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Annex for Bluetooth low Energy

Test Report No.: CTL2601202043-MIC01

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1. Frequency Error

1.1 Test Result

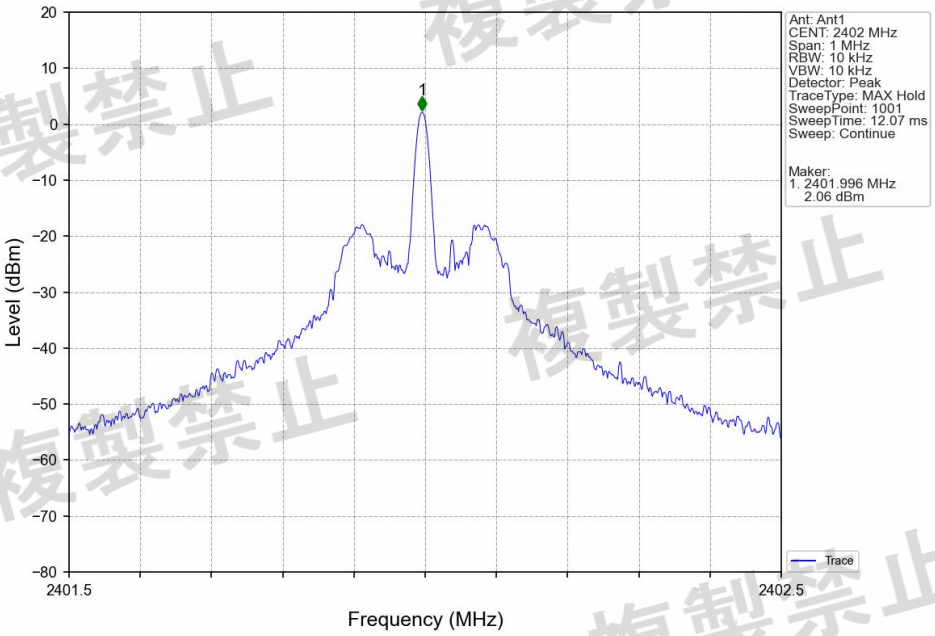
1.1.1 Ant1

Ant1							
ENV	Mode	TX Type	Frequency (MHz)	Measured Frequency (MHz)	Tolerance (ppm)		Verdict
					Result	Limit	
NTNV	Carrier Wave	SISO	2402	2401.996	-1.67	-50 to 50	Pass
			2480	2479.996	-1.61	-50 to 50	Pass
NTLV	Carrier Wave	SISO	2402	2401.996	-1.67	-50 to 50	Pass
			2480	2479.996	-1.61	-50 to 50	Pass
NTHV	Carrier Wave	SISO	2402	2401.996	-1.67	-50 to 50	Pass
			2480	2479.996	-1.61	-50 to 50	Pass

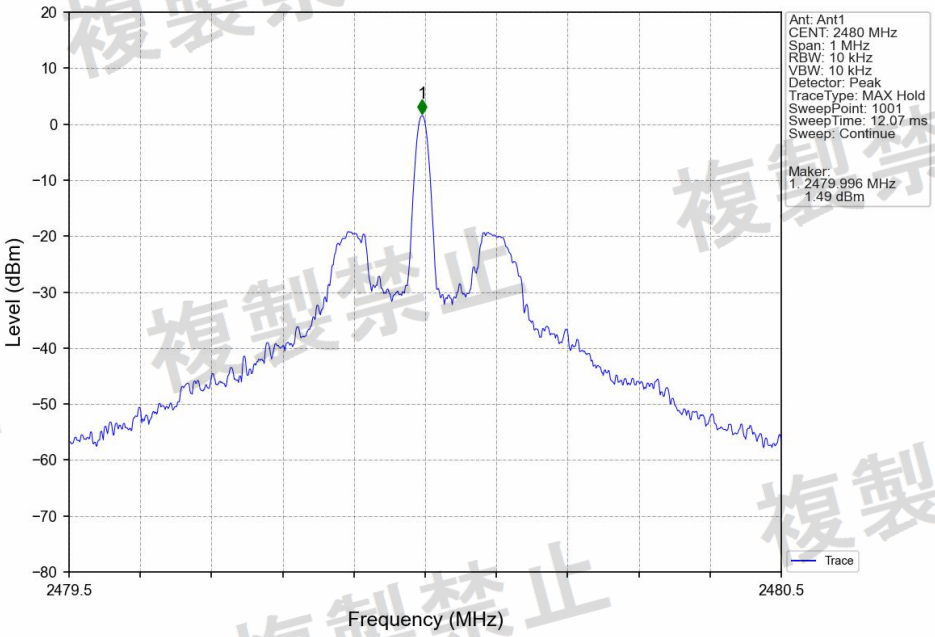
1.2 Test Graph

1.2.1 Ant1

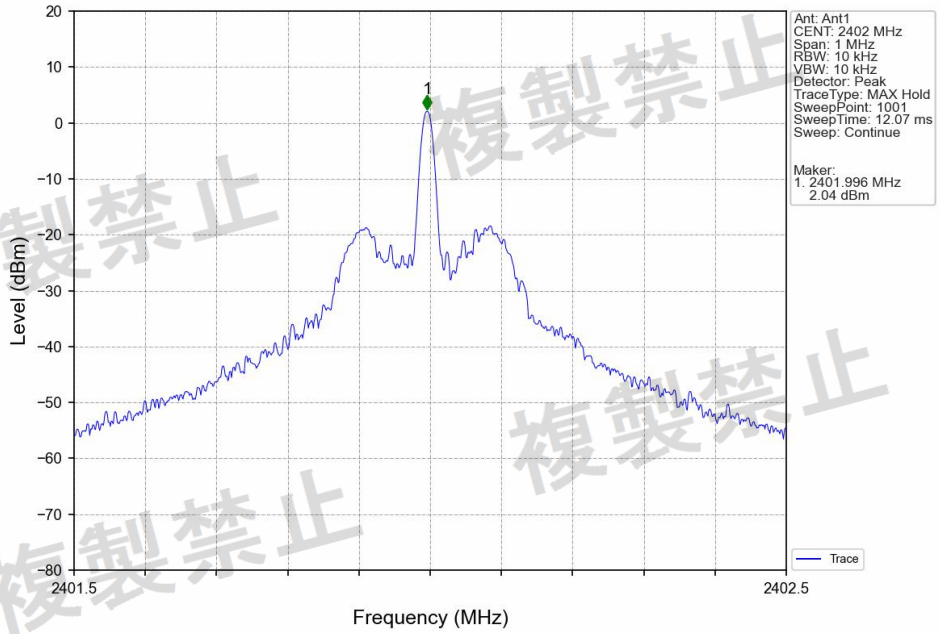
Frequency Error_NTNV_Carrier Wave_2402MHz_Ant1_NTNV



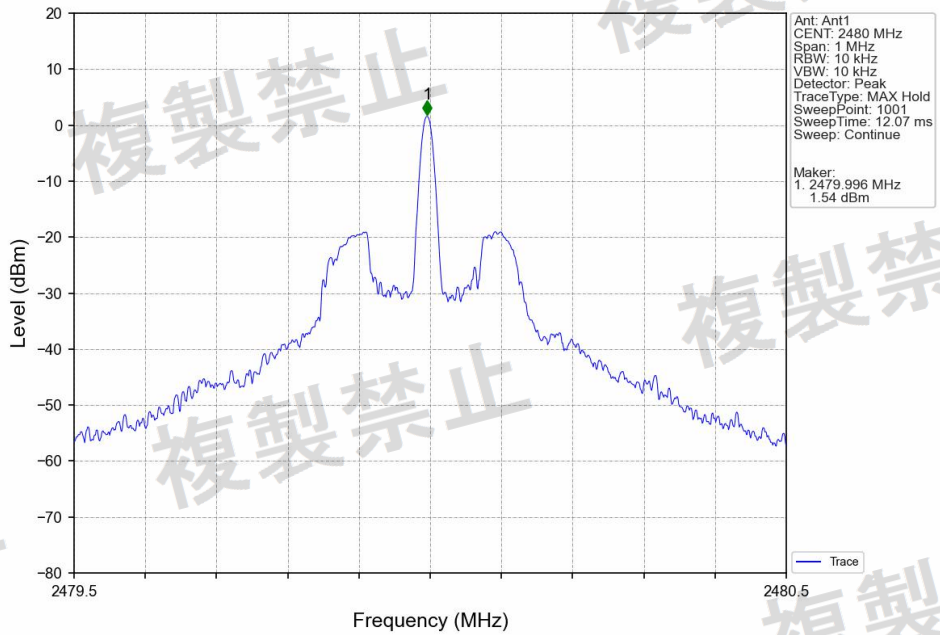
Frequency Error_NTNV_Carrier Wave_2480MHz_Ant1_NTNV



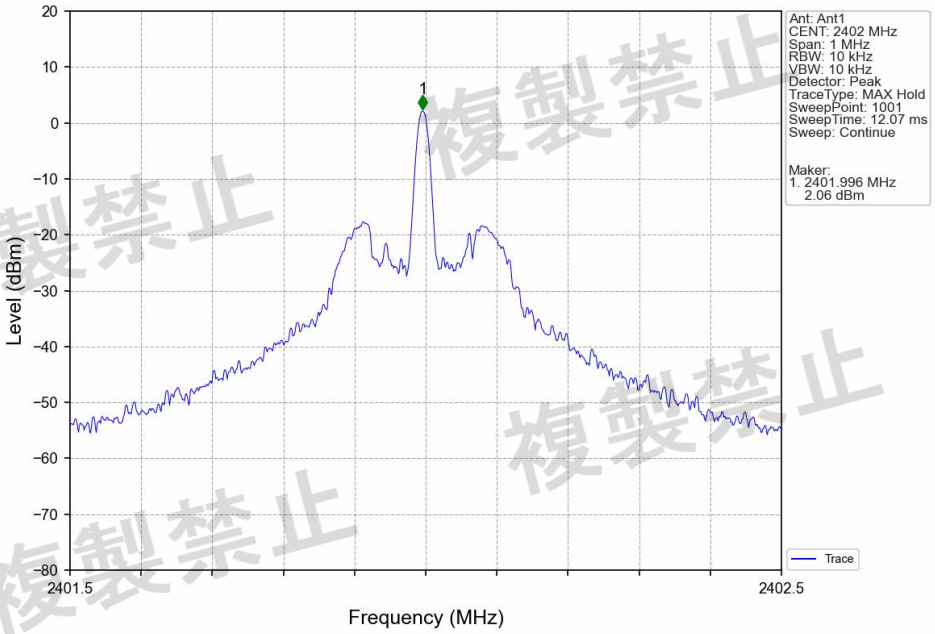
Frequency Error_NTLV_Carrier Wave_2402MHz_Ant1_NTLV



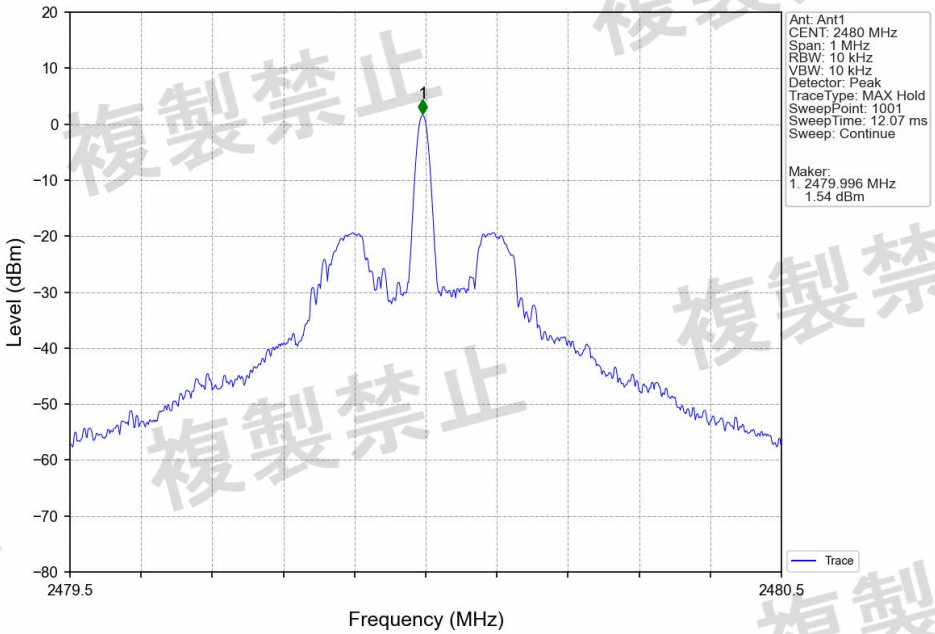
Frequency Error_NTLV_Carrier Wave_2480MHz_Ant1_NTLV



