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Annex for Bluetooth low Energy

Test Report No.: CTL2605222091-MIC02

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MIC: 219-269369

1. Frequency Error

1.1 Test Result

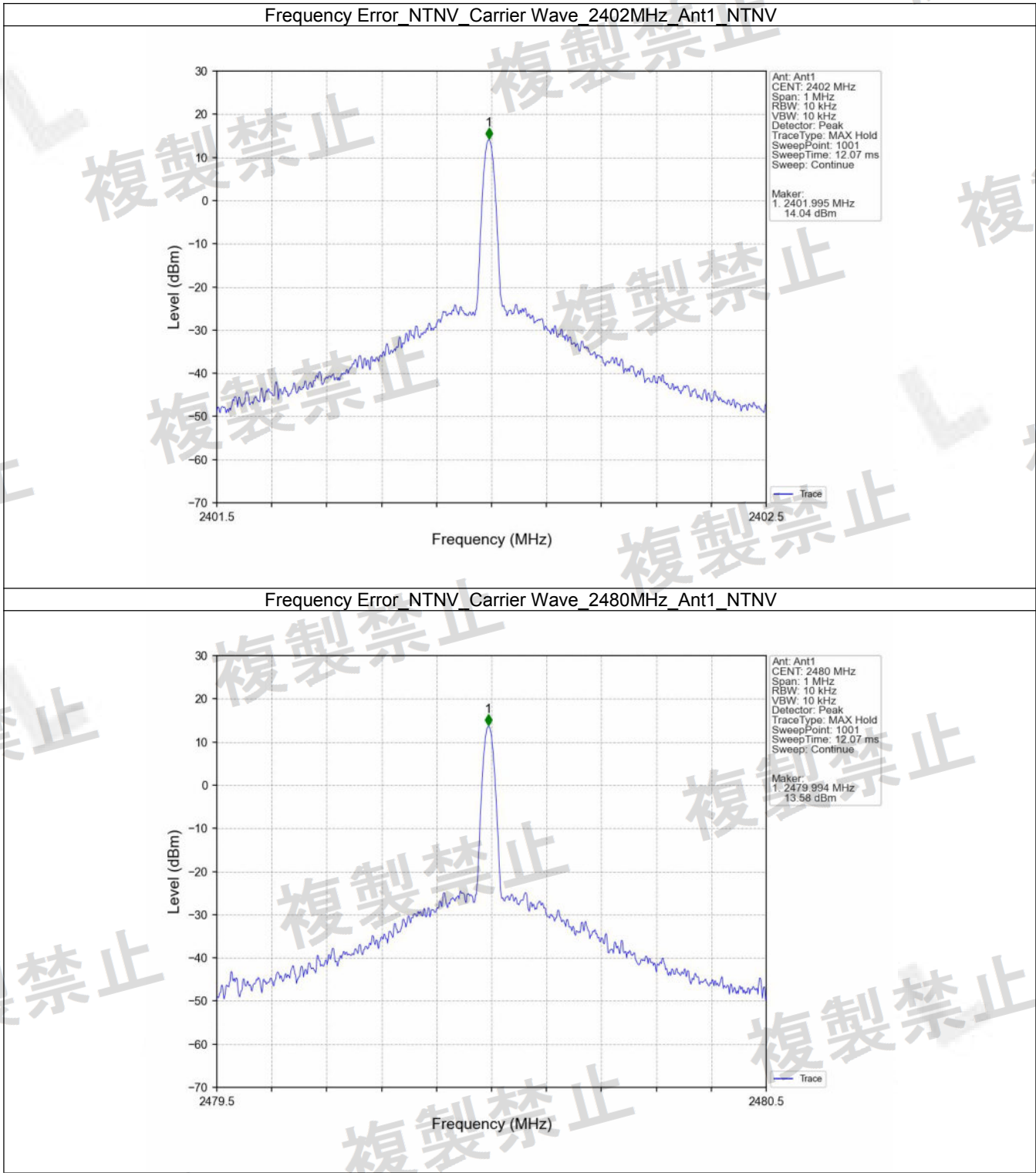
1.1.1 Ant1

Ant1							
ENV	Mode	TX Type	Frequency (MHz)	Measured Frequency (MHz)	Tolerance (ppm)		Verdict
					Result	Limit	
NTNV	Carrier Wave	SISO	2402	2401.995	-2.08	-50 to 50	Pass
			2480	2479.994	-2.42	-50 to 50	Pass
NTLV	Carrier Wave	SISO	2402	2401.995	-2.08	-50 to 50	Pass
			2480	2479.994	-2.42	-50 to 50	Pass
NTHV	Carrier Wave	SISO	2402	2401.995	-2.08	-50 to 50	Pass
			2480	2479.994	-2.42	-50 to 50	Pass

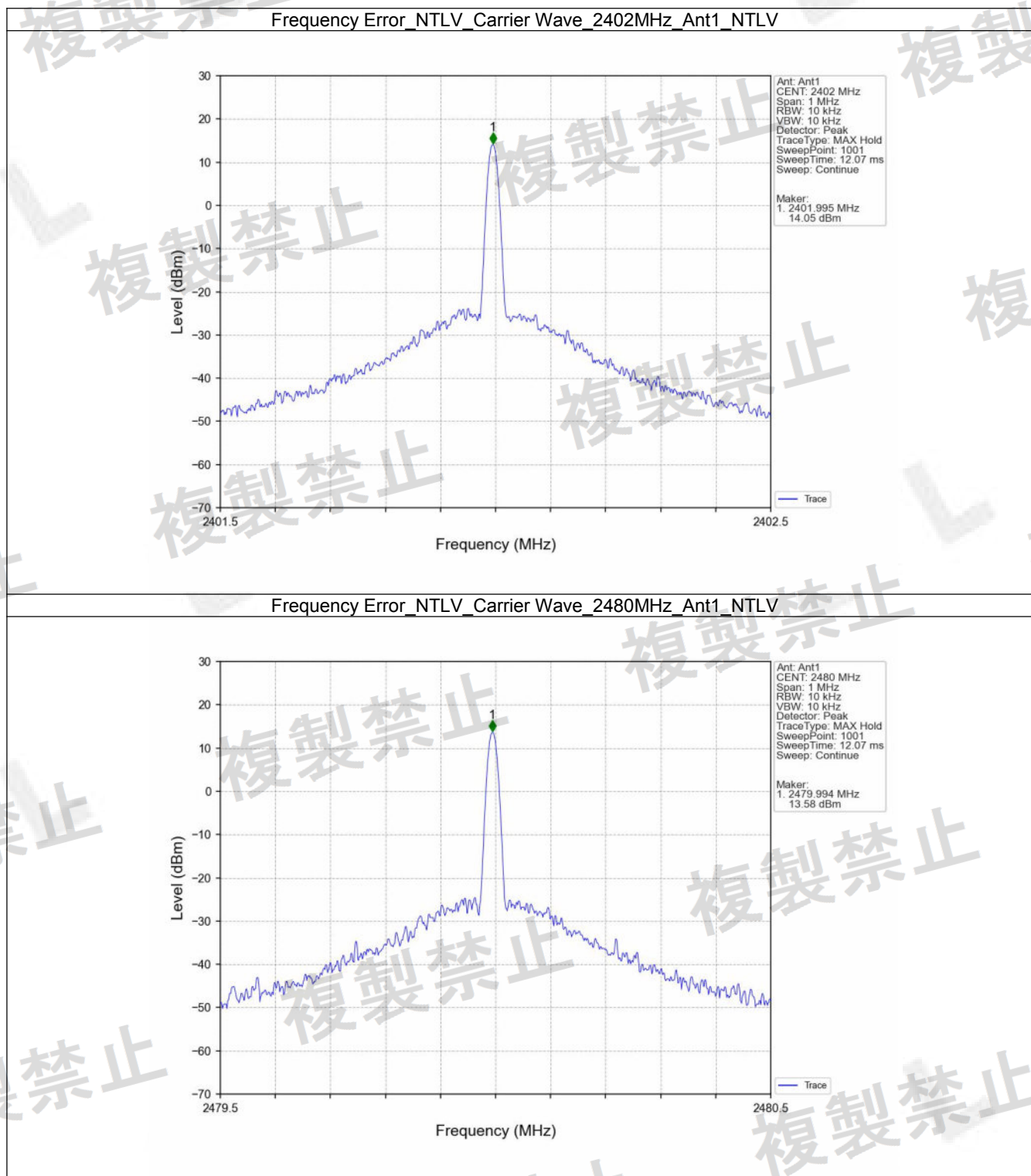
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1.2 Test Graph

1.2.1 Ant1

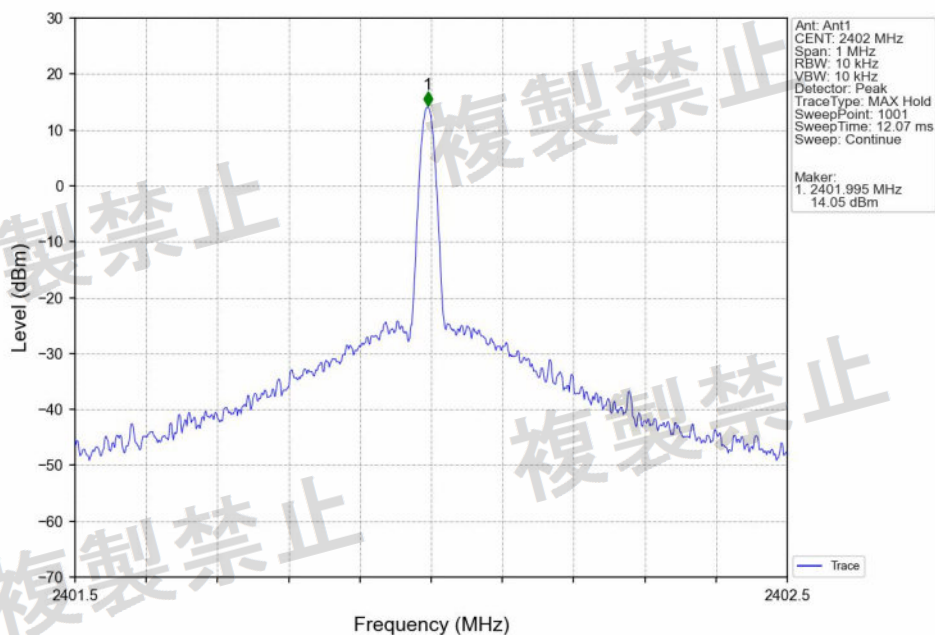


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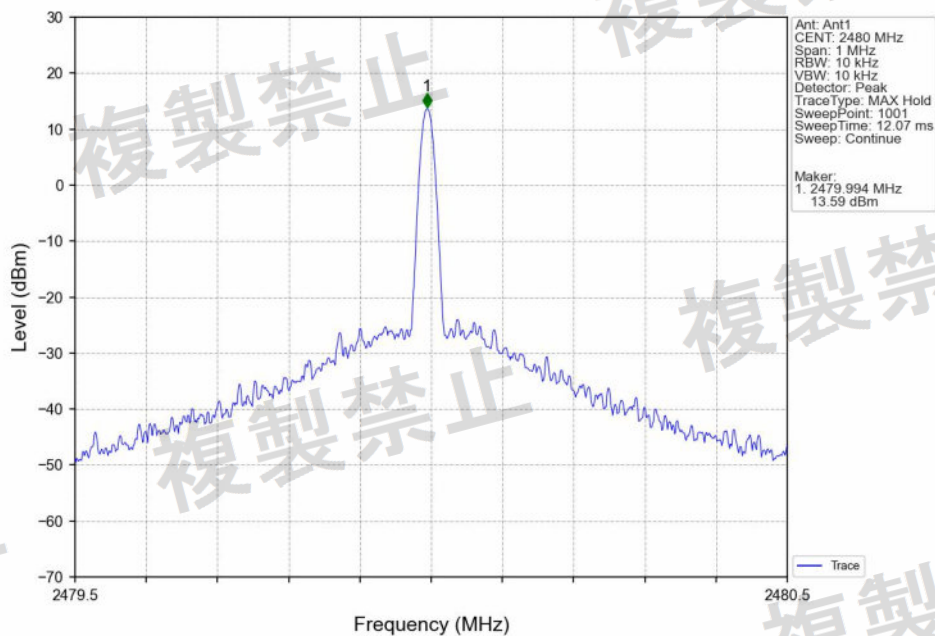


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Frequency Error_NTHV_Carrier Wave_2402MHz_Ant1_NTHV



Frequency Error_NTHV_Carrier Wave_2480MHz_Ant1_NTHV



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2. Occupied Bandwidth

2.1 Test Result

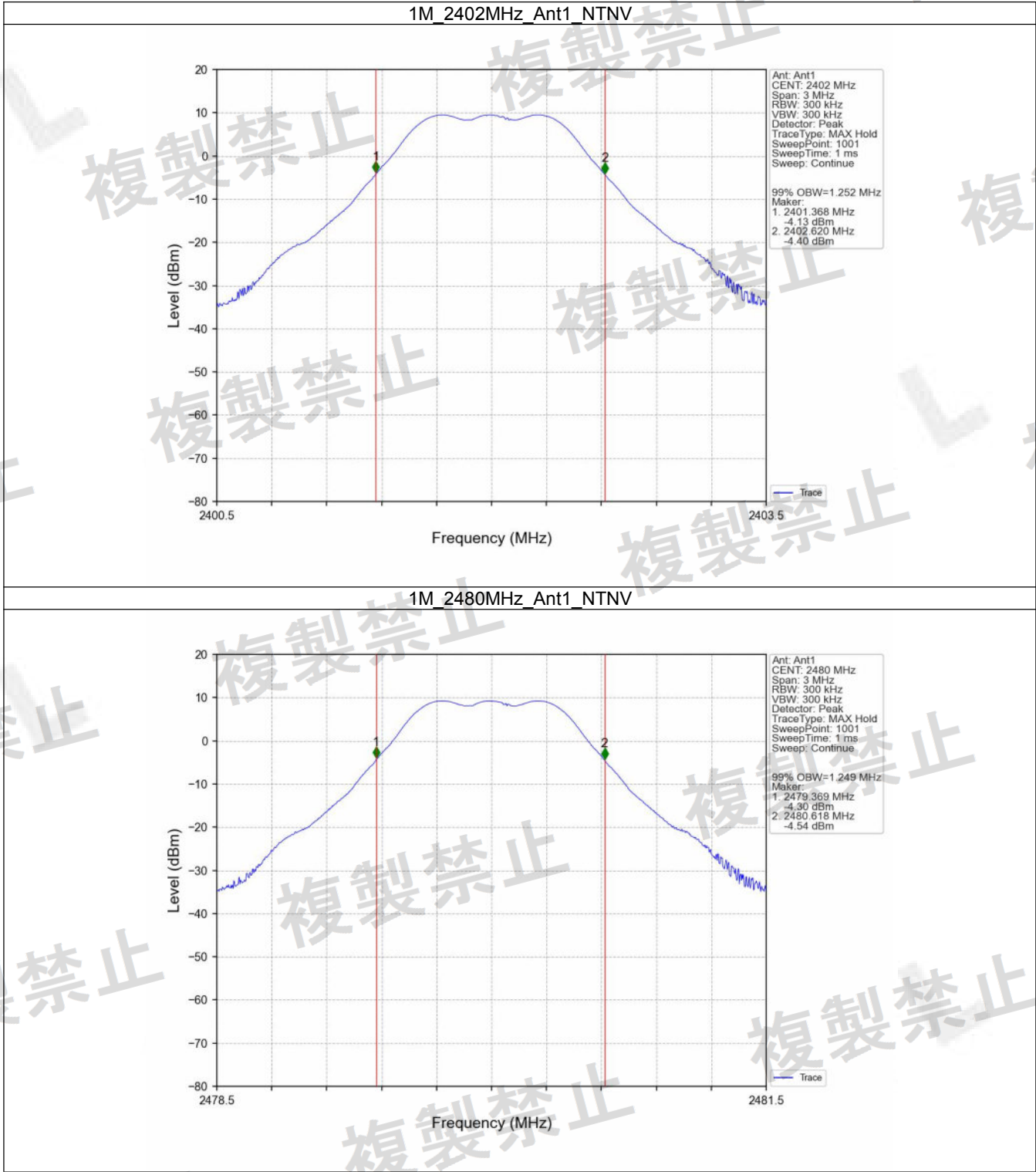
2.1.1 OBW

ENV	Mode	TX Type	Frequency (MHz)	99% Occupied Bandwidth (MHz)		Verdict
				ANT1	Limit	
NTNV	1M	SISO	2402	1.252	<=26	Pass
			2480	1.249	<=26	Pass
	2M	SISO	2402	2.186	<=26	Pass
			2480	2.185	<=26	Pass
NTLV	1M	SISO	2402	1.252	<=26	Pass
			2480	1.249	<=26	Pass
	2M	SISO	2402	2.190	<=26	Pass
			2480	2.184	<=26	Pass
NTHV	1M	SISO	2402	1.252	<=26	Pass
			2480	1.249	<=26	Pass
	2M	SISO	2402	2.187	<=26	Pass
			2480	2.185	<=26	Pass

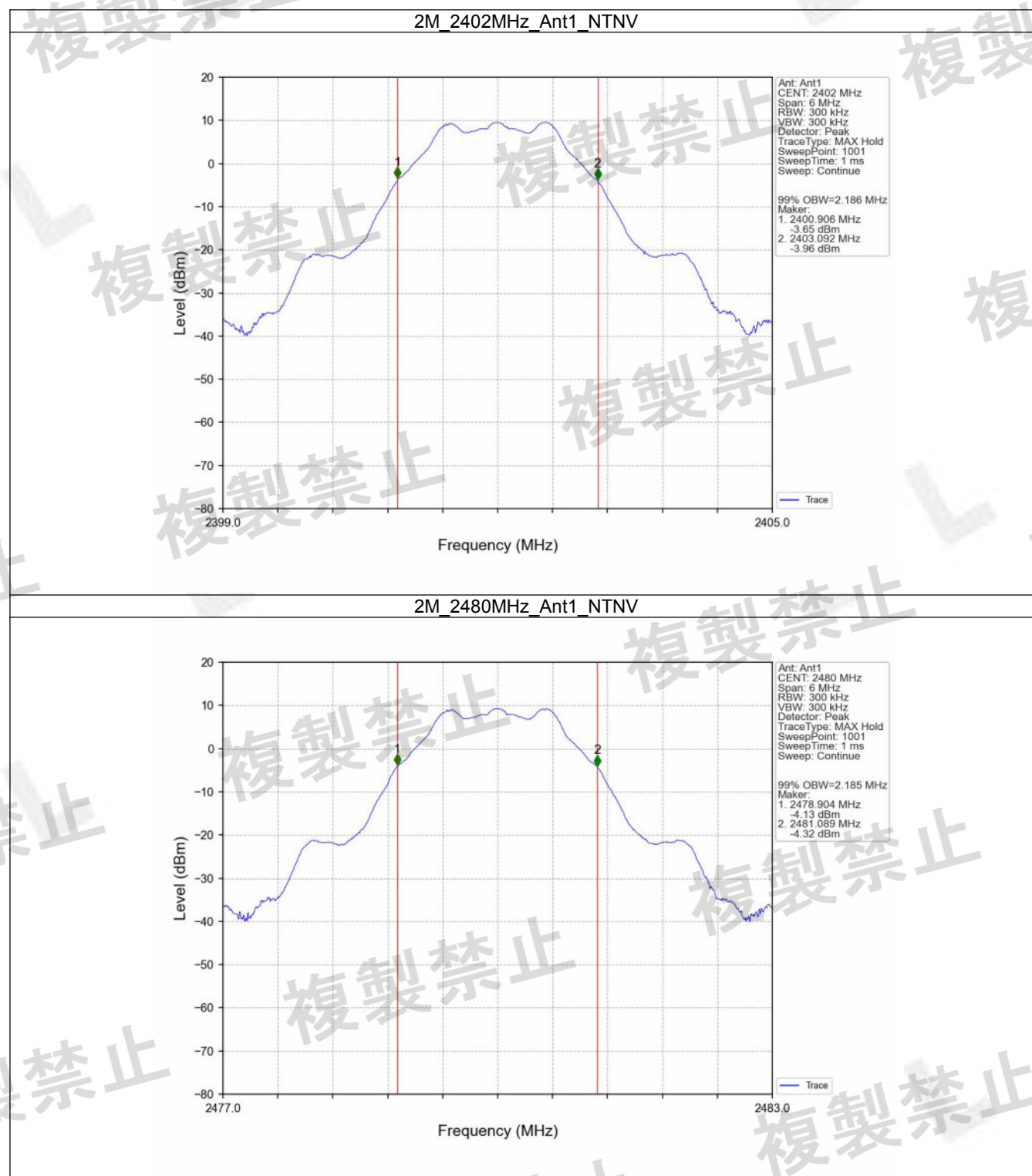
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2.2 Test Graph

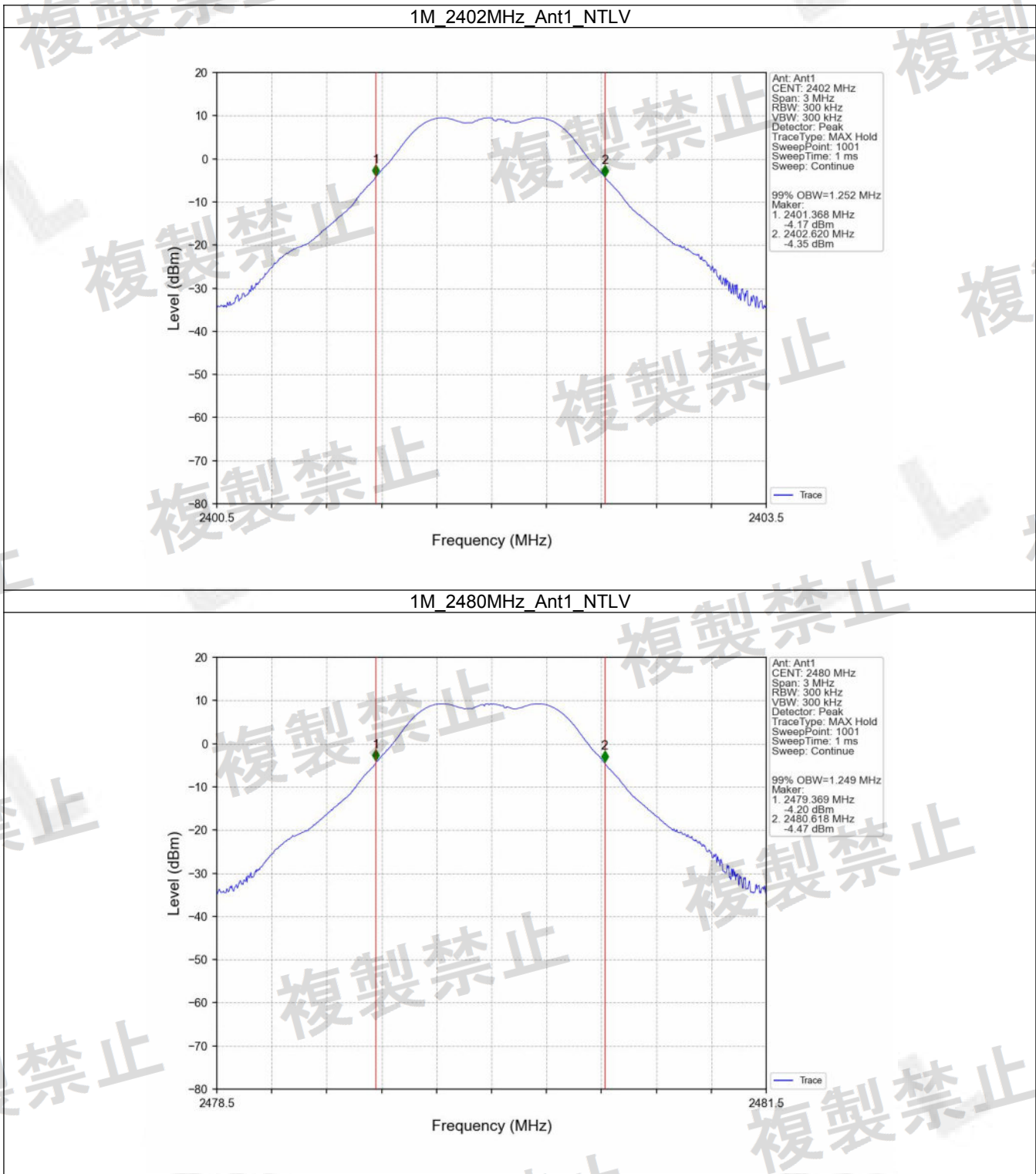
2.2.1 OBW



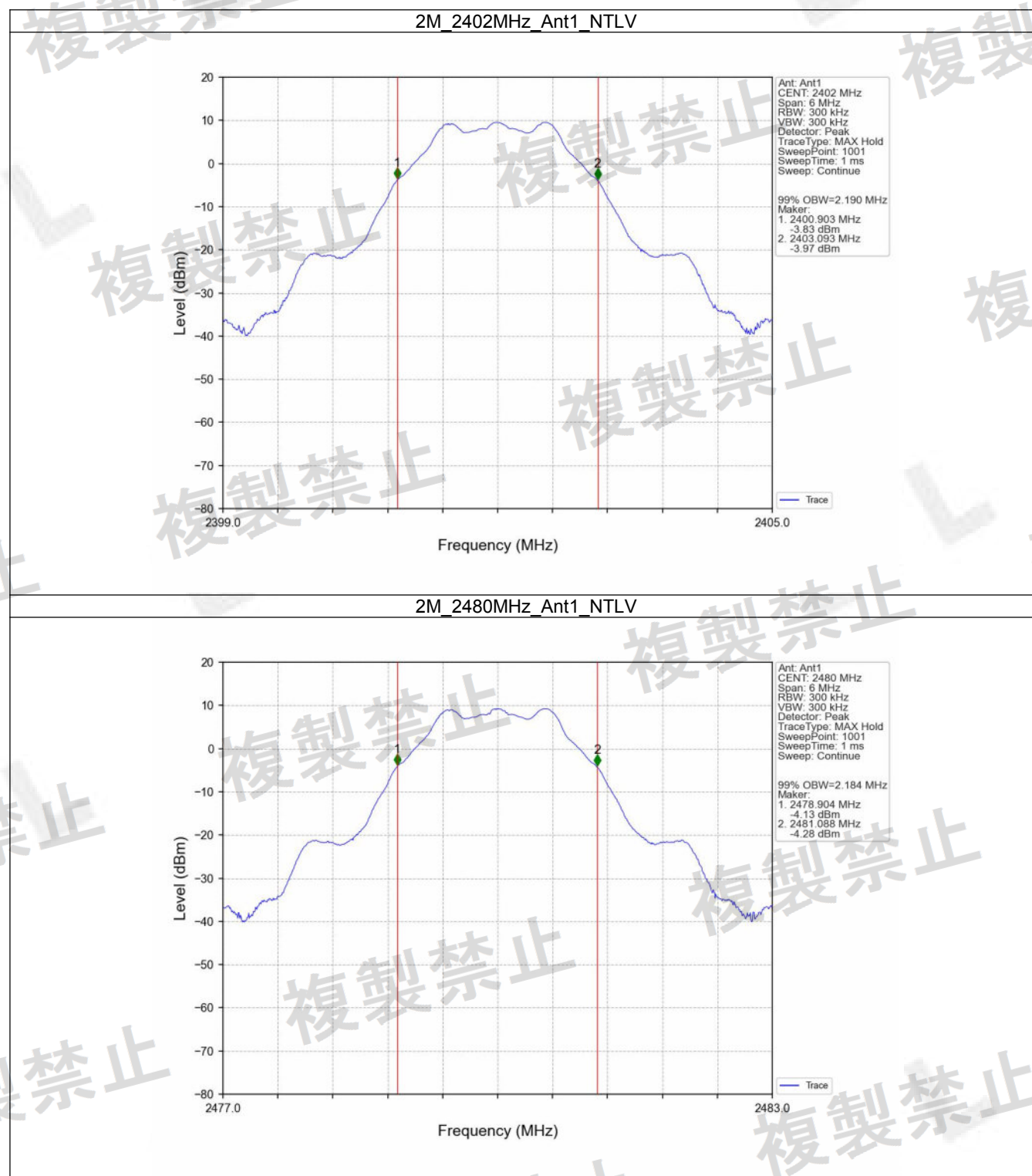
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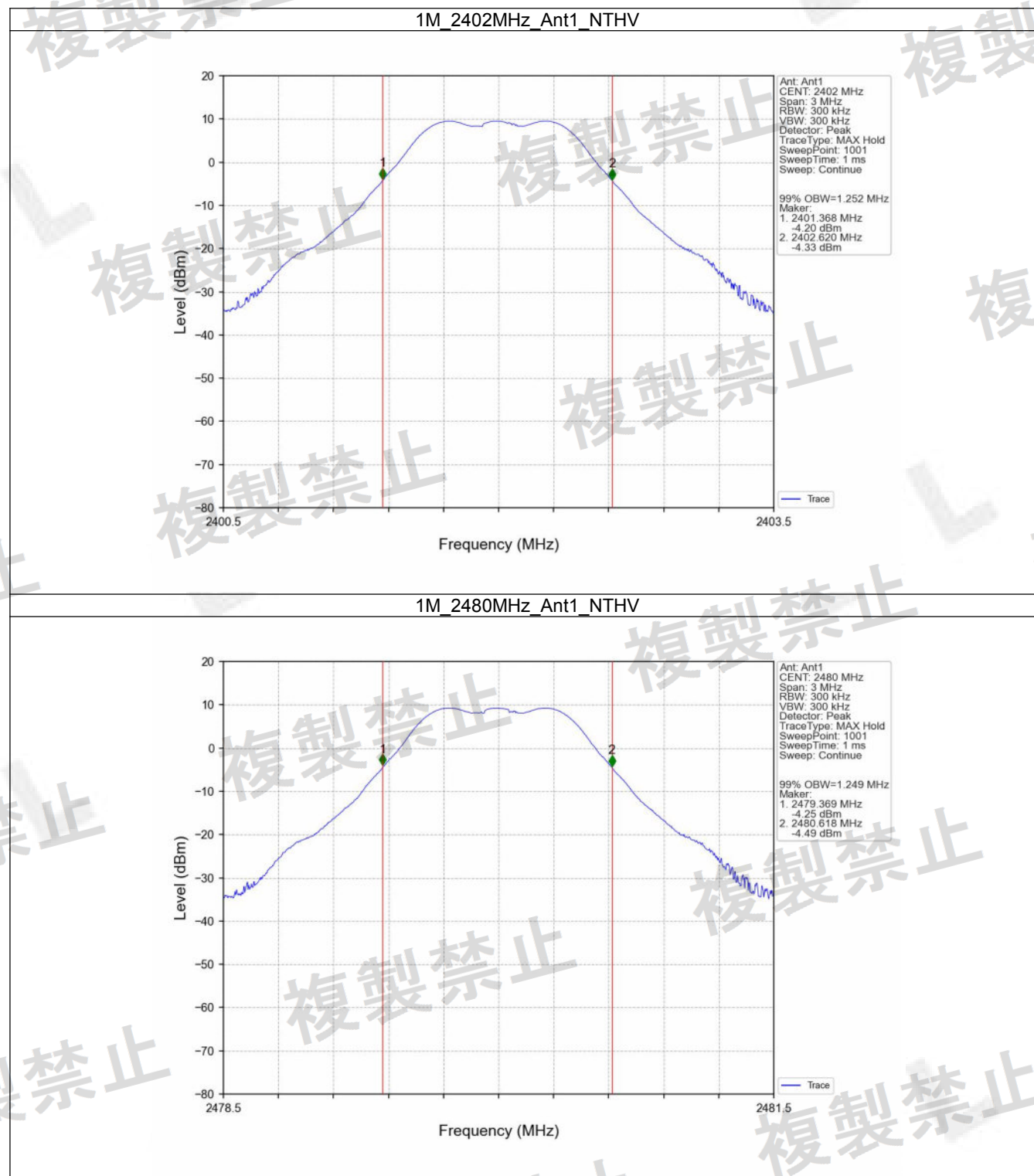
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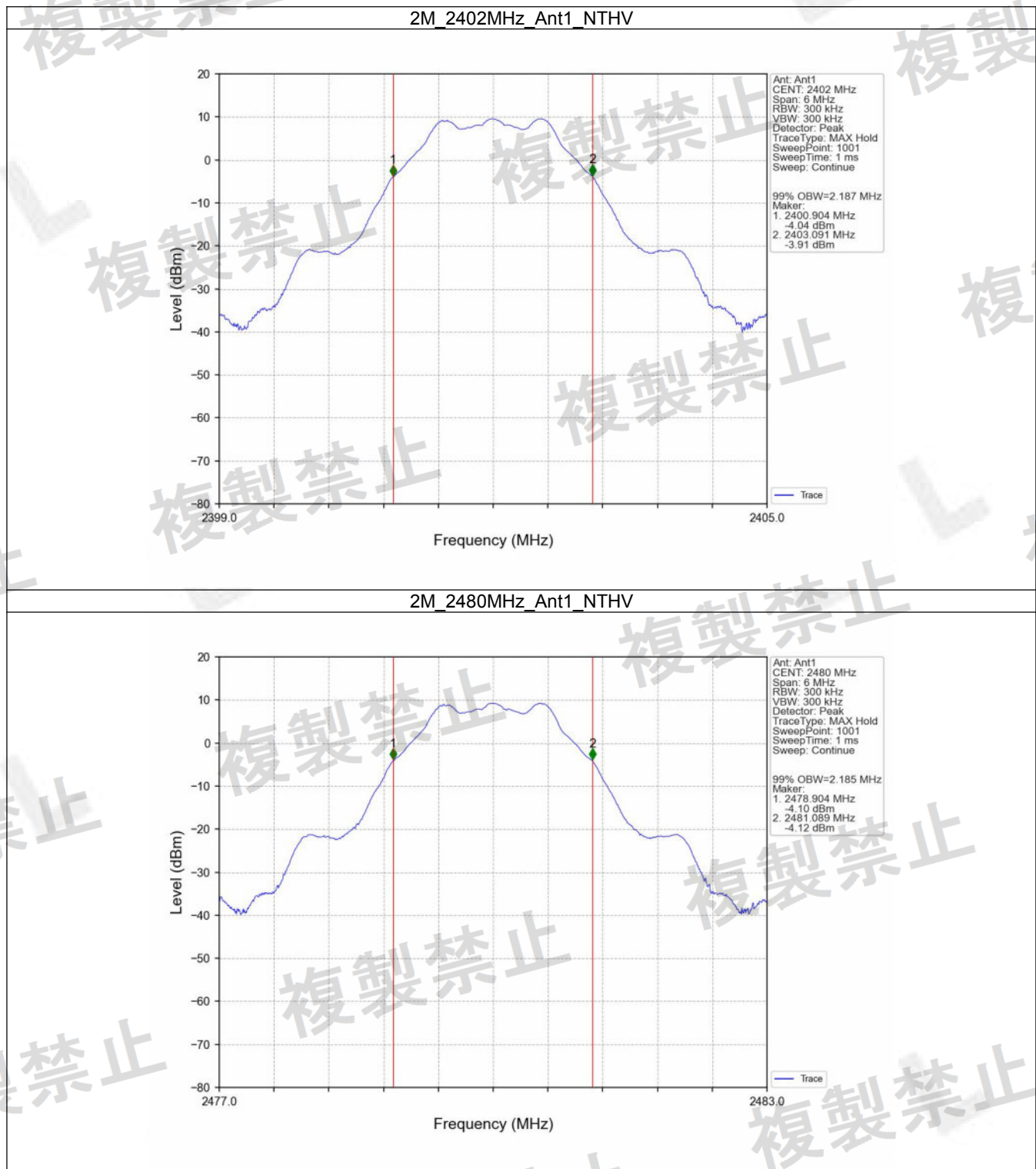
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MIC: 219-269369



