

11. Power Spectral Density

11.1. Block diagram of test setup

Same as section 8.1

11.2. Limits

CFR 47 FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC §15.247 (e)	Power Spectral Density	8 dBm/3 kHz	2400-2483.5

11.3. Test Procedure

Connect the UUT to the spectrum analyzer and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	RMS
RBW	$3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$
VBW	$\geq 3 \times \text{RBW}$
Span	1.5 x DTS bandwidth
Trace	Employ trace averaging (rms) mode over a minimum of 100 traces
Sweep time	Auto couple.

Allow trace to fully stabilize and use the peak marker function to determine the maximum amplitude level within the RBW.

If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

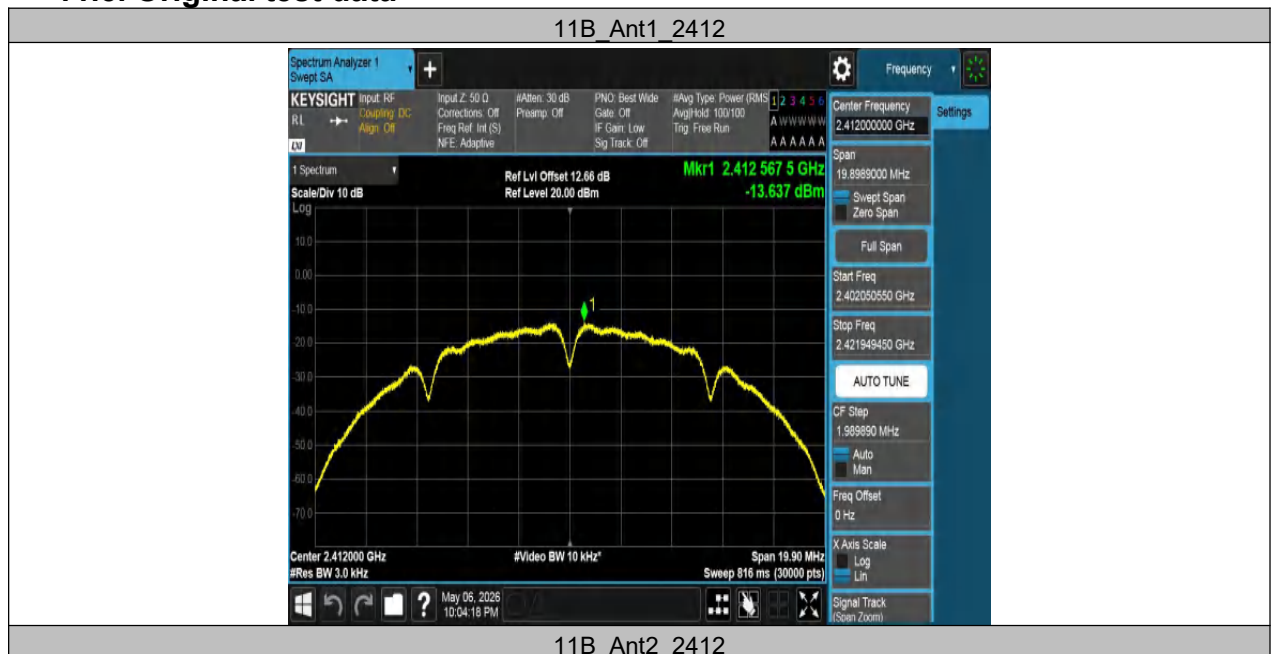
11.4. Results

Test Mode	Ant.	Freq. (MHz)	Result (dBm/3-100kHz)	Limit (dBm/3kHz)	Verdict
11B	Ant1	2412	-13.64	≤ 8.00	PASS
	Ant2	2412	-9.75	≤ 8.00	PASS
	Ant1	2437	-10.85	≤ 8.00	PASS
	Ant2	2437	-11.90	≤ 8.00	PASS
	Ant1	2462	-12.69	≤ 8.00	PASS
	Ant2	2462	-12.41	≤ 8.00	PASS
11G	Ant1	2412	-12.91	≤ 8.00	PASS
	Ant2	2412	-13.18	≤ 8.00	PASS
	Ant1	2437	-12.71	≤ 8.00	PASS
	Ant2	2437	-12.55	≤ 8.00	PASS
	Ant1	2462	-12.84	≤ 8.00	PASS
	Ant2	2462	-13.38	≤ 8.00	PASS
11N20MIMO	Ant1	2412	-12.79	≤ 8.00	PASS
	Ant2	2412	-11.98	≤ 8.00	PASS
	total	2412	-9.36	≤ 8.00	PASS
	Ant1	2437	-13.27	≤ 8.00	PASS
	Ant2	2437	-15.06	≤ 8.00	PASS
	total	2437	-11.06	≤ 8.00	PASS
	Ant1	2462	-14.74	≤ 8.00	PASS
	Ant2	2462	-11.04	≤ 8.00	PASS
	total	2462	-9.50	≤ 8.00	PASS
11N40MIMO	Ant1	2422	-14.76	≤ 8.00	PASS
	Ant2	2422	-17.12	≤ 8.00	PASS
	total	2422	-12.77	≤ 8.00	PASS

	Ant1	2437	-15.35	≤8.00	PASS
	Ant2	2437	-17.64	≤8.00	PASS
	total	2437	-13.34	≤8.00	PASS
	Ant1	2452	-14.43	≤8.00	PASS
	Ant2	2452	-14.59	≤8.00	PASS
	total	2452	-11.50	≤8.00	PASS
11AX20MIMO	Ant1	2412	-16.66	≤8.00	PASS
	Ant2	2412	-15.38	≤8.00	PASS
	total	2412	-12.96	≤8.00	PASS
	Ant1	2437	-14.68	≤8.00	PASS
	Ant2	2437	-15.91	≤8.00	PASS
	total	2437	-12.24	≤8.00	PASS
	Ant1	2462	-17.31	≤8.00	PASS
	Ant2	2462	-14.41	≤8.00	PASS
	total	2462	-12.61	≤8.00	PASS
11AX40MIMO	Ant1	2422	-21.22	≤8.00	PASS
	Ant2	2422	-23.60	≤8.00	PASS
	total	2422	-19.24	≤8.00	PASS
	Ant1	2437	-21.17	≤8.00	PASS
	Ant2	2437	-23.49	≤8.00	PASS
	total	2437	-19.17	≤8.00	PASS
	Ant1	2452	-20.13	≤8.00	PASS
	Ant2	2452	-20.68	≤8.00	PASS
	total	2452	-17.39	≤8.00	PASS

