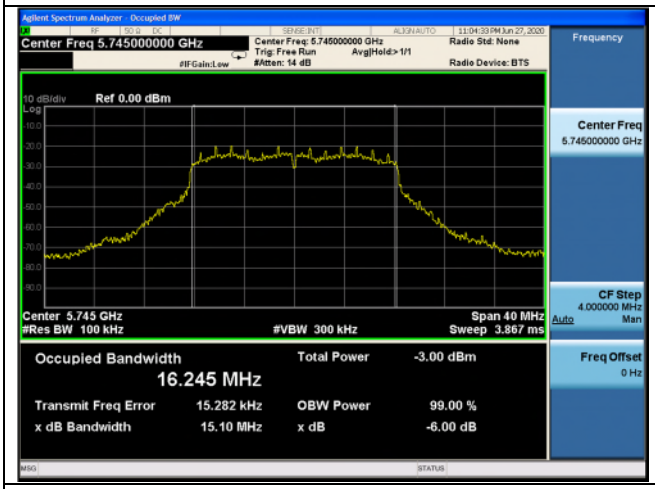
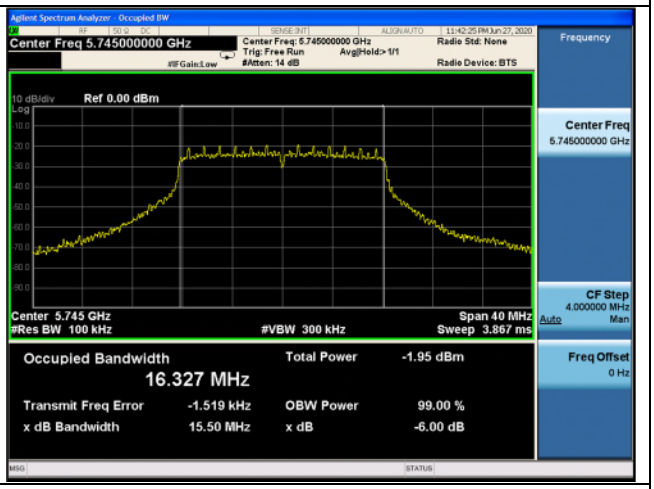
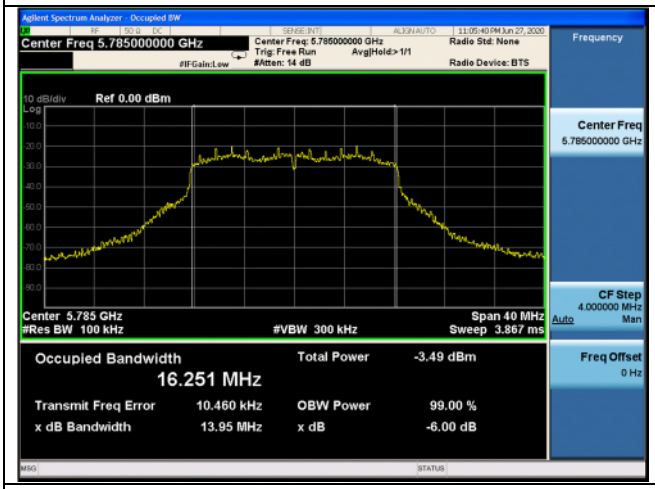
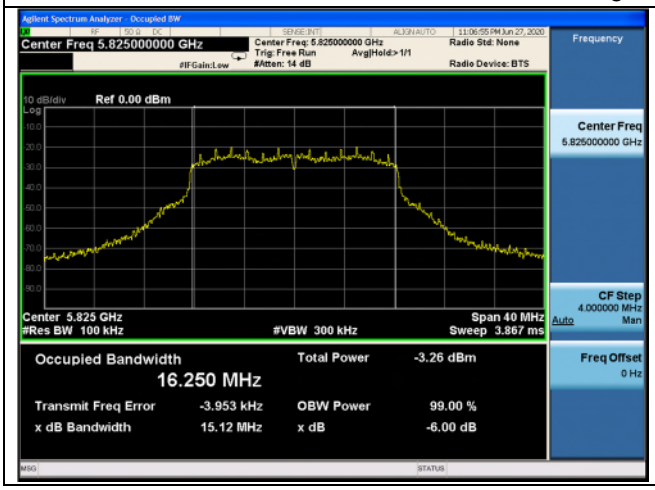
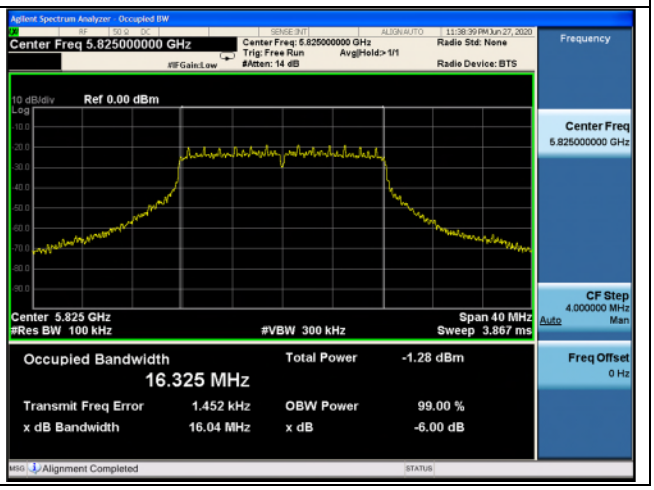
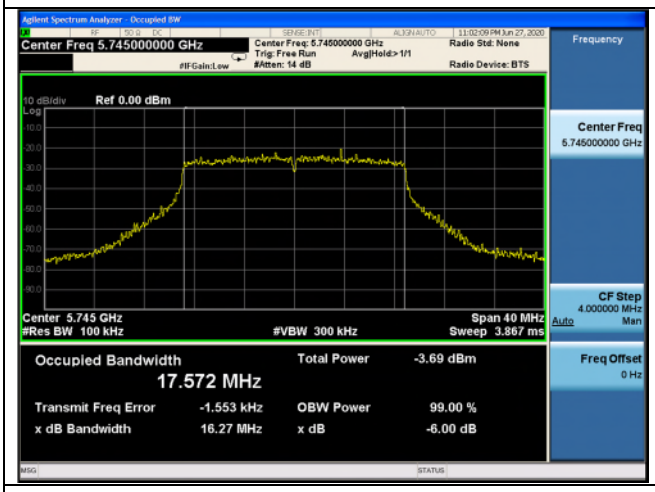
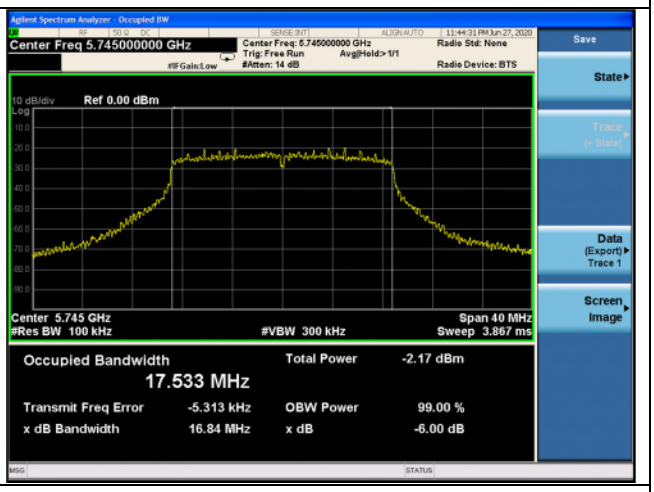
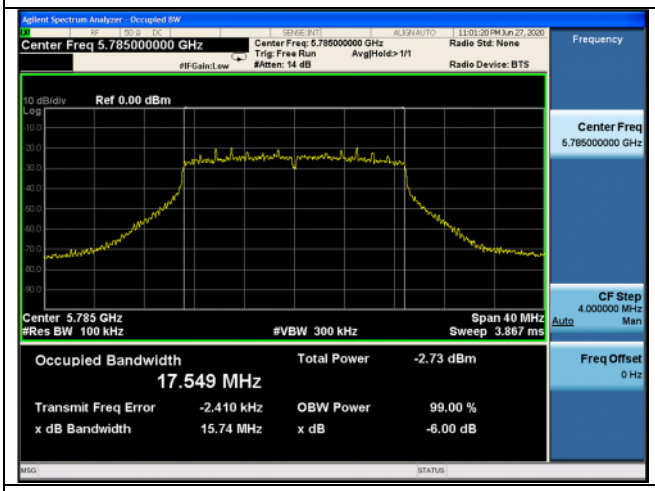
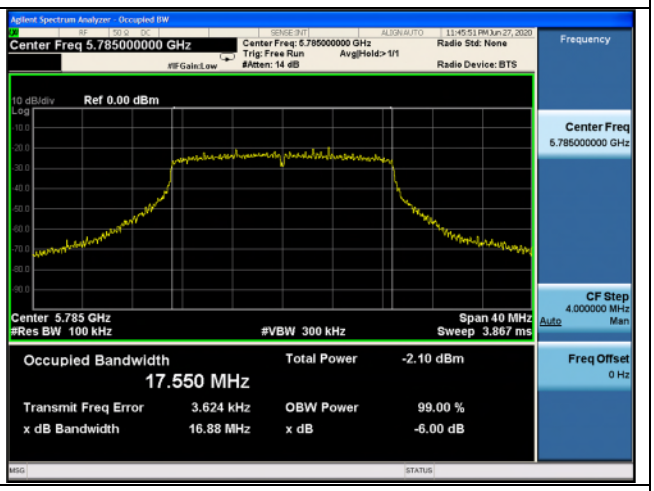
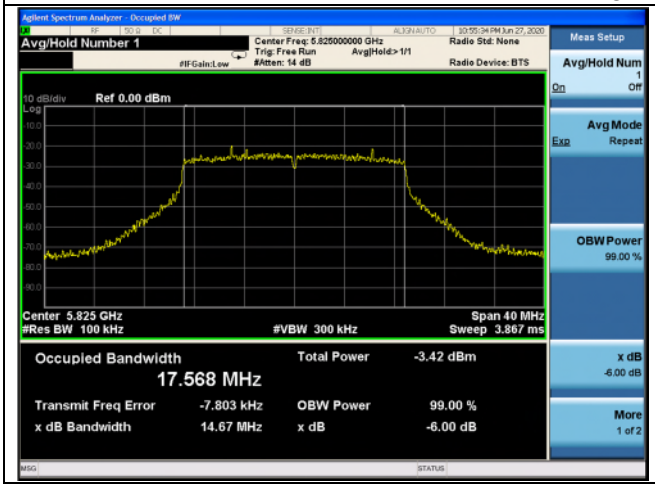
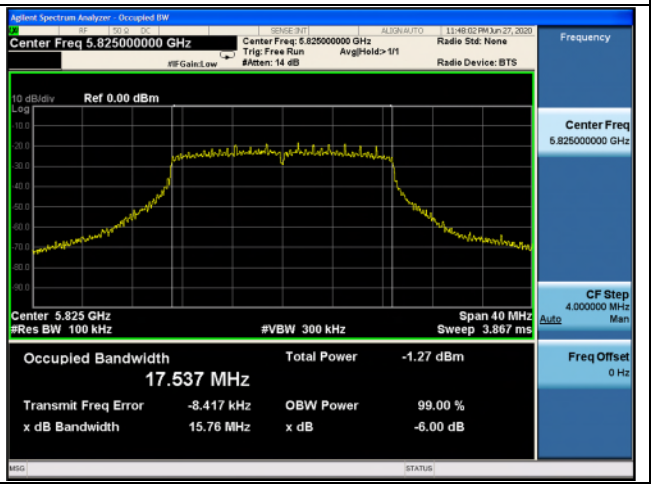
- Test plots

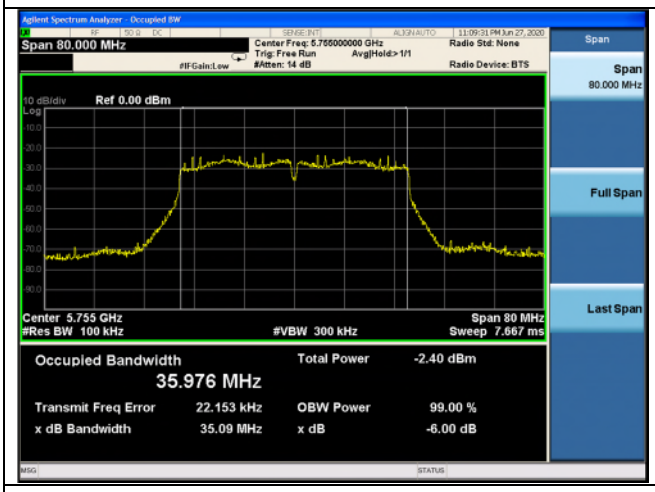
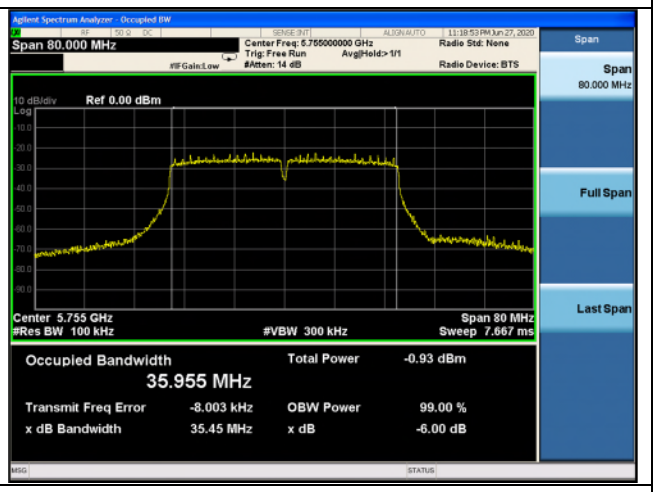
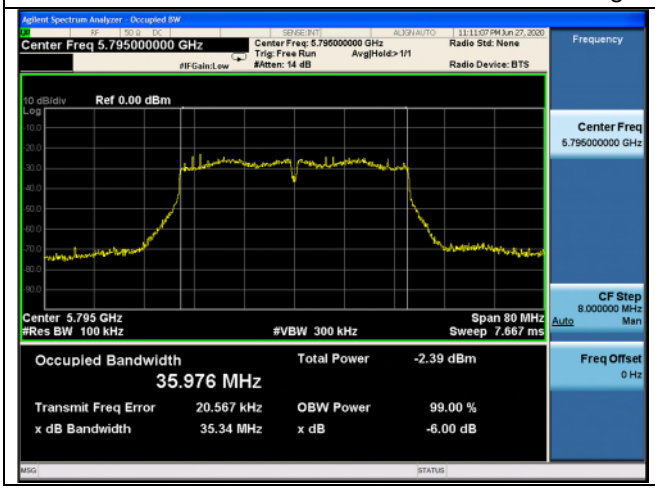
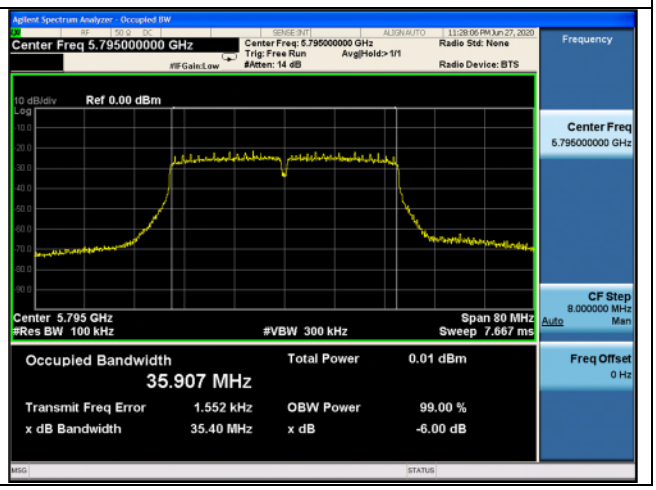
OFDM: 802.11a (Band 3)

	Ant.1	Ant.2
Low channel		
Middle channel		
High channel		

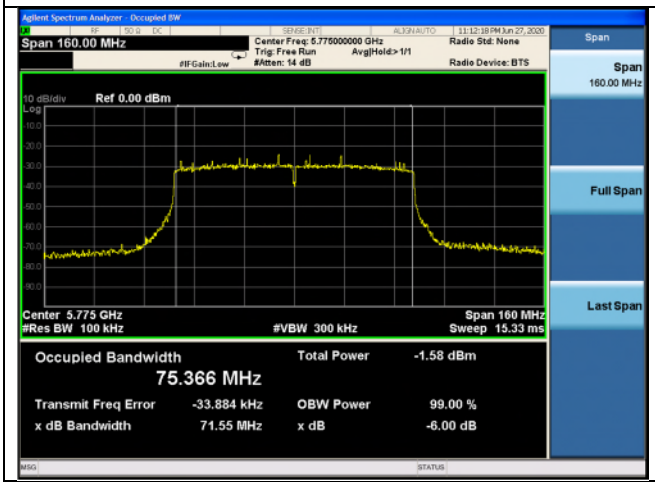
OFDM: 802.11ac_VHT20 (Band 3)

Ant.1	Ant.2
Low channel	
	
Middle channel	
	
High channel	
	

OFDM: 802.11n_HT40 (Band 3)

Ant.1	Ant.2
Low channel	
	
High channel	
	

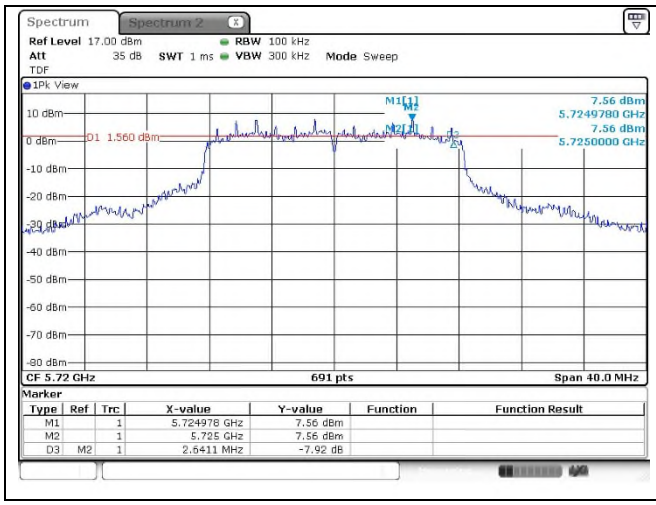
802.11ac_VHT80 (Band 3)

