CTC Laboratories, Inc.

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Appendix for 5G WIFI

Applicant: FOXSTAR TECHNOLOGY CO., LTD

Address: LONGSHENG ROAD, OPTRPNIC INDUSTRY CLUSTER AREA NANTANG CITY, 473000, P.R., CHINA

Product Name: DLP Laser Projector

Model: VB1-LH3200W

FCC ID: 2A3ABVB1-LH3200W

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Appendix A1: Emission Bandwidth

Test Result

Test Mode	Channel	26db EBW [MHz]	FL[MHz]	FH[MHz]	Verdict
802.11a	5180	27.720	5166.440	5194.160	PASS
	5200	30.360	5184.680	5215.040	PASS
	5240	31.960	5224.080	5256.040	PASS
	5745	34.520	5727.120	5761.640	PASS
	5785	33.120	5767.640	5800.760	PASS
	5825	34.280	5808.280	5842.560	PASS
802.11n(HT20)	5180	31.960	5166.040	5198.000	PASS
	5200	33.920	5184.600	5218.520	PASS
	5240	34.280	5223.160	5257.440	PASS
	5745	33.200	5727.080	5760.280	PASS
	5785	33.400	5767.680	5801.080	PASS
	5825	36.160	5807.080	5843.240	PASS
802.11n(HT40)	5190	59.040	5164.560	5223.600	PASS
	5230	58.640	5203.360	5262.000	PASS
	5755	59.920	5722.200	5782.120	PASS
	5795	57.040	5764.200	5821.240	PASS
802.11ac(VHT20)	5180	32.280	5164.720	5197.000	PASS
	5200	32.240	5184.320	5216.560	PASS
	5240	33.640	5225.240	5258.880	PASS
	5745	31.040	5729.720	5760.760	PASS
	5785	30.680	5768.120	5798.800	PASS
	5825	33.320	5808.320	5841.640	PASS
802.11ac(VHT40)	5190	64.480	5161.680	5226.160	PASS
	5230	64.320	5201.520	5265.840	PASS
	5755	57.840	5721.640	5779.480	PASS
	5795	61.920	5759.560	5821.480	PASS
802.11ac(VHT80)	5210	116.320	5159.120	5275.440	PASS
	5775	112.960	5708.920	5821.880	PASS

Test Graphs

802.11a_5180

802.11a_5200

802.11a_5240

802.11a_5745

802.11a_5785

802.11a_5825

802.11n(HT20)_5180

802.11n(HT20)_5200

802.11n(HT20)_5240

802.11n(HT20)_5745

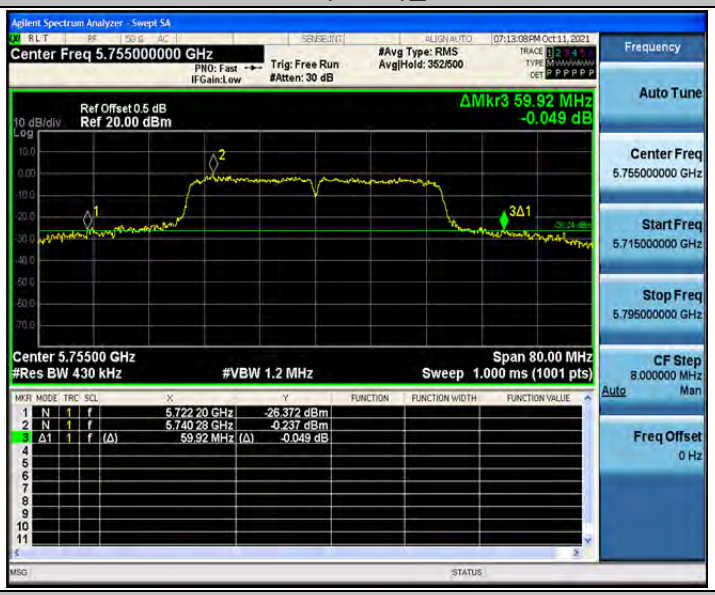
802.11n(HT20)_5785

802.11n(HT20)_5825

802.11n(HT40)_5190

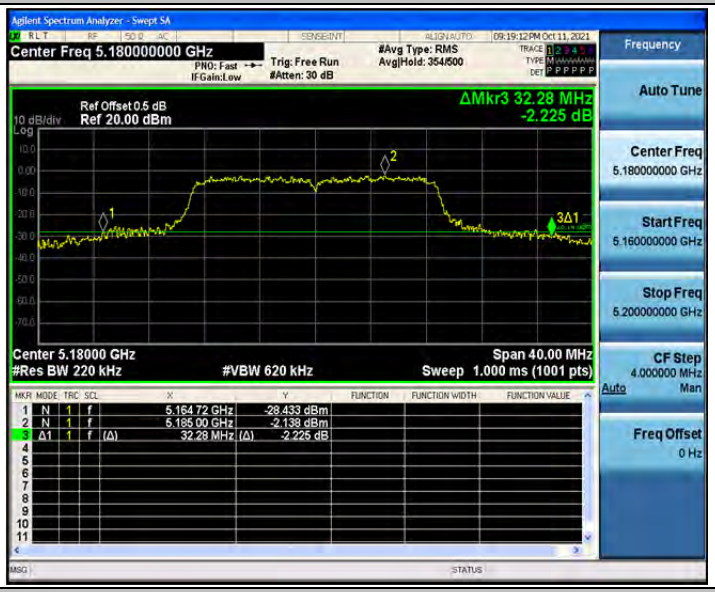
802.11n(HT40)_5230

802.11n(HT40)_5755



802.11n(HT40)_5795

802.11ac(VHT20)_5180



802.11ac(VHT20)_5200

802.11ac(VHT20)_5240

802.11ac(VHT20)_5745

802.11ac(VHT20)_5785

802.11ac(VHT20)_5825

802.11ac(VHT40)_5190

802.11ac(VHT40)_5230

802.11ac(VHT40)_5755

802.11ac(VHT40)_5795

802.11ac(VHT80)_5210

802.11ac(VHT80)_5775

Agilent Spectrum Analyzer - Swept SA
Center Freq 5.775000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 360/500
12:49:44 AM Oct 12, 2021
Frequency
Auto Tune
Ref Offset 0.5 dB
10 dB/div
Ref 20.00 dBm
Log
ΔMkr3 112.96 MHz
-0.157 dB
Center Freq
5.775000000 GHz
Start Freq
5.695000000 GHz
Stop Freq
5.855000000 GHz
Center 5.77500 GHz
#Res BW 820 kHz
#VBW 2.7 MHz
Span 160.0 MHz
Sweep 1.000 ms (1001 pts)
CF Step
16.000000 MHz
Auto
Man
Freq Offset
0 Hz
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 5.708 92 GHz -27.951 dBm
2 N 1 f 5.747 32 GHz -0.315 dBm
3 Δ1 1 f (Δ) 112.96 MHz (Δ) -0.157 dB
MSG
STATUS

Appendix A2: Occupied channel bandwidth

Test Result

Test Mode	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Verdict
802.11a	5180	17.507	5171.256	5188.763	PASS
	5200	17.487	5191.306	5208.793	PASS
	5240	17.861	5231.097	5248.958	PASS
	5745	19.036	5735.413	5754.449	PASS
	5785	18.482	5775.445	5793.927	PASS
	5825	18.768	5815.433	5834.201	PASS
802.11n(HT20)	5180	18.626	5170.858	5189.484	PASS
	5200	18.910	5190.611	5209.521	PASS
	5240	18.523	5230.748	5249.271	PASS
	5745	18.723	5735.536	5754.259	PASS
	5785	19.048	5775.434	5794.482	PASS
	5825	18.925	5815.481	5834.406	PASS
802.11n(HT40)	5190	37.124	5171.580	5208.704	PASS
	5230	37.242	5211.461	5248.703	PASS
	5755	36.926	5736.359	5773.285	PASS
	5795	36.804	5776.525	5813.329	PASS
802.11ac(VHT20)	5180	18.402	5170.864	5189.266	PASS
	5200	18.954	5190.579	5209.533	PASS
	5240	18.493	5230.730	5249.223	PASS
	5745	18.518	5735.624	5754.142	PASS
	5785	18.528	5775.698	5794.226	PASS
	5825	18.677	5815.600	5834.277	PASS
802.11ac(VHT40)	5190	37.074	5171.615	5208.689	PASS
	5230	37.205	5211.396	5248.601	PASS
	5755	36.863	5736.431	5773.294	PASS
	5795	37.146	5776.309	5813.455	PASS
802.11ac(VHT80)	5210	75.724	5172.285	5248.009	PASS
	5775	75.766	5736.792	5812.558	PASS

