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FCC ID: OJFDLRUG21719235

Appendix -

Test Data and Result for report GZCR230300024803 (B)

(For 100MHz AWGN test data)



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1 AWS-2 & AWS-4 (only for downlink: 1995-2020MHz)

1.1 AGC threshold level

Test Conf.	AGC Threshold level	
DL_1S_M_AWGN	-0.10dBm	



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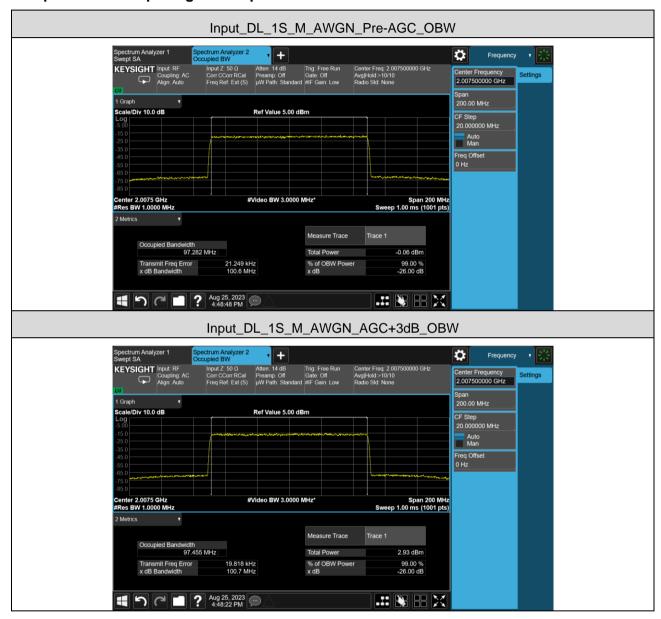
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1.2 Input-versus-output signal comparison





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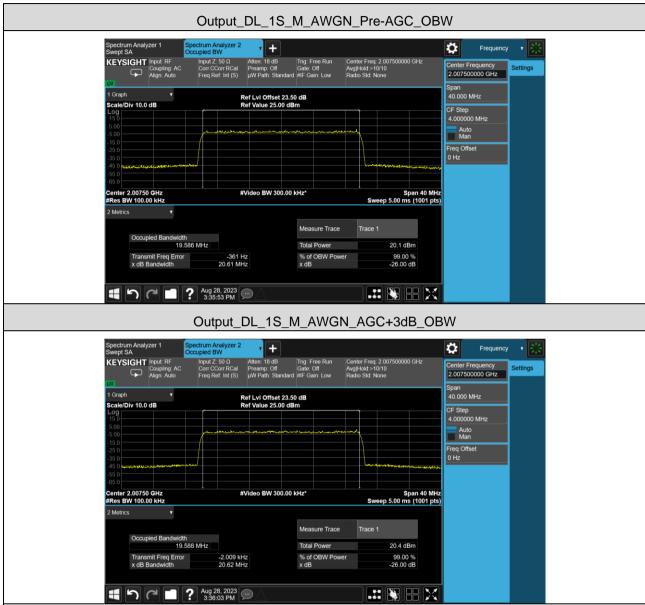
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Remark:

- 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.
- 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
	Pre-AGC	-0.20	20.23	20.43	PASS	
DL_1S_AWGN	2009.1	AGC+3dB	2.80	20.17	/	PASS

Remark:

1. 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 (20.23dBm+20.23dBm) +15.5dBi=38.74dBm (7.482W) which don't exceed the required EIRP limit (1640W/MHz).

2. Based on discussion in docket No. DA 13-2409 (section 26 & 47) for operation in 2000-2020MHz in downlink, only 27.50(d)(1) and 27.50(d)(2) apply.



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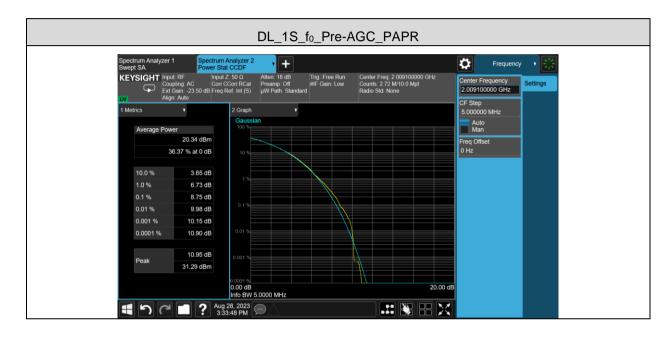
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Test Conf.	Test Freq. f ₀ (MHz)	Signal Level	PAPR (dB)	Limit (dB)	Verdict
DL_1S_AWGI	N 2009.1	Pre-AGC	9.98	13	PASS





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

Note:

The EUT support 2x2 MIMO, Per KDB662911 D01 Multiple Transmitter Output v02r01 clause (3)(a)(iii): Measure and add 10 log(NANT) dB, where NANT is the number of outputs to combine the emission measurements from multiple outputs prior to comparing to the emission limit.

