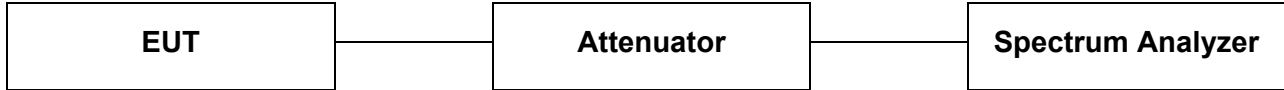


### 3. 26 dB Bandwidth & 99 % Bandwidth

#### 3.1. Test Setup



#### 3.2. Limit

None; for reporting purpose only.

#### 3.3. Test Procedure

All data rates and modes were investigated for this test. The full data for the worst case data rate are reported in this section.

##### 3.3.1. 26 dB Bandwidth

1. This measurement settings are specified in section II.C.1 of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. Set RBW = approximately 1 % of the emission bandwidth.
3. Set the VBW > RBW.
4. Detector = Peak.
5. Trace mode = max hold.
6. Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1 %.

### 3.2.2. 99 % Bandwidth

1. This measurement settings are specified in section II.D of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. Set center frequency to the nominal EUT channel center frequency.
3. Set span = 1.5 times to 5.0 times the OBW.
4. Set RBW = 1 % to 5 % of the OBW.
5. Set VBW  $\geq 3 \times$  RBW.
6. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
7. Use the 99 % power bandwidth function of the instrument (if available).
8. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99 % occupied bandwidth is the difference between these two frequencies.

In the result,

- DFS requirements are not applicable in the 5 150 MHz ~ 5 250 MHz.

#### Remark;

In case of band crossing channels 138, 142 and 144, the measurement is complied with section III.A of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

### 3.4. Test Result

Ambient temperature : (23 ± 1) °C  
 Relative humidity : 47 % R.H.

#### Test mode: 11a

Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	26 dB Bandwidth (MHz)	99 % Bandwidth (MHz)
U-NII 1	5 180	36	6	20.955	-
	5 220	44		21.129	-
	5 240	48		20.839	17.019
U-NII 2A	5 260	52		20.955	-
	5 300	60		21.071	-
	5 320	64		21.013	-
U-NII 2C	5 500	100		21.187	-
	5 580	116		21.187	-
	5 720	144		21.245	-
U-NII 3	5 745	149		20.897	-
	5 785	157		21.013	-
	5 825	165		20.955	-

#### Test mode: 11n\_HT20

Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	26 dB Bandwidth (MHz)	99 % Bandwidth (MHz)
U-NII 1	5 180	36	MCS1	21.303	-
	5 220	44		21.245	-
	5 240	48		21.360	17.945
U-NII 2A	5 260	52		21.708	-
	5 300	60		21.360	-
	5 320	64		21.360	-
U-NII 2C	5 500	100		21.418	-
	5 580	116		21.534	-
	5 720	144		21.476	-
U-NII 3	5 745	149		21.650	-
	5 785	157		21.418	-
	5 825	165		21.476	-

**Test mode: 11ac\_VHT40**

Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	26 dB Bandwidth (MHz)	99 % Bandwidth (MHz)
U-NII 1	5 190	38	MCS1	39.826	-
	5 230	46		39.363	36.237
U-NII 2A	5 270	54		39.711	-
	5 310	62		39.711	-
U-NII 2C	5 510	102		39.826	-
	5 550	110		39.826	-
	5 710	142		39.942	-
U-NII 3	5 755	151		39.826	-
	5 795	159		39.479	-

**Test mode: 11ac\_VHT80**

Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	26 dB Bandwidth (MHz)	99 % Bandwidth (MHz)
U-NII 1	5 210	42	MCS2	81.737	75.716
U-NII 2A	5 290	58		81.968	-
U-NII 2C	5 530	106		82.200	-
	5 690	138		81.968	-
U-NII 3	5 775	155		81.737	-

**Band-crossing channel**

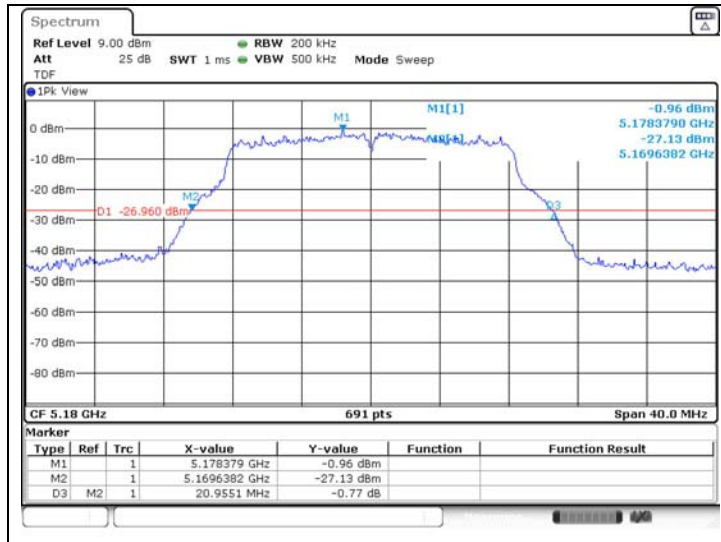
Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	26 dB Bandwidth (MHz)
11a	5 720	144	6	15.651
11n_HT20	5 720	144	MCS1	15.651
11ac_VHT40	5 710	142	MCS1	34.797
11ac_VHT80	5 690	138	MCS2	75.753

**- Test plots**

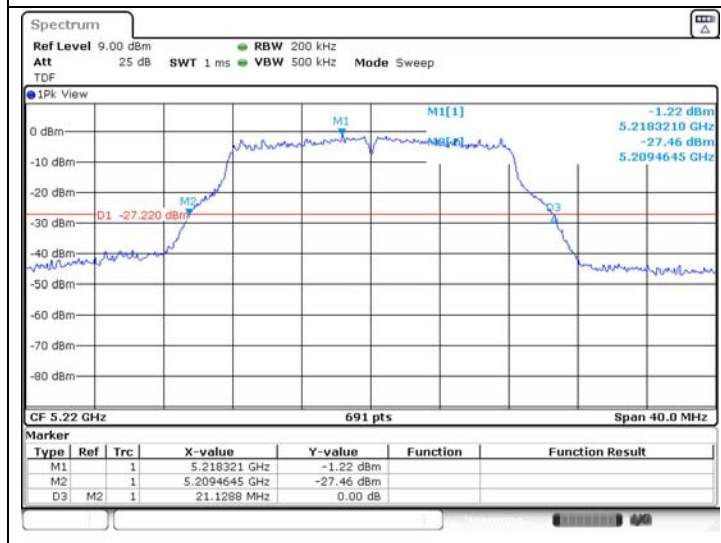
**26 dB Bandwidth**

**802.11a (Band 1)**

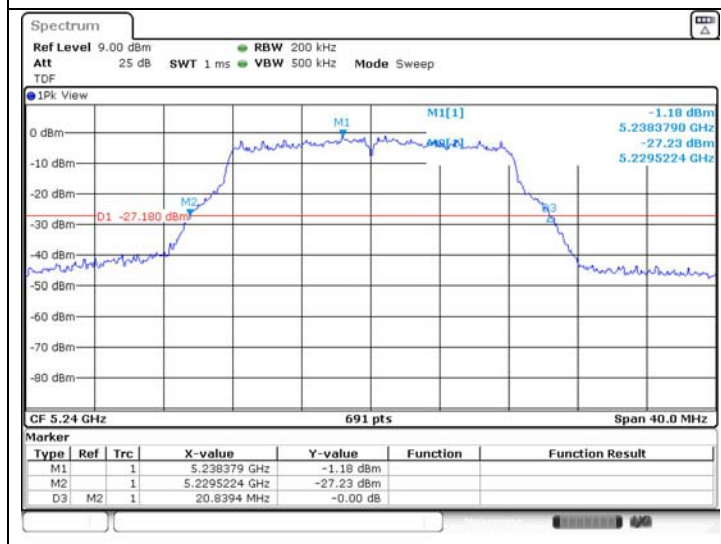
Low Channel  
(5 180 MHz)



Middle Channel  
(5 220 MHz)

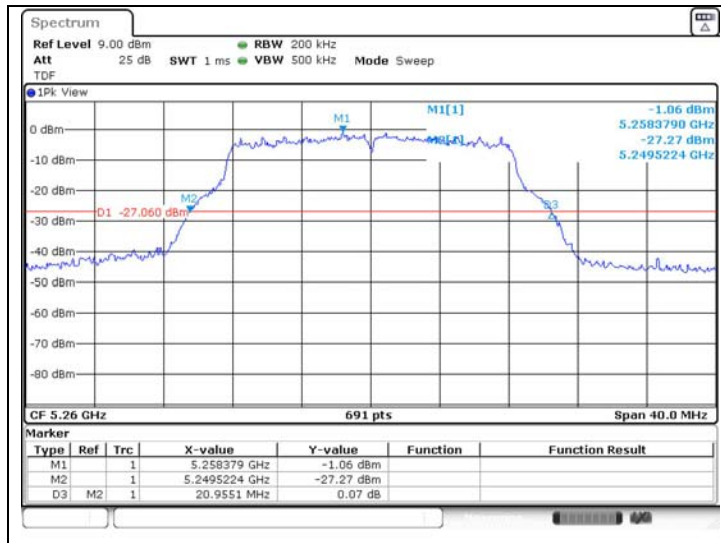


High Channel  
(5 240 MHz)

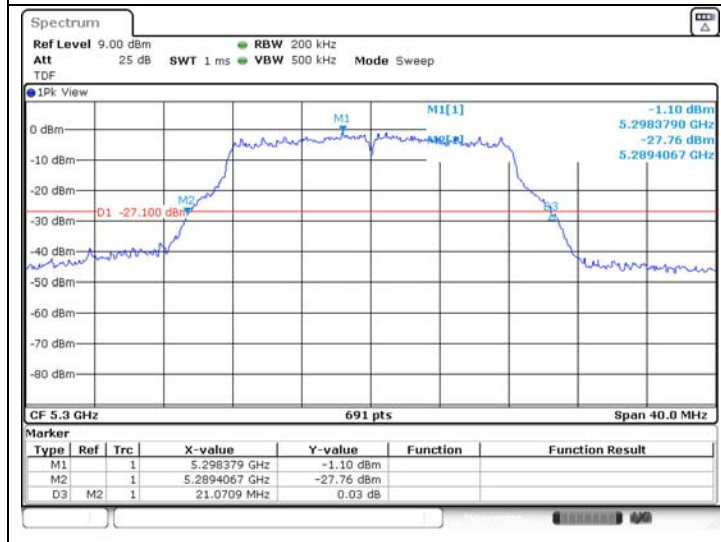


**802.11a (Band 2A)**

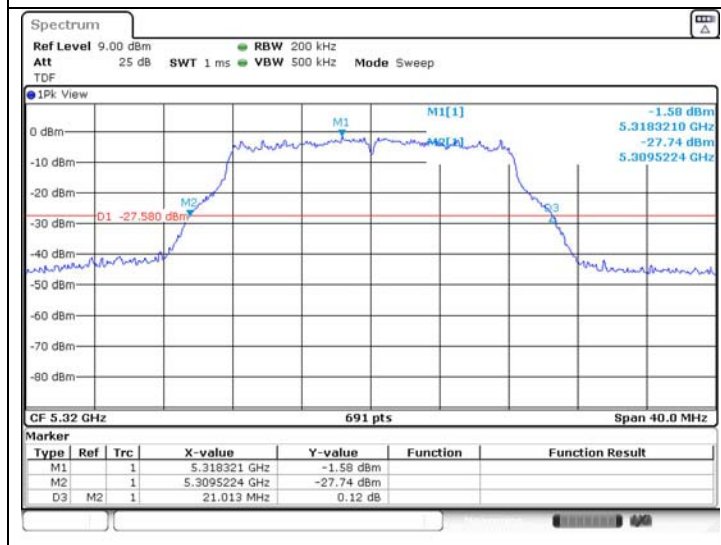
Low Channel  
(5 260 MHz)



Middle Channel  
(5 300 MHz)

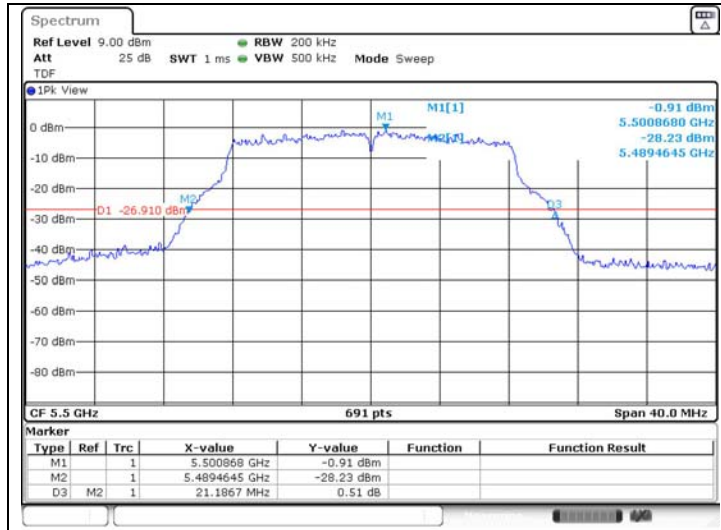


High Channel  
(5 320 MHz)

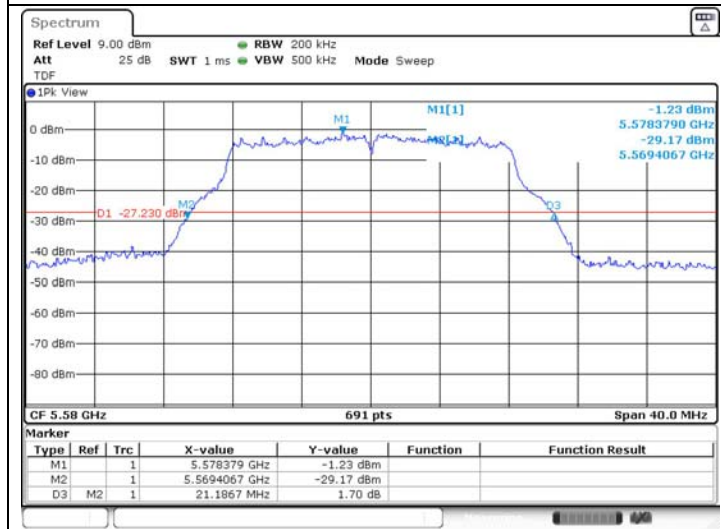


**802.11a (Band 2C)**

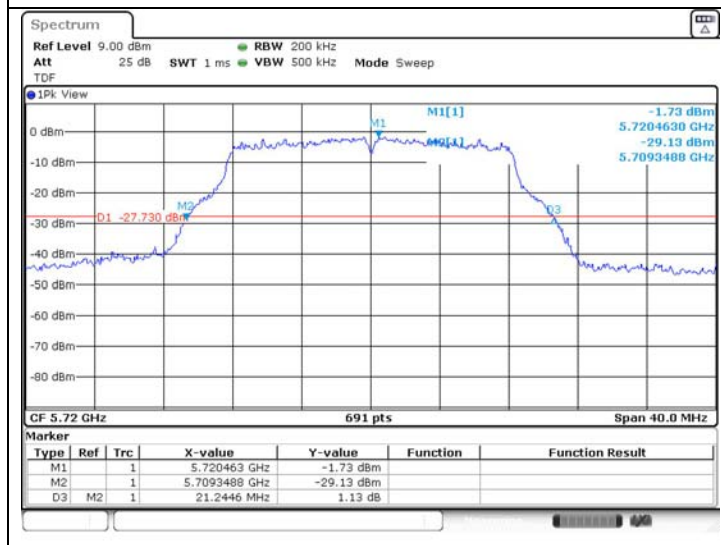
Low Channel  
(5 500 MHz)



Middle Channel  
(5 580 MHz)

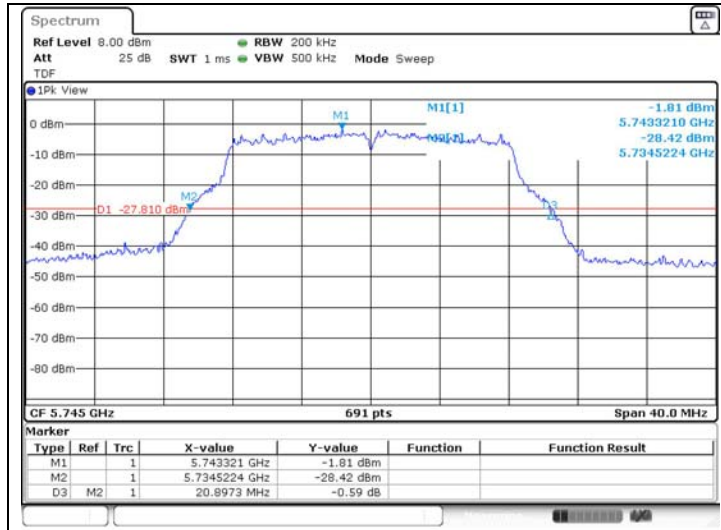


High Channel  
(5 720 MHz)

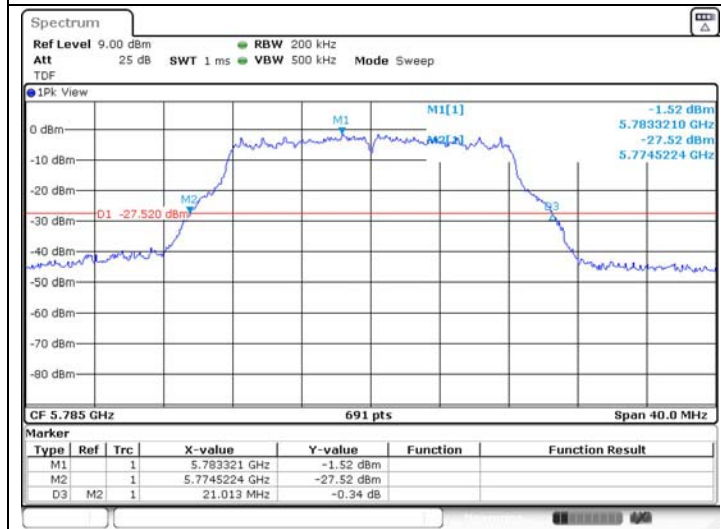


**802.11a (Band 3)**

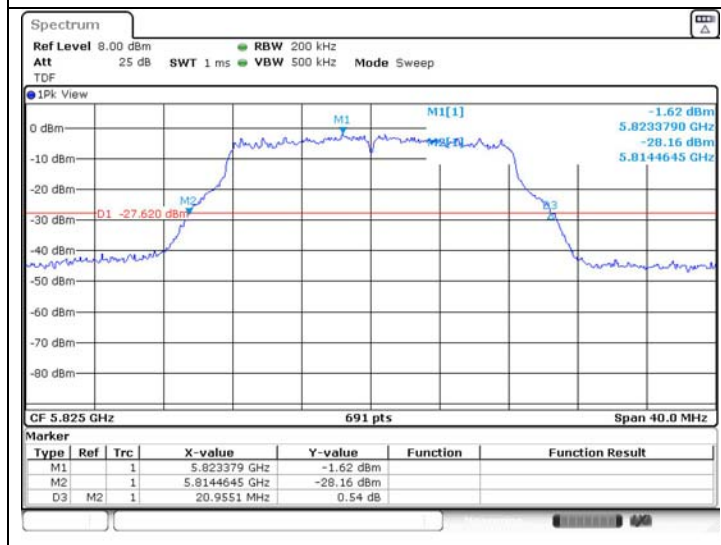
Low Channel  
(5 745 MHz)



Middle Channel  
(5 785 MHz)



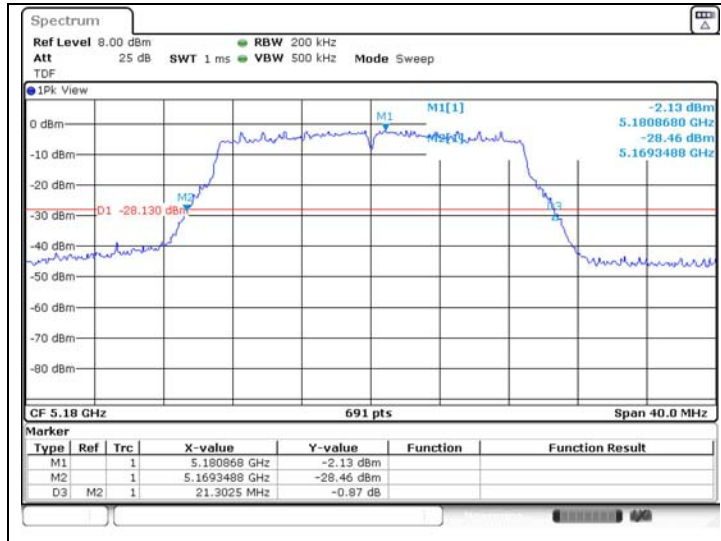
High Channel  
(5 825 MHz)



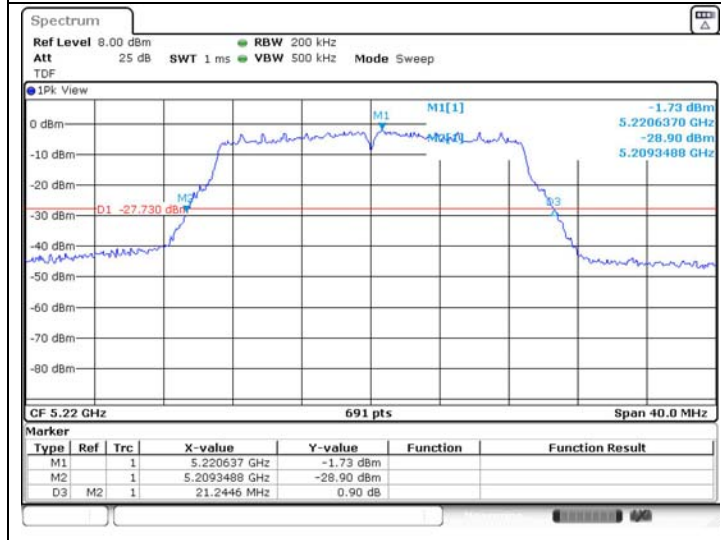


**802.11n\_HT20 (Band 1)**

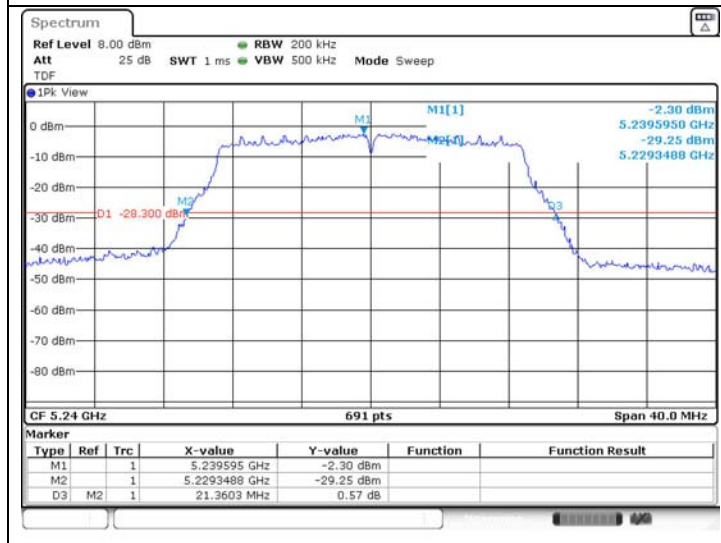
Low Channel  
(5 180 MHz)



