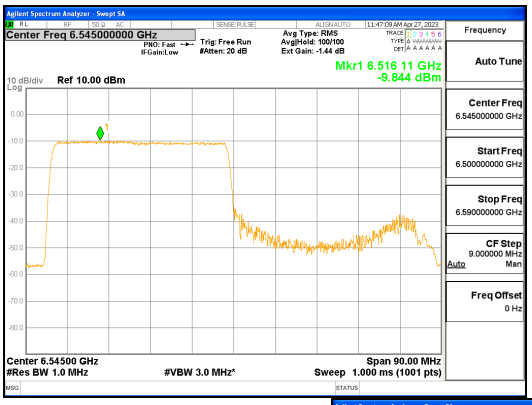

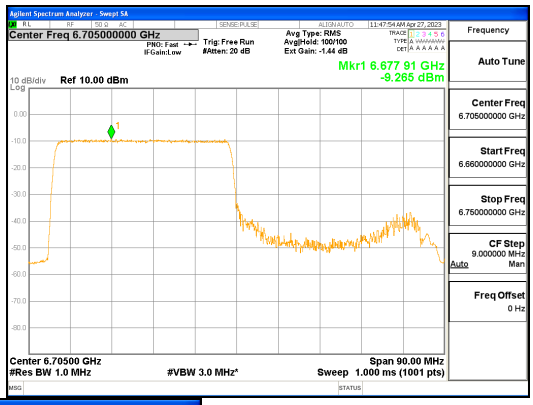

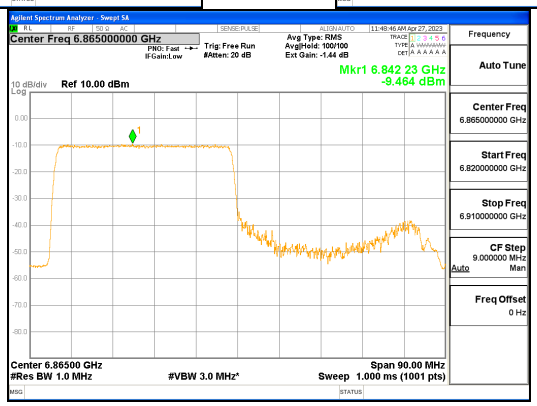

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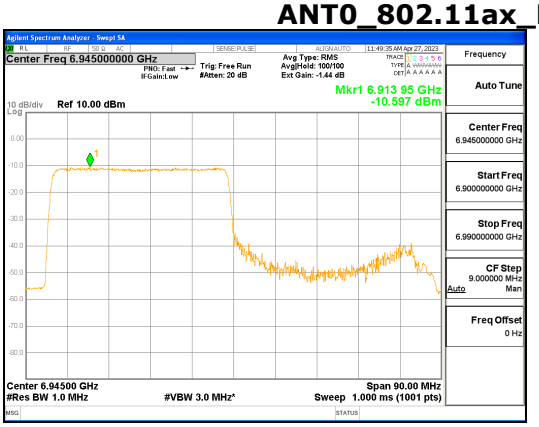

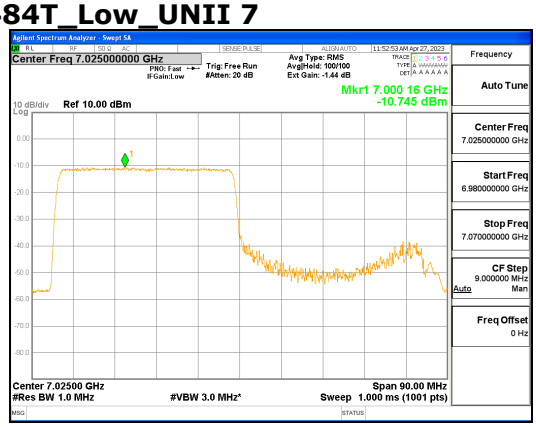

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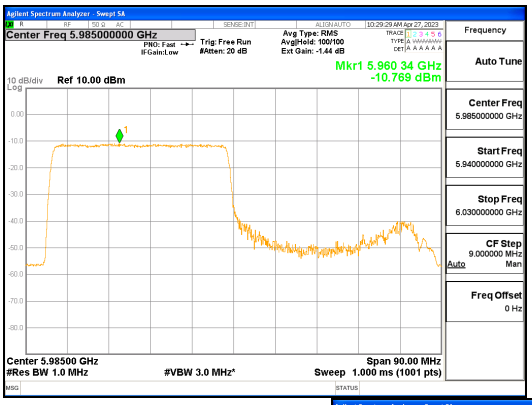

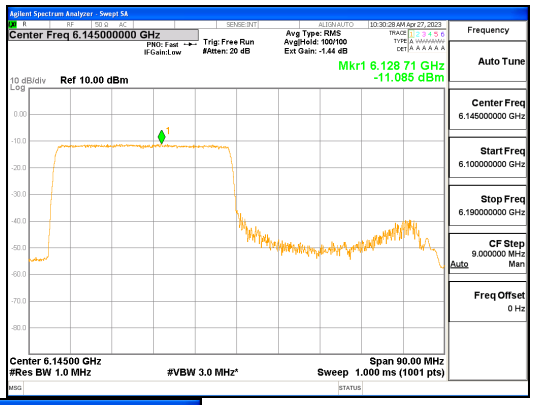

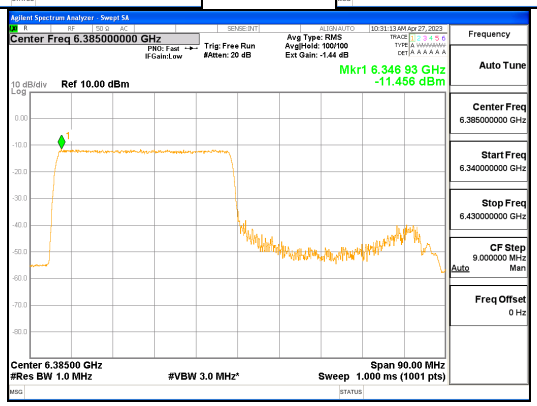

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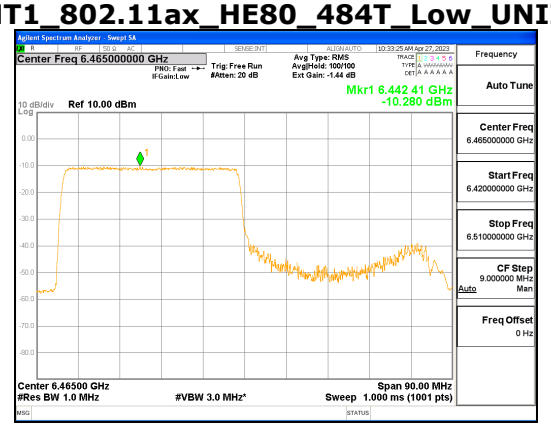

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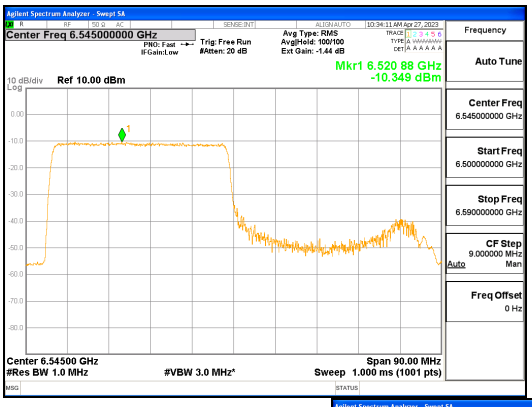

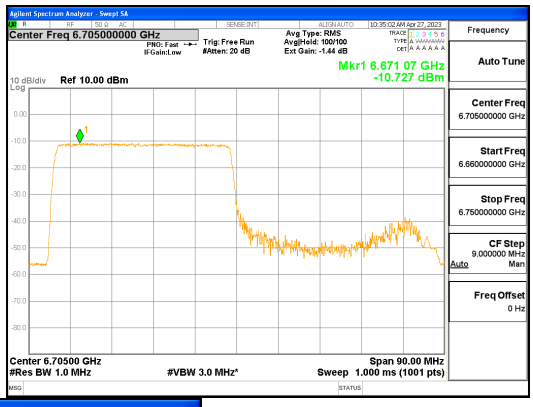

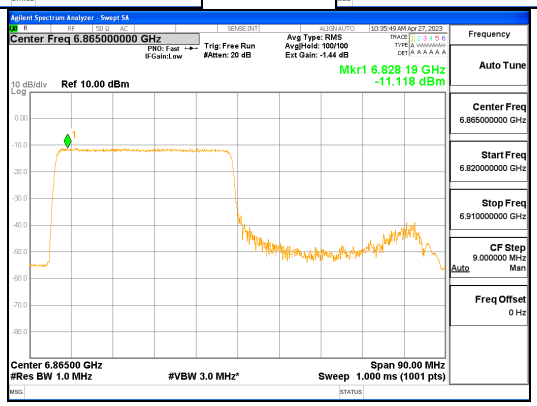

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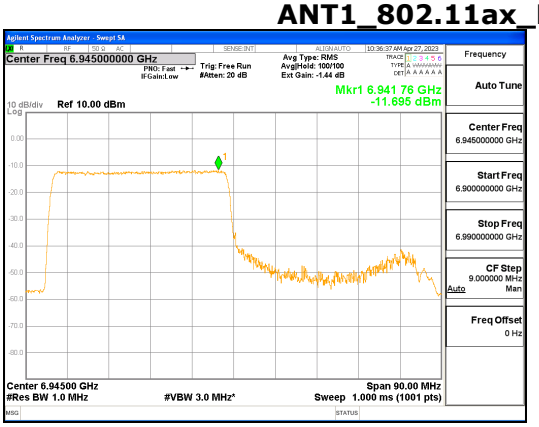

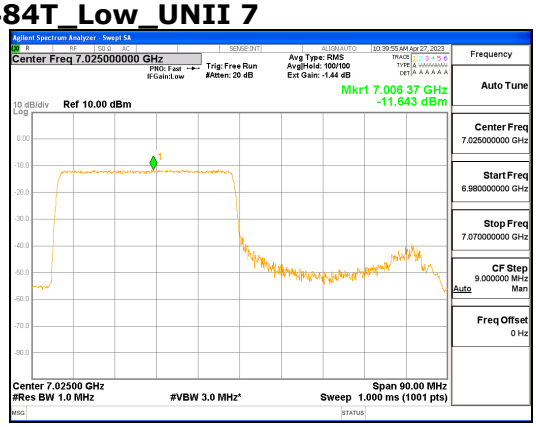

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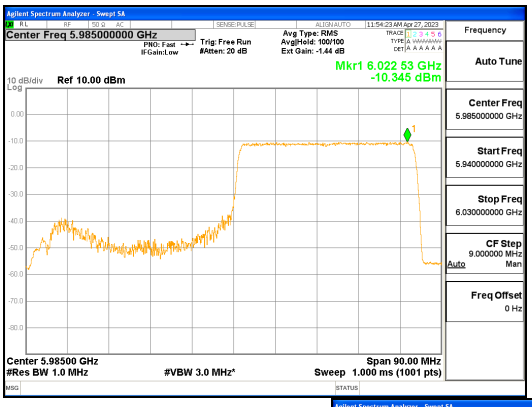

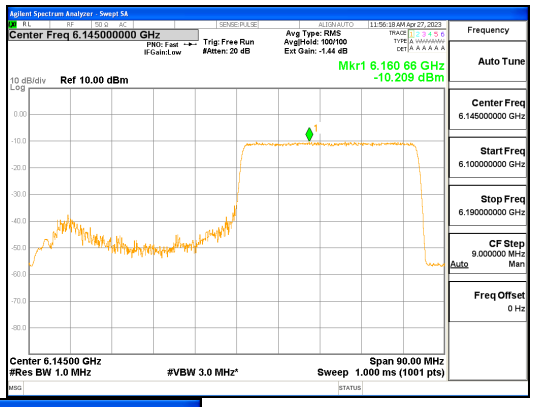

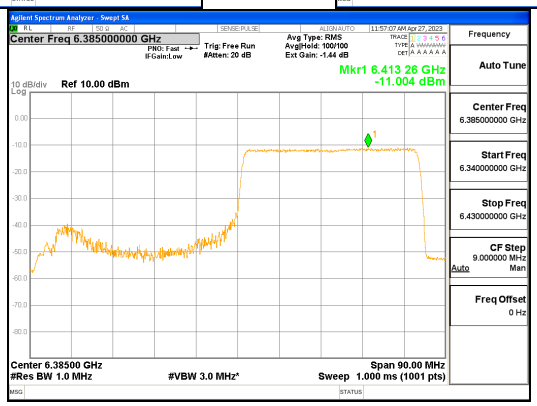

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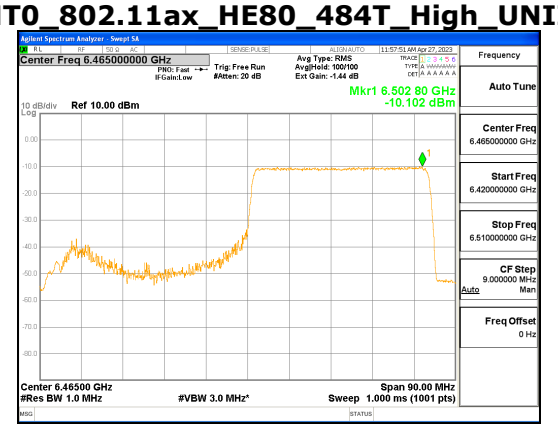

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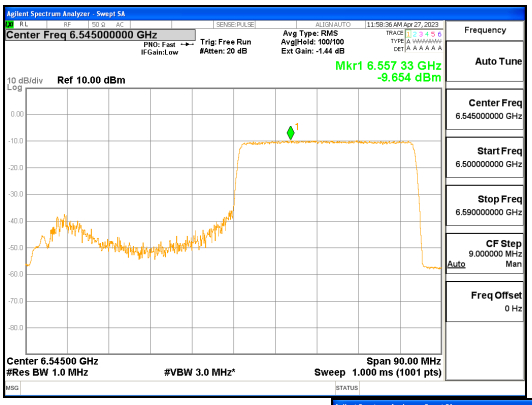

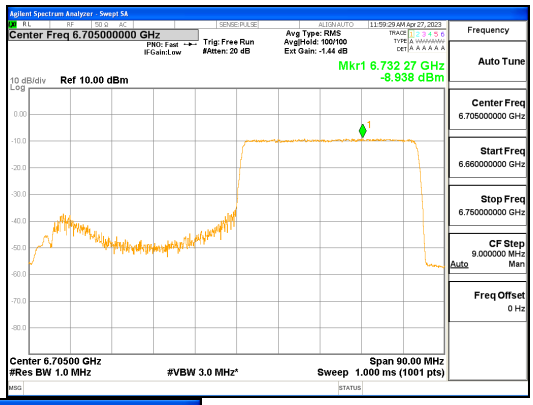

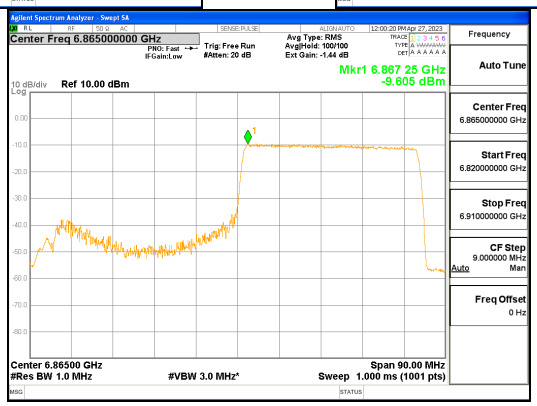

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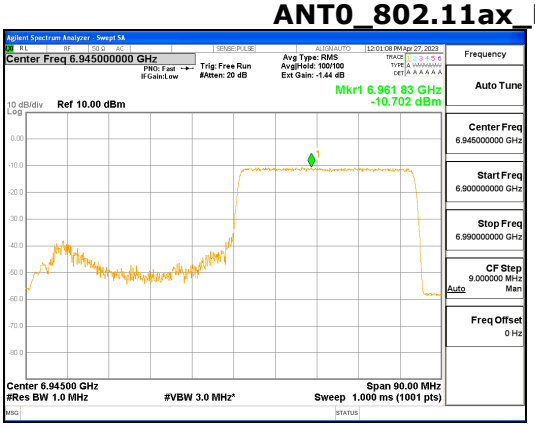

