

Appendix -

Test Data and Result for report

GZCR231100125802

(B)

(Supplement test data for 5G NR with 100 MHz AWGN signal)

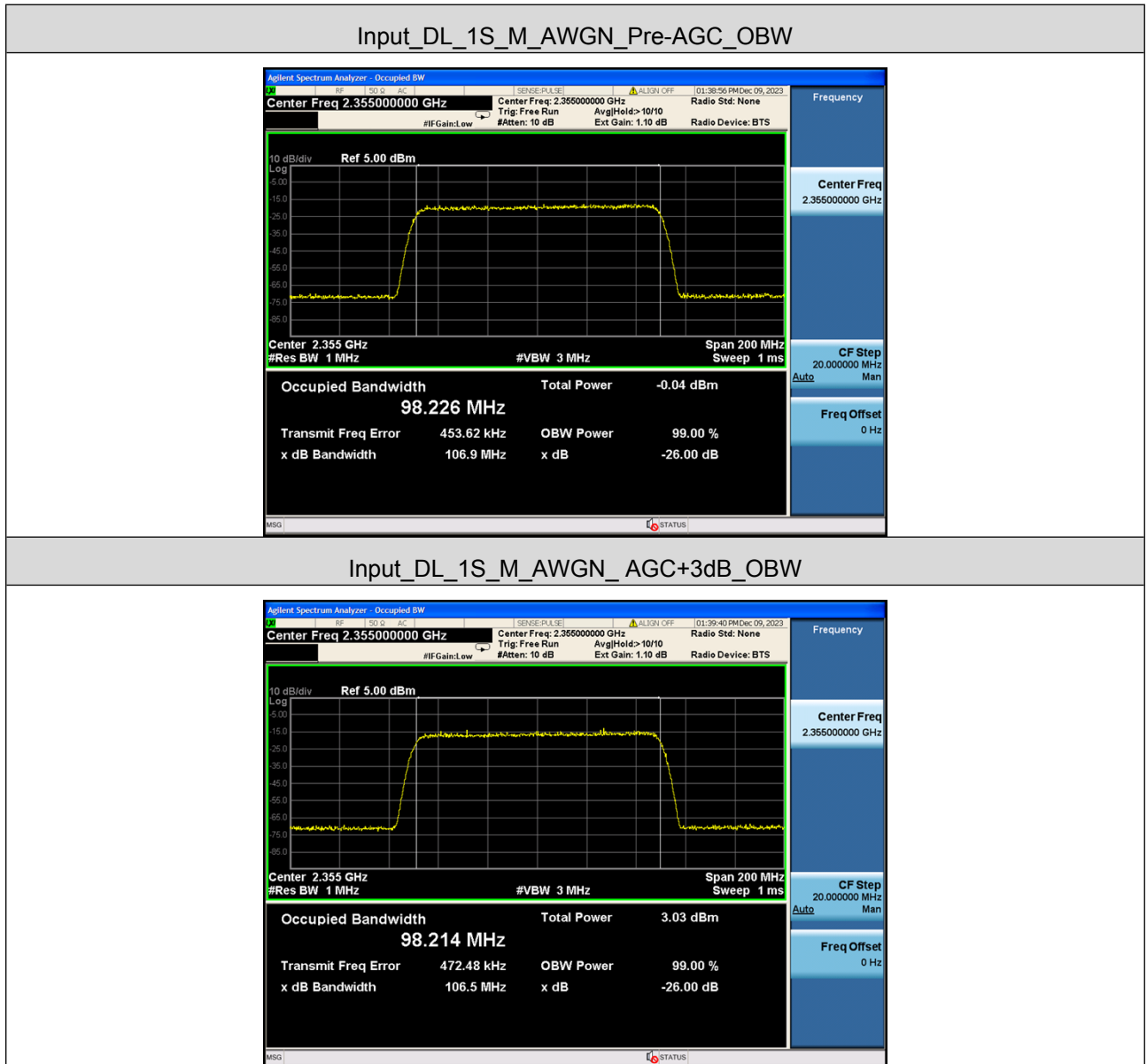


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1 WCS (only for downlink: 2350-2360MHz)

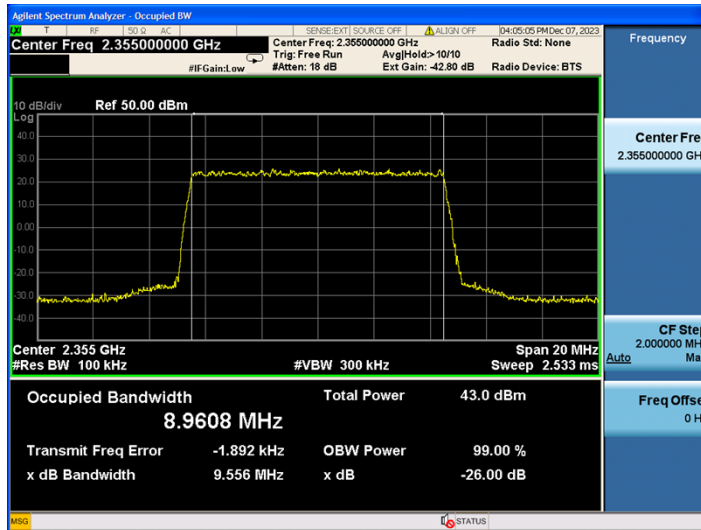
1.1 Input-versus-output signal comparison



