

Appendix -

Test Data and Result for report

GZCR230600056702

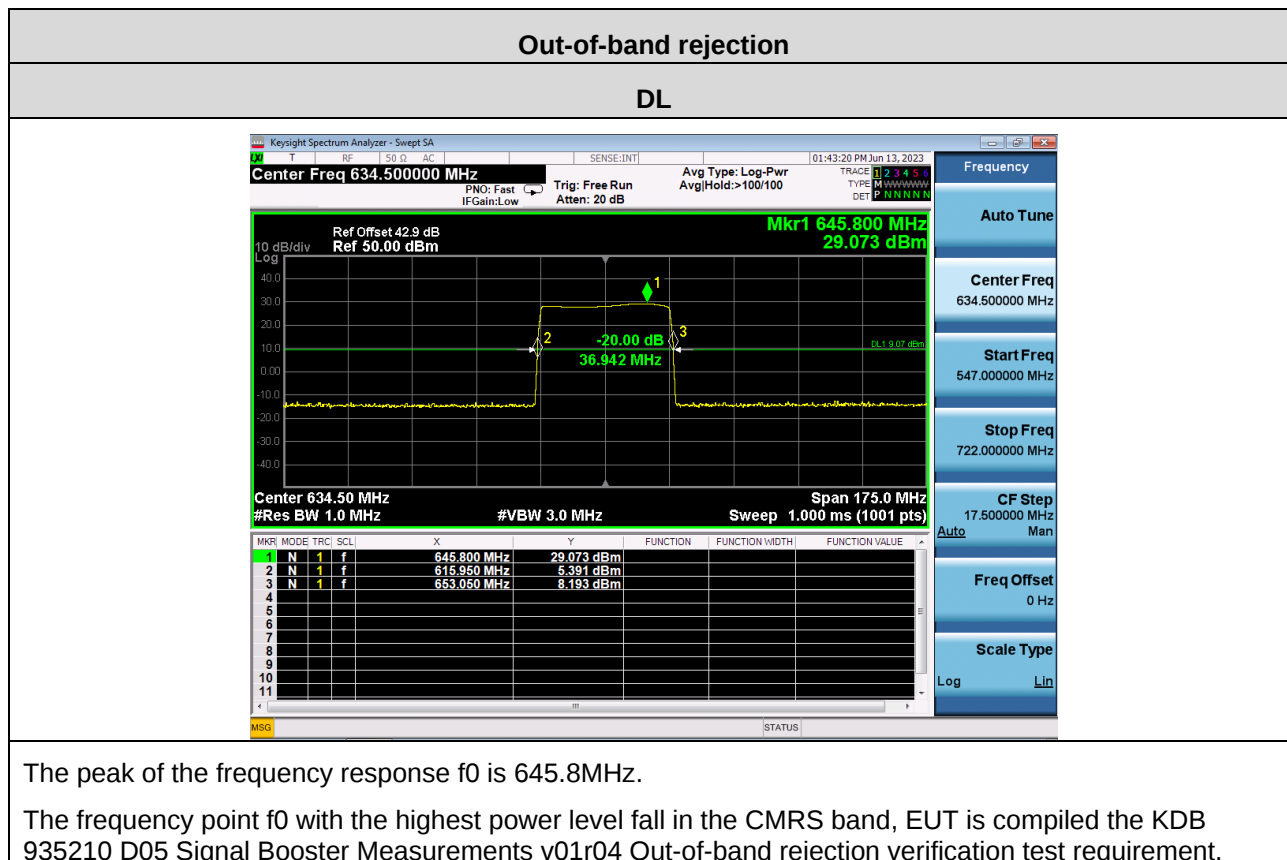
(For 600MHz Service Band DL)



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1 Out-of-band rejection



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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
	100MHz AWGN	MCH	Pre-AGC	PASS*
			3dB above AGC	PASS*
	GSM	MCH	Pre-AGC	PASS
			3dB above AGC	PASS

Remark:

- * The band supports maximum channel BW is 20MHz for NR, so the output signal OBW was less than the input when 100MHz AWGN as input signal.
- 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.

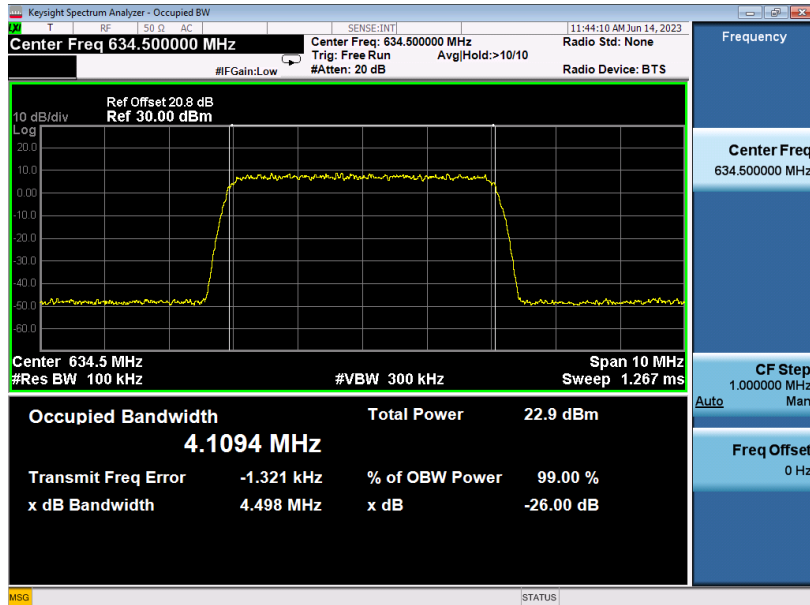


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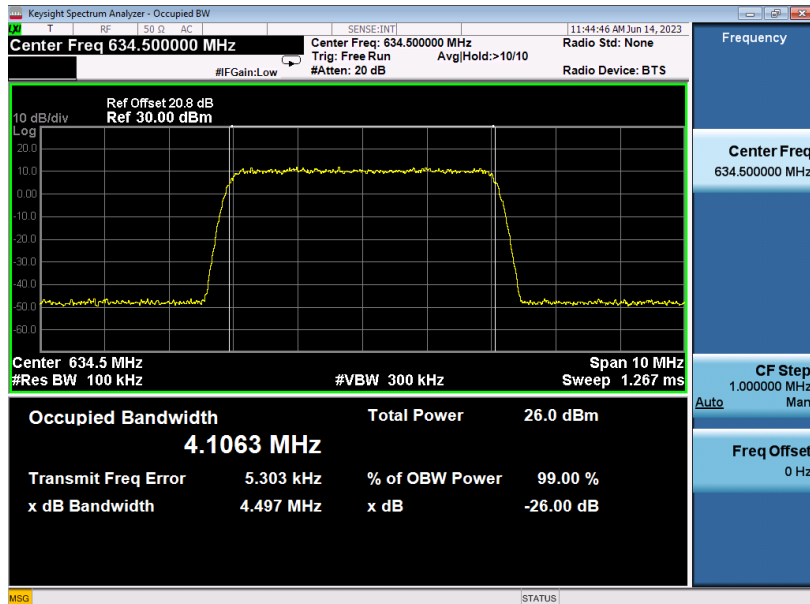
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99% OBW

