5.4. Power Spectral Density

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

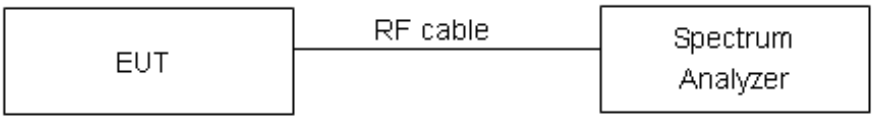
The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable.

Set RBW = 510 kHz, VBW =1.5MHz for the band 5.725-5.85 GHz

Set RBW = 1 MHz, VBW =3MHz for the band 5.150-5.250 GHz

The conducted PSD is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically.

Test setup



Limits

Rule FCC Part 15.407(a)(1)/ Part 15.407(a)(2) / Part 15.407(a)(3)
For an indoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmittingantennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Frequency Bands/MHz	Limits
5150-5250	17dBm/MHz
5725-5850	30dBm/500kHz

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 0.75dB.

Test Results:

Note: Power Spectral Density =Read Value+Duty cycle correction factor

Antenna 1

U-NII-1

Network Standards	Channel Number	Read Value (dBm /MHz)	Power Spectral Density (dBm /MHz)	Limit (dBm /MHz)	Conclusion
802.11a	36	0.30	0.33	17	PASS
	40	4.25	4.28	17	PASS
	48	6.07	6.10	17	PASS
802.11n HT20	36	0.14	0.19	17	PASS
	40	4.00	4.05	17	PASS
	48	6.12	6.17	17	PASS
802.11n HT40	38	-5.05	-4.92	17	PASS
	46	0.79	0.93	17	PASS
802.11ac VHT20	36	0.17	0.22	17	PASS
	40	4.11	4.16	17	PASS
	48	5.84	5.89	17	PASS
802.11ac VHT40	38	-4.95	-4.70	17	PASS
	46	0.91	1.15	17	PASS
802.11ac VHT80	42	-15.29	-15.01	17	PASS

U-NII-3

Network Standards	Channel Number	Read Value (dBm/500kHz)	Power Spectral Density (dBm/500kHz)	Limit (dBm/500kHz)	Conclusion
802.11a	149	4.63	4.66	30	PASS
	157	3.78	3.81	30	PASS
	165	4.38	4.41	30	PASS
802.11n HT20	149	4.09	4.14	30	PASS
	157	3.62	3.67	30	PASS
	165	4.38	4.43	30	PASS
802.11n HT40	151	1.95	2.09	30	PASS
	159	3.43	3.56	30	PASS
802.11ac VHT20	149	4.66	4.71	30	PASS
	157	3.45	3.50	30	PASS
	165	4.18	4.23	30	PASS
802.11ac VHT40	151	2.32	2.56	30	PASS
	159	2.88	3.12	30	PASS
802.11ac VHT80	155	-2.99	-2.71	30	PASS

Antenna 2

U-NII-1

Network Standards	Channel Number	Read Value (dBm /MHz)	Power Spectral Density (dBm /MHz)	Limit (dBm /MHz)	Conclusion
802.11a	36	1.09	1.12	17	PASS
	40	4.96	4.99	17	PASS
	48	6.41	6.44	17	PASS
802.11n HT20	36	0.32	0.37	17	PASS
	40	4.21	4.26	17	PASS
	48	5.24	5.29	17	PASS
802.11n HT40	38	-3.92	-3.79	17	PASS
	46	1.20	1.34	17	PASS
802.11ac VHT20	36	0.57	0.62	17	PASS
	40	4.70	4.75	17	PASS
	48	5.95	6.00	17	PASS
802.11ac VHT40	38	-4.06	-3.82	17	PASS
	46	0.80	1.05	17	PASS
802.11ac VHT80	42	-12.78	-12.50	17	PASS

