



SGS-CSTC Standards Technical Services Co., Ltd. Guangzhou Branch

EMC-ARF-05 Rev 1.1

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FCC ID: OWWF110725S

Appendix -

Test Data and Result for report

GZCR240500044402



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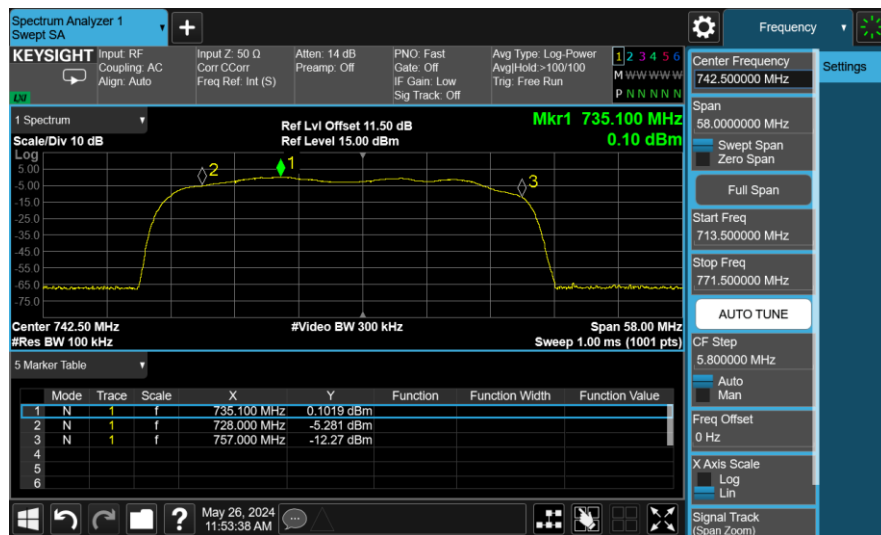
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1 Authorized frequency band verification

Authorized frequency band verification

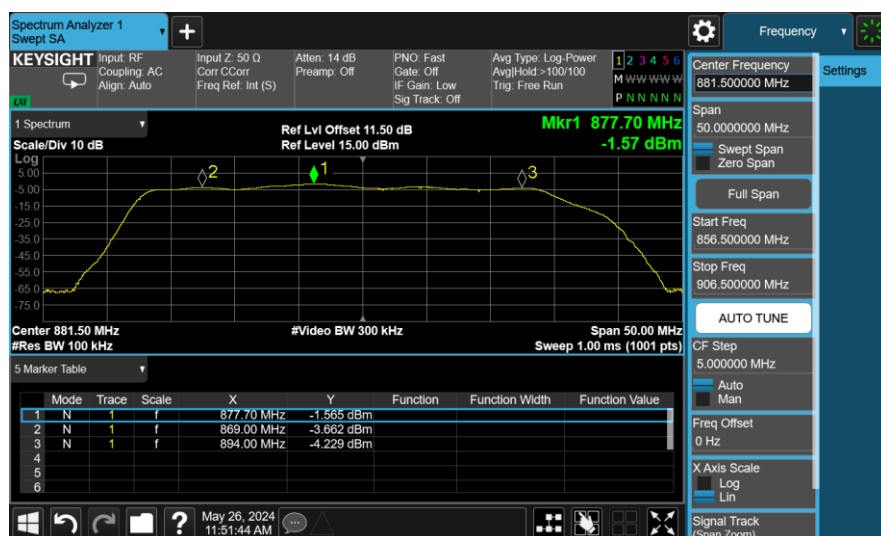
DL

Lower & Upper 700MHz Band



$f_0 = 735.1\text{MHz}$

Cellular Band



$f_0 = 877.7\text{MHz}$



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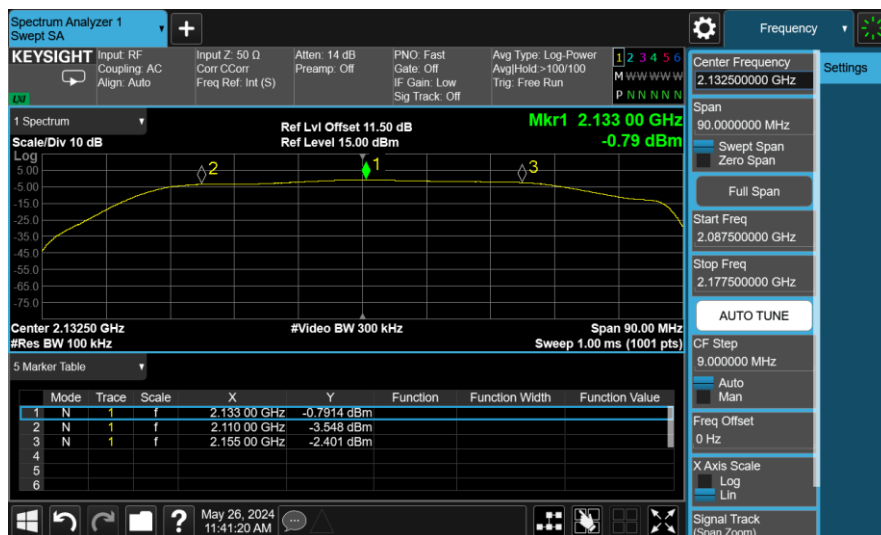
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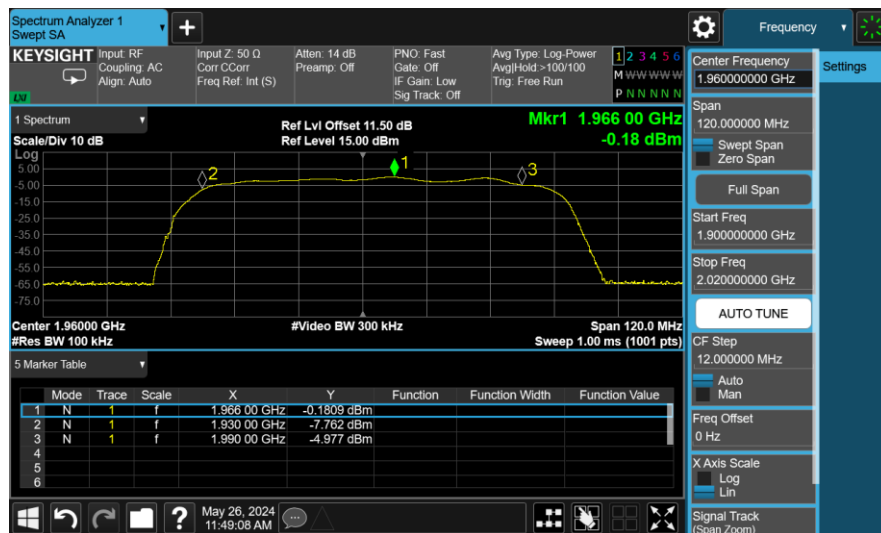
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AWS-1 Band



f0 =2133.0MHz

Broadband PCS



f0 =1966.0MHz



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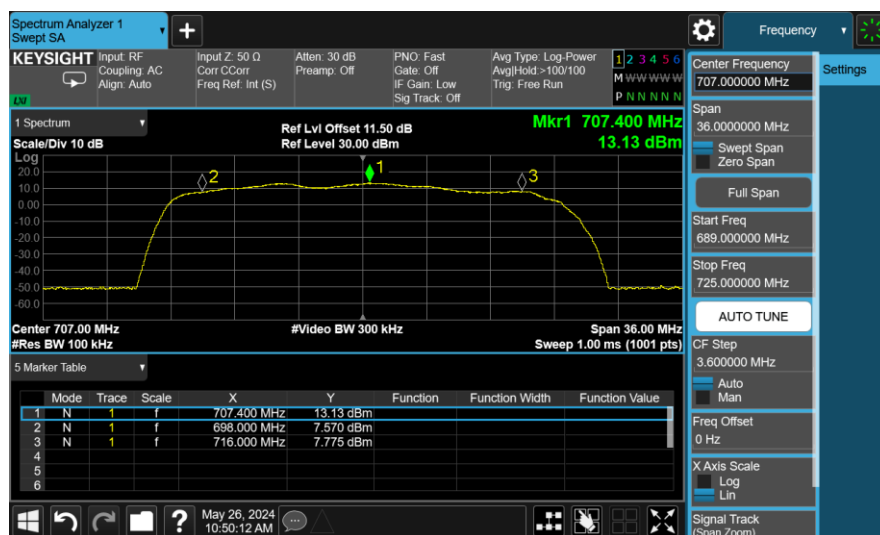
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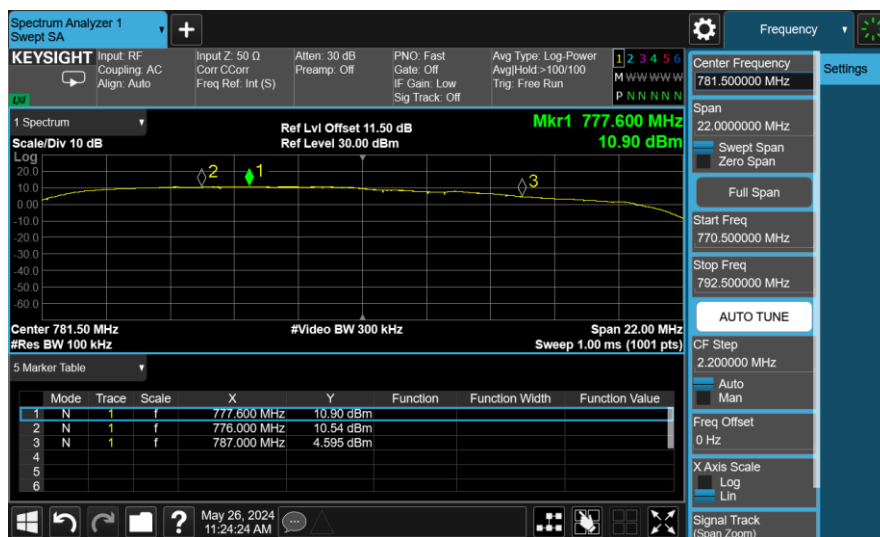
UL

