



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

EMC-ARF-05 Rev 1.1

Page: 1 of 35

FCC ID: 2BEYB-TP-WE-WRB2I

Appendix -

Test Data and Result for report

GZCR231000104603

(For 817-824MHz/862-869MHz)



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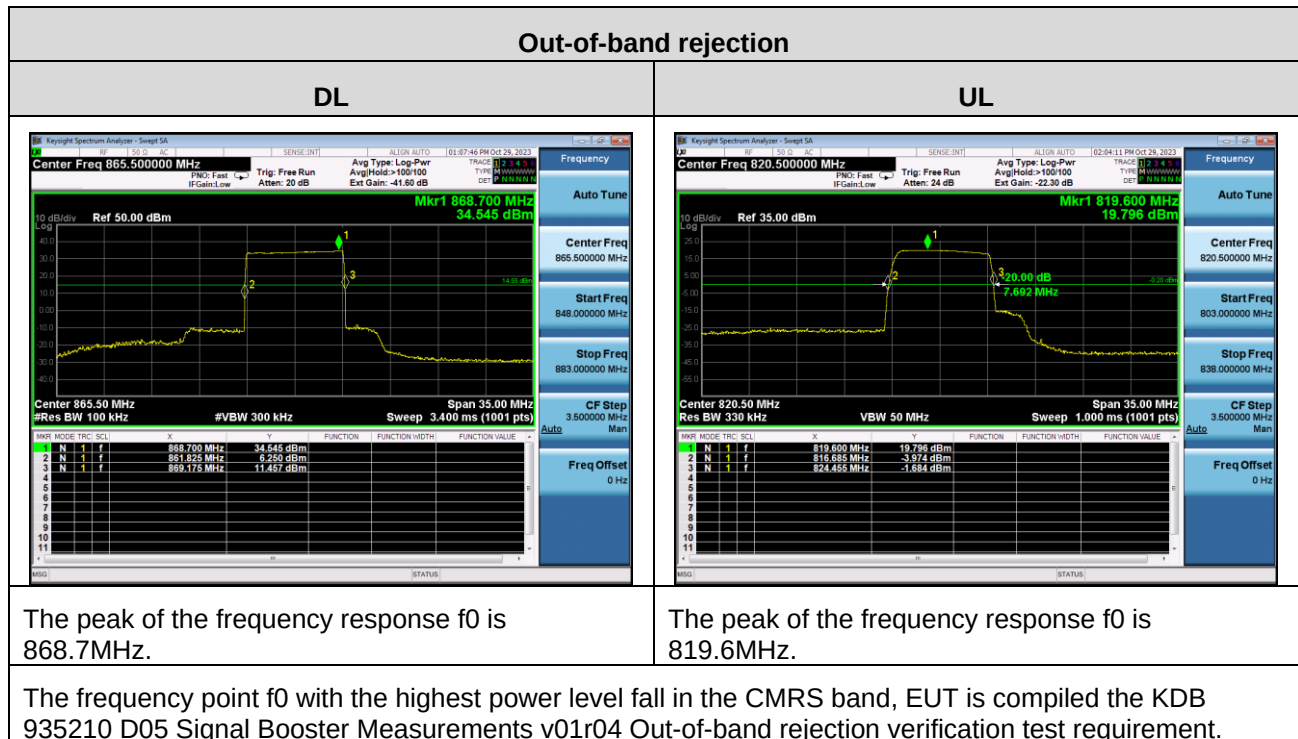
SGS-CSTC Standards Technical Services Co., Ltd.
Guangzhou Branch Testing Center EMC Laboratory

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1 Out-of-band rejection



2 Input versus Output comparison

Occupied Bandwidth				
Test Path	Test Signal	Test Channel	Signal Level	Verdict
DL	4.1MHz AWGN	MCH	Pre-AGC	PASS
			3dB above AGC	PASS
	GSM	MCH	Pre-AGC	PASS
			3dB above AGC	PASS
UL	4.1MHz AWGN	MCH	Pre-AGC	PASS
			3dB above AGC	PASS
	GSM	MCH	Pre-AGC	PASS
			3dB above AGC	PASS
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.				

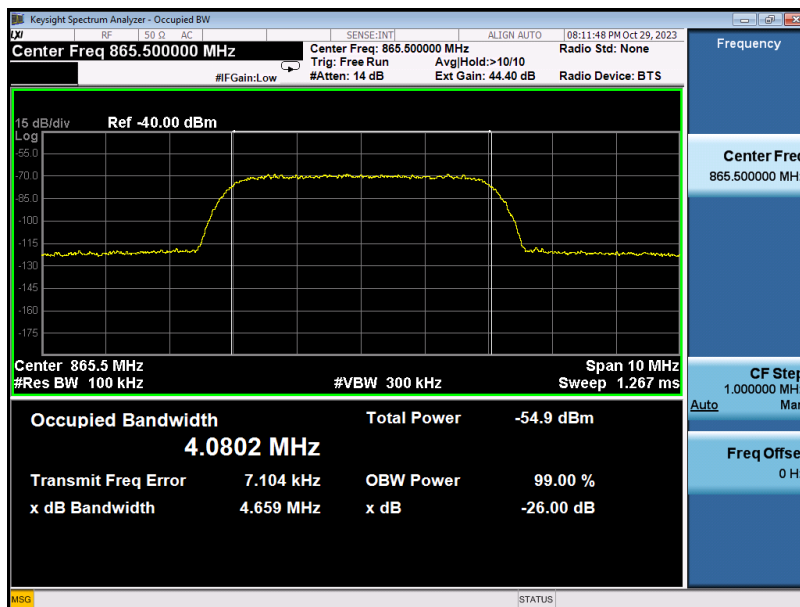


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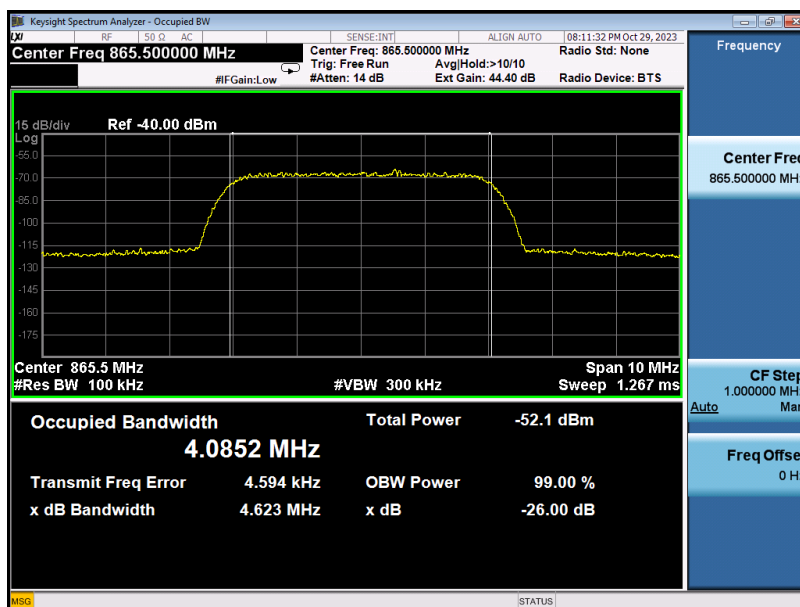
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DL_4.1MHz AWGN_MCH_Input_Pre-AGC



DL_4.1MHz AWGN_MCH_Input_3dB above AGC



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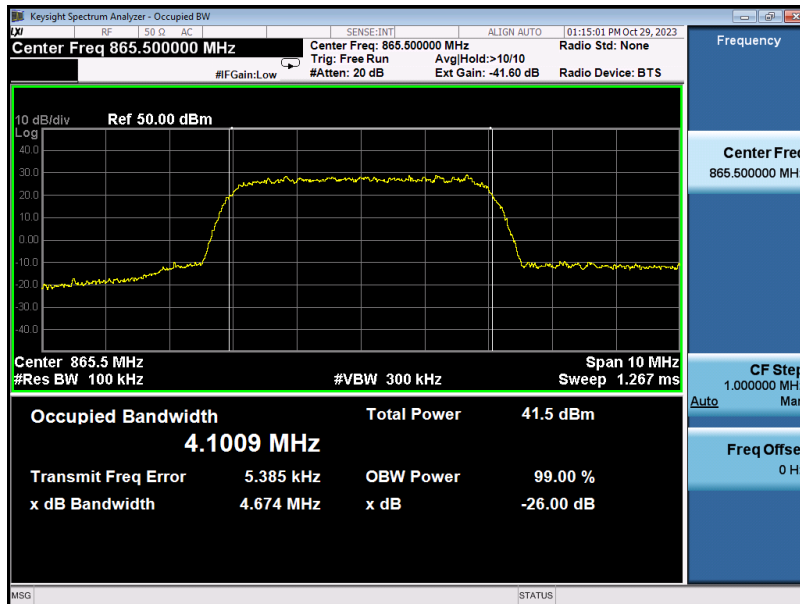
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DL_4.1MHz AWGN_MCH_Output_Pre-AGC



