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Appendix -

Test Data and Result for report GZCR230300024802 (A)

(For copied data)



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1 AWS-1 (1710-1755MHz paired with 2110-2155MHz)

1.1 AGC threshold level

Test Conf.	AGC Threshold level
DL_1S_M_AWGN	-0.23dBm
DL_1S_M_GSM	-0.13dBm



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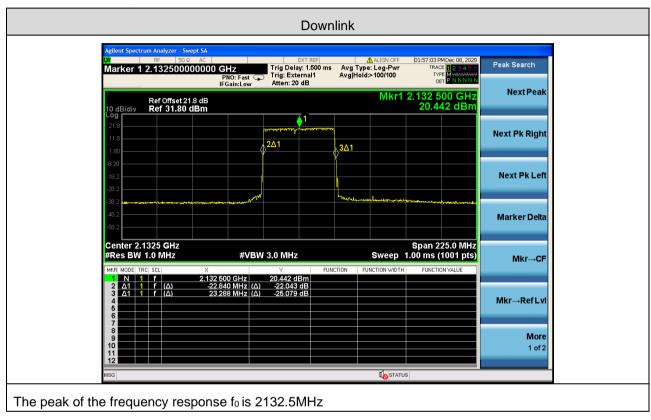
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1.2 Out-of-band rejection





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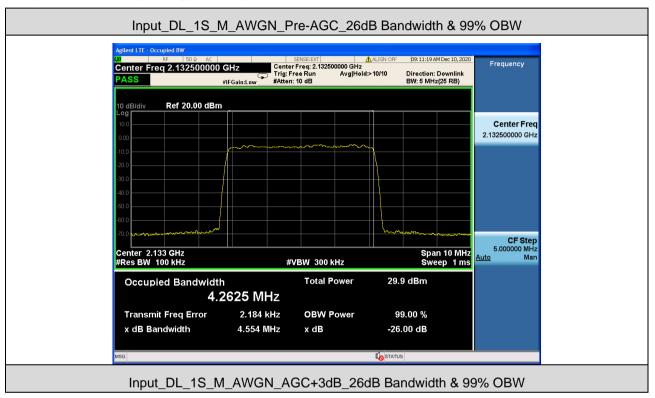
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1.3 Input-versus-output signal comparison





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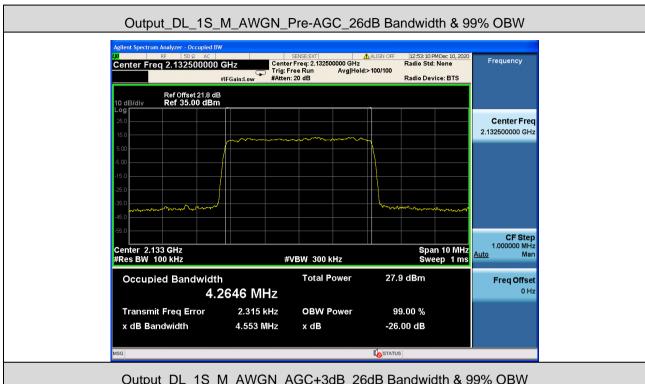


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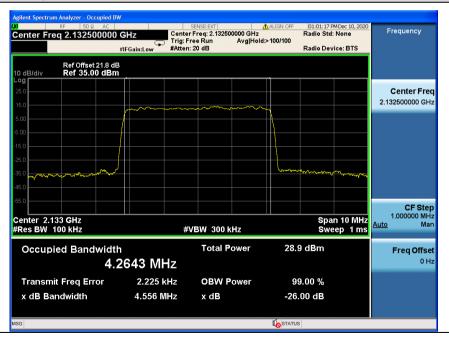
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Output_DL_1S_M_AWGN_AGC+3dB_26dB Bandwidth & 99% OBW





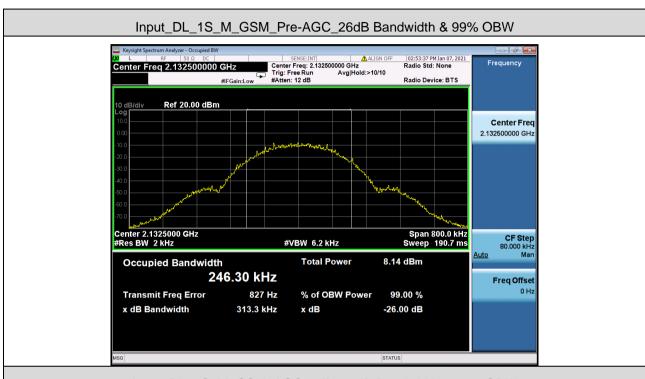
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Input_DL_1S_M_GSM_AGC+3dB_26dB Bandwidth & 99% OBW



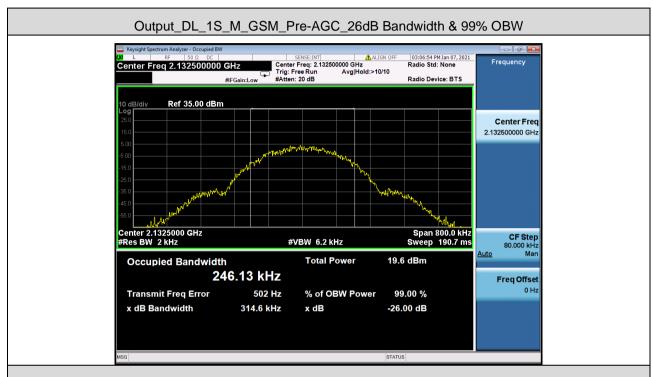


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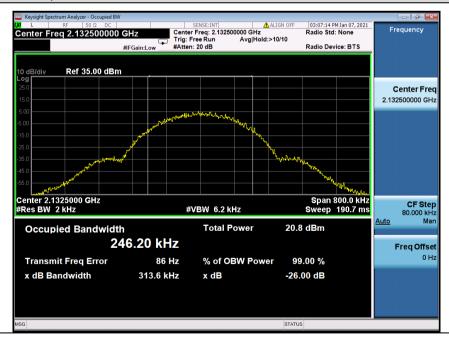
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Output_DL_1S_M_GSM_AGC+3dB_26dB Bandwidth & 99% OBW





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Remark:

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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1.4 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	-0.26	20.21	20.47	PASS
DL_1S_AWGN	2132.5	AGC+3dB	2.74	20.12	/	PASS
		Pre-AGC	-0.26	20.09	20.35	PASS
DL_1S_GSM	2132.5	AGC+3dB	2.74	20.14	/	PASS

Remark:

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

The total maximum EIRP for the EUT is (20.21dBm+20.21dBm) +15.5dBi=38.72dBm (7.447W) which don't exceed the required EIRP limit (1640W/MHz)



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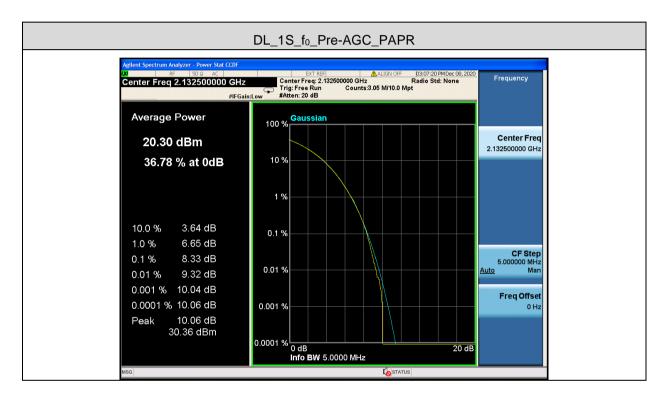
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Test Conf.	Test Freq. f ₀ (MHz)	Signal Level	PAPR (dB)	Limit (dB)	Verdict
DL_1S_AWGN	2132.5	Pre-AGC	8.3	13	PASS





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

Note:

1. The tested max conducted power for single antenna port is 20.21dBm, 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=20.21dBm= 0.1050W.

So the limit =

P(dBm)- [43 + 10 log (0.1050W)] = -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. Out-of-band/out-of-block (including intermodulation) emissions and spurious emissions have been tested using an AWGN test signal and a GSM-TDMA test signal, only the worst-case was recorded in this report.