Frequency Error_NTHV_Carrier Wave_2402MHz_Ant1_NTHV



Frequency Error_NTHV_Carrier Wave_2480MHz_Ant1_NTHV



2. Occupied Bandwidth

2.1 Test Result

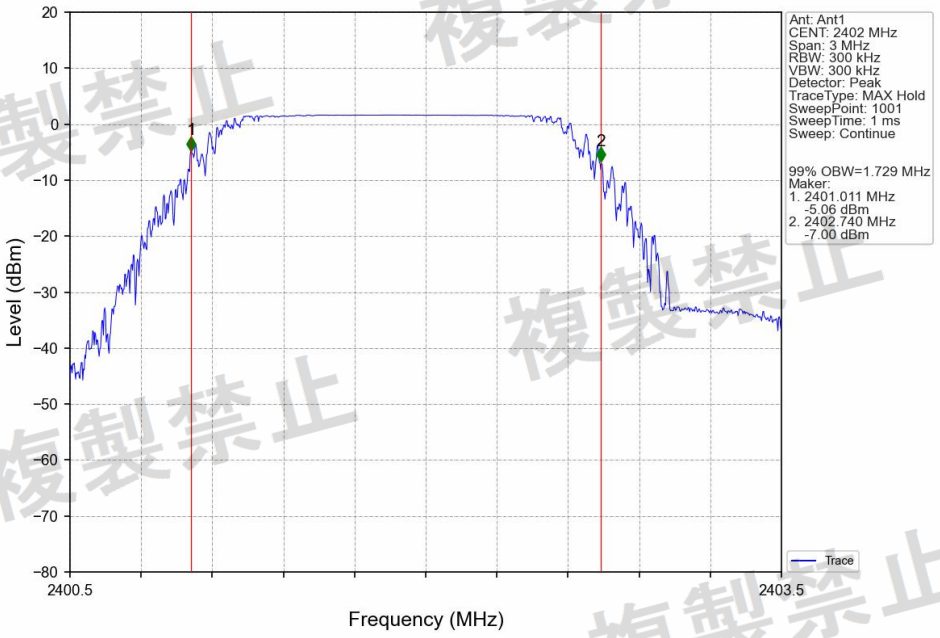
2.1.1 OBW

ENV	Mode	TX Type	Frequency (MHz)	99% Occupied Bandwidth (MHz)		Verdict
				ANT1	Limit	
NTNV	1M	SISO	2402	1.729	<=26	Pass
			2480	1.707	<=26	Pass
NTLV	1M	SISO	2402	1.740	<=26	Pass
			2480	1.708	<=26	Pass
NTHV	1M	SISO	2402	1.707	<=26	Pass
			2480	1.711	<=26	Pass

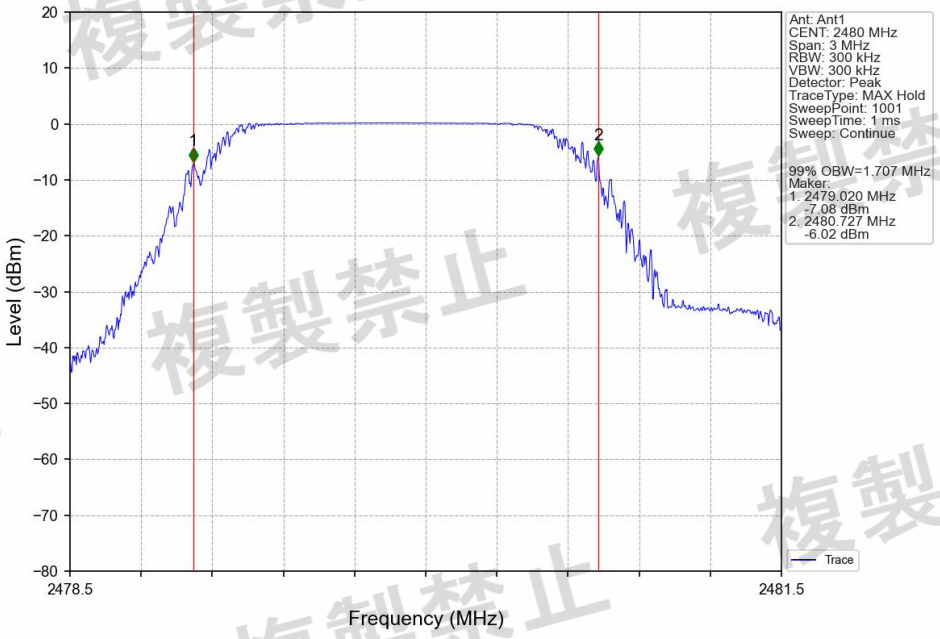
2.2 Test Graph

2.2.1 OBW

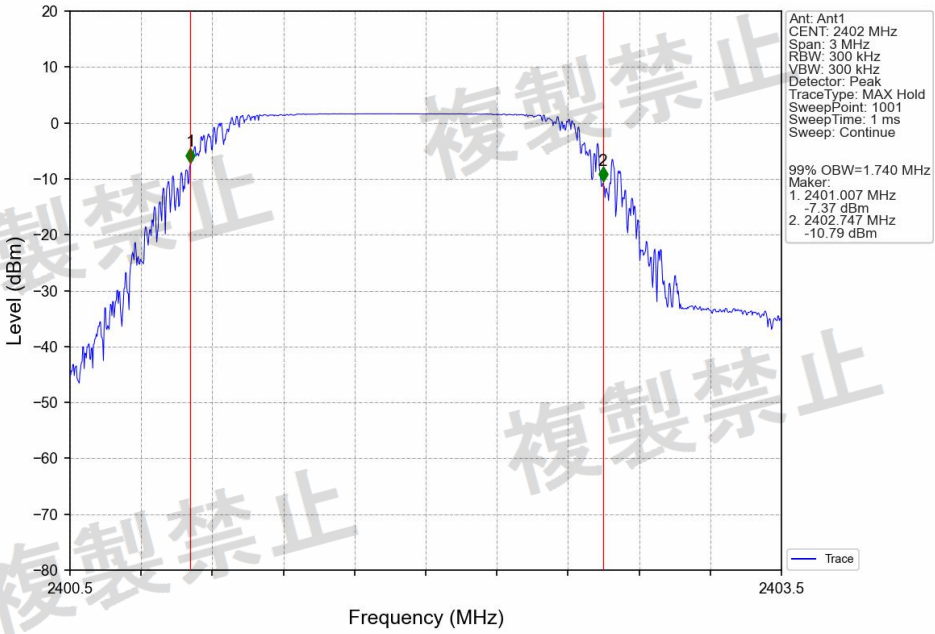
1M_2402MHz_Ant1_NTNV



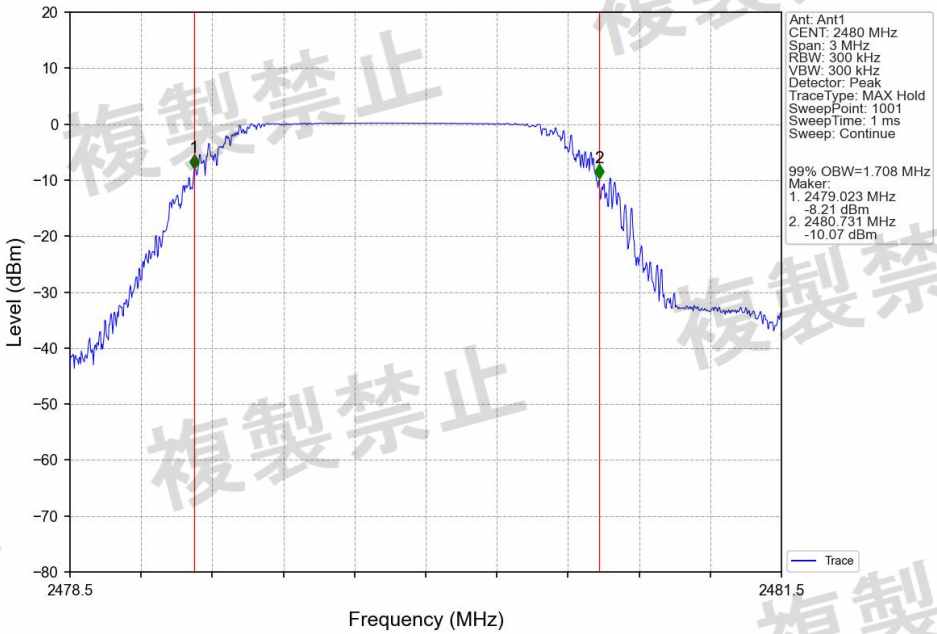
1M_2480MHz_Ant1_NTNV



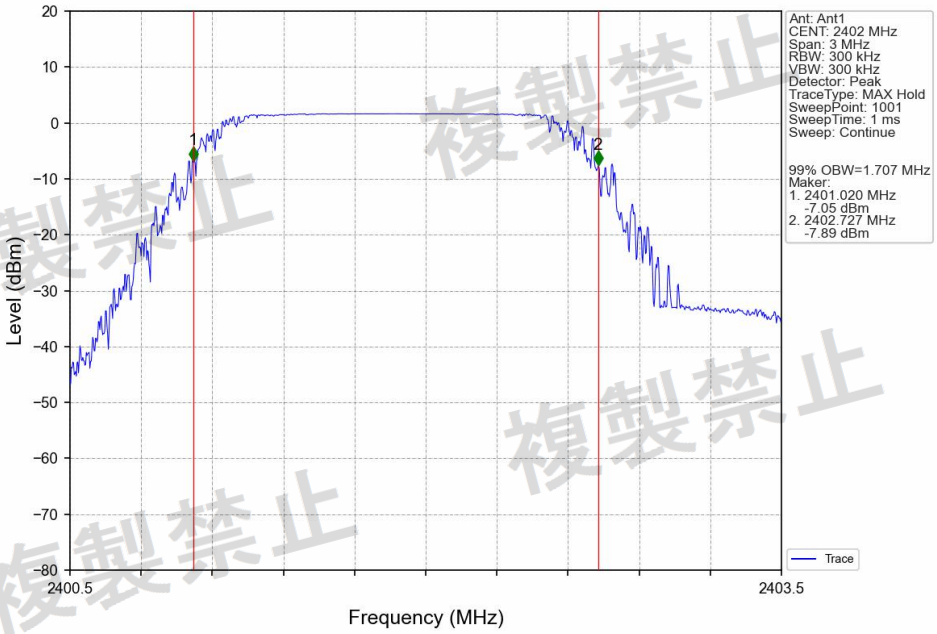
1M_2402MHz_Ant1_NTLV



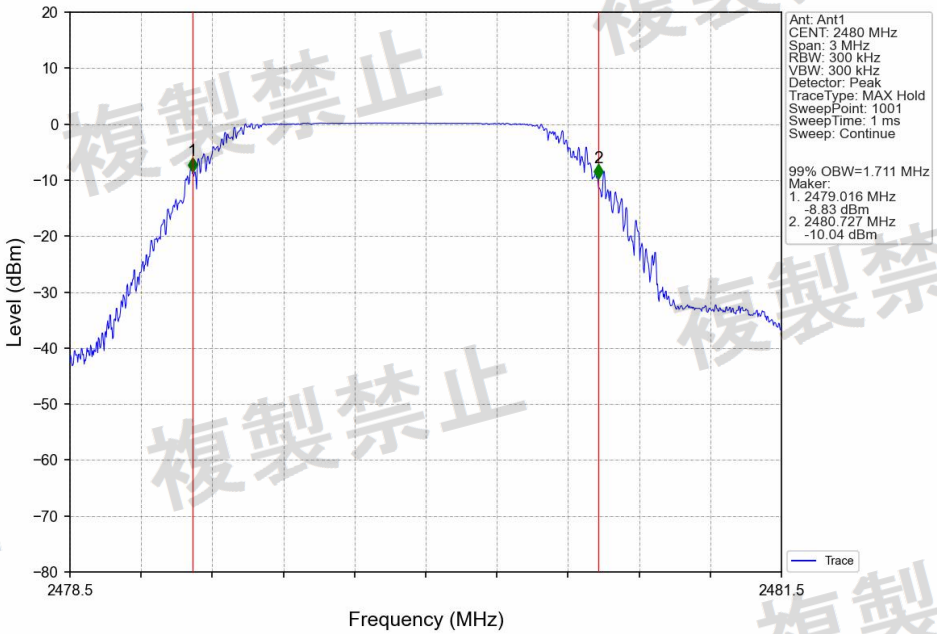
1M_2480MHz_Ant1_NTLV



1M_2402MHz_Ant1_NTHV



1M_2480MHz_Ant1_NTHV



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	1.126	<=10.00	1.300	-13.38	<=20	Pass
			2480	1	0.832	<=10.00	1.300	-36.00	<=20	Pass
NTLV	1M	SISO	2402	1	1.399	<=10.00	1.300	7.62	<=20	Pass
			2480	1	0.828	<=10.00	1.300	-36.31	<=20	Pass
NTHV	1M	SISO	2402	1	1.142	<=10.00	1.300	-12.15	<=20	Pass
			2480	1	0.929	<=10.00	1.300	-28.54	<=20	Pass

