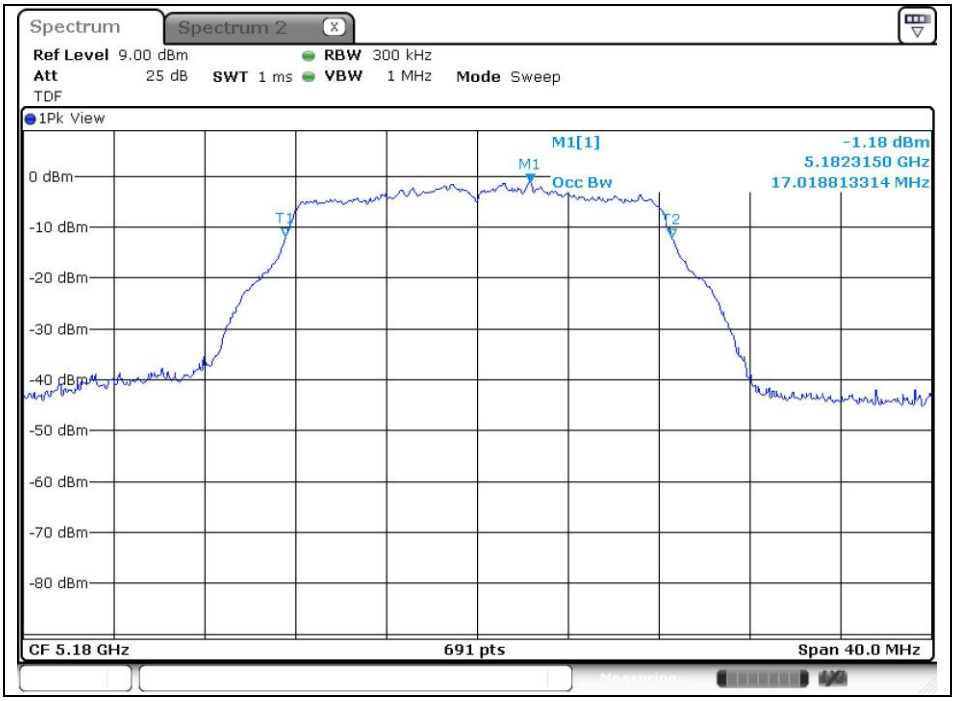
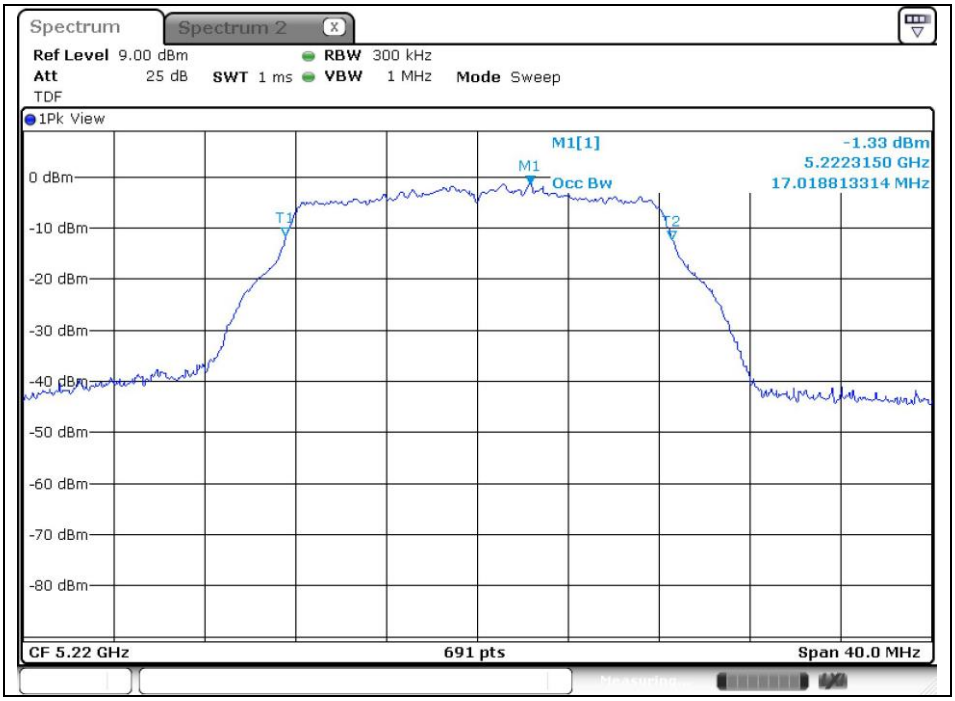
99 % Bandwidth

802.11a (Band 1)

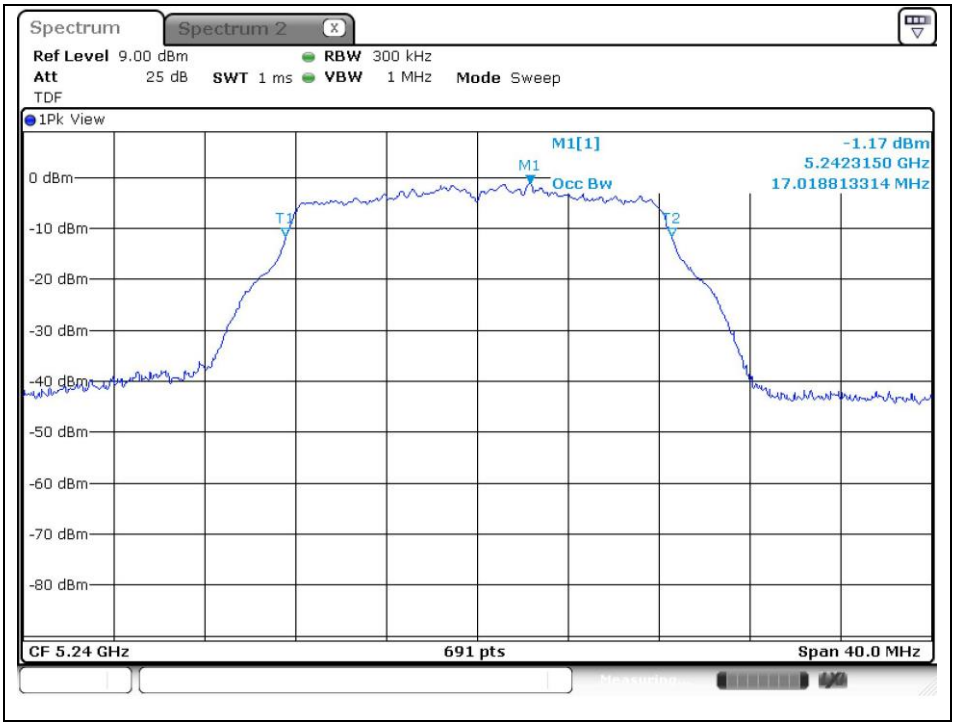
Low Channel (5 180 ㎒)



Middle Channel (5 220 ㎒)

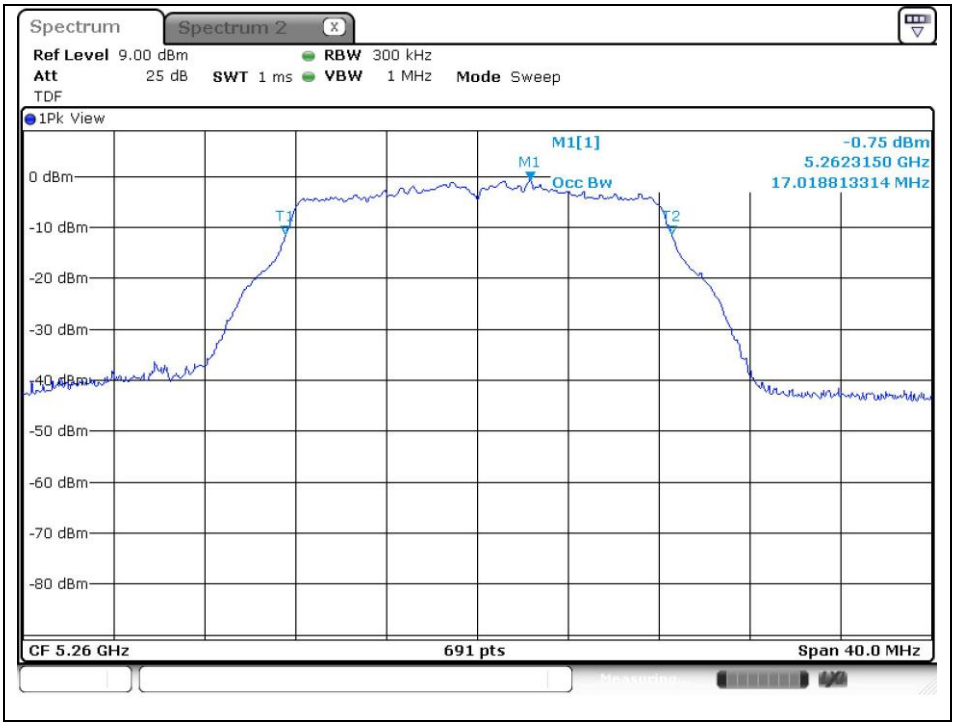


High Channel (5 240 ㎒)

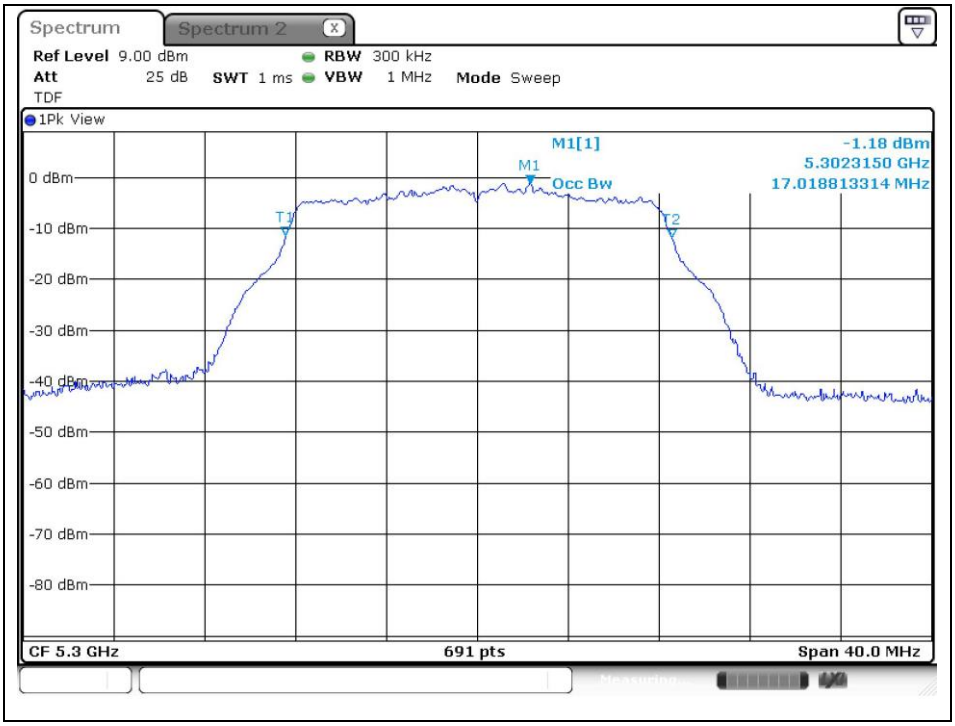


802.11a (Band 2A)

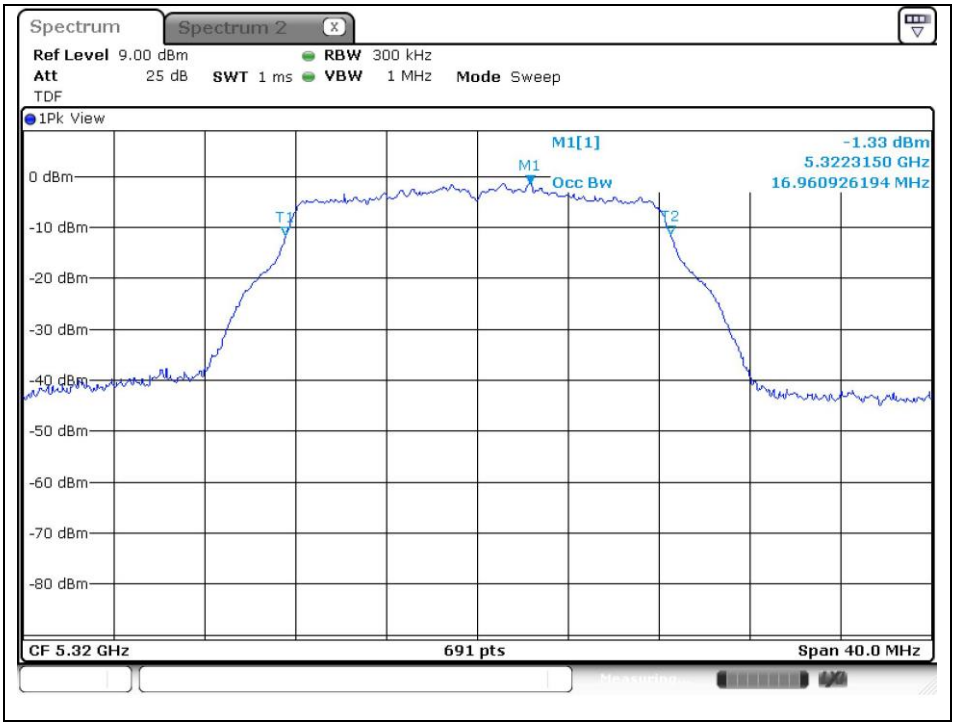
Low Channel (5 260 ㎒)



Middle Channel (5 300 ㎒)

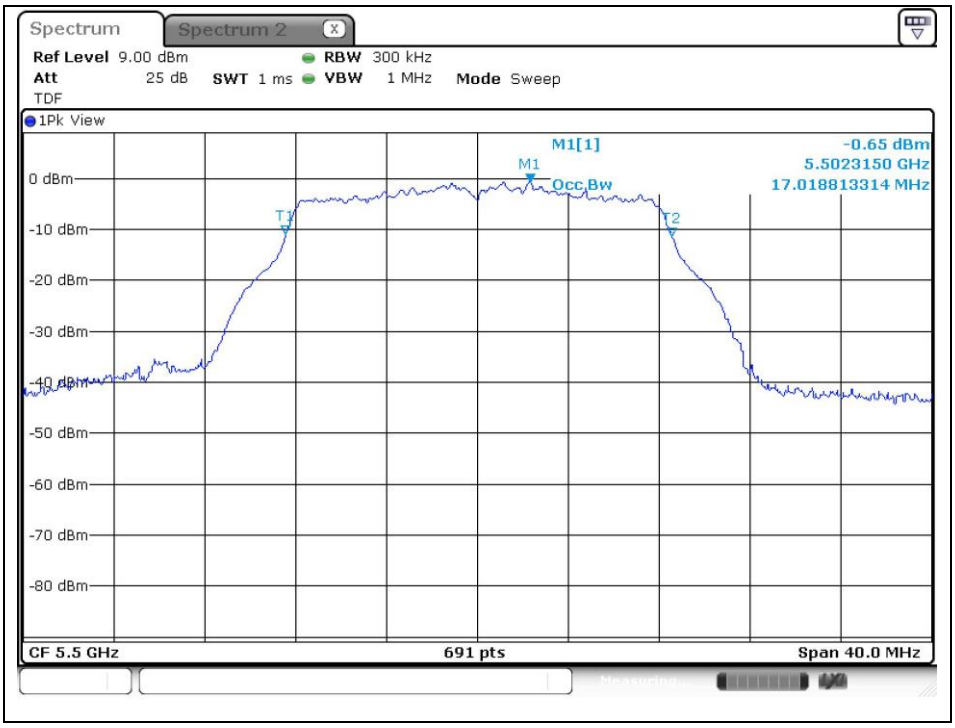


High Channel (5 320 ㎒)

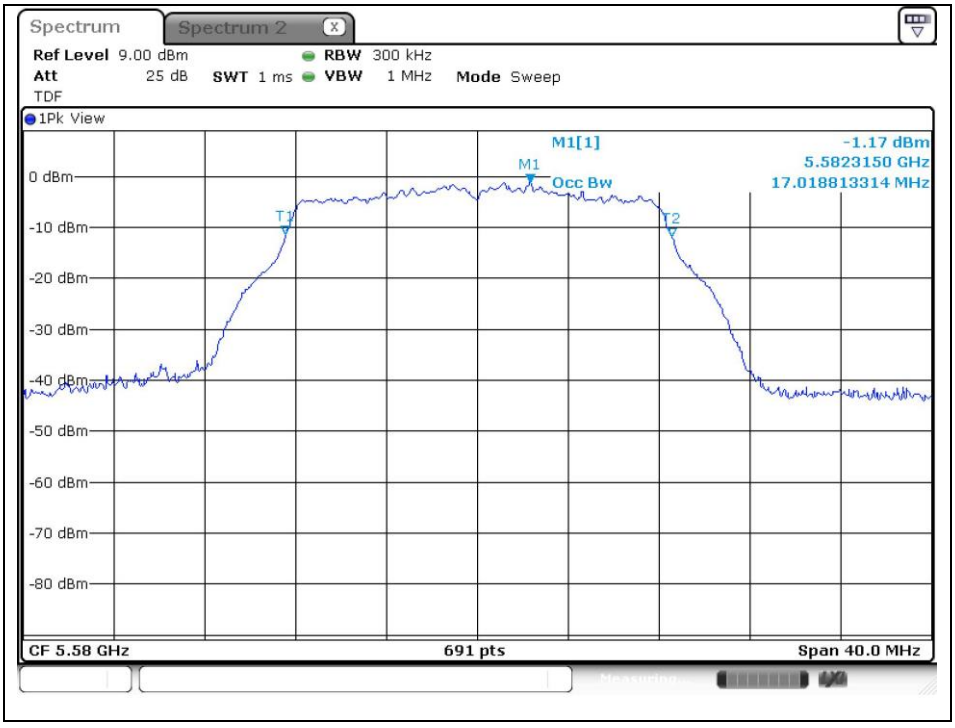


802.11a (Band 2C)

