

Appendix -

Test Data and Result for report

GZCR230300024902 (B)

(For 100MHz AWGN test data)



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1 600MHz Service (663-698MHz paired with 617-652MHz)

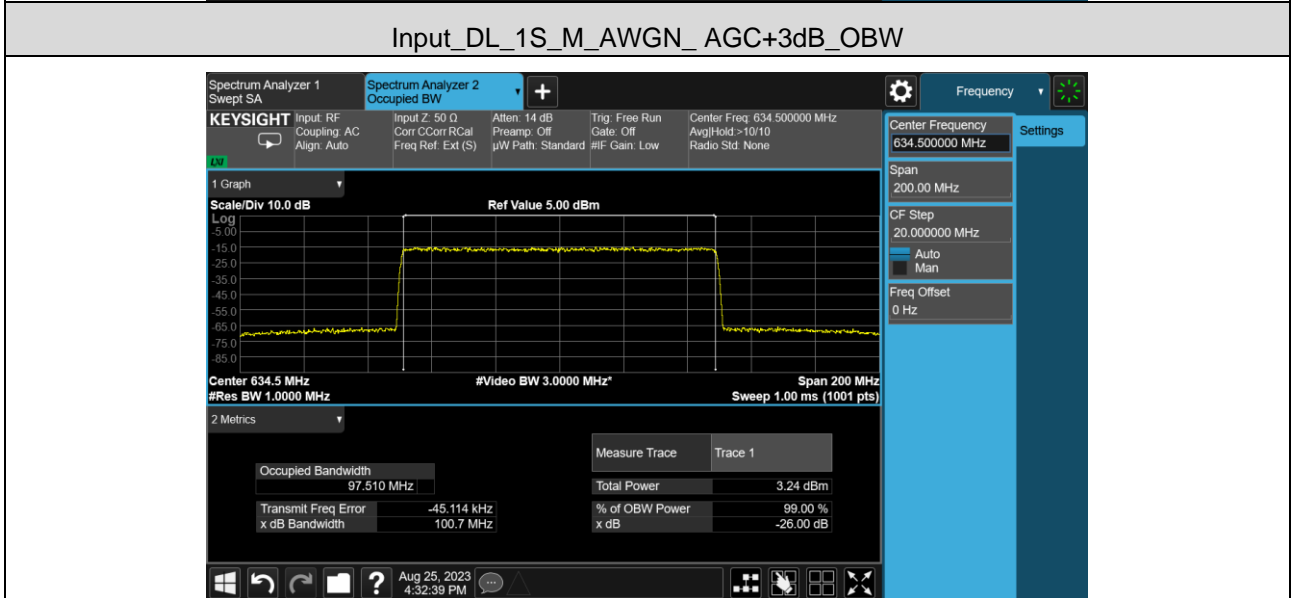
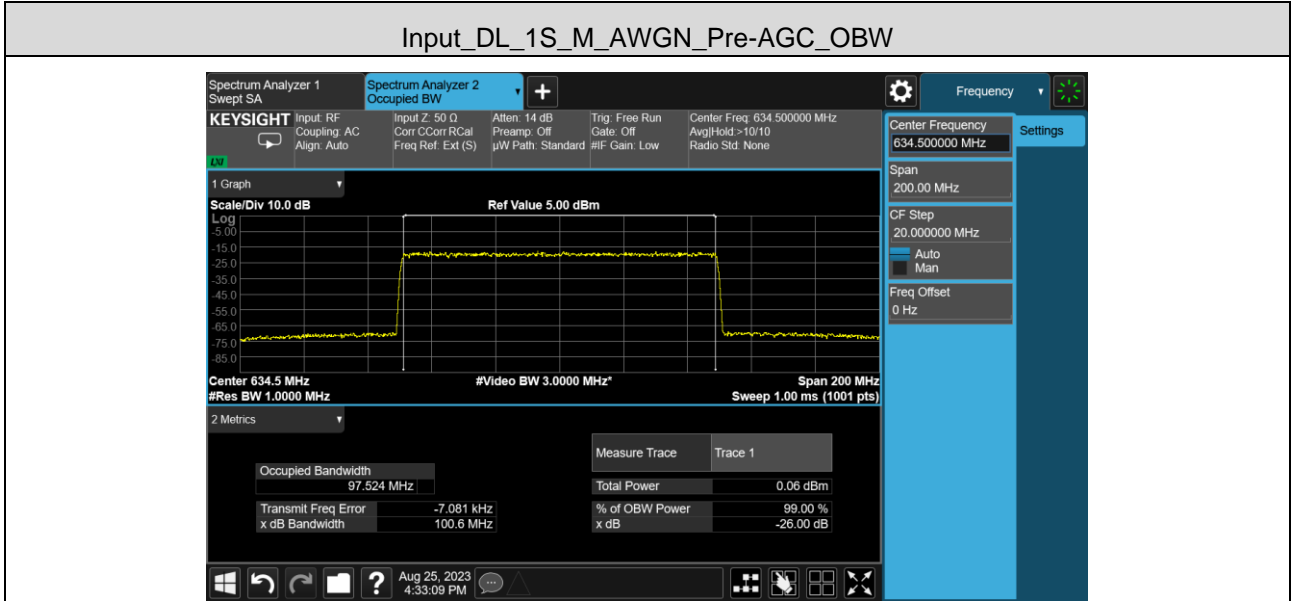
1.1 AGC threshold level

Test Conf.	AGC Threshold level
DL_1S_M_AWGN	0dBm



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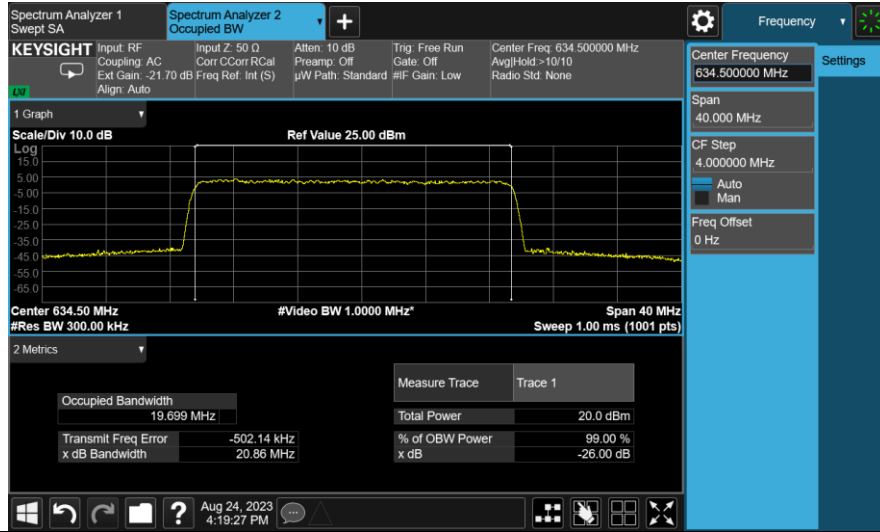
1.2 Input-versus-output signal comparison



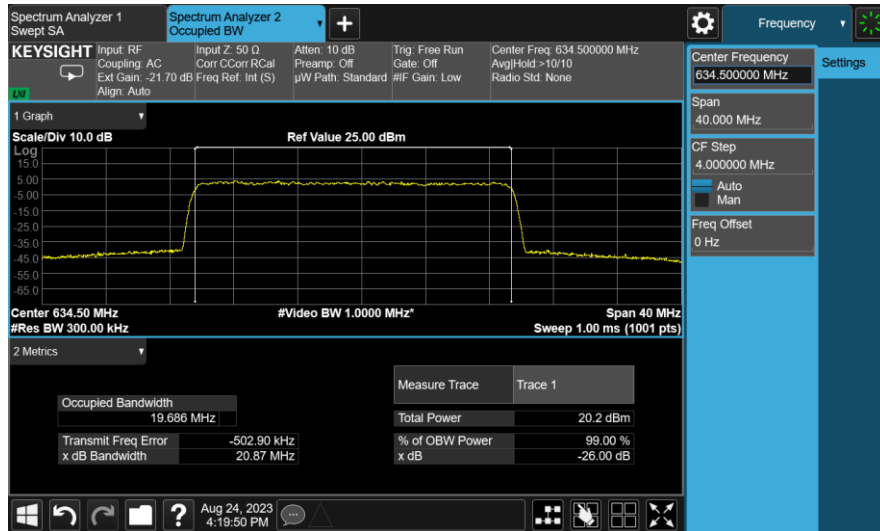
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output_DL_1S_M_AWGN_Pre-AGC_OBW



output_DL_1S_M_AWGN_AGC+3dB_OBW



Remark:

1. The band supports maximum channel BW is 20MHz for NR, so the output signal OBW was less than the input when 100MHz AWGN as input signal.
2. 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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1.3 Mean output power and amplifier/booster gain

Test Conf.	Test Freq. f ₀ (MHz)	Signal Level	Input Power (dBm)	Output Power (dBm)	Gain (dB)	Verdict
DL_1S_AWGN	617.67	Pre-AGC	0	20.10	20.10	PASS
		AGC+3dB	3	19.95	/	PASS

Remark:

According to the declaration from the applicant, the single antenna gain should not exceed 12.5dBi, the Directional gain = G(ANT) + 10 log (NANT) dBi = 12.5dBi+10log (2) dBi= 15.5dBi.

ERP= EIRP-2.15dB

The total maximum ERP for the EUT is (20.10dBm+20.10dBm) +15.5dBi-2.15dB=36.46dBm (4.426W) which don't exceed the required ERP limit (1000W/MHz).



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1.4 Out-of-band/out-of-block (including intermodulation) emissions and spurious emissions

Note: 1.The tested max conducted power for single antenna port is 20.1dBm, 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.

Here,

$$P=20.1\text{dBm}=0.1023\text{W}.$$

So the limit =

$$P(\text{dBm})-[43 + 10 \log (0.1023\text{W})] =20.22\text{dBm}-33.22\text{dB}=-13\text{dBm}$$

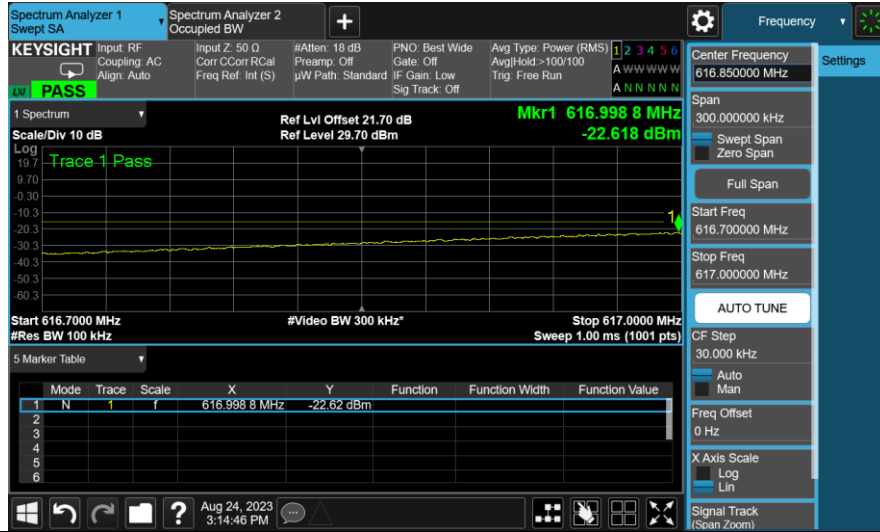
The EUT supports 2x2 MIMO and the emissions were measured at one of output port, so the limit line was set to -16.01dBm in following test plots in order to determine the test result conveniently.