DL_4.1MHz AWGN_MCH_Input_Pre-AGC



DL_4.1MHz AWGN_MCH_Input_3dB above AGC

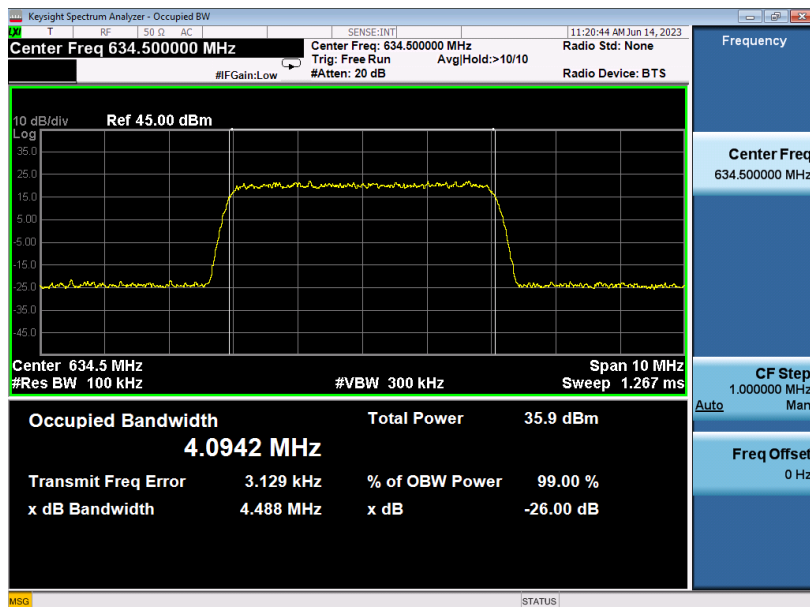


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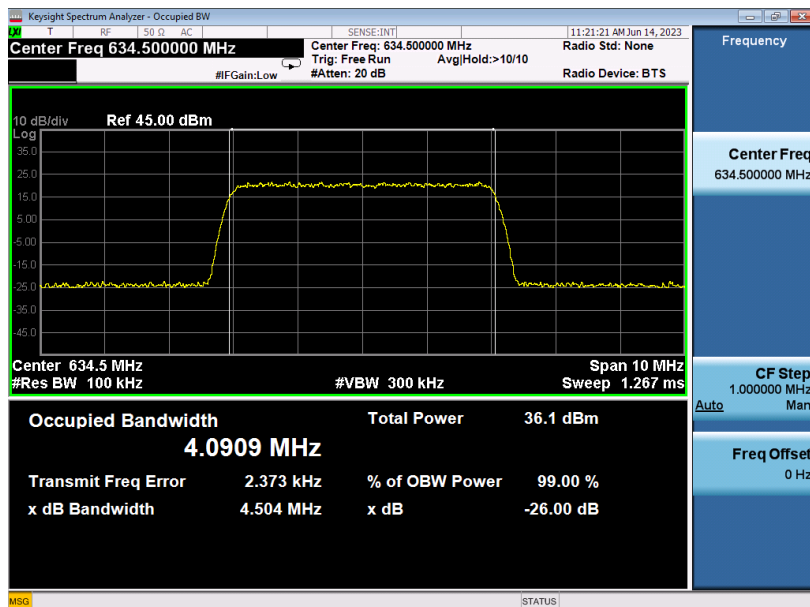
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99% OBW

DL_4.1MHz AWGN_MCH_Output_Pre-AGC



DL_4.1MHz AWGN_MCH_Output_3dB above AGC

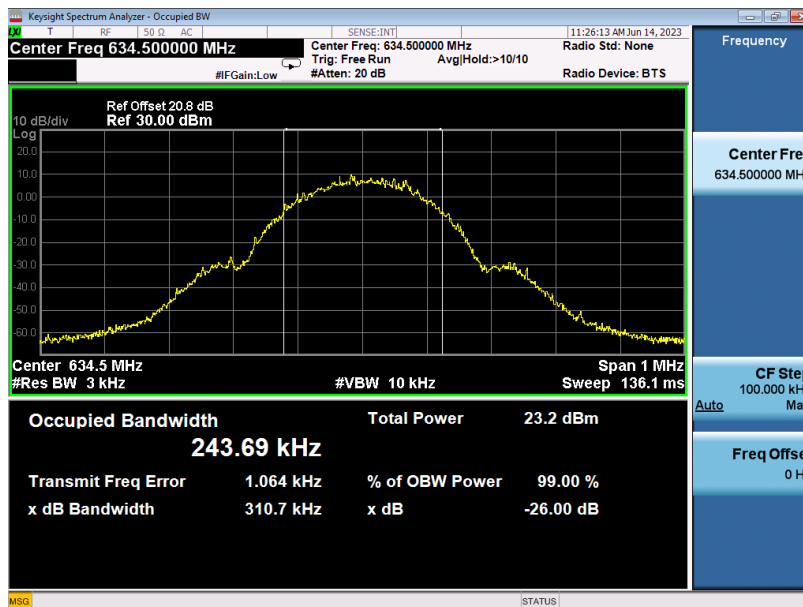


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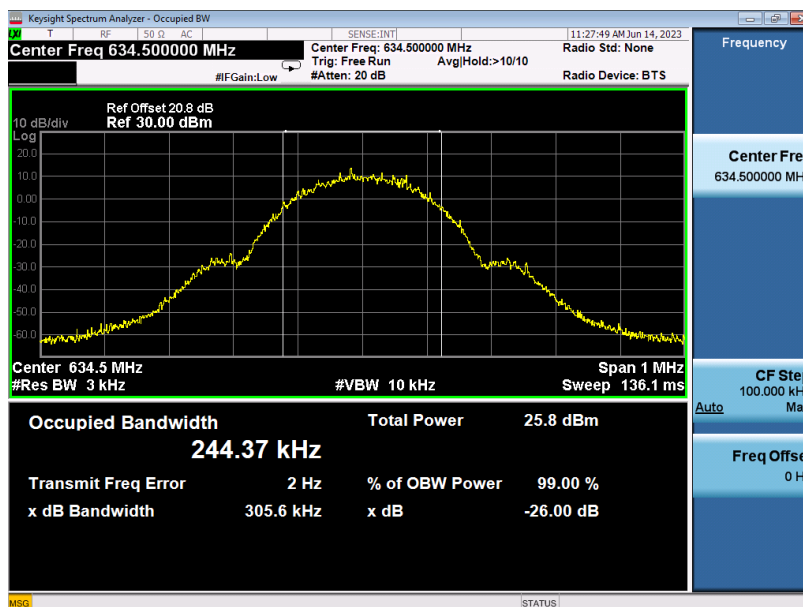
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99% OBW

