

Appendix -

Test Data and Result for report

GZCR230300024902 (A)

(For copied data)





SGS-CSTC Standards Technical Services Co., Ltd. Guangzhou Branch

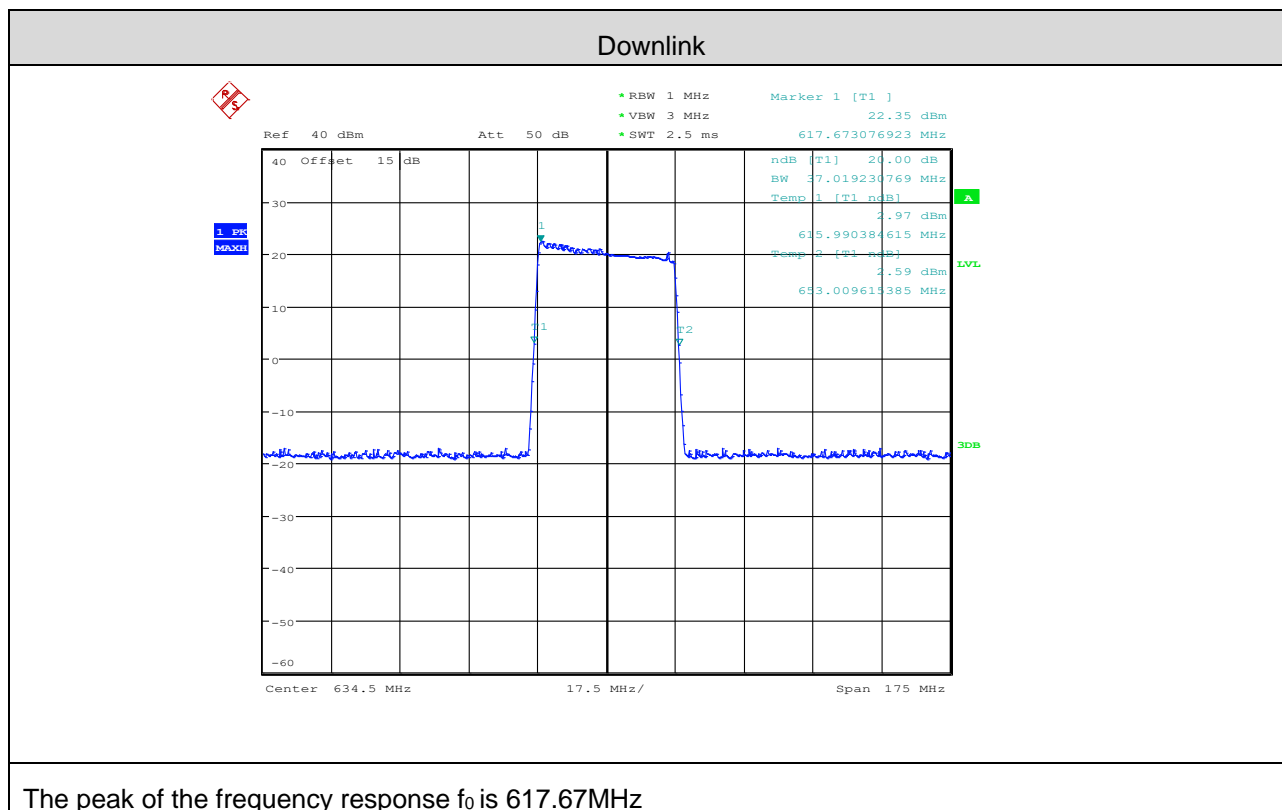
Page: 2 of 148

1 600MHz Service (663-698MHz paired with 617-652MHz)

1.1 AGC threshold level

Test Conf.	AGC Threshold level
DL_1S_M_AWGN	0.18dBm
DL_1S_M_GSM	0.13dBm

1.2 Out-of-band rejection



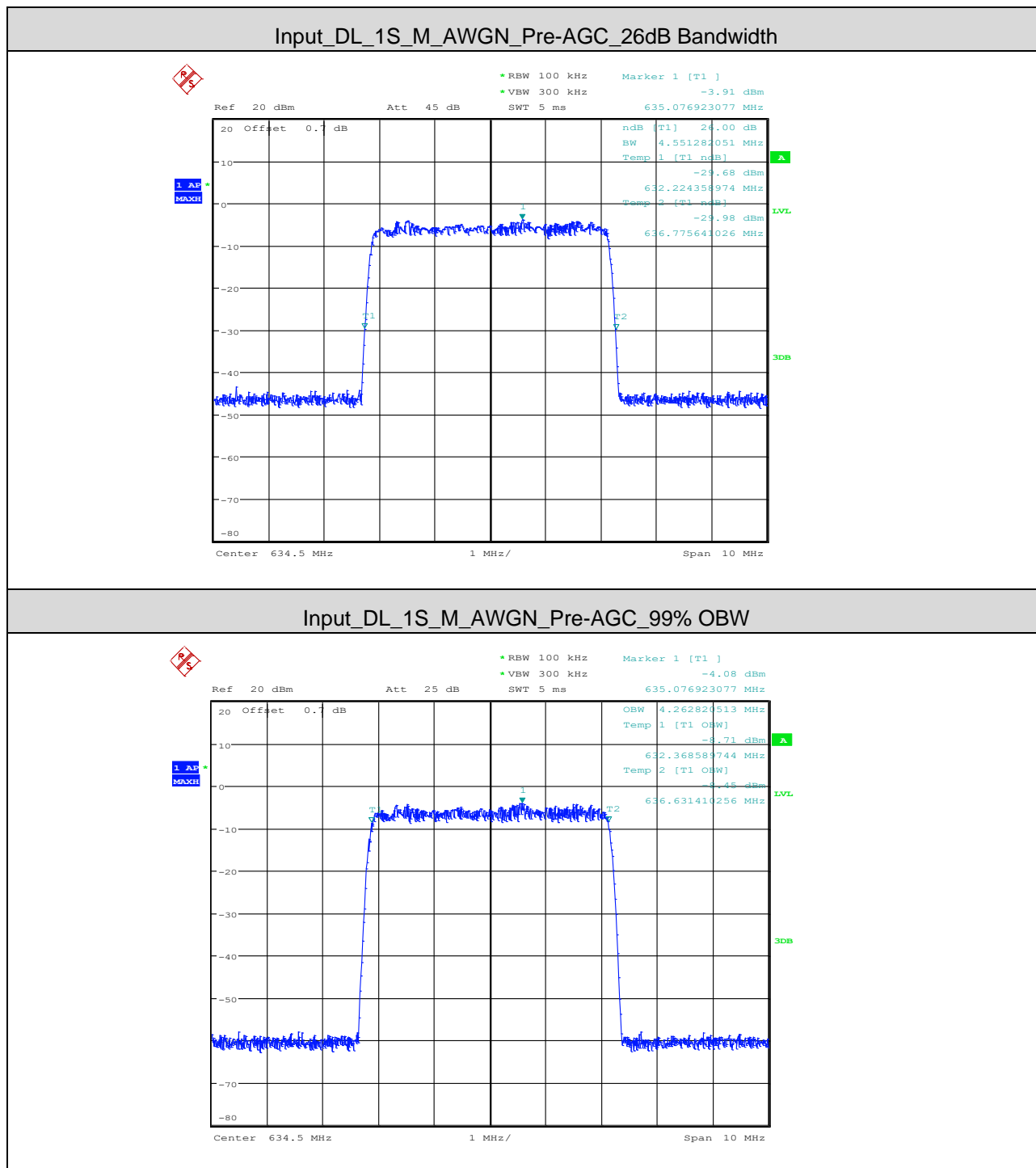
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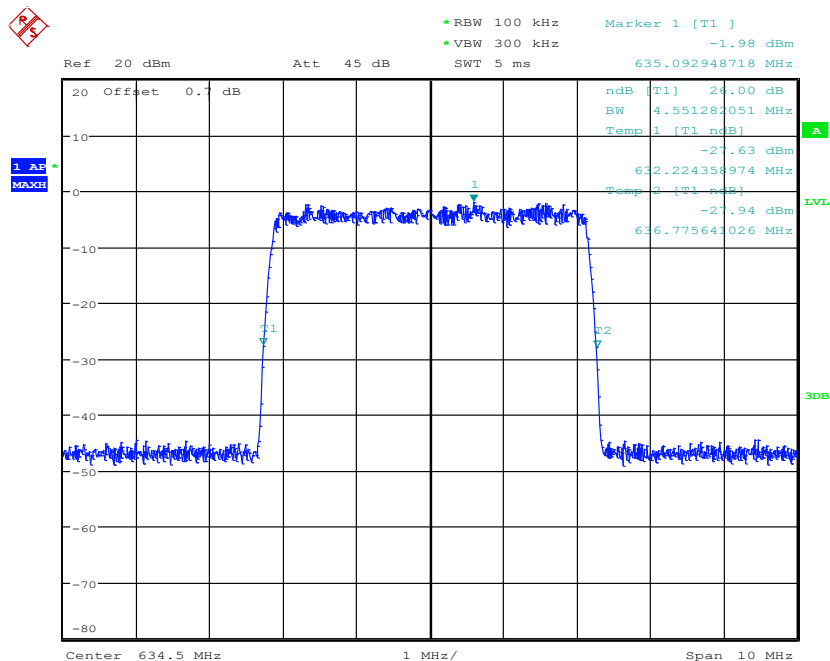
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Guangzhou Branch Test Service EEC Laboratory. 中国·广州·经济技术开发区科学城科珠路198号 邮编: 510663 t (86-20) 82155555 f (86-20) 82075058 sgs.china@sgs.com

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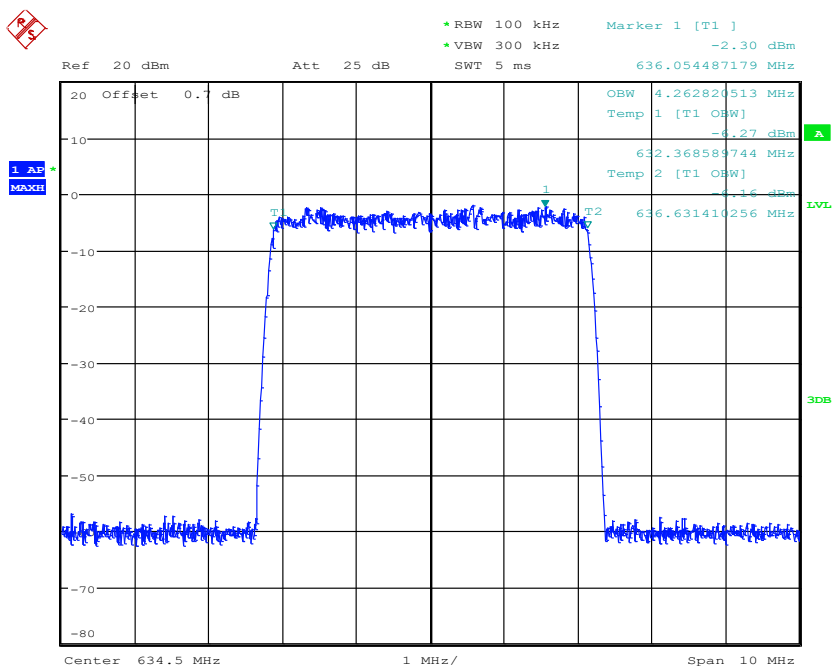
1.3 Input-versus-output signal comparison



Input_DL_1S_M_AWGN_AGC+3dB_26dB Bandwidth



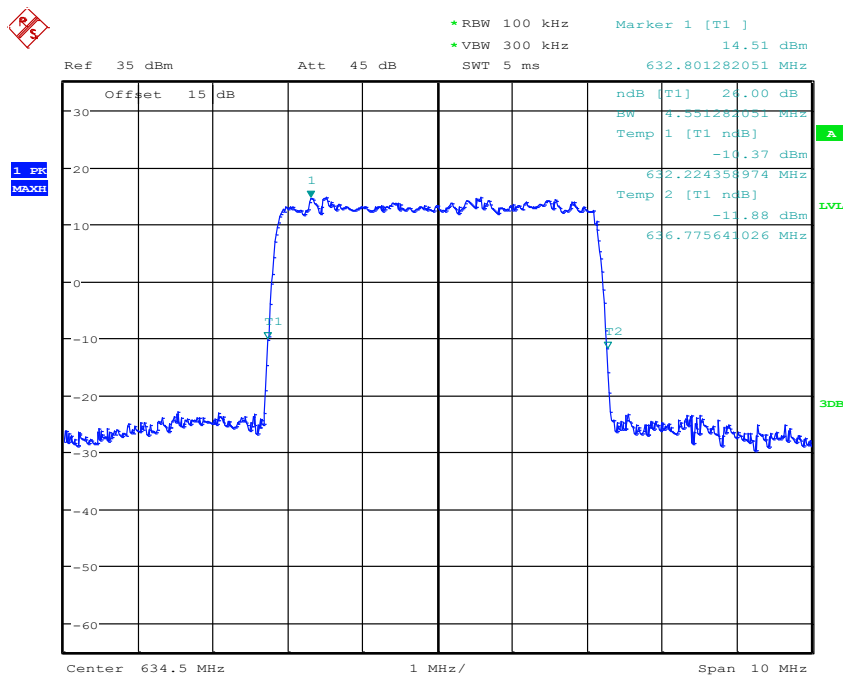
Input_DL_1S_M_AWGN_AGC+3dB_99% OBW



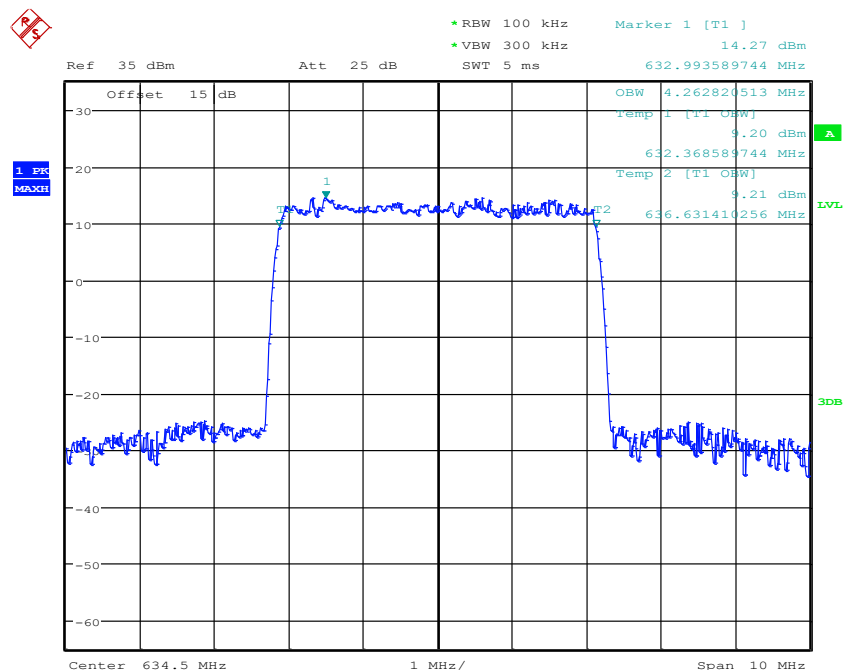
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Output_DL_1S_M_AWGN_Pre-AGC_26dB Bandwidth



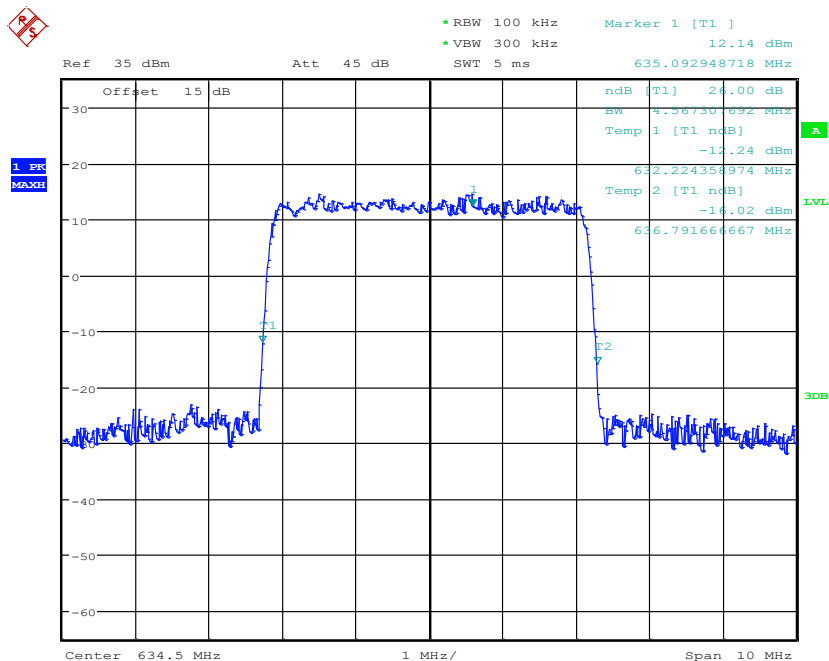
Output_DL_1S_M_AWGN_Pre-AGC_99% OBW



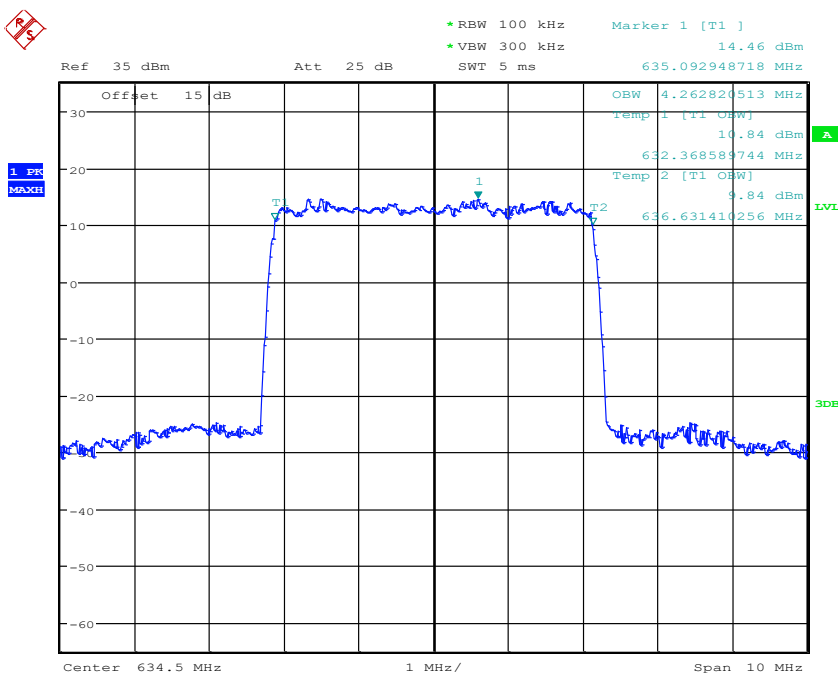
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Output_DL_1S_M_AWGN_AGC+3dB_26dB Bandwidth



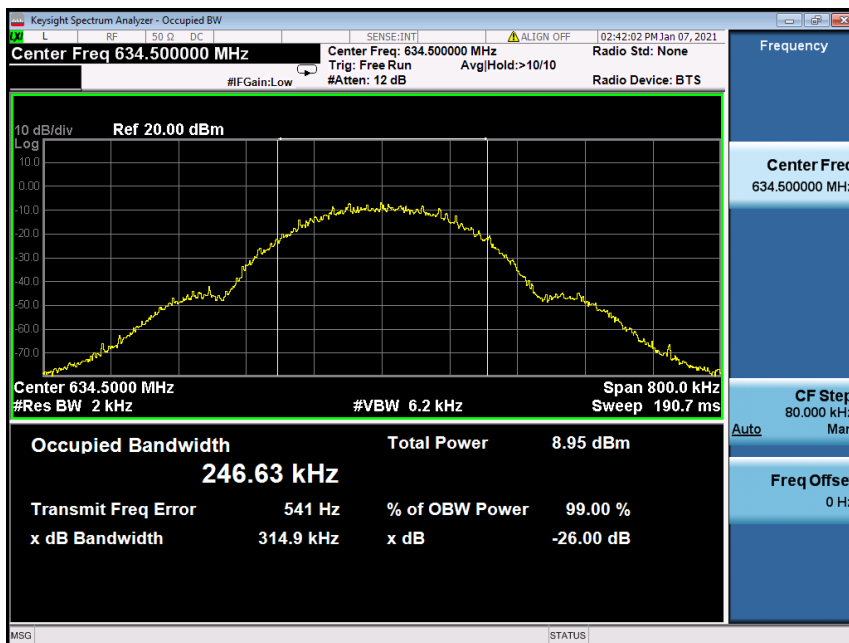
Output_DL_1S_M_AWGN_AGC+3dB_99% OBW



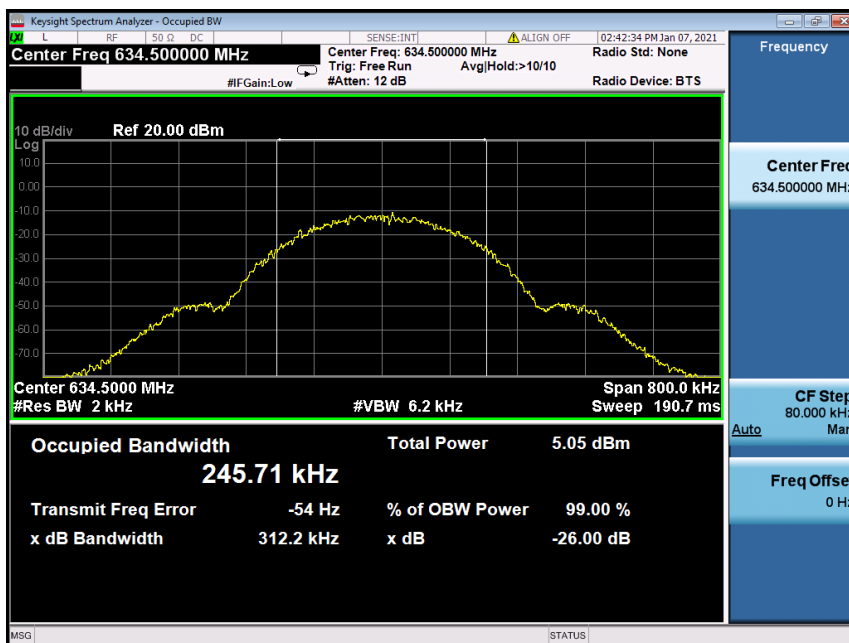
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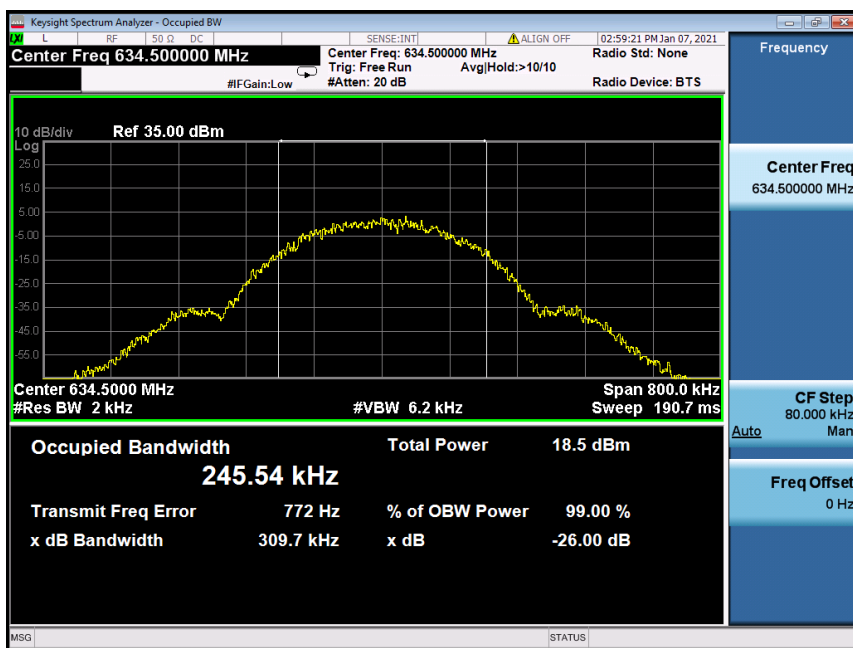
Input_DL_1S_M_GSM_Pre-AGC_26dB Bandwidth & 99% OBW



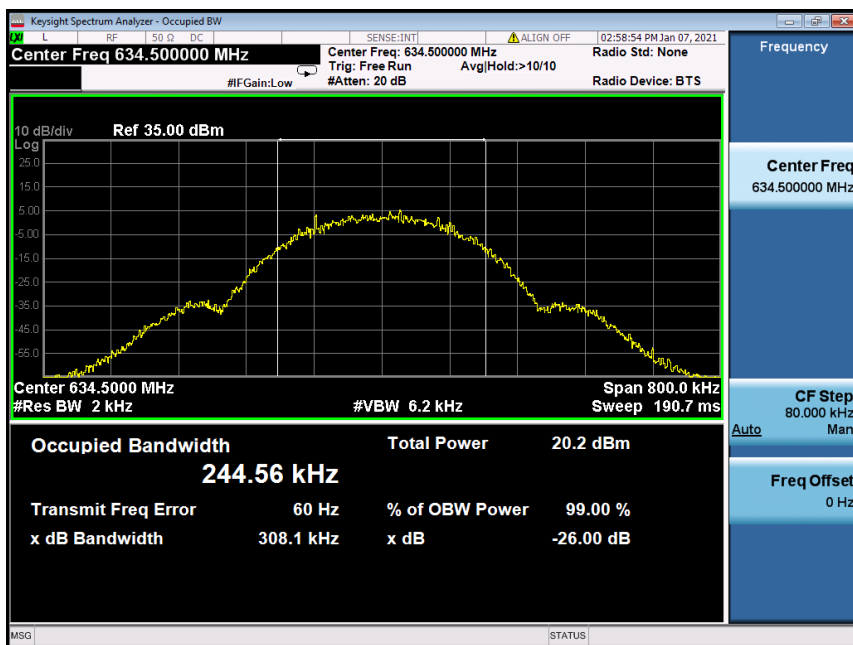
Input_DL_1S_M_GSM_AGC+3dB_26dB Bandwidth & 99% OBW



Output_DL_1S_M_GSM_Pre-AGC_26dB Bandwidth & 99% OBW



Output_DL_1S_M_GSM_AGC+3dB_26dB Bandwidth & 99% 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.



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
DL_1S_AWGN	617.67	Pre-AGC	0.14	20.22	20.08	PASS
		AGC+3dB	3.14	20.17	/	PASS
DL_1S_GSM	617.67	Pre-AGC	0.14	20.16	20.02	PASS
		AGC+3dB	3.14	20.02	/	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 (NANT) dBi = 12.5dBi+10log (2) dBi= 15.5dBi.

ERP= EIRP-2.15dB

The total maximum ERP for the EUT is (20.22dBm+20.22dBm) +15.5dBi-2.15dB=36.58dBm (4.549W) which don't exceed the required ERP limit (1000W/MHz).

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 20.22dBm, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB.

Here,

P=20.22dBm= 0.1052W.

So the limit =

P(dBm)- [43 + 10 log (0.1052W)] =20.22dBm-33.22dB=-13dBm

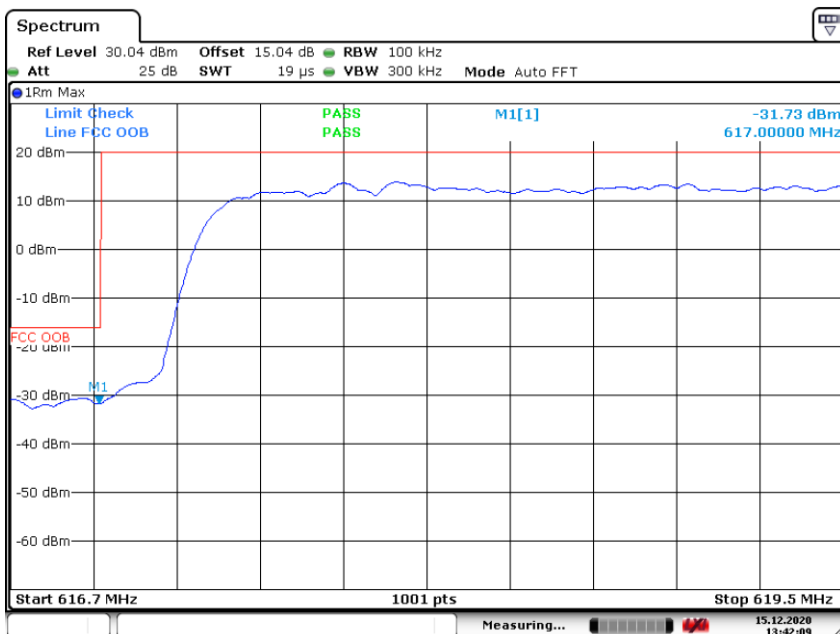
The EUT supports 2x2 MIMO and the emissions were measured at one of output port, so the limit line was set to -16.01dBm in following test plots in order to determine the test result conveniently.

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.

