

TEST REPORT

Report No.: BCTC2601345731E

Applicant: Shenzhen Minew Technologies Co., Ltd.

Product Name: Bluetooth low energy module

Test Model: MS88SF3

Tested Date: 2026-01-21 to 2026-03-10

Issued Date: 2026-03-17

Shenzhen BCTC Technology Co., Ltd.



Product Name: Bluetooth low energy module

Trademark: MINEW

Model/Type reference: MS88SF3

Prepared For: Shenzhen Minew Technologies Co., Ltd.

Address: 3rd Floor, Technology Incubation Center, Gangzhihong Science Park, No. 6 QingLong Road, Qinghua Community, Longhua District, Shenzhen

Manufacturer: Shenzhen Minew Technologies Co., Ltd.

Address: 2nd to 4th Floors, Building 3, Instrument World Industrial Park, No.306 Guiyue Road, Guanlan Pitouxia Community, Longhua District, Shenzhen

Prepared By: Shenzhen BCTC Technology Co., Ltd.

Address: Room 101M, Unit 1, Building1, Pengyuan, No.18, Lilang Road, Shanglilang, Nanwan Subdistrict, Longgang District, Shenzhen, Guangdong, China

Sample Received Date: 2026-01-21

Sample tested Date: 2026-01-21 to 2026-03-10

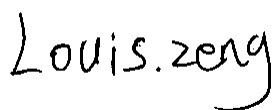
Report No.: BCTC2601345731E

Test Standards: Article 2 paragraph 1 of item 19
MIC Notice No.88 Appendix No.43

Test Results: PASS

Remark: This is JAPAN RADIO test report.

Tested by:



Louis Zeng / Project Handler

Approved by:



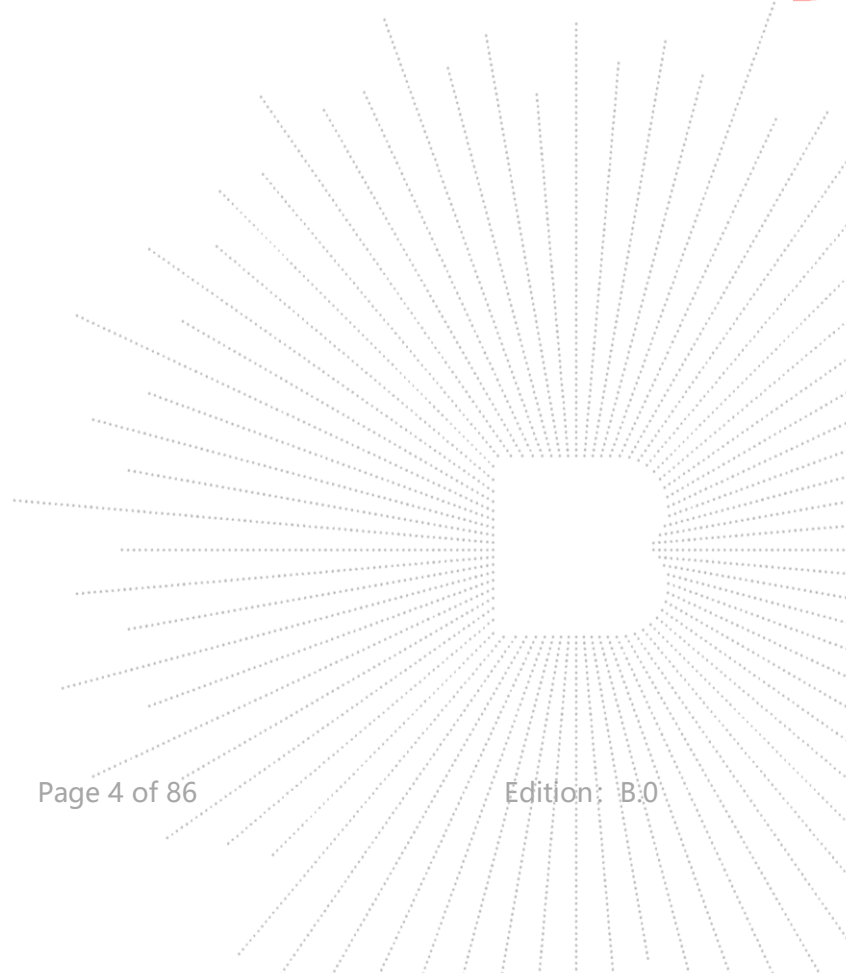
Sewen Guo/Reviewer

The test report is effective only with both signature and specialized stamp. This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen BCTC Technology Co., Ltd, this report can't be reproduced except in full. The tested sample(s) and the sample information are provided by the client.

Table Of Content

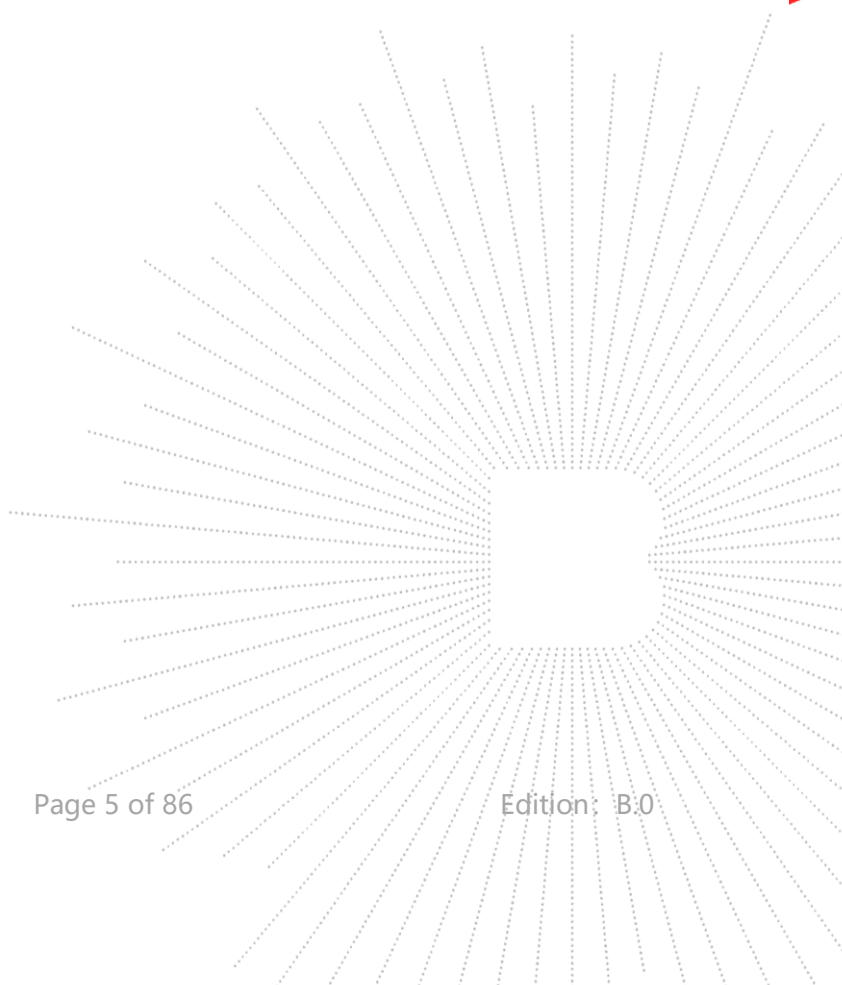
Test Report Declaration	Page
1. Version	5
2. Test Summary	6
3. Measurement Uncertainty	7
4. Product Information And Test Setup	8
4.1 Product Information.....	8
4.2 Block Diagram Parameters Of Test Software Setting	9
4.3 Description Of Support Units (Conducted Mode)	9
4.4 Channel List	9
4.5 Test Mode	9
4.6 Test Conditions	10
4.7 Table Of Parameters Of Test Software Setting	10
5. Test Facility And Test Instrument Used	11
5.1 Test Facility	11
5.2 Test Instrument Used	11
6. RF Shielding Method	12
7. Frequency Error	13
7.1 Block Diagram Of Test Setup.....	13
7.2 Limit	13
7.3 Measuring Instruments And Setting	13
7.4 Test procedure	13
7.5 Test Result.....	14
8. Antenna Power	16
8.1 Block Diagram Of Test Setup.....	16
8.2 Limit	16
8.3 Test procedure	16
8.4 Test Result.....	17
9. Occupied Bandwidth	18
9.1 Block Diagram Of Test Setup.....	18
9.2 Limit	18
9.3 Test procedure	18
9.4 Test Result.....	19
10. Unwanted Emission Intensity Measurement.....	26
10.1 Block Diagram Of Test Setup.....	26
10.2 Limit	26
10.3 Measuring Instruments And Setting	26
10.4 Test procedure	26
10.5 Test Result.....	27
11. Imitation Of Collateral Emission Of Receiver Measurement.....	62
11.1 Block Diagram Of Test Setup.....	62
11.2 Limit	62
11.3 Measuring Instruments And Setting	62
11.4 Test procedure	62
11.5 Test Result.....	63
12. Transmission Antenna Gain (Eirp Antenna Power) Measurement	79
12.1 Block Diagram Of Test Setup.....	79
12.2 Limit	79

12.3	Measuring Instruments And Setting	80
12.4	Test procedure	80
12.5	Test Result	81
13.	Transmission Radiation Angle Width (3db Beamwidth) Measurement.....	82
13.1	Block Diagram Of Test Setup.....	82
13.2	Limit	82
13.3	Measuring Instruments And Setting	82
13.4	Test procedure	83
13.5	Test Result	83
14.	Radio Interference Prevention Capability Measurement	84
14.1	Block Diagram Of Test Setup.....	84
14.2	Limit	84
14.3	Measuring Instruments And Setting	84
14.4	Test procedure	84
14.5	Test Result	84
15.	EUT Test Setup Photographs.....	84



1. Version

Report No.	Issue Date	Description	Approved
BCTC2601345731E	2026-03-17	Original	Valid



2. Test Summary

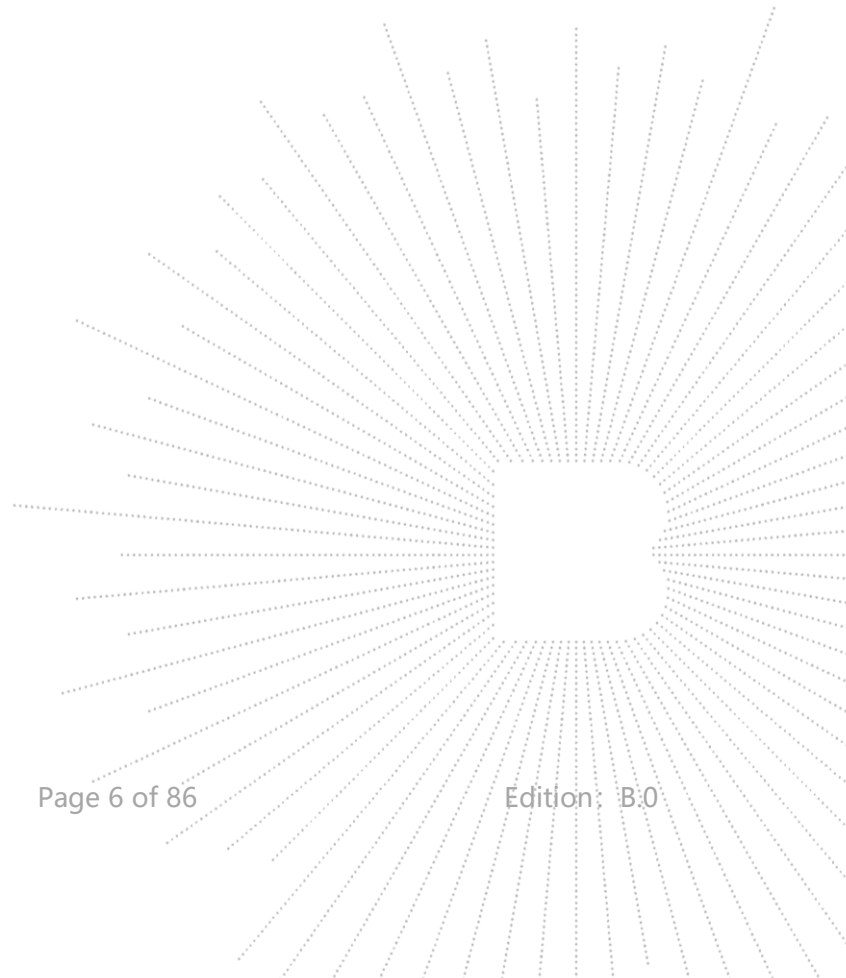
Test procedures according to the technical standards:

Article 2 paragraph 1 of item 19	
Description of Test	Result
Frequency Error	Complies
Occupied Bandwidth (99%) and Spread-spectrum Bandwidth (90%)	Complies
Unwanted Emission Intensity	Complies
Antenna Power Error	Complies
Limitation of Collateral Emission of Receiver	Complies
Transmission Antenna Gain (EIRP Antenna Power)	Complies
Transmission Radiation Angle Width (3dB Beamwidth)	N/A
Radio Interference Prevention Capability	Complies
Construction Protection Confirmation	Complies

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

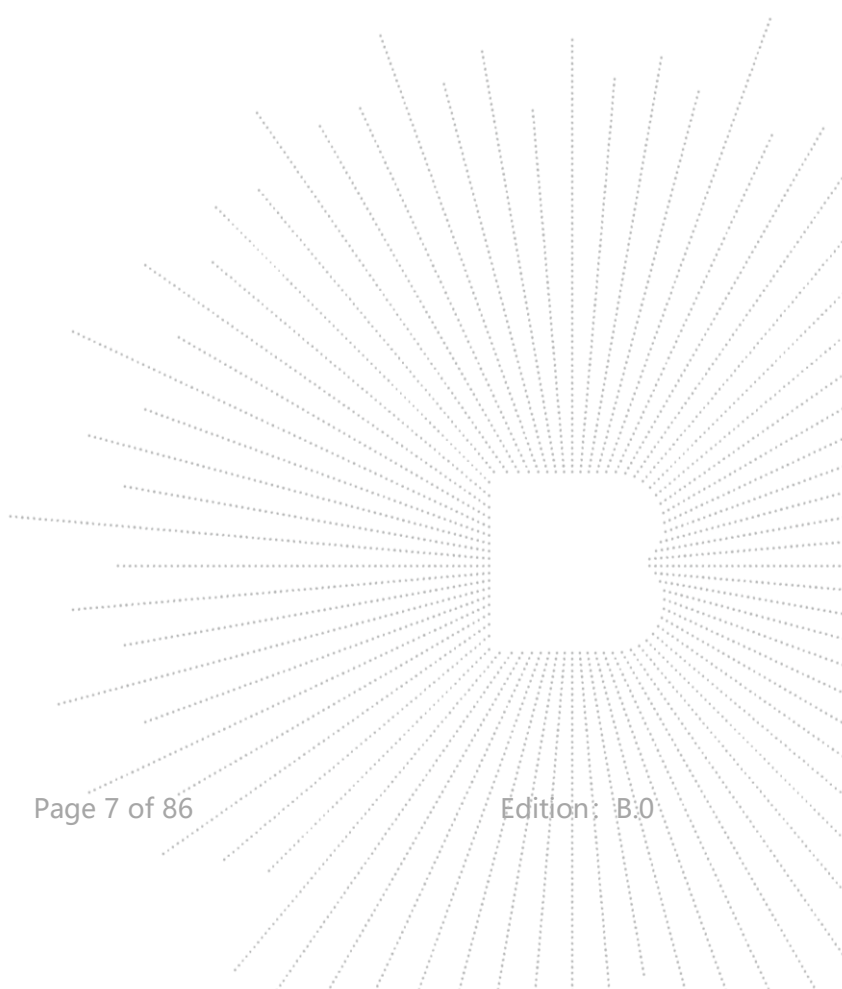
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3. Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

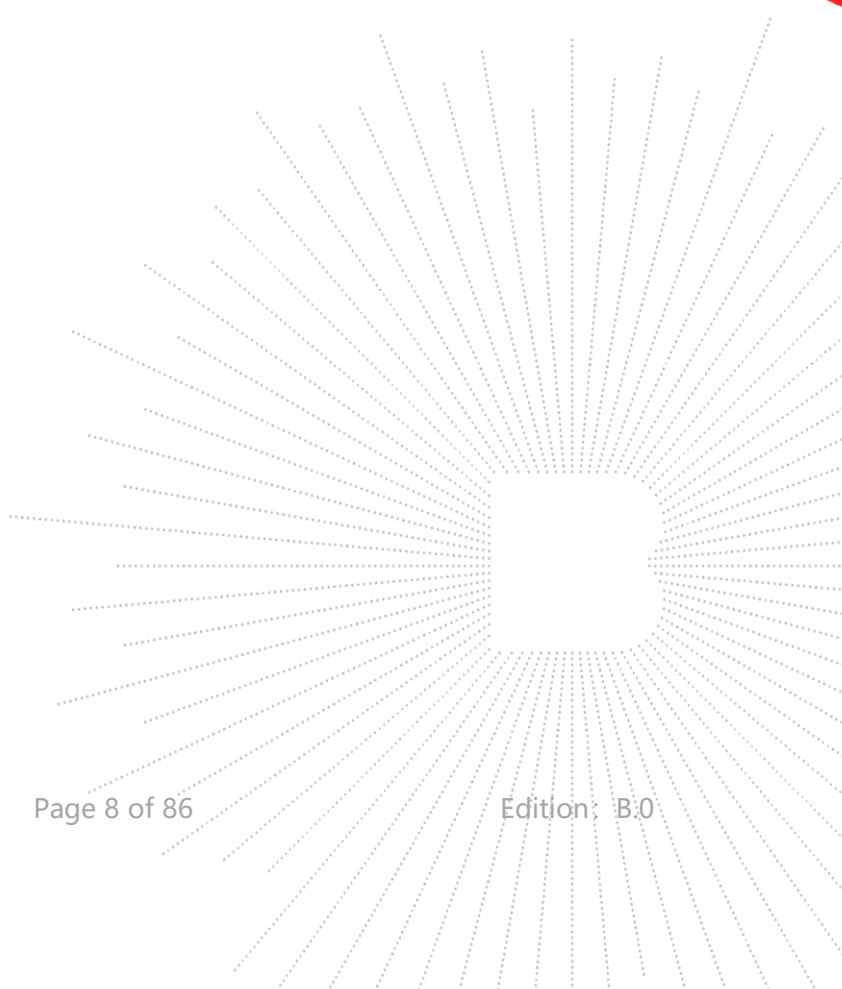
No.	Item	Uncertainty
1	Conducted Emission Test	$\pm 3.2\text{dB}$
2	Radiated Emission Test	$\pm 4.7\text{dB}$
3	RF power,conducted	$\pm 0.16\text{dB}$
4	Spurious emissions,conducted	$\pm 0.21\text{dB}$
5	All emissions,radiated(<1G)	$\pm 4.68\text{dB}$
6	All emissions,radiated(>1G)	$\pm 5.0\text{dB}$
7	frequency error ppm	$\pm 0.5\text{ppm}$



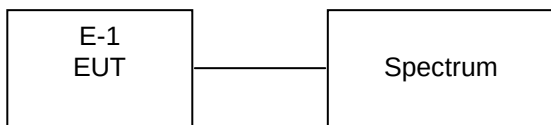
4. Product Information And Test Setup

4.1 Product Information

Model/Type reference:	MS88SF3
Model differences:	N/A
Hardware Version:	N/A
Software Version:	N/A
Operation Frequency:	2402-2480MHz
Type of Modulation:	GFSK,125K/500K/1Mbps/2Mbps
Number Of Channel:	40 Channels for Bluetooth DTS;
Transmit Power Max:	2mW
Antenna installation:	PCB antenna
Antenna Gain:	3.06dBi
Remark:	The antenna gain of the product comes from the antenna report provided by the customer, and the test data is affected by the customer information.
power supply:	DC 3.3V



4.2 Block Diagram Parameters Of Text Software Setting



4.3 Description Of Support Units (Conducted Mode)

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	Bluetooth low energy module	N/A	MS88SF3	N/A	EUT

Notes:

1. The support equipment was authorized by Declaration of Confirmation.
2. For detachable type I/O cable should be specified the length in cm in 『Length』 column
3. “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.

4.4 Channel List

Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2402	11	2422	21	2442
02	2404	12	2424	22	2444
03	2406	13	2426	23	2446
~	~	~	~	~	~
09	2418	19	2438	39	2478
10	2420	20	2440	40	2480

4.5 Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

For All Mode	Description	Modulation Type
Mode 1	CH01	GFSK,125K/500K/1Mbps/2Mbps
Mode 2	CH20	
Mode 3	CH40	
Mode 4	RX	GFSK,125K/500K/1Mbps/2Mbps

4.6 Test Conditions

The BLE module was tested while in a continuous transmitter/receiver mode.

The EUT was tuned to a low, middle, and high channel for all tests. For all test case pre/scans were completed in all Modes to determine worst case levels.

Power Supply Voltage Fluctuation Test

Voltage Fluctuation Test	Normal Voltage	High Voltage +10% of Normal Voltage	Low Voltage -10% of Normal Voltage
Input DC Power	DC 3.3V	DC 3.63V	DC 2.97V
output voltage(RF chip voltage)	DC 3.3V	DC 3.3V	DC 3.3V

Note:

Voltage Variation (%) = (Output high or Low Voltage - Output Normal Voltage)/ Output Normal Voltage* 100

During the input supply voltage to the EUT from the external power source is varied by +/-10%, +/-10% of the external power change, will not affect the voltage of the RF, so only operated in normal voltage to test all regulations.

4.7 Table Of Parameters Of Test Software Setting

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters

Test software Version	nRF-DTM-master 32bits		
Frequency	2402 MHz	2440 MHz	2480 MHz
Parameters	DEF	DEF	DEF

5. Test Facility And Test Instrument Used

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at Shenzhen BCTC Technology Co., Ltd. Address: Room 101M, Unit 1, Building1, Pengyuan, No.18, Lilang Road, Shanglilang, Nanwan Subdistrict, Longgang District, Shenzhen, Guangdong, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

5.2 Test Instrument Used

RF Conducted Test					
Equipment	Manufacturer	Model#	Serial#	Last Cal.	Next Cal.
Spectrum Analyzer	Keysight	N9020A	MY51287403	Aug.30, 2025	Aug.29, 2026
Signal Generator	Keysight	N5182A	MY50144088	Aug.30, 2025	Aug.29, 2026
Power Sensor	MWRFTest	MW100-RFCB	\	Aug.30, 2025	Aug.29, 2026
Radio frequency control box	MWRFTest	MW100-RFCB	\	\	\
Software	Frad	EZ-EMC	FA-03A2 RE	\	\
Software	Keysight	Keysight.ETSL Test system	1.02.05	\	\
D.C. Power Supply	LongWei	D-41747 Viersen	6230316	Aug.30, 2025	Aug.29, 2026
Communication test set	R&S	CMW500	157483	Aug.30, 2025	Aug.29, 2026
Programmable constant temperature and humidity test chamber	Auchno	OJN-9606-408 L	19120183	July.9, 2025	July.8, 2026

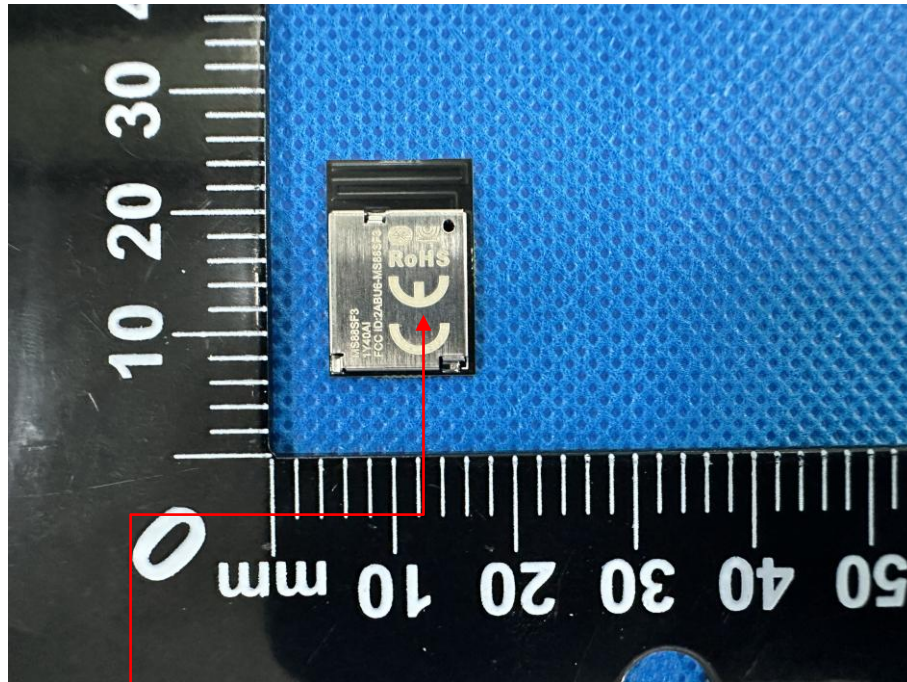
Calibration laboratory: CCIC(Shenzhen) Co., Ltd

6. RF Shielding Method

Enclosure:

As shown in the figure above, the structure of this product is fixed by welding, and its outer shell needs to be protected by a metal shielding cover. If the outer shell is opened, the product will be damaged.

