

Appendix -

Test Data and Result for report

GZCR231100125602

(A)

(For copied data from original report GZCR210300001502)

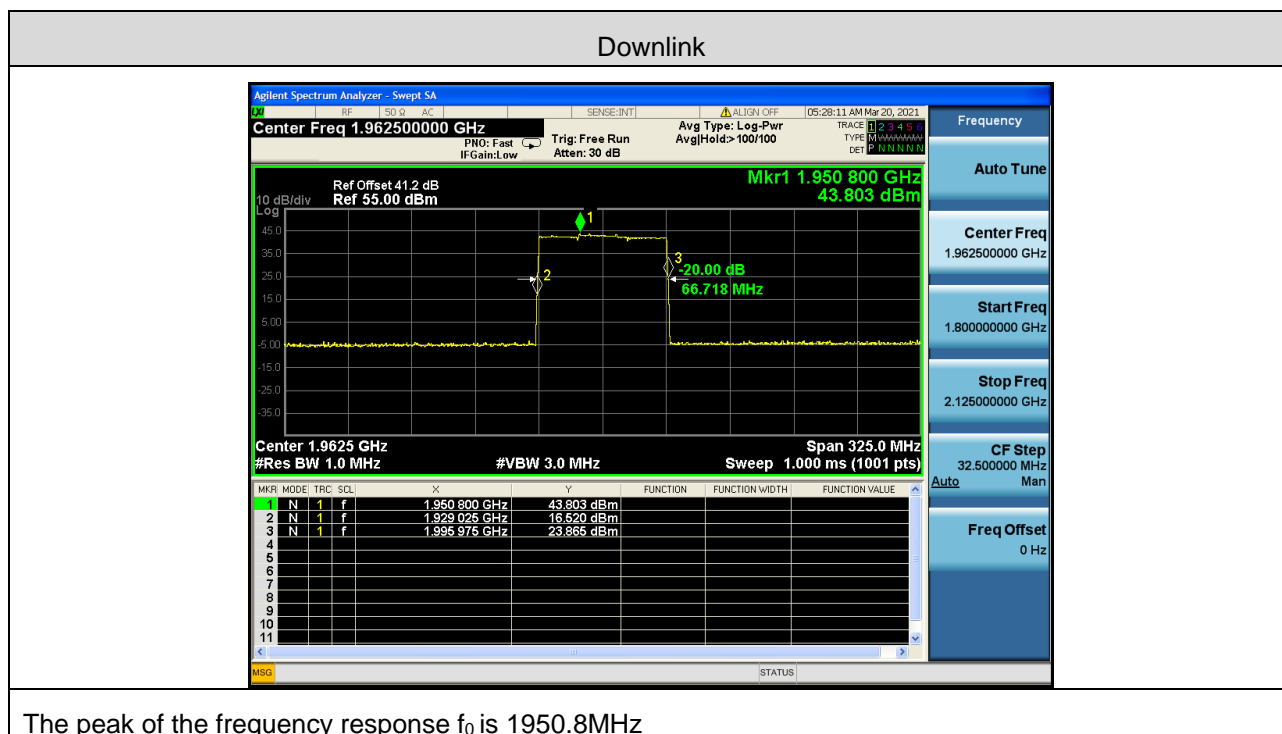


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1 Broadband PCS (only for downlink: 1930-1995MHz)

1.1 Out-of-band rejection



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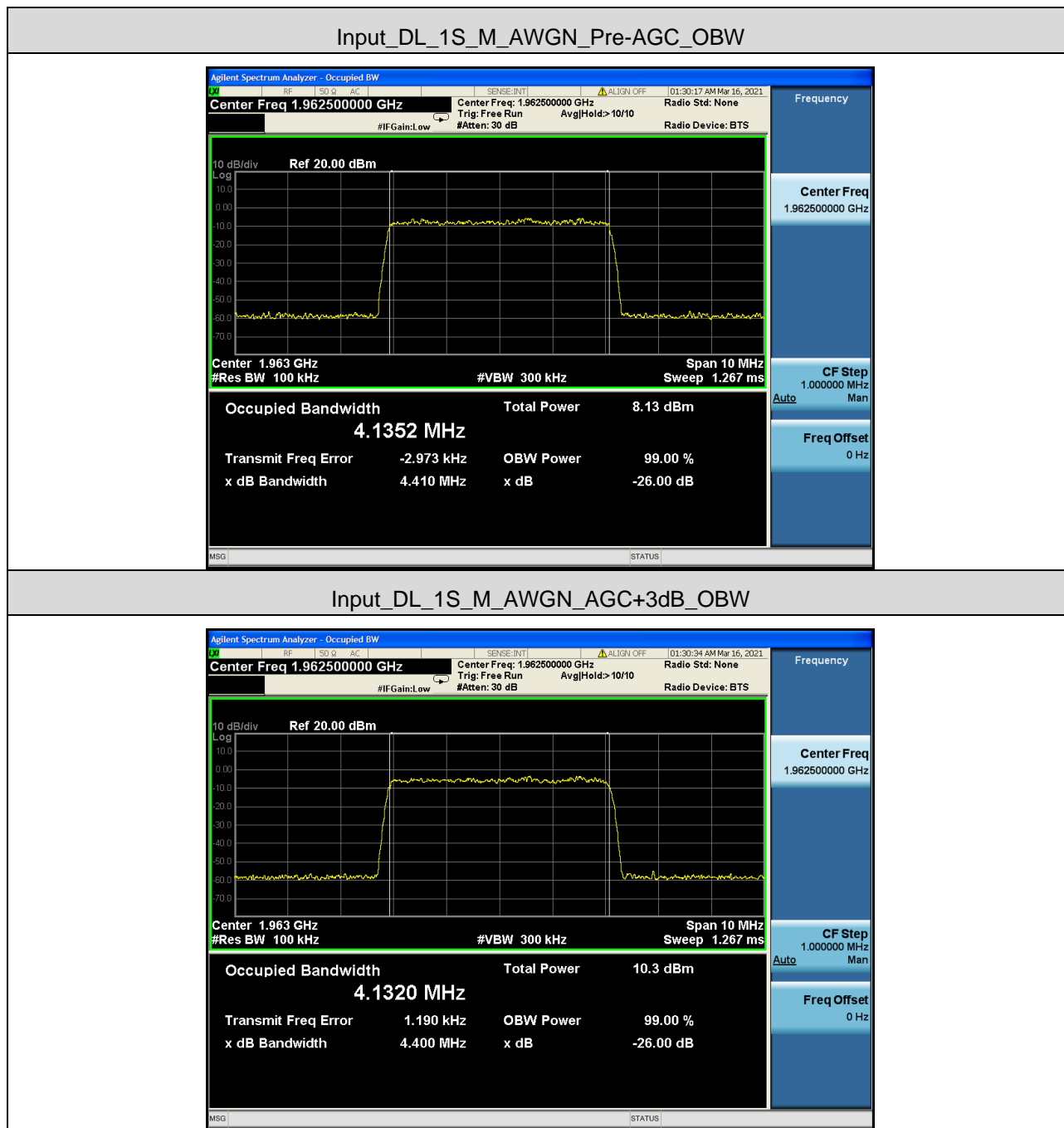
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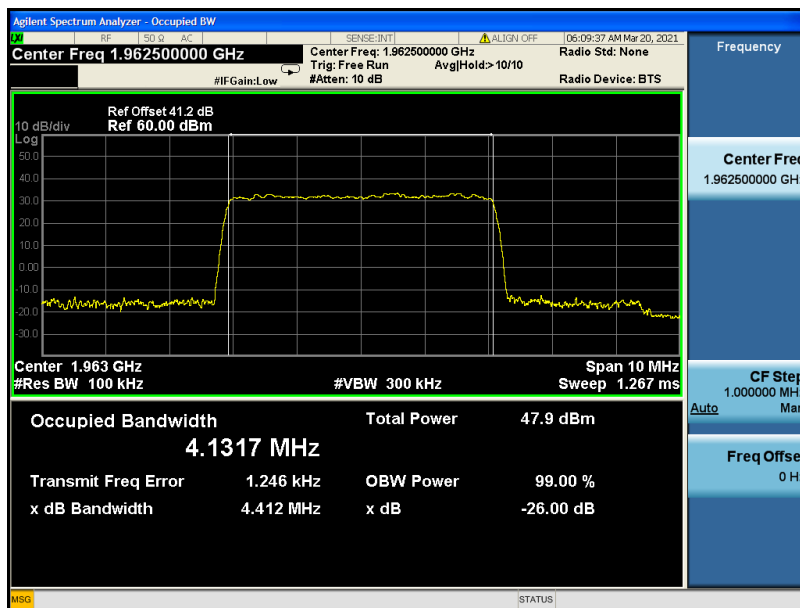
1.2 Input-versus-output signal comparison



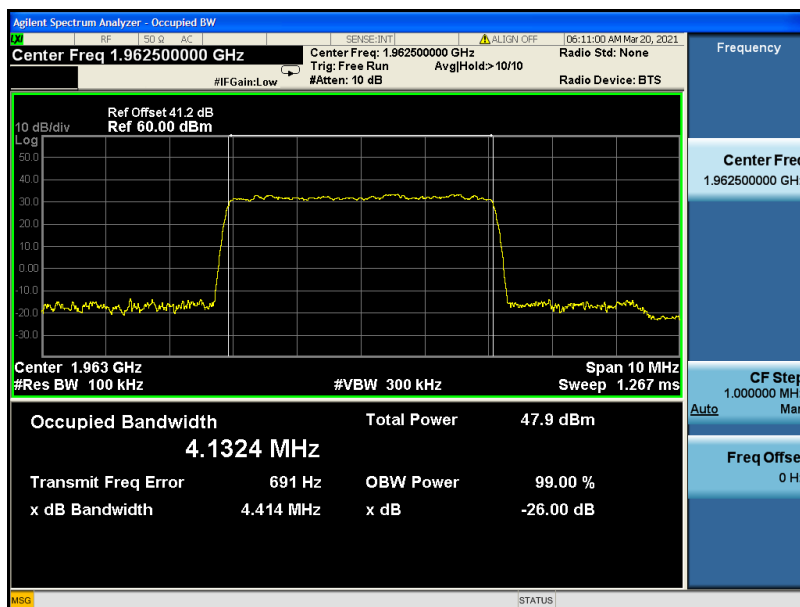
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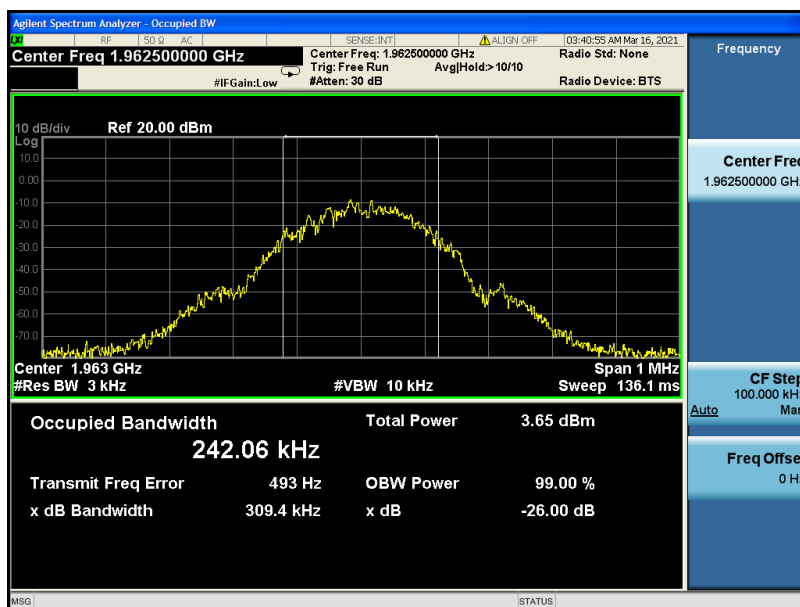
Output_DL_1S_M_AWGN_Pre-AGC_OBW



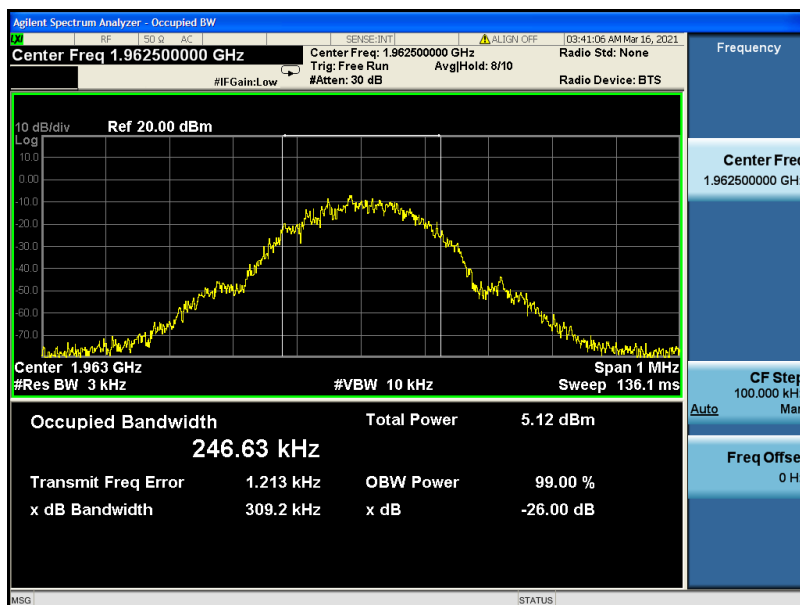
Output_DL_1S_M_AWGN_AGC+3dB_OBW



Input_DL_1S_M_GSM_Pre-AGC_OBW



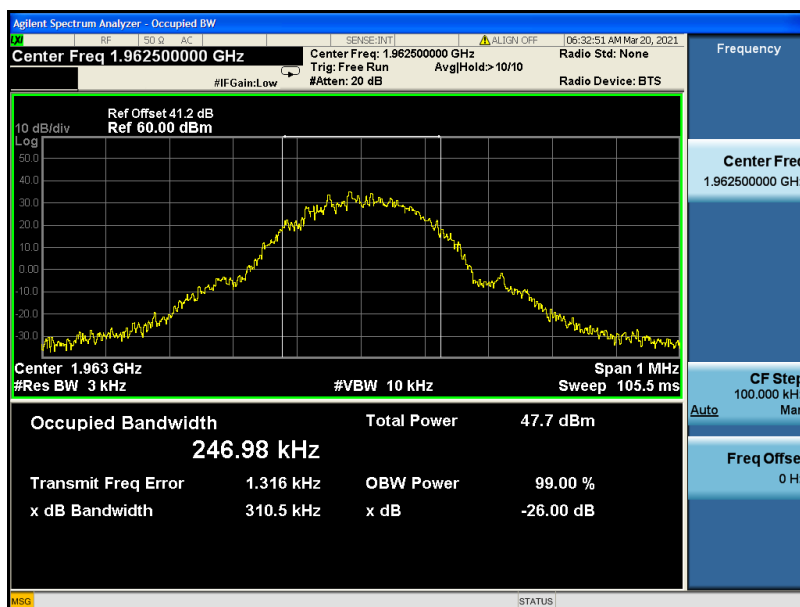
Input_DL_1S_M_GSM_AGC+3dB_OBW



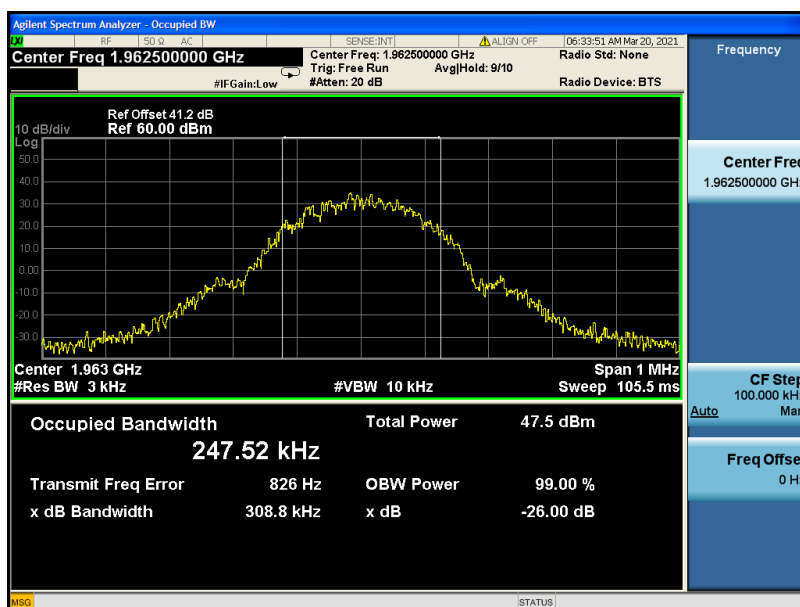
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Output_DL_1S_M_GSM_Pre-AGC_OBW



Output_DL_1S_M_GSM_AGC+3dB_OBW



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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1.3 Mean output power and amplifier/booster gain

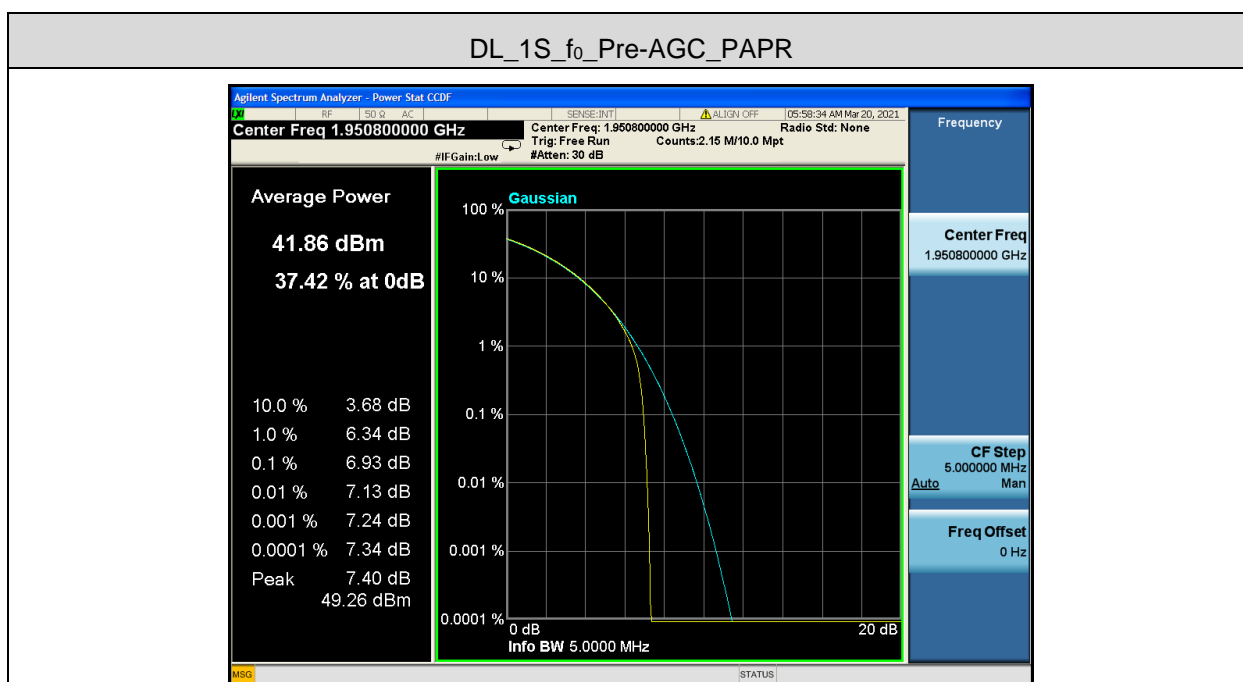
Test Conf.	Test Freq. f ₀ (MHz)	Signal Level	Input Power (dBm)	Output Power (dBm)	Gain (dB)	Verdict
DL_1S_AWGN	1950.8	Pre-AGC	-0.25	42.95	43.20	PASS
		AGC+3dB	2.75	42.79	/	PASS
DL_1S_GSM	1950.8	Pre-AGC	-0.28	43.03	43.31	PASS
		AGC+3dB	2.72	43.26	/	PASS

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 (43.26dBm+43.26dBm) +15.5dBd=61.77dBm (1503.1W) which don't exceed the required EIRP limit (1640W/MHz).