Lower 700MHz Band



f0 =707.4MHz

Upper 700MHz Band



f0 =777.6MHz



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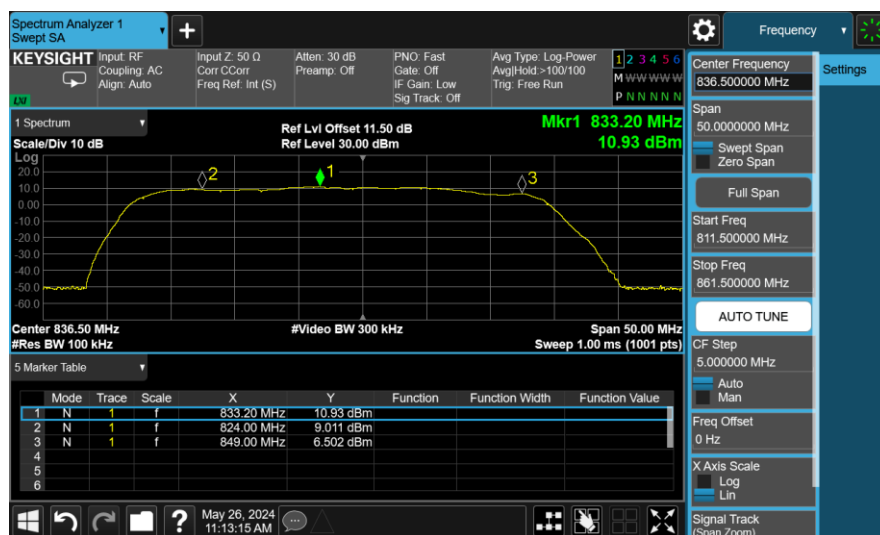
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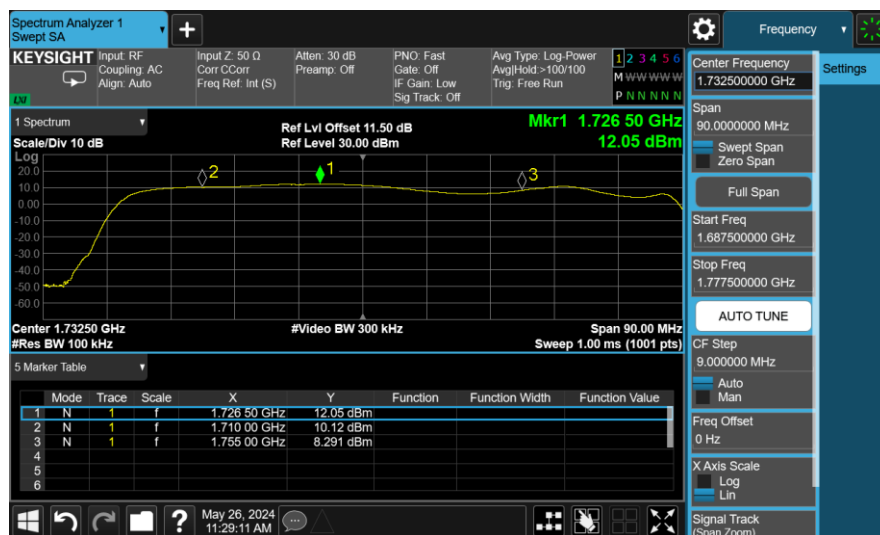
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Cellular Band



f₀ = 833.2 MHz

AWS-1 Band



f₀ = 1726.5 MHz



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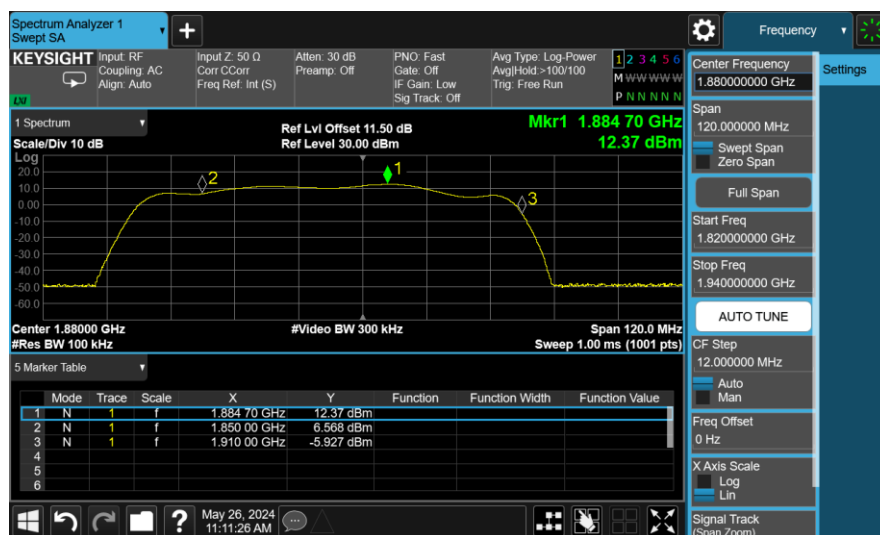
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Authorized frequency band verification

UL

Broadband PCS



$f_0 = 1884.7\text{MHz}$

Remark:

The frequency point f_0 with the highest power level fall in the CMRS band under test with reset the spectrum analyser span to $2 \times$ the width of the CMRS band under test and adjust the tuned frequency of the signal generator to sweep $2 \times$ the width of the CMRS band using the sweep function. EUT is compiled the KDB 935210 D03 Signal Booster Measurements v04r04 Authorized frequency band verification test requirement.



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2 Maximum power

Maximum Output Power										
Path	Band	Signal Type	Input Signal Level (dBm)		Maximum Output Power					Verdict
					Conducted (dBm)	Limit (dBm)	EIRP ¹ (dBm)	EIRP ² (dBm)	Limit (dBm)	
DL	700MHz	AWGN	Pre-AGC	-56.3	5.6	≤17	7.0	9.8	≤17	PASS
		GSM	Pre-AGC	-56.4	5.9		7.5	10.1		PASS
	Cellular	AWGN	Pre-AGC	-56.9	5.5		7.0	9.7		PASS
		GSM	Pre-AGC	-58.0	5.1		6.6	9.3		PASS
	AWS-1	AWGN	Pre-AGC	-61.1	9.6		12.1	14.1		PASS
		GSM	Pre-AGC	-61.4	9.3		11.8	13.8		PASS
	Broadband PCS	AWGN	Pre-AGC	-61.2	9.9		12.4	15.1		PASS
		GSM	Pre-AGC	-61.8	9.5		12.0	14.7		PASS
UL	Lower 700MHz	AWGN	Pre-AGC	-40.0	18.7	≥17 & ≤30	18.3	18.3	≤30	PASS
		GSM	Pre-AGC	-38.8	20.6		20.2	20.2		PASS
	Upper 700MHz	AWGN	Pre-AGC	-41.8	18.3		17.9	17.9		PASS
		GSM	Pre-AGC	-39.3	21.3		20.9	20.9		PASS
	Cellular	AWGN	Pre-AGC	-41.6	18.1		17.7	17.7		PASS
		GSM	Pre-AGC	-56.3	20.2		19.8	19.8		PASS
	AWS-1	AWGN	Pre-AGC	-56.4	18.6		19.2	19.2		PASS
		GSM	Pre-AGC	-56.9	20.4		21.0	21.0		PASS
	Broadband PCS	AWGN	Pre-AGC	-58.0	18.8		19.4	19.4		PASS
		GSM	Pre-AGC	-61.1	19.5		20.1	20.1		PASS

Remark:

- The test frequency f_0 was determined in Authorized frequency band verification test in this report.
- ERIP = Conducted Output Power + Antenna Gain – Cable loss, refer to clause 2 for the details about the declared antenna gain and cable loss.
 EIRP¹: for using Antenna Kitting 1
 EIRP²: for using Antenna Kitting 2



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Maximum transmitter test input levels					
Path	Band	Signal Type	Input Power (dBm)	Conducted output power (dBm)	Verdict
DL	700MHz	AWGN	-45.0	5.2	PASS
		GSM	-44.0	5.4	PASS
	Cellular	AWGN	-45.0	5.1	PASS
		GSM	-47.0	4.8	PASS
	AWS-1	AWGN	-50.0	9.2	PASS
		GSM	-50.0	9.4	PASS
	Broadband PCS	AWGN	-50.0	9.6	PASS
		GSM	-50.0	9.2	PASS
UL	Lower 700MHz	AWGN	-29.0	18.3	PASS
		GSM	-28.0	20.2	PASS
	Upper 700MHz	AWGN	-30.0	18.1	PASS
		GSM	-28.0	21.1	PASS
	Cellular	AWGN	-30.0	17.8	PASS
		GSM	-45.0	19.9	PASS
	AWS-1	AWGN	-45.0	18.3	PASS
		GSM	-45.0	20.1	PASS
	Broadband PCS	AWGN	-47.0	18.3	PASS
		GSM	-50.0	19.1	PASS
Remark: The EUT went into shutdown mode at the maximum input level indicated in 5.5 of KDB 935210 D03. Above test data was measured at input level 1dB less than that found to cause the shutdown, where the input power is much greater than 10dB above AGC.					



