

4.5.7 Test Results

For U-NII-1, U-NII-2A, U-NII-2C Band

802.11a

SISO

Channel	Frequency (MHz)	PSD (dBm)	Maximum Limit (dBm)	Pass / Fail
36	5180	6.56	11	Pass
40	5200	7.16	11	Pass
48	5240	7.09	11	Pass
52	5260	6.90	11	Pass
60	5300	6.56	11	Pass
64	5320	4.98	11	Pass
100	5500	5.16	11	Pass
116	5580	7.51	11	Pass
140	5700	5.92	11	Pass
144 (U-NII-2C Band)	5720	7.15	11	Pass

MIMO

Channel	Frequency (MHz)	PSD (dBm)		Total Power Density (dBm)	Maximum Limit (dBm)	Pass / Fail
		Chain 0	Chain 1			
36	5180	3.43	4.80	7.18	11	Pass
40	5200	3.56	3.91	6.75	11	Pass
48	5240	3.14	3.13	6.15	11	Pass
52	5260	3.47	2.84	6.18	11	Pass
60	5300	3.44	1.95	5.77	11	Pass
64	5320	4.77	3.25	7.09	11	Pass
100	5500	3.57	3.51	6.55	11	Pass
116	5580	5.04	6.53	8.86	11	Pass
140	5700	3.17	2.99	6.09	11	Pass
144 (U-NII-2C Band)	5720	4.53	4.51	7.53	11	Pass

Note:

- Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
- For U-NII-1:** The directional gain = 5 dBi <= 6dBi, so there is no need to reduce the power density limit.
For U-NII-2A: Directional gain = 5 dBi <= 6dBi, so there is no need to reduce the power density limit.
For U-NII-2C: Directional gain = 4.59 dBi <= 6dBi, so there is no need to reduce the power density limit.

802.11ac (VHT20)

SISO

Channel	Frequency (MHz)	PSD (dBm)	Maximum Limit (dBm)	Pass / Fail
36	5180	4.85	11	Pass
40	5200	6.35	11	Pass
48	5240	6.39	11	Pass
52	5260	7.12	11	Pass
60	5300	6.87	11	Pass
64	5320	3.59	11	Pass
100	5500	4.45	11	Pass
116	5580	6.96	11	Pass
140	5700	4.81	11	Pass
144 (U-NII-2C Band)	5720	6.53	11	Pass

MIMO

Channel	Frequency (MHz)	PSD (dBm)		Total Power Density (dBm)	Maximum Limit (dBm)	Pass / Fail
		Chain 0	Chain 1			
36	5180	4.69	4.41	7.56	11	Pass
40	5200	4.67	4.28	7.49	11	Pass
48	5240	5.17	3.73	7.52	11	Pass
52	5260	5.08	3.51	7.38	11	Pass
60	5300	4.78	2.42	6.77	11	Pass
64	5320	4.38	1.75	6.27	11	Pass
100	5500	3.38	2.43	5.94	11	Pass
116	5580	4.92	5.50	8.23	11	Pass
140	5700	3.37	2.41	5.93	11	Pass
144 (U-NII-2C Band)	5720	4.44	4.59	7.53	11	Pass

Note:

- Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
- For U-NII-1:** The directional gain = 5 dBi $\leq$ 6dBi, so there is no need to reduce the power density limit.
For U-NII-2A: Directional gain = 5 dBi $\leq$ 6dBi, so there is no need to reduce the power density limit.
For U-NII-2C: Directional gain = 4.59 dBi $\leq$ 6dBi, so there is no need to reduce the power density limit.

802.11ac (VHT40)

SISO

Channel	Frequency (MHz)	PSD (dBm)	Maximum Limit (dBm)	Pass / Fail
38	5190	-0.25	11	Pass
46	5230	2.56	11	Pass
54	5270	2.81	11	Pass
62	5310	-1.99	11	Pass
102	5510	-0.90	11	Pass
110	5550	5.36	11	Pass
134	5670	3.29	11	Pass
142 (U-NII-2C Band)	5710	2.63	11	Pass

MIMO

Channel	Frequency (MHz)	PSD (dBm)		Total Power Density (dBm)	Maximum Limit (dBm)	Pass / Fail
		Chain 0	Chain 1			
38	5190	-0.68	-0.61	2.37	11	Pass
46	5230	2.51	2.42	5.48	11	Pass
54	5270	2.69	1.91	5.33	11	Pass
62	5310	-2.06	-3.37	0.34	11	Pass
102	5510	-3.68	-2.84	-0.23	11	Pass
110	5550	3.53	5.40	7.58	11	Pass
134	5670	1.85	2.59	5.25	11	Pass
142 (U-NII-2C Band)	5710	3.91	4.02	6.98	11	Pass

Note:

- Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
- For U-NII-1:** The directional gain = 5 dBi $\leq$ 6dBi, so there is no need to reduce the power density limit.
For U-NII-2A: Directional gain = 5 dBi $\leq$ 6dBi, so there is no need to reduce the power density limit.
For U-NII-2C: Directional gain = 4.59 dBi $\leq$ 6dBi, so there is no need to reduce the power density limit.

802.11ac (VHT80):

SISO

Channel	Frequency (MHz)	PSD (dBm)	Maximum Limit (dBm)	Pass / Fail
42	5210	-3.89	11	Pass
58	5290	-5.19	11	Pass
106	5530	-3.83	11	Pass
138 (U-NII-2C Band)	5690	-1.03	11	Pass

MIMO

Channel	Frequency (MHz)	PSD (dBm)		Total Power Density (dBm)	Maximum Limit (dBm)	Pass / Fail
		Chain 0	Chain 1			
42	5210	-3.91	-4.11	-1.00	11	Pass
58	5290	-4.78	-6.23	-2.43	11	Pass
106	5530	-5.60	-3.98	-1.70	11	Pass
138 (U-NII-2C Band)	5690	2.23	2.02	5.14	11	Pass

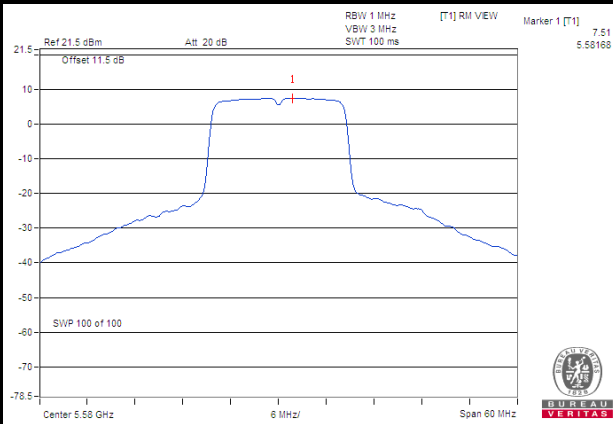
Note:

- Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
- For U-NII-1:** The directional gain = 5 dBi $\leq$ 6dBi, so there is no need to reduce the power density limit.
For U-NII-2A: Directional gain = 5 dBi $\leq$ 6dBi, so there is no need to reduce the power density limit.
For U-NII-2C: Directional gain = 4.59 dBi $\leq$ 6dBi, so there is no need to reduce the power density limit.

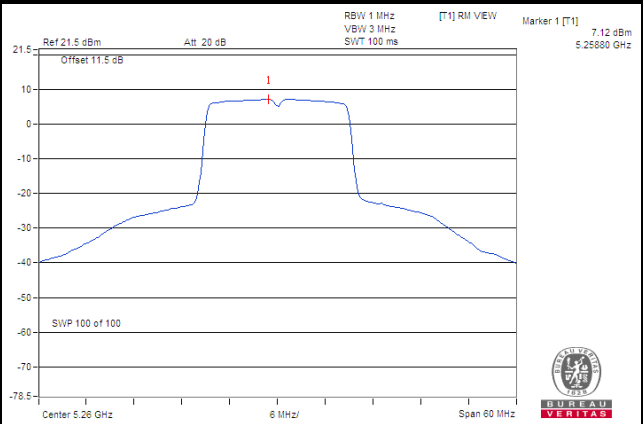
SISO

Spectrum Plot of Worst Value

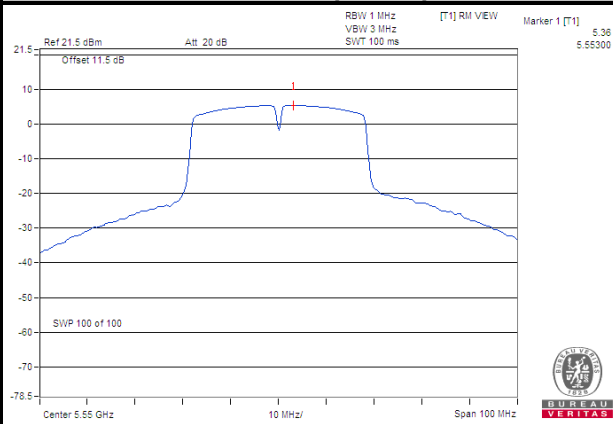
802.11a



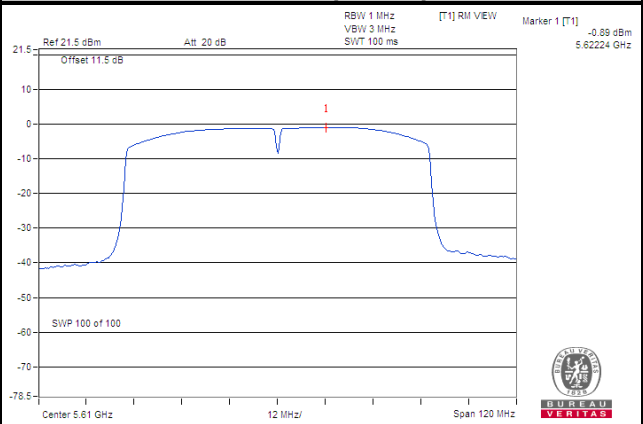
802.11ac (VHT20)



802.11ac (VHT40)



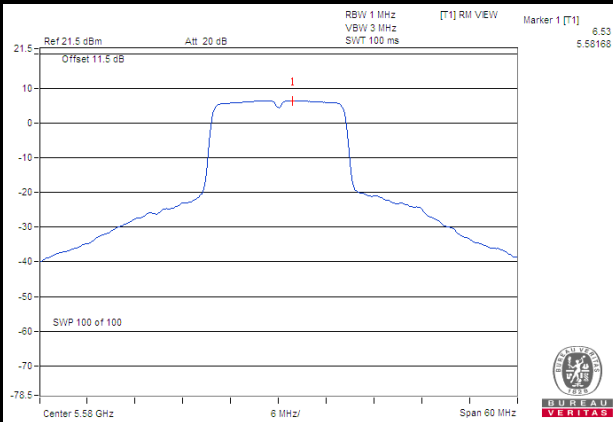
802.11ac (VHT80)



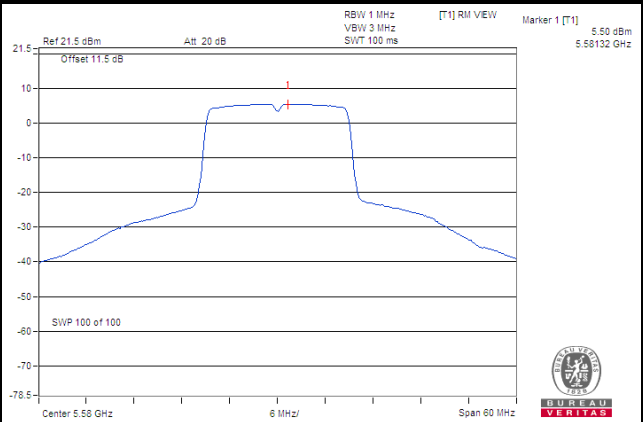
MIMO

Spectrum Plot of Worst Value

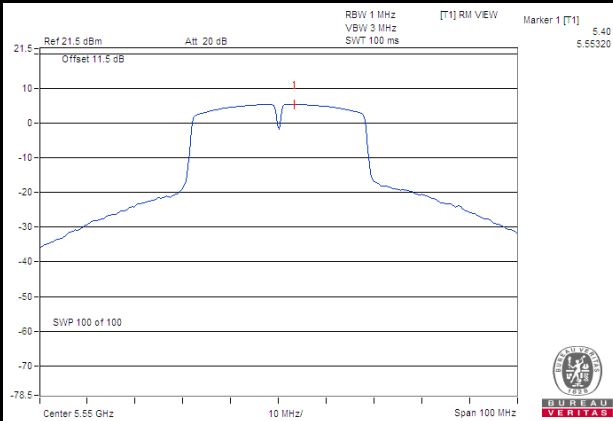
802.11a



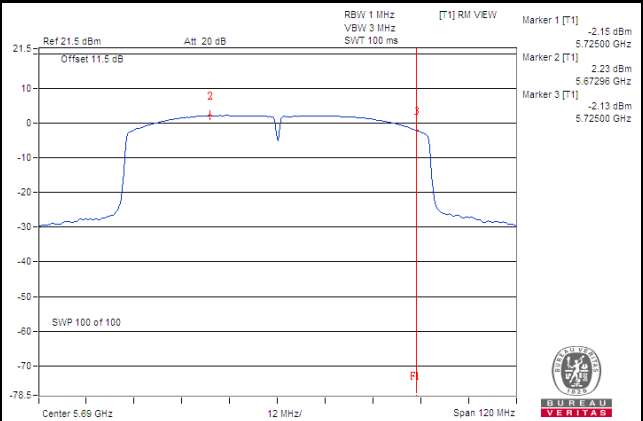
802.11ac (VHT20)



802.11ac (VHT40)



802.11ac (VHT80)



For U-NII-3 Band

802.11a

SISO

Channel	Freq. (MHz)	PSD (dBm/300kHz)	PSD (dBm/500kHz)	Limit (dBm/500 kHz)	Pass / Fail
144 (U-NII-3 Band)	5720	-2.08	0.14	30	Pass
149	5745	0.01	2.23	30	Pass
157	5785	0	2.22	30	Pass
165	5825	-0.48	1.74	30	Pass

MIMO

TX Chain	Channel	Freq. (MHz)	PSD (dBm/300k Hz)	PSD (dBm/500k Hz)	10 log (N=2) dB	Total PSD (dBm/500 kHz)	Limit (dBm/500 kHz)	Pass / Fail
0	144 (U-NII-3 Band)	5720	-4.74	-2.52	3.01	0.49	30	Pass
	149	5745	-1.65	0.57	3.01	3.58	30	Pass
	157	5785	-1.59	0.63	3.01	3.64	30	Pass
	165	5825	-2.1	0.12	3.01	3.13	30	Pass
1	144 (U-NII-3 Band)	5720	-4.63	-2.41	3.01	0.6	30	Pass
	149	5745	-1.97	0.25	3.01	3.26	30	Pass
	157	5785	-2.42	-0.2	3.01	2.81	30	Pass
	165	5825	-2.84	-0.62	3.01	2.39	30	Pass

Note: Directional gain = 4.8 dBi <= 6dBi, so there is no need to reduce the power density limit.

802.11ac (VHT20)

SISO

Channel	Freq. (MHz)	PSD (dBm/300kHz)	PSD (dBm/500kHz)	Limit (dBm/500 kHz)	Pass / Fail
144 (U-NII-3 Band)	5720	-2.75	-0.53	30	Pass
149	5745	-0.47	1.75	30	Pass
157	5785	-0.27	1.95	30	Pass
165	5825	-0.98	1.24	30	Pass

MIMO

TX Chain	Channel	Freq. (MHz)	PSD (dBm/300k Hz)	PSD (dBm/500k Hz)	10 log (N=2) dB	Total PSD (dBm/500 kHz)	Limit (dBm/500 kHz)	Pass / Fail
0	144 (U-NII-3 Band)	5720	-5.07	-2.85	3.01	0.16	30	Pass
	149	5745	-0.35	1.87	3.01	4.88	30	Pass
	157	5785	-0.88	1.34	3.01	4.35	30	Pass
	165	5825	-1.7	0.52	3.01	3.53	30	Pass
1	144 (U-NII-3 Band)	5720	-4.81	-2.59	3.01	0.42	30	Pass
	149	5745	-1.59	0.63	3.01	3.64	30	Pass
	157	5785	-2.28	-0.06	3.01	2.95	30	Pass
	165	5825	-2.7	-0.48	3.01	2.53	30	Pass

Note: Directional gain = 4.8 dBi <= 6dBi, so there is no need to reduce the power density limit.

802.11ac (VHT40)

SISO

Channel	Freq. (MHz)	PSD (dBm/300kHz)	PSD (dBm/500kHz)	Limit (dBm/500 kHz)	Pass / Fail
142 (U-NII-3 Band)	5710	-8.69	-6.47	30	Pass
151	5755	-5.33	-3.11	30	Pass
159	5795	-4.88	-2.66	30	Pass

MIMO

TX Chain	Channel	Freq. (MHz)	PSD (dBm/300k Hz)	PSD (dBm/500k Hz)	10 log (N=2) dB	Total PSD (dBm/500 kHz)	Limit (dBm/500 kHz)	Pass / Fail
0	142 (U-NII-3 Band)	5710	-7.37	-5.15	3.01	-2.14	30	Pass
	151	5755	-6.31	-4.09	3.01	-1.08	30	Pass
	159	5795	-6.11	-3.89	3.01	-0.88	30	Pass
1	142 (U-NII-3 Band)	5710	-7.35	-5.13	3.01	-2.12	30	Pass
	151	5755	-6.91	-4.69	3.01	-1.68	30	Pass
	159	5795	-7.02	-4.8	3.01	-1.79	30	Pass

Note: Directional gain = 4.8 dBi <= 6dBi, so there is no need to reduce the power density limit.

802.11ac (VHT80)

SISO

Channel	Freq. (MHz)	PSD (dBm/300kHz)	PSD (dBm/500kHz)	Limit (dBm/500 kHz)	Pass / Fail
138 (U-NII-3 Band)	5690	-14.71	-12.49	30	Pass
155	5775	-9.03	-6.81	30	Pass

MIMO

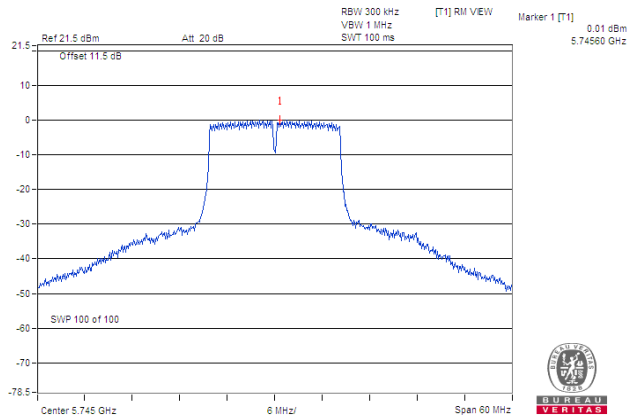
TX Chain	Channel	Freq. (MHz)	PSD (dBm/300k Hz)	PSD (dBm/500k Hz)	10 log (N=2) dB	Total PSD (dBm/500 kHz)	Limit (dBm/500 kHz)	Pass / Fail
0	138 (U-NII-3 Band)	5690	-11.68	-9.46	3.01	-6.45	30	Pass
	155	5775	-11.02	-8.8	3.01	-5.79	30	Pass
1	138 (U-NII-3 Band)	5690	-11.86	-9.64	3.01	-6.63	30	Pass
	155	5775	-12.11	-9.89	3.01	-6.88	30	Pass

Note: Directional gain = 4.8 dBi <= 6dBi, so there is no need to reduce the power density limit.

