



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

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Email: ee.guangzhou@sgs.com

Application No.: GZEM2011016736CR  
Page: 1 of 170  
FCC ID: OJFDLRU678

# Appendix B

## Test Data and Result Details of GZEM2011016736CR



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Guangzhou Branch | 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

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

**1.1 AGC threshold level**

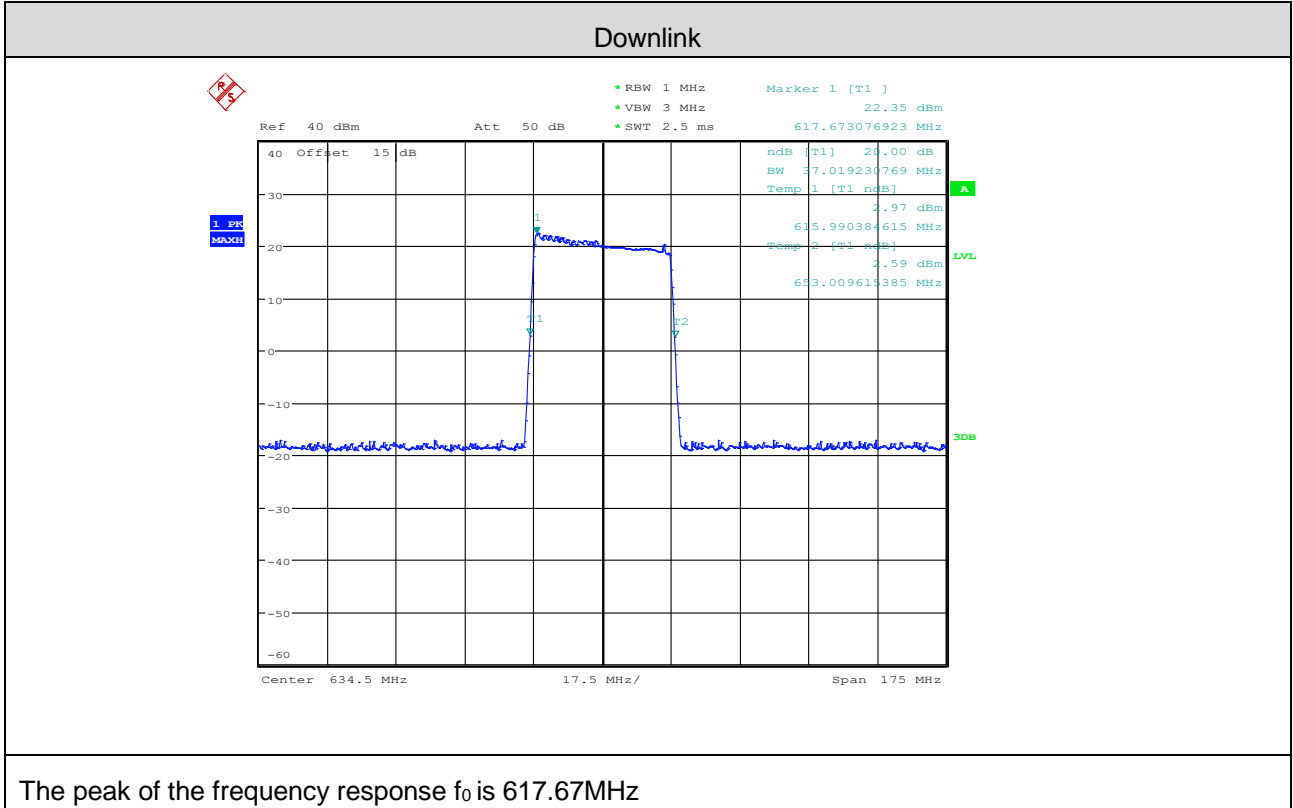
Test Conf.	AGC Threshold level
DL_1S_M_AWGN_AWGN	0.18dBm
DL_1S_M_AWGN_GSM	0.13dBm



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**1.2 Out-of-band rejection**

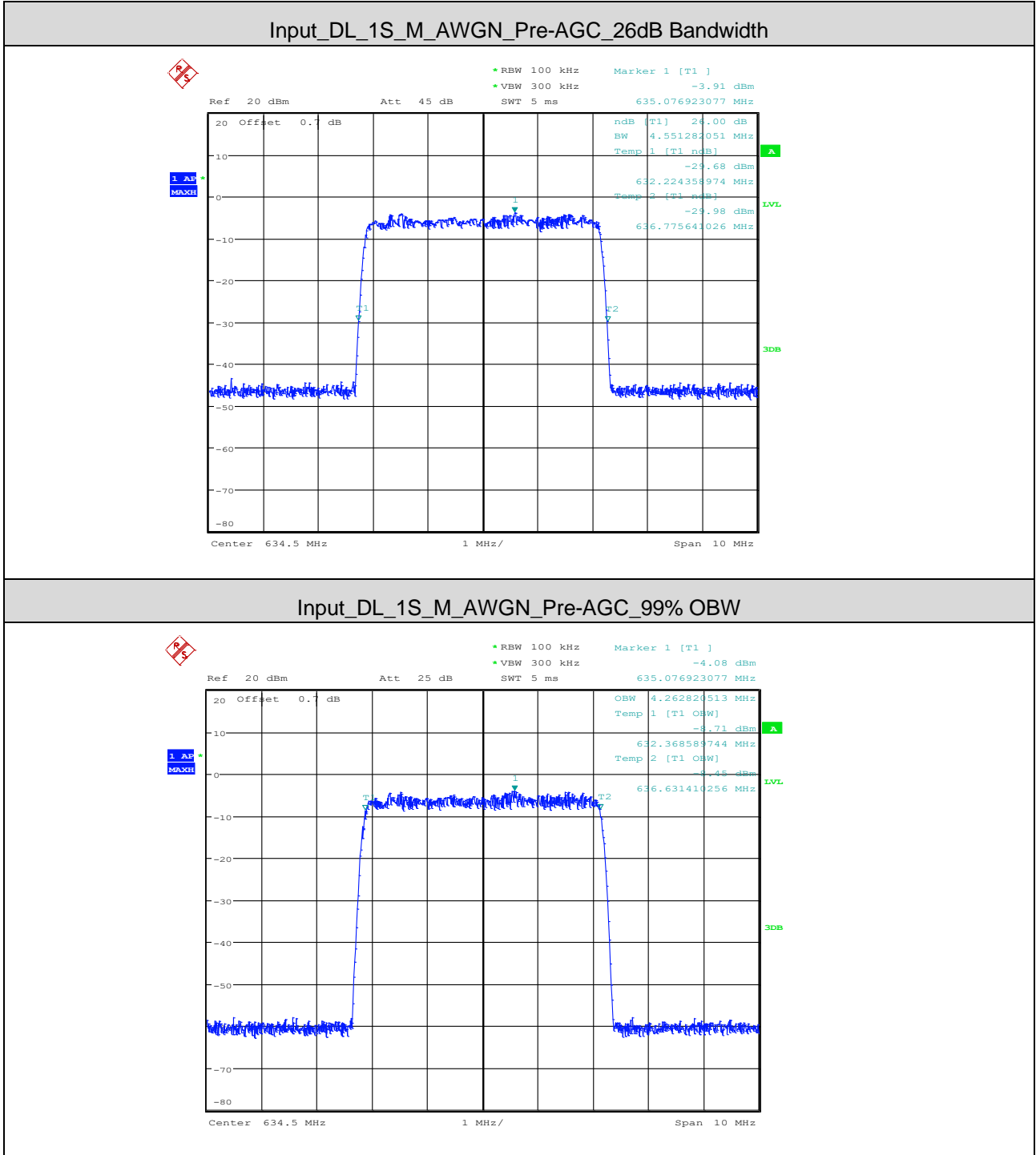


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**1.3 Input-versus-output signal comparison**

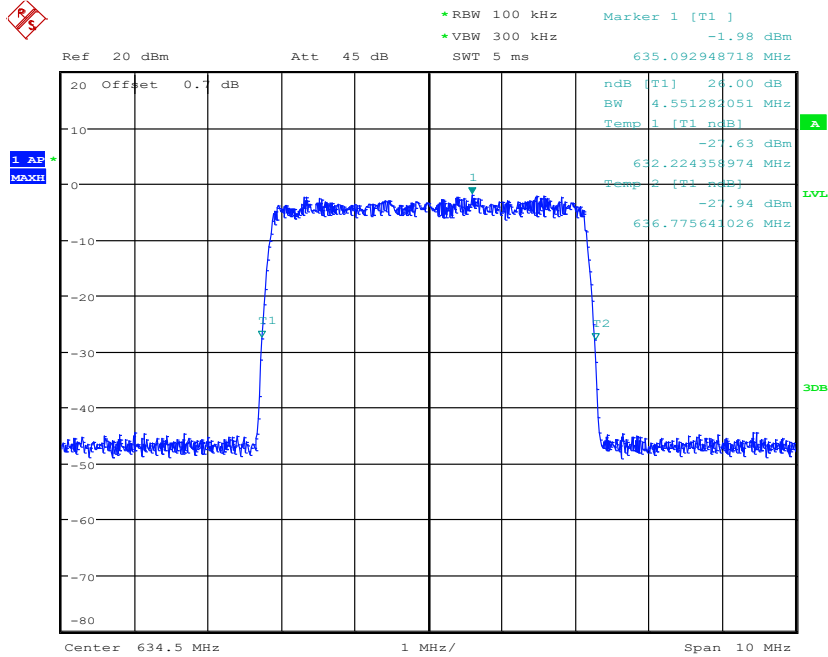


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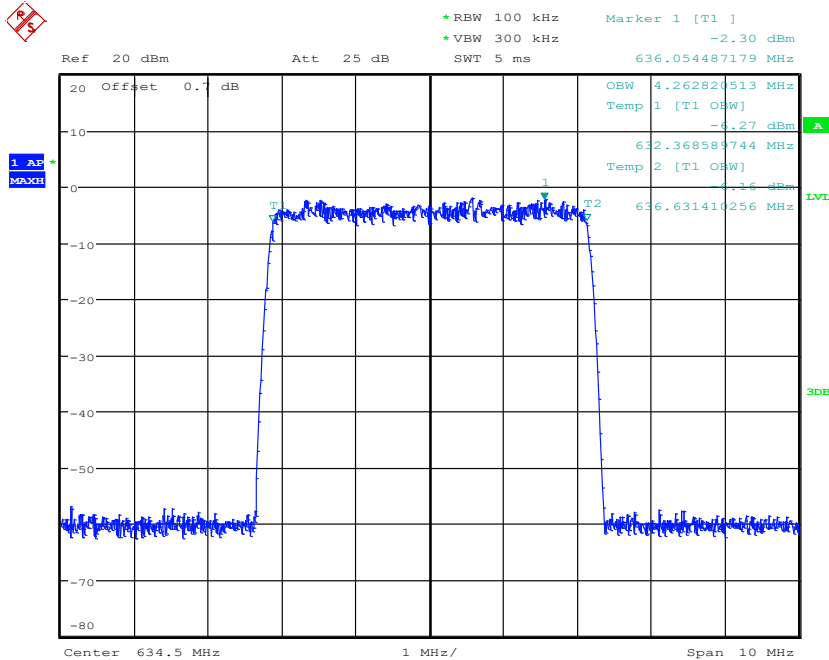
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Input\_DL\_1S\_M\_AWGN\_AGC+3dB\_26dB Bandwidth



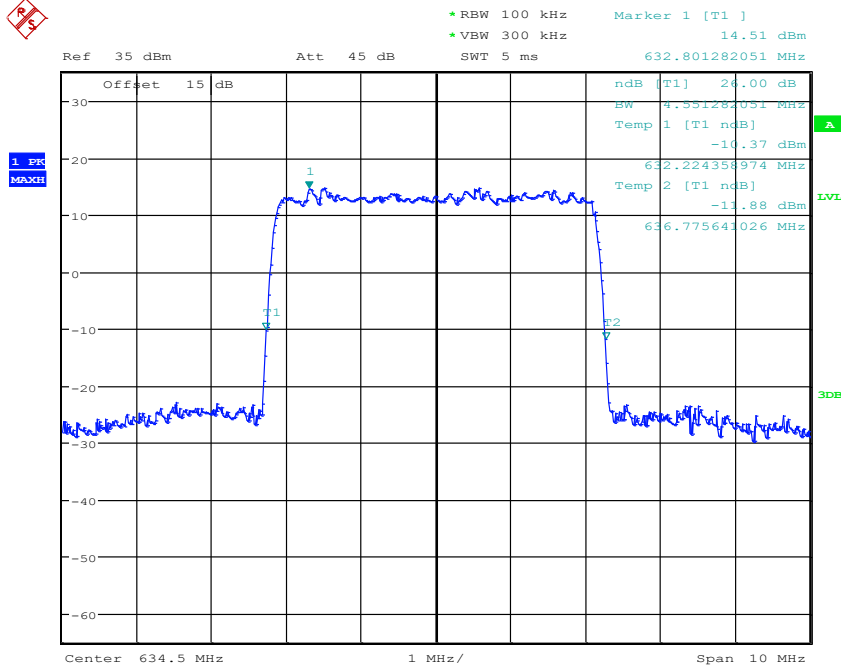
Input\_DL\_1S\_M\_AWGN\_AGC+3dB\_99% OBW



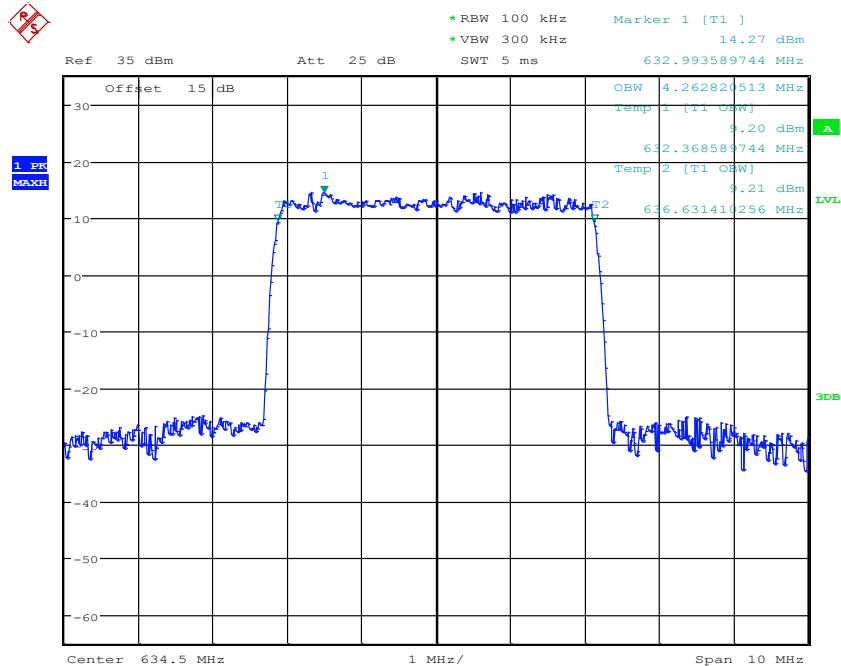
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## Output\_DL\_1S\_M\_AWGN\_Pre-AGC\_26dB Bandwidth



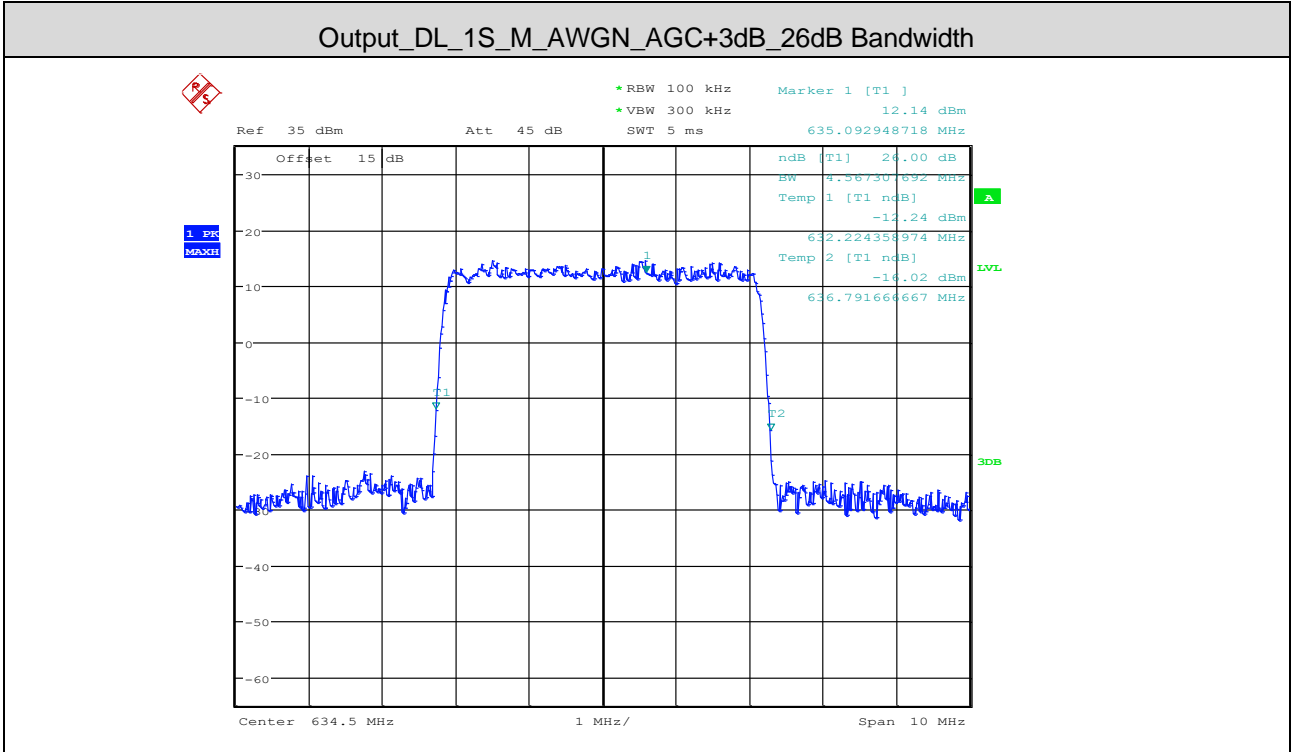
## Output\_DL\_1S\_M\_AWGN\_Pre-AGC\_99% OBW



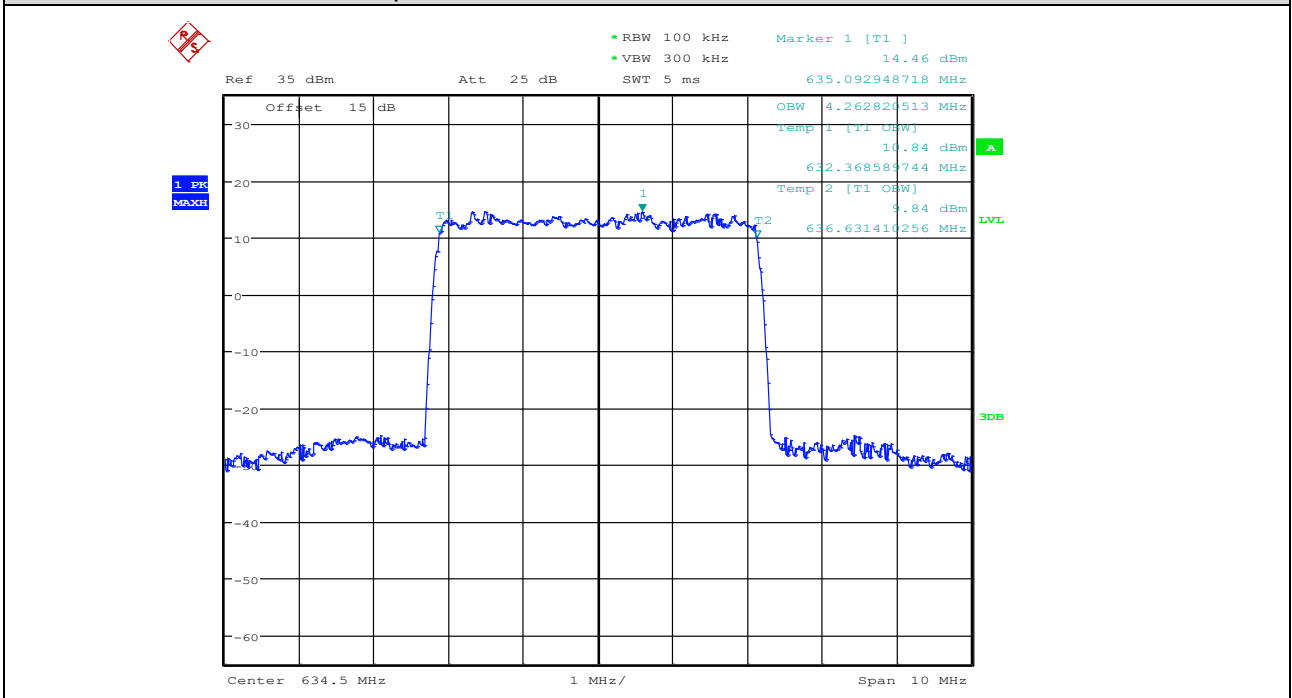
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Output\_DL\_1S\_M\_AWGN\_AGC+3dB\_26dB Bandwidth

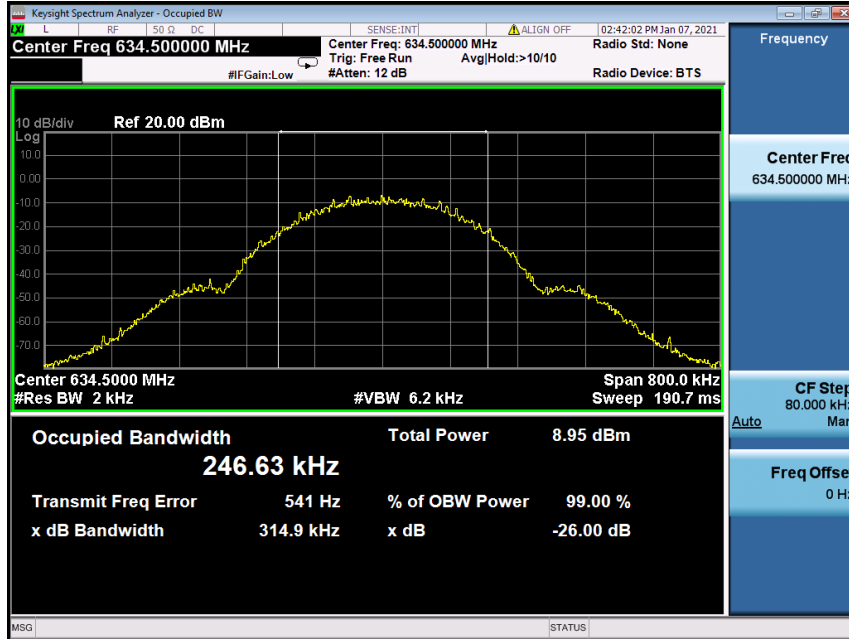


Output\_DL\_1S\_M\_AWGN\_AGC+3dB\_99% OBW

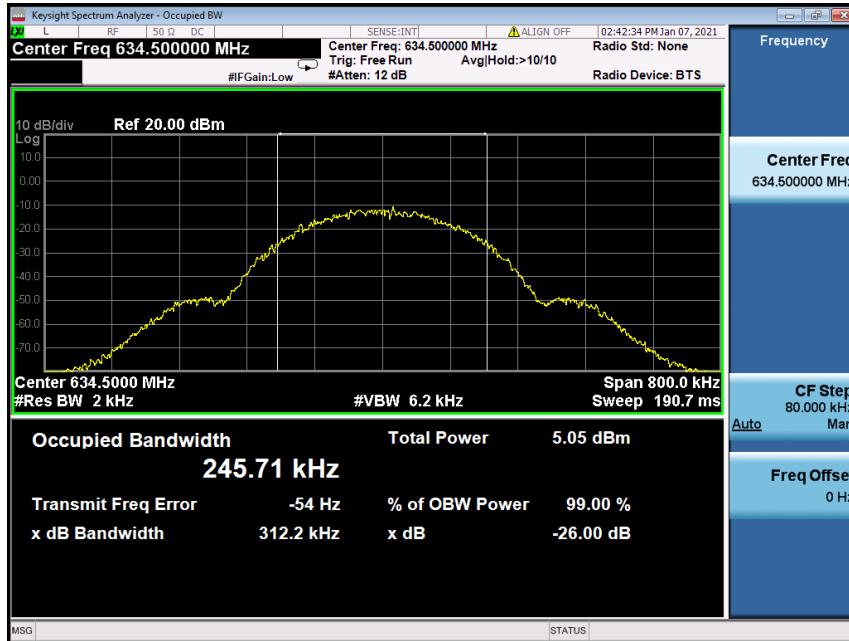


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Input\_DL\_1S\_M\_GSM\_Pre-AGC\_26dB Bandwidth & 99% OBW



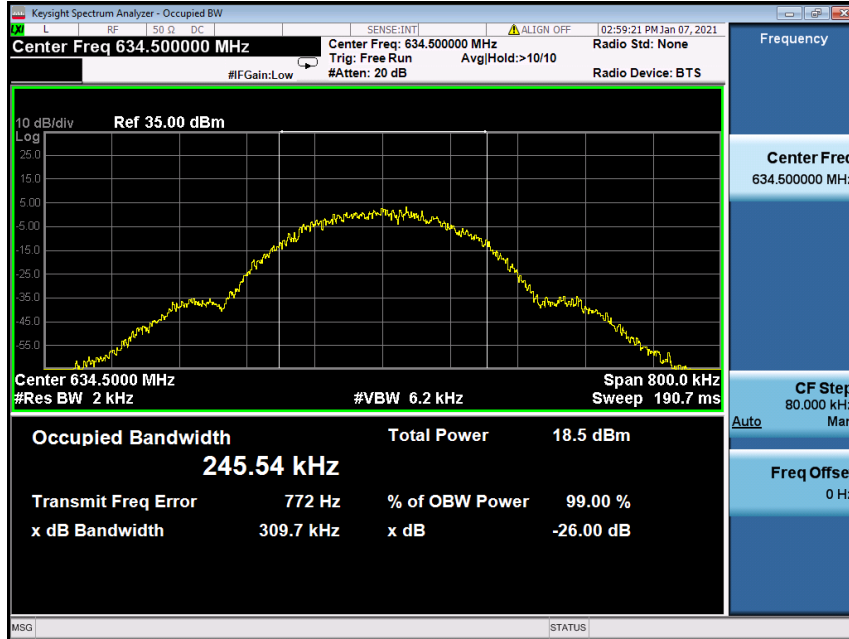
Input\_DL\_1S\_M\_GSM\_AGC+3dB\_26dB Bandwidth & 99% OBW



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Output\_DL\_1S\_M\_GSM\_Pre-AGC\_26dB Bandwidth & 99% OBW



Output\_DL\_1S\_M\_GSM\_AGC+3dB\_26dB Bandwidth & 99% OBW



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**Remark:**

Compare the spectral plot of the input signal to the output signal affirm that they are similar (in passband and roll off characteristic features and relative spectral locations). The test result complies with the requirement.