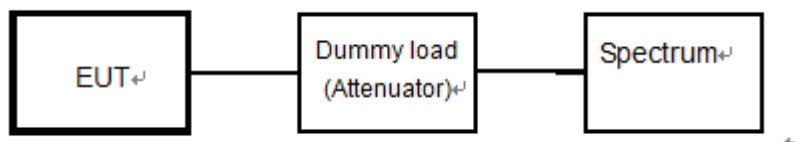
terminal number is 74. Pitch is 0.5mm.



Protective containment soldering

7. Frequency Error

7.1 Block Diagram Of Test Setup



7.2 Limit

Item	Limits
Frequency Error	±50ppm

7.3 Measuring Instruments And Setting

The following table is the setting of Spectrum Analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
RB / VB	10KHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

7.4 Test procedure

- (1) In the case of unmodulated signal (continuous or continuous burst), measure the frequency directly by a frequency meter.
- (2) In the case of burst waves, the measurement shall be done for enough time in order to obtain the enough measuring accuracy, and the average of the measured values becomes the final value.
- (3) In the case of a test mode with a specific frequency spectrum, measure the frequency of the specific spectrum by a spectrum analyzer.
- (4) In the cases above, if the frequency equivalent to the test frequency is not directly measured in principle, it shall be obtained by necessary calculation.
In the case of modulated signal, if there is no specific spectrum measurable by a spectrum analyzer but a specific dip is observed, it is allowed to measure the frequency with the signal generator (synthesized). That is, observe a signal of the signal generator concurrently (or alternately) with the tested signal using the spectrum analyzer while setting the frequency of the signal generator to the position of the dip on the screen of the spectrum analyzer, and determine the frequency of the signal generator at the time as a measured value.

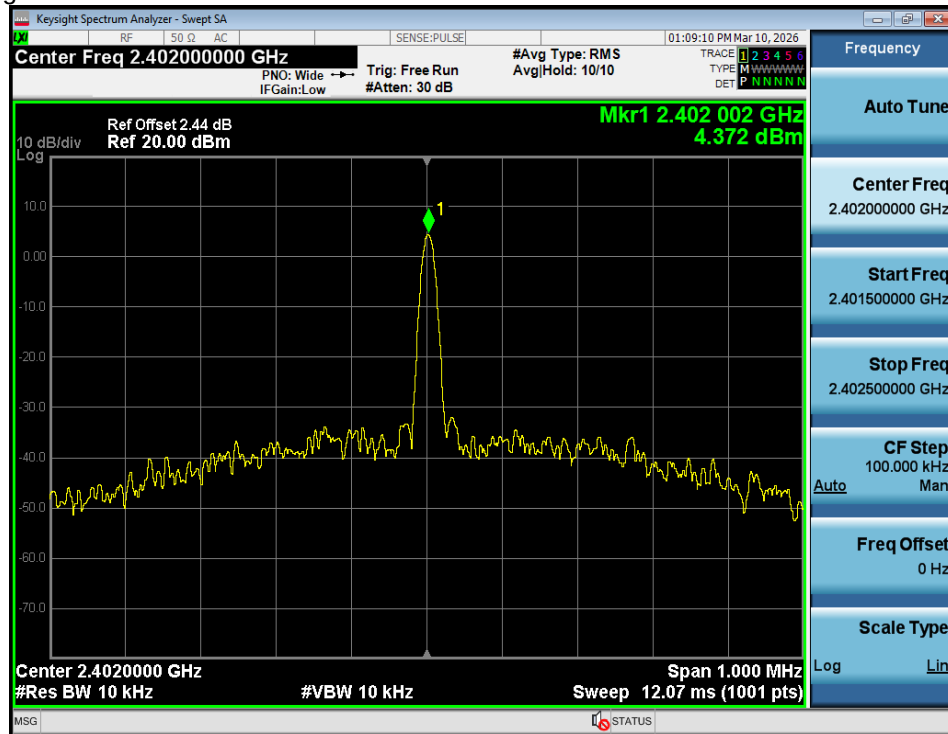
7.5 Test Result

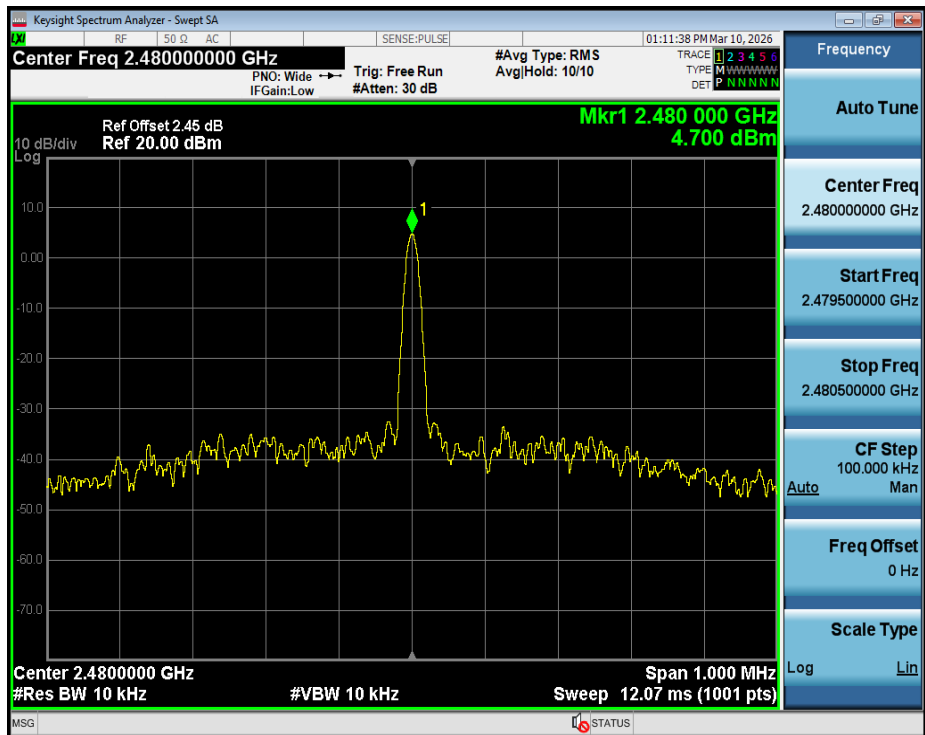
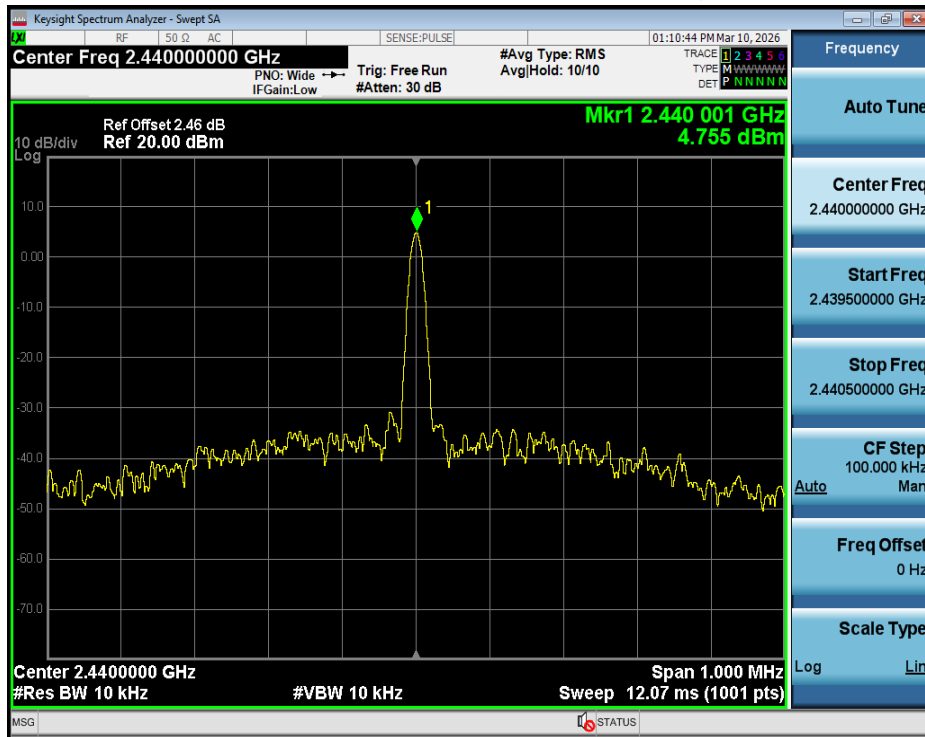
Temperature:	26°C		
Humidity:	54 % RH	Test Voltage	DC 3.3V

Operation Mode:	Transmitting- unmodulation mode
-----------------	---------------------------------

Voltage	Frequency	Reading	Tolerance	Limit
Normal Voltage	MHz	MHz	ppm	(ppm)
	2402	2402.002	0.83	±50
	2440	2440.001	0.41	±50
	2480	2480	0	±50

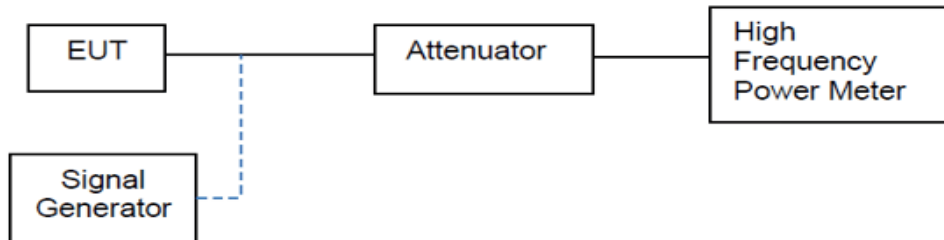
Normal Voltage:





8. Antenna Power

8.1 Block Diagram Of Test Setup



8.2 Limit

Item	Limits
Antenna Power Density	(1) $\leq 3\text{mW/MHz}$ (FH, FH+DS, FH+OFDM form 2400 - 2483.5 MHz) (2) $\leq 10\text{mW/MHz}$ (OFDM OBW < 26MHz, DS, FH other than (1)) (3) $\leq 5\text{mW}$ (OFDM OBW 26-38MHz) (4) $\leq 10\text{mW}$ (Other than (1) & (2)& (3))
Antenna Power Error	+20%, -80% (Base on manufacturer declare antenna power density)

8.3 Test procedure

- 1: Measure the total power by Power Meter in a state of hopping mode or non-hopping mode (with Average Sensor)
 - 2: If it's the burst wave, please measure the burst ratio. Then calculate the real total power by burst ratio.
 - 3: Calculate the mean power.
- Output Power Density (mW) = Total Output Power (mW) / Duty cycle

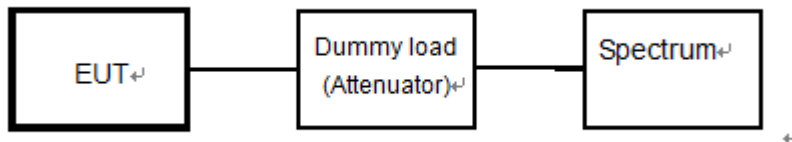
8.4 Test Result

Temperature:	26°C		
Humidity:	54 % RH	Test Voltage	DC 3.3V

Modulate	Voltage		Test Frequency	Antenna Power (dBm)	Antenna Power (mW)	Rated output power (mW)	Antenna Power Error (%)	Limit
GFSK 125K	Normal Voltage	DC 3.3V	CH 01	3.26	2.118	2	5.90	10mW
			CH 20	3.59	2.286		14.30	
			CH 40	3.56	2.27		13.50	
GFSK 500K			CH 01	3.06	2.023		1.15	
			CH 20	3.55	2.265		13.25	
			CH 40	3.47	2.223		11.15	
GFSK 1M			CH 01	3.26	2.118		5.90	
			CH 20	3.47	2.223		11.15	
			CH 40	3.44	2.208		10.40	
GFSK 2M			CH 01	1.3	1.349		-32.55	
			CH 20	1.73	1.489		-25.55	
			CH 40	1.52	1.419		-29.05	
Limit : +20% (Base on manufacturer declare antenna power density)								

9. Occupied Bandwidth

9.1 Block Diagram Of Test Setup



9.2 Limit

Item	Limits
Occupied Band Width:	FH 83.5MHz; OFDM,DS $\leq$ 26MHz;Others $\leq$ 26MHz

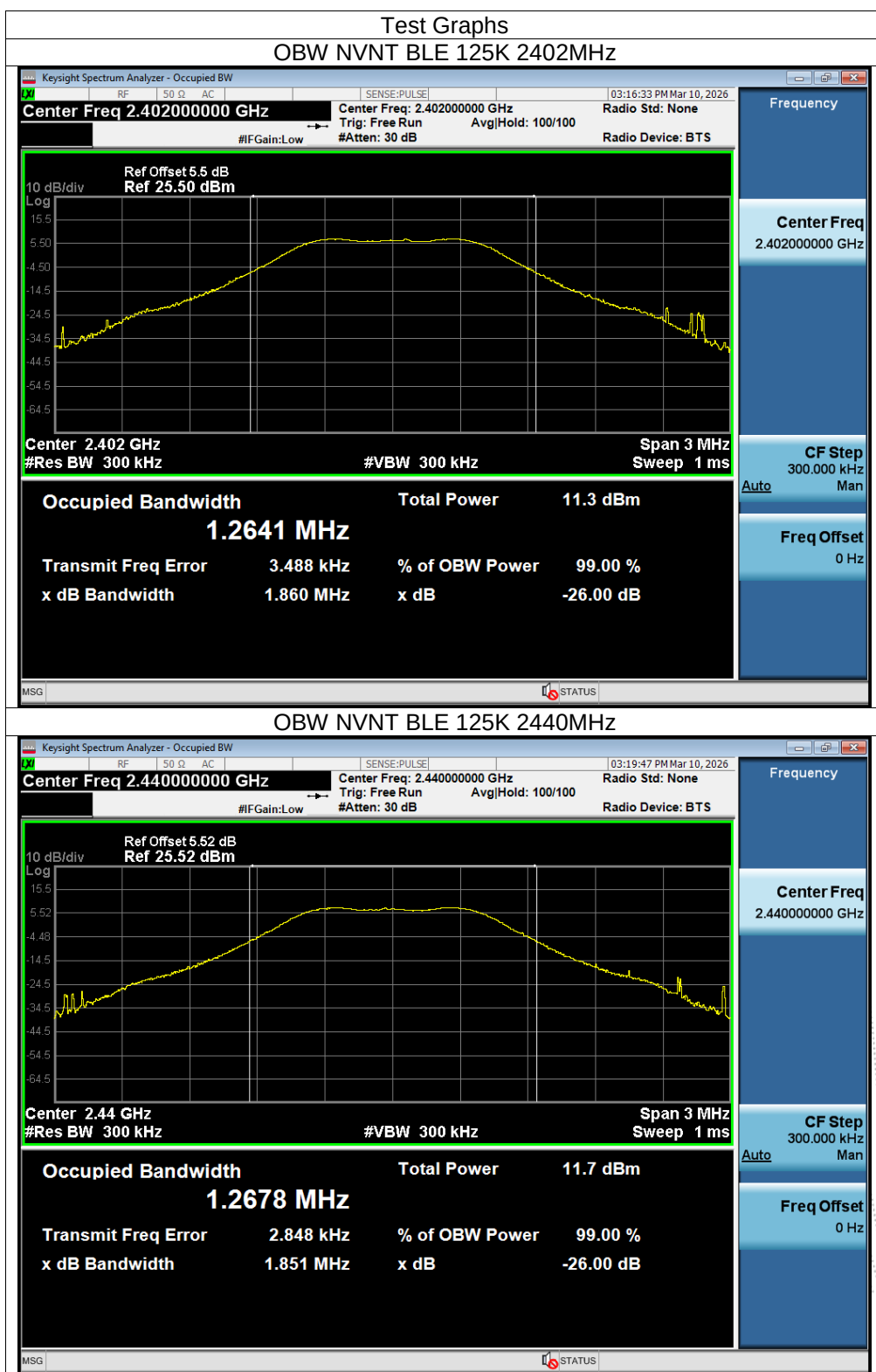
9.3 Test procedure

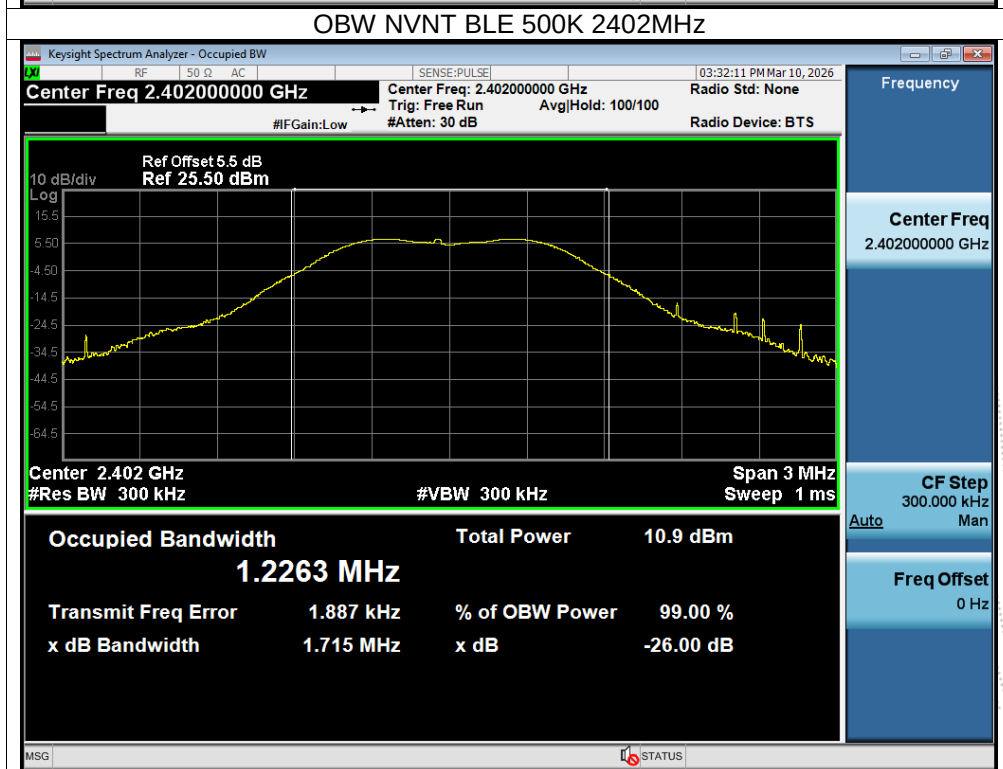
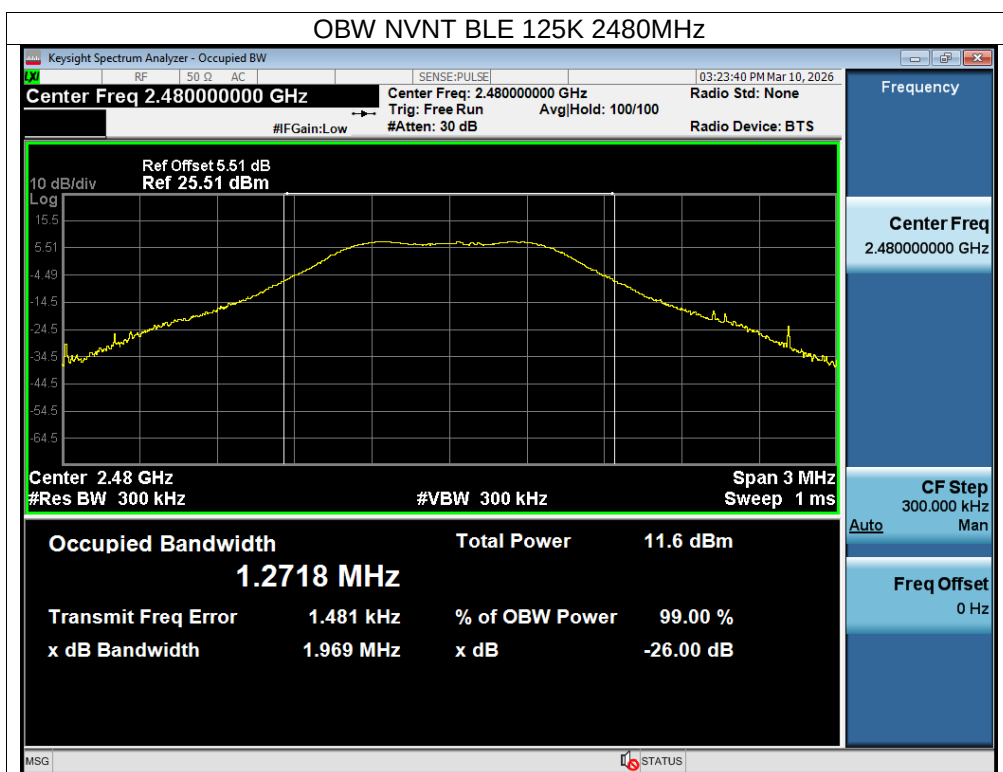
- Setting of SA is following as: RB: 300kHz / VB:300kHz / SPAN: 3MHz / AT: 20dB Ref: 10dBm / Sweep time: Auto / Sweep Mode: Continuous sweep / Detect mode: Positive peak / Trace mode: Max hold
- EUT have transmitted the maximum modulation signal and fixed channelize (For DSSS or OFDM Device) or continuous maximum power of hopping mode(For FHSS Device).
SA set to 99% of occupied bandwidth to measure occupied bandwidth. The limit is less than 26MHz (For DSSS or OFDM Device) or 83.5MHz (For FHSS Device).
- SA set to 90% of occupied bandwidth to measure Spread Spectrum Bandwidth and must greater than 500kHz.
- Spread Spectrum Factor = Spread Spectrum Bandwidth / modulation rate of EUT.
- Spread Spectrum Factor limit is greater than 5

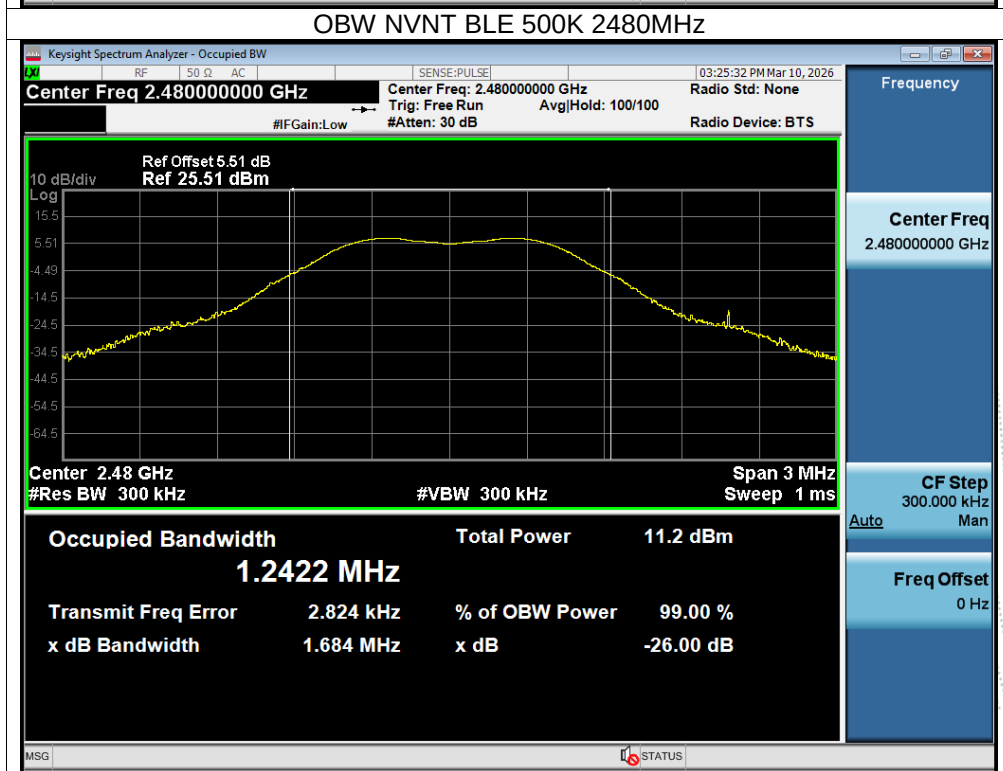
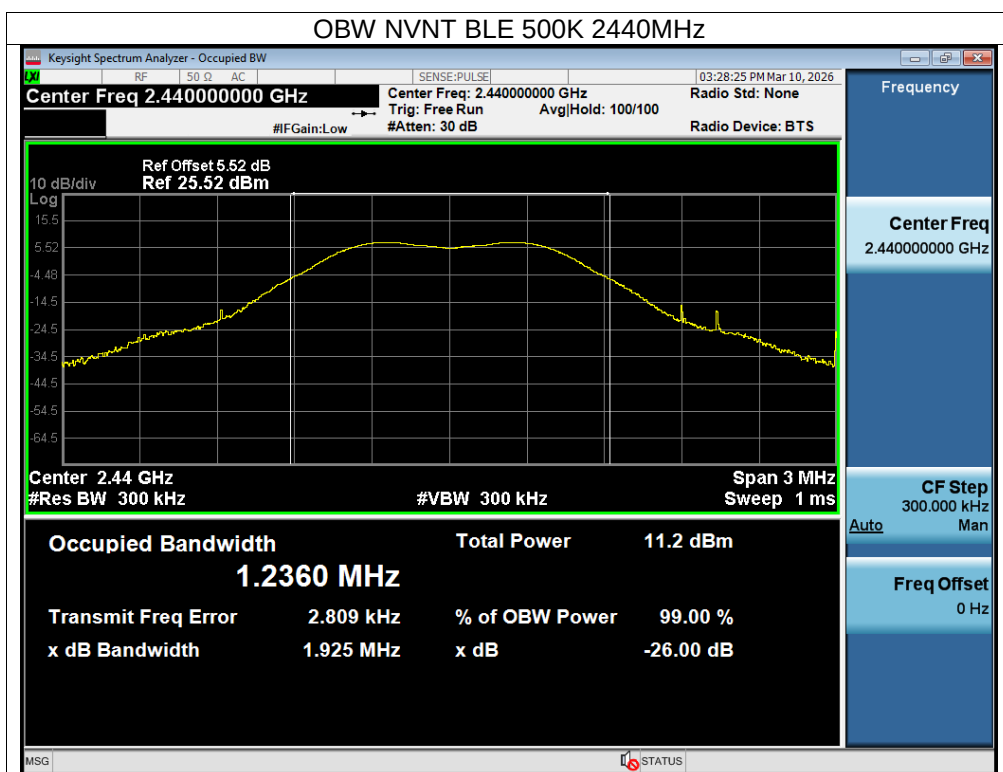
9.4 Test Result