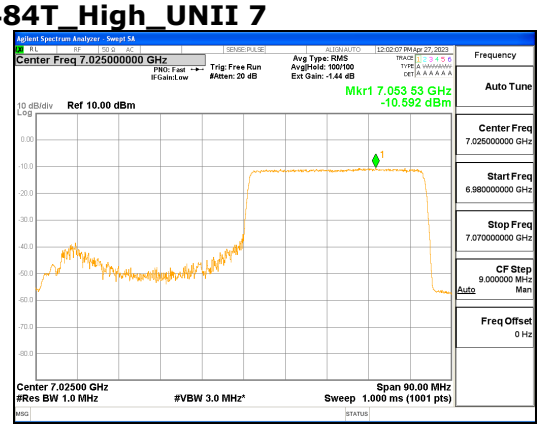

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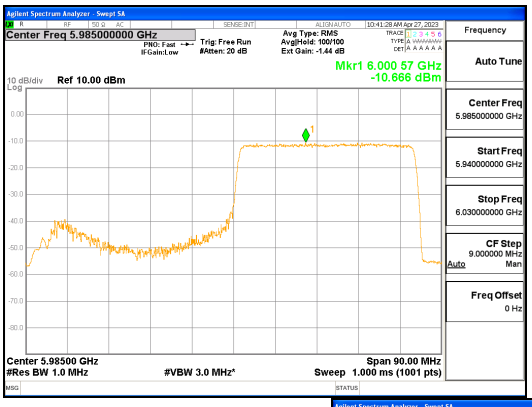

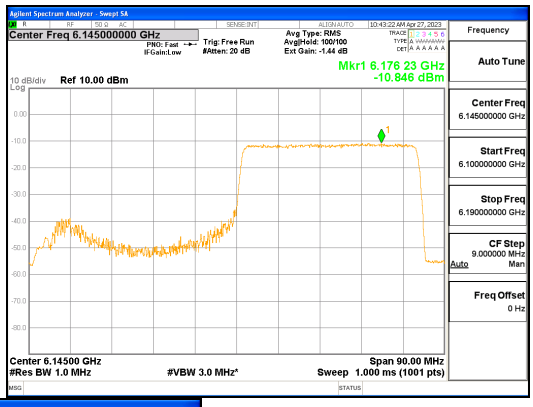

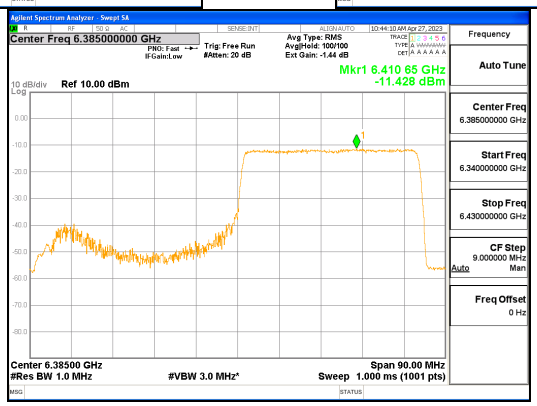

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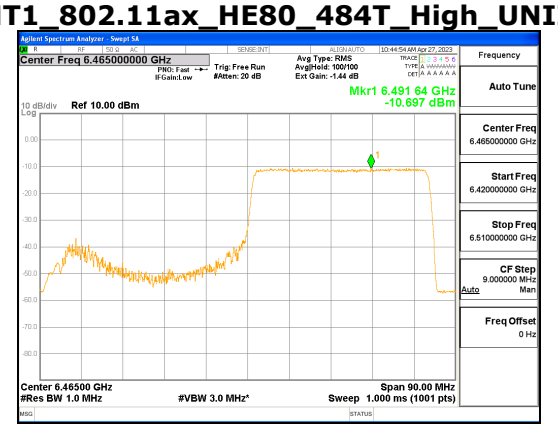

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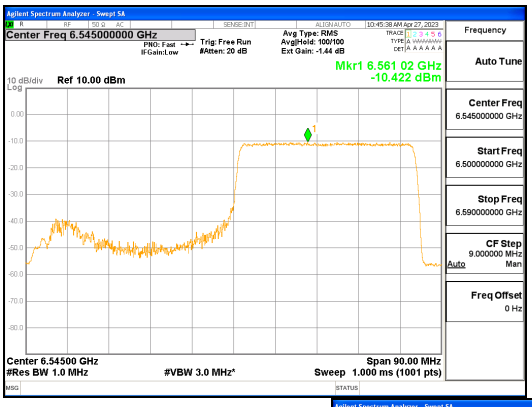

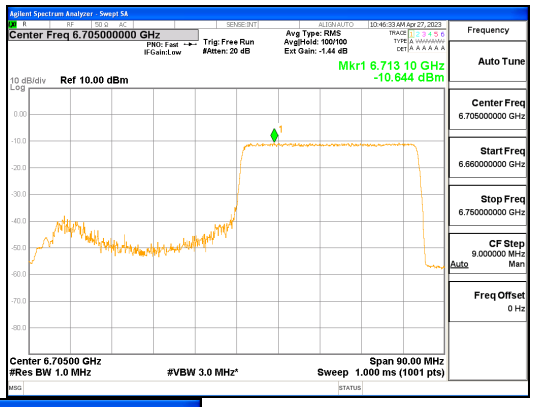

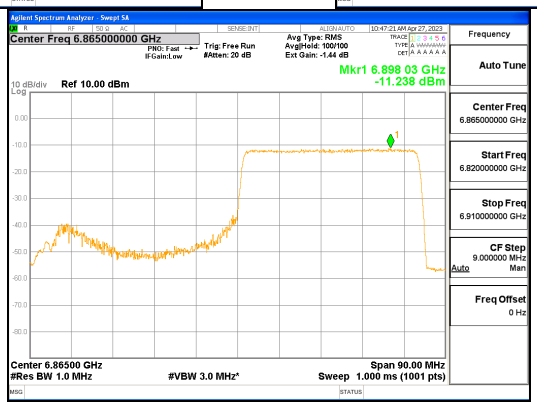

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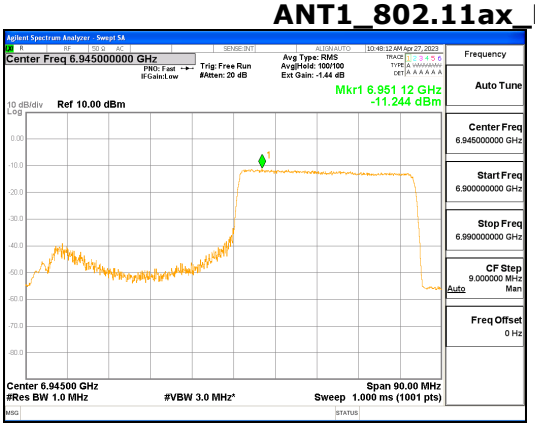

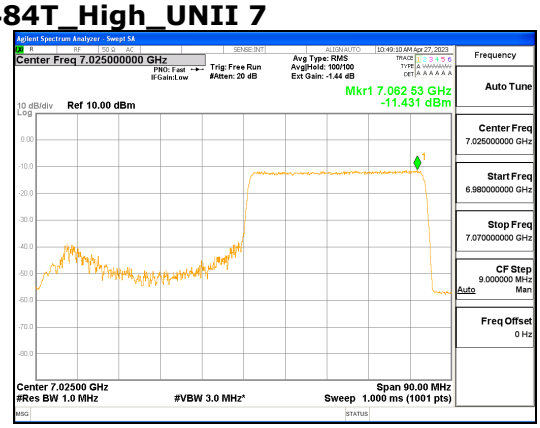

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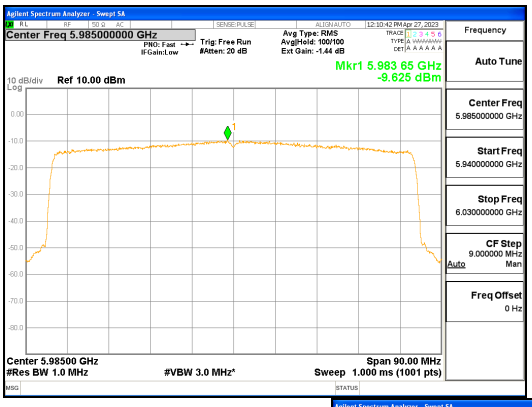

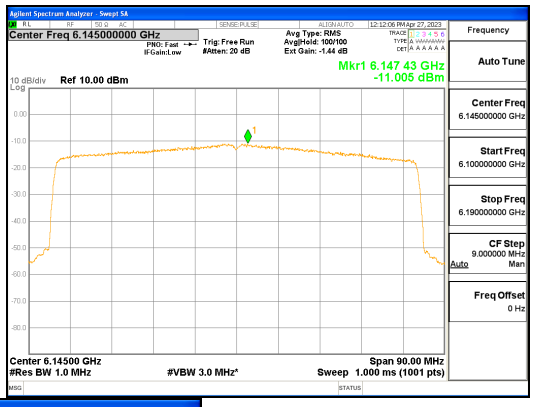

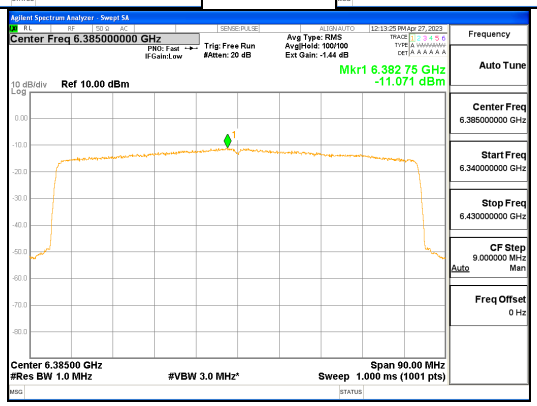

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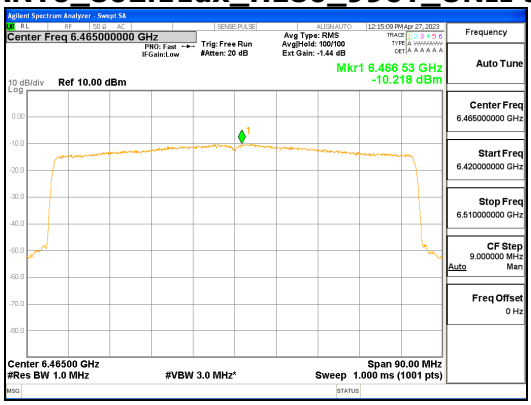

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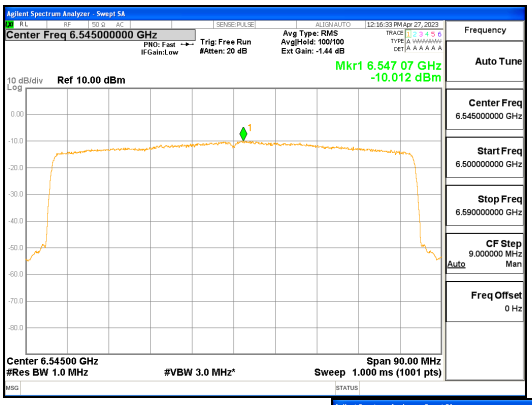

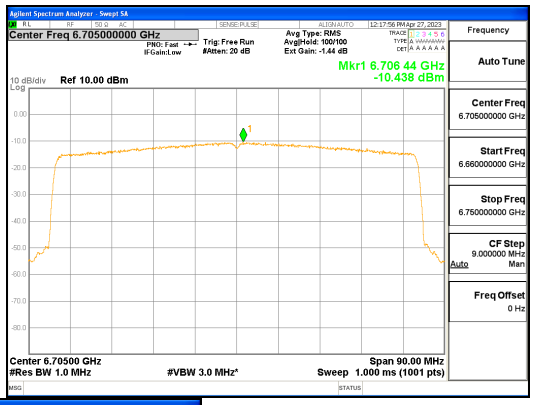

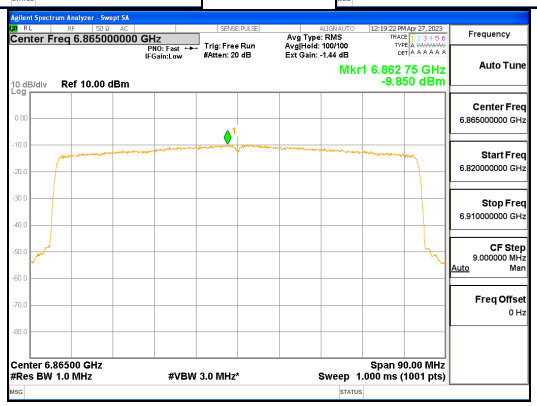

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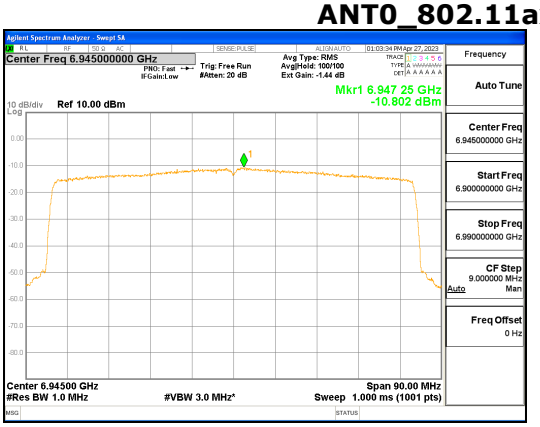

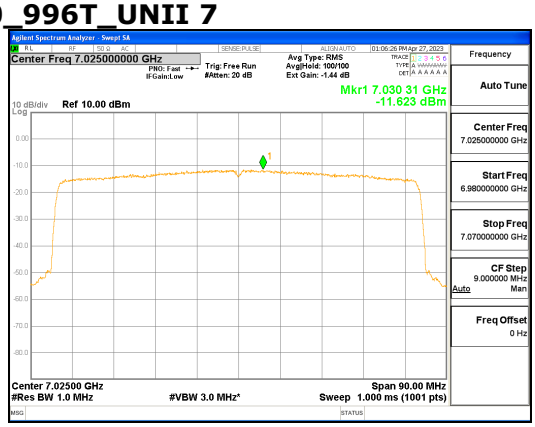

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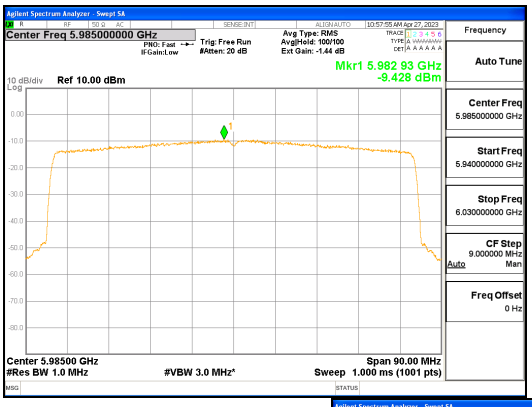

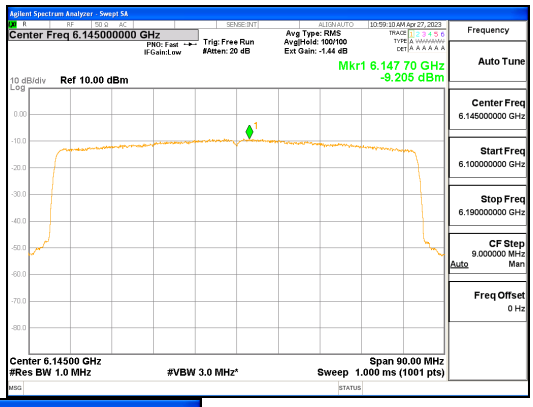

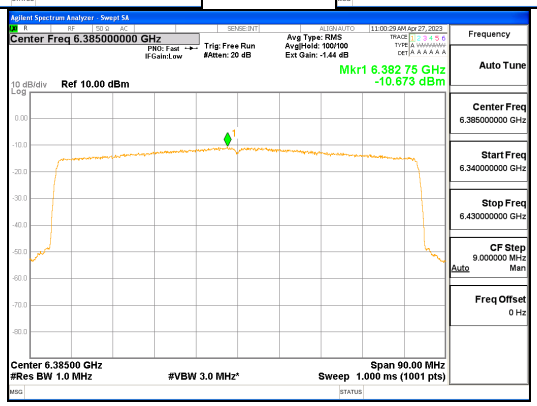

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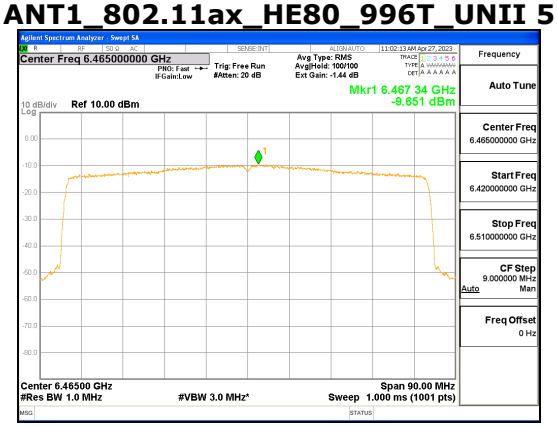