DL_4.1MHz AWGN_MCH_Output_3dB above AGC

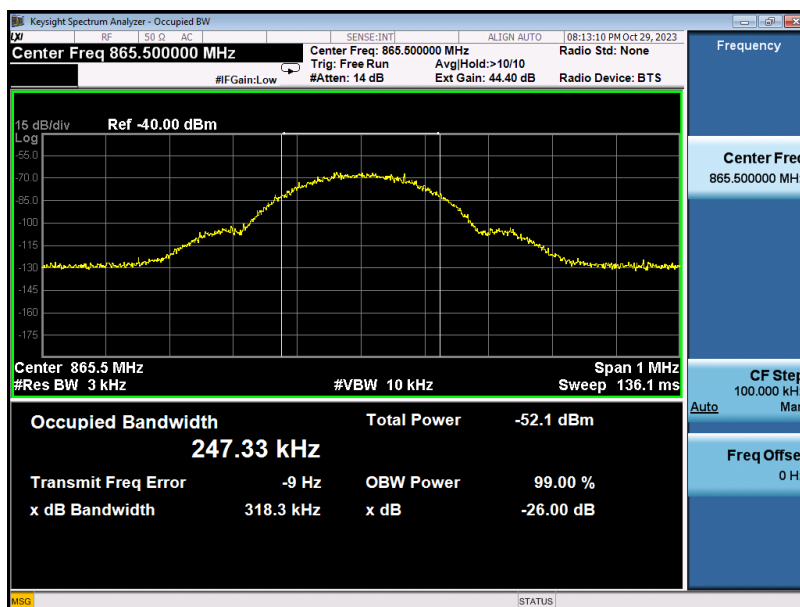


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DL_GSM_MCH_Input_Pre-AGC



DL_GSM_MCH_Input_3dB above AGC



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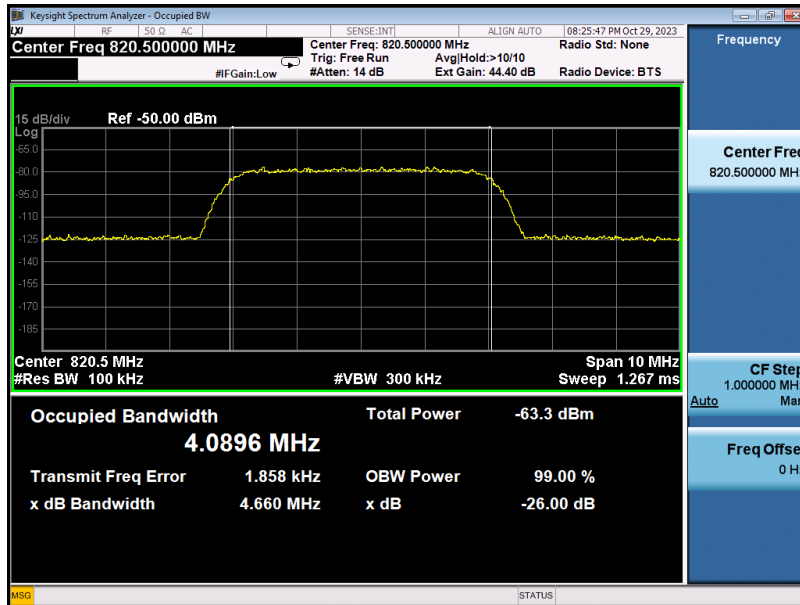
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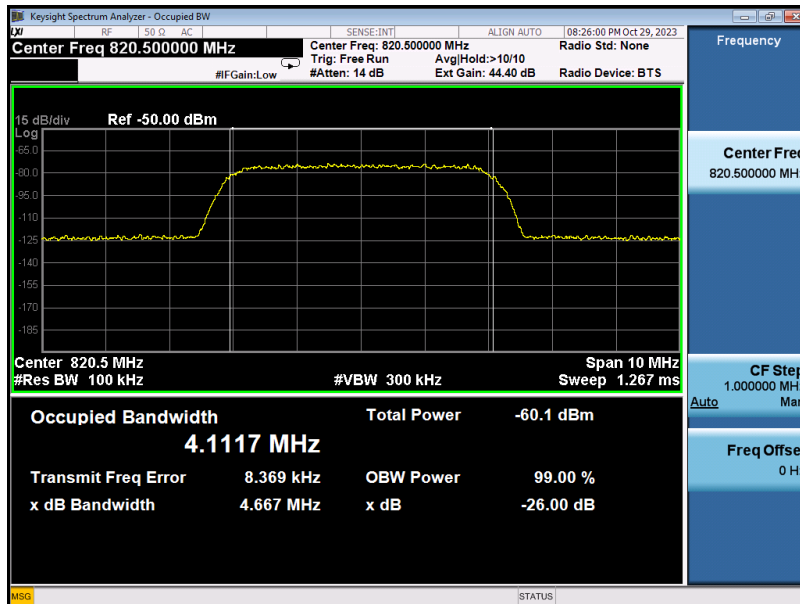
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UL_4.1MHz AWGN_MCH_Input_Pre-AGC

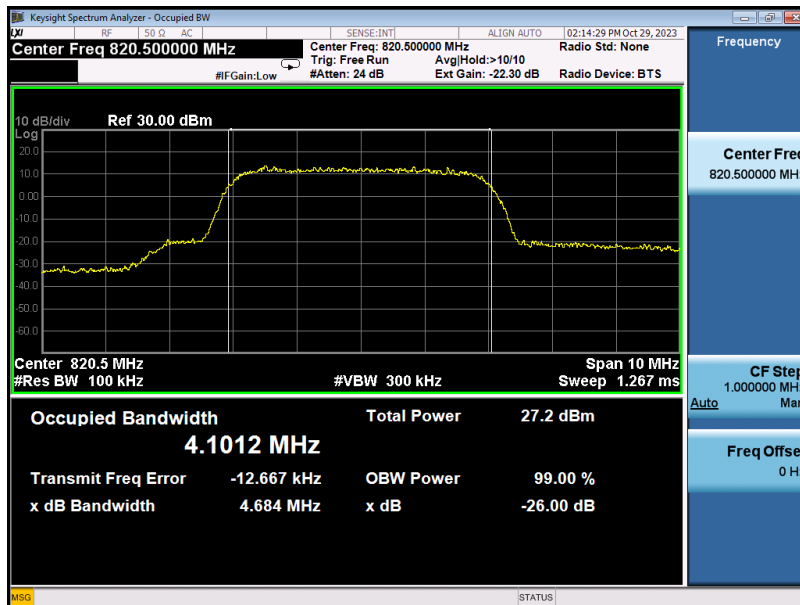


UL_4.1MHz AWGN_MCH_Input_3dB above AGC



99% OBW

UL_4.1MHz AWGN_MCH_Output_Pre-AGC



UL_4.1MHz AWGN_MCH_Output_3dB above AGC



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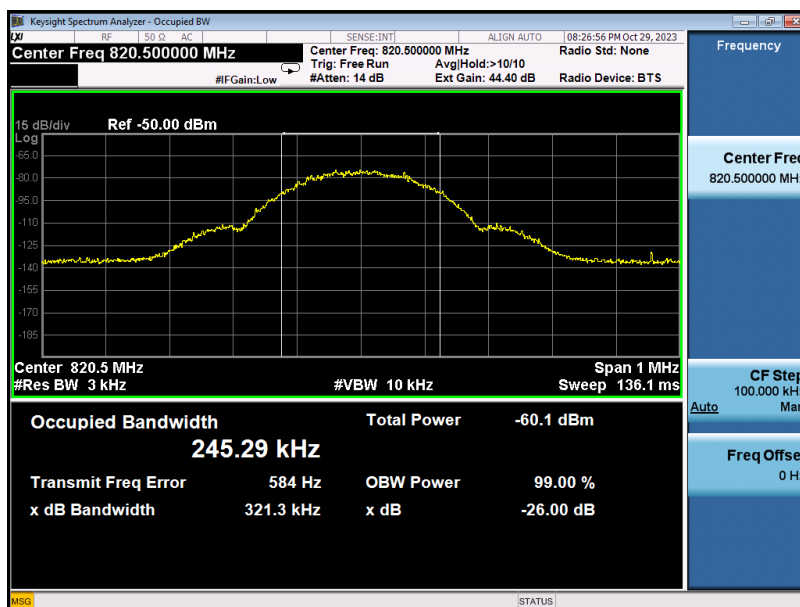
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UL_GSM_MCH_Input_Pre-AGC

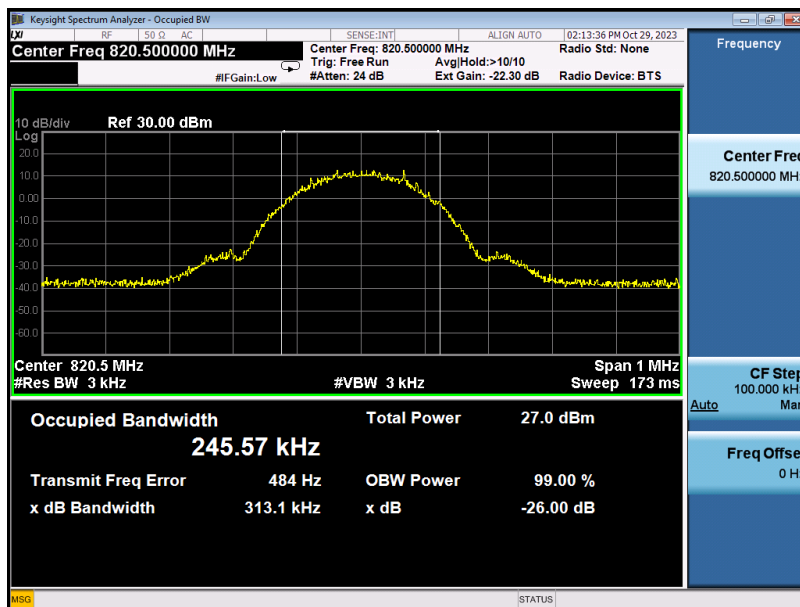


UL_GSM_MCH_Input_3dB above AGC

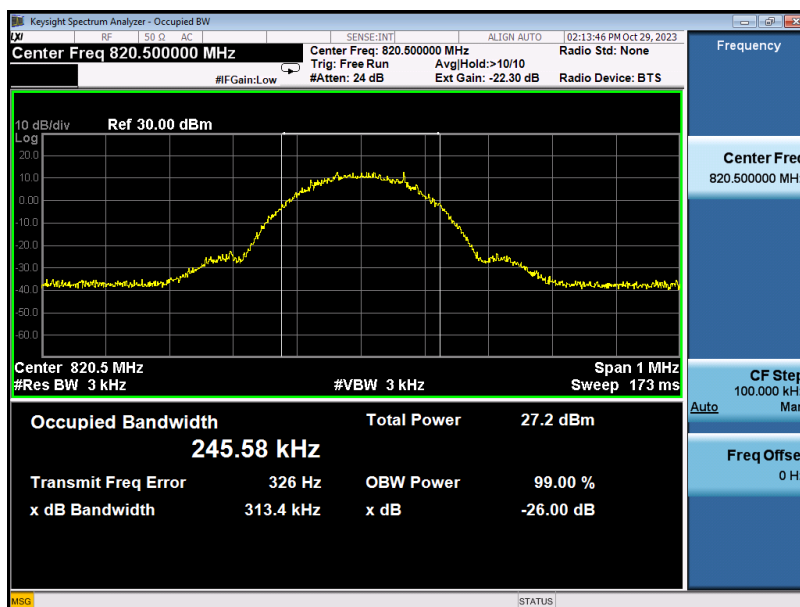


99% OBW

UL_GSM_MCH_Output_Pre-AGC



UL_GSM_MCH_Output_3dB above AGC



3 Mean output power and amplifier/booster gain

Mean output power and gain							
Test Path	Test Freq. f0 (MHz)	Test Signal	Signal Level	Input power (dBm)	Output Power (dBm)	ERP (W)	Gain (dB)
DL	868.7	4.1MHz AWGN	Pre-AGC	-55	41.6	88.2	96.6
			3dB above AGC	-52	41.9	94.5	/
		GSM	Pre-AGC	-55	41.4	84.2	96.4
			3dB above AGC	-52	41.2	80.4	/
UL	819.6	4.1MHz AWGN	Pre-AGC	-63	27.5	3.5	90.5
			3dB above AGC	-60	27.8	3.7	/
		GSM	Pre-AGC	-63	27.2	3.2	90.2
			3dB above AGC	-60	27.3	3.3	/
Remark: 1. f0 is from Out-of-band Rejection test in the report. 2. ERP= output power (dBm)+ antenna gain (dBi)- 2.15, the antenna gain is 10dBi declared by the manufacturer. 3. The output power is limited to an ERP of 1000W and the total ERP does not exceed the limit.							