Middle Channel  
(5 220 MHz)

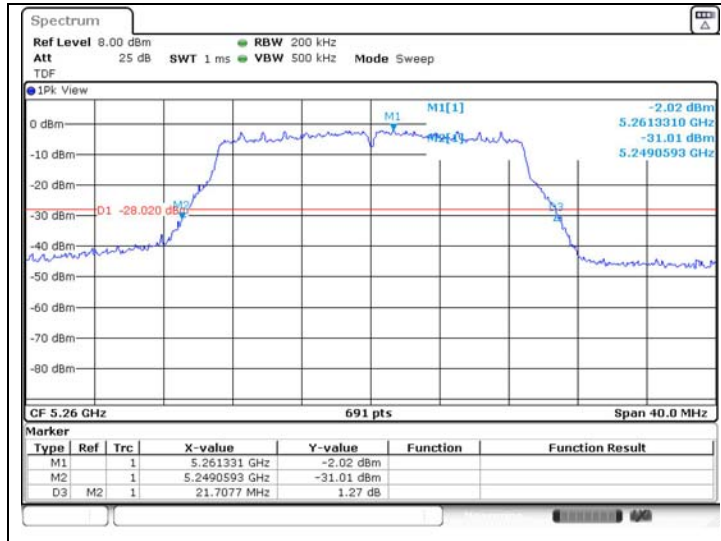


High Channel  
(5 240 MHz)

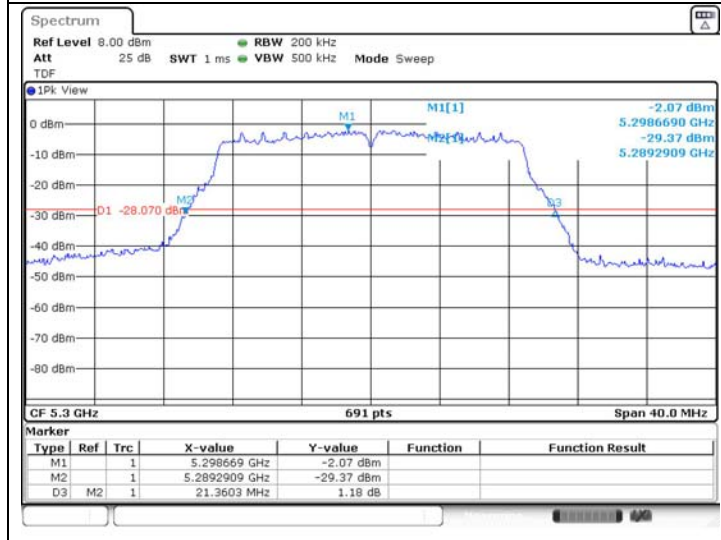


**802.11n\_HT20 (Band 2A)**

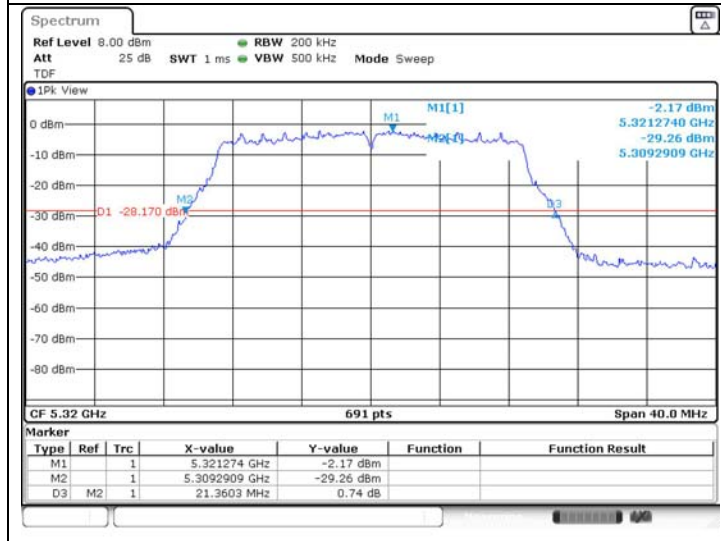
Low Channel  
(5 260 MHz)



Middle Channel  
(5 300 MHz)

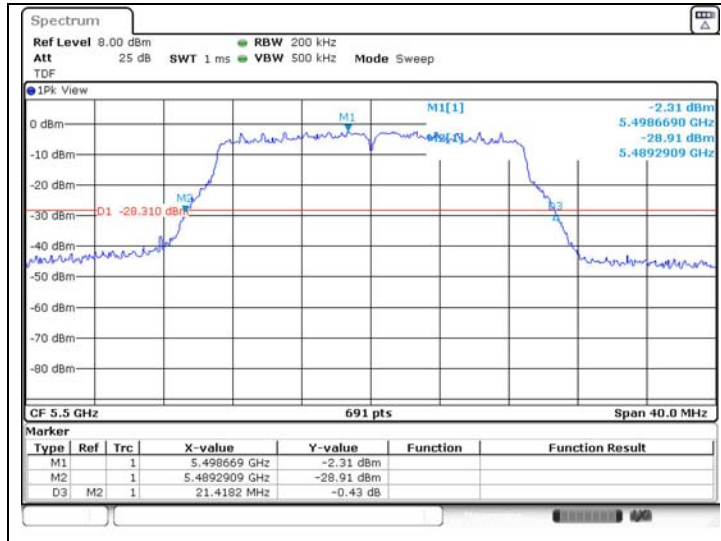


High Channel  
(5 320 MHz)

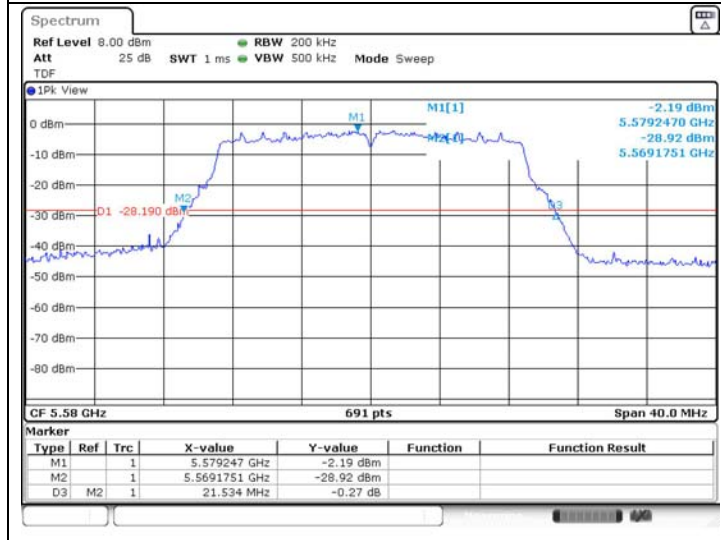


**802.11n\_HT20 (Band 2C)**

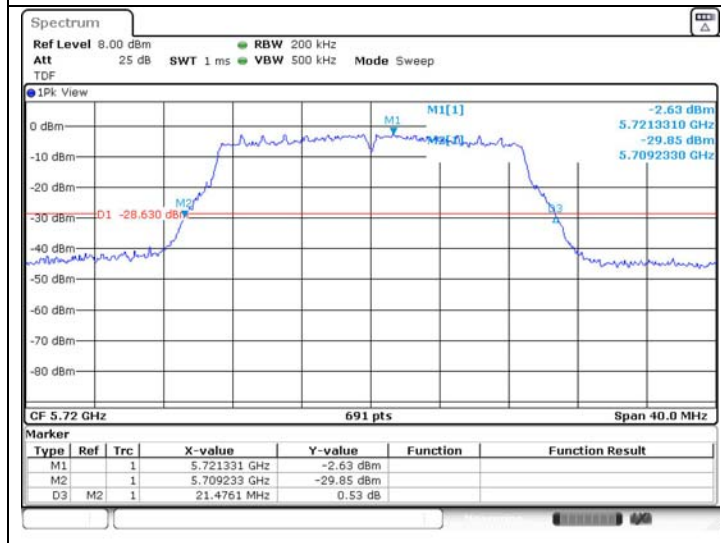
Low Channel  
(5 500 MHz)



Middle Channel  
(5 580 MHz)

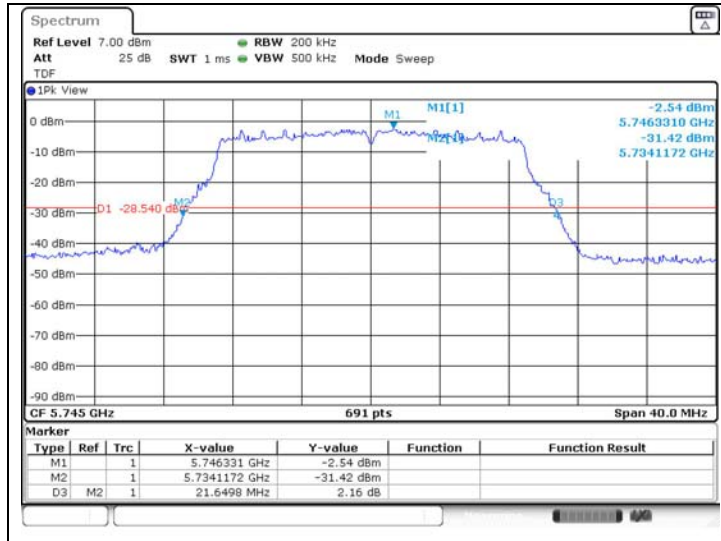


High Channel  
(5 720 MHz)

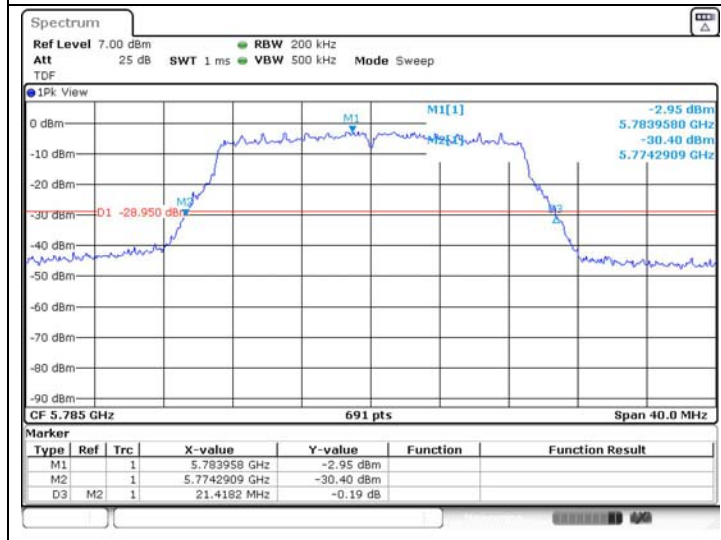


**802.11n\_HT20 (Band 3)**

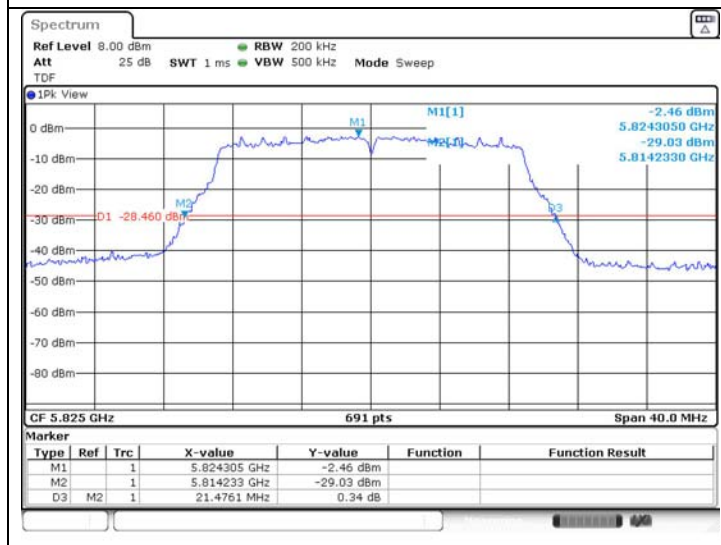
Low Channel  
(5 745 MHz)



Middle Channel  
(5 785 MHz)

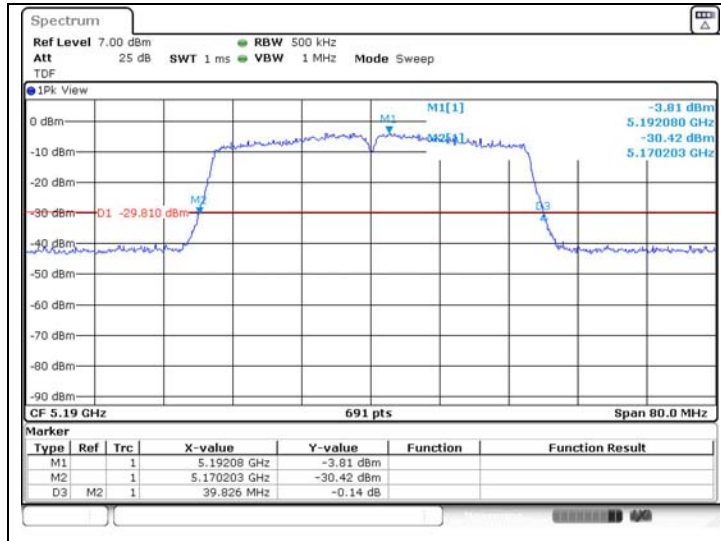


High Channel  
(5 825 MHz)

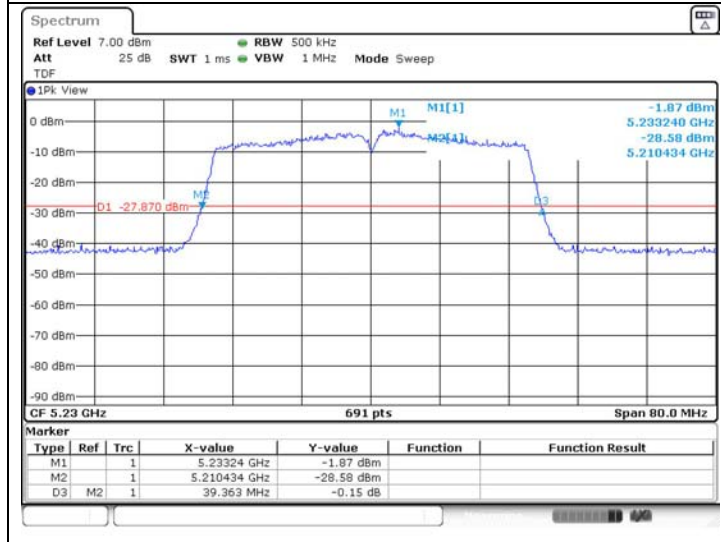


**802.11ac\_VHT40 (Band 1)**

Low Channel  
(5 190 MHz)

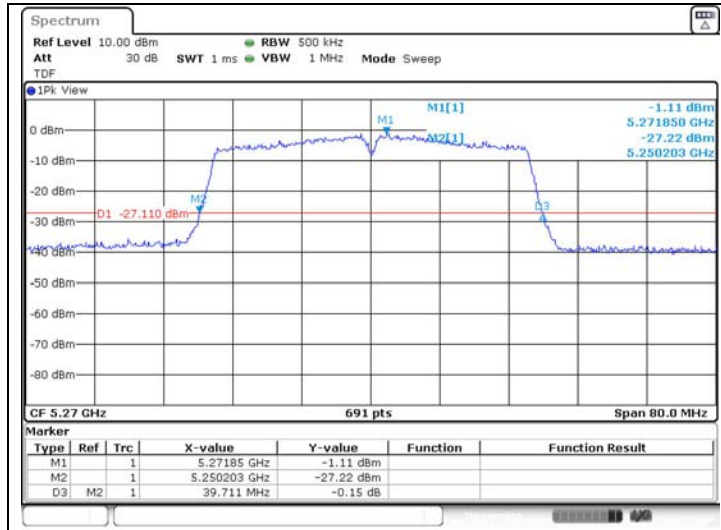


High Channel  
(5 230 MHz)

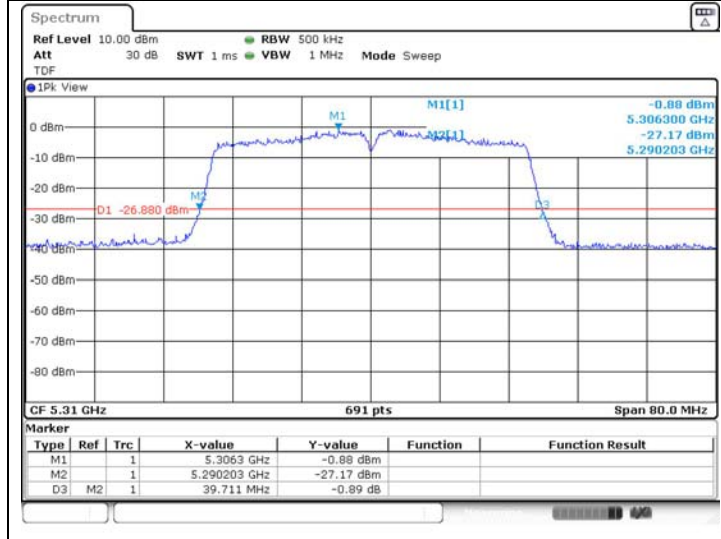


**802.11ac\_VHT40 (Band 2A)**

Low Channel  
(5 270 MHz)



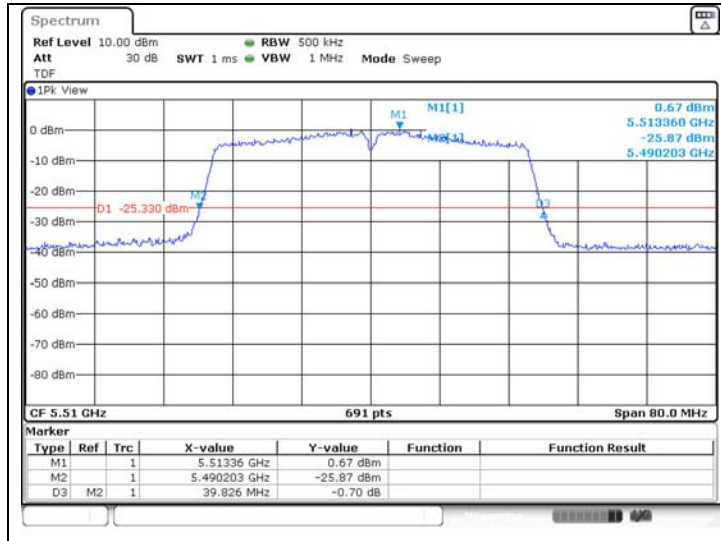
High Channel  
(5 310 MHz)



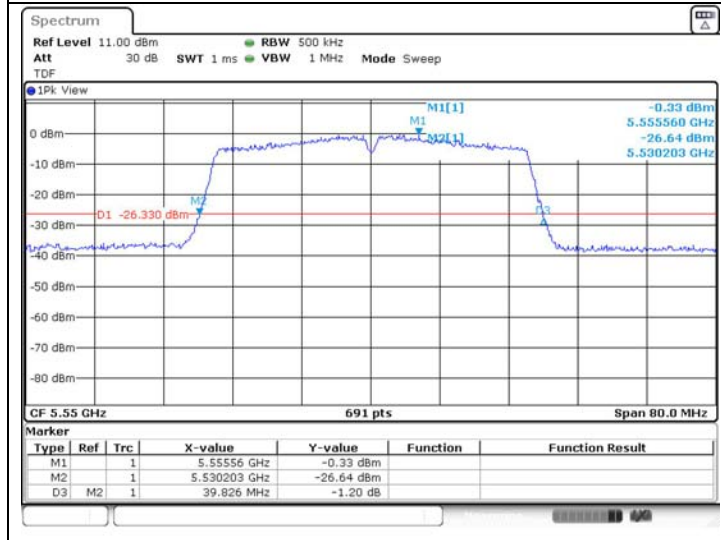


**802.11ac\_VHT40 (Band 2C)**

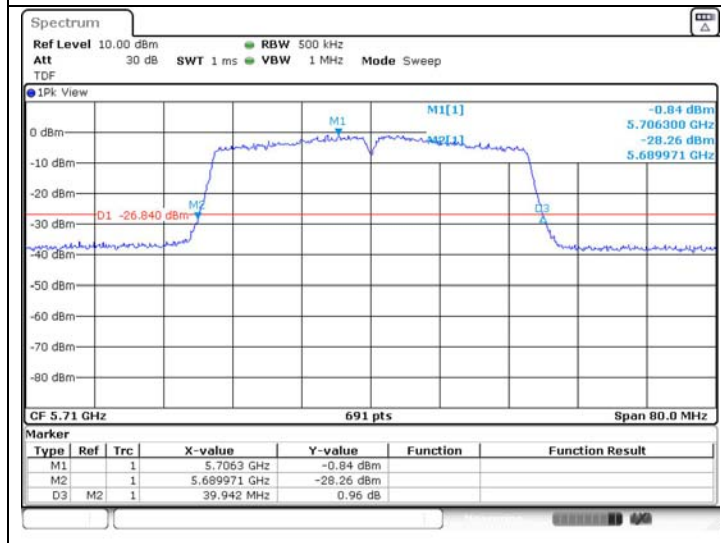
Low Channel  
(5 510 MHz)



Middle Channel  
(5 550 MHz)

