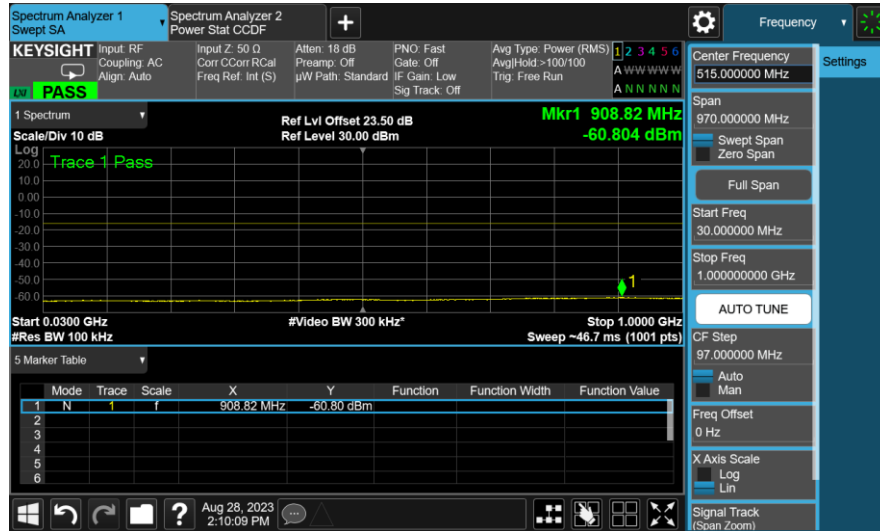
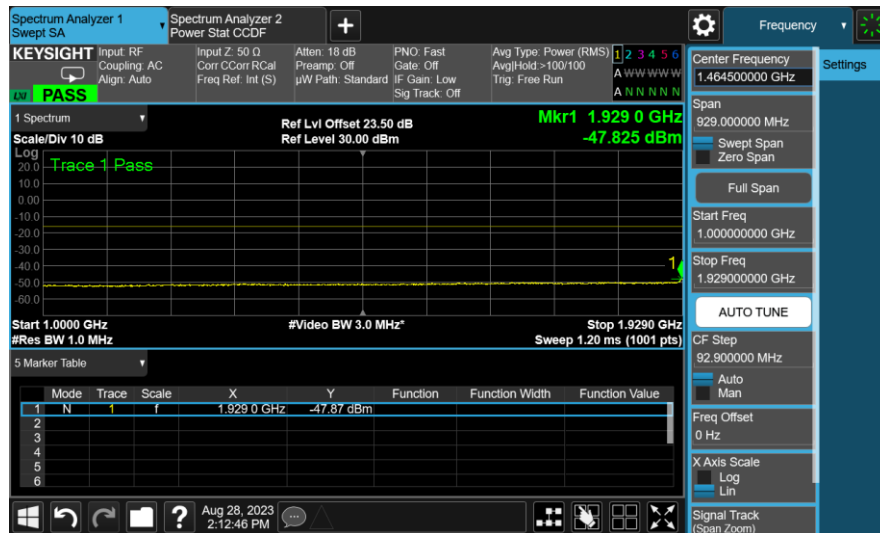


DL_1S_M_AWGN_AWGN_Pre-AGC_Spurious emission 1



DL_1S_M_AWGN_Pre-AGC_Spurious emission 2

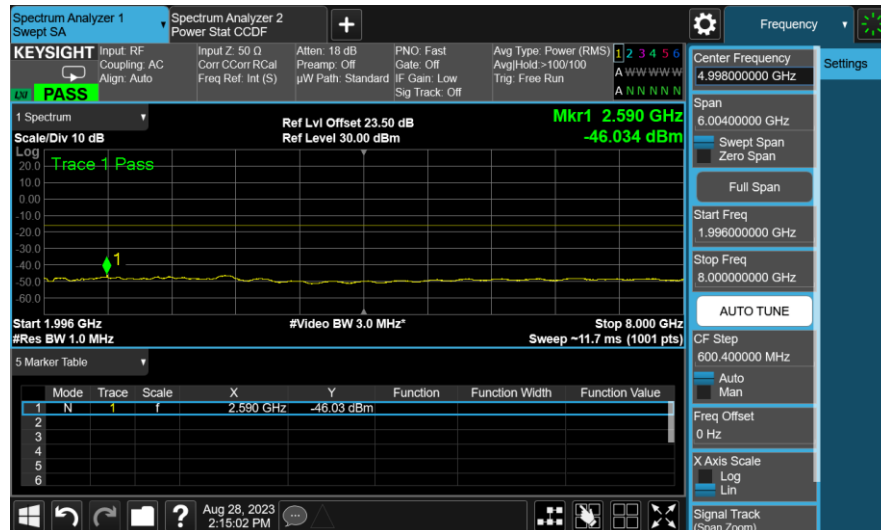


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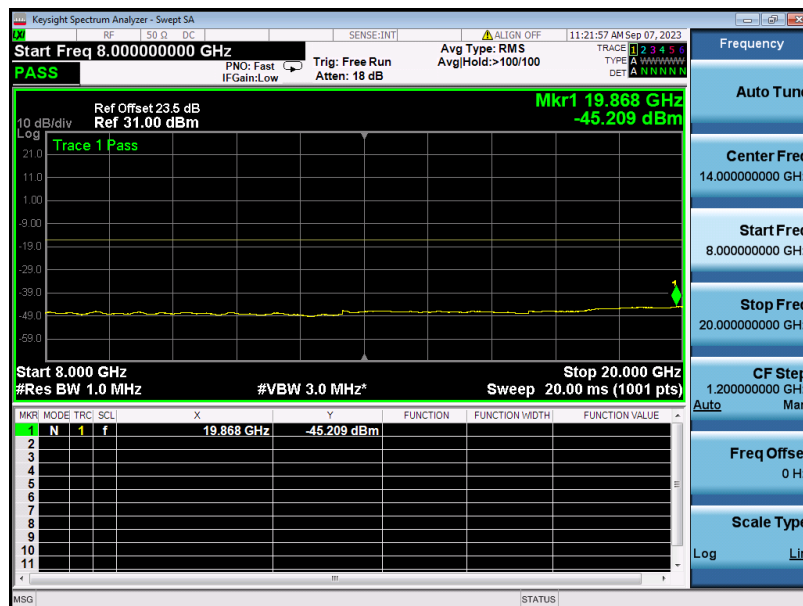
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DL_1S_M_AWGN_Pre-AGC_Spurious emission 3



DL_1S_M_AWGN_Pre-AGC_Spurious emission 4

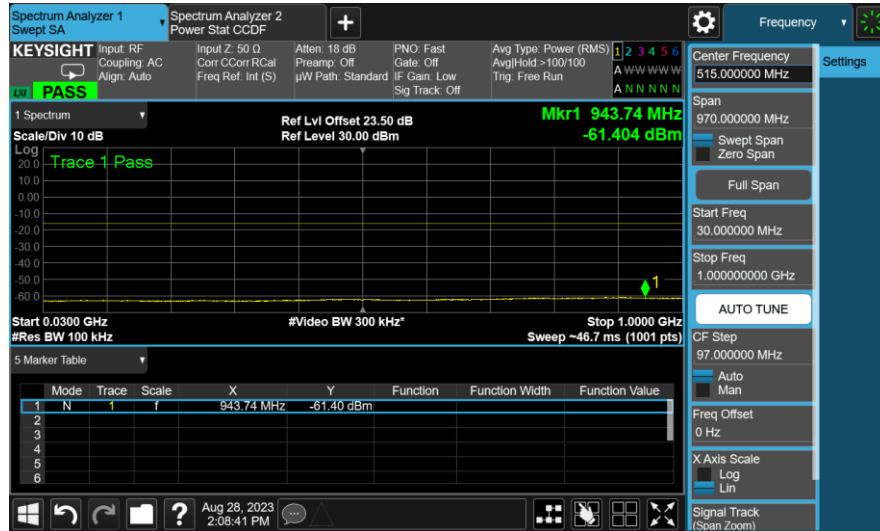


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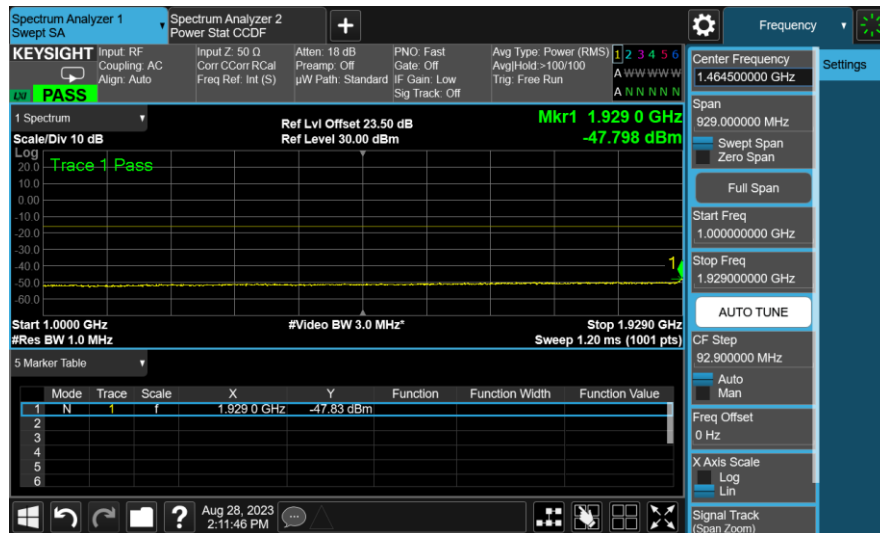
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DL_1S_T_AWGN_Pre-AGC_Spurious emission 1