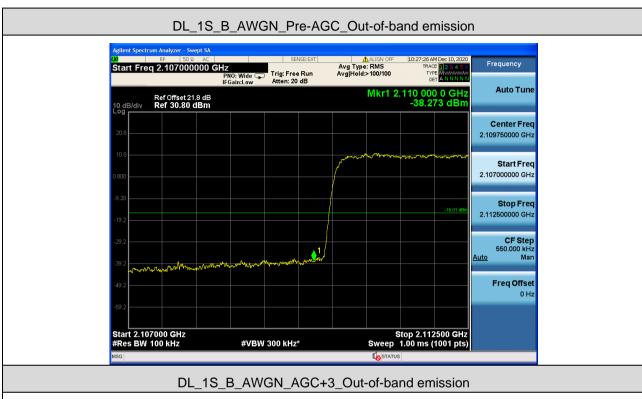


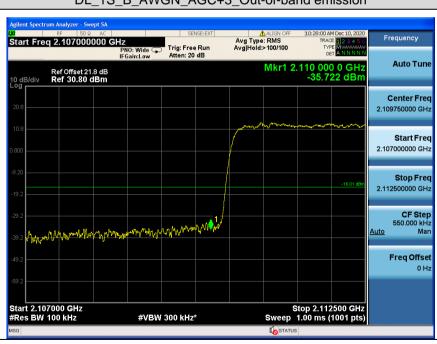
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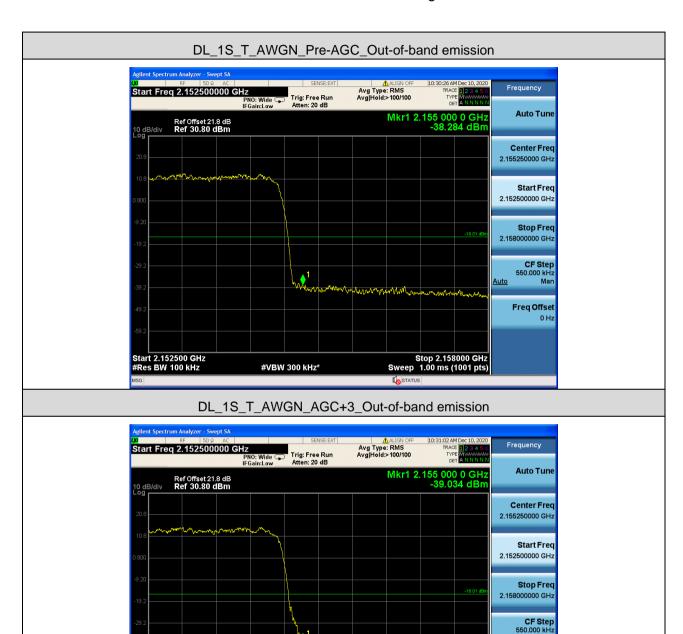


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Start 2.152500 GHz #Res BW 100 kHz

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#VBW 300 kHz*

Stop 2.158000 GHz Sweep 1.00 ms (1001 pts)

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<u>Auto</u>

Mar

Freq Offset



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DL 2S B AWGN Pre-AGC Out-of-band emission Avg Type: RMS Avg|Hold:>100/100 Frequency Start Freg 2.107000000 GHz Mkr1 2.110 000 0 GHz -31.360 dBm **Auto Tune** Ref Offset 21.8 dB Ref 30.80 dBm Center Fred 2.112250000 GHz Start Freq 2.107000000 GHz 2.117500000 GH CF Step 1.050000 MHz Mar Freq Offset Stop 2.117500 GHz Sweep 1.33 ms (1001 pts) Start 2.107000 GHz #Res BW 100 kHz **#VBW** 300 kHz* DL_2S_B_AWGN_AGC+3_Out-of-band emission Avg Type: RMS Avg|Hold:>100/100 Start Freq 2.107000000 GHz Trig: Free Run Auto Tune 10 000 0 GH: -31.394 dBn Ref Offset 21.8 dB Ref 30.80 dBm 2.112250000 GH Start Freq 2.107000000 GHz Stop Freq 2.117500000 GHz CF Step 1.050000 MHz Auto Mai Frea Offset 0 Hz Stop 2.117500 GHz Sweep 1.33 ms (1001 pts) Start 2.107000 GHz #Res BW 100 kHz



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#VBW 300 kHz*

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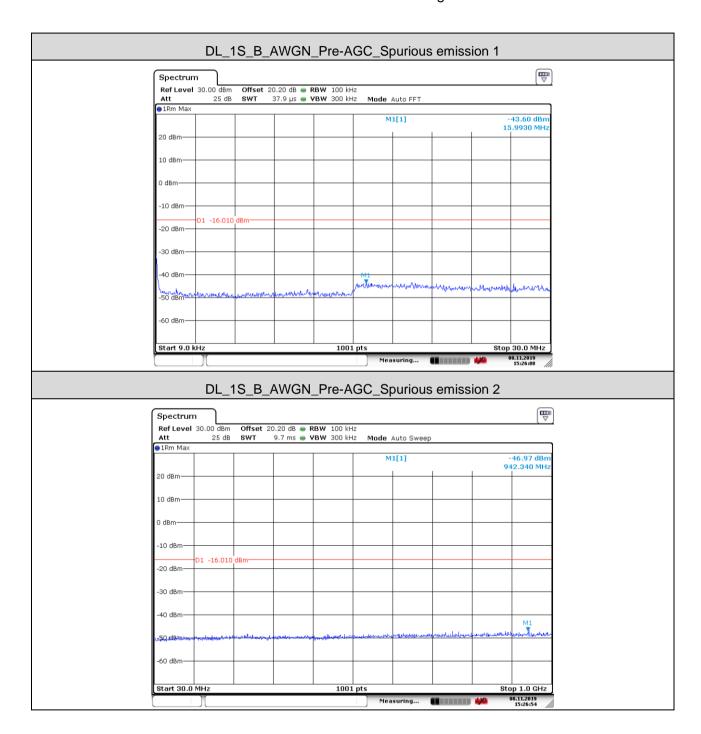


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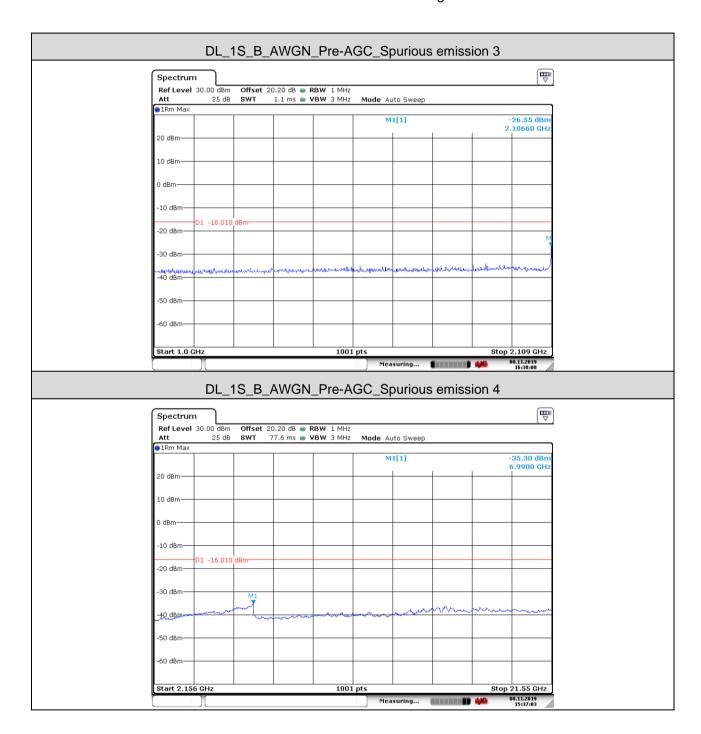
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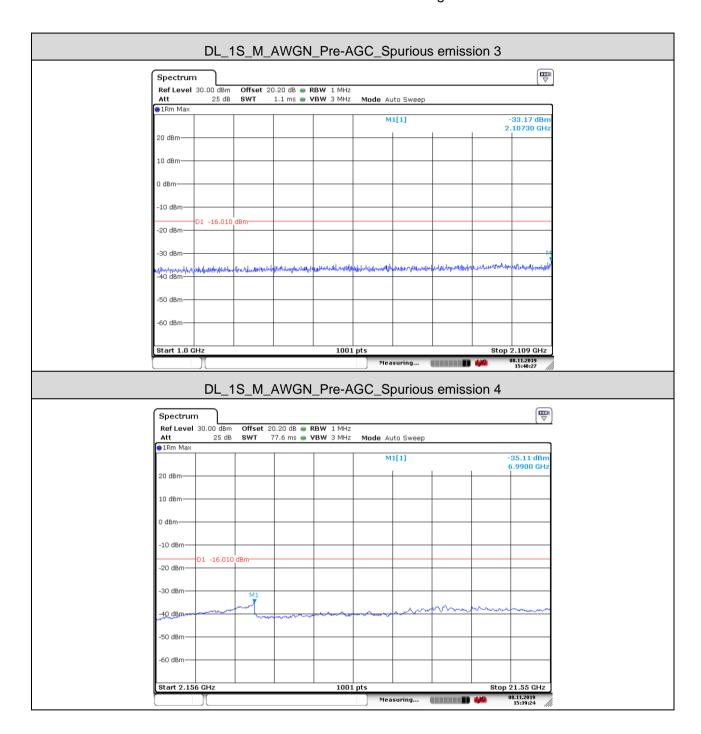
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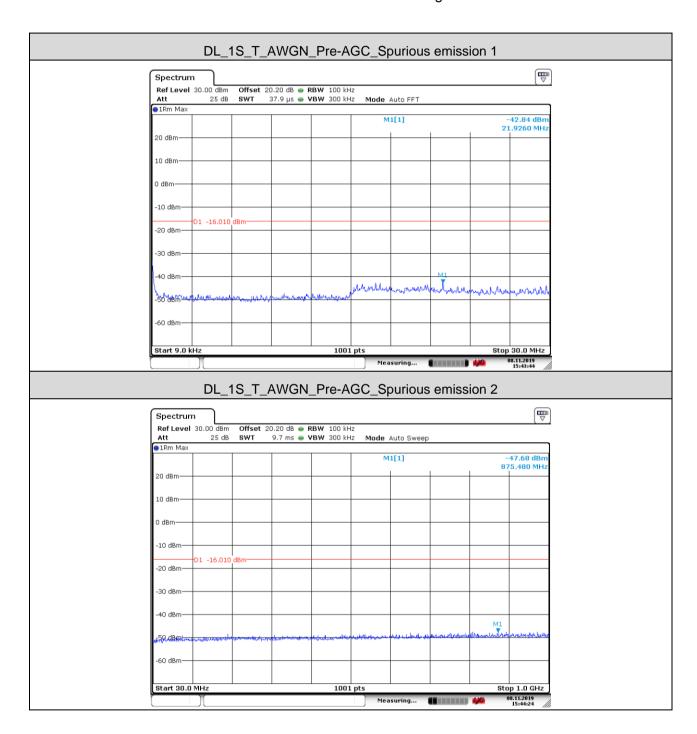
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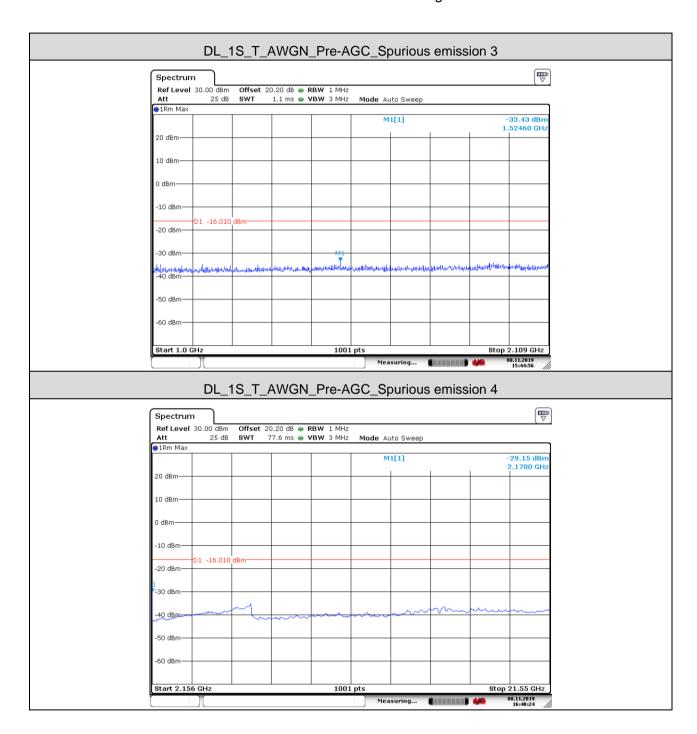
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1.6 Frequency Stability