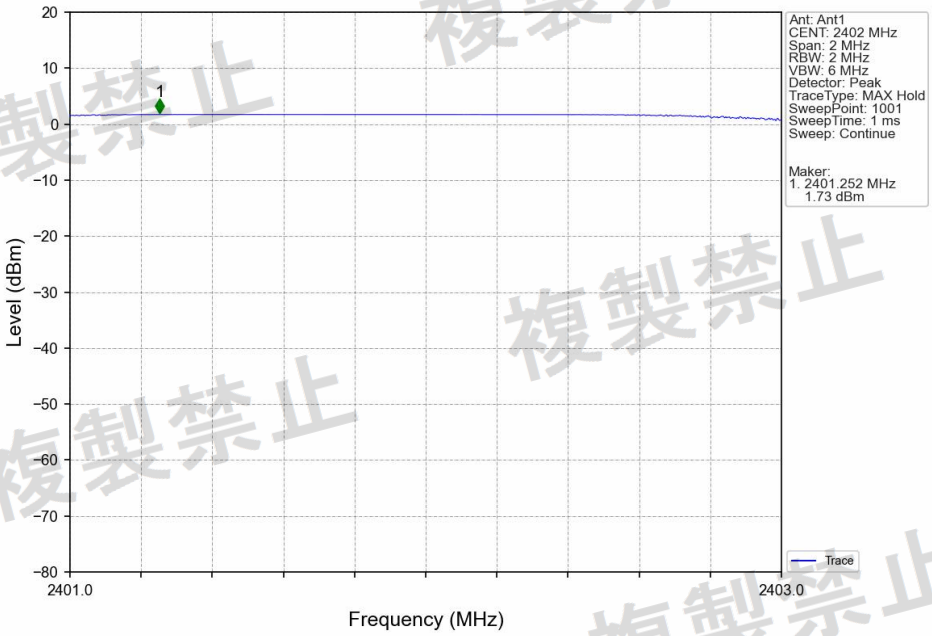
3.1.2 EIRP

ENV	Mode	TX Type	Frequency (MHz)	ANT	Gain (dBi)	EIRP (dBm)		Verdict
						Result	Limit	
NTNV	1M	SISO	2402	1	5.22	5.73	<=12.14	Pass
			2480	1	5.22	4.42	<=12.14	Pass
NTLV	1M	SISO	2402	1	5.22	6.68	<=12.14	Pass
			2480	1	5.22	4.40	<=12.14	Pass
NTHV	1M	SISO	2402	1	5.22	5.80	<=12.14	Pass
			2480	1	5.22	4.90	<=12.14	Pass