2. The spurious emissions 9kHz to 30MHz were very low and not displayed in this report.

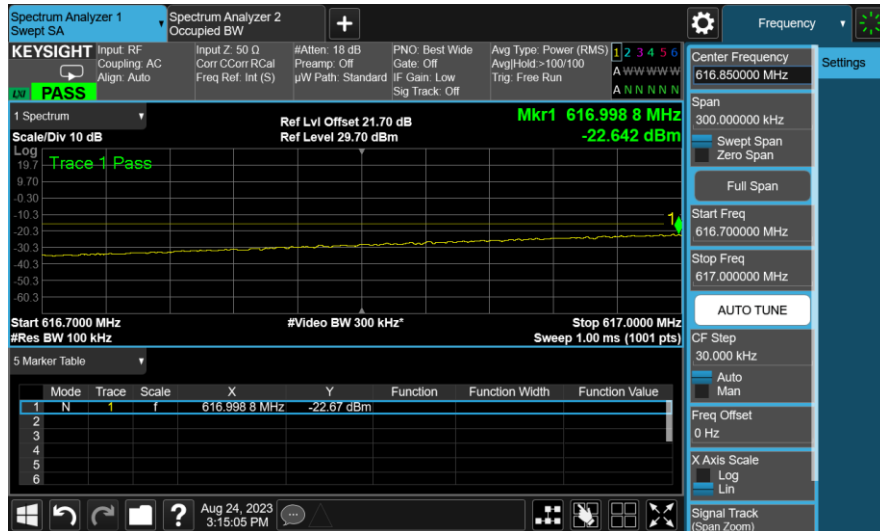


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DL_1S_B_AWGN_Pre-AGC_Out-of-band emission



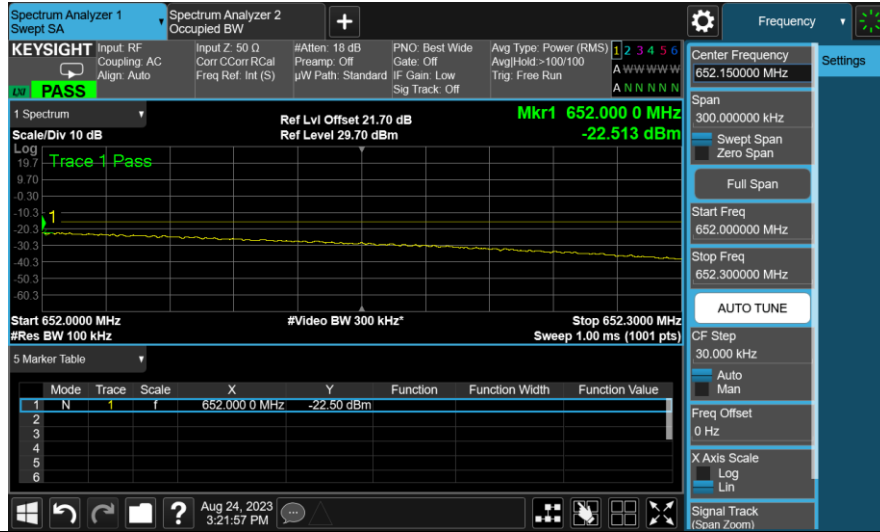
DL_1S_B_AWGN_AGC+3_Out-of-band emission



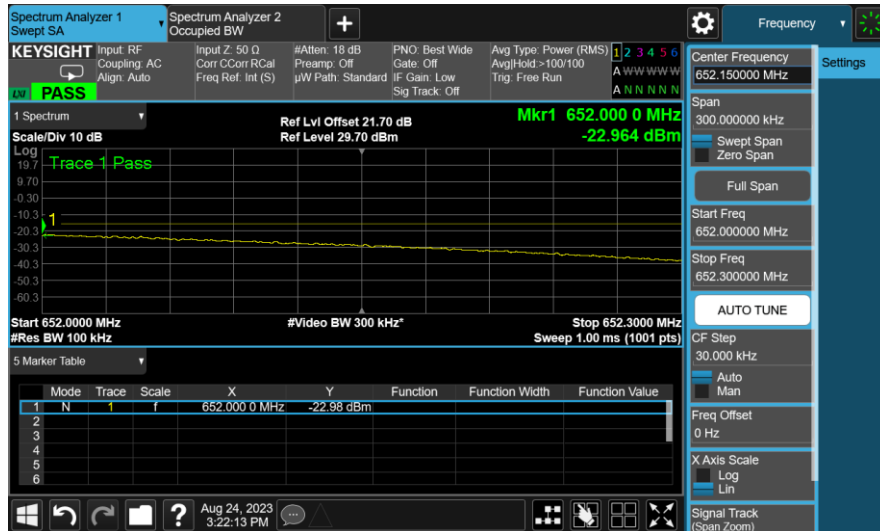
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DL_1S_T_AWGN_Pre-AGC_Out-of-band emission



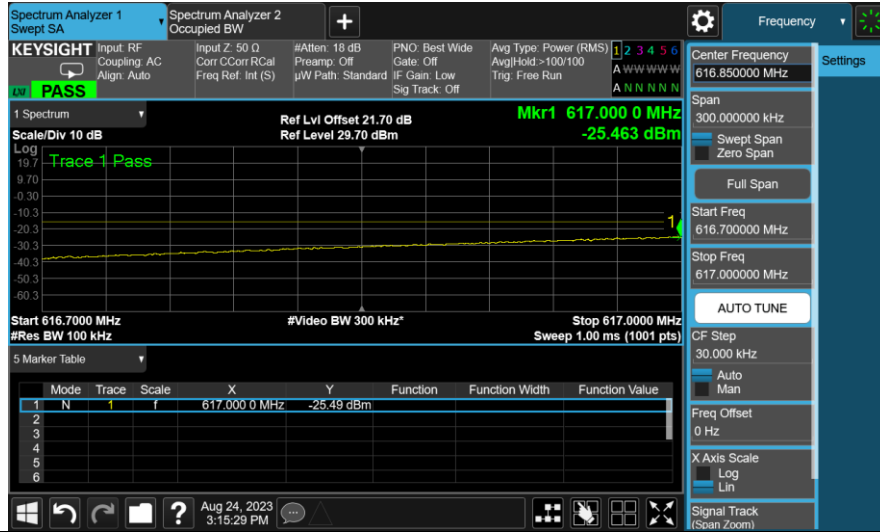
DL_1S_T_AWGN_AGC+3_Out-of-band emission



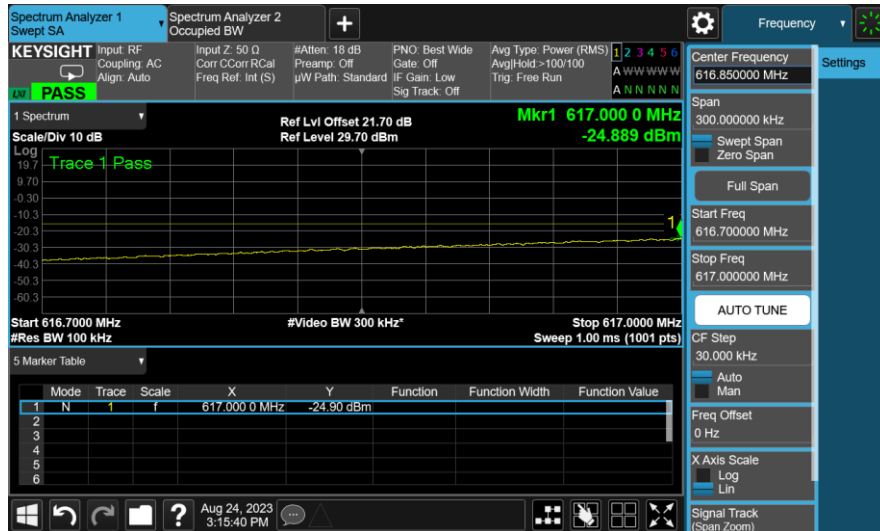
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DL_2S_B_AWGN_Pre-AGC_Out-of-band emission



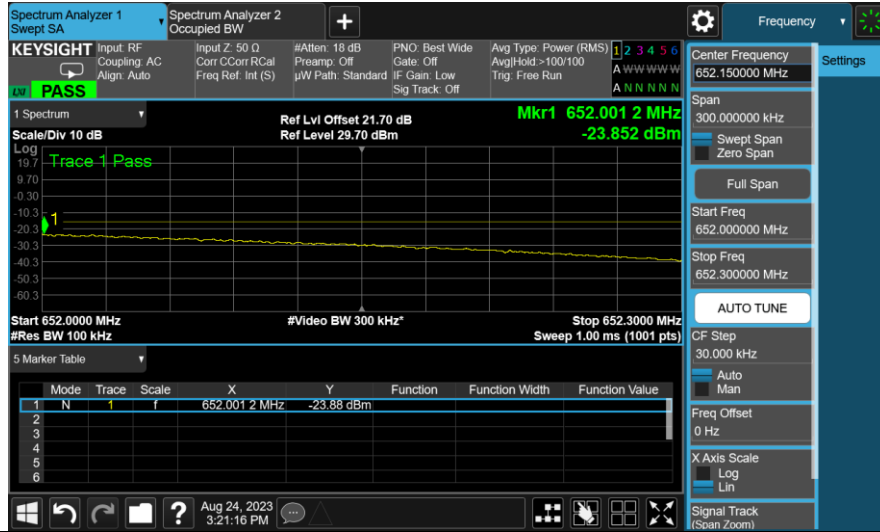
DL_2S_B_AWGN_AGC+3_Out-of-band emission



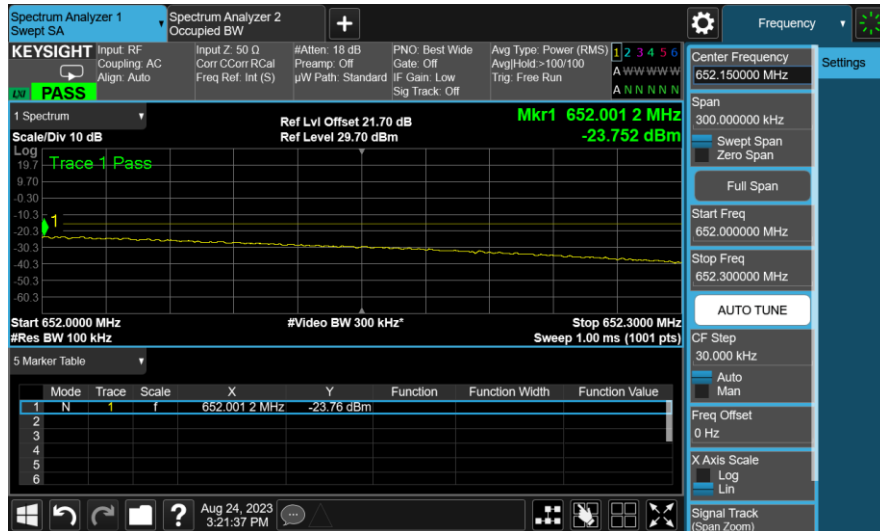
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DL_2S_T_AWGN_Pre-AGC_Out-of-band emission



