

EMC-ARF-03 Rev 1.1 Page: 1 of 23

FCC ID: OJFDHRU-G2-17

# Appendix -

# Test Data and Result for report GZCR231100125702

(B)

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



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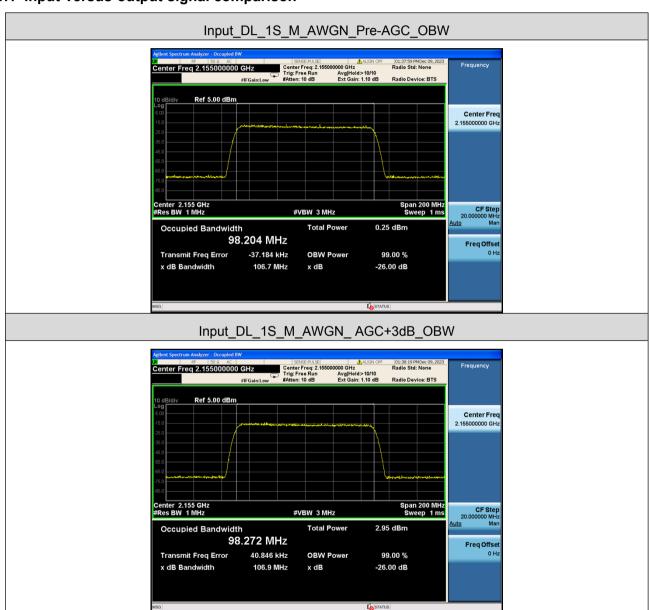
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EMC-ARF-05 Rev 1.1 Page: 2 of 23

### 1 AWS-1 & AWS-3 & AWS-4 (only for downlink: 2110-2200MHz)

### 1.1 Input-versus-output signal comparison





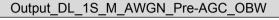
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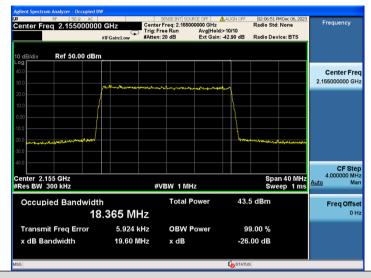
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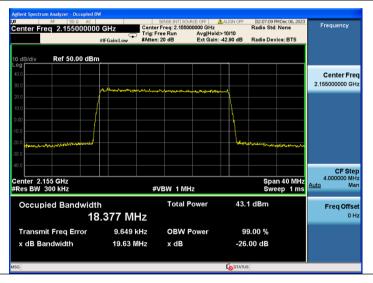


EMC-ARF-05 Rev 1.1 Page: 3 of 23





### Output DL 1S M AWGN AGC+3dB OBW



#### 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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EMC-ARF-05 Rev 1.1 Page: 4 of 23

### 1.2 Mean output power and amplifier/booster gain

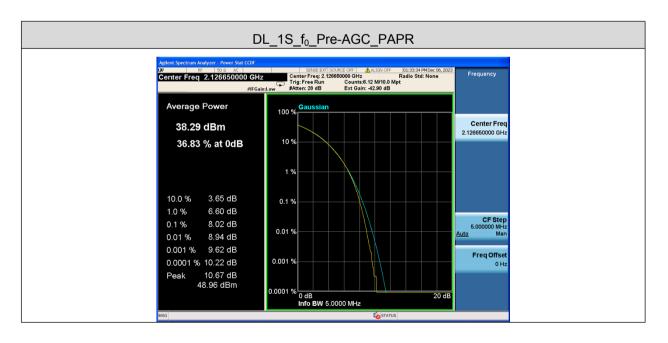
Test Conf.	Test Freq. f <sub>0</sub> (MHz)	Signal Level	Input Power (dBm)	Output Power (dBm)	Gain (dB)	Verdict
DL_1S_AWG	1S_AWG 2126.65	Pre-AGC	-6.00	38.33	42.33	PASS
N		AGC+3dB	-3.00	38.10	/	PASS

#### 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 (38.33dBm+38.33dBm) +15.5dBi=56.84dBm (483.1W) which don't exceed the required EIRP limit (1640W/MHz).

Test Conf.	Test Freq. f <sub>0</sub> (MHz)	Signal Level	PAPR (dB)	Limit (dB)	Verdict
DL_1S_AWG	2126.65	Pre-AGC	8.94	13	PASS





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EMC-ARF-05 Rev 1.1 Page: 5 of 23

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

Note:

The tested max conducted power for single antenna port is 38.33dBm, the power of any emission must be reduced below the mean output power (P) by at least 43 + 10log (P) dB Here.

