rate

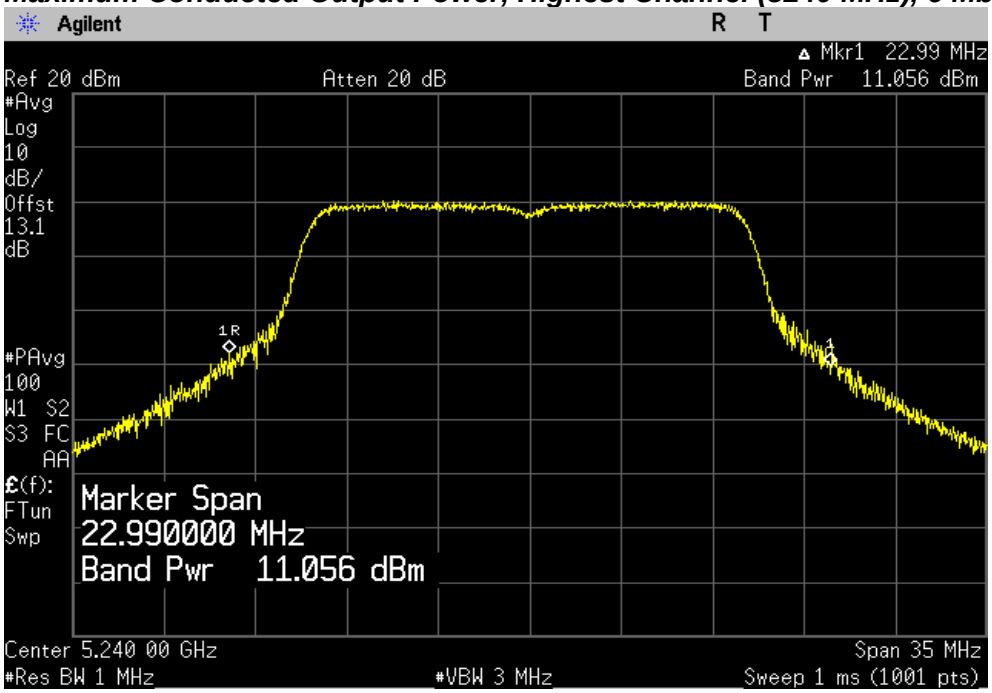


PLOTS OF EMISSIONS

Maximum Conducted Output Power, Middle Channel (5200 MHz), 6 Mbps data rate



Maximum Conducted Output Power, Highest Channel (5240 MHz), 6 Mbps data rate

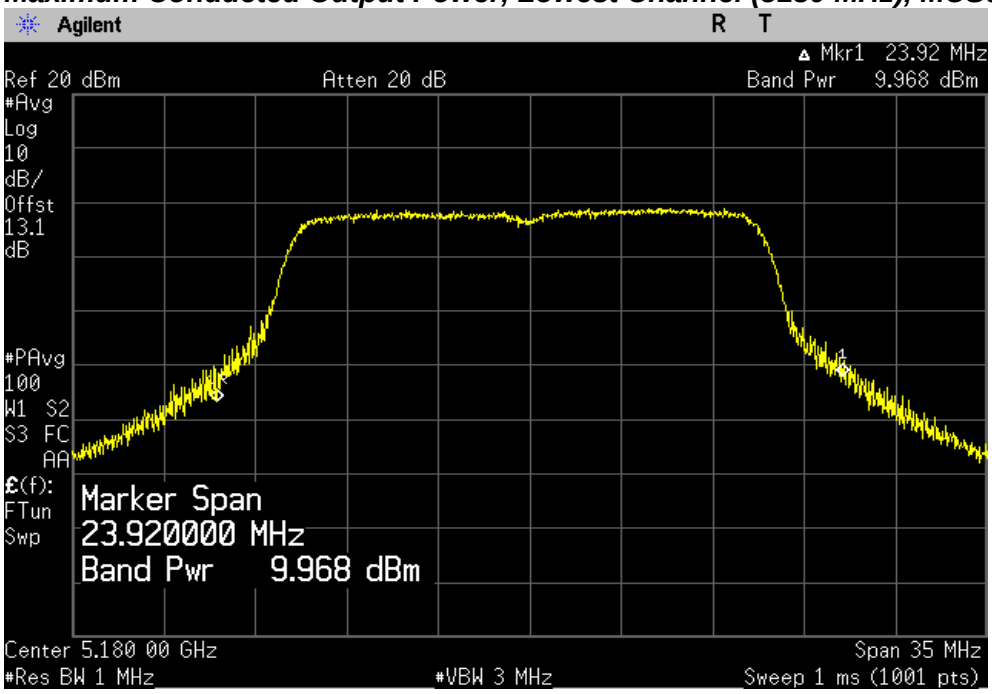


PLOT OF TEST DATA

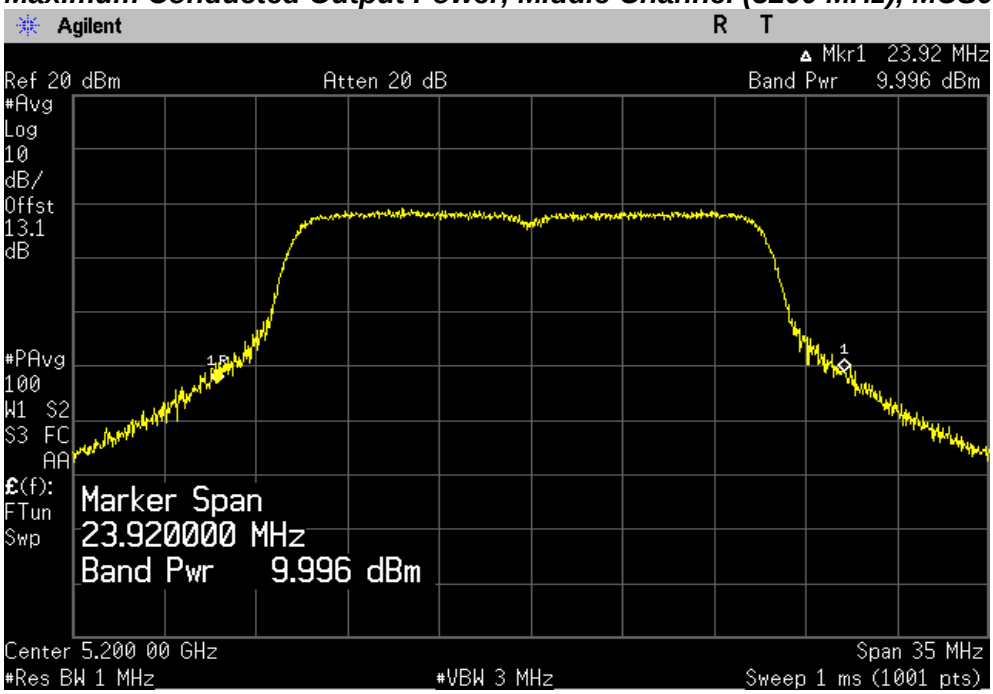
802.11n mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5180 MHz), MCS0 data rate

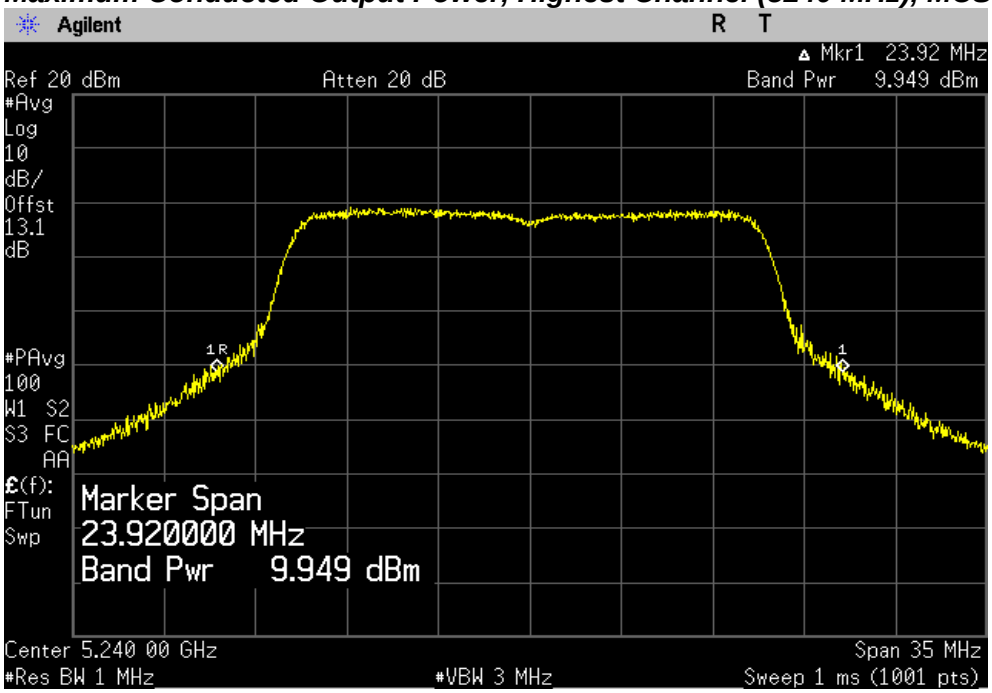


Maximum Conducted Output Power, Middle Channel (5200 MHz), MCS0 data rate



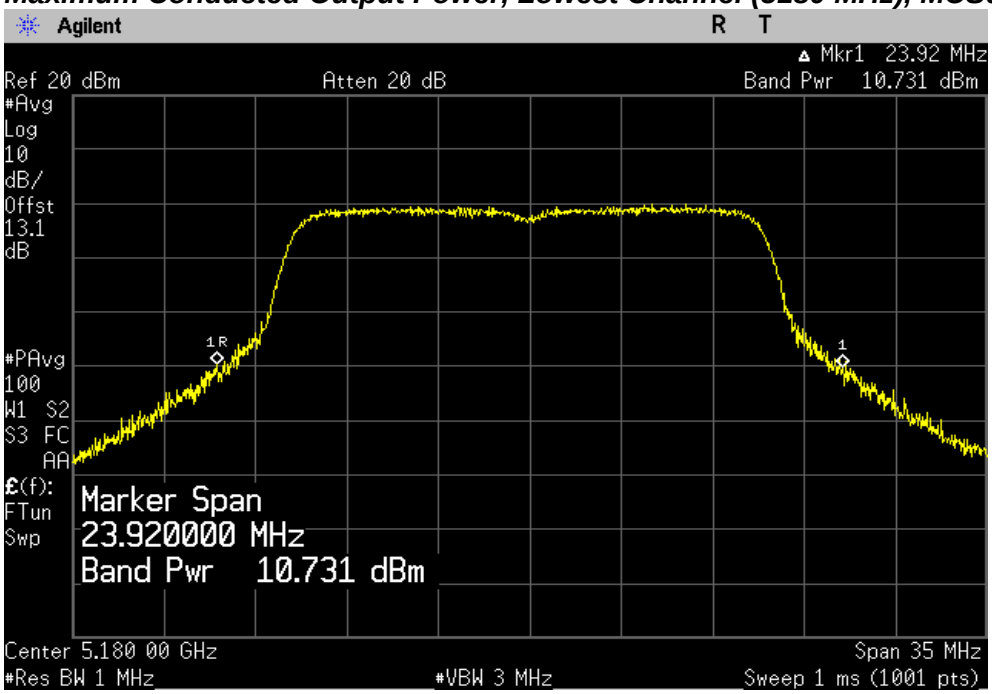
PLOTS OF EMISSIONS

Maximum Conducted Output Power, Highest Channel (5240 MHz), MCS0 data rate



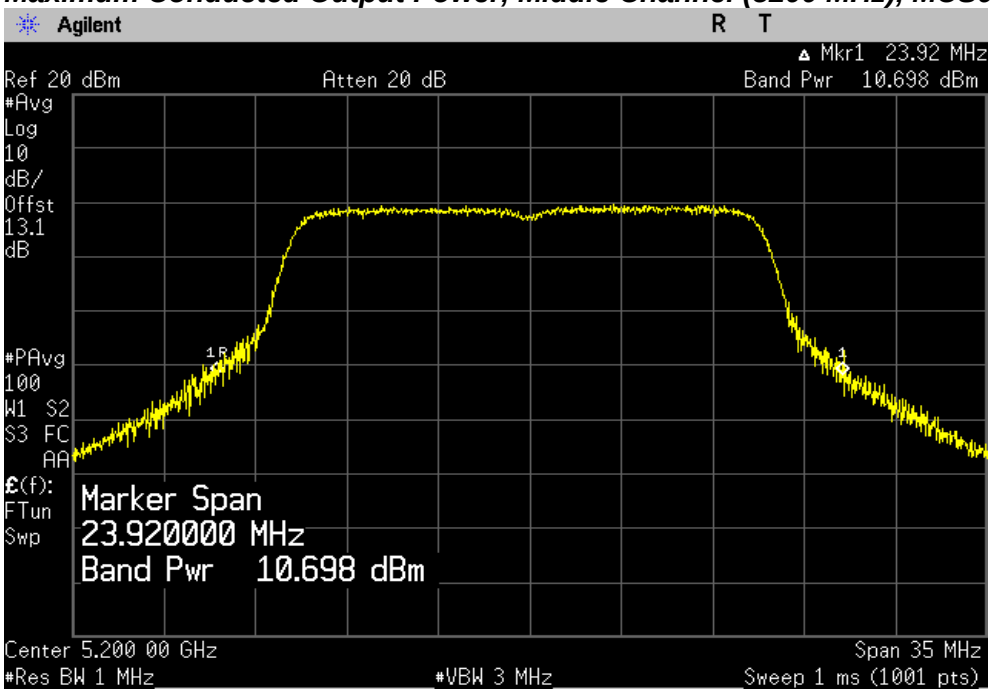
Chain 1

Maximum Conducted Output Power, Lowest Channel (5180 MHz), MCS0 data rate

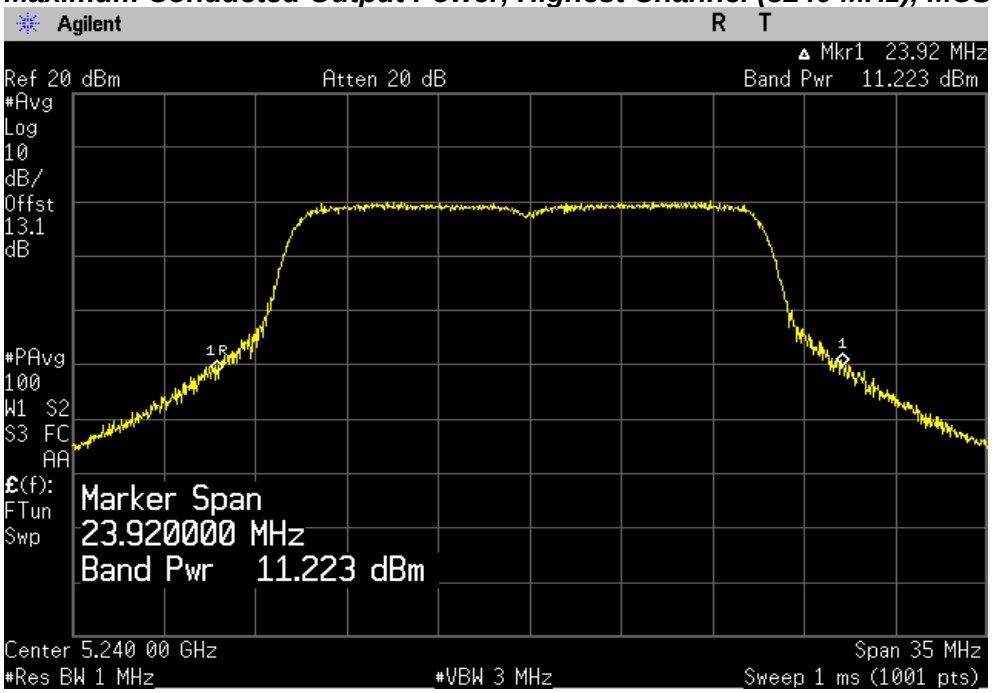


PLOTS OF EMISSIONS

Maximum Conducted Output Power, Middle Channel (5200 MHz), MCS0 data rate



Maximum Conducted Output Power, Highest Channel (5240 MHz), MCS0 data rate



8.4.2 Maximum Conducted Output Power – Band II

FCC §15.407(a)

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

802.11a mode

Frequency (MHz)	Data rate (Mbps)	Conducted Output Power (dBm)		[1)]Total Output Power (dBm)	[2)]Limit (dBm)	Margin (dB)
		Chain 0	Chain 1			
5260	6	16.34	17.07	19.73	23.20	3.47
	9	16.28	16.85	19.58	23.20	3.62
	12	16.25	16.75	19.52	23.20	3.68
	18	16.25	17.03	19.67	23.20	3.53
	24	16.26	17.00	19.66	23.20	3.54
	36	16.29	17.01	19.68	23.20	3.52
	48	16.28	17.00	19.67	23.20	3.53
	54	15.77	17.03	19.46	23.20	3.74
5280	6	16.44	16.55	19.51	23.20	3.69
	9	16.32	16.48	19.41	23.20	3.79
	12	16.18	16.42	19.31	23.20	3.89
	18	16.13	16.36	19.26	23.20	3.94
	24	16.40	16.31	19.37	23.20	3.83
	36	16.37	16.31	19.35	23.20	3.85
	48	16.32	16.30	19.32	23.20	3.88
	54	16.26	16.30	19.29	23.20	3.91
5320	6	12.58	12.52	15.56	23.20	7.64
	9	12.52	12.50	15.52	23.20	7.68
	12	12.43	12.51	15.48	23.20	7.72
	18	12.50	12.50	15.51	23.20	7.69
	24	12.38	12.47	15.44	23.20	7.76
	36	12.41	12.52	15.48	23.20	7.72
	48	12.35	12.49	15.43	23.20	7.77
	54	12.31	12.47	15.40	23.20	7.80

802.11n mode

Frequency (MHz)	Data rate (Mbps)	Conducted Output Power (dBm)		[1)]Total Output Power (dBm)	[2)]Limit (dBm)	Margin (dB)
		Chain 0	Chain 1			
5260	MCS0	15.15	15.80	18.50	23.20	4.70
	MCS1	15.15	15.77	18.48	23.20	4.72
	MCS2	15.14	15.75	18.47	23.20	4.73
	MCS3	15.13	15.72	18.45	23.20	4.75
	MCS4	15.11	15.75	18.45	23.20	4.75
	MCS5	15.12	15.79	18.48	23.20	4.72
	MCS6	15.12	15.75	18.46	23.20	4.74
	MCS7	15.22	15.77	18.51	23.20	4.69
	MCS8	15.17	15.72	18.46	23.20	4.74
	MCS9	15.18	15.72	18.47	23.20	4.73
	MCS10	15.23	15.64	18.45	23.20	4.75
	MCS11	15.21	15.70	18.47	23.20	4.73
	MCS12	14.72	15.70	18.25	23.20	4.95
	MCS13	14.78	15.70	18.27	23.20	4.93
	MCS14	14.80	15.71	18.29	23.20	4.91
	MCS15	14.79	15.76	18.31	23.20	4.89
5280	MCS0	15.41	15.29	18.36	23.20	4.84
	MCS1	15.16	15.29	18.24	23.20	4.96
	MCS2	14.96	15.26	18.12	23.20	5.08
	MCS3	15.30	15.24	18.28	23.20	4.92
	MCS4	14.84	15.25	18.06	23.20	5.14
	MCS5	14.91	15.20	18.07	23.20	5.13
	MCS6	15.38	15.26	18.33	23.20	4.87
	MCS7	14.88	15.21	18.06	23.20	5.14
	MCS8	15.36	15.20	18.29	23.20	4.91
	MCS9	15.31	15.23	18.28	23.20	4.92
	MCS10	15.31	15.22	18.28	23.20	4.92
	MCS11	14.88	15.25	18.08	23.20	5.12
	MCS12	14.87	15.22	18.06	23.20	5.14
	MCS13	14.92	15.21	18.08	23.20	5.12
	MCS14	14.89	15.21	18.06	23.20	5.14
	MCS15	14.96	15.20	18.09	23.20	5.11
5320	MCS0	12.52	12.97	15.76	23.20	7.44
	MCS1	12.50	12.96	15.75	23.20	7.45
	MCS2	12.51	12.41	15.47	23.20	7.73
	MCS3	12.50	12.49	15.51	23.20	7.69
	MCS4	12.47	12.46	15.48	23.20	7.72
	MCS5	12.42	12.46	15.45	23.20	7.75
	MCS6	12.51	12.45	15.49	23.20	7.71
	MCS7	11.93	12.43	15.20	23.20	8.00
	MCS8	12.51	12.54	15.54	23.20	7.66
	MCS9	12.51	12.50	15.52	23.20	7.68
	MCS10	12.02	12.47	15.26	23.20	7.94
	MCS11	12.09	12.55	15.34	23.20	7.86
	MCS12	12.06	12.51	15.30	23.20	7.90
	MCS13	12.06	12.49	15.29	23.20	7.91
	MCS14	12.05	12.45	15.26	23.20	7.94
	MCS15	12.04	12.50	15.29	23.20	7.91

Note(s):

The following equation was used for spectrum offset:

Spectrum offset (dB) = Attenuator (dB) + Cable Loss (dB) + SMA Type Connector Loss (dB)

[1] Total Peak power = 10 log [(10^(Chain 0 Power/10) + 10^(Chain 1 Power/10)]

*For the band 5.25~5.35 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of **250 mW(24 dBm)** or 11 dBm + 10log(26 dB Bandwidth)*

= 11 dBm + 10log(23.76) = 24.76 dBm

The maximum conducted output limit is 24 dBm.

[2] As the directional gain is 6.8 dBi, the Maximum conducted output power limit 24 dBm should be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Therefore, the Maximum conducted output power limit is 23.2 dBm.

According to the KDB 662911 D01 v01r02, the directional gain of the correlated signal for the output power is as in the following table.

Frequency Band	Antenna G1 (dBi)	Antenna G2 (dBi)	[3]Directional gain for CCD mode (dBi)	[4]Directional gain for correlated signal (dBi)	Antenna limit (dBi)
Band II	3.79	3.79	3.79	6.80	6.00

[3] Directional gain for CCD mode (correlated signal) = G_{ANT} + 0 dB for N_{ANT} = 2

[4] Directional gain for the correlated signal with equal antenna gains, with equal transmit powers

= G_{ANT} + 10 log(N_{ANT}) dBi for G_{ANT} = 3.79 and N_{ANT} = 2

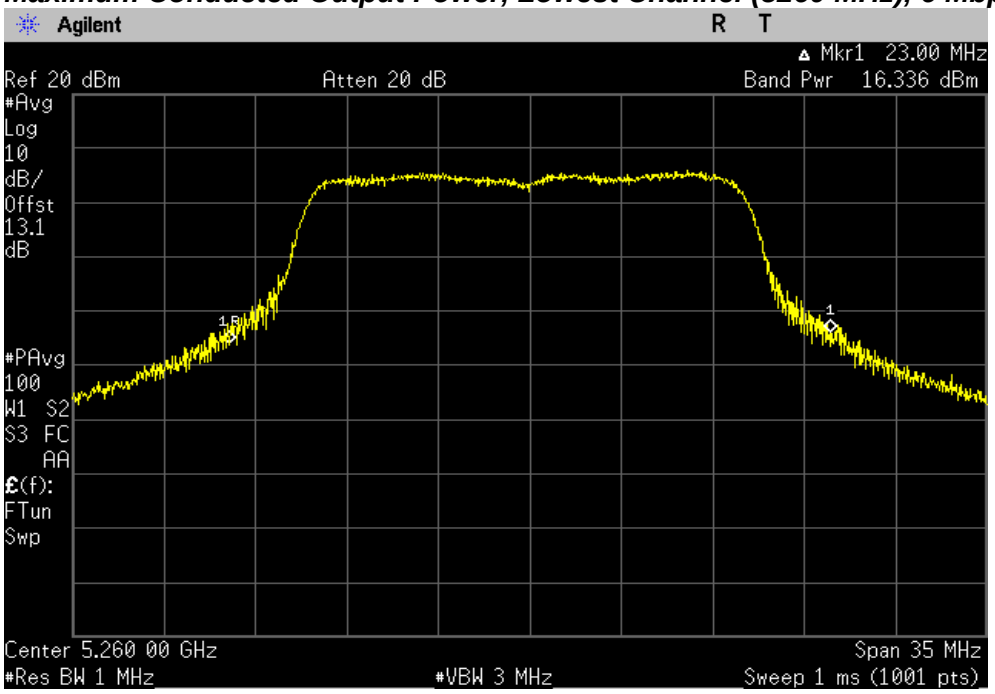
The maximum directional gain is 6.80 dBi.

PLOT OF TEST DATA

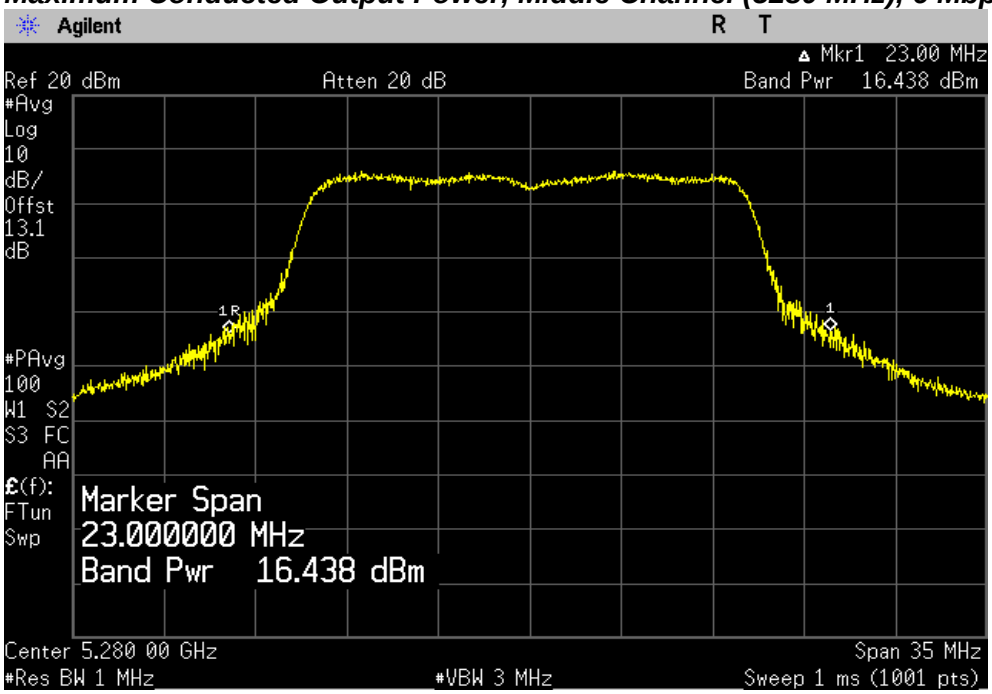
802.11a mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5260 MHz), 6 Mbps data rate