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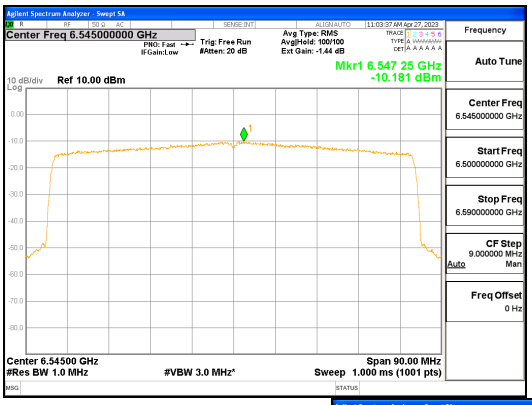

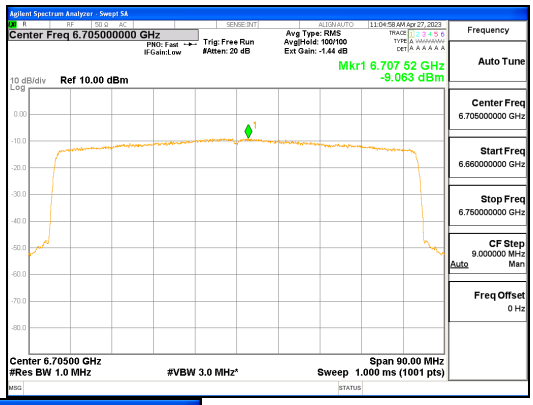

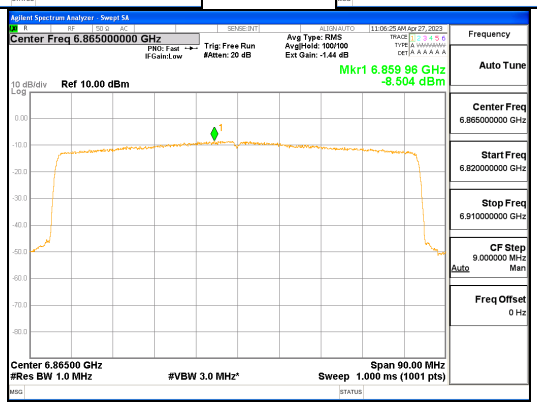

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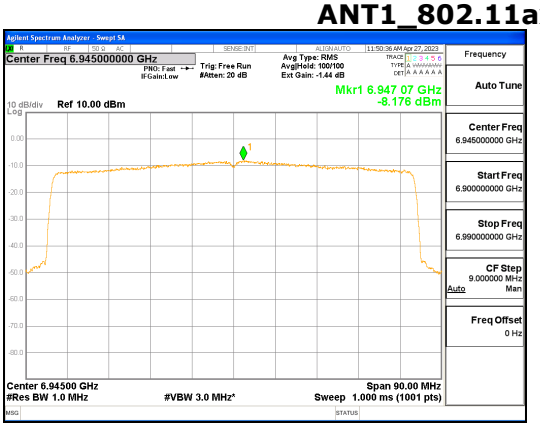
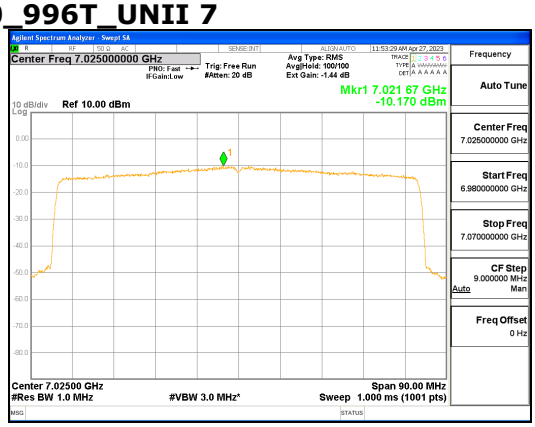




ANT1_802.11ax_HE80_996T_UNII 8

4.4 In-Band Emissions

Test Procedures

KDB 987594 – Section J

Test Settings :

1. Measure the power spectral density (which will be used for emissions mask reference) using the following procedure:
   a. Set the span to encompass the entire 26 dB EBW of the signal.
   b. Set RBW = same RBW used for 26 dB EBW measurement.
   c. Set VBW ≥ 3 X RBW
   d. Number of points in sweep ≥ [2 X span / RBW].
   e. Sweep time = auto.
   f. Detector = RMS (i.e., power averaging)
   g. Trace average at least 100 traces in power averaging (rms) mode.
   h. Use the peak search function on the instrument to find the peak of the spectrum.
2. For the purposes of developing the emission mask, the channel bandwidth is defined as the 26 dB EBW.
3. Clear trace.
4. Trace average at least 100 traces in power averaging (rms) mode.
5. Adjust the reference level as necessary so that the crest of the channel touches the top of the emission mask.

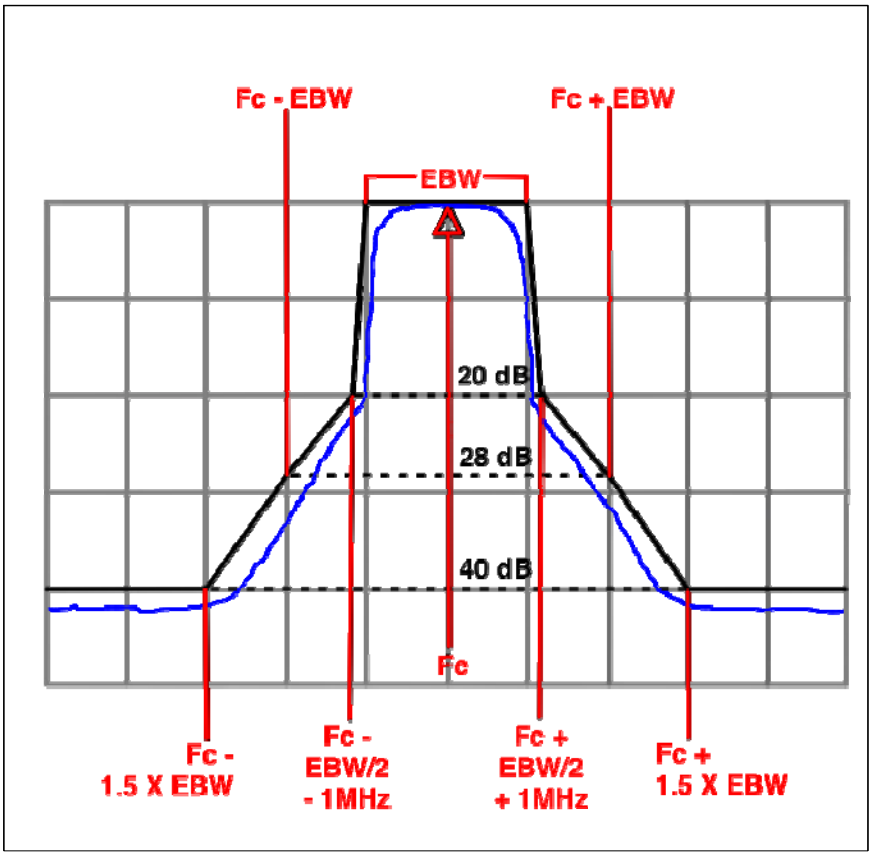
Limit

The emissions power spectral density must be reduced below the peak power spectral density (in dB) as follows:

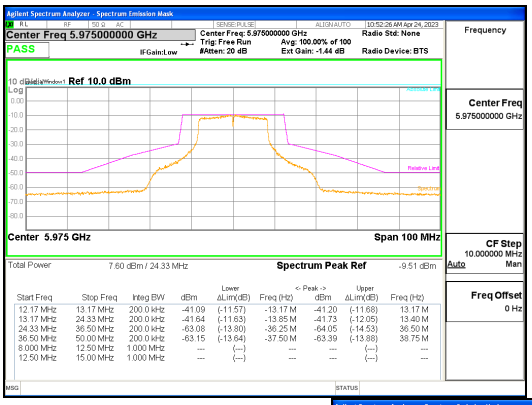
a. Suppressed by 20 dB at 1 MHz outside of the channel edge. (The channel edge is defined as the 26-dB point on either side of the carrier center frequency.)

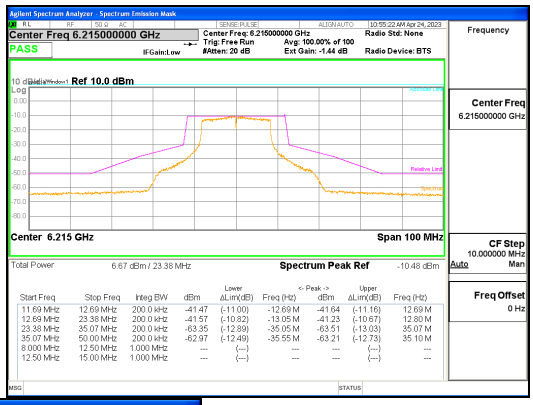
b. Suppressed by 28 dB at one channel bandwidth from the channel center.

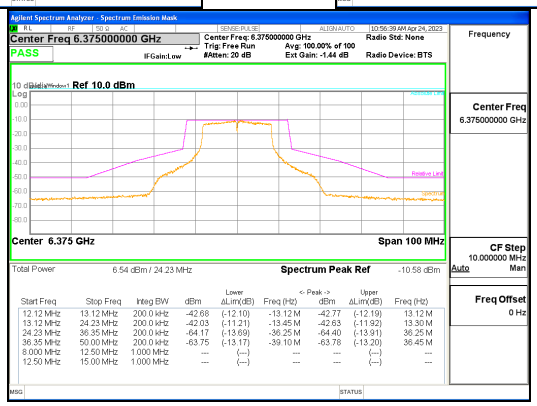
c. Suppressed by 40 dB at one- and one-half times the channel bandwidth from the channel center.



See next pages for actual measured spectrum plots.







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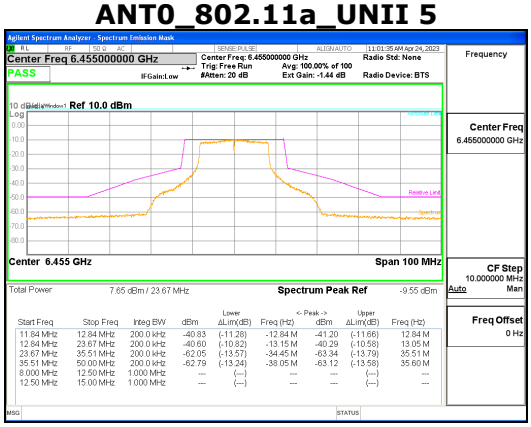

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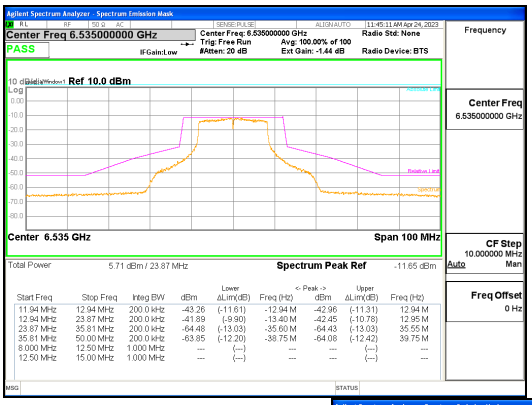

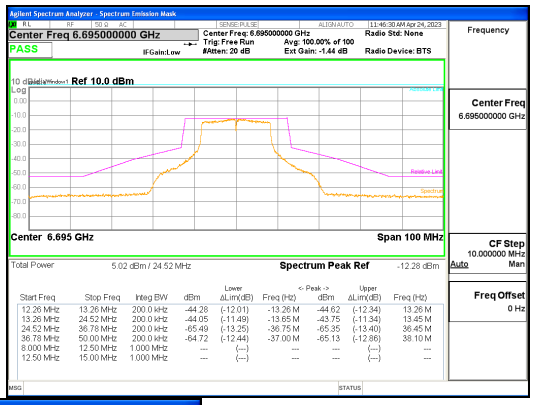

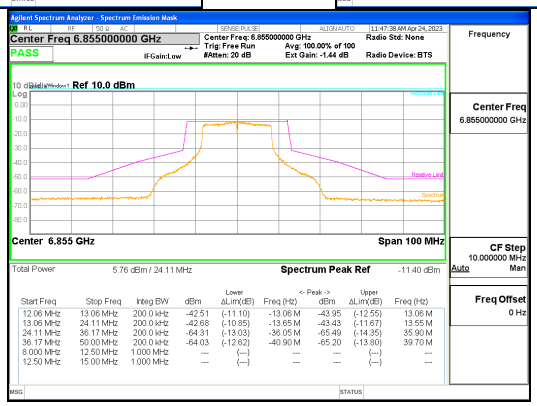

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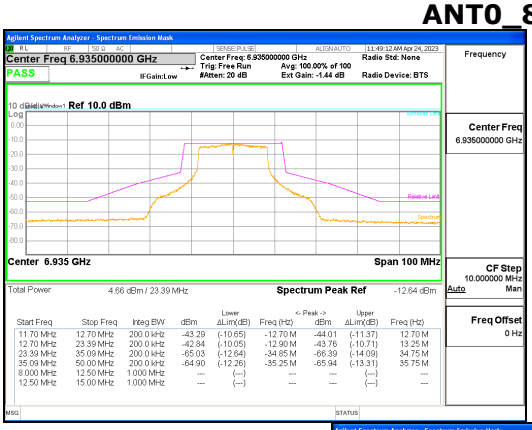

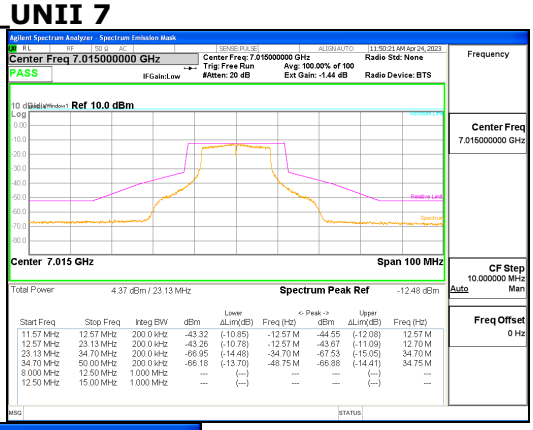

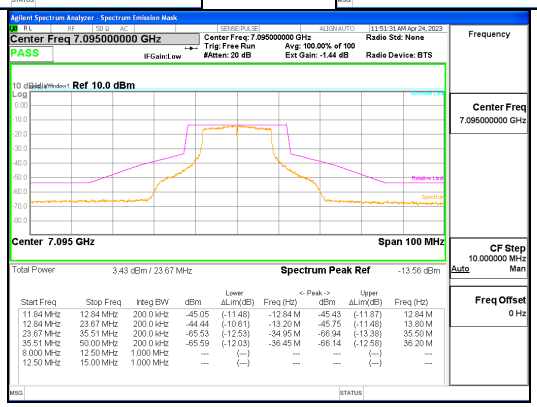

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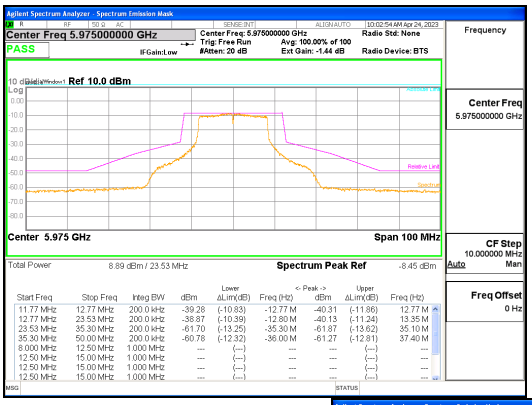