MIC: 219-269369



MIC: 219-269369

3. Antenna Power

3.1 Test Result

3.1.1 Power

ENV	Mode	TX Type	Frequency (MHz)	ANT	Antenna Power (mW)		Nominal Power (mW)	Tolerance (%)		Verdict
					Measured	Limit		Measured	Limit	
NTNV	1M	SISO	2402	1	8.419	<=10.00	8.400	0.23	<=20	Pass
			2480	1	7.983	<=10.00	8.400	-4.96	<=20	Pass
	2M	SISO	2402	1	8.315	<=10.00	8.400	-1.01	<=20	Pass
			2480	1	7.634	<=10.00	8.400	-9.12	<=20	Pass
NTLV	1M	SISO	2402	1	8.440	<=10.00	8.400	0.48	<=20	Pass
			2480	1	7.950	<=10.00	8.400	-5.36	<=20	Pass
	2M	SISO	2402	1	8.307	<=10.00	8.400	-1.11	<=20	Pass
			2480	1	7.596	<=10.00	8.400	-9.57	<=20	Pass
NTHV	1M	SISO	2402	1	8.462	<=10.00	8.400	0.74	<=20	Pass
			2480	1	7.983	<=10.00	8.400	-4.96	<=20	Pass
	2M	SISO	2402	1	8.298	<=10.00	8.400	-1.21	<=20	Pass
			2480	1	7.378	<=10.00	8.400	-12.17	<=20	Pass

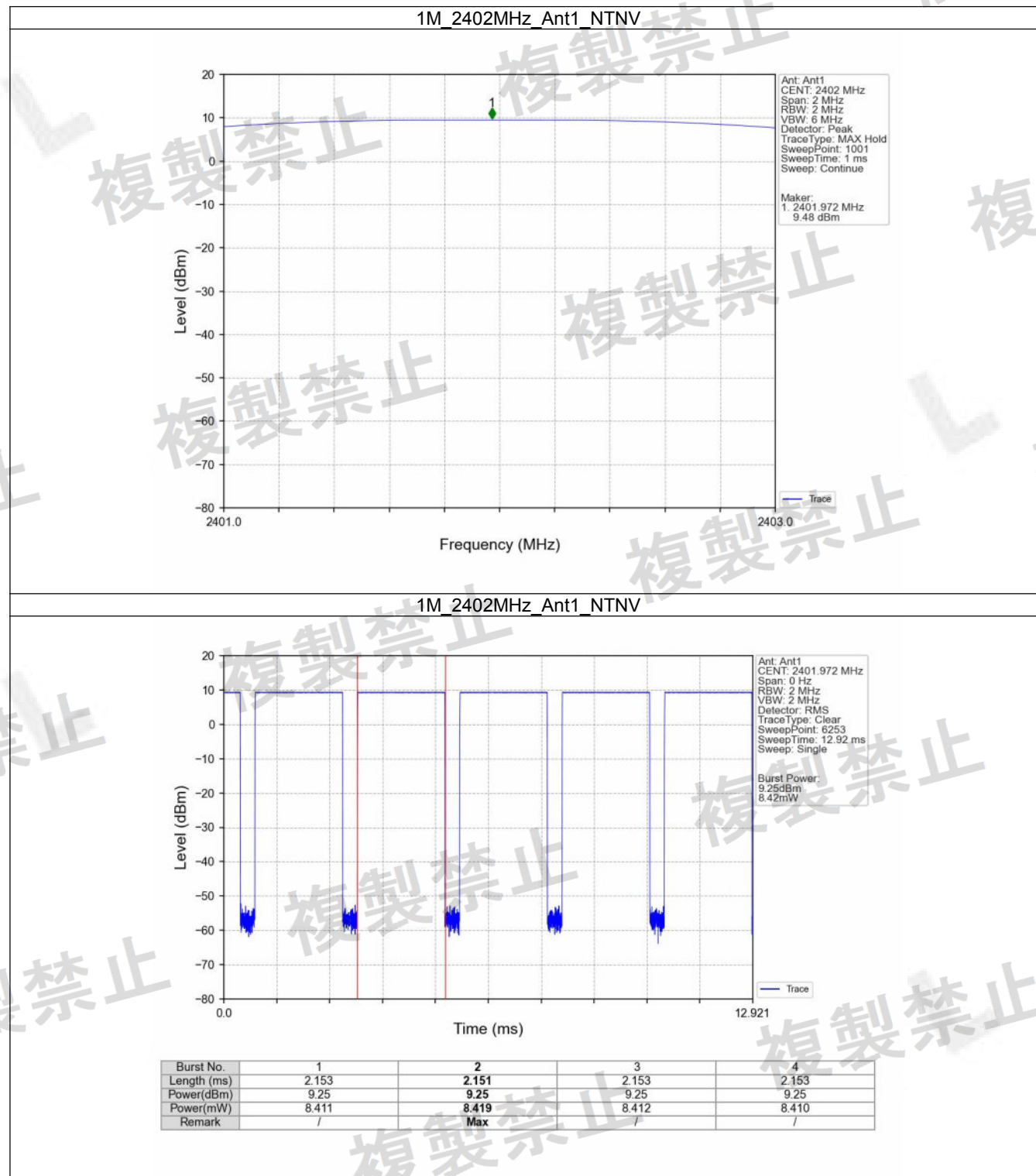
3.1.2 EIRP

ENV	Mode	TX Type	Frequency (MHz)	ANT	Gain (dBi)	EIRP (dBm)		Verdict
						Result	Limit	
NTNV	1M	SISO	2402	1	0.00	9.25	<=12.14	Pass
			2480	1	0.00	9.02	<=12.14	Pass
	2M	SISO	2402	1	0.00	9.20	<=12.14	Pass
			2480	1	0.00	8.83	<=12.14	Pass
NTLV	1M	SISO	2402	1	0.00	9.26	<=12.14	Pass
			2480	1	0.00	9.00	<=12.14	Pass
	2M	SISO	2402	1	0.00	9.19	<=12.14	Pass
			2480	1	0.00	8.81	<=12.14	Pass
NTHV	1M	SISO	2402	1	0.00	9.27	<=12.14	Pass
			2480	1	0.00	9.02	<=12.14	Pass
	2M	SISO	2402	1	0.00	9.19	<=12.14	Pass
			2480	1	0.00	8.68	<=12.14	Pass

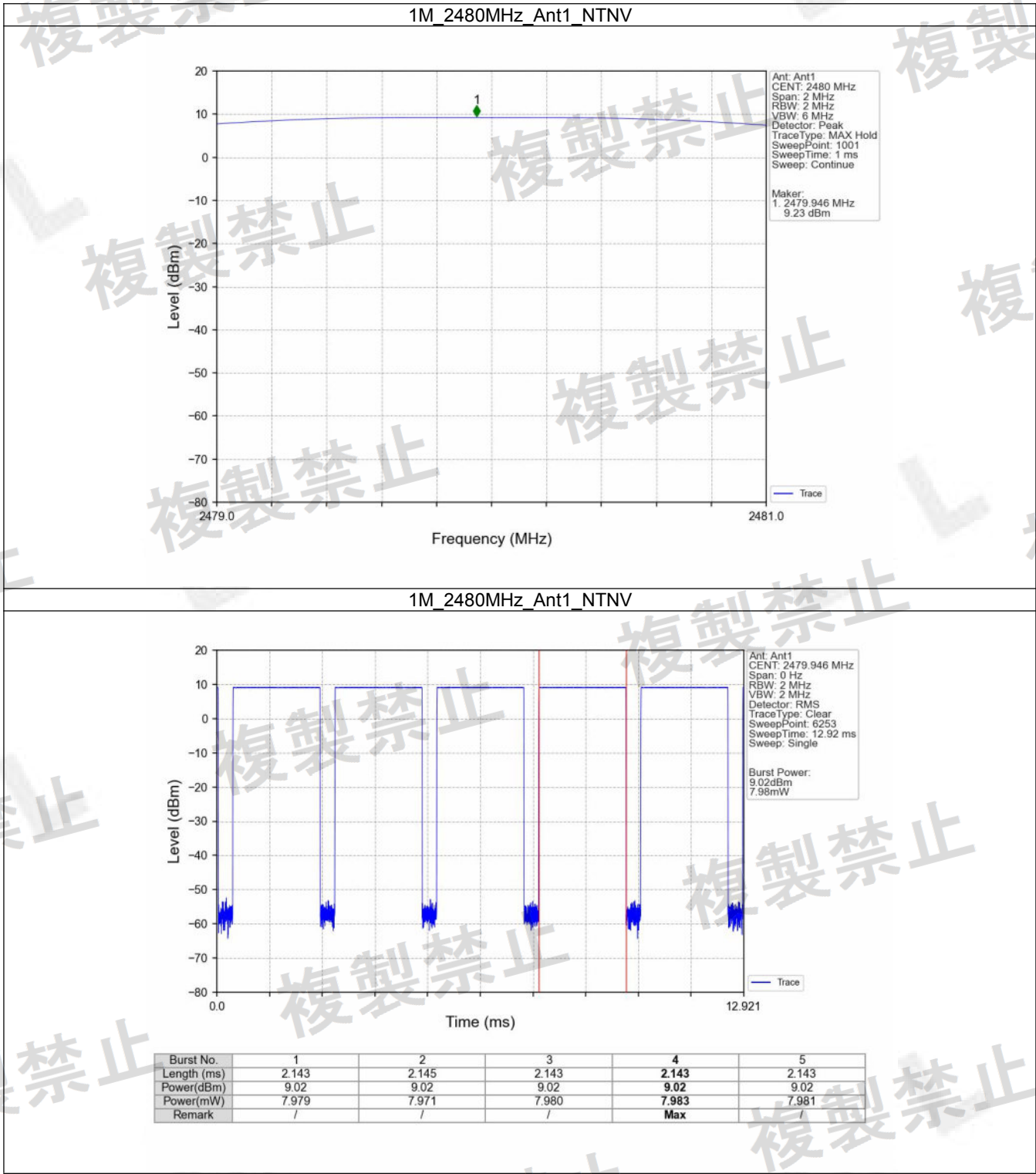
MIC: 219-269369

3.2 Test Graph

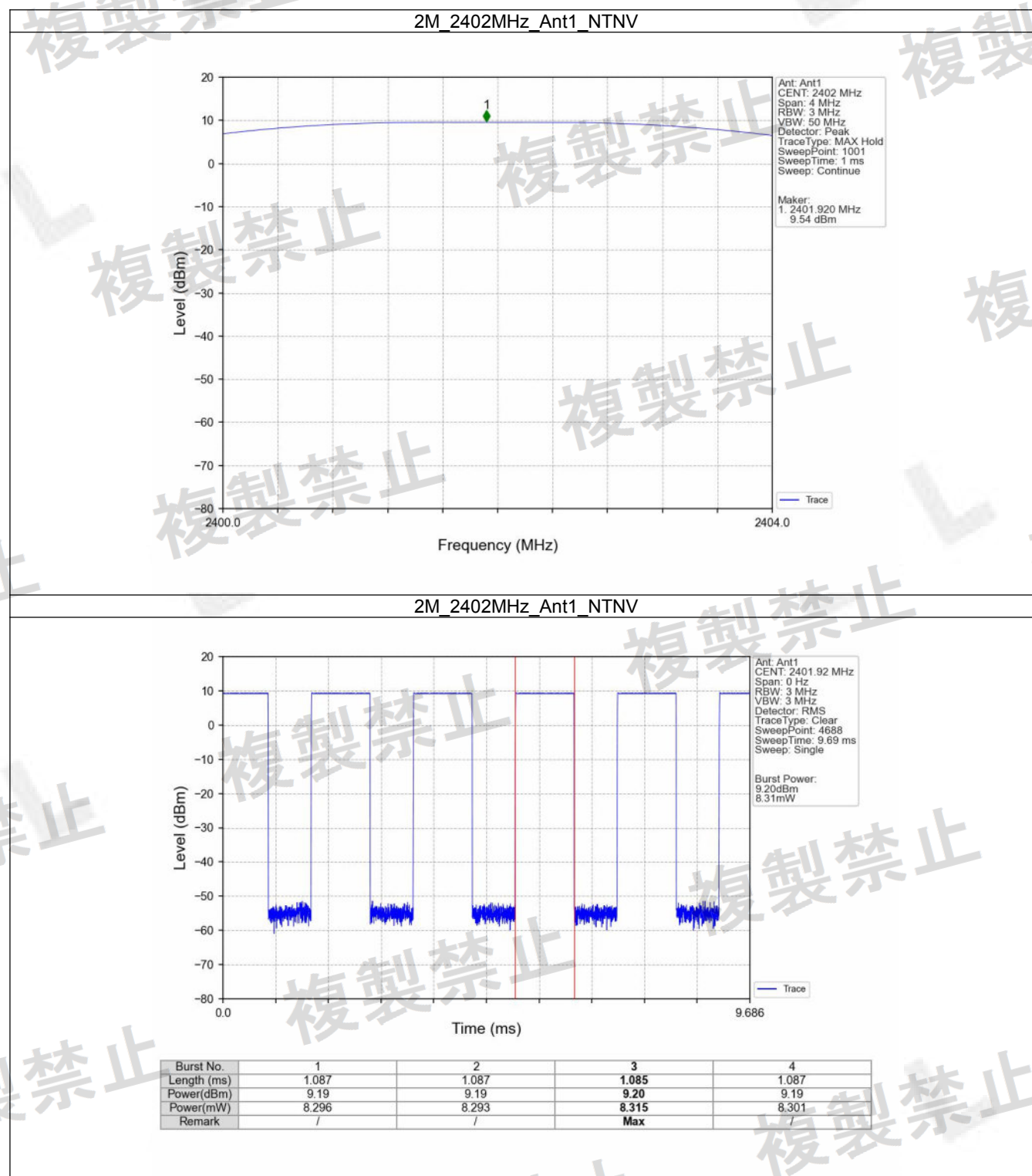
3.2.1 Power



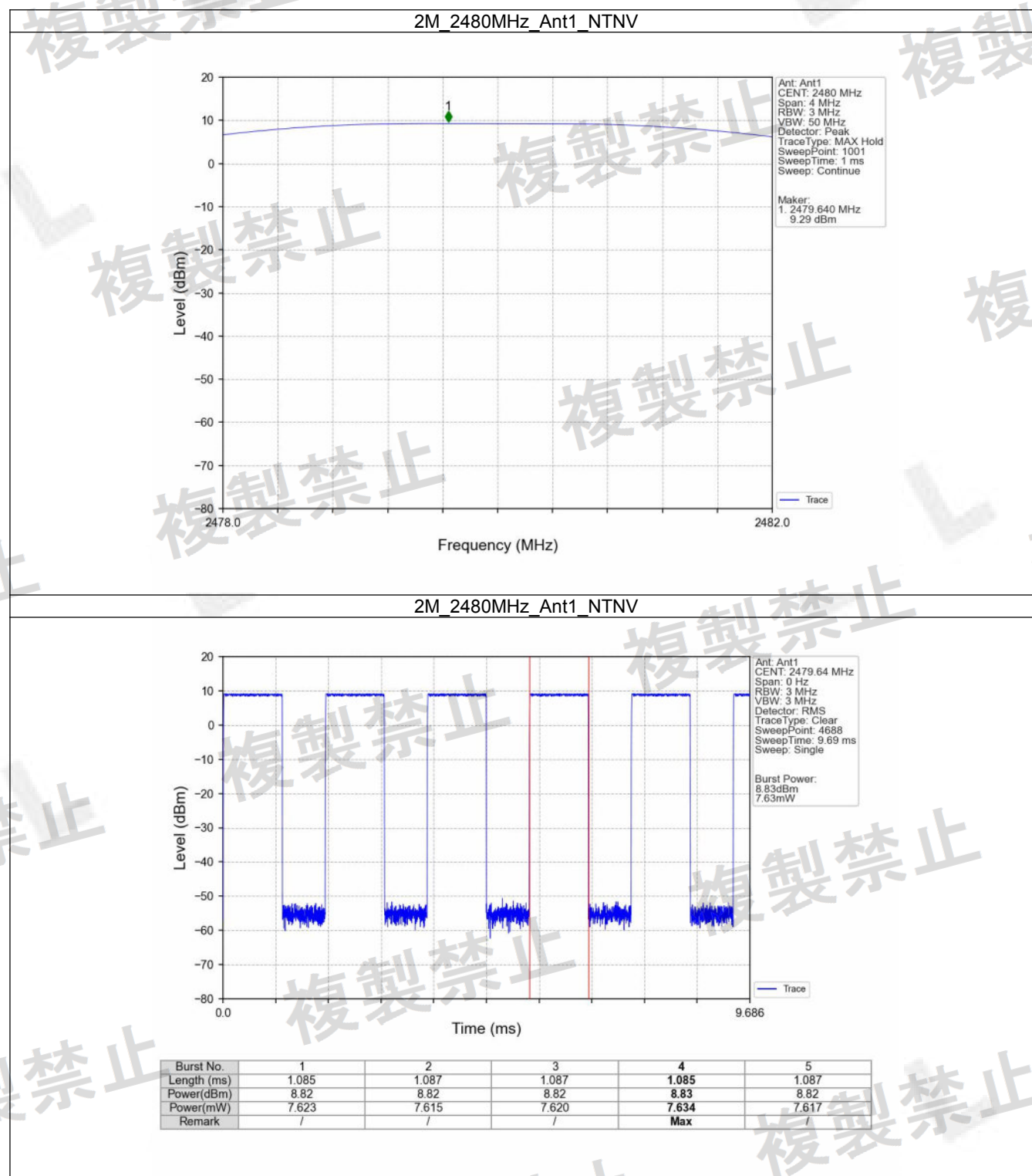
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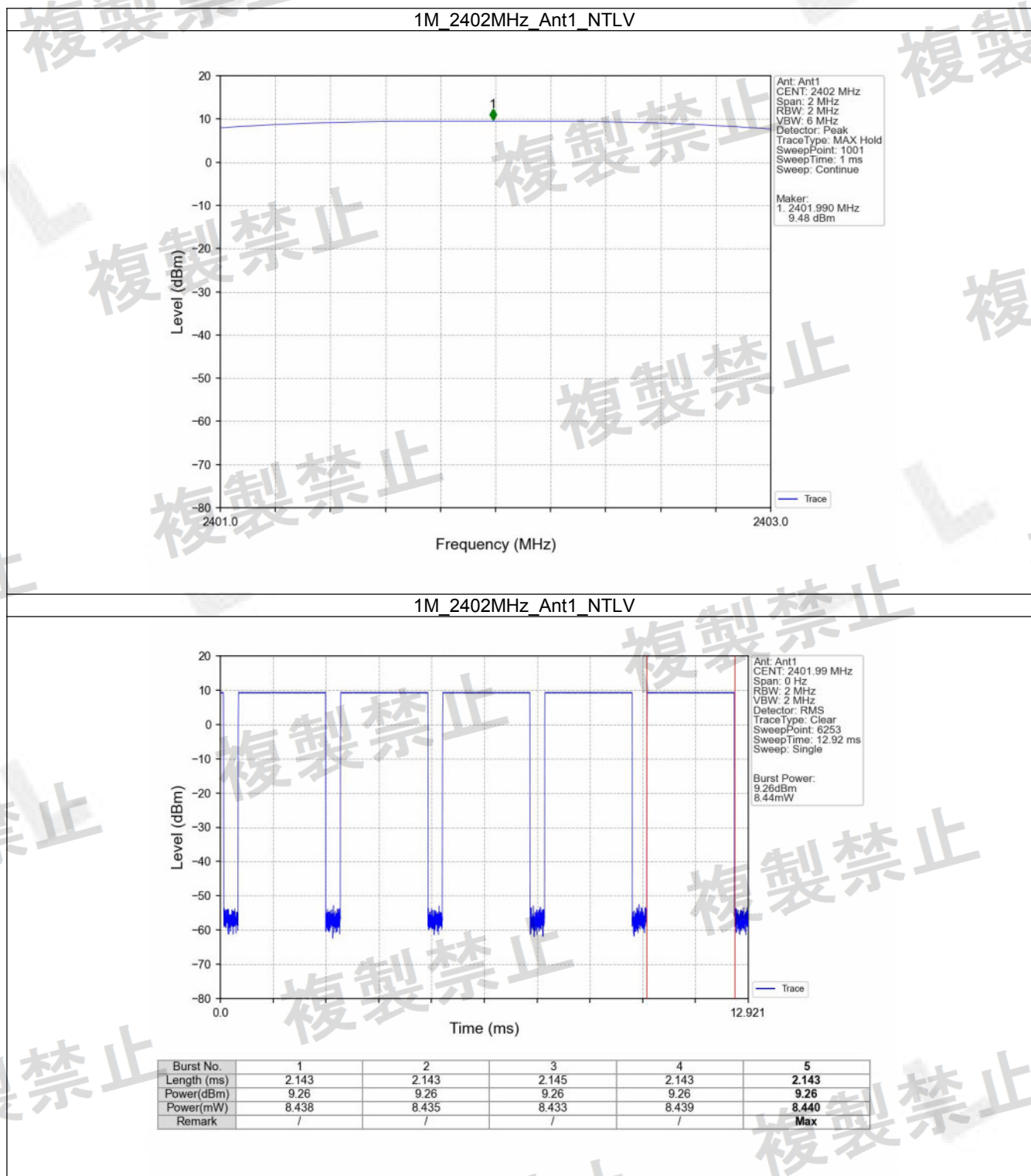
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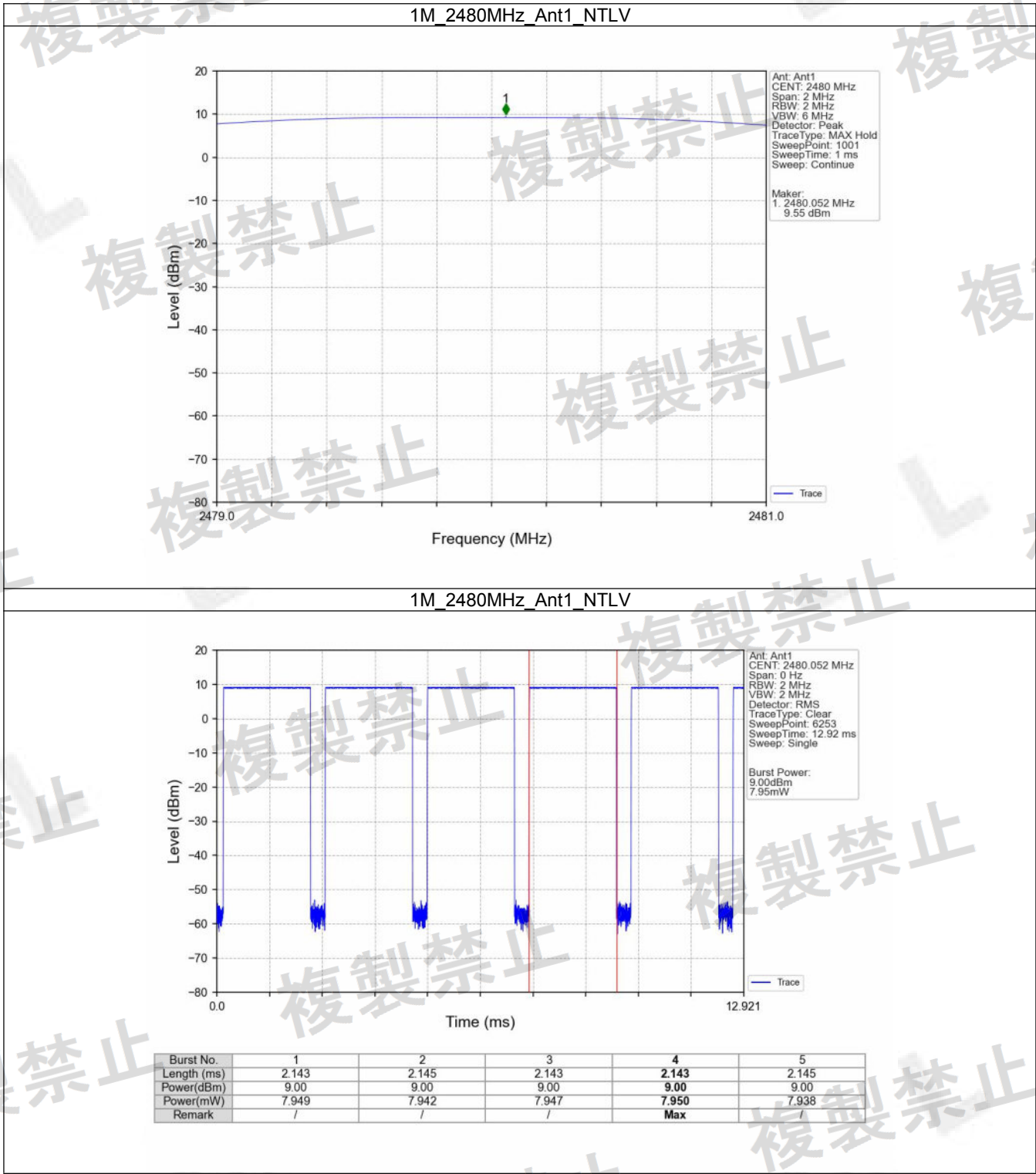
MIC: 219-269369