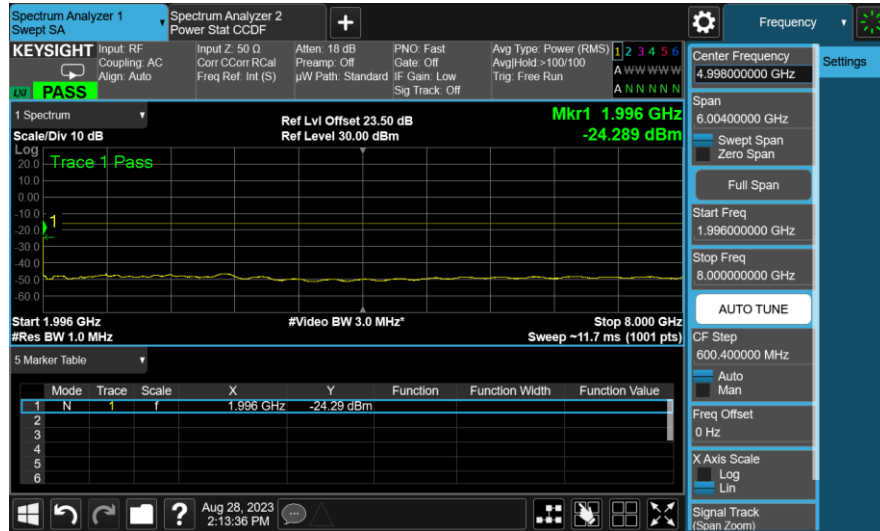
DL_1S_T_AWGN_Pre-AGC_Spurious emission 2



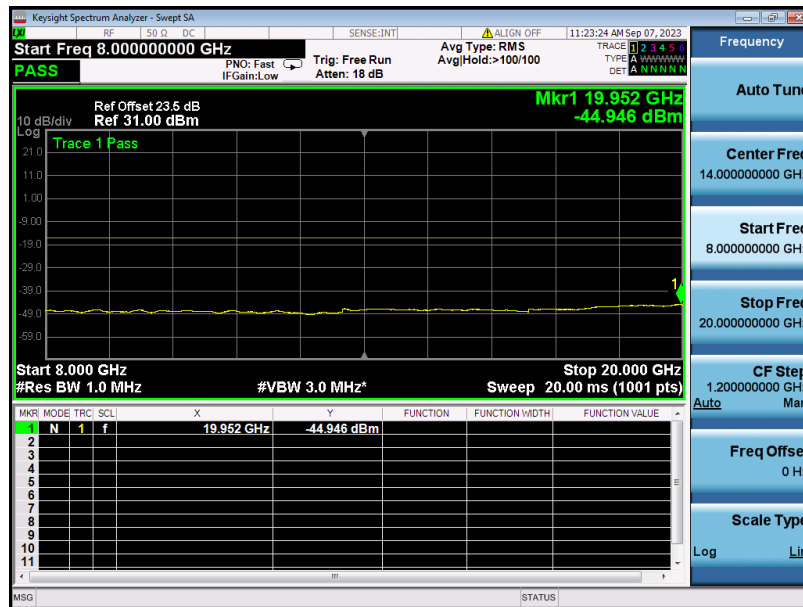
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DL_1S_T_AWGN_Pre-AGC_Spurious emission 3



DL_1S_T_AWGN_Pre-AGC_Spurious emission 4



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3.5 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 $\pm 15\%$ 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.



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Frequency stability vs temperature				
Temperature (°C)	Test Conf.	Frequency Error (Hz)	Tolerance (ppm)	Verdict
50	DL_1S_M_AWGN	99	0.050	PASS
40		113	0.058	PASS
30		111	0.057	PASS
20		111	0.057	PASS
10		113	0.058	PASS
0		95	0.048	PASS
-10		106	0.054	PASS
-20		100	0.051	PASS
-30		115	0.059	PASS

Frequency stability vs voltage				
Voltage (V)	Test Conf.	Frequency Error (Hz)	Tolerance (ppm)	Verdict
DC 40.8	DL_1S_M_AWGN	105	0.054	PASS
DC 48		111	0.057	PASS
DC 55.2		110	0.056	PASS



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3.6 Radiated spurious emissions

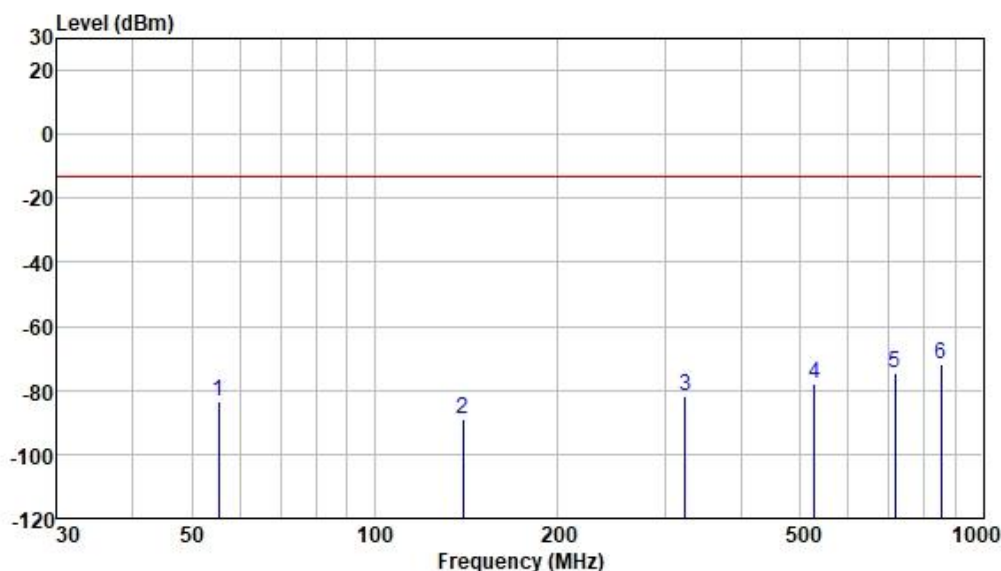
- Note:
1. The tested max conducted power for single antenna port is 20.35dBm. the 2x2 MIMO total power is $20.35\text{dBm} + 20.35\text{dBm} = 0.2168\text{W}$.
the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10} (P)$ dB
Here,
 $P = 0.2168\text{W}$,
So the limit =
 $P(\text{dBm}) - [43 + 10 \log (0.2168\text{W})] = -13\text{dBm}$
 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



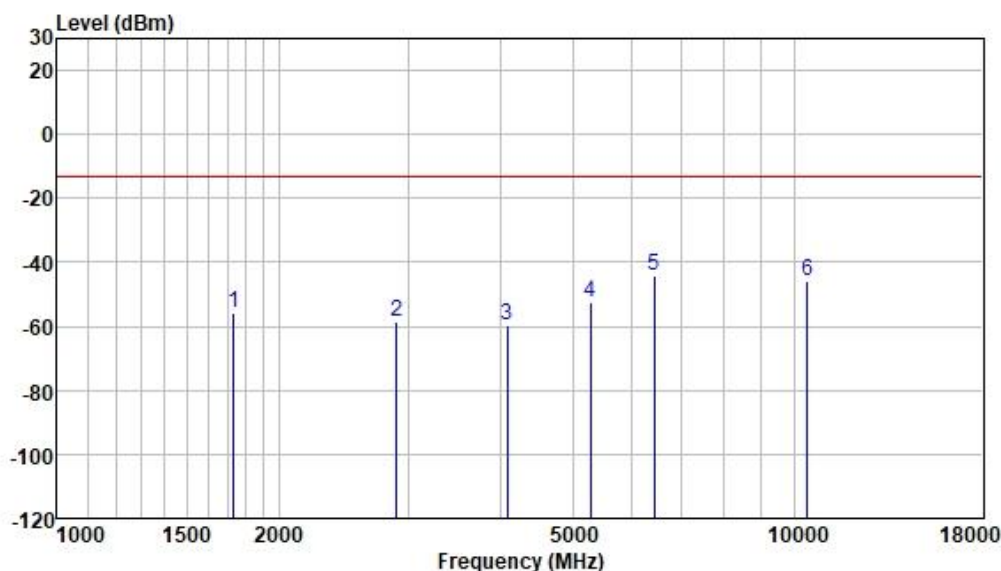
	Freq	Read Level	Correction Factor	Level	Limit Line	Over Limit	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	55.22	-81.52	-1.98	-83.50	-13.00	-70.50	HORIZONTAL
2	139.36	-81.42	-7.84	-89.26	-13.00	-76.26	HORIZONTAL
3	323.32	-78.94	-2.92	-81.86	-13.00	-68.86	HORIZONTAL
4	528.25	-78.46	0.60	-77.86	-13.00	-64.86	HORIZONTAL
5	716.68	-78.01	3.64	-74.37	-13.00	-61.37	HORIZONTAL
6	854.02	-78.97	7.28	-71.69	-13.00	-58.69	HORIZONTAL



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DL_1S_M_AWGN_Horizontal_above 1GHz



