

5.5 PEAK POWER SPECTRAL DENSITY

Test Requirement: FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(1)(2)(3)

Test Method: KDB 789033 D02 v02r01 Section F

Limits: FCC 47 CFR Part 15 Subpart E

1. For the band 5.15-5.25 GHz.
 - (i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, 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. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).
 - (ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, 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.
 - (iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. 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.
 - (iv) For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 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.
2. For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 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.

Test Procedure:

The output from the transmitter was connected to an attenuator and then to the input of the RF Spectrum Analyzer.

Spectrum analyzer according to the following Settings:

1. For U-NII-1, U-NII-2A, U-NII-2C band:

Using method SA-2

- a) Set span to encompass the entire emission bandwidth (EBW) of the signal.
- b) Set RBW = 1 MHz, Set VBW $\geq$ 3 RBW, Detector = RMS
- c) Sweep time = auto, trigger set to "free run".
- d) Trace average at least 100 traces in power averaging mode.

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e) Record the max value and add 10 log (1/duty cycle)

2. For U-NII-3 band:

a) Set span to encompass the entire emission bandwidth (EBW) of the signal.

b) Set RBW = 500 kHz, Set VBW ≥ 3 RBW, Detector = RMS

c) Use the peak marker function to determine the maximum power level in any 500 kHz band segment within the fundamental EBW.

d) Sweep time = auto, trigger set to "free run".

e) Trace average at least 100 traces in power averaging mode.

f) Record the max value and add 10 log (1/duty cycle)

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.5.3 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Transmitter mode

Test Results: Pass

Test Data:

Directional gain and the maximum power spectral density limit.

FCC 47 CFR Part 15 Subpart E

Frequency Band	Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Correlated chains directional gain (dBi)	PSD Limits (dBm/MHz or dBm/500kHz)
U-NII-1	3.20	3.20	6.21	10.79
U-NII-2A	3.40	3.40	6.41	10.59
U-NII-2C	5.36	5.36	8.37	8.63

Unequal antenna gains, with equal transmit powers. Directional gain is to be computed as follows:
If transmit signals are correlated, then
Directional gain = $10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / NANT]$ dBi [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.]

Frequency band 5150-5250 MHz

Mode	Channel/ Frequency (MHz)	Power spectral density (dBm/MHz)		Total power spectral density Chain 0+1 (dBm/MHz)	Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1			
IEEE 802.11a (CDD)	36 (5180)	-2.86	-2.05	0.57	10.79	Pass
	44 (5220)	-6.88	-5.34	-3.03	10.79	Pass
	48 (5240)	-3.03	-5.06	-0.92	10.79	Pass
IEEE 802.11n-HT20 (MIMO)	36 (5180)	-2.67	-2.75	0.30	10.79	Pass
	44 (5220)	-2.39	-2.64	0.50	10.79	Pass
	48 (5240)	-2.64	2.51	3.67	10.79	Pass
IEEE 802.11n-HT40 (MIMO)	38 (5190)	-7.64	-1.06	-0.20	10.79	Pass
	46 (5230)	-6.63	-2.86	-1.34	10.79	Pass
IEEE 802.11ac-VHT80 (MIMO)	42 (5210)	-8.76	-10.22	-6.42	10.79	Pass

Remark:

- Power spectral density = Conducted power spectral density + Duty Cycle Factor
- Total Power (Chain 0+1) = $10 \cdot \log[(10^{Chain\ 0/10}) + (10^{Chain\ 1/10})]$

Frequency band 5250-5350 MHz

Mode	Channel/ Frequency (MHz)	Power spectral density (dBm/MHz)		Total power spectral density Chain 0+1 (dBm/MHz)	Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1			
IEEE 802.11a (CDD)	52 (5260)	-1.26	-2.95	0.99	10.59	Pass
	60 (5300)	-1.74	-2.76	0.79	10.59	Pass
	64 (5320)	-1.67	-2.89	0.77	10.59	Pass
IEEE 802.11n-HT20 (MIMO)	52 (5260)	-0.82	3.71	5.02	10.59	Pass
	60 (5300)	-1.08	2.67	4.20	10.59	Pass
	64 (5320)	-0.76	-2.69	1.39	10.59	Pass
IEEE 802.11n-HT40 (MIMO)	54 (5270)	-7.07	-1.88	-0.73	10.59	Pass
	62 (5310)	-7.37	-1.13	-0.20	10.59	Pass
IEEE 802.11ac- VHT80 (MIMO)	58 (5290)	-9.29	-10.72	-6.94	10.59	Pass

Remark:

- Power spectral density = Conducted power spectral density + Duty Cycle Factor
- Total Power (Chain 0+1) = $10 \cdot \log[(10^{\text{Chain 0/10}}) + (10^{\text{Chain 1/10}})]$

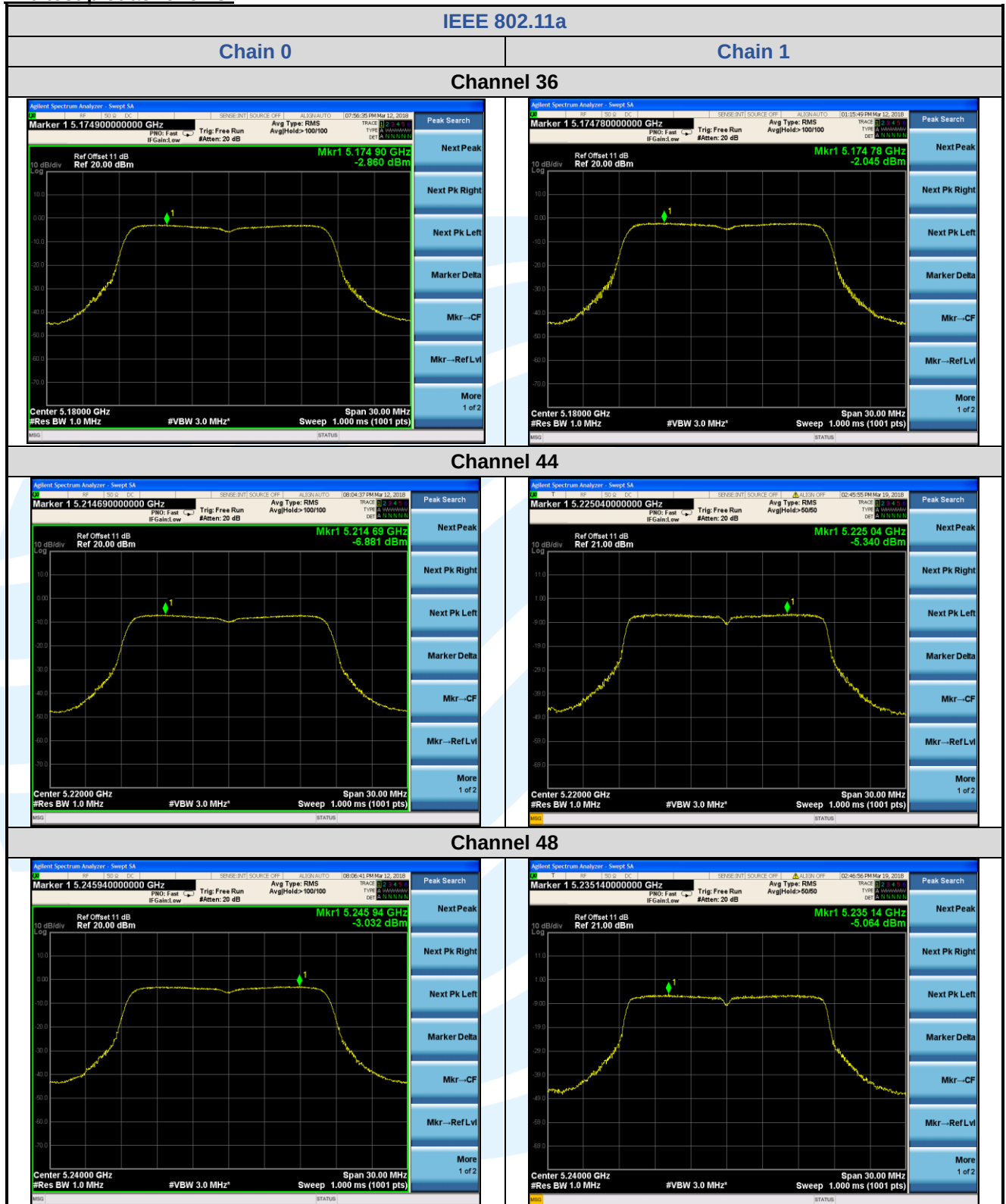
Frequency bands 5470-5725 MHz (Not including 5600-5650 MHz)

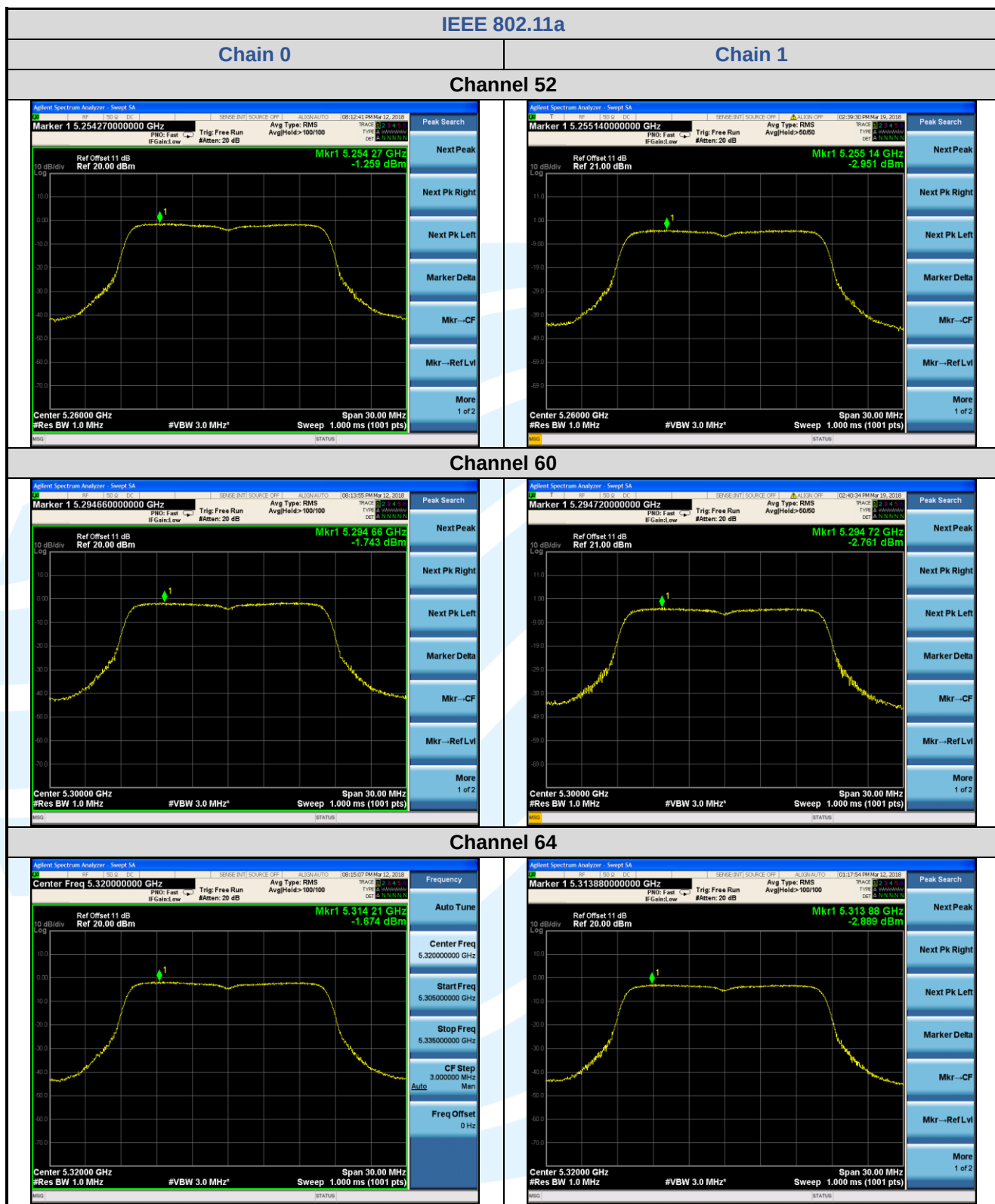
Mode	Channel/ Frequency (MHz)	Power spectral density (dBm/MHz)		Total power spectral density Chain 0+1 (dBm/MHz)	Limit (dBm/MHz)	Pass / Fail
		Chain 0	Chain 1			
IEEE 802.11a (CDD)	100 (5500)	-1.28	-3.19	0.88	8.63	Pass
	116 (5580)	1.92	-4.04	2.90	8.63	Pass
	140 (5700)	-0.94	-2.90	1.20	8.63	Pass
IEEE 802.11n-HT20 (MIMO)	100 (5500)	-1.42	-3.15	0.81	8.63	Pass
	116 (5580)	-1.83	0.75	2.66	8.63	Pass
	140 (5700)	-4.65	-5.64	-2.11	8.63	Pass
IEEE 802.11n-HT40 (MIMO)	102 (5510)	-4.94	-0.64	0.73	8.63	Pass
	134 (5670)	-3.75	-0.20	1.39	8.63	Pass
IEEE 802.11ac- VHT80 (MIMO)	106 (5530)	-8.94	-10.85	-6.78	8.63	Pass

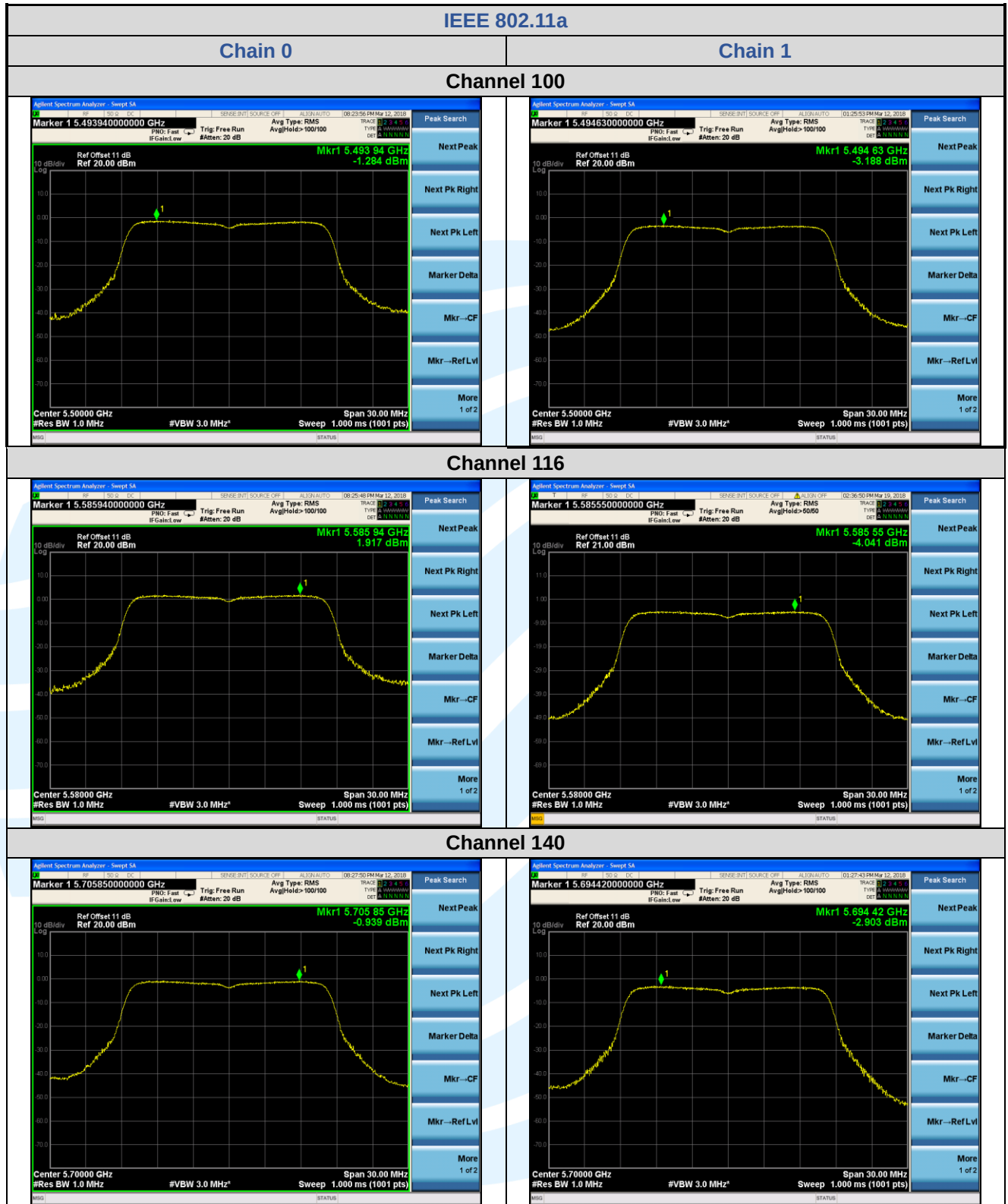
Remark:

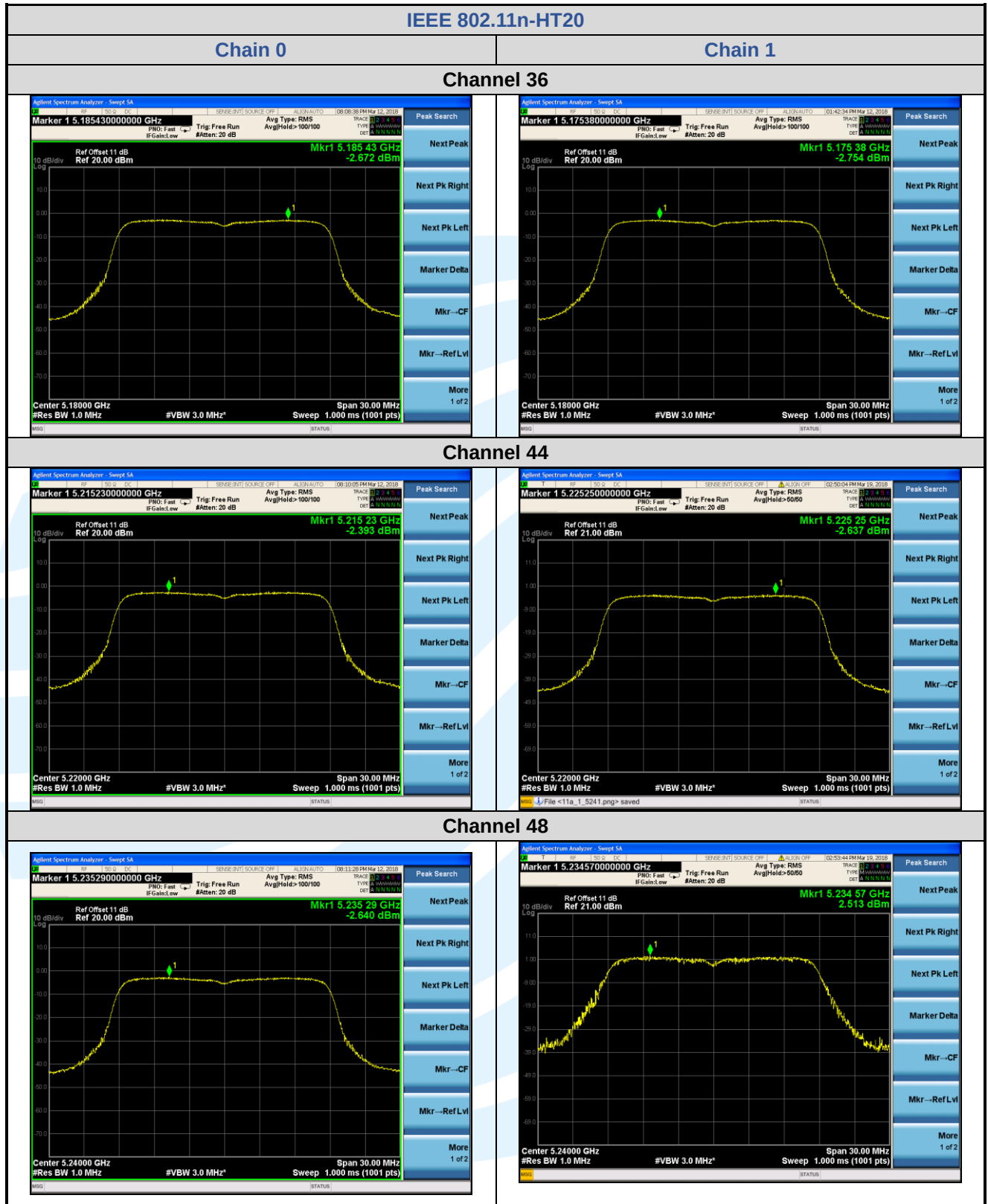
- Power spectral density = Conducted power spectral density + Duty Cycle Factor
- Total Power (Chain 0+1) = $10 \cdot \log[(10^{\text{Chain 0/10}}) + (10^{\text{Chain 1/10}})]$

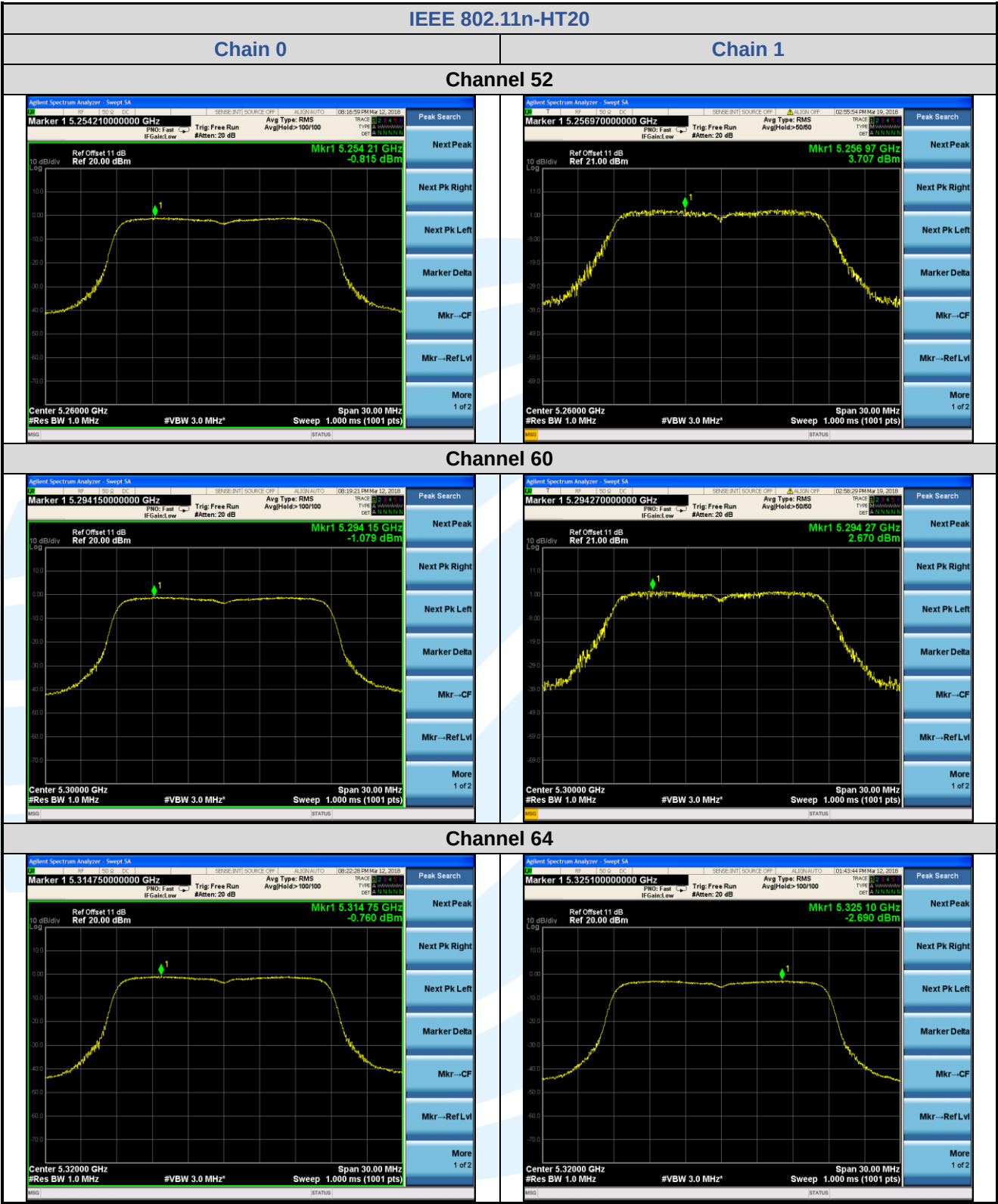
The test plot as follows:

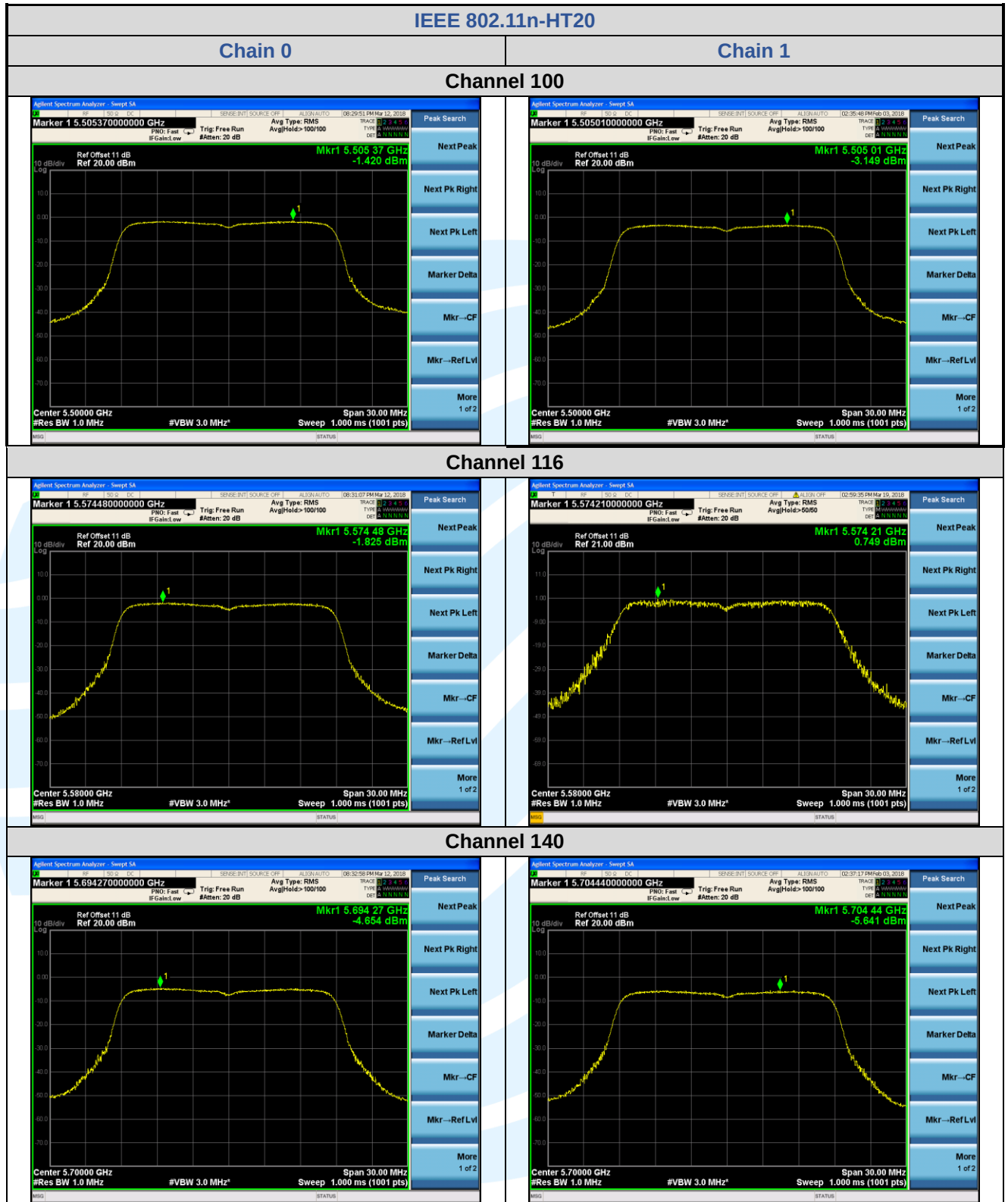


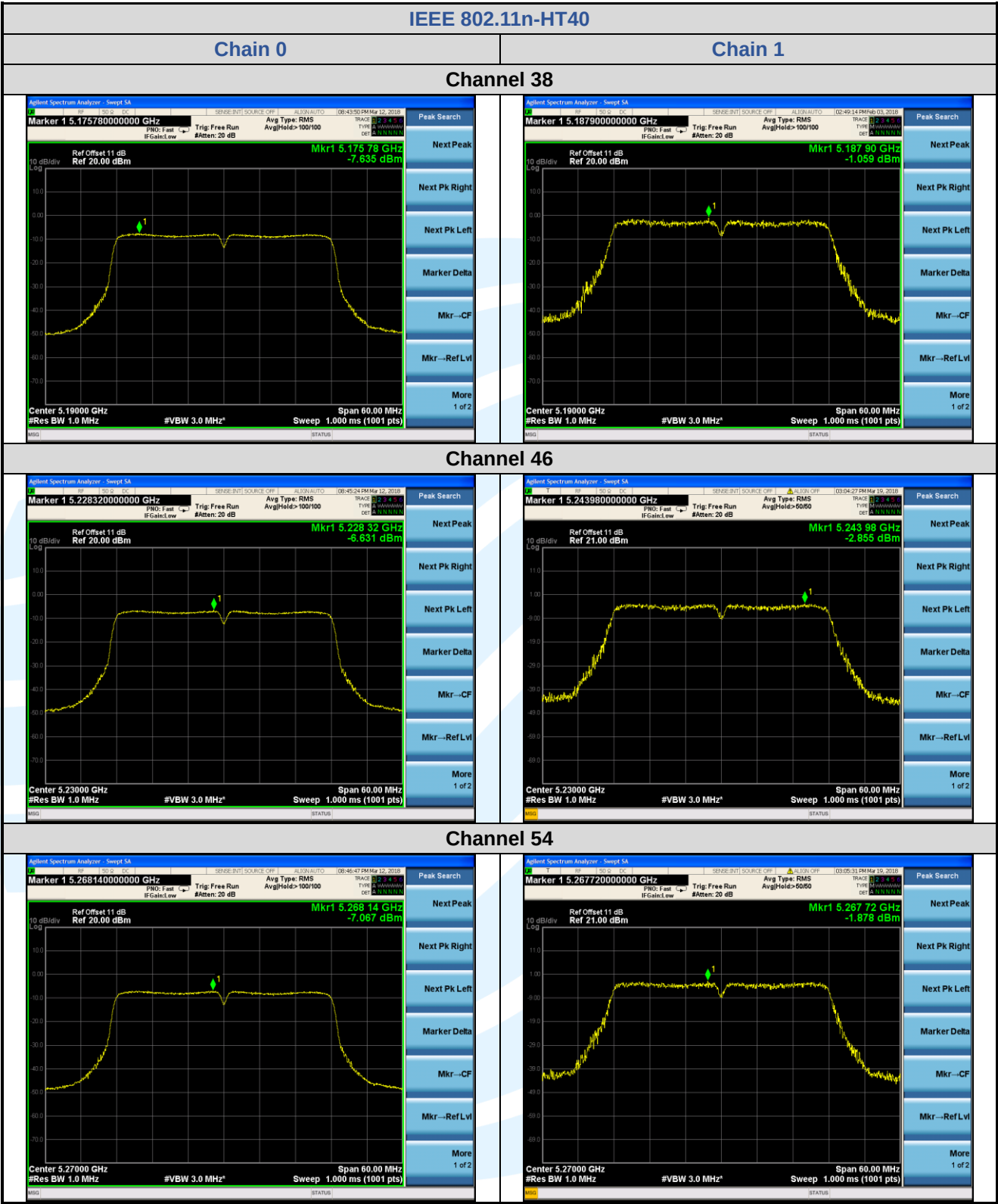


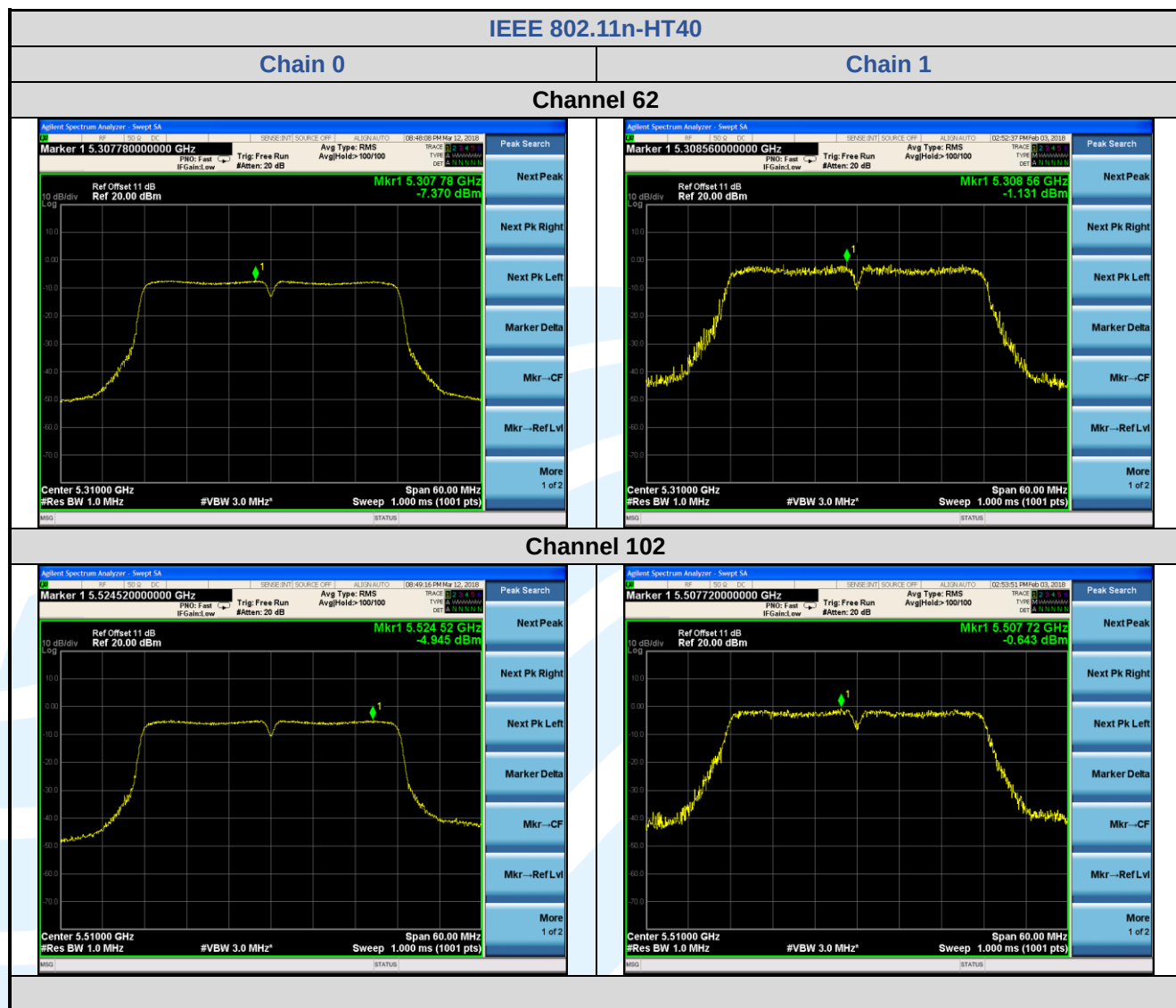


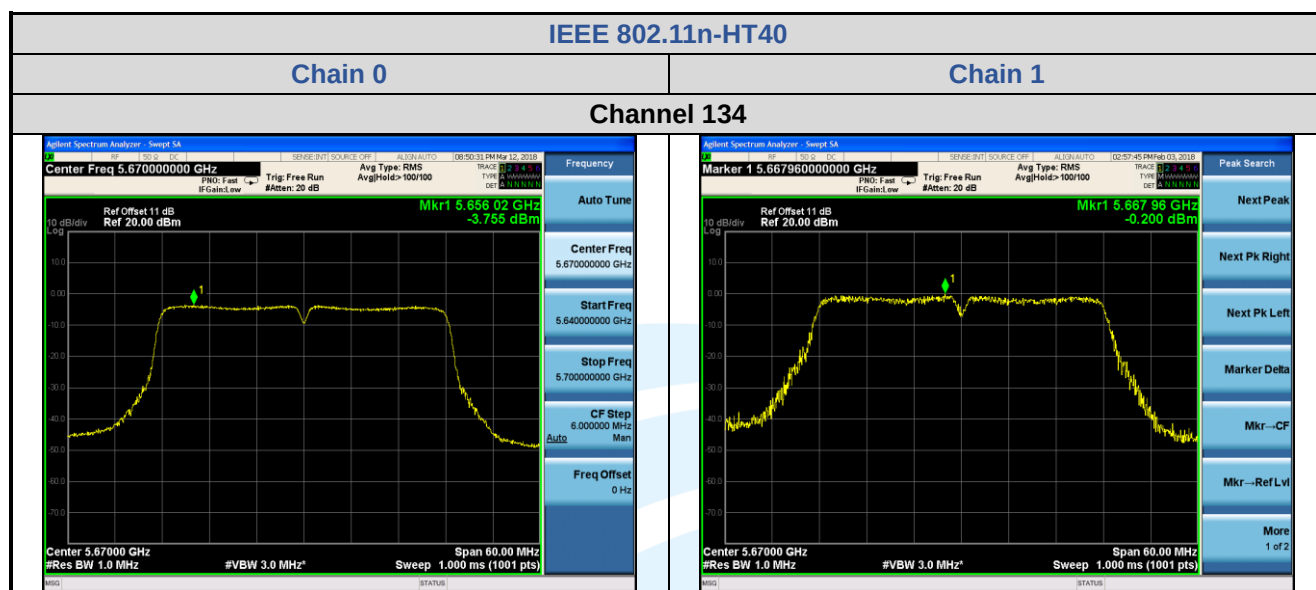














5.6 FREQUENCY STABILITY

Test Requirement: FCC 47 CFR Part 15 Subpart E Section 15.407 (g)

Test Method: ANSI C63.10-2013

Limit: The frequency of the carrier signal shall be maintained within band of operation.

Test Procedure:

a) To ensure emission at the band edge is maintained within the authorized band, those values shall be measured by radiation emissions at upper and lower frequency points, and finally compensated by frequency deviation as procedures below.

b) The EUT was operated at the maximum output power, and connected to the spectrum analyzer, which is set to maximum hold function and peak detector. The peak value of the power envelope was measured and noted. The upper and lower frequency points were respectively measured relatively 10 dB lower than the measured peak value.

c) The frequency deviation was calculated by adding the upper frequency point and the lower frequency point divided by two. Those detailed values of frequency deviation are provided in table below.

EUT Operation Condition:

☐ Keep the EUT transmit at un-modulation mode to frequency stability

☒ Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate.

Test Setup: Refer to section 4.5.3 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Transmitter mode

Test Results: Pass

Test Data:

Frequency Stability Versus Temp.			
Operation Frequency: 5180 MHz			
Temp.	Voltage	Measured Frequency	Frequency Drift
(°C)		(MHz)	(ppm)
70		5179.939134	-11.750193
60		5179.975299	-4.768533
50		5179.984356	-3.020077
40		5179.997651	-0.453475
30		5179.997821	-0.420656
20		5179.996870	-0.604247
10		5179.987651	-2.383977
0		5179.986545	-2.597490
Frequency Stability Versus Voltage			
Operation Frequency: 5180 MHz			
Temp.	Voltage	Measured Frequency	Frequency Drift
TN	VL	5179.995475	-0.873552
	VN	5179.994222	-1.115444
	VH	5179.994063	-1.146139

Frequency Stability Versus Temp.			
Operation Frequency: 5320 MHz			
Temp. (°C)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
70	VN	5319.974428	-4.806767
60		5319.984005	-3.006579
50		5319.985001	-2.819361
40		5319.994462	-1.040977
30		5319.994032	-1.121805
20		5319.994482	-1.037218
10		5319.995315	-0.880639
0		5319.995024	-0.935338

Frequency Stability Versus Voltage			
Operation Frequency: 5320 MHz			
Temp.	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
TN	VL	5320.005427	1.020113
	VN	5320.005285	0.993421
	VH	5320.004276	0.803759

Frequency Stability Versus Temp.			
Operation Frequency: 5500 MHz			
Temp. (°C)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
70	VN	5500.085157	15.483091
60		5500.069179	12.578000
50		5500.064214	11.675273
40		5500.064473	11.722364
30		5500.05221	9.492727
20		5500.055118	10.021455
10		5500.054247	9.863091
0		5500.074345	13.517273

Frequency Stability Versus Voltage			
Operation Frequency: 5500 MHz			
Temp.	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
TN	VL	5500.035062	6.374909
	VN	5500.035019	6.367091
	VH	5500.034300	6.236364

The Maximum value is 11.858364 ppm.

It is proved that the frequency stability such that an emission is maintained within the band of operation under all condition.

5.7 RADIATED EMISSIONS AND BAND EDGE MEASUREMENT

Test Requirement: FCC 47 CFR Part 15 Subpart E Section 15.407 (b)(1)(2)(3)(4)(6)
FCC 47 CFR Part 15 Subpart C Section 15.209/205

Test Method: KDB 789033 D02 v02r01 Section G.3, G.4, G.5, and G.6

Receiver Setup:

Frequency	RBW
0.009 MHz-0.150 MHz	200/300 kHz
0.150 MHz -30 MHz	9/10 kHz
30 MHz-1 GHz	100/120 kHz
Above 1 GHz	1 MHz

Limits:

1. Limits of Radiated Emission and Band edge Measurement

Radiated emissions that fall in the restricted bands must comply with the general emissions limits in 15.209(a) as below table. Other emissions shall be at least 20 dB below the highest level of the desired power.

Frequency	Field strength (microvolt/meter)	Limit (dB μ V/m)	Remark	Measurement distance (m)
0.009 MHz-0.490 MHz	2400/F(kHz)	--	--	300
0.490 MHz-1.705 MHz	24000/F(kHz)	--	--	30
1.705 MHz-30 MHz	30	--	--	30
30 MHz-88 MHz	100	40.0	Quasi-peak	3
88 MHz-216 MHz	150	43.5	Quasi-peak	3
216 MHz-960 MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1 GHz	500	54.0	Average	3

Remark:

- The lower limit shall apply at the transition frequencies.
- Emission level (dB μ V/m) = 20 log Emission level (uV/m).
- For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

2. Limits of Unwanted Emission Out of the Restricted Bands

Applicable To	Limit	
789033 D02 General U-NII Test Procedures New Rules v01r04	Field Strength at 3 m	
	PK: 74 (dBμV/m)	AV: 54 (dBμV/m)
Applicable To	EIRP Limit	Equivalent Field Strength at 3 m
FCC Part 15.407 (b)(1)	PK: -27 (dBm/MHz)	PK: 74 (dBμV/m)
FCC Part 15.407 (b)(2)	PK: -27 (dBm/MHz)	PK: 74 (dBμV/m)
FCC Part 15.407 (b)(3)	PK: -27 (dBm/MHz)	PK: 68.2 (dBμV/m)
FCC Part 15.407 (b)(4)	27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 dBm/MHz at 5 MHz above or below the band edges;	PK: 68.2 (dBμV/m)
	15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges;	
	10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm/MHz at 75 MHz above or below the band edges;	
	-27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.	

Test Setup: Refer to section 4.5.1 for details.

Test Procedures:

- The EUT was placed on the top of a rotating table 0.8 meters (for below 1 GHz) / 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Remark:

- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for RMS Average (Duty cycle < 98 %) for Average detection (AV) at frequency above 1 GHz, then the measurement results was added to a correction factor (10 log(1/duty cycle)).
- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz (Duty cycle ≥ 98 %) or ≥ 1/T(duty cycle is < 98%) for Average detection (AV) at frequency above 1 GHz.
- All modes of operation were investigated and the worst-case emissions are reported.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

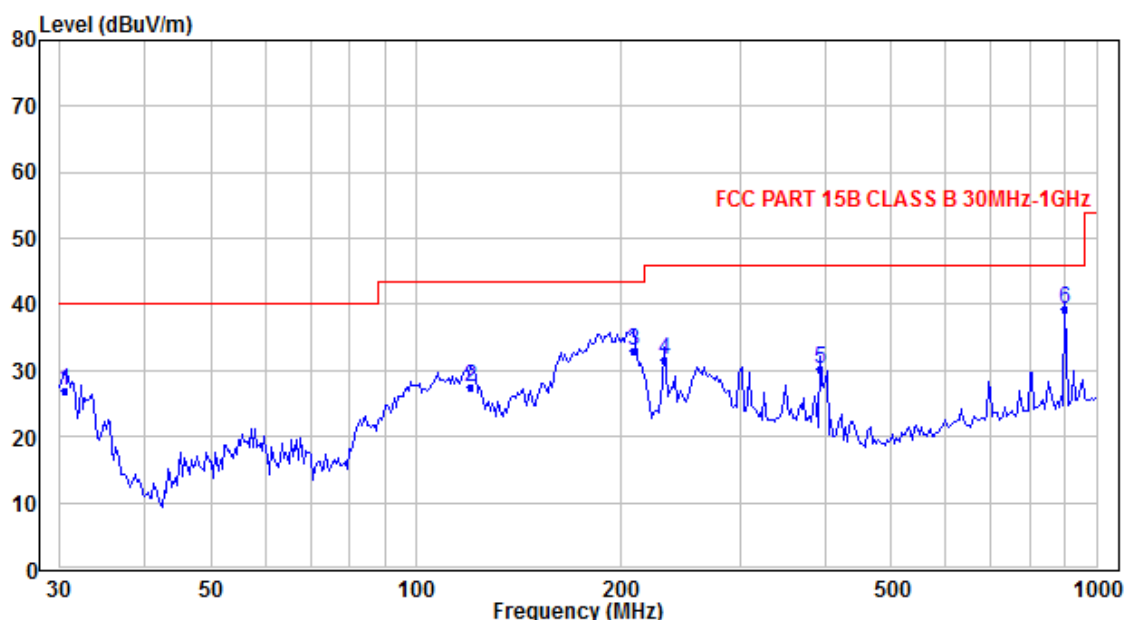
The measurement data as follows:

Radiated Emission Test Data (9 KHz ~ 30 MHz):

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

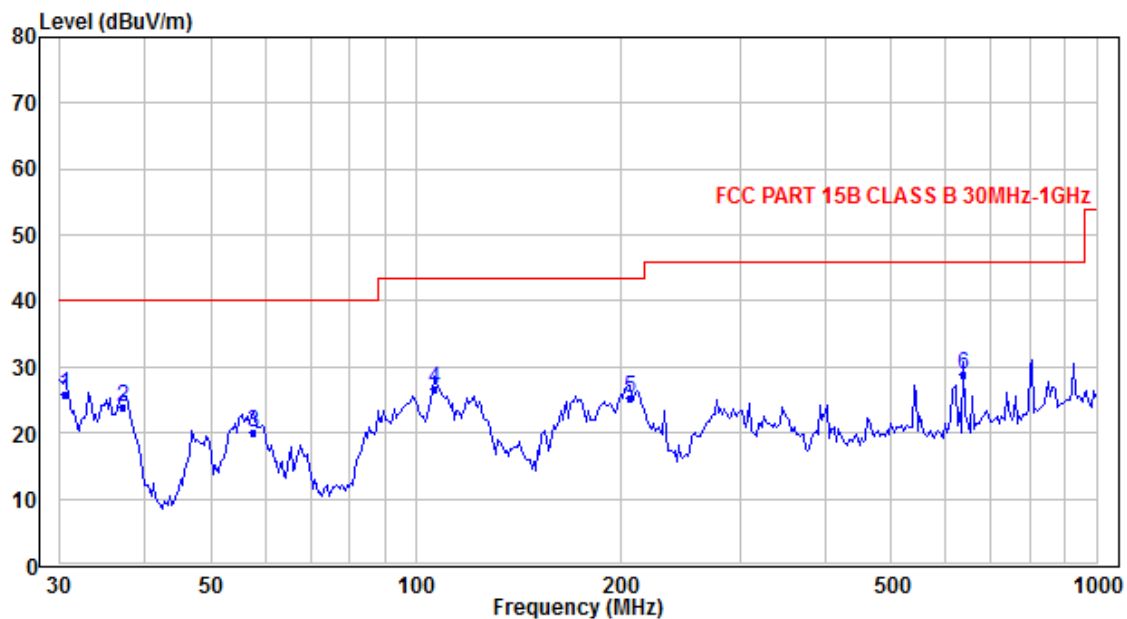
Radiated Emission Test Data (30 MHz ~ 1 GHz Worst Case):

IEEE 802.11a_Channel 116

Horizontal


No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.425	38.42	-11.43	26.99	40.00	13.01	QP
2	120.612	45.62	-18.13	27.49	43.50	16.01	QP
3	208.658	48.00	-15.08	32.92	43.50	10.58	QP
4	231.853	45.42	-13.78	31.64	46.00	14.36	QP
5	392.738	38.77	-8.57	30.20	46.00	15.80	QP
6*	899.958	39.40	-0.10	39.30	46.00	6.70	QP

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1*	30.425	38.39	-12.43	25.96	40.00	14.04	QP
2	37.041	39.73	-15.86	23.87	40.00	16.13	QP
3	57.669	40.10	-20.12	19.98	40.00	20.02	QP
4	106.281	45.39	-18.74	26.65	43.50	16.85	QP
5	205.746	40.15	-14.98	25.17	43.50	18.33	QP
6	637.795	34.40	-5.66	28.74	46.00	17.26	QP

Remark: Margin=Limit-Result

Radiated Emission Worst Test Data (Above 1GHz):
CDD_Chain 0+1_ IEEE 802.11a_Channel 36

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10360.00	54.20	74.00	-19.80	Peak	Horizontal
2	10360.00	38.97	54.00	-15.03	Average	Horizontal
3	15540.00	51.89	74.00	-22.11	Peak	Horizontal
4	15540.00	38.76	54.00	-15.24	Average	Horizontal
5	10360.00	55.07	74.00	-18.93	Peak	Vertical
6	10360.00	38.65	54.00	-15.35	Average	Vertical
7	15540.00	51.03	74.00	-22.97	Peak	Vertical
8	15540.00	37.95	54.00	-16.05	Average	Vertical