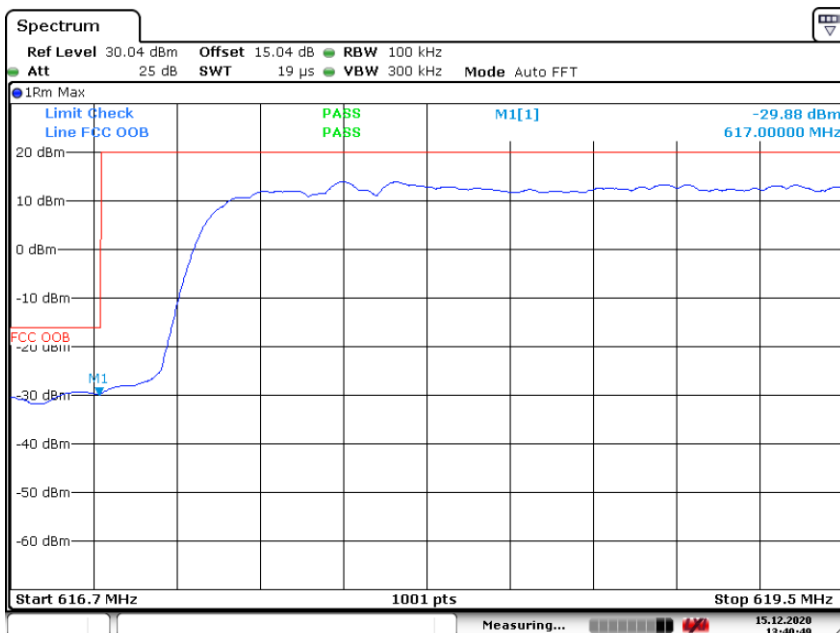


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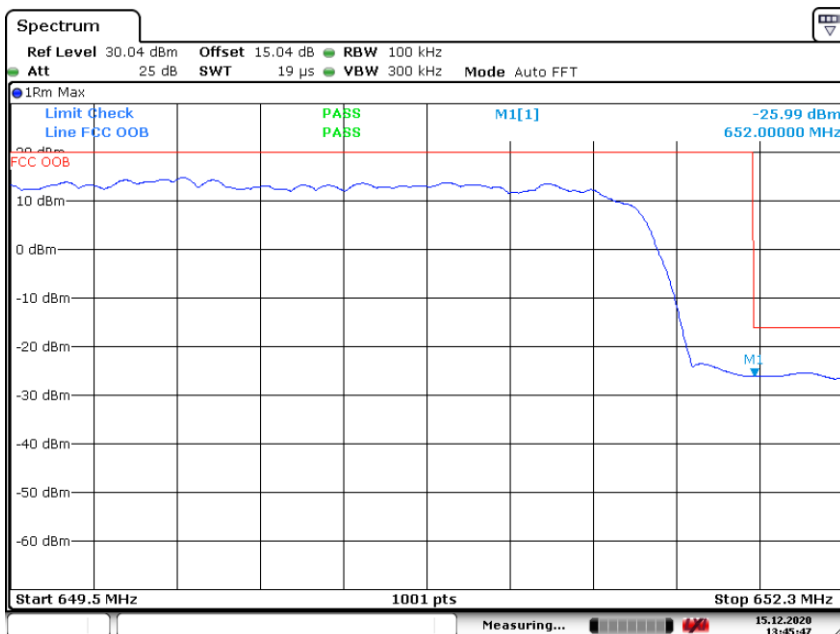
DL_1S_B_AWGN_Pre-AGC_Out-of-band emission



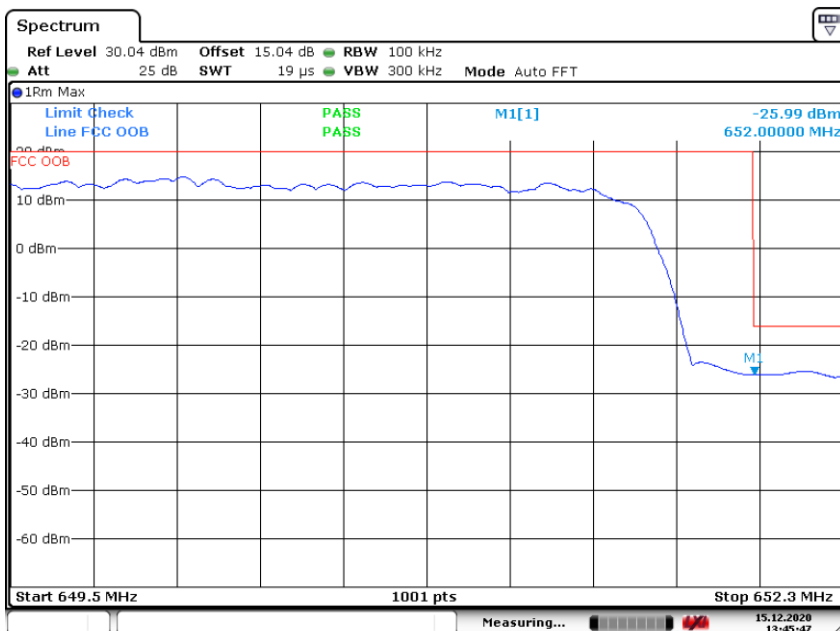
DL_1S_B_AWGN_AGC+3_Out-of-band emission



DL_1S_T_AWGN_Pre-AGC_Out-of-band emission



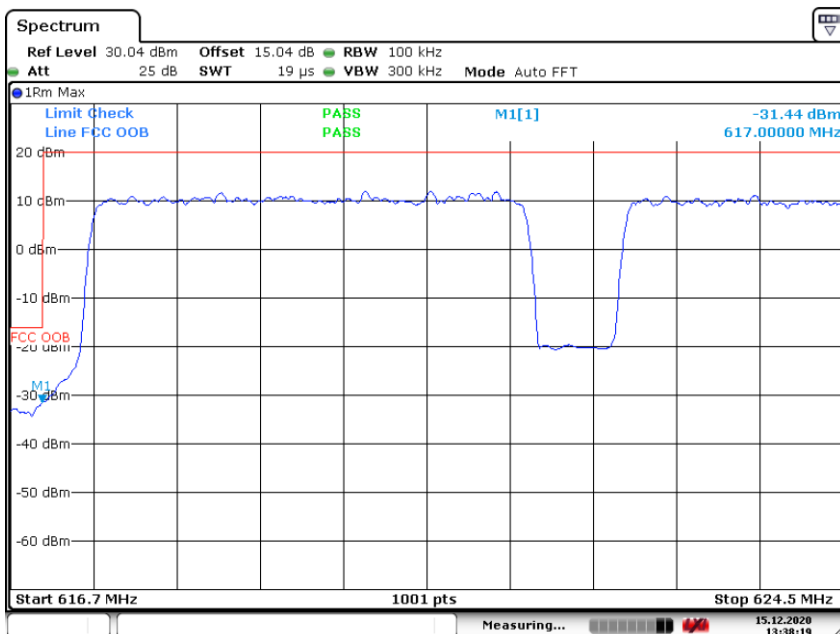
DL_1S_T_AWGN_AGC+3_Out-of-band emission



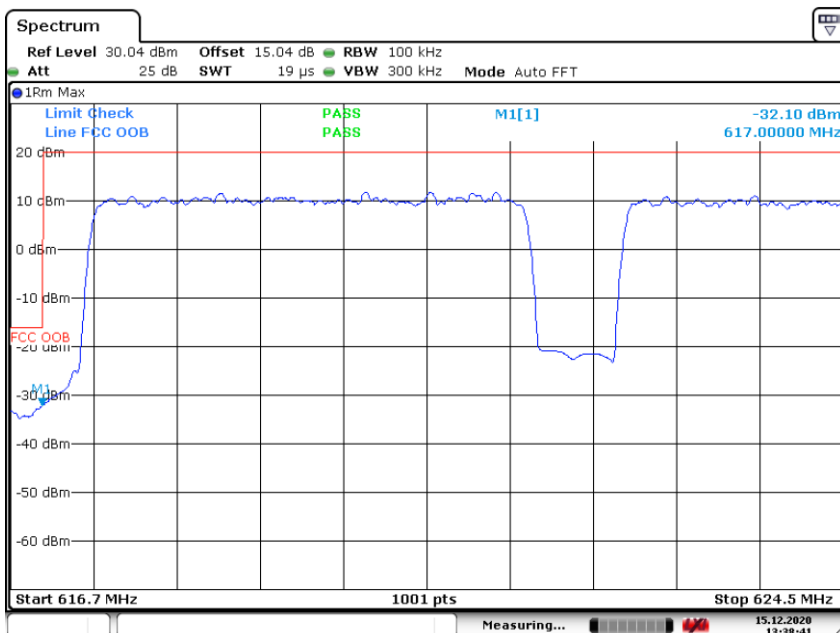
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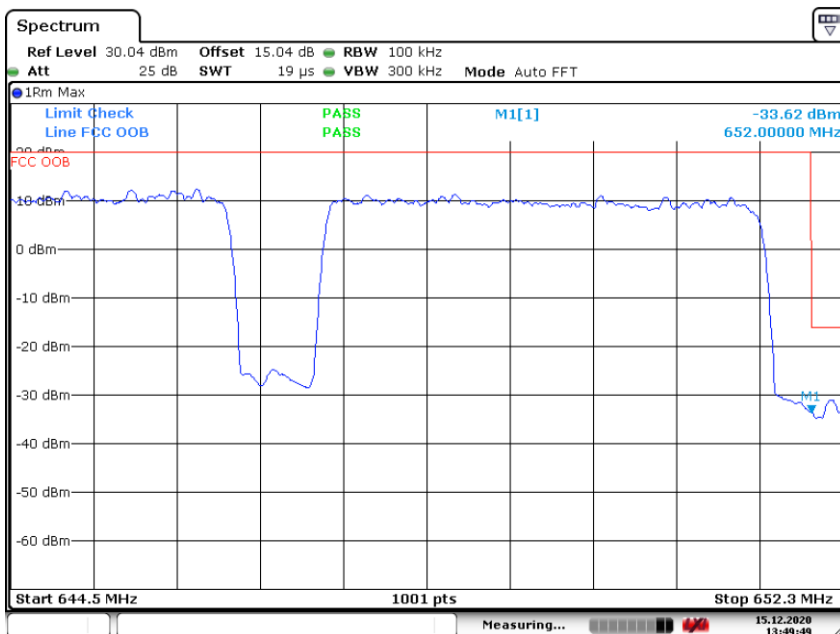
DL_2S_B_AWGN_Pre-AGC_Out-of-band emission



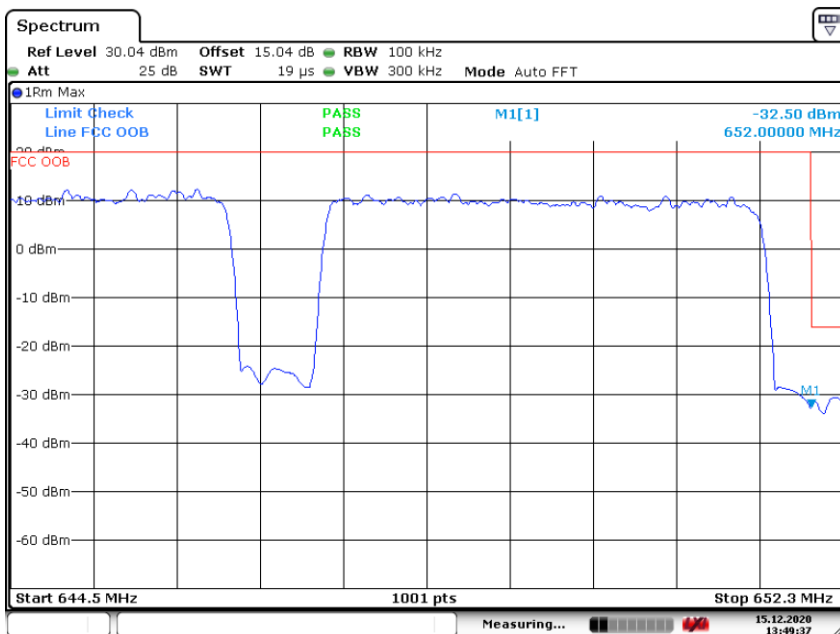
DL_2S_B_AWGN_AGC+3_Out-of-band emission



DL_2S_T_AWGN_Pre-AGC_Out-of-band emission



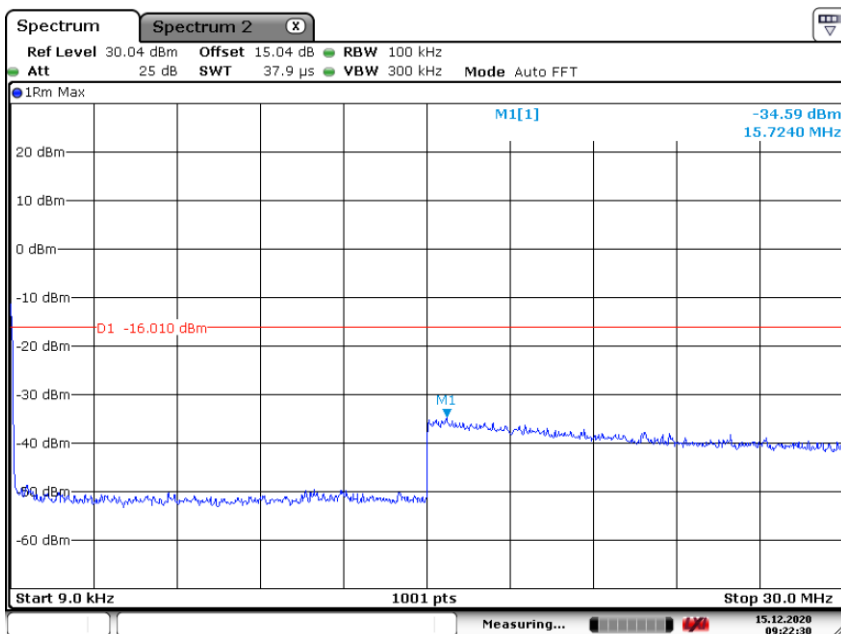
DL_2S_T_AWGN_AGC+3_Out-of-band emission



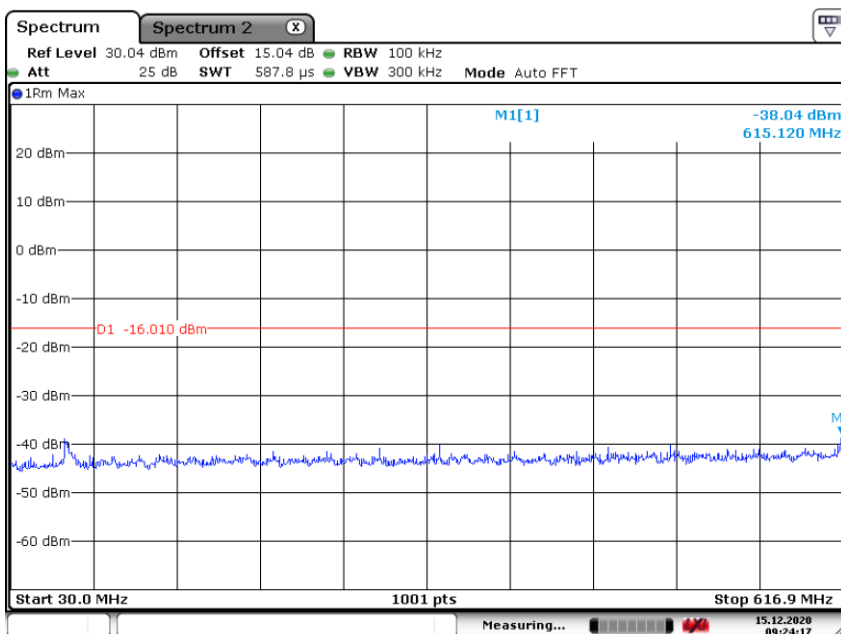
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DL_1S_B_AWGN_Pre-AGC_Spurious emission 1



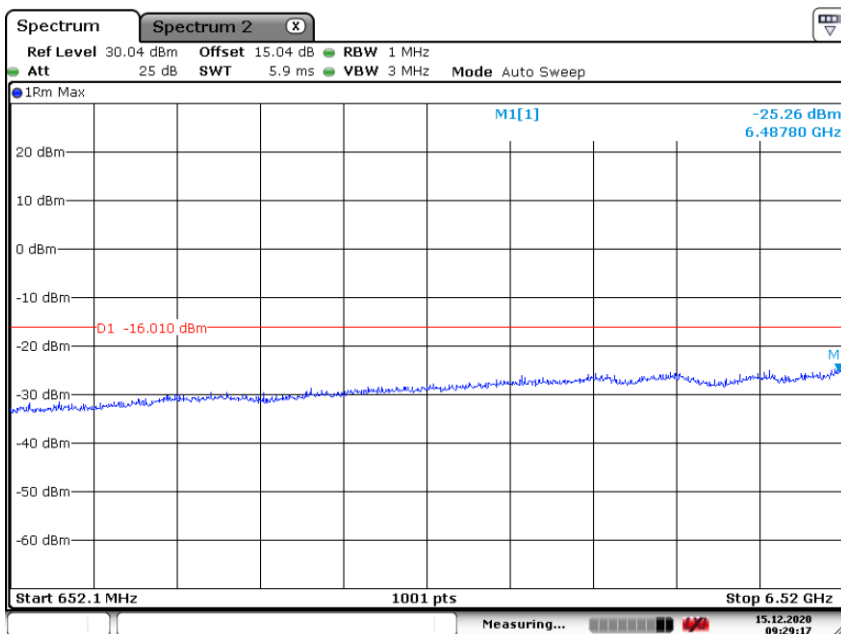
DL_1S_B_AWGN_Pre-AGC_Spurious emission 2



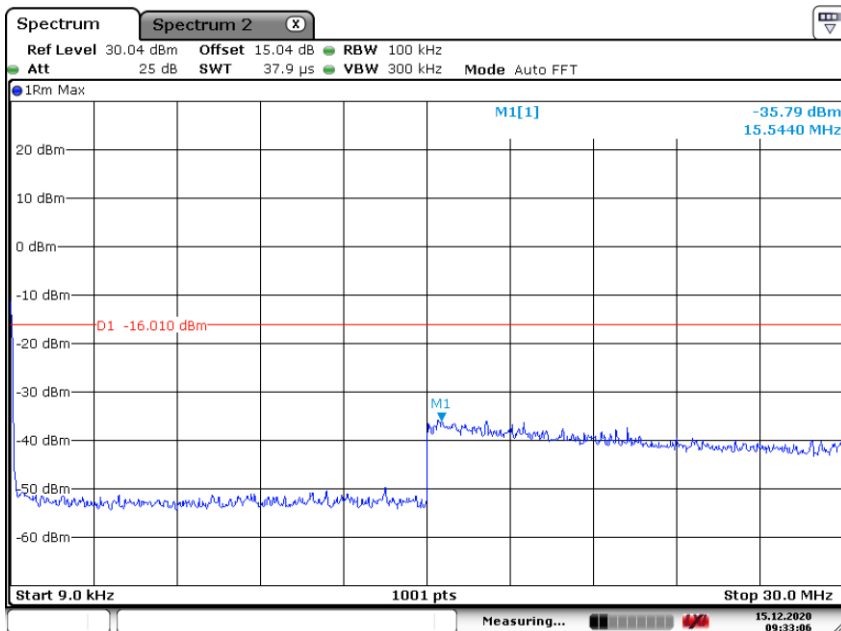
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DL_1S_B_AWGN_Pre-AGC_Spurious emission 3



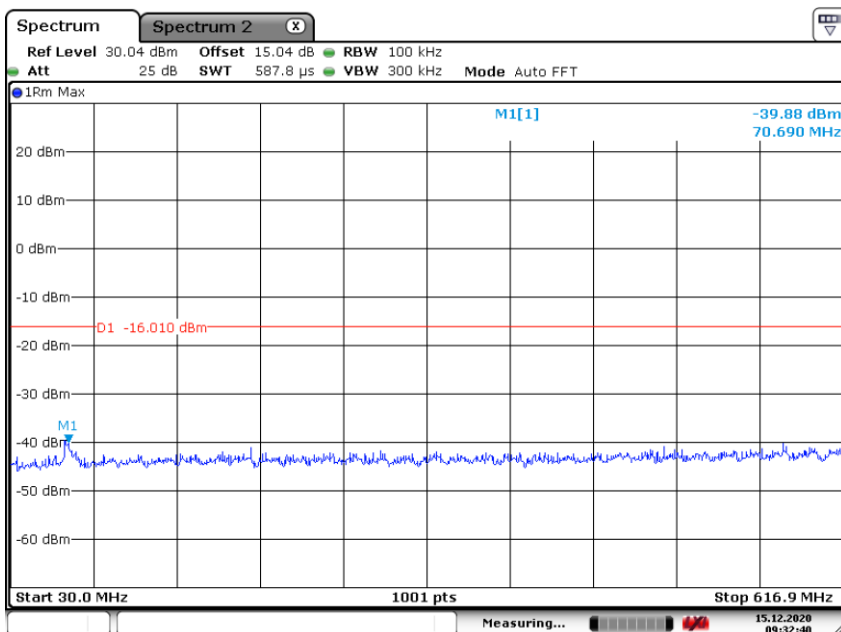
DL_1S_M_AWGN_Pre-AGC_Spurious emission 1



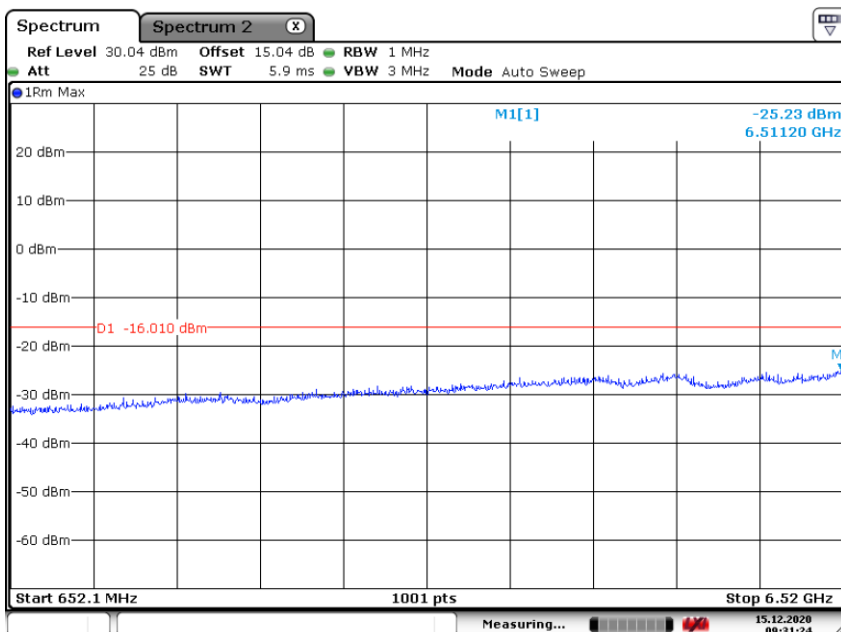
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DL_1S_M_AWGN_Pre-AGC_Spurious emission 2



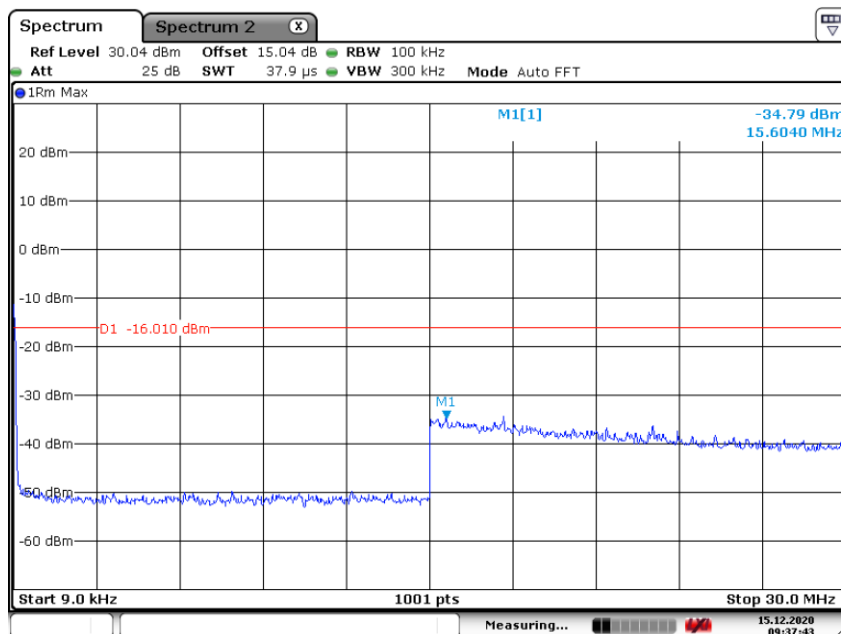
DL_1S_M_AWGN_Pre-AGC_Spurious emission 3



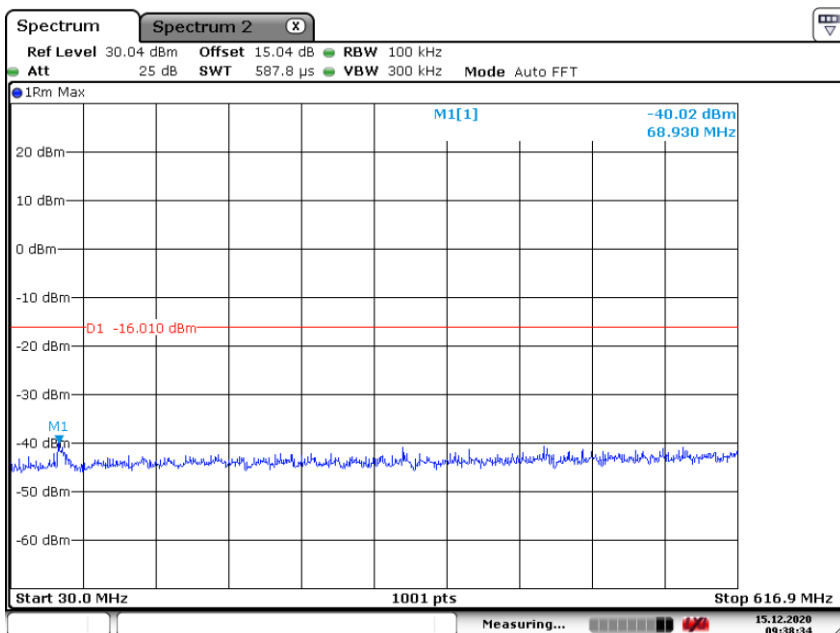
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DL_1S_T_AWGN_Pre-AGC_Spurious emission 1

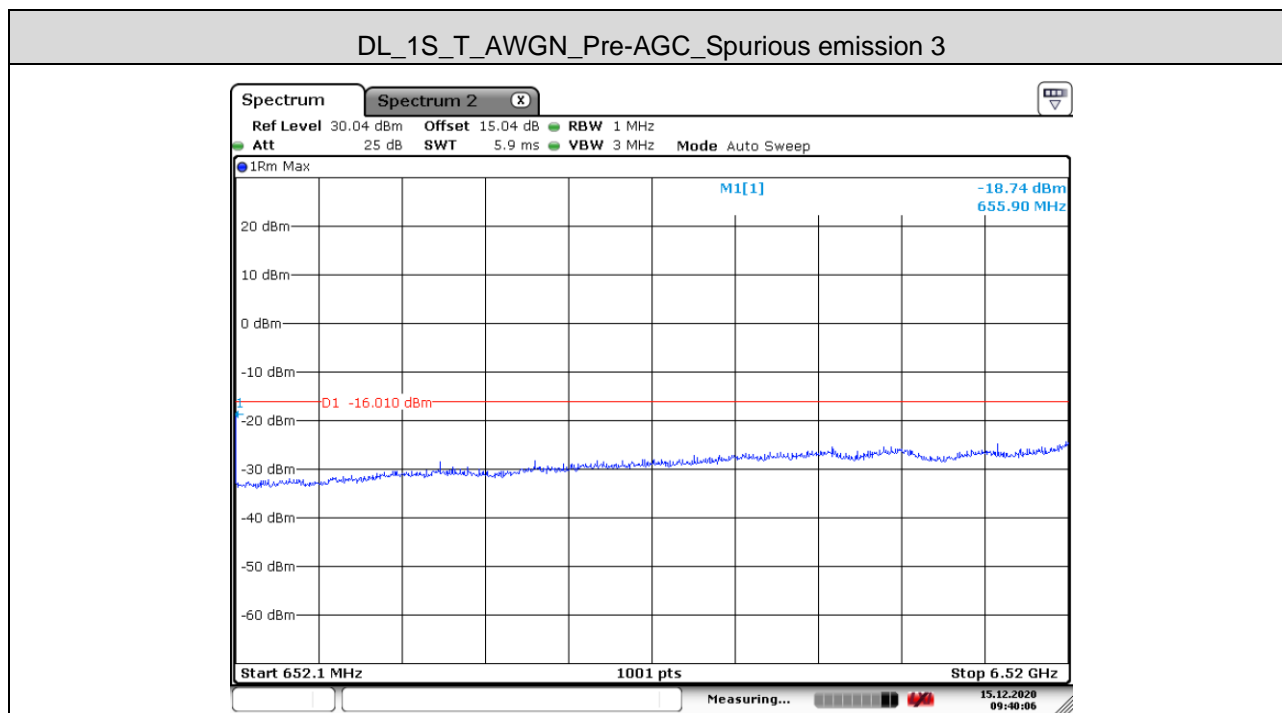


DL_1S_T_AWGN_Pre-AGC_Spurious emission 2



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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 -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	634.554894	0.17	PASS
40		634.554734	-0.08	PASS
30		634.554533	-0.39	PASS
20		634.554784	Reference	PASS
10		634.554841	0.09	PASS
0		634.554732	-0.08	PASS
-10		634.554435	-0.55	PASS
-20		634.554523	-0.41	PASS
-30		634.554548	-0.37	PASS

Frequency stability vs voltage				
Voltage (V)	Test Conf.	Test data (MHz)	Tolerance (ppm)	Verdict
DC 40.8	DL_1S_M_AWGN	634.554531	-0.24	PASS
DC 48		634.554683	Reference	PASS
DC 55.2		634.554653	-0.47	PASS



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1.7 Radiated spurious emissions

Note: 1. The tested max conducted power for single antenna port is 20.22dBm. the 2x2 MIMO total power is 20.22dBm+20.22dBm= 0.2104W.

The any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB.