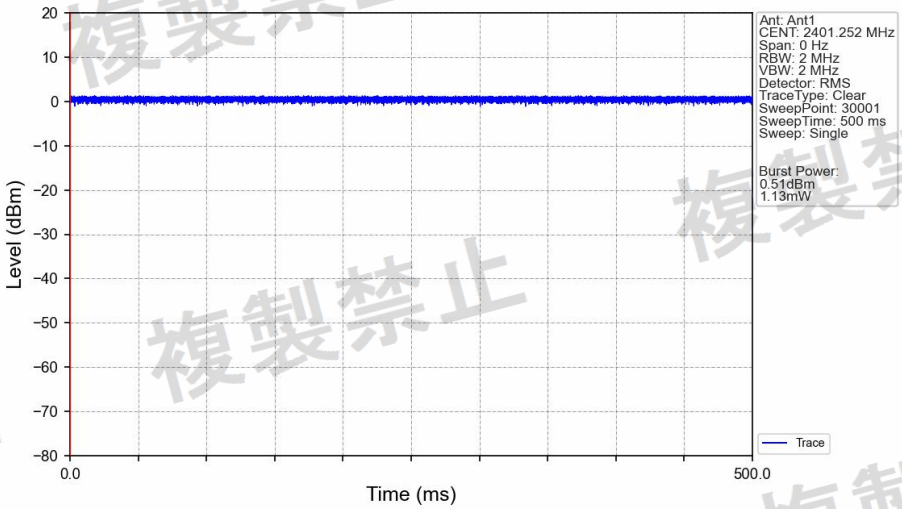
3.2 Test Graph

3.2.1 Power

1M_2402MHz_Ant1_NTNV

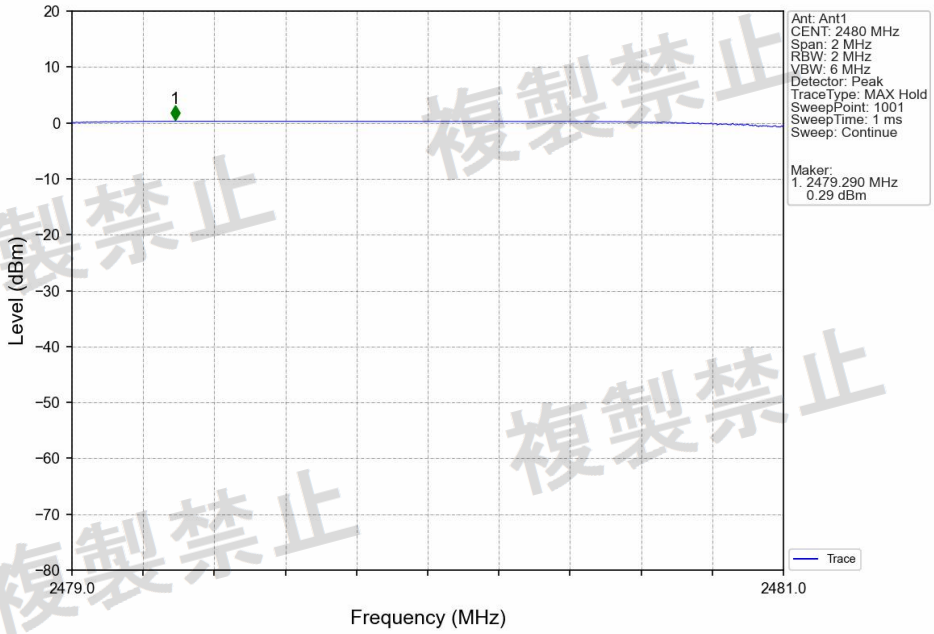


1M_2402MHz_Ant1_NTNV

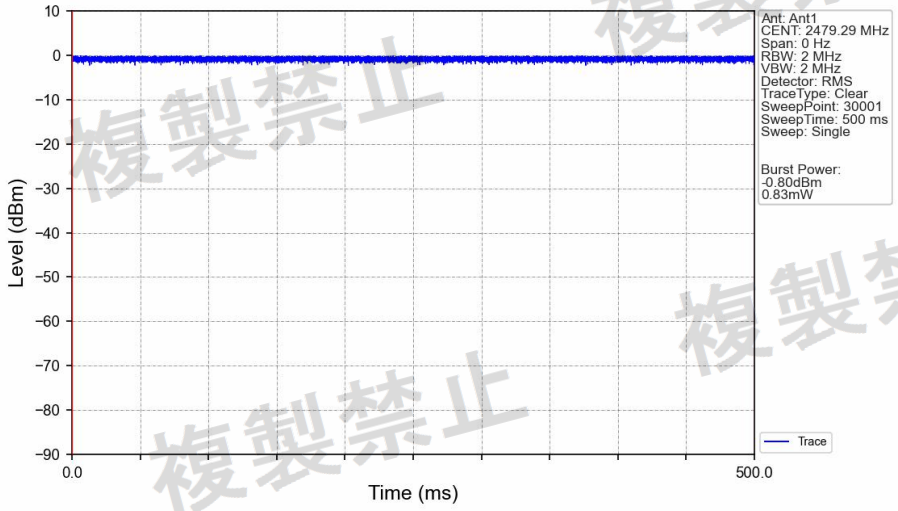


Burst No.	1
Length (ms)	500.000
Power(dBm)	0.51
Power(mW)	1.126
Remark	Max

1M_2480MHz_Ant1_NTNV

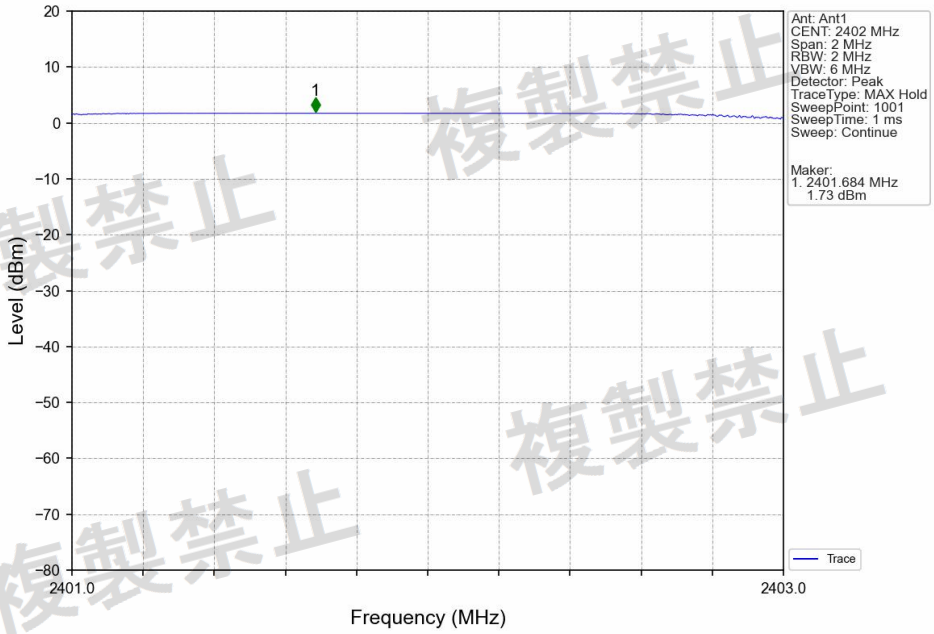


1M_2480MHz_Ant1_NTNV

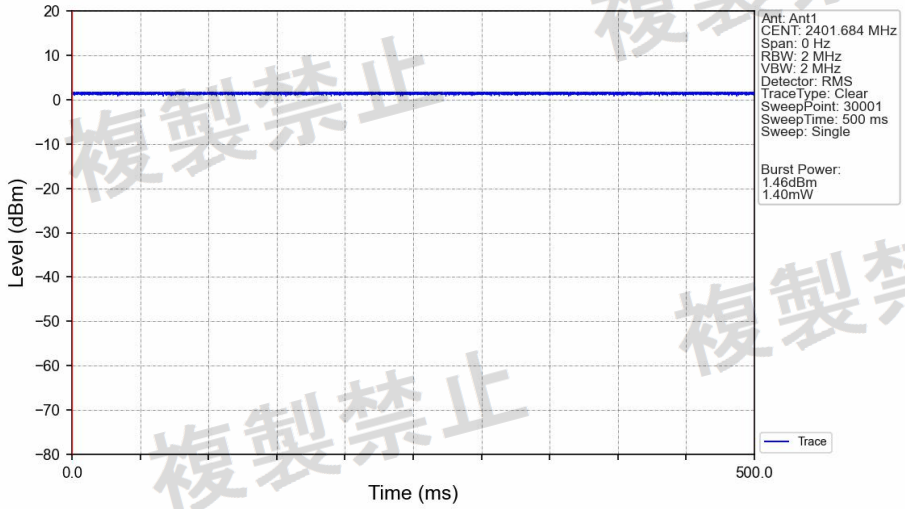


Burst No.	1
Length (ms)	500.000
Power(dBm)	-0.80
Power(mW)	0.832
Remark	Max

1M_2402MHz_Ant1_NTLV

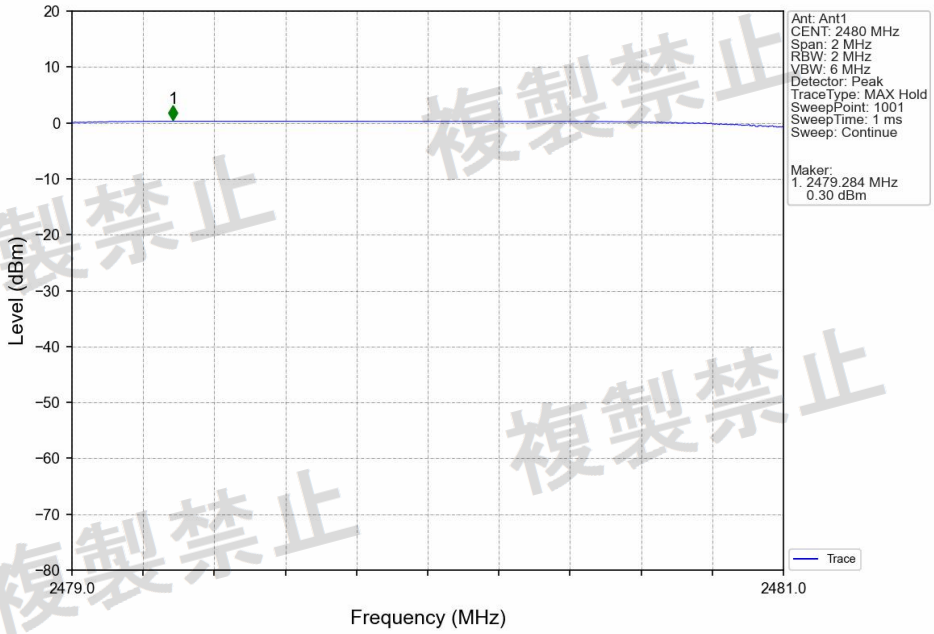


1M_2402MHz_Ant1_NTLV

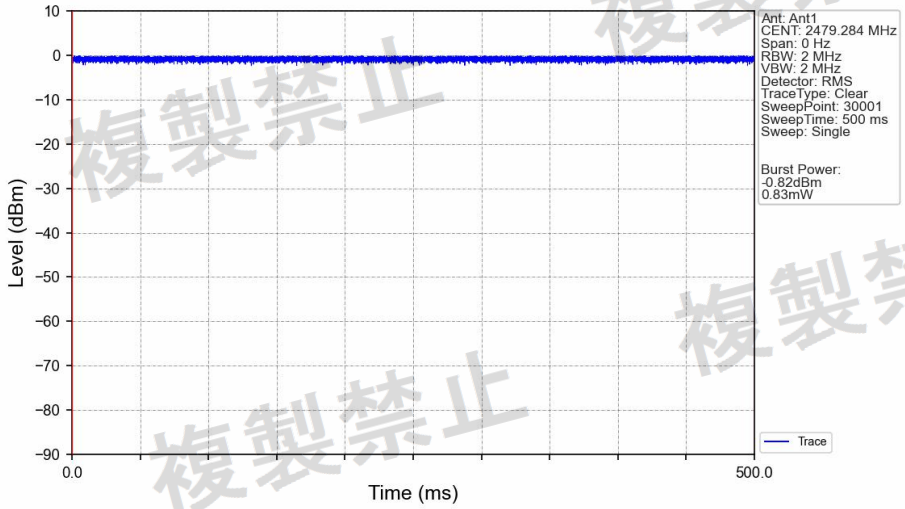


Burst No.	1
Length (ms)	500.000
Power(dBm)	1.46
Power(mW)	1.399
Remark	Max

1M_2480MHz_Ant1_NTLV

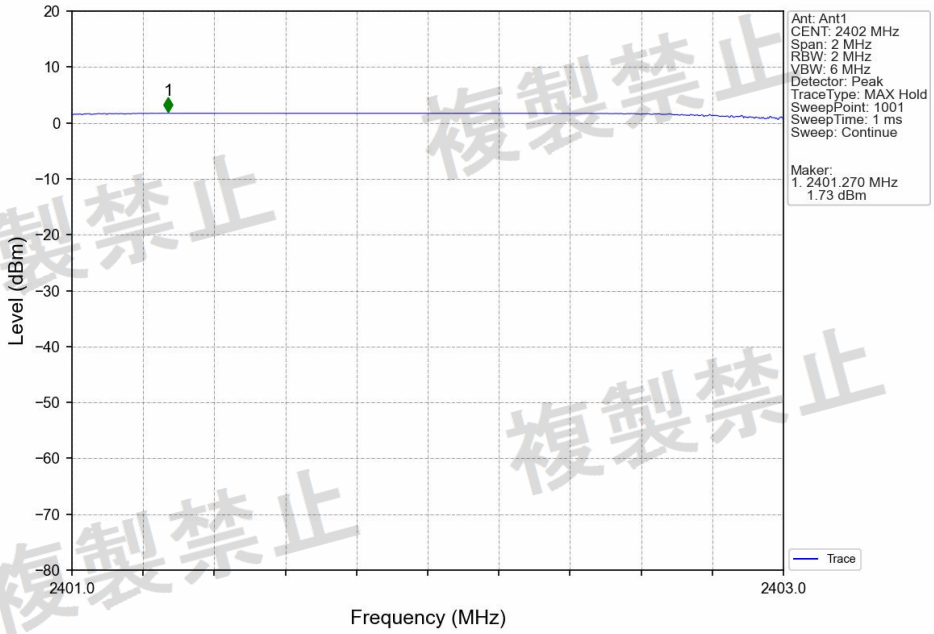


1M_2480MHz_Ant1_NTLV

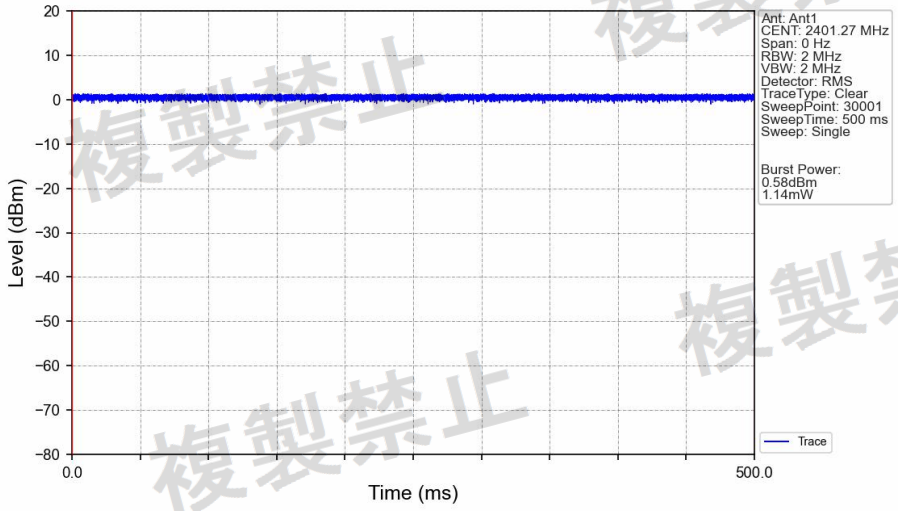


Burst No.	1
Length (ms)	500.000
Power(dBm)	-0.82
Power(mW)	0.828
Remark	Max

1M_2402MHz_Ant1_NTHV

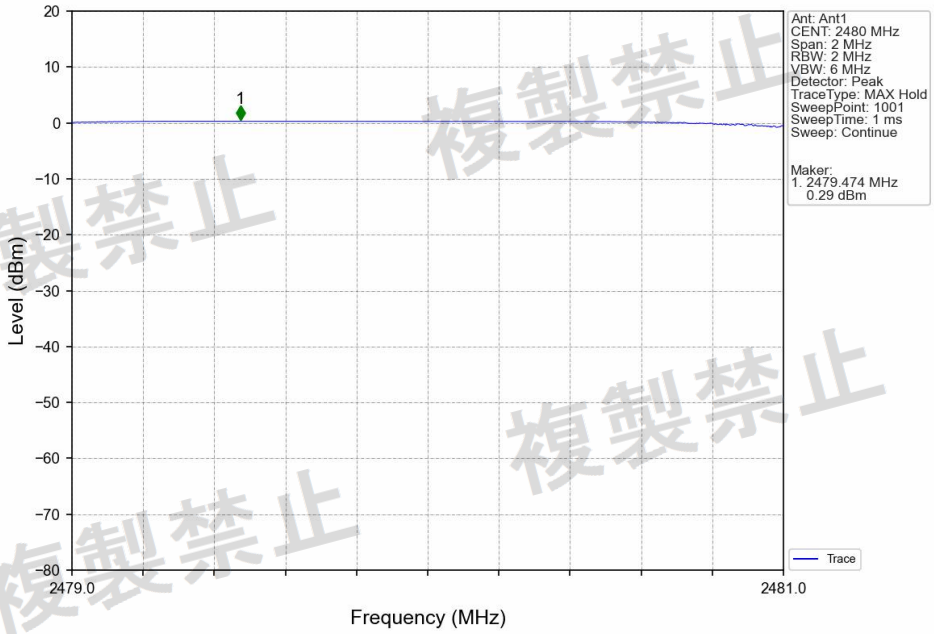


1M_2402MHz_Ant1_NTHV

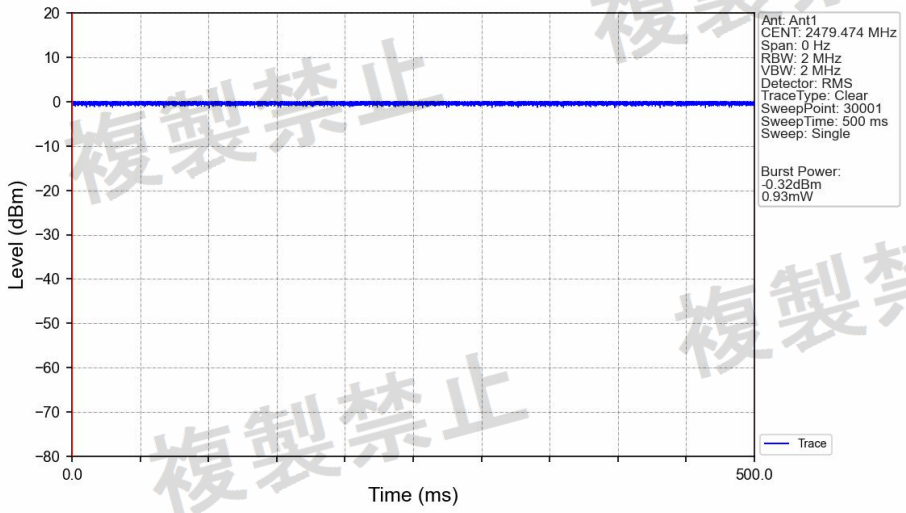


Burst No.	1
Length (ms)	500.000
Power(dBm)	0.58
Power(mW)	1.142
Remark	Max

1M_2480MHz_Ant1_NTHV



1M_2480MHz_Ant1_NTHV



Burst No.	1
Length (ms)	500.000
Power(dBm)	-0.32
Power(mW)	0.929
Remark	Max

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	2354.5	-33.42	0.455	/	/	2.5	Pass
				2387	2400	2399.961	-19.73	10.641	/	/	25	Pass
				2483.5	2496.5	2486.282	-42.55	0.056	/	/	25	Pass
				2496.5	12500	2497.5	-43.81	0.042	/	/	2.5	Pass
		2480	1	30	2387	2385	-44.27	0.037	/	/	2.5	Pass
				2387	2400	2399.714	-41.06	0.078	/	/	25	Pass
				2483.5	2496.5	2496.279	-31.54	0.701	/	/	25	Pass
				2496.5	12500	2497	-31.42	0.721	/	/	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	2353.5	-33.41	0.456	/	/	2.5	Pass
				2387	2400	2399.935	-20.69	8.531	/	/	25	Pass
				2483.5	2496.5	2485.788	-42.49	0.056	/	/	25	Pass
				2496.5	12500	2497.5	-43.67	0.043	/	/	2.5	Pass
		2480	1	30	2387	706	-35.16	0.305	/	/	2.5	Pass
				2387	2400	2399.792	-41.12	0.077	/	/	25	Pass
				2483.5	2496.5	2496.357	-31.51	0.706	/	/	25	Pass
				2496.5	12500	2497	-31.68	0.679	/	/	2.5	Pass