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**1.4 Mean output power and amplifier/booster gain**

Test Conf.	Test Freq. f <sub>0</sub> (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).



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

Note: 1. The tested max conducted power for single antenna port is 20.22dBm, 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,

$$P=20.22\text{dBm}= 0.1052\text{W}.$$

So the limit =

$$P(\text{dBm})- [43 + 10 \log (0.1052\text{W})] =20.22\text{dBm}-33.22\text{dB}=-13\text{dBm}$$

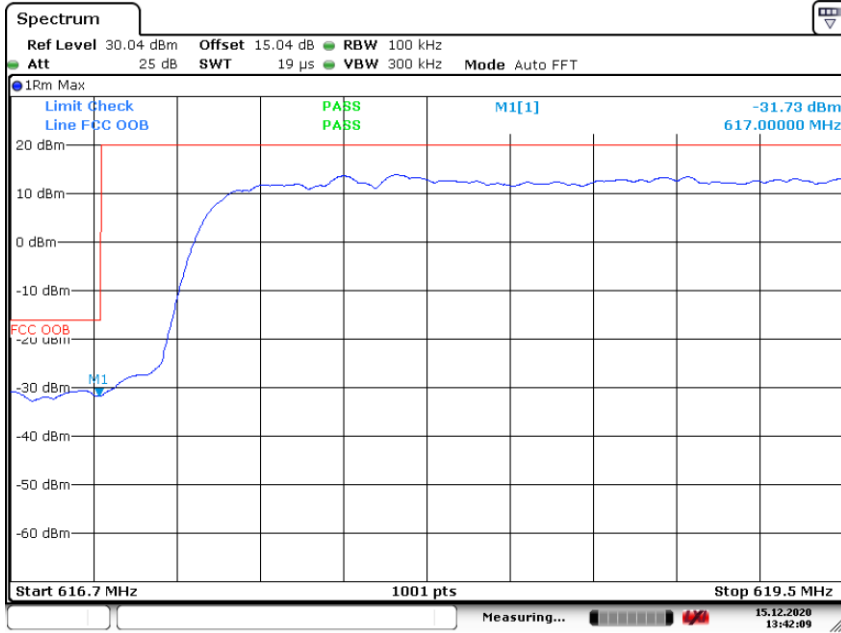
The EUT supports 2x2 MIMO and the emissions were measured at one of output port, so the limit line was set to -16.01dBm in following test plots in order to determine the test result conveniently.

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.

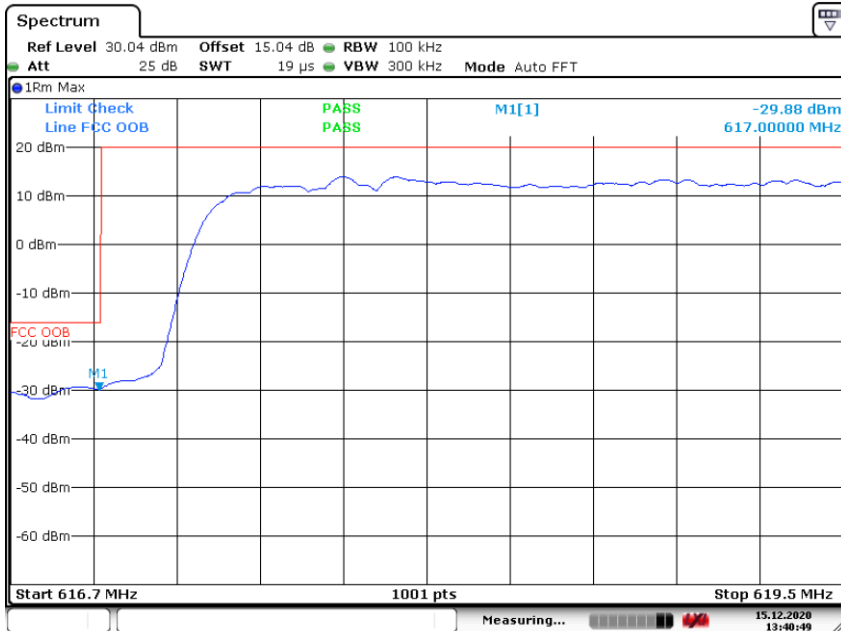


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DL\_1S\_B\_AWGN\_Pre-AGC\_Out-of-band emission

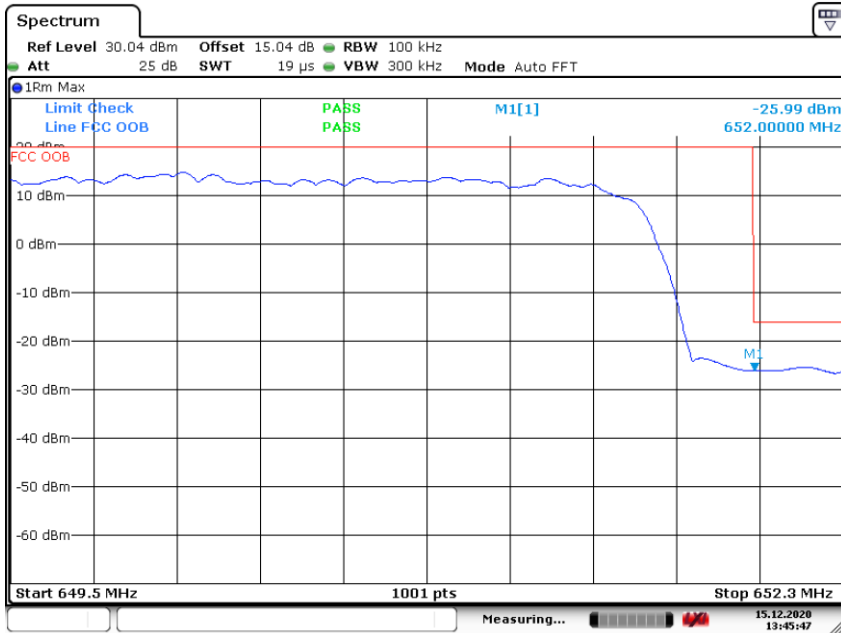


DL\_1S\_B\_AWGN\_AGC+3\_Out-of-band emission

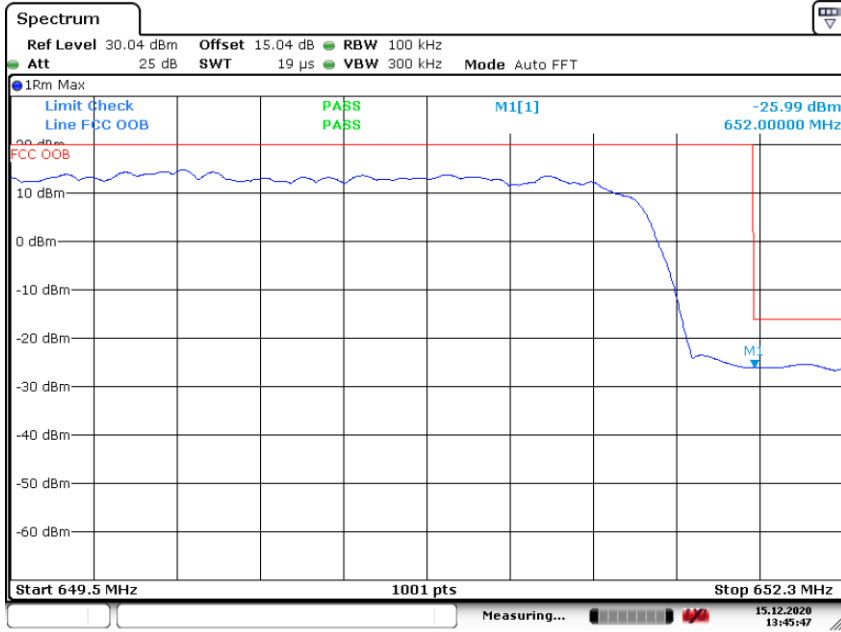


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DL\_1S\_T\_AWGN\_Pre-AGC\_Out-of-band emission



DL\_1S\_T\_AWGN\_AGC+3\_Out-of-band emission

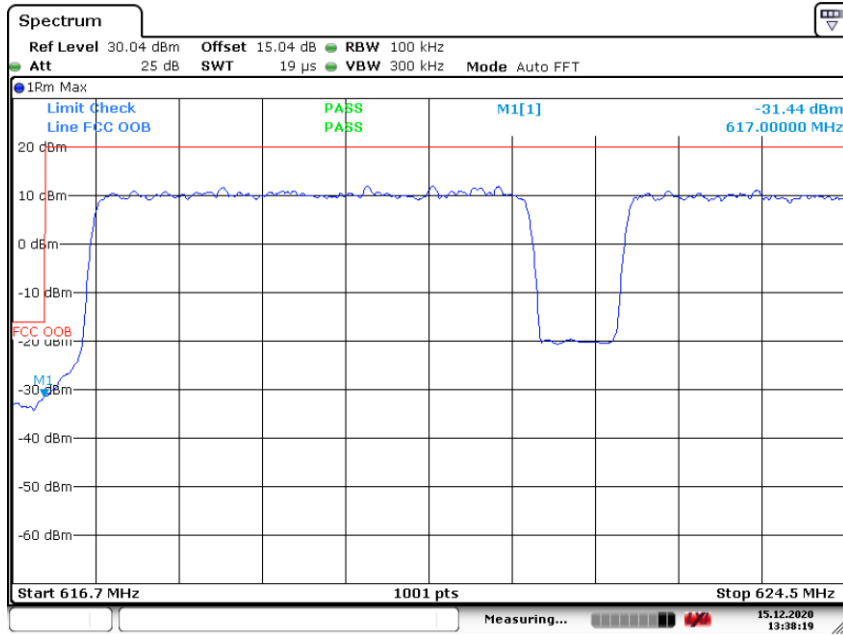


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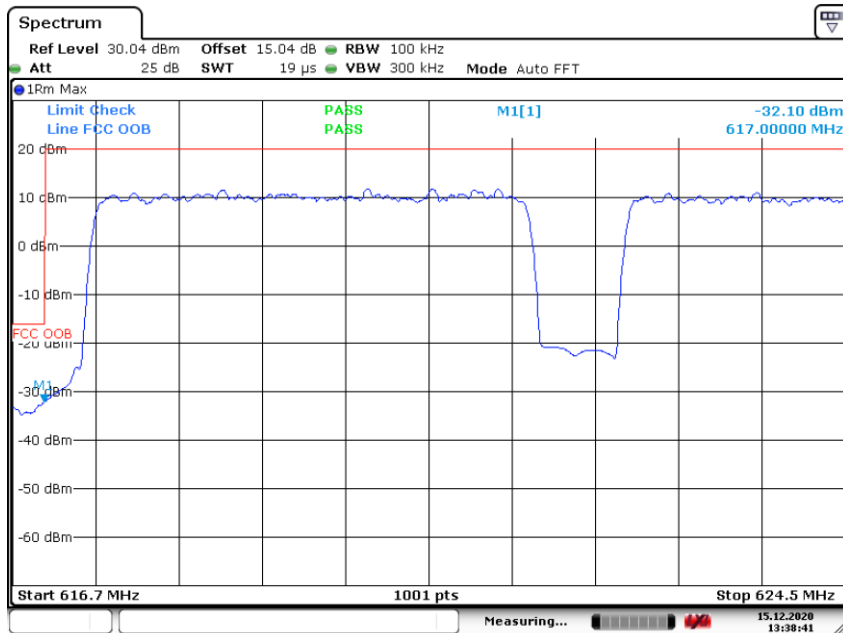
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DL\_2S\_B\_AWGN\_Pre-AGC\_Out-of-band emission

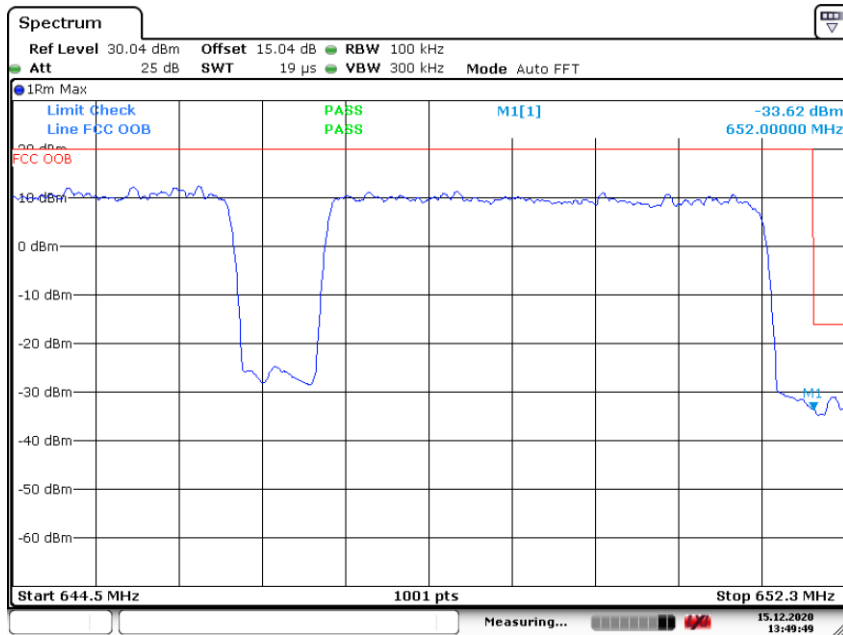


DL\_2S\_B\_AWGN\_AGC+3\_Out-of-band emission

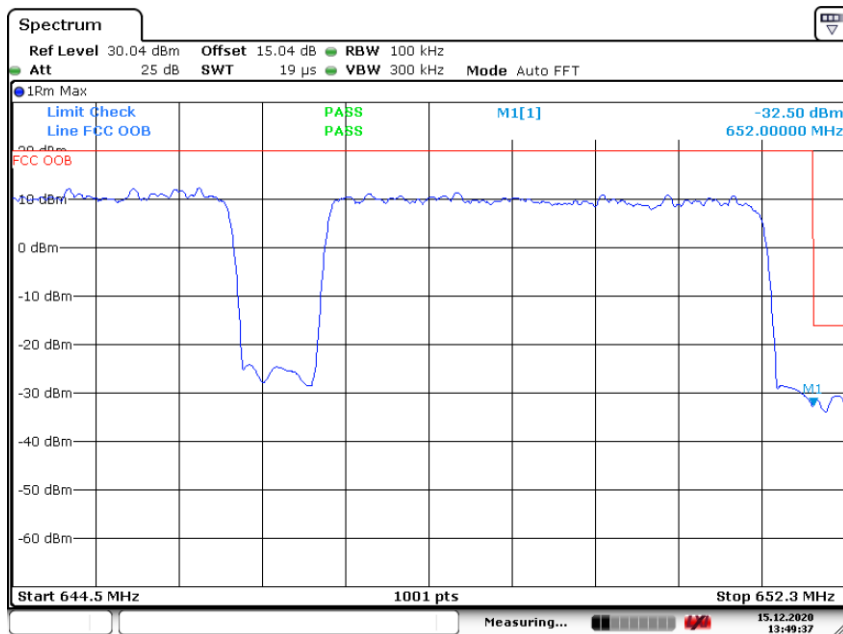


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DL\_2S\_T\_AWGN\_Pre-AGC\_Out-of-band emission



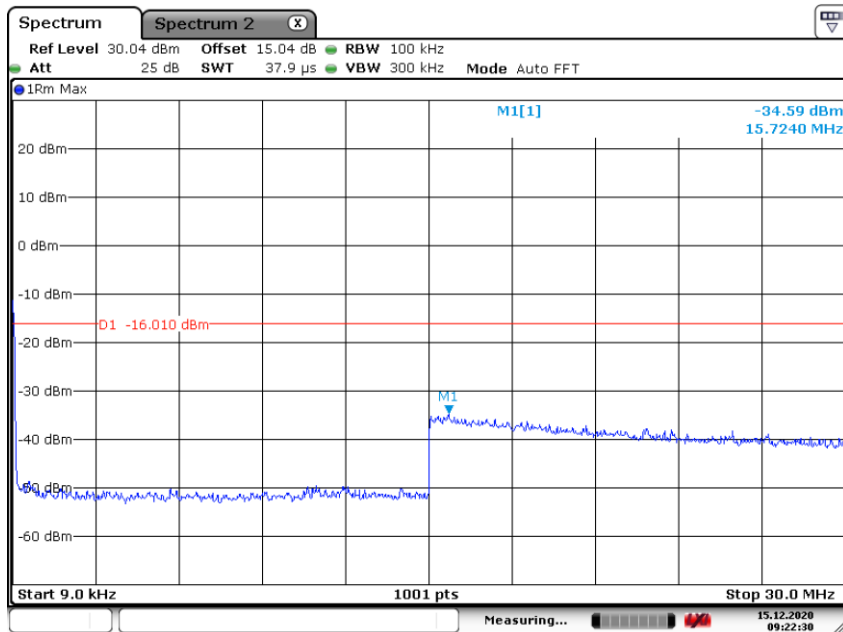
DL\_2S\_T\_AWGN\_AGC+3\_Out-of-band emission



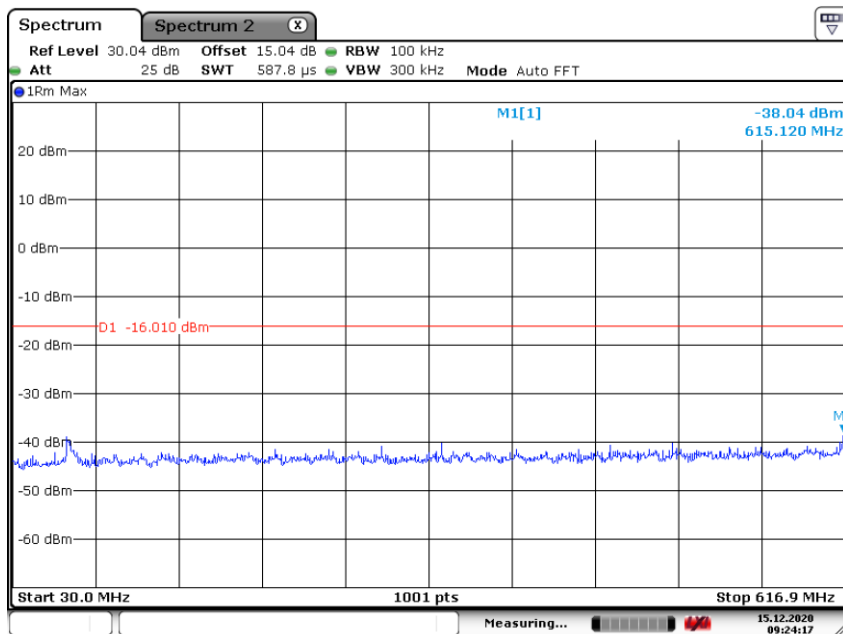
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DL\_1S\_B\_AWGN\_Pre-AGC\_Spurious emission 1

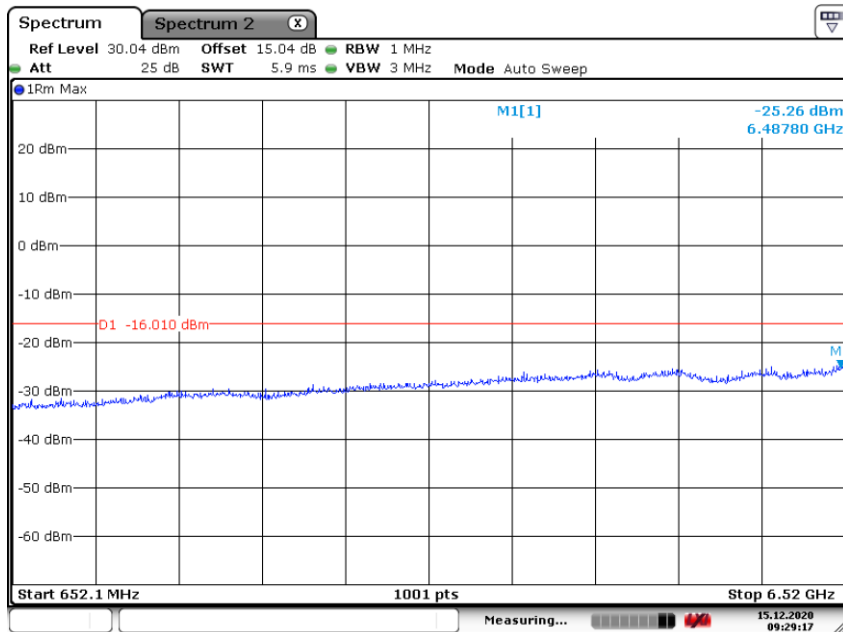


DL\_1S\_B\_AWGN\_Pre-AGC\_Spurious emission 2

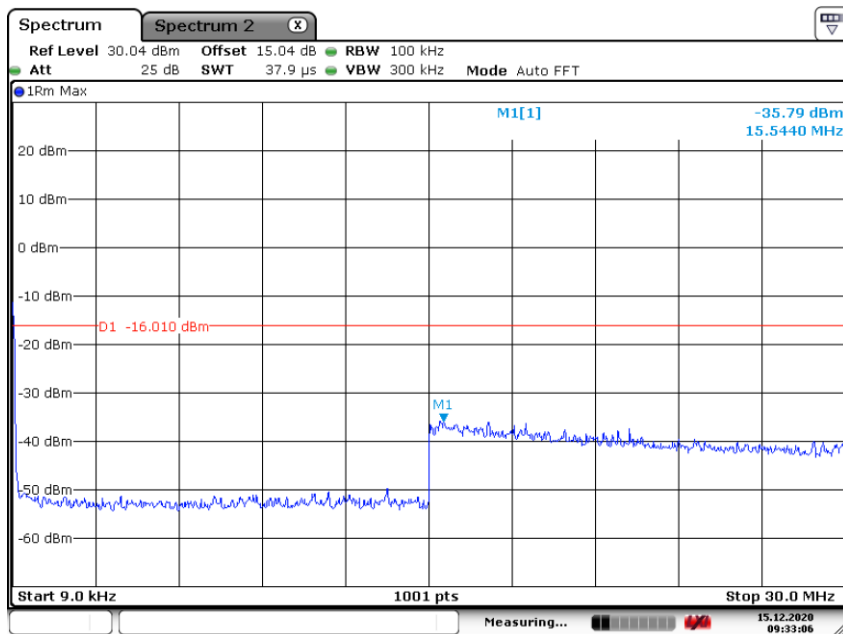


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DL\_1S\_B\_AWGN\_Pre-AGC\_Spurious emission 3

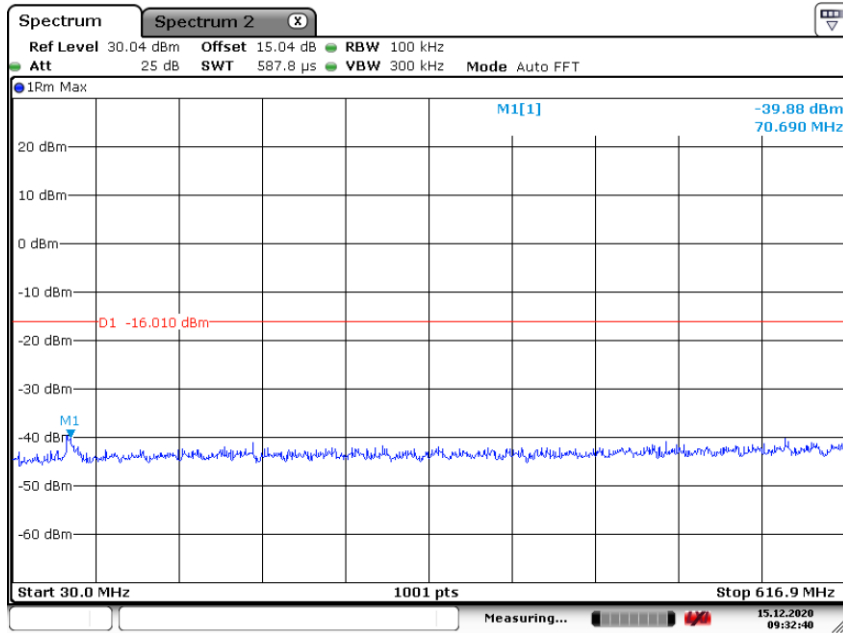


DL\_1S\_M\_AWGN\_Pre-AGC\_Spurious emission 1

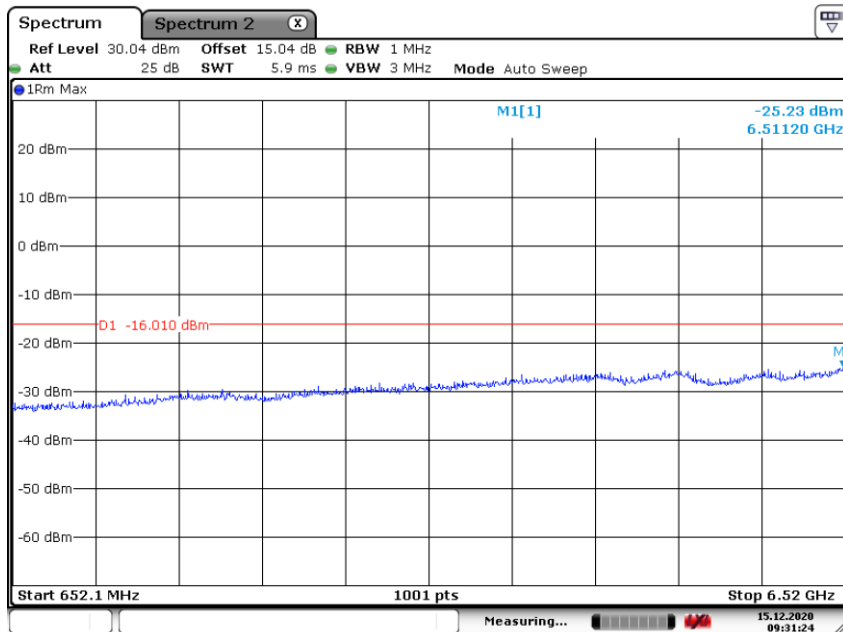


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DL\_1S\_M\_AWGN\_Pre-AGC\_Spurious emission 2