Test Graphs

802.11a_5180

802.11a_5200

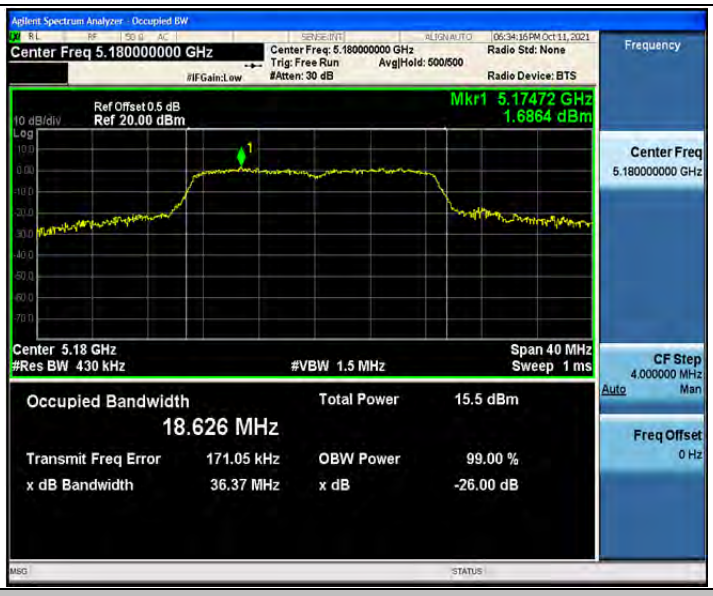
802.11a_5240

802.11a_5745

802.11a_5785

802.11a_5825

802.11n(HT20)_5180



802.11n(HT20)_5200

802.11n(HT20)_5240

802.11n(HT20)_5745

802.11n(HT20)_5785

802.11n(HT20)_5825

802.11n(HT40)_5190

802.11n(HT40)_5230

802.11n(HT40)_5755

802.11n(HT40)_5795

802.11ac(VHT20)_5180

802.11ac(VHT20)_5200

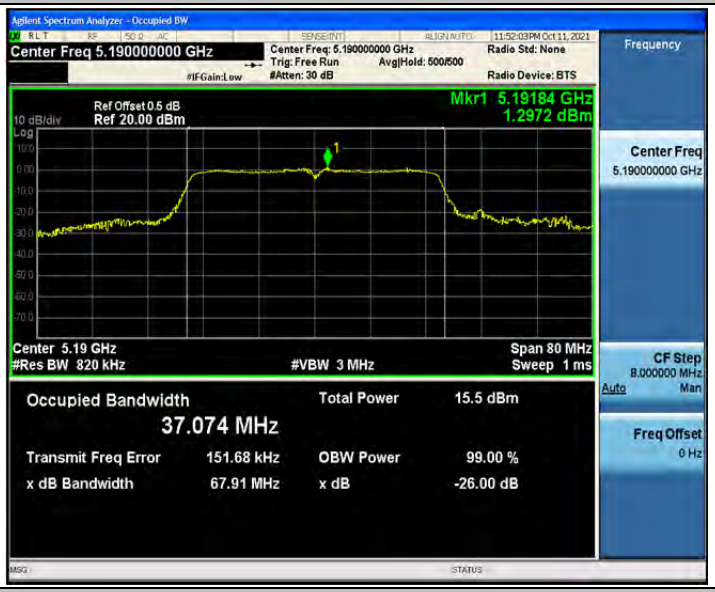
802.11ac(VHT20)_5240

802.11ac(VHT20)_5745

802.11ac(VHT20)_5785

802.11ac(VHT20)_5825

802.11ac(VHT40)_5190



802.11ac(VHT40)_5230

802.11ac(VHT40)_5755

802.11ac(VHT40)_5795

802.11ac(VHT80)_5210

802.11ac(VHT80)_5775

Agilent Spectrum Analyzer - Occupied BW
Center Freq 5.775000000 GHz
Center Freq: 5.775000000 GHz
Trig: Free Run
Avg|Hold: 500/500
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
12:50:18 AM Oct 12, 2021
Frequency
Ref Offset 0.5 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 5.74844 GHz
4.0508 dBm
Center Freq
5.775000000 GHz
Center 5.775 GHz
#Res BW 1.6 MHz
#VBW 6 MHz
Span 160 MHz
Sweep 1 ms
CF Step
16.000000 MHz
Auto
Man
Occupied Bandwidth
75.766 MHz
Total Power
17.2 dBm
Transmit Freq Error
-324.99 kHz
OBW Power
99.00 %
x dB Bandwidth
109.2 MHz
x dB
-26.00 dB
Freq Offset
0 Hz
MSG
STATUS

Appendix A3: Min emission bandwidth

Test Result

Test Mode	Channel	6db EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
802.11a	5745	16.360	5736.840	5753.200	>0.5	PASS
	5785	16.400	5776.800	5793.200	>0.5	PASS
	5825	16.160	5816.800	5832.960	>0.5	PASS
802.11n(HT20)	5745	16.920	5736.520	5753.440	>0.5	PASS
	5785	17.000	5776.440	5793.440	>0.5	PASS
	5825	16.880	5816.560	5833.440	>0.5	PASS
802.11n(HT40)	5755	35.280	5737.320	5772.600	>0.5	PASS
	5795	35.280	5777.320	5812.600	>0.5	PASS
802.11ac(VHT20)	5745	16.480	5736.440	5752.920	>0.5	PASS
	5785	16.480	5776.440	5792.920	>0.5	PASS
	5825	17.000	5816.440	5833.440	>0.5	PASS
802.11ac(VHT40)	5755	35.360	5737.320	5772.680	>0.5	PASS
	5795	35.200	5777.400	5812.600	>0.5	PASS
802.11ac(VHT80)	5775	72.960	5737.240	5810.200	>0.5	PASS