DL_GSM_MCH_Input_Pre-AGC



DL_GSM_MCH_Input_3dB above AGC

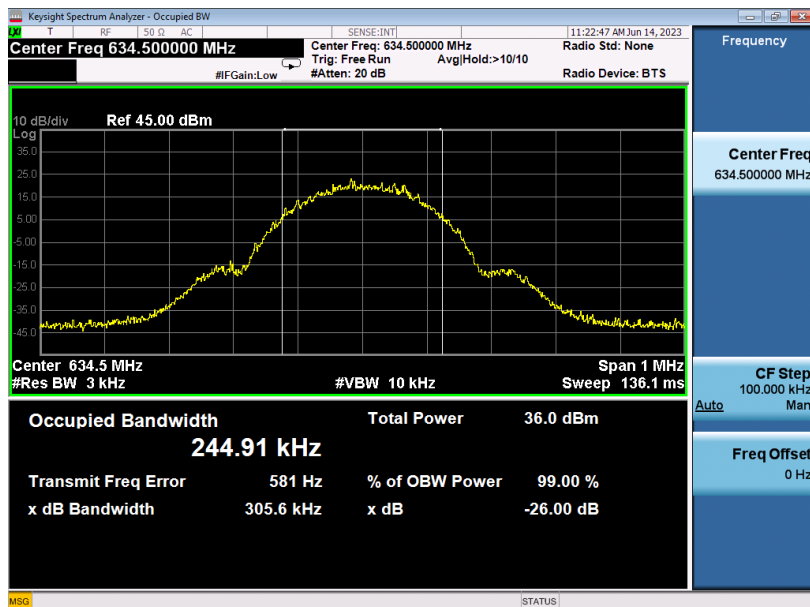


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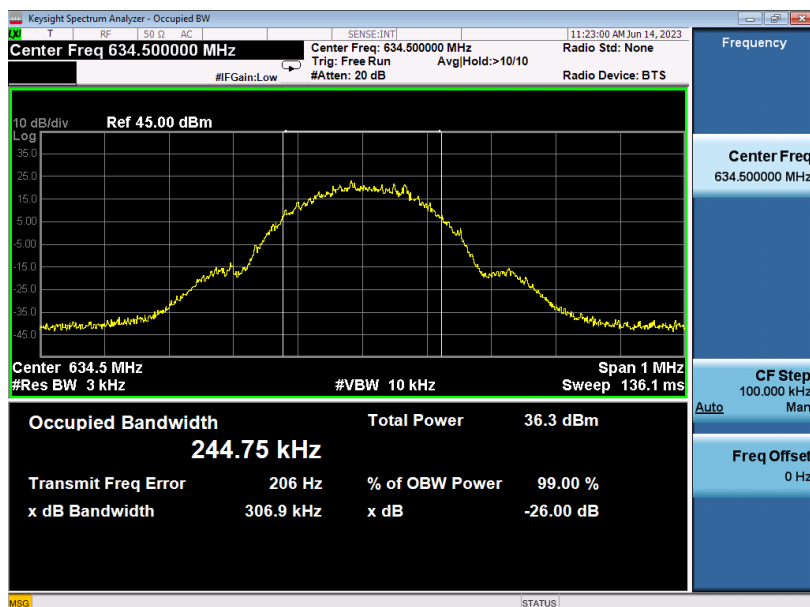
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99% OBW

DL_GSM_MCH_Output_Pre-AGC



DL_GSM_MCH_Output_3dB above AGC

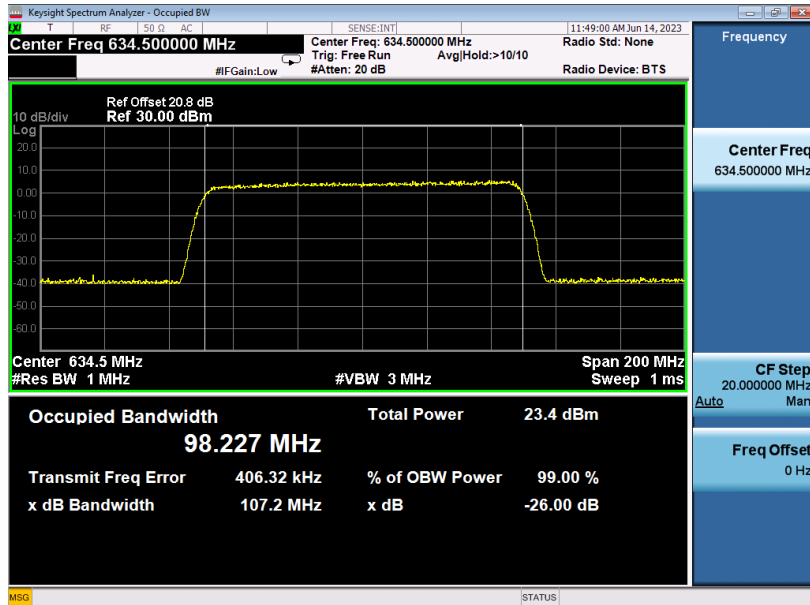


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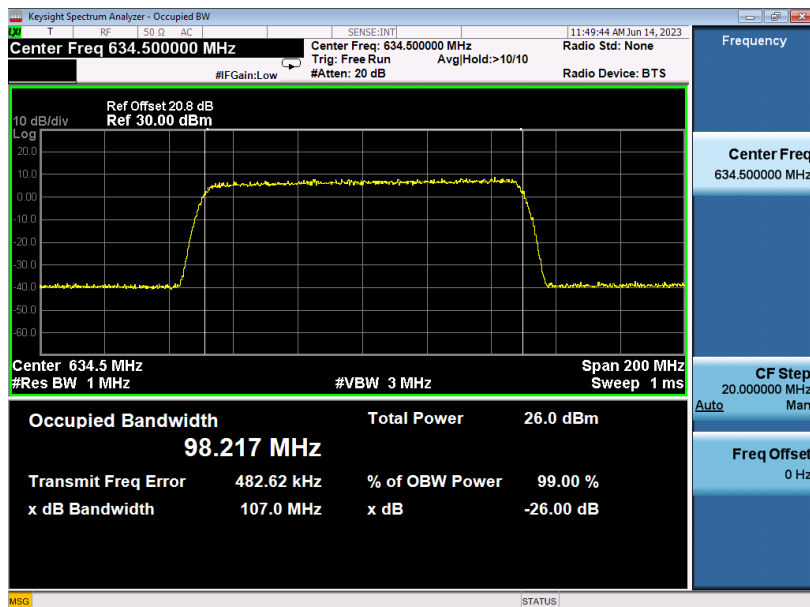
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99% OBW

DL_100MHz AWGN_MCH_Input_Pre-AGC



DL_100MHz AWGN_MCH_Input_3dB above AGC

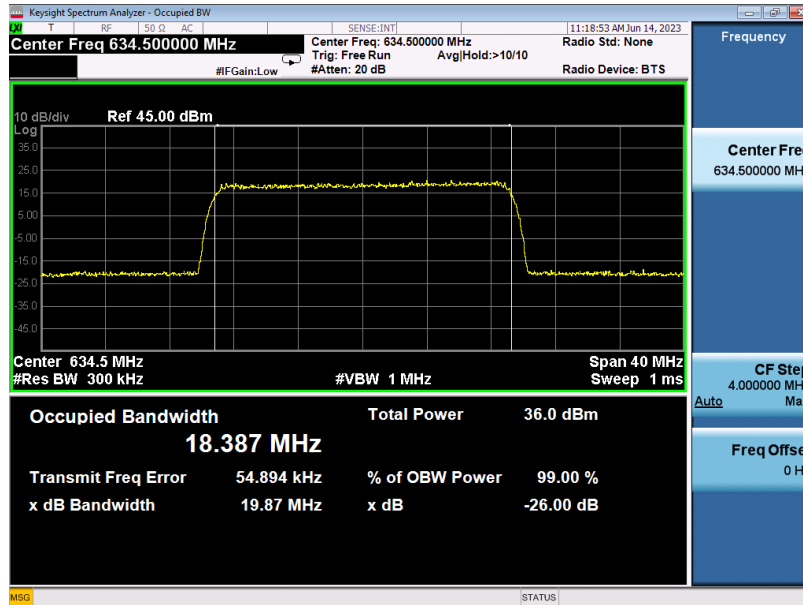


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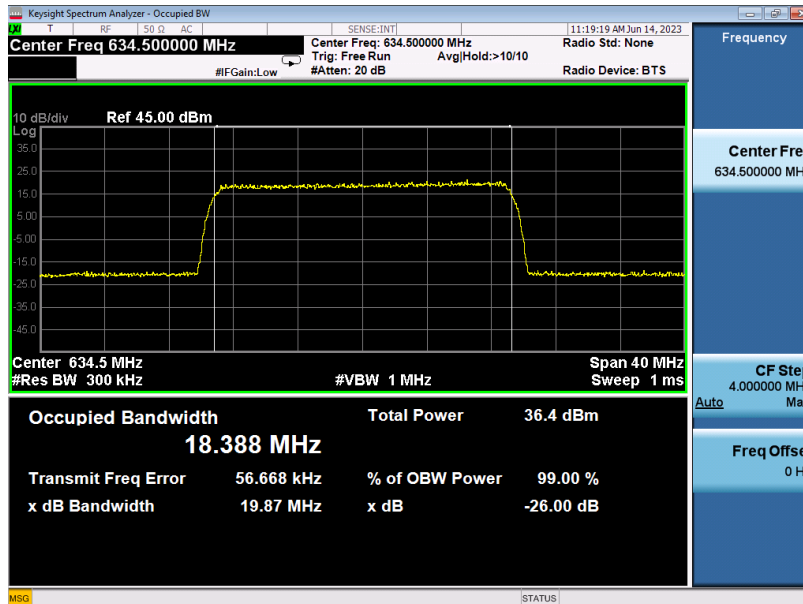
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99% OBW