3 Maximum booster gain computation

Maximum Gain								
Path	Band	Signal Type	Input Signal Level (dBm)		Conducted Output Power (dBm)	Gain (dB)	Limit (dB)	Verdict
DL	700MHz	AWGN	Pre-AGC	-56.3	5.6	61.9	≤63.4	PASS
		GSM	Pre-AGC	-56.4	5.9	62.3		PASS
	Cellular	AWGN	Pre-AGC	-56.9	5.5	62.4	≤64.9	PASS
		GSM	Pre-AGC	-58.0	5.1	63.1		PASS
	AWS-1	AWGN	Pre-AGC	-61.1	9.6	70.7	≤71.2	PASS
		GSM	Pre-AGC	-61.4	9.3	70.7		PASS
	Broadband PCS	AWGN	Pre-AGC	-61.2	9.9	71.1	≤71.9	PASS
		GSM	Pre-AGC	-61.8	9.5	71.3		PASS
UL	Lower 700MHz	AWGN	Pre-AGC	-40.0	18.7	58.7	≤63.4	PASS
		GSM	Pre-AGC	-38.8	20.6	59.4		PASS
	Upper 700MHz	AWGN	Pre-AGC	-41.8	18.3	60.1	≤64.3	PASS
		GSM	Pre-AGC	-39.3	21.3	60.6		PASS
	Cellular	AWGN	Pre-AGC	-41.6	18.1	59.7	≤64.9	PASS
		GSM	Pre-AGC	-40.1	20.2	60.3		PASS
	AWS-1	AWGN	Pre-AGC	-48.4	18.6	67.0	≤71.2	PASS
		GSM	Pre-AGC	-47.8	20.4	68.2		PASS
	Broadband PCS	AWGN	Pre-AGC	-50.0	18.8	68.8	≤71.9	PASS
		GSM	Pre-AGC	-49.9	19.5	69.4		PASS



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Equivalent Uplink and Downlink Gain						
Band	Signal Type	Uplink Gain (dB)	Downlink Gain (dB)	UL vs DL Gain (dB)	Limit (dB)	Verdict
Lower 700MHz	AWGN	58.7	61.9	3.2	≤9	PASS
	GSM	59.4	62.3	2.9		PASS
Upper 700MHz	AWGN	60.1	61.9	1.8		PASS
	GSM	60.6	62.3	1.7		PASS
Cellular	AWGN	59.7	62.4	2.7		PASS
	GSM	60.3	63.1	2.8		PASS
AWS-1	AWGN	67.0	70.7	3.7		PASS
	GSM	68.2	70.7	2.5		PASS
Broadband PCS	AWGN	68.8	71.1	2.3		PASS
	GSM	69.4	71.3	1.9		PASS



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4 Intermodulation product

Intermodulation product						
Path	Band	Input Signal		Worst Test Level (dBm)	Limit (dBm)	Verdict
DL	700MHz	two CW signals	Pre-AGC	-48.4	≤-19	PASS
			10dB above AGC	-47.1		PASS
	Cellular	two CW signals	Pre-AGC	-38.2	≤-19	PASS
			10dB above AGC	-39.4		PASS
	AWS-1	two CW signals	Pre-AGC	-33.7	≤-19	PASS
			10dB above AGC	-33.7		PASS
	Broadband PCS	two CW signals	Pre-AGC	-31.2	≤-19	PASS
			10dB above AGC	-30.8		PASS
UL	Lower 700MHz	two CW signals	Pre-AGC	-22.2	≤-19	PASS
			10dB above AGC	-21.4		PASS
	Upper 700MHz	two CW signals	Pre-AGC	-21.1	≤-19	PASS
			10dB above AGC	-21.1		PASS
	Cellular	two CW signals	Pre-AGC	-31.7	≤-19	PASS
			10dB above AGC	-32.1		PASS
	AWS-1	two CW signals	Pre-AGC	-26.3	≤-19	PASS
			10dB above AGC	-26.2		PASS
	Broadband PCS	two CW signals	Pre-AGC	-32.4	≤-19	PASS
			10dB above AGC	-32.3		PASS



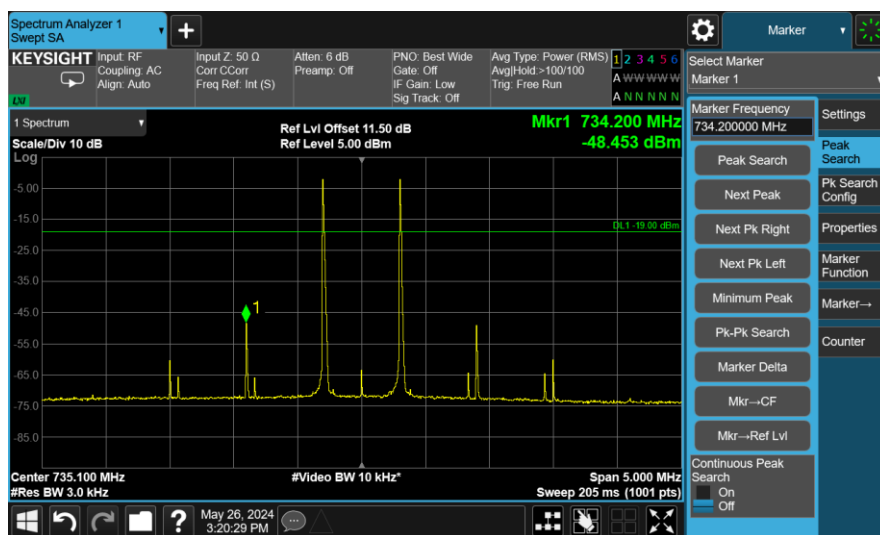
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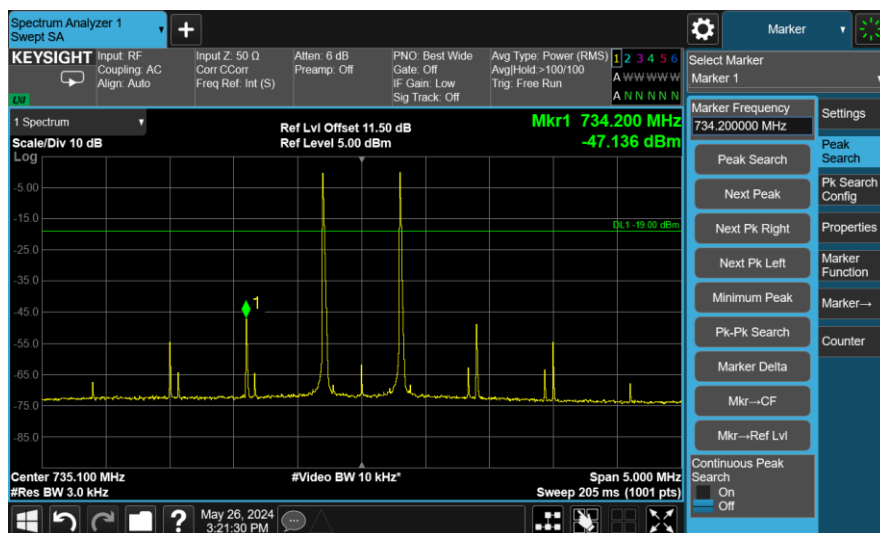
Intermodulation product

DL

700MHz Band_Pre-AGC



700MHz Band_10dB above AGC



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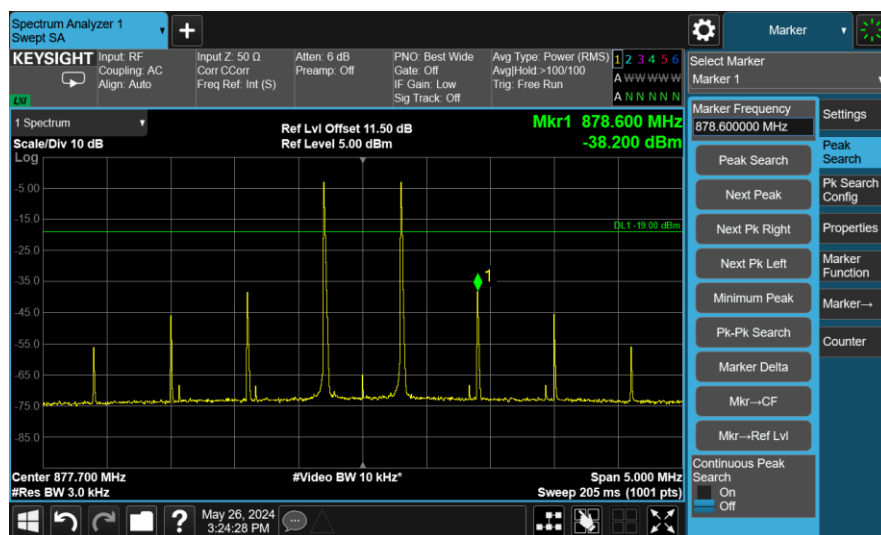
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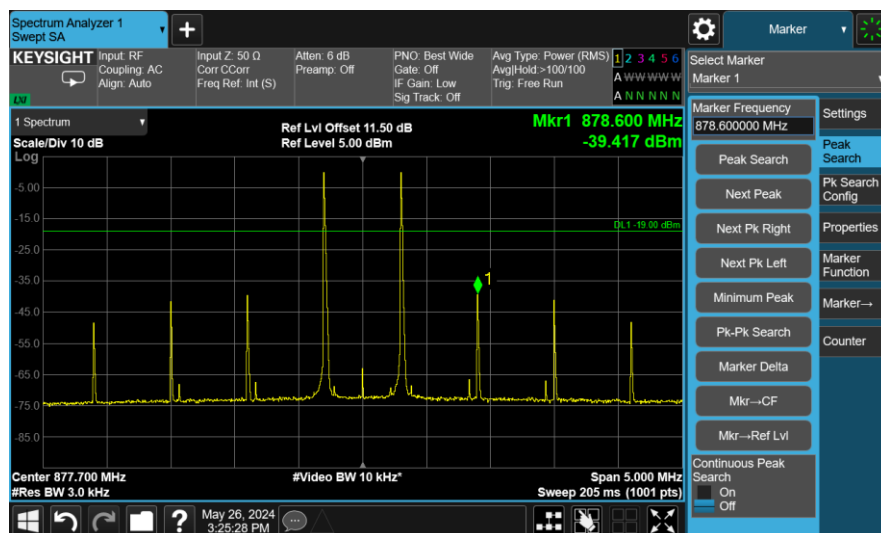
Intermodulation product