Test Conf.	Test Freq. f ₀ (MHz)	Signal Level	PAPR (dB)	Limit (dB)	Verdict
DL_1S_AWGN	1950.8	Pre-AGC	7.13	13	PASS



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

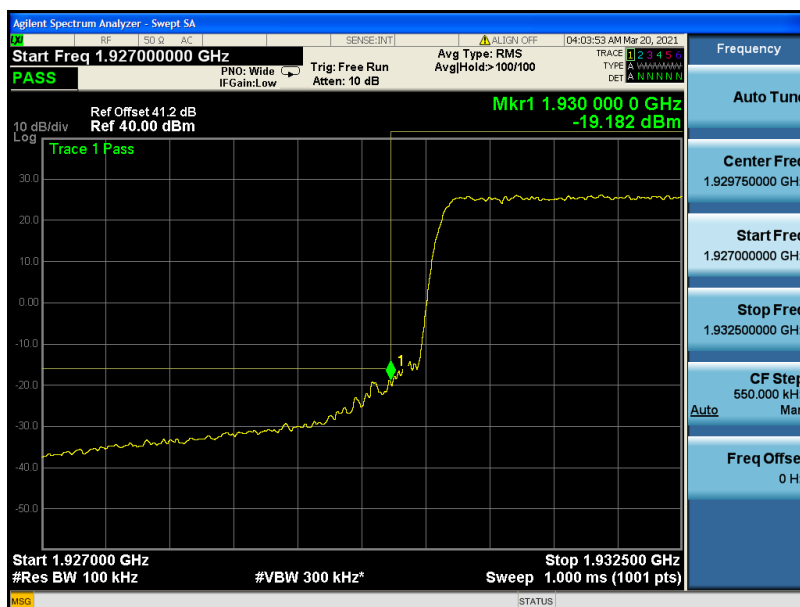
Note: The tested max conducted power for single antenna port is 43.26dBm, the power of any emission must be reduced below the mean output power (P) by at least $43 + 10\log(P)$ dB
Here, $P=43.26\text{dBm}=21.18\text{W}$.

So the limit = $P(\text{dBm}) - [43 + 10\log(21.18\text{W})] = -13\text{dBm}$

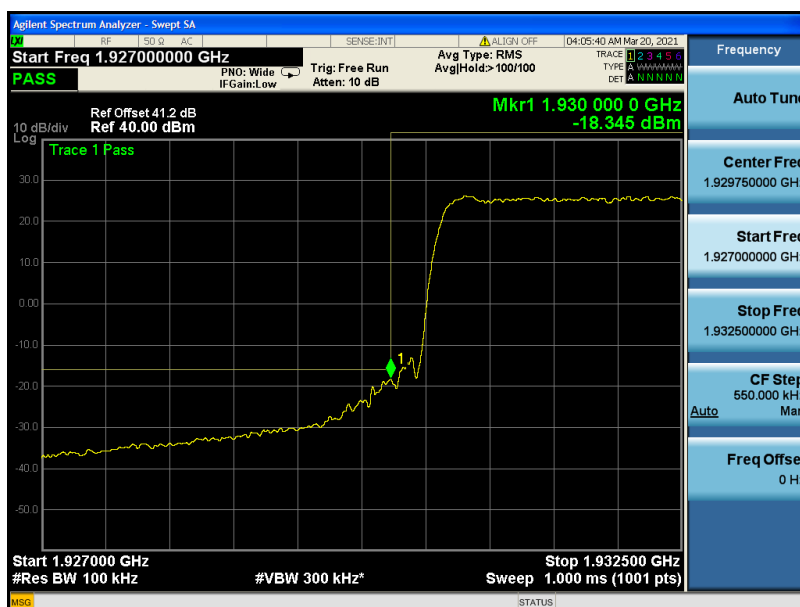
The EUT supports 2x2 MIMO and the emissions were measured at one of output port, so the limit line was set to -16.01dBm in following test plots in order to determine the test result conveniently.

The spurious emissions from 9kHz to 30MHz was very low and 20dB below the limit, therefore, the data was not recorded in the report.

DL_1S_B_AWGN_Pre-AGC_Out-of-band emission



DL_1S_B_AWGN_AGC+3_Out-of-band emission



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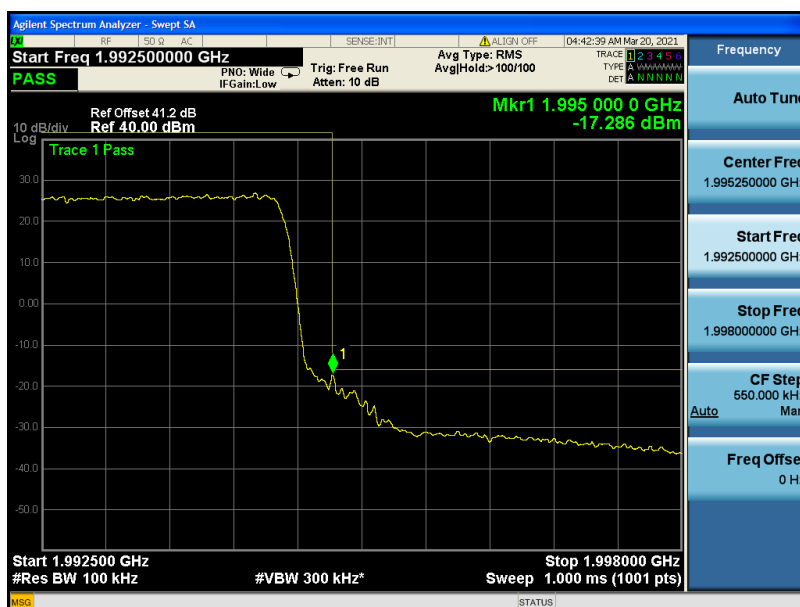
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DL_1S_T_AWGN_Pre-AGC_Out-of-band emission



DL_1S_T_AWGN_AGC+3_Out-of-band emission



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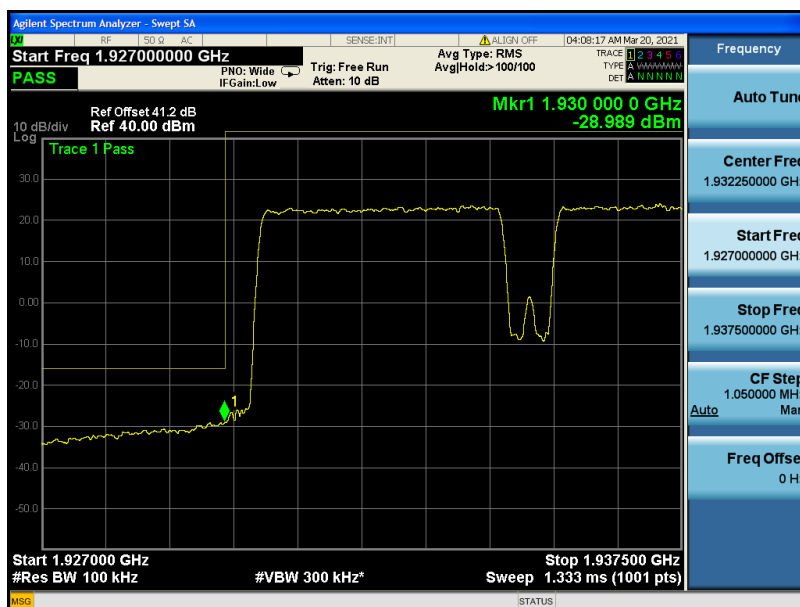
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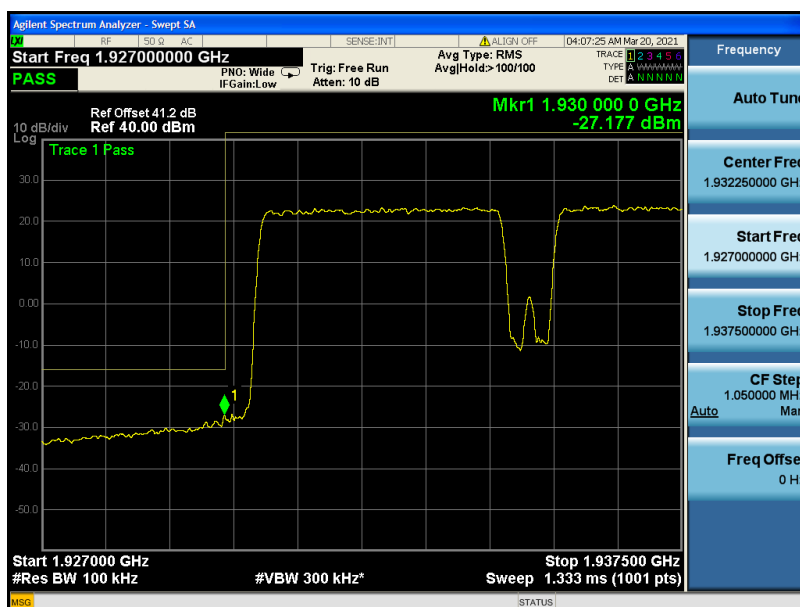
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DL_2S_B_AWGN_Pre-AGC_Out-of-band emission



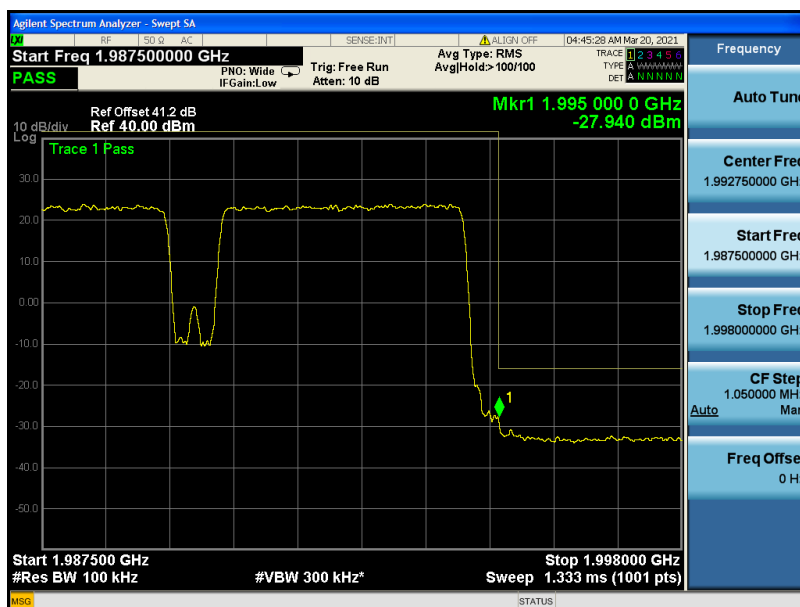
DL_2S_B_AWGN_AGC+3_Out-of-band emission



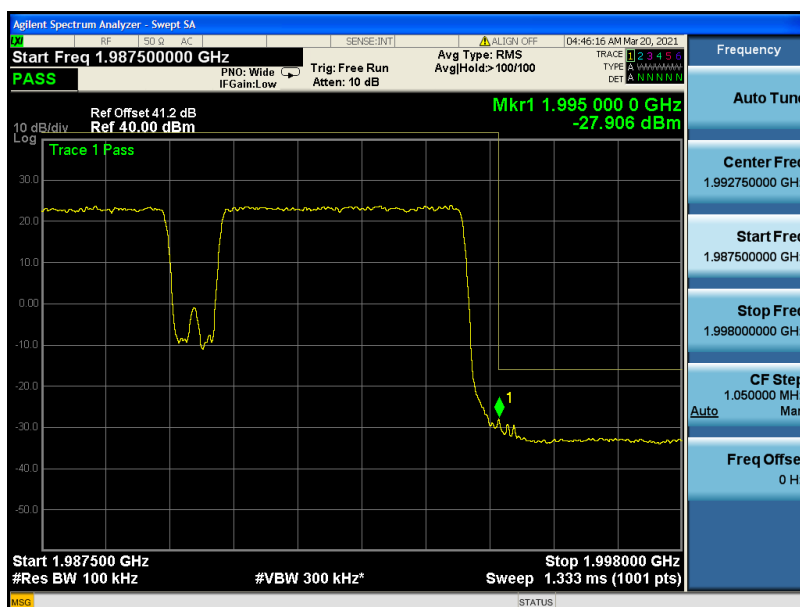
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DL_2S_T_AWGN_Pre-AGC_Out-of-band emission



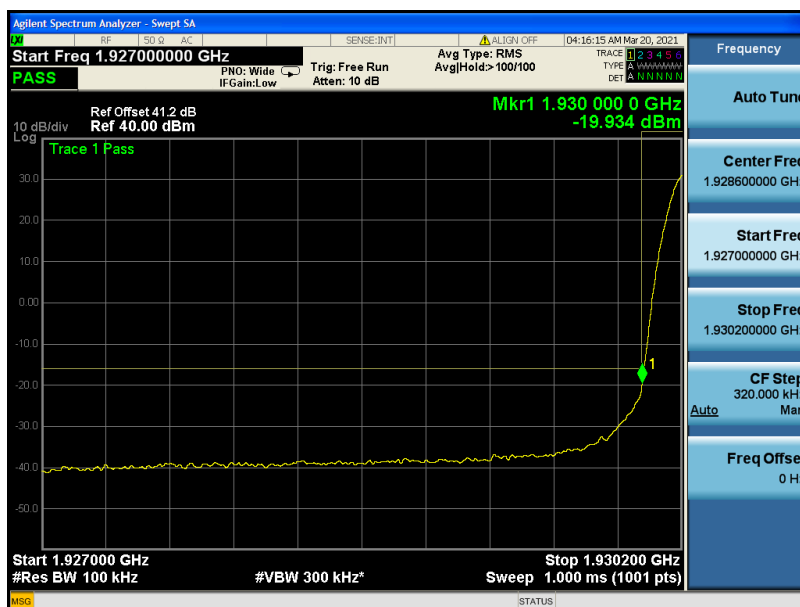
DL_2S_T_AWGN_AGC+3_Out-of-band emission



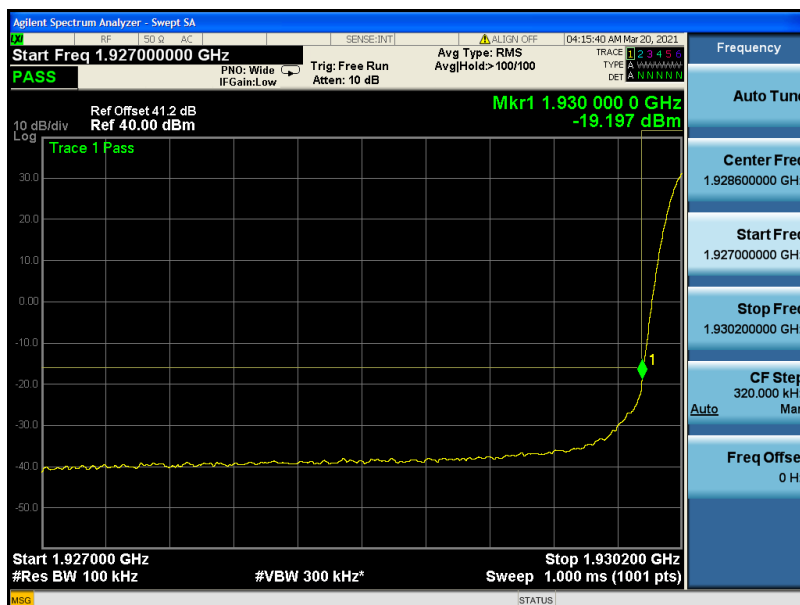
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DL_1S_B_GSM_Pre-AGC_Out-of-band emission