P=38.33dBm= 6.81W.

So the limit =

P(dBm)- [43 + 10 log (6.81W)] = -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.

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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EMC-ARF-05 Rev 1.1 Page: 6 of 23

# DL\_1S\_B\_AWGN\_Pre-AGC\_Out-of-band emission Avg Type: Pwr(RMS) Avg|Hold>100/100 Ext Gain Start Freg. 2.107000000 GHz Auto Tun Ref 40.00 dBm Start Fred 2.107000000 GH: Start 2.107000 GHz #Res BW 1.0 MHz Stop 2.110000 GHz Sweep 1.00 ms (1001 pts #VBW 3.0 MHz\* DL 1S B AWGN AGC+3 Out-of-band emission Start Freq 2.107000000 GHz Avg Type: Pwr(RMS) Avg|Hold:>100/100 Ext Gain: -42.90 dB Auto Tun Mkr1 2.110 000 GF -19.232 dB Ref 40.00 dBm 2.107000000 GH Freq Offs Stop 2.110000 GHz Sweep 1.00 ms (1001 pts) Start 2.107000 GHz #Res BW 1.0 MHz



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#VBW 3.0 MHz\*



EMC-ARF-05 Rev 1.1 Page: 7 of 23

# DL\_1S\_T\_AWGN\_Pre-AGC\_Out-of-band emission Avg Type: Pwr(RMS) Avg|Hold>100/100 Ext Gain Start Freg. 2.200000000 GHz Auto Tun Mkr1 2.200 000 GF -19.316 dB Ref 40.00 dBm Start Fred #VBW 3.0 MHz\* DL 1S T AWGN AGC+3 Out-of-band emission Start Freq 2.200000000 GHz Avg Type: Pwr(RMS) Avg|Hold:>100/100 Ext Gain: -42.90 dB Auto Tun Mkr1 2.200 000 Gr -19.925 dB Ref 40.00 dBm 2.200000000 GH Freq Offs Stop 2.203000 GHz Sweep 1.00 ms (1001 pts) #VBW 3.0 MHz\*



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EMC-ARF-05 Rev 1.1 Page: 8 of 23

# DL\_2S\_B\_AWGN\_Pre-AGC\_Out-of-band emission Avg Type: Pwr(RMS) Avg|Hold:>100/100 Ext Gain: Start Freg. 2.107000000 GHz Auto Tun Ref 40.00 dBm Start Fred 2.107000000 GH: Start 2.107000 GHz #Res BW 1.0 MHz Stop 2.110000 GHz Sweep 1.00 ms (1001 pts #VBW 3.0 MHz\* DL 2S B AWGN AGC+3 Out-of-band emission Start Freq 2.107000000 GHz Avg Type: Pwr(RMS) Avg|Hold:>100/100 Ext Gain: -42.90 dB Mkr1 2.110 000 GF -20.833 dB Auto Tun Ref 40.00 dBm 2.107000000 GH Freq Offse Stop 2.110000 GHz Sweep 1.00 ms (1001 pts) Start 2.107000 GHz #Res BW 1.0 MHz



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#VBW 3.0 MHz\*



EMC-ARF-05 Rev 1.1 Page: 9 of 23

# DL\_2S\_T\_AWGN\_Pre-AGC\_Out-of-band emission Avg Type: Pwr(RMS) Avg|Hold>100/100 Ext Gain: 42.5 Start Freg. 2.200000000 GHz Auto Tun Ref 40.00 dBm Start Fred #VBW 3.0 MHz\* DL 2S T AWGN AGC+3 Out-of-band emission Start Freq 2.200000000 GHz Auto Tun Mkr1 2.200 000 Gr -22.507 dB Ref 40.00 dBm 2.200000000 GH Freq Offs Stop 2.203000 GHz Sweep 1.00 ms (1001 pts) #VBW 3.0 MHz\*