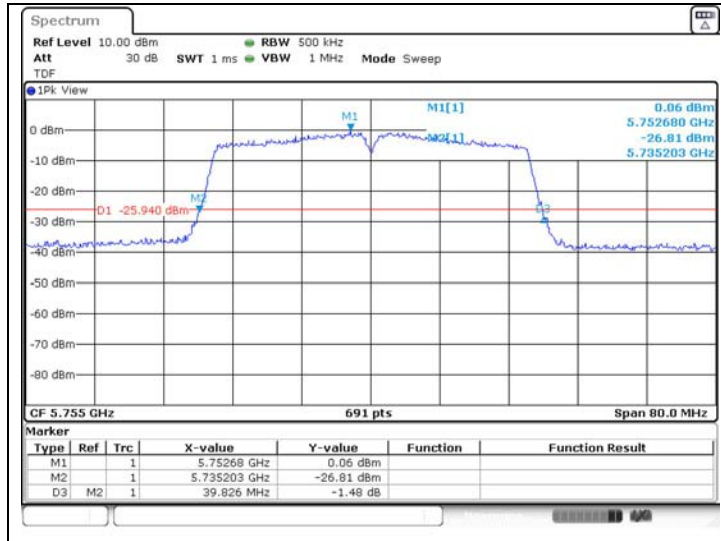


High Channel  
(5 710 MHz)

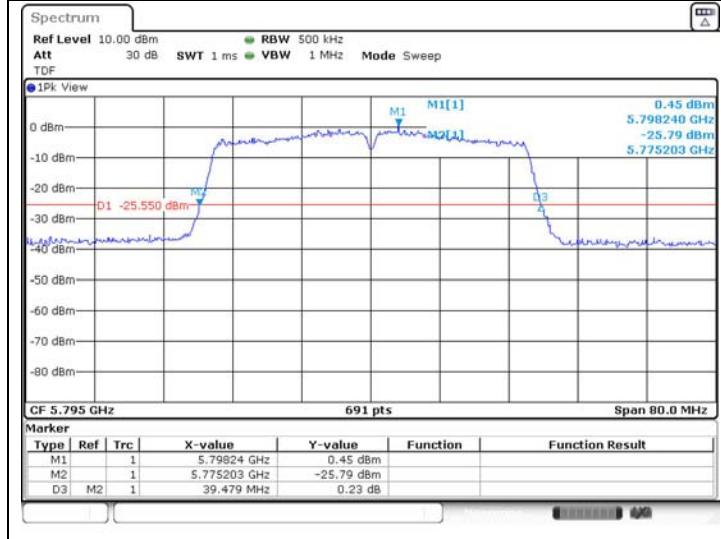


**802.11ac\_VHT40 (Band 3)**

Low Channel  
(5 755 MHz)



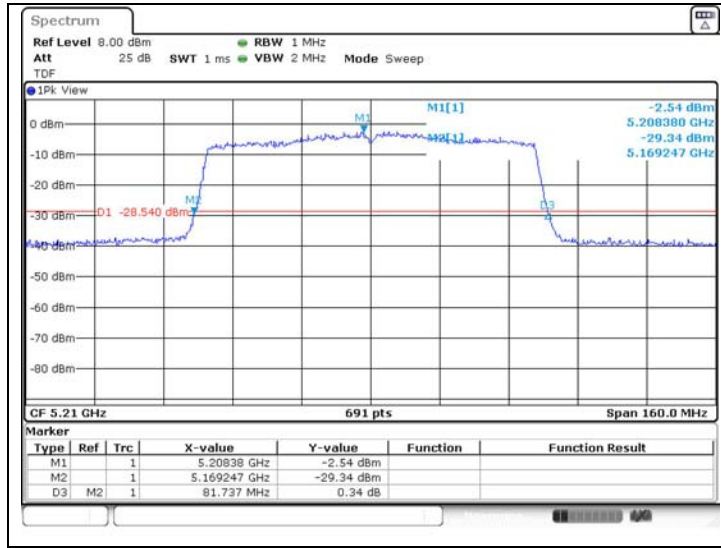
High Channel  
(5 795 MHz)





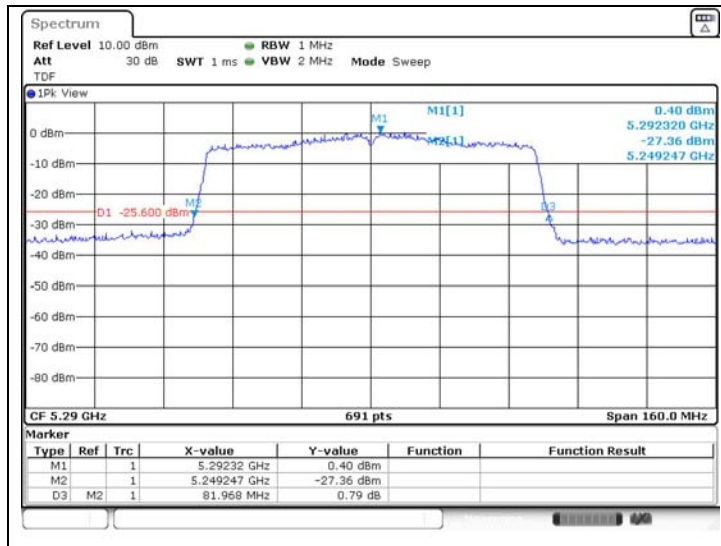
**802.11ac\_VHT80 (Band 1)**

Middle Channel  
(5 210 MHz)



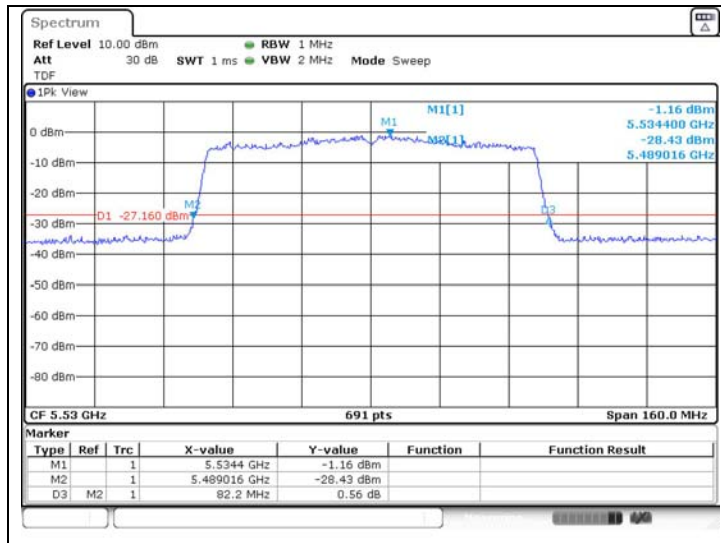
**802.11ac\_VHT80 (Band 2A)**

Middle Channel  
(5 290 MHz)

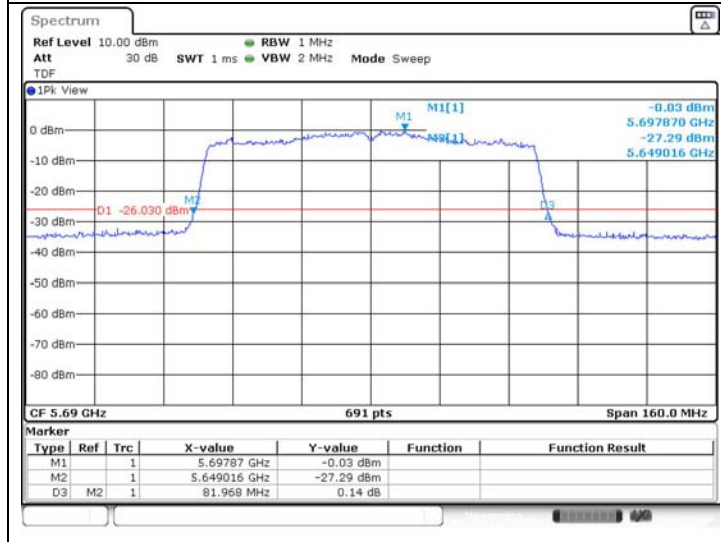


**802.11ac\_VHT80 (Band 2C)**

Low Channel  
(5 530 MHz)

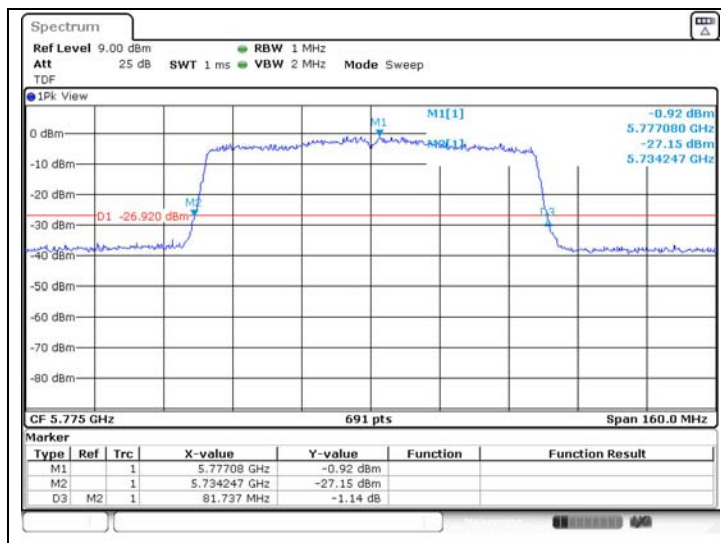


High Channel  
(5 690 MHz)



**802.11ac\_VHT80 (Band 3)**

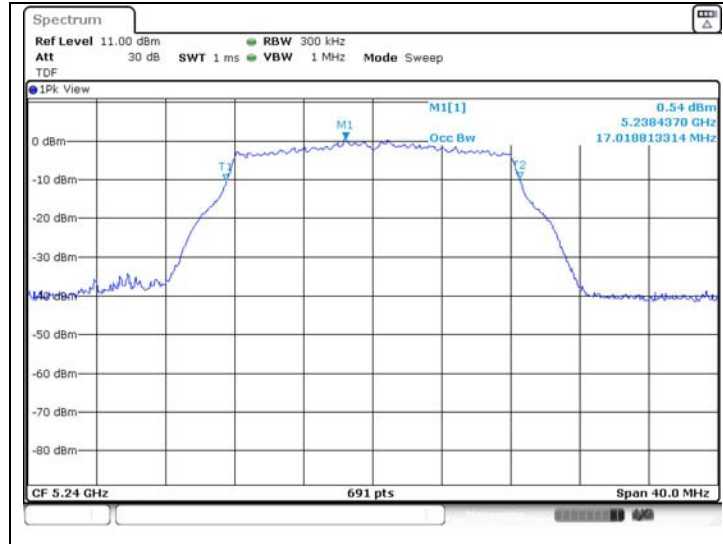
Middle Channel  
(5 775 MHz)



**99 % Bandwidth**

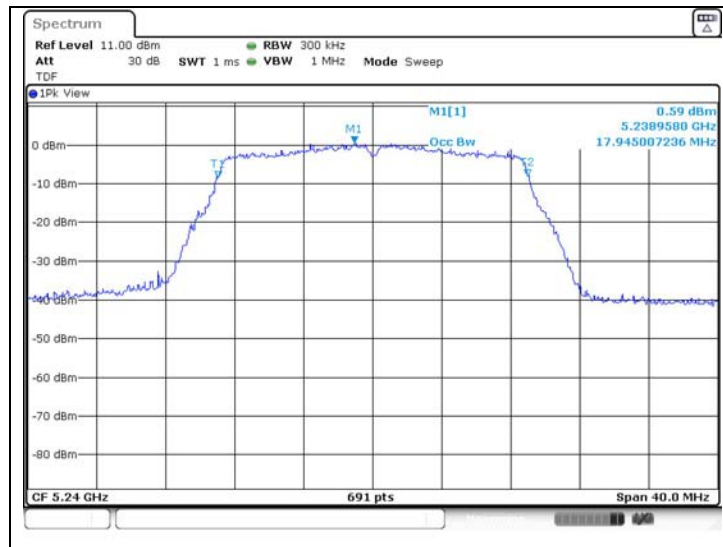
**802.11a (Band 1)**

High Channel  
(5 240 MHz)



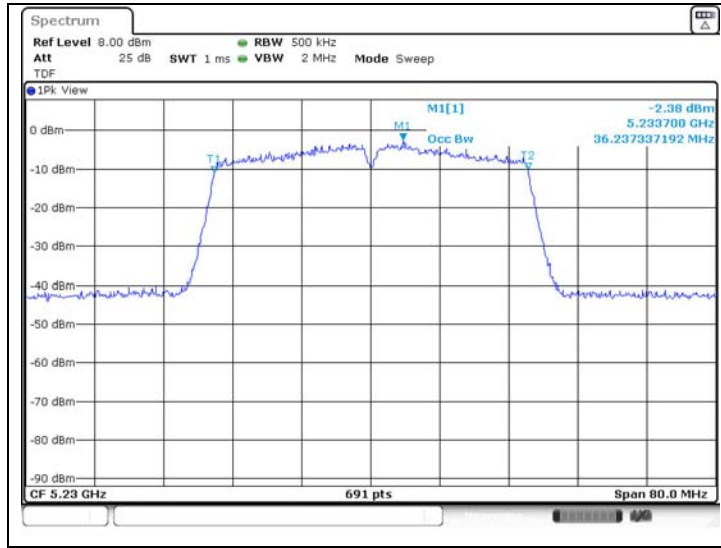
**802.11n\_HT20 (Band 1)**

High Channel  
(5 240 MHz)



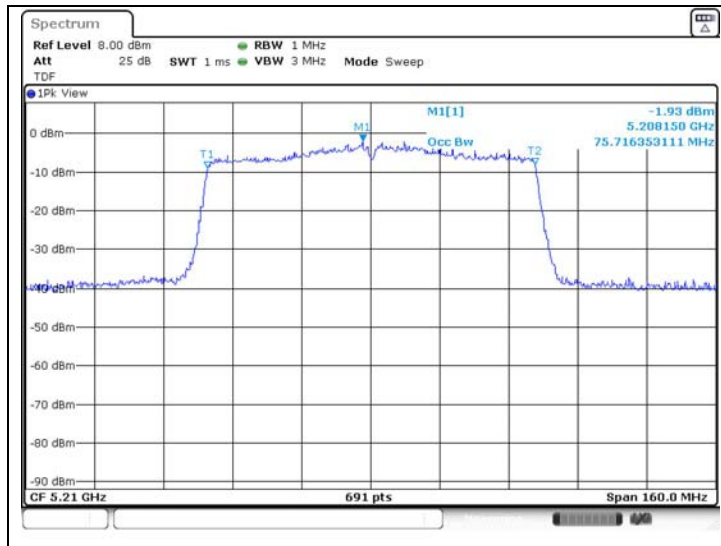
**802.11ac\_VHT40 (Band 1)**

High Channel  
(5 230 MHz)



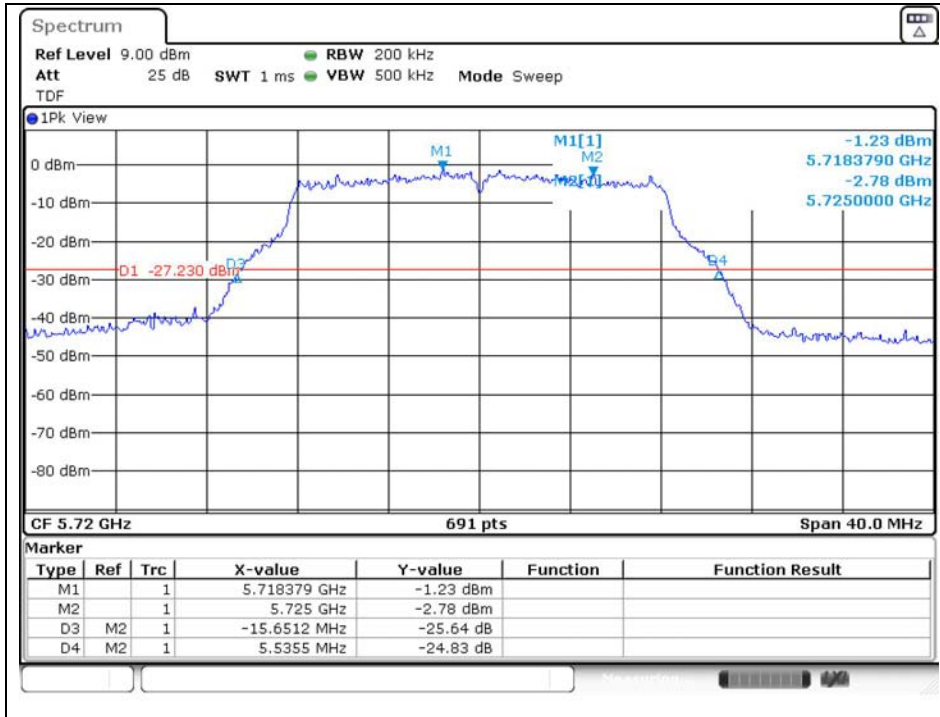
**802.11ac\_VHT80 (Band 1)**

Middle Channel  
(5 210 MHz)

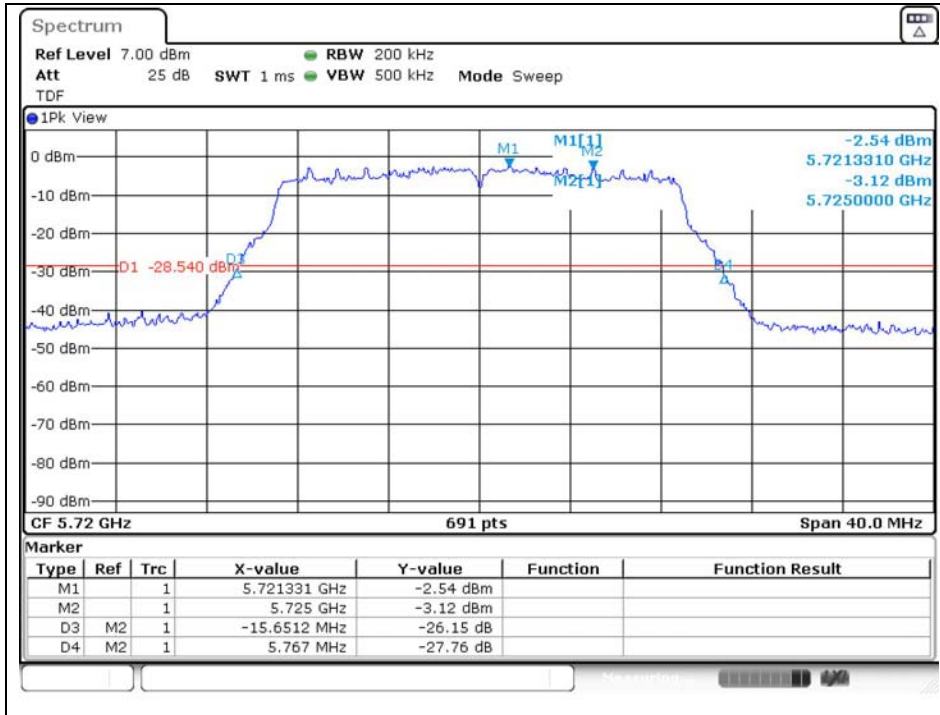


**Band-crossing channels**

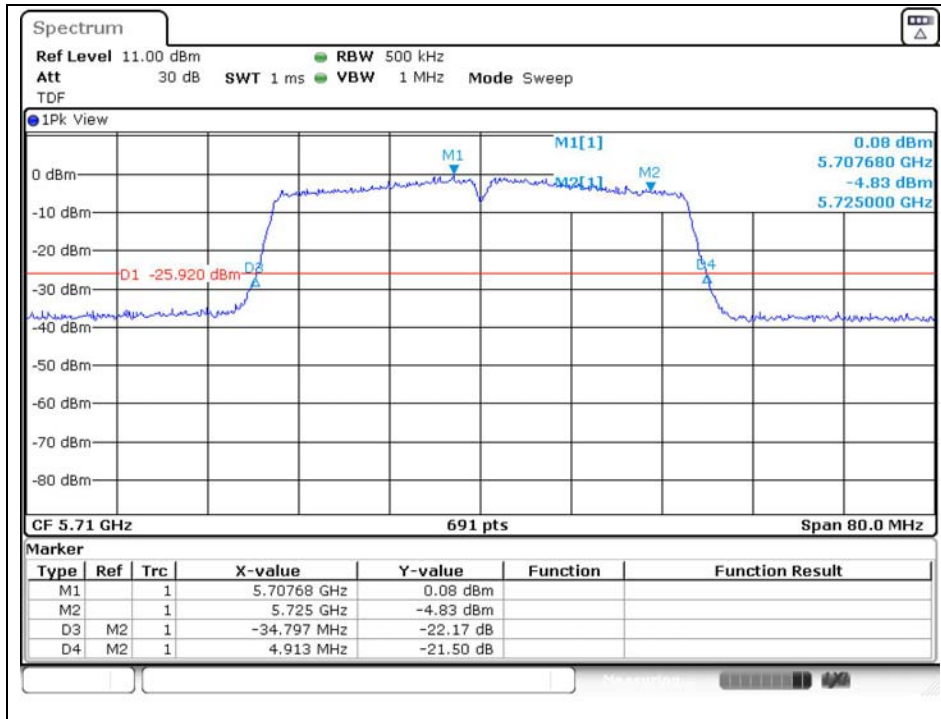
802.11a (5 720 MHz)



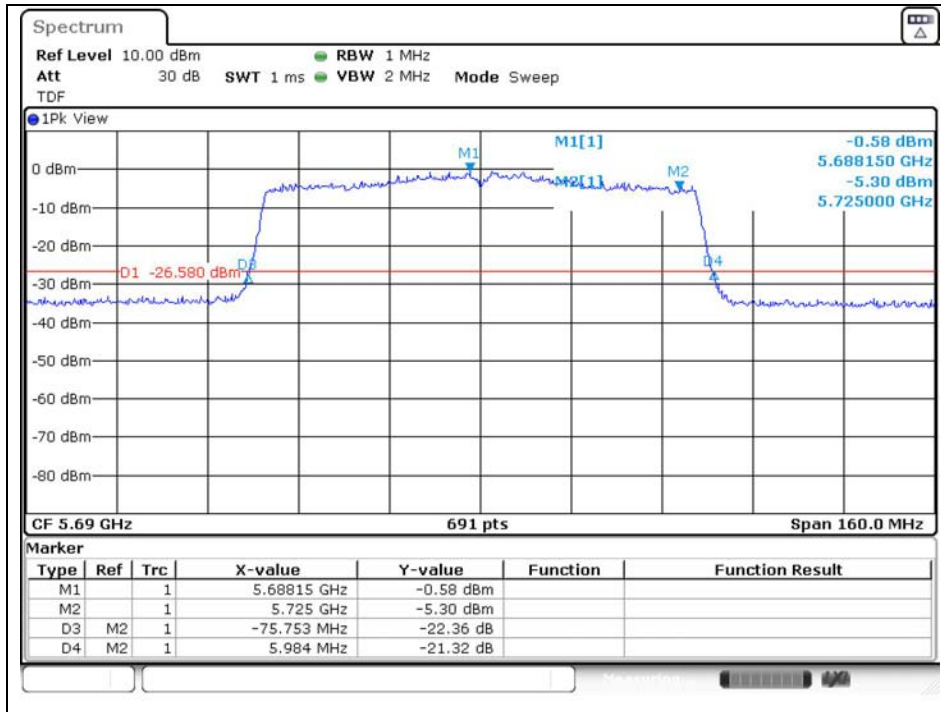
802.11n\_HT20 (5 720 MHz)



802.11ac\_VHT40 (5 710 MHz)



802.11ac\_VHT80 (5 690 MHz)



## 4. 6 dB Bandwidth

### 4.1. Test Setup



### 4.2. Limit

According to §15.407(e), within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

### 4.3. Test Procedure

All data rates and modes were investigated for this test. The full data for the worst case data rate are reported in this section.

