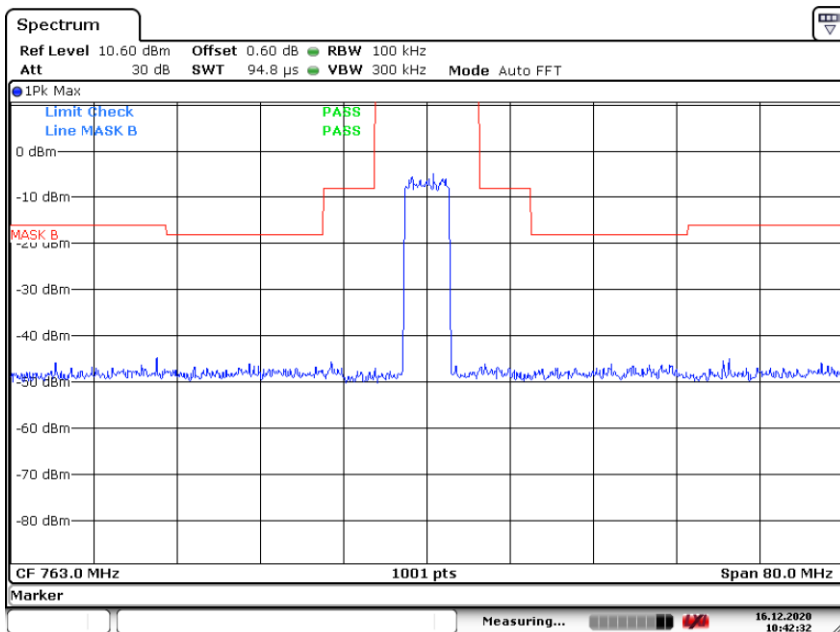
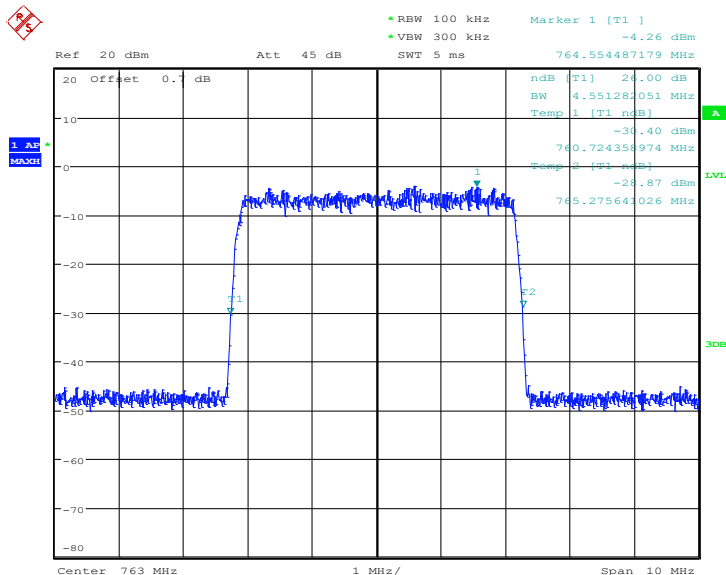


Input_DL_1S_M_AWGN_Pre-AGC_Emission Mask



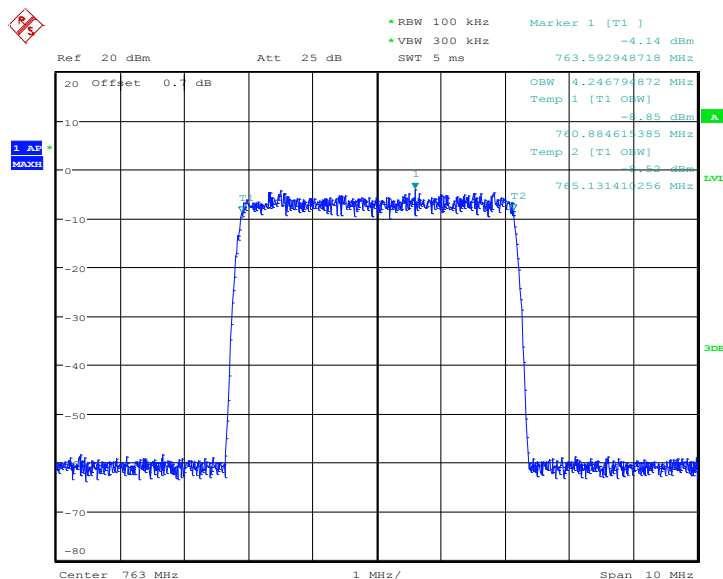
Input_DL_1S_M_AWGN_AGC+3dB_26dB Bandwidth



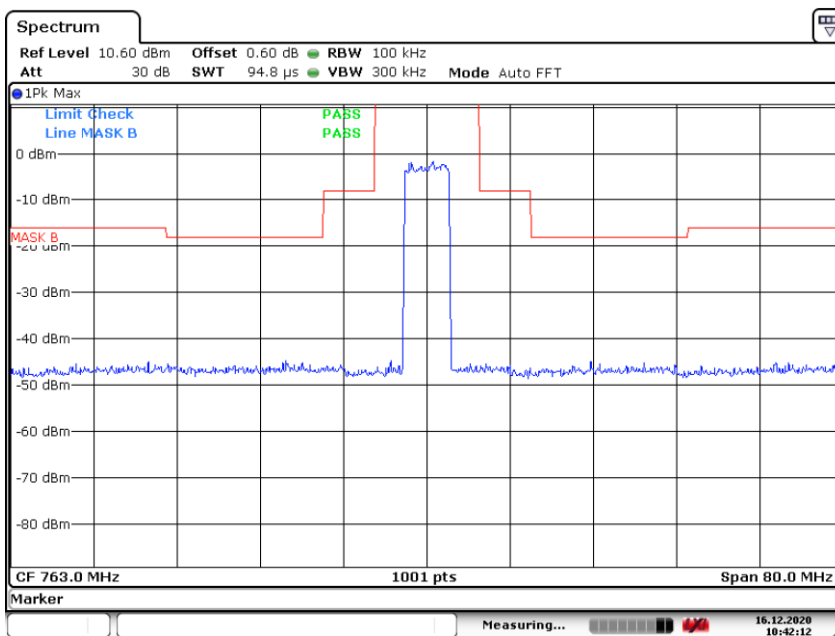
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Input_DL_1S_M_AWGN_AGC+3dB_99% OBW



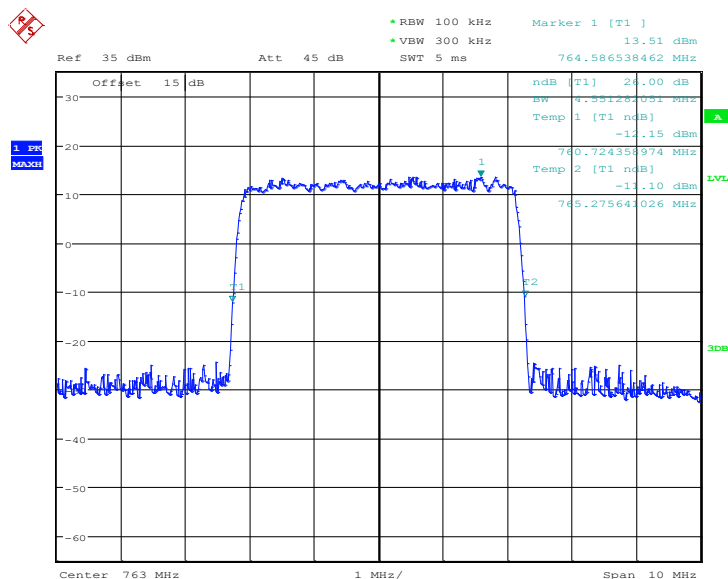
Input_DL_1S_M_AWGN_AGC+3dB_Emission Mask



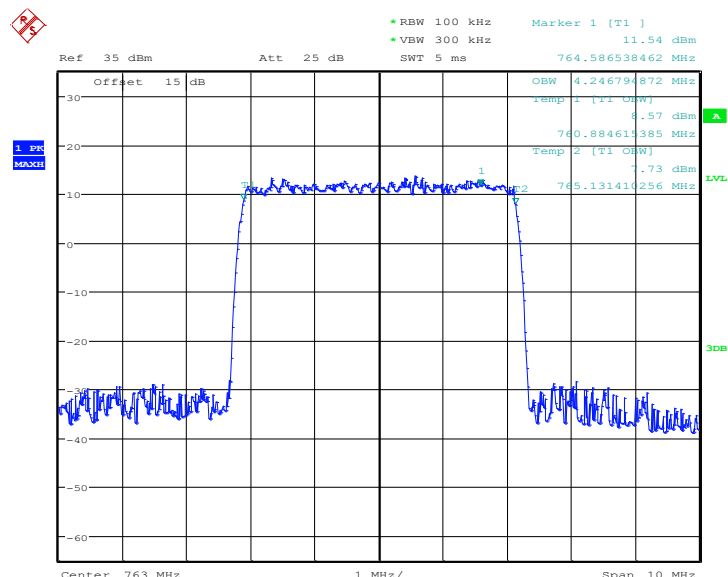
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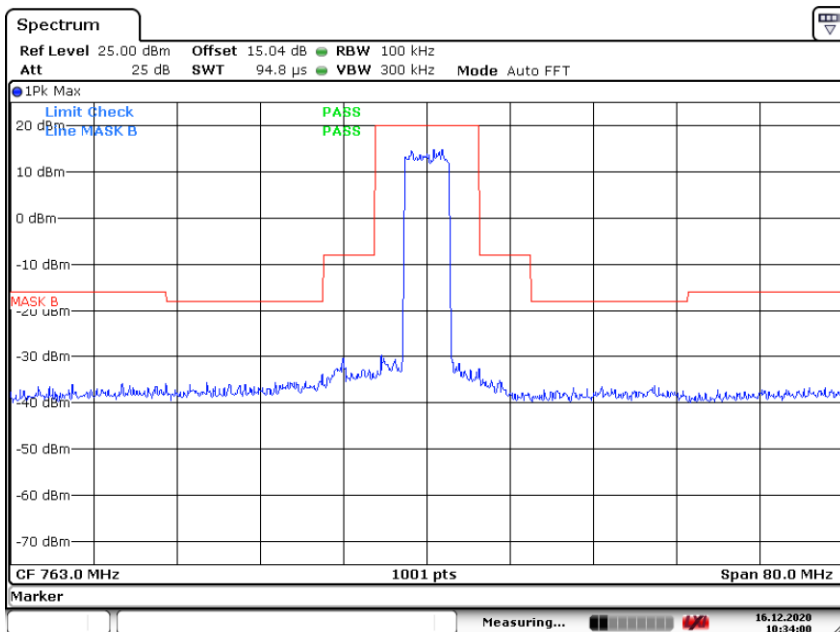
Output_DL_1S_M_AWGN_Pre-AGC_26dB Bandwidth



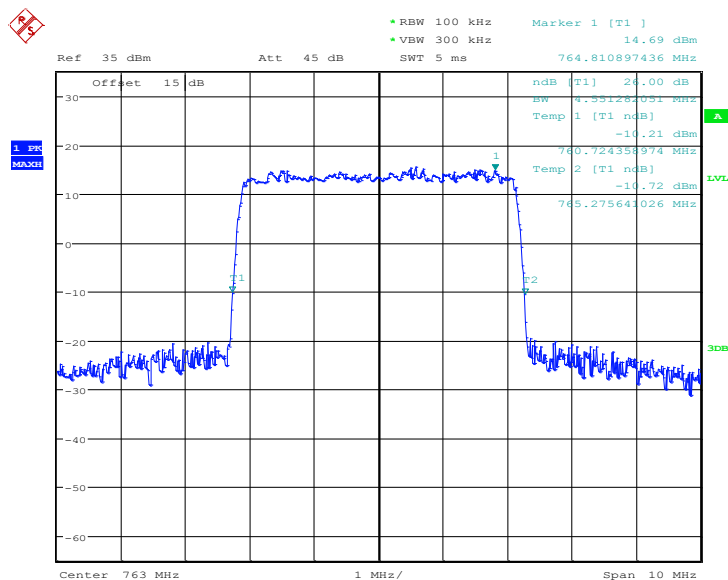
Output_DL_1S_M_AWGN_Pre-AGC_99% OBW



Output_DL_1S_M_AWGN_Pre-AGC_Emission Mask



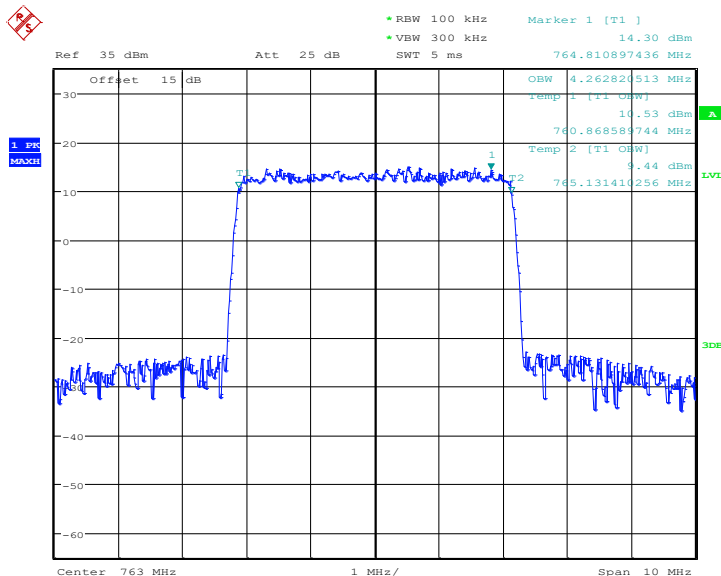
Output_DL_1S_M_AWGN_AGC+3dB_26dB Bandwidth



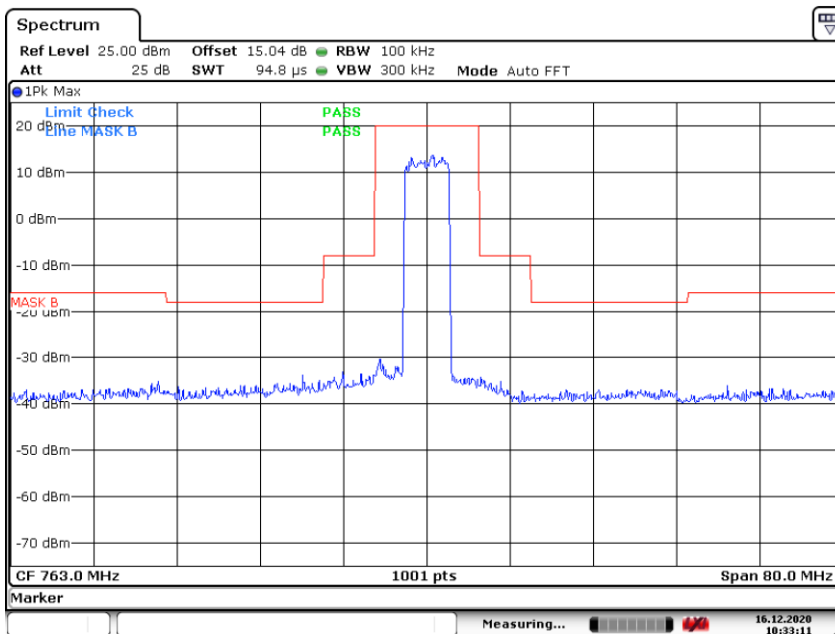
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Output_DL_1S_M_AWGN_AGC+3dB_99% OBW



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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Guangzhou Branch

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4.4 Input/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	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 = $G(\text{ANT}) + 10 \log (N\text{ANT}) \text{ dBi} = 12.5\text{dBi} + 10\log (2) \text{ dBi} = 15.5\text{dBi}$.

ERP= EIRP-2.15dB

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



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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 + 10log (P) dB, 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.

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.

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

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

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.

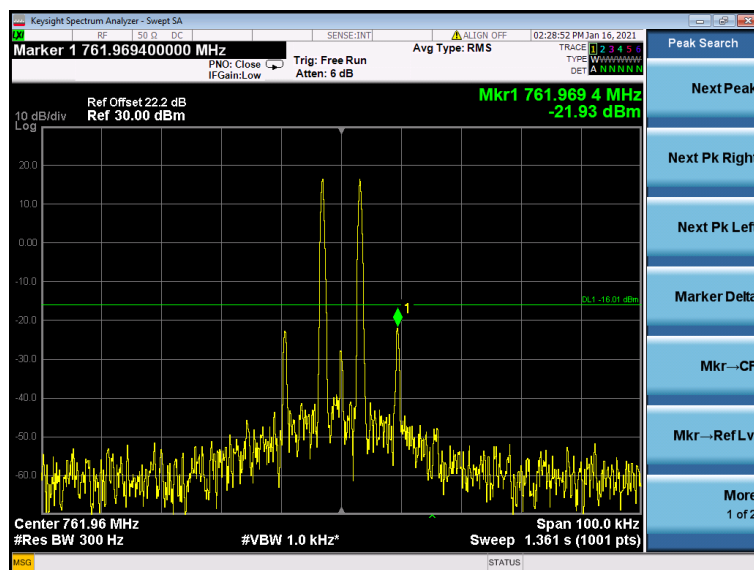
4. Intermodulation has been tested using an input signal with Pre-AGC level and an input signal with AGC+3dB level, only the worst-case was recorded in this report.



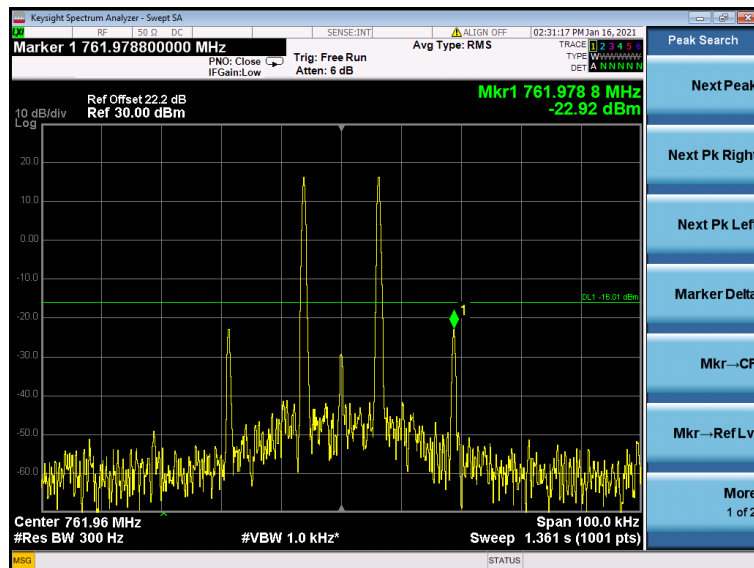
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CW_Pre-AGC_Intermodulation



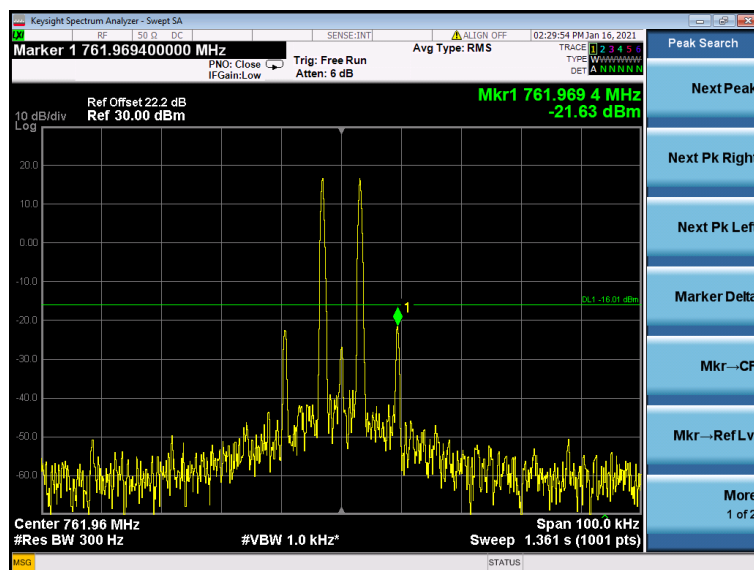
CW_Pre-AGC_Intermodulation



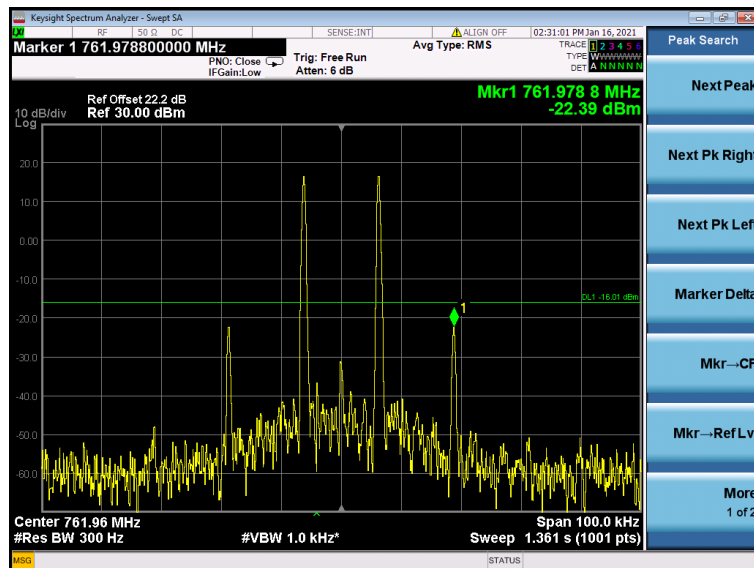
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CW_AGC+3dB_Intermodulation



CW_AGC+3dB_Intermodulation

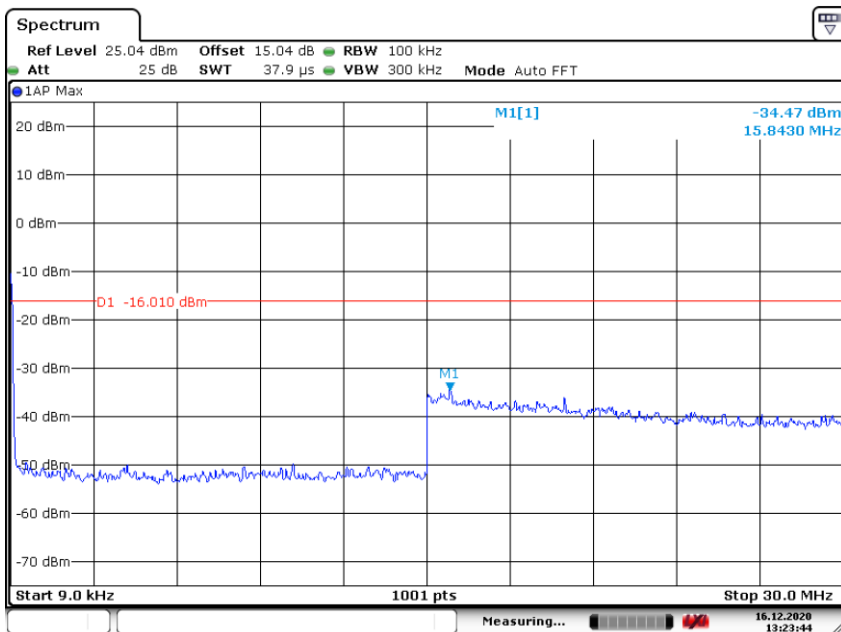


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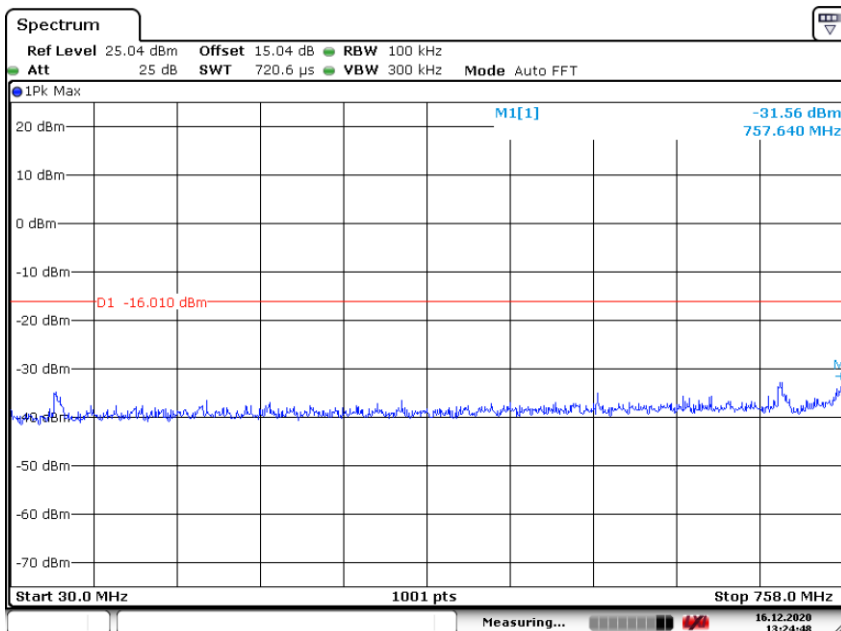
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DL_1S_B_AWGN_Pre-AGC_Spurious emission 1



