

Appendix A: Test Results of Bluetooth LE

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Appendix A.1: Test Results of Frequency Tolerance

Test Result

TestCondition	TestMode	Antenna	Freq(MHz)	Result[ppm]	Limit[ppm]	Verdict
NTNV	BLE_1M	Ant1	2402	3.37219	±50	PASS
			2440	3.31967	±50	PASS
			2480	3.14516	±50	PASS
	BLE_2M	Ant1	2402	3.37219	±50	PASS
			2440	3.19672	±50	PASS
			2480	3.14516	±50	PASS

Appendix A.2: Test Results of Antenna Power

Test Result

Antenna Power							
Test Condition	Test Mode	Antenna	Freq(MHz)	Result(dBm)	Result(mW)	Limit(mW)	Verdict
NTNV	BLE_1M	Ant1	2402	6.30	4.266	≤10	PASS
			2440	5.41	3.475	≤10	PASS
			2480	4.35	2.723	≤10	PASS
	BLE_2M	Ant1	2402	6.26	4.227	≤10	PASS
			2440	5.32	3.404	≤10	PASS
			2480	4.35	2.723	≤10	PASS

Tolerance								
Test Condition	Test Mode	Antenna	Freq(MHz)	Power (mW)	RatedPower (mW)	Result (%)	Limit (%)	Verdict
NTNV	BLE_1M	Ant1	2402	4.266	10	-57.34	+20	PASS
			2440	3.475	10	-65.25	+20	PASS
			2480	2.723	10	-72.77	+20	PASS
	BLE_2M	Ant1	2402	4.227	10	-57.73	+20	PASS
			2440	3.404	10	-65.96	+20	PASS
			2480	2.723	10	-72.77	+20	PASS

EIRP							
Test Condition	Test Mode	Antenna	Freq(MHz)	Power (dBm)	EIRP(dBm)	Limit(dBm)	Verdict
NTNV	BLE_1M	Ant1	2402	6.30	8.40	≤12.14	PASS
			2440	5.41	7.51	≤12.14	PASS
			2480	4.35	6.45	≤12.14	PASS
	BLE_2M	Ant1	2402	6.26	8.36	≤12.14	PASS
			2440	5.32	7.42	≤12.14	PASS
			2480	4.35	6.45	≤12.14	PASS