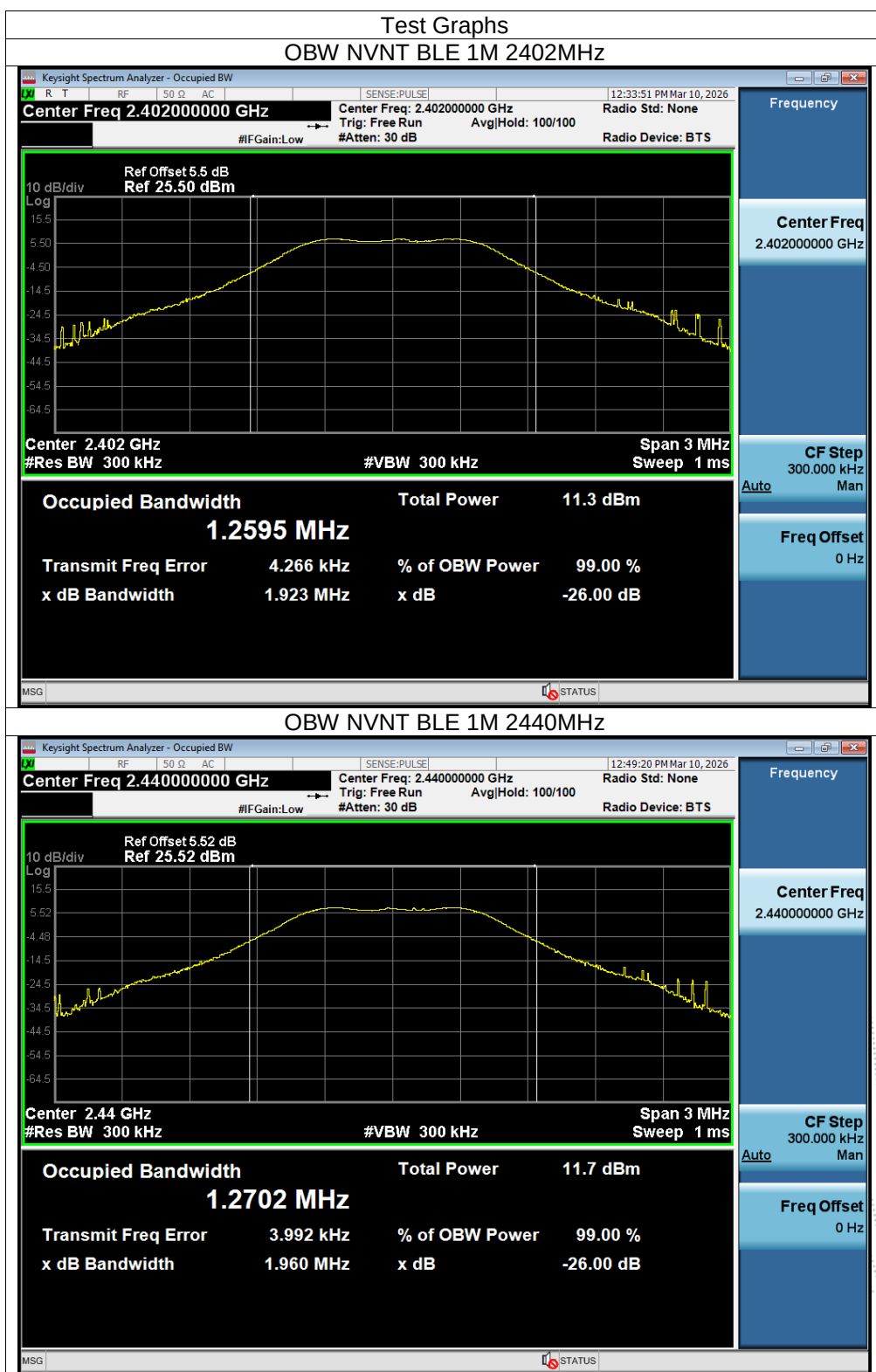
Temperature:	26°C		
Humidity:	54 % RH	Test Voltage	DC 3.3V

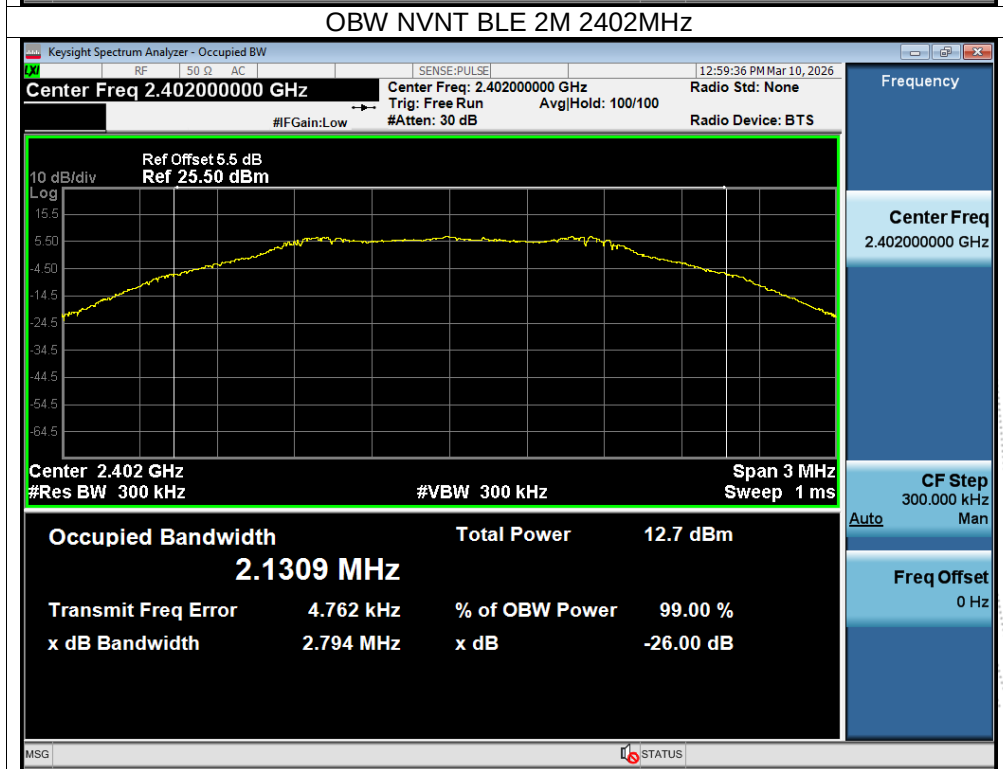
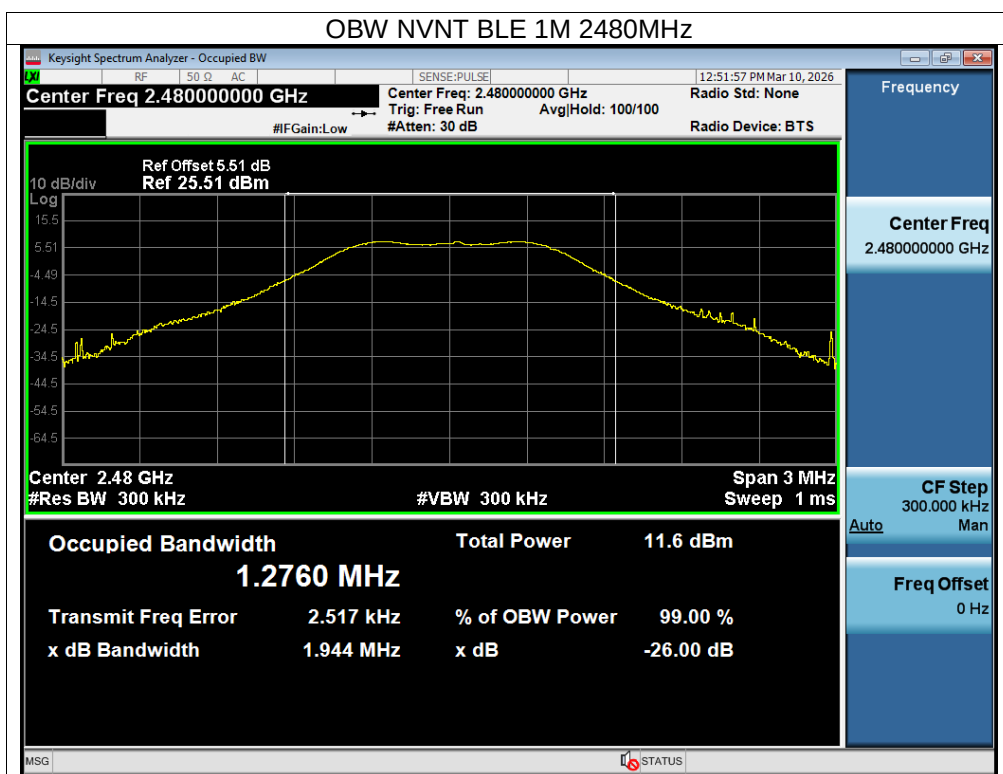
Voltage	Mode	Normal Voltage	99%Occupied bandwidth MHz	Occupied Bandwidth Limit MHz
Normal Voltage	GFSK (125K)	CH01	1.264	≤26MHz
		CH20	1.268	≤26MHz
		CH40	1.272	≤26MHz
	GFSK (500K)	CH01	1.226	≤26MHz
		CH20	1.236	≤26MHz
		CH40	1.242	≤26MHz
	GFSK (1Mbps)	CH01	1.259	≤26MHz
		CH20	1.27	≤26MHz
		CH40	1.276	≤26MHz
	GFSK (2Mbps)	CH01	2.131	≤26MHz
		CH20	2.136	≤26MHz
		CH40	2.133	≤26MHz



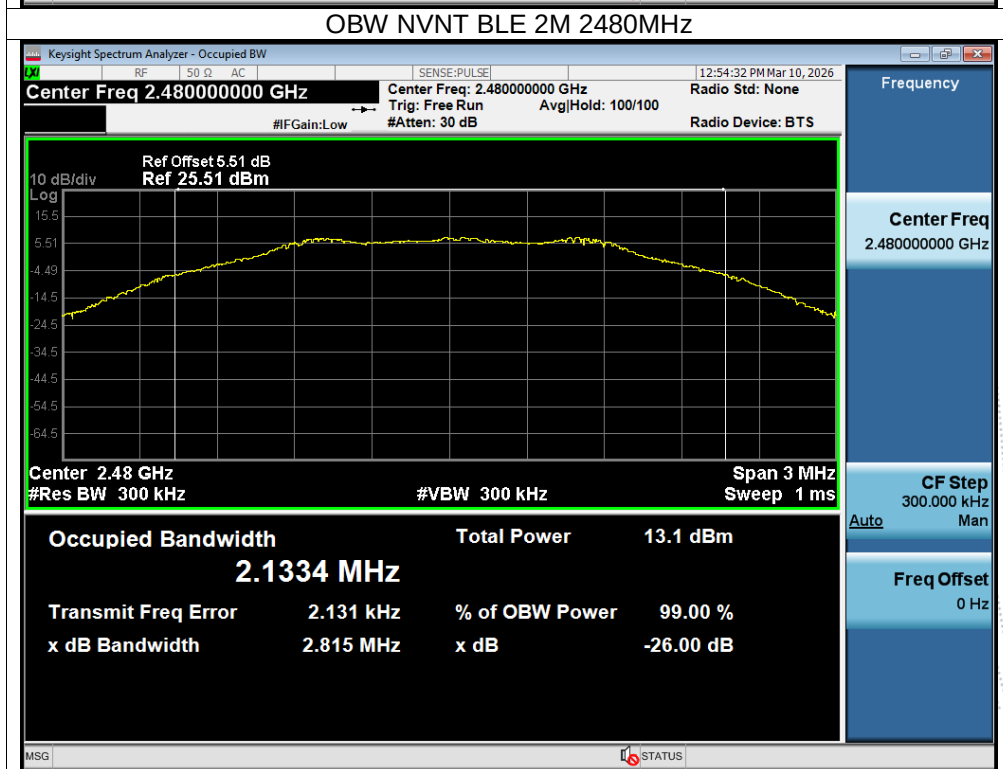
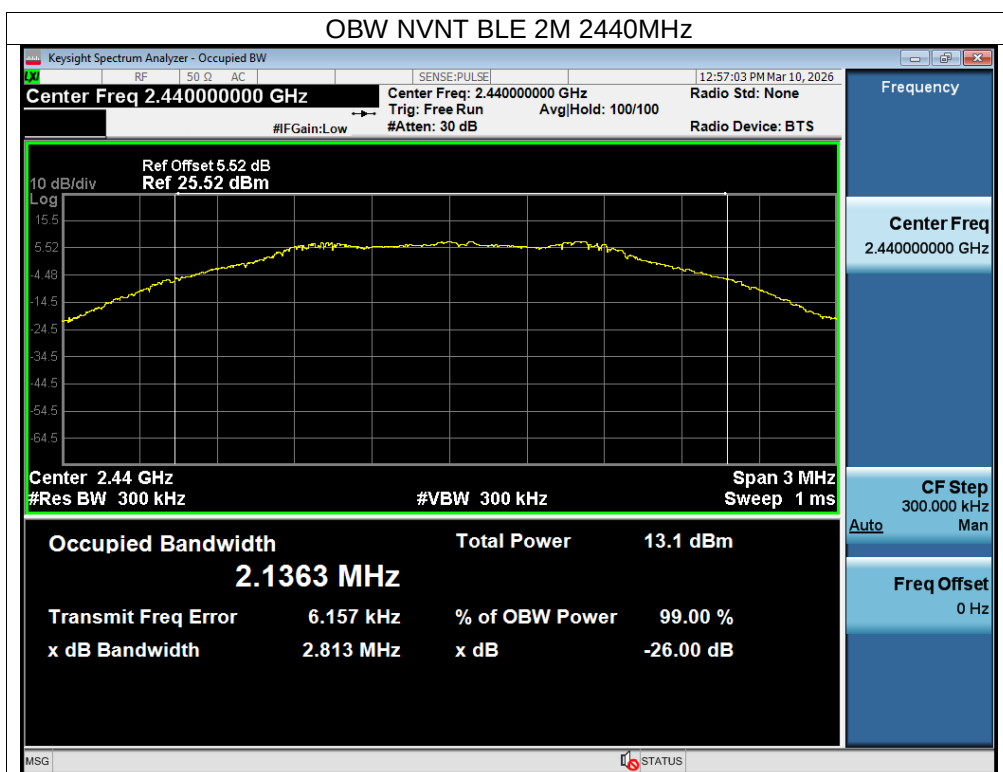






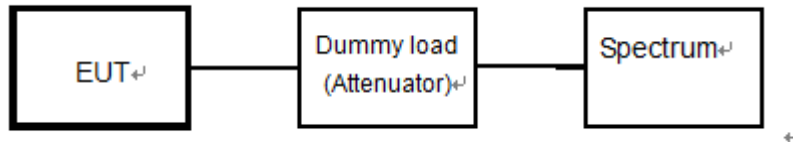


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10. Unwanted Emission Intensity Measurement

10.1 Block Diagram Of Test Setup



10.2 Limit

Item	Limits
TX Spurious Emission	$\leq 0.25 \mu\text{W} (-36\text{dBm})$ ($30\text{MHz} \leq f \leq 1000\text{MHz}$)
	$\leq 2.5 \mu\text{W} (-26\text{dBm})$ ($1000\text{MHz} < f \leq 2387\text{MHz}$)
	$\leq 25 \mu\text{W} (-16\text{dBm})$ ($2387\text{MHz} < f < 2400\text{MHz}$)
	$\leq 25 \mu\text{W} (-16\text{dBm})$ ($2483.5\text{MHz} \leq f < 2496.5\text{MHz}$)
	$\leq 2.5 \mu\text{W} (-26\text{dBm})$ ($2496.5\text{MHz} \leq f < 12500\text{MHz}$)

10.3 Measuring Instruments And Setting

Please refer to section 5 in this report. The following table is the setting of Spectrum Analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
RB / VB	1 MHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

10.4 Test procedure

1. EUT have transmitted the maximum modulation signal and fixed channelize.
2. Setting of SA is following as: Below 1GHz RB:100KHz / VB:100KHz
Above 1GHz RB:1MHz / VB:1MHz / AT: 20dB Ref: 10dBm / Sweep time: Auto
Sweep Mode: Continuous sweep / Detect mode: Positive peak
Trace mode: Max hold
3. Setting of SA is following as 30MHz and stop frequency 1000MHz Then to mark peak reading value + cable loss shall be less than 0.25μW.
4. Setting of SA is following as 1000MHz and stop frequency 2387MHz Then to mark peak reading value + cable loss shall be less than 2.5μW.
5. SA adjusted to start frequency 2387MHz and stop frequency 2400MHz. Then to mark peak reading value + cable loss shall be less than 25μW.
6. SA adjusted to start frequency 2483.5MHz and stop frequency 2496.5MHz Then to mark peak reading value + cable loss shall be less than 25μW
7. SA adjusted to start frequency 2496.5MHz and stop frequency 12500MHz Then to mark peak reading value + cable loss shall be less than 2.5μW

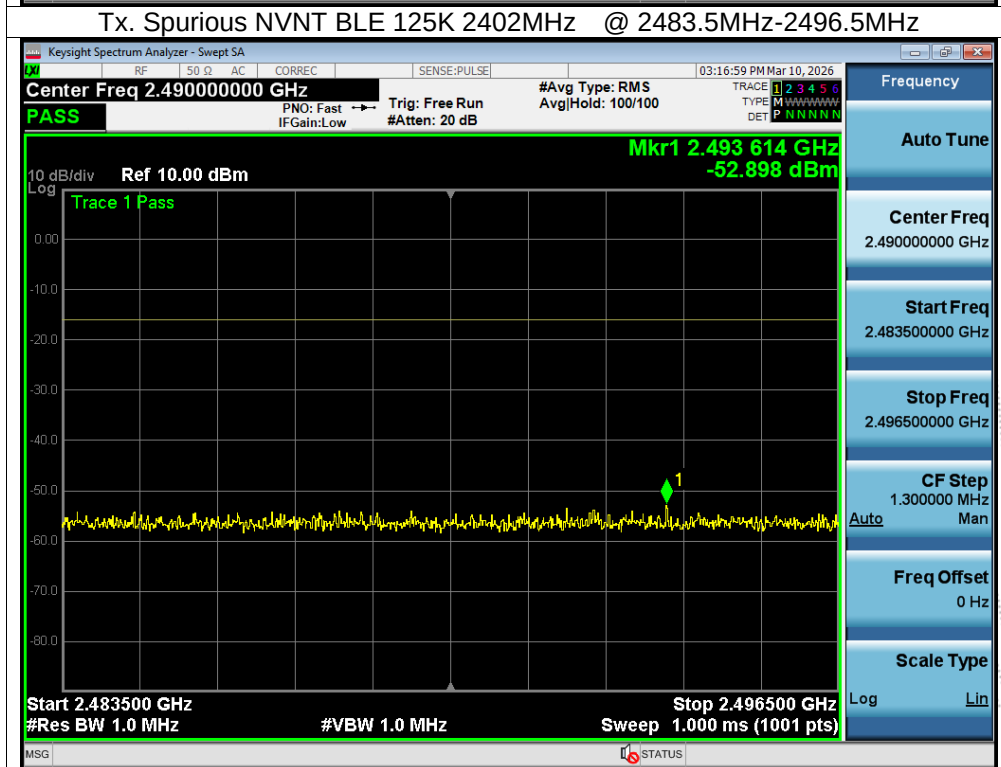
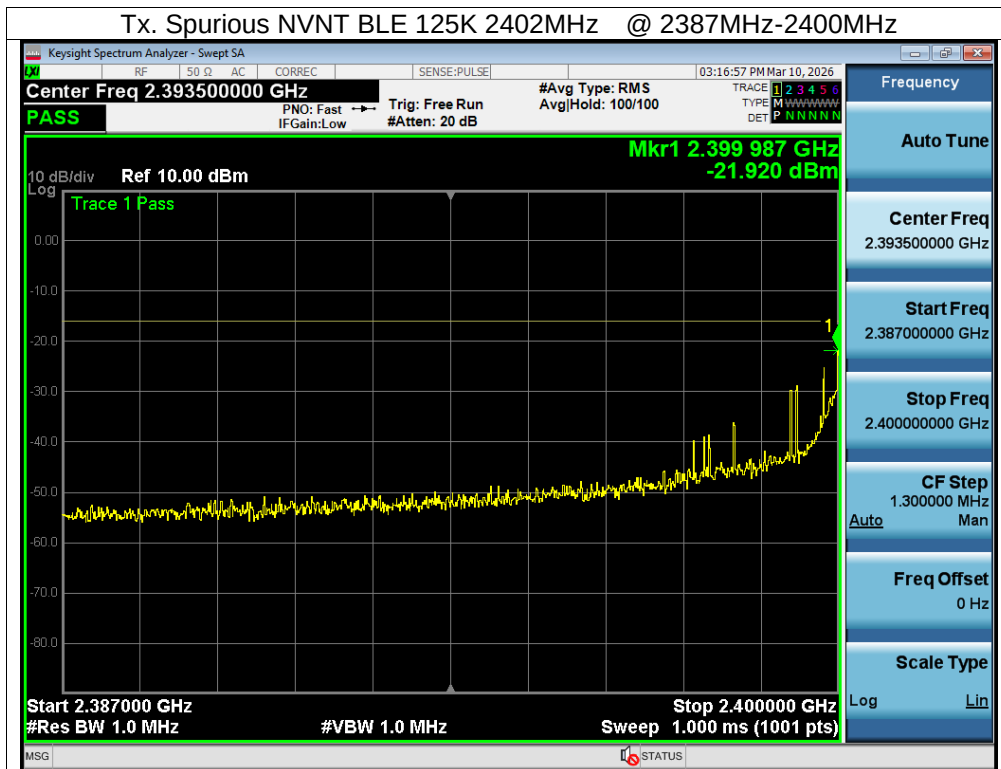
10.5 Test Result