Note: Offset=cable loss + Test system insertion loss

11.5. Original test data





11B_Ant1_2437



11B_Ant2_2437



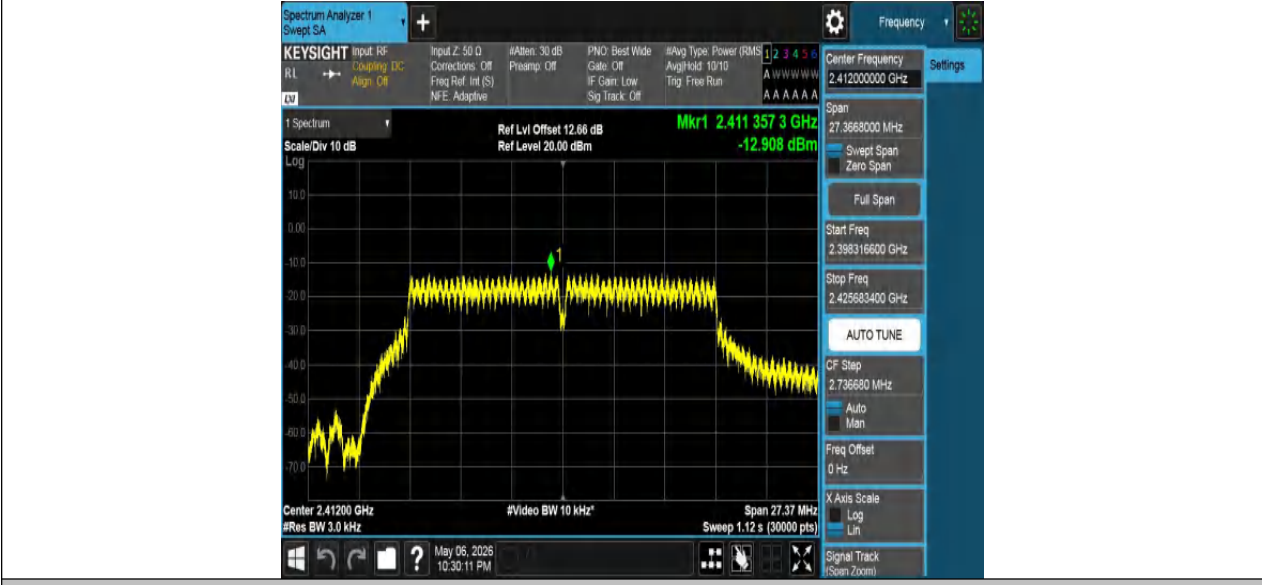
11B_Ant1_2462



11B_Ant2_2462

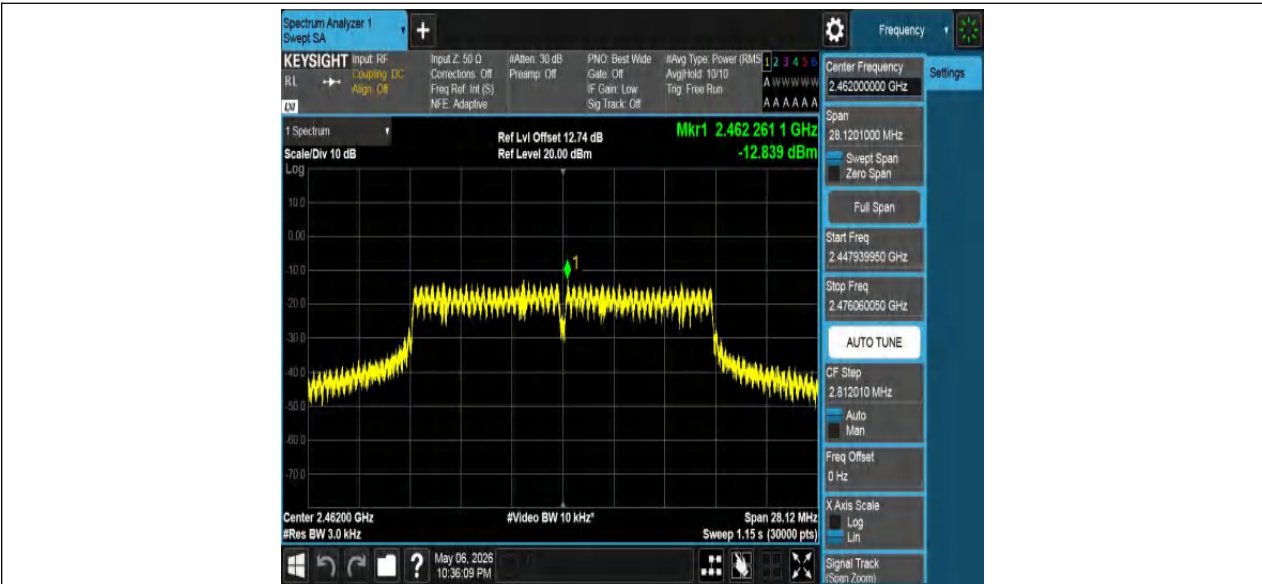


11G_Ant1_2412

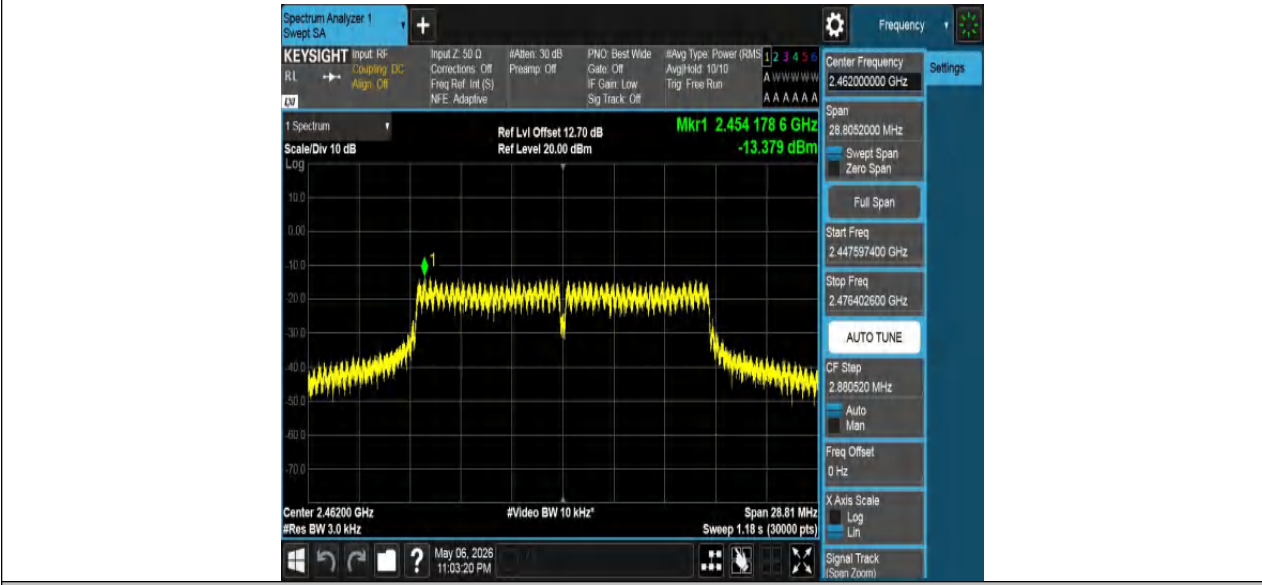


11G_Ant2_2412

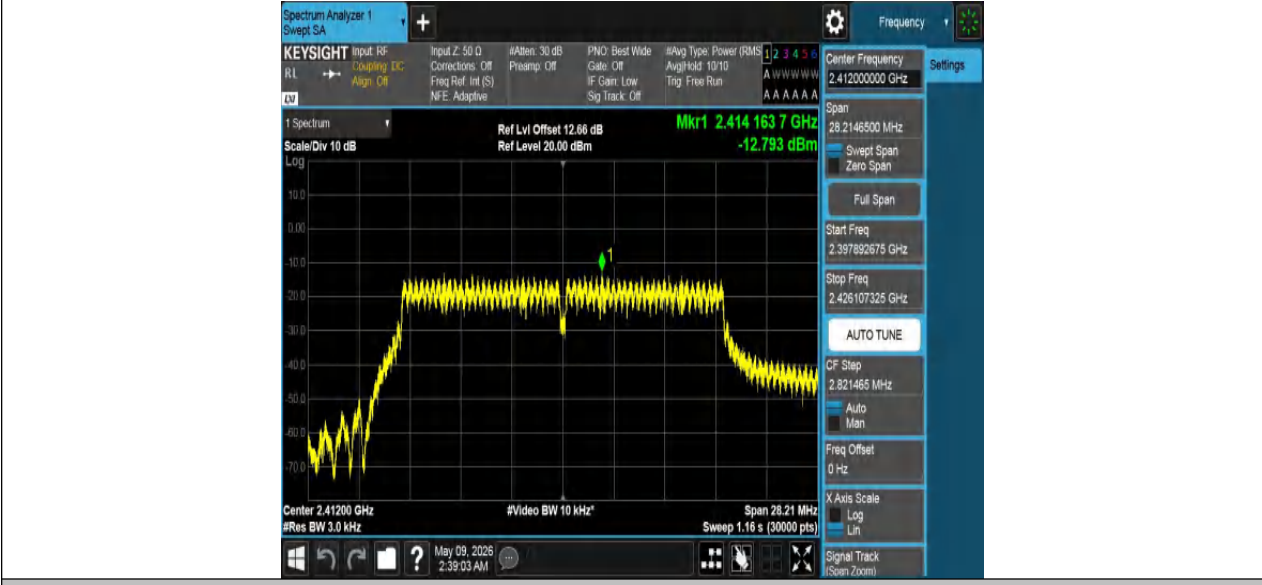