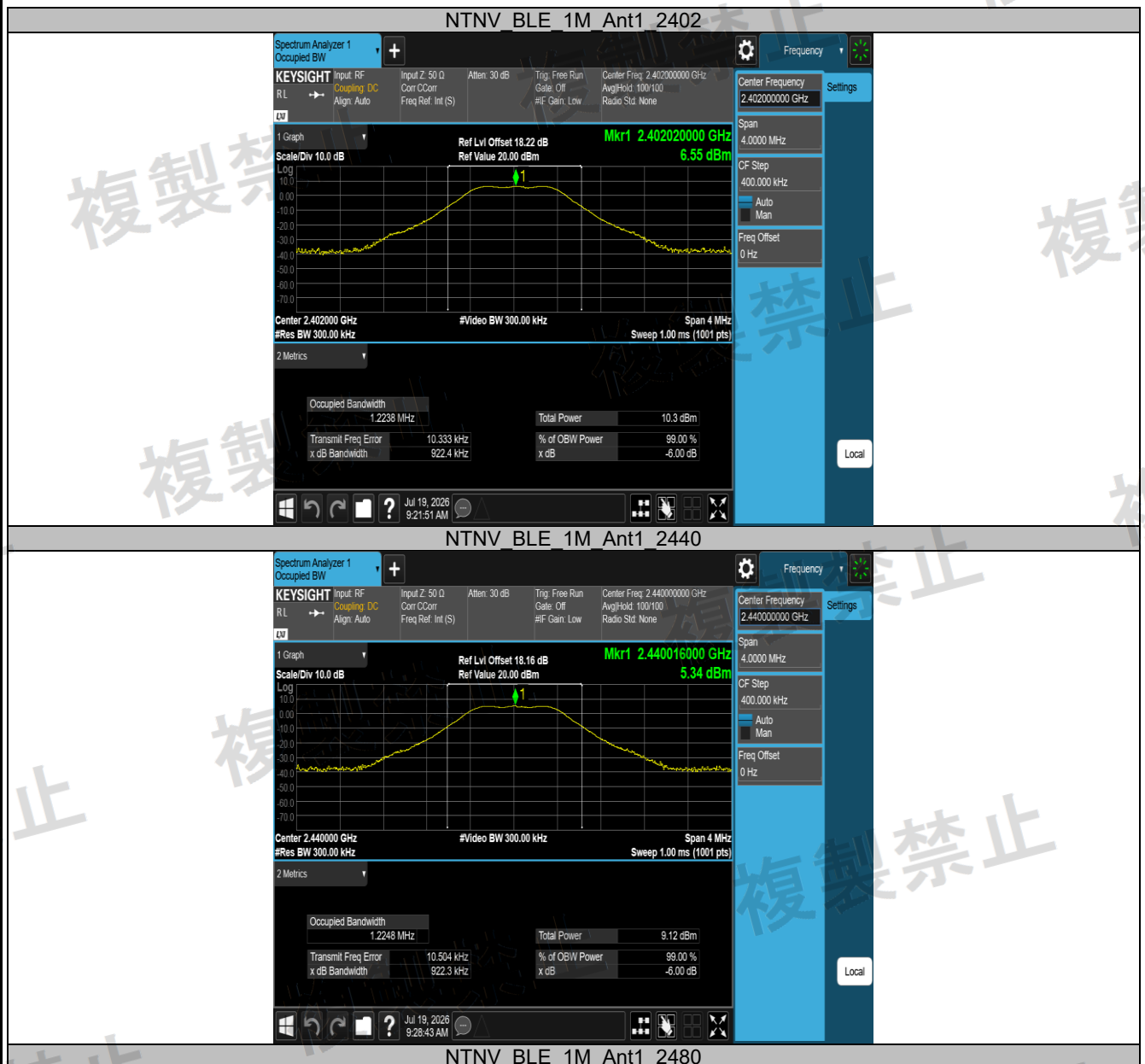
Antenna Gain: 2.1dBi

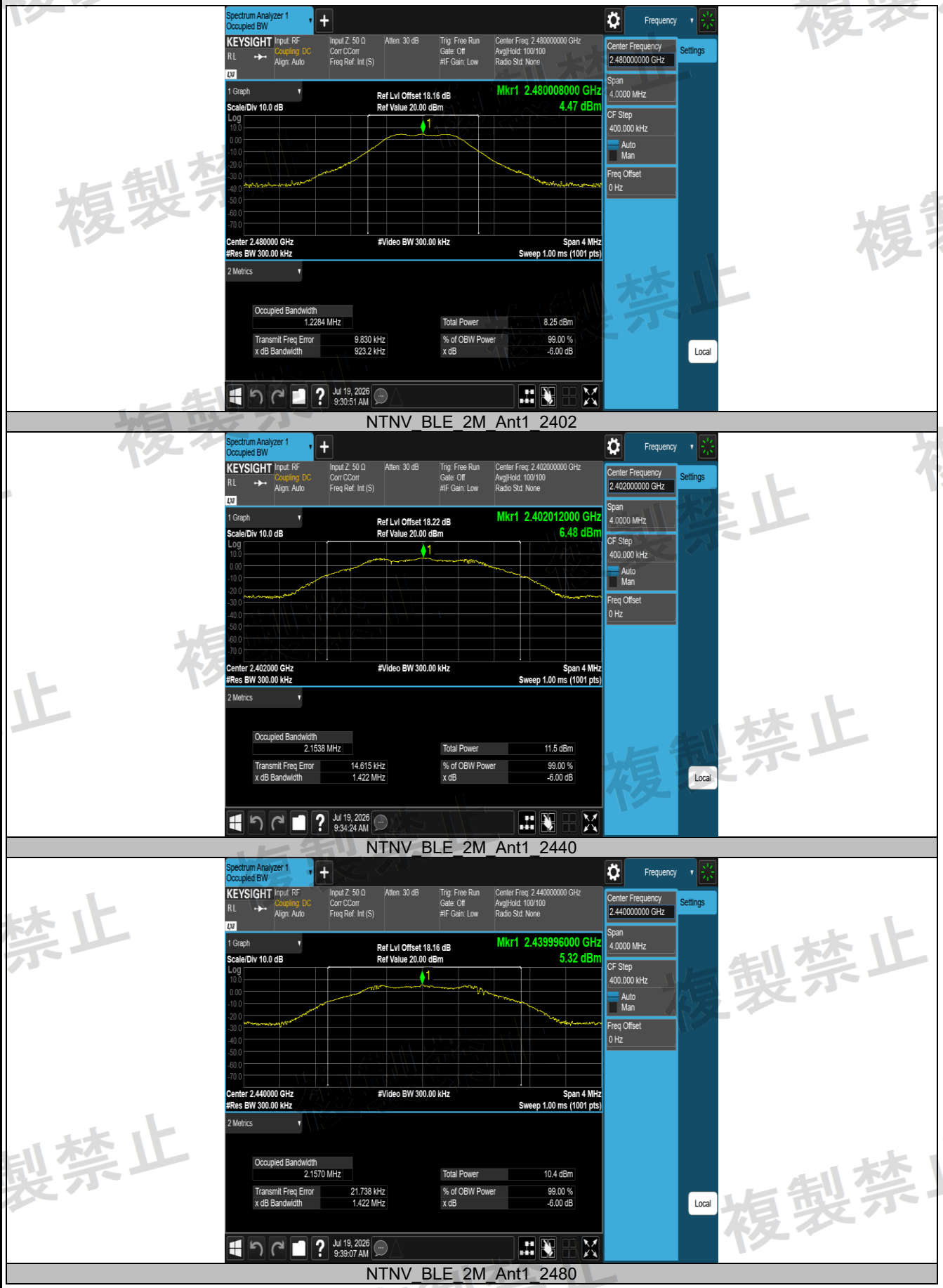
Appendix A.3: Test Results of Occupied Channel Bandwidth (99%)

Test Result

TestCondition	TestMode	Antenna	Freq(MHz)	Result [MHz]	Limit [MHz]	Verdict
NTNV	BLE_1M	Ant1	2402	1.224	≤26	PASS
			2440	1.225	≤26	PASS
			2480	1.228	≤26	PASS
	BLE_2M	Ant1	2402	2.154	≤26	PASS
			2440	2.157	≤26	PASS
			2480	2.142	≤26	PASS