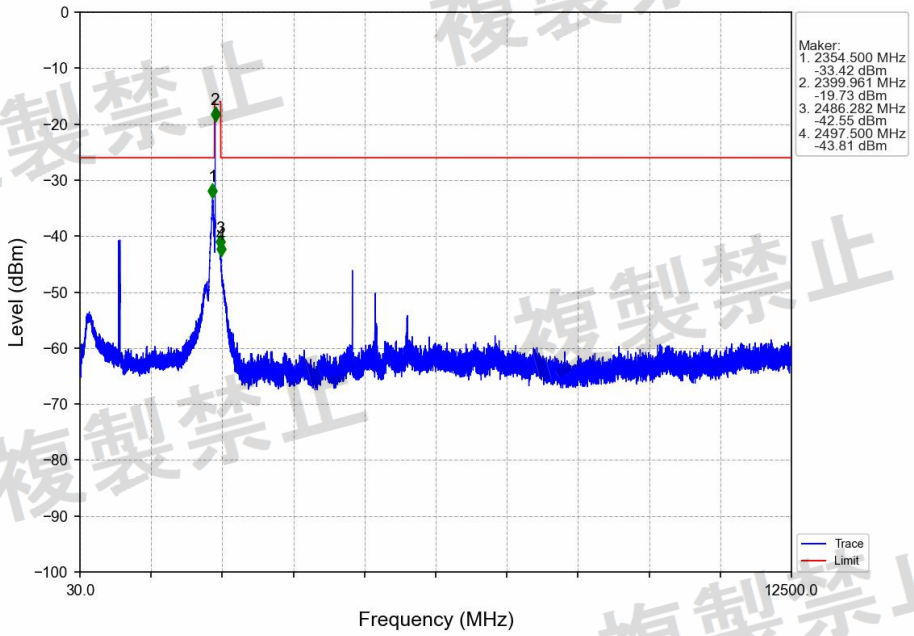
4.1.3 TxSe_NTHV

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	732	-32.35	0.582	/	/	2.5	Pass
				2387	2400	2399.987	-20.57	8.770	/	/	25	Pass
				2483.5	2496.5	2485.606	-42.56	0.055	/	/	25	Pass
				2496.5	12500	2500.5	-43.87	0.041	/	/	2.5	Pass
		2480	1	30	2387	2384.5	-44.19	0.038	/	/	2.5	Pass
				2387	2400	2399.87	-41.12	0.077	/	/	25	Pass
				2483.5	2496.5	2496.5	-31.50	0.708	/	/	25	Pass
				2496.5	12500	2497.5	-31.56	0.698	/	/	2.5	Pass

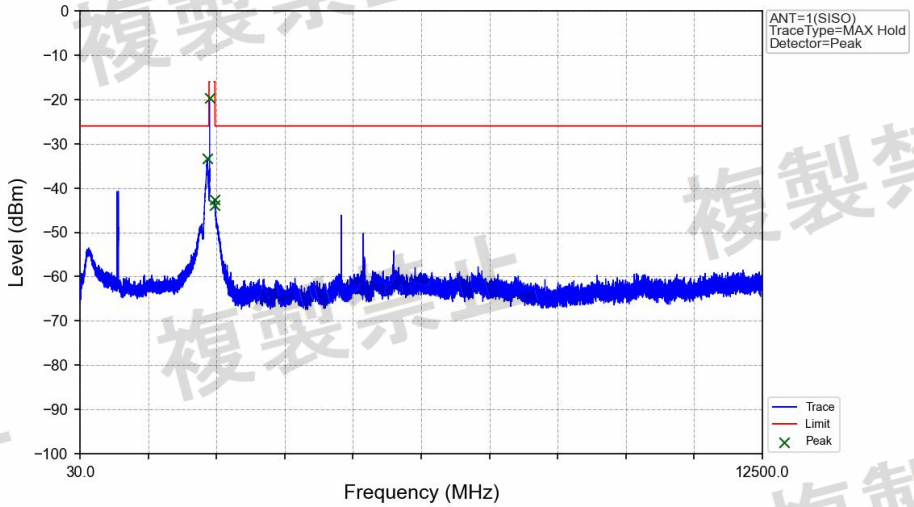
4.2 Test Graph

4.2.1 TxSe_NTNV

1M_2402MHz_Ant1_NTNV

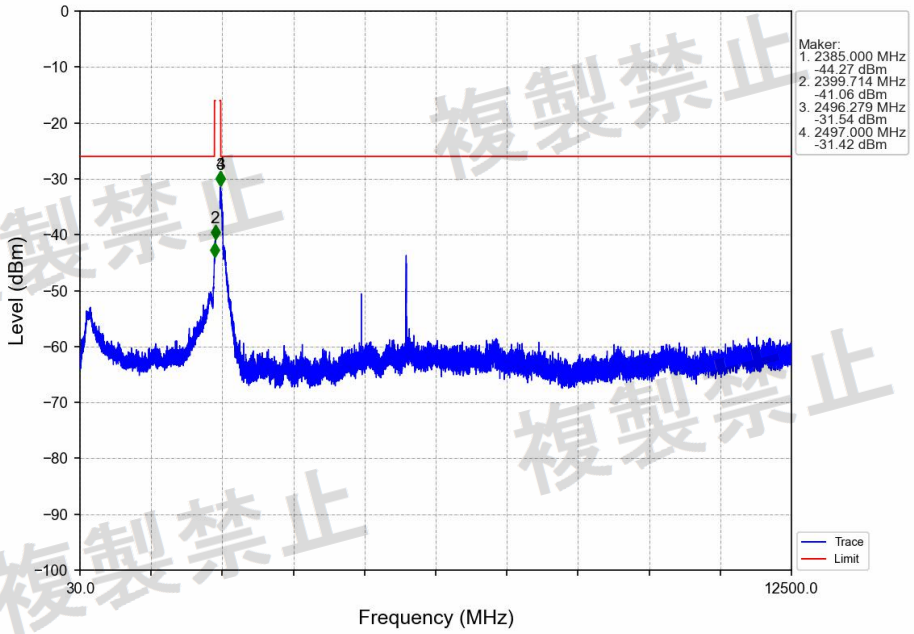


1M_2402MHz_Ant1_NTNV

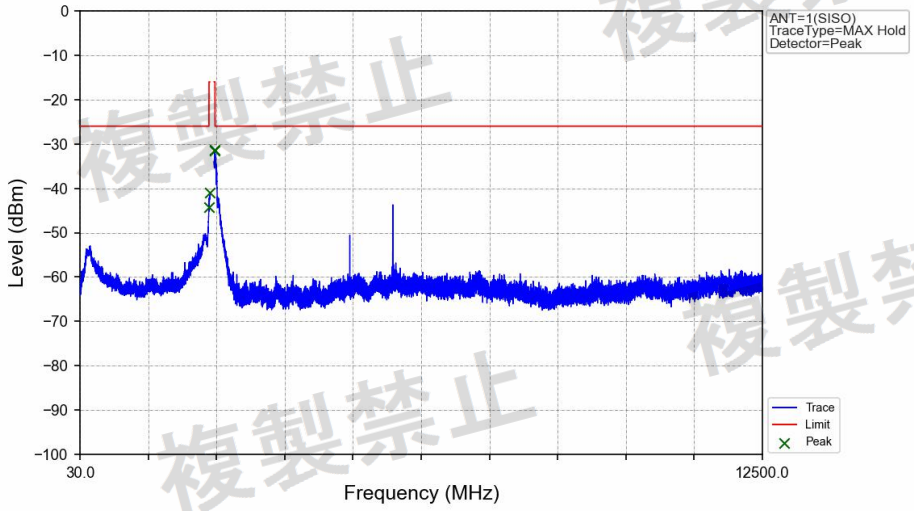


Start (MHz)	Stop (MHz)	RBW (MHz)	VBW (MHz)	Freq (MHz)	PK Power (dBm)	AV Power (dBm)	Limit (dBm)	Result
30	2387	1	1	2354.500	-33.42	/	-26	Pass
2387	2400	1	1	2399.961	-19.73	/	-16	Pass
2483.5	2496.5	1	1	2486.282	-42.55	/	-16	Pass
2496.5	12500	1	1	2497.500	-43.81	/	-26	Pass

1M_2480MHz_Ant1_NTNV



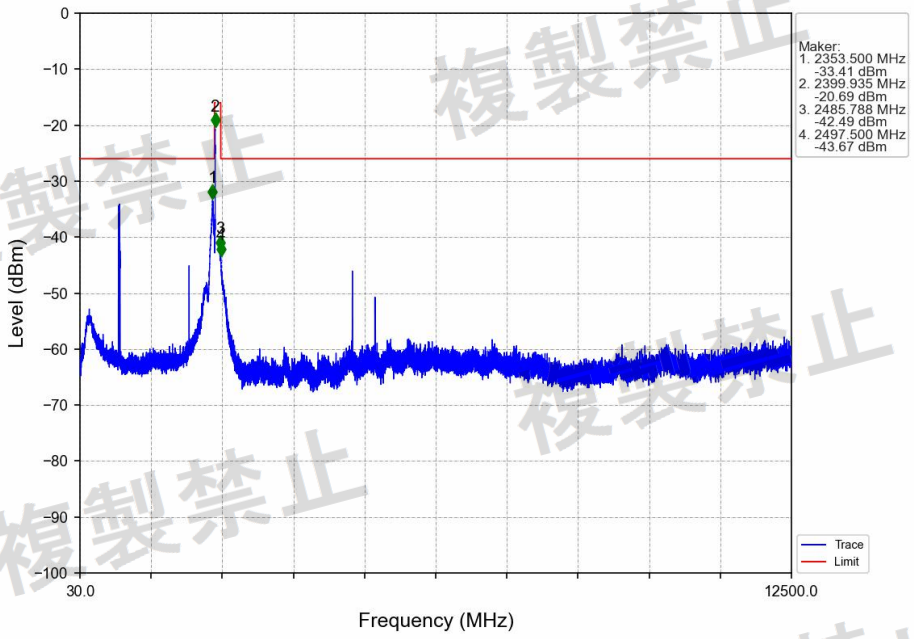
1M_2480MHz_Ant1_NTNV



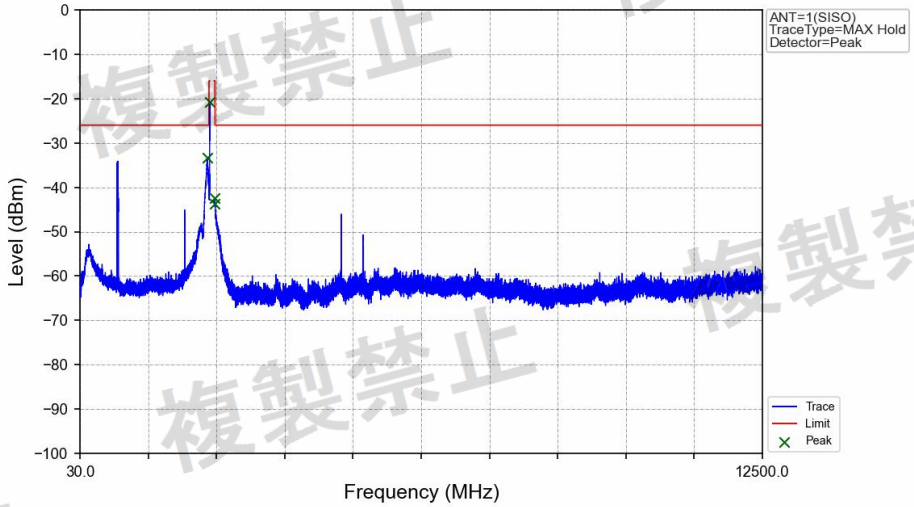
Start (MHz)	Stop (MHz)	RBW (MHz)	VBW (MHz)	Freq (MHz)	PK Power (dBm)	AV Power (dBm)	Limit (dBm)	Result
30	2387	1	1	2385.000	-44.27	/	-26	Pass
2387	2400	1	1	2399.714	-41.06	/	-16	Pass
2483.5	2496.5	1	1	2496.279	-31.54	/	-16	Pass
2496.5	12500	1	1	2497.000	-31.42	/	-26	Pass