DL_100MHz AWGN_MCH_Output_Pre-AGC



DL_100MHz AWGN_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)	SISO ERP (W)	Total ERP (W)	Gain (dB)
DL	645.8	4.1MHz AWGN	Pre-AGC	23.00	36.62	27.99	111.95	13.62
			3dB above AGC	26.00	36.33	26.19	104.72	/
		100MHz AWGN	Pre-AGC	18.00	31.66	8.94	35.73	13.66
			3dB above AGC	21.00	31.43	8.48	33.89	/
		GSM	Pre-AGC	23.00	35.59	22.09	88.31	12.59
			3dB above AGC	26.00	35.99	24.22	96.83	/
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, the directional gain = $G_{ANT} + 10 \log (N_{ANT})$ dBi = 13dBi. 3. The conducted test performed at ANT 1 port only due to the two MIMO ports with identical design(Hardware & software) and radio output.								

Mean output power							
Test Path	Test Freq. f0 (MHz)	Test Signal	Signal Level	Output Power (dBm/MHz)	SISO ERP (W/MHz)	Total ERP (W/MHz)	Verdict
DL	645.8	4.1MHz AWGN	Pre-AGC	30.52	6.88	27.48	PASS
			3dB above AGC	30.16	6.33	25.30	PASS
		100MHz AWGN	Pre-AGC	19.21	0.51	2.04	PASS
			3dB above AGC	19.05	0.49	1.96	PASS
		GSM	Pre-AGC	35.59	22.09	88.31	PASS
			3dB above AGC	35.99	24.22	96.83	PASS
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, the directional gain = $G_{ANT} + 10 \log (N_{ANT})$ dBi = 13dBi. 3. The output power is limited to an ERP of 1000W/MHz. 4. The conducted test performed at ANT 1 port only due to the two MIMO ports with identical design(Hardware & software) and radio output.							



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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	-27.52	≤-16	PASS
				3dB above AGC	-27.21		PASS
			Two signals input	Pre-AGC	-33.93		PASS
				3dB above AGC	-33.96		PASS
	HCH		One signal input	Pre-AGC	-29.36		PASS
				3dB above AGC	-29.26		PASS
			Two signals input	Pre-AGC	-33.94		PASS
				3dB above AGC	-34.20		PASS
DL	LCH	100MHz AWGN	One signal input	Pre-AGC	-19.88	≤-16	PASS
				3dB above AGC	-20.28		PASS
			Two signals input	Pre-AGC	-21.37		PASS
				3dB above AGC	-21.84		PASS
	HCH		One signal input	Pre-AGC	-19.27		PASS
				3dB above AGC	-18.95		PASS
			Two signals input	Pre-AGC	-20.59		PASS
				3dB above AGC	-21.13		PASS

Remark:

1. 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, here,

$$P = 36\text{dBm} = 3.98\text{W}$$

$$\text{the limit} = 36\text{dBm} - [43 + 10 \log_{10}(3.98\text{W})] \text{ dB} = -13\text{dBm}$$

2. For 2×2 MIMO, ANT1 port was measured and the limit was showed $-13\text{dBm} - 10\lg(2) = -16\text{dBm}$ to determine the test result conveniently.



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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	GSM	One signal input	Pre-AGC	-22.79	≤-16	PASS
				3dB above AGC	-23.66		PASS
			Two signals input	Pre-AGC	-26.66		PASS
				3dB above AGC	-25.37		PASS
	HCH		One signal input	Pre-AGC	-24.73		PASS
				3dB above AGC	-24.61		PASS
			Two signals input	Pre-AGC	-27.67		PASS
				3dB above AGC	-26.35		PASS
Remark: 1. 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 + 10log10 (P) dB, here, P = 36dBm = 3.98W the limit = 36dBm – [43 + 10 log10 (3.98W)] dB = -13dBm 2. For 2×2 MIMO, ANT1 port was measured and the limit was showed -13dBm- 10lg(2)= -16dBm to determine the test result conveniently.							

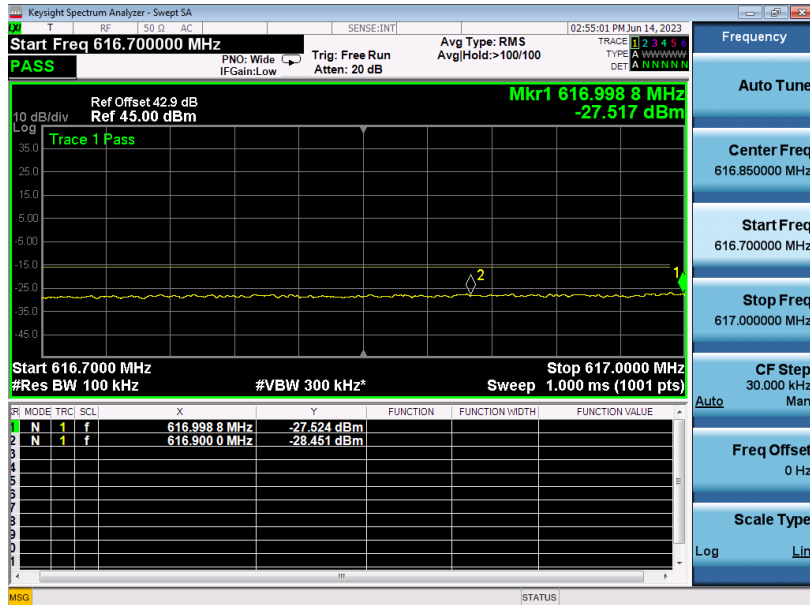


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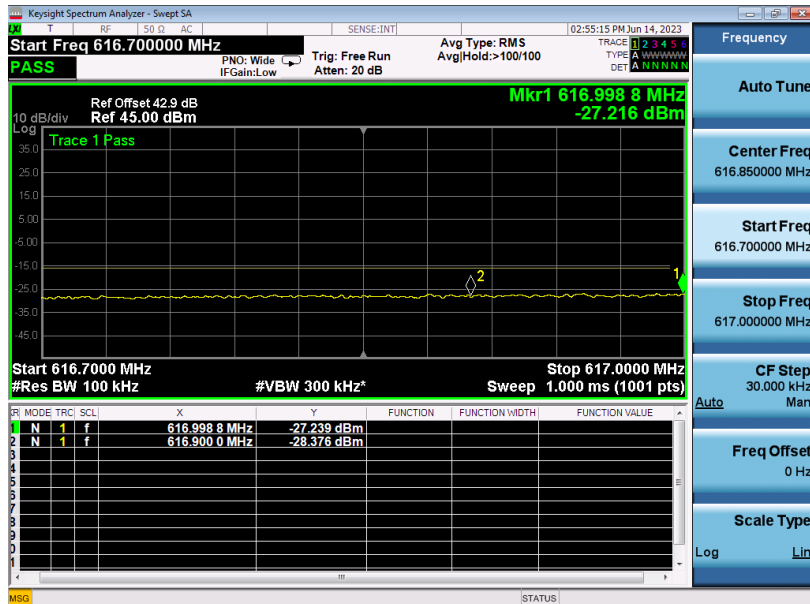
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Out-of-band/out-of-block emissions