Here, the factor 10 log (NANT) dB= 10 log (2) dB=3.01dB.

1. The tested max conducted power for single antenna port is 20.26dBm, 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 log10 (P) dB

Here,

P=20.23dBm= 0.1054W.

So the limit =

P(dBm)- [43 + 10 log (0.1054W)] = -13dBm

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. Based on discussion in docket No. DA 13-2409 (section 26 & 47) for operation in 2000-2020MHz in downlink, only 27.53(h)(1) and 27.53(h)(3) apply.
- 3. Pretest performe at AWS-2 block, AWS-4 block and combined AWS-4&AWS-2 block, only the worst-case combined AWS-4 and AWS-2 block test plot was record in the report.
- 4. The spurious emissions 9kHz to 30MHz were very low and not displayed in this report.





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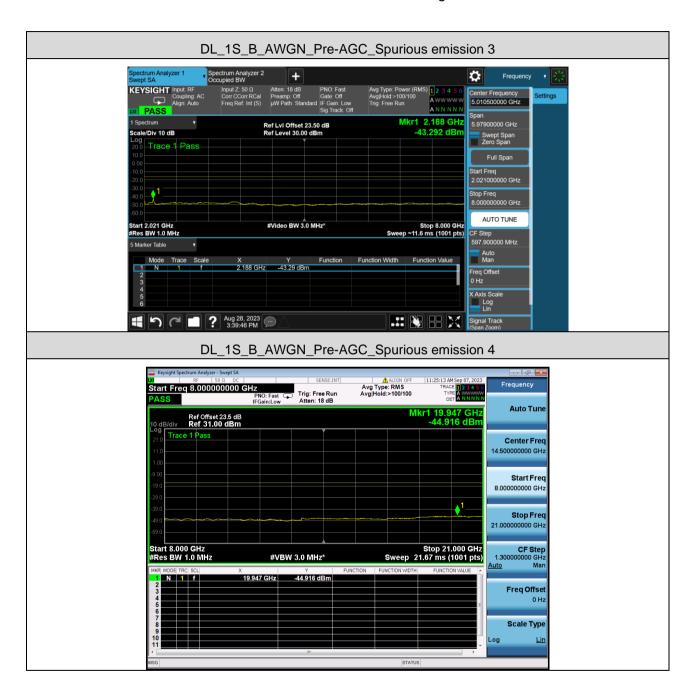
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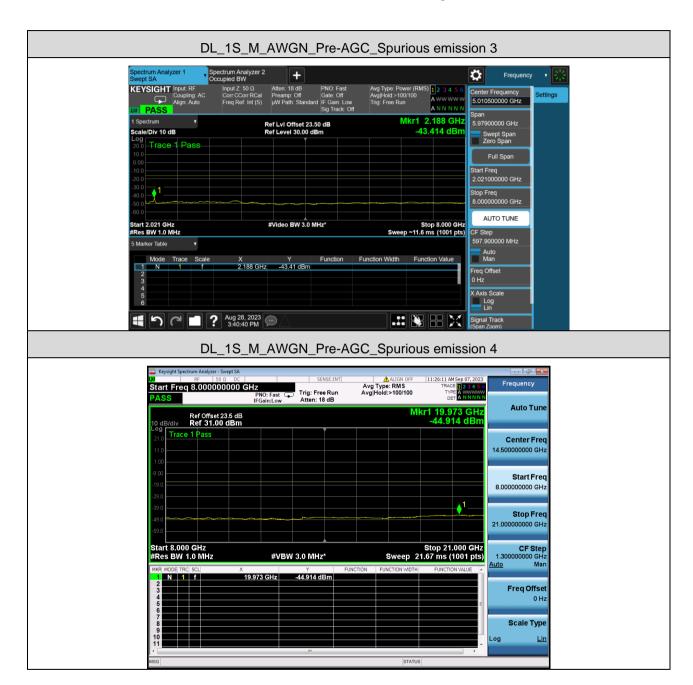
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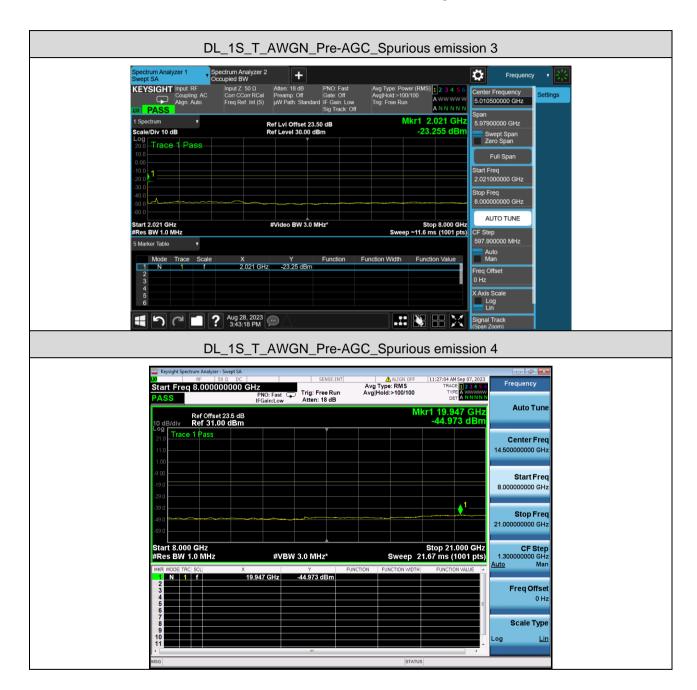
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1.5 Frequency Stability