CDD_Chain 0+1_ IEEE 802.11a_Channel 44

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10440.00	59.17	74.00	-14.83	Peak	Horizontal
2	10440.00	43.16	54.00	-10.84	Average	Horizontal
3	15660.00	52.67	74.00	-21.33	Peak	Horizontal
4	15660.00	38.26	54.00	-15.74	Average	Horizontal
5	10440.00	61.56	74.00	-12.44	Peak	Vertical
6	10440.00	44.28	54.00	-9.72	Average	Vertical
7	15660.00	51.17	74.00	-22.83	Peak	Vertical
8	15660.00	38.17	54.00	-15.83	Average	Vertical

CDD_Chain 0+1_ IEEE 802.11a_Channel 48

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10480.00	59.21	74.00	-14.79	Peak	Horizontal
2	10480.00	42.26	54.00	-11.74	Average	Horizontal
3	15720.00	51.17	74.00	-22.83	Peak	Horizontal
4	15720.00	39.16	54.00	-14.84	Average	Horizontal
5	10480.00	57.87	74.00	-16.13	Peak	Vertical
6	10480.00	42.23	54.00	-11.77	Average	Vertical
7	15720.00	50.67	74.00	-23.33	Peak	Vertical
8	15720.00	39.25	54.00	-14.75	Average	Vertical

CDD_Chain 0+1_ IEEE 802.11a_Channel 52

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10520.00	58.78	74.00	-15.22	Peak	Horizontal
2	10520.00	41.67	54.00	-12.33	Average	Horizontal
3	15780.00	52.03	74.00	-21.97	Peak	Horizontal
4	15780.00	38.42	54.00	-15.58	Average	Horizontal
5	10520.00	58.22	74.00	-15.78	Peak	Vertical
6	10520.00	40.79	54.00	-13.21	Average	Vertical
7	15780.00	51.21	74.00	-22.79	Peak	Vertical
8	15780.00	39.31	54.00	-14.69	Average	Vertical

CDD_Chain 0+1_ IEEE 802.11a_Channel 60

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10600.00	57.45	74.00	-16.55	Peak	Horizontal
2	10600.00	40.93	54.00	-13.07	Average	Horizontal
3	15900.00	52.19	74.00	-21.81	Peak	Horizontal
4	15900.00	38.76	54.00	-15.24	Average	Horizontal
5	10600.00	58.54	74.00	-15.46	Peak	Vertical
6	10600.00	41.34	54.00	-12.66	Average	Vertical
7	15900.00	52.31	74.00	-21.69	Peak	Vertical
8	15900.00	40.16	54.00	-13.84	Average	Vertical

CDD_Chain 0+1_ IEEE 802.11a_Channel 64

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10640.00	56.32	74.00	-17.68	Peak	Horizontal
2	10640.00	40.13	54.00	-13.87	Average	Horizontal
3	15960.00	54.27	74.00	-19.73	Peak	Horizontal
4	15960.00	39.43	54.00	-14.57	Average	Horizontal
5	10640.00	55.28	74.00	-18.72	Peak	Vertical
6	10640.00	38.94	54.00	-15.06	Average	Vertical
7	15960.00	52.67	74.00	-21.33	Peak	Vertical
8	15960.00	40.12	54.00	-13.88	Average	Vertical

CDD_Chain 0+1_ IEEE 802.11a_Channel 100

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11000.00	55.22	74.00	-18.78	Peak	Horizontal
2	11000.00	41.32	54.00	-12.68	Average	Horizontal
3	16500.00	52.21	74.00	-21.79	Peak	Horizontal
4	16500.00	39.05	54.00	-14.95	Average	Horizontal
5	11000.00	55.56	74.00	-18.44	Peak	Vertical
6	11000.00	38.95	54.00	-15.05	Average	Vertical
7	16500.00	51.19	74.00	-22.81	Peak	Vertical
8	16500.00	38.22	54.00	-15.78	Average	Vertical

CDD_Chain 0+1_ IEEE 802.11a_Channel 116

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11160.00	58.79	74.00	-15.21	Peak	Horizontal
2	11160.00	39.23	54.00	-14.77	Average	Horizontal
3	16740.00	51.87	74.00	-22.13	Peak	Horizontal
4	16740.00	39.79	54.00	-14.21	Average	Horizontal
5	11160.00	57.22	74.00	-16.78	Peak	Vertical
6	11160.00	38.54	54.00	-15.46	Average	Vertical
7	16740.00	50.85	74.00	-23.15	Peak	Vertical
8	16740.00	39.43	54.00	-14.57	Average	Vertical

CDD_Chain 0+1_ IEEE 802.11a_Channel 140

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11400.00	59.38	74.00	-14.62	Peak	Horizontal
2	11400.00	43.76	54.00	-10.24	Average	Horizontal
3	17100.00	52.18	74.00	-21.82	Peak	Horizontal
4	17100.00	40.09	54.00	-13.91	Average	Horizontal
5	11400.00	58.43	74.00	-15.57	Peak	Vertical
6	11400.00	41.68	54.00	-12.32	Average	Vertical
7	17100.00	50.26	74.00	-23.74	Peak	Vertical
8	17100.00	39.17	54.00	-14.83	Average	Vertical

MIMO_Chain 0+ 1_ IEEE 802.11n-HT20_Channel 36

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10360.00	53.23	74.00	-20.77	Peak	Horizontal
2	10360.00	38.12	54.00	-15.88	Average	Horizontal
3	15540.00	51.02	74.00	-22.98	Peak	Horizontal
4	15540.00	38.34	54.00	-15.66	Average	Horizontal
5	10360.00	51.62	74.00	-22.38	Peak	Vertical
6	10360.00	37.18	54.00	-16.82	Average	Vertical
7	15540.00	51.58	74.00	-22.42	Peak	Vertical
8	15540.00	38.67	54.00	-15.33	Average	Vertical

MIMO_Chain 0+ 1_ IEEE 802.11n-HT20_Channel 44

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10440.00	55.66	74.00	-18.34	Peak	Horizontal
2	10440.00	42.18	54.00	-11.82	Average	Horizontal
3	15660.00	51.48	74.00	-22.52	Peak	Horizontal
4	15660.00	39.04	54.00	-14.96	Average	Horizontal
5	10440.00	57.27	74.00	-16.73	Peak	Vertical
6	10440.00	41.38	54.00	-12.62	Average	Vertical
7	15660.00	51.08	74.00	-22.92	Peak	Vertical
8	15660.00	38.42	54.00	-15.58	Average	Vertical

MIMO_Chain 0+ 1_ IEEE 802.11n-HT20_Channel 48

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10480.00	53.29	74.00	-20.71	Peak	Horizontal
2	10480.00	39.10	54.00	-14.90	Average	Horizontal
3	15720.00	51.03	74.00	-22.97	Peak	Horizontal
4	15720.00	38.42	54.00	-15.58	Average	Horizontal
5	10480.00	54.74	74.00	-19.26	Peak	Vertical
6	10480.00	38.54	54.00	-15.46	Average	Vertical
7	15720.00	51.03	74.00	-22.97	Peak	Vertical
8	15720.00	37.78	54.00	-16.22	Average	Vertical

MIMO_Chain 0+ 1_ IEEE 802.11n-HT20_Channel 52

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10520.00	55.37	74.00	-18.63	Peak	Horizontal
2	10520.00	40.17	54.00	-13.83	Average	Horizontal
3	15780.00	51.78	74.00	-22.22	Peak	Horizontal
4	15780.00	39.06	54.00	-14.94	Average	Horizontal
5	10520.00	54.33	74.00	-19.67	Peak	Vertical
6	10520.00	39.18	54.00	-14.82	Average	Vertical
7	15780.00	51.03	74.00	-22.97	Peak	Vertical
8	15780.00	37.48	54.00	-16.52	Average	Vertical

MIMO_Chain 0+ 1_ IEEE 802.11n-HT20_Channel 60

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10600.00	53.32	74.00	-20.68	Peak	Horizontal
2	10600.00	39.47	54.00	-14.53	Average	Horizontal
3	15900.00	52.49	74.00	-21.51	Peak	Horizontal
4	15900.00	40.02	54.00	-13.98	Average	Horizontal
5	10600.00	53.37	74.00	-20.63	Peak	Vertical
6	10600.00	39.04	54.00	-14.96	Average	Vertical
7	15900.00	51.57	74.00	-22.43	Peak	Vertical
8	15900.00	38.55	54.00	-15.45	Average	Vertical

MIMO_Chain 0+ 1_ IEEE 802.11n-HT20_Channel 64

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10640.00	53.48	74.00	-20.52	Peak	Horizontal
2	10640.00	39.31	54.00	-14.69	Average	Horizontal
3	15960.00	53.89	74.00	-20.11	Peak	Horizontal
4	15960.00	41.27	54.00	-12.73	Average	Horizontal
5	10640.00	52.28	74.00	-21.72	Peak	Vertical
6	10640.00	38.46	54.00	-15.54	Average	Vertical
7	15960.00	51.88	74.00	-22.12	Peak	Vertical
8	15960.00	39.05	54.00	-14.95	Average	Vertical

MIMO_Chain 0+ 1_ IEEE 802.11n-HT20_Channel 100

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11000.00	52.55	74.00	-21.45	Peak	Horizontal
2	11000.00	38.94	54.00	-15.06	Average	Horizontal
3	16500.00	51.79	74.00	-22.21	Peak	Horizontal
4	16500.00	39.17	54.00	-14.83	Average	Horizontal
5	11000.00	51.82	74.00	-22.18	Peak	Vertical
6	11000.00	38.06	54.00	-15.94	Average	Vertical
7	16500.00	51.79	74.00	-22.21	Peak	Vertical
8	16500.00	38.42	54.00	-15.58	Average	Vertical

MIMO_Chain 0+ 1_ IEEE 802.11n-HT20_Channel 116

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11160.00	55.02	74.00	-18.98	Peak	Horizontal
2	11160.00	39.15	54.00	-14.85	Average	Horizontal
3	16740.00	52.68	74.00	-21.32	Peak	Horizontal
4	16740.00	40.27	54.00	-13.73	Average	Horizontal
5	11160.00	51.68	74.00	-22.32	Peak	Vertical
6	11160.00	37.27	54.00	-16.73	Average	Vertical
7	16740.00	51.88	74.00	-22.12	Peak	Vertical
8	16740.00	39.67	54.00	-14.33	Average	Vertical

MIMO_Chain 0+ 1_IEEE 802.11n-HT20_Channel 140

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11400.00	51.58	74.00	-22.42	Peak	Horizontal
2	11400.00	39.11	54.00	-14.89	Average	Horizontal
3	17100.00	51.76	74.00	-22.24	Peak	Horizontal
4	17100.00	40.27	54.00	-13.73	Average	Horizontal
5	11400.00	49.65	74.00	-24.35	Peak	Vertical
6	11400.00	38.03	54.00	-15.97	Average	Vertical
7	17100.00	51.65	74.00	-22.35	Peak	Vertical
8	17100.00	38.97	54.00	-15.03	Average	Vertical

MIMO_Chain 0+ 1_IEEE 802.11n-HT40_Channel 38

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10380.00	51.06	74.00	-22.94	Peak	Horizontal
2	10380.00	38.12	54.00	-15.88	Average	Horizontal
3	15570.00	51.45	74.00	-22.55	Peak	Horizontal
4	15570.00	39.26	54.00	-14.74	Average	Horizontal
5	10380.00	50.75	74.00	-23.25	Peak	Vertical
6	10380.00	38.22	54.00	-15.78	Average	Vertical
7	15570.00	51.48	74.00	-22.52	Peak	Vertical
8	15570.00	38.19	54.00	-15.81	Average	Vertical

MIMO_Chain 0+ 1_IEEE 802.11n-HT40_Channel 46

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10460.00	52.26	74.00	-21.74	Peak	Horizontal
2	10460.00	39.27	54.00	-14.73	Average	Horizontal
3	15690.00	50.18	74.00	-23.82	Peak	Horizontal
4	15690.00	38.66	54.00	-15.34	Average	Horizontal
5	10460.00	54.27	74.00	-19.73	Peak	Vertical
6	10460.00	41.15	54.00	-12.85	Average	Vertical
7	15690.00	50.04	74.00	-23.96	Peak	Vertical
8	15690.00	38.65	54.00	-15.35	Average	Vertical

MIMO_Chain 0+ 1_IEEE 802.11n-HT40_Channel 54

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10540.00	55.13	74.00	-18.87	Peak	Horizontal
2	10540.00	37.77	54.00	-16.23	Average	Horizontal
3	15810.00	51.92	74.00	-22.08	Peak	Horizontal
4	15810.00	41.23	54.00	-12.77	Average	Horizontal
5	10540.00	53.75	74.00	-34.58	Peak	Vertical
6	10540.00	39.42	54.00	-13.23	Average	Vertical
7	15810.00	51.68	74.00	-34.55	Peak	Vertical
8	15810.00	39.45	54.00	-15.00	Average	Vertical

MIMO_Chain 0+ 1_ IEEE 802.11n-HT40_Channel 62

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10620.00	51.48	74.00	-22.52	Peak	Horizontal
2	10620.00	39.02	54.00	-14.98	Average	Horizontal
3	15930.00	52.89	74.00	-21.11	Peak	Horizontal
4	15930.00	39.61	54.00	-14.39	Average	Horizontal
5	10620.00	50.88	74.00	-23.12	Peak	Vertical
6	10620.00	38.72	54.00	-15.28	Average	Vertical
7	15930.00	51.56	74.00	-22.44	Peak	Vertical
8	15930.00	38.29	54.00	-15.71	Average	Vertical

MIMO_Chain 0+ 1_ IEEE 802.11n-HT40_Channel 102

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11020.00	50.25	74.00	-23.75	Peak	Horizontal
2	11020.00	37.90	54.00	-16.10	Average	Horizontal
3	16530.00	52.16	74.00	-21.84	Peak	Horizontal
4	16530.00	38.55	54.00	-15.45	Average	Horizontal
5	11020.00	49.34	74.00	-24.66	Peak	Vertical
6	11020.00	36.75	54.00	-17.25	Average	Vertical
7	16530.00	51.47	74.00	-22.53	Peak	Vertical
8	16530.00	37.43	54.00	-16.57	Average	Vertical

MIMO_Chain 0+ 1_ IEEE 802.11n-HT40_Channel 110

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11100.00	52.67	74.00	-21.33	Peak	Horizontal
2	11100.00	38.68	54.00	-15.32	Average	Horizontal
3	16650.00	51.79	74.00	-22.21	Peak	Horizontal
4	16650.00	39.66	54.00	-14.34	Average	Horizontal
5	11100.00	50.27	74.00	-23.73	Peak	Vertical
6	11100.00	37.72	54.00	-16.28	Average	Vertical
7	16650.00	51.39	74.00	-22.61	Peak	Vertical
8	16650.00	38.79	54.00	-15.21	Average	Vertical

MIMO_Chain 0+ 1_ IEEE 802.11n-HT40_Channel 134

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11340.00	52.36	74.00	-21.64	Peak	Horizontal
2	11340.00	38.64	54.00	-15.36	Average	Horizontal
3	17010.00	53.68	74.00	-20.32	Peak	Horizontal
4	17010.00	39.77	54.00	-14.23	Average	Horizontal
5	11340.00	48.69	74.00	-25.31	Peak	Vertical
6	11340.00	38.44	54.00	-15.56	Average	Vertical
7	17010.00	52.38	74.00	-21.62	Peak	Vertical
8	17010.00	38.67	54.00	-15.33	Average	Vertical

MIMO_Chain 0+ 1_ IEEE 802.11ac-VHT80_Channel 42

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	10460.00	51.88	74.00	-22.12	Peak	Horizontal
2	10460.00	38.86	54.00	-15.14	Average	Horizontal
3	15690.00	50.26	74.00	-23.74	Peak	Horizontal
4	15690.00	38.56	54.00	-15.44	Average	Horizontal
5	10460.00	52.77	74.00	-21.23	Peak	Vertical
6	10460.00	40.06	54.00	-13.94	Average	Vertical
7	15690.00	48.74	74.00	-25.26	Peak	Vertical
8	15690.00	38.14	54.00	-15.86	Average	Vertical

MIMO_Chain 0+ 1_ IEEE 802.11ac-VHT80_Channel 58

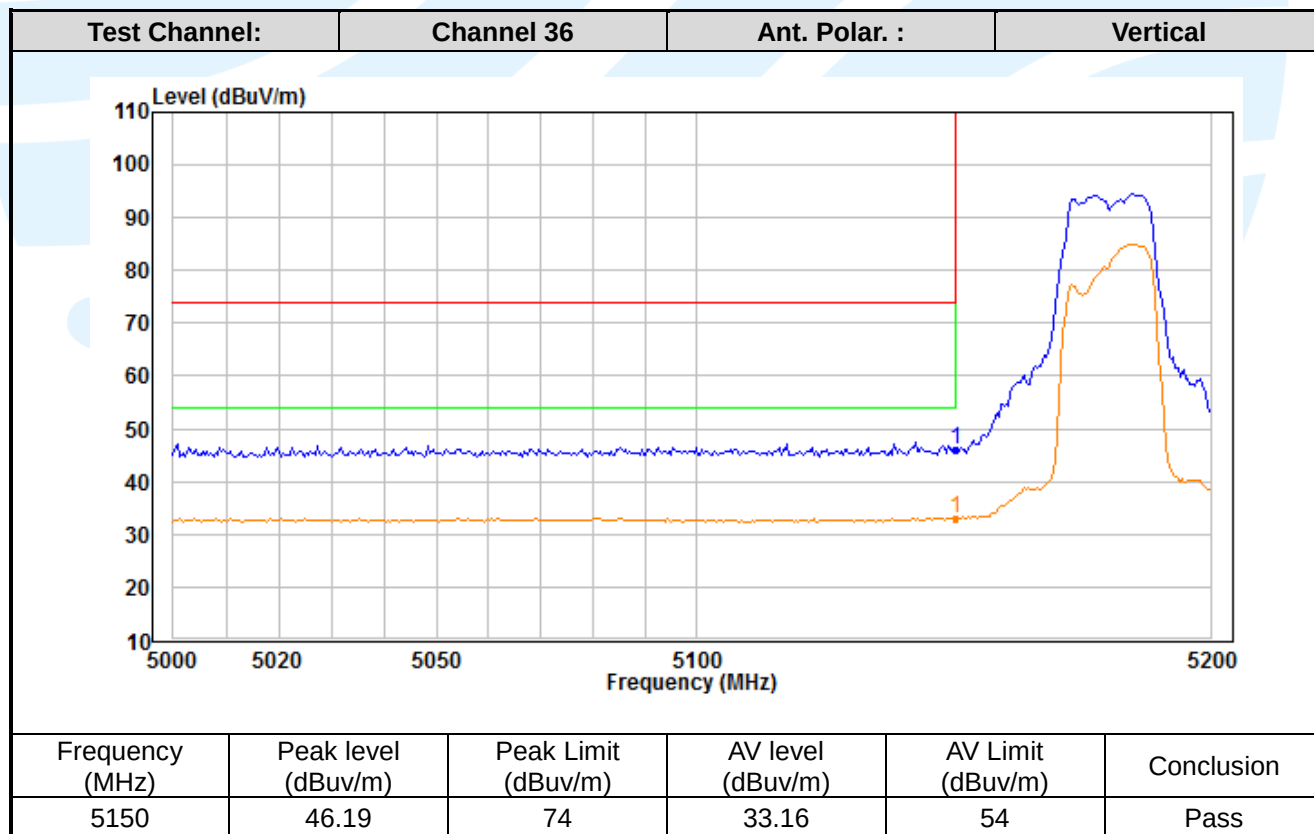
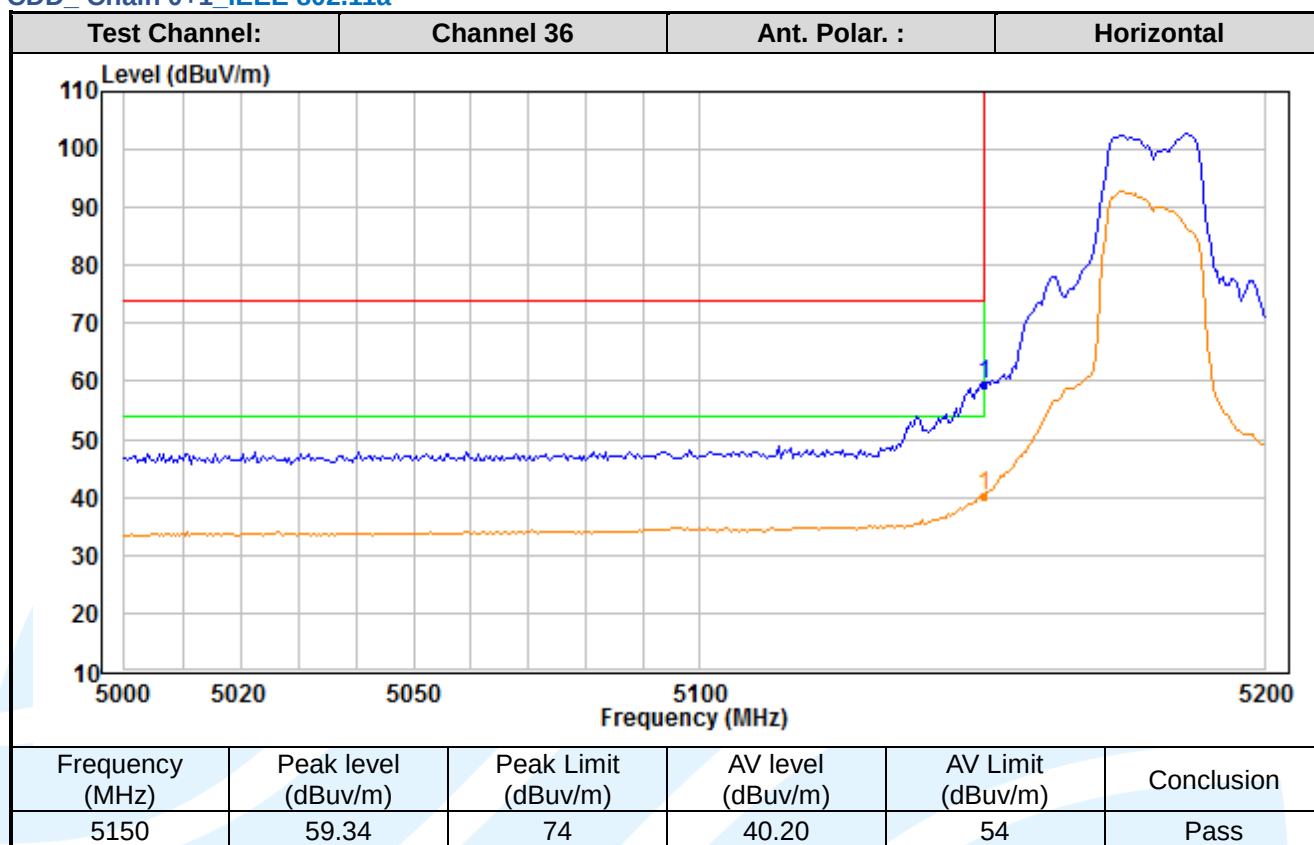
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1	10580.00	51.67	74.00	-22.33	Peak	Horizontal
2	10580.00	39.32	54.00	-14.68	Average	Horizontal
3	15870.00	52.17	74.00	-21.83	Peak	Horizontal
4	15870.00	39.76	54.00	-14.24	Average	Horizontal
5	10580.00	52.56	74.00	-21.44	Peak	Vertical
6	10580.00	39.27	54.00	-14.73	Average	Vertical
7	15870.00	49.89	74.00	-24.11	Peak	Vertical
8	15870.00	39.23	54.00	-14.77	Average	Vertical

MIMO_Chain 0+ 1_ IEEE 802.11ac-VHT80_Channel 106

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	11550.00	52.86	74.00	-21.14	Peak	Horizontal
2	11550.00	38.47	54.00	-15.53	Average	Horizontal
3	17325.00	50.23	74.00	-23.77	Peak	Horizontal
4	17325.00	38.88	54.00	-15.12	Average	Horizontal
5	11550.00	51.53	74.00	-22.47	Peak	Vertical
6	11550.00	38.26	54.00	-15.74	Average	Vertical
7	17325.00	50.93	74.00	-23.07	Peak	Vertical
8	17325.00	37.68	54.00	-16.32	Average	Vertical

Band Edge Measurements (Radiated)