Here,

$P=0.2104W$,

So the limit =

$P(dBm)- [43 + 10 \log (0.2104W)] = -13dBm$

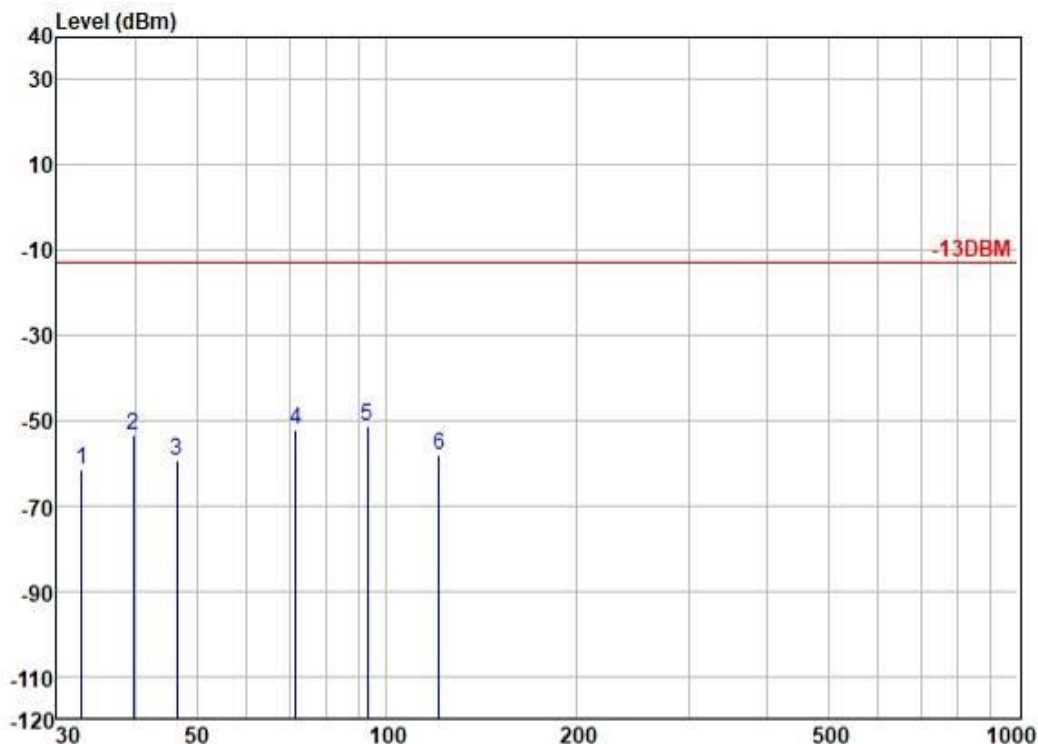
2. The radiated test performed at bottom / middle / top channel, the data with more than 20db margin, therefore, only the worst-case middle channel test data was recorded in the report.

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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DL_1S_M_AWGN_Horizontal_30MHz~1GHz



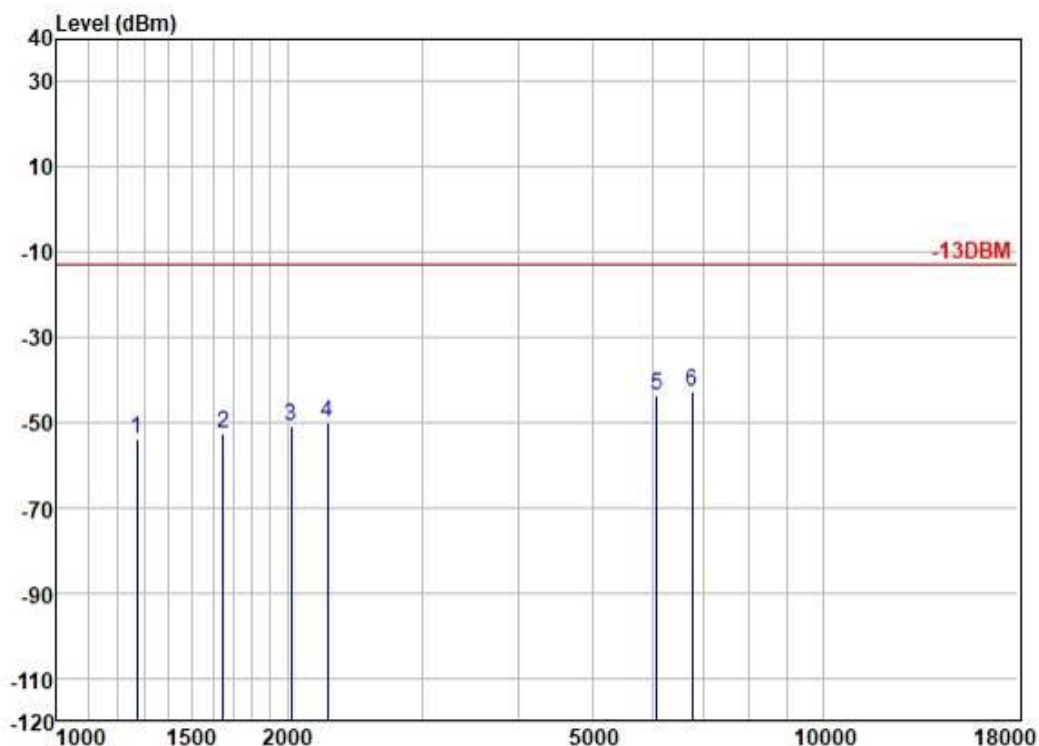
Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
32.864	-61.66	-13	-48.66	Horizontal	PASS
39.715	-53.62	-13	-40.62	Horizontal	PASS
46.503	-59.29	-13	-46.29	Horizontal	PASS
71.832	-52.11	-13	-39.11	Horizontal	PASS
93.113	-51.26	-13	-38.26	Horizontal	PASS
121.123	-58.10	-13	-45.1	Horizontal	PASS



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DL_1S_M_AWGN_Horizontal_above 1GHz



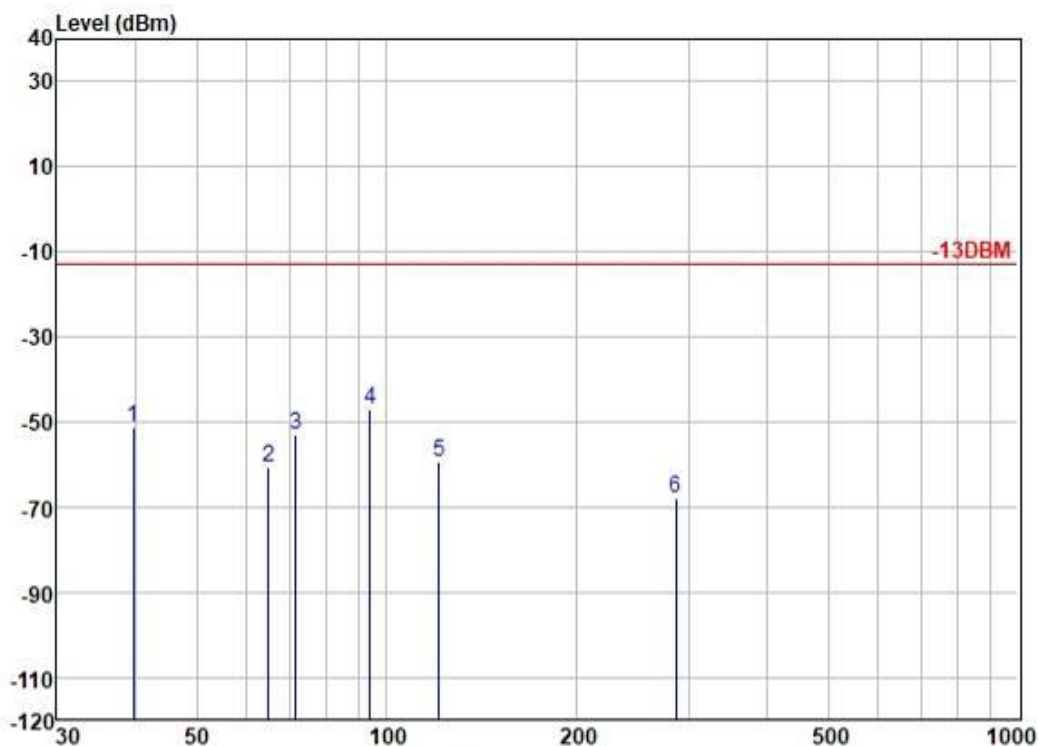
Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
1271.123	-53.97	-13	-40.97	Horizontal	PASS
1684.778	-52.69	-13	-39.69	Horizontal	PASS
2024.354	-51.01	-13	-38.01	Horizontal	PASS
2259.367	-50.11	-13	-37.11	Horizontal	PASS
6071.417	-43.46	-13	-30.46	Horizontal	PASS
6756.708	-42.70	-13	-29.7	Horizontal	PASS



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DL_1S_M_AWGN_Vertical_30MHz~1GHz



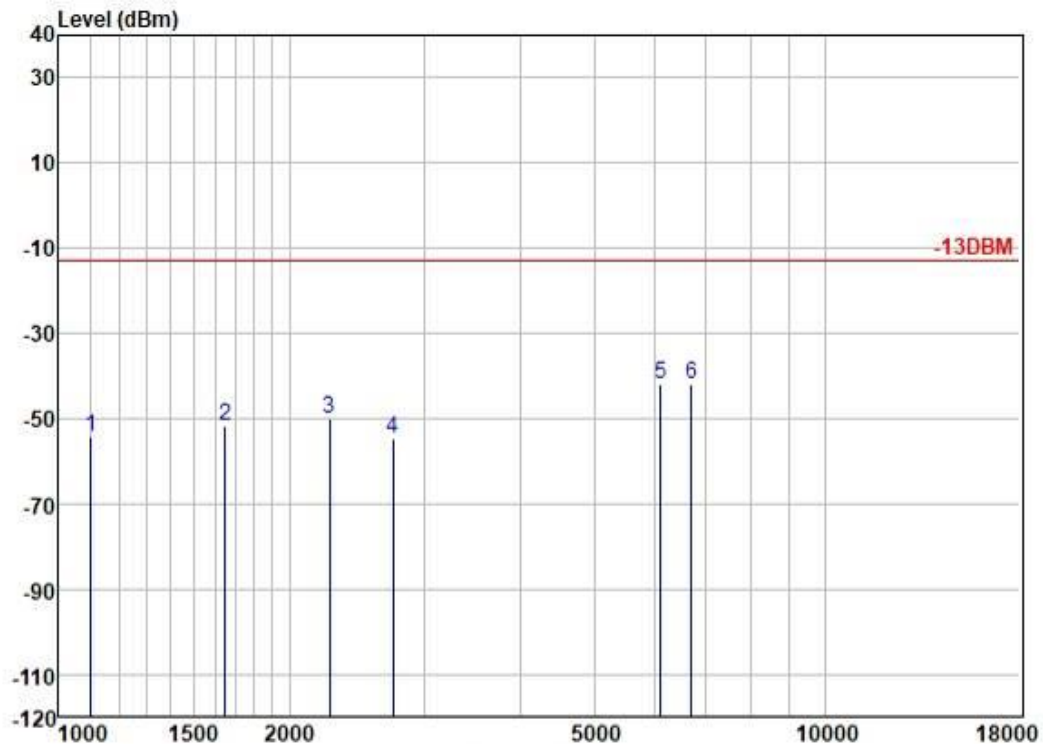
Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
39.715	-51.45	-13	-38.45	Vertical	PASS
64.887	-60.73	-13	-47.73	Vertical	PASS
71.832	-52.90	-13	-39.9	Vertical	PASS
94.098	-46.97	-13	-33.97	Vertical	PASS
121.123	-59.21	-13	-46.21	Vertical	PASS
286.982	-67.81	-13	-54.81	Vertical	PASS



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DL_1S_M_AWGN_Vertical_above 1GHz



Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
1100.079	-54.44	-13	-41.44	Vertical	PASS
1648.778	-51.73	-13	-38.73	Vertical	PASS
2259.367	-49.87	-13	-36.87	Vertical	PASS
2734.229	-54.63	-13	-41.63	Vertical	PASS
6106.616	-41.84	-13	-28.84	Vertical	PASS
6698.373	-42.02	-13	-29.02	Vertical	PASS

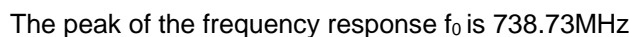


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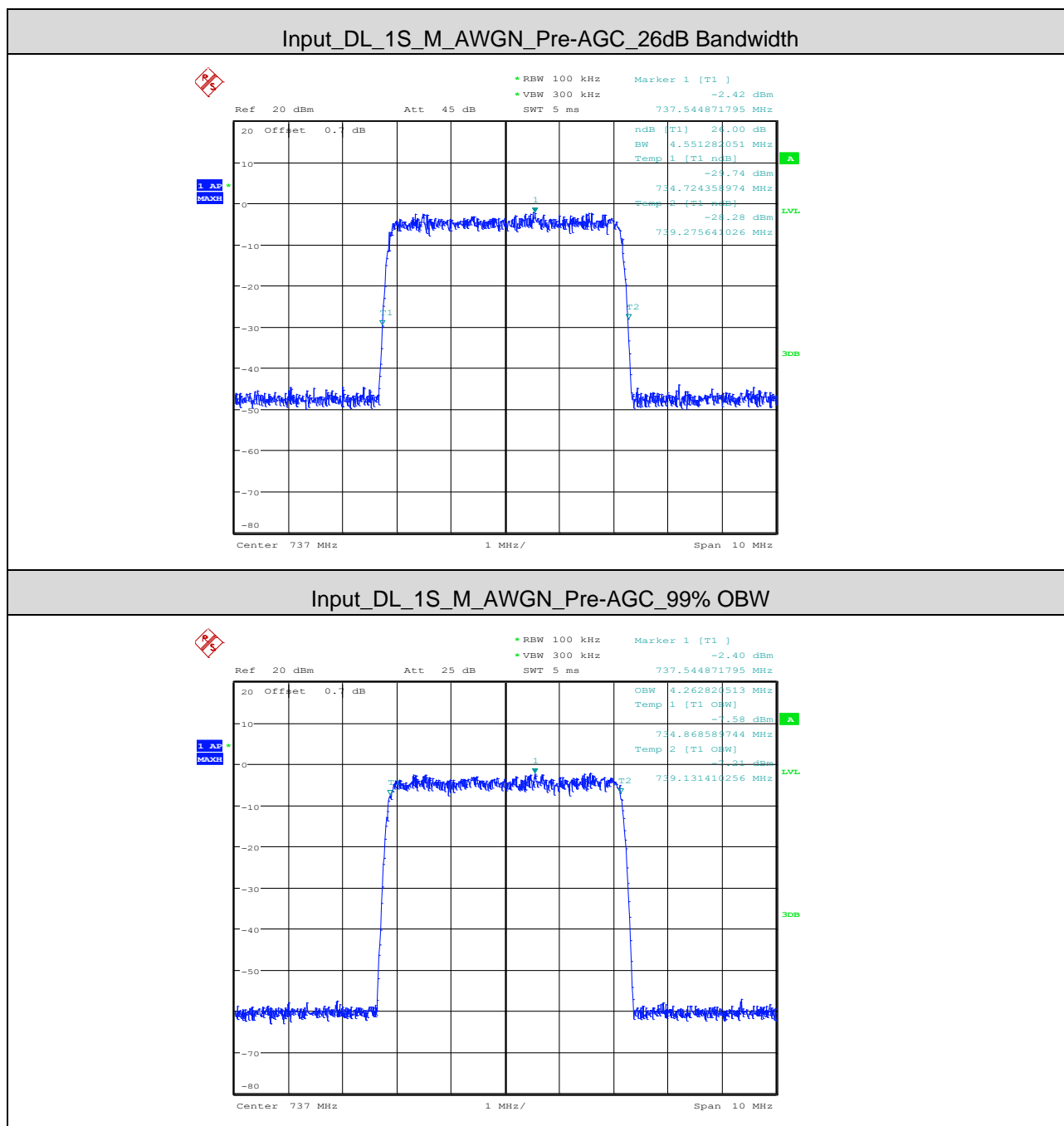
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2.1 AGC threshold level

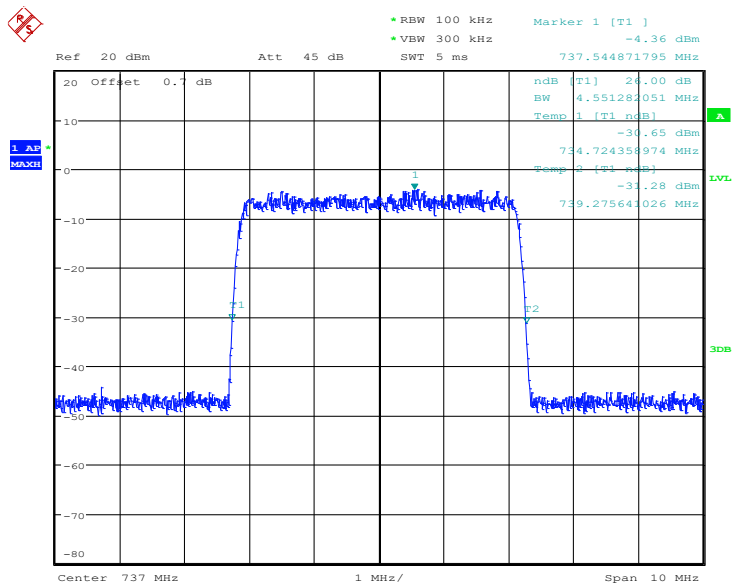
2.2 Out-of-band rejection



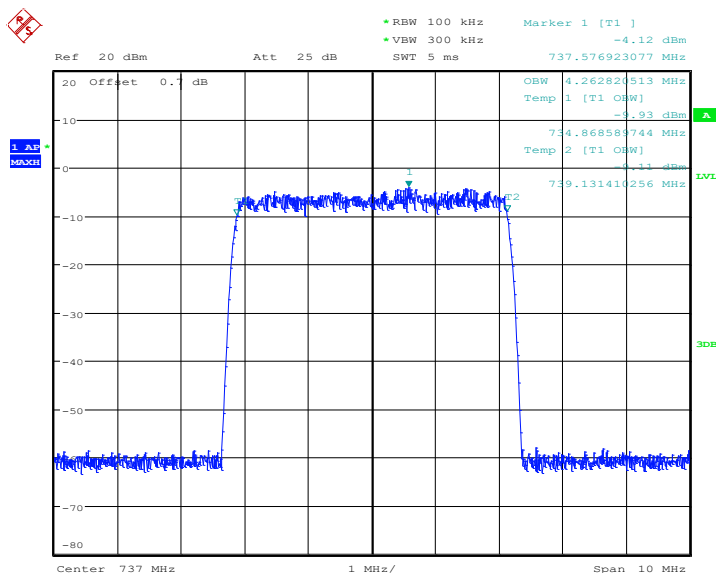
2.3 Input-versus-output signal comparison



Input_DL_1S_M_AWGN_AGC+3dB_26dB Bandwidth



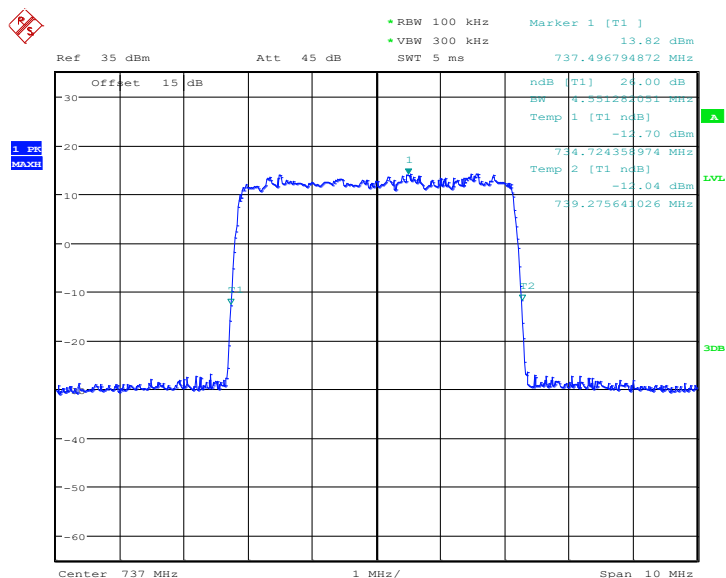
Input_DL_1S_M_AWGN_AGC+3dB_99% OBW



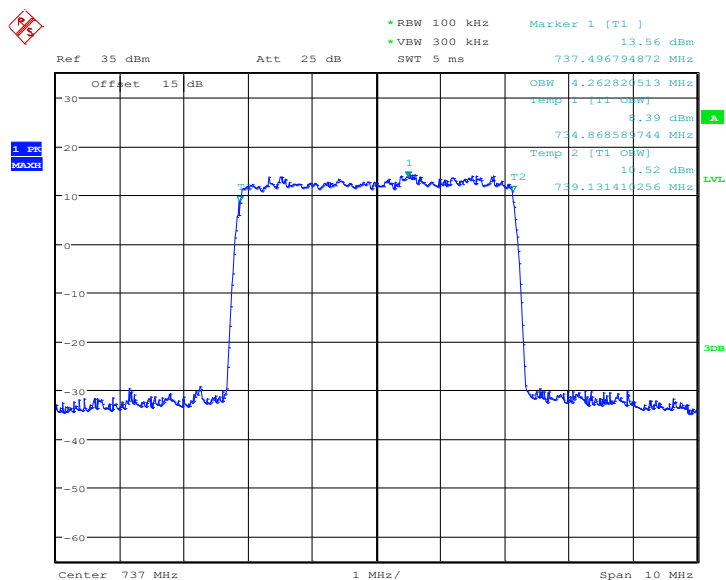
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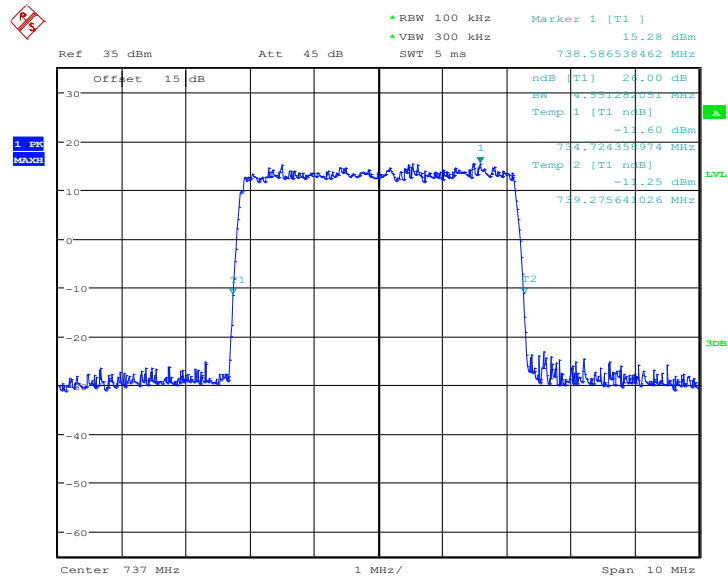
Output_DL_1S_M_AWGN_Pre-AGC_26dB Bandwidth



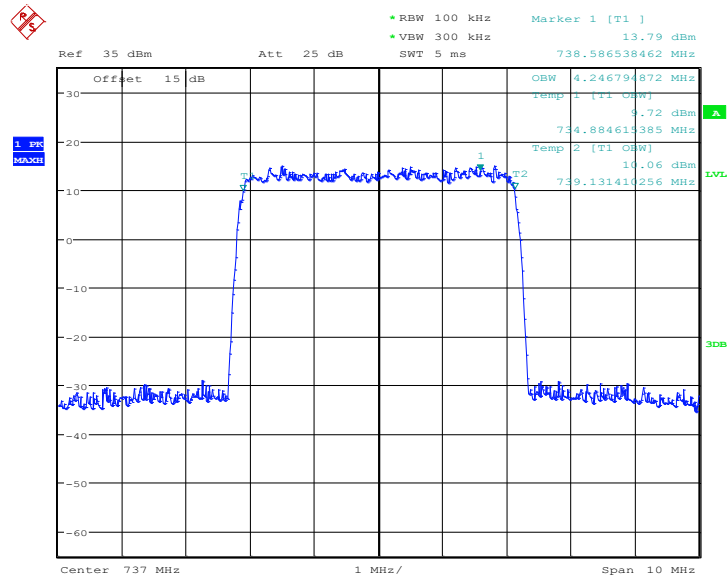
Output_DL_1S_M_AWGN_Pre-AGC_99% OBW



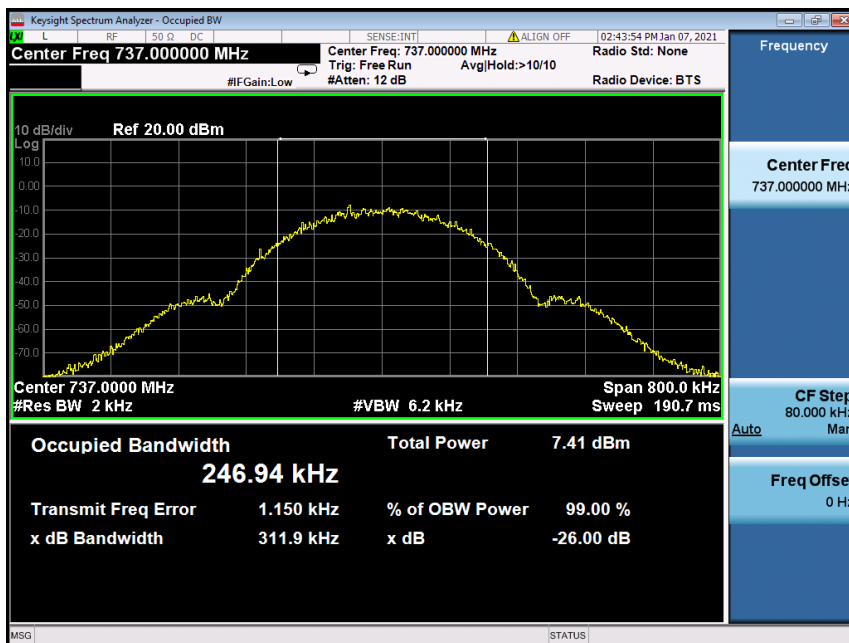
Output_DL_1S_M_AWGN_AGC+3dB_26dB Bandwidth



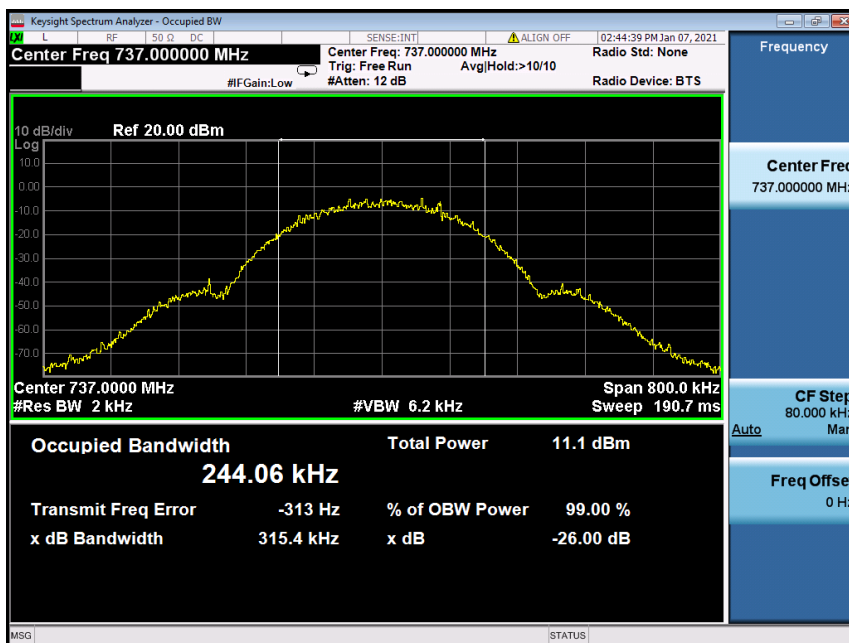
Output_DL_1S_M_AWGN_AGC+3dB_99% OBW



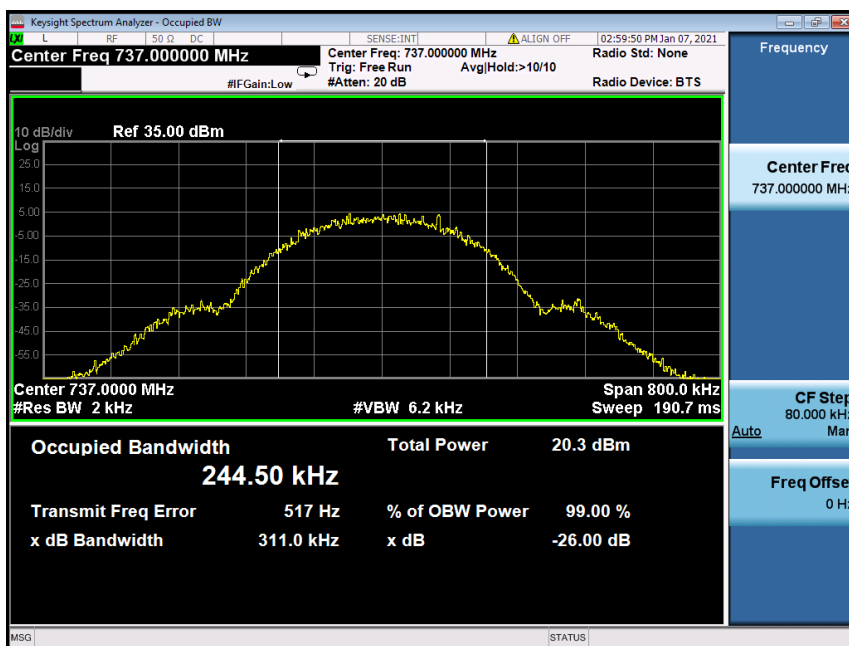
Input_DL_1S_M_GSM_Pre-AGC_26dB Bandwidth & 99% OBW



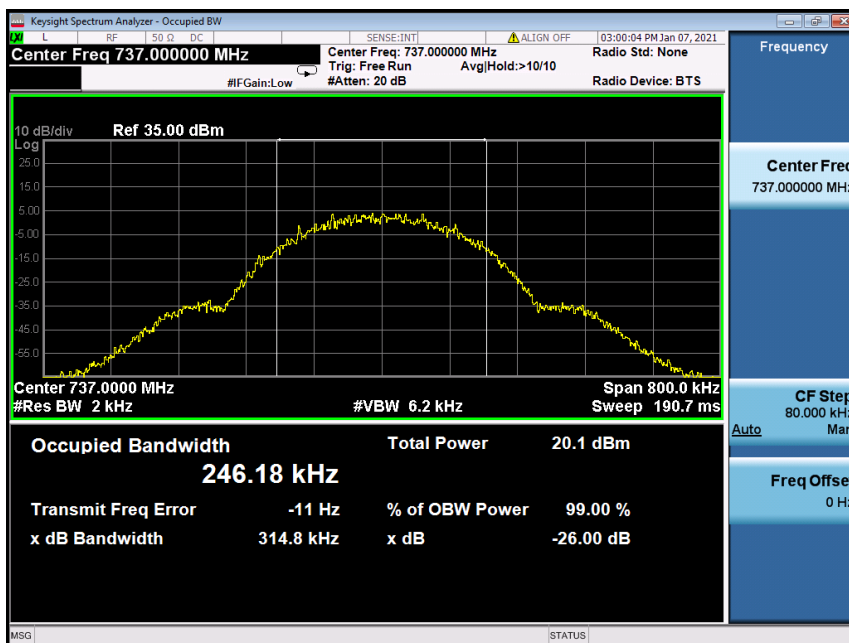
Input_DL_1S_M_GSM_AGC+3dB_26dB Bandwidth & 99% OBW



Output_DL_1S_M_GSM_Pre-AGC_26dB Bandwidth & 99% OBW



Output_DL_1S_M_GSM_AGC+3dB_26dB Bandwidth & 99% 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.