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 (℃)	Test Conf.	Frequency Error (Hz)	Tolerance (ppm)	Verdict		
50		103	0.051	PASS		
40		103	0.051	PASS		
30		111	0.055	PASS		
20		95	0.047	PASS		
10	DL_1S_M_AWGN	115	0.057	PASS		
0		102	0.051	PASS		
-10		95	0.047	PASS		
-20		112	0.056	PASS		
-30		97	0.048	PASS		

Frequency stability vs voltage						
Voltage (V)	Test Conf.	Frequency Error (Hz)	Tolerance (ppm)	Verdict		
DC 40.8		95	0.047	PASS		
DC 48	DL_1S_M_AWGN	95	0.047	PASS		
DC 55.2		100	0.050	PASS		



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1.6 Radiated spurious emissions

Note:

1. The tested max conducted power for single antenna port is 20.26dBm, 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 log10 (P) dB

Here,

P=20.26dBm= 0.1062W.

So the limit =

P(dBm)- [43 + 10 log (0.1062W)] = -13dBm

- 2. Based on discussion in docket No. DA 13-2409 (section 26 & 47) for operation in 2000-2020MHz in downlink, only 27.53(h)(1) and 27.53(h)(3) apply.
- 3. 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.
- 4. 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 30 Level (dBm) 20 0 -20 -40 -60 6 3 -80 2 -100 -120₃₀ 50 100 200 500 1000 Frequency (MHz) Read Correction Limit Over Pol/Phase Level Factor Level Limit Frea Line MHz dBm dB dBm dBm dB 55.22 -81.52 -1.98 -83.50 -13.00 -70.50 HORIZONTAL -81.42 -7.84 -89.26 -13.00 -76.26 139.36 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 854.02 -78.97 7.28 -71.69 -13.00 -58.69 HORIZONTAL



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DL 1S M AWGN Horizontal above 1GHz 30 Level (dBm) 20 0 -20 -40 6 3 2 -60 -80 -100 -120 1000 1500 2000 5000 10000 18000 Frequency (MHz) Read Correction Limit Over Pol/Phase Freq Level Factor Level Limit Line MHz dBm dB dBm dBm dB 1910.65 -61.65 6.73 -54.92 -13.00 -41.92 HORIZONTAL -62.15 4.09 -58.06 -13.00 -45.06 2888.58 HORIZONTAL 4790.25 -64.46 8.23 -56.23 -13.00 -43.23 HORIZONTAL 3 4 5519.07 -63.30 14.34 -48.96 -13.00 -35.96 HORIZONTAL 5 6213.44 -64.49 19.08 -45.41 -13.00 -32.41 HORIZONTAL 11871.71 -70.73 21.13 -49.60 -13.00 -36.60 HORIZONTAL