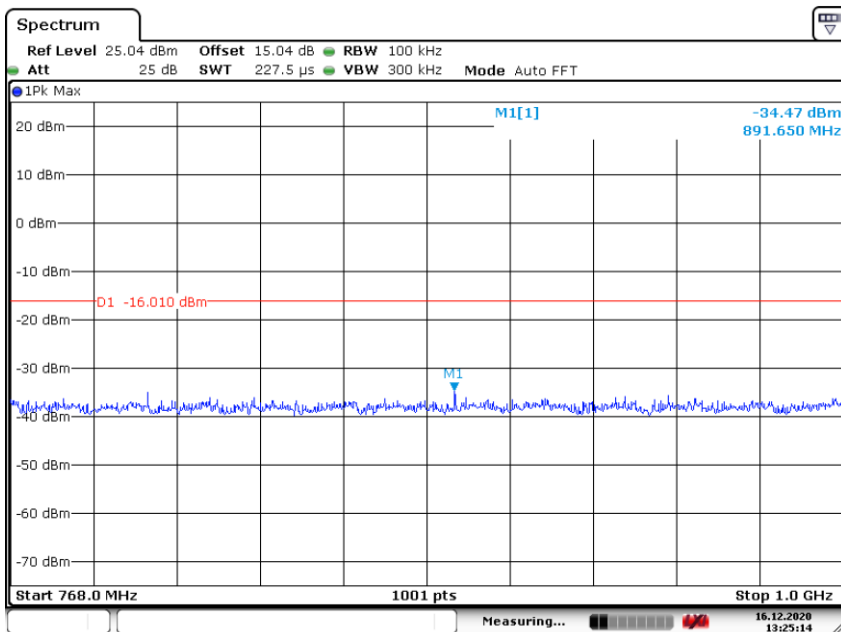
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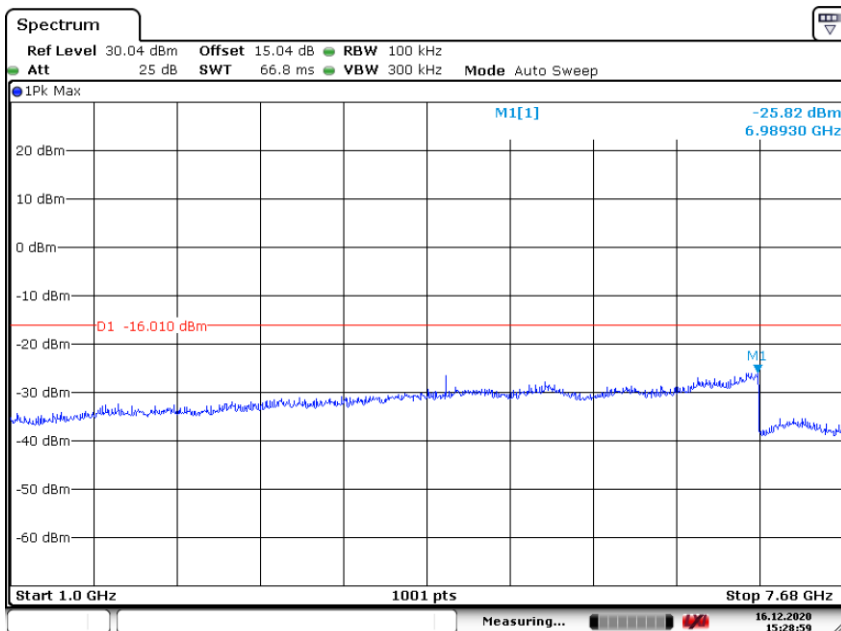
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DL_1S_B_AWGN_Pre-AGC_Spurious emission 3



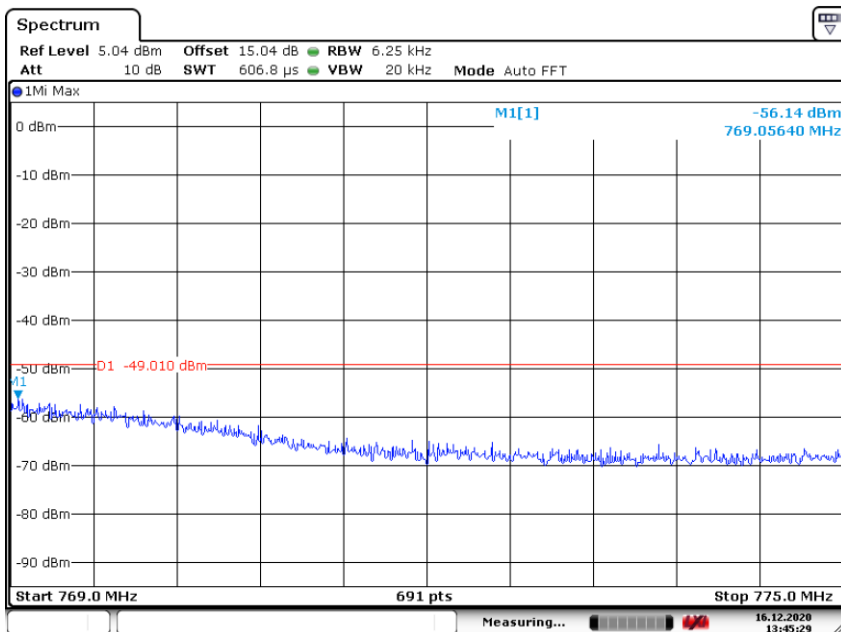
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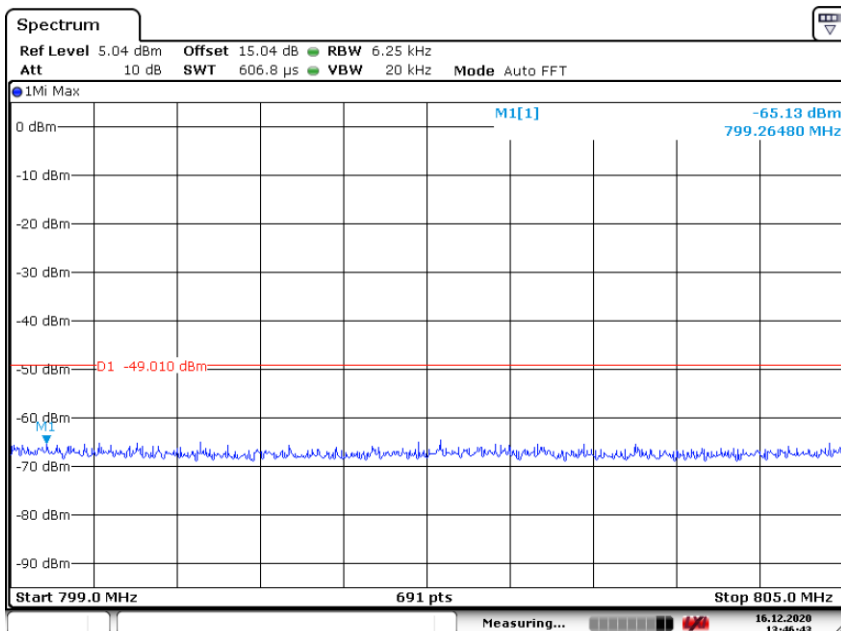
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DL_1S_B_AWGN_Pre-AGC_Spurious emission 5



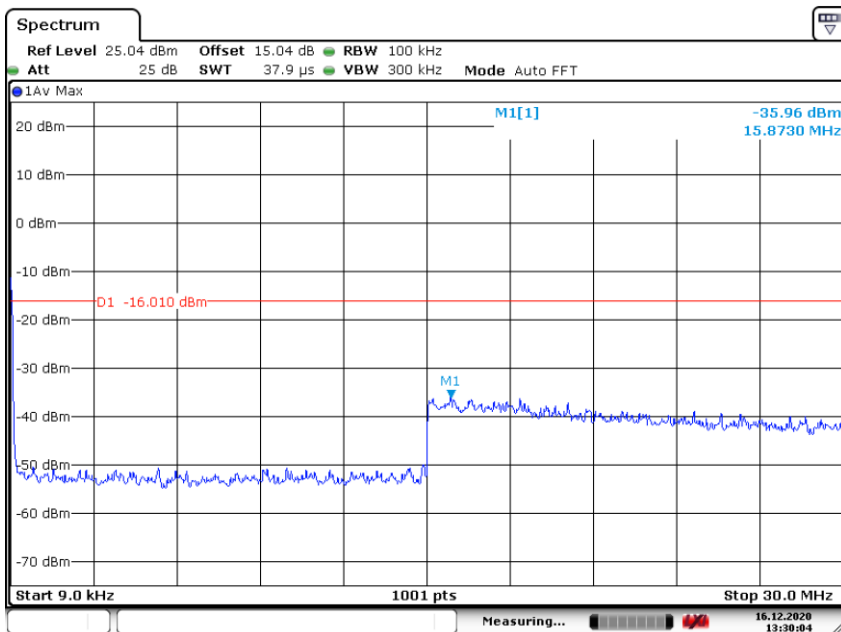
DL_1S_B_AWGN_Pre-AGC_Spurious emission 6



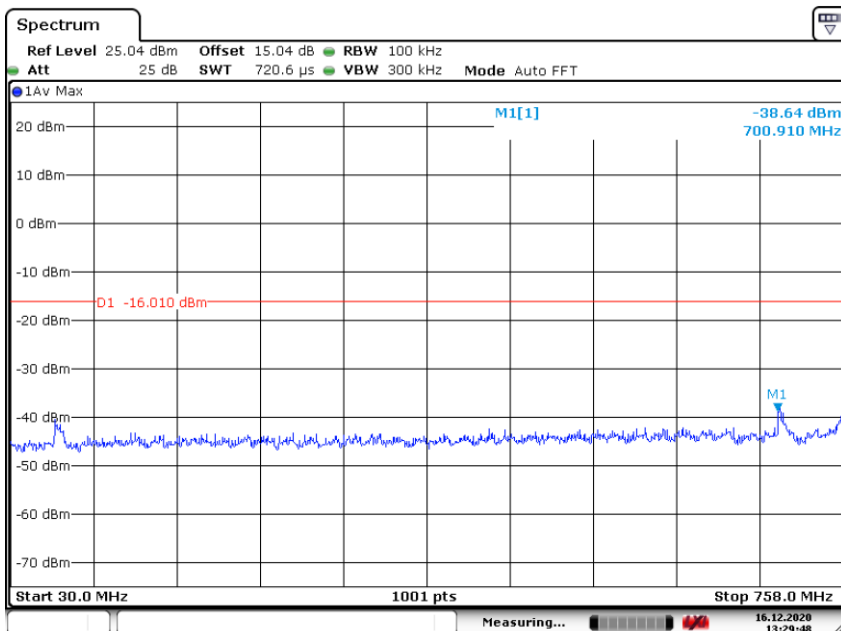
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DL_1S_M_AWGN_Pre-AGC_Spurious emission 1



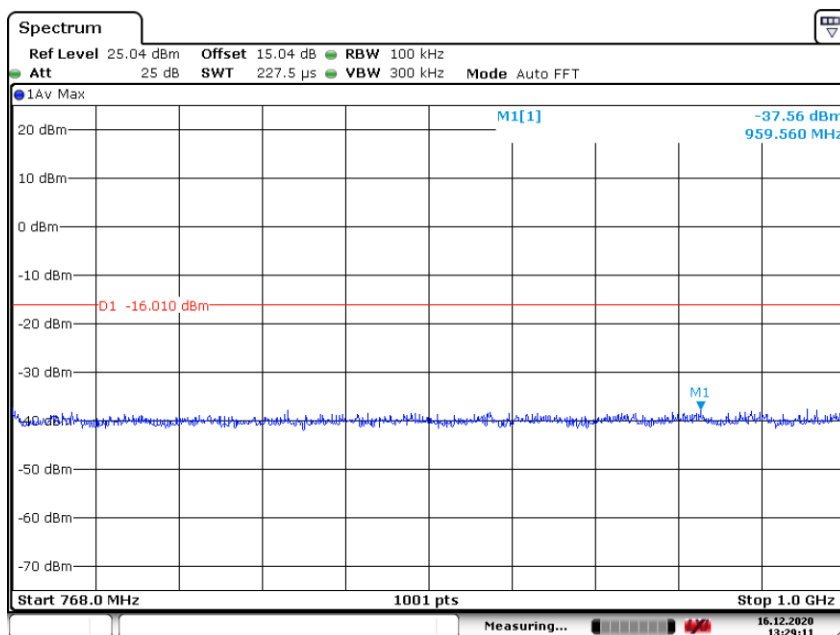
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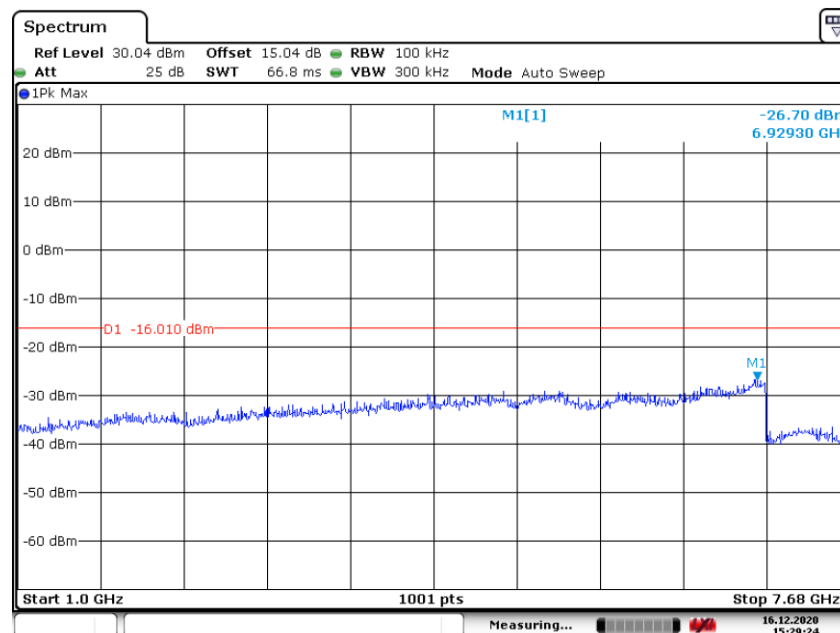
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DL_1S_M_AWGN_Pre-AGC_Spurious emission 3



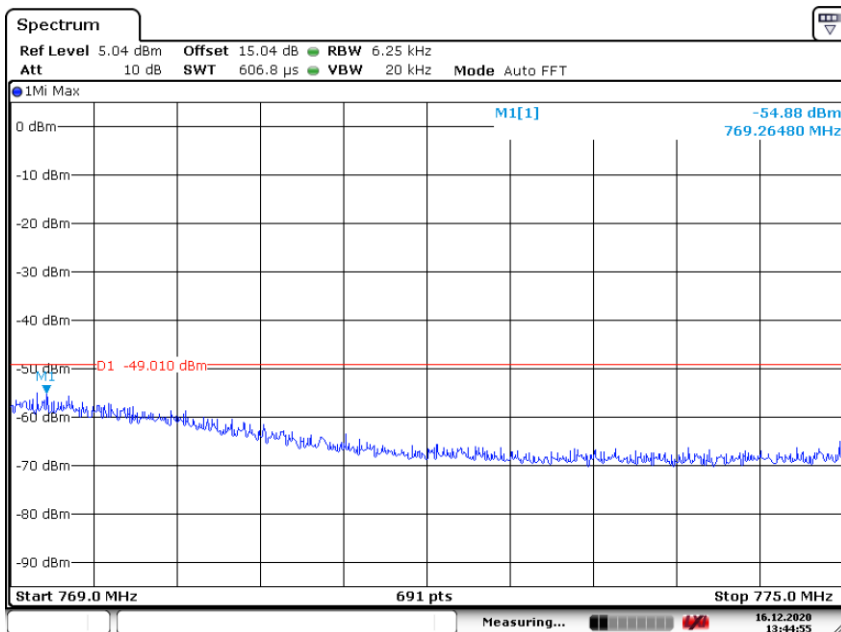
DL_1S_M_AWGN_Pre-AGC_Spurious emission 4



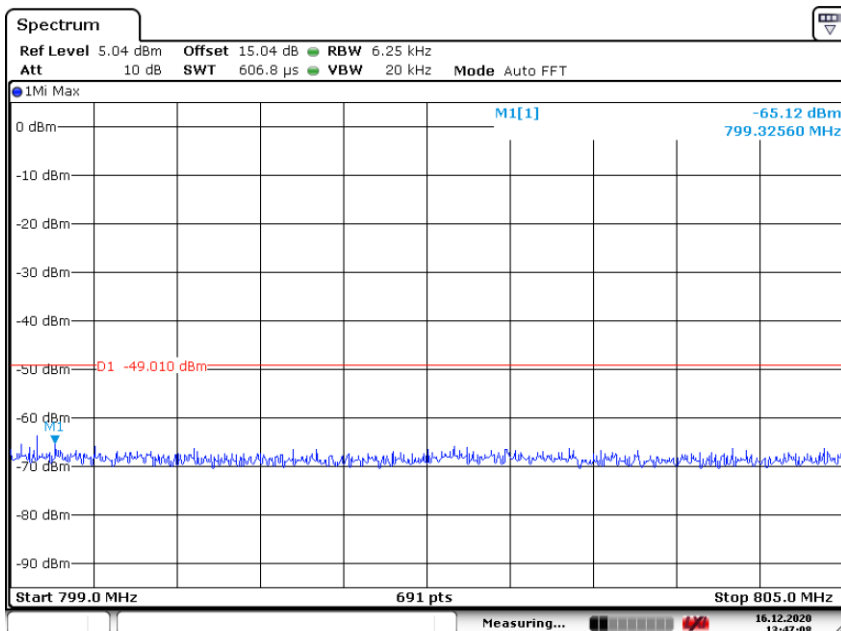
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DL_1S_M_AWGN_Pre-AGC_Spurious emission 5



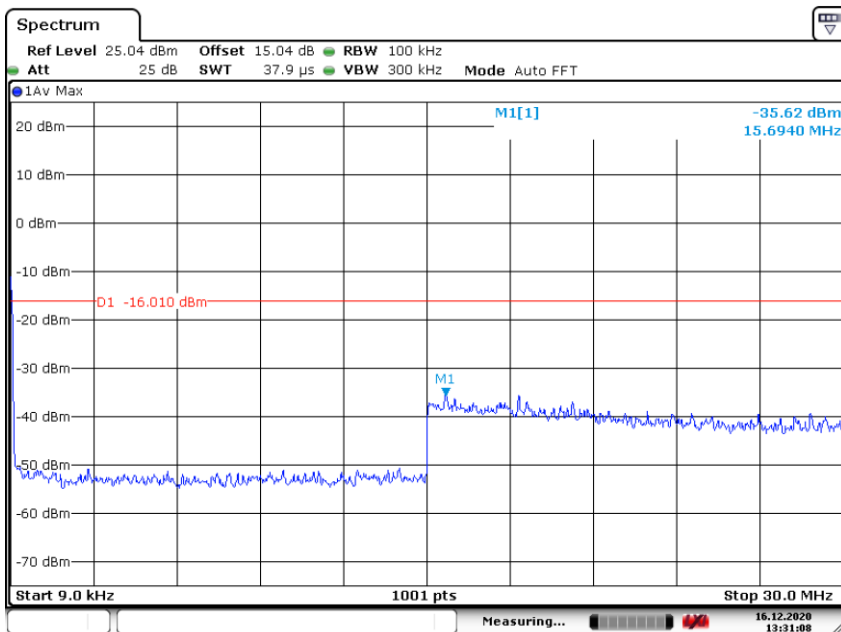
DL_1S_M_AWGN_Pre-AGC_Spurious emission 6



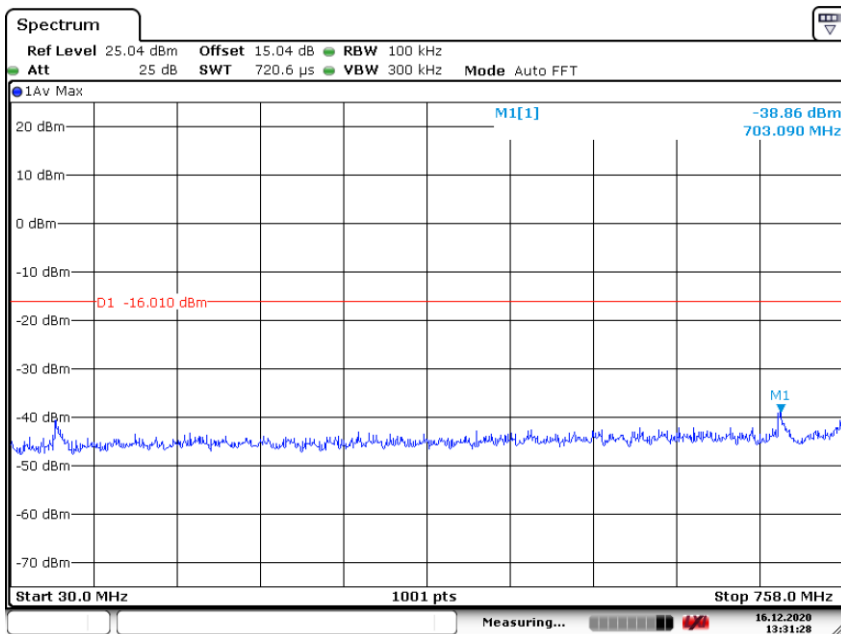
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DL_1S_T_AWGN_Pre-AGC_Spurious emission 1



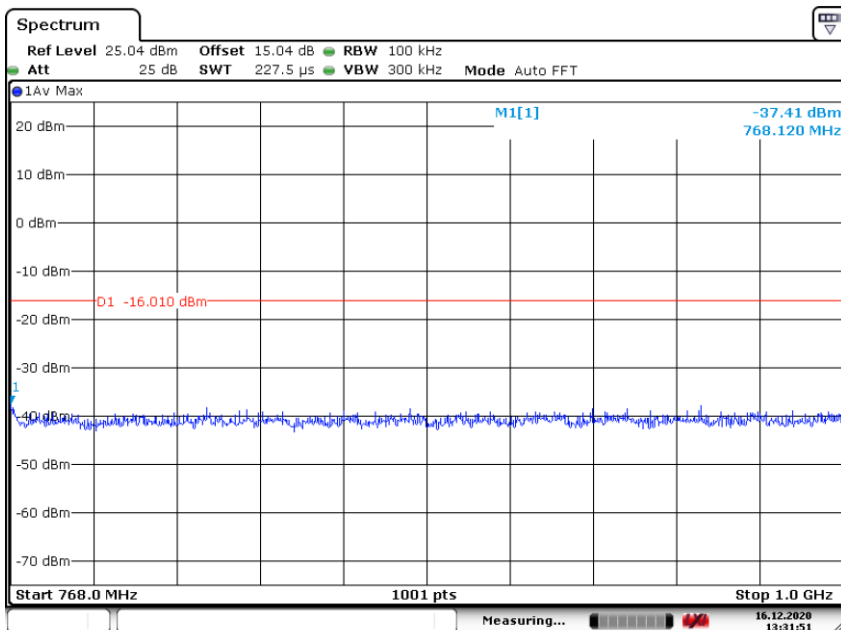
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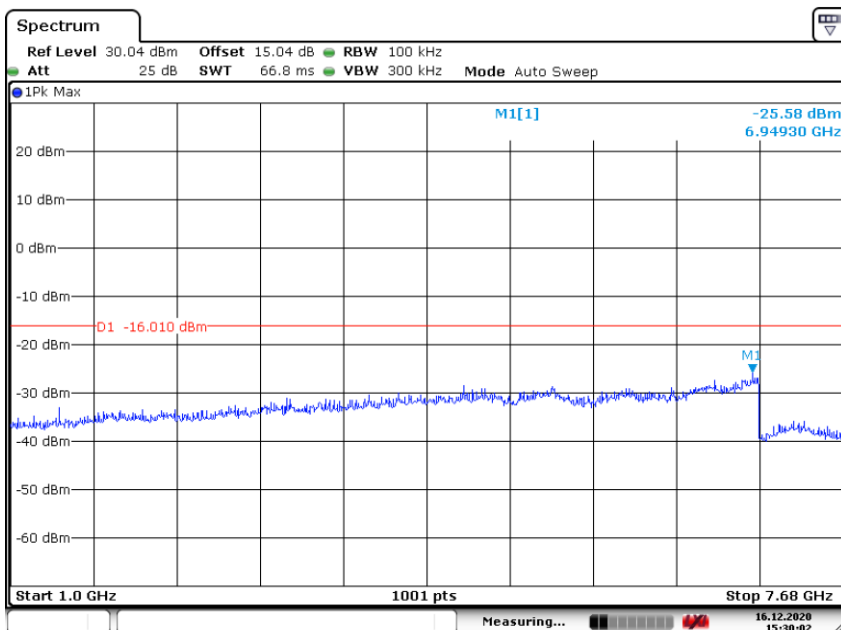
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DL_1S_T_AWGN_Pre-AGC_Spurious emission 3



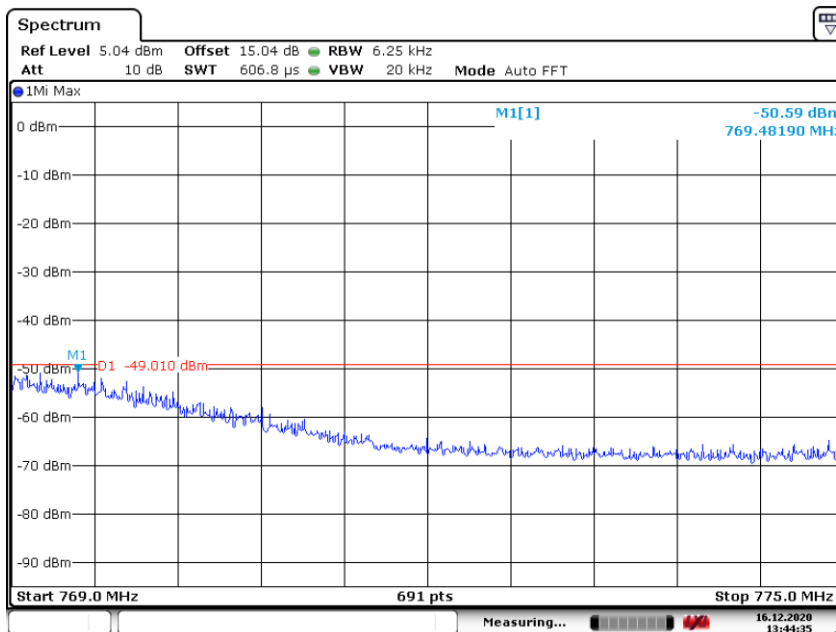
DL_1S_T_AWGN_Pre-AGC_Spurious emission 4



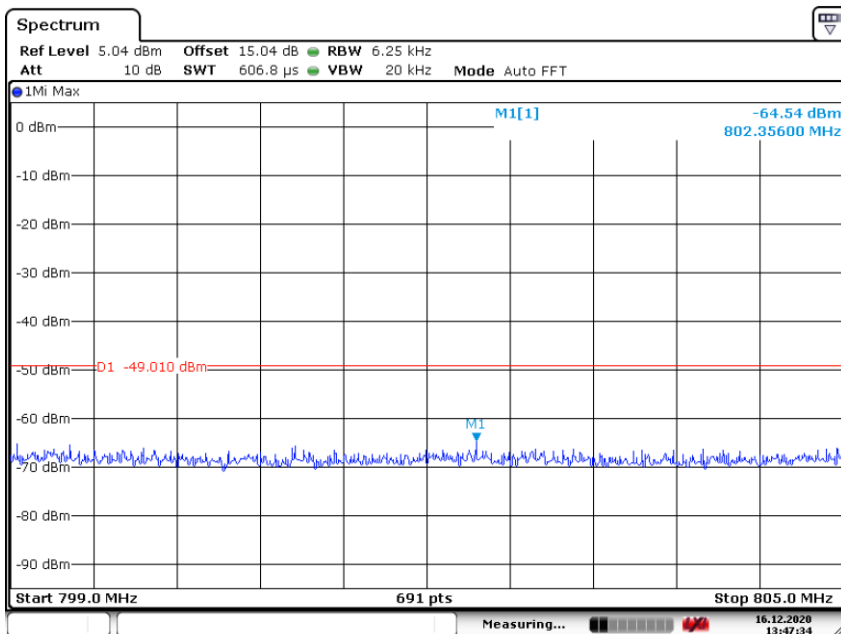
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DL_1S_T_AWGN_Pre-AGC_Spurious emission 5



DL_1S_T_AWGN_Pre-AGC_Spurious emission 6



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4.7 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.