4.2.2 TxSe_NTLV

1M_2402MHz_Ant1_NTLV

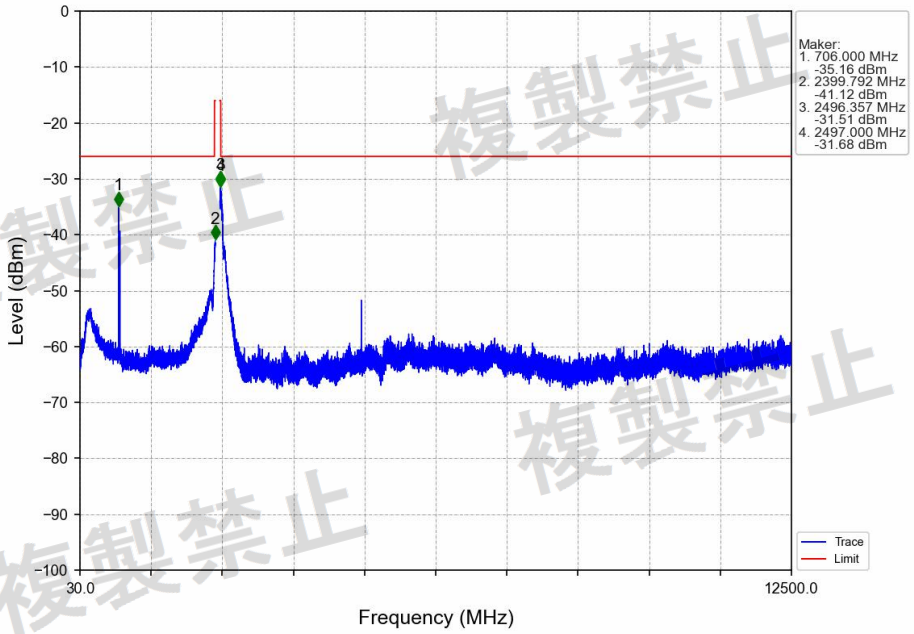


1M_2402MHz_Ant1_NTLV

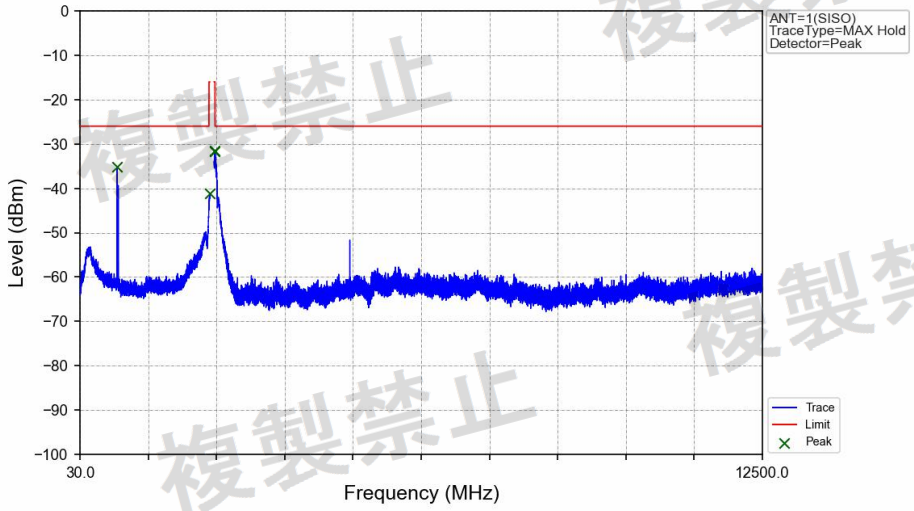


Start (MHz)	Stop (MHz)	RBW (MHz)	VBW (MHz)	Freq (MHz)	PK Power (dBm)	AV Power (dBm)	Limit (dBm)	Result
30	2387	1	1	2353.500	-33.41	/	-26	Pass
2387	2400	1	1	2399.935	-20.69	/	-16	Pass
2483.5	2496.5	1	1	2485.788	-42.49	/	-16	Pass
2496.5	12500	1	1	2497.500	-43.67	/	-26	Pass

1M_2480MHz_Ant1_NTLV



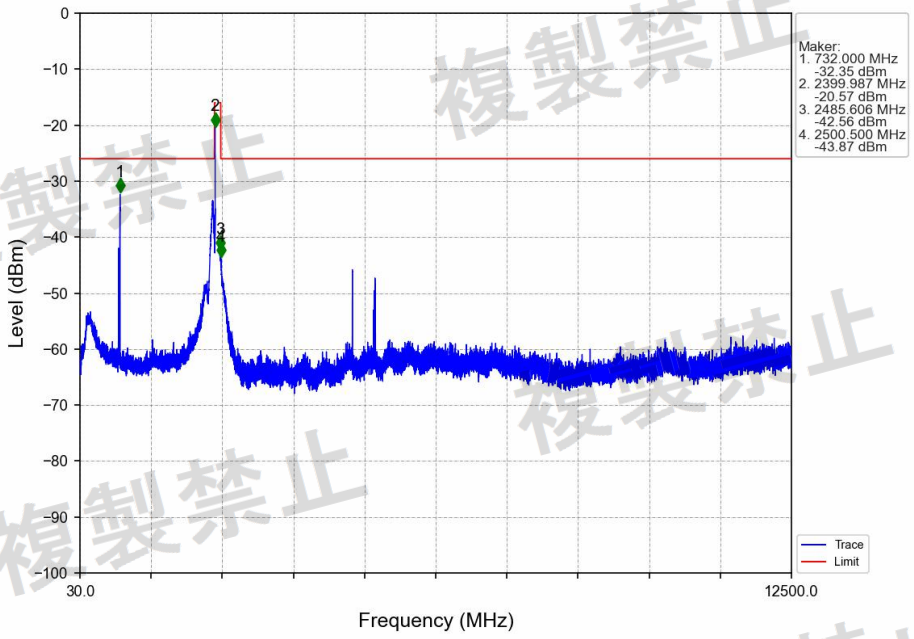
1M_2480MHz_Ant1_NTLV



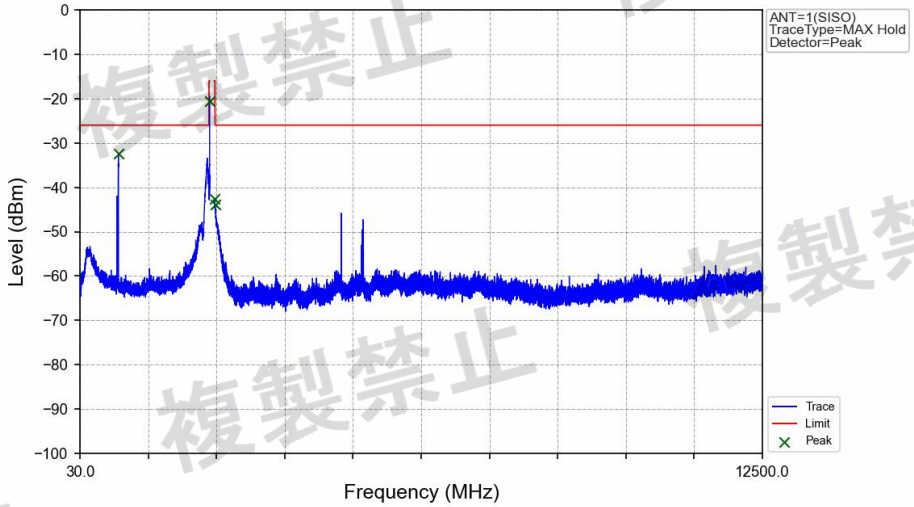
Start (MHz)	Stop (MHz)	RBW (MHz)	VBW (MHz)	Freq (MHz)	PK Power (dBm)	AV Power (dBm)	Limit (dBm)	Result
30	2387	1	1	706.000	-35.16	/	-26	Pass
2387	2400	1	1	2399.792	-41.12	/	-16	Pass
2483.5	2496.5	1	1	2496.357	-31.51	/	-16	Pass
2496.5	12500	1	1	2497.000	-31.68	/	-26	Pass

4.2.3 TxSe_NTHV

1M_2402MHz_Ant1_NTHV

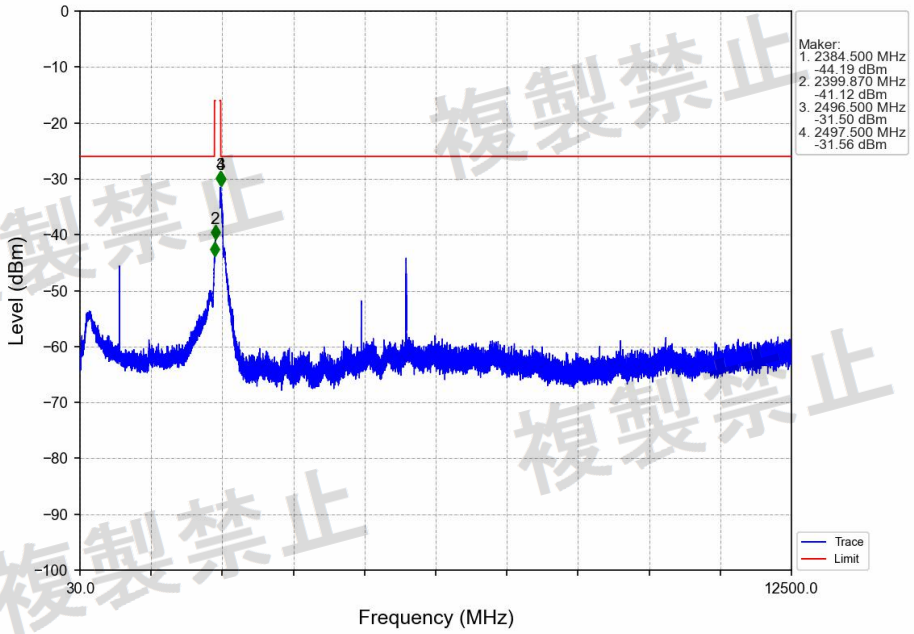


1M_2402MHz_Ant1_NTHV

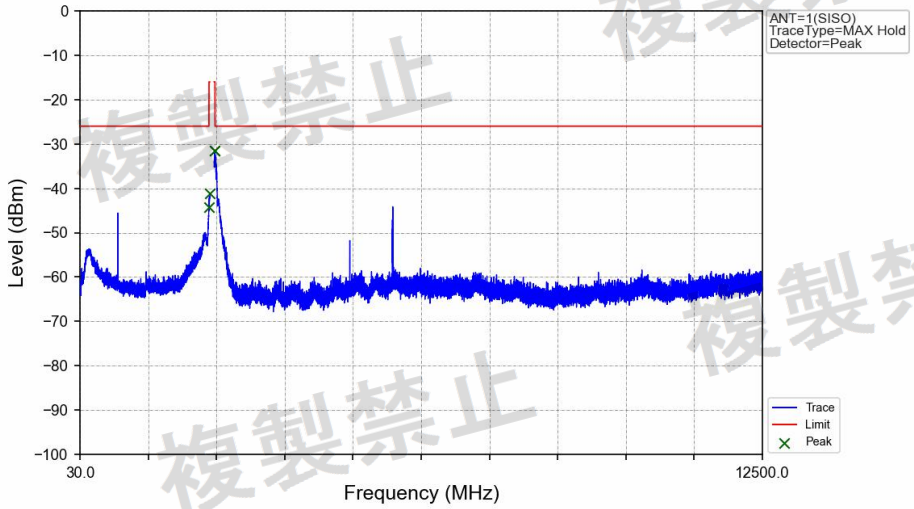


Start (MHz)	Stop (MHz)	RBW (MHz)	VBW (MHz)	Freq (MHz)	PK Power (dBm)	AV Power (dBm)	Limit (dBm)	Result
30	2387	1	1	732.000	-32.35	/	-26	Pass
2387	2400	1	1	2399.987	-20.57	/	-16	Pass
2483.5	2496.5	1	1	2485.606	-42.56	/	-16	Pass
2496.5	12500	1	1	2500.500	-43.87	/	-26	Pass