DL

Cellular Band_Pre-AGC



Cellular Band_10dB above AGC



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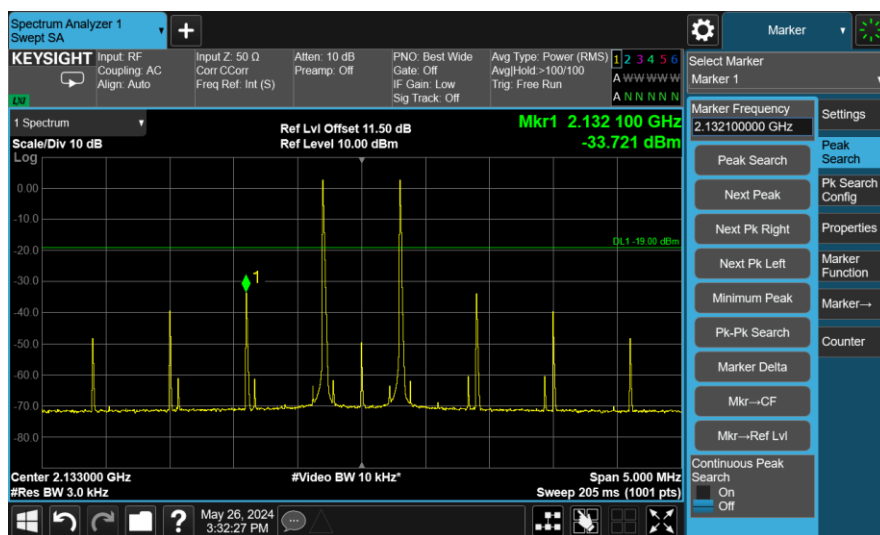
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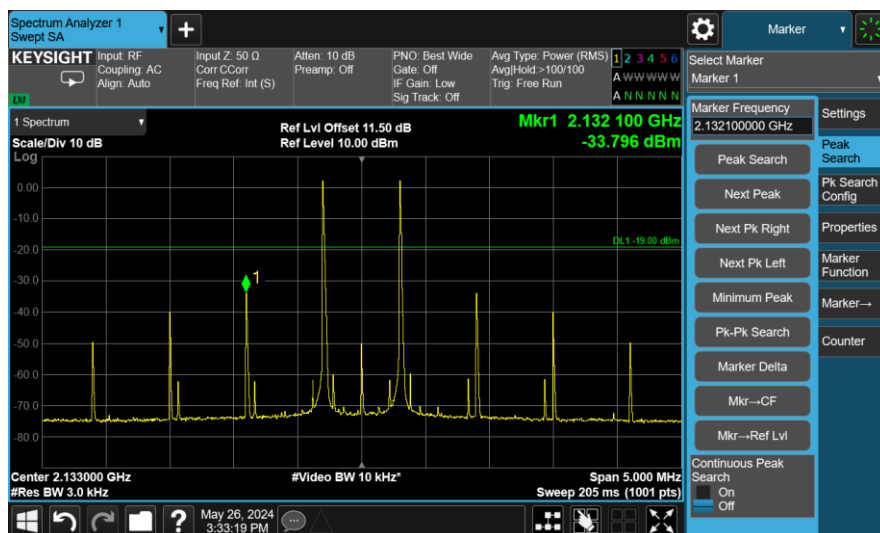
Intermodulation product

DL

AWS-1_Pre-AGC



AWS-1_10dB above AGC



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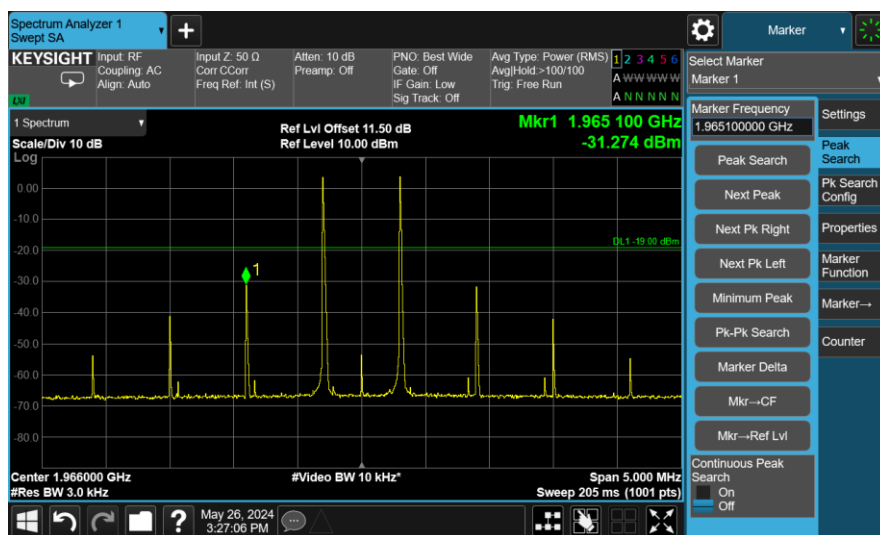
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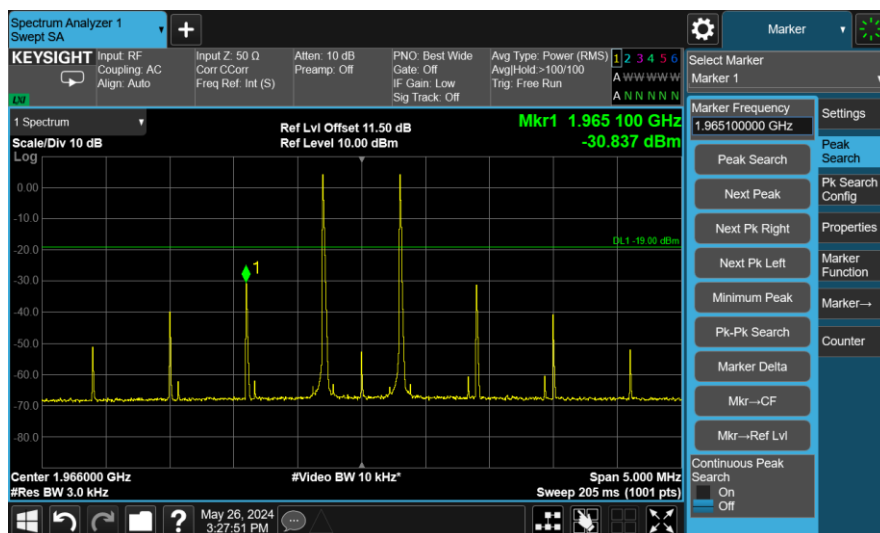
Intermodulation product

DL

Broadband PCS_Pre-AGC



Broadband PCS_10dB above AGC



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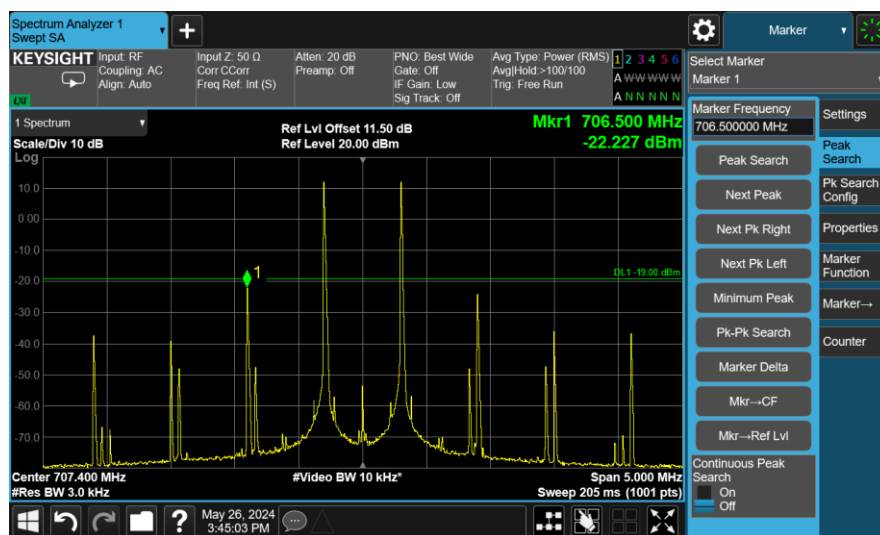
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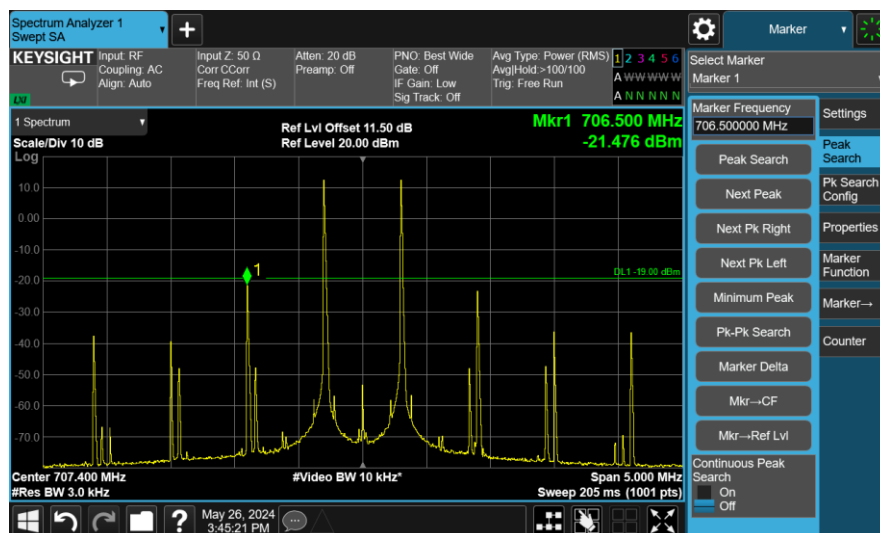
Intermodulation product