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Frequency stability vs temperature				
Temperature (°C)	Test Conf.	Test data (MHz)	Tolerance (ppm)	Verdict
50	DL_1S_M_AWGN	763.000318	0.10	PASS
40		763.000321	0.10	PASS
30		763.000123	-0.16	PASS
20		763.000243	Reference	PASS
10		763.000212	-0.04	PASS
0		763.000111	-0.17	PASS
-10		763.000321	0.10	PASS
-20		763.000176	-0.09	PASS
-30		763.000263	-0.3	PASS

Frequency stability vs voltage				
Voltage (V)	Test Conf.	Test data (MHz)	Tolerance (ppm)	Verdict
DC 40.8	DL_1S_M_AWGN	763.000187	-0.12	PASS
DC 48		763.000275	Reference	PASS
DC 55.2		763.000254	-0.03	PASS

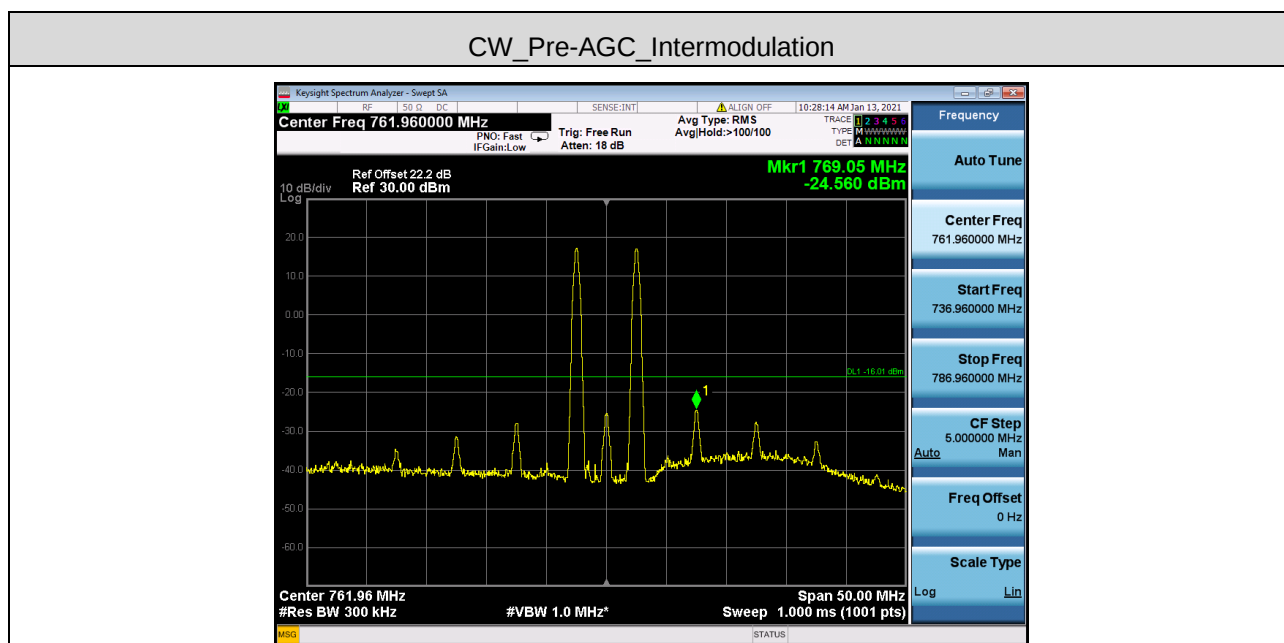


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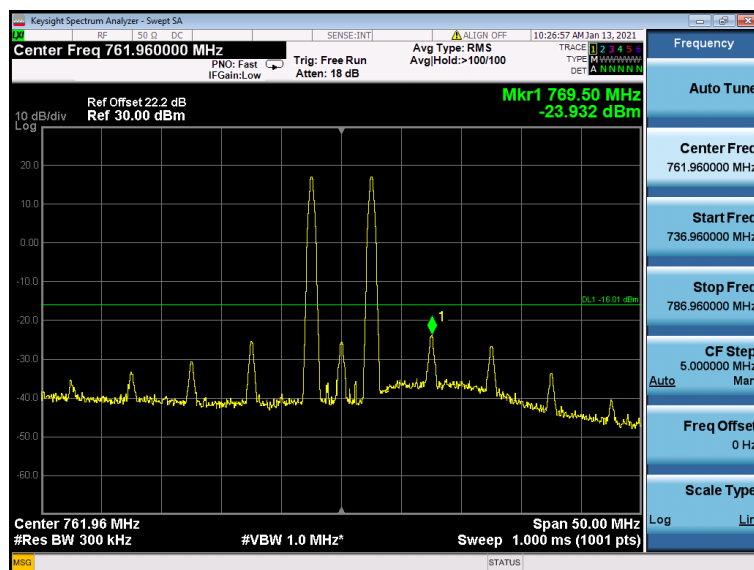
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4.8 Noise/emission at antenna terminal

Good engineering practice must be used regarding the radiation of intermodulation products and noise. Thus, the ERP of intermodulation products should not exceed the level -30dBm in 10 kHz measurement bandwidth and the ERP of noise within the passband should not exceed the level -43dBm in 10 kHz measurement bandwidth and the ERP of noise on spectrum more than 1MHz outside of the passband should not exceed the level -70dBm in 10 kHz measurement bandwidth. In the event of harmful interference caused by any given deployment, the FCC may require additional attenuation or filtering of the emissions and/or noise from signal boosters or signal booster systems, as necessary to eliminate the interference. Detailed setting was declared by manufacturer and stated in the user manual. Below test plots were only for recorded the case without engineering practice for refence.



CW_AGC+3B_Intermodulation



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 conducted max intermodulation product is -23.93dBm, the conducted intermodulation product for 2X2 MIMO is -20.93dBm, ERP of intermodulation products is $-20.93\text{dBm} + 15.5\text{dBi} - 2.15\text{dB} = -7.58\text{dBm}$.

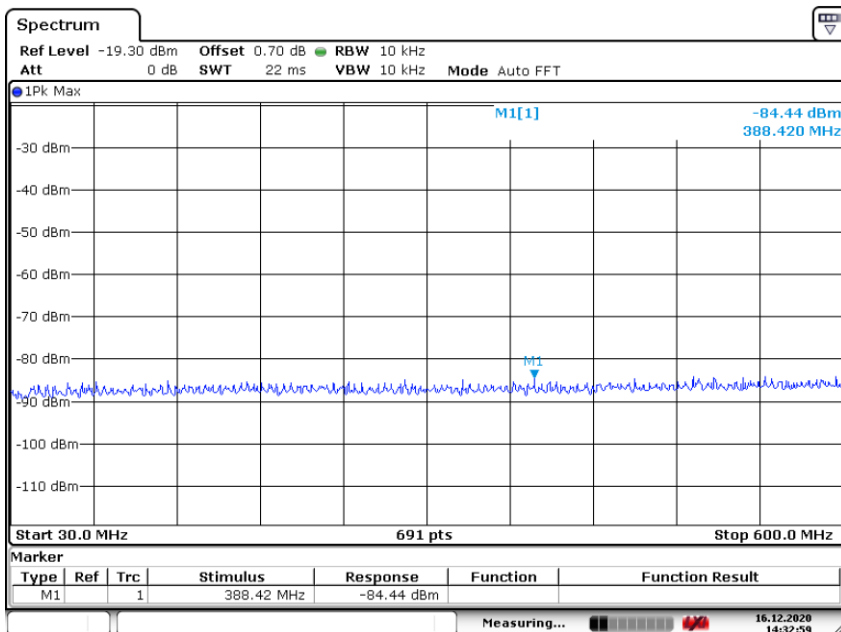
Applicant must use good engineering practice make sure the ERP of intermodulation products should not exceed the level -30 dBm in 10 kHz measurement bandwidth.



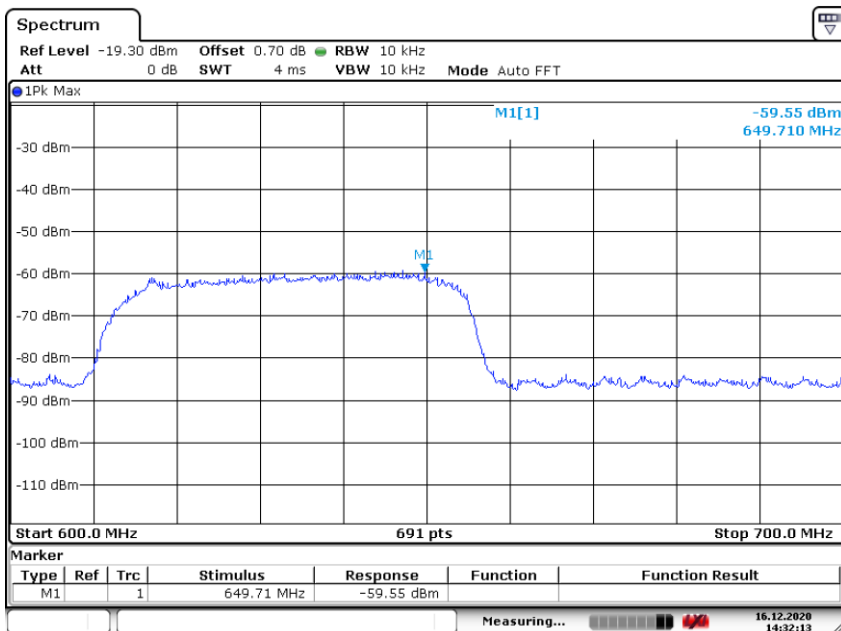
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DL_Noise outside of the passband



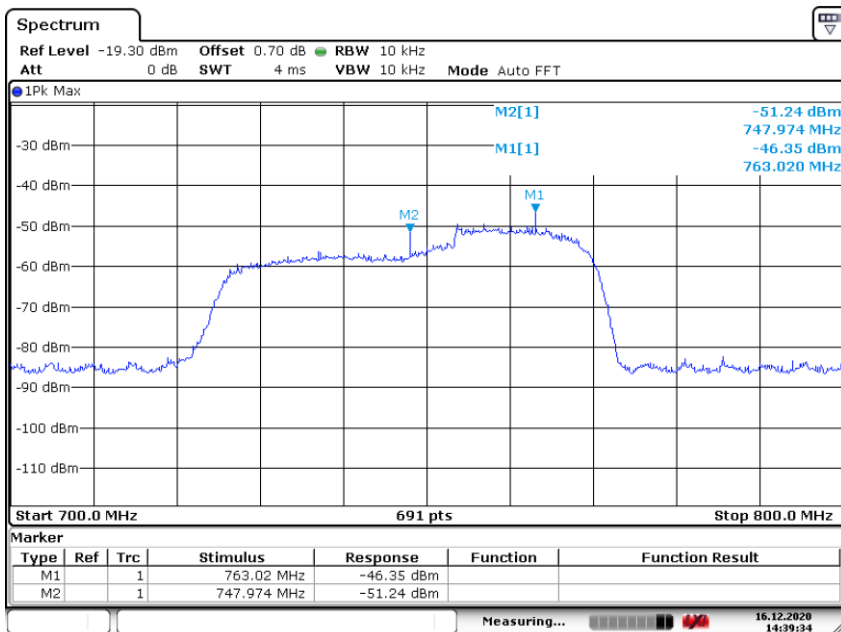
DL_Noise outside of the passband



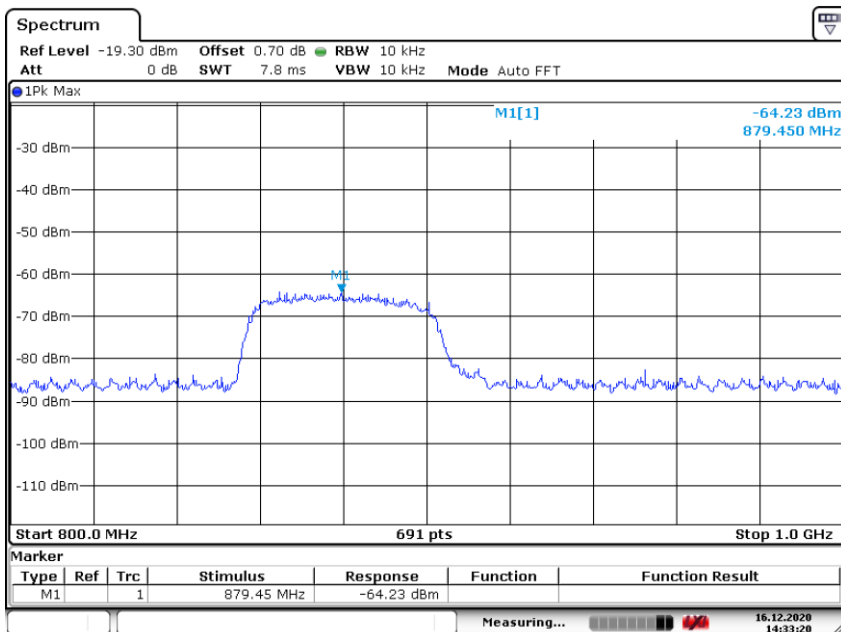
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DL_Noise within the passband



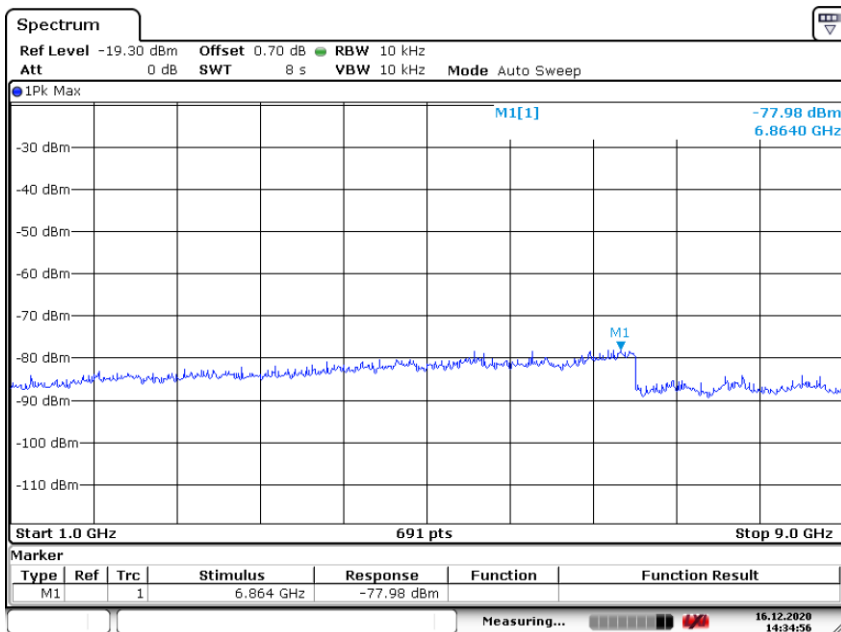
DL_Noise outside of the passband



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DL_Noise outside of the passband



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4.9 Radiated spurious emissions

Note: 1. 47 CFR Part 90.219(e)(3)

Spurious emissions from a signal booster must not exceed -13 dBm within any 100 kHz measurement bandwidth.

The tested max conducted power for single antenna port is 20.15dBm. the 2x2 MIMO total power is 20.15dBm+20.15dBm= 0.2070W.

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,

$P=0.2070W$

So the limit =

$P(\text{dBm}) - [43 + 10 \log (0.2070W)] = -13\text{dBm}$

2. 47 CFR Part 90.543(f)

For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to -70 dBW/MHz (i.e. -40dBm) equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW (i.e. -50dBm) EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

3. 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.

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



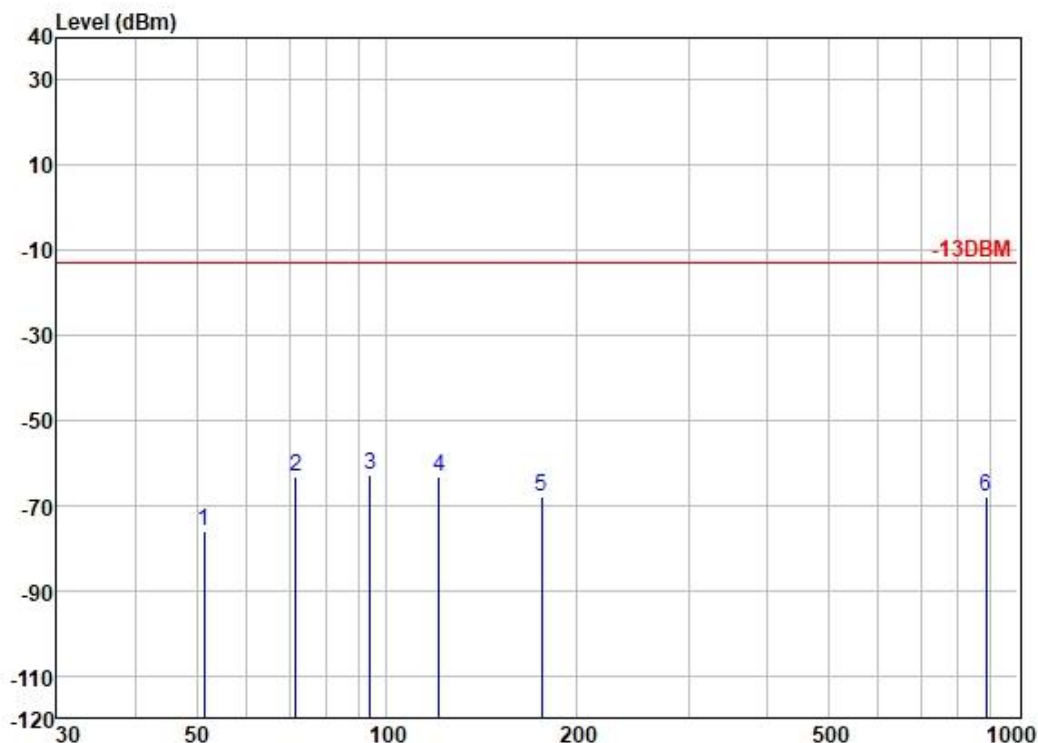
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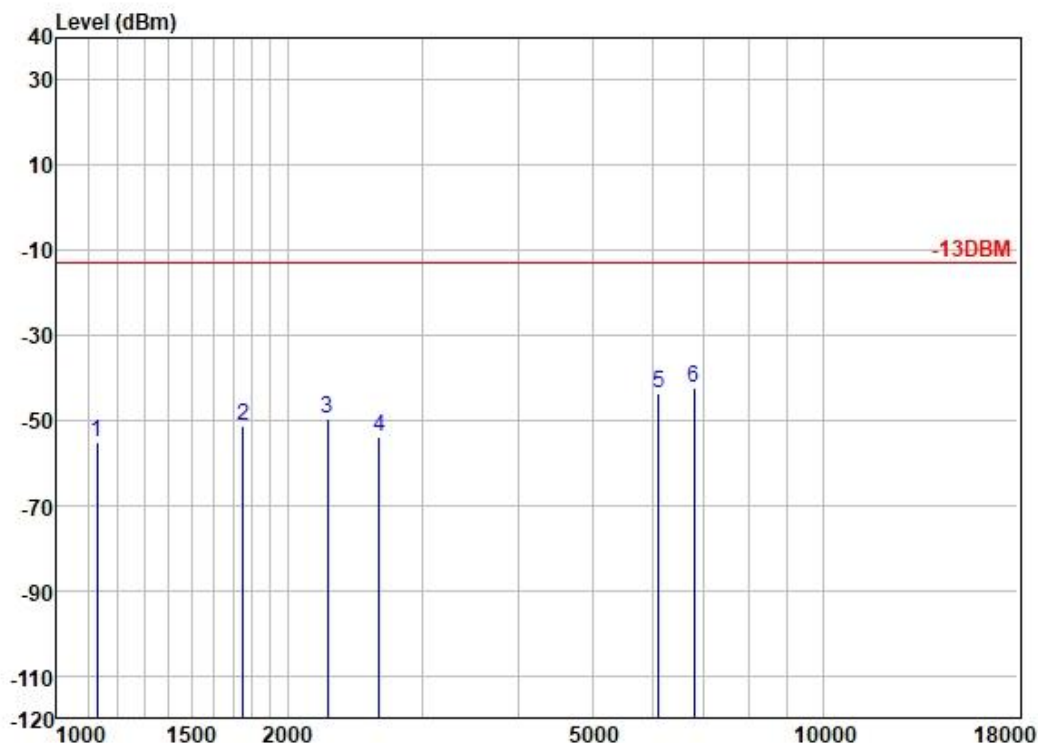
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DL_1S_M_AWGN_Horizontal_30MHz~1GHz



Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
51.301	-76.25	-13	-63.25	Horizontal	PASS
71.832	-63.29	-13	-50.29	Horizontal	PASS
94.098	-62.79	-13	-49.79	Horizontal	PASS
121.123	-63.09	-13	-50.09	Horizontal	PASS
175.652	-67.96	-13	-54.96	Horizontal	PASS
890.728	-67.84	-13	-54.84	Horizontal	PASS

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
2259.955	-49.40	-13	-36.4	Horizontal	PASS
2633.397	-53.81	-13	-40.81	Horizontal	PASS
6106.616	-43.76	-13	-30.76	Horizontal	PASS
6795.879	-42.36	-13	-29.36	Horizontal	PASS

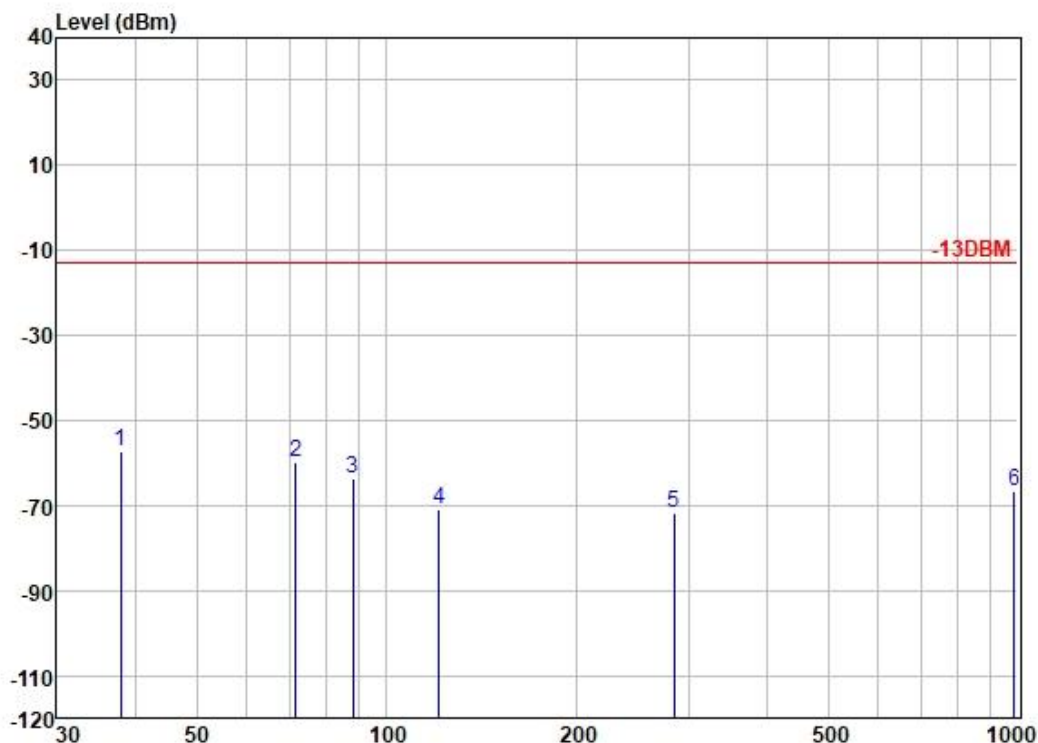


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DL_1S_M_AWGN_Vertical_30MHz~1GHz