DL_1S_B_GSM_AGC+3_Out-of-band emission



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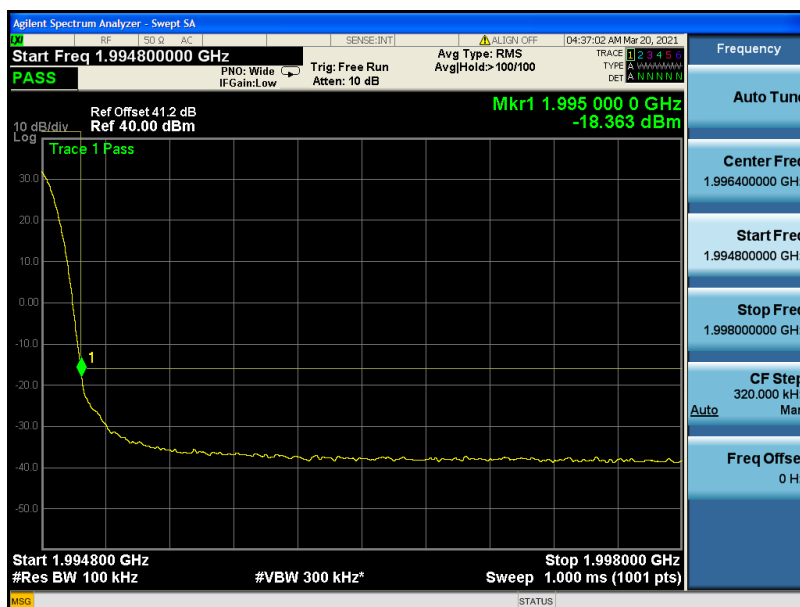
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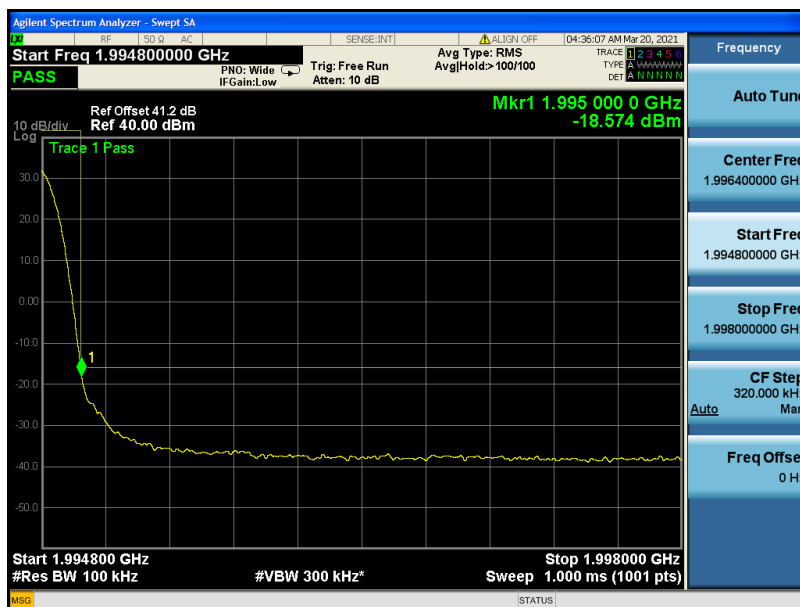
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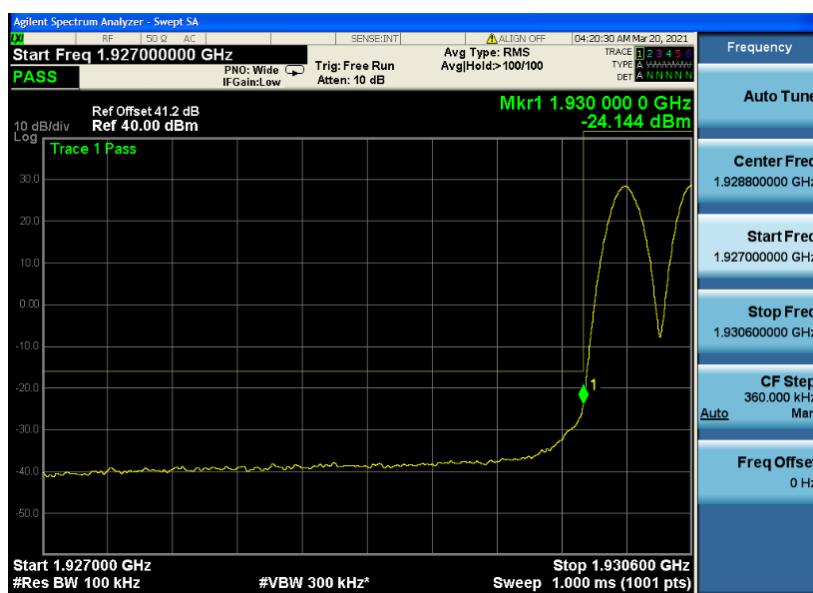
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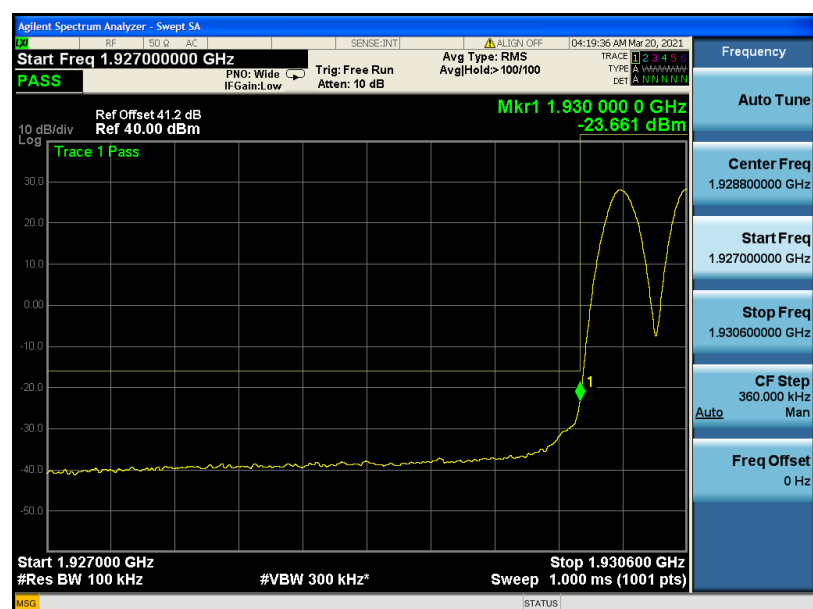
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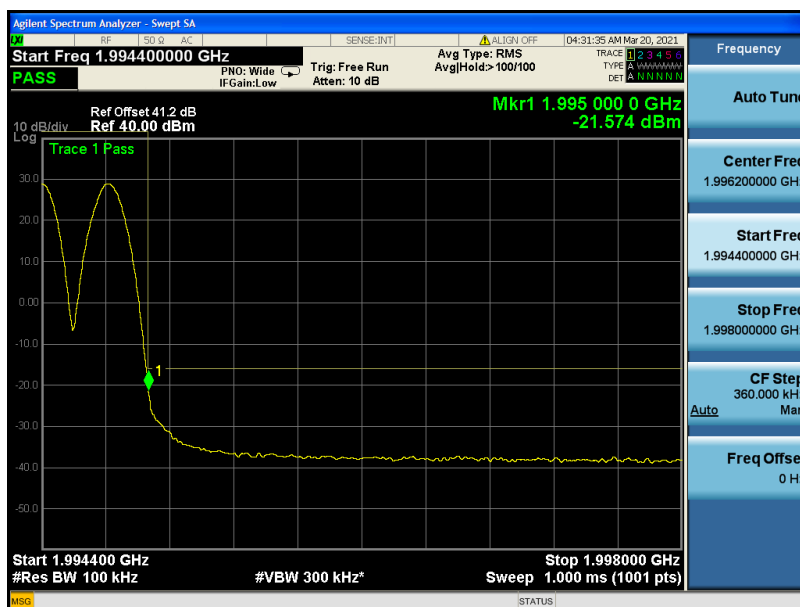
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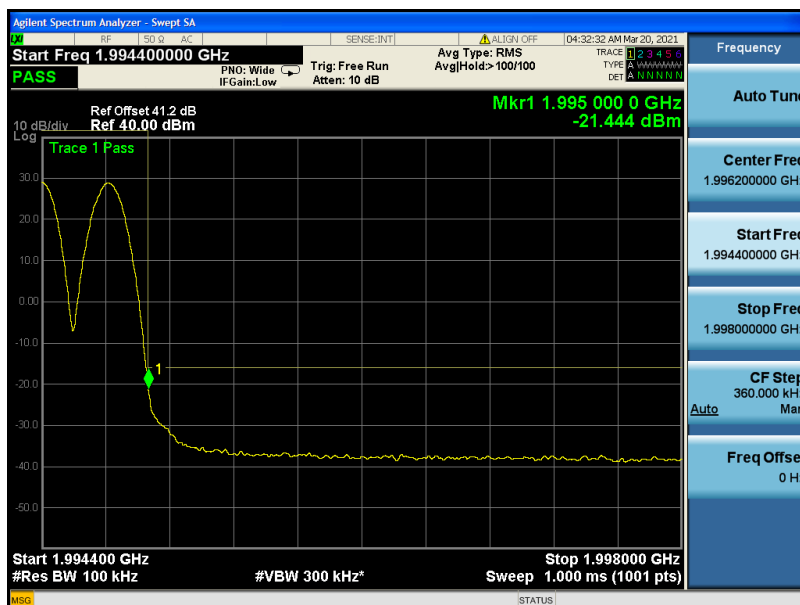
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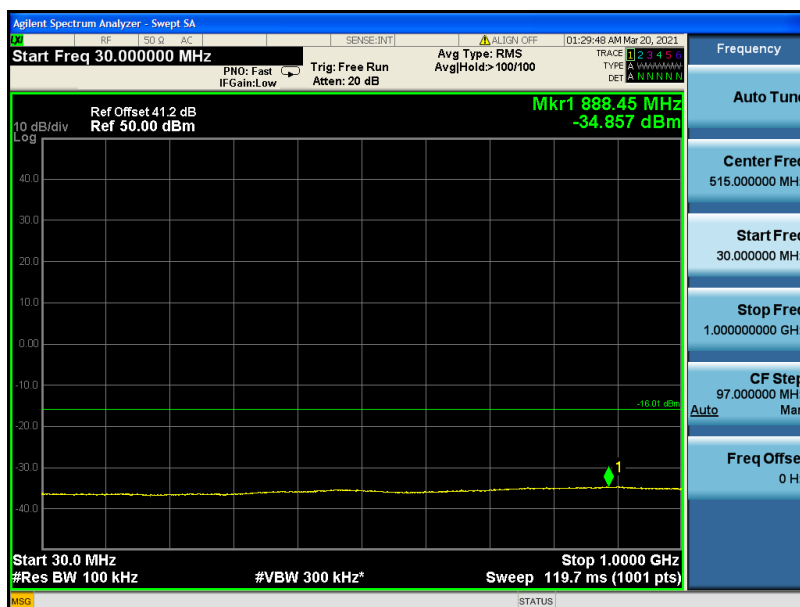
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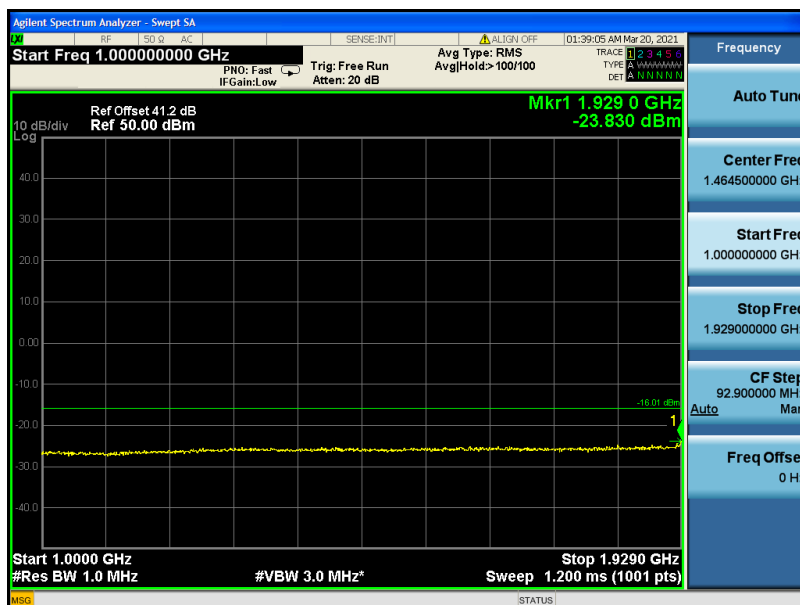
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DL_1S_B_AWGN_Pre-AGC_Spurious emission 1



DL_1S_B_AWGN_Pre-AGC_Spurious emission 2



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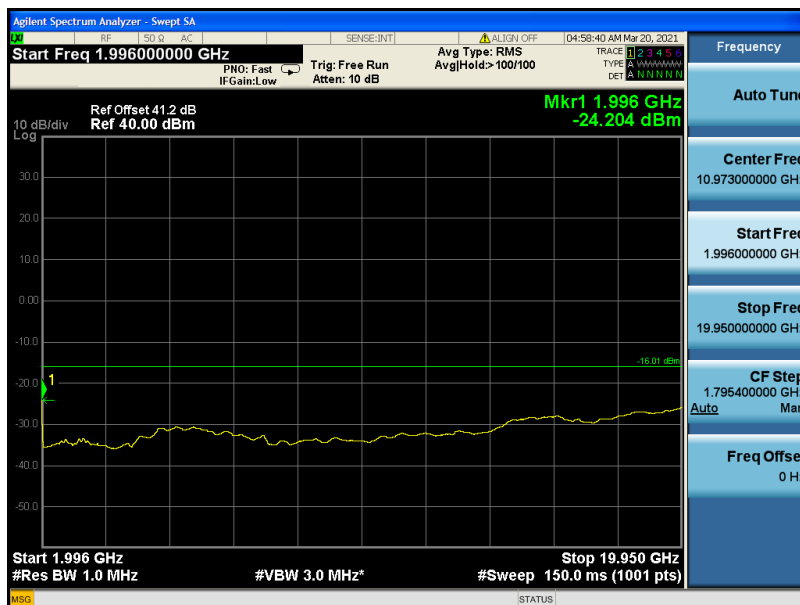
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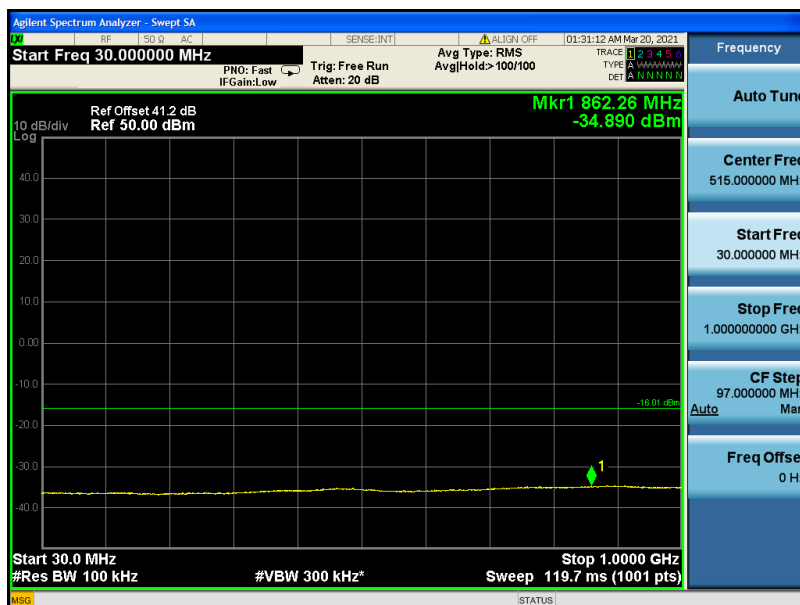
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DL_1S_B_AWGN_Pre-AGC_Spurious emission 3



DL_1S_M_AWGN_Pre-AGC_Spurious emission 1



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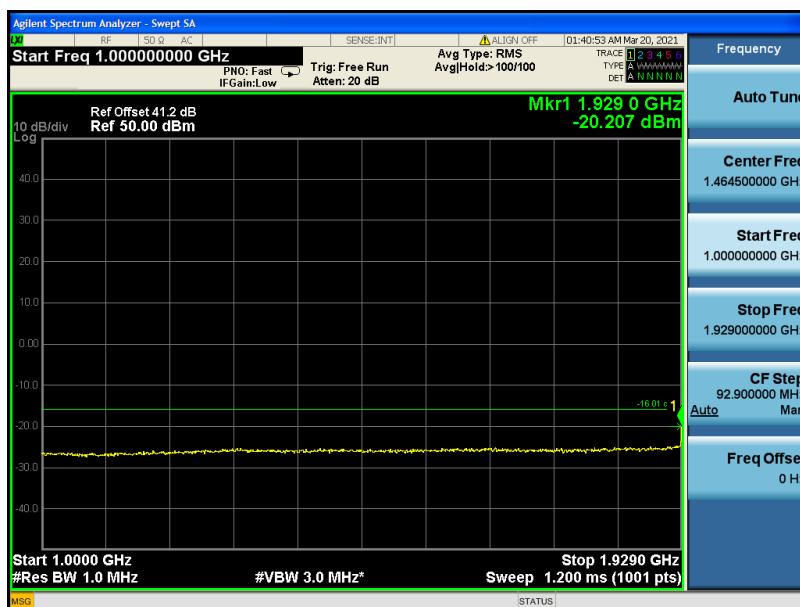
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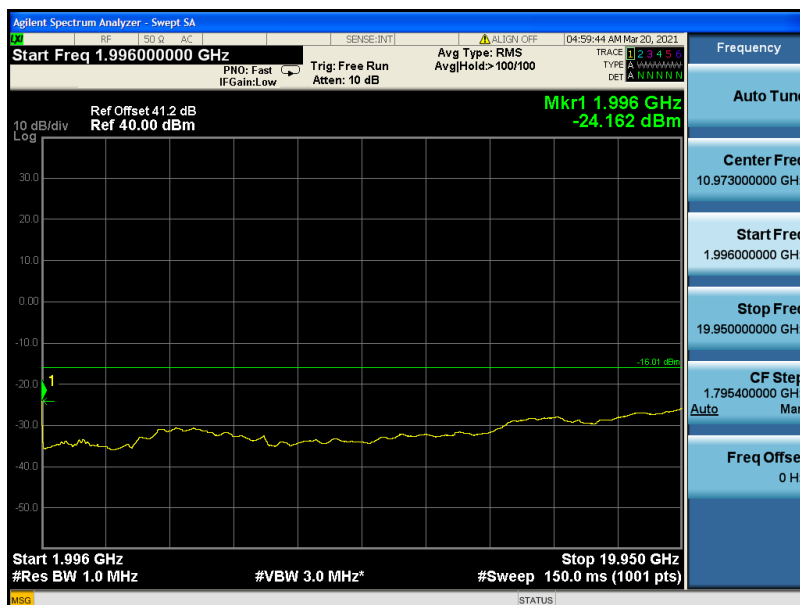
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DL_1S_M_AWGN_Pre-AGC_Spurious emission 2



DL_1S_M_AWGN_Pre-AGC_Spurious emission 3



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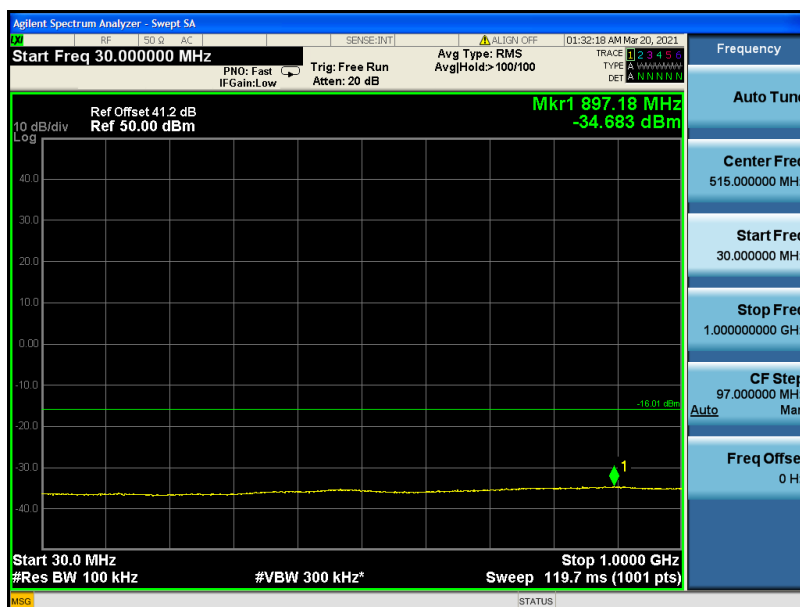
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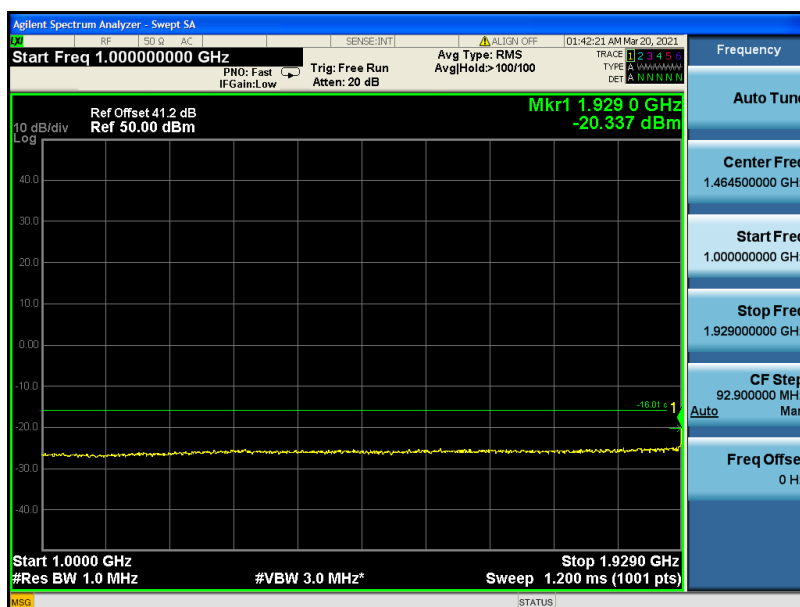
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DL_1S_T_AWGN_Pre-AGC_Spurious emission 1



DL_1S_T_AWGN_Pre-AGC_Spurious emission 2



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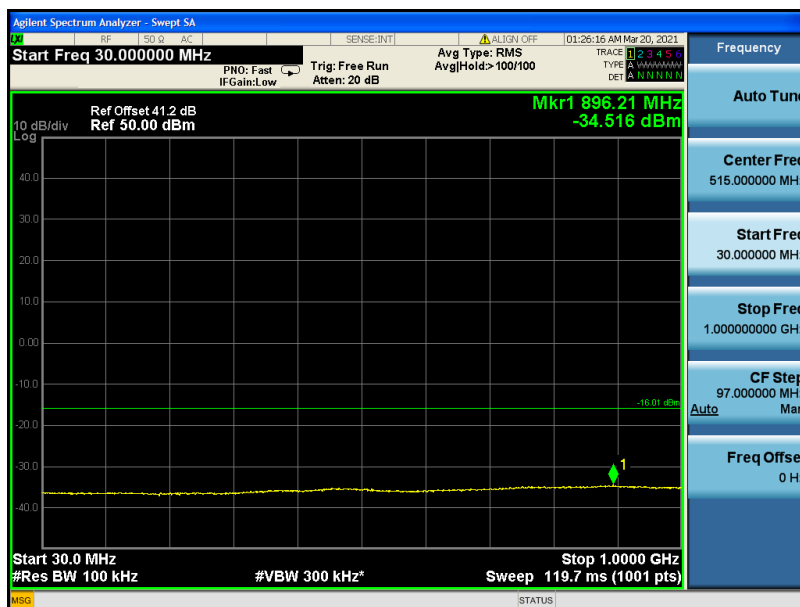
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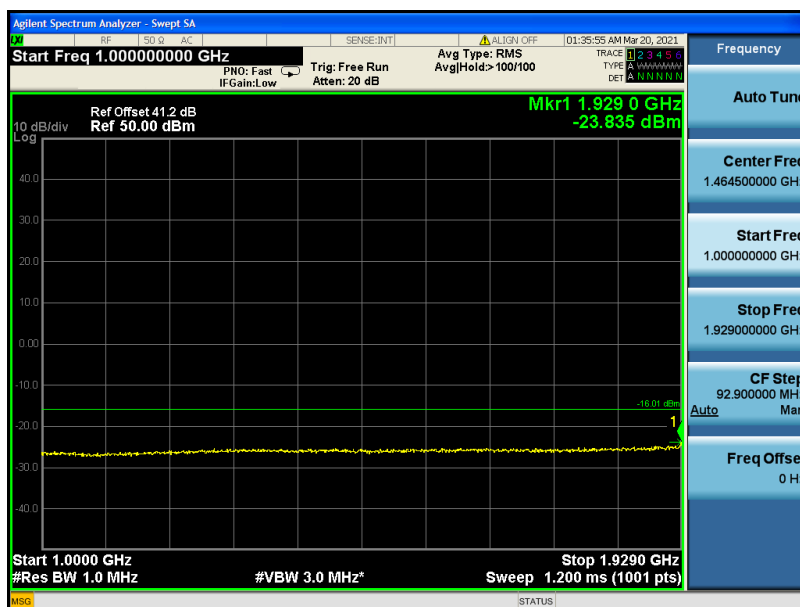
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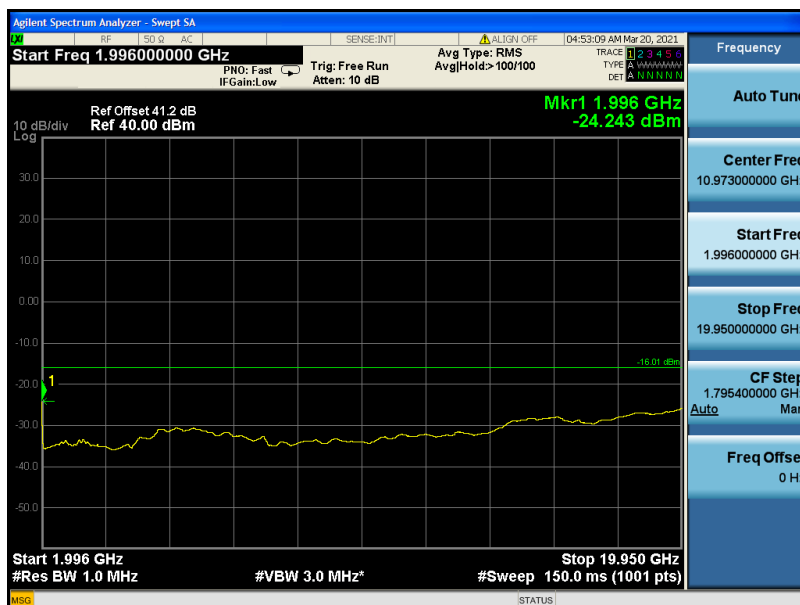
DL_1S_B_GSM_Pre-AGC_Spurious emission 1