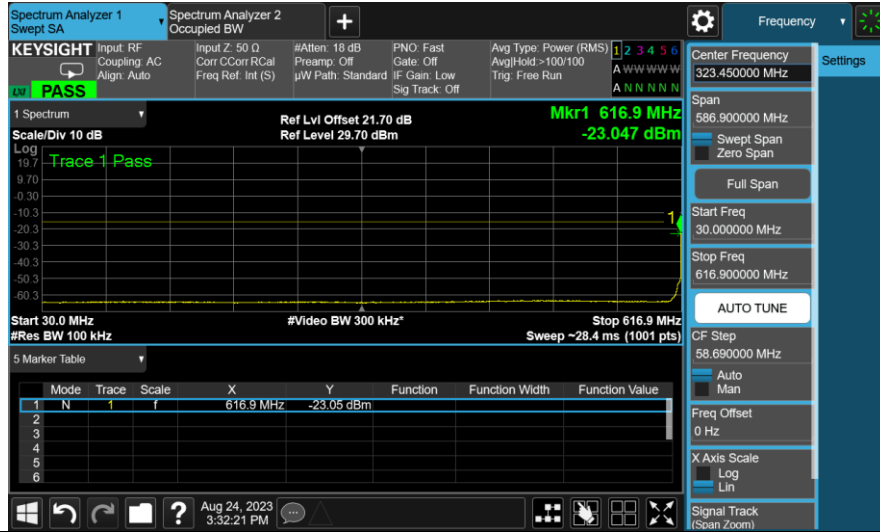
DL_2S_T_AWGN_AGC+3_Out-of-band emission



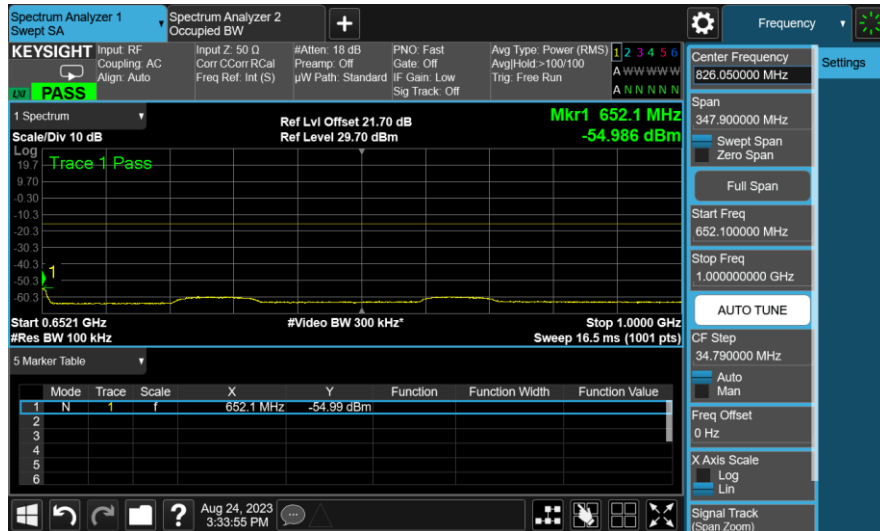
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DL_1S_B_AWGN_Pre-AGC_Spurious emission 1



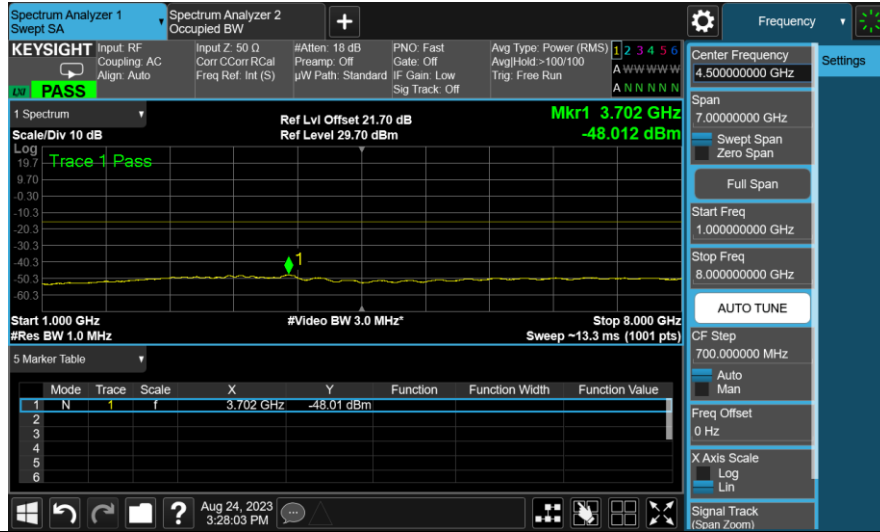
DL_1S_B_AWGN_Pre-AGC_Spurious emission 2



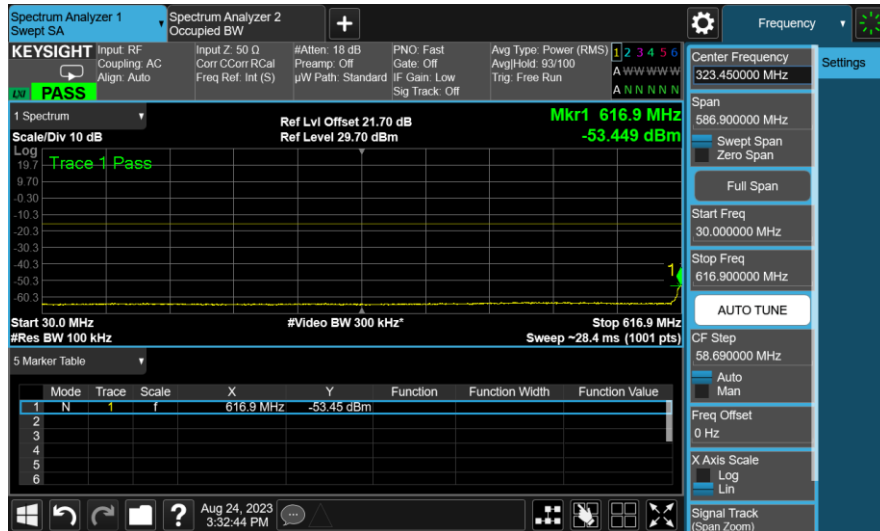
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DL_1S_B_AWGN_Pre-AGC_Spurious emission 3



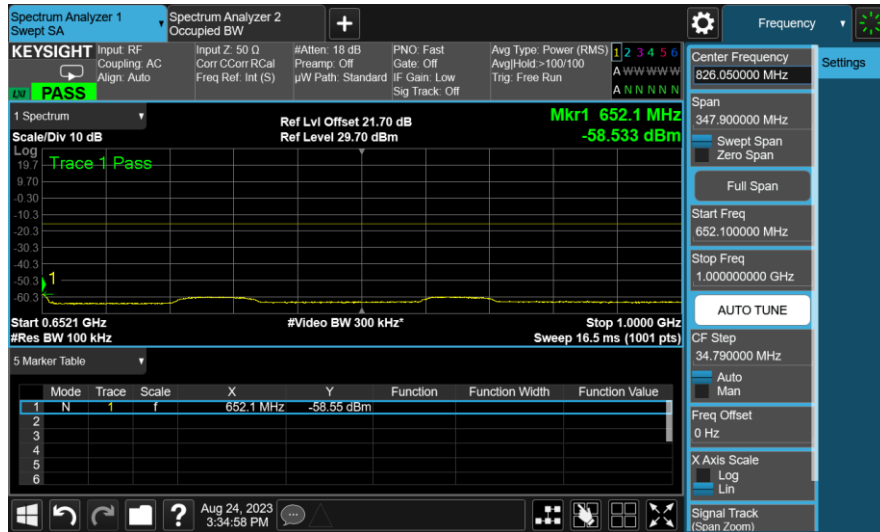
DL_1S_M_AWGN_Pre-AGC_Spurious emission 1



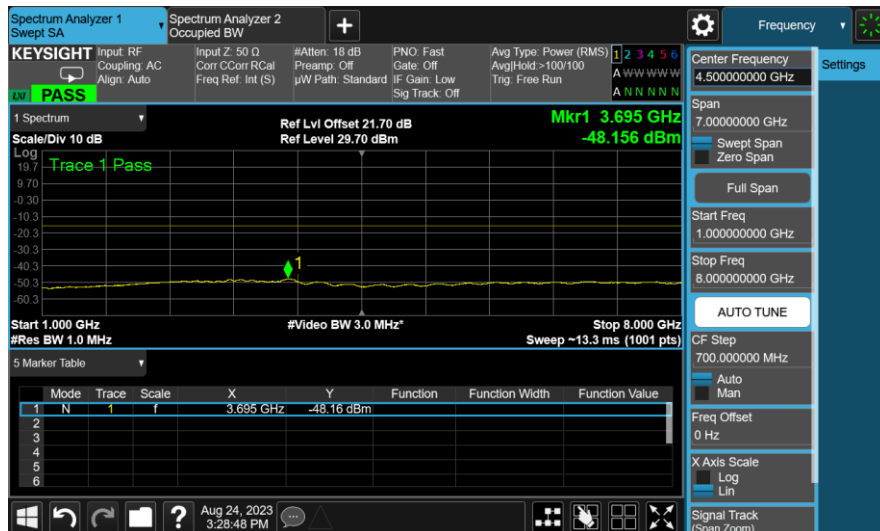
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DL_1S_M_AWGN_Pre-AGC_Spurious emission 2