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 $\pm 15\%$ 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.
- 4. Frequency stability has been tested using an AWGN test signal and a GSM-TDMA test signal, only the worst-case was recorded in this report.

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Frequency stability vs temperature				
Temperature (°C)	Test Conf.	Test data (MHz)	Tolerance (ppm)	Verdict
50		2132.523564	-0.03	PASS
40		2132.523529	-0.04	PASS
30		2132.523567	-0.03	PASS
20		2132.523622	Reference	PASS
10	DL_1S_M_AWGN	2132.523538	-0.04	PASS
0		2132.523435	-0.09	PASS
-10		2132.523647	0.01	PASS
-20		2132.523745	0.06	PASS
-30		2132.523572	-0.02	PASS

Frequency stability vs voltage				
Voltage (V)	Test Conf.	Test data (MHz)	Tolerance (ppm)	Verdict
DC 40.8		2132.523567	0.05	PASS
DC 48	DL_1S_M_AWGN	2132.523456	Reference	PASS
DC 55.2		2132.523678	0.11	PASS



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1.7 Radiated spurious emissions

Note:

1. The tested max conducted power for single antenna port is 20.21dBm. the 2x2 MIMO total power is 20.21dBm+20.21dBm= 0.2100W.

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=0.2100W,

So the limit =

P(dBm)- [43 + 10 log (0.2100W)] = -13dBm

- 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.



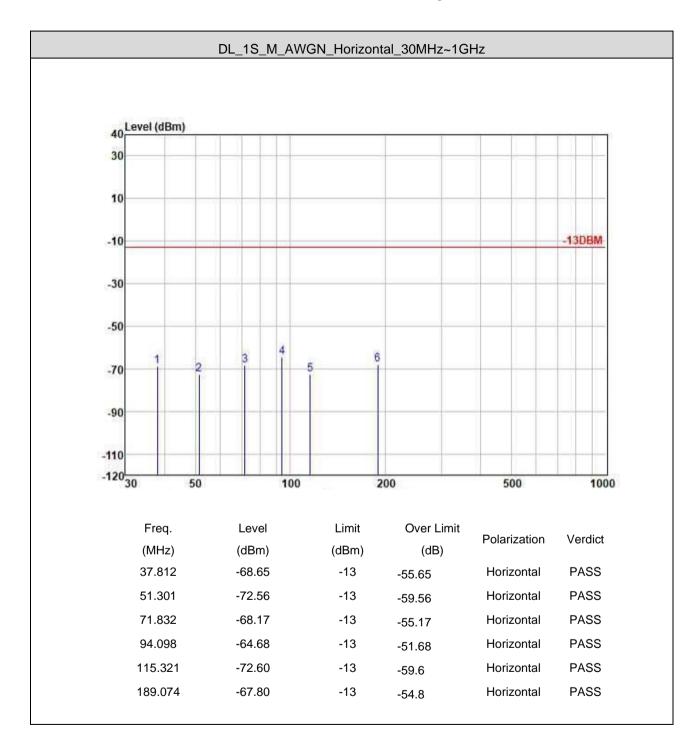
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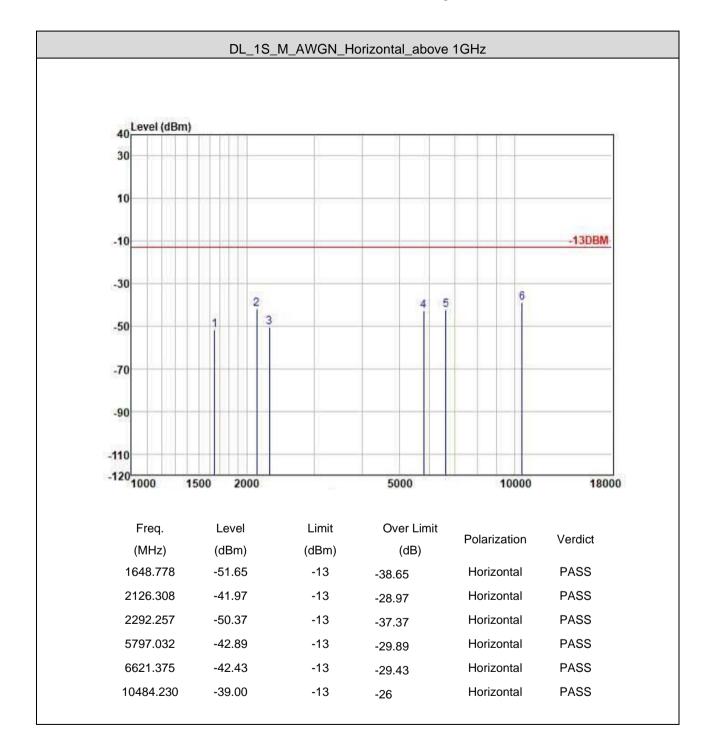
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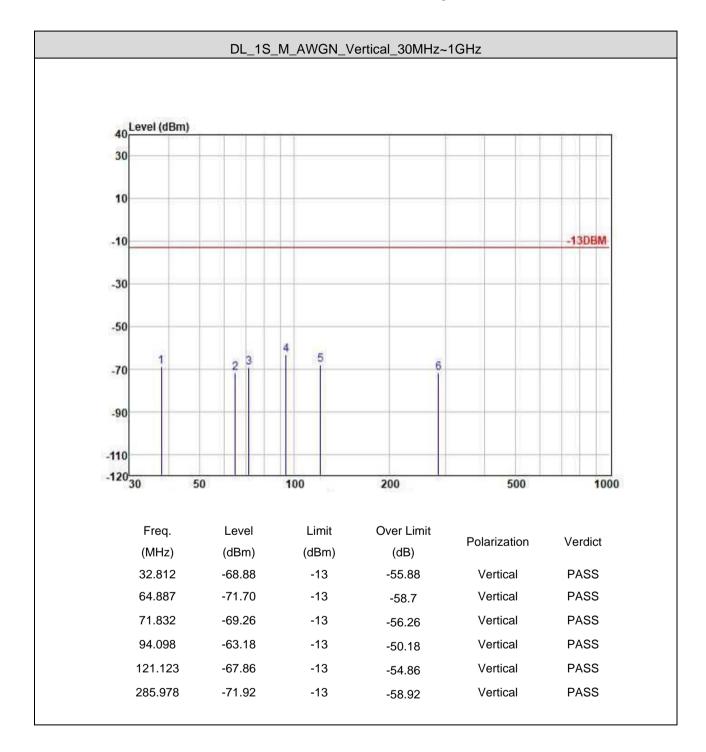
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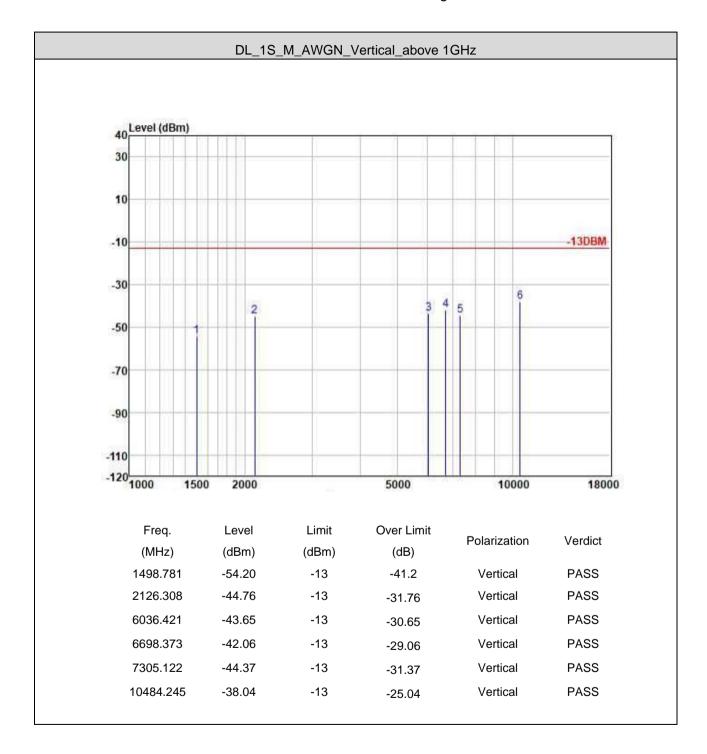