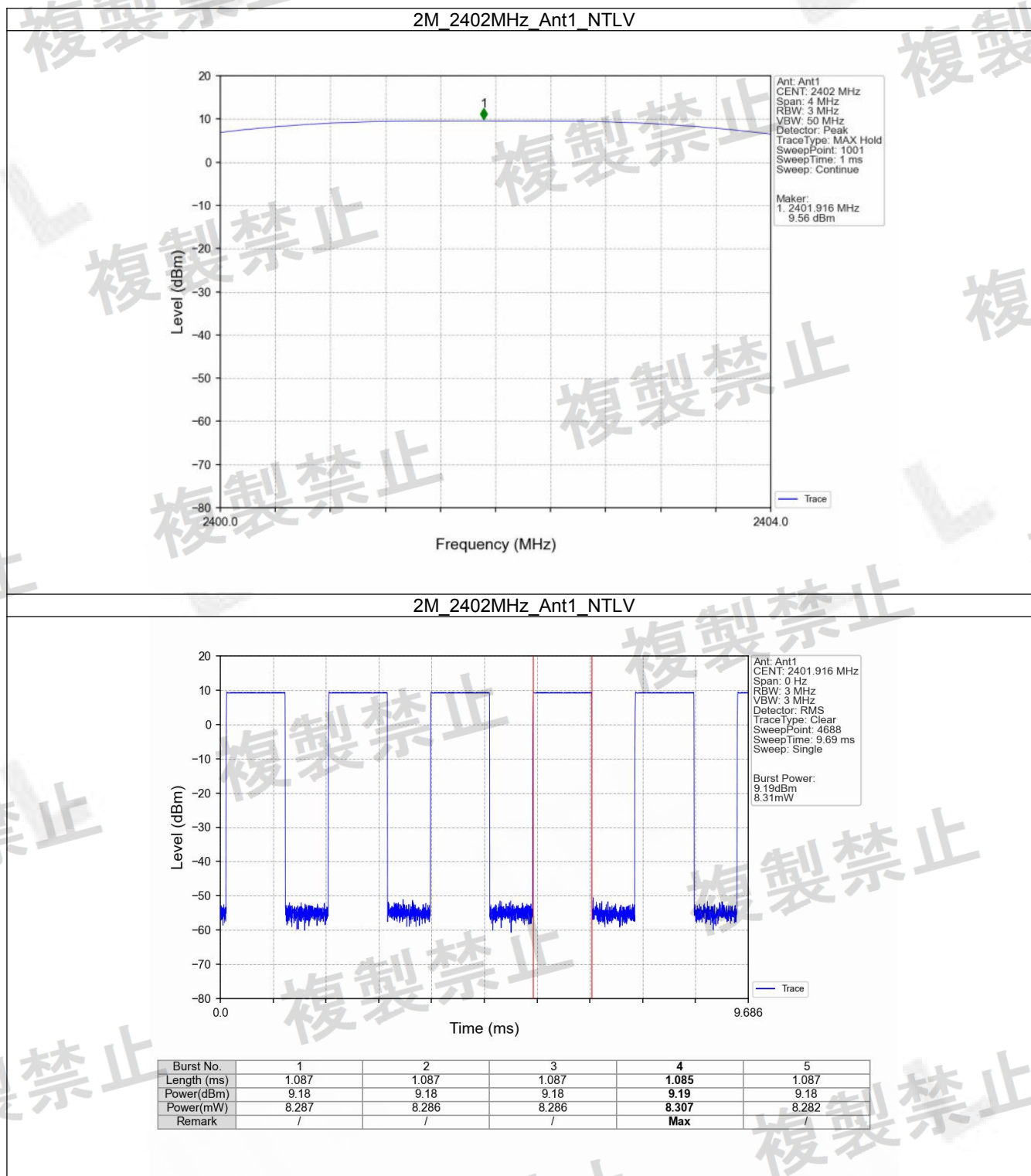
MIC: 219-269369



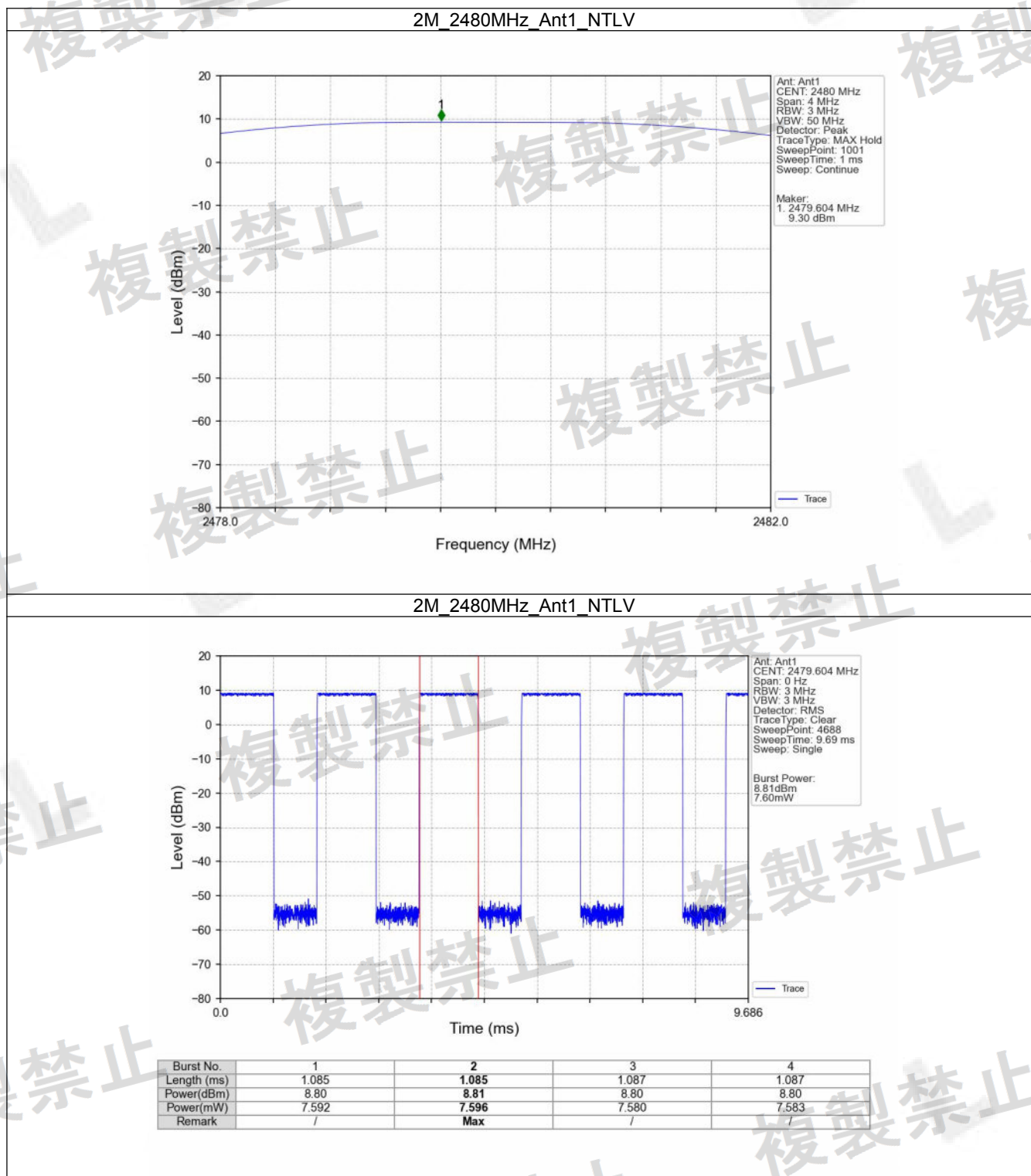
MIC: 219-269369



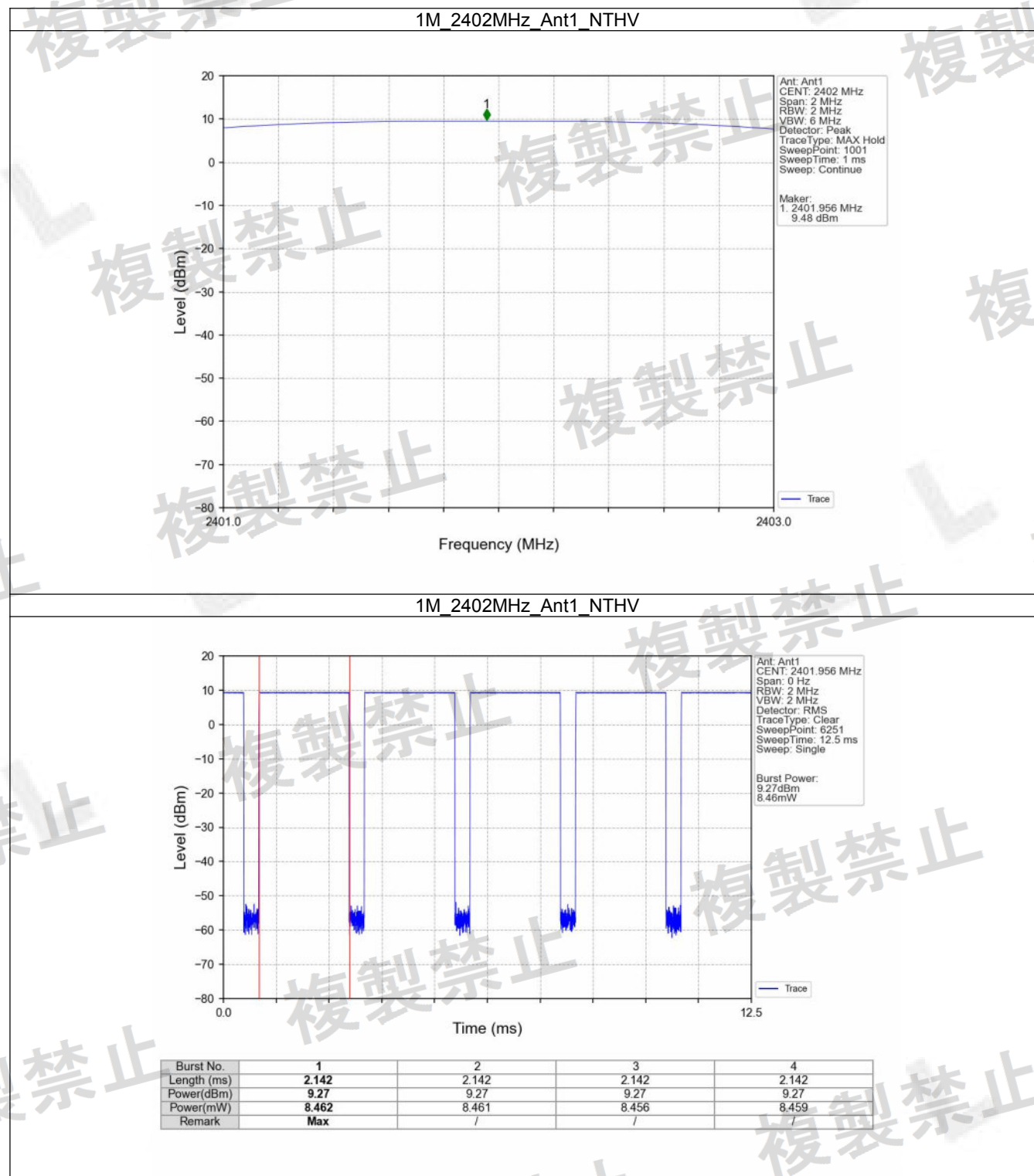
MIC: 219-269369



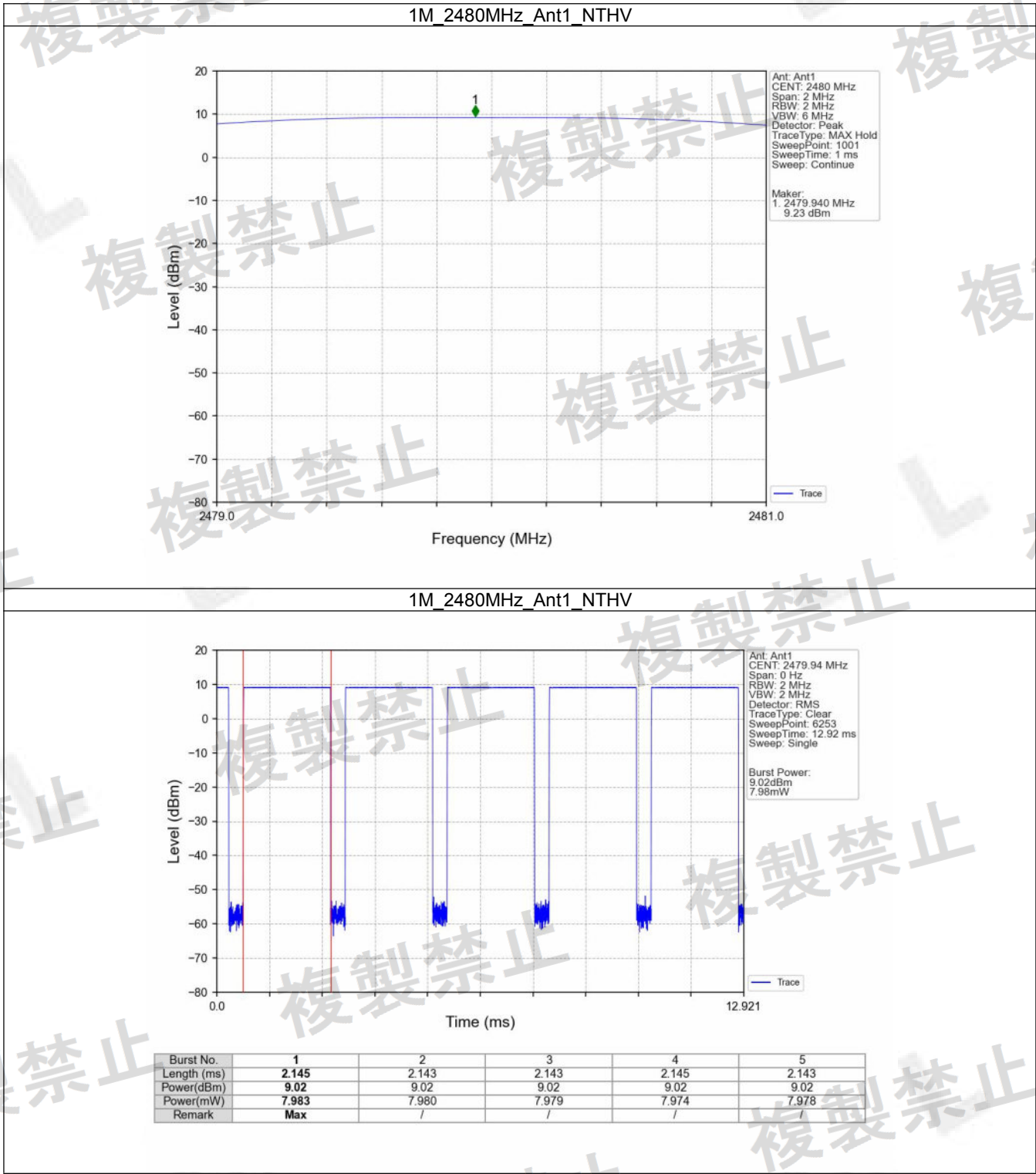
MIC: 219-269369



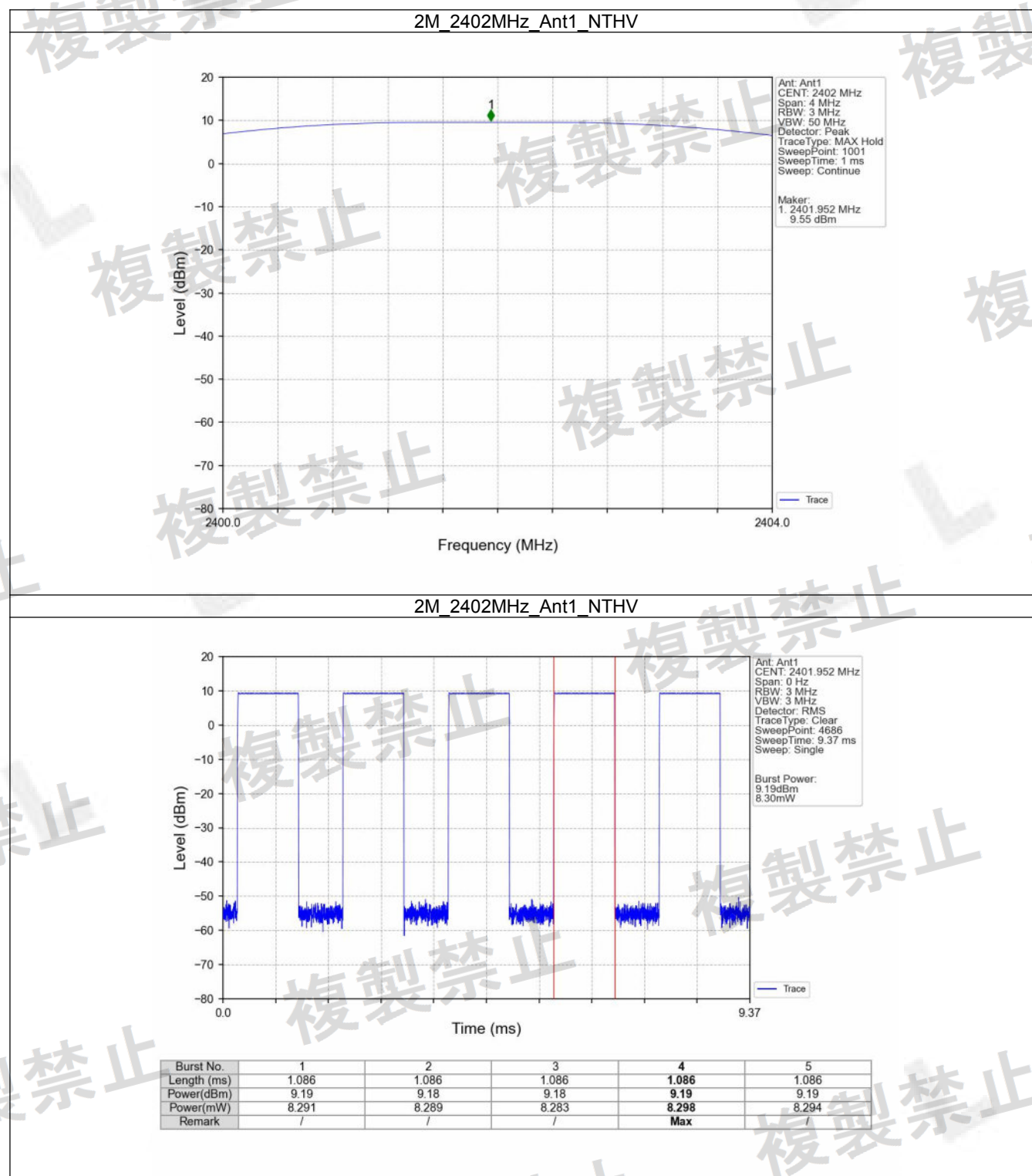
MIC: 219-269369



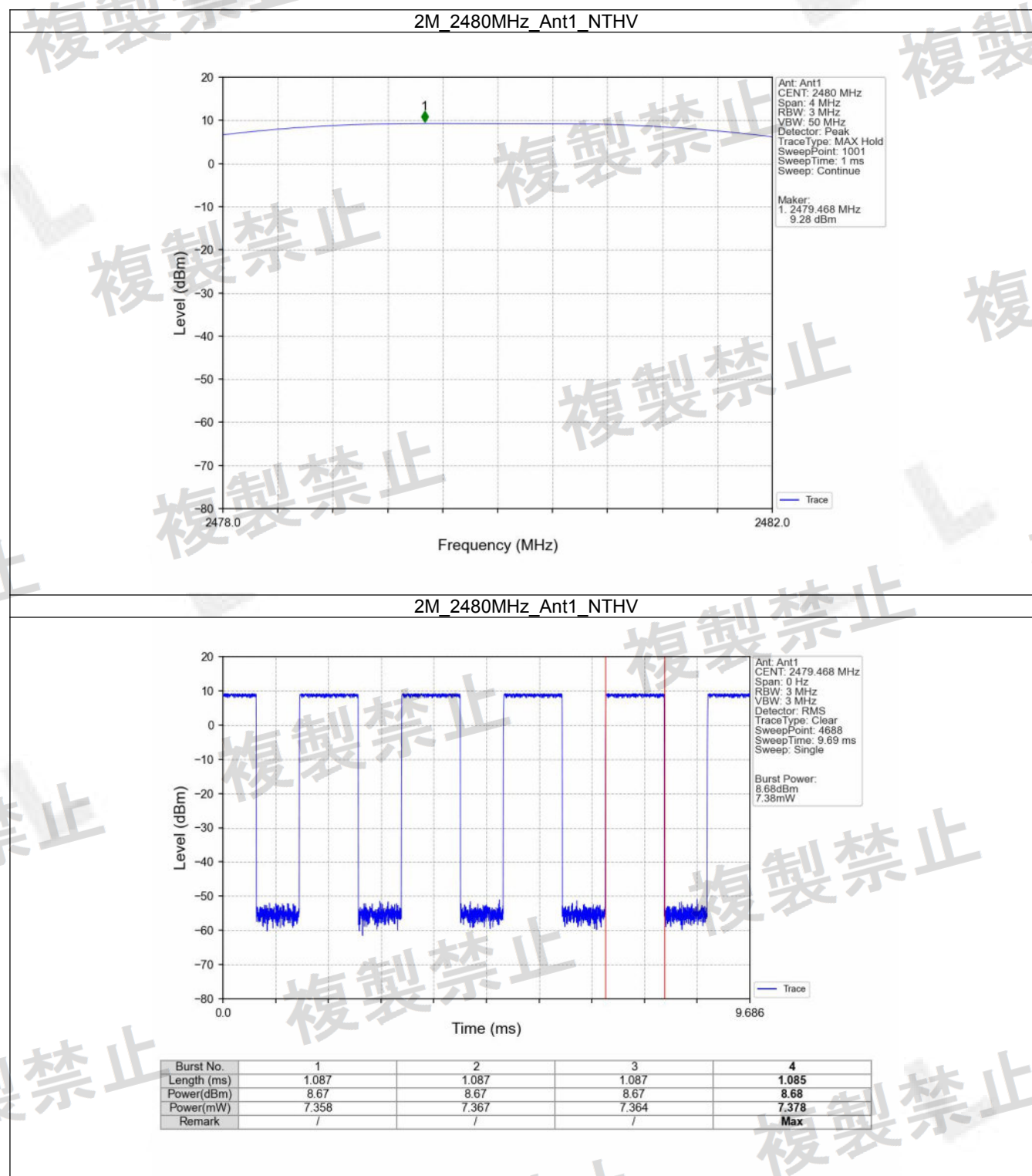
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MIC: 219-269369



MIC: 219-269369



MIC: 219-269369

4. Spurious Emission Intensity

4.1 Test Result

4.1.1 TxSe_NTNV

NTNV												
Mode	TX Type	Freq. (MHz)	ANT	Freq. Range		Marker					Limit (uW /MHz)	Verdict
				Start (MHz)	Stop (MHz)	Freq. (MHz)	PK Power (dBm /MHz)	PK Power (uW /MHz)	AV Power (dBm /MHz)	AV Power (uW /MHz)		
1M	SISO	2402	1	30	2387	2103.5	-46.10	0.025	/	/	2.5	Pass
				2387	2400	2399.987	-24.66	3.420	/	/	25	Pass
				2483.5	2496.5	2494.394	-48.37	0.015	/	/	25	Pass
				2496.5	12500	4804	-39.15	0.122	/	/	2.5	Pass
		2480	1	30	2387	894	-37.50	0.178	/	/	2.5	Pass
				2387	2400	2399.48	-47.46	0.018	/	/	25	Pass
				2483.5	2496.5	2483.578	-42.34	0.058	/	/	25	Pass
				2496.5	12500	4961	-41.74	0.067	/	/	2.5	Pass
2M	SISO	2402	1	30	2387	2138.5	-45.76	0.027	/	/	2.5	Pass
				2387	2400	2399.987	-12.42	57.280	-20.39	9.141	25	Pass
				2483.5	2496.5	2494.979	-48.14	0.015	/	/	25	Pass
				2496.5	12500	4805.5	-39.44	0.114	/	/	2.5	Pass
		2480	1	30	2387	2209.5	-46.20	0.024	/	/	2.5	Pass
				2387	2400	2397.153	-47.48	0.018	/	/	25	Pass
				2483.5	2496.5	2483.513	-35.48	0.283	/	/	25	Pass
				2496.5	12500	4961.5	-42.27	0.059	/	/	2.5	Pass

4.1.2 TxSe_NTLV

NTLV												
Mode	TX Type	Freq. (MHz)	ANT	Freq. Range		Marker					Limit (uW /MHz)	Verdict
				Start (MHz)	Stop (MHz)	Freq. (MHz)	PK Power (dBm /MHz)	PK Power (uW /MHz)	AV Power (dBm /MHz)	AV Power (uW /MHz)		
1M	SISO	2402	1	30	2387	2202	-46.06	0.025	/	/	2.5	Pass
				2387	2400	2399.987	-24.67	3.412	/	/	25	Pass
				2483.5	2496.5	2494.771	-48.33	0.015	/	/	25	Pass
				2496.5	12500	4805	-39.59	0.110	/	/	2.5	Pass
		2480	1	30	2387	2229	-45.86	0.026	/	/	2.5	Pass
				2387	2400	2395.775	-47.81	0.017	/	/	25	Pass
				2483.5	2496.5	2487.816	-41.96	0.064	/	/	25	Pass
				2496.5	12500	4960	-41.81	0.066	/	/	2.5	Pass
2M	SISO	2402	1	30	2387	2204.5	-45.15	0.031	/	/	2.5	Pass
				2387	2400	2399.987	-12.38	57.810	-20.40	9.120	25	Pass
				2483.5	2496.5	2495.603	-48.44	0.014	/	/	25	Pass
				2496.5	12500	4803.5	-39.18	0.121	/	/	2.5	Pass
		2480	1	30	2387	2197.5	-44.74	0.034	/	/	2.5	Pass
				2387	2400	2399.272	-48.12	0.015	/	/	25	Pass
				2483.5	2496.5	2483.513	-35.41	0.288	/	/	25	Pass
				2496.5	12500	4959.5	-42.37	0.058	/	/	2.5	Pass

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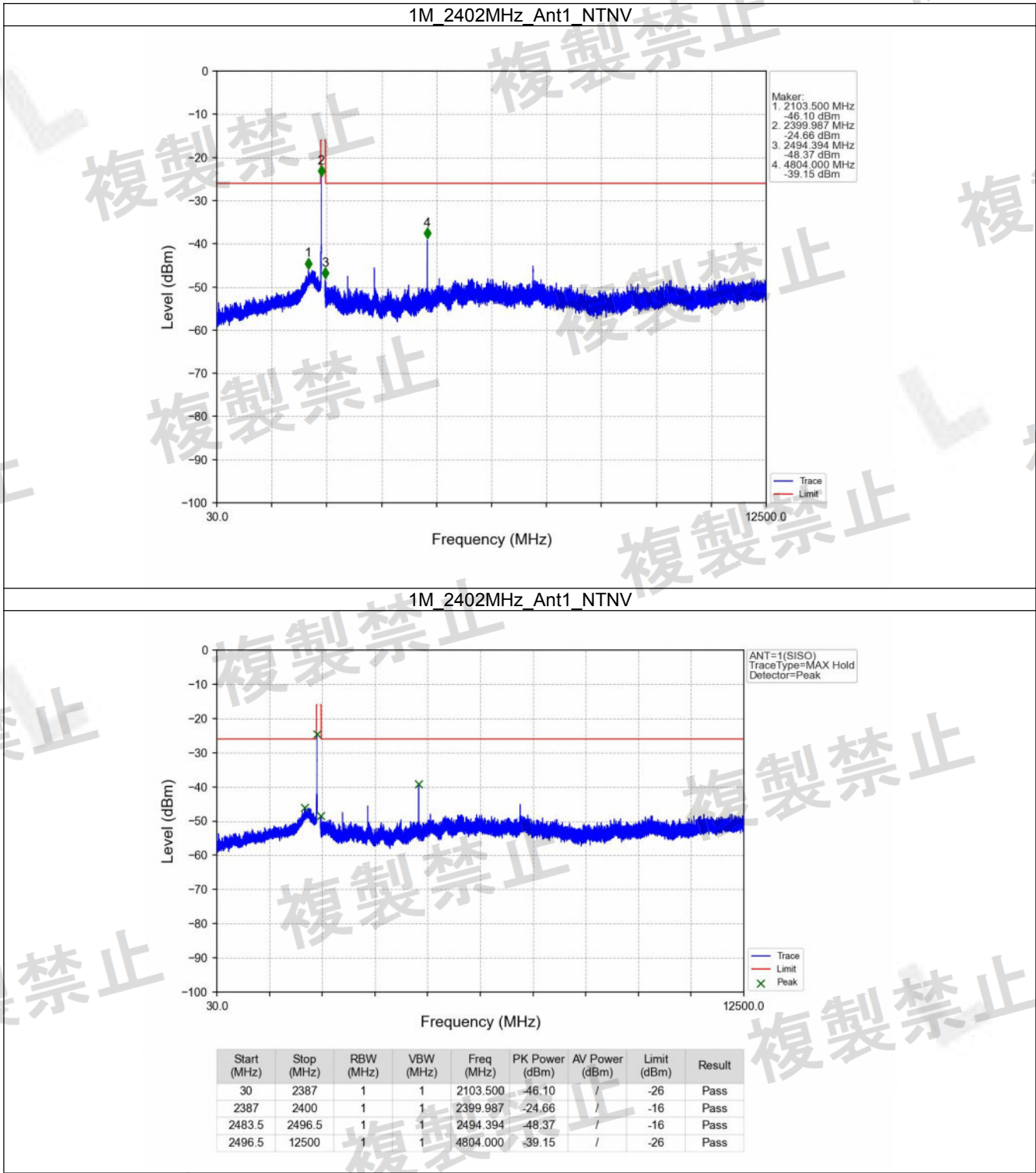
4.1.3 TxSe_NTHV

NTHV												
Mode	TX Type	Freq. (MHz)	ANT	Freq. Range		Marker					Limit (uW /MHz)	Verdict
				Start (MHz)	Stop (MHz)	Freq. (MHz)	PK Power (dBm /MHz)	PK Power (uW /MHz)	AV Power (dBm /MHz)	AV Power (uW /MHz)		
1M	SISO	2402	1	30	2387	721	-40.58	0.087	/	/	2.5	Pass
				2387	2400	2399.987	-24.76	3.342	/	/	25	Pass
				2483.5	2496.5	2489.883	-48.08	0.016	/	/	25	Pass
				2496.5	12500	4804.5	-38.86	0.130	/	/	2.5	Pass
		2480	1	30	2387	2236	-45.50	0.028	/	/	2.5	Pass
				2387	2400	2388.794	-47.72	0.017	/	/	25	Pass
				2483.5	2496.5	2488.011	-42.54	0.056	/	/	25	Pass
				2496.5	12500	4960.5	-42.06	0.062	/	/	2.5	Pass
2M	SISO	2402	1	30	2387	1942	-33.98	0.400	/	/	2.5	Pass
				2387	2400	2399.987	-12.46	56.754	-20.39	9.141	25	Pass
				2483.5	2496.5	2490.013	-48.27	0.015	/	/	25	Pass
				2496.5	12500	4803.5	-39.16	0.121	/	/	2.5	Pass
		2480	1	30	2387	2163.5	-45.81	0.026	/	/	2.5	Pass
				2387	2400	2390.991	-47.61	0.017	/	/	25	Pass
				2483.5	2496.5	2483.513	-35.26	0.298	/	/	25	Pass
				2496.5	12500	4959.5	-43.19	0.048	/	/	2.5	Pass

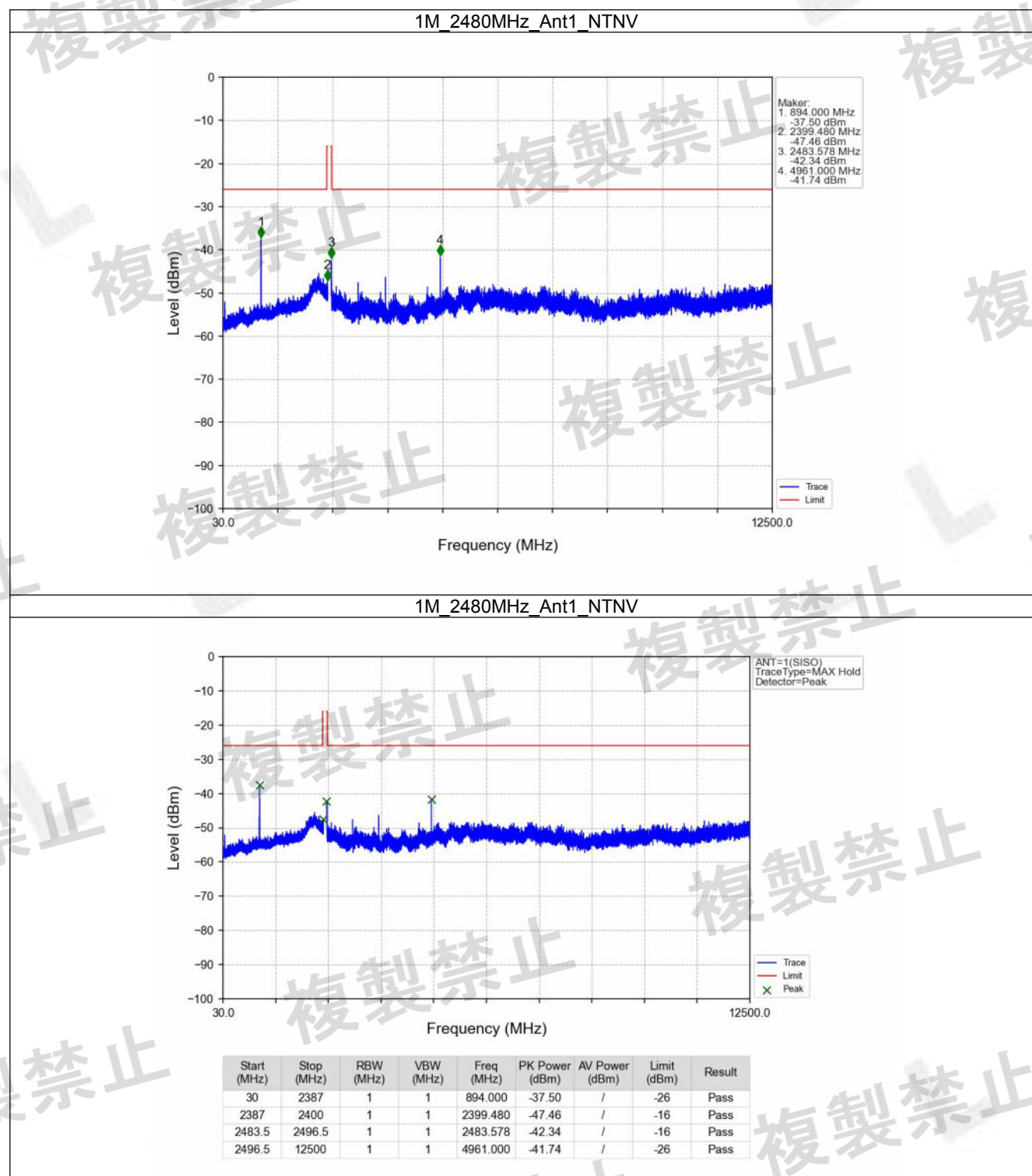
MIC: 219-269369

4.2 Test Graph

4.2.1 TxSe_NTNV

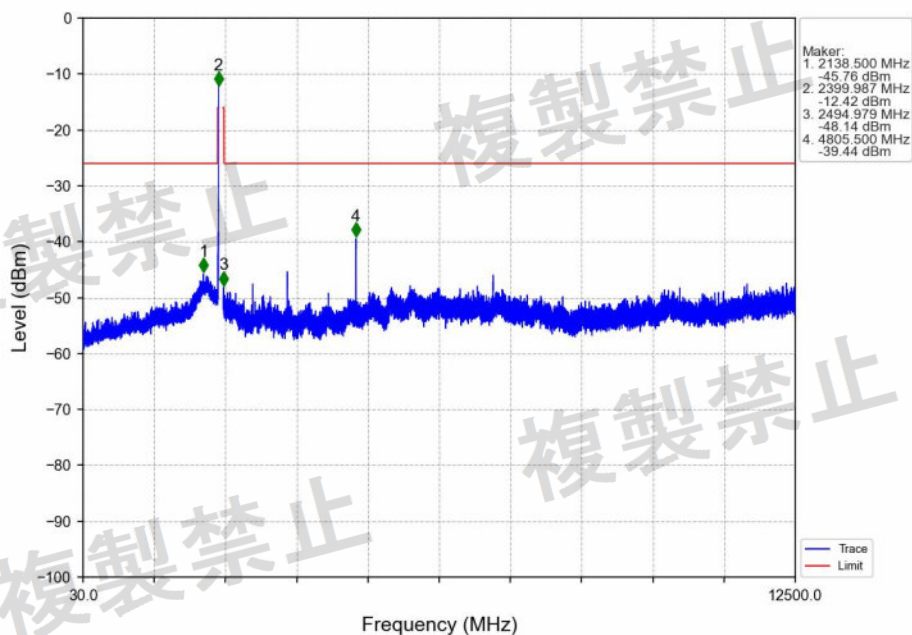


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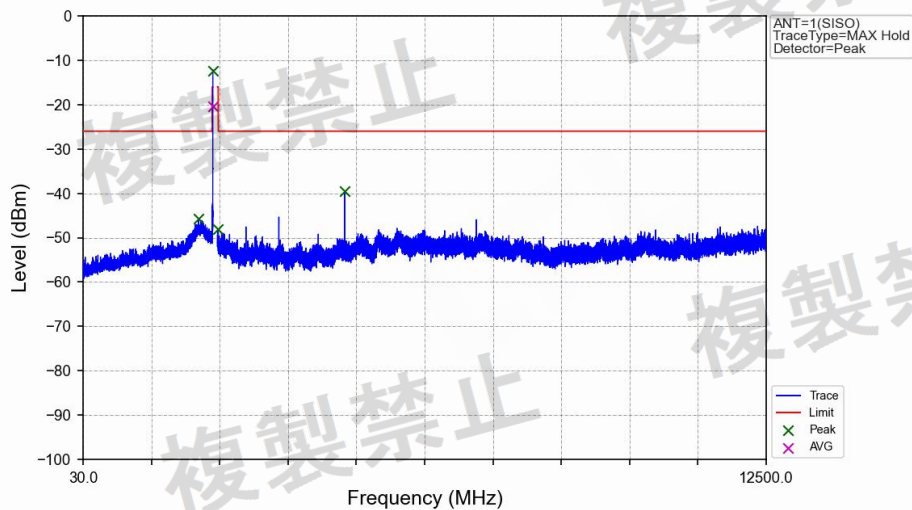