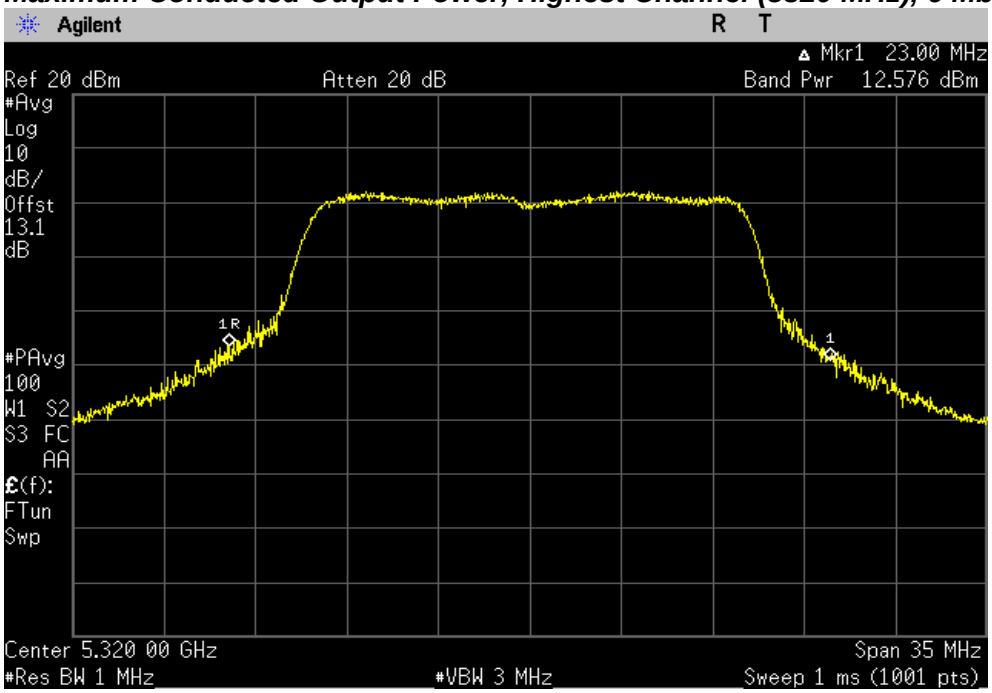


Maximum Conducted Output Power, Middle Channel (5280 MHz), 6 Mbps data rate



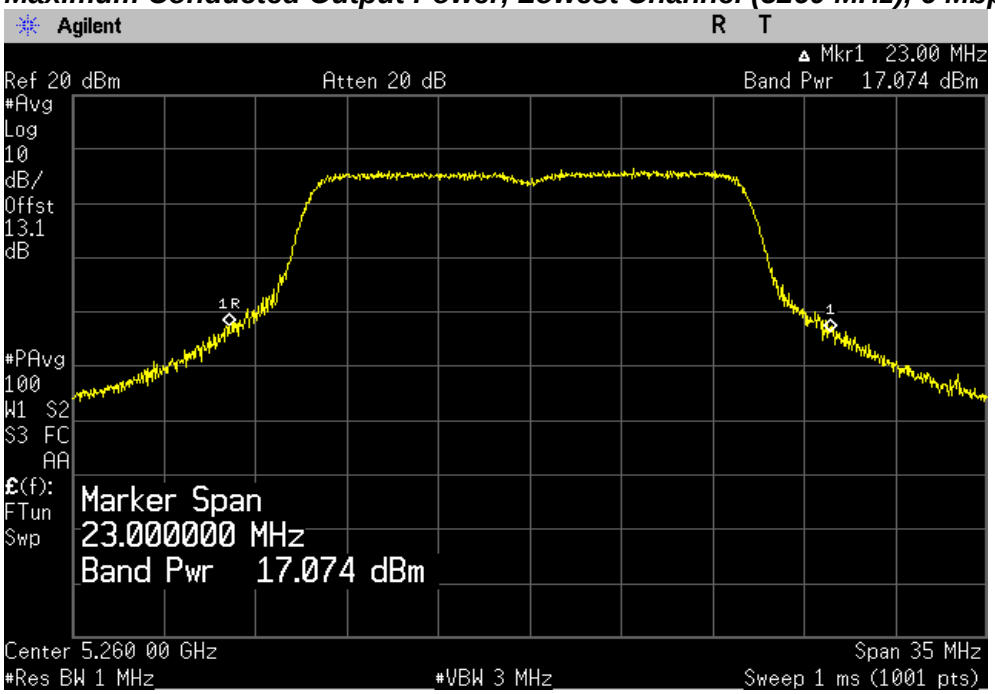
PLOTS OF EMISSIONS

Maximum Conducted Output Power, Highest Channel (5320 MHz), 6 Mbps data rate



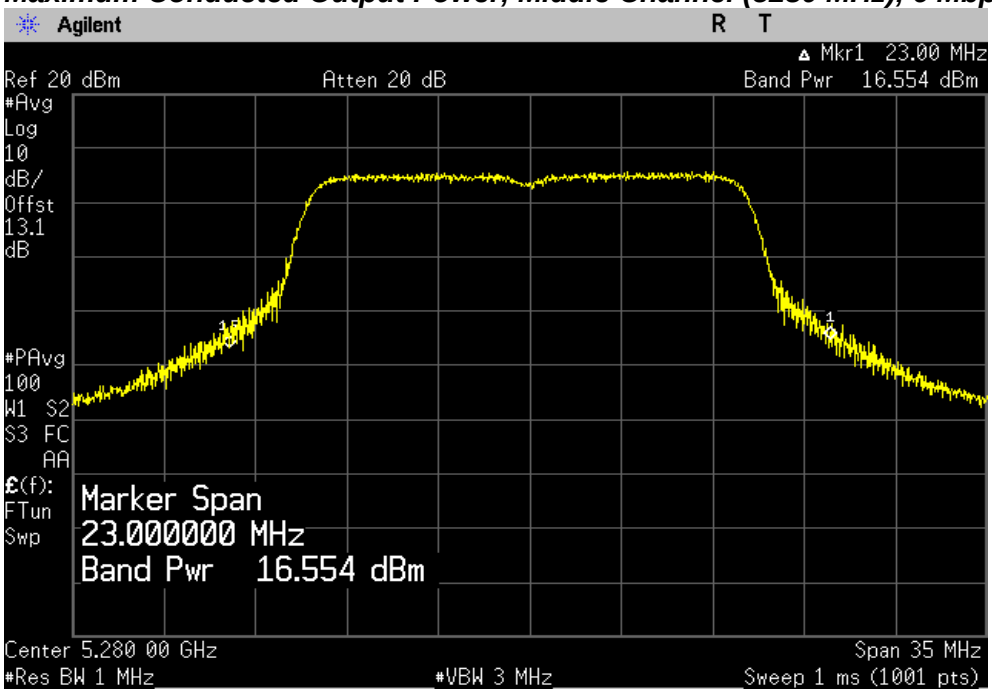
Chain 1

Maximum Conducted Output Power, Lowest Channel (5260 MHz), 6 Mbps data rate

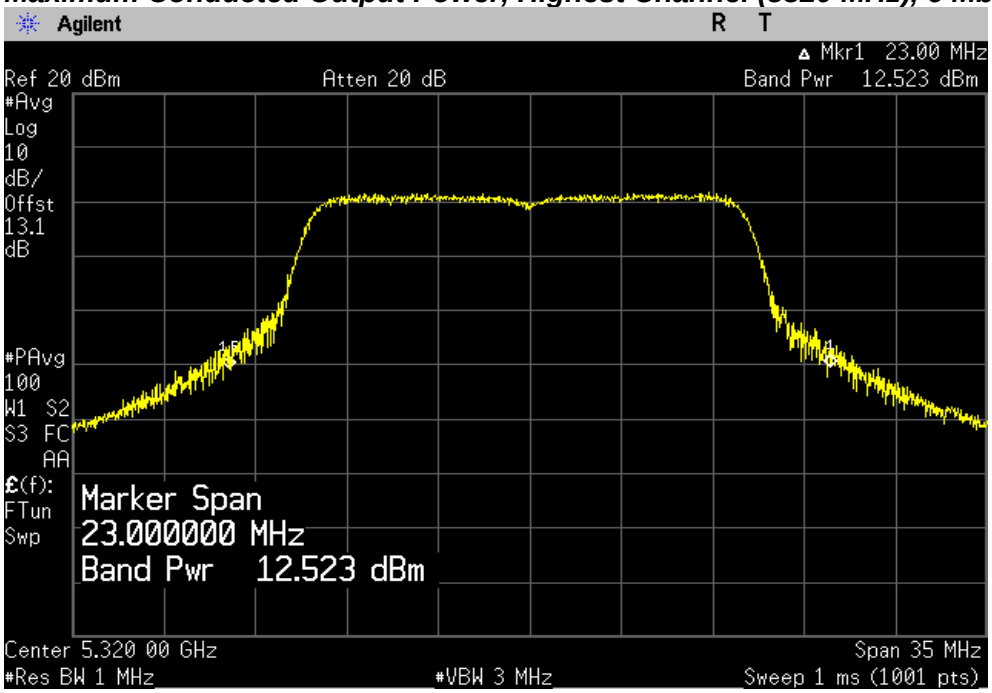


PLOTS OF EMISSIONS

Maximum Conducted Output Power, Middle Channel (5280 MHz), 6 Mbps data rate



Maximum Conducted Output Power, Highest Channel (5320 MHz), 6 Mbps data rate

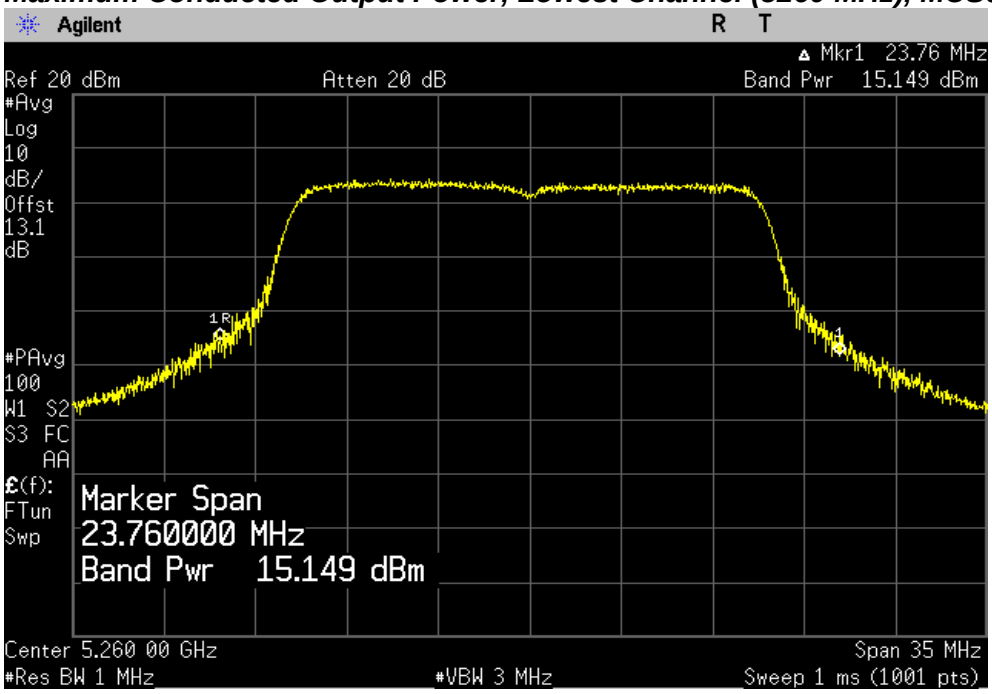


PLOT OF TEST DATA

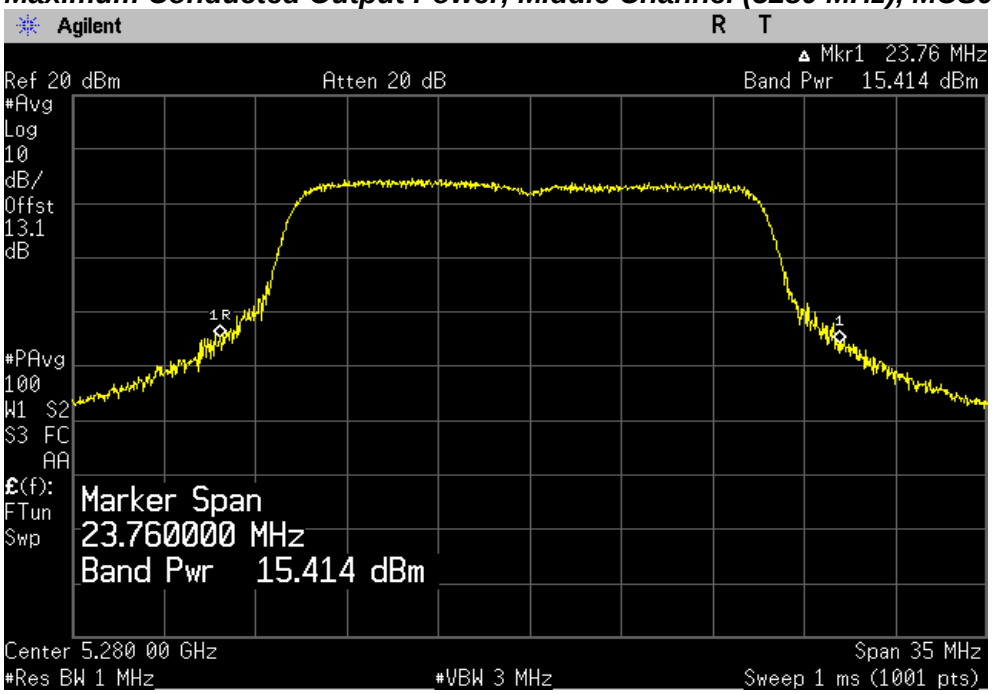
802.11n mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5260 MHz), MCS0 data rate

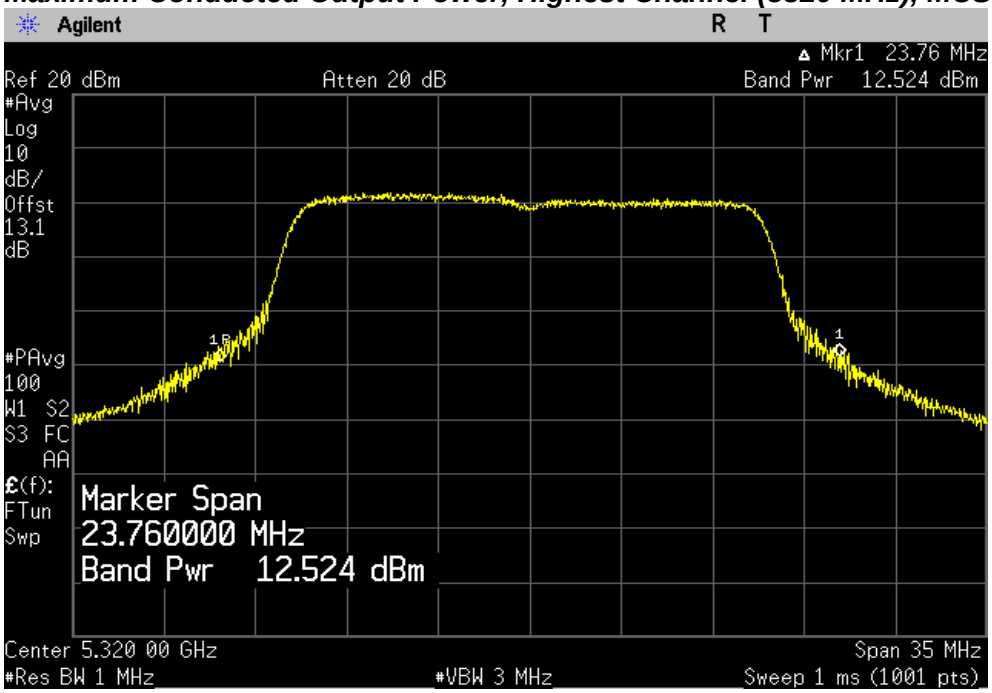


Maximum Conducted Output Power, Middle Channel (5280 MHz), MCS0 data rate



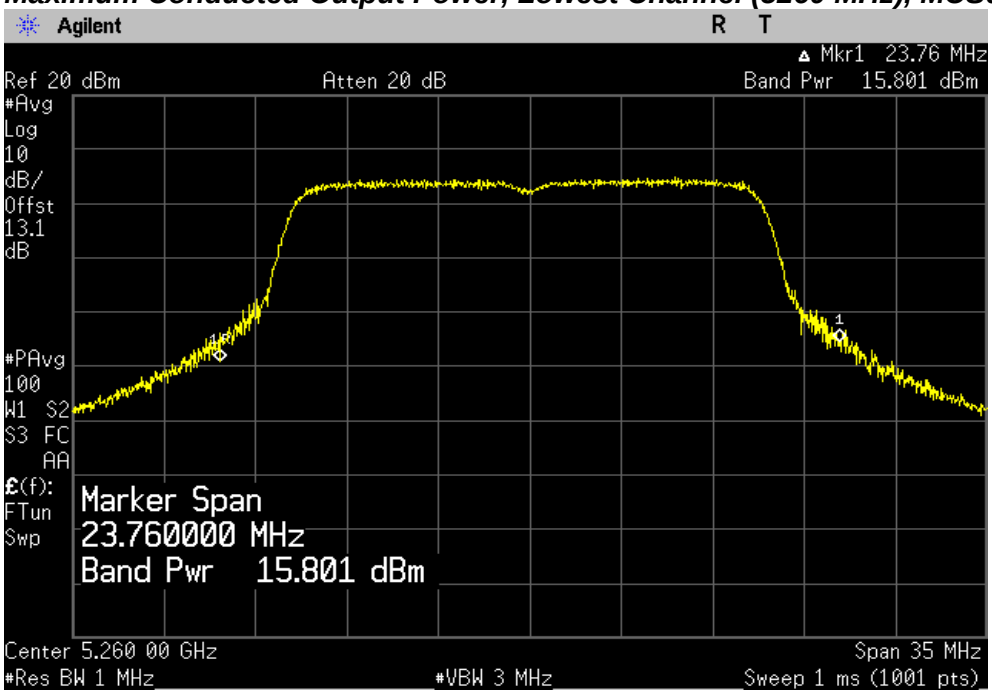
PLOTS OF EMISSIONS

Maximum Conducted Output Power, Highest Channel (5320 MHz), MCS0 data rate



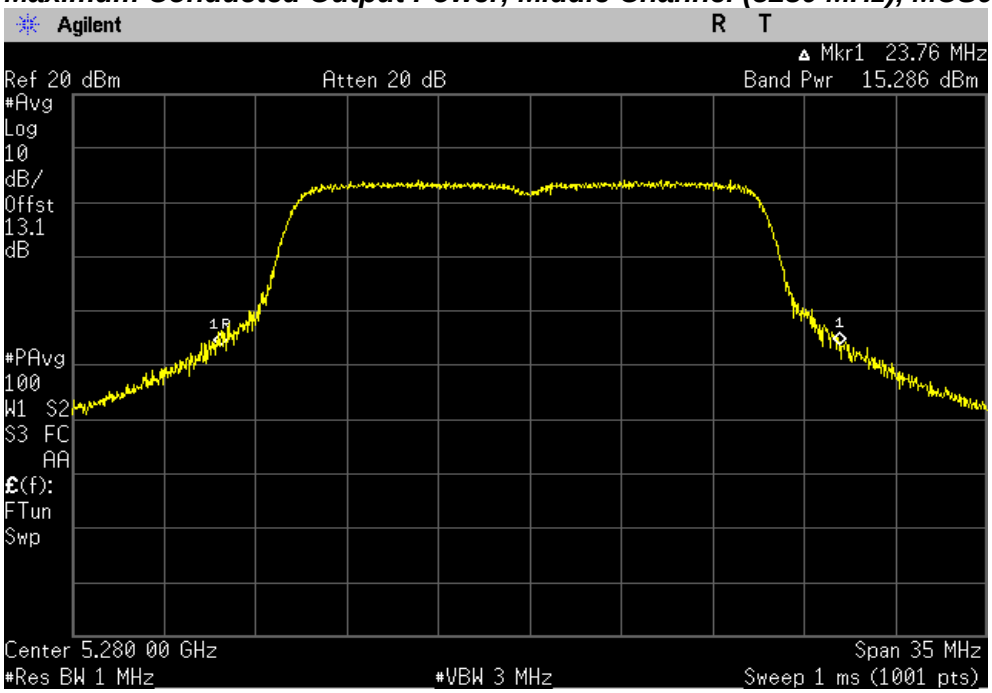
Chain 1

Maximum Conducted Output Power, Lowest Channel (5260 MHz), MCS0 data rate

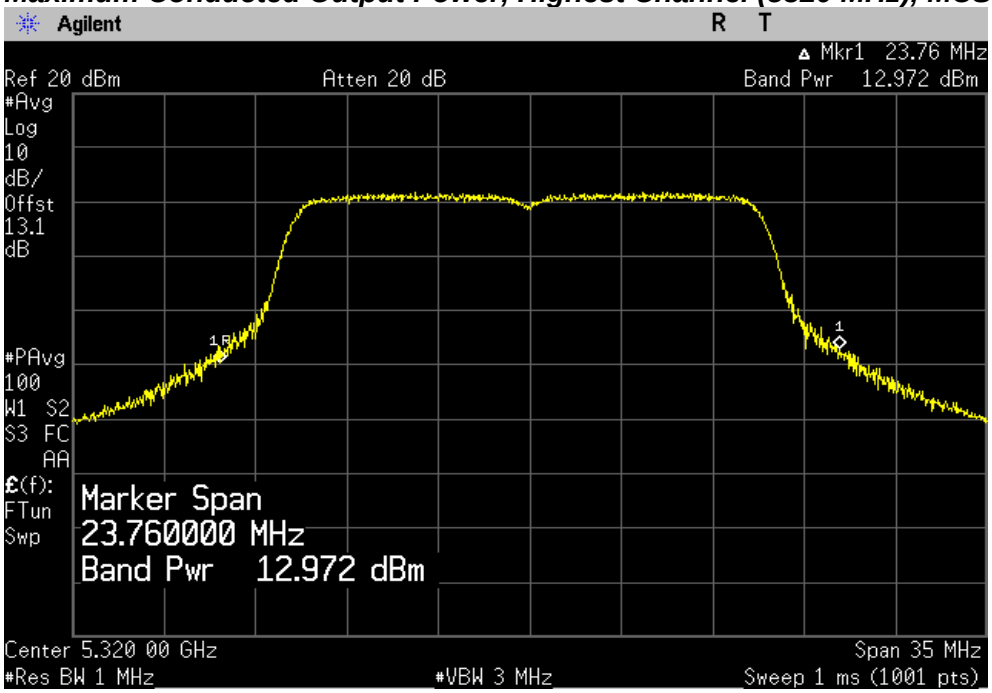


PLOTS OF EMISSIONS

Maximum Conducted Output Power, Middle Channel (5280 MHz), MCS0 data rate



Maximum Conducted Output Power, Highest Channel (5320 MHz), MCS0 data rate



8.4.3 Maximum Conducted Output Power – Band III

FCC §15.407(a)

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

802.11a mode

Frequency (MHz)	Data rate (Mbps)	Conducted Output Power (dBm)		[1)]Total Output Power (dBm)	[2)]Limit (dBm)	Margin (dB)
		Chain 0	Chain 1			
5500	6	12.15	12.58	15.38	23.02	7.64
	9	12.12	12.57	15.36	23.02	7.66
	12	12.07	12.57	15.34	23.02	7.68
	18	12.13	12.08	15.12	23.02	7.90
	24	12.04	12.21	15.14	23.02	7.88
	36	12.08	12.23	15.17	23.02	7.85
	48	11.59	12.25	14.94	23.02	8.08
	54	11.56	12.27	14.94	23.02	8.08
5580	6	15.20	15.81	18.53	23.02	4.49
	9	15.00	15.71	18.38	23.02	4.64
	12	14.95	15.63	18.31	23.02	4.71
	18	15.01	15.67	18.36	23.02	4.66
	24	15.05	15.46	18.27	23.02	4.75
	36	15.10	15.54	18.34	23.02	4.68
	48	14.56	15.52	18.08	23.02	4.94
	54	14.79	15.45	18.14	23.02	4.88
5700	6	12.83	13.68	16.29	23.02	6.73
	9	12.81	13.64	16.26	23.02	6.76
	12	12.53	13.61	16.11	23.02	6.91
	18	12.43	13.58	16.05	23.02	6.97
	24	12.41	13.46	15.98	23.02	7.04
	36	12.50	13.50	16.04	23.02	6.98
	48	12.54	13.54	16.08	23.02	6.94
	54	12.44	13.48	16.00	23.02	7.02

802.11n mode

Frequency (MHz)	Data rate	Conducted Output Power (dBm)		[1)]Total Output Power (dBm)	[2)]Limit (dBm)	Margin (dB)
		Chain 0	Chain 1			
5500	MCS0	12.10	12.25	15.19	23.02	7.83
	MCS1	12.05	12.17	15.12	23.02	7.90
	MCS2	12.04	12.16	15.11	23.02	7.91
	MCS3	12.09	12.17	15.14	23.02	7.88
	MCS4	12.09	12.18	15.15	23.02	7.87
	MCS5	12.06	12.18	15.13	23.02	7.89
	MCS6	12.05	12.22	15.15	23.02	7.87
	MCS7	12.05	11.69	14.88	23.02	8.14
	MCS8	12.08	12.20	15.15	23.02	7.87
	MCS9	12.08	12.23	15.17	23.02	7.85
	MCS10	12.07	12.23	15.16	23.02	7.86
	MCS11	11.55	12.23	14.91	23.02	8.11
	MCS12	11.60	12.17	14.90	23.02	8.12
	MCS13	11.64	12.19	14.93	23.02	8.09
	MCS14	11.59	12.21	14.92	23.02	8.10
	MCS15	11.66	12.20	14.95	23.02	8.07
5580	MCS0	14.23	14.77	17.52	23.02	5.50
	MCS1	14.16	14.69	17.44	23.02	5.58
	MCS2	14.10	14.64	17.39	23.02	5.63
	MCS3	14.09	14.67	17.40	23.02	5.62
	MCS4	14.20	14.70	17.47	23.02	5.55
	MCS5	13.89	14.75	17.35	23.02	5.67
	MCS6	13.90	14.74	17.35	23.02	5.67
	MCS7	14.04	14.73	17.41	23.02	5.61
	MCS8	14.14	14.73	17.46	23.02	5.56
	MCS9	13.74	14.74	17.28	23.02	5.74
	MCS10	13.75	14.73	17.28	23.02	5.74
	MCS11	14.13	14.63	17.40	23.02	5.62
	MCS12	13.72	14.58	17.18	23.02	5.84
	MCS13	13.87	14.57	17.24	23.02	5.78
	MCS14	13.81	14.58	17.22	23.02	5.80
	MCS15	13.80	14.18	17.00	23.02	6.02
5700	MCS0	12.72	13.80	16.30	23.02	6.72
	MCS1	12.45	13.37	15.94	23.02	7.08
	MCS2	12.47	13.38	15.96	23.02	7.06
	MCS3	12.36	13.44	15.94	23.02	7.08
	MCS4	12.35	13.43	15.93	23.02	7.09
	MCS5	12.43	13.46	15.99	23.02	7.03
	MCS6	12.35	12.95	15.67	23.02	7.35
	MCS7	12.33	13.49	15.96	23.02	7.06
	MCS8	12.81	13.55	16.21	23.02	6.81
	MCS9	12.77	13.53	16.18	23.02	6.84
	MCS10	12.73	13.49	16.14	23.02	6.88
	MCS11	12.70	13.54	16.15	23.02	6.87
	MCS12	12.72	13.49	16.13	23.02	6.89
	MCS13	12.30	13.46	15.93	23.02	7.09
	MCS14	12.26	13.13	15.73	23.02	7.29
	MCS15	12.35	13.20	15.81	23.02	7.21

Note(s):

The following equation was used for spectrum offset:

Spectrum offset (dB) = Attenuator (dB) + Cable Loss (dB) + SMA Type Connector Loss (dB)

[1] Total Peak power = 10 log [(10^(Chain 0 Power/10) + 10^(Chain 1 Power/10)]

For the band 5.47~5.725 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of ***250 mW(24 dBm)*** *or 11 dBm + 10log(26 dB Bandwidth) = 11 dBm + 10log(23.68) = 24.74 dBm*

The maximum conducted output limit is 24 dBm.

[2] As the directional gain is 6.98 dBi, the Maximum conducted output power limit 24 dBm should be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Therefore, the Maximum conducted output power limit is 23.02 dBm.

According to the KDB 662911 D01 v01r02, the directional gain of the correlated signal for the output power is as in the following table.

Frequency Band (GHz)	Antenna G1 (dBi)	Antenna G2 (dBi)	[3]Directional gain for CCD mode (dBi)	[4]Directional gain for correlated signal (dBi)	Antenna limit (dBi)
Band III	4.42	3.50	4.42	6.98	6.00

[3] Directional gain for CCD mode (correlated signal) = G_{ANT} + 0 dB for N_{ANT} = 2

[4] Directional gain for the correlated signal with unequal antenna gains, with equal transmit powers = 10 log[($10^{G1/20}$+$10^{G2/20}$)^2/N_{ANT}] dBi for N_{ANT} = 2

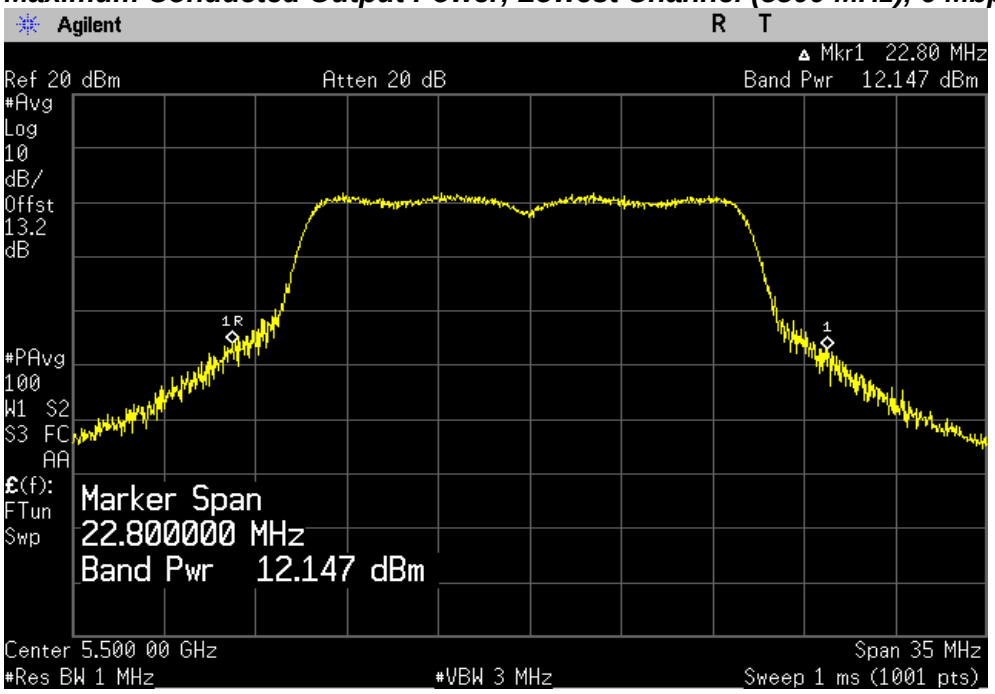
The maximum directional gain is 6.98 dBi.

PLOT OF TEST DATA

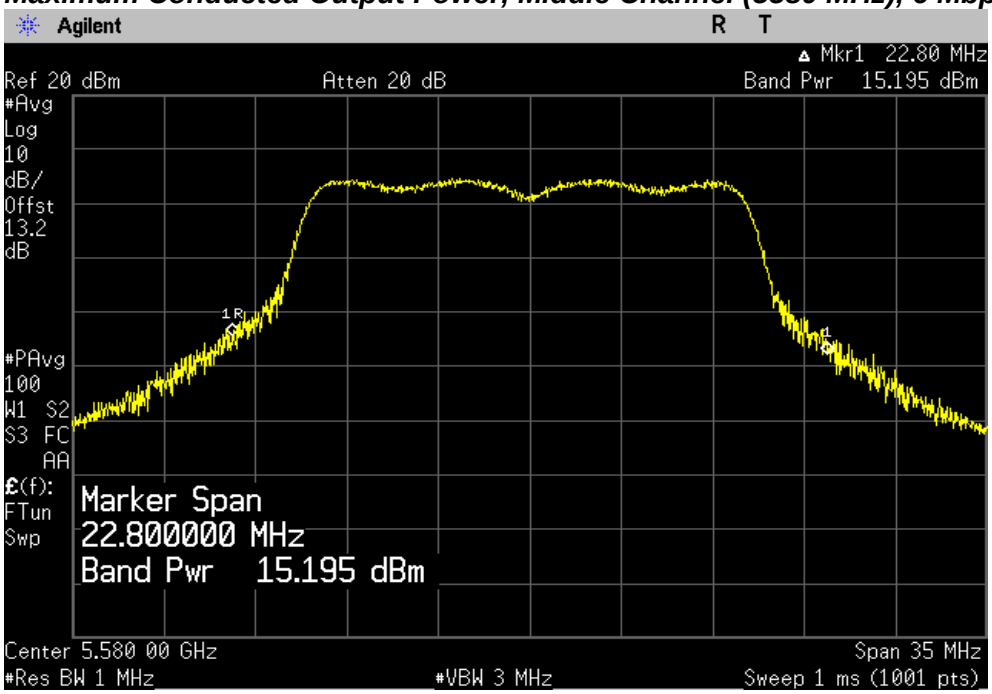
802.11a mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5500 MHz), 6 Mbps data rate