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4 Out-of-band/out-of-block(including intermodulation) emissions

Out-of-band/out-of-block(including intermodulation) emissions							
Test Path	Test Channel	Test Signal	Stimulus Condition	Signal Level	Worst conducted test level (dBm)	Limit (dBm)	Verdict
DL	LCH	4.1MHz AWGN	One signal input	Pre-AGC	-23.76	≤-13	PASS
				3dB above AGC	-23.41		PASS
	HCH		One signal input	Pre-AGC	-20.82		PASS
				3dB above AGC	-20.81		PASS
	LCH	GSM	One signal input	Pre-AGC	-23.76	≤-13	PASS
				3dB above AGC	-22.61		PASS
			Two signals input	Pre-AGC	-22.56		PASS
				3dB above AGC	-22.16		PASS
	HCH		One signal input	Pre-AGC	-20.79		PASS
				3dB above AGC	-20.45		PASS
			Two signals input	Pre-AGC	-22.69		PASS
				3dB above AGC	-22.66		PASS
UL	LCH	4.1MHz AWGN	One signal input	Pre-AGC	-26.77	≤-13	PASS
				3dB above AGC	-26.60		PASS
	HCH		One signal input	Pre-AGC	-27.73		PASS
				3dB above AGC	-28.36		PASS
	LCH	GSM	One signal input	Pre-AGC	-27.28	≤-13	PASS
				3dB above AGC	-27.27		PASS
			Two signals input	Pre-AGC	-29.96		PASS
				3dB above AGC	-29.82		PASS
	HCH		One signal input	Pre-AGC	-20.30		PASS
				3dB above AGC	-20.79		PASS
			Two signals input	Pre-AGC	-22.75		PASS
				3dB above AGC	-22.27		PASS



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Remark:

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 rated max conducted power for single antenna port is 40dBm for DL, 27dBm for UL.
the power of any emission must be reduced below the mean output power (P) by at least $50 + 10 \log(P)$ dB

Here,

For DL, $P = 40\text{dBm} = 10\text{W}$

The limit = $40\text{dBm} - [50 + 10 \log_{10}(10\text{W})]$ dB = -20dBm

For UL, $P = 27\text{dBm} = 0.5\text{W}$

The limit = $27\text{dBm} - [50 + 10 \log_{10}(0.5\text{W})]$ dB = -20dBm

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 power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ dB

For DL, $P = 40\text{dBm} = 10\text{W}$

The limit = $40\text{dBm} - [43 + 10 \log_{10}(10\text{W})]$ dB = -13dBm

For UL, $P = 27\text{dBm} = 0.5\text{W}$

The limit = $27\text{dBm} - [43 + 10 \log_{10}(0.5\text{W})]$ dB = -13dBm

3. The EUT supported frequency band (817-824 MHz, 862-869 MHz) with max bandwidth 7 MHz that is narrow than two 4.1 MHz AWGN signal, so EUT cannot accommodate two simultaneous AWGN signals within the passband, it should be excluded from the Out-of-band/out-of-block emissions test with two AWGN signals input.

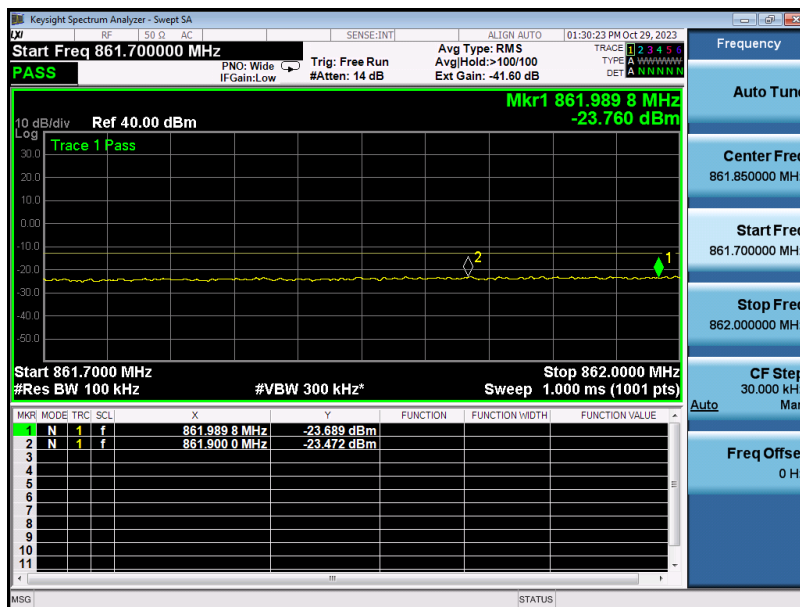


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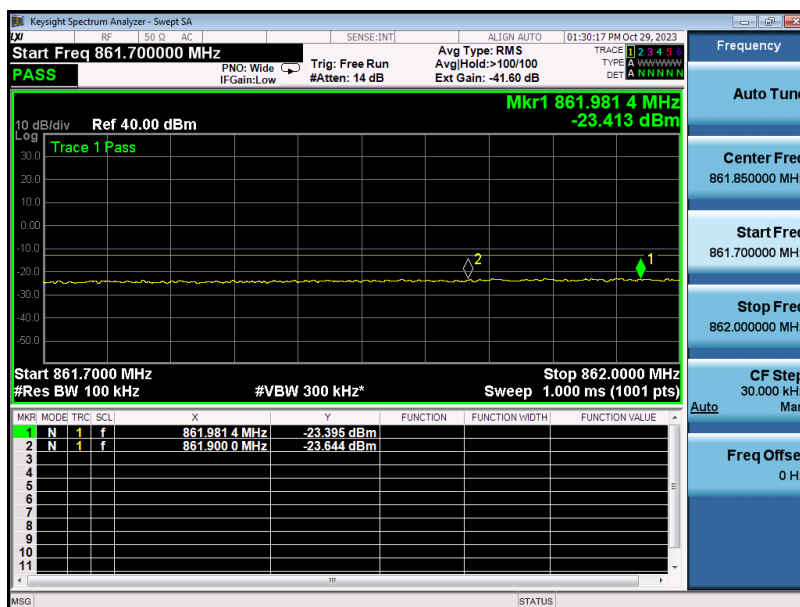
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Out-of-band/out-of-block emissions

DL_4.1MHz AWGN_LCH_a single test signal_Pre-AGC



DL_4.1MHz AWGN_LCH_a single test signal_3dB above AGC

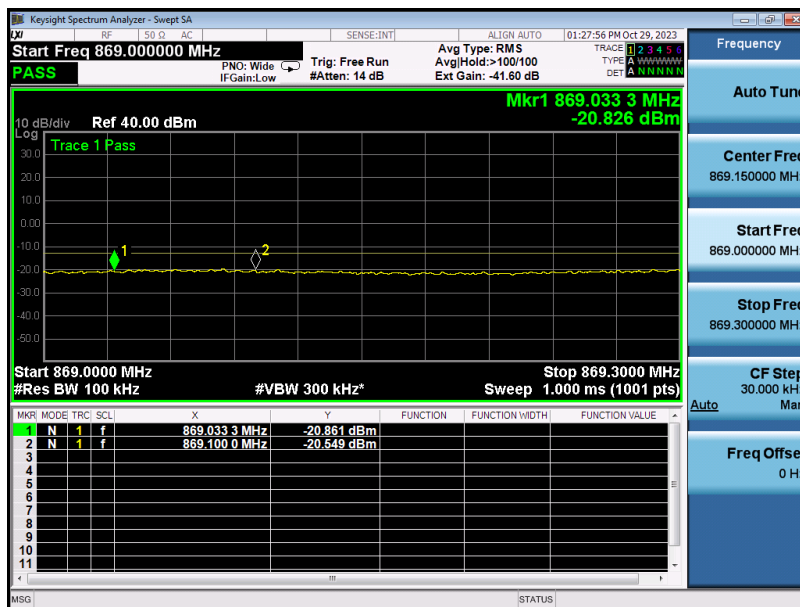


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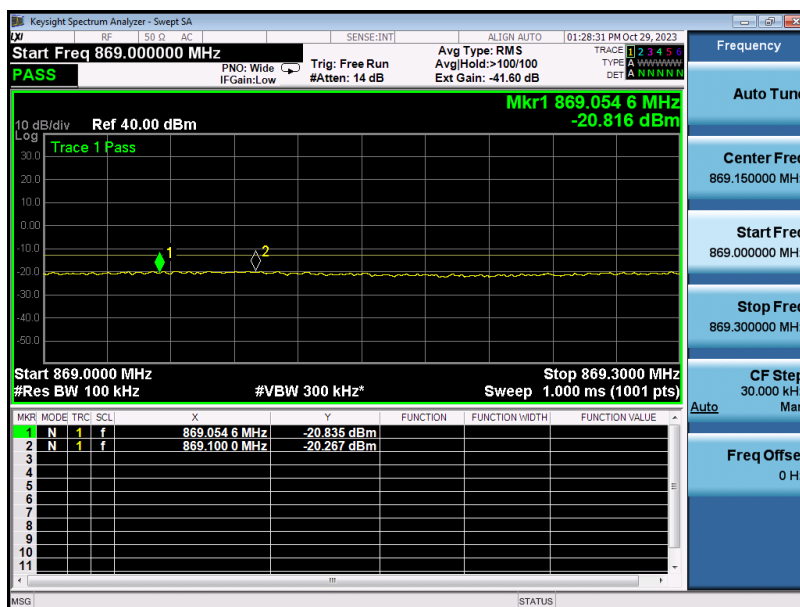
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Out-of-band/out-of-block emissions