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2M_2402MHz_Ant1_NTNV

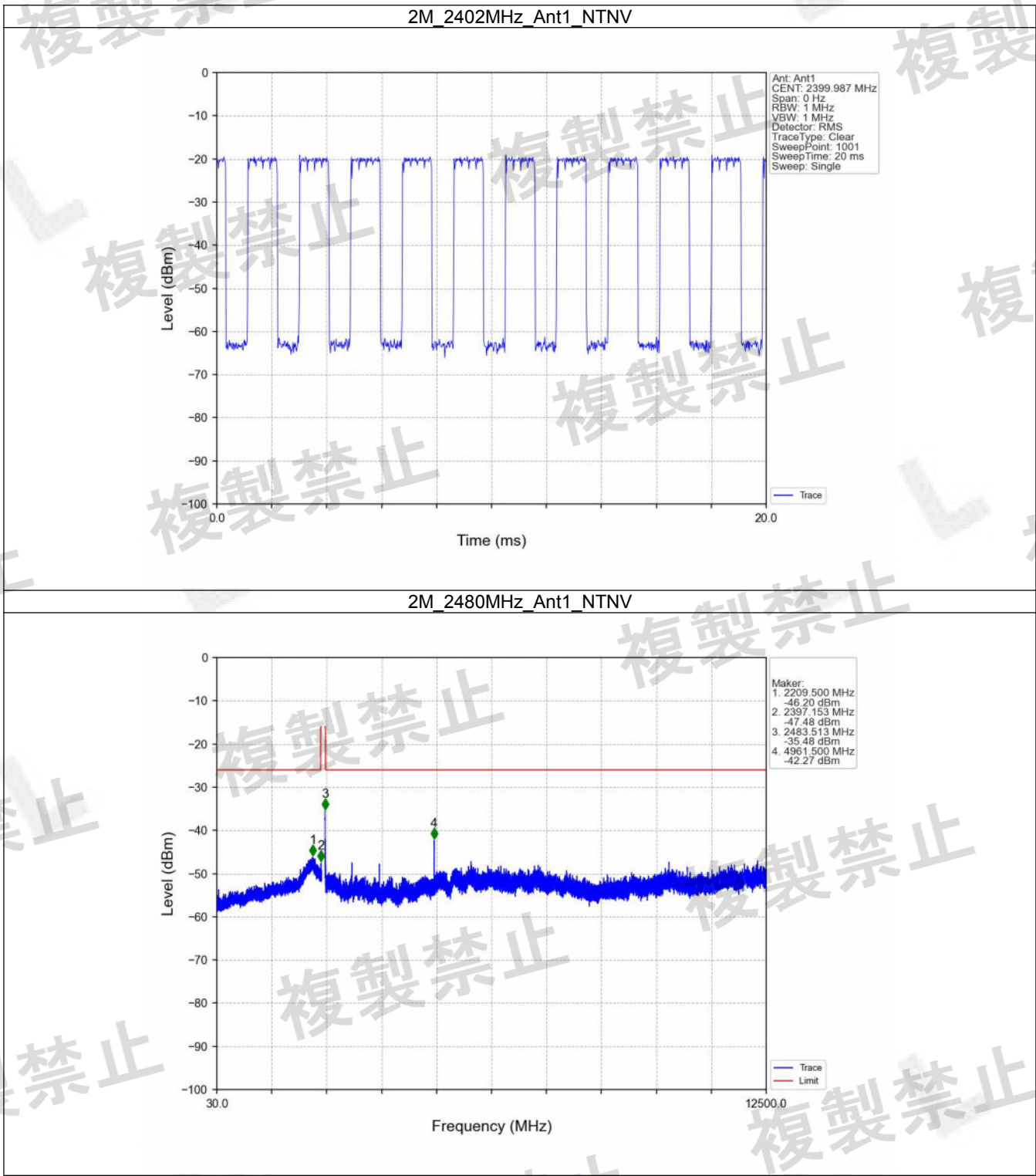


2M_2402MHz_Ant1_NTNV

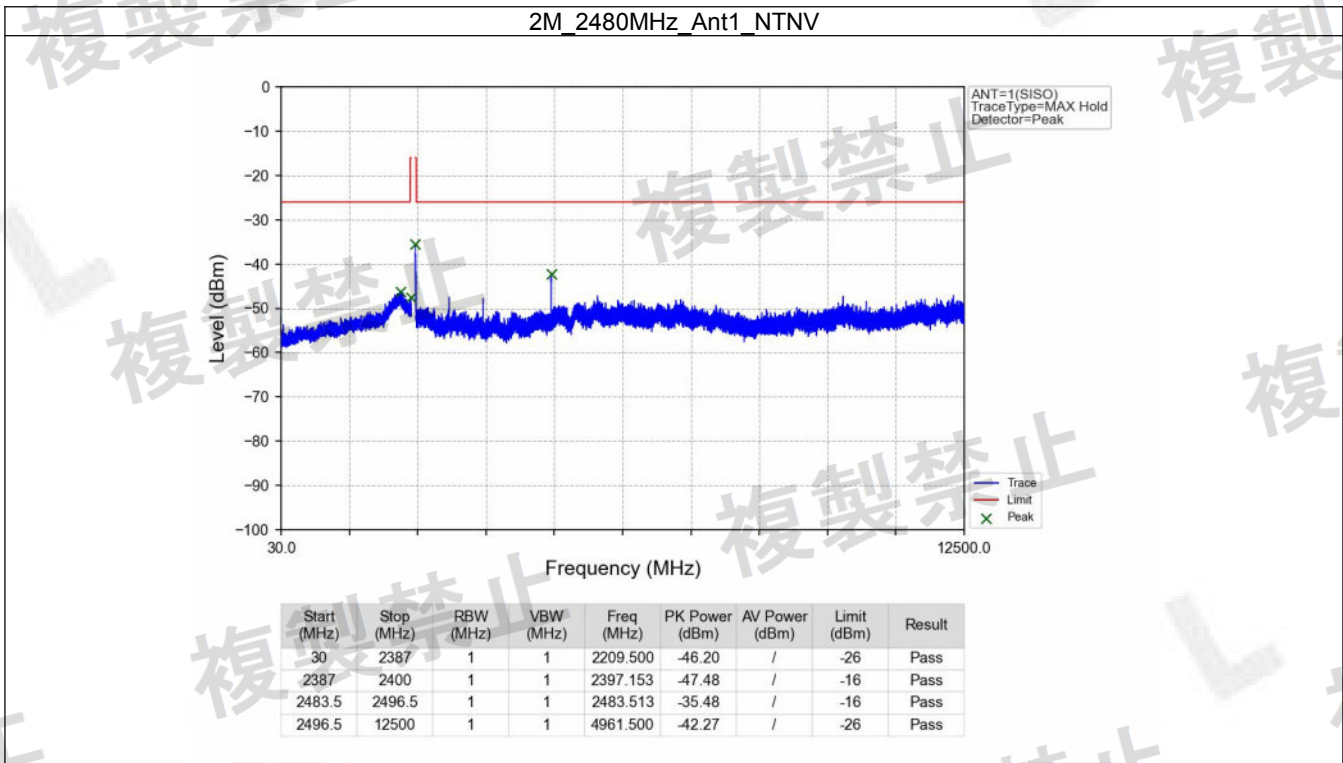


Start (MHz)	Stop (MHz)	RBW (MHz)	VBW (MHz)	Freq (MHz)	PK Power (dBm)	AV Power (dBm)	Limit (dBm)	Result
30	2387	1	1	2138.500	-45.76	/	-26	Pass
2387	2400	1	1	2399.987	-12.42	-20.39	-16	Pass
2483.5	2496.5	1	1	2494.979	-48.14	/	-16	Pass
2496.5	12500	1	1	4805.500	-39.44	/	-26	Pass

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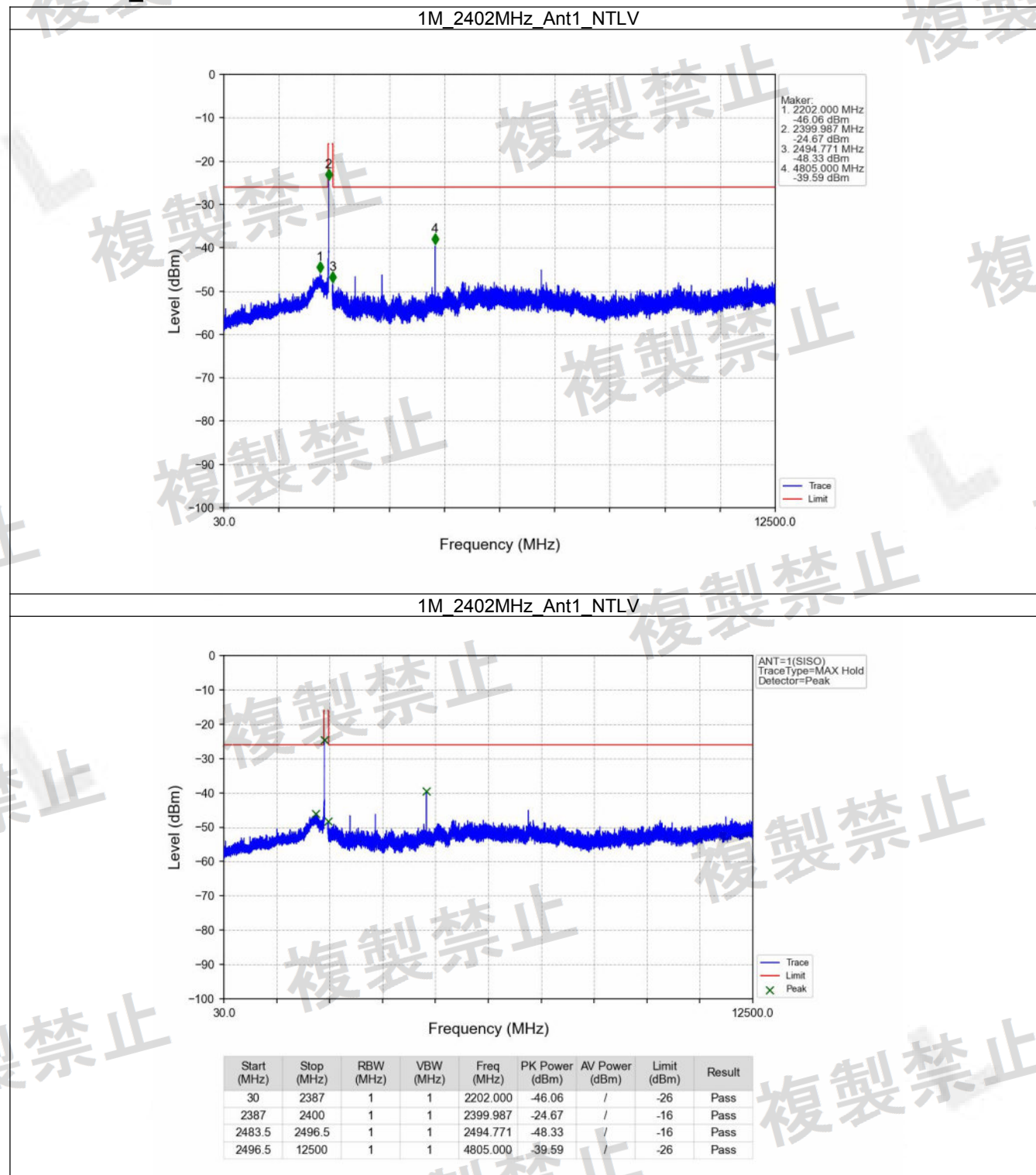


MIC: 219-269369



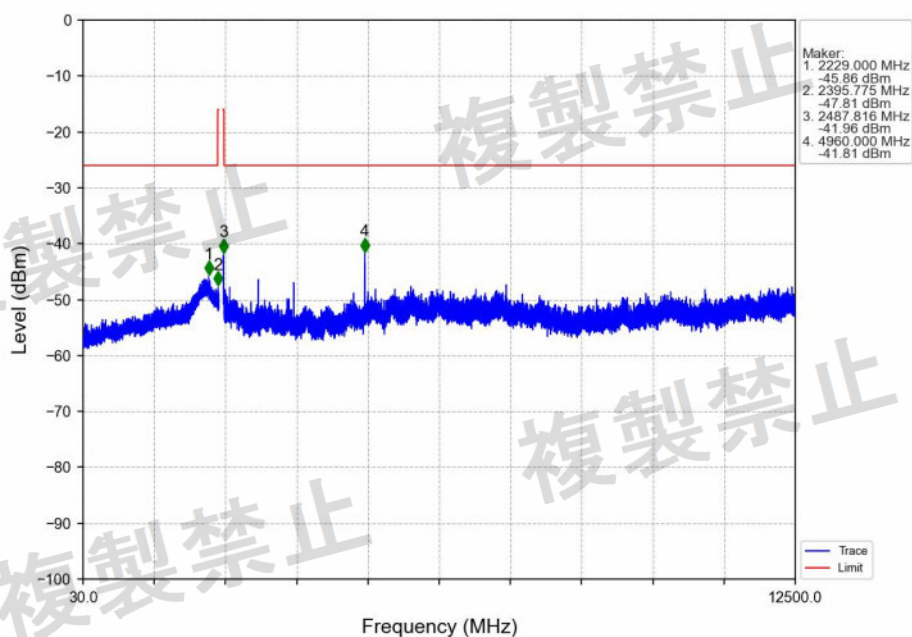
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4.2.2 TxSe_NTLV

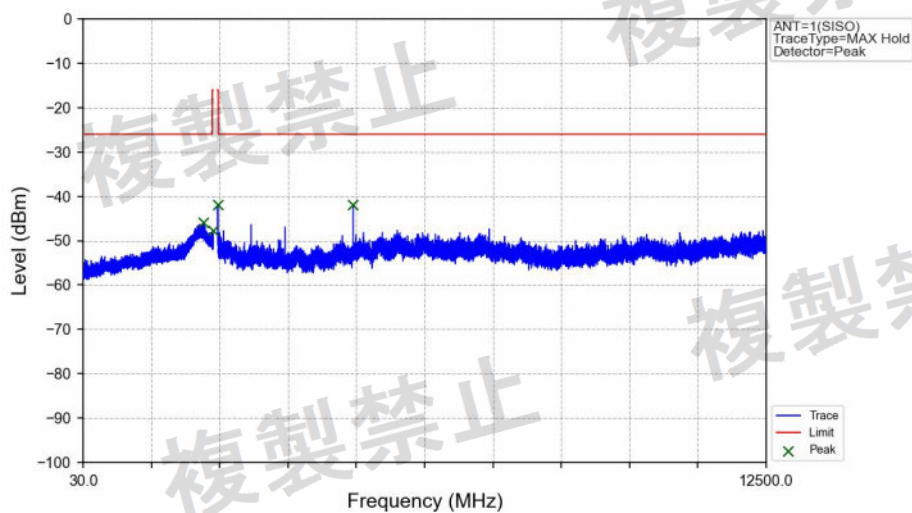


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1M_2480MHz_Ant1_NTLV



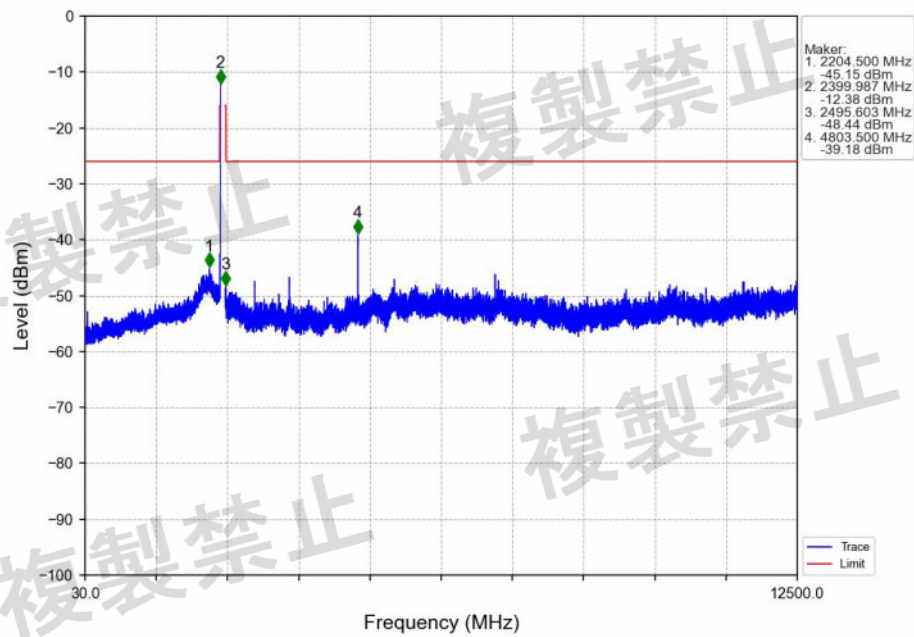
1M_2480MHz_Ant1_NTLV



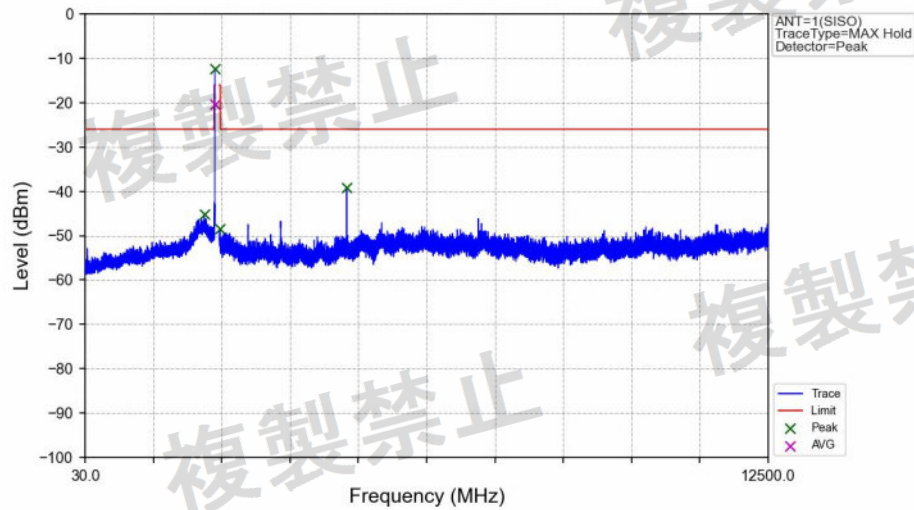
Start (MHz)	Stop (MHz)	RBW (MHz)	VBW (MHz)	Freq (MHz)	PK Power (dBm)	AV Power (dBm)	Limit (dBm)	Result
30	2387	1	1	2229.000	-45.86	/	-26	Pass
2387	2400	1	1	2395.775	-47.81	/	-16	Pass
2483.5	2496.5	1	1	2487.816	-41.96	/	-16	Pass
2496.5	12500	1	1	4960.000	-41.81	/	-26	Pass

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2M_2402MHz_Ant1_NTLV

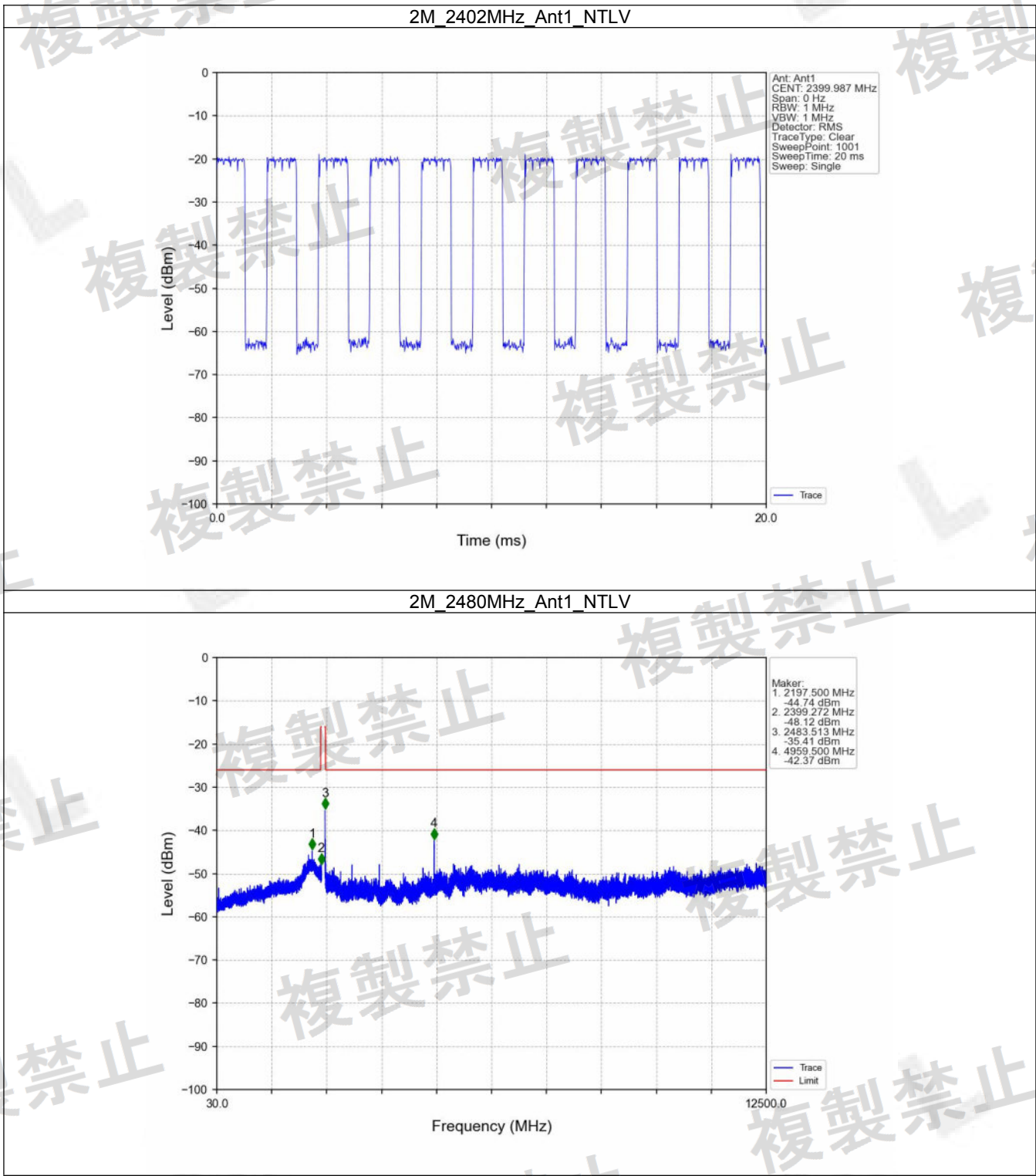


2M_2402MHz_Ant1_NTLV

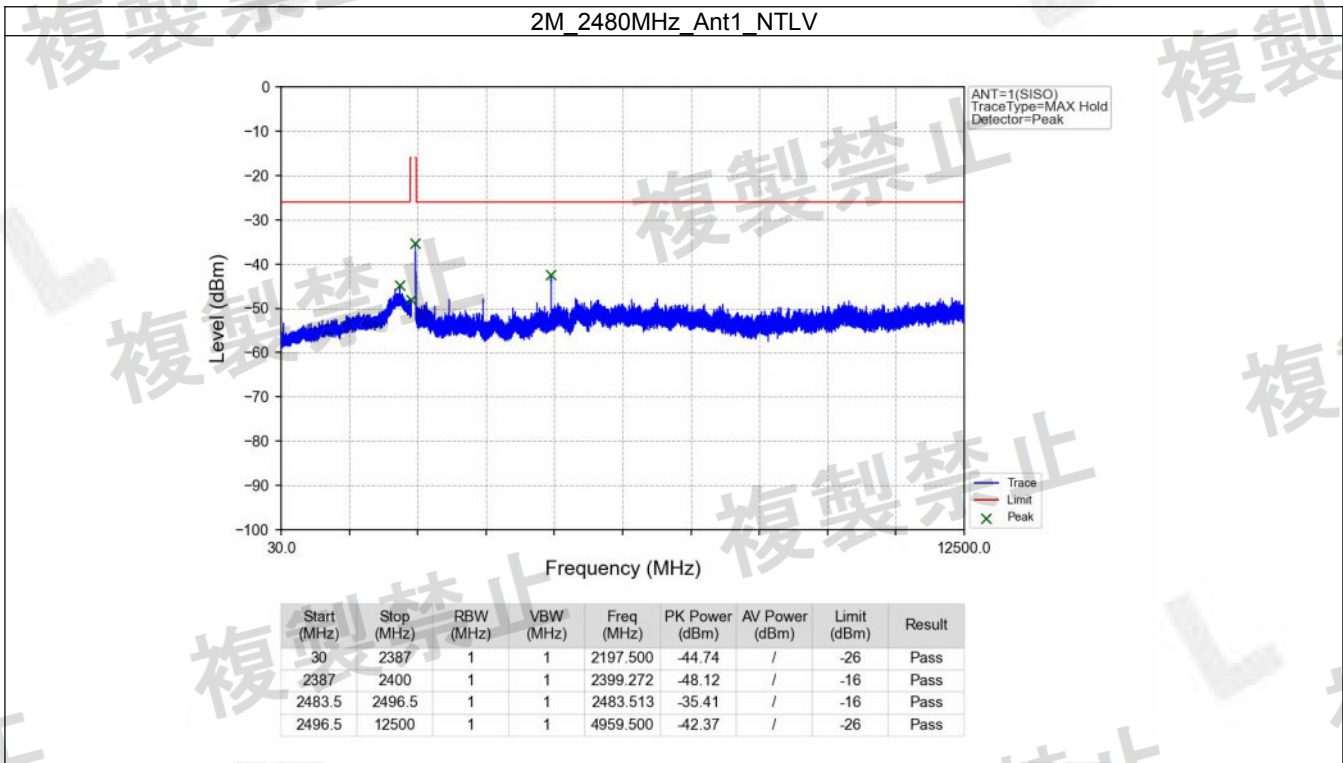


Start (MHz)	Stop (MHz)	RBW (MHz)	VBW (MHz)	Freq (MHz)	PK Power (dBm)	AV Power (dBm)	Limit (dBm)	Result
30	2387	1	1	2204.500	-45.15	/	-26	Pass
2387	2400	1	1	2399.987	-12.38	-20.40	-16	Pass
2483.5	2496.5	1	1	2495.603	-48.44	/	-16	Pass
2496.5	12500	1	1	4803.500	-39.18	/	-26	Pass