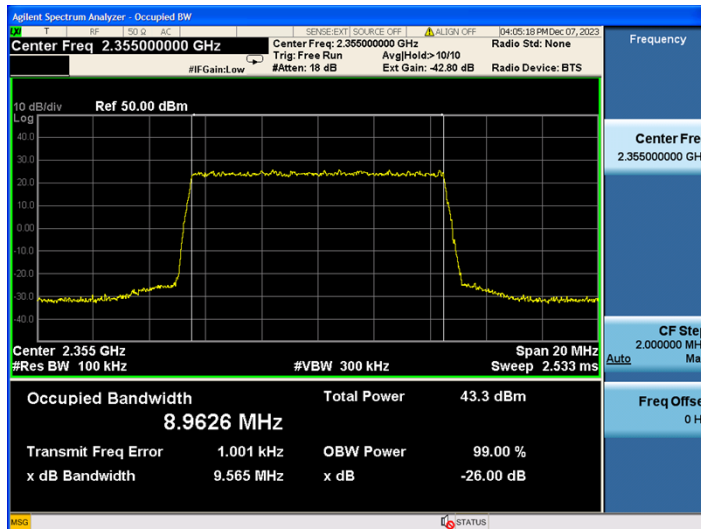
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Output_DL_1S_M_AWGN_Pre-AGC_OBW



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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1.2 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_AWG N	2353.10	Pre-AGC	-6.00	33.85	40.00	PASS
		AGC+3dB	-3.00	33.90	/	PASS

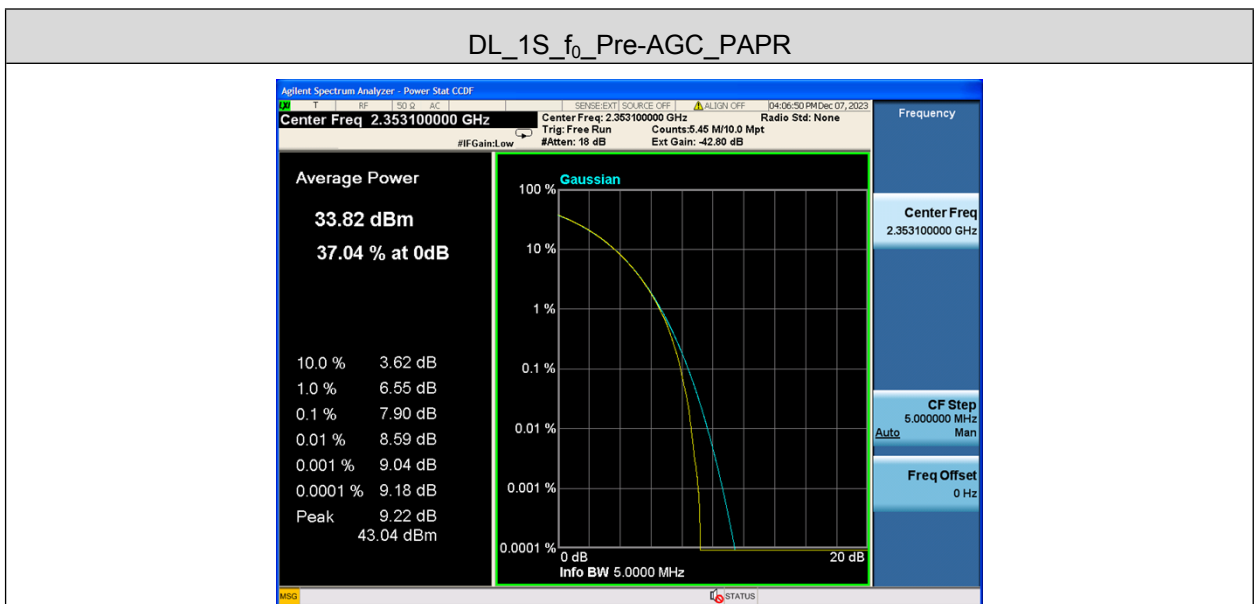
Remark:

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

The total maximum EIRP for the EUT is (33.90dBm+33.90dBm) +15.5dBi=52.41dBm (174.2W) which don't exceed the required EIRP limit (2000W/5MHz).