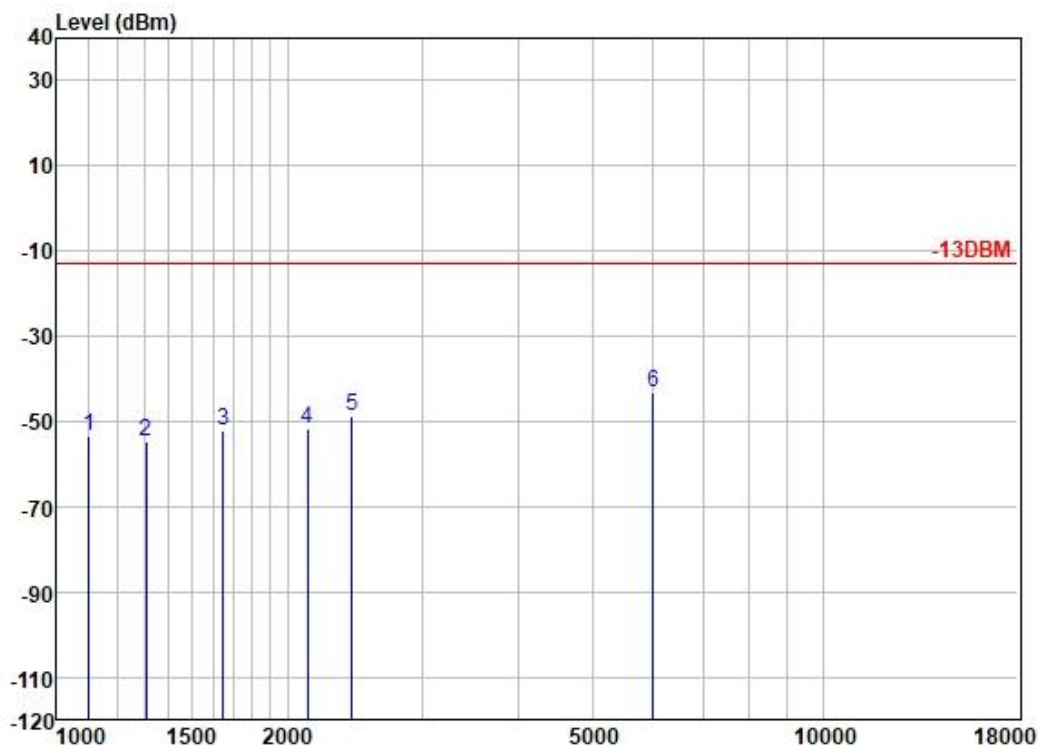
Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
37.812	-57.27	-13	-44.27	Vertical	PASS
71.832	-59.80	-13	-46.8	Vertical	PASS
88.342	-63.63	-13	-50.63	Vertical	PASS
121.123	-70.83	-13	-57.83	Vertical	PASS
284.977	-71.99	-13	-58.99	Vertical	PASS
986.072	-66.46	-13	-53.46	Vertical	PASS



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DL_1S_M_AWGN_Vertical_above 1GHz



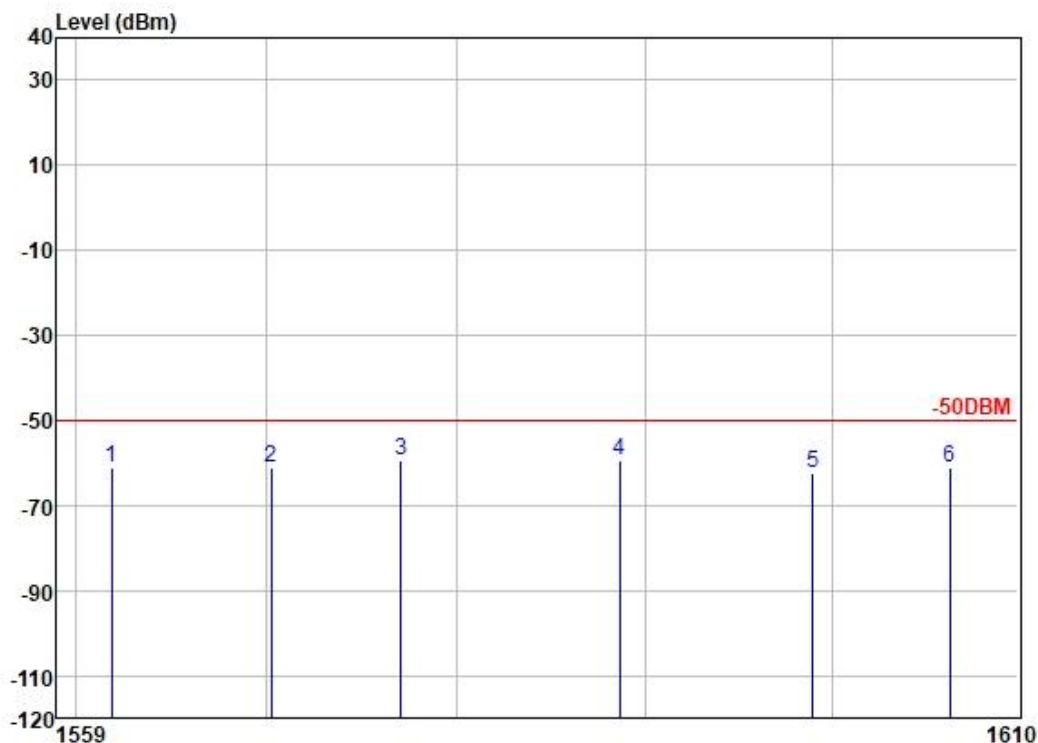
Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
1100.079	-53.61	-13	-40.61	Vertical	PASS
1308.399	-54.66	-13	-41.66	Vertical	PASS
1648.778	-52.16	-13	-39.16	Vertical	PASS
2126.308	-51.73	-13	-38.73	Vertical	PASS
2428.671	-48.93	-13	-35.93	Vertical	PASS
6001.626	-42.99	-13	-29.99	Vertical	PASS



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DL_1S_M_AWGN_Horizontal_above 1GHz



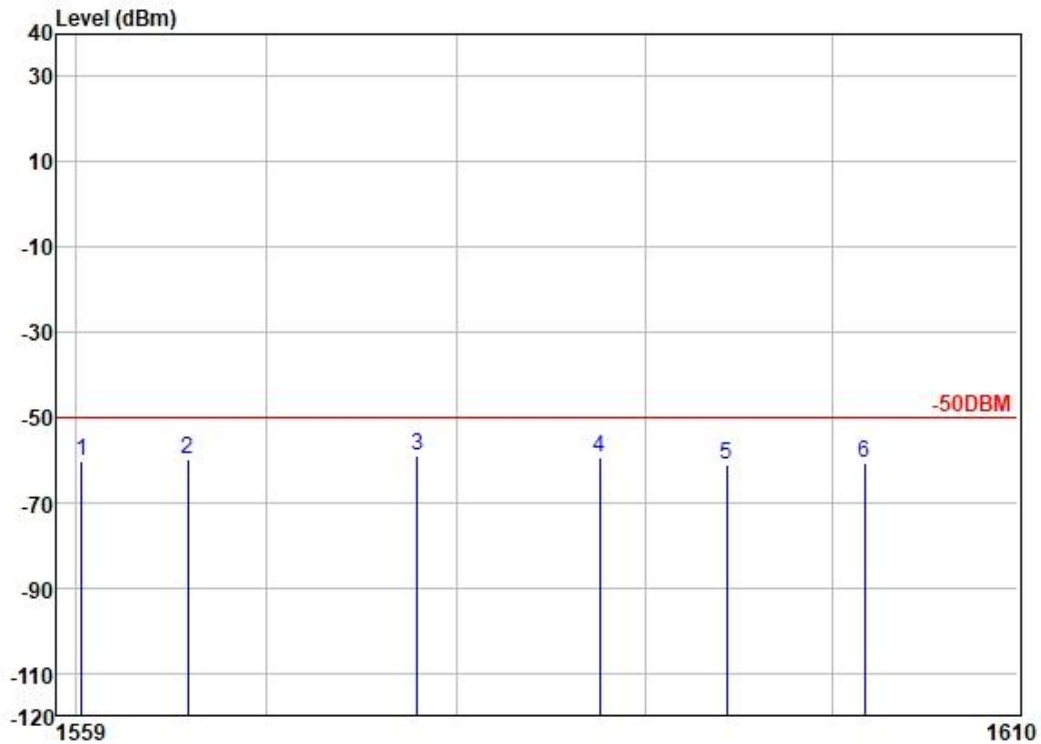
Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
1561.863	-61.15	-50	-11.15	Horizontal	PASS
1570.231	-61.25	-50	-11.25	Horizontal	PASS
1577.070	-59.57	-50	-9.57	Horizontal	PASS
1588.635	-59.46	-50	-9.46	Horizontal	PASS
1598.948	-62.30	-50	-12.3	Horizontal	PASS
1606.325	-61.28	-50	-11.28	Horizontal	PASS



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DL_1S_M_AWGN_Vertical_above 1GHz



Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
1560.305	-60.16	-50	-10.16	Vertical	PASS
1565.840	-59.97	-50	-9.97	Vertical	PASS
1577.933	-58.81	-50	-8.81	Vertical	PASS
1587.613	-59.42	-50	-9.42	Vertical	PASS
1594.373	-61.26	-50	-11.26	Vertical	PASS
1601.729	-60.89	-50	-10.89	Vertical	PASS

5 ESMR (817-824MHz paired with 862-869MHz)

5.1 AGC threshold level

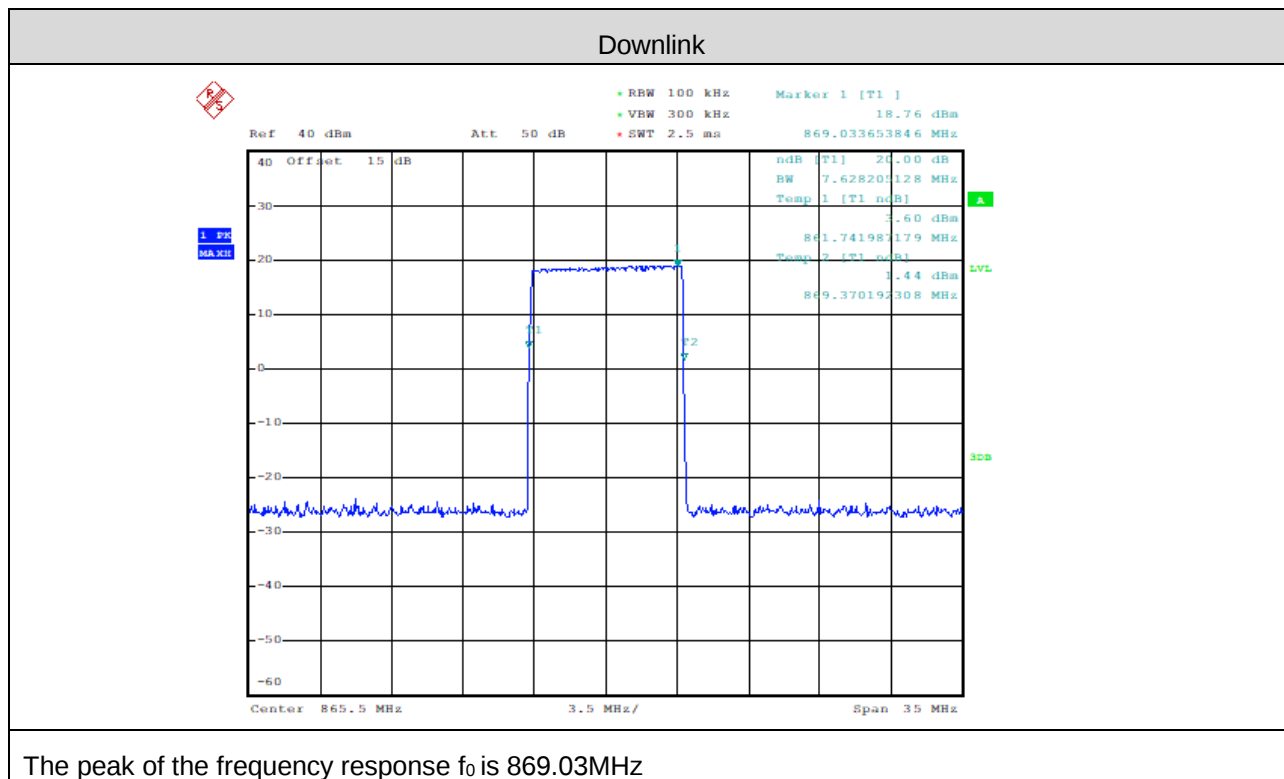
Test Conf.	AGC Threshold level
DL_1S_M_AWGN_AWGN	-0.25dBm
DL_1S_M_AWGN_GSM	-0.18dBm



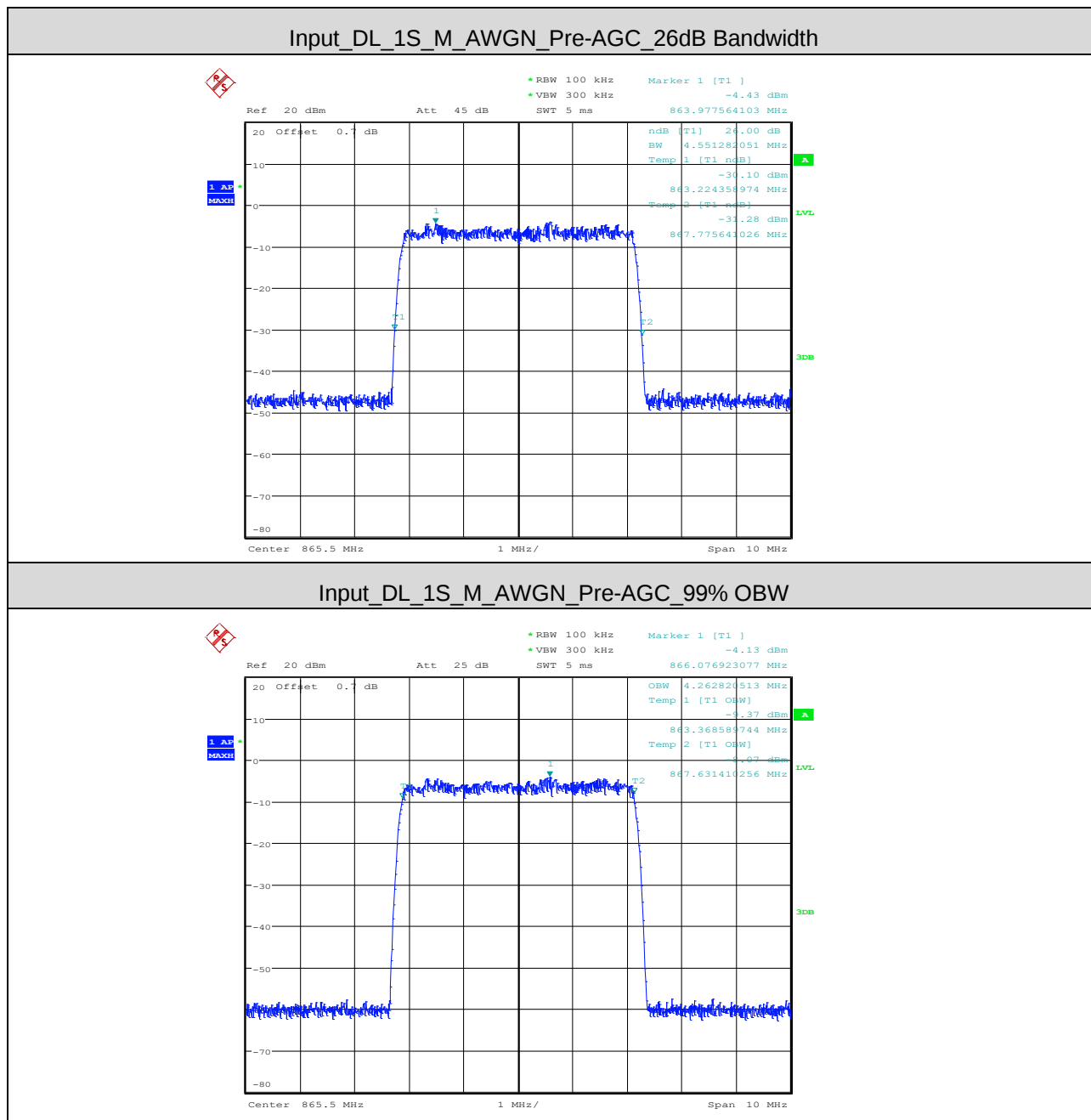
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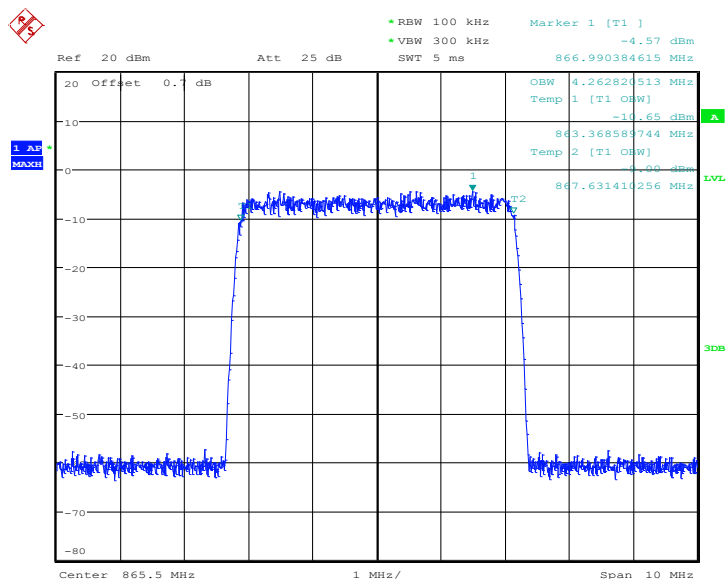
5.2 Out-of-band rejection



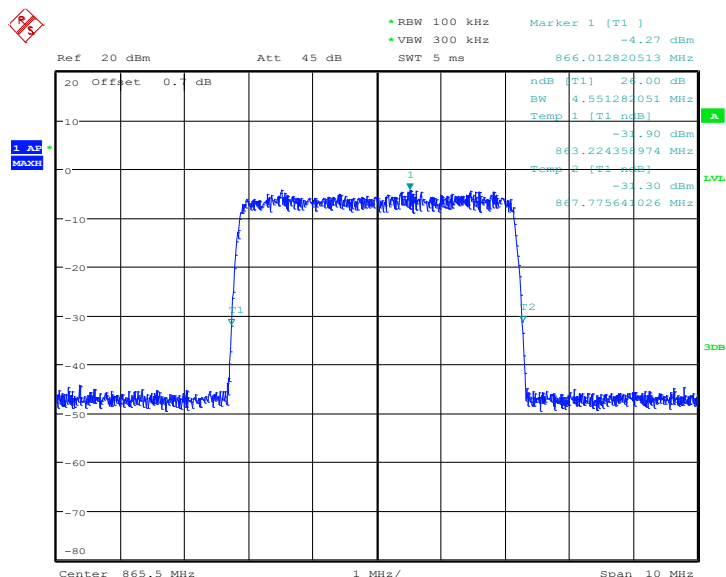
5.3 Input-versus-output signal comparison



Input_DL_1S_M_AWGN_AGC+3dB_26dB Bandwidth



Input_DL_1S_M_AWGN_AGC+3dB_99% OBW

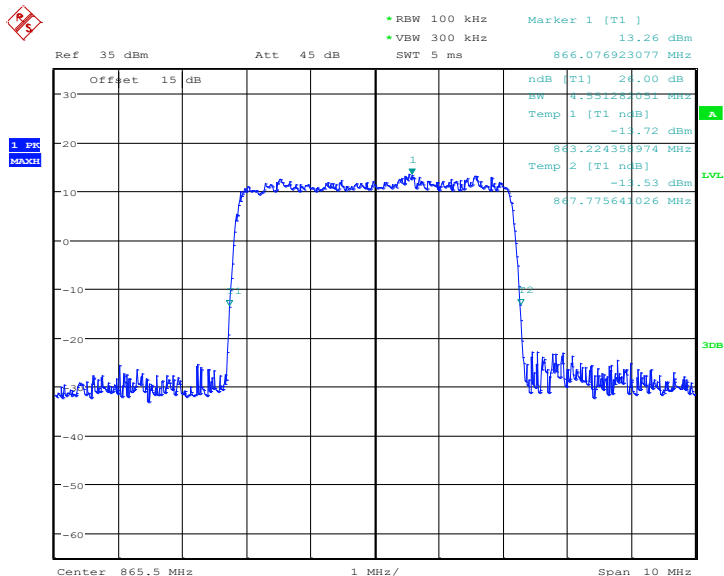


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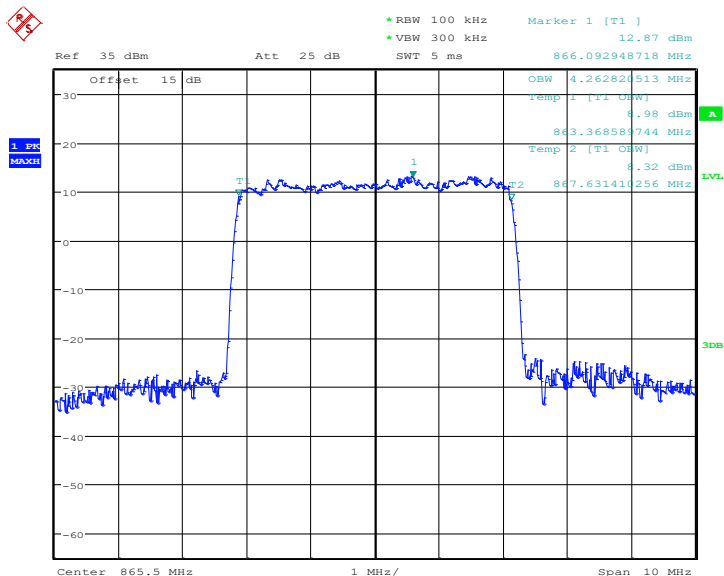
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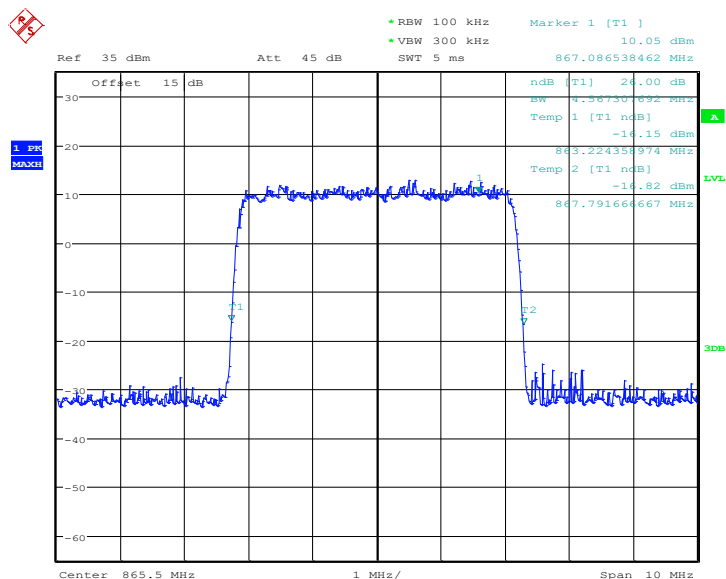
Output_DL_1S_M_AWGN_Pre-AGC_26dB Bandwidth



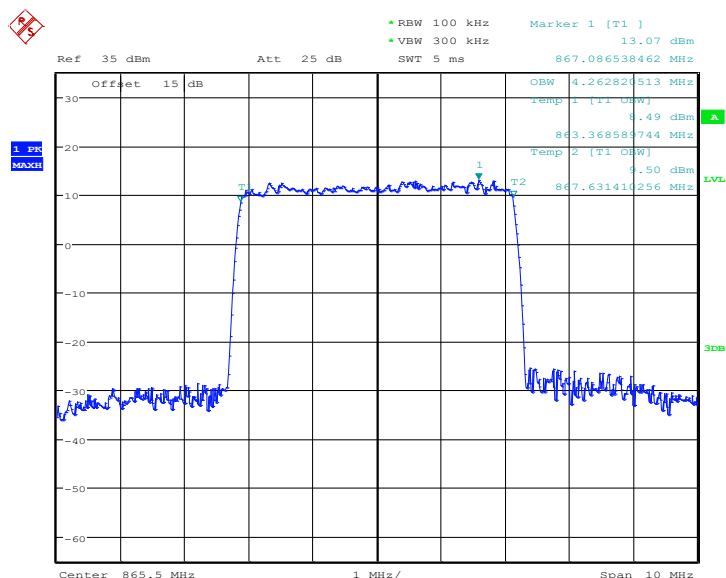
Output_DL_1S_M_AWGN_Pre-AGC_99% OBW



Output	DL	1S	M	AWGN	AGC+3dB	26dB	Bandwidth
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Output DL 1S M AWGN AGC+3dB 99% OBW



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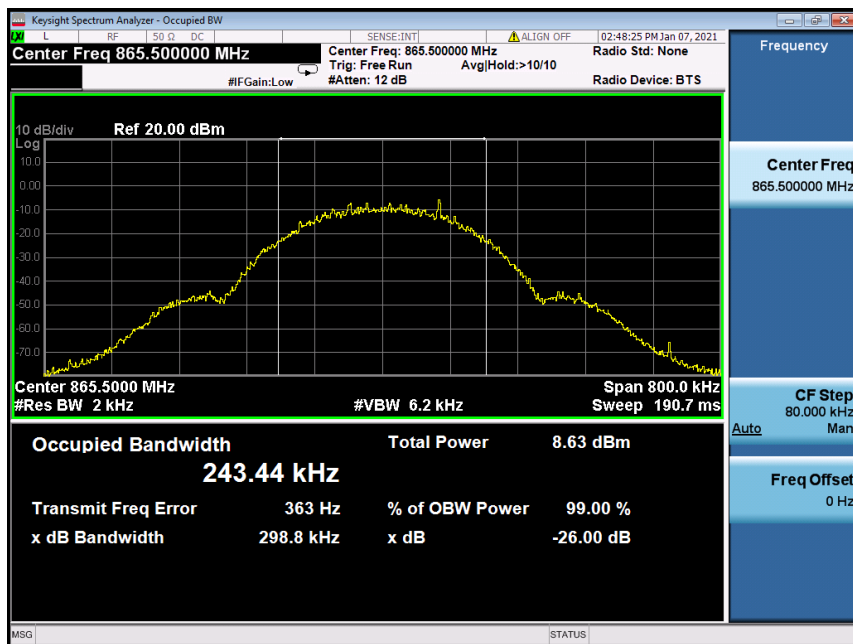
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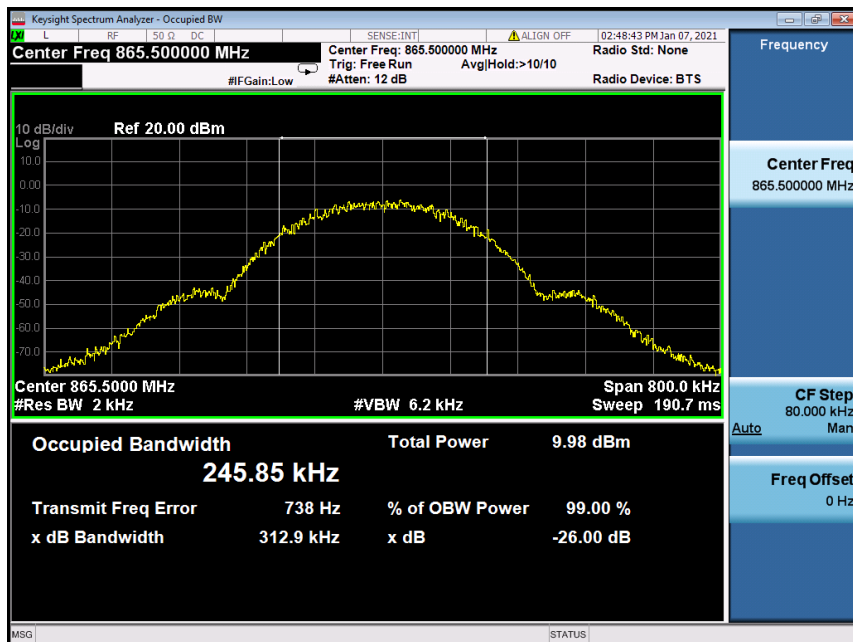
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Input_DL_1S_M_GSM_Pre-AGC_26dB Bandwidth & 99% OBW