DL_4.1MHz AWGN_HCH_a single test signal_Pre-AGC



DL_4.1MHz AWGN_HCH_a single test signal_3dB above AGC

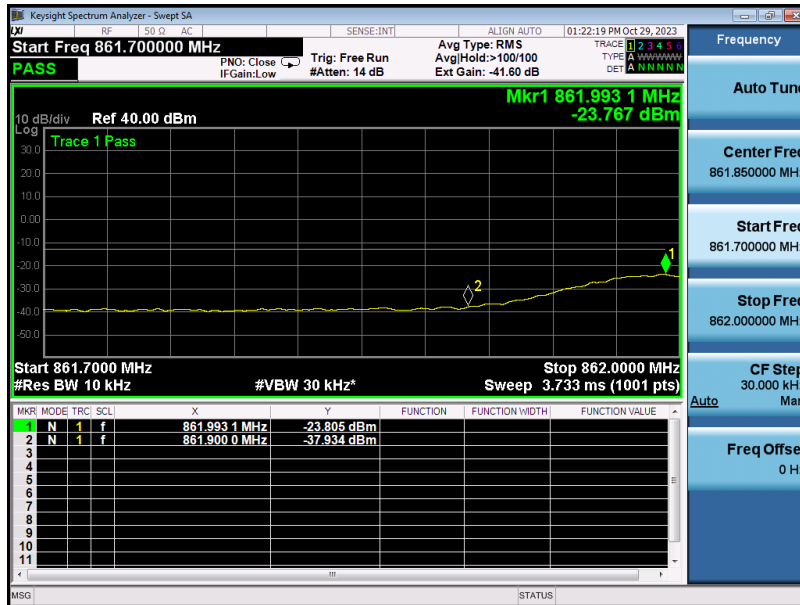


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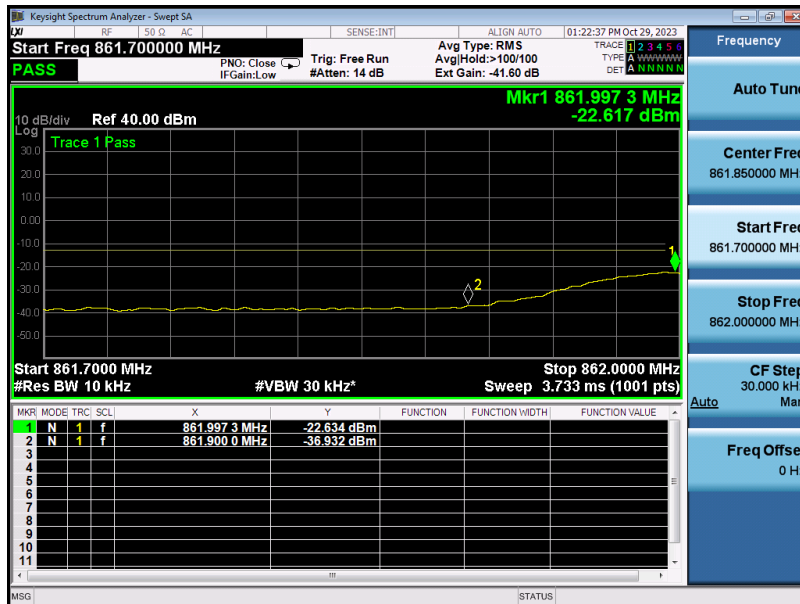
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Out-of-band/out-of-block emissions

DL_GSM_LCH_a single test signal_Pre-AGC



DL_GSM_LCH_a single test signal_3dB above AGC

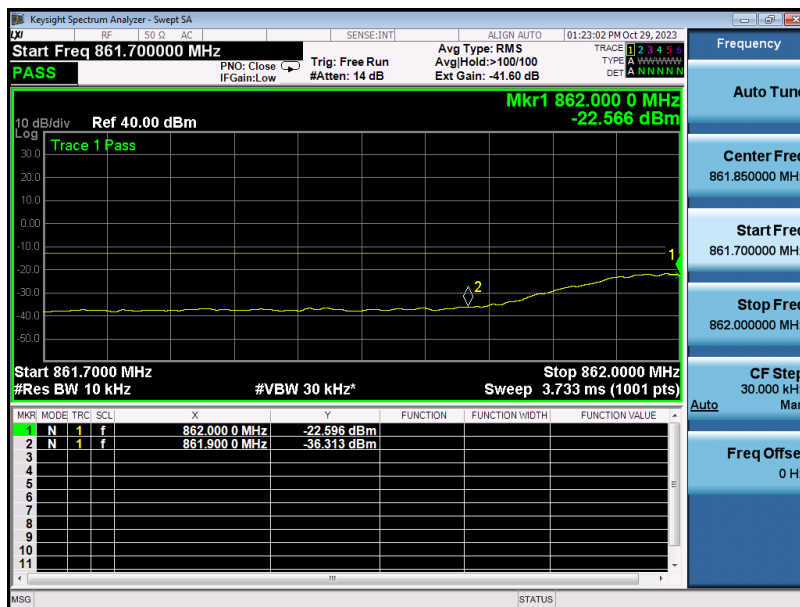


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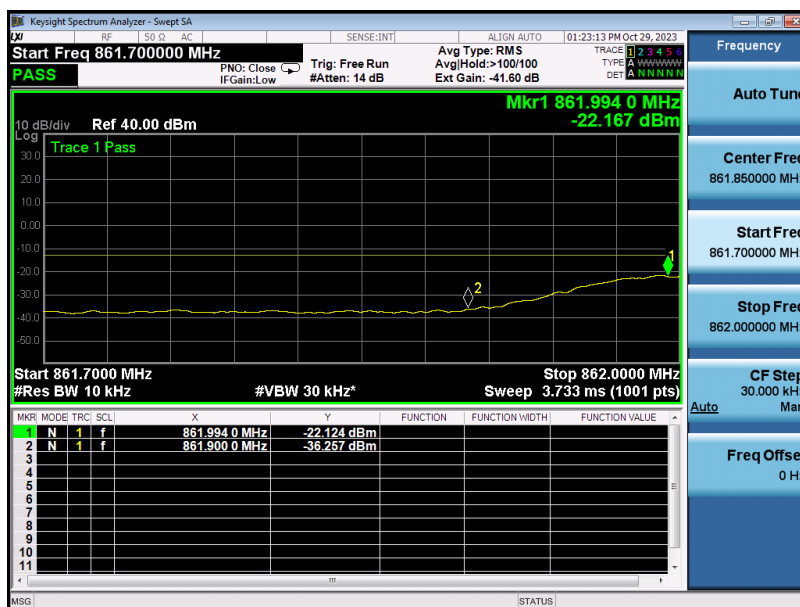
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Out-of-band/out-of-block emissions

DL_GSM_LCH_two adjacent test signals_Pre-AGC



DL_GSM_LCH_two adjacent test signals_3dB above AGC



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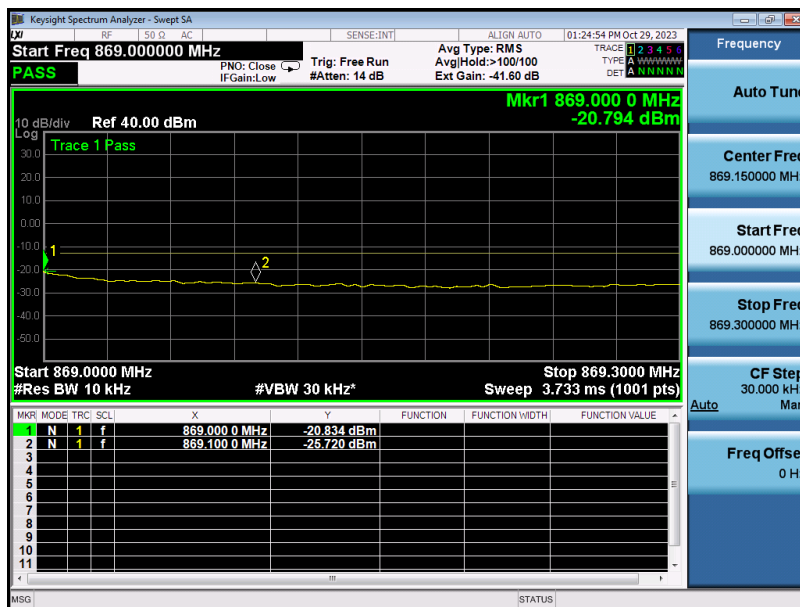
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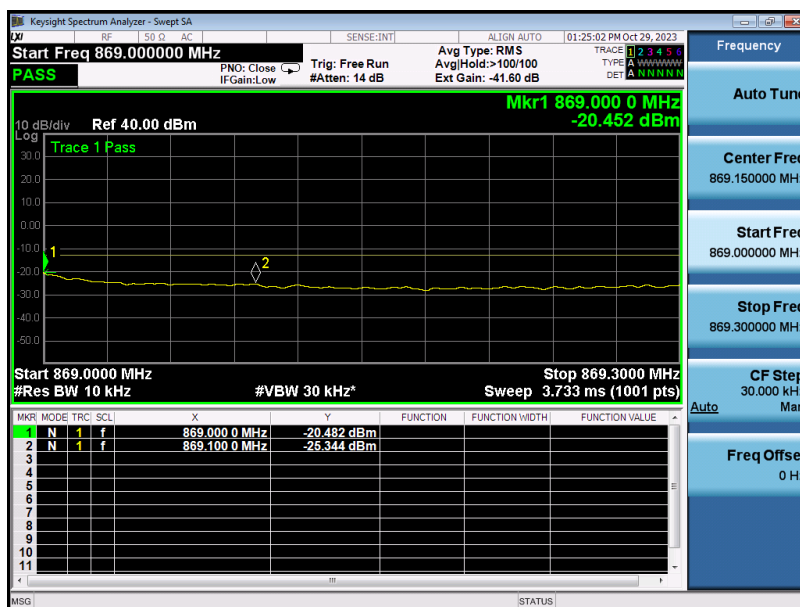
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Out-of-band/out-of-block emissions