1. This measurement settings are specified in section II.C.2 of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. Set RBW = 100 kHz.
3. Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
4. Detector = Peak.
5. Trace mode = max hold.
6. Sweep = auto couple.
7. Allow the trace to stabilize.
8. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

#### Remark;

In case of band crossing channels 138, 142 and 144, the measurement is complied with section III.A of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

#### 4.4. Test Result

Ambient temperature : (23 ± 1) °C

Relative humidity : 47 % R.H.

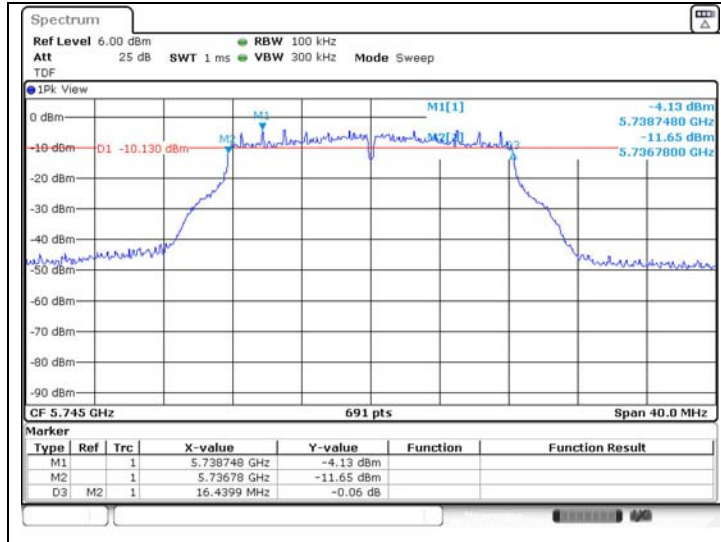
Band	Mode	Frequency (MHz)	Ch.	Data Rate (Mbps)	6 dB Bandwidth (MHz)	Minimum Bandwidth (kHz)
U-NII 3	11a	5 745	149	6	16.440	500
		5 785	157		16.440	
		5 825	165		16.440	
	11n_HT20	5 745	149	MCS1	17.714	
		5 785	157		17.714	
		5 825	165		17.714	
	11ac_VHT40	5 755	151	MCS1	36.237	
		5 795	159		36.469	
	11ac_VHT80	5 775	155	MCS2	75.948	
U-NII 3 (Band-crossing channels)	11a	5 720	144	6	3.220	
	11n_HT20	5 720	144	MCS1	3.857	
	11ac_VHT40	5 710	142	MCS1	3.061	
	11ac_VHT80	5 690	138	MCS2	2.974	



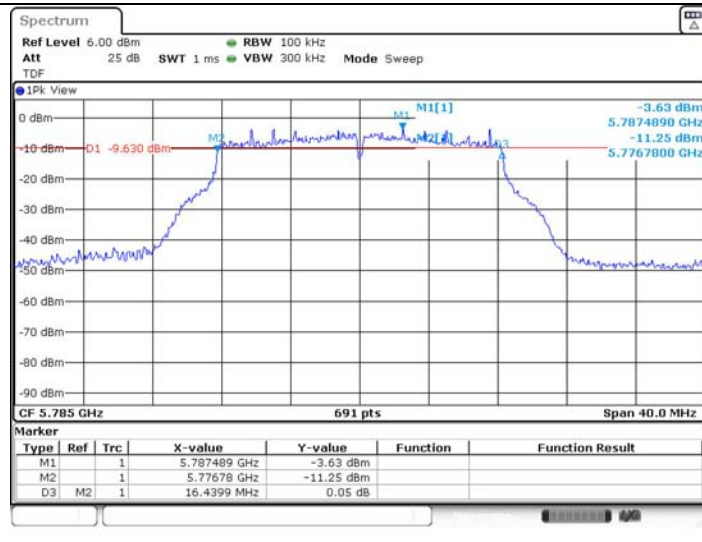
**- Test plots**

**802.11a (Band 3)**

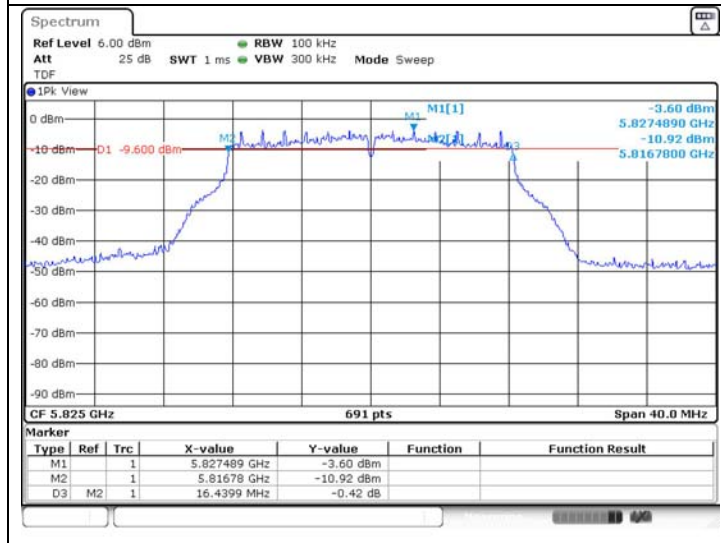
Low Channel  
(5 745 MHz)



Middle Channel  
(5 785 MHz)

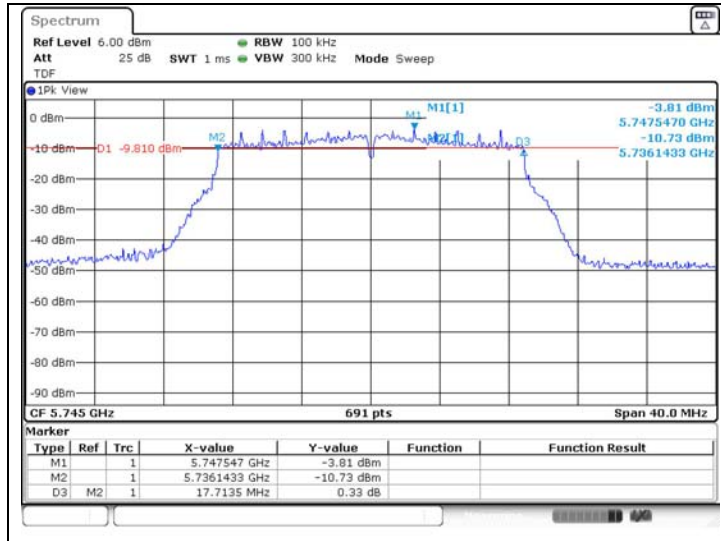


High Channel  
(5 825 MHz)

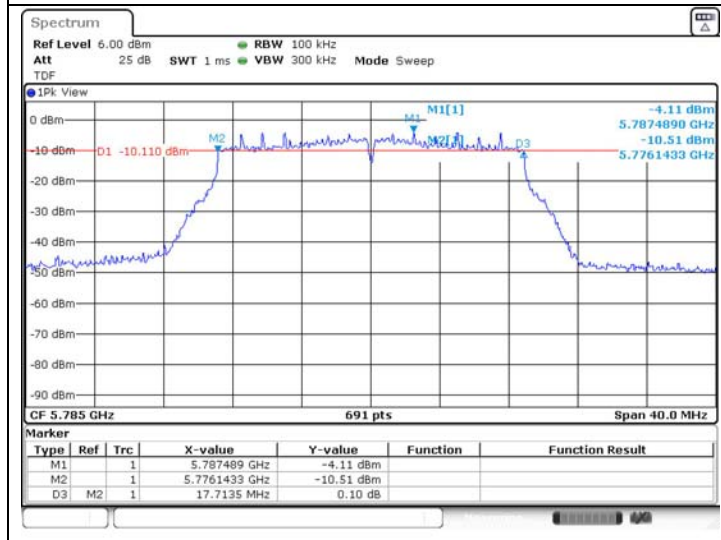


**802.11n\_HT20 (Band 3)**

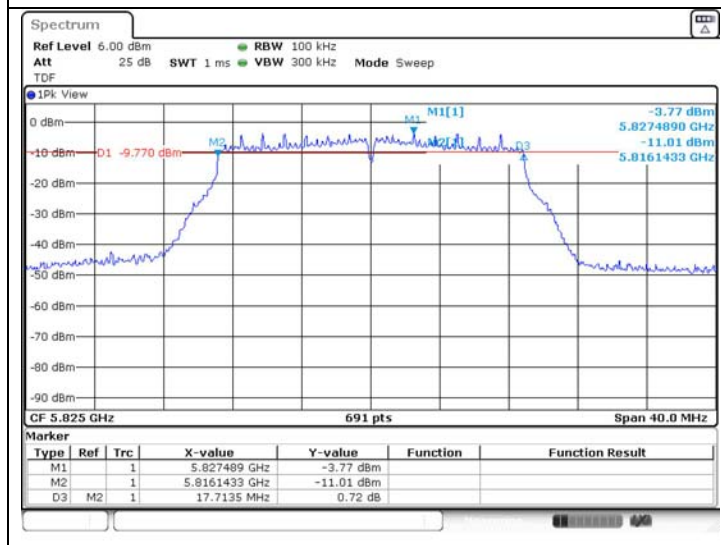
Low Channel  
(5 745 MHz)



Middle Channel  
(5 785 MHz)

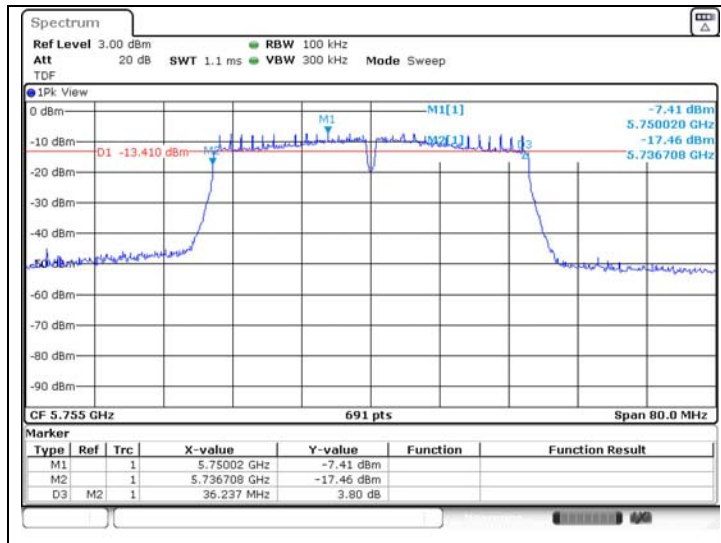


High Channel  
(5 825 MHz)

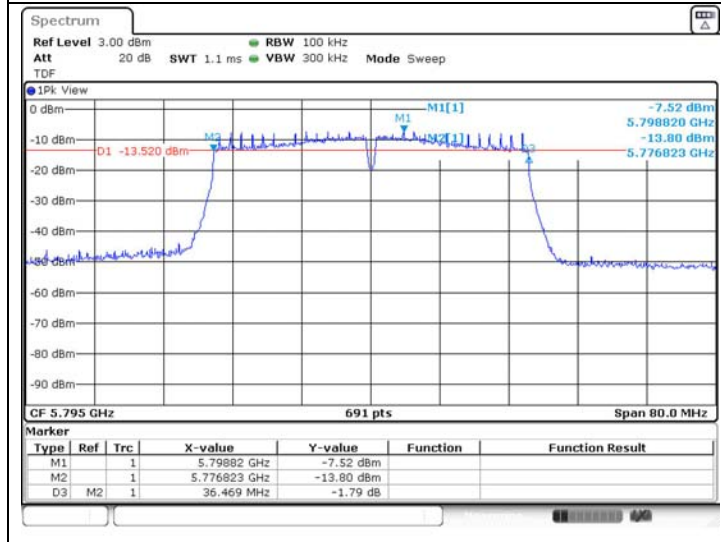


**802.11ac\_VHT40 (Band 3)**

Low Channel  
(5 755 MHz)

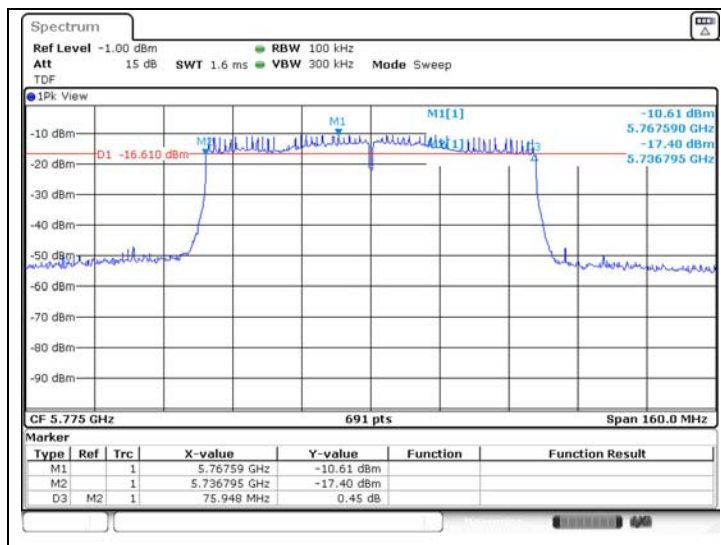


High Channel  
(5 795 MHz)



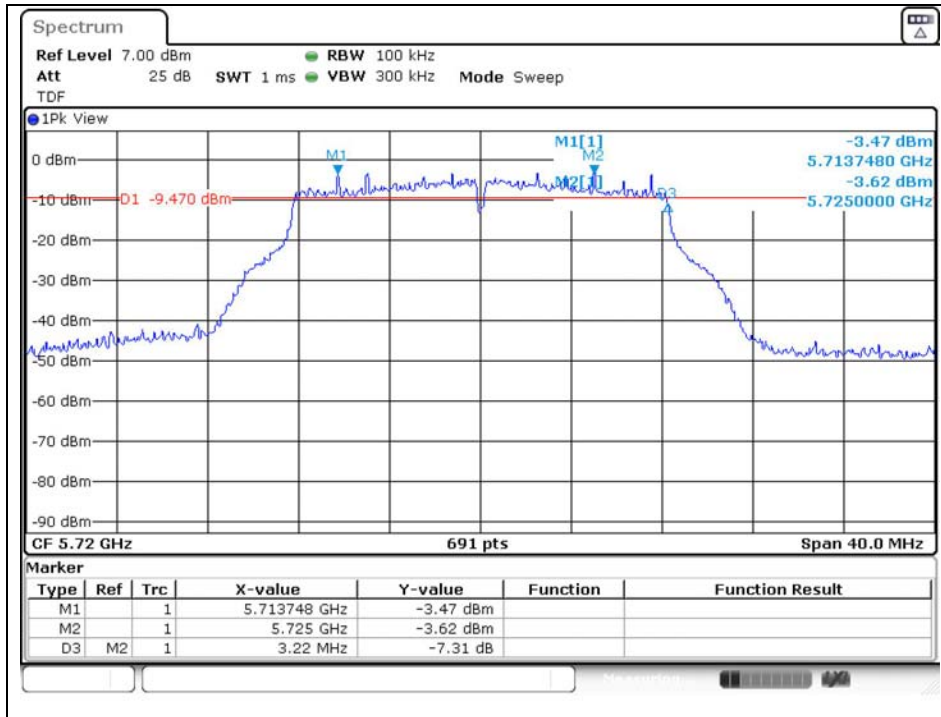
**802.11ac\_VHT80 (Band 3)**

Middle Channel  
(5 775 MHz)

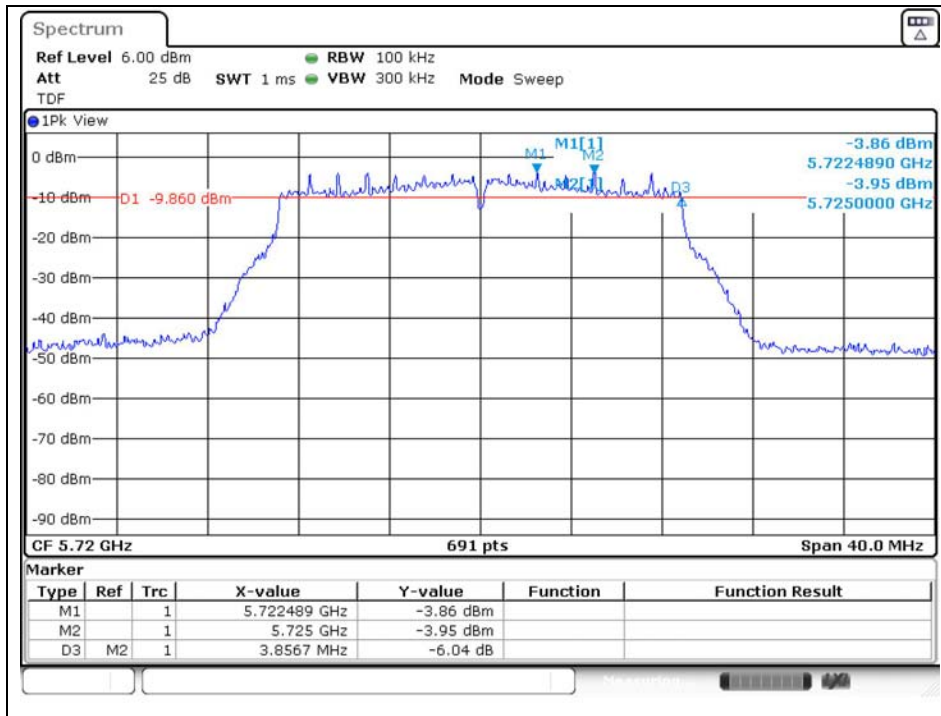


**Band-crossing channels**

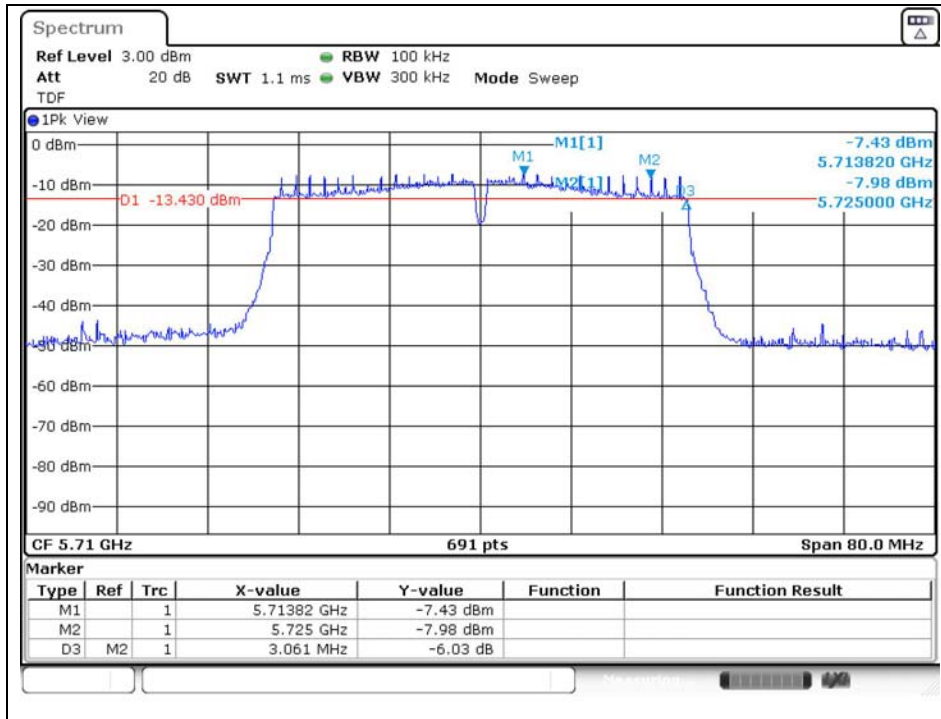
802.11a (5 720 MHz)



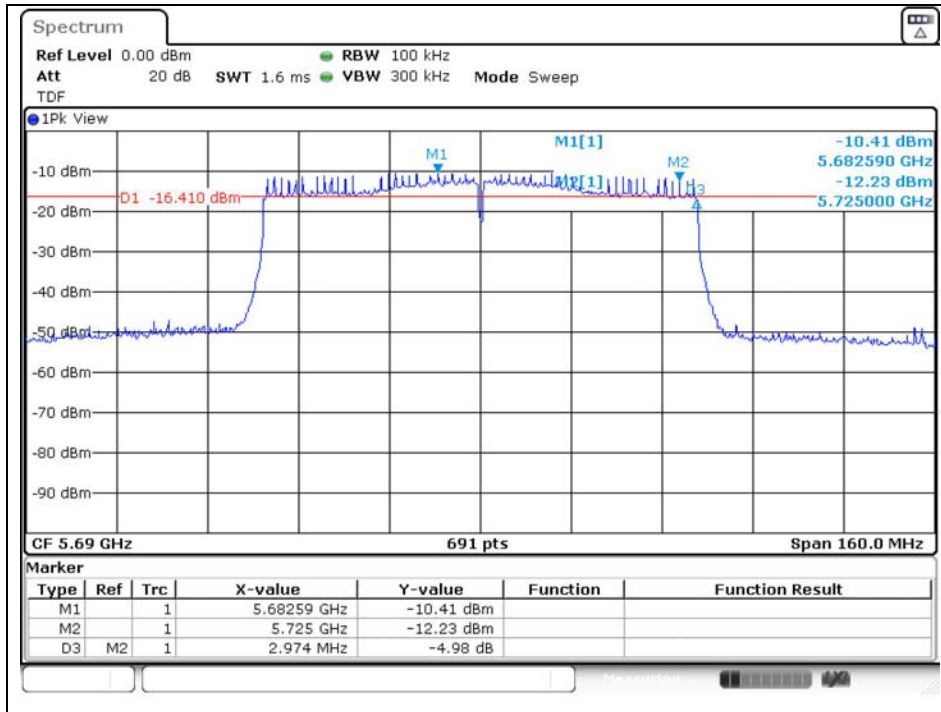
802.11n\_HT20 (5 720 MHz)



802.11ac\_VHT40 (5 710 MHz)

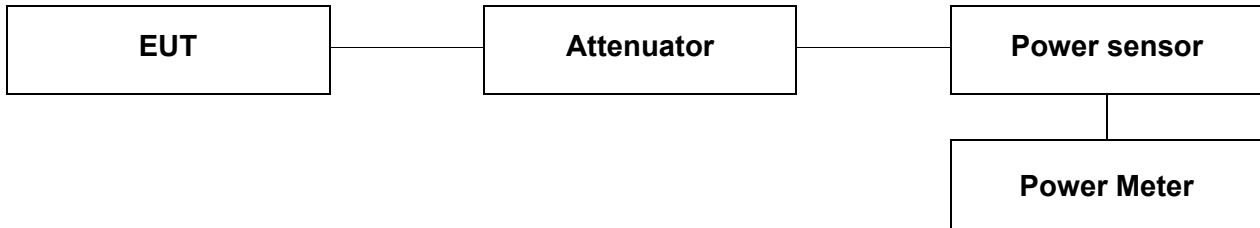


802.11ac\_VHT80 (5 690 MHz)



## 5. Maximum Conducted Output Power

### 5.1. Test Setup



### 5.2. Limit

According to 15.407(a)(1)(iv)

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dB i. In addition, the maximum power spectral density shall not exceed 11 dB m in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dB i are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB i.