Test Graphs





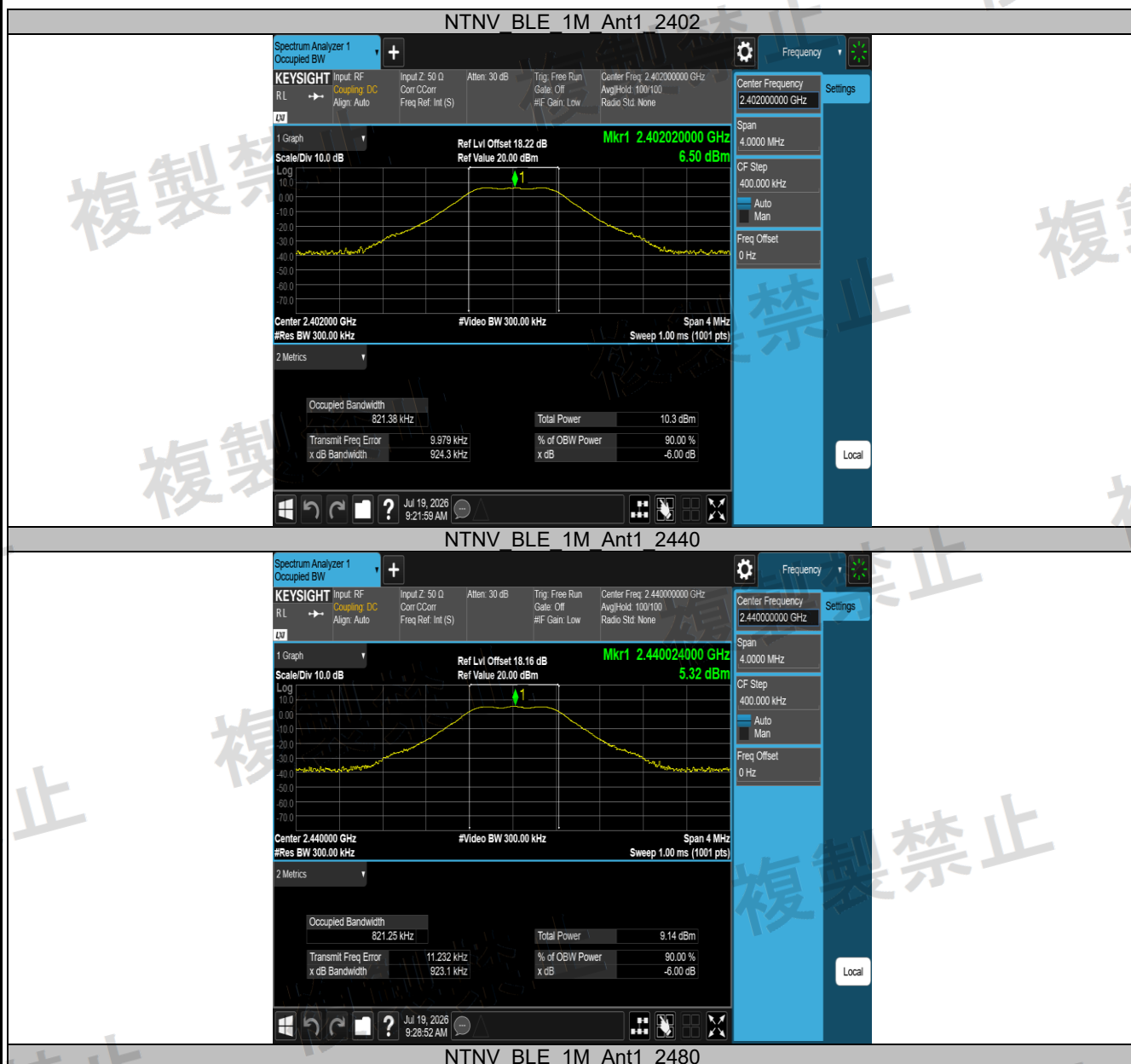


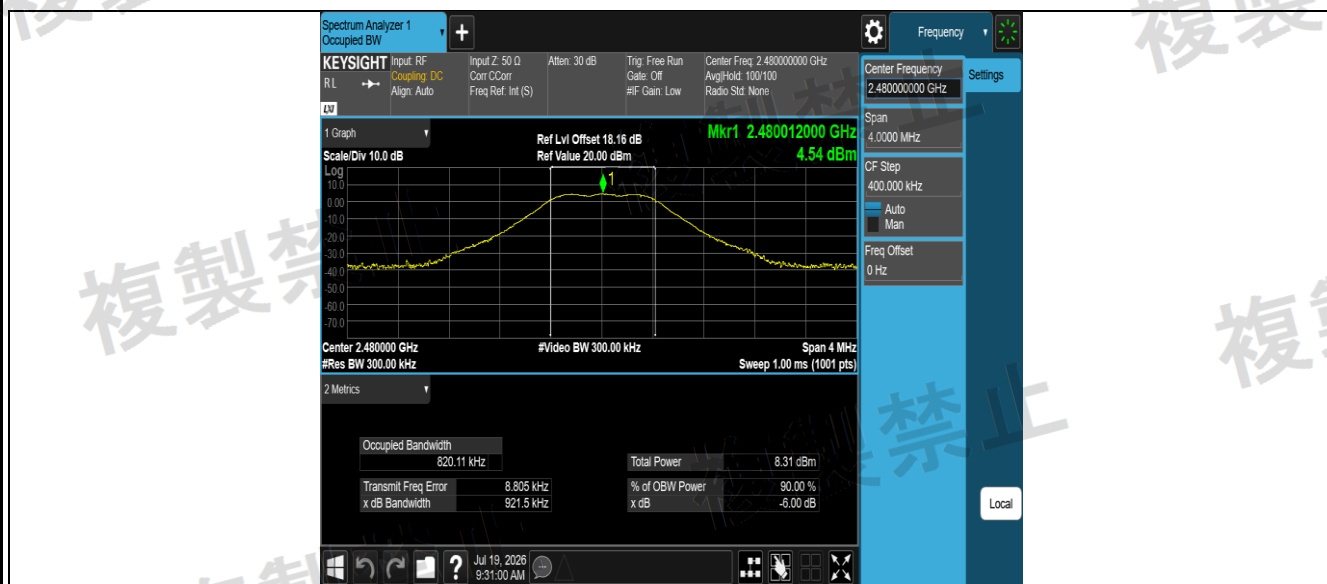
Appendix A.4: Test Results of Spread Bandwidth (90%)

Test Result

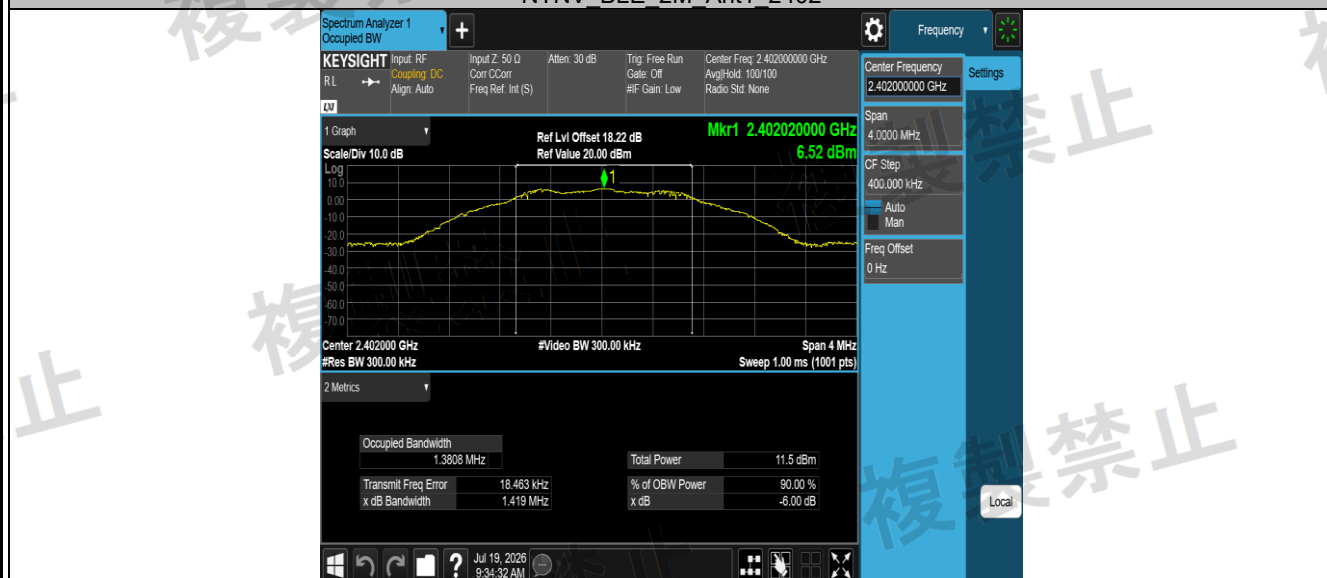
TestCondition	TestMode	Antenna	Freq(MHz)	Result [MHz]	Limit [MHz]	Verdict
NTNV	BLE_1M	Ant1	2402	0.821	≥0.5	PASS
			2440	0.821	≥0.5	PASS
			2480	0.820	≥0.5	PASS
	BLE_2M	Ant1	2402	1.381	≥0.5	PASS
			2440	1.386	≥0.5	PASS
			2480	1.373	≥0.5	PASS