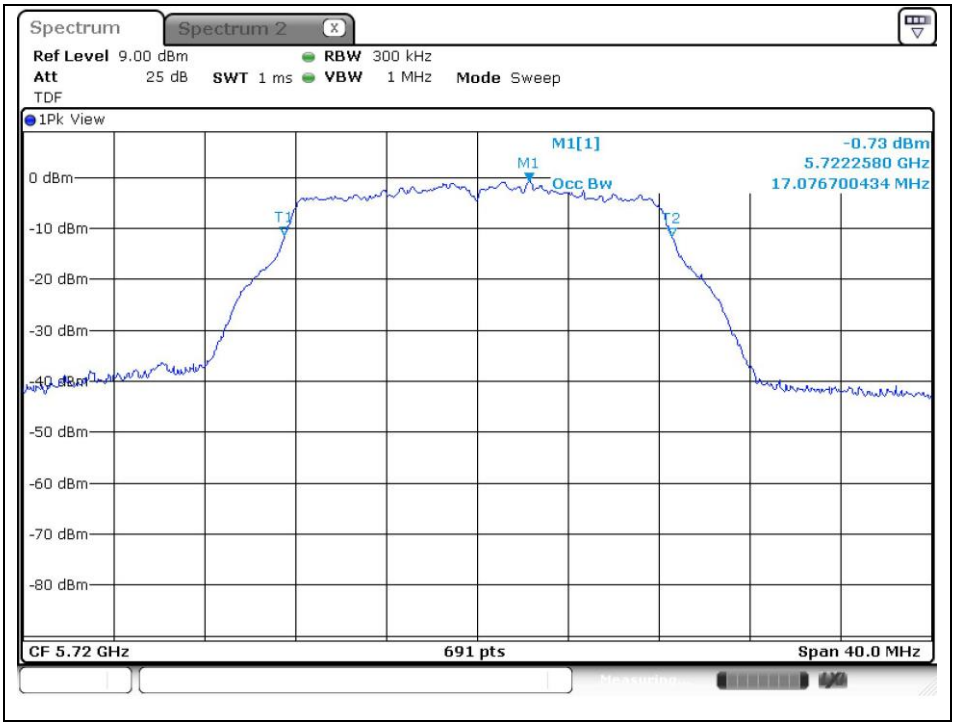
Low Channel (5 500 ㎒)



Middle Channel (5 580 ㎒)

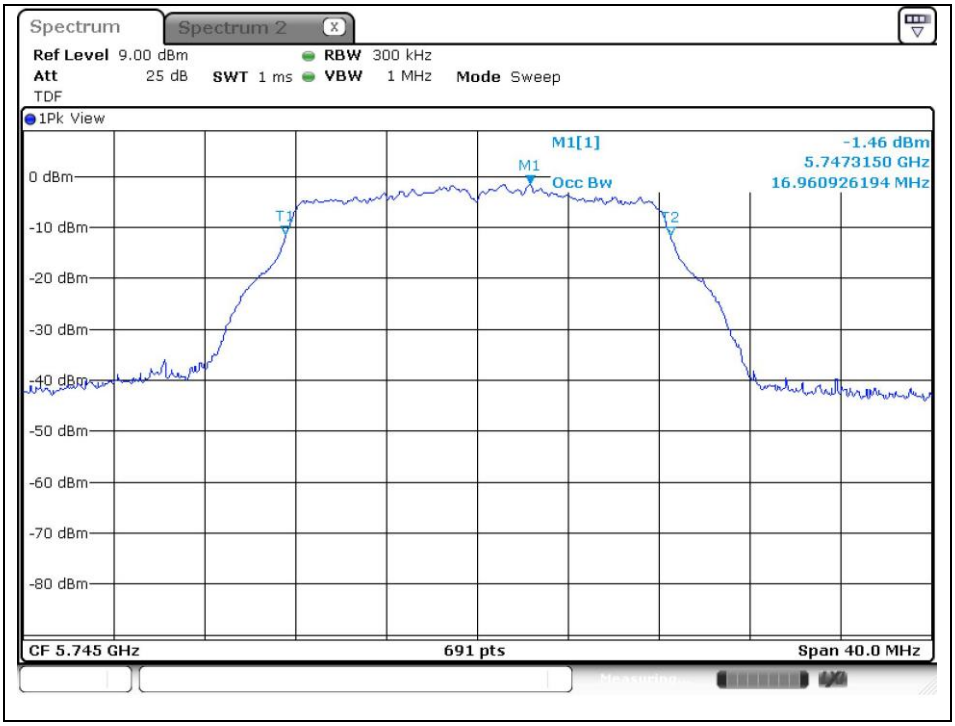


High Channel (5 720 ㎒)

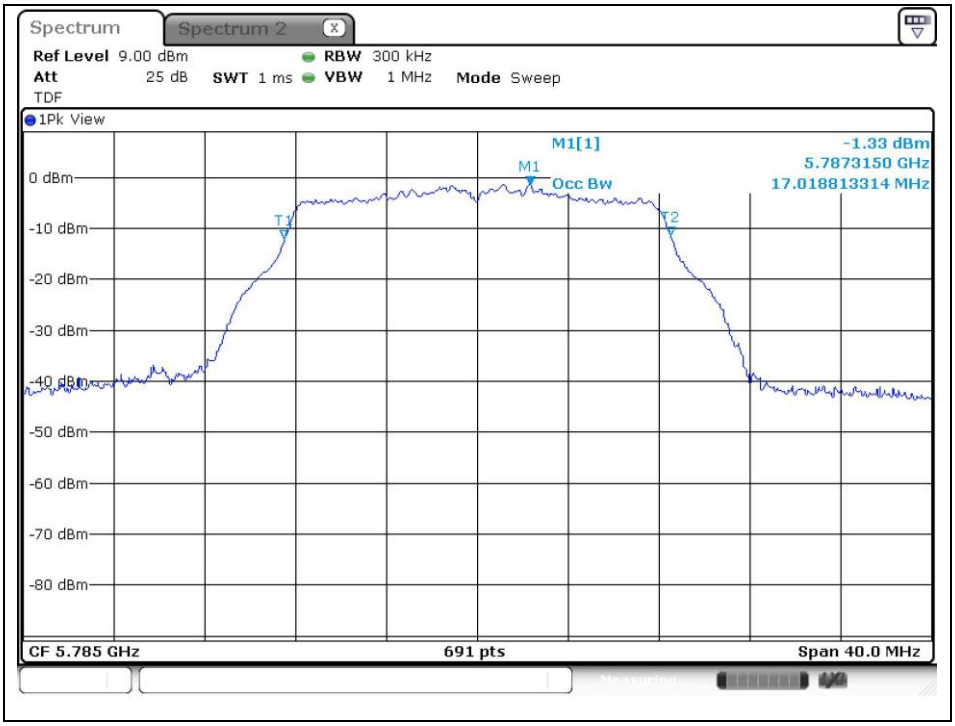


802.11a (Band 3)

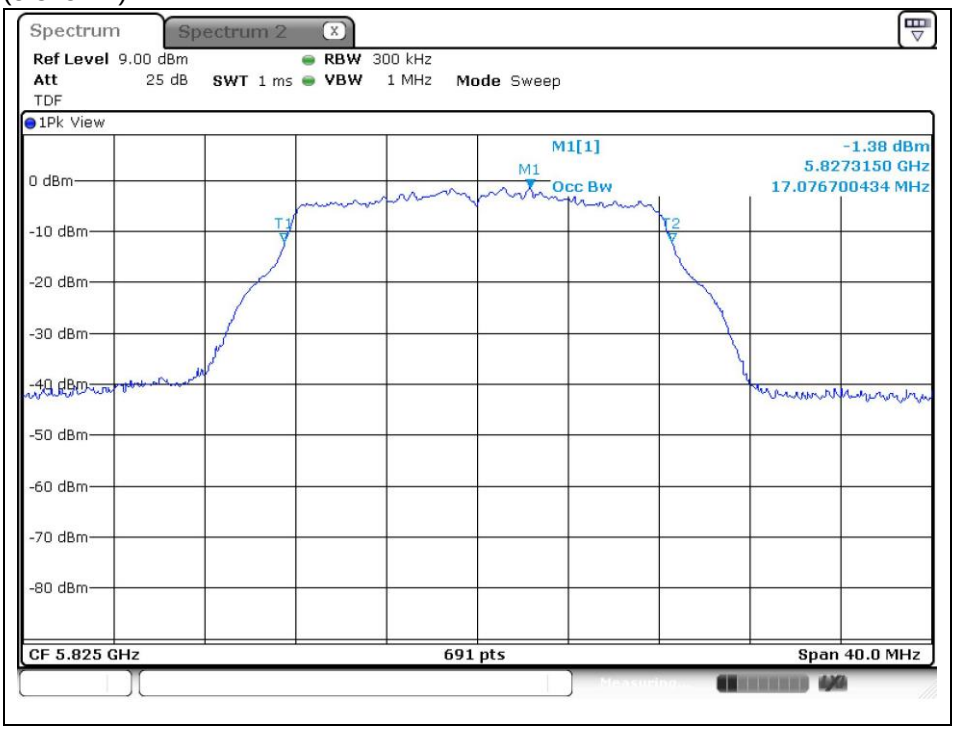
Low Channel (5 745 ㎒)



Middle Channel (5 785 ㎒)

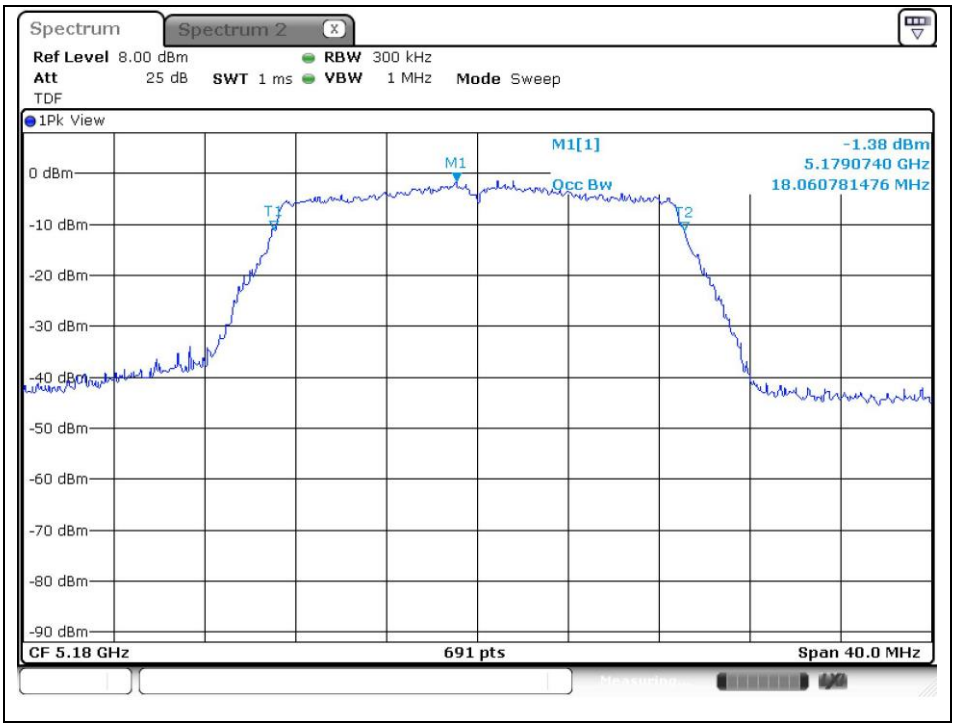


High Channel (5 825 ㎒)

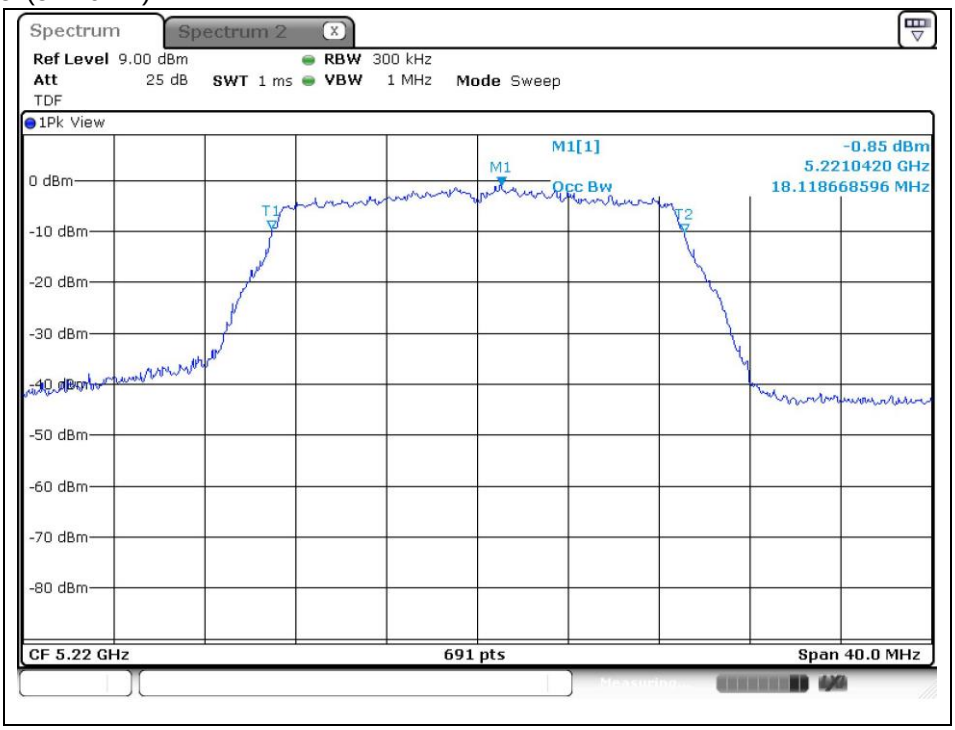


802.11n_HT20 (Band 1)

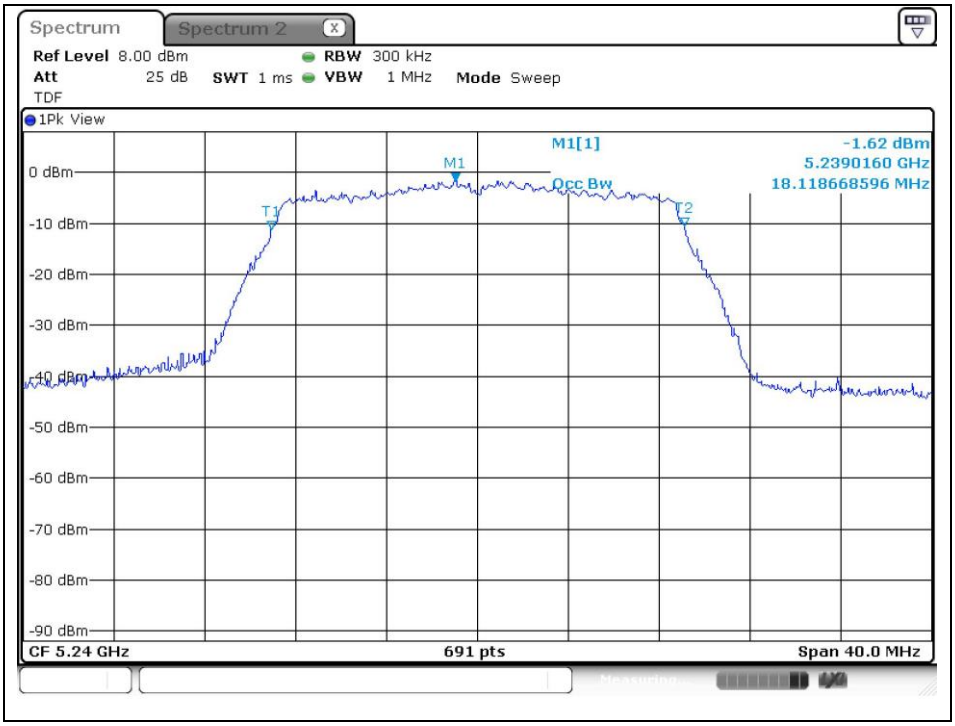
Low Channel (5 180 ㎒)



Middle Channel (5 220 ㎒)

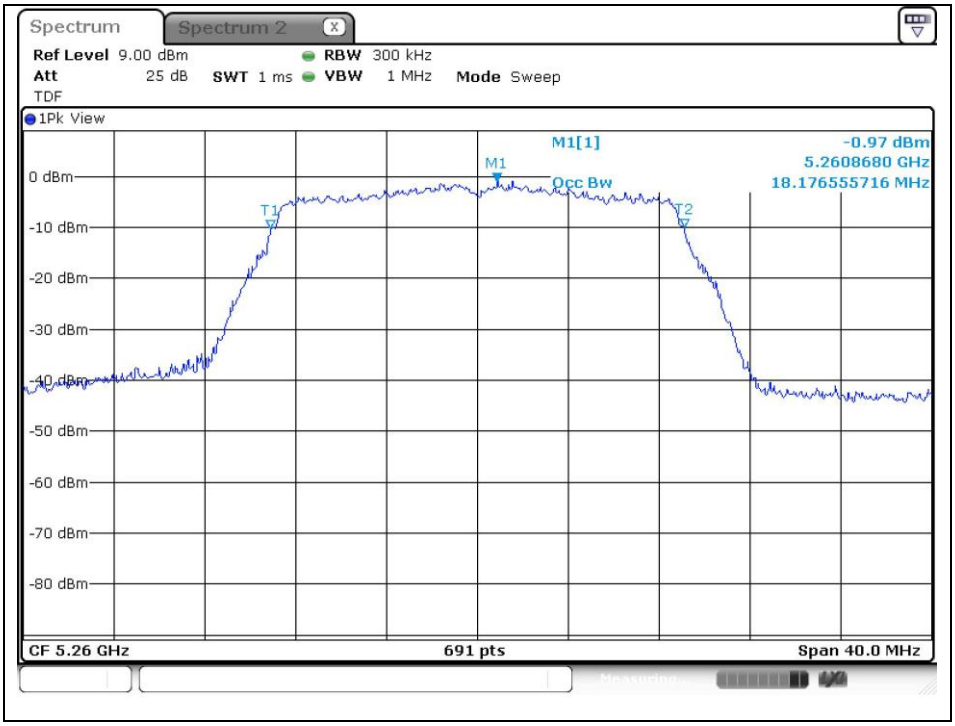


High Channel (5 240 ㎒)