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	738.73	Pre-AGC	-0.41	20.16	20.57	PASS
		AGC+3dB	2.59	20.32	/	PASS
DL_1S_GSM	738.73	Pre-AGC	-0.41	20.26	20.67	PASS
		AGC+3dB	2.59	20.30	/	PASS

Remark:

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

ERP= EIRP-2.15dB,

The total maximum ERP for the EUT is $(20.32\text{dBm} + 20.32\text{dBm}) + 15.5\text{dBi} - 2.15\text{dB} = 36.68\text{dBm}$ (4.66W) which don't exceed the required ERP limit (1000W/MHz).

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 20.32dBm, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P) \text{ dB}$, the limit corresponds to an absolute limit of -13 dBm.

Here,

$P = 20.32\text{dBm} = 0.1076\text{W}$.

So the limit =

$P(\text{dBm}) - [43 + 10 \log (0.1076\text{W})] = -13\text{dBm}$

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.

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.

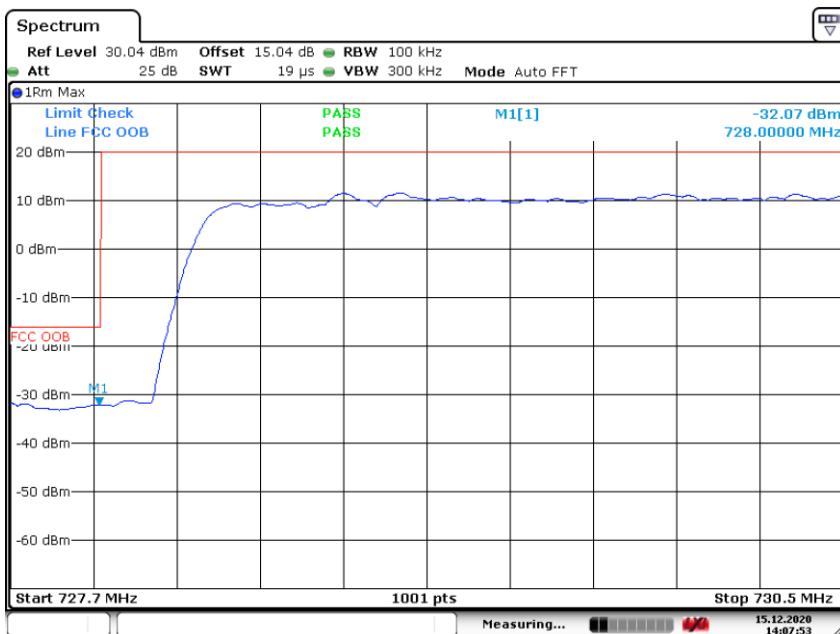


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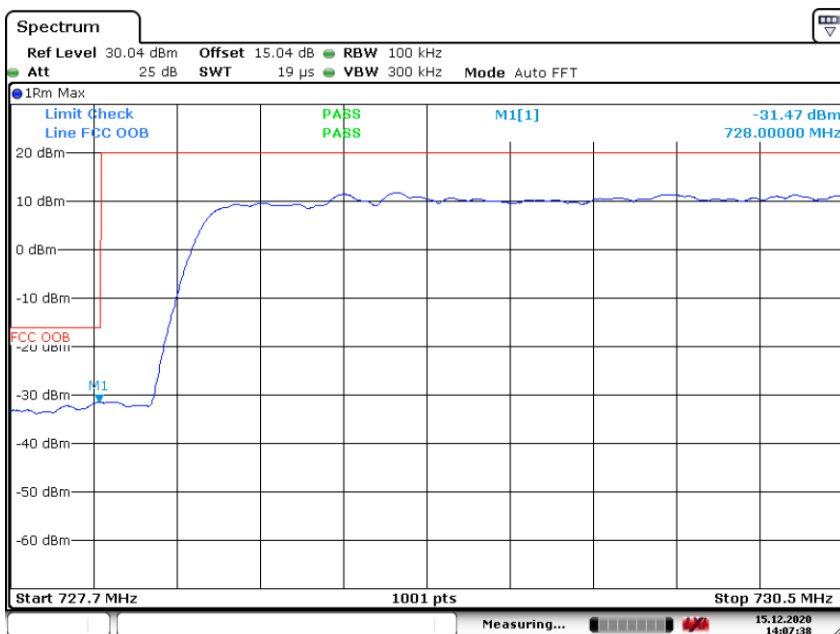
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DL_1S_B_AWGN_Pre-AGC_Out-of-band emission



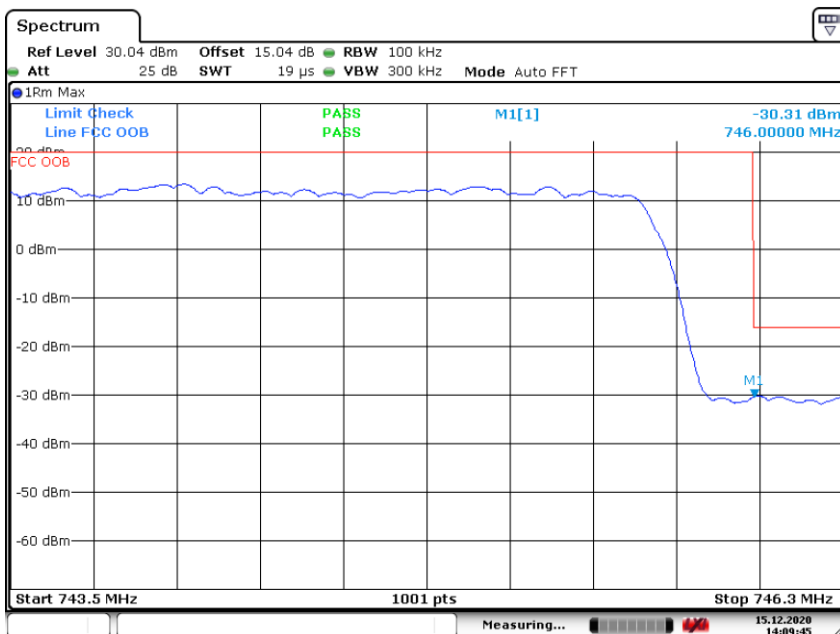
DL_1S_B_AWGN_AGC+3_Out-of-band emission



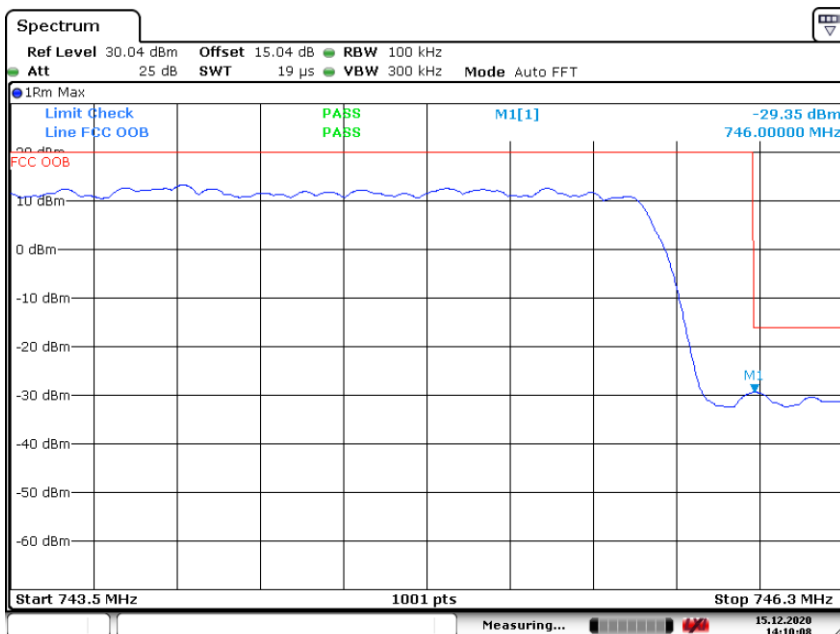
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DL_1S_T_AWGN_Pre-AGC_Out-of-band emission

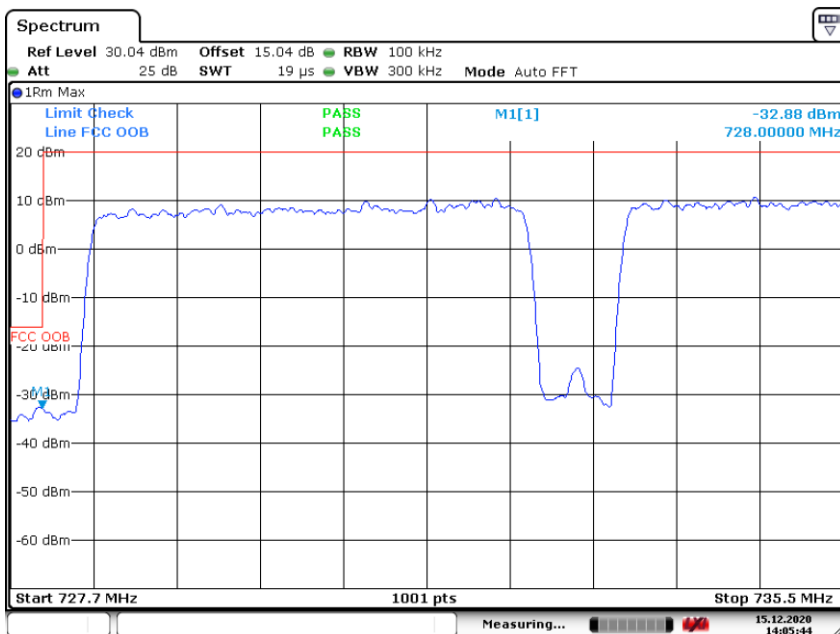


DL_1S_T_AWGN_AGC+3_Out-of-band emission

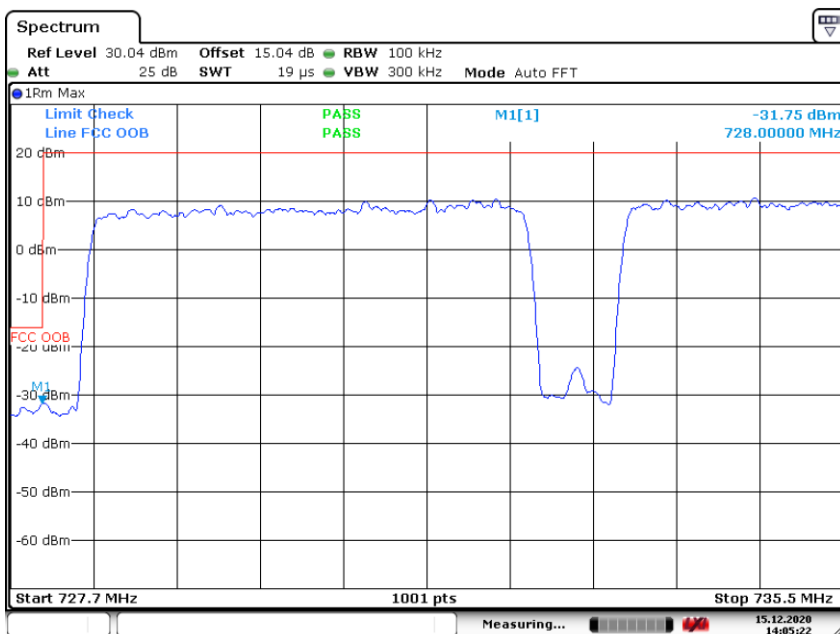


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DL_2S_B_AWGN_Pre-AGC_Out-of-band emission



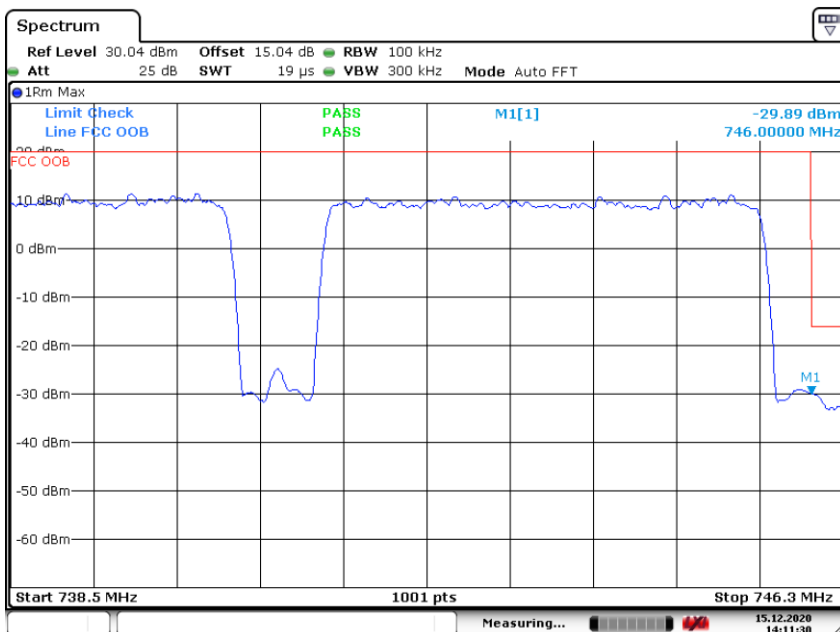
DL_2S_B_AWGN_AGC+3_Out-of-band emission



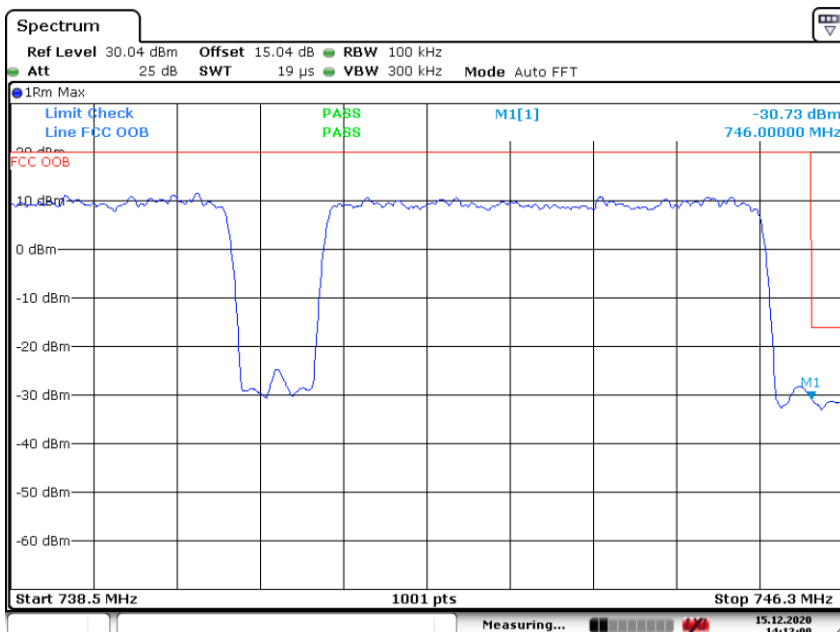
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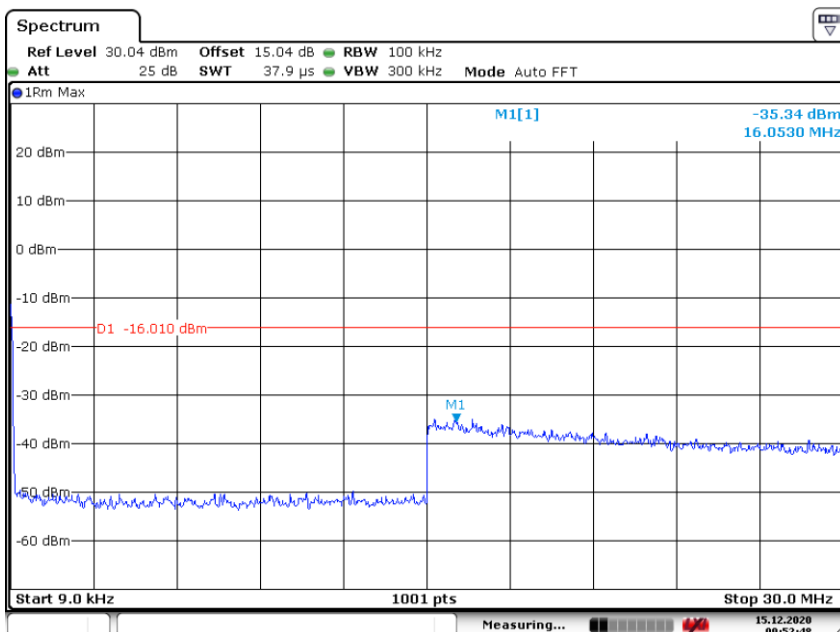
DL_2S_T_AWGN_Pre-AGC_Out-of-band emission



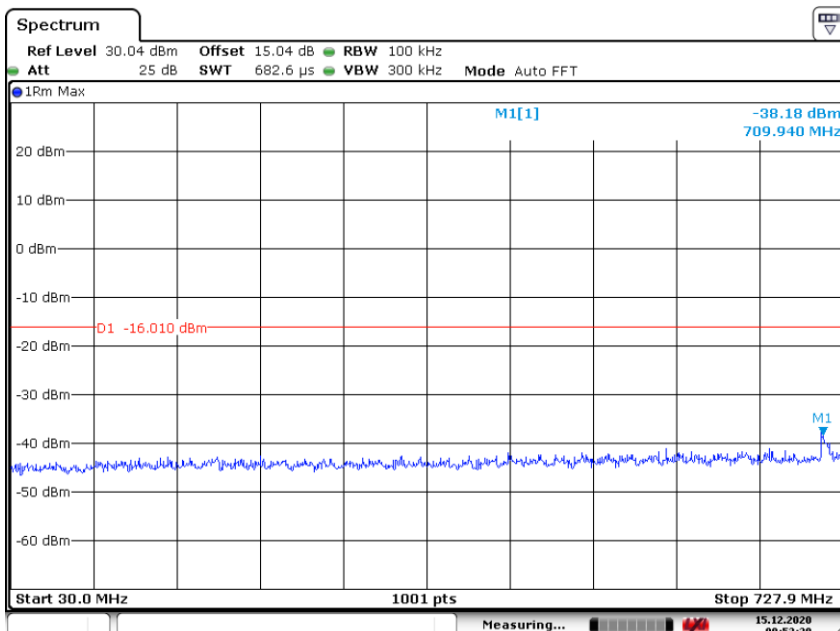
DL_2S_T_AWGN_AGC+3_Out-of-band emission



DL_1S_B_AWGN_Pre-AGC_Spurious emission 1

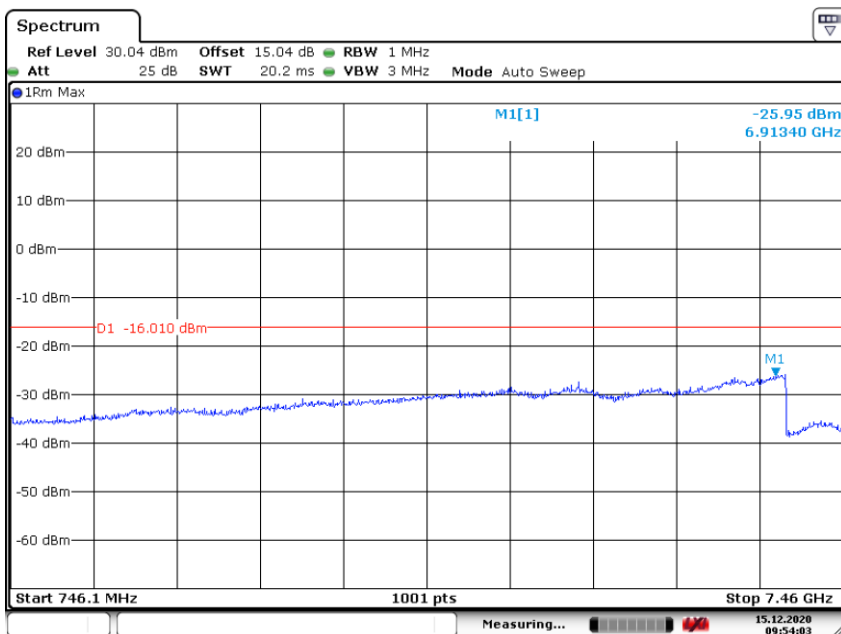


DL_1S_B_AWGN_Pre-AGC_Spurious emission 2

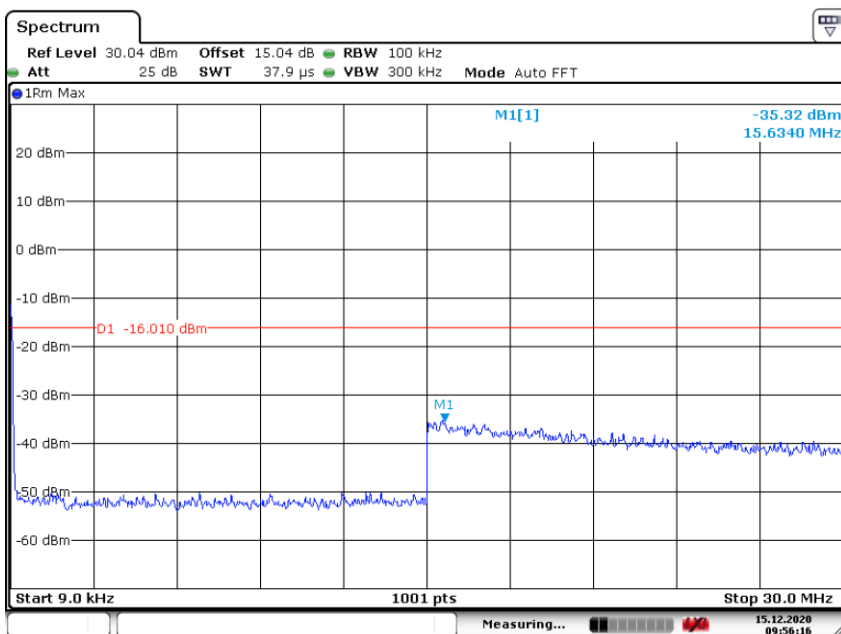


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DL_1S_B_AWGN_Pre-AGC_Spurious emission 3



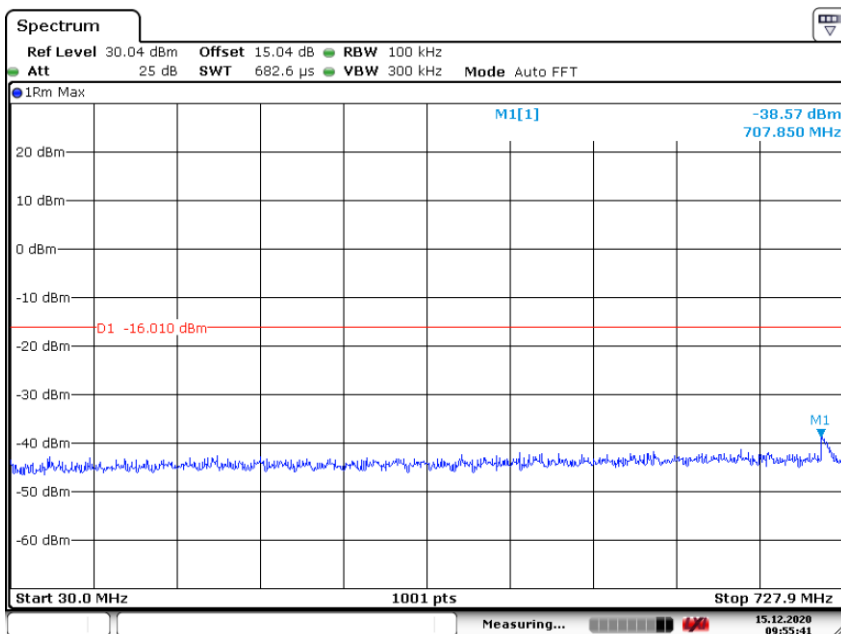
DL_1S_M_AWGN_Pre-AGC_Spurious emission 1



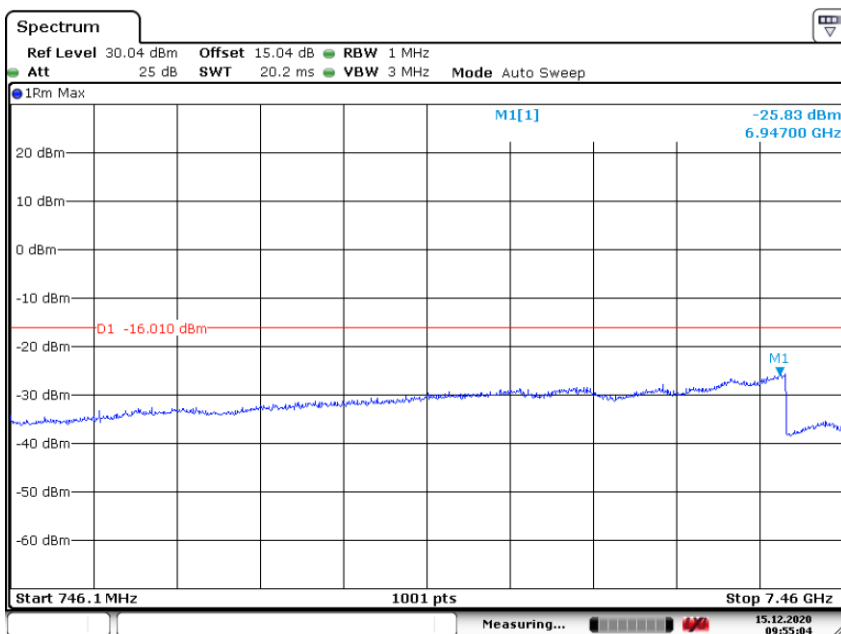
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DL_1S_M_AWGN_Pre-AGC_Spurious emission 2



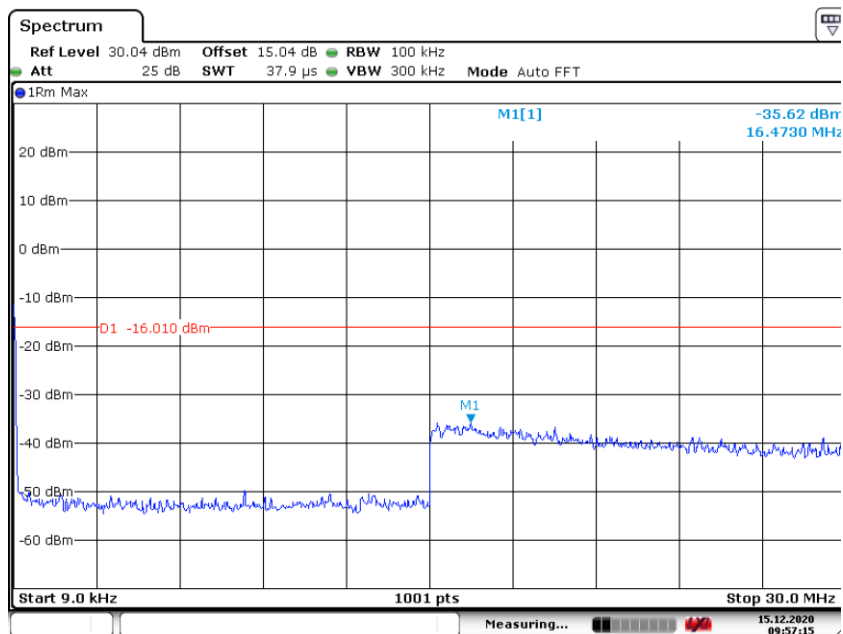
DL_1S_M_AWGN_Pre-AGC_Spurious emission 3