UL

Lower 700MHz Band_Pre-AGC



Lower 700MHz Band_10dB above AGC



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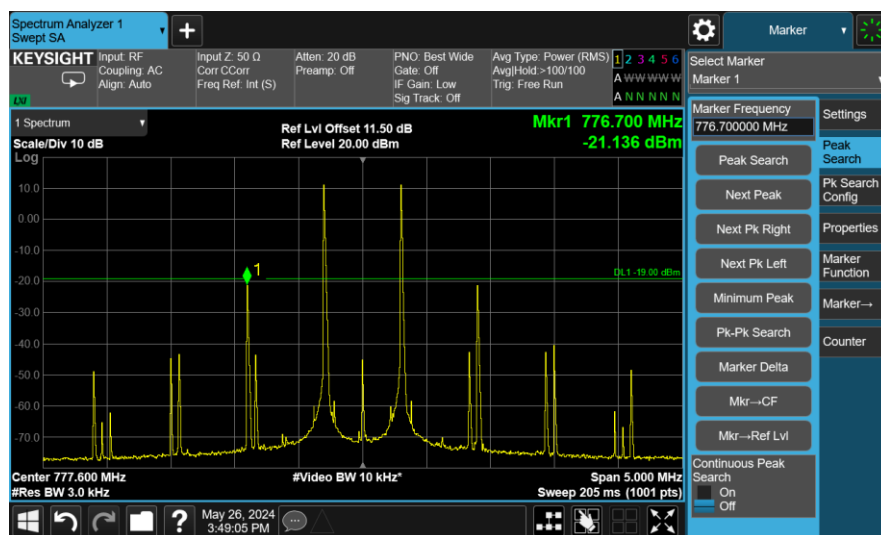
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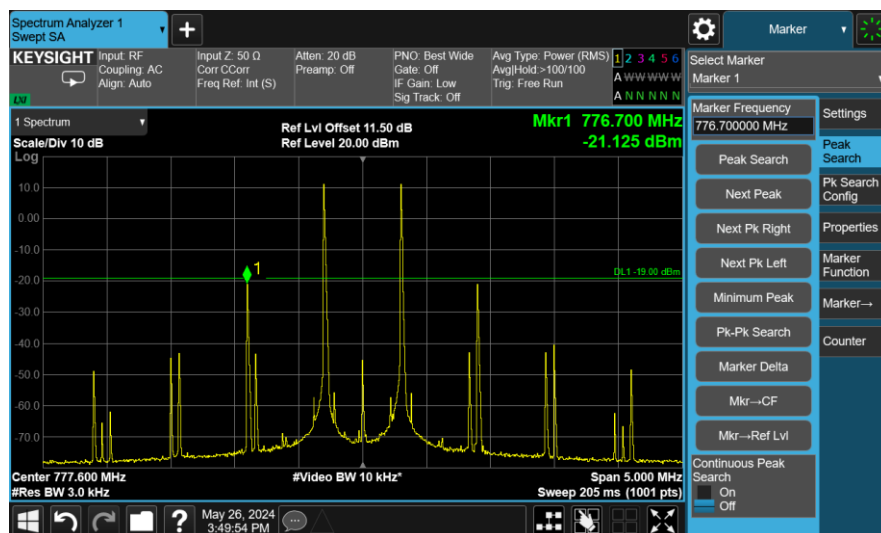
Intermodulation product

UL

Upper 700MHz Band_Pre-AGC



Upper 700MHz Band_10dB above AGC



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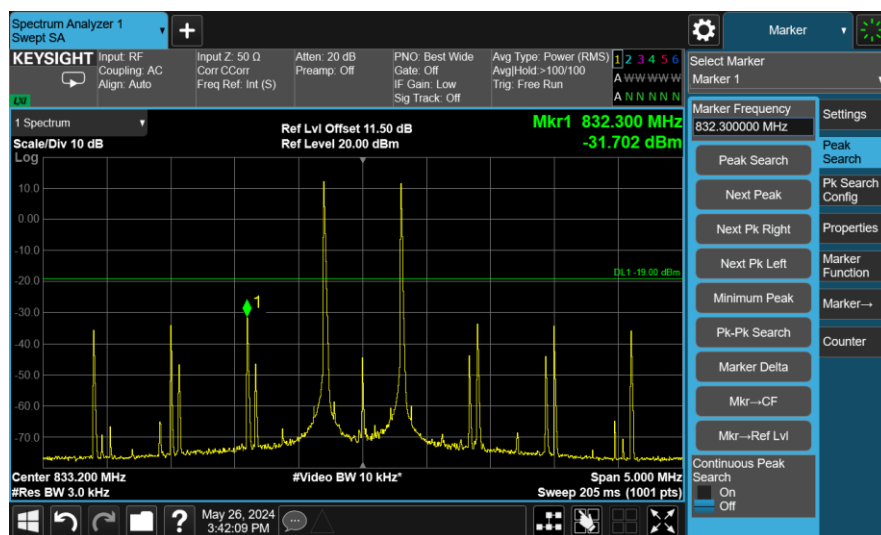
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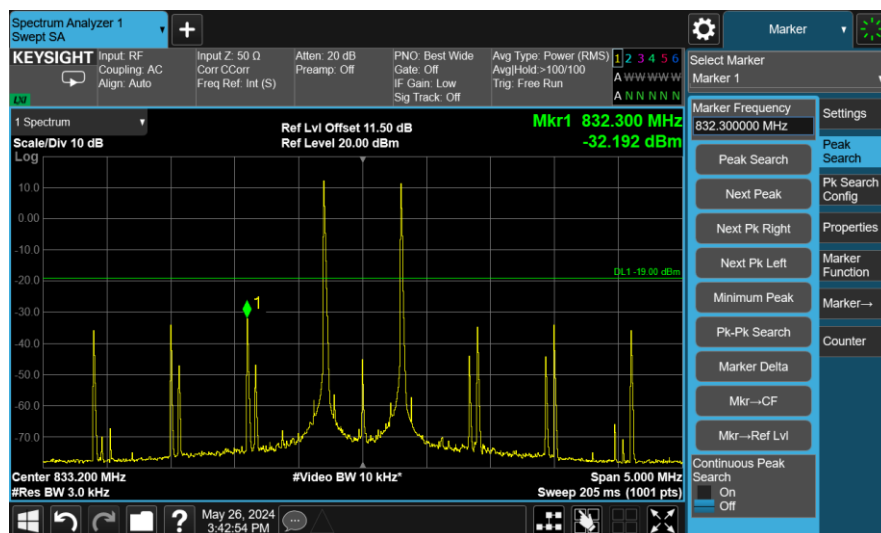
Intermodulation product

UL

Cellular Band_Pre-AGC



Cellular Band_10dB above AGC



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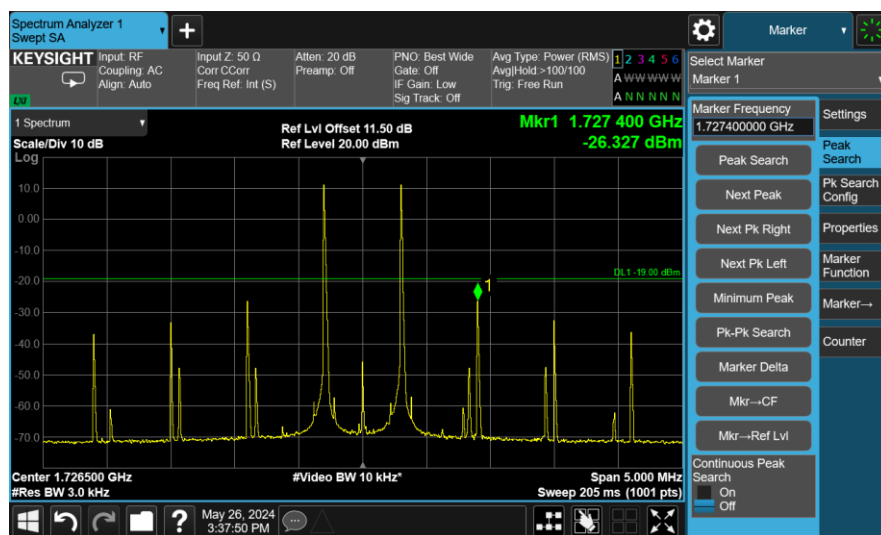
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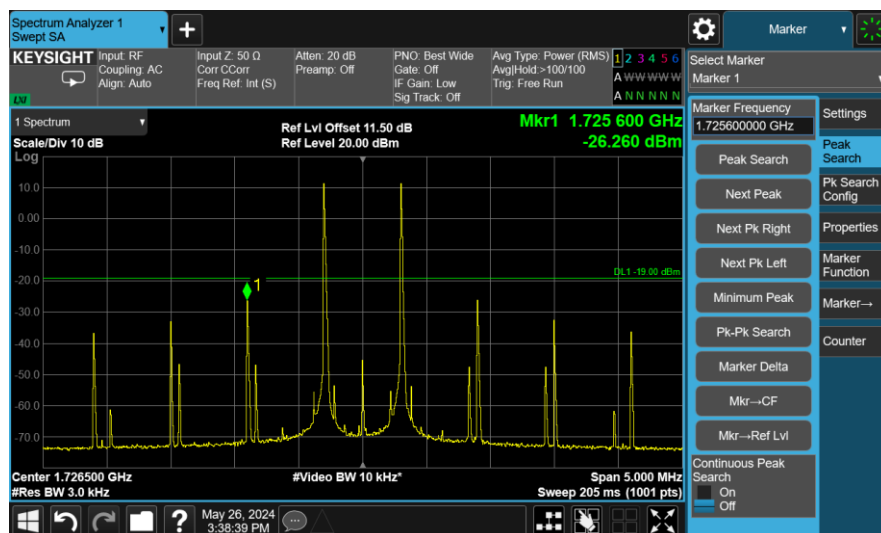
Intermodulation product

UL

AWS-1 Band_Pre-AGC



AWS-1 Band_10dB above AGC



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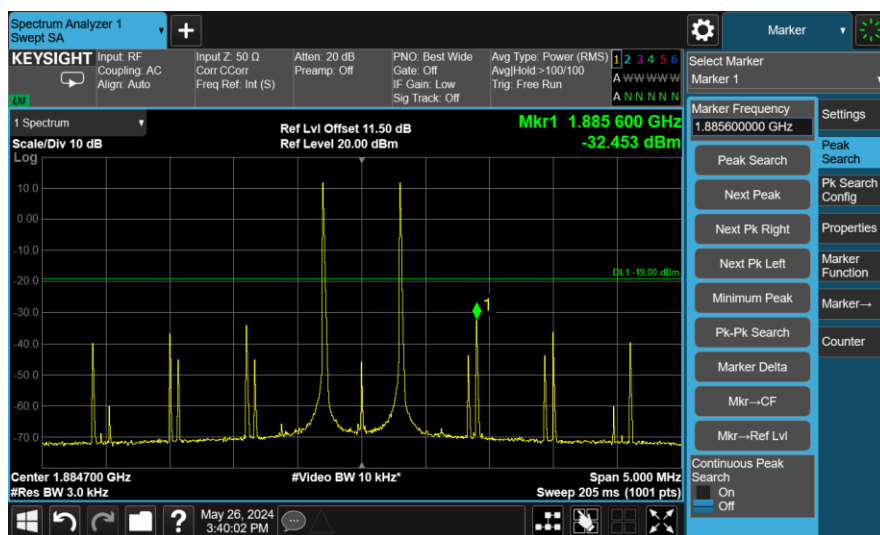
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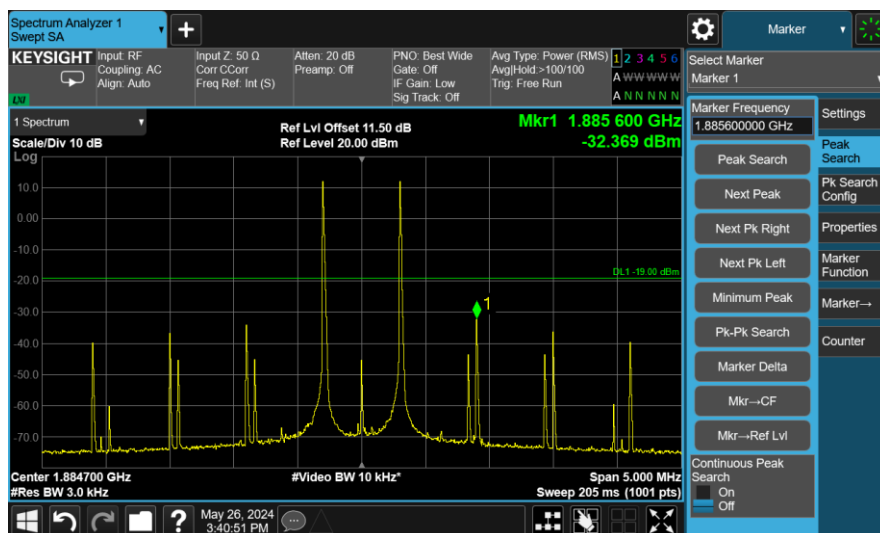
Intermodulation product