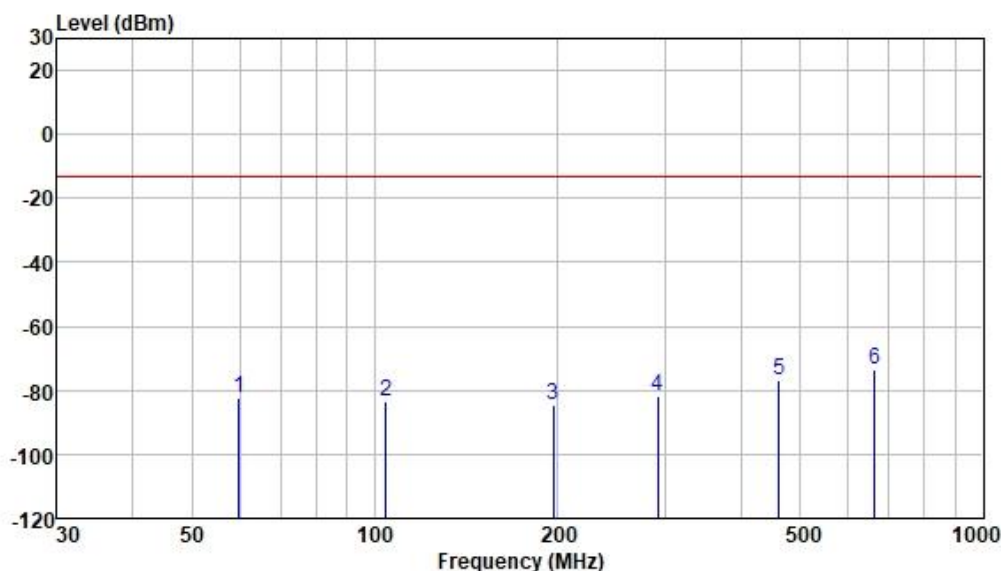
	Freq	Read Level	Correction Factor	Level	Limit Line	Over Limit	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	1736.83	-61.81	6.17	-55.64	-13.00	-42.64	HORIZONTAL
2	2888.58	-62.49	4.09	-58.40	-13.00	-45.40	HORIZONTAL
3	4074.39	-62.95	3.18	-59.77	-13.00	-46.77	HORIZONTAL
4	5284.90	-63.68	11.45	-52.23	-13.00	-39.23	HORIZONTAL
5	6451.35	-63.66	19.61	-44.05	-13.00	-31.05	HORIZONTAL
6	10393.71	-68.65	22.88	-45.77	-13.00	-32.77	HORIZONTAL



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DL_1S_M_AWGN_Vertical_30MHz~1GHz



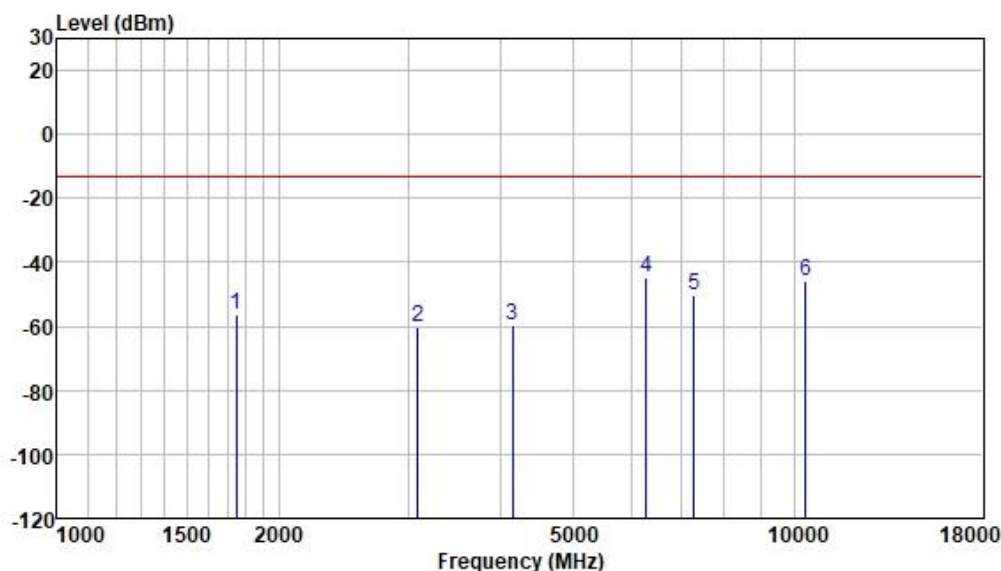
	Freq	Read Level	Correction Factor	Level	Limit Line	Over Limit	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	59.65	-80.41	-2.21	-82.62	-13.00	-69.62	VERTICAL
2	104.17	-78.31	-4.95	-83.26	-13.00	-70.26	VERTICAL
3	196.51	-80.02	-4.69	-84.71	-13.00	-71.71	VERTICAL
4	292.06	-79.25	-2.68	-81.93	-13.00	-68.93	VERTICAL
5	462.35	-78.67	1.70	-76.97	-13.00	-63.97	VERTICAL
6	663.47	-78.31	4.82	-73.49	-13.00	-60.49	VERTICAL



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DL_1S_M_AWGN_Vertical_above 1GHz



	Freq	Read Level	Correction Factor	Level	Limit Line	Over Limit	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	1751.96	-62.31	5.70	-56.61	-13.00	-43.61	VERTICAL
2	3087.14	-63.06	2.79	-60.27	-13.00	-47.27	VERTICAL
3	4145.66	-63.63	4.03	-59.60	-13.00	-46.60	VERTICAL
4	6285.70	-63.71	19.07	-44.64	-13.00	-31.64	VERTICAL
5	7305.12	-68.23	18.01	-50.22	-13.00	-37.22	VERTICAL
6	10333.80	-68.73	23.02	-45.71	-13.00	-32.71	VERTICAL



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4 WCS (2305-2315MHz paired with 2350-2360MHz)

4.1 AGC threshold level

Test Conf.	AGC Threshold level
DL_1S_M_AWGN	-0.20dBm



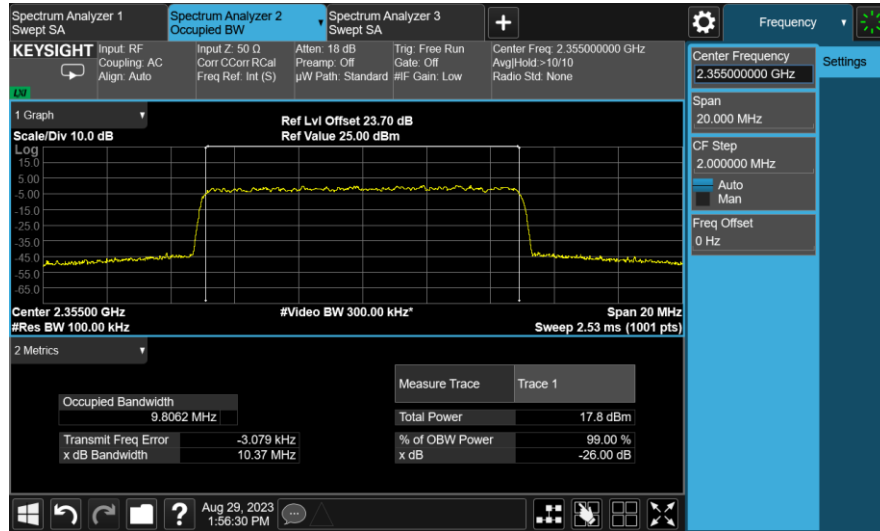
4.2 Input-versus-output signal comparison



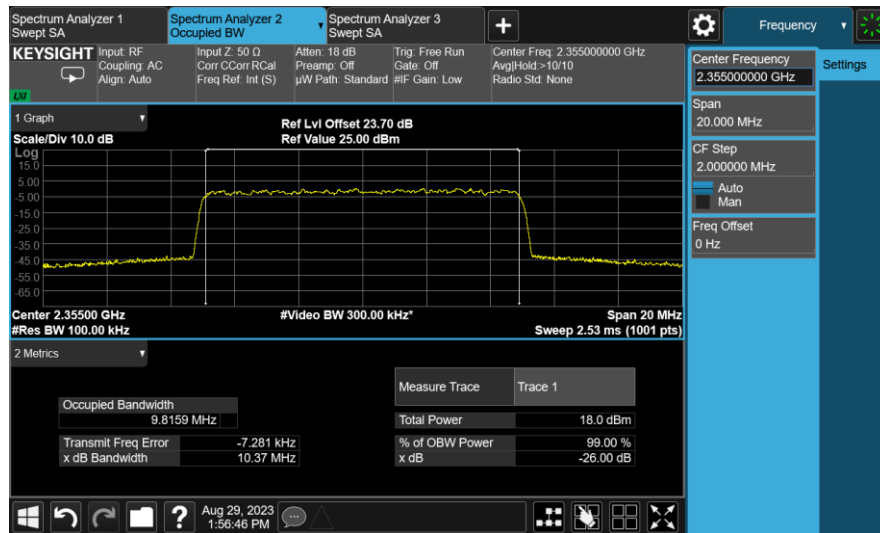
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Output_DL_1S_M_AWGN_Pre-AGC_OBW



Output_DL_1S_M_AWGN_AGC+3dB_OBW



Remark:

1. The band supports maximum channel BW is 10MHz 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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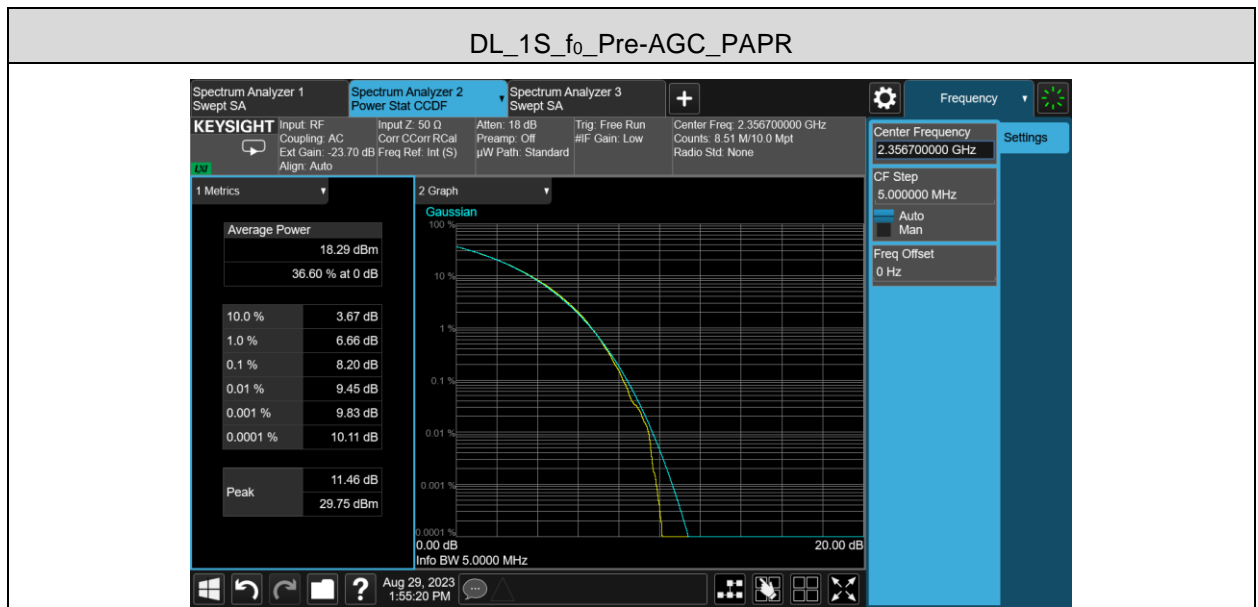
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4.3 Mean output power and amplifier/booster gain

Test Conf.	Test Freq. f ₀ (MHz)	Signal Level	Input Power (dBm)	Output Power (dBm)	Gain (dB)	Verdict
DL_1S_AWGN	2356.70	Pre-AGC	-0.30	18.29	18.59	PASS
		AGC+3dB	2.70	18.18	/	PASS
Remark: According to the declaration from the applicant, the antenna gain should not exceed 12.5dBi, the Directional gain = G(ANT) + 10 log (NANT) dBi = 12.5dBi+10log (2) dBi= 15.5dBi. The total maximum EIRP for the EUT is (18.29dBm+18.29dBm) +15.5dBi=36.80dBm (4.787W) which don't exceed the required EIRP limit (400W/MHz)						



Test Conf.	Test Freq. f_0 (MHz)	Signal Level	PAPR (dB)	Limit (dB)	Verdict
DL_1S_AWGN	2356.7	Pre-AGC	9.45	13	PASS



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

Note: 1. The tested max conducted power for single antenna port is 18.29dBm, the power of any emission outside a licensee's frequency band(s) shall be attenuated below the transmitter power (P) in watts

(i)

By a factor of not less than $43 + 10 \log (P)$ dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation.

Here,

$$P=18.29\text{dBm}=0.0675\text{W}.$$

So the limit =

$$P(\text{dBm})-[43+10\log(0.0675\text{W})]=-13\text{dBm}$$

By a factor of not less than $75 + 10 \log (P)$ dB on all frequencies between 2320 and 2345 MHz

Here,

$$P=18.29\text{dBm}=0.0675\text{W}.$$

So the limit =

$$P(\text{dBm})-[75+10\log(0.0675\text{W})]=-45\text{dBm}$$

(ii)

By a factor of not less than $43 + 10 \log (P)$ dB on all frequencies between 2300 and 2305 MHz

Here,

$$P=18.29\text{dBm}=0.0675\text{W}.$$

So the limit =

$$P(\text{dBm})-[43+10\log(0.0675\text{W})]=-13\text{dBm}$$



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By a factor of not less than $70 + 10 \log (P)$ dB on all frequencies between 2287.5 and 2300 MHz

Here,

$$P=18.29\text{dBm}=0.0675\text{W}.$$

So the limit =

$$P(\text{dBm})-[70+10\log(0.0675\text{W})]=-40\text{dBm}$$

By a factor of not less than $72 + 10 \log (P)$ dB on all frequencies between 2285 and 2287.5 MHz

Here,

$$P=18.29\text{dBm}=0.0675\text{W}.$$

So the limit =

$$P(\text{dBm})-[72+10\log(0.0675\text{W})]=-42\text{dBm}$$

By a factor of not less than $75 + 10 \log (P)$ dB below 2285 MHz

Here,

$$P=18.29\text{dBm}=0.0675\text{W}.$$

So the limit =

$$P(\text{dBm})-[75+10\log(0.0675\text{W})]=-45\text{dBm}$$

(iii)

By a factor of not less than $43 + 10 \log (P)$ dB on all frequencies between 2360 and 2362.5 MHz

Here,

$$P=18.29\text{dBm}=0.0675\text{W}.$$

So the limit =

$$P(\text{dBm})-[43+10\log(0.0675\text{W})]=-13\text{dBm}$$



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By a factor of not less than $55 + 10 \log (P)$ dB on all frequencies between 2362.5 and 2365 MHz

Here,

$$P=18.29\text{dBm}=0.0675\text{W}.$$

So the limit =

$$P(\text{dBm})-[55+10\log(0.0675\text{W})]=-25\text{dBm}$$

By a factor of not less than $70 + 10 \log (P)$ dB on all frequencies between 2365 and 2367.5 MHz

Here,

$$P=18.29\text{dBm}=0.0675\text{W}.$$

So the limit =

$$P(\text{dBm})-[70+10\log(0.0675\text{W})]=-40\text{dBm}$$

By a factor of not less than $72 + 10 \log (P)$ dB on all frequencies between 2367.5 and 2370 MHz

Here,

$$P=18.29\text{dBm}=0.0675\text{W}.$$

So the limit =

$$P(\text{dBm})-[72+10\log(0.0675\text{W})]=-42\text{dBm}$$

By a factor of not less than $75 + 10 \log (P)$ dB above 2370 MHz

Here,

$$P=18.29\text{dBm}=0.0675\text{W}.$$

So the limit =

$$P(\text{dBm})-[75+10\log(0.0675\text{W})]=-45\text{dBm}$$

The EUT supports 2x2 MIMO and the emissions were measured at one of output port, so the limit lines were set to -16.01dBm/-48.01dBm/43.01dBm/45.01dBm/28.01dBm Separately in following test plots in order to determine the test result conveniently.

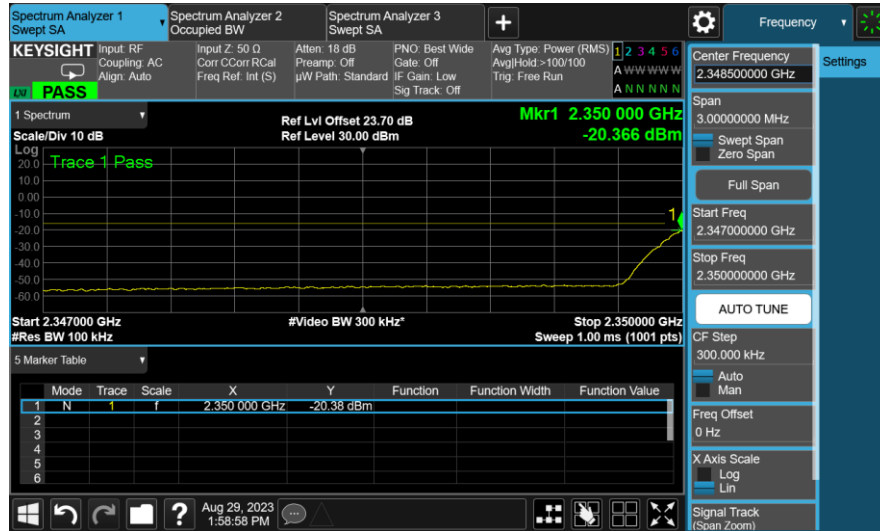
2. The spurious emissions 9kHz to 30MHz were very low and not displayed in this report.



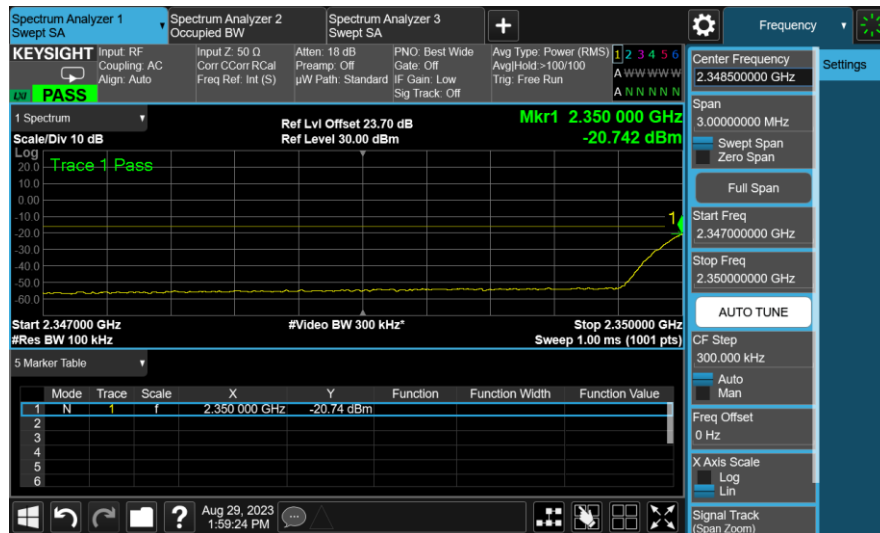
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DL_1S_B_AWGN_Pre-AGC_Out-of-band emission