Test Graphs

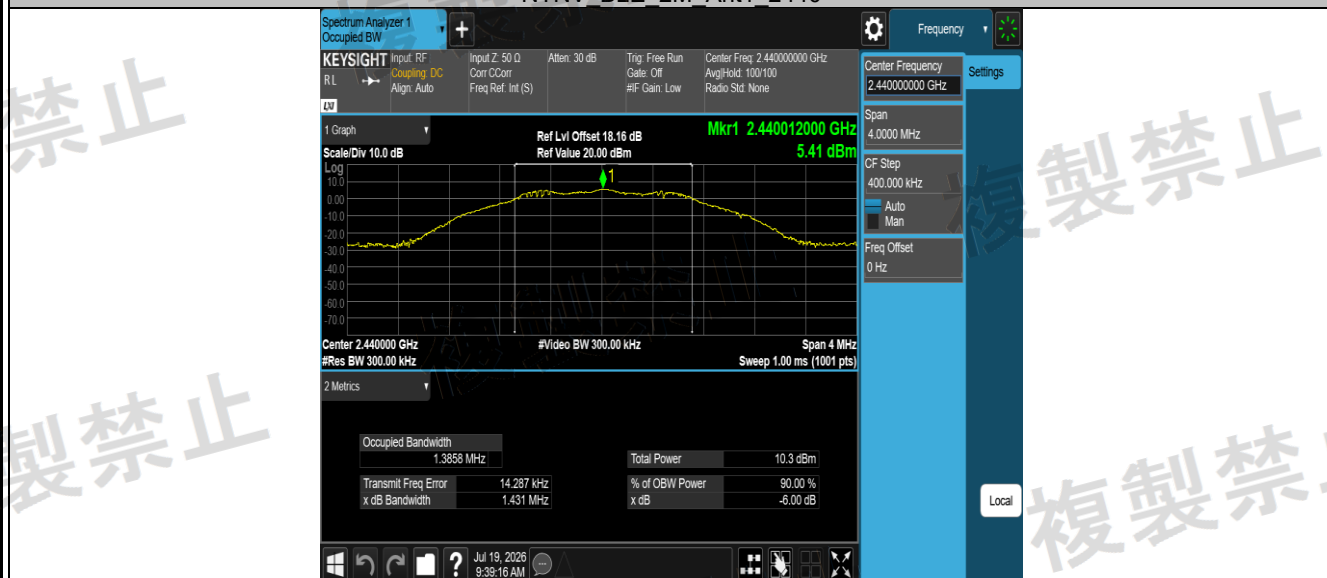




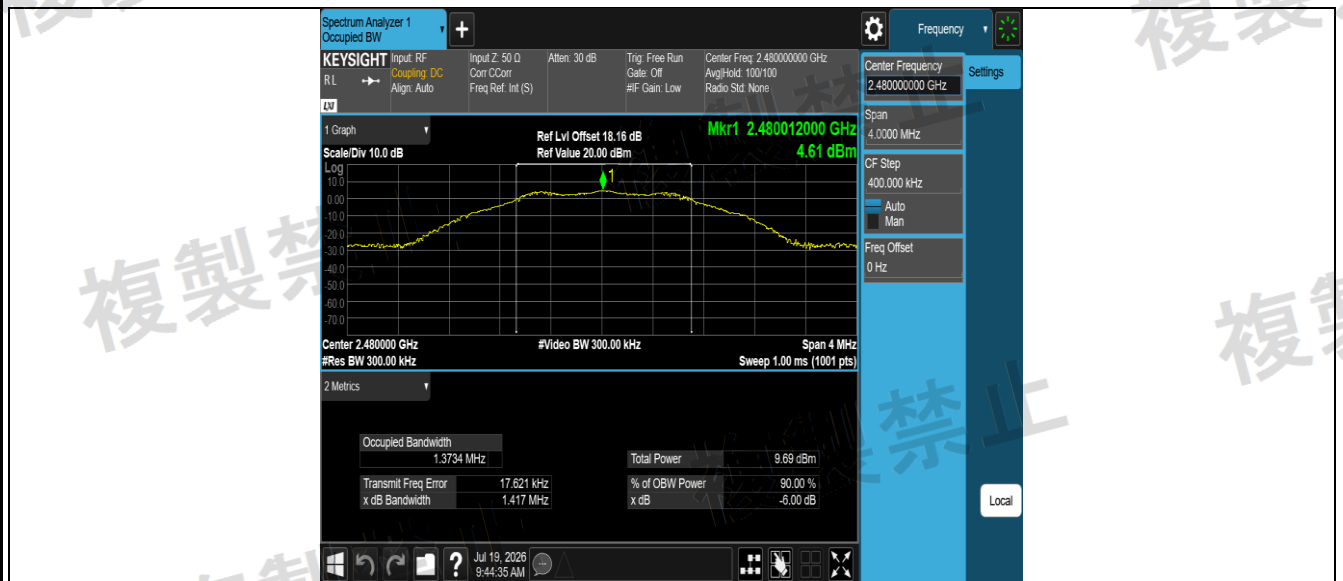
NTNV_BLE_2M_Ant1_2402



NTNV_BLE_2M_Ant1_2440



NTNV_BLE_2M_Ant1_2480



Appendix A.5: Test Results of Spurious Emissions for Transmitter

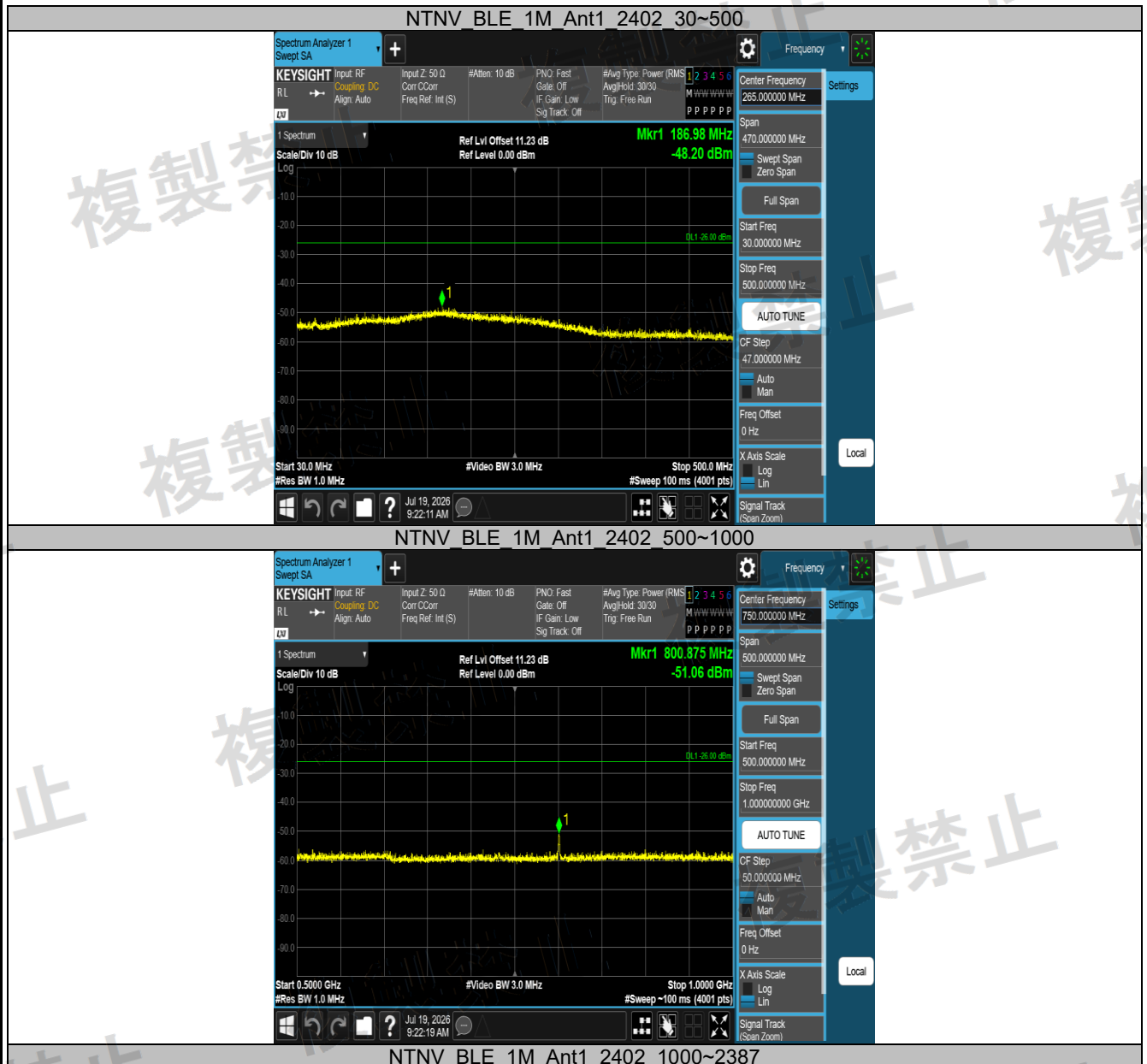
Test Result

Test Condition	Test Mode	Antenna	Freq (MHz)	Freq.Range [MHz]	Freq. [MHz]	Result [dBm]	Limit [dBm]	Result [μW]	Limit [μW]	Verdict
NTNV	BLE_1M	Ant1	2402	30~500	186.98	-48.20	≤-26	0.01514	≤2.5	PASS
				500~1000	800.88	-51.06	≤-26	0.00783	≤2.5	PASS
				1000~2387	2363.77	-46.22	≤-26	0.02388	≤2.5	PASS
				2387~2400	2400.00	-29.49	≤-16	1.12460	≤25	PASS
				2483.5~2496.5	2489.36	-43.20	≤-16	0.04786	≤25	PASS
				2496.5~13000	3803.14	-53.47	≤-26	0.00450	≤2.5	PASS
			2440	30~500	189.21	-47.79	≤-26	0.01663	≤2.5	PASS
				500~1000	813.25	-51.63	≤-26	0.00687	≤2.5	PASS
				1000~2387	2335.68	-46.69	≤-26	0.02143	≤2.5	PASS
				2387~2400	2390.47	-42.10	≤-16	0.06166	≤25	PASS
				2483.5~2496.5	2489.13	-42.81	≤-16	0.05236	≤25	PASS
				2496.5~13000	2503.33	-50.40	≤-26	0.00912	≤2.5	PASS
			2480	30~500	181.58	-47.99	≤-26	0.01589	≤2.5	PASS
				500~1000	826.88	-51.70	≤-26	0.00676	≤2.5	PASS
				1000~2387	2371.40	-46.59	≤-26	0.02193	≤2.5	PASS
				2387~2400	2387.95	-42.43	≤-16	0.05715	≤25	PASS