UL

Broadband PCS Band_Pre-AGC



Broadband PCS Band_10dB above AGC



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5 Out-of-band emissions

Out-of-band emissions						
Path	Band	Input Signal			Limit (dBm)	Verdict
DL	700MHz	GSM	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS
		1.25MHz AWGN	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS
		4.1MHz AWGN	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS
	Cellular	GSM	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS
		1.25MHz AWGN	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS
		4.1MHz AWGN	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS



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Out-of-band emissions						
Path	Band	Input Signal			Limit (dBm)	Verdict
DL	AWS-1	GSM	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS
		1.25MHz AWGN	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS
		4.1MHz AWGN	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS
	Broadband PCS	GSM	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS
		1.25MHz AWGN	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS
		4.1MHz AWGN	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS



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Out-of-band emissions						
Path	Band	Input Signal			Limit (dBm)	Verdict
UL	Lower 700MHz	GSM	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS
		1.25MHz AWGN	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS
		4.1MHz AWGN	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS
	Upper 700MHz	GSM	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS
		1.25MHz AWGN	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS
		4.1MHz AWGN	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS



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Out-of-band emissions						
Path	Band	Input Signal			Limit (dBm)	Verdict
UL	Cellular	GSM	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS
		1.25MHz AWGN	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS
		4.1MHz AWGN	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS
	AWS-1	GSM	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS
		1.25MHz AWGN	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS
		4.1MHz AWGN	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS



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Out-of-band emissions						
Path	Band	Input Signal			Limit (dBm)	Verdict
UL	Broadband PCS	GSM	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS
		1.25MHz AWGN	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS
		4.1MHz AWGN	Lower Edge	Pre-AGC	≤-19	PASS
				10dB above AGC		PASS
			Upper Edge	Pre-AGC		PASS
				10dB above AGC		PASS

Remark:

20.21(e)(8)(i)(E) Out of Band Emission Limits:

Booster out of band emissions (OOBE) shall be at least 6 dB below the FCC's mobile emission limits for the supported bands of operation.

27.53(c)

For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

1) On any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB.

So, the limit = $\{P - [43 + 10 \log (P)]\} - 6\text{dB} = -19\text{dBm}$

(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB.

So, the limit = $\{P - [43 + 10 \log (P)]\} - 6\text{dB} = -19\text{dBm}$

(3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations.

So, the limit = $\{P - [76 + 10 \log (P)]\} - 6\text{dB} = -52\text{dBm}$

27.53(g)

For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB.

So, the limit = $\{P - [43 + 10 \log (P)]\} - 6\text{dB} = -19\text{dBm}$



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27.53(h)

the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10} (P)$ dB.

So, the limit = $\{P - [43 + 10 \log (P)]\} - 6\text{dB} = -19\text{dBm}$

22.917

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

So, the limit = $\{P - [43 + 10 \log (P)]\} - 6\text{dB} = -19\text{dBm}$

24.238

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

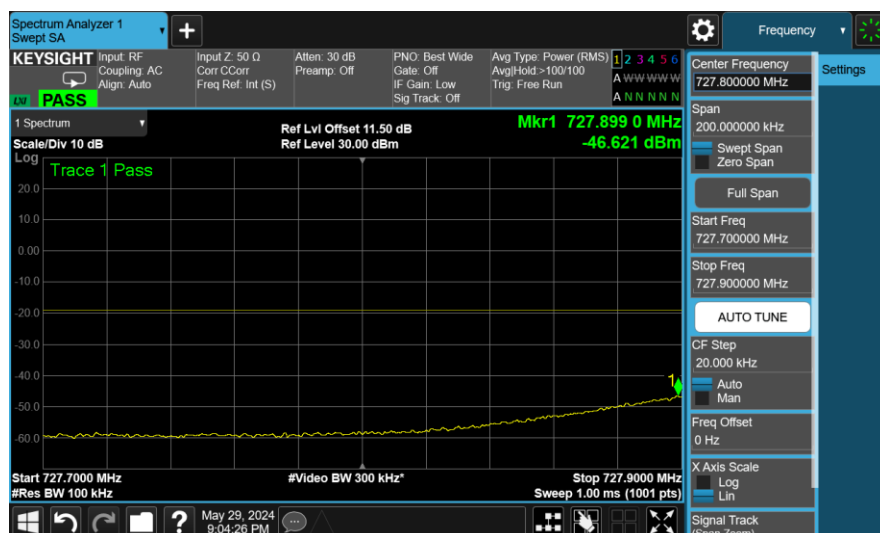
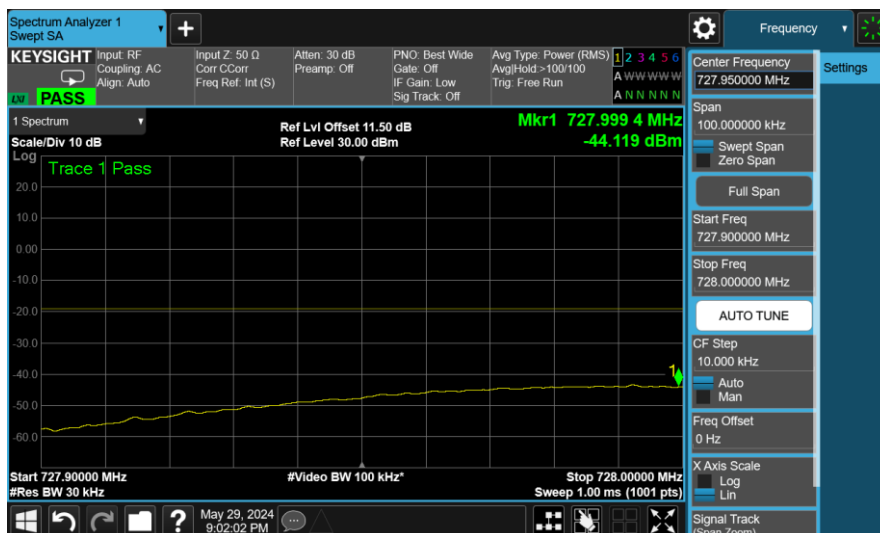
So, the limit = $\{P - [43 + 10 \log (P)]\} - 6\text{dB} = -19\text{dBm}$



Out-of-band emissions

DL_700MHz Band

GSM signal input_Lower band edge_Pre-AGC



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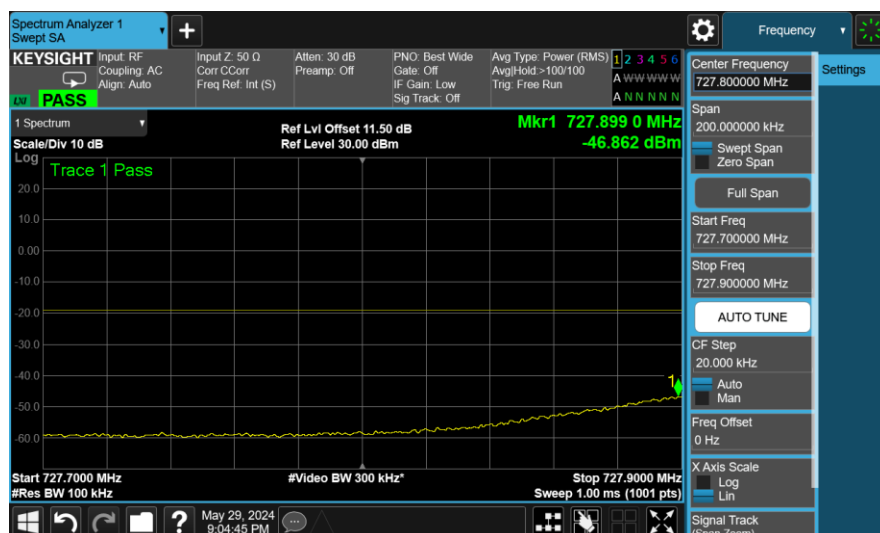
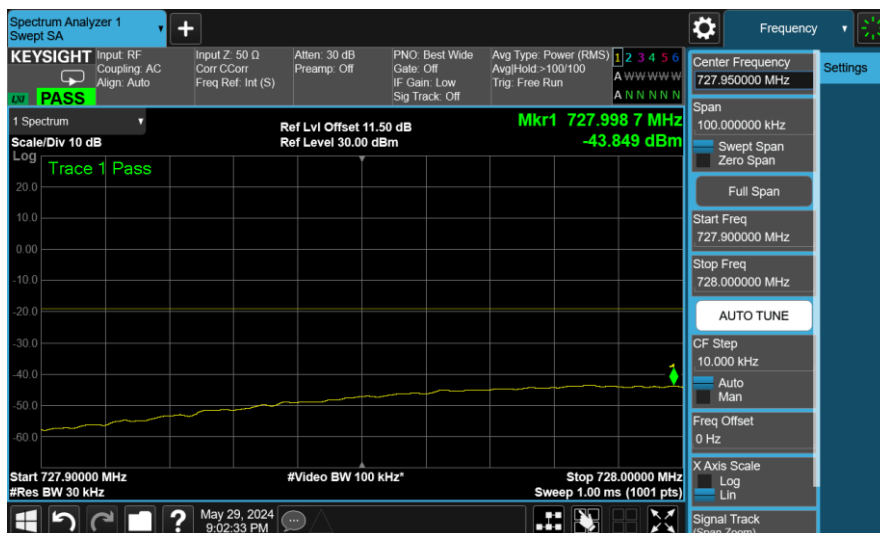
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Out-of-band emissions