Ant.1	Ant.2
Middle channel	
	

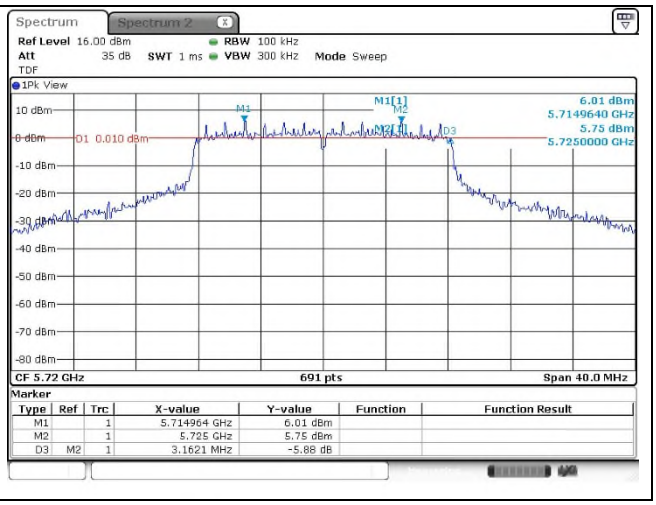
- Straddle channels

OFDM: 802.11a

Ant.1

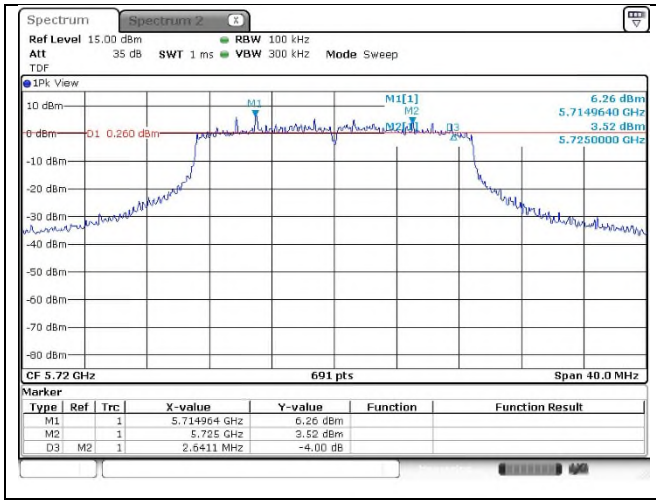


Ant.2

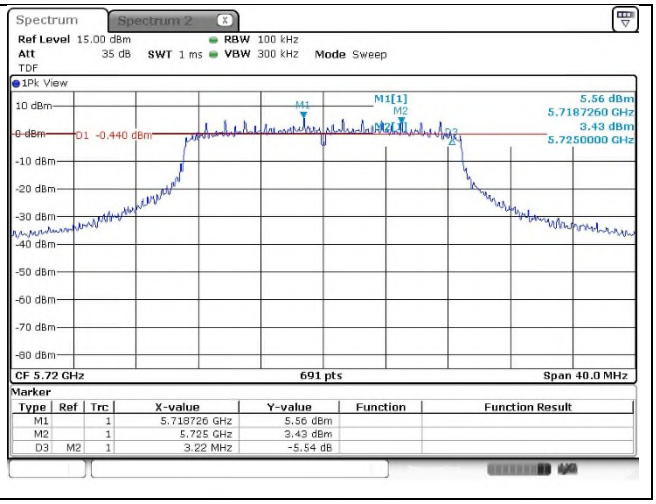


OFDM: 802.11ac_VHT20

Ant.1

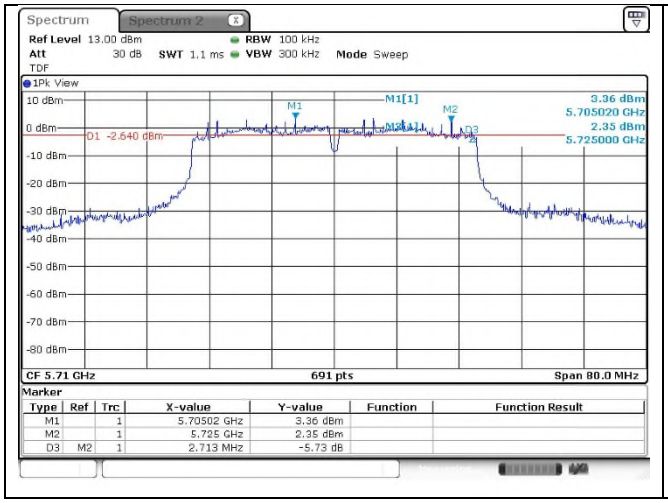


Ant.2

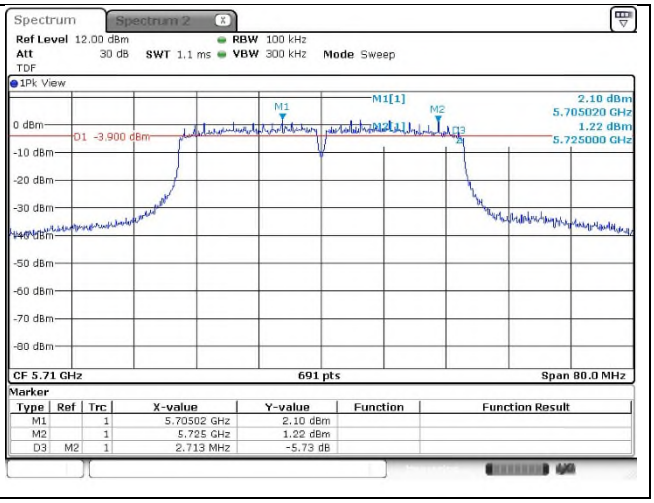


OFDM: 802.11n_HT40

Ant.1

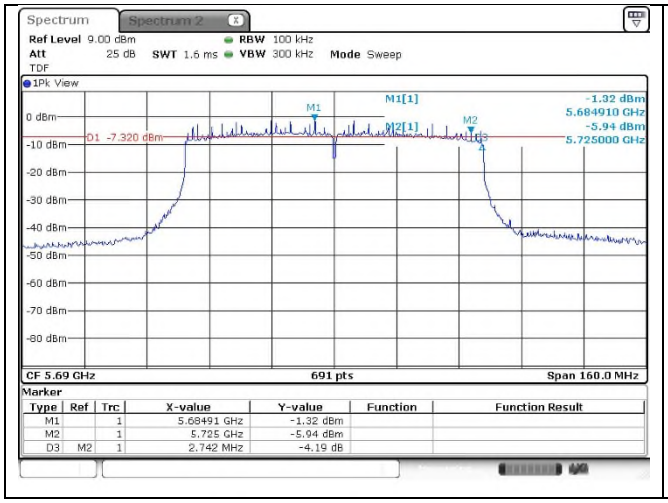


Ant.2

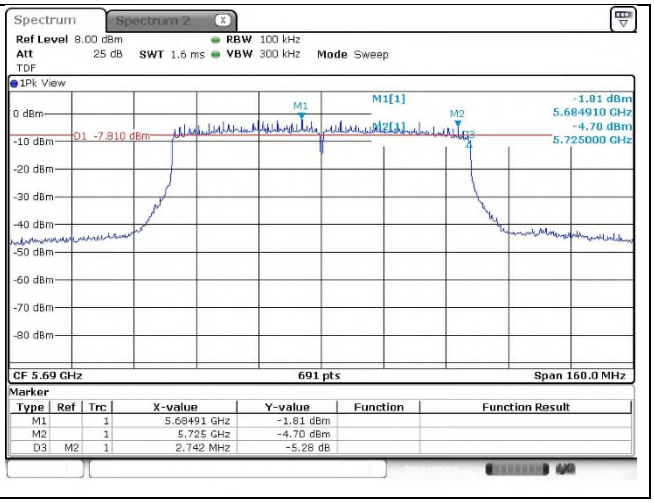


OFDM: 802.11ac_VHT80

Ant.1

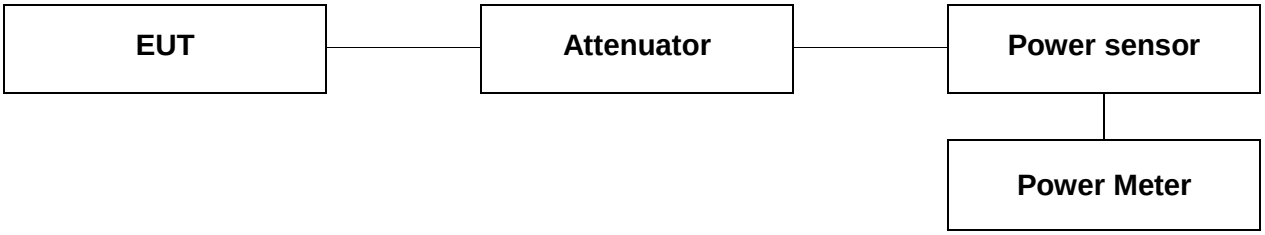


Ant.2



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 + 10 $\log_{10}$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 + 10 $\log_{10}$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 + 10 $\log_{10}$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 + 10$\log_{10}$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 + 10 $\log_{10}$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 + 10 $\log_{10}$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 + 10 $\log_{10}$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 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) ℃
Relative humidity : 47 % R.H.

Mode	Band	Data Rate (Mbps)	Channel	Frequency (㎒)	Average Power (㏈m)		
					Ant.1	Ant.2	Ant.1 + Ant.2
11a	U-NII 1	6	Low	5 180	17.03	17.45	20.26
			Middle	5 220	17.21	17.37	20.30
			High	5 240	17.19	17.55	20.38
	U-NII 2A		Low	5 260	17.18	17.44	20.32
			Middle	5 300	17.35	17.46	20.42
			High	5 320	17.00	17.57	20.30
	U-NII 2C		Low	5 500	17.25	17.48	20.38
			Middle	5 580	17.14	18.05	20.63
			High	5 700	16.72	17.23	19.99
	U-NII 3		Low	5 745	17.07	17.70	20.41
			Middle	5 785	17.44	17.86	20.67
			High	5 825	17.41	17.78	20.61

Mode	Band	Data Rate (Mbps)	Channel	Frequency (㎒)	Average Power (㏈m)	Antenna Gain (㏈i)	E.I.R.P. (㏈m)
11a	U-NII 1	6	Low	5 180	20.26	-3.68	16.58
			Middle	5 220	20.30		16.62
			High	5 240	20.38		16.70

Band	FCC Limit					
	Frequency (㎒)	Fixed Limit (㏈m)	26 ㏈ BW (㎒)	11+10LogB (㏈m)	Antenna Gain (㏈i)	Limit (㏈m)
U-NII 1	5 180	23.98			-3.68	23.98
	5 220					
	5 240					
U-NII 2A	5 260		20.608	24.14	-3.01	
	5 300		20.550	24.13		
	5 320		20.550	24.13		
U-NII 2C	5 500		20.492	24.12	-2.44	
	5 580		20.220	24.06		
	5 700		21.823	24.39		
U-NII 3	5 745	30			-2.93	30
	5 785					
	5 825					

Band	IC Limit					
	Frequency (㎒)	Fixed Limit (㏈m)	99 % BW (㎒)	10+10LogB (㏈m)	Antenna Gain (㏈i)	Limit (㏈m)
U-NII 1	5 180	23.01	16.498	22.17	-3.68	22.17
	5 220		16.498	22.17		22.17
	5 240		16.498	22.17		22.17

Band	IC Limit					
	Frequency (㎒)	Fixed Limit (㏈m)	99 % BW (㎒)	11+10LogB (㏈m)	Antenna Gain (㏈i)	Limit (㏈m)
U-NII 2A	5 260	23.98	16.498	23.17	-3.01	23.17
	5 300		16.498	23.17		23.17
	5 320		16.498	23.17		23.17
U-NII 2C	5 500		16.498	23.17	-2.44	23.17
	5 580		16.440	23.16		23.16
	5 720		16.556	23.19		23.19
U-NII 3	5 745	30			-2.93	30
	5 785					
	5 825					

Remark;

1. E.I.R.P. (㏈m) = Average Power (㏈m) + Antenna Gain (㏈i)
2.. According to KDB 662911, average power of each port and antenna gain was combined by using below calculation.

   - Average power: 10 log {10^(Ant.1 power / 10)+10^(Ant.2 power / 10)}

   - Unequal antenna gains, with equal transmit powers. For antenna gains given by G_1, G_2, …, G_N ㏈i
   (i) If transmit signals are correlated, then
   Directional gain = 10 log[($10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20}$)^2/$N_{ANT}$] ㏈i [Note the “20”s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

Mode	Band	Data Rate (Mbps)	Channel	Frequency (㎒)	Average Power (㏈m)		
					Ant.1	Ant.2	Ant.1 + Ant.2
11ac_VHT20	U-NII 1	MCS0	Low	5 180	15.80	16.58	19.22
			Middle	5 220	15.82	16.54	19.21
			High	5 240	15.86	16.68	19.30
	U-NII 2A		Low	5 260	15.90	16.60	19.27
			Middle	5 300	16.00	16.72	19.39
			High	5 320	15.75	16.63	19.22
	U-NII 2C		Low	5 500	15.90	16.26	19.09
			Middle	5 580	15.78	16.90	19.39
			High	5 700	15.58	16.13	18.87
	U-NII 3		Low	5 745	16.03	16.56	19.31
			Middle	5 785	16.39	16.58	19.50
			High	5 825	16.33	16.63	19.49

Mode	Band	Data Rate (Mbps)	Channel	Frequency (㎒)	Average Power (㏈m)	Antenna Gain (㏈i)	E.I.R.P. (㏈m)
11ac_VHT20	U-NII 1	MCS0	Low	5 180	19.22	-3.68	15.54
			Middle	5 220	19.21		15.53
			High	5 240	19.30		15.62

Band	FCC Limit					
	Frequency (㎒)	Fixed Limit (㏈m)	26 ㏈ BW (㎒)	11+10LogB (㏈m)	Antenna Gain (㏈i)	Limit (㏈m)
U-NII 1	5 180	23.98			-3.68	23.98
	5 220					
	5 240					
U-NII 2A	5 260		20.029	24.02	-3.01	
	5 300		20.839	24.19		
	5 320		20.434	24.10		
U-NII 2C	5 500		20.839	24.19	-2.44	
	5 580		21.187	24.26		
	5 700		20.955	24.21		
U-NII 3	5 745	30			-2.93	30
	5 785					
	5 825					

Band	IC Limit					
	Frequency (㎒)	Fixed Limit (㏈m)	99 % BW (㎒)	10+10LogB (㏈m)	Antenna Gain (㏈i)	Limit (㏈m)
U-NII 1	5 180	23.01	17.598	22.45	-3.68	22.45
	5 220		17.598	22.45		22.45
	5 240		17.598	22.45		22.45

Band	IC Limit					
	Frequency (㎒)	Fixed Limit (㏈m)	99 % BW (㎒)	11+10LogB (㏈m)	Antenna Gain (㏈i)	Limit (㏈m)
U-NII 2A	5 260	23.98	17.598	23.45	-3.01	23.45
	5 300		17.598	23.45		23.45
	5 320		17.598	23.45		23.45
U-NII 2C	5 500		17.598	23.45	-2.44	23.45
	5 580		17.598	23.45		23.45
	5 720		17.598	23.45		23.45
U-NII 3	5 745	30			-2.93	30
	5 785					
	5 825					

Remark;

1. E.I.R.P. (㏈m) = Average Power (㏈m) + Antenna Gain (㏈i)
2.. According to KDB 662911, average power of each port and antenna gain was combined by using below calculation.

   - Average power: 10 log {10^(Ant.1 power / 10)+10^(Ant.2 power / 10)}

   - Unequal antenna gains, with equal transmit powers. For antenna gains given by G_1, G_2, …, G_N ㏈i
   (i) If transmit signals are correlated, then
   Directional gain = 10 log[($10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20}$)^2/$N_{ANT}$] ㏈i [Note the “20”s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

Mode	Band	Data Rate (Mbps)	Channel	Frequency (㎒)	Average Power (㏈m)		
					Ant.1	Ant.2	Ant.1 + Ant.2
11n_HT40	U-NII 1	MCS0	Low	5 190	12.20	13.03	15.65
			High	5 230	16.27	16.71	19.51
	U-NII 2A		Low	5 270	16.27	16.71	19.51
			High	5 310	12.29	12.51	15.41
	U-NII 2C		Low	5 510	16.18	17.01	19.63
			Middle	5 590	16.23	16.89	19.58
			High	5 670	16.40	16.80	19.61
	U-NII 3		Low	5 755	15.85	17.55	19.79
			High	5 795	16.36	16.64	19.51

Mode	Band	Data Rate (Mbps)	Channel	Frequency (㎒)	Average Power (㏈m)	Antenna Gain (㏈i)	E.I.R.P. (㏈m)
11n_HT40	U-NII 1	MCS0	Low	5 190	15.65	-3.68	11.97
			High	5 230	19.51		15.83

Band	FCC Limit					
	Frequency (㎒)	Fixed Limit (㏈ m)	26 ㏈ BW (㎒)	11+10LogB (㏈ m)	Antenna Gain (㏈ i)	Limit (㏈ m)
U-NII 1	5 190	23.98			-3.68	23.98
	5 230					
U-NII 2A	5 270		40.289	27.05	-3.01	
	5 310		40.405	27.06		
U-NII 2C	5 510		40.521	27.08	-2.44	
	5 590		40.174	27.04		
	5 670		41.447	27.17		
U-NII 3	5 755	30			-2.93	30
	5 795					

Band	IC Limit					
	Frequency (㎒)	Fixed Limit (㏈ m)	99 % BW (㎒)	10+10LogB (㏈ m)	Antenna Gain (㏈ i)	Limit (㏈ m)
U-NII 1	5 190	23.01	36.122	25.58	-3.68	23.01
	5 230		36.006	25.56		

Band	IC Limit					
	Frequency (㎒)	Fixed Limit (㏈ m)	99 % BW (㎒)	11+10LogB (㏈ m)	Antenna Gain (㏈ i)	Limit (㏈ m)
U-NII 2A	5 270	23.98	36.122	26.58	-3.01	23.98
	5 310		36.122	26.58		
U-NII 2C	5 510		36.122	26.58	-2.44	
	5 590		35.890	26.55		
	5 670		36.237	26.59		
U-NII 3	5 755	30			-2.93	30
	5 795					

Remark;

1. E.I.R.P. (㏈ m) = Average Power (㏈ m) + Antenna Gain (㏈ i)
2.. According to KDB 662911, average power of each port and antenna gain was combined by using below calculation.