CDD_Chain 0+1_ IEEE 802.11a



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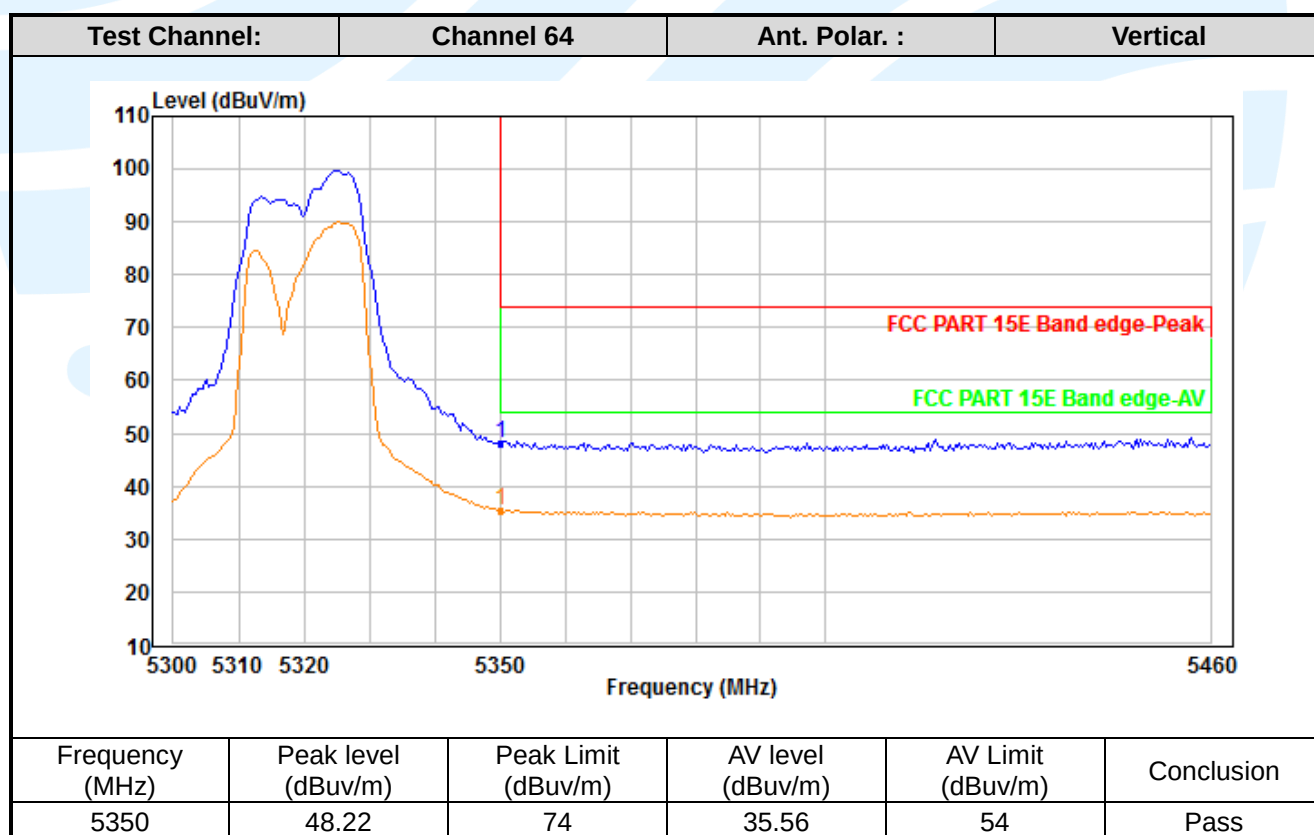
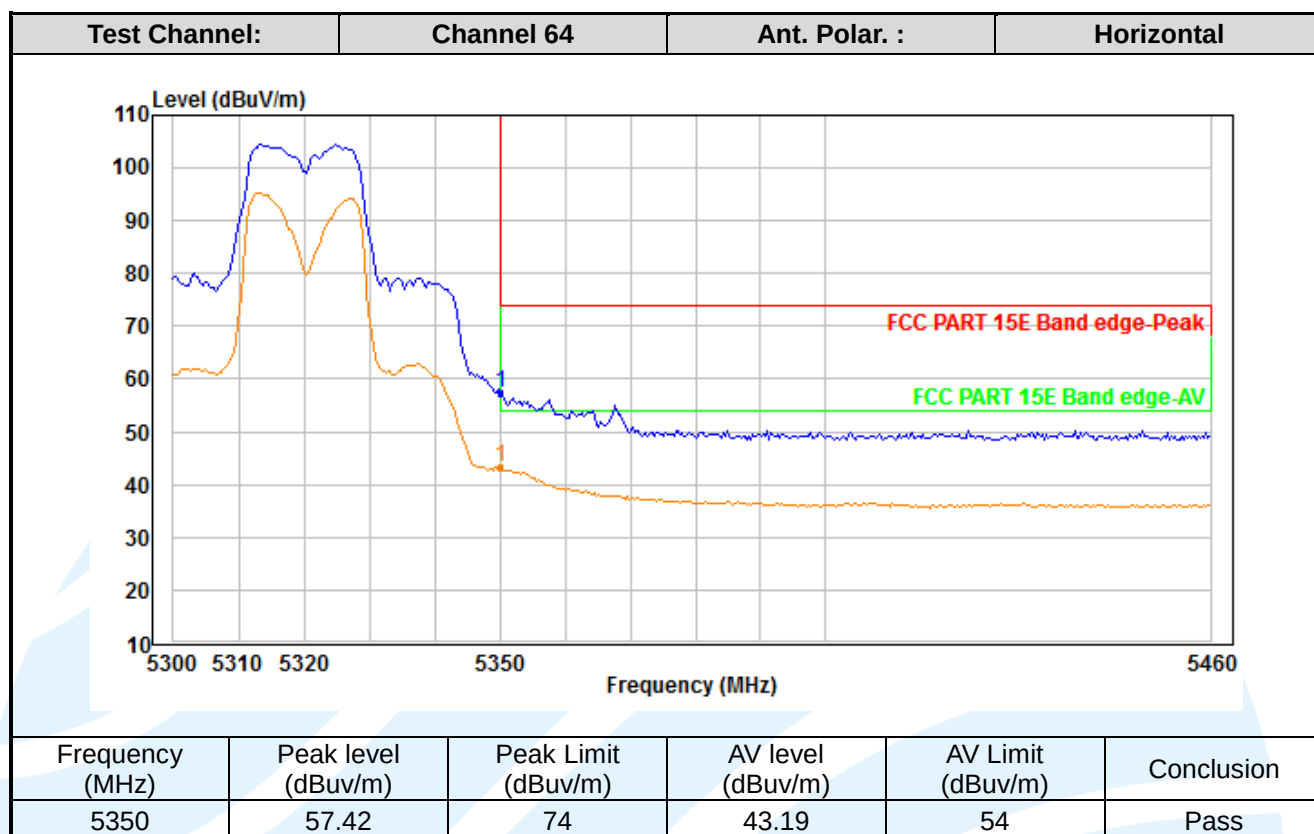
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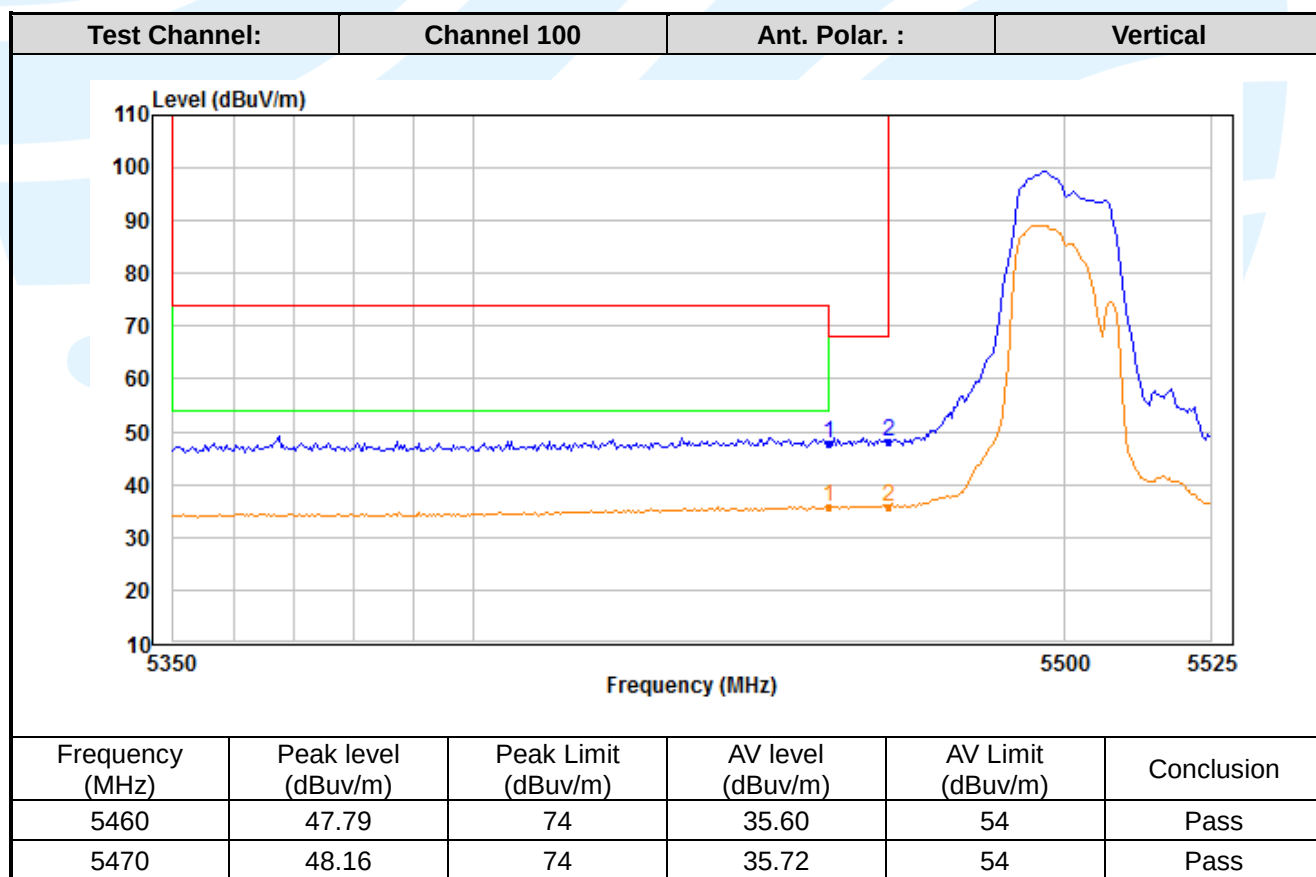
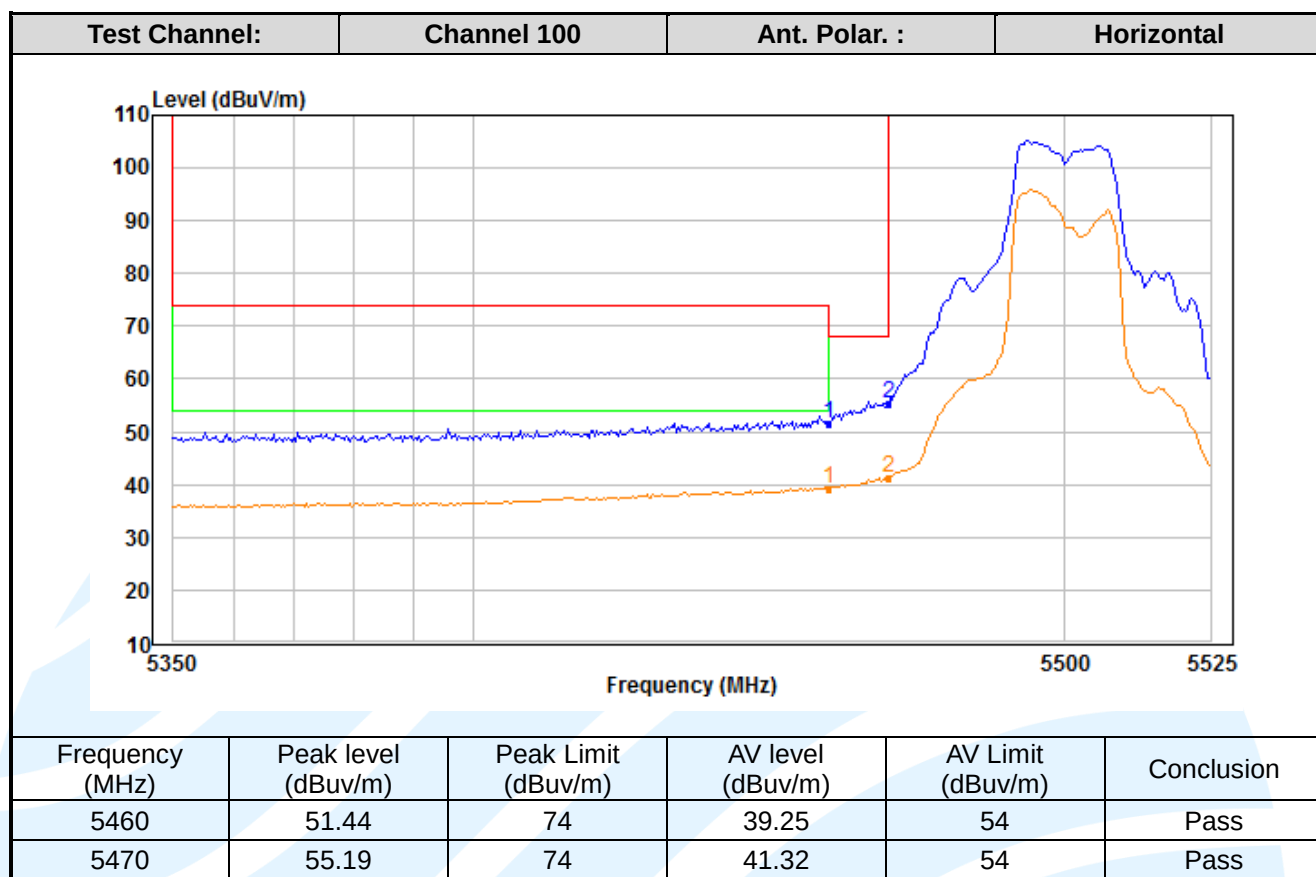
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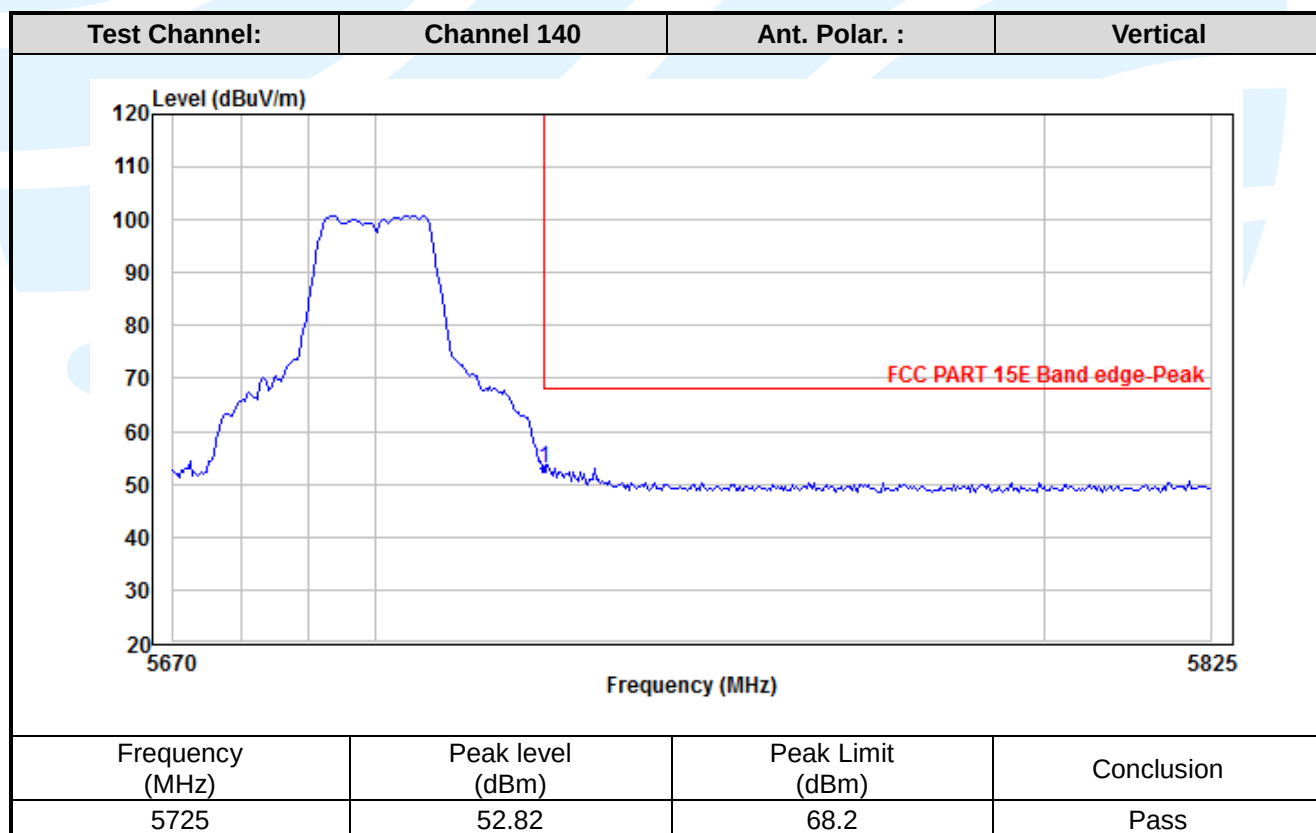
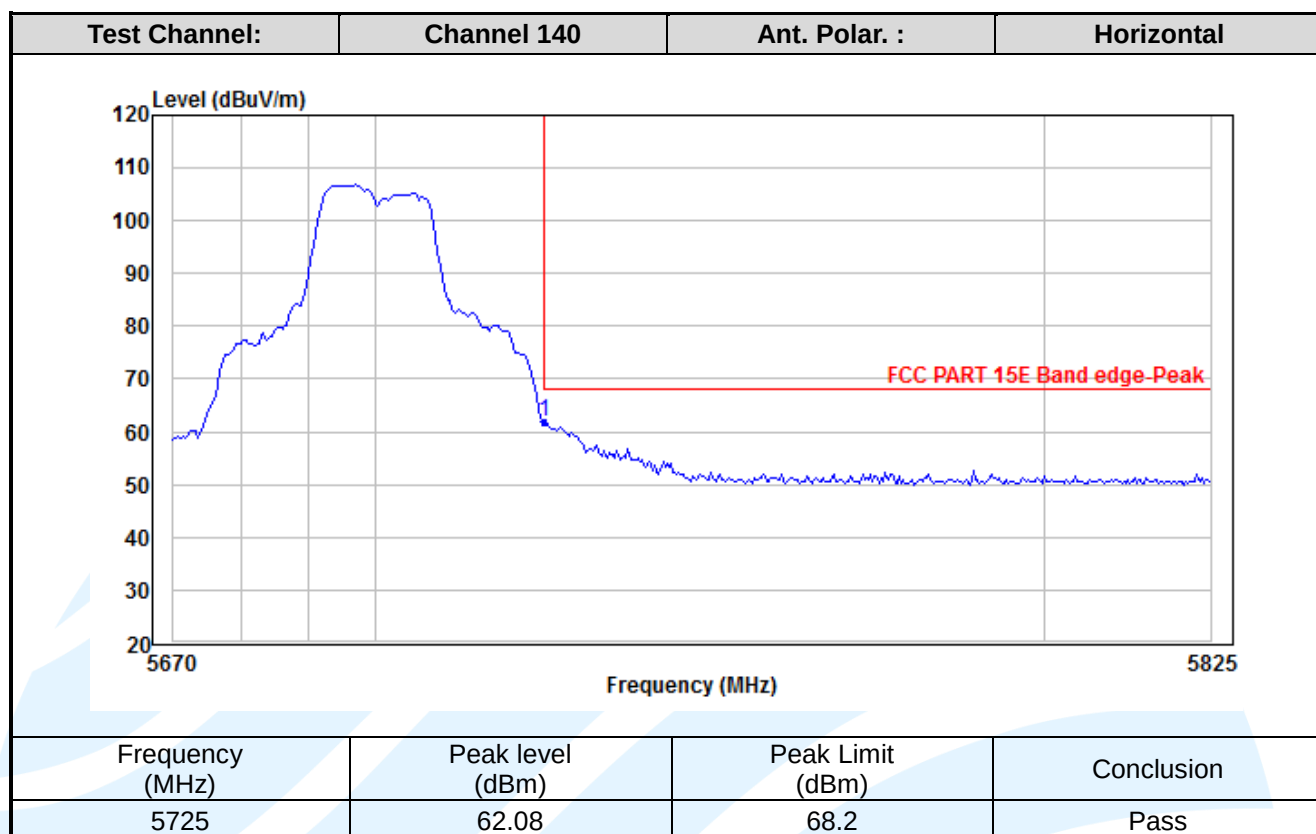
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E-mail: info@uttlab.com