According to 15.407(a)(2)

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dB m + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dB m in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dB i are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB i.

According to 15.407(a)(3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dB m in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dB i are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB i. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dB i without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.



### 5.3. Test Procedure

All data rates and modes were investigated for this test. The full data for the worst case data rate are reported in this section.

1. This measurement settings are specified in section II.E.3.a of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied:
  - The EUT is configured to transmit continuously or to transmit with a consistent duty cycle.
  - At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.
  - The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
3. If the transmitter does not transmit continuously, measure the duty cycle,  $x$ , of the transmitter output signal as described in section II.B.
4. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
5. Adjust the measurement in dBm by adding  $10 \log (1/x)$  where  $x$  is the duty cycle (e.g.,  $10 \log (1 / 0.25)$  if the duty cycle is 25 %).
6. In case of band crossing channels 138, 142 and 144, the measurement is complied with section III.A of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

### 5.4. Test Result

Ambient temperature : (23 ± 1) °C  
 Relative humidity : 47 % R.H.

**Test mode: 11a**

Band	Frequency (MHz)	Data Rate (Mbps)	Average Power (dB m)	Duty Cycle Correction Factor (dB)	Average Power Result (dB m)
U-NII 1	5 180	6	8.00	0.21	8.21
	5 220		8.08		8.29
	5 240		8.17		8.38
U-NII 2A	5 260		7.91		8.12
	5 300		7.55		7.76
	5 320		8.06		8.27
U-NII 2C	5 500		8.22		8.43
	5 580		8.33		8.54
	5 720		8.54		8.75
U-NII 3	5 745		7.68		7.89
	5 785		7.64		7.85
	5 825		7.55		7.76

Band	Frequency (MHz)	Limit				Limit (dB m)		
		Fixed Limit (dB m)	26 dB BW (MHz)	11+10LogB (dB m)	Antenna Gain (dB i)			
U-NII 1	5 180	23.98			-0.61	23.98		
	5 220							
	5 240							
U-NII 2A	5 260		20.955	24.21	-0.18			
	5 300		21.071	24.24				
	5 320		21.013	24.22				
U-NII 2C	5 500		21.187	24.26	-0.77			
	5 580		21.187	24.26				
	5 720		21.245	24.27				
U-NII 3	5 745		30				-0.18	30
	5 785							
	5 825							

**Remark;**

1. Average Power Result (dB m) = Average Power (dB m) + Duty Cycle Correction Factor (dB)



**Test mode: 11n HT20**

Band	Frequency (MHz)	Data Rate (Mbps)	Average Power (dB m)	Duty Cycle Correction Factor (dB)	Average Power Result (dB m)
U-NII 1	5 180	MCS1	7.76	0.43	8.19
	5 220		7.65		8.08
	5 240		7.78		8.21
U-NII 2A	5 260		7.60		8.03
	5 300		7.49		7.92
	5 320		7.62		8.05
U-NII 2C	5 500		7.73		8.16
	5 580		7.88		8.31
	5 720		7.73		8.16
U-NII 3	5 745		7.45		7.88
	5 785		7.12		7.55
	5 825		7.66		8.09

Band	Limit							
	Frequency (MHz)	Fixed Limit (dB m)	26 dB BW (MHz)	11+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)		
U-NII 1	5 180	23.98			-0.61	23.98		
	5 220							
	5 240							
U-NII 2A	5 260		21.708	24.37	-0.18			
	5 300		21.360	24.30				
	5 320		21.360	24.30				
U-NII 2C	5 500		21.418	24.31	-0.77			
	5 580		21.534	24.33				
	5 720		21.476	24.32				
U-NII 3	5 745		30				-0.18	30
	5 785							
	5 825							

**Remark;**

1. Average Power Result (dB m) = Average Power (dB m) + Duty Cycle Correction Factor (dB)

**Test mode: 11ac\_VHT40**

Band	Frequency (MHz)	Data Rate (Mbps)	Average Power (dB m)	Duty Cycle Correction Factor (dB)	Average Power Result (dB m)
U-NII 1	5 190	MCS1	3.04	0.81	3.85
	5 230		3.21		4.02
U-NII 2A	5 270		5.37		6.18
	5 310		5.43		6.24
U-NII 2C	5 510		5.96		6.77
	5 550		6.09		6.90
	5 710		6.02		6.83
U-NII 3	5 755		5.67		6.48
	5 795		5.91		6.72

Band	Limit					
	Frequency (MHz)	Fixed Limit (dB m)	26 dB BW (MHz)	11+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)
U-NII 1	5 190	23.98			-0.61	23.98
	5 230					
U-NII 2A	5 270		39.711	26.99	-0.18	
	5 310		39.711	26.99		
U-NII 2C	5 510		39.826	27.00	-0.77	
	5 550		39.826	27.00		
	5 710	39.942	27.01			
U-NII 3	5 755	30			0.18	30
	5 795					

**Remark;**

1. Average Power Result (dB m) = Average Power (dB m) + Duty Cycle Correction Factor (dB)

**Test mode: 11ac\_VHT80**

Band	Frequency (MHz)	Data Rate (Mbps)	Average Power (dB m)	Duty Cycle Correction Factor (dB)	Average Power Result (dB m)
U-NII 1	5 210	MCS2	2.91	1.93	4.84
U-NII 2A	5 290		5.06		6.99
U-NII 2C	5 530		3.55		5.48
	5 690		4.33		6.26
U-NII 3	5 775		4.55		6.48

Band	Limit					
	Frequency (MHz)	Fixed Limit (dB m)	26 dB BW (MHz)	11+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)
U-NII 1	5 210	23.98			-0.61	23.98
U-NII 2A	5 290		81.968	30.14	-0.18	
U-NII 2C	5 530		82.200	30.15	-0.77	
	5 690	81.968	30.14			
U-NII 3	5 775	30			-0.18	30

**Remark;**

1. Average Power Result (dB m) = Average Power (dB m) + Duty Cycle Correction Factor (dB)

**- Band-crossing channels**

Mode	Band	Frequency (MHz)	Data Rate (Mbps)	Average Power (dB m)	Duty Cycle Correction Factor (dB)	Average Power Result (dB m)
11a	U-NII 2C	5 720	6	7.14	0.21	7.35
	U-NII 3			-0.03		0.18
11n_HT20	U-NII 2C	5 720	MCS1	6.58	0.43	7.01
	U-NII 3			0.01		0.44
11ac_VHT40	U-NII 2C	5 710	MCS1	5.74	0.81	6.55
	U-NII 3			-5.98		-5.17
11ac_VHT80	U-NII 2C	5 690	MCS2	4.51	1.93	6.44
	U-NII 3			-10.30		-8.37

Mode	Band	Limit					
		Frequency (MHz)	Fixed Limit (dB m)	26 dB BW (MHz)	11+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)
11a	U-NII 2C	5 720	23.98	15.651	22.95	-0.77	22.95
	U-NII 3		30				30
11n_HT20	U-NII 2C	5 720	23.98	15.651	22.95	-0.77	22.95
	U-NII 3		30				30
11ac_VHT40	U-NII 2C	5 710	23.98	34.797	26.42	-0.77	23.98
	U-NII 3		30				30
11ac_VHT80	U-NII 2C	5 690	23.98	75.753	29.79	-0.77	23.98
	U-NII 3		30				30

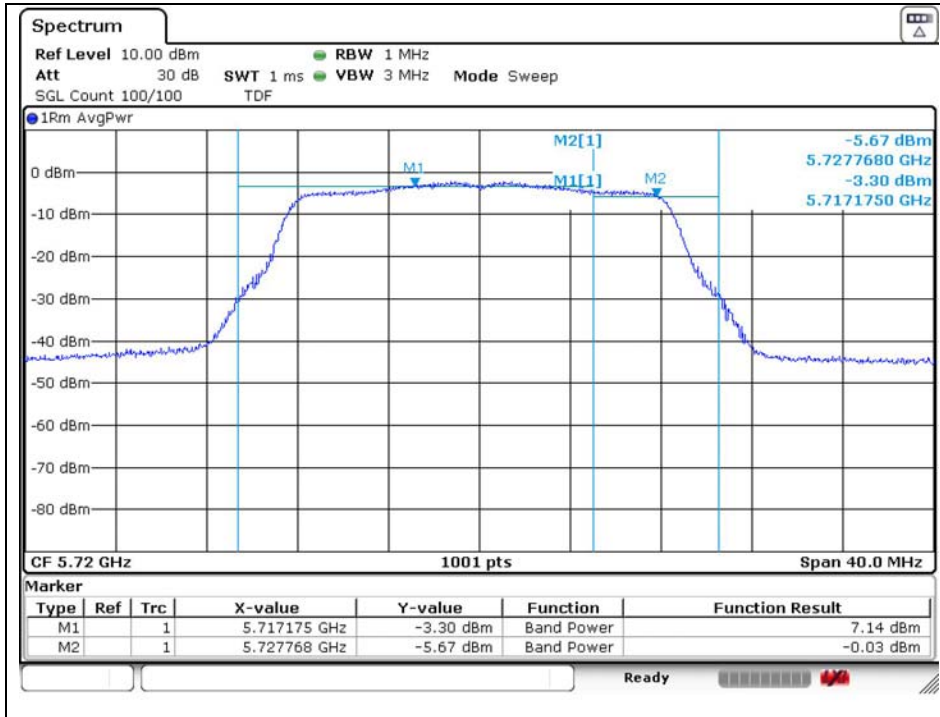
**Remark;**

1. Average Power Result (dB m) = Average Power (dB m) + Duty Cycle Correction Factor (dB)

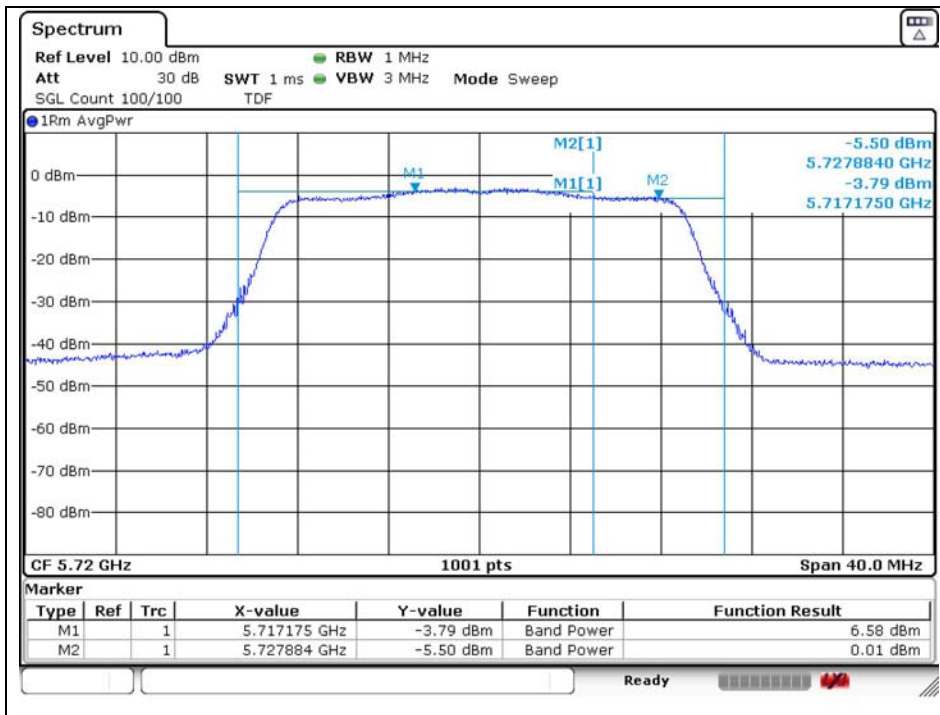
**- Test plots**

**Band-crossing channels**

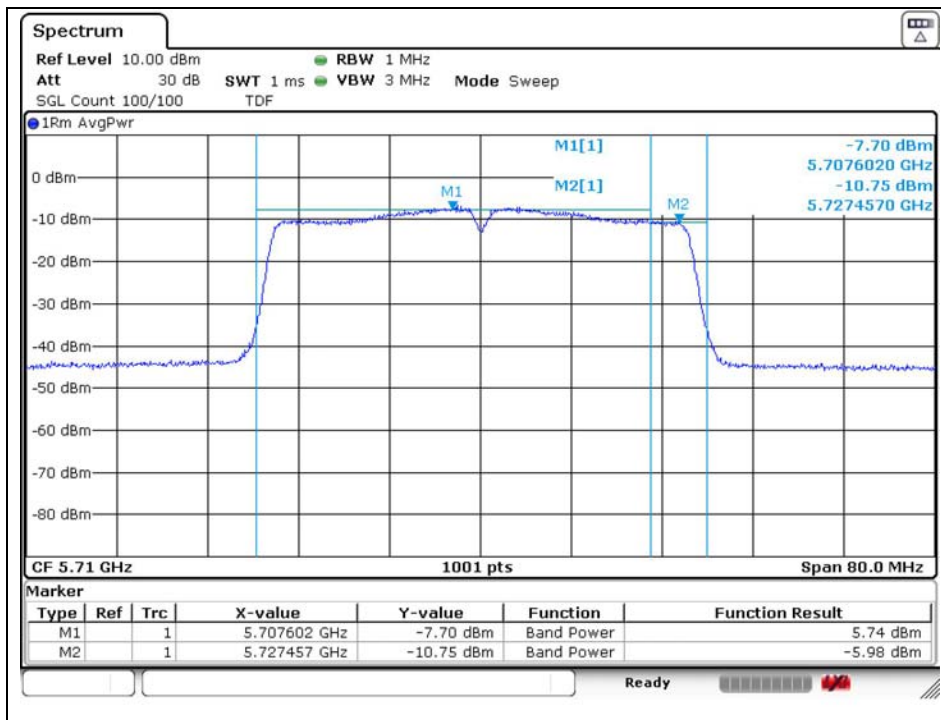
802.11a (5 720 MHz)



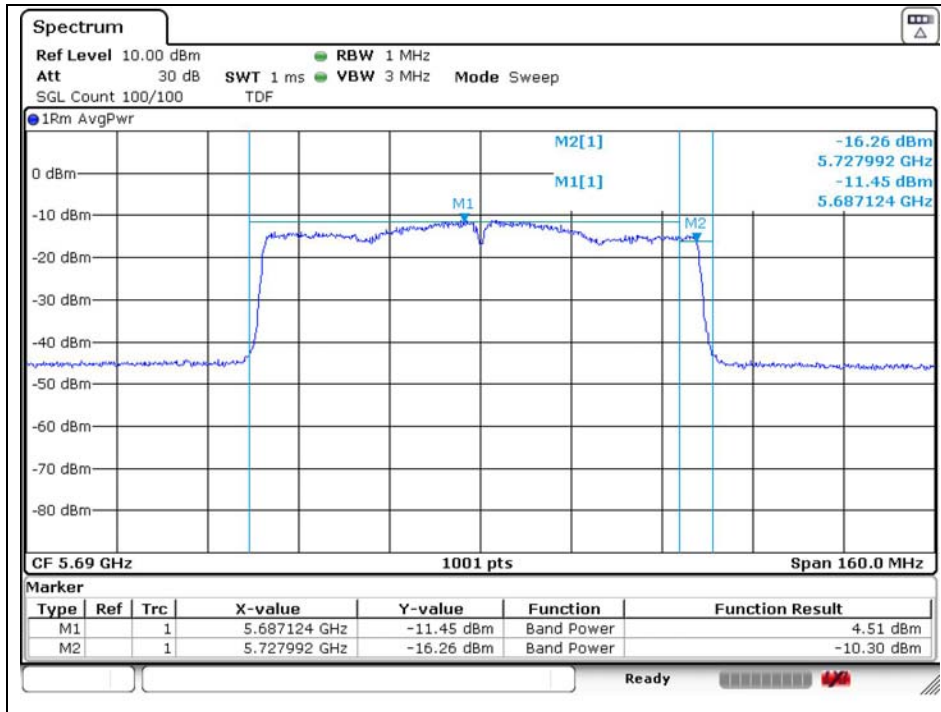
802.11n\_HT20 (5 720 MHz)



802.11ac\_VHT40 (5 710 MHz)



802.11ac\_VHT80 (5 690 MHz)



## 6. Peak Power Spectral Density

### 6.1. Test Setup



### 6.2. Limit

According to 15.407(a)(1)(iv)

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dB i. In addition, the maximum power spectral density shall not exceed 11 dB m in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dB i are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB i.

According to 15.407(a)(2)

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dB m + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dB m in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dB i are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB i.

According to 15.407(a)(3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dB m in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dB i are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB i. However, fixed point-to point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dB i without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

### 6.3. Test Procedure

All data rates and modes were investigated for this test. The full data for the worst case data rate are reported in this section.

1. This measurement settings are specified in section II.F of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. Create an average power spectrum for the EUT operating mode being tested by following the instructions in section II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, "Compute power...". (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)
3. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
4. Make the following adjustments to the peak value of the spectrum, if applicable:
  - a) **If Method SA-2 or SA-2 Alternative was used, add  $10\log(1/x)$ , where  $x$  is the duty cycle, to the peak of the spectrum.**
  - b) If Method SA-3 Alternative was used and the linear mode was used in step II.E.2.g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.
5. The result is the Maximum PSD over 1 MHz reference bandwidth.
6. For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, "provided that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth (*i.e.*, 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth ( $< 1$  MHz, or  $< 500$  kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:
  - a) Set  $RBW \geq 1/T$ , where  $T$  is defined in section II.B.1.a).
  - b) Set  $VBW \geq 3$  RBW.
  - c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add  $10\log(500 \text{ kHz} / RBW)$  to the measured result, whereas  $RBW (< 500 \text{ kHz})$  is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
  - d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add  $10\log(1 \text{ MHz} / RBW)$  to the measured result, whereas  $RBW (< 1 \text{ MHz})$  is the reduced resolution bandwidth of spectrum analyzer set during measurement.
  - e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.
7. In case of band crossing channels 138, 142 and 144, the measurement is complied with section III.A of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.



### 6.4. Test Result

Ambient temperature : (23 ± 1) °C  
 Relative humidity : 47 % R.H.