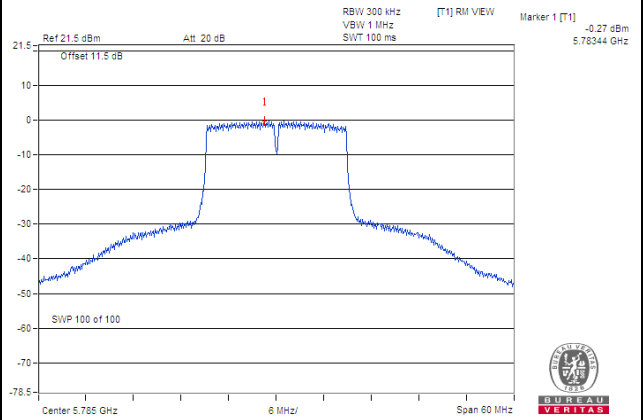
SISO

Spectrum Plot of Worst Value

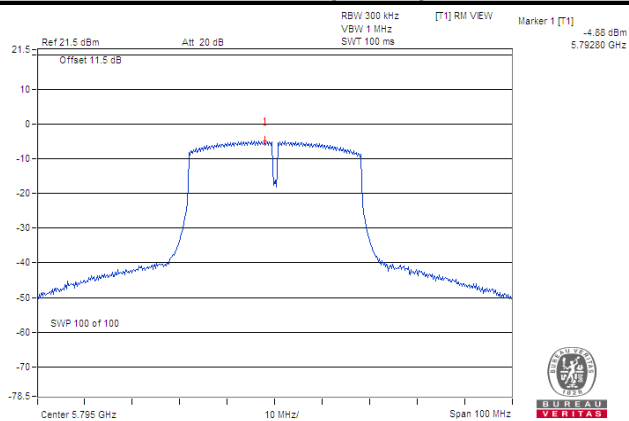
802.11a



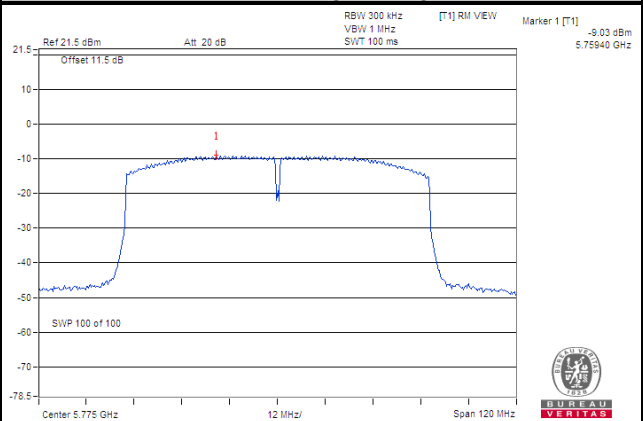
802.11ac (VHT20)



802.11ac (VHT40)



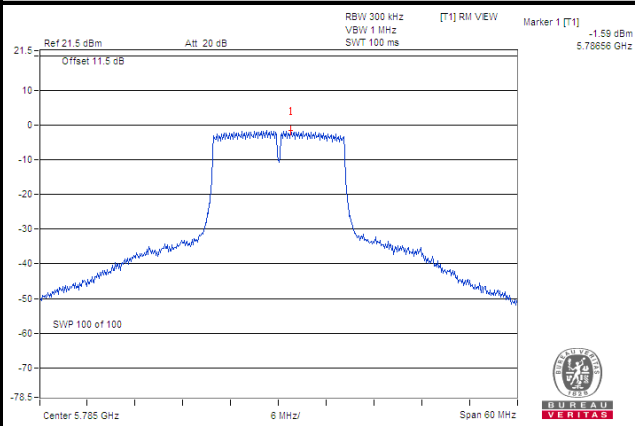
802.11ac (VHT80)



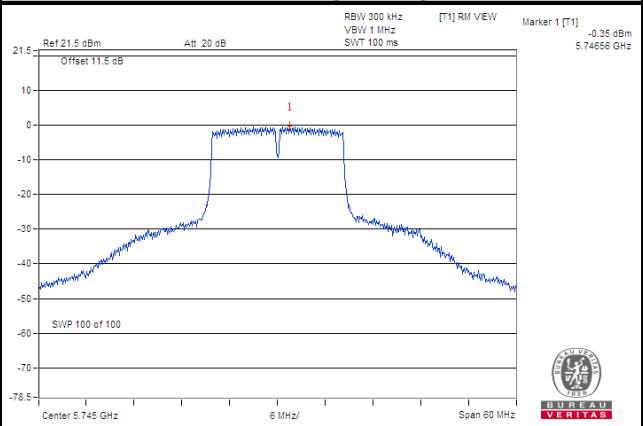
MIMO

Spectrum Plot of Worst Value

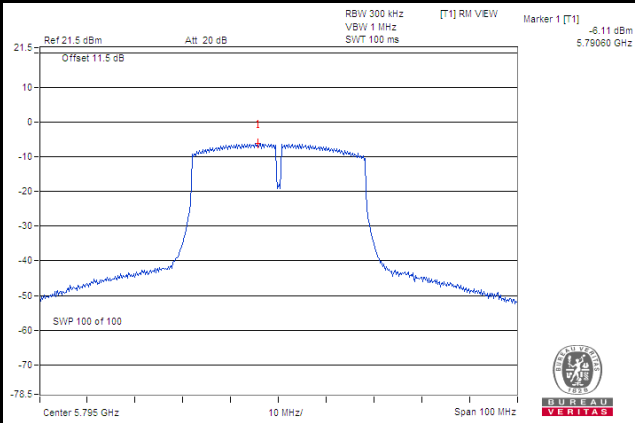
802.11a



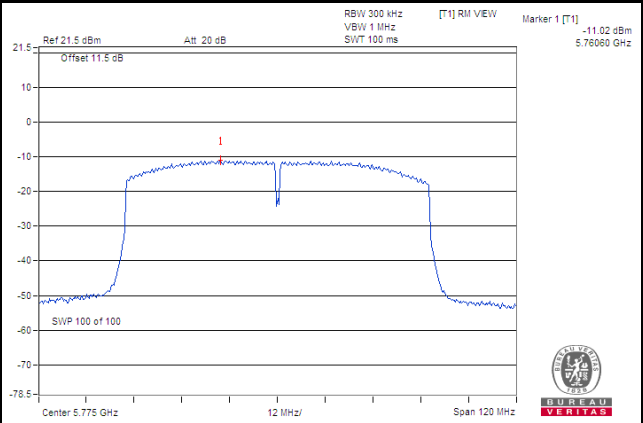
802.11ac (VHT20)



802.11ac (VHT40)



802.11ac (VHT80)

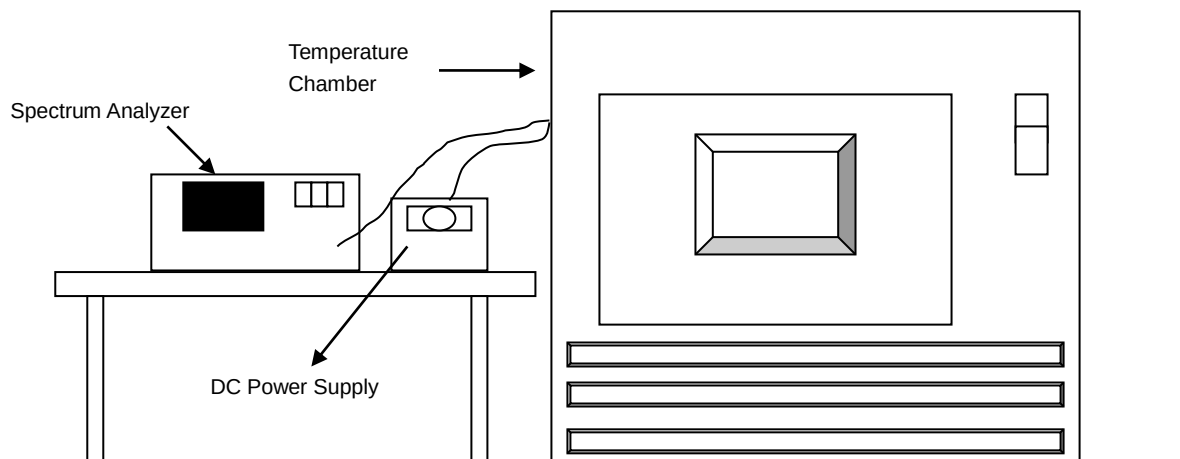


4.6 Frequency Stability

4.6.1 Limit of Frequency Stability Measurement

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

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.3 to get information of above instrument.

4.6.4 Test Procedure

- 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.
- 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.
- 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.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

Set the EUT transmit at un-modulation mode to test frequency stability.

4.6.7 Test Results

SISO

Frequency Stability Versus Temp.									
Operating Frequency: 5180 MHz									
Temp. (°C)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)
50	120	5179.9963	PASS	5179.9979	PASS	5179.9936	PASS	5179.9983	PASS
40	120	5180.0259	PASS	5180.0255	PASS	5180.0244	PASS	5180.024	PASS
30	120	5179.9742	PASS	5179.9772	PASS	5179.976	PASS	5179.9777	PASS
20	120	5179.9956	PASS	5179.9964	PASS	5179.9976	PASS	5179.9957	PASS
10	120	5179.9874	PASS	5179.9838	PASS	5179.9876	PASS	5179.9854	PASS
0	120	5179.9986	PASS	5179.9985	PASS	5179.9983	PASS	5179.9996	PASS
-10	120	5180.0182	PASS	5180.0198	PASS	5180.0198	PASS	5180.0165	PASS
-20	120	5179.9922	PASS	5179.9952	PASS	5179.9932	PASS	5179.9957	PASS

Frequency Stability Versus Temp.									
Operating Frequency: 5180 MHz									
Temp. (°C)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)
20	138	5179.9947	PASS	5179.996	PASS	5179.9986	PASS	5179.9957	PASS
	120	5179.9956	PASS	5179.9964	PASS	5179.9976	PASS	5179.9957	PASS
	102	5179.9951	PASS	5179.9972	PASS	5179.9968	PASS	5179.9953	PASS

MIMO

Frequency Stability Versus Temp.									
Operating Frequency: 5180 MHz									
Temp. (°C)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)
50	120	5180.0048	PASS	5180.006	PASS	5180.0016	PASS	5180.0053	PASS
40	120	5179.9824	PASS	5179.9821	PASS	5179.9793	PASS	5179.9829	PASS
30	120	5180.0081	PASS	5180.007	PASS	5180.0116	PASS	5180.0103	PASS
20	120	5180.0121	PASS	5180.0148	PASS	5180.0142	PASS	5180.0112	PASS
10	120	5179.9851	PASS	5179.987	PASS	5179.9833	PASS	5179.9864	PASS
0	120	5179.992	PASS	5179.9962	PASS	5179.9924	PASS	5179.9926	PASS
-10	120	5180.0148	PASS	5180.0129	PASS	5180.0119	PASS	5180.0157	PASS
-20	120	5180.0179	PASS	5180.0196	PASS	5180.0152	PASS	5180.0184	PASS

Frequency Stability Versus Temp.									
Operating Frequency: 5180 MHz									
Temp. (°C)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)
20	138	5180.0117	PASS	5180.0138	PASS	5180.0137	PASS	5180.0115	PASS
	120	5180.0121	PASS	5180.0148	PASS	5180.0142	PASS	5180.0112	PASS
	102	5180.0113	PASS	5180.0152	PASS	5180.0149	PASS	5180.0121	PASS

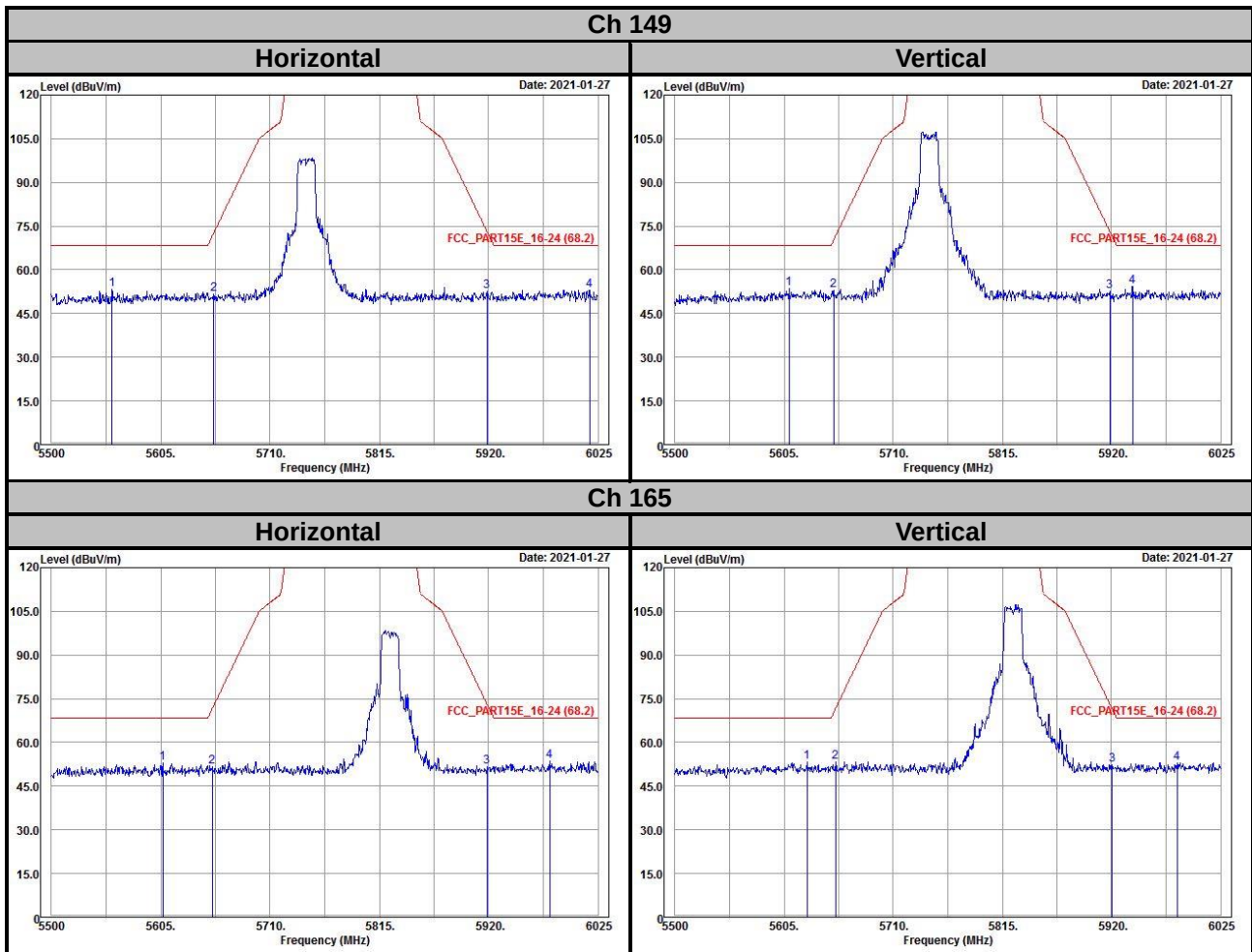
5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

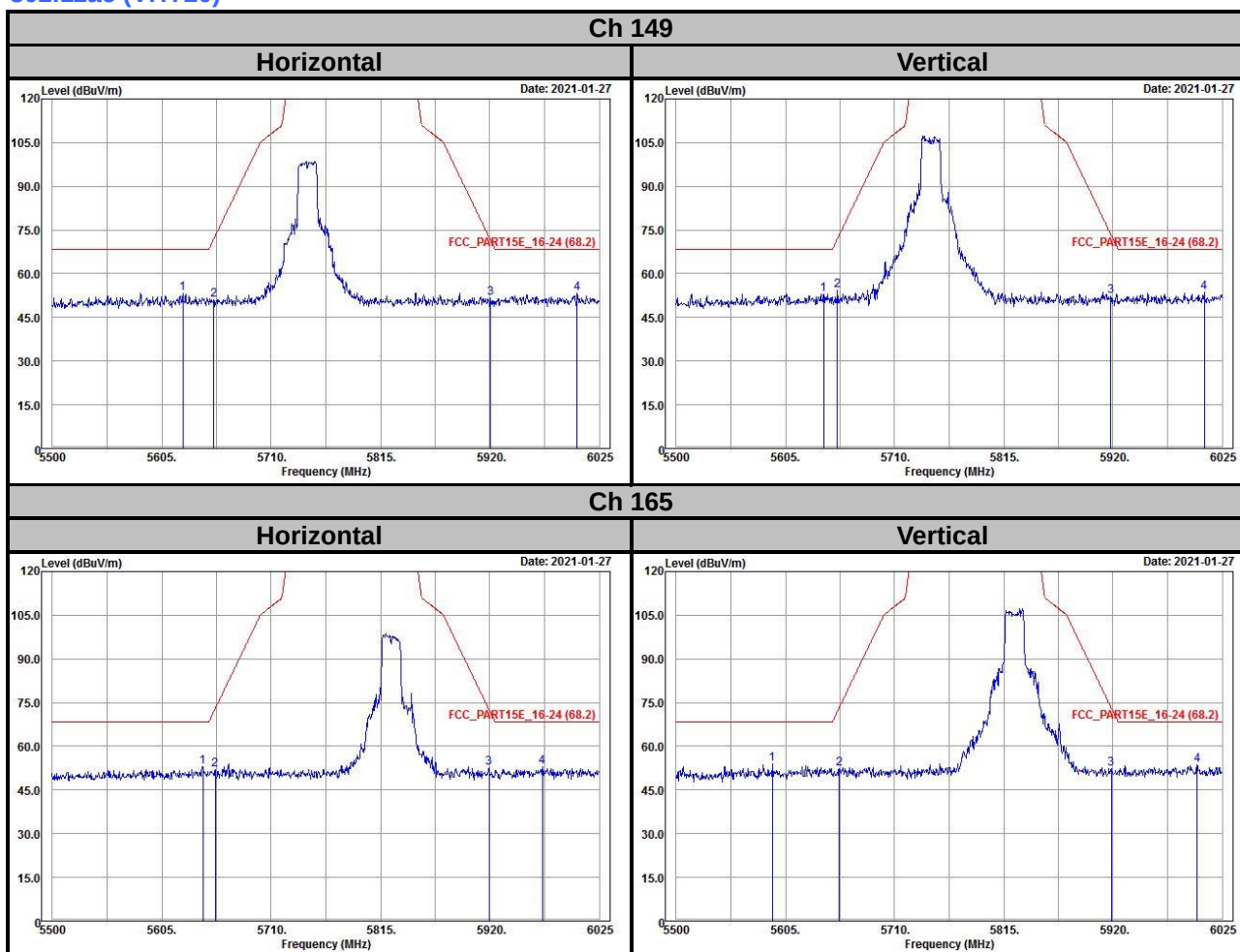
Annex A- Radiated Out of Band Emission (OOBE) Measurement (For U-NII-3 band)

SISO

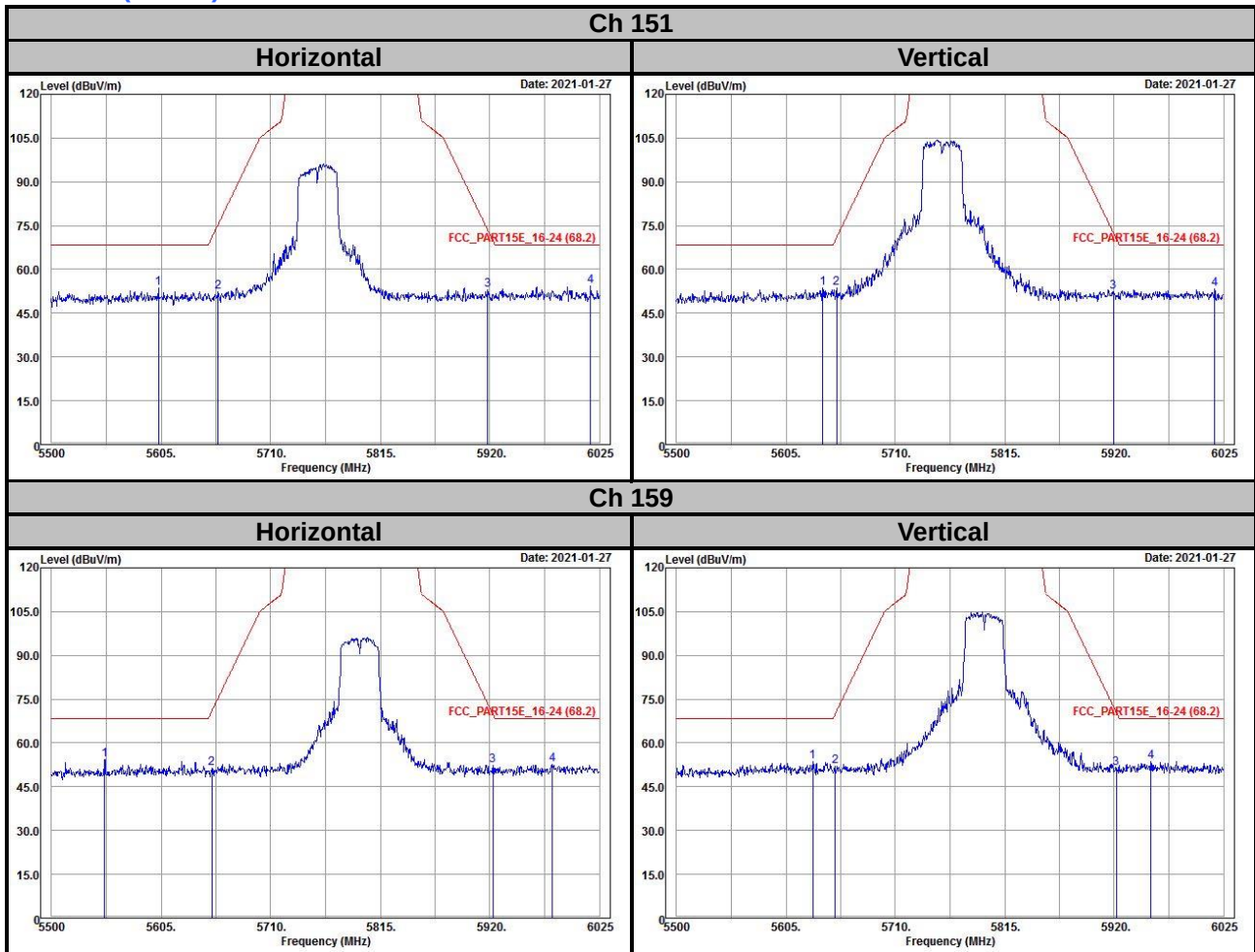
802.11a



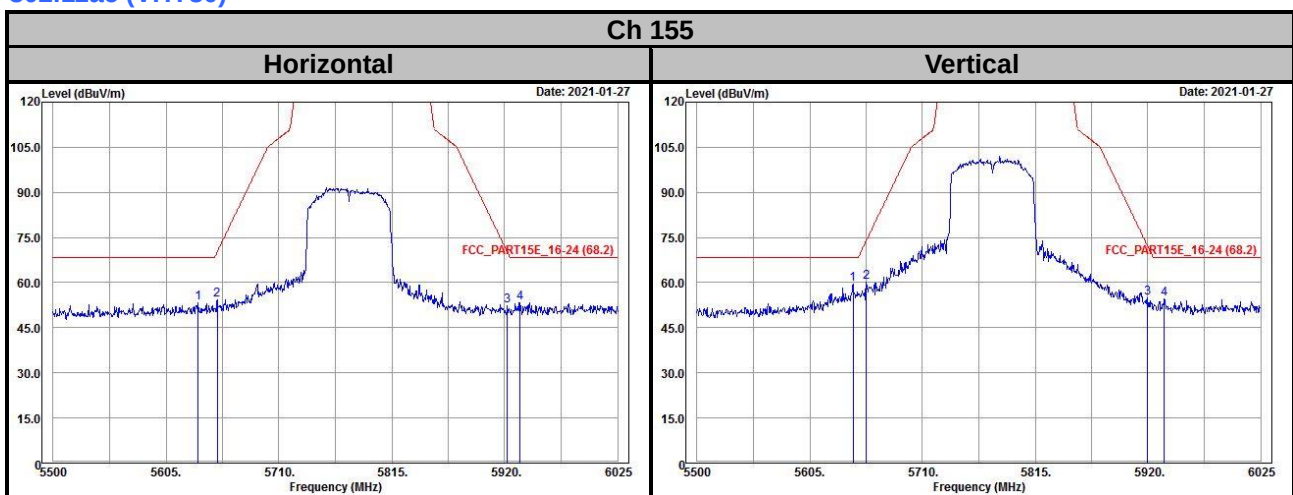
802.11ac (VHT20)