DL_1S_M_AWGN_Pre-AGC_Spurious emission 3



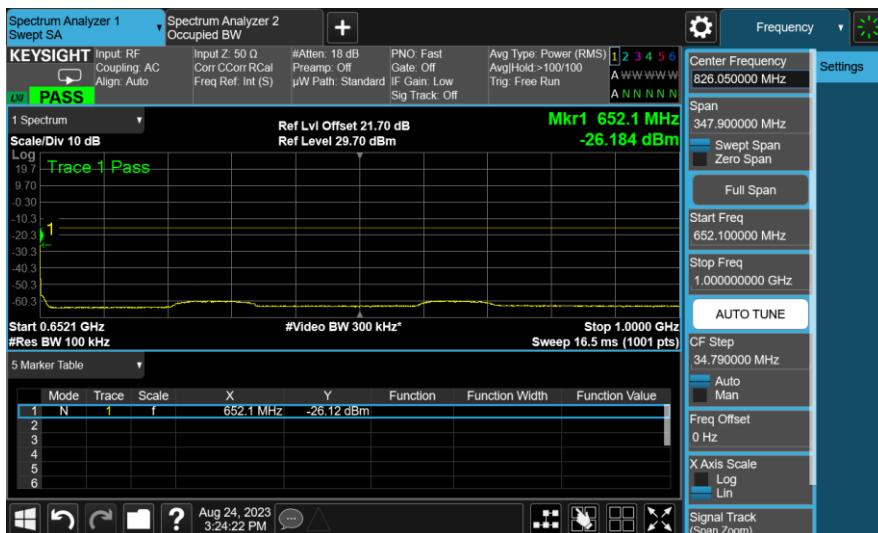
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DL_1S_T_AWGN_Pre-AGC_Spurious emission 1

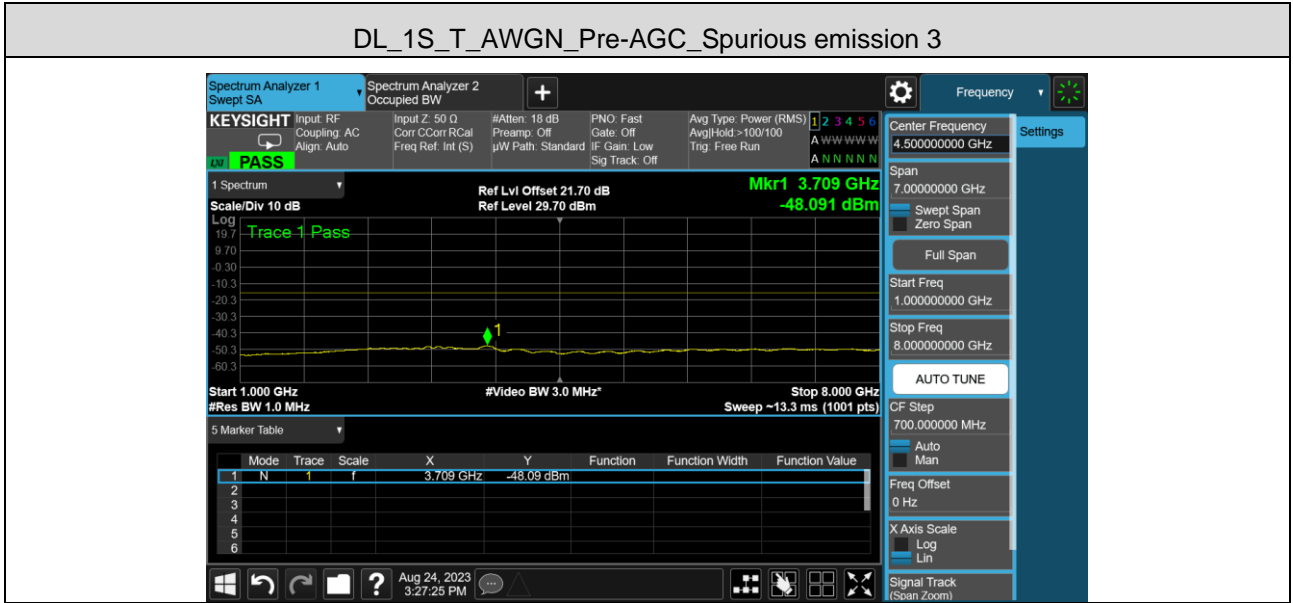


DL_1S_T_AWGN_Pre-AGC_Spurious emission 2



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1.5 Frequency Stability

- Note:
1. At 10 °C intervals of temperatures between -30 °C and +50 °C at the manufacturer's rated supply voltage, here the rated supply voltage is DC 48V.
 2. At +20 °C temperature and ±15% supply voltage variations. If a product is specified to operate over a range of input voltage, then the -15% variation is applied to the lowermost voltage and the +15% is applied to the uppermost voltage.
 3. The frequency stabilities can be maintained within the authorized bands of operation. Meet the requirement.

Frequency stability vs temperature				
Temperature (°C)	Test Conf.	Frequency Error (Hz)	Tolerance (ppm)	Verdict
50	DL_1S_M_AWGN	93	0.15	PASS
40		90	0.14	PASS
30		130	0.20	PASS
20		90	0.14	PASS
10		132	0.21	PASS
0		105	0.17	PASS
-10		104	0.16	PASS
-20		94	0.15	PASS
-30		107	0.17	PASS

Frequency stability vs voltage				
Voltage (V)	Test Conf.	Frequency Error (Hz)	Tolerance (ppm)	Verdict
DC 40.8	DL_1S_M_AWGN	117	0.18	PASS
DC 48		114	0.18	PASS
DC 55.2		109	0.17	PASS



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1.6 Radiated spurious emissions

Note: 1. The tested max conducted power for single antenna port is 20.1dBm. the 2x2 MIMO total power is $20.1\text{dBm}+20.1\text{dBm}= 0.2046\text{W}$.

The 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.

Here,

$P=0.2046\text{W}$,

So the limit =

$P(\text{dBm})- [43 + 10 \log (0.2046\text{W})] =-13\text{dBm}$

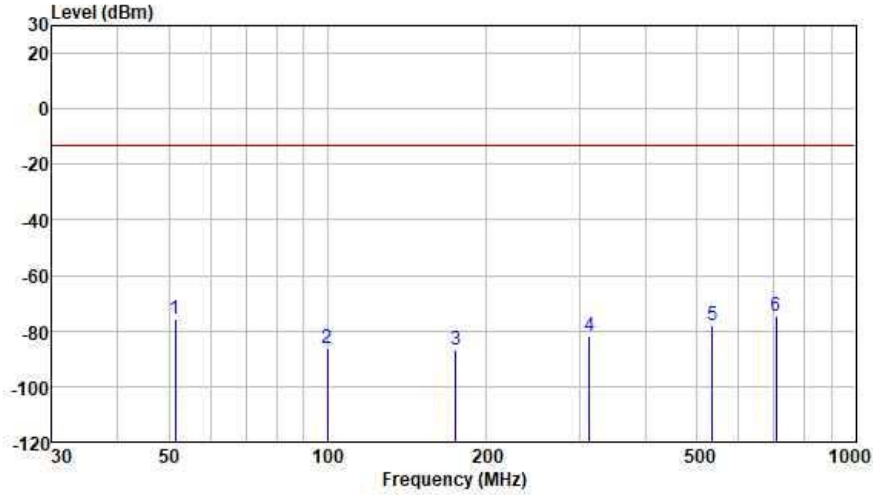
2. The radiated test performed at bottom / middle / top channel, the data with more than 20db margin, therefore, only the worst-case middle channel test data was recorded in the report.

3. The disturbance 9kHz to 30MHz was very low and 20dB below the limit, therefore, the data was not recorded in the report.



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DL_1S_M_AWGN_Horizontal_30MHz~1GHz

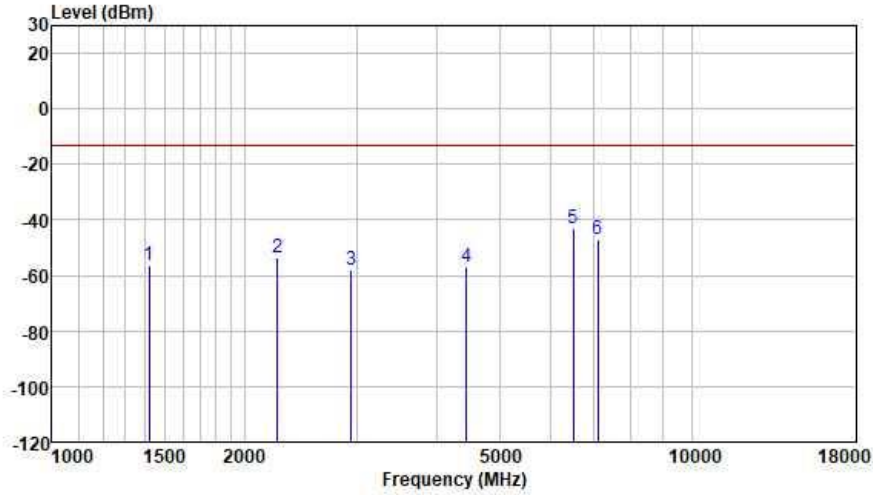


	Freq	Read Level	Correction Factor	Limit Level	Over Limit	Pol/Phase	
	MHz	dBm	dB	dBm	dB		
1	51.30	-74.31	-1.37	-75.68	-13.00	-62.68	HORIZONTAL
2	99.88	-76.39	-9.63	-86.02	-13.00	-73.02	HORIZONTAL
3	174.42	-80.53	-6.10	-86.63	-13.00	-73.63	HORIZONTAL
4	313.28	-78.65	-3.38	-82.03	-13.00	-69.03	HORIZONTAL
5	535.71	-78.45	0.77	-77.68	-13.00	-64.68	HORIZONTAL
6	706.70	-78.58	4.06	-74.52	-13.00	-61.52	HORIZONTAL



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DL_1S_M_AWGN_Horizontal_above 1GHz

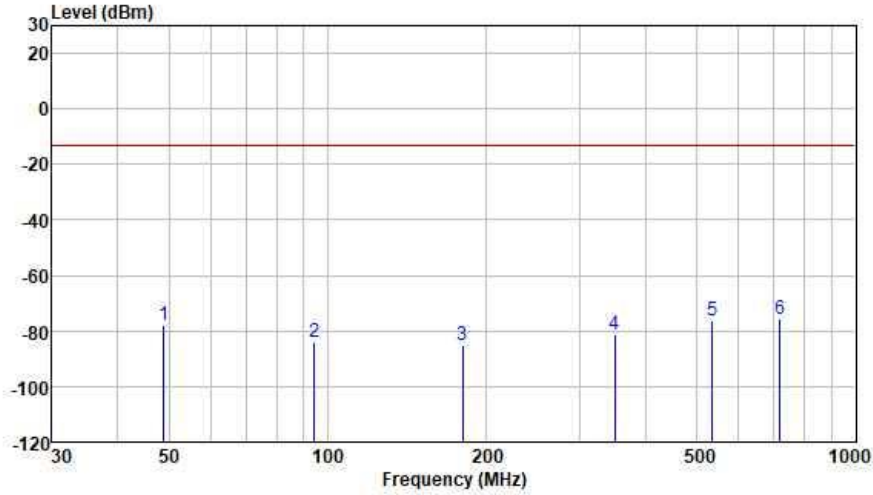


	Freq	Read Level	Correction Factor	Level	Limit Line	Over Limit	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	1418.69	-60.85	4.62	-56.23	-13.00	-43.23	HORIZONTAL
2	2252.85	-63.01	9.44	-53.57	-13.00	-40.57	HORIZONTAL
3	2930.63	-61.90	3.62	-58.28	-13.00	-45.28	HORIZONTAL
4	4443.45	-62.08	4.99	-57.09	-13.00	-44.09	HORIZONTAL
5	6526.37	-62.79	19.88	-42.91	-13.00	-29.91	HORIZONTAL
6	7117.54	-66.05	18.97	-47.08	-13.00	-34.08	HORIZONTAL