   - Average power: 10 log {10^(Ant.1 power / 10)+10^(Ant.2 power / 10)}

   - Unequal antenna gains, with equal transmit powers. For antenna gains given by G_1, G_2, …, G_N ㏈ i
   (i) If transmit signals are correlated, then
   Directional gain = 10 log[($10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20}$)^2/$N_{ANT}$] ㏈ i [Note the “20”s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

Mode	Band	Data Rate (Mbps)	Channel	Frequency (㎒)	Average Power (㏈m)		
					Ant.1	Ant.2	Ant.1 + Ant.2
11ac_VHT80	U-NII 1	MCS0	Middle	5 210	12.24	12.72	15.50
	U-NII 2A		Middle	5 290	11.85	12.42	15.15
	U-NII 2C		Low	5 530	13.08	13.93	16.54
			High	5 610	12.83	13.85	16.38
	U-NII 3		Middle	5 775	13.24	13.79	16.53

Mode	Band	Data Rate (Mbps)	Channel	Frequency (㎒)	Average Power (㏈m)	Antenna Gain (㏈i)	E.I.R.P. (㏈m)
11ac_VHT80	U-NII 1	MCS0	Middle	5 210	15.50	-3.68	11.82

Band	FCC Limit					
	Frequency (㎒)	Fixed Limit (㏈m)	26 ㏈ BW (㎒)	11+10LogB (㏈m)	Antenna Gain (㏈i)	Limit (㏈m)
U-NII 1	5 210	23.98			-3.68	23.98
U-NII 2A	5 290		82.431	30.16	-3.01	
U-NII 2C	5 530		82.431	30.16	-2.44	
	5 610		83.357	30.21		
U-NII 3	5 775	30			-2.93	30

Band	IC Limit					
	Frequency (㎒)	Fixed Limit (㏈m)	99 % BW (㎒)	10+10LogB (㏈m)	Antenna Gain (㏈i)	Limit (㏈m)
U-NII 1	5 210	23.01	75.253	28.77	-3.68	23.01

Band	IC Limit					
	Frequency (㎒)	Fixed Limit (㏈m)	99 % BW (㎒)	11+10LogB (㏈m)	Antenna Gain (㏈i)	Limit (㏈m)
U-NII 2A	5 290	23.98	75.485	29.78	-3.01	23.98
U-NII 2C	5 530		75.253	29.77	-2.44	
	5 610		75.485	29.78		
U-NII 3	5 775	30			-2.93	30

Remark;

1. E.I.R.P. (㏈m) = Average Power (㏈m) + Antenna Gain (㏈i)
2.. According to KDB 662911, average power of each port and antenna gain was combined by using below calculation.

   - Average power: 10 log {10^(Ant.1 power / 10)+10^(Ant.2 power / 10)}

   - Unequal antenna gains, with equal transmit powers. For antenna gains given by G_1, G_2, …, G_N ㏈i
   (i) If transmit signals are correlated, then
   Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2/N_{ANT}$] ㏈i [Note the “20”s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

- Straddle channels

Mode	Band	Frequency (㎒)	Data Rate (Mbps)	Average Power (㏈m)		
				Ant.1	Ant.2	Ant.1 + Ant.2
11a	U-NII 2C	5 720	6	16.04	15.48	18.78
	U-NII 3			9.18	8.83	12.02
11ac_VHT20	U-NII 2C	5 720	MCS0	14.84	14.34	17.61
	U-NII 3			8.59	8.18	11.40
11n_HT40	U-NII 2C	5 710	MCS0	15.54	14.70	18.15
	U-NII 3			4.46	3.60	7.06
11ac_VHT80	U-NII 2C	5 690	MCS0	13.26	13.22	16.25
	U-NII 3			-1.97	-1.89	1.08

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	16.346	23.13	-2.44	23.13
	U-NII 3		30			-2.93	30
11ac_VHT20	U-NII 2C	5 720	23.98	15.304	22.85	-2.44	22.85
	U-NII 3		30			-2.93	30
11n_HT40	U-NII 2C	5 710	23.98	35.260	26.47	-2.44	23.98
	U-NII 3		30			-2.93	30
11ac_VHT80	U-NII 2C	5 690	23.98	76.447	29.83	-2.44	23.98
	U-NII 3		30			-2.93	30

Remark;

1. According to KDB 662911, average power of each port and antenna gain was combined by using below calculation.

   - Average power: 10 log {10^(Ant.1 power / 10)+10^(Ant.2 power / 10)}

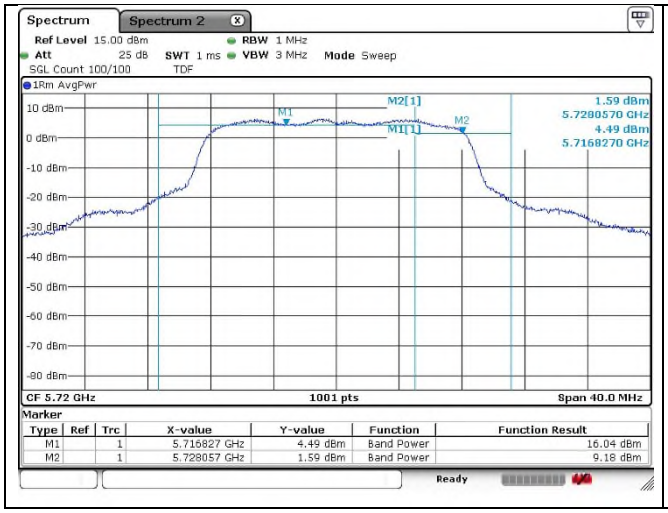
   - Unequal antenna gains, with equal transmit powers. For antenna gains given by G_1, G_2, …, G_N ㏈i
   (i) If transmit signals are correlated, then
   Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/N_{ANT}$] ㏈i [Note the “20”s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

- Test plots

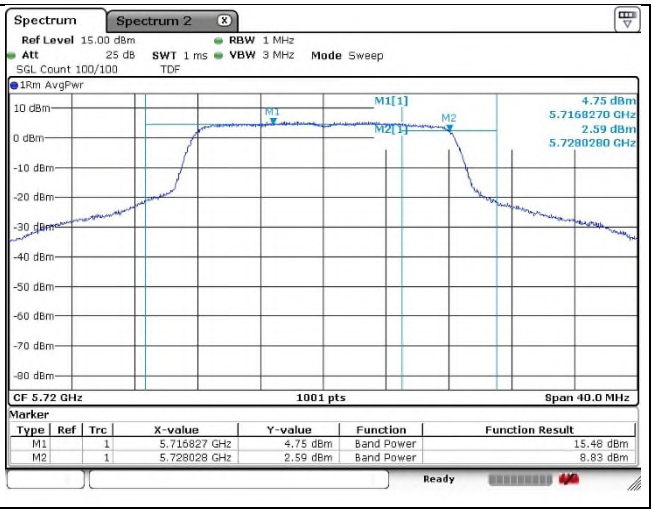
- Straddle channels

OFDM: 802.11a

Ant.1

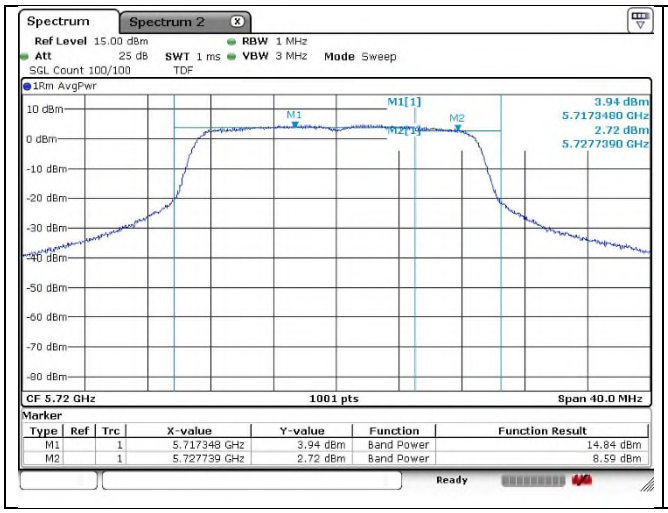


Ant.2

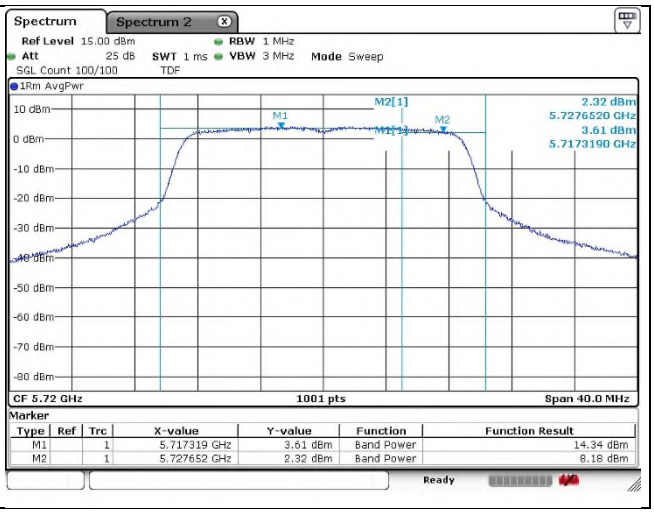


OFDM: 802.11ac_VHT20

Ant.1

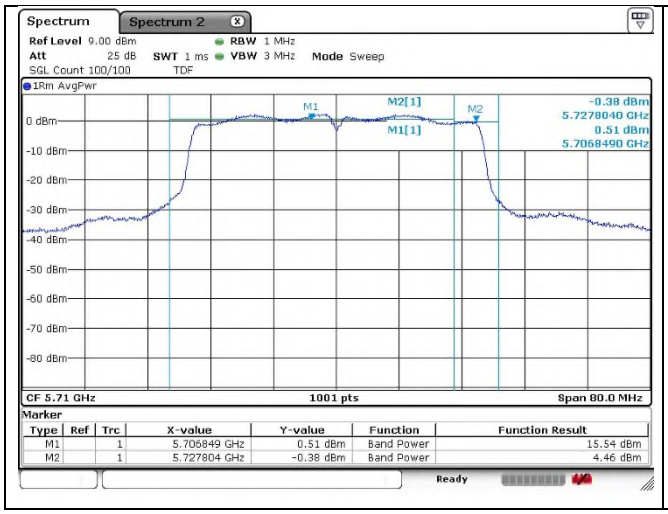


Ant.2

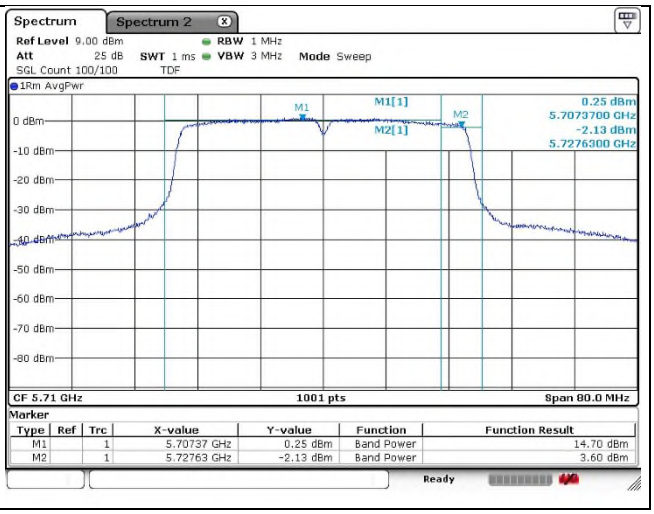


OFDM: 802.11n_HT40

Ant.1

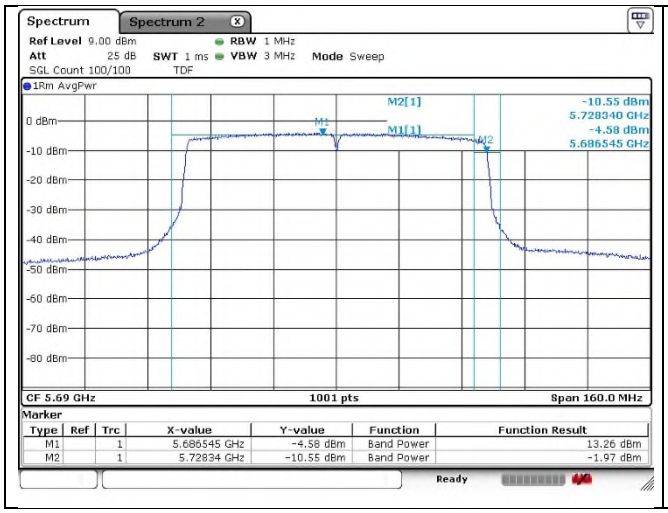


Ant.2

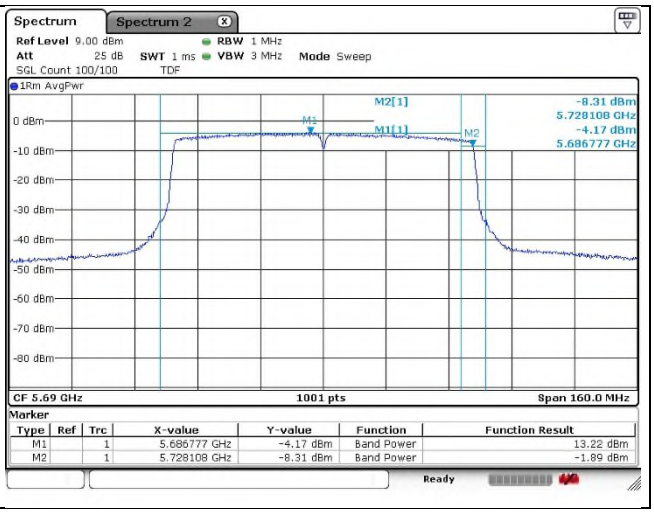


OFDM: 802.11ac_VHT80

Ant.1

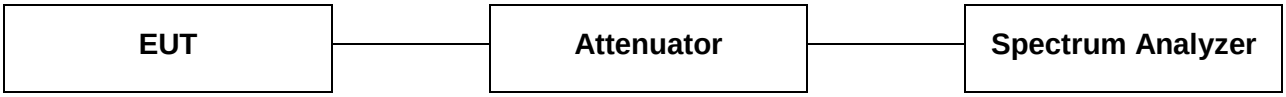


Ant.2



6. Power Spectral Density

6.1. Test Setup



6.2. Limit

6.2.1. 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.

6.2.2. 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 + 10 $\log_{10}$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 + 10 $\log_{10}$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 + 10 $\log_{10}$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 + 10 $\log_{10}$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 + 10 $\log_{10}$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 + 10 $\log_{10}$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 + 10 $\log_{10}$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.

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 ㏈ to the final result to compensate for the difference between linear averaging and power averaging.

5. The result is the Maximum PSD over 1 ㎒ reference bandwidth.

6. For devices operating in the bands 5.15-5.25 ㎓, 5.25-5.35 ㎓, and 5.47-5.725 ㎓, the above procedures make use of 1 ㎒ RBW to satisfy directly the 1 ㎒ reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 ㎓, the rules specify a measurement bandwidth of 500 ㎑. Many spectrum analyzers do not have 500 ㎑ RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 ㎒, or 500 ㎑, “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 ㎒, or 500 ㎑). If measurements are performed using a reduced resolution bandwidth (< 1 ㎒, or < 500 ㎑) and integrated over 1 ㎒, or 500 ㎑ bandwidth, the following adjustments to the procedures apply:

   a) Set RBW ≥ 1/*T*, where *T* is defined in section II.B.1.a).
   b) Set VBW ≥ 3 RBW.
   c) If measurement bandwidth of Maximum PSD is specified in 500 ㎑, add 10 log(500 ㎑/RBW) to the measured result, whereas RBW (< 500 ㎑) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
   d) If measurement bandwidth of Maximum PSD is specified in 1 ㎒, add 10 log(1 ㎒/RBW) to the measured result, whereas RBW (< 1 ㎒) 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) ℃
Relative humidity : 47 % R.H.

11a

Band	Data Rate (Mbps)	Channel	Frequency (㎒)	PSD (㏈ m)			Limit (㏈ m/1 ㎒)
				Ant.1	Ant.2	Ant.1 + Ant.2	
U-NII 1	6	Low	5 180	6.67	6.12	9.41	11
		Middle	5 220	6.83	6.05	9.47	
		High	5 240	6.60	6.23	9.43	
U-NII 2A		Low	5 260	6.75	6.16	9.48	
		Middle	5 300	6.59	6.12	9.37	
		High	5 320	6.68	6.14	9.43	
U-NII 2C		Low	5 500	6.87	5.63	9.30	
		Middle	5 580	6.82	6.18	9.52	
		High	5 700	6.31	5.18	8.79	
Band	**Data Rate (Mbps)**	**Channel**	**Frequency (㎒)**	**PSD (㏈ m)**			**Limit (㏈ m/500 ㎑)**
				Ant.1	**Ant.2**	**Ant.1 + Ant.2**	
U-NII 3	6	Low	5 745	4.03	2.91	6.52	30
		Middle	5 785	4.21	3.29	6.78	
		High	5 825	4.36	3.05	6.76	

Band	Data Rate (Mbps)	Channel	Frequency (㎒)	PSD (㏈ m)	Antenna Gain (㏈ i)	E.I.R.P. PSD (㏈ m)	IC Limit (㏈ m/1 ㎒)
U-NII 1	6	Low	5 180	9.41	-3.68	5.73	10
		Middle	5 220	9.47		5.79	
		High	5 240	9.43		5.75	

11ac_VHT20

Band	Data Rate (Mbps)	Channel	Frequency (㎒)	PSD (㏈ m)			Limit (㏈ m/1 ㎒)
				Ant.1	Ant.2	Ant.1 + Ant.2	
U-NII 1	MCS0	Low	5 180	4.84	4.92	7.89	11
		Middle	5 220	5.13	4.50	7.84	
		High	5 240	5.08	5.04	8.07	
U-NII 2A		Low	5 260	5.06	4.82	7.95	
		Middle	5 300	5.20	4.77	8.00	
		High	5 320	4.77	4.81	7.80	
U-NII 2C		Low	5 500	5.04	4.13	7.62	
		Middle	5 580	4.94	4.70	7.83	
		High	5 700	4.62	3.83	7.25	
Band	**Data Rate (Mbps)**	**Channel**	**Frequency (㎒)**	**PSD (㏈ m)**			**Limit (㏈ m/500 ㎑)**
				Ant.1	**Ant.2**	**Ant.1 + Ant.2**	
U-NII 3	MCS0	Low	5 745	2.34	1.66	5.02	30
		Middle	5 785	2.46	1.74	5.13	
		High	5 825	2.43	1.70	5.09	

Band	Data Rate (Mbps)	Channel	Frequency (㎒)	PSD (㏈ m)	Antenna Gain (㏈ i)	E.I.R.P. PSD (㏈ m)	IC Limit (㏈ m/1 ㎒)
U-NII 1	MCS0	Low	5 180	7.89	-3.68	4.21	10
		Middle	5 220	7.84		4.16	
		High	5 240	8.07		4.39	

11n_HT40

Band	Data Rate (Mbps)	Channel	Frequency (㎒)	PSD (㏈ m)			Limit (㏈ m/1 ㎒)
				Ant.1	Ant.2	Ant.1 + Ant.2	
U-NII 1	MCS0	Low	5 190	-1.35	-1.33	1.67	11
		High	5 230	3.09	1.96	5.57	
U-NII 2A		Low	5 270	2.90	1.83	5.41	
		High	5 310	-1.82	-2.10	1.05	
U-NII 2C		Low	5 510	2.76	2.07	5.44	
		Middle	5 590	2.13	1.79	4.97	
		High	5 670	2.92	1.49	5.27	
Band	**Data Rate (Mbps)**	**Channel**	**Frequency (㎒)**	**PSD (㏈ m)**			**Limit (㏈ m/500 ㎑)**
				Ant.1	**Ant.2**	**Ant.1 + Ant.2**	
U-NII 3	MCS0	Low	5 755	-0.33	-0.34	2.68	30
		High	5 795	-0.22	-1.31	2.28	

Band	Data Rate (Mbps)	Channel	Frequency (㎒)	PSD (㏈ m)	Antenna Gain (㏈ i)	E.I.R.P. PSD (㏈ m)	IC Limit (㏈ m/1 ㎒)
U-NII 1	MCS0	Low	5 190	1.67	-3.68	-2.01	10
		High	5 230	5.57		1.89	

11ac_VHT80

Band	Data Rate (Mbps)	Channel	Frequency (㎒)	PSD (㏈ m)			Limit (㏈ m/1 ㎒)
				Ant.1	Ant.2	Ant.1 + Ant.2	
U-NII 1	MCS0	Middle	5 210	-3.80	-3.26	-0.51	11
U-NII 2A		Middle	5 290	-3.81	-3.10	-0.43	
U-NII 2C		Low	5 530	-4.77	-4.43	-1.59	
		High	5 610	-3.75	-2.53	-0.09	
Band	**Data Rate (Mbps)**	**Channel**	**Frequency (㎒)**	**PSD (㏈ m)**			**Limit (㏈ m/500 ㎑)**
				Ant.1	**Ant.2**	**Ant.1 + Ant.2**	
U-NII 3	MCS0	Middle	5 775	-6.55	-7.31	-3.90	30

Band	Data Rate (Mbps)	Channel	Frequency (㎒)	PSD (㏈ m)	Antenna Gain (㏈ i)	E.I.R.P. PSD (㏈ m)	IC Limit (㏈ m/1 ㎒)
U-NII 1	MCS0	Middle	5 210	-0.51	-3.68	-4.19	10

Remark;

1. E.I.R.P. PSD (㏈ m) = PSD (㏈ m) + Antenna Gain (㏈ i)
2. According to KDB 662911, PSD of each port and antenna gain was combined by using below calculation.