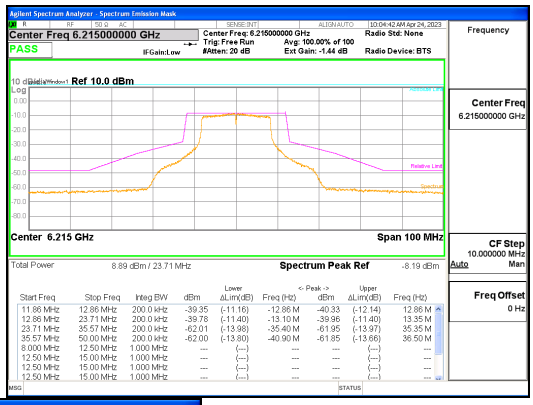

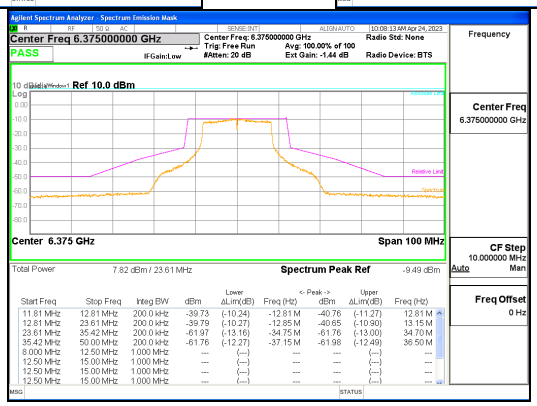

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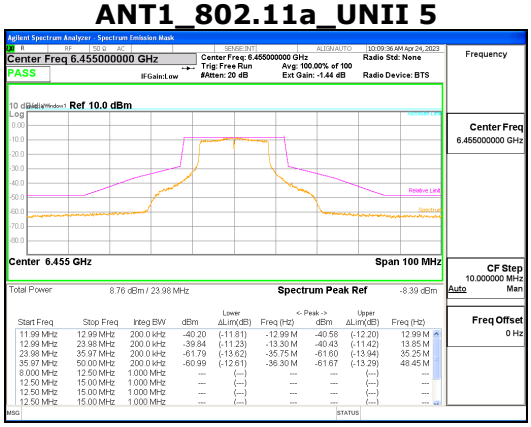

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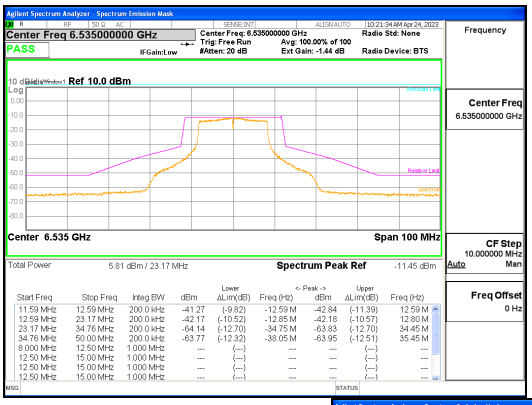

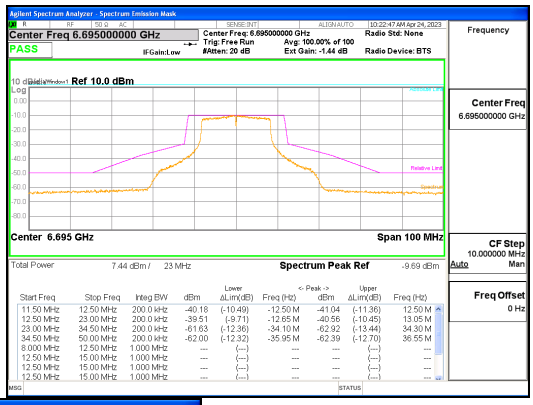

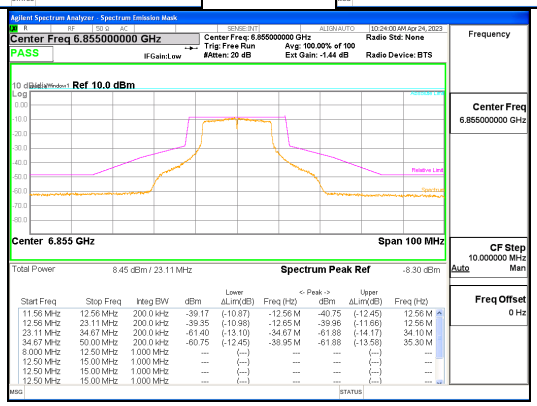

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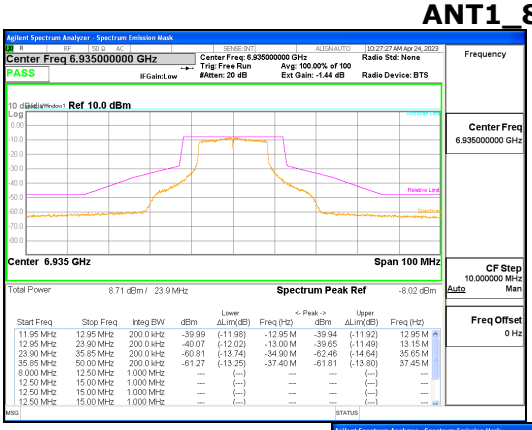

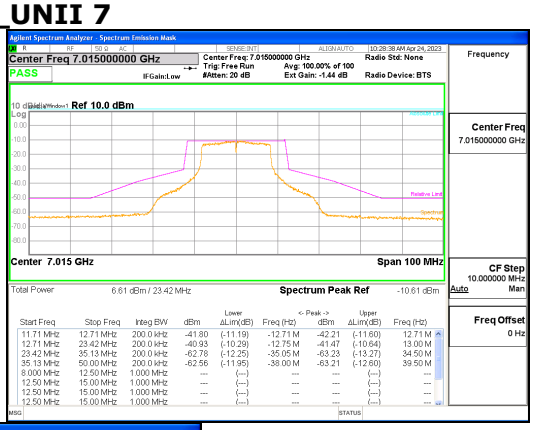

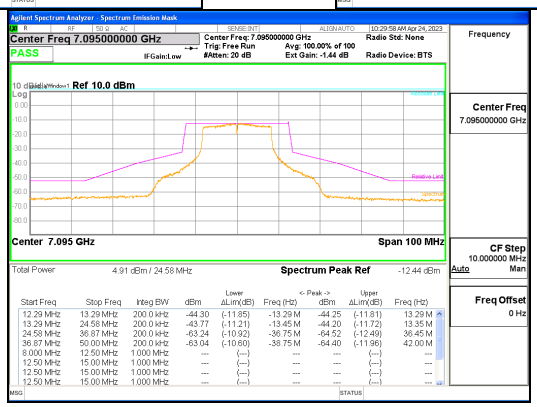

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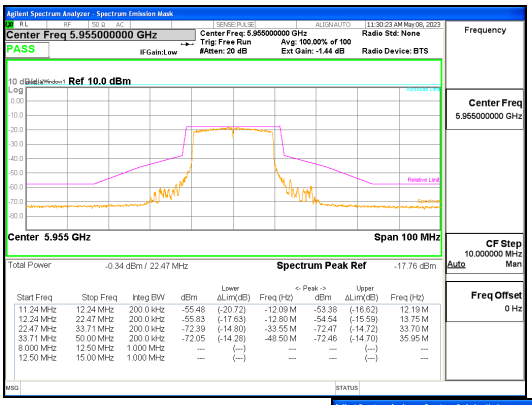

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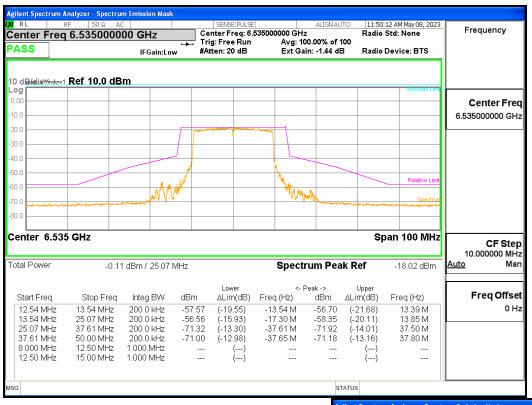

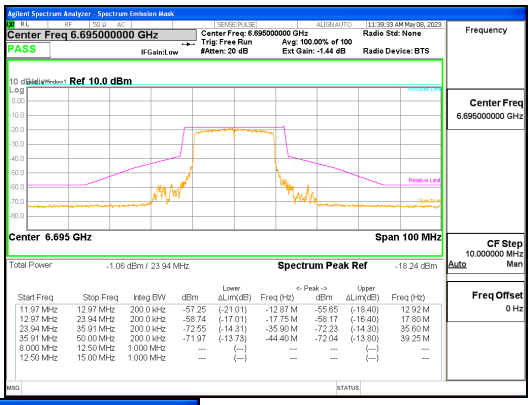

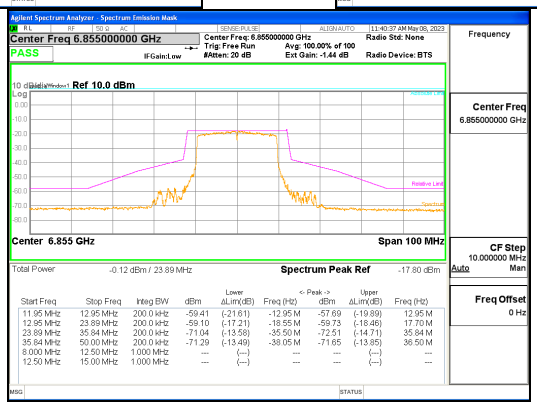

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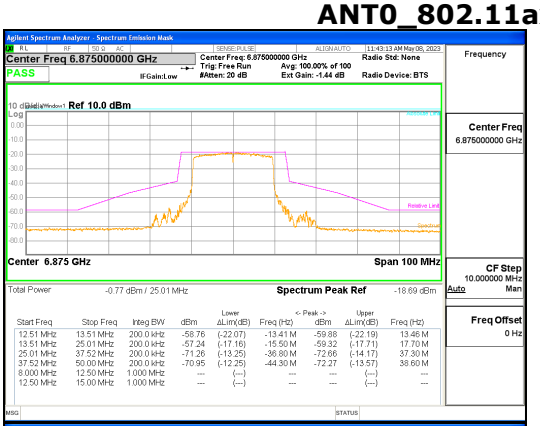

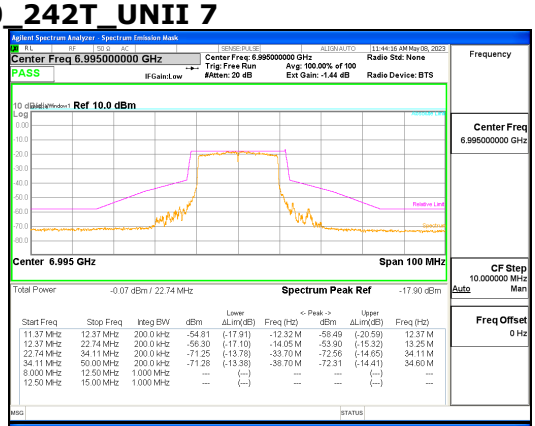

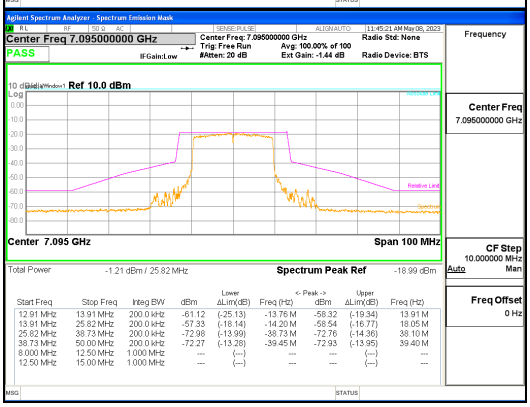

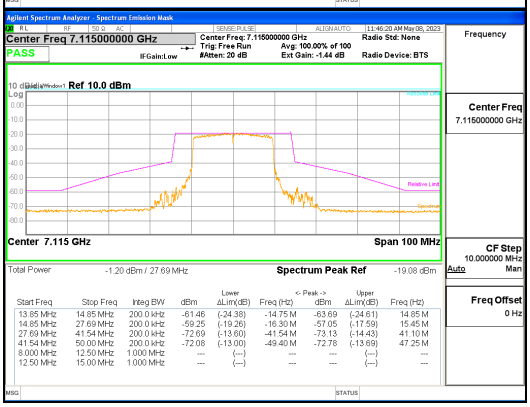

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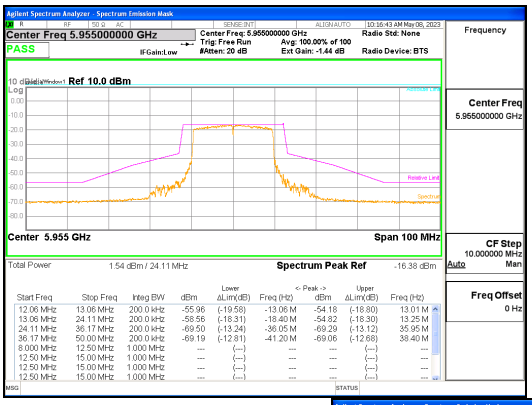

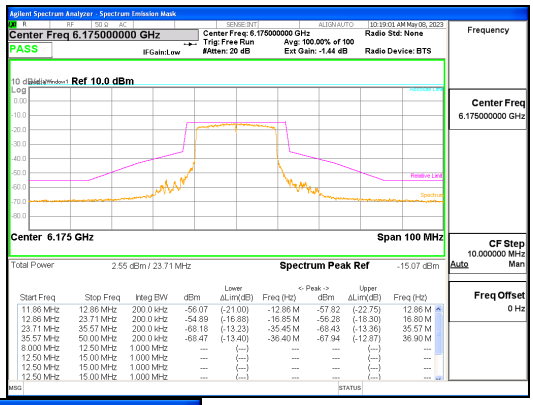

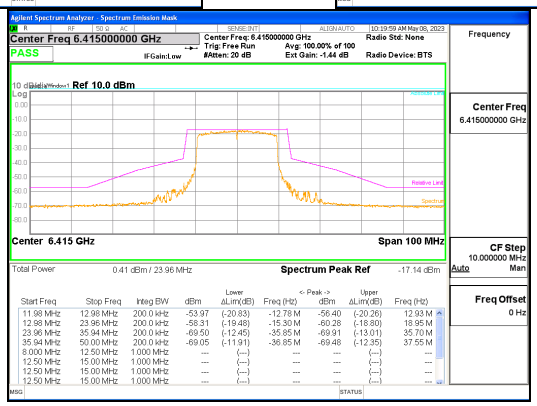

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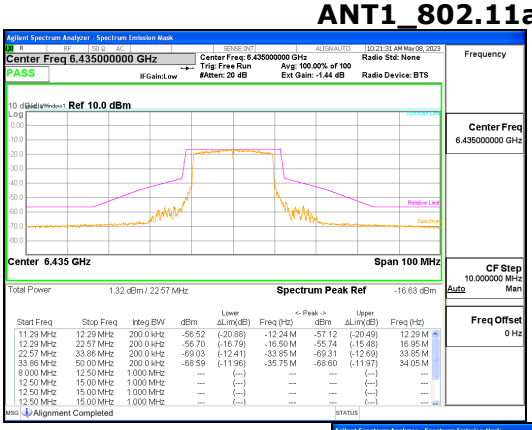