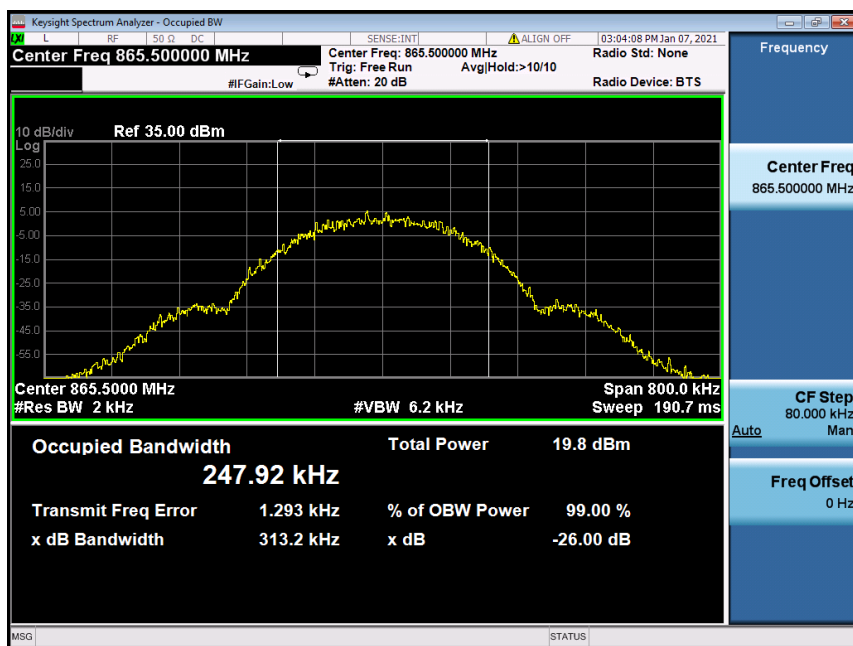
Input_DL_1S_M_GSM_AGC+3dB_26dB Bandwidth & 99% OBW



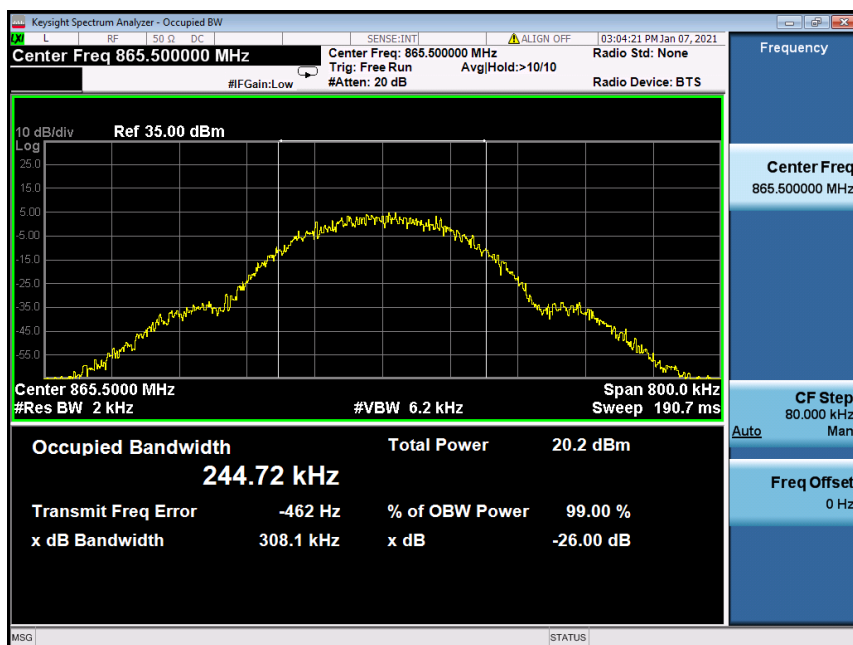
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Output_DL_1S_M_GSM_Pre-AGC_26dB Bandwidth & 99% OBW



Output_DL_1S_M_GSM_AGC+3dB_26dB Bandwidth & 99% OBW



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Guangzhou Branch**

Application No.: GZEM2011016736CR

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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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5.4 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	869.03	Pre-AGC	0.05	20.35	20.20	PASS
		AGC+3dB	3.05	20.21	/	PASS
DL_1S_GSM	869.03	Pre-AGC	0.05	20.31	20.16	PASS
		AGC+3dB	3.05	20.26	/	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 $(20.35\text{dBm} + 20.35\text{dBm}) + 15.5\text{dBi} - 2.15\text{dB} = 36.71\text{dBm}$ (4.688W) which don't exceed the required ERP limit (1000W/MHz).



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

Note: 1. 90.691 a (1) Limit:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $116 \log_{10}(f/6.1)$ decibels or $50 + 10 \log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

The tested max conducted power for single antenna port is 20.35dBm, the power of any emission must be reduced below the mean output power (P) by at least $50 + 10 \log(P)$ dB
 Here, $P=20.35\text{dBm}=0.1084\text{W}$.

So the limit = $P(\text{dBm}) - [50 + 10 \log(0.1084\text{W})] = -20\text{dBm}$

The EUT supports 2x2 MIMO and the emissions were measured at one of output port, so the limit line was set to -23.01dBm in following test plots in order to determine the test result conveniently.

2. 90.691 a (2) Limit:

(1) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

The tested max conducted power for single antenna port is 20.35dBm, the power of any emission must be reduced below the mean output power (P) by at least $43 + 10 \log(P)$ dB
 Here, $P=20.35\text{dBm}=0.1084\text{W}$. So the limit = $P(\text{dBm}) - [43 + 10 \log(0.1084\text{W})] = -13\text{dBm}$

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.

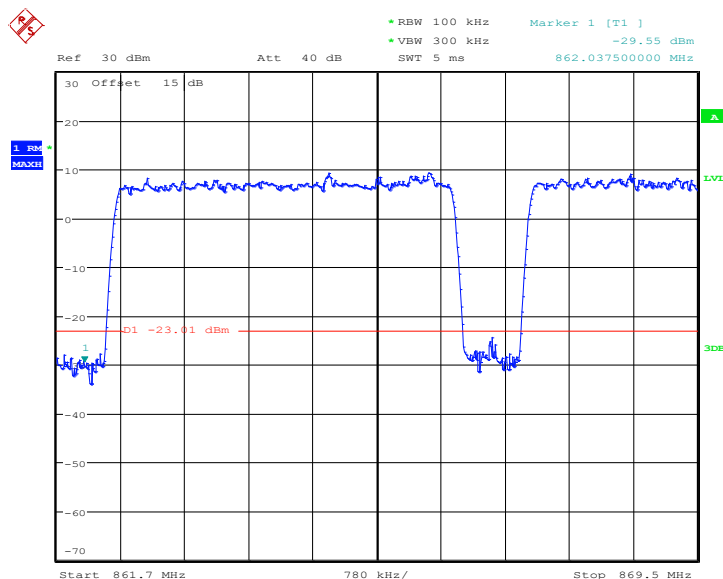
3. Out-of-band/out-of-block (including intermodulation) emissions and spurious emissions have been tested using an AWGN test signal and a GSM-TDMA test signal, only the worst-case was recorded in this report.



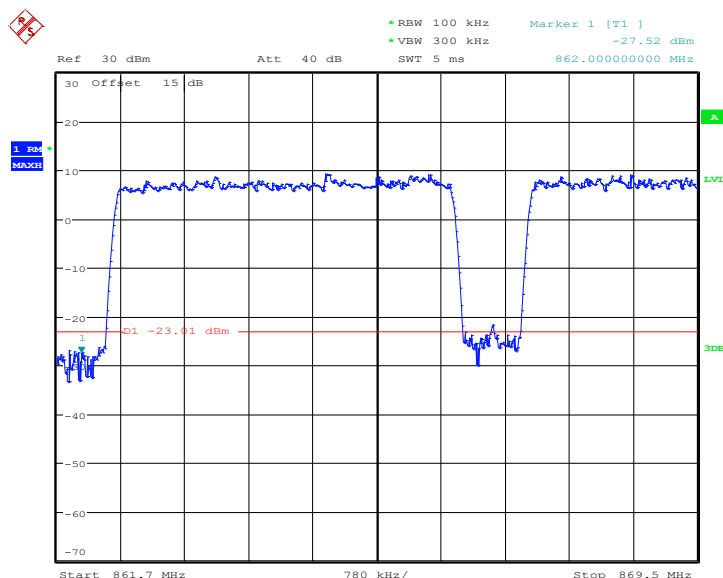
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DL 2S B AWGN Pre-AGC Out-of-band emission



DL 2S B AWGN AGC+3 Out-of-band emission



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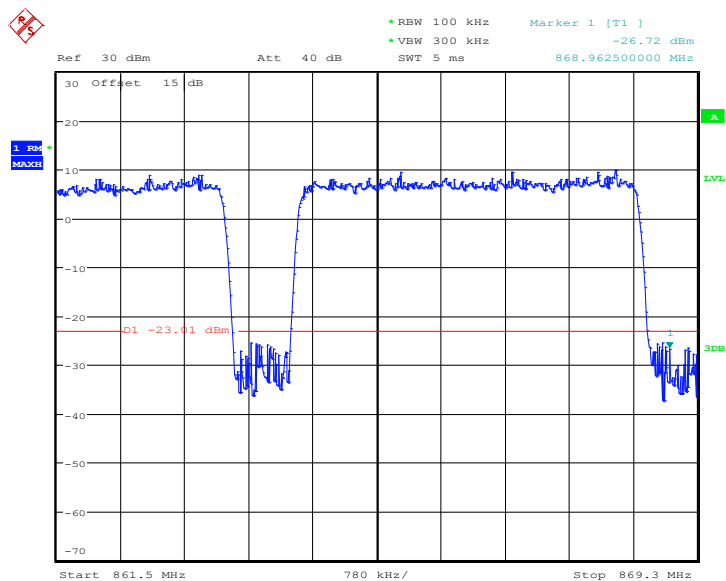
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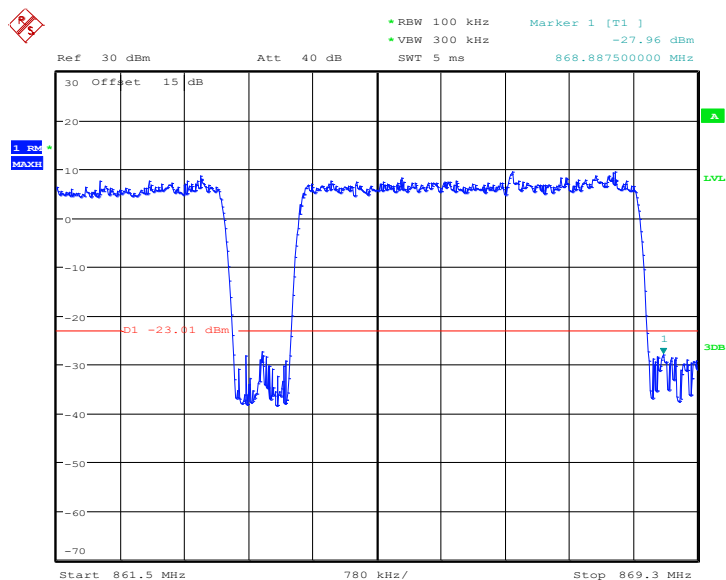
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DL 2S T AWGN Pre-AGC Out-of-band emission



DL_2S_T_AWGN_AGC+3_Out-of-band emission



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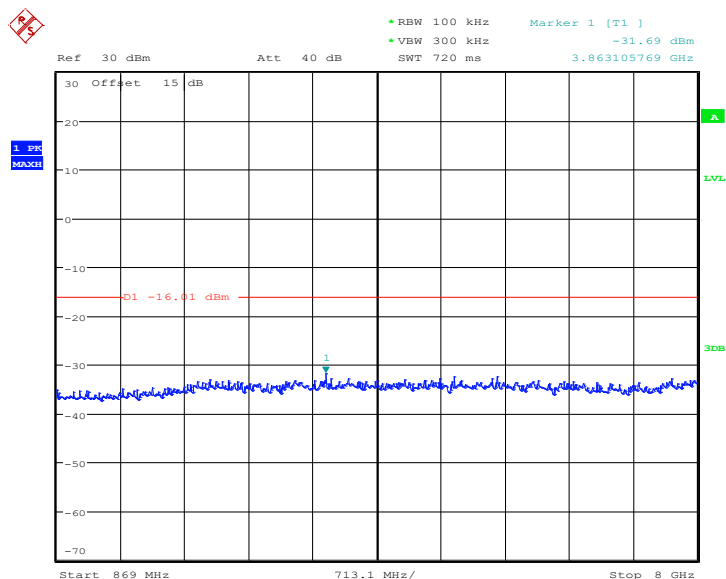
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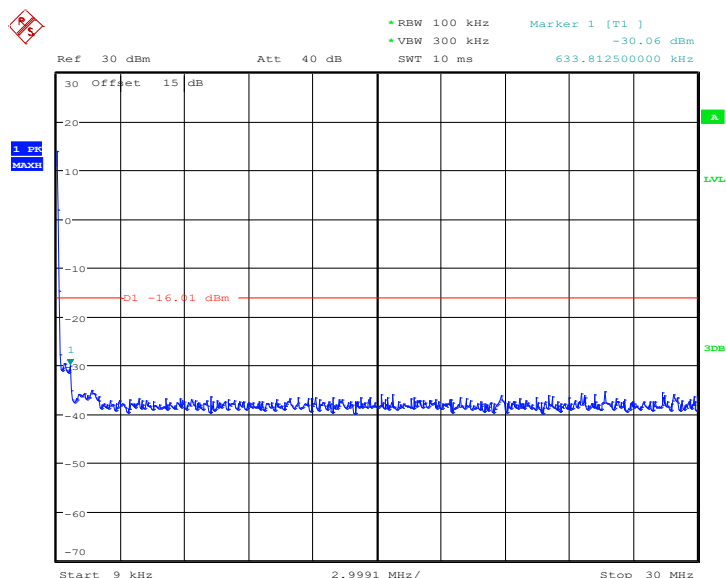
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DL_1S_B_AWGN_Pre-AGC_Spurious emission 3



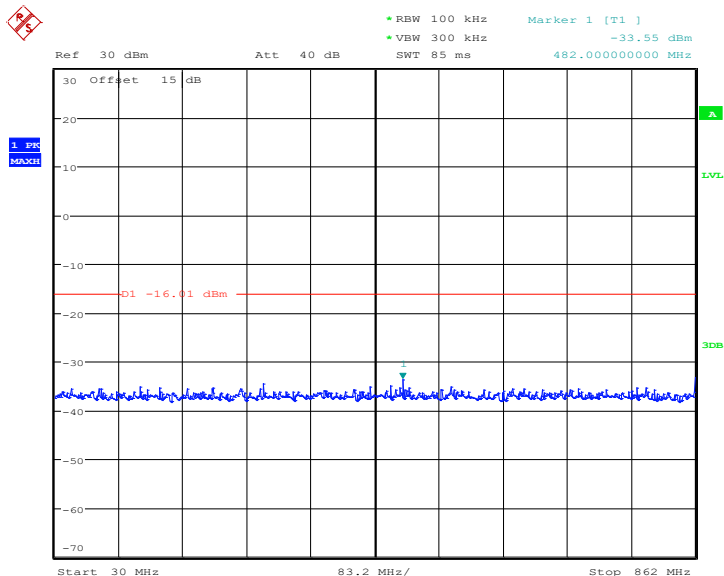
DL_1S_M_AWGN_Pre-AGC_Spurious emission 1



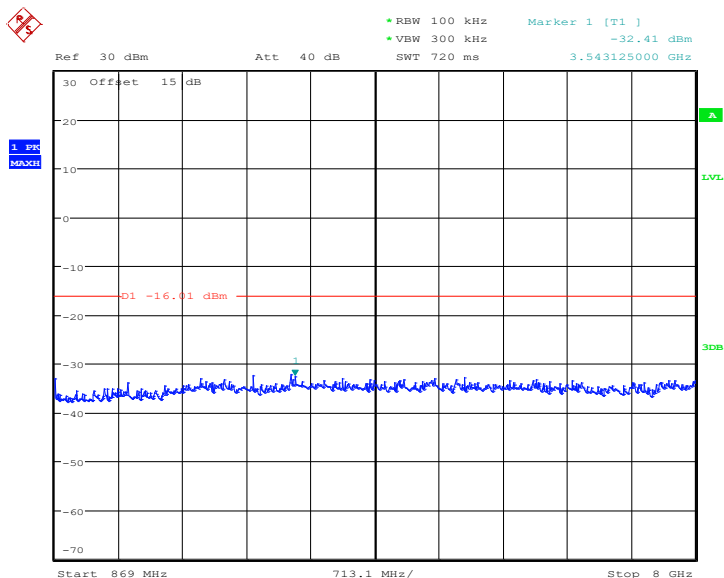
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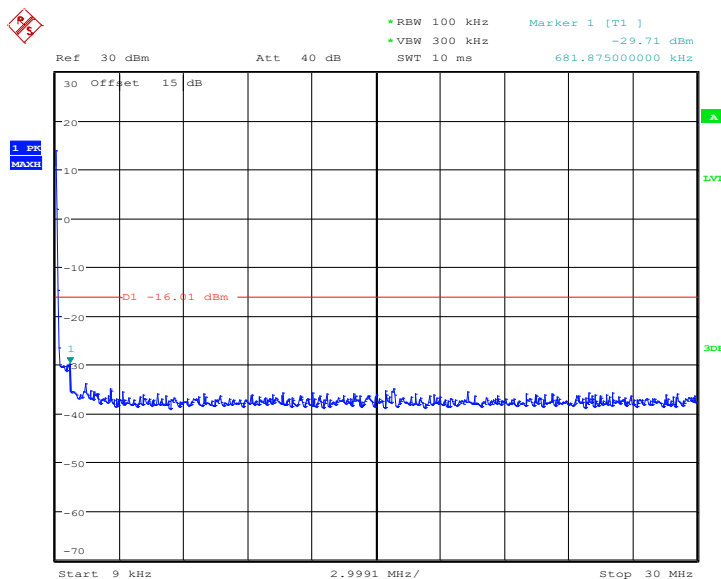
DL_1S_M_AWGN_Pre-AGC_Spurious emission 2



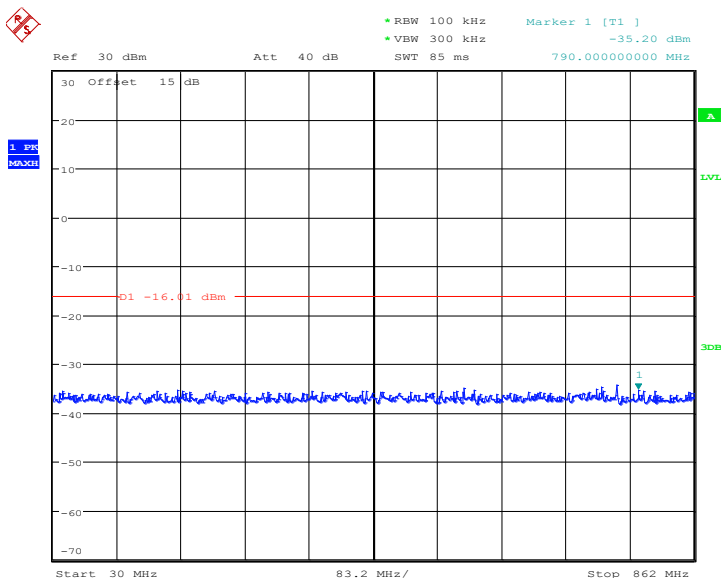
DL_1S_M_AWGN_Pre-AGC_Spurious emission 3



DL_1S_T_AWGN_Pre-AGC_Spurious emission 1



DL_1S_T_AWGN_Pre-AGC_Spurious emission 2



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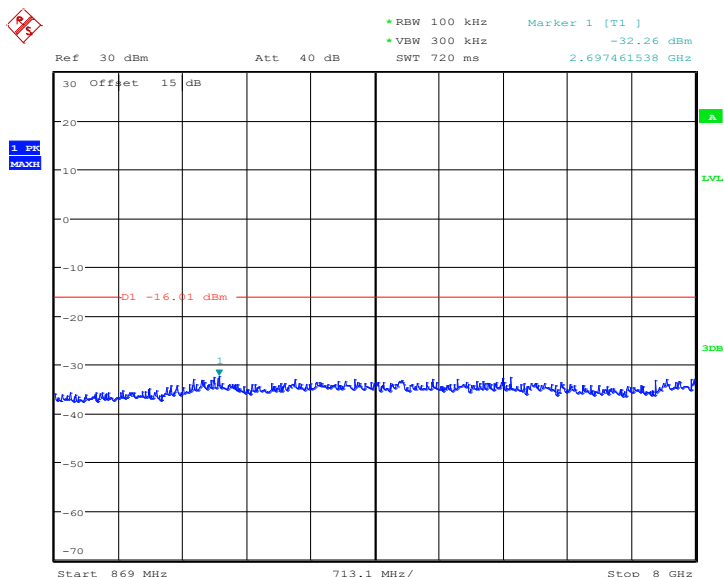
SGS-CSTC Standards Technical Services Co., Ltd. Guangzhou Branch

Application No.: GZEM2011016736CR

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FCC ID: OJFDLRU678

DL_1S_T_AWGN_Pre-AGC_Spurious emission 3



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Guangzhou Branch Testing Center EEC Laboratory

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5.6 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 and less than 1.5ppm. Meet the requirement.
 4. Frequency stability has been tested using an AWGN test signal and a GSM-TDMA test signal, only the worst-case was recorded in this report.