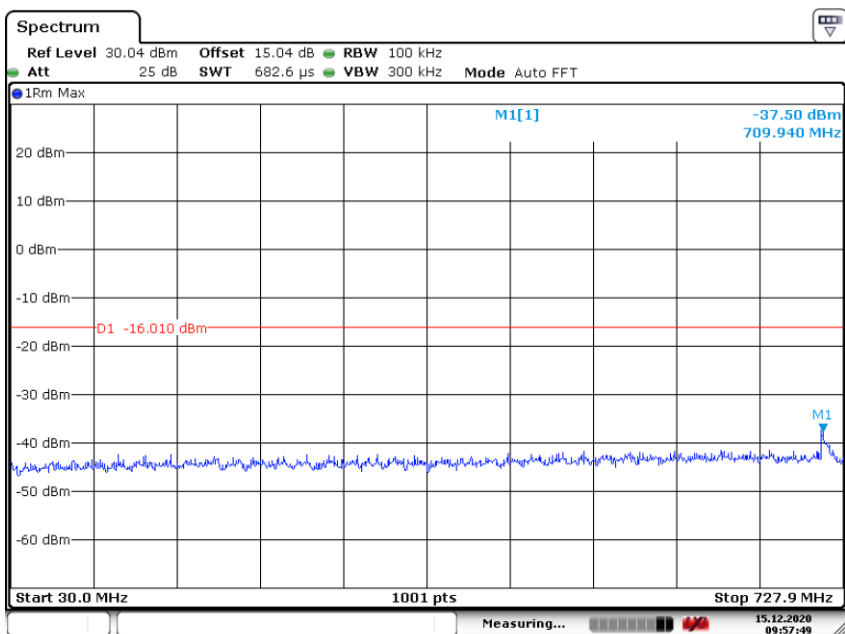
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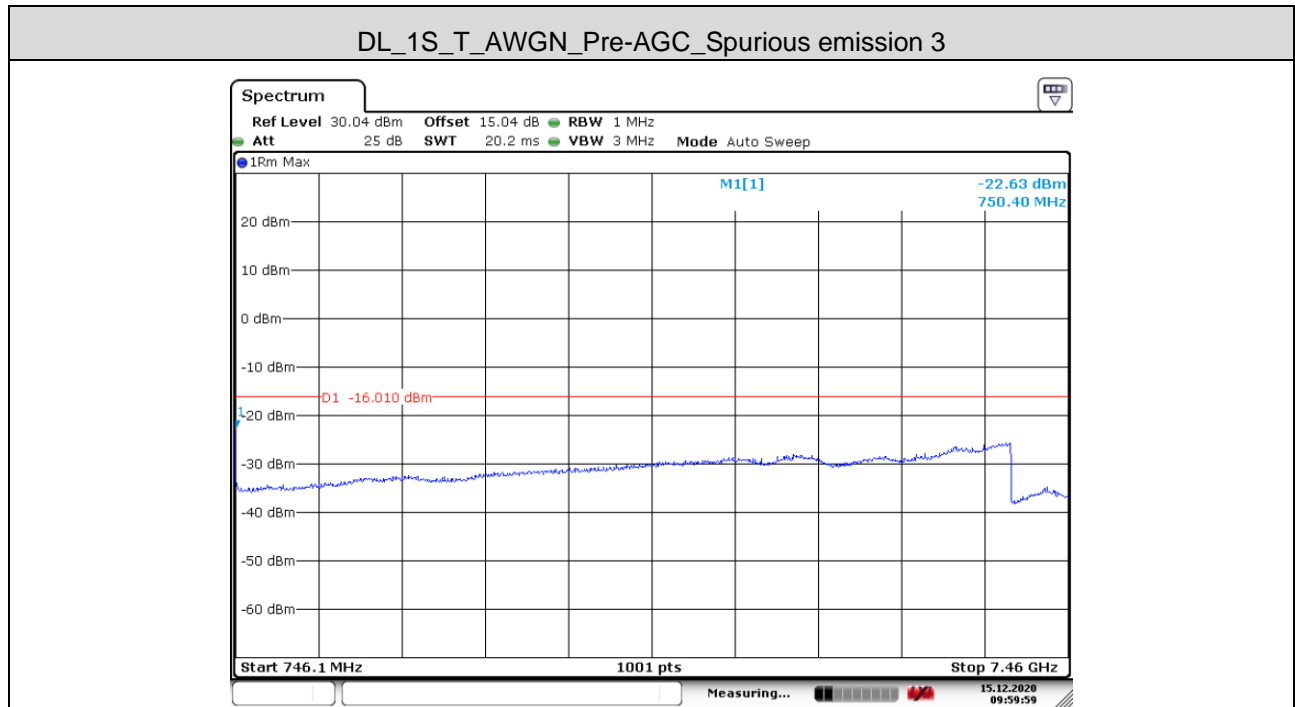
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DL_1S_T_AWGN_Pre-AGC_Spurious emission 1



DL_1S_T_AWGN_Pre-AGC_Spurious emission 2





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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 $\pm 15\%$ 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	737.000328	0.22	PASS
40		737.000293	0.18	PASS
30		737.000300	0.18	PASS
20		737.000164	Reference	PASS
10		737.000267	0.14	PASS
0		737.000146	-0.02	PASS
-10		737.000302	0.19	PASS
-20		737.000226	0.084	PASS
-30		737.000343	0.24	PASS

Frequency stability vs voltage				
Voltage (V)	Test Conf.	Test data (MHz)	Tolerance (ppm)	Verdict
DC 40.8	DL_1S_M_AWGN	737.000402	0.26	PASS
DC 48		737.000211	Reference	PASS
DC 55.2		737.000364	0.21	PASS



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2.7 Radiated spurious emissions

Note: 1. The tested max conducted power for single antenna port is 20.32dBm. the 2x2 MIMO total power is 20.32dBm+20.32dBm= 0.2153W.

The any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB.

Here,

$P=0.2153W$,

So the limit =

$P(dBm)- [43 + 10 \log (0.2153W)] = -13dBm$

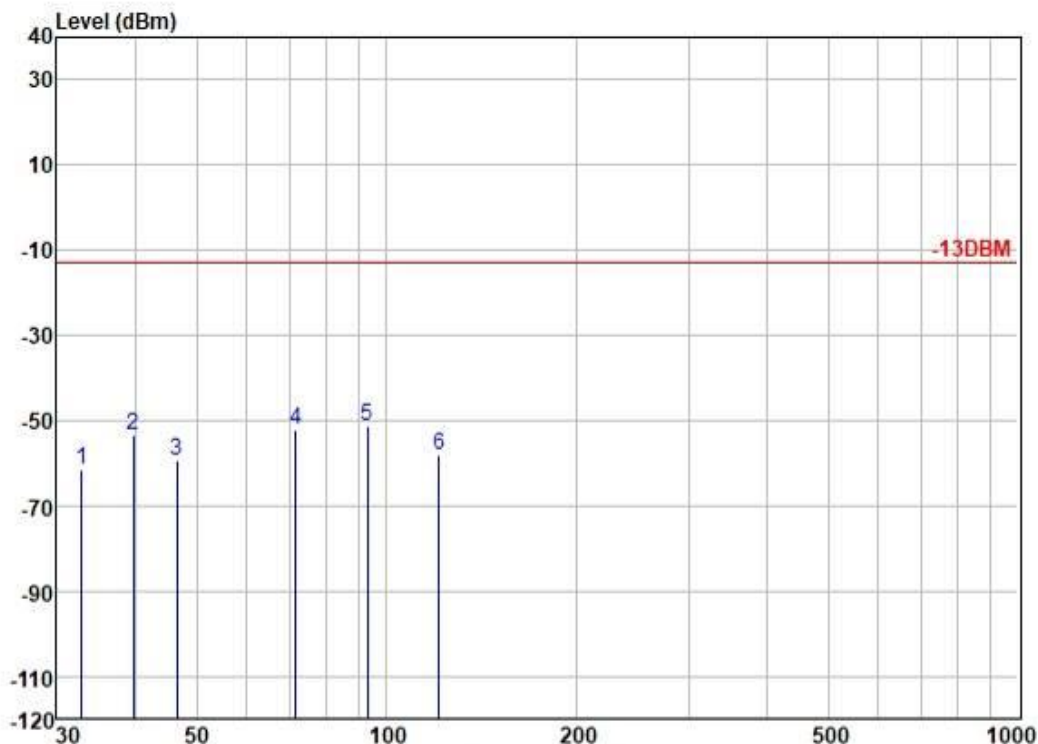
2. The radiated test performed at bottom / middle / top channel, the data with more than 20db margin, therefore, only the worst-case middle channel test data was recorded in the report.

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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DL_1S_M_AWGN_Horizontal_30MHz~1GHz



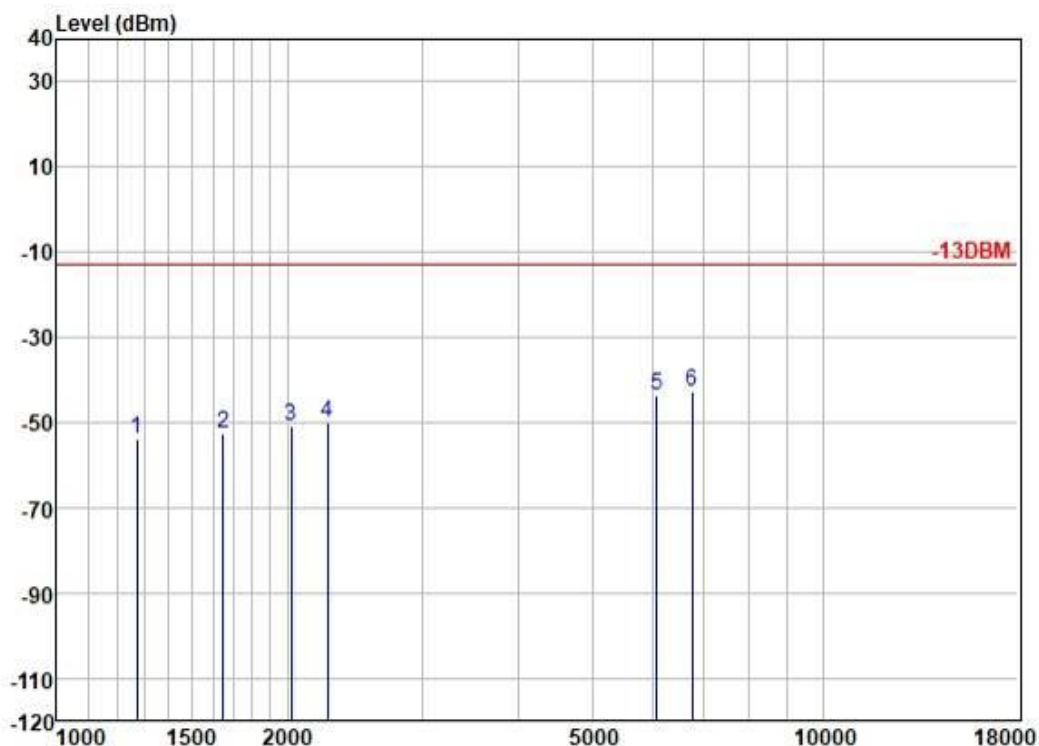
Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
32.864	-61.66	-13	-48.66	Horizontal	PASS
39.715	-53.62	-13	-40.62	Horizontal	PASS
46.503	-59.29	-13	-46.29	Horizontal	PASS
71.832	-52.11	-13	-39.11	Horizontal	PASS
93.113	-51.26	-13	-38.26	Horizontal	PASS
121.123	-58.10	-13	-45.1	Horizontal	PASS



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DL_1S_M_AWGN_Horizontal_above 1GHz



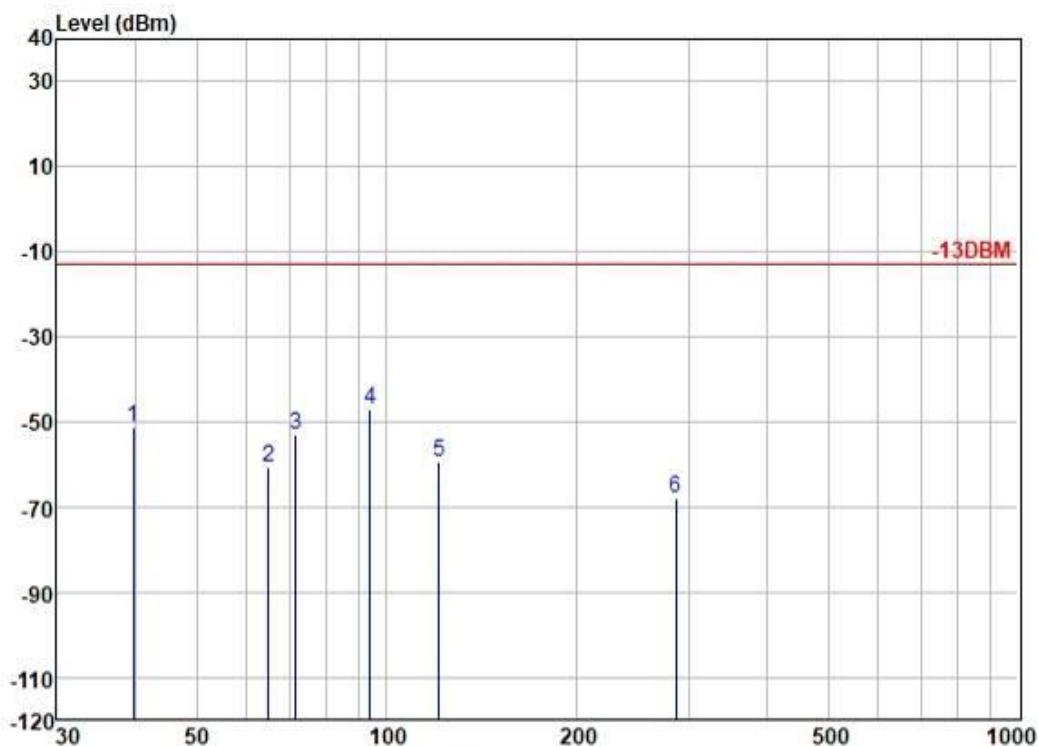
Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
1271.123	-53.97	-13	-40.97	Horizontal	PASS
1684.778	-52.69	-13	-39.69	Horizontal	PASS
2024.354	-51.01	-13	-38.01	Horizontal	PASS
2259.367	-50.11	-13	-37.11	Horizontal	PASS
6071.417	-43.46	-13	-30.46	Horizontal	PASS
6756.708	-42.70	-13	-29.7	Horizontal	PASS



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DL_1S_M_AWGN_Vertical_30MHz~1GHz



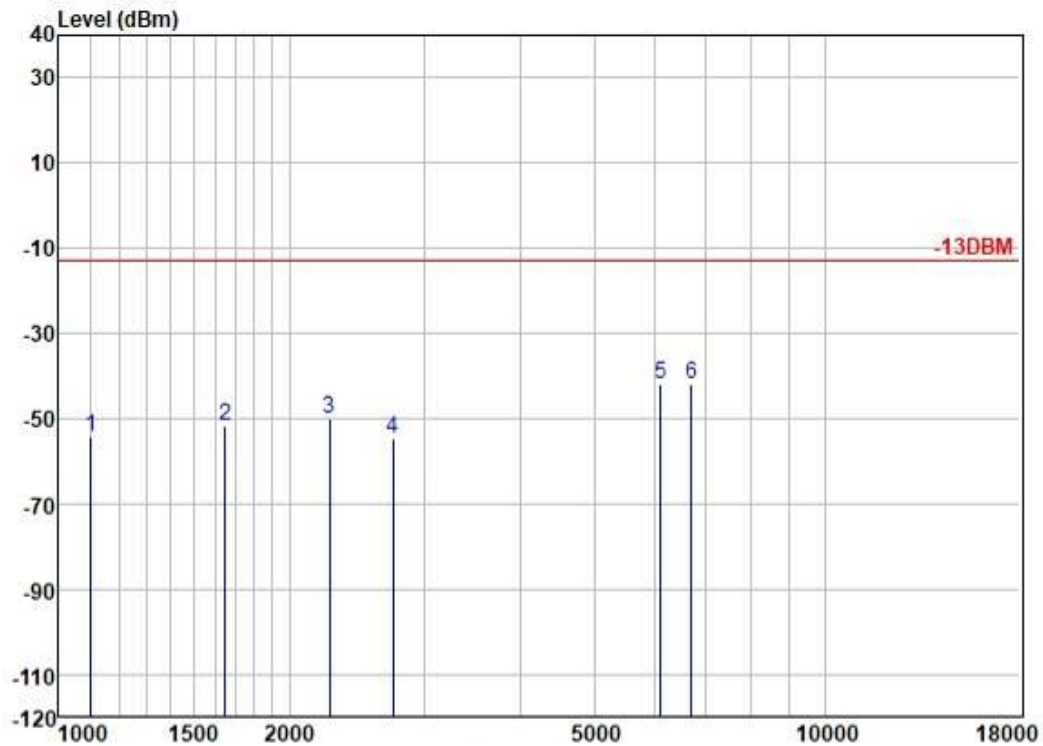
Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
39.715	-51.45	-13	-38.45	Vertical	PASS
64.887	-60.73	-13	-47.73	Vertical	PASS
71.832	-52.90	-13	-39.9	Vertical	PASS
94.098	-46.97	-13	-33.97	Vertical	PASS
121.123	-59.21	-13	-46.21	Vertical	PASS
286.982	-67.81	-13	-54.81	Vertical	PASS



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DL_1S_M_AWGN_Vertical_above 1GHz



Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
1100.079	-54.44	-13	-41.44	Vertical	PASS
1648.778	-51.73	-13	-38.73	Vertical	PASS
2259.367	-49.87	-13	-36.87	Vertical	PASS
2734.229	-54.63	-13	-41.63	Vertical	PASS
6106.616	-41.84	-13	-28.84	Vertical	PASS
6698.373	-42.02	-13	-29.02	Vertical	PASS



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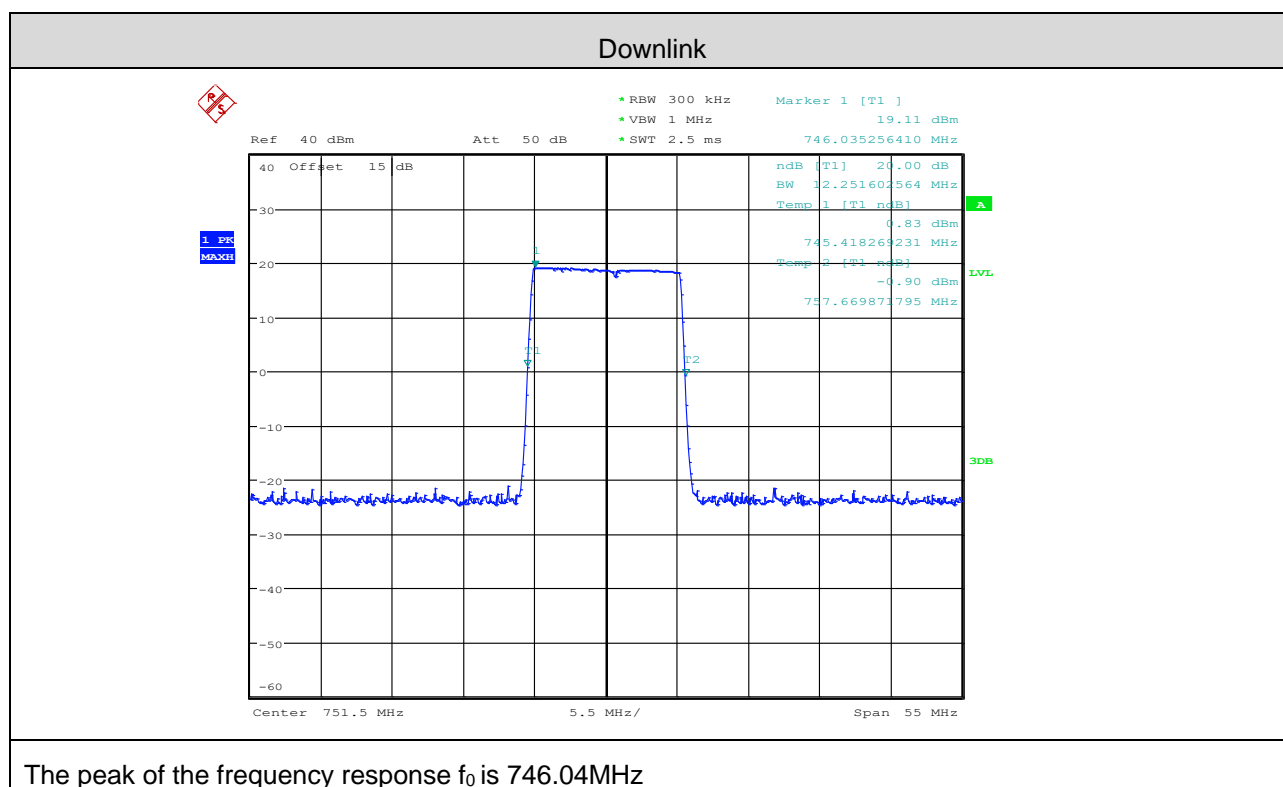
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3 Upper 700MHz (776-787MHz paired with 746-757MHz)

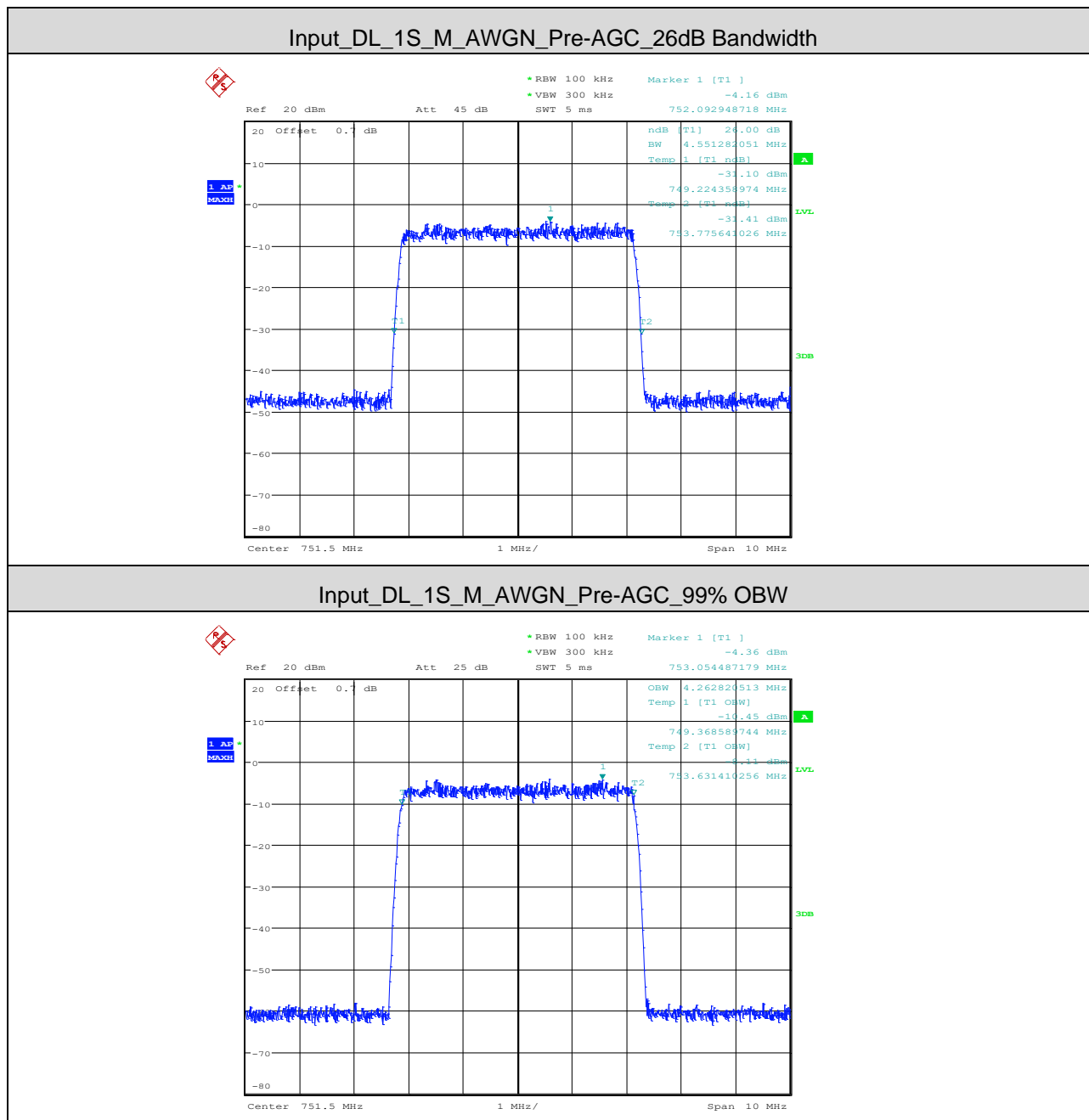
3.1 AGC threshold level

Test Conf.	AGC Threshold level
DL_1S_M_AWGN	-0.23dBm
DL_1S_M_GSM	-0.29dBm

3.2 Out-of-band rejection



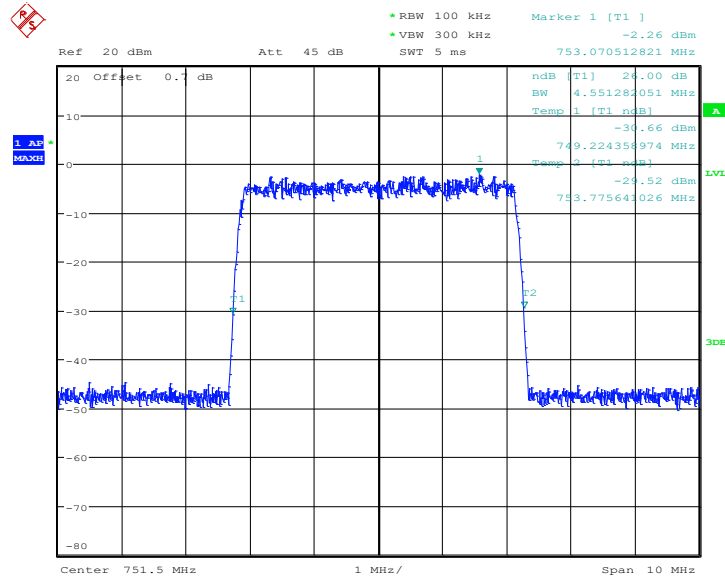
3.3 Input-versus-output signal comparison



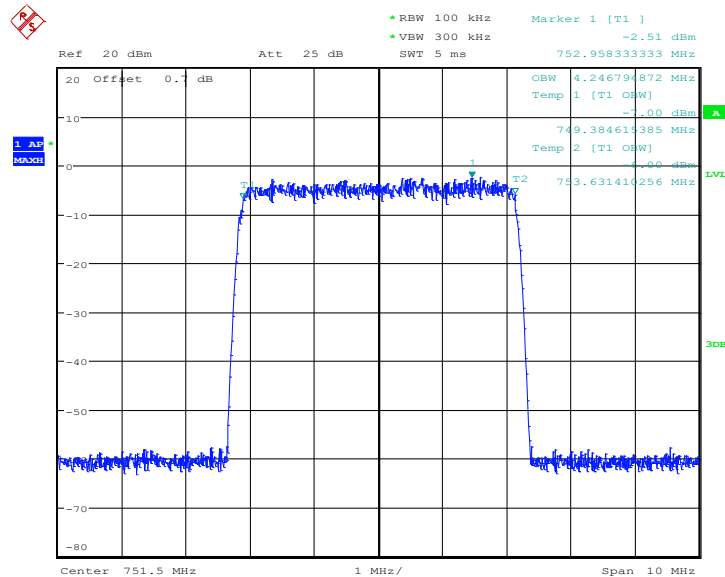
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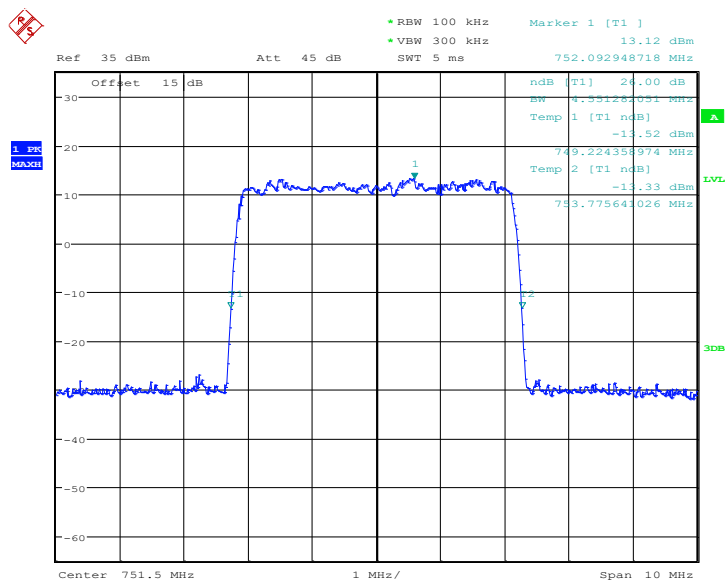
Input_DL_1S_M_AWGN_AGC+3dB_26dB Bandwidth