   - PSD: 10 log {10^(Ant.1 PSD / 10)+10^(Ant.2 PSD / 10)}

   - Unequal antenna gains, with equal transmit powers. For antenna gains given by G_1, G_2, …, G_N ㏈ i
   (i) If transmit signals are correlated, then
   Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/N_{ANT}$] ㏈ i [Note the “20”s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

- Straddle channels

Mode	Band	Frequency (㎒)	Data Rate (Mbps)	PSD (㏈m)			Limit (㏈m/1㎒ or ㏈m/500㎑)
				Ant.1	Ant.2	Ant.1 + Ant.2	
11a	U-NII 2C	5 720	6	7.01	5.50	9.33	11
	U-NII 3			3.86	2.11	6.08	30
11ac_VHT20	U-NII 2C	5 720	MCS0	5.17	4.66	7.93	11
	U-NII 3			1.30	0.56	3.96	30
11n_HT40	U-NII 2C	5 710	MCS0	2.73	1.07	4.99	11
	U-NII 3			-2.82	-3.33	-0.06	30
11ac_VHT80	U-NII 2C	5 690	MCS0	-3.68	-4.00	-0.83	11
	U-NII 3			-8.72	-9.19	-5.94	30

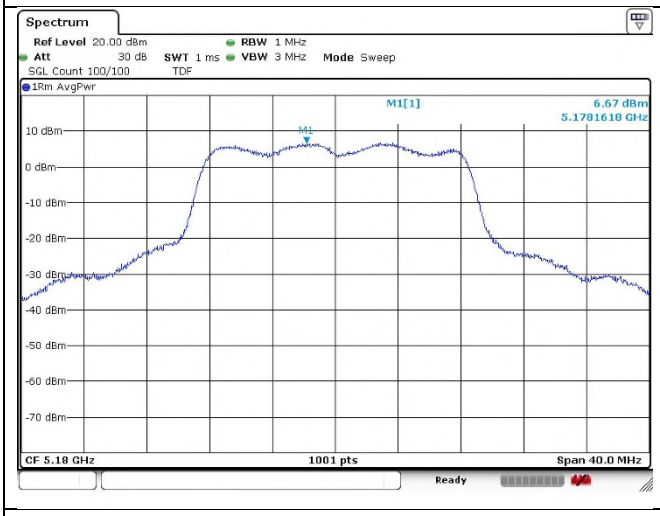
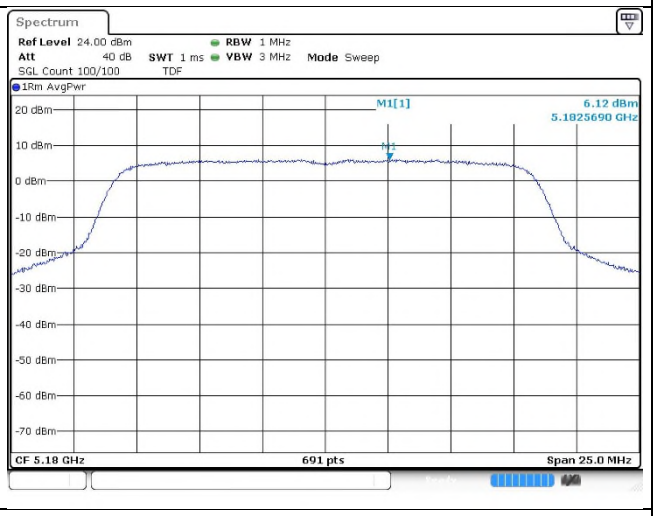
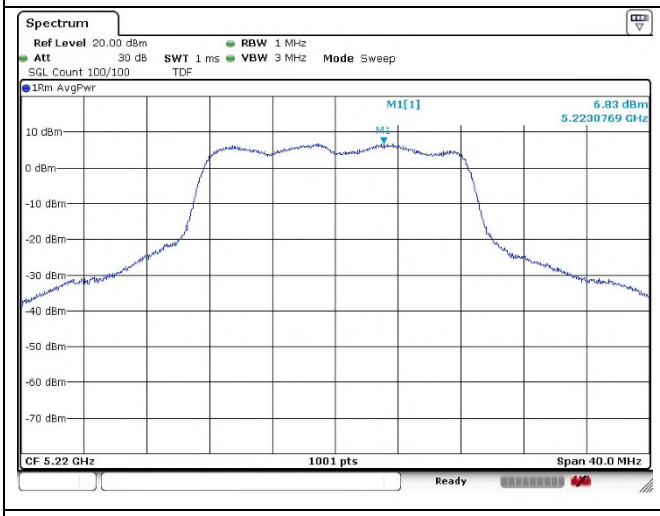
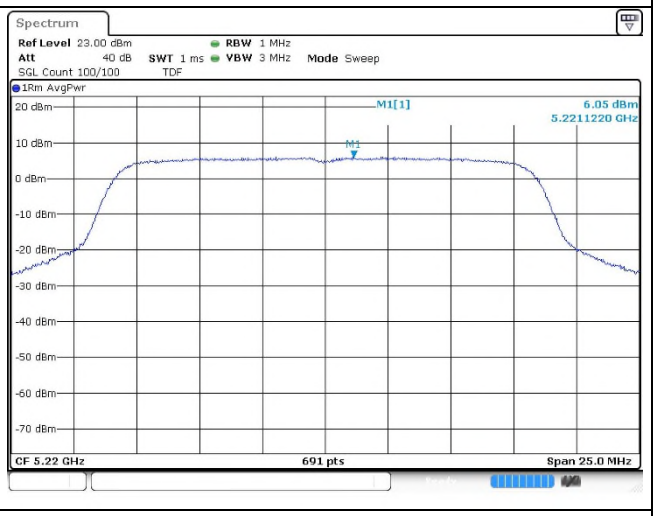
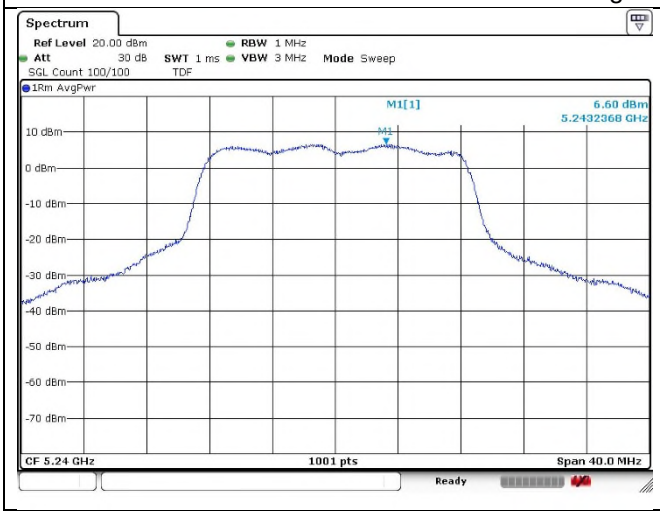
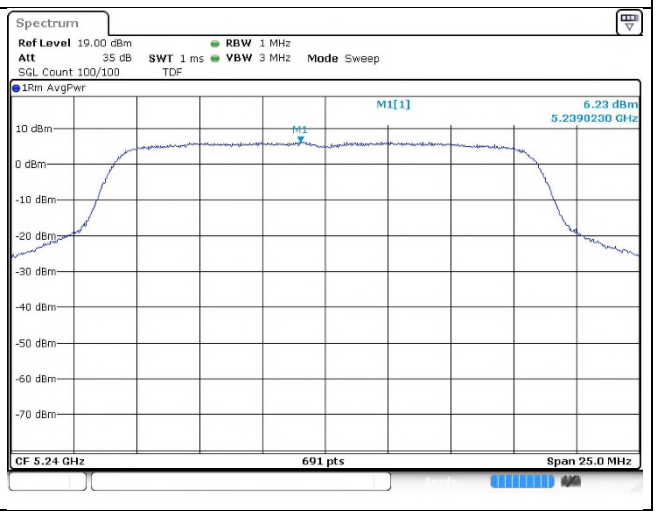
Remark;

1. According to KDB 662911, PSD of each port was combined by using below calculation.

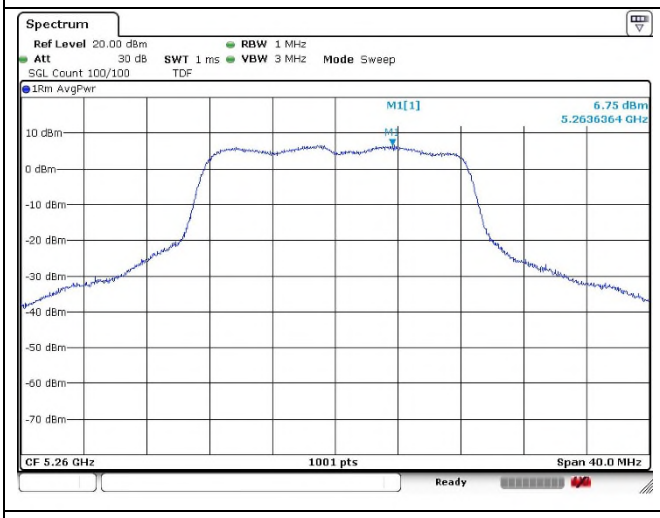
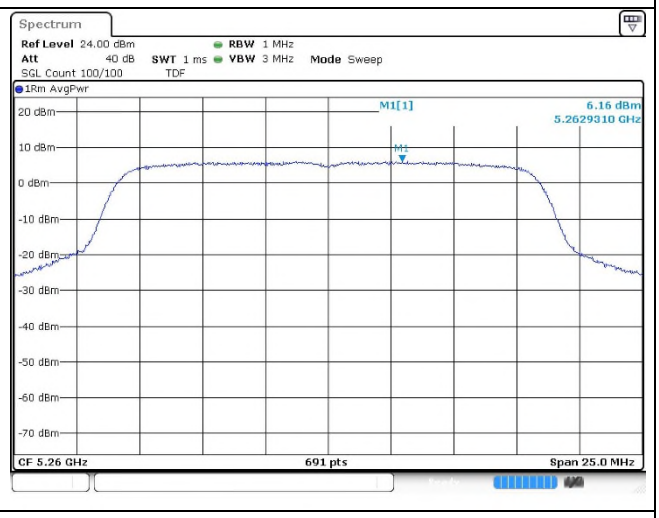
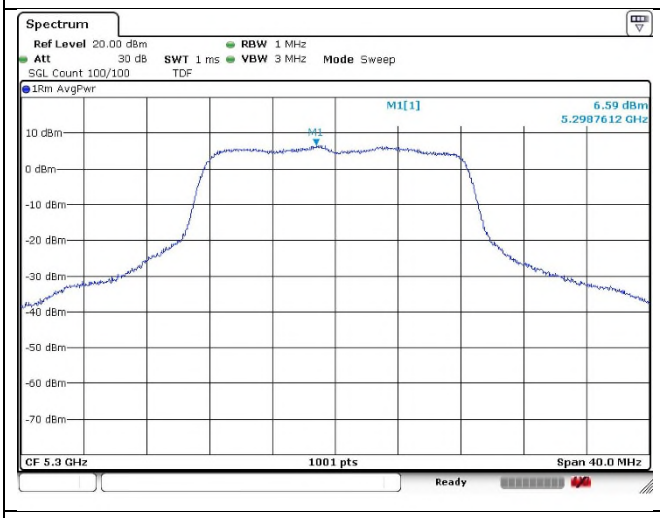
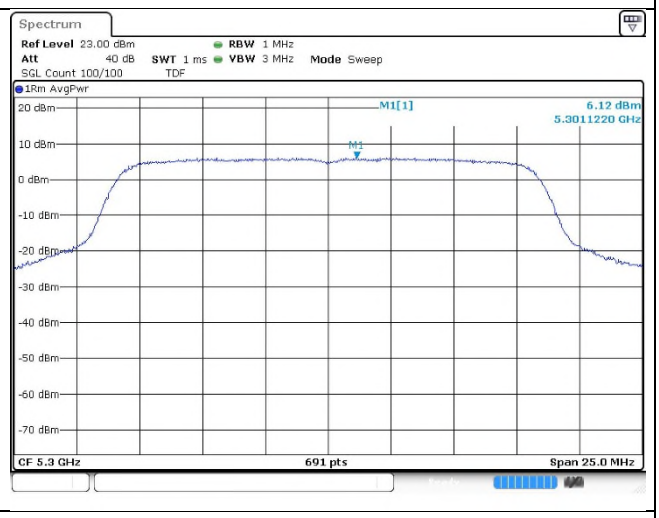
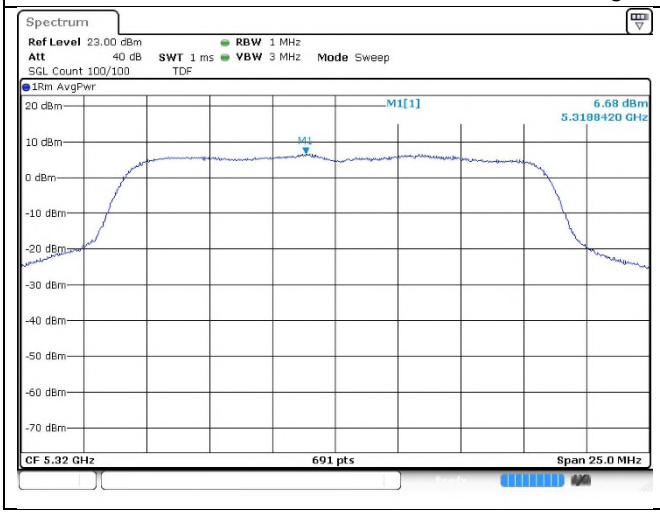
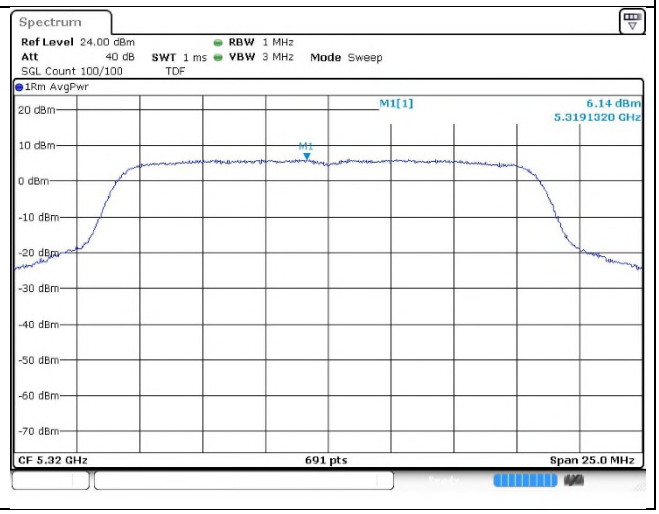
   - PSD: 10 log {10^(Ant.1 PSD / 10)+10^(Ant.2 PSD / 10)}