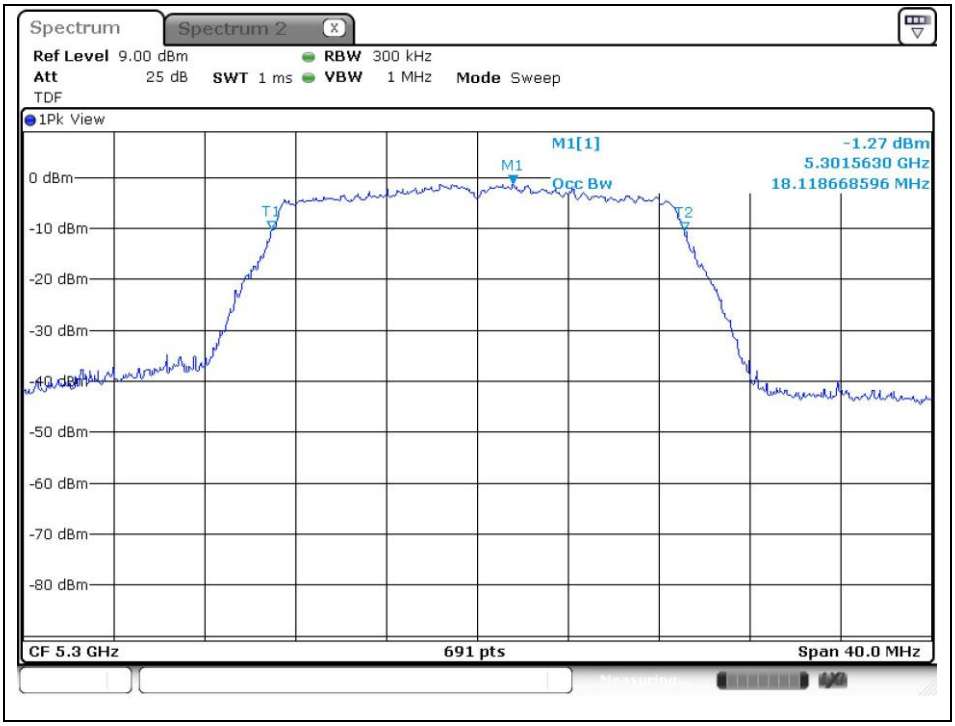


802.11n_HT20 (Band 2A)

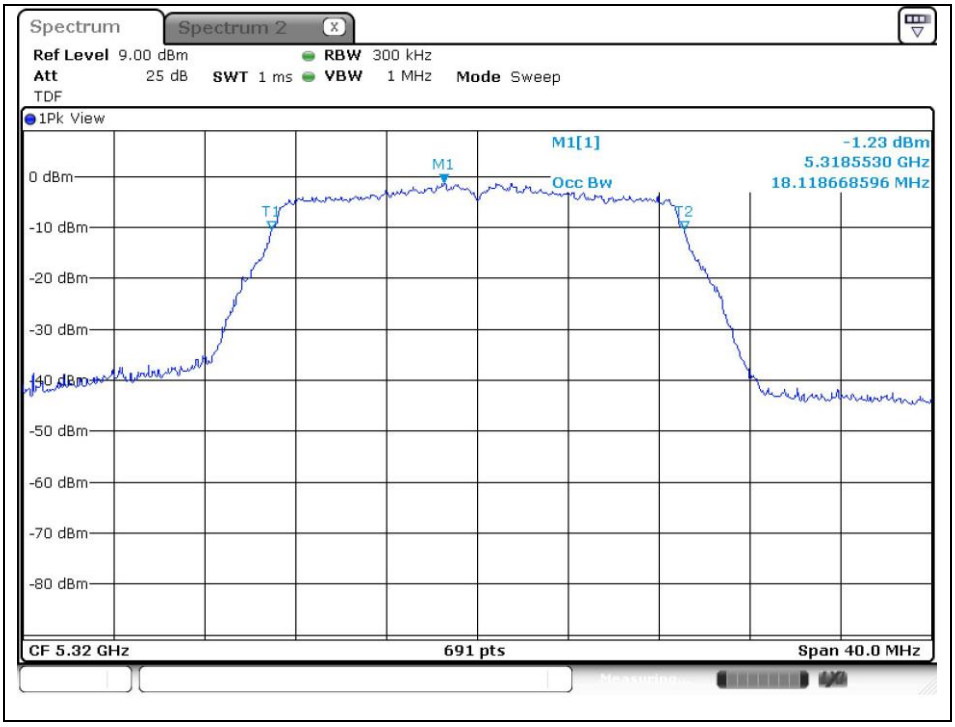
Low Channel (5 260 ㎒)



Middle Channel (5 300 ㎒)

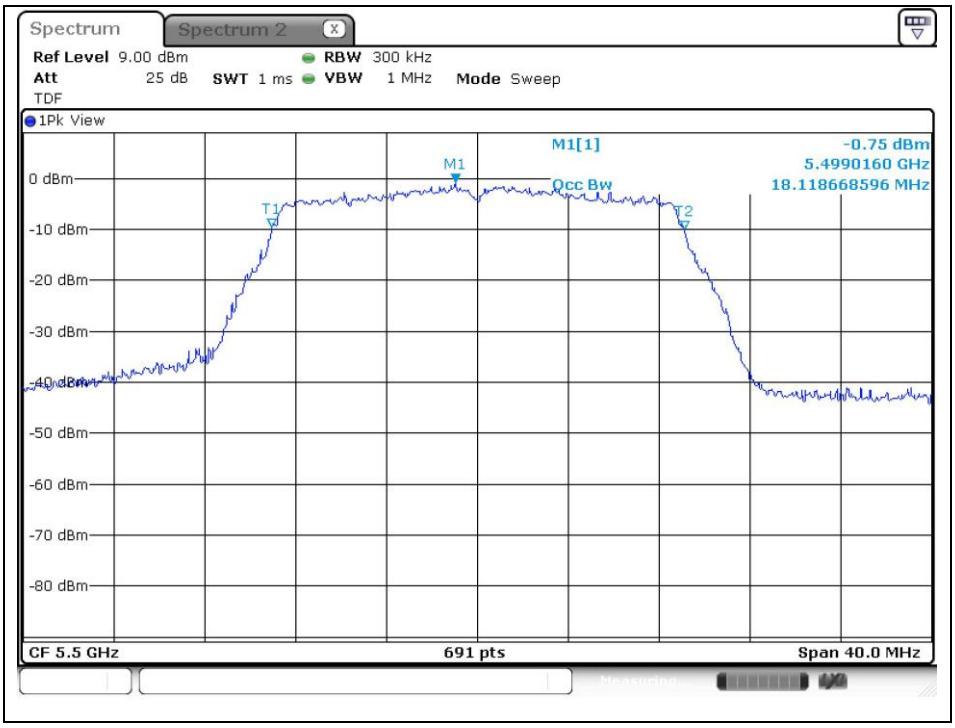


High Channel (5 320 ㎒)

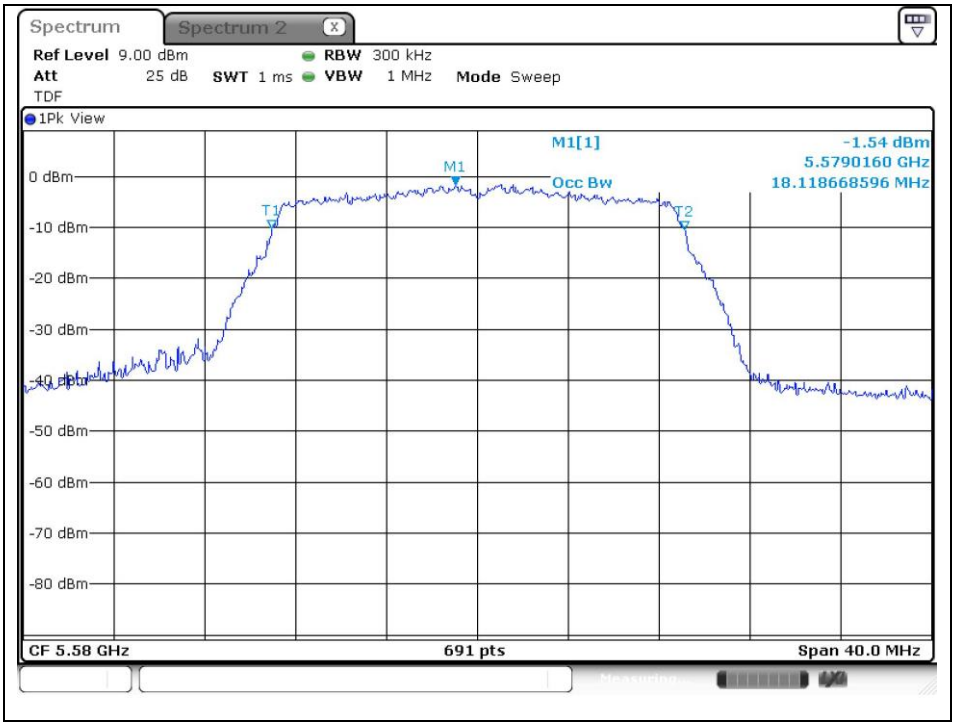


802.11n_HT20 (Band 2C)

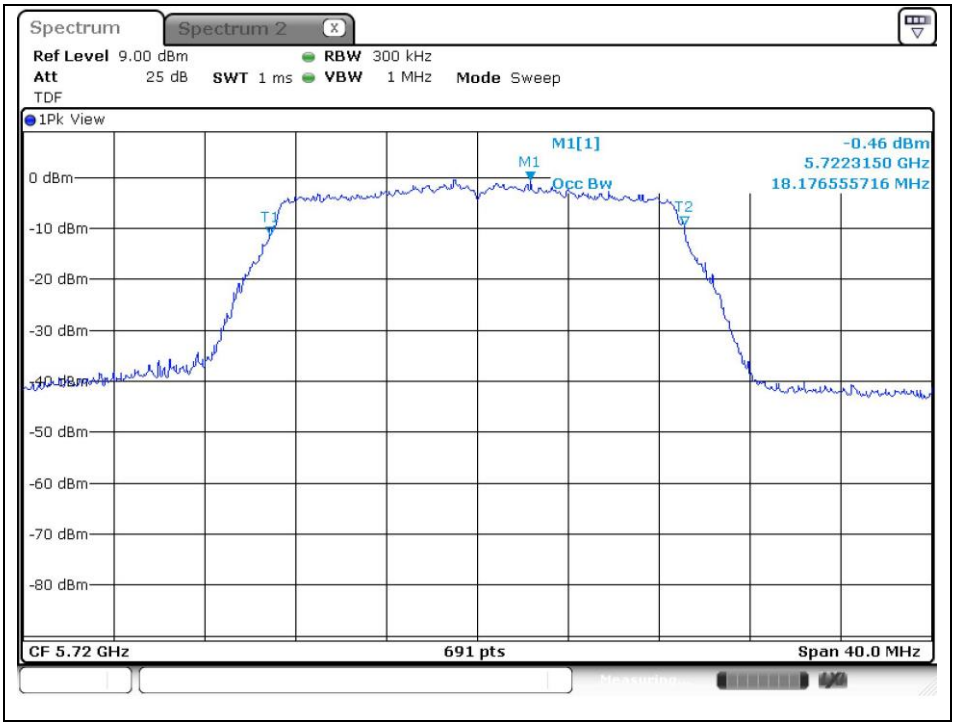
Low Channel (5 500 ㎒)



Middle Channel (5 580 ㎒)

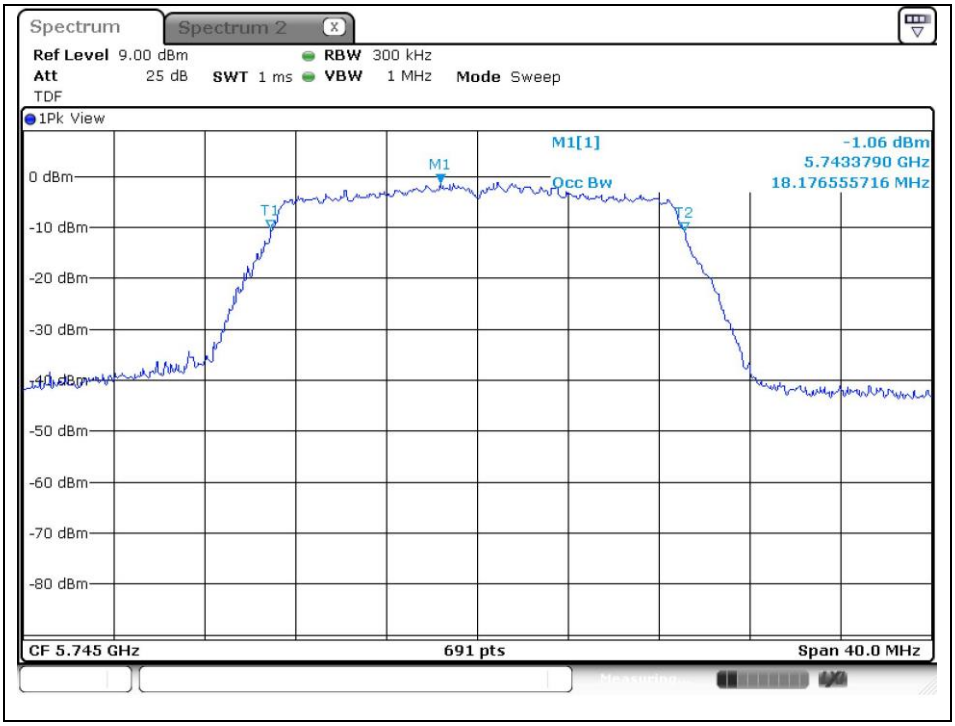


High Channel (5 720 ㎒)

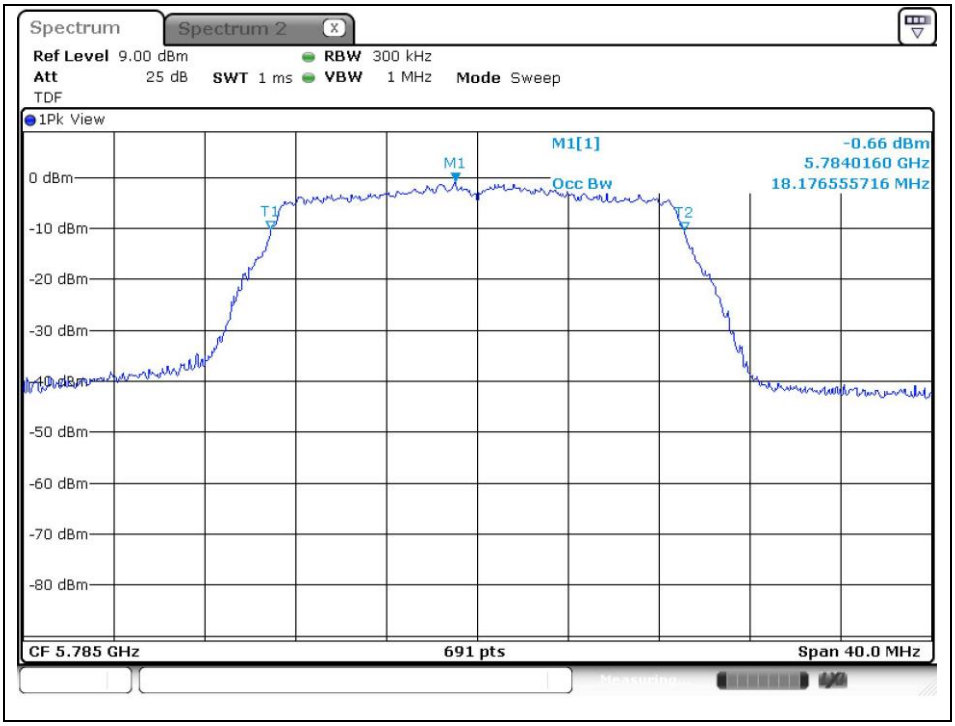


802.11n_HT20 (Band 3)

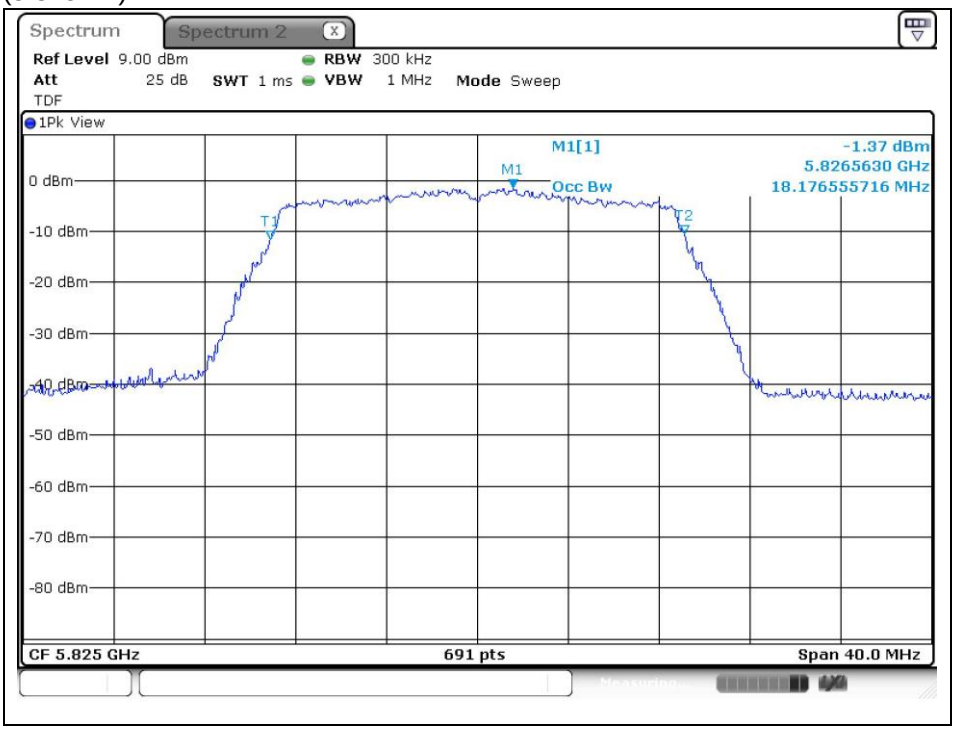
Low Channel (5 745 ㎒)



Middle Channel (5 785 ㎒)

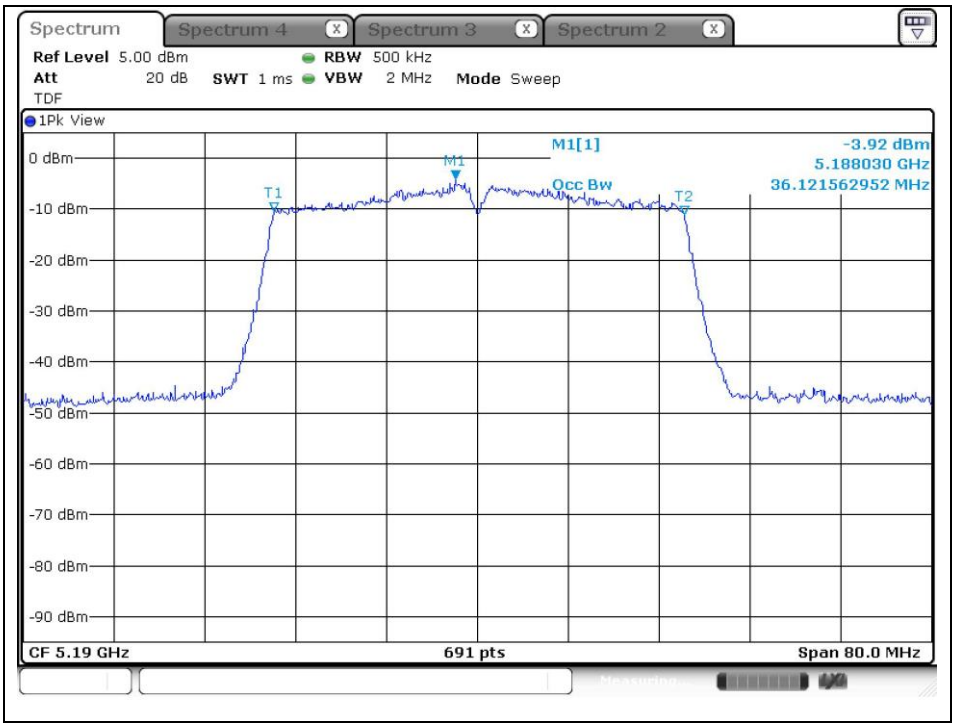


High Channel (5 825 ㎒)