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2 AWS-3 (1755-1780MHz paired with 2155-2180MHz)

2.1 AGC threshold level

Test Conf.	AGC Threshold level	
DL_1S_M_AWGN	-0.11dBm	
DL_1S_M_GSM	-0.20dBm	



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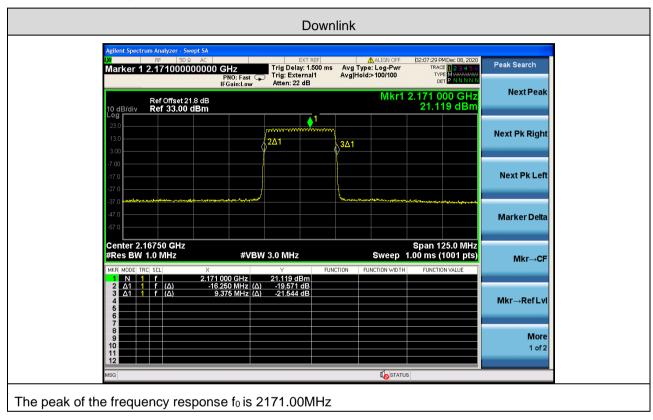
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2.2 Out-of-band rejection





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2.3 Input-versus-output signal comparison





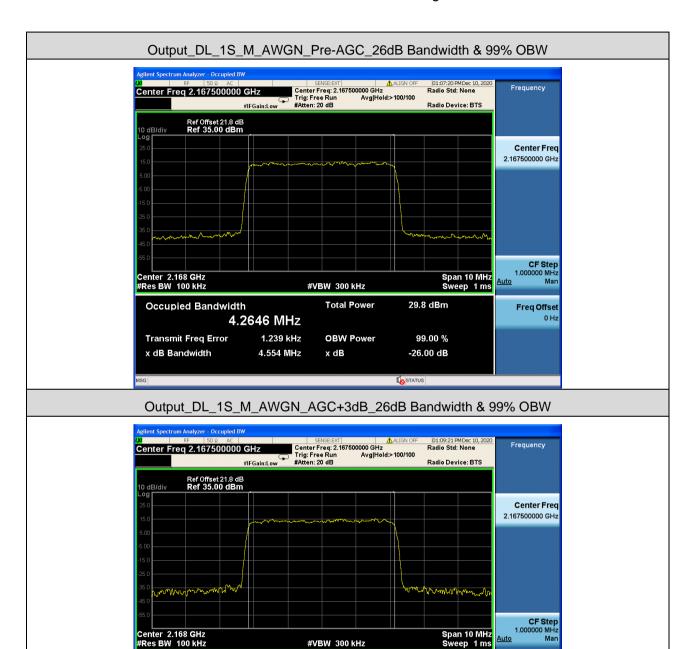
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Total Power

OBW Power

x dB



Occupied Bandwidth

Transmit Freq Error

x dB Bandwidth

4.2642 MHz

1.582 kHz

4.554 MHz

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29.7 dBm

99.00 %

-26.00 dB

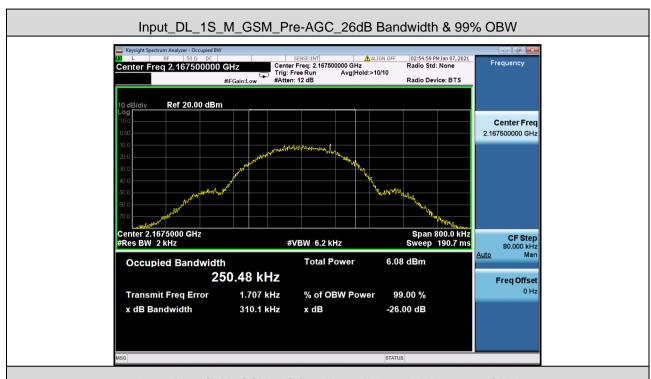
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Frea Offset

0 Hz



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Input_DL_1S_M_GSM_AGC+3dB_26dB Bandwidth & 99% OBW



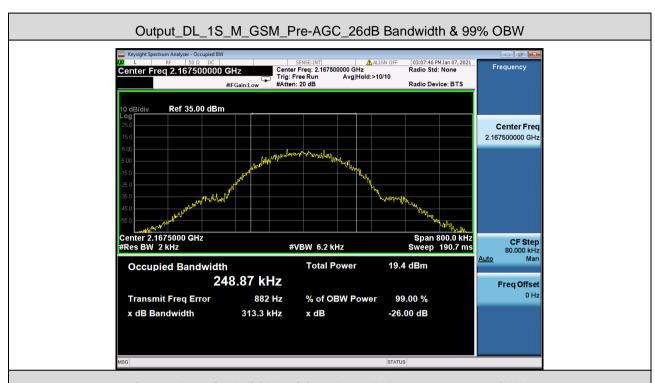


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Output_DL_1S_M_GSM_AGC+3dB_26dB Bandwidth & 99% OBW





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Remark:

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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2.4 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		Pre-AGC	-0.15	20.36	20.51	PASS
	2171.0	AGC+3dB	2.85	20.24	/	PASS
		Pre-AGC	-0.15	20.24	20.39	PASS
DL_1S_GSM	2171.0	AGC+3dB	2.85	20.15	/	PASS

Remark:

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

The total maximum EIRP for the EUT is (20.36dBm+20.36dBm) +15.5dBi=38.87dBm (7.709W) which don't exceed the required EIRP limit (1640W/MHz)



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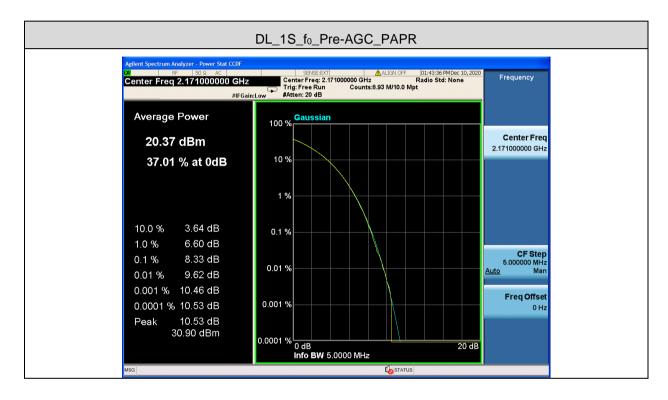
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Test Conf.	Test Freq. f ₀ (MHz)	Signal Level	PAPR (dB)	Limit (dB)	Verdict
DL_1S_AWGN	2171.0	Pre-AGC	8.3	13	PASS





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

Note:

1. The tested max conducted power for single antenna port is 20.36dBm, 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=20.36dBm= 0.1086W.

So the limit =

P(dBm)- [43 + 10 log (0.1050W)] = -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. Out-of-band/out-of-block (including intermodulation) emissions and spurious emissions have been tested using an AWGN test signal and a GSM-TDMA test signal, only the worst-case was recorded in this report.



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DL_1S_B_AWGN_AGC+3_Out-of-band emission





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DL 1S T AWGN Pre-AGC Out-of-band emission Avg Type: RMS Avg|Hold:>100/100 Frequency Start Freq 2.177500000 GHz Mkr1 2.180 000 0 GHz -38.510 dBm **Auto Tune** Ref Offset 21.8 dB Ref 30.80 dBm Center Fred 2.180250000 GHz Start Freq 2.177500000 GHz 2.183000000 GH: CF Step 550.000 kHz Mar <u>Auto</u> Freq Offset Stop 2.183000 GHz Sweep 1.00 ms (1001 pts) Start 2.177500 GHz #Res BW 100 kHz #VBW 300 kHz* DL_1S_T_AWGN_AGC+3_Out-of-band emission