Test Conf.	Test Freq. f ₀ (MHz)	Signal Level	PAPR (dB)	Limit (dB)	Verdict
DL_1S_AWG N	2353.10	Pre-AGC	8.59	13	PASS

DL_1S_f₀_Pre-AGC_PAPR



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

Note: 1. The tested max conducted power for single antenna port is 33.90dBm, 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,

$$P=33.90\text{dBm}= 2.46\text{W}.$$

So the limit =

$$P(\text{dBm})- [43 + 10 \log (2.46\text{W})] =-13\text{dBm}$$

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

Here,

$$P=33.90\text{dBm}= 2.46\text{W}.$$

So the limit =

$$P(\text{dBm})- [75 + 10 \log (2.46\text{W})] =-45\text{dBm}$$

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

Here,

$$P=33.90\text{dBm}= 2.46\text{W}.$$

So the limit =

$$P(\text{dBm})- [43 + 10 \log (2.46\text{W})] =-13\text{dBm}$$

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

Here,

$$P=33.90\text{dBm}= 2.46\text{W}.$$

So the limit =

$$P(\text{dBm})- [70 + 10 \log (2.46\text{W})] =-40\text{dBm}$$



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

Here,

$$P=33.90\text{dBm}= 2.46\text{W}.$$

So the limit =

$$P(\text{dBm})- [72 + 10 \log (2.46\text{W})] =-42\text{dBm}$$

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

Here,

$$P=33.90\text{dBm}= 2.46\text{W}.$$

So the limit =

$$P(\text{dBm})- [75 + 10 \log (2.46\text{W})] =-45\text{dBm}$$

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

Here,

$$P=33.90\text{dBm}= 2.46\text{W}.$$

So the limit =

$$P(\text{dBm})- [43 + 10 \log (2.46\text{W})] =-13\text{dBm}$$

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

Here,

$$P=33.90\text{dBm}= 2.46\text{W}.$$

So the limit =

$$P(\text{dBm})- [55 + 10 \log (2.46\text{W})] =-25\text{dBm}$$

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

Here,

$$P=33.90\text{dBm}= 2.46\text{W}.$$

So the limit =

$$P(\text{dBm})- [70 + 10 \log (2.46\text{W})] =-40\text{dBm}$$



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

Here,

$P=33.90\text{dBm}= 2.46\text{W}$.

So the limit =

$P(\text{dBm})- [72 + 10 \log (2.46\text{W})] =-42\text{dBm}$

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

Here,

$P=33.90\text{dBm}= 2.46\text{W}$.

So the limit =

$P(\text{dBm})- [75 + 10 \log (2.46\text{W})] =-45\text{dBm}$

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

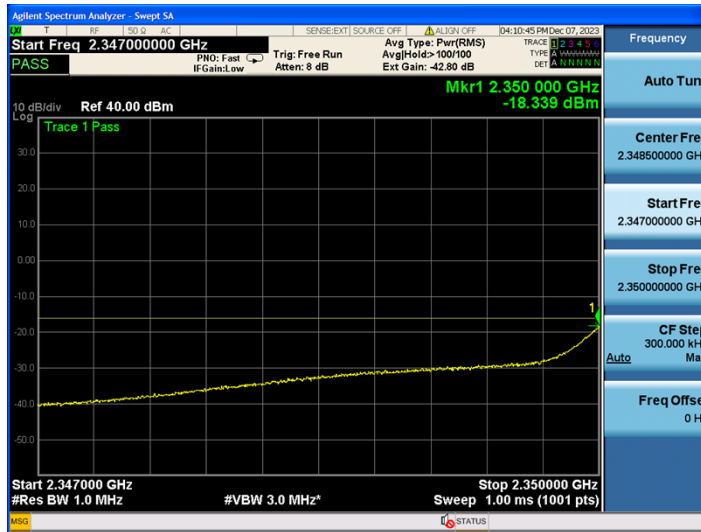
2. Spurious emissions have been tested using a single test signal sequentially tuned to the low, middle and high channels within the authorized frequency band of operation, only the worst-case was recorded in this report.
3. The spurious emissions from 9kHz to 30MHz was very low and 20dB below the limit, therefore, the data was not recorded in the report.



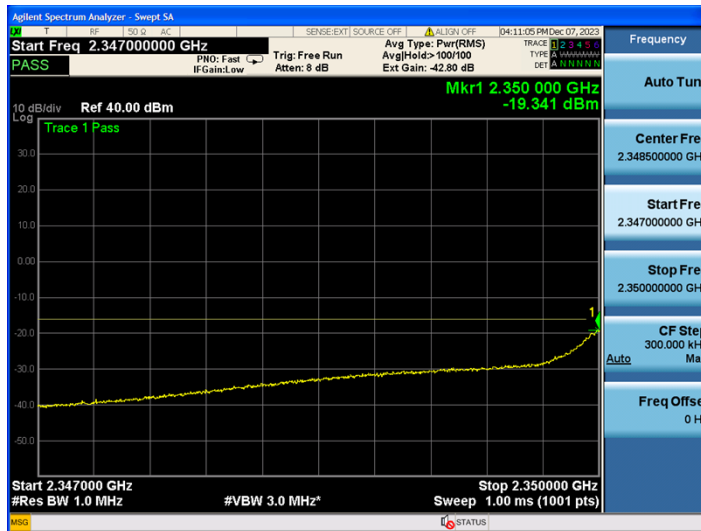
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DL_1S_B_AWGN_Pre-AGC_Out-of-band emission