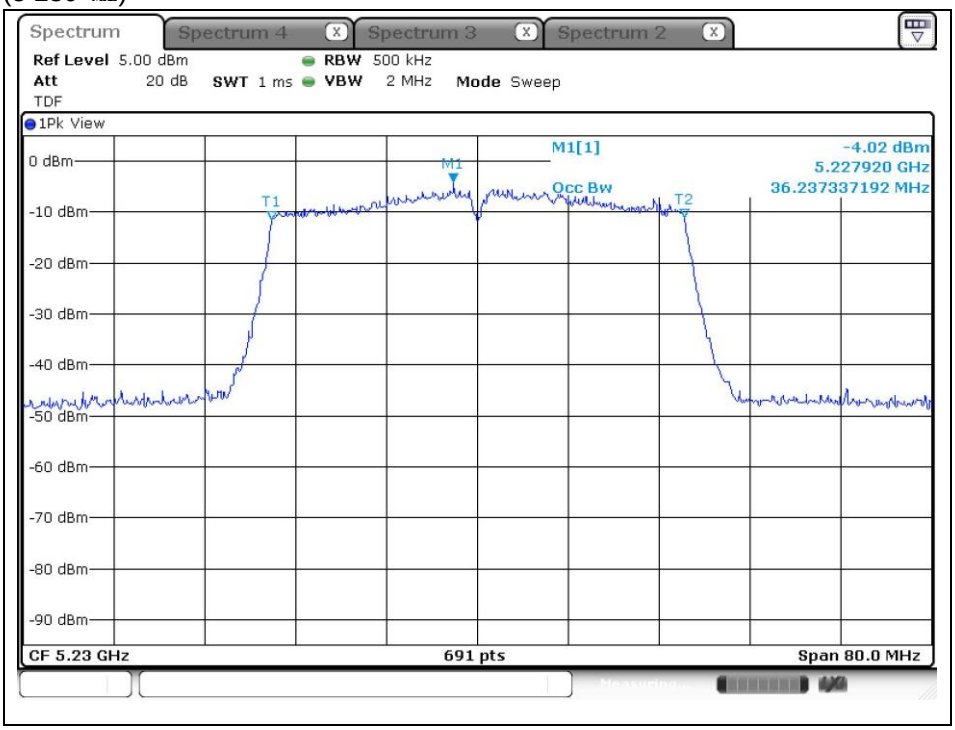


802.11n_HT40 (Band 1)

Low Channel (5 190 ㎒)

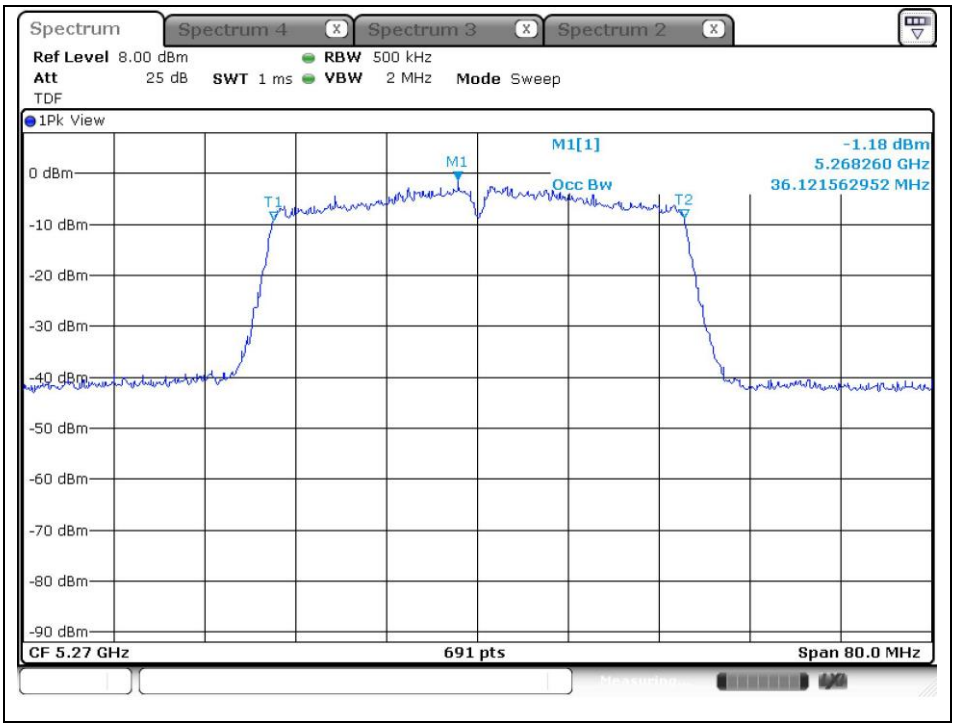


High Channel (5 230 ㎒)

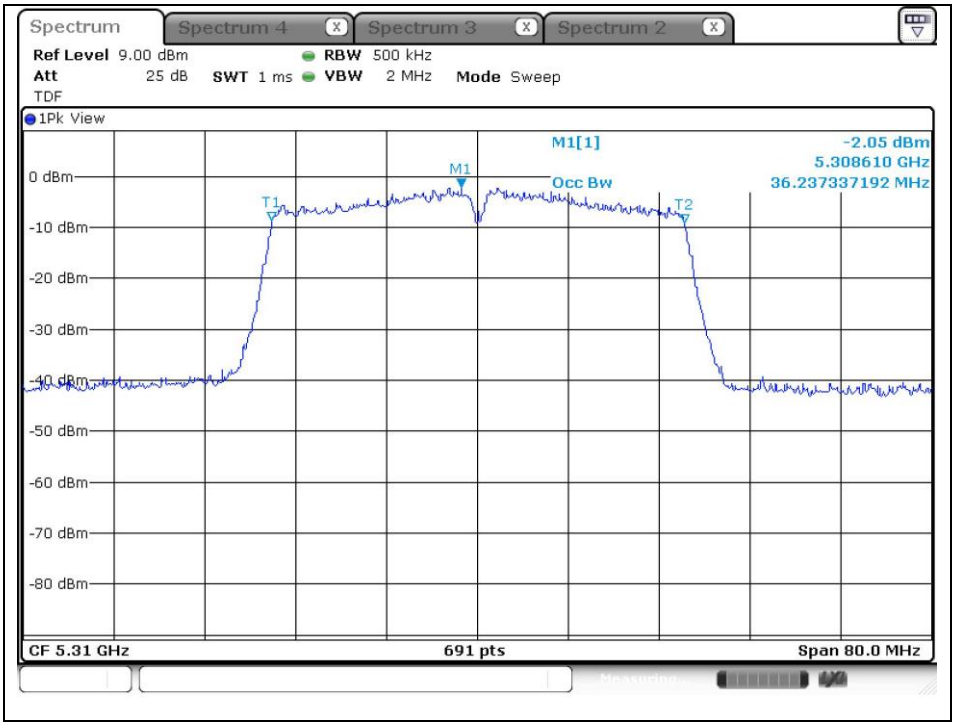


802.11n_HT40 (Band 2A)

Low Channel (5 270 ㎒)

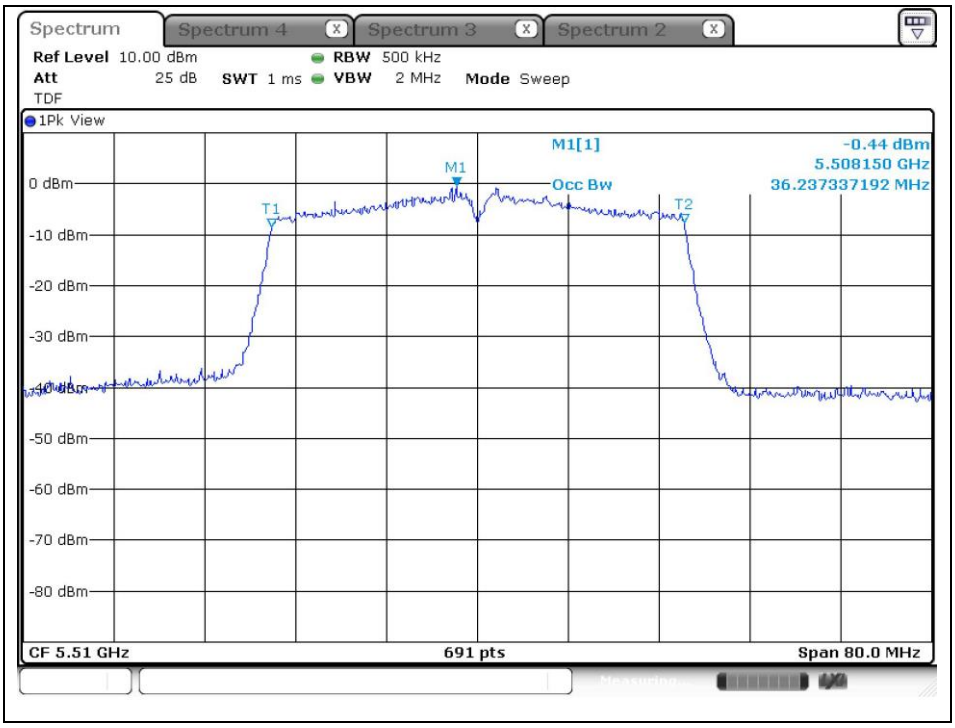


High Channel (5 310 ㎒)

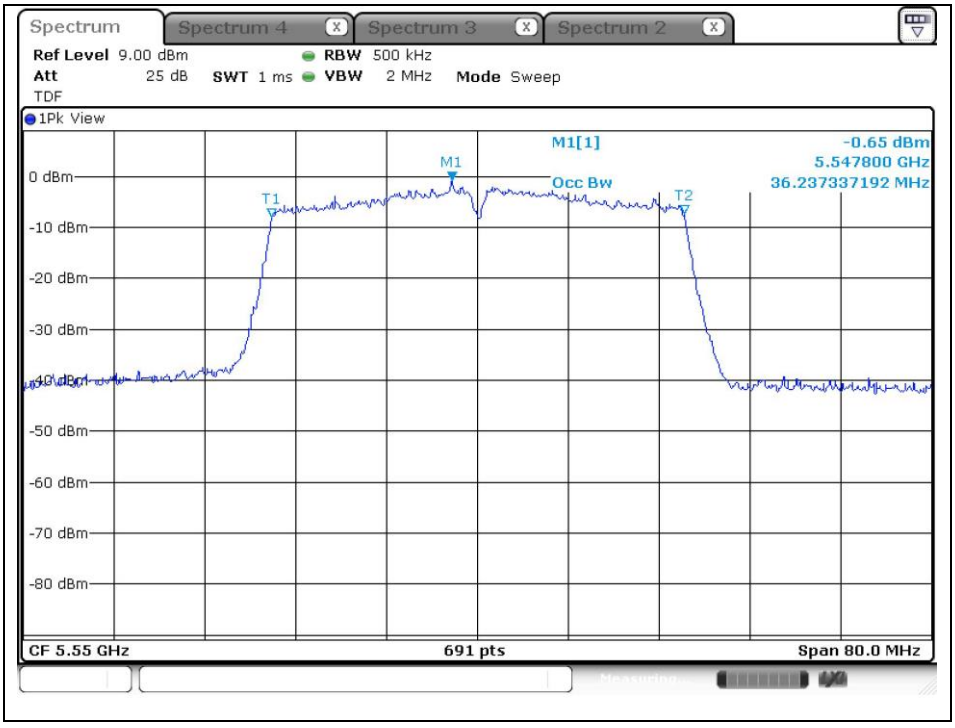


802.11n_HT40 (Band 2C)

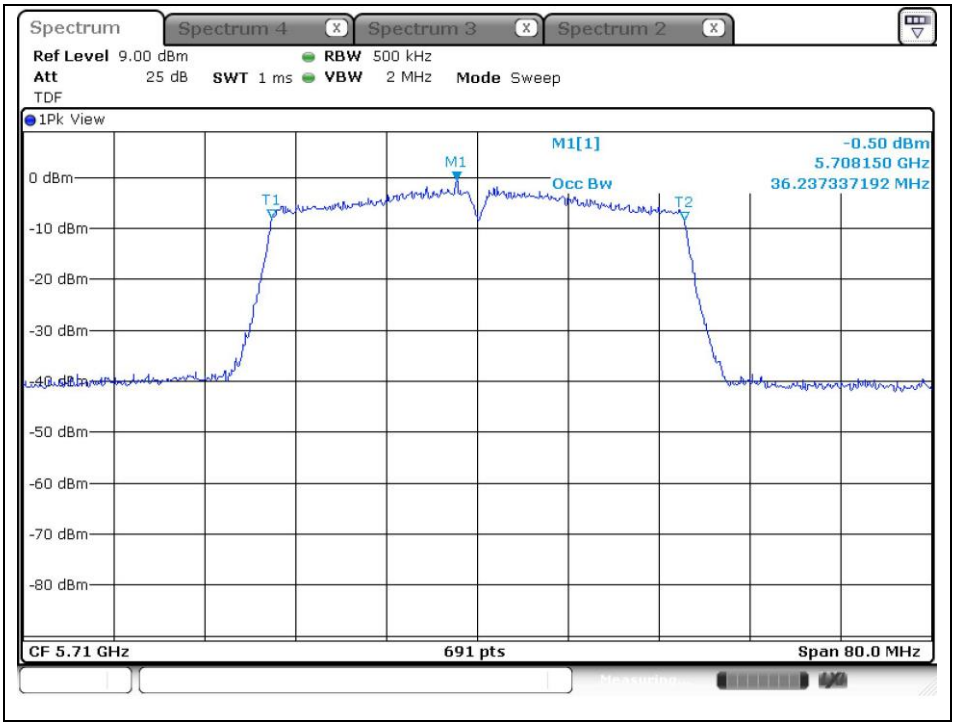
Low Channel (5 510 ㎒)



Middle Channel (5 550 ㎒)

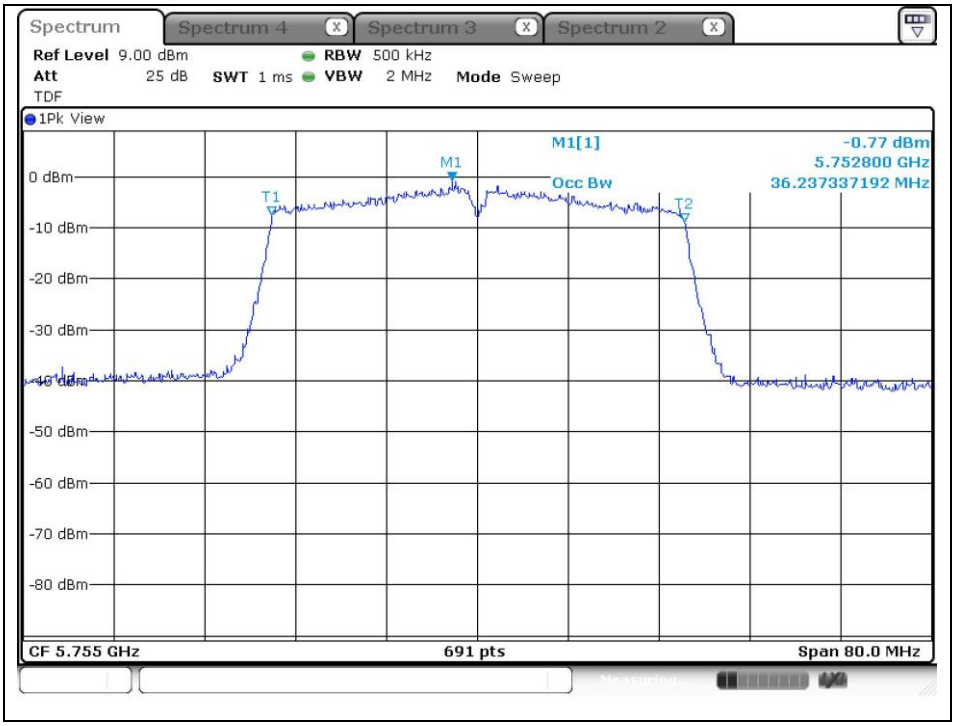


High Channel (5 710 ㎒)

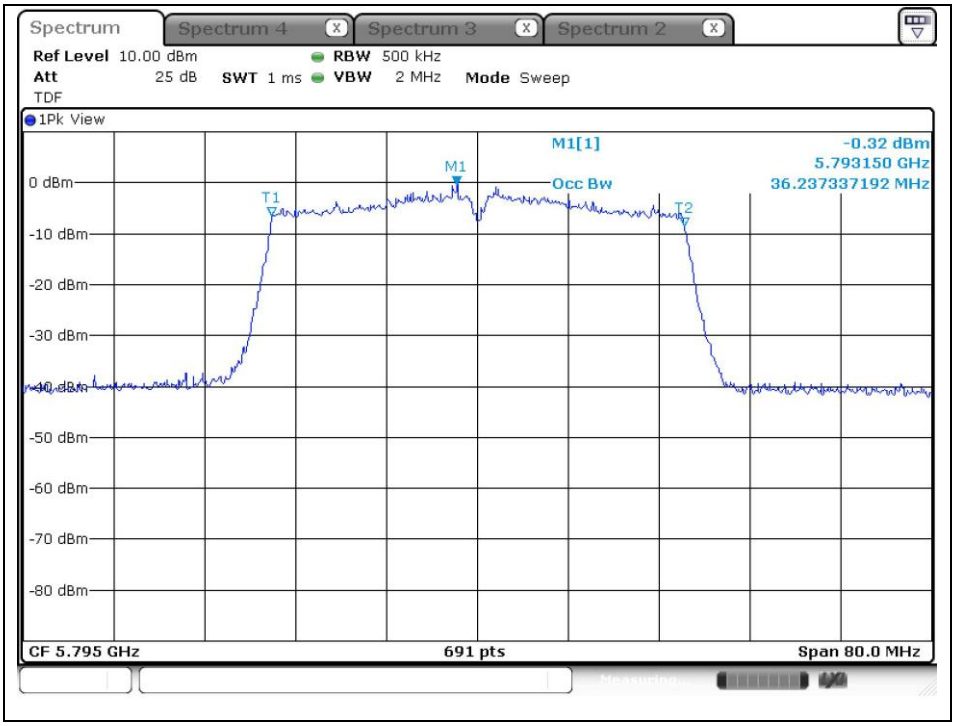


802.11n_HT40 (Band 3)