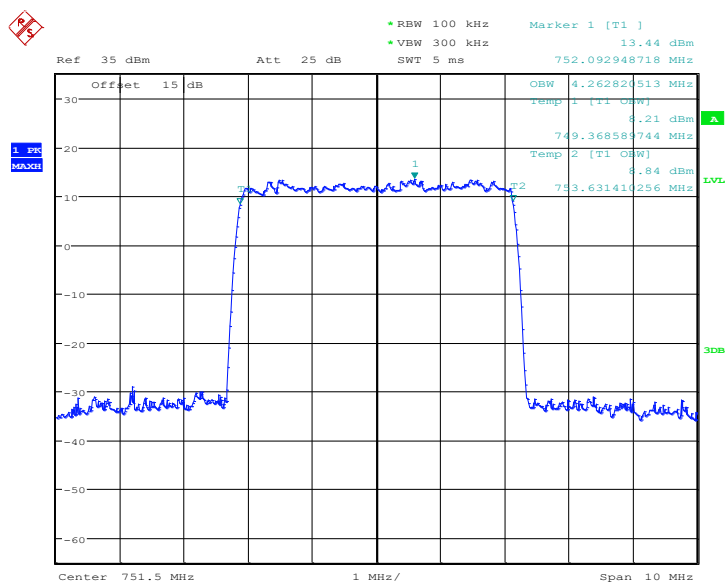
Input_DL_1S_M_AWGN_AGC+3dB_99% OBW



Output_DL_1S_M_AWGN_Pre-AGC_26dB Bandwidth



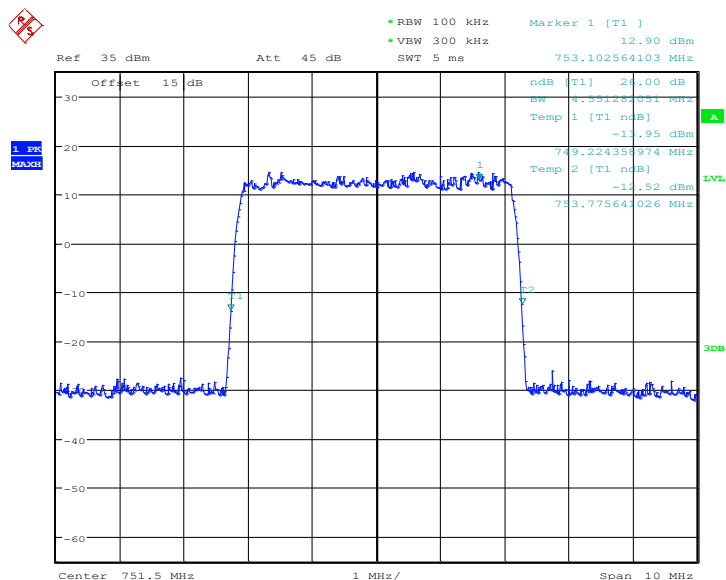
Output_DL_1S_M_AWGN_Pre-AGC_99% OBW



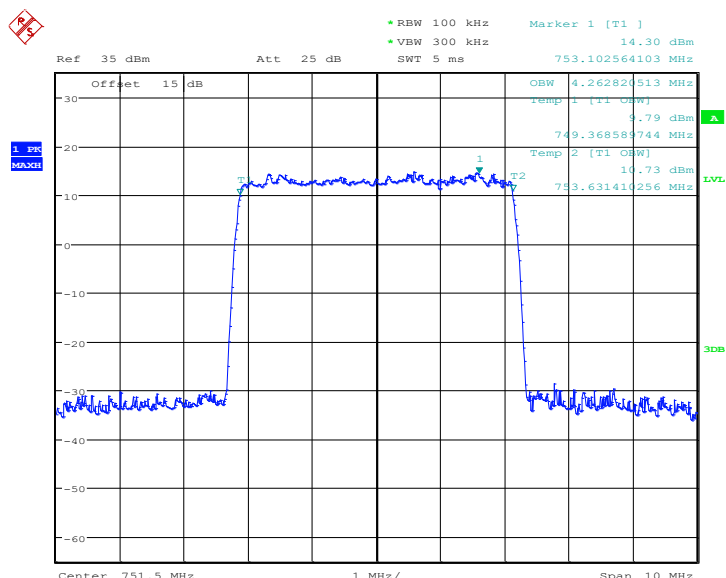
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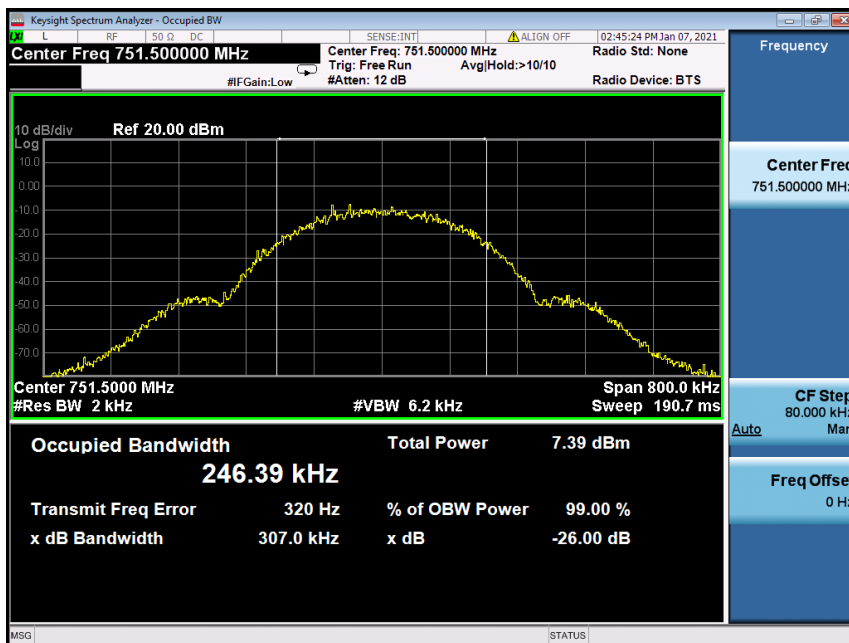
Output_DL_1S_M_AWGN_AGC+3dB_26dB Bandwidth



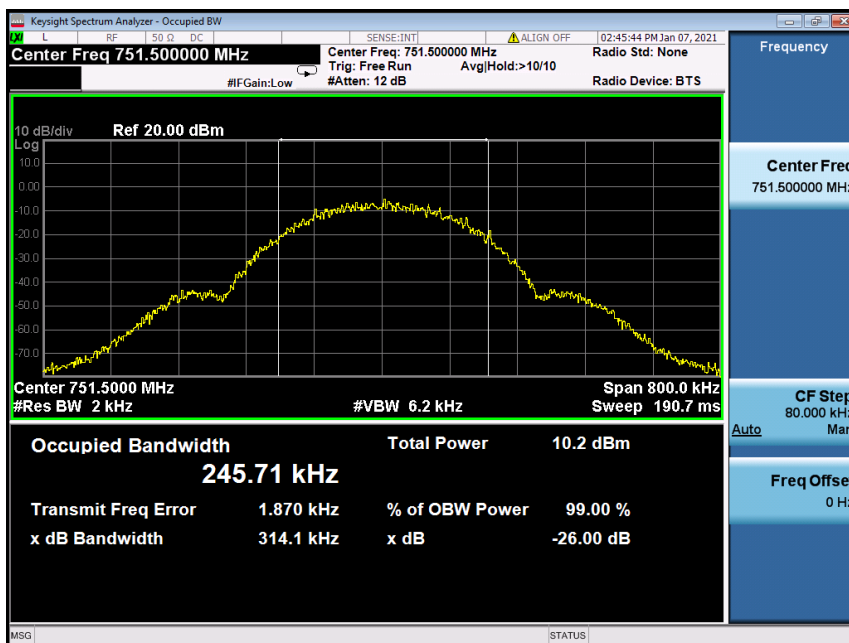
Output_DL_1S_M_AWGN_AGC+3dB_99% OBW



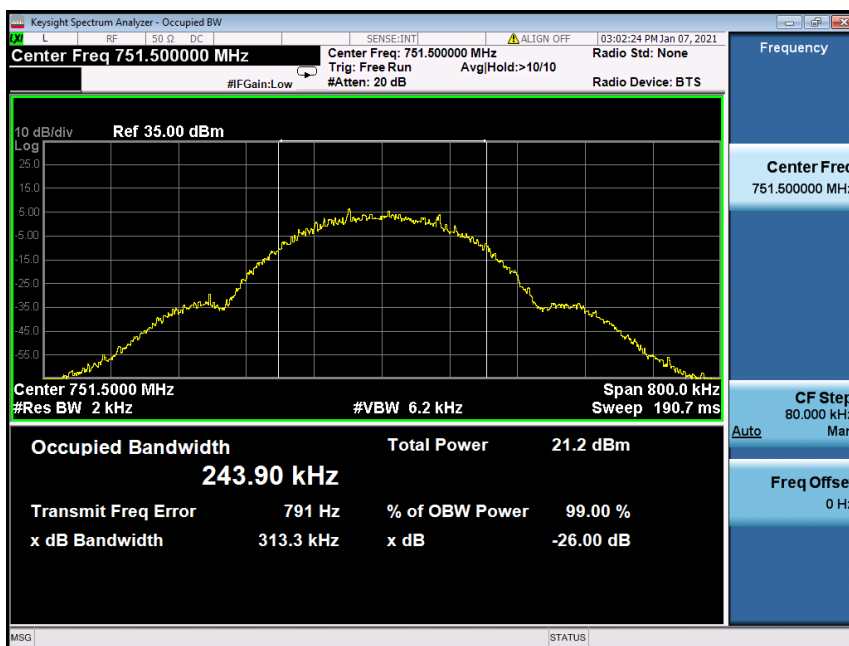
Input_DL_1S_M_GSM_Pre-AGC_26dB Bandwidth & 99% OBW



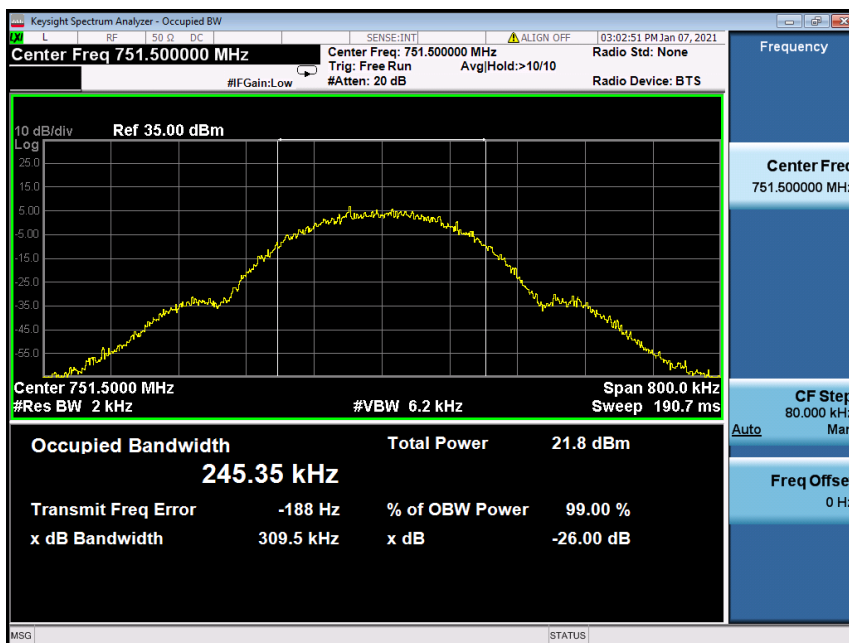
Input_DL_1S_M_GSM_AGC+3dB_26dB Bandwidth & 99% OBW



Output_DL_1S_M_GSM_Pre-AGC_26dB Bandwidth & 99% OBW



Output_DL_1S_M_GSM_AGC+3dB_26dB Bandwidth & 99% 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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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	746.04	Pre-AGC	-0.26	20.09	20.35	PASS
		AGC+3dB	2.74	20.04	/	PASS
DL_1S_GSM	746.04	Pre-AGC	-0.26	20.03	20.29	PASS
		AGC+3dB	2.74	20.06	/	PASS

Remark:

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

ERP= EIRP-2.15dB,

The total maximum ERP for the EUT is $(20.09\text{dBm} + 20.09\text{dBm}) + 15.5\text{dBi} - 2.15\text{dB} = 36.45\text{dBm}$ (4.416W) which don't exceed the required ERP limit (1000W/MHz).

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 20.09dBm, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P) \text{ dB}$, the limit corresponds to an absolute limit of -13 dBm .

Here,

$P = 20.09\text{dBm} = 0.1021\text{W}$.

So the limit =

$P(\text{dBm}) - [43 + 10 \log (0.108\text{W})] = -13\text{dBm}$

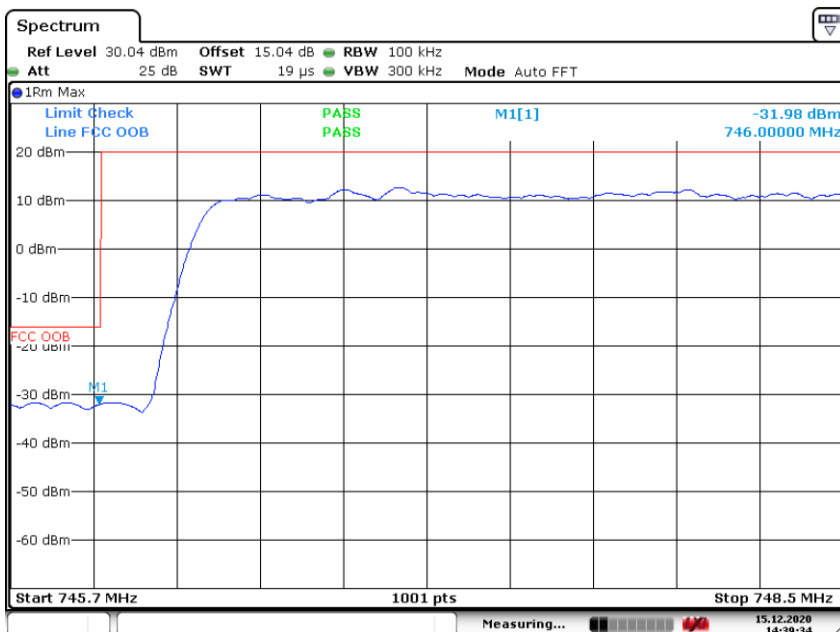
The EUT supports 2x2 MIMO and the emissions were measured at one of output port, so the limit line was set to -16.01dBm in following test plots in order to determine the test result conveniently.

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.

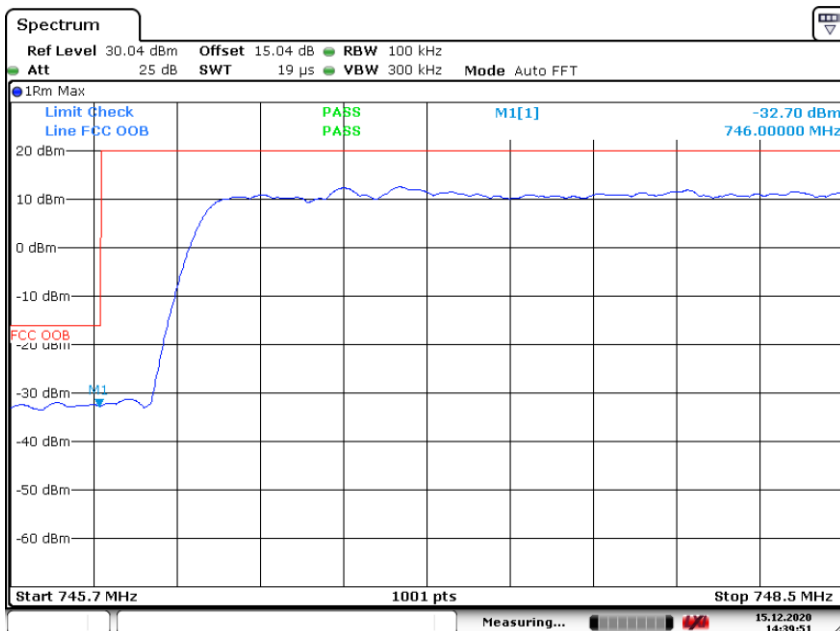


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DL_1S_B_AWGN_Pre-AGC_Out-of-band emission



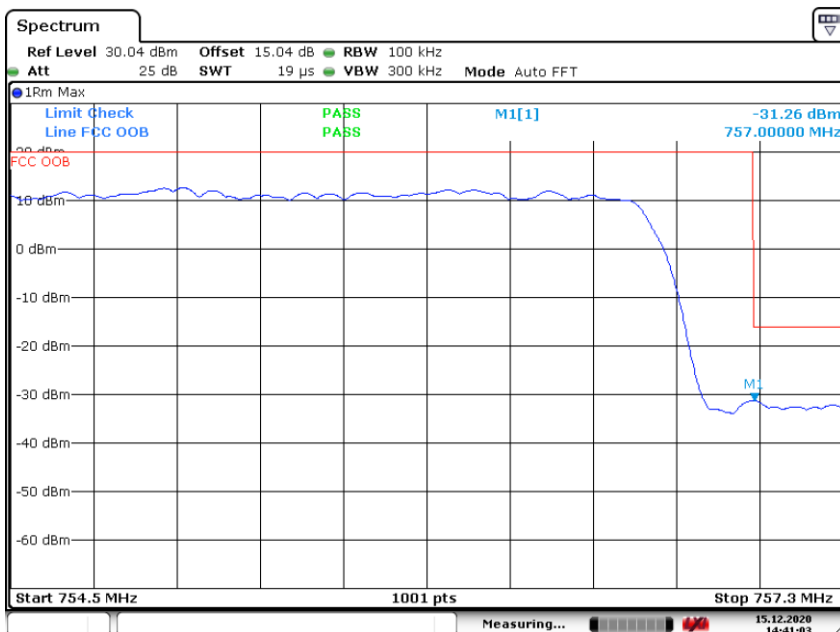
DL_1S_B_AWGN_AGC+3_Out-of-band emission



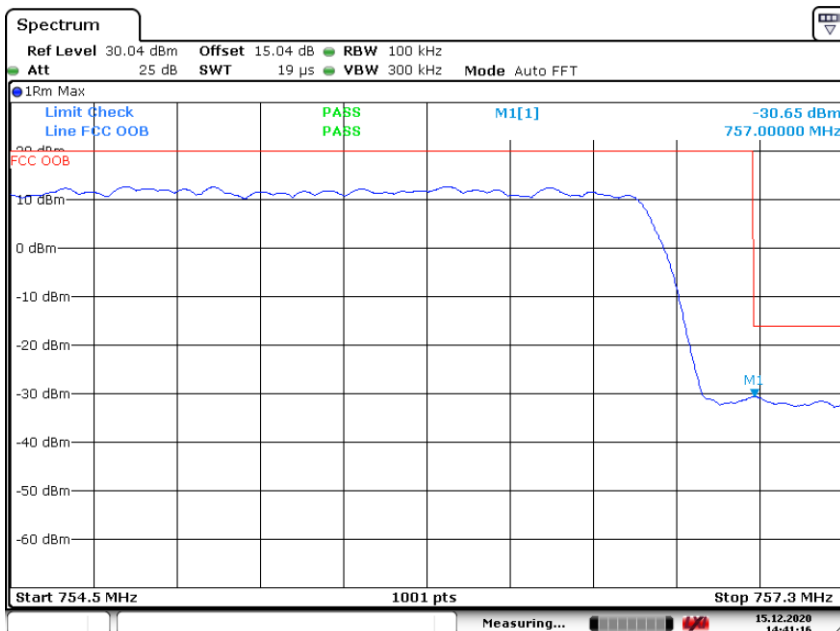
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DL_1S_T_AWGN_Pre-AGC_Out-of-band emission

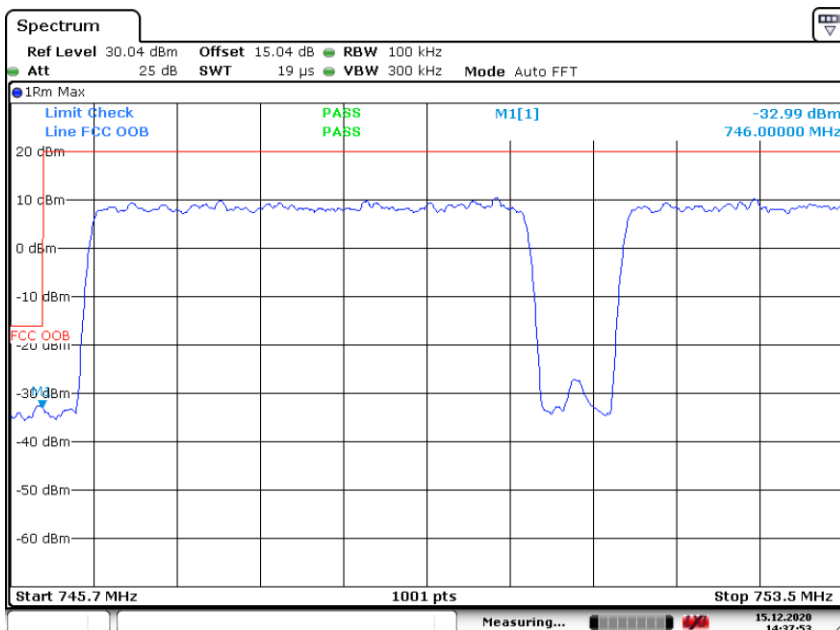


DL_1S_T_AWGN_AGC+3_Out-of-band emission

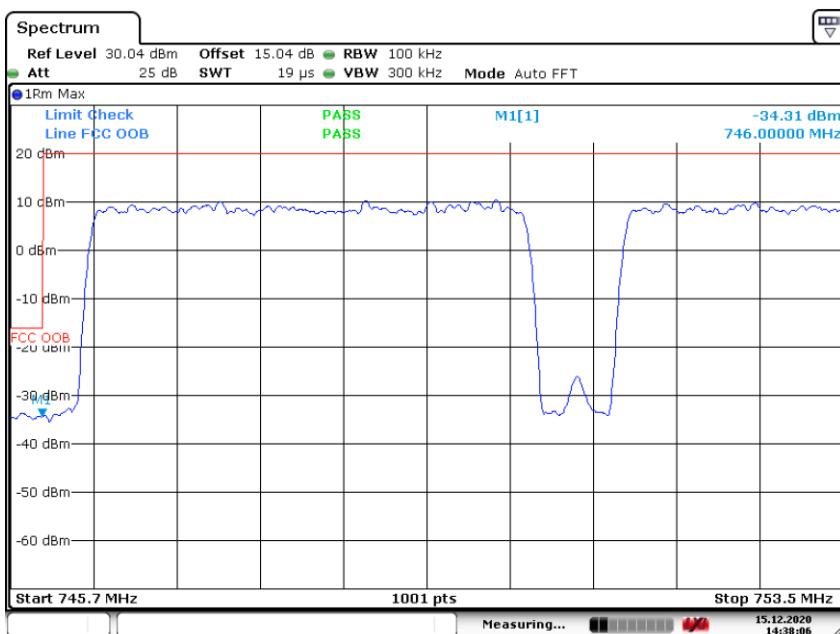


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DL_2S_B_AWGN_Pre-AGC_Out-of-band emission



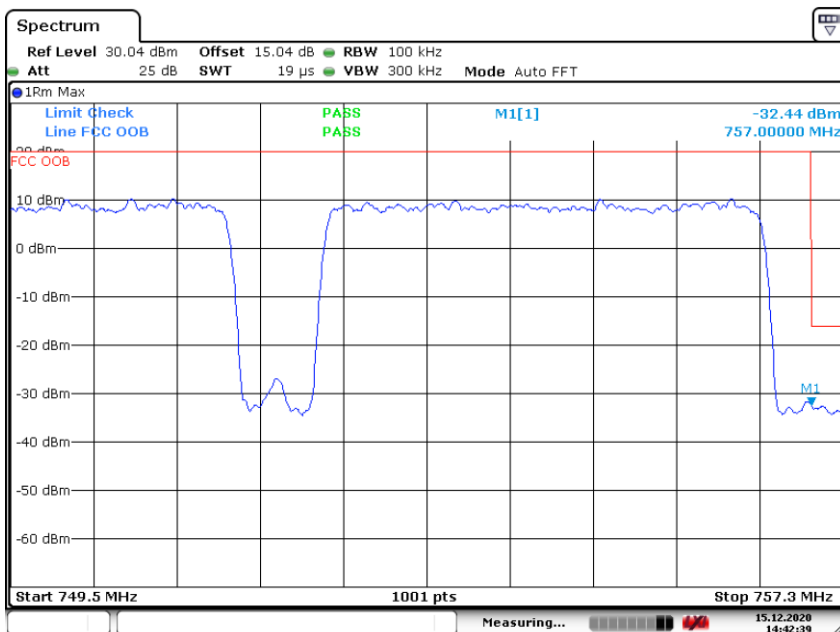
DL_2S_B_AWGN_AGC+3_Out-of-band emission



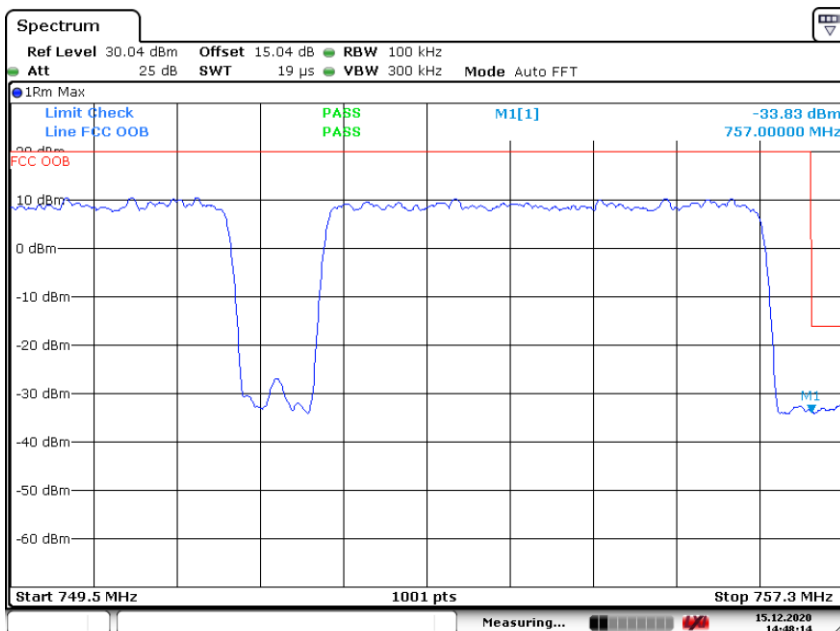
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DL_2S_T_AWGN_Pre-AGC_Out-of-band emission



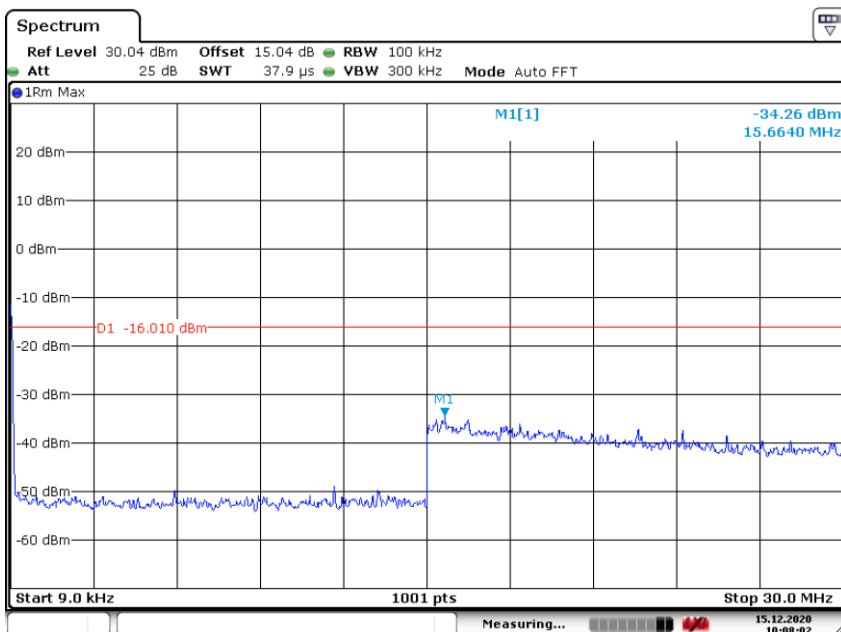
DL_2S_T_AWGN_AGC+3_Out-of-band emission



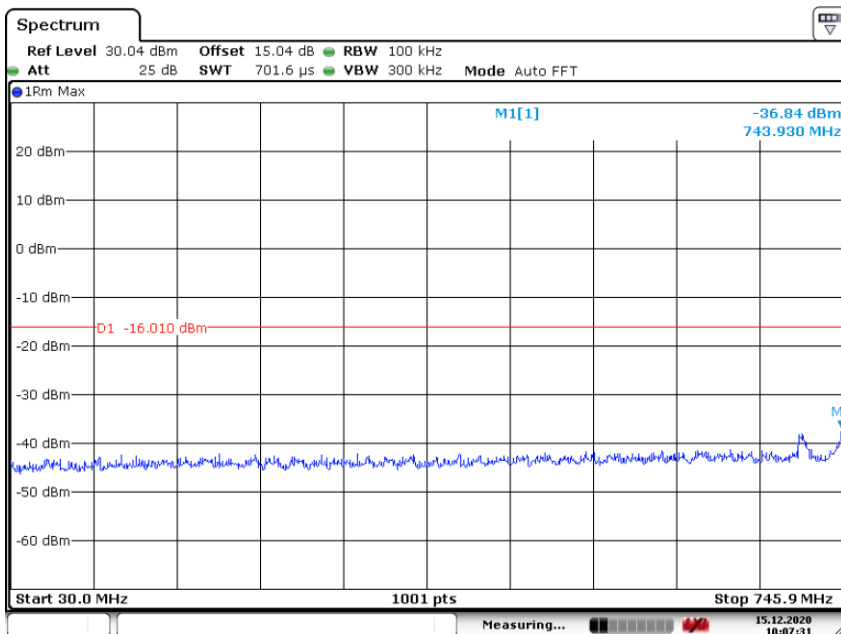
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DL_1S_B_AWGN_Pre-AGC_Spurious emission 1