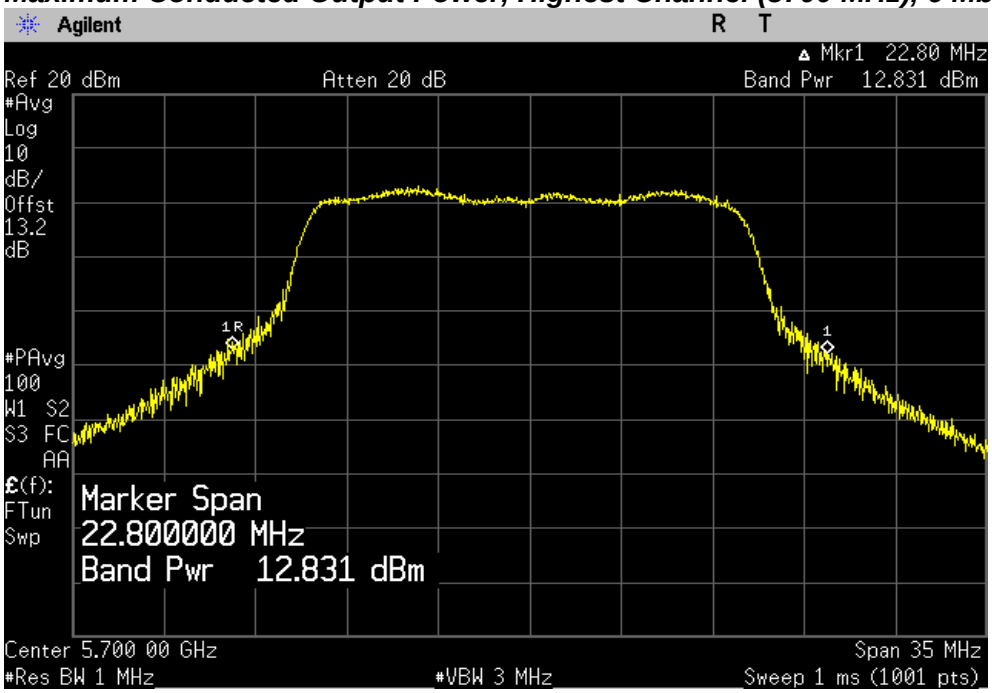


Maximum Conducted Output Power, Middle Channel (5580 MHz), 6 Mbps data rate



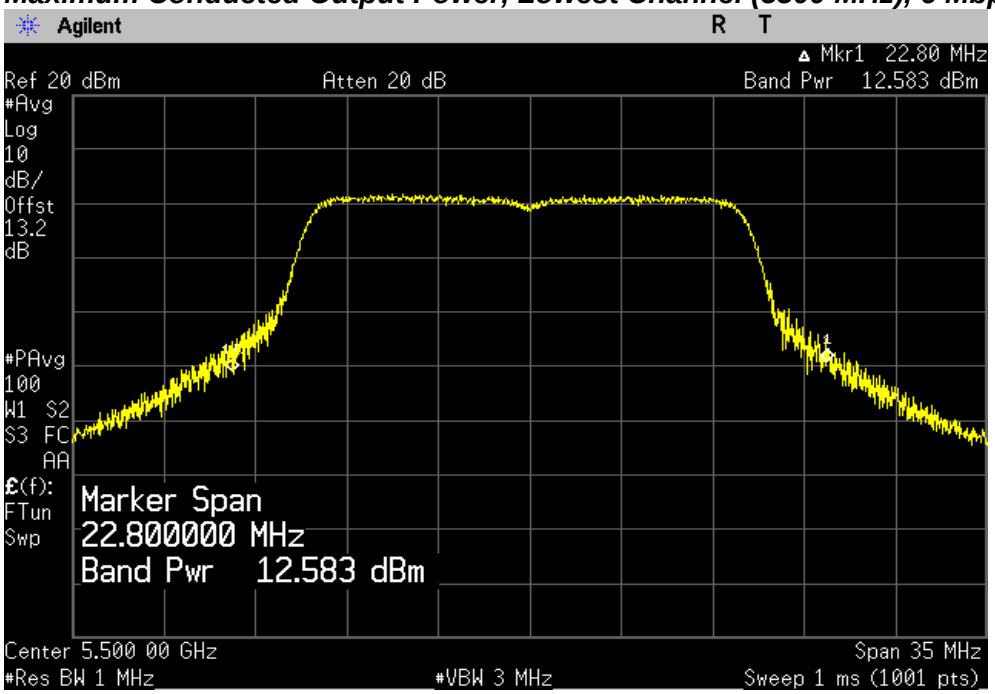
PLOT OF TEST DATA

Maximum Conducted Output Power, Highest Channel (5700 MHz), 6 Mbps data rate



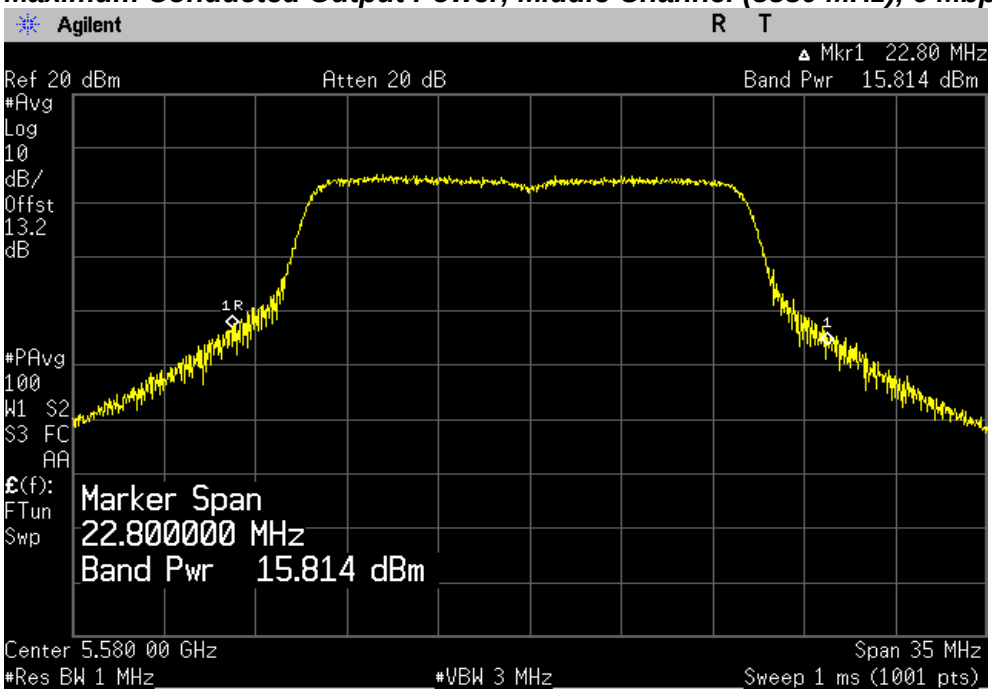
Chain 1

Maximum Conducted Output Power, Lowest Channel (5500 MHz), 6 Mbps data rate

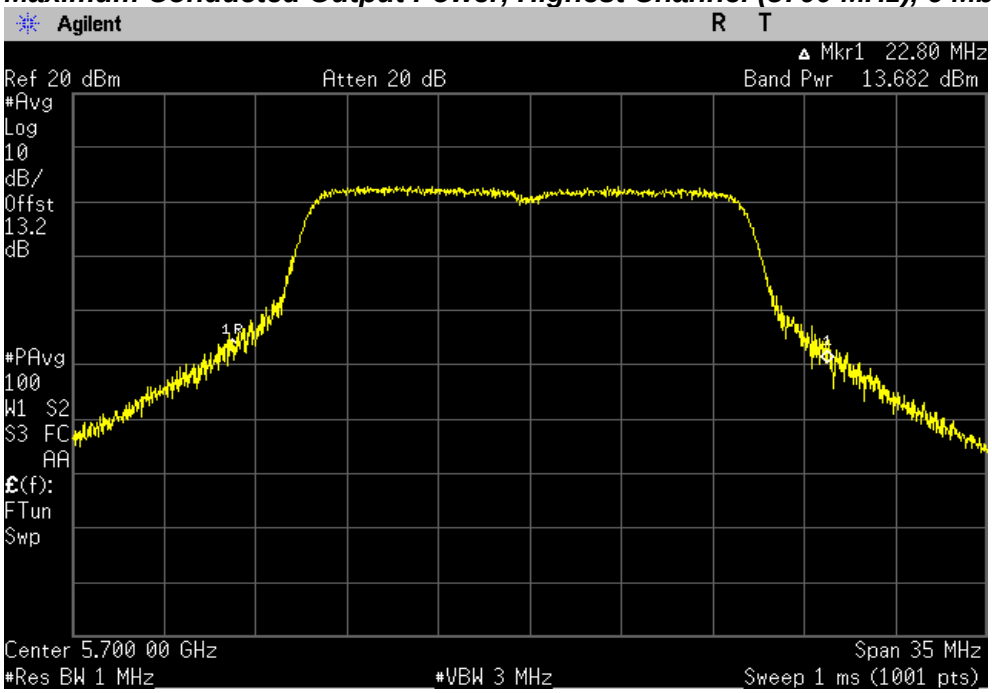


PLOT OF TEST DATA

Maximum Conducted Output Power, Middle Channel (5580 MHz), 6 Mbps data rate



Maximum Conducted Output Power, Highest Channel (5700 MHz), 6 Mbps data rate

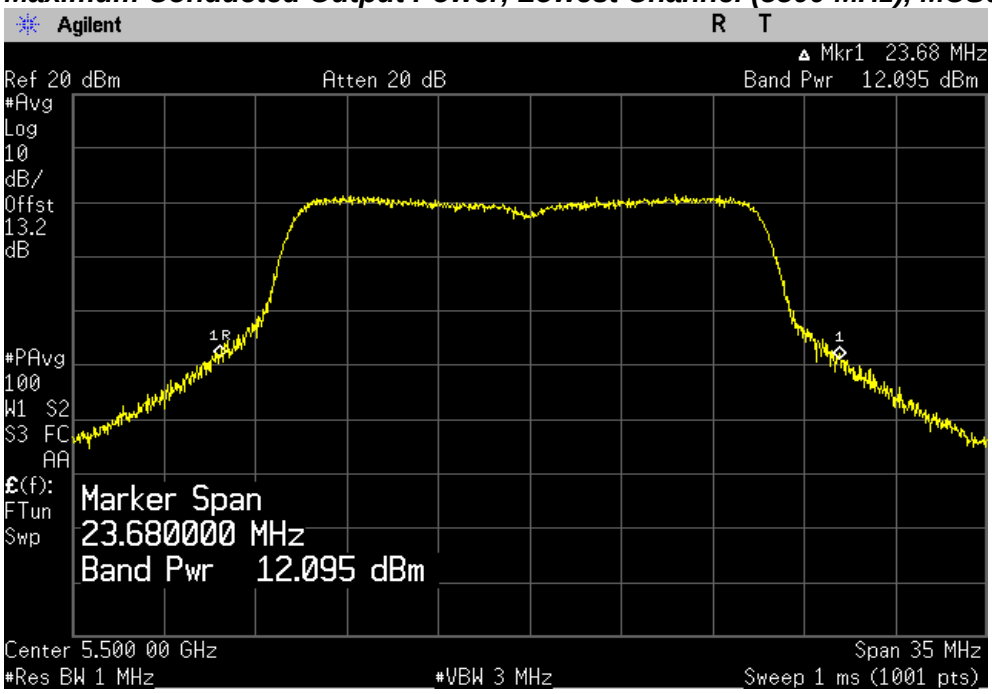


PLOT OF TEST DATA

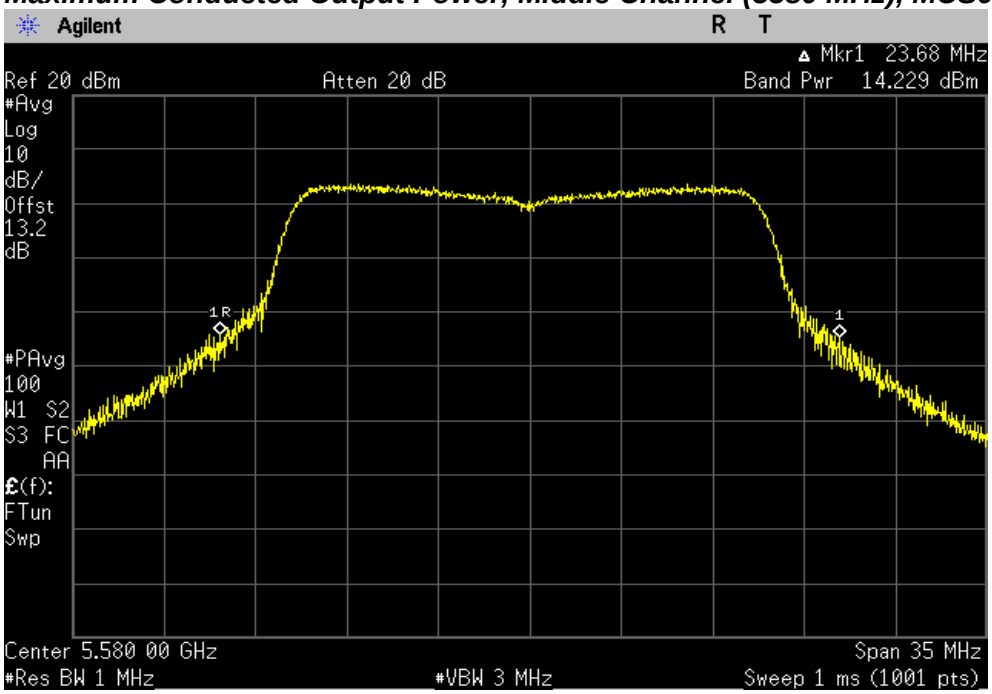
802.11n mode

Chain 0

Maximum Conducted Output Power, Lowest Channel (5500 MHz), MCS0 data rate

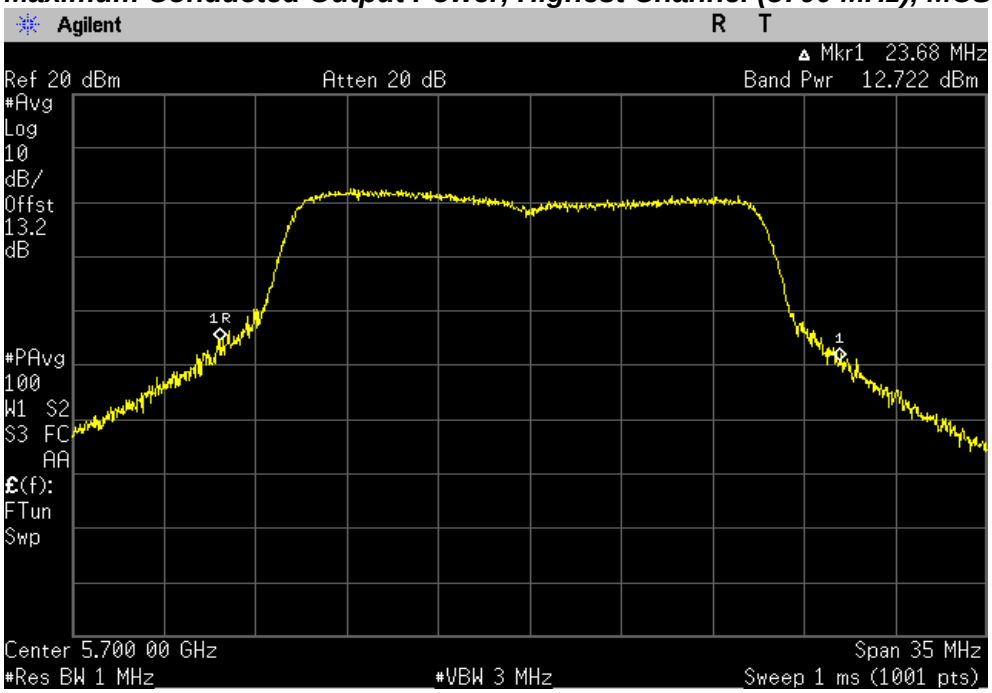


Maximum Conducted Output Power, Middle Channel (5580 MHz), MCS0 data rate



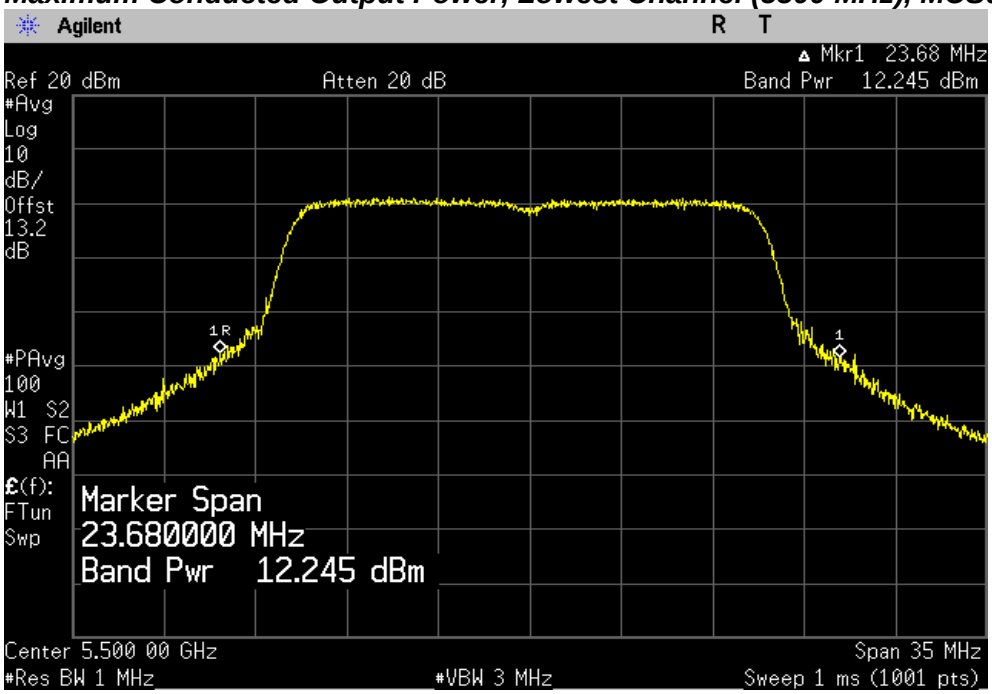
PLOT OF TEST DATA

Maximum Conducted Output Power, Highest Channel (5700 MHz), MCS0 data rate



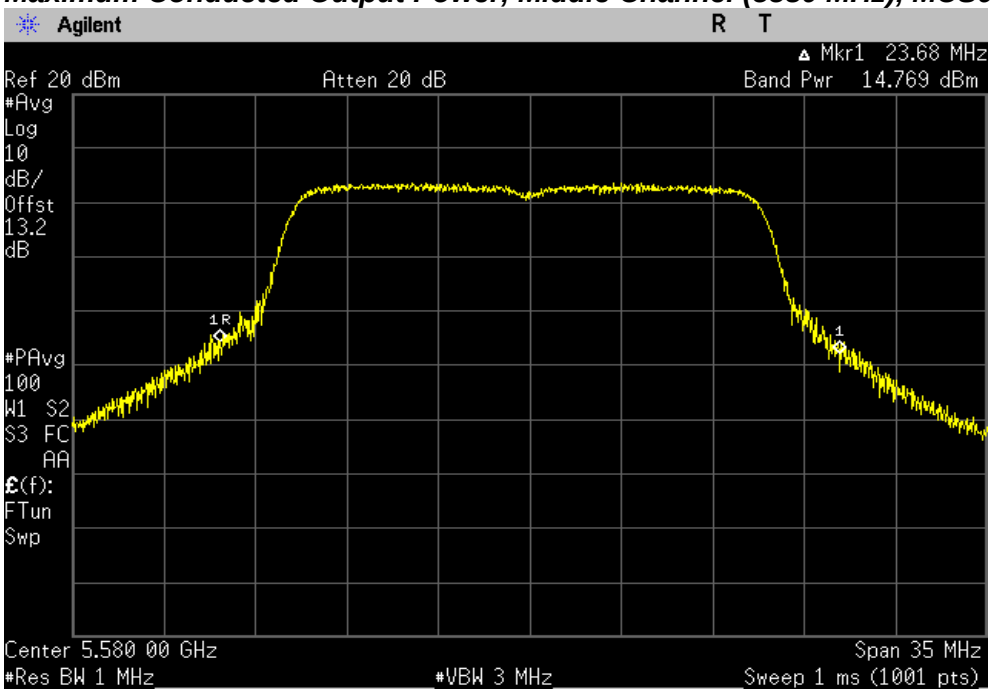
Chain 1

Maximum Conducted Output Power, Lowest Channel (5500 MHz), MCS0 data rate

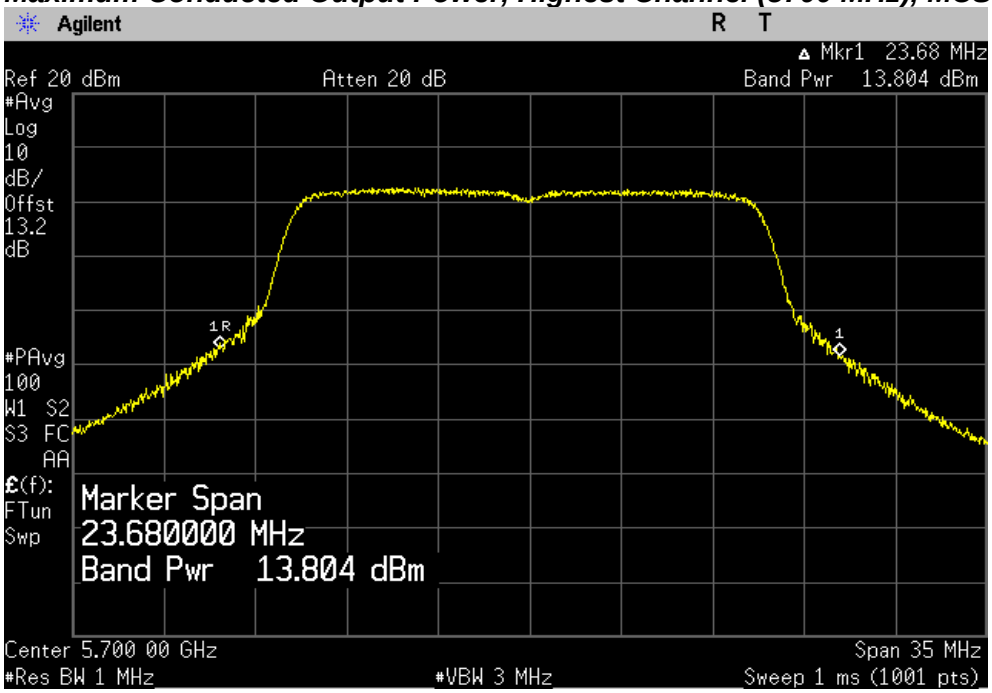


PLOT OF TEST DATA

Maximum Conducted Output Power, Middle Channel (5580 MHz), MCS0 data rate



Maximum Conducted Output Power, Highest Channel (5700 MHz), MCS0 data rate



8.5 Power Spectral Density

8.5.1 Power Spectral Density – Band I

FCC §15.407(a)

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

802.11a

Frequency (MHz)	TX Chain	Power Spectral Density (dBm)	1)10 log(N_{ANT}) (dB)	2)Total Power Density(dBm)	3)Limit (dBm)	Margin (dB)
5180	Chain 0	-1.01	3.01	2.00	3.20	1.20
	Chain 1	-0.25	3.01	2.76	3.20	0.44
5200	Chain 0	-1.02	3.01	2.00	3.20	1.21
	Chain 1	-0.42	3.01	2.59	3.20	0.61
5240	Chain 0	-0.66	3.01	2.35	3.20	0.85
	Chain 1	-0.27	3.01	2.74	3.20	0.46

802.11n

Frequency (MHz)	TX Chain	Power Spectral Density (dBm)	1)10 log(N_{ANT}) (dB)	2)Total Power Density(dBm)	3)Limit (dBm)	Margin (dB)
5180	Chain 0	-1.35	3.01	1.66	3.20	1.54
	Chain 1	-0.52	3.01	2.49	3.20	0.71
5200	Chain 0	-1.12	3.01	1.89	3.20	1.31
	Chain 1	-0.32	3.01	2.69	3.20	0.51
5240	Chain 0	-1.12	3.01	1.89	3.20	1.31
	Chain 1	-0.49	3.01	2.52	3.20	0.68

Note(s):

The following equation was used for spectrum offset:
Spectrum offset (dB) = Attenuator (dB) + Cable Loss (dB) + SMA Type Connector Loss (dB)

1) According to "KDB 662911 D01 Multiple Transmitter Output v1r02 In-band Power Spectral Density (PSD) Measurement", 10 log (N_{ANT}) was be added at each output of the device.
Since the device have two antennas, 10 log(N_{ANT}) will be 3.01 dB.
2) Total power density = Each of the spectral power density (dBm) + 10 log(N_{ANT}) (dB)
3) As the directional gain is 6.80 dBi, the peak power spectral density limit 4 dBm should be reduced by the amount in dB that directional gain of the antenna exceeds 6 dBi.
Therefore, the peak power spectral density limit is 3.2 dBm.

According to the KDB 662911 D01 v01r02, the directional gain of the correlated signal for the power spectral density is as in the following table.

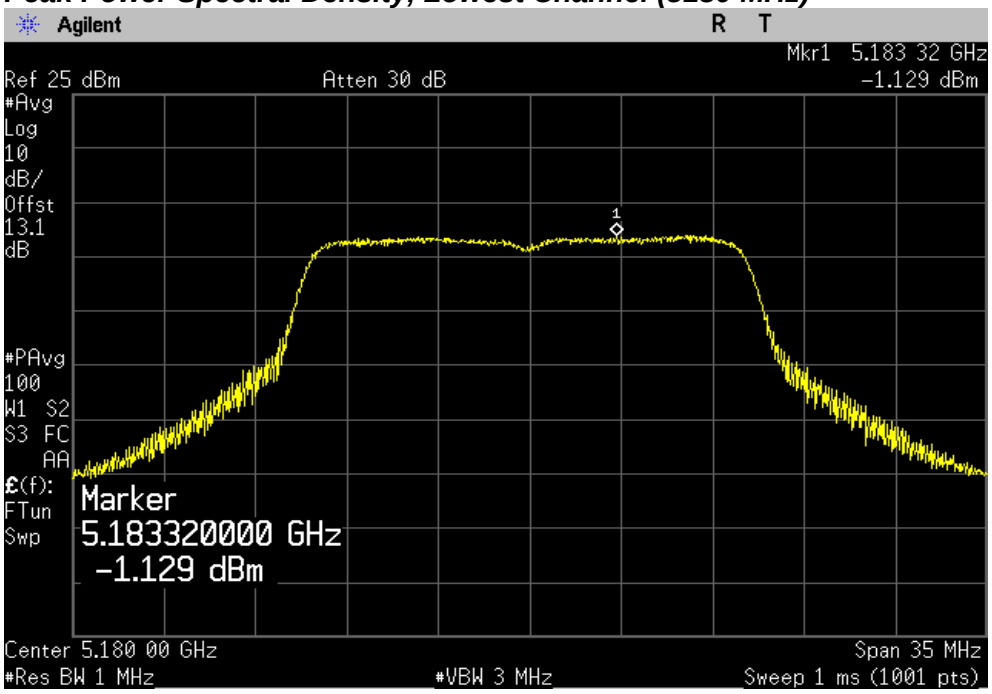
Frequency Band	Antenna G1 (dBi)	Antenna G2 (dBi)	4)Directional gain for CCD mode (dBi)	5)Directional gain for correlated signal (dBi)	Antenna limit (dBi)
Band I	3.79	3.79	6.80	6.80	6.00

4) Directional gain for CCD mode (correlated signal) = G_{ANT} + 10log(N_{ANT}/N_{SS}) dB for N_{ANT} = 2, N_{SS} = 1
5) Directional gain for the correlated signal with equal antenna gains, with equal transmit powers = G_{ANT} + 10 log(N_{ANT}) dBi for G_{ANT} = 3.79 and N_{ANT} = 2
The maximum directional gain is 6.80 dBi.

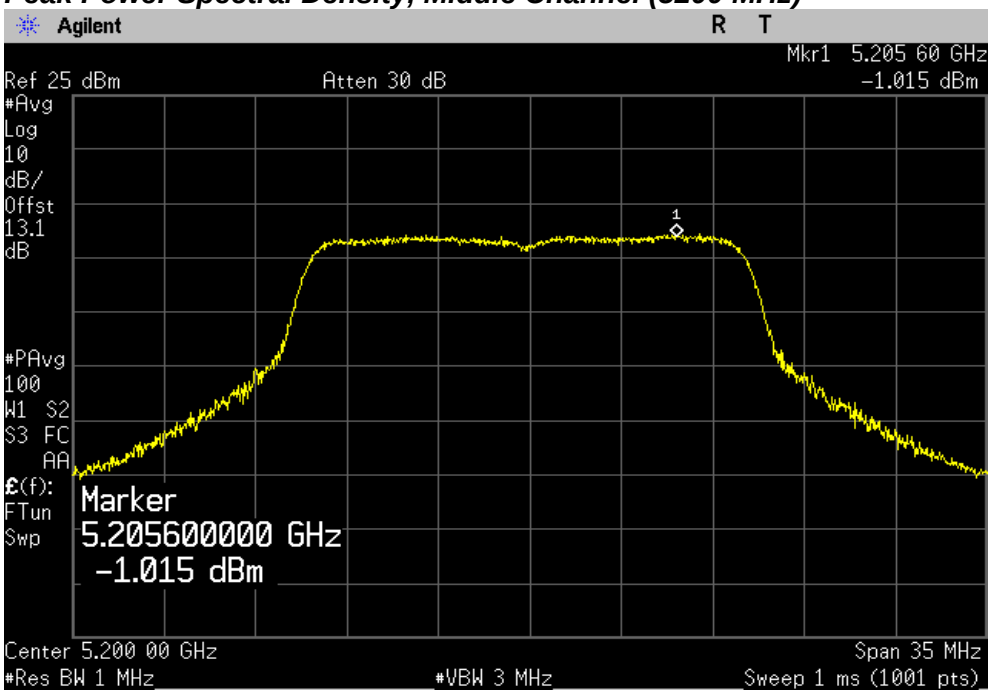
802.11a mode

Chain 0

Peak Power Spectral Density, Lowest Channel (5180 MHz)

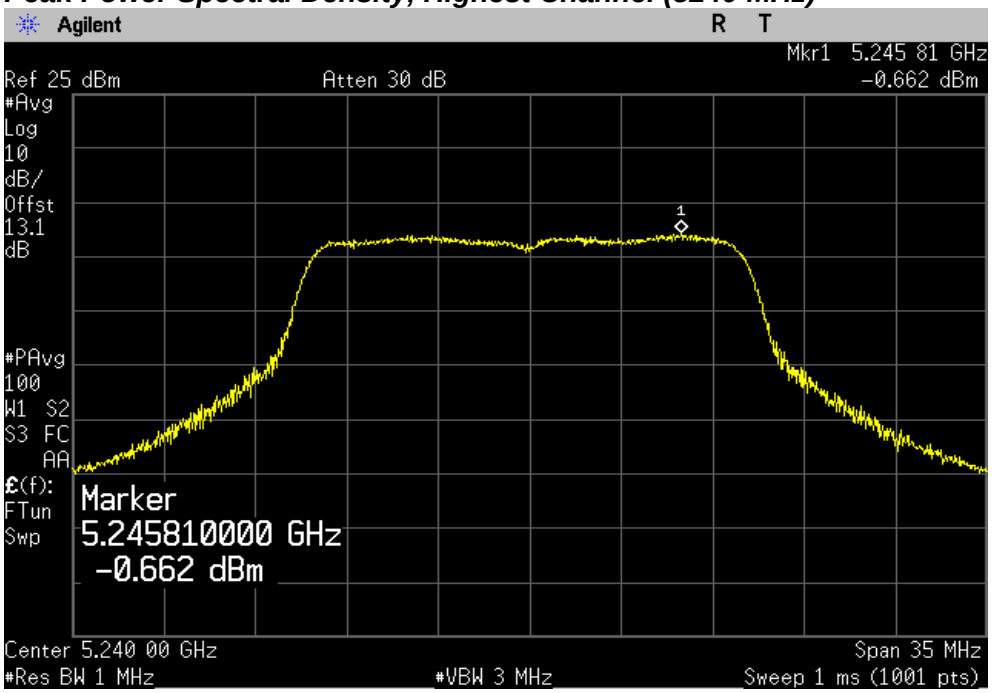


Peak Power Spectral Density, Middle Channel (5200 MHz)



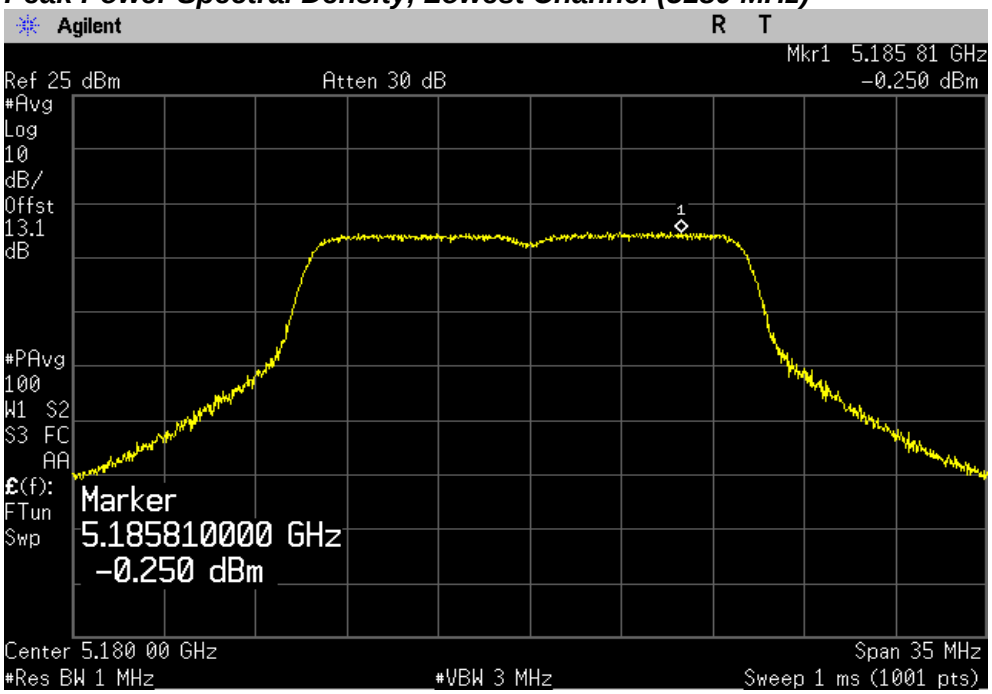
PLOTS OF EMISSIONS

Peak Power Spectral Density, Highest Channel (5240 MHz)



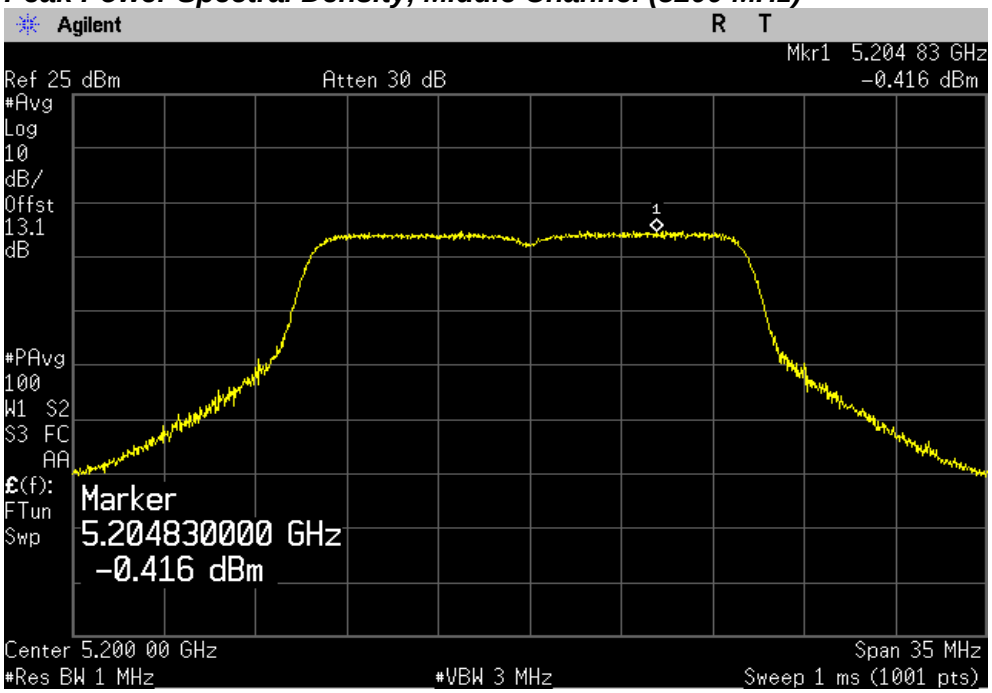
Chain 1

Peak Power Spectral Density, Lowest Channel (5180 MHz)