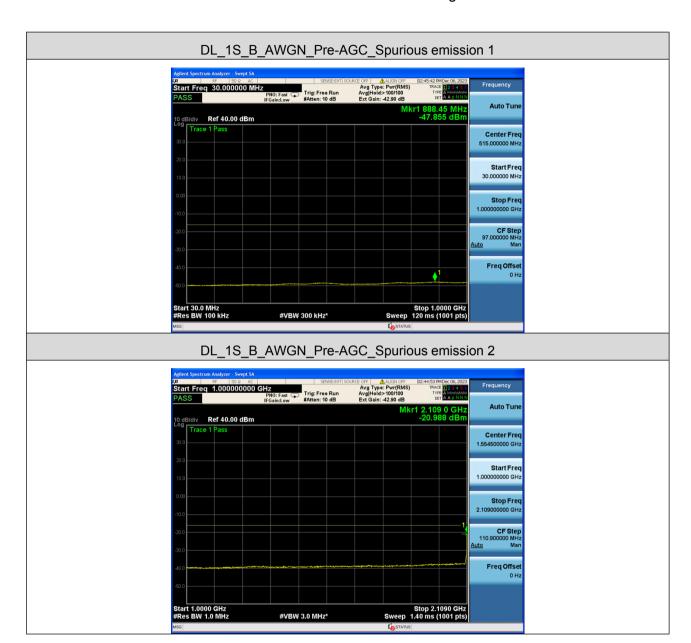
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EMC-ARF-05 Rev 1.1 Page: 11 of 23

# DL\_1S\_B\_AWGN\_Pre-AGC\_Spurious emission 3 Avg Type: Pwr(RMS) Avg|Hold>100/100 Ext Gain: Start Freg. 2.201000000 GHz Auto Tun Ref 40.00 dBm Start Fred #VBW 3.0 MHz\* DL 1S B AWGN Pre-AGC Spurious emission 4 art Freq 3.000000000 GHz Auto Tun Ref 40.00 dBm Start Free Stop Fred 22.000000000 GH:



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Stop 22.000 GHz Sweep 47.53 ms (1001 pts

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#VBW 3.0 MHz\*



EMC-ARF-05 Rev 1.1 Page: 12 of 23

# DL\_1S\_M\_AWGN\_Pre-AGC\_Spurious emission 1 Avg Type: Pwr(RMS) Avg|Hold:>100/100 Ext Gain: -42.90 dB Start Freg. 30,000000 MHz Auto Tun Ref 40.00 dBm 515.000000 MH Start Free CF Ste 97.000000 MH #VBW 300 kHz\* DL 1S M AWGN Pre-AGC Spurious emission 2 Avg Type: Pwr(RMS) Avg|Hold:>100/100 Ext Gain: -42.90 dB Start Freq 1.000000000 GHz Auto Tun Ref 40.00 dBm 1.000000000 GH CF Step 110.900000 MH: <u>Auto</u> Mar



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Stop 2.1090 GHz Sweep 1.40 ms (1001 pts)

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#VBW 3.0 MHz\*



EMC-ARF-05 Rev 1.1 Page: 13 of 23

### DL\_1S\_M\_AWGN\_Pre-AGC\_Spurious emission 3



### DL 1S M AWGN Pre-AGC Spurious emission 4





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EMC-ARF-05 Rev 1.1 Page: 14 of 23

# DL\_1S\_T\_AWGN\_Pre-AGC\_Spurious emission 1 Avg Type: Pwr(RMS) Avg|Hold:>100/100 Ext Gain: -42.90 dB Start Freg. 30,000000 MHz Auto Tun Mkr1 879.72 MH -47.939 dB Ref 40.00 dBm 515.000000 MH Start Free CF Ste 97.000000 MH #VBW 300 kHz\* DL 1S T AWGN Pre-AGC Spurious emission 2 Avg Type: Pwr(RMS) Avg|Hold:>100/100 Ext Gain: -42.90 dB Start Freq 1.000000000 GHz Auto Tun 2.109 0 GH -32.645 dB Ref 40.00 dBm 1.000000000 GH CF Step 110.900000 MH: <u>Auto</u> Mar Stop 2.1090 GHz Sweep 1.40 ms (1001 pts) #VBW 3.0 MHz\*



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EMC-ARF-05 Rev 1.1 Page: 15 of 23

# DL\_1S\_T\_AWGN\_Pre-AGC\_Spurious emission 3 Avg Type: Pwr(RMS) Avg|Hold>100/100 Ext Gain Start Freg. 2.201000000 GHz Auto Tun Ref 40.00 dBm Start Fred #VBW 3.0 MHz\* DL 1S T AWGN Pre-AGC Spurious emission 4 art Freq 3.000000000 GHz Auto Tun Ref 40.00 dBm Start Fred 3.000000000 GH: Stop Free 22.000000000 GH Freq Offse



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Stop 22.000 GHz Sweep 47.53 ms (1001 pts