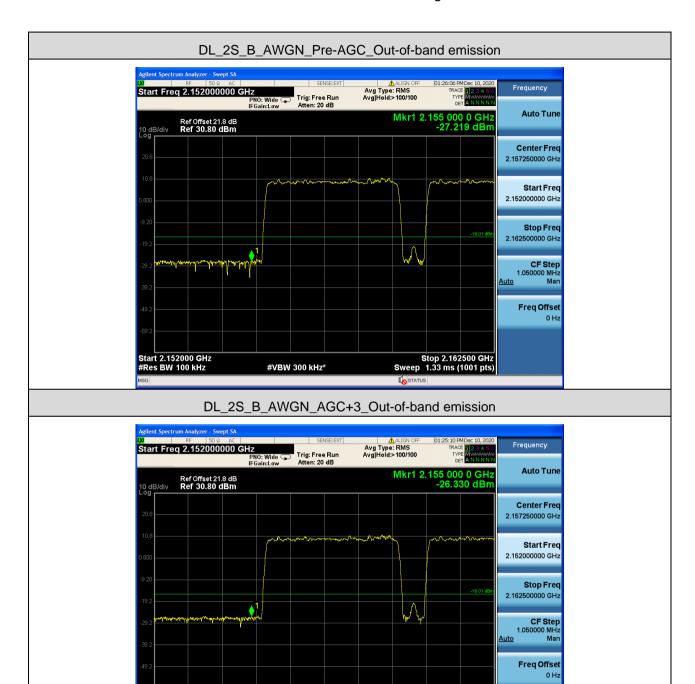


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Start 2.152000 GHz #Res BW 100 kHz

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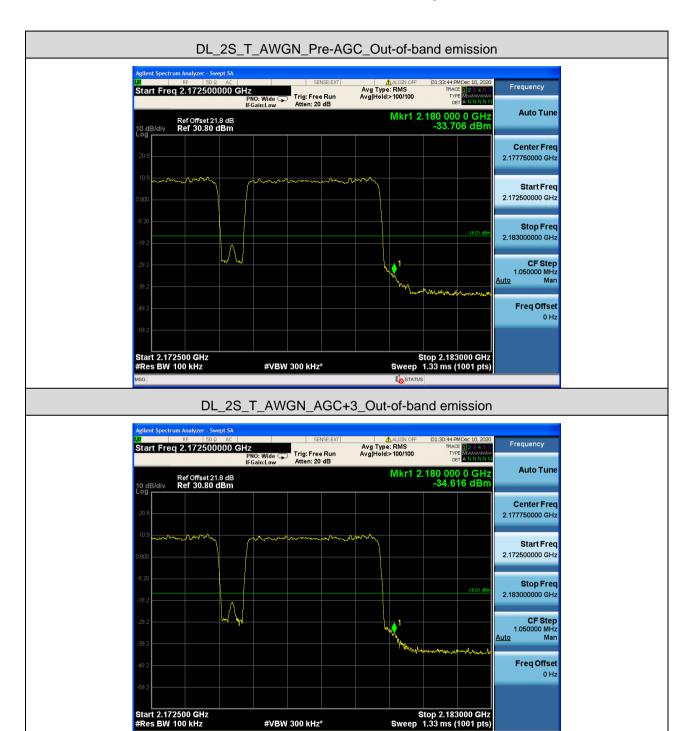
#VBW 300 kHz*

Stop 2.162500 GHz Sweep 1.33 ms (1001 pts)

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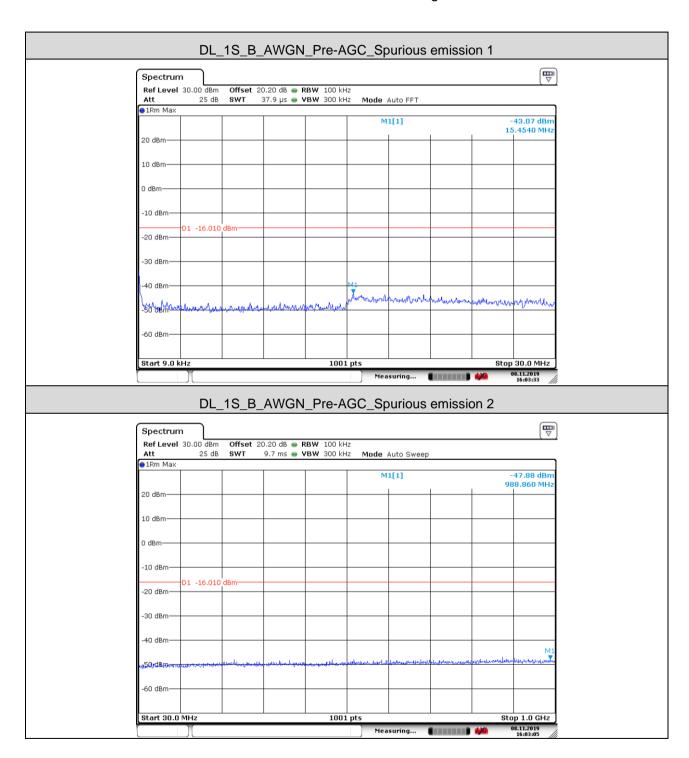


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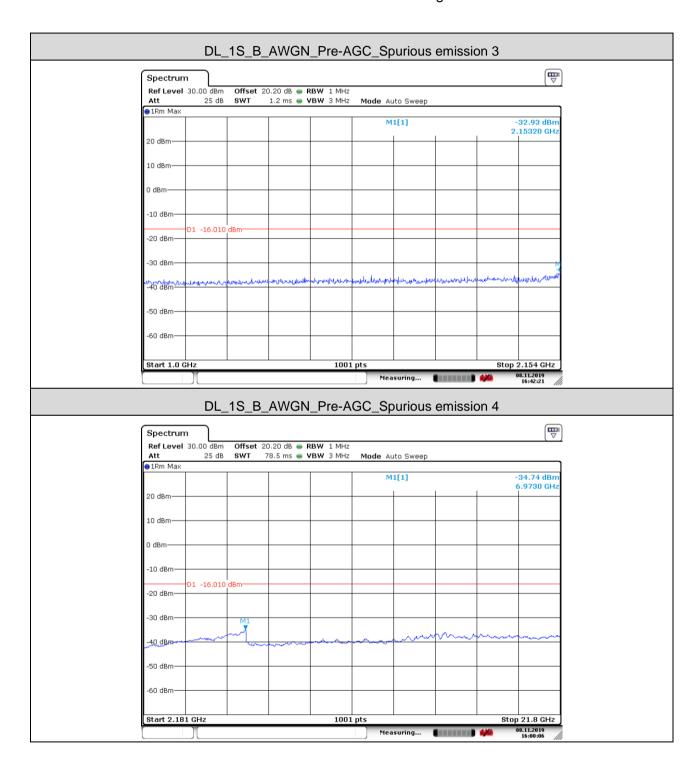


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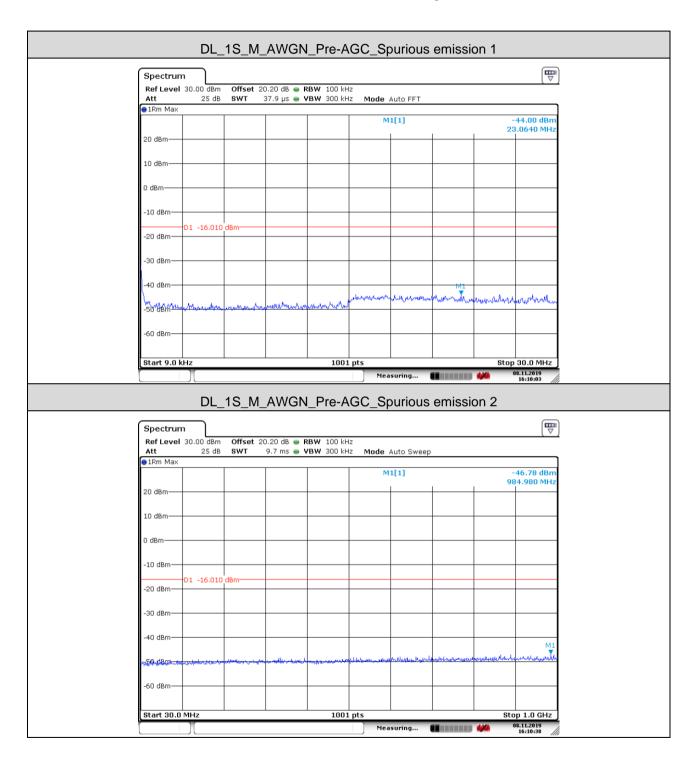
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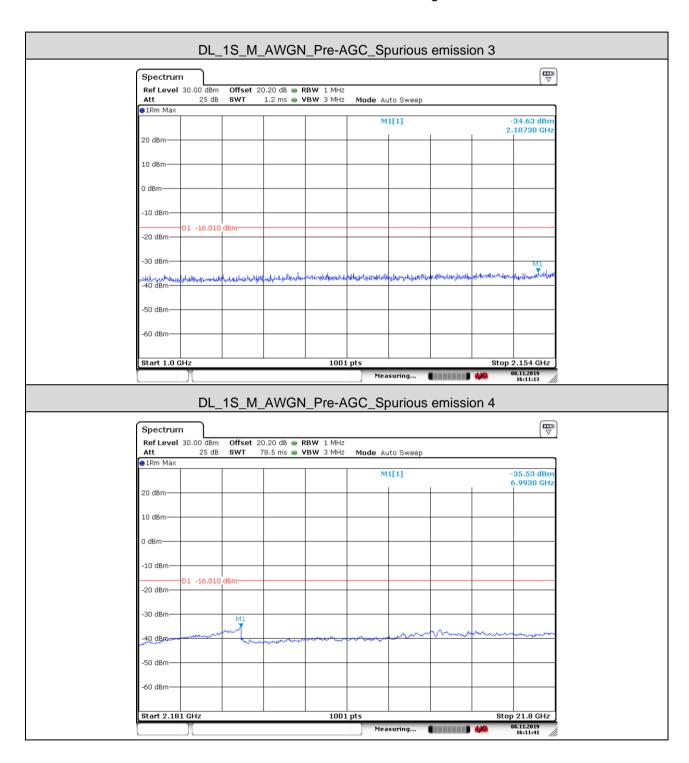


