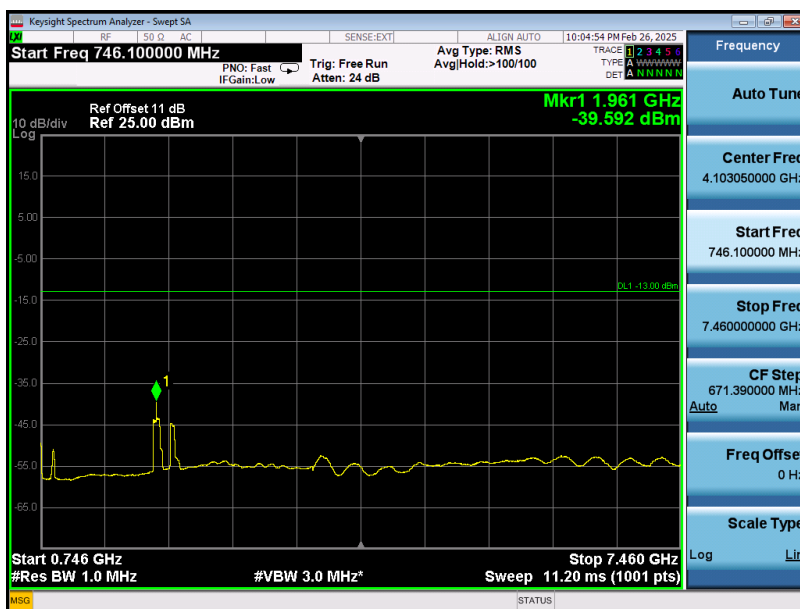
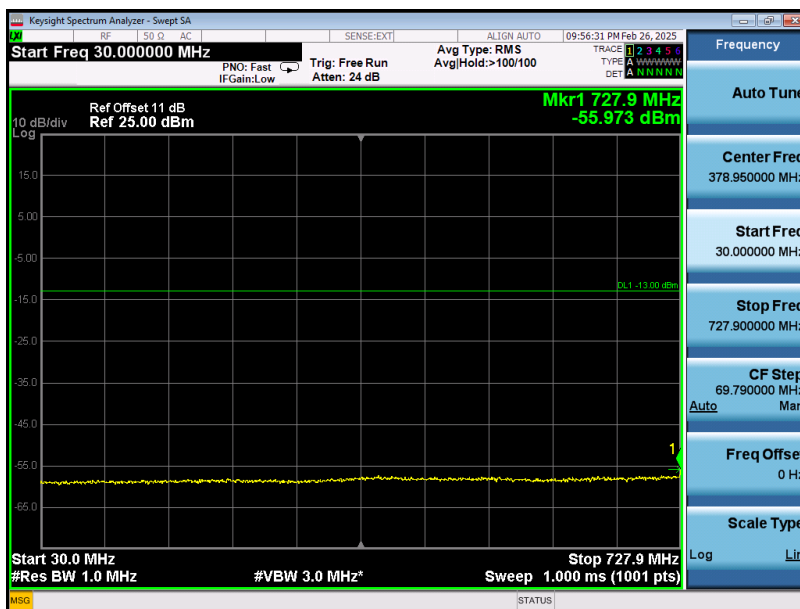


Conducted spurious emissions

DL_MT2

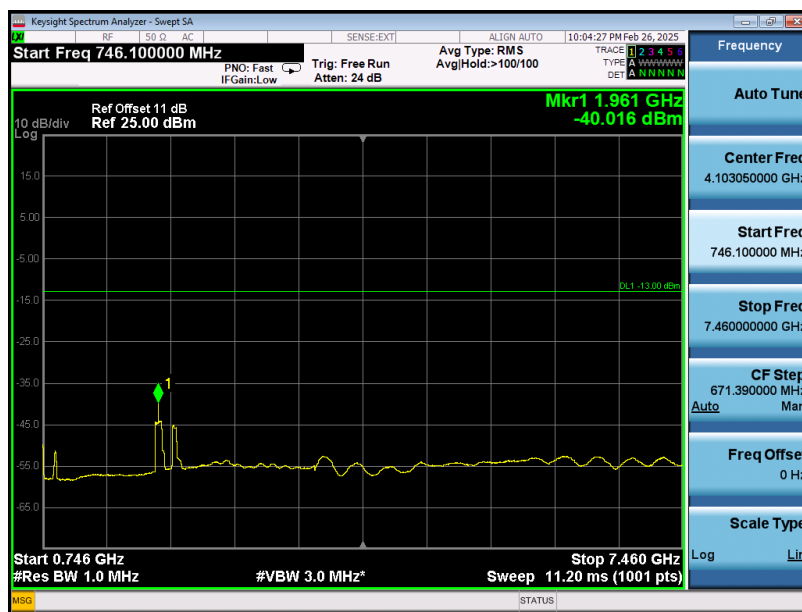
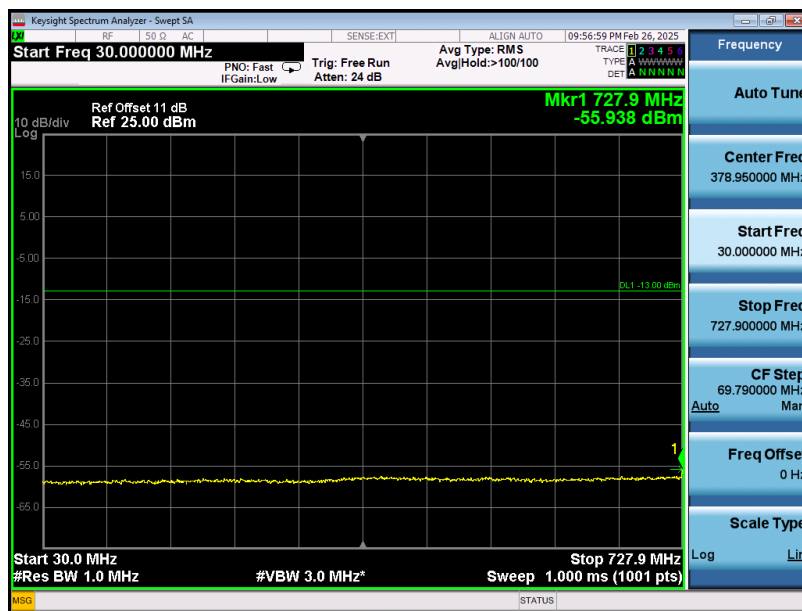


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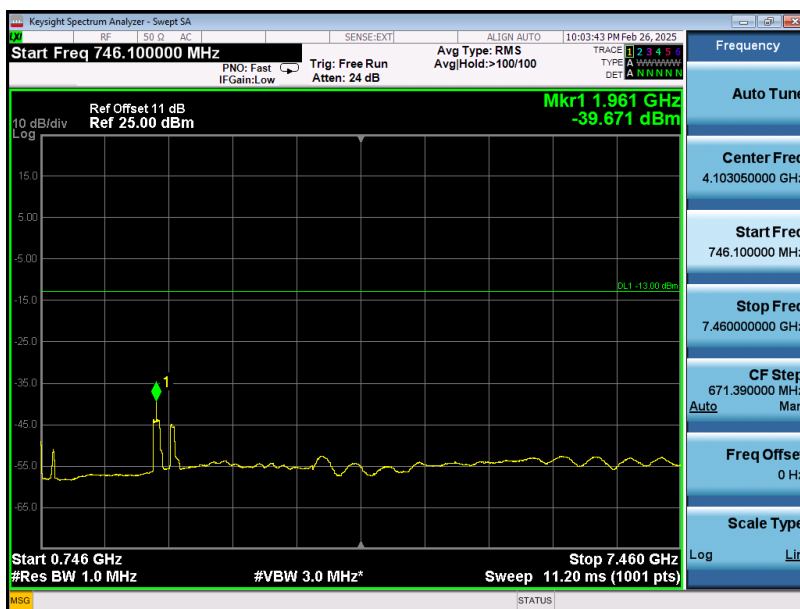
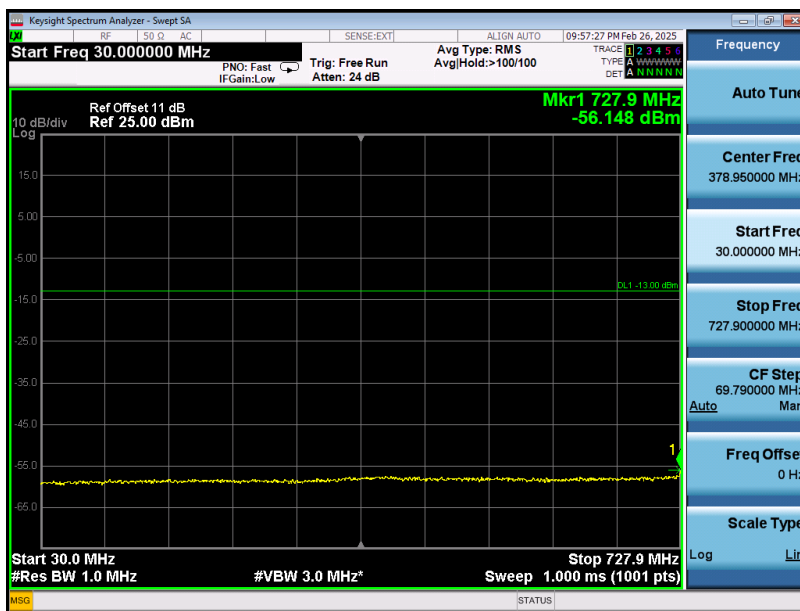
Conducted spurious emissions

DL_MT3



Conducted spurious emissions

DL_MT4

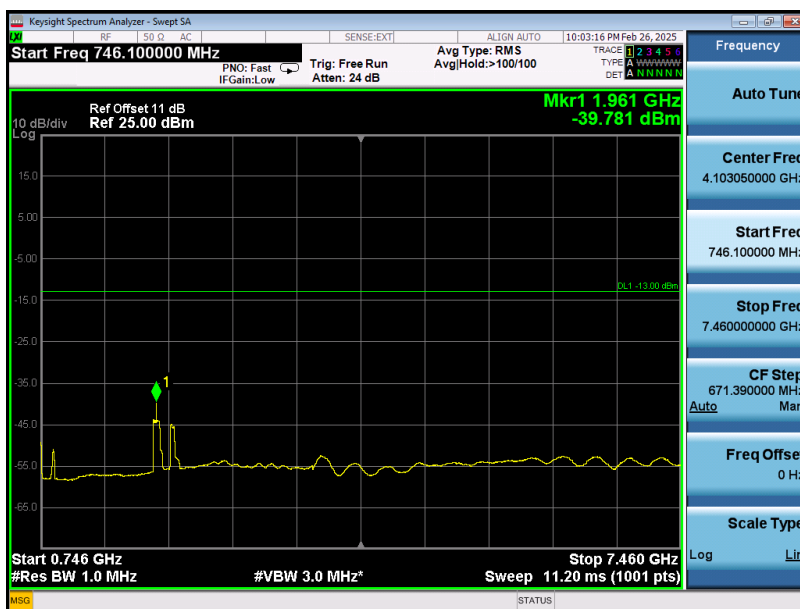
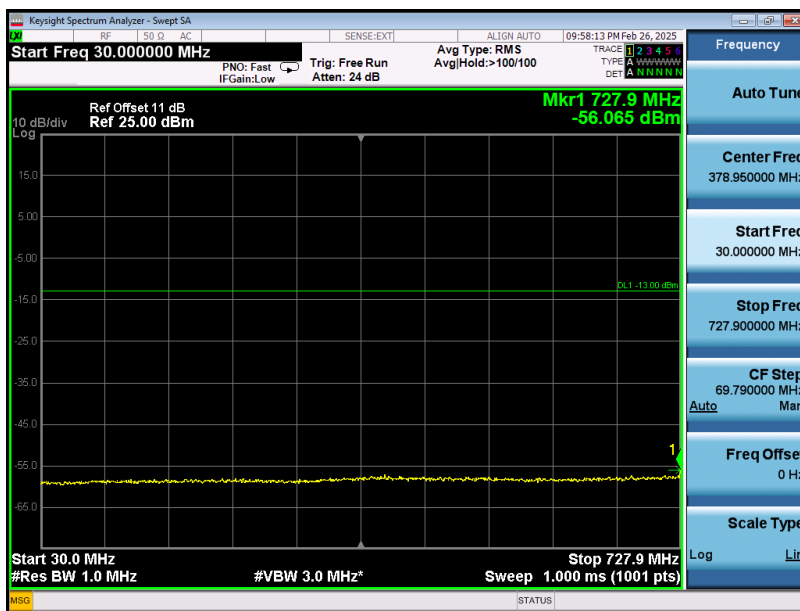


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Conducted spurious emissions