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Frequency stability vs temperature				
Temperature (°C)	Test Conf.	Test data (MHz)	Tolerance (ppm)	Verdict
50	DL_1S_M_AWGN	865.500428	-0.16	PASS
40		865.500327	-0.27	PASS
30		865.500422	-0.16	PASS
20		865.500563	Reference	PASS
10		865.500423	-0.16	PASS
0		865.500599	0.42	PASS
-10		865.500626	0.73	PASS
-20		865.500601	0.44	PASS
-30		865.500581	0.21	PASS

Frequency stability vs voltage				
Voltage (V)	Test Conf.	Test data (MHz)	Tolerance (ppm)	Verdict
DC 40.8	DL_1S_M_AWGN	865.500471	0.55	PASS
DC 48		865.500423	Reference	PASS
DC 55.2		865.500328	-0.11	PASS



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5.7 Radiated spurious emissions

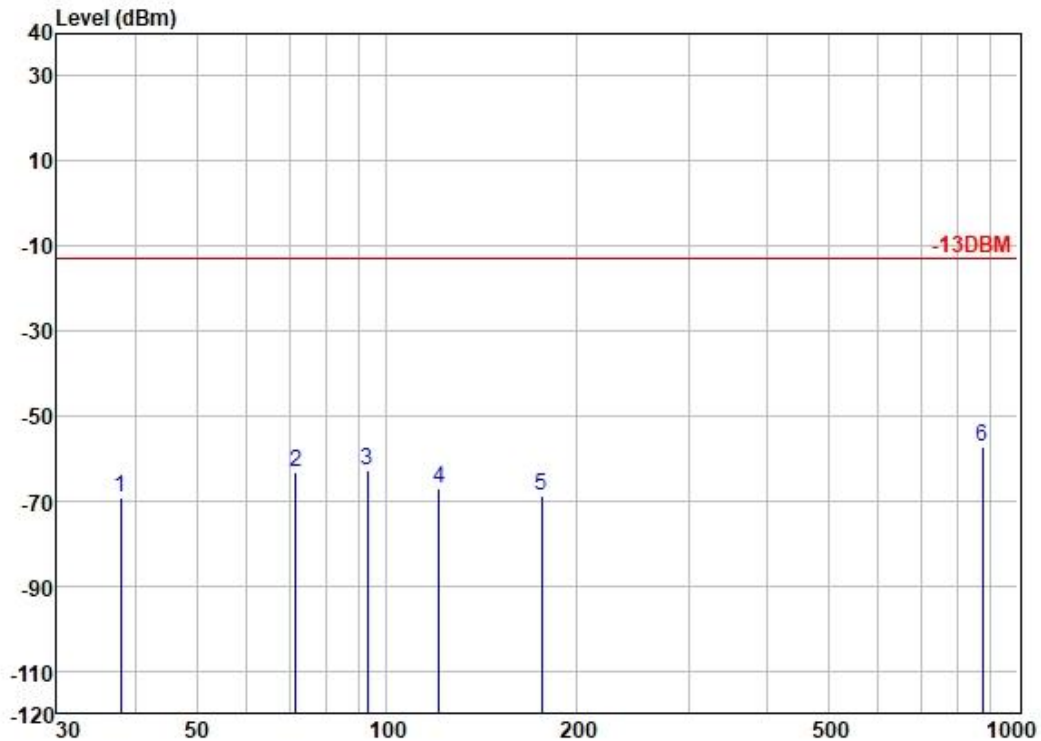
- Note:
1. The tested max conducted power for single antenna port is 20.35dBm, the power of any emission must be reduced below the mean output power (P) by at least $43 + 10\log(P)$ dB
Here, $P = 20.35\text{dBm} + 20.35\text{dBm} = 0.2168\text{W}$.
the limit = $P(\text{dBm}) - [43 + 10 \log(0.2168\text{W})] = -13\text{dBm}$
 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



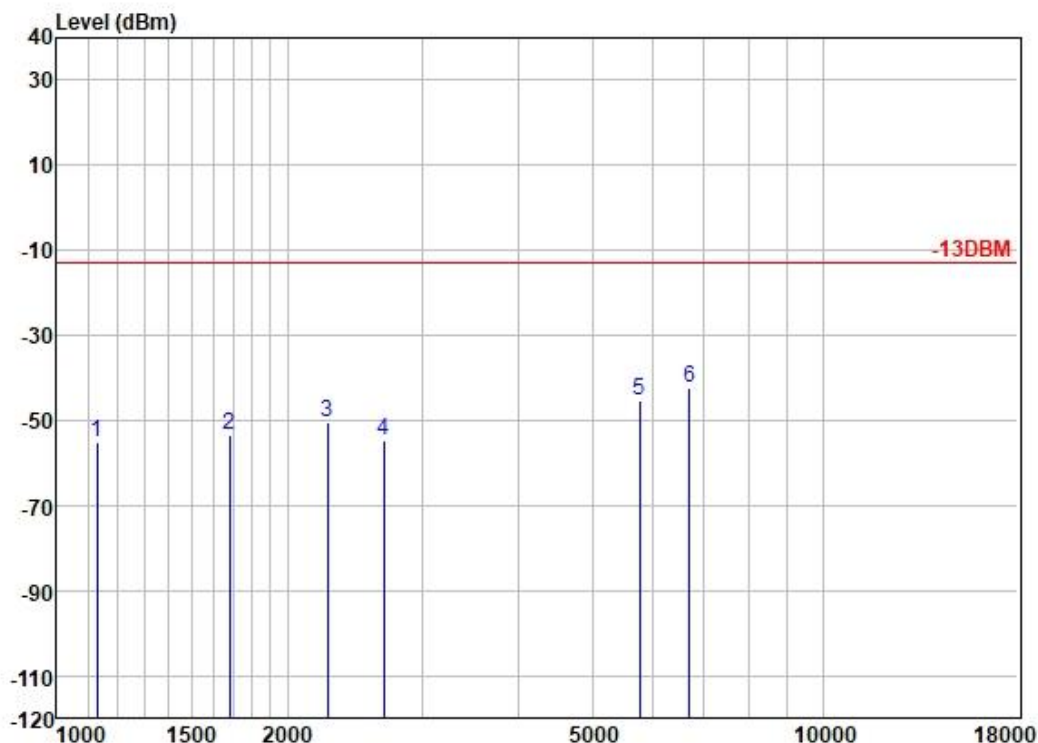
Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
37.812	-69.12	-20	-49.12	Horizontal	PASS
71.832	-63.17	-20	-43.17	Horizontal	PASS
93.113	-62.72	-20	-42.72	Horizontal	PASS
121.123	-67.00	-20	-47	Horizontal	PASS
175.652	-68.62	-20	-48.62	Horizontal	PASS
878.322	-57.25	-20	-37.25	Horizontal	PASS



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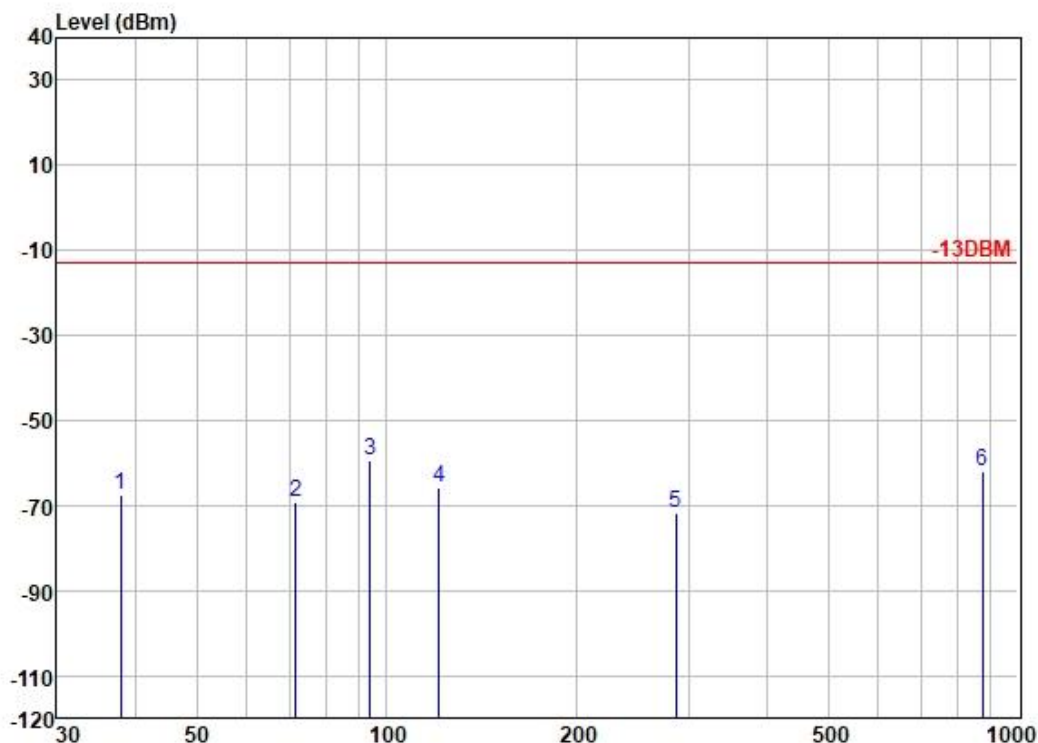
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DL_1S_M_AWGN_Horizontal_above 1GHz



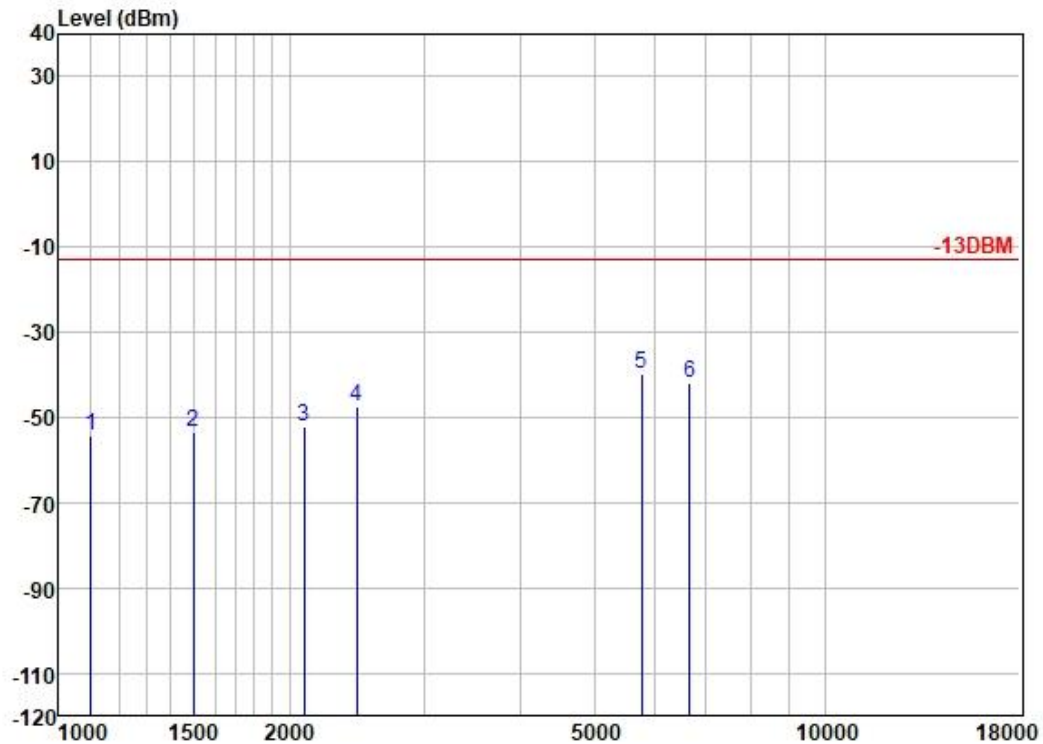
Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
1271.123	-53.97	-20	-33.97	Horizontal	PASS
1684.778	-52.69	-20	-32.69	Horizontal	PASS
2024.354	-51.01	-20	-31.01	Horizontal	PASS
2259.367	-50.11	-20	-30.11	Horizontal	PASS
6071.417	-43.46	-20	-23.46	Horizontal	PASS
6756.708	-42.70	-20	-22.7	Horizontal	PASS

DL_1S_M_AWGN_Vertical_30MHz~1GHz



Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
37.812	-67.36	-20	-47.36	Vertical	PASS
71.832	-69.21	-20	-49.21	Vertical	PASS
94.098	-59.30	-20	-39.3	Vertical	PASS
121.123	-65.84	-20	-45.84	Vertical	PASS
286.982	-71.91	-20	-51.91	Vertical	PASS
878.322	-62.15	-20	-42.15	Vertical	PASS

DL_1S_M_AWGN_Vertical_above 1GHz



Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
1100.079	-54.31	-20	-34.31	Vertical	PASS
1498.781	-53.55	-20	-33.55	Vertical	PASS
2089.751	-52.05	-20	-32.05	Vertical	PASS
2449.822	-47.66	-20	-27.66	Vertical	PASS
5763.617	-39.62	-20	-19.62	Vertical	PASS
6659.763	-41.80	-20	-21.8	Vertical	PASS



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6 Cellular (824-849MHz paired with 869-894MHz)

6.1 AGC threshold level

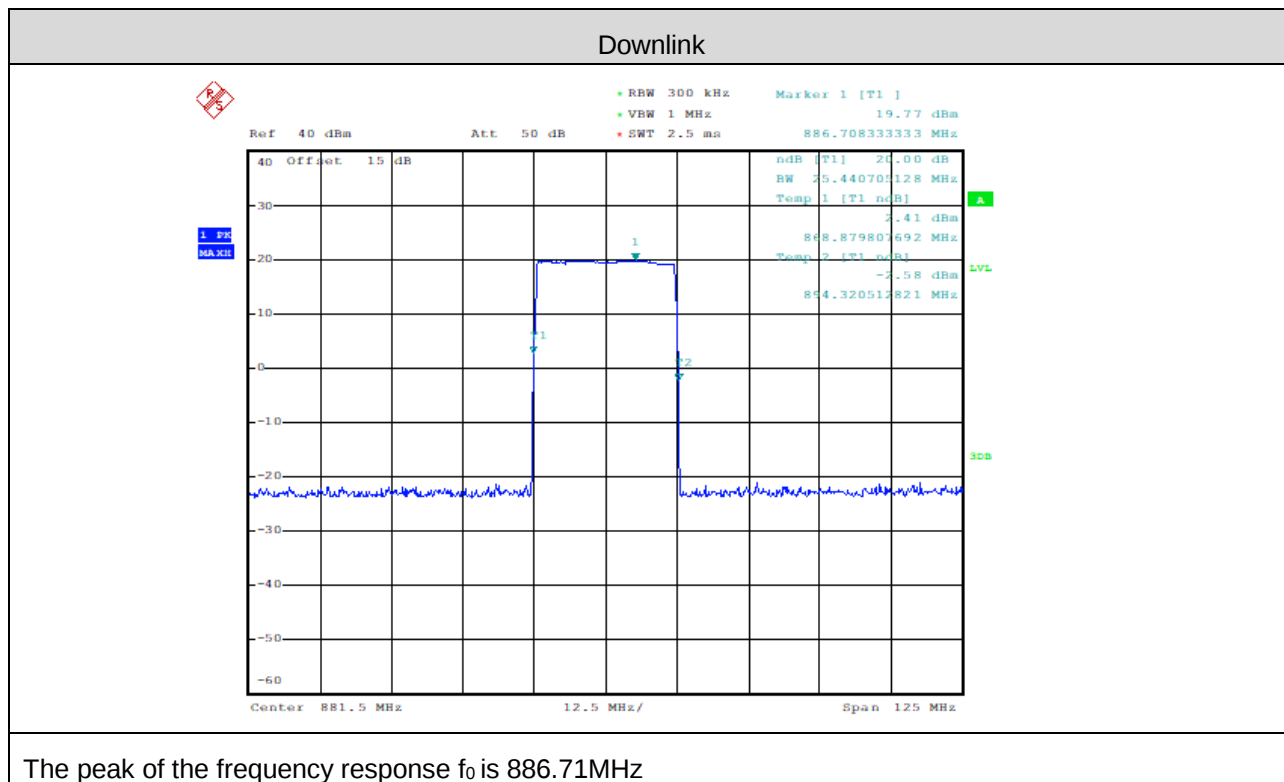
Test Conf.	AGC Threshold level
DL_1S_M_AWGN_AWGN	0.32dBm
DL_1S_M_AWGN_GSM	0.25dBm



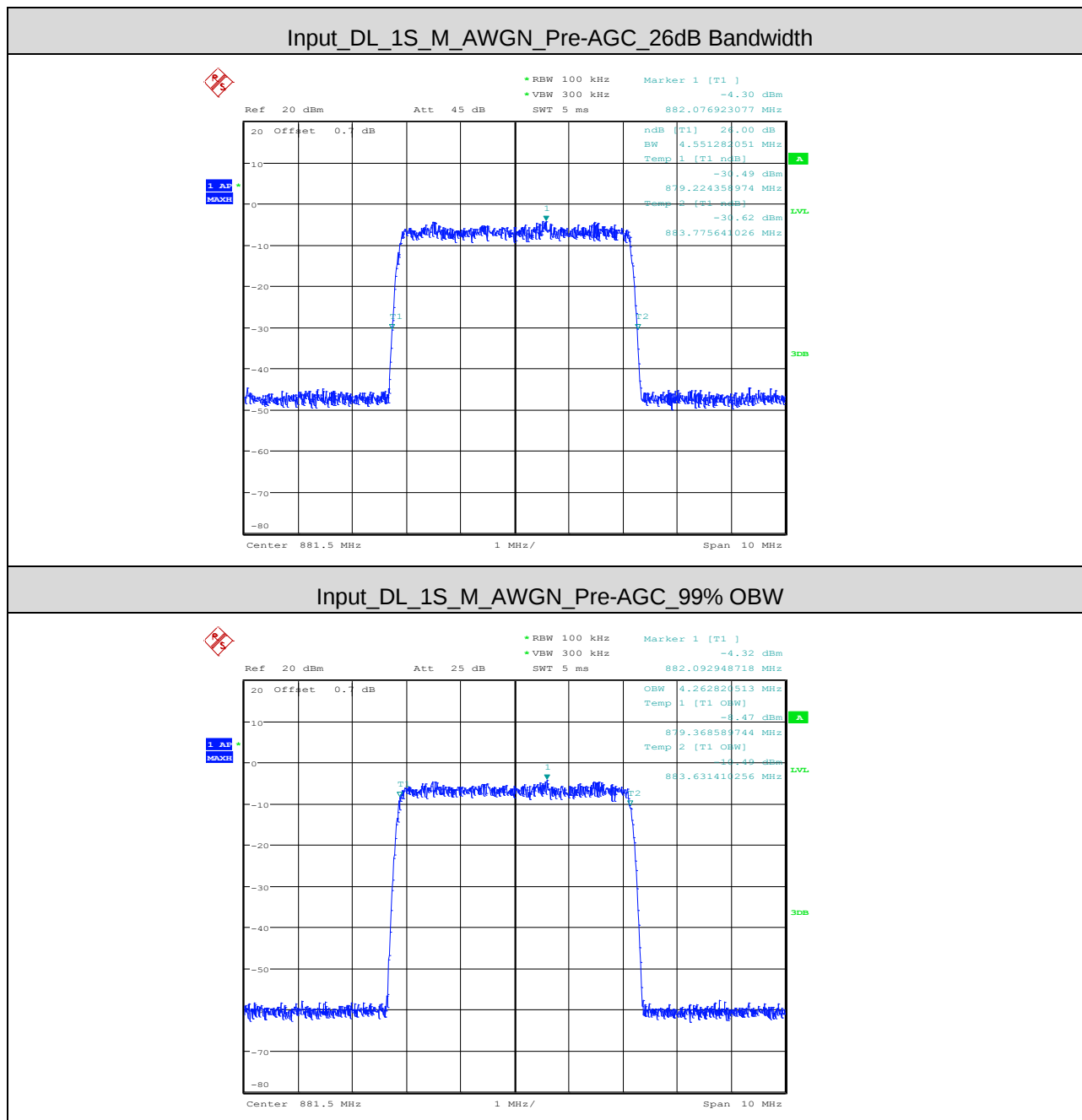
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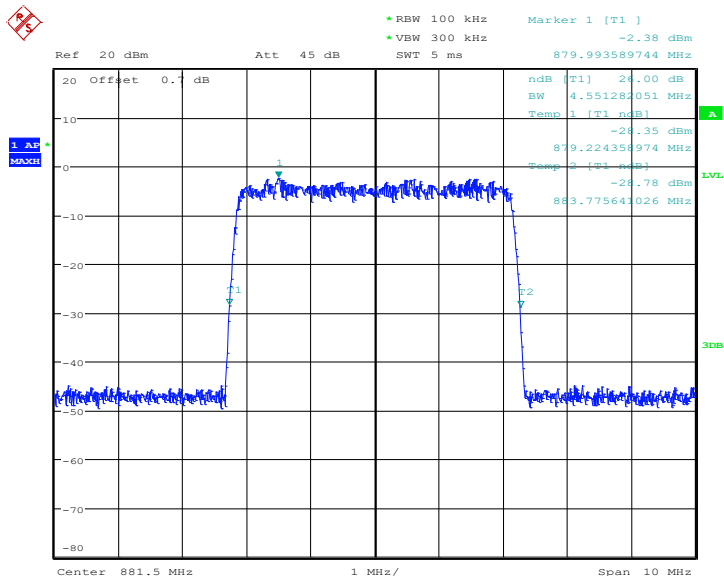
6.2 Out-of-band rejection



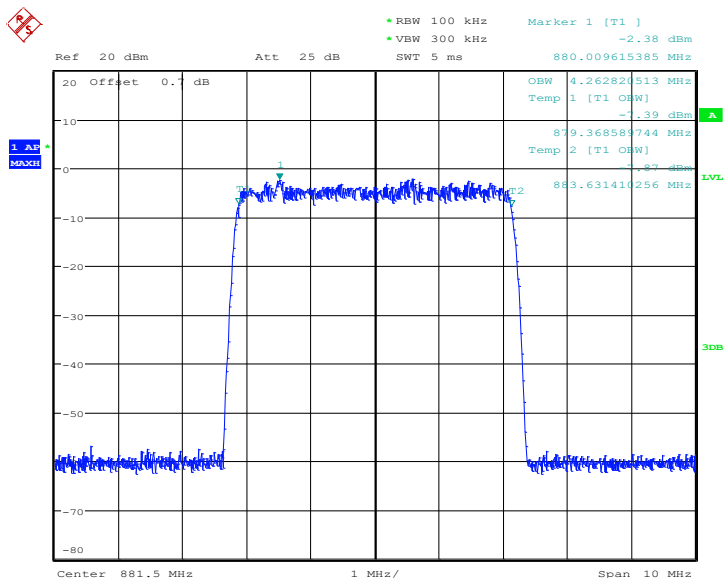
6.3 Input-versus-output signal comparison



Input_DL_1S_M_AWGN_AGC+3dB_26dB Bandwidth



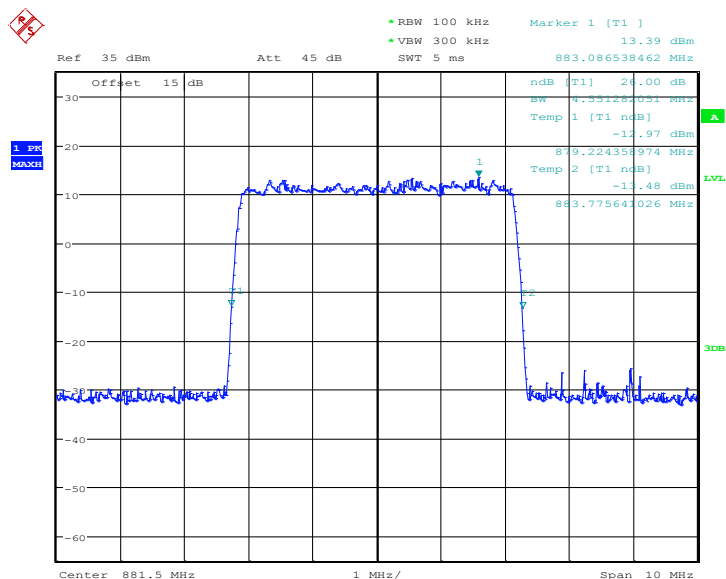
Input_DL_1S_M_AWGN_AGC+3dB_99% OBW



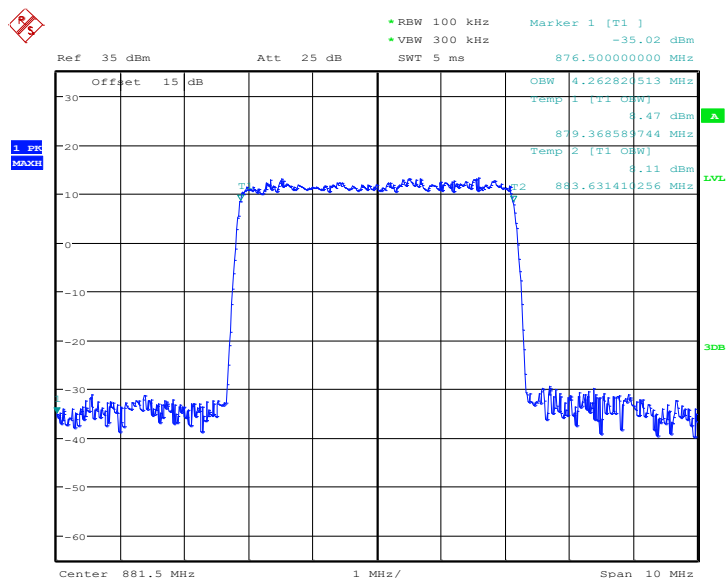
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Output DL 1S M AWGN Pre-AGC 26dB Bandwidth



Output DL 1S M AWGN Pre-AGC 99% OBW



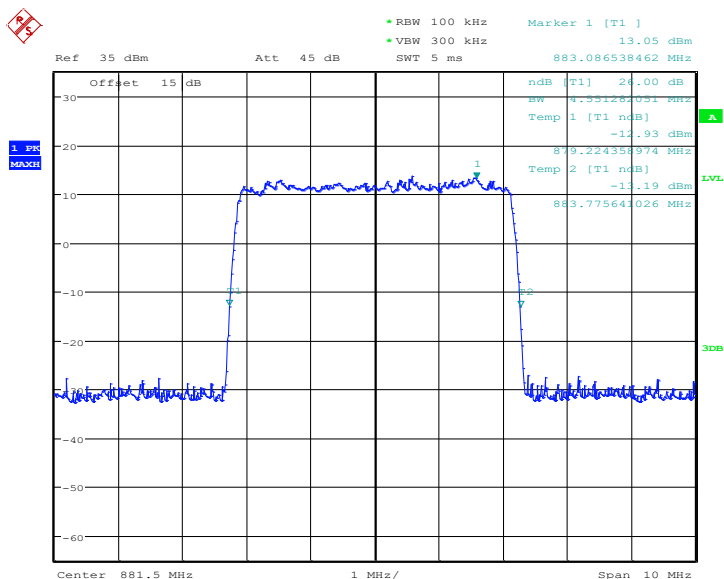
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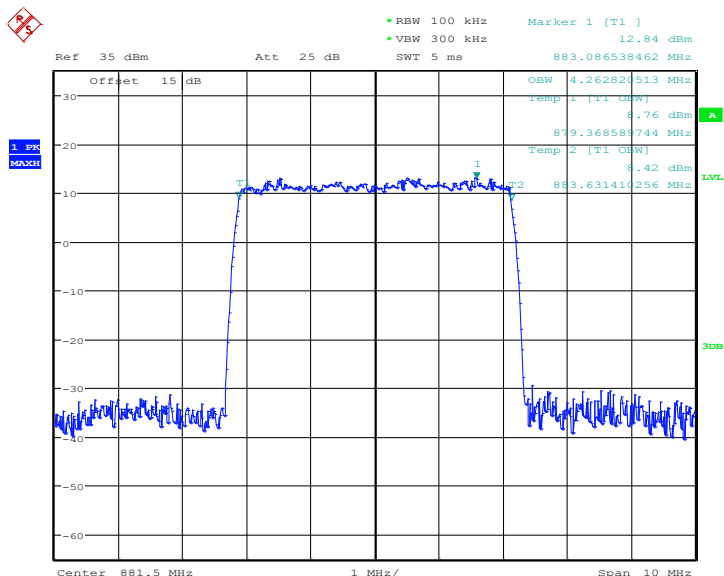
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Output_DL_1S_M_AWGN_AGC+3dB_26dB Bandwidth