MIC: 219-269369

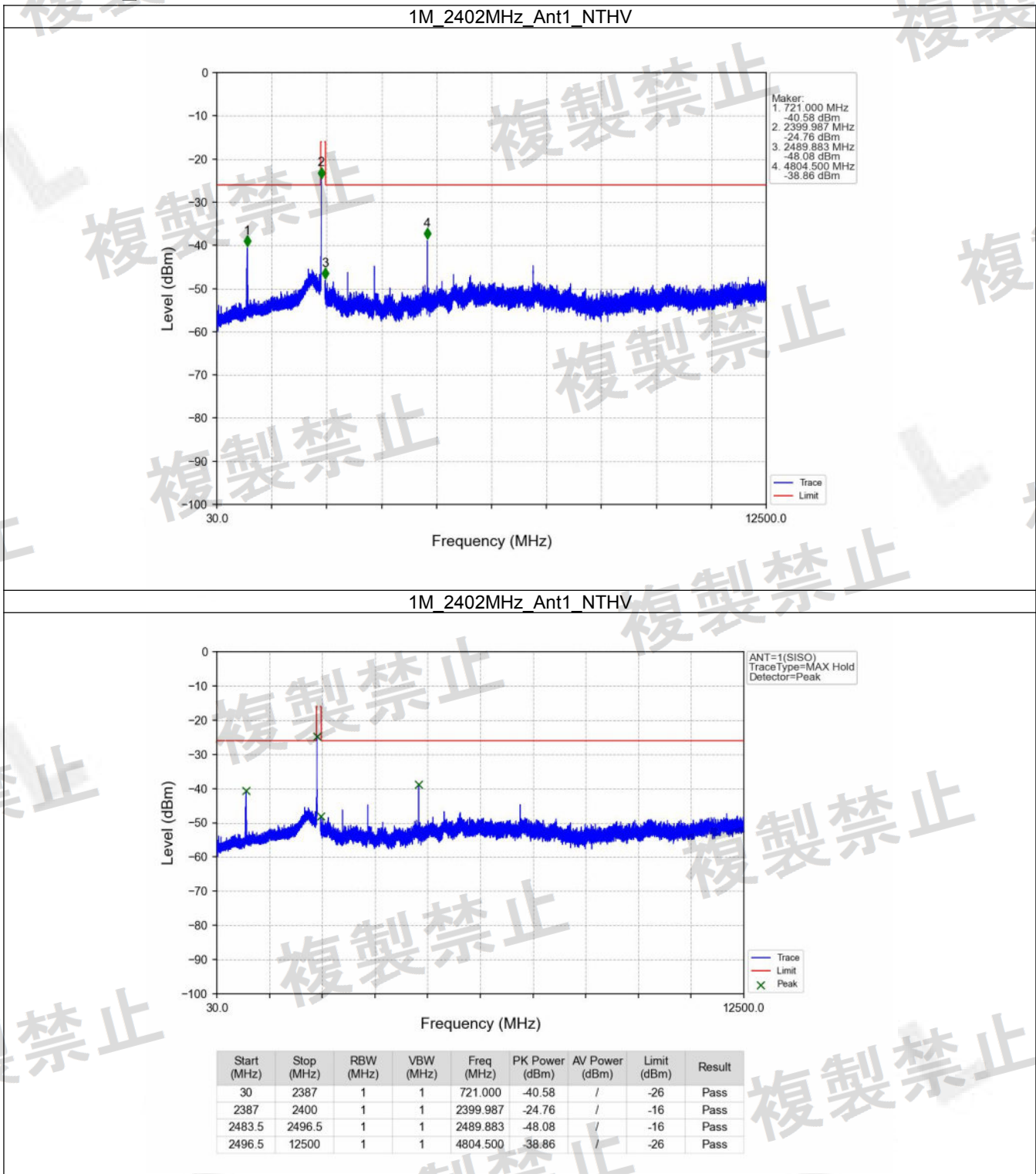


MIC: 219-269369

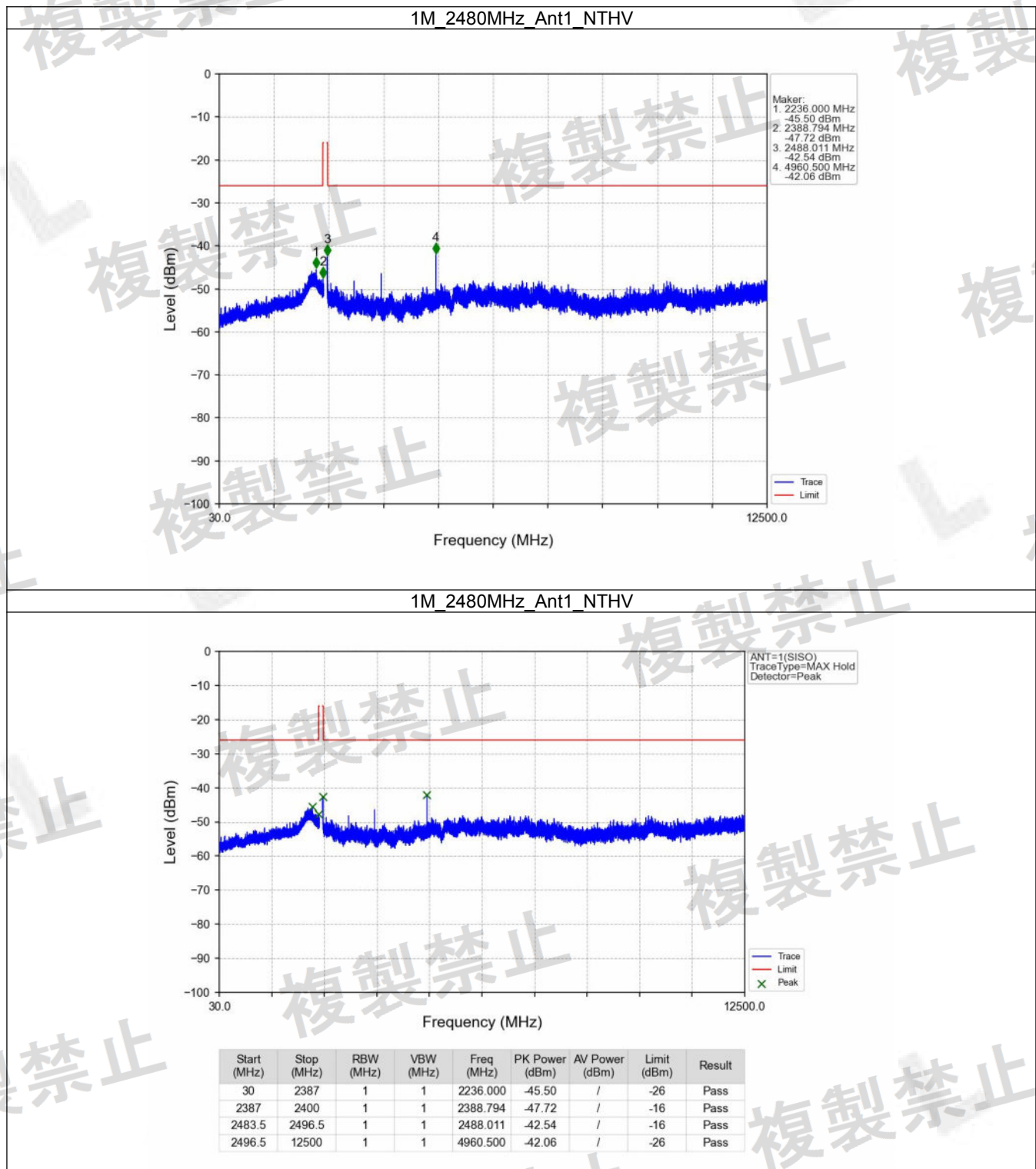


MIC: 219-269369

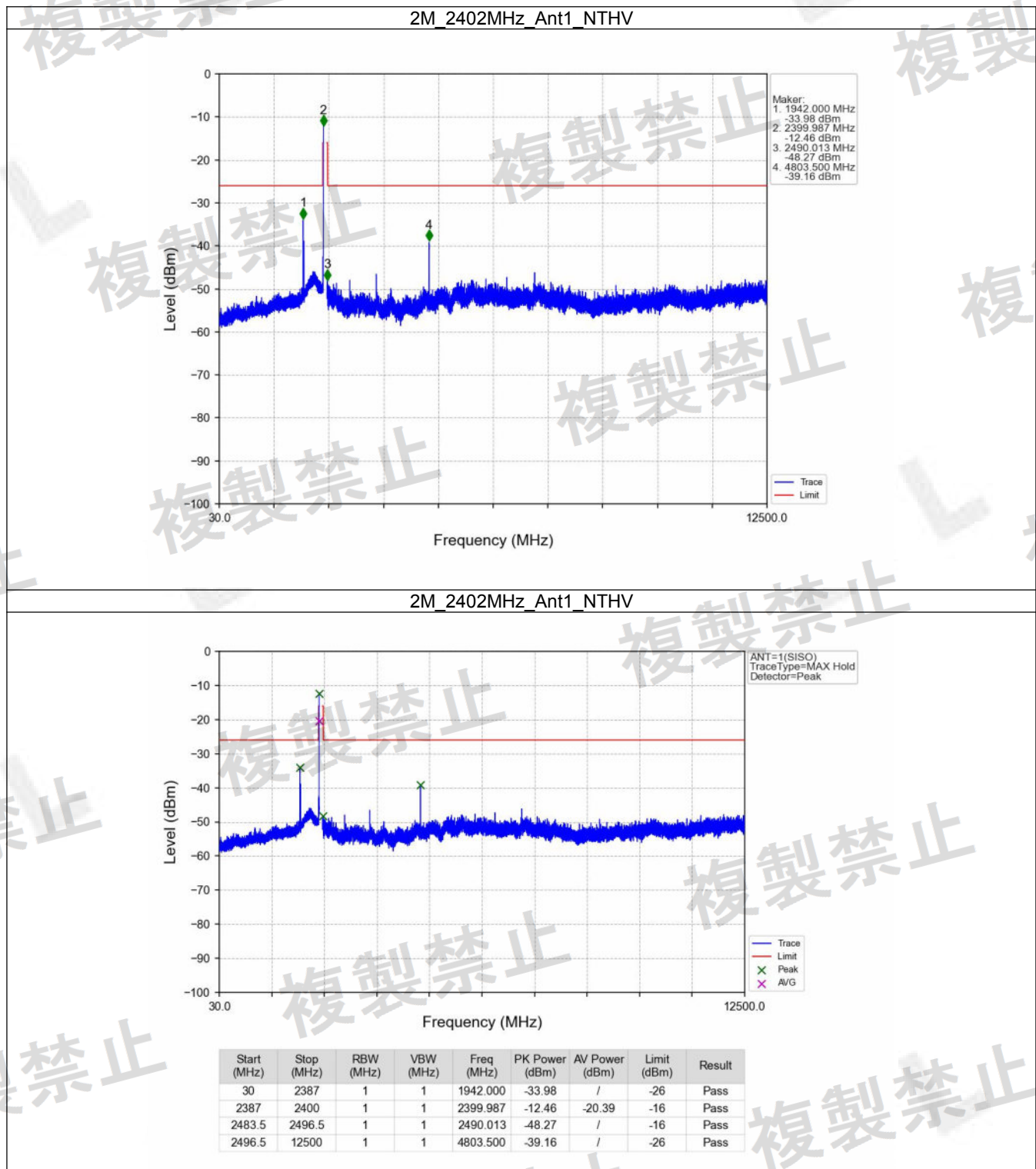
4.2.3 TxSe_NTHV



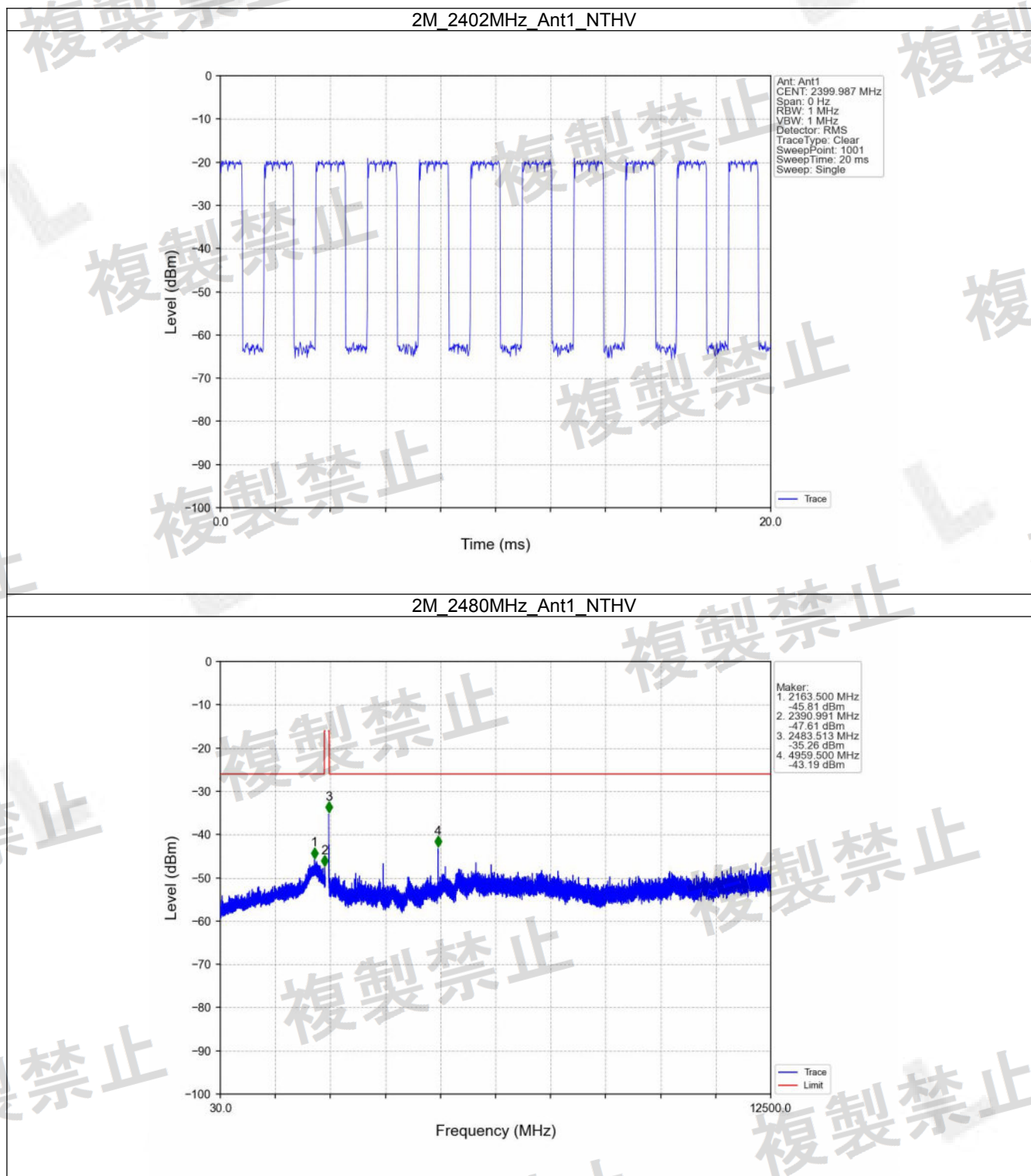
MIC: 219-269369



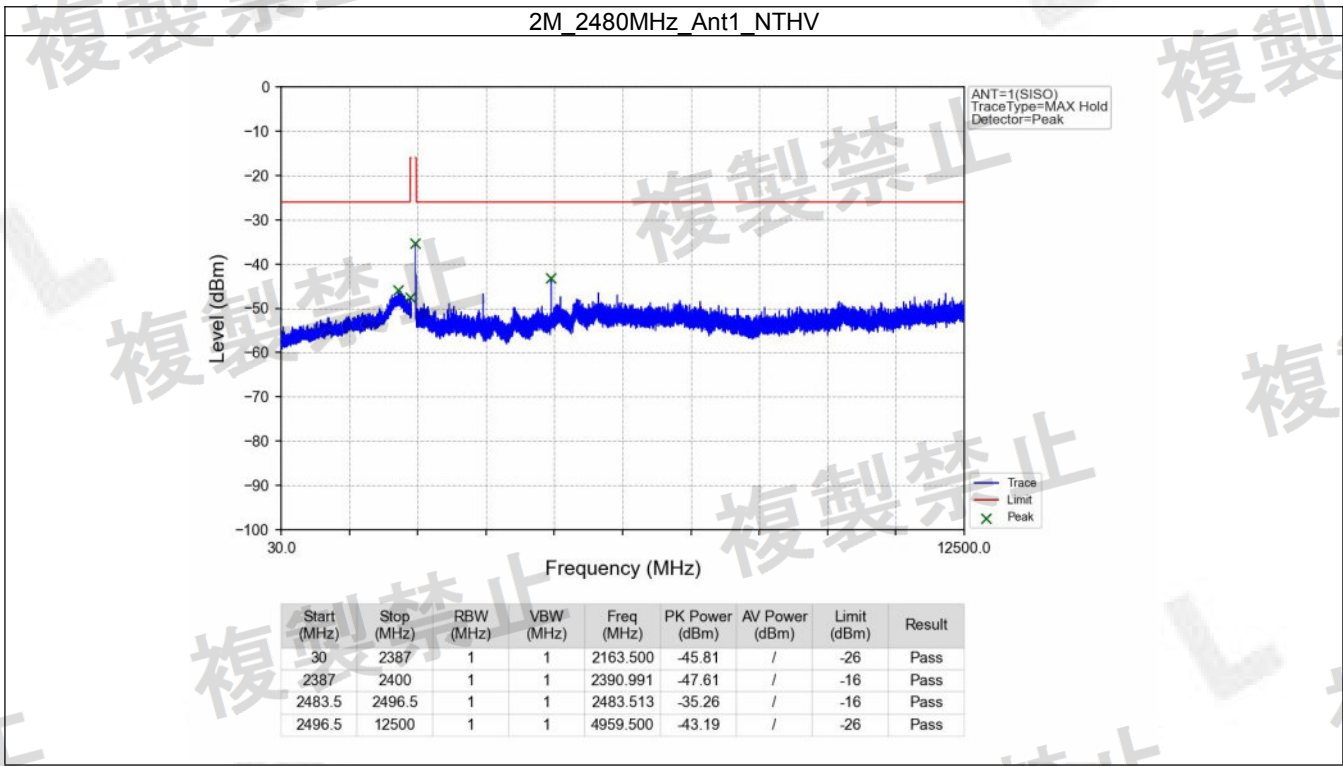
MIC: 219-269369



MIC: 219-269369



MIC: 219-269369



MIC: 219-269369

5. Secondary Radiated Emission

5.1 Test Result

5.1.1 RxSe_NTNV

NTNV												
Mode	TX Type	Freq. (MHz)	ANT	Freq. Range		Marker					Limit (nW)	Verdict
				Start (MHz)	Stop (MHz)	Freq. (MHz)	PK Power (dBm)	PK Power (nW)	AV Power (dBm)	AV Power (nW)		
1M	SISO	2402	1	30	1000	67.25	-75.23	0.030	/	/	4	Pass
				1000	12500	2432	-53.67	4.295	-79.09	0.012	20	Pass
						2435	-50.21	9.528	-76.82	0.021	20	Pass
						2438.5	-46.68	21.478	-54.59	3.475	20	Pass
						2441.5	-50.46	8.995	-65.59	0.276	20	Pass
		2480	-52.66	5.420	-60.66	0.859	20	Pass				
		2480	1	30	1000	67.55	-75.25	0.030	/	/	4	Pass
				1000	12500	2434	-50.88	8.166	-79.16	0.012	20	Pass
						2439	-50.75	8.414	-66.42	0.228	20	Pass
						2442	-52.93	5.093	-67.52	0.177	20	Pass
2480.5	-52.56					5.546	-62.23	0.598	20	Pass		
2M	SISO	2402	1	30	1000	66.3	-74.93	0.032	/	/	4	Pass
				1000	12500	2434	-48.21	15.101	-79.15	0.012	20	Pass
						2441.5	-51.21	7.568	-71.40	0.072	20	Pass
						2480.5	-52.78	5.272	-62.24	0.597	20	Pass
		2480	1	30	1000	67.55	-76.19	0.024	/	/	4	Pass
				1000	12500	2432.5	-56.20	2.399	-79.13	0.012	20	Pass
						2438.5	-47.39	18.239	-53.43	4.539	20	Pass
						2444.5	-56.51	2.234	-74.27	0.037	20	Pass
						2480.5	-52.84	5.200	-64.55	0.351	20	Pass

5.1.2 RxSe_NTLV

NTLV												
Mode	TX Type	Freq. (MHz)	ANT	Freq. Range		Marker					Limit (nW)	Verdict
				Start (MHz)	Stop (MHz)	Freq. (MHz)	PK Power (dBm)	PK Power (nW)	AV Power (dBm)	AV Power (nW)		
1M	SISO	2402	1	30	1000	66.3	-74.89	0.032	/	/	4	Pass
				1000	12500	2434.5	-50.30	9.333	-79.16	0.012	20	Pass
						2439	-52.40	5.754	-65.50	0.282	20	Pass
						2442	-51.93	6.412	-79.13	0.012	20	Pass
						2480	-52.69	5.383	-60.38	0.916	20	Pass
		2480	1	30	1000	66.75	-74.28	0.037	/	/	4	Pass
				1000	12500	2480	-52.50	5.623	-60.59	0.873	20	Pass
2M	SISO	2402	1	30	1000	62.3	-74.98	0.032	/	/	4	Pass
				1000	12500	2438.5	-50.22	9.506	-79.10	0.012	20	Pass
						2444.5	-56.75	2.113	-75.51	0.028	20	Pass
						2480	-52.58	5.521	-60.61	0.869	20	Pass
		2480	1	30	1000	66.45	-75.71	0.027	/	/	4	Pass
				1000	12500	2480	-52.82	5.224	-60.43	0.906	20	Pass

MIC: 219-269369

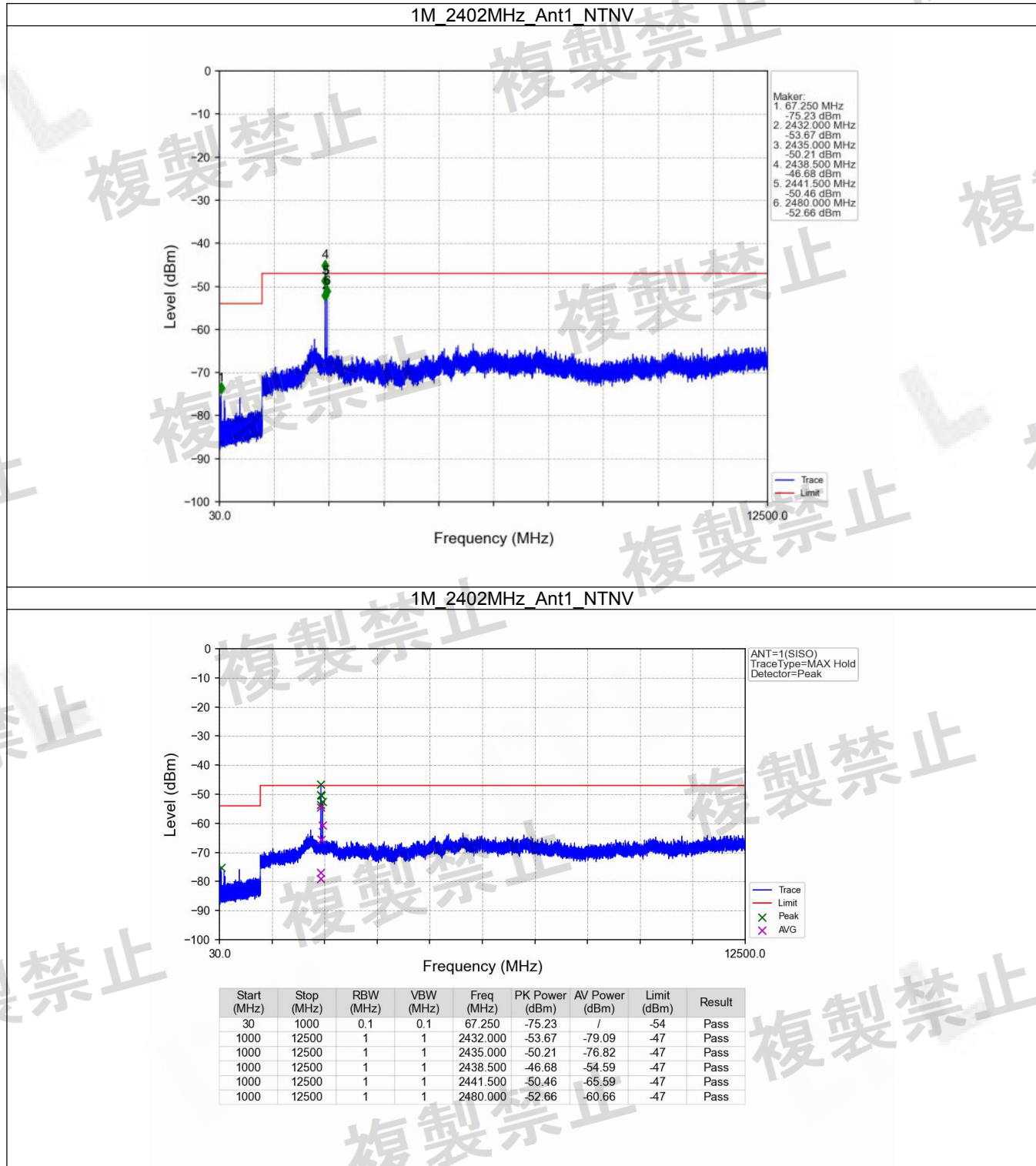
5.1.3 RxSe_NTHV

NTHV												
Mode	TX Type	Freq. (MHz)	ANT	Freq. Range		Marker					Limit (nW)	Verdict
				Start (MHz)	Stop (MHz)	Freq. (MHz)	PK Power (dBm)	PK Power (nW)	AV Power (dBm)	AV Power (nW)		
1M	SISO	2402	1	30	1000	892.75	-59.53	1.114	-92.15	0.001	4	Pass
				1000	12500	2432	-56.86	2.061	-79.16	0.012	20	Pass
						2435	-48.72	13.428	-79.11	0.012	20	Pass
						2439	-48.70	13.490	-65.78	0.264	20	Pass
						2442	-51.64	6.855	-68.57	0.139	20	Pass
						2480	-52.70	5.370	-60.42	0.908	20	Pass
		2480	1	30	1000	62.25	-75.65	0.027	/	/	4	Pass
				1000	12500	2480	-52.92	5.105	-60.37	0.918	20	Pass
2M	SISO	2402	1	30	1000	68.25	-75.29	0.030	/	/	4	Pass
				1000	12500	2439	-48.67	13.583	-55.18	3.034	20	Pass
						2480	-52.96	5.058	-60.57	0.877	20	Pass
		2480	1	30	1000	66.35	-74.13	0.039	/	/	4	Pass
				1000	12500	2438.5	-47.99	15.885	-79.13	0.012	20	Pass
						2480.5	-52.72	5.346	-61.90	0.646	20	Pass