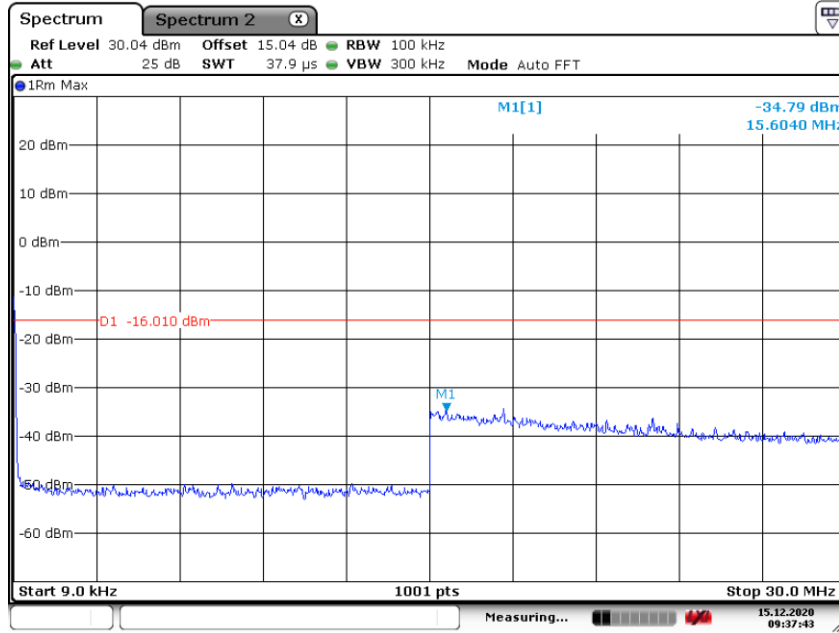


DL\_1S\_M\_AWGN\_Pre-AGC\_Spurious emission 3

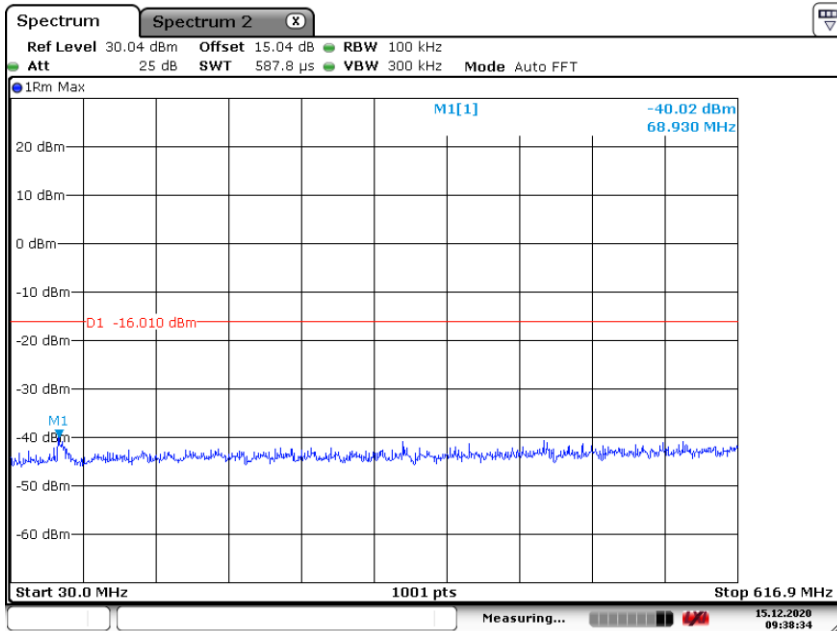


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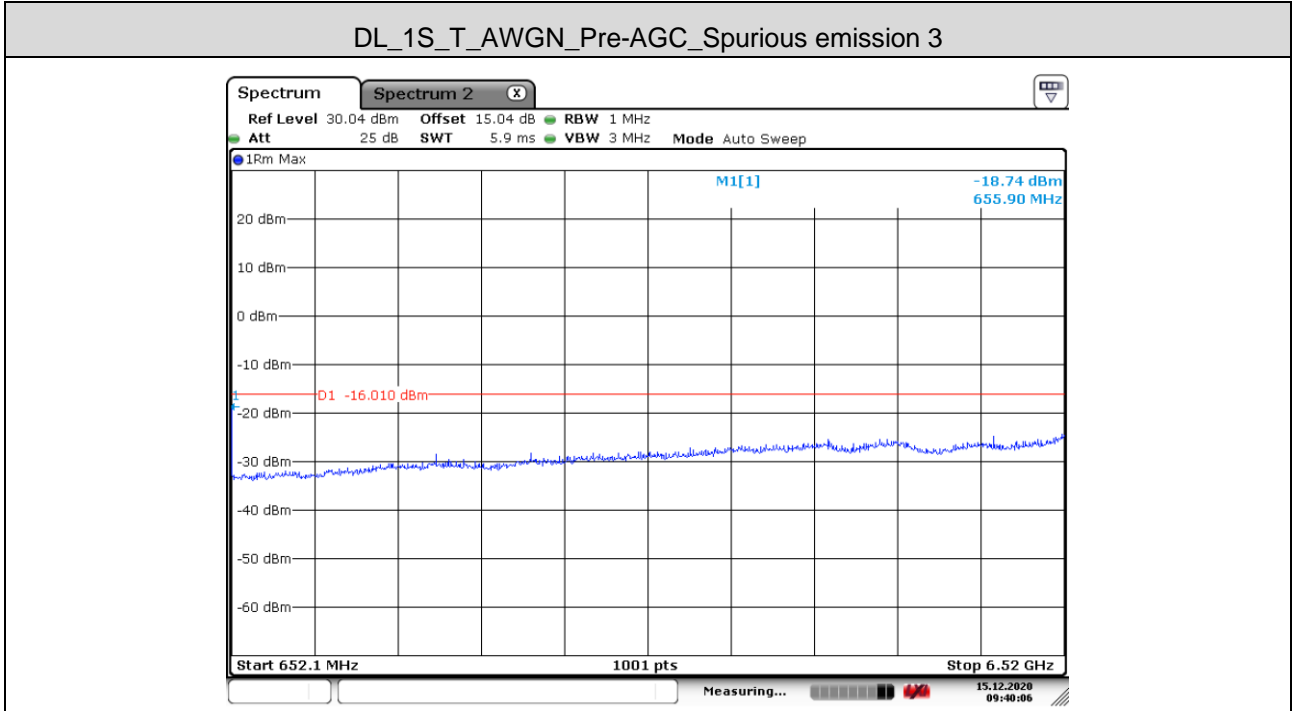
DL\_1S\_T\_AWGN\_Pre-AGC\_Spurious emission 1



DL\_1S\_T\_AWGN\_Pre-AGC\_Spurious emission 2



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## 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 ±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.



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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 =

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

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.

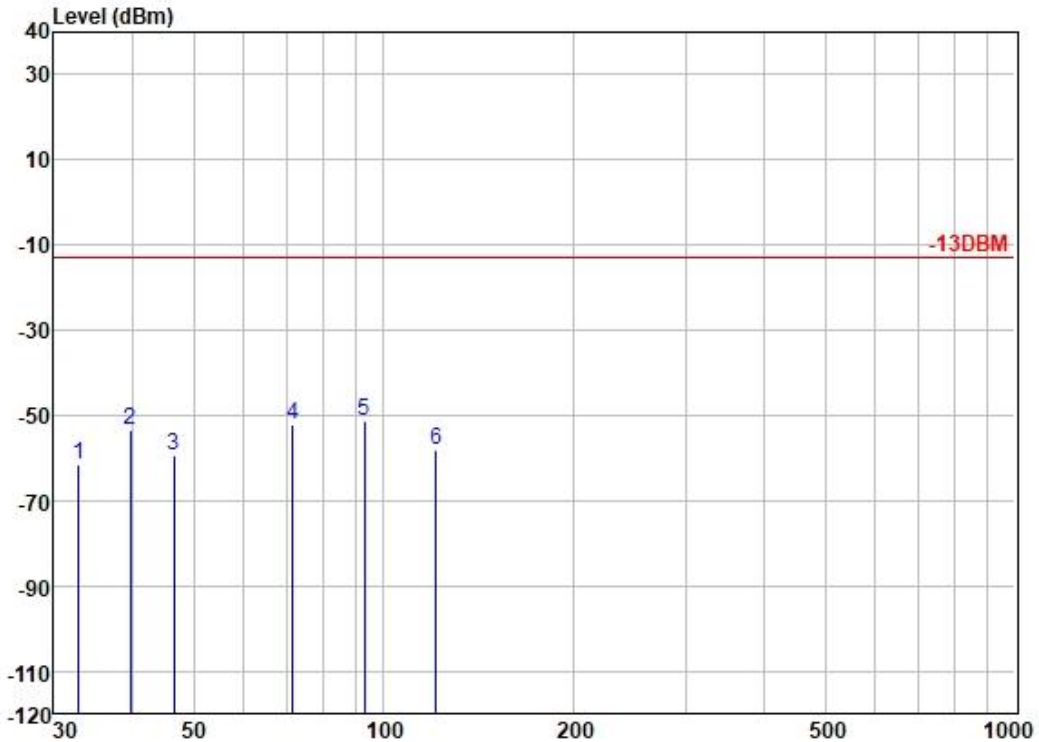
3. The disturbance 9kHz to 30MHz was very low and 20dB below the limit, therefore, the data was not recorded in the report.



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DL\_1S\_M\_AWGN\_Horizontal\_30MHz~1GHz

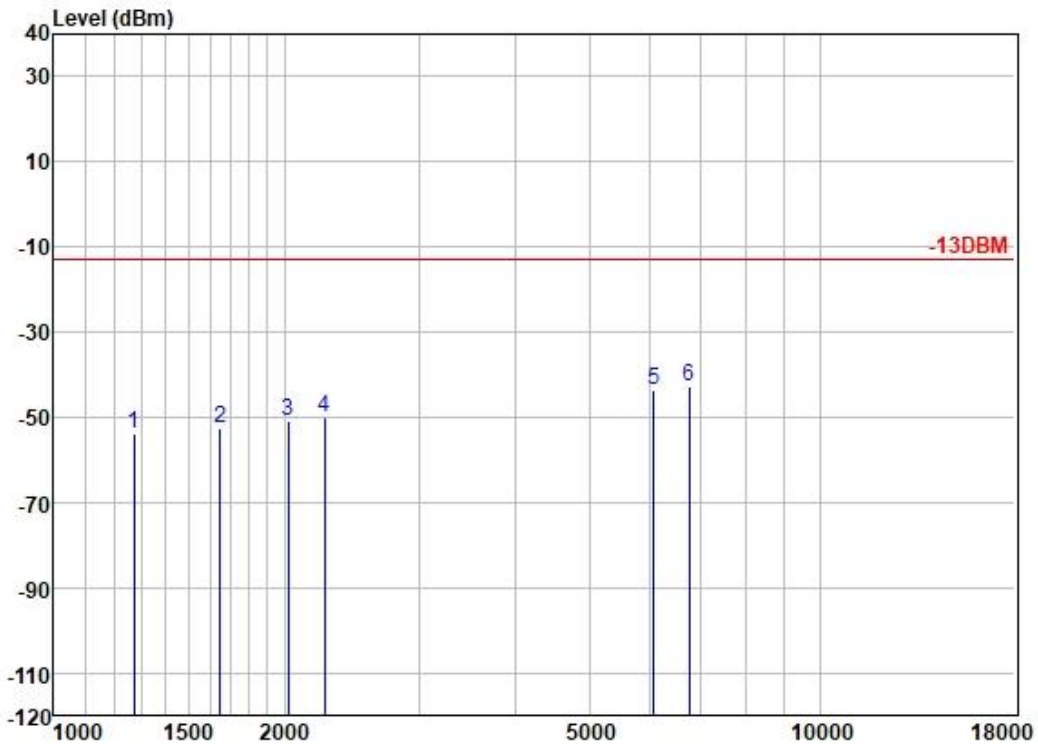


Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
32.864	-61.66	-13	-48.66	Horizontal	PASS
39.715	-53.62	-13	-40.62	Horizontal	PASS
46.503	-59.29	-13	-46.29	Horizontal	PASS
71.832	-52.11	-13	-39.11	Horizontal	PASS
93.113	-51.26	-13	-38.26	Horizontal	PASS
121.123	-58.10	-13	-45.1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



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DL\_1S\_M\_AWGN\_Horizontal\_above 1GHz

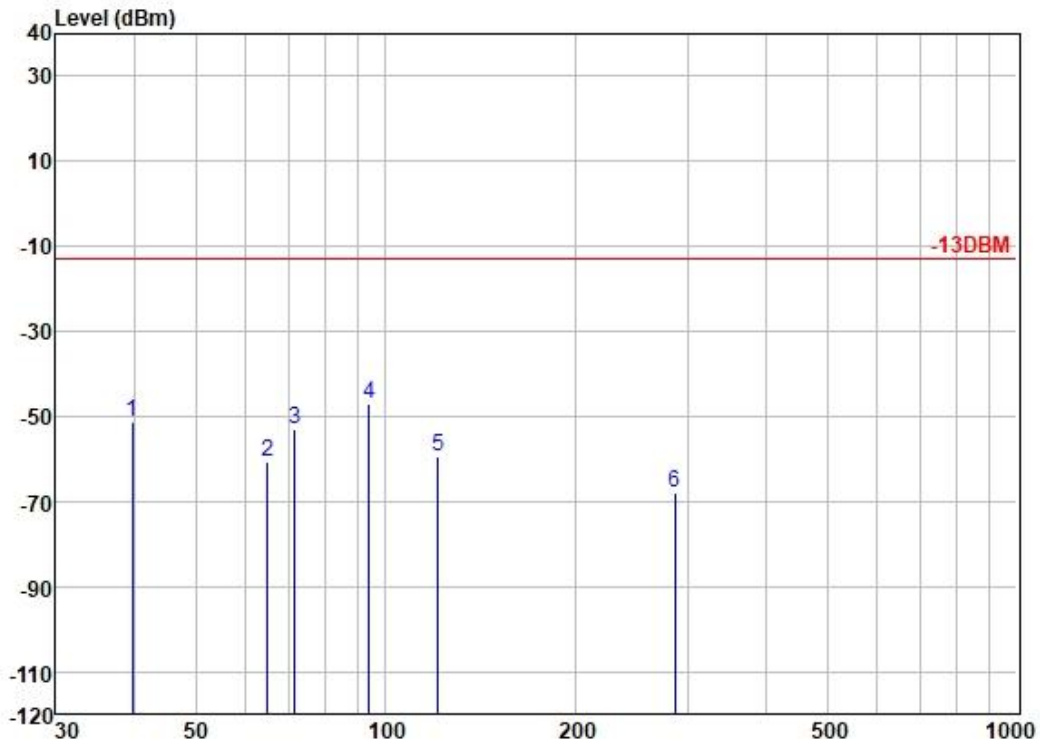


Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
1271.123	-53.97	-13	-40.97	Horizontal	PASS
1684.778	-52.69	-13	-39.69	Horizontal	PASS
2024.354	-51.01	-13	-38.01	Horizontal	PASS
2259.367	-50.11	-13	-37.11	Horizontal	PASS
6071.417	-43.46	-13	-30.46	Horizontal	PASS
6756.708	-42.70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



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DL\_1S\_M\_AWGN\_Vertical\_30MHz~1GHz

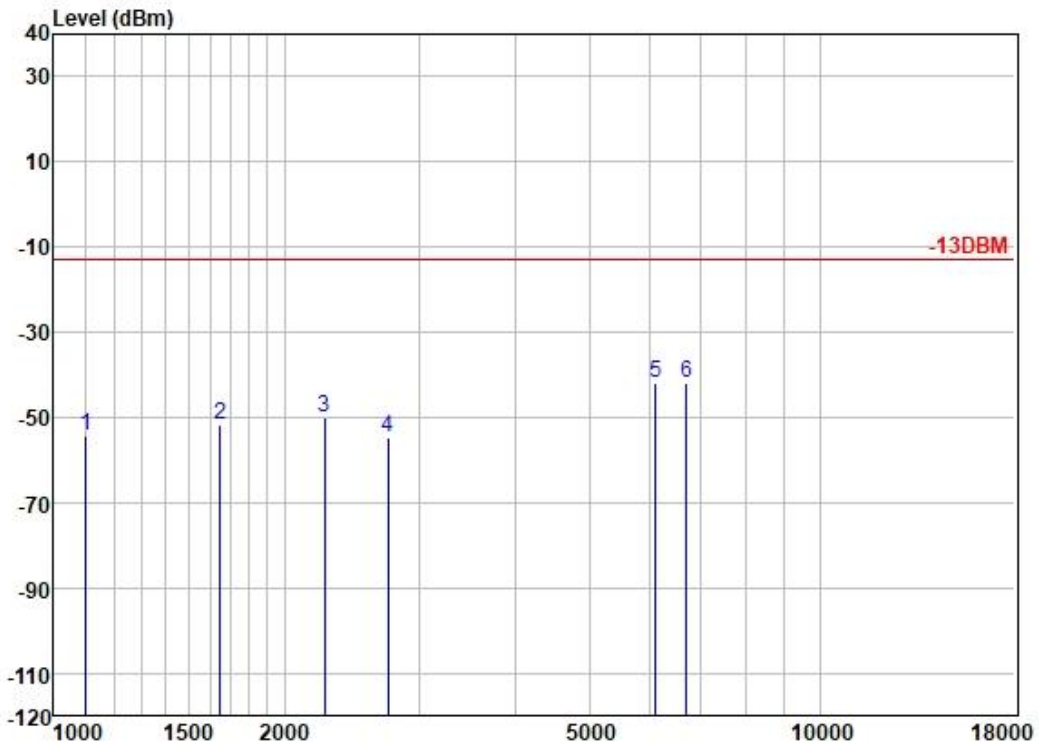


Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
39.715	-51.45	-13	-38.45	Vertical	PASS
64.887	-60.73	-13	-47.73	Vertical	PASS
71.832	-52.90	-13	-39.9	Vertical	PASS
94.098	-46.97	-13	-33.97	Vertical	PASS
121.123	-59.21	-13	-46.21	Vertical	PASS
286.982	-67.81	-13	-54.81	Vertical	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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## 2 Lower 700MHz (698-716MHz paired with 728-746MHz)

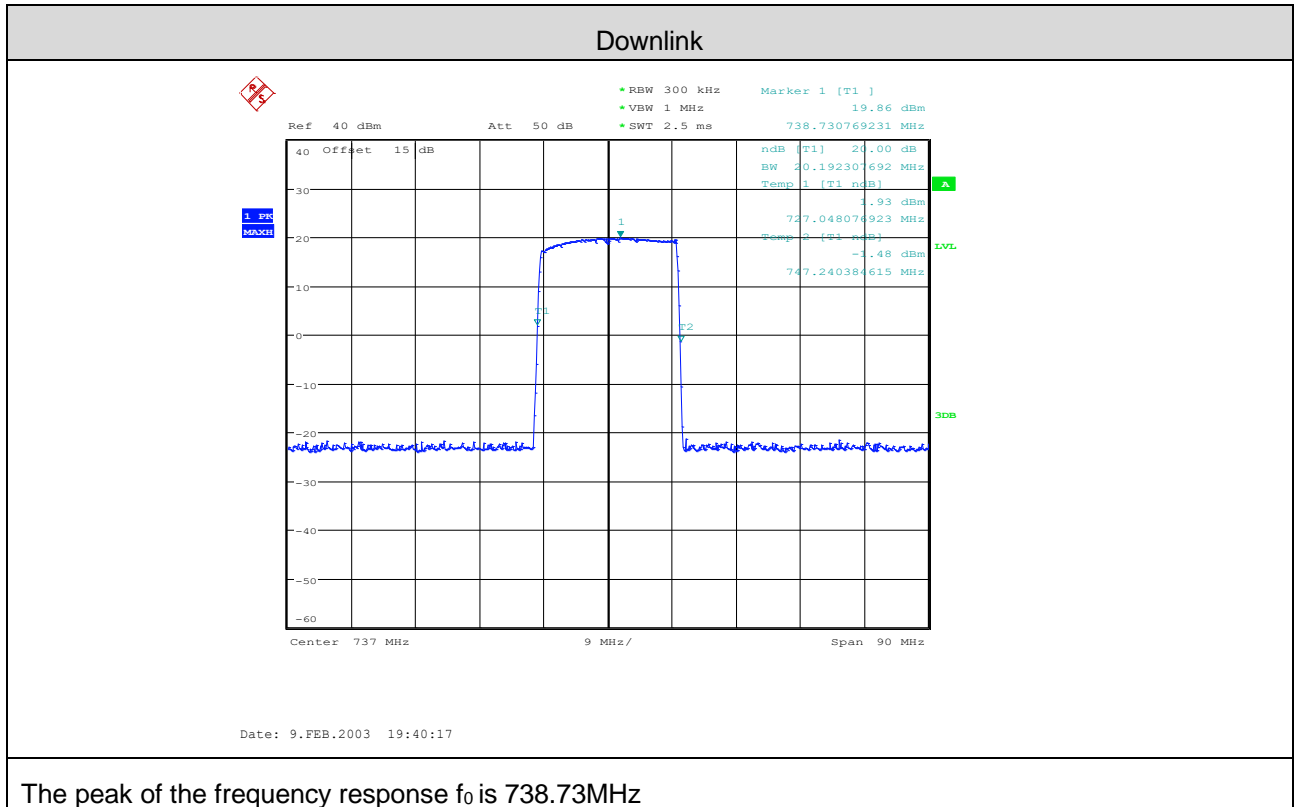
### 2.1 AGC threshold level

Test Conf.	AGC Threshold level
DL_1S_M_AWGN_AWGN	-0.36dBm
DL_1S_M_AWGN_GSM	-0.26dBm



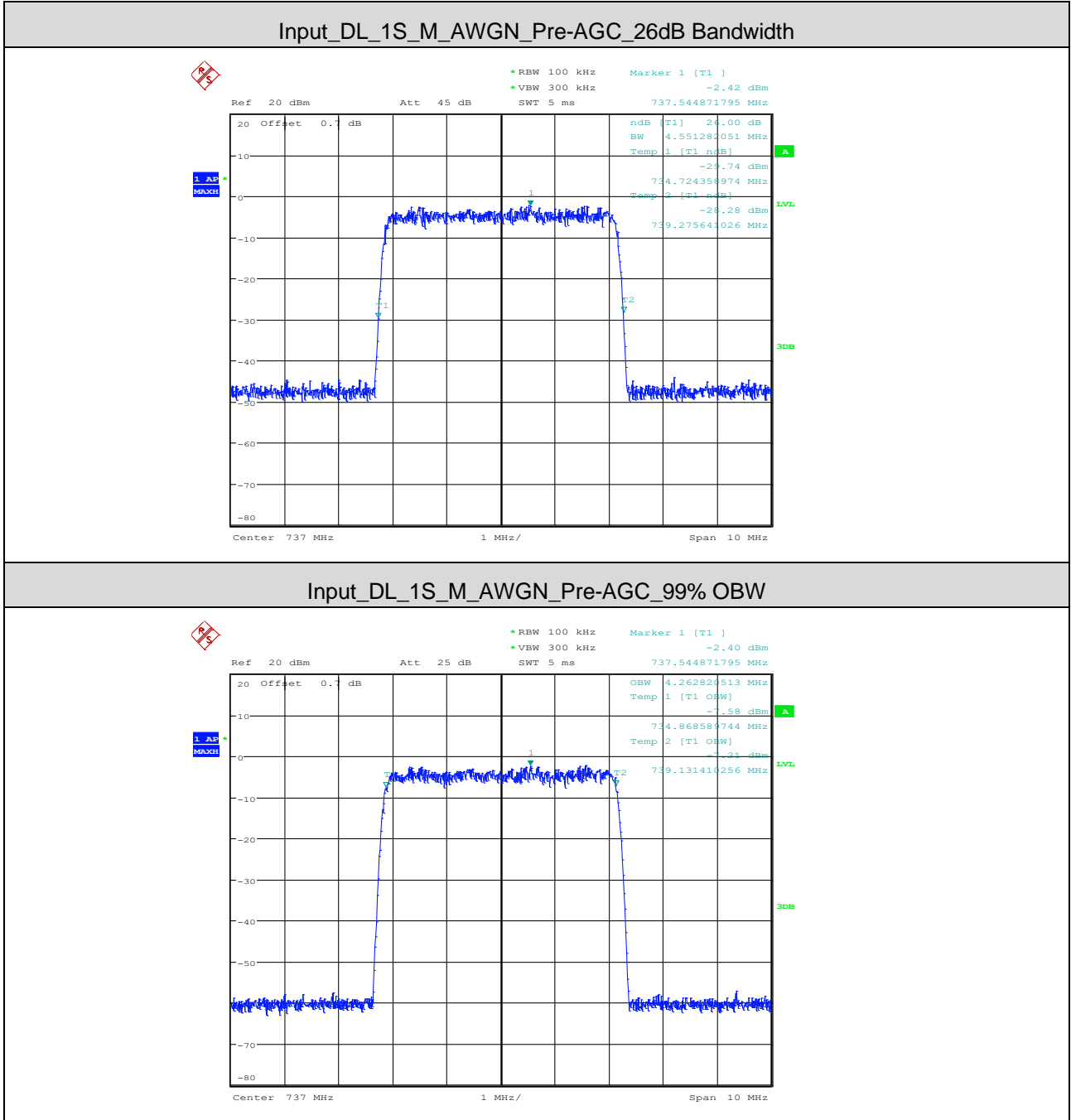
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**2.2 Out-of-band rejection**