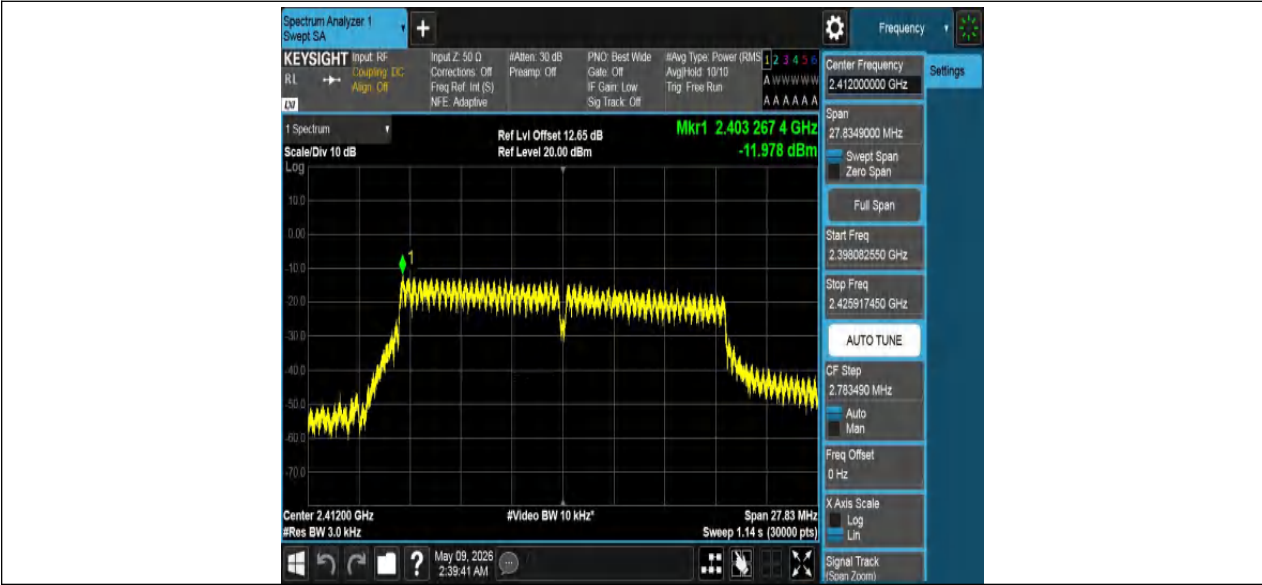
11G_Ant2_2462



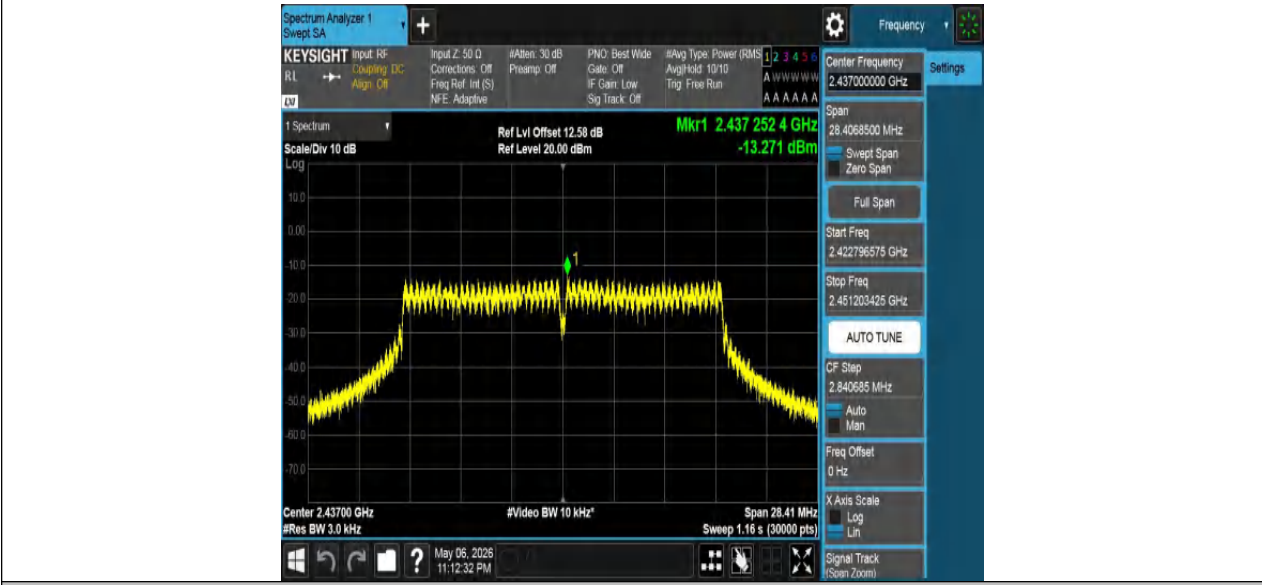
11N20MIMO_Ant1_2412



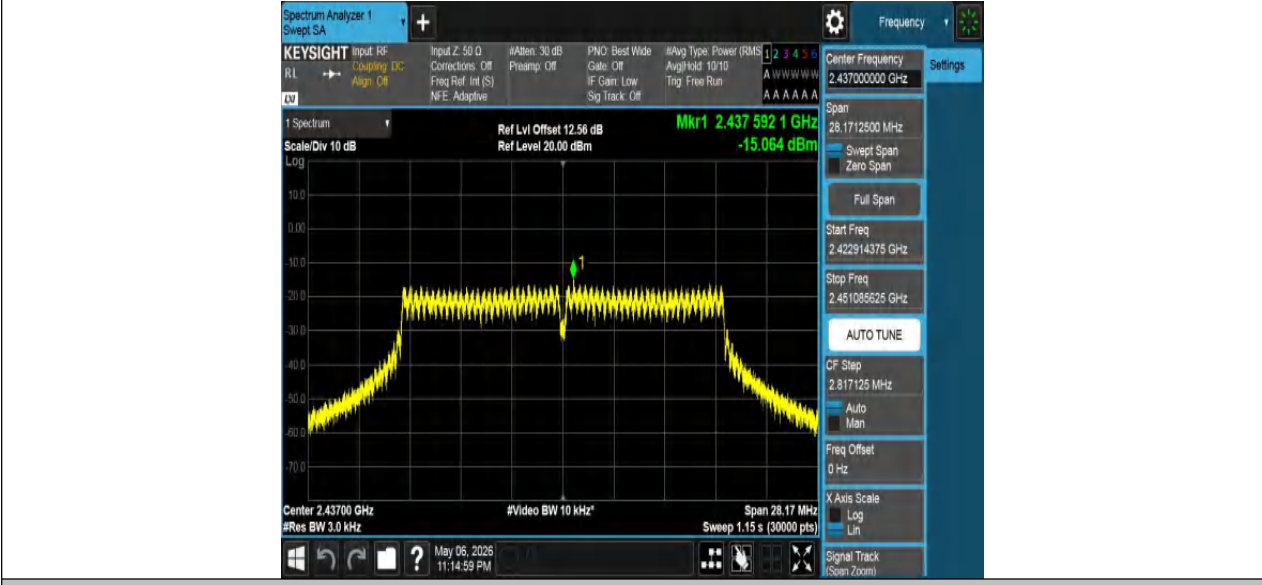
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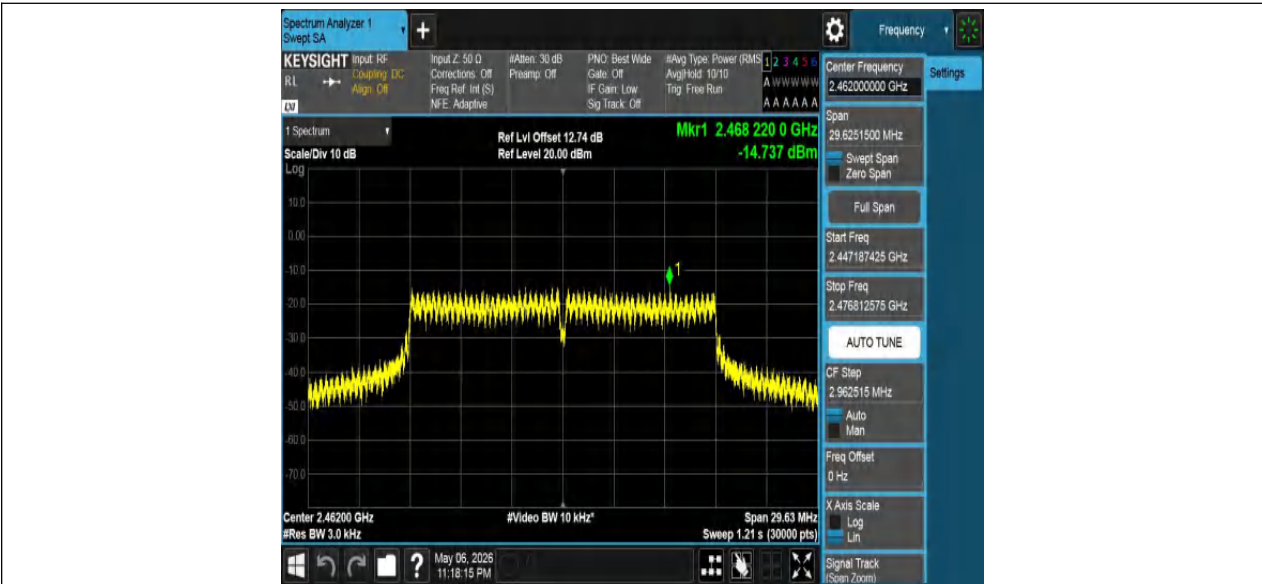
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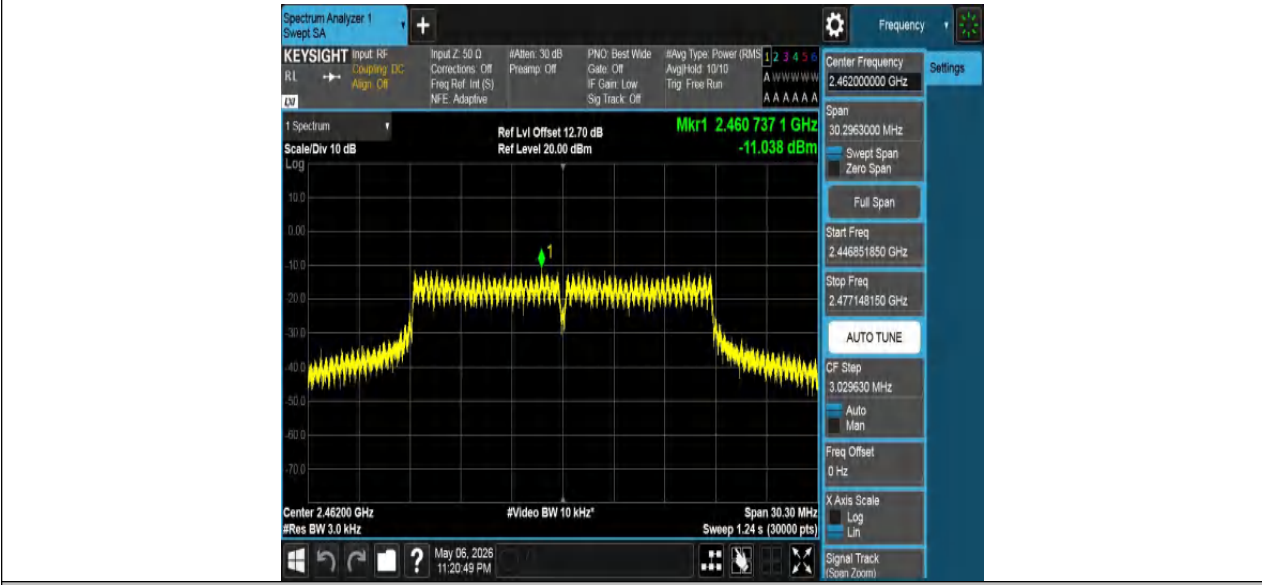