DL_MT5

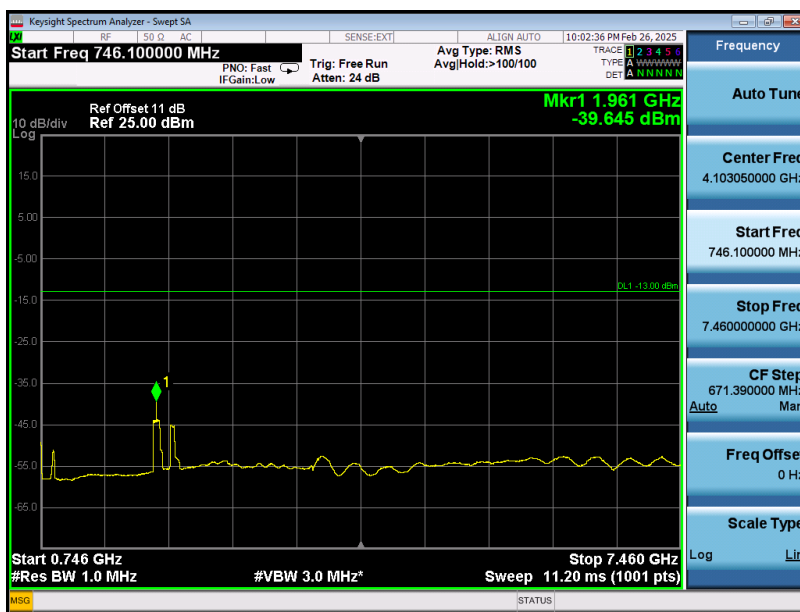
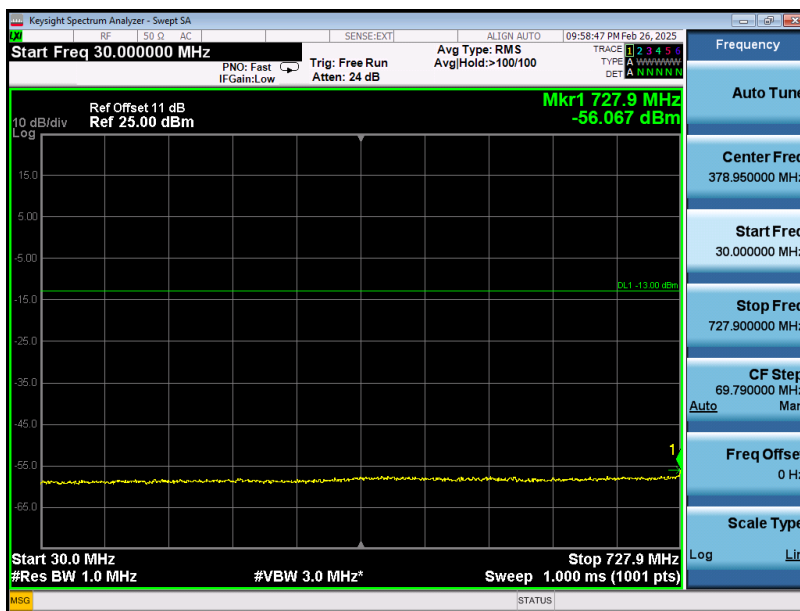


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Conducted spurious emissions

DL_MT6

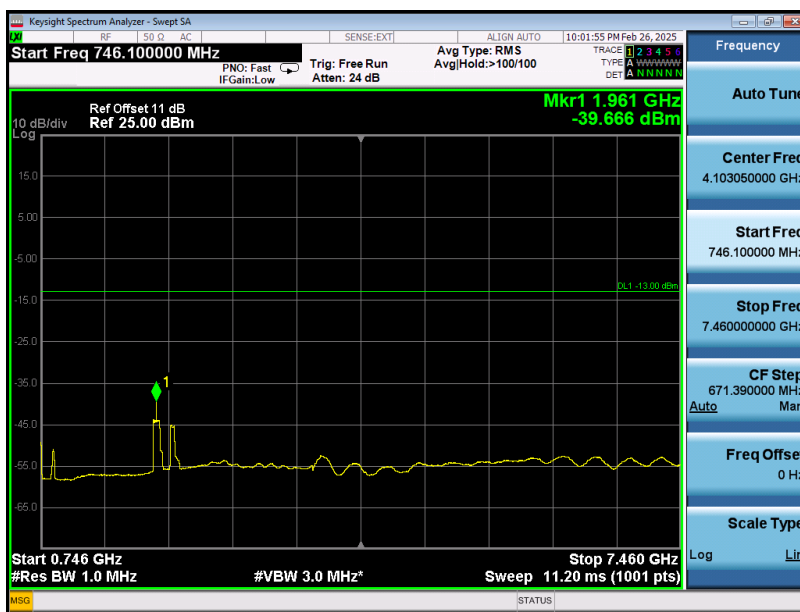
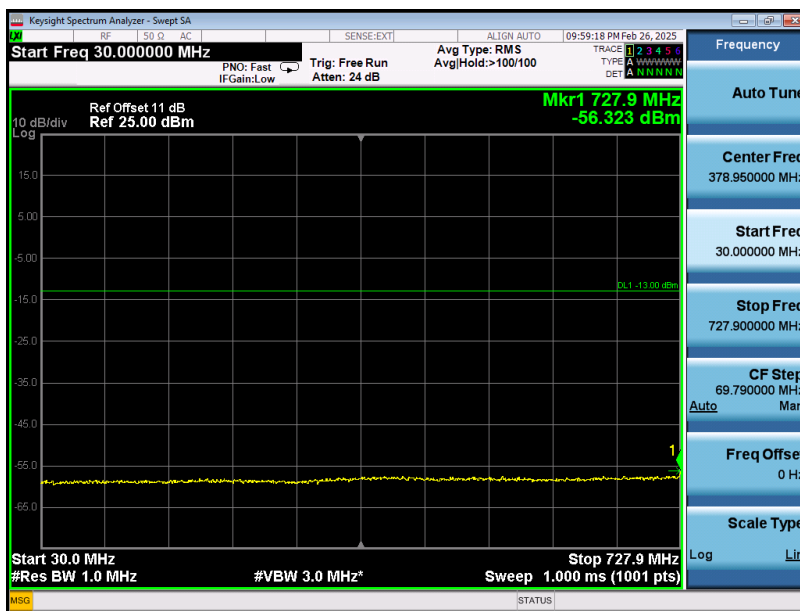


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Conducted spurious emissions

DL_MT7

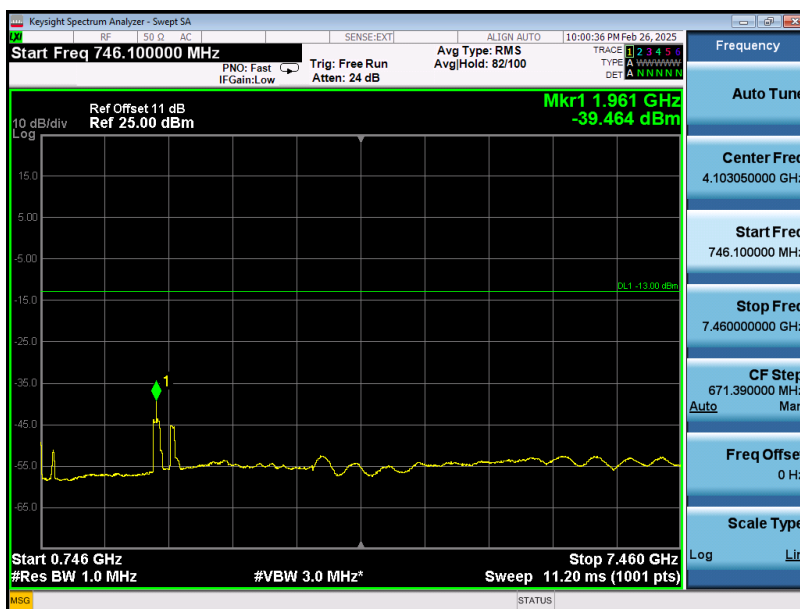
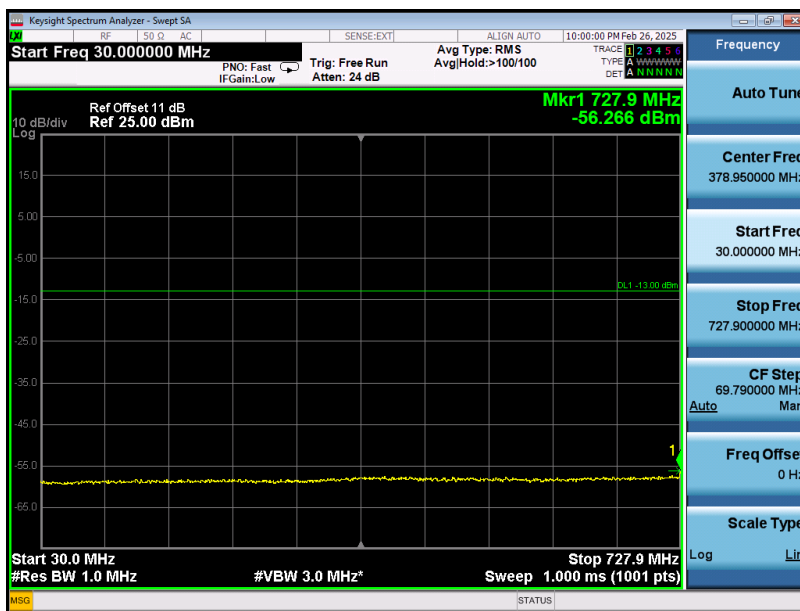


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Conducted spurious emissions

DL_MT7

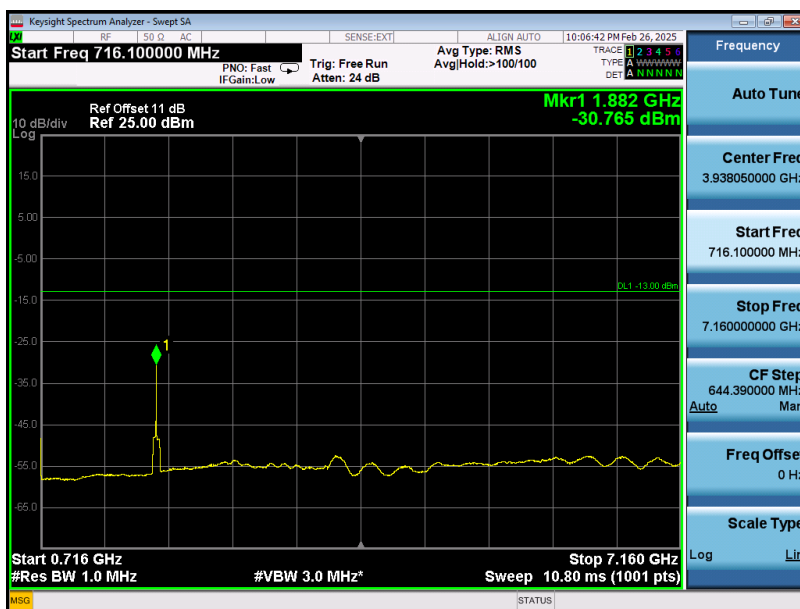
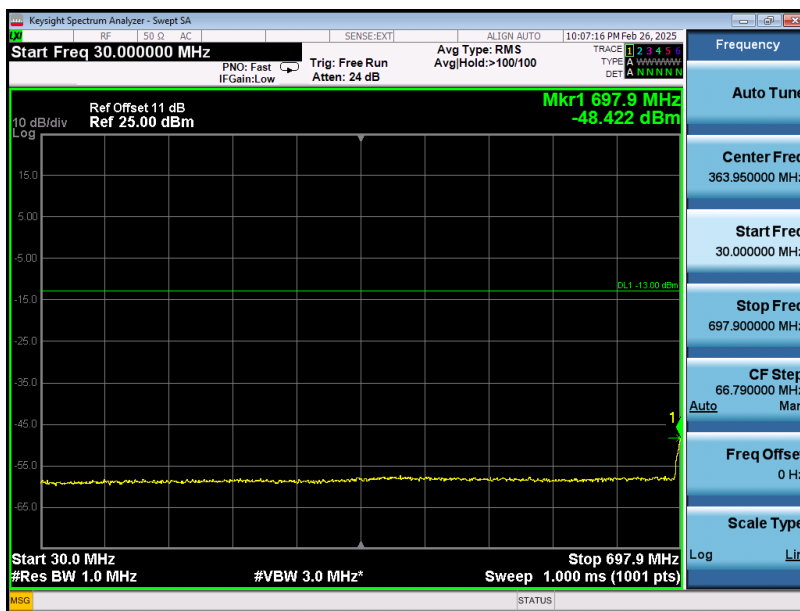


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Conducted spurious emissions

UL_DT



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8 Noise

8.1 Maximum transmitter noise power level

Maximum transmitter noise power level				
Test Path	Test Port	Noise Level (dBm/MHz)	Limit (dBm/MHz)	Verdict
DL	MT1	-49.73	≤-45.5	PASS
	MT2	-48.24	≤-45.5	PASS
	MT3	-48.98	≤-45.5	PASS
	MT4	-48.29	≤-45.5	PASS
	MT5	-49.04	≤-45.5	PASS
	MT6	-48.75	≤-45.5	PASS
	MT7	-49.40	≤-45.5	PASS
	MT8	-49.22	≤-45.5	PASS
Remark: The uplink mid-band frequency is 707MHz for Lower 700MHz, the maximum downlink noise limit is -102.5dBm/MHz+ 20 Log (707)= -45.5dBm/MHz.				