Test Graphs

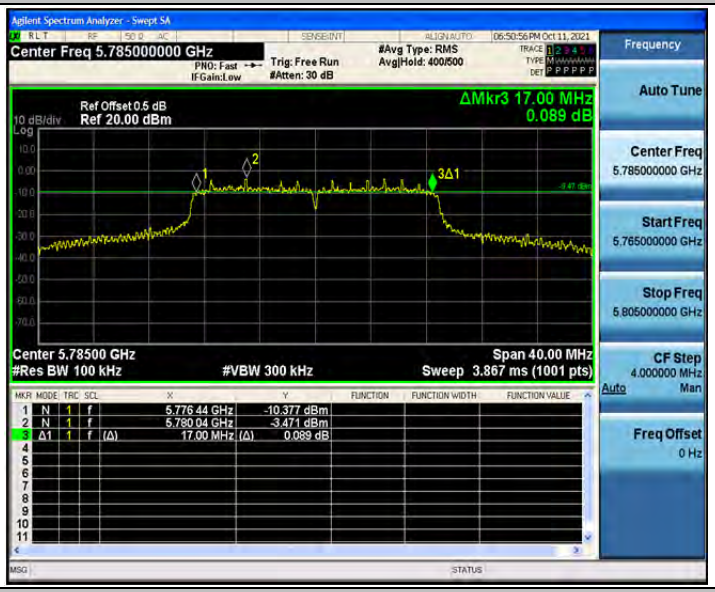
802.11a_5745

802.11a_5785

802.11a_5825

802.11n(HT20)_5745

802.11n(HT20)_5785

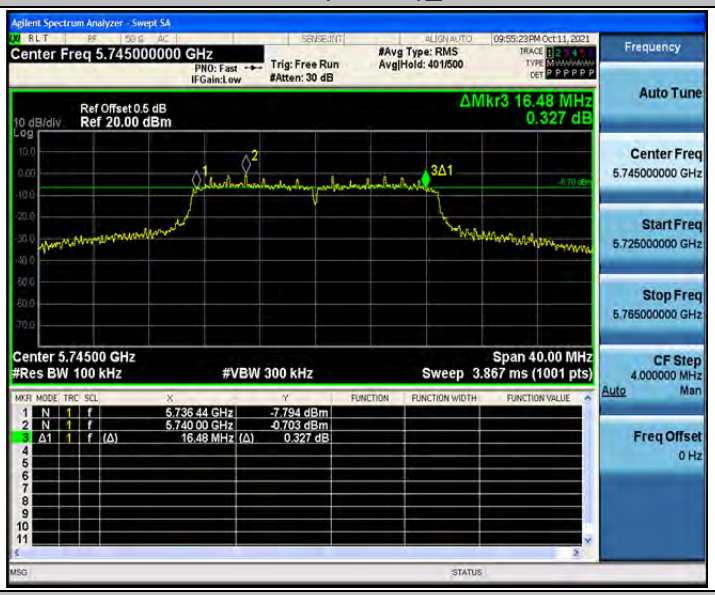


802.11n(HT20)_5825

802.11n(HT40)_5755

802.11n(HT40)_5795

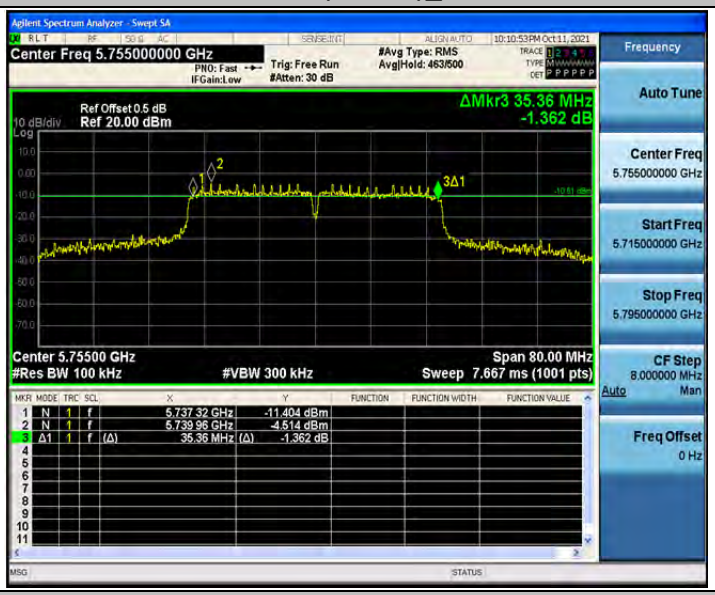
802.11ac(VHT20)_5745



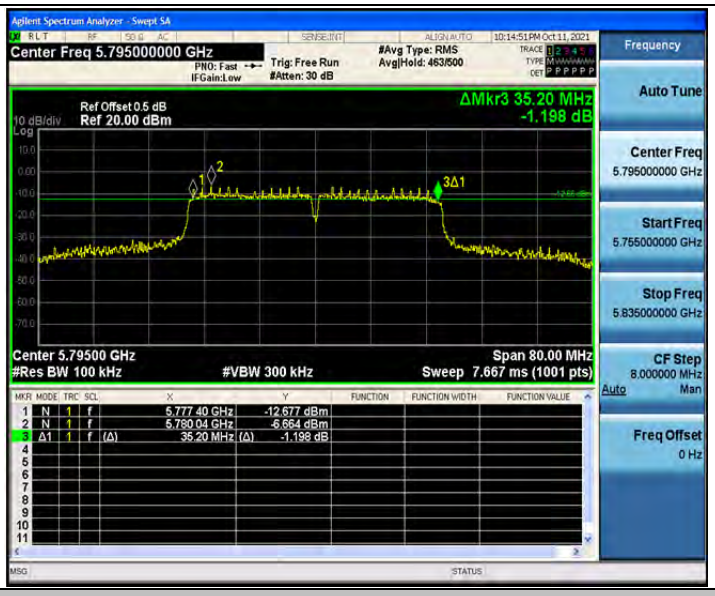
802.11ac(VHT20)_5785

802.11ac(VHT20)_5825

802.11ac(VHT40)_5755



802.11ac(VHT40)_5795



802.11ac(VHT80)_5775

Appendix B: Maximum conducted output power

Test Result

Test Mode	Channel	Result[dBm]	Limit[dBm]	Verdict
802.11a	5180	8.27	<=24	PASS
	5200	7.95	<=24	PASS
	5240	7.56	<=24	PASS
	5745	8.77	<=30	PASS
	5785	8.51	<=30	PASS
	5825	7.31	<=30	PASS
802.11n(HT20)	5180	8.77	<=24	PASS
	5200	8.59	<=24	PASS
	5240	7.58	<=24	PASS
	5745	8.17	<=30	PASS
	5785	7.04	<=30	PASS
	5825	6.07	<=30	PASS
802.11n(HT40)	5190	8.20	<=24	PASS
	5230	7.50	<=24	PASS
	5755	8.99	<=30	PASS
	5795	7.27	<=30	PASS
802.11ac(VHT20)	5180	7.97	<=24	PASS
	5200	8.56	<=24	PASS
	5240	7.40	<=24	PASS
	5745	9.43	<=30	PASS
	5785	7.61	<=30	PASS
	5825	6.97	<=30	PASS
802.11ac(VHT40)	5190	8.26	<=24	PASS
	5230	7.32	<=24	PASS
	5755	9.25	<=30	PASS
	5795	7.04	<=30	PASS
802.11ac(VHT80)	5210	7.89	<=24	PASS
	5775	8.92	<=30	PASS

Note：Test results increased RF cable loss by 0.5dB.
The Duty Cycle Factor is compensated in the graph.

Appendix C: Maximum power spectral density

Test Result

Test Mode	Channel	Result [dBm/MHz]	Limit[dBm/MHz]	Verdict
802.11a	5180	-1.18	<=11	PASS
	5200	-0.95	<=11	PASS
	5240	-0.83	<=11	PASS
	5745	-2.91	<=30	PASS
	5785	-2.63	<=30	PASS
	5825	-4.00	<=30	PASS
802.11n(HT20)	5180	-0.22	<=11	PASS
	5200	-0.52	<=11	PASS
	5240	-11.21	<=11	PASS
	5745	-3.83	<=30	PASS
	5785	-5.03	<=30	PASS
	5825	-6.16	<=30	PASS
802.11n(HT40)	5190	-4.17	<=11	PASS
	5230	-4.76	<=11	PASS
	5755	-5.62	<=30	PASS
	5795	-7.38	<=30	PASS
802.11ac(VHT20)	5180	-1.57	<=11	PASS
	5200	-1.12	<=11	PASS
	5240	-2.14	<=11	PASS
	5745	-2.79	<=30	PASS
	5785	-4.41	<=30	PASS
	5825	-4.92	<=30	PASS
802.11ac(VHT40)	5190	-3.78	<=11	PASS
	5230	-5.15	<=11	PASS
	5755	-5.08	<=30	PASS
	5795	-8.57	<=30	PASS
802.11ac(VHT80)	5210	-6.45	<=11	PASS
	5775	-8.15	<=30	PASS

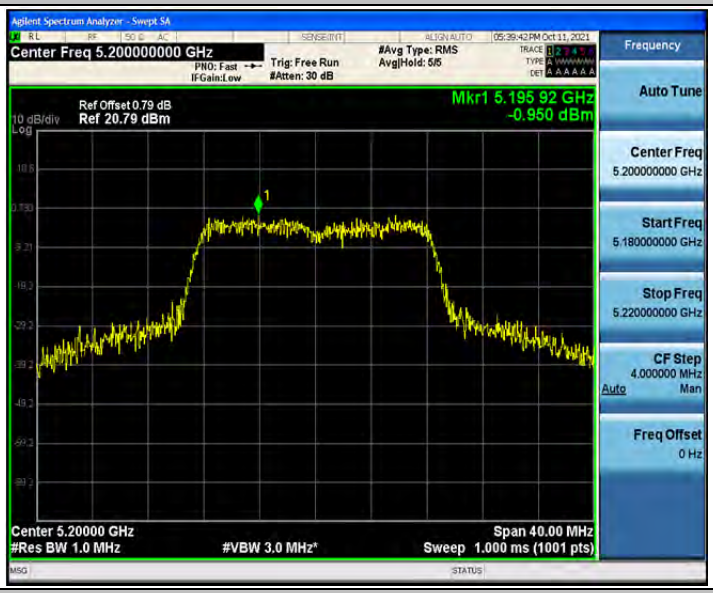
Note：1. The Result and Limit Unit is dBm/500 kHz in the band 5.725–5.85 GHz.

2. The Duty Cycle Factor and RBW Factor is compensated in the graph.

Test Graphs

802.11a_5180

802.11a_5200



802.11a_5240

802.11a_5745

802.11a_5785

802.11a_5825

802.11n(HT20)_5180

802.11n(HT20)_5200

802.11n(HT20)_5240

802.11n(HT20)_5745

802.11n(HT20)_5785

802.11n(HT20)_5825

802.11n(HT40)_5190

802.11n(HT40)_5230

802.11n(HT40)_5755

802.11n(HT40)_5795

802.11ac(VHT20)_5180

802.11ac(VHT20)_5200

802.11ac(VHT20)_5240

802.11ac(VHT20)_5745

802.11ac(VHT20)_5785

802.11ac(VHT20)_5825

802.11ac(VHT40)_5190

802.11ac(VHT40)_5230

802.11ac(VHT40)_5755

802.11ac(VHT40)_5795

802.11ac(VHT80)_5210

802.11ac(VHT80)_5775

Agilent Spectrum Analyzer - Swept SA
Center Freq 5.775000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 5/5
12:50:49 AM Oct 12, 2021
Frequency
Auto Tune
Ref Offset 4.02 dB
10 dB/div
Log
Ref 24.02 dBm
Mkr1 5.783 96 GHz
-8.146 dBm
Center Freq
5.775000000 GHz
Start Freq
5.695000000 GHz
Stop Freq
5.855000000 GHz
CF Step
16.000000 MHz
Auto
Man
Freq Offset
0 Hz
Center 5.77500 GHz
#Res BW 300 kHz
#VBW 1.5 MHz*
Span 160.0 MHz
Sweep 2.200 ms (1001 pts)
MSG
STATUS

Appendix D: Frequency Stability

Test Result

Voltage							
Test Mode	Channel	Voltage [Vdc]	Temperature (℃)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
20MHz	5180	NV	NT	-7000	-1.351351	20	PASS
		LV	NT	-6000	-1.158301	20	PASS
		HV	NT	-5000	-0.965251	20	PASS
	5200	NV	NT	-2000	-0.384615	20	PASS
		LV	NT	-2000	-0.384615	20	PASS
		HV	NT	-2000	-0.384615	20	PASS
	5240	NV	NT	-8000	-1.526718	20	PASS
		LV	NT	-8000	-1.526718	20	PASS
		HV	NT	-8000	-1.526718	20	PASS
	5745	NV	NT	-7000	-1.218451	20	PASS
		LV	NT	-7000	-1.218451	20	PASS
		HV	NT	-7000	-1.218451	20	PASS
	5785	NV	NT	-8000	-1.382887	20	PASS
		LV	NT	-8000	-1.382887	20	PASS
		HV	NT	-8000	-1.382887	20	PASS
	5825	NV	NT	-8000	-1.373391	20	PASS
		LV	NT	-8000	-1.373391	20	PASS
		HV	NT	-8000	-1.373391	20	PASS
40MHz	5190	NV	NT	-7000	-1.348748	20	PASS
		LV	NT	-7000	-1.348748	20	PASS
		HV	NT	-7000	-1.348748	20	PASS
	5230	NV	NT	-8000	-1.529637	20	PASS
		LV	NT	-8000	-1.529637	20	PASS
		HV	NT	-7000	-1.338432	20	PASS
	5755	NV	NT	-4000	-0.695048	20	PASS
		LV	NT	-5000	-0.86881	20	PASS
		HV	NT	-6000	-1.042572	20	PASS
	5795	NV	NT	-8000	-1.3805	20	PASS
		LV	NT	-8000	-1.3805	20	PASS
		HV	NT	-7000	-1.207938	20	PASS
80MHz	5210	NV	NT	-1000	-0.191939	20	PASS
		LV	NT	-2000	-0.383877	20	PASS
		HV	NT	-2000	-0.383877	20	PASS
	5775	NV	NT	-9000	-1.558442	20	PASS
		LV	NT	-9000	-1.558442	20	PASS
		HV	NT	-8000	-1.385281	20	PASS