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



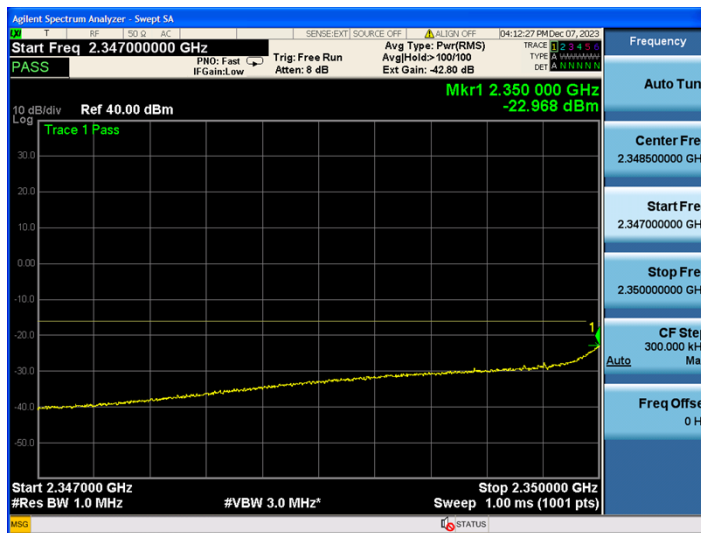
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DL_2S_B_AWGN_Pre-AGC_Out-of-band emission



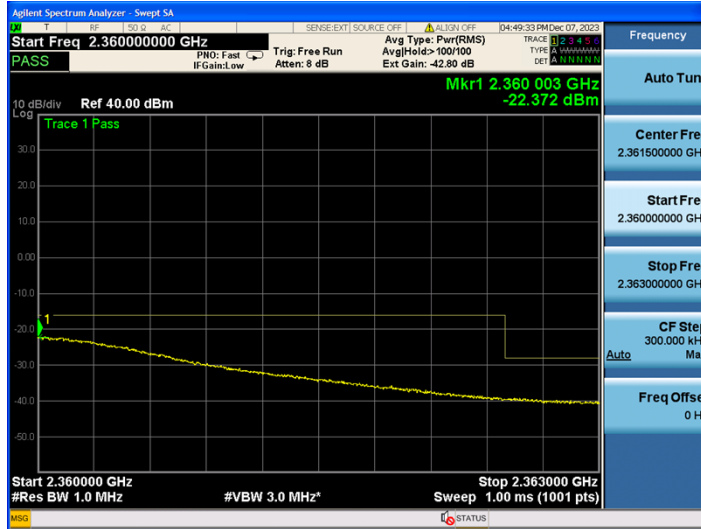
DL_2S_B_AWGN_AGC+3_Out-of-band emission



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DL_2S_T_AWGN_Pre-AGC_Out-of-band emission