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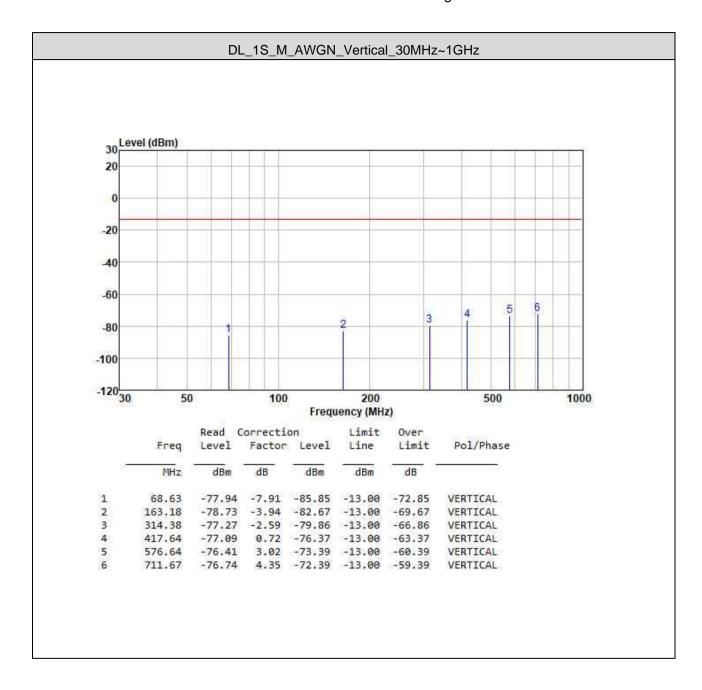
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DL 1S M AWGN Vertical above 1GHz 30 Level (dBm) 20 0 -20 5 -40 4 3 -60 -80 -100 -120 1000 5000 1500 2000 10000 18000 Frequency (MHz) Read Correction Limit Over Pol/Phase Freq Level Factor Level Limit Line MHz dBm dB dBm dBm dB 1894.15 -63.93 6.87 -57.06 -13.00 -44.06 VERTICAL -65.12 3.31 -61.81 -13.00 -48.81 3425.68 VERTICAL 4521.19 -64.29 6.17 -58.12 -13.00 -45.12 3 VERTICAL 4 6303.89 -66.48 19.12 -47.36 -13.00 -34.36 VERTICAL 5 6776.27 -64.92 20.97 -43.95 -13.00 -30.95 VERTICAL 10423.80 -69.74 24.00 -45.74 -13.00 -32.74 VERTICAL



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2 AWS-4 (only for downlink: 2180-2200MHz)

2.1 AGC threshold level

Test Conf.	AGC Threshold level	
DL_1S_M_AWGN	0.10dBm	



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2.2 Input-versus-output signal comparison





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Remark:

- 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.
- 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
		Pre-AGC	0.00	19.95	19.95	PASS
DL_1S_AWGN	2180.6	AGC+3dB	3.00	19.89	/	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 (19.95dBm+19.95dBm) +15.5dBi=38.46dBm (7.015W) which don't exceed the required EIRP limit (1640W/MHz)



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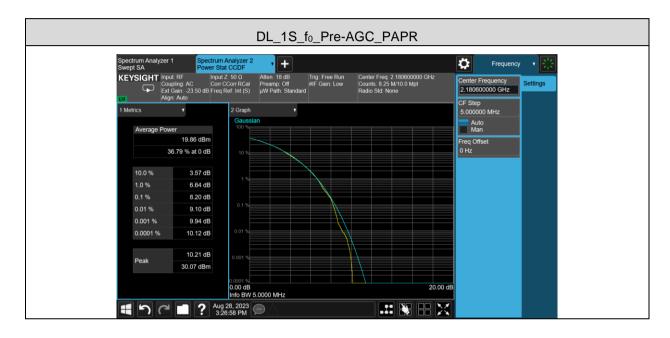
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Test Conf.	Test Freq. f ₀ (MHz)	Signal Level	PAPR (dB)	Limit (dB)	Verdict
DL_1S_AWGN	2180.6	Pre-AGC	9.1	13	PASS





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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 19.95dBm, 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 log10 (P) dB

Here,

P=19.95dBm= 0.1081W.