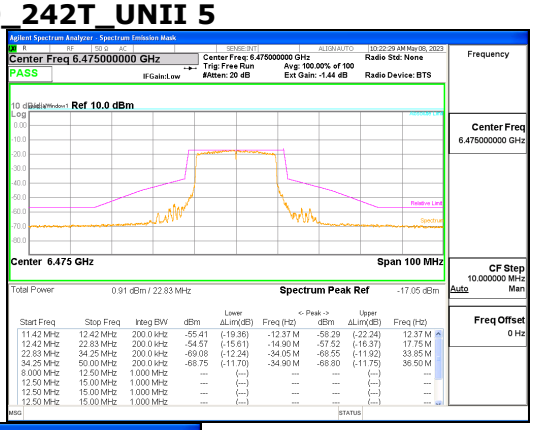

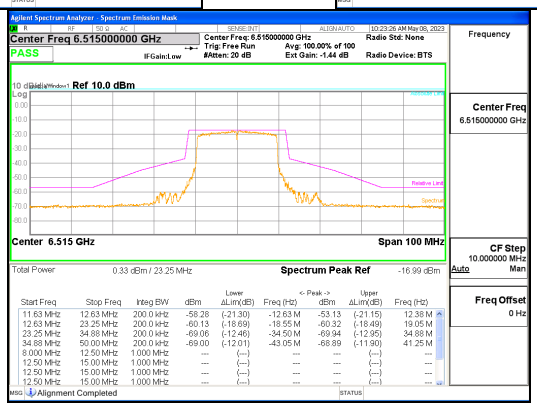

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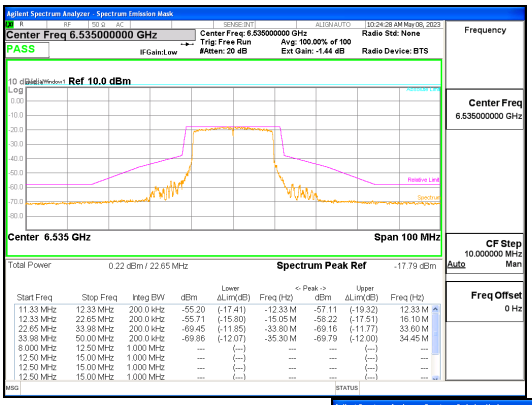

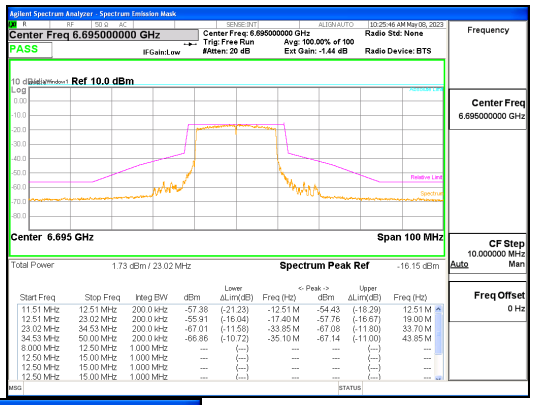

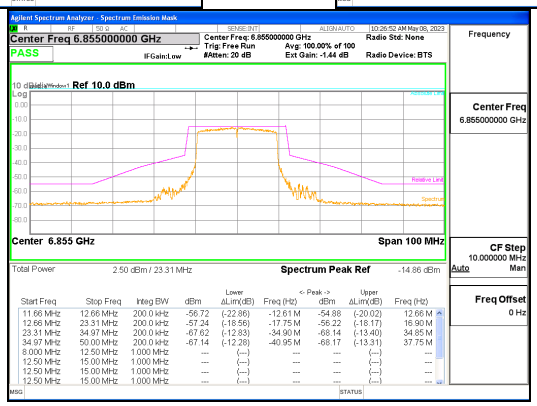

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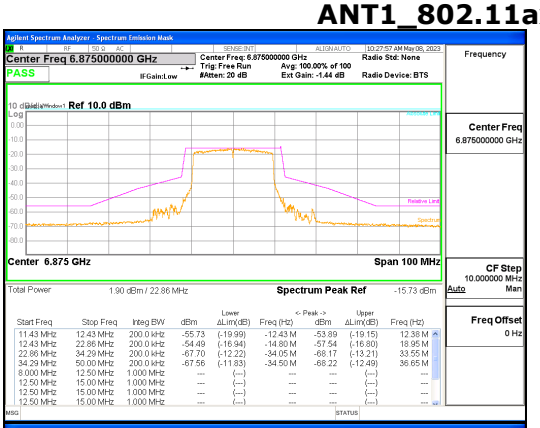

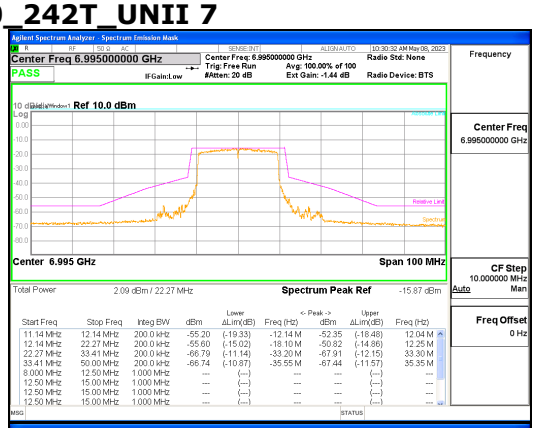

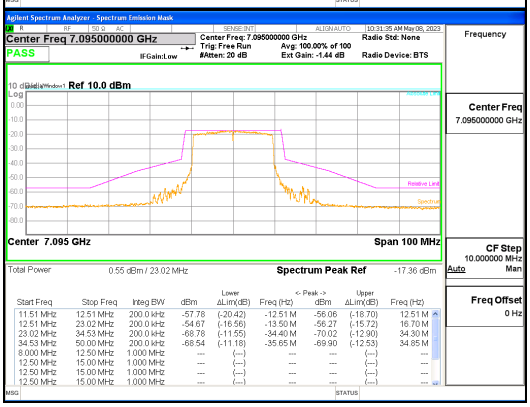

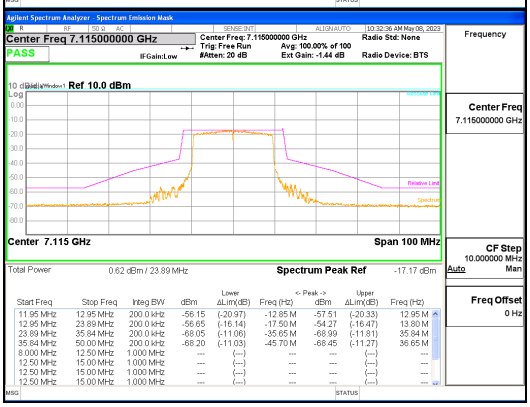

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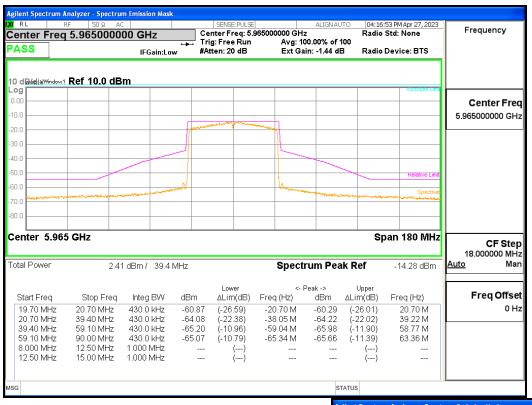

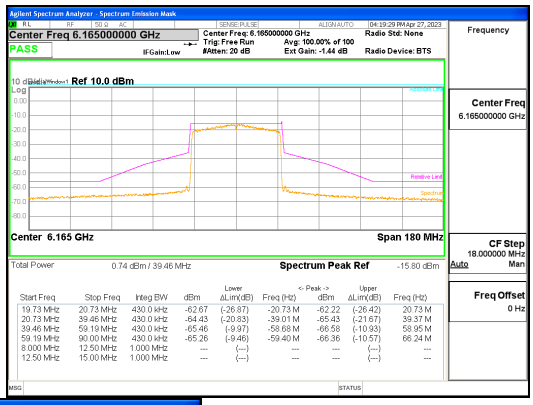

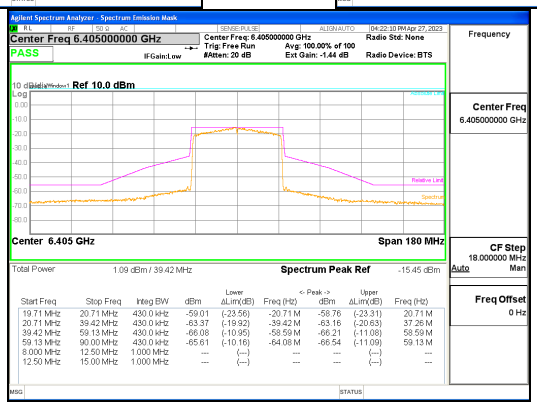

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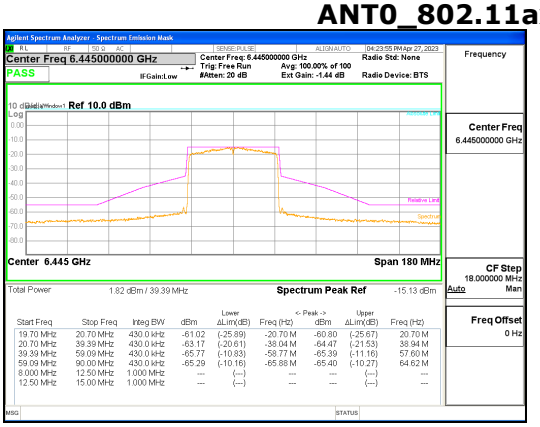

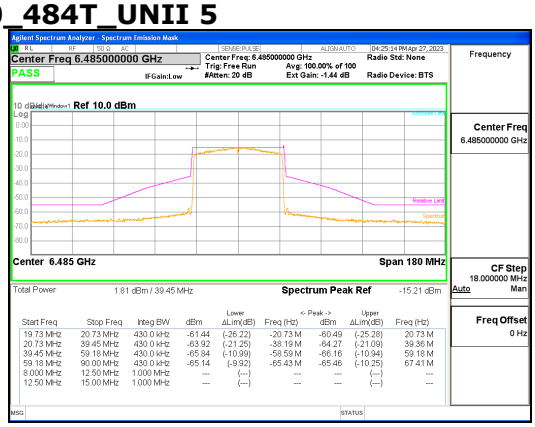

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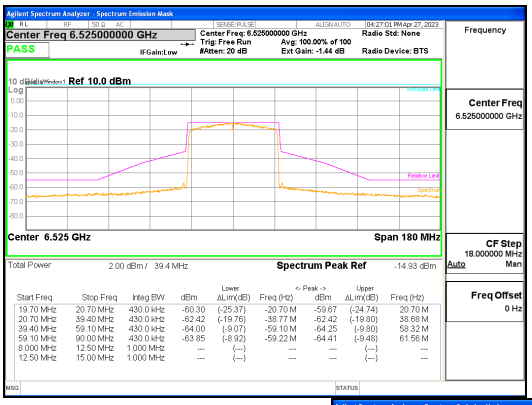

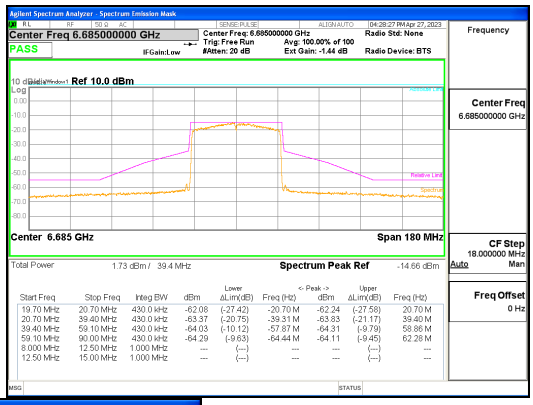

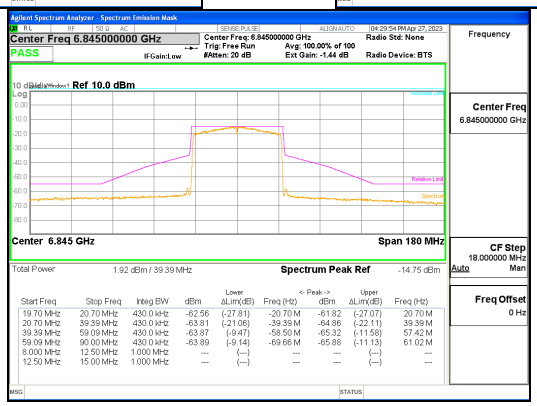

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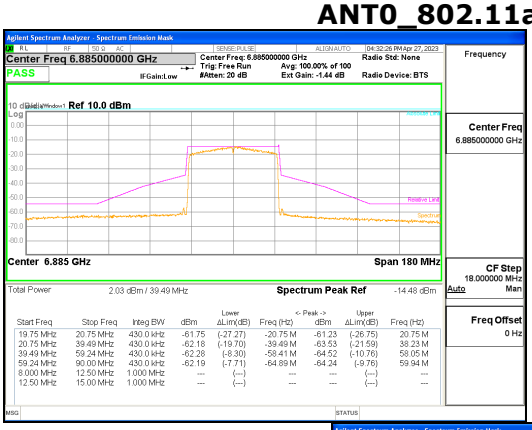

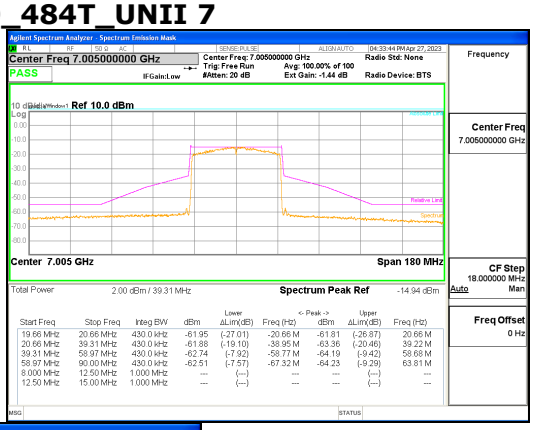

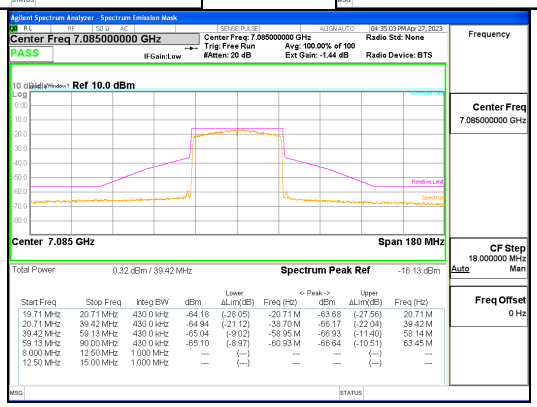

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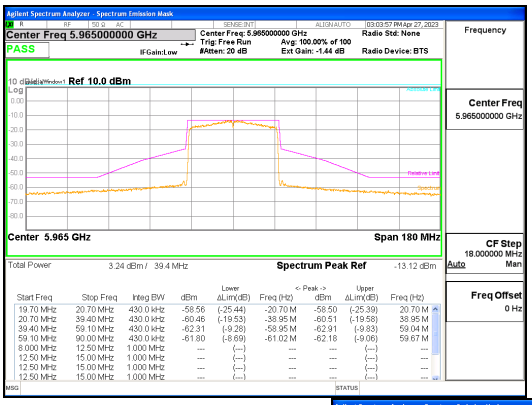
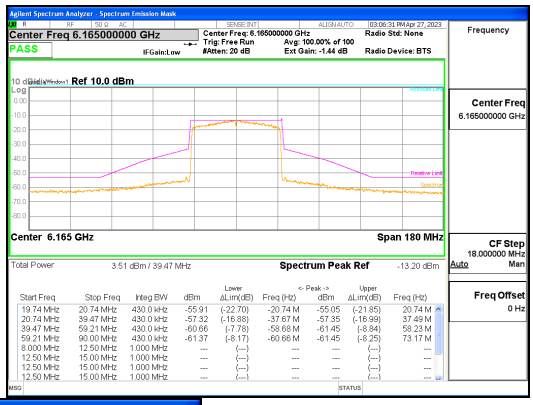
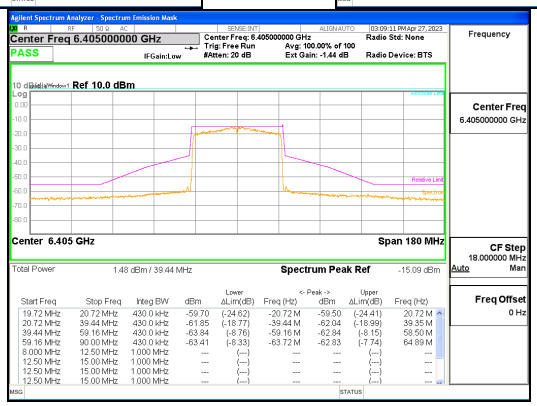
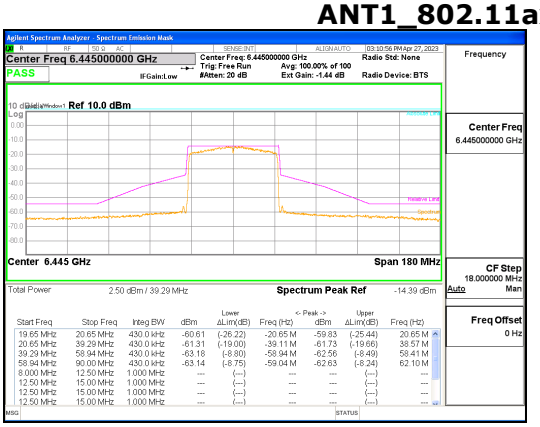
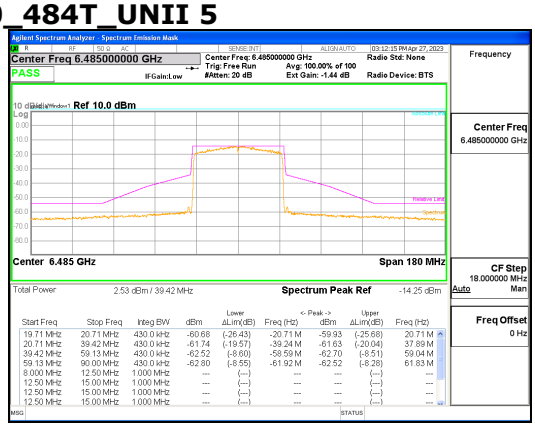