DL_4.1MHz AWGN_LCH_a single test signal_Pre-AGC



DL_4.1MHz AWGN_LCH_a single test signal_3dB above AGC

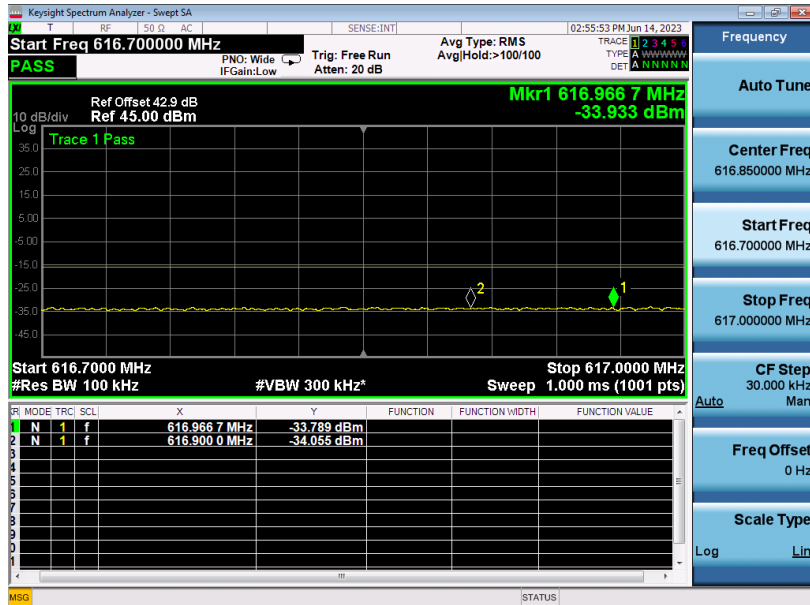


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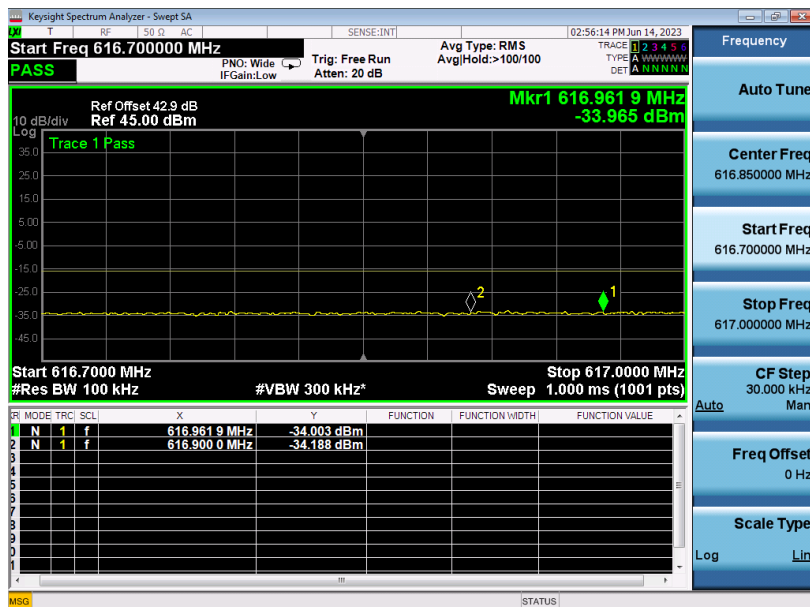
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Out-of-band/out-of-block emissions

DL_4.1MHz AWGN_LCH_two adjacent test signals_Pre-AGC



DL_4.1MHz AWGN_LCH_two adjacent test signals_3dB above AGC

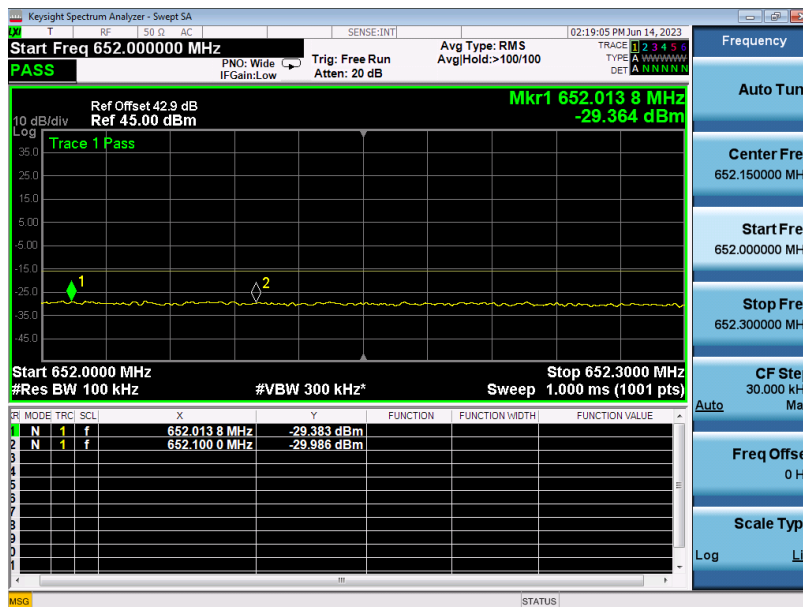


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Out-of-band/out-of-block emissions

DL_4.1MHz AWGN_HCH_a single test signal_Pre-AGC



DL_4.1MHz AWGN_HCH_a single test signal_3dB above AGC

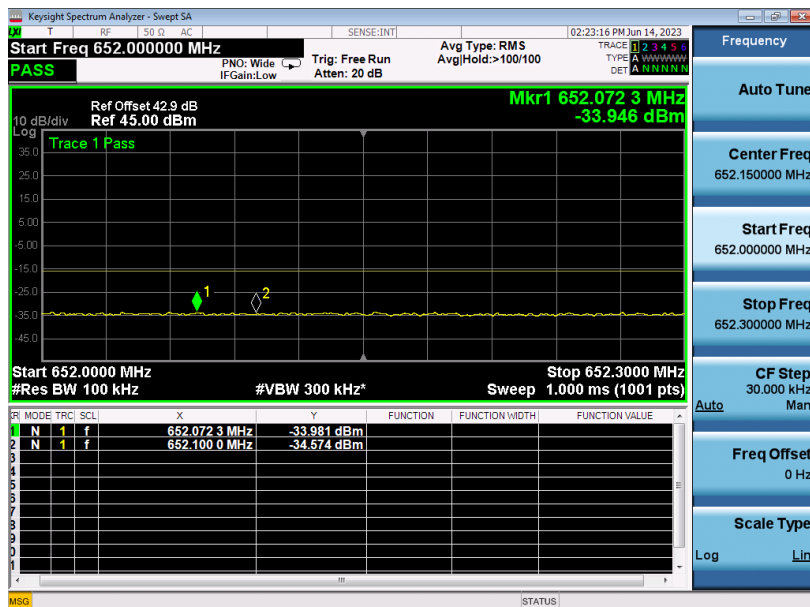


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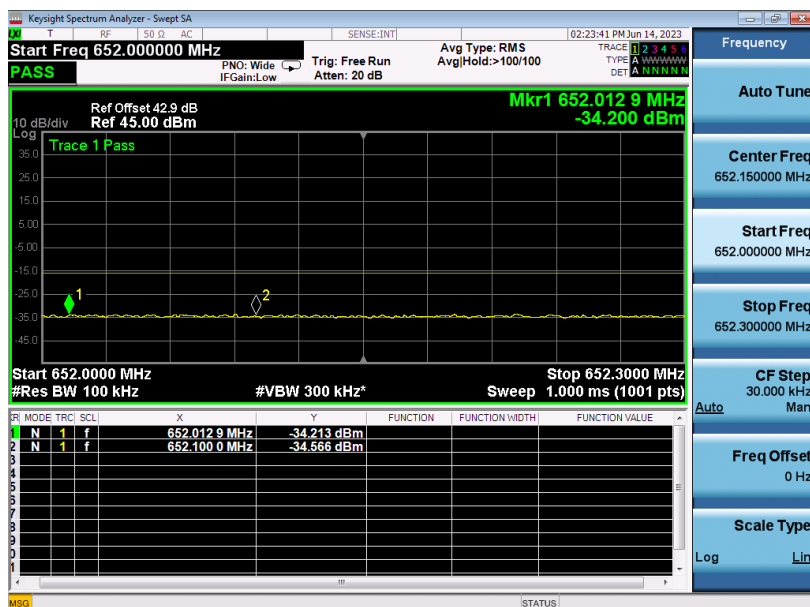
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Out-of-band/out-of-block emissions