So the limit =

P(dBm)- [43 + 10 log (0.098W)] = -13dBm

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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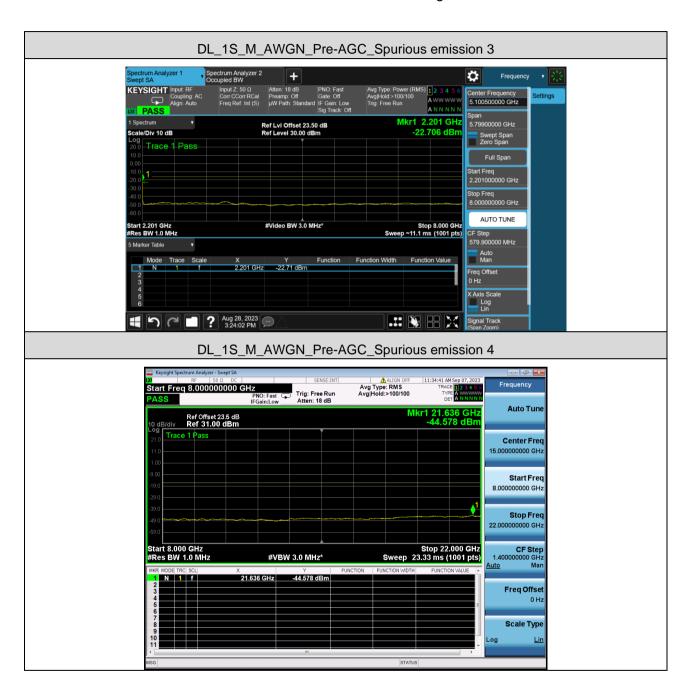
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2.5 Frequency Stability

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.

Temperature (℃)	Test Conf.	Frequency Error (Hz)	Tolerance (ppm)	Verdict
50		108	0.049	PASS
40		105	0.048	PASS
30		113	0.052	PASS
20		106	0.048	PASS
10	DL_1S_M_AWGN	95	0.043	PASS
0		94	0.043	PASS
-10		105	0.048	PASS
-20		93	0.042	PASS
-30		110	0.050	PASS

Frequency stability vs voltage						
Voltage (V)	Test Conf.	Frequency Error (Hz)	Tolerance (ppm)	Verdict		
DC 40.8		110	0.050	PASS		
DC 48	DL_1S_M_AWGN	106	0.048	PASS		
DC 55.2		101	0.046	PASS		



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2.6 Radiated spurious emissions

Note:

1. The tested max conducted power for single antenna port is 20.23dBm. the 2x2 MIMO total power is 20.23dBm+20.23dBm= 0.2103W.

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 log10 (P) dB

Here,

P=0.2103W,

So the limit =

P(dBm)- [43 + 10 log (0.2103W)] = -13dBm

For these AWS-4 operations in the 2180-2200 MHz band, the power of any emissions on all frequencies between 2200 and 2290 MHz shall not exceed an EIRP of -100.6 dBW/4 kHz,

- -100.6 dBW/4 kHz = -70.6 dBm/4 kHz = -46.6 dBm/1 MHz
- 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 30 Level (dBm) 20 0 -20 -40 -60 6 -80 2 -100 -120₃₀ 50 100 200 500 1000 Frequency (MHz) Read Correction Limit 0ver Pol/Phase Freq Level Limit Factor Level line MHz dBm dB dBm dBm dB 49.53 -79.89 -1.50 -81.39 -13.00 -68.39 HORIZONTAL 96.77 -76.80 -9.66 -86.46 -13.00 -73.46 HORIZONTAL 3 245.09 -79.79 -5.83 -85.62 -13.00 -72.62 HORIZONTAL 4 501.18 -78.01 0.39 -77.62 -13.00 -64.62 HORIZONTAL 5 706.70 -78.96 4.06 -74.90 -13.00 -61.90 HORIZONTAL 801.79 -78.87 6.79 -72.08 -13.00 -59.08 HORIZONTAL