ANT1_802.11ax_HE40_484T_UNII 5





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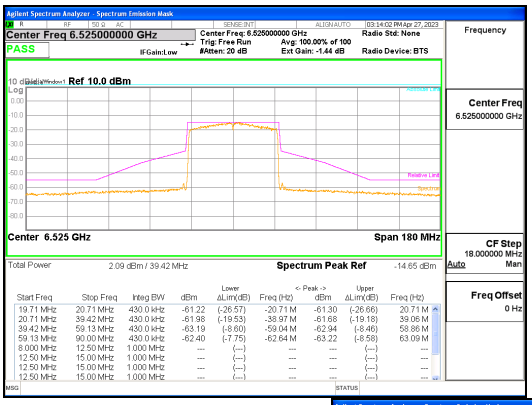
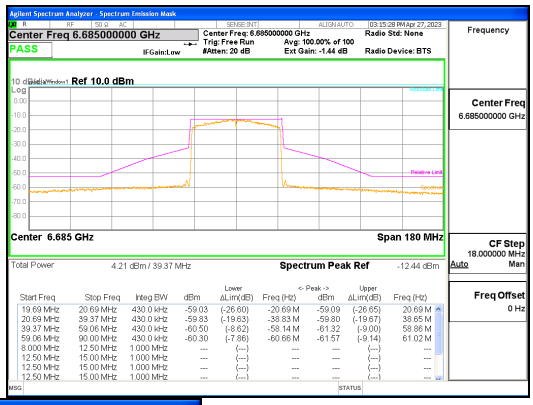
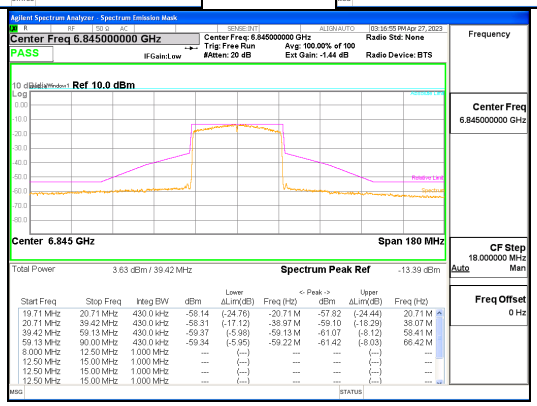
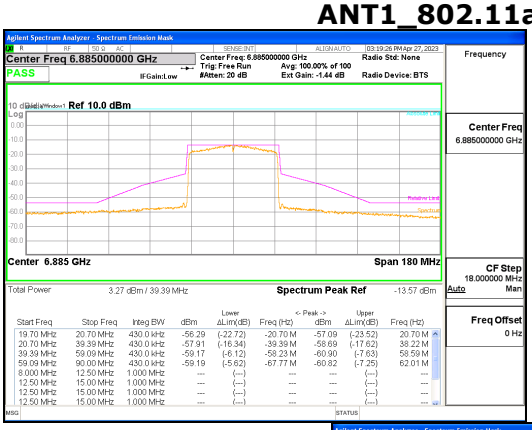
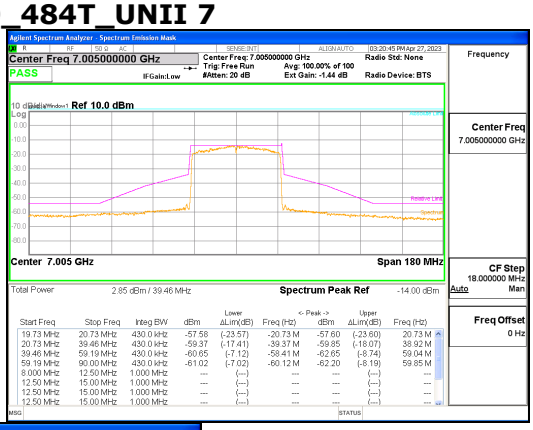


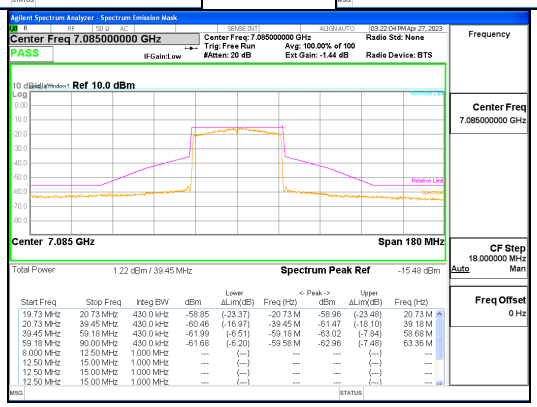




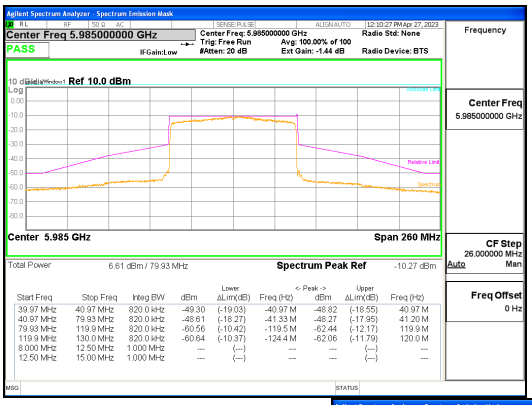
ANT1_802.11ax_HE40_484T_UNII 7

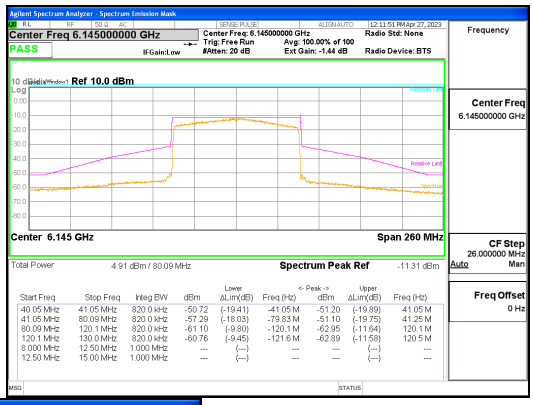


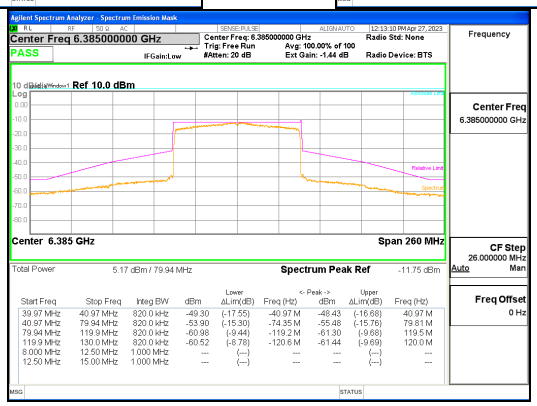




ANT1_802.11ax_HE40_484T_UNII 8







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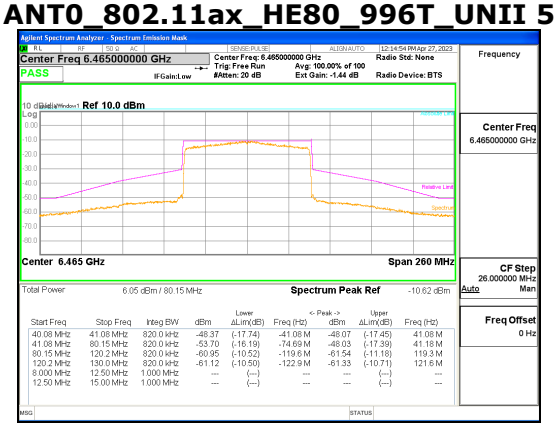

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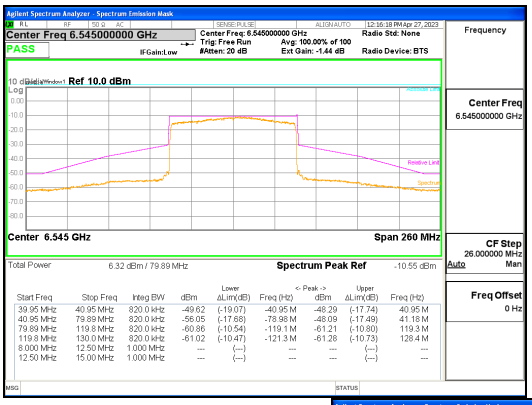
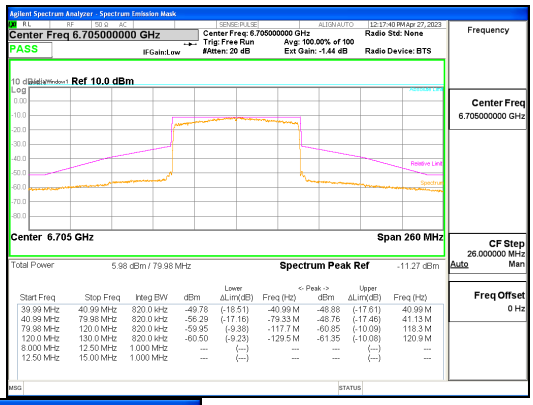
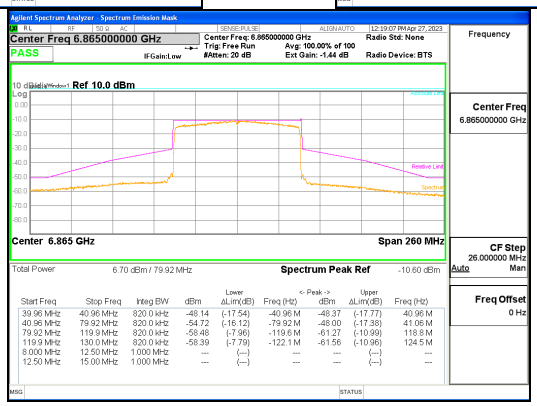
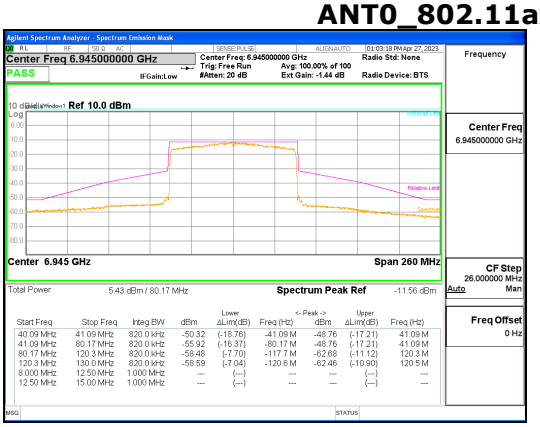
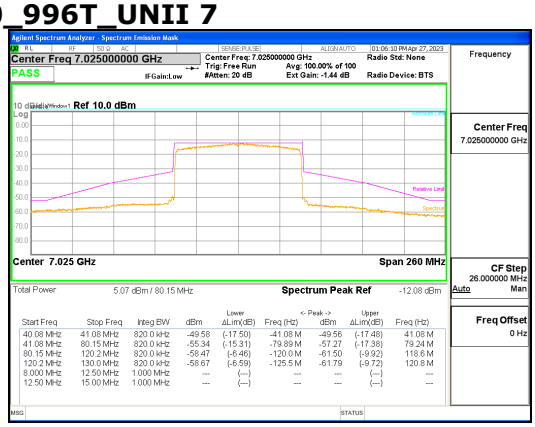