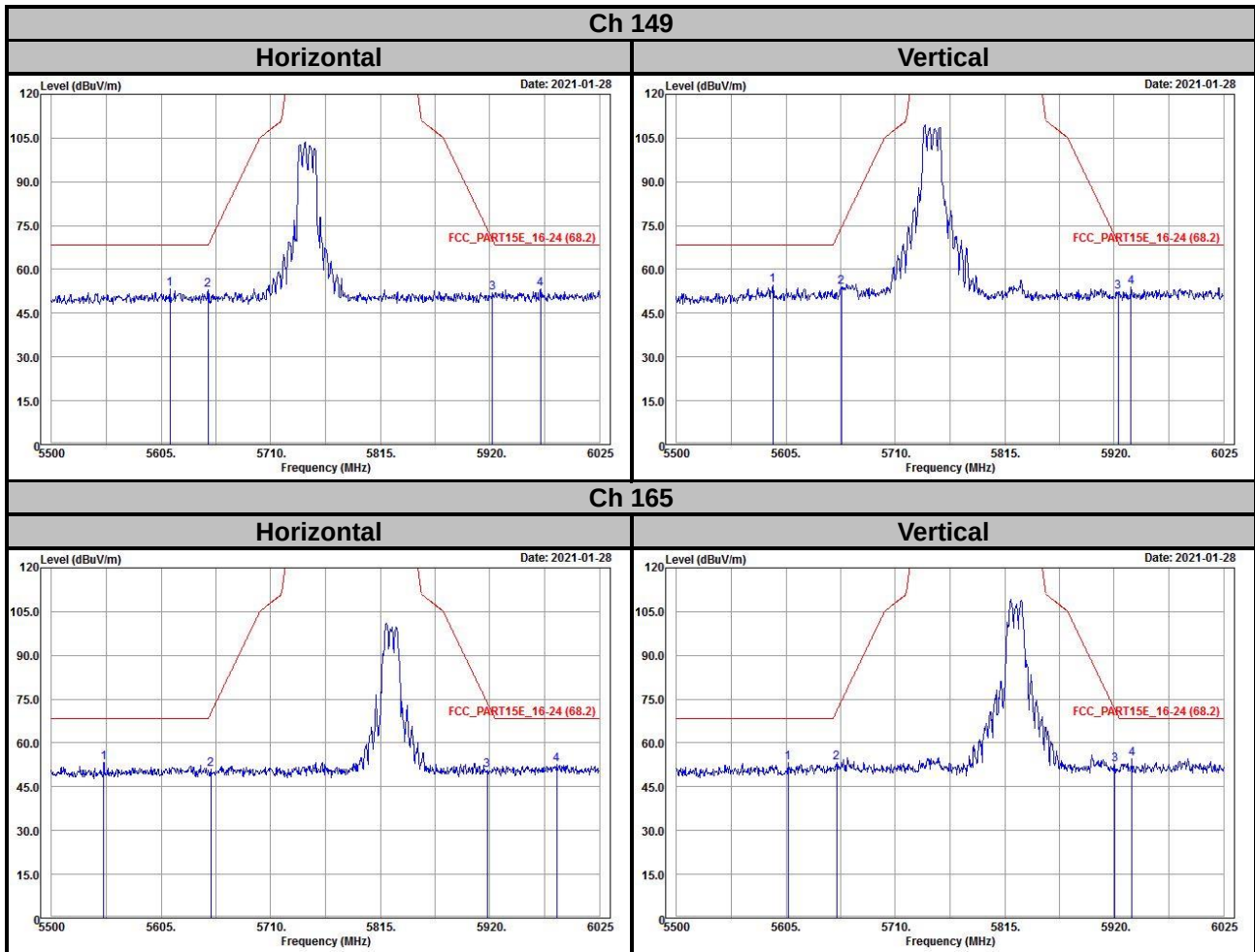
802.11ac (VHT40)



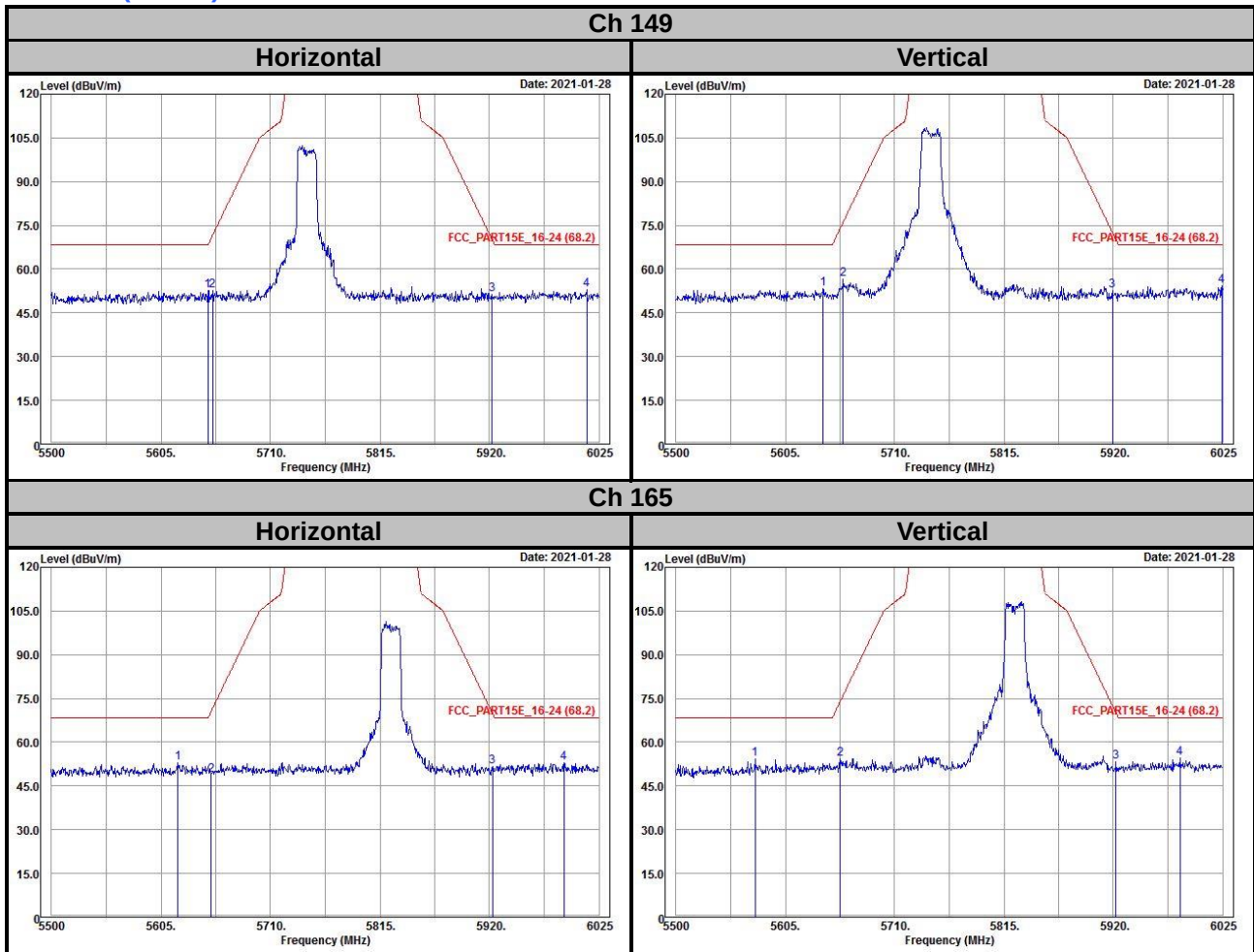
802.11ac (VHT80)



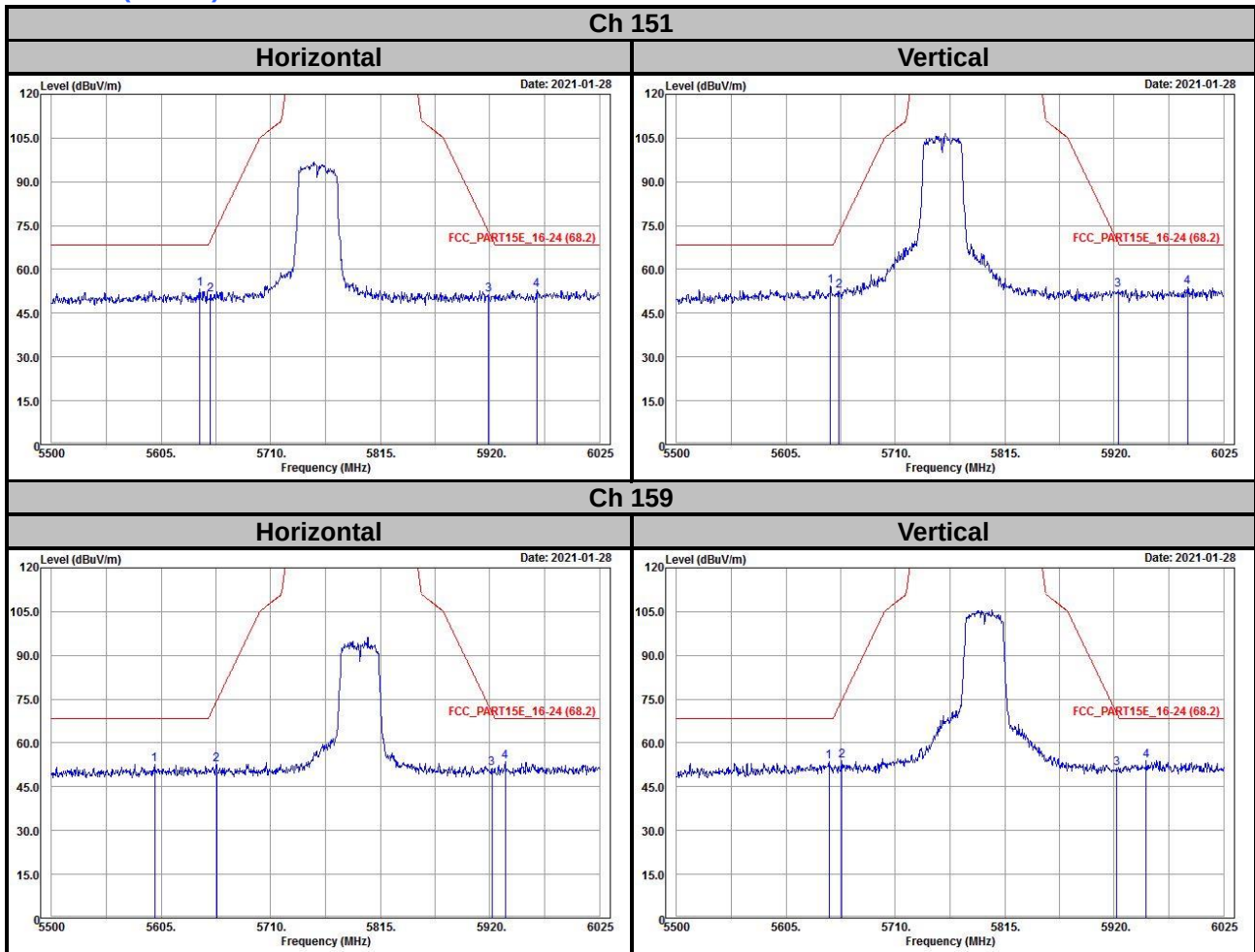
MIMO
802.11a



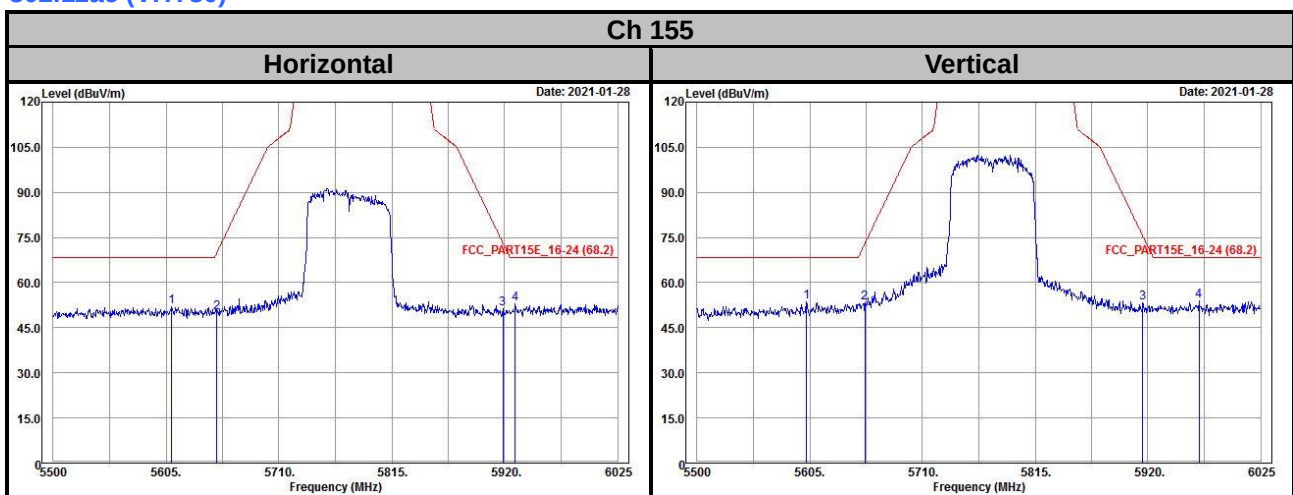
802.11ac (VHT20)



802.11ac (VHT40)



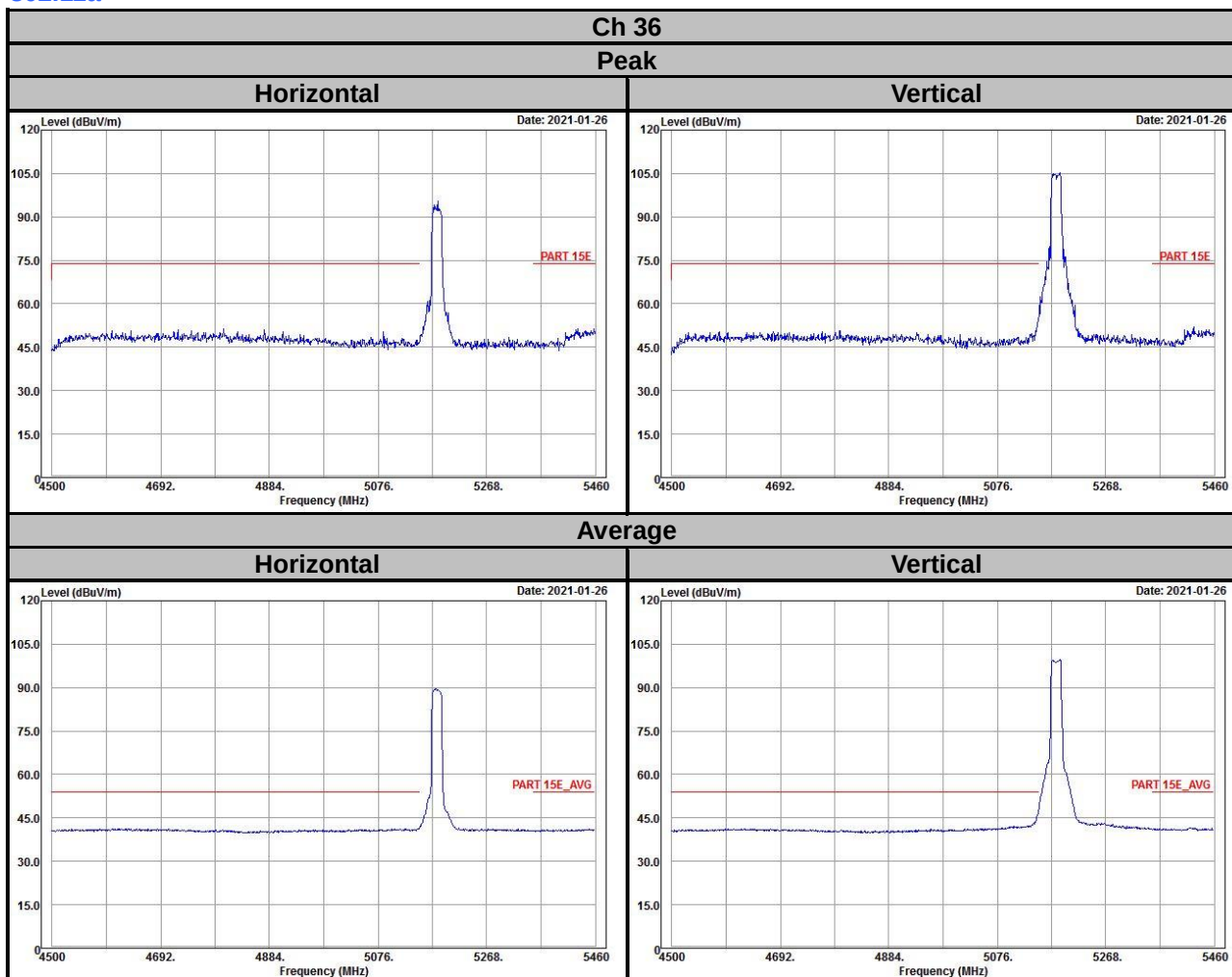
802.11ac (VHT80)