U-NII-3

Network Standards	Channel Number	Read Value (dBm/500kHz)	Power Spectral Density (dBm/500kHz)	Limit (dBm/500kHz)	Conclusion
802.11a	149	4.94	4.97	30	PASS
	157	4.00	4.03	30	PASS
	165	4.77	4.80	30	PASS
802.11n HT20	149	4.72	4.77	30	PASS
	157	4.19	4.24	30	PASS
	165	4.56	4.61	30	PASS
802.11n HT40	151	3.05	3.19	30	PASS
	159	3.65	3.78	30	PASS
802.11ac VHT20	149	4.65	4.70	30	PASS
	157	4.41	4.46	30	PASS
	165	4.58	4.63	30	PASS
802.11ac VHT40	151	2.07	2.31	30	PASS
	159	4.21	4.45	30	PASS
802.11ac VHT80	155	-2.50	-2.22	30	PASS

MIMO

without Beamforming

U-NII-1

Network Standards	Channel/ Frequency (MHz)	Power Spectral Density					Limit (dBm /MHz)	Conclusion
		Antenna 1		Antenna 2		Total Power (dBm /MHz)		
		Read Value (dBm/MHz)	PSD (dBm /MHz)	Read Value (dBm/MHz)	PSD (dBm /MHz)			
802.11a	36/5180	1.21	1.24	1.68	1.71	4.49	17	PASS
	40/5200	4.82	4.85	5.72	5.75	8.33	17	PASS
	48/5240	6.53	6.56	6.24	6.27	9.43	17	PASS
802.11n HT20	36/5180	-0.05	0.00	0.80	0.85	3.45	17	PASS
	40/5200	3.97	4.02	4.36	4.41	7.23	17	PASS
	48/5240	5.77	5.82	5.89	5.94	8.89	17	PASS
802.11n HT40	38/5190	-4.59	-4.45	-3.82	-3.69	-1.04	17	PASS
	46/5230	0.99	1.13	1.17	1.30	4.23	17	PASS
802.11ac VHT20	36/5180	-0.31	-0.26	0.02	0.07	2.92	17	PASS
	40/5200	3.71	3.76	4.96	5.01	7.44	17	PASS
	48/5240	6.02	6.07	5.89	5.94	9.02	17	PASS
802.11ac VHT40	38/5190	-5.11	-4.86	-4.07	-3.83	-1.30	17	PASS
	46/5230	1.34	1.58	0.89	1.13	4.37	17	PASS
802.11ac VHT80	42/5210	-15.79	-15.51	-12.81	-12.53	-10.76	17	PASS

Note: 1. Power Spectral Density =Read Value+Duty cycle correction factor

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),the power spectral density=$10\log(10^{(\text{PSD antenna1 in dBm/10})}+10^{(\text{PSD antenna2 in dBm/10})}$.

3. The manufacturer declared the transmitter output signals is CDD mode And Nss=2. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = GANT + Array Gain, For PSD measurements on all devices,Array Gain=10log(Nant/Nss)dB,so directional gain=GANT+Array Gain=4+10log（2/2)=4＜6 dBi. So the PSD limt is 17 dBm.