Temperature							
Test Mode	Channel	Voltage [Vdc]	Temperature (℃)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
20MHz	5180	NV	0	-4000	-0.772201	20	PASS
		NV	10	-4000	-0.772201	20	PASS
		NV	20	-3000	-0.579151	20	PASS
		NV	30	-3000	-0.579151	20	PASS
		NV	40	-3000	-0.579151	20	PASS
	5200	NV	0	-1000	-0.192308	20	PASS
		NV	10	-1000	-0.192308	20	PASS
		NV	20	-2000	-0.384615	20	PASS
		NV	30	-1000	-0.192308	20	PASS
		NV	40	-1000	-0.192308	20	PASS
	5240	NV	0	-7000	-1.335878	20	PASS
		NV	10	-6000	-1.145038	20	PASS
		NV	20	-6000	-1.145038	20	PASS
		NV	30	-7000	-1.335878	20	PASS
		NV	40	-6000	-1.145038	20	PASS
	5745	NV	0	-8000	-1.392515	20	PASS
		NV	10	-8000	-1.392515	20	PASS
		NV	20	-8000	-1.392515	20	PASS
		NV	30	-8000	-1.392515	20	PASS
		NV	40	-8000	-1.392515	20	PASS
	5785	NV	0	-8000	-1.382887	20	PASS
		NV	10	-8000	-1.382887	20	PASS
		NV	20	-8000	-1.382887	20	PASS
		NV	30	-8000	-1.382887	20	PASS
		NV	40	-8000	-1.382887	20	PASS
	5825	NV	0	-8000	-1.373391	20	PASS
		NV	10	-8000	-1.373391	20	PASS
		NV	20	-8000	-1.373391	20	PASS
		NV	30	-8000	-1.373391	20	PASS
		NV	40	-8000	-1.373391	20	PASS
40MHz	5190	NV	0	-7000	-1.348748	20	PASS
		NV	10	-7000	-1.348748	20	PASS
		NV	20	-7000	-1.348748	20	PASS
		NV	30	-6000	-1.156069	20	PASS
		NV	40	-7000	-1.348748	20	PASS
	5230	NV	0	-3000	-0.573614	20	PASS
		NV	10	-3000	-0.573614	20	PASS
		NV	20	-3000	-0.573614	20	PASS
		NV	30	-2000	-0.382409	20	PASS
		NV	40	-1000	-0.191205	20	PASS
	5755	NV	0	-7000	-1.216334	20	PASS
		NV	10	-7000	-1.216334	20	PASS
		NV	20	-7000	-1.216334	20	PASS

		NV	30	-7000	-1.216334	20	PASS
		NV	40	-8000	-1.390096	20	PASS
	5795	NV	0	-8000	-1.3805	20	PASS
		NV	10	-8000	-1.3805	20	PASS
		NV	20	-8000	-1.3805	20	PASS
		NV	30	-8000	-1.3805	20	PASS
		NV	40	-8000	-1.3805	20	PASS
80MHz	5210	NV	0	-1000	-0.191939	20	PASS
		NV	10	-1000	-0.191939	20	PASS
		NV	20	0	0	20	PASS
		NV	30	0	0	20	PASS
		NV	40	-1000	-0.191939	20	PASS
	5775	NV	0	-8000	-1.385281	20	PASS
		NV	10	-8000	-1.385281	20	PASS
		NV	20	-8000	-1.385281	20	PASS
		NV	30	-8000	-1.385281	20	PASS
		NV	40	-8000	-1.385281	20	PASS

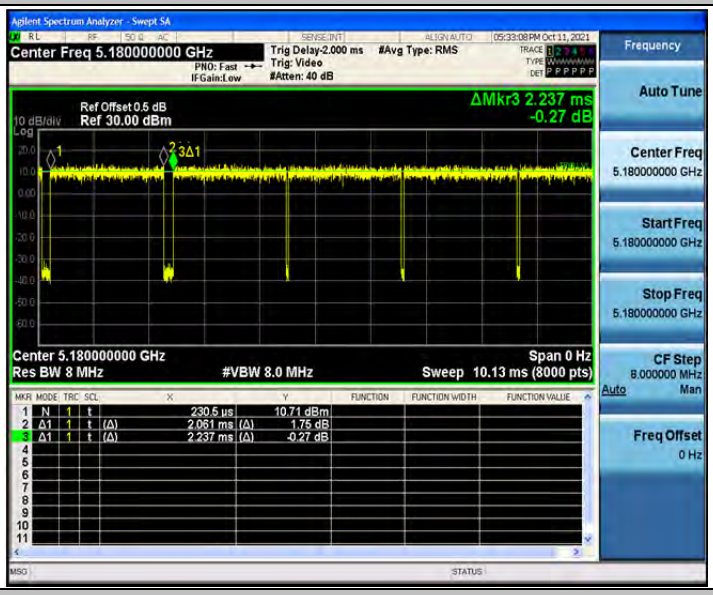
Appendix E: Duty Cycle

Test Result

Test Mode	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	1/T Minimum VBW (kHz)	Final setting For VBW (kHz)
802.11a	5180	2.06	2.24	91.96	0.49	1
	5200	2.06	2.20	93.64	0.49	1
	5240	2.06	2.14	96.26	0.49	1
	5745	2.06	2.16	95.37	0.49	1
	5785	2.06	2.16	95.37	0.49	1
	5825	2.06	2.16	95.37	0.49	1
802.11n(HT20)	5180	1.92	2.09	91.87	0.52	1
	5200	1.92	1.96	97.96	0.52	1
	5240	1.92	1.96	97.96	0.52	1
	5745	1.92	2.01	95.52	0.52	1
	5785	1.92	2.02	95.05	0.52	1
	5825	1.92	2.09	91.87	0.52	1
802.11n(HT40)	5190	0.94	1.06	88.68	1.06	2
	5230	0.94	1.05	89.52	1.06	2
	5755	0.94	1.00	94.00	1.06	2
	5795	0.94	1.11	84.68	1.06	2
802.11ac(VHT20)	5180	1.93	2.01	96.02	0.52	1
	5200	1.93	2.04	94.61	0.52	1
	5240	1.93	1.98	97.47	0.52	1
	5745	1.93	1.99	96.98	0.52	1
	5785	1.93	1.99	96.98	0.52	1
	5825	1.93	2.04	94.61	0.52	1
802.11ac(VHT40)	5190	0.95	1.10	86.36	1.05	2
	5230	0.95	1.02	93.14	1.05	2
	5755	0.95	1.08	87.96	1.05	2
	5795	0.95	1.03	92.23	1.05	2
802.11ac(VHT80)	5210	0.46	0.62	74.19	2.17	3
	5775	0.46	0.62	74.19	2.17	3

Test Graphs

802.11a_5180



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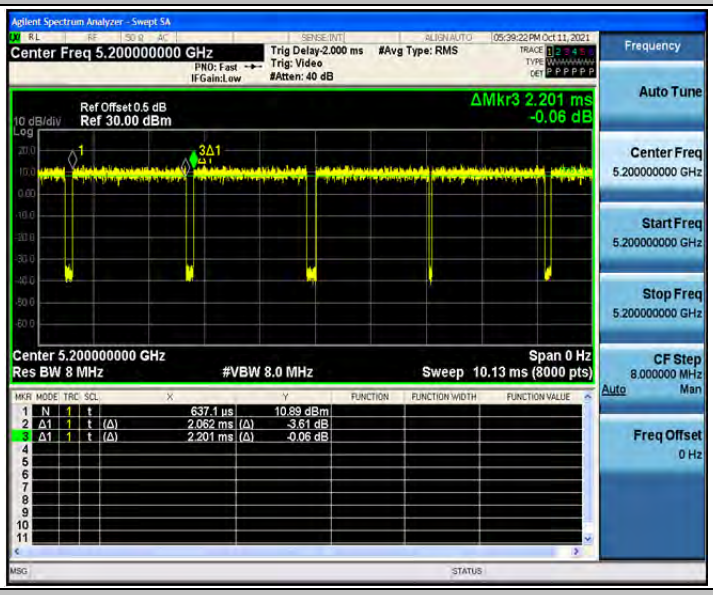