Annex B- Band Edge Measurement

SISO

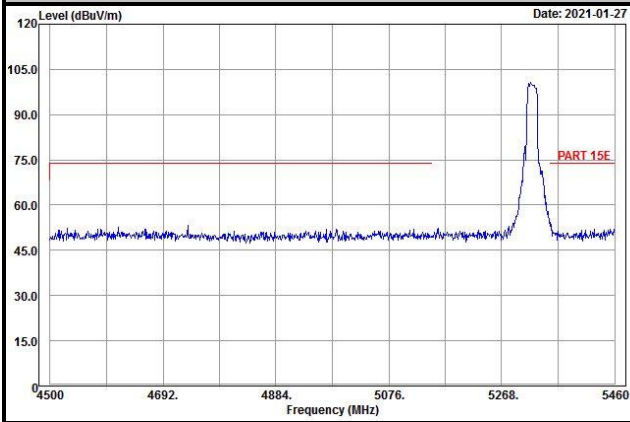
802.11a



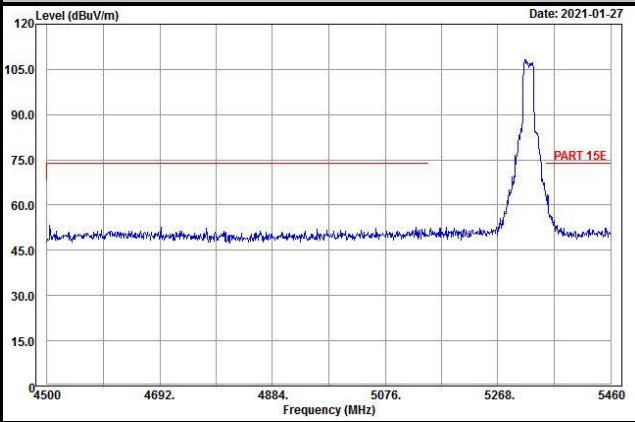
Ch 64

Peak

Horizontal

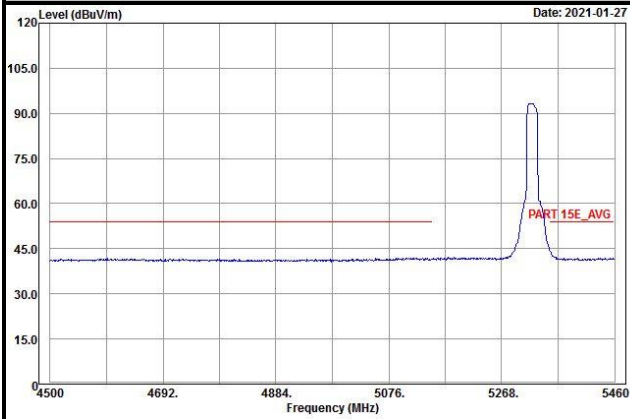


Vertical

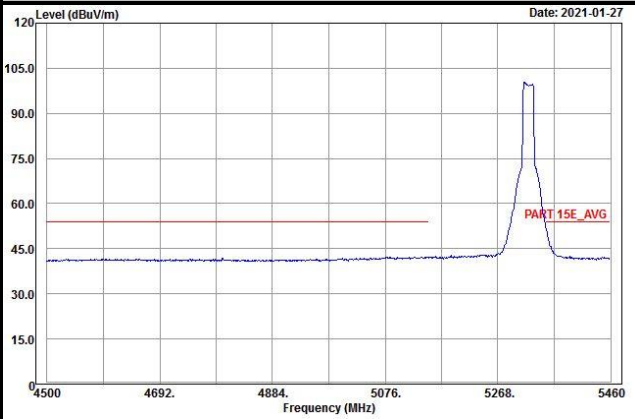


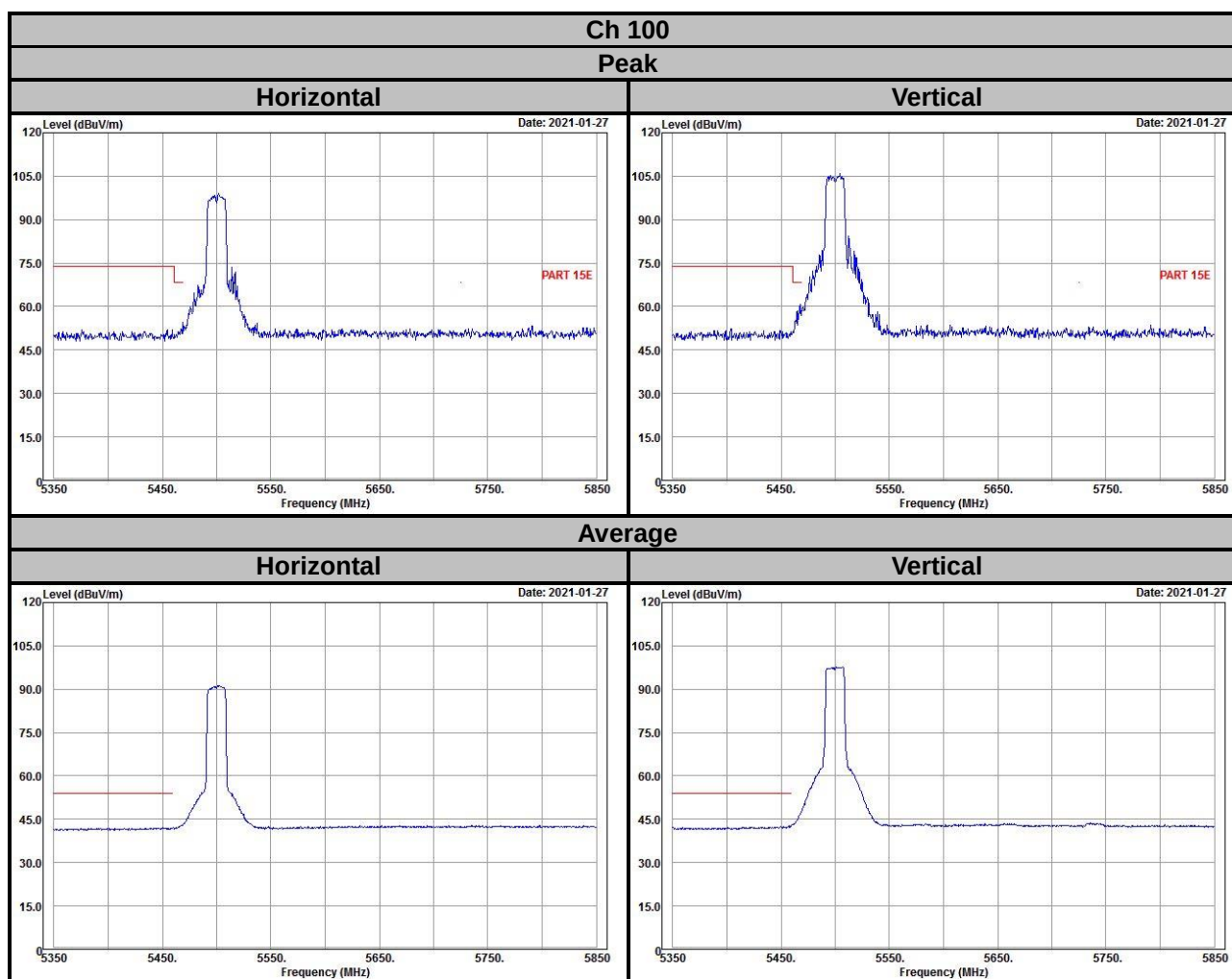
Average

Horizontal



Vertical

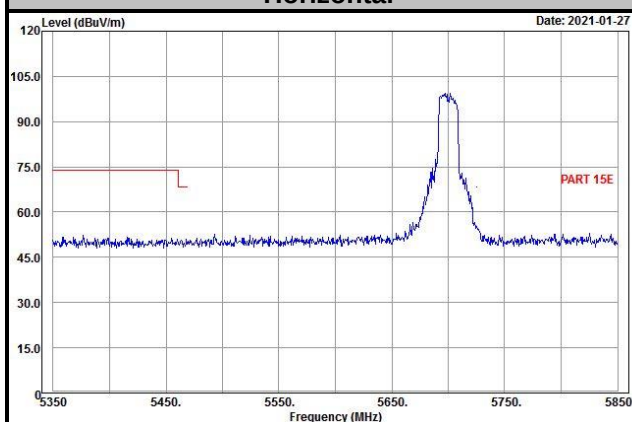




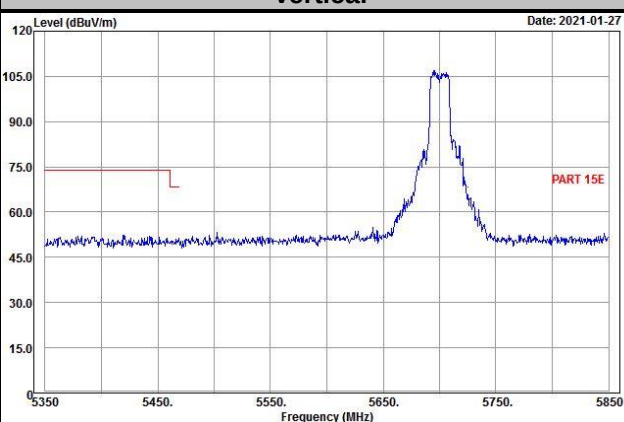
Ch 140

Peak

Horizontal

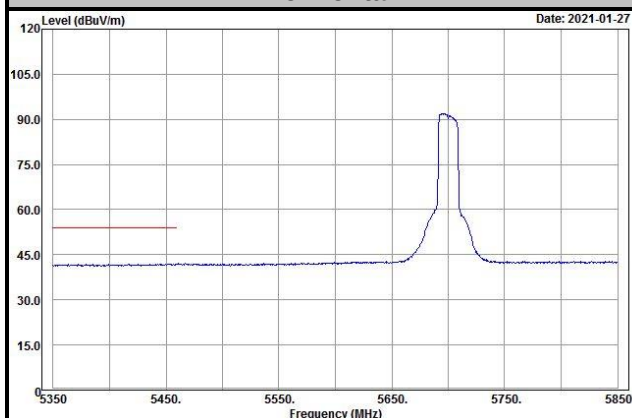


Vertical

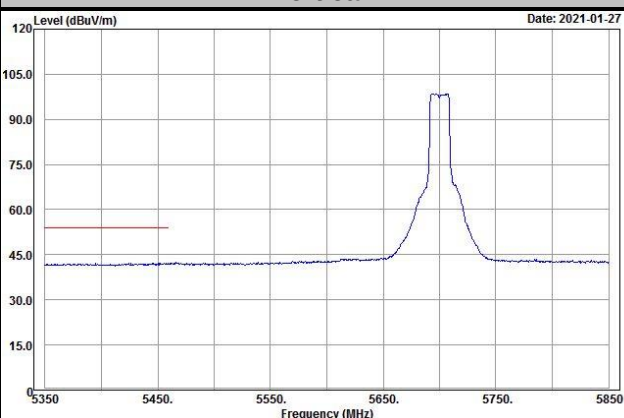


Average

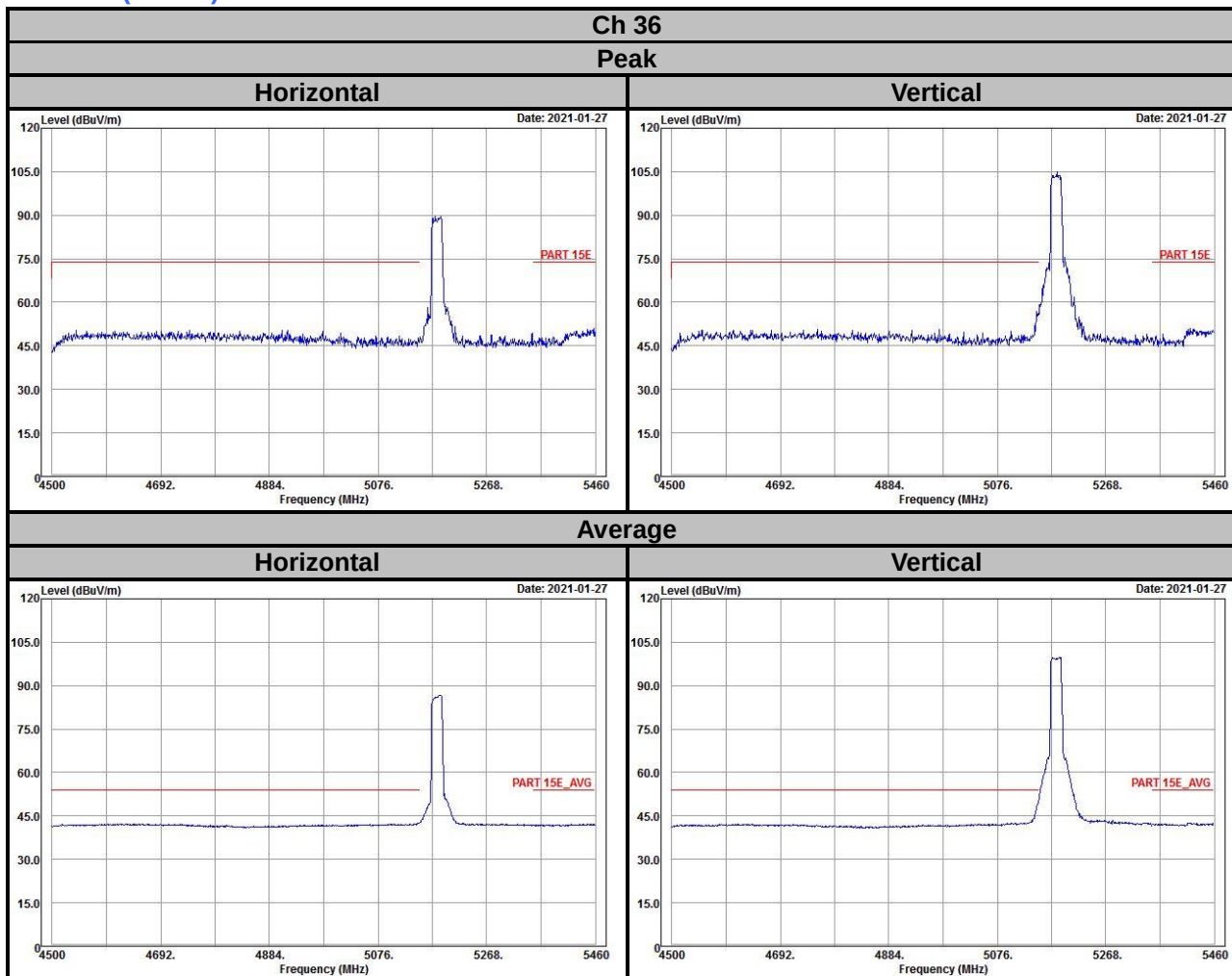
Horizontal



Vertical



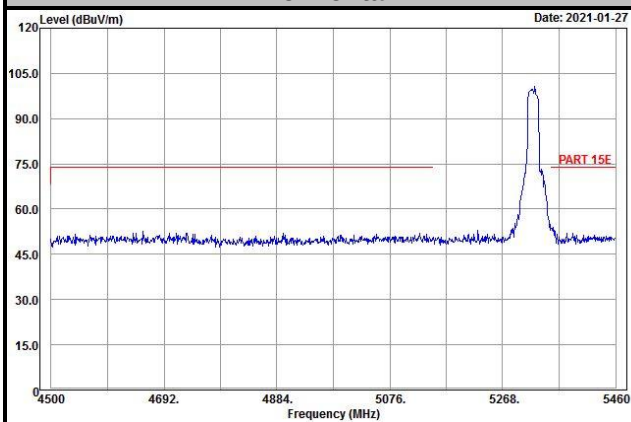
802.11ac (VHT20)