				2483.5~2496.5	2489.24	-42.44	≤-16	0.05702	≤25	PASS
				2496.5~13000	2515.41	-50.19	≤-26	0.00957	≤2.5	PASS
	BLE_2M	Ant1	2402	30~500	177.23	-48.14	≤-26	0.01535	≤2.5	PASS
				500~1000	800.63	-51.81	≤-26	0.00659	≤2.5	PASS
				1000~2387	2363.07	-44.45	≤-26	0.03589	≤2.5	PASS
				2387~2400	2400	-15.62	≤-16	27.4157 4	≤25	See table below
				2483.5~2496.5	2484.84	-43.67	≤-16	0.04295	≤25	PASS
				2496.5~13000	3775.83	-52.61	≤-26	0.00548	≤2.5	PASS
			2440	30~500	180.64	-48.23	≤-26	0.01503	≤2.5	PASS
				500~1000	813.38	-51.95	≤-26	0.00638	≤2.5	PASS
				1000~2387	2348.51	-45.28	≤-26	0.02965	≤2.5	PASS
				2387~2400	2391.12	-41.41	≤-16	0.07228	≤25	PASS
				2483.5~2496.5	2485.25	-42.26	≤-16	0.05943	≤25	PASS
				2496.5~13000	2510.68	-49.45	≤-26	0.01135	≤2.5	PASS
			2480	30~500	169.36	-47.98	≤-26	0.01592	≤2.5	PASS
				500~1000	826.75	-51.75	≤-26	0.00668	≤2.5	PASS
				1000~2387	2348.51	-45.31	≤-26	0.02944	≤2.5	PASS
				2387~2400	2392.97	-41.44	≤-16	0.07178	≤25	PASS
				2483.5~2496.5	2487.97	-41.85	≤-16	0.06531	≤25	PASS
				2496.5~13000	2503.33	-47.78	≤-26	0.01667	≤2.5	PASS

Test Result_Step2

Test Condition	Test Mode	Antenna	Freq (MHz)	Freq. [MHz]	Result [dBm]	Limit [dBm]	Result [μW]	Limit [μW]	Verdict
NTNV	BLE_2M	Ant1	2402	2400.00	-23.42	≤-16	4.54988	≤25	PASS