DL_GSM_HCH_a single test signal_Pre-AGC



DL_GSM_HCH_a single test signal_3dB above AGC

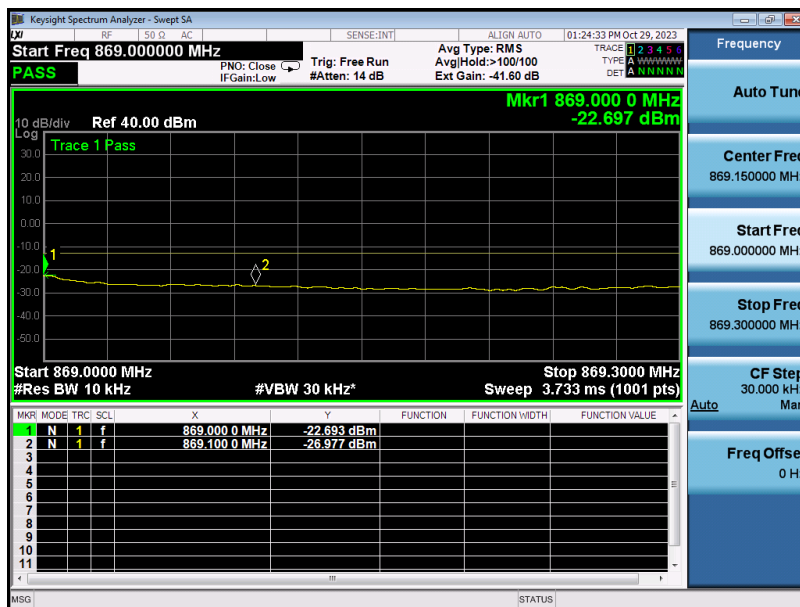


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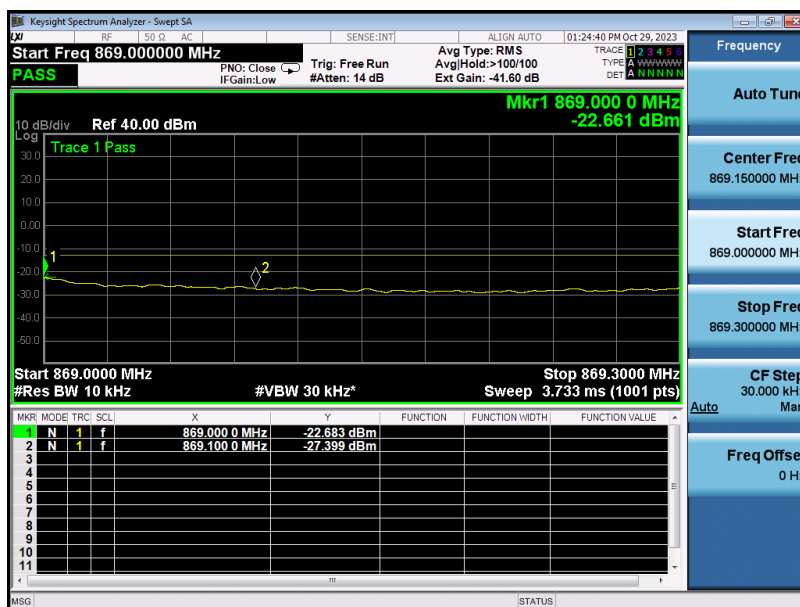
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Out-of-band/out-of-block emissions

DL_GSM_HCH_two adjacent test signals_Pre-AGC



DL_GSM_HCH_two adjacent test signals_3dB above AGC

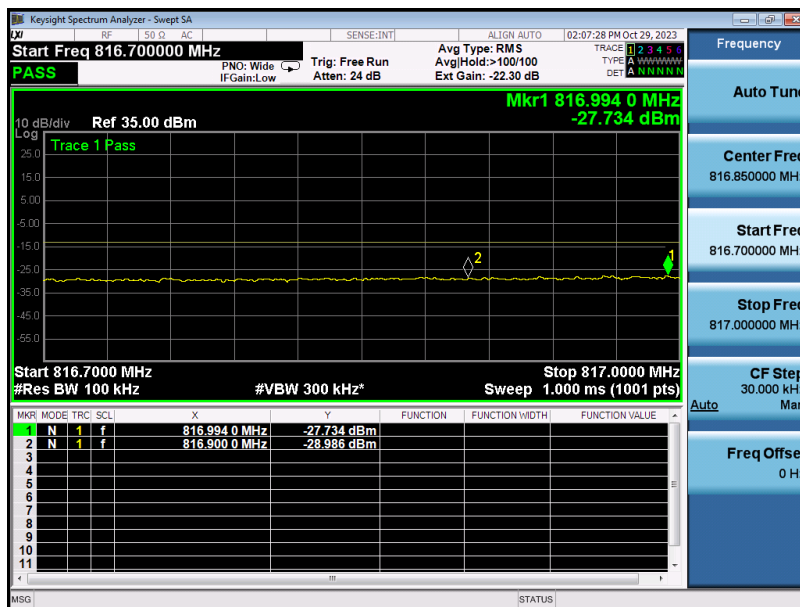


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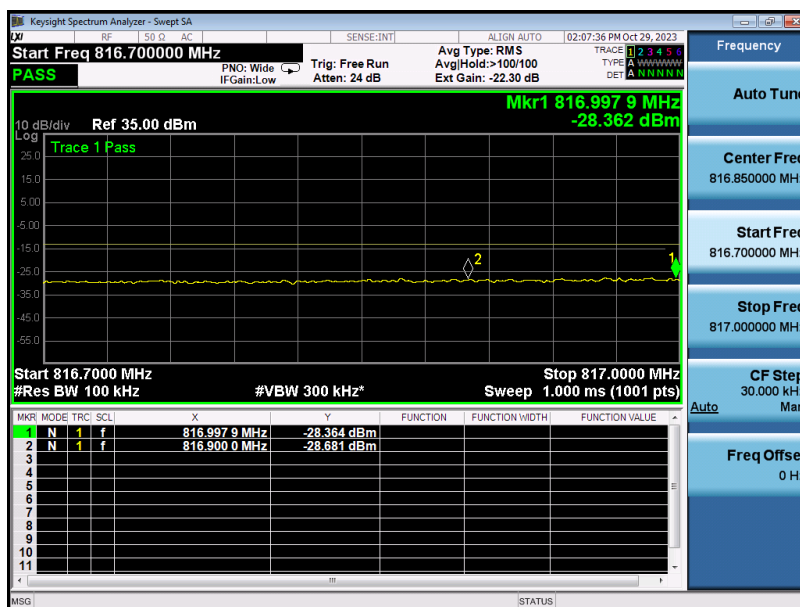
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Out-of-band/out-of-block emissions

UL_4.1MHz AWGN_LCH_a single test signal_Pre-AGC



UL_4.1MHz AWGN_LCH_a single test signal_3dB above AGC

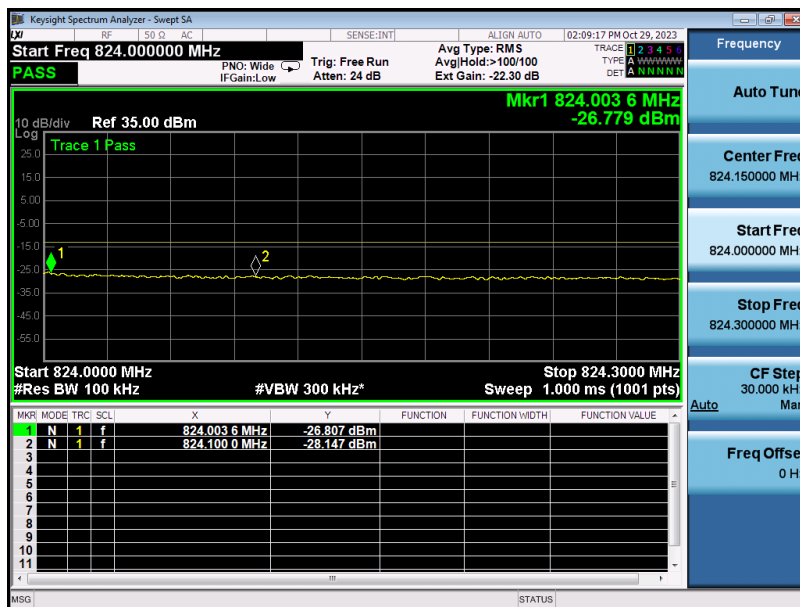


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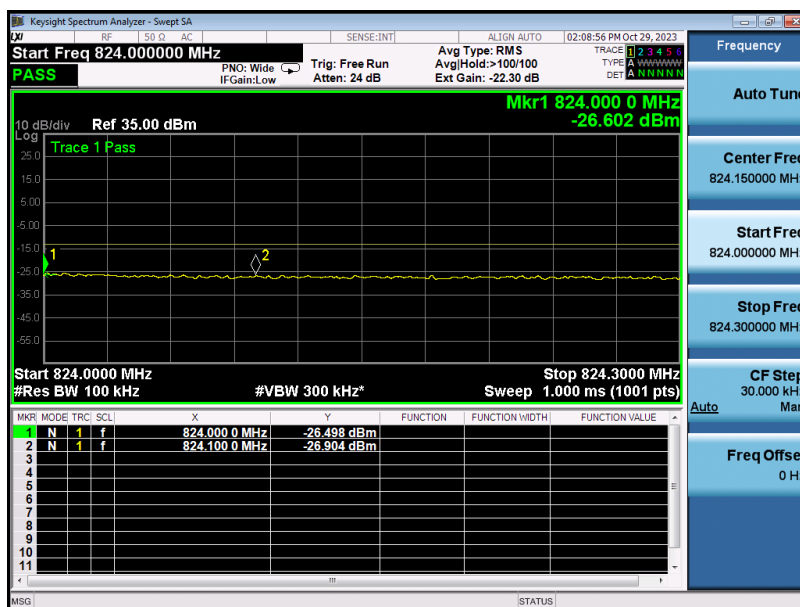
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Out-of-band/out-of-block emissions