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DL 1S M AWGN Horizontal above 1GHz 30 Level (dBm) 20 0 -20 -40 6 5 -60 -80 -100 -120 1000 5000 1500 2000 10000 18000 Frequency (MHz) Read Correction Limit 0ver Pol/Phase Freq Limit Level Factor Level line MHz dBm dB dBm dBm dB 2151.03 -62.58 9.34 -53.24 -13.00 -40.24 HORIZONTAL -62.10 2.33 -59.77 -13.00 -46.77 3114.03 HORIZONTAL 4157.66 -63.75 3.87 -59.88 -13.00 -46.88 3 HORIZONTAL -64.46 19.17 -45.29 -13.00 -32.29 4 6019.00 HORIZONTAL 5 7200.31 -67.63 18.41 -49.22 -13.00 -36.22 HORIZONTAL 10636.85 -67.70 23.79 -43.91 -13.00 -30.91 HORIZONTAL



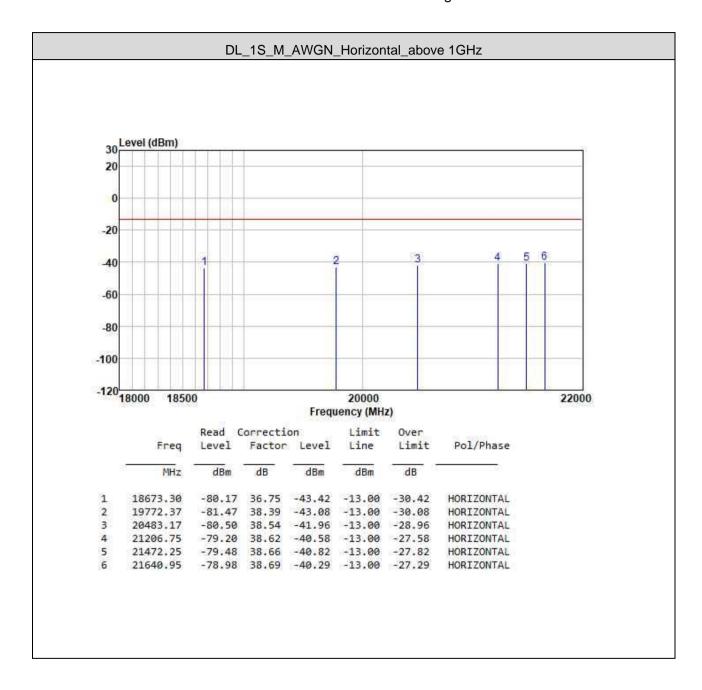
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DL 1S M AWGN Vertical 30MHz~1GHz 30 Level (dBm) 20 0 -20 -40 -60 5 -80 -100 -120₃₀ 50 100 200 500 1000 Frequency (MHz) Read Correction Limit 0ver Pol/Phase Freq Level Limit Factor Level line MHz dBm dB dBm dBm dB -81.28 -5.55 -86.83 -13.00 -73.83 VERTICAL 65.11 -80.79 -3.93 -84.72 -13.00 -71.72 141.83 VERTICAL 3 -79.17 -2.31 -81.48 -13.00 -68.48 334.86 VERTICAL 4 566.62 -78.62 2.75 -75.87 -13.00 -62.87 VERTICAL 5 742.26 -78.31 5.52 -72.79 -13.00 -59.79 VERTICAL -78.44 7.46 -70.98 -13.00 -57.98 804.60 VERTICAL



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DL 1S M AWGN Vertical above 1GHz 30 Level (dBm) 20 0 -20 5 -40 4 3 -60 -80 -100 -120 1000 1500 2000 5000 10000 18000 Frequency (MHz) Read Correction Limit 0ver Pol/Phase Freq Limit Level Factor Level line MHz dBm dB dBm dBm dB 1511.83 -62.24 6.77 -55.47 -13.00 -42.47 VERTICAL 2507.13 -65.01 7.15 -57.86 -13.00 -44.86 VERTICAL 3455.51 -62.27 3.55 -58.72 -13.00 -45.72 3 VERTICAL 4 5830.64 -64.93 16.00 -48.93 -13.00 -35.93 VERTICAL 5 6776.27 -63.79 20.97 -42.82 -13.00 -29.82 VERTICAL 10244.58 -68.15 21.88 -46.27 -13.00 -33.27 VERTICAL