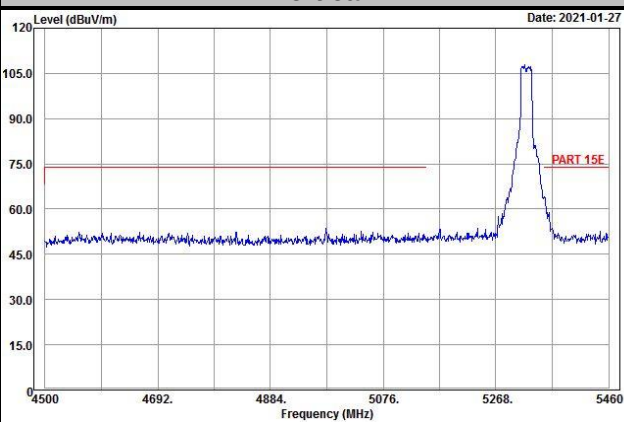
Ch 64

Peak

Horizontal

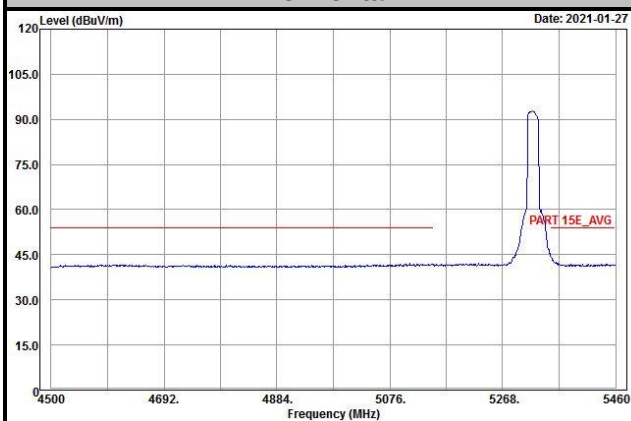


Vertical

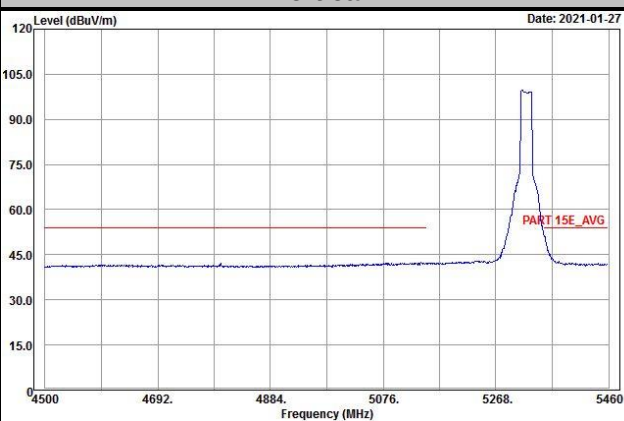


Average

Horizontal



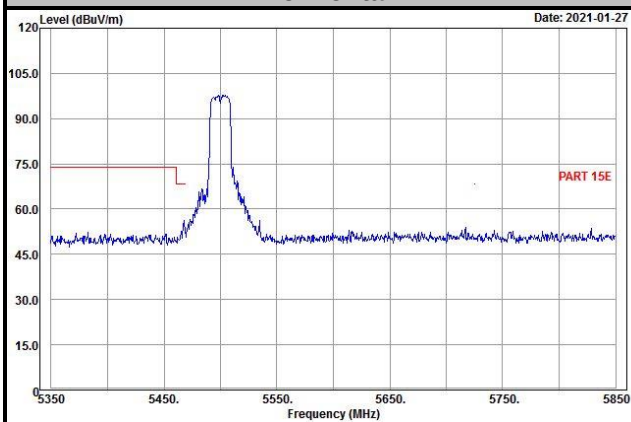
Vertical



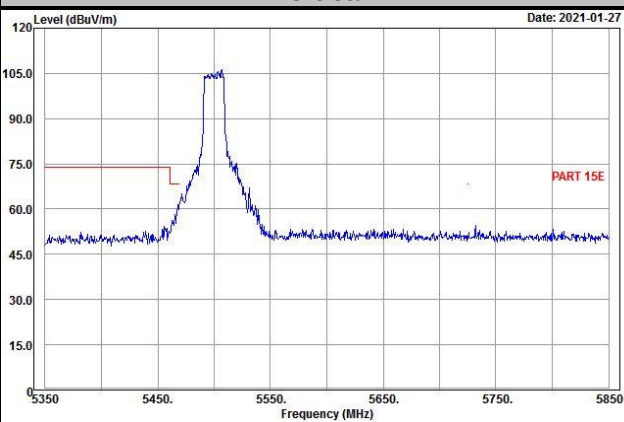
Ch 100

Peak

Horizontal

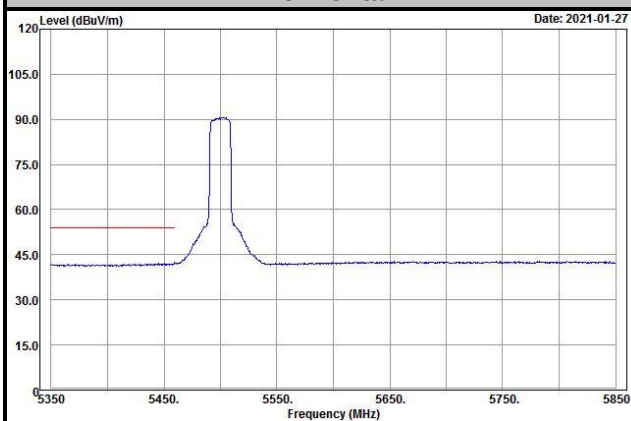


Vertical

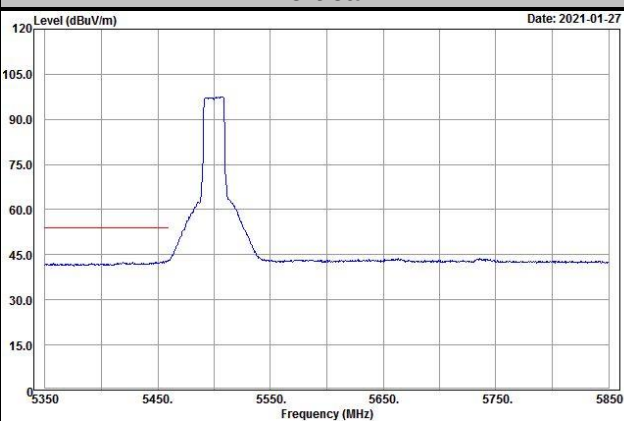


Average

Horizontal



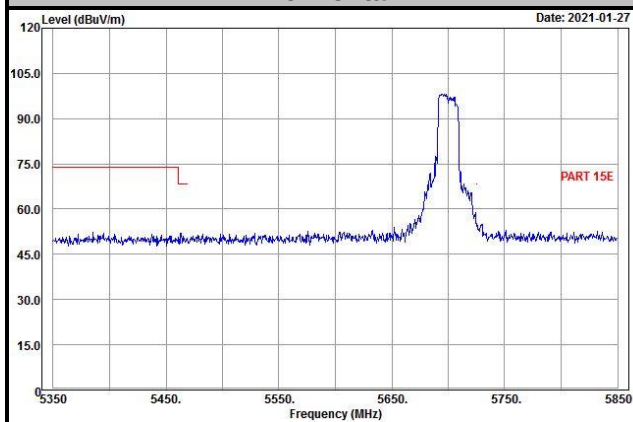
Vertical



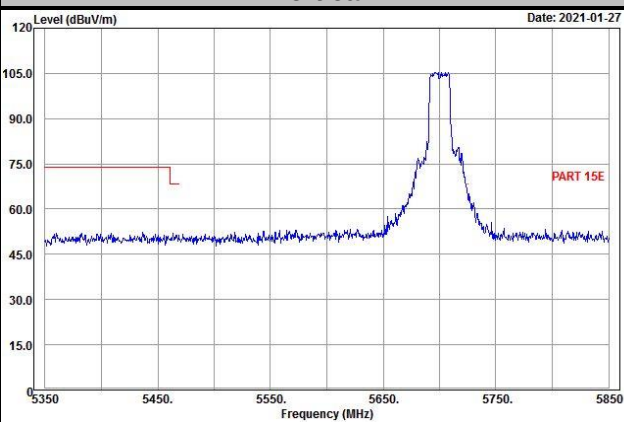
Ch 140

Peak

Horizontal

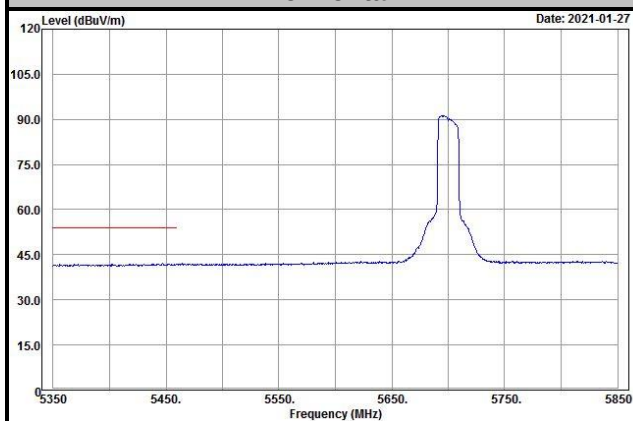


Vertical

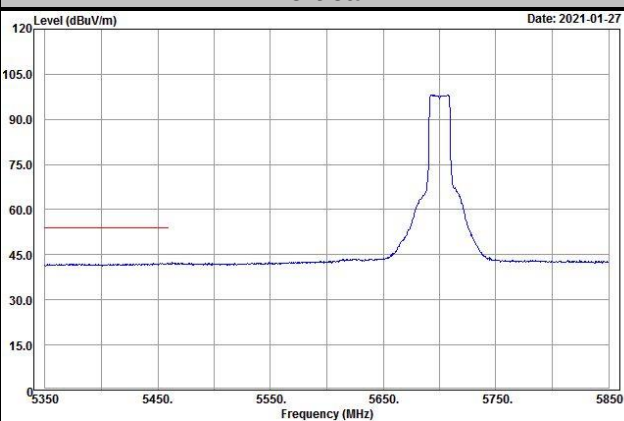


Average

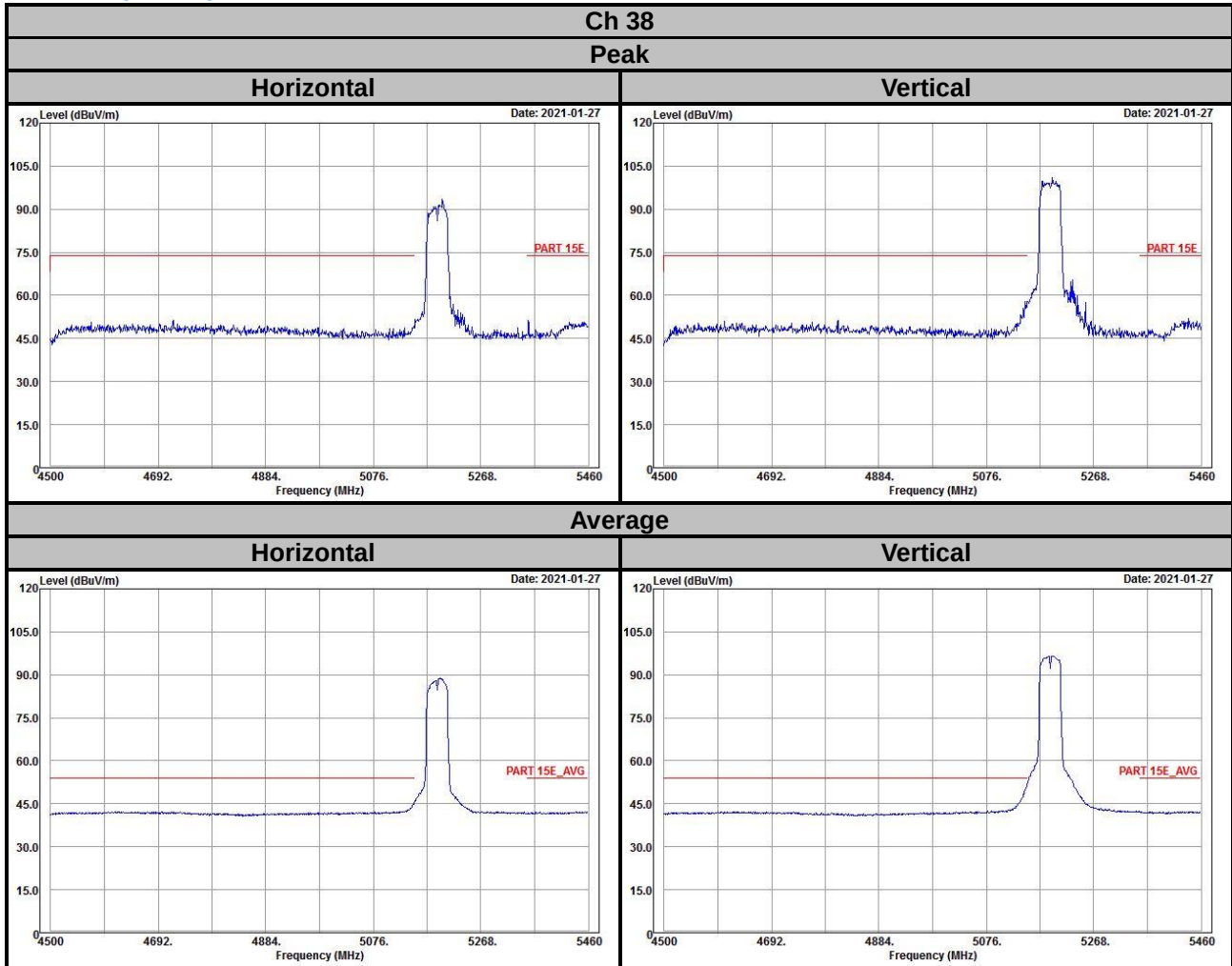
Horizontal



Vertical



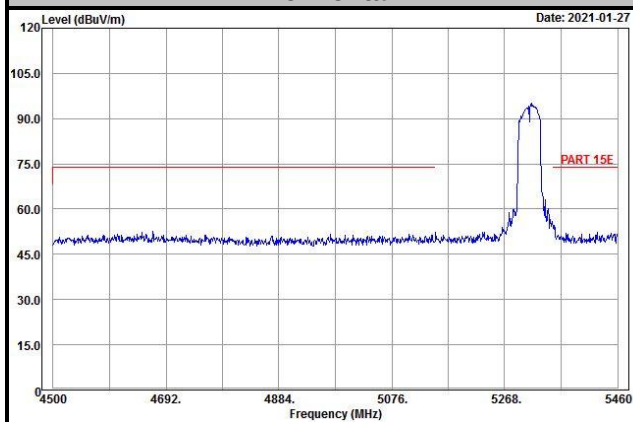
802.11ac (VHT40)



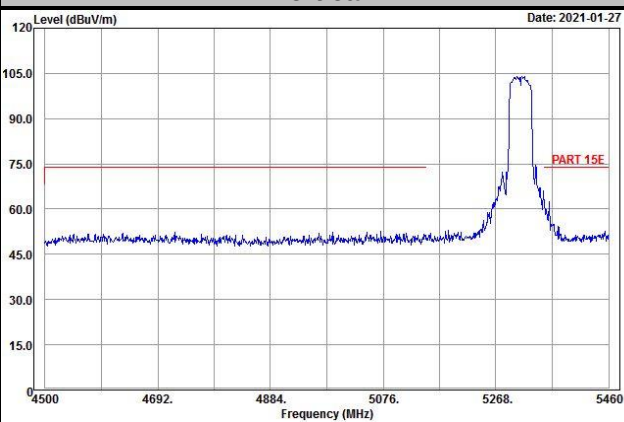
Ch 62

Peak

Horizontal

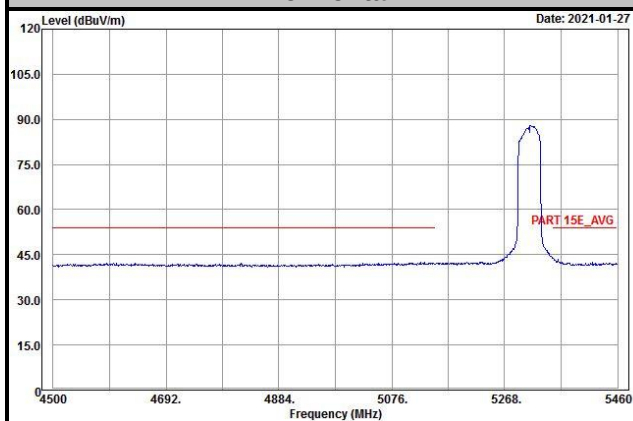


Vertical

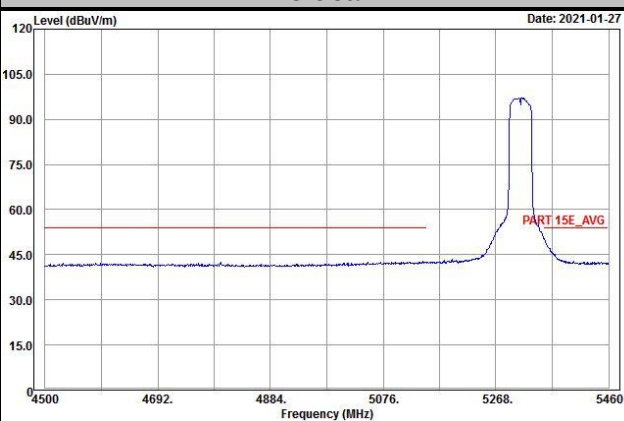


Average

Horizontal



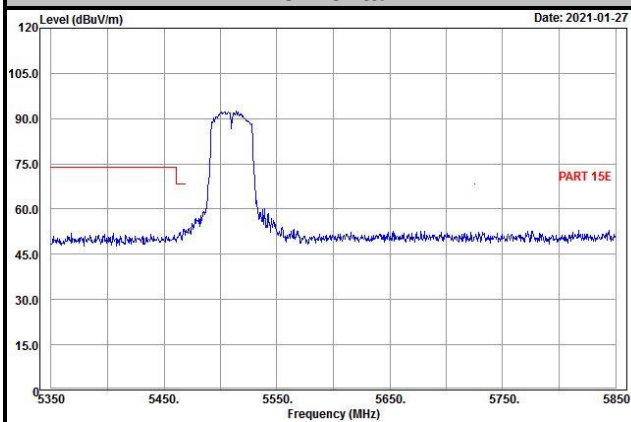
Vertical



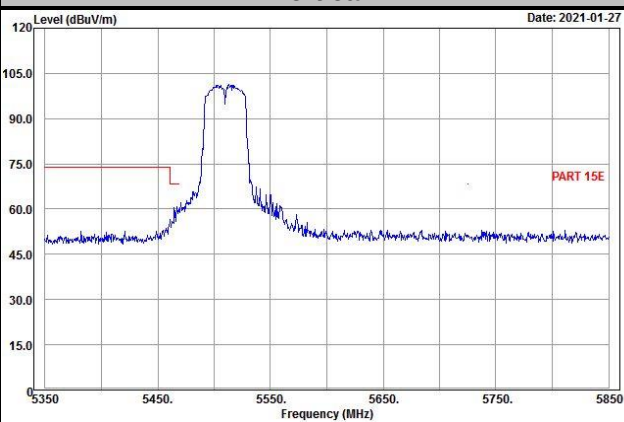
Ch 102

Peak

Horizontal

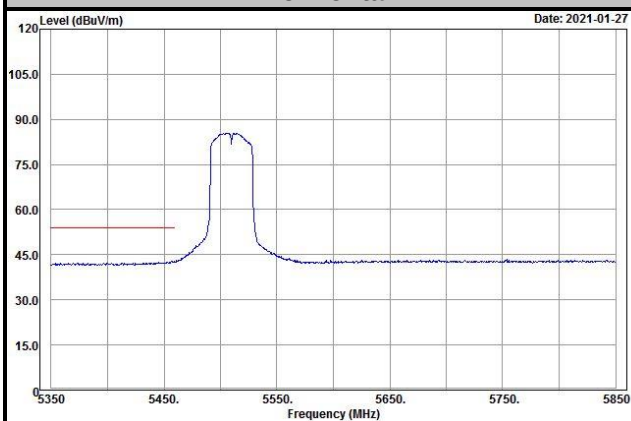


Vertical

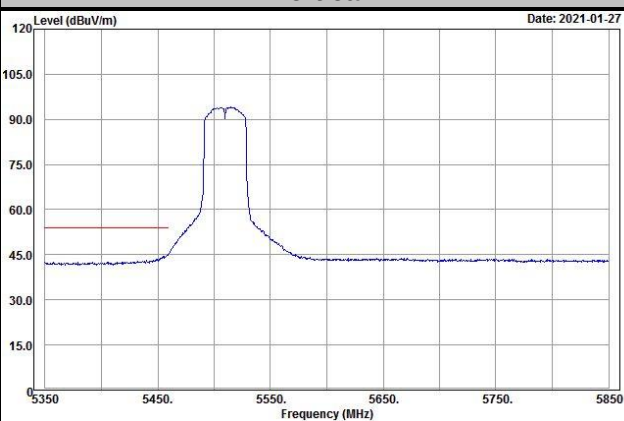


Average

Horizontal



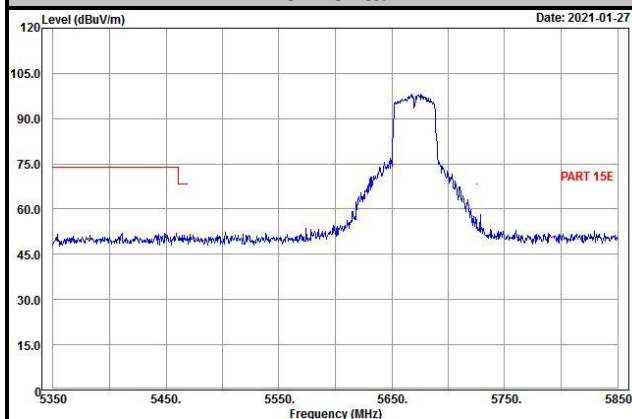
Vertical



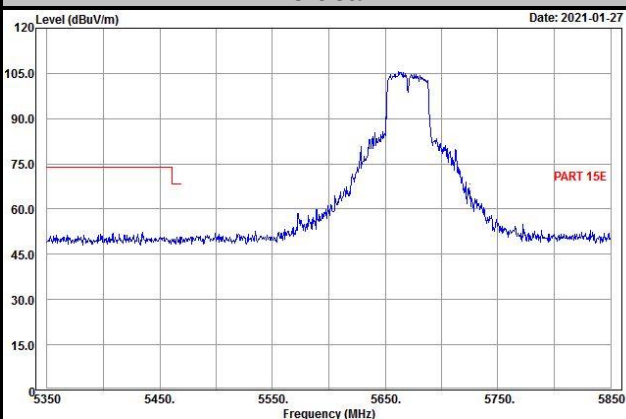
Ch 134

Peak

Horizontal

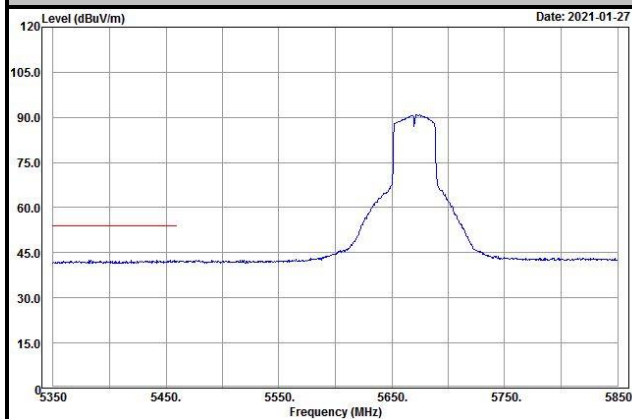


Vertical

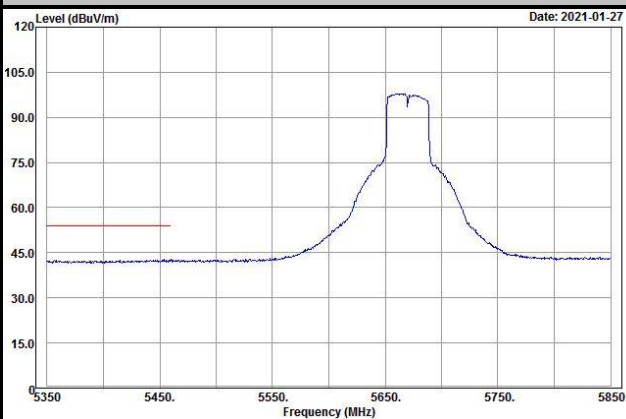


Average

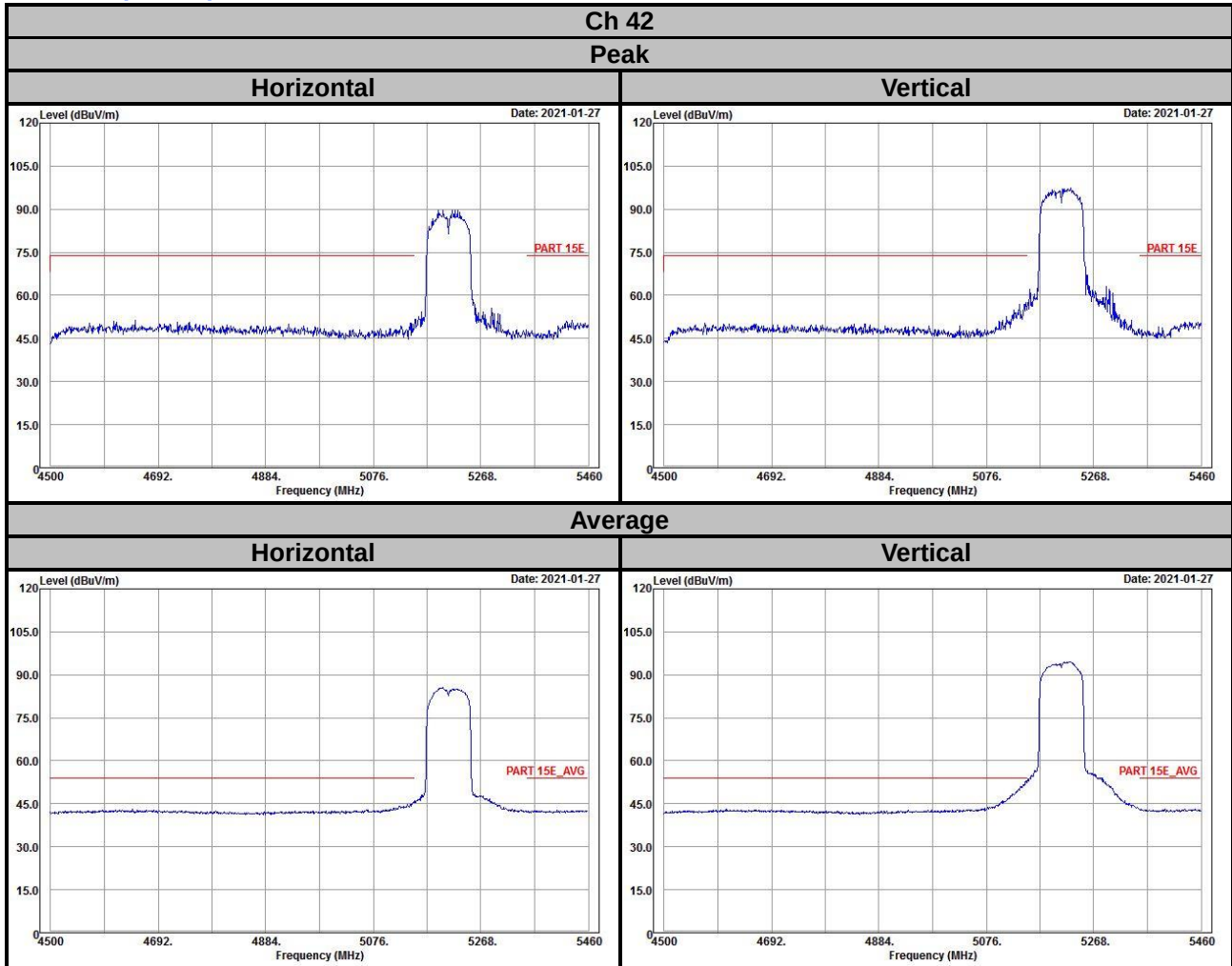
Horizontal



Vertical



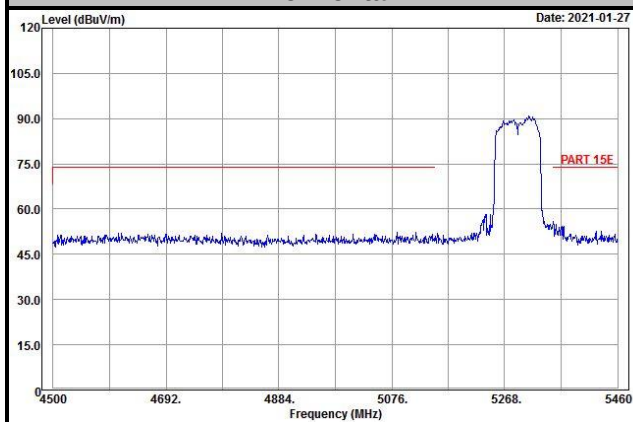
802.11ac (VHT80)