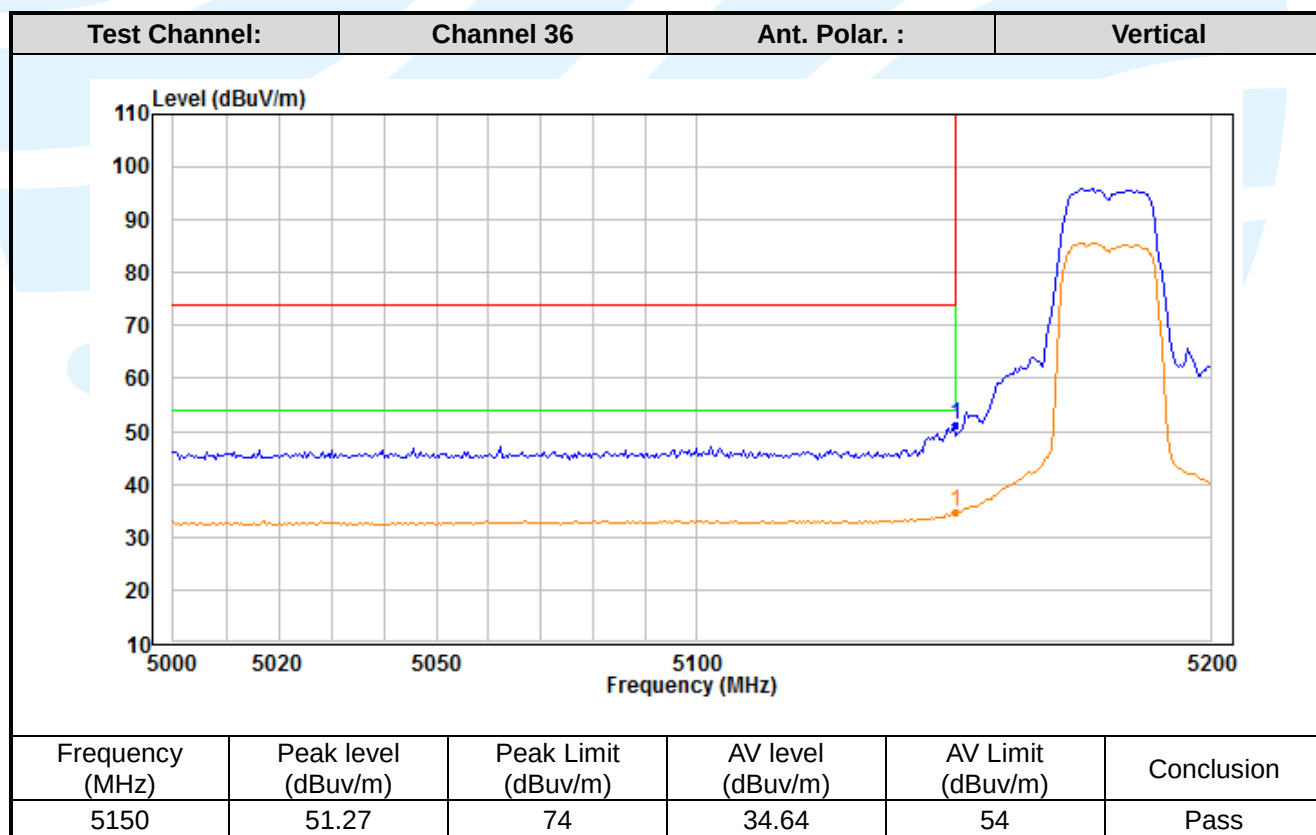
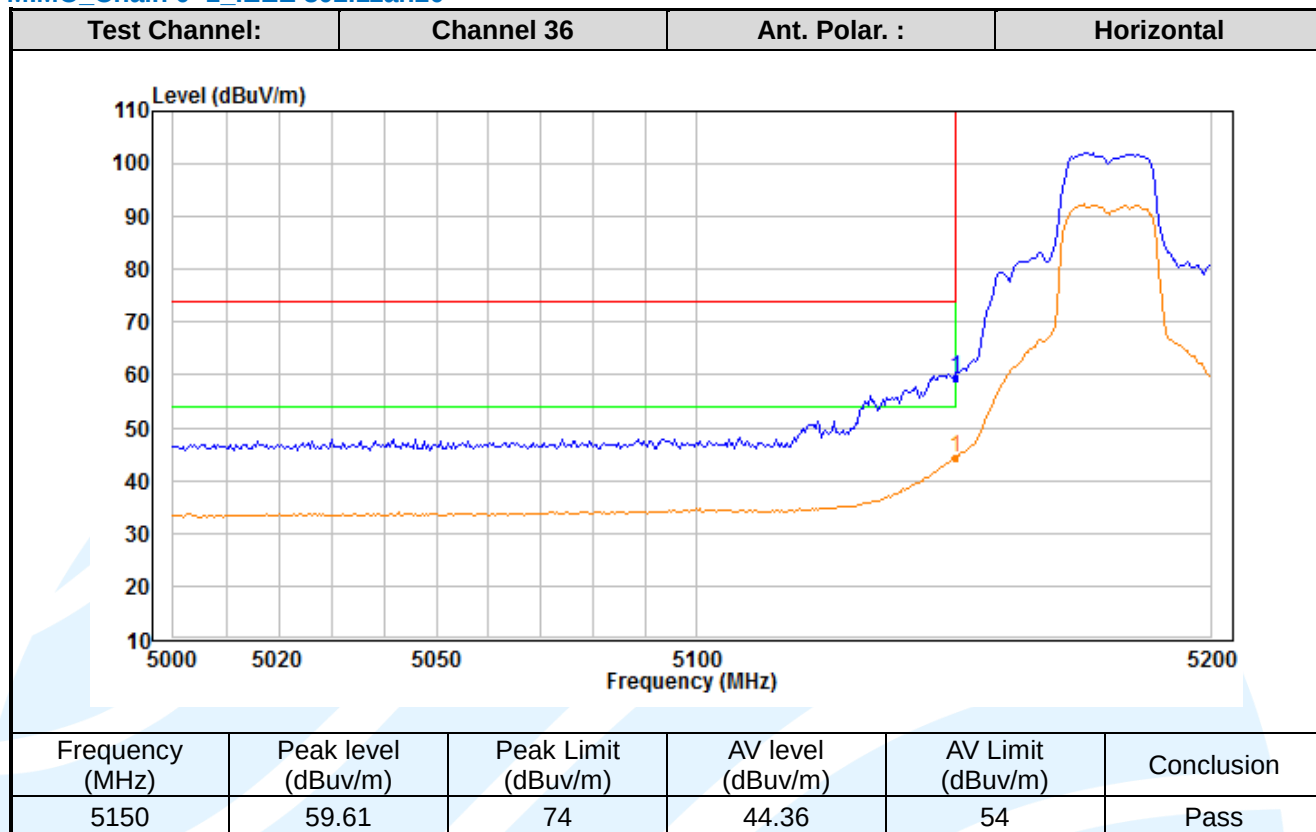
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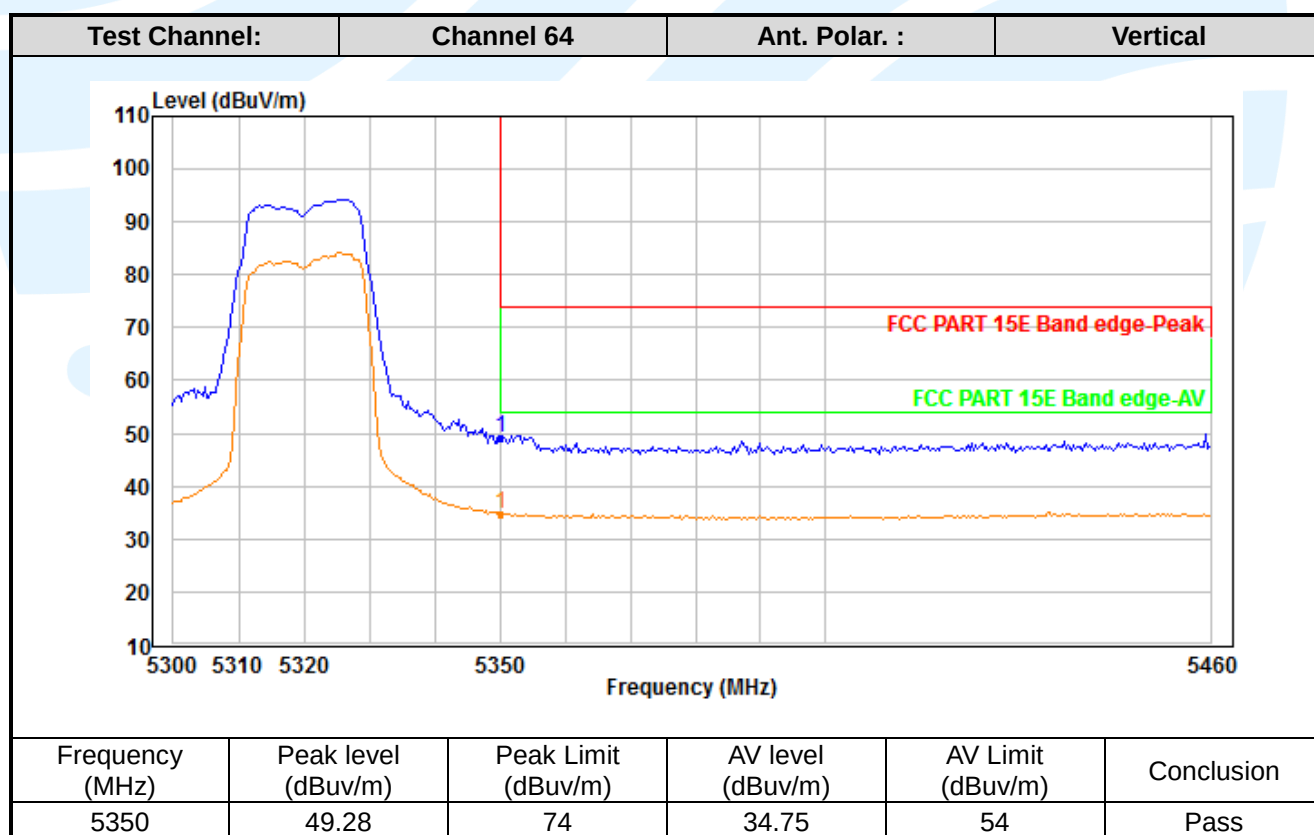
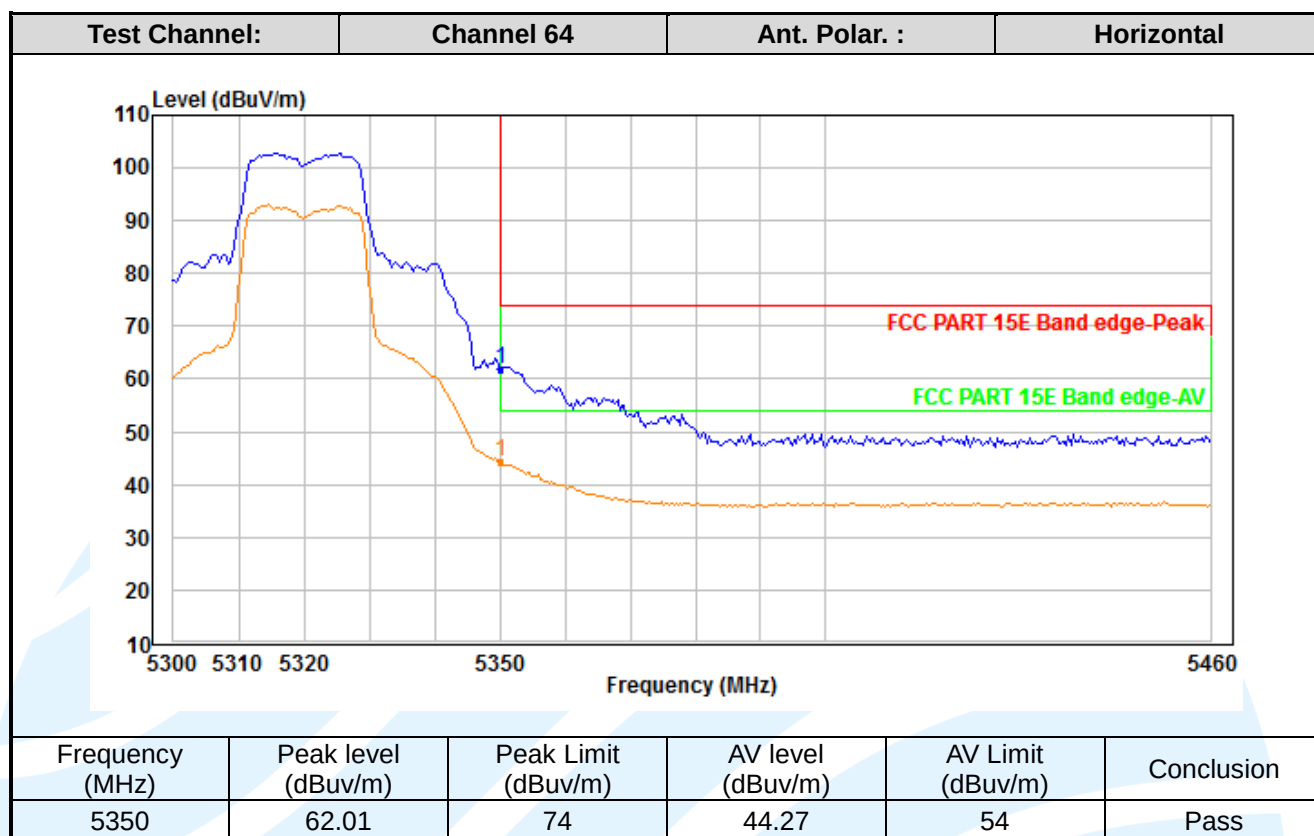


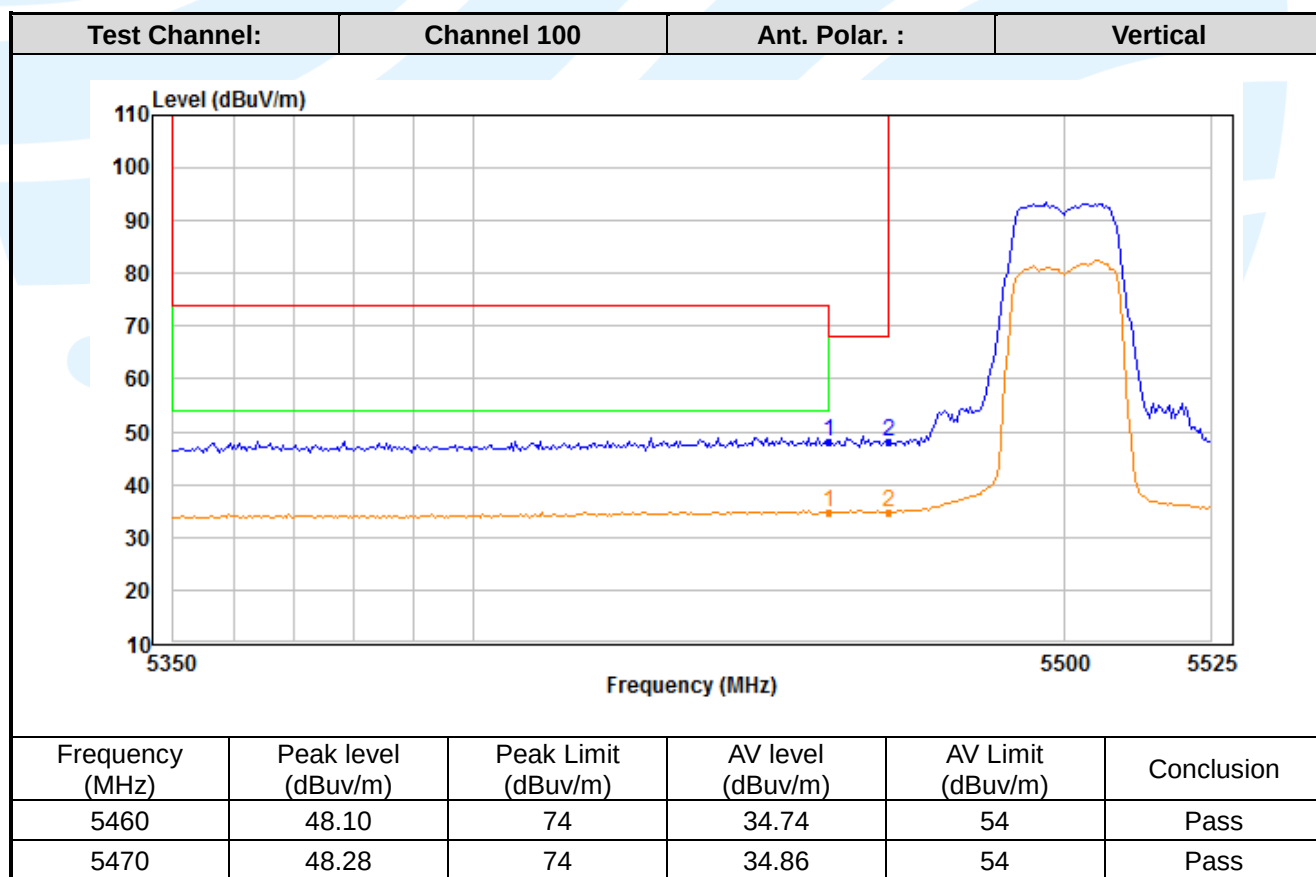
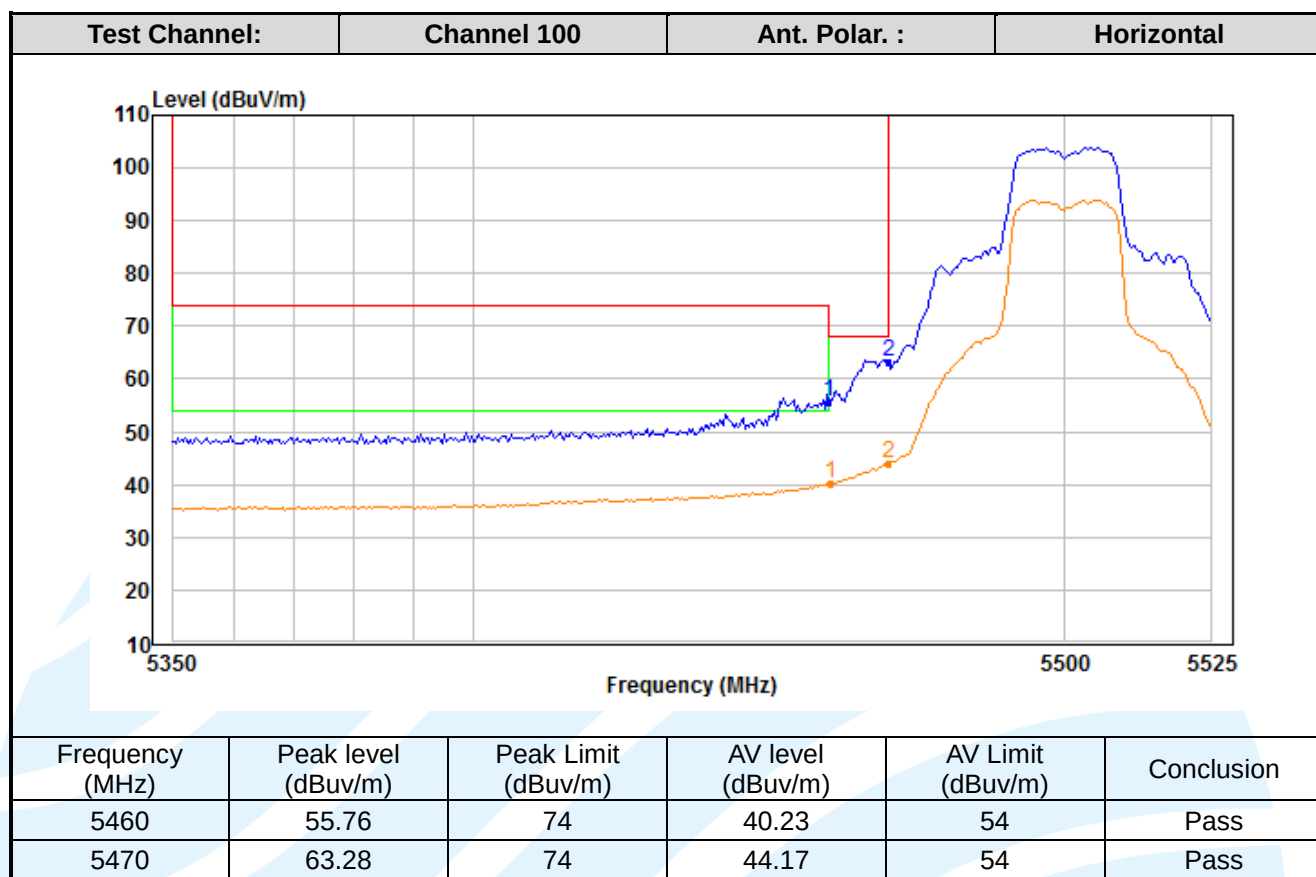


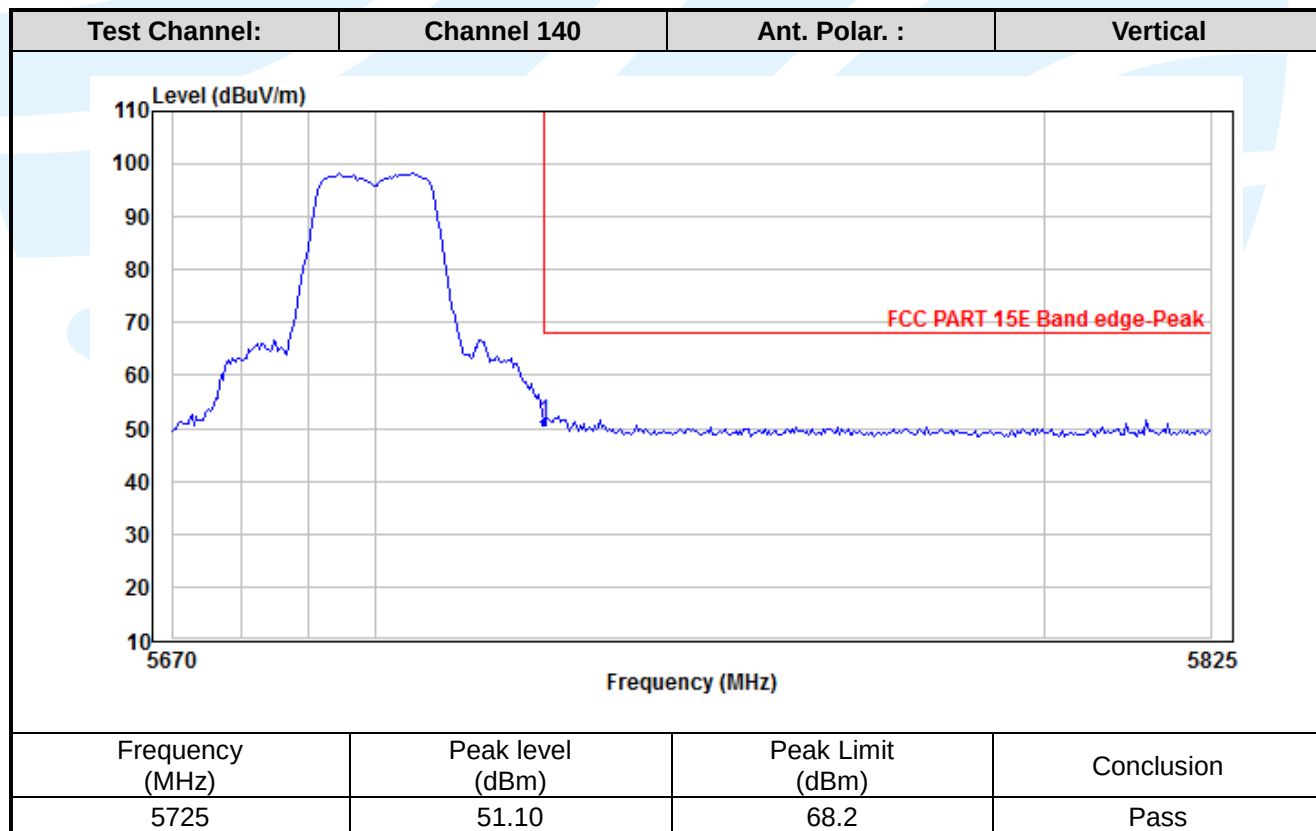
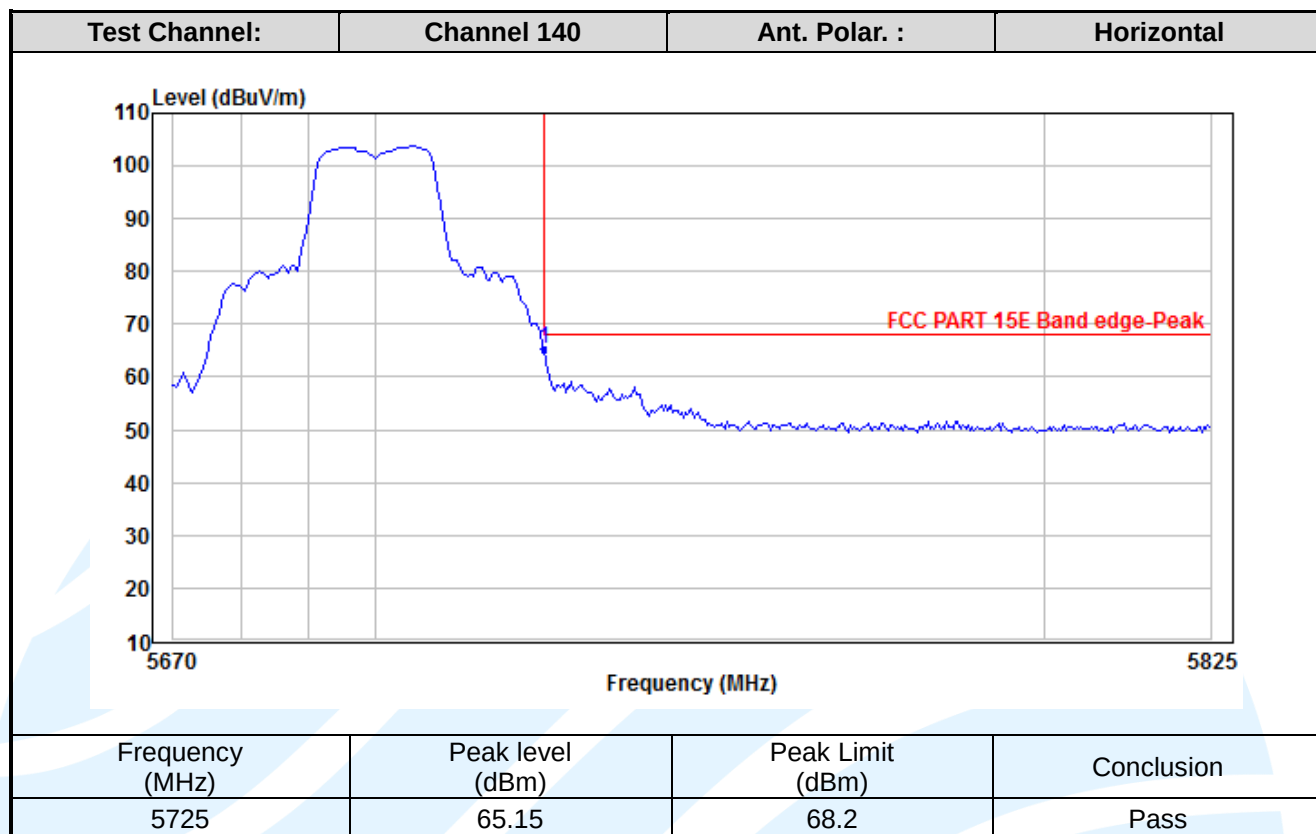