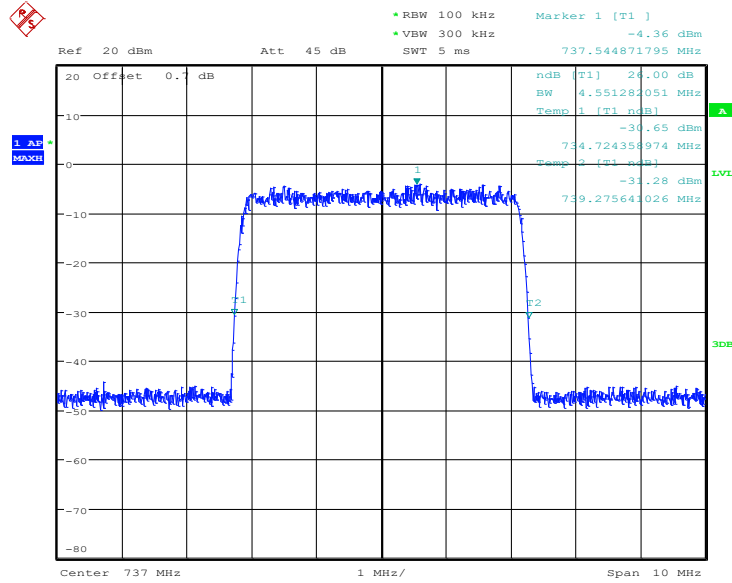
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**2.3 Input-versus-output signal comparison**

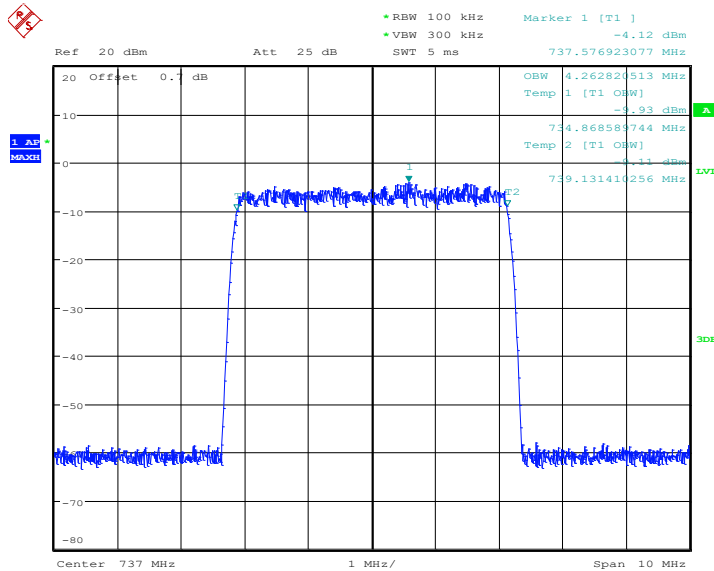


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Input\_DL\_1S\_M\_AWGN\_AGC+3dB\_26dB Bandwidth



Input\_DL\_1S\_M\_AWGN\_AGC+3dB\_99% OBW

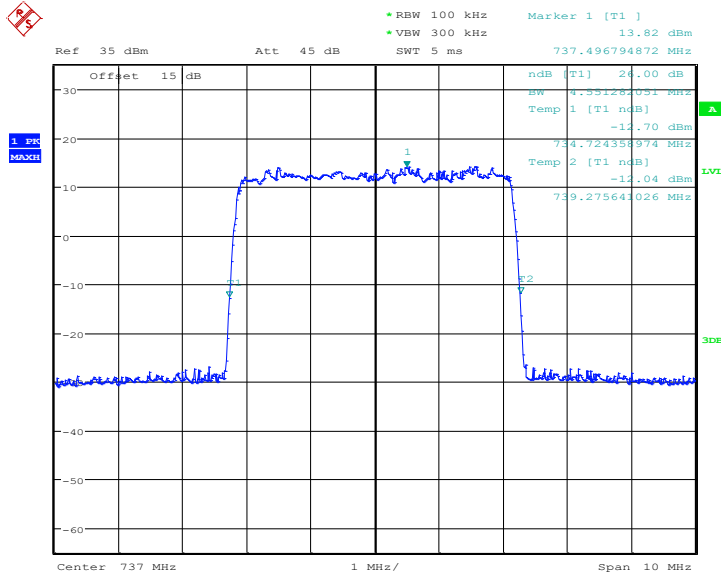


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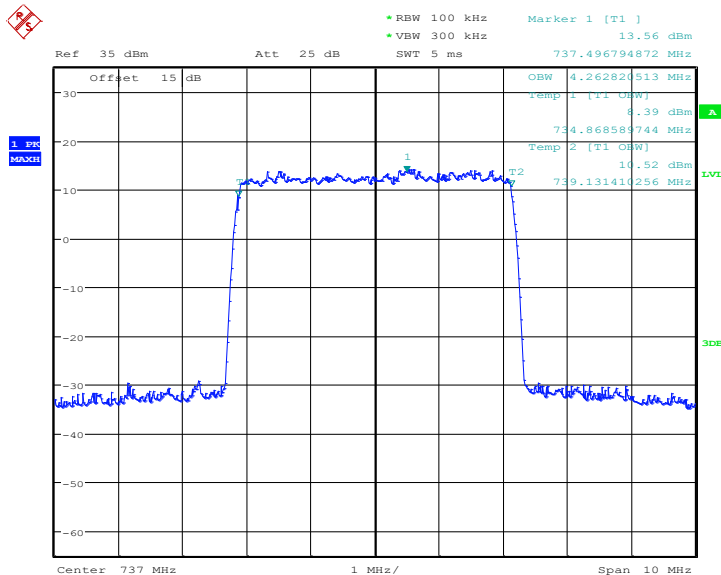
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Output\_DL\_1S\_M\_AWGN\_Pre-AGC\_26dB Bandwidth

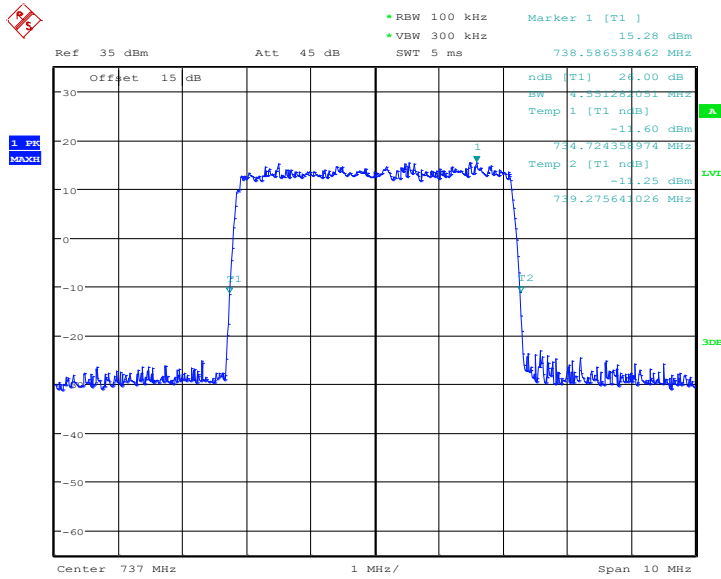


Output\_DL\_1S\_M\_AWGN\_Pre-AGC\_99% OBW

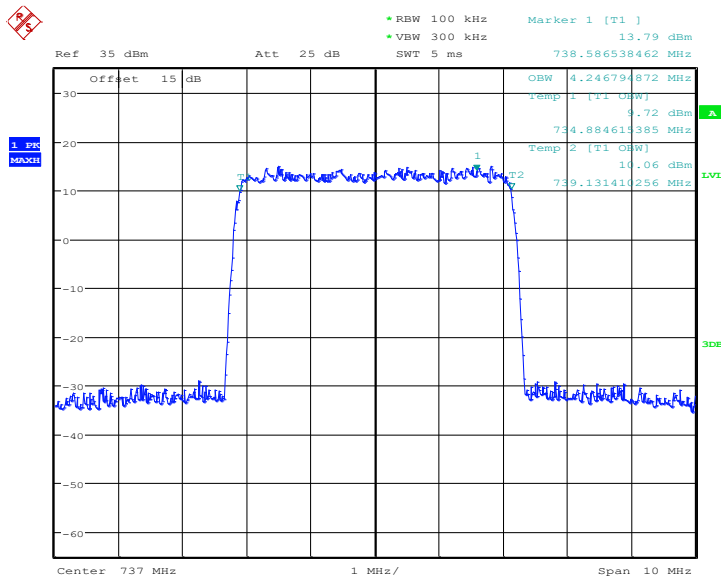


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Output\_DL\_1S\_M\_AWGN\_AGC+3dB\_26dB Bandwidth

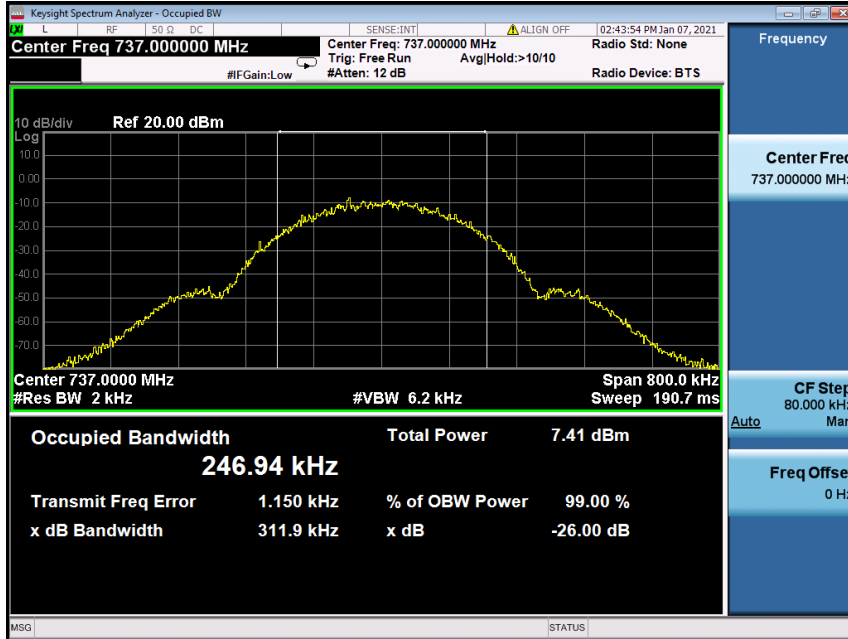


Output\_DL\_1S\_M\_AWGN\_AGC+3dB\_99% OBW

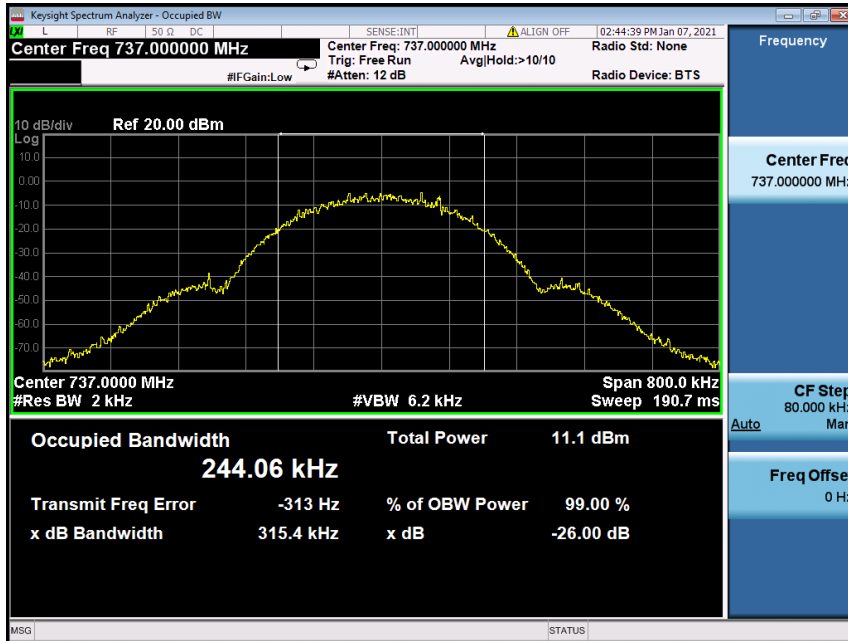


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Input\_DL\_1S\_M\_GSM\_Pre-AGC\_26dB Bandwidth & 99% OBW



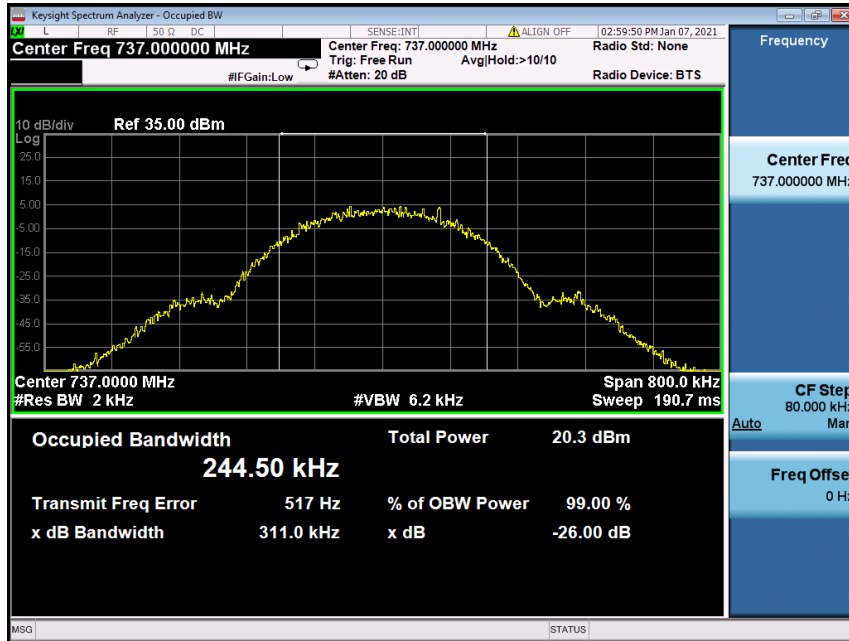
Input\_DL\_1S\_M\_GSM\_AGC+3dB\_26dB Bandwidth & 99% OBW



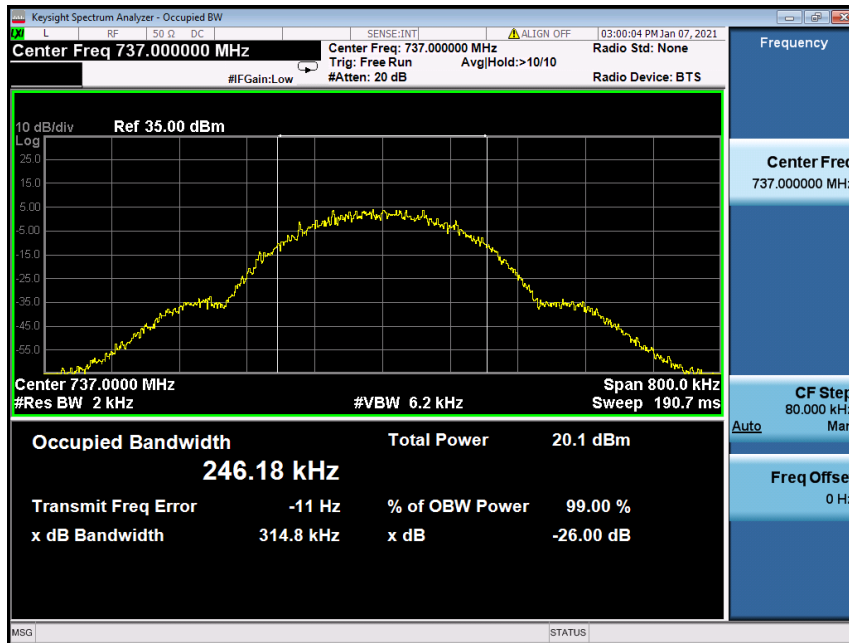
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Output\_DL\_1S\_M\_GSM\_Pre-AGC\_26dB Bandwidth & 99% OBW



Output\_DL\_1S\_M\_GSM\_AGC+3dB\_26dB Bandwidth & 99% OBW



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

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**Remark:**

Compare the spectral plot of the input signal to the output signal affirm that they are similar (in passband and roll off characteristic features and relative spectral locations). The test result complies with the requirement.



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**2.4 Mean output power and amplifier/booster gain**

Test Conf.	Test Freq. f <sub>0</sub> (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(ANT) + 10 log (NANT) dBi = 12.5dBi+10log (2) dBi= 15.5dBi.

ERP= EIRP-2.15dB,

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



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

Note: 1. The tested max conducted power for single antenna port is 20.32dBm, 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  $43 + 10 \log (P)$  dB, the limit corresponds to an absolute limit of -13 dBm.

Here,

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

So the limit =

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

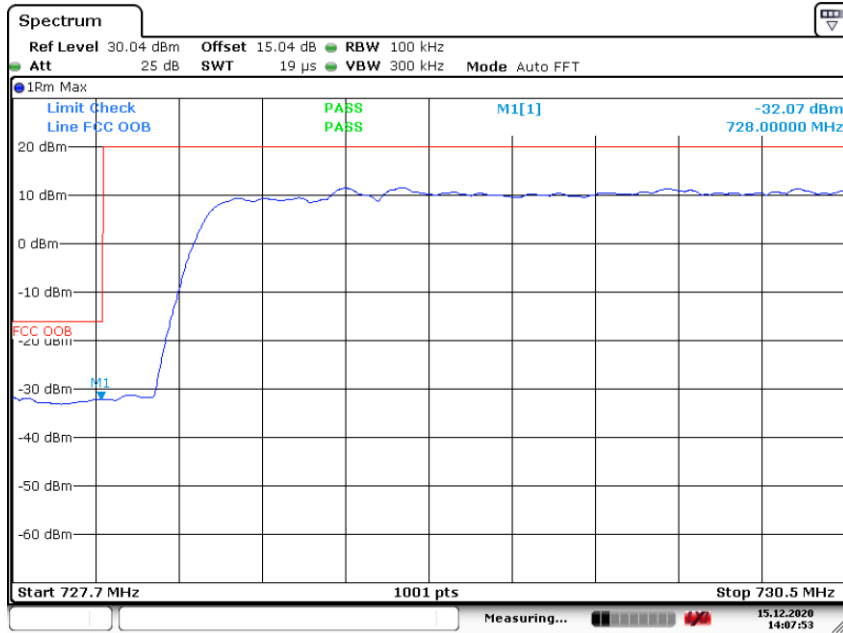
The EUT supports 2x2 MIMO and the emissions were measured at one of output port, so the limit line was set to -16.01dBm in following test plots in order to determine the test result conveniently.

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.

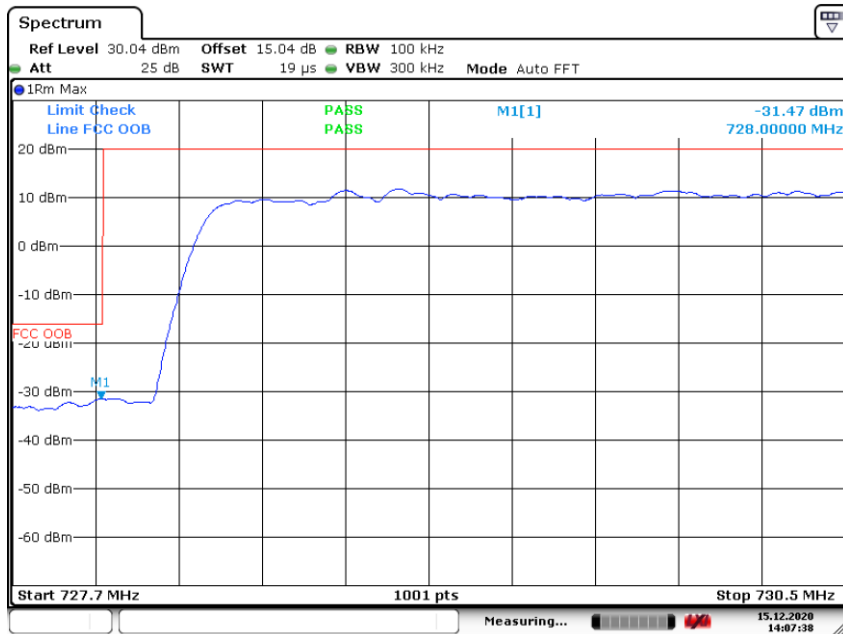


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DL\_1S\_B\_AWGN\_Pre-AGC\_Out-of-band emission



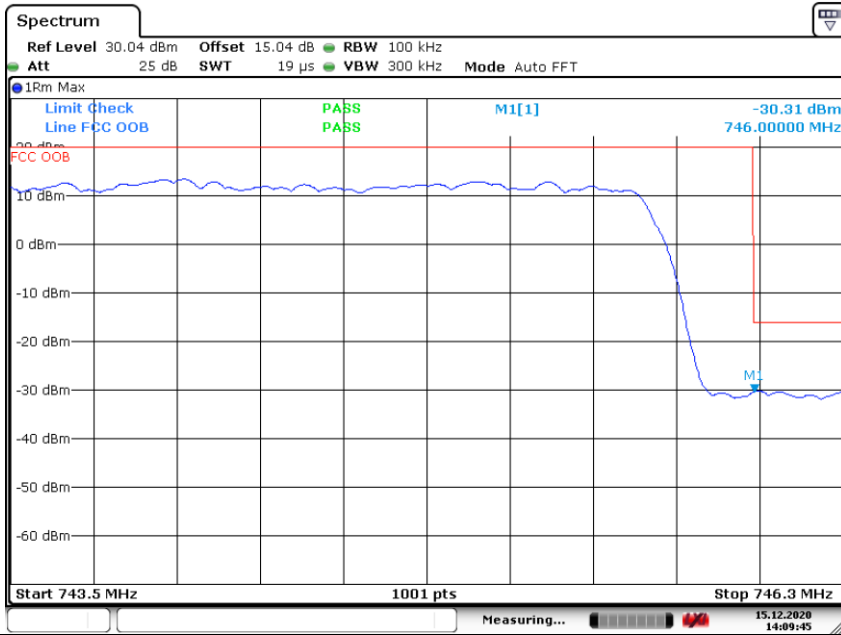
DL\_1S\_B\_AWGN\_AGC+3\_Out-of-band emission



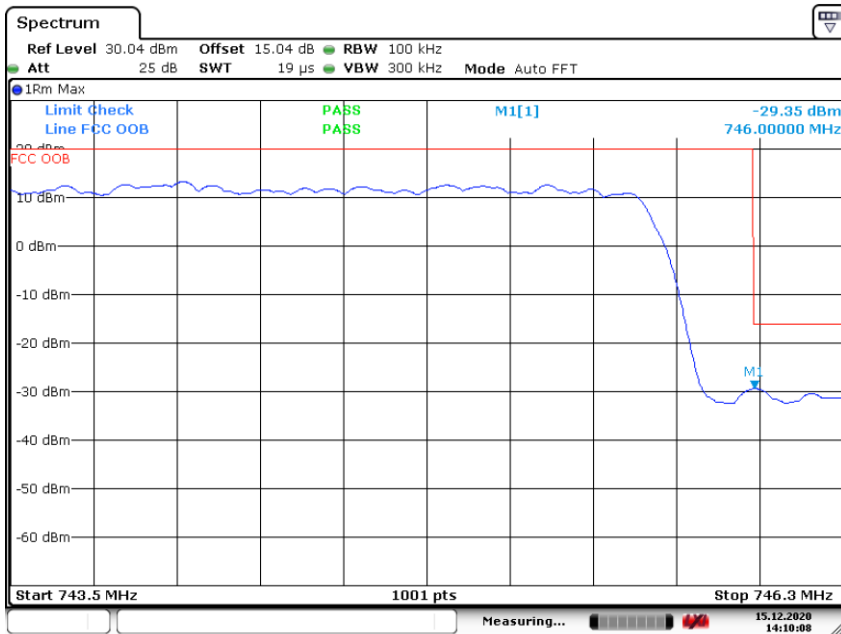
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DL\_1S\_T\_AWGN\_Pre-AGC\_Out-of-band emission

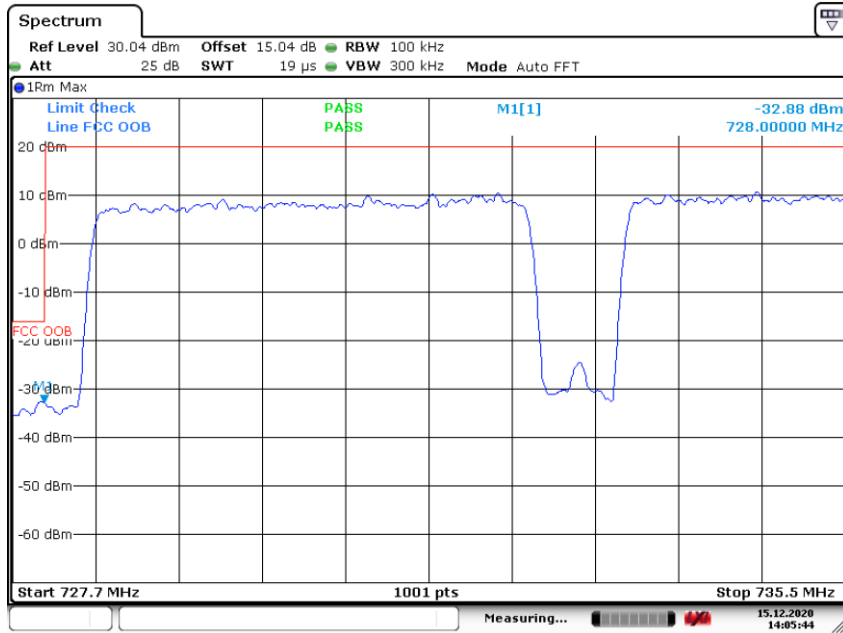


DL\_1S\_T\_AWGN\_AGC+3\_Out-of-band emission

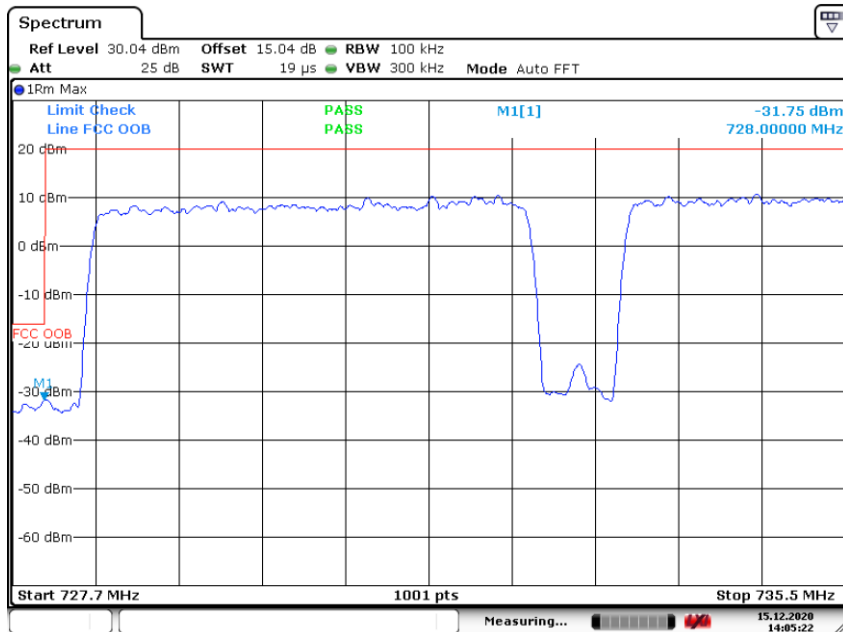


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DL\_2S\_B\_AWGN\_Pre-AGC\_Out-of-band emission