DL_700MHz Band

GSM signal input_Lower band edge_10dB above AGC



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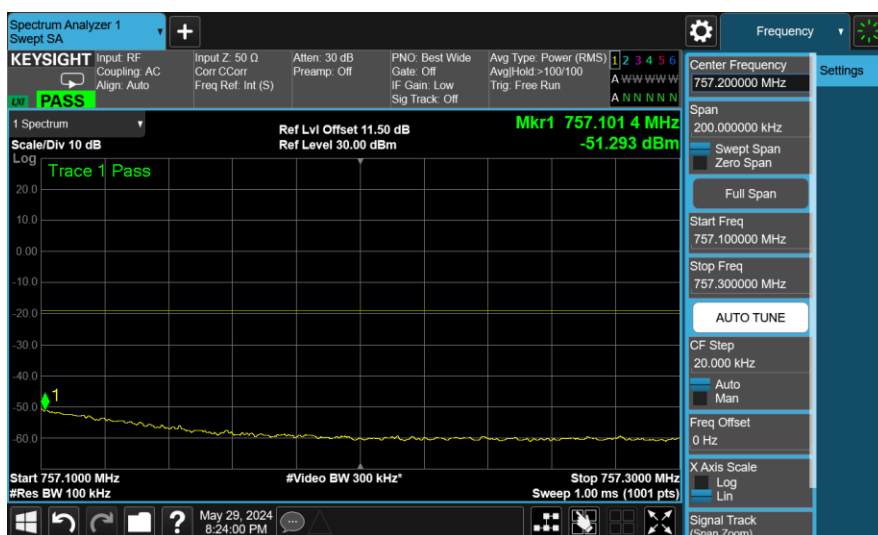
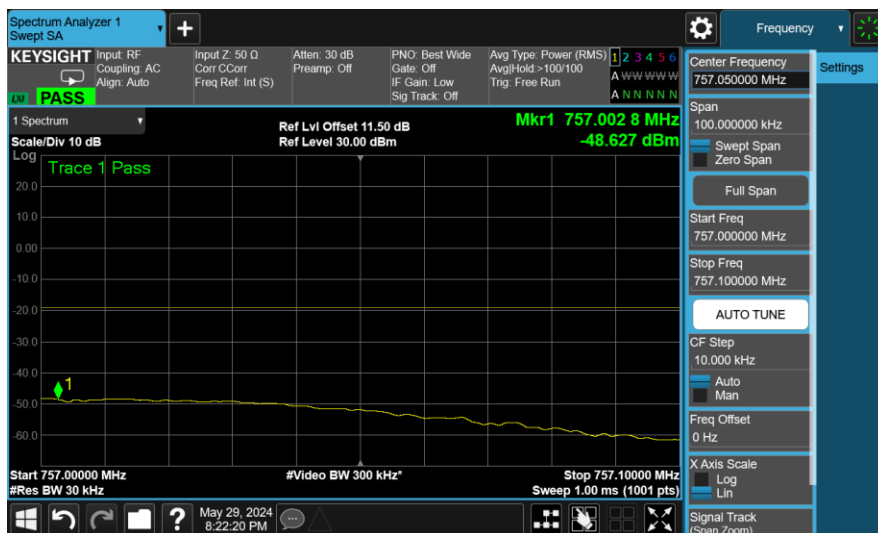
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Out-of-band emissions

DL_700MHz Band

GSM signal input_Upper band edge_Pre-AGC



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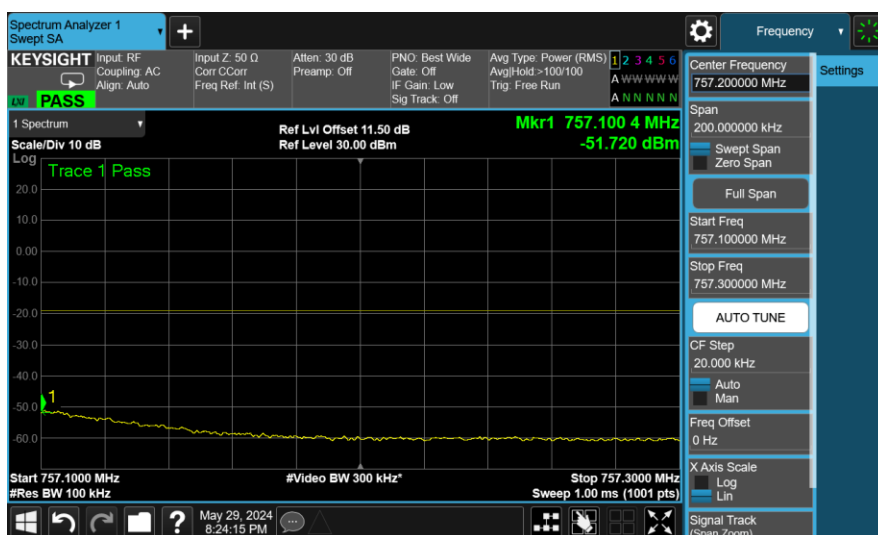
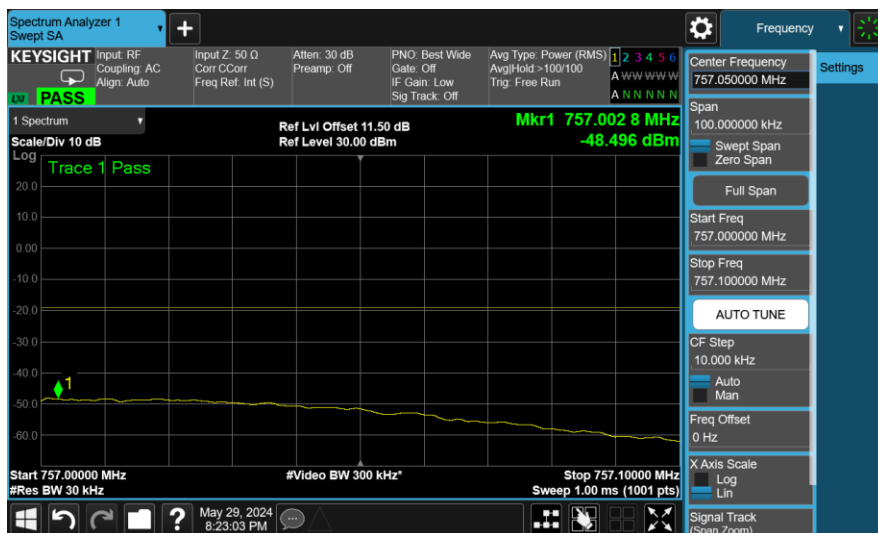
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Out-of-band emissions

DL_700MHz Band

GSM signal input_Upper band edge_10dB above AGC



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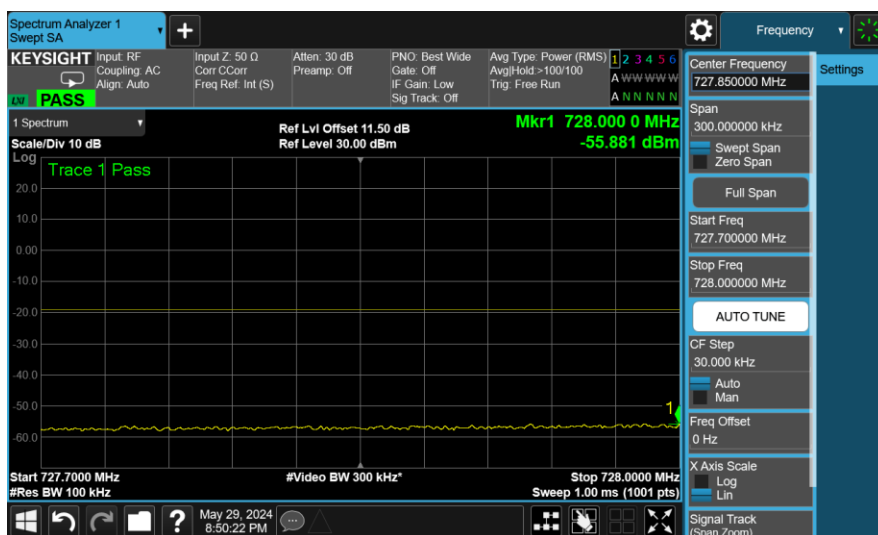
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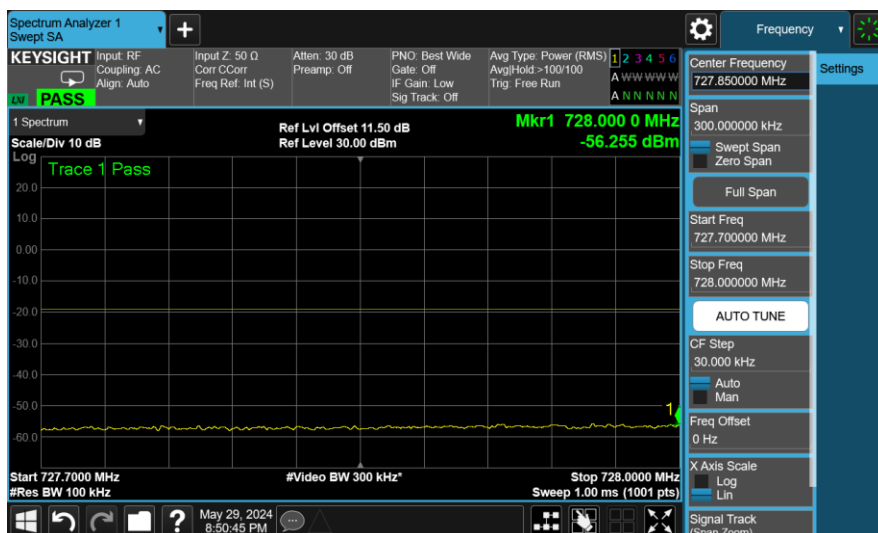
Out-of-band emissions