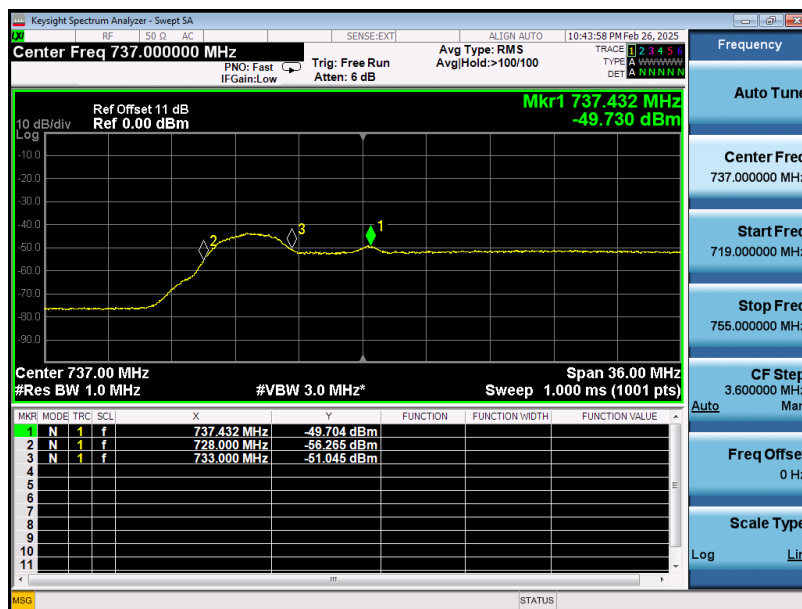


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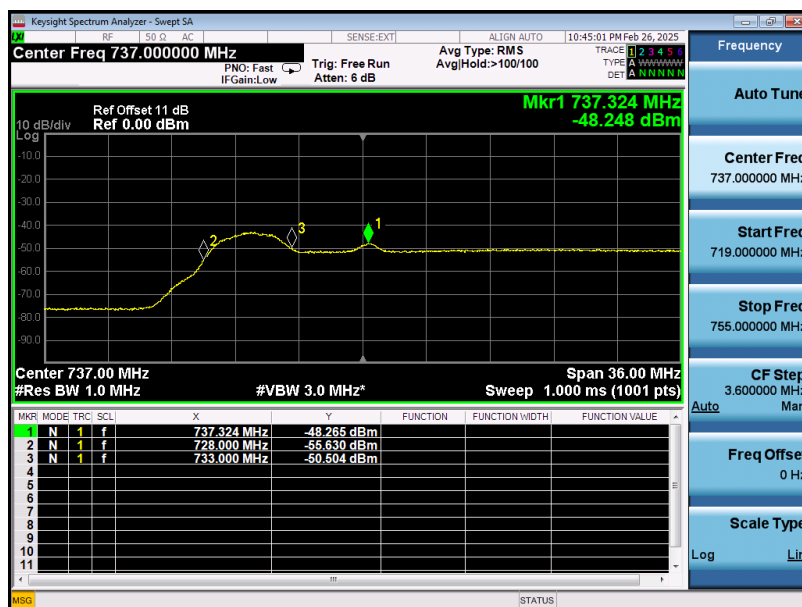
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Maximum transmitter Noise Power Level

DL_MT1



DL_MT2



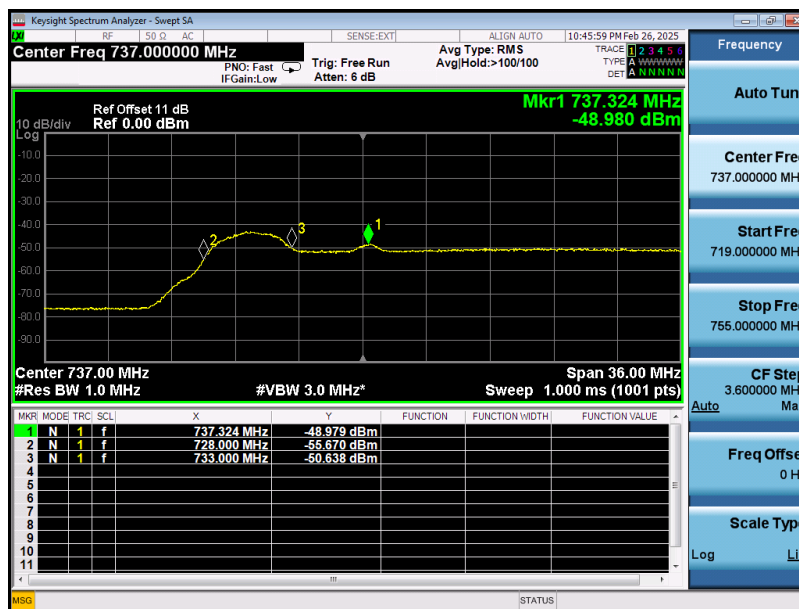
Remark:

Between Mkr 2 and Mkr 3 represents the authorized licensee spectrum block set for the EUT, the noise power within that does not need to be measured.

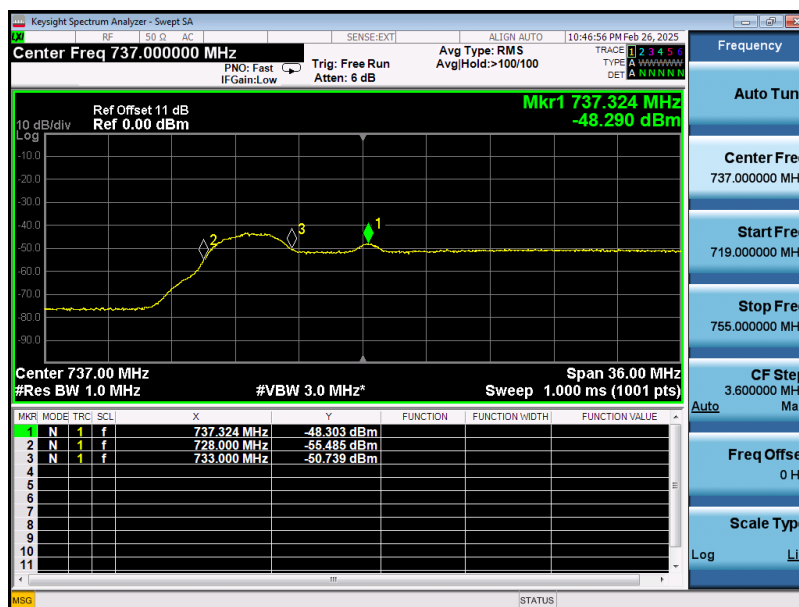


Maximum transmitter Noise Power Level

DL_MT3



DL_MT4



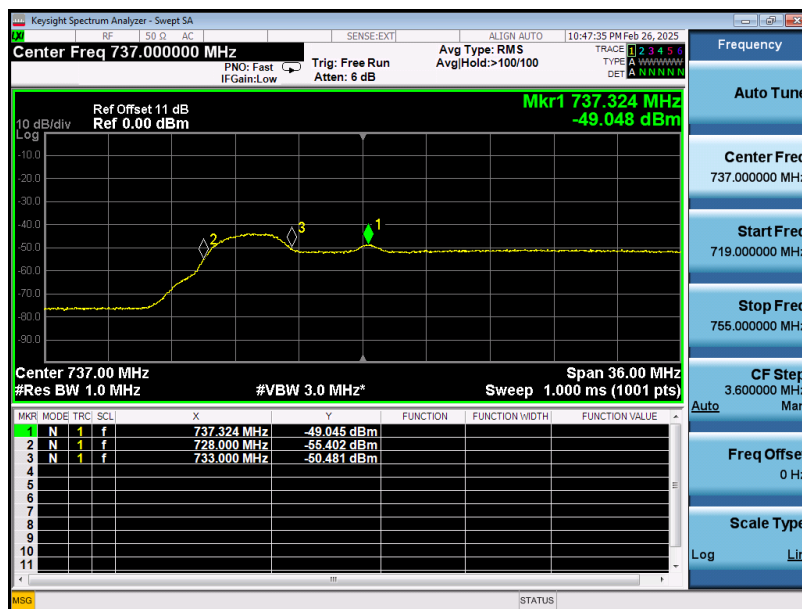
Remark:

Between Mkr 2 and Mkr 3 represents the authorized licensee spectrum block set for the EUT, the noise power within that does not need to be measured.

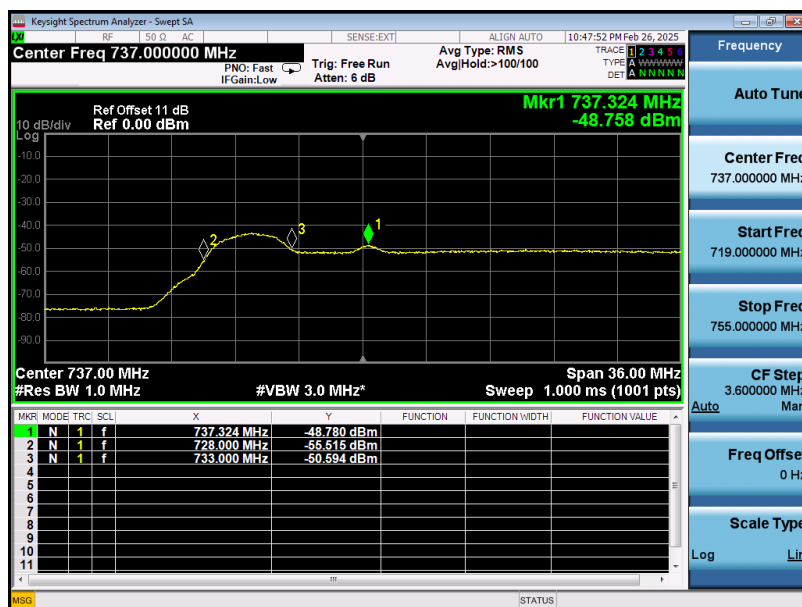


Maximum transmitter Noise Power Level

DL_MT5



DL_MT6



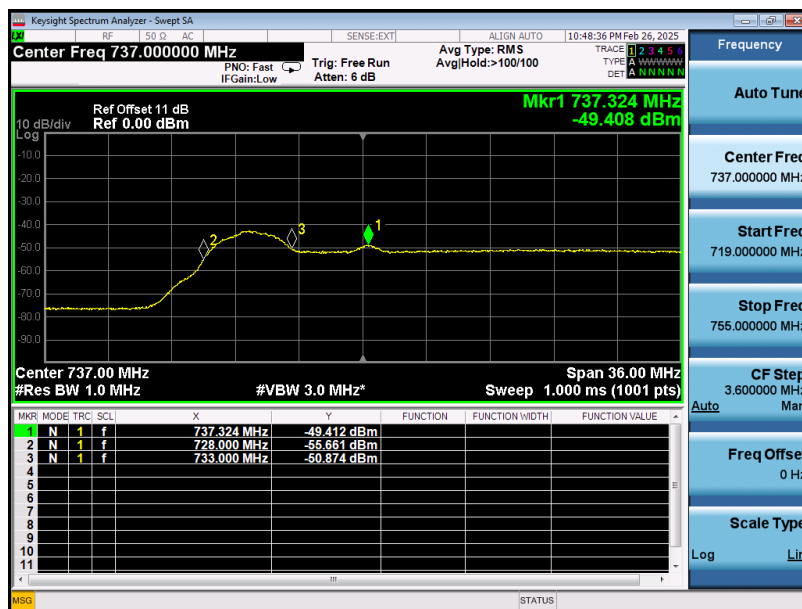
Remark:

Between Mkr 2 and Mkr 3 represents the authorized licensee spectrum block set for the EUT, the noise power within that does not need to be measured.

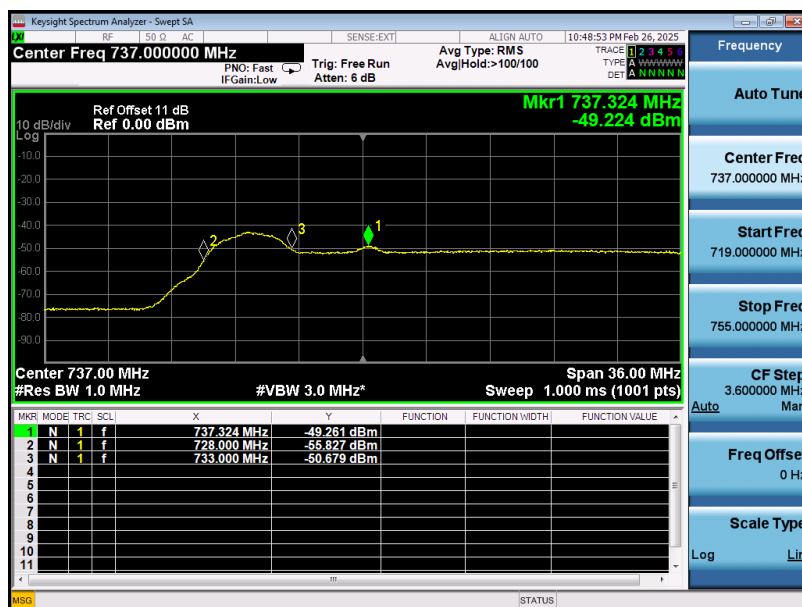


Maximum transmitter Noise Power Level

DL_MT7



DL_MT8



Remark:

Between Mkr 2 and Mkr 3 represents the authorized licensee spectrum block set for the EUT, the noise power within that does not need to be measured.



8.2 RSSI-dependent noise power level

20.21(e)(9)(i)(A) Noise Limits:

The transmitted noise power shall not exceed $-103 \text{ dBm/MHz-RSSI}$. Boosters with MSCL less than 40 dB, shall reduce the Noise output in (A) by 40 dB-MSCL, where MSCL is the minimum coupling loss in dB between the wireless device and booster's server port.

According to appendix B and the declaration from the manufacturer, the Lowest MSCL value can be calculated:

Band	f (MHz)	d (m)	Service ANT Gain (dBi)	Cable Loss (dB)	Min. MSCL (dB)
Lower 700MHz	698	1.5	9	-9	32.8

Therefore, the transmitted noise power shall not exceed $-103 \text{ dBm/MHz-RSSI}-(40\text{-MSCL})$

20.21(e)(9)(i)(I) Transmit Power Off Mode:

The uplink and downlink noise power shall not exceed -70 dBm/MHz in "Transmit Power OFF Mode".