U-NII-3

Network Standards	Channel/ Frequency (MHz)	Power Spectral Density					Limit (dBm /MHz)	Conclusion
		Antenna 1		Antenna 2		Total Power (dBm /MHz)		
		Read Value (dBm/MHz)	PSD (dBm /MHz)	Read Value (dBm/MHz)	PSD (dBm /MHz)			
802.11a	149/5745	4.72	4.76	4.92	4.95	7.86	30	PASS
	157/5785	4.22	4.25	4.64	4.68	7.48	30	PASS
	165/5825	5.04	5.07	4.92	4.95	8.02	30	PASS
802.11n HT20	149/5745	3.92	3.97	4.76	4.81	7.42	30	PASS
	157/5785	3.65	3.70	4.22	4.27	7.00	30	PASS
	165/5825	4.05	4.10	4.76	4.81	7.48	30	PASS
802.11n HT40	151/5755	1.42	1.56	2.78	2.92	5.30	30	PASS
	159/5795	3.07	3.21	4.13	4.27	6.78	30	PASS
802.11ac VHT20	149/5745	4.03	4.08	4.49	4.54	7.32	30	PASS
	157/5785	3.85	3.90	3.47	3.52	6.73	30	PASS
	165/5825	3.81	3.86	4.14	4.19	7.04	30	PASS
802.11ac VHT40	151/5755	2.44	2.68	2.49	2.73	5.72	30	PASS
	159/5795	3.09	3.33	4.30	4.55	6.99	30	PASS
802.11ac VHT80	155/5775	-3.06	-2.79	-2.36	-2.08	0.59	30	PASS

Note: 1. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),

The Total Power =$10\log(10^{(\text{Power antenna1 in dBm}/10)}+10^{(\text{Power antenna2 in dBm}/10)})$.

2. The manufacturer declared the transmitter output signals is CDD mode And Nss=2. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = GANT + Array Gain, For PSD measurements on all devices,Array Gain=10log(Nant/Nss)dB, so directional gain=GANT+Array Gain=4+10log（2/2)= 4＜6 dBi. So the PSD limt is 30 dBm.

MIMO

with Beamforming

U-NII-1

Network Standards	Channel/ Frequency (MHz)	Power Spectral Density					Limit (dBm /MHz)	Conclusion
		Antenna 1		Antenna 2		Total Power (dBm /MHz)		
		Read Value (dBm/MHz)	PSD (dBm /MHz)	Read Value (dBm/MHz)	PSD (dBm /MHz)			
802.11ac VHT20	36/5180	0.25	0.30	0.33	0.38	3.35	17	PASS
	40/5200	3.68	3.73	4.56	4.61	7.20	17	PASS
	48/5240	5.83	5.88	6.25	6.30	9.11	17	PASS
802.11ac VHT40	38/5190	-4.97	-4.73	-4.13	-3.88	-1.28	17	PASS
	46/5230	1.29	1.53	1.27	1.52	4.54	17	PASS
802.11ac VHT80	42/5210	-15.29	-15.01	-12.40	-12.12	-10.32	17	PASS

Note: 1. Power Spectral Density =Read Value+Duty cycle correction factor

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),the power spectral density=$10\log(10^{(\text{PSD antenna1 in dBm/10})}+10^{(\text{PSD antenna2 in dBm/10})}$.

3. The manufacturer declared the transmitter output signals is CDD mode And Nss=2. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = GANT + Array Gain, For PSD measurements on all devices,Array Gain=10log(Nant/Nss)dB,so directional gain=GANT+Array Gain=4+10log（2/2)=4＜6 dBi. So the PSD limt is 17 dBm.

U-NII-3

Network Standards	Channel/ Frequency (MHz)	Power Spectral Density					Limit (dBm /MHz)	Conclusion
		Antenna 1		Antenna 2		Total Power (dBm /MHz)		
		Read Value (dBm/MHz)	PSD (dBm /MHz)	Read Value (dBm/MHz)	PSD (dBm /MHz)			
802.11ac VHT20	149/5745	4.30	4.35	4.85	4.90	7.64	30	PASS
	157/5785	3.96	4.01	3.50	3.55	6.80	30	PASS
	165/5825	3.54	3.59	4.57	4.62	7.15	30	PASS
802.11ac VHT40	151/5755	1.82	2.06	2.57	2.81	5.46	30	PASS
	159/5795	2.99	3.23	4.19	4.43	6.88	30	PASS
802.11ac VHT80	155/5775	-3.15	-2.87	-2.51	-2.23	0.47	30	PASS