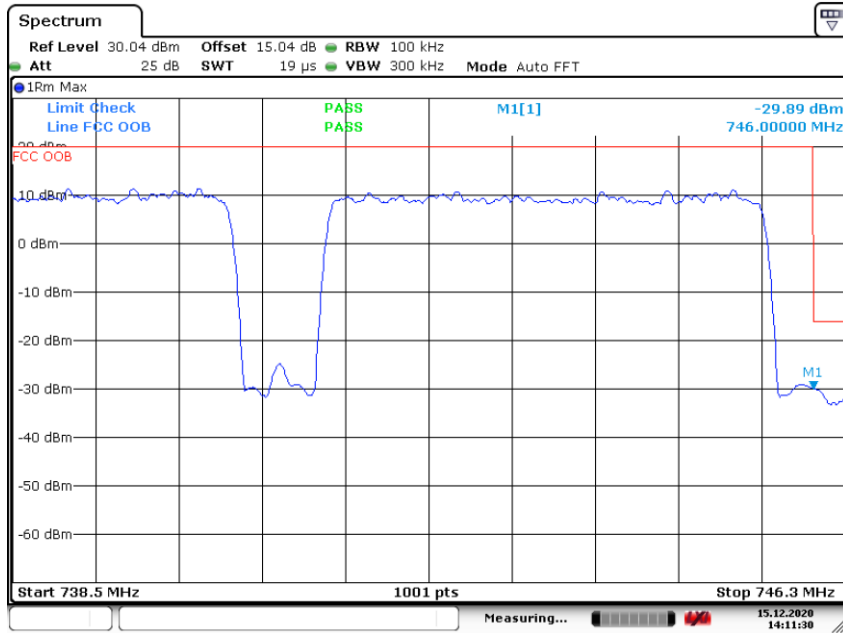


DL\_2S\_B\_AWGN\_AGC+3\_Out-of-band emission

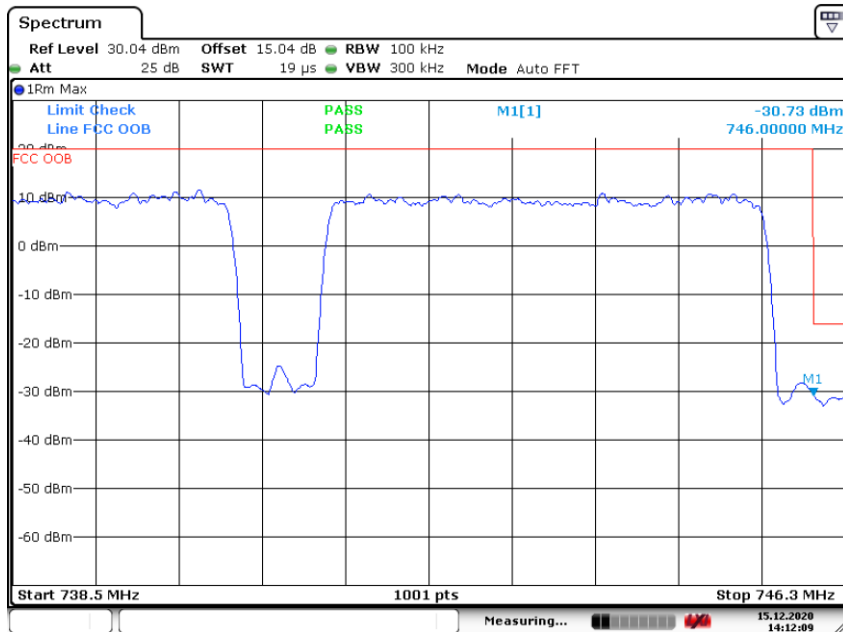


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DL\_2S\_T\_AWGN\_Pre-AGC\_Out-of-band emission

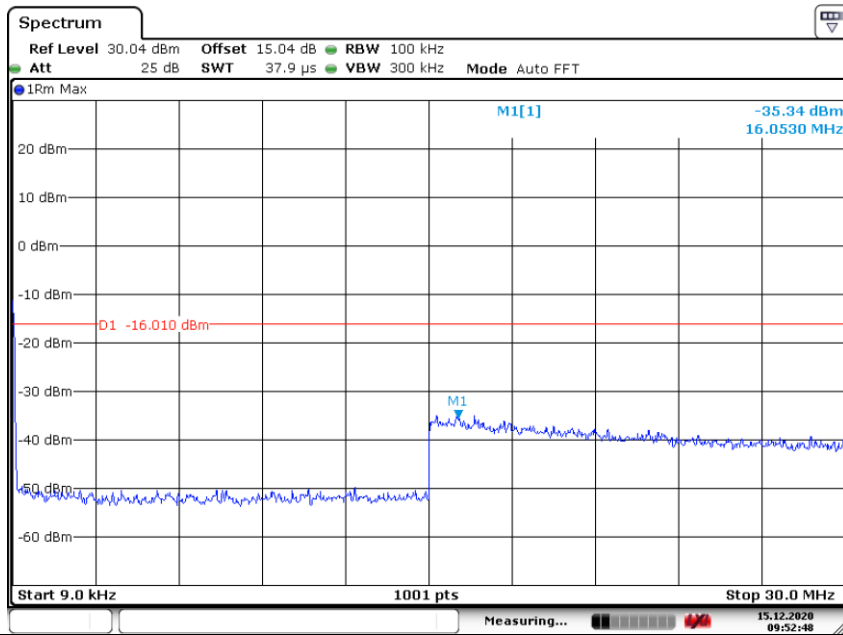


DL\_2S\_T\_AWGN\_AGC+3\_Out-of-band emission

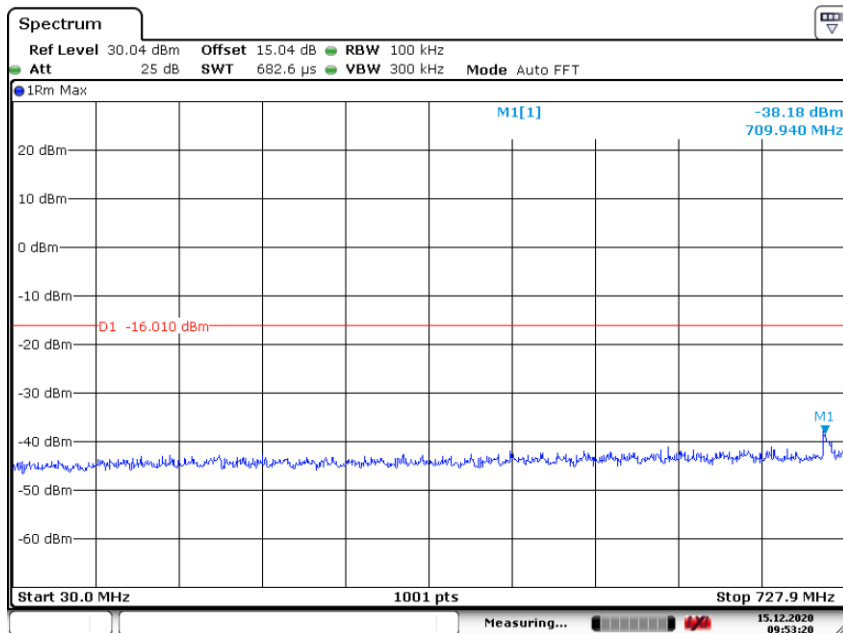


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DL\_1S\_B\_AWGN\_Pre-AGC\_Spurious emission 1

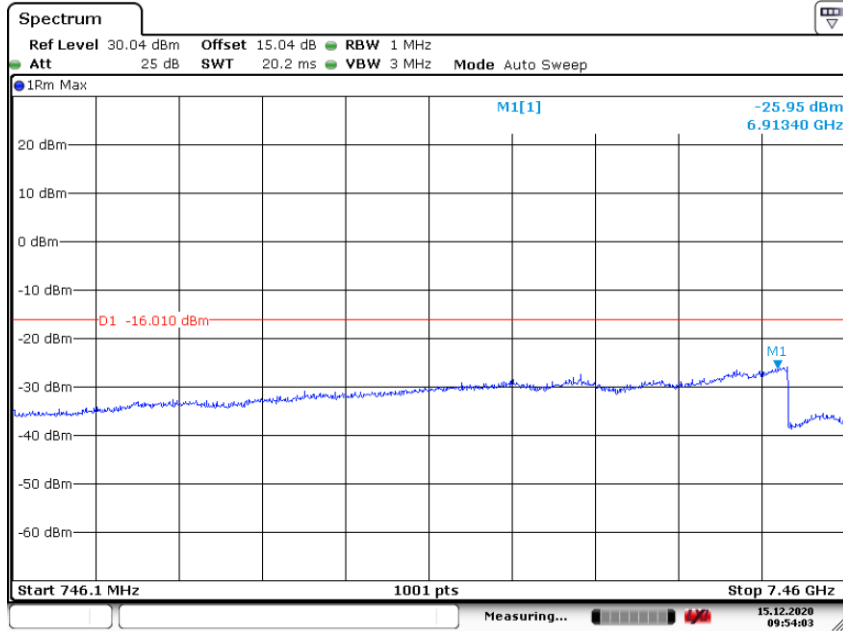


DL\_1S\_B\_AWGN\_Pre-AGC\_Spurious emission 2

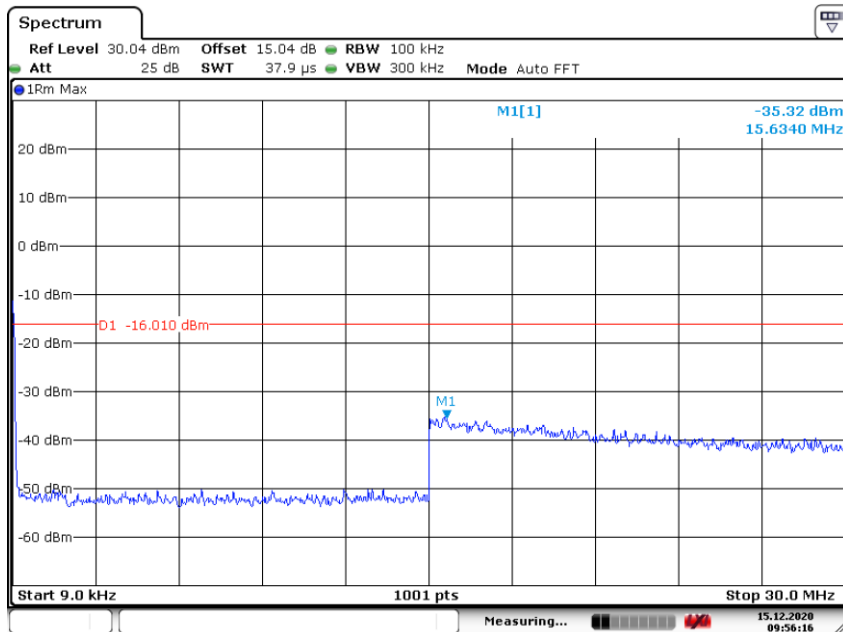


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DL\_1S\_B\_AWGN\_Pre-AGC\_Spurious emission 3

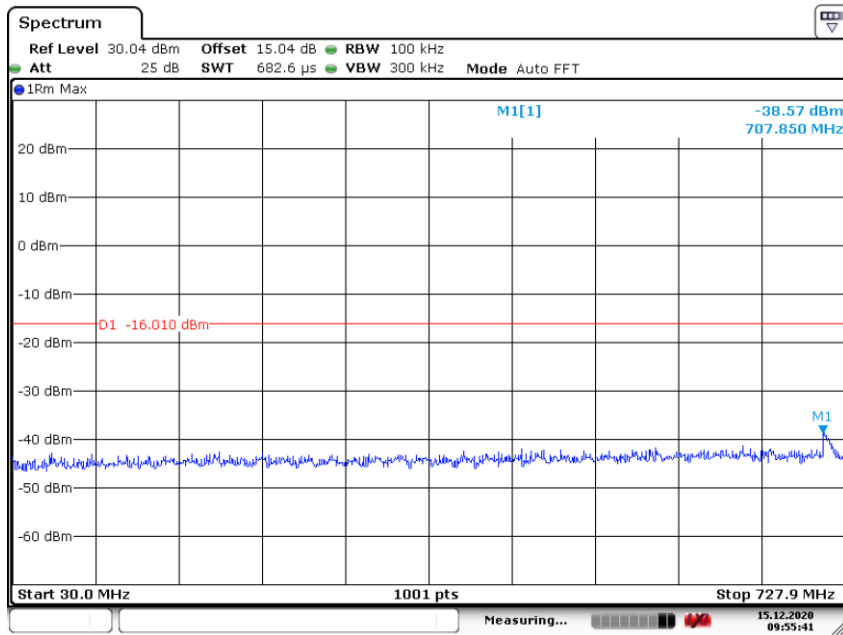


DL\_1S\_M\_AWGN\_Pre-AGC\_Spurious emission 1

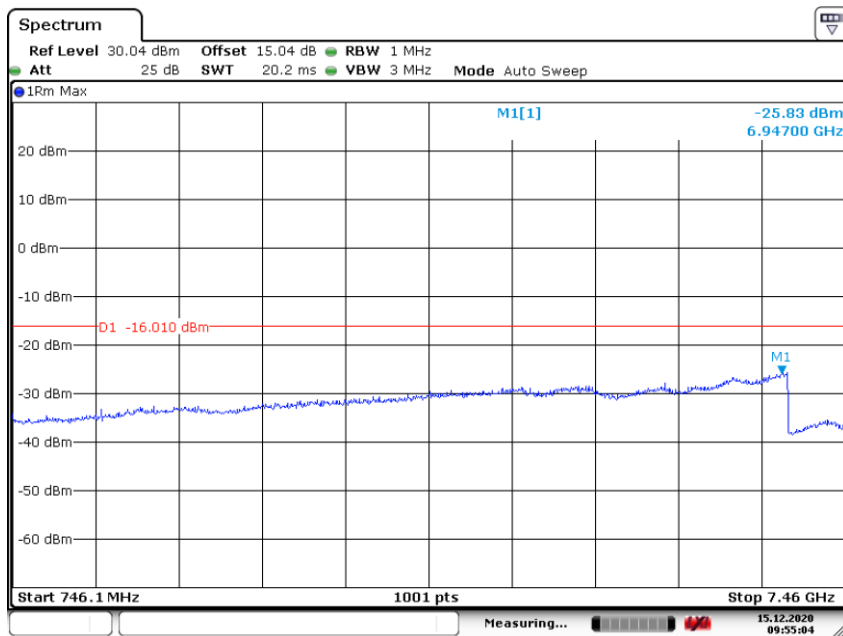


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DL\_1S\_M\_AWGN\_Pre-AGC\_Spurious emission 2

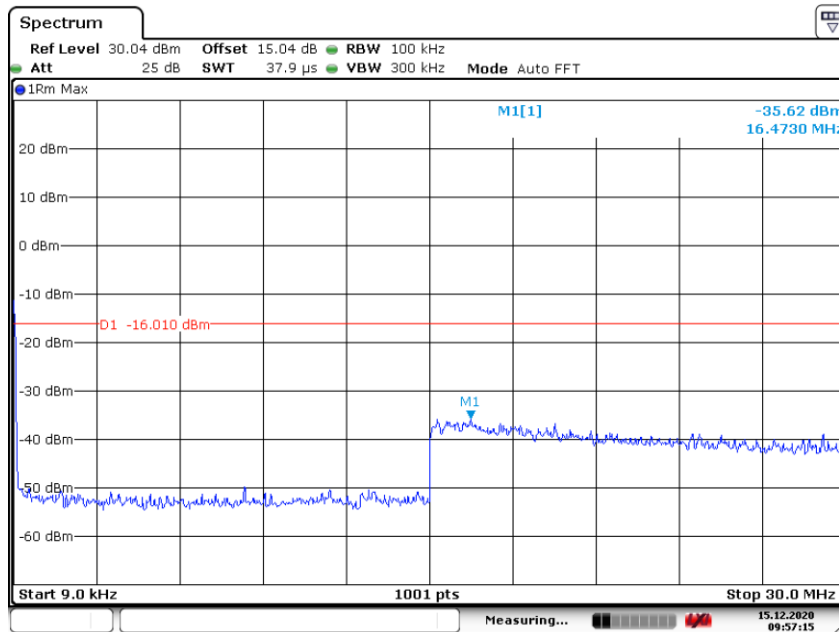


DL\_1S\_M\_AWGN\_Pre-AGC\_Spurious emission 3

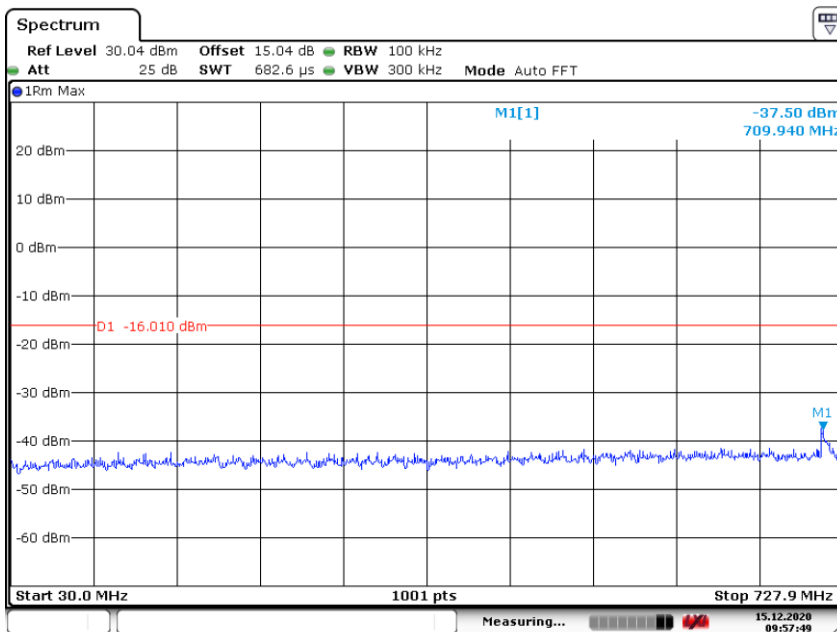


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DL\_1S\_T\_AWGN\_Pre-AGC\_Spurious emission 1

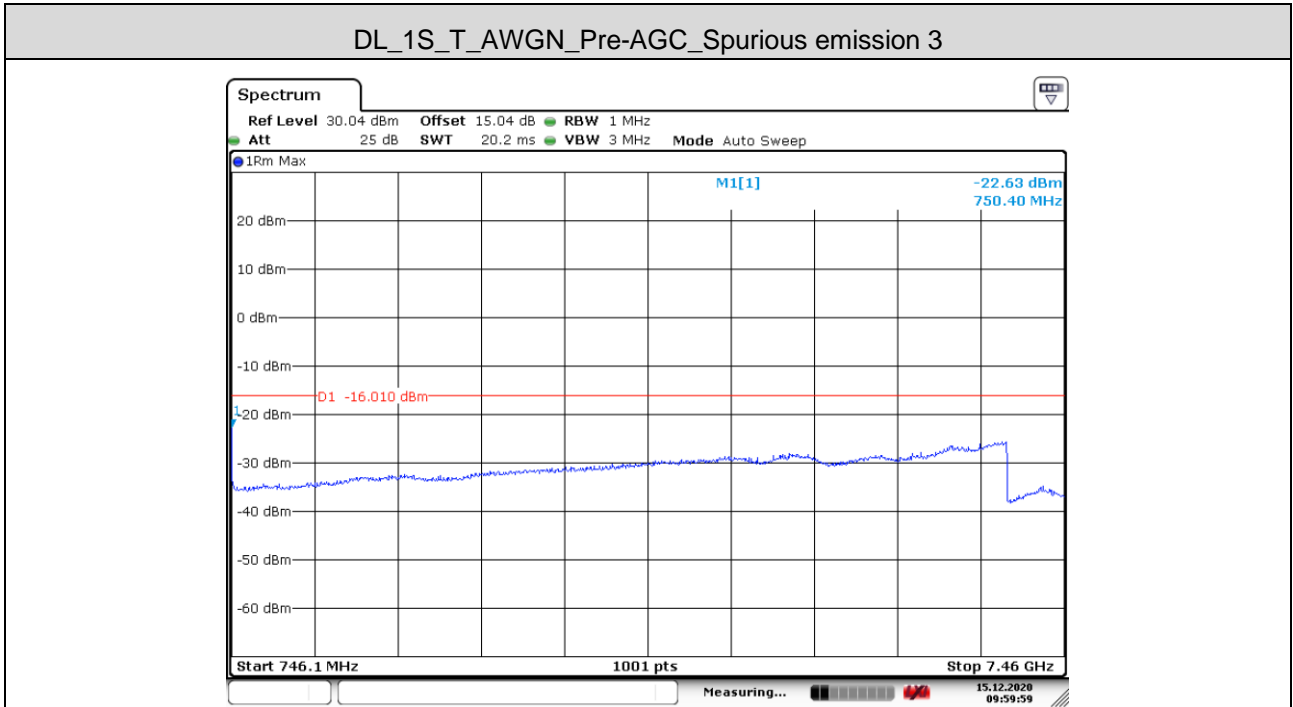


DL\_1S\_T\_AWGN\_Pre-AGC\_Spurious emission 2



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## 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 ±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.



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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 =

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

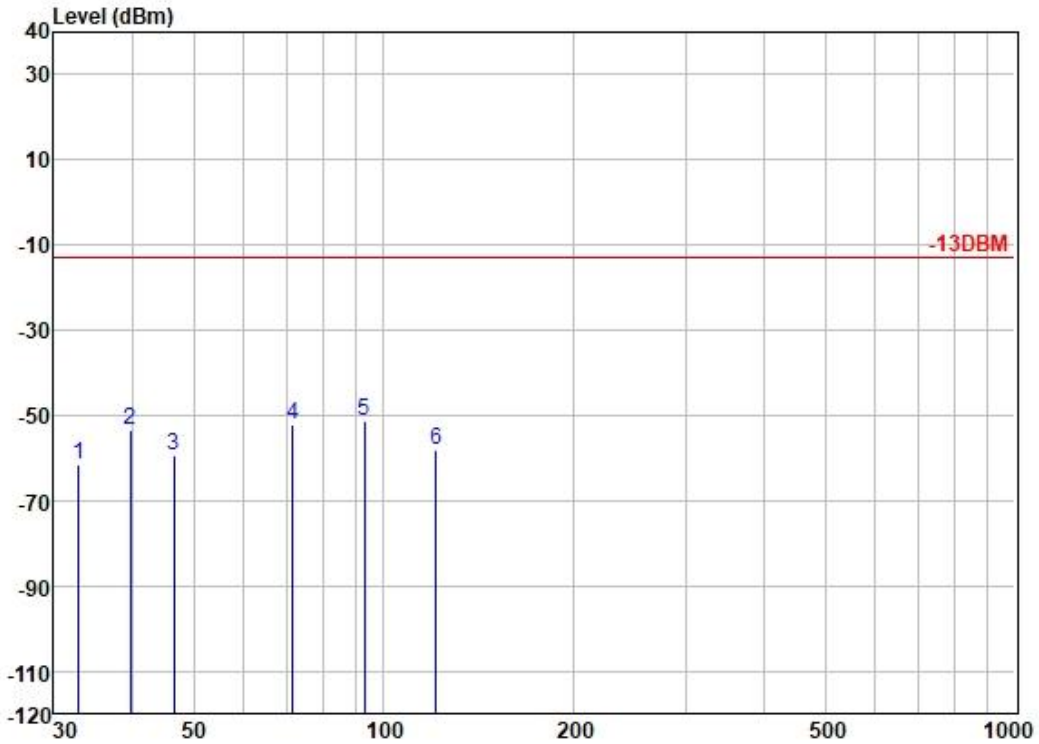
2. The radiated test performed at bottom / middle / top channel, the data with more than 20db margin, therefore, only the worst-case middle channel test data was recorded in the report.