KDB 935210 D04 appendix D figure D1 provider-specific consumer signal booster variable noise limits:

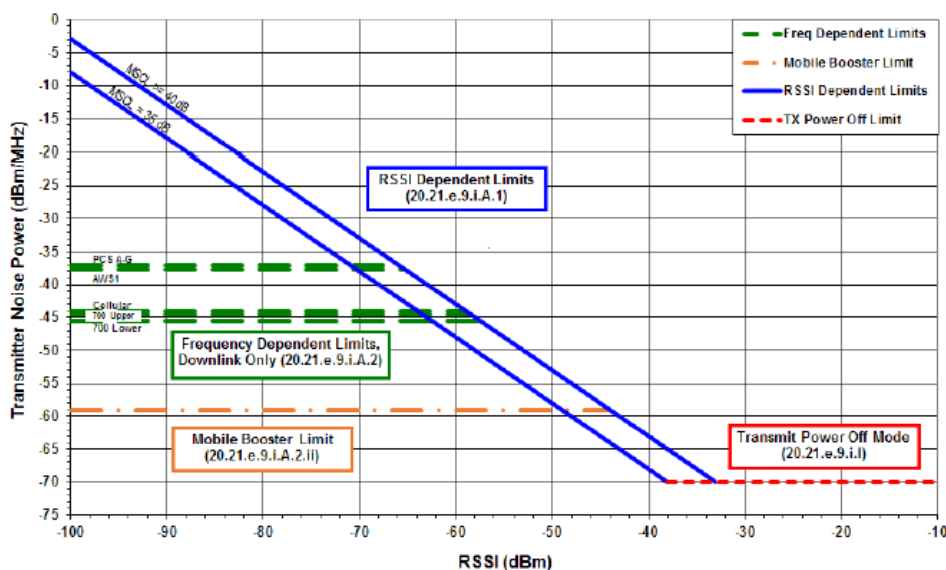


Figure D1 – Provider-specific consumer signal booster variable noise limits

Therefore, the RSSI-dependent region can be calculated as: -64.7 dBm to -40.2 dBm

RSSI-dependent noise power level					
Test Path	Test Port	RSSI (dBm)	Noise Level (dBm/MHz)	Limit (dBm/MHz)	Verdict
DL	MT2	-90	-48.24	≤-45.5	PASS
		-80	-49.21	≤-45.5	PASS
		-70	-50.05	≤-45.5	PASS
		-60	-54.32	≤-50.2	PASS
		-54	-56.91	≤-56.2	PASS
		-42	-70.75	≤-68.2	PASS
UL	DT	-90	-47.53	≤-45.5	PASS
		-80	-48.03	≤-45.5	PASS
		-70	-48.63	≤-45.5	PASS
		-60	-51.33	≤-50.2	PASS
		-54	-57.75	≤-56.2	PASS
		-42	-70.05	≤-68.2	PASS



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8.3 Variable noise response time

Variable noise response time				
Test Path	Test Port	Time (s)	Limit (s)	Verdict
DL	MT2	0.03	≤3	PASS
UL	DT	0.04	≤3	PASS



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Variable noise response time

DL



UL



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9 Uplink inactivity

Uplink Inactivity						
Test Path	Test Port	Time (s)	limit (s)	Noise Level (dBm/MHz)	Limit (dBm/MHz)	Verdict
UL	DT	0.09	≤5	-76.09	≤-70	PASS

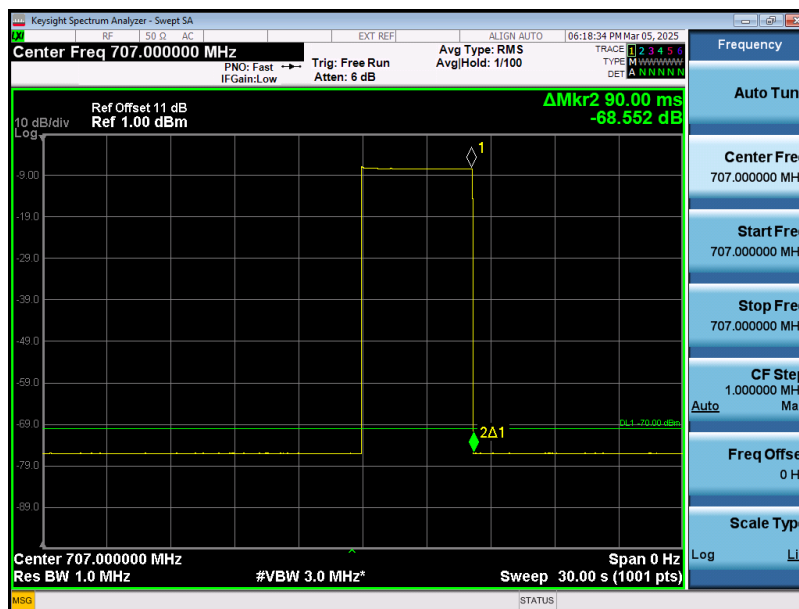


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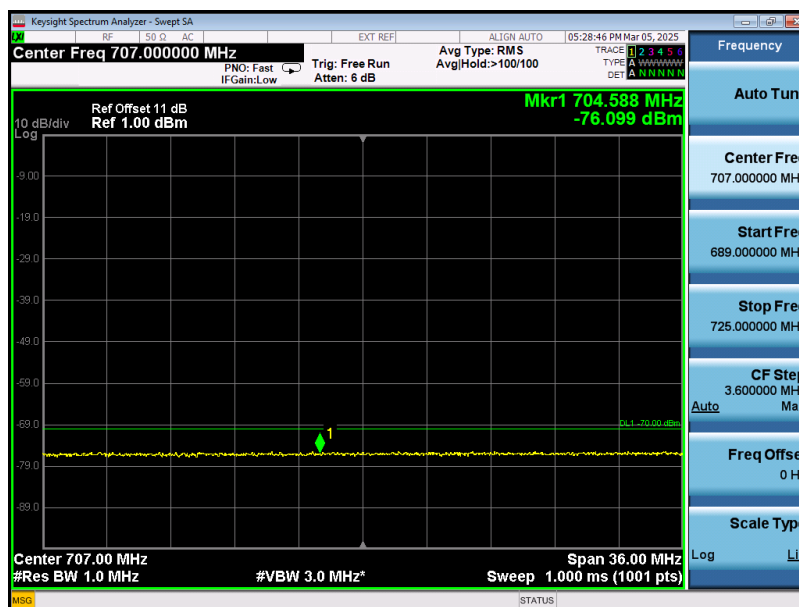
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Uplink inactivity

UL_Time



UL_Noise power



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10 Variable booster gain

10.1 Variable gain

20.21(e)(9)(i)(C)(1) *Booster Gain Limits:*

The uplink and downlink gain in dB of a frequency selective consumer booster referenced to its input and output ports shall not exceed BSCL-28 dB-(40 dB-MSCL).

20.21(e)(9)(i)(I) *Transmit Power Off Mode:*

The uplink gain shall not exceed the lesser of 23 dB or MSCL in "Transmit Power OFF Mode".

KDB 935210 D04 appendix D figure D2 provider-specific consumer signal booster variable gain limits:

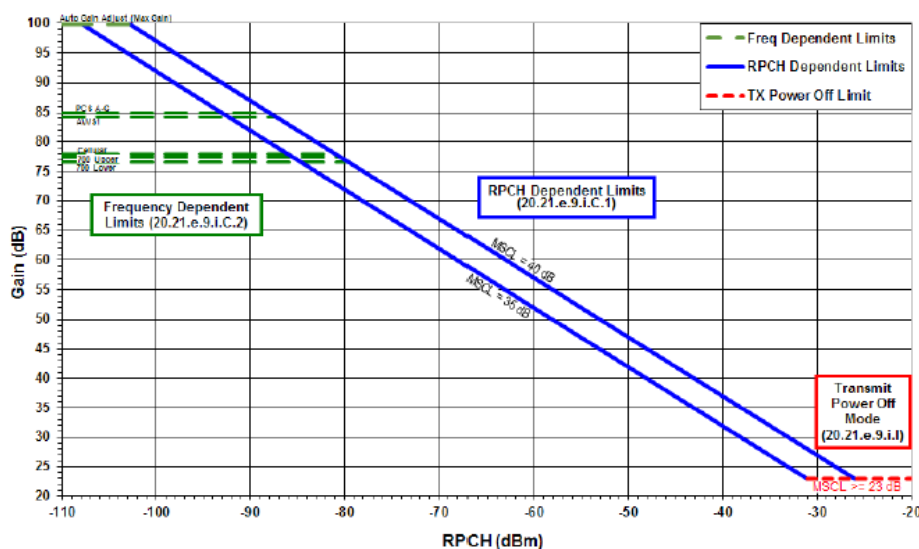


Figure D2 – Provider-specific consumer signal booster variable gain limits

According to appendix B and the declaration from the manufacturer, the Lowest MSCL value can be calculated:

Band	f (MHz)	d (m)	Service ANT Gain (dBi)	Cable Loss (dB)	Min. MSCL (dB)
Lower 700MHz	698	1.5	9	-9	32.8

Therefore, the RSSI-dependent region can be calculated as (RPCH): -110.2dBm to -33.2dBm

Variable Gain							
Test Path	Test Port	RPCH (dBm)	BSCL (dBm)	P _{out} (dBm)	Gain (dB)	Limit (dB)	Verdict
DL	MT6	-90	115	-20.12	69.88	≤79.8	PASS
		-82	107	-12.12	69.88	≤71.8	PASS
		-50	75	-11.78	38.22	≤39.8	PASS
		-42	67	-5.36	36.64	≤31.8	PASS
		-30	55	/	/	≤23	PASS
		-20	45	/	/	≤23	PASS
UL	DT	-90	115	13.00	64.50	≤79.8	PASS
		-82	107	13.00	64.50	≤71.8	PASS
		-50	75	-19.05	32.45	≤39.8	PASS
		-42	67	-21.76	29.74	≤31.8	PASS
		-30	55	/	/	≤23	PASS
		-20	45	/	/	≤23	PASS
Remark: 1. "/" presents the EUT shut down. It can demonstrate compliance to the gain limit because the EUT lost amplification ability when it was in shutdown mode. 2. For UL, the input signal levels were set to -51.5dBm.							



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10.2 Variable gain timing

Variable Uplink Gain Timing				
Test Path	Test Port	Time (s)	Limit (s)	Verdict
UL	DT	0.050	≤3	PASS



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11 Occupied bandwidth

Occupied Bandwidth				
Path	Test Port	Test Channel	Input Signal	Verdict
DL	MT1	Middle	GSM	PASS
			1.25MHz AWGN	PASS
			4.1MHz AWGN	PASS
UL	DT	Middle	GSM	PASS
			1.25MHz AWGN	PASS
			4.1MHz AWGN	PASS
Remark: Compare the spectral plot of the input signal to the output signal affirm that they are similar (in passband and roll off characteristic features and relative spectral locations). The test result complies with the requirement.				



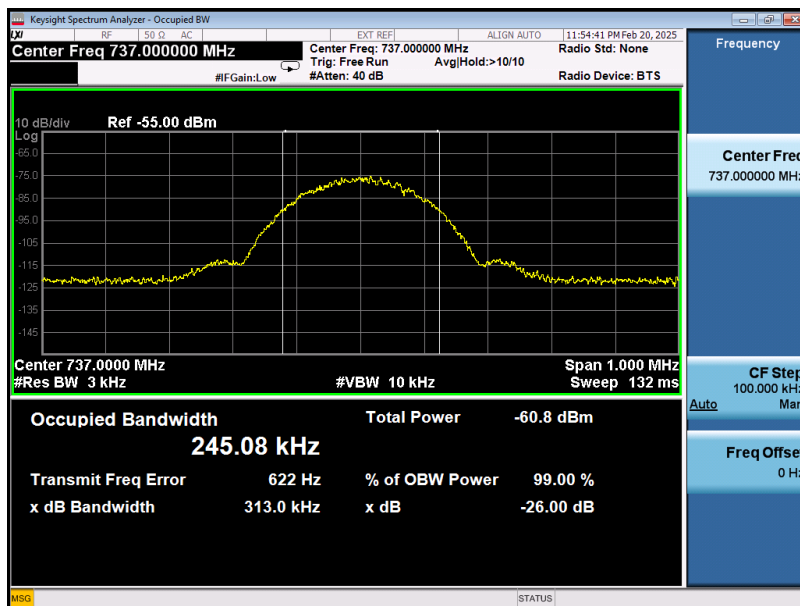
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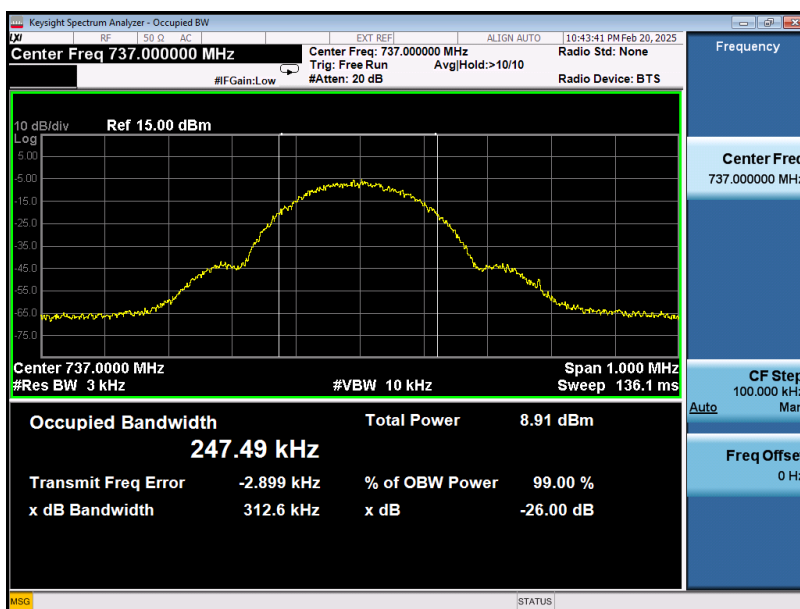
Occupied bandwidth