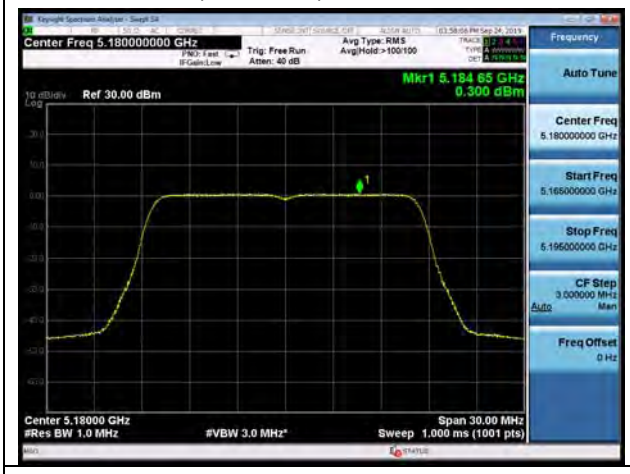
Note: 1. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),

The Total Power =$10\log(10^{(\text{Power antenna1 in dBm/10})}+10^{(\text{Power antenna2 in dBm/10})})$.

2. The manufacturer declared the transmitter output signals is CDD mode And Nss=2. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = GANT + Array Gain, For PSD measurements on all devices,Array Gain=10log(Nant/Nss)dB, so directional gain=GANT+Array Gain=4+10log（2/2)= 4＜6 dBi. So the PSD limt is 30 dBm.