Test Graphs



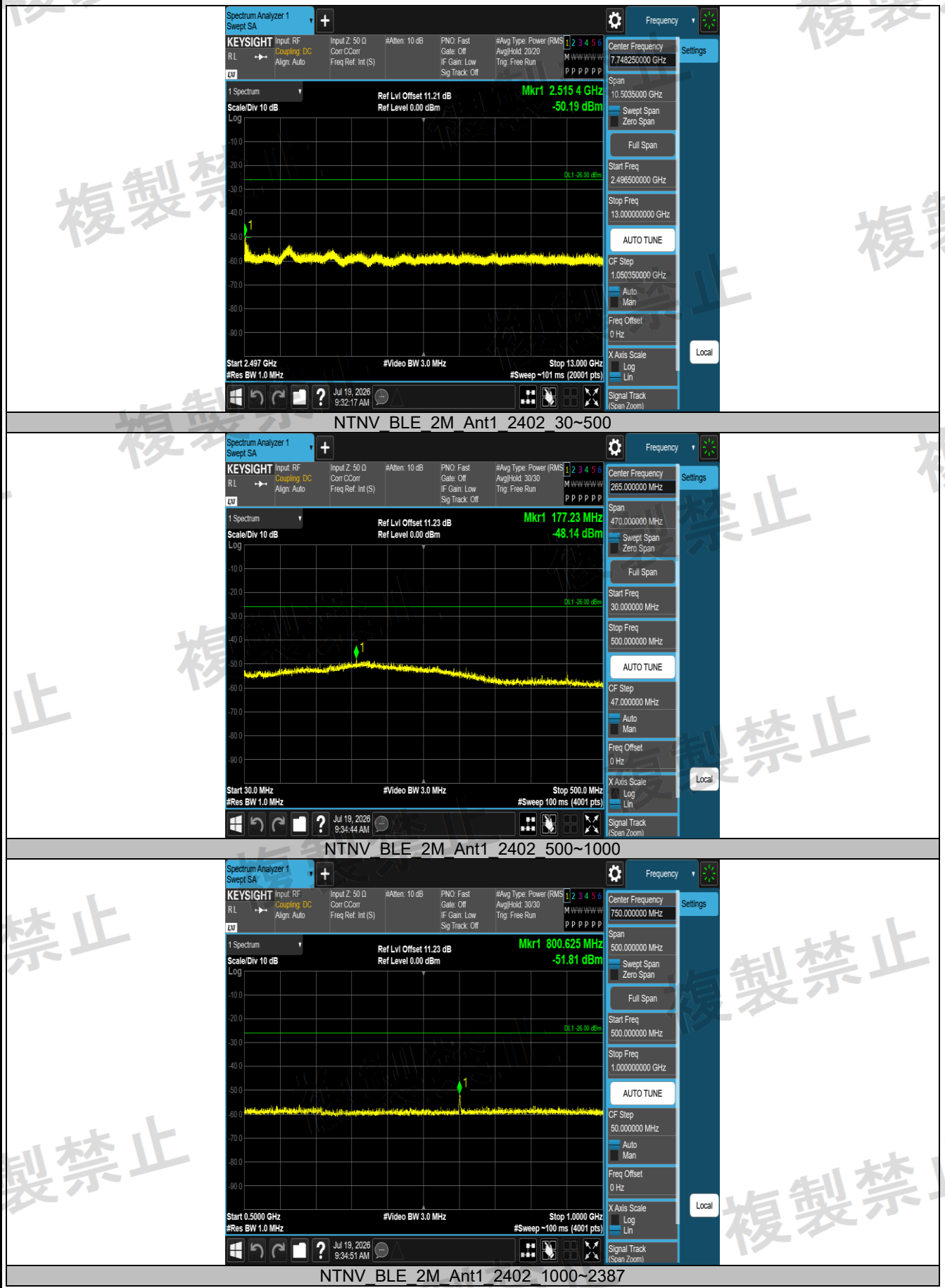










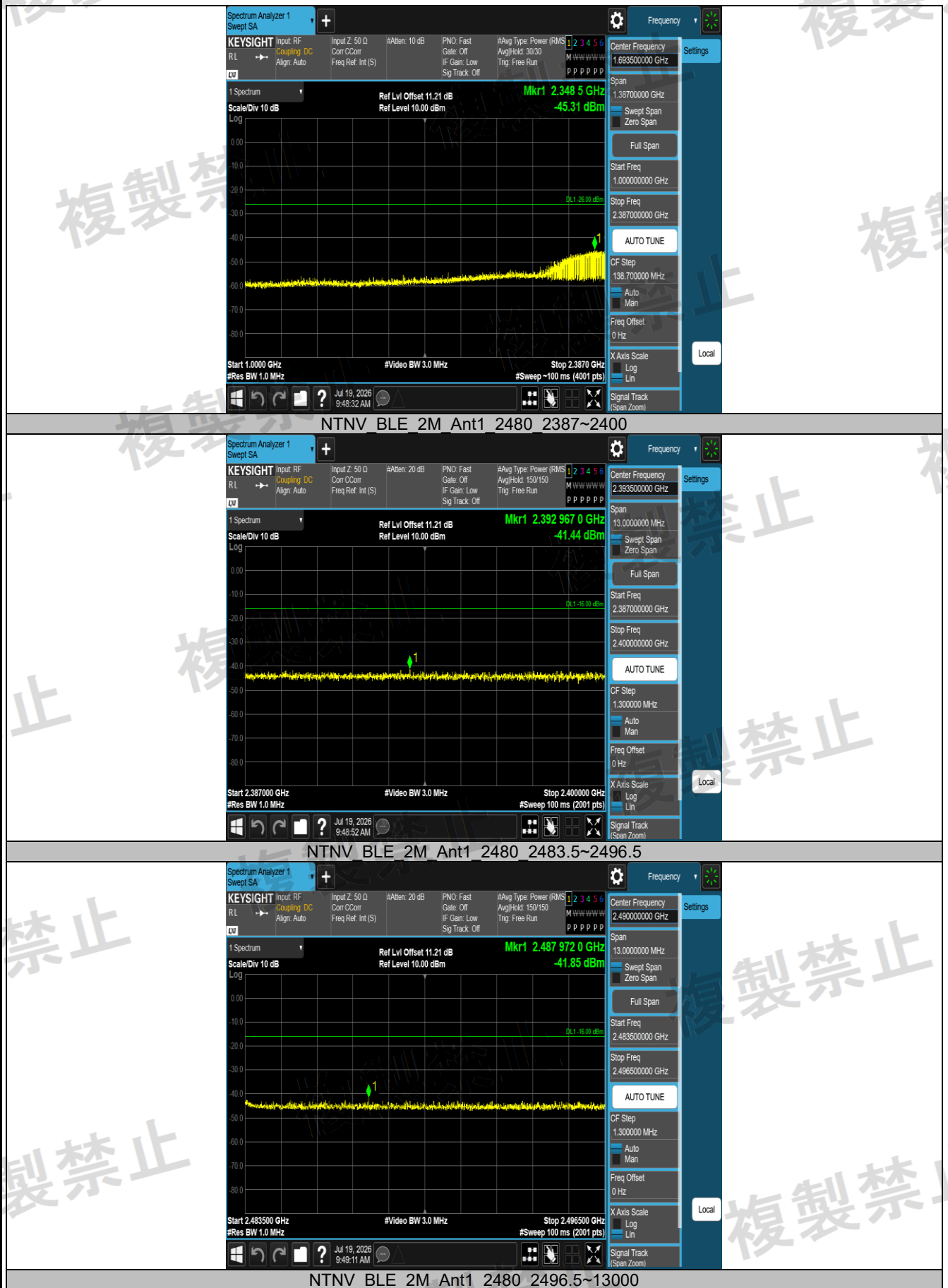


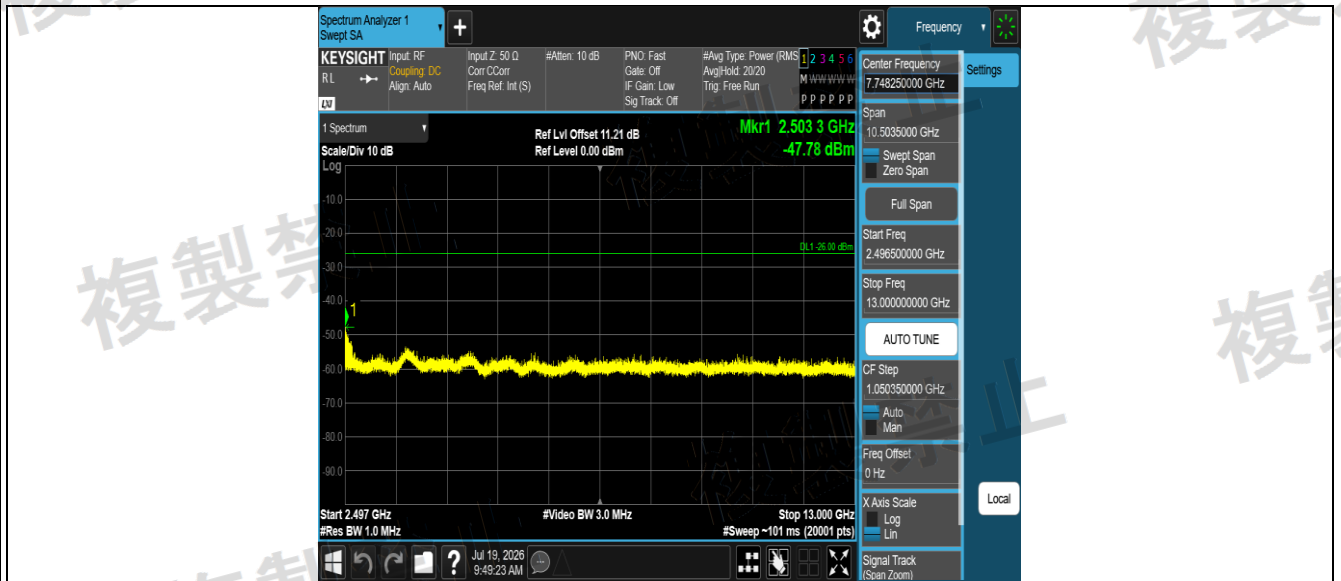




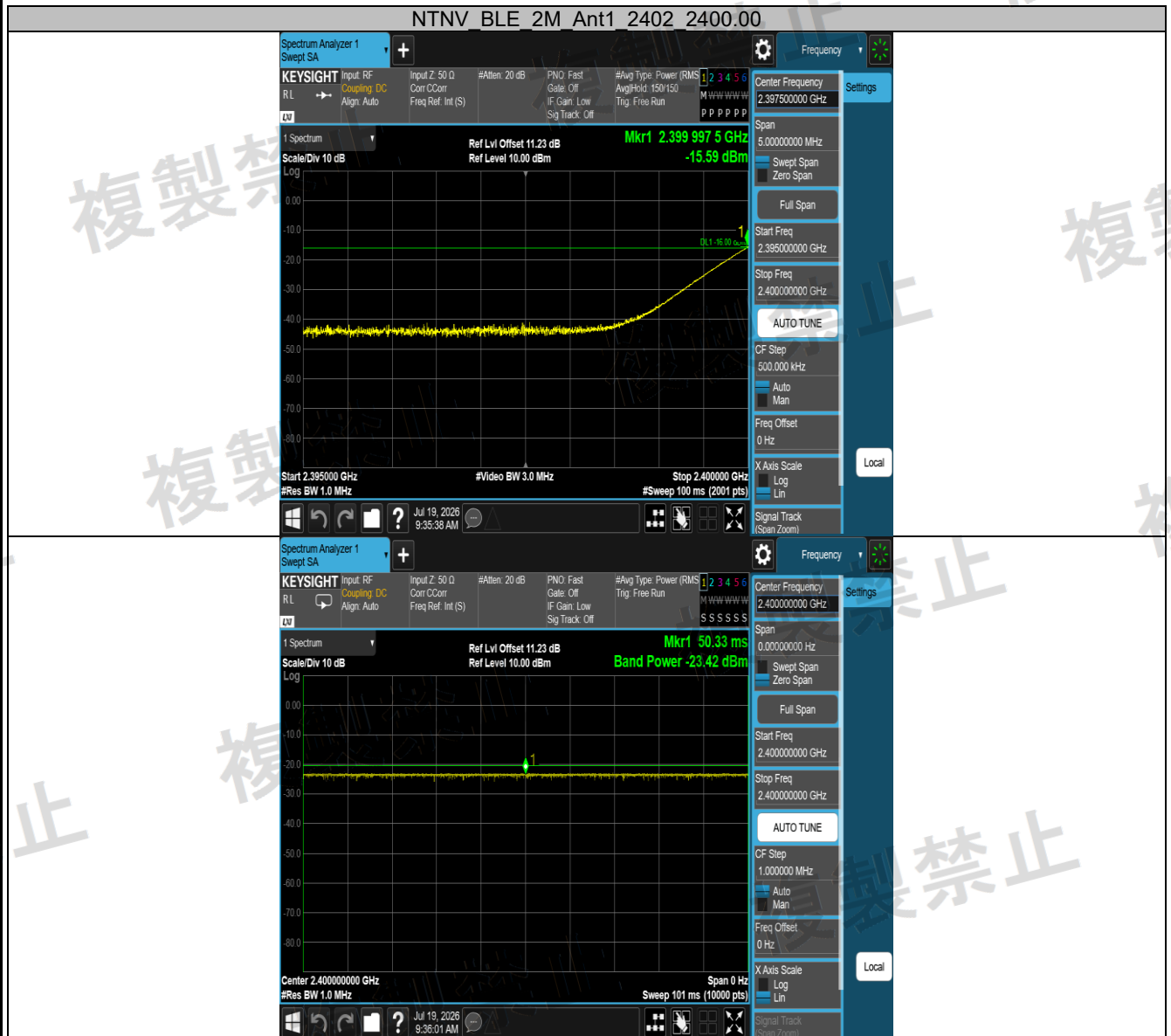








Test Graphs_Step2



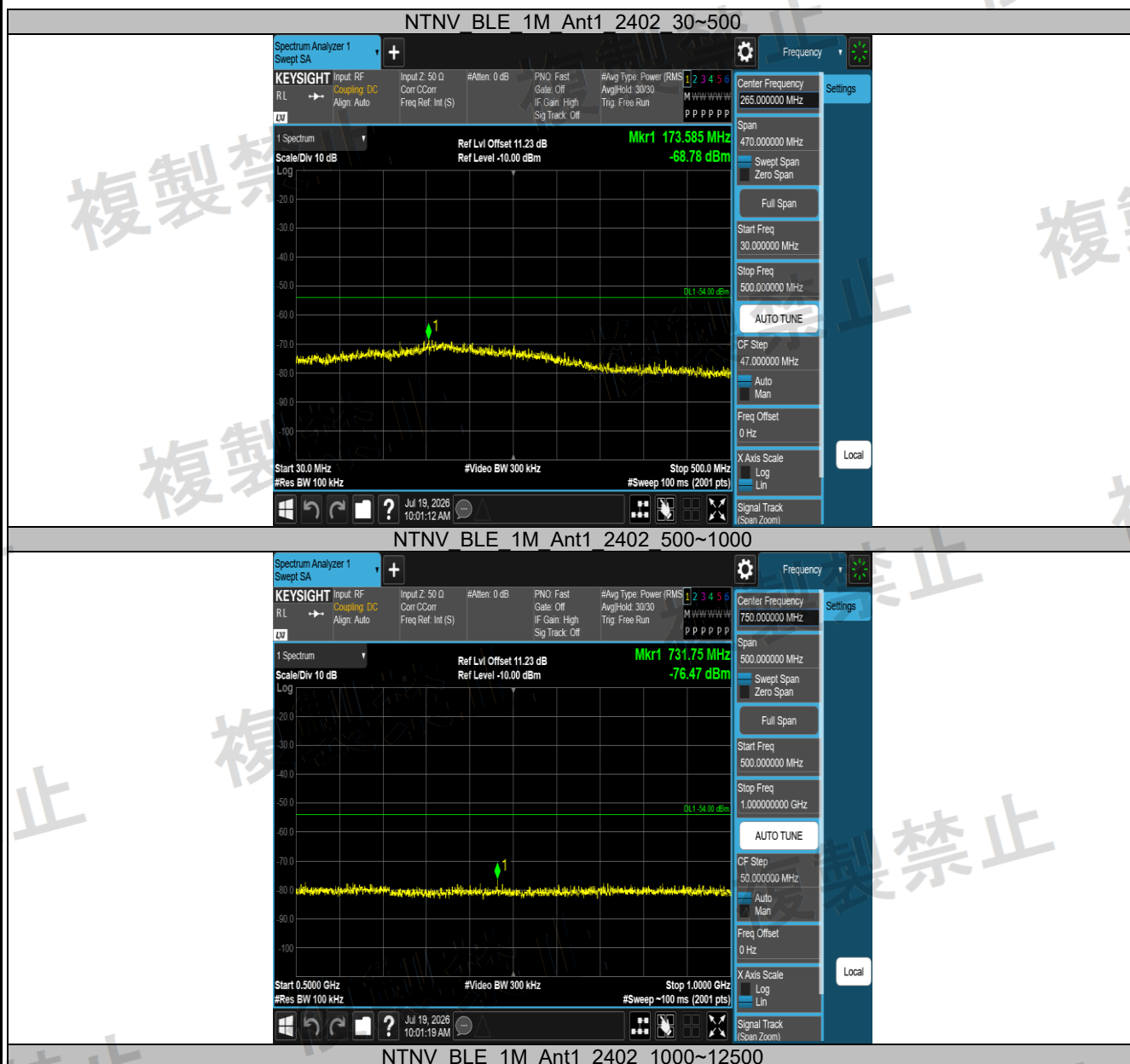
Appendix A.6: Test Results of Spurious Emissions for Receiver

Test Result

Test Condition	Test Mode	Antenna	Freq (MHz)	Freq.Range [MHz]	Freq. [MHz]	Result [dBm]	Limit [dBm]	Result [nW]	Limit [nW]	Verdict
NTNV	BLE_1M	Ant1	2402	30~500	173.59	-68.78	≤-54	0.13243	≤4	PASS