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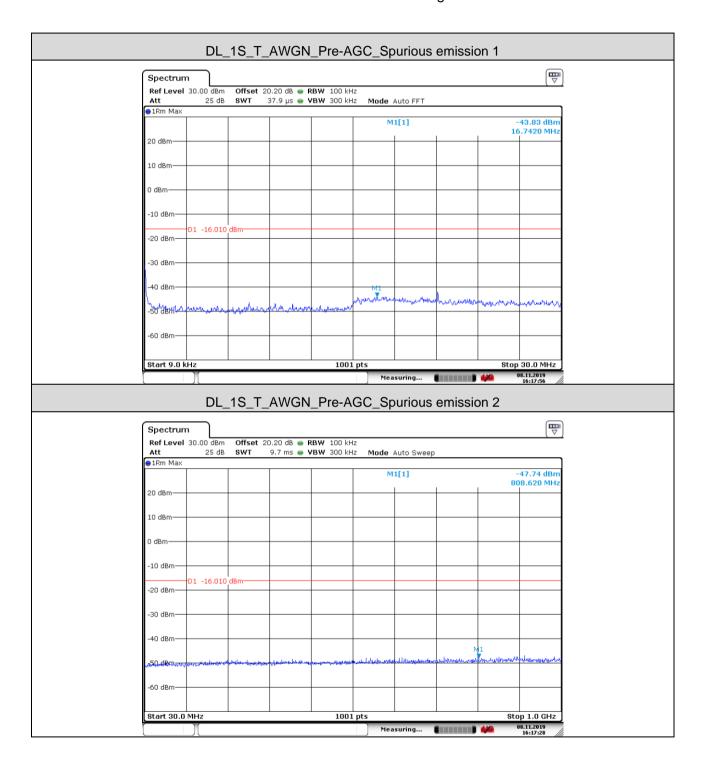
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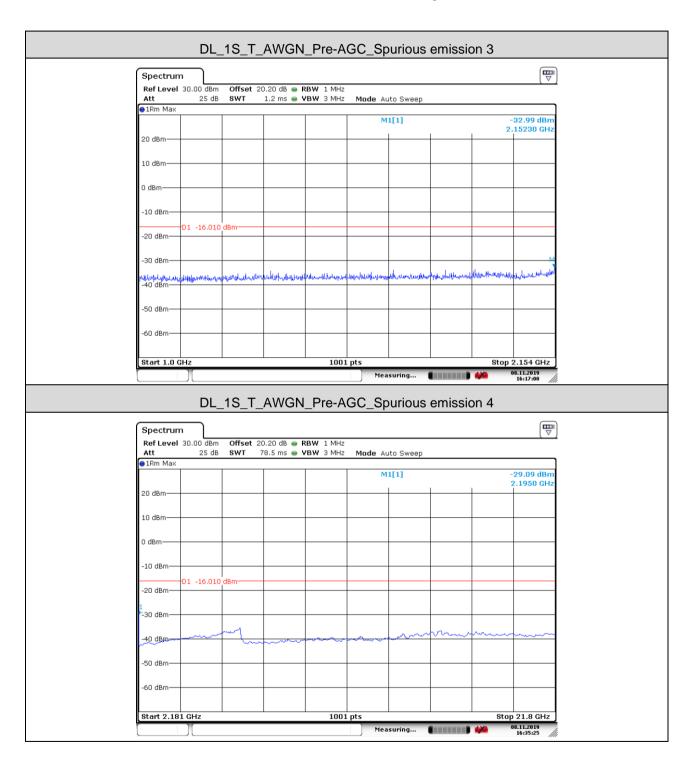
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2.6 Frequency Stability

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 $\pm15\%$ 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.
- 4. Frequency stability has been tested using an AWGN test signal and a GSM-TDMA test signal, only the worst-case was recorded in this report.

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Temperature (°C)	Test Conf.	Test data (MHz)	Tolerance (ppm)	Verdict
50		2167.500764	0.07	PASS
40		2167.500345	-0.13	PASS
30		2167.500543	-0.4	PASS
20		2167.500623	Reference	PASS
10	DL_1S_M_AWGN	2167.500564	-0.3	PASS
0		2167.500466	-0.7	PASS
-10		2167.500643	0.01	PASS
-20		2167.500577	-0.03	PASS
-30		2167.500345	-0.13	PASS

Frequency stability vs voltage							
Voltage (V)	Test Conf.	Test data (MHz)	Tolerance (ppm)	Verdict			
DC 40.8		2167.500463	-0.13	PASS			
DC 48	DL_1S_M_AWGN	2167.500753	Reference	PASS			
DC 55.2		2167.500864	0.05	PASS			



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2.7 Radiated spurious emissions

Note:

1. The tested max conducted power for single antenna port is 20.36dBm. the 2x2 MIMO total power is 20.36dBm+20.36dBm= 0.2173W.

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=0.2173W,

So the limit =

P(dBm)- [43 + 10 log (0.2173W)] = -13dBm

- 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.



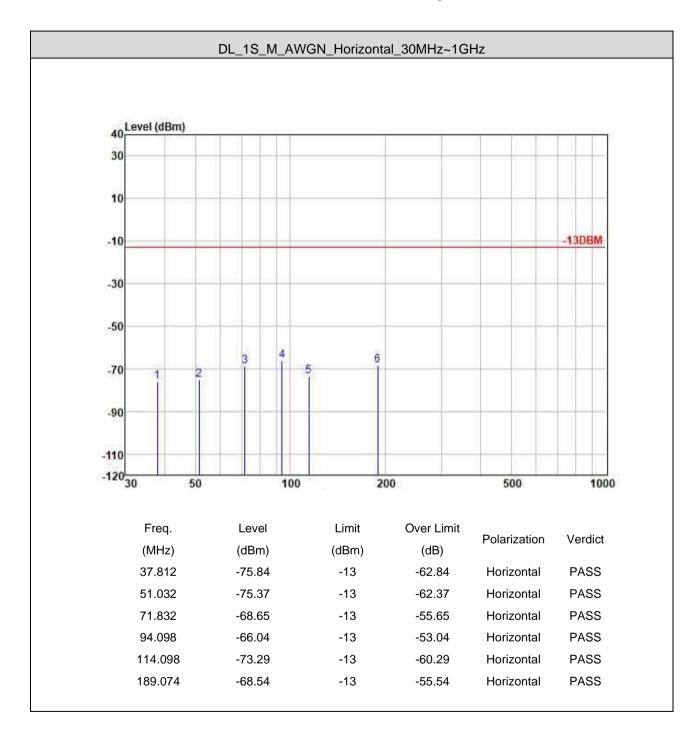
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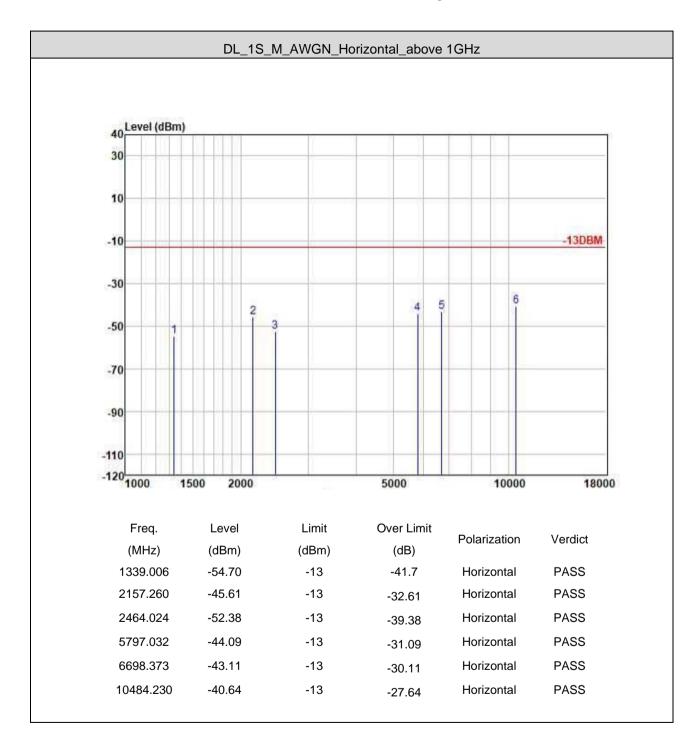
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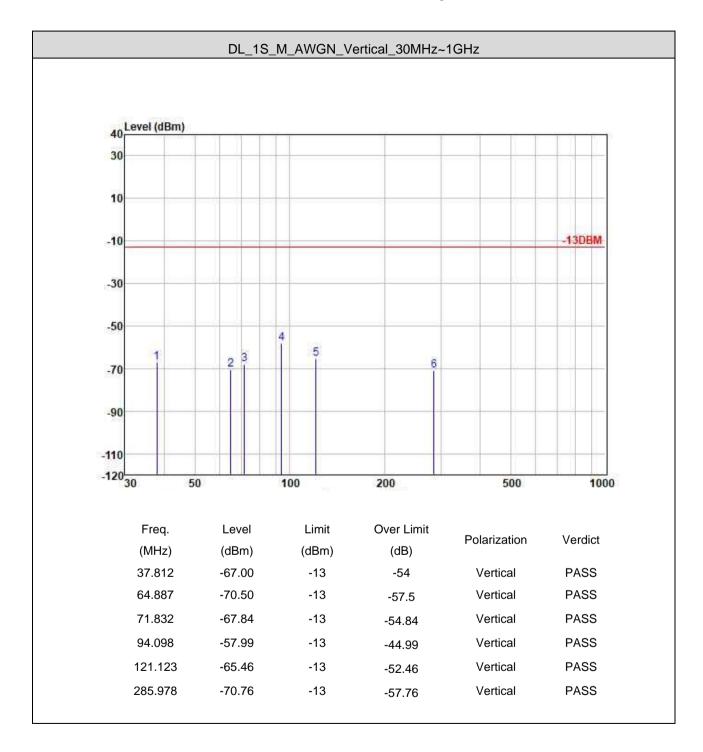
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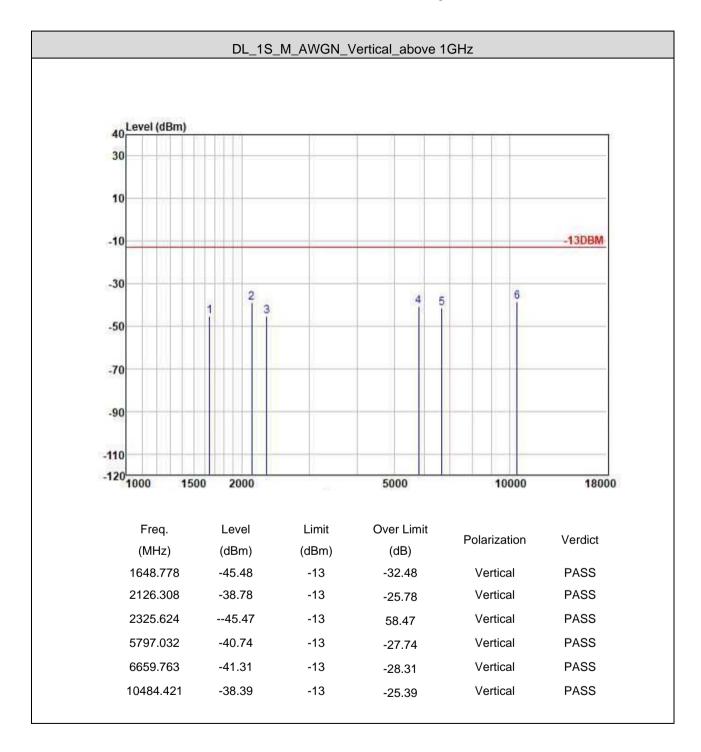
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3 Broadband PCS (1850-1915MHz paired with 1930-1995MHz)