DL_700MHz Band

1.25MHz AWGN signal input_Lower band edge_Pre-AGC



1.25MHz AWGN signal input_Lower band edge_10dB above AGC



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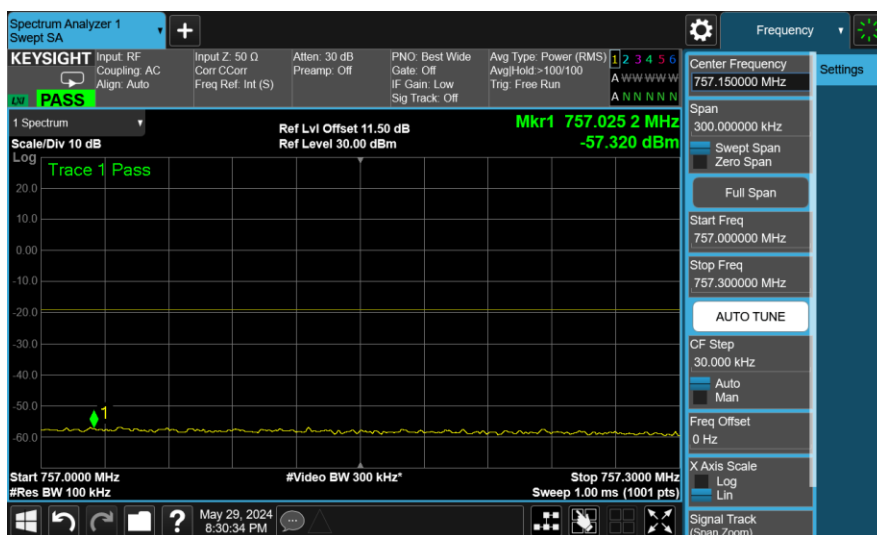
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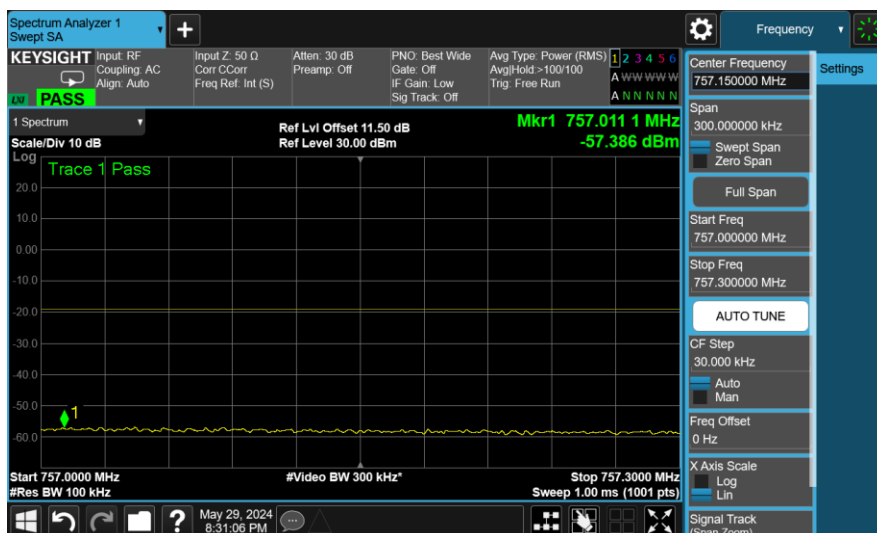
Out-of-band emissions

DL_700MHz Band

1.25MHz AWGN signal input_Upper band edge_Pre-AGC



1.25MHz AWGN signal input_Upper band edge_10dB above AGC



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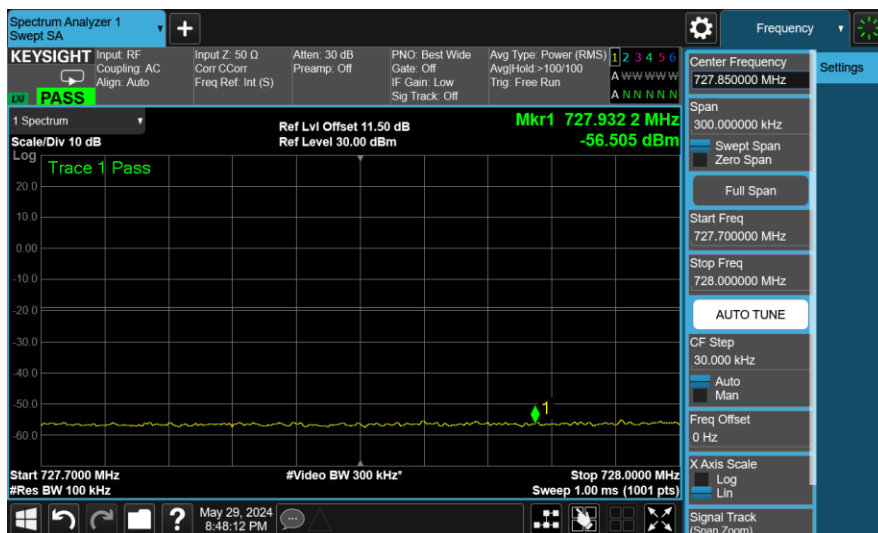
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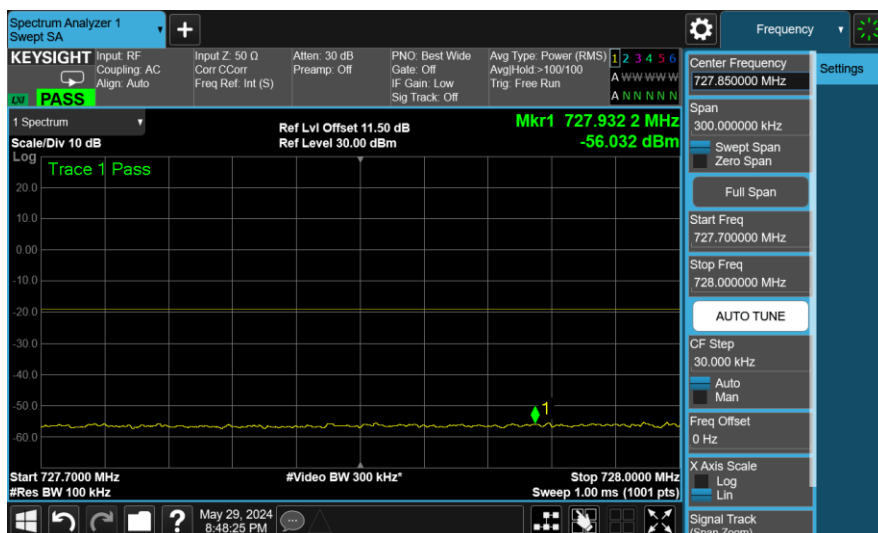
Out-of-band emissions

DL_700MHz Band

4.1MHz AWGN signal input_Lower band edge_Pre-AGC



4.1MHz AWGN signal input_Lower band edge_10dB above AGC



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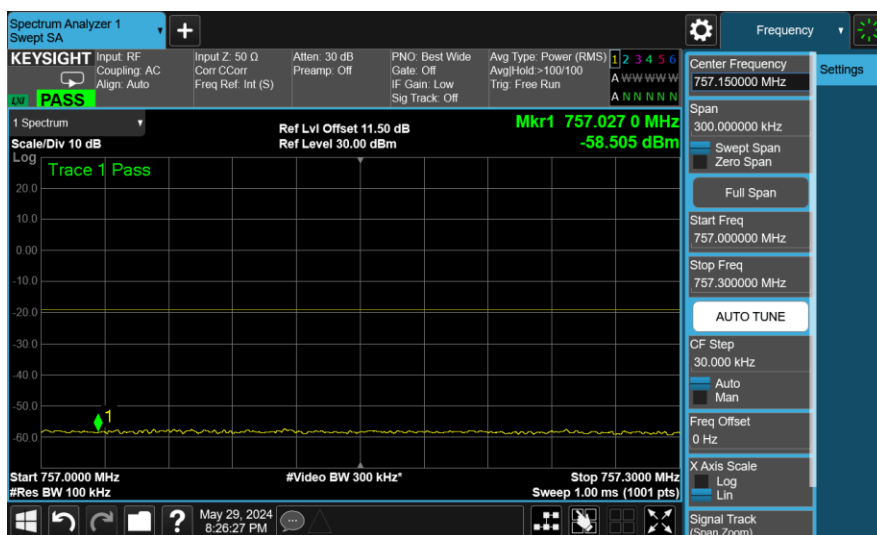
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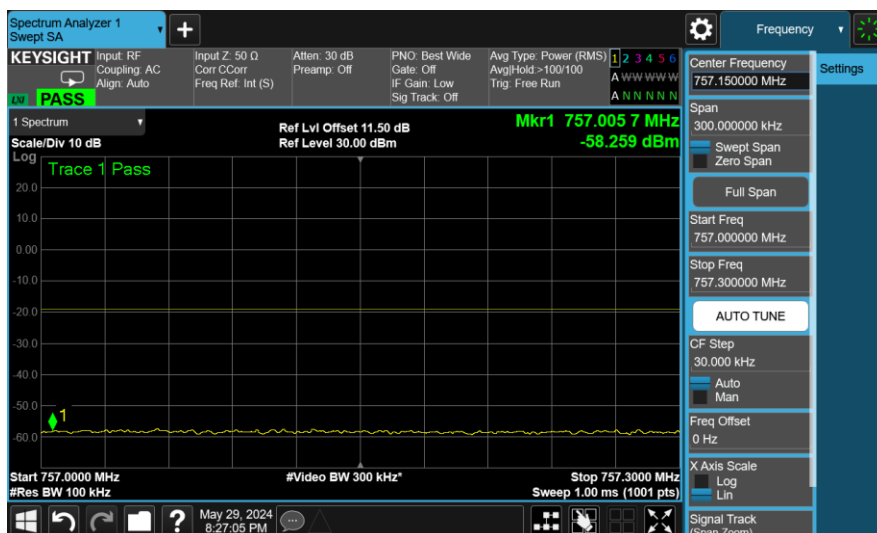
Out-of-band emissions

DL_700MHz Band

4.1MHz AWGN signal input_Upper band edge_Pre-AGC



4.1MHz AWGN signal input_Upper band edge_10dB above AGC



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