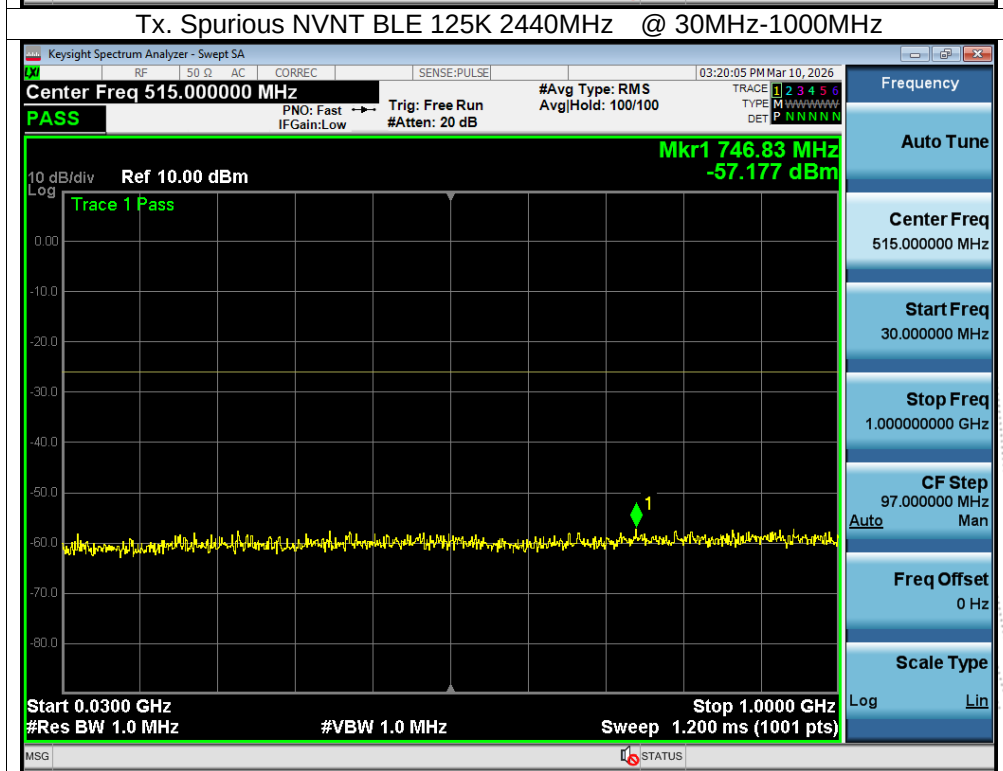
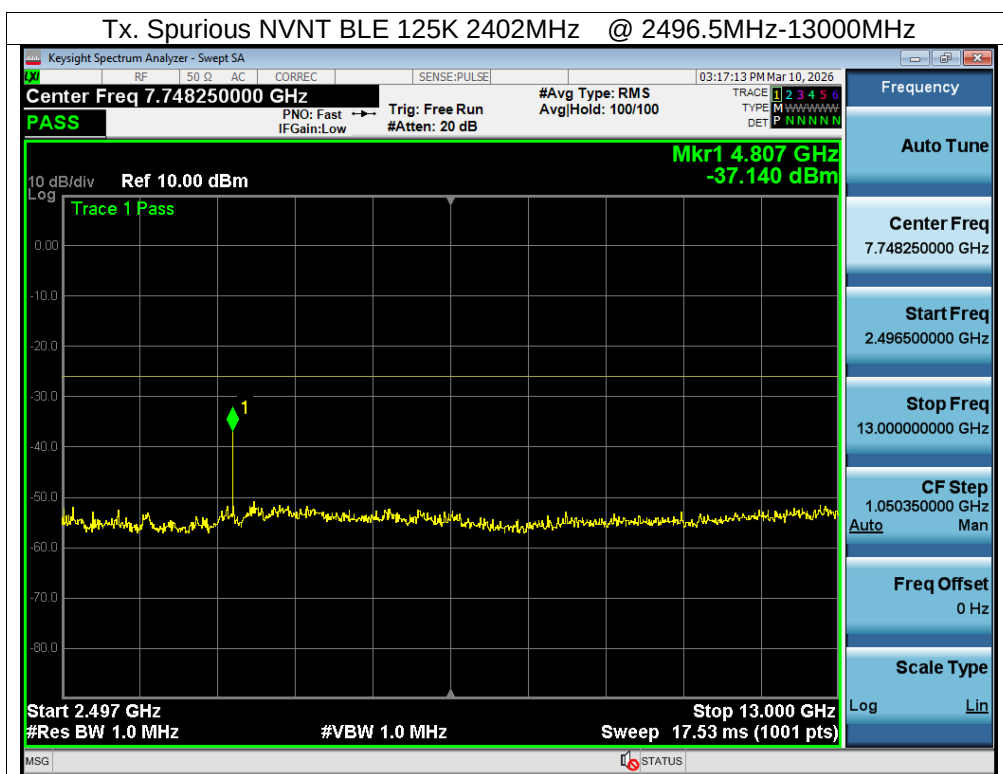
Temperature:	26°C		
Humidity:	54% RH	Test Voltage	DC 3.3V
Operation Mode:	GFSK TX ; Normal Voltage		

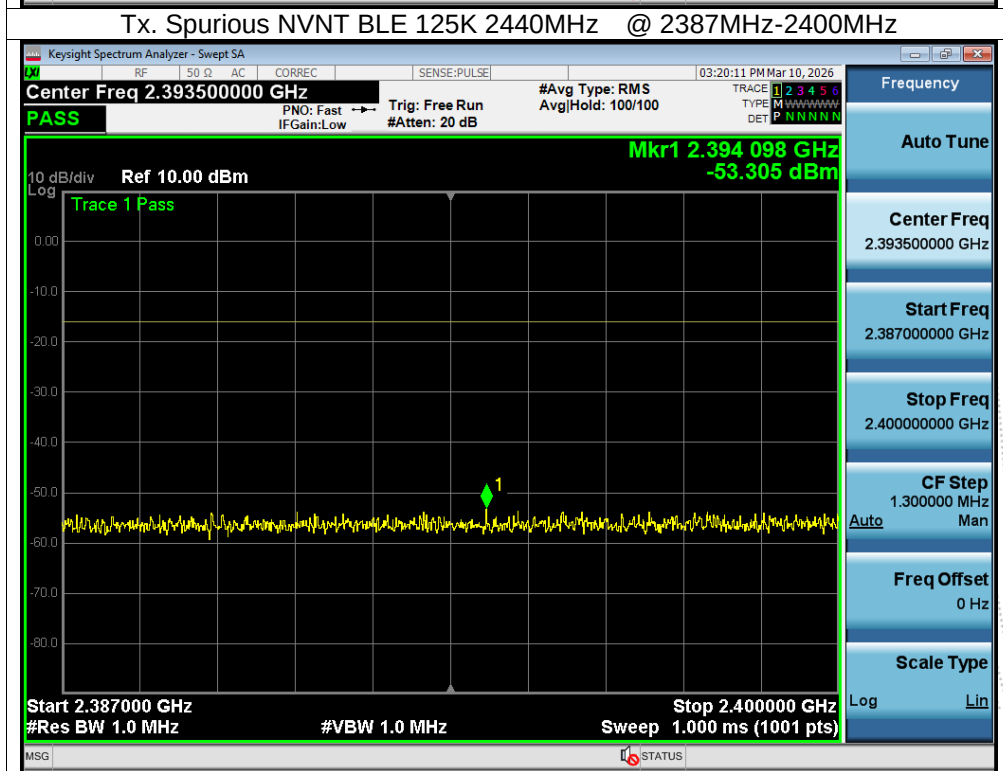
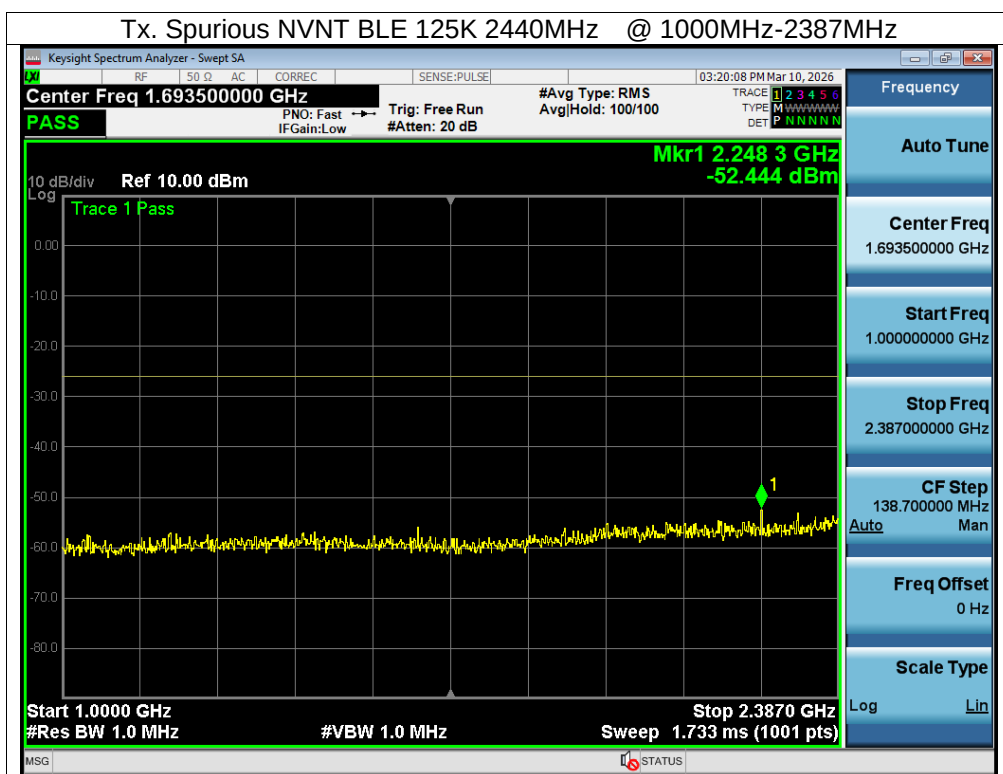
Mode	Frequency (MHz)	Range (MHz)	Emission Frequency (MHz)	Max Peak Value (dBm)	Max RMS Value (dBm)	Max Peak Value (uW)	Max RMS Value (uW)	Limit Start(uW)	Limit Stop (uW)	Verdict
BLE 125K	2402	30-1000	753.62	-55.70	NA	0.0027	NA	2.5	2.5	Pass
BLE 125K	2402	1000-2387	2339.84	-51.59	NA	0.0069	NA	2.5	2.5	Pass
BLE 125K	2402	2387-2400	2399.99	-21.91	NA	6.4417	NA	25	25	Pass
BLE 125K	2402	2483.5-2496.5	2493.61	-52.89	NA	0.0051	NA	25	25	Pass
BLE 125K	2402	2496.5-13000	4807.27	-37.14	NA	0.1932	NA	2.5	2.5	Pass
BLE 125K	2440	30-1000	746.83	-57.17	NA	0.0019	NA	2.5	2.5	Pass
BLE 125K	2440	1000-2387	2248.30	-52.44	NA	0.0057	NA	2.5	2.5	Pass
BLE 125K	2440	2387-2400	2394.10	-53.30	NA	0.0047	NA	25	25	Pass
BLE 125K	2440	2483.5-2496.5	2489.43	-51.70	NA	0.0068	NA	25	25	Pass
BLE 125K	2440	2496.5-13000	4880.79	-40.24	NA	0.0946	NA	2.5	2.5	Pass
BLE 125K	2480	30-1000	705.12	-55.36	NA	0.0029	NA	2.5	2.5	Pass
BLE 125K	2480	1000-2387	2352.32	-50.88	NA	0.0082	NA	2.5	2.5	Pass
BLE 125K	2480	2387-2400	2397.53	-53.23	NA	0.0048	NA	25	25	Pass
BLE 125K	2480	2483.5-2496.5	2484.36	-41.69	NA	0.0678	NA	25	25	Pass
BLE 125K	2480	2496.5-13000	4964.82	-40.73	NA	0.0845	NA	2.5	2.5	Pass
BLE 500K	2402	30-1000	825.40	-55.11	NA	0.0031	NA	2.5	2.5	Pass
BLE 500K	2402	1000-2387	2371.74	-51.73	NA	0.0067	NA	2.5	2.5	Pass
BLE 500K	2402	2387-2400	2399.97	-28.96	NA	1.2706	NA	25	25	Pass
BLE 500K	2402	2483.5-2496.5	2494.88	-52.61	NA	0.0055	NA	25	25	Pass
BLE 500K	2402	2496.5-13000	4807.27	-37.19	NA	0.191	NA	2.5	2.5	Pass
BLE 500K	2440	30-1000	727.43	-52.12	NA	0.0061	NA	2.5	2.5	Pass
BLE 500K	2440	1000-2387	2377.29	-51.86	NA	0.0065	NA	2.5	2.5	Pass
BLE 500K	2440	2387-2400	2394.75	-53.36	NA	0.0046	NA	25	25	Pass

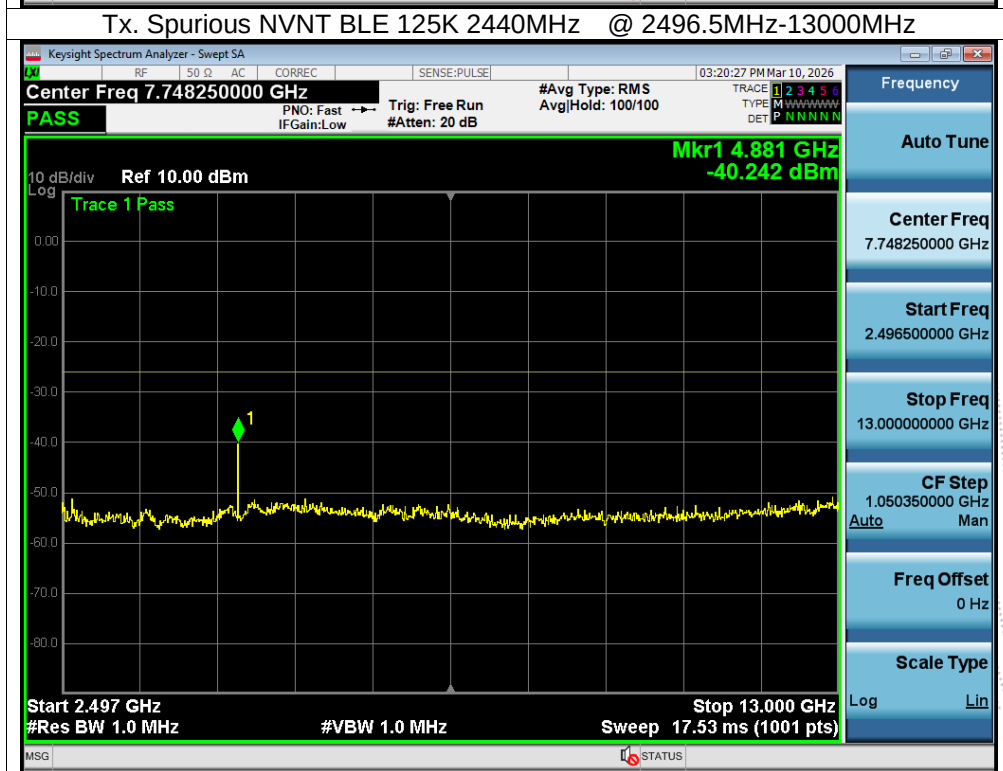
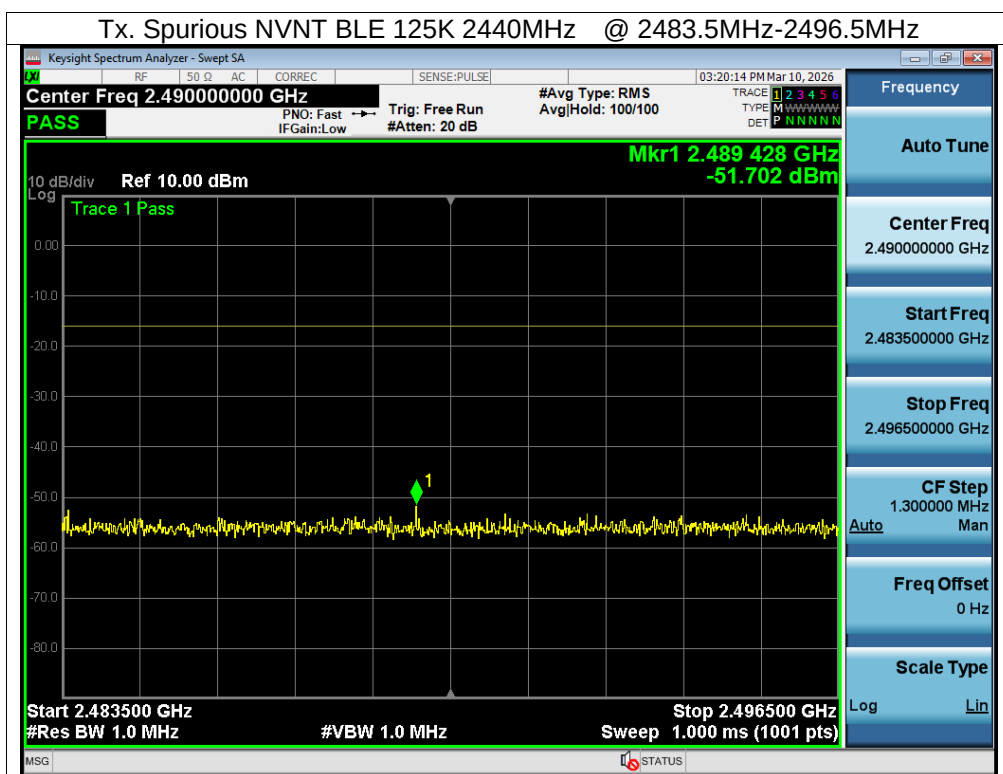
BLE 500K	2440	2483.5-2496.5	2490.47	-53.18	NA	0.0048	NA	25	25	Pass
BLE 500K	2440	2496.5-13000	4880.79	-39.90	NA	0.1023	NA	2.5	2.5	Pass
BLE 500K	2480	30-1000	705.12	-54.09	NA	0.0039	NA	2.5	2.5	Pass
BLE 500K	2480	1000-2387	2352.32	-52.26	NA	0.0059	NA	2.5	2.5	Pass
BLE 500K	2480	2387-2400	2395.50	-54.04	NA	0.0039	NA	25	25	Pass
BLE 500K	2480	2483.5-2496.5	2483.63	-43.32	NA	0.0466	NA	25	25	Pass
BLE 500K	2480	2496.5-13000	4964.82	-40.03	NA	0.0993	NA	2.5	2.5	Pass

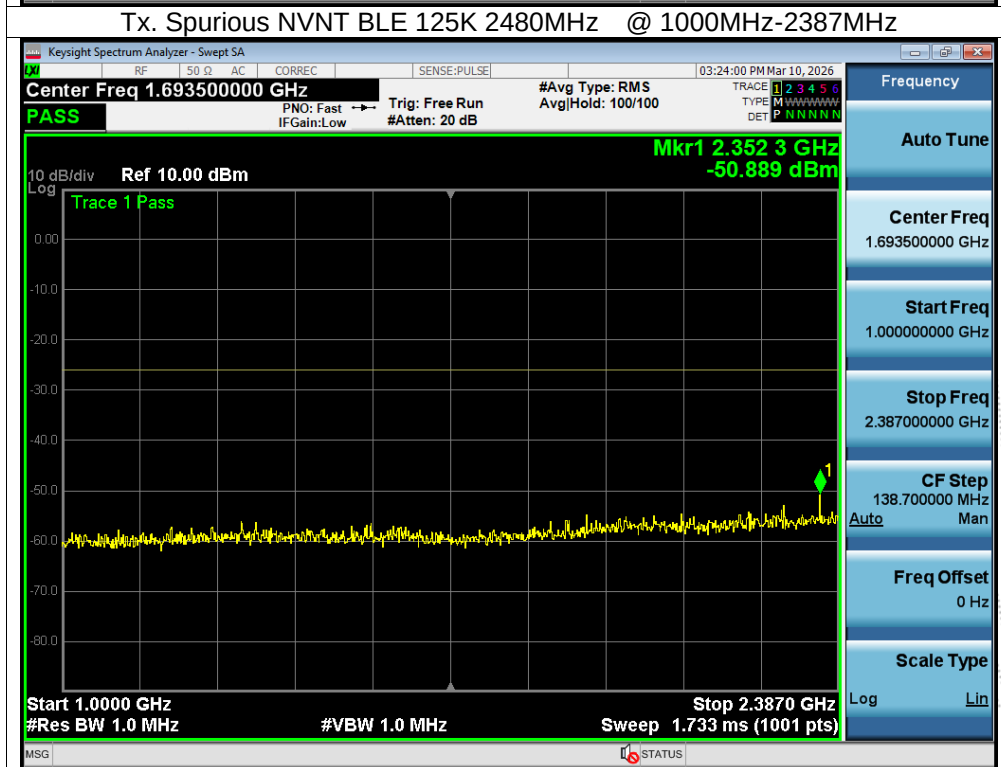
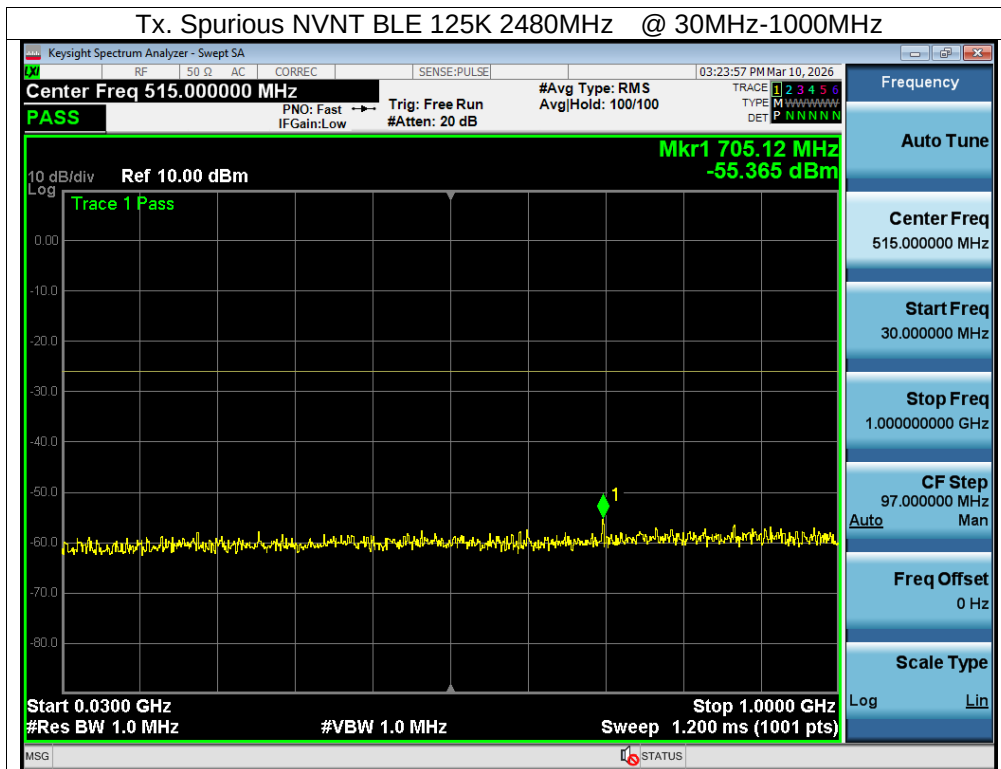


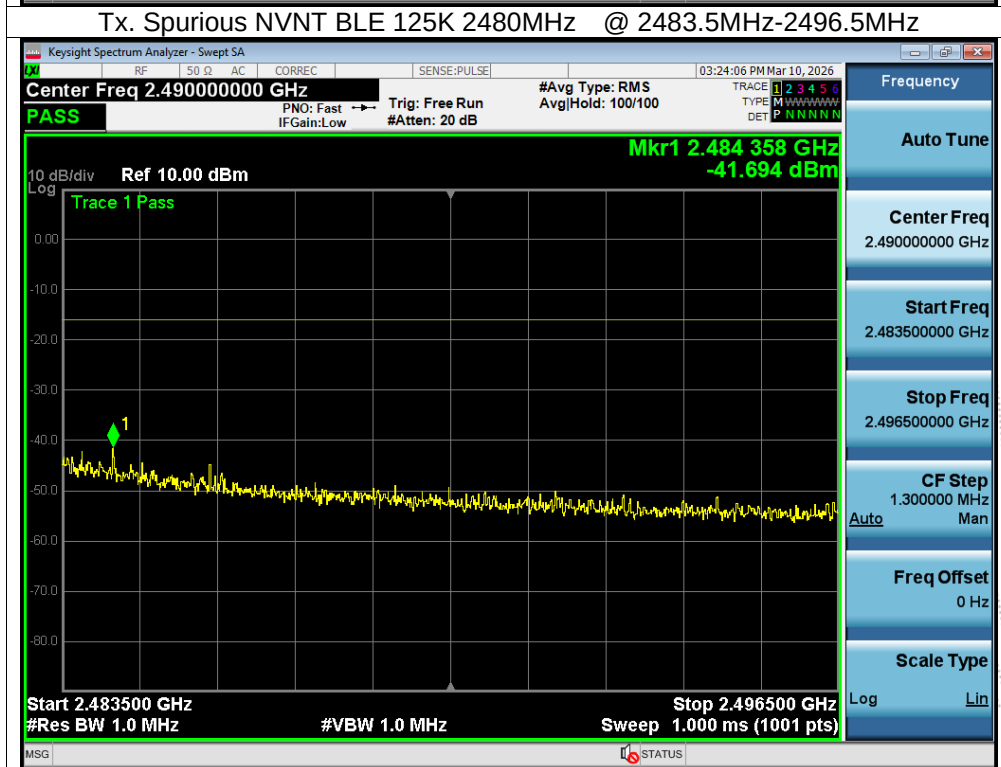
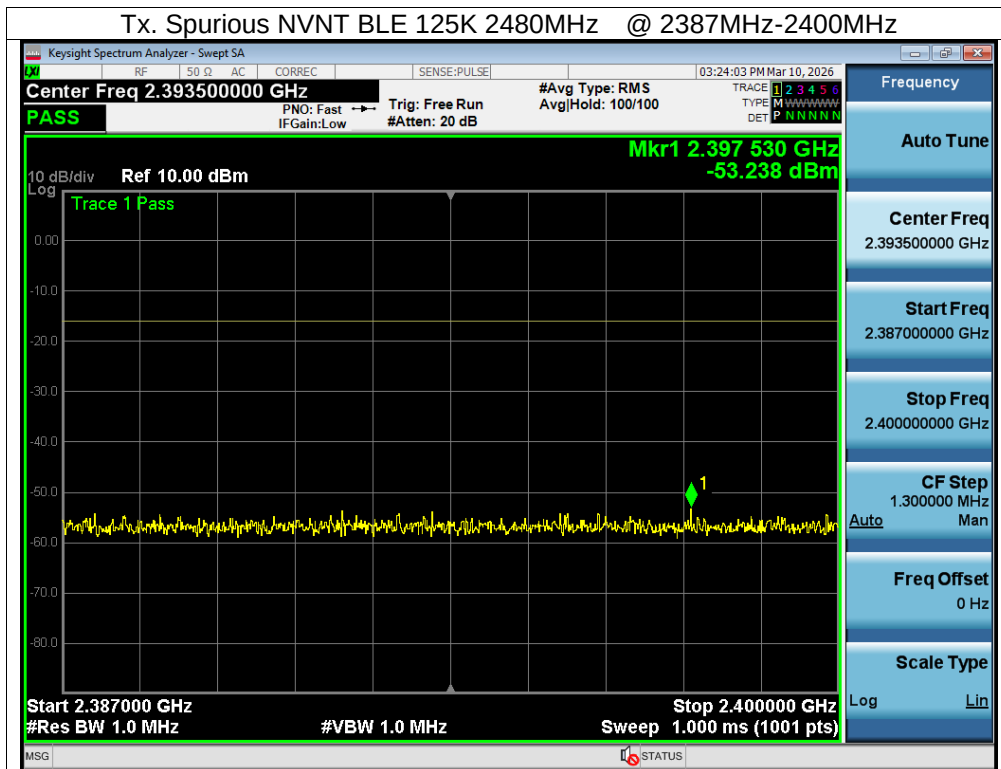