DL_1S_B_GSM_Pre-AGC_Spurious emission 2



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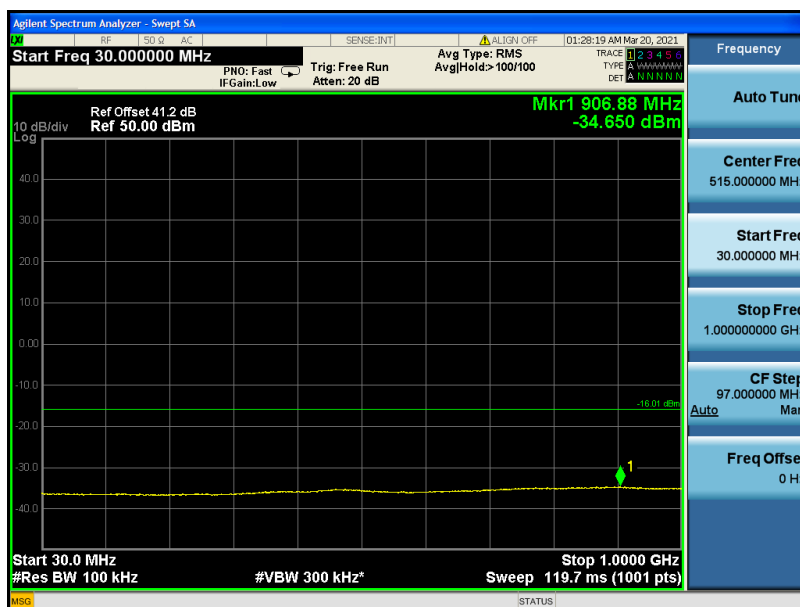
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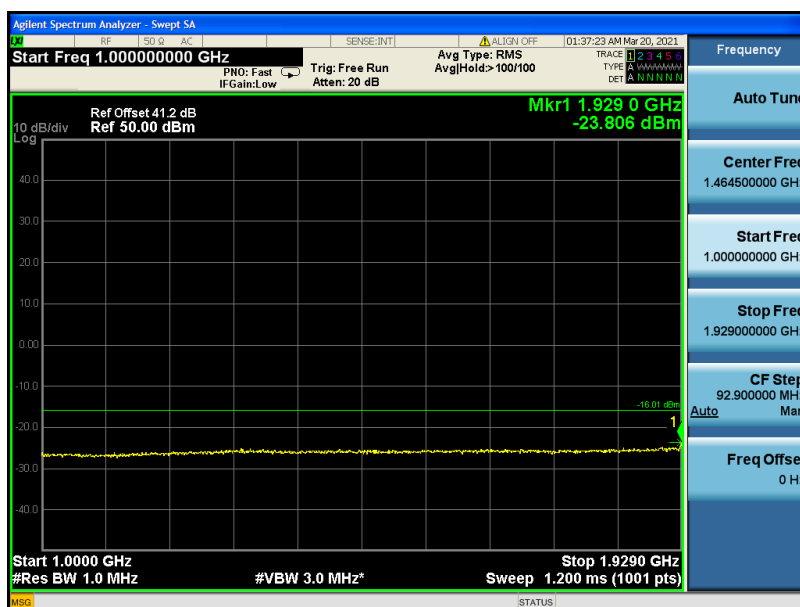
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DL_1S_M_GSM_Pre-AGC_Spurious emission 1



DL_1S_M_GSM_Pre-AGC_Spurious emission 2



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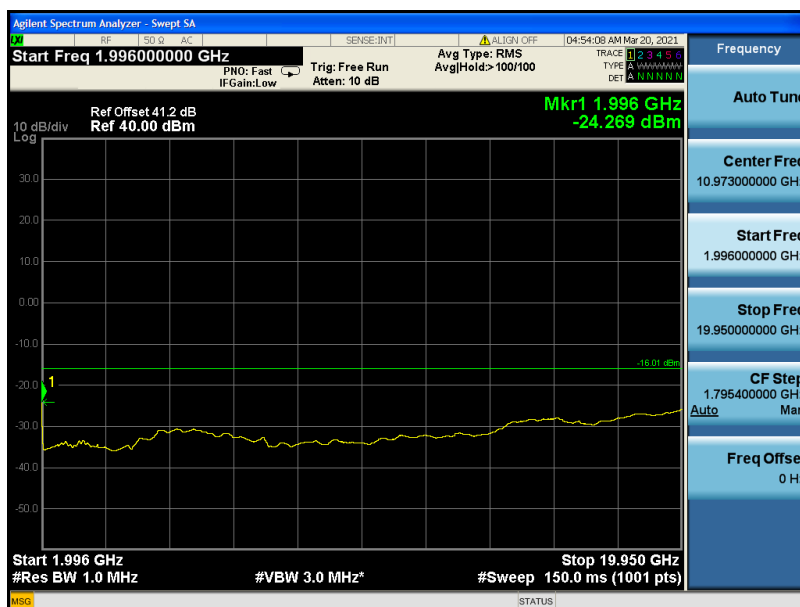
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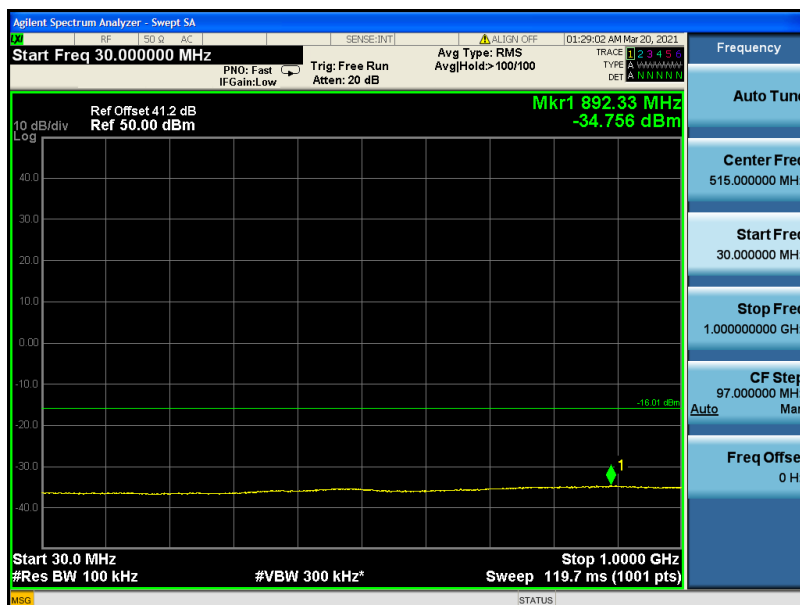
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DL_1S_M_GSM_Pre-AGC_Spurious emission 3



DL_1S_T_GSM_Pre-AGC_Spurious emission 1



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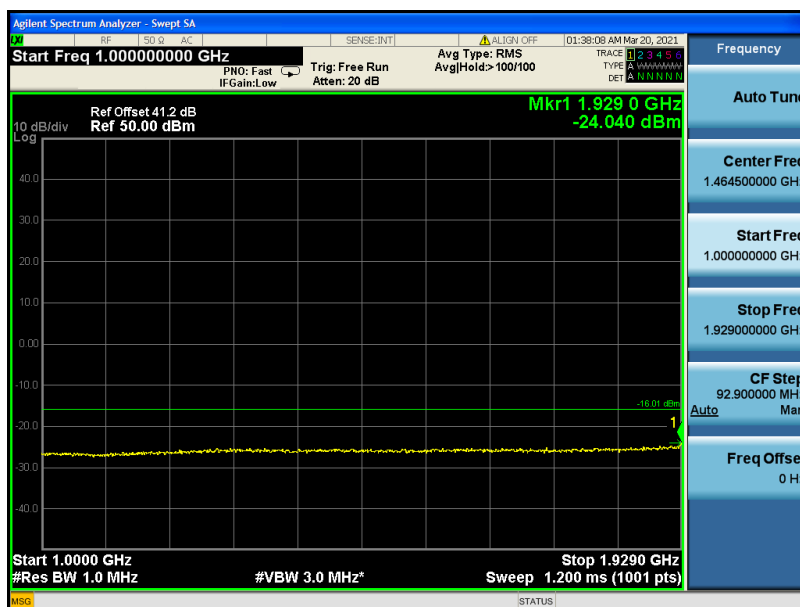
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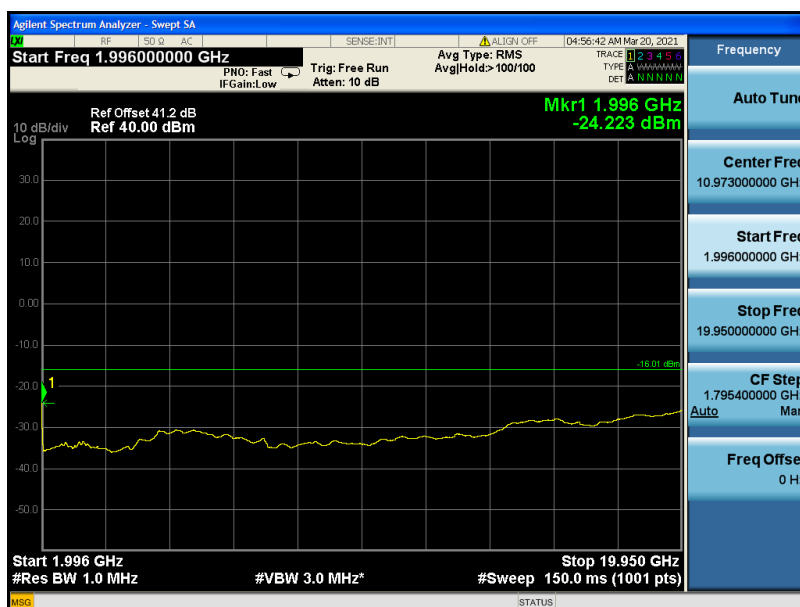
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DL_1S_T_GSM_Pre-AGC_Spurious emission 2



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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 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 and less than 1.5ppm. 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.

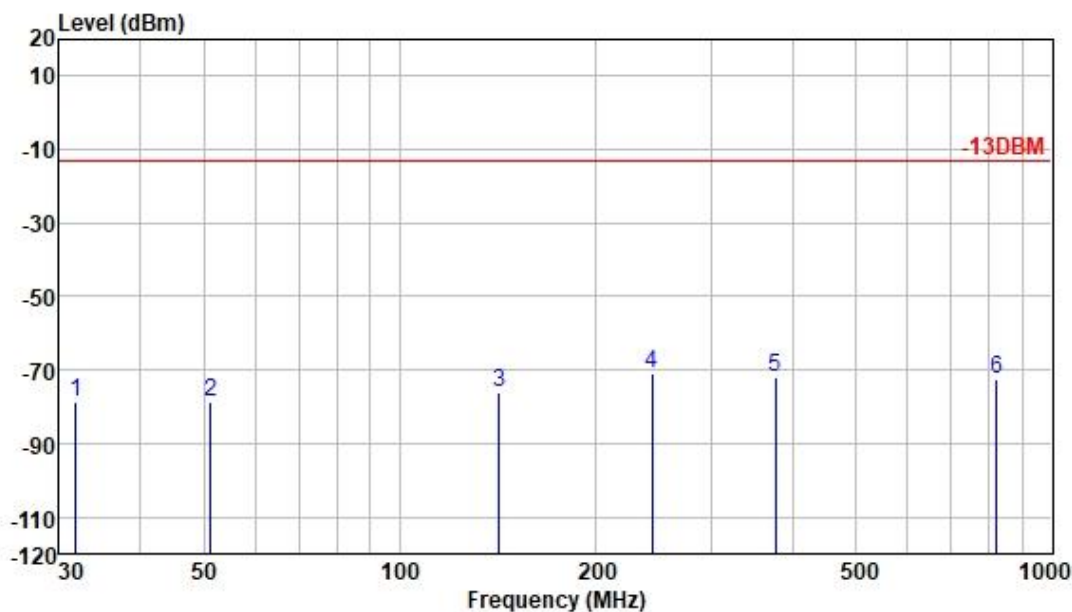
Frequency stability vs temperature				
Temperature (°C)	Test Conf.	Test data (MHz)	Tolerance (ppm)	Verdict
50	DL_1S_M_AWGN	1962.502437	-0.56	PASS
40		1962.502347	-0.61	PASS
30		1962.504352	0.41	PASS
20		1962.503543	Reference	PASS
10		1962.503274	-0.14	PASS
0		1962.503234	-0.16	PASS
-10		1962.502735	-0.41	PASS
-20		1962.502353	0.61	PASS
-30		1962.503724	0.09	PASS

Frequency stability vs voltage				
Voltage (V)	Test Conf.	Test data (MHz)	Tolerance (ppm)	Verdict
AC 93.5	DL_1S_M_AWGN	1962.503243	-0.15	PASS
AC 110		1962.503543	Reference	PASS
AC 126.5		1962.503497	-0.23	PASS

1.6 Radiated spurious emissions

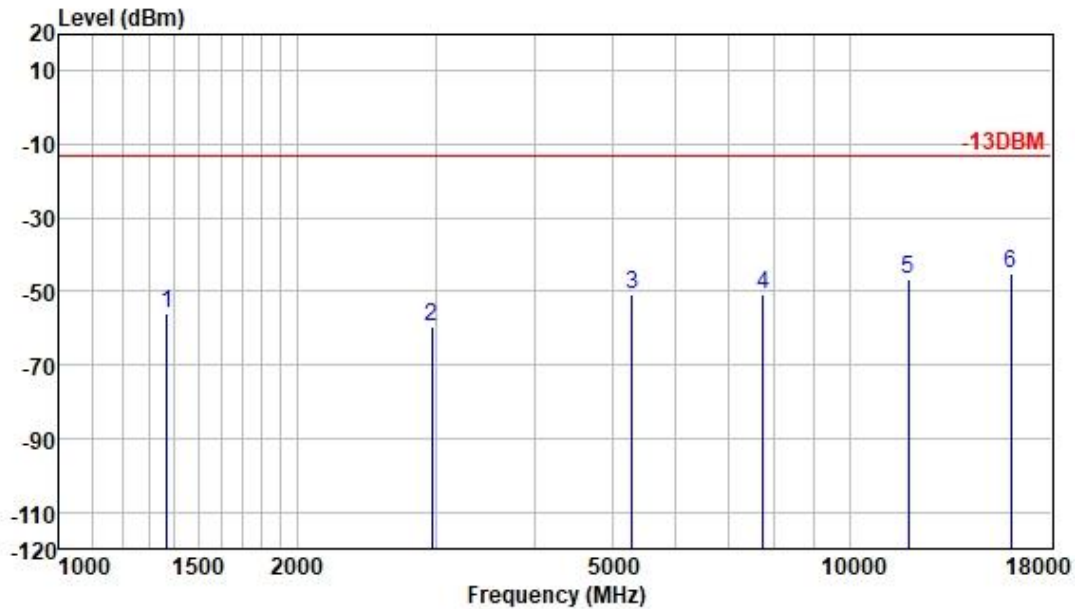
- Note:
1. The tested max conducted power for single antenna port is 43.26dBm, the 2x2 MIMO total power is 43.26dBm+43.26dBm= 42.36W.
The power of any emission must be reduced below the mean output power (P) by at least $43 + 10\log(P)$ dB
Here, $P=42.36W$.
the limit = $P(dBm) - [43 + 10 \log(42.36W)] = -13dBm$
 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 from 9kHz to 30MHz was very low and 20db below the limit, therefore, the data was not recorded in the report.

DL_1S_M_AWGN_Horizontal_30MHz~1GHz



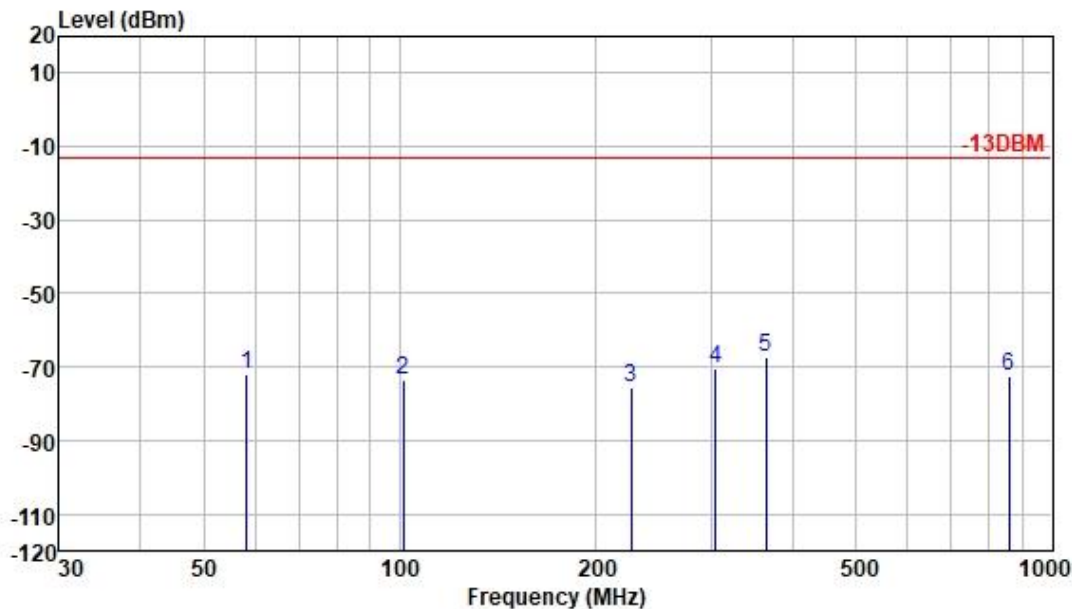
	Freq	Read Level	Correction Factor	Level	Limit Line	Over Limit	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	31.84	-82.15	3.33	-78.82	-12.99	-65.83	HORIZONTAL
2	51.12	-77.50	-1.35	-78.85	-12.99	-65.86	HORIZONTAL
3	141.83	-68.15	-7.70	-75.85	-12.99	-62.86	HORIZONTAL
4	243.38	-65.23	-5.95	-71.18	-12.99	-58.19	HORIZONTAL
5	375.94	-70.68	-1.19	-71.87	-12.99	-58.88	HORIZONTAL
6	821.71	-79.51	7.05	-72.46	-12.99	-59.47	HORIZONTAL

DL_1S_M_AWGN_Horizontal_above 1GHz



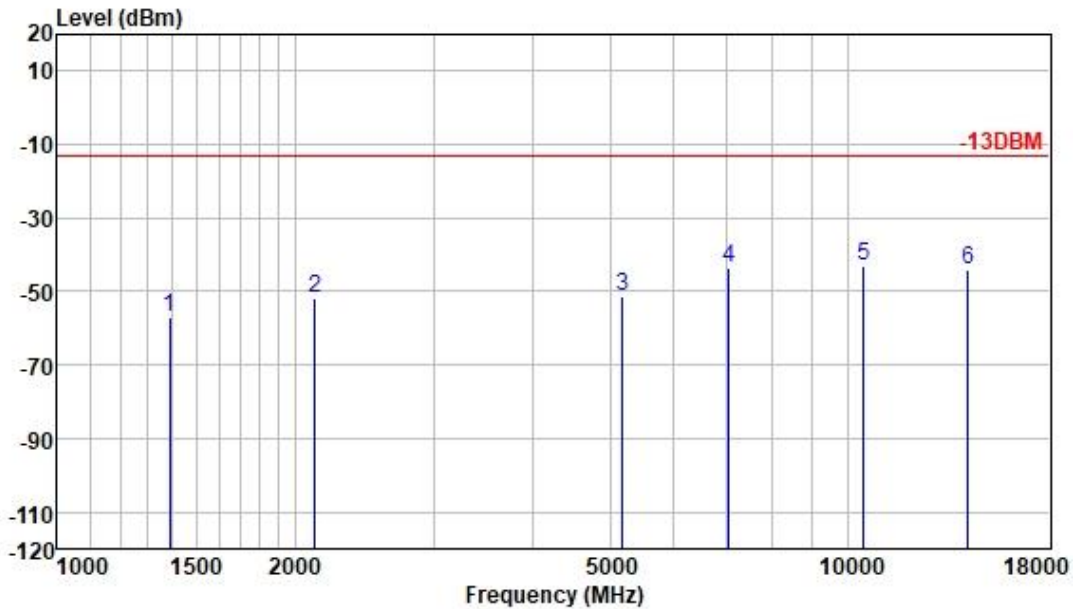
	Freq	Read Level	Correction Factor	Level	Limit Line	Over Limit	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	1366.37	-60.49	4.40	-56.09	-12.99	-43.10	HORIZONTAL
2	2956.16	-62.56	3.14	-59.42	-12.99	-46.43	HORIZONTAL
3	5300.20	-63.45	12.53	-50.92	-12.99	-37.93	HORIZONTAL
4	7762.26	-65.10	14.44	-50.66	-12.99	-37.67	HORIZONTAL
5	11837.45	-68.01	21.17	-46.84	-12.99	-33.85	HORIZONTAL
6	15942.30	-68.37	23.10	-45.27	-12.99	-32.28	HORIZONTAL