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DL_1S_M_AWGN_Vertical_30MHz~1GHz



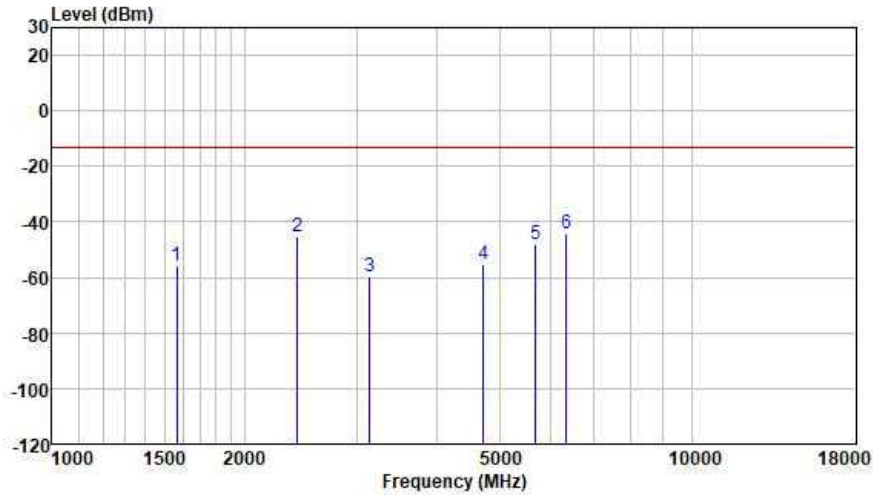
	Freq	Read Level	Correction Factor	Limit Level	Over Limit	Pol/Phase
	MHz	dBm	dB	dBm	dB	
1	48.84	-70.23	-7.89	-13.00	-65.12	VERTICAL
2	94.10	-78.09	-6.13	-13.00	-71.22	VERTICAL
3	180.02	-81.45	-3.94	-13.00	-72.39	VERTICAL
4	349.25	-79.32	-2.16	-13.00	-68.48	VERTICAL
5	535.71	-77.81	1.50	-13.00	-63.31	VERTICAL
6	719.20	-79.44	3.90	-13.00	-62.54	VERTICAL



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DL_1S_M_AWGN_Vertical_above 1GHz



	Read Freq	Level	Correction Factor	Level	Limit Line	Over Limit	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	1565.19	-61.34	5.51	-55.83	-13.00	-42.83	VERTICAL
2	2414.67	-55.09	9.60	-45.49	-13.00	-32.49	VERTICAL
3	3132.08	-62.39	2.69	-59.70	-13.00	-46.70	VERTICAL
4	4721.52	-63.63	8.16	-55.47	-13.00	-42.47	VERTICAL
5	5697.37	-63.62	15.66	-47.96	-13.00	-34.96	VERTICAL
6	6358.79	-63.37	19.31	-44.06	-13.00	-31.06	VERTICAL



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2 Lower 700MHz (698-716MHz paired with 728-746MHz)

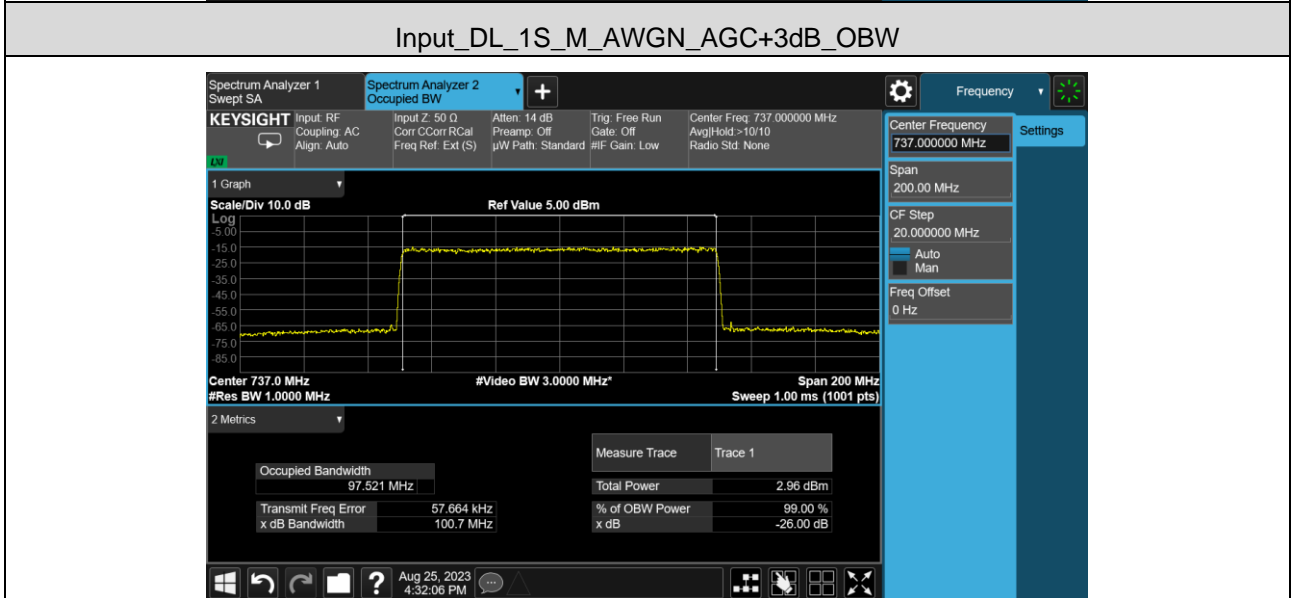
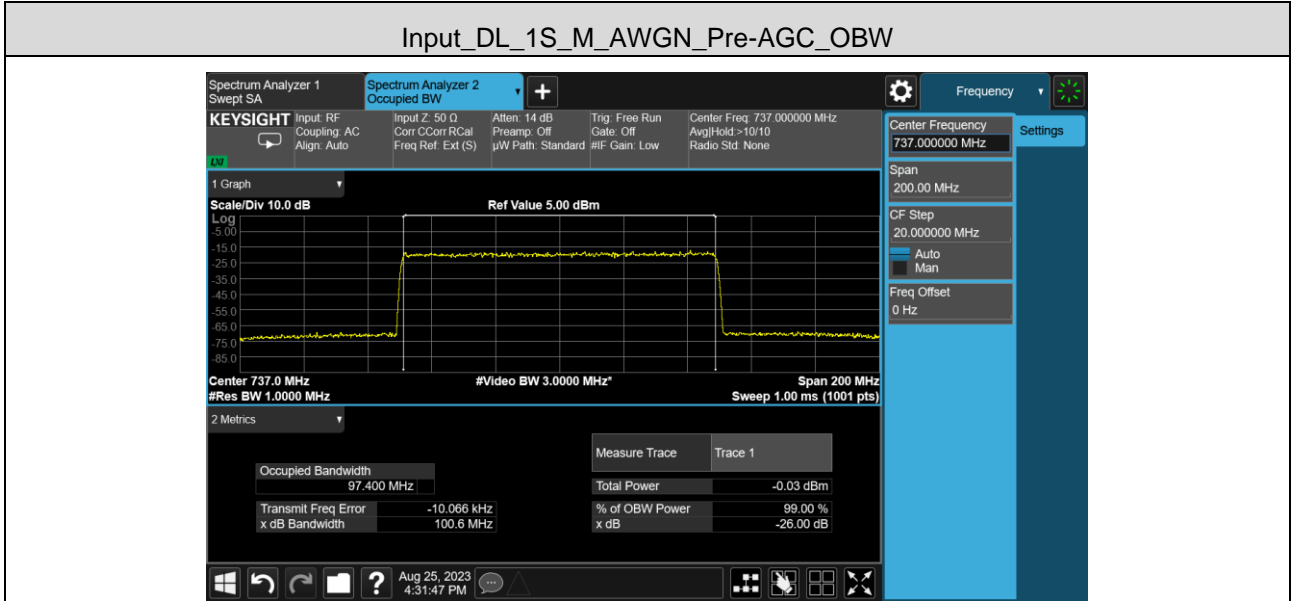
2.1 AGC threshold level