SISO Antenna 1

U-NII-1, 802.11a, Channel No.: 36

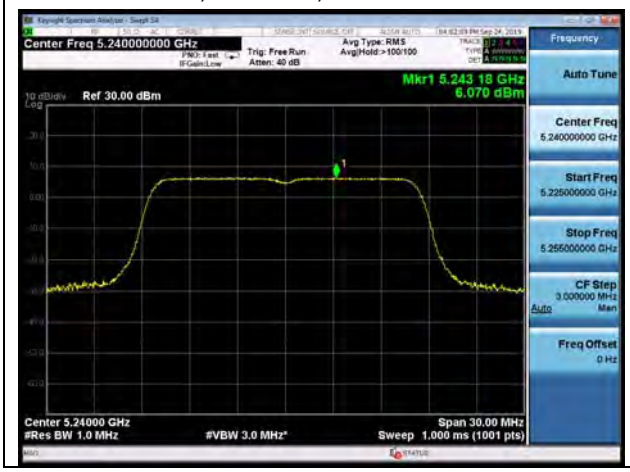


U-NII-1, 802.11n HT20, Channel No.: 36

U-NII-1, 802.11a, Channel No.: 40

U-NII-1, 802.11n HT20, Channel No.: 40

U-NII-1, 802.11a, Channel No.: 48



U-NII-1, 802.11n HT20, Channel No.: 48

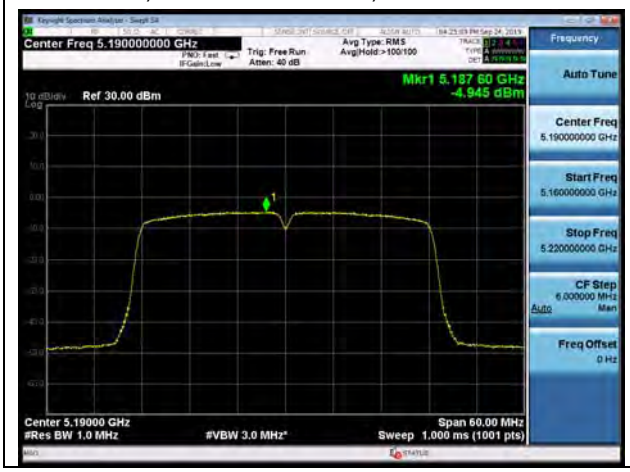
U-NII-1, 802.11n HT40, Channel No.: 38

U-NII-1, 802.11ac VHT20, Channel No.: 36

U-NII-1, 802.11n HT40, Channel No.: 46

U-NII-1, 802.11ac VHT20, Channel No.: 40

U-NII-1, 802.11ac VHT40, Channel No.: 38



U-NII-1, 802.11ac VHT20, Channel No.: 48

U-NII-1, 802.11ac VHT40, Channel No.: 46

U-NII-1, 802.11ac VHT80, Channel No.: 42

U-NII-3, 802.11a, Channel No.: 149

U-NII-3, 802.11n HT20, Channel No.: 149

U-NII-3, 802.11a, Channel No.: 157

U-NII-3, 802.11n HT20, Channel No.: 157

U-NII-3, 802.11a, Channel No.: 165

U-NII-3, 802.11n HT20, Channel No.: 165

U-NII-3, 802.11n HT40, Channel No.: 151

U-NII-3, 802.11ac VHT20, Channel No.: 149

U-NII-3, 802.11n HT40, Channel No.: 159

U-NII-3, 802.11ac VHT20, Channel No.: 157

U-NII-3, 802.11ac VHT40, Channel No.: 151

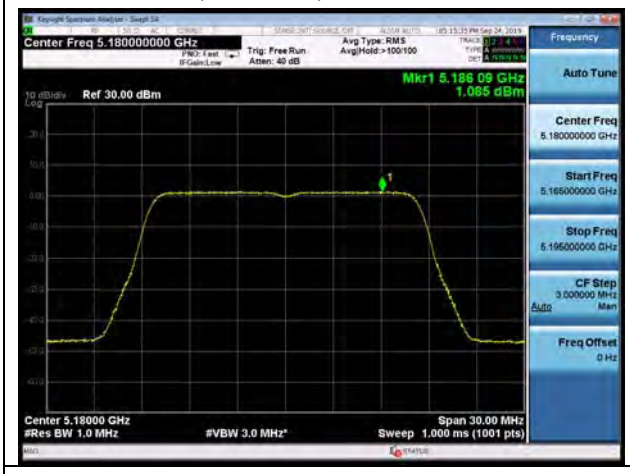
U-NII-3, 802.11ac VHT20, Channel No.: 165