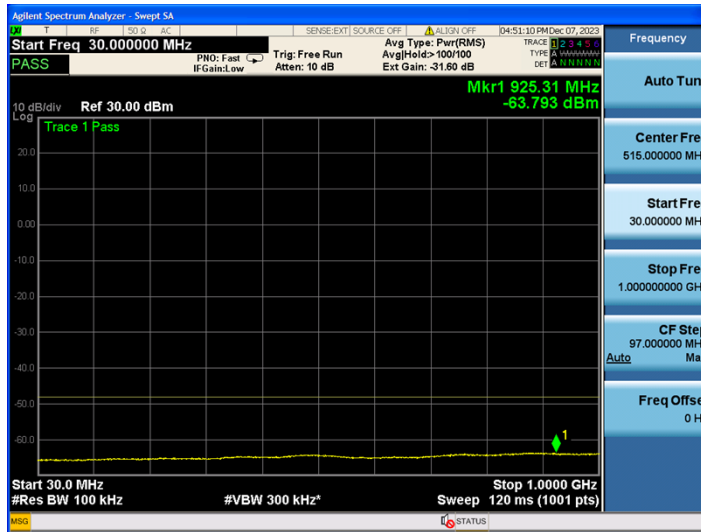
DL_2S_T_AWGN_AGC+3_Out-of-band emission



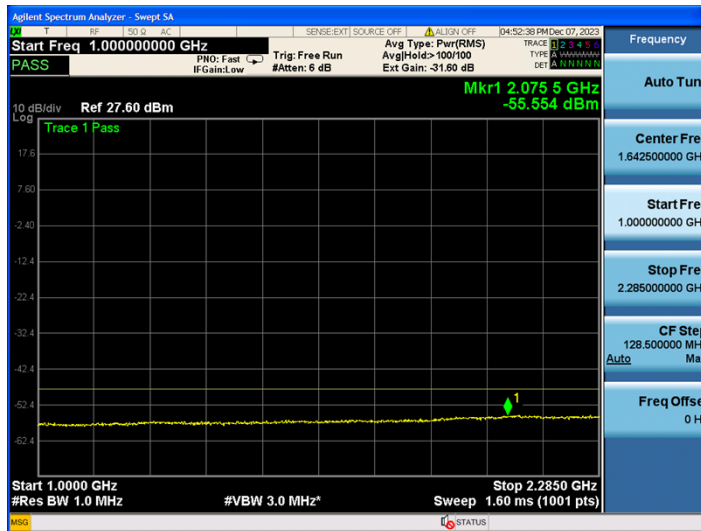
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DL_1S_B_AWGN_Pre-AGC_Spurious emission 1



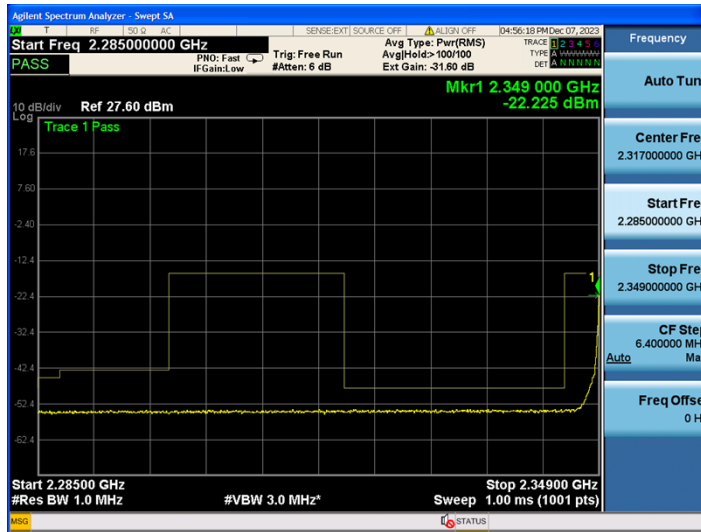
DL_1S_B_AWGN_Pre-AGC_Spurious emission 2



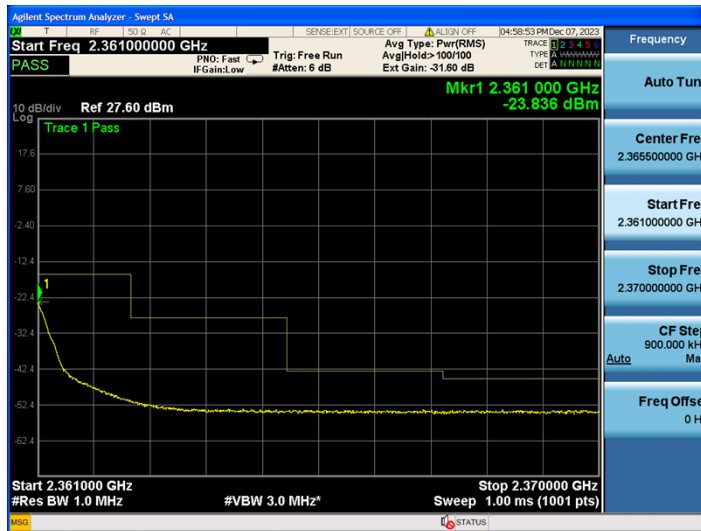
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DL_1S_B_AWGN_Pre-AGC_Spurious emission 3



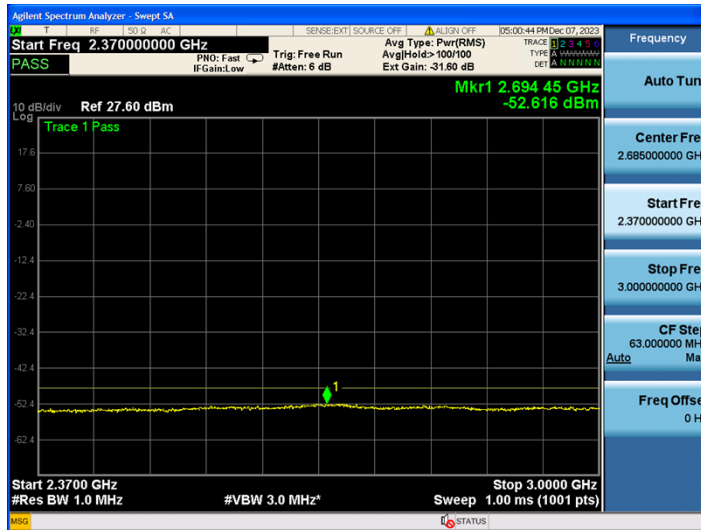
DL_1S_B_AWGN_Pre-AGC_Spurious emission 4