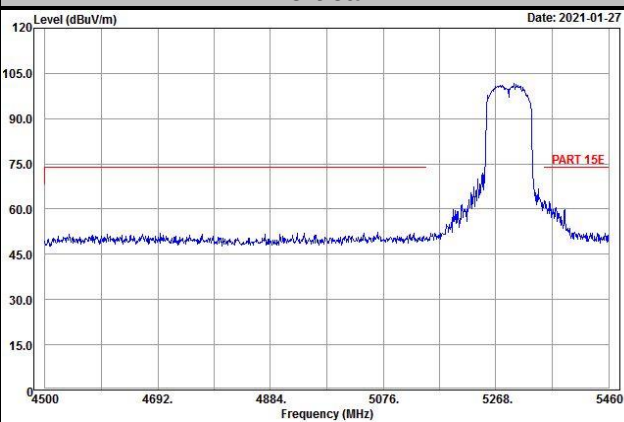
Ch 58

Peak

Horizontal

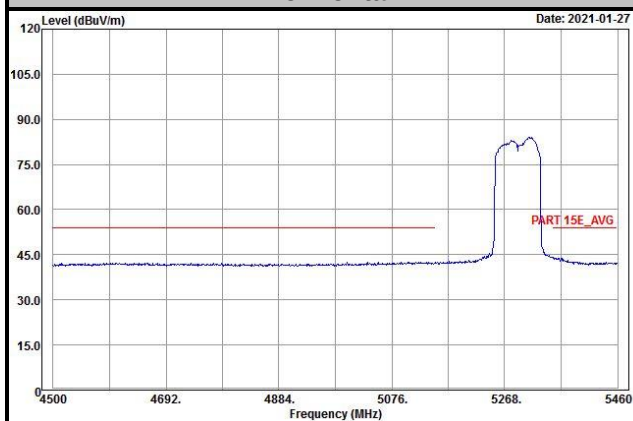


Vertical

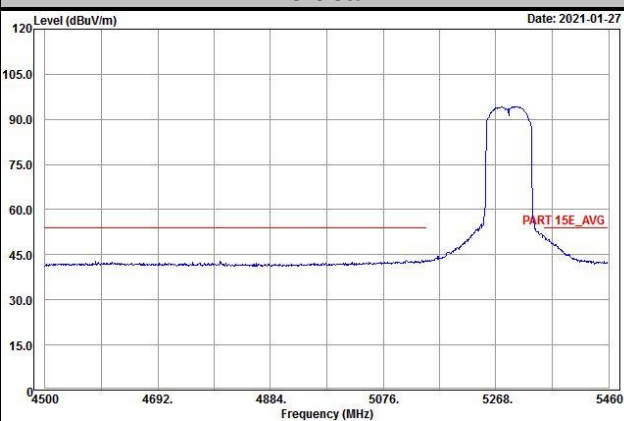


Average

Horizontal



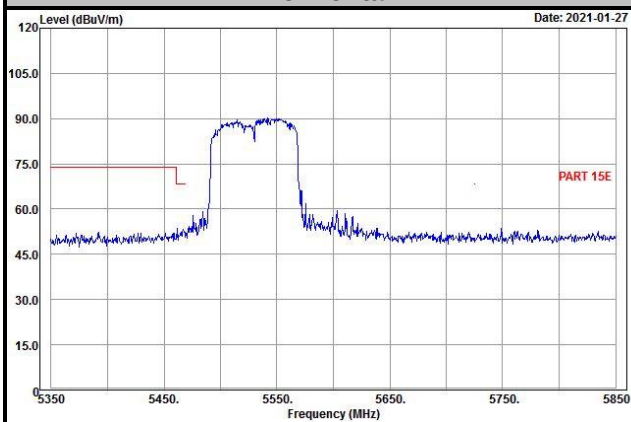
Vertical



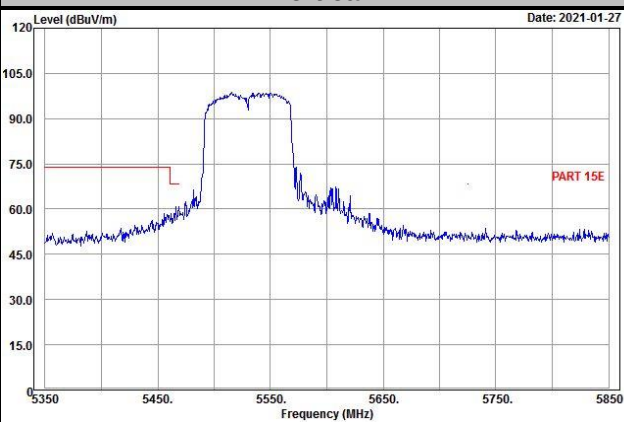
Ch 106

Peak

Horizontal

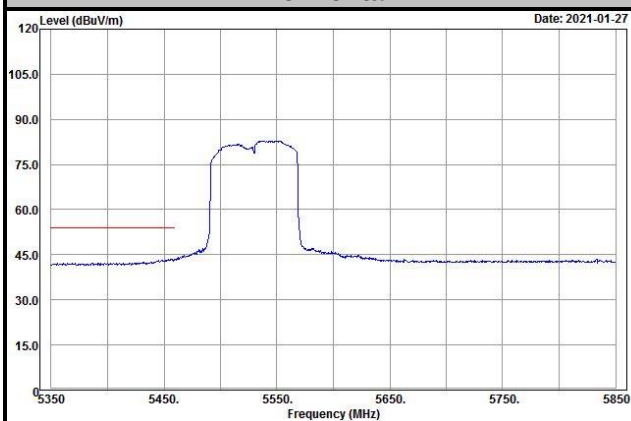


Vertical

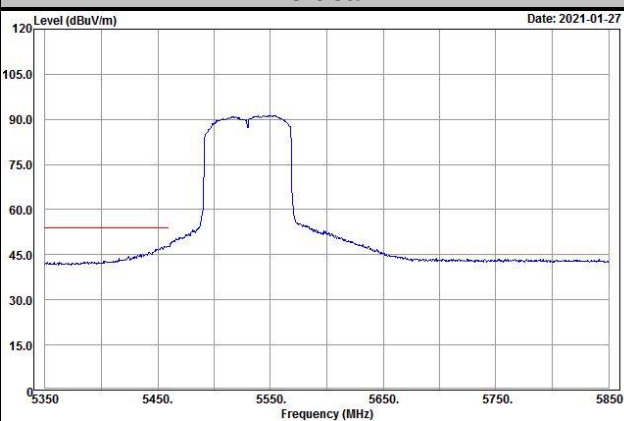


Average

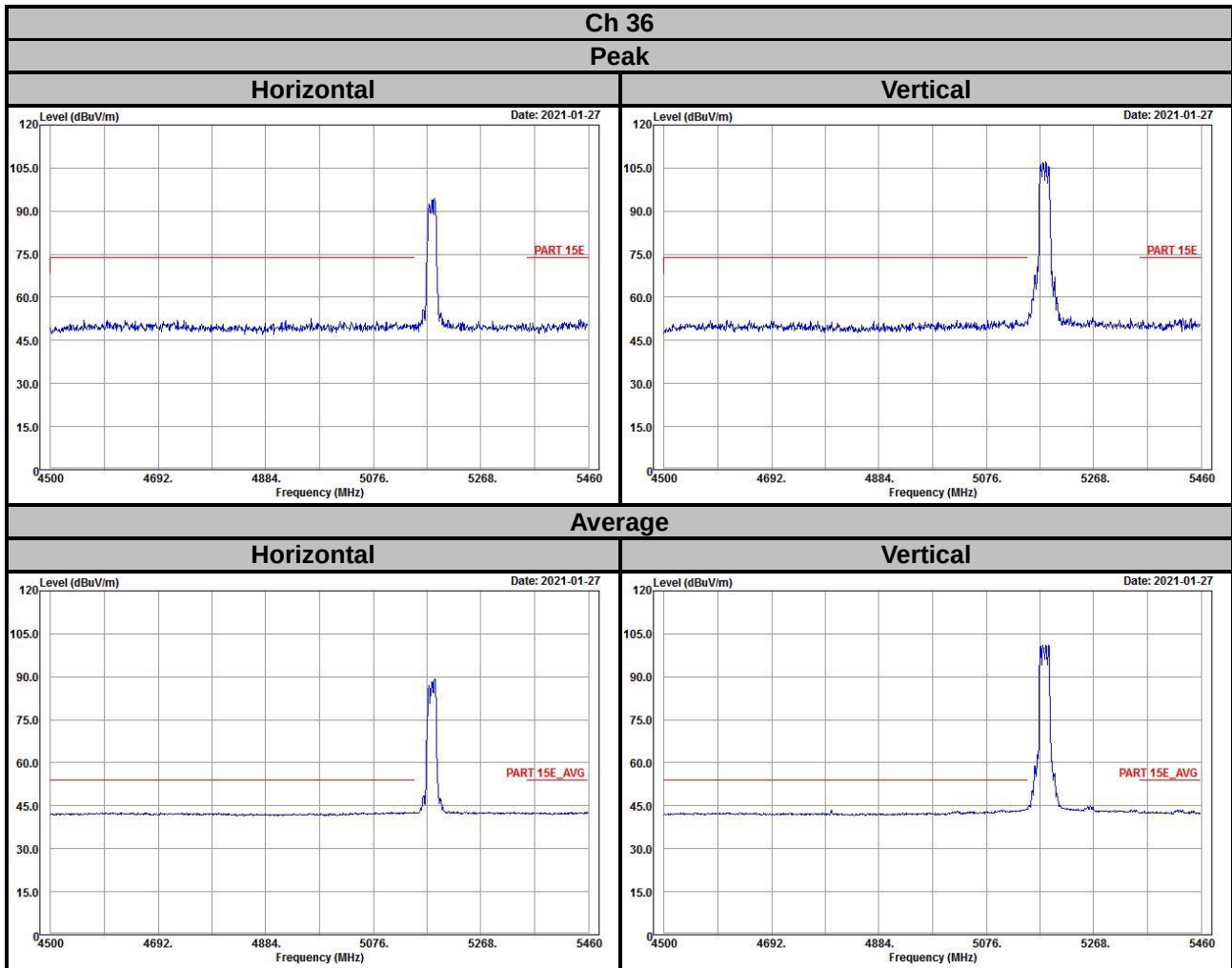
Horizontal



Vertical



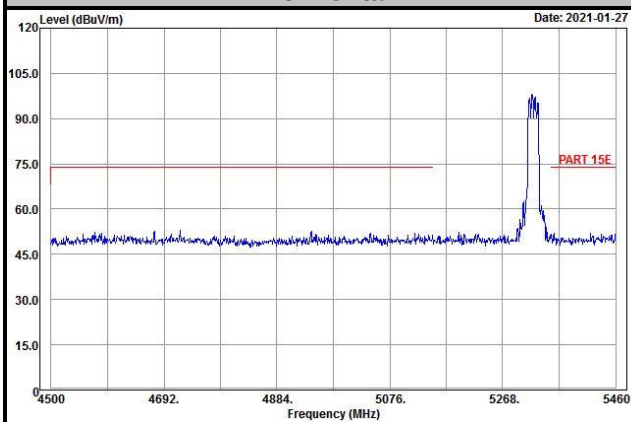
MIMO
802.11a



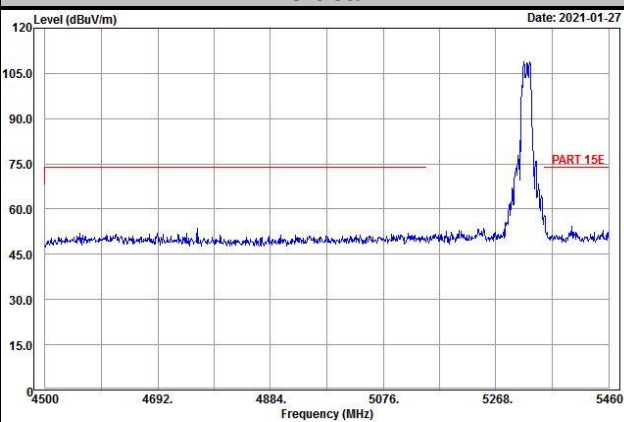
Ch 64

Peak

Horizontal

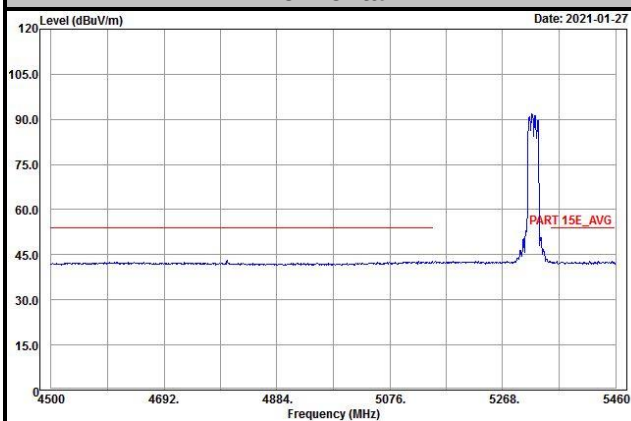


Vertical

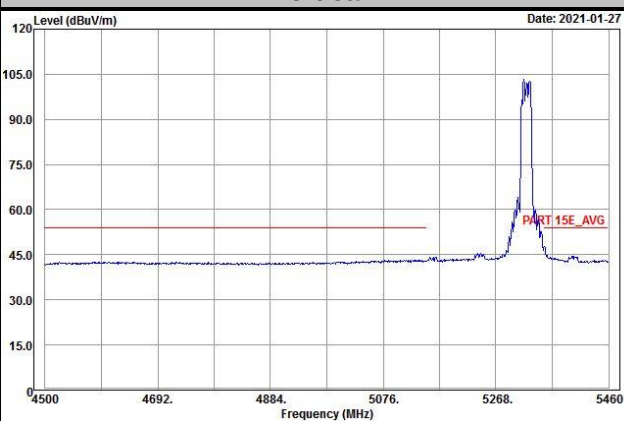


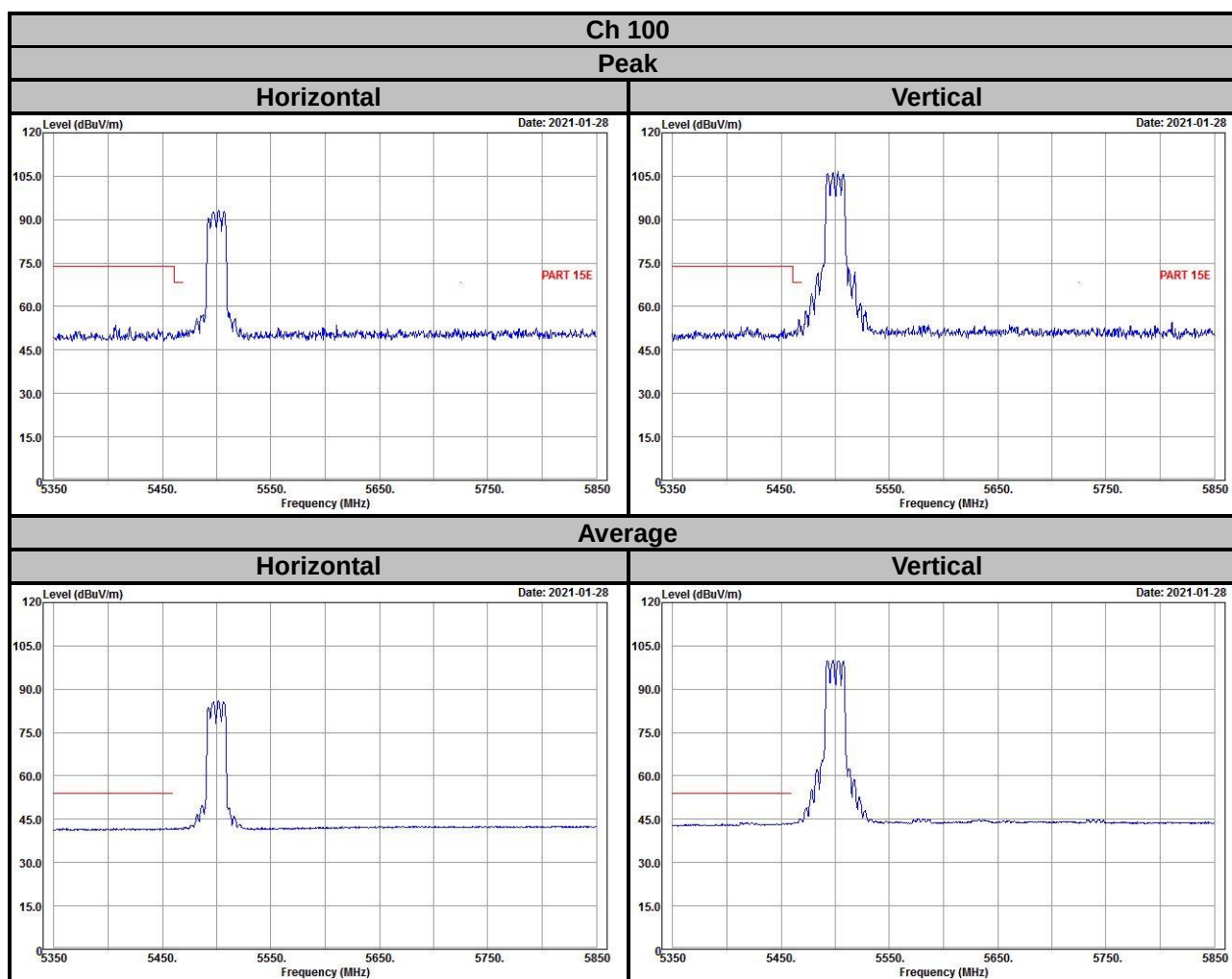
Average

Horizontal



Vertical

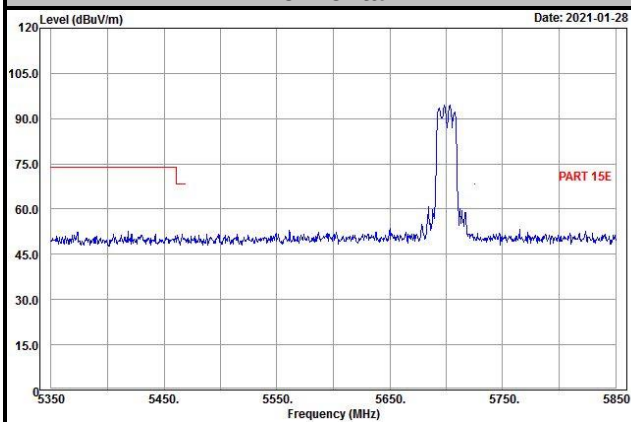




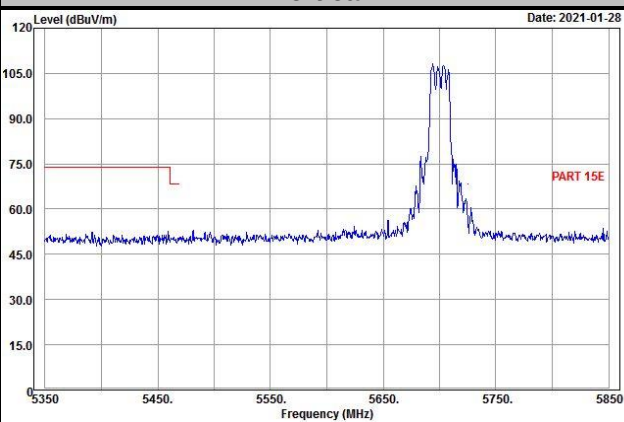