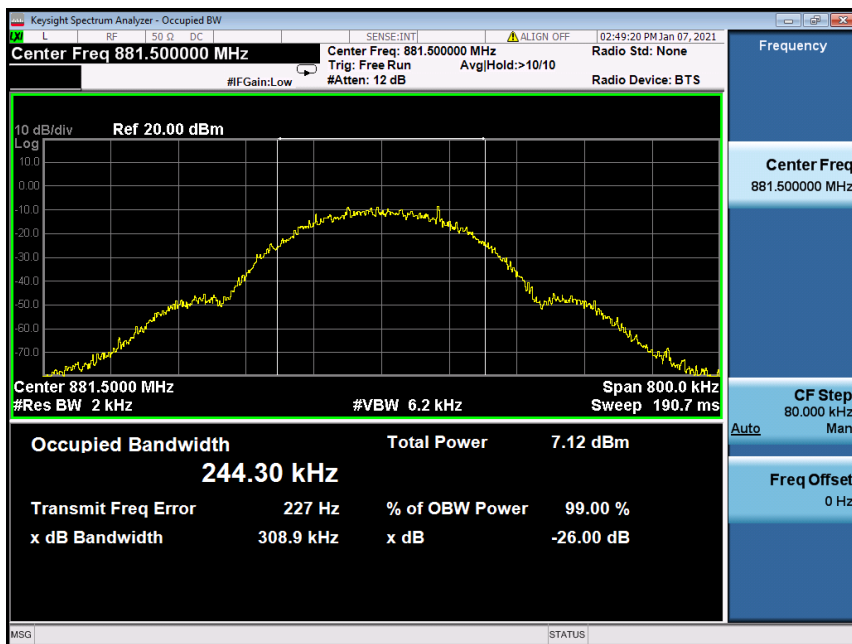
Output_DL_1S_M_AWGN_AGC+3dB_99% OBW



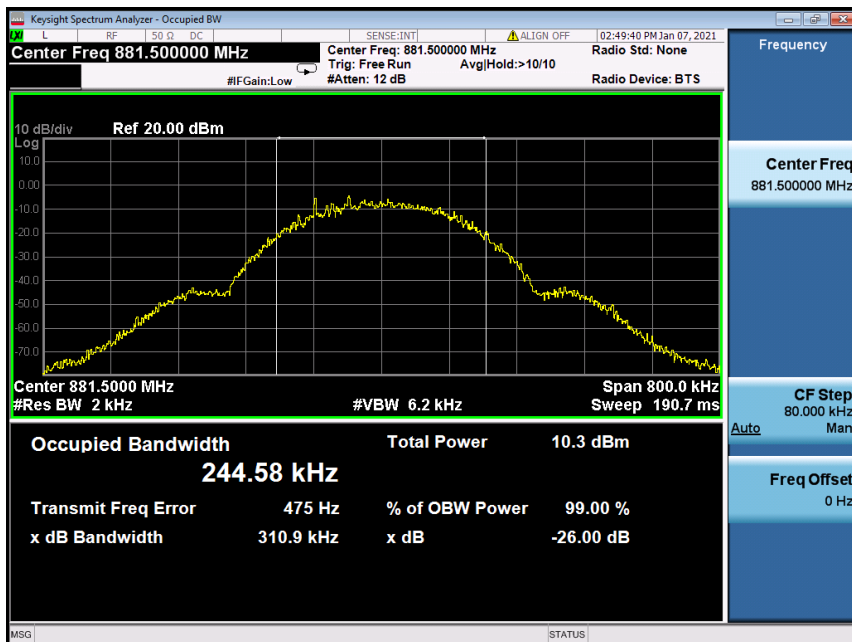
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Input_DL_1S_M_GSM_Pre-AGC_26dB Bandwidth & 99% OBW



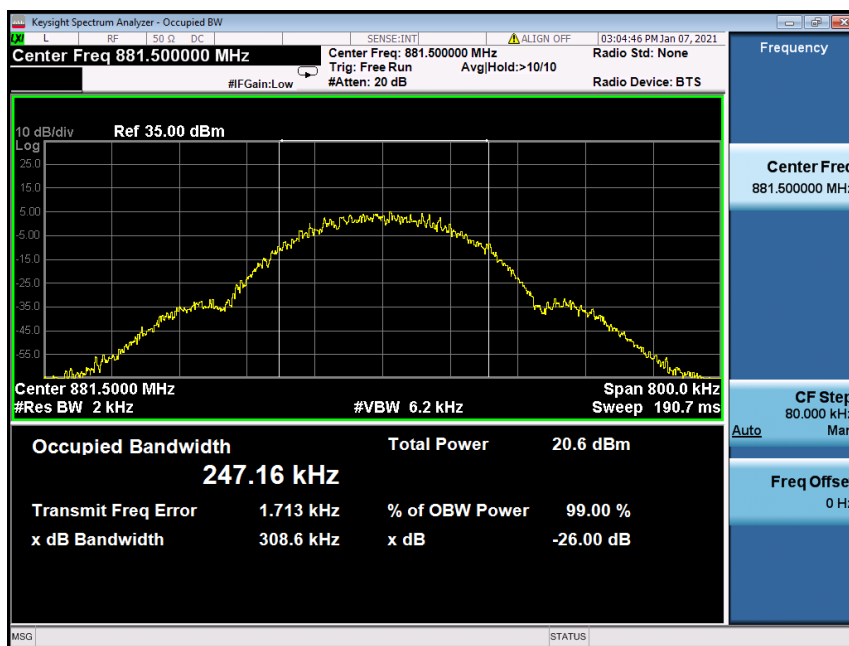
Input_DL_1S_M_GSM_AGC+3dB_26dB Bandwidth & 99% OBW



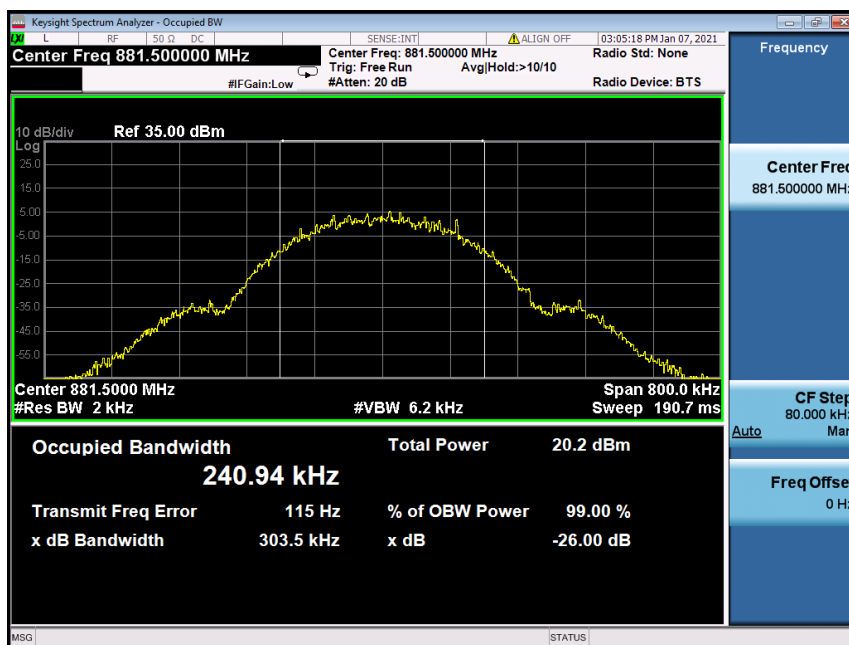
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Output_DL_1S_M_GSM_Pre-AGC_26dB Bandwidth & 99% OBW



Output_DL_1S_M_GSM_AGC+3dB_26dB Bandwidth & 99% OBW



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Guangzhou Branch**

Application No.: GZEM2011016736CR

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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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Guangzhou Branch Testing Center 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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6.4 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	886.71	Pre-AGC	0.30	20.24	19.94	PASS
		AGC+3dB	3.18	20.09	/	PASS
DL_1S_GSM	886.71	Pre-AGC	0.30	20.19	19.89	PASS
		AGC+3dB	3.18	20.22	/	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 $(20.24\text{dBm} + 20.24\text{dBm}) + 15.5\text{dBi} - 2.15\text{dB} = 36.6\text{dBm}$ (4.571W) which don't exceed the required ERP limit (500W).

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

Note: 1. The tested max conducted power for single antenna port is 20.24dBm, the power of any emission must be reduced below the mean output power (P) by at least $43 + 10\log(P)$ dB Here,

$$P=20.24\text{dBm}=0.1057\text{W}.$$

So the limit =

$$P(\text{dBm})-[43 + 10 \log (0.1057\text{W})] = -13\text{dBm}$$

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.

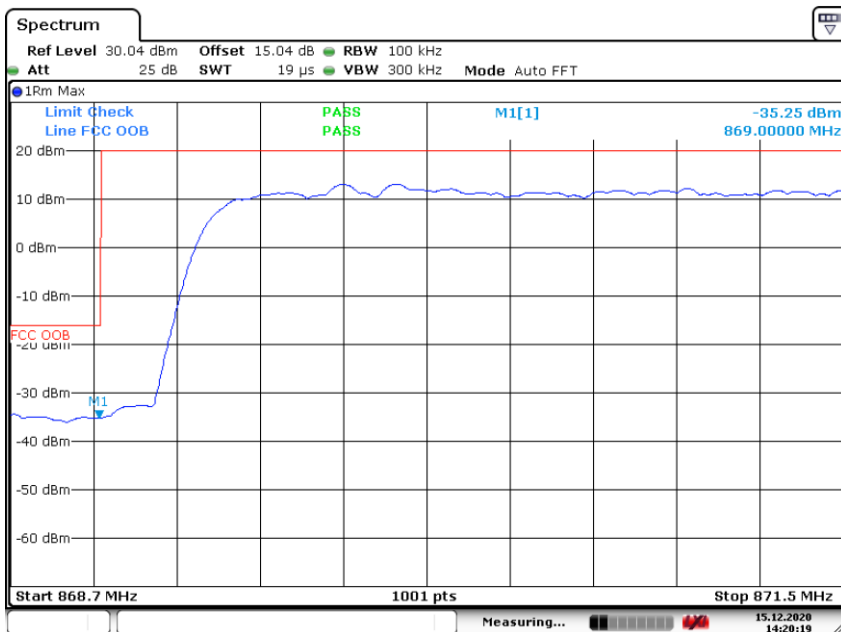
2. Out-of-band/out-of-block (including intermodulation) emissions and spurious emissions have been tested using an AWGN test signal and a GSM-TDMA test signal, only the worst-case was recorded in this report.



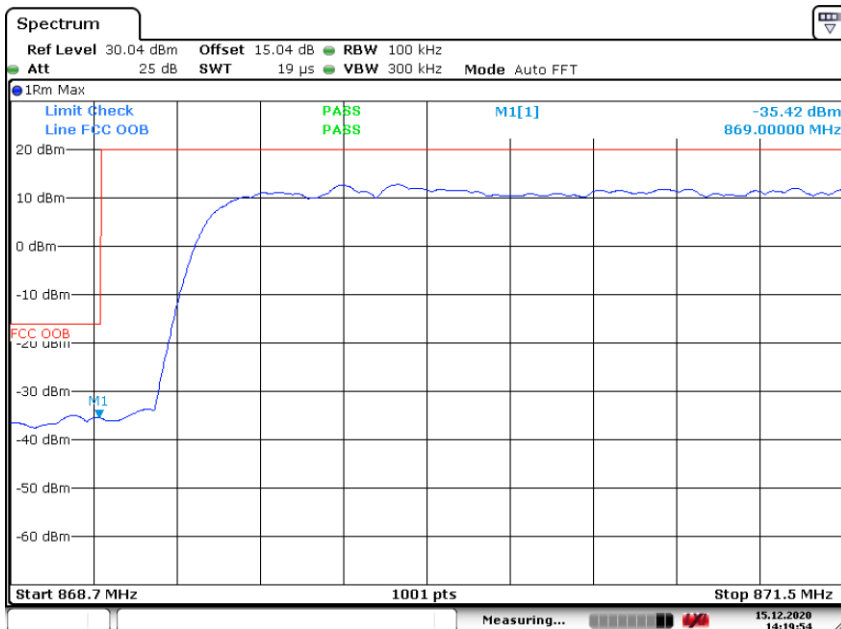
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DL_1S_B_AWGN_Pre-AGC_Out-of-band emission



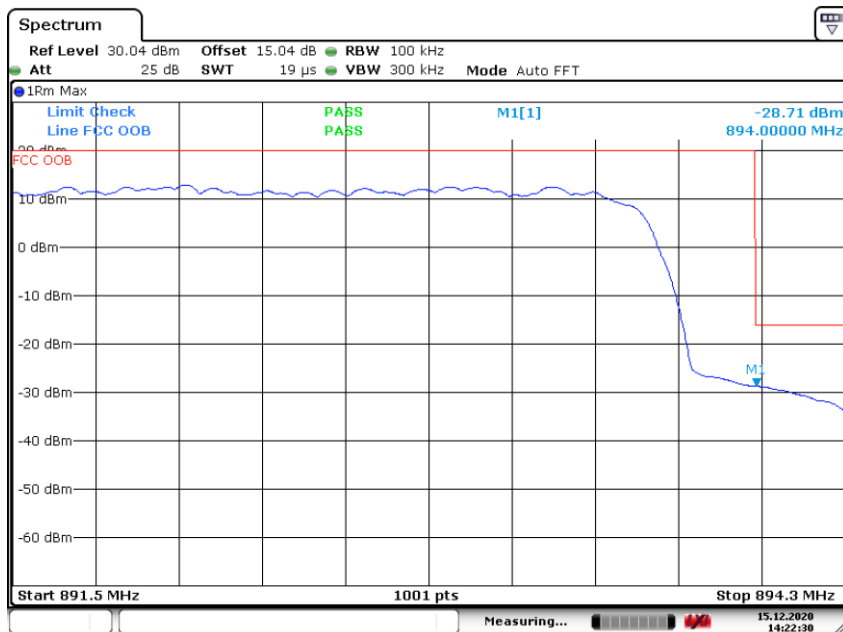
DL_1S_B_AWGN_AGC+3_Out-of-band emission



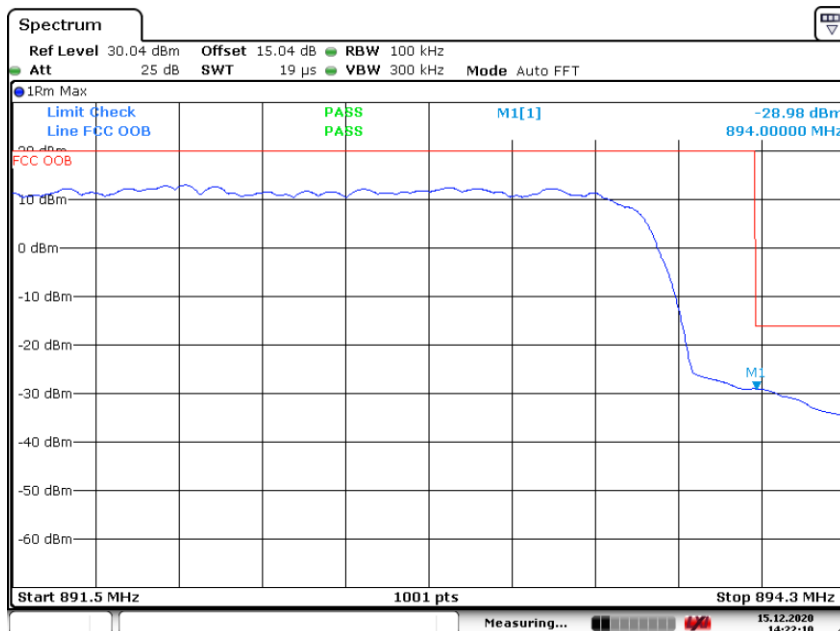
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DL_1S_T_AWGN_Pre-AGC_Out-of-band emission



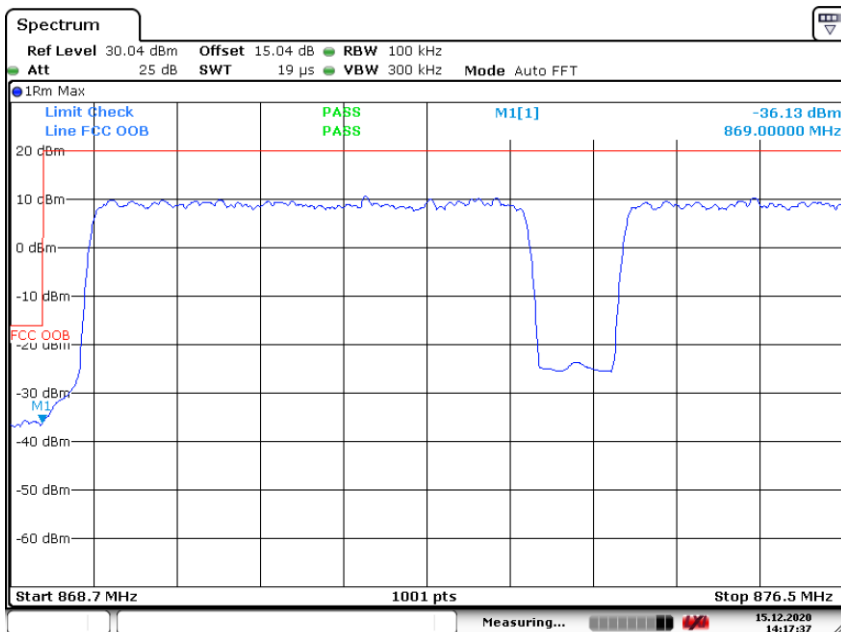
DL_1S_T_AWGN_AGC+3_Out-of-band emission



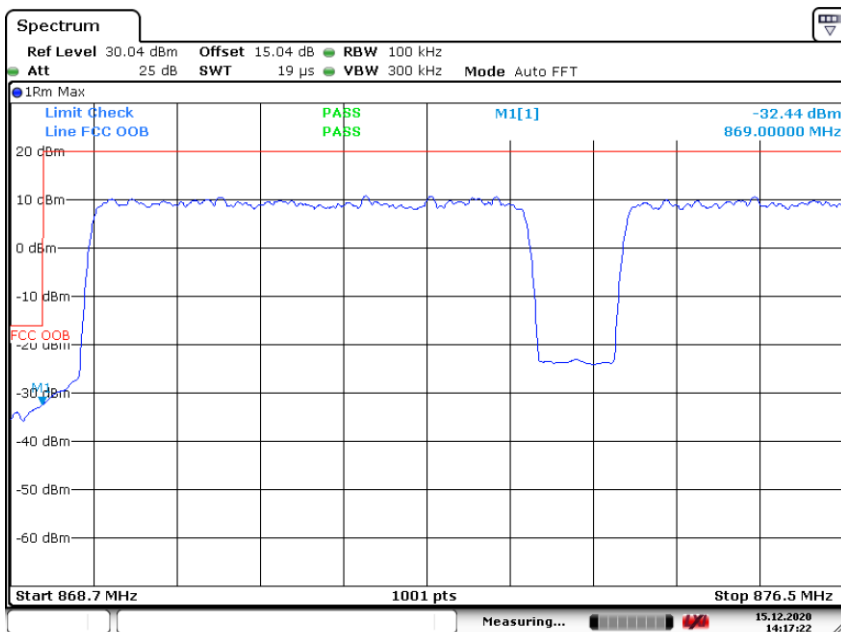
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DL_2S_B_AWGN_Pre-AGC_Out-of-band emission



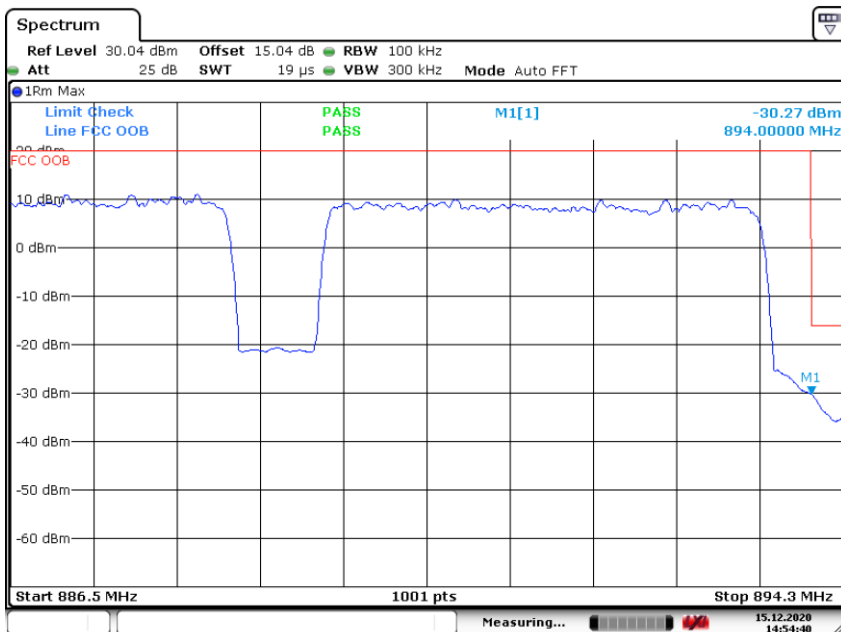
DL_2S_B_AWGN_AGC+3_Out-of-band emission



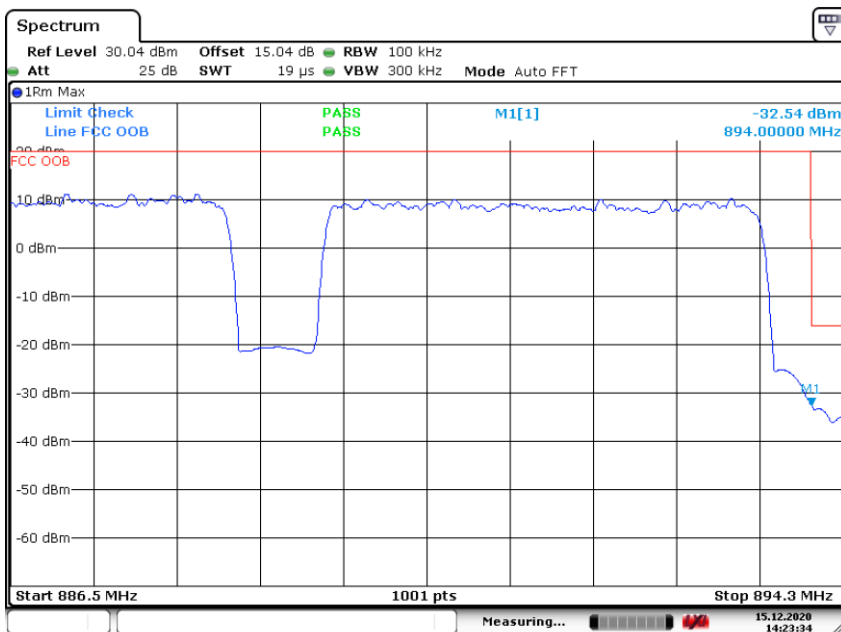
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DL_2S_T_AWGN_Pre-AGC_Out-of-band emission



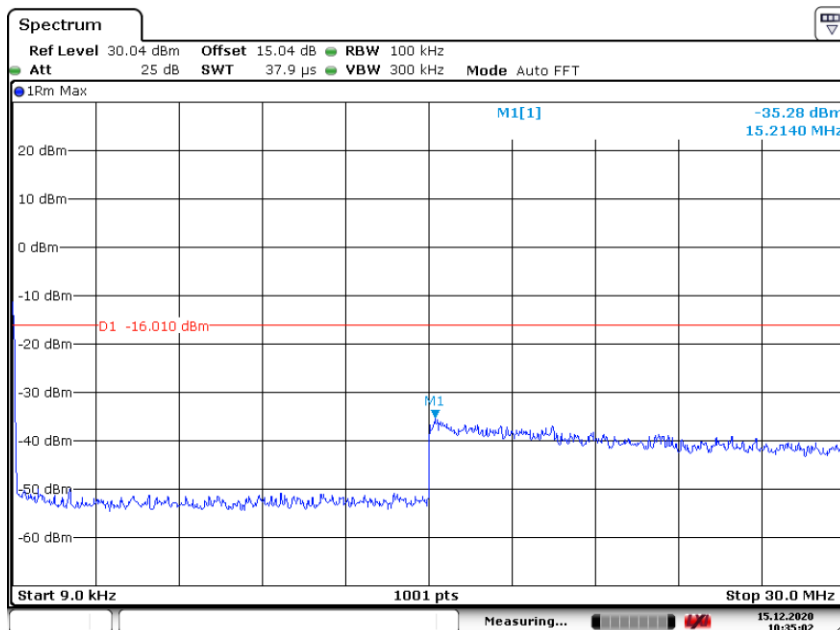
DL_2S_T_AWGN_AGC+3_Out-of-band emission



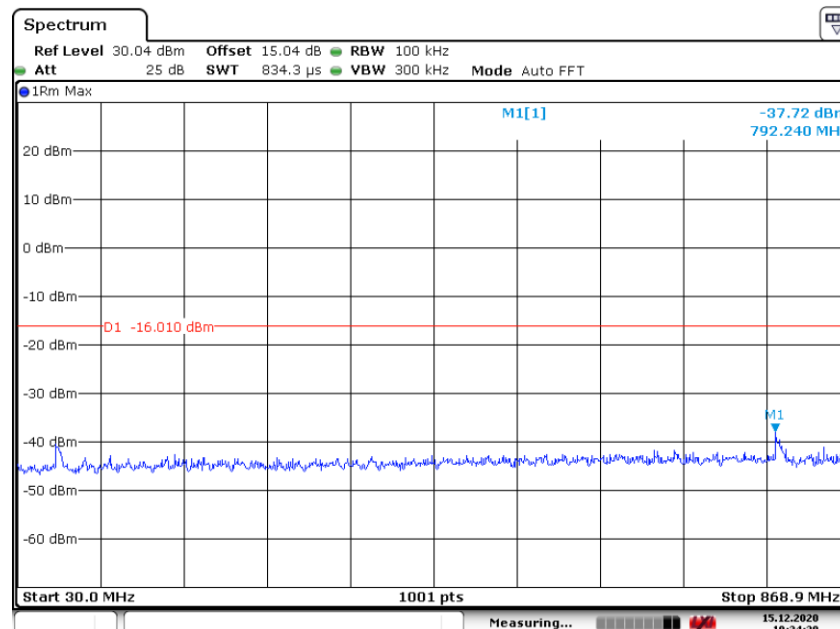
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DL_1S_B_AWGN_Pre-AGC_Spurious emission 1