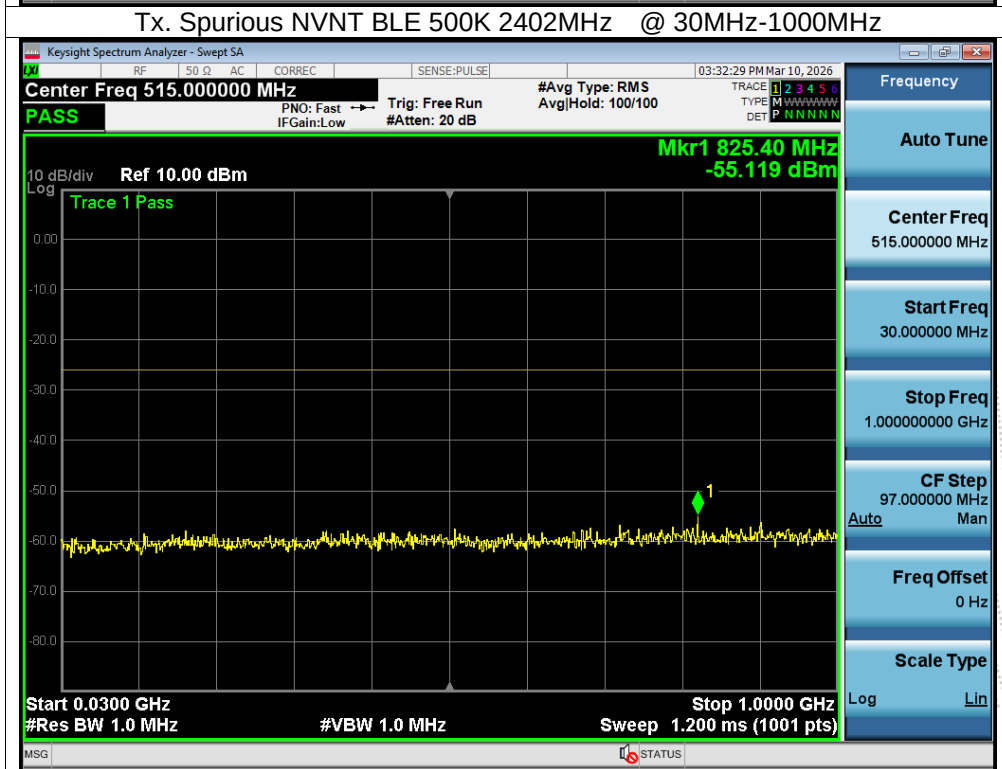
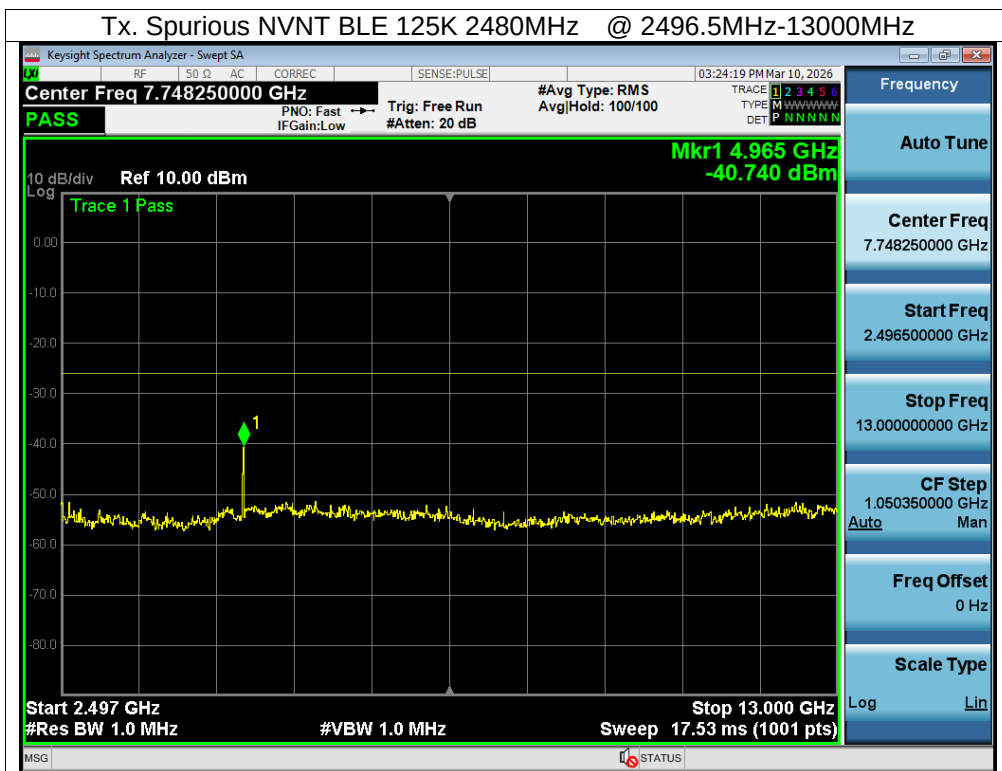


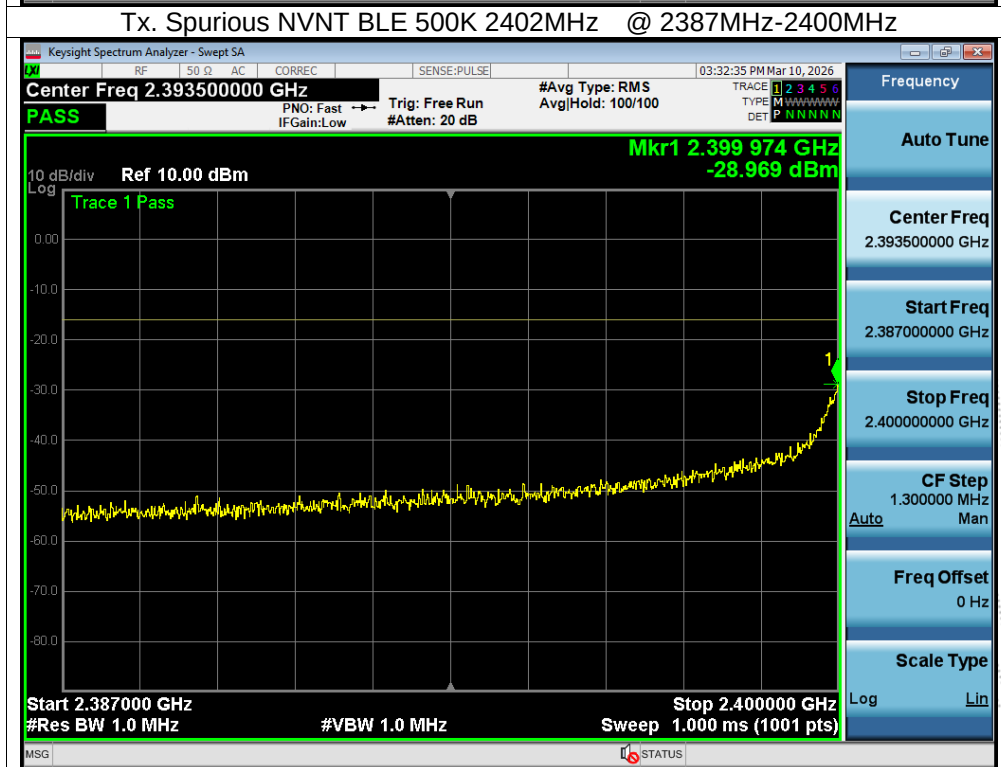
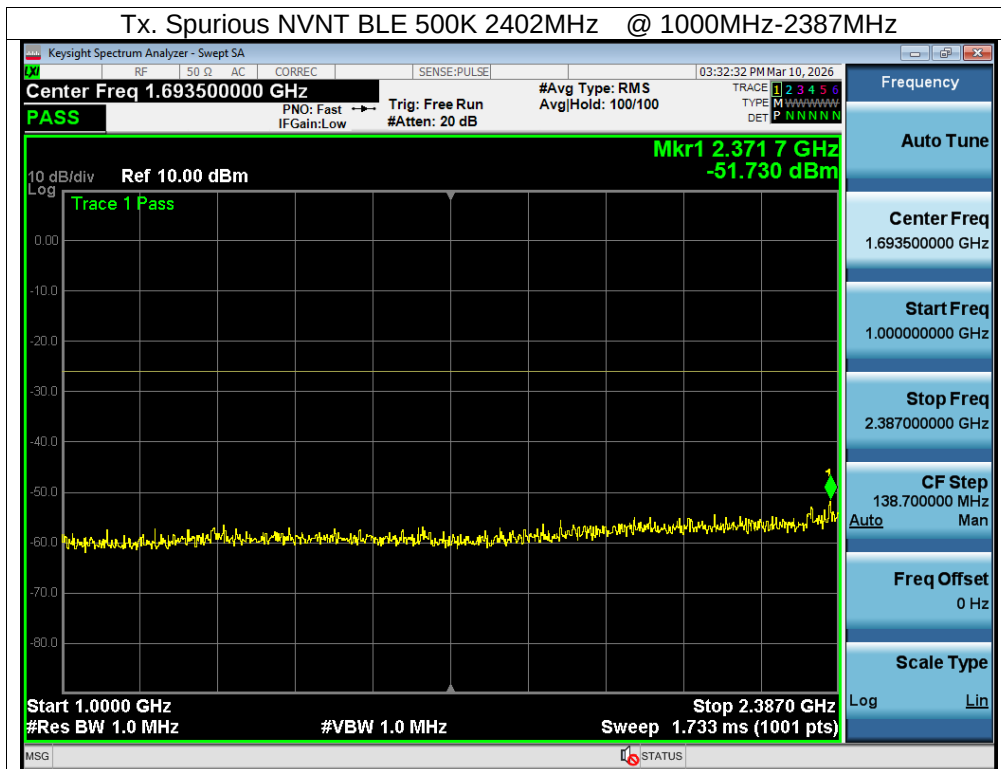


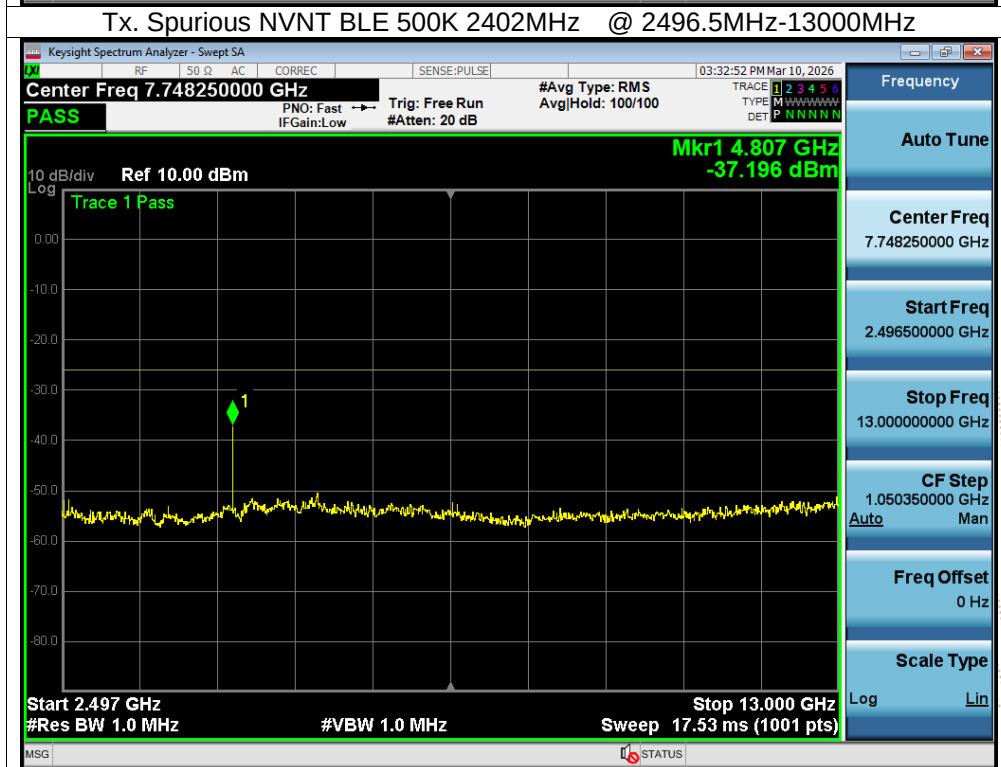
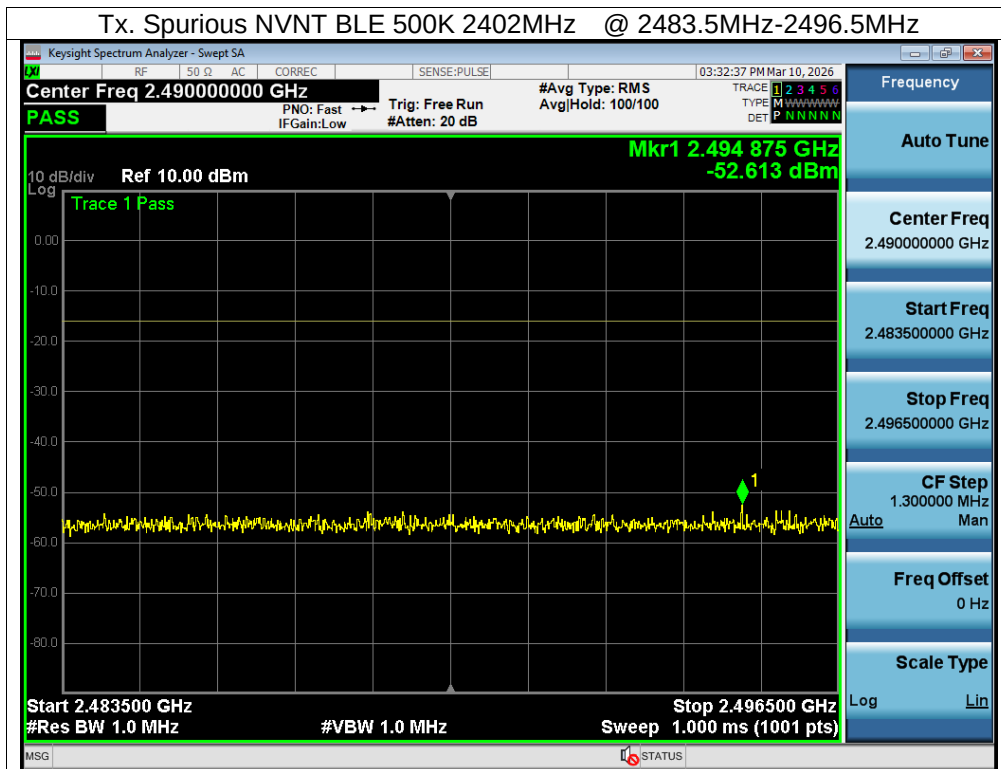


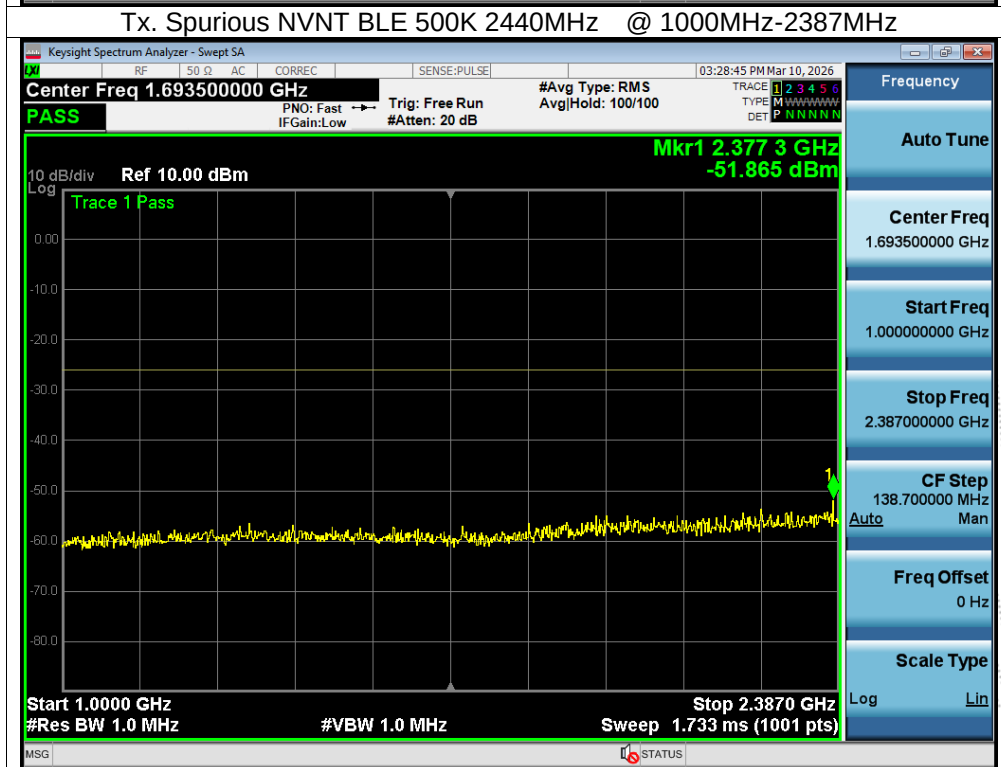
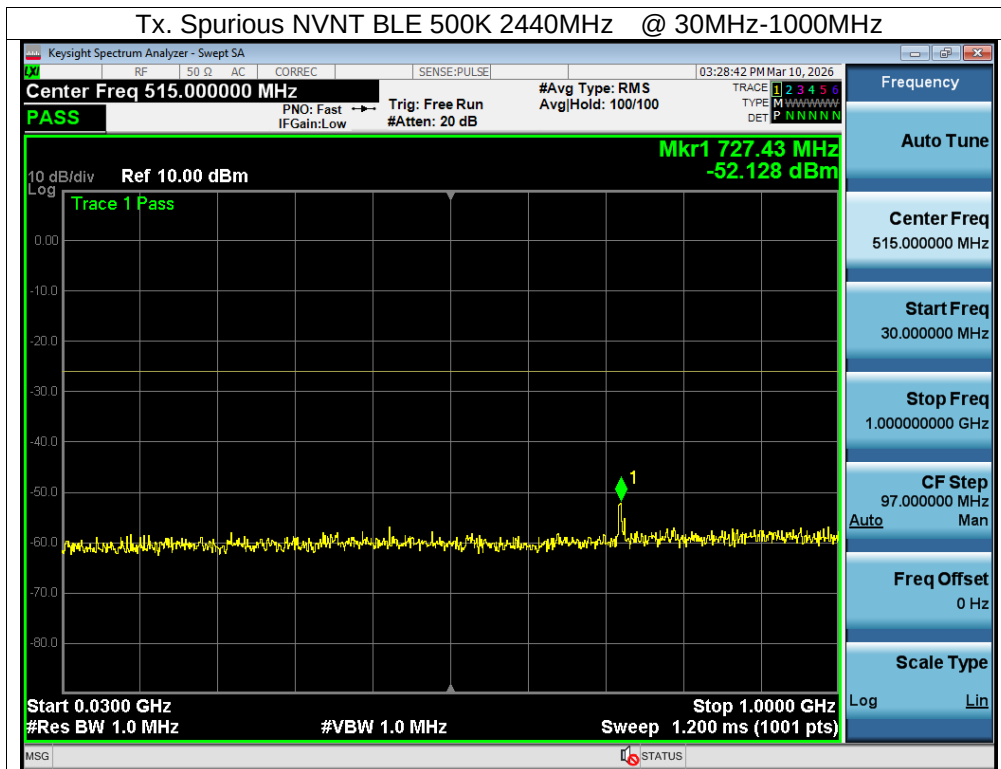


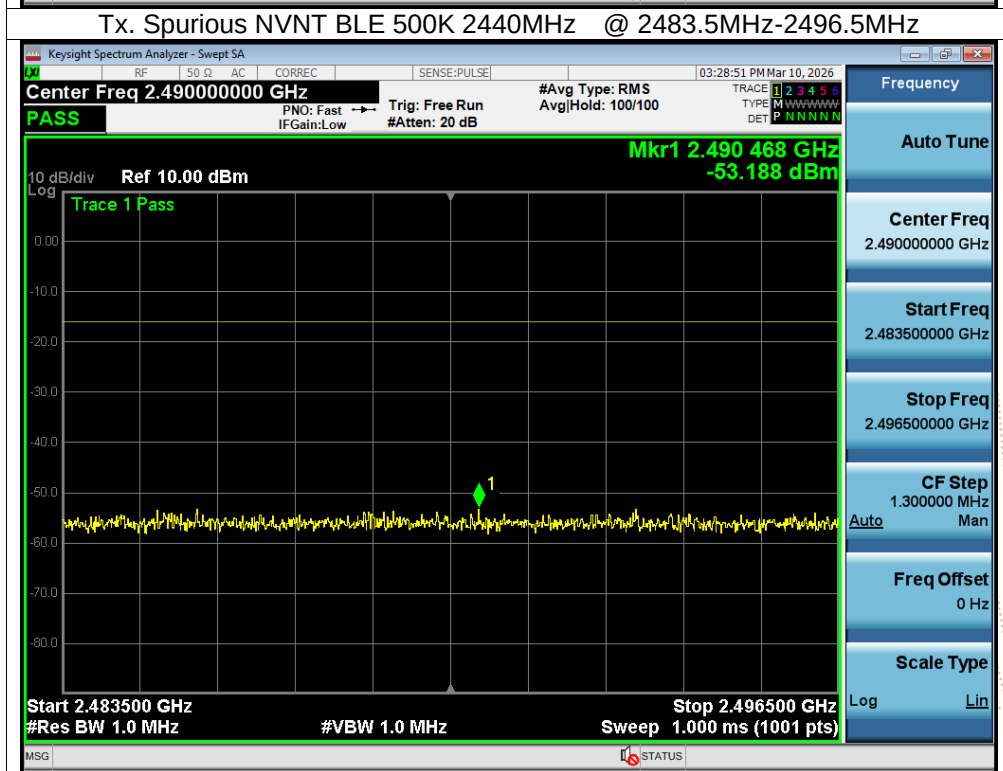
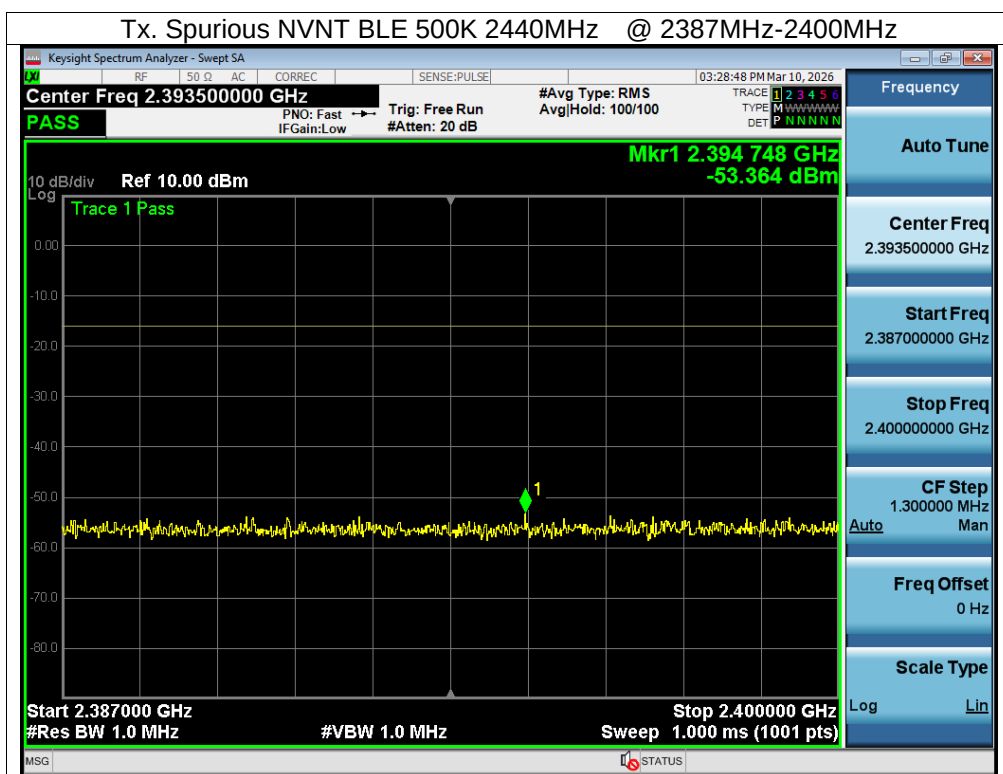