**Test mode: 11a**

Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSD (dB m)	Duty Cycle Correction Factor (dB)	Final PPSD (dB m)	Limit (dB m/1 MHz)
U-NII 1	5 180	36	6	-1.96	0.21	-1.75	11
	5 220	44		-2.44		-2.23	
	5 240	48		-2.30		-2.09	
U-NII 2A	5 260	52		-2.22		-2.01	
	5 300	60		-2.00		-1.79	
	5 320	64		-2.35		-2.14	
U-NII 2C	5 500	100		-1.94		-1.73	
	5 580	116		-2.19		-1.98	
	5 720	144		-2.27		-2.06	
Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSD (dB m)	Duty Cycle Correction Factor (dB)	Final PPSD (dB m)	Limit (dB m/500 kHz)
U-NII 3	5 745	149	6	-5.46	0.21	-5.25	30
	5 785	157		-5.12		-4.91	
	5 825	165		-5.12		-4.91	

**Remark;**

- Final PPSD (dB m) = Measured PPSD (dB m) + Duty Cycle Correction Factor (dB)

**Test mode: 11n\_HT20**

Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSD (dB m)	Duty Cycle Correction Factor (dB)	Final PPSD (dB m)	Limit (dB m/1 MHz)
U-NII 1	5 180	36	MCS1	-2.61	0.43	-2.18	11
	5 220	44		-3.09		-2.66	
	5 240	48		-2.50		-2.07	
U-NII 2A	5 260	52		-3.15		-2.72	
	5 300	60		-2.67		-2.24	
	5 320	64		-2.58		-2.15	
U-NII 2C	5 500	100		-2.84		-2.41	
	5 580	116		-2.60		-2.17	
	5 720	144		-3.05		-2.62	
Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSD (dB m)	Duty Cycle Correction Factor (dB)	Final PPSD (dB m)	Limit (dB m/500 kHz)
U-NII 3	5 745	149	MCS1	-5.67	0.43	-5.24	30
	5 785	157		-6.20		-5.77	
	5 825	165		-5.64		-5.21	

**Remark;**

- Final PPSD (dB m) = Measured PPSD (dB m) + Duty Cycle Correction Factor (dB)

**Test mode: 11ac\_VHT40**

Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSD (dB m)	Duty Cycle Correction Factor (dB)	Final PPSD (dB m)	Limit (dB m/1 MHz)			
U-NII 1	5 190	38	MCS1	-9.85	0.81	-9.04	11			
	5 230	46		-9.81		-9.00				
U-NII 2A	5 270	54		-7.48		-6.67				
	5 310	62		-7.16		-6.35				
U-NII 2C	5 510	102		-6.93		-6.12				
	5 550	110		-6.96		-6.15				
	5 710	142		-7.24		-6.43				
Band	Frequency (MHz)	Ch.		Data Rate (Mbps)		Measured PPSD (dB m)		Duty Cycle Correction Factor (dB)	Final PPSD (dB m)	Limit (dB m/500 kHz)
U-NII 3	5 755	151		MCS1		-9.77		0.81	-8.96	30
	5 795	159	-9.99		-9.18					

**Remark;**

- Final PPSD (dB m) = Measured PPSD (dB m) + Duty Cycle Correction Factor (dB)

**Test mode: 11ac\_VHT80**

Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSD (dB m)	Duty Cycle Correction Factor (dB)	Final PPSD (dB m)	Limit (dB m/1 MHz)
U-NII 1	5 210	42	MCS2	-12.63	1.93	-10.70	11
U-NII 2A	5 290	58		-10.73		-8.80	
U-NII 2C	5 530	106		-11.42		-9.49	
	5 690	138		-10.78		-8.85	
Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSD (dB m)	Duty Cycle Correction Factor (dB)	Final PPSD (dB m)	Limit (dB m/500 kHz)
U-NII 3	5 775	155	MCS2	-14.73	1.93	-12.80	30

**Remark;**

- Final PPSD (dB m) = Measured PPSD (dB m) + Duty Cycle Correction Factor (dB)

**Band-crossing channels**

Mode	Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSD (dB m)	Duty Cycle Correction Factor (dB)	Final PPSD (dB m)	Limit (dB m/1 MHz or dB m/500 kHz)
11a	U-NII 2C	5 720	144	6	-2.17	0.21	-1.96	11
	U-NII 3				-7.34		-7.13	30
11n_HT20	U-NII 2C	5 720	144	MCS1	-2.50	0.43	-2.07	11
	U-NII 3				-7.64		-7.21	30
11ac_VHT40	U-NII 2C	5 710	142	MCS1	-6.74	0.81	-5.93	11
	U-NII 3				-12.72		-11.91	30
11ac_VHT80	U-NII 2C	5 690	138	MCS2	-10.58	1.93	-8.65	11
	U-NII 3				-15.99		-14.06	30

**Remark;**

1. Final PPSD (dB m) = Measured PPSD (dB m) + Duty Cycle Correction Factor (dB)

- Test plots

802.11a (Band 1)

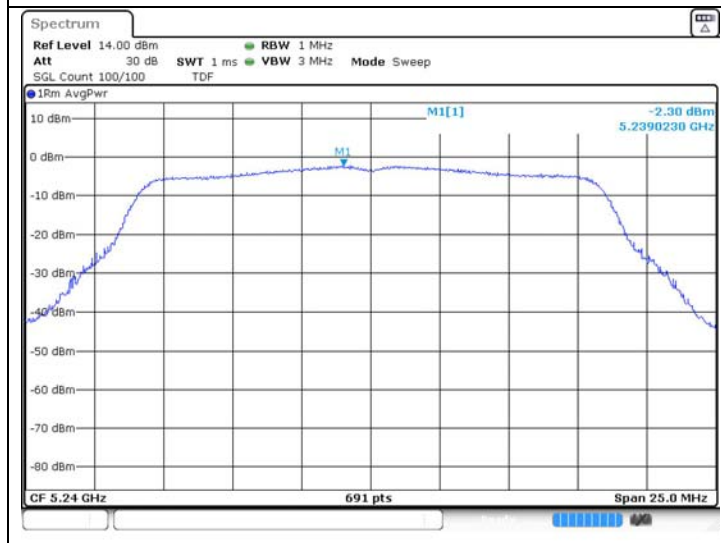
Low Channel  
(5 180 MHz)



Middle Channel  
(5 220 MHz)

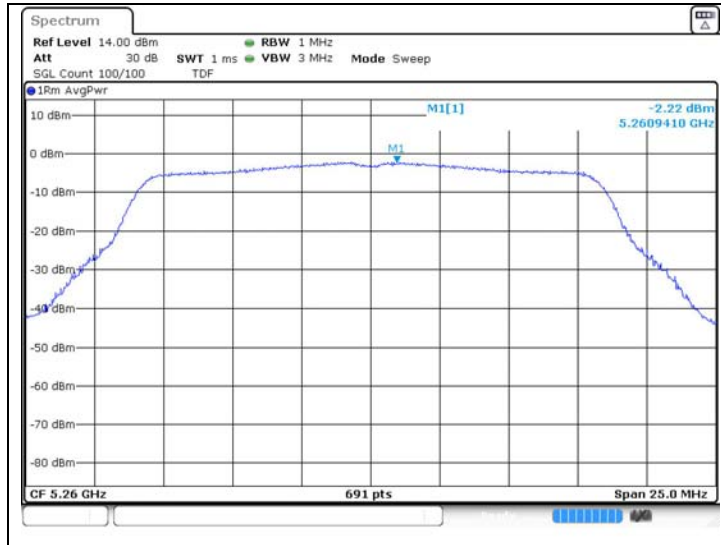


High Channel  
(5 240 MHz)

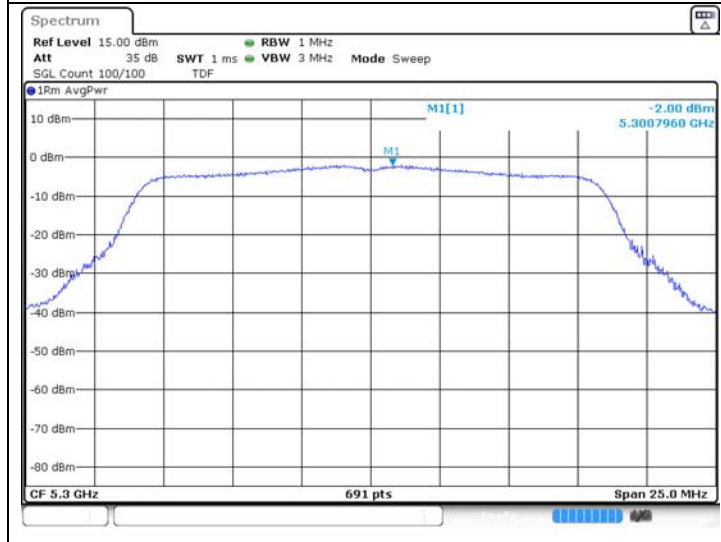


**802.11a (Band 2A)**

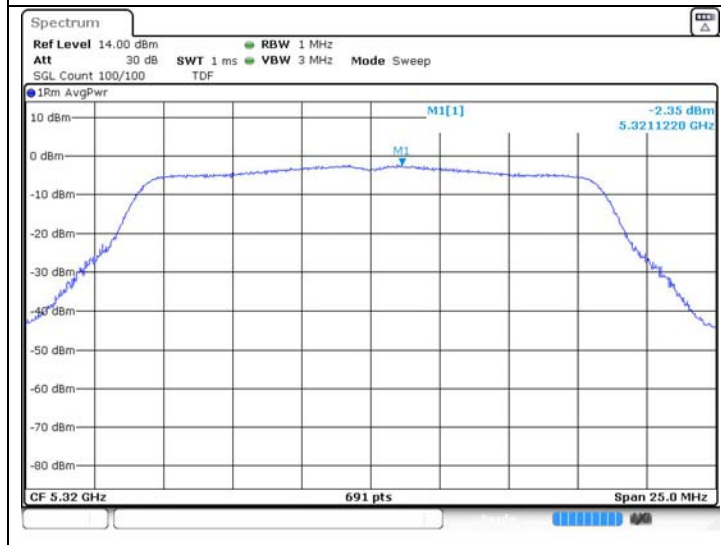
Low Channel  
(5 260 MHz)



Middle Channel  
(5 300 MHz)



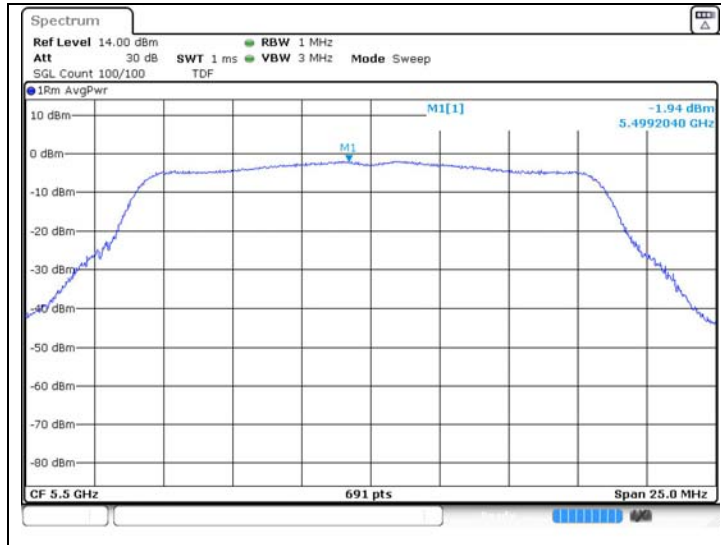
High Channel  
(5 320 MHz)



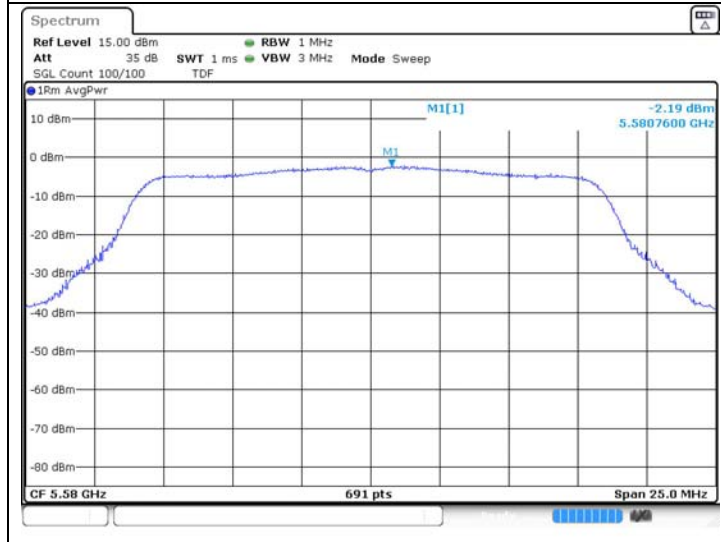


802.11a (Band 2C)

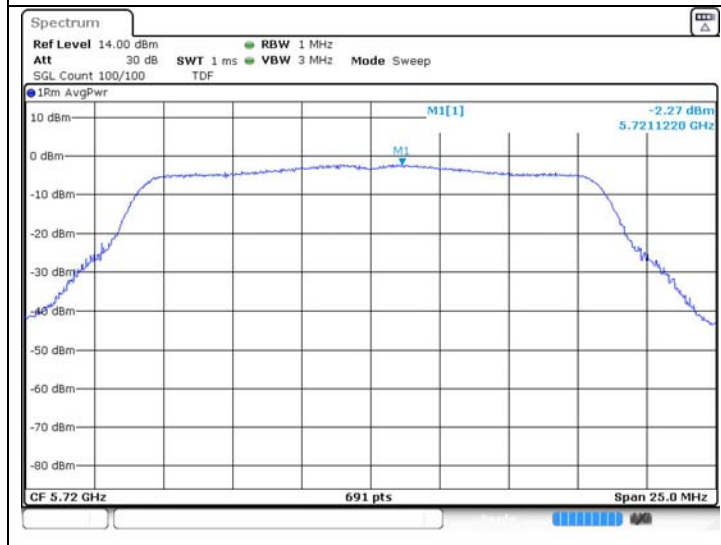
Low Channel  
 (5 500 MHz)



Middle Channel  
 (5 580 MHz)

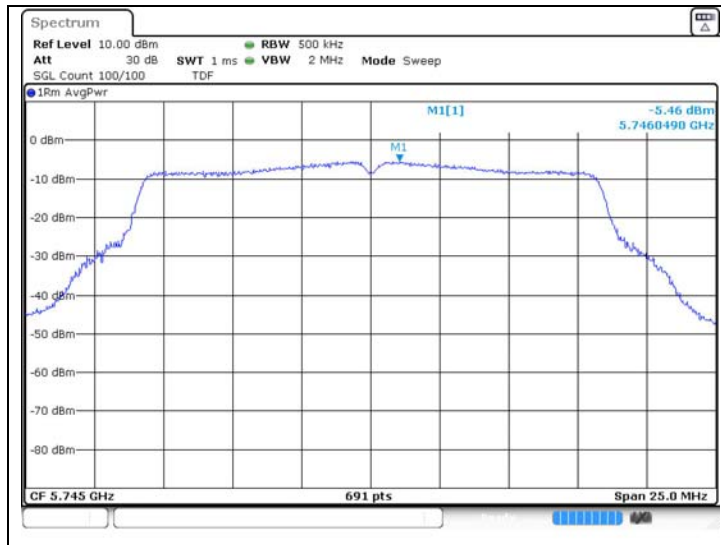


High Channel  
 (5 720 MHz)

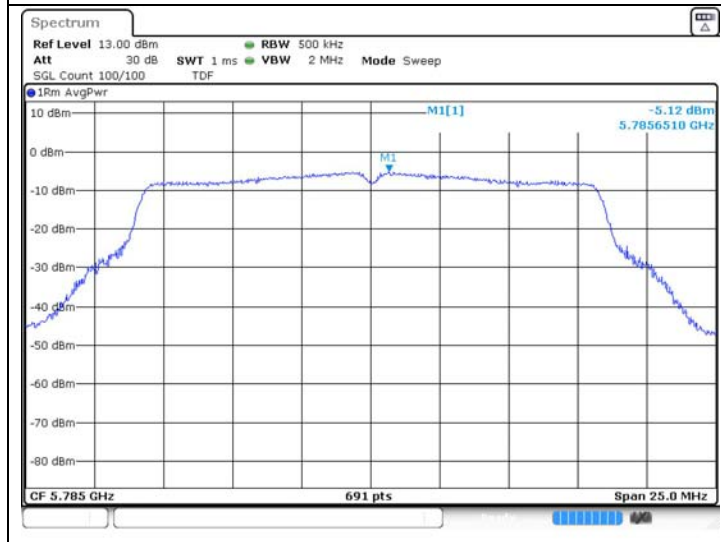


**802.11a (Band 3)**

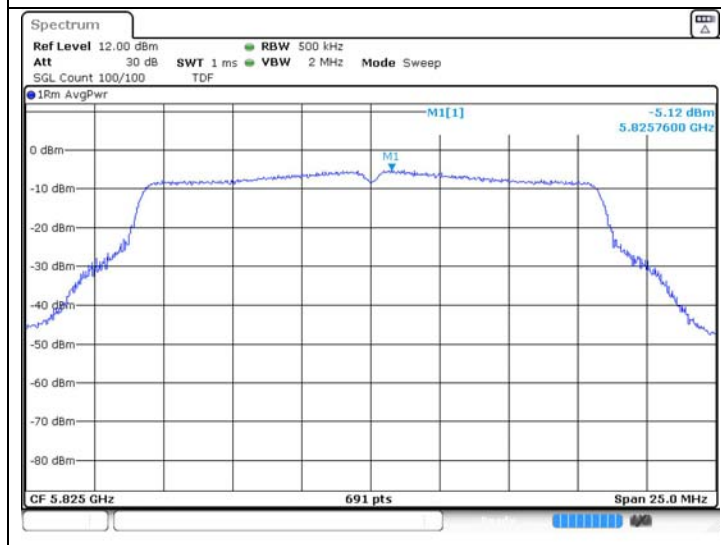
Low Channel  
(5 745 MHz)



Middle Channel  
(5 785 MHz)

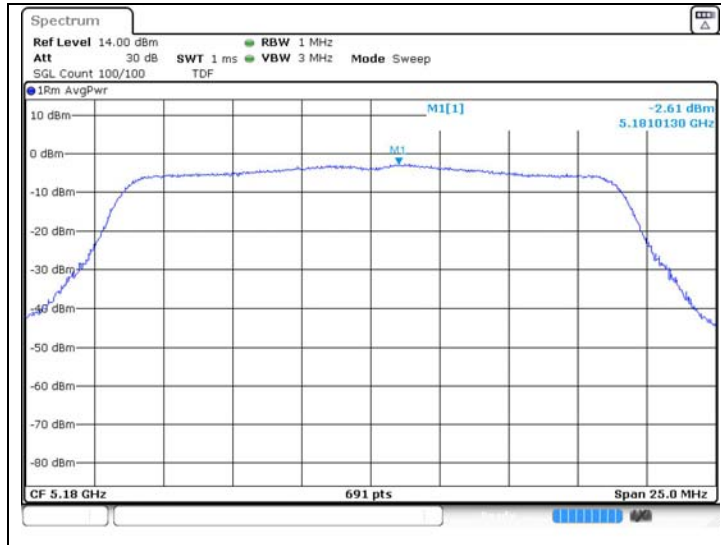


High Channel  
(5 825 MHz)

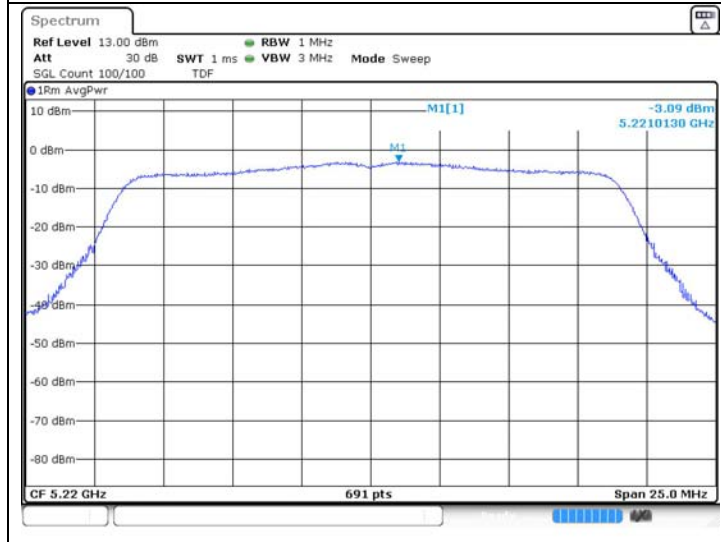


**802.11n\_HT20 (Band 1)**

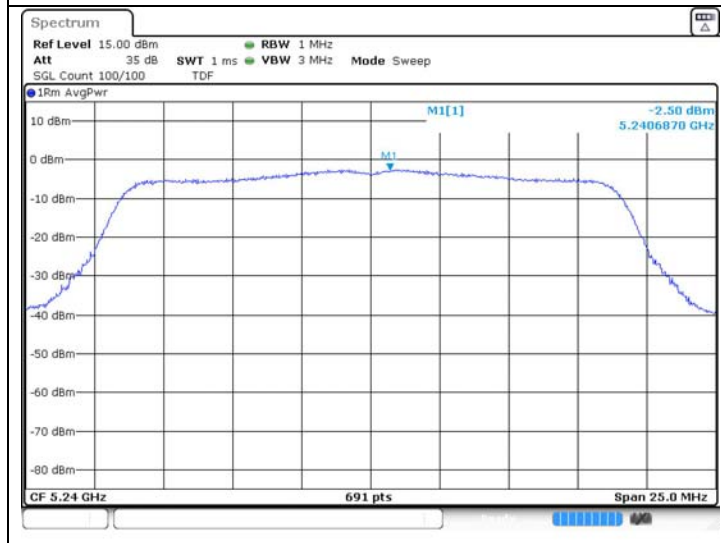
Low Channel  
(5 180 MHz)



Middle Channel  
(5 220 MHz)

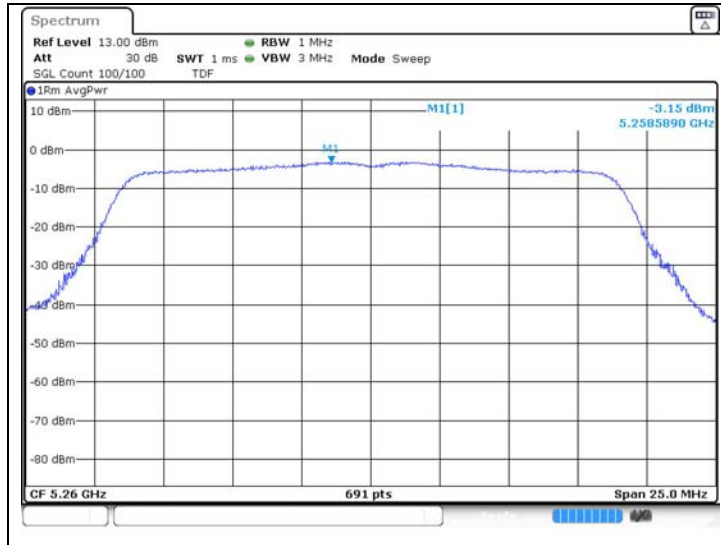


High Channel  
(5 240 MHz)

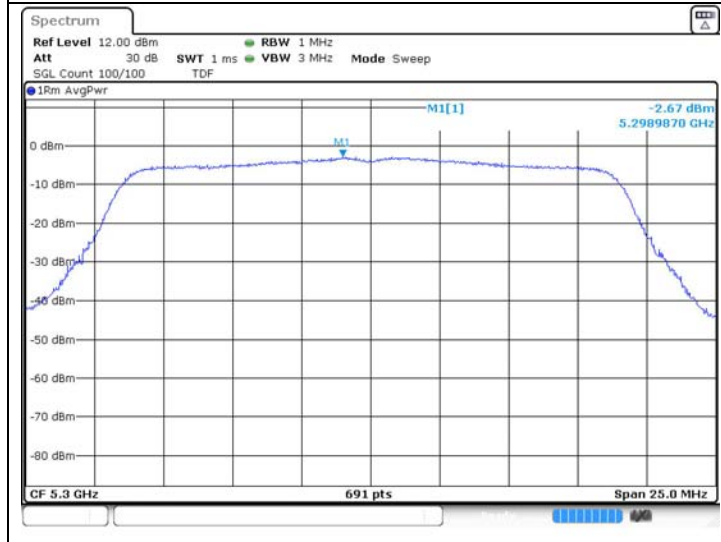


**802.11n\_HT20 (Band 2A)**

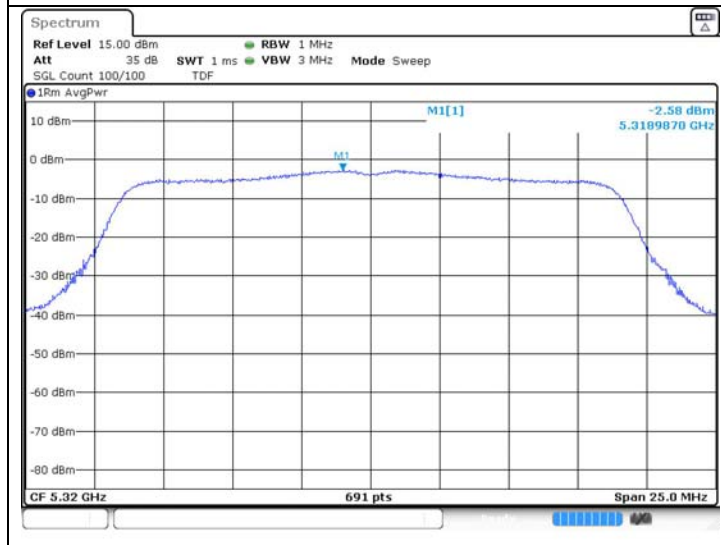
Low Channel  
(5 260 MHz)