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DL_1S_B_AWGN_Pre-AGC_Spurious emission 5



DL_1S_B_AWGN_Pre-AGC_Spurious emission 6



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1.4 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 AC 110V.
 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_AWG N	51	0.0238	PASS
40		86	0.0331	PASS
30		58	0.0229	PASS
20		67	0.0195	PASS
10		68	0.0225	PASS
0		82	0.0344	PASS
-10		74	0.0327	PASS
-20		73	0.0289	PASS
-30		48	0.0242	PASS

Frequency stability vs voltage				
Voltage (V)	Test Conf.	Frequency Error (Hz)	Tolerance (ppm)	Verdict
AC 93.5	DL_1S_M_AWG N	67	0.0195	PASS
AC 110		67	0.0195	PASS
AC 126.5		67	0.0195	PASS



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1.5 Radiated spurious emissions

Note: 1. The tested max conducted power for single antenna port is 33.90dBm, the 2x2 MIMO total power is 33.90dBm+33.90dBm= 4.91W.

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,

$P=4.91W$.

So the limit =

$P(\text{dBm}) - [43 + 10 \log (4.91W)] = -13\text{dBm}$

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

Here,

$P=4.91W$.

So the limit =

$P(\text{dBm}) - [75 + 10 \log (4.91W)] = -45\text{dBm}$

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

Here,

$P=4.91W$

So the limit =

$P(\text{dBm}) - [43 + 10 \log (4.91W)] = -13\text{dBm}$

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

Here,

$P=4.91W$

So the limit =

$P(\text{dBm}) - [70 + 10 \log (4.91W)] = -40\text{dBm}$



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

Here,

$P=4.91W$

So the limit =

$P(\text{dBm}) - [72 + 10 \log (4.91W)] = -42\text{dBm}$

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

Here,

$P=4.91W$

So the limit =

$P(\text{dBm}) - [75 + 10 \log (4.91W)] = -45\text{dBm}$

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

Here,

$P=4.91W$

So the limit =

$P(\text{dBm}) - [43 + 10 \log (4.91W)] = -13\text{dBm}$

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

Here,

$P=4.91W$

So the limit =

$P(\text{dBm}) - [55 + 10 \log (4.91W)] = -25\text{dBm}$

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

Here,

$P=4.91W$

So the limit =

$P(\text{dBm}) - [70 + 10 \log (4.91W)] = -40\text{dBm}$



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

Here,

$P=4.91W$

So the limit =

$P(\text{dBm}) - [72 + 10 \log (4.91W)] = -42\text{dBm}$

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

Here,

$P=4.91W$

So the limit =

$P(\text{dBm}) - [75 + 10 \log (4.91W)] = -45\text{dBm}$

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.

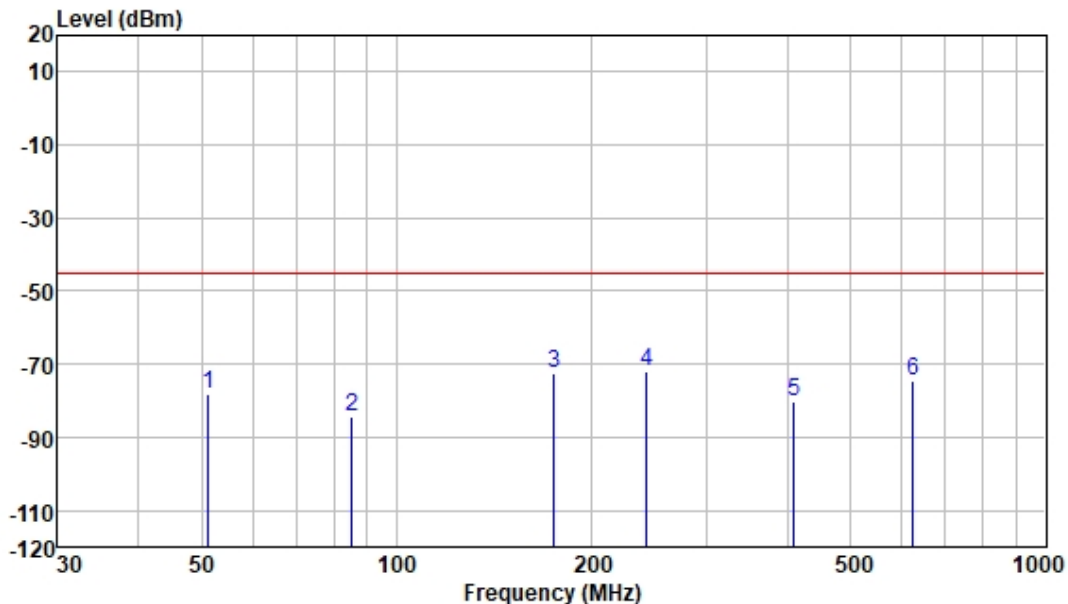
3. The disturbance from 9kHz to 30MHz was very low and 20db below the limit, therefore, the data was not recorded in the report.