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	58.20	-69.56	-2.63	-72.19	-12.99	-59.20	VERTICAL
2	101.29	-68.64	-5.08	-73.72	-12.99	-60.73	VERTICAL
3	226.10	-69.60	-6.15	-75.75	-12.99	-62.76	VERTICAL
4	304.61	-67.58	-2.64	-70.22	-12.99	-57.23	VERTICAL
5	364.26	-65.77	-1.72	-67.49	-12.99	-54.50	VERTICAL
6	860.04	-80.42	7.92	-72.50	-12.99	-59.51	VERTICAL

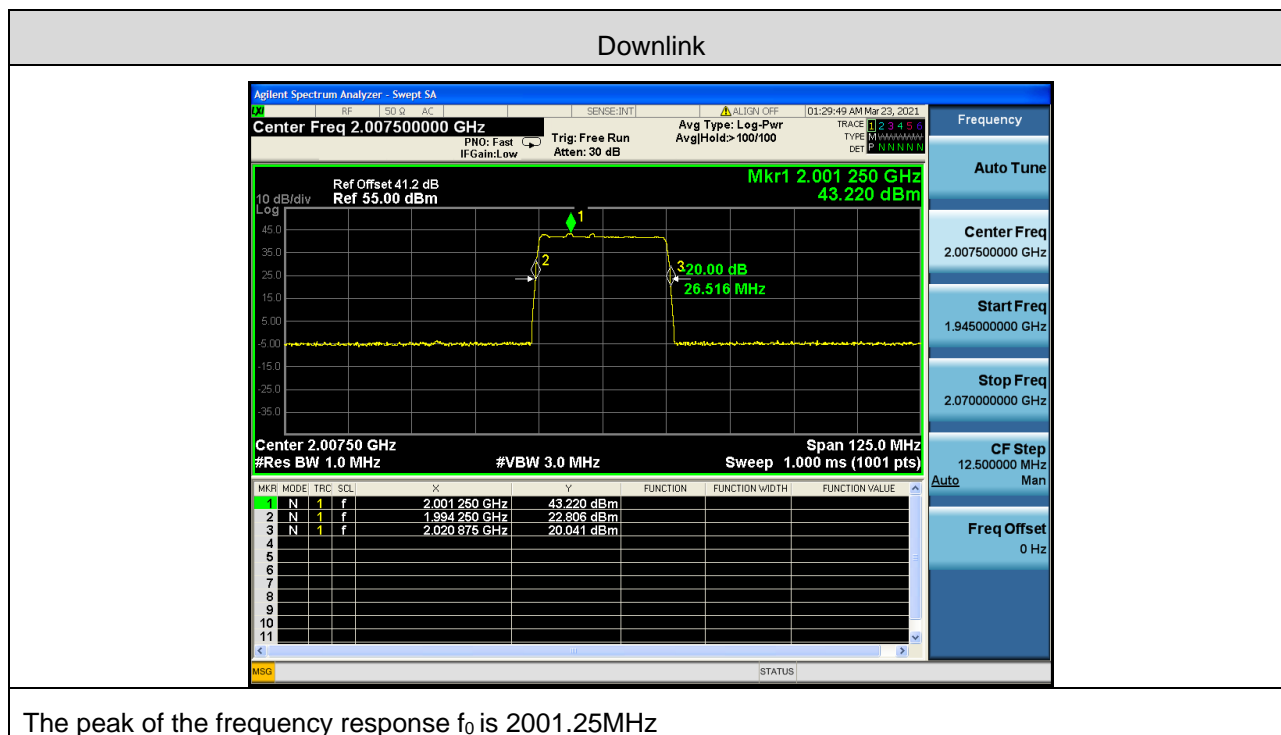
DL_1S_M_AWGN_Vertical_above 1GHz



	Freq	Read Level	Correction Factor	Level	Limit Line	Over Limit	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	1386.26	-61.21	4.06	-57.15	-12.99	-44.16	VERTICAL
2	2120.17	-61.20	9.15	-52.05	-12.99	-39.06	VERTICAL
3	5179.05	-63.66	12.38	-51.28	-12.99	-38.29	VERTICAL
4	7056.09	-63.62	19.89	-43.73	-12.99	-30.74	VERTICAL
5	10453.97	-67.50	24.28	-43.22	-12.99	-30.23	VERTICAL
6	14160.71	-68.86	25.01	-43.85	-12.99	-30.86	VERTICAL

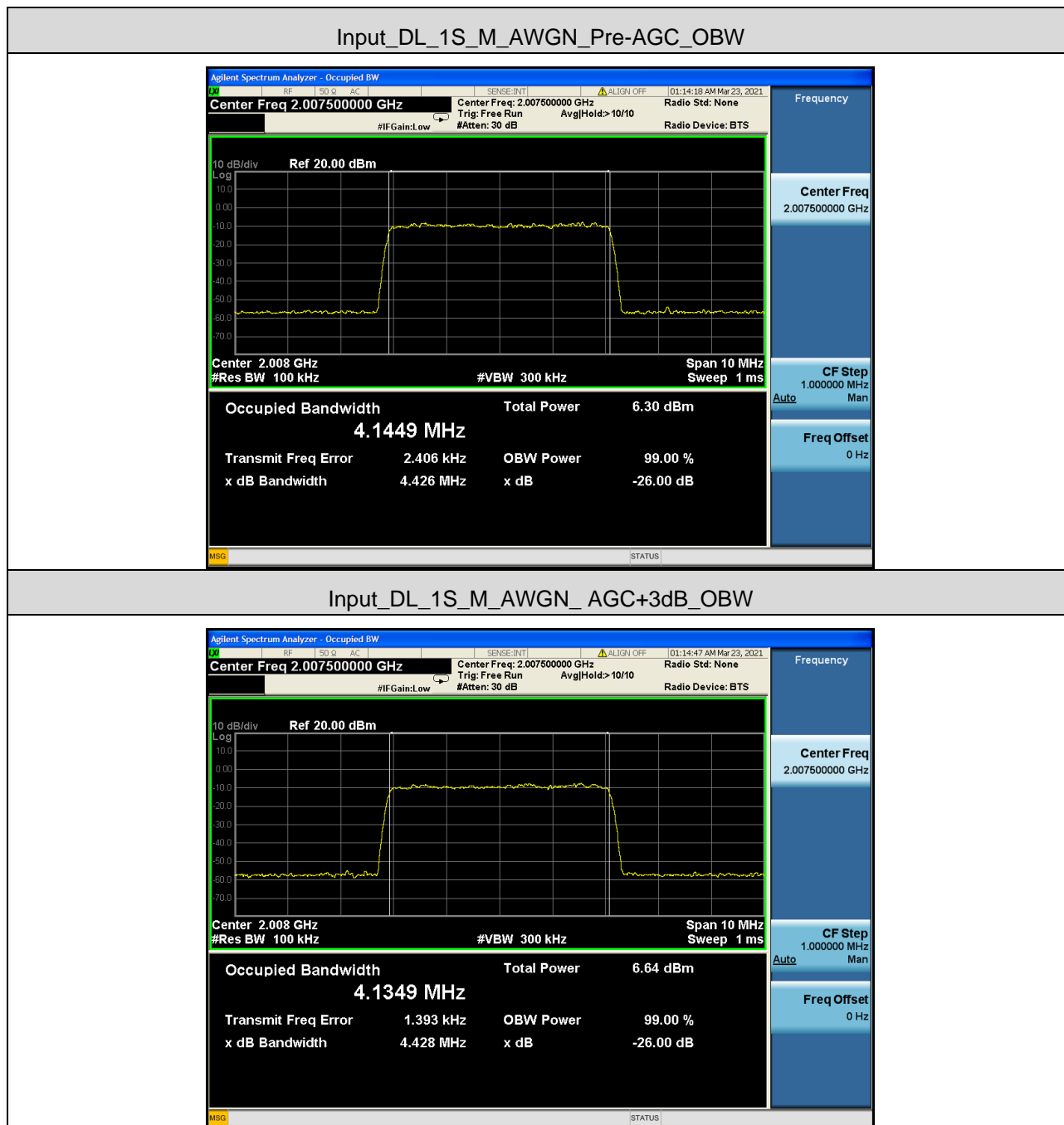
2 AWS-2 & AWS-4 (only for downlink: 1995-2020MHz)

2.1 Out-of-band rejection



The peak of the frequency response f_0 is 2001.25MHz

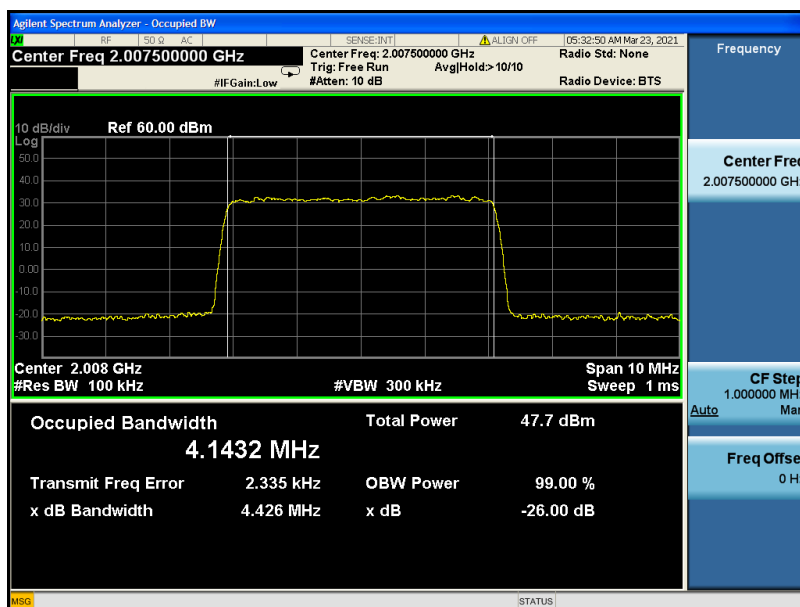
2.2 Input-versus-output signal comparison



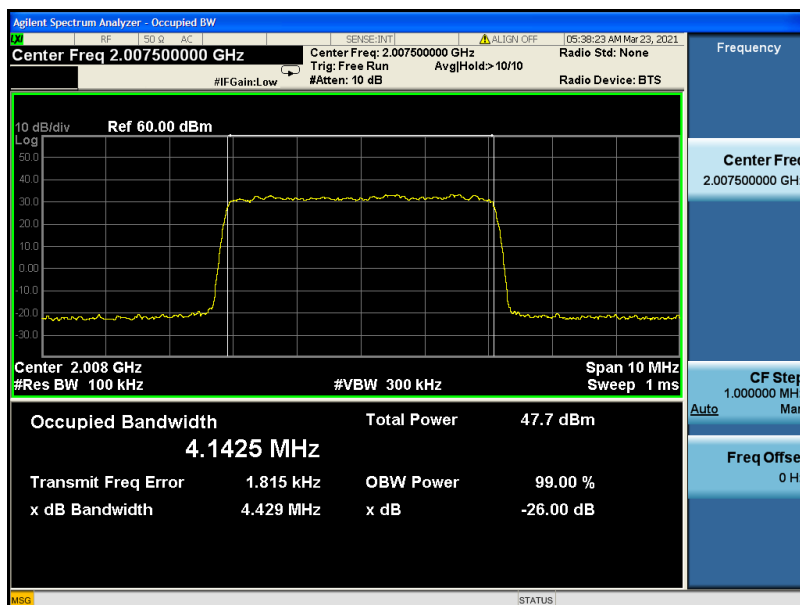
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Output_DL_1S_M_AWGN_Pre-AGC_OBW



Output_DL_1S_M_AWGN_AGC+3dB_OBW



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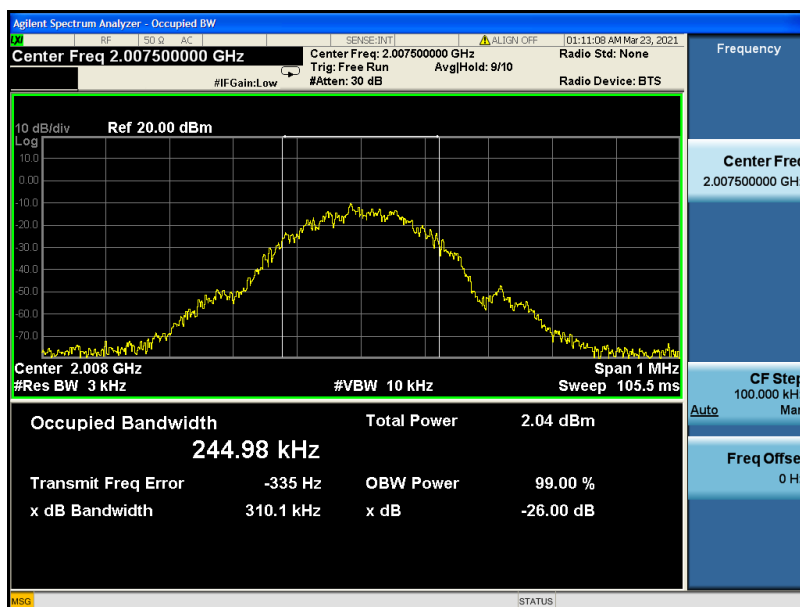
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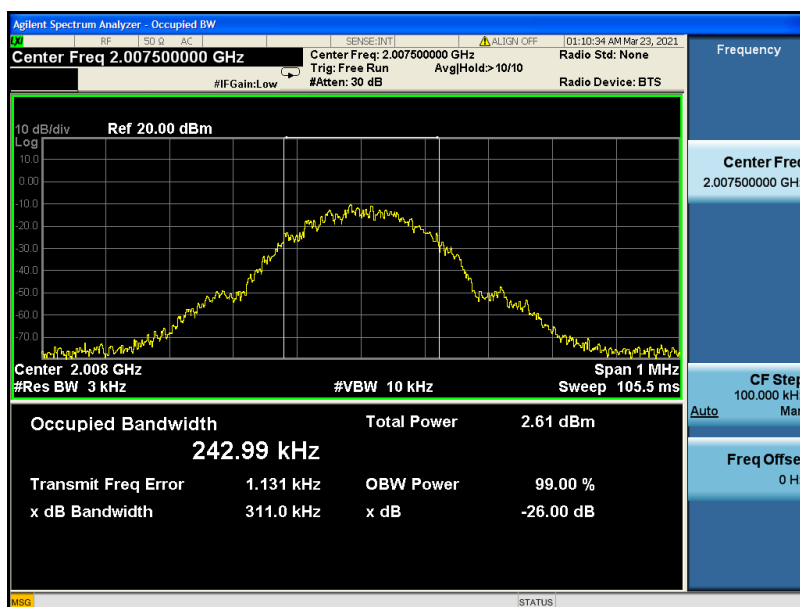
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Input_DL_1S_M_GSM_Pre-AGC_OBW



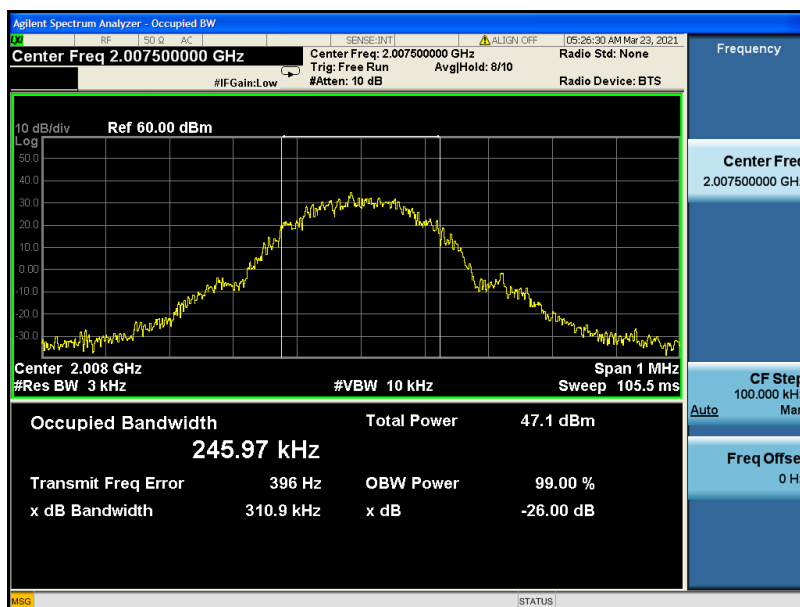
Input_DL_1S_M_GSM_AGC+3dB_OBW



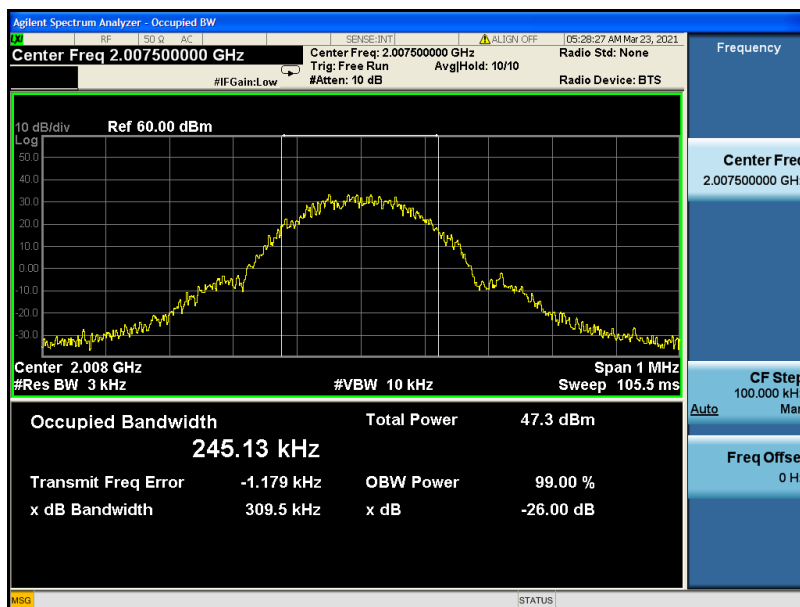
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Output_DL_1S_M_GSM_Pre-AGC_OBW



Output_DL_1S_M_GSM_AGC+3dB_OBW



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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2.3 Mean output power and amplifier/booster gain

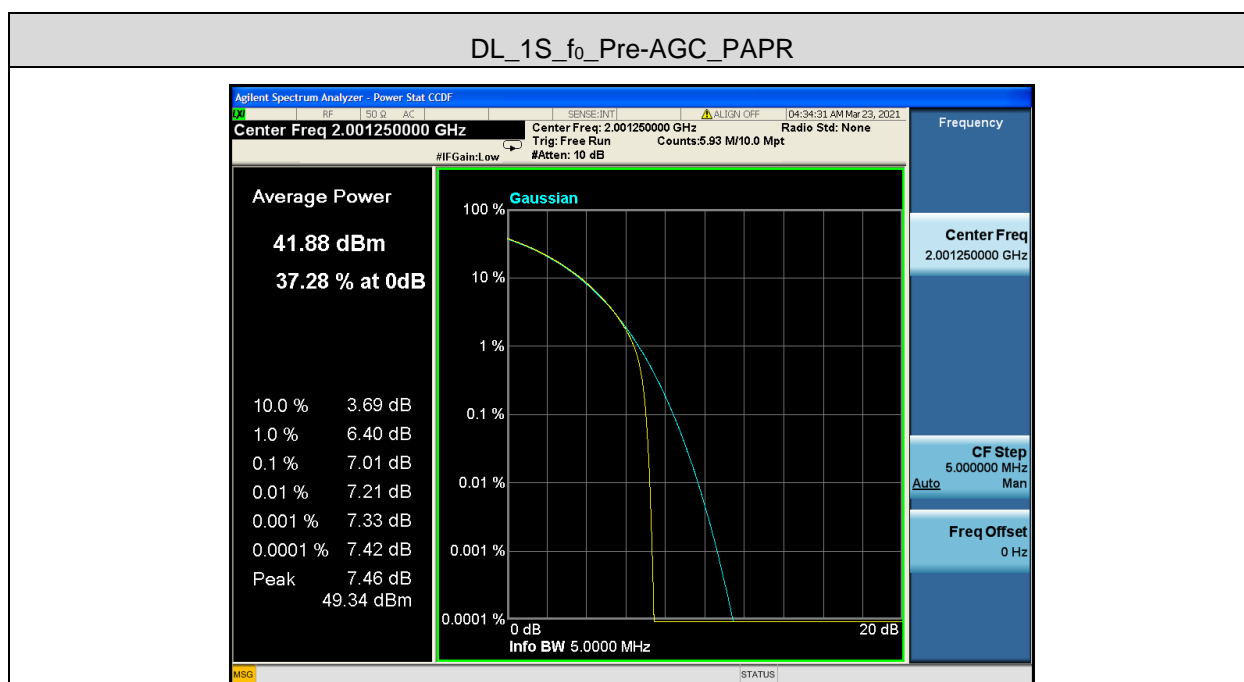
Test Conf.	Test Freq. f ₀ (MHz)	Signal Level	Input Power (dBm)	Output Power (dBm)	Gain (dB)	Verdict
DL_1S_AWGN	2001.25	Pre-AGC	0.22	43.06	42.84	PASS
		AGC+3dB	2.78	42.87	/	PASS
DL_1S_GSM	2001.25	Pre-AGC	0.10	42.95	42.85	PASS
		AGC+3dB	2.90	43.01	/	PASS

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 (43.06dBm+43.06dBm) +15.5dBi=61.57dBm (1435.5W) which don't exceed the required EIRP limit (1640W/MHz).
- 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.