Low Channel (5 755 ㎒)

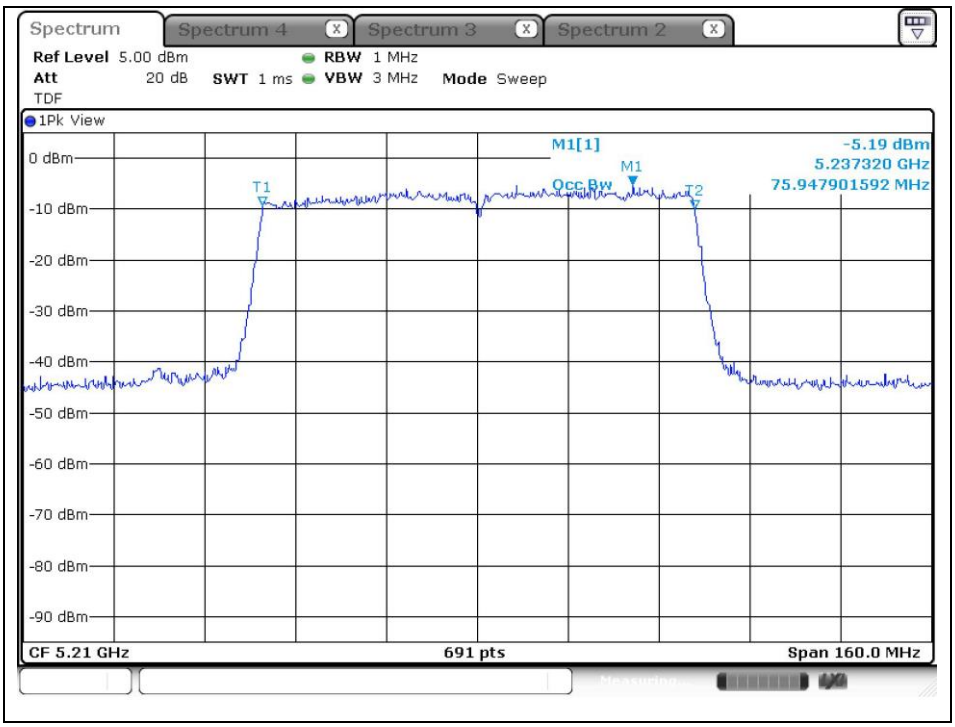


High Channel (5 795 ㎒)



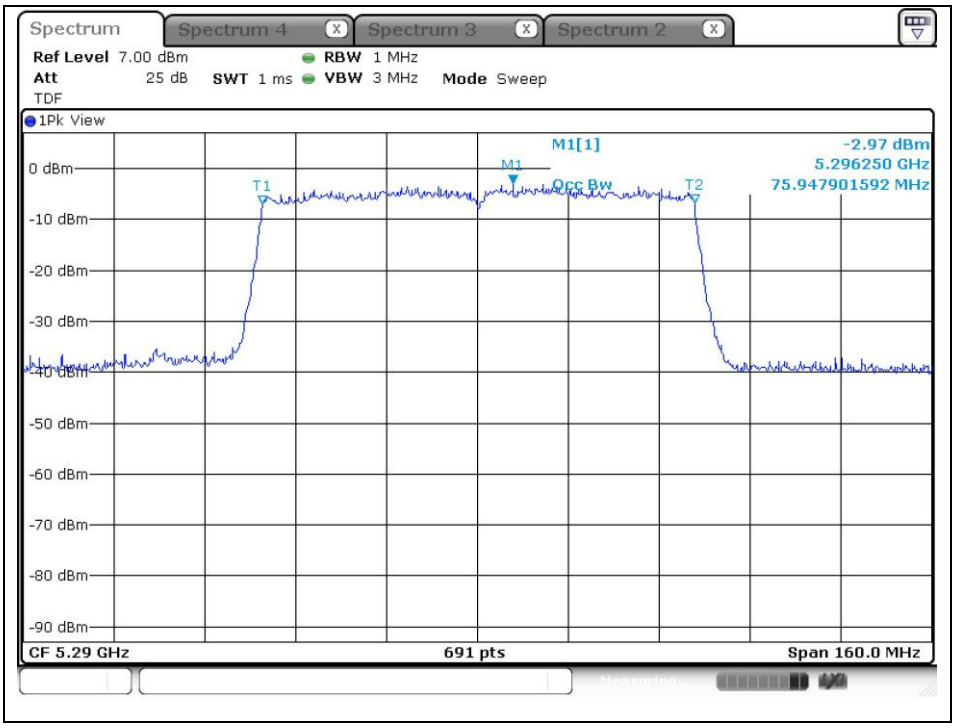
802.11ac_VHT80 (Band 1)

Middle Channel (5 210 ㎒)



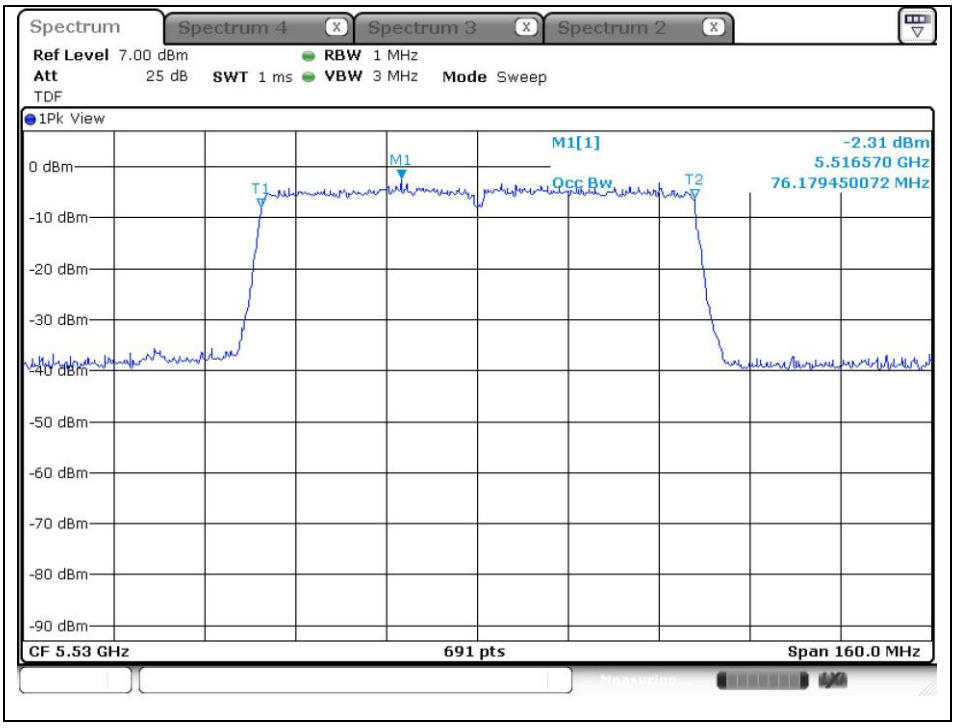
802.11ac_VHT80 (Band 2A)

Middle Channel (5 290 ㎒)



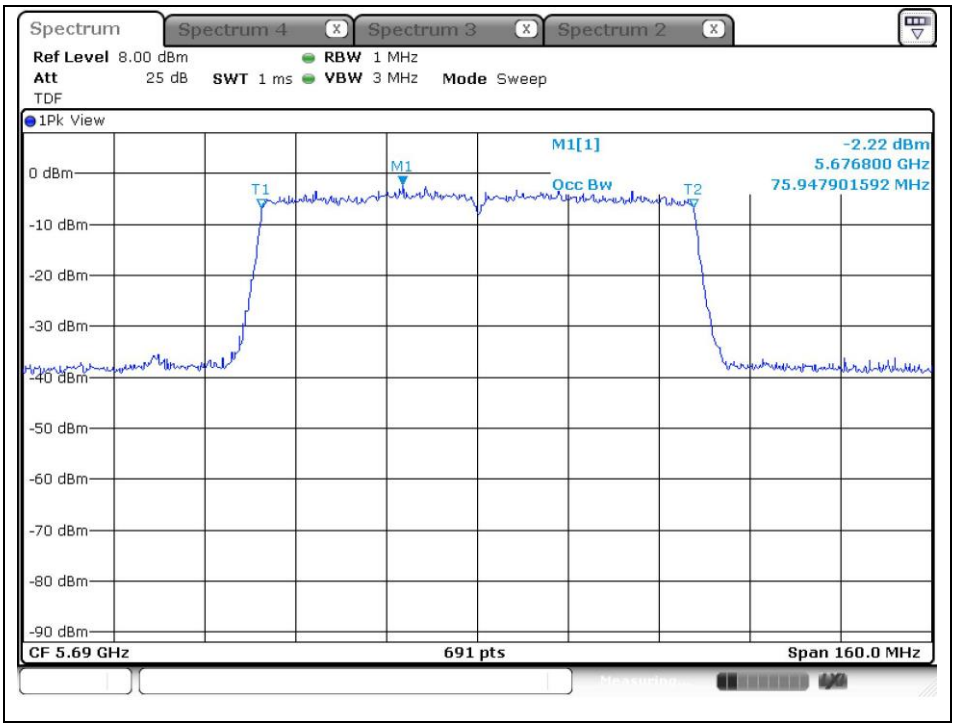
802.11ac_VHT80 (Band 2C)

Low Channel (5 530 ㎒)



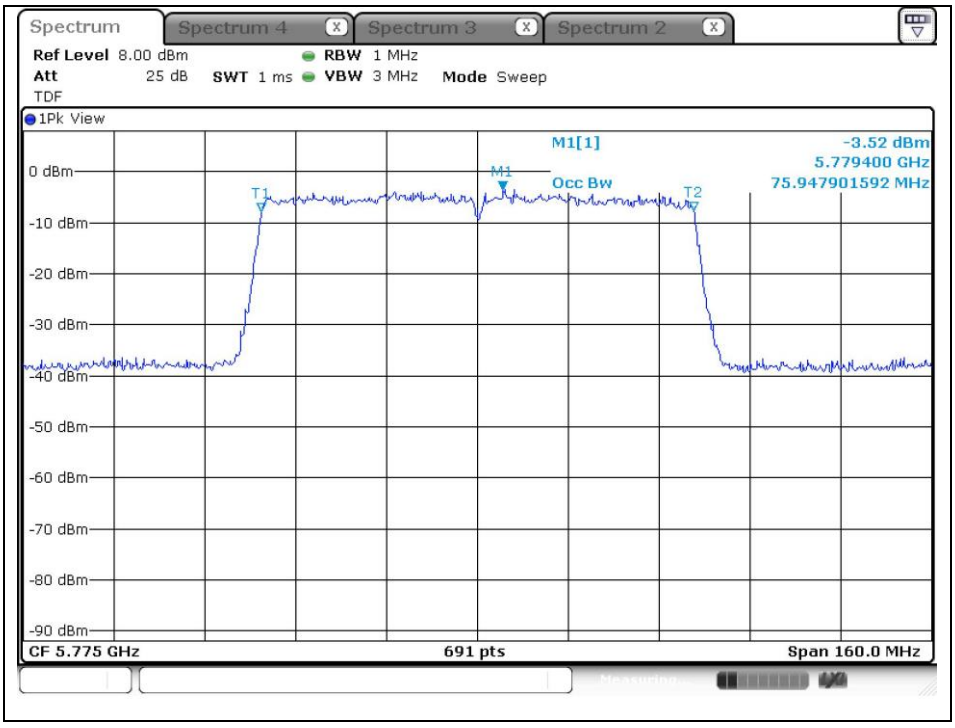
802.11ac_VHT80 (Band 2C)

High Channel (5 690 ㎒)



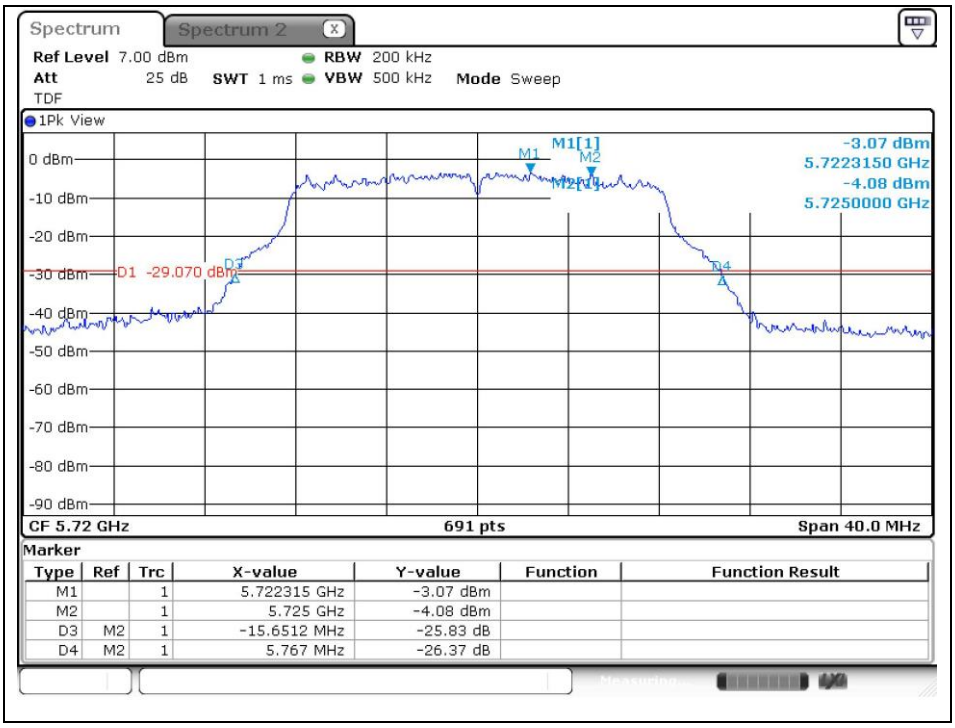
802. 11ac_VHT80 (Band 3)

Middle Channel (5 775 ㎒)

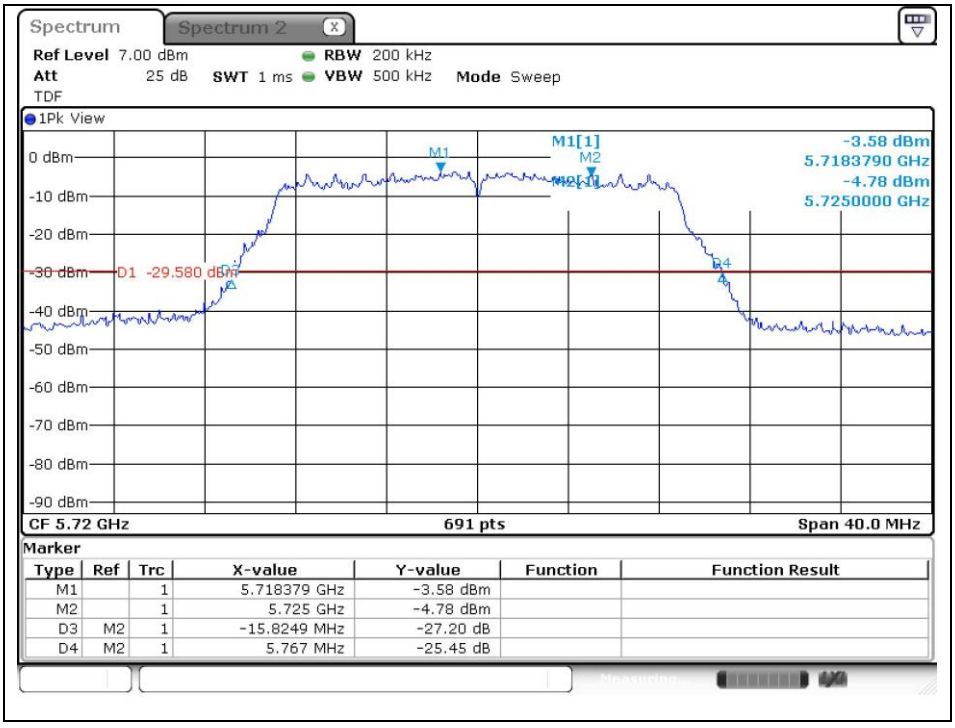


Band-crossing channels

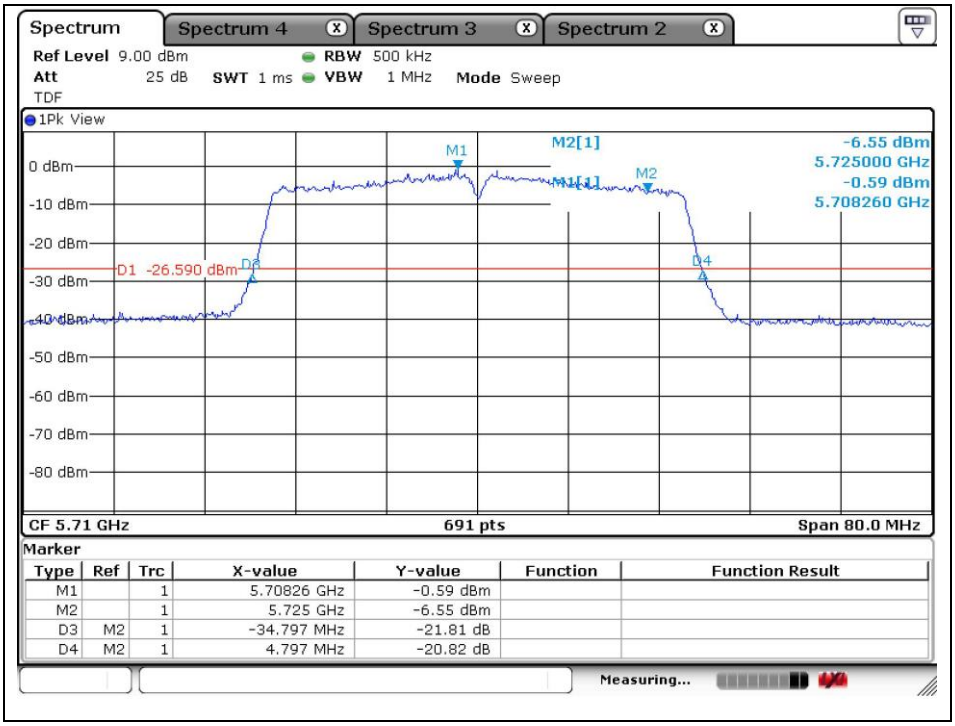
802.11a (5 720 ㎒)