3.1 AGC threshold level

Test Conf.	AGC Threshold level		
DL_1S_M_AWGN	0.15dBm		
DL_1S_M_GSM	0.04dBm		



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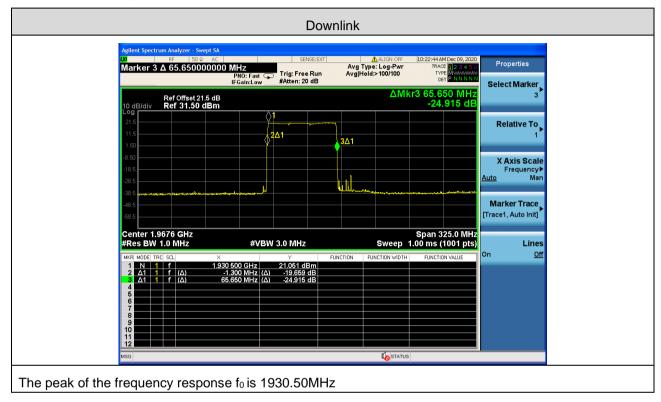
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3.2 Out-of-band rejection





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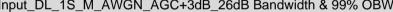
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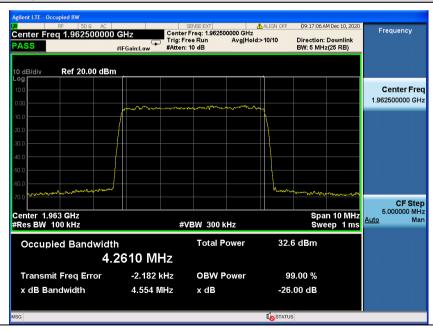


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3.3 Input-versus-output signal comparison









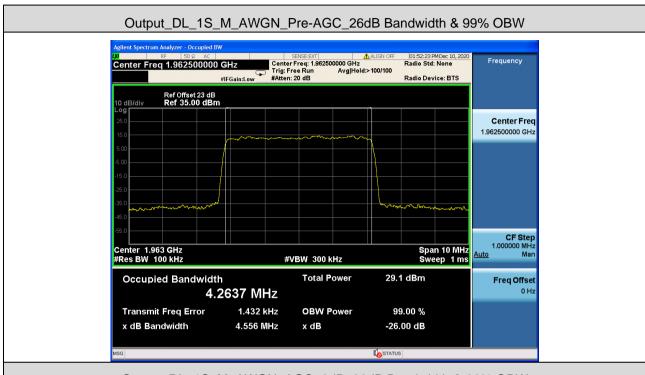
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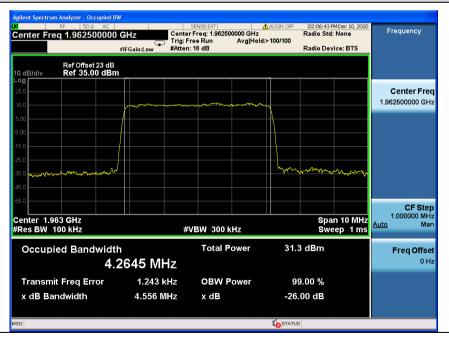
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Output_DL_1S_M_AWGN_AGC+3dB_26dB Bandwidth & 99% OBW





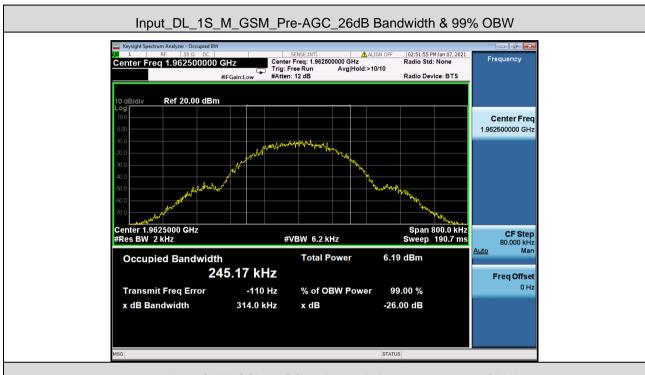
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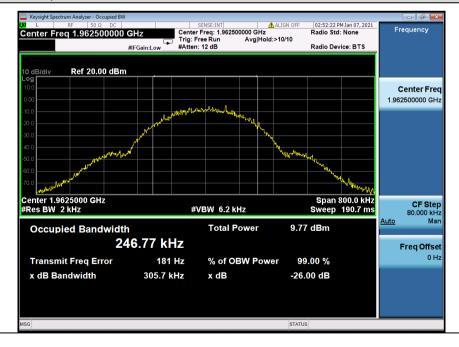
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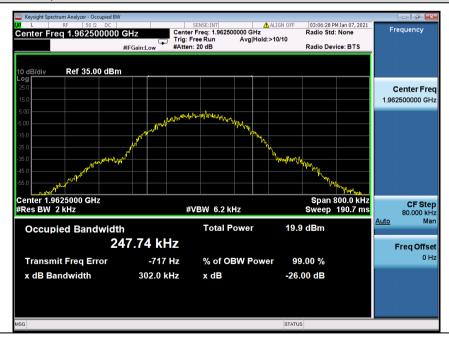
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Output DL 1S M GSM Pre-AGC 26dB Bandwidth & 99% OBW SENSE:INT ALIGN OFF Center Freq: 1.962500000 GHz Trig: Free Run Avg|Hold:>10/10 #Atten: 20 dB Center Freq 1.962500000 GHz Radio Device: BTS Ref 35.00 dBm 1 962500000 GH Center 1.9625000 GHz #Res BW 2 kHz Span 800.0 kHz Sweep 190.7 ms **#VBW** 6.2 kHz **Total Power** 20.2 dBm Occupied Bandwidth 245.92 kHz Freq Offset Transmit Freq Error -594 Hz % of OBW Power 99.00 % x dB Bandwidth 315.8 kHz -26.00 dB

Output_DL_1S_M_GSM_AGC+3dB_26dB Bandwidth & 99% OBW





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Remark:

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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3.4 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	1930.50	Pre-AGC	0.00	20.32	20.35	PASS
		AGC+3dB	3.00	20.35	/	PASS
DL_1S_GSM		Pre-AGC	0.00	20.18	20.21	PASS
	1930.50	AGC+3dB	3.00	20.20	/	PASS

Remark:

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

The total maximum EIRP for the EUT is (20.35dBm+20.35dBm) +15.5dBi=38.86dBm (7.691W) which don't exceed the required EIRP limit (1640W/MHz)



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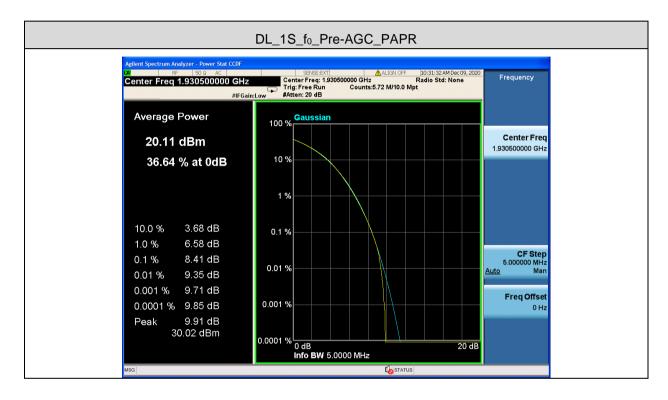
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Test Conf.	Test Freq. f ₀ (MHz)	Signal Level	PAPR (dB)	Limit (dB)	Verdict
DL_1S_AWGN	1930.5	Pre-AGC	8.4	13	PASS





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

Note:

1. The tested max conducted power for single antenna port is 20.35dBm, 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=20.35dBm= 0.1084W.