Ch 140

Peak

Horizontal

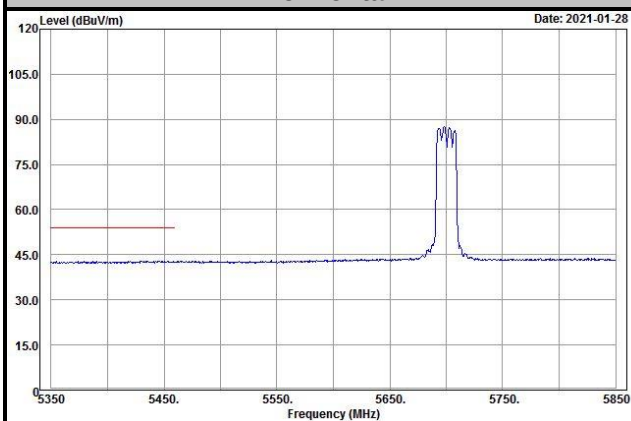


Vertical

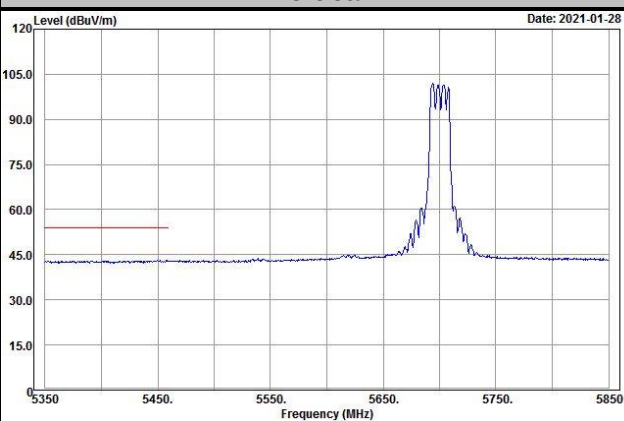


Average

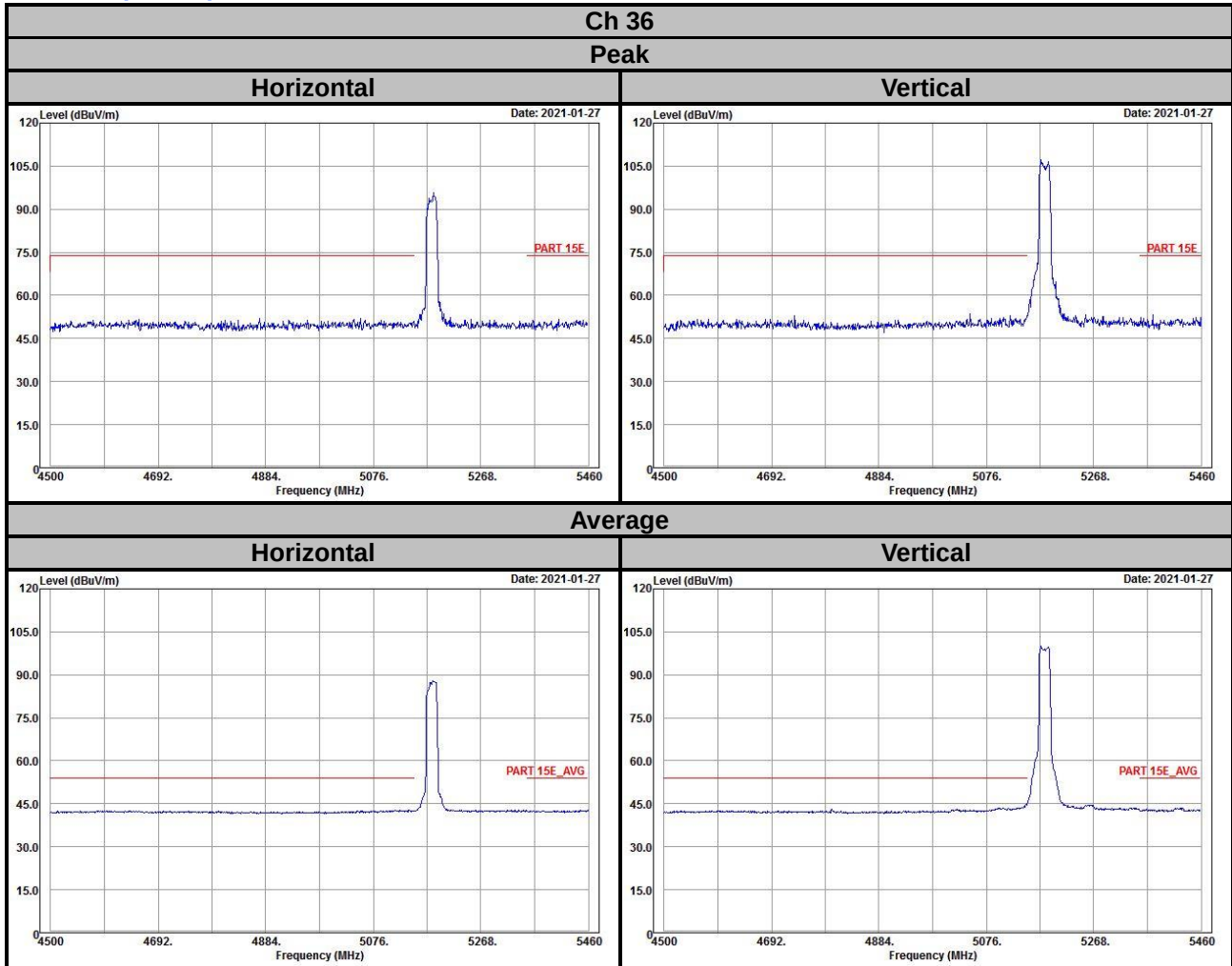
Horizontal



Vertical



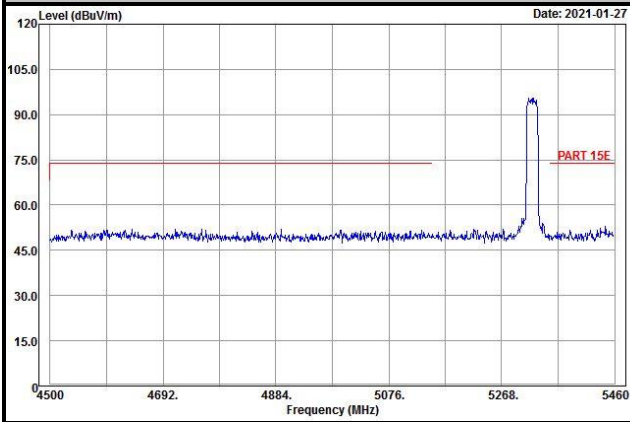
802.11ac (VHT20)



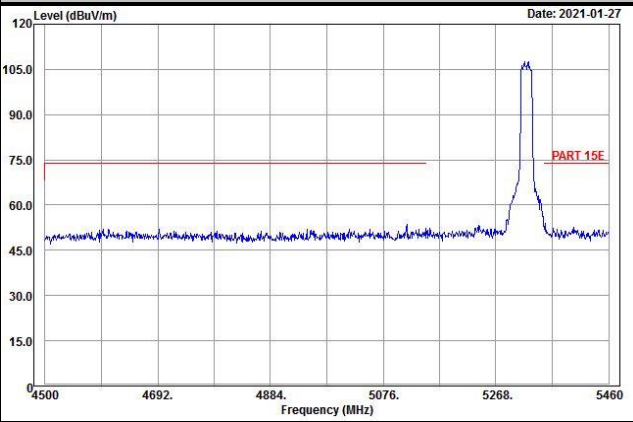
Ch 64

Peak

Horizontal

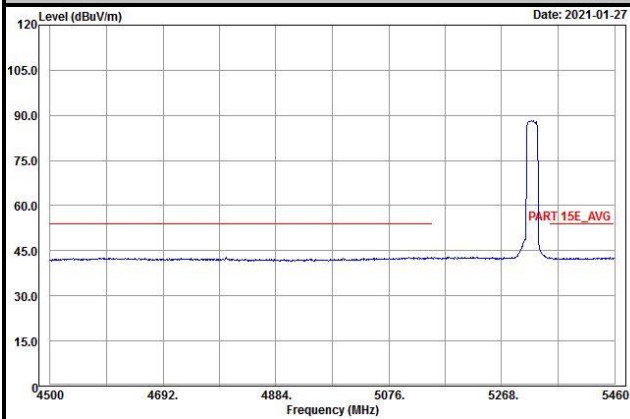


Vertical

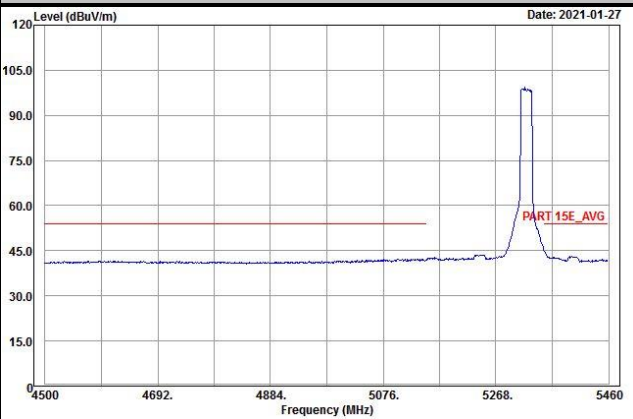


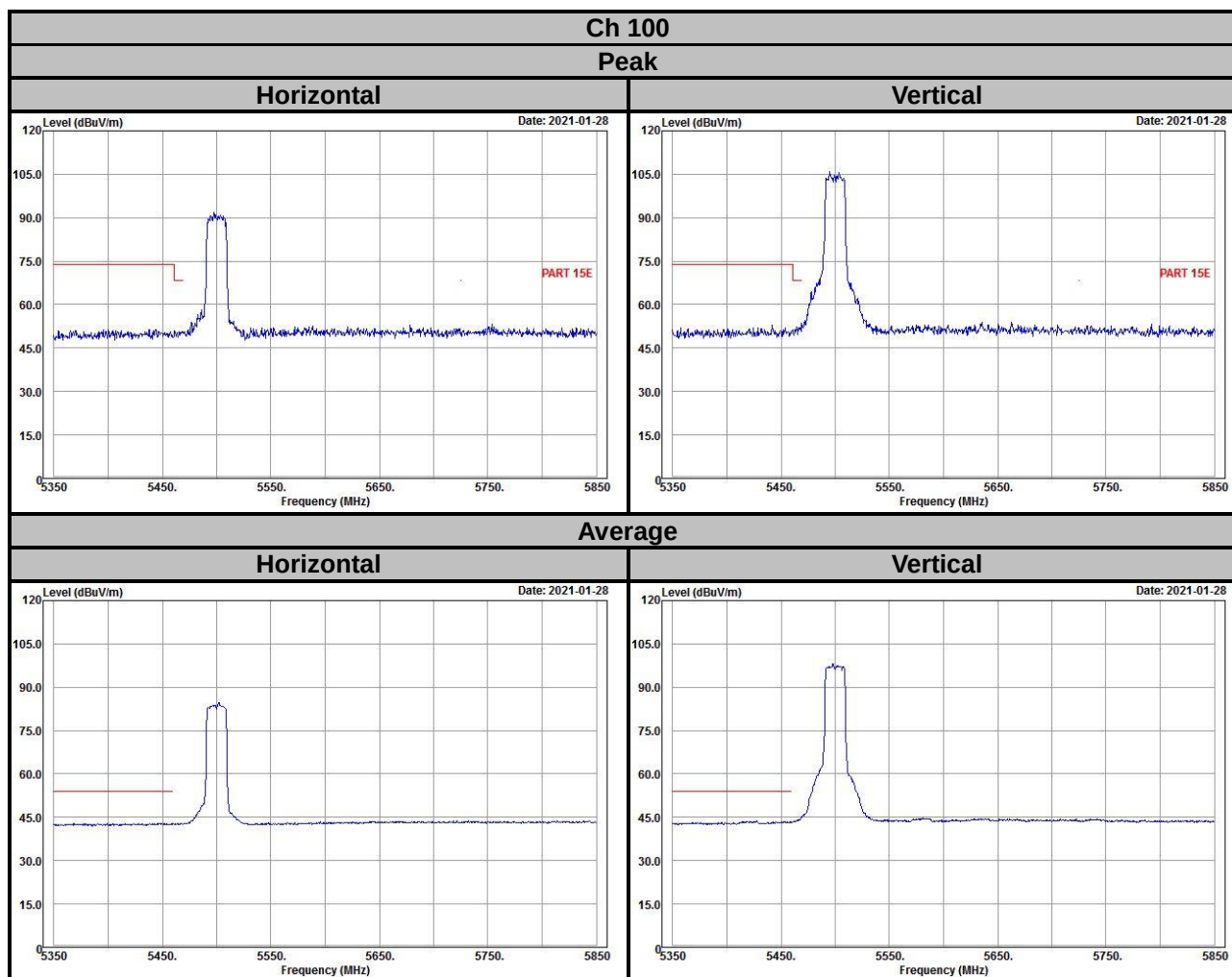
Average

Horizontal



Vertical

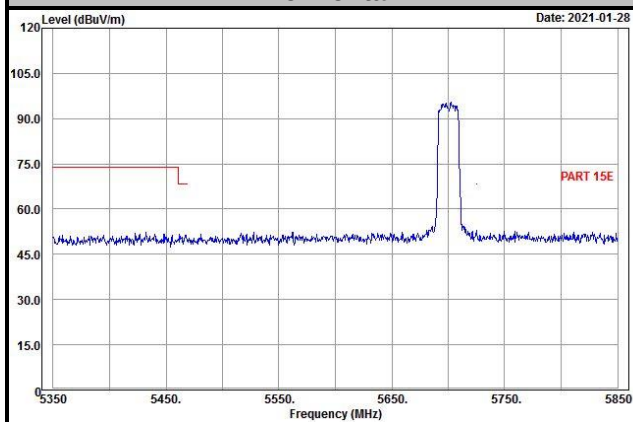




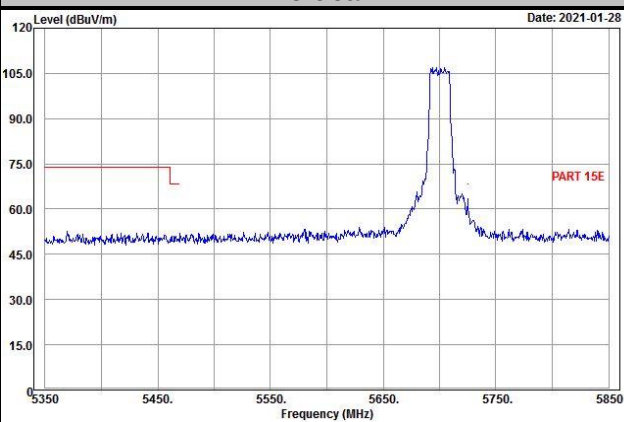
Ch 140

Peak

Horizontal

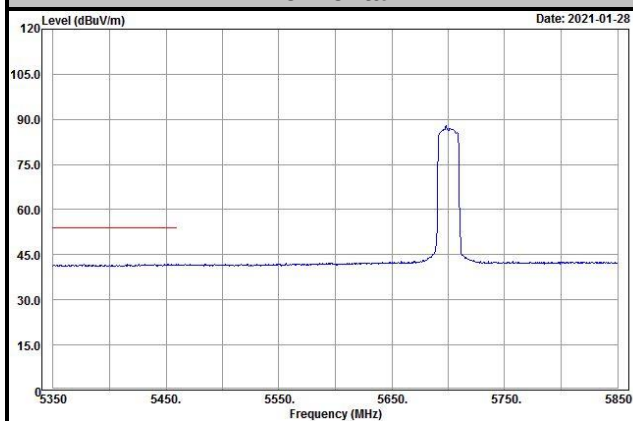


Vertical

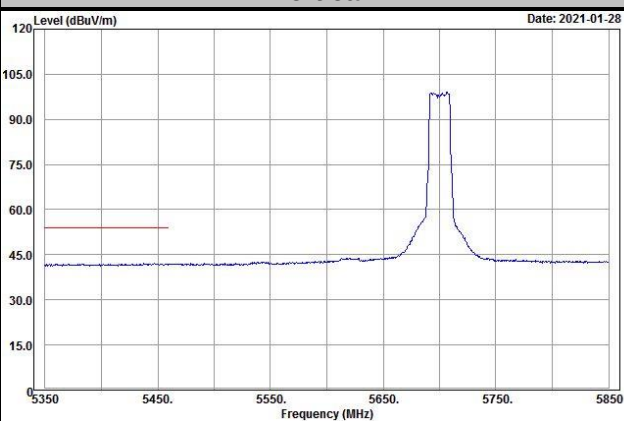


Average

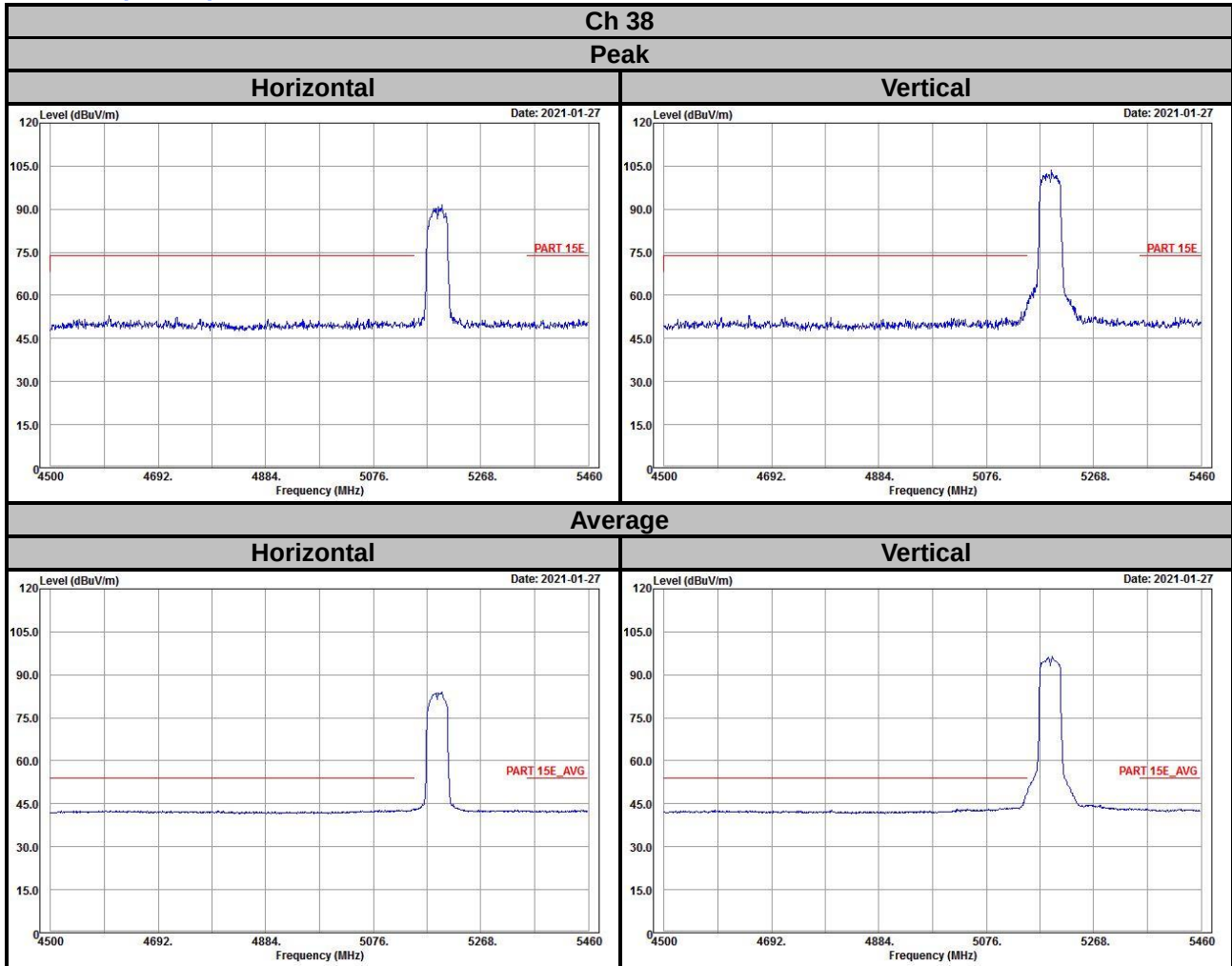
Horizontal



Vertical



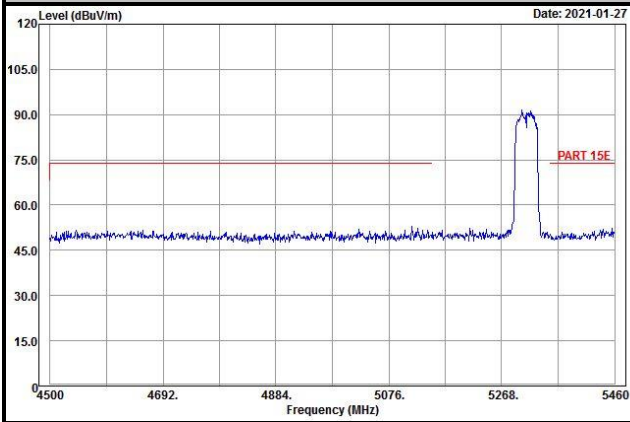
802.11ac (VHT40)