Test Conf.	Test Freq. f ₀ (MHz)	Signal Level	PAPR (dB)	Limit (dB)	Verdict
DL_1S_AWGN	2001.25	Pre-AGC	7.21	13	PASS

DL_1S_f0_Pre-AGC_PAPR



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

Note: The EUT support 2x2 MIMO, Per 662911 D01 Multiple Transmitter Output v02r01 clause (3)(a)(iii): Measure and add $10 \log(\text{NANT})$ 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 $10 \log(\text{NANT})$ dB = $10 \log(2)$ dB = 3.01dB.

1. The tested max conducted power for single antenna port is 43.06dBm, the power of any emission must be reduced below the mean output power (P) by at least $43 + 10 \log(P)$ dB

Here,

$P = 43.06\text{dBm} = 20.23\text{W}$.

So the limit =

$P(\text{dBm}) - [43 + 10 \log(20.23\text{W})] = -13\text{dBm}$.

The EUT supports 2x2 MIMO and the both antenna port with identical out emissions, therefore only perform measurement at output port 1, the limit line was decreased 3.01dB as -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 : 1995MHz to 2000MHz block ;

Pretest performe at AWS-4 : 2000MHz to 2020MHz block ;

Pretest performe at combined AWS-4 and AWS-2 : 1995MHz to 2020MHz block ;

As the emission limit of above sub-block are identical, therefore, only the worst-case combined AWS-4 and AWS-2 block test plot was record in the report.

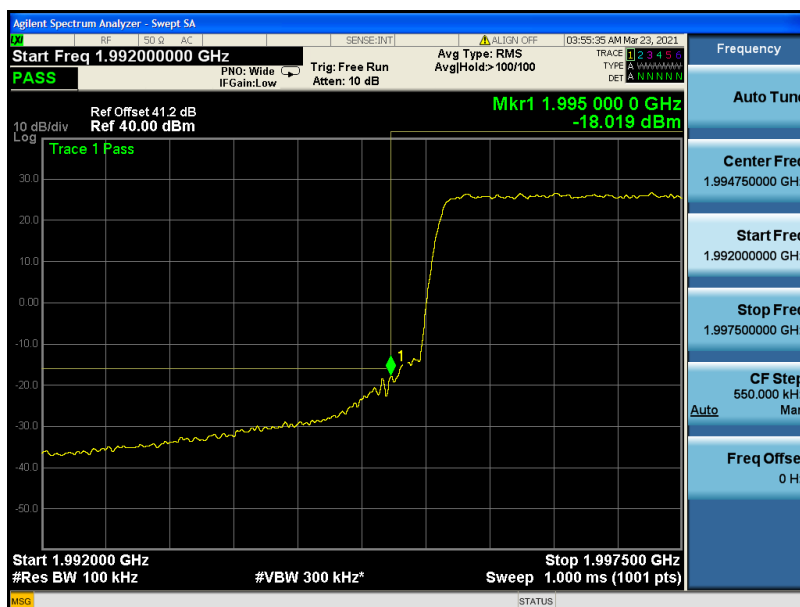
4. The spurious emissions from 9kHz to 30MHz was very low and 20dB below the limit, therefore, the data was not recorded in the report.



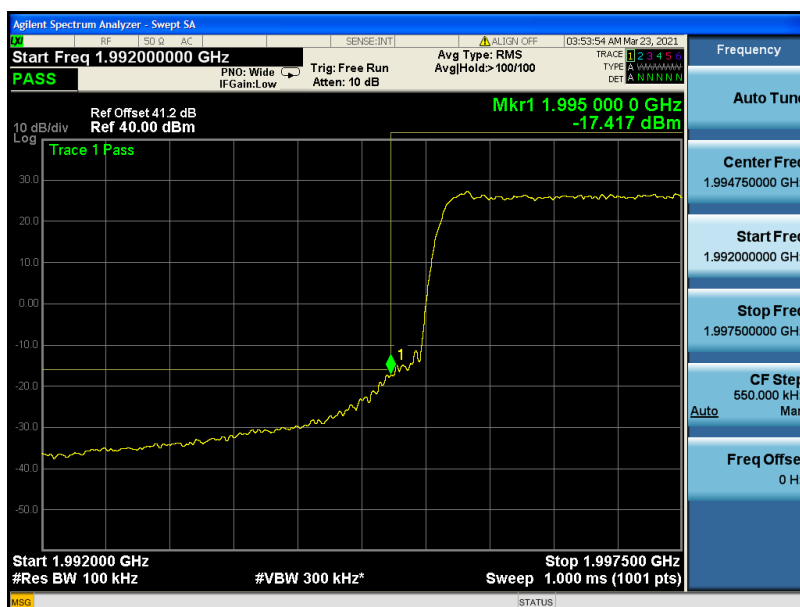
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DL_1S_B_AWGN_Pre-AGC_Out-of-band emission



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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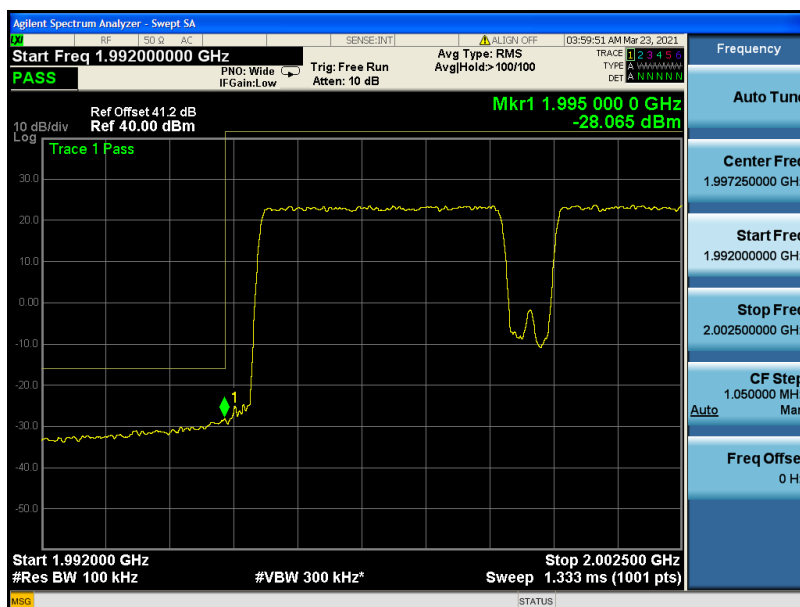
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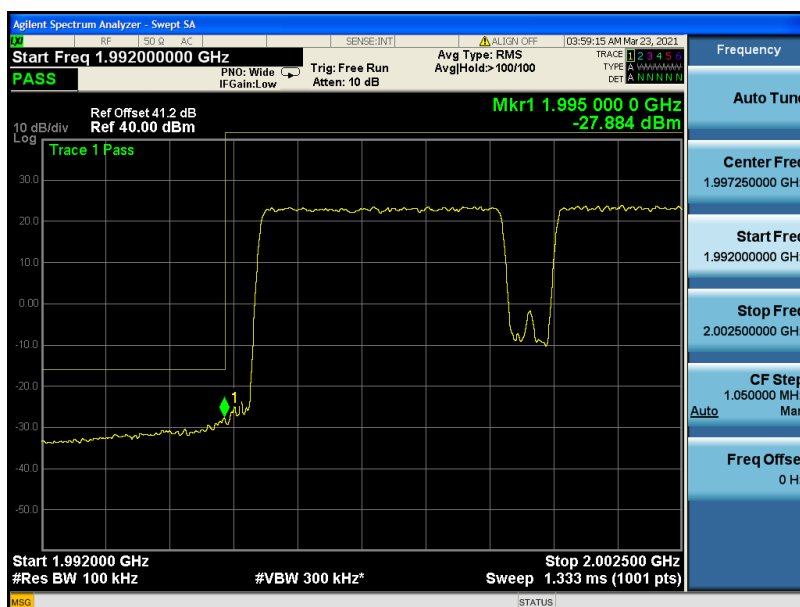
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DL_2S_B_AWGN_Pre-AGC_Out-of-band emission



DL_2S_B_AWGN_AGC+3_Out-of-band emission



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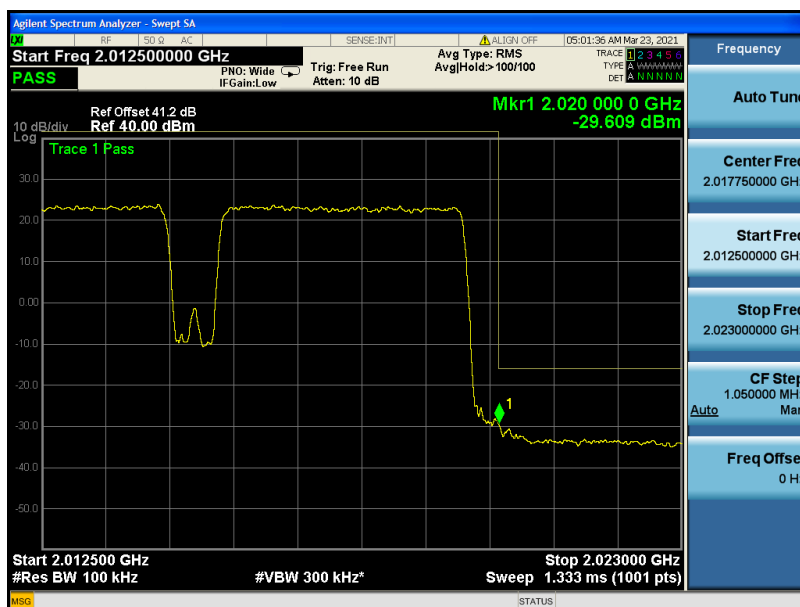
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DL_2S_T_AWGN_Pre-AGC_Out-of-band emission



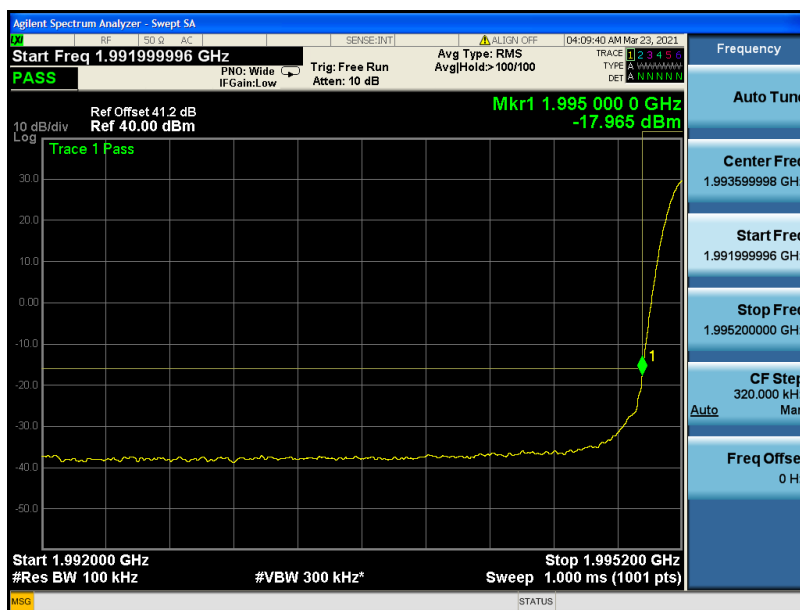
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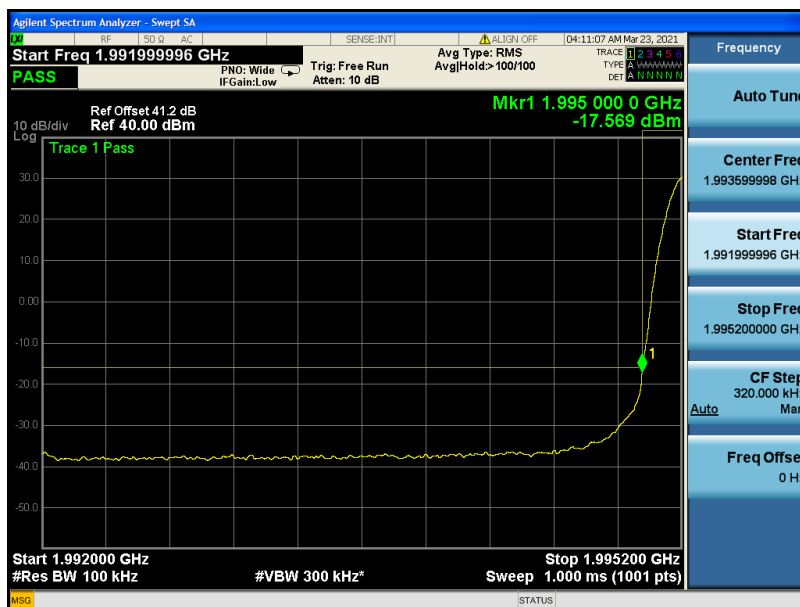
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DL_1S_B_GSM_Pre-AGC_Out-of-band emission



DL_1S_B_GSM_AGC+3_Out-of-band emission



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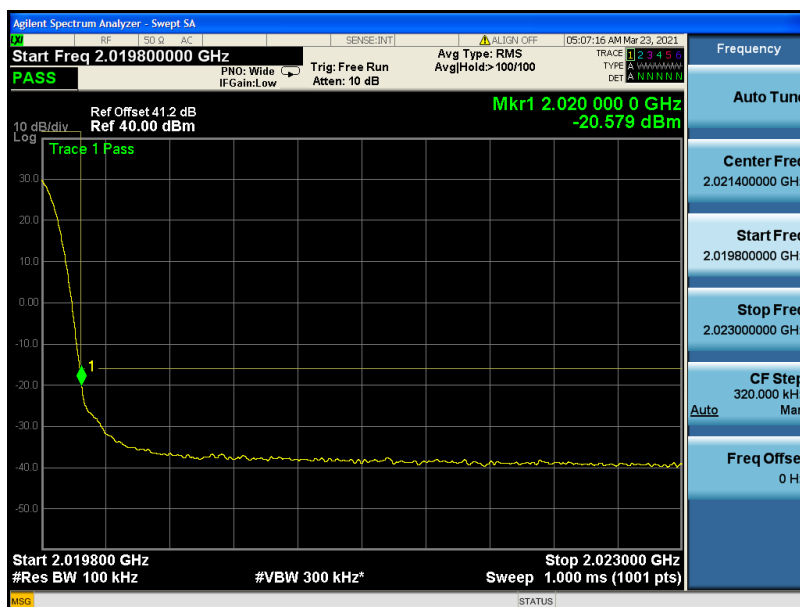
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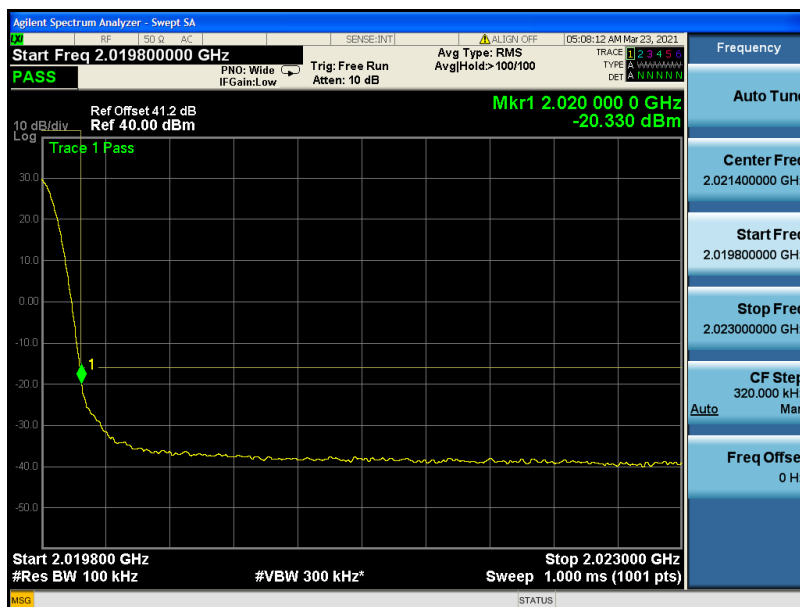
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DL_1S_T_GSM_Pre-AGC_Out-of-band emission



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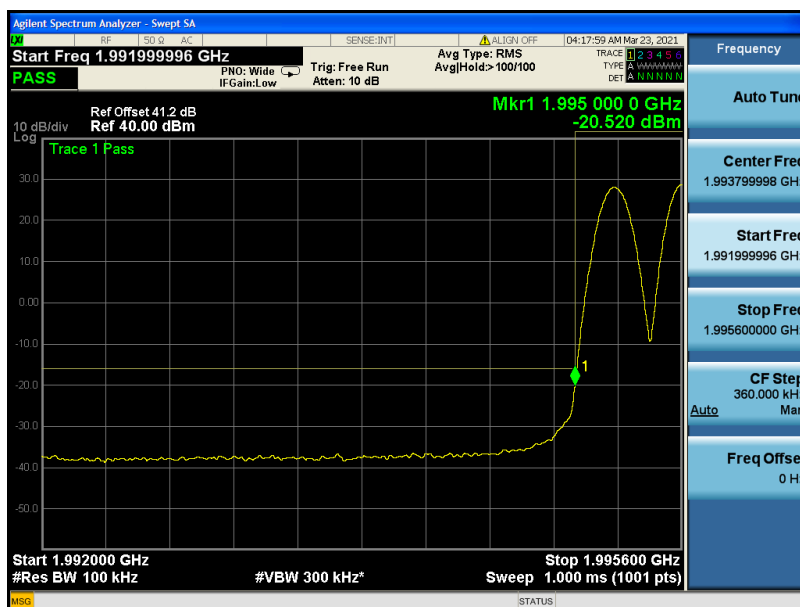
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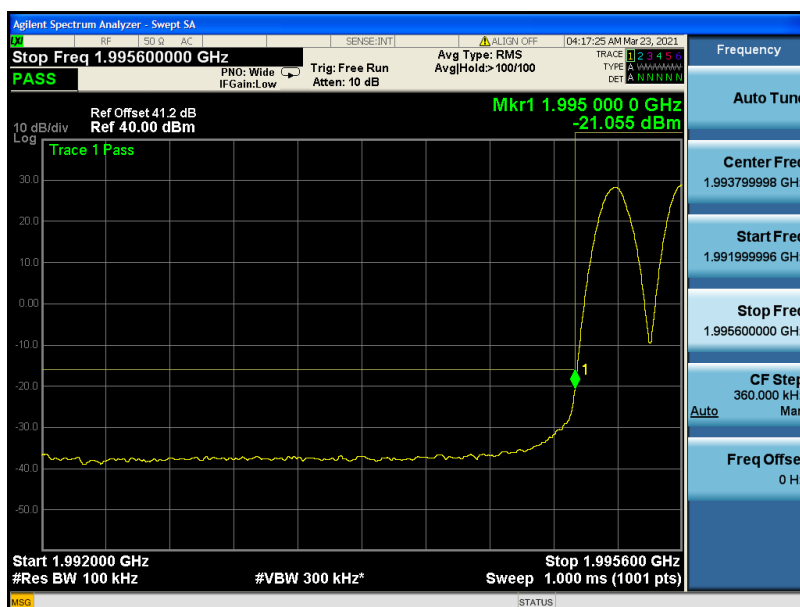
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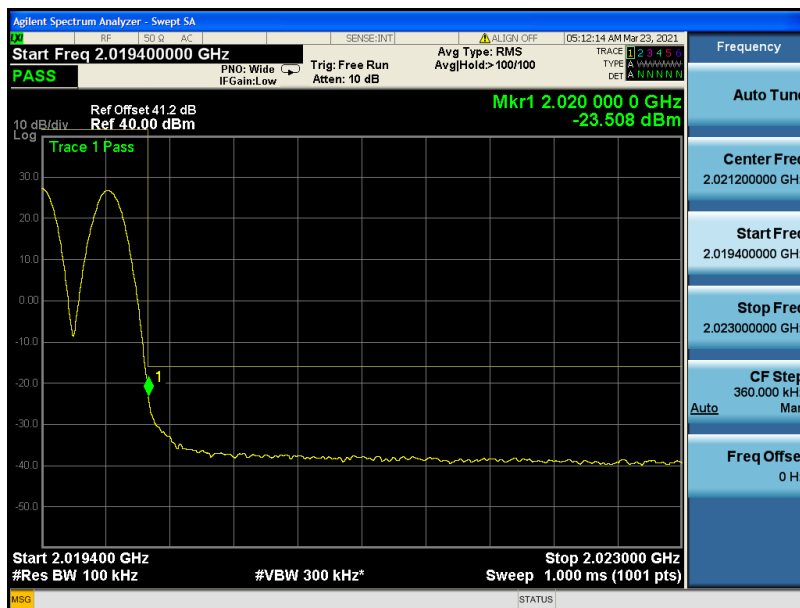
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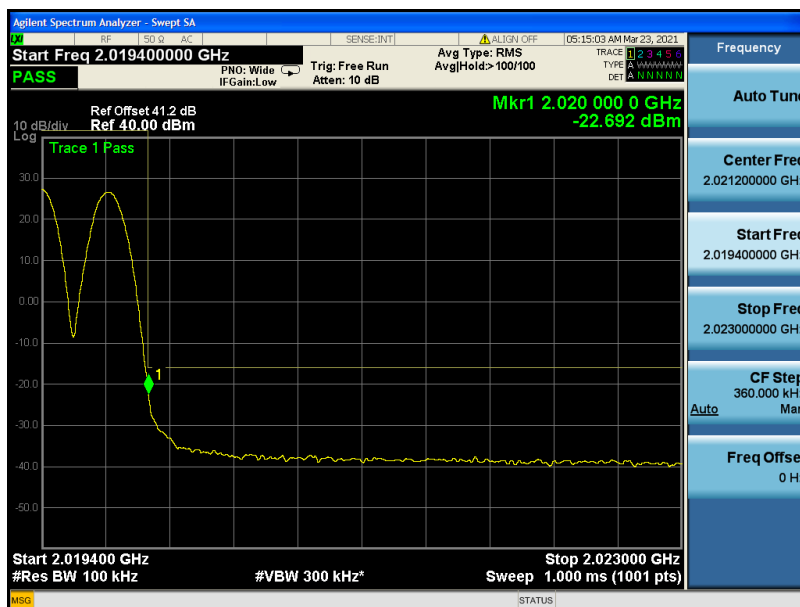
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DL_2S_T_GSM_AGC+3_Out-of-band emission