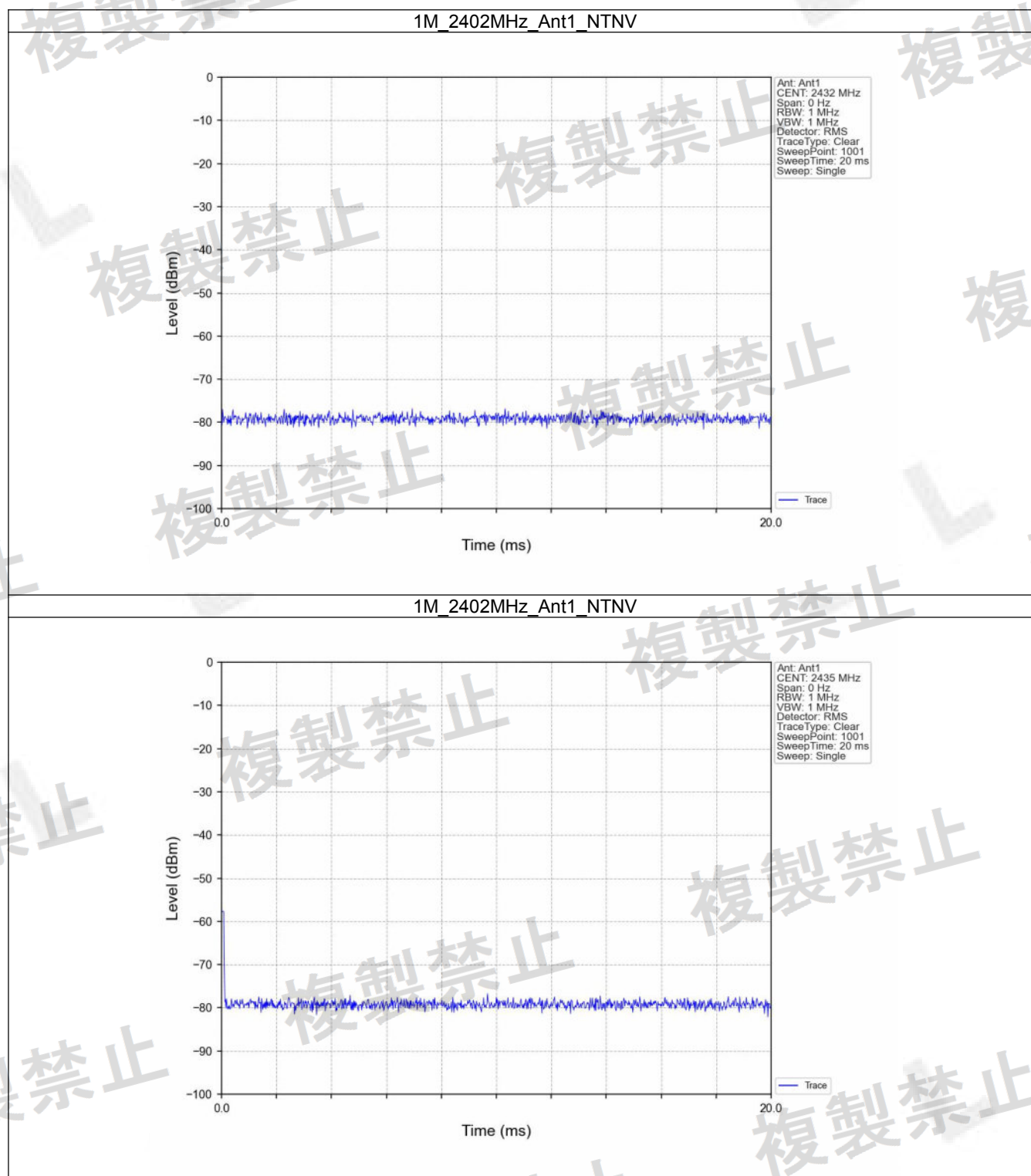
MIC: 219-269369

5.2 Test Graph

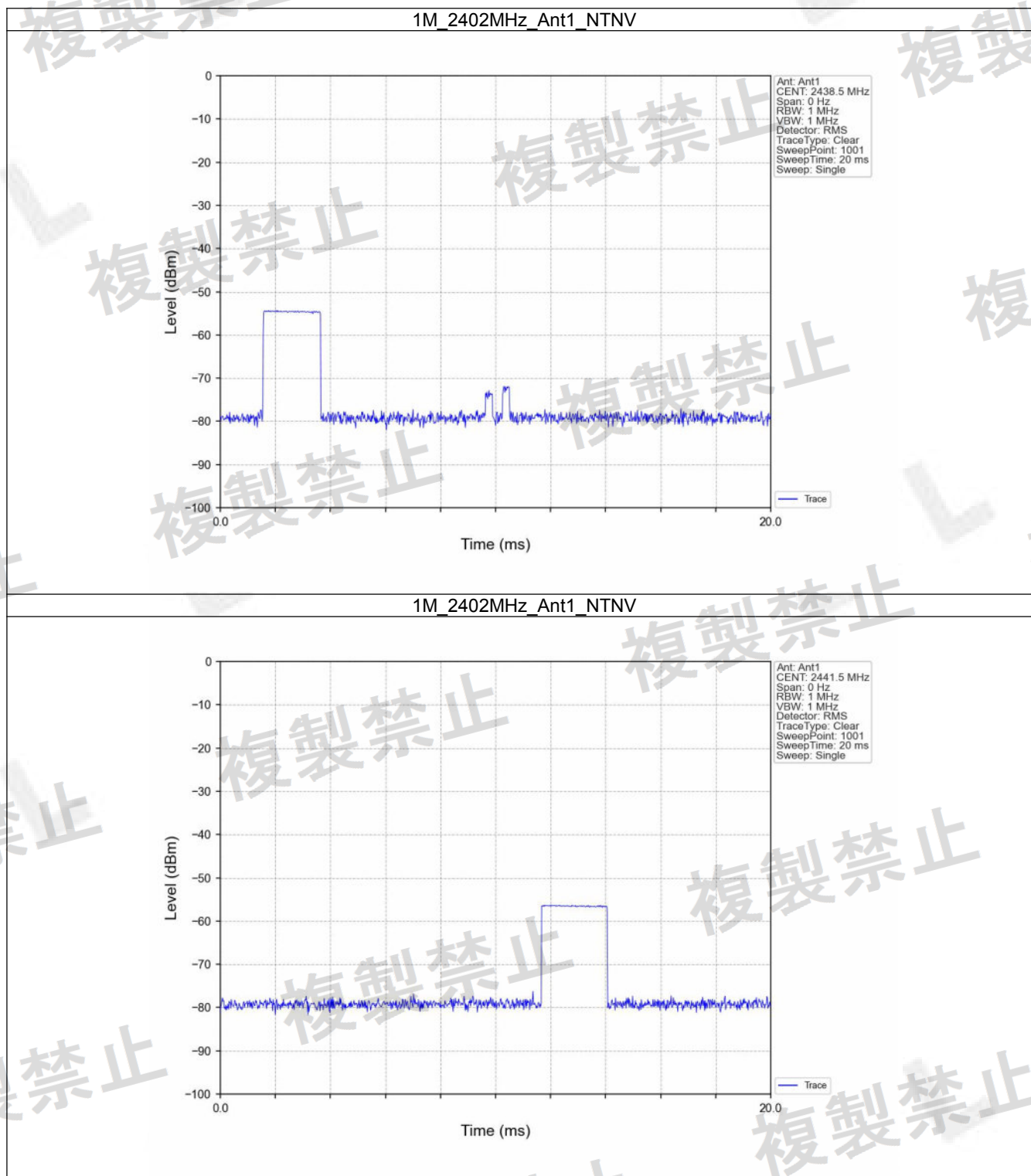
5.2.1 RxSe_NTNV



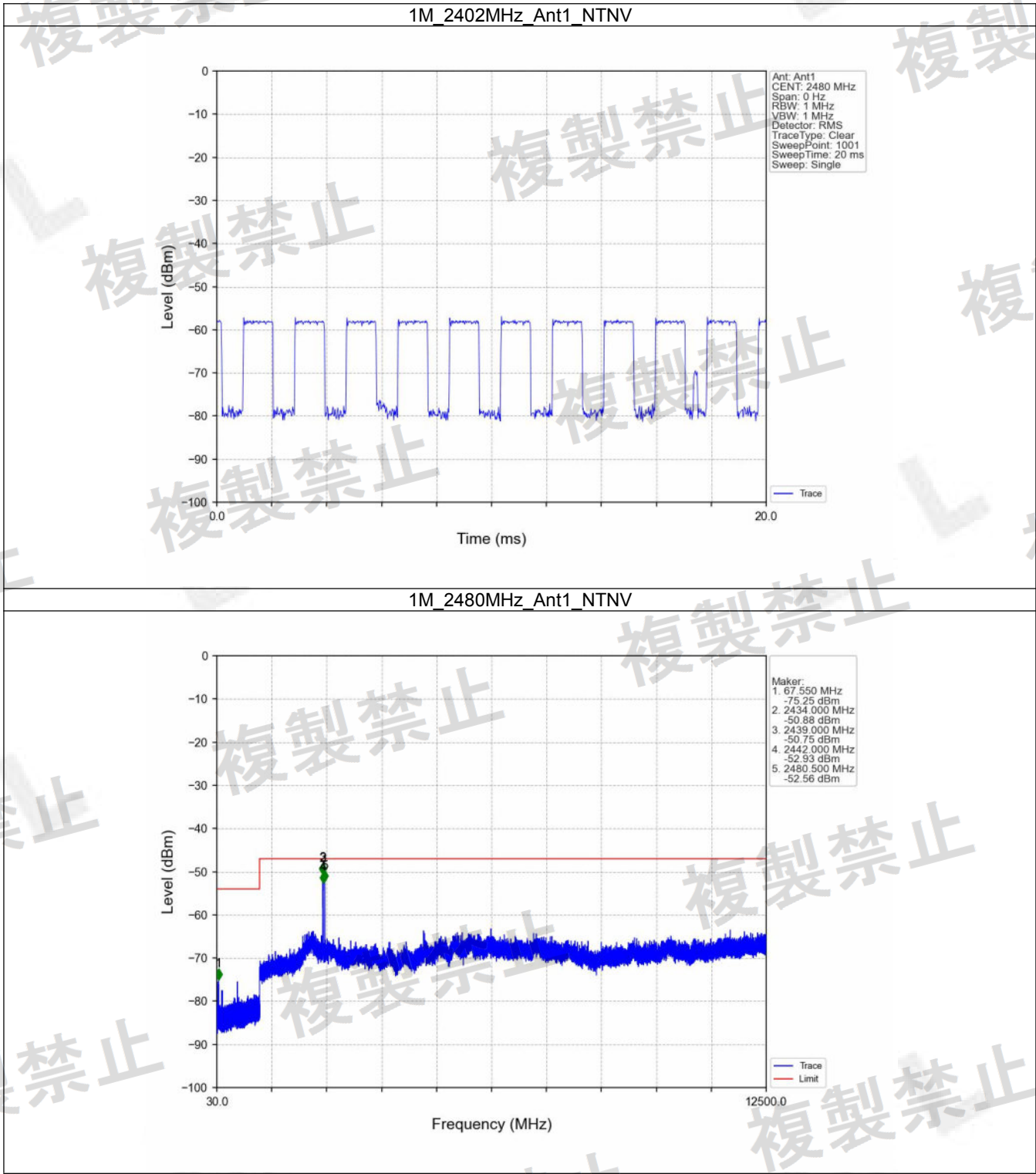
MIC: 219-269369



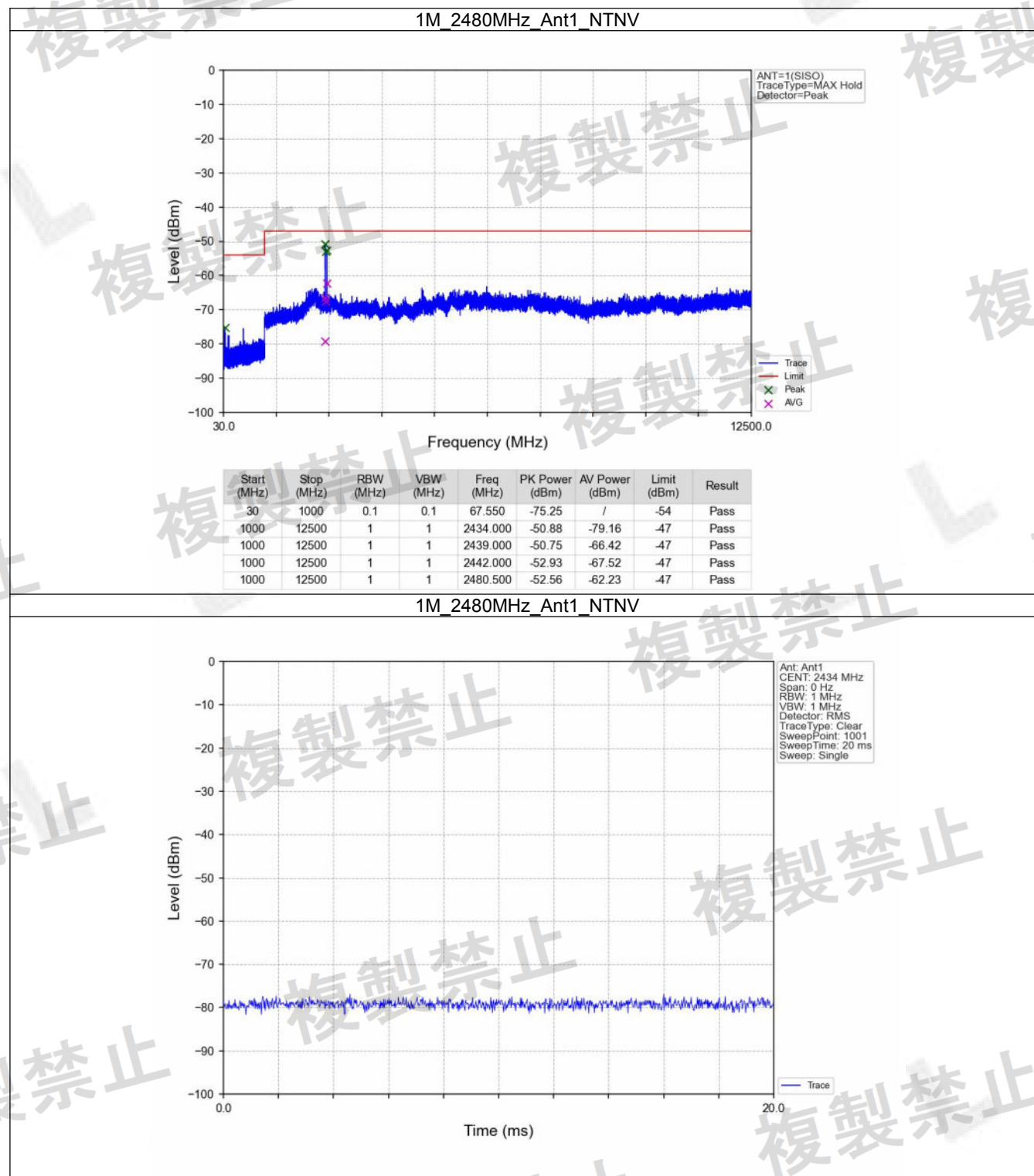
MIC: 219-269369



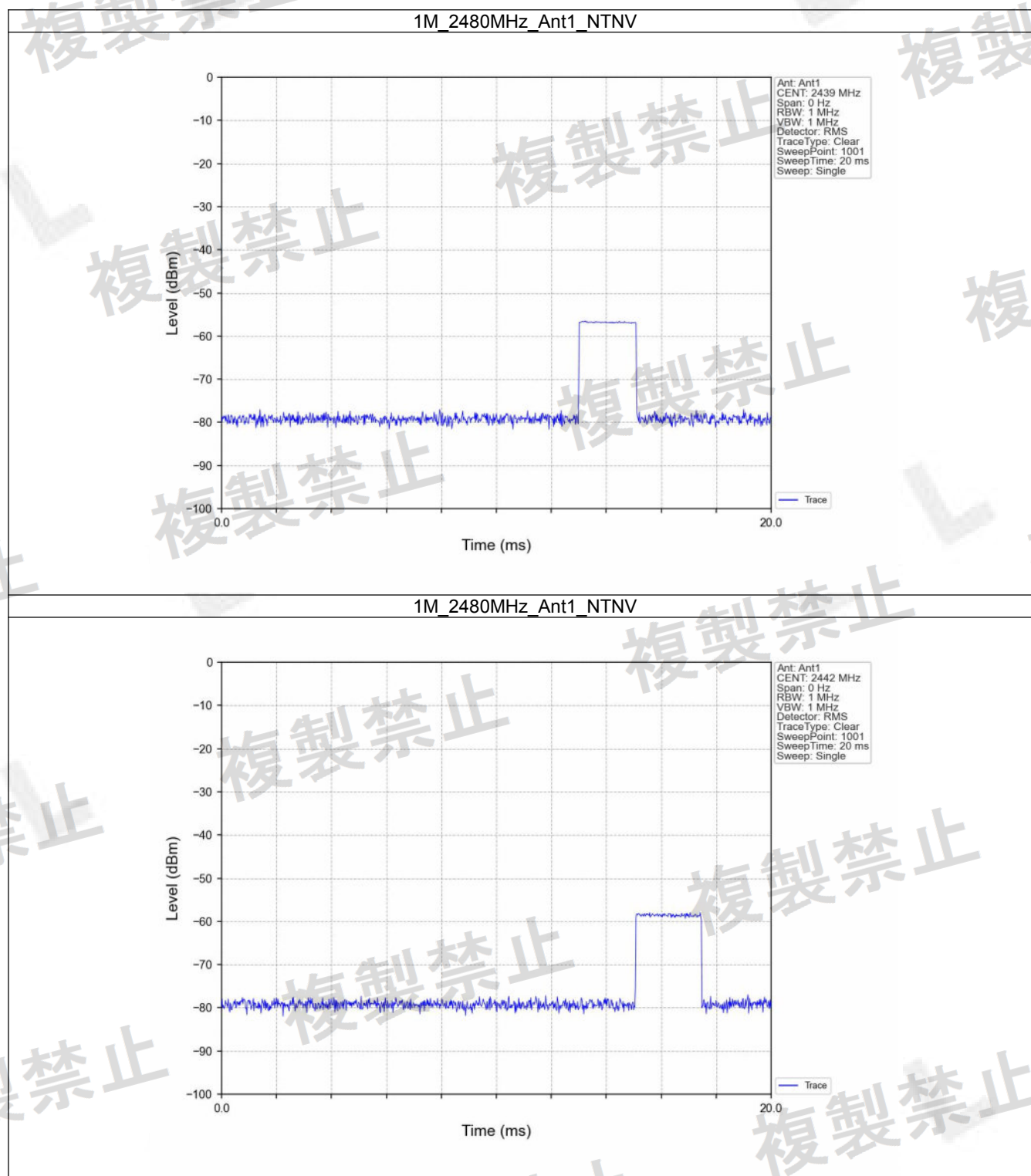
MIC: 219-269369



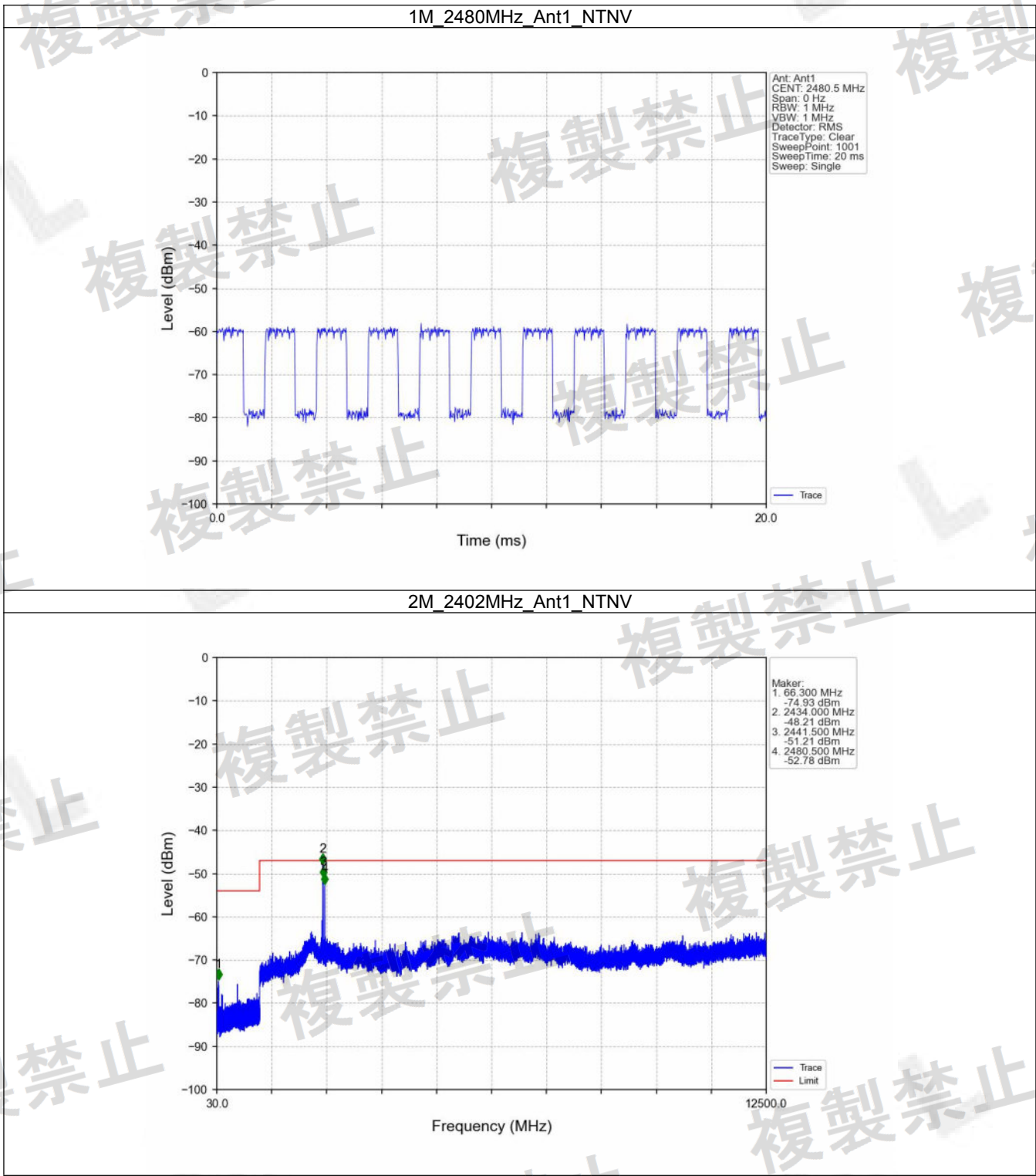
MIC: 219-269369



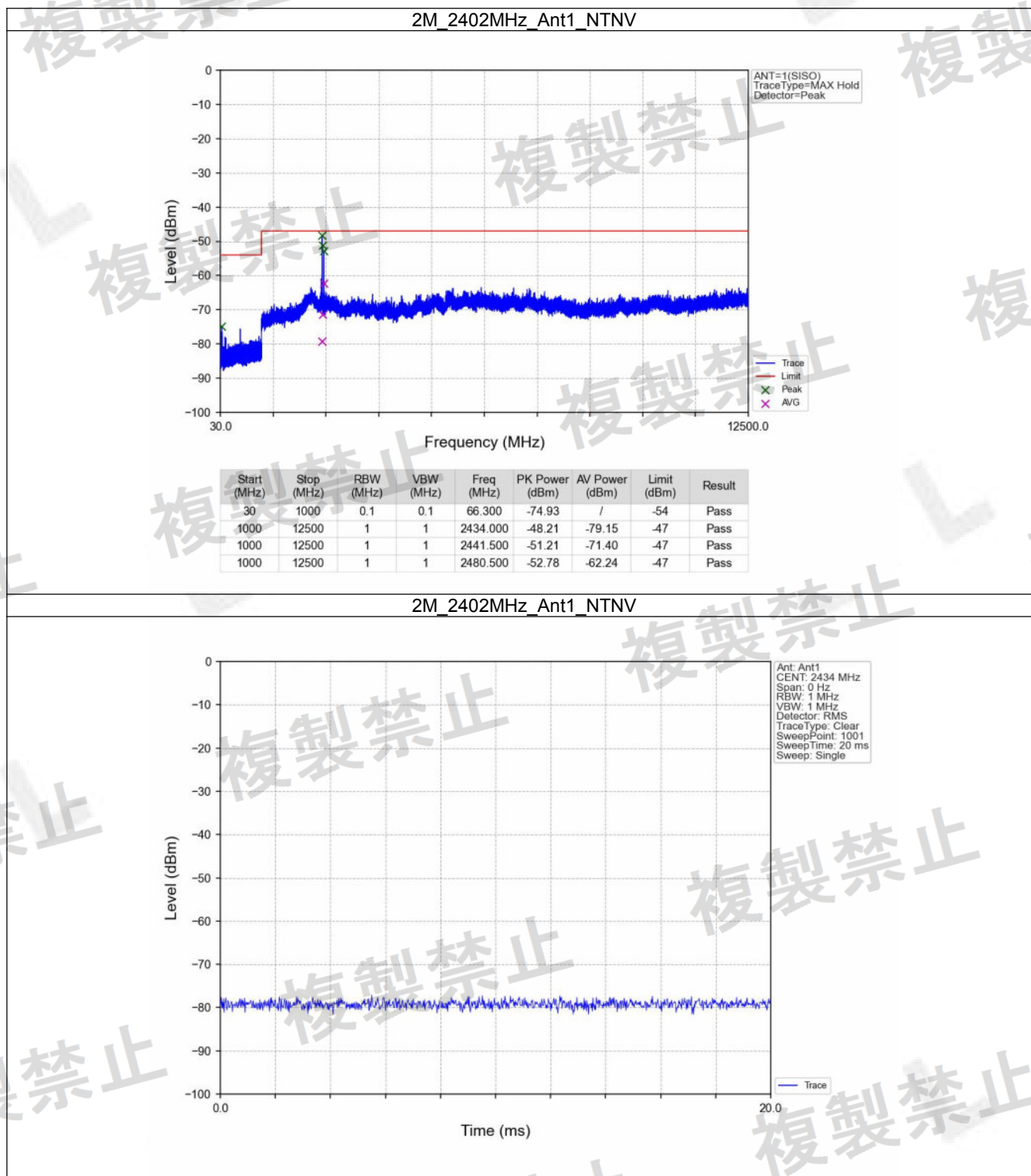
MIC: 219-269369



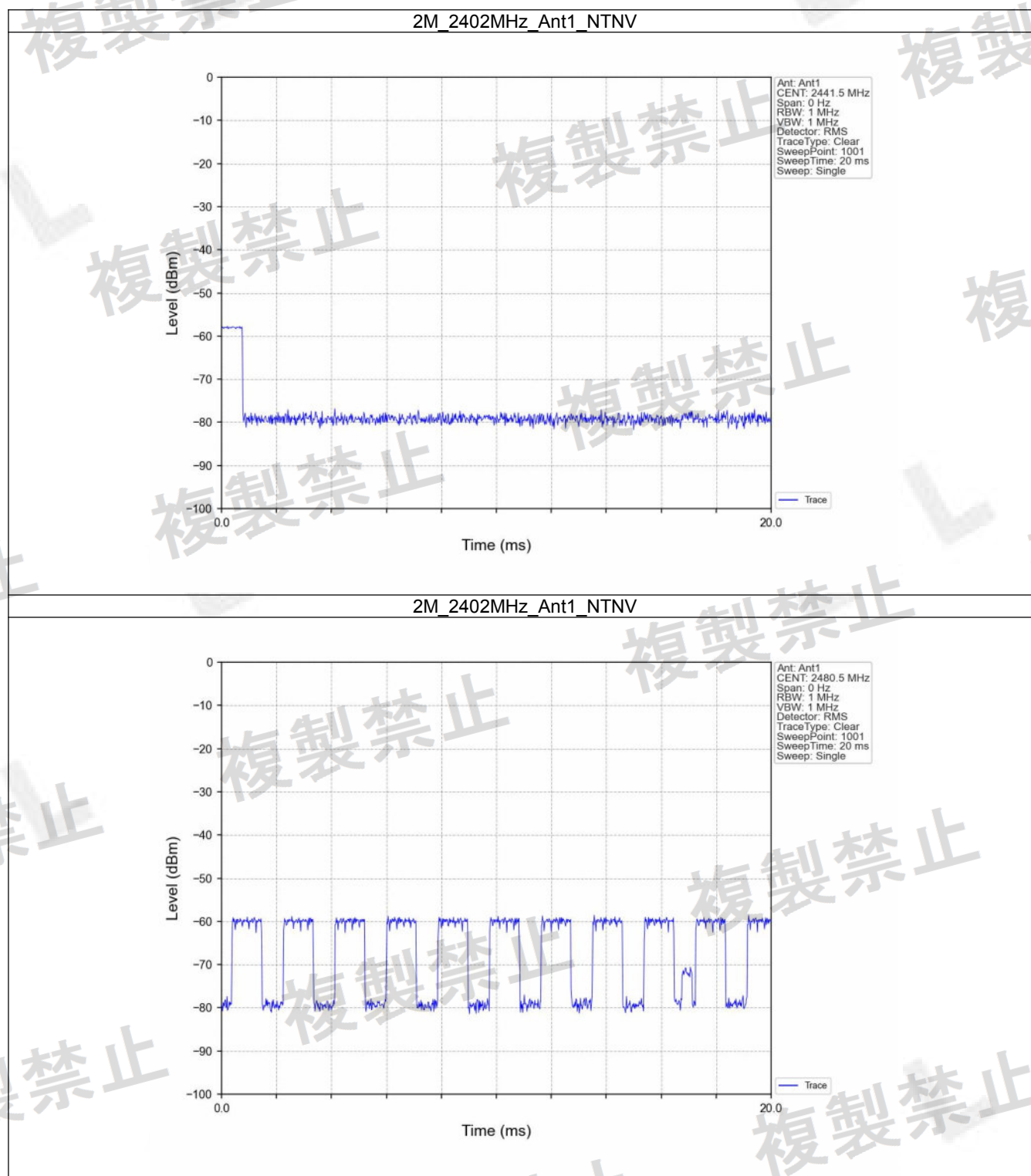
MIC: 219-269369



MIC: 219-269369

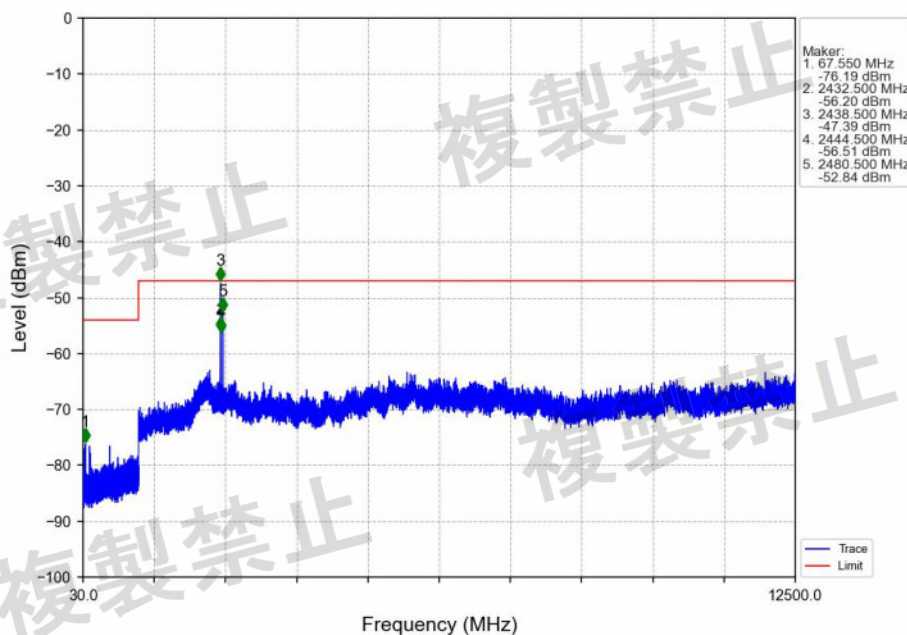


MIC: 219-269369

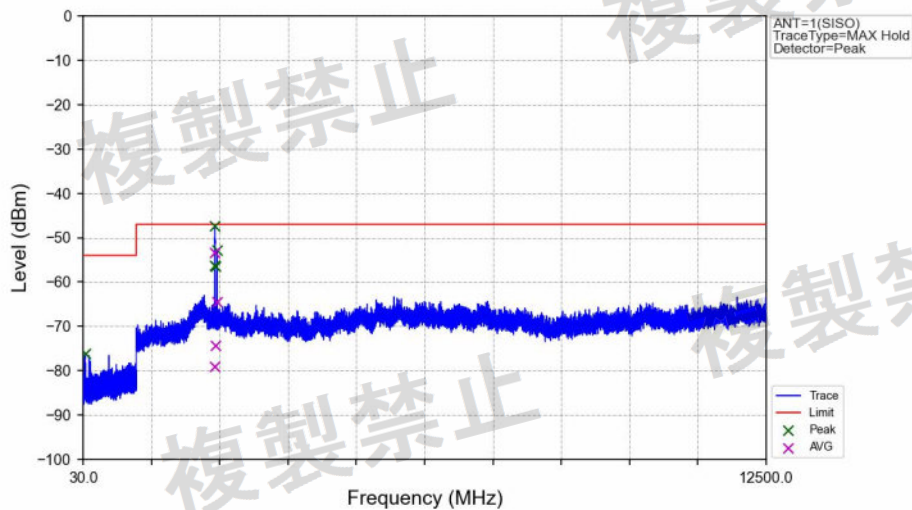


MIC: 219-269369

2M_2480MHz_Ant1_NTNV

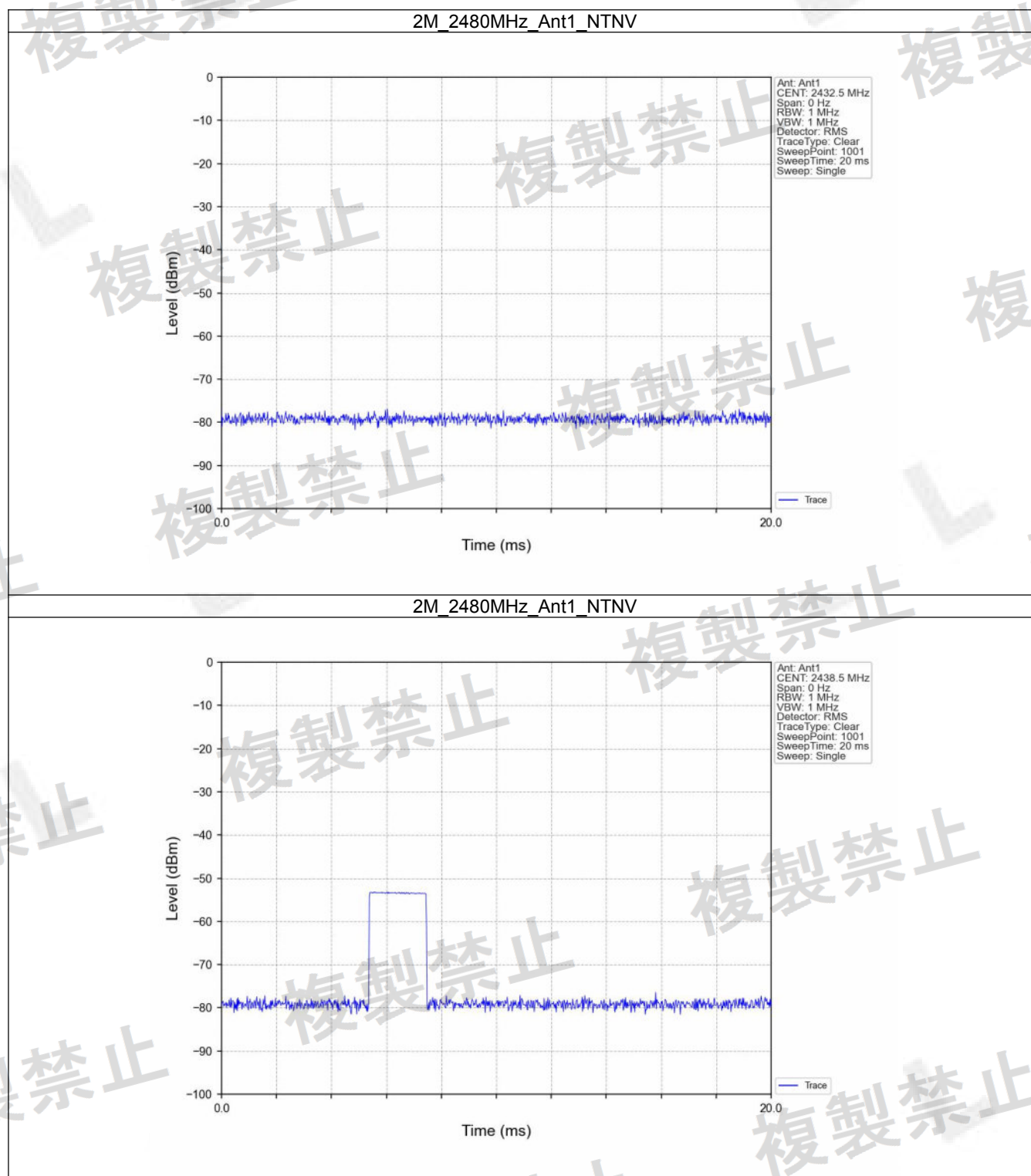


2M_2480MHz_Ant1_NTNV

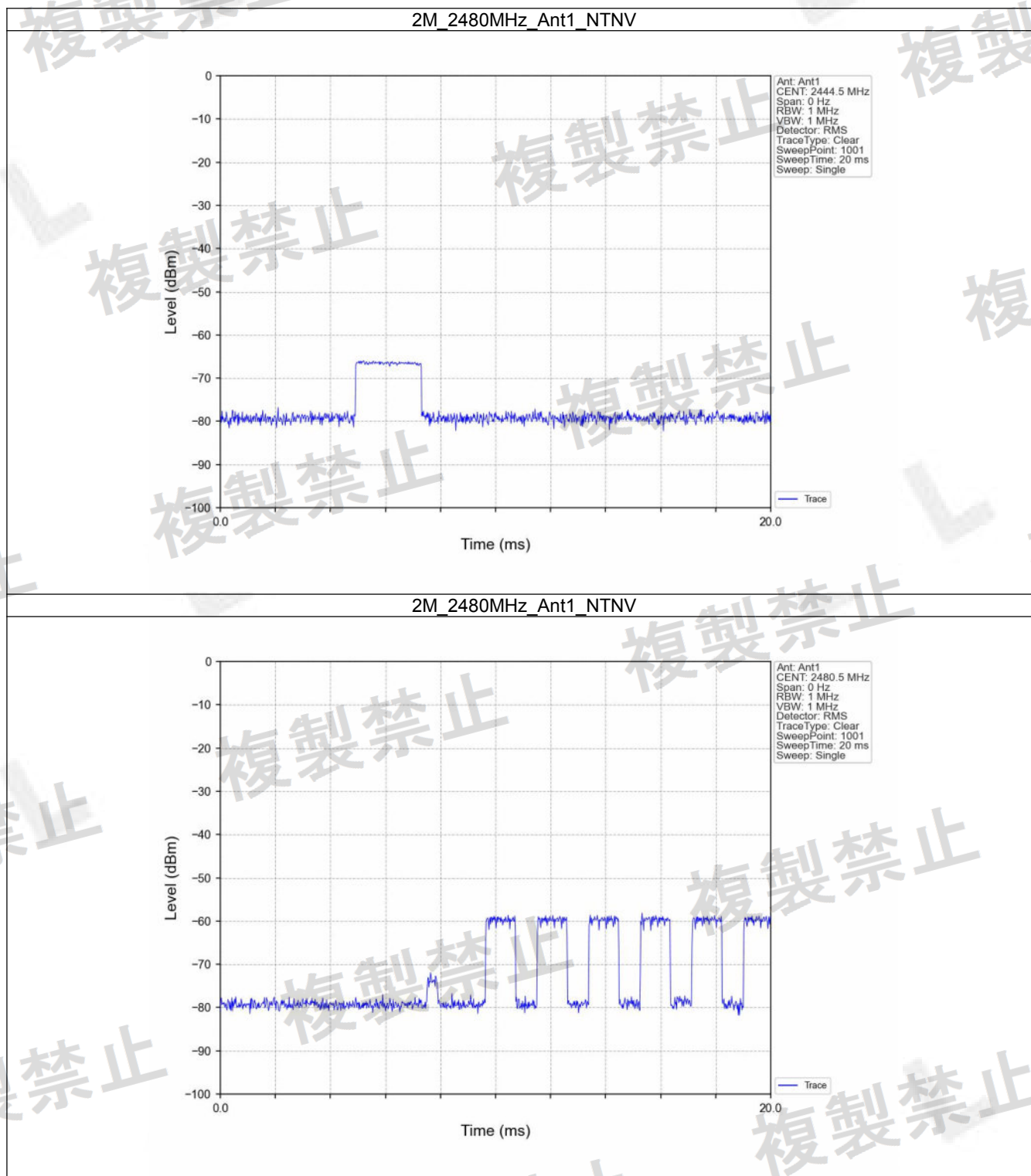


Start (MHz)	Stop (MHz)	RBW (MHz)	VBW (MHz)	Freq (MHz)	PK Power (dBm)	AV Power (dBm)	Limit (dBm)	Result
30	1000	0.1	0.1	67.550	-76.19	/	-54	Pass
1000	12500	1	1	2432.500	-56.20	-79.13	-47	Pass
1000	12500	1	1	2438.500	-47.39	-53.43	-47	Pass
1000	12500	1	1	2444.500	-56.51	-74.27	-47	Pass
1000	12500	1	1	2480.500	-52.84	-64.55	-47	Pass