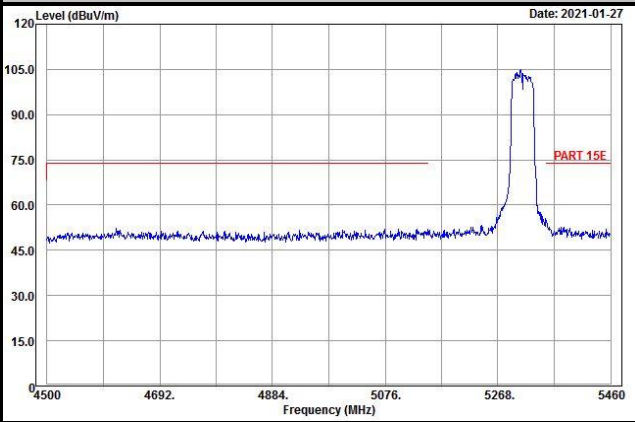
Ch 62

Peak

Horizontal

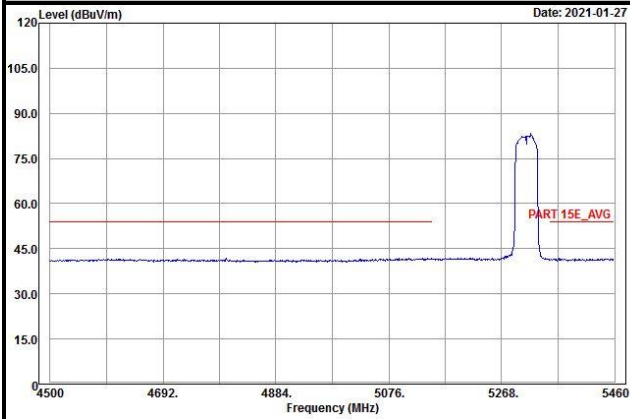


Vertical

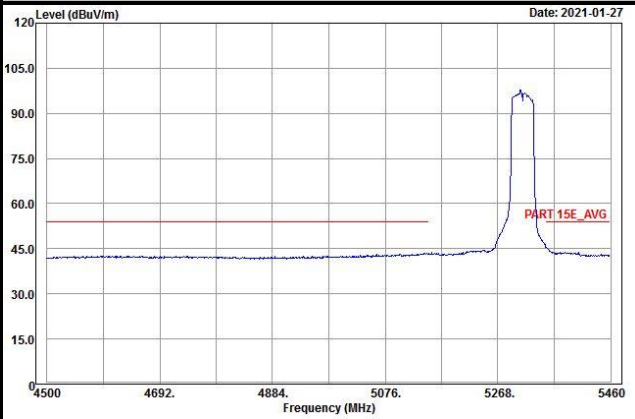


Average

Horizontal



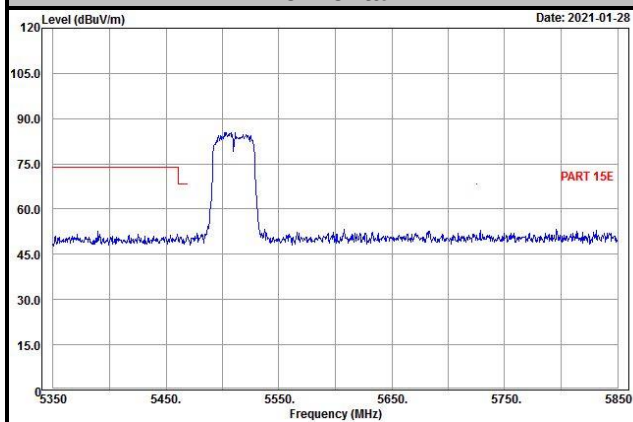
Vertical



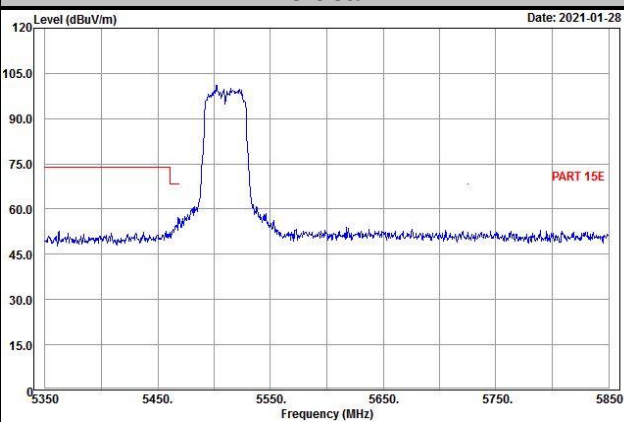
Ch 102

Peak

Horizontal

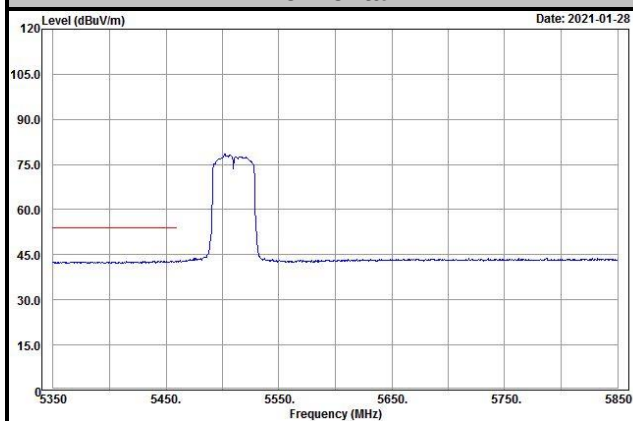


Vertical

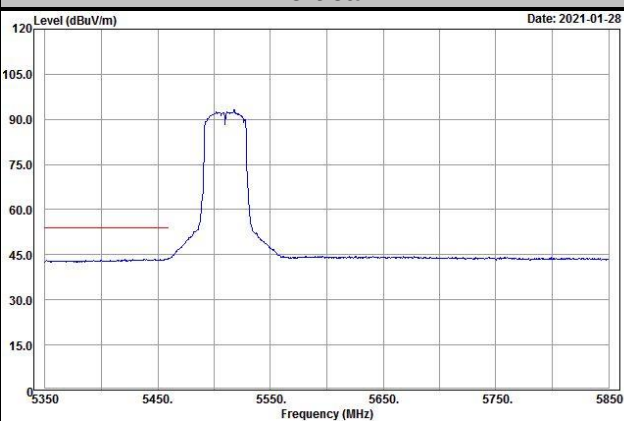


Average

Horizontal



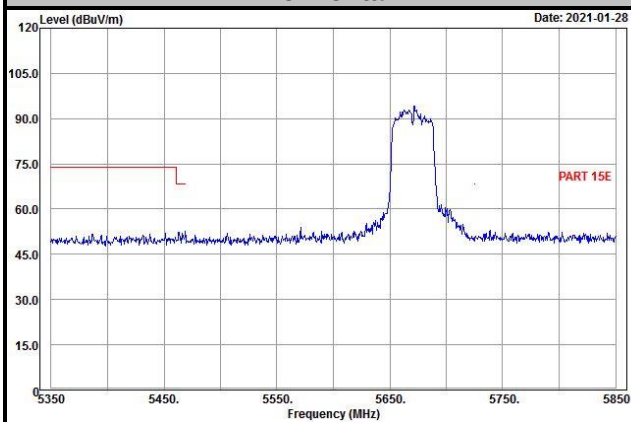
Vertical



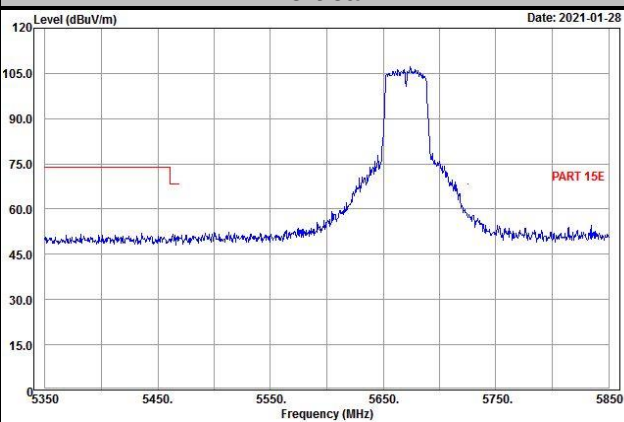
Ch 134

Peak

Horizontal

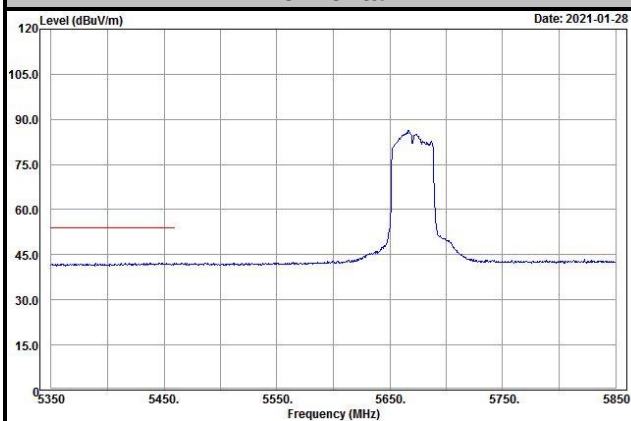


Vertical

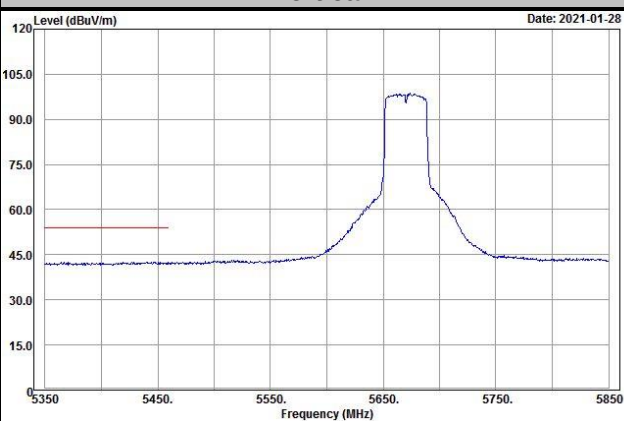


Average

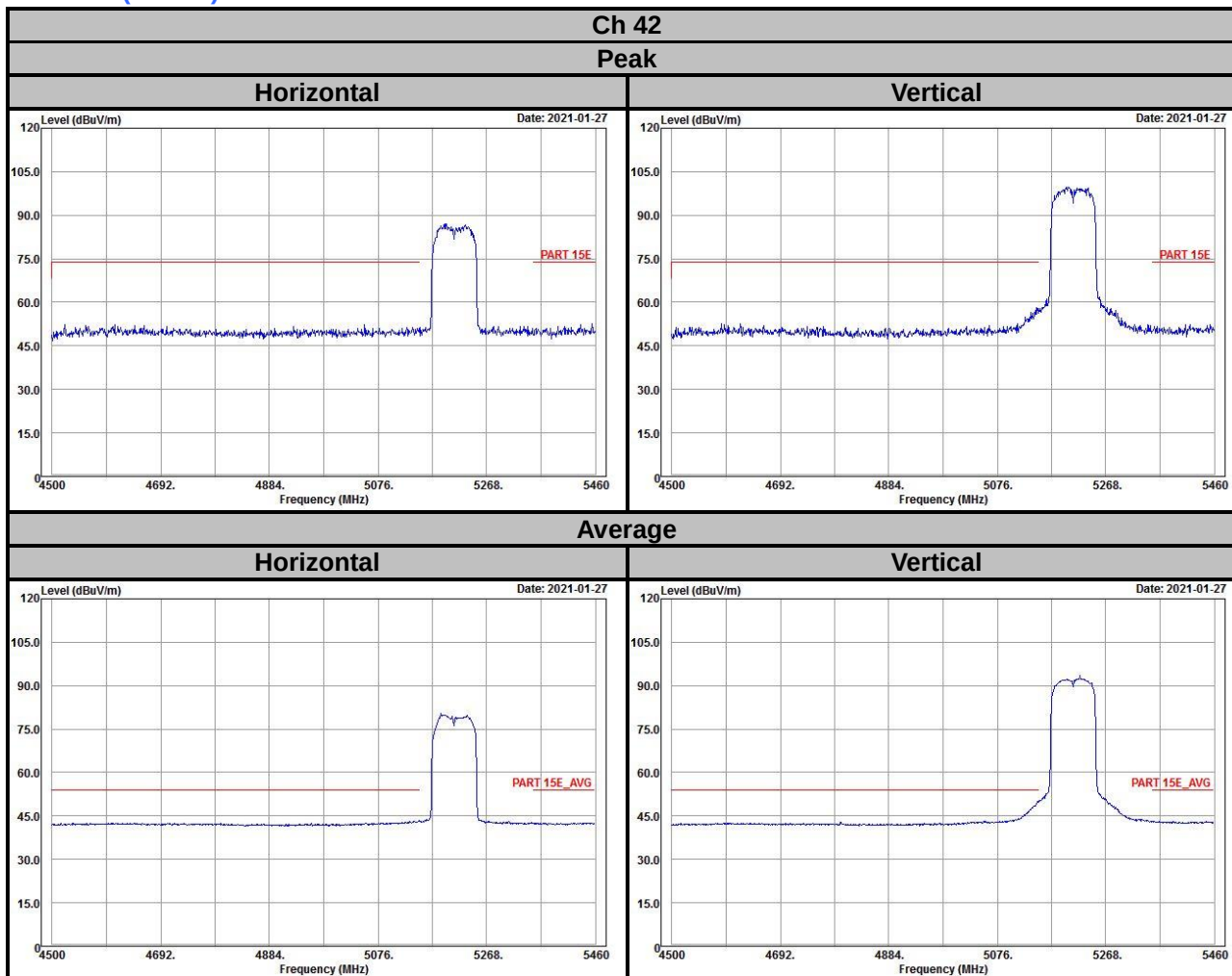
Horizontal



Vertical



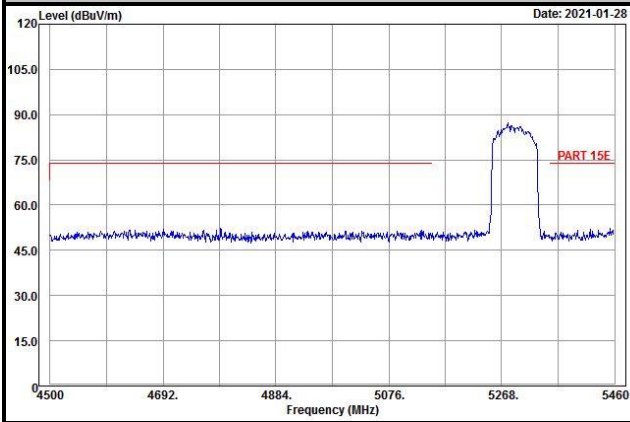
802.11ac (VHT80)



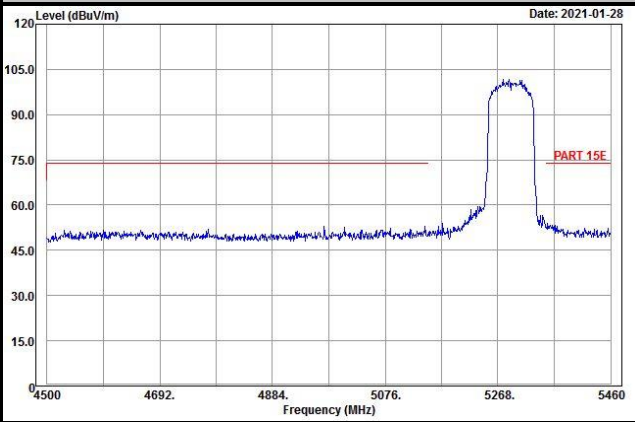
Ch 58

Peak

Horizontal

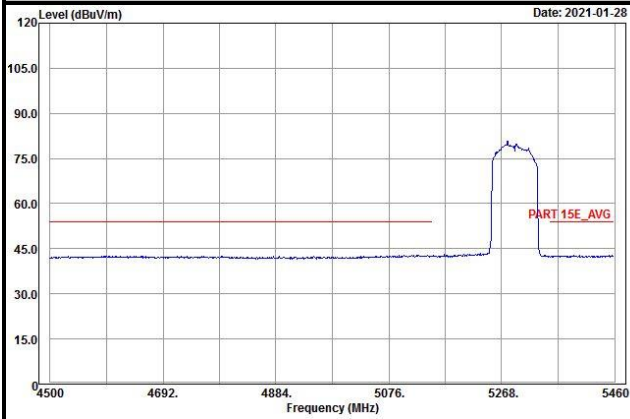


Vertical

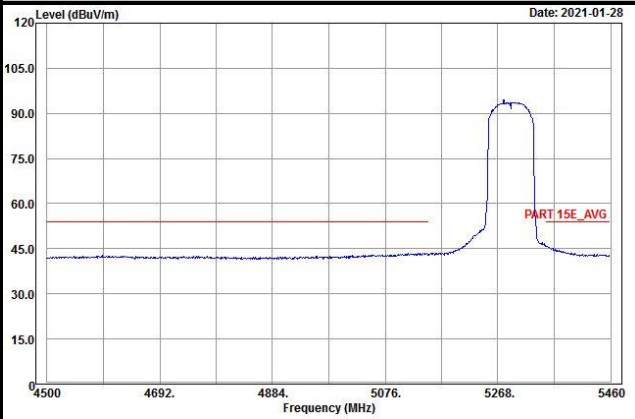


Average

Horizontal



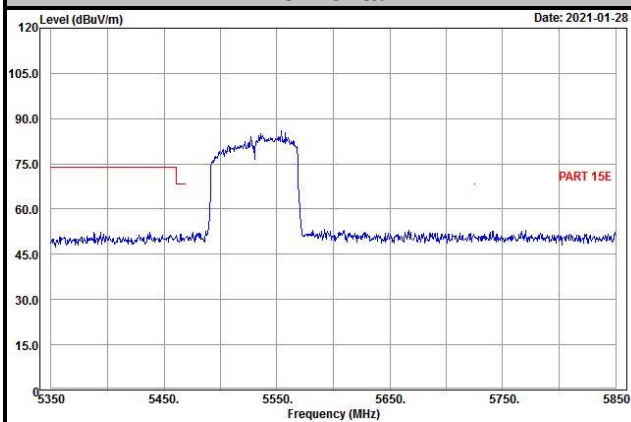
Vertical



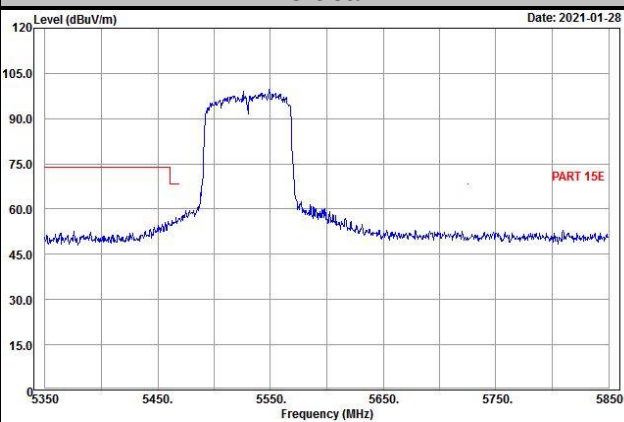
Ch 106

Peak

Horizontal

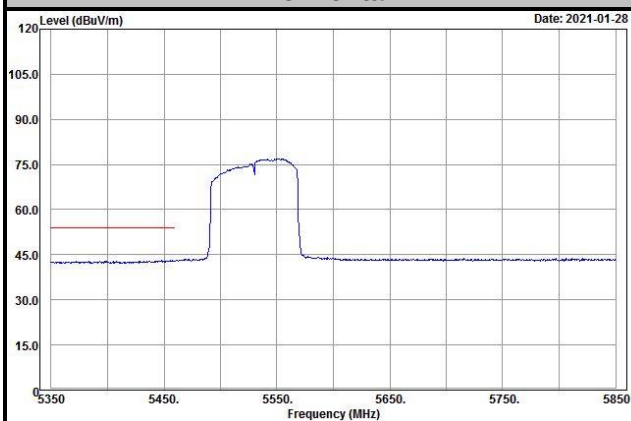


Vertical

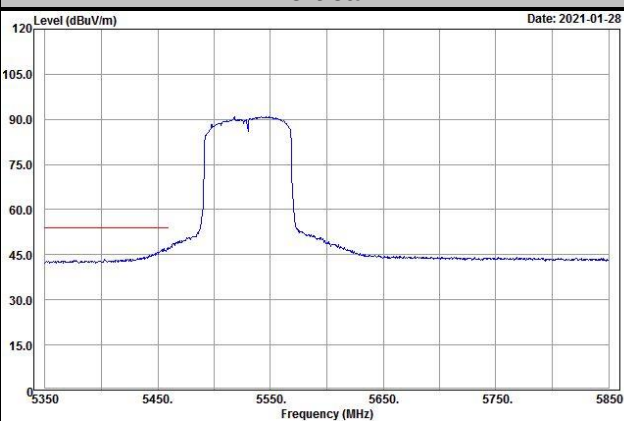


Average

Horizontal



Vertical



Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

--- END ---