U-NII-3, 802.11ac VHT40, Channel No.: 159

U-NII-3, 802.11ac VHT80, Channel No.: 155

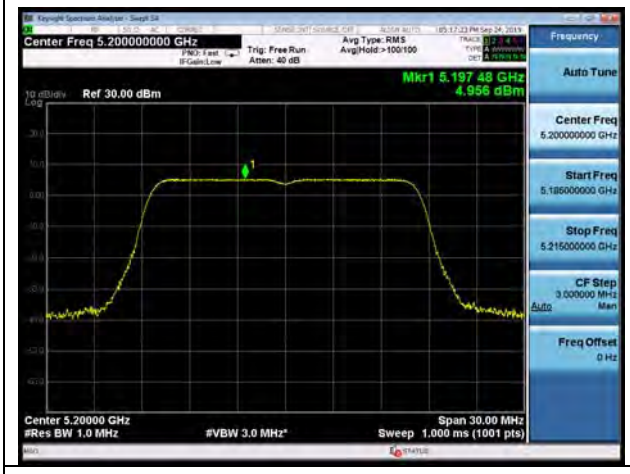
SISO Antenna 2

U-NII-1, 802.11a, Channel No.: 36



U-NII-1, 802.11n HT20, Channel No.: 36

U-NII-1, 802.11a, Channel No.: 40



U-NII-1, 802.11n HT20, Channel No.: 40

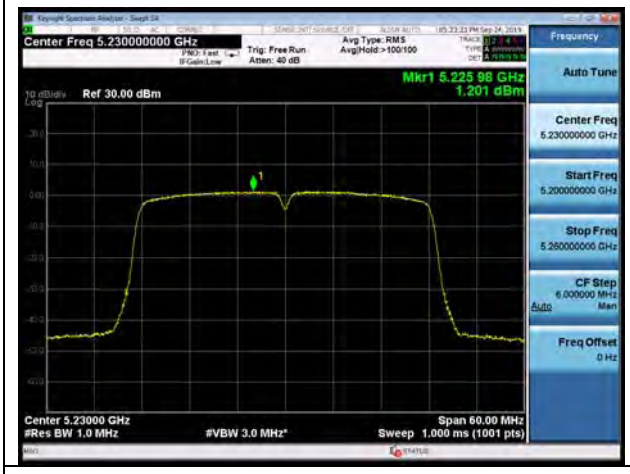
U-NII-1, 802.11a, Channel No.: 48

U-NII-1, 802.11n HT20, Channel No.: 48

U-NII-1, 802.11n HT40, Channel No.: 38

U-NII-1, 802.11ac VHT20, Channel No.: 36

U-NII-1, 802.11n HT40, Channel No.: 46



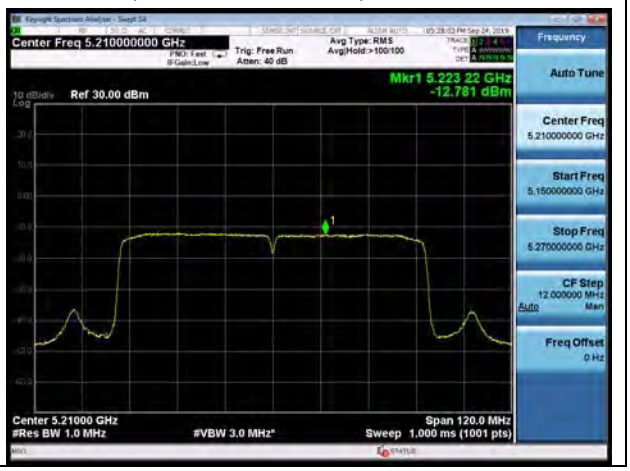
U-NII-1, 802.11ac VHT20, Channel No.: 40

U-NII-1, 802.11ac VHT40, Channel No.: 38

U-NII-1, 802.11ac VHT20, Channel No.: 48

U-NII-1, 802.11ac VHT40, Channel No.: 46

U-NII-1, 802.11ac VHT80, Channel No.: 42



U-NII-3, 802.11a, Channel No.: 149

U-NII-3, 802.11n HT20, Channel No.: 149

U-NII-3, 802.11a, Channel No.: 157

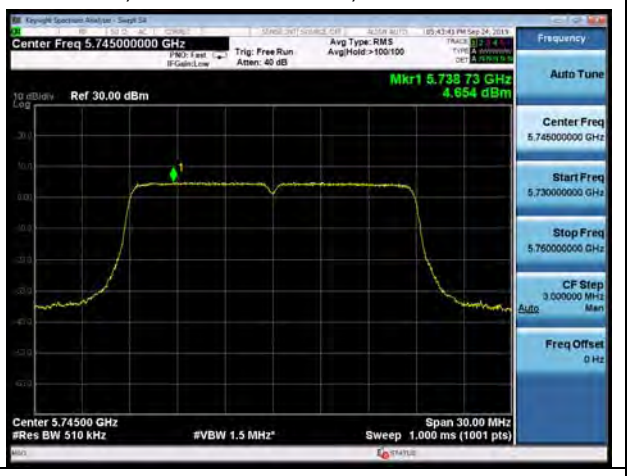
U-NII-3, 802.11n HT20, Channel No.: 157

U-NII-3, 802.11a, Channel No.: 165

U-NII-3, 802.11n HT20, Channel No.: 165

U-NII-3, 802.11n HT40, Channel No.: 151

U-NII-3, 802.11ac VHT20, Channel No.: 149



U-NII-3, 802.11n HT40, Channel No.: 159

U-NII-3, 802.11ac VHT20, Channel No.: 157