MIMO_Chain 0+1_ IEEE 802.11an20

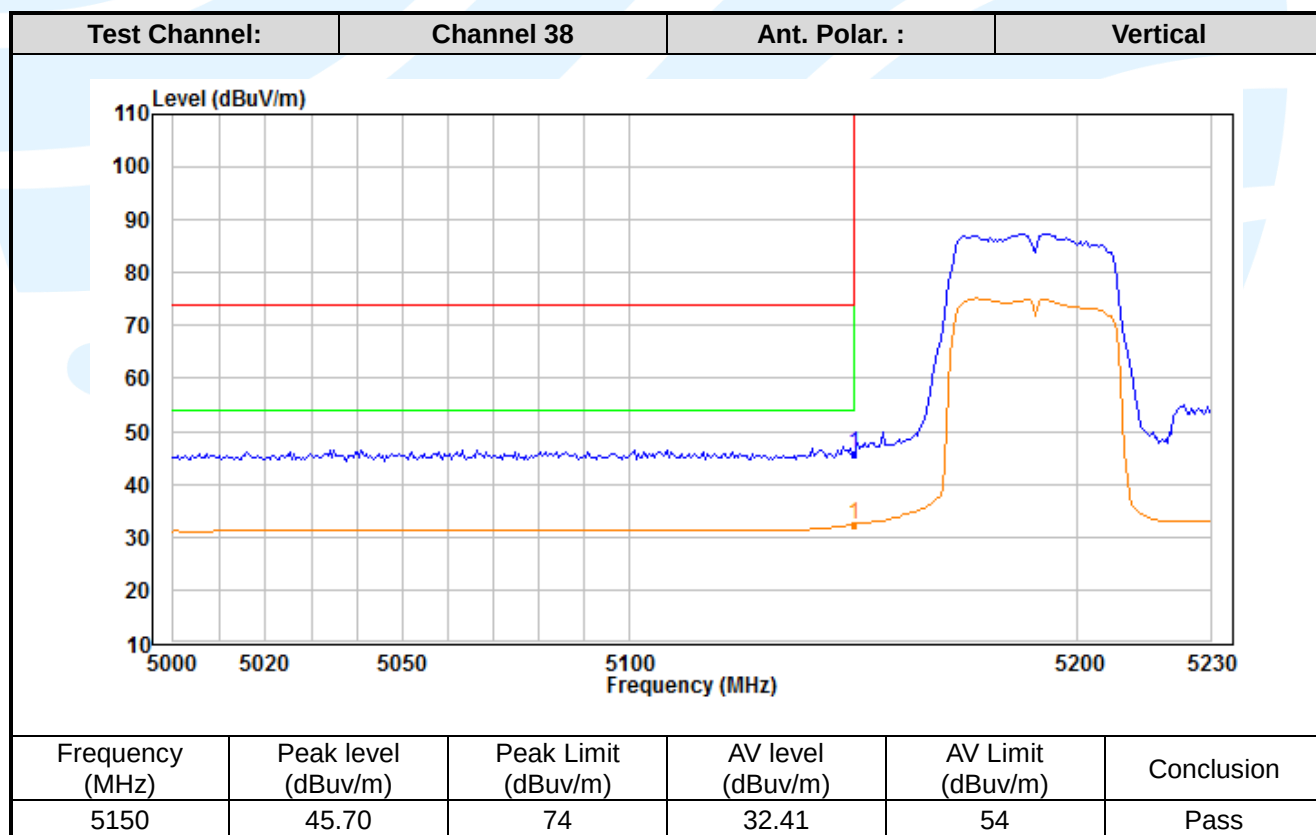
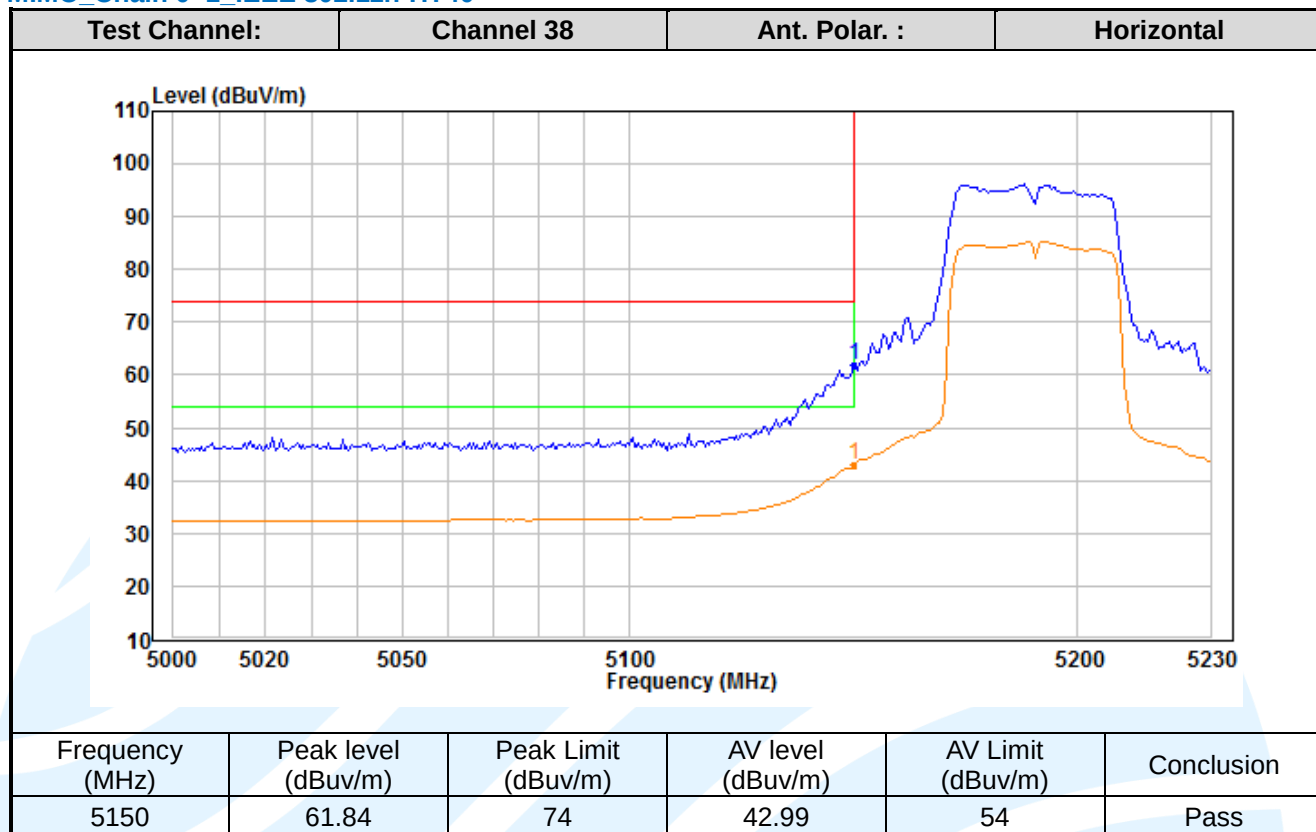


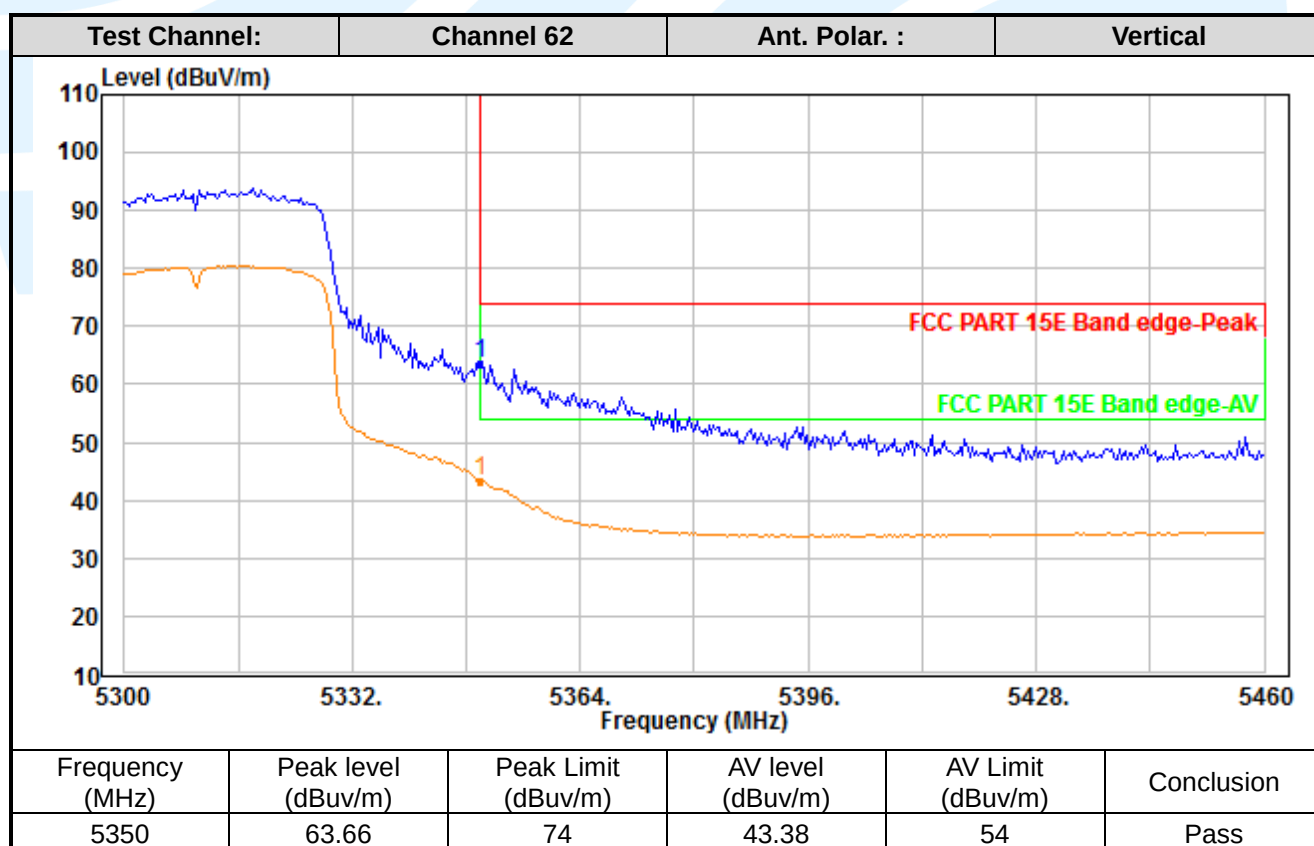
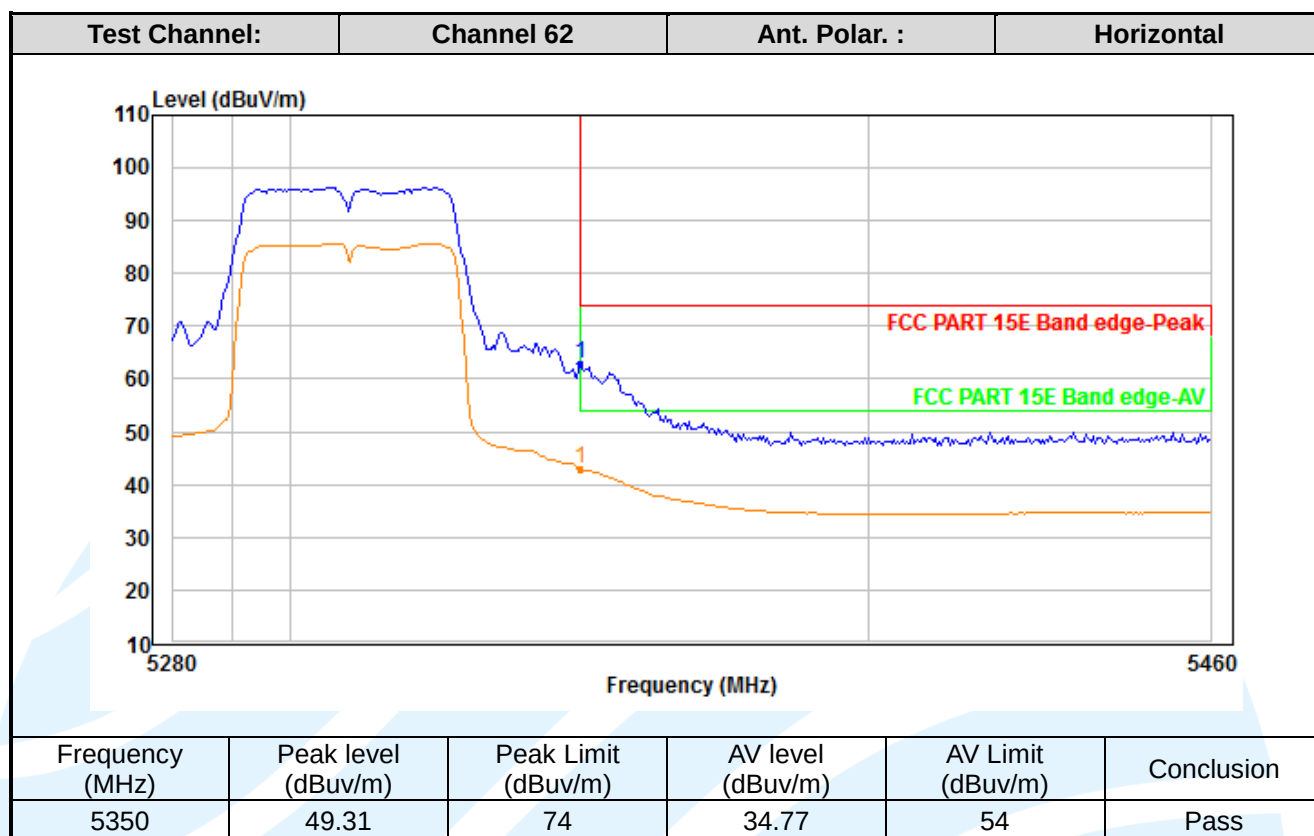


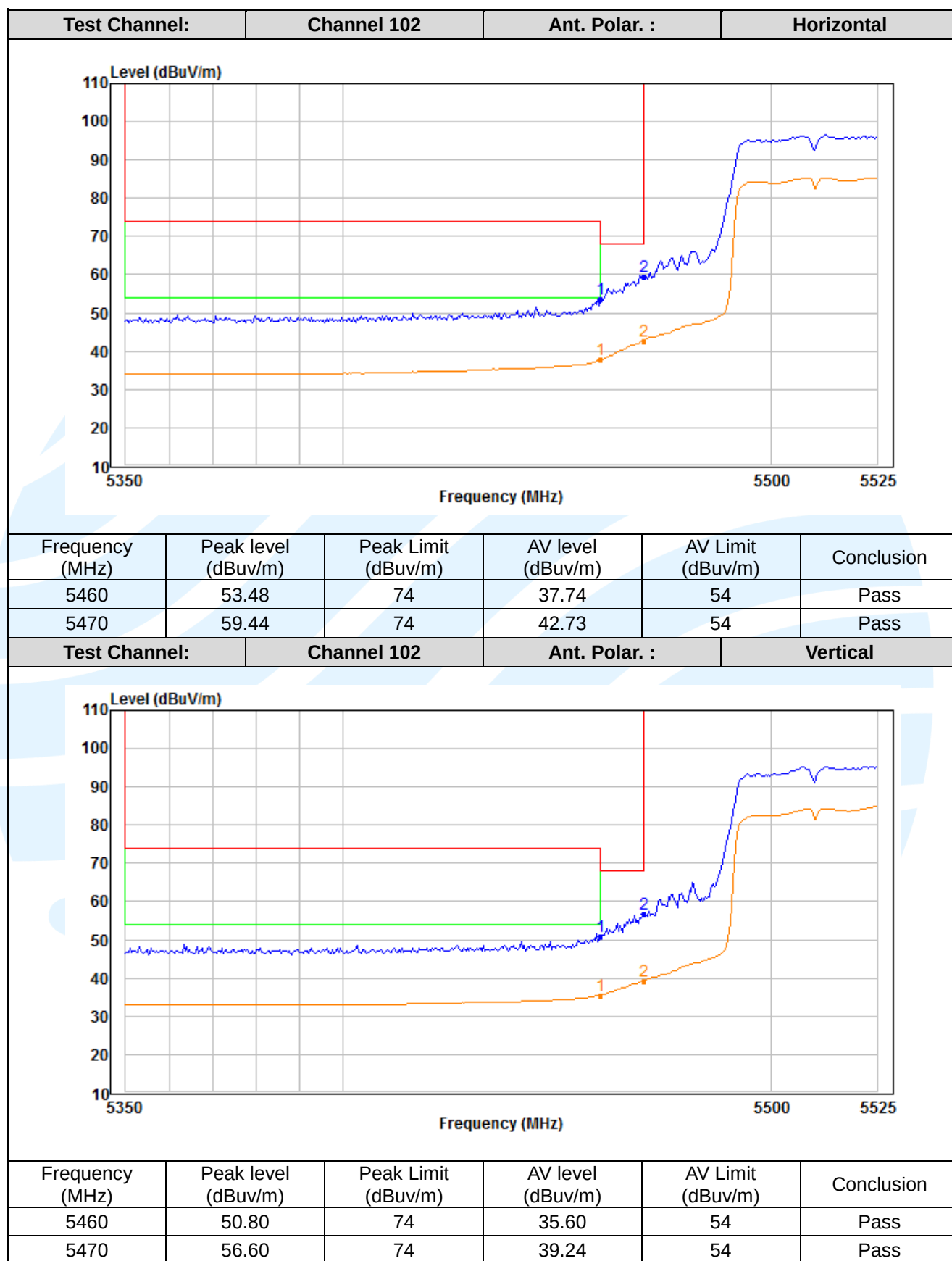


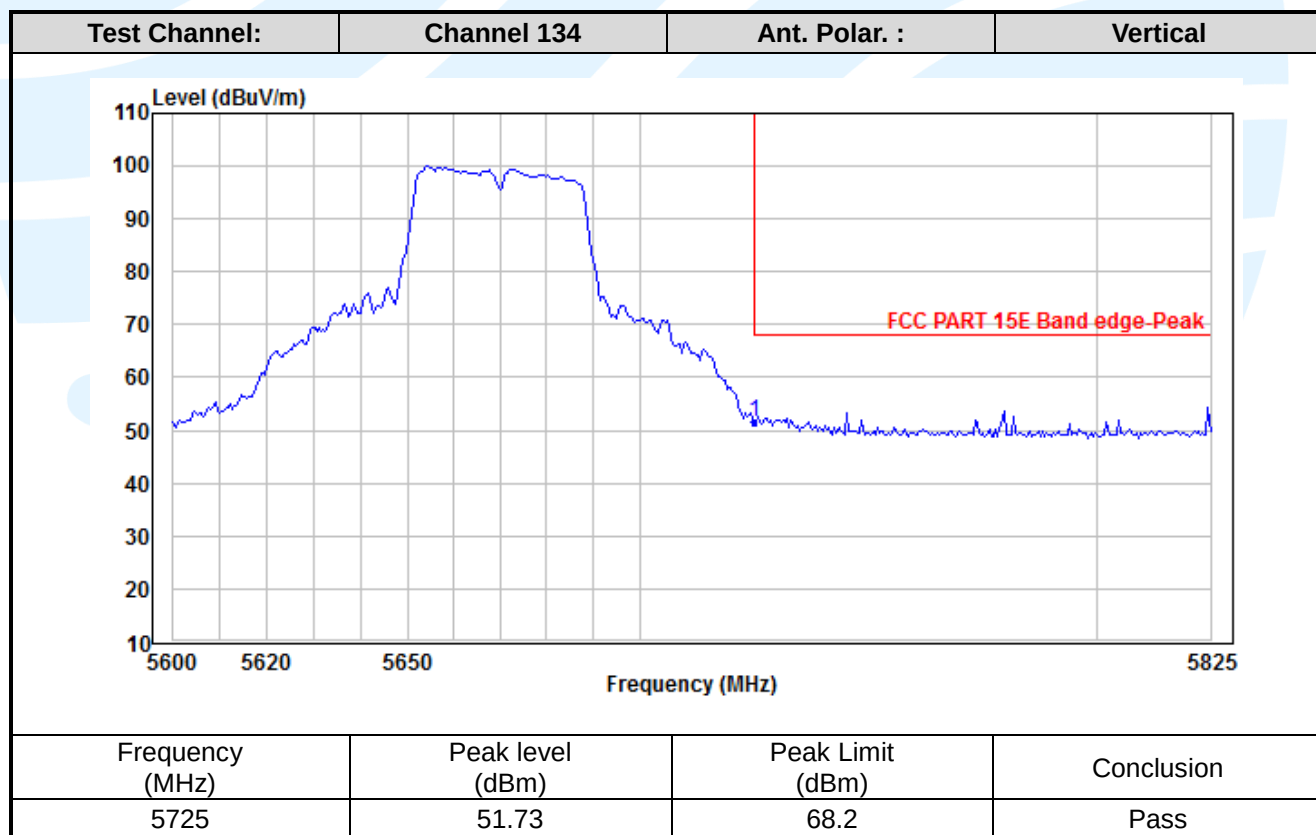
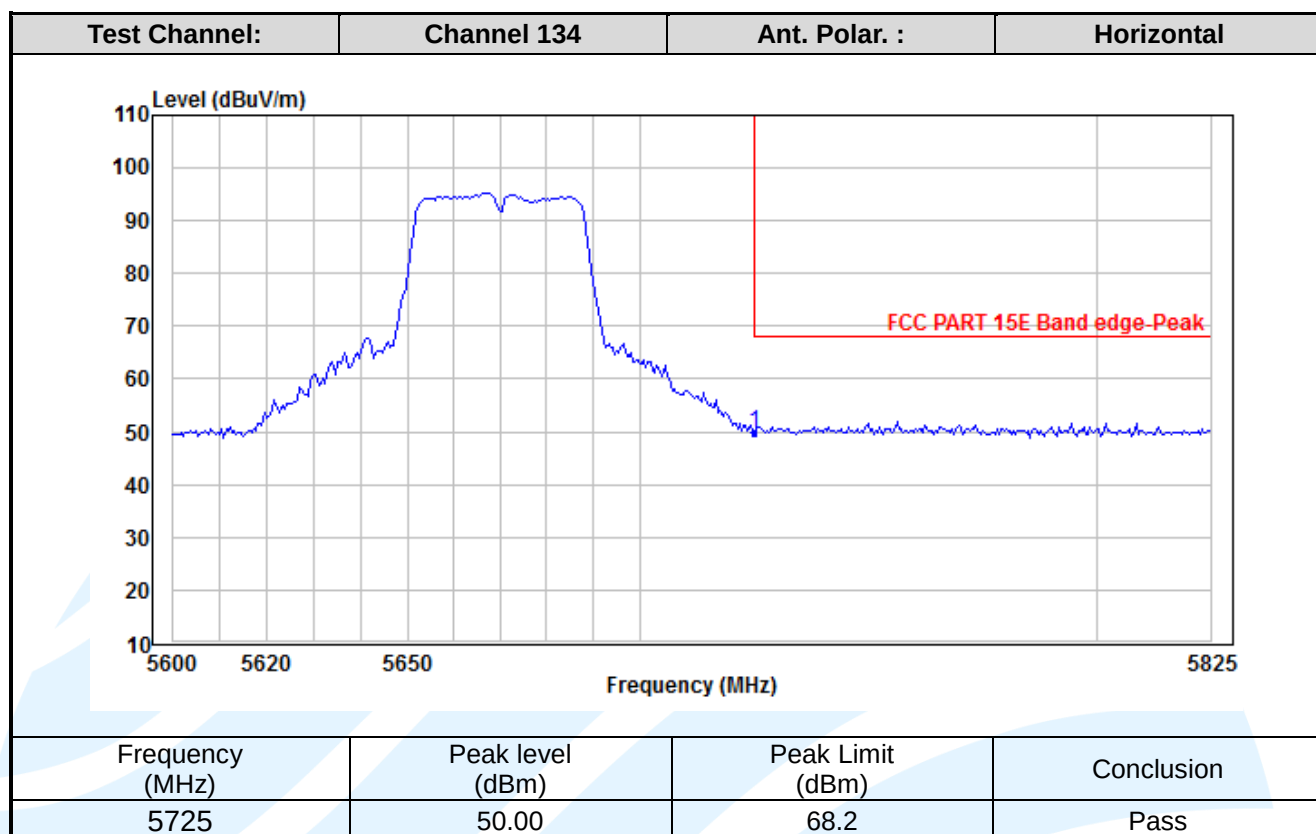


MIMO_Chain 0+1_ IEEE 802.11n-HT40

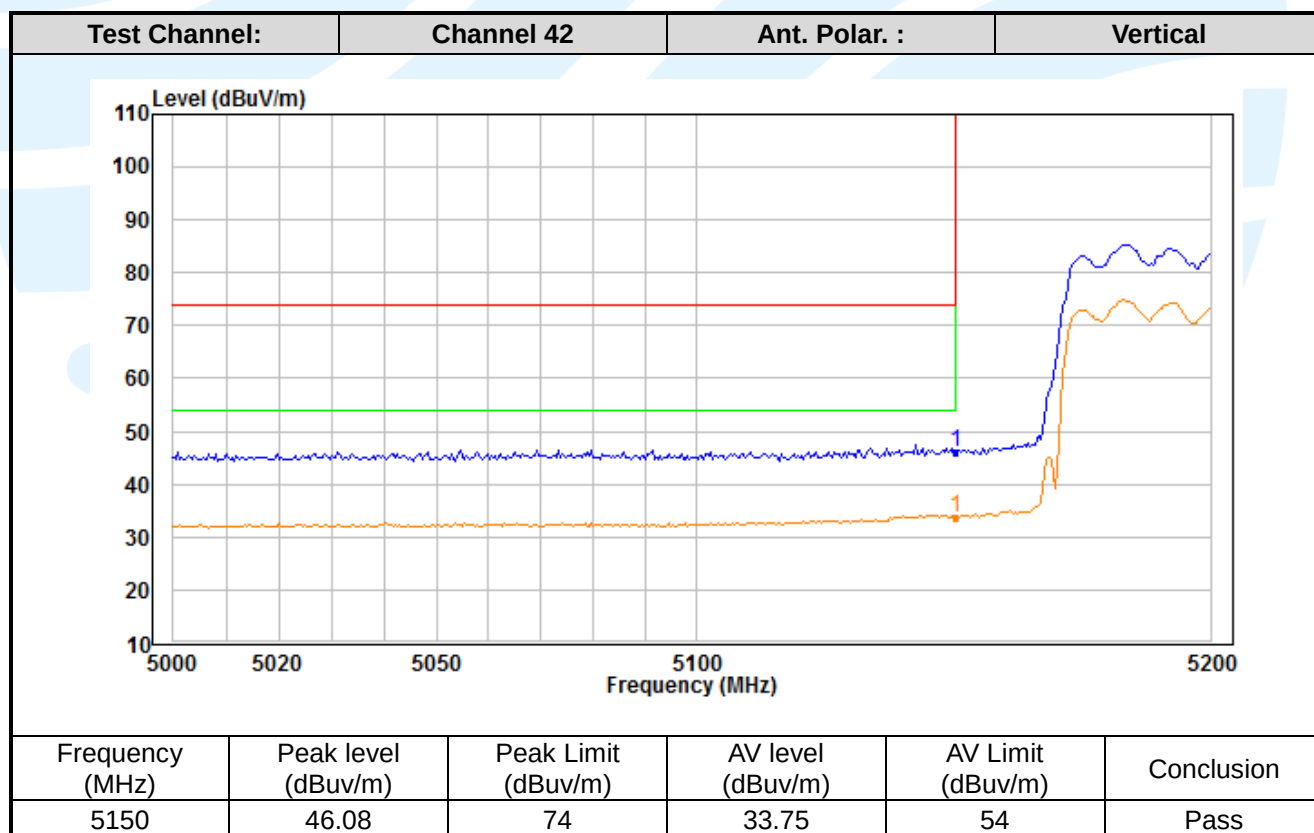
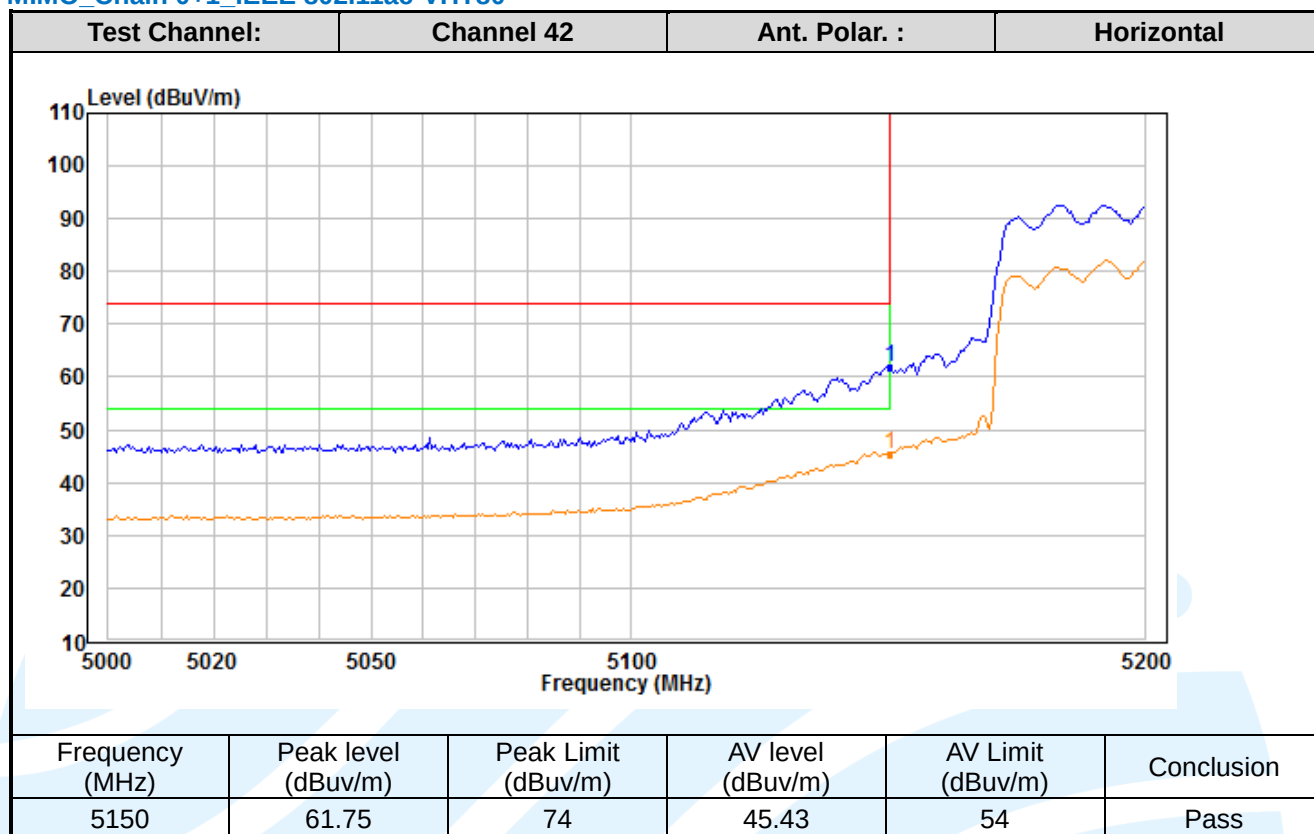