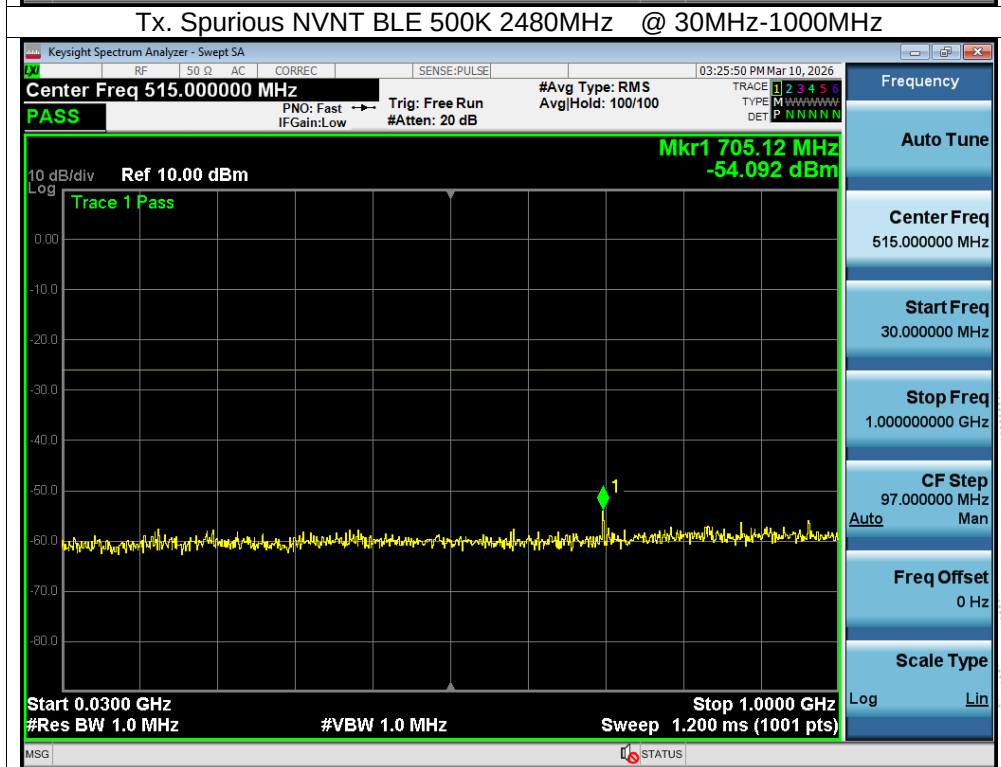
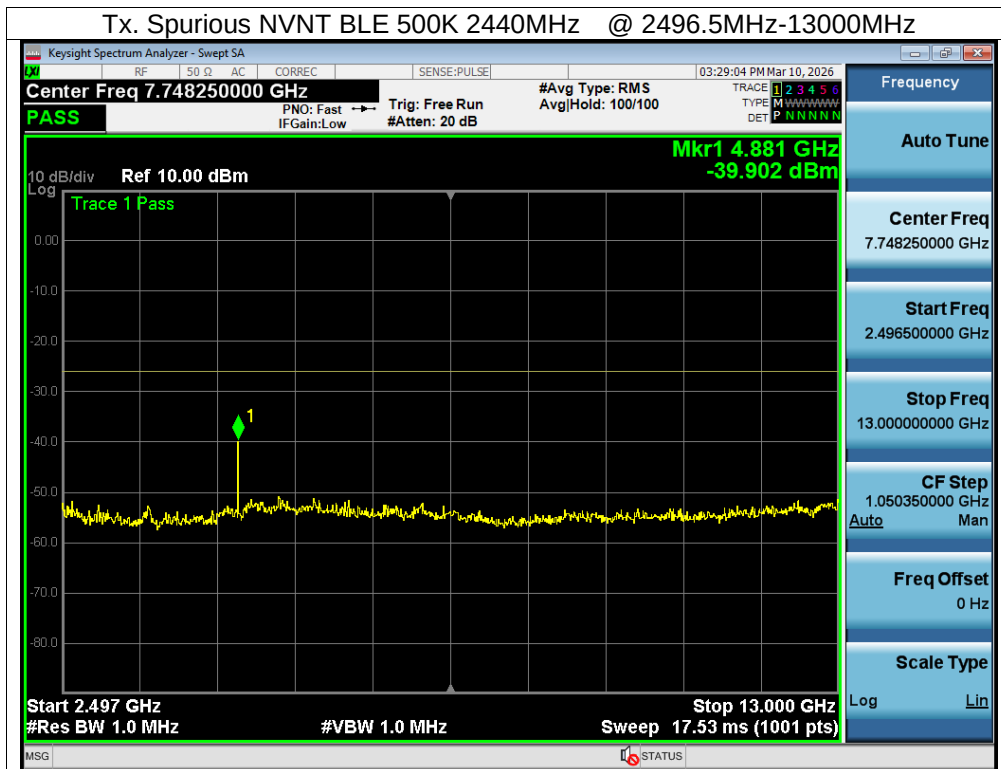


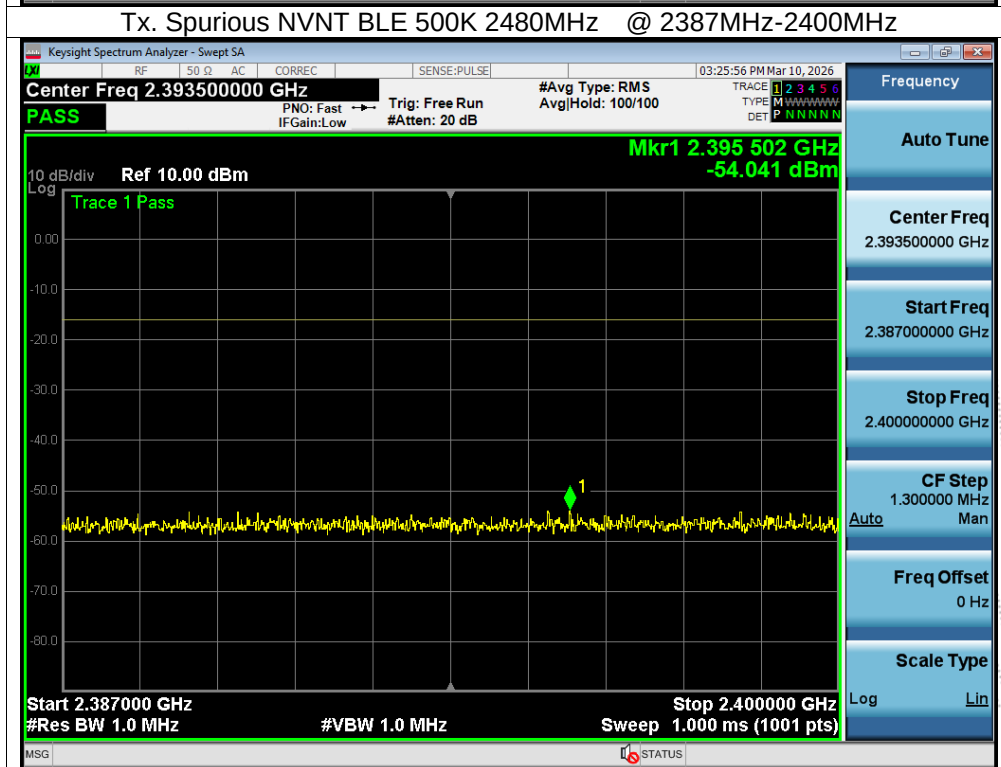
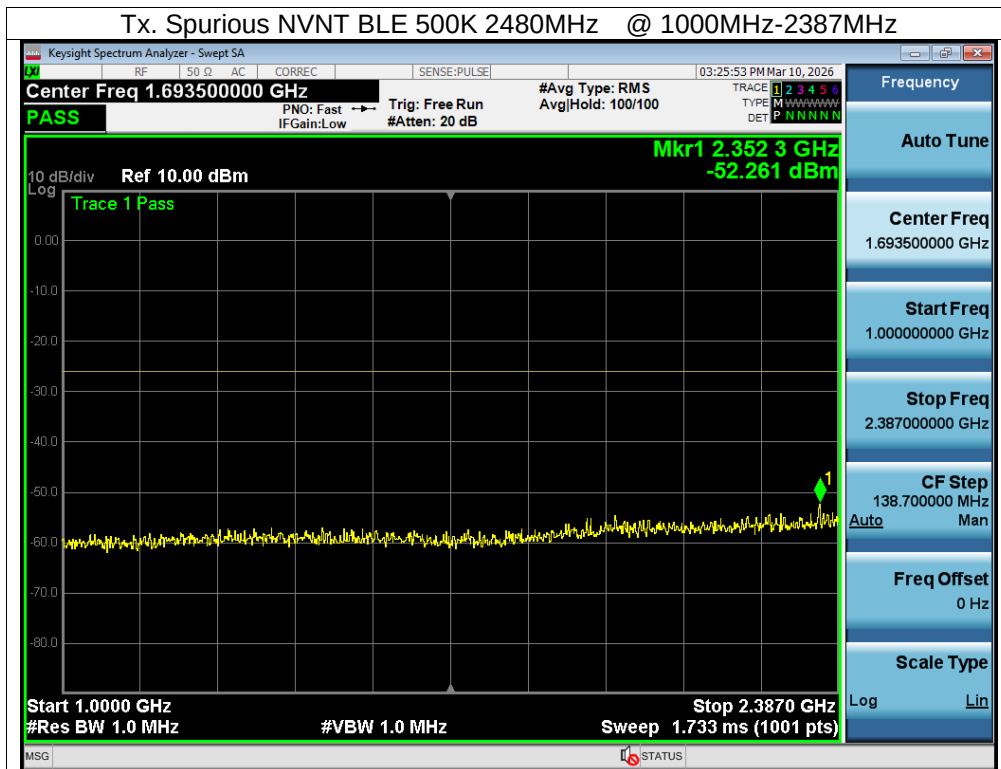


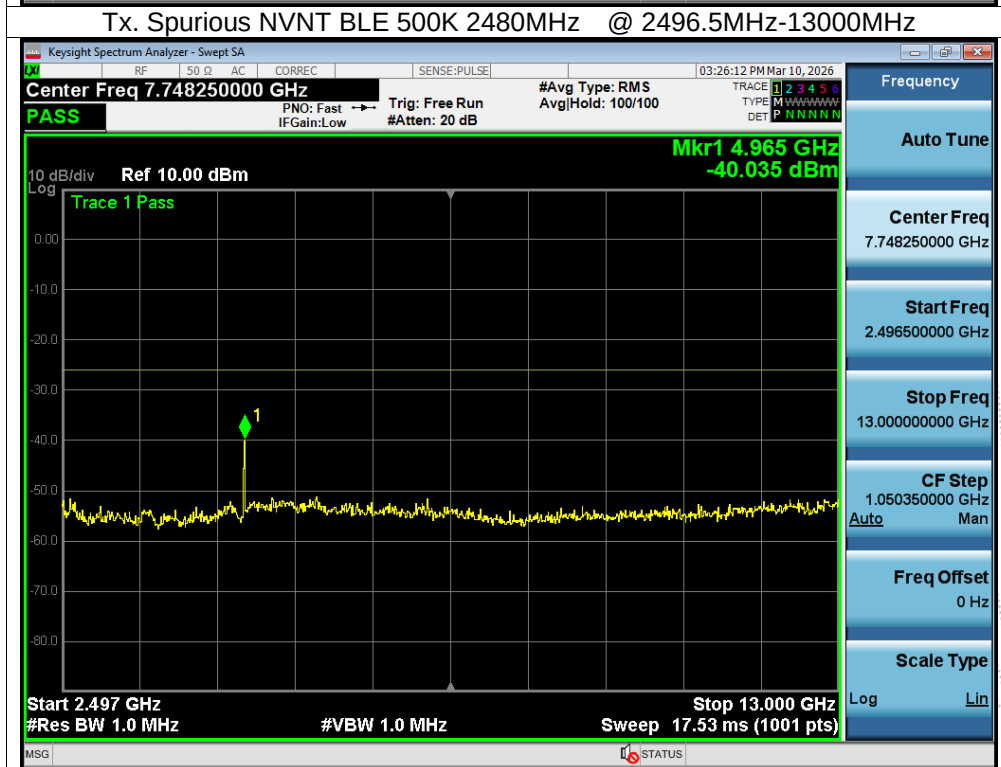
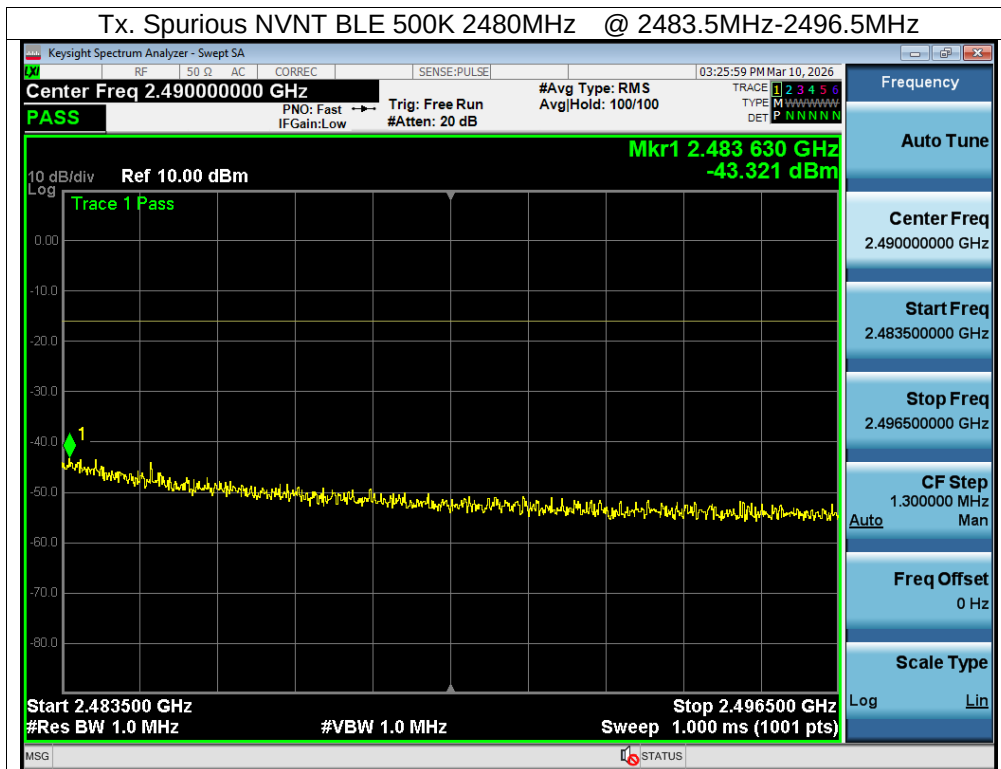






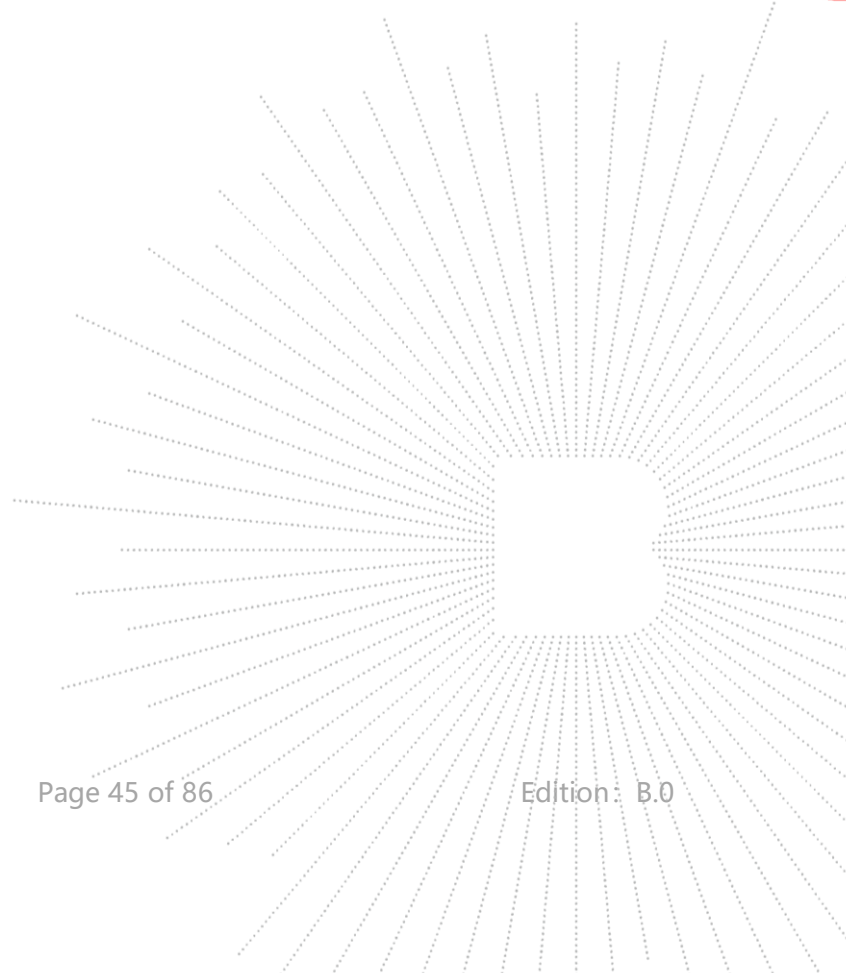


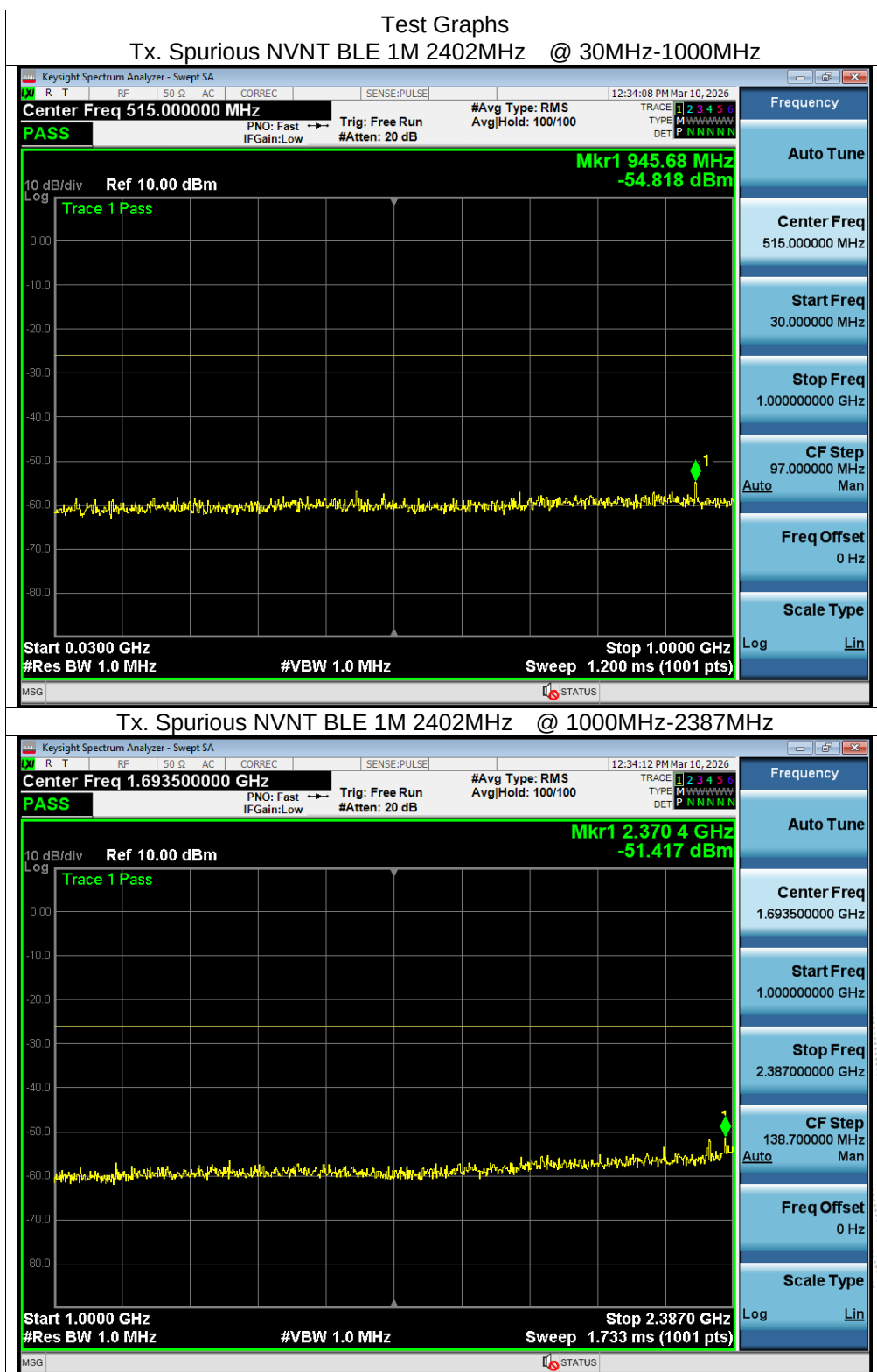


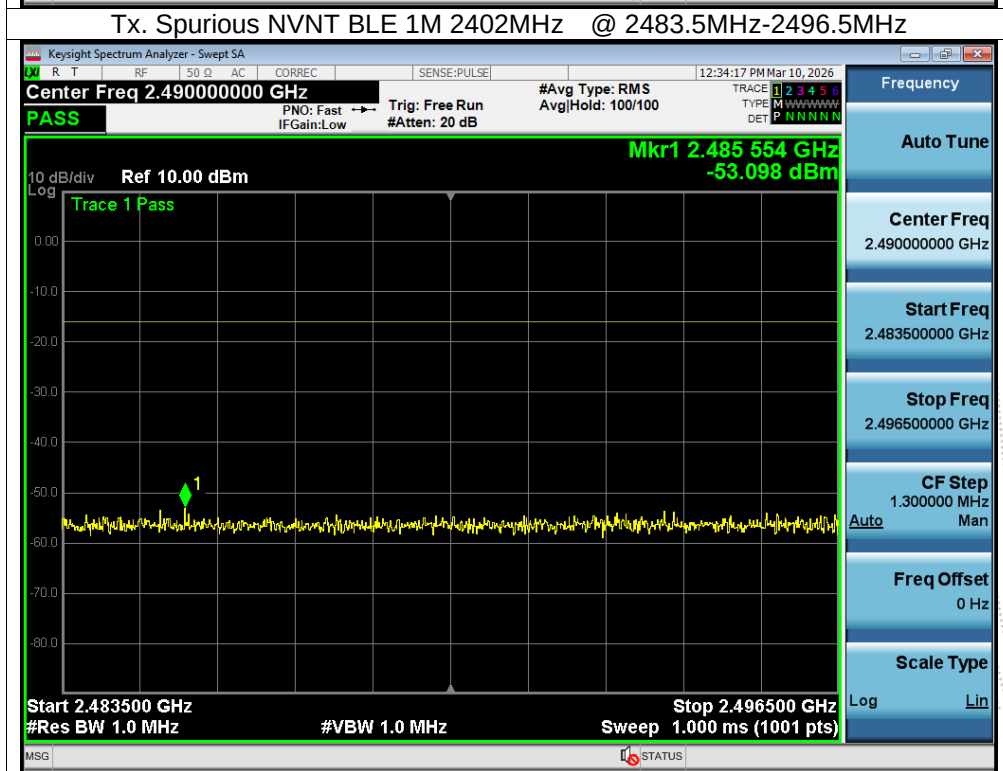
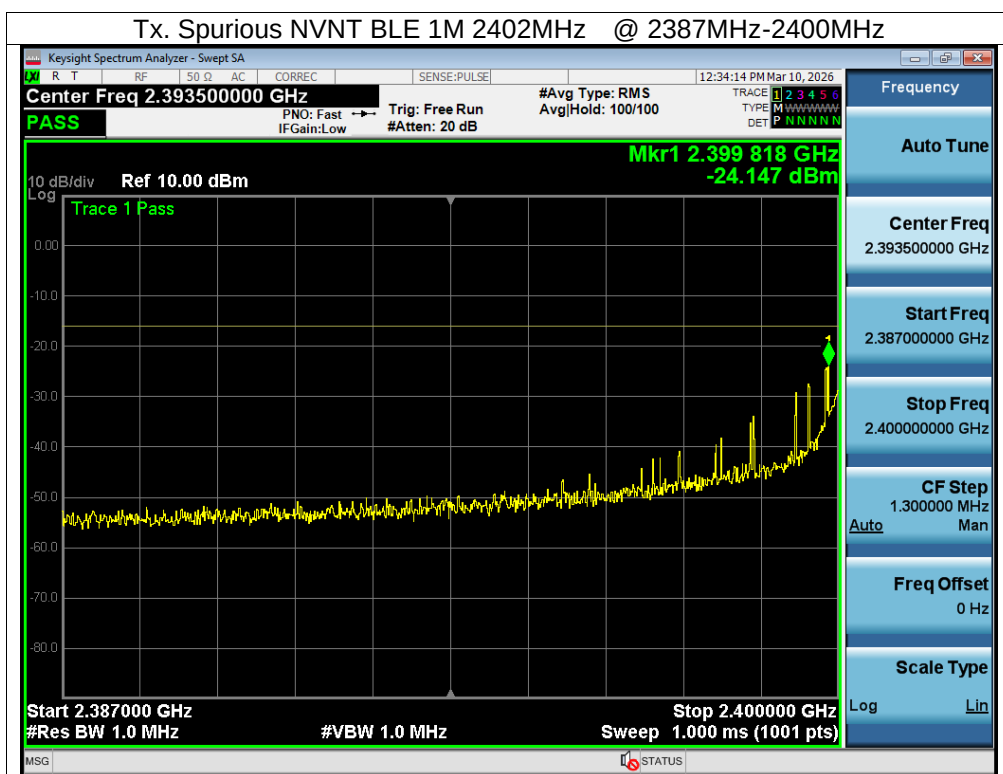