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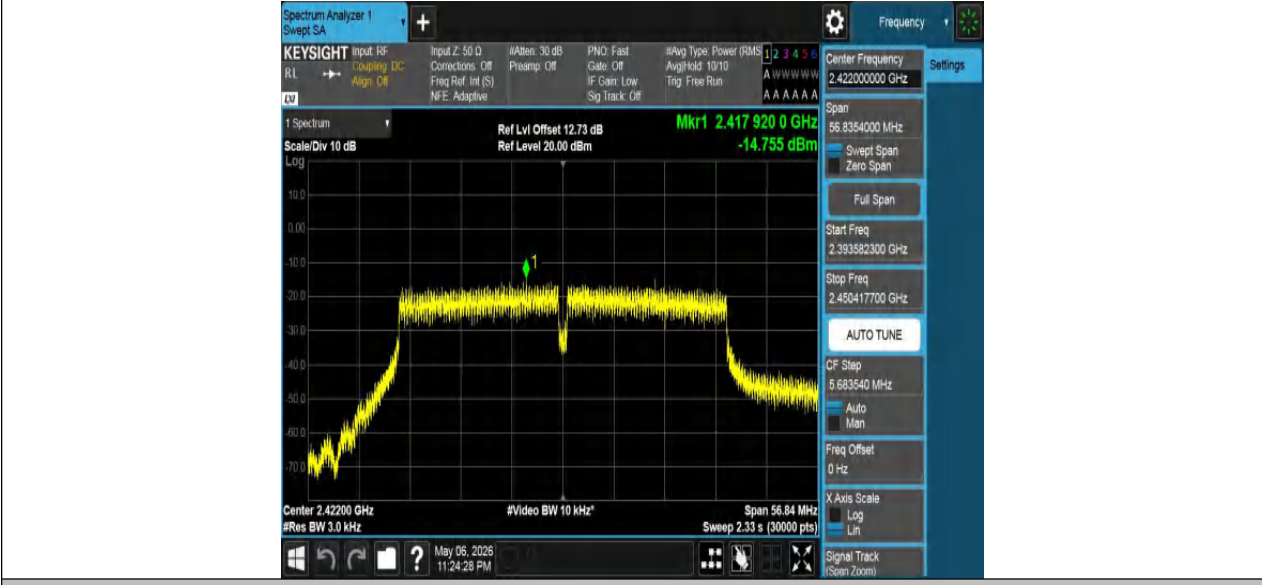
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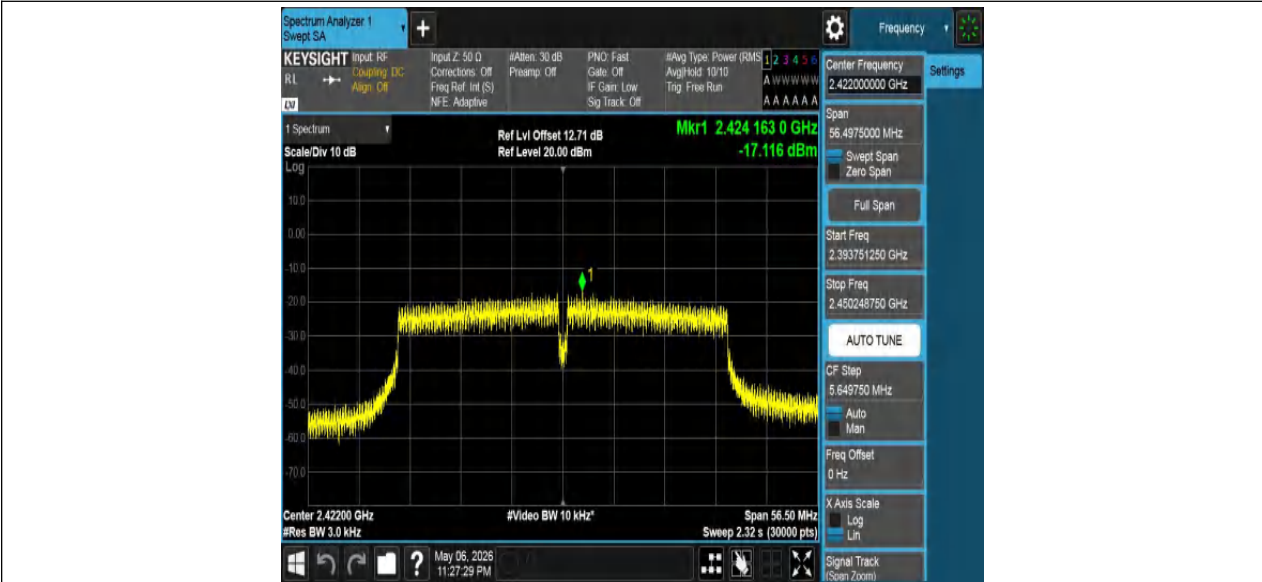
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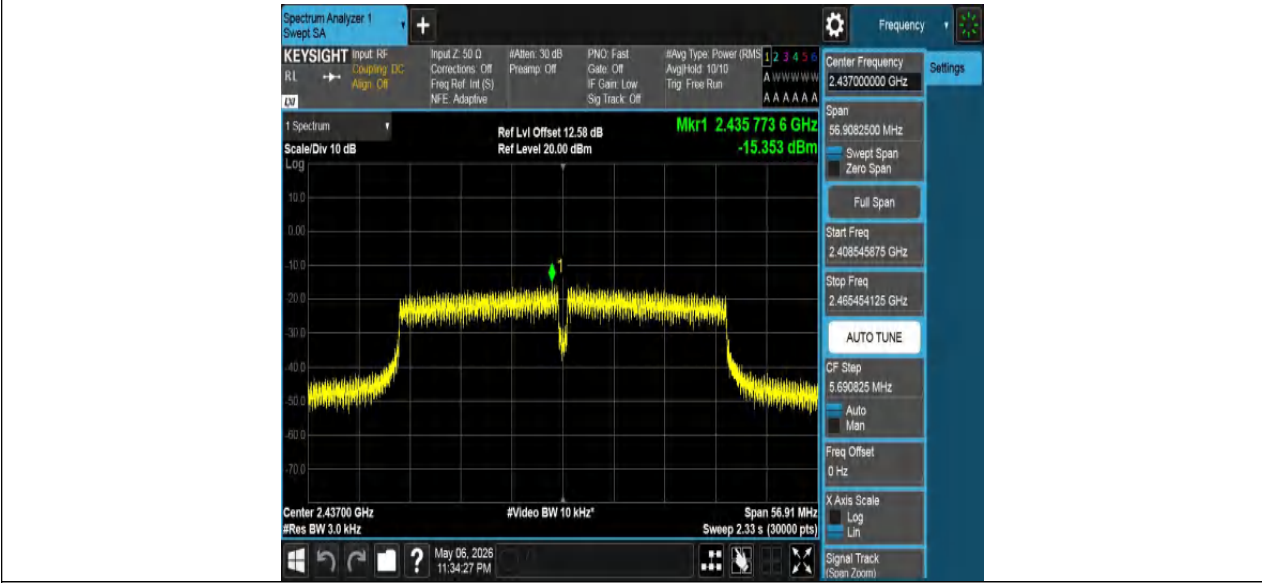
11N40MIMO_Ant1_2422