DL_4.1MHz AWGN_HCH_two adjacent test signals_Pre-AGC



DL_4.1MHz AWGN_HCH_two adjacent test signals_3dB above AGC



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

DL_100MHz AWGN_LCH_a single test signal_Pre-AGC



DL_100MHz AWGN_LCH_a single test signal_3dB above AGC



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

DL_100MHz AWGN_LCH_two adjacent test signals_Pre-AGC



DL_100MHz AWGN_LCH_two adjacent test signals_3dB above AGC

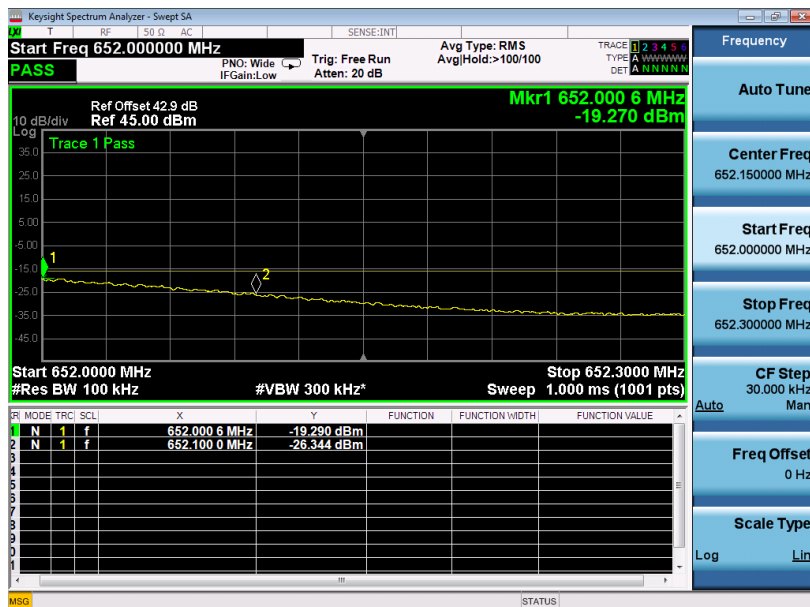


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Out-of-band/out-of-block emissions

DL_100MHz AWGN_HCH_a single test signal_Pre-AGC



DL_100MHz AWGN_HCH_a single test signal_3dB above AGC



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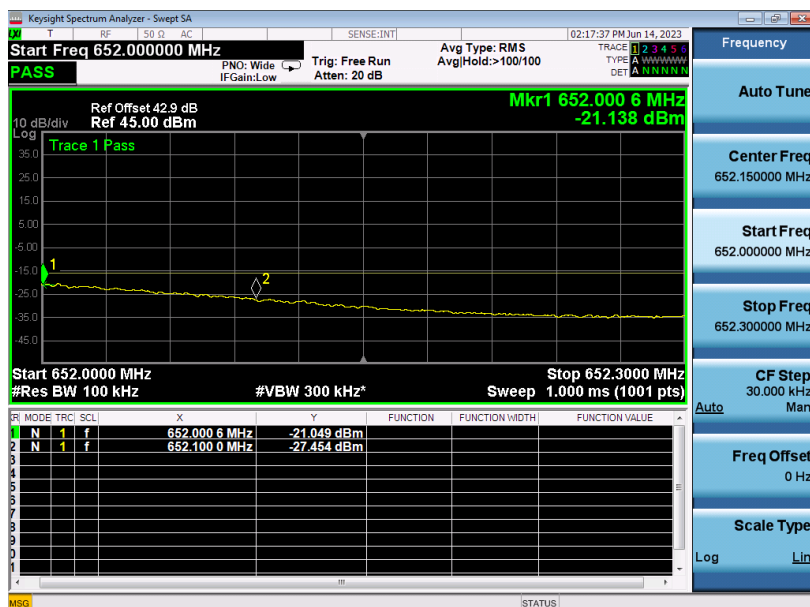
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Out-of-band/out-of-block emissions

DL_100MHz AWGN_HCH_two adjacent test signals_Pre-AGC



DL_100MHz AWGN_HCH_two adjacent test signals_3dB above AGC

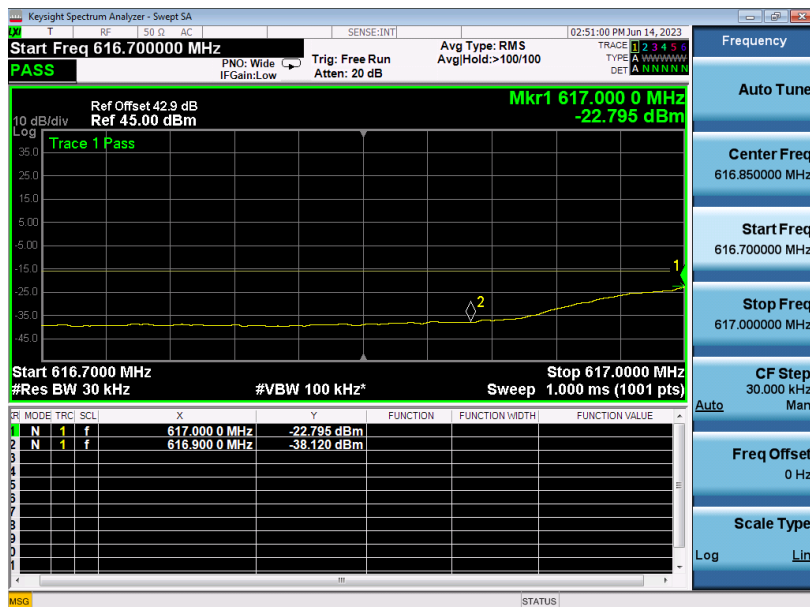


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Out-of-band/out-of-block emissions

DL_GSM_LCH_a single test signal_Pre-AGC



DL_GSM_LCH_a single test signal_3dB above AGC

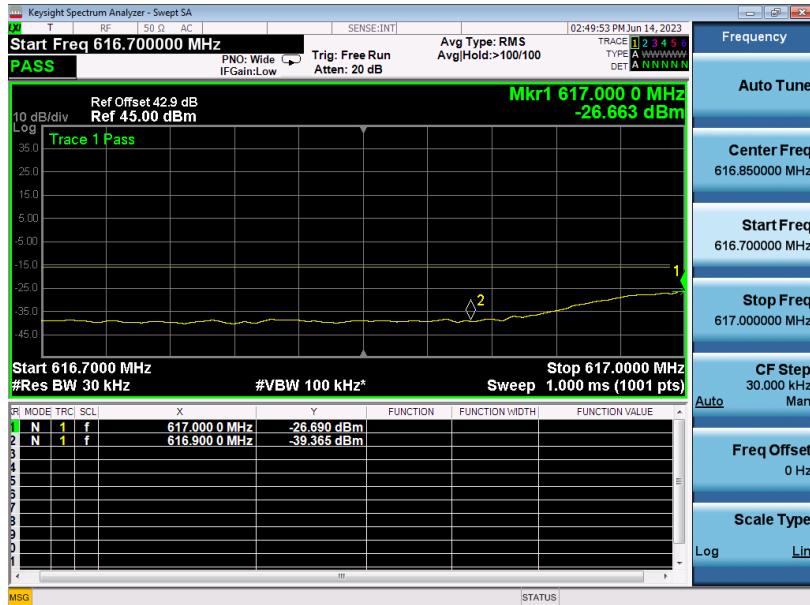


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Out-of-band/out-of-block emissions