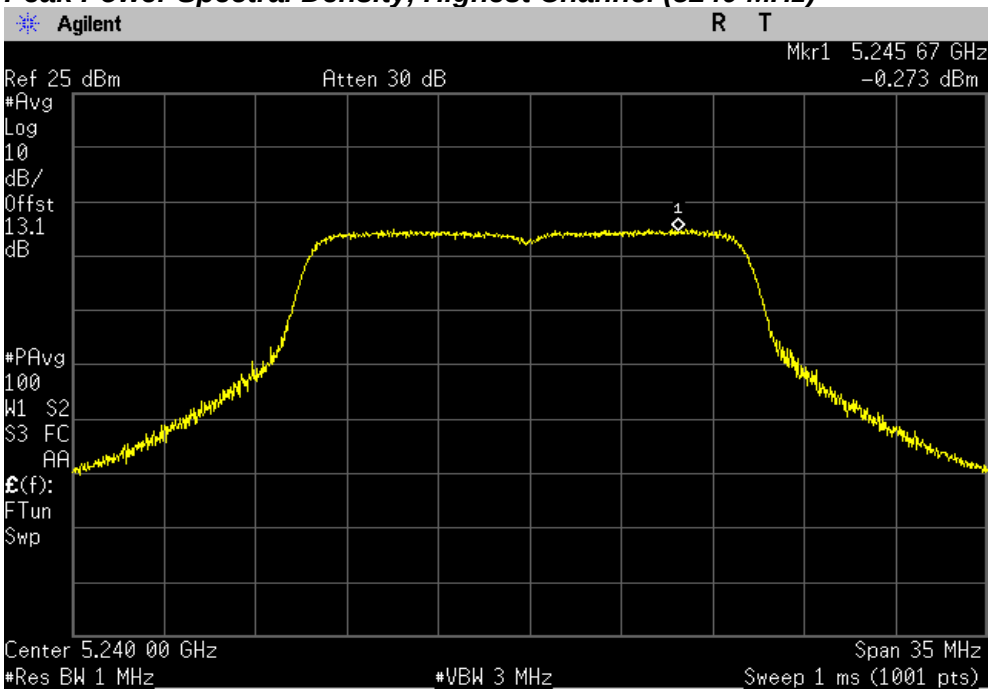


PLOTS OF EMISSIONS

Peak Power Spectral Density, Middle Channel (5200 MHz)



Peak Power Spectral Density, Highest Channel (5240 MHz)

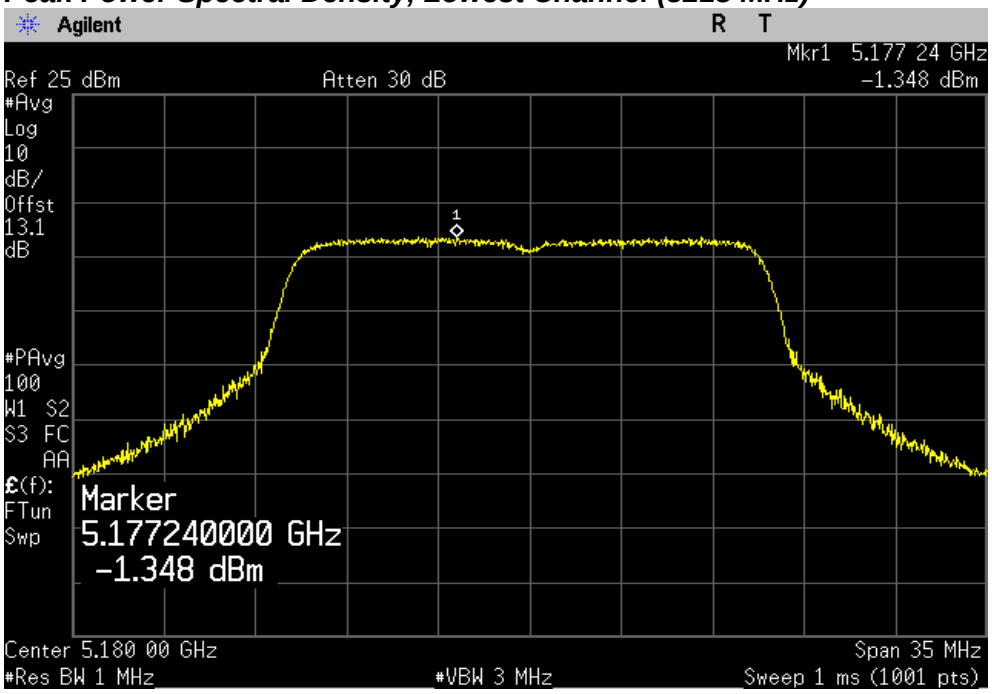


PLOT OF TEST DATA

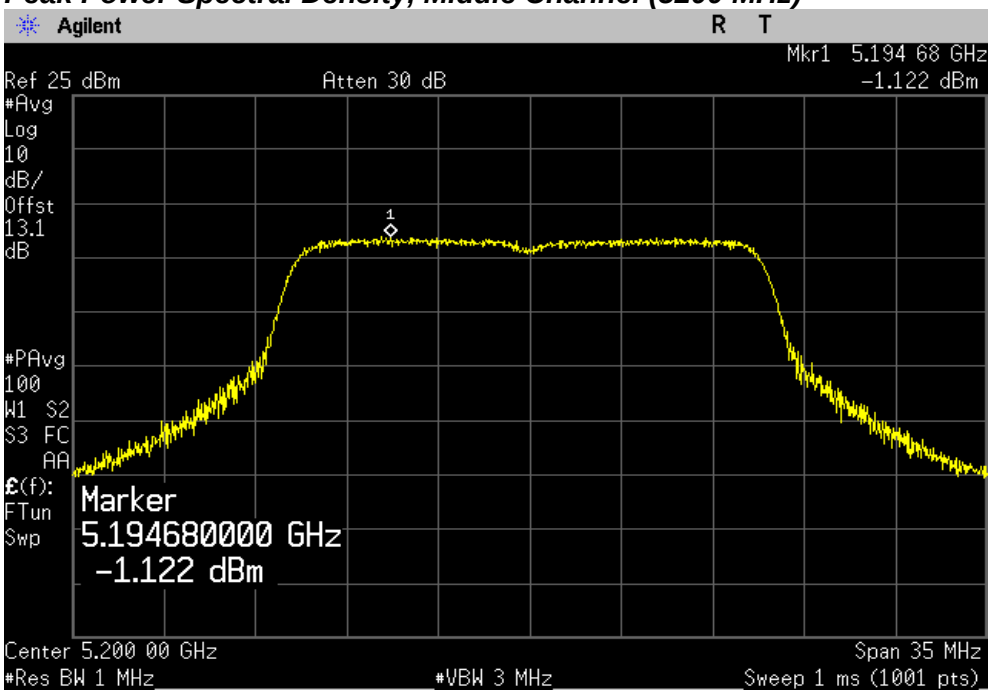
802.11n mode

Chain 0

Peak Power Spectral Density, Lowest Channel (5218 MHz)

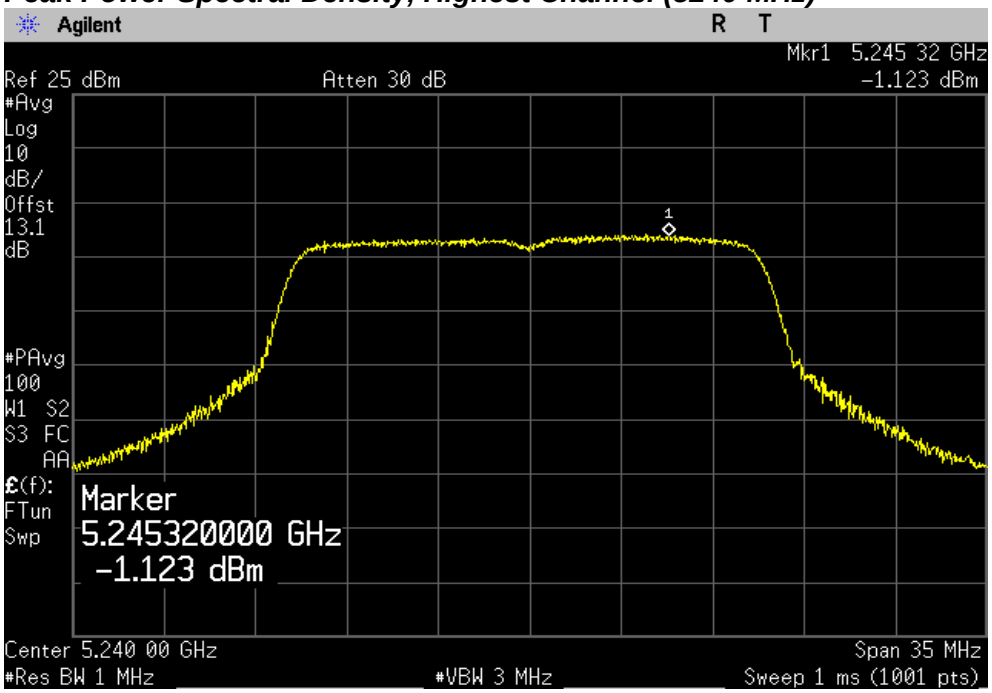


Peak Power Spectral Density, Middle Channel (5200 MHz)



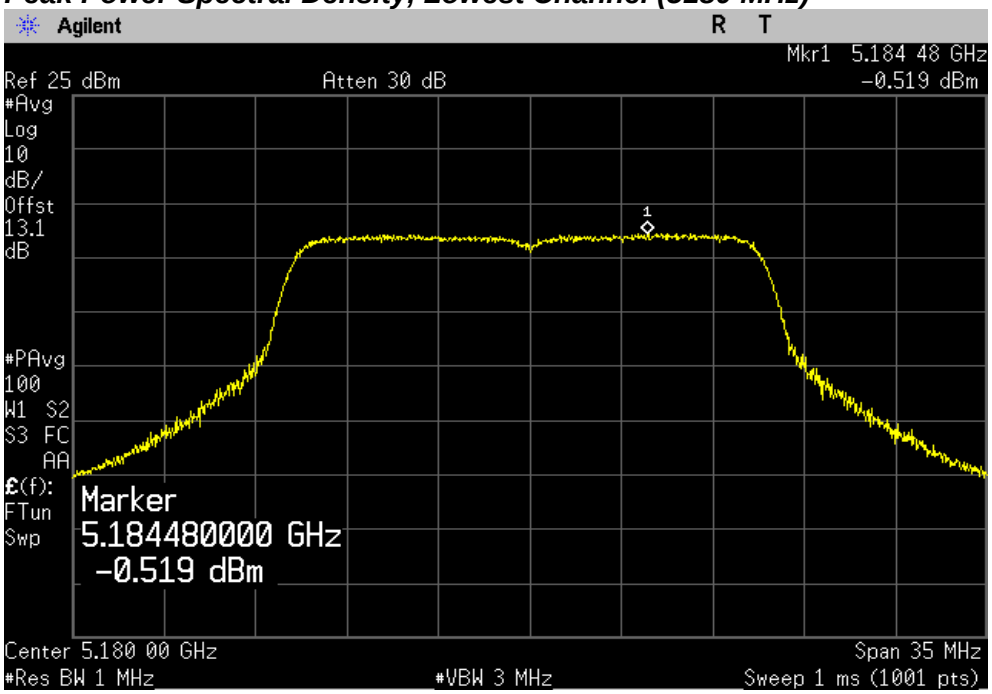
PLOTS OF EMISSIONS

Peak Power Spectral Density, Highest Channel (5240 MHz)



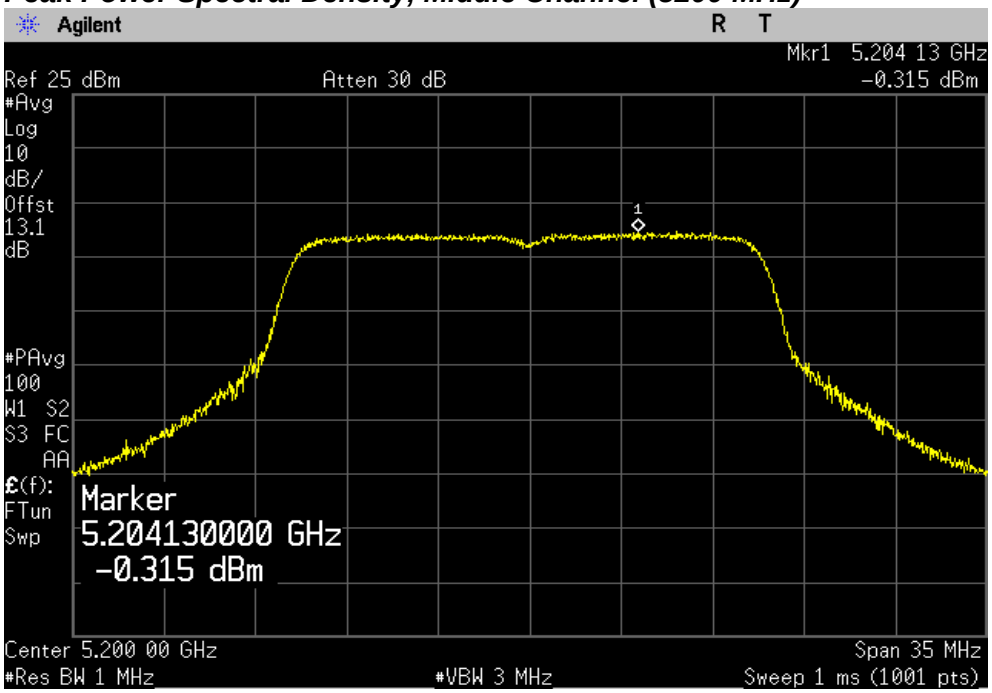
Chain 1

Peak Power Spectral Density, Lowest Channel (5180 MHz)

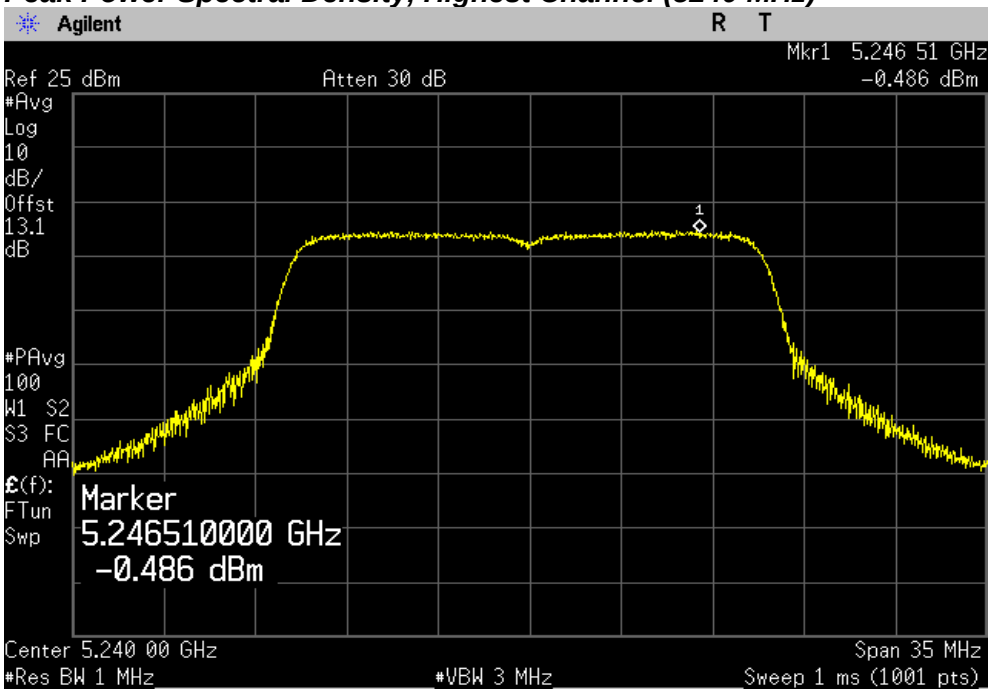


PLOTS OF EMISSIONS

Peak Power Spectral Density, Middle Channel (5200 MHz)



Peak Power Spectral Density, Highest Channel (5240 MHz)



8.5.2 Power Spectral Density – Band II

FCC §15.407(a)

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

802.11a

Frequency (MHz)	TX Chain	Power Spectral Density (dBm)	1)10 log(N_{ANT}) (dB)	2)Total Power Density(dBm)	3)Limit (dBm)	Margin (dB)
5260	Chain 0	5.56	3.01	8.57	10.21	1.64
	Chain 1	5.55	3.01	8.56	10.21	1.65
5280	Chain 0	5.73	3.01	8.74	10.21	1.47
	Chain 1	5.54	3.01	8.55	10.21	1.66
5320	Chain 0	1.66	3.01	4.67	10.21	5.54
	Chain 1	2.08	3.01	5.09	10.21	5.12

802.11n

Frequency (MHz)	TX Chain	Power Spectral Density (dBm)	1)10 log(N_{ANT}) (dB)	2)Total Power Density(dBm)	3)Limit (dBm)	Margin (dB)
5260	Chain 0	4.04	3.01	7.05	10.21	3.16
	Chain 1	4.30	3.01	7.31	10.21	2.90
5280	Chain 0	4.24	3.01	7.25	10.21	2.96
	Chain 1	3.79	3.01	6.80	10.21	3.41
5320	Chain 0	1.48	3.01	4.49	10.21	5.72
	Chain 1	0.98	3.01	3.99	10.21	6.22

Note(s):

The following equation was used for spectrum offset:
Spectrum offset (dB) = Attenuator (dB) + Cable Loss (dB) + SMA Type Connector Loss (dB)

[1] According to "KBD 662911 D01 Multiple Transmitter Output v1r02 In-band Power Spectral Density (PSD) Measurement", 10 log (N_{ANT}) was be added at each output of the device.
Since the device have two antennas, 10 log(N_{ANT}) will be 3.01 dB.
[2] Total power density = Each of the spectral power density (dBm) + 10 log(N_{ANT}) (dB)
[3] As the directional gain is 6.79 dBi, the peak power spectral density limit 11 dBm should be reduced by the amount in dB that directional gain of the antenna exceeds 6 dBi.
Therefore, the peak power spectral density limit is 10.21 dBm.

According to the KDB 662911 D01 v01r02, the directional gain of the correlated signal for the power spectral density is as in the following table.

Frequency Band	Antenna G1 (dBi)	Antenna G2 (dBi)	[4]Directional gain for CCD mode (dBi)	[5]Directional gain for correlated signal (dBi)	Antenna limit (dBi)
Band II	3.79	3.79	6.80	6.80	6.00

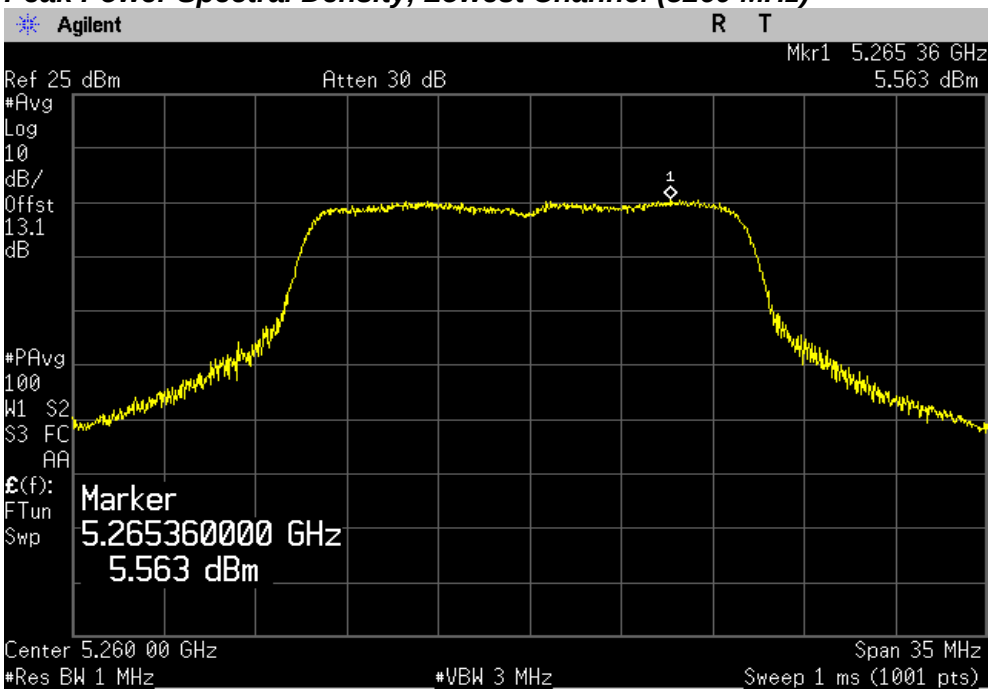
[4] Directional gain for CCD mode (correlated signal) = G_{ANT} + 10log(N_{ANT}/N_{SS}) dB for N_{ANT} = 2, N_{SS} = 1
[5] Directional gain for the correlated signal with equal antenna gains, with equal transmit powers
= G_{ANT} + 10 log(N_{ANT}) dBi for G_{ANT} = 3.79 and N_{ANT} = 2
The maximum directional gain is 6.80 dBi.

PLOT OF TEST DATA

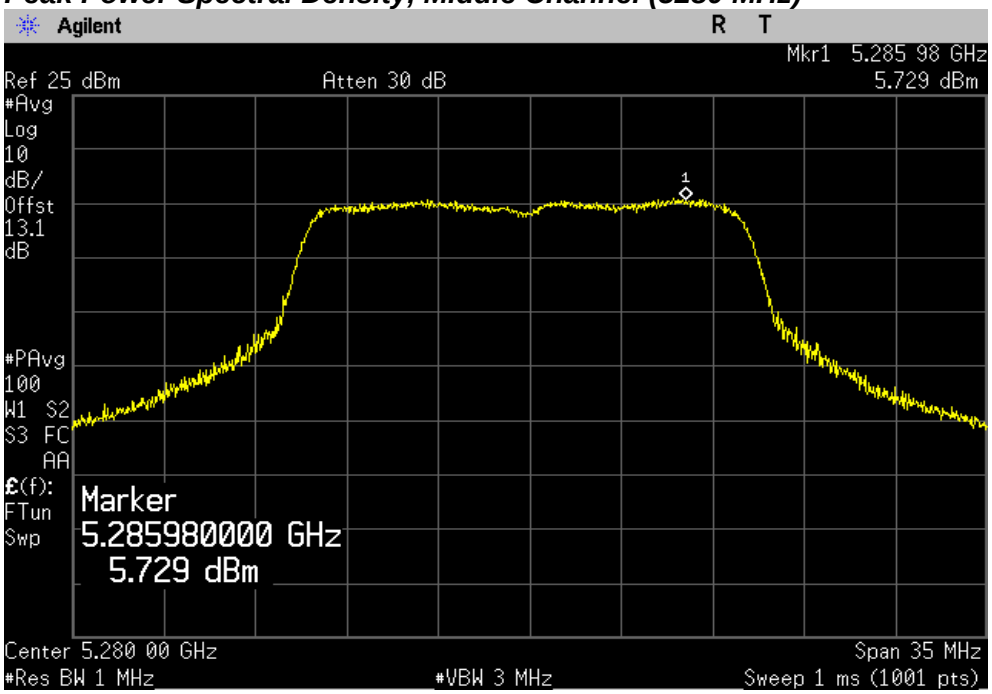
802.11a mode

Chain 0

Peak Power Spectral Density, Lowest Channel (5260 MHz)

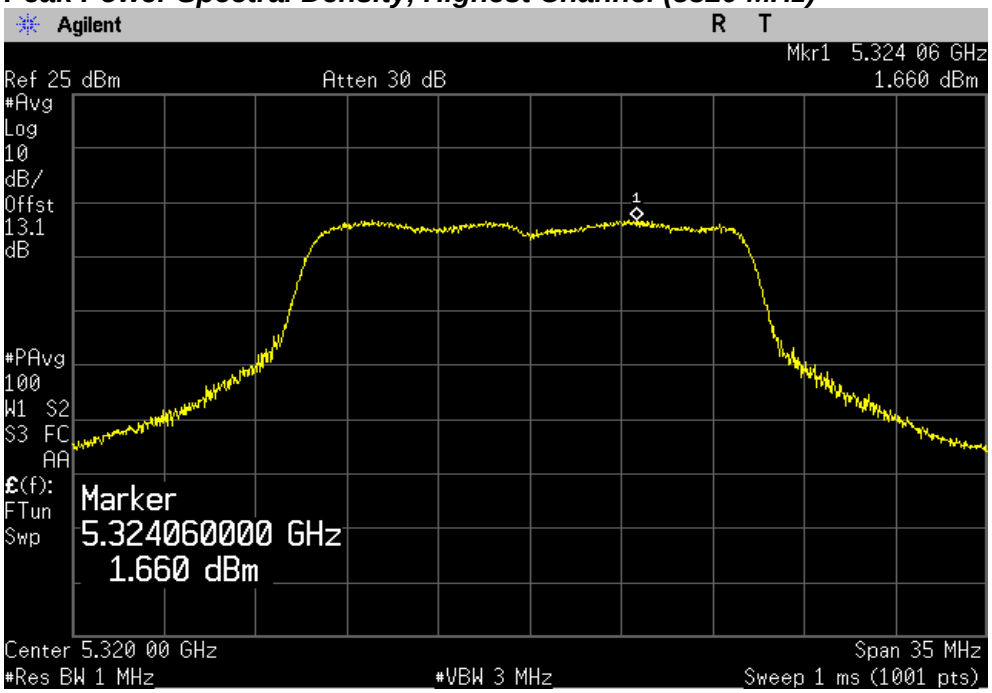


Peak Power Spectral Density, Middle Channel (5280 MHz)



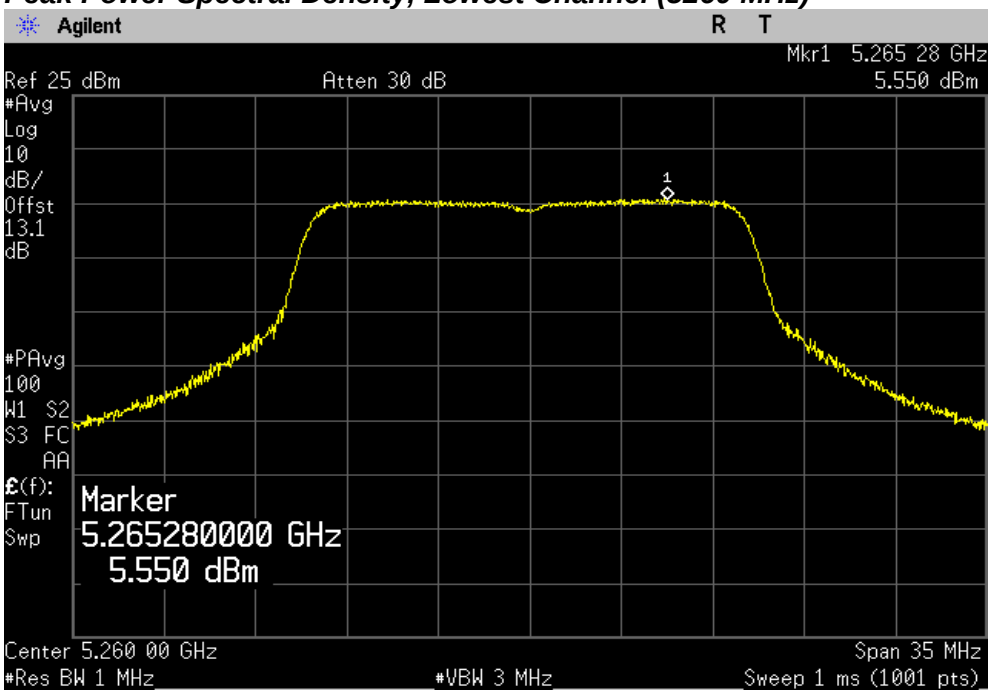
PLOTS OF EMISSIONS

Peak Power Spectral Density, Highest Channel (5320 MHz)



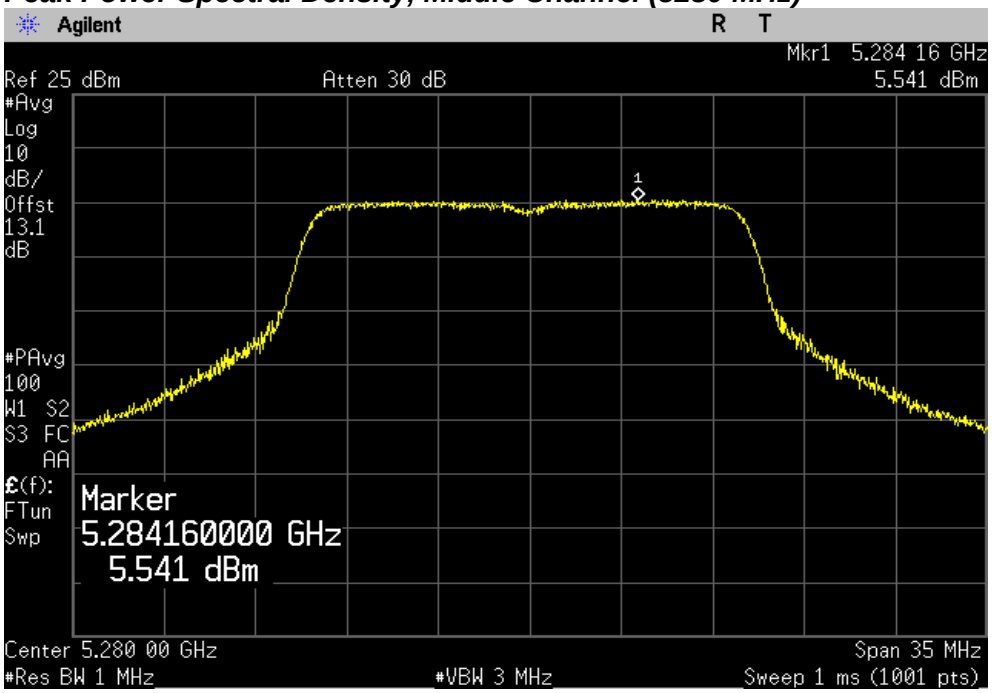
Chain 1

Peak Power Spectral Density, Lowest Channel (5260 MHz)