- Test plots

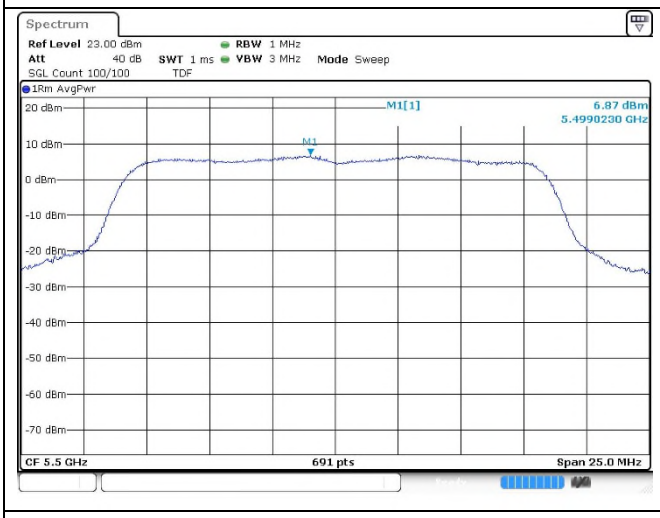
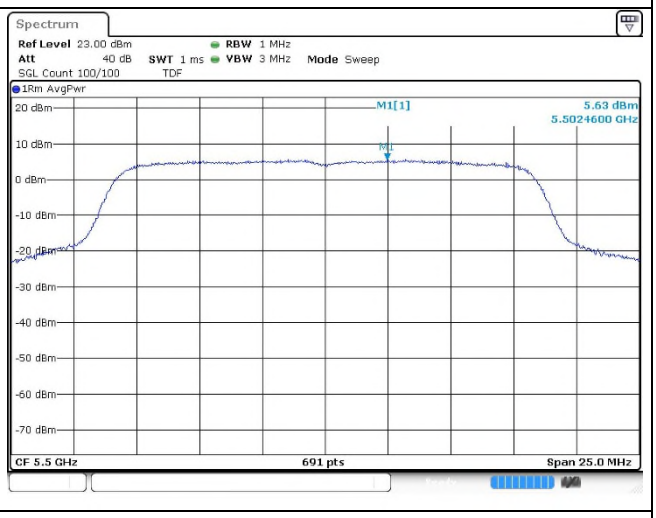
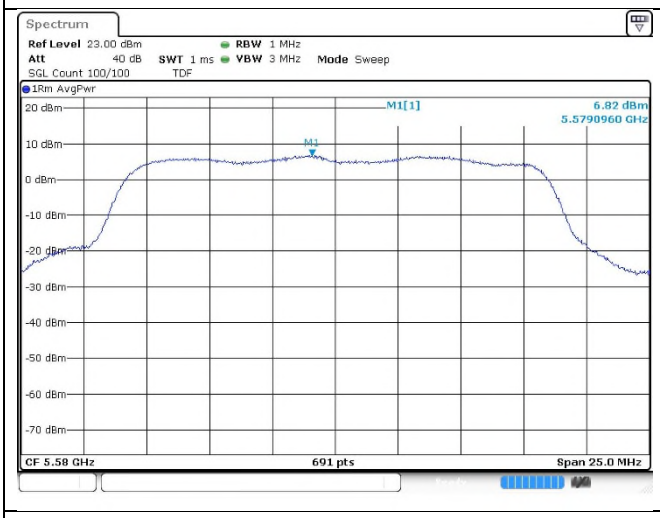
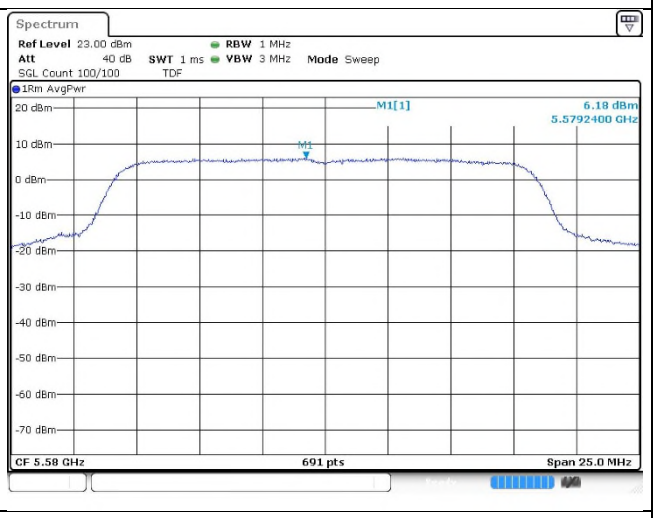
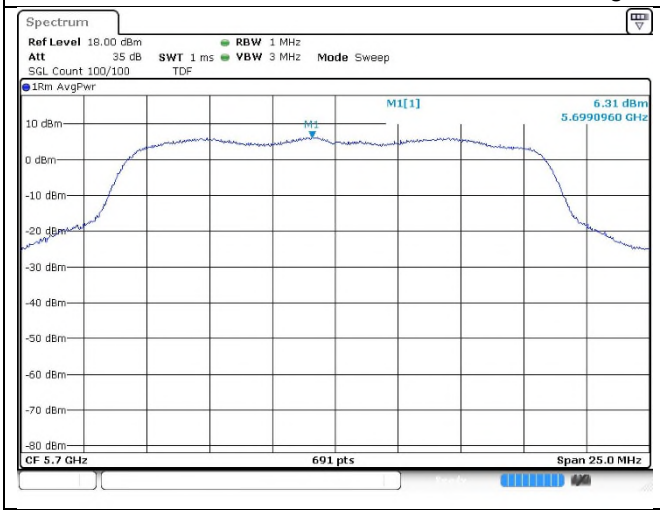
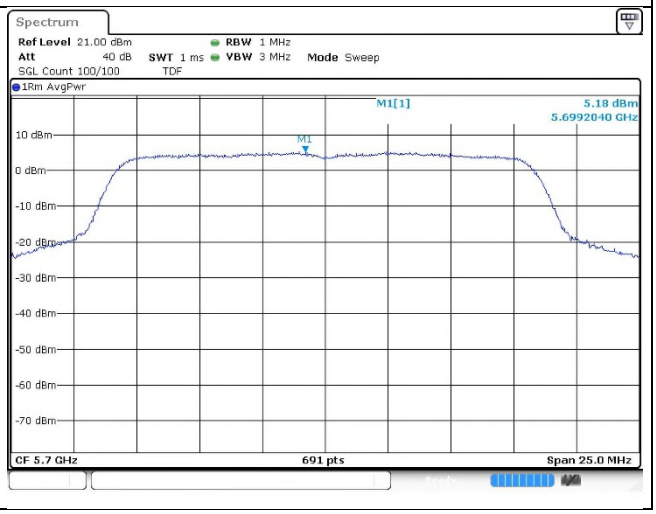
OFDM: 802.11a (Band 1)

Ant.1	Ant.2
Low channel	
	
Middle channel	
	
High channel	
	

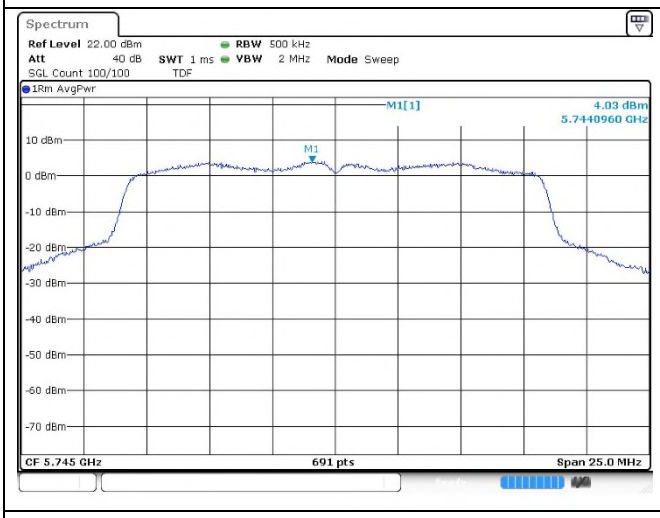
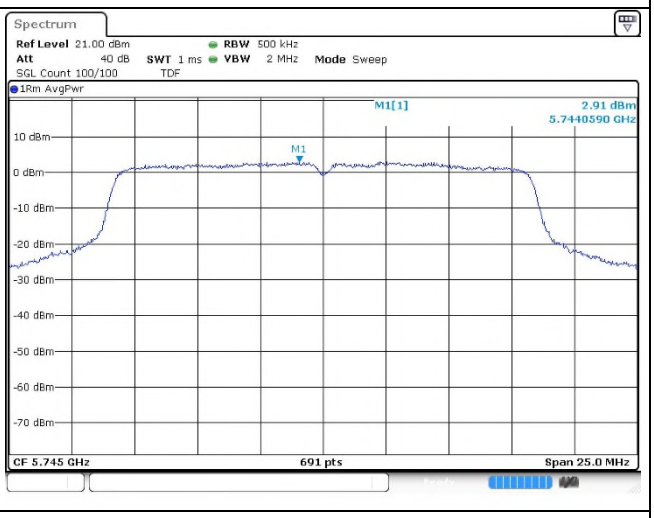
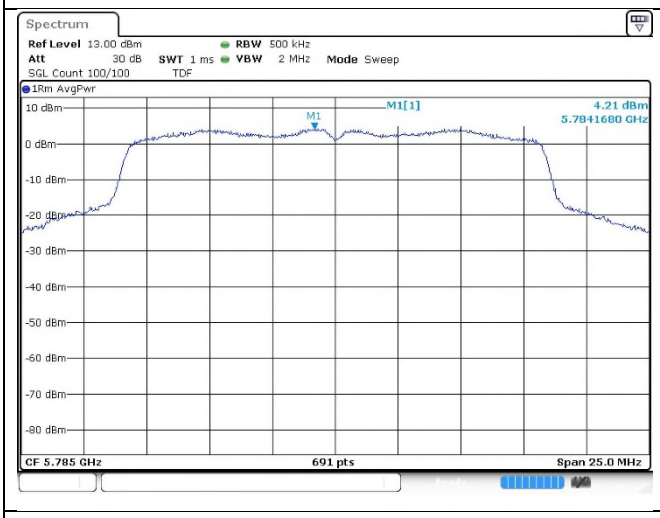
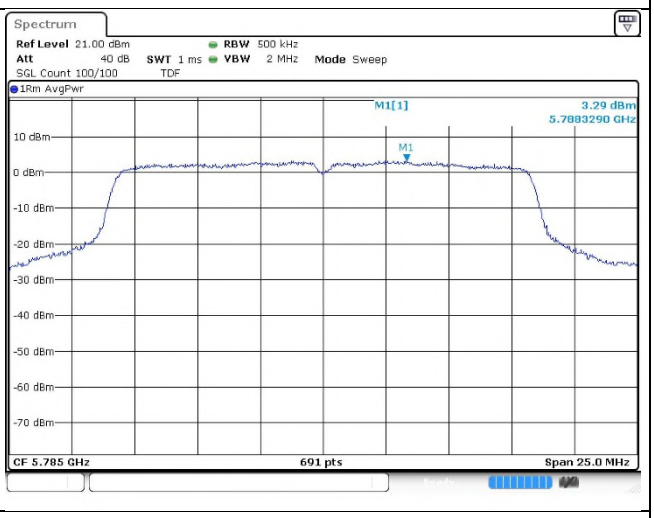
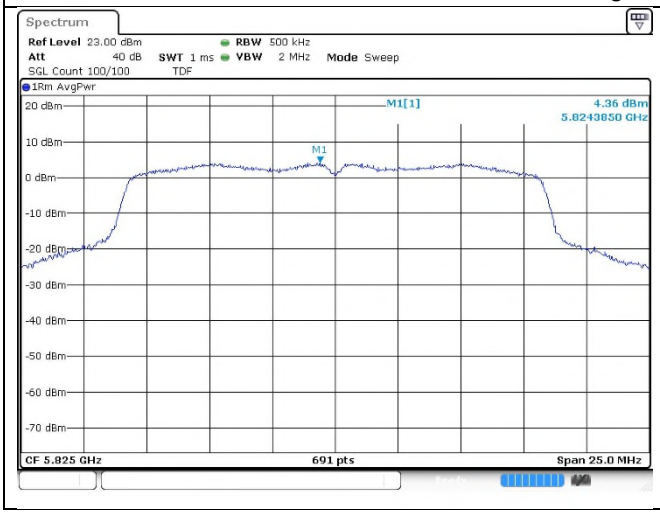
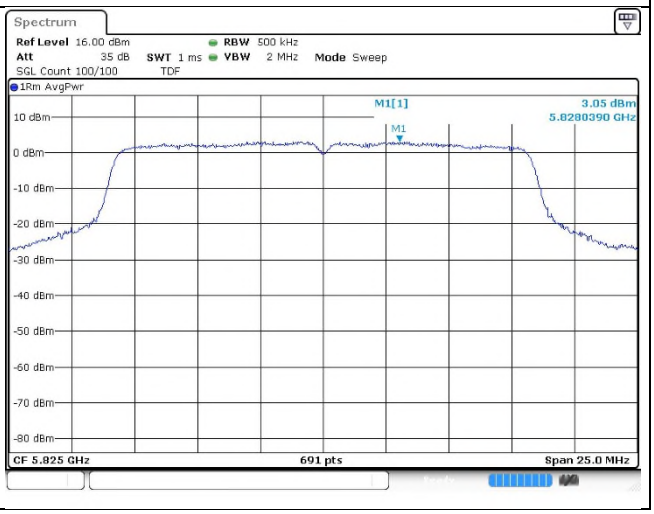
OFDM: 802.11a (Band 2A)

Ant.1	Ant.2
Low channel	
	
Middle channel	
	
High channel	
	

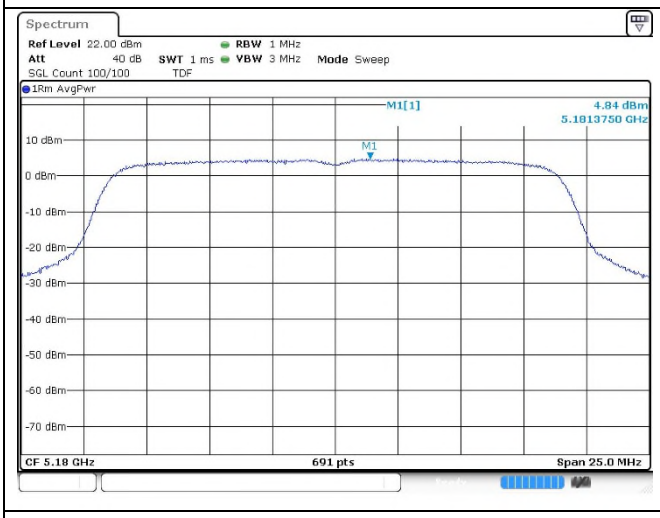
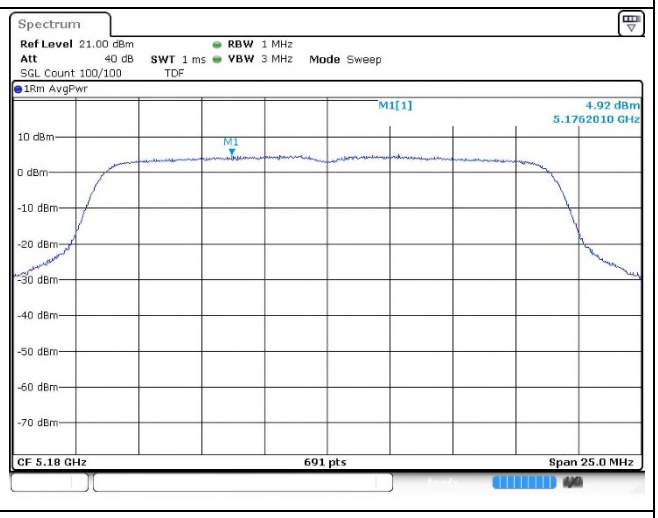
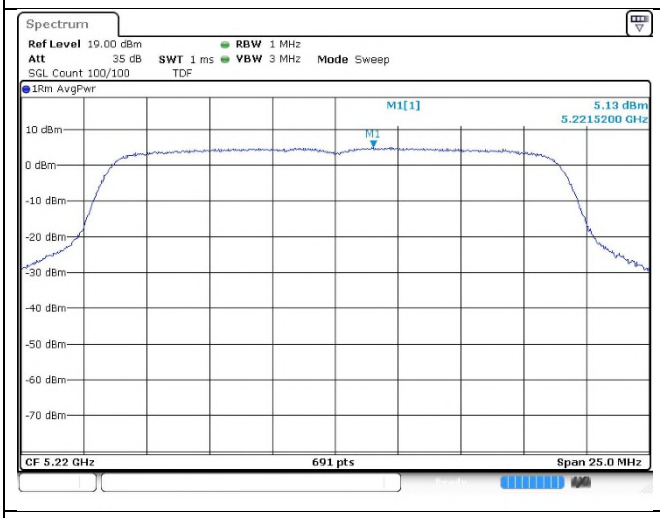
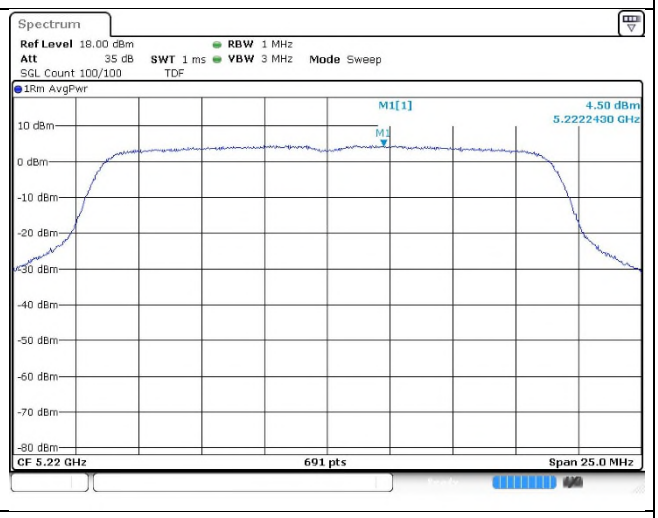
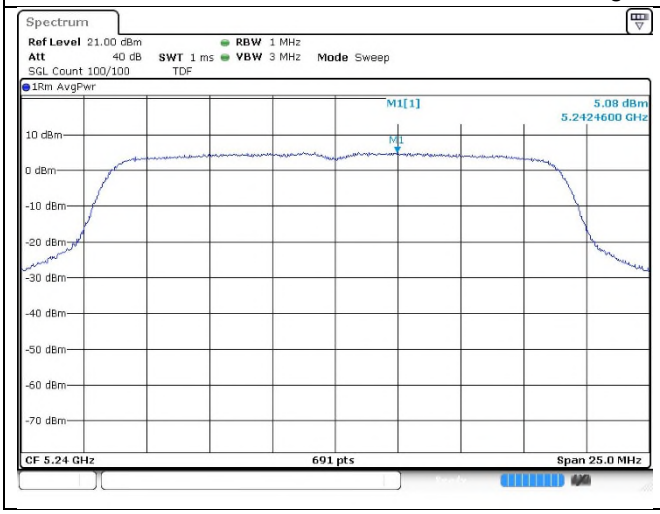
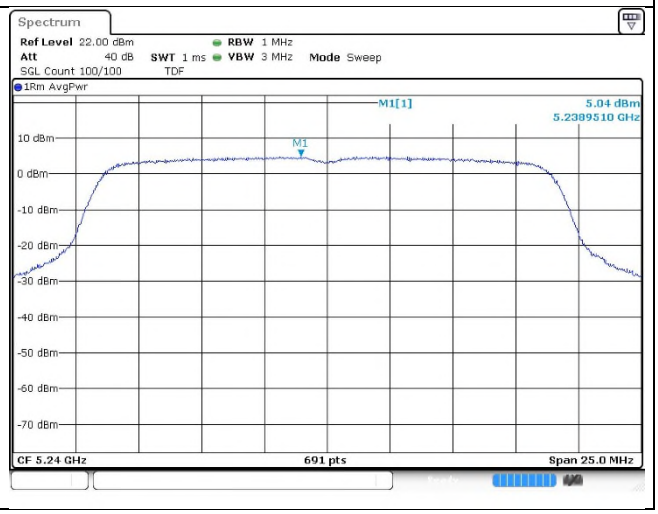
OFDM: 802.11a (Band 2C)