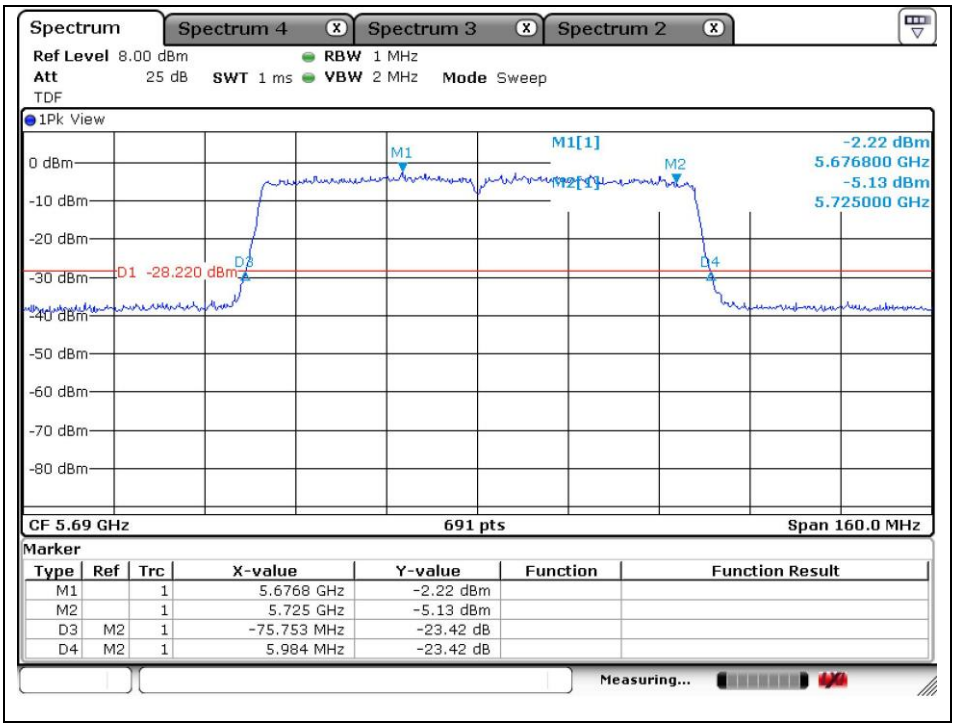
802.11n_HT20 (5 720 ㎒)



802.11n_HT40 (5 710 ㎒)

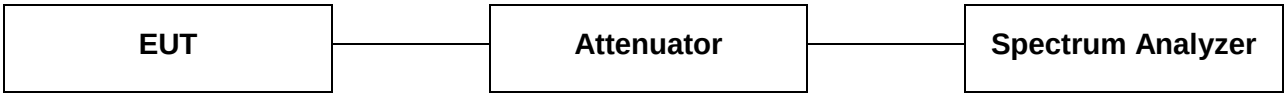


802.11ac_VHT80 (5 690 ㎒)



4. 6 dB Bandwidth

4.1. Test Setup



4.2. Limit

4.2.1. FCC

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

4.2.2. IC

According to RSS-247 Issue 2, 6.2.4.1, the minimum -6 ㏈ Bandwidth shall be at least 500 ㎑.

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 C.2 of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. Set RBW = 100 ㎑.
3. Set the video bandwidth (VBW) ≥ 3 x 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 ㏈ 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

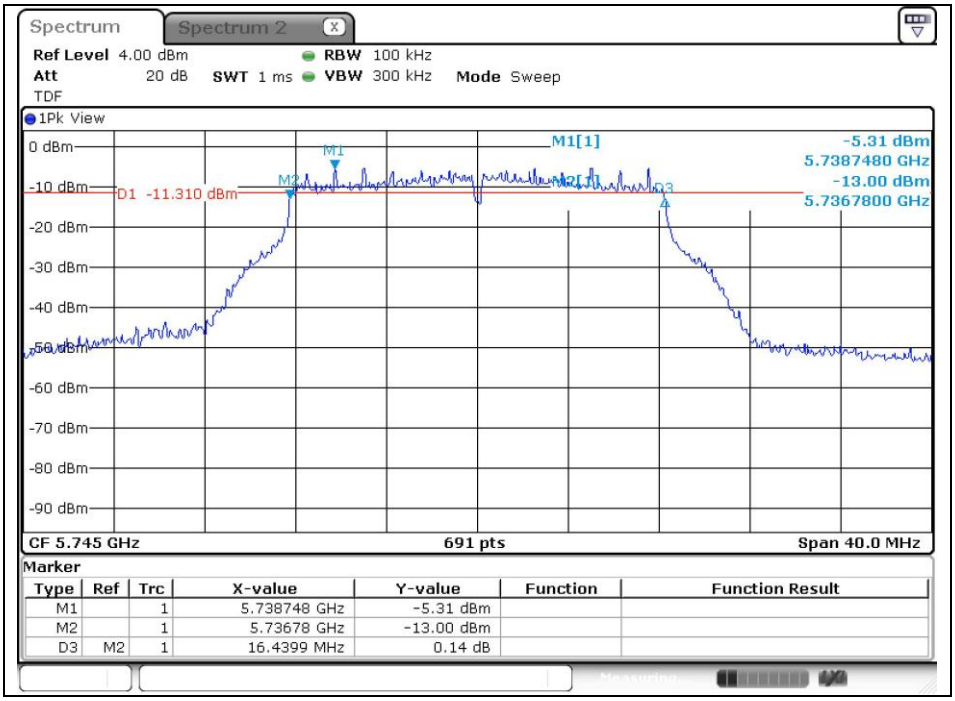
Ambient temperature : (23 ± 1) ℃
Relative humidity : 47 % R.H.

Band	Mode	Frequency (㎒)	Ch.	Data Rate (Mbps)	6 ㏈ Bandwidth (㎒)	Minimum Bandwidth (㎑)
U-NII 3	11a	5 745	149	9	16.440	500
		5 785	157		16.440	
		5 825	165		16.440	
	11n_HT20	5 745	149	MCS0	17.598	
		5 785	157		17.714	
		5 825	165		17.656	
	11n_HT40	5 755	151	MCS5	36.585	
		5 795	159		36.585	
	11ac_VHT80	5 775	155	MCS8	76.410	
U-NII 3 (Band-crossing channels)	11a	5 720	144	9	3.220	
	11n_HT20	5 720	144	MCS0	3.857	
	11n_HT40	5 710	142	MCS5	3.292	
	11ac_VHT80	5 690	138	MCS8	3.437	

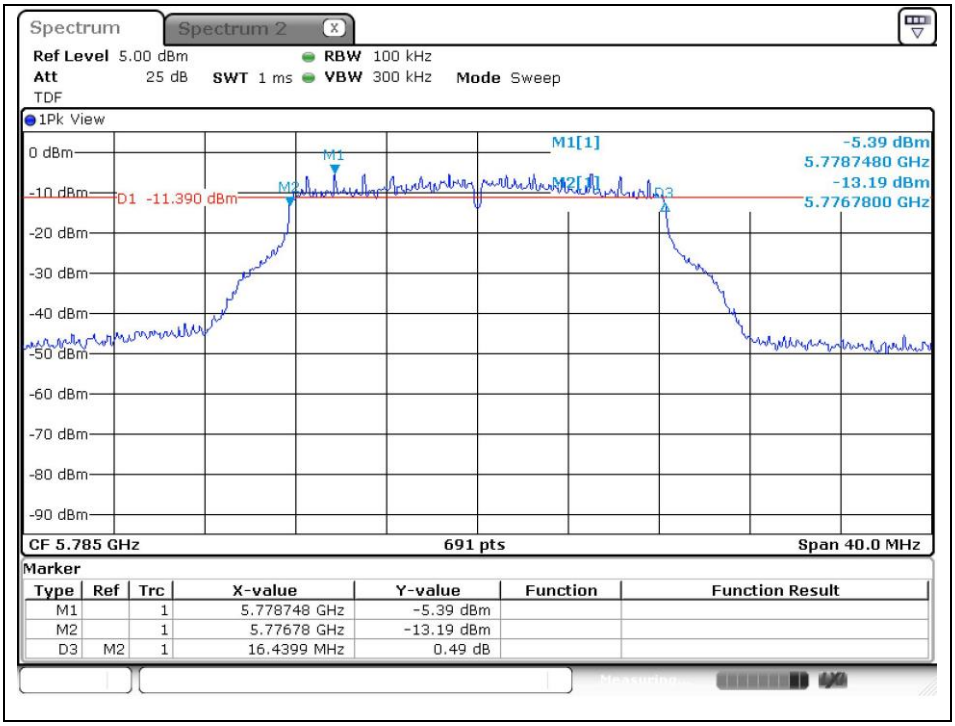
- Test plots

802.11a (Band 3)

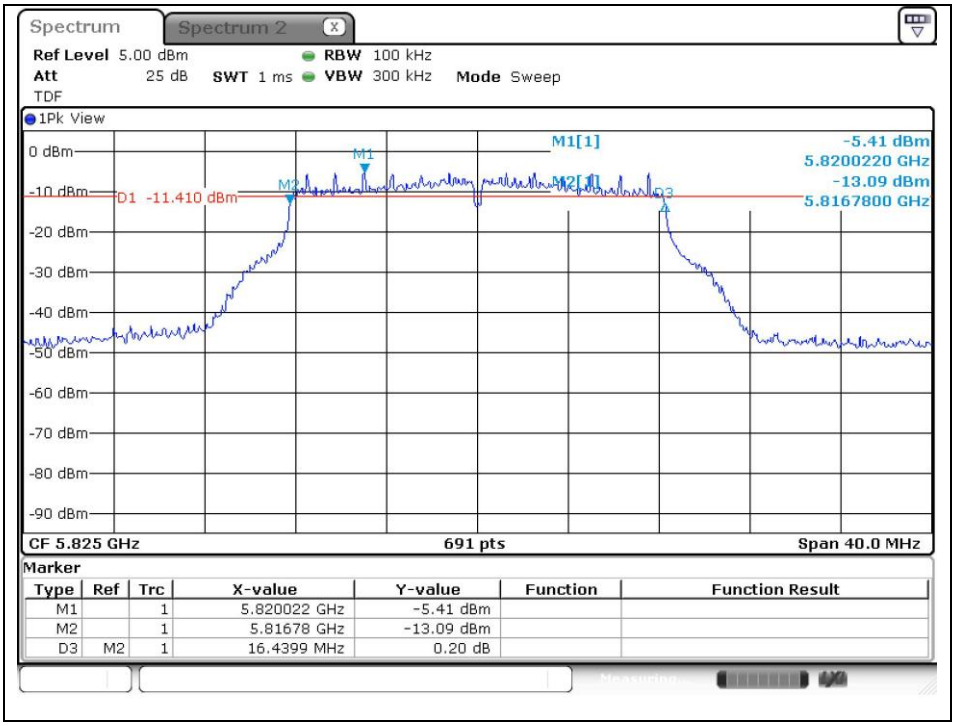
Low Channel (5 745 ㎒)



Middle Channel (5 785 ㎒)

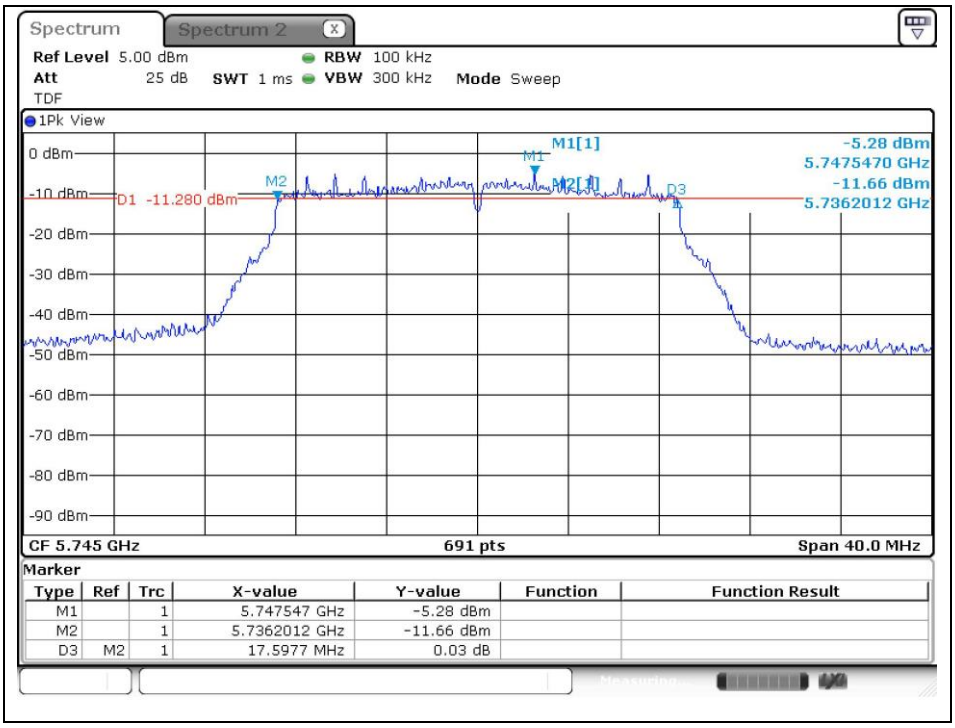


High Channel (5 825 ㎒)

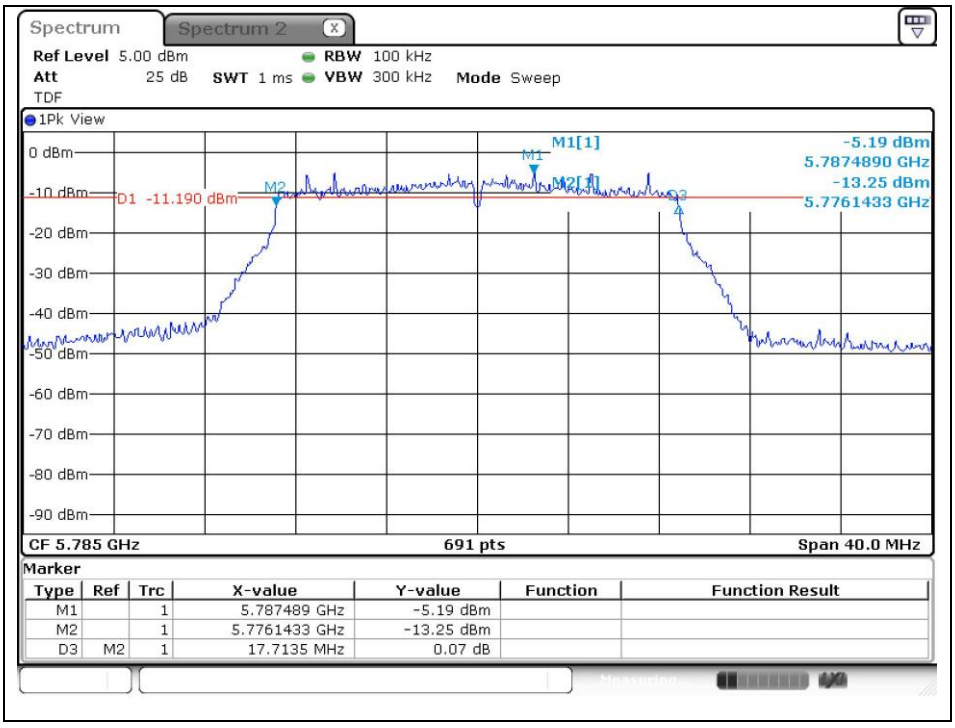


802.11n_HT20 (Band 3)

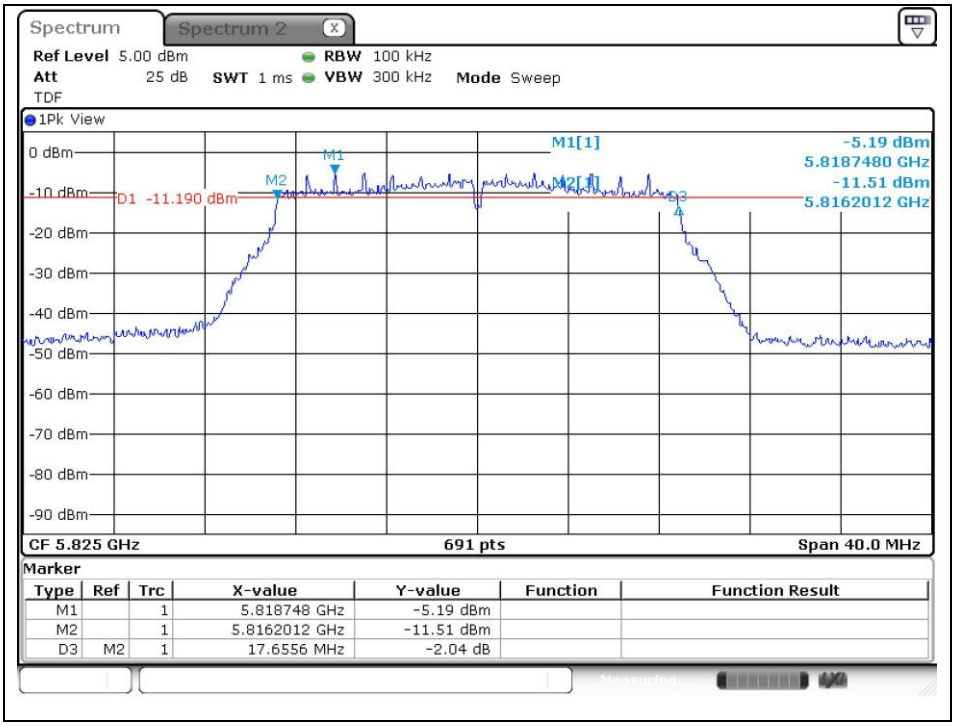
Low Channel (5 745 ㎒)



Middle Channel (5 785 ㎒)