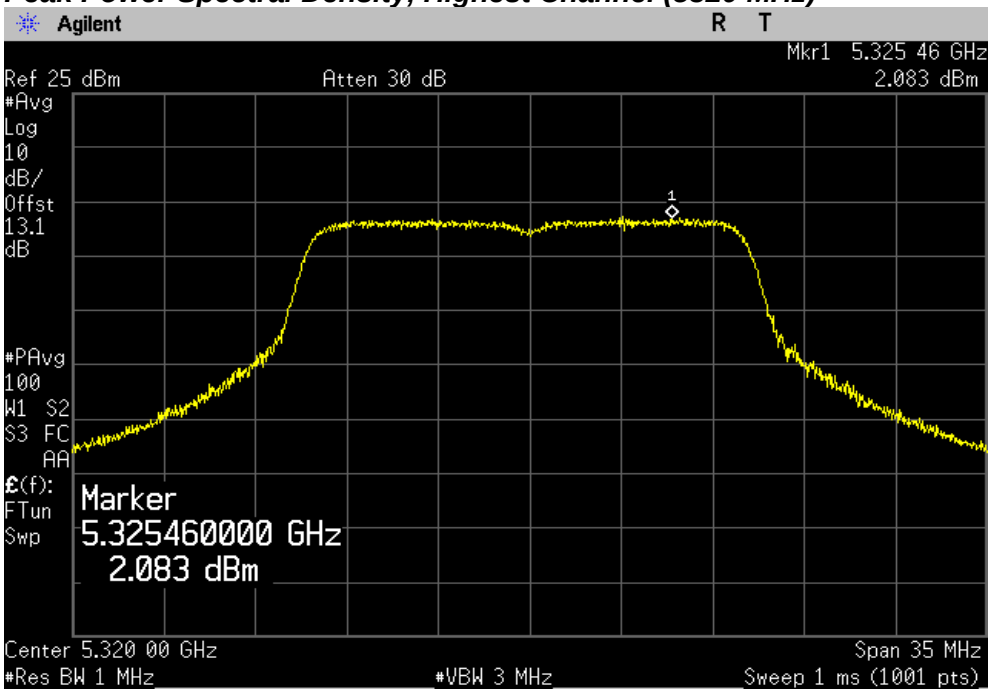


PLOTS OF EMISSIONS

Peak Power Spectral Density, Middle Channel (5280 MHz)



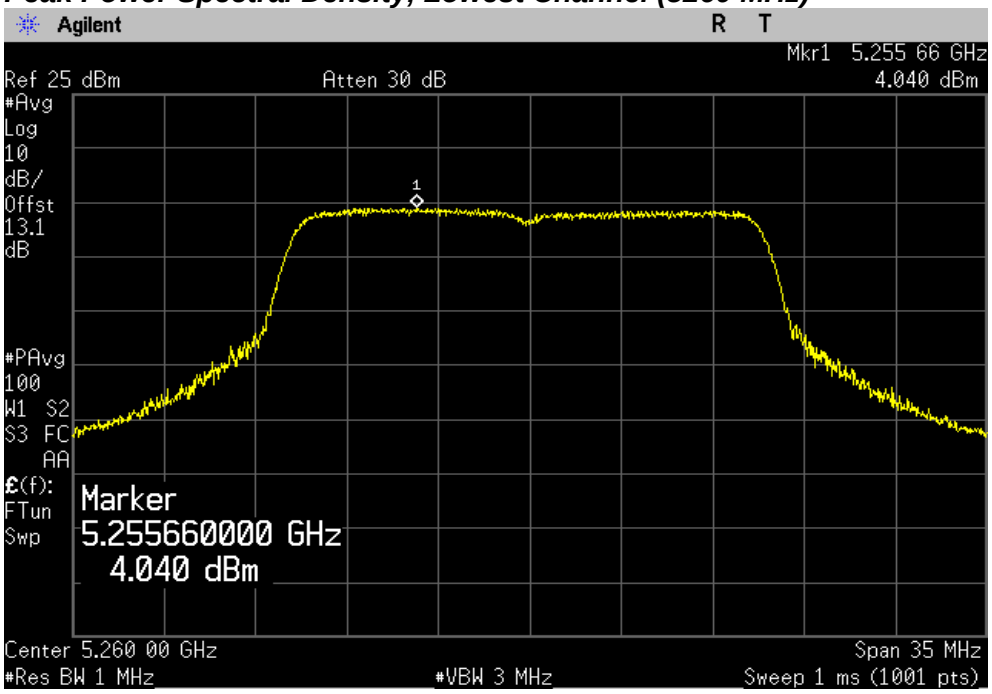
Peak Power Spectral Density, Highest Channel (5320 MHz)



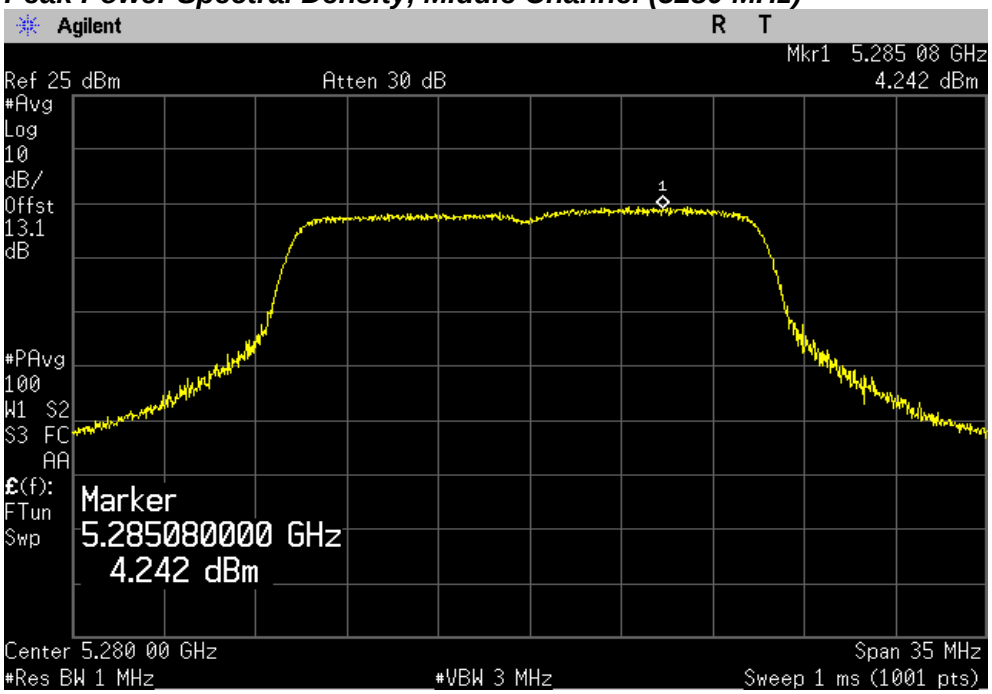
802.11n mode

Chain 0

Peak Power Spectral Density, Lowest Channel (5260 MHz)

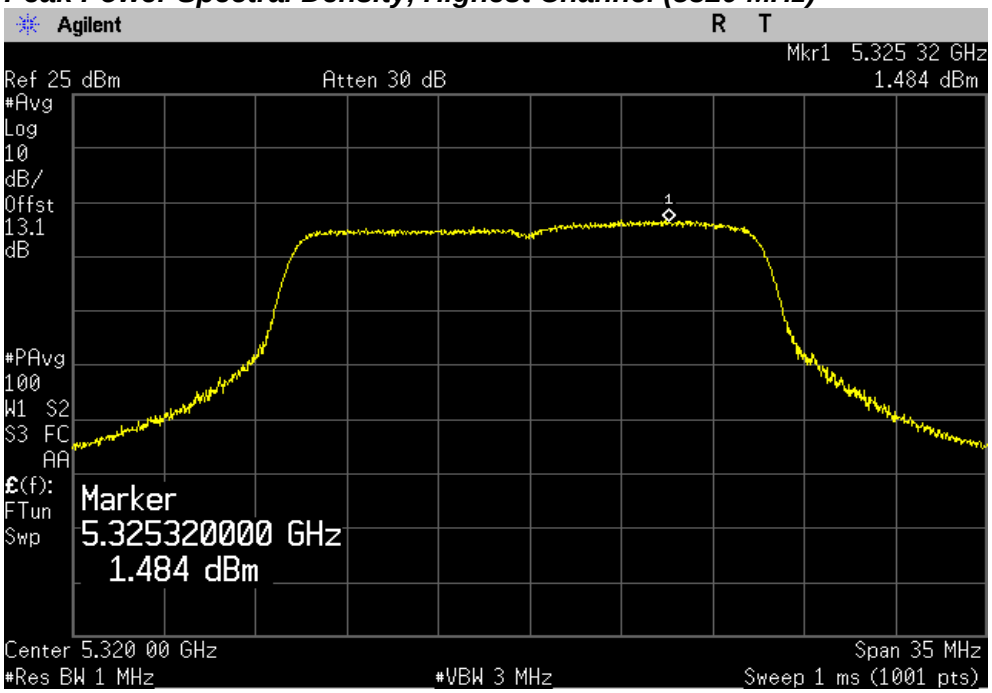


Peak Power Spectral Density, Middle Channel (5280 MHz)



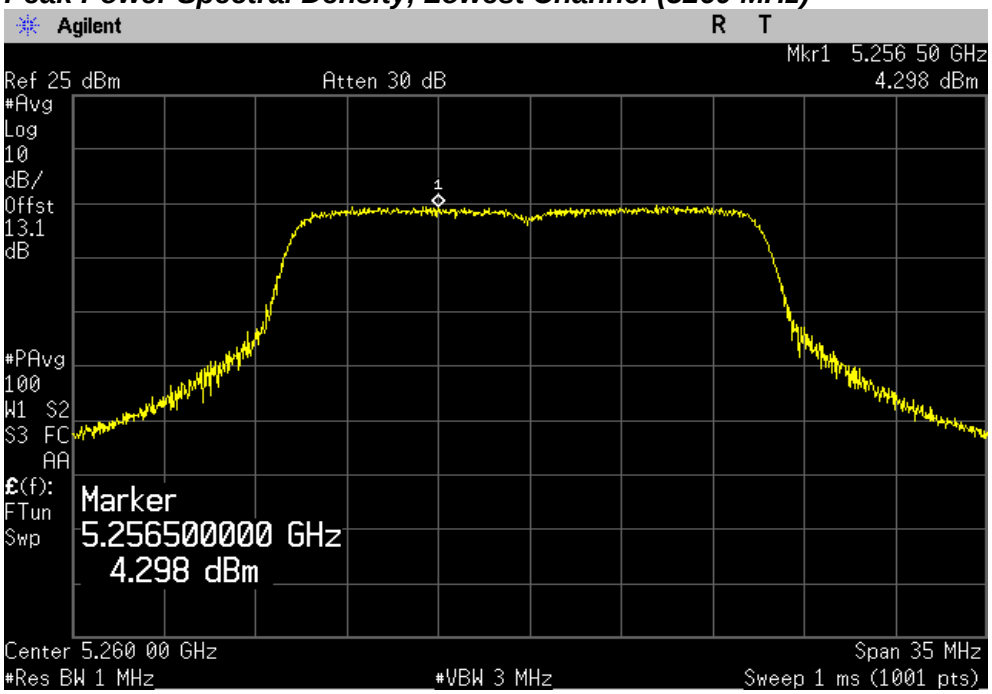
PLOTS OF EMISSIONS

Peak Power Spectral Density, Highest Channel (5320 MHz)



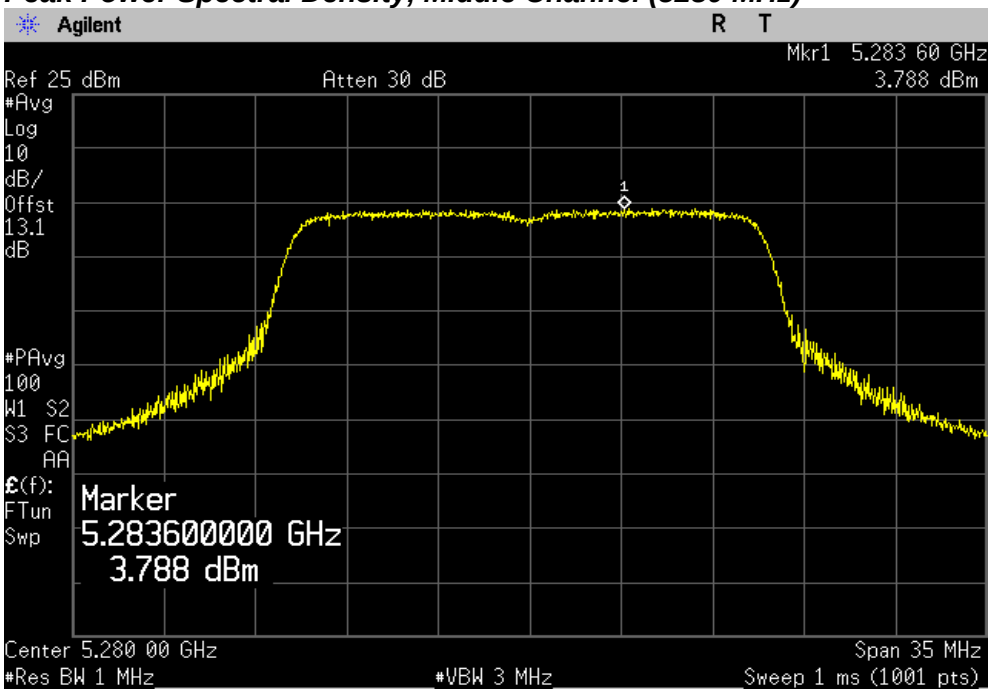
Chain 1

Peak Power Spectral Density, Lowest Channel (5260 MHz)

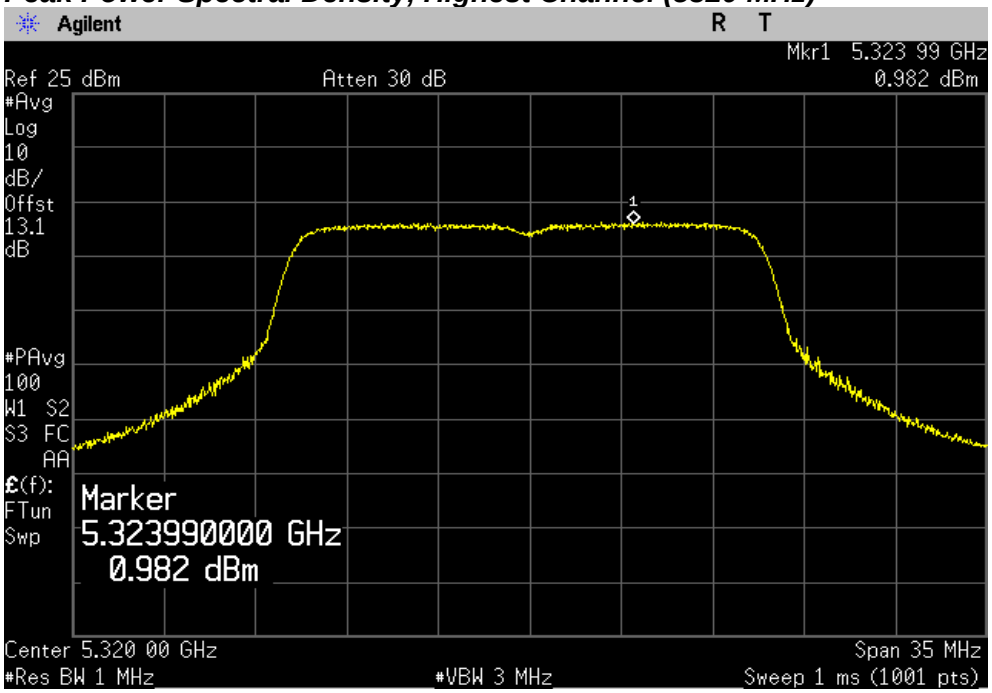


PLOTS OF EMISSIONS

Peak Power Spectral Density, Middle Channel (5280 MHz)



Peak Power Spectral Density, Highest Channel (5320 MHz)



8.5.3 Power Spectral Density – Band III

FCC §15.407(a)

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

802.11a

Frequency (MHz)	TX Chain	Power Spectral Density (dBm)	1)10 log(N_{ANT}) (dB)	2)Total Power Density(dBm)	3)Limit (dBm)	Margin (dB)
5500	Chain 0	1.75	3.01	4.76	9.57	4.81
	Chain 1	1.65	3.01	4.66	9.57	4.91
5580	Chain 0	4.93	3.01	7.94	9.57	1.63
	Chain 1	5.18	3.01	8.19	9.57	1.38
5700	Chain 0	2.40	3.01	5.41	9.57	4.16
	Chain 1	2.28	3.01	5.29	9.57	4.28

802.11n

Frequency (MHz)	TX Chain	Power Spectral Density (dBm)	1)10 log(N_{ANT}) (dB)	2)Total Power Density(dBm)	3)Limit (dBm)	Margin (dB)
5500	Chain 0	1.13	3.01	4.14	9.57	5.43
	Chain 1	1.11	3.01	4.12	9.57	5.45
5580	Chain 0	3.59	3.01	6.60	9.57	2.97
	Chain 1	3.67	3.01	6.68	9.57	2.89
5700	Chain 0	2.44	3.01	5.45	9.57	4.12
	Chain 1	2.27	3.01	5.28	9.57	4.29

Note(s):

The following equation was used for spectrum offset:
Spectrum offset (dB) = Attenuator (dB) + Cable Loss (dB) + SMA Type Connector Loss (dB)

[1] According to "KDB 662911 D01 Multiple Transmitter Output v1r02 In-band Power Spectral Density (PSD) Measurement", 10 log (N_{ANT}) was be added at each output of the device.
Since the device have two antennas, 10 log(N_{ANT}) will be 3.01 dB.
[2] Total power density = Each of the spectral power density (dBm) + 10 log(N_{ANT}) (dB)
[3] As the directional gain is 7.43 dBi, the peak power spectral density limit 11 dBm should be reduced by the amount in dB that directional gain of the antenna exceeds 6 dBi.
Therefore, the peak power spectral density limit is 9.57 dBm.

According to the KDB 662911 D01 v01r02, the directional gain of the correlated signal for the power spectral density is as in the following table.

Frequency Band	Antenna G1 (dBi)	Antenna G2 (dBi)	[4]Directional gain for CCD mode (dBi)	[5]Directional gain for correlated signal (dBi)	Antenna limit (dBi)
Band III	4.42	3.50	7.43	6.98	6.00

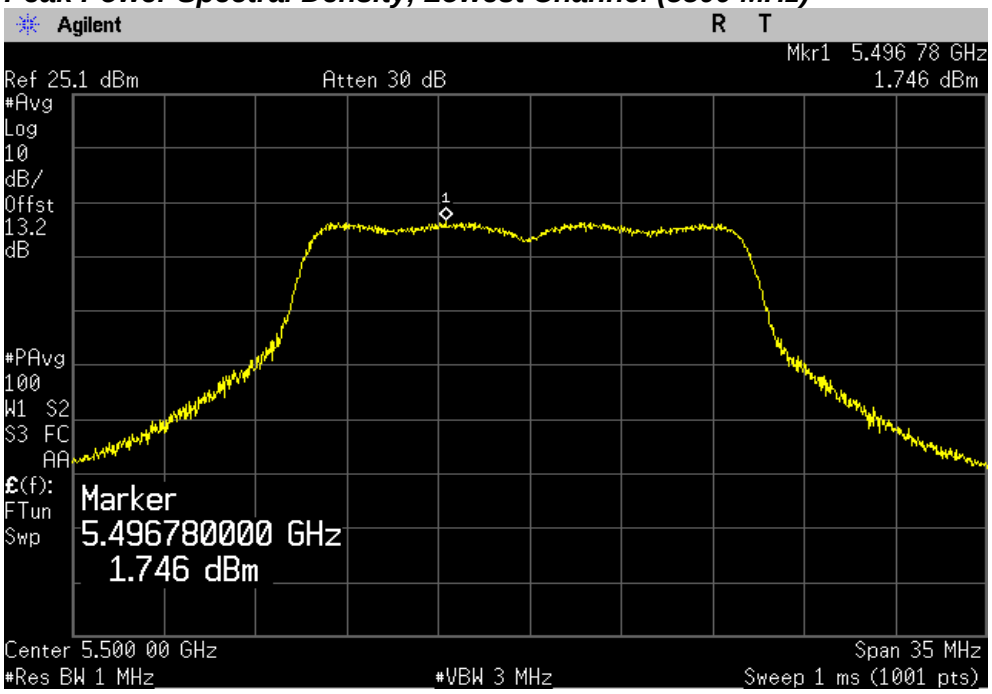
[4] Directional gain for CCD mode (correlated signal) = G_{ANT} + 10log(N_{ANT}/N_{SS}) dB for N_{ANT} = 2, N_{SS} = 1
[5] Directional gain for the correlated signal with unequal antenna gains, with equal transmit powers = 10 log[$(10^{G1/20}+10^{G2/20})^2/N_{ANT}$] dBi for N_{ANT} = 2
The maximum directional gain is 7.43 dBi.

PLOT OF TEST DATA

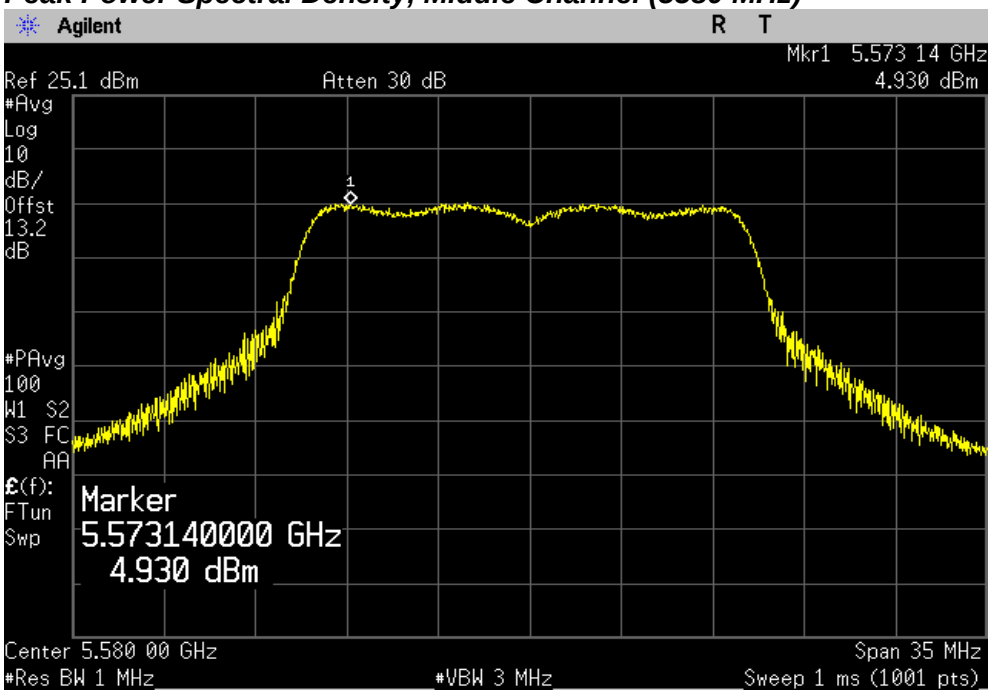
802.11a mode

Chain 0

Peak Power Spectral Density, Lowest Channel (5500 MHz)

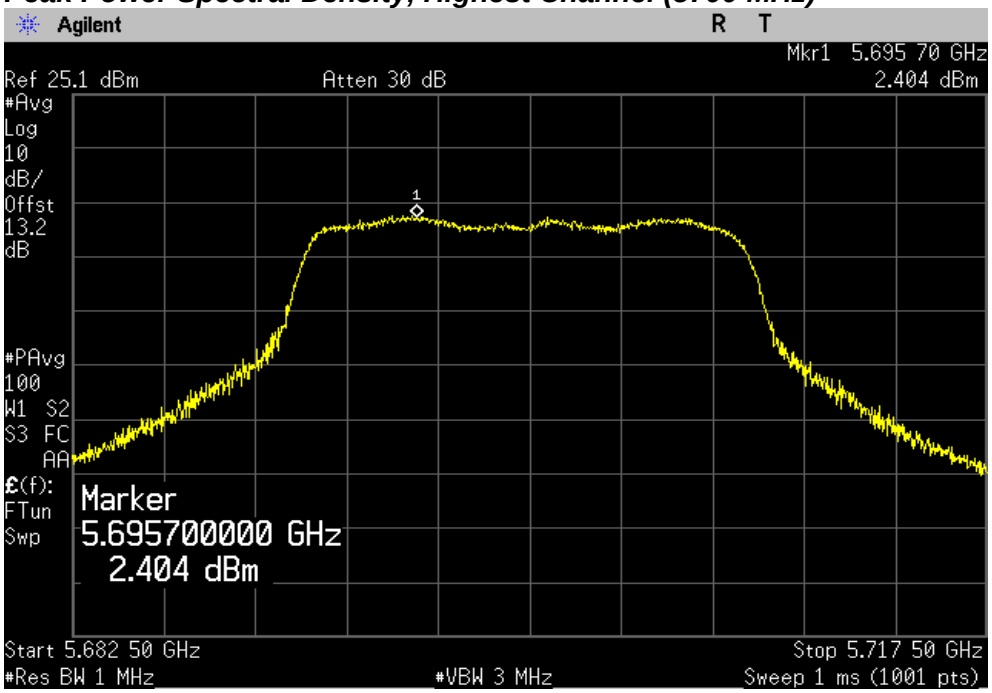


Peak Power Spectral Density, Middle Channel (5580 MHz)



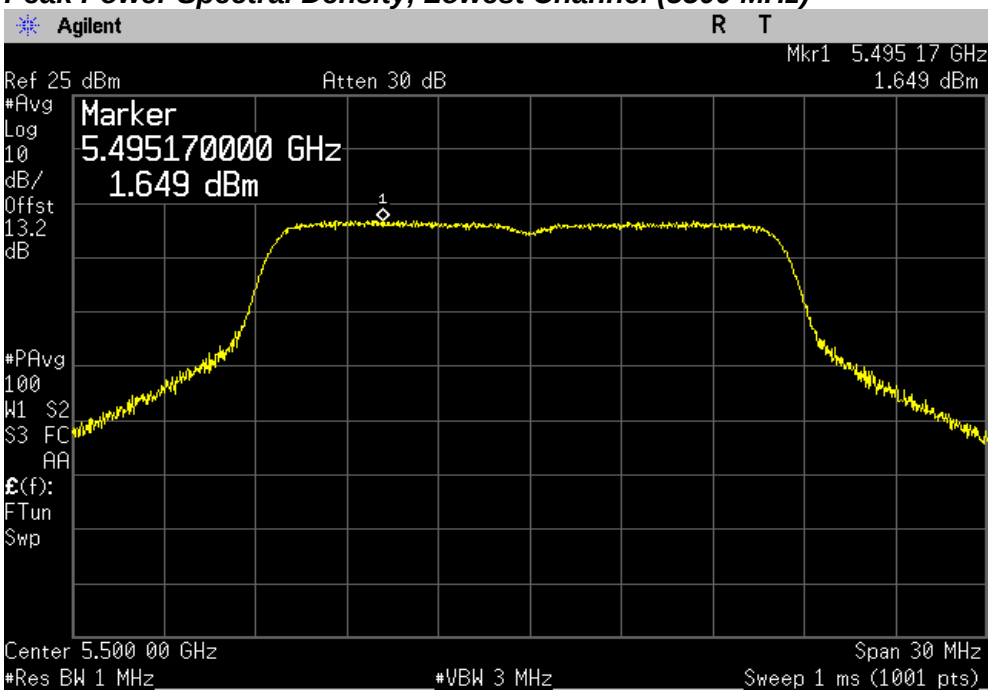
PLOTS OF EMISSIONS

Peak Power Spectral Density, Highest Channel (5700 MHz)



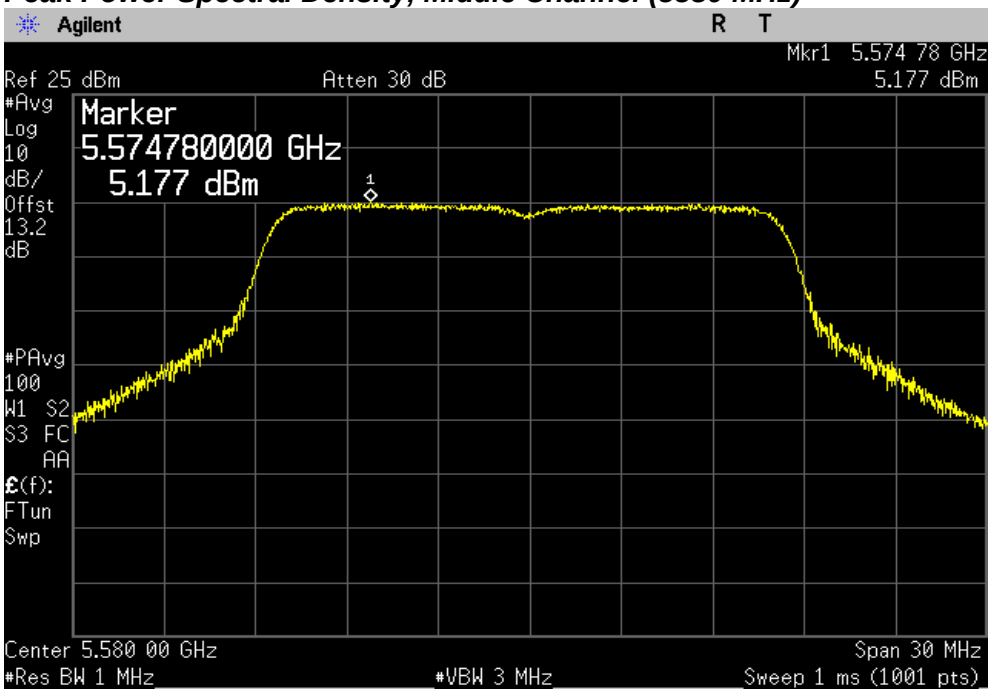
Chain 1

Peak Power Spectral Density, Lowest Channel (5500 MHz)

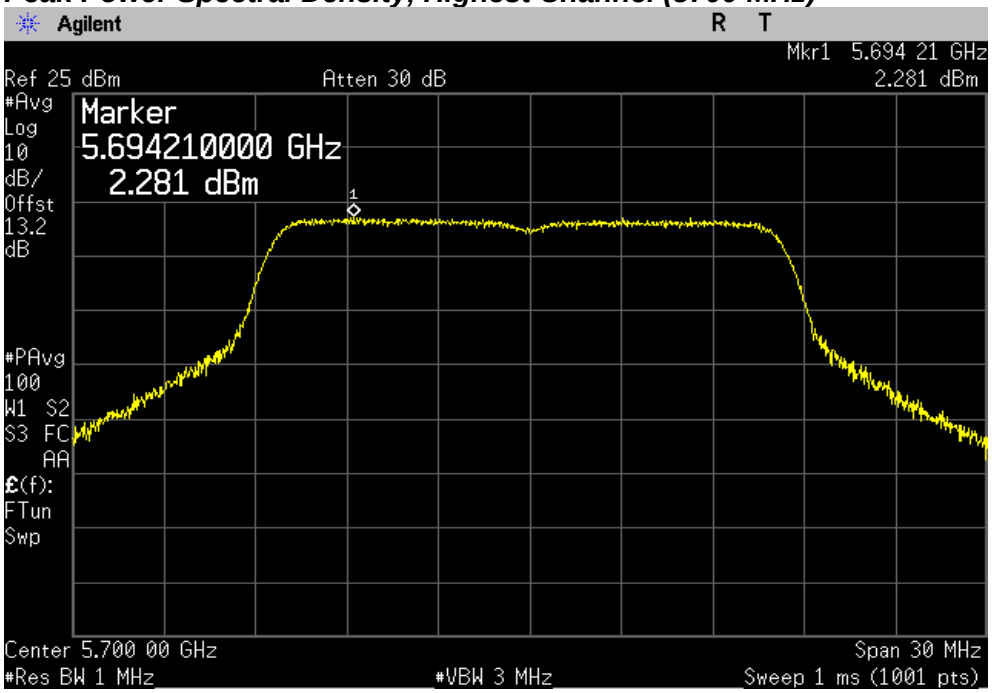


PLOTS OF EMISSIONS

Peak Power Spectral Density, Middle Channel (5580 MHz)