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

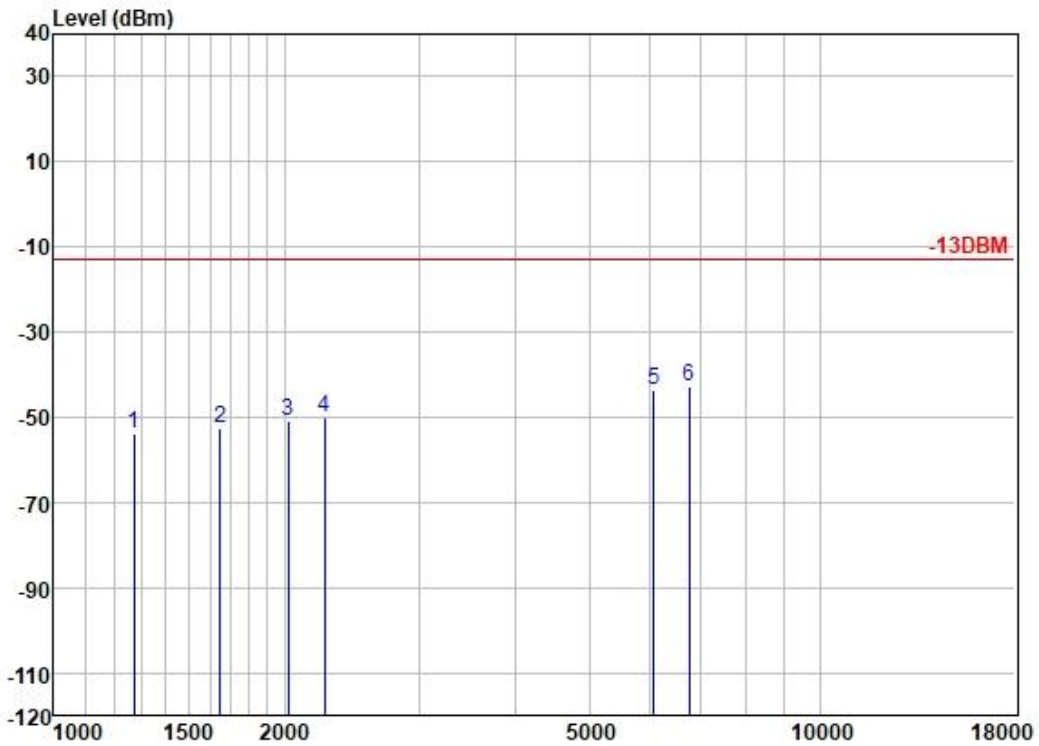


Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
32.864	-61.66	-13	-48.66	Horizontal	PASS
39.715	-53.62	-13	-40.62	Horizontal	PASS
46.503	-59.29	-13	-46.29	Horizontal	PASS
71.832	-52.11	-13	-39.11	Horizontal	PASS
93.113	-51.26	-13	-38.26	Horizontal	PASS
121.123	-58.10	-13	-45.1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



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DL\_1S\_M\_AWGN\_Horizontal\_above 1GHz



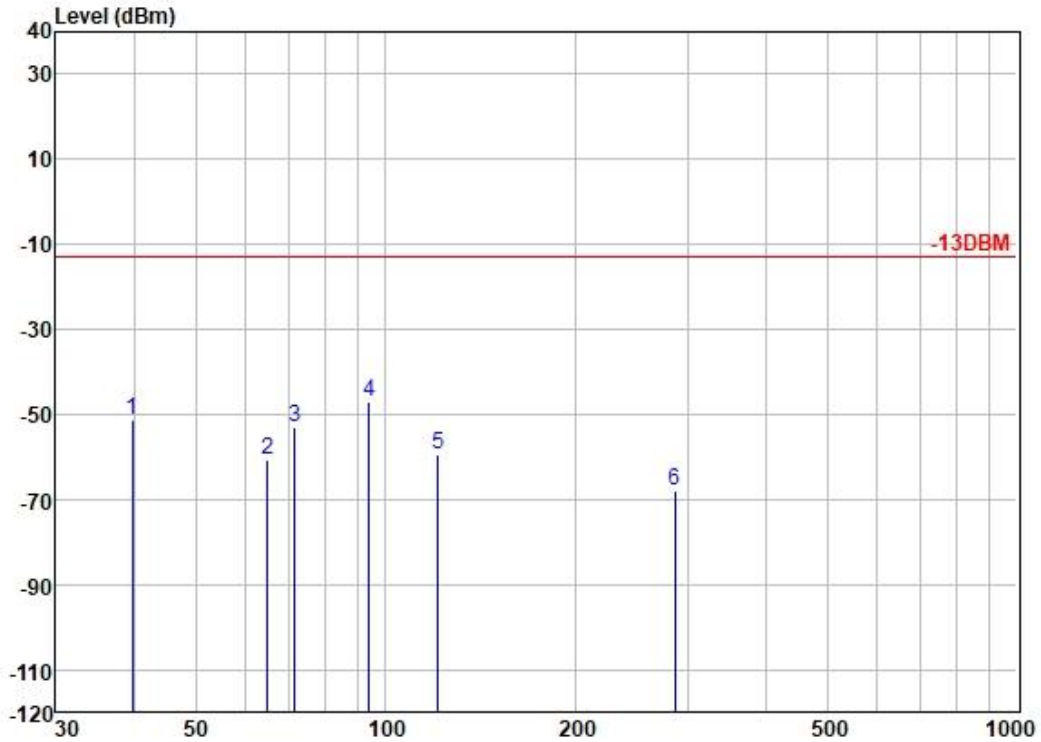
Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
1271.123	-53.97	-13	-40.97	Horizontal	PASS
1684.778	-52.69	-13	-39.69	Horizontal	PASS
2024.354	-51.01	-13	-38.01	Horizontal	PASS
2259.367	-50.11	-13	-37.11	Horizontal	PASS
6071.417	-43.46	-13	-30.46	Horizontal	PASS
6756.708	-42.70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



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DL\_1S\_M\_AWGN\_Vertical\_30MHz~1GHz

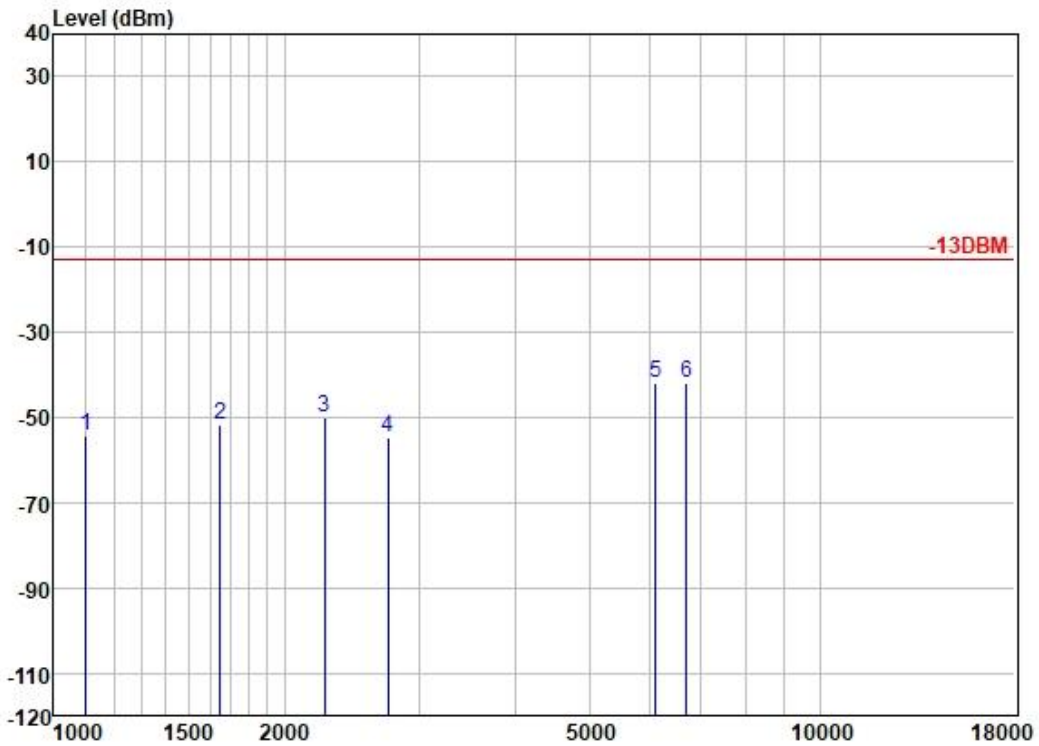


Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
39.715	-51.45	-13	-38.45	Vertical	PASS
64.887	-60.73	-13	-47.73	Vertical	PASS
71.832	-52.90	-13	-39.9	Vertical	PASS
94.098	-46.97	-13	-33.97	Vertical	PASS
121.123	-59.21	-13	-46.21	Vertical	PASS
286.982	-67.81	-13	-54.81	Vertical	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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### 3 Upper 700MHz (776-787MHz paired with 746-757MHz)

#### 3.1 AGC threshold level

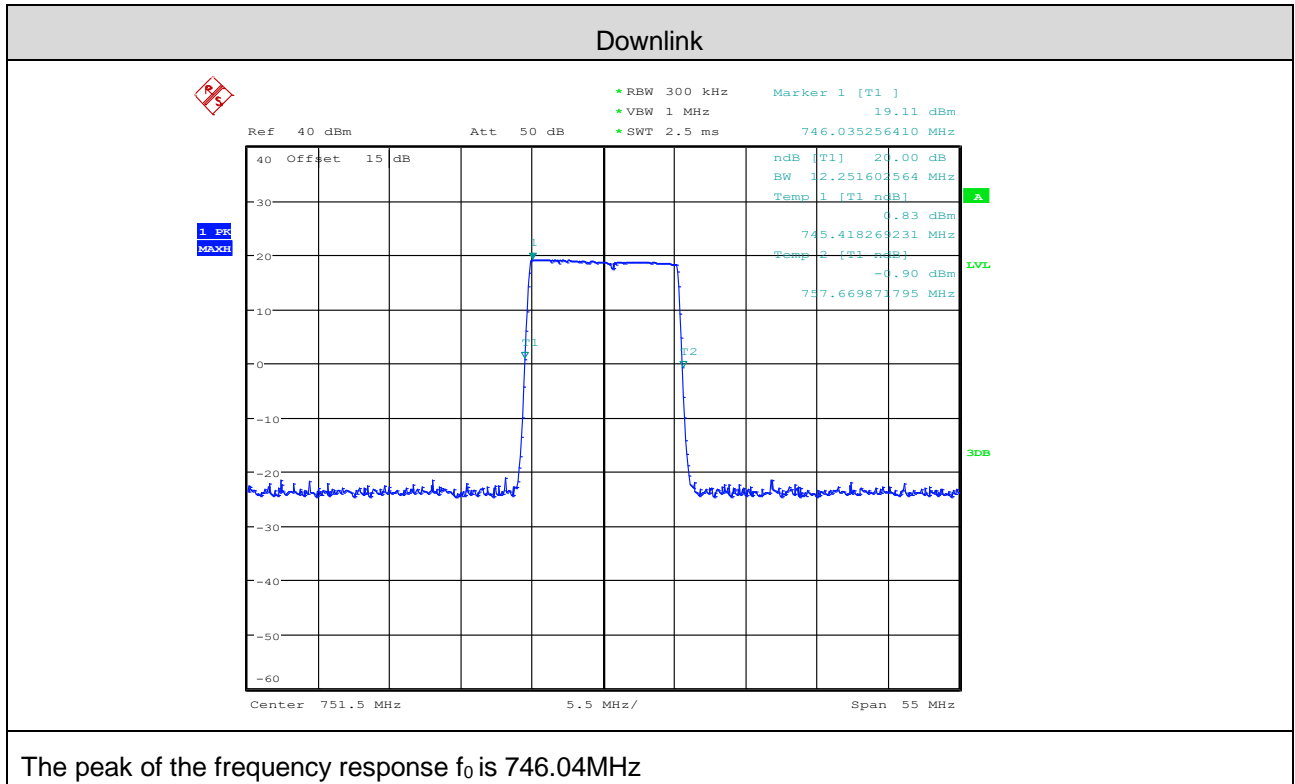
Test Conf.	AGC Threshold level
DL_1S_M_AWGN_AWGN	-0.23dBm
DL_1S_M_AWGN_GSM	-0.29dBm



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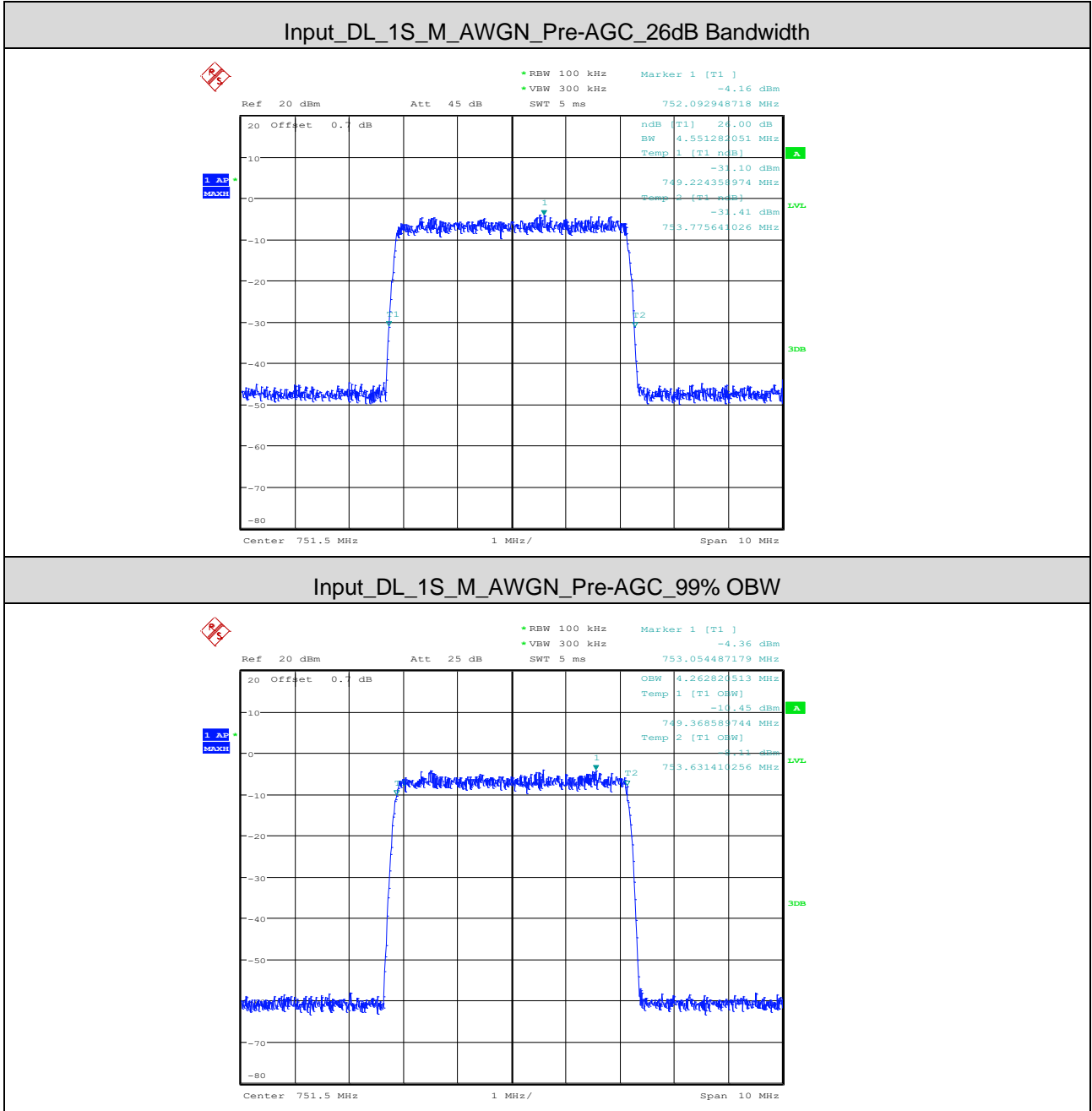


### 3.2 Out-of-band rejection



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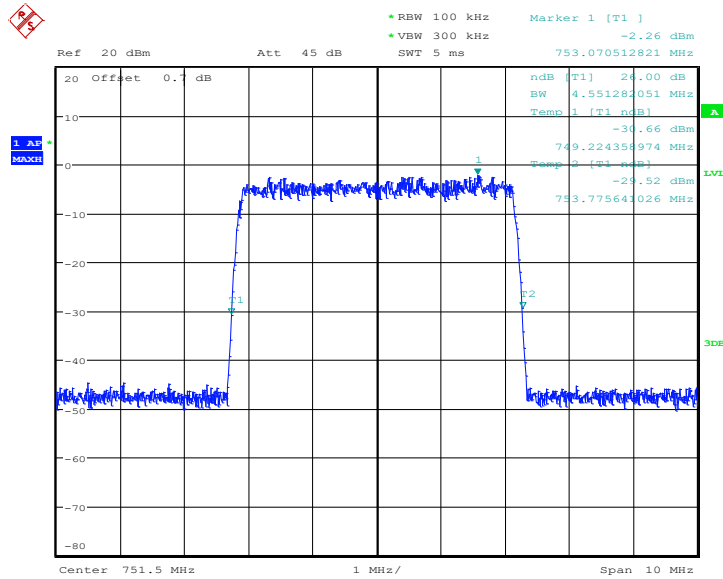
**3.3 Input-versus-output signal comparison**



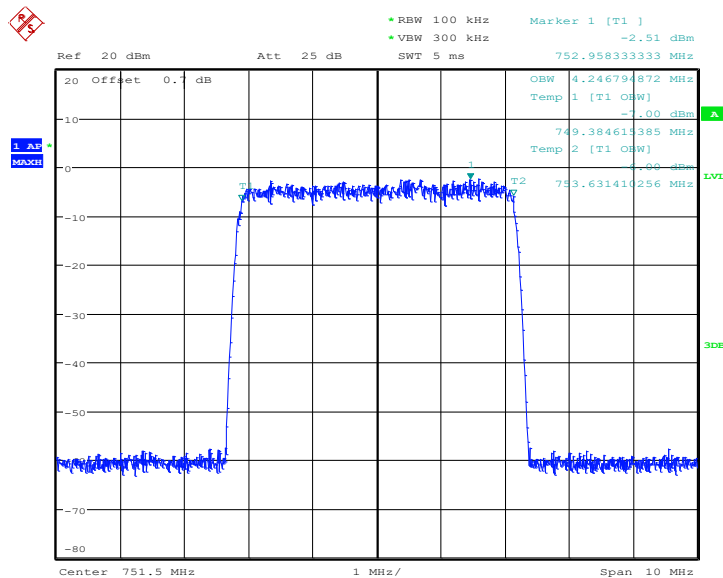
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Input\_DL\_1S\_M\_AWGN\_AGC+3dB\_26dB Bandwidth



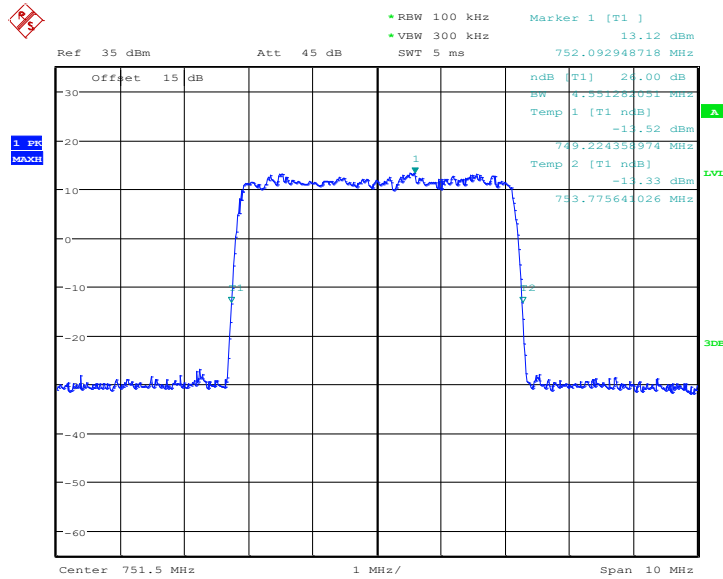
Input\_DL\_1S\_M\_AWGN\_AGC+3dB\_99% OBW



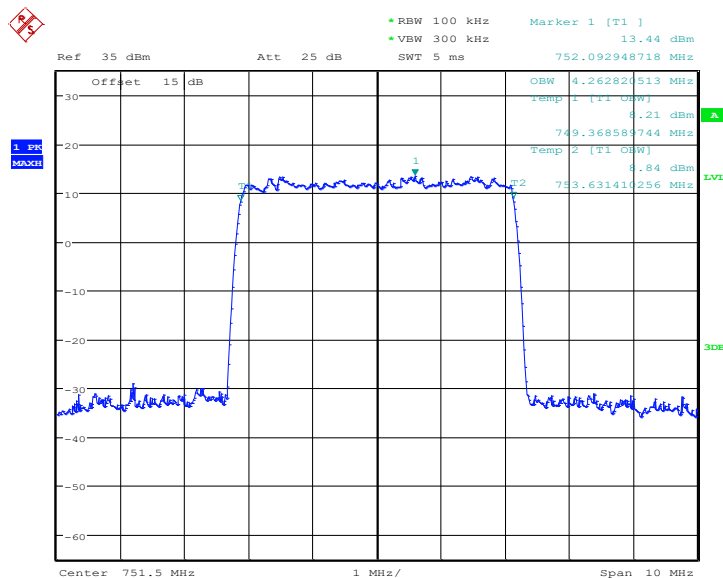
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Output\_DL\_1S\_M\_AWGN\_Pre-AGC\_26dB Bandwidth



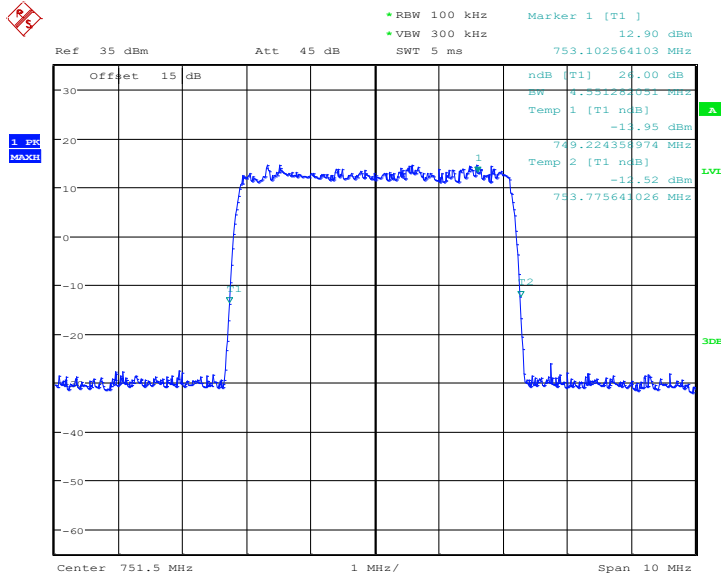
Output\_DL\_1S\_M\_AWGN\_Pre-AGC\_99% OBW



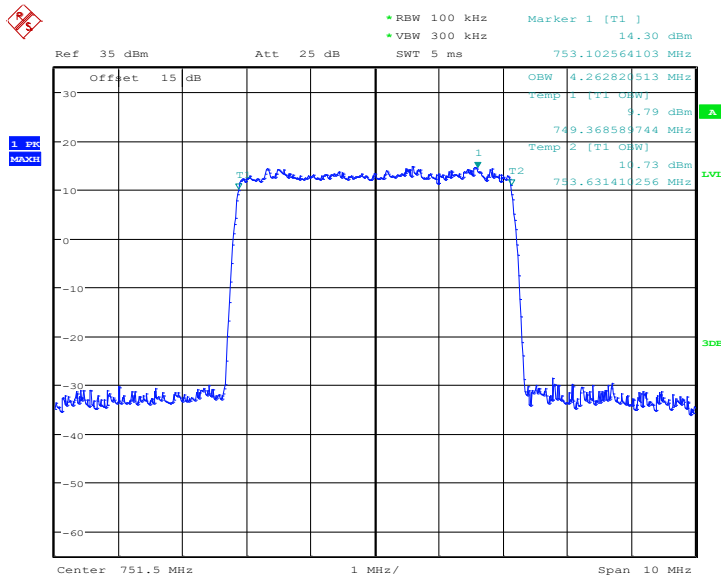
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Output\_DL\_1S\_M\_AWGN\_AGC+3dB\_26dB Bandwidth

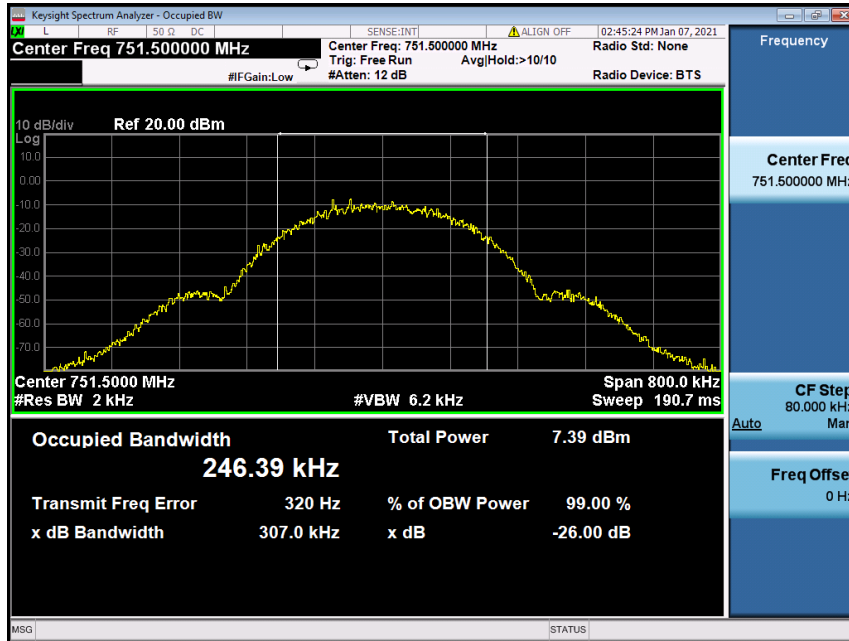


Output\_DL\_1S\_M\_AWGN\_AGC+3dB\_99% OBW

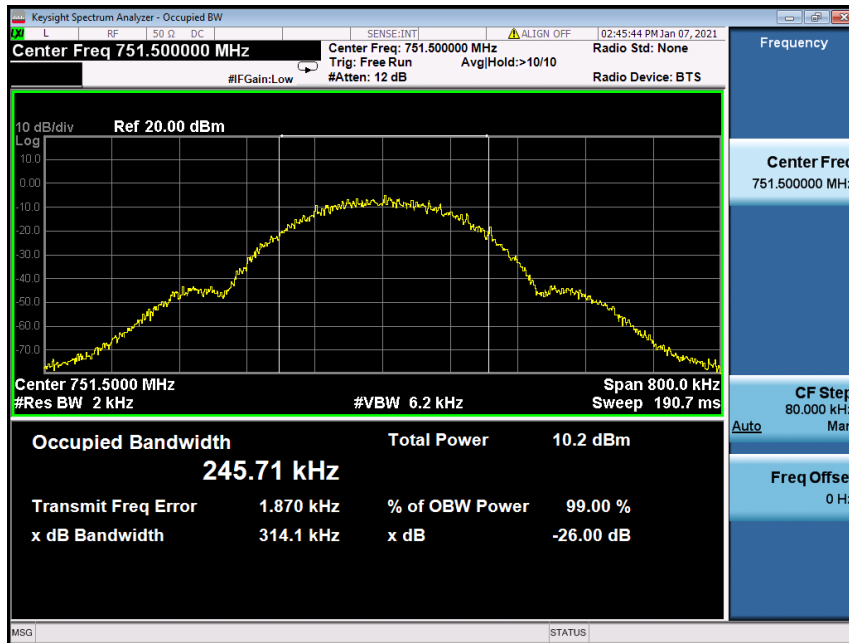


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Input\_DL\_1S\_M\_GSM\_Pre-AGC\_26dB Bandwidth & 99% OBW

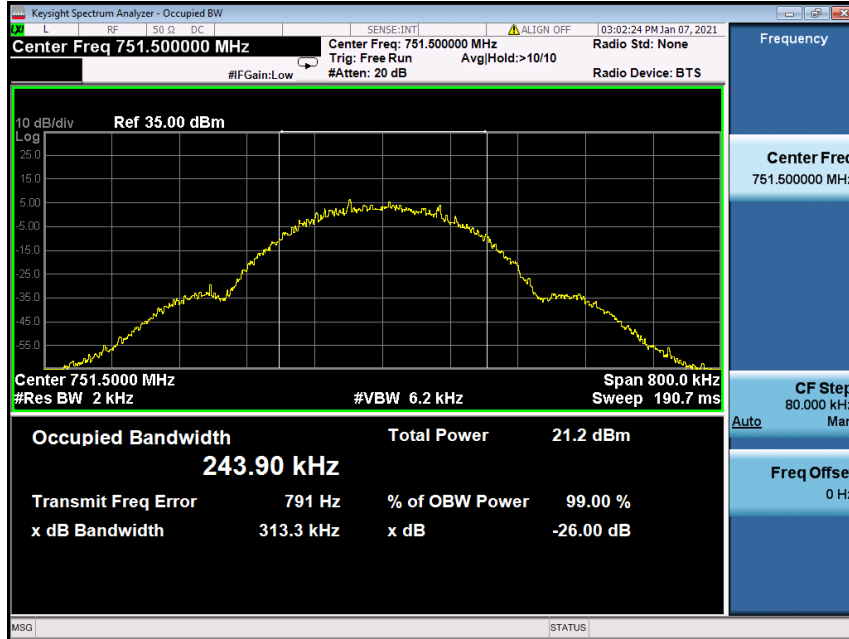


Input\_DL\_1S\_M\_GSM\_AGC+3dB\_26dB Bandwidth & 99% OBW



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Output\_DL\_1S\_M\_GSM\_Pre-AGC\_26dB Bandwidth & 99% OBW



Output\_DL\_1S\_M\_GSM\_AGC+3dB\_26dB Bandwidth & 99% OBW



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

Application No.: GZEM2011016736CR

Page: 64 of 170

FCC ID: OJFDLRU678

**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 <sub>0</sub> (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(ANT) + 10 log (NANT) dBi = 12.5dBi+10log (2) dBi= 15.5dBi.