UL_4.1MHz AWGN_HCH_a single test signal_Pre-AGC



UL_4.1MHz AWGN_HCH_a single test signal_3dB above AGC

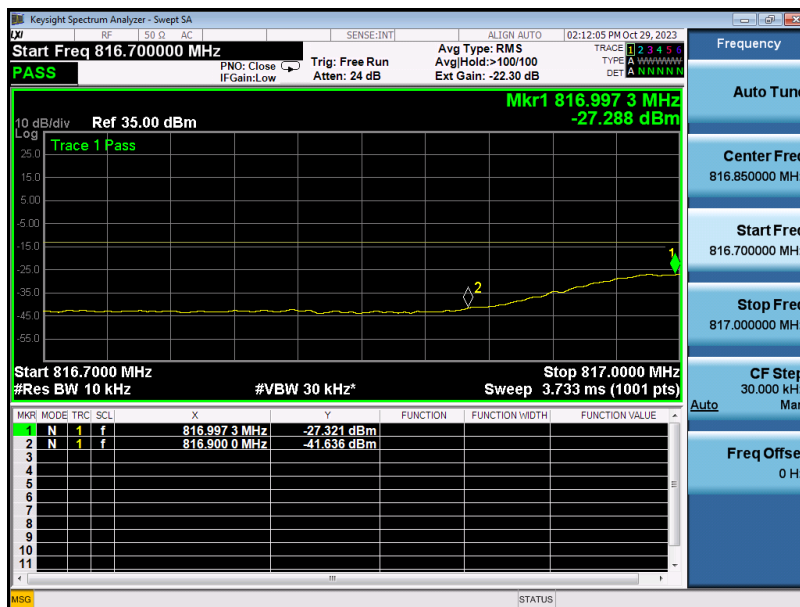


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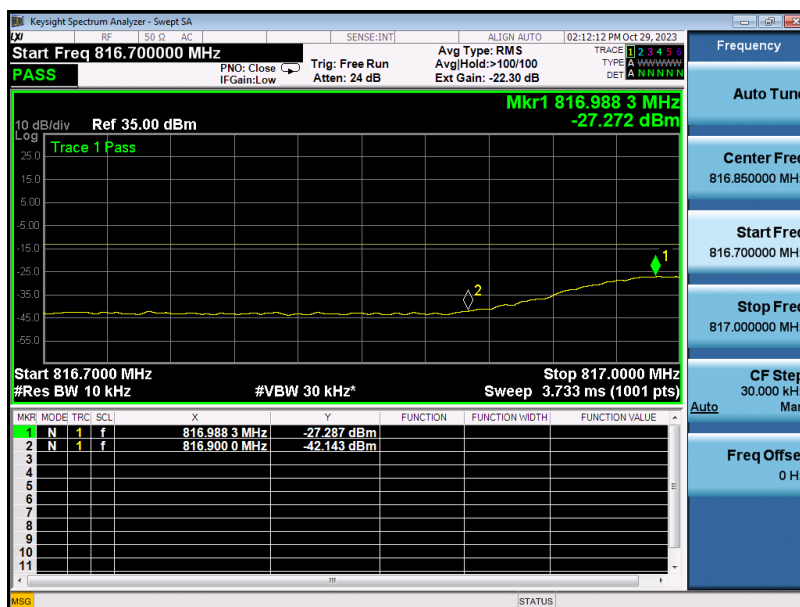
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Out-of-band/out-of-block emissions

UL_GSM_LCH_a single test signal_Pre-AGC



UL_GSM_LCH_a single test signal_3dB above AGC

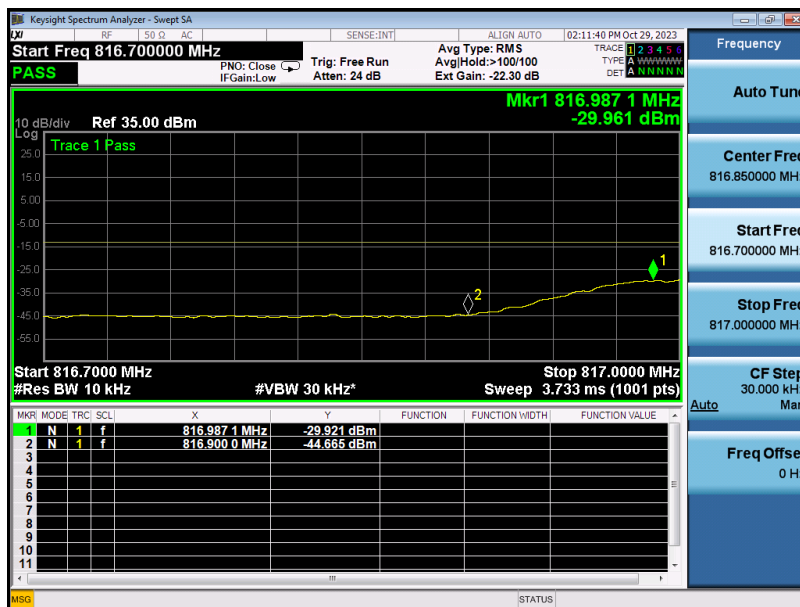


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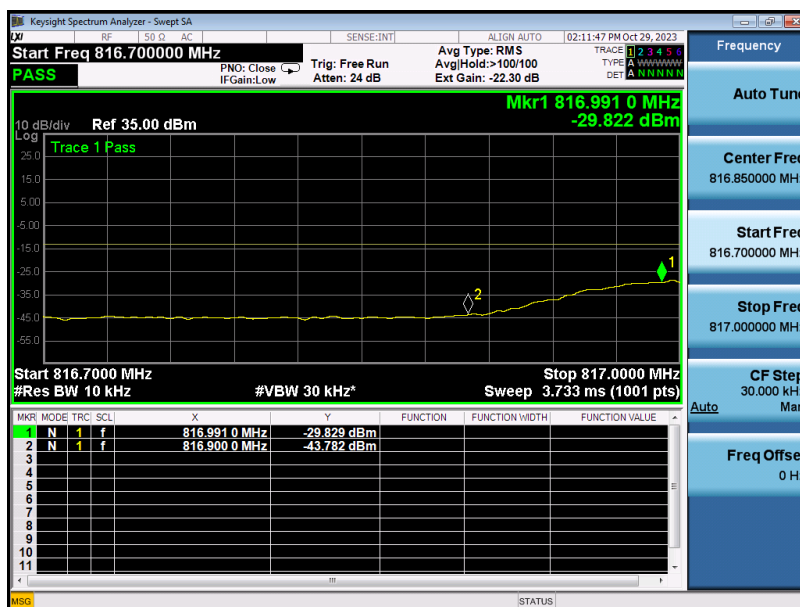
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Out-of-band/out-of-block emissions

UL_GSM_LCH_two adjacent test signals_Pre-AGC



UL_GSM_LCH_two adjacent test signals_3dB above AGC

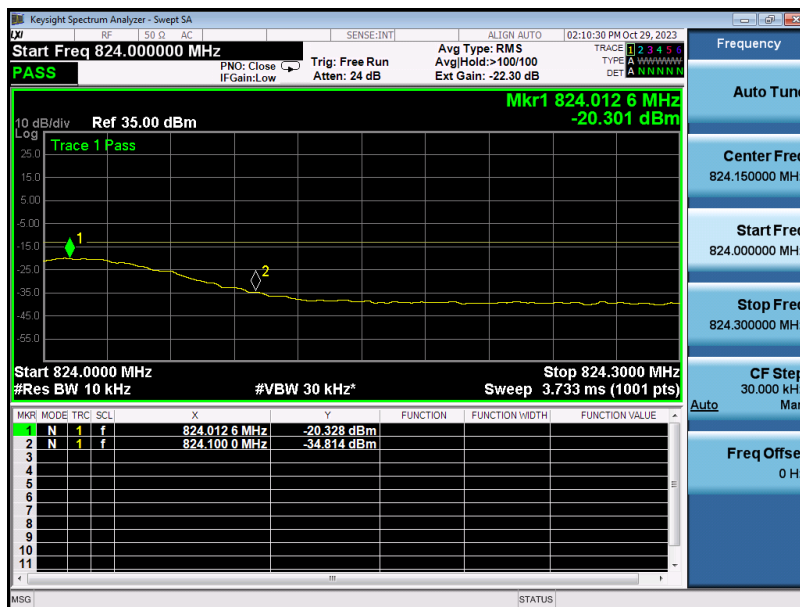


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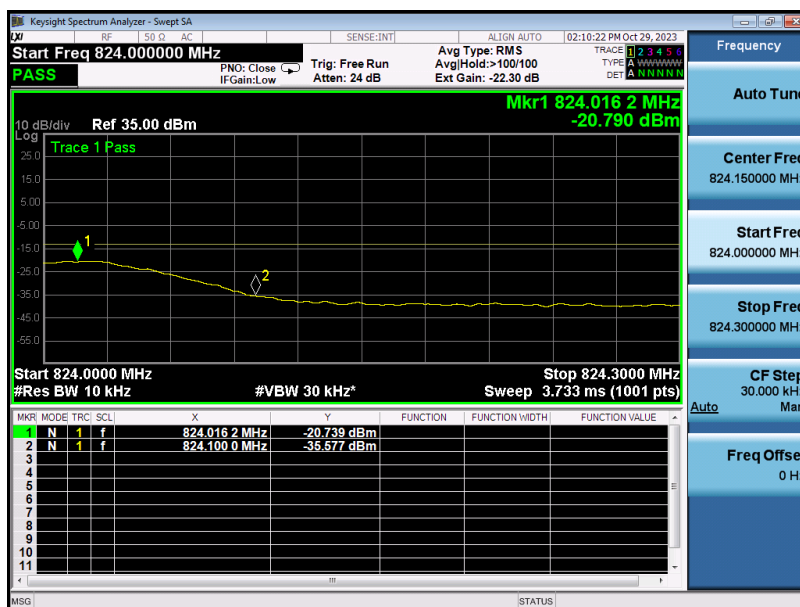
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Out-of-band/out-of-block emissions