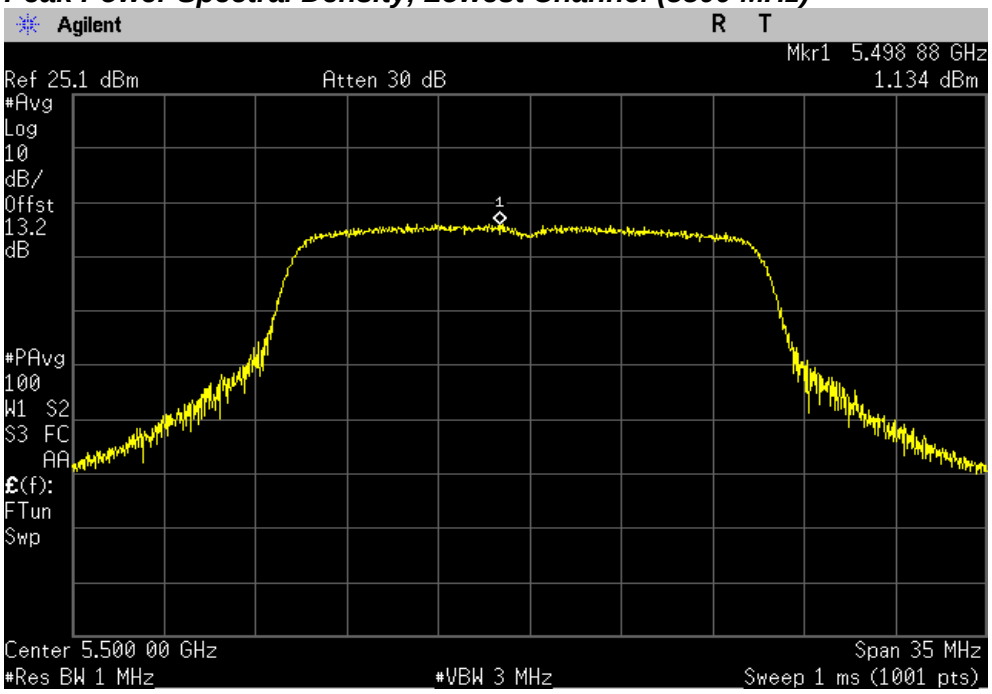
Peak Power Spectral Density, Highest Channel (5700 MHz)



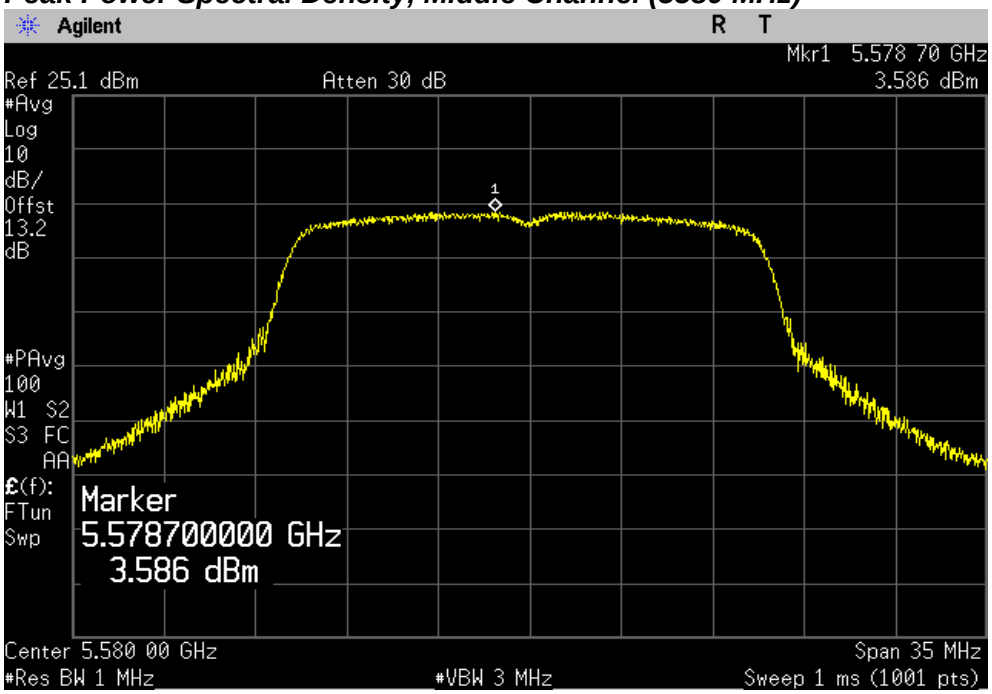
802.11n mode

Chain 0

Peak Power Spectral Density, Lowest Channel (5500 MHz)

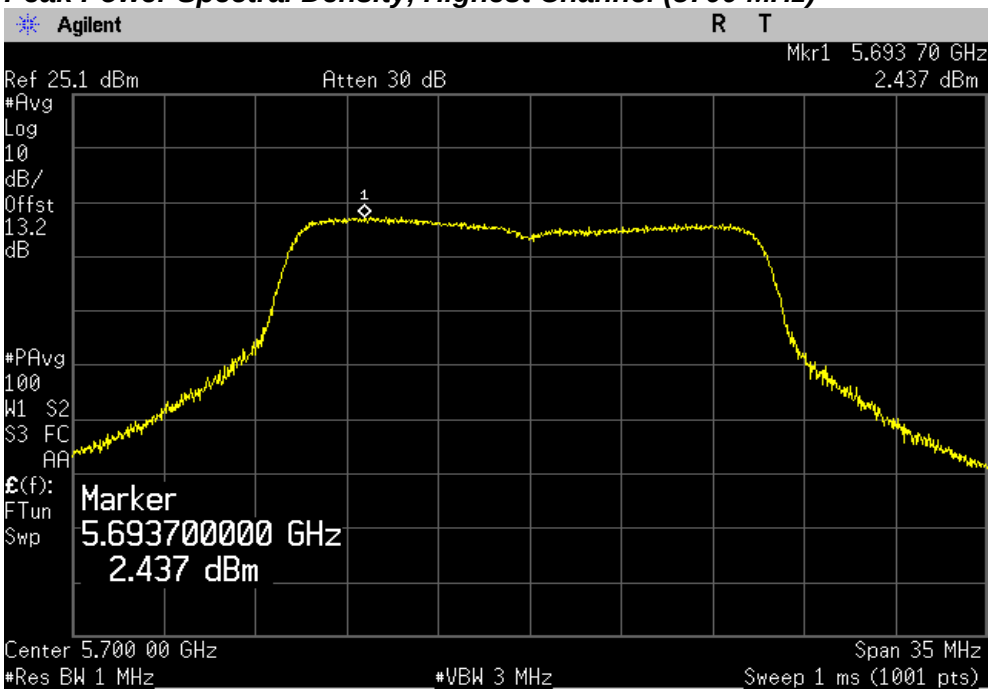


Peak Power Spectral Density, Middle Channel (5580 MHz)



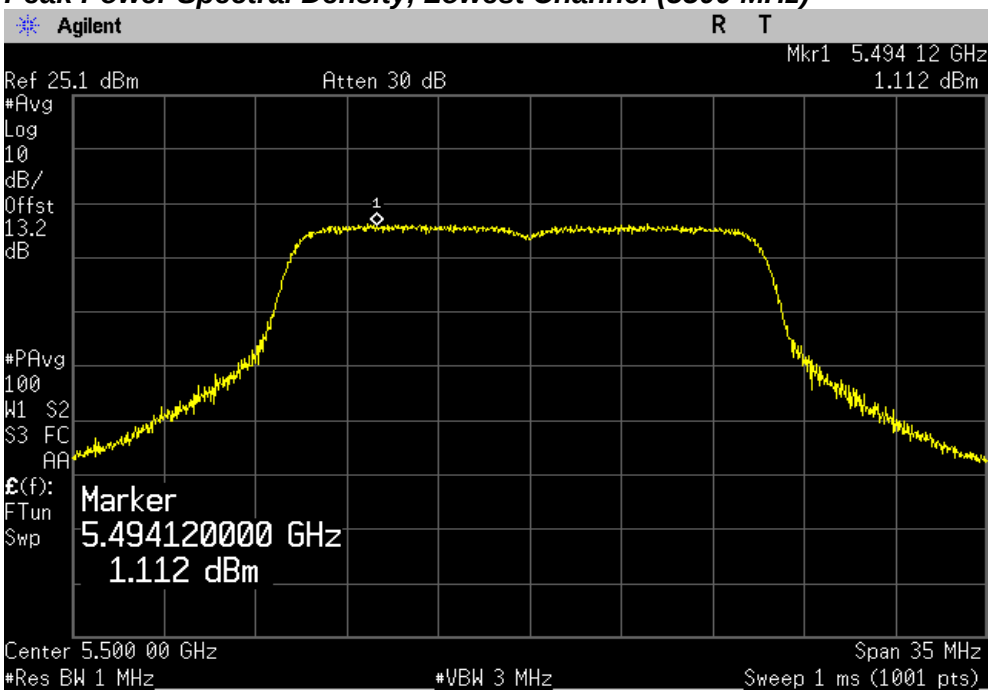
PLOTS OF EMISSIONS

Peak Power Spectral Density, Highest Channel (5700 MHz)



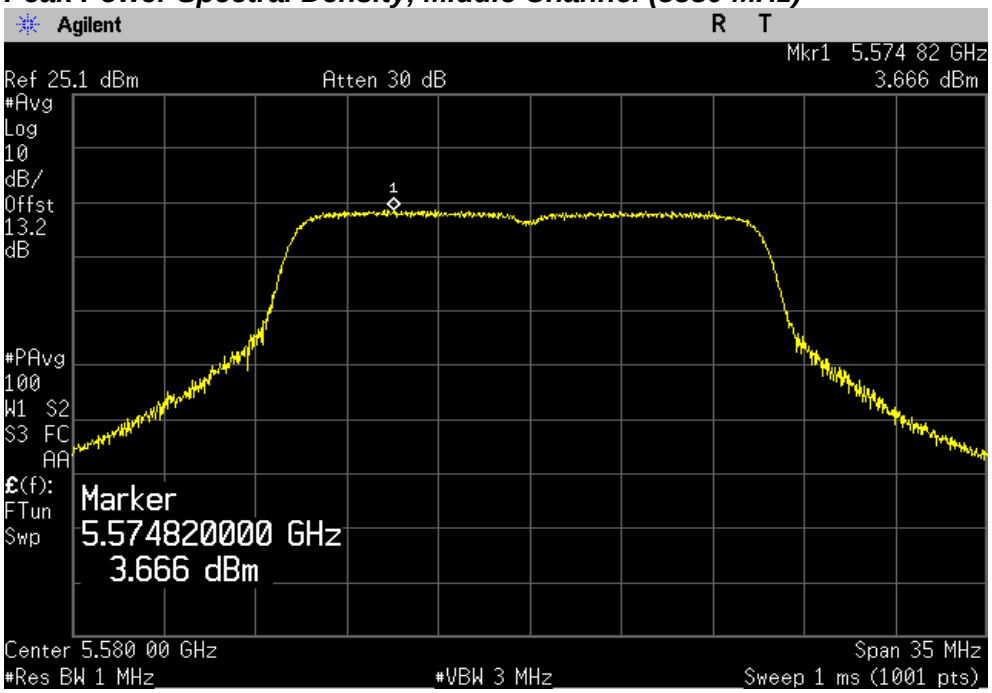
Chain 1

Peak Power Spectral Density, Lowest Channel (5500 MHz)

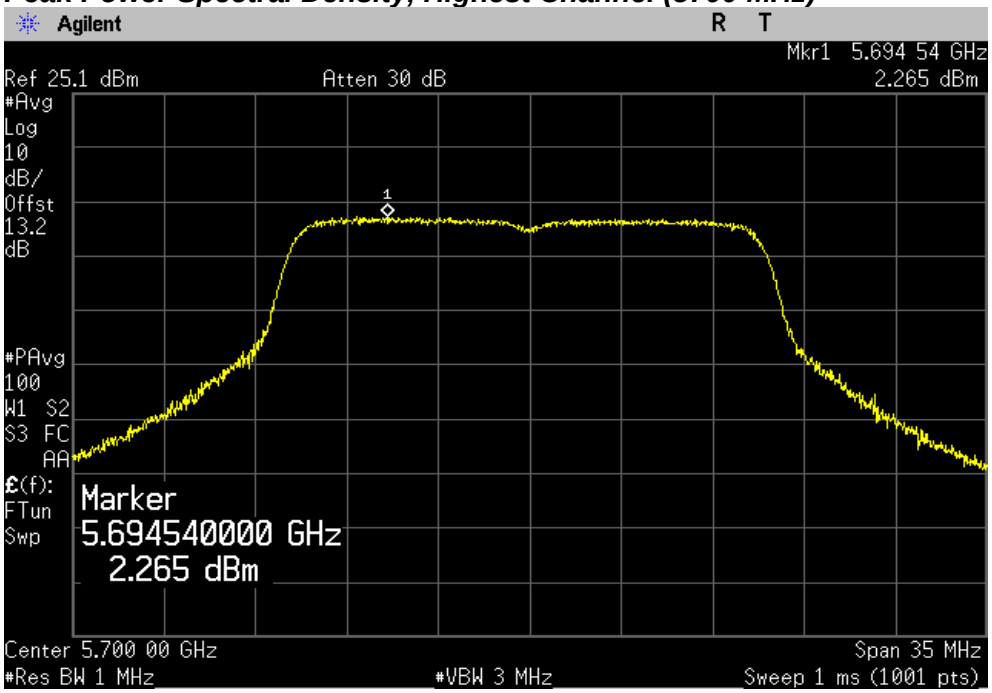


PLOTS OF EMISSIONS

Peak Power Spectral Density, Middle Channel (5580 MHz)



Peak Power Spectral Density, Highest Channel (5700 MHz)



8.6 Peak Excursion

FCC §15.407(a)

Test Mode : Set to Middle channel

Frequency (MHz)	Mode	Peak Excursion (dB)	Limit (dB)	Margin (dB)
5200	802.11a	9.22	13.00	3.8
5200	802.11n	8.62	13.00	4.4
5280	802.11a	9.71	13.00	3.3
5280	802.11n	8.37	13.00	4.6
5580	802.11a	9.62	13.00	3.4
5580	802.11n	8.23	13.00	4.8

Note(s):

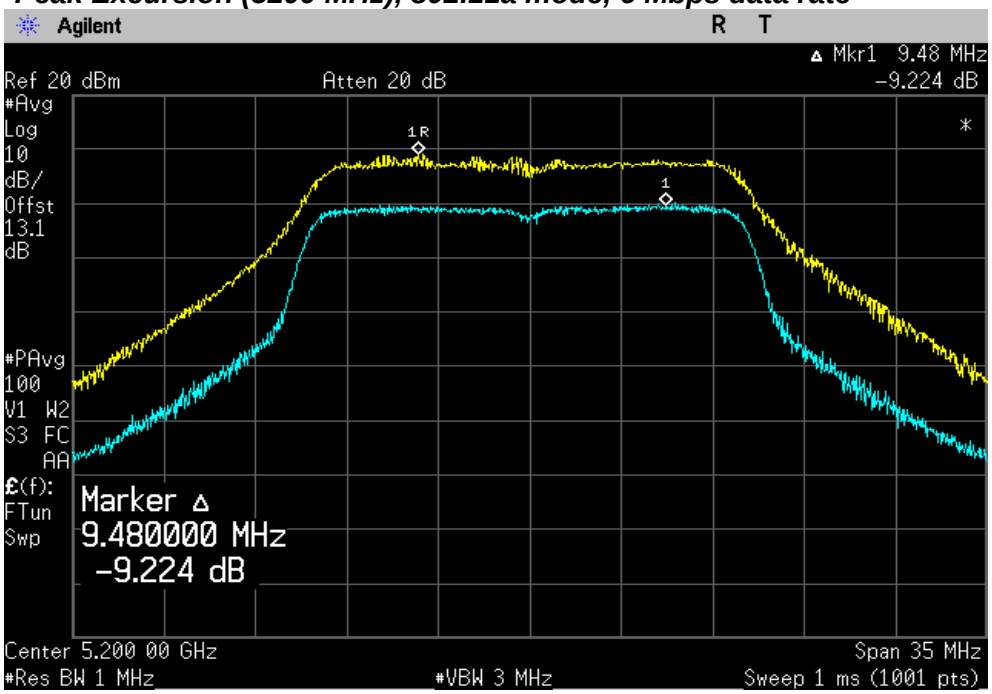
According to the requirements of the Peak excursion measurement at "KBD 789033 D01 General UNII Test Procedures v01r03", the worst case of the peak excursion was investigated for all signal types, modulation types, bandwidth modes, variation signal parameters.

AS 6 Mbps data rate for 802.11a mode and MCS0 data rate for 802.11n were the worst case mode on a single output port, that modulation modes were only reported.

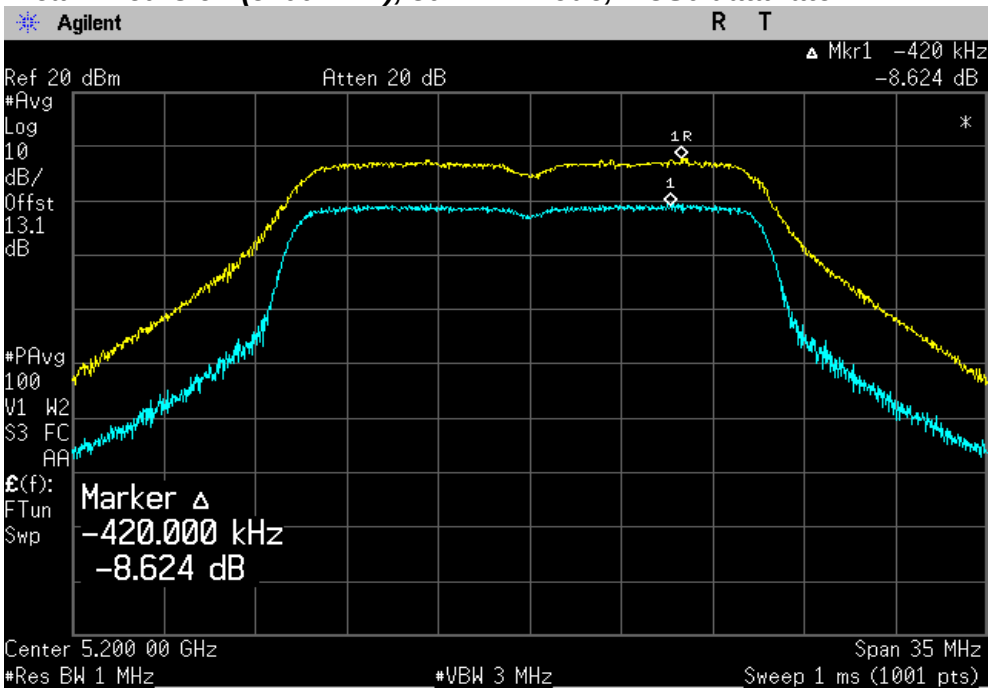
PLOTS OF EMISSIONS

Band I

Peak Excursion (5200 MHz), 802.11a mode, 6 Mbps data rate



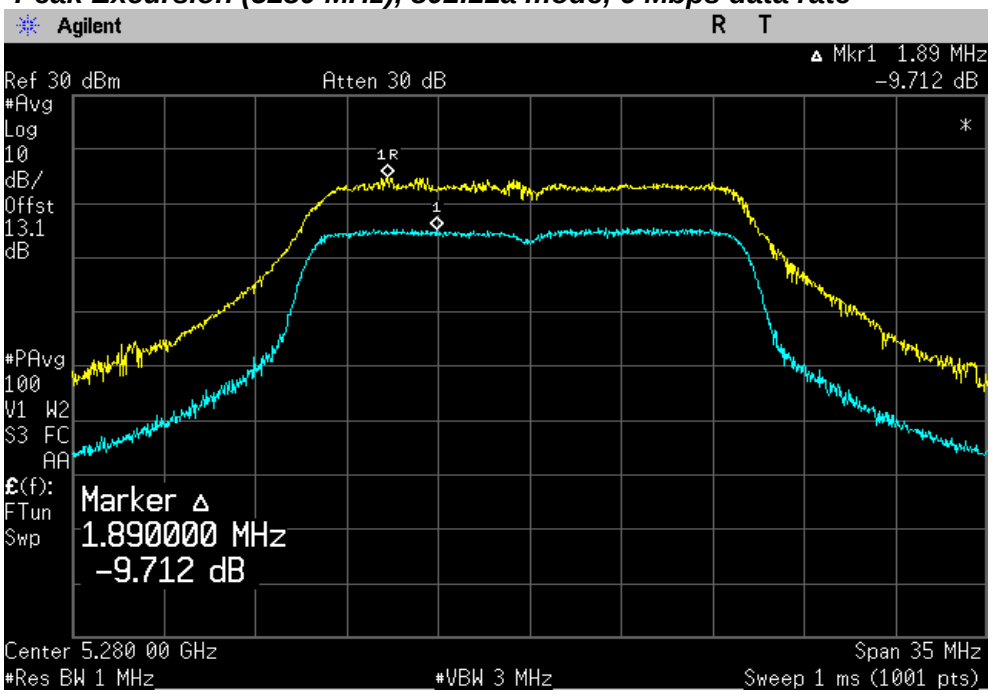
Peak Excursion (5200 MHz), 802.11n mode, MCS0 data rate



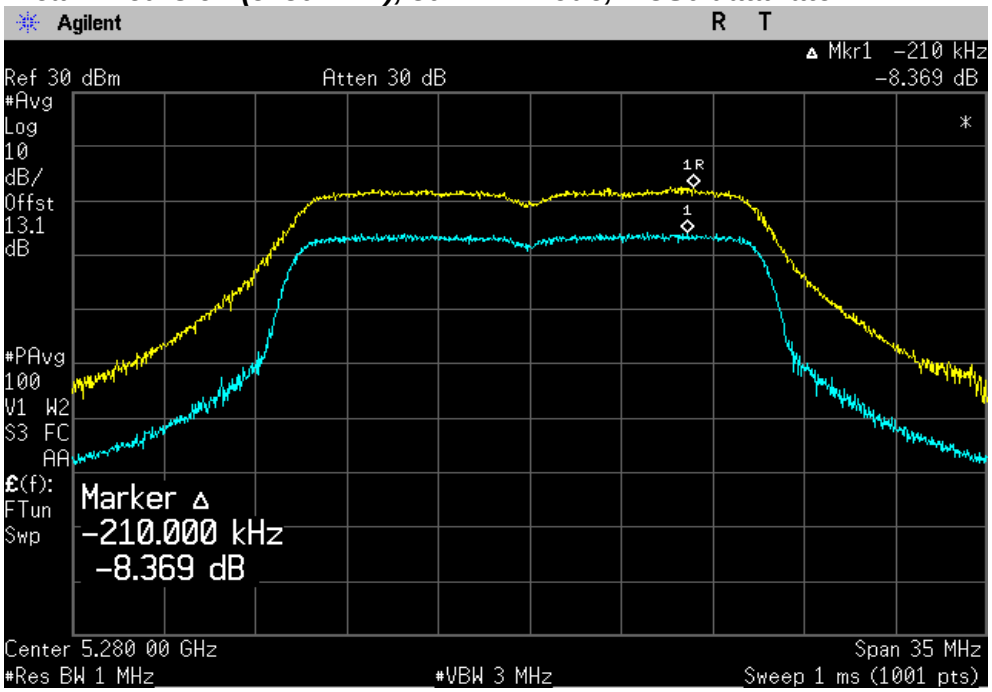
PLOTS OF EMISSIONS

Band II

Peak Excursion (5280 MHz), 802.11a mode, 6 Mbps data rate



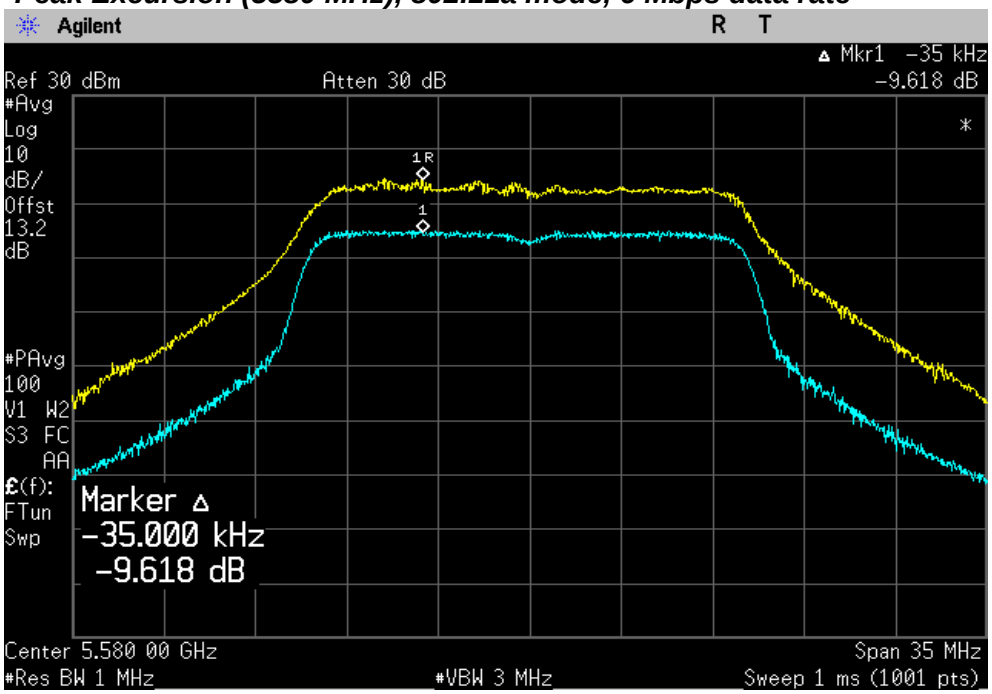
Peak Excursion (5280 MHz), 802.11n mode, MCS0 data rate



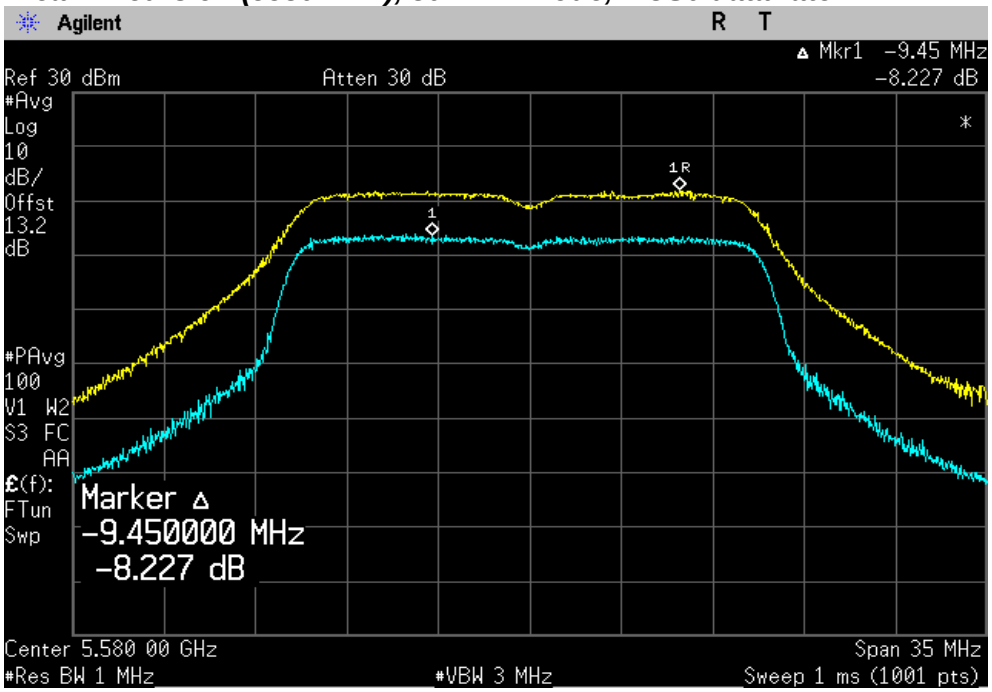
PLOTS OF EMISSIONS

Band III

Peak Excursion (5580 MHz), 802.11a mode, 6 Mbps data rate



Peak Excursion (5580 MHz), 802.11n mode, MCS0 data rate



8.7 Radiated Spurious Emissions

8.7.1 Radiated Spurious Emissions – Band I

FCC §15.407(b)

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

802.11a mode

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	52.35	V	peak	7.22	-6.02	53.55	68.2	14.65
15.54	49.21	H	peak	6.84	-6.02	50.03	74.0	23.97
15.54	37.02	H	average	6.84	-6.02	37.84	54.0	16.16
15.54	48.96	V	peak	6.84	-6.02	49.78	74.0	24.22
15.54	36.98	V	average	6.84	-6.02	37.80	54.0	16.20

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	51.55	V	peak	7.06	-6.02	52.59	68.2	15.61
15.60	49.37	H	peak	6.62	-6.02	49.97	74.0	24.03
15.60	37.11	H	average	6.62	-6.02	37.71	54.0	16.29
15.60	49.03	V	peak	6.62	-6.02	49.63	74.0	24.37
15.60	36.87	V	average	6.62	-6.02	37.47	54.0	16.53

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	50.91	V	peak	6.97	-6.02	51.86	68.2	16.34
15.72	48.20	H	peak	6.51	-6.02	48.69	74.0	25.31
15.72	36.55	H	average	6.51	-6.02	37.04	54.0	16.96
15.72	48.23	V	peak	6.51	-6.02	48.72	74.0	25.28
15.72	36.35	V	average	6.51	-6.02	36.84	54.0	17.16

802.11n mode

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	52.58	V	peak	7.22	-6.02	53.78	68.2	14.42
15.54	48.91	H	peak	6.84	-6.02	49.73	74.0	24.27
15.54	36.91	H	average	6.84	-6.02	37.73	54.0	16.27
15.54	48.54	V	peak	6.84	-6.02	49.36	74.0	24.64
15.54	36.64	V	average	6.84	-6.02	37.46	54.0	16.54

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	53.86	V	peak	7.02	-6.02	54.86	68.2	13.34
15.60	48.53	H	peak	6.62	-6.02	49.13	74.0	24.87
15.60	37.01	H	average	6.62	-6.02	37.61	54.0	16.39
15.60	48.81	V	peak	6.62	-6.02	49.41	74.0	24.59
15.60	36.95	V	average	6.62	-6.02	37.55	54.0	16.45

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	53.49	V	peak	6.97	-6.02	54.44	68.2	13.76
15.72	48.49	H	peak	6.51	-6.02	48.98	74.0	25.02
15.72	36.12	H	average	6.51	-6.02	36.61	54.0	17.39
15.72	48.89	V	peak	6.51	-6.02	49.38	74.0	24.62
15.72	36.34	V	average	6.51	-6.02	36.83	54.0	17.17

Note(s):

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 (1.5 / 3)
4. Measurement of the radiated emissions is performed in vertical and horizontal polarizations. The worst data were recorded.
5. At frequencies above 1 GHz, peak emissions were measured using RBW = 1 MHz, VBW = 3 MHz, Detector = Peak.
6. 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 = 1 kHz (VBW ≤ RBW/100), Detector = Peak.
7. 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.
8. The peak limit of non-restricted band is -27 dBm/MHz can be converted 68.2 dBμV/m per KDB789033.
9. 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 – Band II

FCC §15.407(b)

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

802.11a mode

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	60.58	V	peak	7.67	-6.02	62.23	68.2	5.97
15.78	52.21	H	peak	6.64	-6.02	52.83	74.0	21.17
15.78	38.24	H	average	6.64	-6.02	38.86	54.0	15.14
15.78	52.03	V	peak	6.64	-6.02	52.65	74.0	21.35
15.78	36.93	V	average	6.64	-6.02	37.55	54.0	16.45

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	60.63	V	peak	7.37	-6.02	61.98	68.2	6.22
15.84	52.23	H	peak	7.10	-6.02	53.31	74.0	20.69
15.84	39.23	H	average	7.10	-6.02	40.31	54.0	13.69
15.84	51.92	V	peak	7.10	-6.02	53.00	74.0	21.00
15.84	37.88	V	average	7.10	-6.02	38.96	54.0	15.04

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	51.93	H	peak	7.87	-6.02	53.78	74.0	20.22
10.64	39.10	H	average	7.87	-6.02	40.95	54.0	13.05
10.64	54.53	V	peak	7.87	-6.02	56.38	74.0	17.62
10.64	42.36	V	average	7.87	-6.02	44.21	54.0	9.79
15.96	47.76	H	peak	7.03	-6.02	48.77	74.0	25.23
15.96	36.14	H	average	7.03	-6.02	37.15	54.0	16.85
15.96	47.99	V	peak	7.03	-6.02	49.00	74.0	25.00
15.96	36.17	V	average	7.03	-6.02	37.18	54.0	16.82

802.11n mode

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	59.20	V	peak	7.67	-6.02	60.85	68.2	7.35
15.78	49.44	H	peak	6.64	-6.02	50.06	74.0	23.94
15.78	36.54	H	average	6.64	-6.02	37.16	54.0	16.84
15.78	49.54	V	peak	6.64	-6.02	50.16	74.0	23.84
15.78	36.08	V	average	6.64	-6.02	36.70	54.0	17.30

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	57.41	V	peak	7.37	-6.02	58.76	68.2	9.44
15.84	51.21	H	peak	7.10	-6.02	52.29	74.0	21.71
15.84	37.39	H	average	7.10	-6.02	38.47	54.0	15.53
15.84	48.84	V	peak	7.10	-6.02	49.92	74.0	24.08
15.84	36.14	V	average	7.10	-6.02	37.22	54.0	16.78

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	49.22	H	peak	7.87	-6.02	51.07	74.0	22.93
10.64	37.48	H	average	7.87	-6.02	39.33	54.0	14.67
10.64	54.62	V	peak	7.87	-6.02	56.47	74.0	17.53
10.64	41.63	V	average	7.87	-6.02	43.48	54.0	10.52
15.96	48.72	H	peak	7.03	-6.02	49.73	74.0	24.27
15.96	35.91	H	average	7.03	-6.02	36.92	54.0	17.08
15.96	47.48	V	peak	7.03	-6.02	48.49	74.0	25.51
15.96	35.96	V	average	7.03	-6.02	36.97	54.0	17.03

Note(s):

*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 (1.5 / 3)*

4. Measurement of the radiated emissions is performed in vertical and horizontal polarizations. The worst data were recorded.