DL_GSM_LCH_two adjacent test signals_Pre-AGC



DL_GSM_LCH_two adjacent test signals_3dB above AGC

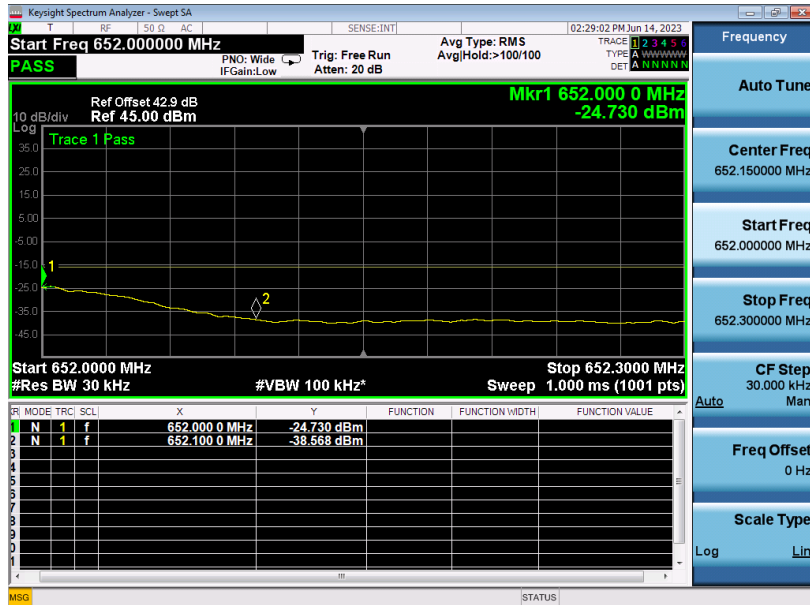


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Out-of-band/out-of-block emissions

DL_GSM_HCH_a single test signal_Pre-AGC



DL_GSM_HCH_a single test signal_3dB above AGC



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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



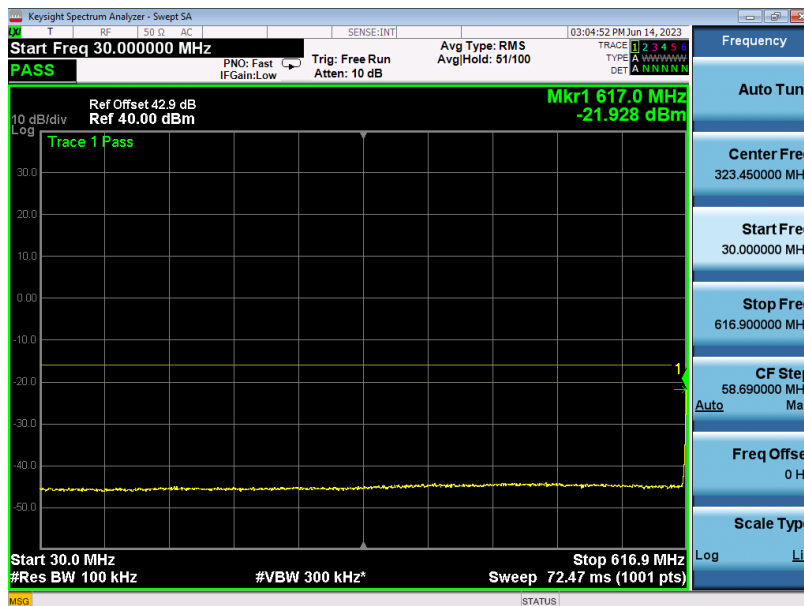
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5 Conducted Spurious emissions

Conducted spurious emissions

DL_100MHz AWGN_LCH_Pre-AGC



DL_100MHz AWGN_HCH_Pre-AGC

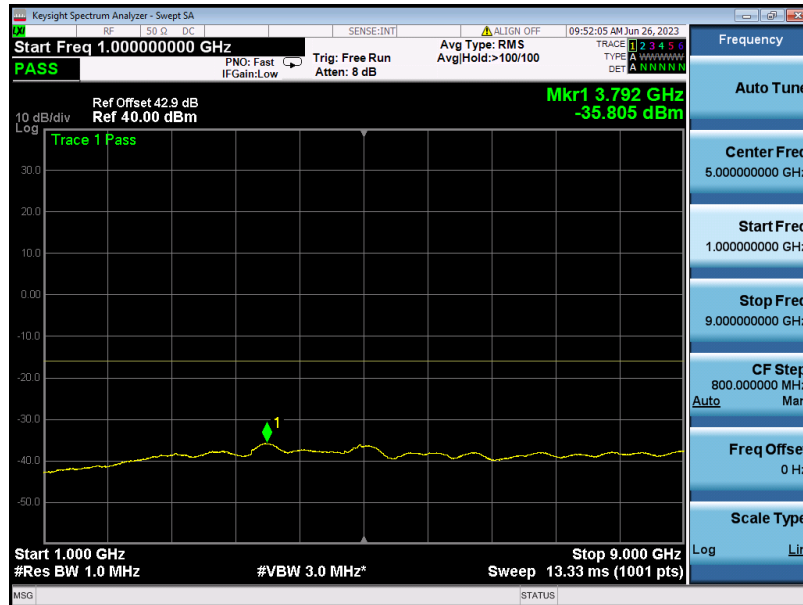


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Conducted spurious emissions

DL_100MHz AWGN_HCH_Pre-AGC



Remark:

1. 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, here,
 $P = 36\text{dBm} = 3.98\text{W}$,
the limit = $36\text{dBm} - [43 + 10\log_{10}(3.98\text{W})]$ dB = -13dBm
2. For 2x2 MIMO, ANT1 port was measured and the limit was showed -13dBm- $10\lg(2)$ = -16dBm to determine the test result conveniently.
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/ with 100MHz AWGN signal) had been tested, only show the worst-case in this report.



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6 Frequency Stability

Frequency stability vs voltage							
Test path	Test Freq. (MHz)	Test Signal	Temperature	Voltage	Freq. error (Hz)	Tolerance (ppm)	Verdict
DL	634.5	4.1MHz AWGN	TN	VL	15	0.0236	PASS
			TN	VH	19	0.0299	PASS
		100MHz AWGN	TN	VL	21	0.0331	PASS
			TN	VH	17	0.0268	PASS
		GSM	TN	VL	18	0.0284	PASS
			TN	VH	22	0.0347	PASS