ERP= EIRP-2.15dB,

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



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

Note: 1. The tested max conducted power for single antenna port is 20.09dBm, 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  $43 + 10 \log (P)$  dB, the limit corresponds to an absolute limit of -13 dBm.

Here,

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

So the limit =

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

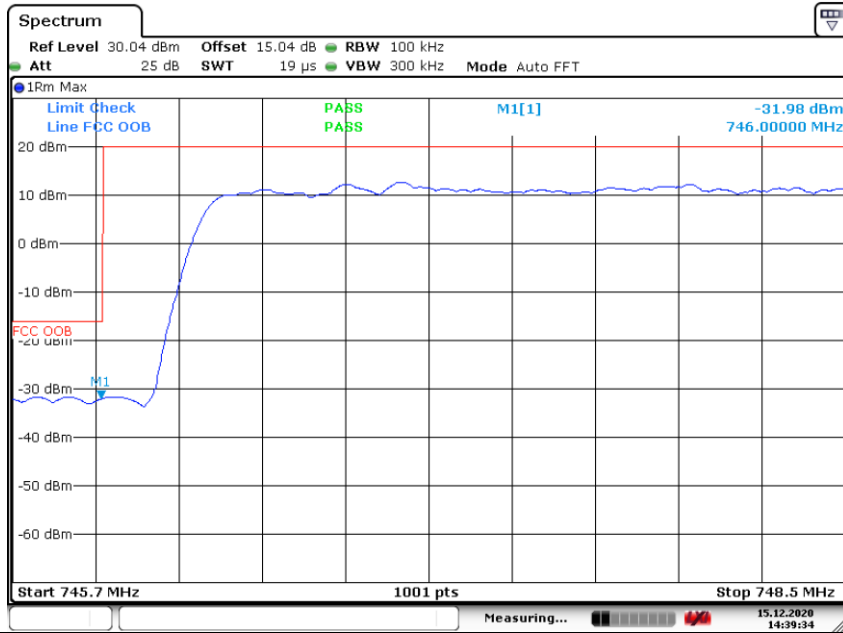
The EUT supports 2x2 MIMO and the emissions were measured at one of output port, so the limit line was set to -16.01dBm in following test plots in order to determine the test result conveniently.

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.

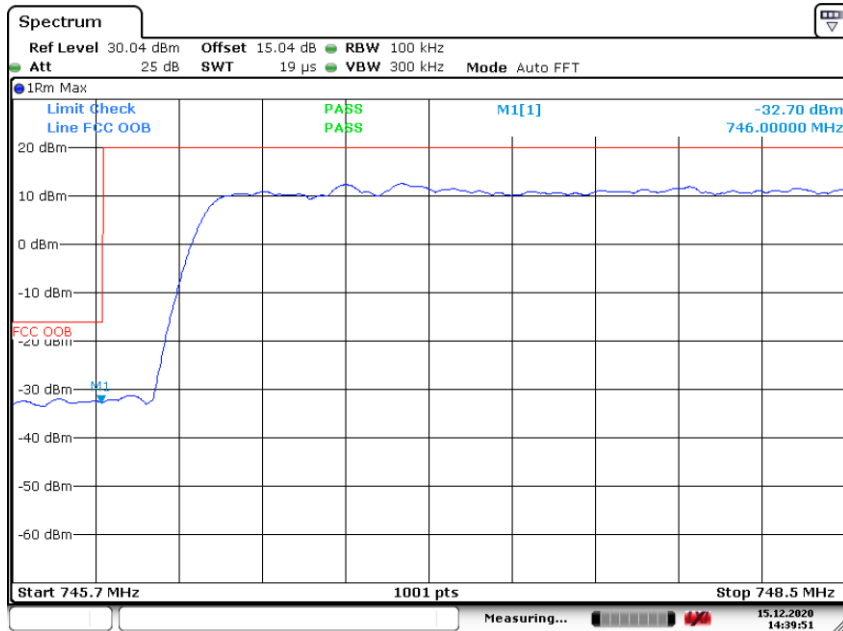


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DL\_1S\_B\_AWGN\_Pre-AGC\_Out-of-band emission

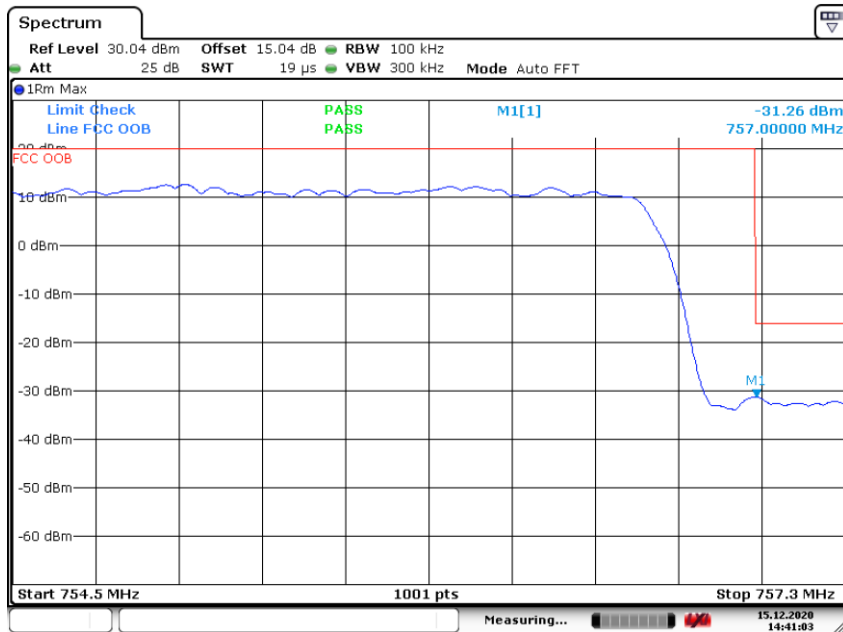


DL\_1S\_B\_AWGN\_AGC+3\_Out-of-band emission

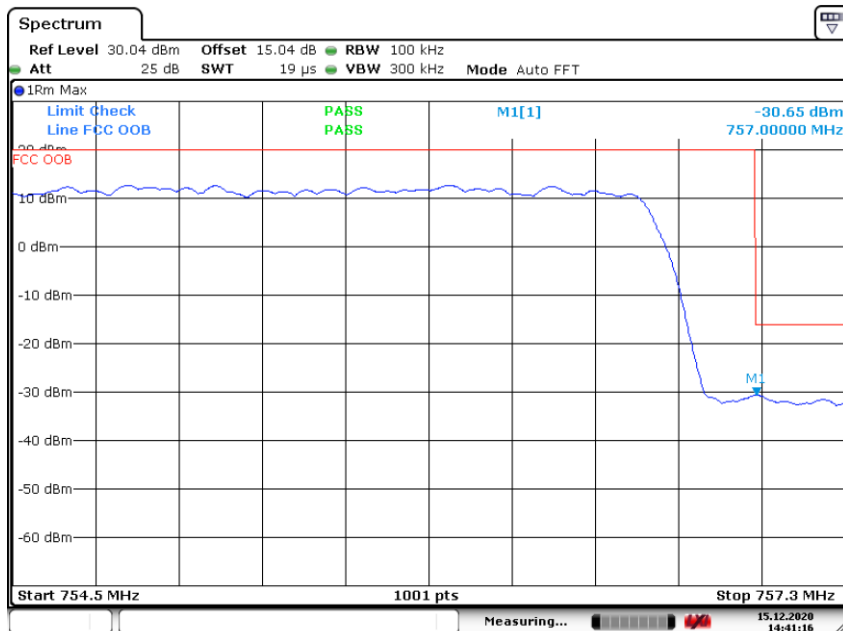


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DL\_1S\_T\_AWGN\_Pre-AGC\_Out-of-band emission

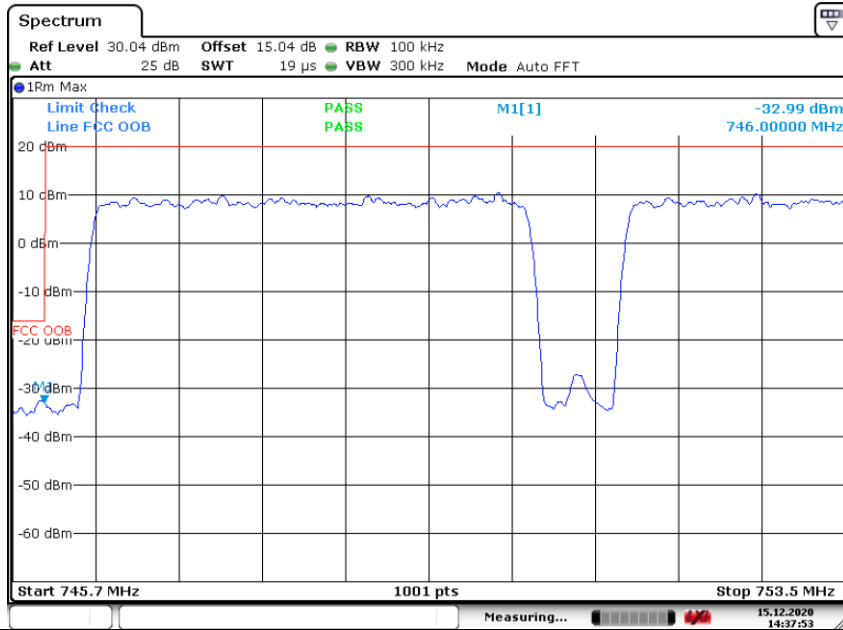


DL\_1S\_T\_AWGN\_AGC+3\_Out-of-band emission

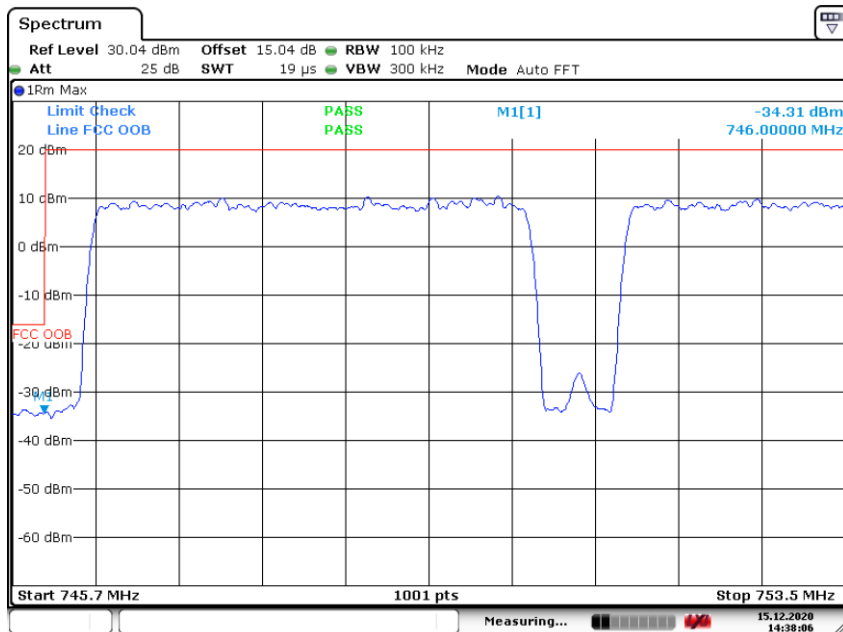


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DL\_2S\_B\_AWGN\_Pre-AGC\_Out-of-band emission



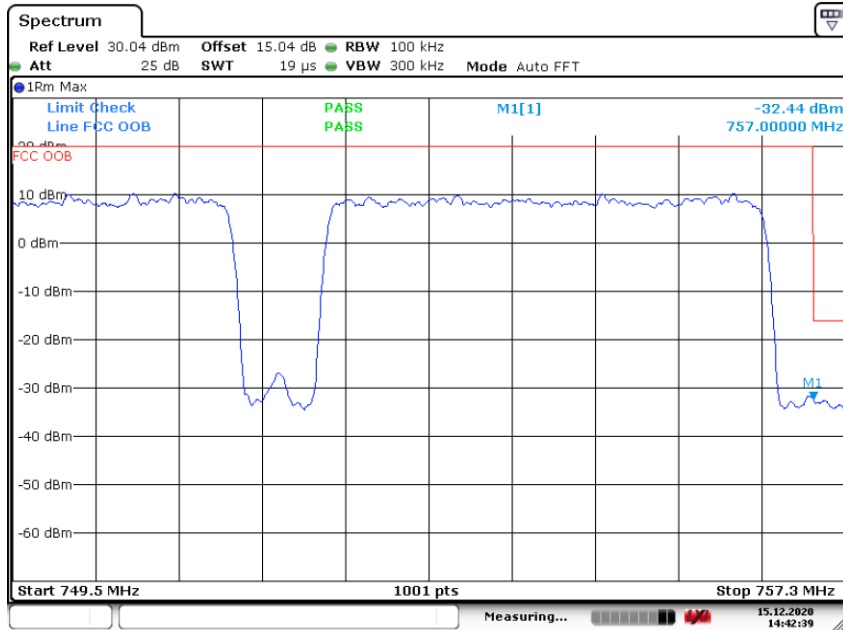
DL\_2S\_B\_AWGN\_AGC+3\_Out-of-band emission



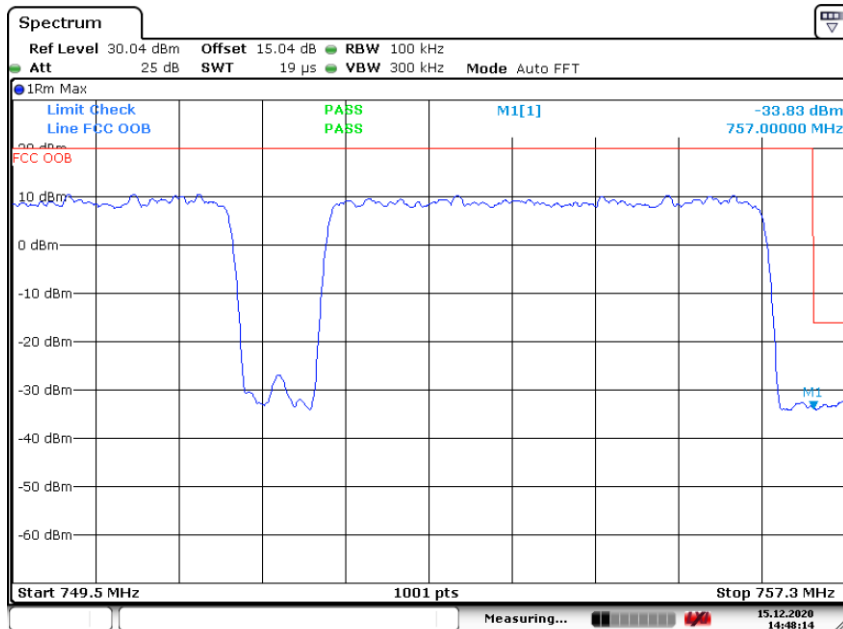
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DL\_2S\_T\_AWGN\_Pre-AGC\_Out-of-band emission

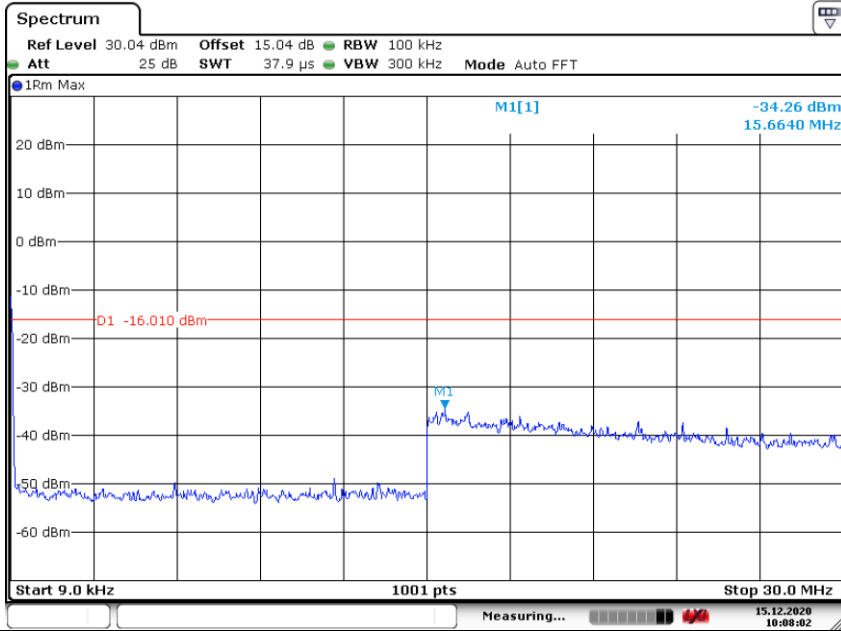


DL\_2S\_T\_AWGN\_AGC+3\_Out-of-band emission

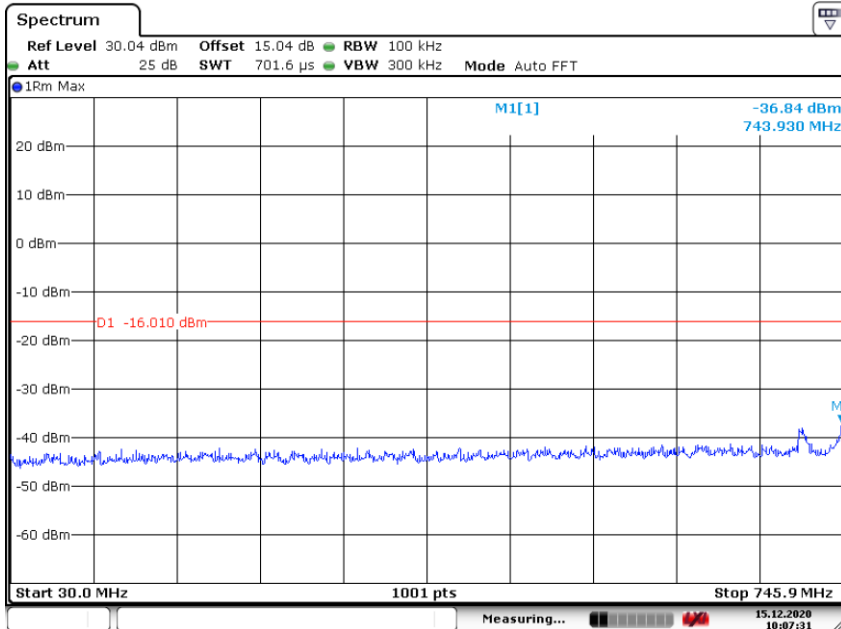


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DL\_1S\_B\_AWGN\_Pre-AGC\_Spurious emission 1

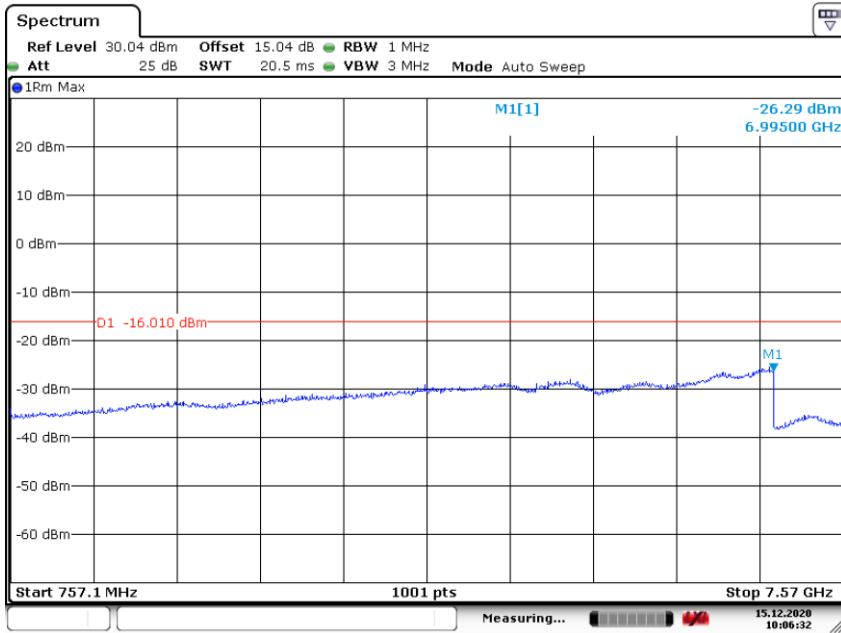


DL\_1S\_B\_AWGN\_Pre-AGC\_Spurious emission 2

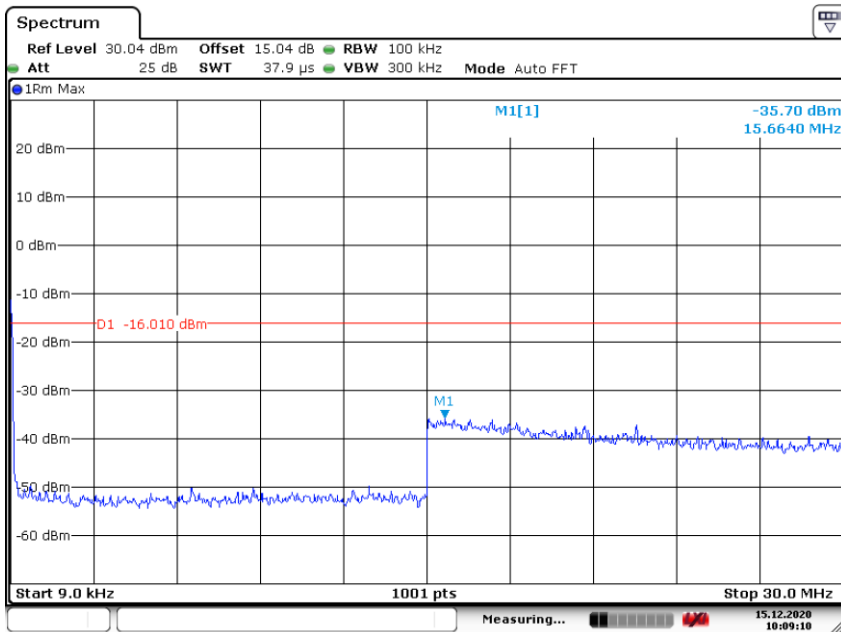


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DL\_1S\_B\_AWGN\_Pre-AGC\_Spurious emission 3



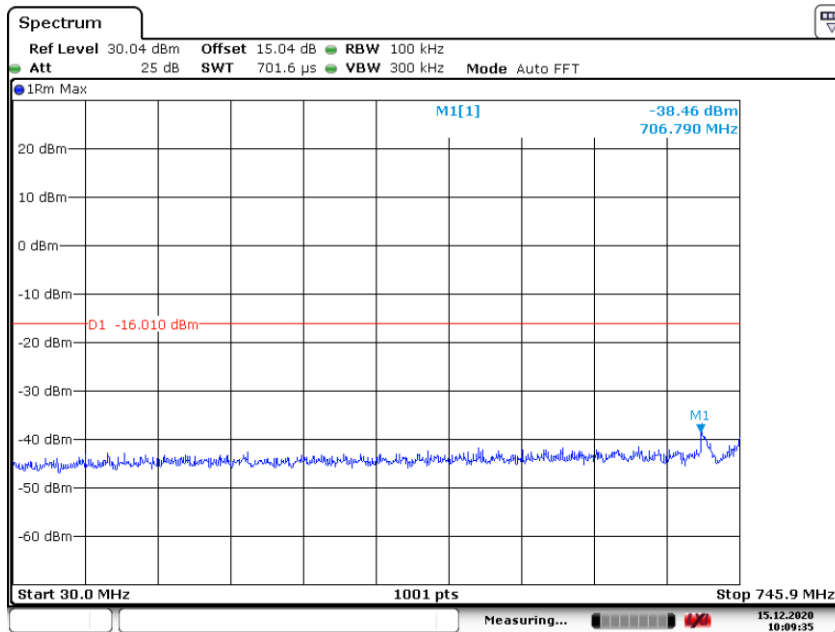
DL\_1S\_M\_AWGN\_Pre-AGC\_Spurious emission 1