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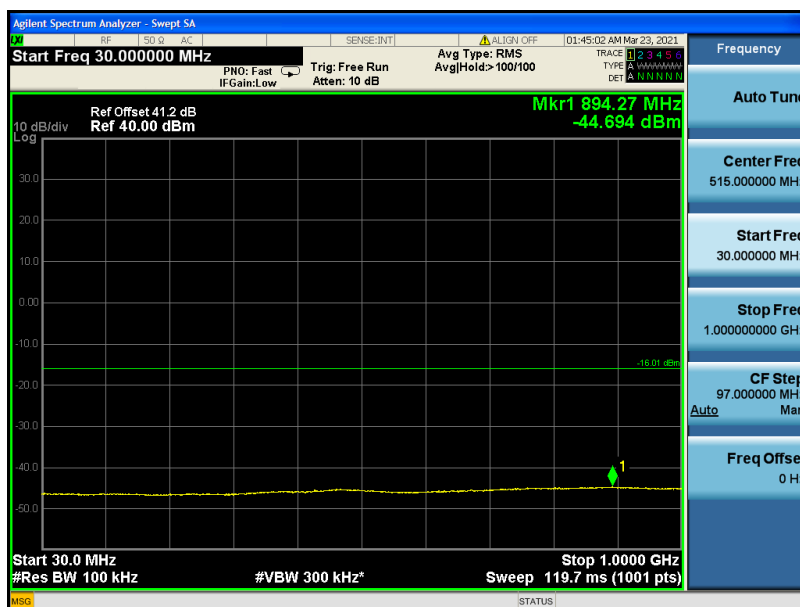
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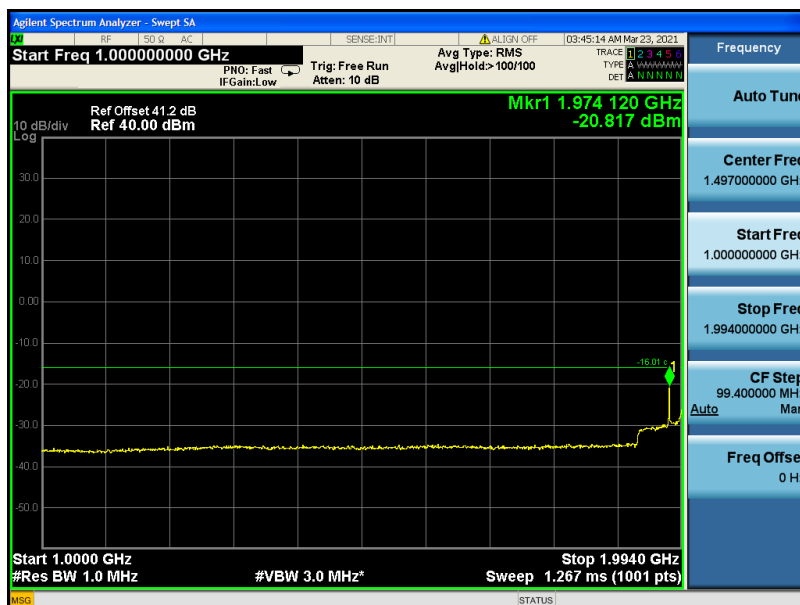
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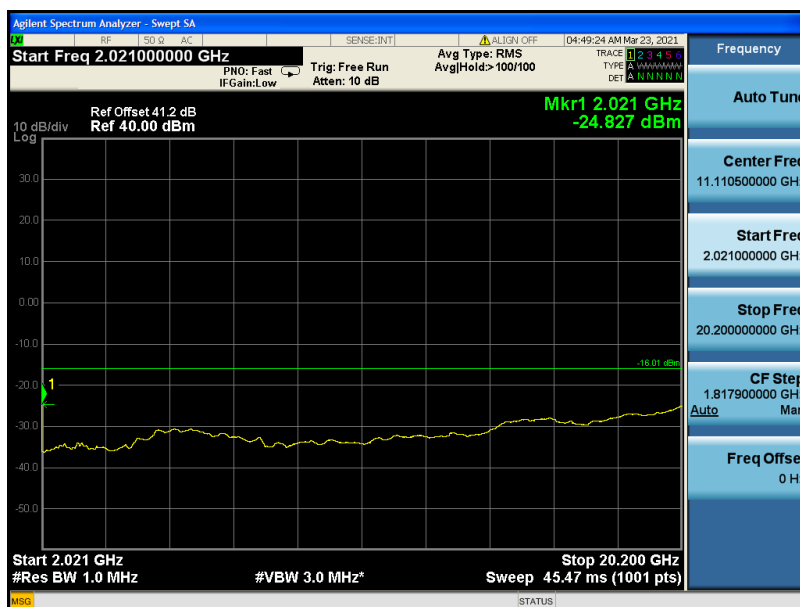
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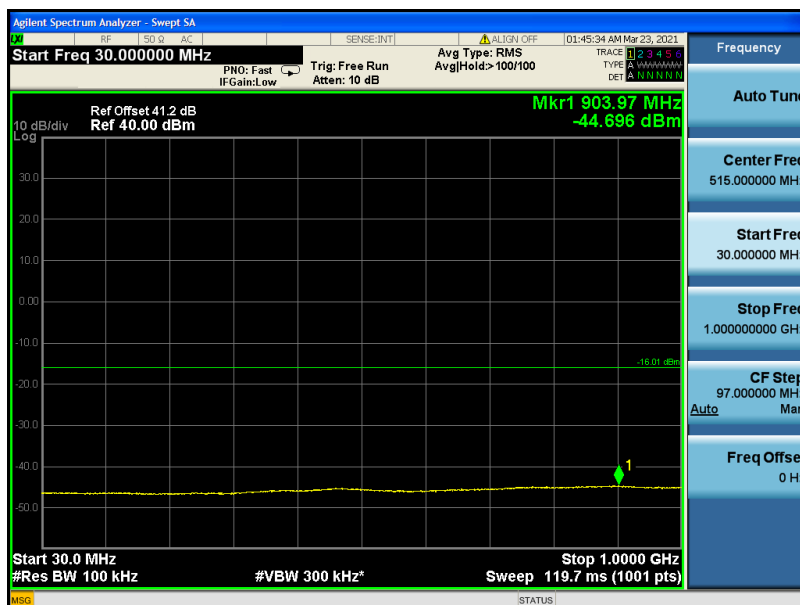
DL_1S_B_AWGN_Pre-AGC_Spurious emission 2



DL_1S_B_AWGN_Pre-AGC_Spurious emission 3



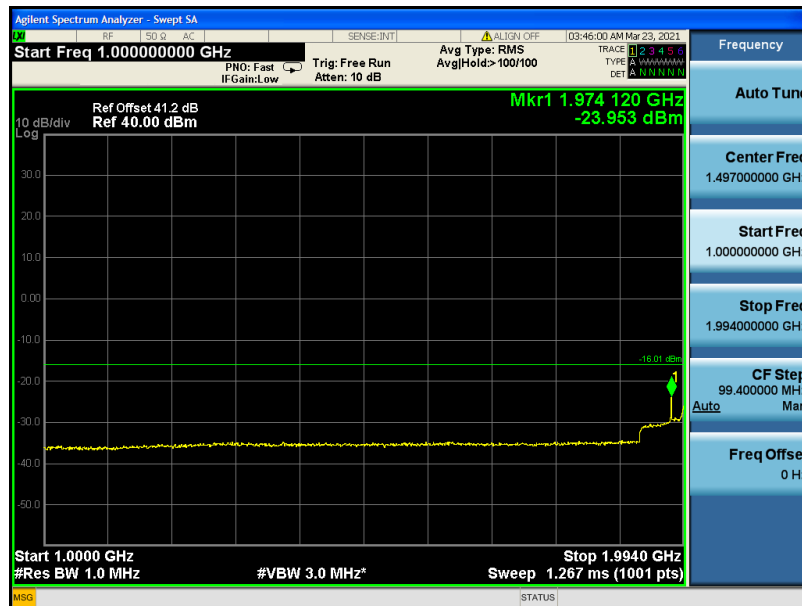
DL_1S_M_AWGN_Pre-AGC_Spurious emission 1



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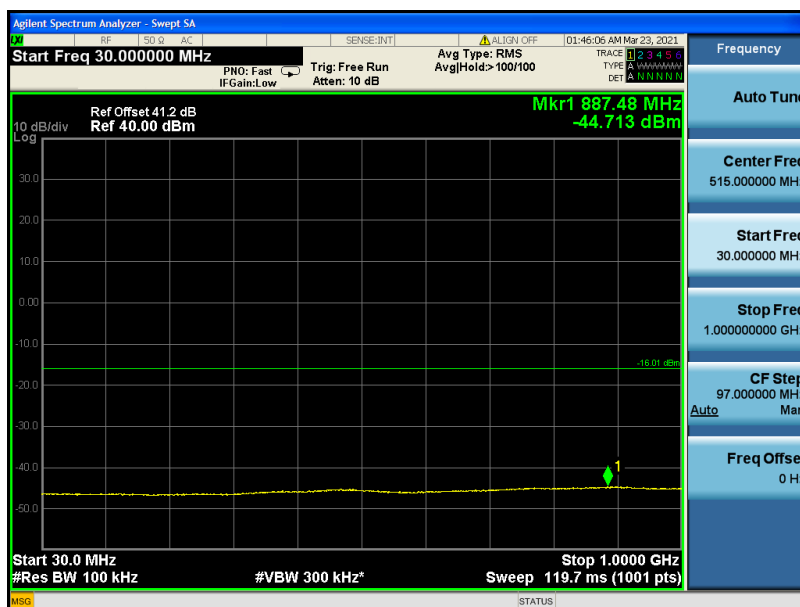
DL_1S_M_AWGN_Pre-AGC_Spurious emission 3



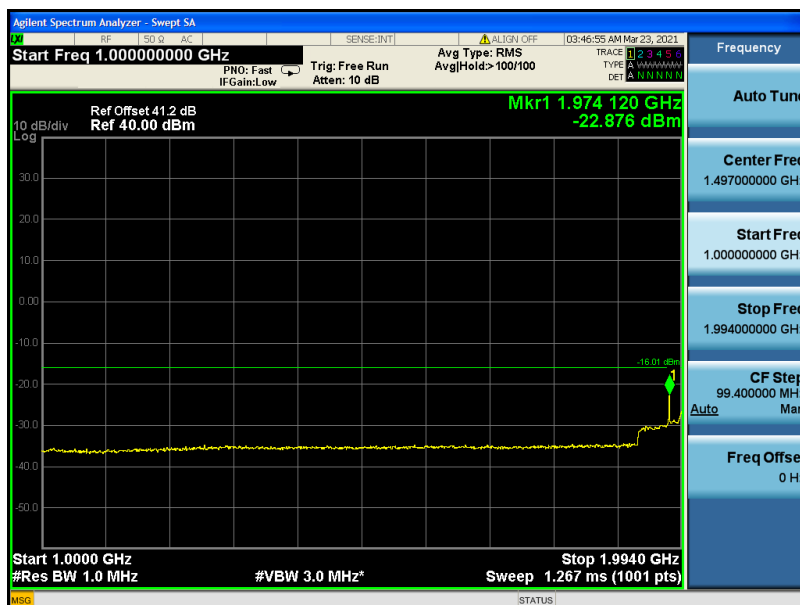
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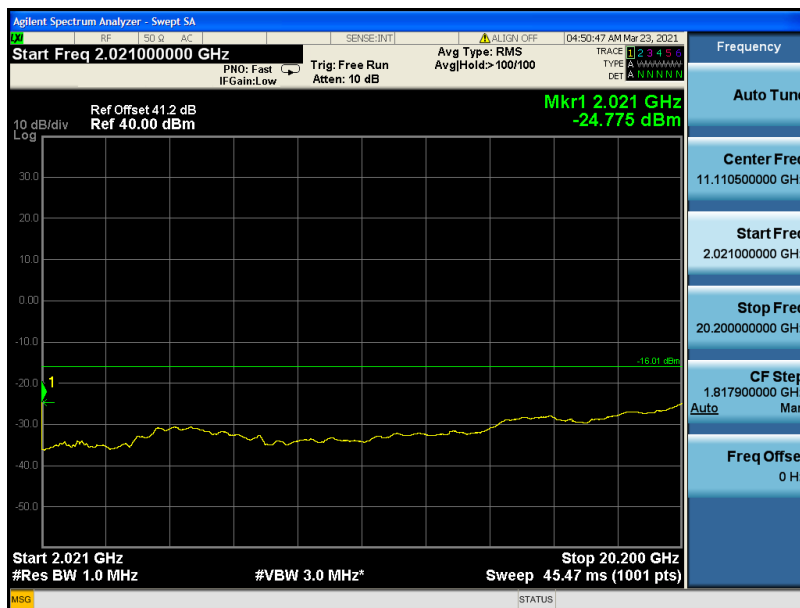
DL_1S_T_AWGN_Pre-AGC_Spurious emission 1



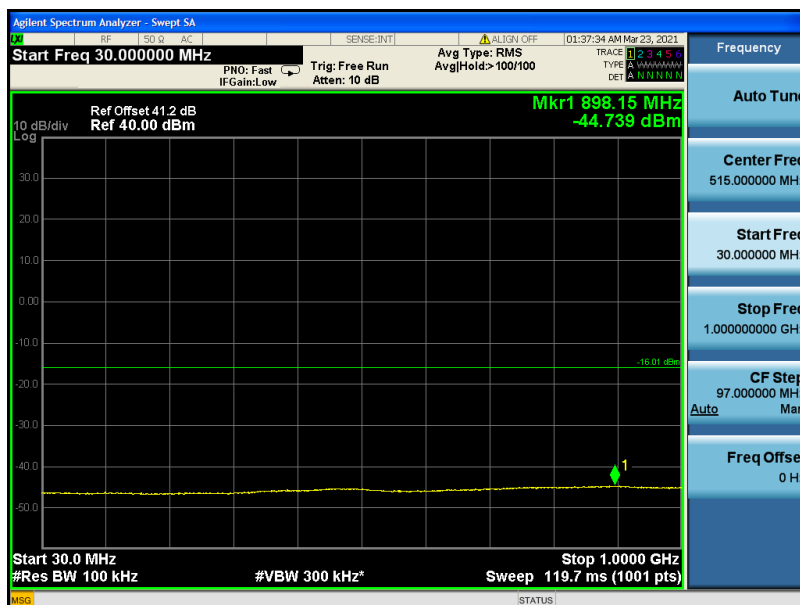
DL_1S_T_AWGN_Pre-AGC_Spurious emission 2



DL_1S_T_AWGN_Pre-AGC_Spurious emission 3



DL_1S_B_GSM_Pre-AGC_Spurious emission 1



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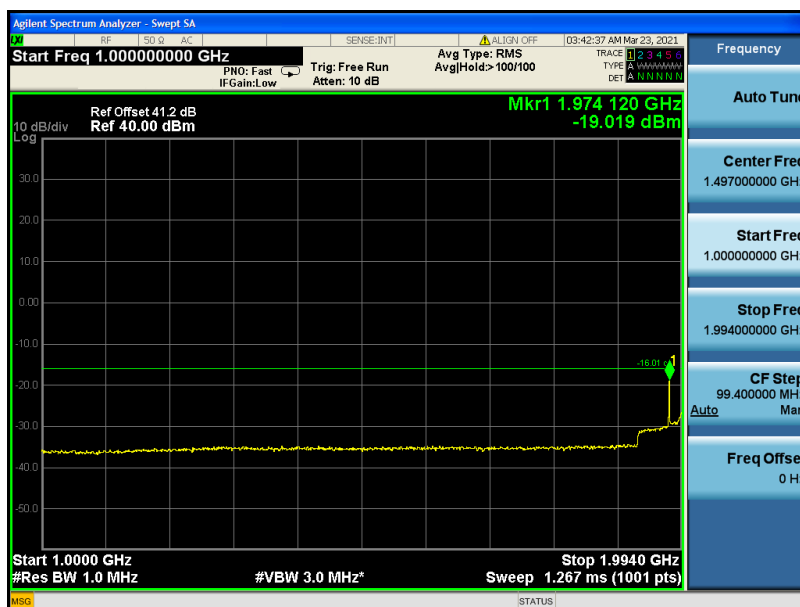
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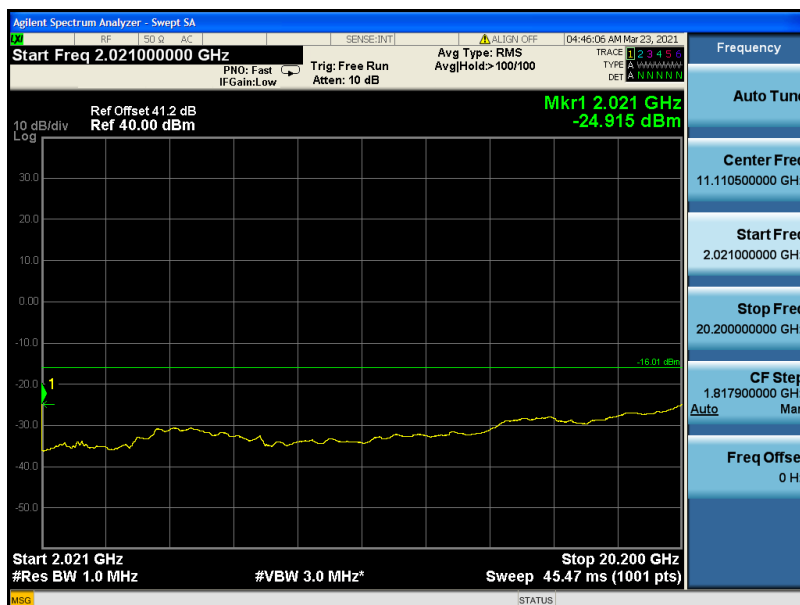
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DL_1S_B_GSM_Pre-AGC_Spurious emission 2