Ant.1	Ant.2
Low channel	
	
Middle channel	
	
High channel	
	

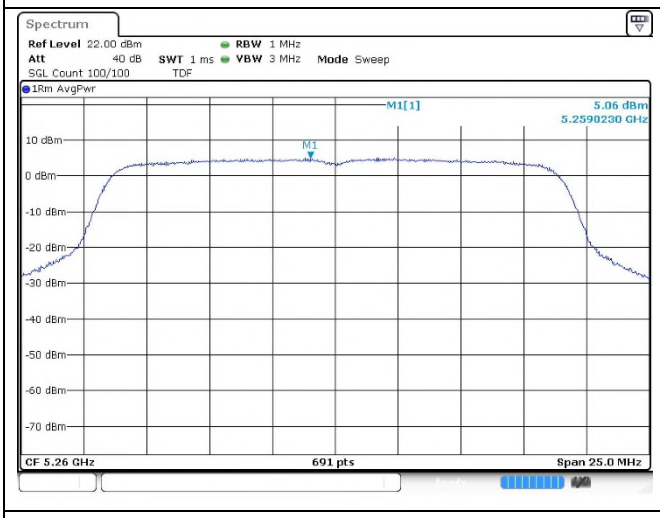
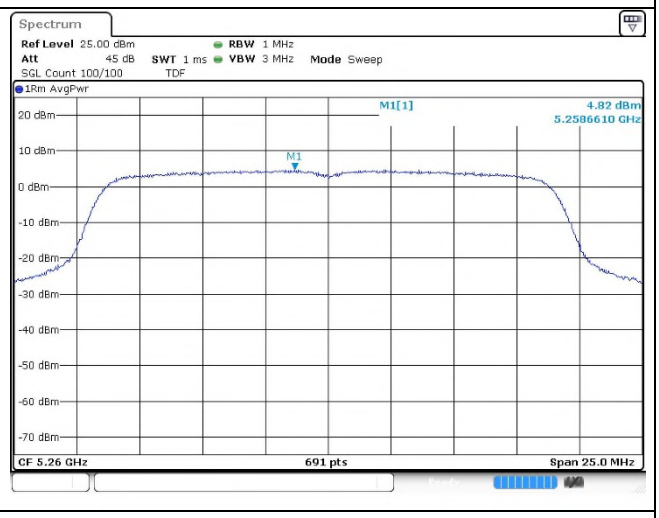
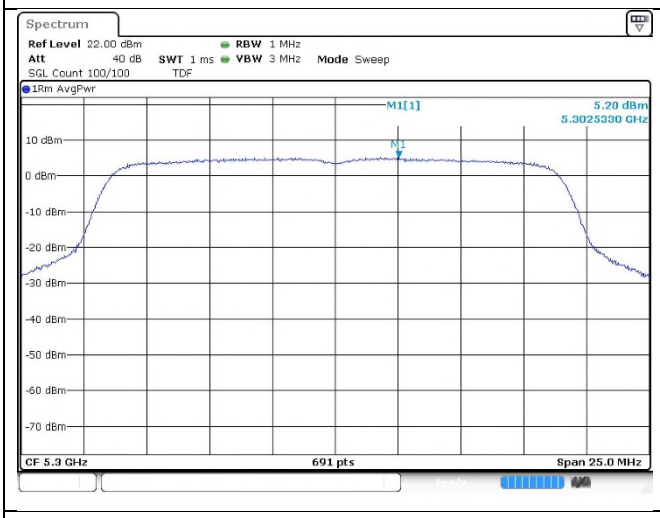
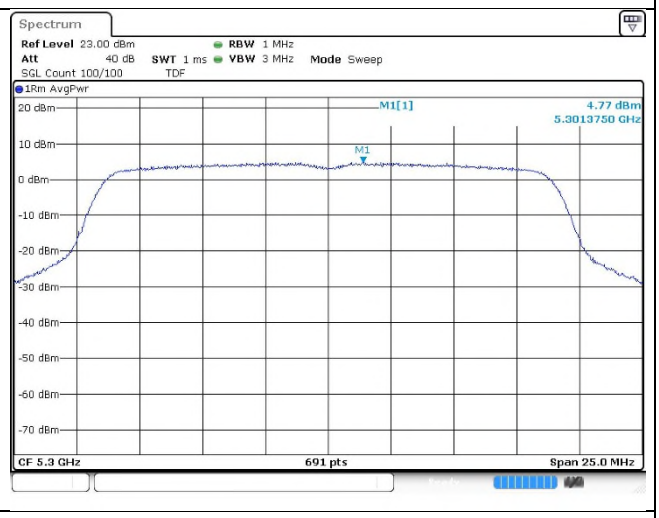
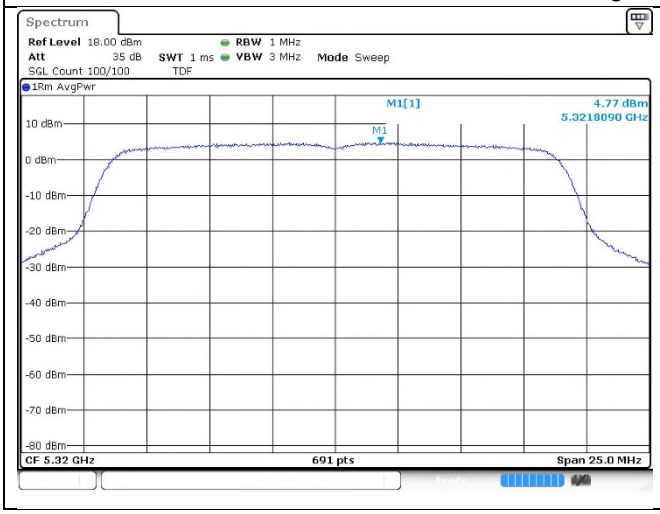
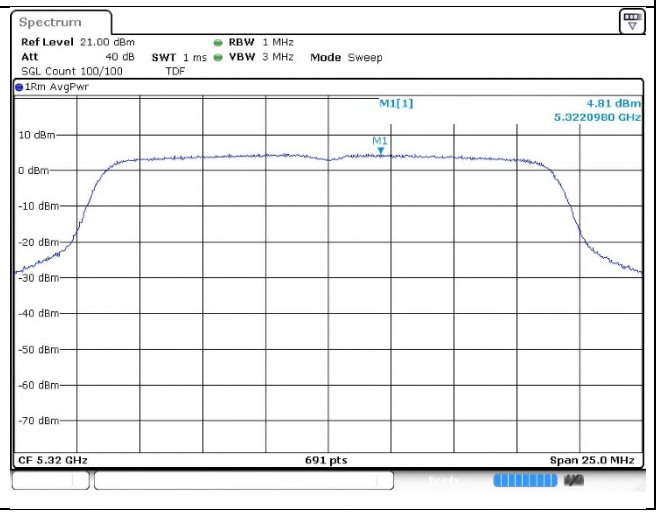
OFDM: 802.11a (Band 3)

Ant.1	Ant.2
Low channel	
	
Middle channel	
	
High channel	
	

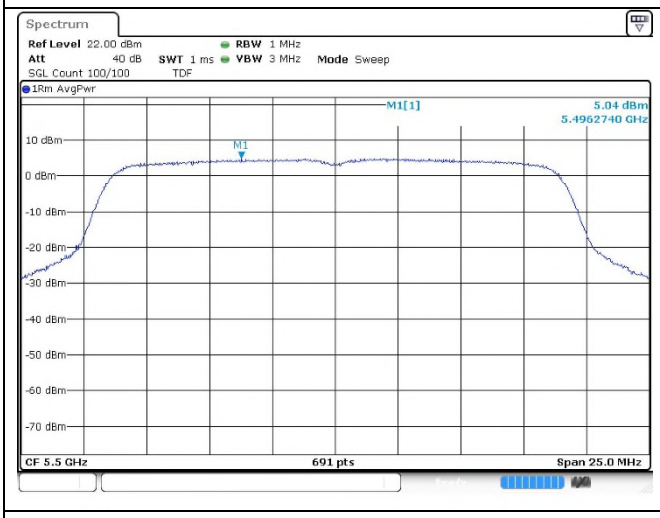
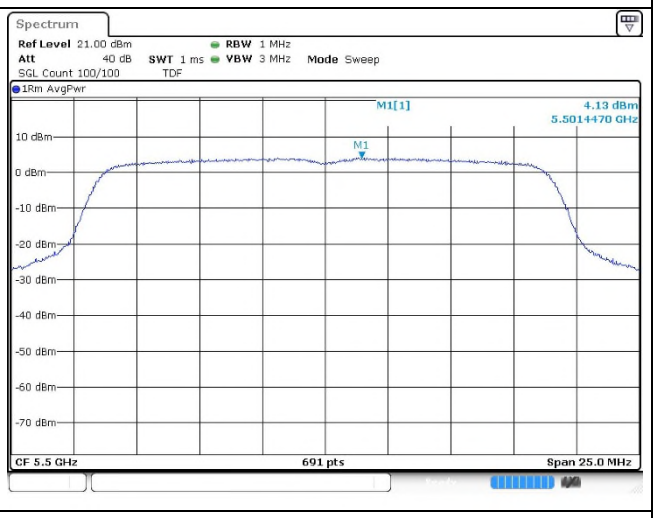
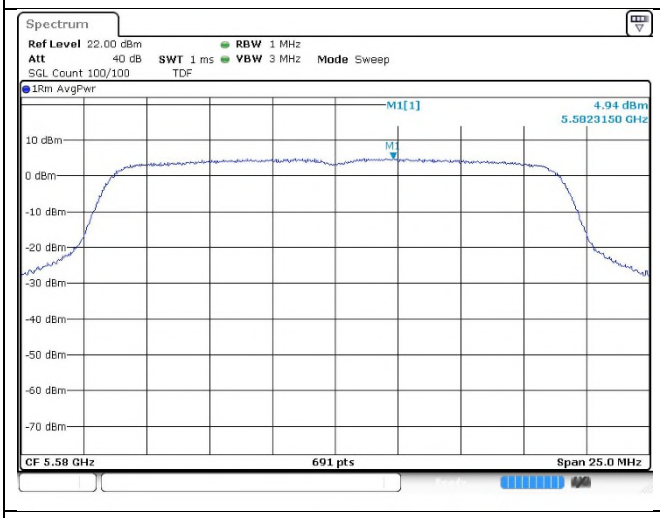
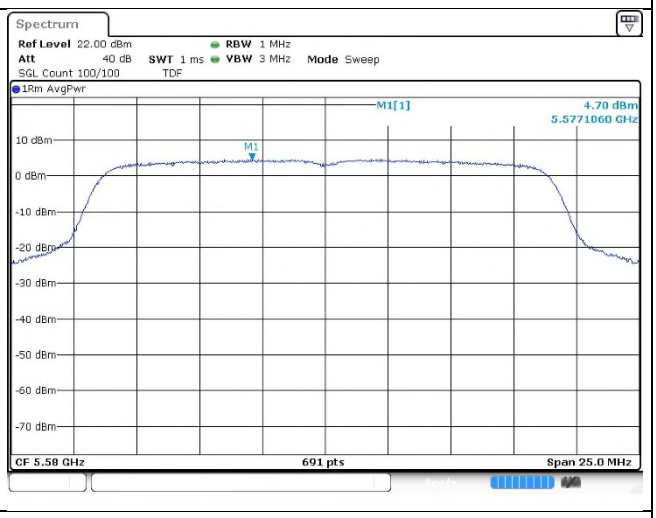
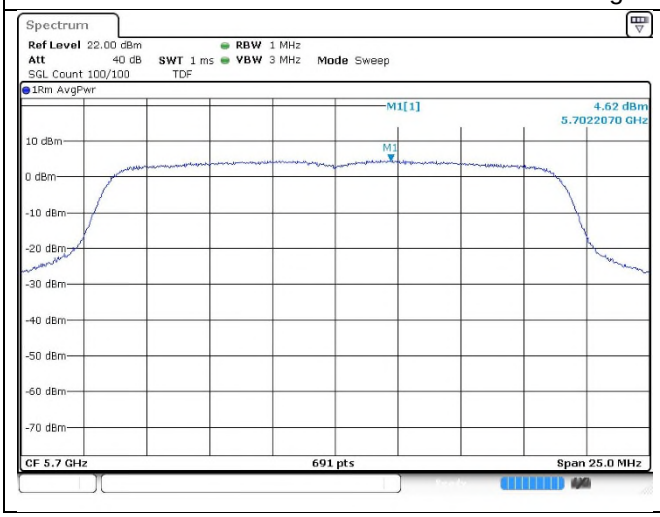
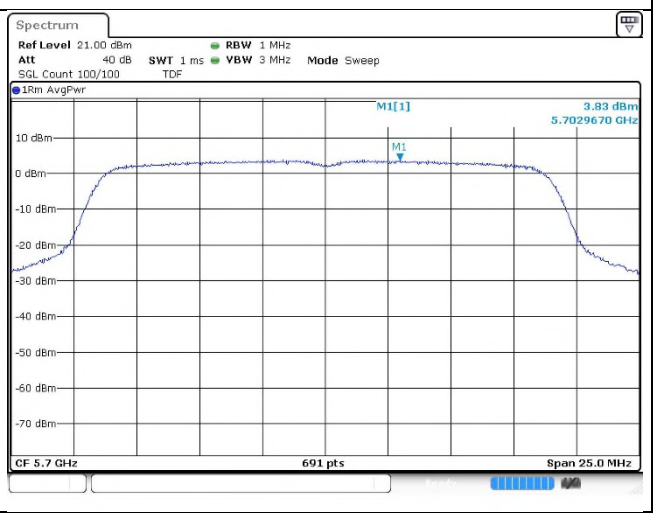
OFDM: 802.11ac_VHT20 (Band 1)

Ant.1	Ant.2
Low channel	
	
Middle channel	
	
High channel	
	

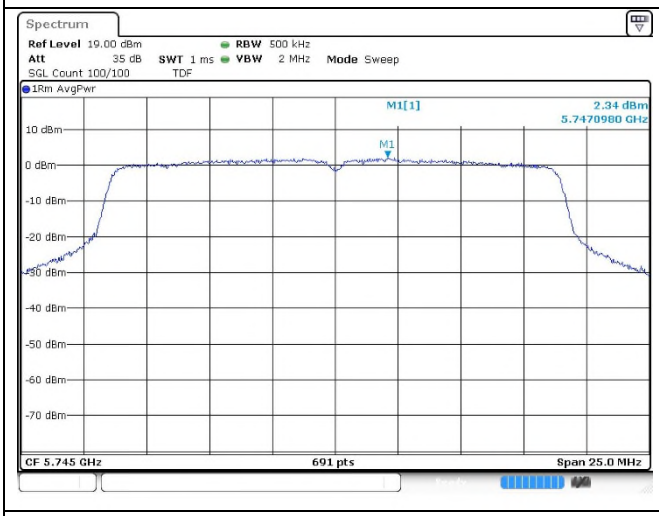
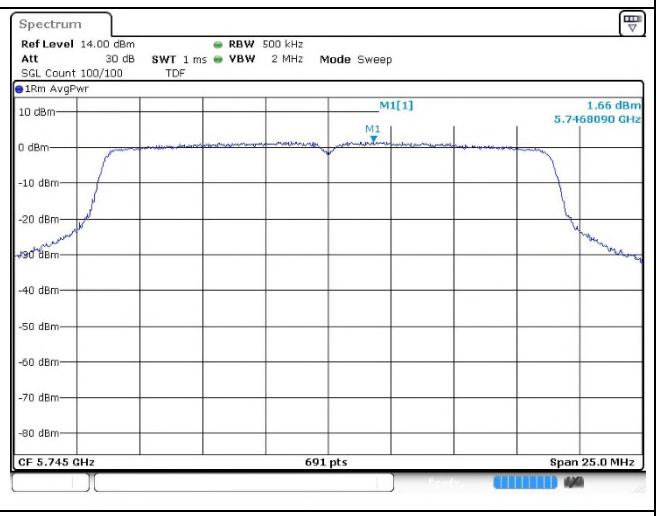
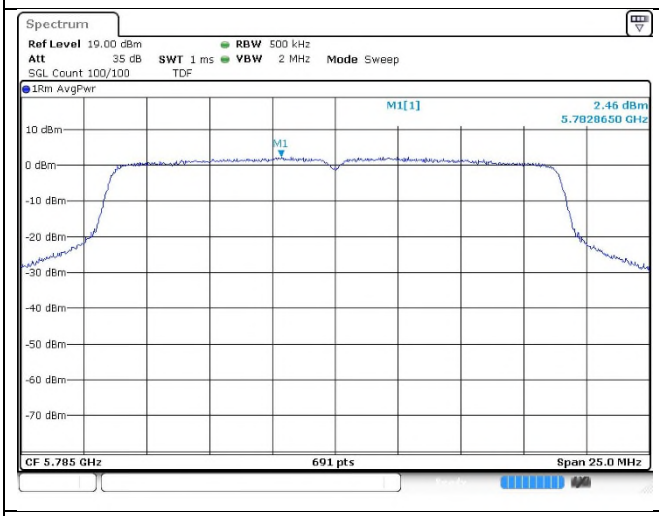
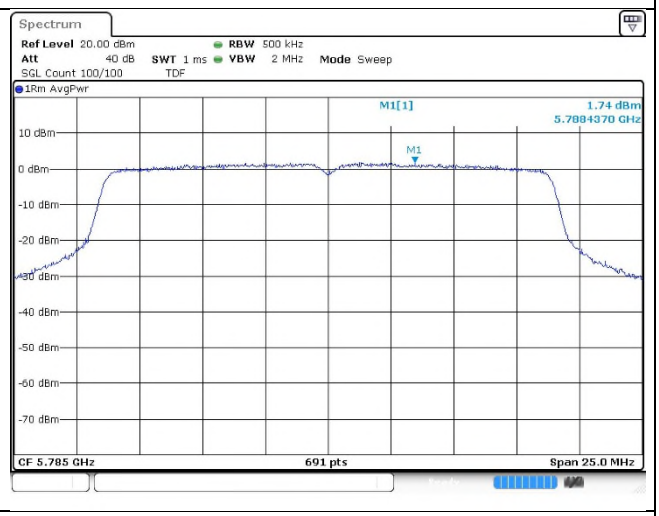
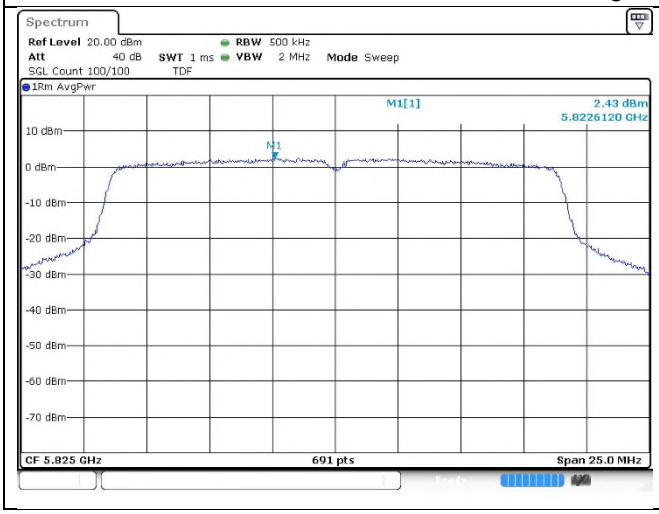
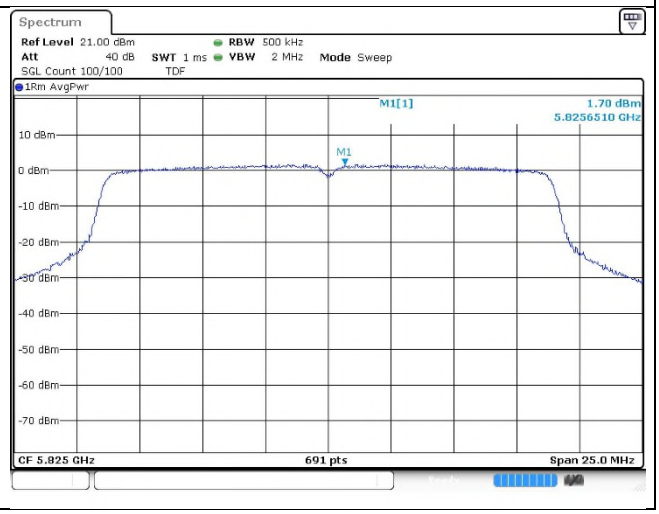
OFDM: 802.11ac_VHT20 (Band 2A)