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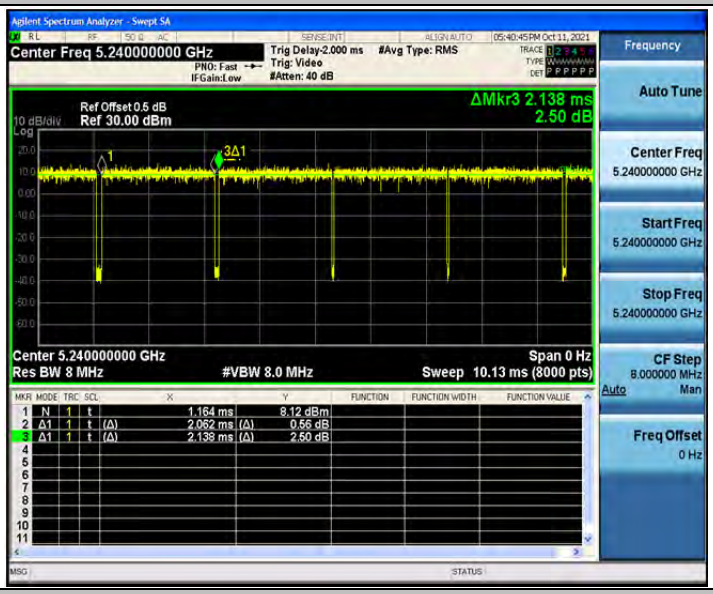

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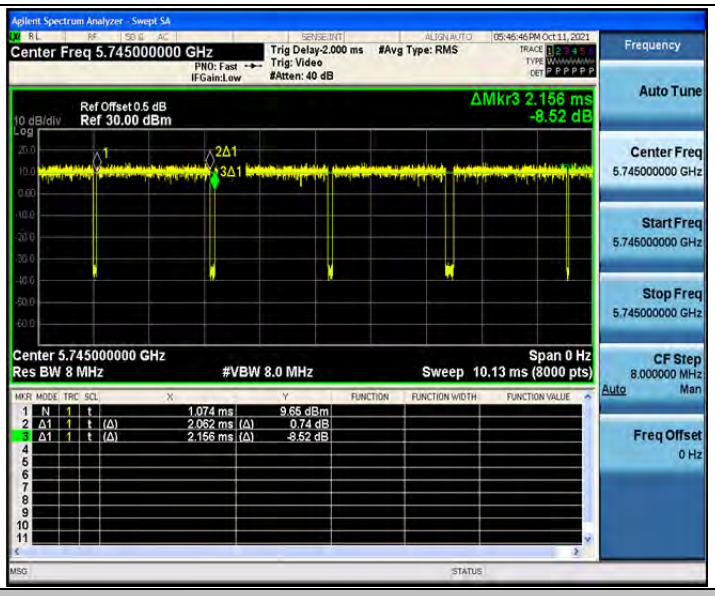

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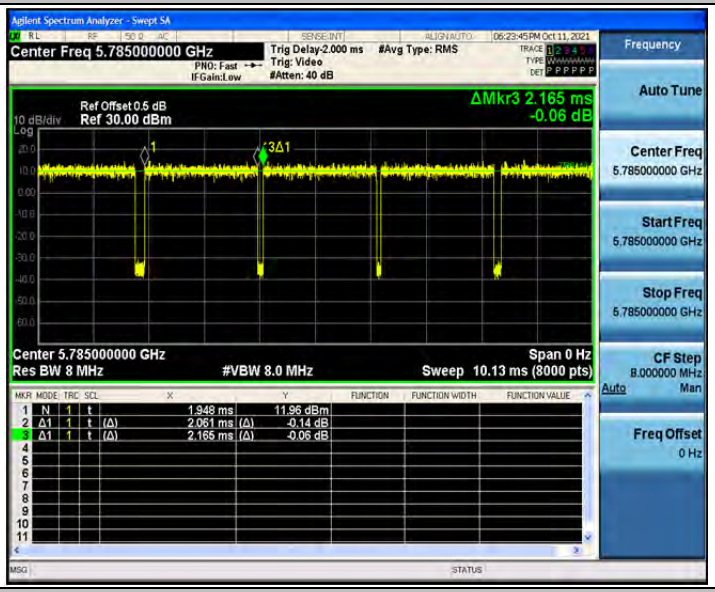

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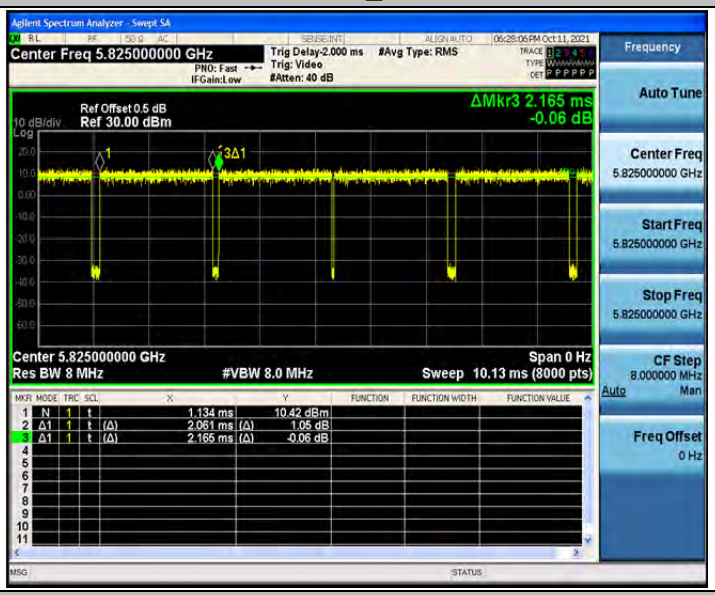

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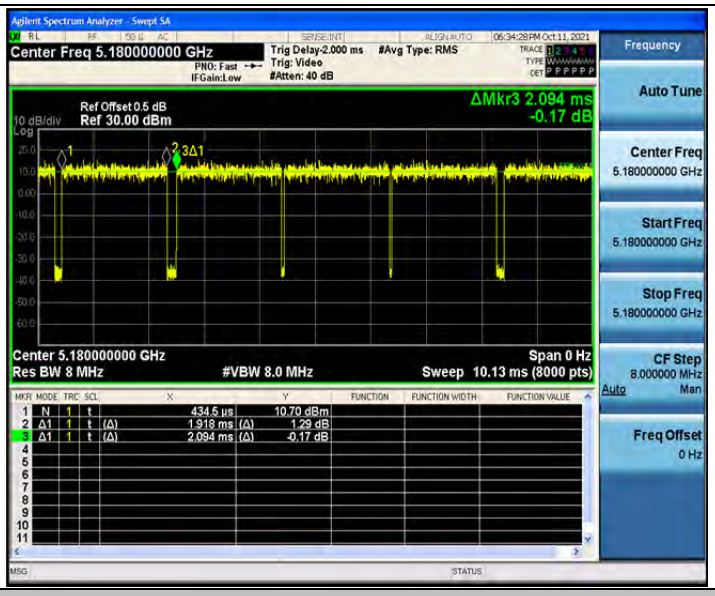

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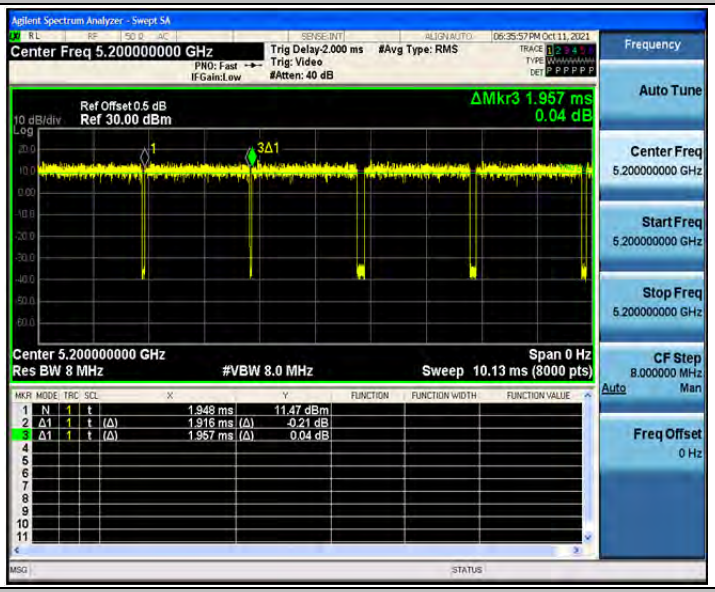

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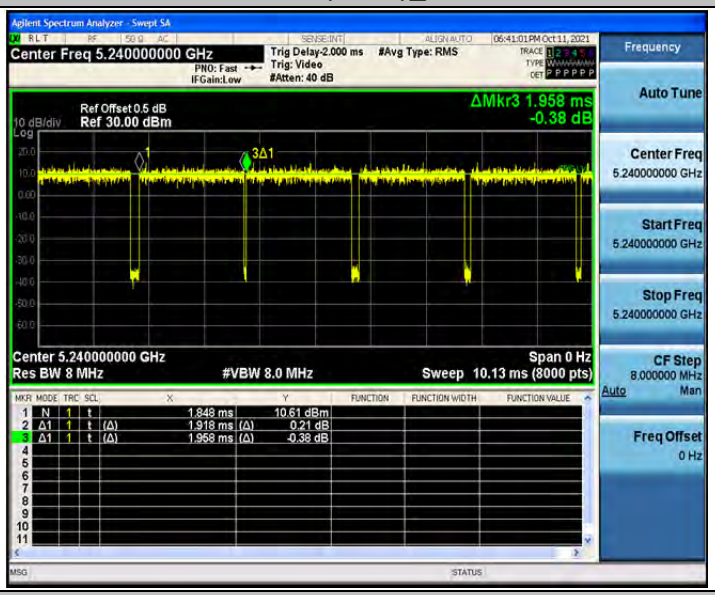