Test Conf.	AGC Threshold level
DL_1S_M_AWGN	-0.15dBm



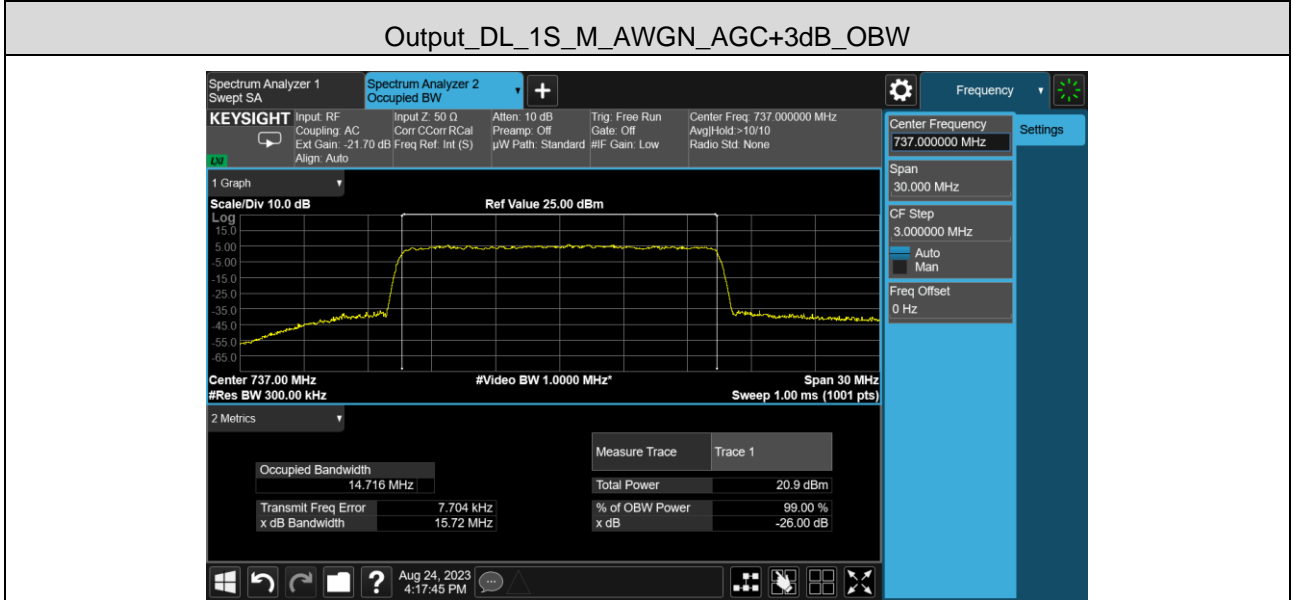
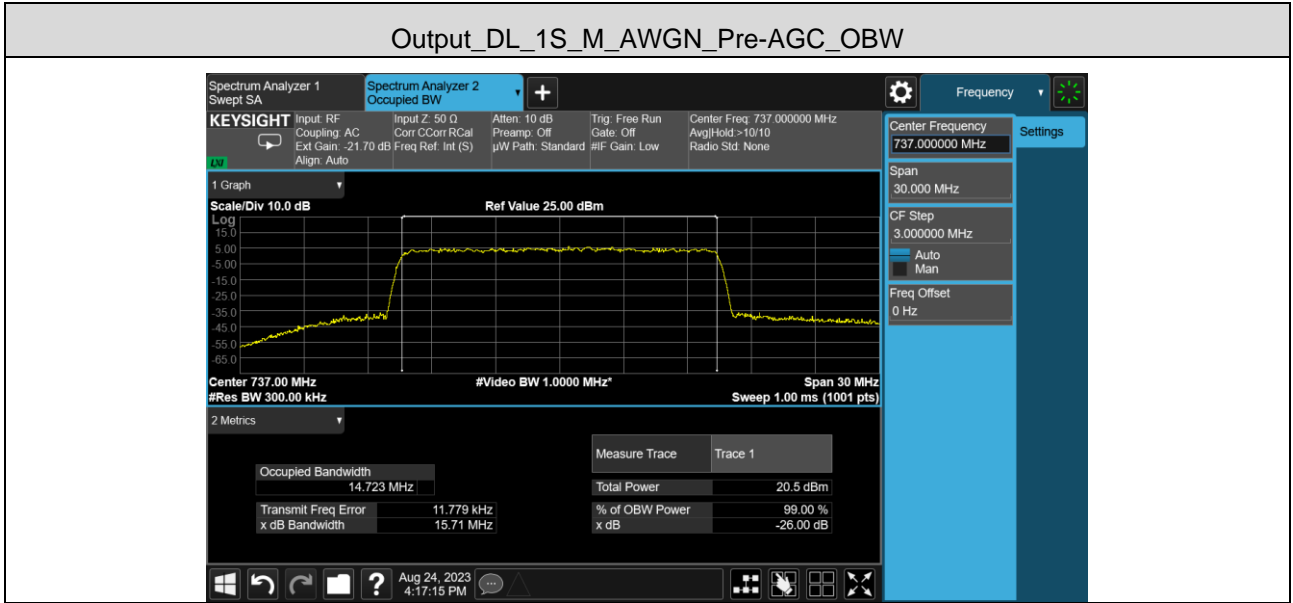
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2.2 Input-versus-output signal comparison



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Remark:

1. The band supports maximum channel BW is 15MHz for NR, so the output signal OBW was less than the input when 100MHz AWGN as input signal.
2. 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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2.3 Mean output power and amplifier/booster gain

Test Conf.	Test Freq. f ₀ (MHz)	Signal Level	Input Power (dBm)	Output Power (dBm)	Gain (dB)	Verdict
DL_1S_AWGN	738.73	Pre-AGC	-0.15	20.00	20.15	PASS
		AGC+3dB	2.85	20.16	/	PASS

Remark:

According to the declaration from the applicant, the single antenna gain should not exceed 12.5dBi, the Directional gain = G(ANT) + 10 log (NANT) dBi = 12.5dBi+10log (2) dBi= 15.5dBi.

ERP= EIRP-2.15dB,

The total maximum ERP for the EUT is (20.16dBm+20.16dBm) +15.5dBi-2.15dB=36.52dBm (4.488W) which don't exceed the required ERP limit (1000W/MHz).



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2.4 Out-of-band/out-of-block (including intermodulation) emissions and spurious emissions

Note: 1.The tested max conducted power for single antenna port is 20.16dBm, 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, the limit corresponds to an absolute limit of -13 dBm.

Here,

$$P=20.16\text{dBm}= 0.1037\text{W}.$$

So the limit =

$$P(\text{dBm})- [43 + 10 \log (0.1037\text{W})] =-13\text{dBm}$$

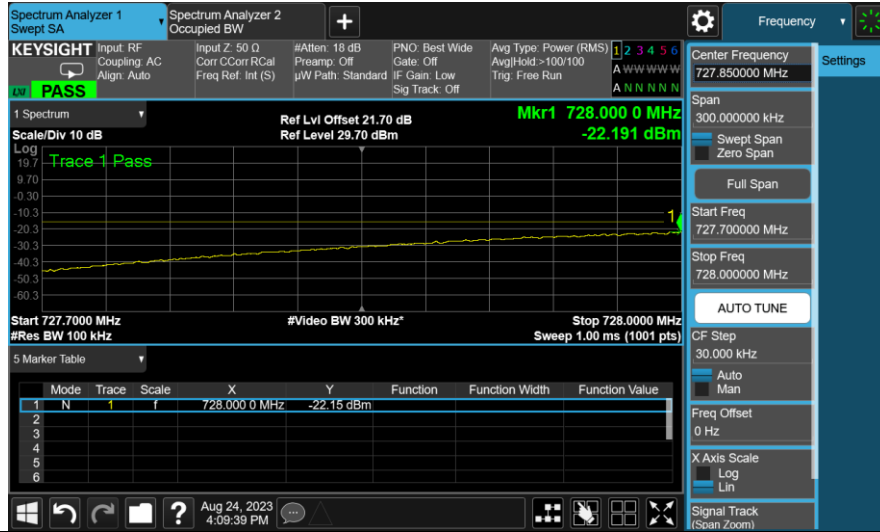
The EUT supports 2x2 MIMO and the emissions were measured at one of output port, so the limit line was set to -16.01dBm in following test plots in order to determine the test result conveniently.

2. The spurious emissions 9kHz to 30MHz were very low and not displayed in this report.

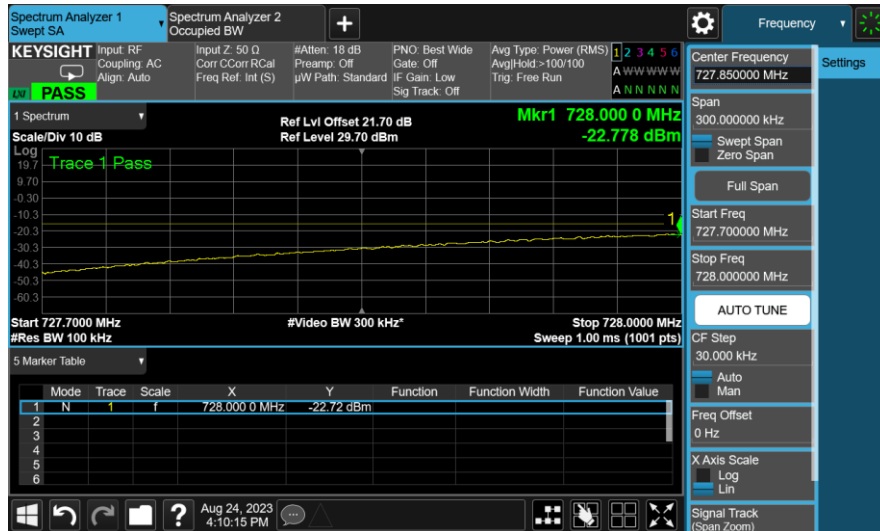


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DL_1S_B_AWGN_Pre-AGC_Out-of-band emission



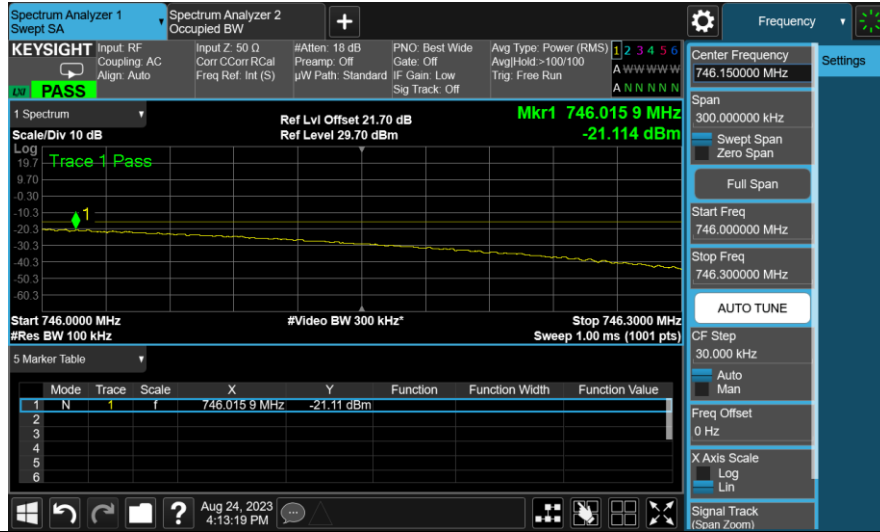
DL_1S_B_AWGN_AG+3_Out-of-band emission



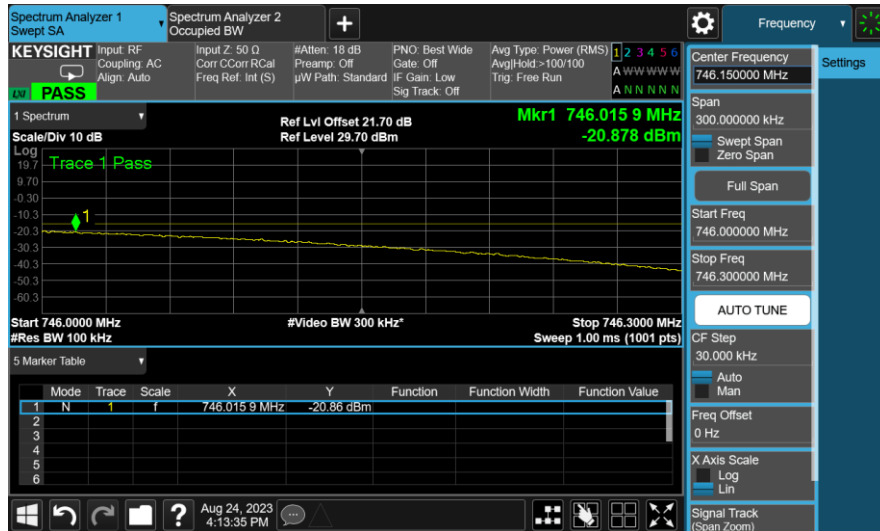
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DL_1S_T_AWGN_Pre-AGC_Out-of-band emission