DL_1S_B_GSM_Pre-AGC_Spurious emission 3



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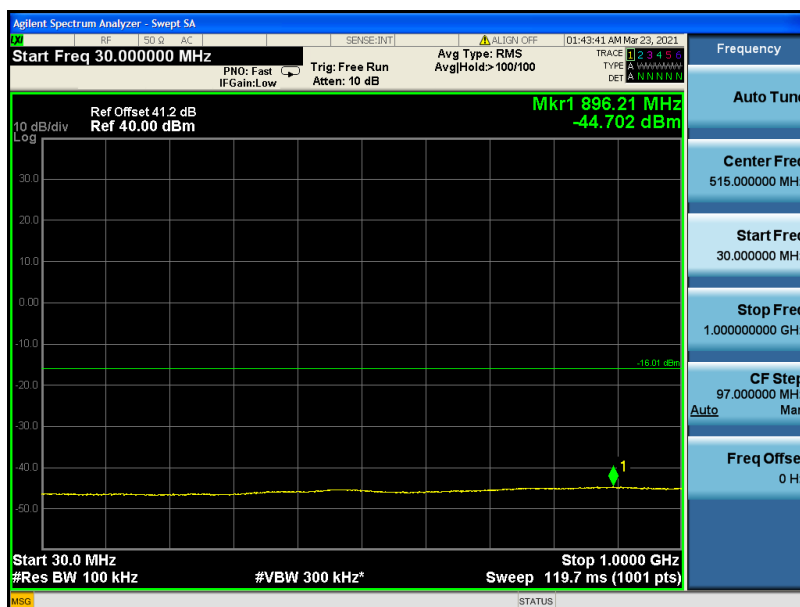
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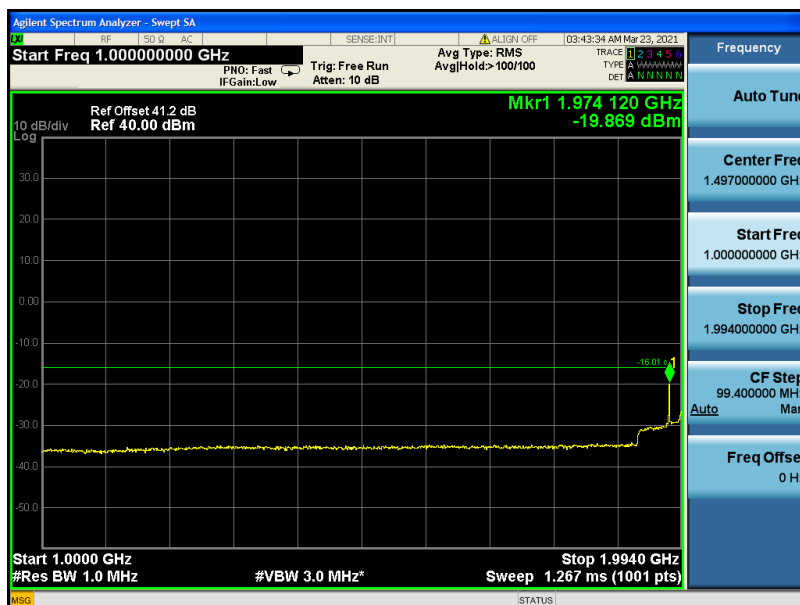
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DL_1S_M_GSM_Pre-AGC_Spurious emission 1



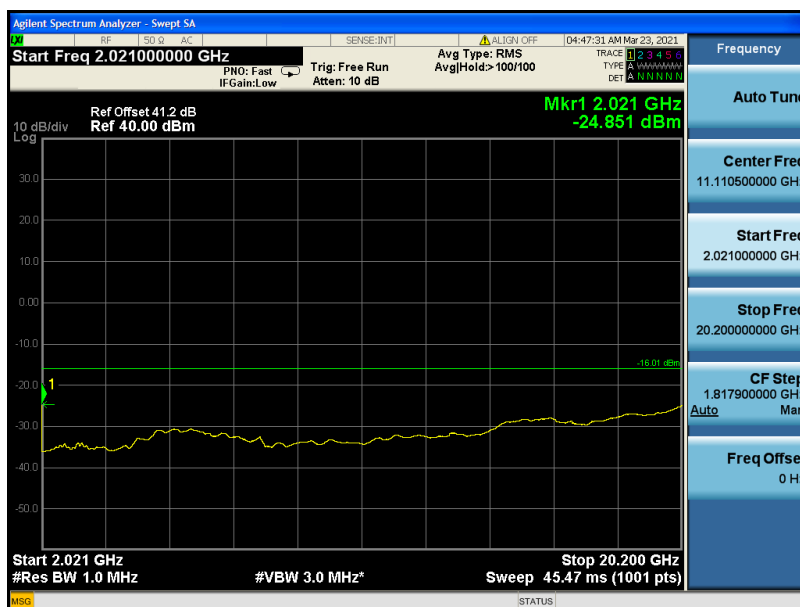
DL_1S_M_GSM_Pre-AGC_Spurious emission 2



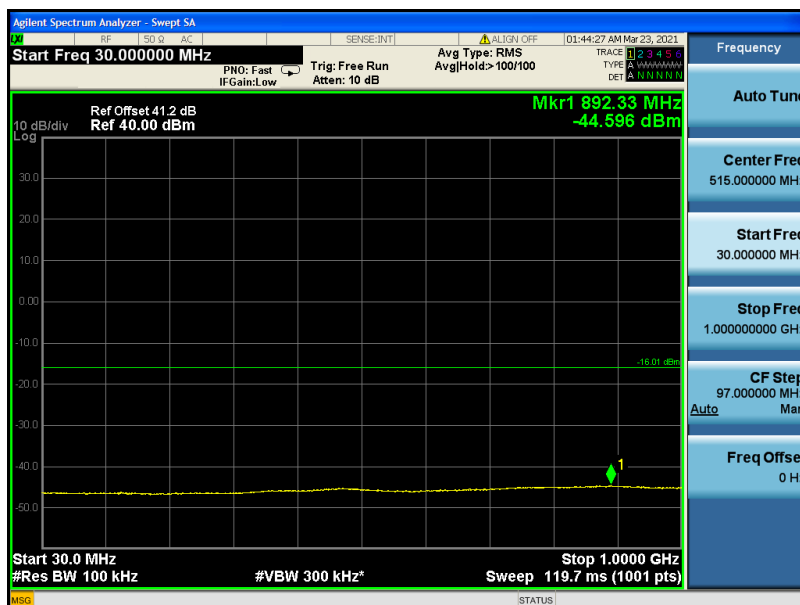
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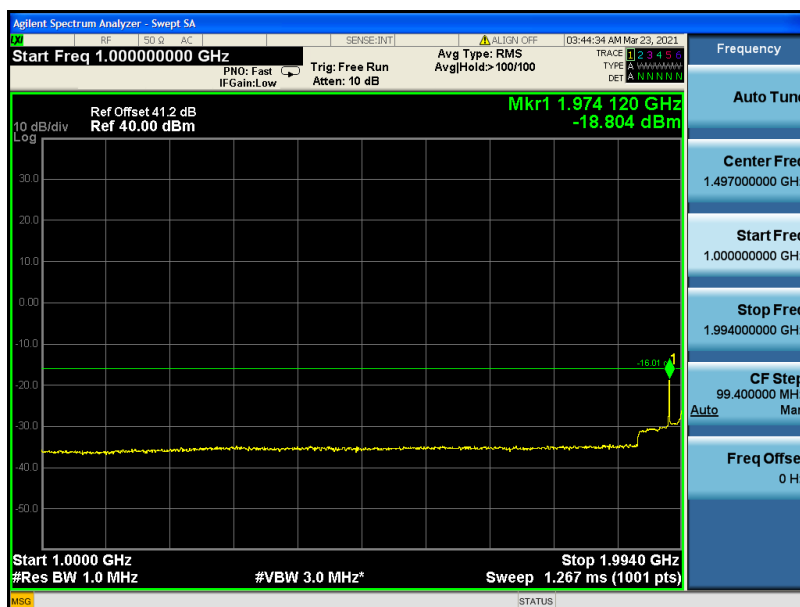
DL_1S_M_GSM_Pre-AGC_Spurious emission 3



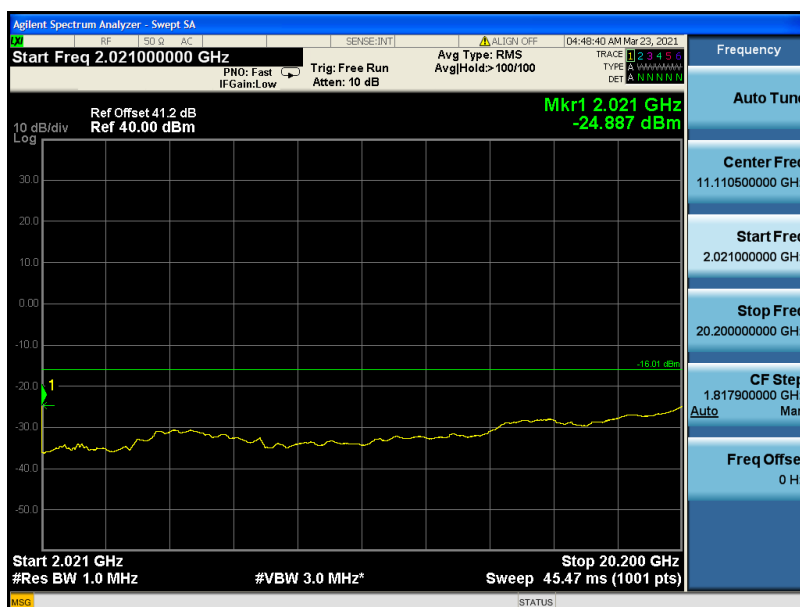
DL_1S_T_GSM_Pre-AGC_Spurious emission 1



DL_1S_T_GSM_Pre-AGC_Spurious emission 2



DL_1S_T_GSM_Pre-AGC_Spurious emission 3



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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 AC 110V.
 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.
 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.

Frequency stability vs temperature				
Temperature (°C)	Test Conf.	Test data (MHz)	Tolerance (ppm)	Verdict
50	DL_1S_M_AWGN	2007.502031	0.25	PASS
40		2007.501836	0.15	PASS
30		2007.501123	-0.21	PASS
20		2007.501535	Reference	PASS
10		2007.501653	0.06	PASS
0		2007.503023	0.07	PASS
-10		2007.501023	-0.25	PASS
-20		2007.500534	-0.05	PASS
-30		2007.502594	0.52	PASS

Frequency stability vs voltage				
Voltage (V)	Test Conf.	Test data (MHz)	Tolerance (ppm)	Verdict
AC 93.5	DL_1S_M_AWGN	2007.501976	0.22	PASS
AC 110		2007.501535	Reference	PASS
AC 126.5		2007.500753	-0.39	PASS



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2.6 Radiated spurious emissions

Note: 1. The tested max conducted power for single antenna port is 43.06dBm, the 2x2 MIMO total power is 43.06dBm+43.06dBm=40.46W, the power of any emission must be reduced below the mean output power (P) by at least $43 + 10\log(P)$ dB

Here,

$P=40.46W$.

So the limit =

$P(dBm) - [43 + 10 \log(40.46W)] = -13dBm$

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.

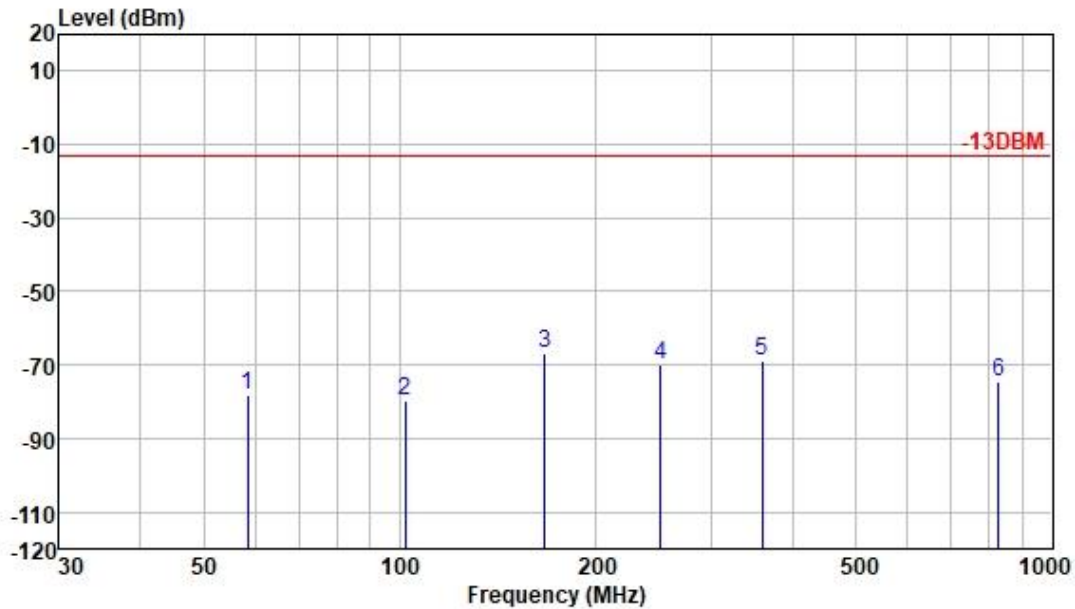
3. The disturbance from 9kHz to 30MHz was very low and 20db below the limit, therefore, the data was not recorded in the report.



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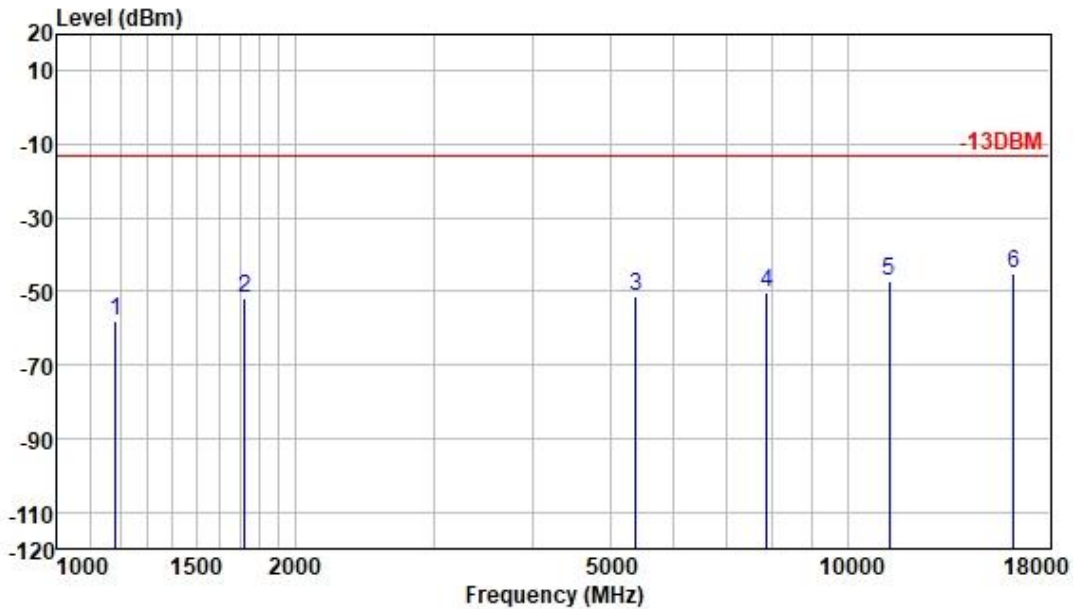
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DL_1S_M_AWGN_Horizontal_30MHz~1GHz



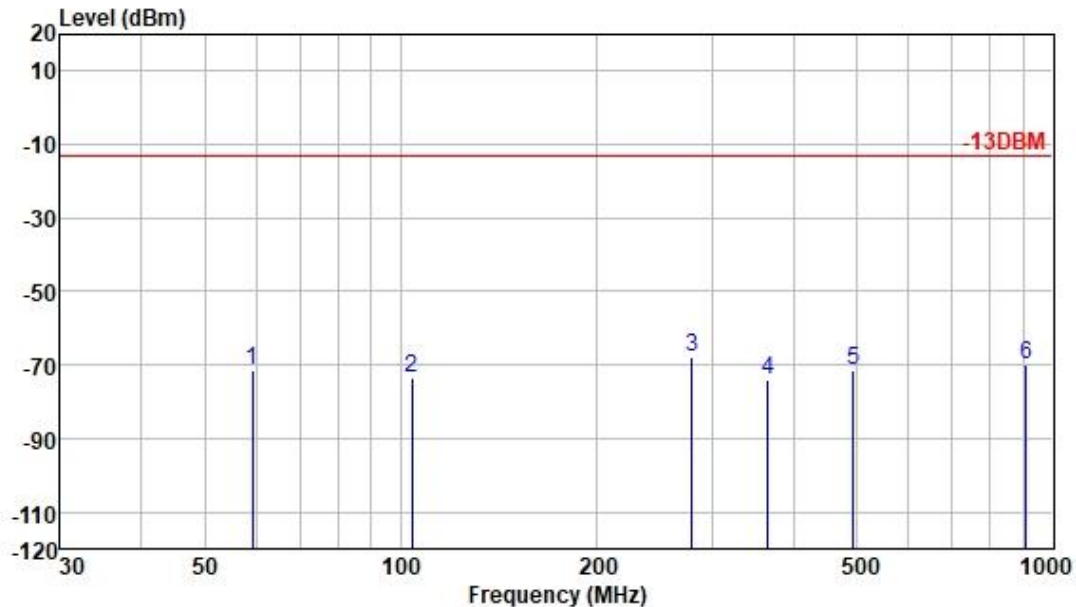
	Freq	Read Level	Correction Factor	Level	Limit Line	Over Limit	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	58.41	-75.91	-2.40	-78.31	-12.99	-65.32	HORIZONTAL
2	101.64	-69.90	-9.56	-79.46	-12.99	-66.47	HORIZONTAL
3	166.65	-60.67	-6.26	-66.93	-12.99	-53.94	HORIZONTAL
4	251.18	-64.80	-5.32	-70.12	-12.99	-57.13	HORIZONTAL
5	359.19	-67.64	-1.33	-68.97	-12.99	-55.98	HORIZONTAL
6	827.49	-81.52	7.09	-74.43	-12.99	-61.44	HORIZONTAL

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	1185.94	-60.92	2.93	-57.99	-12.99	-45.00	HORIZONTAL
2	1726.82	-57.82	6.24	-51.58	-12.99	-38.59	HORIZONTAL
3	5392.92	-64.18	12.96	-51.22	-12.99	-38.23	HORIZONTAL
4	7898.05	-63.96	13.86	-50.10	-12.99	-37.11	HORIZONTAL
5	11269.86	-69.06	22.05	-47.01	-12.99	-34.02	HORIZONTAL
6	16174.37	-68.17	23.09	-45.08	-12.99	-32.09	HORIZONTAL

DL_1S_M_AWGN_Vertical_30MHz~1GHz



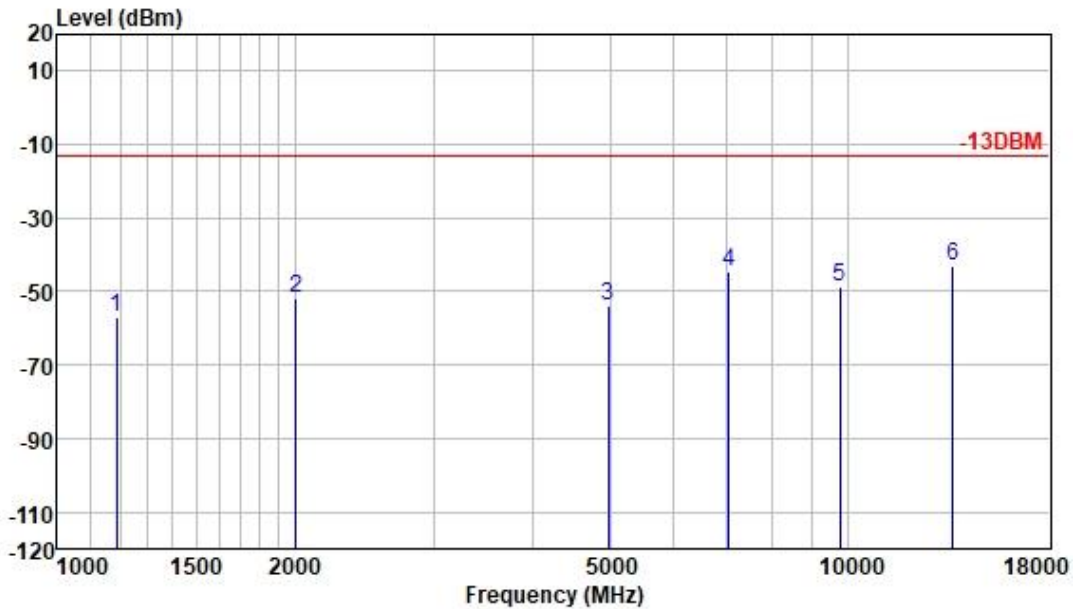
	Freq	Read	Correction	Limit	Over	
	MHz	Level	Factor	Line	Limit	Pol/Phase
		dBm	dB	dBm	dB	
1	59.23	-69.28	-2.32	-71.60	-12.99	VERTICAL
2	103.81	-68.71	-4.97	-73.68	-12.99	VERTICAL
3	279.04	-64.92	-2.76	-67.68	-12.99	VERTICAL
4	365.54	-72.46	-1.67	-74.13	-12.99	VERTICAL
5	494.20	-73.28	1.92	-71.36	-12.99	VERTICAL
6	909.67	-79.53	9.69	-69.84	-12.99	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	1189.37	-60.40	3.18	-57.22	-12.99	-44.23	VERTICAL
2	2001.08	-60.61	8.61	-52.00	-12.99	-39.01	VERTICAL
3	4973.66	-63.64	9.92	-53.72	-12.99	-40.73	VERTICAL
4	7056.09	-64.62	19.89	-44.73	-12.99	-31.74	VERTICAL
5	9753.37	-67.30	18.61	-48.69	-12.99	-35.70	VERTICAL
6	13559.88	-69.49	26.46	-43.03	-12.99	-30.04	VERTICAL

--End of Appendix -