DL_Middle channel_GSM signal type

Input



Output



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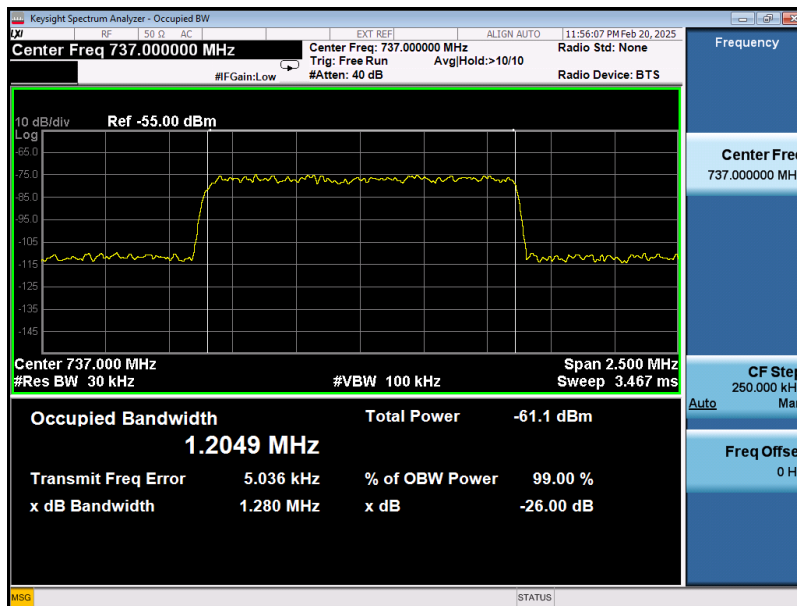
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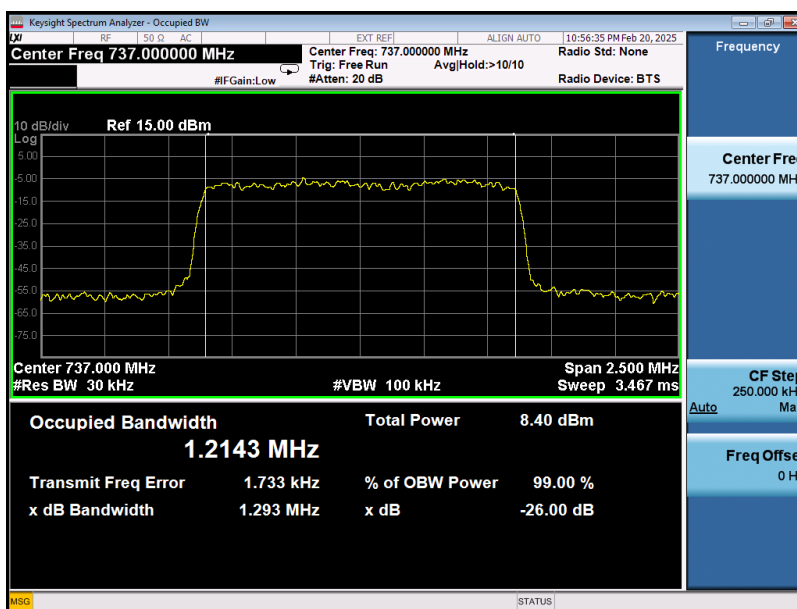
Occupied bandwidth

DL_Middle channel_1.25MHz AWGN signal type

Input



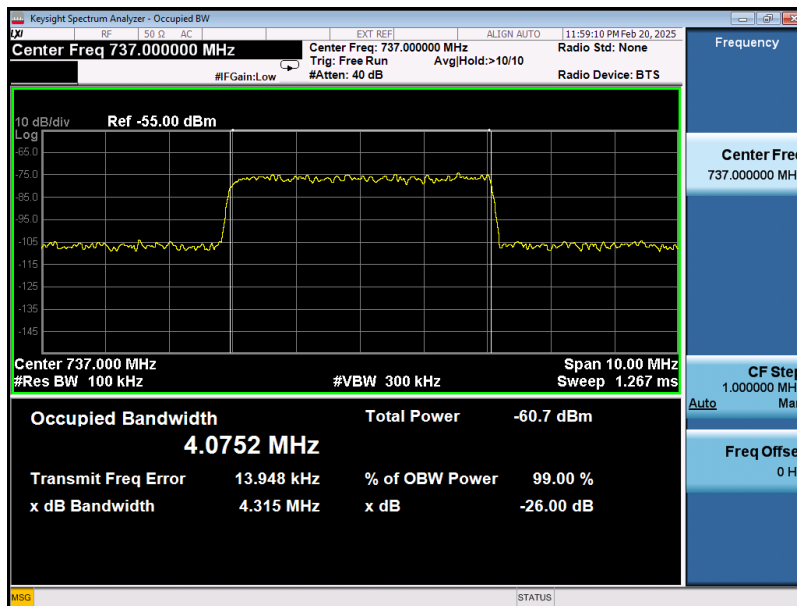
Output



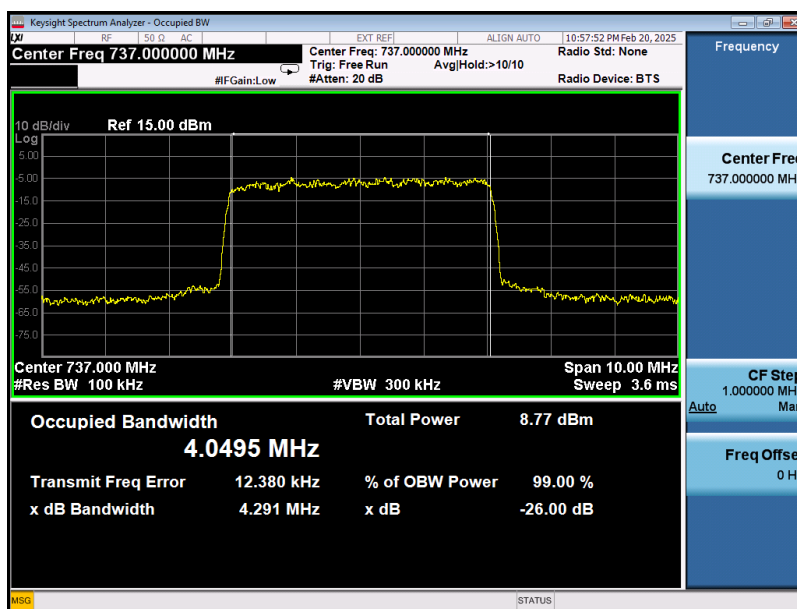
Occupied bandwidth

DL_Middle channel_4.1MHz AWGN signal type

Input



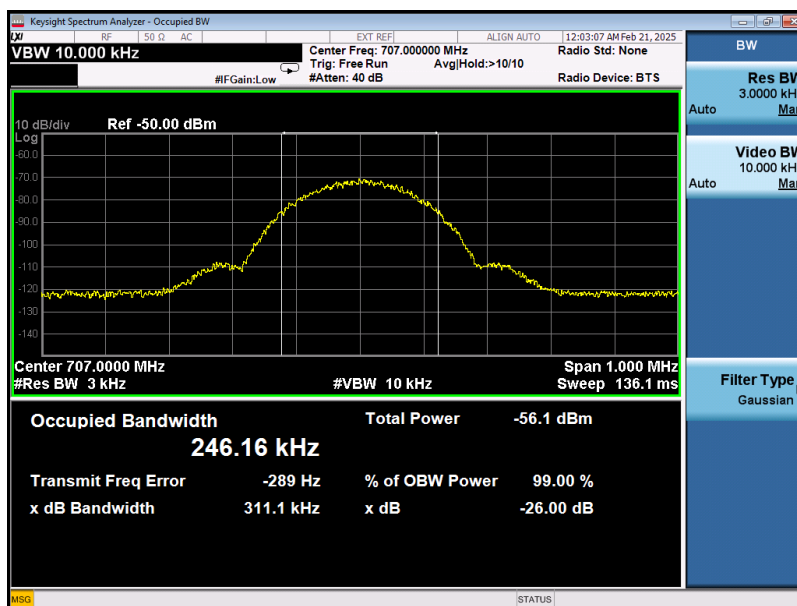
Output



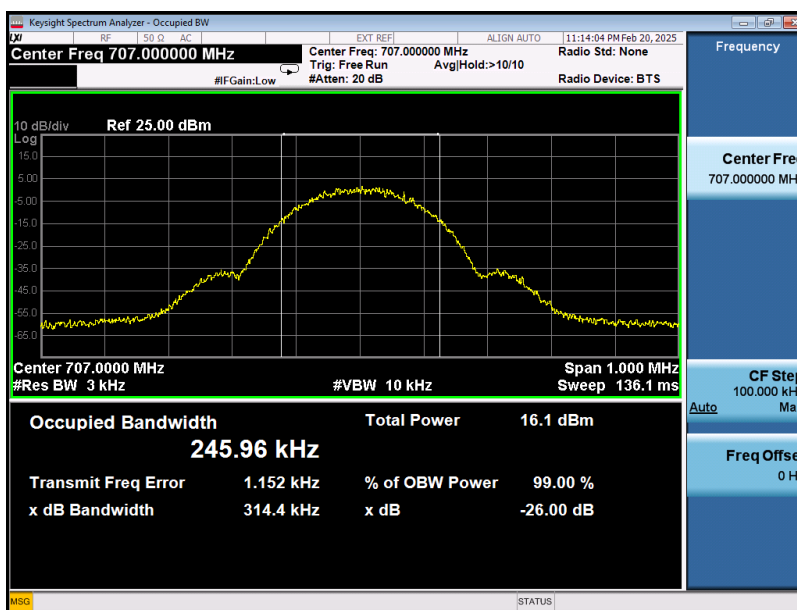
Occupied bandwidth

UL_Middle channel_GSM signal type

Input



Output



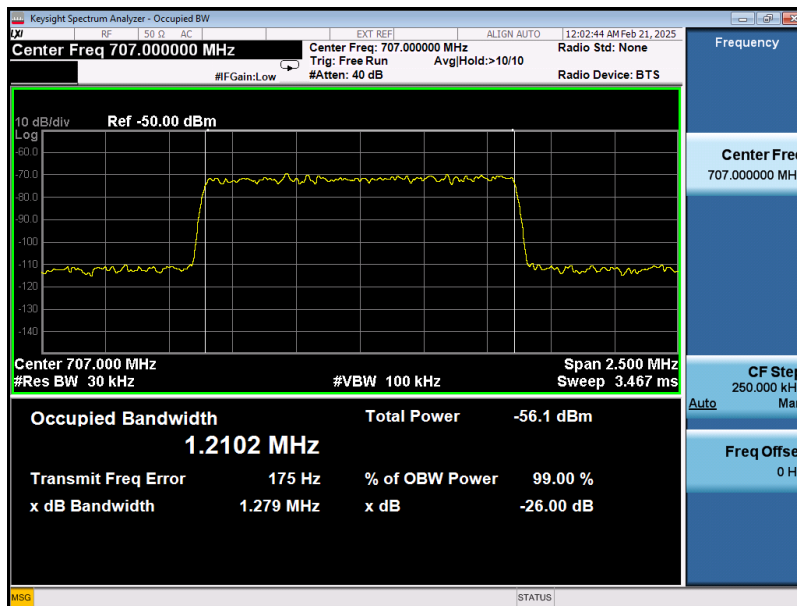
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Occupied bandwidth

UL_Middle channel_1.25MHz AWGN signal type

Input



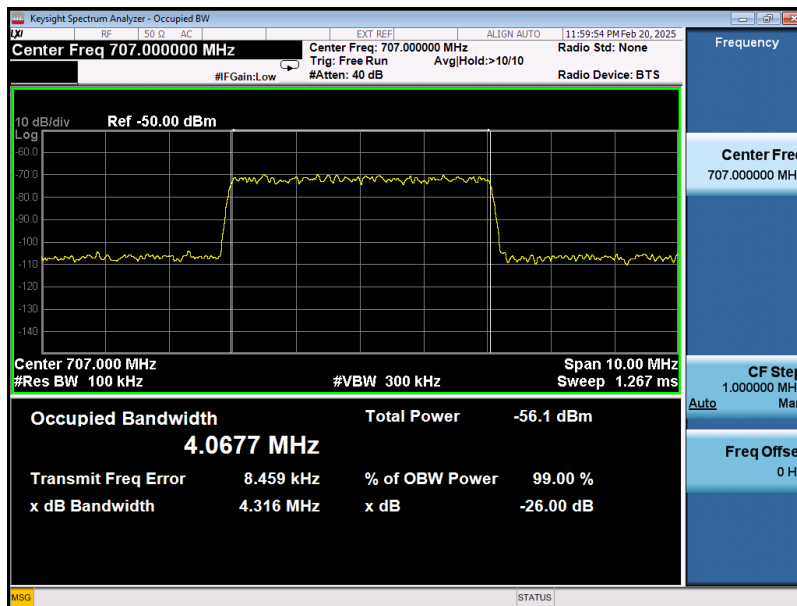
Output



Occupied bandwidth

UL_Middle channel_4.1MHz AWGN signal type

Input



Output



12 Oscillation detection

12.1 Oscillation detection

Oscillation Detection									
Test Path	Test Port	Mitigation Time (s)	Limit (s)	Oscillation Level (dBm)	Number of Restart	Limit	Restart time (s)	Limit (s)	Verdict
DL	MT1	0.580	≤1	-2.78	0	≤5	/	≥60	PASS
	MT2	0.235		-5.98	0		/		PASS
	MT3	0.225		-0.08	0		/		PASS
	MT4	0.240		-2.54	0		/		PASS
	MT5	0.295		-7.93	0		/		PASS
	MT6	0.230		-0.71	0		/		PASS
	MT7	0.270		-0.59	0		/		PASS
	MT8	0.295		-2.90	0		/		PASS
UL	DT	0.035	≤0.3	-1.22	0	≤5	/	≥60	PASS

Remark:
The EUT will not restart after oscillation detection and mitigation. It can demonstrate compliance to the restart limit without restart time testing.