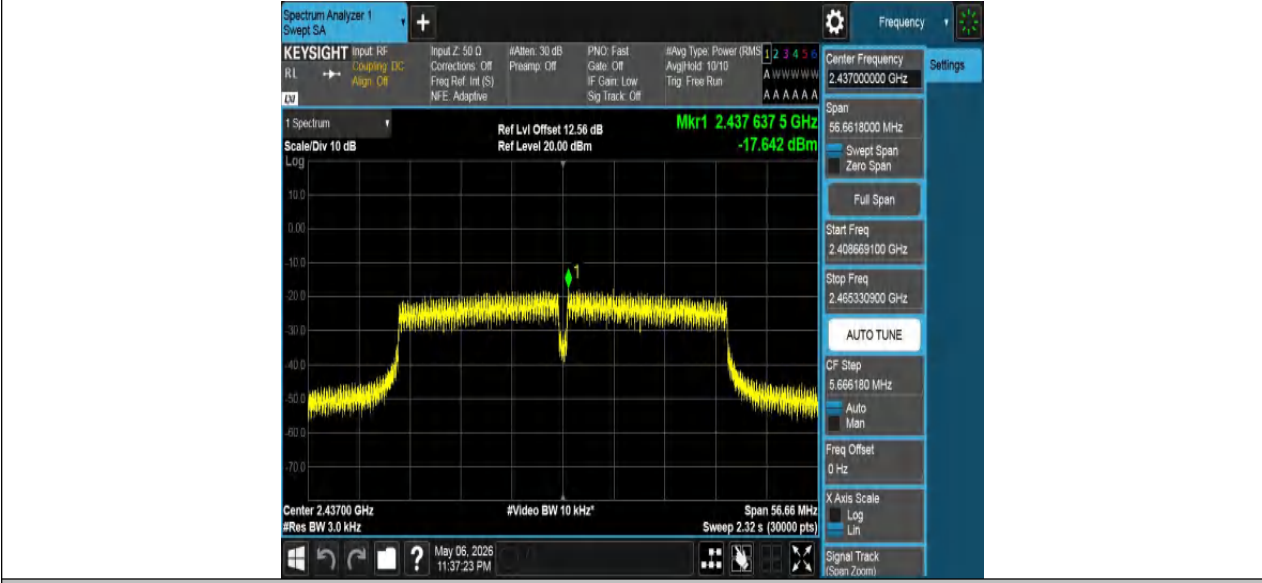
11N40MIMO_Ant2_2422



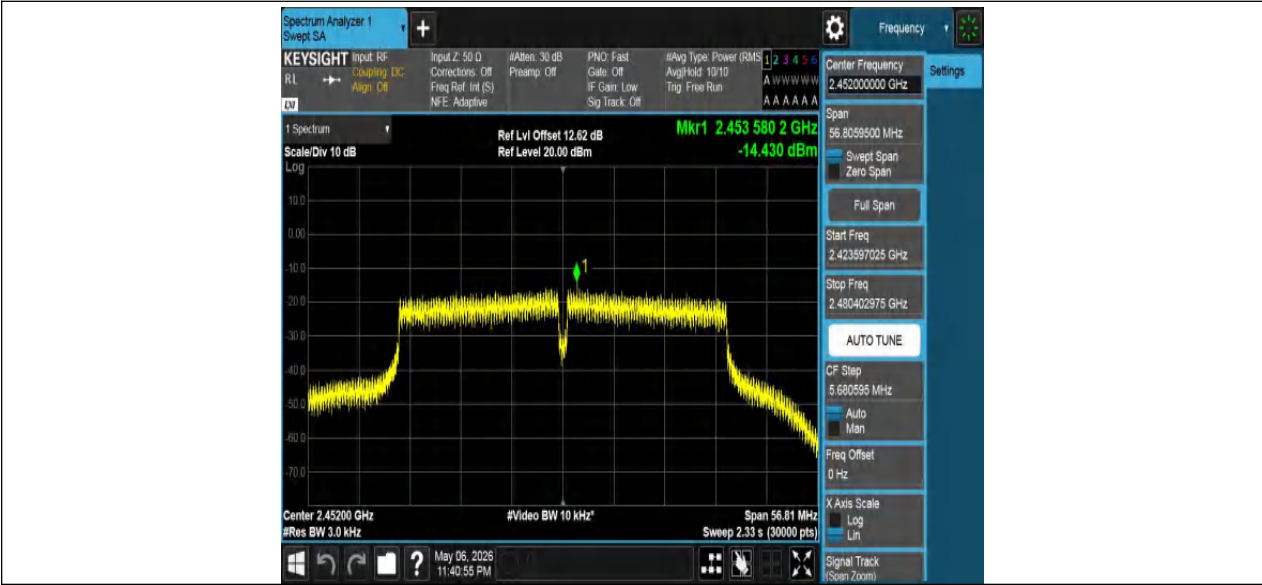
11N40MIMO_Ant1_2437



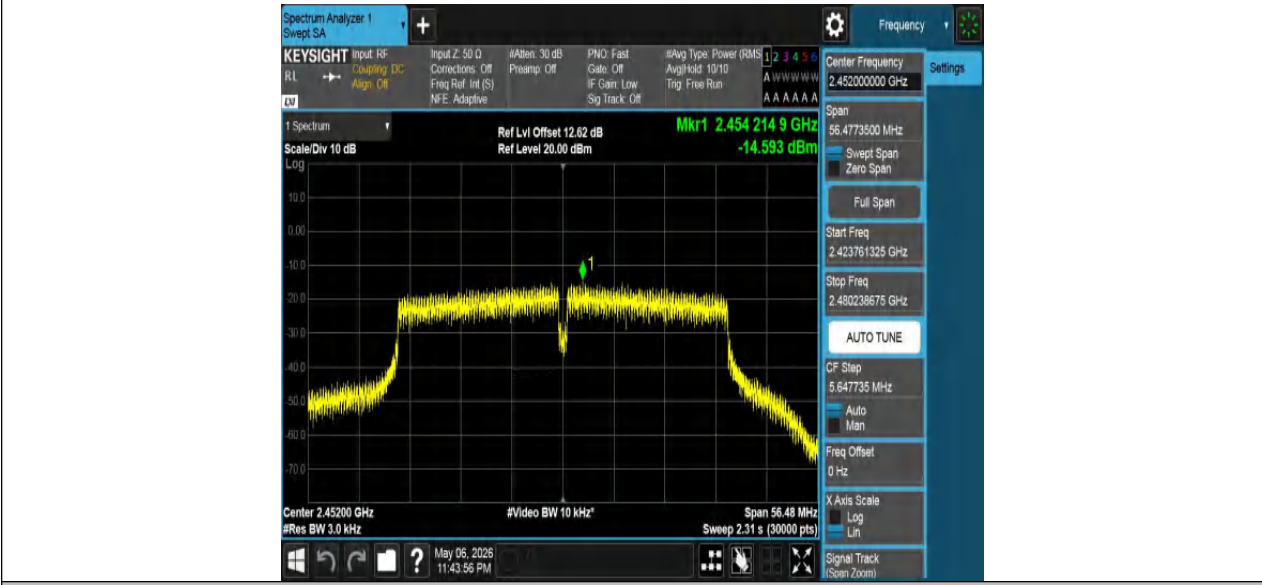
11N40MIMO_Ant2_2437



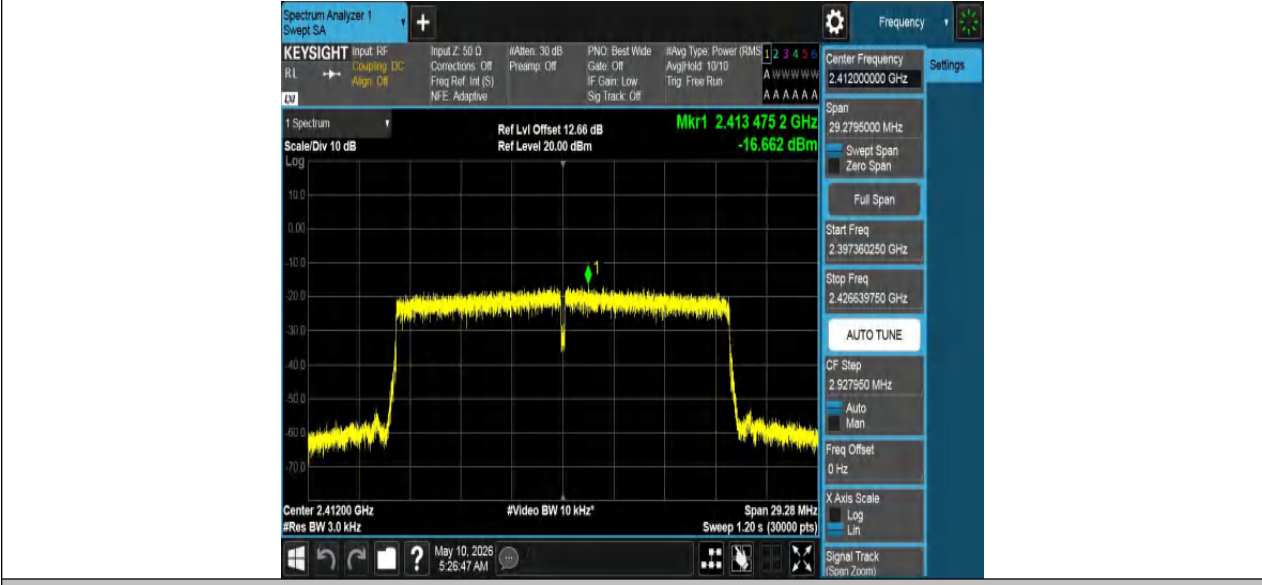
11N40MIMO_Ant1_2452



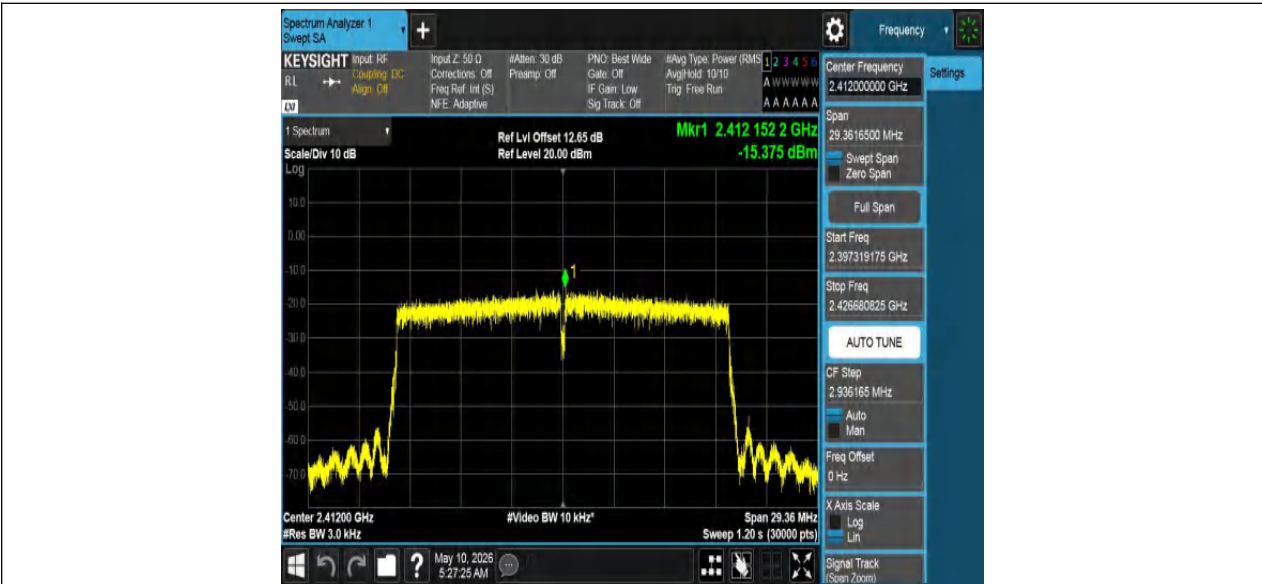
11N40MIMO_Ant2_2452



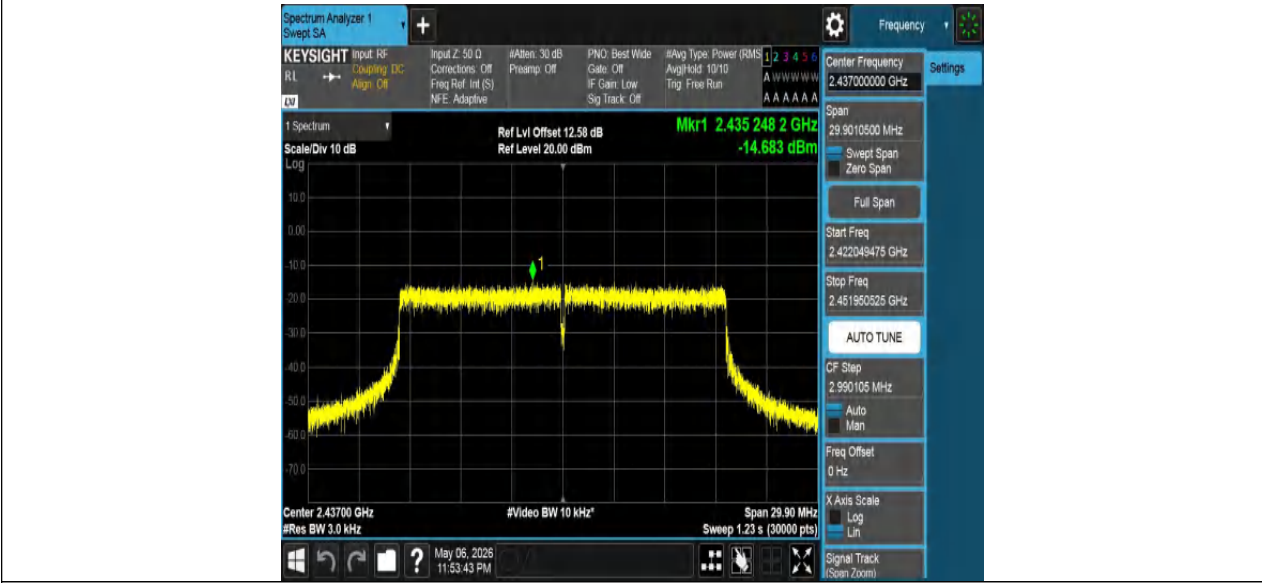
11AX20MIMO_Ant1_2412



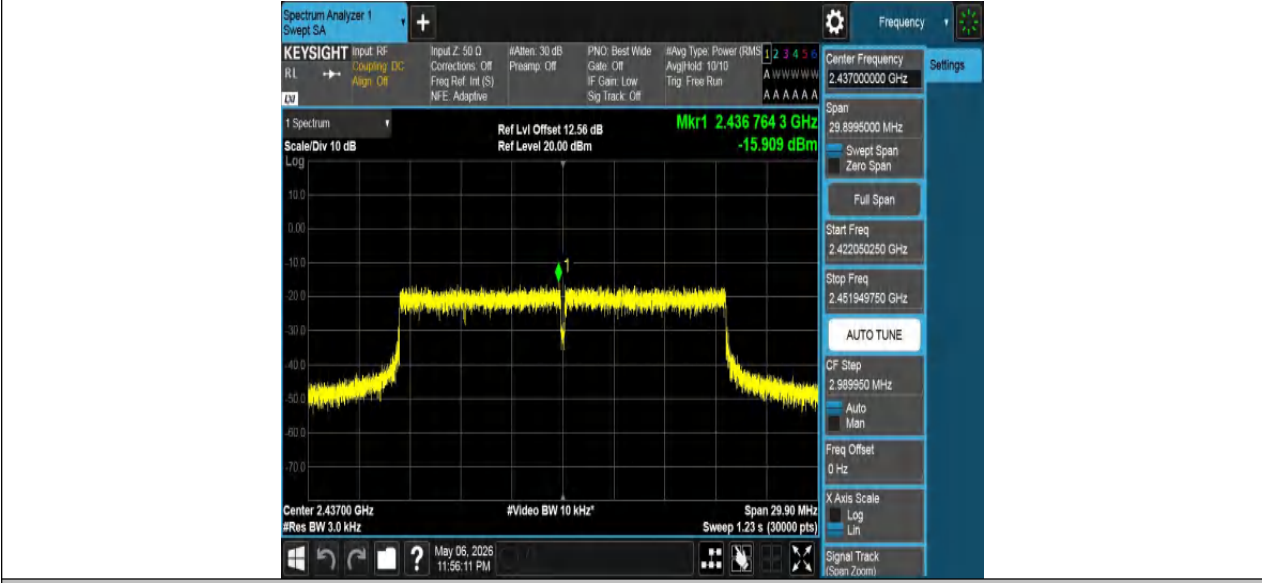
11AX20MIMO_Ant2_2412



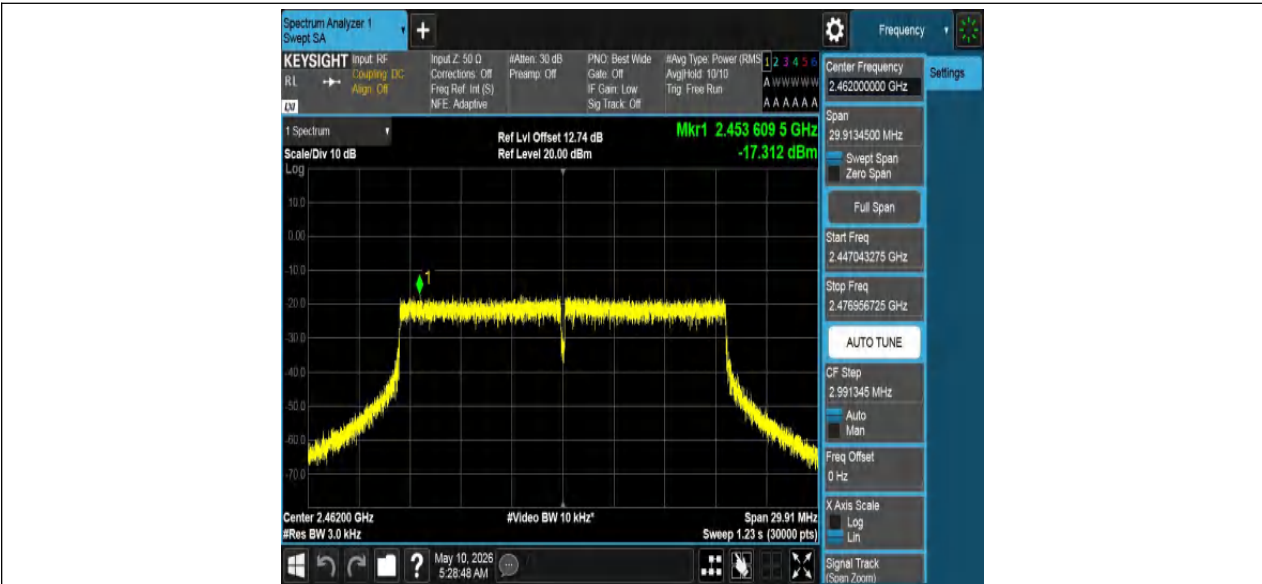
11AX20MIMO_Ant1_2437



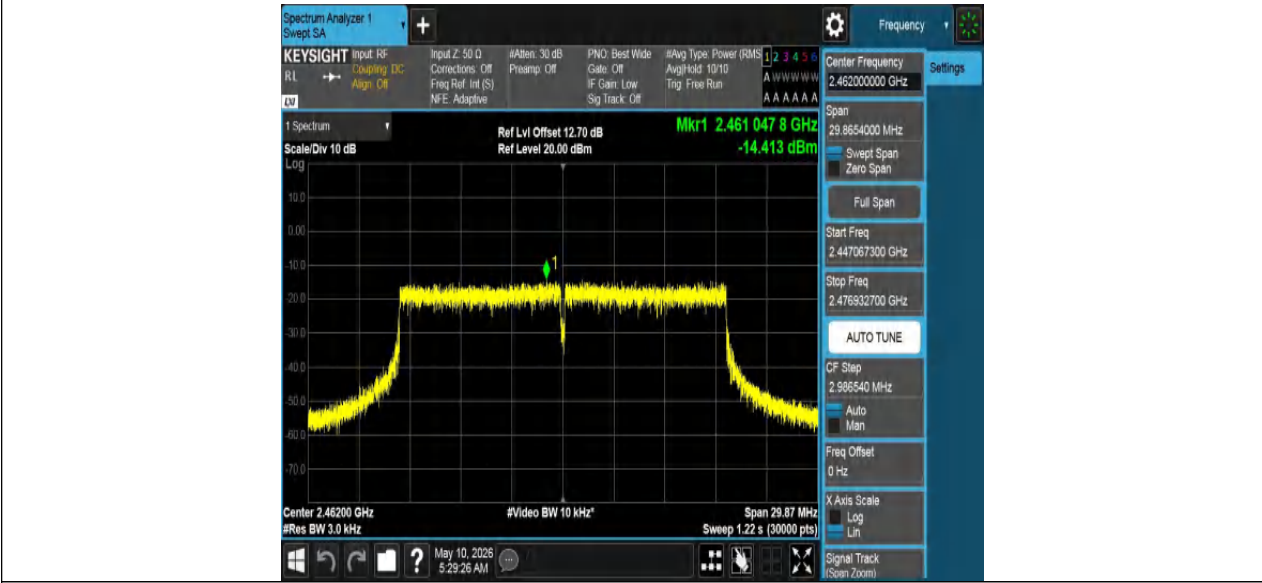
11AX20MIMO_Ant2_2437



11AX20MIMO_Ant1_2462



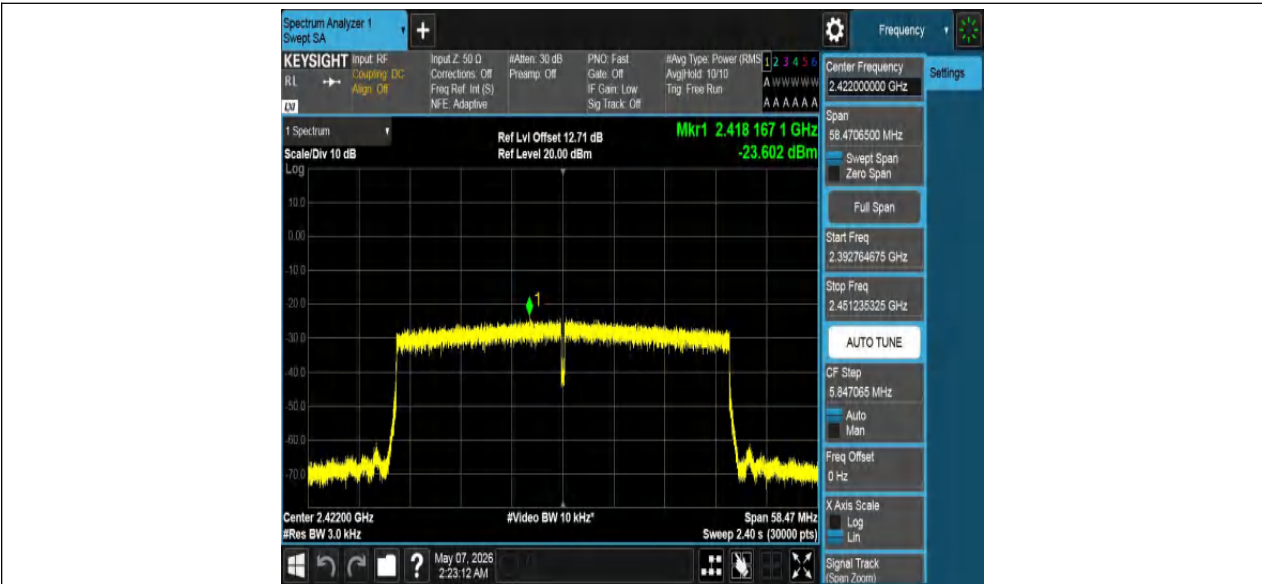
11AX20MIMO_Ant2_2462



11AX40MIMO_Ant1_2422



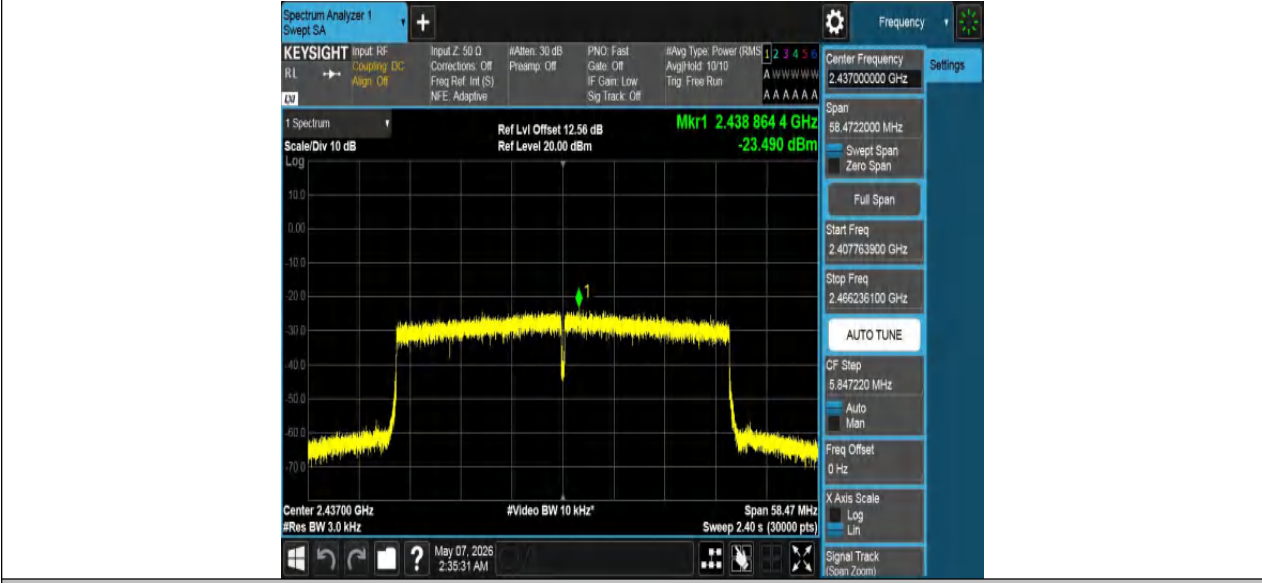
11AX40MIMO_Ant2_2422



11AX40MIMO_Ant1_2437



11AX40MIMO_Ant2_2437



11AX40MIMO_Ant1_2452



11AX40MIMO_Ant2_2452



12. Conducted Band edge and Spurious Emissions

12.1. Block diagram of test setup

Same as section 8.1

12.2. Limits