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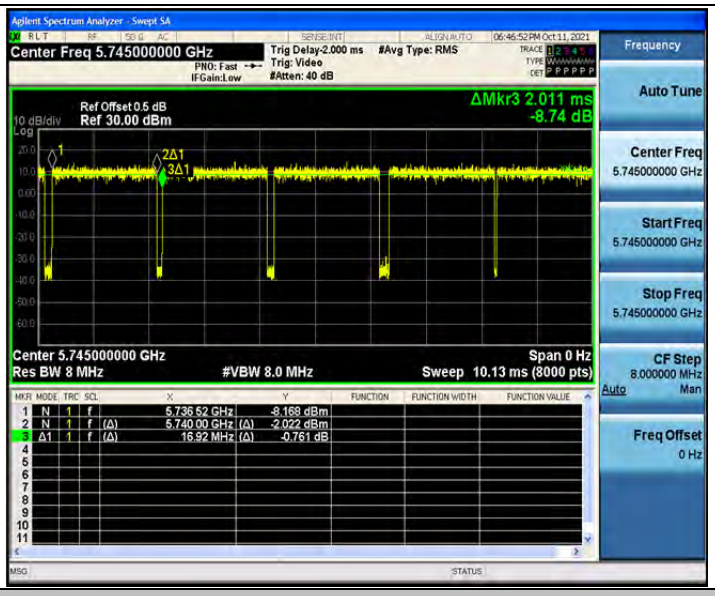

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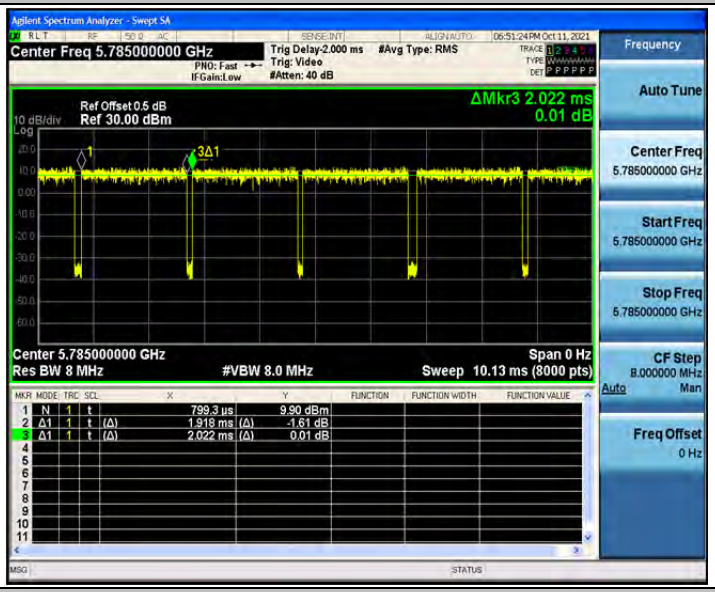

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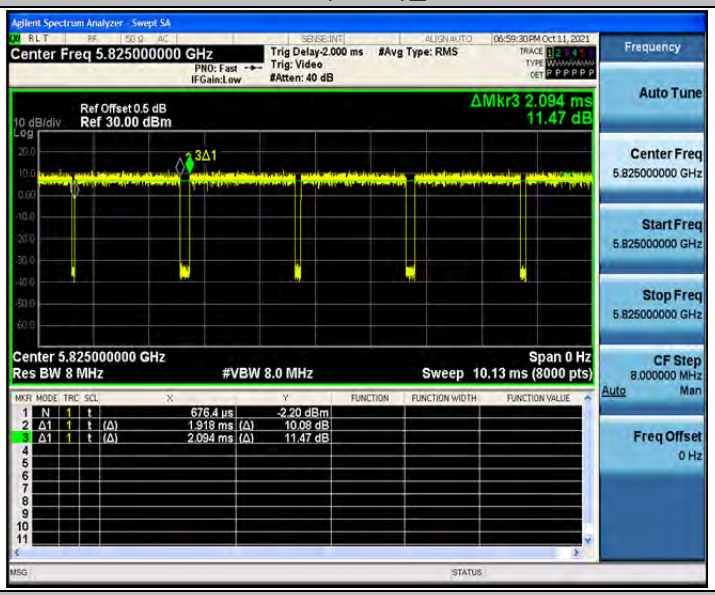

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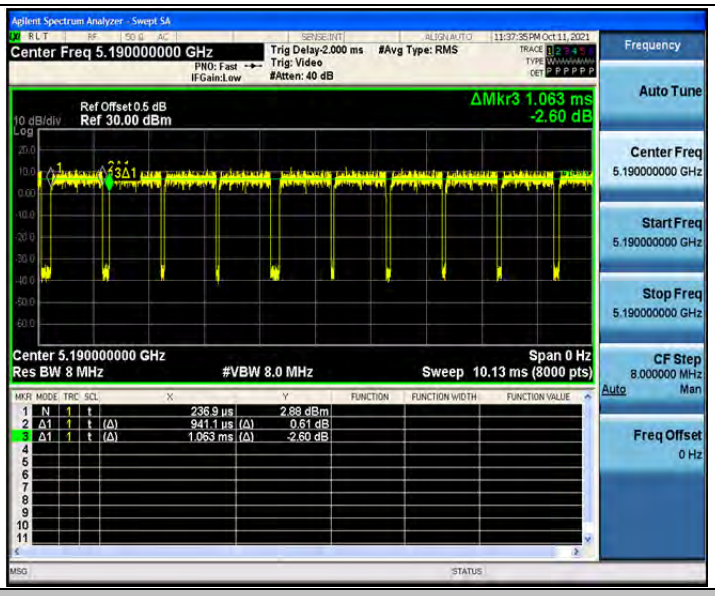

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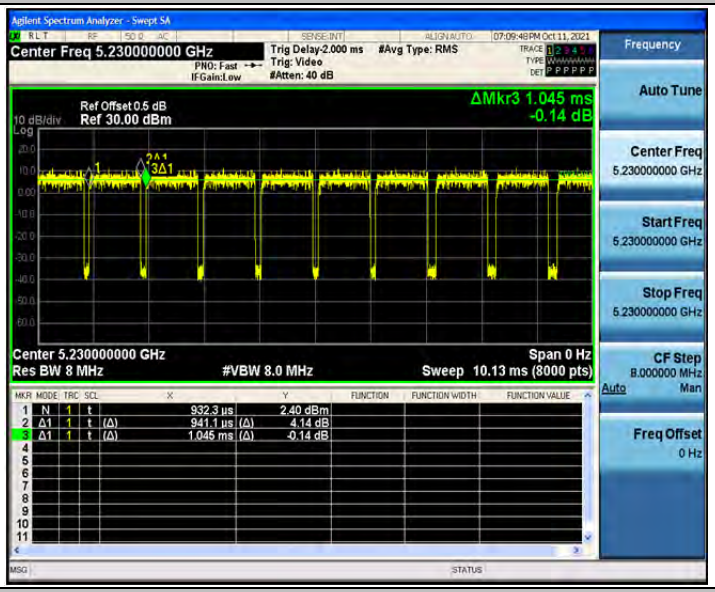

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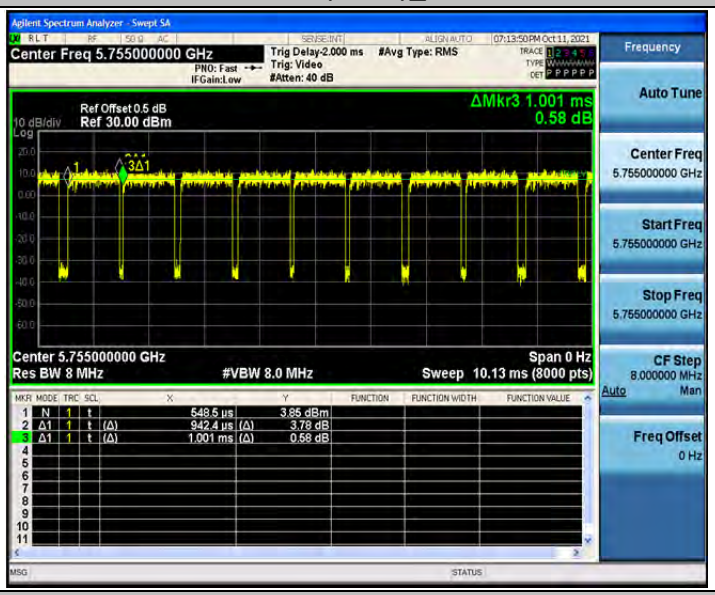