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#VBW 3.0 MHz\*



EMC-ARF-05 Rev 1.1 Page: 16 of 23

### 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  $\pm$ 20 °C temperature and  $\pm$ 15% supply voltage variations. If a product is specified to operate over a range of input voltage, then the  $\pm$ 15% variation is applied to the lowermost voltage and the  $\pm$ 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		85	0.0394	PASS		
40		73	0.0339	PASS		
30		60	0.0278	PASS		
20		79	0.0367	PASS		
10	DL_1S_M_AWG	81	0.0376	PASS		
0	N	103	0.0478	PASS		
-10		69	0.0320	PASS		
-20		101	0.0469	PASS		
-30		83	0.0385	PASS		

Frequency stability vs voltage						
Voltage (V)	Test Conf.	Frequency Error (Hz)	Tolerance (ppm)	Verdict		
AC 93.5		79	0.0367	PASS		
AC 110	DL_1S_M_AWG	79	0.0367	PASS		
AC 126.5	N	79	0.0367	PASS		



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EMC-ARF-05 Rev 1.1 Page: 17 of 23

### 1.5 Radiated spurious emissions

Note:

1. The tested max conducted power for single antenna port is 38.33dBm, the 2x2 MIMO total power is 38.33dBm+38.33dBm=13.62W, the power of any emission must be reduced below the mean output power (P) by at least 43 + 10log (P) dB

Here.

P=13.62W

So the limit =

P(dBm)- [43 + 10 log (13.62W)] =-13dBm

In additional, 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 -70.6 dBm/4 kHz = -46.6 dBm/1 MHz

- 2. The radiated spurious emissions were performed at bottom / middle / top channel and 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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EMC-ARF-05 Rev 1.1 Page: 18 of 23

#### DL\_1S\_M\_AWGN\_Horizontal\_30MHz~1GHz 20 Level (dBm) 10 -10 -30 5 -50 -70 -90 -110 -120<sup>L</sup>30 50 100 200 500 1000 Frequency (MHz) Limit Read Correction Over Factor Level Limit Pol/Phase Freq Level Line MHz dBm dB dBm dBm dB -46.26 -1.40 -47.66 -13.00 -34.66 51.66 HORTZONTAL -35.59 -7.67 -43.26 -13.00 -30.26 73.88 HORIZONTAL 3 105.27 -41.28 -9.39 -50.67 -13.00 -37.67 HORIZONTAL 4 205.68 -42.61 -7.11 -49.72 -13.00 -36.72 HORIZONTAL 5 -43.38 -1.28 -44.66 -13.00 -31.66 366.82 HORIZONTAL 618.54 -54.33 3.31 -51.02 -13.00 -38.02 HORIZONTAL



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EMC-ARF-05 Rev 1.1 Page: 19 of 23

#### DL\_1S\_M\_AWGN\_Horizontal\_above 1GHz 20 Level (dBm) 10 -10 -30 5 -50 4 -70 -90 -110 -120 1000 2000 1500 5000 10000 18000 Frequency (MHz) Limit Read Correction Over Factor Level Limit Pol/Phase Freq Level Line MHz dBm dB dBm dBm dB -61.40 4.62 -56.78 -13.00 -43.78 1414.60 HORTZONTAL 9.67 -52.55 -13.00 -39.55 2 2071.71 -62.22 HORIZONTAL 3 2734.23 -61.95 4.21 -57.74 -13.00 -44.74 HORIZONTAL -63.99 3.38 -60.61 -13.00 -47.61 4 3768.51 HORIZONTAL 5 -62.87 16.77 -46.10 -13.00 -33.10 5932.64 HORIZONTAL 10097.60 -63.91 20.63 -43.28 -13.00 -30.28 HORIZONTAL



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EMC-ARF-05 Rev 1.1 Page: 20 of 23

#### DL\_1S\_M\_AWGN\_Vertical\_30MHz~1GHz 20 Level (dBm) 10 -10 -30 -50 -70 -90 -110 -120<sup>L</sup>30 100 50 200 500 1000 Frequency (MHz) Limit Read Correction Over Level Factor Level Limit Pol/Phase Freq Line MHz dBm dB dBm dBm dB -42.87 -2.89 -45.76 -13.00 -32.76 61.78 VERTICAL -42.15 -9.17 -51.32 -13.00 -38.32 85.90 VERTICAL 3 118.19 -51.44 -3.99 -55.43 -13.00 -42.43 VERTICAL 4 202.81 -45.02 -5.24 -50.26 -13.00 -37.26 VERTICAL 5 400.43 -49.94 -0.25 -50.19 -13.00 -37.19 VERTICAL 576.64 -54.03 3.02 -51.01 -13.00 -38.01 VERTICAL