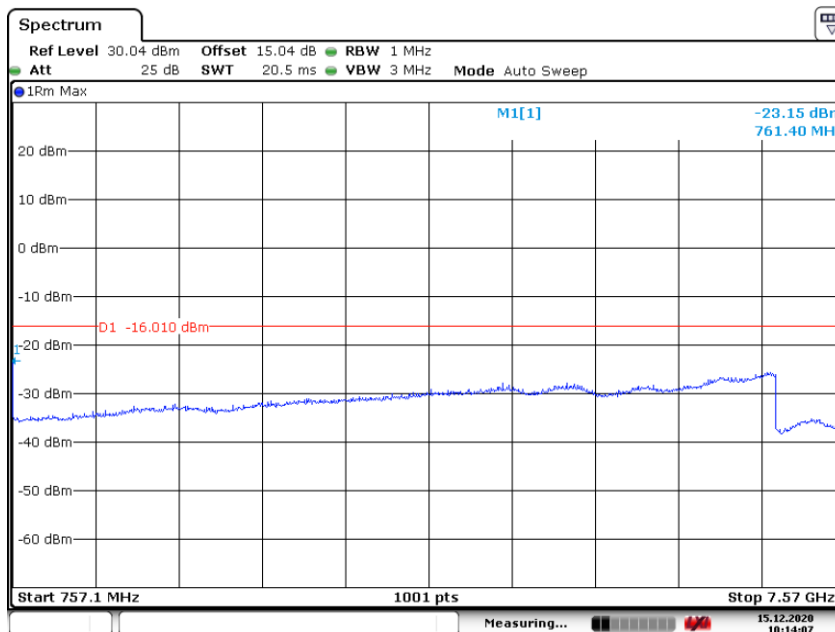
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DL\_1S\_M\_AWGN\_Pre-AGC\_Spurious emission 2

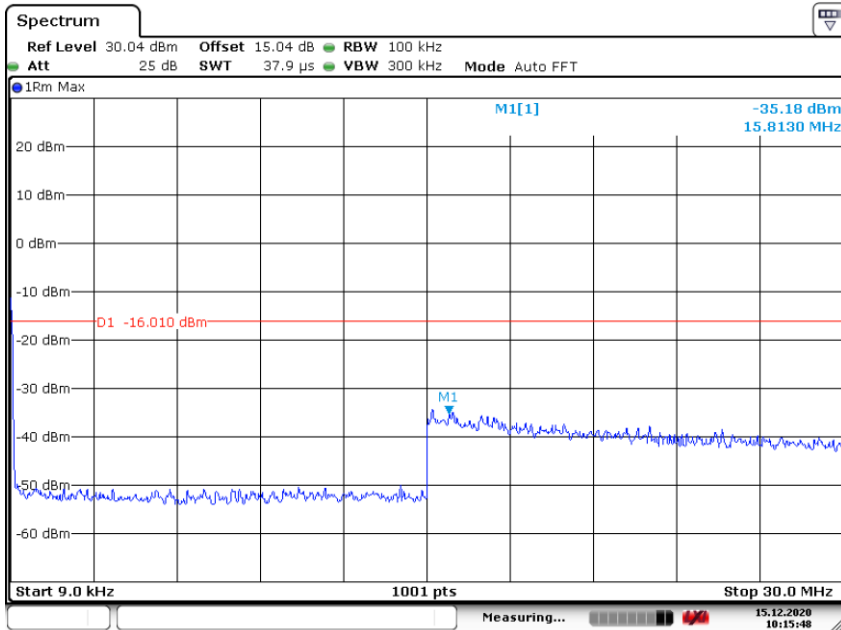


DL\_1S\_M\_AWGN\_Pre-AGC\_Spurious emission 3

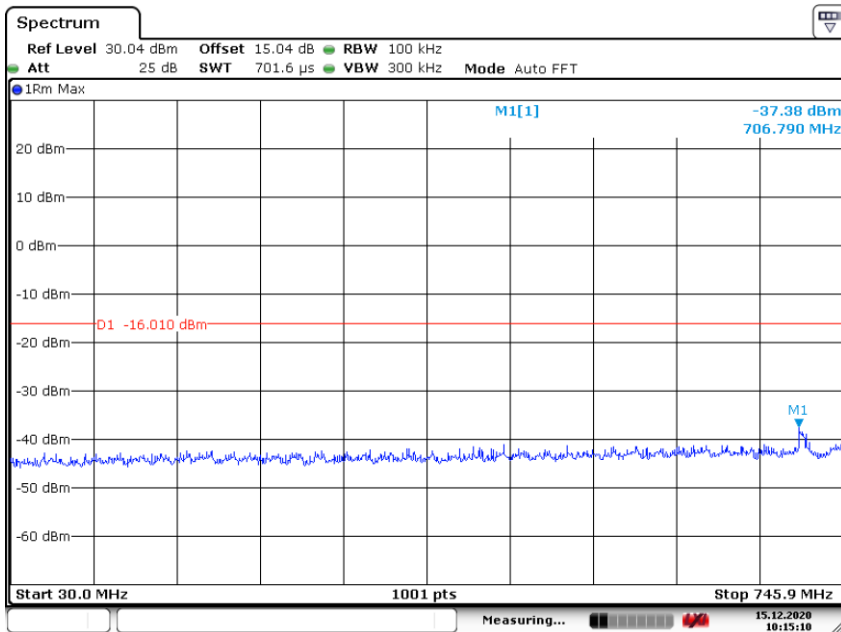


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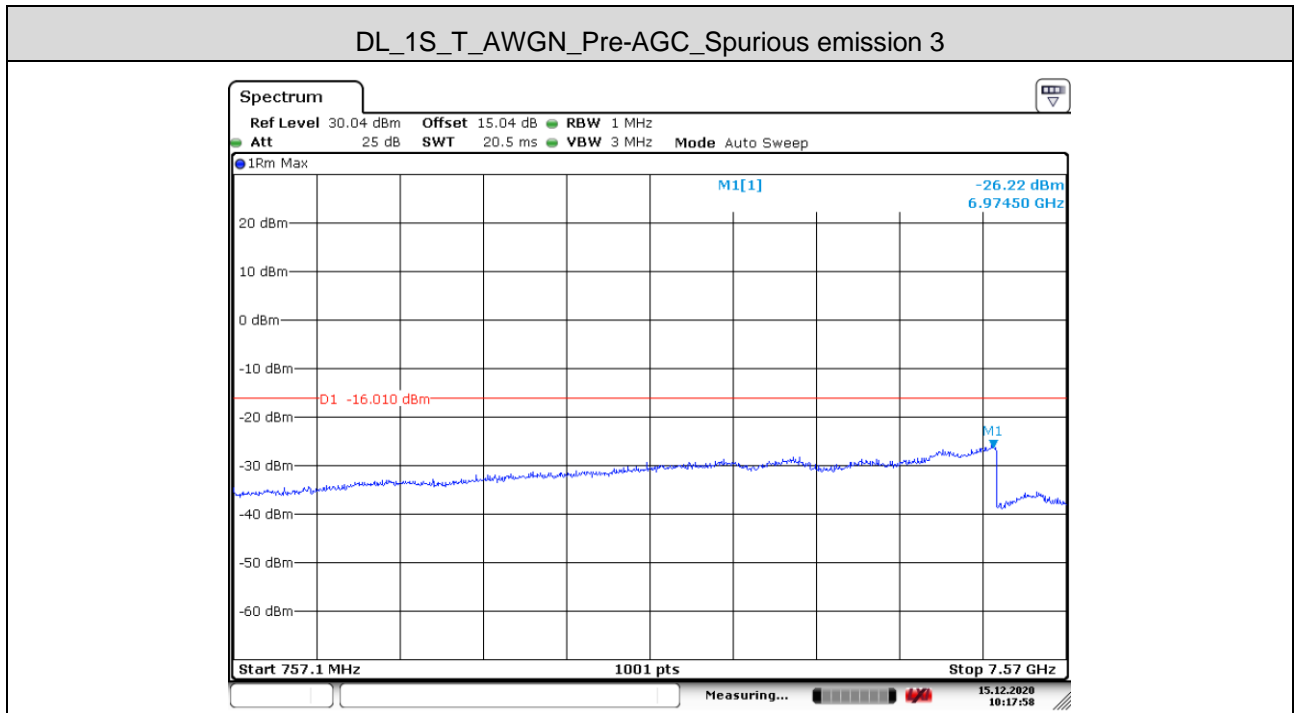
DL\_1S\_T\_AWGN\_Pre-AGC\_Spurious emission 1



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 ±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.



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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 =

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

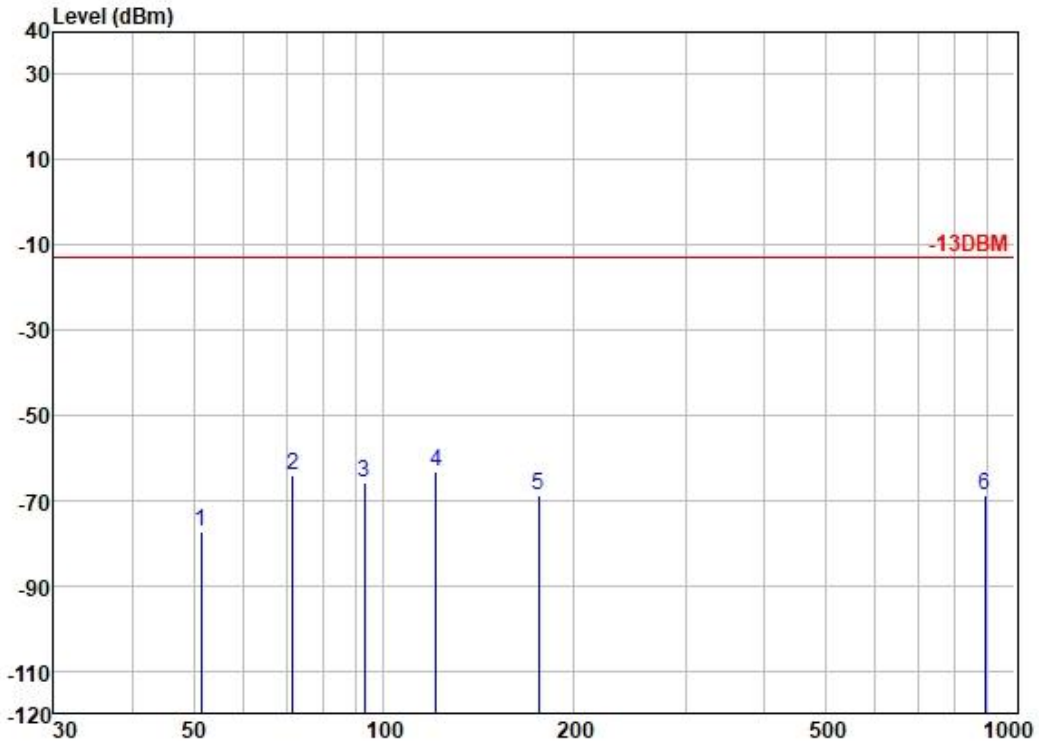
2. The radiated test performed at bottom / middle / top channel, the data with more than 20db margin, therefore, only the worst-case middle channel test data was recorded in the report.

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

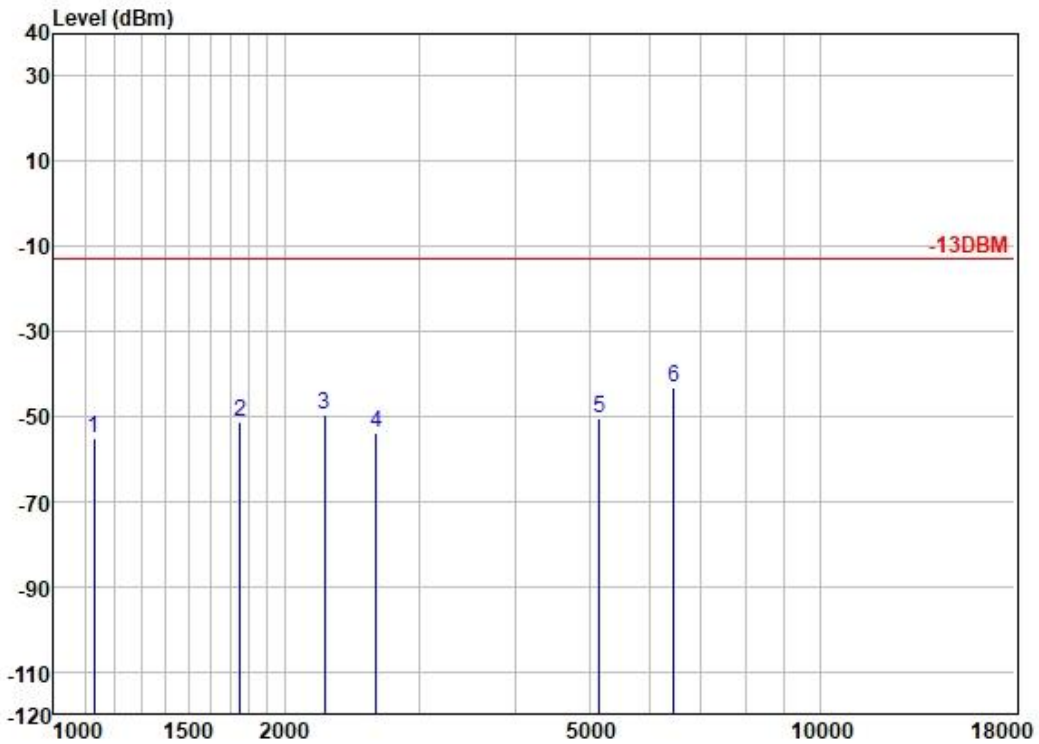


Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
51.301	-77.13	-13	-64.13	Horizontal	PASS
71.832	-63.90	-13	-50.9	Horizontal	PASS
93.113	-65.91	-13	-52.91	Horizontal	PASS
121.123	-63.30	-13	-50.3	Horizontal	PASS
175.652	-68.81	-13	-55.81	Horizontal	PASS
893.857	-68.79	-13	-55.79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



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DL\_1S\_M\_AWGN\_Horizontal\_above 1GHz



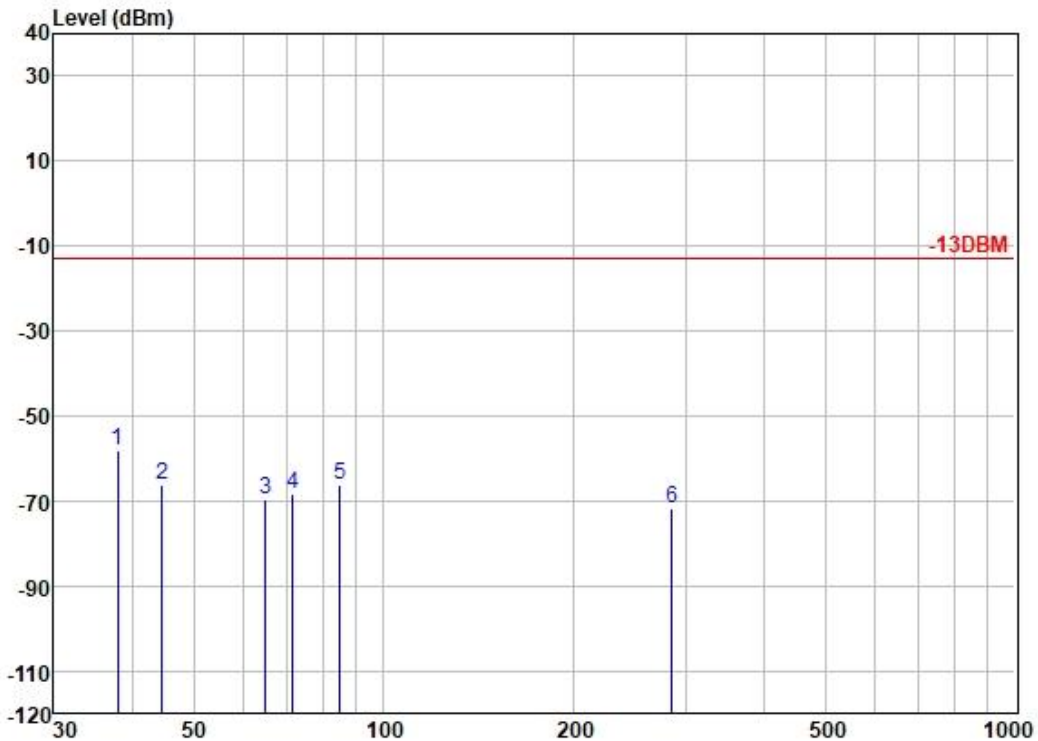
Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
1129.072	-55.05	-13	-42.05	Horizontal	PASS
1751.955	-51.38	-13	-38.38	Horizontal	PASS
2259.367	-49.40	-13	-36.4	Horizontal	PASS
2633.397	-53.81	-13	-40.81	Horizontal	PASS
5149.197	-50.41	-13	-37.41	Horizontal	PASS
6451.353	-43.03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



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DL\_1S\_M\_AWGN\_Vertical\_30MHz~1GHz

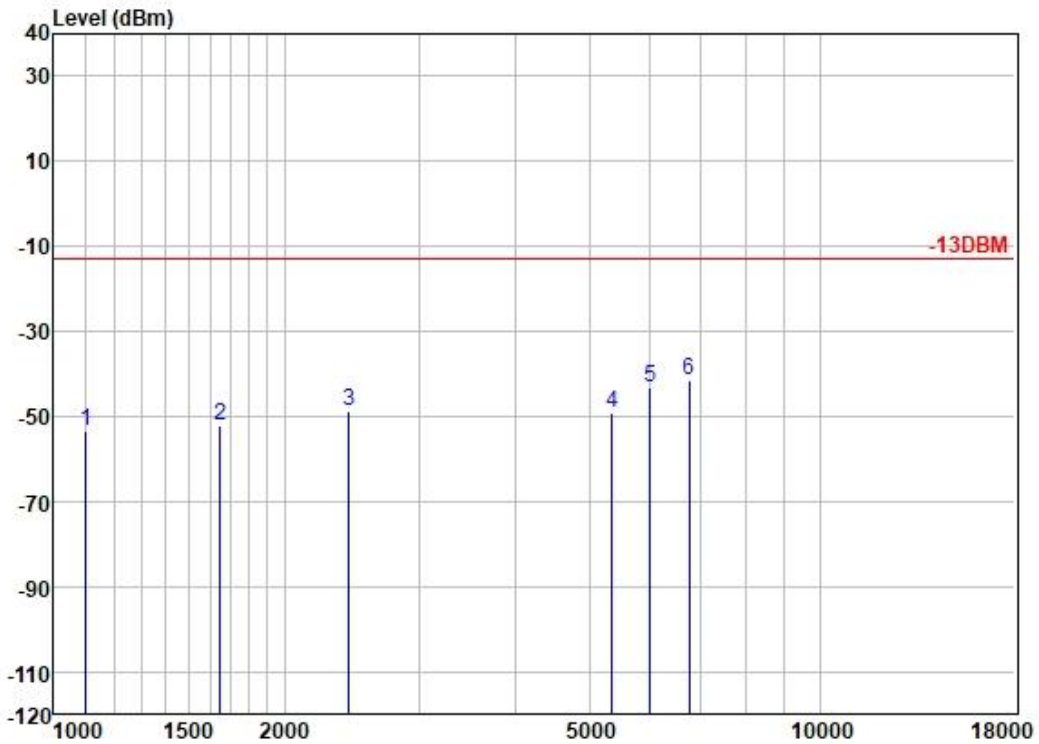


Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
37.812	-58.14	-13	-45.14	Vertical	PASS
44.587	-66.36	-13	-53.36	Vertical	PASS
64.887	-69.60	-13	-56.6	Vertical	PASS
71.832	-68.41	-13	-55.41	Vertical	PASS
85.298	-66.31	-13	-53.31	Vertical	PASS
285.978	-71.59	-13	-58.59	Vertical	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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#### 4 FirstNet (788-798MHz paired with 758-768MHz)

##### 4.1 AGC threshold level

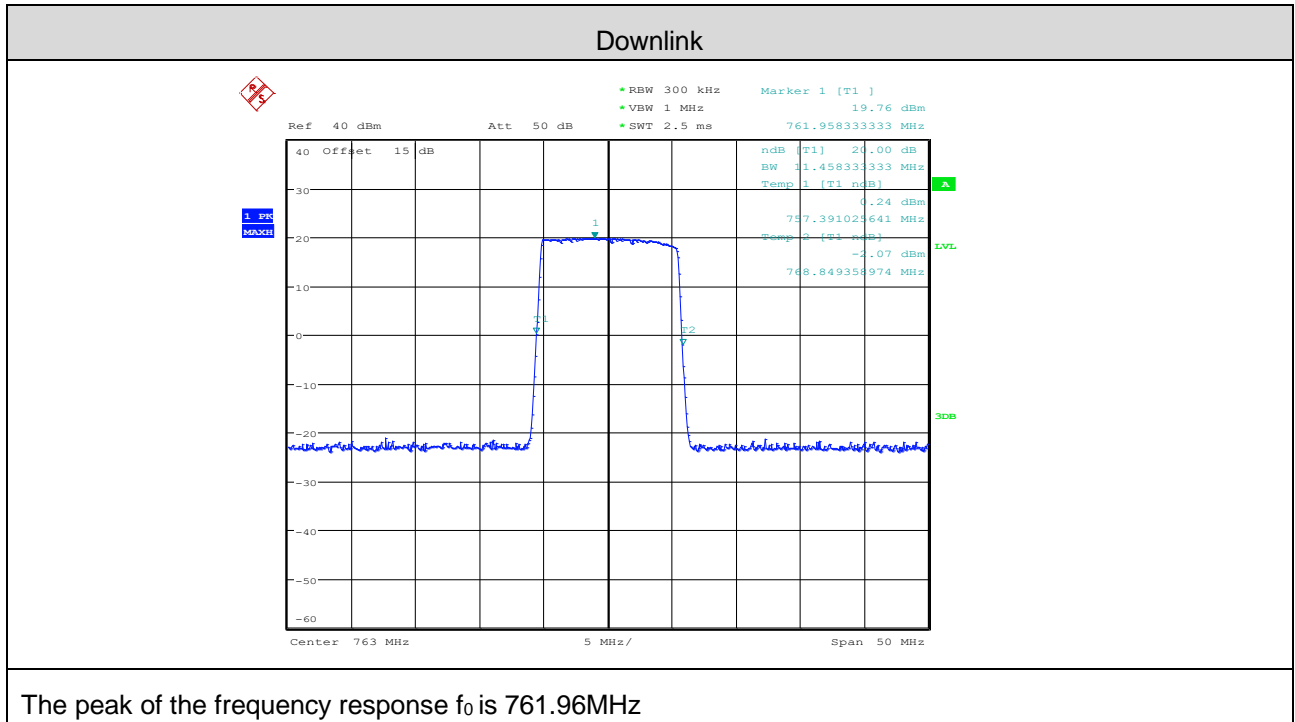
Test Conf.	AGC Threshold level
DL_1S_M_AWGN_AWGN	0.05dBm



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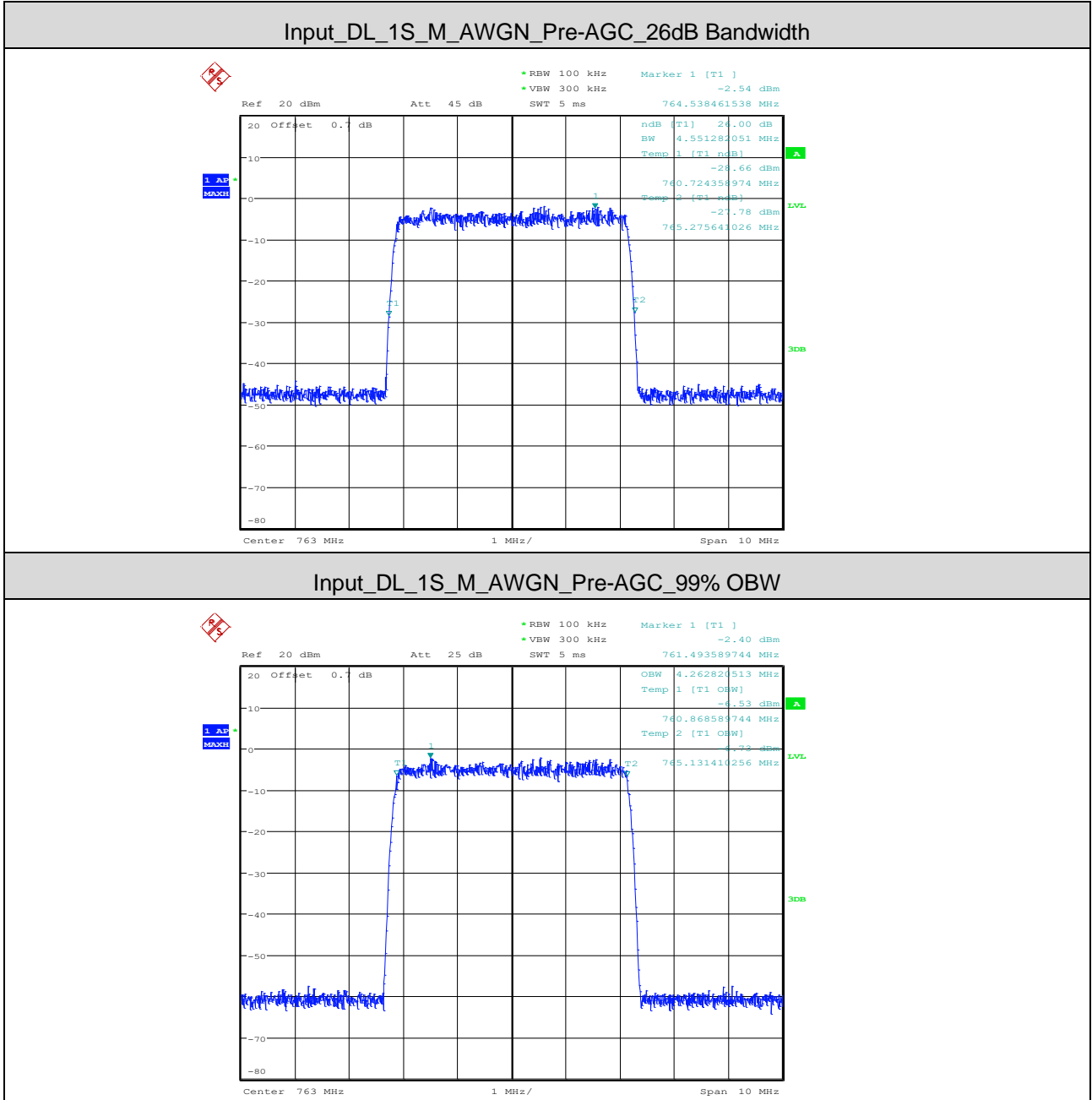
**4.2 Out-of-band rejection**



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**4.3 Input-versus-output signal comparison**



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