CFR 47 FCC Part15 (15.247) Subpart C		
Section	Test Item	Limit
CFR 47 FCC §15.247 (d)	Conducted Bandedge and Spurious Emissions	at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

12.3. Test Procedure

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	100 kHz
VBW	$\geq 3 \times \text{RBW}$
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

Connect the UUT to the spectrum analyzer and use the following settings:

Use the peak marker function to determine the maximum PSD level.

Span	Set the center frequency and span to encompass frequency range to be measured
Detector	Peak
RBW	100 kHz
VBW	$\geq 3 \times \text{RBW}$
measurement points	$\geq \text{span}/\text{RBW}$
Trace	Max hold
Sweep time	Auto couple.

Use the peak marker function to determine the maximum amplitude level.

12.4. Test result

Test Mode	Ant.	Ch Name	Freq. (MHz)	Ref Level (dBm)	Result (dBm)	Limit (dBm)	Verdict
11B	Ant1	Low	2412	9.28	-37.86	≤ -20.72	PASS
	Ant2	Low	2412	9.13	-40.38	≤ -20.87	PASS
	Ant1	High	2462	9.21	-45.57	≤ -20.8	PASS
	Ant2	High	2462	9.51	-46.34	≤ -20.49	PASS
11G	Ant1	Low	2412	5.09	-35.48	≤ -24.91	PASS
	Ant2	Low	2412	5.06	-32.55	≤ -24.94	PASS
	Ant1	High	2462	5.19	-45.07	≤ -24.81	PASS
	Ant2	High	2462	4.67	-45.45	≤ -25.33	PASS
11N20MIMO	Ant1	Low	2412	3.37	-37.32	≤ -26.63	PASS
	Ant2	Low	2412	5.57	-34.35	≤ -24.44	PASS
	Ant1	High	2462	3.92	-44.18	≤ -26.08	PASS
	Ant2	High	2462	7.12	-32.4	≤ -22.88	PASS

11N40MIMO	Ant1	Low	2422	1.82	-30.13	≤ -28.18	PASS
	Ant2	Low	2422	1.13	-29.26	≤ -28.87	PASS
	Ant1	High	2452	2.26	-44.75	≤ -27.74	PASS
	Ant2	High	2452	3.65	-35.11	≤ -26.35	PASS
11AX20MIMO	Ant1	Low	2412	5.62	-28.37	≤ -24.38	PASS
	Ant2	Low	2412	4.61	-28.79	≤ -25.39	PASS
	Ant1	High	2462	6.02	-33.2	≤ -23.98	PASS
	Ant2	High	2462	5.91	-30.36	≤ -24.1	PASS
11AX40MIMO	Ant1	Low	2422	-1.83	-43.88	≤ -31.83	PASS
	Ant2	Low	2422	-4.67	-39.65	≤ -34.67	PASS
	Ant1	High	2452	-1.66	-46.2	≤ -31.66	PASS
	Ant2	High	2452	-2.18	-44.22	≤ -32.18	PASS