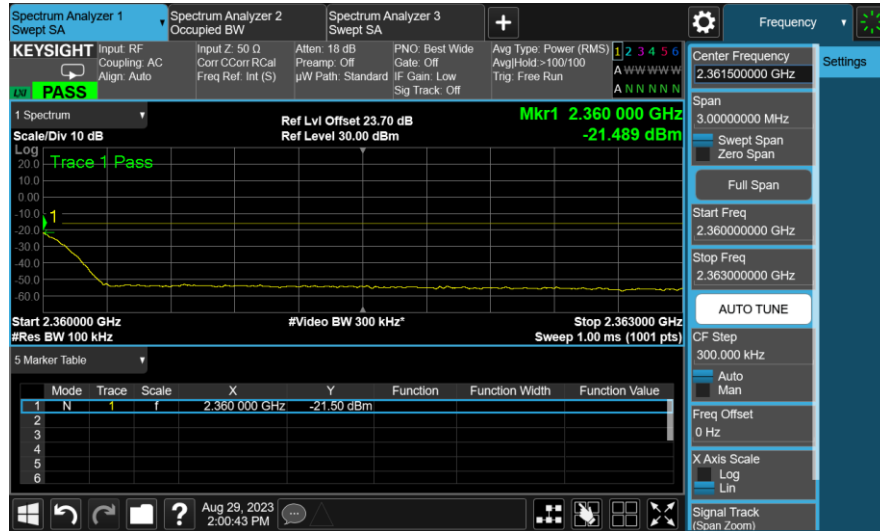
DL_1S_B_AWGN_AGC+3_Out-of-band emission



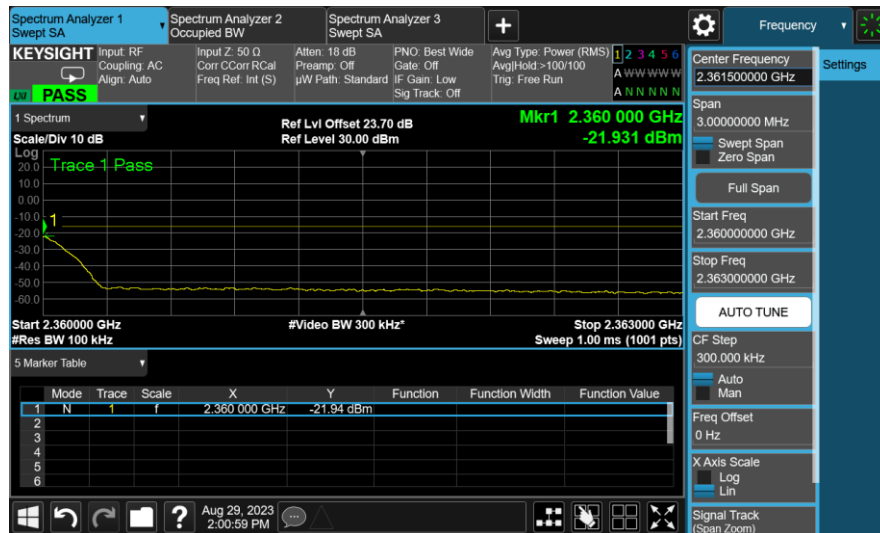
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DL_1S_T_AWGN_Pre-AGC_Out-of-band emission



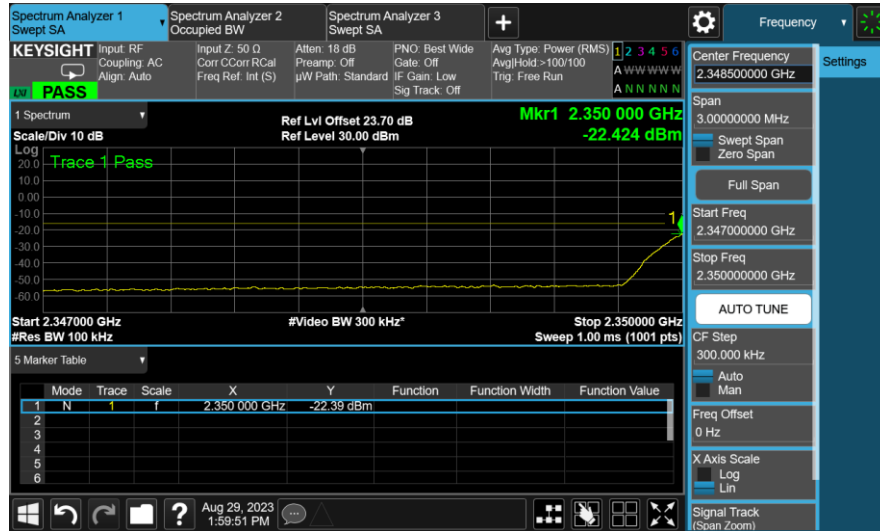
DL_1S_T_AWGN_AGC+3_Out-of-band emission



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DL_2S_B_AWGN_Pre-AGC_Out-of-band emission



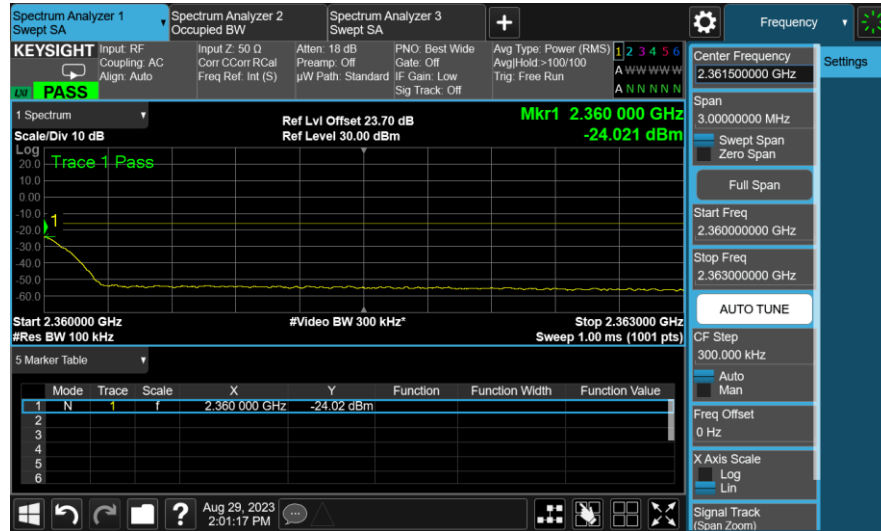
DL_2S_B_AWGN_AGC+3_Out-of-band emission



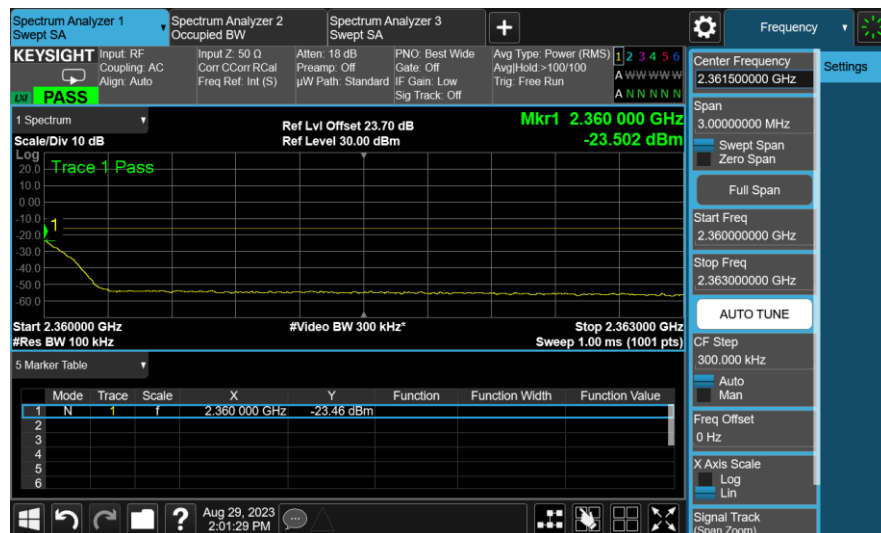
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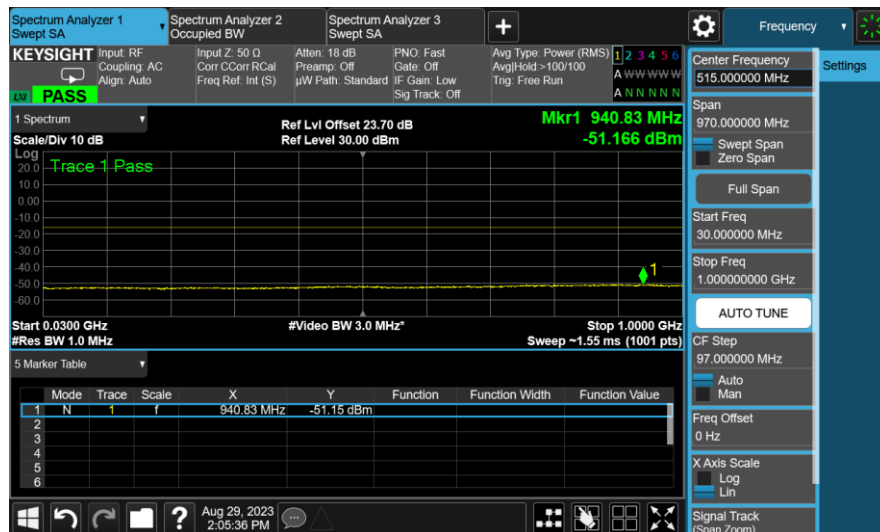
DL_2S_T_AWGN_AGC+3_Out-of-band emission