Middle Channel  
(5 300 MHz)

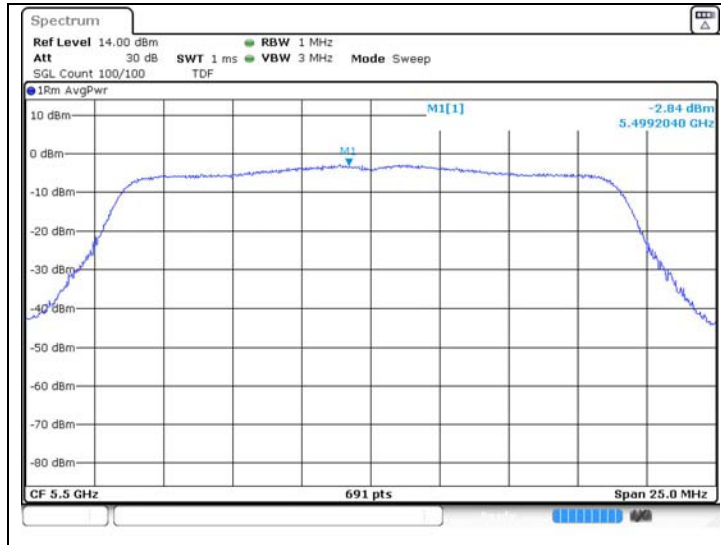


High Channel  
(5 320 MHz)

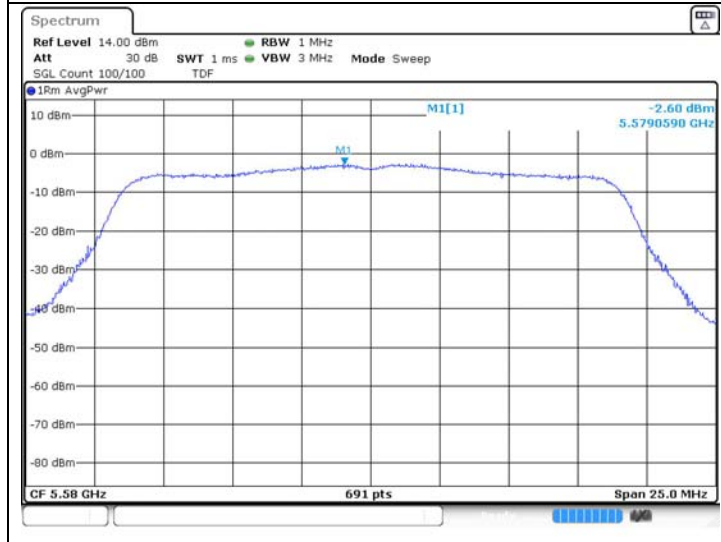


**802.11n\_HT20 (Band 2C)**

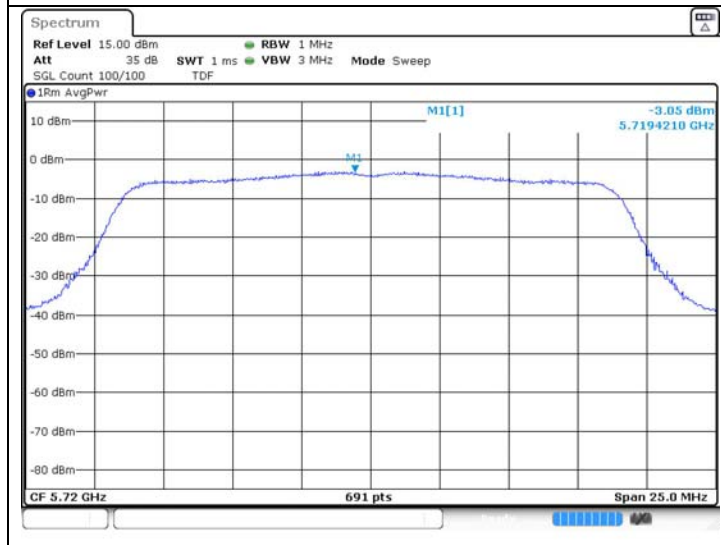
Low Channel  
(5 500 MHz)



Middle Channel  
(5 580 MHz)

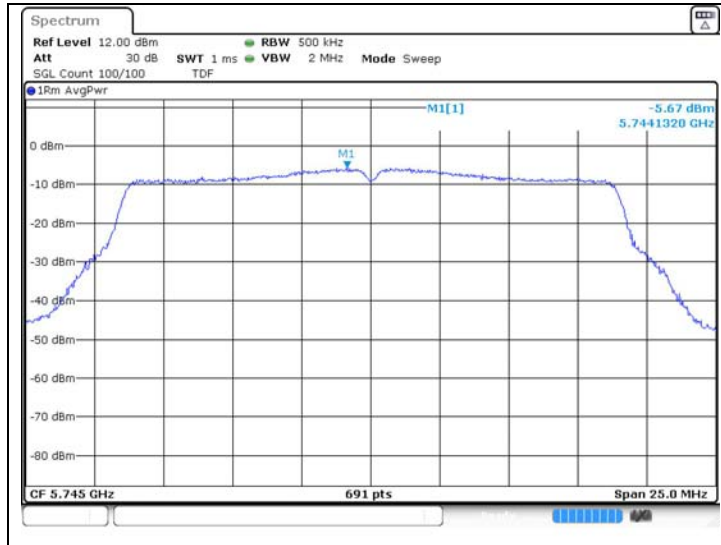


High Channel  
(5 720 MHz)

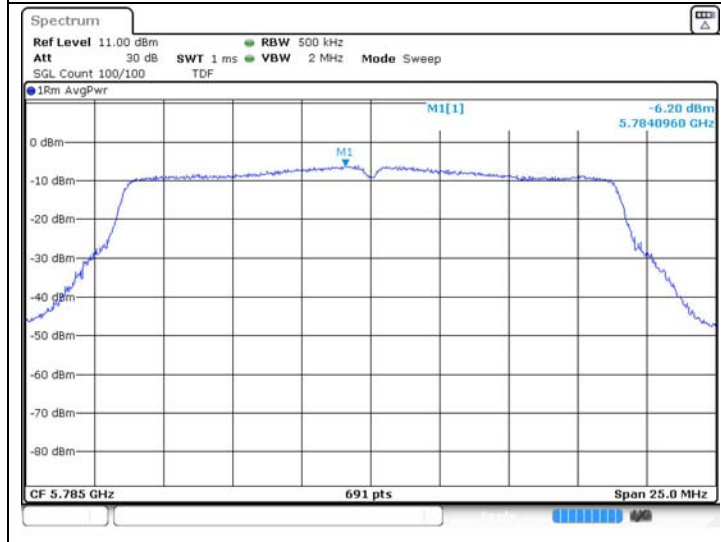


**802.11n\_HT20 (Band 3)**

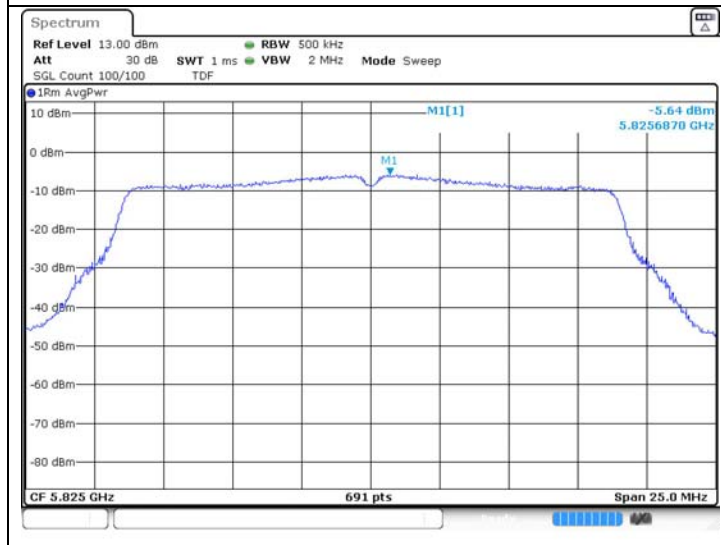
Low Channel  
(5 745 MHz)



Middle Channel  
(5 785 MHz)

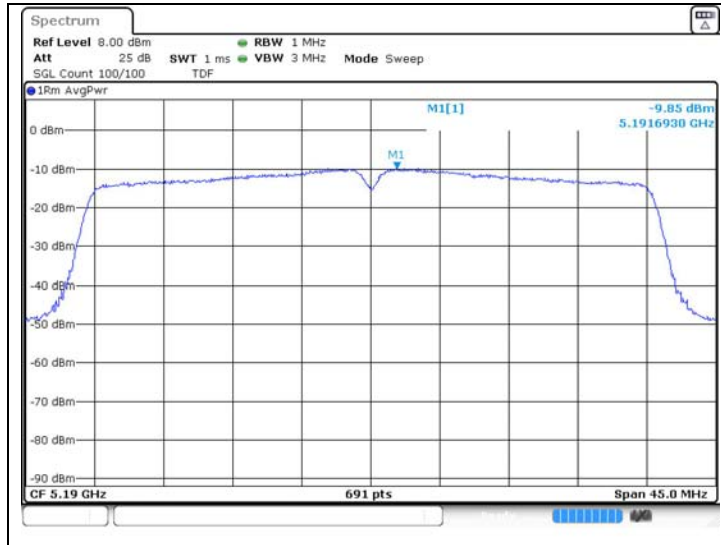


High Channel  
(5 825 MHz)

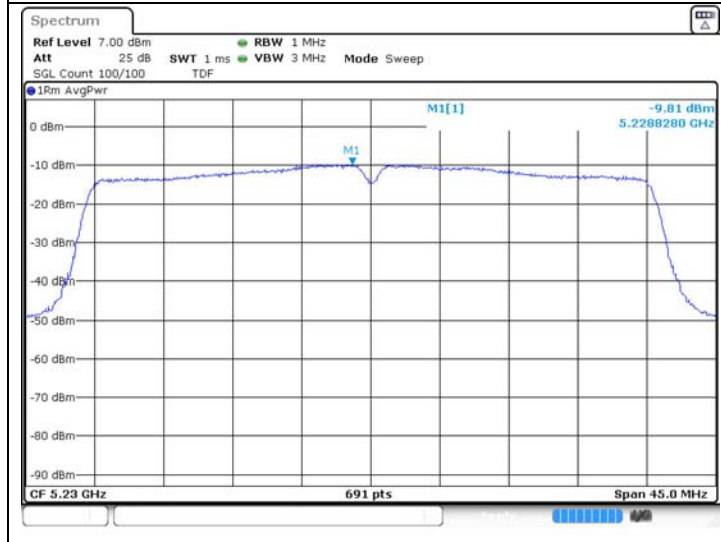


**802.11ac\_VHT40 (Band 1)**

Low Channel  
(5 190 MHz)



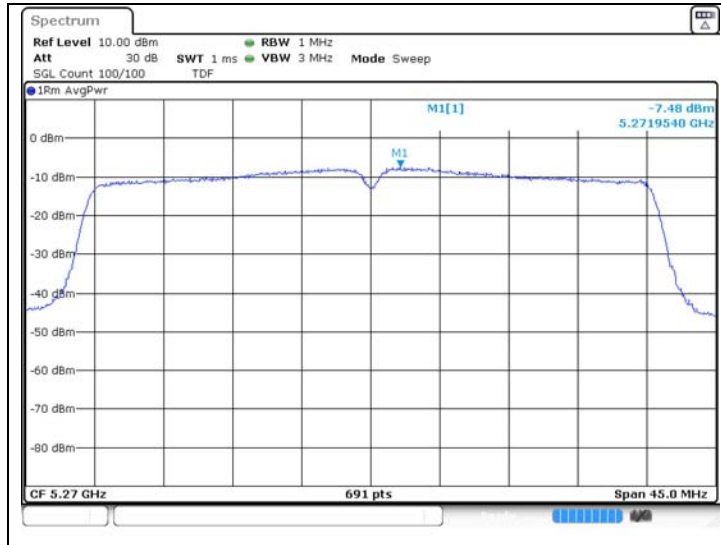
High Channel  
(5 230 MHz)



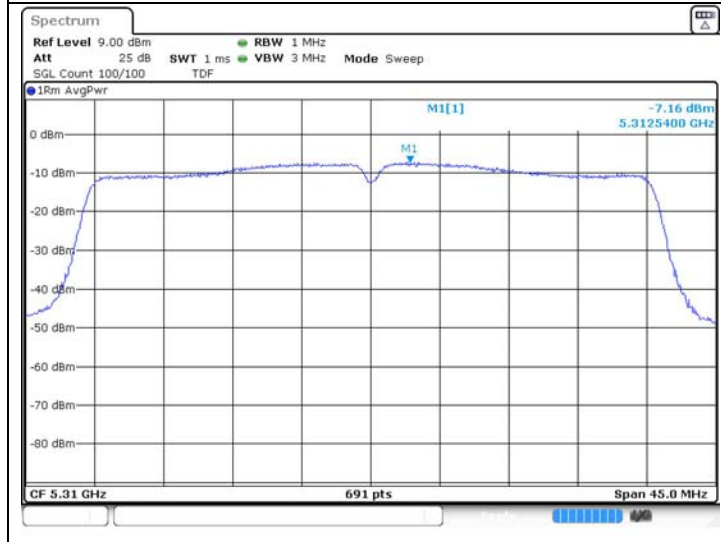


**802.11ac\_VHT40 (Band 2A)**

Low Channel  
(5 270 MHz)

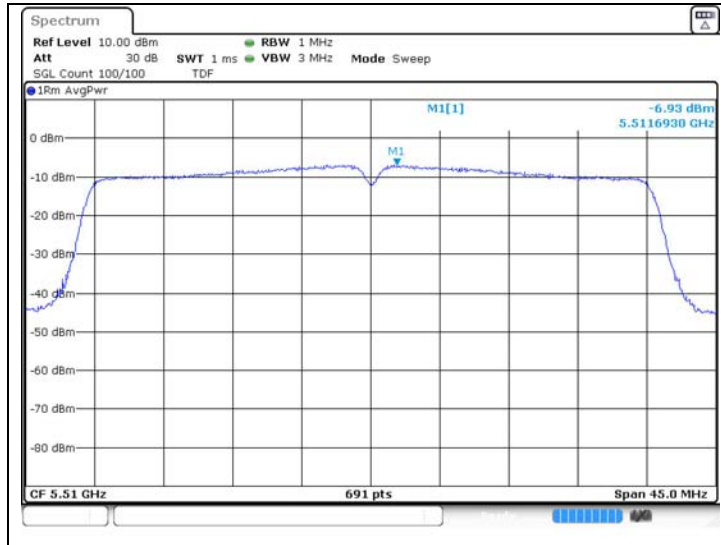


High Channel  
(5 310 MHz)

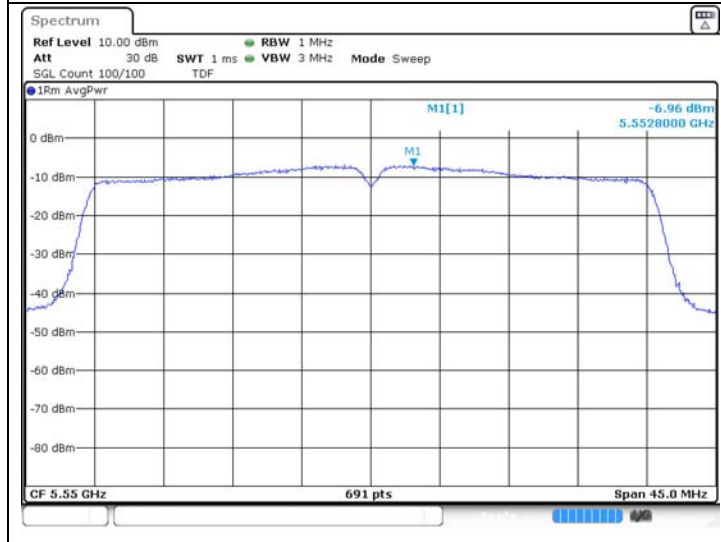


802.11ac\_VHT40 (Band 2C)

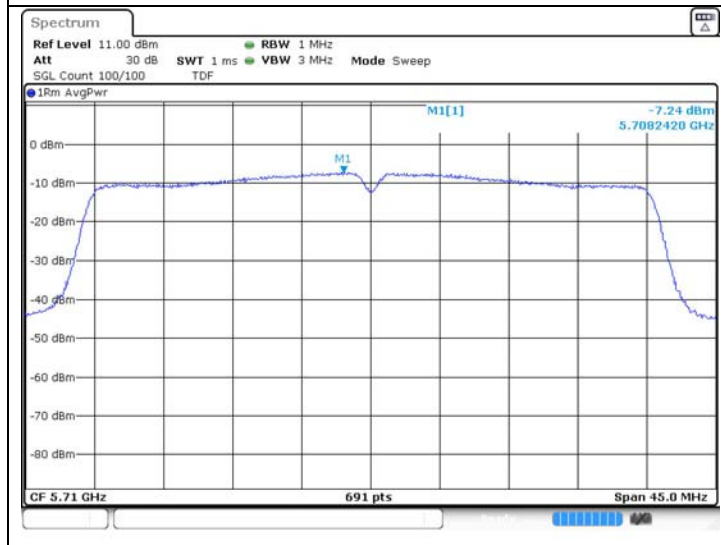
Low Channel  
 (5 510 MHz)



Middle Channel  
 (5 550 MHz)

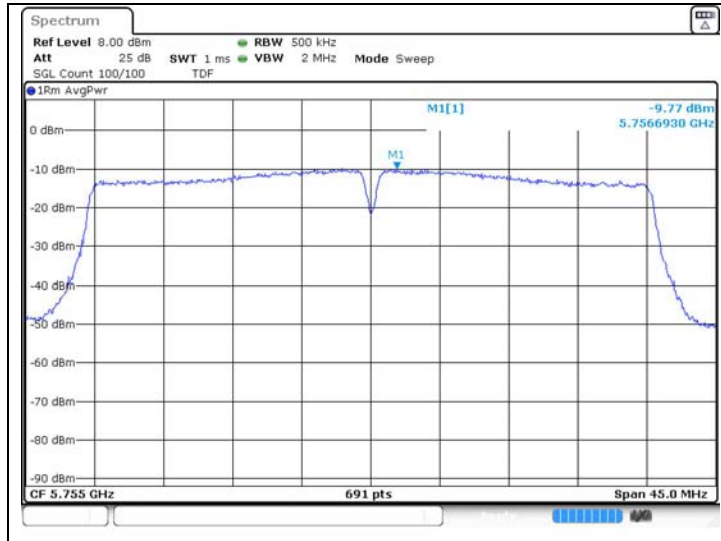


High Channel  
 (5 710 MHz)

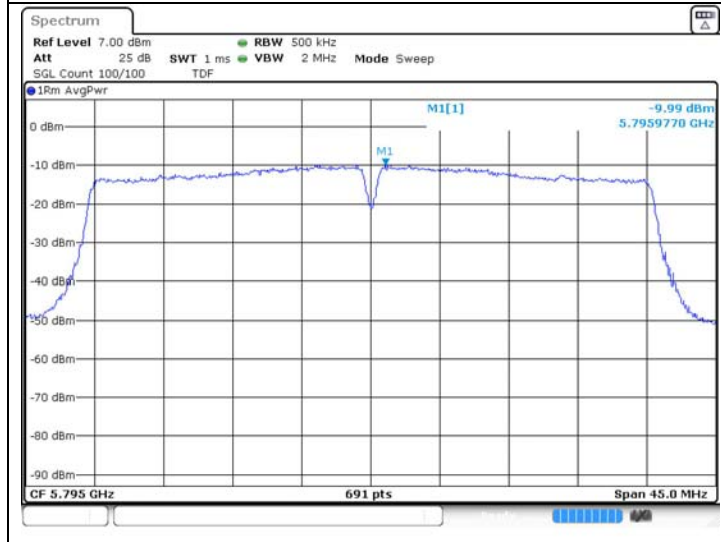


**802.11ac\_VHT40 (Band 3)**

Low Channel  
(5 755 MHz)

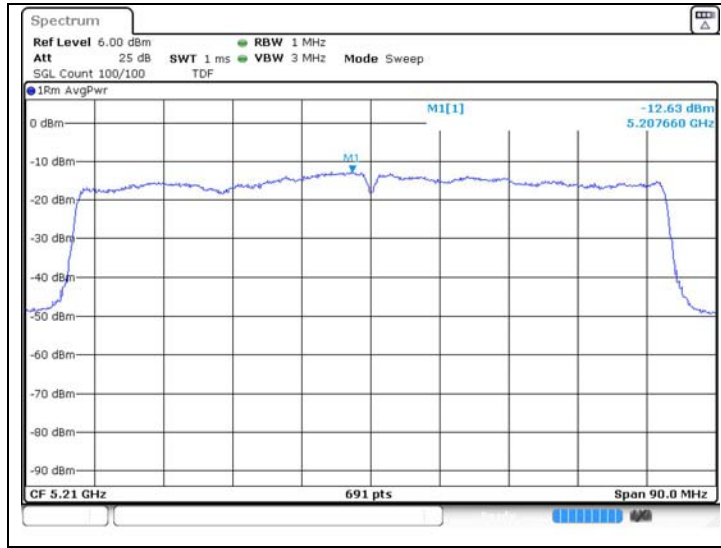


High Channel  
(5 795 MHz)



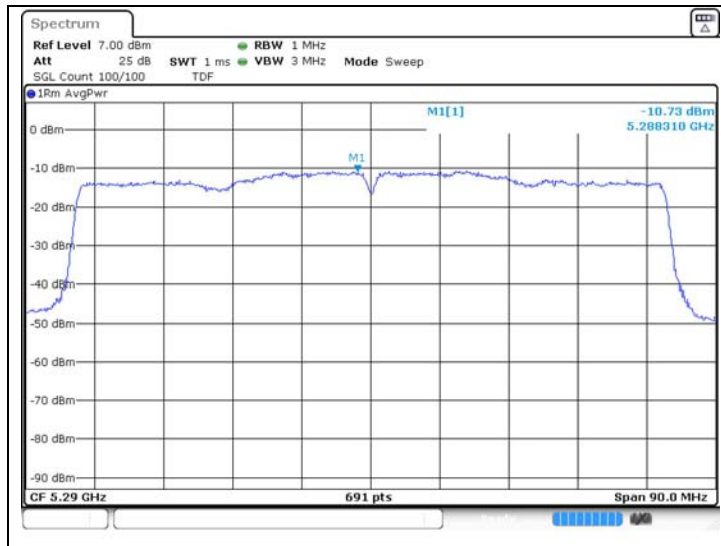
**802.11ac\_VHT80 (Band 1)**

Middle Channel  
(5 210 MHz)