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EMC-ARF-05 Rev 1.1 Page: 21 of 23

#### DL\_1S\_M\_AWGN\_Vertical\_above 1GHz 20 Level (dBm) 10 -10 -30 6 5 -50 3 -70 -90 -110 -120 1000 1500 2000 5000 10000 18000 Frequency (MHz) Read Correction Limit 0ver Freq Factor Level Line Limit Pol/Phase MHz dBm dB dBm dBm dB 1787.76 -61.765.75 -56.01 -13.00 -43.01VERTICAL 2 2292.26 -61.03 9.57 -51.46 -13.00 -38.46 VERTICAL 3 -62.79 3.31 -59.48 -13.00 -46.48 3425.68 VERTICAL 4482.15 -63.33 5.68 -57.65 -13.00 -44.65 VERTICAL 7221.15 -63.82 18.86 -44.96 -13.00 -31.96 VERTICAL 10575.54 -63.60 24.78 -38.82 -13.00 -25.82 VERTICAL



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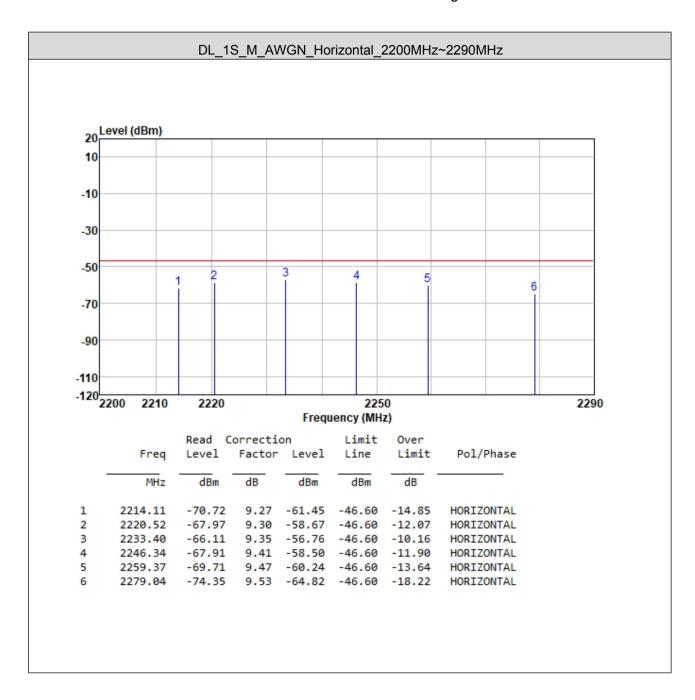
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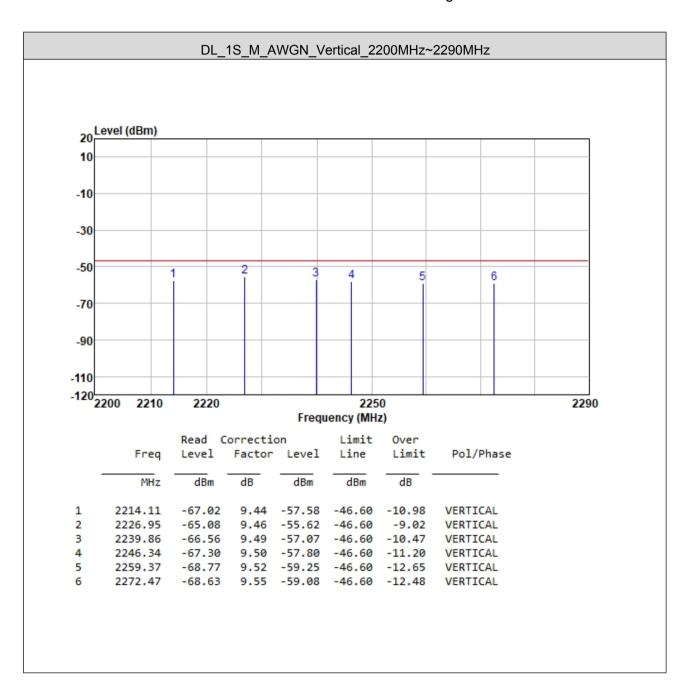
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#### -- End of Appendix-



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