Ant.1	Ant.2
Low channel	
	
Middle channel	
	
High channel	
	

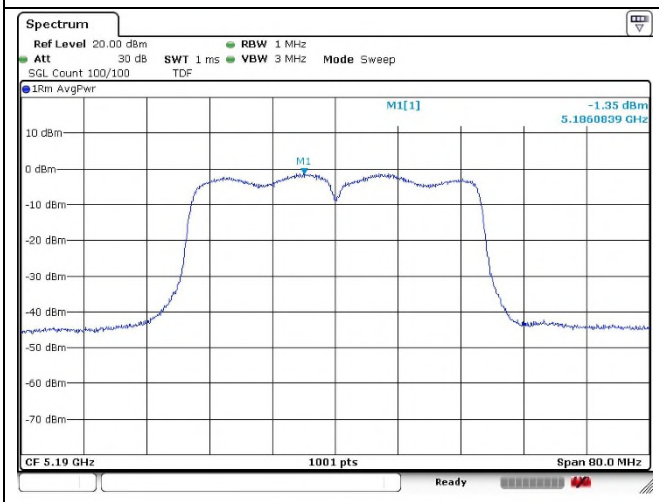
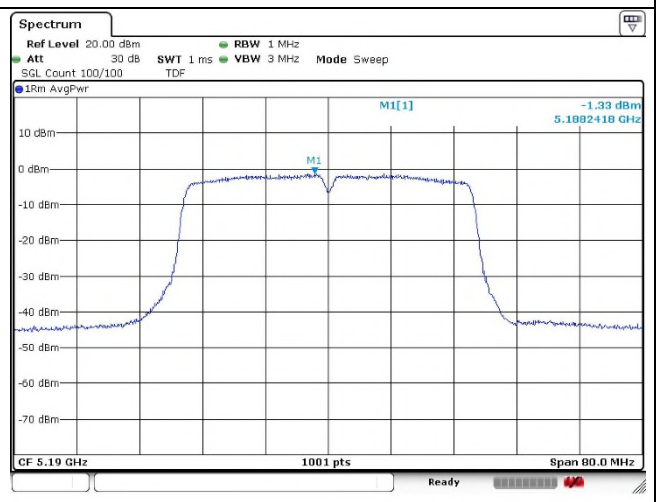
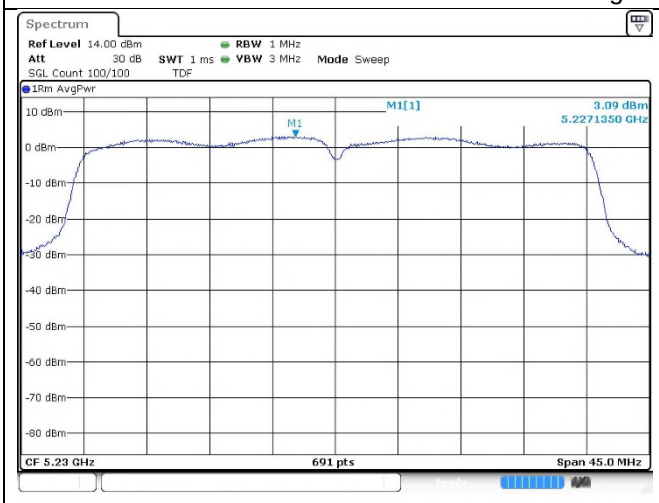
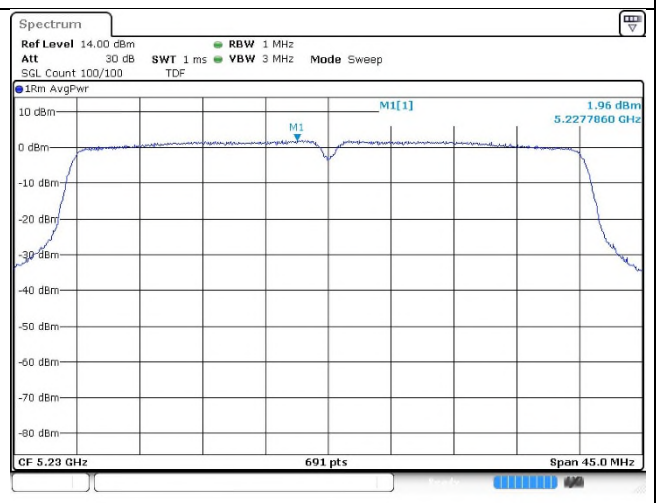
OFDM: 802.11ac_VHT20 (Band 2C)

Ant.1	Ant.2
Low channel	
	
Middle channel	
	
High channel	
	

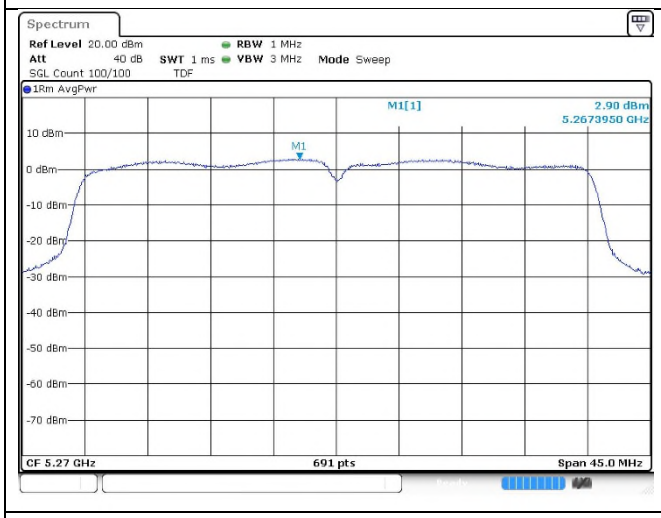
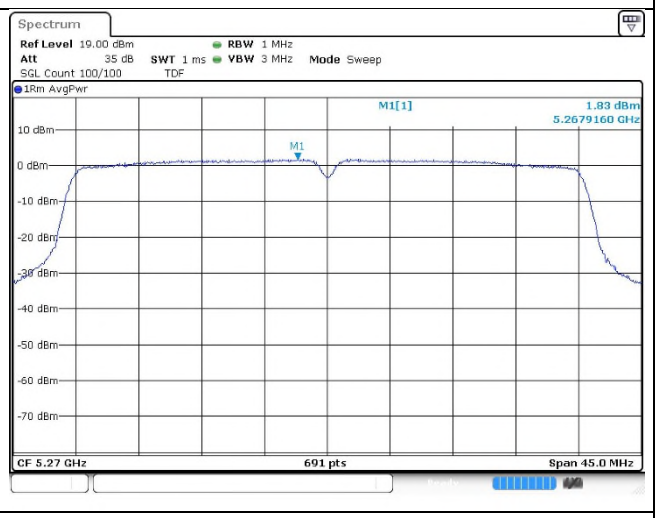
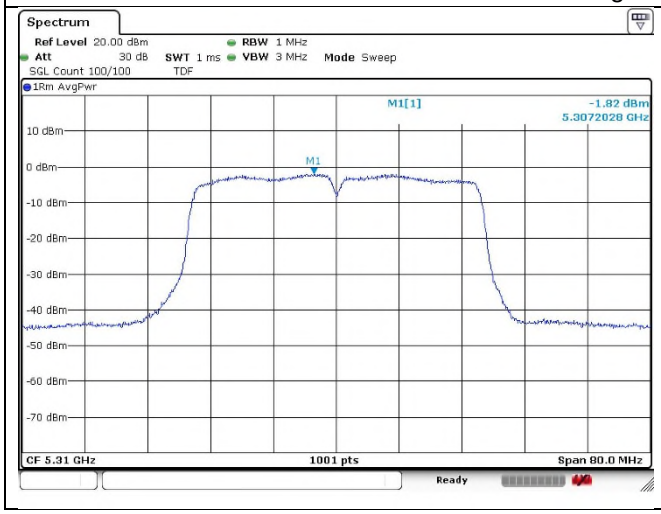
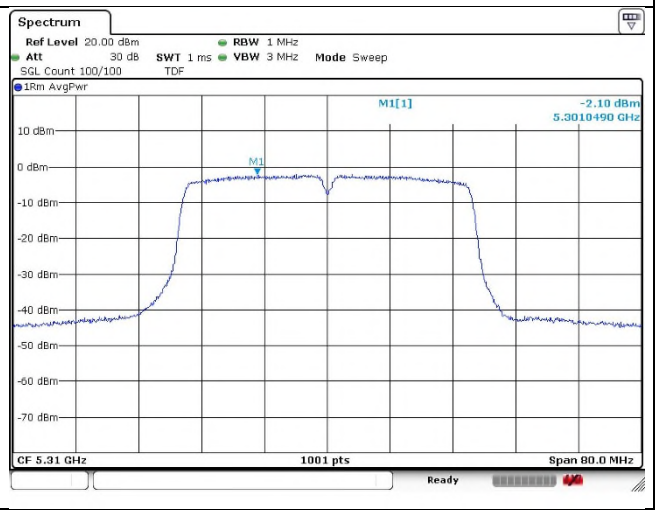
OFDM: 802.11ac_VHT20 (Band 3)

Ant.1	Ant.2
Low channel	
	
Middle channel	
	
High channel	
	

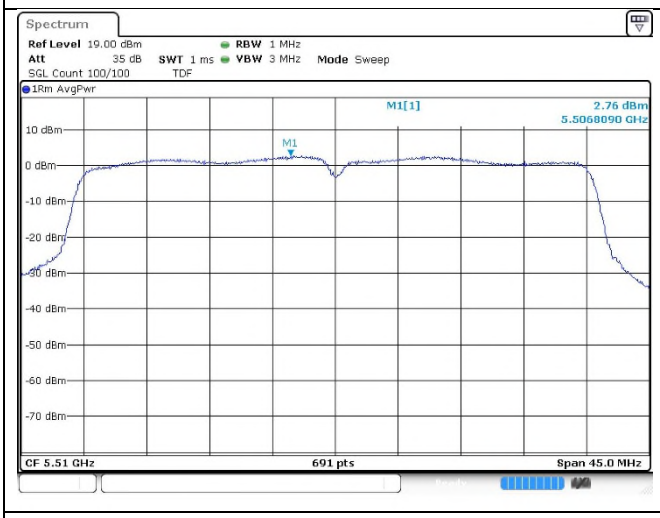
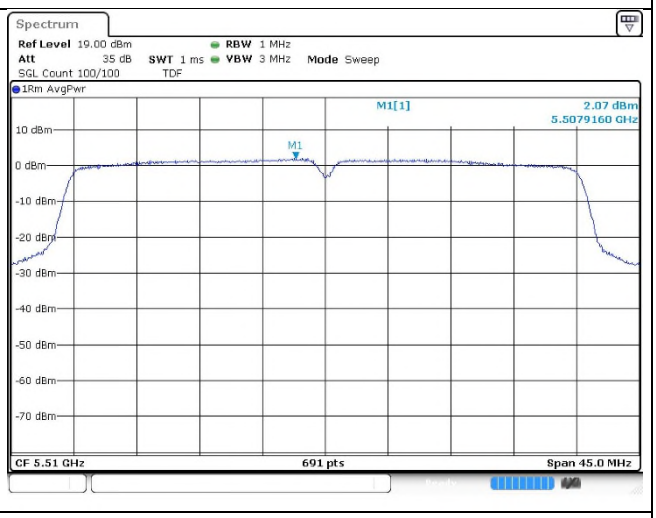
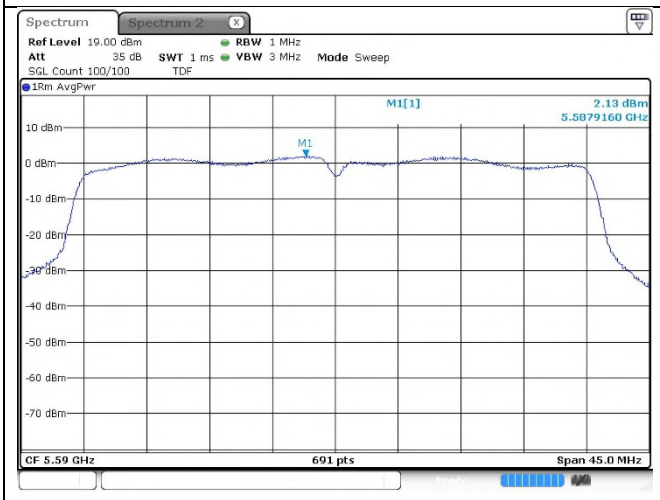
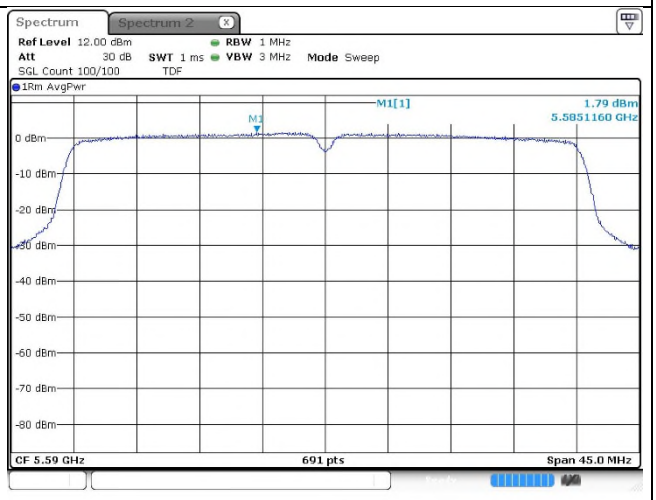
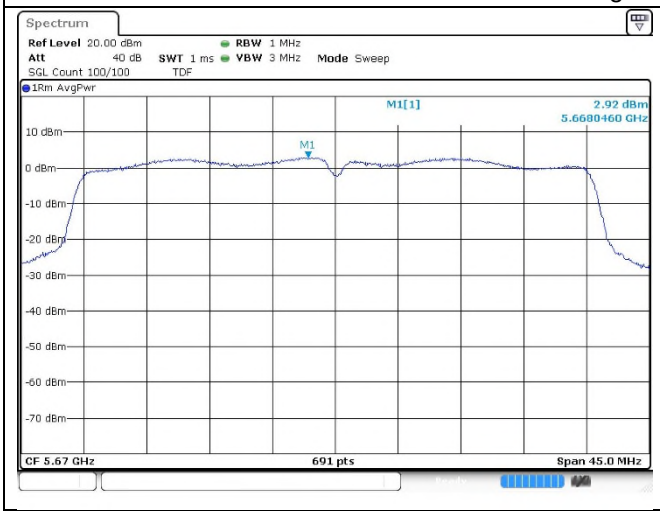
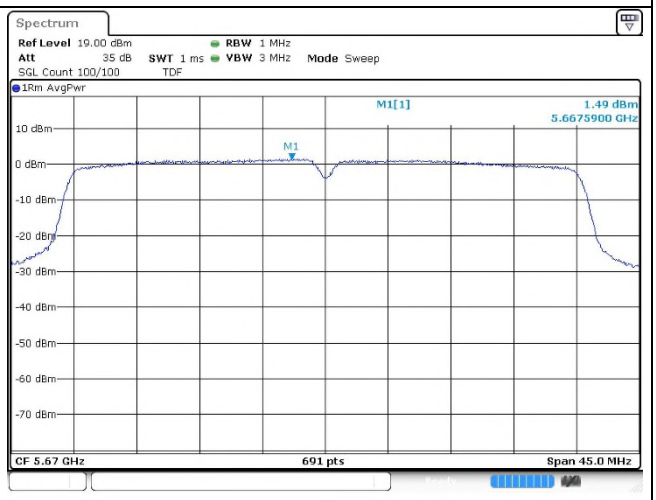
OFDM: 802.11n_HT40 (Band 1)

Ant.1	Ant.2
Low channel	
	
High channel	
	

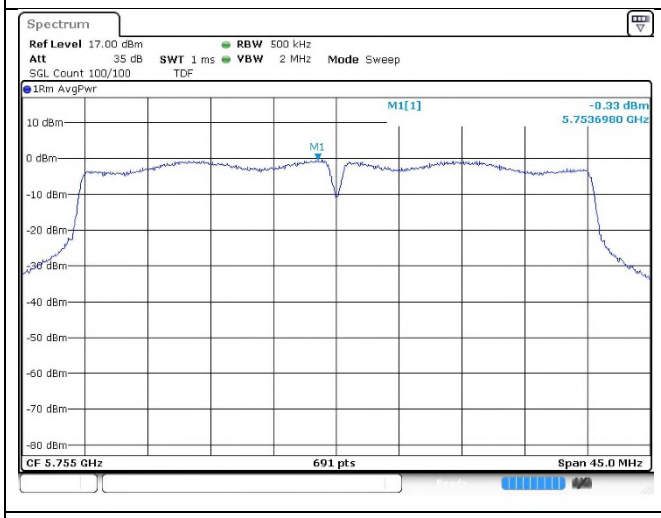
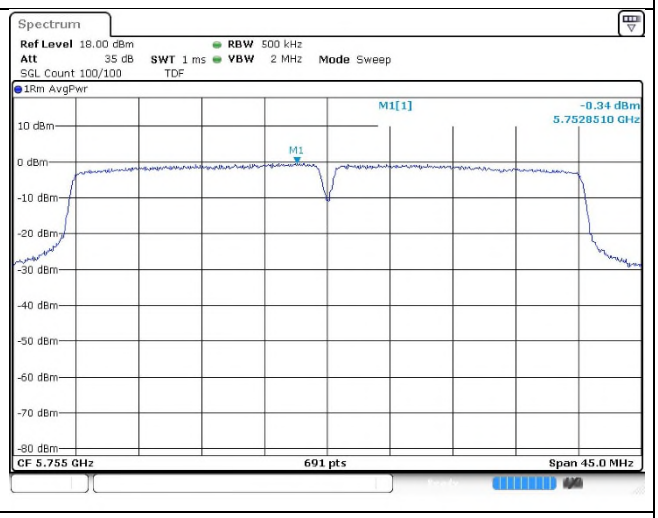
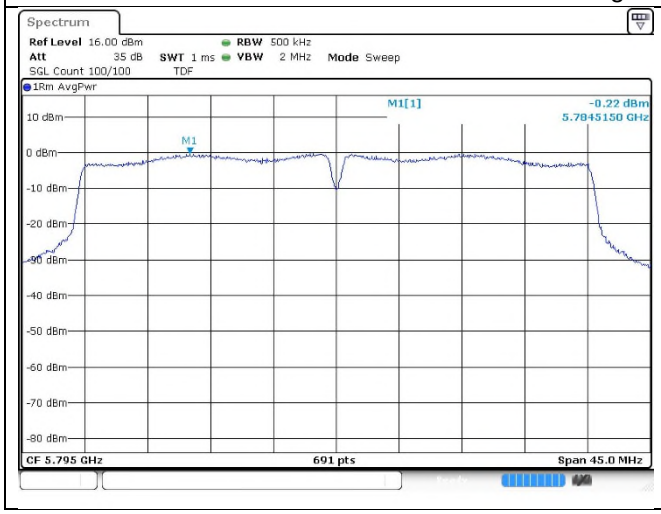
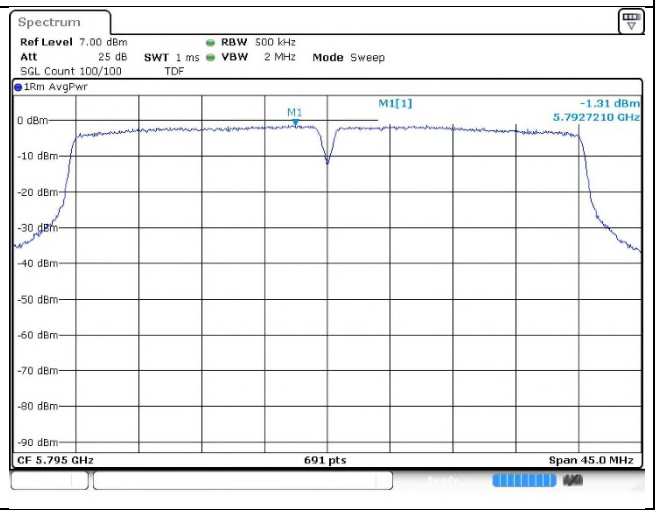
OFDM: 802.11n_HT40 (Band 2A)