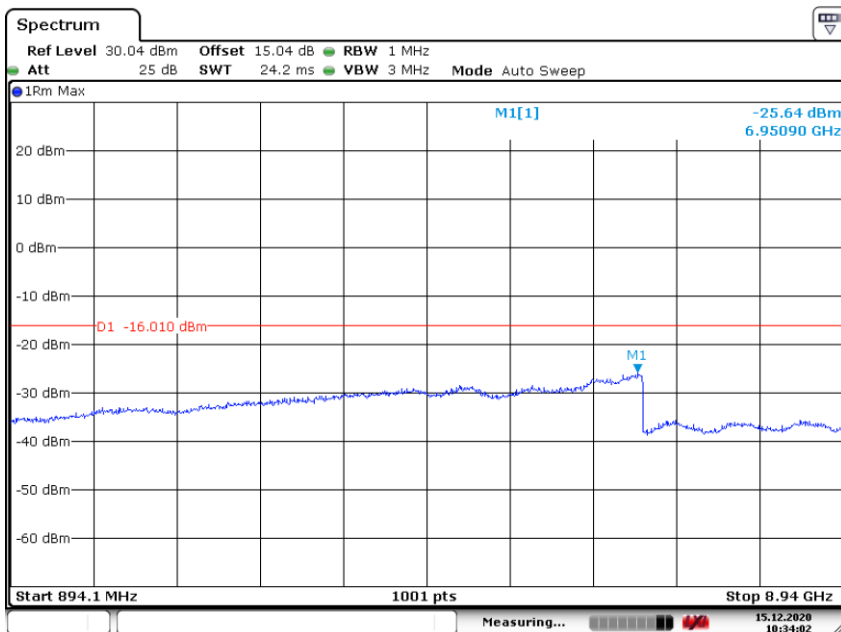
DL_1S_B_AWGN_Pre-AGC_Spurious emission 2



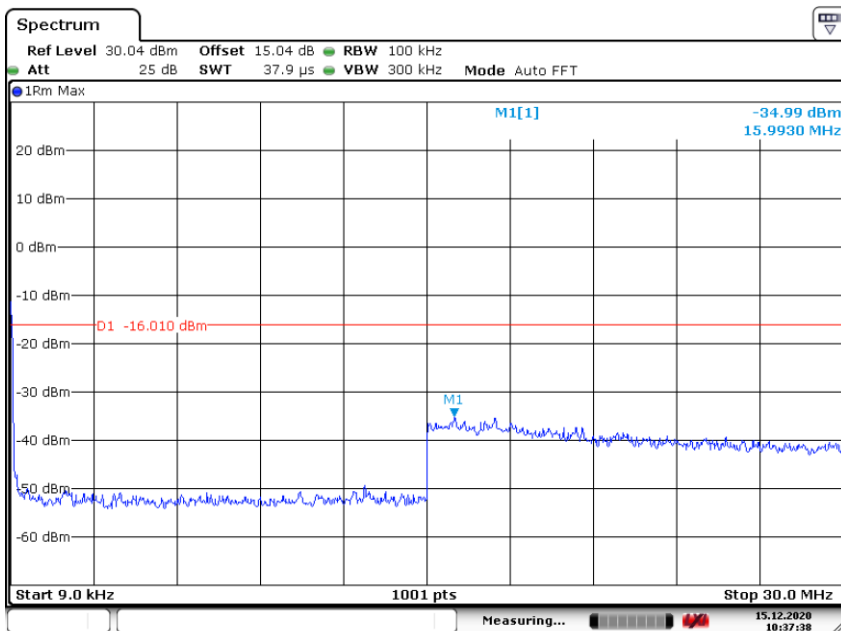
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DL_1S_B_AWGN_Pre-AGC_Spurious emission 3



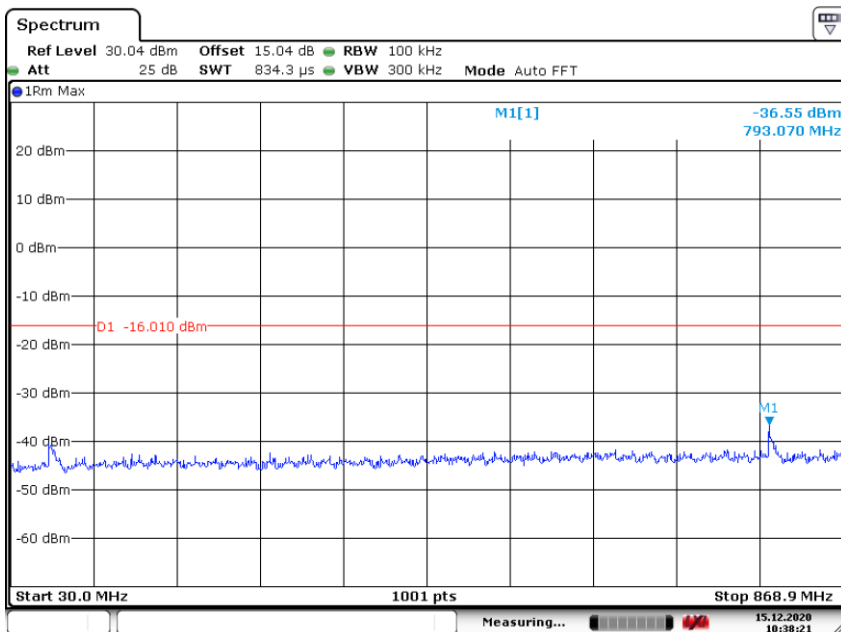
DL_1S_M_AWGN_Pre-AGC_Spurious emission 1



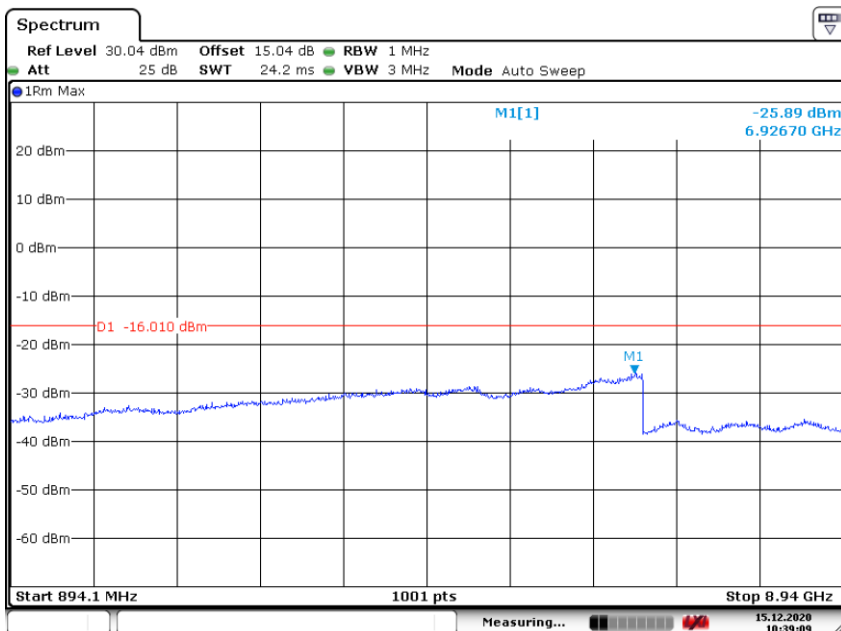
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DL_1S_M_AWGN_Pre-AGC_Spurious emission 2



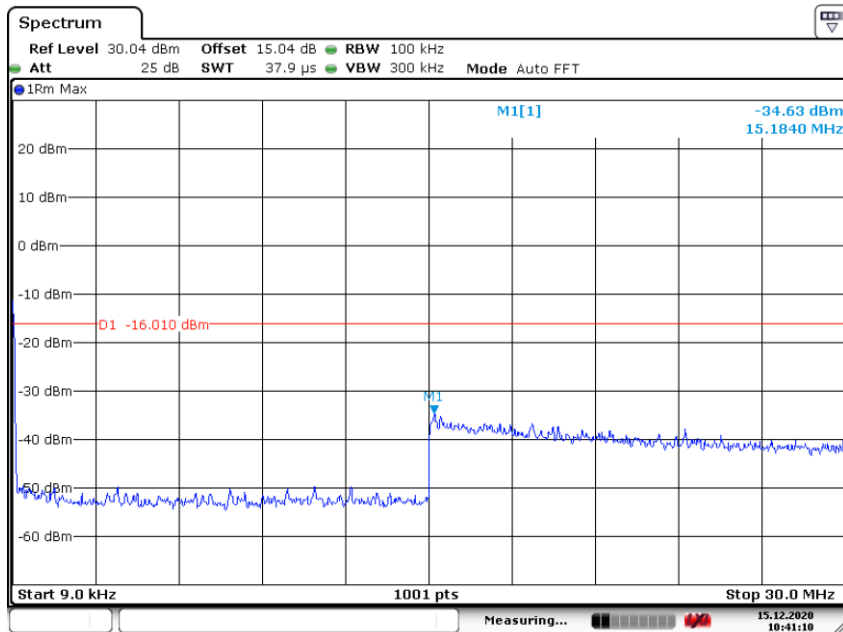
DL_1S_M_AWGN_Pre-AGC_Spurious emission 3



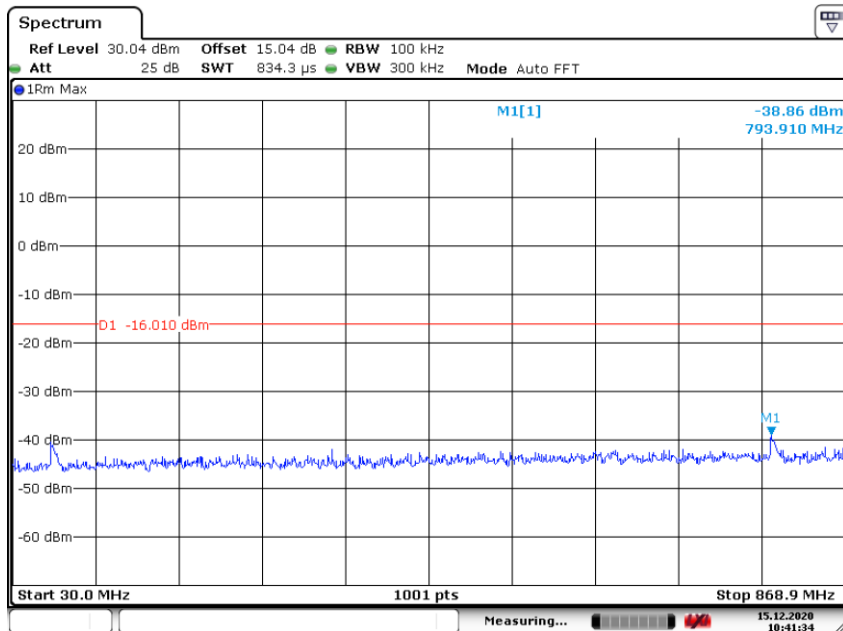
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DL_1S_T_AWGN_Pre-AGC_Spurious emission 1



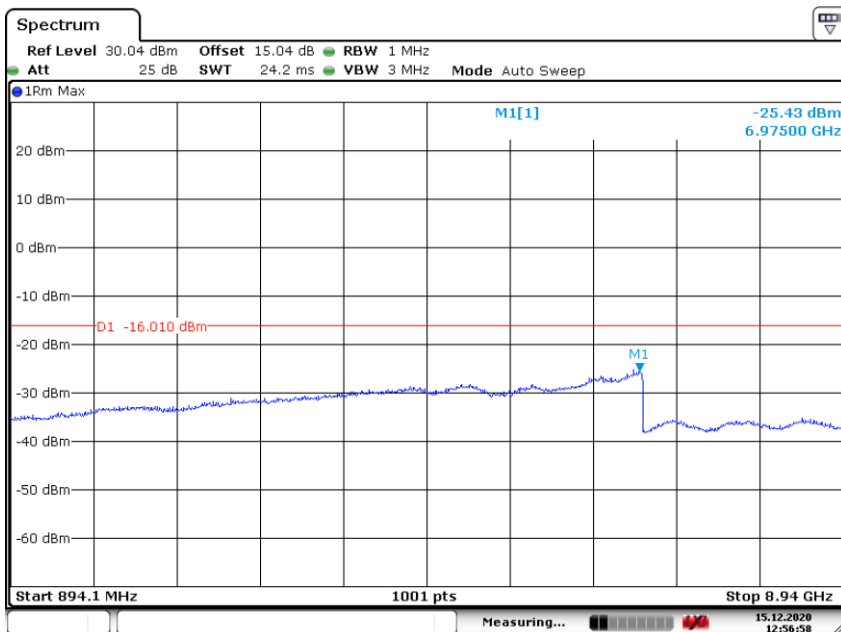
DL_1S_T_AWGN_Pre-AGC_Spurious emission 2



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DL_1S_T_AWGN_Pre-AGC_Spurious emission 3



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6.6 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	881.500326	-0.11	PASS
40		881.500502	0.09	PASS
30		881.500483	0.07	PASS
20		881.500423	Reference	PASS
10		881.500352	-0.08	PASS
0		881.500532	0.12	PASS
-10		881.500464	0.47	PASS
-20		881.500489	0.75	PASS
-30		881.500403	-0.23	PASS

Frequency stability vs voltage				
Voltage (V)	Test Conf.	Test data (MHz)	Tolerance (ppm)	Verdict
DC 40.8	DL_1S_M_AWGN	881.500403	0.02	PASS
DC 48		881.500387	Reference	PASS
DC 55.2		881.500341	-0.05	PASS



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6.7 Radiated spurious emissions

Note: 1. The tested max conducted power for single antenna port is 20.24dBm, the 2x2 MIMO total power is 20.24dBm+20.24dBm= 0.2114W, the power of any emission must be reduced below the mean output power (P) by at least 43 + 10log (P) dB

Here,

$P = 20.24 + 20.24 \text{ dBm} = 0.2114 \text{ W}$.

So the limit =

$P(\text{dBm}) - [43 + 10 \log (0.2114 \text{ W})] = -13 \text{ dBm}$

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.

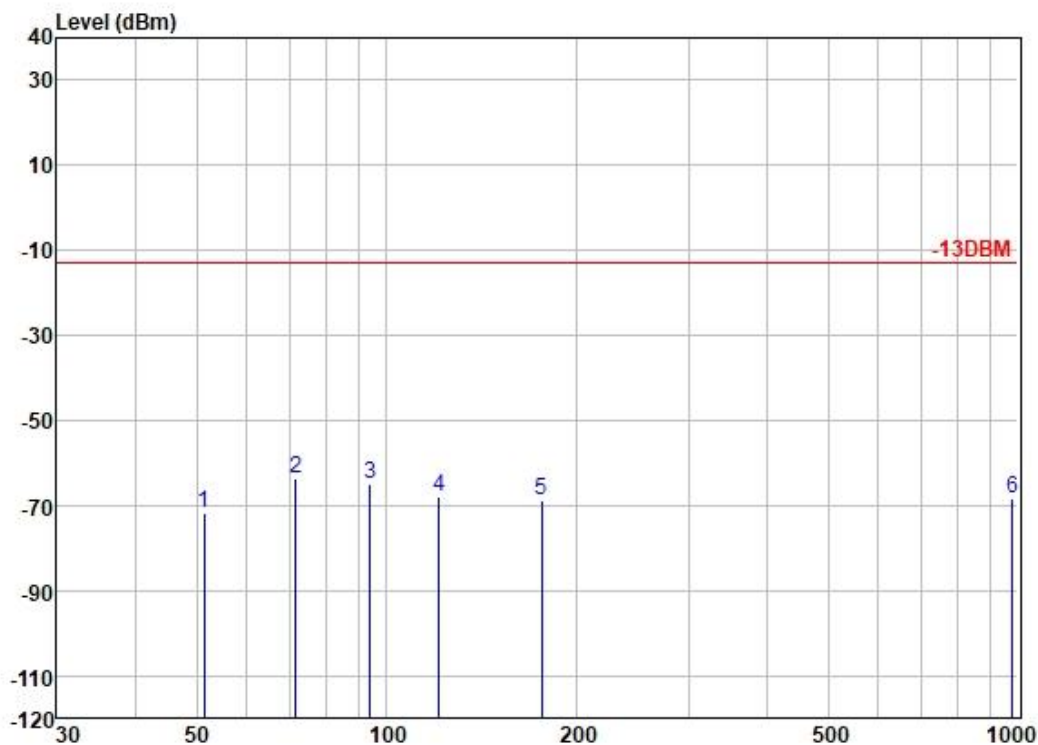
3. The disturbance from 9kHz to 30MHz was very low and 20db below the limit, therefore, the data was not recorded in the report.



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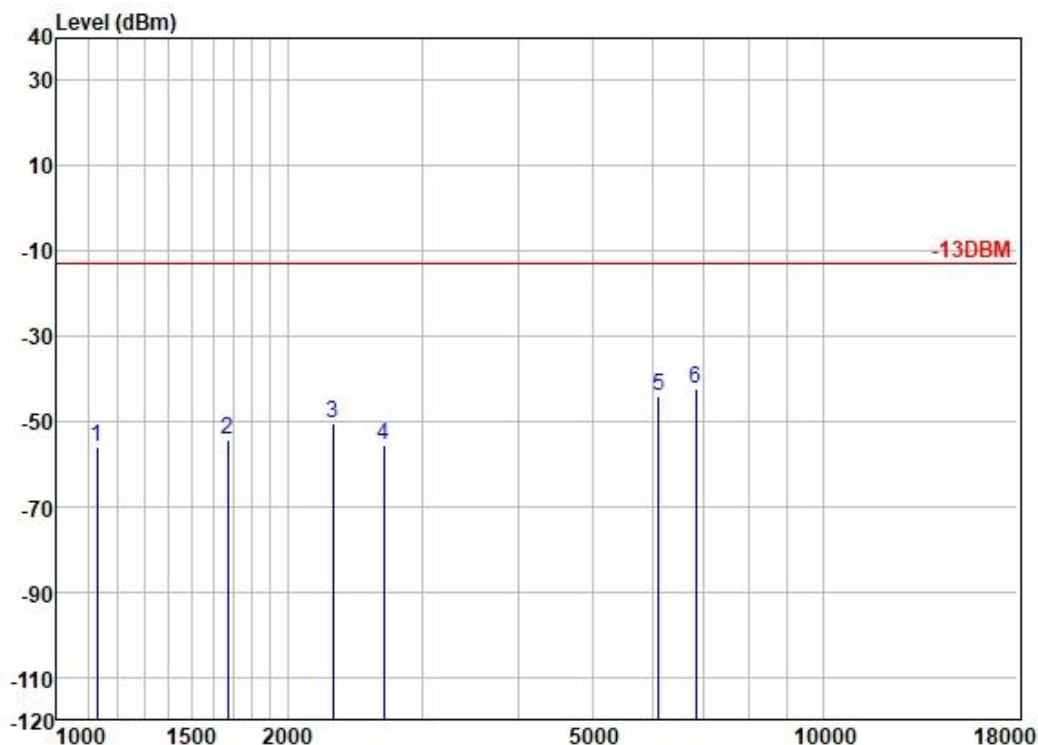
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DL_1S_M_AWGN_Horizontal_30MHz~1GHz



Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
51.301	-71.90	-13	-58.9	Horizontal	PASS
71.832	-63.86	-13	-50.86	Horizontal	PASS
94.098	-64.91	-13	-51.91	Horizontal	PASS
121.121	-67.90	-13	-54.9	Horizontal	PASS
175.652	-68.99	-13	-55.99	Horizontal	PASS
979.180	-68.33	-13	-55.33	Horizontal	PASS

DL_1S_M_AWGN_Horizontal_above 1GHz



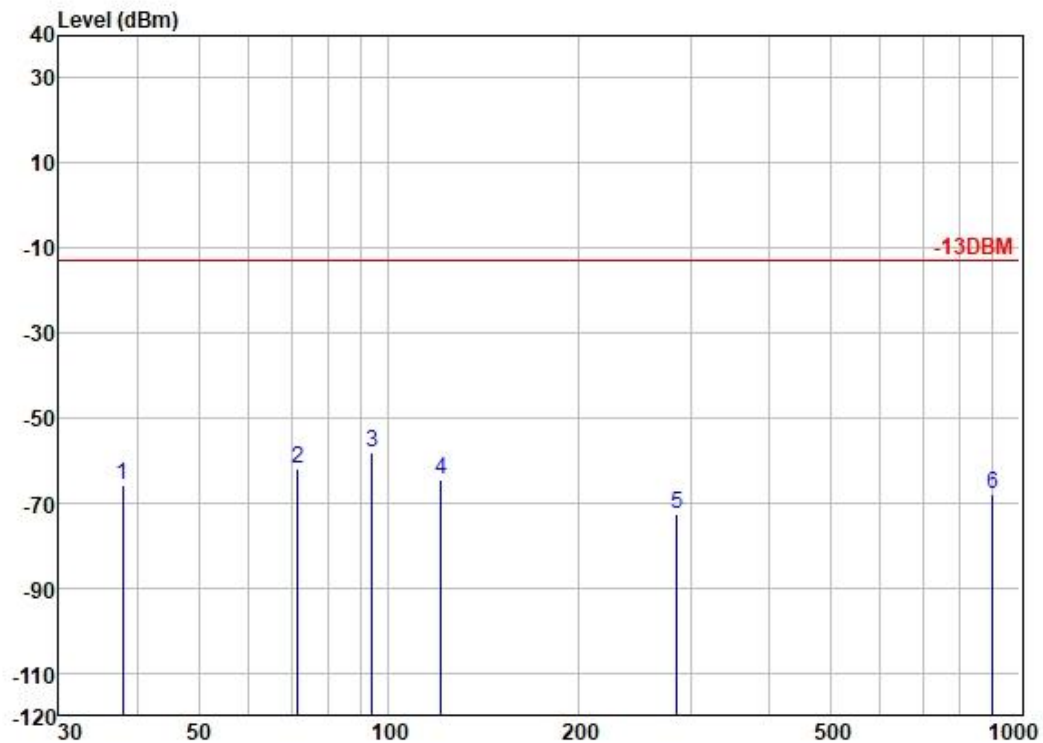
Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
1129.072	-56.11	-13	-43.11	Horizontal	PASS
1672.779	-54.44	-13	-41.44	Horizontal	PASS
2292.257	-50.60	-13	-37.6	Horizontal	PASS
2671.730	-55.48	-13	-42.48	Horizontal	PASS
6106.616	-44.16	-13	-31.16	Horizontal	PASS
6835.279	-42.50	-13	-29.5	Horizontal	PASS



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DL_1S_M_AWGN_Vertical_30MHz~1GHz



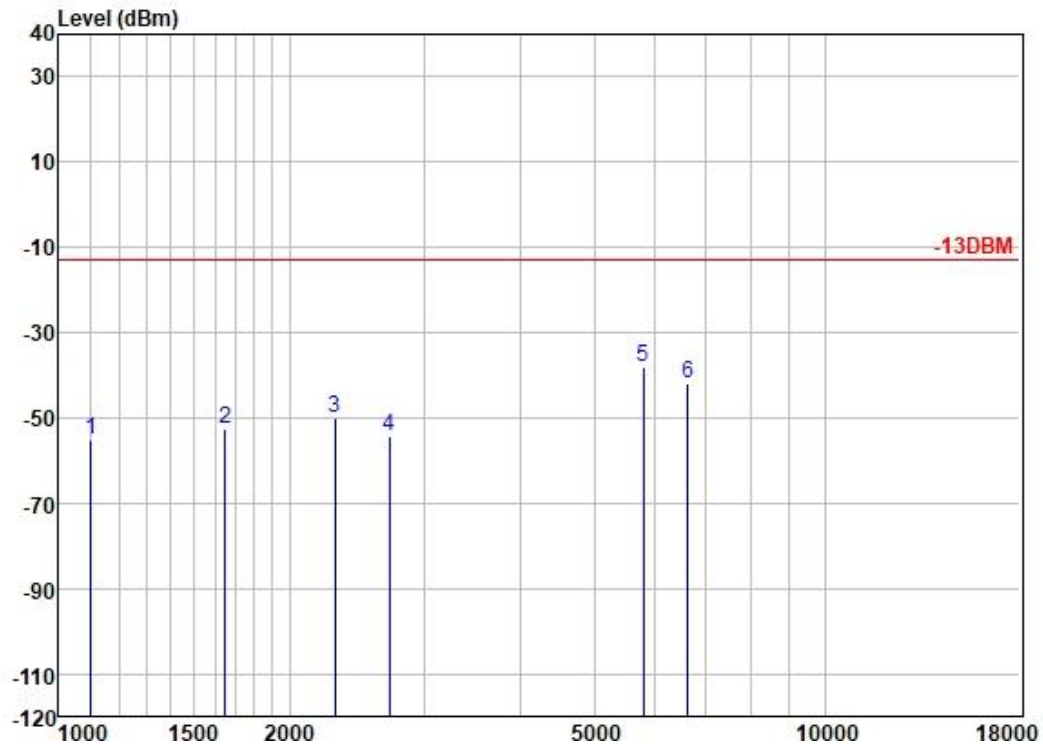
Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
37.812	-66.00	-13	-53	Vertical	PASS
71.832	-61.95	-13	-48.95	Vertical	PASS
94.098	-58.02	-13	-45.02	Vertical	PASS
121.332	-64.34	-13	-51.34	Vertical	PASS
285.979	-72.43	-13	-59.43	Vertical	PASS
903.309	-68.01	-13	-55.01	Vertical	PASS



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DL_1S_M_AWGN_Vertical_above 1GHz



Freq. (MHz)	Level (dBm)	Limit (dBm)	Over Limit (dB)	Polarization	Verdict
1100.001	-55.10	-13	-42.1	Vertical	PASS
1648.778	-55.42	-13	-42.42	Vertical	PASS
2290.257	-49.99	-13	-36.99	Vertical	PASS
2702.799	-54.23	-13	-41.23	Vertical	PASS
5797.032	-37.88	-13	-24.88	Vertical	PASS
6621.375	-41.93	-13	-28.93	Vertical	PASS

--End of Appendix B--



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