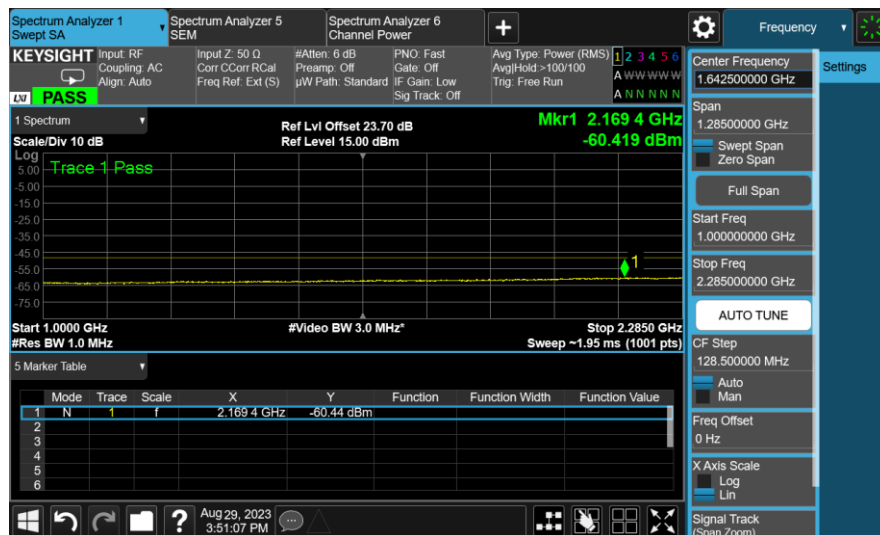
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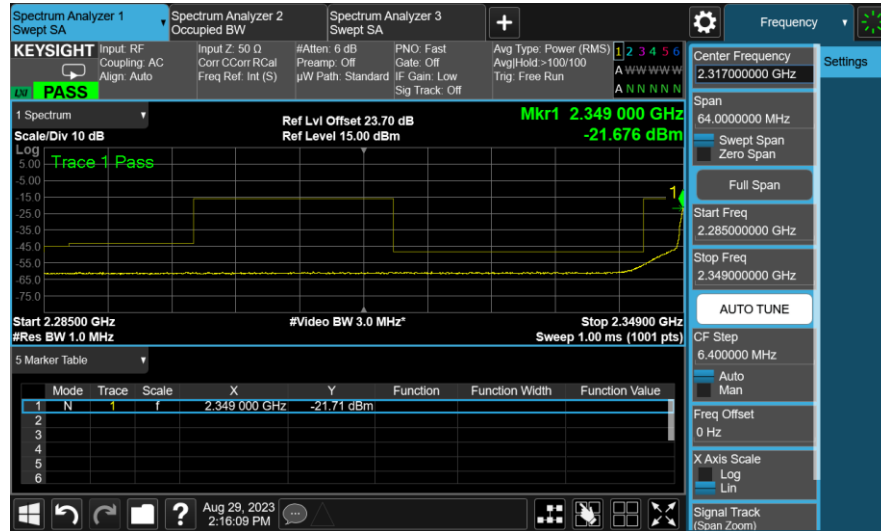
DL_1S_M_AWGN_Pre-AGC_Spurious emission 1



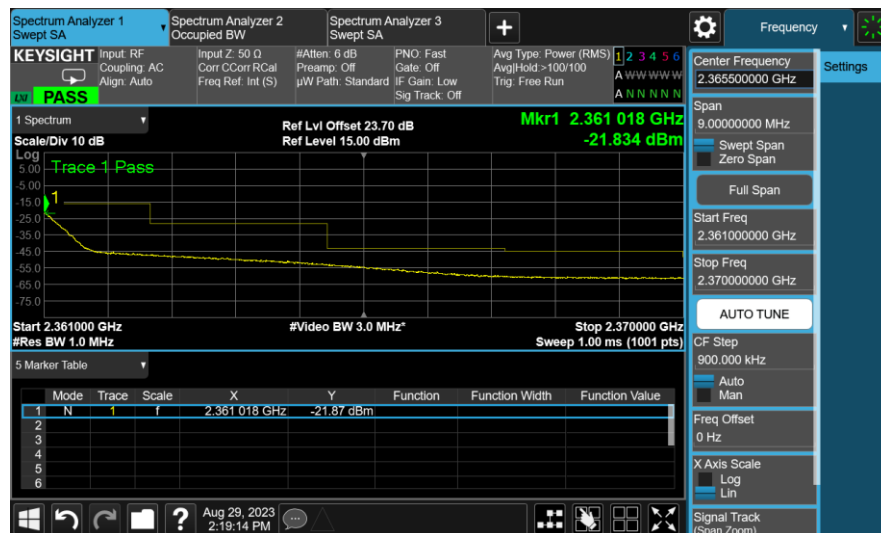
DL_1S_M_AWGN_Pre-AGC_Spurious emission 2



DL_1S_M_AWGN_Pre-AGC_Spurious emission 3



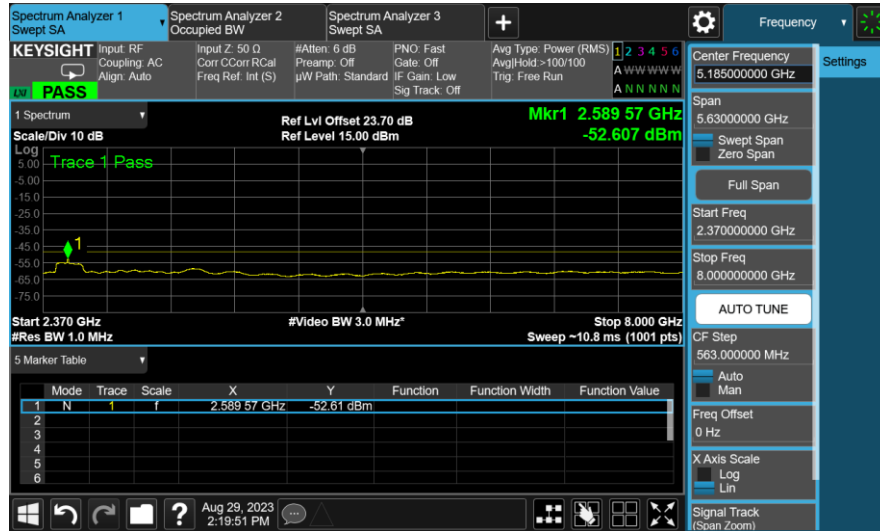
DL_1S_M_AWGN_Pre-AGC_Spurious emission 4



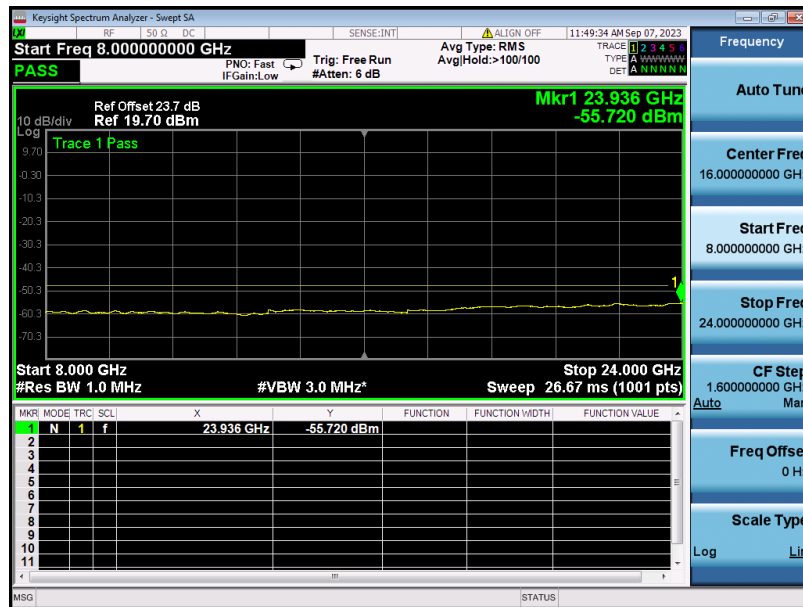
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DL_1S_M_AWGN_Pre-AGC_Spurious emission 5



DL_1S_M_AWGN_Pre-AGC_Spurious emission 6



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4.5 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 $\pm 15\%$ 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.



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Frequency stability vs temperature				
Temperature (°C)	Test Conf.	Frequency Error (Hz)	Tolerance (ppm)	Verdict
50	DL_1S_M_AWGN	97	0.041	PASS
40		96	0.041	PASS
30		95	0.040	PASS
20		101	0.043	PASS
10		115	0.049	PASS
0		107	0.045	PASS
-10		106	0.045	PASS
-20		93	0.039	PASS
-30		101	0.043	PASS

Frequency stability vs voltage				
Voltage (V)	Test Conf.	Frequency Error (Hz)	Tolerance (ppm)	Verdict
DC 40.8	DL_1S_M_AWGN	98	0.042	PASS
DC 48		101	0.043	PASS
DC 55.2		100	0.042	PASS



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4.6 Radiated spurious emissions

Note(1): The tested max conducted power for single antenna port is 18.29dBm, the power of any emission outside a licensee's frequency band(s) shall be attenuated below the transmitter power (P) in watts

(i)

By a factor of not less than $43 + 10 \log (P)$ dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation.