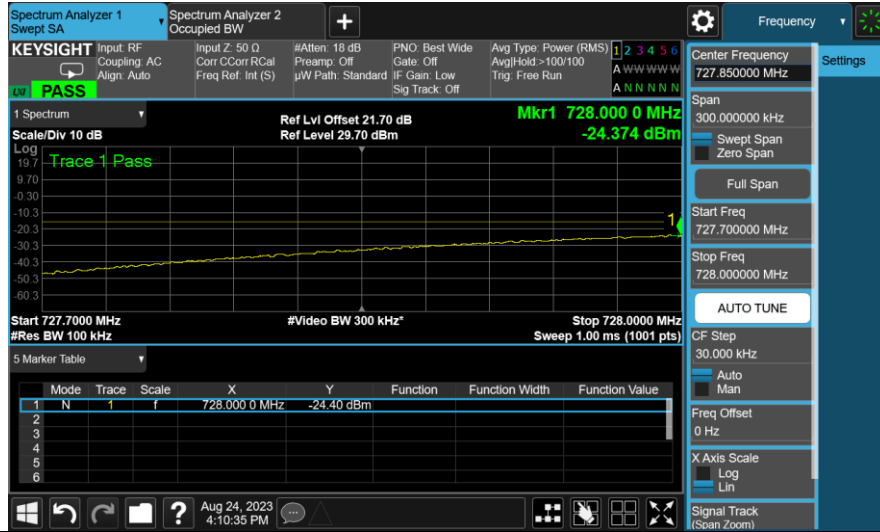
DL_1S_T_AWGN_AGC+3_Out-of-band emission



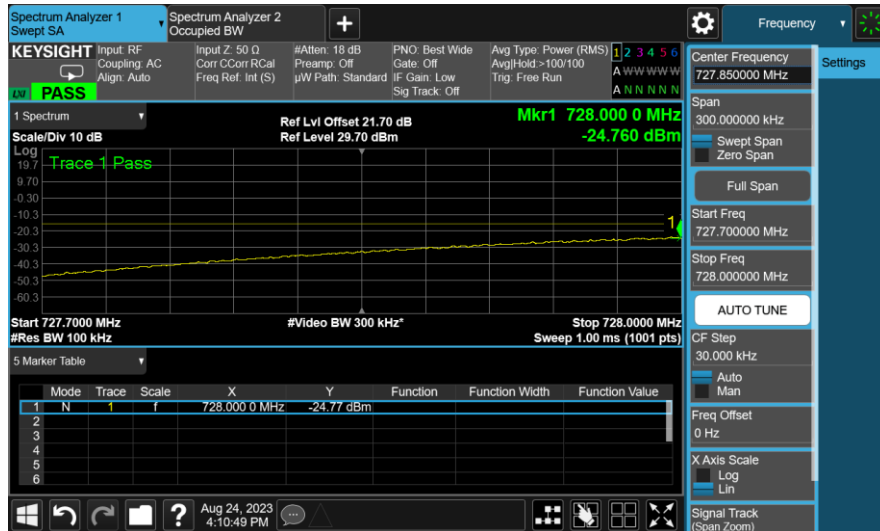
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DL_2S_B_AWGN_Pre-AGC_Out-of-band emission



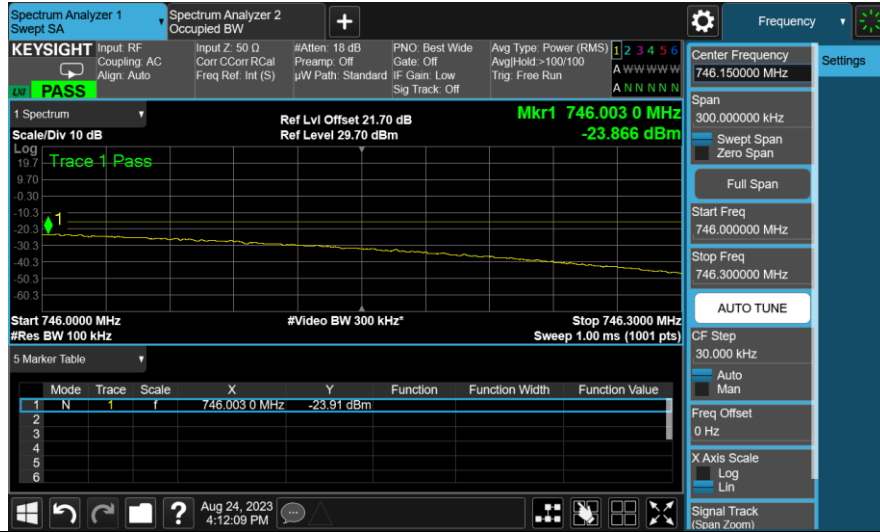
DL_2S_B_AWGN_AGC+3_Out-of-band emission



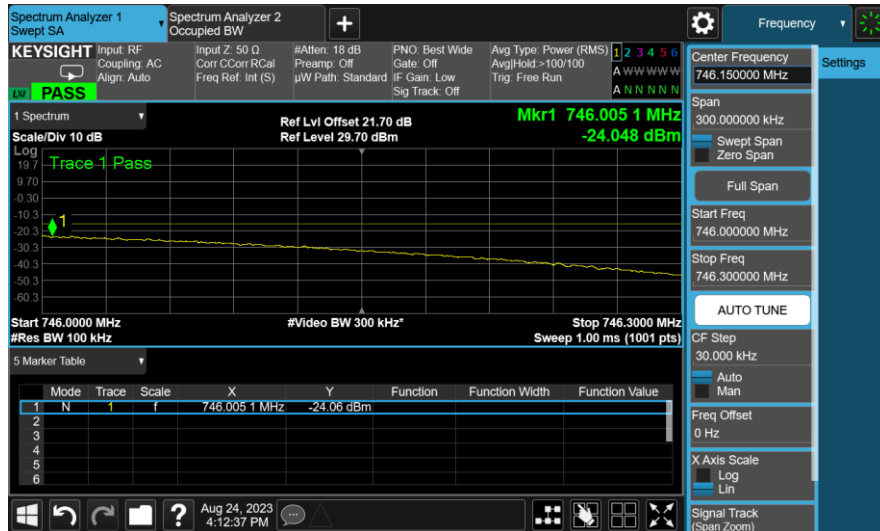
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DL_2S_T_AWGN_Pre-AGC_Out-of-band emission

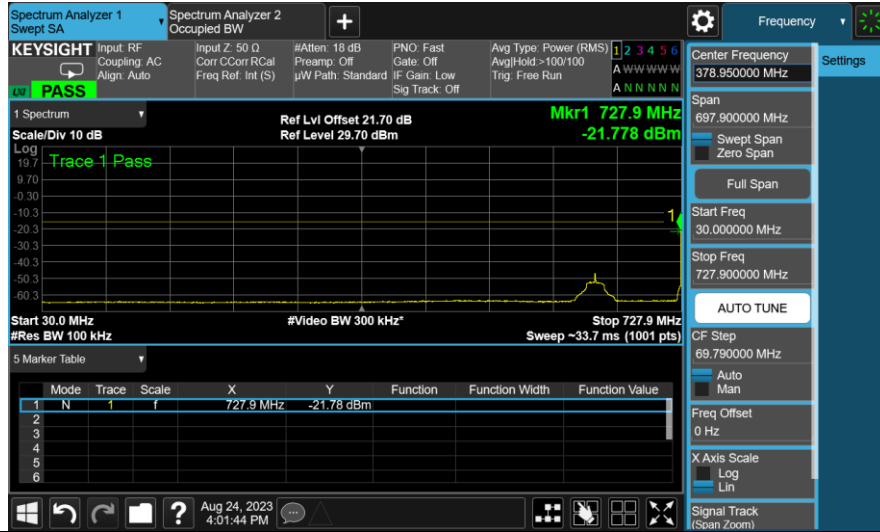


DL_2S_T_AWGN_AGC+3_Out-of-band emission

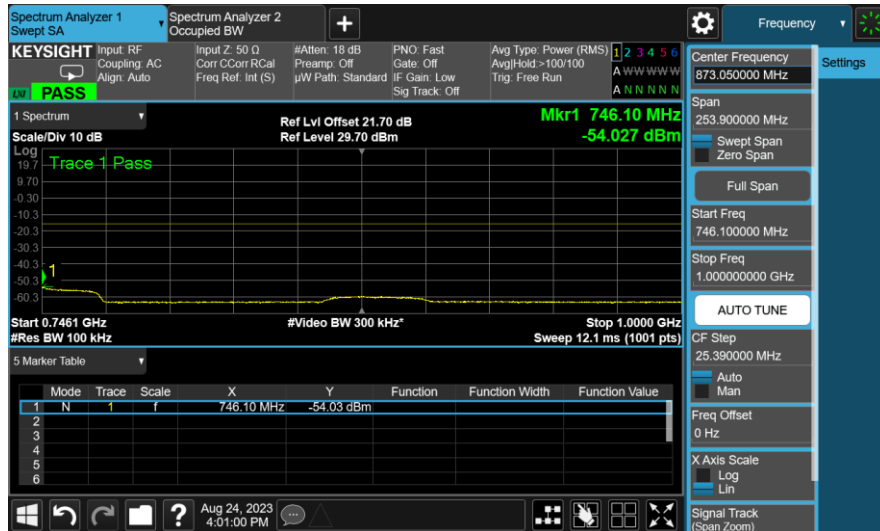


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DL_1S_B_AWGN_Pre-AGC_Spurious emission 1



DL_1S_B_AWGN_Pre-AGC_Spurious emission 2

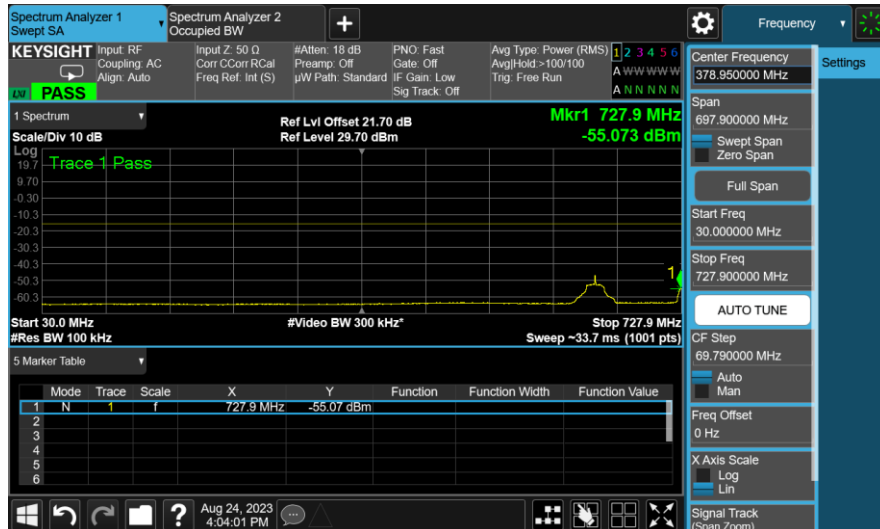


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DL_1S_B_AWGN_Pre-AGC_Spurious emission 3