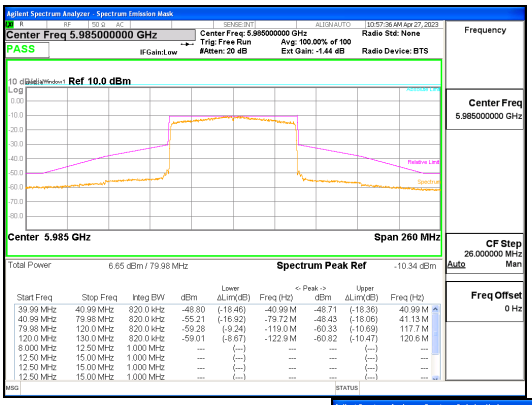


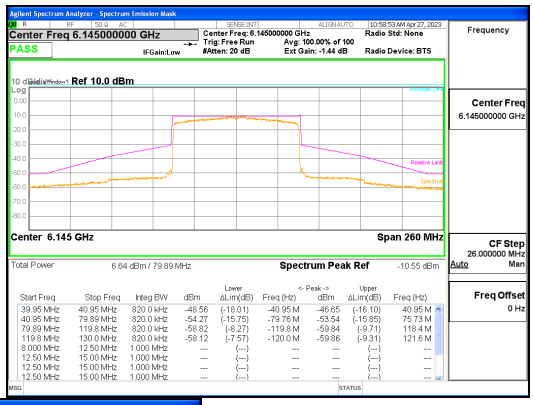
ANT0_802.11ax_HE80_996T_UNII 7

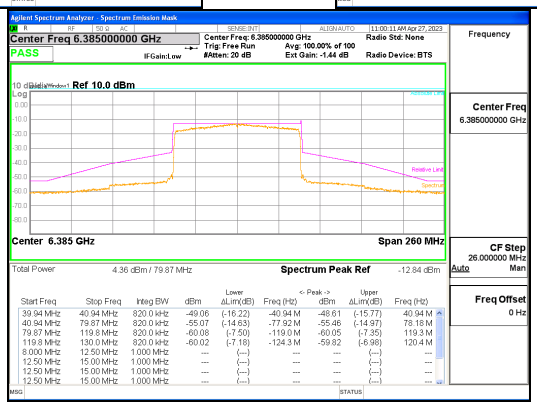




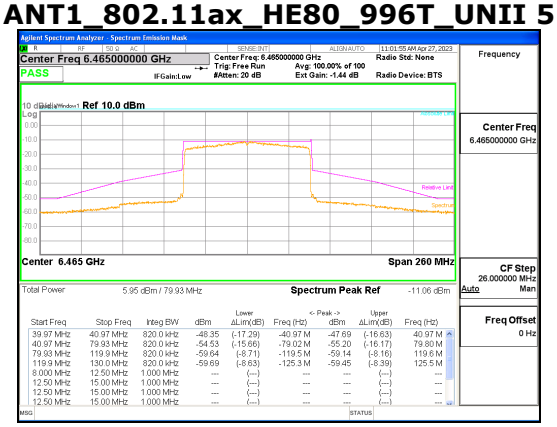
ANT0_802.11ax_HE80_996T_UNII 8



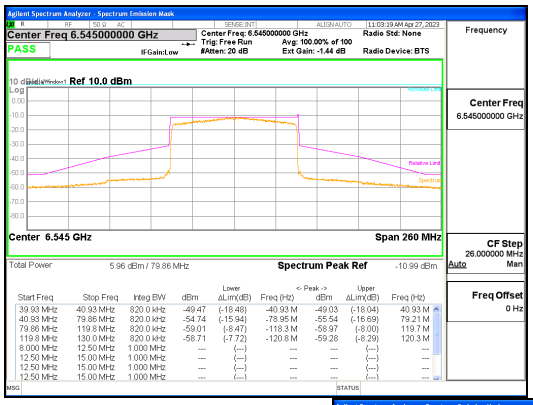


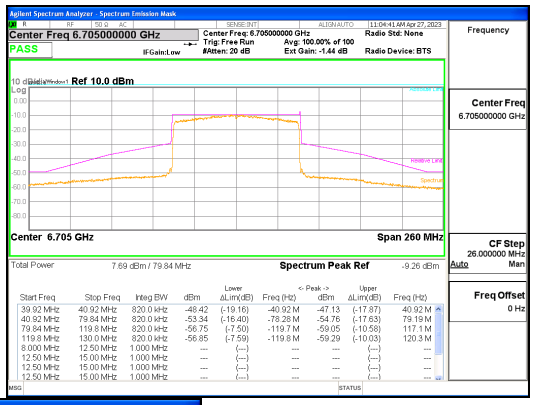


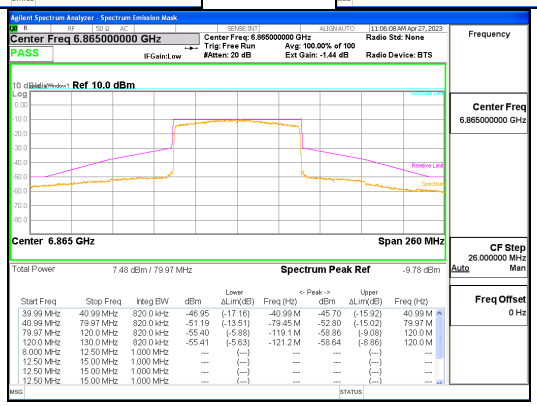
ANT1_802.11ax_HE80_996T_UNII 5



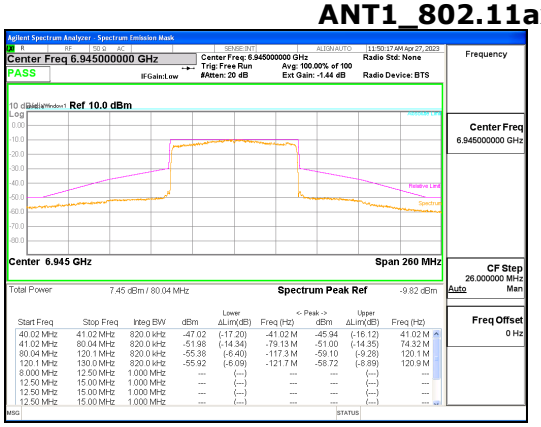
ANT1_802.11ax_HE80_996T_UNII 6

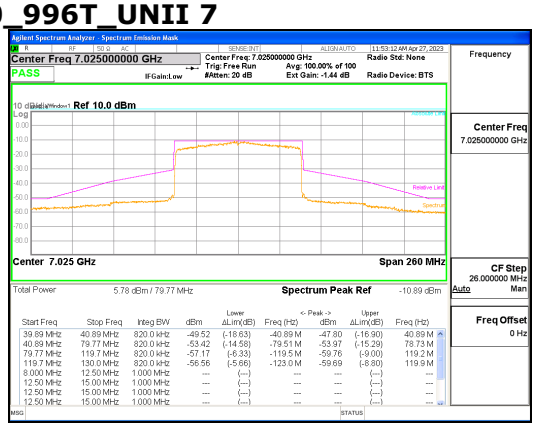






ANT1_802.11ax_HE80_996T_UNII 7





ANT1_802.11ax_HE80_996T_UNII 8

4.5 Frequency Stability

Test Procedures

KDB 789033 – Section A.3

The EUT was placed inside of an environmental chamber as the temperature in the chamber was varied between -20 ℃ and +50 ℃(Declaration by the Manufacturer). The temperature was incremented by 10 ℃ intervals and the unit was allowed to stabilize at each temperature before each measurement. The center frequency of the transmitting channel was evaluated at each temperature and the frequency deviation from the channel's center frequency was recorded.
Data for the worst case channel is shown below.

Measured Frequency Error (kHz)								
Voltage (VDC)	Temperature (℃)	Test Frequency (MHz)						
		5 955	6 175	6 415	6 435	6 475	6 515	6 535
5.0	-20	16.285	16.644	17.470	17.389	17.554	17.462	18.006
5.0	-10	17.545	18.310	18.832	18.952	19.122	19.134	19.426
5.0	0	6.698	7.148	7.339	7.452	7.482	7.555	7.581
5.0	10	-9.195	-9.270	-9.553	-9.425	-9.587	-9.666	-9.713
5.0	20(Ref)	-74.963	-82.109	-84.687	-85.342	-85.877	-87.439	-88.244
5.0	30	-53.956	-55.851	-57.465	-63.248	-64.173	-64.267	-63.602
5.0	40	-72.361	-76.939	-79.544	-80.812	-81.618	-81.493	-82.030
5.0	50	-83.659	-84.911	-88.385	-89.611	-90.417	-90.896	-90.927
4.25	20(Ref)	-77.321	-82.336	-87.073	-87.639	-88.894	-88.969	-90.026
5.75	20(Ref)	-80.665	-81.146	-85.010	-85.157	-86.615	-87.083	-87.913

Measured Frequency Error (kHz)							
Voltage (VDC)	Temperature (℃)	Test Frequency (MHz)					
		6 695	6 855	6 875	6 995	7 095	7 115
5.0	-20	18.734	18.789	19.014	19.367	19.488	19.389
5.0	-10	19.908	20.181	20.419	20.821	21.001	21.009
5.0	0	7.740	7.816	7.919	8.099	8.231	8.113
5.0	10	-9.912	-8.976	-9.168	-9.379	-9.604	-9.770
5.0	20(Ref)	-79.579	-86.613	-89.361	-94.241	-95.754	-96.431
5.0	30	-66.800	-67.050	-64.693	-66.226	-66.095	-66.455
5.0	40	-83.709	-84.661	-84.827	-89.393	-89.599	-88.579
5.0	50	-93.171	-95.345	-95.600	-97.177	-99.066	-99.409
4.25	20(Ref)	-92.911	-95.891	-95.831	-97.463	-99.525	-100.071
5.75	20(Ref)	-88.381	-91.760	-92.289	-95.890	-98.366	-98.899

Note :

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature range as tested.

4.6 Contention Based Protocol

Test Procedures

KDB 987594 – Section I

1. Configure the EUT to transmit with a constant duty cycle.
2. Set the operating parameters of the EUT including power level, operating frequency, modulation and bandwidth.
3. Set the signal analyzer center frequency to the nominal EUT channel center frequency. The span range of the signal analyzer shall be between two times and five times the OBW of the EUT.
   Connect the output port of the EUT to the signal analyzer 2, as shown in Figure 2. Ensure that the attenuator 2 provides enough attenuation to not overload the signal analyzer 2 receiver.
4. Monitoring the signal analyzer 2, verify the EUT is operating and transmitting with the parameters set at step two.
5. Using an AWGN signal source, generate (but do not transmit, i.e., RF OFF) a 10 MHz-wide AWGN signal. Use Table 1 to determine the center frequency of the 10 MHz AWGN signal relative to the EUT's channel bandwidth and center frequency.
6. Set the AWGN signal power to an extremely low level (more than 20 dB below the -62 dBm threshold). Connect the AWGN signal source, via a 3-dB splitter, to the signal analyzer 1 and the EUT as shown in Figure 2.
7. Transmit the AWGN signal (RF ON) and verify its characteristics on the signal analyzer 1.
8. Monitor the signal analyzer 2 to verify if the AWGN signal has been detected and the EUT has ceased transmission. If the EUT continues to transmit, then incrementally increase the AWGN signal power level until the EUT stops transmitting.
9. (Including all losses in the RF paths) Determine and record the AWGN signal power level (at the EUT's antenna port) at which the EUT ceased transmission. Repeat the procedure at least 10 times to verify the EUT can detect an AWGN signal with 90% (or better) level of certainty.
10. Refer to Table 1 to determine number of times the detection threshold testing needs to be repeated. If testing is required more than once, then go back to step 5, choose a different center frequency for the AWGN signal and repeat the process.

Limit

Unlicensed low-power indoor devices must detect co-channel radio frequency power that is at least -62 dBm or lower.
Additionally, low-power indoor devices must detect co-channel energy with 90% or greater certainty.

Test Data

Contention Based Protocol Measurement

Test Mode	Frequency (MHz)	Channel BW (MHz)	Injected Signal (AWGN)		Antenna Gain (dBi)	Adjusted Power (dBm)	Detection Limit (dBm)	EUT Tx Status
			Frequency (MHz)	Power (dBm)				
802.11ax _HE20	6 135 (UNII 5)	20	6 135	-70.31	-0.04	-70.27	-62.00	Ceased
				-72.31	-0.04	-72.27	-62.00	Minimal
				-82.04	-0.04	-82.00	-62.00	Nomal
	6 455 (UNII 6)	20	6 455	-70.30	-0.04	-70.26	-62.00	Ceased
				-72.30	-0.04	-72.26	-62.00	Minimal
				-82.04	-0.04	-82.00	-62.00	Nomal
	6 695 (UNII 7)	20	6 695	-70.18	-0.04	-70.14	-62.00	Ceased
				-72.18	-0.04	-72.14	-62.00	Minimal
				-82.04	-0.04	-82.00	-62.00	Nomal
	7 015 (UNII 8)	20	7 015	-70.06	-0.04	-70.02	-62.00	Ceased
				-72.06	-0.04	-72.02	-62.00	Minimal
				-82.04	-0.04	-82.00	-62.00	Nomal

Test Mode	Frequency (MHz)	Channel BW (MHz)	Injected Signal (AWGN)		Antenna Gain (dBi)	Adjusted Power (dBm)	Detection Limit (dBm)	EUT Tx Status
			Frequency (MHz)	Power (dBm)				
802.11ax _HE80	6 145 (UNII 5)	80	6 110	-70.40	-0.04	-70.36	-62.00	Ceased
				-72.40	-0.04	-72.36	-62.00	Minimal
				-82.04	-0.04	-82.00	-62.00	Nomal
			6 145	-70.31	-0.04	-70.27	-62.00	Ceased
				-72.31	-0.04	-72.27	-62.00	Minimal
				-82.04	-0.04	-82.00	-62.00	Nomal
			6 180	-70.09	-0.04	-70.05	-62.00	Ceased
				-72.09	-0.04	-72.05	-62.00	Minimal
				-82.04	-0.04	-82.00	-62.00	Nomal
	6 465 (UNII 6)	80	6 430	-70.28	-0.04	-70.24	-62.00	Ceased
				-72.28	-0.04	-72.24	-62.00	Minimal
				-82.04	-0.04	-82.00	-62.00	Nomal
			6 465	-70.16	-0.04	-70.12	-62.00	Ceased
				-72.16	-0.04	-72.12	-62.00	Minimal
				-82.04	-0.04	-82.00	-62.00	Nomal
			6 500	-70.13	-0.04	-70.09	-62.00	Ceased
				-72.13	-0.04	-72.09	-62.00	Minimal
				-82.04	-0.04	-82.00	-62.00	Nomal
	6 705 (UNII 7)	80	6 670	-70.22	-0.04	-70.18	-62.00	Ceased
				-72.22	-0.04	-72.18	-62.00	Minimal
				-82.04	-0.04	-82.00	-62.00	Nomal
			6 705	-70.16	-0.04	-70.12	-62.00	Ceased
				-72.16	-0.04	-72.12	-62.00	Minimal
				-82.04	-0.04	-82.00	-62.00	Nomal
			6 740	-70.23	-0.04	-70.19	-62.00	Ceased
				-72.23	-0.04	-72.19	-62.00	Minimal
				-82.04	-0.04	-82.00	-62.00	Nomal

	7 025 (UNII 8)	80	6 990	-70.03	-0.04	-69.99	-62.00	-70.03
				-72.03	-0.04	-71.99	-62.00	-72.03
				-82.04	-0.04	-82.00	-62.00	-82.04
			7 025	-70.12	-0.04	-70.08	-62.00	Ceased
				-72.12	-0.04	-72.08	-62.00	Minimal
				-82.04	-0.04	-82.00	-62.00	Nomal
			7 060	-70.28	-0.04	-70.24	-62.00	Ceased
				-72.28	-0.04	-72.24	-62.00	Minimal
				-82.04	-0.04	-82.00	-62.00	Nomal

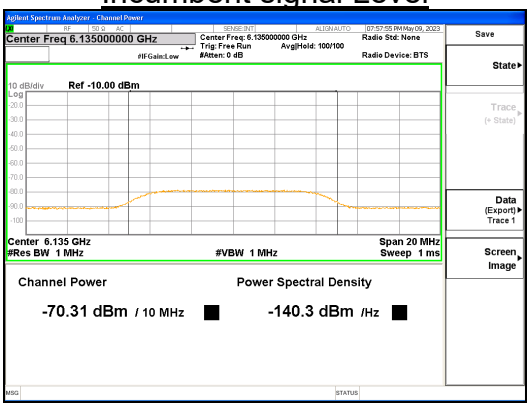
Contention Based Protocol Measurement Detection Probability

Test Mode	Frequency (MHz)	Channel BW (MHz)	Injected Signal (AWGN)	#01	#02	#03	#04	#05	#06	#07	#08	#09	#10	Detection Probability	Detection Limit	Test Result
802.11ax _HE20	6 135 (UNII 5)	20	6 135	v	v	v	v	v	v	x	v	v	v	90%	90%	Pass
	6 455 (UNII 6)	20	6 455	v	v	v	v	v	v	v	v	v	v	100%	90%	Pass
	6 695 (UNII 7)	20	6 695	v	v	v	x	v	v	v	v	v	v	90%	90%	Pass
	7 015 (UNII 8)	20	7 015	v	v	v	v	v	v	v	v	v	v	100%	90%	Pass

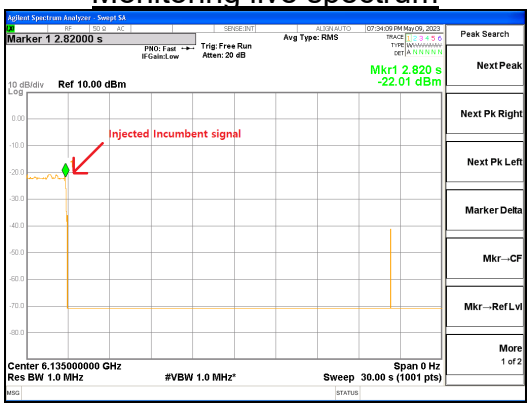
Test Mode	Frequency (MHz)	Channel BW (MHz)	Injected Signal (AWGN)	#01	#02	#03	#04	#05	#06	#07	#08	#09	#10	Detection Probability	Detection Limit	Test Result
802.11ax _HE80	6 145 (UNII 5)	80	6 110	v	x	v	v	v	v	v	v	v	v	90%	90%	Pass
			6 145	v	v	v	v	v	v	v	v	v	v	100%	90%	Pass
			6 180	v	v	v	v	v	v	x	v	v	v	90%	90%	Pass
	6 465 (UNII 6)	80	6 430	v	v	v	v	v	v	v	v	v	v	100%	90%	Pass
			6 465	v	v	x	v	v	v	v	v	v	v	90%	90%	Pass
			6 500	v	v	v	v	v	v	v	v	v	v	100%	90%	Pass
	6 705 (UNII 7)	80	6 670	v	v	v	v	v	v	v	v	v	v	100%	90%	Pass
			6 705	v	v	v	v	v	v	v	v	v	x	90%	90%	Pass
			6 740	v	v	v	v	v	v	v	v	v	v	100%	90%	Pass
	7 025 (UNII 8)	80	6 990	v	v	v	v	v	v	v	x	v	v	90%	90%	Pass
			7 025	v	v	v	v	v	v	v	v	v	v	100%	90%	Pass
			7 060	v	v	v	v	v	v	v	v	v	v	100%	90%	Pass

See next pages for actual measured spectrum plots.