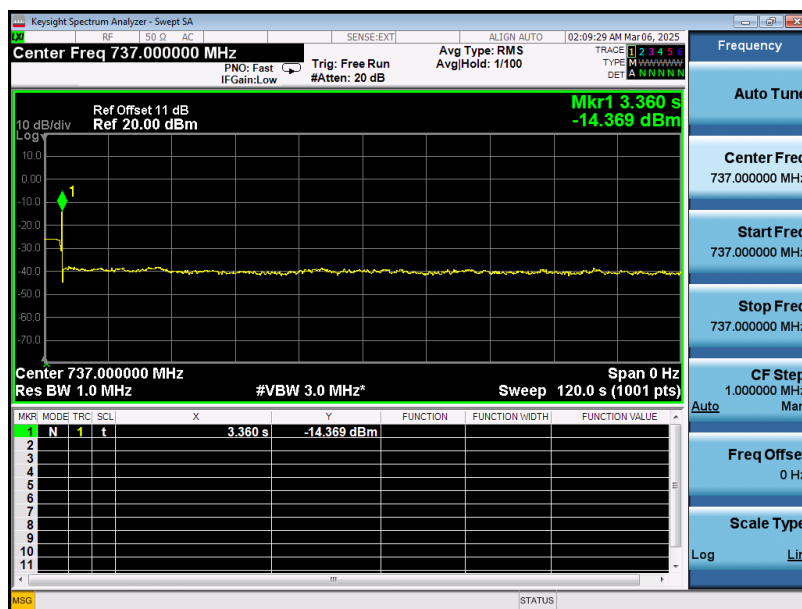
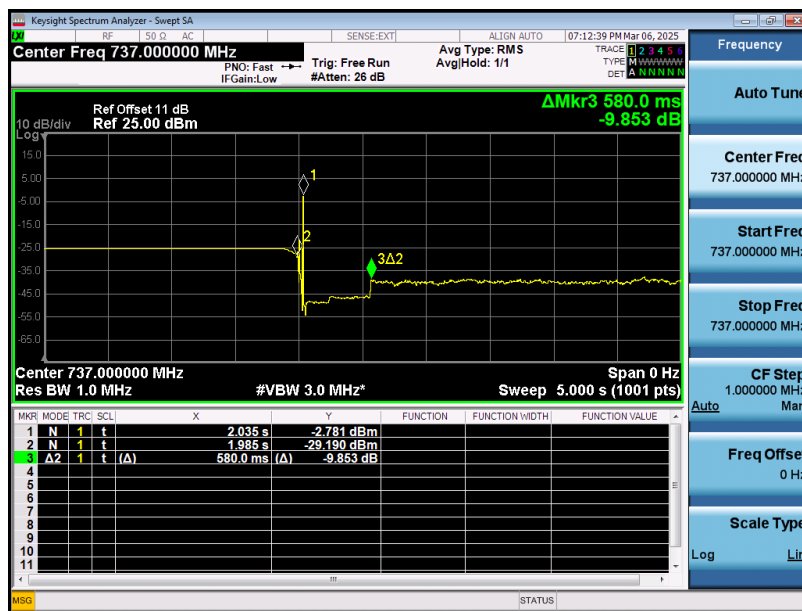


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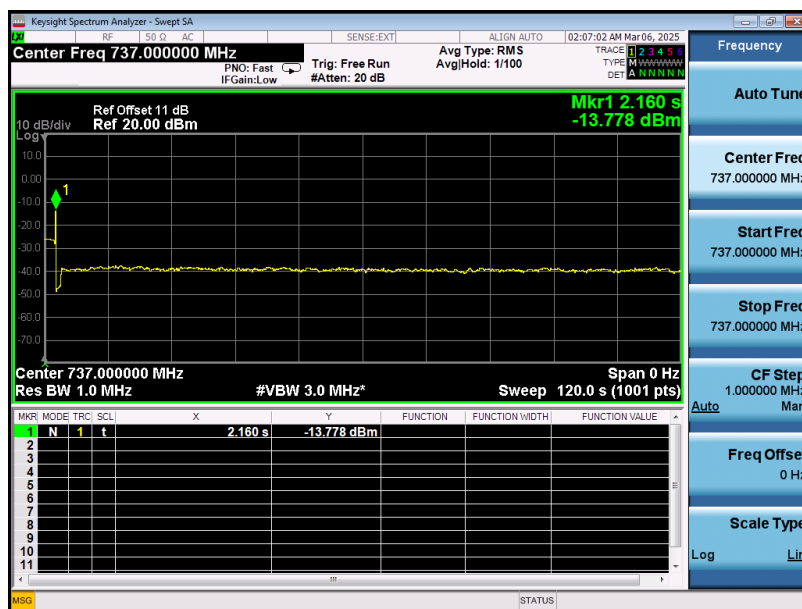
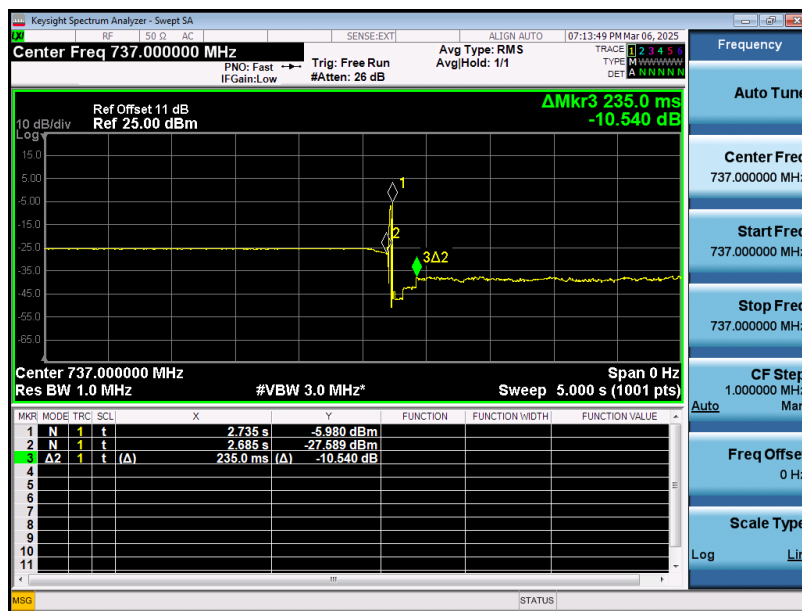
Oscillation detection

DL_MT1



Oscillation detection

DL_MT2



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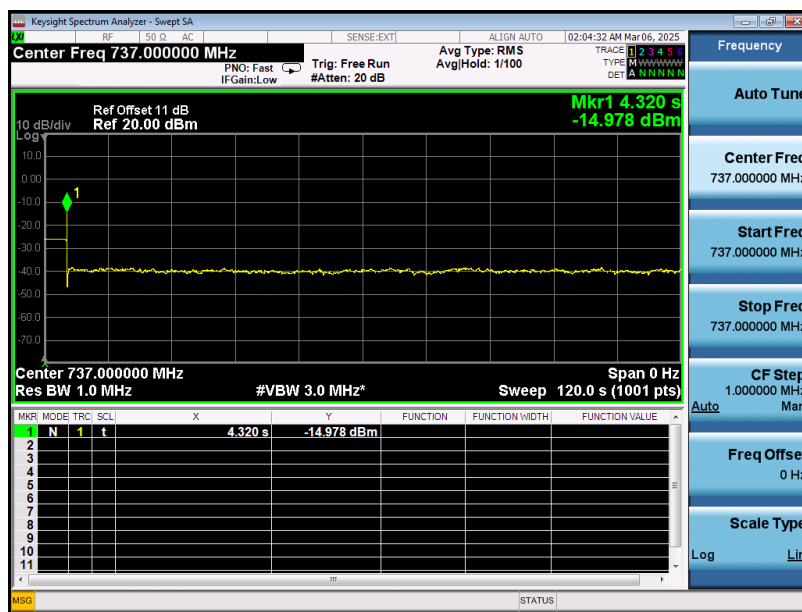
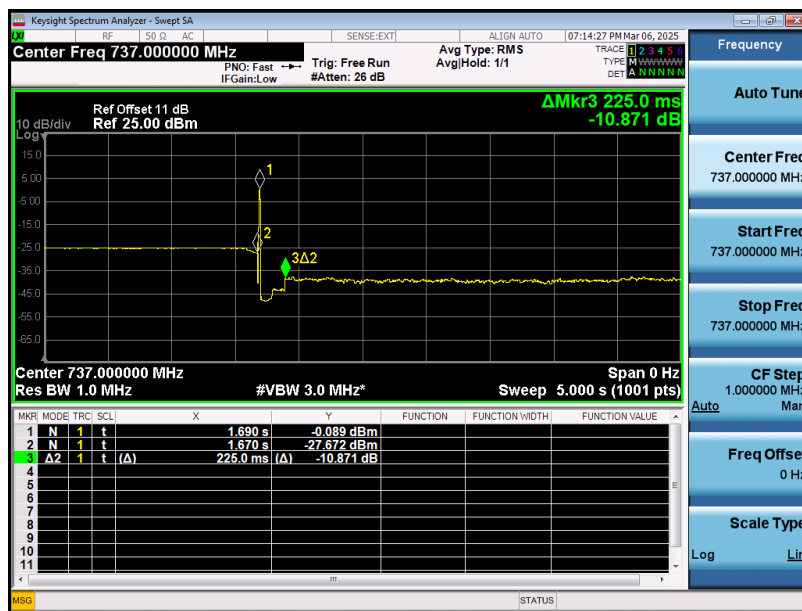
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Oscillation detection

DL_MT3



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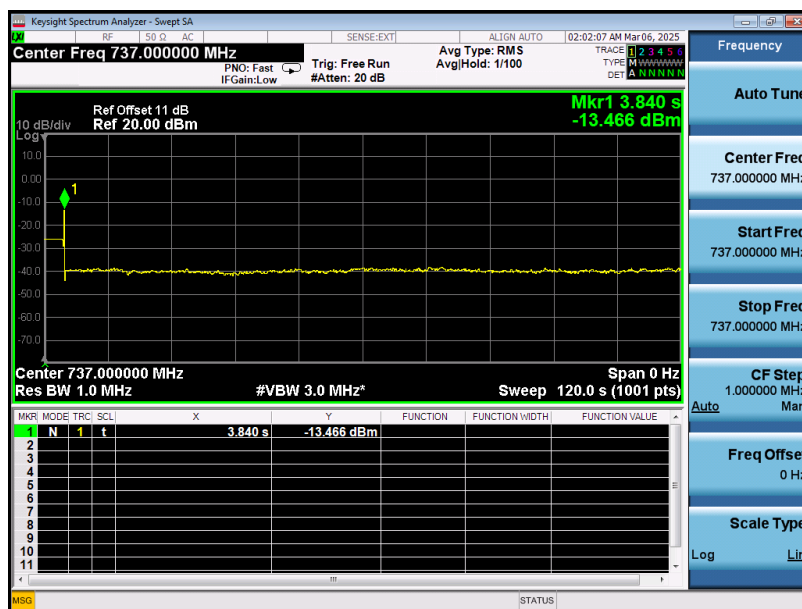
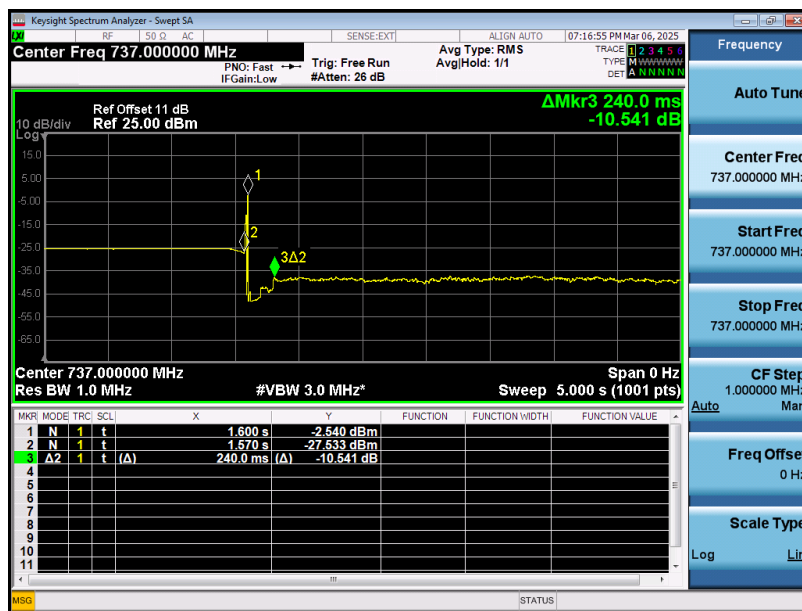
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Oscillation detection