Note: Offset=cable loss + Test system insertion loss

Test Mode	Ant.	Freq. (MHz)	Freq Range (Mhz)	Ref Level (dBm)	Result (dBm)	Limit (dBm)	Verdict
11B	Ant1	2412	Reference	6.79	6.79	---	PASS
			30~1000	6.79	-60.46	≤ -23.21	PASS
			1000~26500	6.79	-40.31	≤ -23.21	PASS
	Ant2	2412	Reference	7.54	7.54	---	PASS
			30~1000	7.54	-61.74	≤ -22.46	PASS
			1000~26500	7.54	-40.13	≤ -22.46	PASS
	Ant1	2437	Reference	8.03	8.03	---	PASS
			30~1000	8.03	-61	≤ -21.97	PASS
			1000~26500	8.03	-41.71	≤ -21.97	PASS
	Ant2	2437	Reference	8.06	8.06	---	PASS
			30~1000	8.06	-62.2	≤ -21.94	PASS
			1000~26500	8.06	-40.88	≤ -21.94	PASS
	Ant1	2462	Reference	7.51	7.51	---	PASS
			30~1000	7.51	-62.18	≤ -22.49	PASS
			1000~26500	7.51	-41.31	≤ -22.49	PASS
	Ant2	2462	Reference	7.42	7.42	---	PASS
			30~1000	7.42	-60.49	≤ -22.58	PASS
			1000~26500	7.42	-40.7	≤ -22.58	PASS
11G	Ant1	2412	Reference	3.95	3.95	---	PASS
			30~1000	3.95	-61.76	≤ -26.05	PASS
			1000~26500	3.95	-40.61	≤ -26.05	PASS
	Ant2	2412	Reference	4.81	4.81	---	PASS
			30~1000	4.81	-61.46	≤ -25.19	PASS
			1000~26500	4.81	-40.62	≤ -25.19	PASS
	Ant1	2437	Reference	4.49	4.49	---	PASS
			30~1000	4.49	-61.34	≤ -25.51	PASS
			1000~26500	4.49	-41.2	≤ -25.51	PASS
	Ant2	2437	Reference	4.61	4.61	---	PASS
			30~1000	4.61	-61.88	≤ -25.39	PASS
			1000~26500	4.61	-40.89	≤ -25.39	PASS
	Ant1	2462	Reference	4.46	4.46	---	PASS
			30~1000	4.46	-61.63	≤ -25.54	PASS
			1000~26500	4.46	-41.19	≤ -25.54	PASS
	Ant2	2462	Reference	3.66	3.66	---	PASS
			30~1000	3.66	-60.78	≤ -26.34	PASS

			1000~26500	3.66	-40.67	≤ -26.34	PASS
11N20MIMO	Ant1	2412	Reference	4.26	4.26	---	PASS
			30~1000	4.26	-61.52	≤ -25.74	PASS
			1000~26500	4.26	-39.9	≤ -25.74	PASS
	Ant2	2412	Reference	5.45	5.45	---	PASS
			30~1000	5.45	-61.62	≤ -24.55	PASS
			1000~26500	5.45	-41.16	≤ -24.55	PASS
	Ant1	2437	Reference	3.08	3.08	---	PASS
			30~1000	3.08	-62.1	≤ -26.92	PASS
			1000~26500	3.08	-41.14	≤ -26.92	PASS
	Ant2	2437	Reference	1.64	1.64	---	PASS
			30~1000	1.64	-61.41	≤ -28.36	PASS
			1000~26500	1.64	-41.22	≤ -28.36	PASS
	Ant1	2462	Reference	3.85	3.85	---	PASS
			30~1000	3.85	-61.45	≤ -26.15	PASS
			1000~26500	3.85	-41.34	≤ -26.15	PASS
	Ant2	2462	Reference	5.79	5.79	---	PASS
			30~1000	5.79	-61.06	≤ -24.21	PASS
			1000~26500	5.79	-41	≤ -24.21	PASS
11N40MIMO	Ant1	2422	Reference	1.32	1.32	---	PASS
			30~1000	1.32	-61.19	≤ -28.68	PASS
			1000~26500	1.32	-40.67	≤ -28.68	PASS
	Ant2	2422	Reference	1.04	1.04	---	PASS
			30~1000	1.04	-61.95	≤ -28.96	PASS
			1000~26500	1.04	-40.9	≤ -28.96	PASS
	Ant1	2437	Reference	2.06	2.06	---	PASS
			30~1000	2.06	-60.32	≤ -27.94	PASS
			1000~26500	2.06	-41.62	≤ -27.94	PASS
	Ant2	2437	Reference	-0.83	-0.83	---	PASS
			30~1000	-0.83	-61.29	≤ -30.83	PASS
			1000~26500	-0.83	-41.01	≤ -30.83	PASS
	Ant1	2452	Reference	1.94	1.94	---	PASS
			30~1000	1.94	-62.14	≤ -28.06	PASS
			1000~26500	1.94	-40.38	≤ -28.06	PASS
	Ant2	2452	Reference	3.70	3.70	---	PASS
			30~1000	3.70	-61.83	≤ -26.3	PASS
			1000~26500	3.70	-40.52	≤ -26.3	PASS
11AX20MIMO	Ant1	2412	Reference	4.63	4.63	---	PASS
			30~1000	4.63	-60.99	≤ -25.37	PASS
			1000~26500	4.63	-41.82	≤ -25.37	PASS
	Ant2	2412	Reference	3.34	3.34	---	PASS
			30~1000	3.34	-61.58	≤ -26.66	PASS
			1000~26500	3.34	-41.13	≤ -26.66	PASS
	Ant1	2437	Reference	3.45	3.45	---	PASS
			30~1000	3.45	-61.54	≤ -26.55	PASS
			1000~26500	3.45	-40.61	≤ -26.55	PASS
	Ant2	2437	Reference	2.02	2.02	---	PASS
			30~1000	2.02	-61.46	≤ -27.98	PASS
			1000~26500	2.02	-41.47	≤ -27.98	PASS
	Ant1	2462	Reference	3.58	3.58	---	PASS
			30~1000	3.58	-62.04	≤ -26.42	PASS
			1000~26500	3.58	-40.6	≤ -26.42	PASS

11AX40MIMO	Ant2	2462	Reference	5.49	5.49	---	PASS
			30~1000	5.49	-61.75	≤ -24.51	PASS
			1000~26500	5.49	-40.98	≤ -24.51	PASS
	Ant1	2422	Reference	-1.46	-1.46	---	PASS
			30~1000	-1.46	-61.42	≤ -31.46	PASS
			1000~26500	-1.46	-41.34	≤ -31.46	PASS
	Ant2	2422	Reference	-5.63	-5.63	---	PASS
			30~1000	-5.63	-60.79	≤ -35.63	PASS
			1000~26500	-5.63	-40.58	≤ -35.63	PASS
	Ant1	2437	Reference	-2.90	-2.90	---	PASS
			30~1000	-2.90	-61.23	≤ -32.9	PASS
			1000~26500	-2.90	-40.67	≤ -32.9	PASS
	Ant2	2437	Reference	-4.67	-4.67	---	PASS
			30~1000	-4.67	-60.8	≤ -34.67	PASS
			1000~26500	-4.67	-41.23	≤ -34.67	PASS
	Ant1	2452	Reference	-3.46	-3.46	---	PASS
			30~1000	-3.46	-60.78	≤ -33.46	PASS
			1000~26500	-3.46	-40.93	≤ -33.46	PASS
	Ant2	2452	Reference	-4.83	-4.83	---	PASS
			30~1000	-4.83	-61.68	≤ -34.83	PASS
			1000~26500	-4.83	-40.76	≤ -34.83	PASS

Note: Offset=cable loss + Test system insertion loss

12.5. Original test data

Band edge:



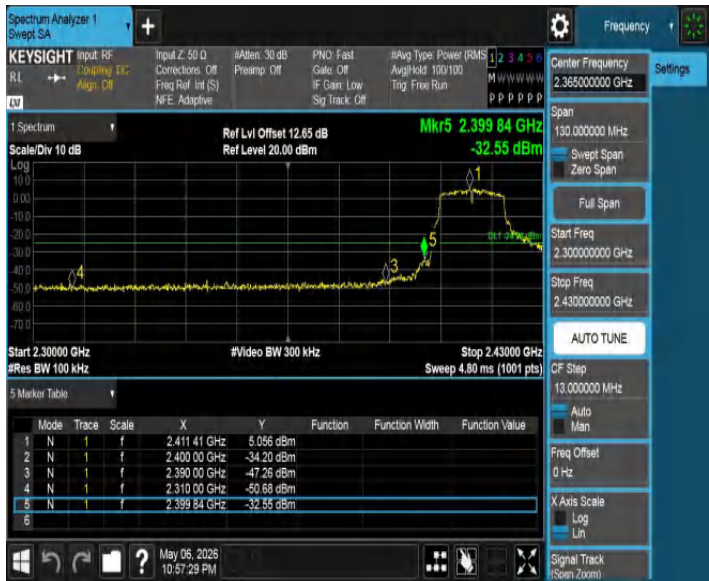
11B Ant2_High 2462



11G Ant1_Low 2412



11G Ant2_Low 2412



11G Ant1_High 2462



11G_Ant2_High_2462



11N20MIMO_Ant1_Low_2412



11N20MIMO_Ant2_Low_2412









11AX20MIMO_Ant2_High_2462



11AX40MIMO_Ant1_Low_2422



11AX40MIMO_Ant2_Low_2422



Spurious Emission:

11B_Ant1_2412_0~Reference