UL_GSM_HCH_a single test signal_Pre-AGC



UL_GSM_HCH_a single test signal_3dB above AGC

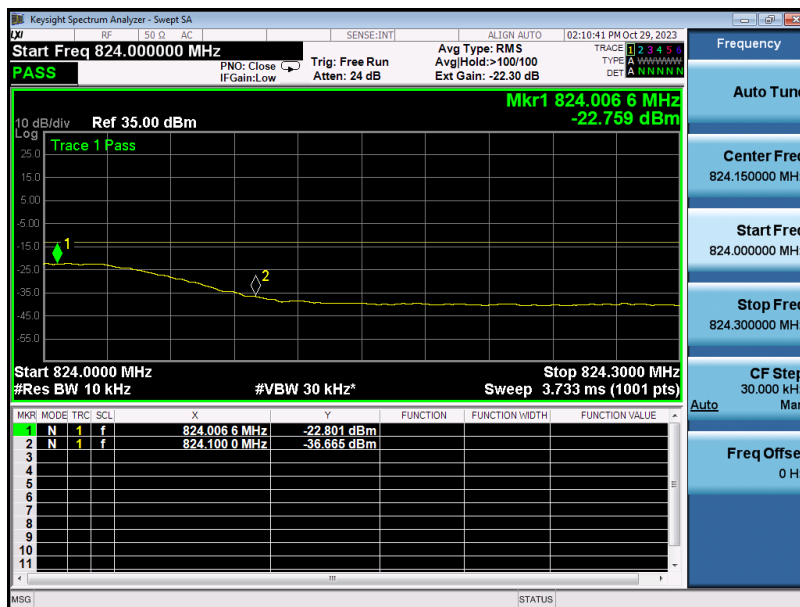


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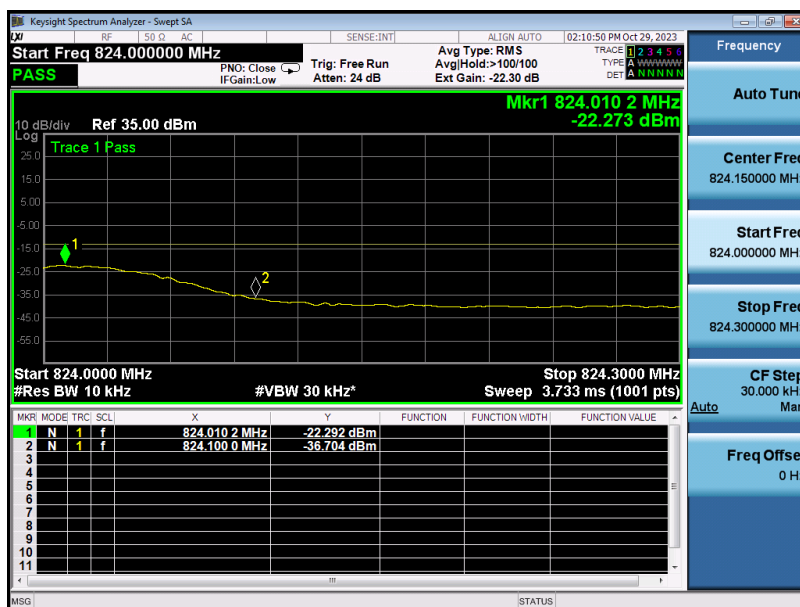
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Out-of-band/out-of-block emissions

UL_GSM_HCH_two adjacent test signals_Pre-AGC



UL_GSM_HCH_two adjacent test signals_3dB above AGC



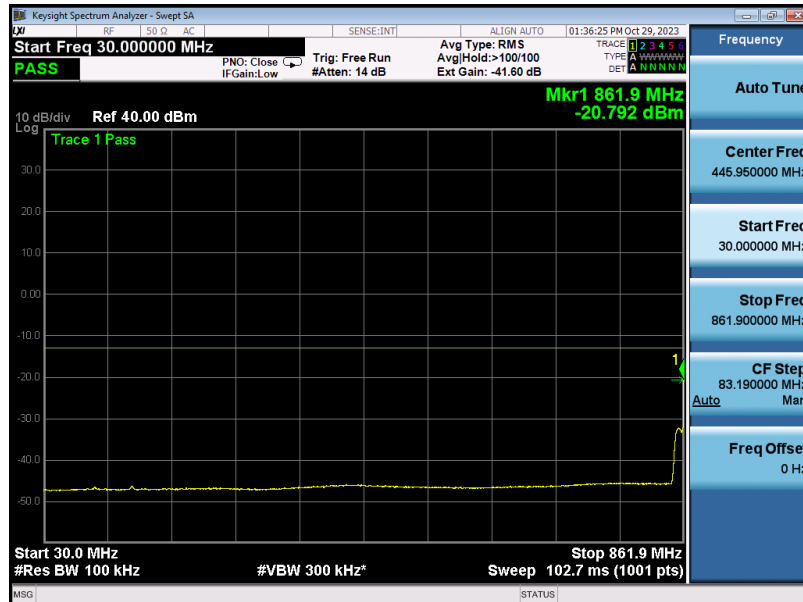
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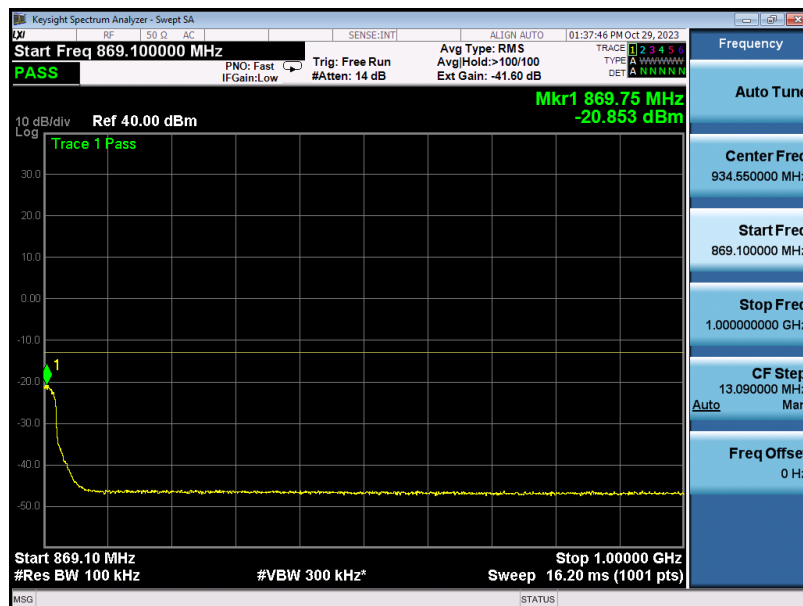
5 Conducted Spurious emissions

Conducted spurious emissions

DL_4.1MHz AWGN_LCH_Pre-AGC



DL_4.1MHz AWGN_HCH_Pre-AGC

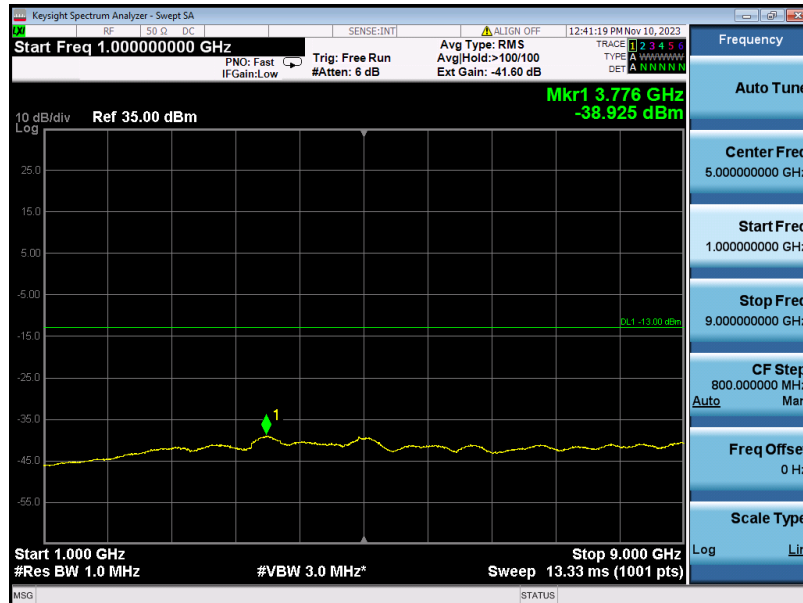


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Conducted spurious emissions

DL_4.1MHz AWGN_HCH_Pre-AGC



UL_4.1MHz AWGN_LCH_Pre-AGC

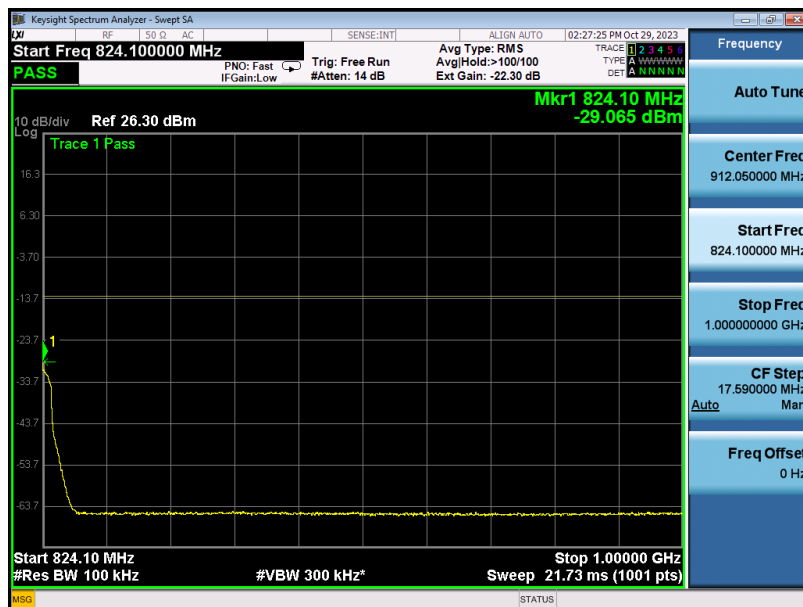


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Conducted spurious emissions

UL_4.1MHz AWGN_HCH_Pre-AGC



UL_4.1MHz AWGN_HCH_Pre-AGC



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Remark:

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.