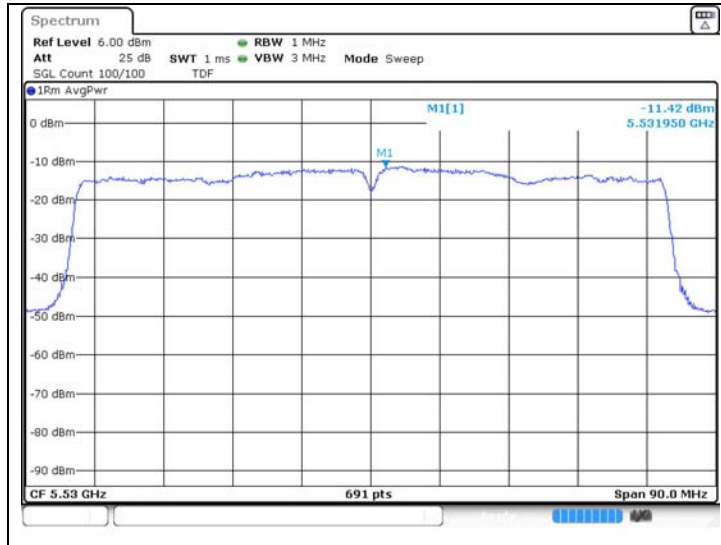
**802.11ac\_VHT80 (Band 2A)**

Middle Channel  
(5 290 MHz)

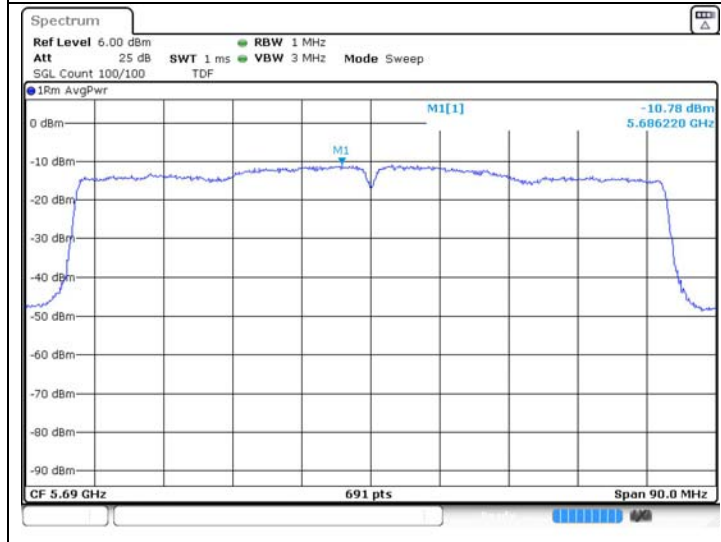


**802.11ac\_VHT80 (Band 2C)**

Low Channel  
(5 530 MHz)

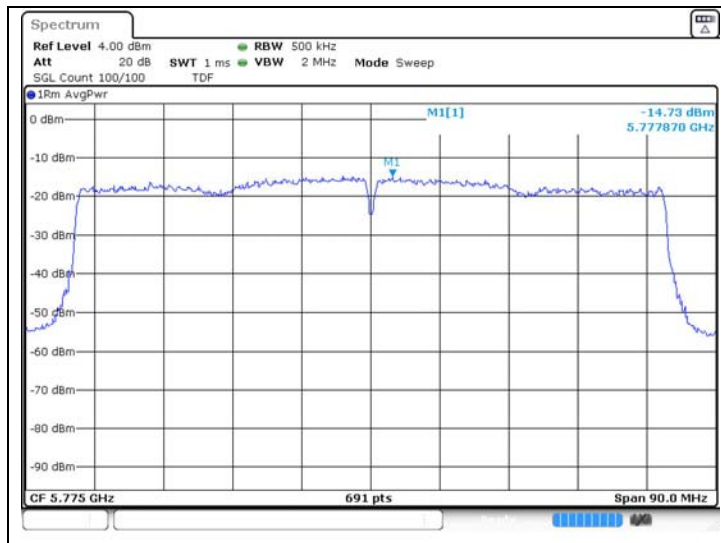


High Channel  
(5 690 MHz)



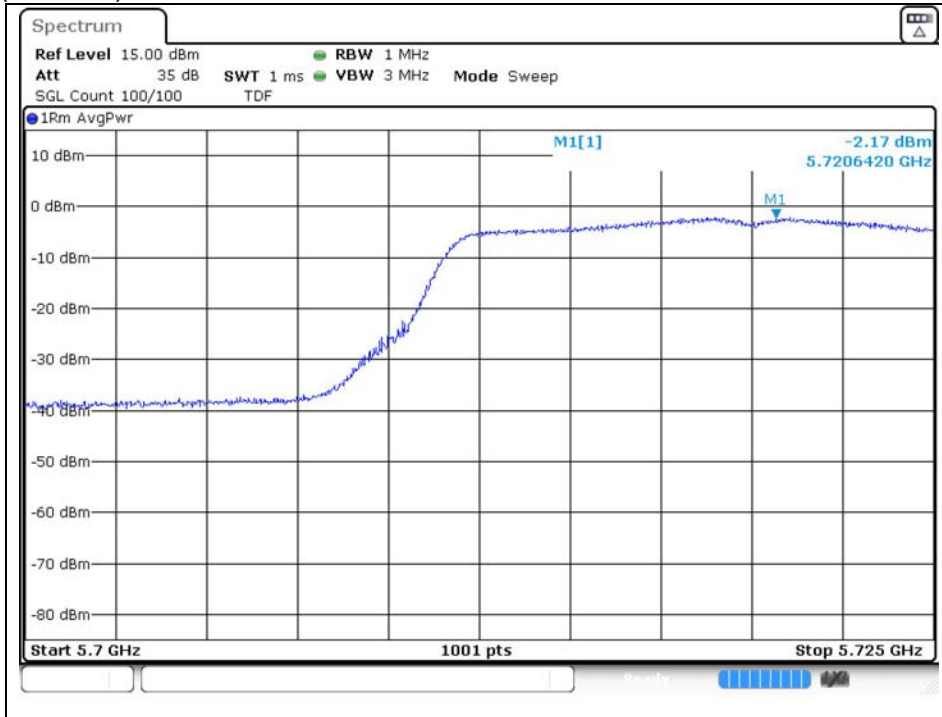
**802.11ac\_VHT80 (Band 3)**

Middle Channel  
(5 775 MHz)

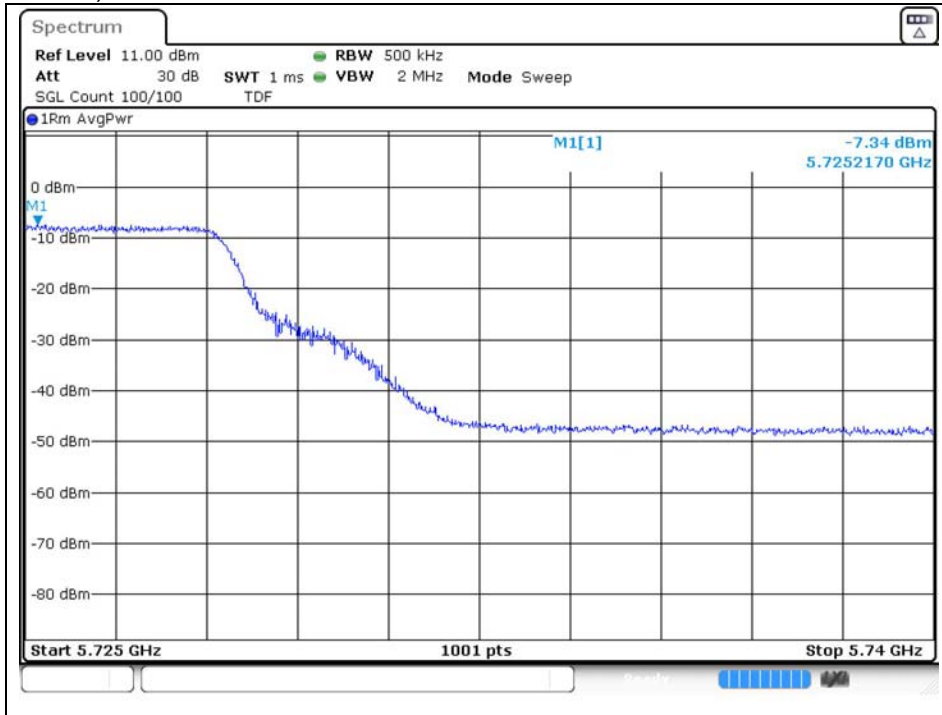


**Band-crossing channels**

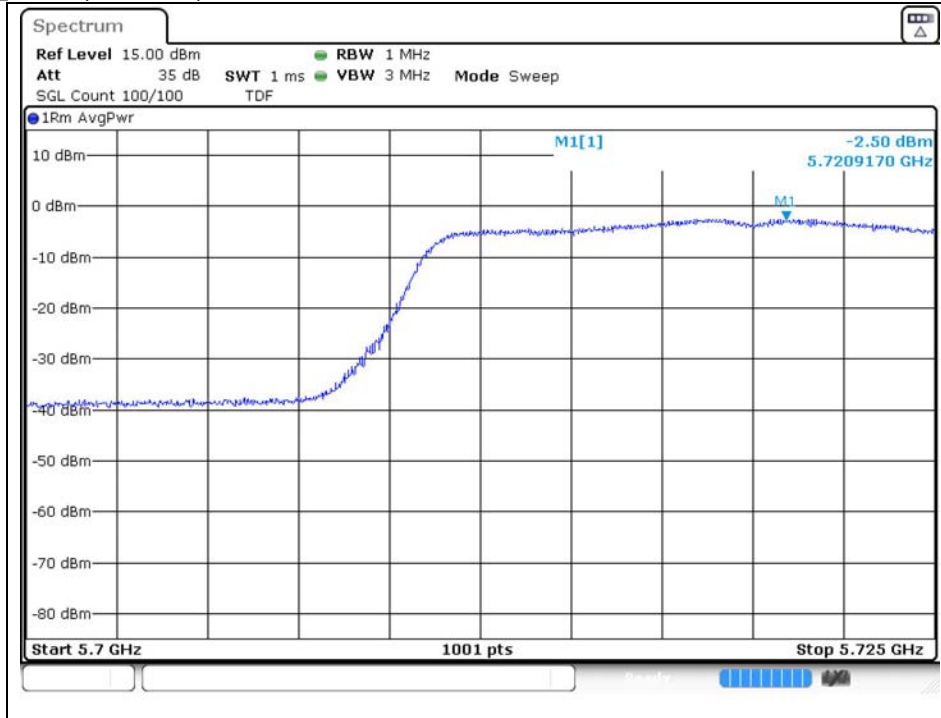
U-NII 2C 11a (5 720 MHz)



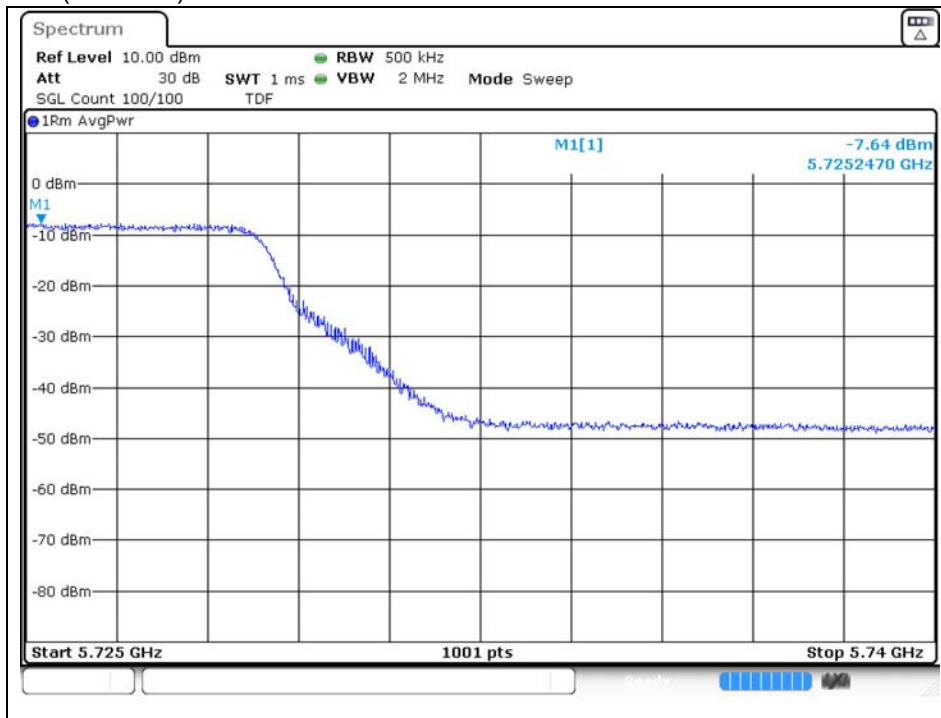
U-NII 3 11a (5 720 MHz)



U-NII 2C 11n\_HT20 (5 720 MHz)

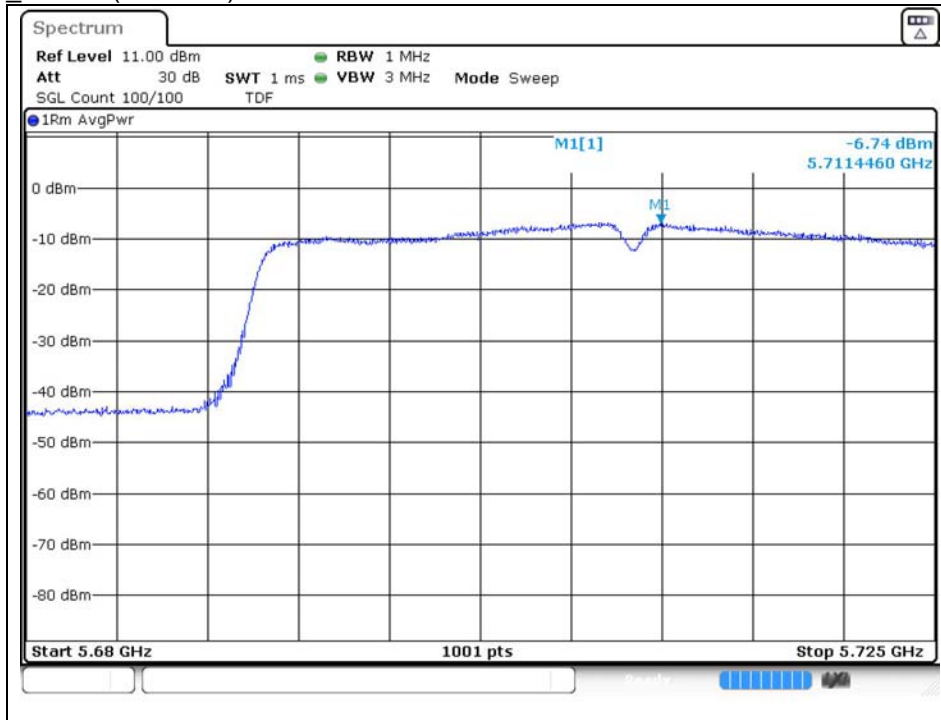


U-NII 3 11n\_HT20 (5 720 MHz)

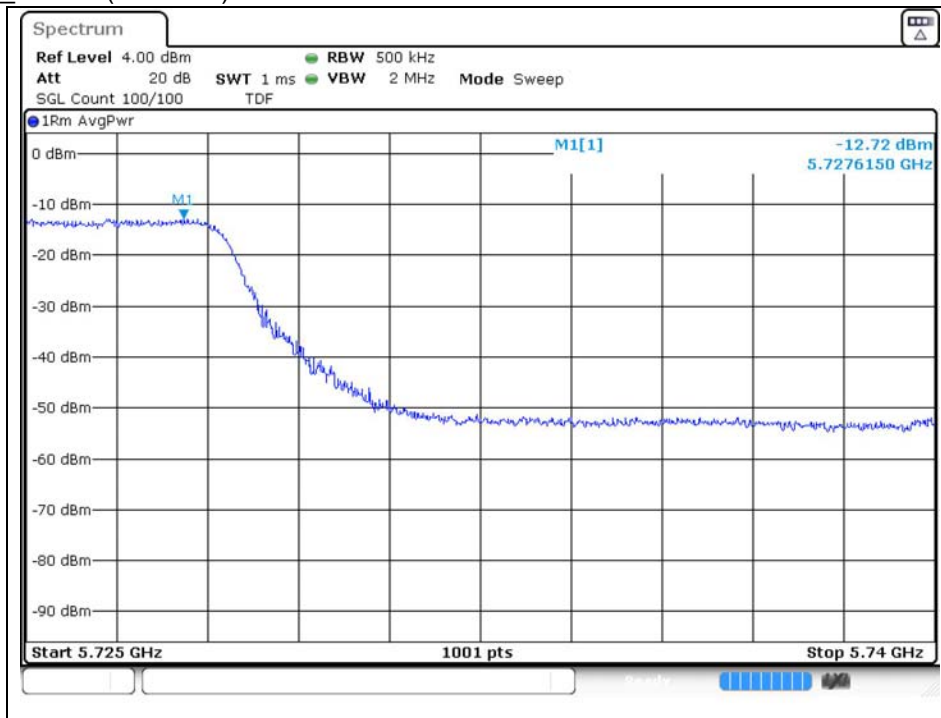




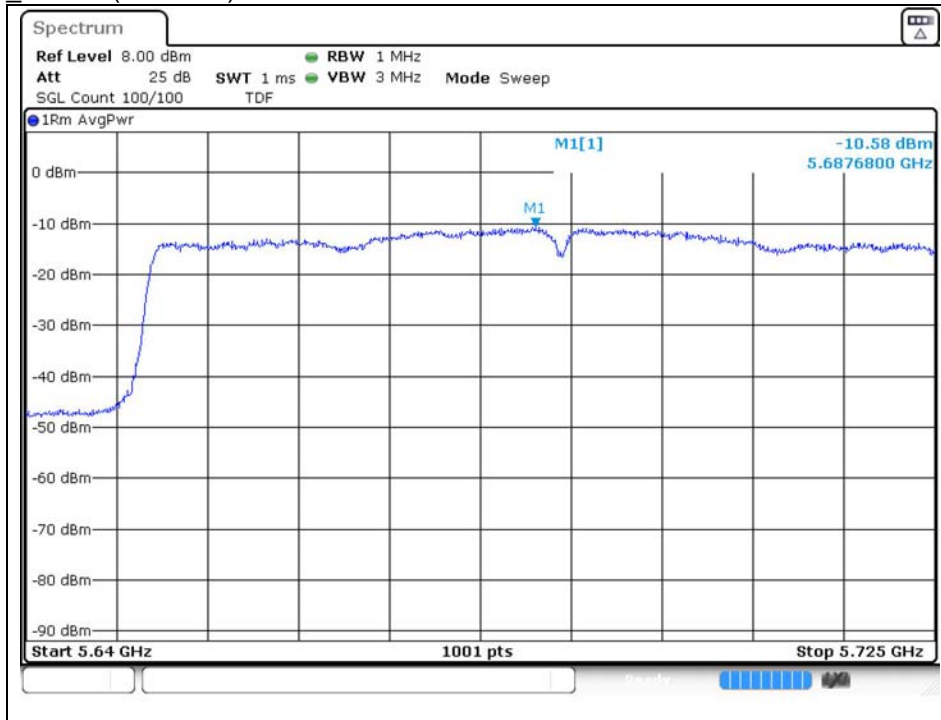
U-NII 2C 11ac VHT40 (5 710 MHz)



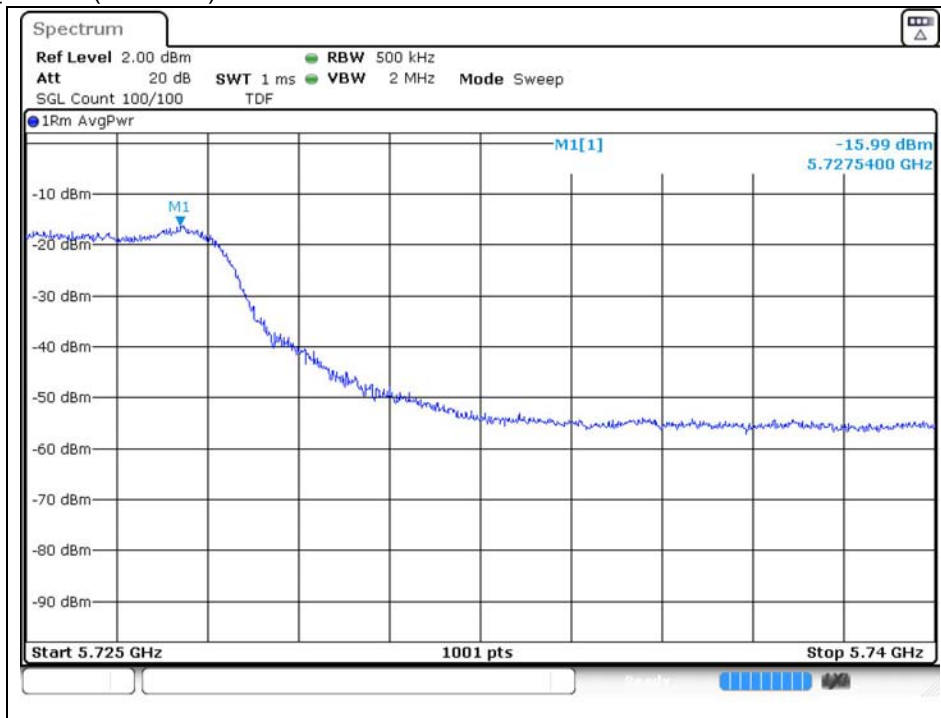
U-NII 3 11ac VHT40 (5 710 MHz)



U-NII 2C 11ac VHT80 (5 690 MHz)



U-NII 3 11ac\_VHT80 (5 690 MHz)



## 7. Antenna Requirement

### 7.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section §15.203, 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. And according to FCC 47 CFR Section §15.407(a) if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the gain of the antenna exceeds 6 dBi.

### 7.2. Antenna Connected Construction

Antenna used in this product is Pattern antenna and peak max gain of antenna as below.

Band	5 150 MHz ~ 5 250 MHz	5 250 MHz ~ 5 350 MHz	5 470 MHz ~ 5 725 MHz	5 725 MHz ~ 5 850 MHz
Mode	11a/n_HT20, HT40, 11ac_VHT20, VHT40, VHT80			
Gain	-0.61 dBi	-0.18 dBi	-0.77 dBi	-0.18 dBi

**- End of the Test Report -**