MIC: 219-269369

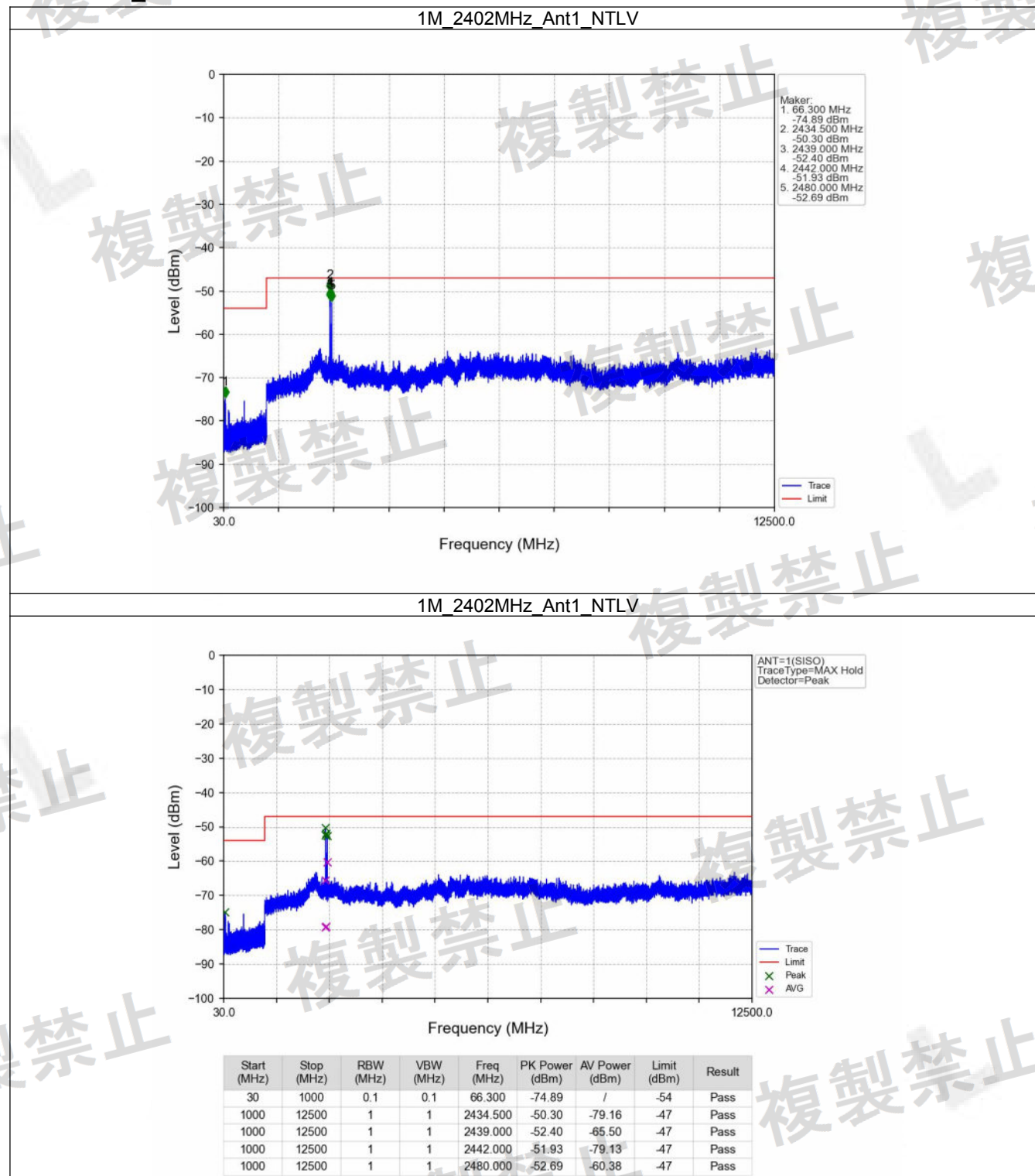


MIC: 219-269369

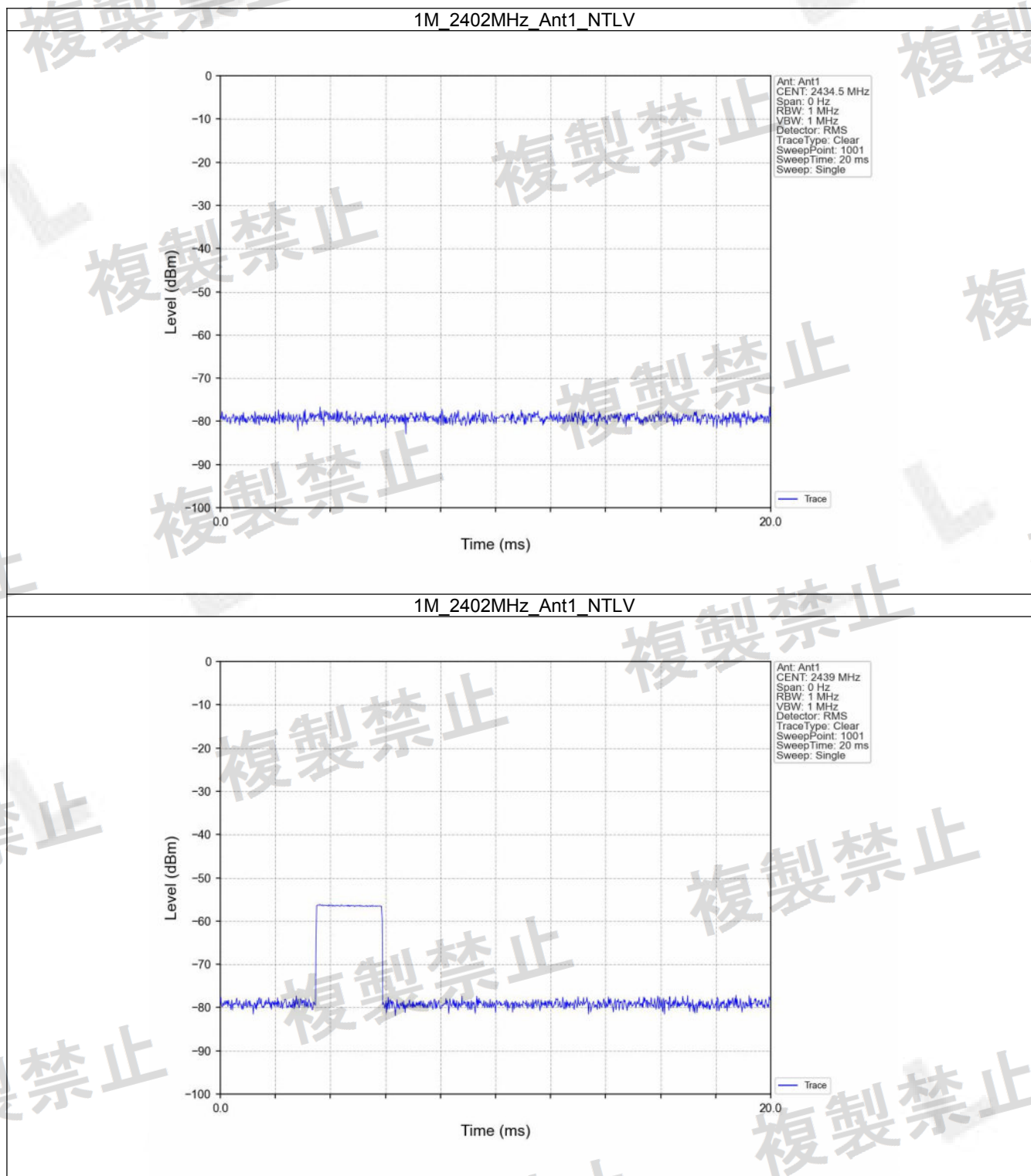


MIC: 219-269369

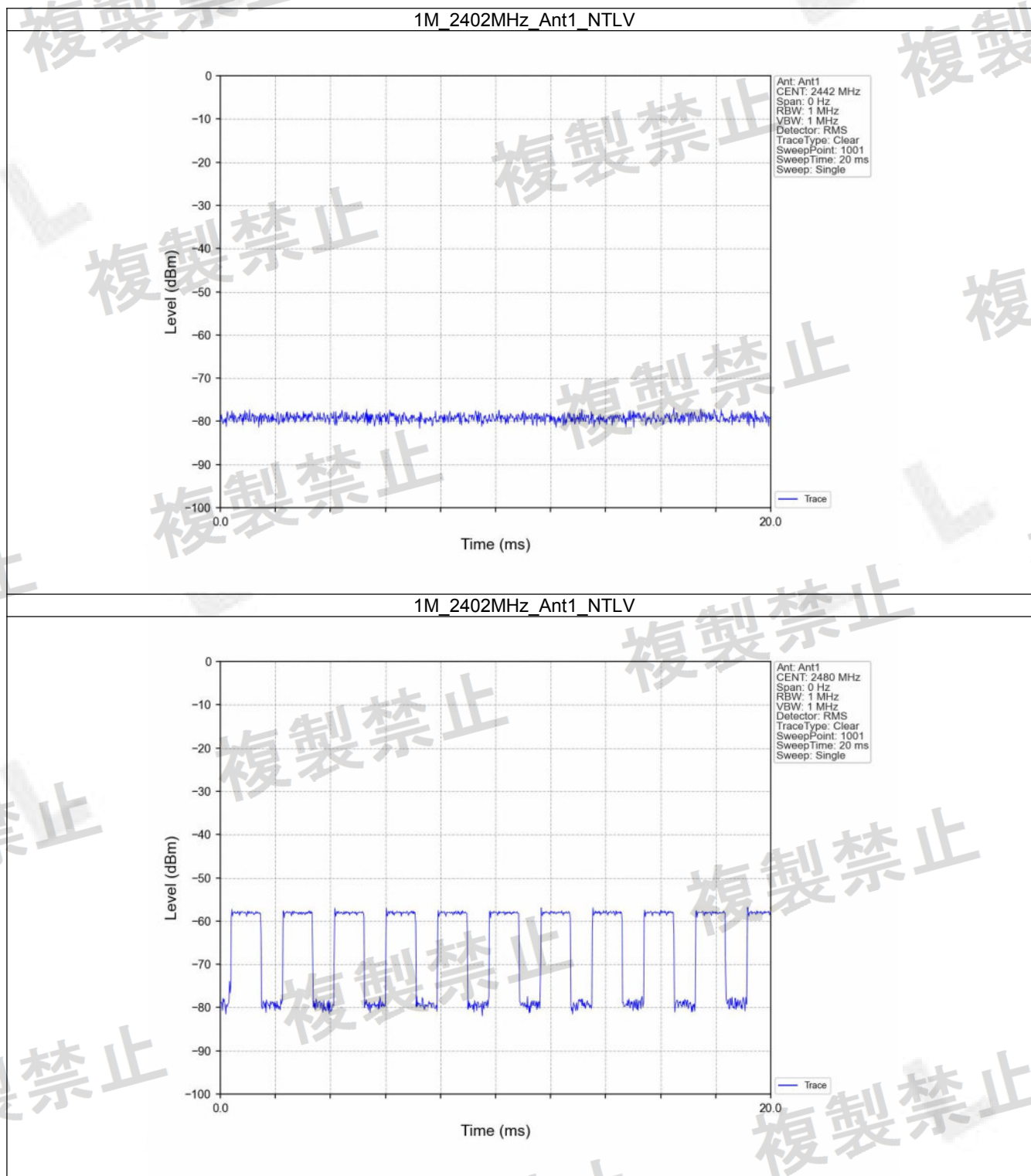
5.2.2 RxSe_NTLV



MIC: 219-269369

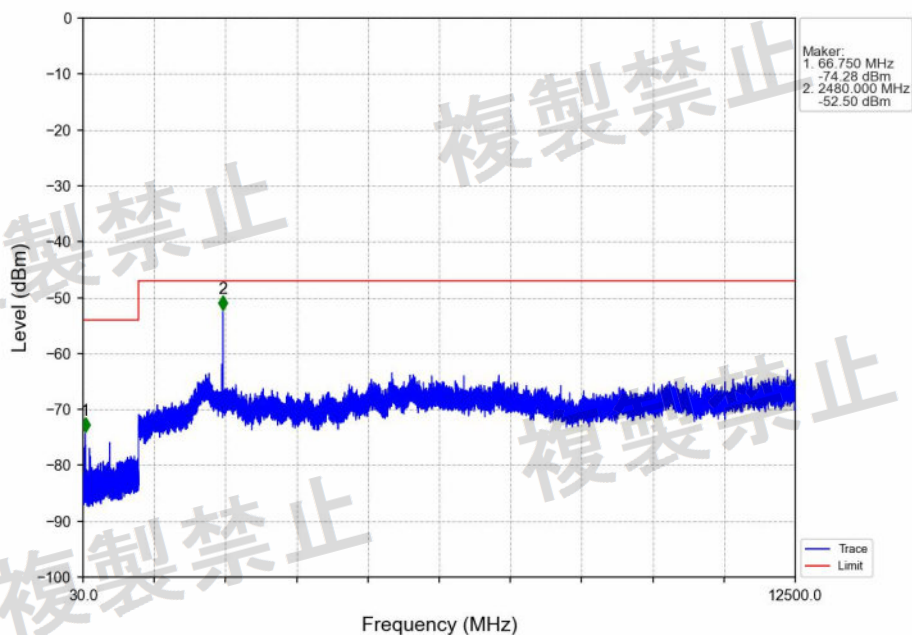


MIC: 219-269369

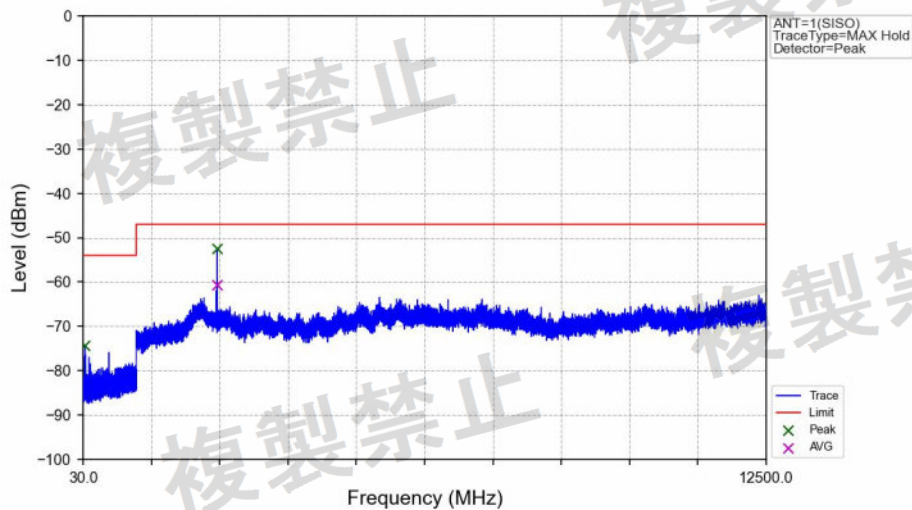


MIC: 219-269369

1M_2480MHz_Ant1_NTLV

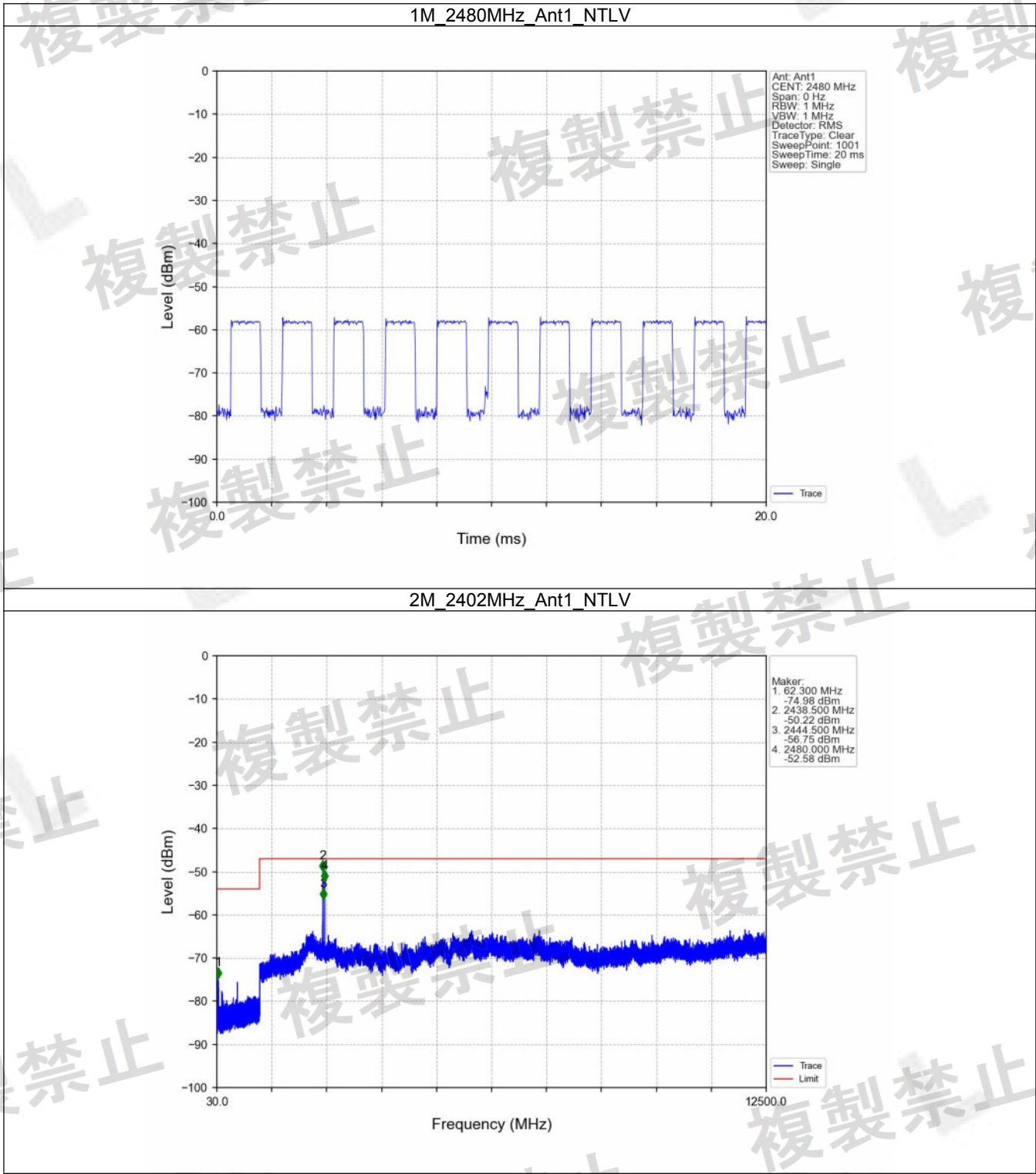


1M_2480MHz_Ant1_NTLV

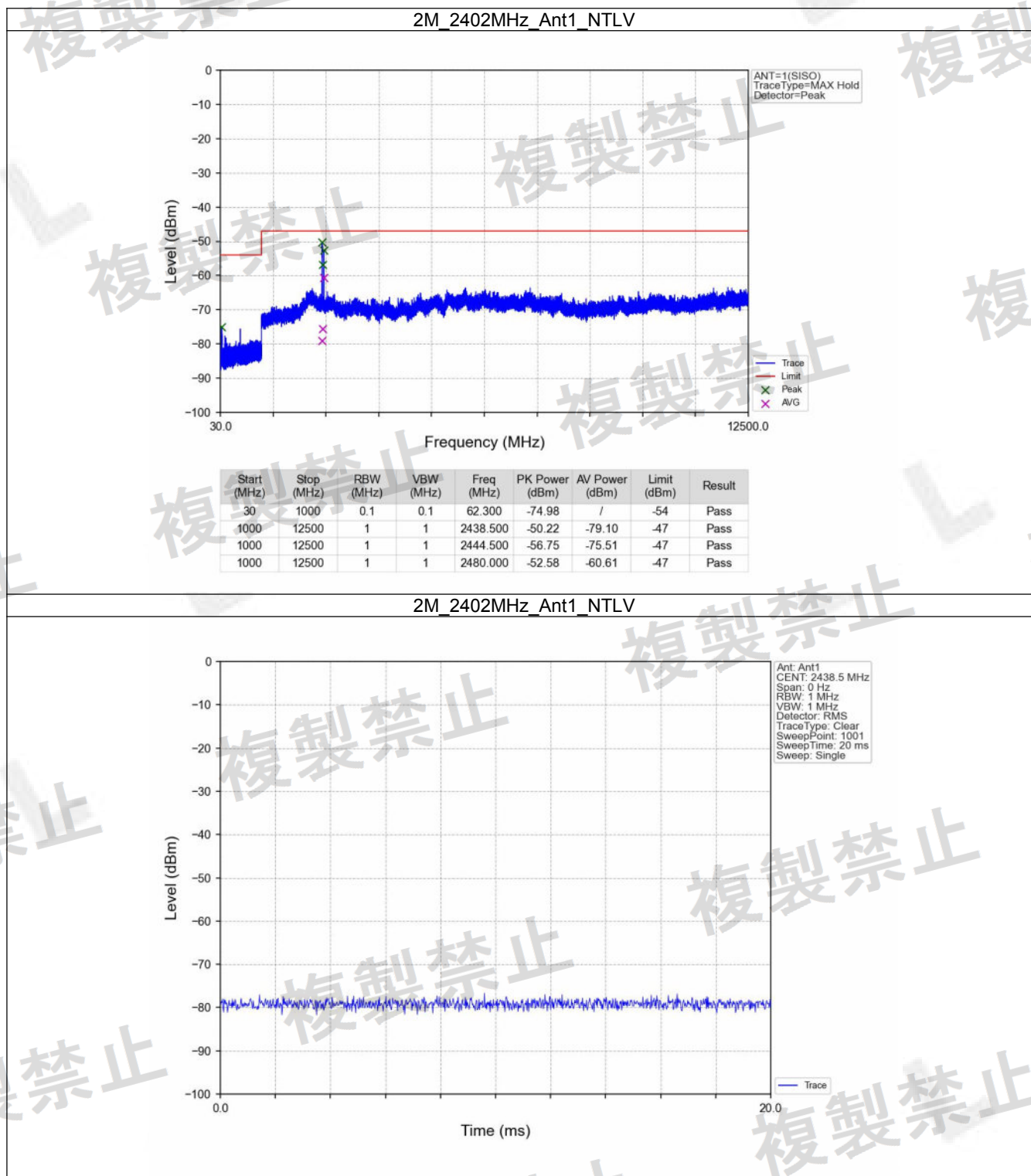


Start (MHz)	Stop (MHz)	RBW (MHz)	VBW (MHz)	Freq (MHz)	PK Power (dBm)	AV Power (dBm)	Limit (dBm)	Result
30	1000	0.1	0.1	66.750	-74.28	/	-54	Pass
1000	12500	1	1	2480.000	-52.50	-60.59	-47	Pass

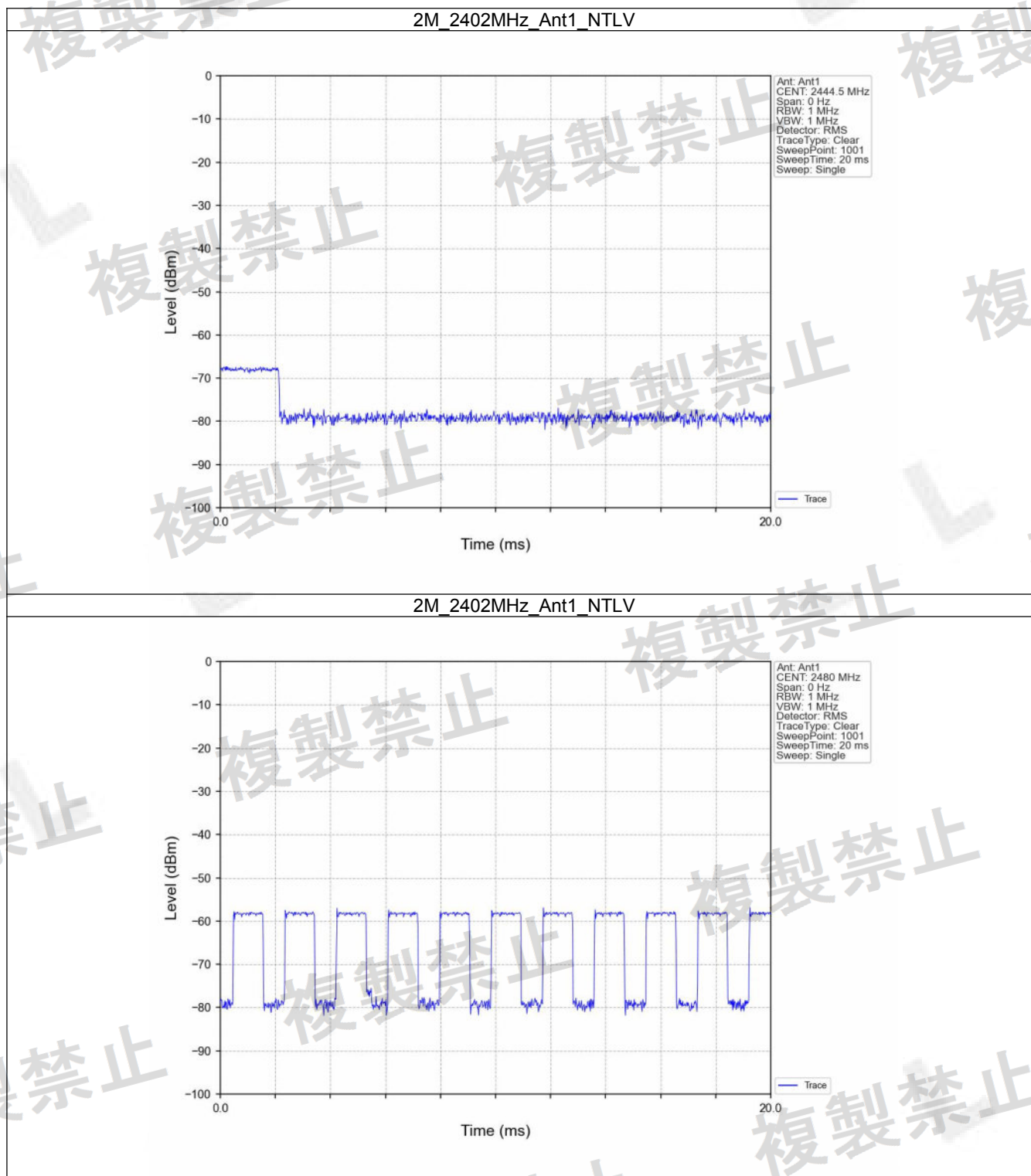
MIC: 219-269369



MIC: 219-269369

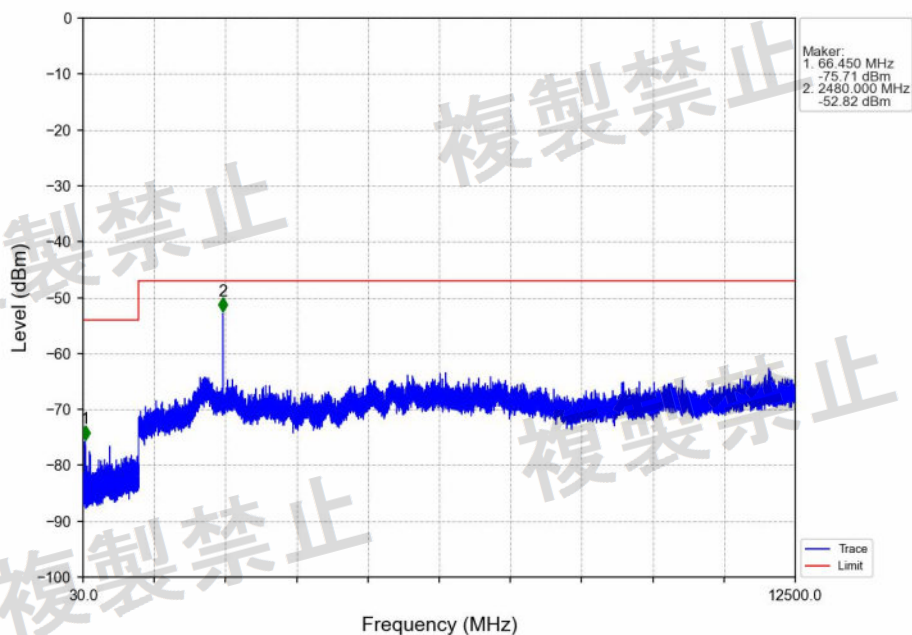


MIC: 219-269369

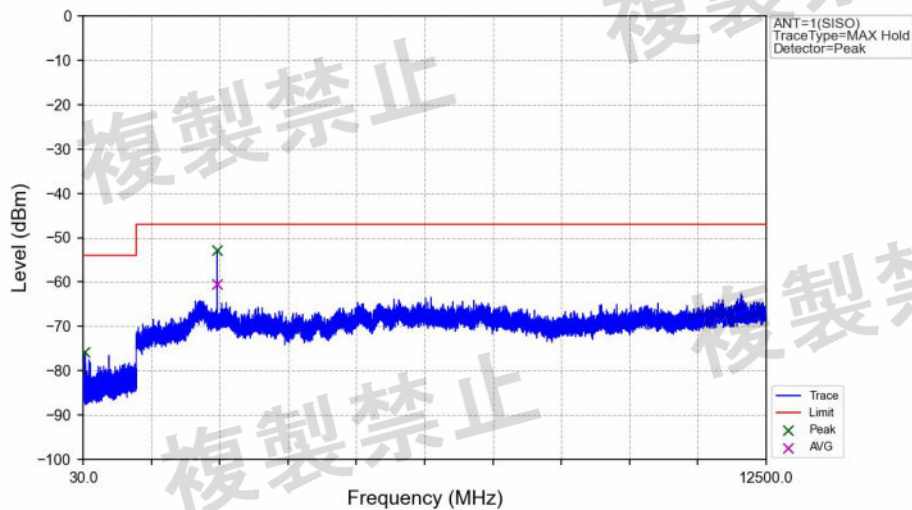


MIC: 219-269369

2M_2480MHz_Ant1_NTLV

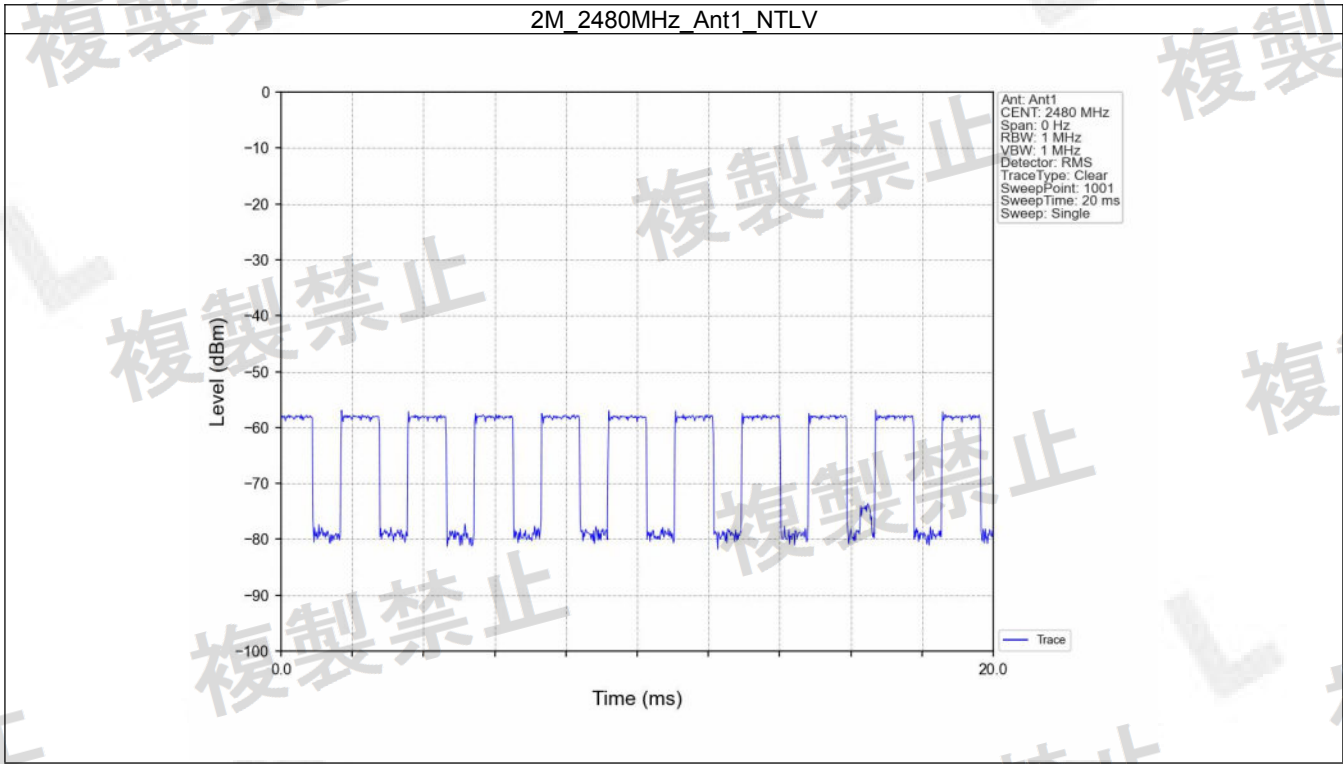


2M_2480MHz_Ant1_NTLV



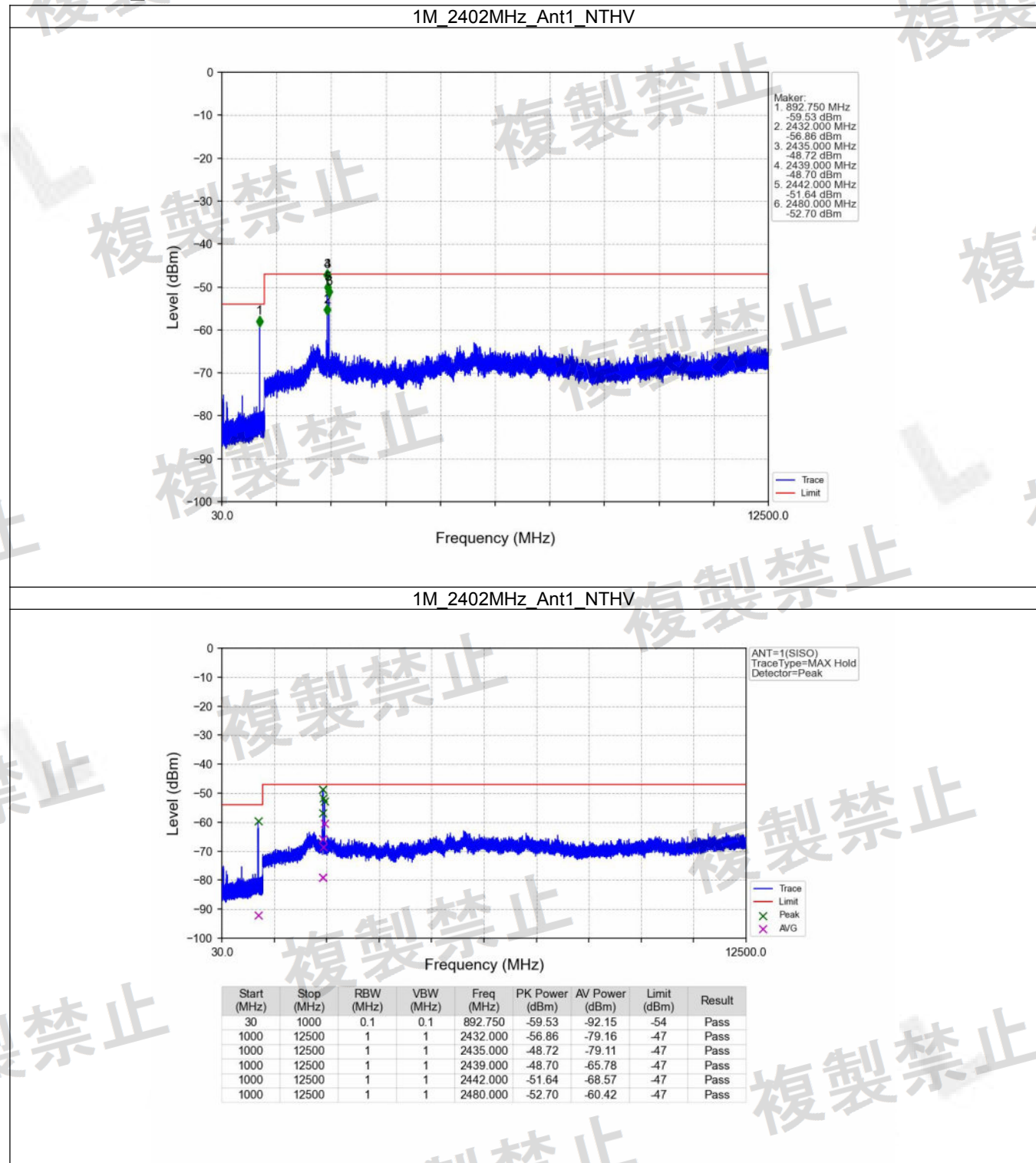
Start (MHz)	Stop (MHz)	RBW (MHz)	VBW (MHz)	Freq (MHz)	PK Power (dBm)	AV Power (dBm)	Limit (dBm)	Result
30	1000	0.1	0.1	66.450	-75.71	/	-54	Pass
1000	12500	1	1	2480.000	-52.82	-60.43	-47	Pass