For LTE and GSM-TDMA signals, f is greater than 200kHz and exceeds the range 12.5kHz~37.5kHz. Therefore, above limit is not applicable.

2. 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.

For DL, $P = 40\text{dBm} = 10\text{W}$

The limit = $40\text{dBm} - [43 + 10 \log_{10}(10\text{W})]$ dB = -13dBm

For UL, $P = 27\text{dBm} = 0.5\text{W}$

The limit = $27\text{dBm} - [43 + 10 \log_{10}(0.5\text{W})]$ dB = -13dBm

3. The spurious emissions 9kHz to 30MHz were very low and not displayed in this report.

4. All modes (LCH/MCH/HCH, with GSM signal/ with 4.1MHz AWGN signal) had been tested, only show the worst-case in this report.



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EMC-ARF-05 Rev 1.1

Page: 31 of 35

6 Frequency Stability

Frequency stability vs voltage							
Test path	Test Freq. (MHz)	Test Signal	Temperature	Voltage	Freq. error (Hz)	Tolerance (ppm)	Verdict
DL	865.5	4.1MHz AWGN	TN	VL	27	0.0312	PASS
			TN	VH	31	0.0358	PASS
		GSM	TN	VL	18	0.0208	PASS
			TN	VH	21	0.0243	PASS
DL	820.5	4.1MHz AWGN	TN	VL	35	0.0427	PASS
			TN	VH	38	0.0463	PASS
		GSM	TN	VL	24	0.0293	PASS
			TN	VH	20	0.0244	PASS



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Frequency stability vs temperature							
Test Path	Test Freq. (MHz)	Test Signal	Voltage	Temperature (°C)	Freq. error (Hz)	Tolerance (ppm)	Verdict
DL	865.5	4.1MHz AWGN	VN	+50	32	0.0370	PASS
			VN	+40	28	0.0324	PASS
			VN	+30	33	0.0381	PASS
			VN	+20	25	0.0289	PASS
			VN	+10	20	0.0231	PASS
			VN	0	19	0.0220	PASS
			VN	-10	24	0.0277	PASS
			VN	-20	21	0.0243	PASS
			VN	-30	27	0.0312	PASS
	865.5	GSM	VN	+50	33	0.0381	PASS
			VN	+40	28	0.0324	PASS
			VN	+30	25	0.0289	PASS
			VN	+20	28	0.0324	PASS
			VN	+10	30	0.0347	PASS
			VN	0	21	0.0243	PASS
			VN	-10	22	0.0254	PASS
			VN	-20	27	0.0312	PASS
			VN	-30	21	0.0243	PASS



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Guangzhou Branch Test Center EEC Laboratory

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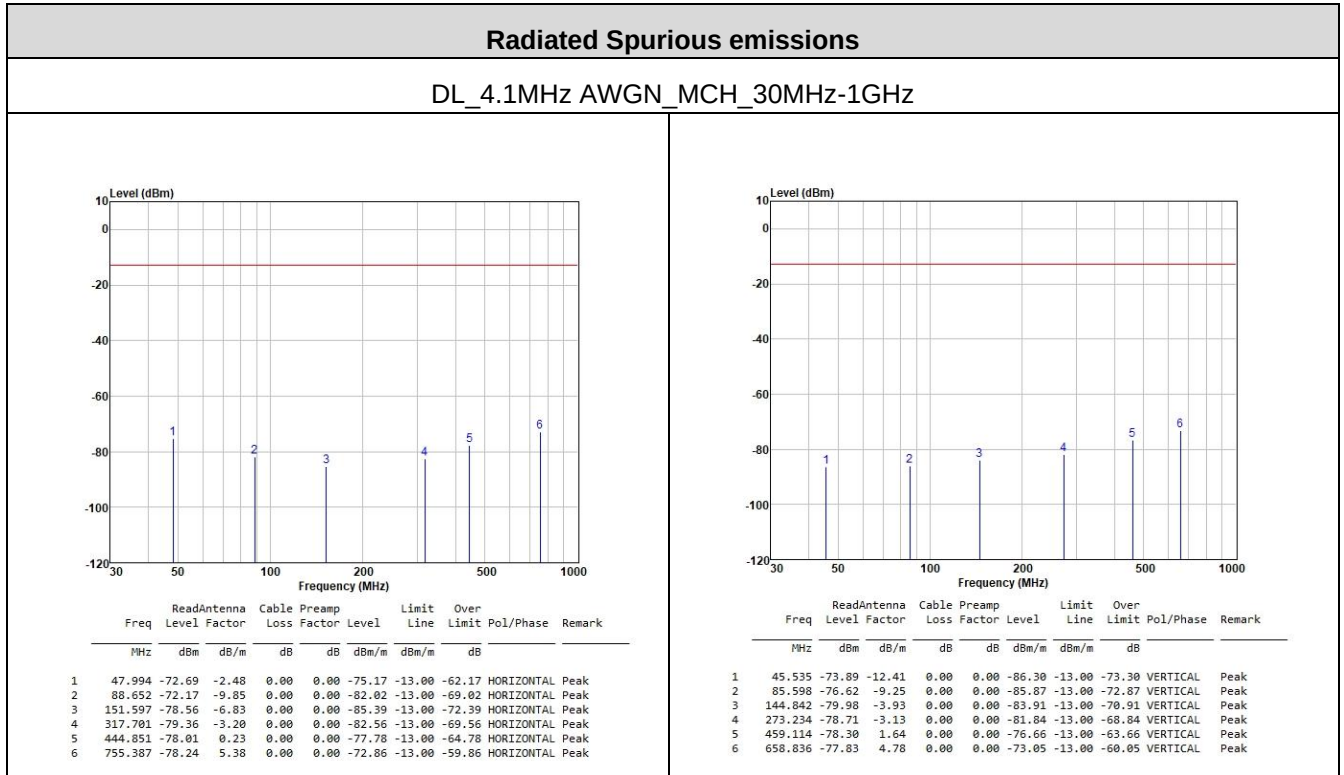
Frequency stability vs temperature							
Test Path	Test Freq. (MHz)	Test Signal	Voltage	Temperature (°C)	Freq. error (Hz)	Tolerance (ppm)	Verdict
UL	820.5	4.1MHz AWGN	VN	+50	39	0.0475	PASS
			VN	+40	33	0.0402	PASS
			VN	+30	37	0.0451	PASS
			VN	+20	27	0.0329	PASS
			VN	+10	21	0.0256	PASS
			VN	0	24	0.0293	PASS
			VN	-10	20	0.0244	PASS
			VN	-20	31	0.0378	PASS
			VN	-30	28	0.0341	PASS
	820.5	GSM	VN	+50	30	0.0366	PASS
			VN	+40	24	0.0293	PASS
			VN	+30	21	0.0256	PASS
			VN	+20	27	0.0329	PASS
			VN	+10	20	0.0244	PASS
			VN	0	17	0.0207	PASS
			VN	-10	15	0.0183	PASS
			VN	-20	11	0.0134	PASS
			VN	-30	16	0.0195	PASS



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7 Radiated Spurious emissions

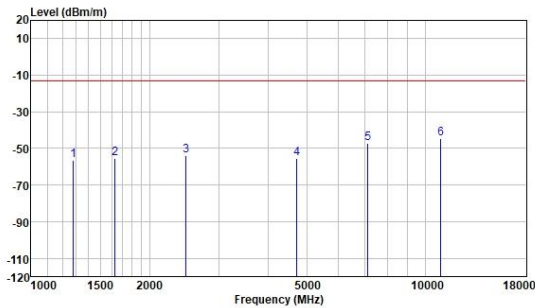


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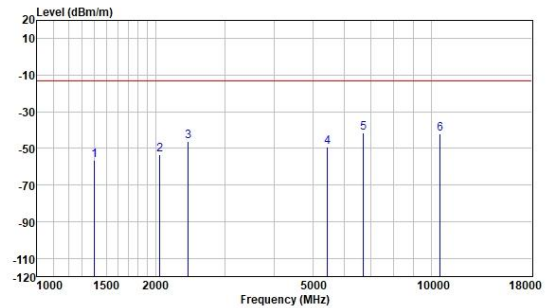
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Radiated Spurious emissions

DL_4.1MHz AWGN_MCH_above 1GHz



	Freq	Read Level	Correction Factor	Level	Limit	Over Limit	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	1282.19	-60.56	4.10	-56.46	-13.00	-43.46	HORIZONTAL
2	1634.54	-61.22	5.56	-55.66	-13.00	-42.66	HORIZONTAL
3	2471.16	-62.82	9.03	-53.79	-13.00	-40.79	HORIZONTAL
4	4721.52	-63.32	7.89	-55.43	-13.00	-42.43	HORIZONTAL
5	7138.14	-66.23	18.84	-47.39	-13.00	-34.39	HORIZONTAL
6	10917.18	-68.74	24.03	-44.71	-13.00	-31.71	HORIZONTAL



	Freq	Read Level	Correction Factor	Level	Limit	Over Limit	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	1398.34	-60.40	4.04	-56.36	-13.00	-43.36	VERTICAL
2	2047.90	-62.19	8.77	-53.42	-13.00	-40.42	VERTICAL
3	2414.67	-55.77	9.60	-46.17	-13.00	-33.17	VERTICAL
4	5455.63	-63.27	14.09	-49.18	-13.00	-36.18	VERTICAL
5	6717.76	-62.40	20.83	-41.57	-13.00	-28.57	VERTICAL
6	10514.58	-66.89	24.78	-42.11	-13.00	-29.11	VERTICAL

Remark: Pre-test was performed for all modes (DL/UL, LCH/MCH/HCH, with GSM signal/with 4.1MHz AWGN signals), the test result always keeps more than 20dB margin, the spurious emissions 9kHz to 30MHz were very low and not displayed in this report. Therefore, only show the worst-case in this report.

--End of Appendix--



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