Here,

$$P=18.29\text{dBm}=0.0675\text{W}.$$

So the limit =

$$P(\text{dBm})-[43+10\log(0.0675\text{W})]=-13\text{dBm}$$

By a factor of not less than $75 + 10 \log (P)$ dB on all frequencies between 2320 and 2345 MHz

Here,

$$P=18.29\text{dBm}=0.0675\text{W}.$$

So the limit =

$$P(\text{dBm})-[75+10\log(0.0675\text{W})]=-45\text{dBm}$$

(ii)

By a factor of not less than $43 + 10 \log (P)$ dB on all frequencies between 2300 and 2305 MHz

Here,

$$P=18.29\text{dBm}=0.0675\text{W}.$$

So the limit =

$$P(\text{dBm})-[43+10\log(0.0675\text{W})]=-13\text{dBm}$$



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By a factor of not less than $70 + 10 \log (P)$ dB on all frequencies between 2287.5 and 2300 MHz

Here,

$$P=18.29\text{dBm}=0.0675\text{W}.$$

So the limit =

$$P(\text{dBm})-[70+10\log(0.0675\text{W})]=-40\text{dBm}$$

By a factor of not less than $72 + 10 \log (P)$ dB on all frequencies between 2285 and 2287.5 MHz

Here,

$$P=18.29\text{dBm}=0.0675\text{W}.$$

So the limit =

$$P(\text{dBm})-[72+10\log(0.0675\text{W})]=-42\text{dBm}$$

By a factor of not less than $75 + 10 \log (P)$ dB below 2285 MHz

Here,

$$P=18.29\text{dBm}=0.0675\text{W}.$$

So the limit =

$$P(\text{dBm})-[75+10\log(0.0675\text{W})]=-45\text{dBm}$$

(iii)

By a factor of not less than $43 + 10 \log (P)$ dB on all frequencies between 2360 and 2362.5 MHz

Here,

$$P=18.29\text{dBm}=0.0675\text{W}.$$

So the limit =

$$P(\text{dBm})-[43+10\log(0.0675\text{W})]=-13\text{dBm}$$



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By a factor of not less than $55 + 10 \log (P)$ dB on all frequencies between 2362.5 and 2365 MHz

Here,

$$P=18.29\text{dBm}=0.0675\text{W}.$$

So the limit =

$$P(\text{dBm})-[55+10\log(0.0675\text{W})]=-25\text{dBm}$$

By a factor of not less than $70 + 10 \log (P)$ dB on all frequencies between 2365 and 2367.5 MHz

Here,

$$P=18.29\text{dBm}=0.0675\text{W}.$$

So the limit =

$$P(\text{dBm})-[70+10\log(0.0675\text{W})]=-40\text{dBm}$$

By a factor of not less than $72 + 10 \log (P)$ dB on all frequencies between 2367.5 and 2370 MHz

Here,

$$P=18.29\text{dBm}=0.0675\text{W}.$$

So the limit =

$$P(\text{dBm})-[72+10\log(0.0675\text{W})]=-42\text{dBm}$$

By a factor of not less than $75 + 10 \log (P)$ dB above 2370 MHz

Here,

$$P=18.29\text{dBm}=0.0675\text{W}.$$

So the limit =

$$P(\text{dBm})-[75+10\log(0.0675\text{W})]=-45\text{dBm}$$

The EUT supports 2x2 MIMO and the emissions were measured at one of output port, so the limit lines were set to -16.01dBm/-48.01dBm/43.01dBm/45.01dBm/28.01dBm Separately in following test plots in order to determine the test result conveniently.



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Note (2):

- (1) : The radiated test performed at bottom / middle / top channel, only the worst-case middle channel test data was recorded in the report.
- (2) : The disturbance 9kHz to 30MHz was very low and 20dB below the limit, therefore, the data was not recorded in the report.
- (3) : The strictest limit -45dbm was used for evaluate the emission from 9kHz~18GHz.



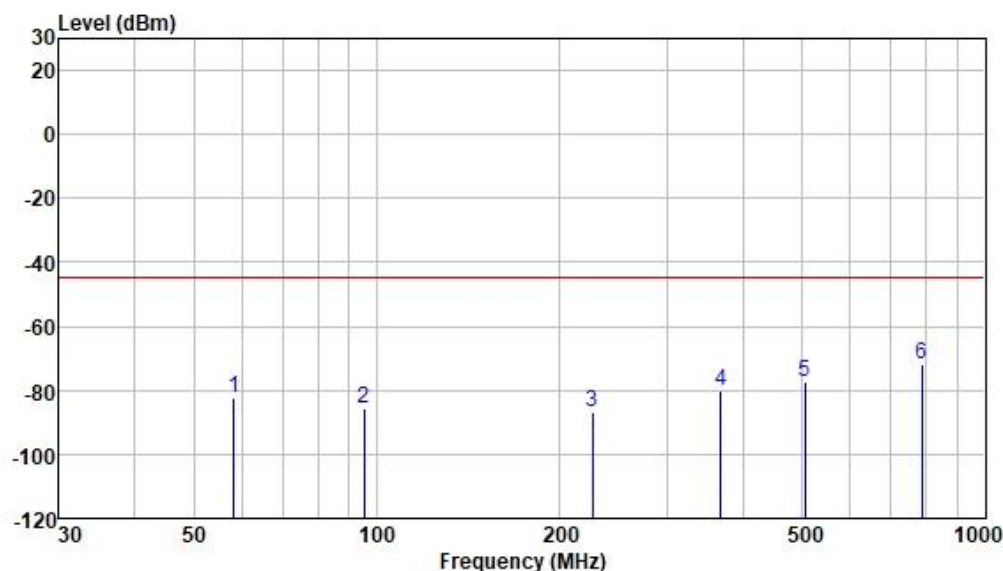
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DL_1S_M_AWGN_Horizontal_30MHz~1GHz



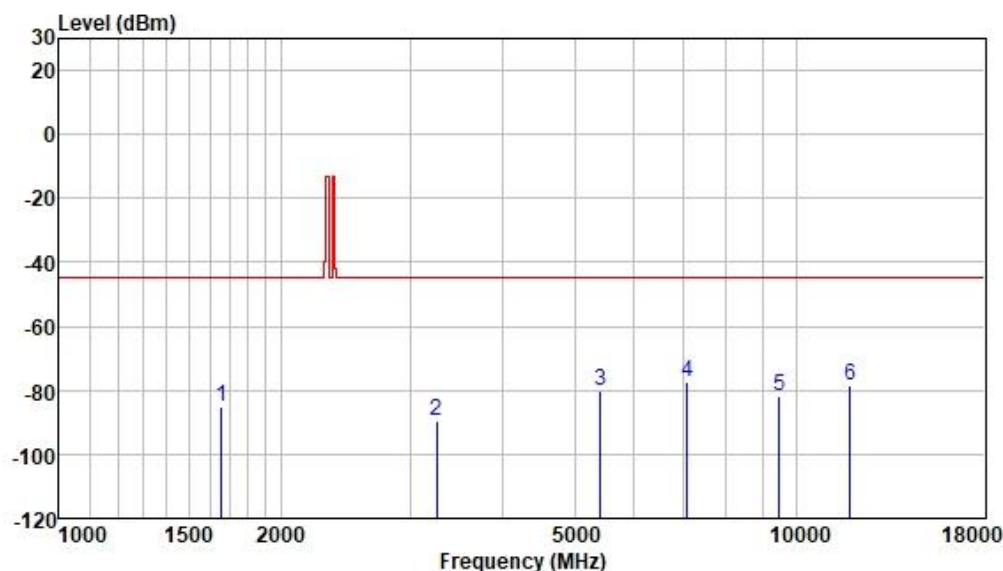
	Freq	Read Level	Correction Factor	Level	Limit	Over Limit	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	58.20	-80.21	-2.38	-82.59	-45.00	-37.59	HORIZONTAL
2	95.09	-75.79	-9.68	-85.47	-45.00	-40.47	HORIZONTAL
3	226.10	-79.95	-7.11	-87.06	-45.00	-42.06	HORIZONTAL
4	368.11	-79.15	-1.27	-80.42	-45.00	-35.42	HORIZONTAL
5	504.71	-77.57	0.40	-77.17	-45.00	-32.17	HORIZONTAL
6	787.85	-78.32	6.38	-71.94	-45.00	-26.94	HORIZONTAL



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DL_1S_M_AWGN_Horizontal_above 1GHz

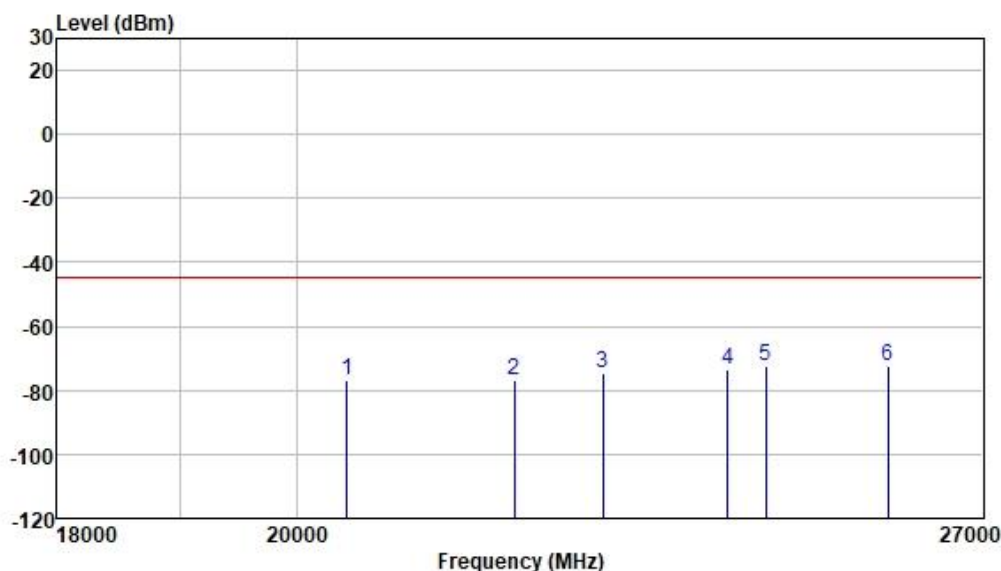


	Freq	Read Level	Correction Factor	Level	Limit Line	Over Limit	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	1658.34	-91.04	5.90	-85.14	-45.00	-40.14	HORIZONTAL
2	3252.01	-91.78	2.22	-89.56	-45.00	-44.56	HORIZONTAL
3	5424.18	-93.34	13.46	-79.88	-45.00	-34.88	HORIZONTAL
4	7097.00	-96.23	19.09	-77.14	-45.00	-32.14	HORIZONTAL
5	9475.50	-99.19	17.44	-81.75	-45.00	-36.75	HORIZONTAL
6	11803.28	-99.57	21.20	-78.37	-45.00	-33.37	HORIZONTAL