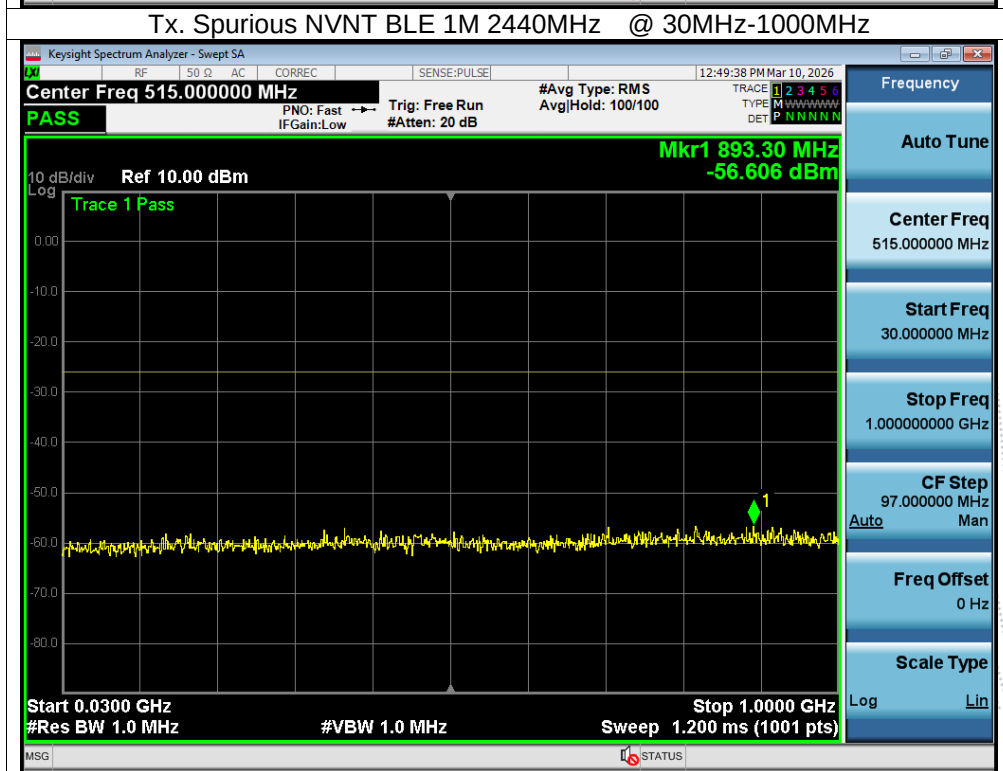
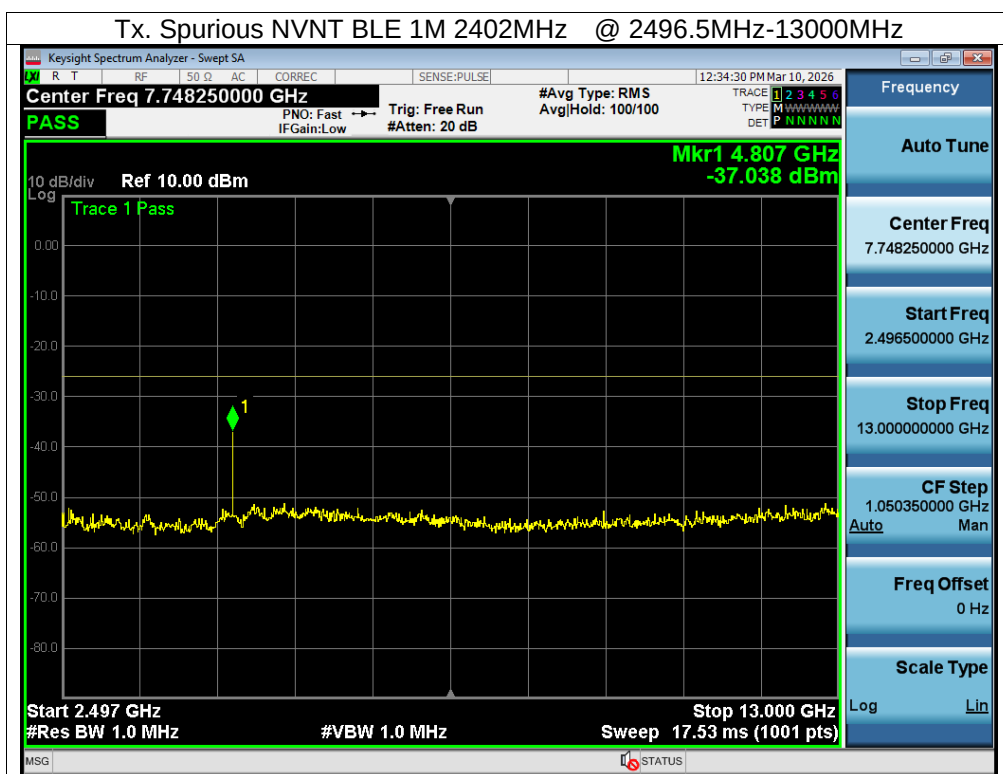
Mode	Frequency (MHz)	Range (MHz)	Emission Frequency (MHz)	Max Peak Value (dBm)	Max RMS Value (dBm)	Max Peak Value (uW)	Max RMS Value (uW)	Limit Start(uW)	Limit Stop (uW)	Verdict
BLE 1M	2402	30-1000	945.68	-54.81	NA	0.0033	NA	2.5	2.5	Pass
BLE 1M	2402	1000-2387	2370.36	-51.41	NA	0.0072	NA	2.5	2.5	Pass
BLE 1M	2402	2387-2400	2399.82	-24.14	NA	3.8548	NA	25	25	Pass
BLE 1M	2402	2483.5-2496.5	2485.55	-53.09	NA	0.0049	NA	25	25	Pass
BLE 1M	2402	2496.5-13000	4807.27	-37.03	NA	0.1982	NA	2.5	2.5	Pass
BLE 1M	2440	30-1000	893.30	-56.60	NA	0.0022	NA	2.5	2.5	Pass
BLE 1M	2440	1000-2387	2377.29	-52.88	NA	0.0052	NA	2.5	2.5	Pass
BLE 1M	2440	2387-2400	2392.85	-53.48	NA	0.0045	NA	25	25	Pass
BLE 1M	2440	2483.5-2496.5	2496.38	-52.31	NA	0.0059	NA	25	25	Pass
BLE 1M	2440	2496.5-13000	4880.79	-40.20	NA	0.0955	NA	2.5	2.5	Pass
BLE 1M	2480	30-1000	827.34	-55.28	NA	0.003	NA	2.5	2.5	Pass
BLE 1M	2480	1000-2387	2353.71	-51.69	NA	0.0068	NA	2.5	2.5	Pass
BLE 1M	2480	2387-2400	2390.50	-54.27	NA	0.0037	NA	25	25	Pass
BLE 1M	2480	2483.5-2496.5	2483.76	-37.76	NA	0.1675	NA	25	25	Pass
BLE 1M	2480	2496.5-13000	4964.82	-40.20	NA	0.0955	NA	2.5	2.5	Pass
BLE 2M	2402	30-1000	730.34	-55.71	NA	0.0027	NA	2.5	2.5	Pass
BLE 2M	2402	1000-2387	2339.84	-52.58	NA	0.0055	NA	2.5	2.5	Pass
BLE 2M	2402	2387-2400	2400.00	-14.63	-19.54	34.435	11.1173	25	25	Pass
BLE 2M	2402	2483.5-2496.5	2488.27	-53.18	NA	0.0048	NA	25	25	Pass
BLE 2M	2402	2496.5-13000	4807.27	-37.30	NA	0.1862	NA	2.5	2.5	Pass
BLE 2M	2440	30-1000	839.95	-56.86	NA	0.0021	NA	2.5	2.5	Pass
BLE 2M	2440	1000-2387	2248.30	-52.62	NA	0.0055	NA	2.5	2.5	Pass
BLE 2M	2440	2387-2400	2392.34	-52.20	NA	0.006	NA	25	25	Pass
BLE 2M	2440	2483.5-2496.5	2493.77	-52.11	NA	0.0062	NA	25	25	Pass
BLE 2M	2440	2496.5-13000	4880.79	-40.28	NA	0.0938	NA	2.5	2.5	Pass
BLE 2M	2480	30-1000	706.09	-50.39	NA	0.0091	NA	2.5	2.5	Pass
BLE	2480	1000-2387	2353.71	-53.39	NA	0.0046	NA	2.5	2.5	Pass

2M										
BLE 2M	2480	2387-2400	2392.25	-53.49	NA	0.0045	NA	25	25	Pass
BLE 2M	2480	2483.5-2496.5	2483.68	-37.89	NA	0.1626	NA	25	25	Pass
BLE 2M	2480	2496.5-13000	4964.82	-40.34	NA	0.0925	NA	2.5	2.5	Pass

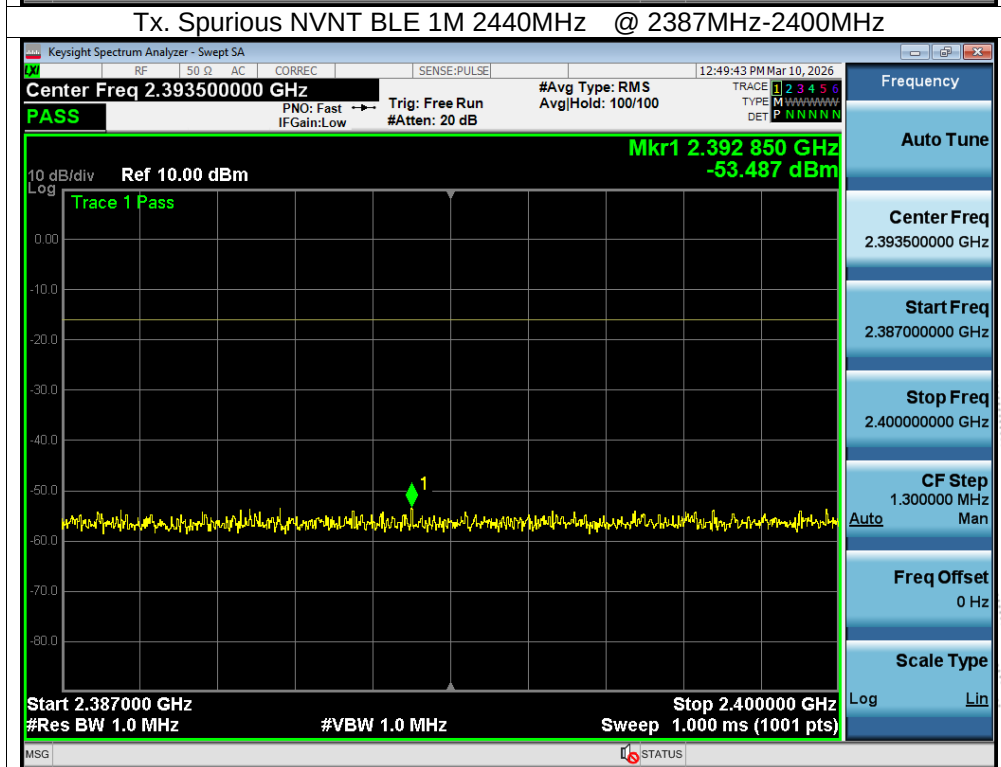
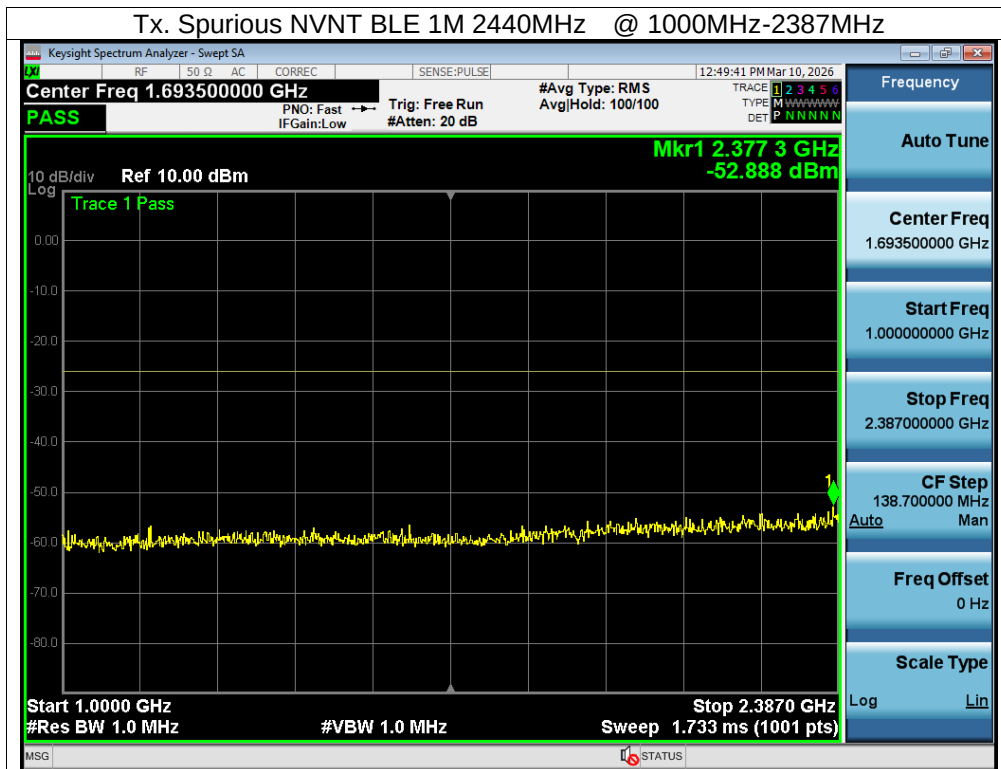


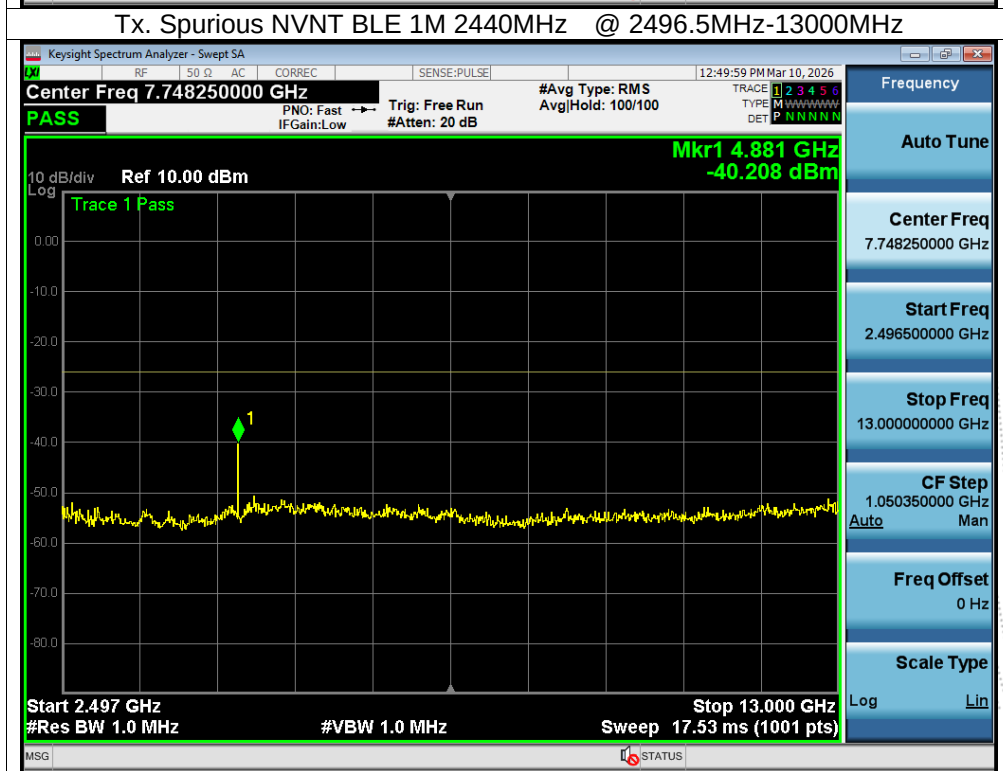
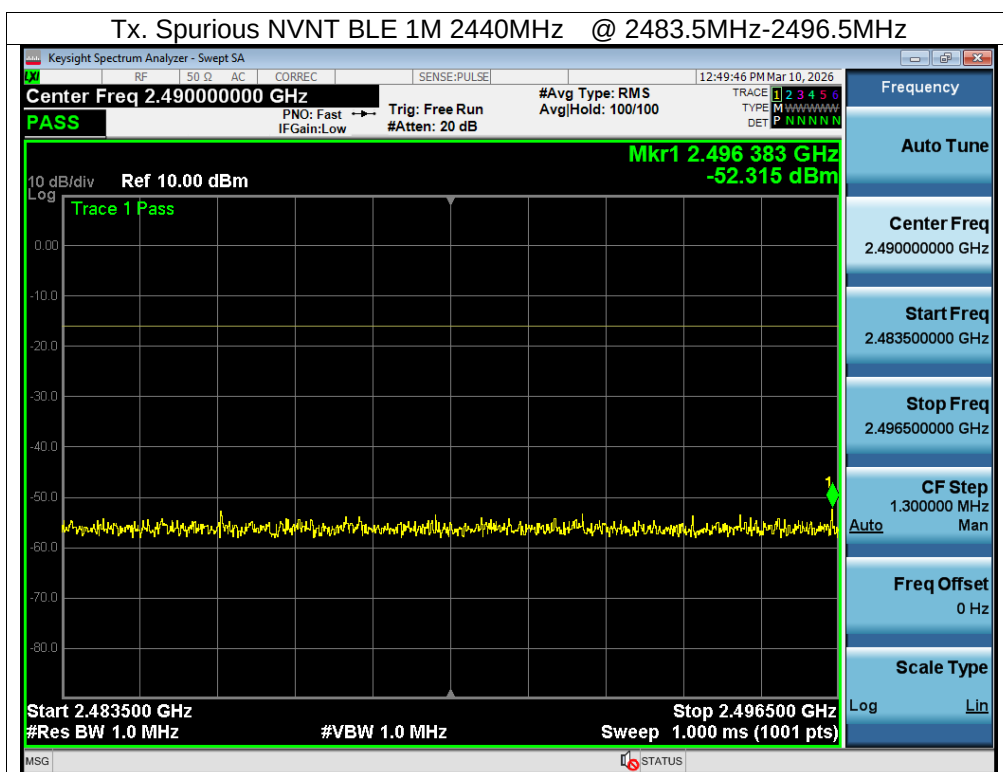


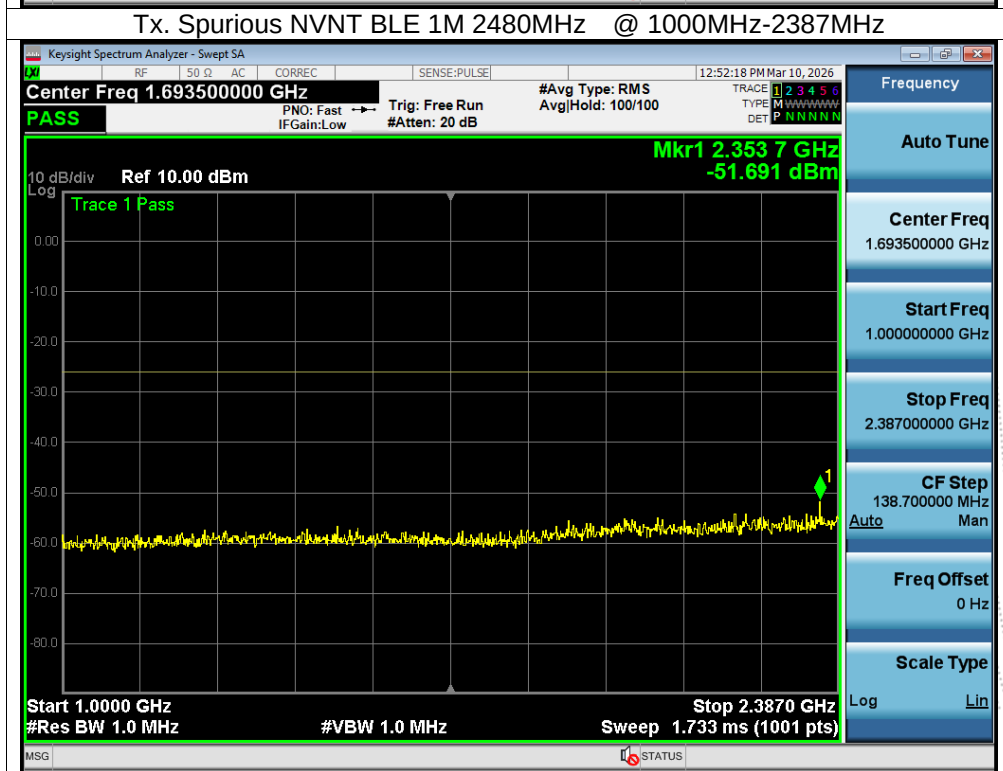
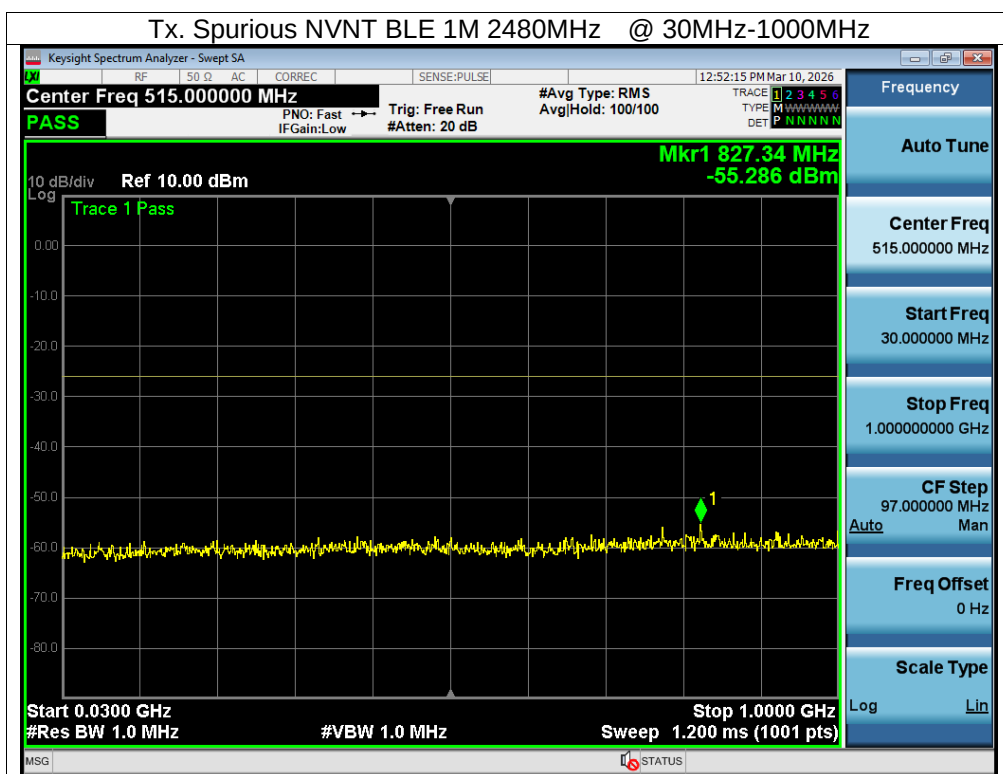