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DL_1S_M_AWGN_Horizontal_30MHz~1GHz



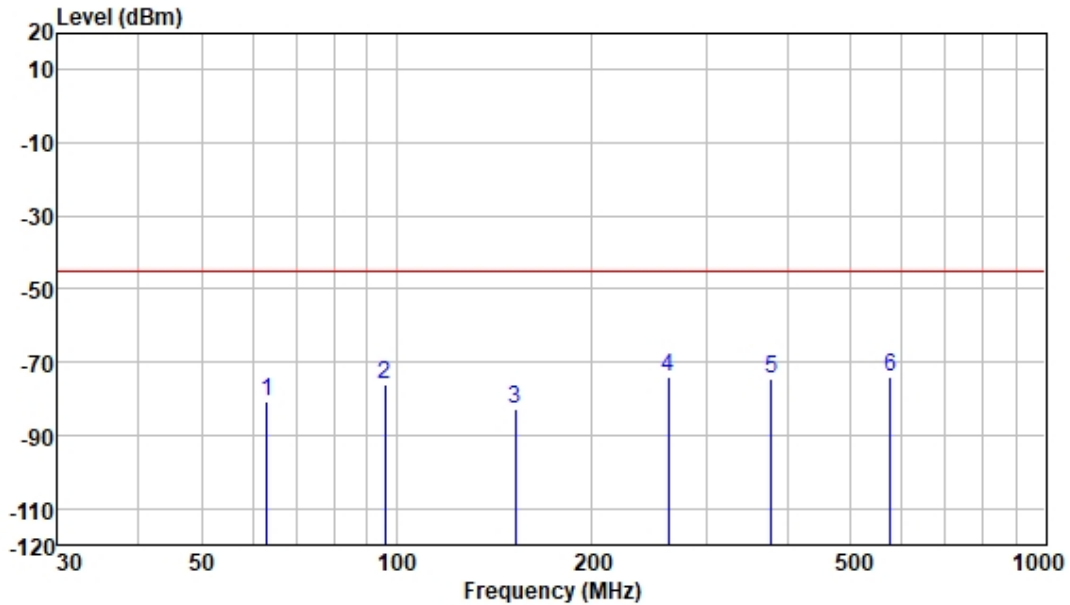
	Freq	Read Level	Correction Factor	Level	Limit	Over Limit	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	51.12	-76.88	-1.35	-78.23	-44.99	-33.24	HORIZONTAL
2	85.30	-74.67	-9.93	-84.60	-44.99	-39.61	HORIZONTAL
3	174.42	-66.41	-6.10	-72.51	-44.99	-27.52	HORIZONTAL
4	242.53	-65.76	-6.00	-71.76	-44.99	-26.77	HORIZONTAL
5	408.95	-79.32	-0.71	-80.03	-44.99	-35.04	HORIZONTAL
6	625.08	-77.88	3.43	-74.45	-44.99	-29.46	HORIZONTAL



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DL_1S_M_AWGN_Horizontal_above 1GHz



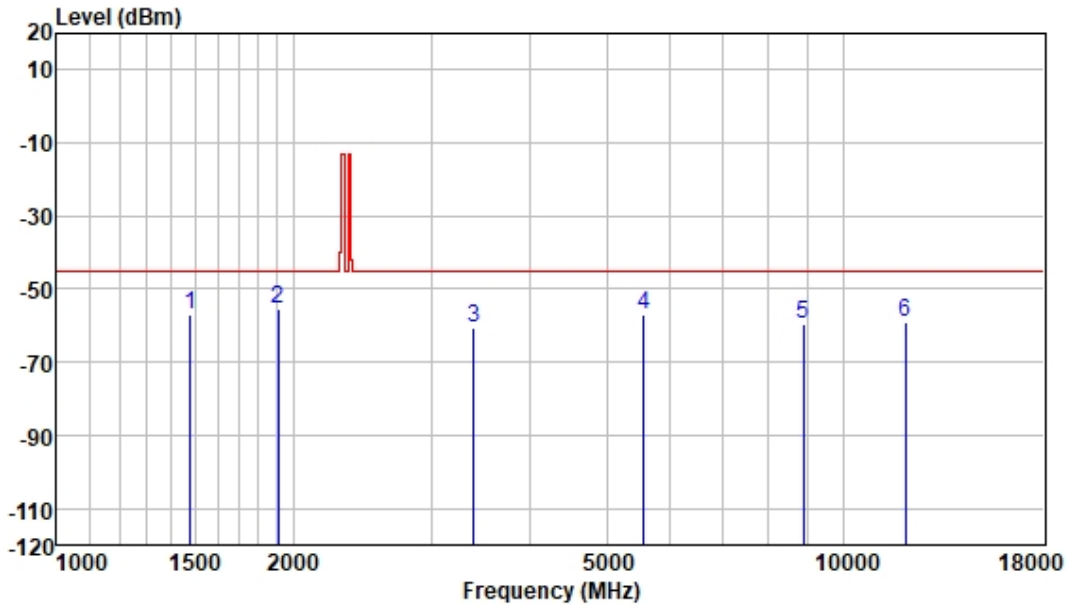
	Freq	Read	Correction	Limit	Over	
	MHz	Level	Factor	Line	Limit	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB
1	63.09	-77.06	-3.68	-44.99	-35.75	VERTICAL
2	95.76	-70.26	-5.78	-44.99	-31.05	VERTICAL
3	152.13	-78.67	-3.94	-44.99	-37.62	VERTICAL
4	261.98	-69.65	-4.25	-44.99	-28.91	VERTICAL
5	377.26	-73.27	-1.04	-44.99	-29.32	VERTICAL
6	576.64	-77.08	3.02	-44.99	-29.07	VERTICAL