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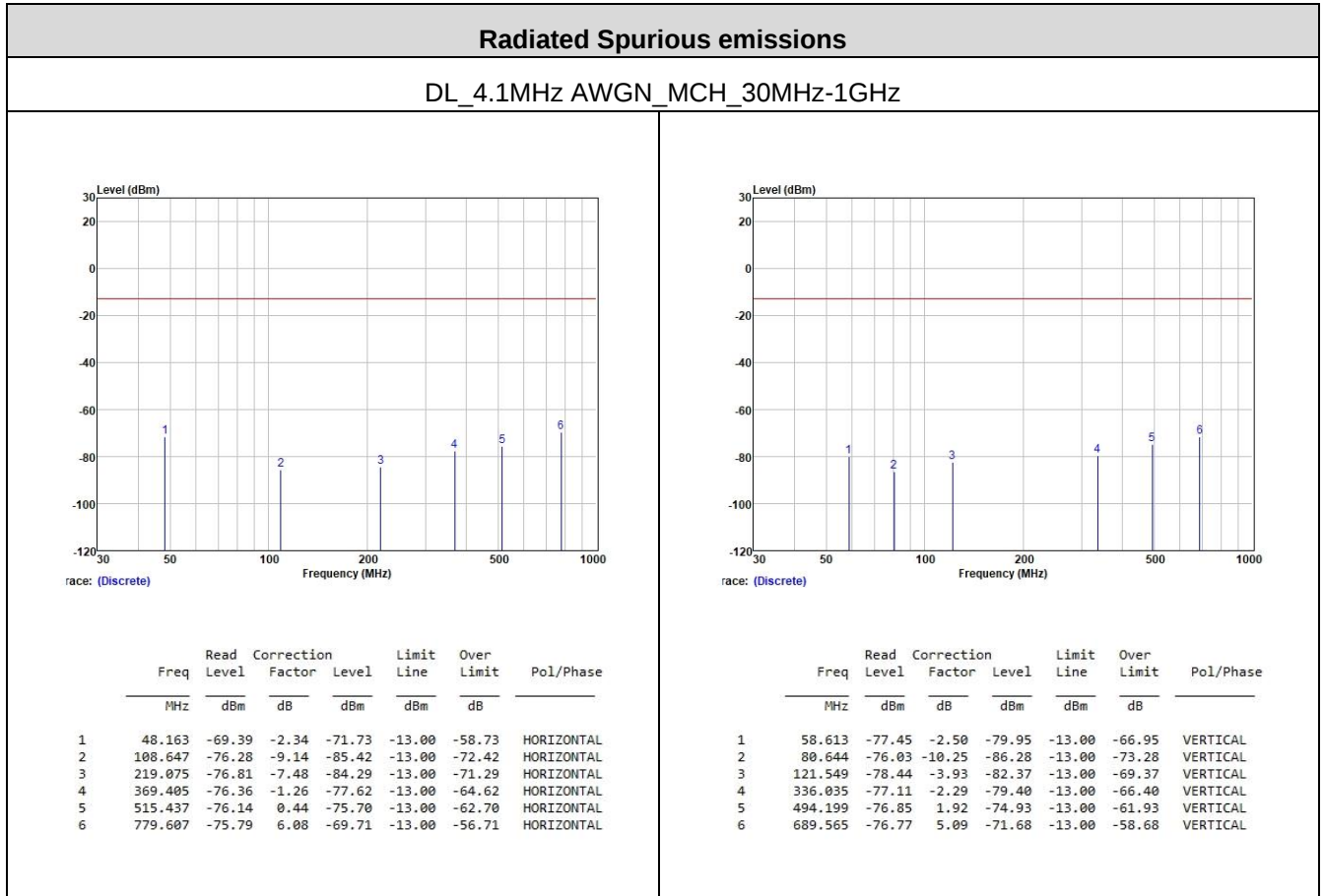
Frequency stability vs temperature							
Test Path	Test Freq. (MHz)	Test Signal	Voltage	Temperature (°C)	Freq. error (Hz)	Tolerance (ppm)	Verdict
DL	634.5	4.1MHz AWGN	VN	+50	21	0.0331	PASS
			VN	+40	24	0.0378	PASS
			VN	+30	18	0.0284	PASS
			VN	+20	15	0.0236	PASS
			VN	+10	20	0.0315	PASS
			VN	0	22	0.0347	PASS
			VN	-10	16	0.0252	PASS
			VN	-20	23	0.0362	PASS
			VN	-30	21	0.0331	PASS
	634.5	100MHz AWGN	VN	+50	27	0.0426	PASS
			VN	+40	24	0.0378	PASS
			VN	+30	19	0.0299	PASS
			VN	+20	20	0.0315	PASS
			VN	+10	17	0.0268	PASS
			VN	0	14	0.0221	PASS
			VN	-10	17	0.0268	PASS
			VN	-20	18	0.0284	PASS
			VN	-30	19	0.0299	PASS
	634.5	GSM	VN	+50	14	0.0221	PASS
			VN	+40	17	0.0268	PASS
			VN	+30	20	0.0315	PASS
			VN	+20	22	0.0347	PASS
			VN	+10	24	0.0378	PASS
			VN	0	19	0.0299	PASS
			VN	-10	15	0.0236	PASS
			VN	-20	14	0.0221	PASS
			VN	-30	20	0.0315	PASS



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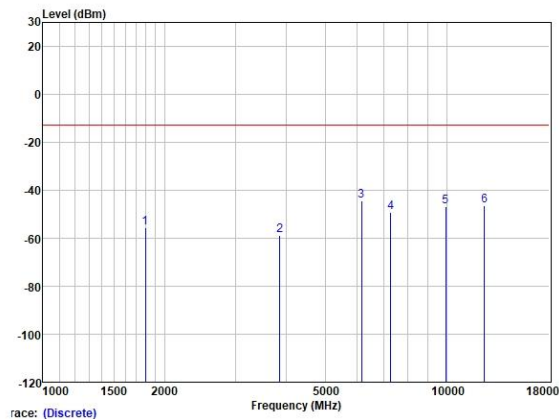
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7 Radiated Spurious emissions

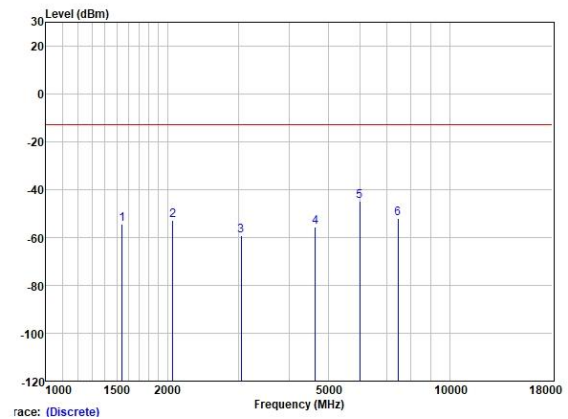


Radiated Spurious emissions

DL_4.1MHz AWGN_MCH_above 1GHz



	Freq	Read Level	Correction Factor	Level	Limit Line	Over Limit	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	1792.937	-61.10	5.68	-55.42	-13.00	-42.42	HORIZONTAL
2	3856.668	-61.84	3.10	-58.74	-13.00	-45.74	HORIZONTAL
3	6159.797	-63.54	19.07	-44.47	-13.00	-31.47	HORIZONTAL
4	7263.015	-66.97	17.89	-49.08	-13.00	-36.08	HORIZONTAL
5	9952.717	-66.60	19.82	-46.78	-13.00	-33.78	HORIZONTAL
6	12397.740	-69.43	23.01	-46.42	-13.00	-33.42	HORIZONTAL



	Freq	Read Level	Correction Factor	Level	Limit Line	Over Limit	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	1542.733	-60.63	6.14	-54.49	-13.00	-41.49	VERTICAL
2	2059.767	-61.70	8.82	-52.88	-13.00	-39.88	VERTICAL
3	3042.846	-61.91	2.88	-59.03	-13.00	-46.03	VERTICAL
4	4653.771	-62.89	7.34	-55.55	-13.00	-42.55	VERTICAL
5	5984.305	-63.85	19.06	-44.79	-13.00	-31.79	VERTICAL
6	7454.429	-68.73	16.57	-52.16	-13.00	-39.16	VERTICAL

Remark:

Pre-test was performed for all modes (LCH/MCH/HCH, with GSM signal/ with 4.1MHz AWGN signals/ with 100MHz 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--