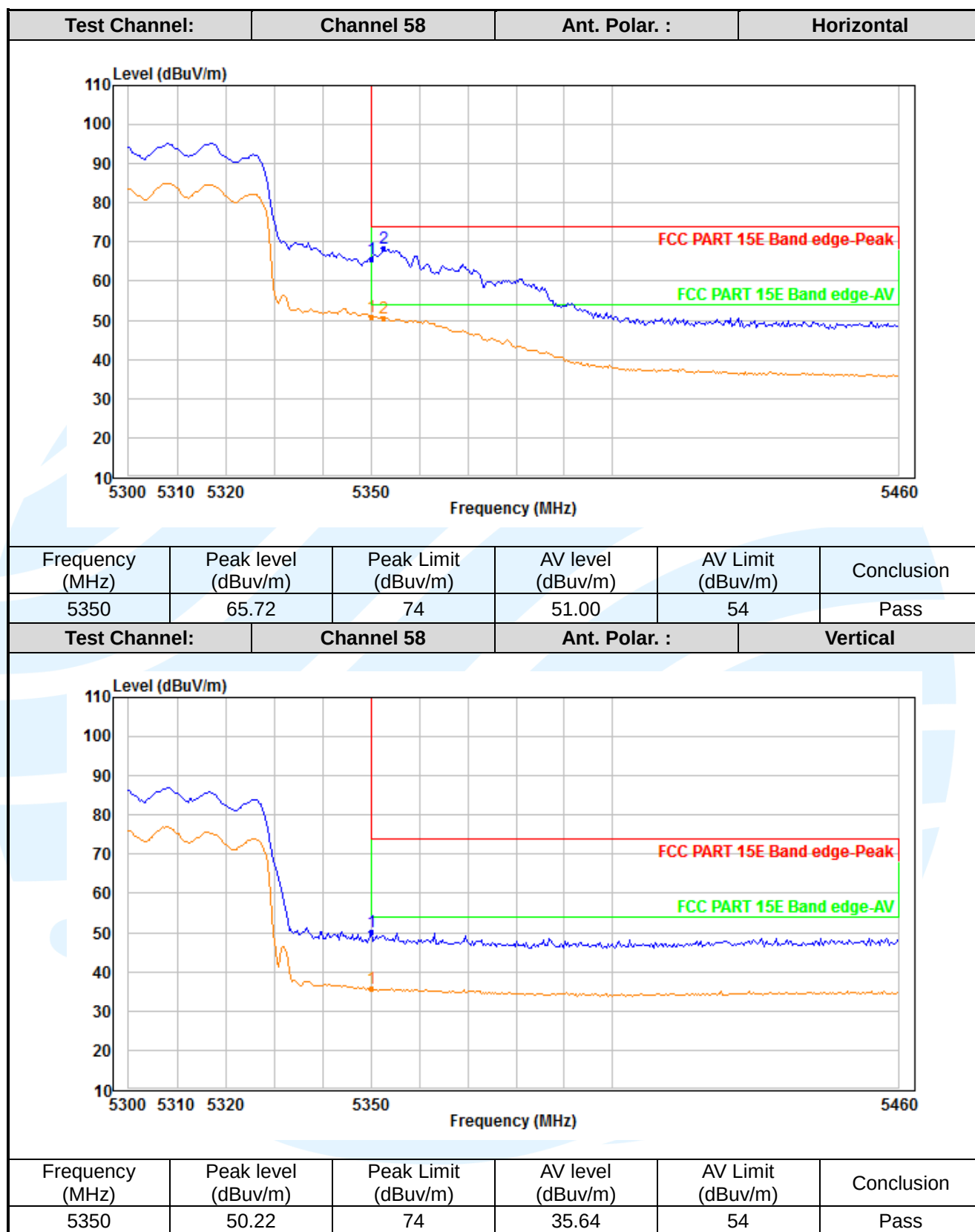


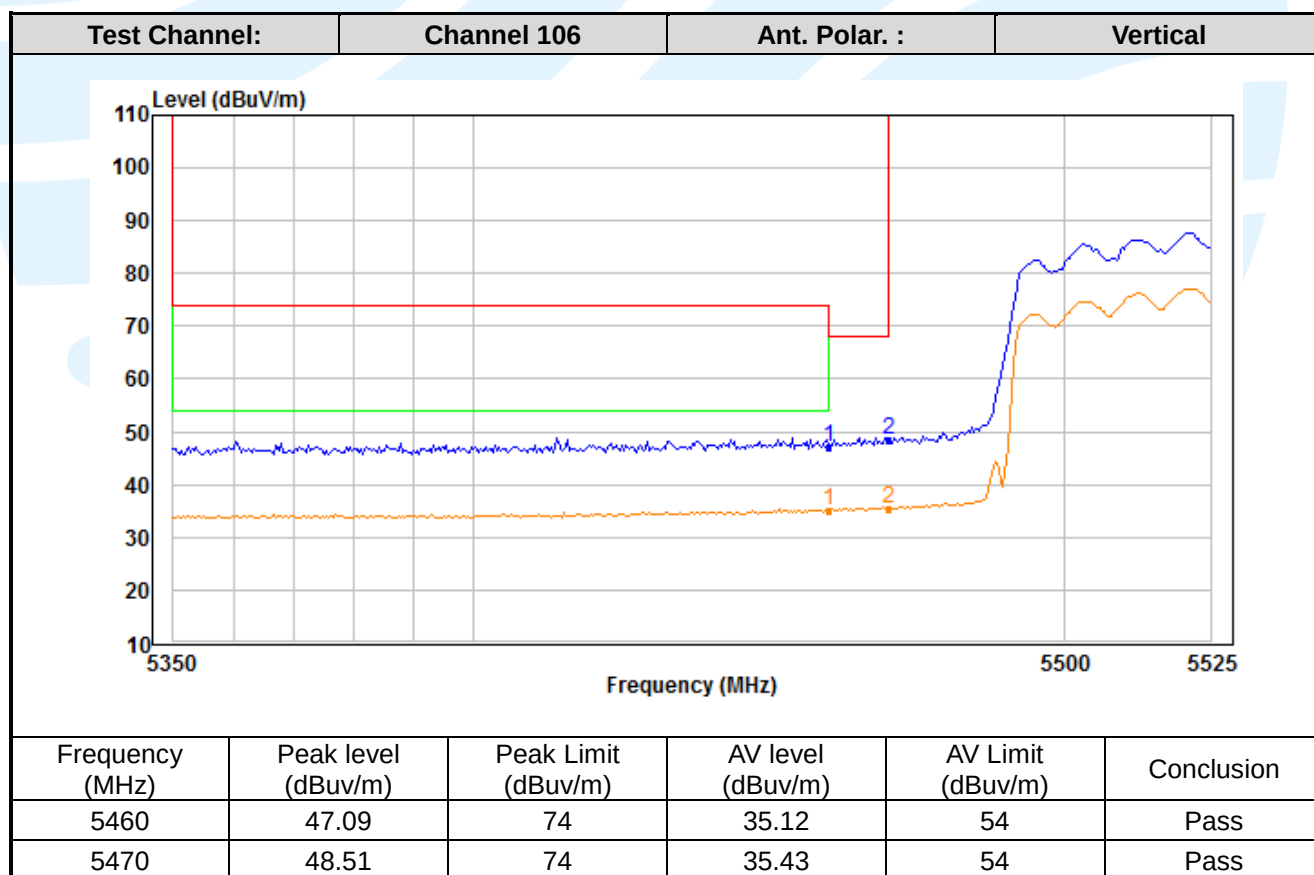
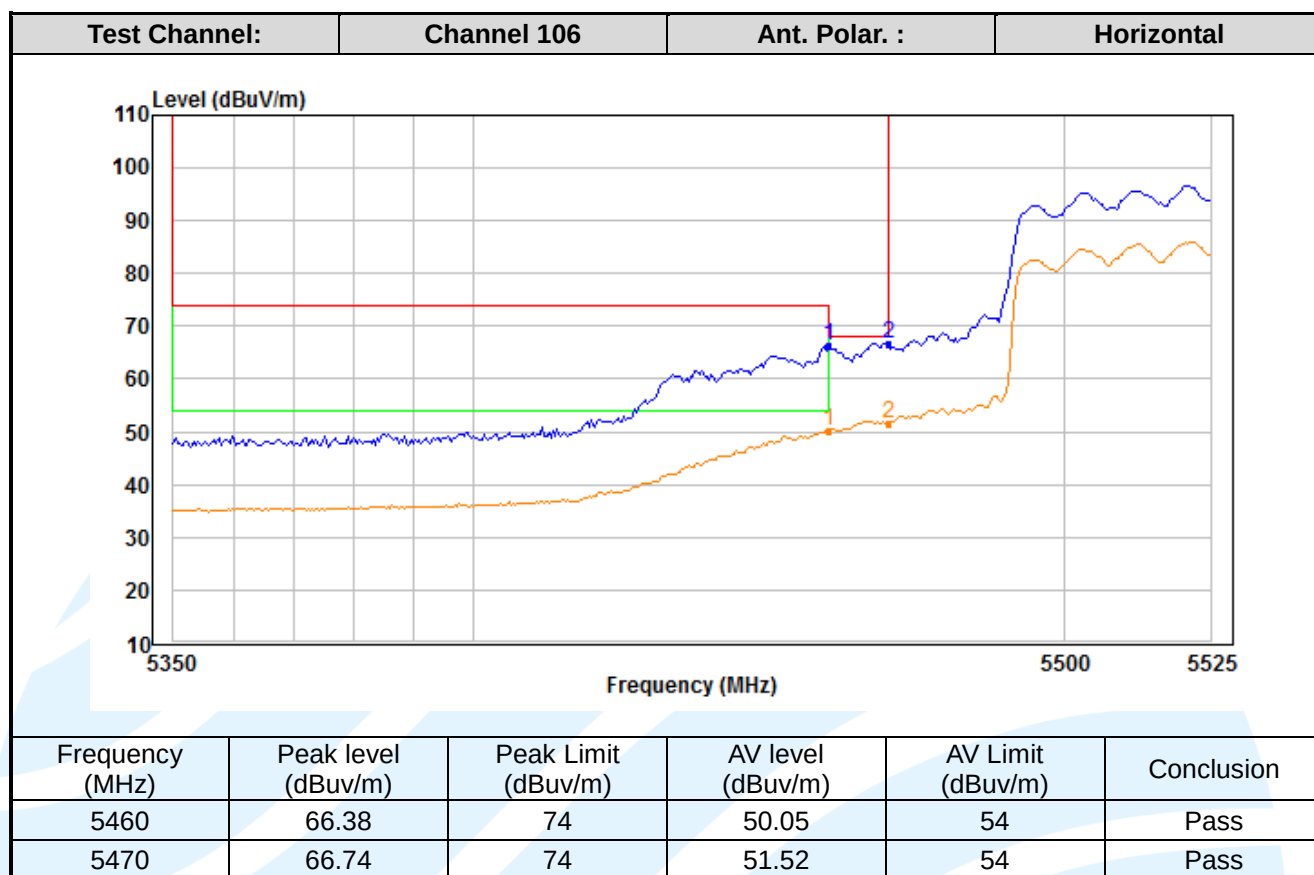




MIMO_Chain 0+1_ IEEE 802.11ac-VHT80







5.8 DYNAMIC FREQUENCY SELECTION

Test Requirement: FCC 47 CFR Part 15 Subpart E Section 15.407 (h)

Test Method: KDB 905462 D03 Client Without DFS New Rules v01r02

EUT Operating Mode:

DFS Operational mode	Operating Frequency Range	
	5250 MHz to 5350 MHz	5470 MHz to 5725 MHz
Slave without radar Interference detection function	✓	✓

Applicability:

The following table from KDB905462 and the lists of the applicable requirements for the DFS testing.

Applicability of DFS Requirements Prior to Use of a Channel:

Requirement	Operational Mode		
	Master	Client Without Radar Detection	Client With Radar Detection
Non-Occupancy Period	✓	Not required	Yes
DFS Detection Threshold	✓	Not required	Yes
Channel Availability Check Time	✓	Not required	Not required
U-NII Detection Bandwidth	✓	Not required	Yes

Applicability of DFS requirements during normal operation:

Requirement	Operational Mode	
	Master Device or Client with Radar Detection	Client Without Radar Detection
DFS Detection Threshold	Yes	Not required
Channel Closing Transmission Time	Yes	Yes
Channel Move Time	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required
Additional requirements for devices with multiple bandwidth modes	Master Device or Client with Radar Detection	Client Without Radar Detection
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other tests	Any single BW mode	Not required

Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.

DFS Detection Thresholds for Master Devices and Client Devices with Radar Detection:

Maximum Transmit Power	Value (See Notes 1, 2, and 3)
EIRP ≥ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64dBm

Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna.

Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.

Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.

DFS Radar Signal Parameter Values:

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds (See Note 1.)
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. (See Notes 1 and 2.)
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. (See Note 3.)

Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.

Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.

Note 3: During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.

DFS Radar Signal Parameter:

Radar Type 0 was used in the evaluation of the Client device for the purpose of measuring the Channel Move Time and the Channel Closing Transmission Time

Table 1-Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (μsec)	PRI (μsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Trials
0	1	1428	18	See Note 1.	See Note 1.
1	1	Test A Test B	$\text{Roundup} \left\{ \begin{array}{l} \left(\frac{1}{360} \right) \\ \left(\frac{19 \cdot 10^6}{\text{PRI}_{\mu\text{sec}}} \right) \end{array} \right\}$	60%	30
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120

Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.

Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a

Test B: 15 unique PRI values randomly selected within the range of 518-3066 μsec, with a minimum increment of 1 μsec, excluding PRI values selected in Test A

A minimum of 30 unique waveforms are required for each of the Short Pulse Radar Types 2 through 4. If more than 30 waveforms are used for Short Pulse Radar Types 2 through 4, then each additional waveform must also be unique and not repeated from the previous waveforms.

If more than 30 waveforms are used for Short Pulse Radar Type 1, then each additional waveform is generated with Test B and must also be unique and not repeated from the previous waveforms in Tests A or B.

The aggregate is the average of the percentage of successful detections of short pulse radar types 1-4

Table 2-Long Pulse Radar Test Waveform

Radar Type	Pulse Width (μsec)	Chirp Width (MHz)	PRI (μsec)	Number of Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

Table 3-Frequency Hopping Radar Test Waveform

Radar Type	Pulse Width (μsec)	PRI (μsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Trials
6	1	333	9	0.333	300	70%	30

In-Service Monitoring: Channel Move Time, Channel Closing Transmission Time and Non-Occupancy Period

Limit of In-Service Monitoring:

Reference to DFS Radar Signal Parameter Values.

Test Procedures:

- One frequency will be chosen from the Operating Channels of the EUT within the 5250-5350 MHz or 5470-5725 MHz bands. For 802.11 devices, the test frequency must contain control signals. This can be verified by disabling channel loading and monitoring the spectrum analyzer. If no control signals are detected, another frequency must be selected within the emission bandwidth where control signals are detected.
- In case the EUT is a Master Device, a U-NII device operating as a Client Device will be used and it is assumed that the Client will associate with the EUT (Master). For radiated tests, the emissions of the Radar Waveform generator will be directed towards the Master Device. If the Master Device has antenna gain, the main beam of the antenna will be directed toward the radar emitter. Vertical polarization is used for testing.
- The TCP protocol unicast data stream was generated by the iperf software command line with at least 17% activity ratio over any 100ms period.
- Timing plots are reported with calculations demonstrating a minimum channel loading of approximately 17% or greater. For example, channel loading can be estimated by setting the spectrum analyzer for zero span and approximate the Time On/ (Time On + Off Time).
- At time T₀ the Radar Waveform generator sends a Burst of pulses for one of the Short Pulse Radar Types 1-4 at DFS Detection Threshold levels on the Operating Channel. An additional 1 dB is added to the radar test signal to ensure it is at or above the DFS Detection Threshold, accounting for equipment variations/errors.
- Observe the transmissions of the EUT at the end of the radar Burst on the Operating Channel for duration greater than 10 seconds. Measure and record the transmissions from the EUT during the observation time (Channel Move Time). Measure and record the Channel Move Time and Channel Closing Transmission Time if radar detection occurs.
- When operating as a Master Device, monitor the EUT for more than 30 minutes following instant T₂ to verify that the EUT does not resume any transmissions on this Channel. Perform this test once and record the measurement result.

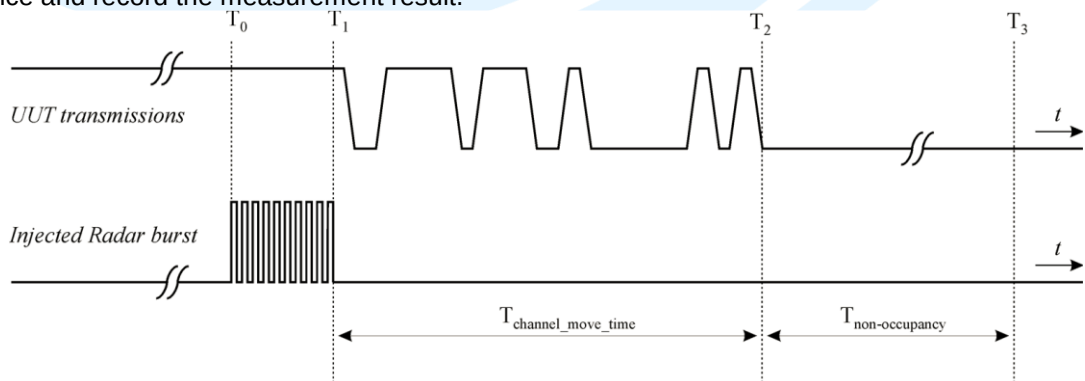


Figure 17: Channel Closing Transmission Time, Channel Move Time and Non-Occupancy Period

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

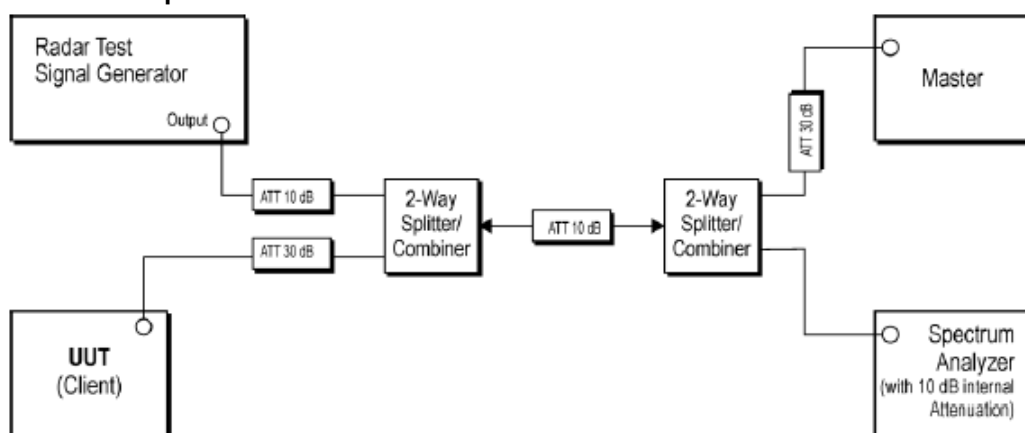
Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

[Http://www.uttlab.com](http://www.uttlab.com)

Conducted test setup



Setup for Client with injection at the Master

Equipment Used: Refer to section 3 for details.