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

6. 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 = 1 kHz (VBW ≤ RBW/100), Detector = Peak.

7. 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.

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

9. 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 – Band III

FCC §15.407(b)

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

802.11a mode

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	45.17	H	peak	9.07	-6.02	48.22	74.0	25.78
11.00	33.24	H	average	9.07	-6.02	36.29	54.0	17.71
11.00	48.60	V	peak	9.07	-6.02	51.65	74.0	22.35
11.00	37.39	V	average	9.07	-6.02	40.44	54.0	13.56
16.50	49.64	V	peak	6.68	-6.02	50.30	68.2	17.90

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	49.96	H	peak	8.56	-6.02	52.50	74.0	21.50
11.16	38.01	H	average	8.56	-6.02	40.55	54.0	13.45
11.16	58.30	V	peak	8.56	-6.02	60.84	74.0	13.16
11.16	44.95	V	average	8.56	-6.02	47.49	54.0	6.51
16.74	52.20	H	peak	8.45	-6.02	54.63	68.2	13.57

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	45.89	H	peak	8.80	-6.02	48.67	74.0	25.33
11.40	34.01	H	average	8.80	-6.02	36.79	54.0	17.21
11.40	51.57	V	peak	8.80	-6.02	54.35	74.0	19.65
11.40	39.64	V	average	8.80	-6.02	42.42	54.0	11.58
17.10	50.90	V	peak	8.32	-6.02	53.20	68.2	15.00

802.11n mode

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	44.59	H	peak	9.07	-6.02	47.64	74.0	26.36
11.00	32.83	H	average	9.07	-6.02	35.88	54.0	18.12
11.00	49.63	V	peak	9.07	-6.02	52.68	74.0	21.32
11.00	37.32	V	average	9.07	-6.02	40.37	54.0	13.63
16.50	48.27	H	peak	6.68	-6.02	48.93	68.2	19.27

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	49.44	H	peak	8.56	-6.02	51.98	74.0	22.02
11.16	36.51	H	average	8.56	-6.02	39.05	54.0	14.95
11.16	55.52	V	peak	8.56	-6.02	58.06	74.0	15.94
11.16	43.34	V	average	8.56	-6.02	45.88	54.0	8.12
16.74	50.84	V	peak	8.45	-6.02	53.27	68.2	14.93

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	44.90	H	peak	8.80	-6.02	47.68	74.0	26.32
11.40	33.46	H	average	8.80	-6.02	36.24	54.0	17.76
11.40	51.40	V	peak	8.80	-6.02	54.18	74.0	19.82
11.40	38.75	V	average	8.80	-6.02	41.53	54.0	12.47
17.10	49.15	V	peak	8.32	-6.02	51.45	68.2	16.75

Note(s):

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 (1.5 / 3)
4. Measurement of the radiated emissions is performed in vertical and horizontal polarizations. The worst data were recorded.
5. At frequencies above 1 GHz, peak emissions were measured using RBW = 1 MHz, VBW = 3 MHz, Detector = Peak.
6. 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 = 1 kHz (VBW ≤ RBW/100), Detector = Peak.
7. 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.
8. The peak limit of non-restricted band is -27 dBm/MHz can be converted 68.2 dBμV/m per KDB789033.
9. For restricted band, the peak limit is 74 dBμV/m and the average limit is 54 dBμV/m per § 15.209.

8.8 Radiated Band Edge

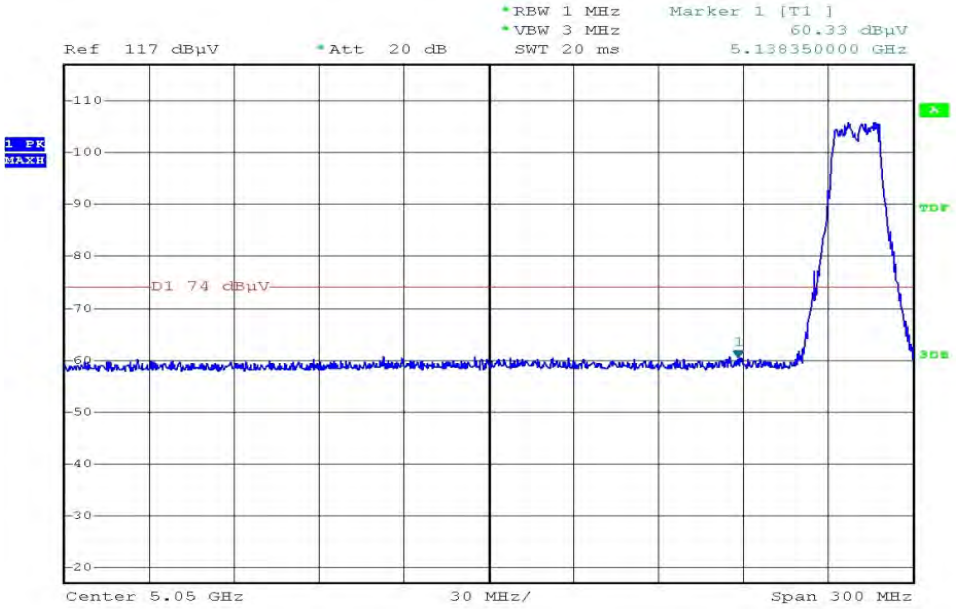
8.8.1 Radiated Band Edge – Band I and II

FCC §15.407(b)

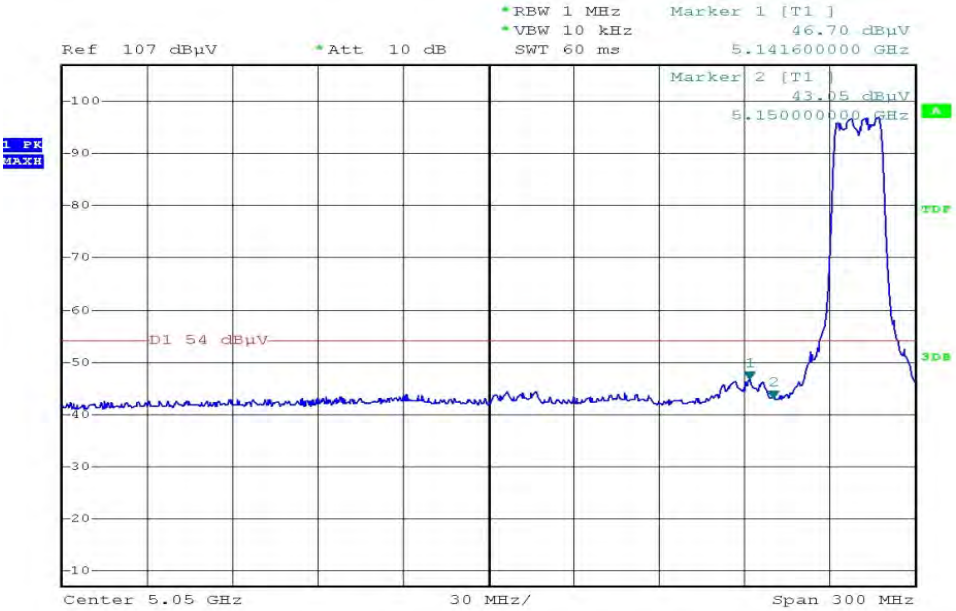
Test Mode : Set to Band Edge channels

802.11a mode

Restricted Band Spurious Emissions, Lowest Channel(5180 MHz), Peak, 802.11a mode

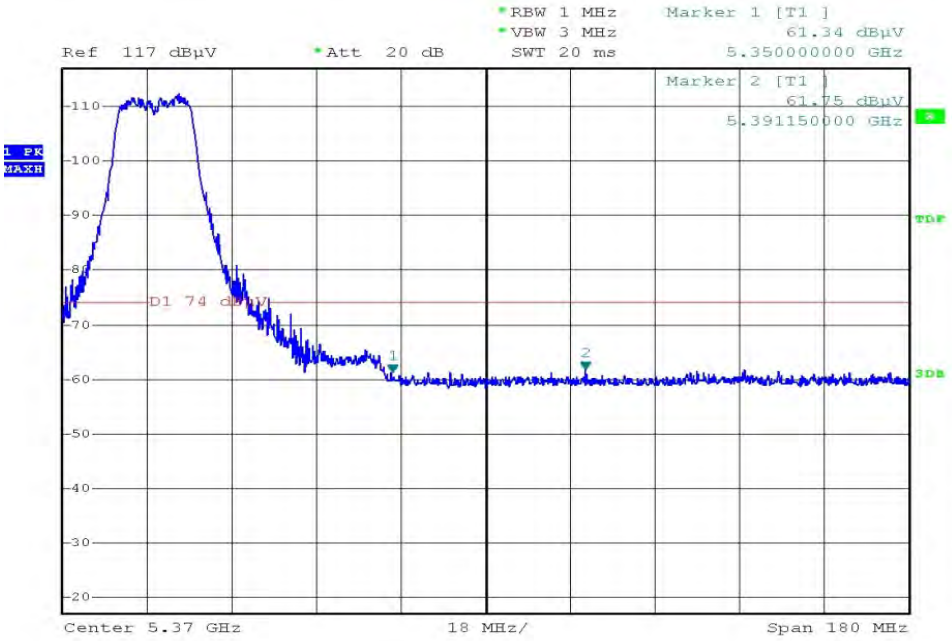


Restricted Band Spurious Emissions, Lowest Channel(5180 MHz), Average, 802.11a mode

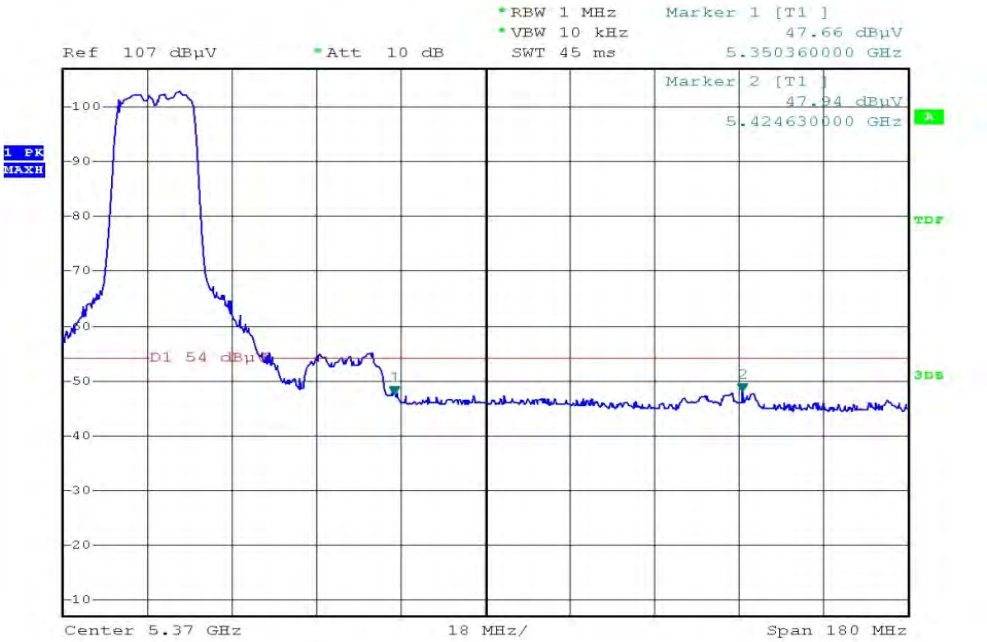


PLOT OF TEST DATA

Restricted Band Spurious Emissions, CH 60(5300 MHz), Peak, 802.11a mode

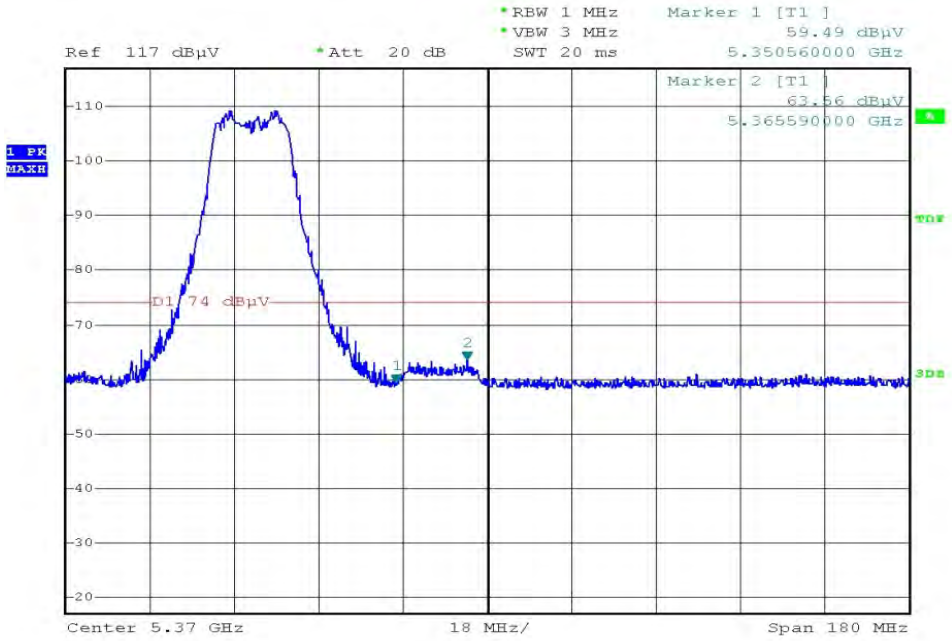


Restricted Band Spurious Emissions, CH 60(5300 MHz), Average, 802.11a mode

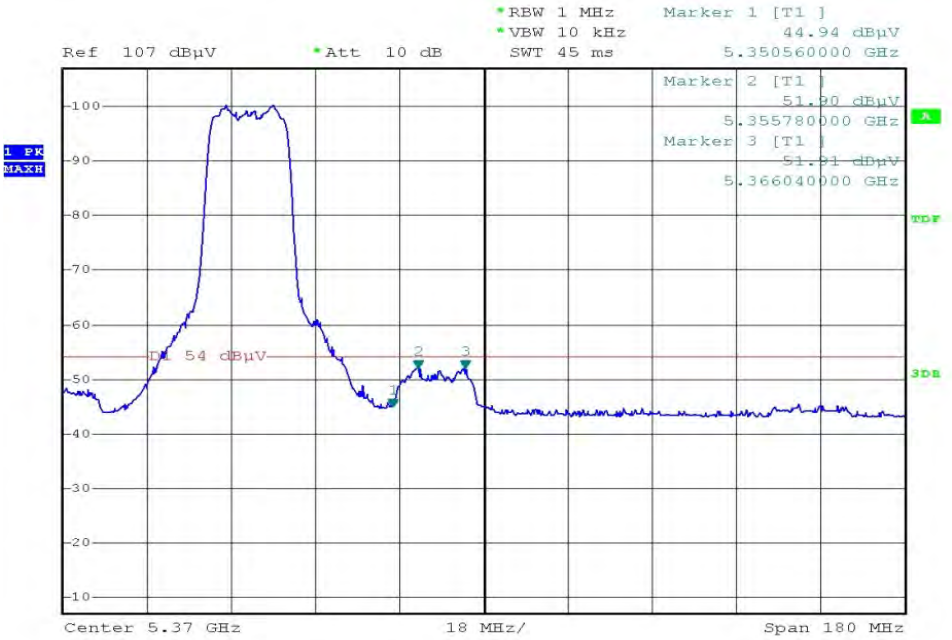


PLOT OF TEST DATA

Restricted Band Spurious Emissions, Highest Channel(5320 MHz), Peak, 802.11a mode



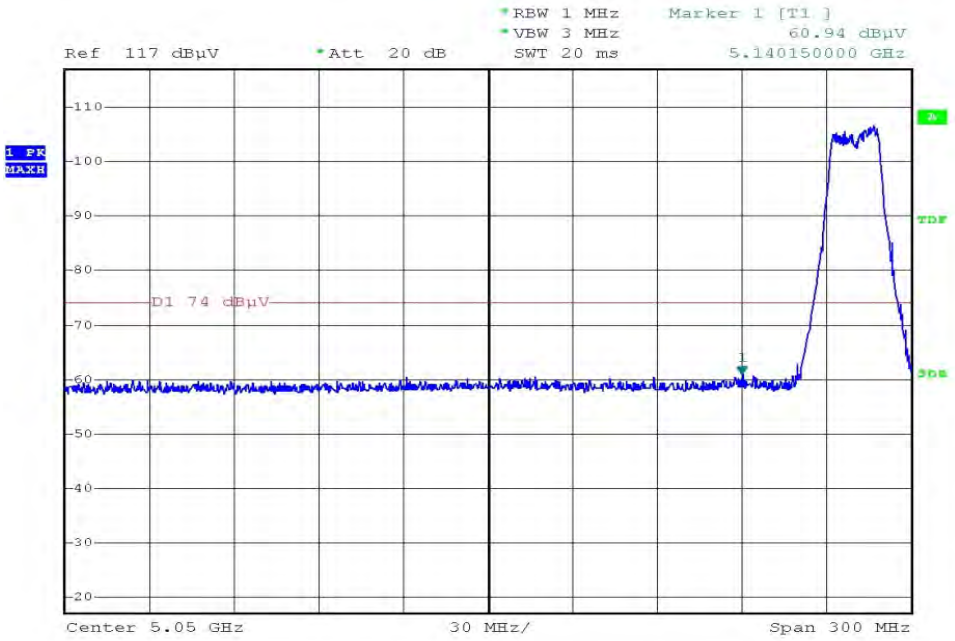
Restricted Band Spurious Emissions, Highest Channel(5320 MHz), Average, 802.11a mode



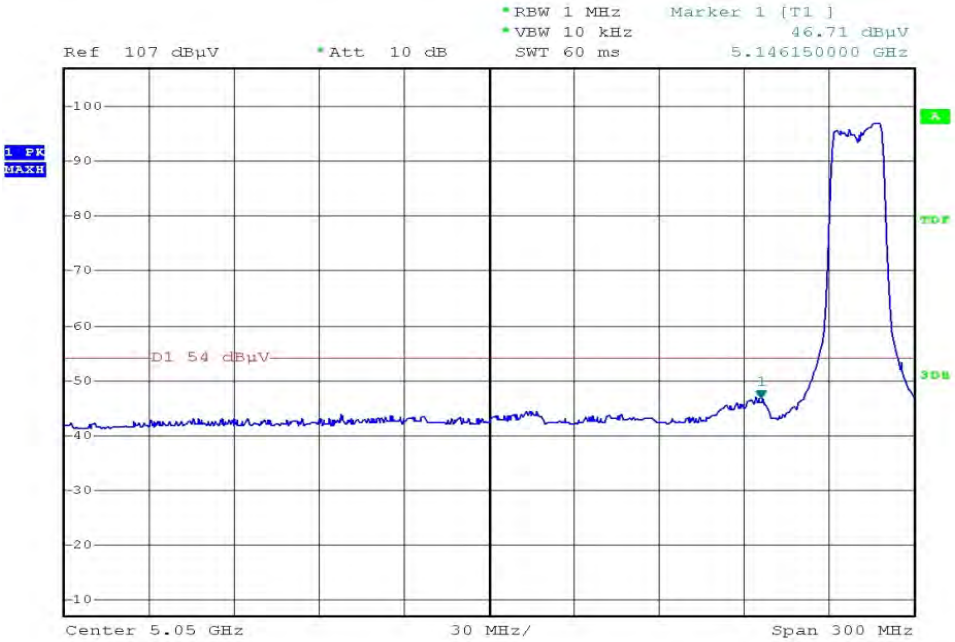
PLOT OF TEST DATA

802.11n mode

Restricted Band Spurious Emissions, Lowest Channel(5180 MHz), Peak, 802.11n mode

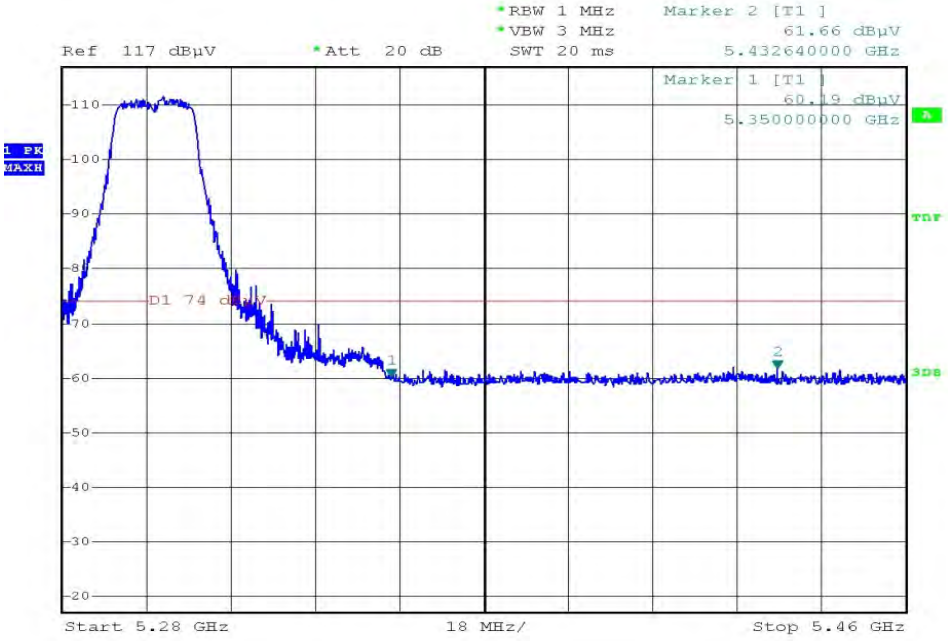


Restricted Band Spurious Emissions, Lowest Channel(5180 MHz), Average, 802.11n mode

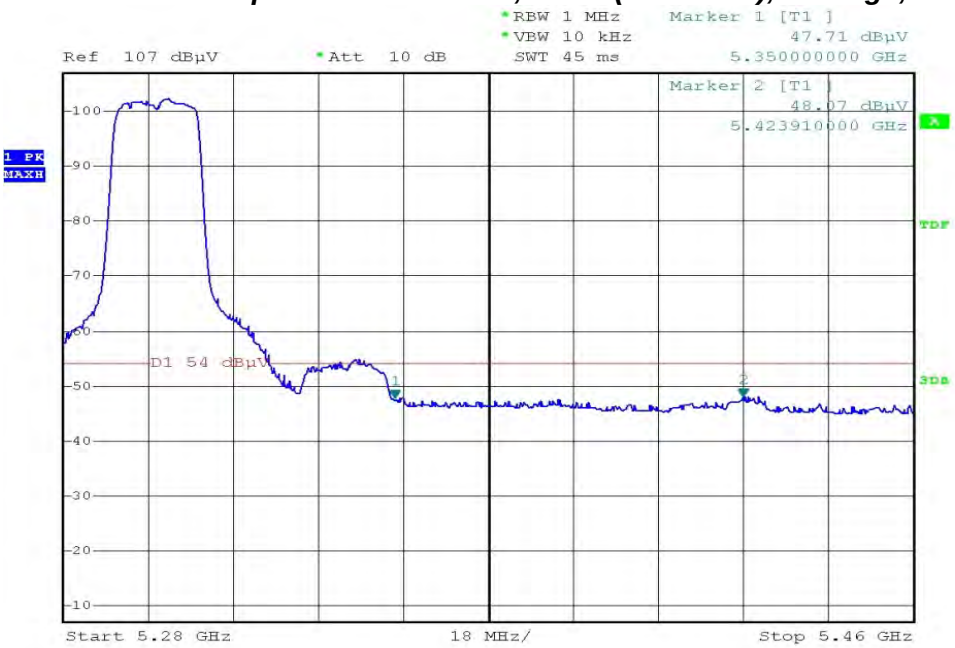


PLOT OF TEST DATA

Restricted Band Spurious Emissions, CH 60(5300 MHz), Peak, 802.11n mode

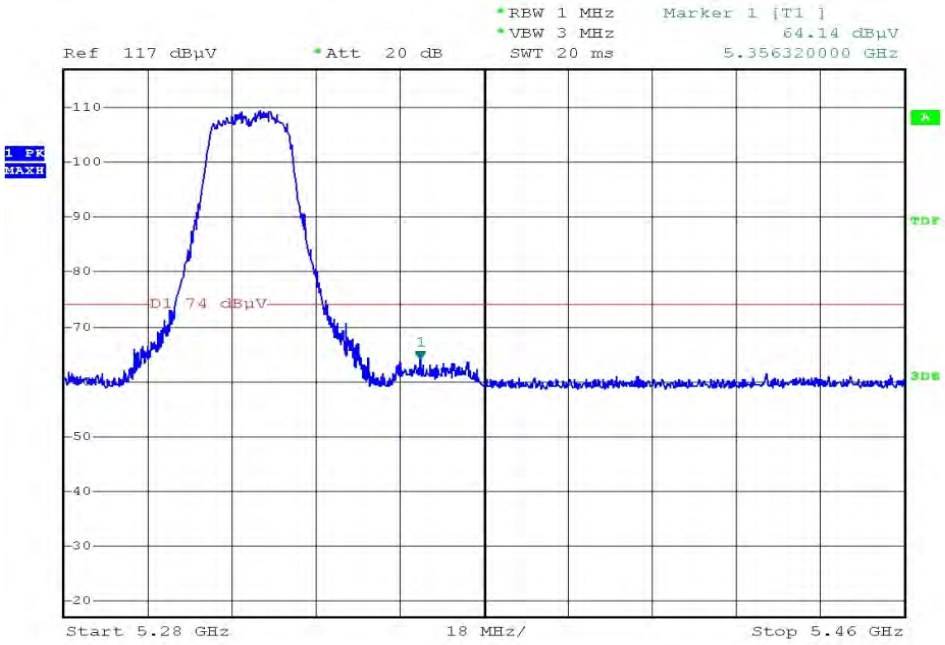


Restricted Band Spurious Emissions, CH 60(5300 MHz), Average, 802.11n mode

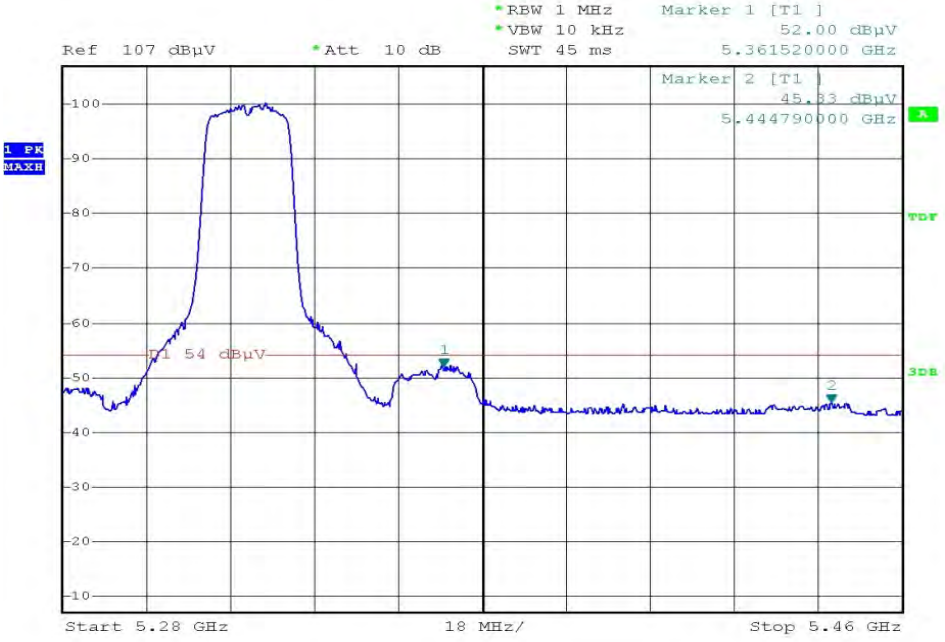


PLOT OF TEST DATA

Restricted Band Spurious Emissions, Highest Channel(5320 MHz), Peak, 802.11n mode



Restricted Band Spurious Emissions, Highest Channel(5320 MHz), Average, 802.11n mode



Note(s):

1. *The antenna factor and cable loss were reflected in spectrum analyzer with correction factor for the Band edge radiated test.*
2. *Measurement of the radiated emissions is performed in vertical and horizontal polarizations. The worst data were recorded*
3. *For the radiated band edge test, the EUT was investigated in all available data rates for 802.11a,n modes. The worst case band edge emissions were found while EUT was transmitting in 802.11a mode at 6 Mbps and 802.11n mode at MCS0*
4. *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, average emission levels were measured using the "Method VB" by setting the analyzer RBW = 1 MHz, VBW = 1 kHz (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 and the average limit is 54 dBμV/m per § 15.209.*

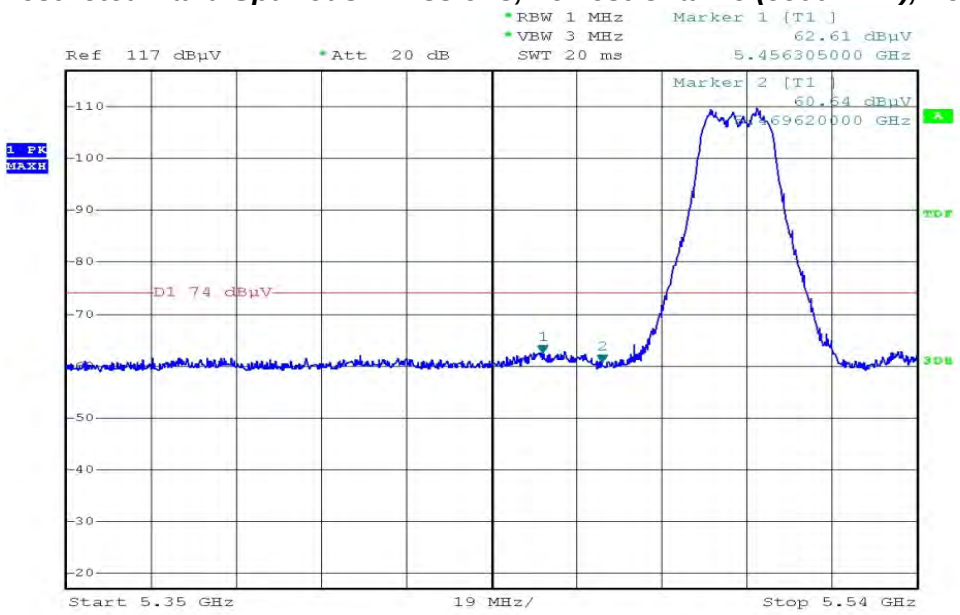
8.8.2 Radiated Band Edge – Band III

FCC §15.407(b)