Ant.1	Ant.2
Low channel	
	
High channel	
	

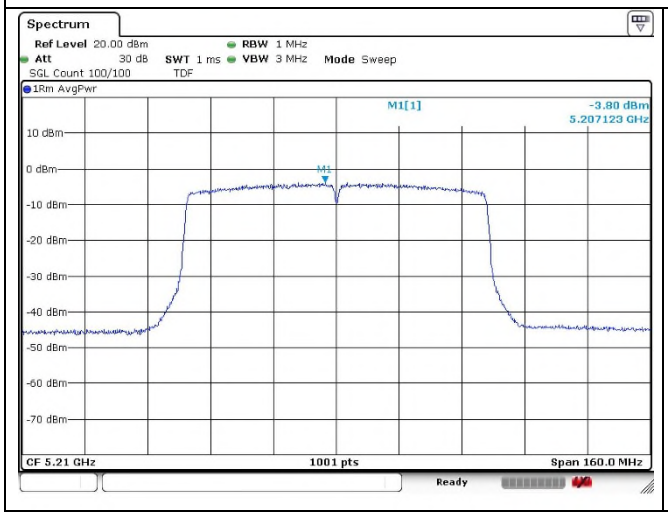
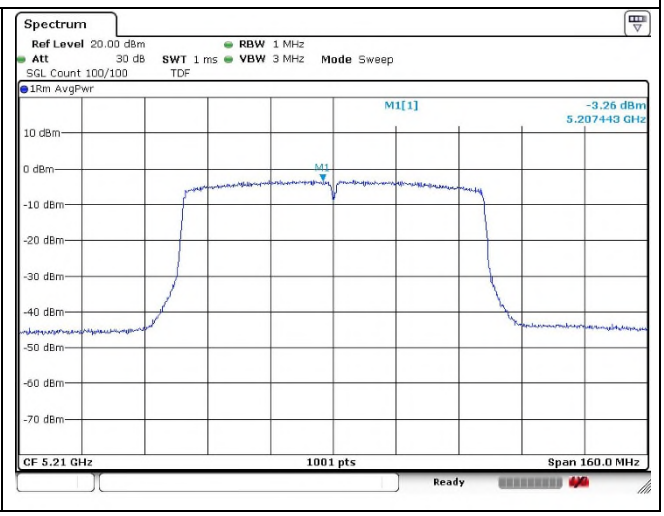
OFDM: 802.11n_HT40 (Band 2C)

Ant.1	Ant.2
Low channel	
	
Middle channel	
	
High channel	
	

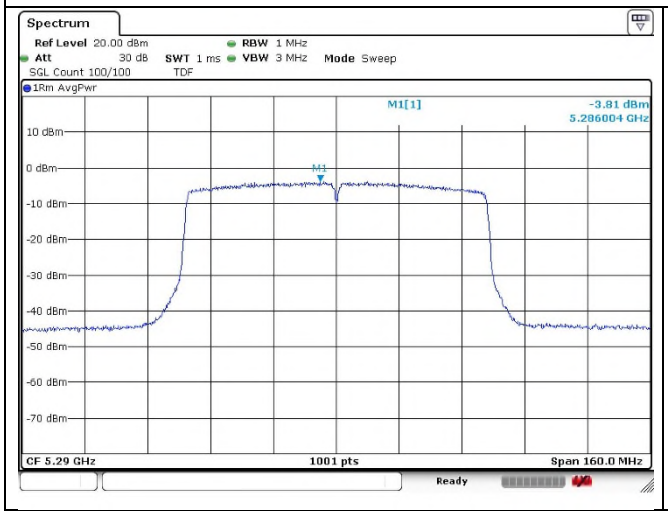
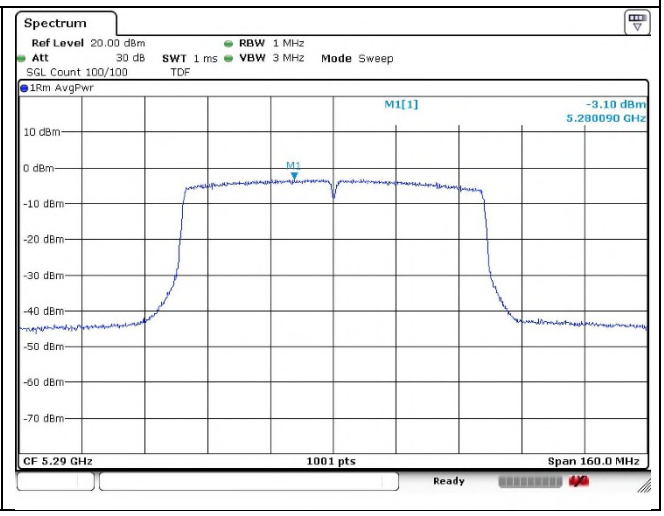
OFDM: 802.11n_HT40 (Band 3)

Ant.1	Ant.2
Low channel	
	
High channel	
	

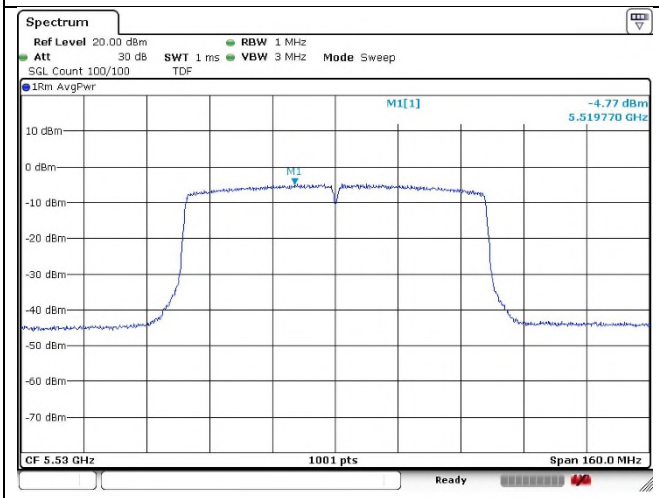
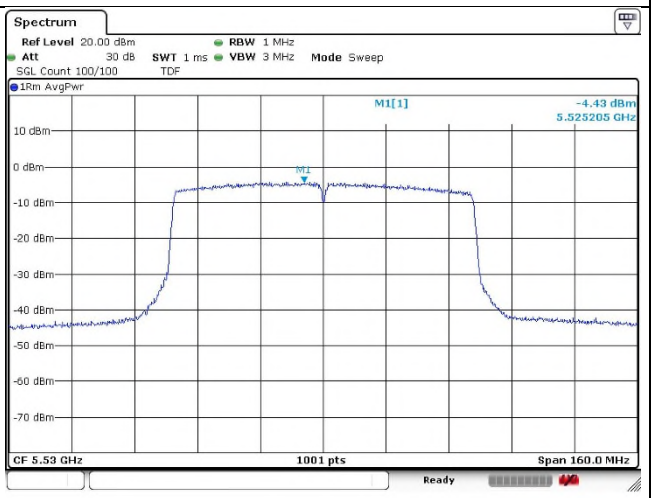
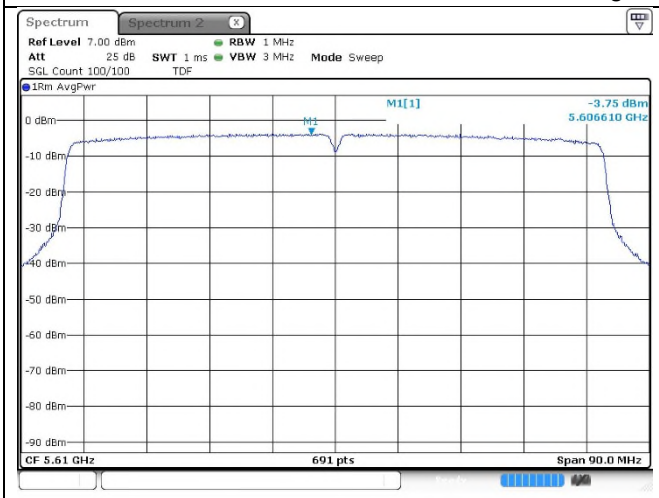
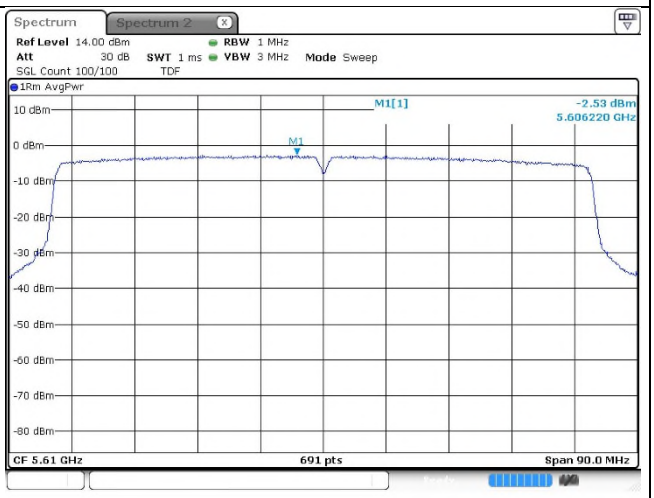
OFDM: 802.11ac_VHT80 (Band 1)

Ant.1	Ant.2
Middle channel	
	

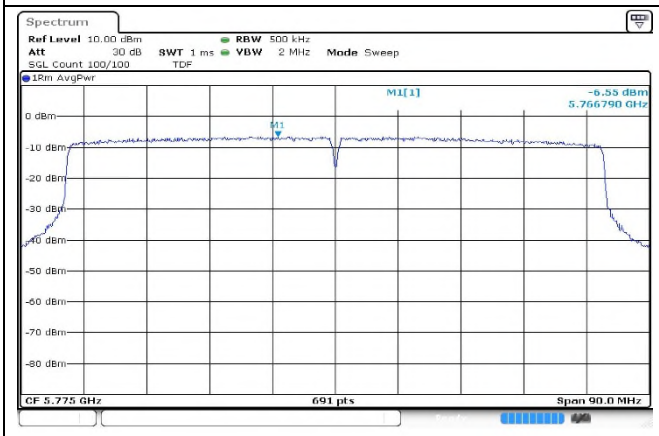
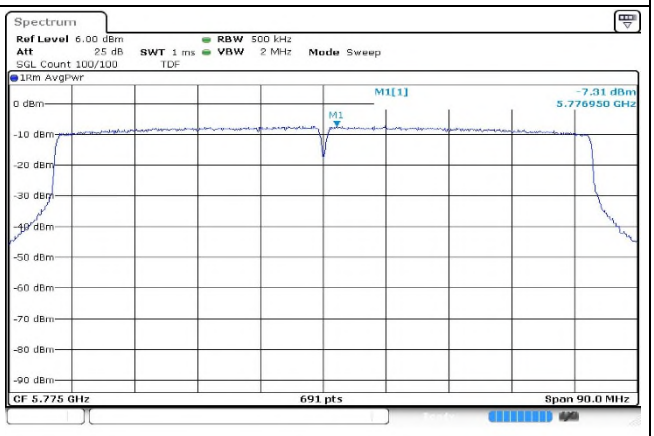
OFDM: 802.11ac_VHT80 (Band 2A)

Ant.1	Ant.2
Middle channel	
	

OFDM: 802.11ac_VHT80 (Band 2C)

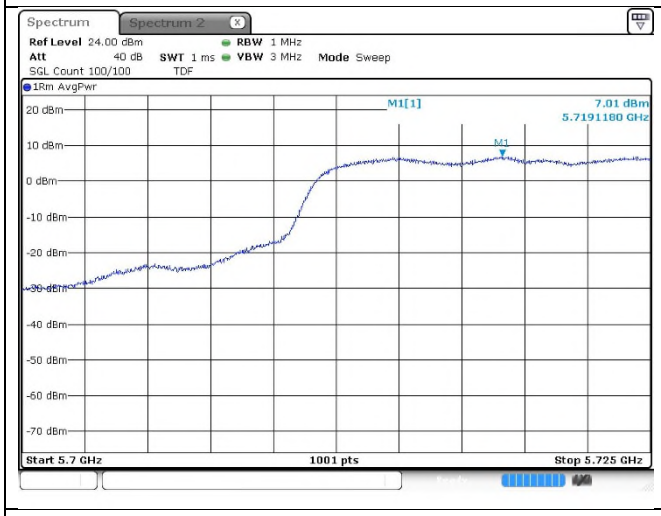
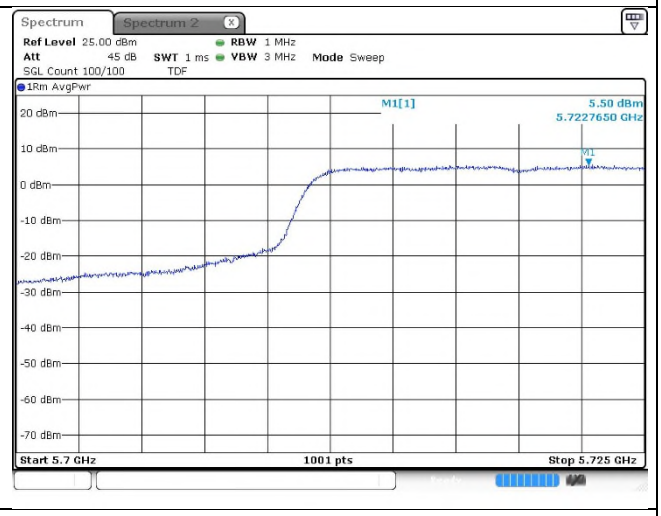
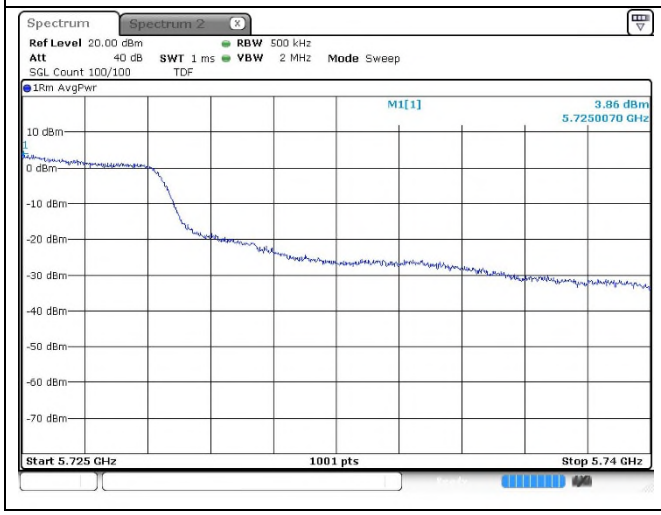
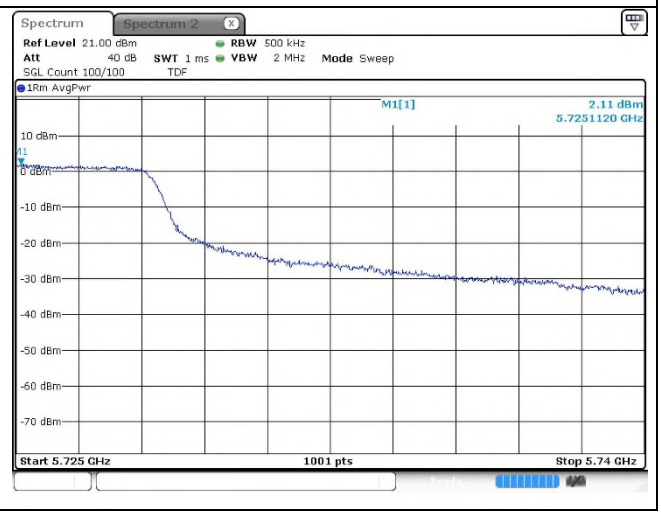
Ant.1	Ant.2
Low channel	
	
High channel	
	

OFDM: 802.11ac_VHT80 (Band 3)

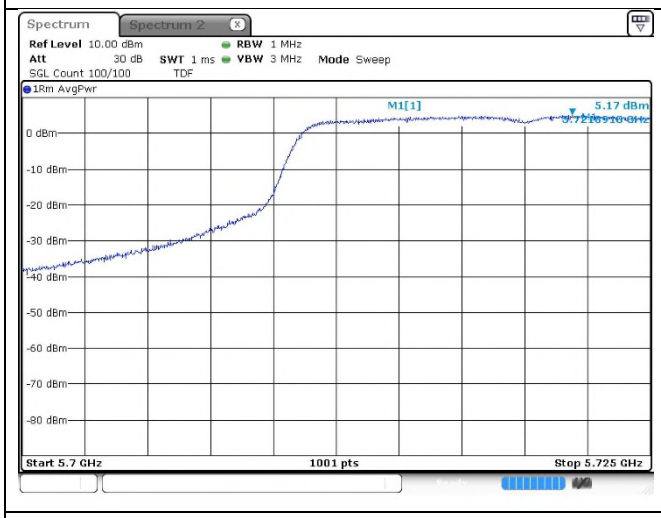
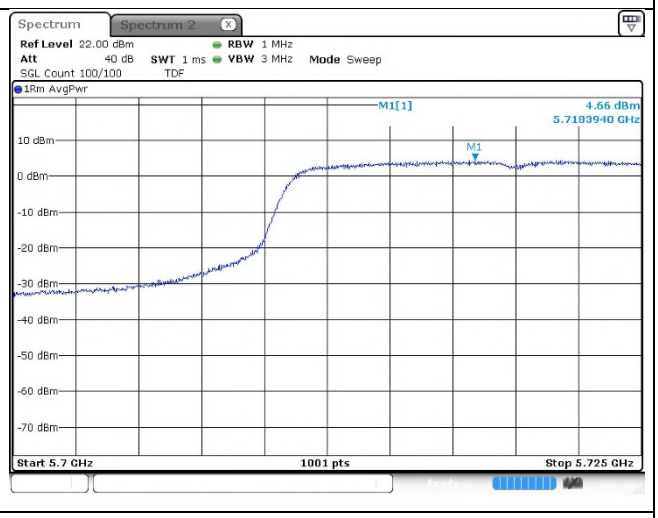
Ant.1	Ant.2
Middle channel	
	

- Straddle channels

OFDM: 802.11a

Ant.1	Ant.2
Band 2C	
	
Band 3	
	

OFDM: 802.11ac_VHT20

Ant.1	Ant.2
Band 2C	
	
Band 3