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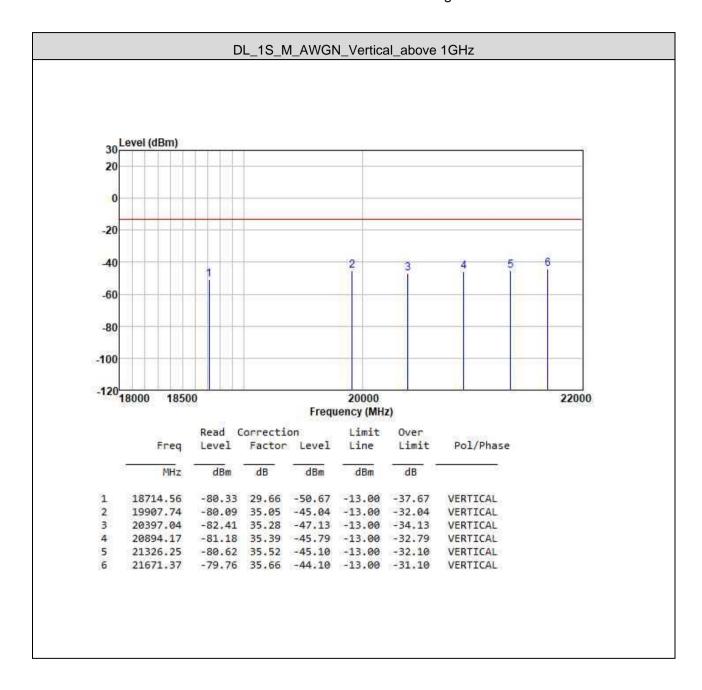
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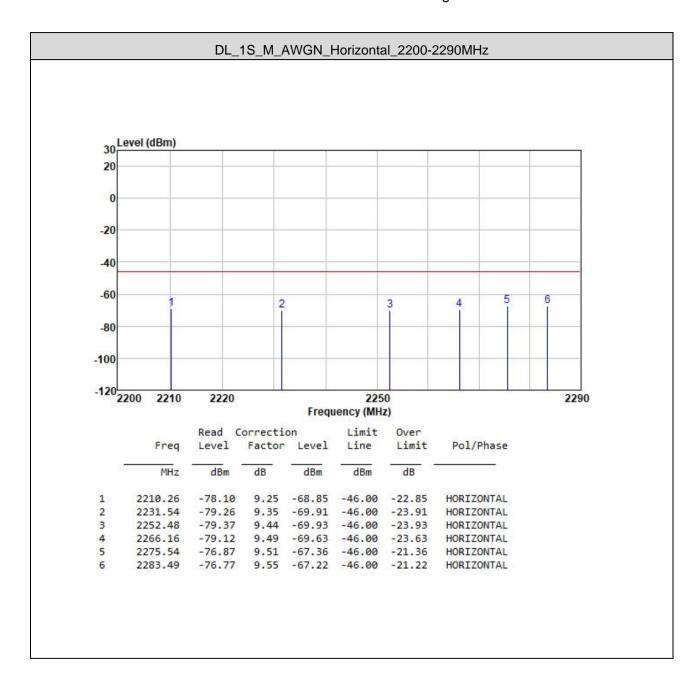
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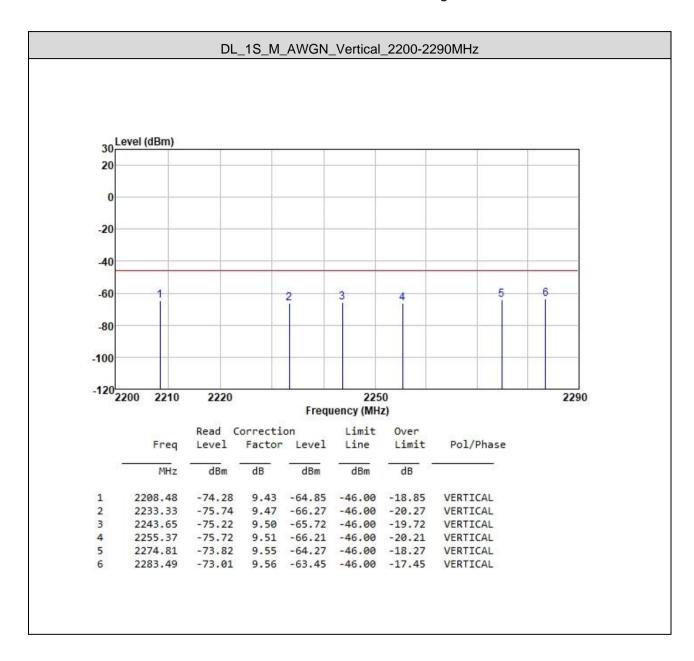
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-- End of Appendix--