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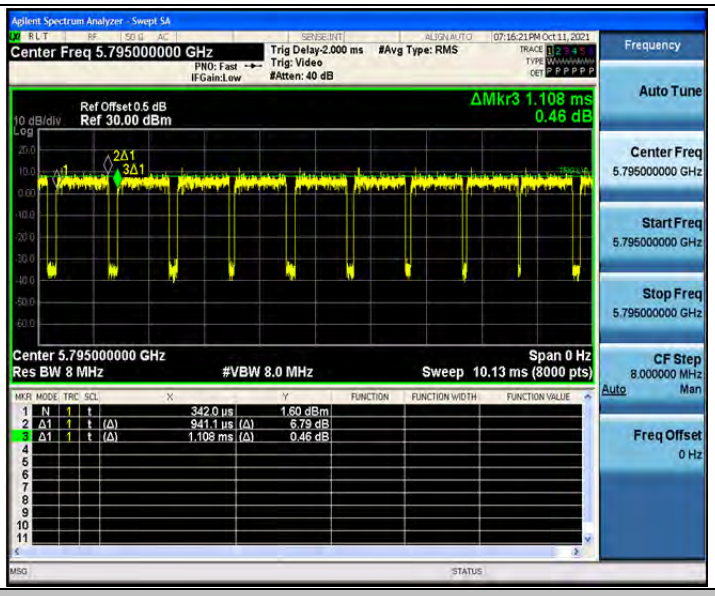

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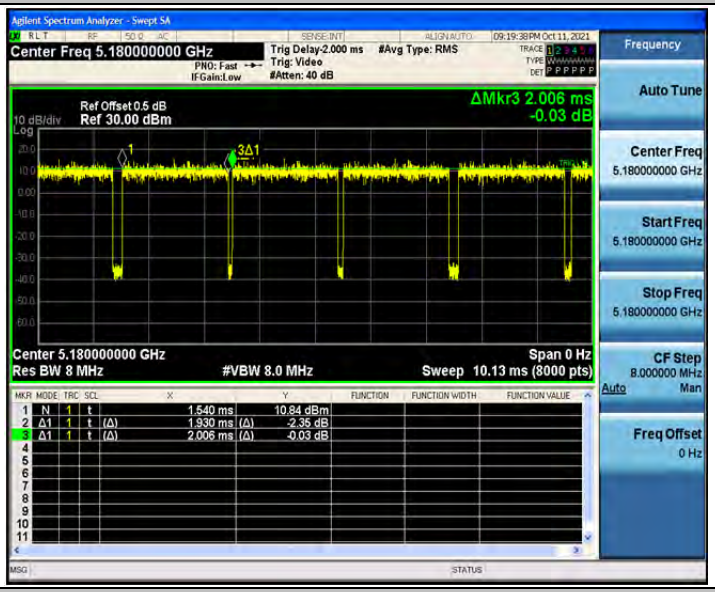

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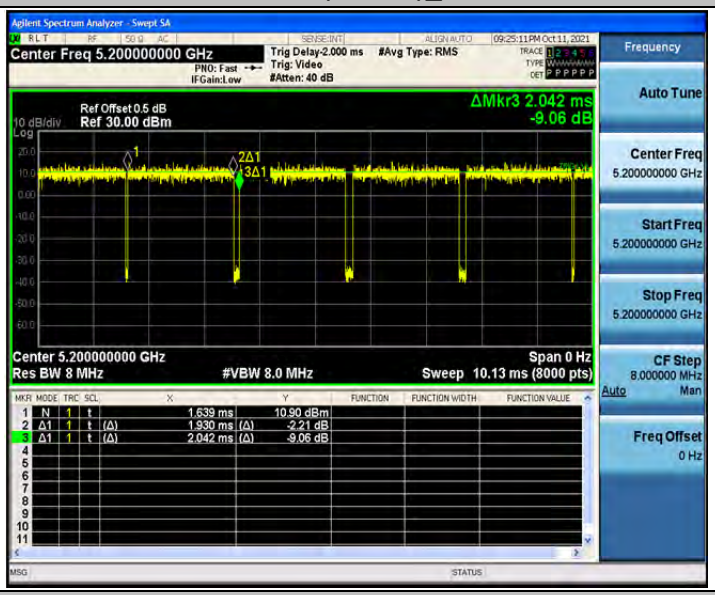

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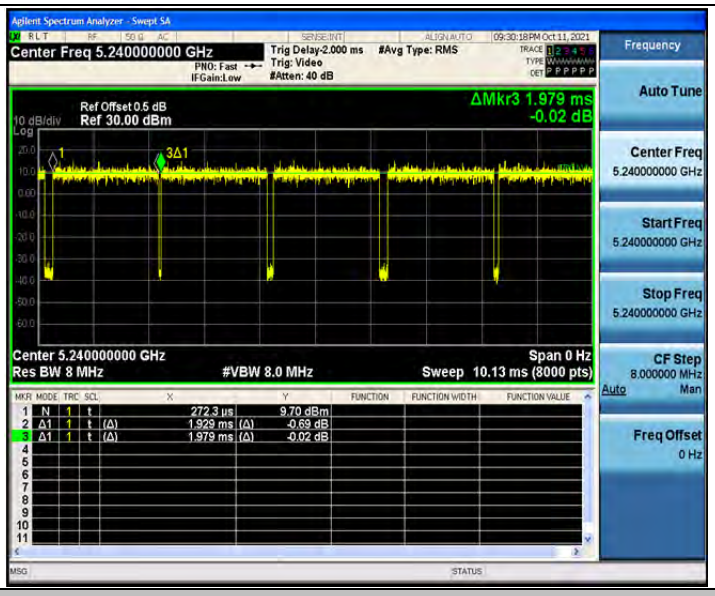

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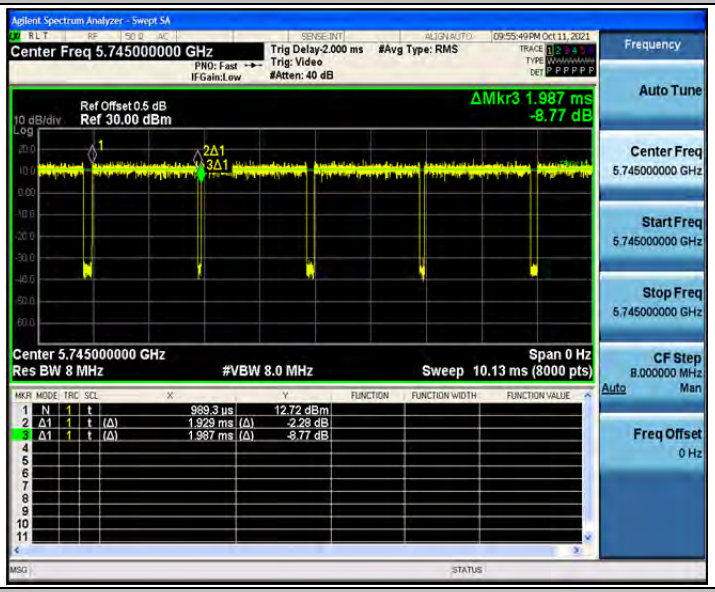

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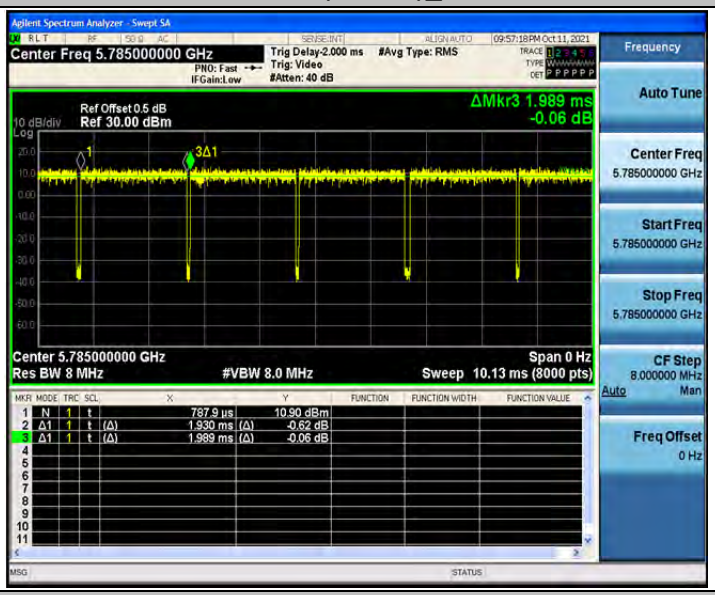

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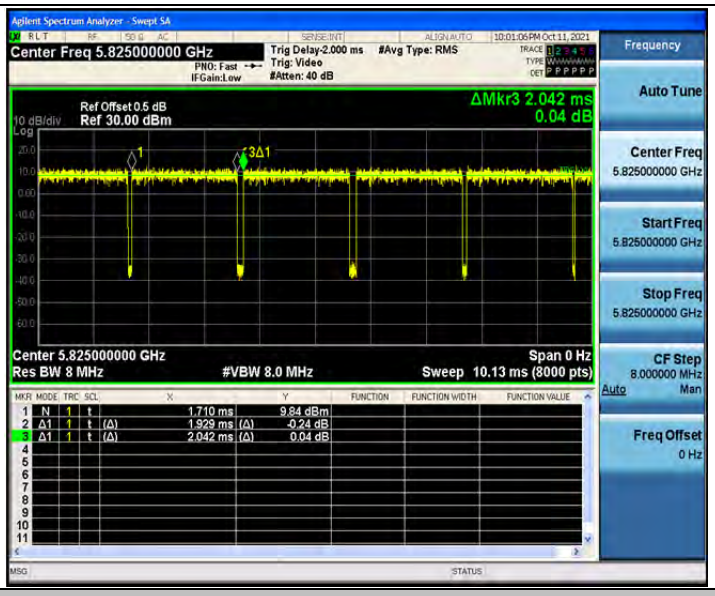