1M_2480MHz_Ant1_NTHV



1M_2480MHz_Ant1_NTHV



Start (MHz)	Stop (MHz)	RBW (MHz)	VBW (MHz)	Freq (MHz)	PK Power (dBm)	AV Power (dBm)	Limit (dBm)	Result
30	2387	1	1	2384.500	-44.19	/	-26	Pass
2387	2400	1	1	2399.870	-41.12	/	-16	Pass
2483.5	2496.5	1	1	2496.500	-31.50	/	-16	Pass
2496.5	12500	1	1	2497.500	-31.56	/	-26	Pass

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	819.7	-78.69	0.014	/	/	4	Pass
				1000	12500	12393	-63.56	0.441	/	/	20	Pass
		2480	1	30	1000	996.85	-78.38	0.015	/	/	4	Pass
				1000	12500	2411	-61.81	0.659	/	/	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	632.65	-78.72	0.013	/	/	4	Pass
				1000	12500	11917	-63.58	0.439	/	/	20	Pass
		2480	1	30	1000	827.7	-78.58	0.014	/	/	4	Pass
				1000	12500	2411.5	-62.49	0.564	/	/	20	Pass

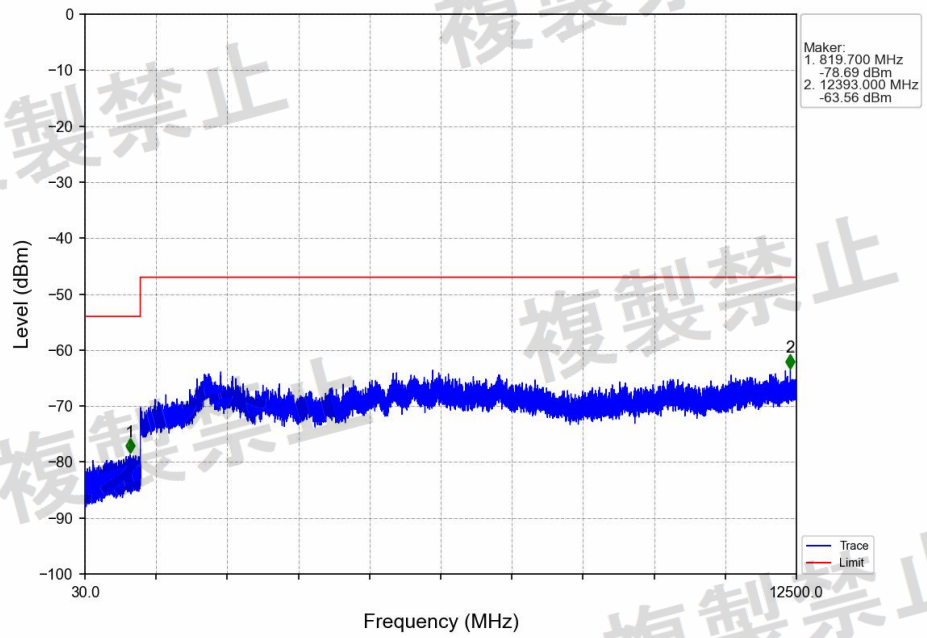
5.1.3 RxSe_NTHV

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	720.8	-69.08	0.124	/	/	4	Pass
				1000	12500	2117.5	-63.19	0.480	/	/	20	Pass
		2480	1	30	1000	835.4	-77.79	0.017	/	/	4	Pass
				1000	12500	2411	-61.82	0.658	/	/	20	Pass

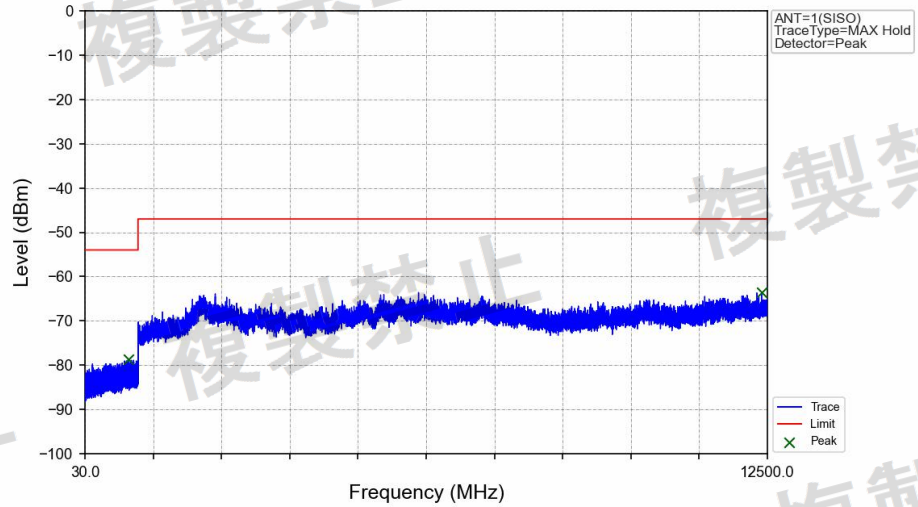
5.2 Test Graph

5.2.1 RxSe_NTNV

1M_2402MHz_Ant1_NTNV

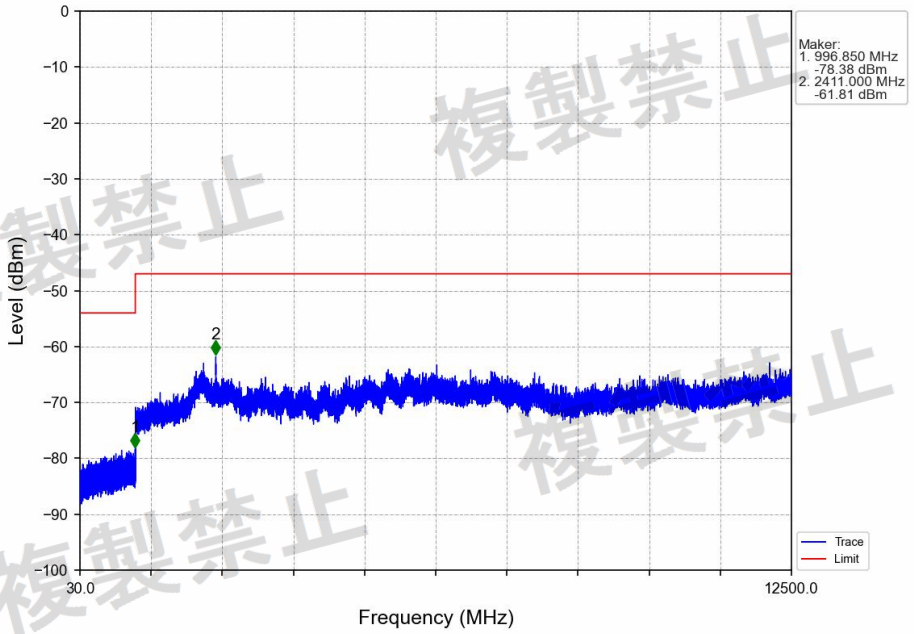


1M_2402MHz_Ant1_NTNV

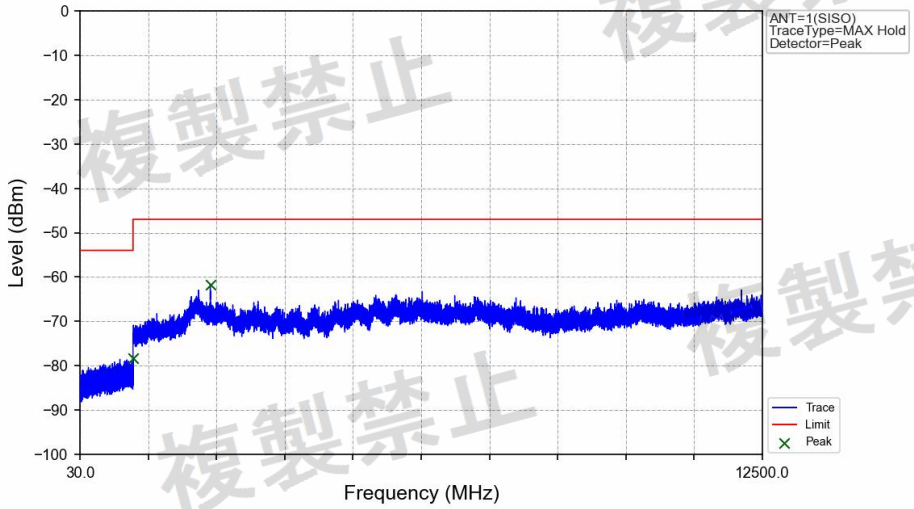


Start (MHz)	Stop (MHz)	RBW (MHz)	VBW (MHz)	Freq (MHz)	PK Power (dBm)	AV Power (dBm)	Limit (dBm)	Result
30	1000	0.1	0.1	819.700	-78.69	/	-54	Pass
1000	12500	1	1	12393.000	-63.56	/	-47	Pass

1M_2480MHz_Ant1_NTNV



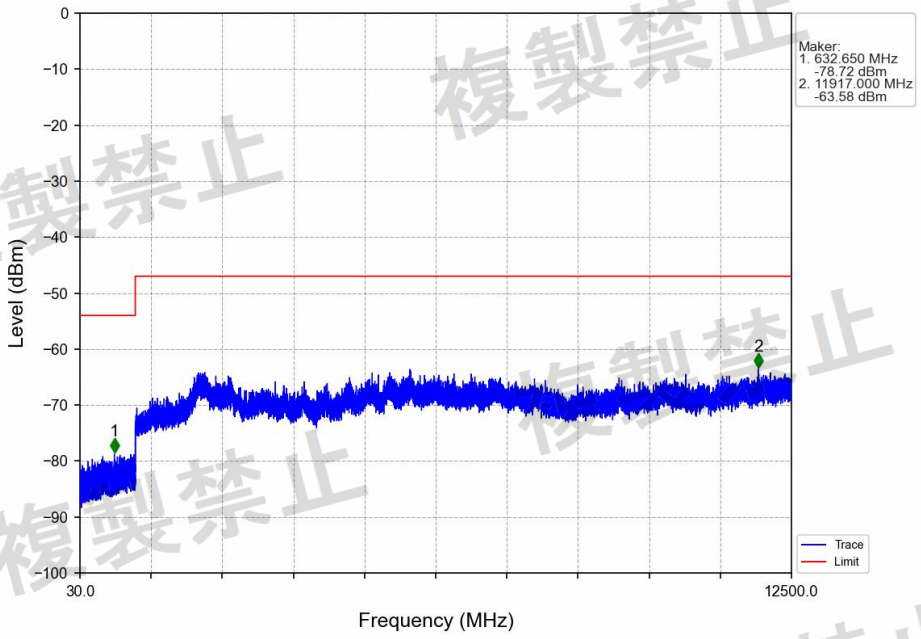
1M_2480MHz_Ant1_NTNV



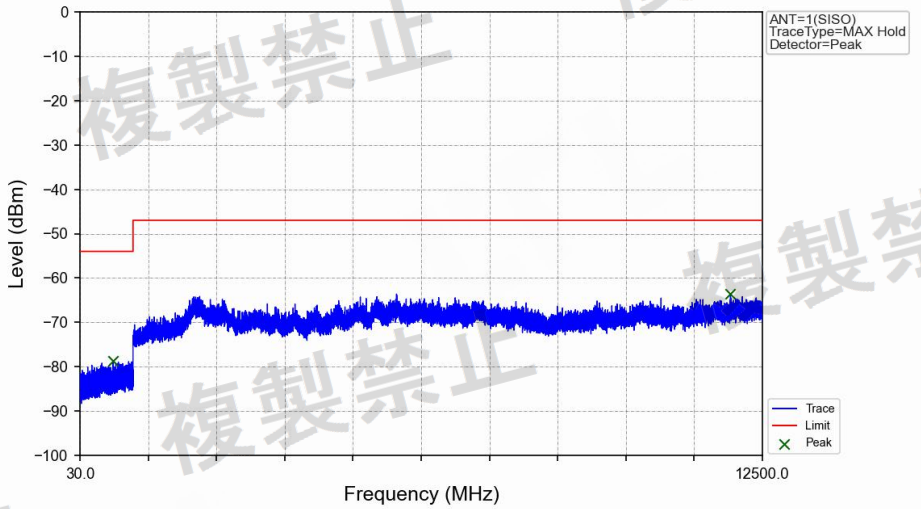
Start (MHz)	Stop (MHz)	RBW (MHz)	VBW (MHz)	Freq (MHz)	PK Power (dBm)	AV Power (dBm)	Limit (dBm)	Result
30	1000	0.1	0.1	996.850	-78.38	/	-54	Pass
1000	12500	1	1	2411.000	-61.81	/	-47	Pass