So the limit =

P(dBm)- [43 + 10 log (0.1084W)] = -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. Out-of-band/out-of-block (including intermodulation) emissions and spurious emissions have been tested using an AWGN test signal and a GSM-TDMA test signal, only the worst-case was recorded in this report.



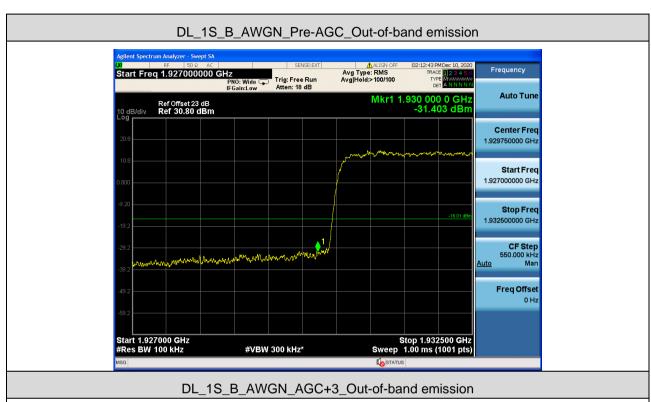
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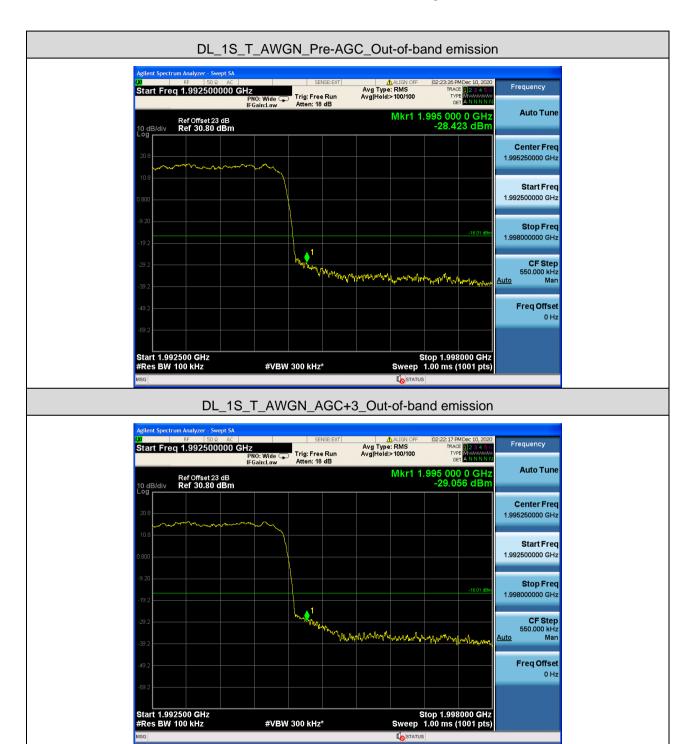


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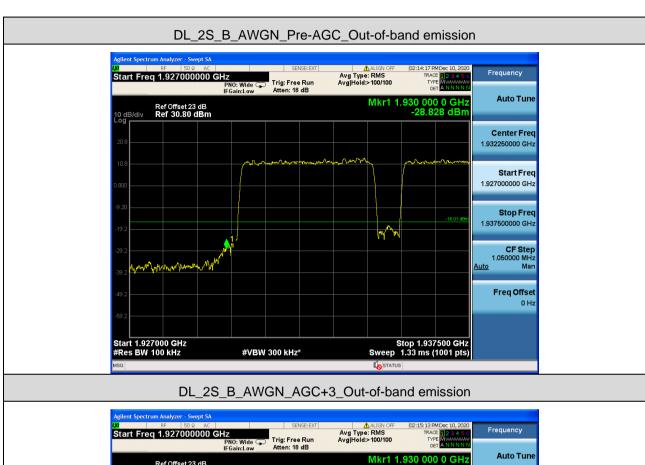


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DL 2S T AWGN Pre-AGC Out-of-band emission Avg Type: RMS Avg|Hold:>100/100 Frequency Start Freq 1.987500000 GHz Mkr1 1.995 000 0 GHz -27.360 dBm **Auto Tune** Ref Offset 23 dB Ref 30.80 dBm Center Fred 1.992750000 GHz Start Freq 1.987500000 GHz 1.998000000 GH: CF Step 1.050000 MHz Mar Freq Offset Stop 1.998000 GHz Sweep 1.33 ms (1001 pts) Start 1.987500 GHz #Res BW 100 kHz #VBW 300 kHz* DL_2S_T_AWGN_AGC+3_Out-of-band emission Avg Type: RMS Avg|Hold:>100/100 Start Freq 1.987500000 GHz Trig: Free Run Select Trace 95 000 0 GH: -27.196 dBn Ref Offset 23 dB Ref 30.80 dBm Clear Write Trace Average Max Hold Min Hold View/Blank Trace On



Start 1.987500 GHz #Res BW 100 kHz

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#VBW 300 kHz*

Stop 1.998000 GHz Sweep 1.33 ms (1001 pts)

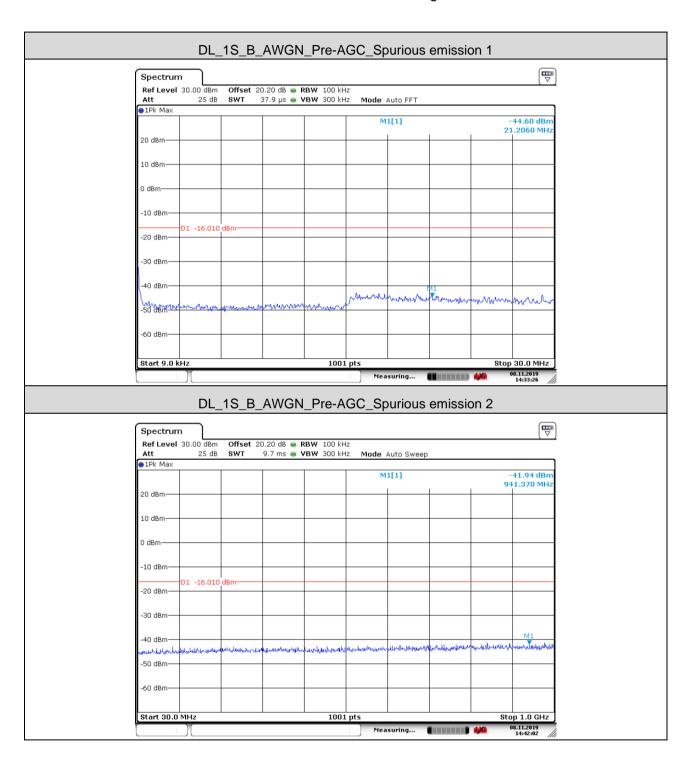
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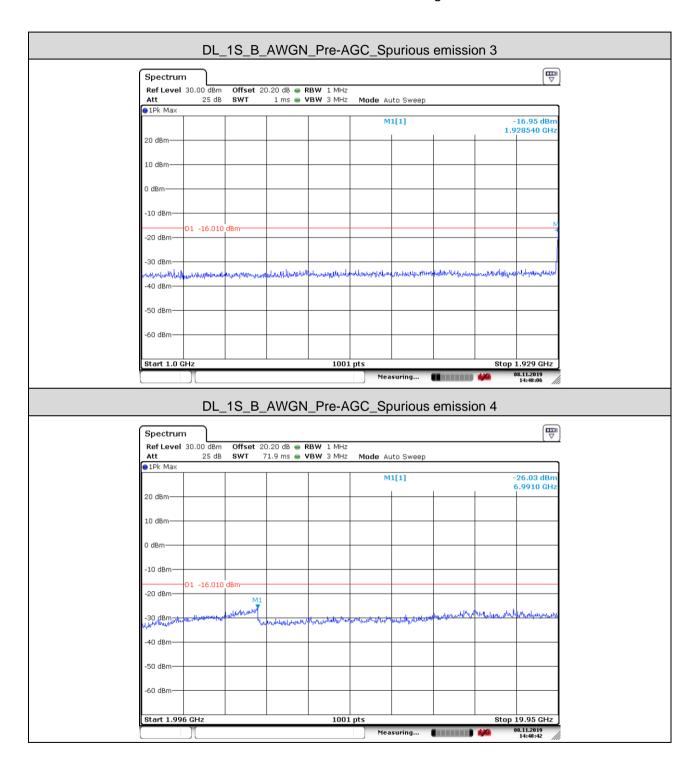


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