DL_MT4



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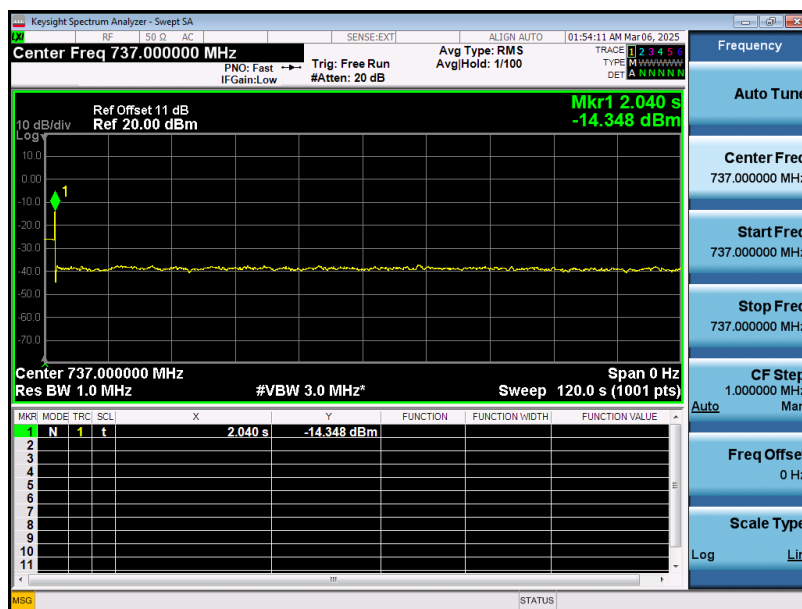
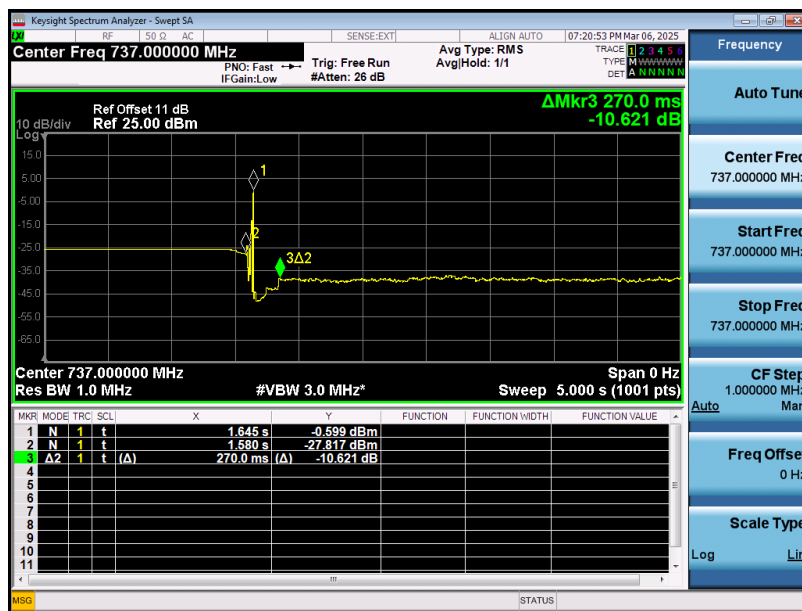
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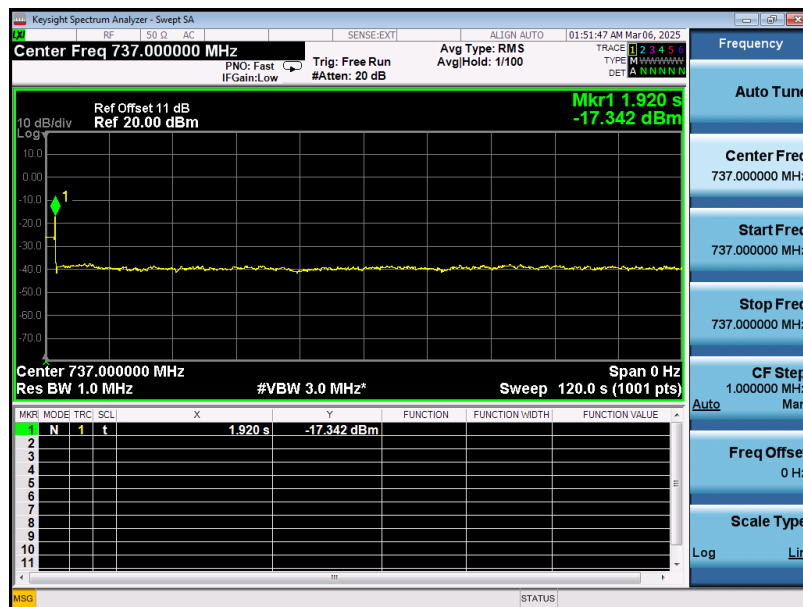
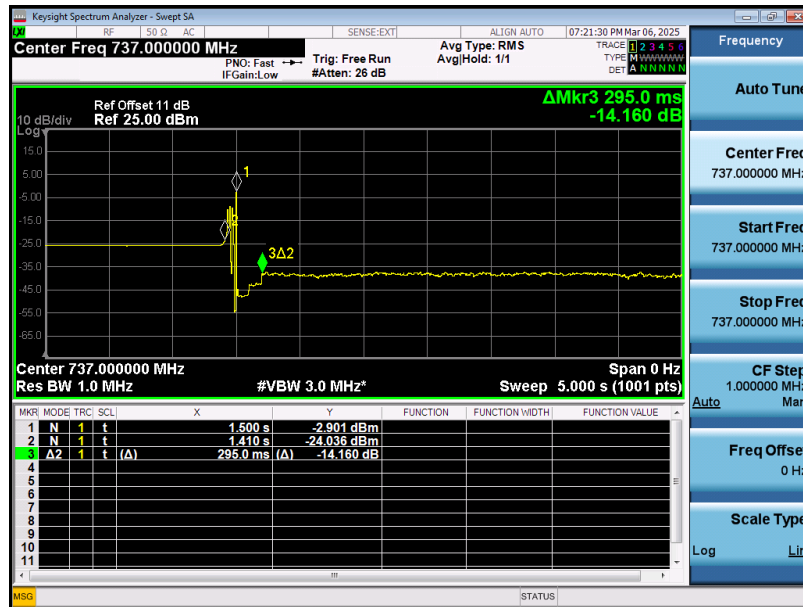
Oscillation detection

DL_MT7



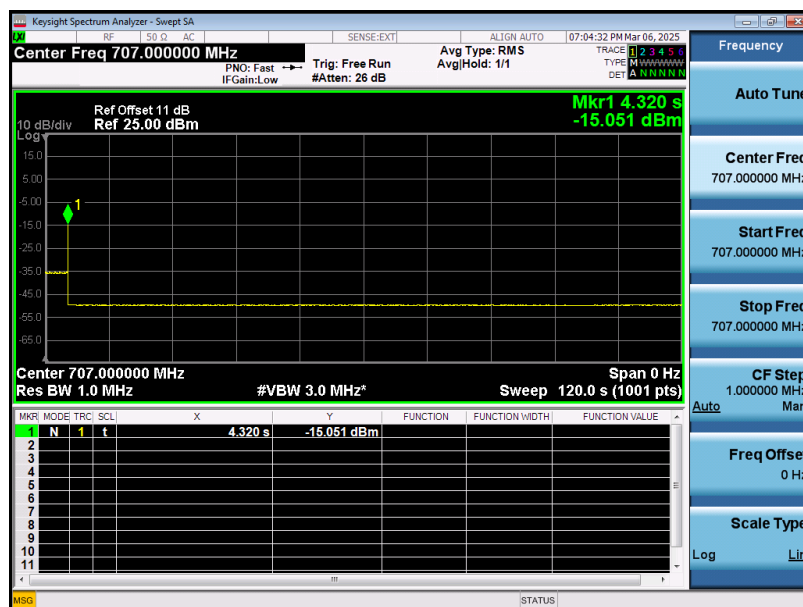
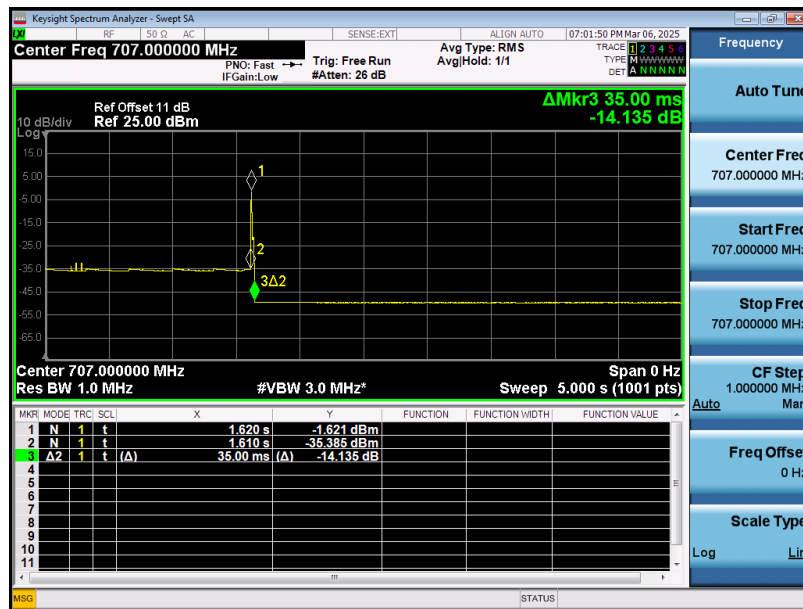
Oscillation detection

DL_MT8



Oscillation detection

UL_DT



12.2 Oscillation mitigation or shutdown

Oscillation Mitigation or Shutdown							
Test Path	Test Port	Isolation (dB)	Oscillation Level				Verdict
			Highest level (dBm)	Lowest level (dBm)	Difference (dB)	Limit (dB)	
DL	MT1	75.75	-4.34	-8.34	4.00	≤12	PASS
		74.75	-2.24	-8.02	5.78		PASS
		73.75	-2.03	-7.43	5.40		PASS
		72.75	-0.84	-4.58	3.74		PASS
		71.75	1.43	-1.24	2.67		PASS
		70.75	3.74	-0.73	4.47		PASS
		69.75	4.44	-1.23	5.67		PASS
		68.75	/	/	/		PASS
		67.75	/	/	/		PASS
		66.75	/	/	/		PASS
		65.75	/	/	/		PASS
	MT2	75.36	-7.65	-11.34	3.69	≤12	PASS
		74.36	-4.58	-9.32	4.74		PASS
		73.36	-3.12	-7.32	4.20		PASS
		72.36	-0.74	-6.32	5.58		PASS
		71.36	1.43	-4.37	5.80		PASS
		70.36	3.32	-1.43	4.75		PASS
		69.36	5.84	-0.47	6.31		PASS
		68.36	/	/	/		PASS
		67.36	/	/	/		PASS
		66.36	/	/	/		PASS
		65.36	/	/	/		PASS
Remark: “/” presents the EUT shut down.							



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Oscillation Mitigation or Shutdown							
Test Path	Test Port	Isolation (dB)	Oscillation Level				Verdict
			Highest level (dBm)	Lowest level (dBm)	Difference (dB)	Limit (dB)	
DL	MT3	75.55	-0.84	-4.32	3.48	≤12	PASS
		74.55	1.32	-3.32	4.64		PASS
		73.55	3.57	0.23	3.34		PASS
		72.55	5.63	0.54	5.09		PASS
		71.55	8.75	3.29	5.46		PASS
		70.55	8.54	4.08	4.46		PASS
		69.55	10.03	5.42	4.61		PASS
		68.55	/	/	/		PASS
		67.55	/	/	/		PASS
		66.55	/	/	/		PASS
		65.55	/	/	/		PASS
	MT4	75.49	-3.26	-6.54	3.28	≤12	PASS
		74.49	-1.83	-6.10	4.27		PASS
		73.49	2.34	-4.32	6.66		PASS
		72.49	2.83	0.84	1.99		PASS
		71.49	4.08	1.43	2.65		PASS
		70.49	5.55	1.97	3.58		PASS
		69.49	6.89	3.29	3.60		PASS
		68.49	/	/	/		PASS
		67.49	/	/	/		PASS
		66.49	/	/	/		PASS
		65.49	/	/	/		PASS

Remark:
"/" presents the EUT shut down.



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Oscillation Mitigation or Shutdown							
Test Path	Test Port	Isolation (dB)	Oscillation Level				Verdict
			Highest level (dBm)	Lowest level (dBm)	Difference (dB)	Limit (dB)	
DL	MT5	75.61	-7.93	-11.23	3.30	≤12	PASS
		74.61	-4.38	-8.34	3.96		PASS
		73.61	-2.94	-7.21	4.27		PASS
		72.61	-2.12	-5.48	3.36		PASS
		71.61	-1.04	-4.32	3.28		PASS
		70.61	-0.22	-2.35	2.13		PASS
		69.61	2.03	-1.32	3.35		PASS
		68.61	4.11	0.32	3.79		PASS
		67.61	6.32	2.93	3.39		PASS
		66.61	/	/	/		PASS
		65.61	/	/	/		PASS
	MT6	75.70	0.27	-4.76	5.03	≤12	PASS
		74.70	2.32	-3.21	5.53		PASS
		73.70	4.83	0.11	4.72		PASS
		72.70	6.43	2.23	4.20		PASS
		71.70	9.47	3.65	5.82		PASS
		70.70	/	/	/		PASS
		69.70	/	/	/		PASS
		68.70	/	/	/		PASS
		67.70	/	/	/		PASS
		66.70	/	/	/		PASS
		65.70	/	/	/		PASS
Remark: “/” presents the EUT shut down.							



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Oscillation Mitigation or Shutdown							
Test Path	Test Port	Isolation (dB)	Oscillation Level				Verdict
			Highest level (dBm)	Lowest level (dBm)	Difference (dB)	Limit (dB)	
DL	MT7	75.57	-0.32	-4.32	4.00	≤12	PASS
		74.57	2.35	-1.25	3.60		PASS
		73.57	3.94	-0.36	4.30		PASS
		72.57	5.22	1.11	4.11		PASS
		71.57	5.98	2.34	3.64		PASS
		70.57	7.12	3.92	3.20		PASS
		69.57	10.34	5.42	4.92		PASS
		68.57	/	/	/		PASS
		67.57	/	/	/		PASS
		66.57	/	/	/		PASS
		65.57	/	/	/		PASS
	MT8	75.40	-3.74	-7.65	3.91	≤12	PASS
		74.40	-2.19	-5.94	3.75		PASS
		73.40	-0.43	-4.21	3.78		PASS
		72.40	1.34	-2.49	3.83		PASS
		71.40	3.29	-1.04	4.33		PASS
		70.40	5.49	2.47	3.02		PASS
		69.40	8.75	4.08	4.67		PASS
		68.40	/	/	/		PASS
		67.40	/	/	/		PASS
		66.40	/	/	/		PASS
		65.40	/	/	/		PASS

Remark:
"/" presents the EUT shut down.