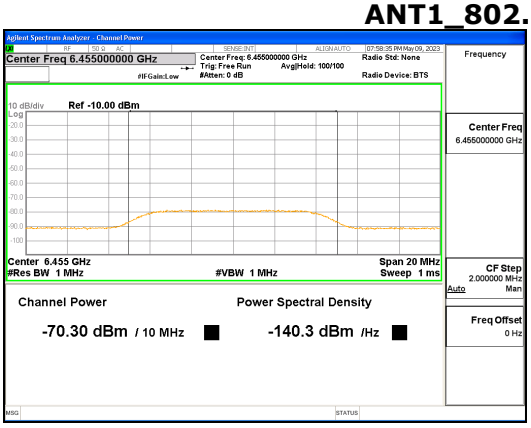
Incumbent signal Level

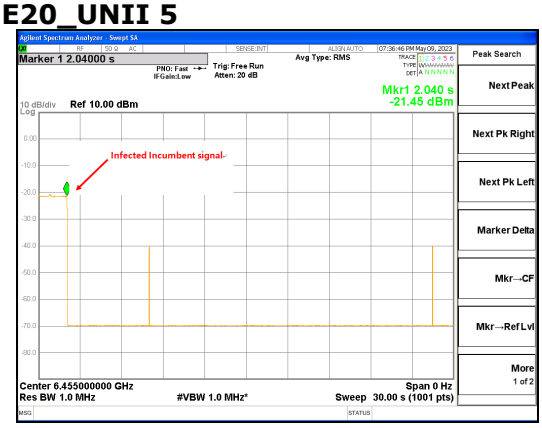


Monitoring live spectrum

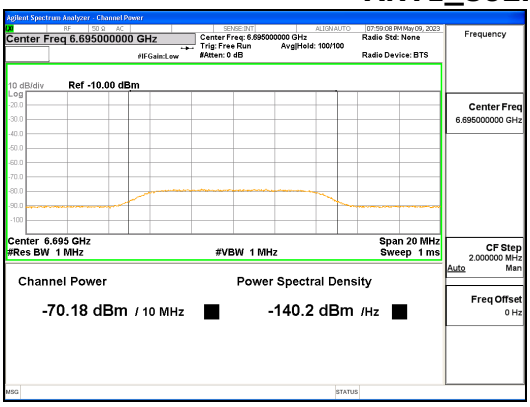


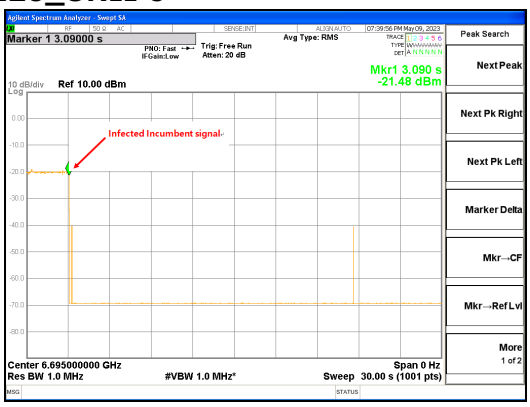
ANT1_802.11ax_HE20_UNII 5



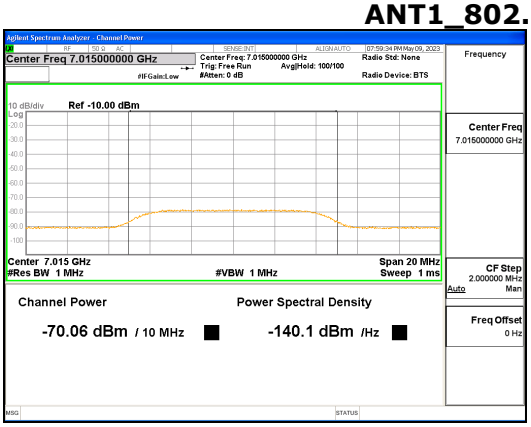


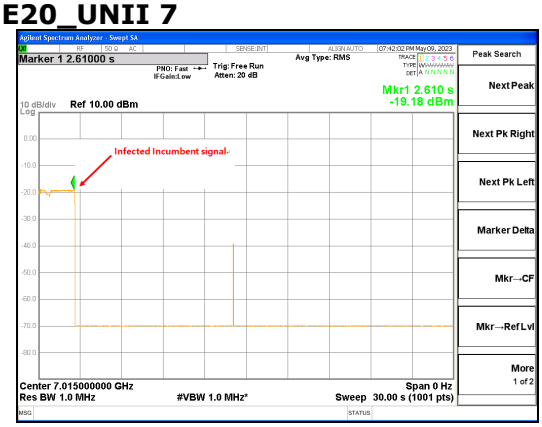
ANT1_802.11ax_HE20_UNII 6





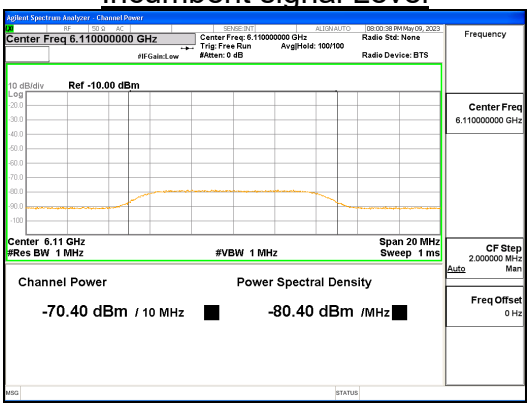
ANT1_802.11ax_HE20_UNII 7



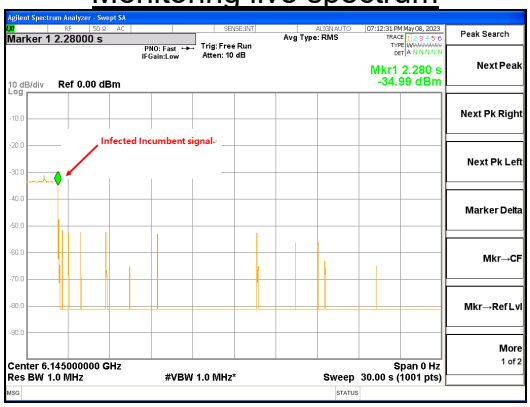


ANT1_802.11ax_HE20_UNII 8

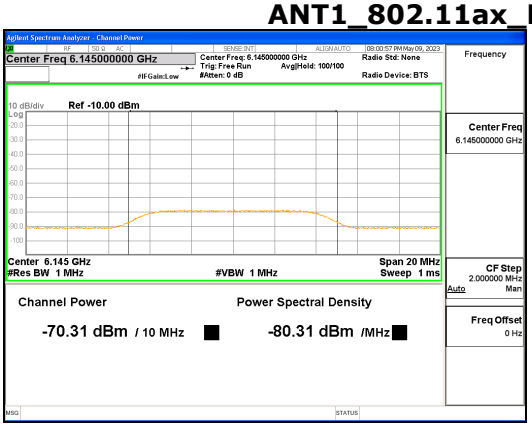
Incumbent signal Level

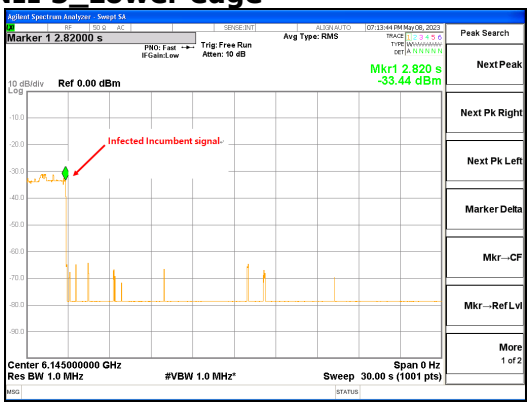


Monitoring live spectrum



ANT1_802.11ax_HE80_UNII 5_Lower edge

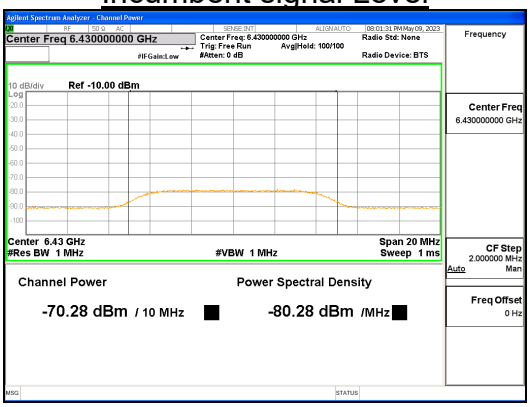




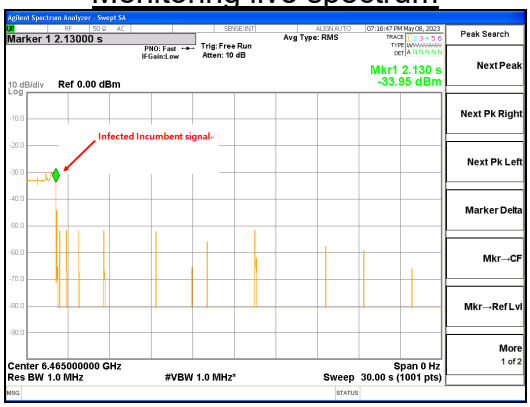
ANT1_802.11ax_HE20_UNII 5_Center

ANT1_802.11ax_HE20_UNII 5_Upper edge

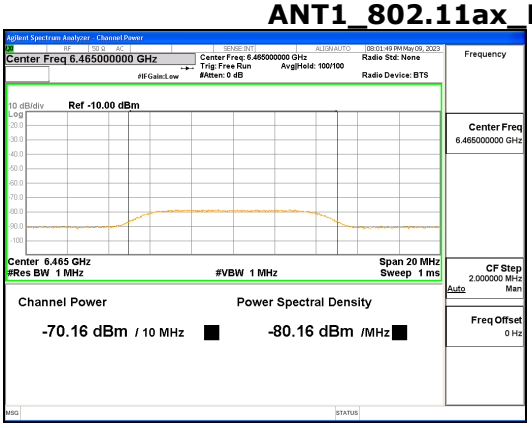
Incumbent signal Level

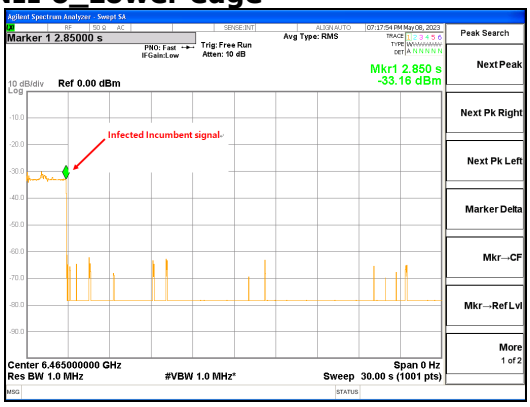


Monitoring live spectrum

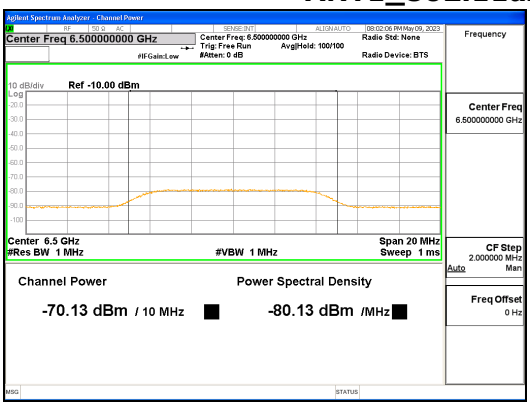


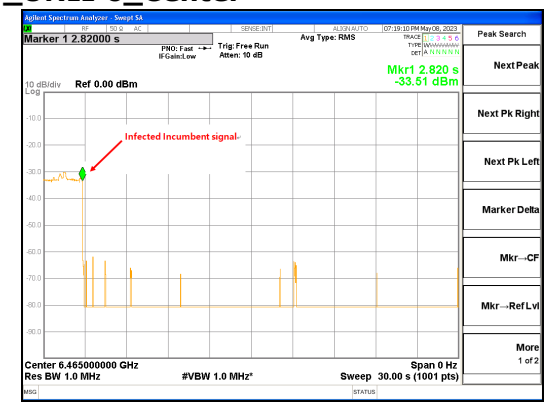
ANT1_802.11ax_HE80_UNII 6_Lower edge





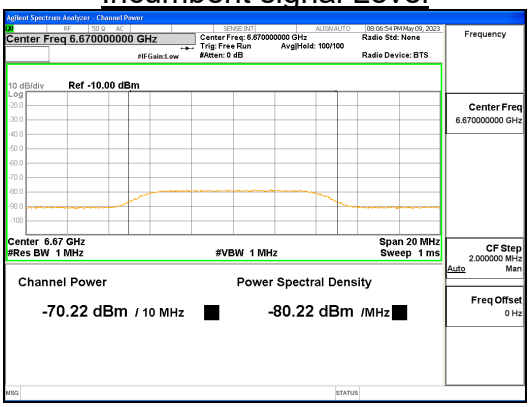
ANT1_802.11ax_HE20_UNII 6_Center



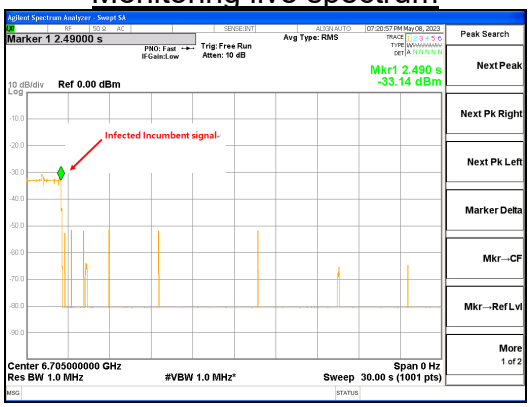


ANT1_802.11ax_HE20_UNII 6_Upper edge

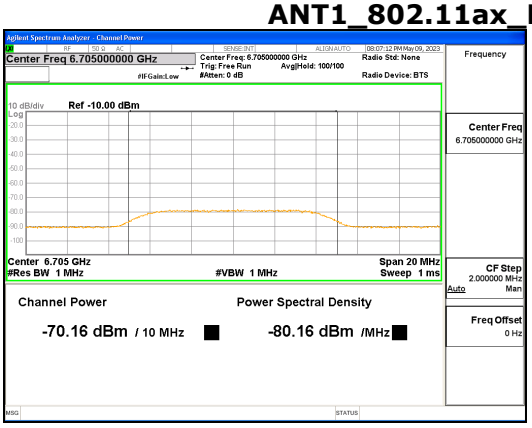
Incumbent signal Level

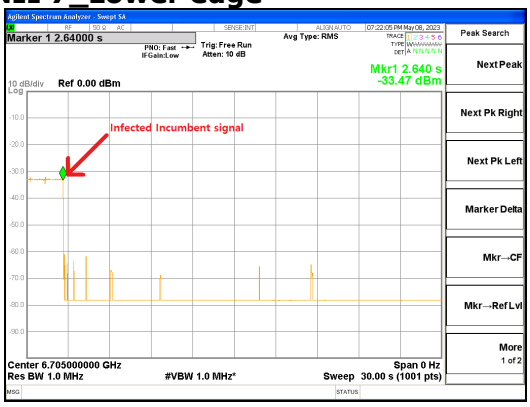


Monitoring live spectrum

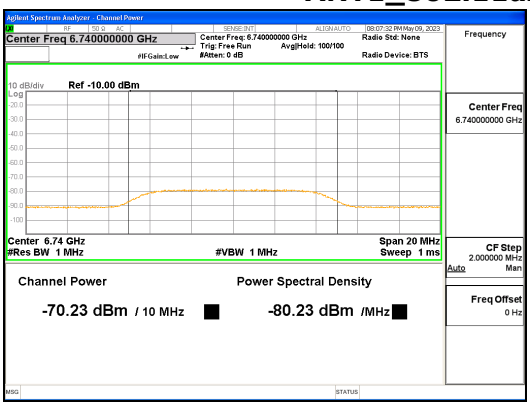


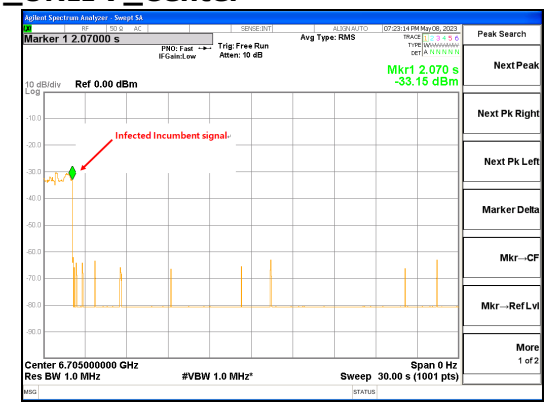
ANT1_802.11ax_HE80_UNII 7_Lower edge





ANT1_802.11ax_HE20_UNII 7_Center





ANT1_802.11ax_HE20_UNII 7_Upper edge