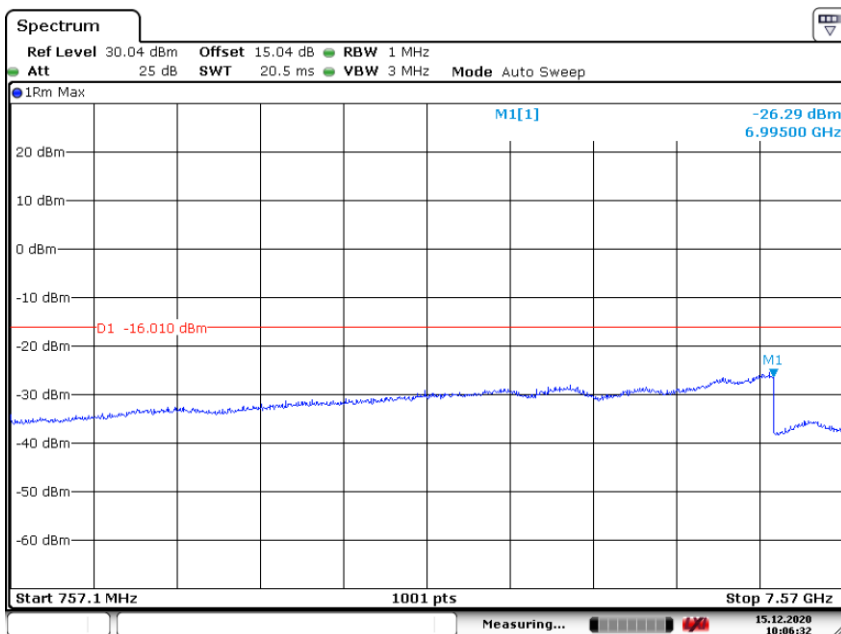


DL_1S_B_AWGN_Pre-AGC_Spurious emission 2

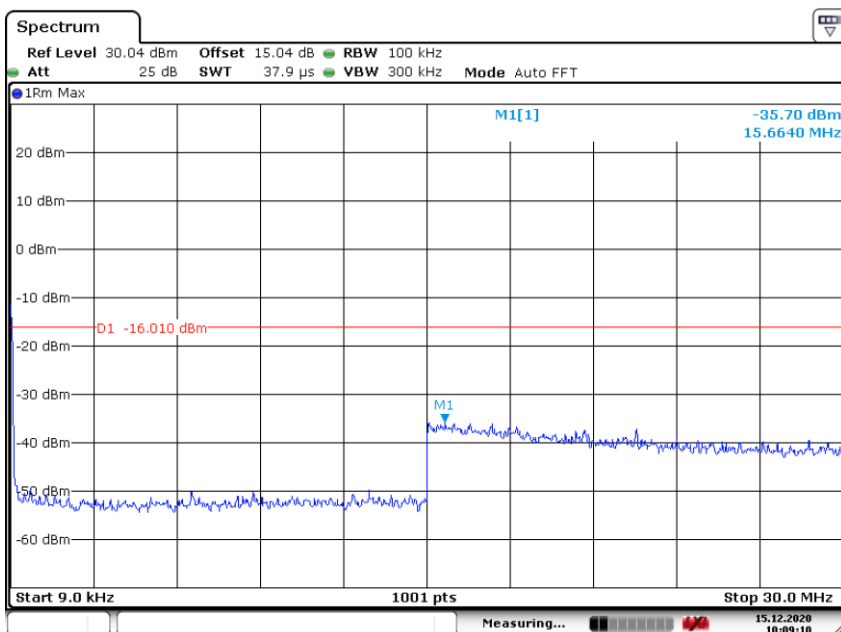


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DL_1S_B_AWGN_Pre-AGC_Spurious emission 3



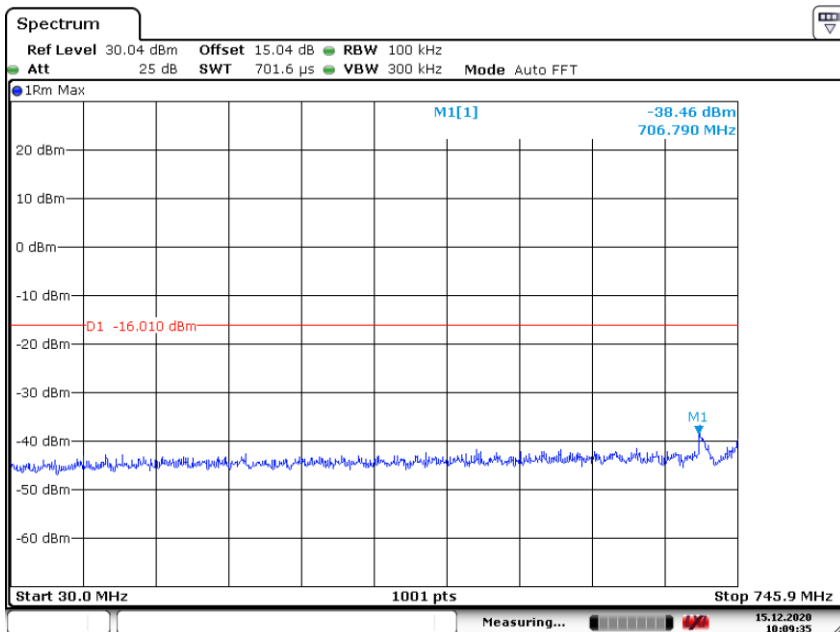
DL_1S_M_AWGN_Pre-AGC_Spurious emission 1



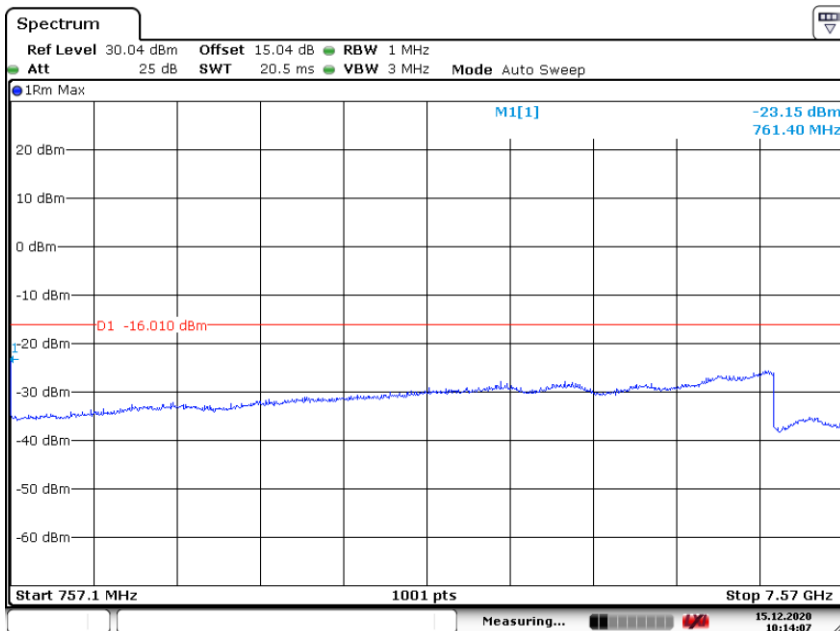
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DL_1S_M_AWGN_Pre-AGC_Spurious emission 2



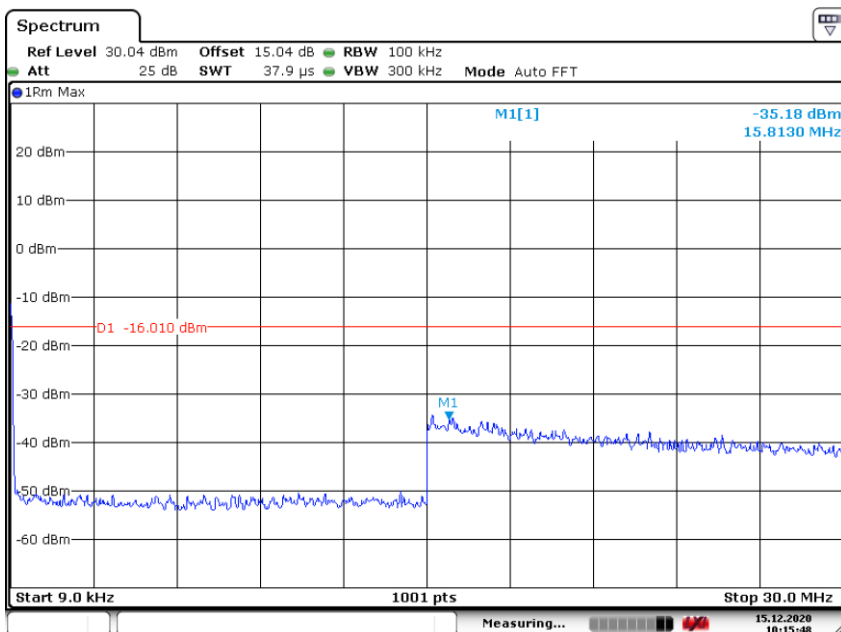
DL_1S_M_AWGN_Pre-AGC_Spurious emission 3



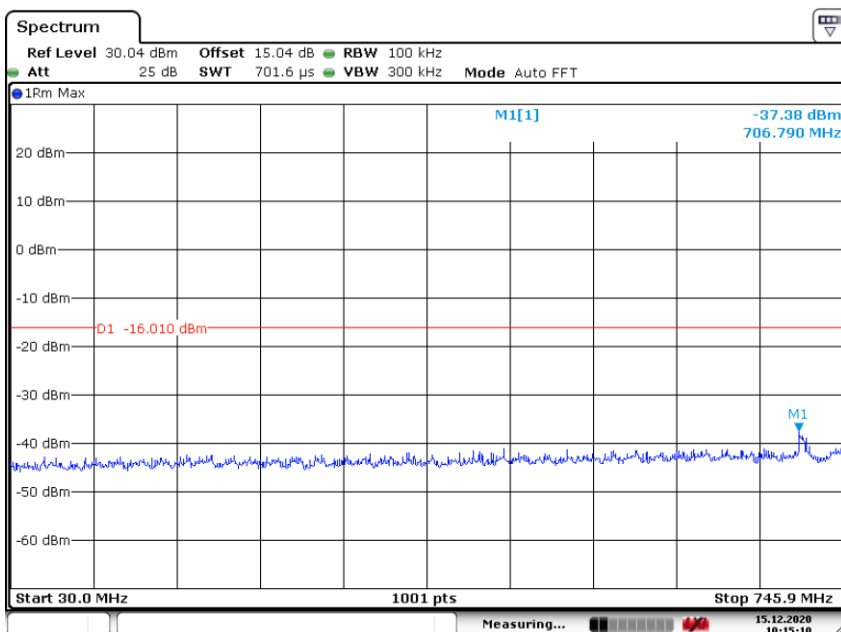
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DL_1S_T_AWGN_Pre-AGC_Spurious emission 1

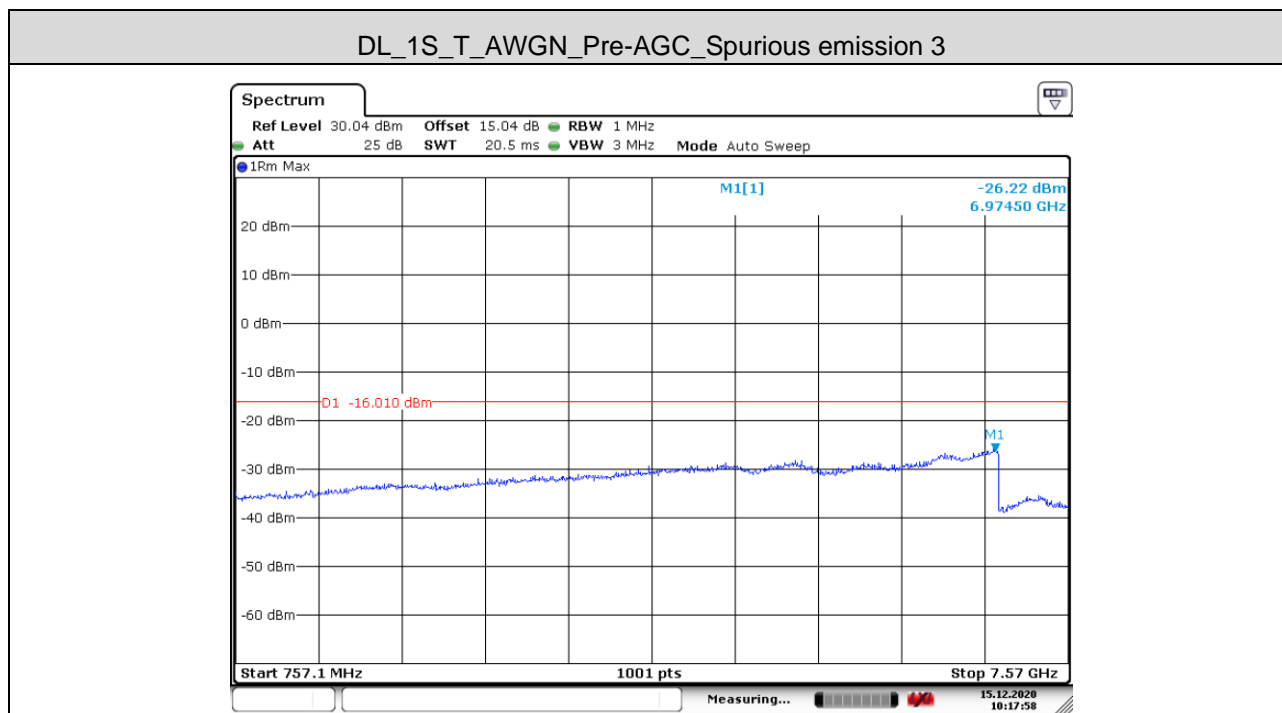


DL_1S_T_AWGN_Pre-AGC_Spurious emission 2



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3.6 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 -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	751.553563	0.13	PASS
40		751.553273	-0.26	PASS
30		751.553642	-0.24	PASS
20		751.553465	Reference	PASS
10		751.553362	-0.14	PASS
0		751.553382	-0.11	PASS
-10		751.553742	0.37	PASS
-20		751.553633	0.22	PASS
-30		751.553452	-0.02	PASS

Frequency stability vs voltage				
Voltage (V)	Test Conf.	Test data (MHz)	Tolerance (ppm)	Verdict
DC 40.8	DL_1S_M_AWGN	751.553437	0.20	PASS
DC 48		751.553285	Reference	PASS
DC 55.2		751.553165	-0.16	PASS



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3.7 Radiated spurious emissions

Note: 1. The tested max conducted power for single antenna port is 20.09dBm. the 2x2 MIMO total power is 20.09dBm+20.09dBm= 0.2042W.

The any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB.

Here,

$P=0.2042W$

So the limit =

$P(dBm)- [43 + 10 \log (0.2042W)] = -13dBm$

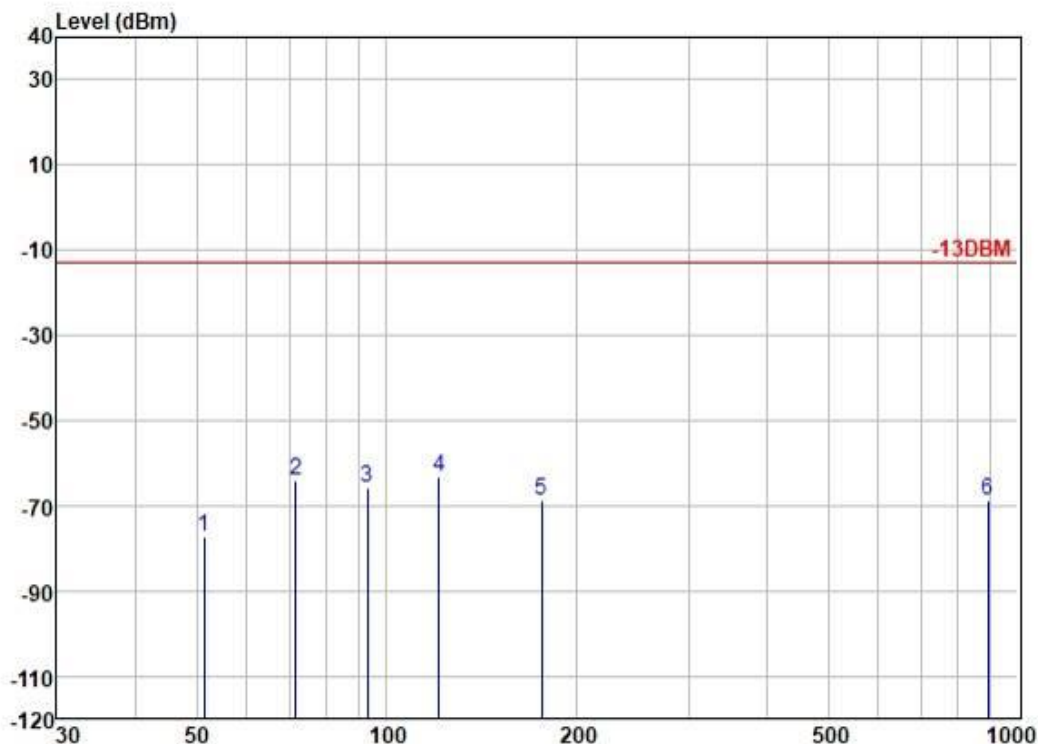
2. The radiated test performed at bottom / middle / top channel, the data with more than 20db margin, therefore, only the worst-case middle channel test data was recorded in the report.

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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DL_1S_M_AWGN_Horizontal_30MHz~1GHz



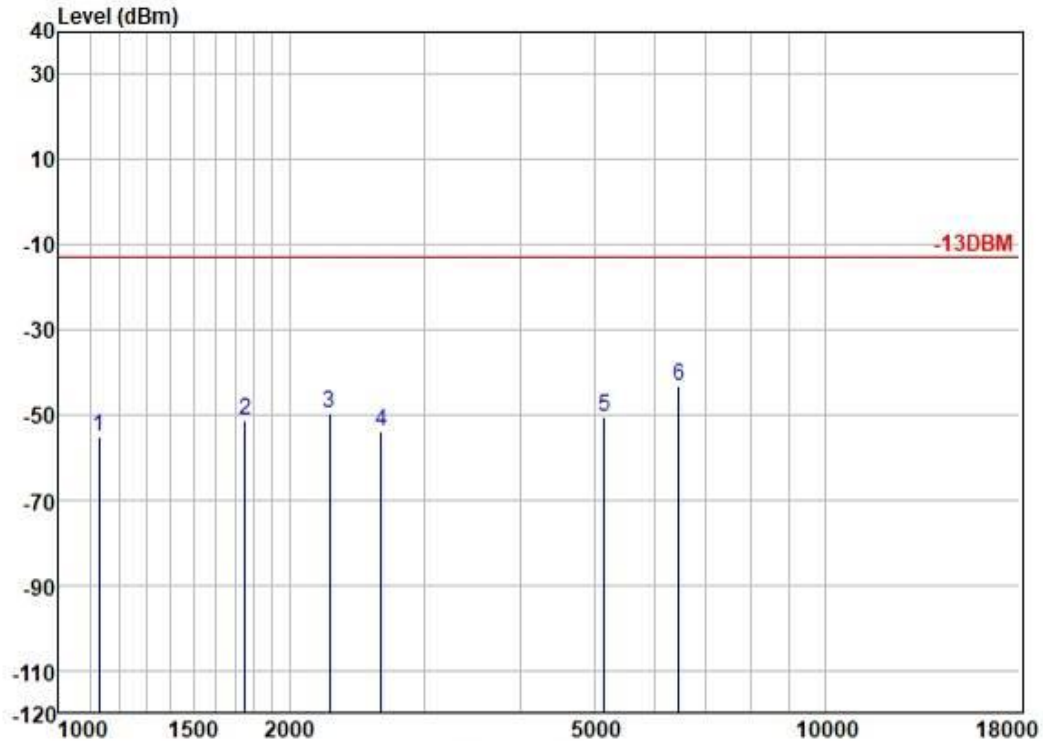
Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
51.301	-77.13	-13	-64.13	Horizontal	PASS
71.832	-63.90	-13	-50.9	Horizontal	PASS
93.113	-65.91	-13	-52.91	Horizontal	PASS
121.123	-63.30	-13	-50.3	Horizontal	PASS
175.652	-68.81	-13	-55.81	Horizontal	PASS
893.857	-68.79	-13	-55.79	Horizontal	PASS



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DL_1S_M_AWGN_Horizontal_above 1GHz



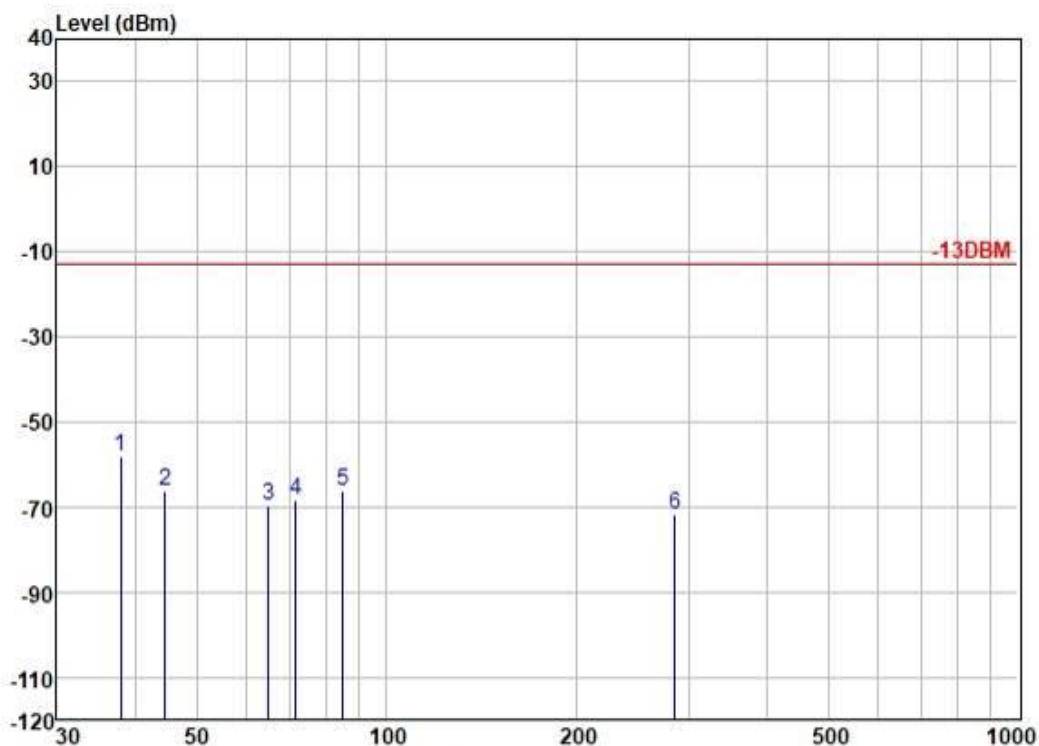
Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
1129.072	-55.05	-13	-42.05	Horizontal	PASS
1751.955	-51.38	-13	-38.38	Horizontal	PASS
2259.367	-49.40	-13	-36.4	Horizontal	PASS
2633.397	-53.81	-13	-40.81	Horizontal	PASS
5149.197	-50.41	-13	-37.41	Horizontal	PASS
6451.353	-43.03	-13	-30.03	Horizontal	PASS



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DL_1S_M_AWGN_Vertical_30MHz~1GHz



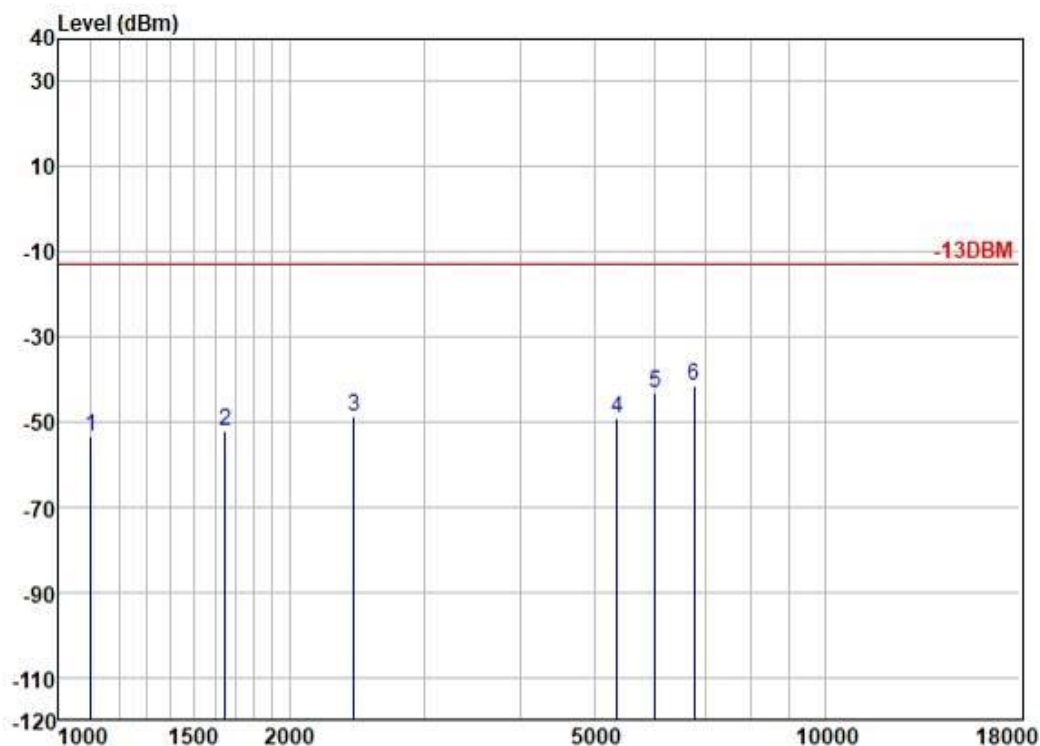
Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
37.812	-58.14	-13	-45.14	Vertical	PASS
44.587	-66.36	-13	-53.36	Vertical	PASS
64.887	-69.60	-13	-56.6	Vertical	PASS
71.832	-68.41	-13	-55.41	Vertical	PASS
85.298	-66.31	-13	-53.31	Vertical	PASS
285.978	-71.59	-13	-58.59	Vertical	PASS



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DL_1S_M_AWGN_Vertical_above 1GHz



Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
1100.079	-53.61	-13	-40.61	Vertical	PASS
1648.778	-52.16	-13	-39.16	Vertical	PASS
2428.671	-48.93	-13	-35.93	Vertical	PASS
5361.833	-48.97	-13	-35.97	Vertical	PASS
6001.626	-42.99	-13	-29.99	Vertical	PASS
6756.708	-41.39	-13	-28.39	Vertical	PASS



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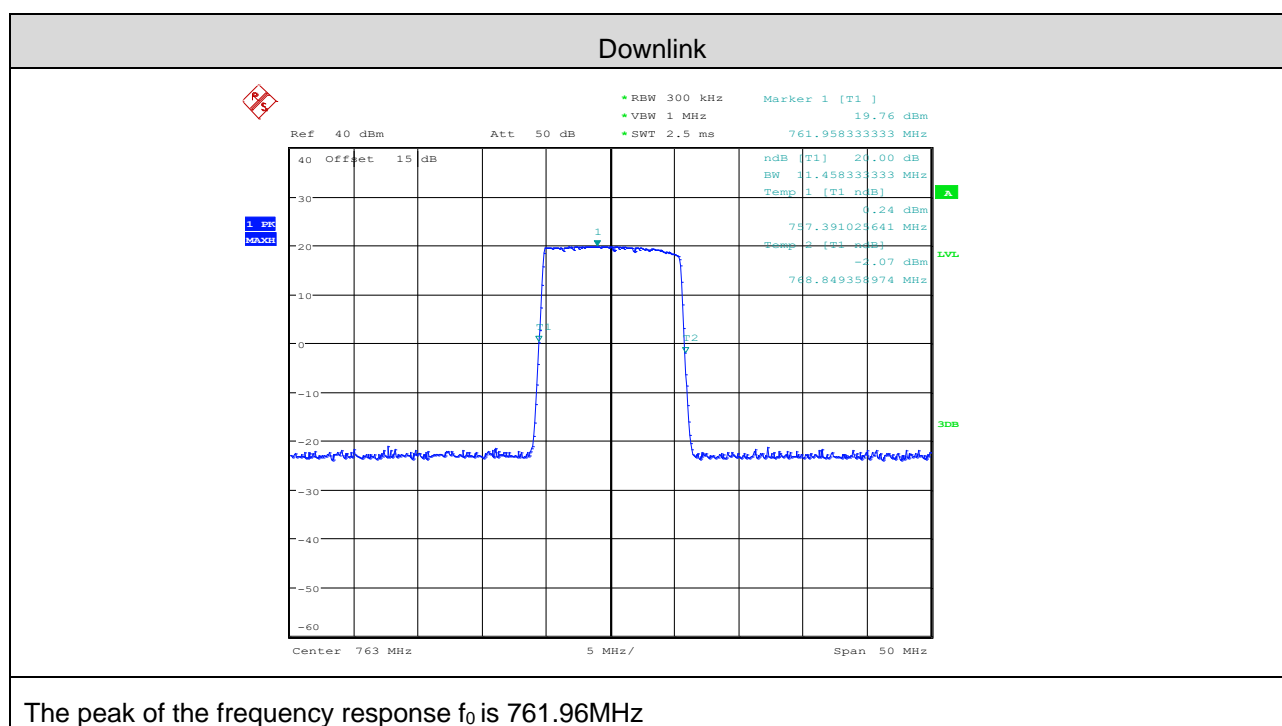
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4 FirstNet (788-798MHz paired with 758-768MHz)