MIC: 219-269369

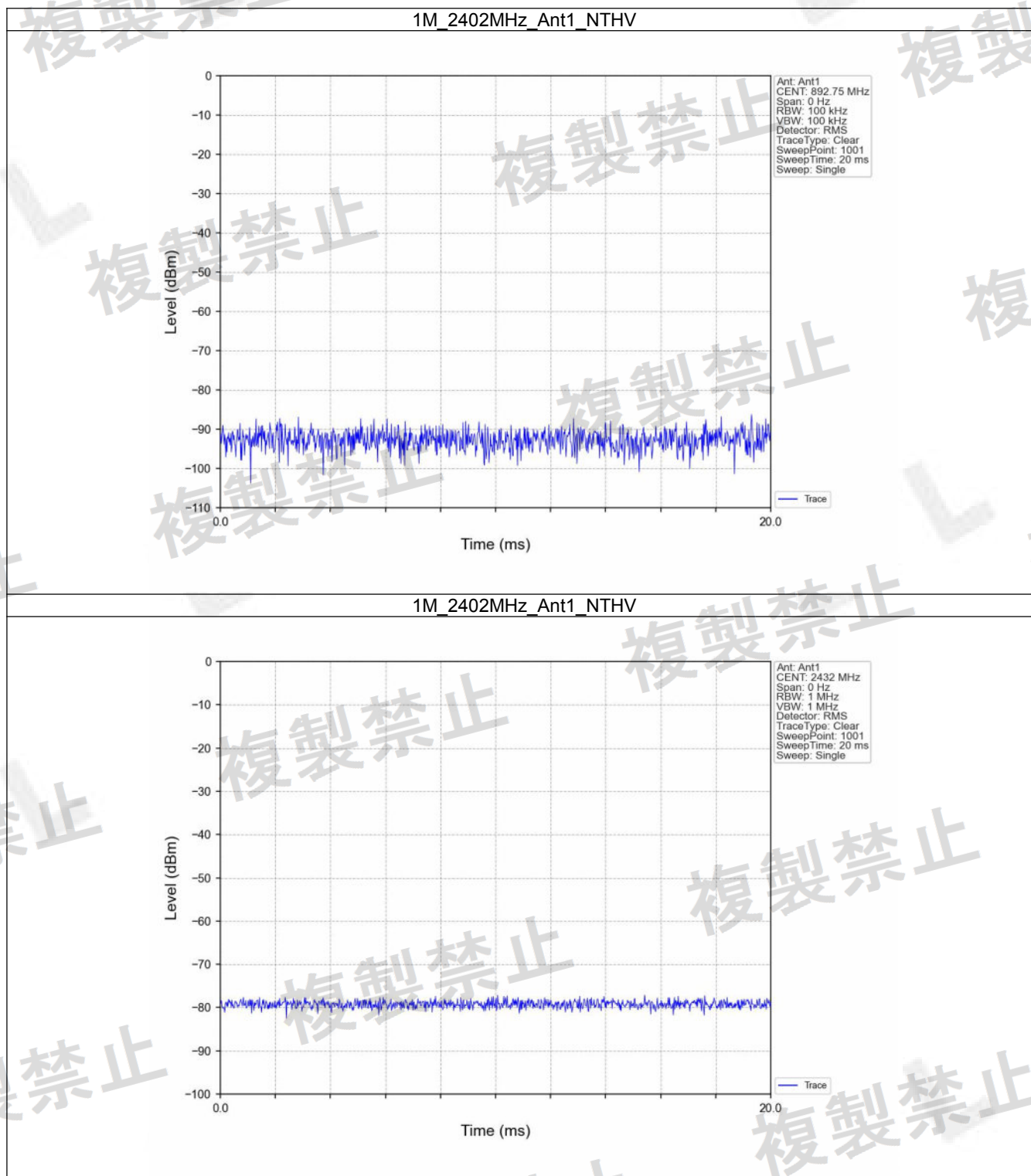


MIC: 219-269369

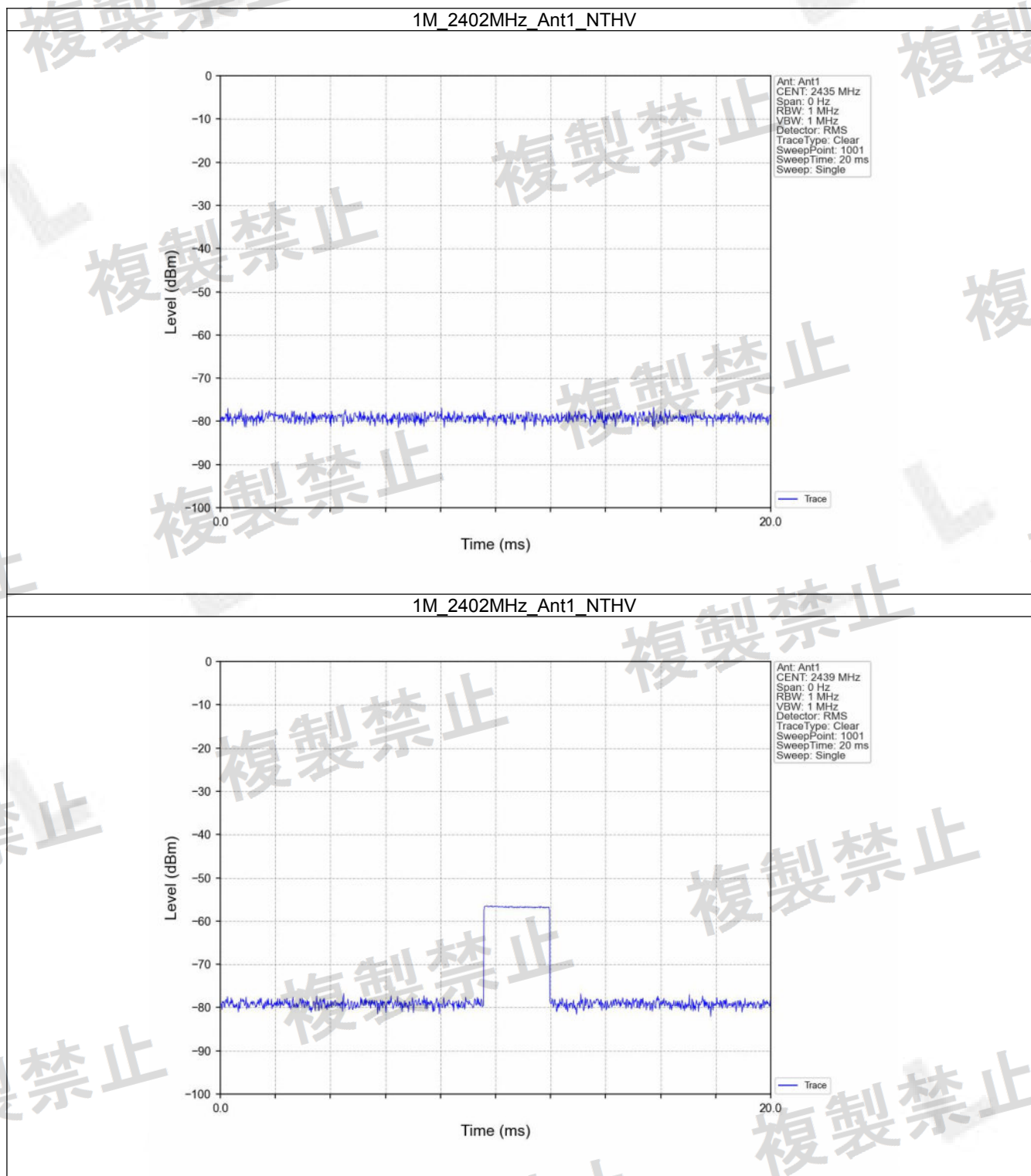
5.2.3 RxSe_NTHV



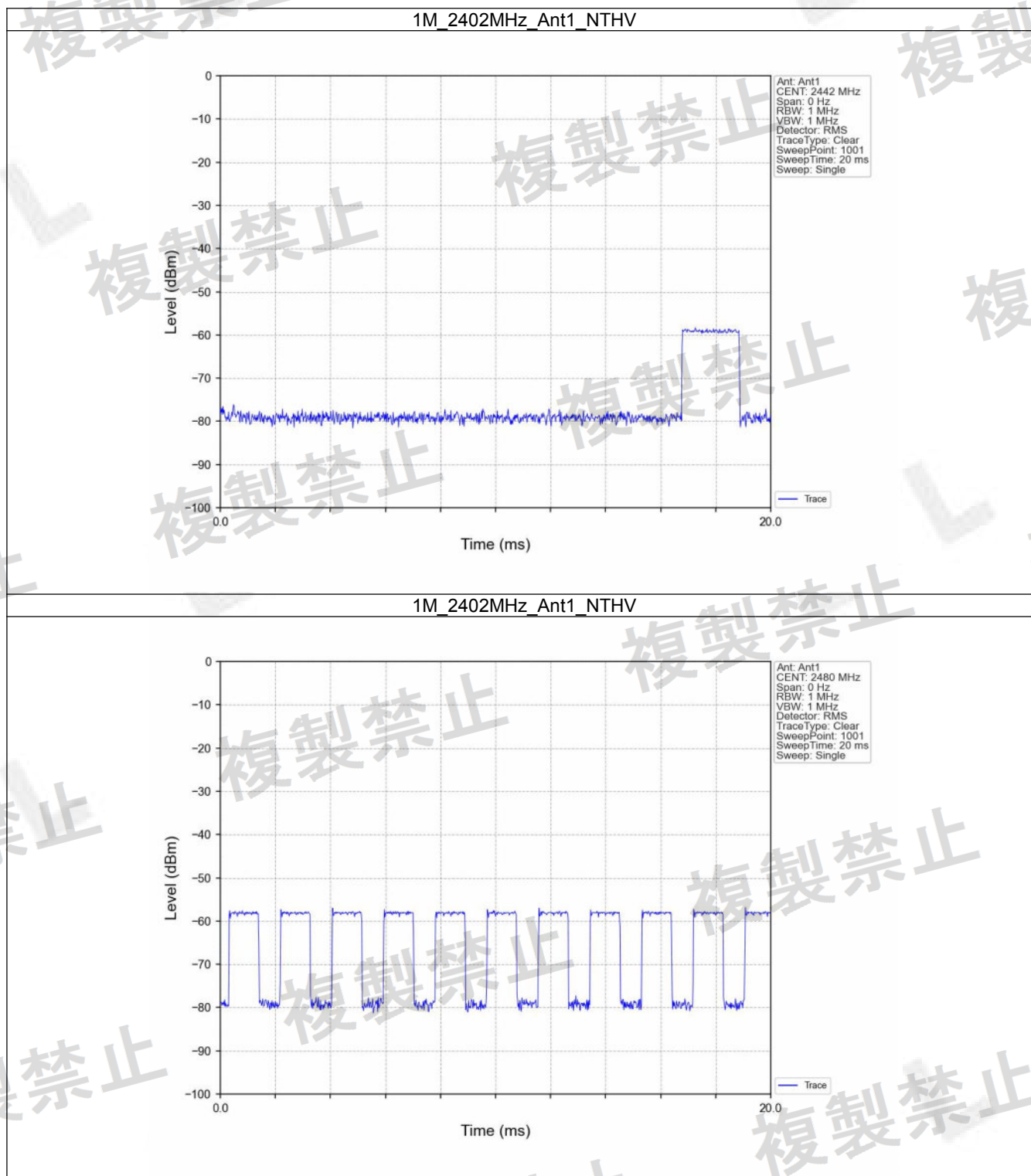
MIC: 219-269369



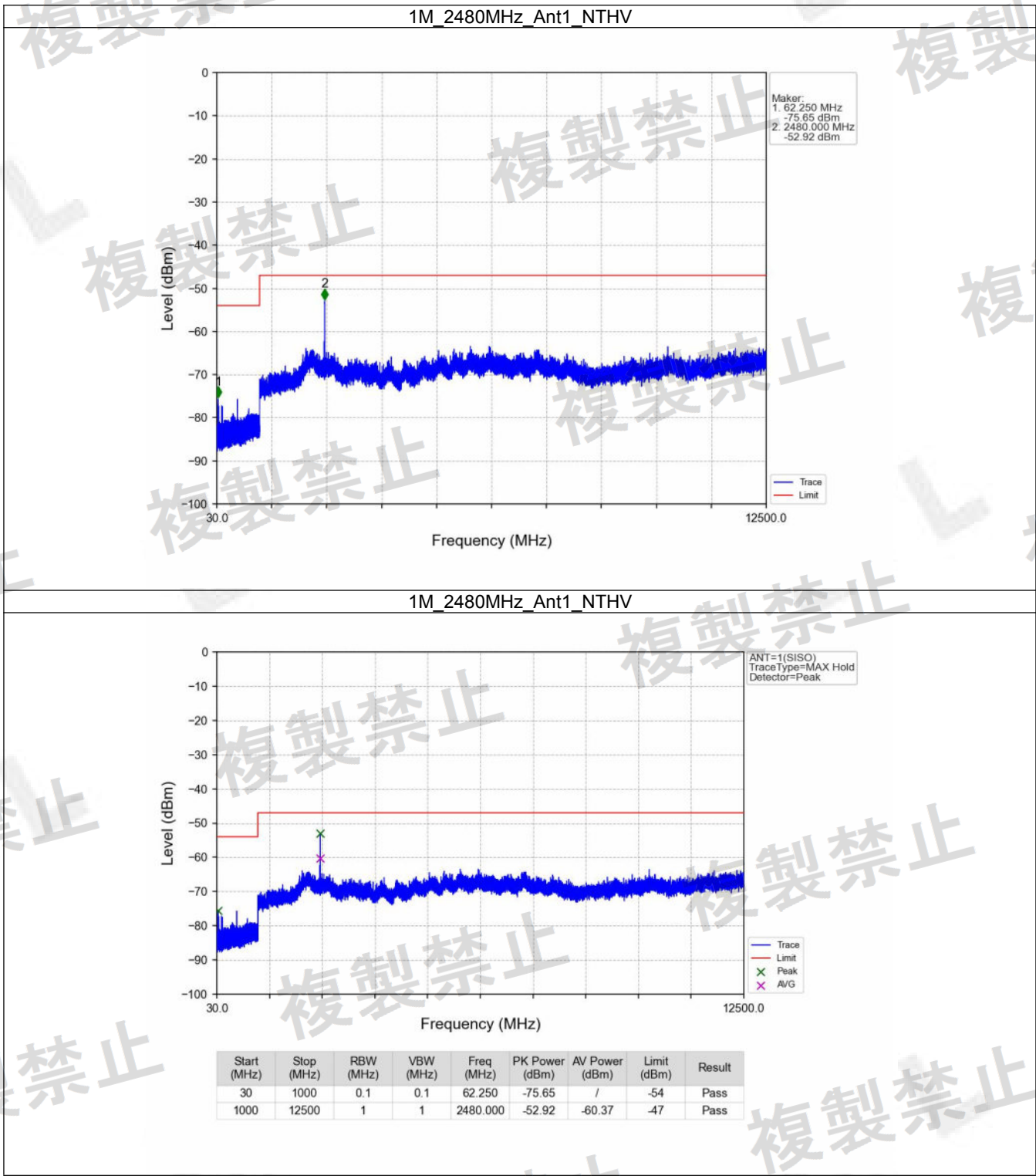
MIC: 219-269369



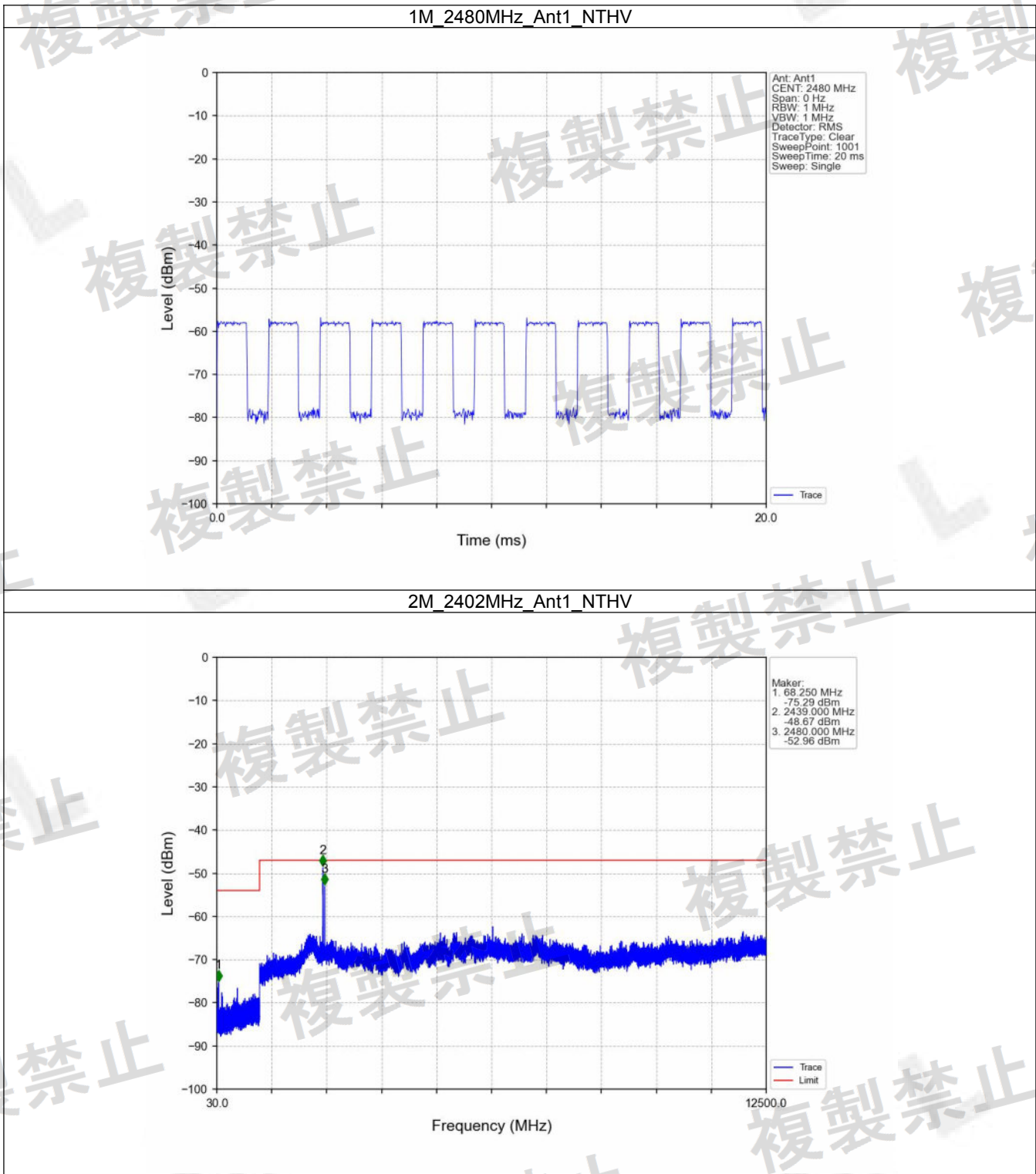
MIC: 219-269369



MIC: 219-269369

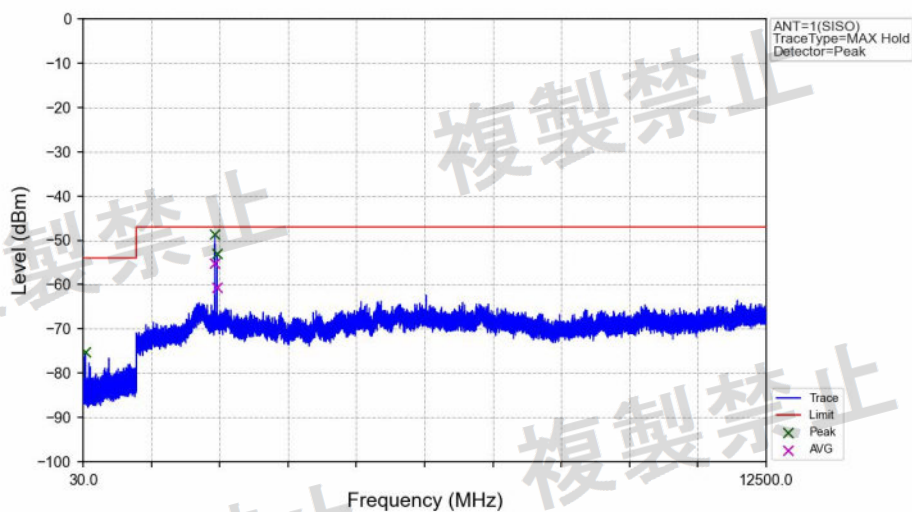


MIC: 219-269369



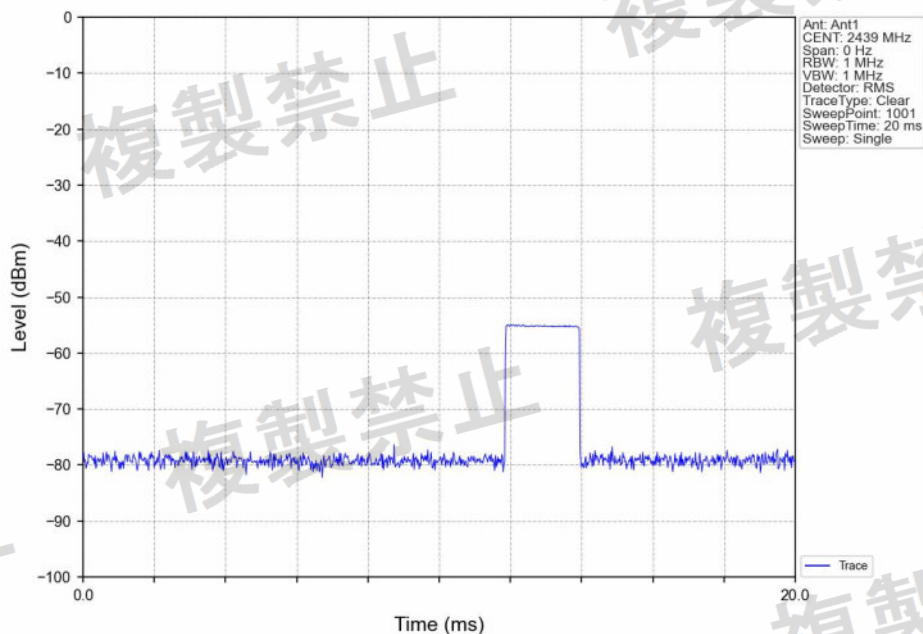
MIC: 219-269369

2M_2402MHz_Ant1_NTHV

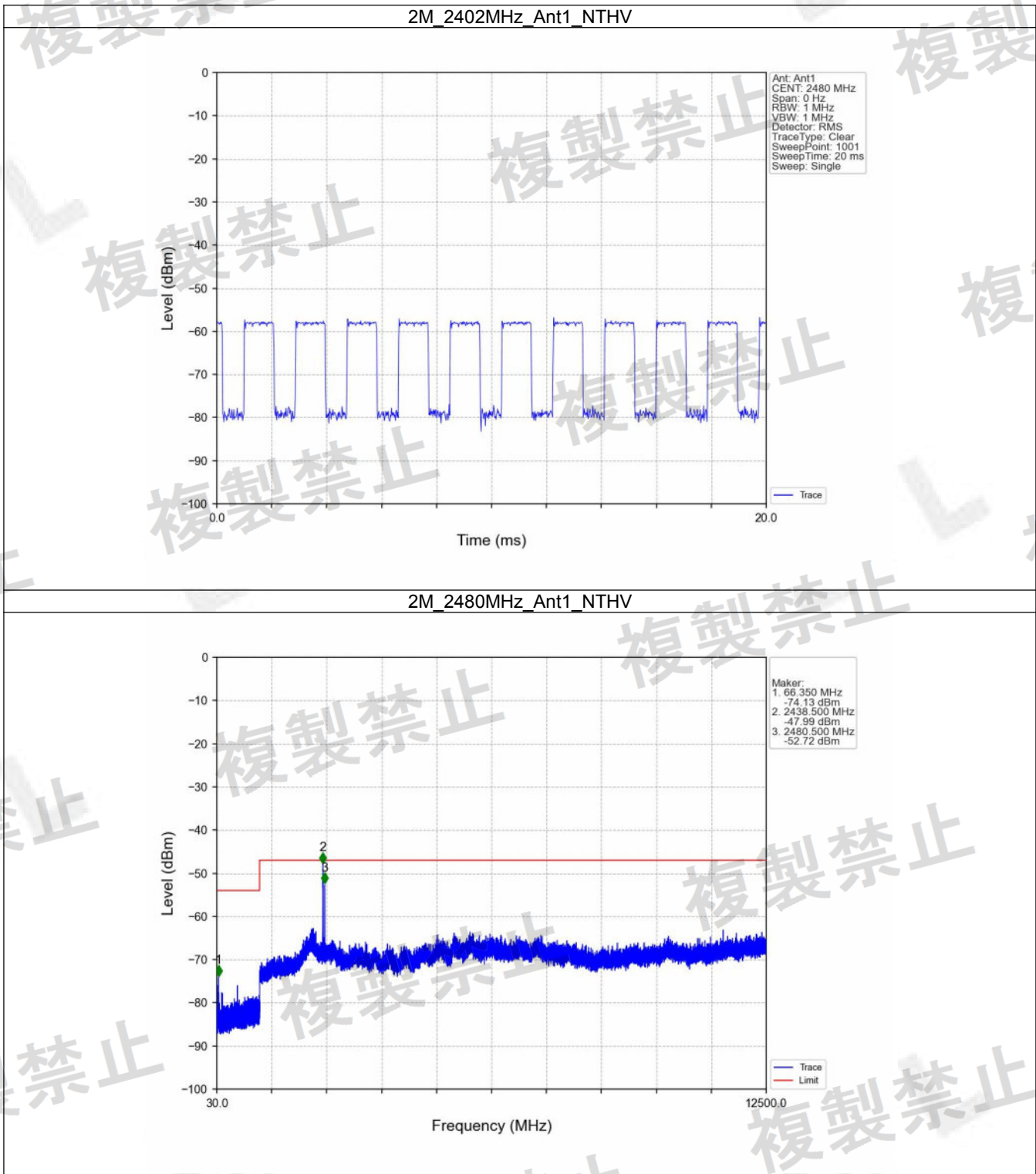


Start (MHz)	Stop (MHz)	RBW (MHz)	VBW (MHz)	Freq (MHz)	PK Power (dBm)	AV Power (dBm)	Limit (dBm)	Result
30	1000	0.1	0.1	68.250	-75.29	/	-54	Pass
1000	12500	1	1	2439.000	-48.67	-55.18	-47	Pass
1000	12500	1	1	2480.000	-52.96	-60.57	-47	Pass

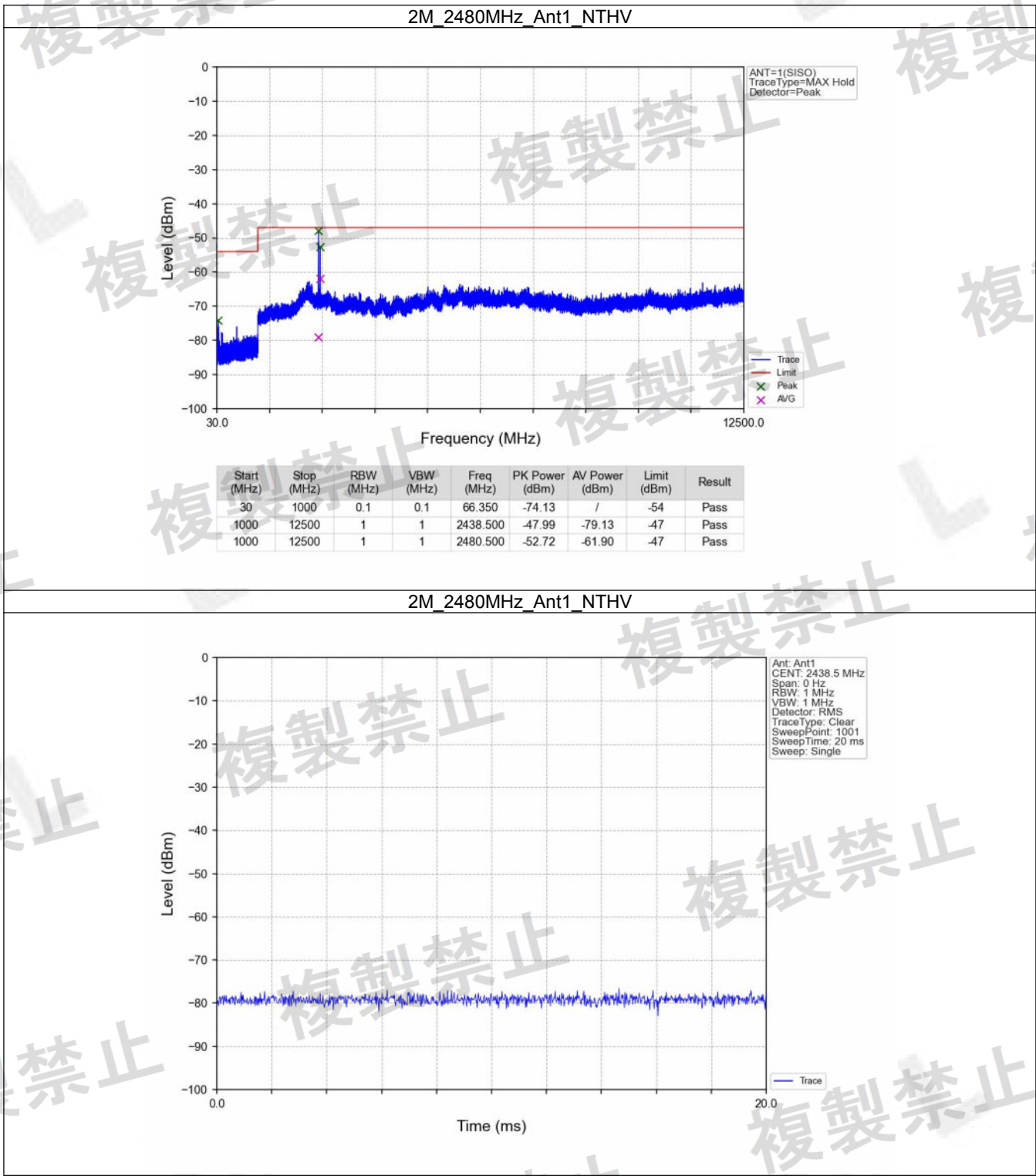
2M_2402MHz_Ant1_NTHV



MIC: 219-269369



MIC: 219-269369



MIC: 219-269369