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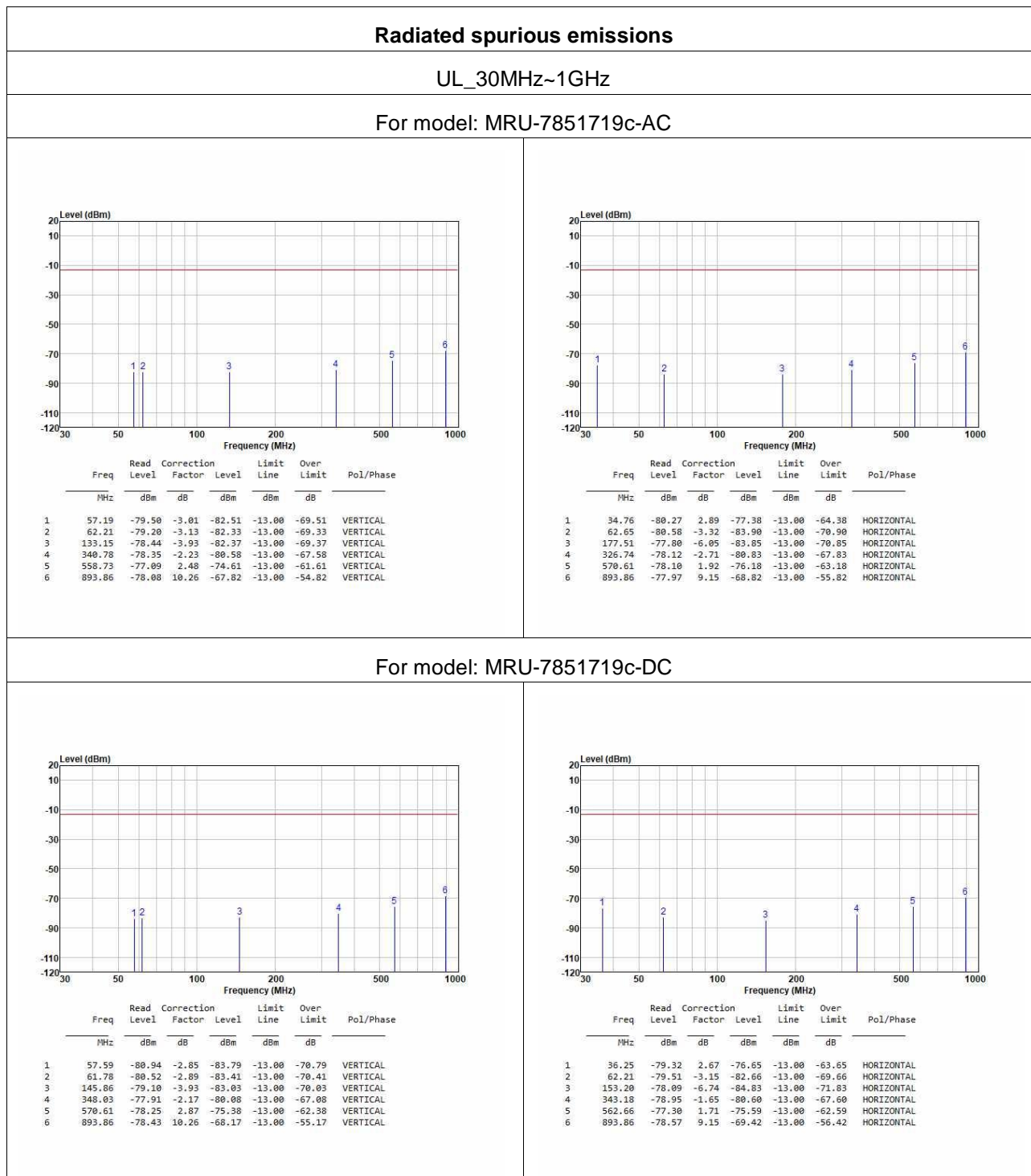
Oscillation Mitigation or Shutdown							
Test Path	Test Port	Isolation (dB)	Oscillation Level				Verdict
			Highest level (dBm)	Lowest level (dBm)	Difference (dB)	Limit (dB)	
UL	DT	70.21	-2.00	-5.43	3.43	≤12	PASS
		69.21	-0.99	-2.37	1.38		PASS
		68.21	2.32	-1.83	4.15		PASS
		67.21	4.75	1.12	3.63		PASS
		66.21	6.85	2.02	4.83		PASS
		65.21	/	/	/		PASS
		64.21	/	/	/		PASS
		63.21	/	/	/		PASS
		62.21	/	/	/		PASS
		61.21	/	/	/		PASS
		60.21	/	/	/		PASS
Remark: "/" presents the EUT shut down.							



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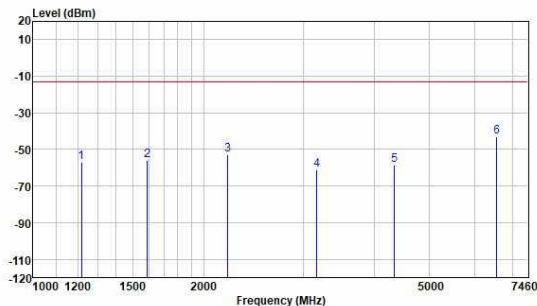
13 Radiated spurious emissions



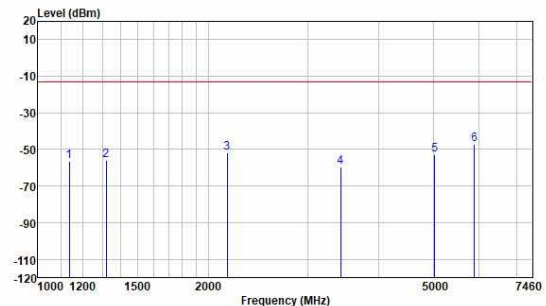
Radiated spurious emissions

UL_above 1GHz

For model: MRU-7851719c-AC

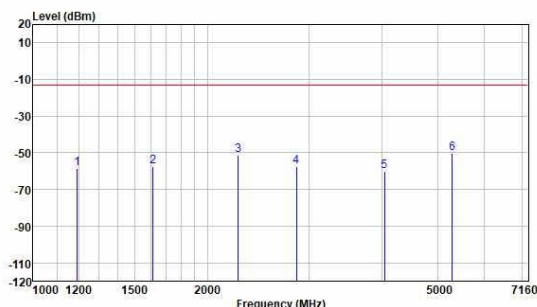


	Freq	Read	Correction	Level	Limit	Over	Pol/Phase
	MHz	Level	Factor	dBm	dBm	Limit	
	MHz	dBm	dB	dBm	dBm	dB	
1	1217.67	-60.42	3.35	-57.07	-13.00	-44.07	VERTICAL
2	1590.75	-61.02	4.97	-56.05	-13.00	-43.05	VERTICAL
3	2202.86	-62.41	9.42	-52.99	-13.00	-39.99	VERTICAL
4	3162.86	-63.54	2.65	-60.89	-13.00	-47.89	VERTICAL
5	4336.10	-63.35	4.67	-58.68	-13.00	-45.68	VERTICAL
6	6559.69	-63.38	20.31	-43.07	-13.00	-30.07	VERTICAL

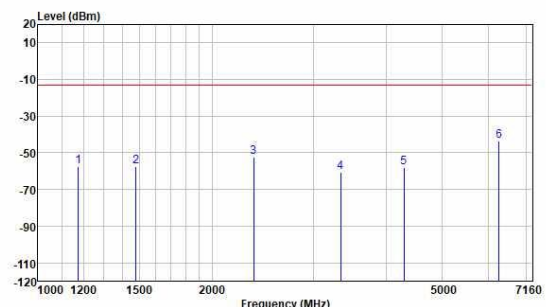


	Freq	Read	Correction	Level	Limit	Over	Pol/Phase
	MHz	Level	Factor	dBm	dBm	Limit	
	MHz	dBm	dB	dBm	dBm	dB	
1	1137.25	-60.56	3.92	-56.64	-13.00	-43.64	HORIZONTAL
2	1319.59	-60.21	4.01	-56.20	-13.00	-43.20	HORIZONTAL
3	2159.03	-60.95	9.33	-51.62	-13.00	-38.62	HORIZONTAL
4	3420.71	-61.95	2.38	-59.57	-13.00	-46.57	HORIZONTAL
5	5021.22	-64.11	11.31	-52.80	-13.00	-39.80	HORIZONTAL
6	5896.96	-62.66	15.65	-47.01	-13.00	-34.01	HORIZONTAL

For model: MRU-7851719c-DC



	Freq	Read	Correction	Level	Limit	Over	Pol/Phase
	MHz	Level	Factor	dBm	dBm	Limit	
	MHz	dBm	dB	dBm	dBm	dB	
1	1191.48	-61.86	3.09	-58.77	-13.00	-45.77	VERTICAL
2	1610.23	-62.29	4.88	-57.41	-13.00	-44.41	VERTICAL
3	2259.09	-60.72	9.52	-51.20	-13.00	-38.20	VERTICAL
4	2849.80	-61.94	4.49	-57.45	-13.00	-44.45	VERTICAL
5	4045.65	-63.47	3.65	-59.82	-13.00	-46.82	VERTICAL
6	5297.99	-63.71	13.20	-50.51	-13.00	-37.51	VERTICAL



	Freq	Read	Correction	Level	Limit	Over	Pol/Phase
	MHz	Level	Factor	dBm	dBm	Limit	
	MHz	dBm	dB	dBm	dBm	dB	
1	1175.18	-60.71	3.07	-57.64	-13.00	-44.64	HORIZONTAL
2	1476.63	-62.27	4.70	-57.57	-13.00	-44.57	HORIZONTAL
3	2359.00	-61.06	9.54	-52.32	-13.00	-39.32	HORIZONTAL
4	3335.85	-62.68	2.21	-60.47	-13.00	-47.47	HORIZONTAL
5	4291.76	-62.46	4.28	-58.18	-13.00	-45.18	HORIZONTAL
6	6275.29	-62.86	19.17	-43.69	-13.00	-30.69	HORIZONTAL

Remark:

Pre-test was performed at uplink and downlink path, the test result always keeps more than 20dB margin, The spurious emissions 9kHz to 30MHz were very low and not displayed in this report. Therefore, only show the worst-case data in this report.



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14 Spectrum blocking filtering

Spectrum blocking filtering			
UL filter attenuation (dB)	DL filter attenuation (dB)	Limit	Verdict
60.68	60.12	UL ≥ DL	PASS
Remark: Please refer to clause 1 “Authorized frequency band verification” test plots for more details.			



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15 Out of band gain

Out of band gain								
Test Path	Test Port	Offset (MHz)	Gain (dB)		ATT (dB)		ATT Limit (dB)	Verdict
			Low edge	High edge	Low edge	High edge		
DL	MT6	f _c	70.52		/		/	/
		0	46.34	49.19	-24.18	-21.33	≤-20	PASS
		1	32.43	37.94	-38.09	-32.58	≤-30	PASS
		5	19.83	16.43	-50.69	-54.09	≤-40	PASS
UL	DT	f _c	65.14		/		/	/
		0	40.23	38.43	-24.91	-26.71	≤-20	PASS
		1	28.64	31.23	-36.50	-33.91	≤-30	PASS
		5	17.92	20.32	-47.22	-44.82	≤-40	PASS
Remark: 1. f _c is the centre frequency of the pass band of the EUT. 2. ATT is the attenuation referenced to the gain in f _c .								

Out of band gain						
Test Path	Test Port	Offset (MHz)	Gain (dB)		Gain Limit (dB)	Verdict
			Low edge	High edge		
DL	MT6	0.2	40.23	44.32	≤ 60	PASS
		1	32.43	37.94	≤ 45	PASS
UL	DT	0.2	36.42	34.21	≤ 60	PASS
		1	28.64	31.23	≤ 45	PASS



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16 Frequency Stability

Frequency stability vs temperature							
Test Path	Test Port	Test Channel	Test Voltage	Test Temp. (°C)	Freq. error (Hz)	Tolerance (ppm)	Verdict
DL	MT1	Middle	VN	+50	3.7	0.00502	PASS
				+40	3.5	0.00475	PASS
				+30	4.4	0.00597	PASS
				+20	3.1	0.00421	PASS
				+10	2.5	0.00339	PASS
				0	3.7	0.00502	PASS
				-10	3.0	0.00407	PASS
				-20	2.8	0.00380	PASS
				-30	2.9	0.00393	PASS
UL	DT	Middle	VN	+50	3.2	0.00453	PASS
				+40	2.9	0.00410	PASS
				+30	3.0	0.00424	PASS
				+20	4.2	0.00594	PASS
				+10	3.8	0.00537	PASS
				0	4.0	0.00566	PASS
				-10	3.0	0.00424	PASS
				-20	3.2	0.00453	PASS
				-30	3.7	0.00523	PASS



Frequency stability vs voltage							
Test Path	Test Port	Test Channel	Test Temp.	Test Voltage	Freq. error (Hz)	Tolerance (ppm)	Verdict
DL	MT1	Middle	TN	VL	3.1	0.00421	PASS
				VN	3.1	0.00421	PASS
				VH	3.1	0.00421	PASS
UL	DT	Middle	TN	VL	4.2	0.00594	PASS
				VN	4.2	0.00594	PASS
				VH	4.2	0.00594	PASS

--End of Appendix--



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