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DL_1S_M_AWGN_Vertical_30MHz~1GHz



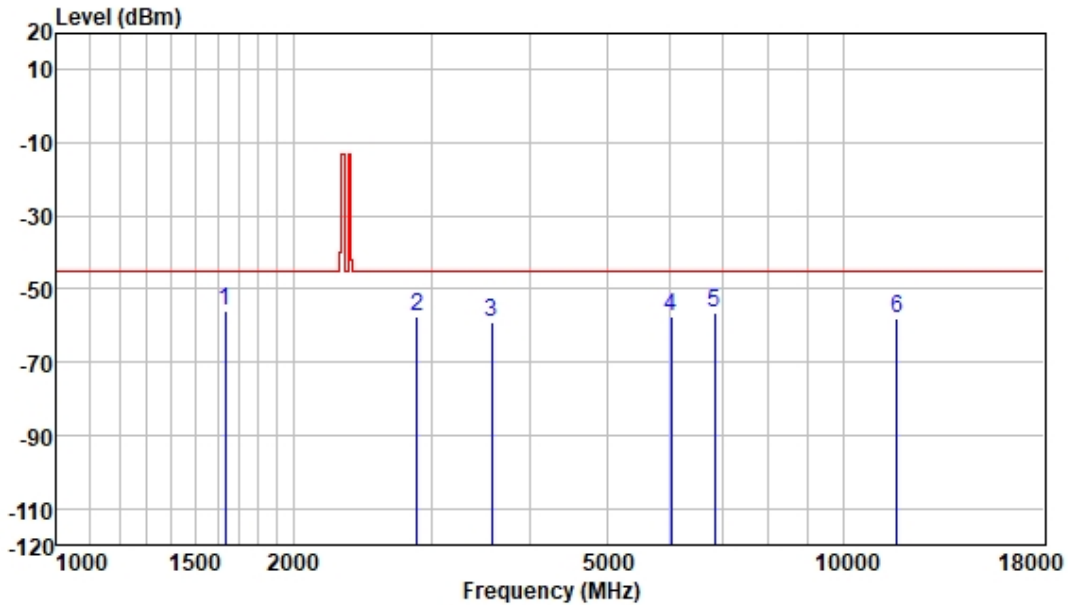
	Freq	Read Level	Correction Factor	Level	Limit	Over Limit	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	1477.28	-61.61	4.70	-56.91	-45.00	-11.91	HORIZONTAL
2	1910.65	-61.97	6.73	-55.24	-45.00	-10.24	HORIZONTAL
3	3386.30	-62.61	2.21	-60.40	-45.00	-15.40	HORIZONTAL
4	5567.14	-70.76	13.68	-57.08	-45.00	-12.08	HORIZONTAL
5	8891.73	-74.10	14.70	-59.40	-45.00	-14.40	HORIZONTAL
6	11975.10	-80.22	21.34	-58.88	-45.00	-13.88	HORIZONTAL



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DL_1S_M_AWGN_Vertical_above 1GHz



	Freq	Read Level	Correction Factor	Level	Limit	Over Limit	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	1639.27	-61.02	5.09	-55.93	-45.00	-10.93	VERTICAL
2	2871.93	-62.12	4.73	-57.39	-45.00	-12.39	VERTICAL
3	3567.14	-63.53	4.65	-58.88	-45.00	-13.88	VERTICAL
4	6036.42	-77.23	19.49	-57.74	-45.00	-12.74	VERTICAL
5	6855.06	-77.29	20.79	-56.50	-45.00	-11.50	VERTICAL
6	11667.60	-79.79	21.89	-57.90	-45.00	-12.90	VERTICAL

--End of Appendix--



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