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DL_1S_M_AWGN_Horizontal_above 1GHz



	Freq	Read Level	Correction Factor	Level	Limit	Over Limit	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	20435.68	-115.16	38.53	-76.63	-45.00	-31.63	HORIZONTAL
2	21991.84	-115.65	38.78	-76.87	-45.00	-31.87	HORIZONTAL
3	22855.47	-113.62	39.21	-74.41	-45.00	-29.41	HORIZONTAL
4	24141.41	-112.92	39.39	-73.53	-45.00	-28.53	HORIZONTAL
5	24546.09	-112.09	39.42	-72.67	-45.00	-27.67	HORIZONTAL
6	25895.62	-111.92	39.69	-72.23	-45.00	-27.23	HORIZONTAL

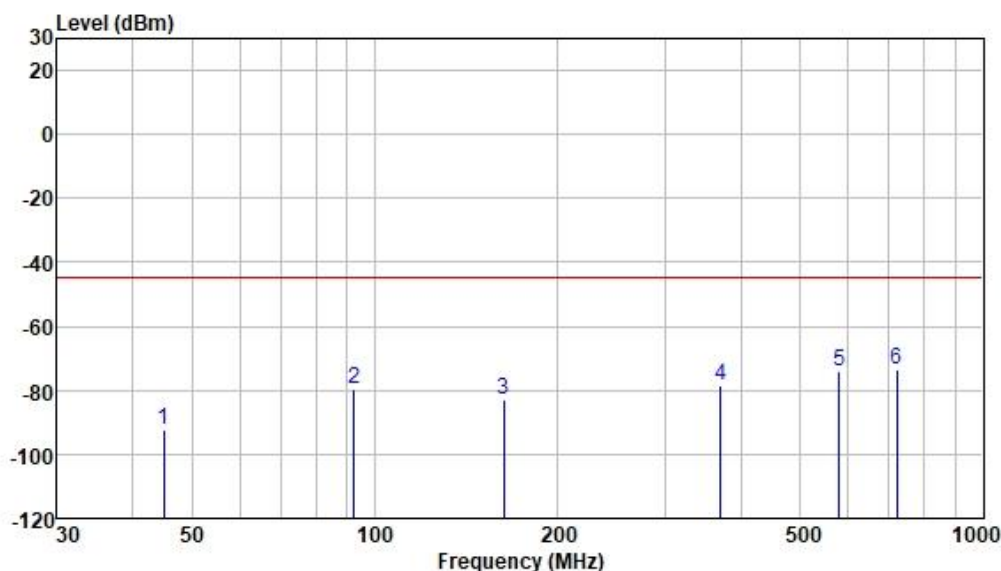


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DL_1S_M_AWGN_Vertical_30MHz~1GHz



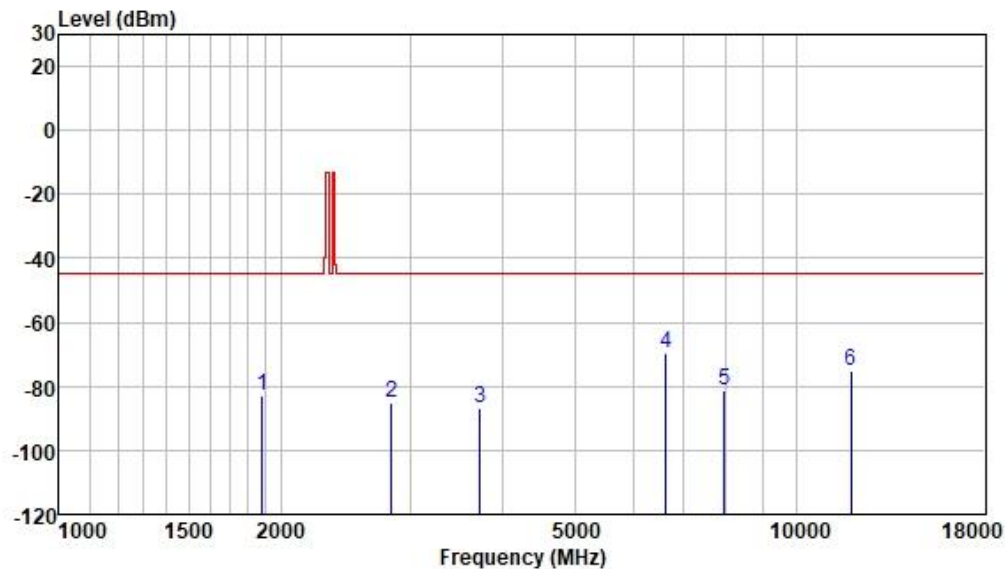
	Freq	Read Level	Correction Factor	Level	Limit Line	Over Limit	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	44.90	-79.43	-12.74	-92.17	-45.00	-47.17	VERTICAL
2	92.46	-73.01	-6.56	-79.57	-45.00	-34.57	VERTICAL
3	162.61	-78.83	-3.94	-82.77	-45.00	-37.77	VERTICAL
4	370.70	-77.33	-1.43	-78.76	-45.00	-33.76	VERTICAL
5	580.70	-76.96	3.11	-73.85	-45.00	-28.85	VERTICAL
6	721.73	-77.80	4.04	-73.76	-45.00	-28.76	VERTICAL



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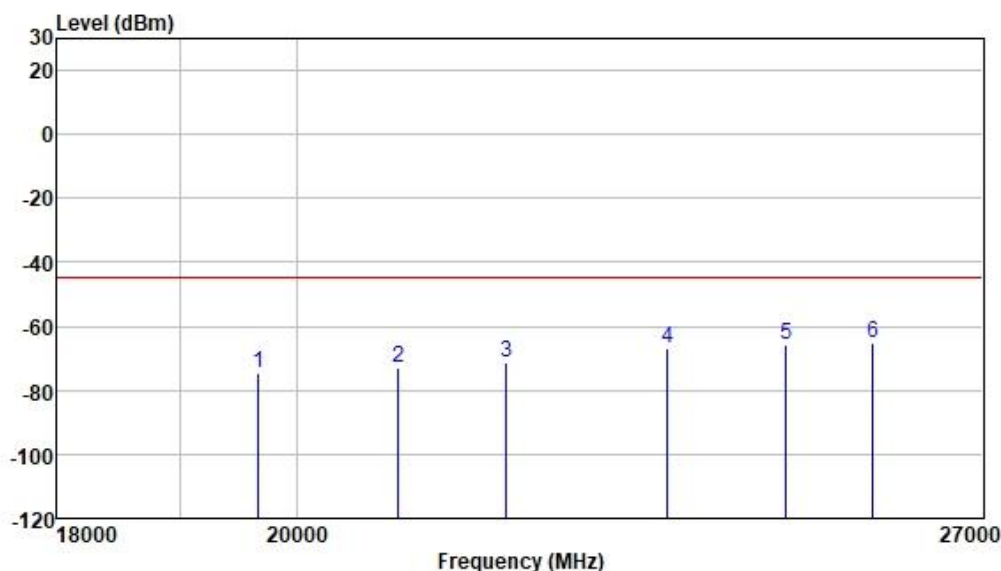
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DL_1S_M_AWGN_Vertical_above 1GHz



	Freq	Read Level	Correction Factor	Level	Limit Line	Over Limit	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	1883.24	-89.59	6.78	-82.81	-45.00	-37.81	VERTICAL
2	2822.56	-89.58	4.24	-85.34	-45.00	-40.34	VERTICAL
3	3725.20	-90.18	3.45	-86.73	-45.00	-41.73	VERTICAL
4	6640.54	-90.36	20.60	-69.76	-45.00	-24.76	VERTICAL
5	7966.83	-97.80	16.44	-81.36	-45.00	-36.36	VERTICAL
6	11837.45	-96.63	21.70	-74.93	-45.00	-29.93	VERTICAL

DL_1S_M_AWGN_Vertical_above 1GHz



	Freq	Read Level	Correction Factor	Level	Limit Line	Over Limit	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	19655.51	-109.01	34.57	-74.44	-45.00	-29.44	VERTICAL
2	20905.00	-108.36	35.39	-72.97	-45.00	-27.97	VERTICAL
3	21911.73	-107.29	35.79	-71.50	-45.00	-26.50	VERTICAL
4	23513.46	-103.84	37.15	-66.69	-45.00	-21.69	VERTICAL
5	24766.03	-102.96	37.42	-65.54	-45.00	-20.54	VERTICAL
6	25728.17	-103.11	37.66	-65.45	-45.00	-20.45	VERTICAL



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