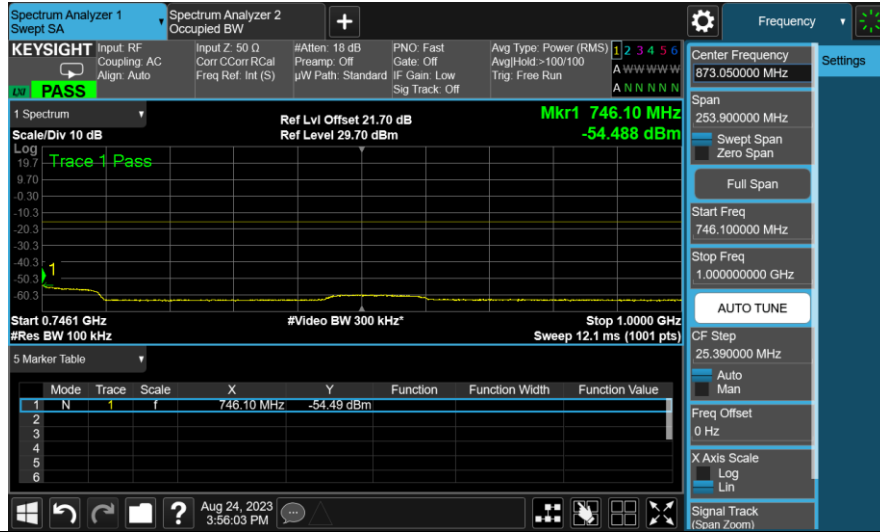
DL_1S_M_AWGN_Pre-AGC_Spurious emission 1



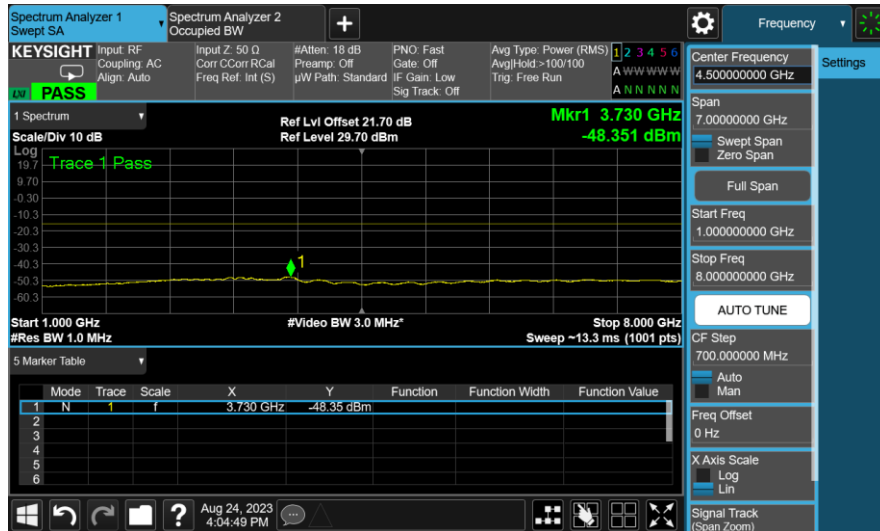
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DL_1S_M_AWGN_Pre-AGC_Spurious emission 2

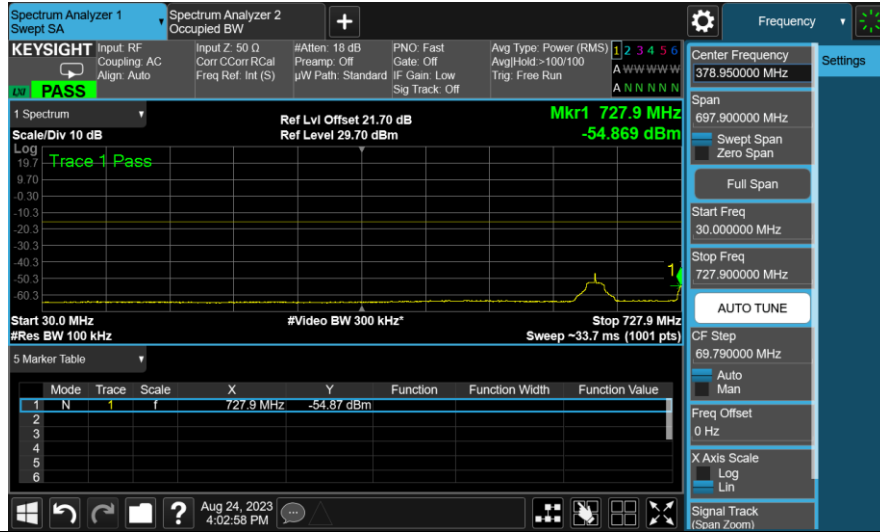


DL_1S_M_AWGN_Pre-AGC_Spurious emission 3

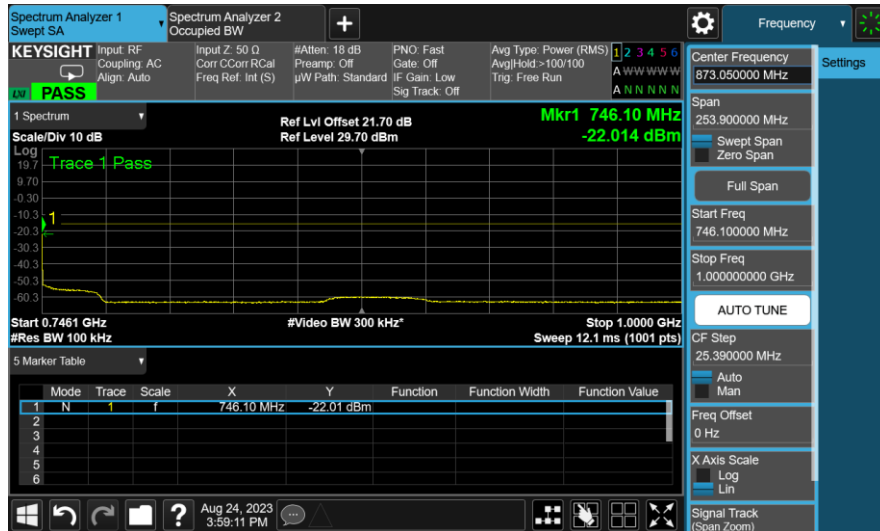


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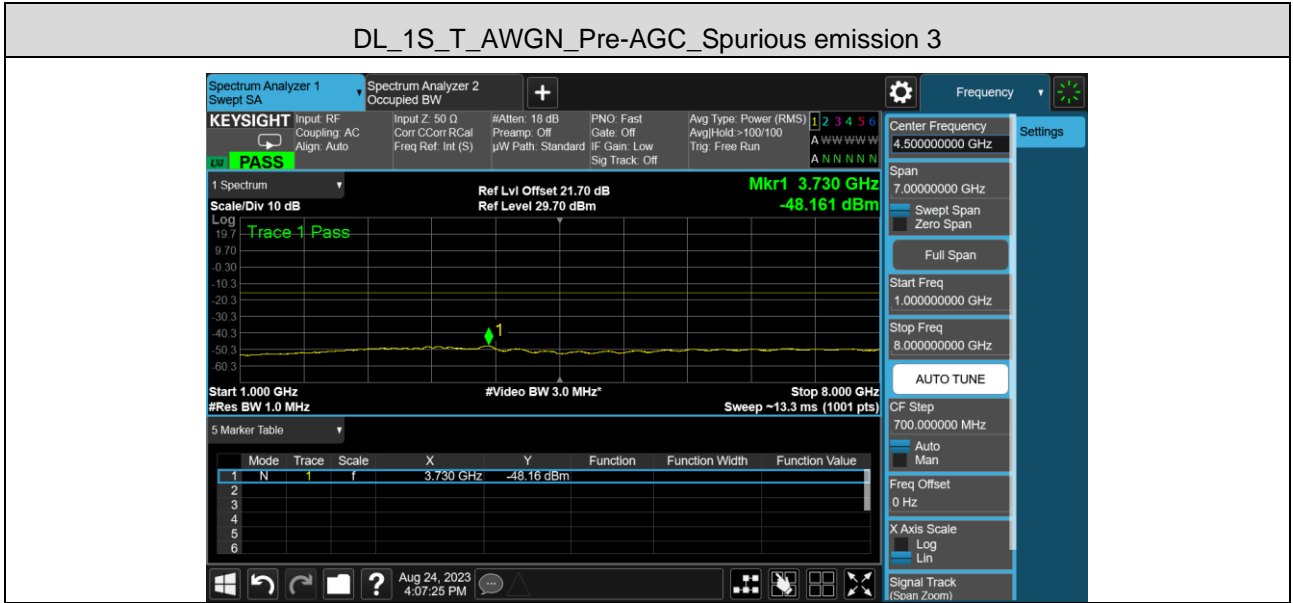
DL_1S_T_AWGN_Pre-AGC_Spurious emission 1



DL_1S_T_AWGN_Pre-AGC_Spurious emission 2



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2.5 Frequency Stability

- Note:
1. At 10 °C intervals of temperatures between -30 °C and +50 °C at the manufacturer's rated supply voltage, here the rated supply voltage is DC 48V.
 2. At +20 °C temperature and ±15% supply voltage variations. If a product is specified to operate over a range of input voltage, then the -15% variation is applied to the lowermost voltage and the +15% is applied to the uppermost voltage.
 3. The frequency stabilities can be maintained within the authorized bands of operation. Meet the requirement.

Frequency stability vs temperature				
Temperature (°C)	Test Conf.	Frequency Error (Hz)	Tolerance (ppm)	Verdict
50	DL_1S_M_AWGN	140	0.19	PASS
40		133	0.18	PASS
30		141	0.19	PASS
20		104	0.14	PASS
10		138	0.19	PASS
0		102	0.14	PASS
-10		101	0.14	PASS
-20		106	0.14	PASS
-30		113	0.15	PASS

Frequency stability vs voltage				
Voltage (V)	Test Conf.	Frequency Error (Hz)	Tolerance (ppm)	Verdict
DC 40.8	DL_1S_M_AWGN	116	0.16	PASS
DC 48		118	0.16	PASS
DC 55.2		104	0.14	PASS



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2.6 Radiated spurious emissions

Note: 1. The tested max conducted power for single antenna port is 20.16dBm. the 2x2 MIMO total power is 20.16dBm+20.16dBm= 0.2074W.

The 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.

Here,

$P=0.2074W$,

So the limit =

$P(\text{dBm}) - [43 + 10 \log (0.2074W)] = -13\text{dBm}$

2. The radiated test performed at bottom / middle / top channel, the data with more than 20db margin, therefore, only the worst-case middle channel test data was recorded in the report.

3. The disturbance from 9kHz to 30MHz was very low and 20db below the limit, therefore, the data was not recorded in the report.



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