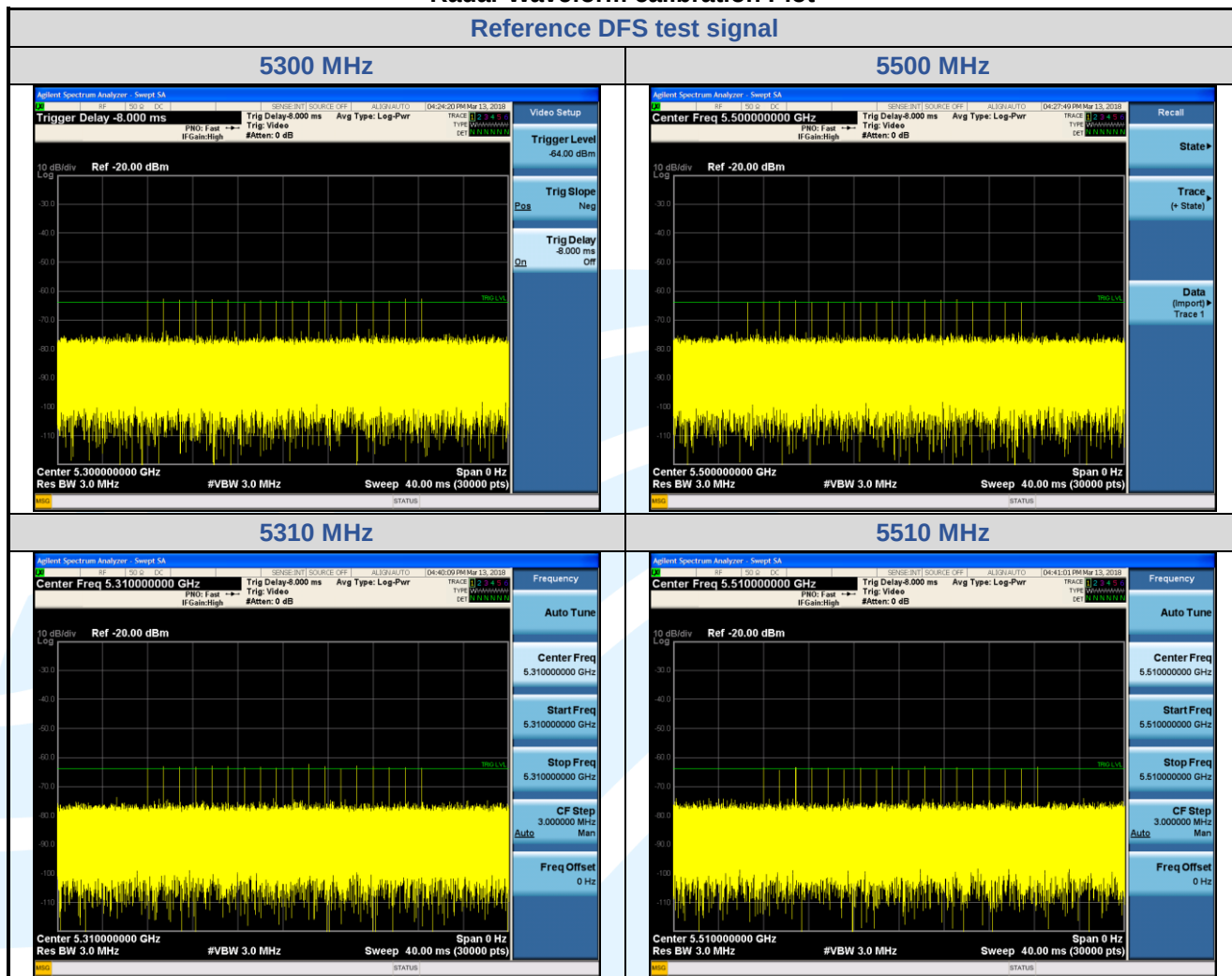
Test Result: Result of Channel Move Time, Channel Closing Transmission Time and Non-Occupancy Period for Client Beacon Test

The measurement data as follows:

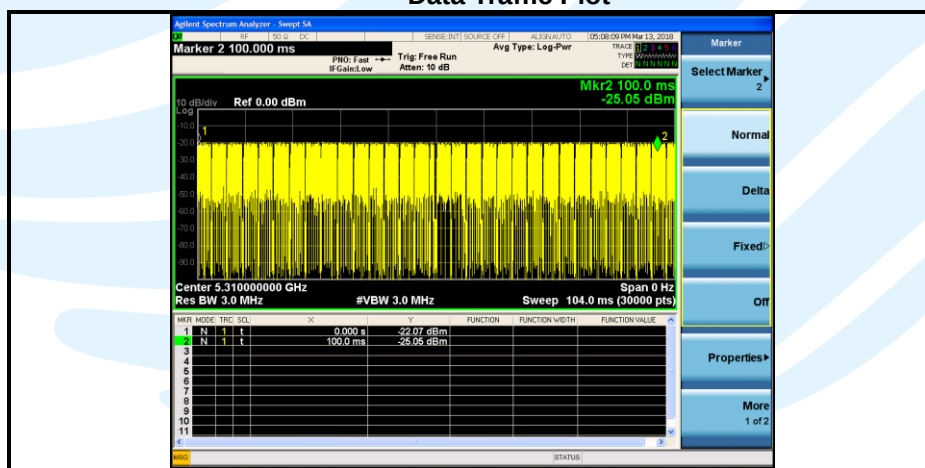
BW / Channel	Test Item	Test Result	Limit	Pass/Fail
20 MHz / 5300 MHz	Channel Move Time	0.6095 s	< 10s	Pass
	Channel Closing Transmission Time	202.0 ms	< 200+60ms	Pass
	Non-Occupancy Period	No transmission	30 minutes	Pass
20 MHz / 5500 MHz	Channel Move Time	0.723 s	< 10s	Pass
	Channel Closing Transmission Time	202.8 ms	< 200+60ms	Pass
	Non-Occupancy Period	No transmission	30 minutes	Pass
40 MHz / 5310 MHz	Channel Move Time	0.3673 s	< 10s	Pass
	Channel Closing Transmission Time	203.2 ms	< 200+60ms	Pass
	Non-Occupancy Period	No transmission	30 minutes	Pass
40 MHz / 5510 MHz	Channel Move Time	0.5154 s	< 10s	Pass
	Channel Closing Transmission Time	202.8 ms	< 200+60ms	Pass
	Non-Occupancy Period	No transmission	30 minutes	Pass

Radars Waveform calibration Plot

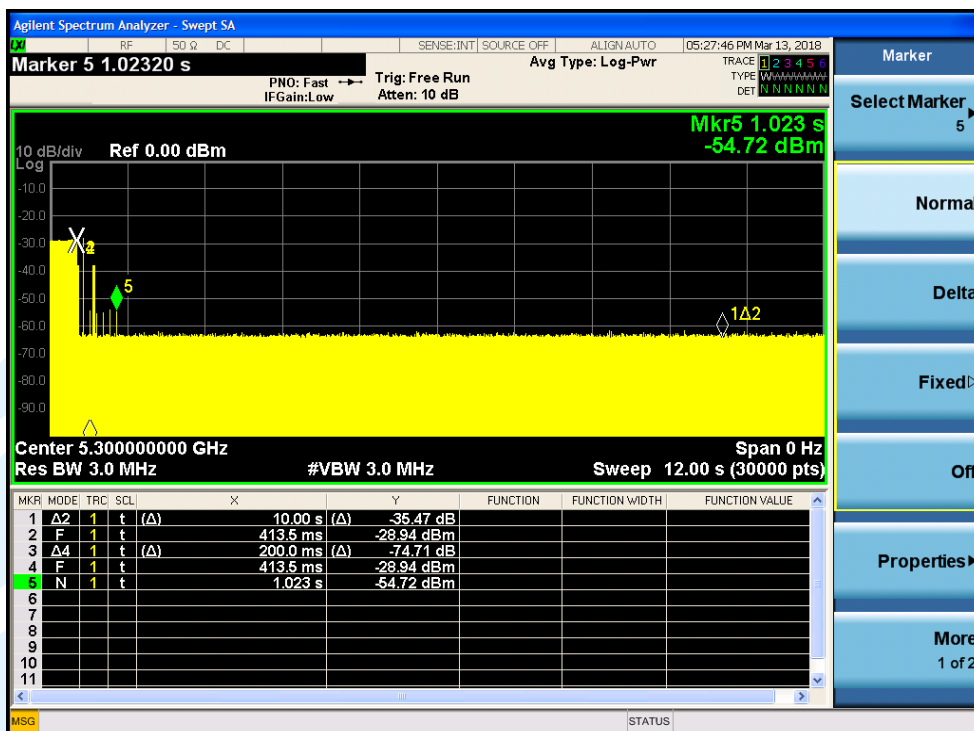
Reference DFS test signal



Data Traffic Plot



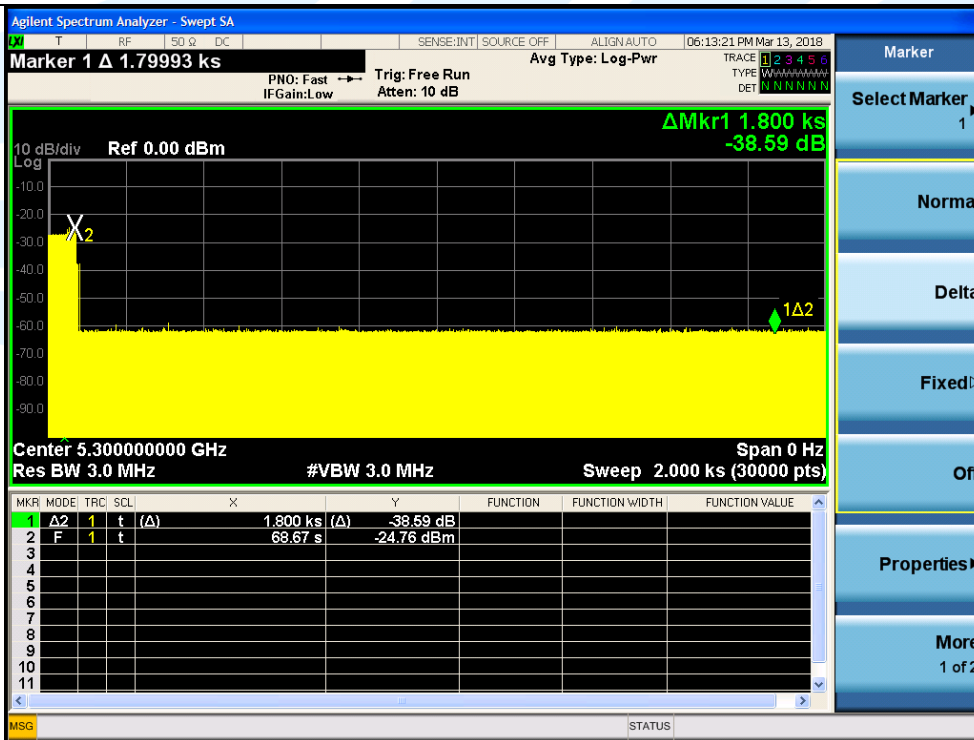
Channel Move Time & Channel Closing Transmission Time 802.11a_5300 MHz



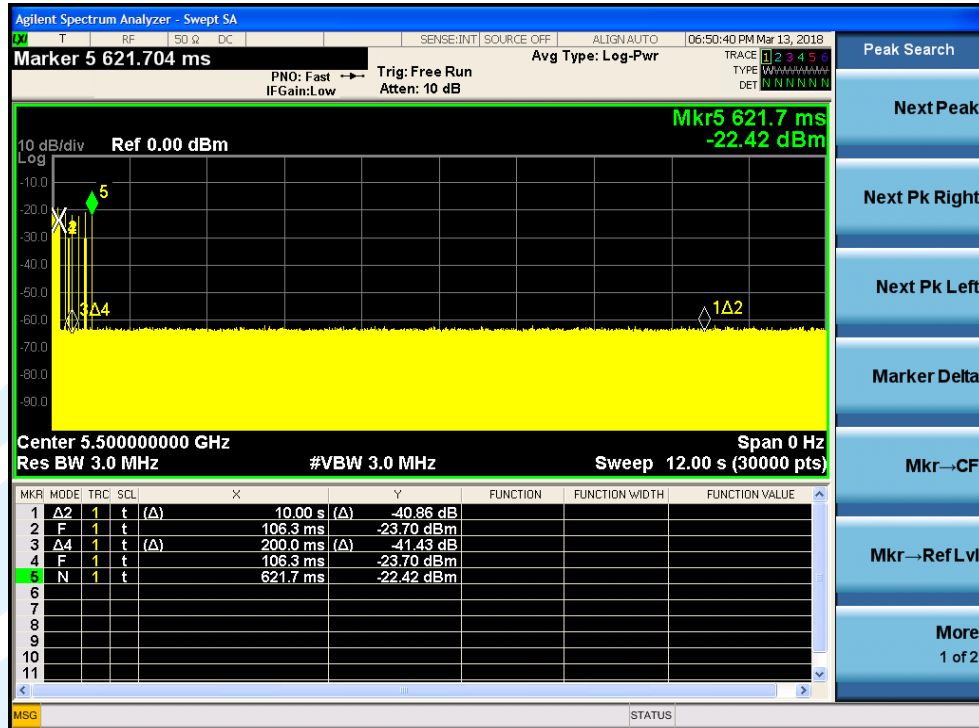
Note:

- 1) Mark1 Time: 413.5 ms, Mark2 Time: 10413 ms, Ontime Points: 5
- 2) Dwell = S/B = 12000ms/30000 = 0.4 ms, C = N x Dwell = 5 x 0.4 = 2.0 ms
- 3) CMT = 1.023 s – 0.4135 s = 0.6095s

Non-Occupancy Period_802.11a_CH60_5300 MHz



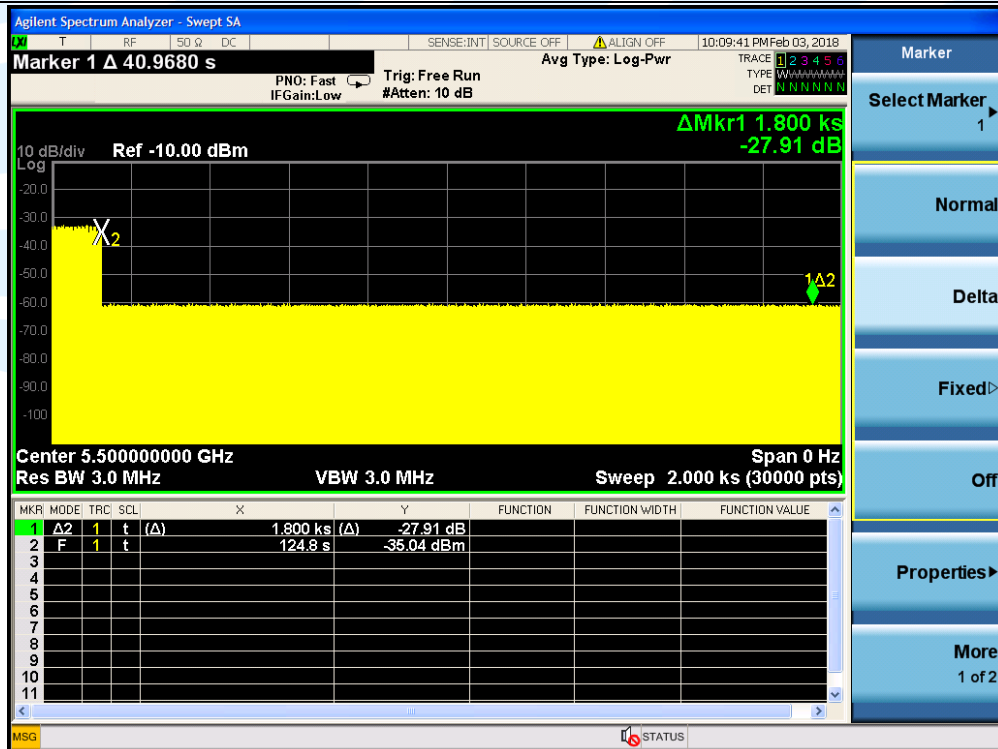
Channel Move Time & Channel Closing Transmission Time 802.11a_CH100_5500 MHz



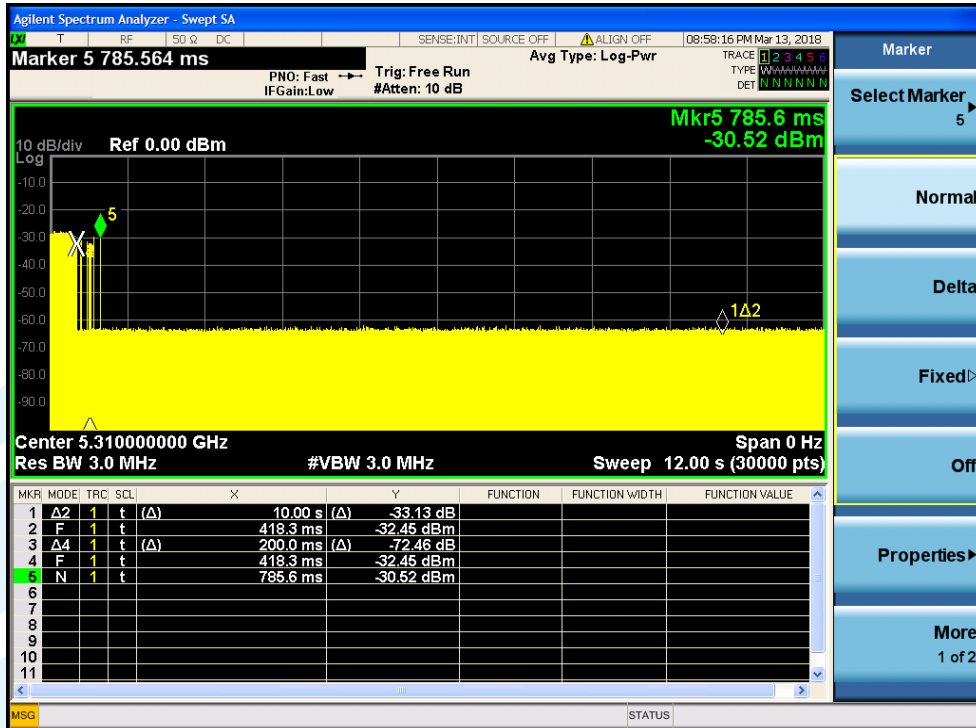
Note:

- 4) Mark1 Time: 106.3 ms, Mark2 Time: 10106.3 ms, Ontime Points: 7
- 5) Dwell = S/B = 12000ms/30000 = 0.4 ms, C = N x Dwell = 7 x 0.4 = 2.8ms
- 6) CMT = 0.6217 s – 0.1063 s = 0.723s

Non-Occupancy Period_802.11a_CH100_5500 MHz



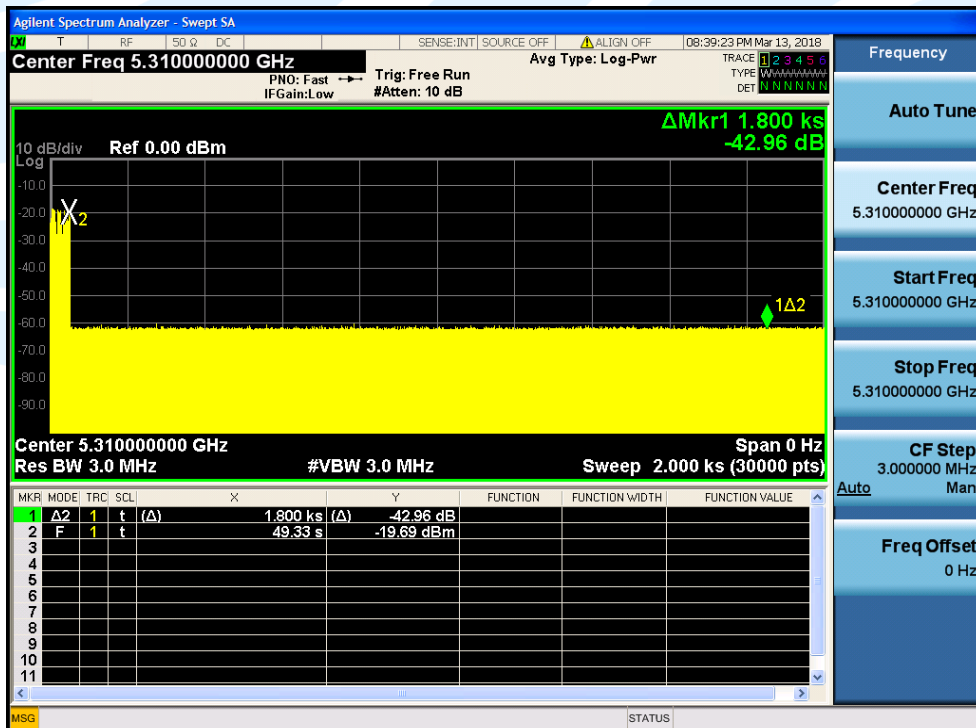
Channel Move Time & Channel Closing Transmission Time 802.11ac_CH62_5310 MHz

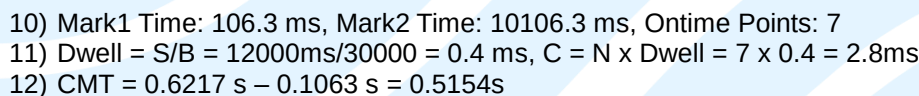


Note:

- 7) Mark1 Time: 418.3 ms, Mark2 Time: 10418.3 ms, Ontime Points: 8
- 8) Dwell = S/B = 12000ms/30000 = 0.4 ms, C = N x Dwell = 8 x 0.4 = 3.2ms
- 9) CMT = 0.7856 s – 0.4183 s = 0.3673s

Non-Occupancy Period_802.11ac_CH62_5310 MHz





5.9 CONDUCTED EMISSION

Test Requirement: 47 CFR Part 15C Section 15.207

Test Method: ANSI C63.10-2013 Section 6.2

Limits:

Frequency range (MHz)	Limits (dB(μV))	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50

Remark:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.50 MHz.

Test Setup: Refer to section 4.4.2 for details.

Test Procedures:

Test frequency range :150KHz-30MHz

- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu\text{H} + 5\Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Equipment Used: Refer to section 3 for details.

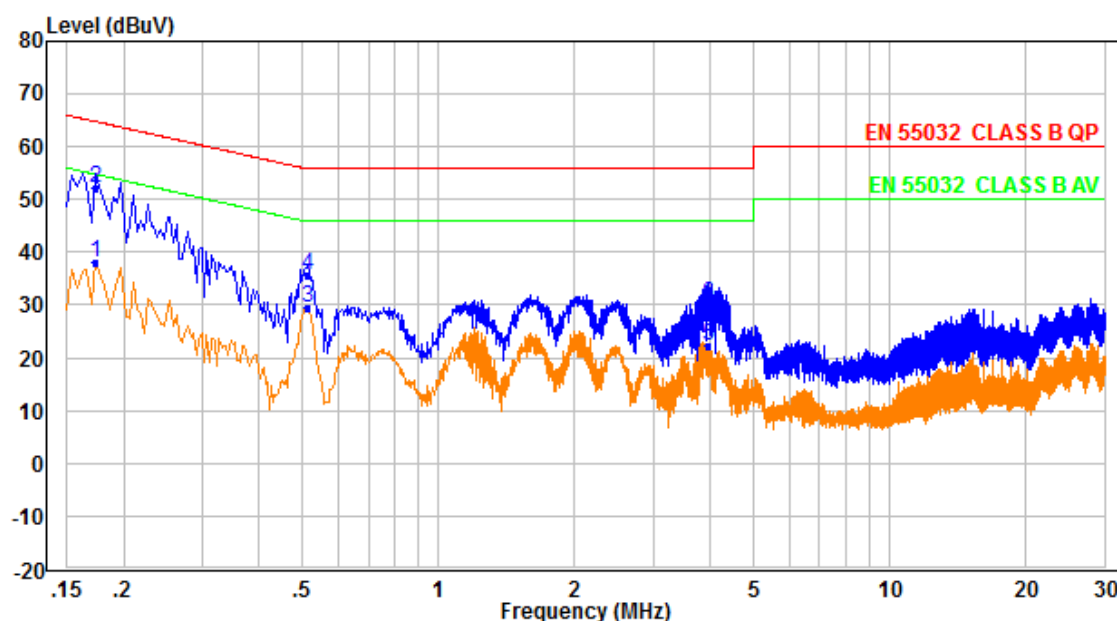
Test Result: Pass

The measurement data as follows:

Quasi Peak and Average:

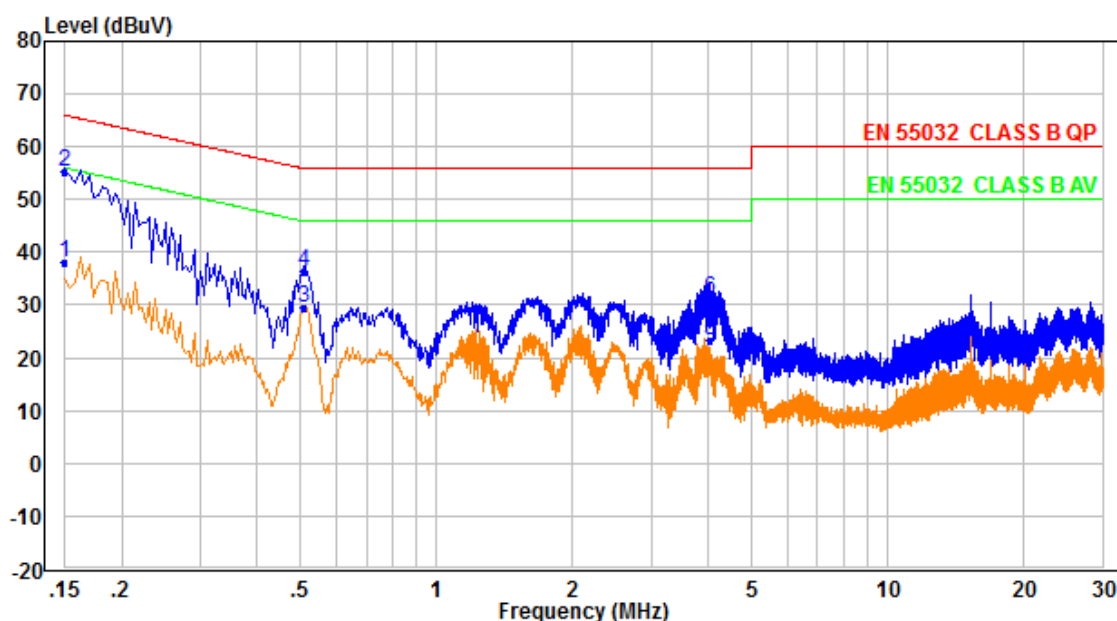
Mode: WIFI Link

Live Line



No.	Frequency (MHz)	Reading (dBUV)	Correction factor (dB)	Result (dBUV)	Limit (dBUV)	Margin (dB)	Remark
1	0.174	28.30	10.20	38.50	54.80	16.30	Average
2*	0.174	41.90	10.20	52.10	64.80	12.70	QP
3	0.514	19.30	10.20	29.50	46.00	16.50	Average
4	0.514	25.30	10.20	35.50	56.00	20.50	QP
5	3.950	11.80	10.40	22.20	46.00	23.80	Average
6	3.950	19.80	10.40	30.20	56.00	25.80	QP

Neutral Line



No.	Frequency (MHz)	Reading (dBUV)	Correction factor (dB)	Result (dBUV)	Limit (dBUV)	Margin (dB)	Remark
1	0.150	27.90	10.20	38.10	56.00	17.90	Average
2*	0.150	44.90	10.20	55.10	66.00	10.90	QP
3	0.506	19.10	10.40	29.50	46.00	16.50	Average
4	0.506	26.10	10.40	36.50	56.00	19.50	QP
5	4.046	12.60	10.60	23.20	46.00	22.80	Average
6	4.046	20.60	10.60	31.20	56.00	24.80	QP

Remark:

1. An initial pre-scan was performed on the Phase and neutral lines with peak detector. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

APPENDIX 1 PHOTOS OF TEST SETUP

See test photos attached in Appendix 1 for the actual connections between Product and support equipment.

APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal photos.

*** End of Report ***

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