5.2.2 RxSe_NTLV

1M_2402MHz_Ant1_NTLV

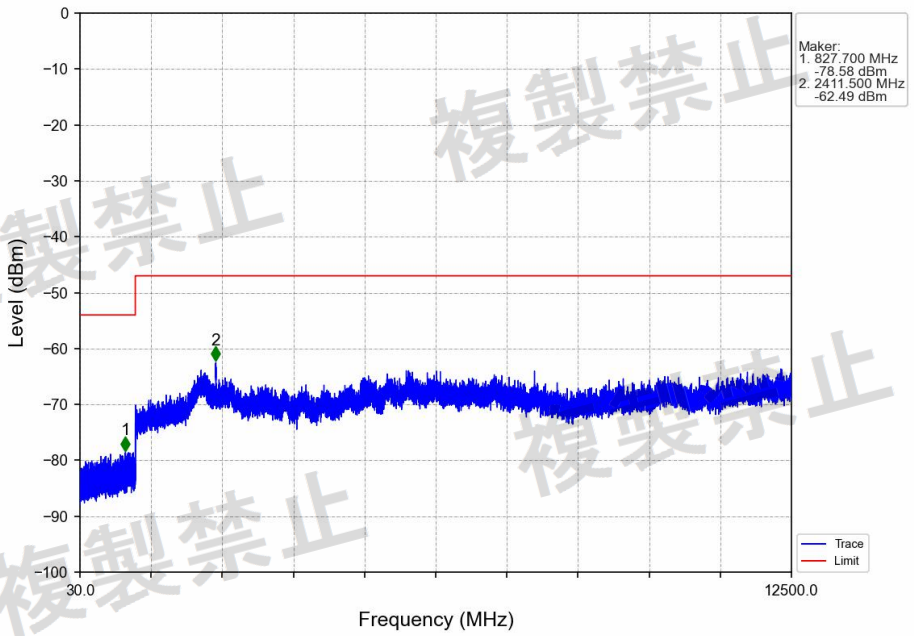


1M_2402MHz_Ant1_NTLV

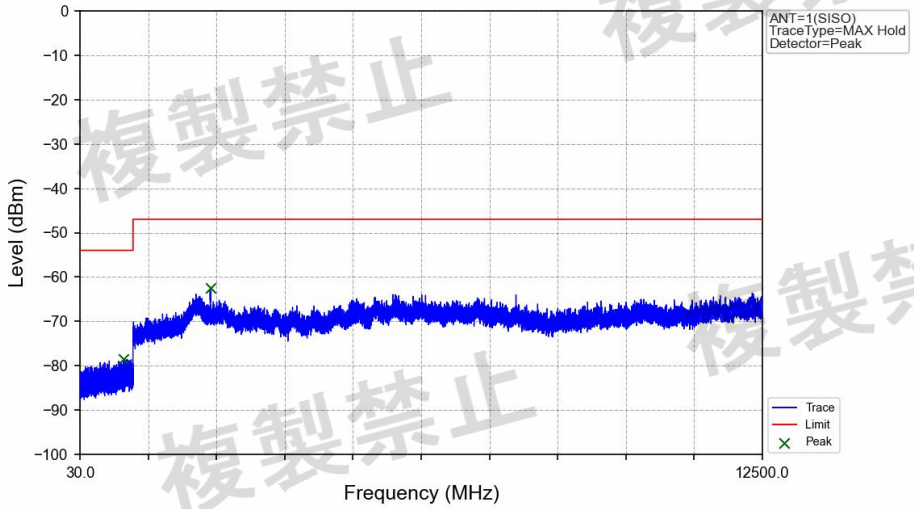


Start (MHz)	Stop (MHz)	RBW (MHz)	VBW (MHz)	Freq (MHz)	PK Power (dBm)	AV Power (dBm)	Limit (dBm)	Result
30	1000	0.1	0.1	632.650	-78.72	/	-54	Pass
1000	12500	1	1	11917.000	-63.58	/	-47	Pass

1M_2480MHz_Ant1_NTLV



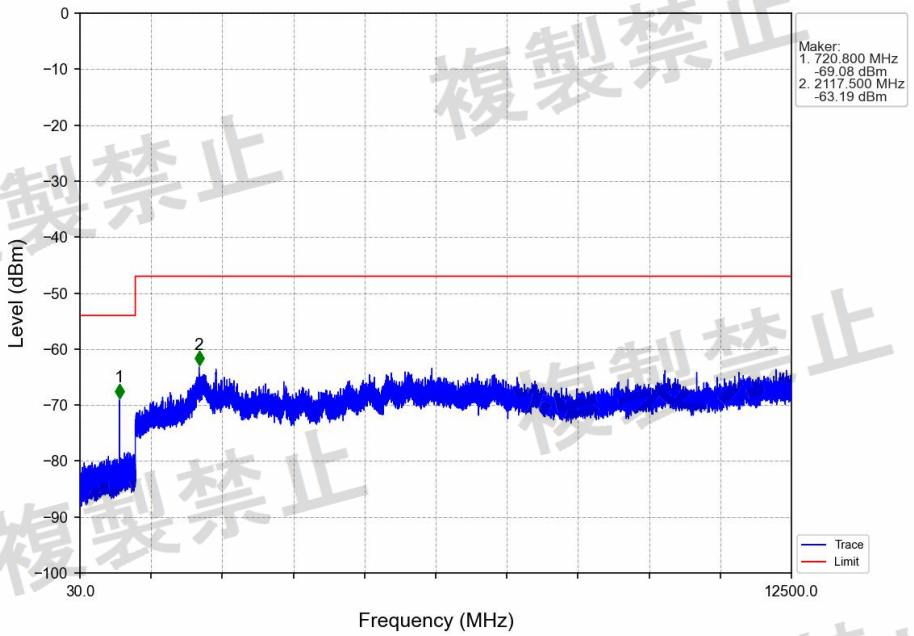
1M_2480MHz_Ant1_NTLV



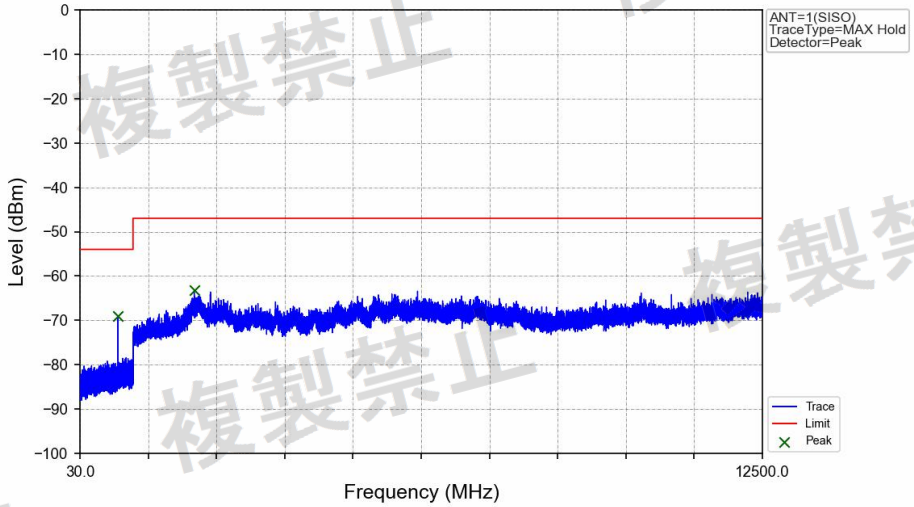
Start (MHz)	Stop (MHz)	RBW (MHz)	VBW (MHz)	Freq (MHz)	PK Power (dBm)	AV Power (dBm)	Limit (dBm)	Result
30	1000	0.1	0.1	827.700	-78.58	/	-54	Pass
1000	12500	1	1	2411.500	-62.49	/	-47	Pass

5.2.3 RxSe_NTHV

1M_2402MHz_Ant1_NTHV

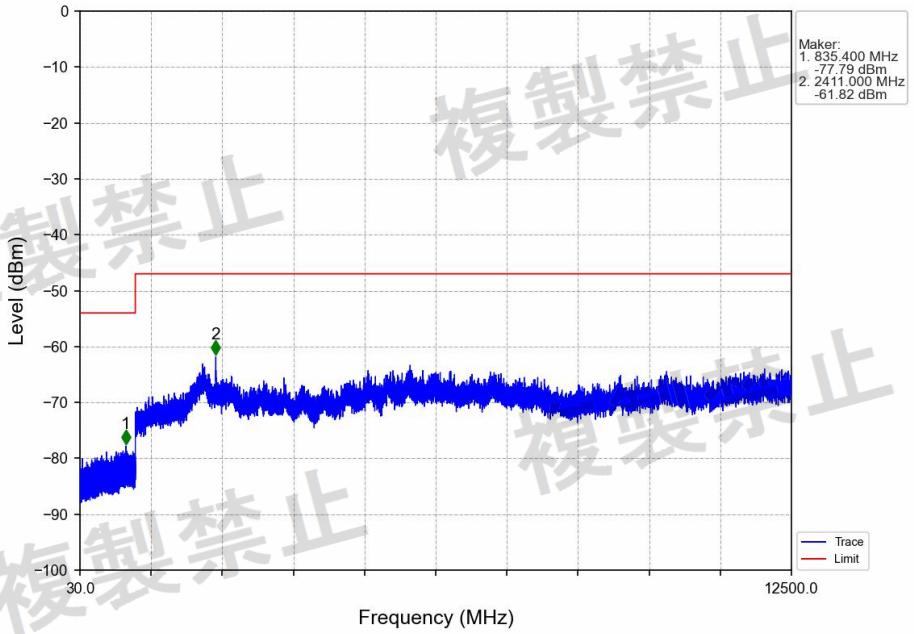


1M_2402MHz_Ant1_NTHV

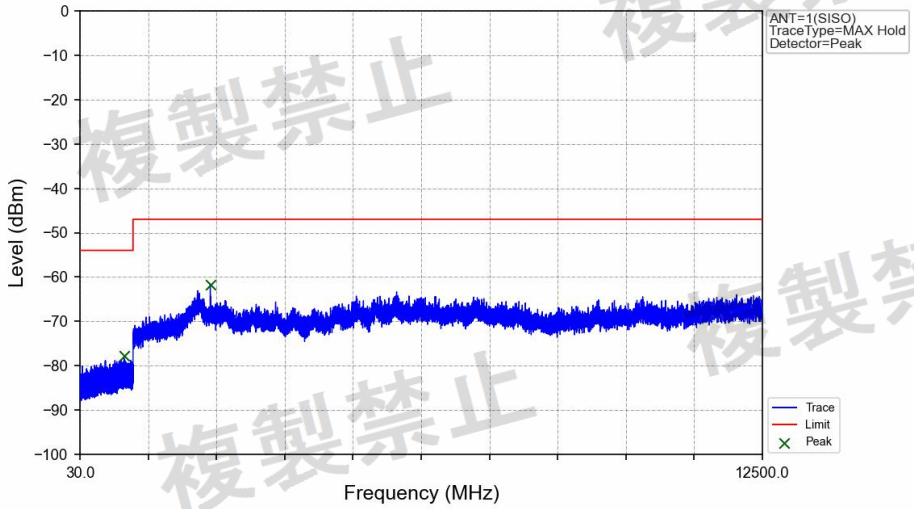


Start (MHz)	Stop (MHz)	RBW (MHz)	VBW (MHz)	Freq (MHz)	PK Power (dBm)	AV Power (dBm)	Limit (dBm)	Result
30	1000	0.1	0.1	720.800	-69.08	/	-54	Pass
1000	12500	1	1	2117.500	-63.19	/	-47	Pass

1M_2480MHz_Ant1_NTHV



1M_2480MHz_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	835.400	-77.79	/	-54	Pass
1000	12500	1	1	2411.000	-61.82	/	-47	Pass