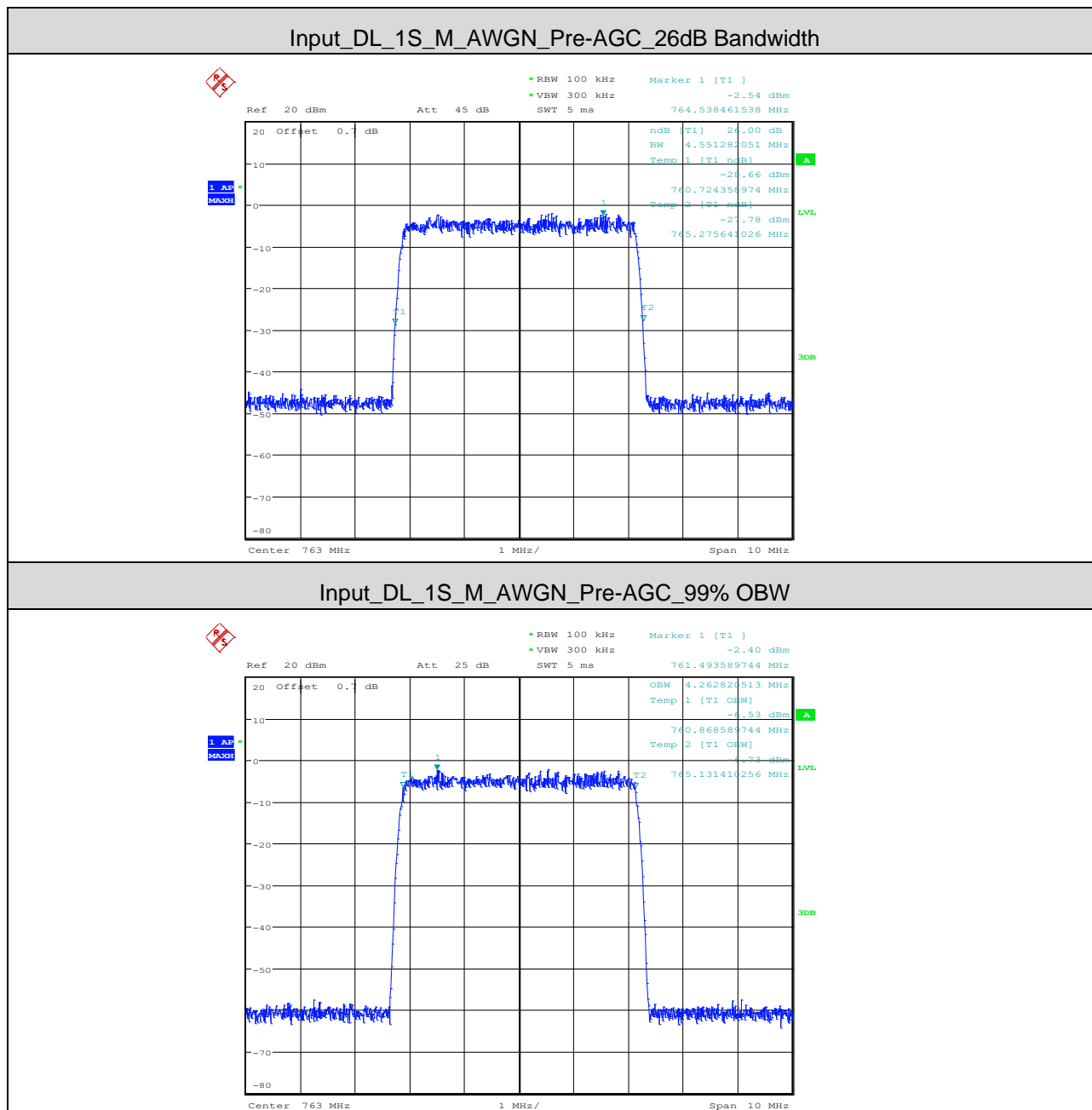
4.1 AGC threshold level

Test Conf.	AGC Threshold level
DL_1S_M_AWGN	0.05dBm

4.2 Out-of-band rejection



4.3 Input-versus-output signal comparison



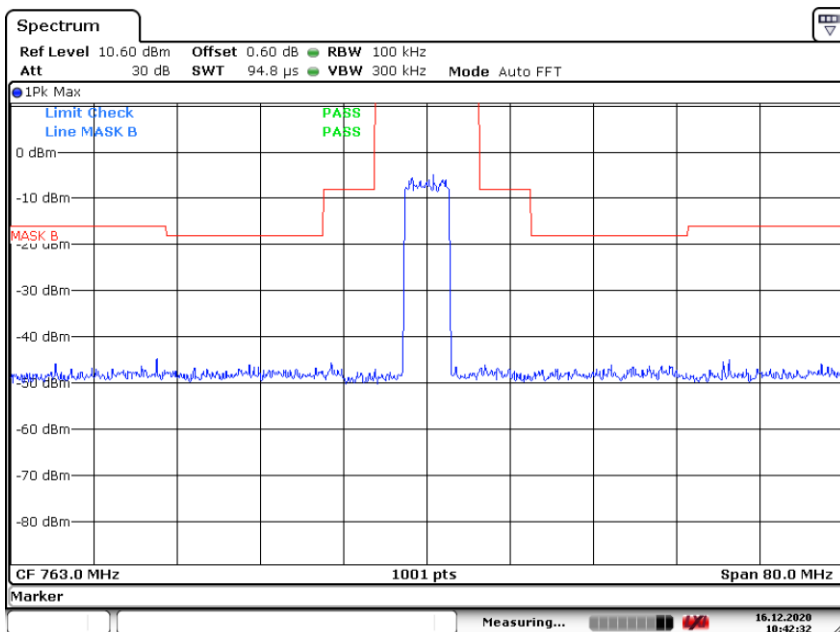
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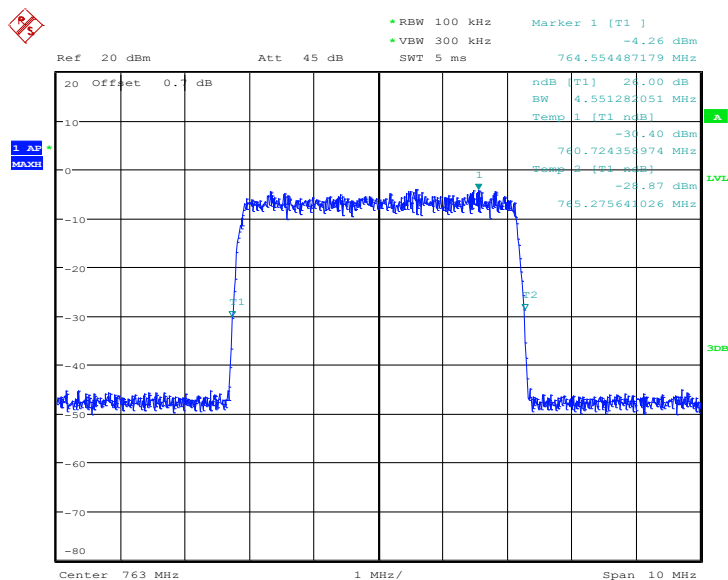
SGS-CSTC Standards Technical Services Co., Ltd.
Guangzhou Branch Test Service EEC Laboratory

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No.198 Kezhu Road, Science Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663 t (86-20) 82155555 f (86-20) 82075058 sgs.china@sgs.com

Input_DL_1S_M_AWGN_ Pre-AGC_Emission Mask



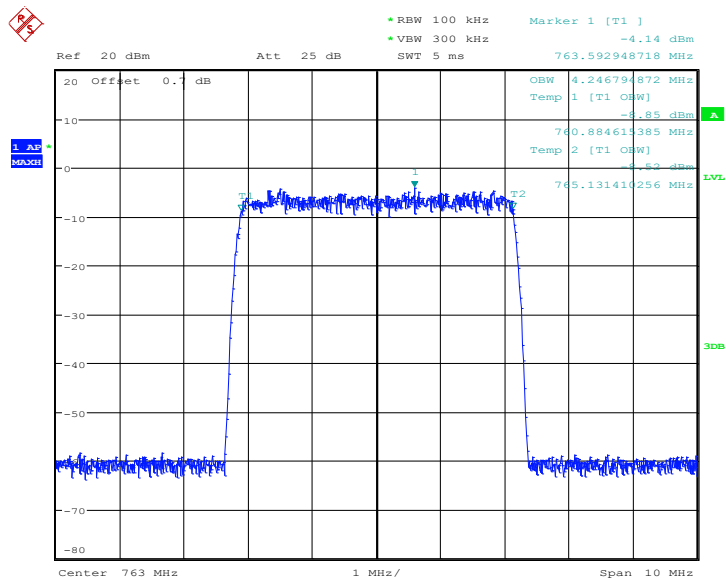
Input_DL_1S_M_AWGN_AGC+3dB_26dB Bandwidth



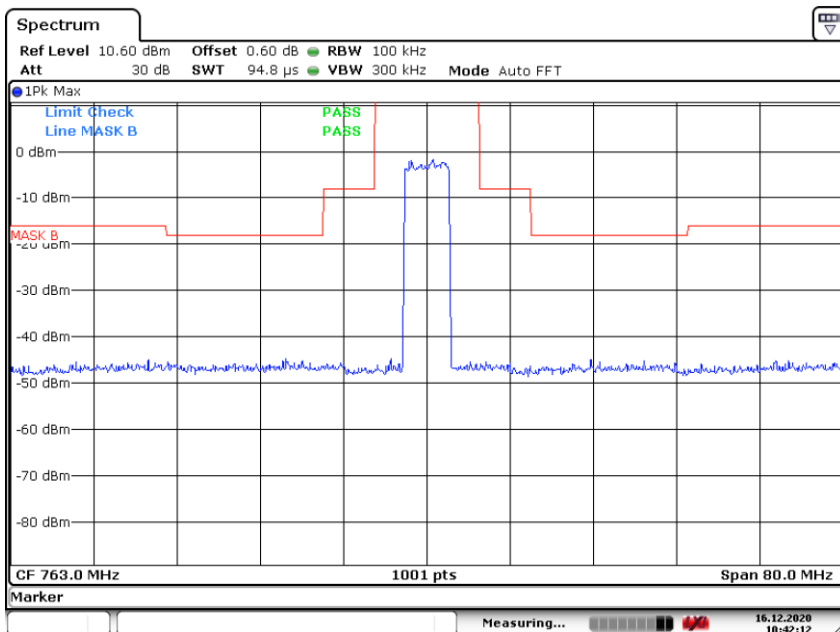
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Input_DL_1S_M_AWGN_AGC+3dB_99% OBW



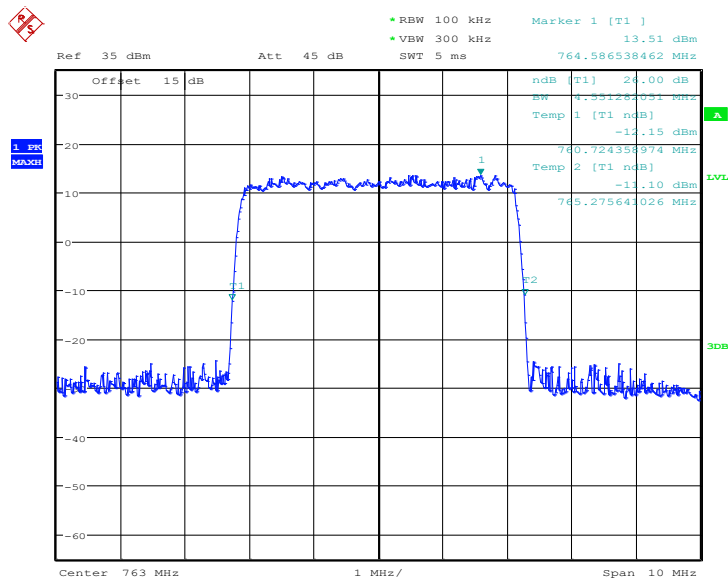
Input_DL_1S_M_AWGN_AGC+3dB_Emission Mask



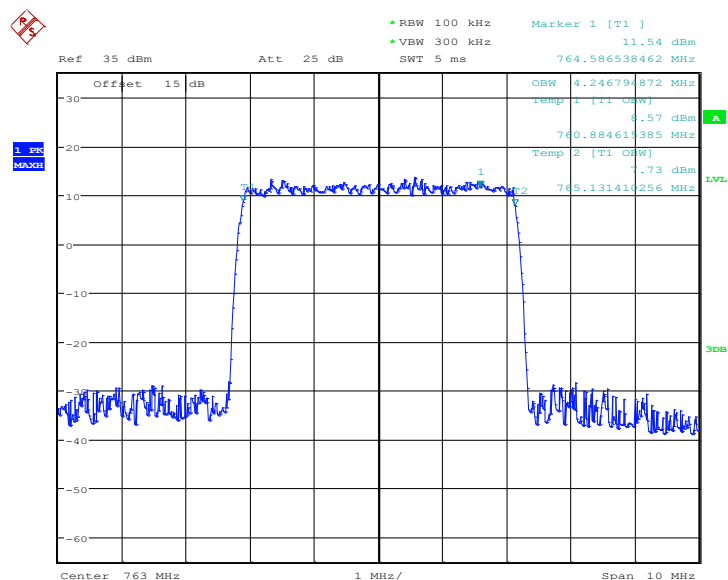
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Output_DL_1S_M_AWGN_Pre-AGC_26dB Bandwidth



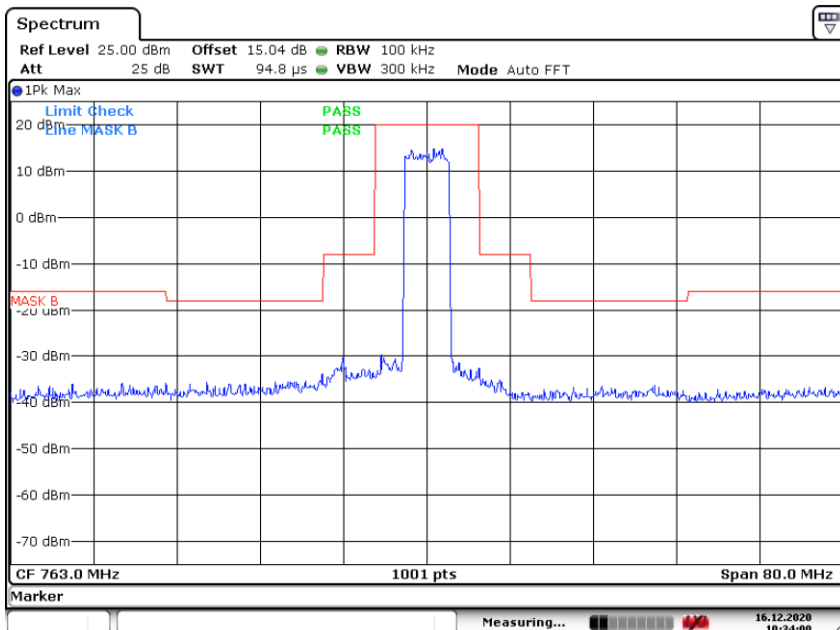
Output_DL_1S_M_AWGN_Pre-AGC_99% OBW



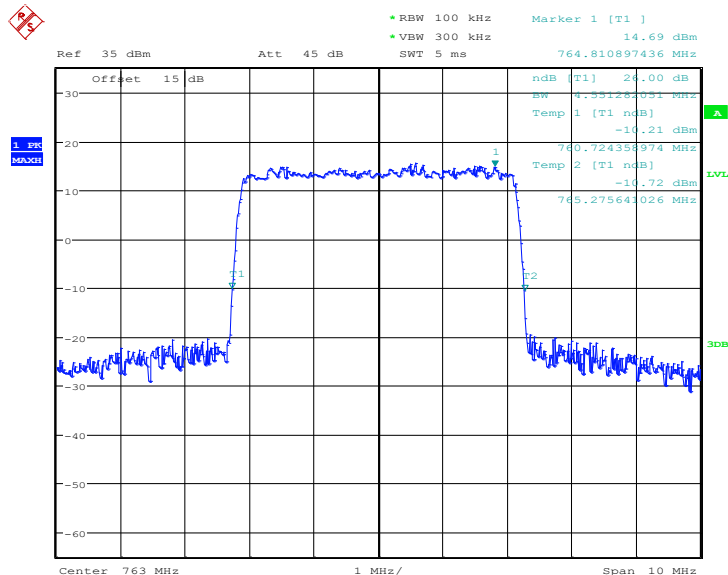
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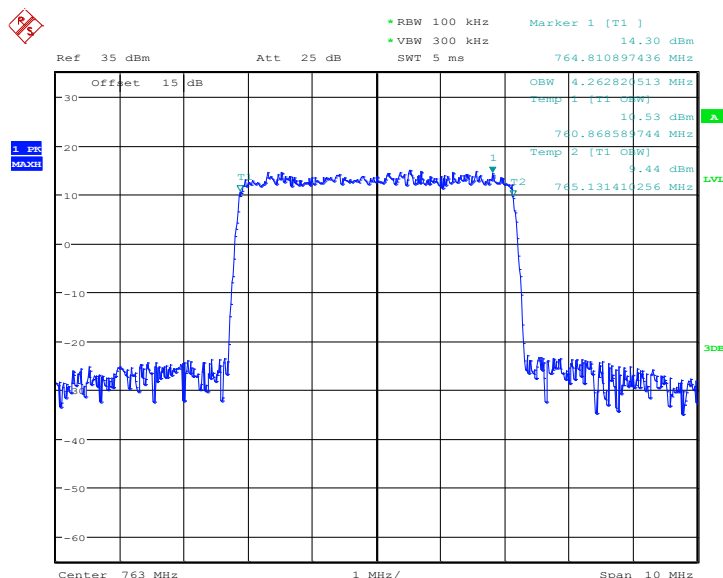
Output_DL_1S_M_AWGN_Pre-AGC_Emission Mask



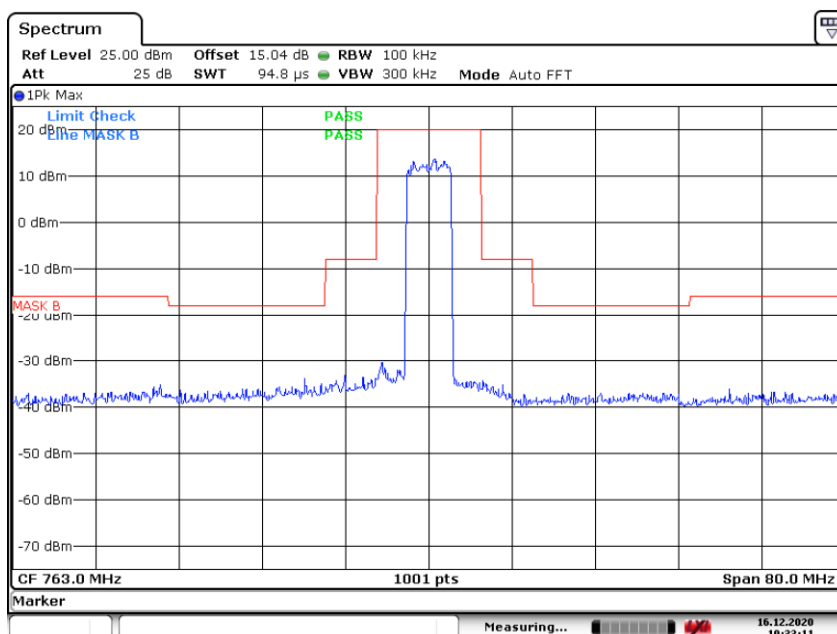
Output_DL_1S_M_AWGN_AGC+3dB_26dB Bandwidth



Output_DL_1S_M_AWGN_AGC+3dB_99% OBW



Output_DL_1S_M_AWGN_AGC+3dB_Emission Mask



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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4.4 Input/output power and amplifier/booster gain

Test Conf.	Test Freq. f ₀ (MHz)	Signal Level	Input Power Power (dBm)	Output Power Power (dBm)	Gain (dB)	Verdict
DL_1S_AWGN	761.96	Pre-AGC	0.00	20.15	20.15	PASS
		AGC+3dB	3.00	20.03	/	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 (NANT) dBi = 12.5dBi+10log (2) dBi= 15.5dBi.

ERP= EIRP-2.15dB

The total maximum ERP for the EUT is (20.15dBm+20.15dBm) +15.5dBi-2.15dB=36.51dBm (4.47W) which don't exceed the required ERP limit (5W).

4.5 Noise Figure

Test Conf.	Noise Figure (dB)	Limit (dB)	Verdict
DL_1S_B_AWGN	8.76	9	PASS
DL_1S_M_AWGN	8.74	9	PASS
DL_1S_T_AWGN	8.69	9	PASS



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

Note: 1. 90.543(c) Out-of-band emission limit.

the power of any emission must be reduced below the mean output power (P) by at least $43 + 10 \log (P)$ dB, Here,

$$P=20.15\text{dBm}=0.1035\text{W}$$

$$\text{So the limit} = P(\text{dBm}) - [43 + 10 \log (0.1035\text{W})] = -13\text{dBm}$$

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.

2. 90.543e (1) limit:

On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations.

$$\text{Here, } P=20.15\text{dBm}=0.1035\text{W}$$

$$\text{So the limit} = P(\text{dBm}) - [76 + 10 \log (0.1035\text{W})] = -46\text{dBm}$$

The EUT supports 2x2 MIMO and the emissions were measured at one of output port, so the limit line was set to **-49.01dBm** in following test plots in order to determine the test result conveniently.

3. 90.543 (e)(3) limit:

On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least $43 + 10 \log (P)$ dB

$$\text{Here, } P=20.15\text{dBm}=0.1035\text{W}$$

So the limit =

$$P(\text{dBm}) - [43 + 10 \log (0.1035\text{W})] = -13\text{dBm}$$

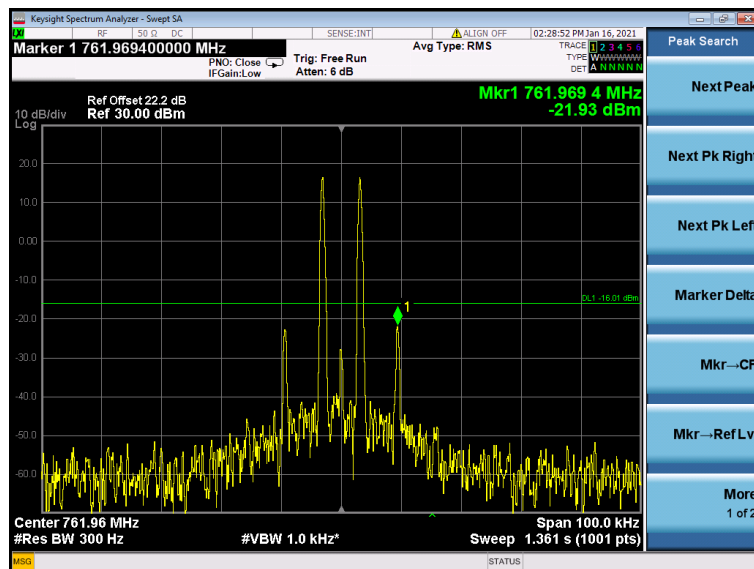
The EUT supports 2x2 MIMO and the emissions were measured at one of output port, so the limit line was set to **-16.01dBm** in following test plots in order to determine the test result conveniently.

4. Intermodulation has been tested using an input signal with Pre-AGC level and an input signal with AGC+3dB level, only the worst-case was recorded in this report.

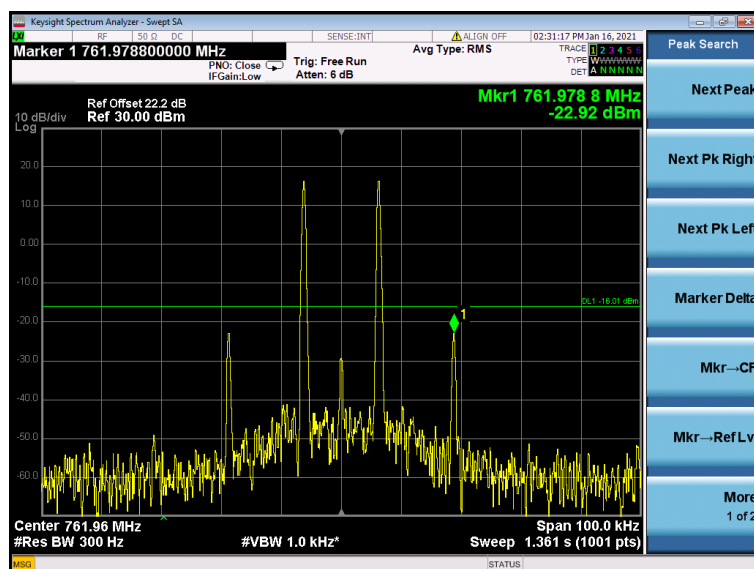


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CW_Pre-AGC_Intermodulation

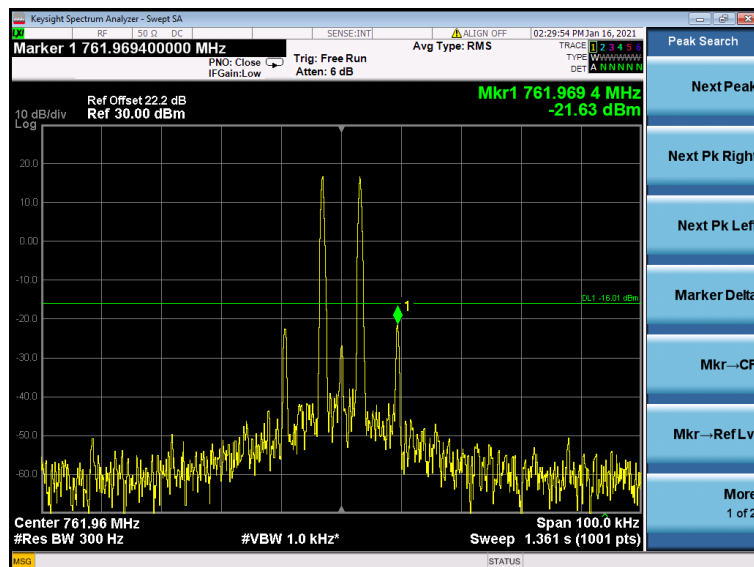


CW_Pre-AGC_Intermodulation

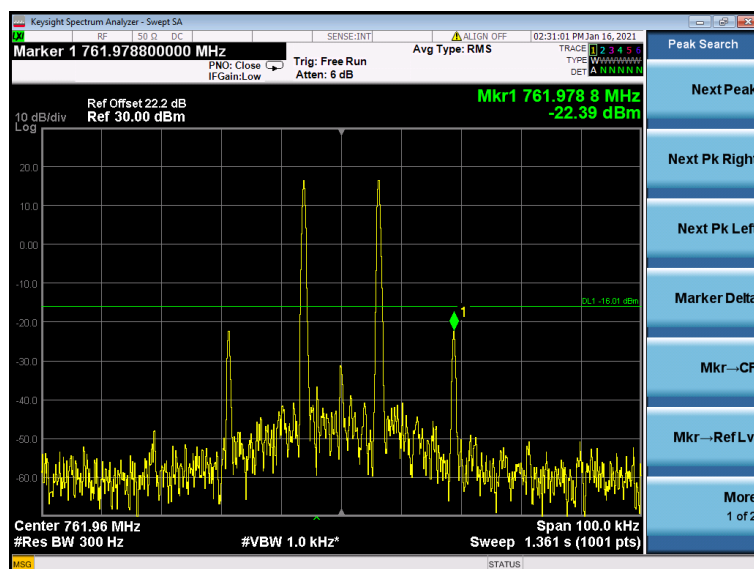


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CW_AGC+3dB_Intermodulation



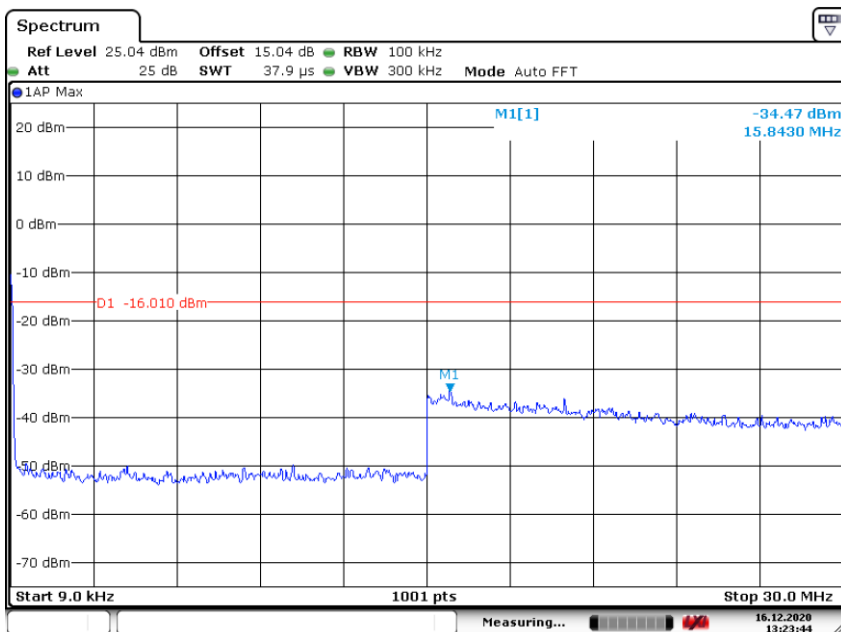
CW_AGC+3dB_Intermodulation



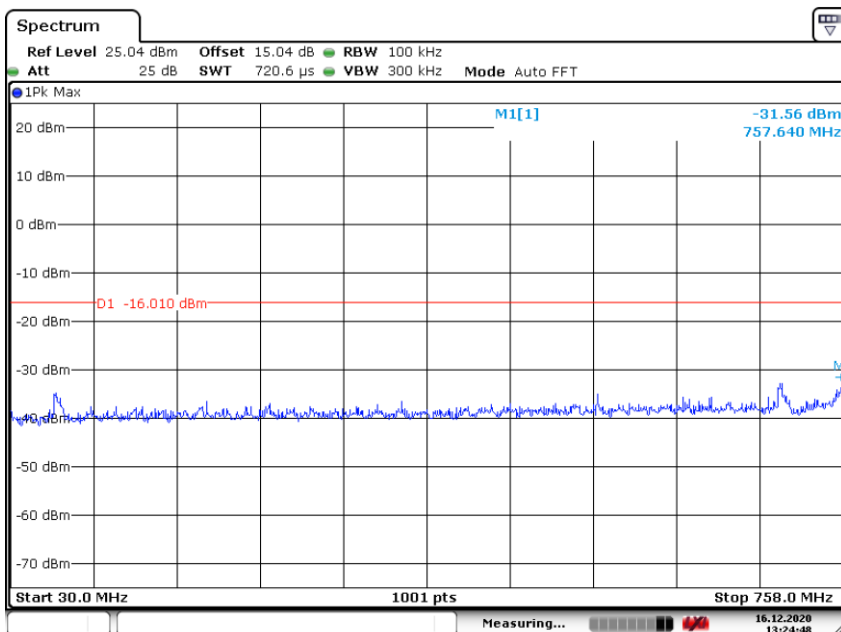
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DL_1S_B_AWGN_Pre-AGC_Spurious emission 1



DL_1S_B_AWGN_Pre-AGC_Spurious emission 2



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