				500~1000	731.75	-76.47	≤-54	0.02254	≤4	PASS
				1000~12500	3826.13	-63.96	≤-47	0.40179	≤20	PASS
			2440	30~500	186.98	-68.32	≤-54	0.14723	≤4	PASS
				500~1000	541.50	-75.61	≤-54	0.02748	≤4	PASS
				1000~12500	3770.35	-63.45	≤-47	0.45186	≤20	PASS
			2480	30~500	204.61	-69.12	≤-54	0.12246	≤4	PASS
				500~1000	731.75	-76.02	≤-54	0.02500	≤4	PASS
				1000~12500	3758.28	-63.46	≤-47	0.45082	≤20	PASS
	BLE_2M	Ant1	2402	30~500	180.40	-68.85	≤-54	0.13032	≤4	PASS
				500~1000	731.75	-75.51	≤-54	0.02812	≤4	PASS
				1000~12500	3755.40	-62.92	≤-47	0.51050	≤20	PASS
			2440	30~500	195.44	-68.39	≤-54	0.14488	≤4	PASS
				500~1000	731.75	-76.12	≤-54	0.02443	≤4	PASS
				1000~12500	3810.03	-63.74	≤-47	0.42267	≤20	PASS
			2480	30~500	188.16	-69.30	≤-54	0.11749	≤4	PASS
				500~1000	731.75	-76.38	≤-54	0.02301	≤4	PASS
				1000~12500	3813.48	-63.91	≤-47	0.40644	≤20	PASS



Test Graphs



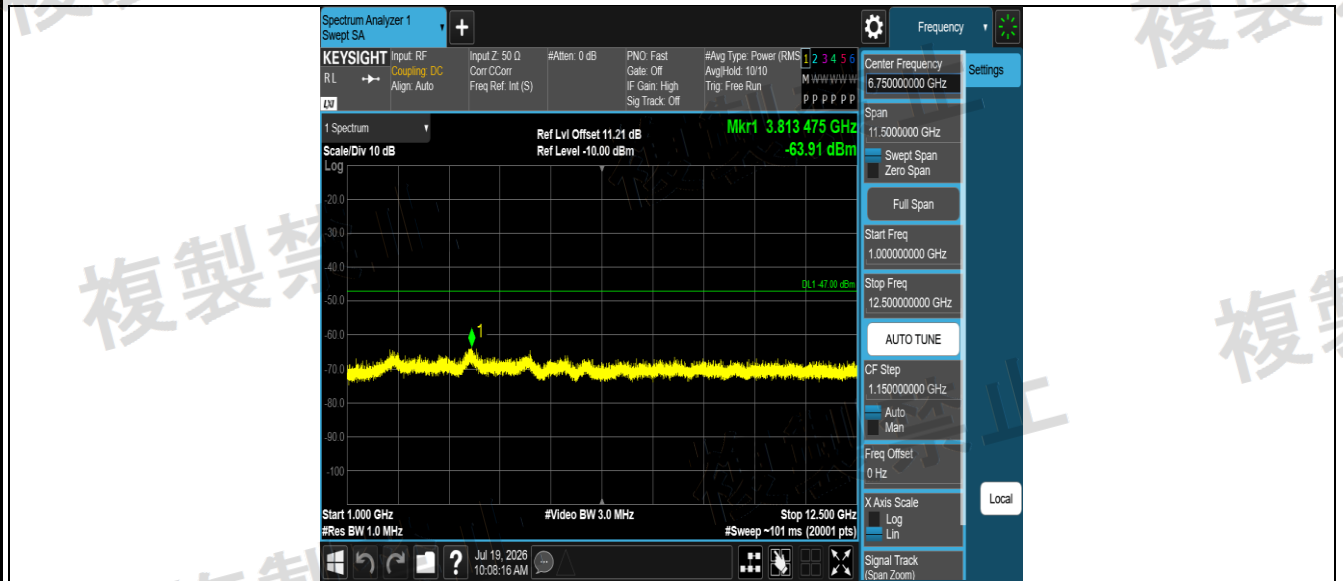












Appendix A.7: Test Results of Interference Prevention Function

Test Result

Temperature:	24.8°C	Humidity:	55%RH
MAC address:	140A02F32C6D	Test result:	Conform