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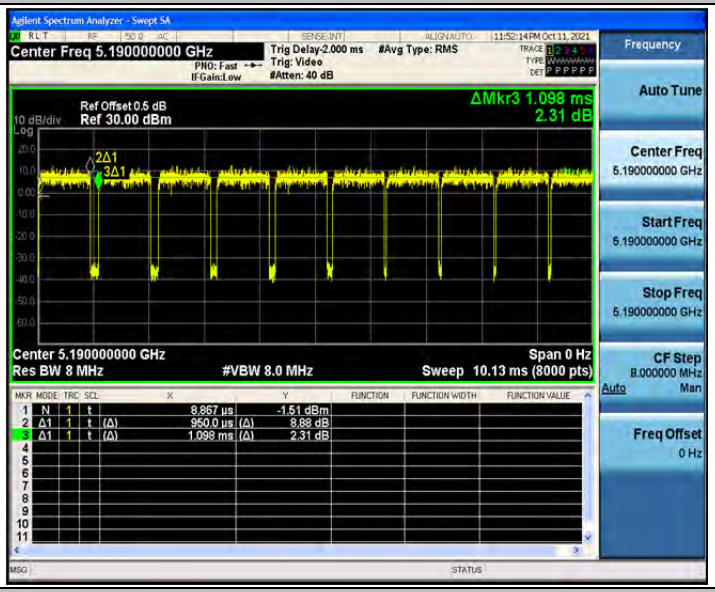

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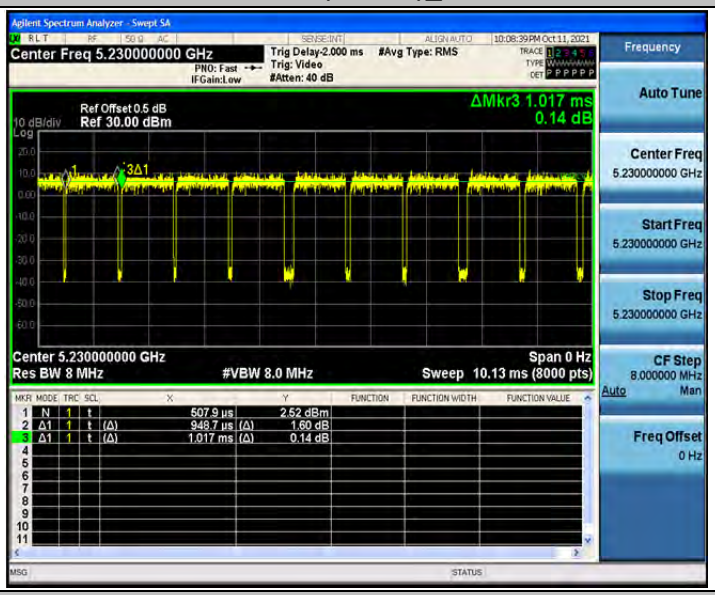

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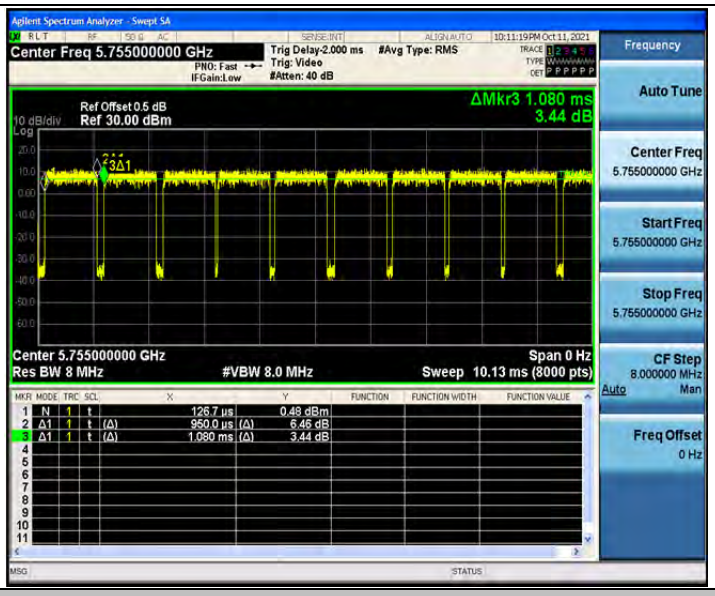

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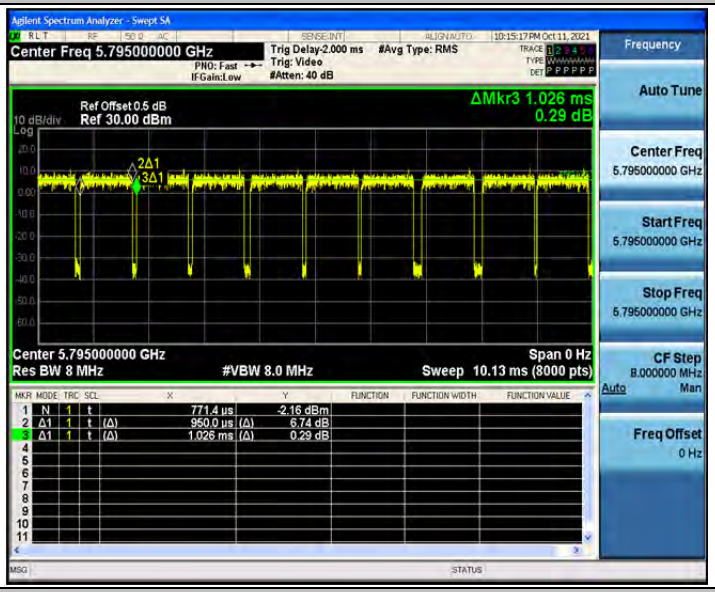

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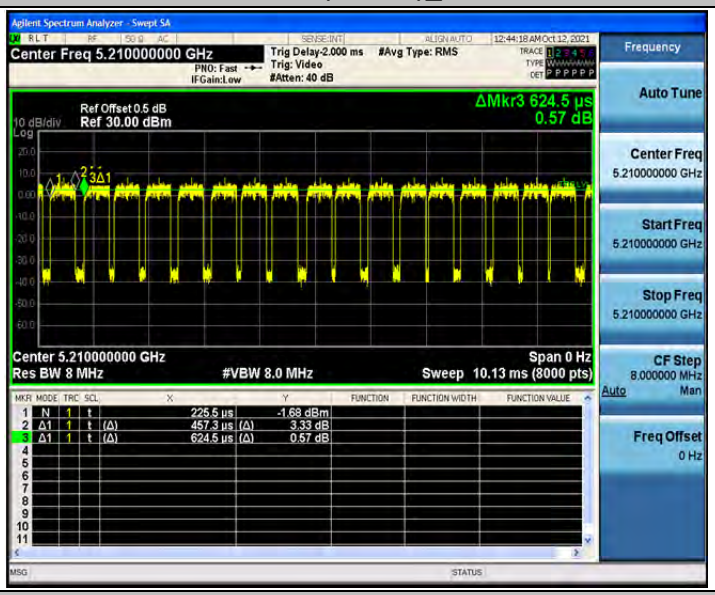

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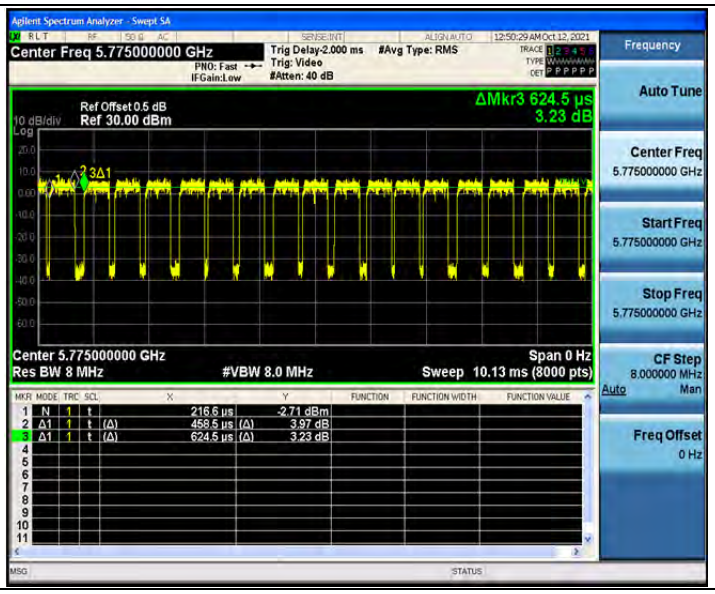
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Trig: Video
#Atten: 40 dB
PNO: Fast
IFGain:Low
Ref Offset 0.5 dB
10 dB/div
Ref 30.00 dBm
ΔMkr3 624.5 µs
3.23 dB
Center 5.775000000 GHz
Span 0 Hz
Res BW 8 MHz
#VBW 8.0 MHz
Sweep 10.13 ms (8000 pts)
1 N 1 t 216.5 µs -2.71 dBm
2 Δ1 1 t (Δ) 458.5 µs (Δ) 3.97 dB
3 Δ1 1 t (Δ) 624.5 µs (Δ) 3.23 dB
Frequency
Auto Tune
Center Freq
5.775000000 GHz
Start Freq
5.775000000 GHz
Stop Freq
5.775000000 GHz
CF Step
8.000000 MHz
Auto
Man
Freq Offset
0 Hz

----------End----------