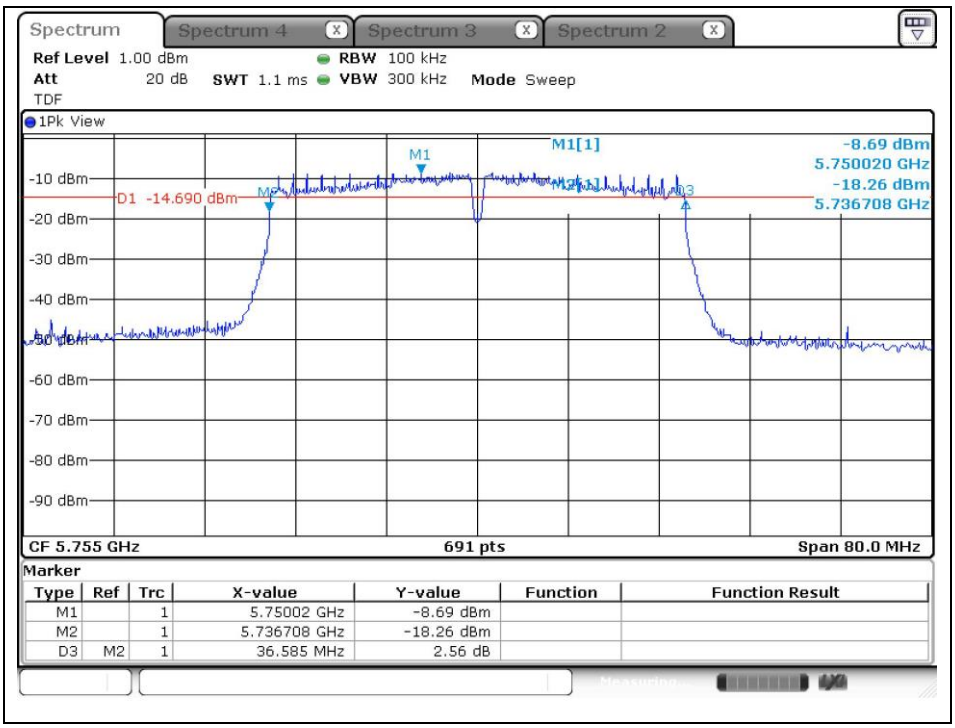


High Channel (5 825 ㎒)

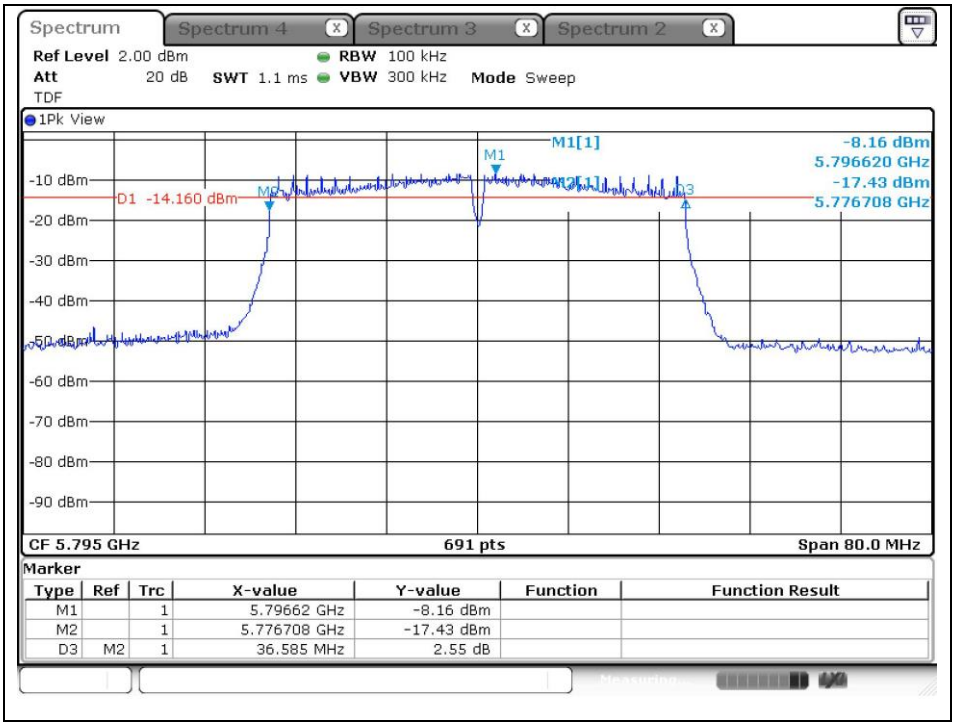


802.11n_HT40 (Band 3)

Low Channel (5 755 ㎒)

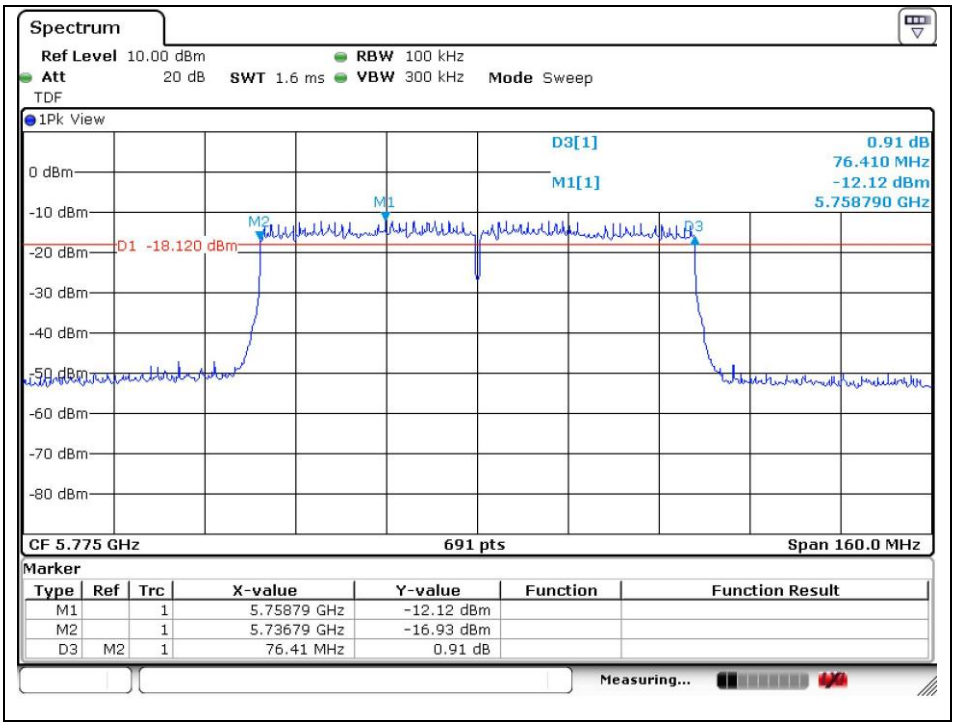


High Channel (5 795 ㎒)



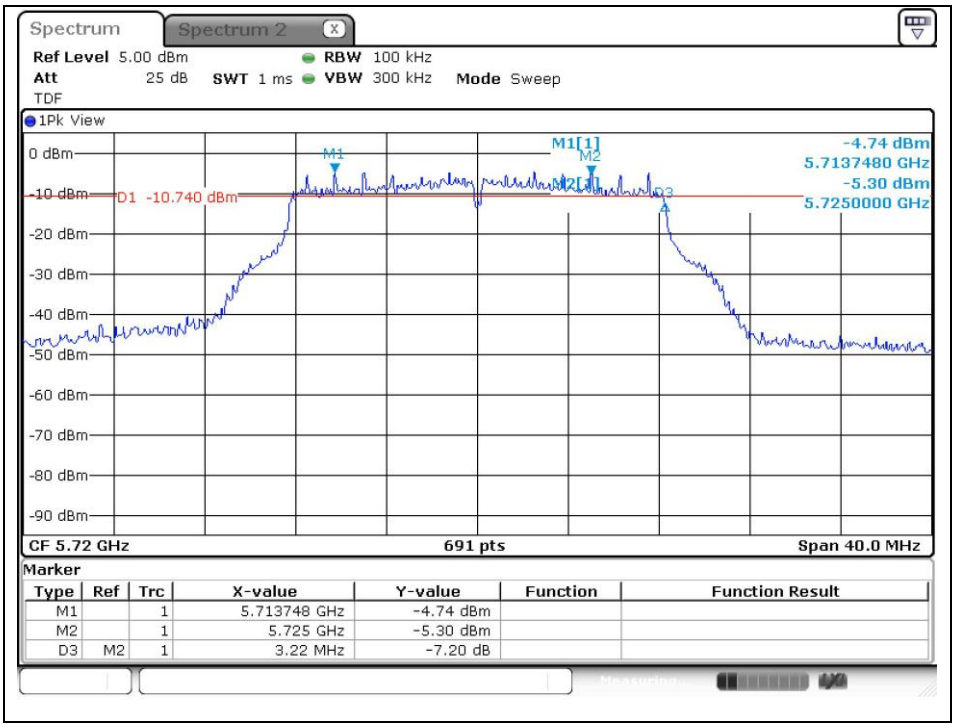
802.11ac_VHT80 (Band 3)

Middle Channel (5 775 ㎒)

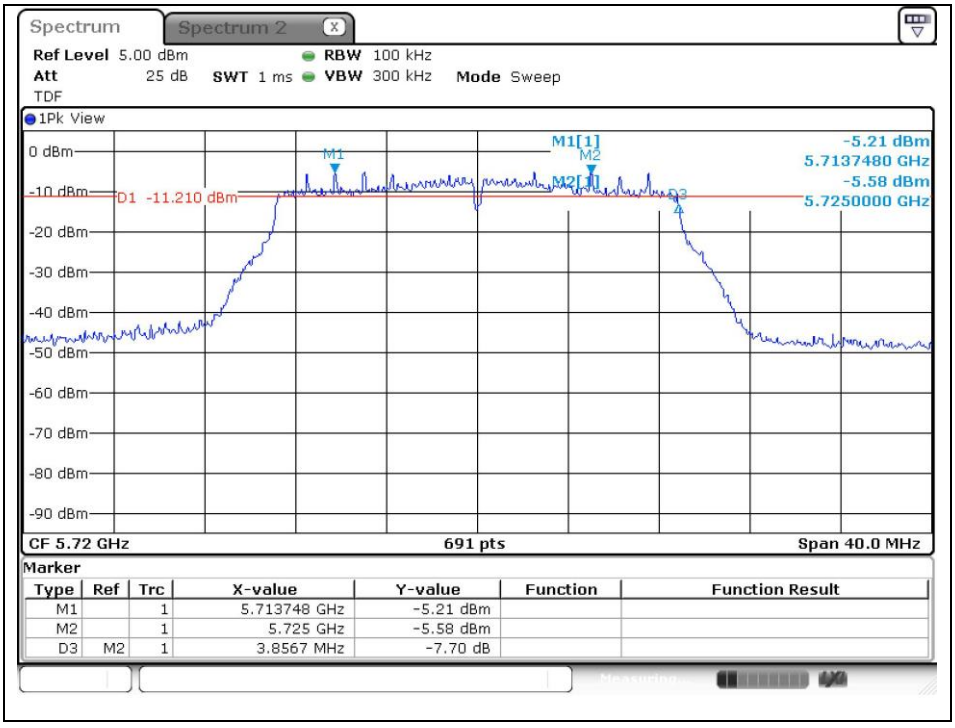


Band-crossing channels

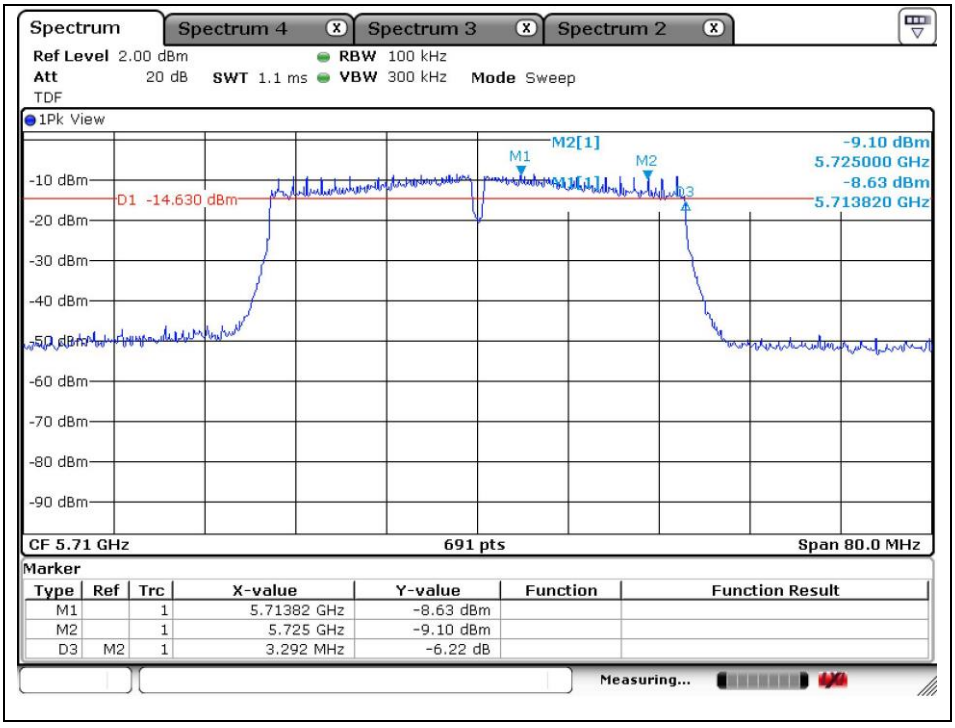
802.11a (5 720 ㎒)



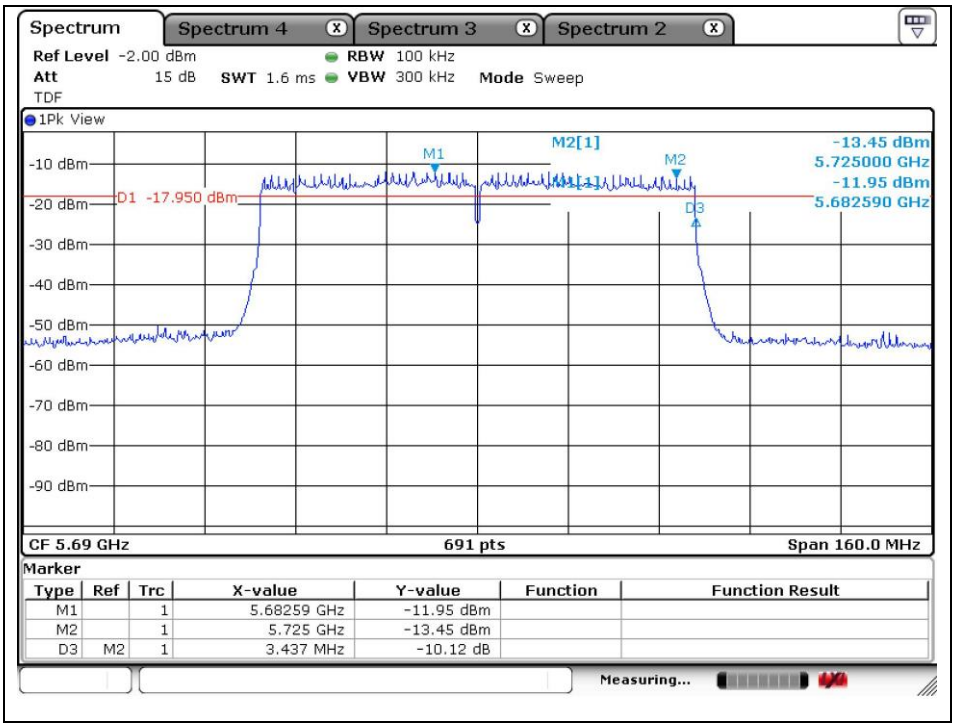
802.11n_HT20 (5 720 ㎒)



802.11n_HT40 (5 710 ㎒)

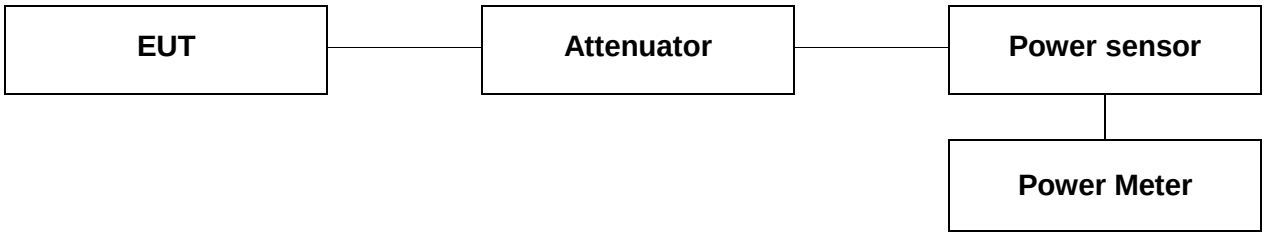


802.11ac_VHT80 (5 690 ㎒)



5. Maximum Conducted Output Power

5.1. Test Setup



5.2. Limit

5.2.1. FCC

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

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

According to 15.407(a)(2)

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

According to 15.407(a)(3)

For the band 5.725-5.85 ㎓, 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 ㏈m in any 500-㎑ band. If transmitting antennas of directional gain greater than 6 ㏈i are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in ㏈ that the directional gain of the antenna exceeds 6 ㏈i. However, fixed point-to point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 ㏈ 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.

5.2.2. IC

According to RSS-247 Issue 2,

6.2.1.1 Frequency band 5 150-5 250 ㎒

For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 ㎽ or 1.76 + 10log$_{10}$B, ㏈m, whichever is less. Devices shall implement transmitter power control (TPC) in order to have the capability to operate at least 3 ㏈ below the maximum permitted e.i.r.p. of 30 ㎽.

For other devices, the maximum e.i.r.p. shall not exceed 200 ㎽ or 10 + 10log$_{10}$B, ㏈m, whichever power is less. B is the 99 % emission bandwidth in megahertz. The e.i.r.p. spectral density shall not exceed 10 ㏈m in any 1.0 ㎒ band.

6.2.2.1 Frequency band 5 250-5 350 ㎒

For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 ㎽ or 1.76 + 10log$_{10}$B, ㏈m, whichever is less. Devices shall implement TPC in order to have the capability to operate at least 3 ㏈ below the maximum permitted e.i.r.p. of 30 ㎽.

Devices, other than devices installed in vehicles, shall comply with the following:
a) The maximum conducted output power shall not exceed 250 ㎽ or 11 + 10log$_{10}$B, ㏈m, whichever is less. The power spectral density shall not exceed 11 ㏈m in any 1.0 ㎒ band;

b) The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10log$_{10}$B, ㏈m, whichever is less. B is the 99 % emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 ㎽ shall implement TPC in order to have the capability to operate at least 6 ㏈ below the maximum permitted e.i.r.p. of 1 W.

6.2.3.1 Frequency band 5 470-5 600 ㎒ and 5 650-5 725 ㎒

The maximum conducted output power shall not exceed 250 ㎽ or 11 + 10log$_{10}$B, ㏈m, whichever is less. The power spectral density shall not exceed 11 ㏈m in any 1.0 ㎒ band.