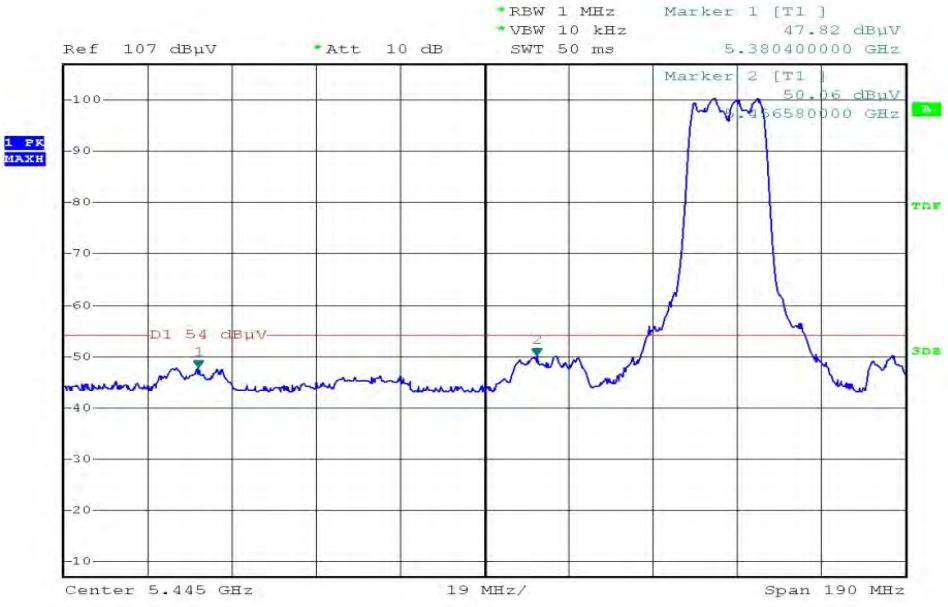
Test Mode : Set to Band Edge channels

802.11a mode

Restricted Band Spurious Emissions, Lowest Channel(5500 MHz), Peak, 802.11a mode

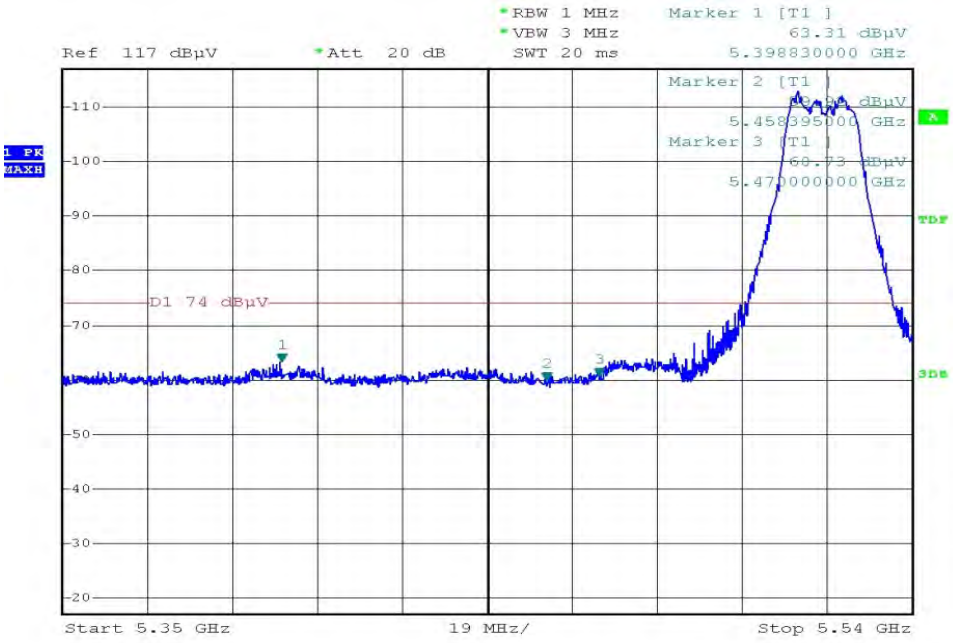


Restricted Band Spurious Emissions, Lowest Channel(5500 MHz), Average, 802.11a mode

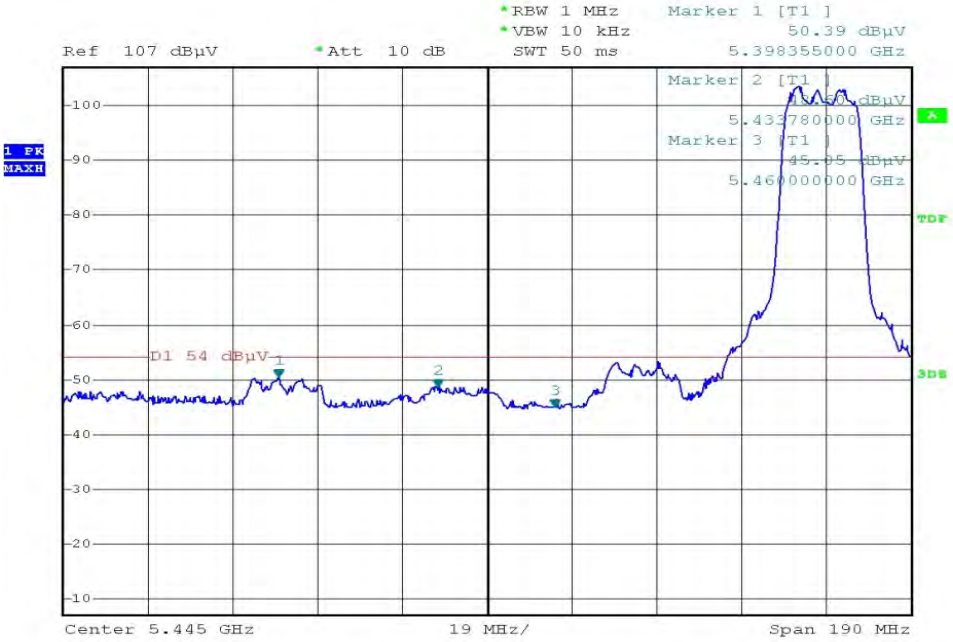


PLOT OF TEST DATA

Restricted Band Spurious Emissions, CH 104(5520 MHz), Peak, 802.11a mode

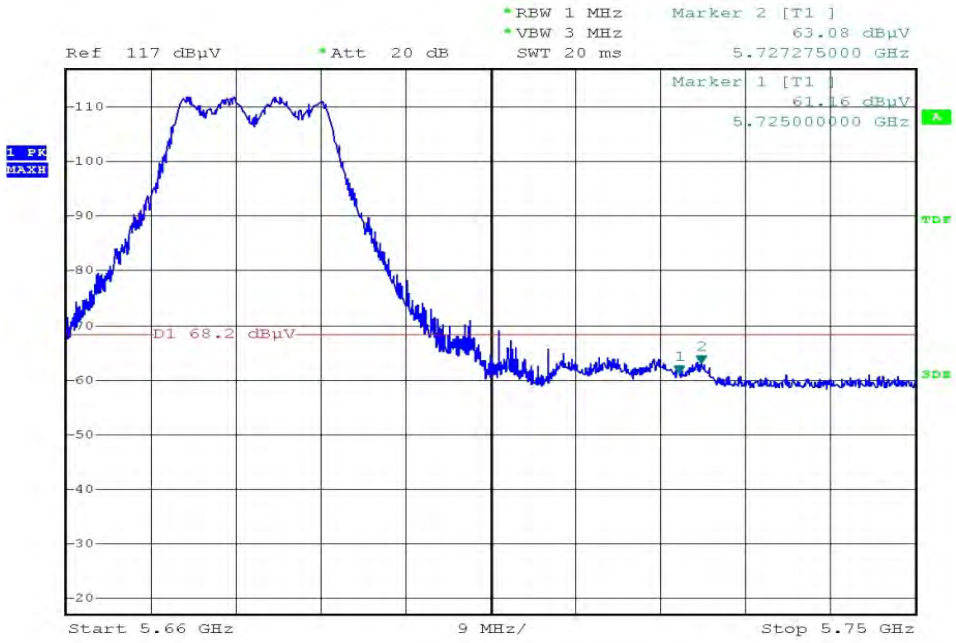


Restricted Band Spurious Emissions, CH 104(5520 MHz), Average, 802.11a mode

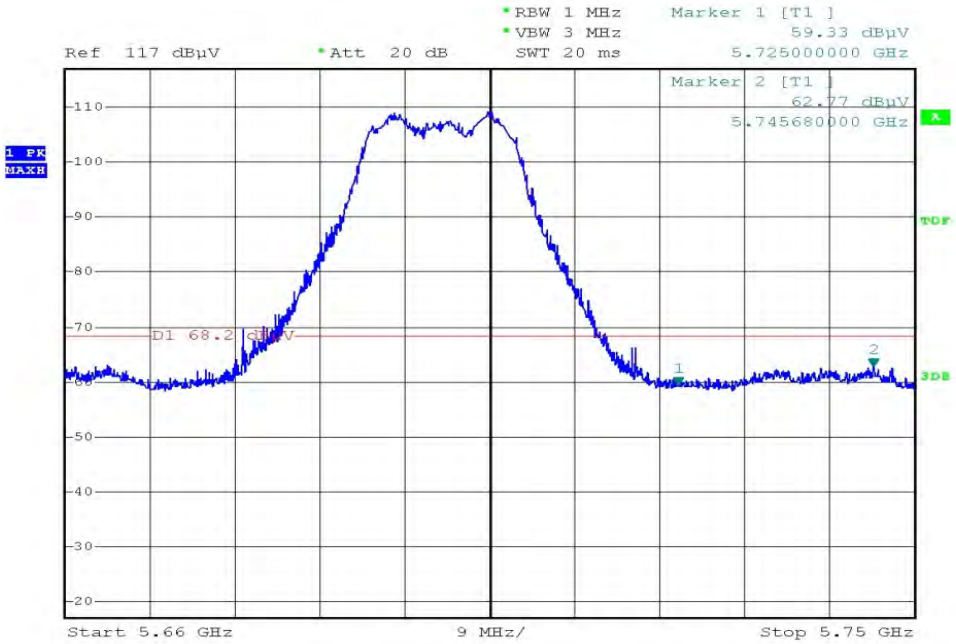


PLOT OF TEST DATA

Restricted Band Spurious Emissions, CH 136(5680 MHz), Peak, 802.11a mode



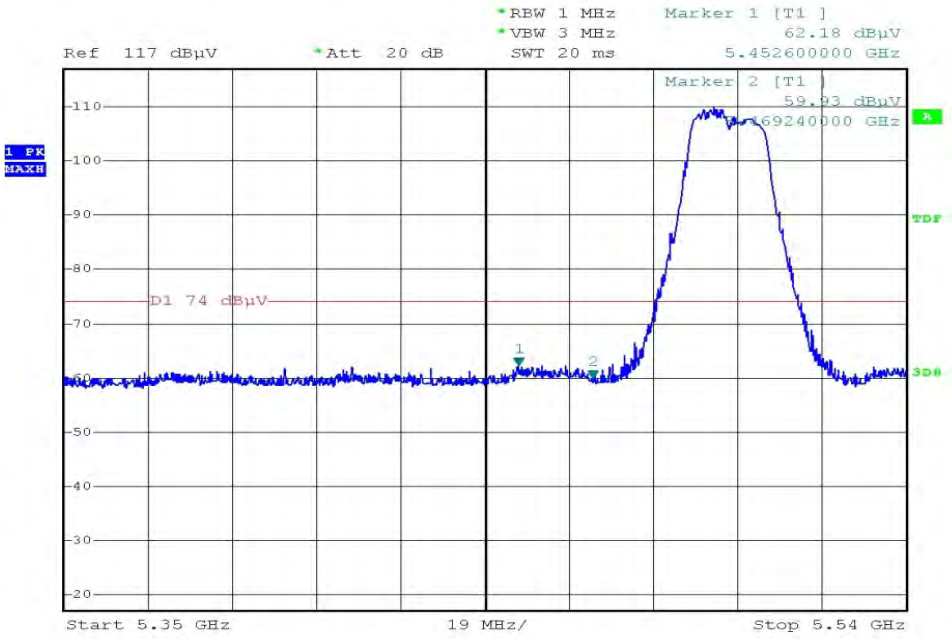
Restricted Band Spurious Emissions, Highest Channel(5700 MHz), Peak, 802.11a mode



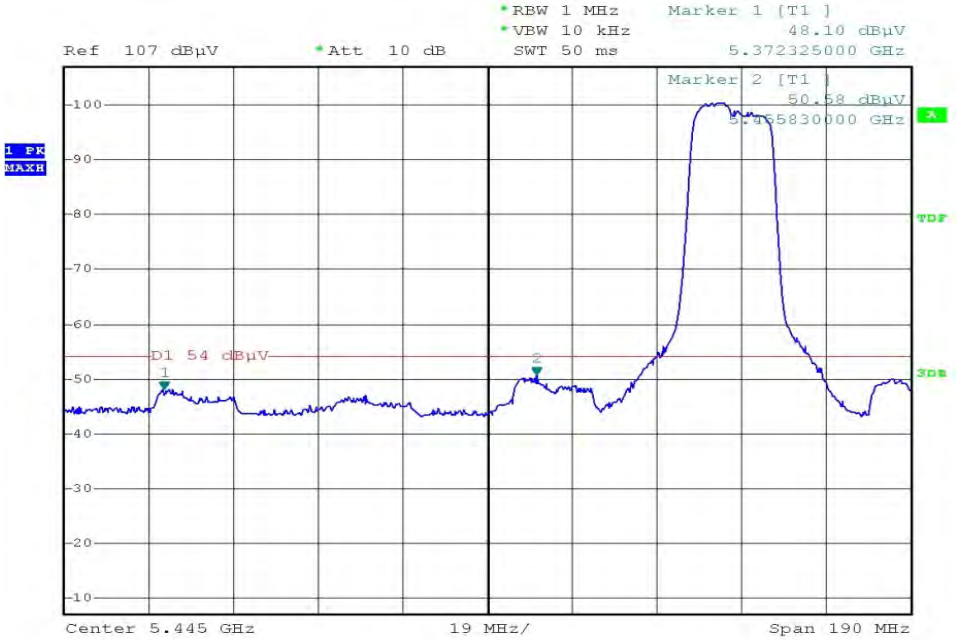
PLOT OF TEST DATA

802.11n mode

Restricted Band Spurious Emissions, Lowest Channel(5500 MHz), Peak, 802.11n mode

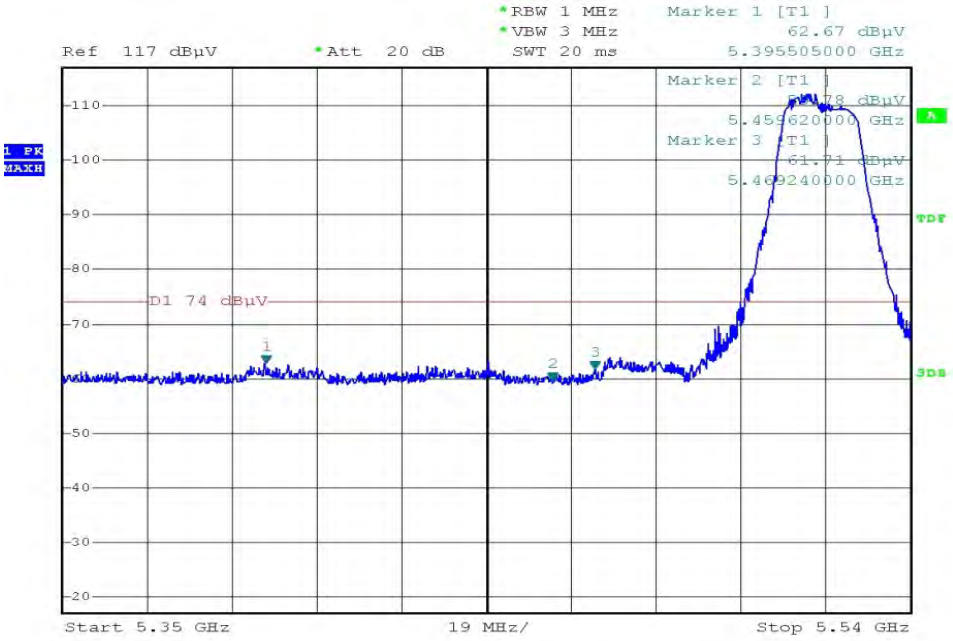


Restricted Band Spurious Emissions, Lowest Channel(5500 MHz), Average, 802.11n mode

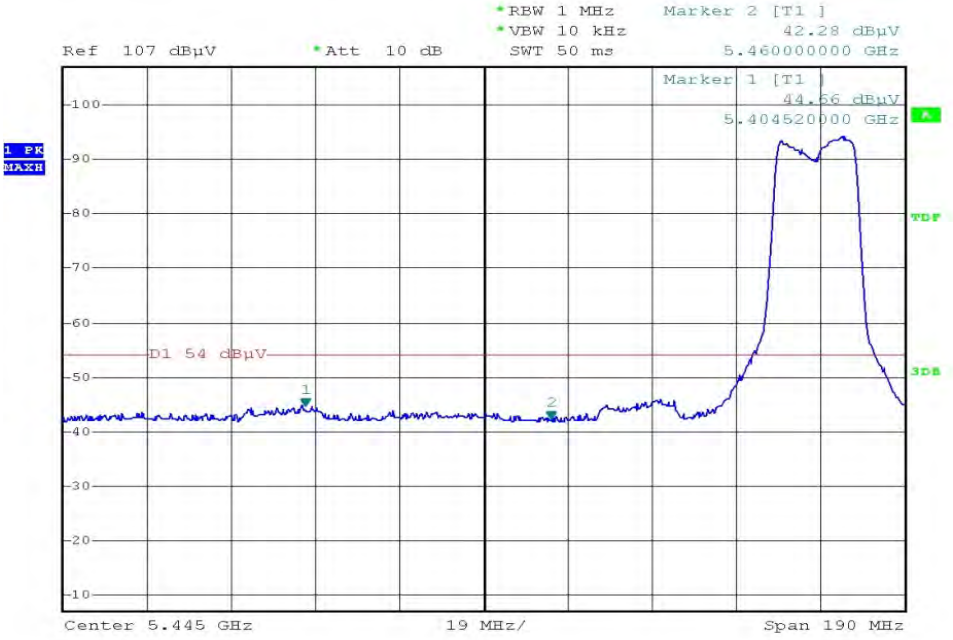


PLOT OF TEST DATA

Restricted Band Spurious Emissions, CH 104(5520 MHz), Peak, 802.11n mode

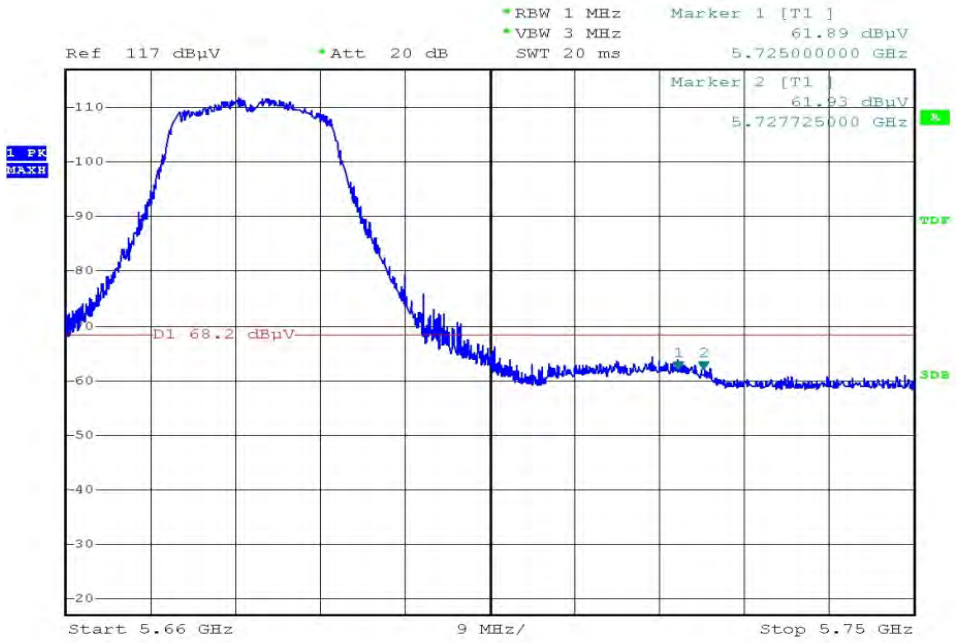


Restricted Band Spurious Emissions, CH 104(5520 MHz), Average, 802.11n mode

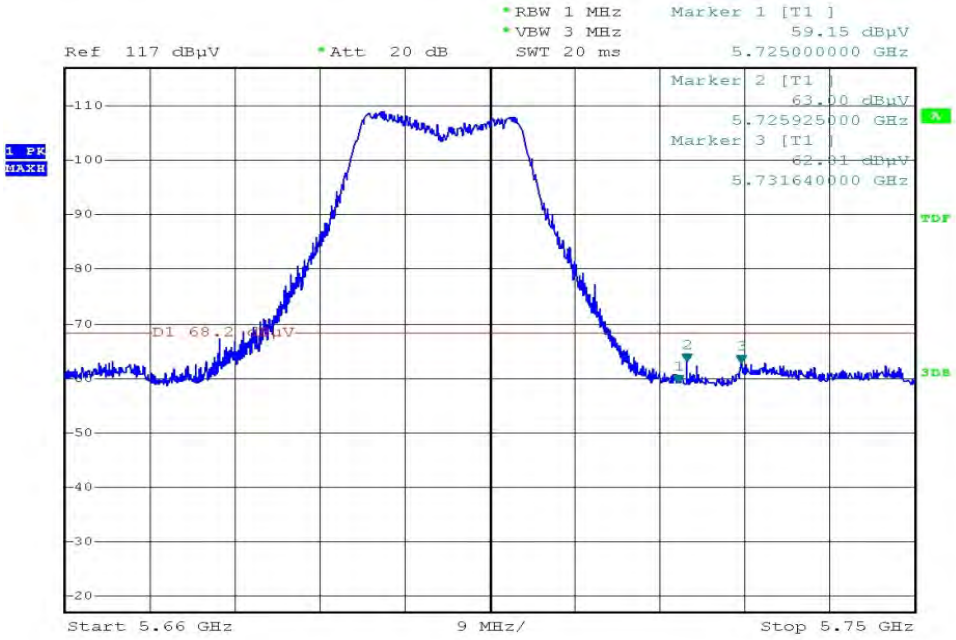


PLOT OF TEST DATA

Restricted Band Spurious Emissions, CH 136(5680 MHz), Peak, 802.11n mode



Restricted Band Spurious Emissions, Highest Channel(5700 MHz), Peak, 802.11n mode



Note(s):

1. *The antenna factor and cable loss were reflected in spectrum analyzer with correction factor for the Band edge radiated test.*
2. *Measurement of the radiated emissions is performed in vertical and horizontal polarizations. The worst data were recorded*
3. *For the radiated band edge test, the EUT was investigated in all available data rates for 802.11a,n modes. The worst case band edge emissions were found while EUT was transmitting in 802.11a mode at 6 Mbps and 802.11n mode at MCS0*
4. *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, average emission levels were measured using the "Method VB" by setting the analyzer RBW = 1 MHz, VBW = 1 kHz (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 and the average limit is 54 dBμV/m per § 15.209.*

8.9 Frequency Stability

8.9.1 Frequency Stability – Band I

FCC §15.407(g)

Test channel : Middle channel (5200 MHz)

Standard test voltage : 120 Vac

Measurement Result :

Voltage (%)	Power (Vac)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	ppm
100 %	120	+ 25(Ref.)	5,199,952,773	-47,227	-9.0821
100 %		- 20	5,199,990,944	-90,560	-1.7415
100 %		- 10	5,199,973,789	-26,211	-5.0406
100 %		0	5,199,964,257	-35,743	-6.8737
100 %		10	5,199,955,352	-44,648	-8.5862
100 %		20	5,199,953,501	-46,499	-8.9421
100 %		30	5,199,963,085	-36,915	-7.0990
100 %		40	5,199,981,169	-18,831	-3.6213
100 %		50	5,200,012,131	12,131	2.3329
100 %		60	5,200,069,437	69,437	13.3533
85 %	102	25	5,199,954,787	-45,213	-8.6948
115 %	138	25	5,199,953,670	-46,330	-8.9069

Note(s):

The temperature is varied from –20 °C to +60 °C using an environmental chamber.

According to the results of the frequency stability test, the maximum frequency tolerance was 13.4 PPM at 60 ℃. Since it is very small and smaller than the tolerance as specified in the users manual, the device is judged that an emission is maintained within the band of operation under all conditions of normal operation.

8.9.2 Frequency Stability – Band II

FCC §15.407(g)

Test channel : Middle channel (5280 MHz)

Standard test voltage : 120 Vac

Measurement Result :

Voltage (%)	Power (Vac)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	ppm
100 %	120	+ 25(Ref.)	5,279,953,997	-46,003	-8.7127
100 %		- 20	5,279,989,710	-10,290	-1.9489
100 %		- 10	5,279,973,191	-26,809	-5.0775
100 %		0	5,279,962,871	-37,129	-7.0320
100 %		10	5,279,954,744	-45,256	-8.5712
100 %		20	5,279,957,604	-42,396	-8.0295
100 %		30	5,279,966,096	-33,904	-6.4212
100 %		40	5,279,986,727	-13,273	-2.5138
100 %		50	5,280,024,406	24,406	4.6223
100 %		60	5,280,075,516	75,516	14.3023
85 %	102	25	5,279,954,886	-45,114	-8.5443
115 %	138	25	5,279,954,334	-45,666	-8.6489

Note(s):

The temperature is varied from –20 °C to +60 °C using an environmental chamber.

According to the results of the frequency stability test, the maximum frequency tolerance was 14.3 PPM at 60 ℃. Since it is very small and smaller than the tolerance as specified in the users manual, the device is judged that an emission is maintained within the band of operation under all conditions of normal operation.

8.9.3 Frequency Stability – Band III

FCC §15.407(g)

Test channel : Middle channel (5580 MHz)

Standard test voltage : 120 Vac

Measurement Result :

Voltage (%)	Power (Vac)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	ppm
100 %	120	+ 25(Ref.)	5,579,950,233	-49,767	-8.9188
100 %		- 20	5,579,990,419	-95,810	-1.7170
100 %		- 10	5,579,972,689	-27,311	-4.8944
100 %		0	5,579,961,262	-38,738	-6.9423
100 %		10	5,579,953,080	-46,920	-8.4086
100 %		20	5,579,952,193	-47,807	-8.5676
100 %		30	5,579,960,757	-39,243	-7.0328
100 %		40	5,579,979,226	-20,774	-3.7229
100 %		50	5,580,015,282	15,282	2.7387
100 %		60	5,580,045,993	45,993	8.2425
85 %	102	25	5,579,952,814	-47,186	-8.4563
115 %	138	25	5,579,952,348	-47,652	-8.5398

Note(s):

The temperature is varied from –20 °C to +60 °C using an environmental chamber.

According to the results of the frequency stability test, the maximum frequency tolerance was -8.9 PPM at 25 ℃. Since it is very small and smaller than the tolerance as specified in the users manual, the device is judged that an emission is maintained within the band of operation under all conditions of normal operation.

9. TEST EQUIPMENT

No.	Instrument	Manufacturer	Model	Serial No.	Calibration Date	Calibration Interval
1	*Test Receiver	R & S	ESCS 30	833364/020	Jan. 09 2013	1 year
2	*Test Receiver	R & S	ESCS 30	100302	Oct. 08 2012	1 year
3	*Amplifier	HP	8447F	2805A03427	Jul. 17 2012	1 year
4	*Amplifier	Sonoma Instrument	310N	291916	Jul. 16 2012	1 year
5	*Amplifier	R & S	SCU18	10065	Apr. 05 2013	1 year
6	*Amplifier	R & S	SCU26	10011	**Jun. 01 2012	1 year
7	*Amplifier	R & S	SCU40	10008	**Jun. 01 2012	1 year
8	*Pre Amplifier	HP	8449B	3008A00107	Jan. 09 2013	1 year
9	*Pre Amplifier	HP	8447F	2805A03351	Jul. 17 2012	1 year
10	*Spectrum Analyzer	Agilent	E4440A	MY44303257	Jul. 16 2012	1 year
11	*Spectrum Analyzer	Agilent	E4440A	MY44022567	Apr. 05 2013	1 year
12	*Spectrum Analyzer	R & S	FSP40	100361	Jul. 17 2012	1 year
13	*Loop Antenna	R & S	HFH2-Z2	100279	Feb. 21 2012	2 year
14	Wideband Power Sensor	R & S	NRP-Z81	100634	Sep 22 2012	1 year
15	*Biconical Log Antenna	ARA	LPB-2520/A	1180	Apr. 26 2012	2 year
16	*Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-474	Aug. 13 2012	2 year
17	*Horn Antenna	Q-par Angus	QSH20S20	8179	Mar. 20 2013	2 year
18	*Horn Antenna	Q-par Angus	QSH22K20	8180	Mar. 20 2013	2 year
19	Trilog-Broadband Antenna	SCHWARZBECK	VULB 9163	9163-454	Feb. 24 2012	2 year
20	*Trilog-Broadband Antenna	SCHWARZBECK	VULB 9168	9168-257	Apr. 26 2012	2 year
21	*LISN	R & S	ESH3-Z5	833874/006	Oct. 08 2012	1 year
22	*LISN	R & S	ESH2-Z5	100227	Apr. 04 2013	1 year
23	*Position Controller	DAEIL EMC	N/A	N/A	N/A	N/A
24	*Turn Table	DAEIL EMC	N/A	N/A	N/A	N/A
25	*Antenna Mast	DAEIL EMC	N/A	N/A	N/A	N/A
26	*Anechoic Chamber	EM Eng.	N/A	N/A	N/A	N/A
27	*Shielded Room	EM Eng.	N/A	N/A	N/A	N/A
28	*Position Controller	Seo-Young EMC	N/A	N/A	N/A	N/A
29	*Turn Table	Seo-Young EMC	N/A	N/A	N/A	N/A
30	*Antenna Mast	Seo-Young EMC	N/A	N/A	N/A	N/A
31	*Anechoic Chamber	Seo-Young EMC	N/A	N/A	N/A	N/A
32	*Shielded Room	Seo-Young EMC	N/A	N/A	N/A	N/A

Note(s)

*1. * Test equipment used during the test*

*3. ** These equipments were not used to test after June 1, 2013.*

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				
Receiver reading	***RI***	± 0.10	normal 1	1.000	0.10	1	0.10
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***	± 0.50	normal 2	2.000	0.25	1	0.25
Antenna Factor Calibration	***AF***	± 1.50	normal 2	2.000	0.75	1	0.75
Attenuation Antenna-receiver	***CL***	± 0.52	normal 2	2.000	0.26	1	0.26
Antenna Directivity	***AD***	± 1.00	rectangular	1.732	0.58	1	0.58
Antenna Factor Height Dependence	***AH***	± 0.50	rectangular	1.732	0.29	1	0.29
Antenna Phase Centre Variation	***AP***	± 0.30	rectangular	1.732	0.17	1	0.17
Antenna Factor Frequency Interpolation	***AI***	± 0.30	rectangular	1.732	0.17	1	0.17
Site Imperfections	***SI***	± 4.00	triangular	2.449	1.63	1	1.63
Measurement Distance Variation	***DV***	± 0.10	rectangular	1.732	0.06	1	0.06
Antenna Balance	***Dbal***	± 0.90	rectangular	1.732	0.52	1	0.52
Cross Polarisation	***DCross***	± 0.90	rectangular	1.732	0.52	1	0.52
ⓐ Mismatch	***M***	+ 0.25	U-Shaped	1.414	0.18	1	0.18
ⓑ Mismatch	***M***	- 0.26	U-Shaped	1.414	- 0.18	1	- 0.18
ⓒ Mismatch	***M***	+ 0.98	U-Shaped	1.414	0.69	1	0.69
ⓓ Mismatch	***M***	- 1.11	U-Shaped	1.414	- 0.79	1	- 0.79
Measurement System Repeatability	***RS***	0.09	normal 1	1.000	0.09	1	0.09
Remark	ⓐ: Biconical Antenna-receiver Mismatch : + (< 200 MHz) ⓑ: Biconical Antenna-receiver Mismatch : - (< 200 MHz) ⓒ: Log Periodic Antenna-receiver Mismatch : + (≧ 200 MHz) ⓓ: Log Periodic Antenna-receiver Mismatch : - (≧ 200 MHz)						
Combined Standard Uncertainty	Normal			± 2.63 (< 200 MHz) ± 2.74 (≧200 MHz)			
Expended Uncertainty U	Normal (*k* = 2)			± 5.26 (< 200 MHz) ± 5.48 (≧200 MHz)			