The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10log$_{10}$B, ㏈m, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than
500 ㎽ shall implement TPC in order to have the capability to operate at least 6 ㏈ below the maximum permitted e.i.r.p. of 1 W.

6.2.4.1 Frequency band 5 725-5 850 ㎒

For equipment operating in the band 5 725-5 850 ㎒, the minimum 6 ㏈ bandwidth shall be at least 500 ㎑. The maximum conducted output power shall not exceed 1 W. The output power spectral density shall not exceed 30 ㏈m in any 500 ㎑ band. If transmitting antennas of directional gain greater than 6 ㏈i are used, both the maximum conducted output power and the output power spectral density shall be reduced by the amount in ㏈ that the directional gain of the antenna exceeds 6 ㏈i. However, fixed point-to-point devices operating in this band may employ transmitting antennas with directional gain greater than 6 ㏈i without any corresponding reduction in transmitter conducted power. Fixed point-to-point operations exclude the use of point-to-multipoint[3] systems, omnidirectional applications and multiple collocated transmitters transmitting the same information.

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 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 ㏈m 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) ℃
Relative humidity : 47 % R.H.

Test mode: 11a

Band	Frequency (㎒)	Data Rate (Mbps)	Average Power (㏈m)	Duty Cycle Correction Factor (㏈)	Average Power Result (㏈m)
U-NII 1	5 180	9	7.58	0.31	7.89
	5 220		7.24		7.55
	5 240		7.30		7.61
U-NII 2A	5 260		7.31		7.62
	5 300		7.61		7.92
	5 320		7.46		7.77
U-NII 2C	5 500		7.70		8.01
	5 580		7.51		7.82
	5 720		7.38		7.69
U-NII 3	5 745		7.23		7.54
	5 785		7.38		7.69
	5 825		7.51		7.82

Band	Frequency (㎒)	Data Rate (Mbps)	Average Power Result (㏈m)	Antenna Gain (㏈i)	E.I.R.P. (㏈m)
U-NII 1	5 180	9	7.89	-0.61	7.28
	5 220		7.55		6.94
	5 240		7.61		7.00

Band	FCC Limit					
	Frequency (㎒)	Fixed Limit (㏈m)	26 ㏈ BW (㎒)	11+10LogB (㏈m)	Antenna Gain (㏈i)	Limit (㏈m)
U-NII 1	5 180	23.98			-0.61	23.98
	5 220					
	5 240					
U-NII 2A	5 260	23.98	21.245	24.27	-0.18	23.98
	5 300		21.245	24.27		
	5 320		21.360	24.30		
U-NII 2C	5 500	23.98	21.360	24.30	-0.77	23.98
	5 580		21.303	24.28		
	5 720		21.071	24.24		
U-NII 3	5 745	30			-0.18	30
	5 785					
	5 825					

Band	IC Limit					
	Frequency (㎒)	Fixed Limit (㏈m)	99 % BW (㎒)	1.76+10Log$_{10}$B (㏈m)	Antenna Gain (㏈i)	Limit (㏈m)
U-NII 1	5 180	14.77	17.019	14.07	-0.61	14.07
	5 220		17.019	14.07		14.07
	5 240		17.019	14.07		14.07
U-NII 2A	5 260	14.77	17.019	14.07	-0.18	14.07
	5 300		17.019	14.07		14.07
	5 320		16.961	14.05		14.05

Band	IC Limit					
	Frequency (㎒)	Fixed Limit (㏈m)	99 % BW (㎒)	11+10Log$_{10}$B (㏈m)	Antenna Gain (㏈i)	Limit (㏈m)
U-NII 2C	5 500	23.98	17.019	23.31	-0.77	23.31
	5 580		17.019	23.31		23.31
	5 720		17.077	23.32		23.32
U-NII 3	5 745	30			-0.18	30
	5 785					30
	5 825					30

Remark;

1. Average Power Result (㏈m) = Average Power (㏈m) + Duty Cycle Correction Factor (㏈)
2 E.I.R.P. (㏈m) = Average Power Result (㏈m) + Antenna Gain (㏈i)

Test mode: 11n_HT20

Band	Frequency (㎒)	Data Rate (Mbps)	Average Power (㏈m)	Duty Cycle Correction Factor (㏈)	Average Power Result (㏈m)
U-NII 1	5 180	MCS0	7.44	0.24	7.68
	5 220		7.07		7.31
	5 240		7.18		7.42
U-NII 2A	5 260		7.71		7.95
	5 300		7.45		7.69
	5 320		7.23		7.47
U-NII 2C	5 500		7.79		8.03
	5 580		7.78		8.02
	5 720		7.45		7.69
U-NII 3	5 745		7.44		7.68
	5 785		7.12		7.36
	5 825		7.30		7.54

Band	Frequency (㎒)	Data Rate (Mbps)	Average Power Result (㏈m)	Antenna Gain (㏈i)	E.I.R.P. (㏈m)
U-NII 1	5 180	MCS0	7.68	-0.61	7.07
	5 220		7.31		6.70
	5 240		7.42		6.81

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

Band	IC Limit					
	Frequency (㎒)	Fixed Limit (㏈m)	99 % BW (㎒)	1.76+10Log$_{10}$B (㏈m)	Antenna Gain (㏈i)	Limit (㏈m)
U-NII 1	5 180	14.77	18.061	14.33	-0.61	14.33
	5 220		18.119	14.34		14.34
	5 240		18.119	14.34		14.34
U-NII 2A	5 260	14.77	18.177	14.36	-0.18	14.36
	5 300		18.119	14.34		14.34
	5 320		18.119	14.34		14.34

Band	IC Limit					
	Frequency (㎒)	Fixed Limit (㏈m)	99 % BW (㎒)	11+10Log$_{10}$B (㏈m)	Antenna Gain (㏈i)	Limit (㏈m)
U-NII 2C	5 500	23.98	18.119	23.58	-0.77	23.58
	5 580		18.119	23.58		23.58
	5 720		18.177	23.60		23.60
U-NII 3	5 745	30			-0.18	30
	5 785					30
	5 825					30

Remark;

1. Average Power Result (㏈m) = Average Power (㏈m) + Duty Cycle Correction Factor (㏈)
2 E.I.R.P. (㏈m) = Average Power Result (㏈m) + Antenna Gain (㏈i)

Test mode: 11n_HT40

Band	Frequency (㎒)	Data Rate (Mbps)	Average Power (㏈m)	Duty Cycle Correction Factor (㏈)	Average Power Result (㏈m)
U-NII 1	5 190	MCS5	1.41	2.23	3.64
	5 230		1.09		3.32
U-NII 2A	5 270		3.83		6.06
	5 310		3.94		6.17
U-NII 2C	5 510		4.37		6.60
	5 550		4.06		6.29
	5 710		4.46		6.69
U-NII 3	5 755		3.93		6.16
	5 795		4.23		6.46

Band	Frequency (㎒)	Data Rate (Mbps)	Average Power Result (㏈m)	Antenna Gain (㏈i)	E.I.R.P. (㏈m)
U-NII 1	5 190	MCS5	3.64	-0.61	3.03
	5 230		3.32		2.71

Band	FCC Limit					
	Frequency (㎒)	Fixed Limit (㏈m)	26 ㏈ BW (㎒)	11+10LogB (㏈m)	Antenna Gain (㏈i)	Limit (㏈m)
U-NII 1	5 190	23.98			-0.61	23.98
	5 230					
U-NII 2A	5 270	23.98	39.711	26.99	-0.18	23.98
	5 310		39.479	26.96		
U-NII 2C	5 510	23.98	39.595	26.98	-0.77	23.98
	5 550		39.595	26.98		
	5 710		39.479	26.96		
U-NII 3	5 755	30			-0.18	30
	5 795					

Band	IC Limit					
	Frequency (㎒)	Fixed Limit (㏈m)	99 % BW (㎒)	1.76+10Log$_{10}$B (㏈m)	Antenna Gain (㏈i)	Limit (㏈m)
U-NII 1	5 190	14.77	36.122	17.34	-0.61	14.77
	5 230		36.237	17.35		
U-NII 2A	5 270	14.77	36.122	17.34	-0.18	14.77
	5 310		36.237	17.35		

Band	IC Limit					
	Frequency (㎒)	Fixed Limit (㏈m)	99 % BW (㎒)	11+10Log$_{10}$B (㏈m)	Antenna Gain (㏈i)	Limit (㏈m)
U-NII 2C	5 510	23.98	36.237	26.59	-0.77	23.98
	5 550		36.237	26.59		
	5 710		36.237	26.59		
U-NII 3	5 755	30			-0.18	30
	5 795					

Remark;

1. Average Power Result (㏈m) = Average Power (㏈m) + Duty Cycle Correction Factor (㏈)
2. E.I.R.P. (㏈m) = Average Power Result (㏈m) + Antenna Gain (㏈i)

Test mode: 11ac_VHT80

Band	Frequency (㎒)	Data Rate (Mbps)	Average Power (㏈m)	Duty Cycle Correction Factor (㏈)	Average Power Result (㏈m)
U-NII 1	5 210	MCS8	0.63	3.73	4.36
U-NII 2A	5 290		2.88		6.61
U-NII 2C	5 530		2.37		6.10
	5 690		2.34		6.07
U-NII 3	5 755		1.88		5.61

Band	Frequency (㎒)	Data Rate (Mbps)	Average Power Result (㏈m)	Antenna Gain (㏈i)	E.I.R.P. (㏈m)
U-NII 1	5 210	MCS0	4.36	-0.61	3.75

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

Band	IC Limit					
	Frequency (㎒)	Fixed Limit (㏈m)	99 % BW (㎒)	1.76+10Log$_{10}$B (㏈m)	Antenna Gain (㏈i)	Limit (㏈m)
U-NII 1	5 210	14.77	75.948	20.57	-0.61	14.77
U-NII 2A	5 290	14.77	75.948	20.57	-0.18	14.77

Band	IC Limit					
	Frequency (㎒)	Fixed Limit (㏈m)	99 % BW (㎒)	11+10Log$_{10}$B (㏈m)	Antenna Gain (㏈i)	Limit (㏈m)
U-NII 2C	5 530	23.98	76.179	29.82	-0.77	23.98
	5 690	23.98	75.948	29.81		
U-NII 3	5 775	30			-0.18	30

Remark;

1. Average Power Result (㏈m) = Average Power (㏈m) + Duty Cycle Correction Factor (㏈)
2. E.I.R.P. (㏈m) = Average Power Result (㏈m) + Antenna Gain (㏈i)

- Band-crossing channels

Mode	Band	Frequency (㎒)	Data Rate (Mbps)	Average Power (㏈m)	Duty Cycle Correction Factor (㏈)	Average Power Result (㏈m)
11a	U-NII 2C	5 720	9	5.76	0.31	6.07
	U-NII 3			-1.65		-1.34
11n_HT20	U-NII 2C	5 720	MCS0	5.48	0.24	5.72
	U-NII 3			-1.38		-1.14
11n_HT40	U-NII 2C	5 710	MCS5	3.03	2.23	5.26
	U-NII 3			-8.58		-6.35
11ac_VHT80	U-NII 2C	5 690	MCS8	1.12	3.73	4.85
	U-NII 3			-12.24		-8.51

Mode	Band	Limit					
		Frequency (㎒)	Fixed Limit (㏈m)	26 ㏈ BW (㎒)	11+10LogB (㏈m)	Antenna Gain (㏈i)	Limit (㏈m)
11a	U-NII 2C	5 720	23.98	15.651	22.95	-0.77	22.95
	U-NII 3					-0.18	30
11n_HT20	U-NII 2C	5 720	23.98	15.825	22.99	-0.77	22.99
	U-NII 3					-0.18	30
11n_HT40	U-NII 2C	5 710	23.98	34.797	26.42	-0.77	23.98
	U-NII 3					-0.18	30
11ac_VHT80	U-NII 2C	5 690	23.98	75.753	29.79	-0.77	23.98
	U-NII 3					-0.18	30

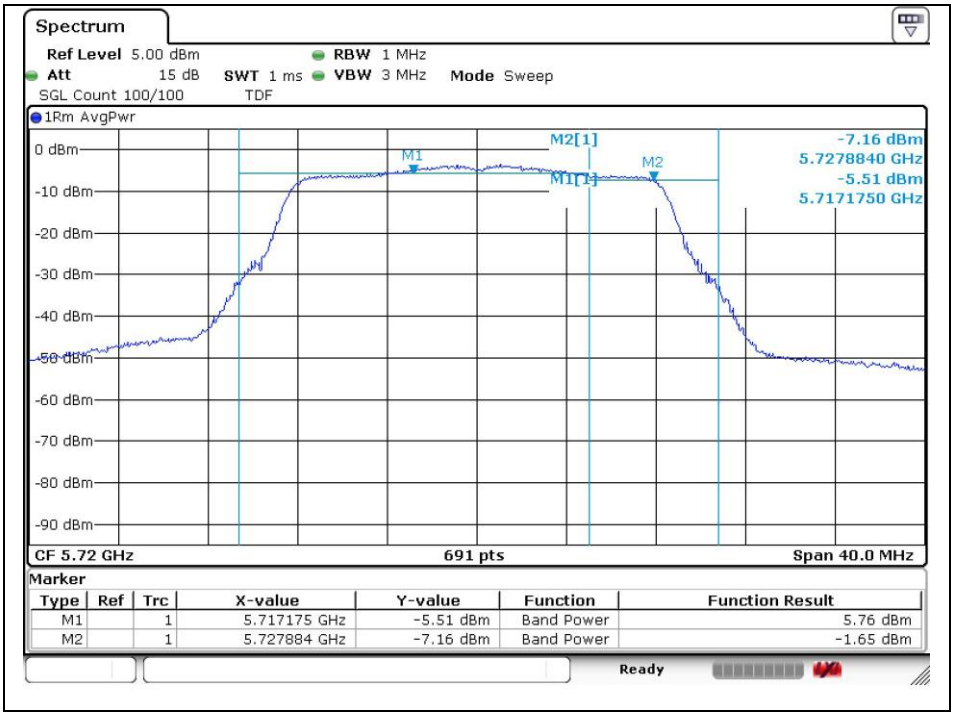
Remark;

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

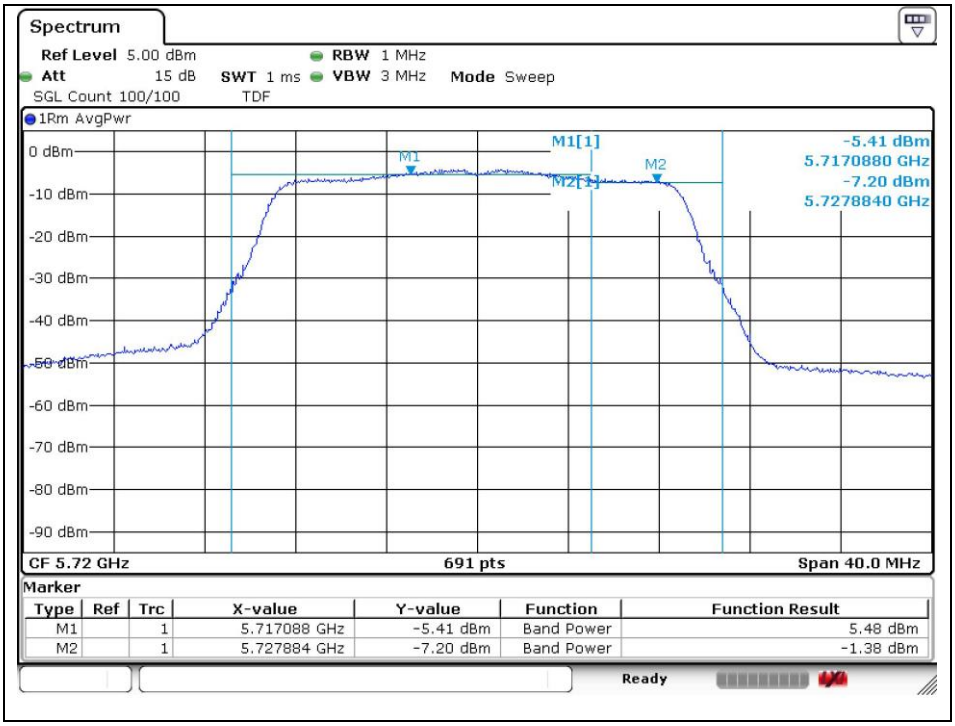
- Test plots

Band-crossing channels

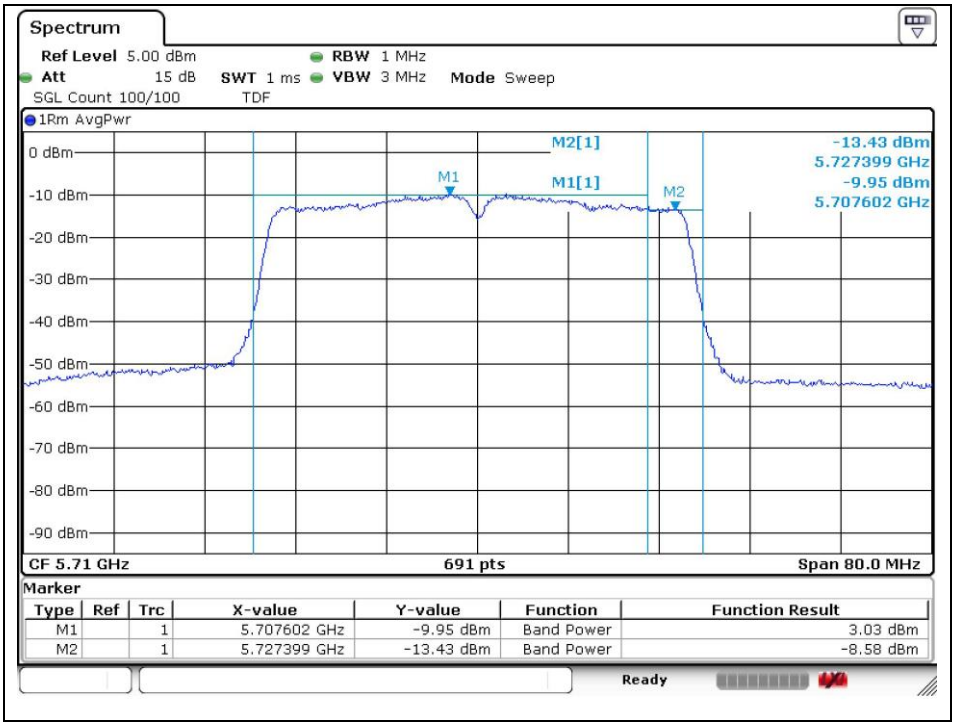
802.11a (5 720 ㎒)



802.11n_HT20 (5 720 ㎒)



802.11n_HT40 (5 710 ㎒)



802.11ac_VHT80 (5 690 ㎒)