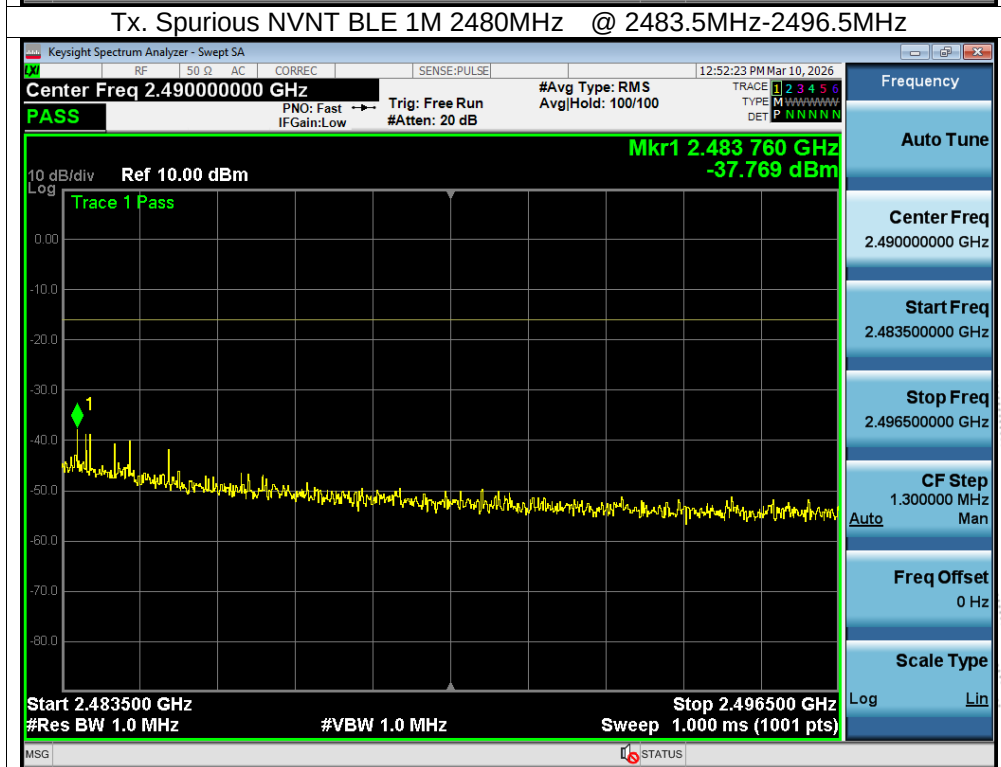
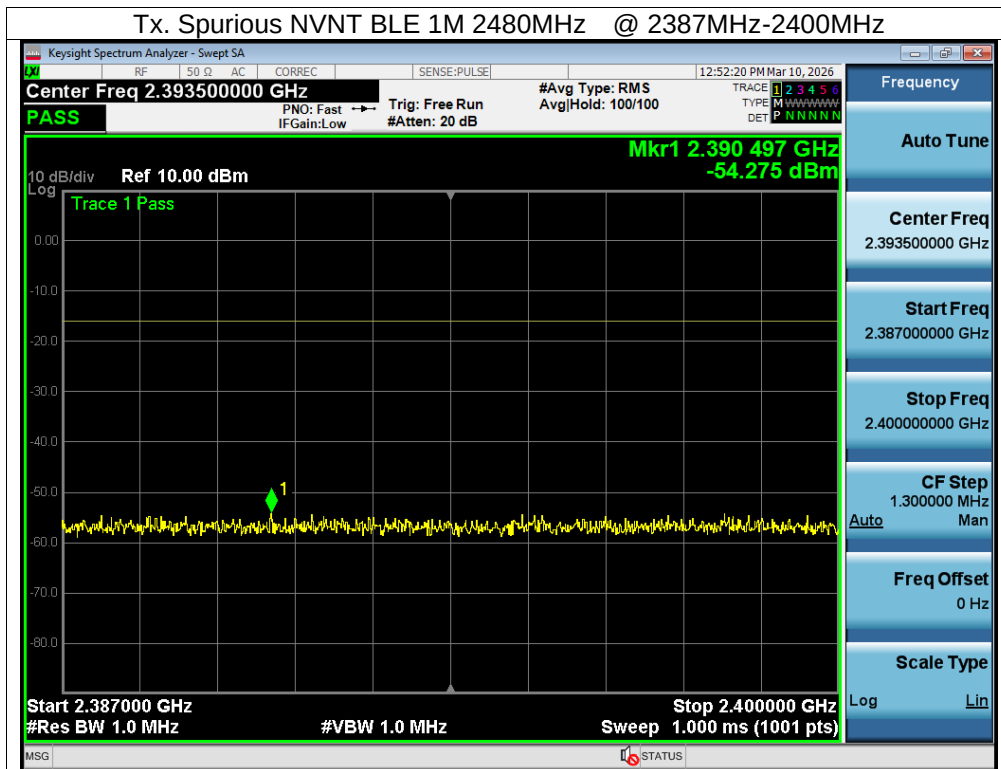


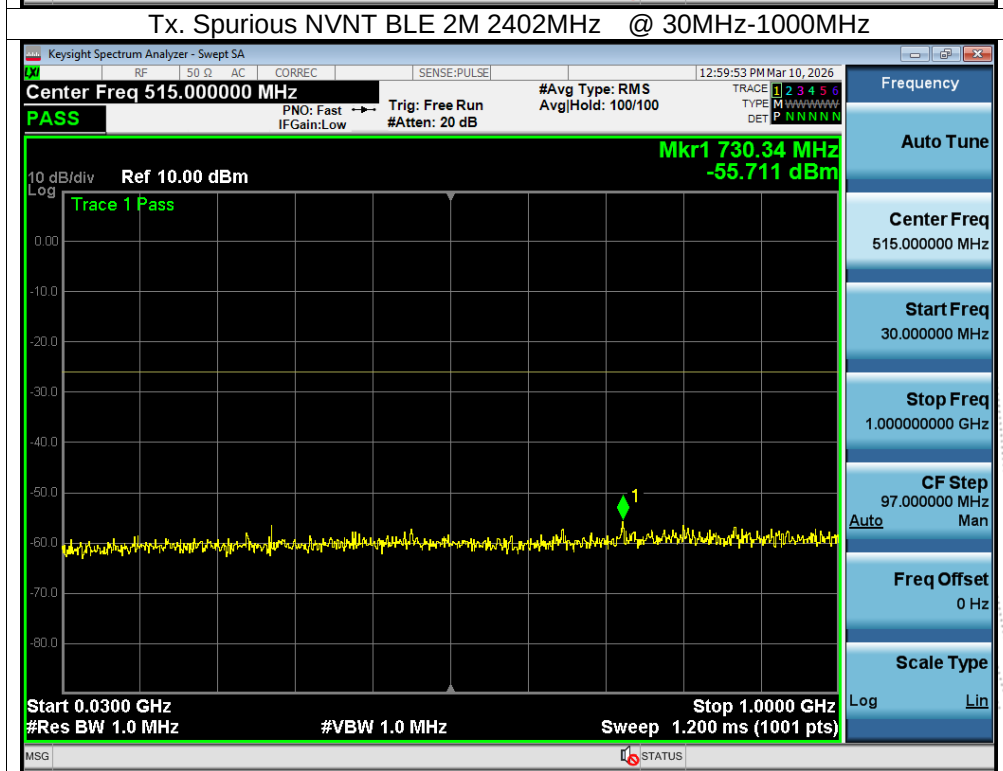
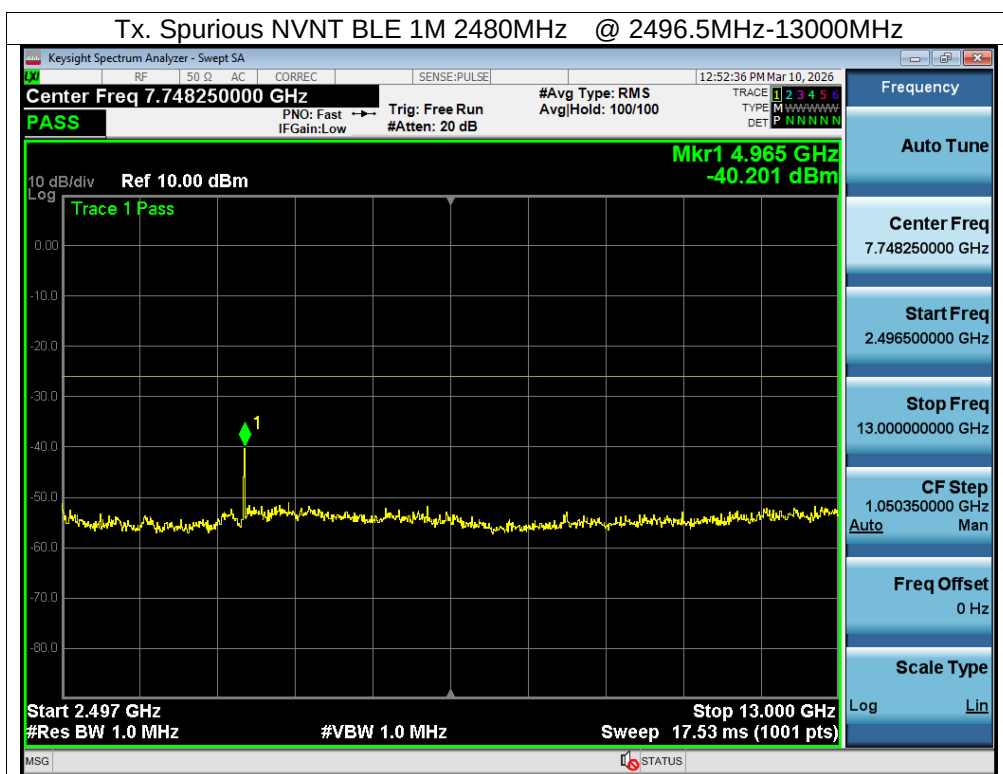
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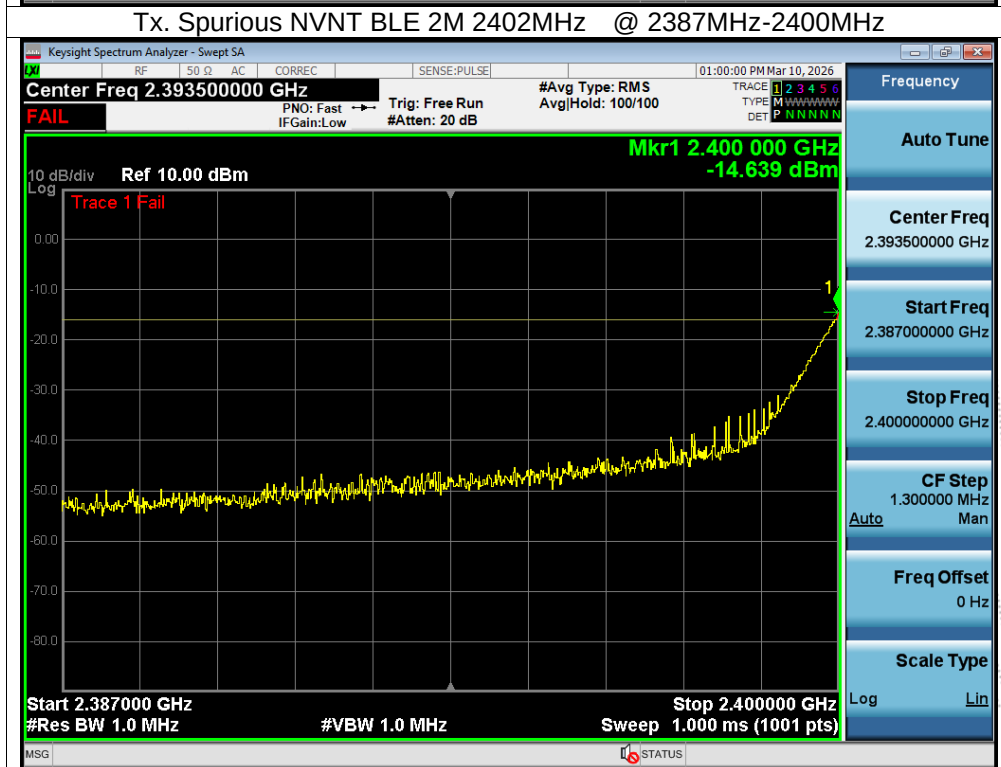
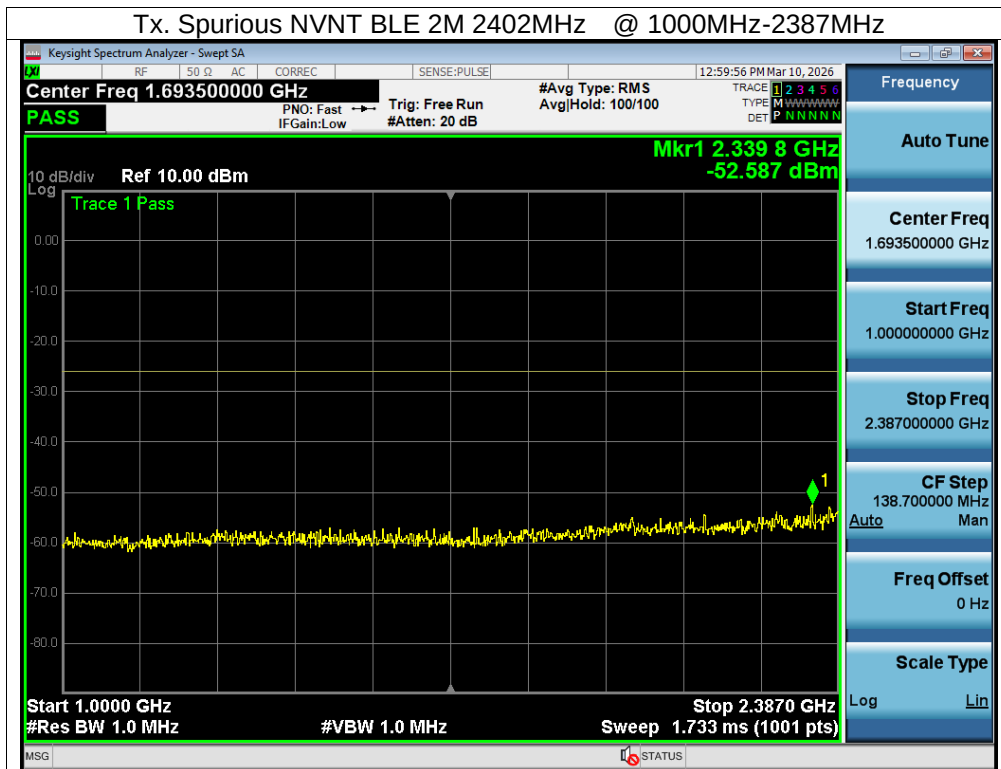


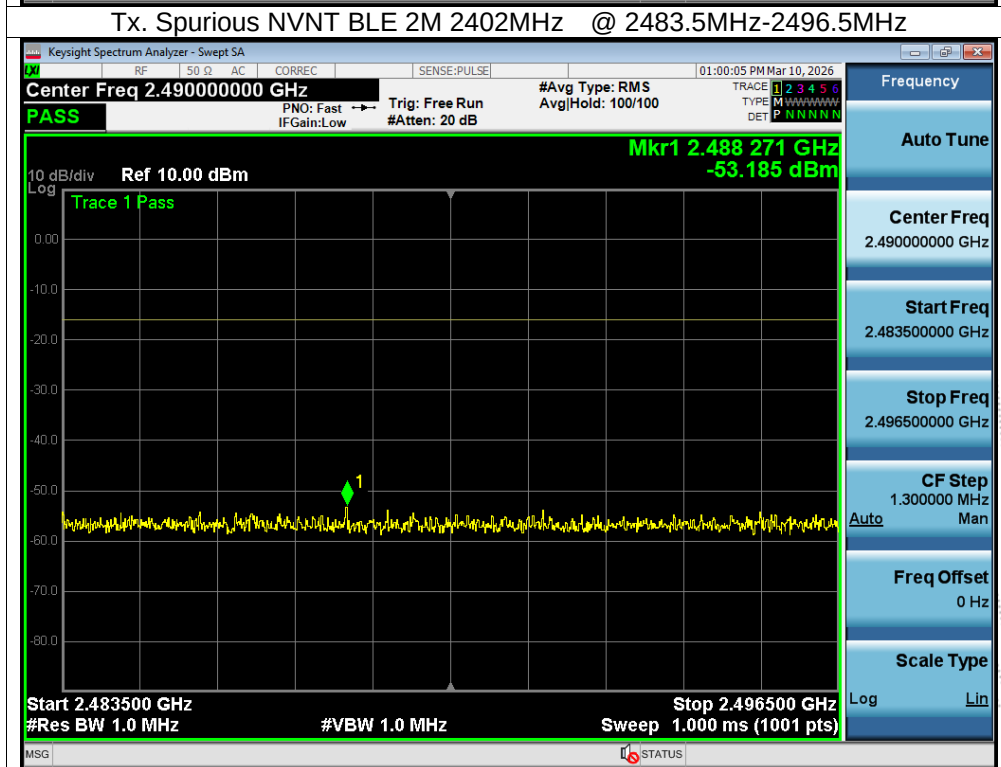
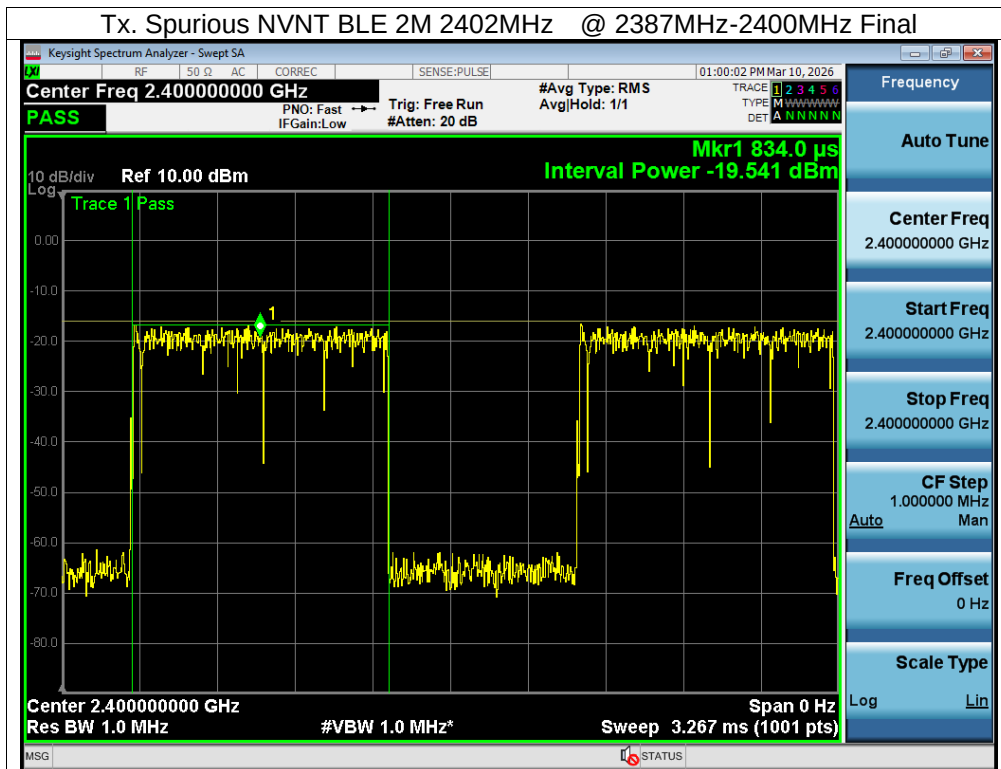


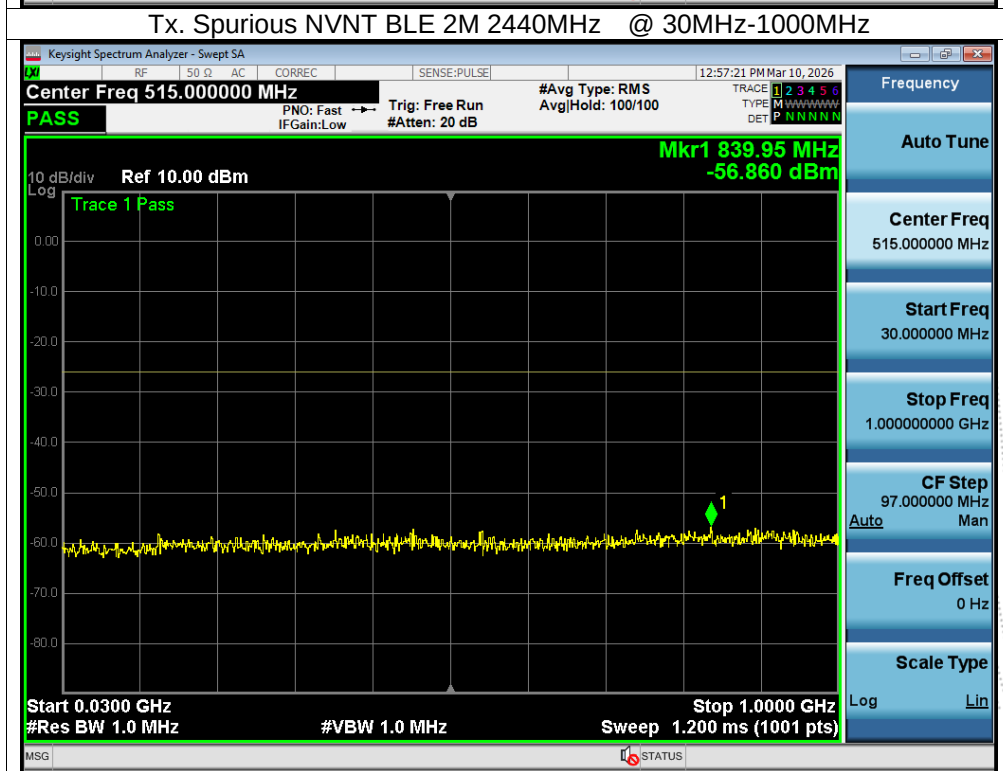
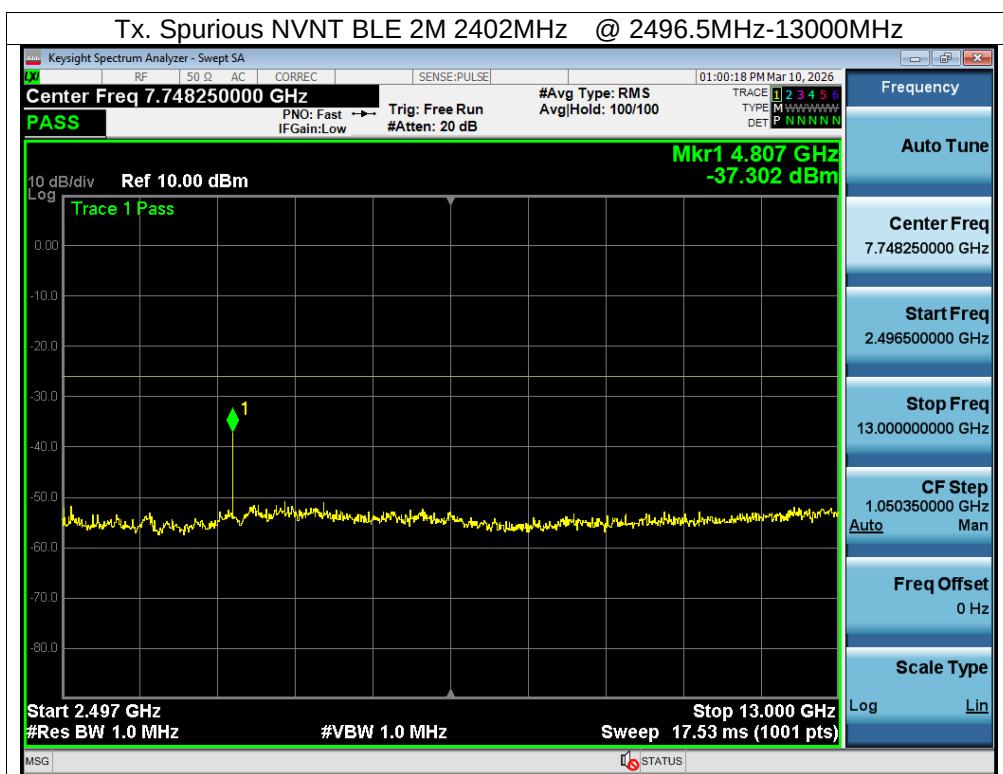


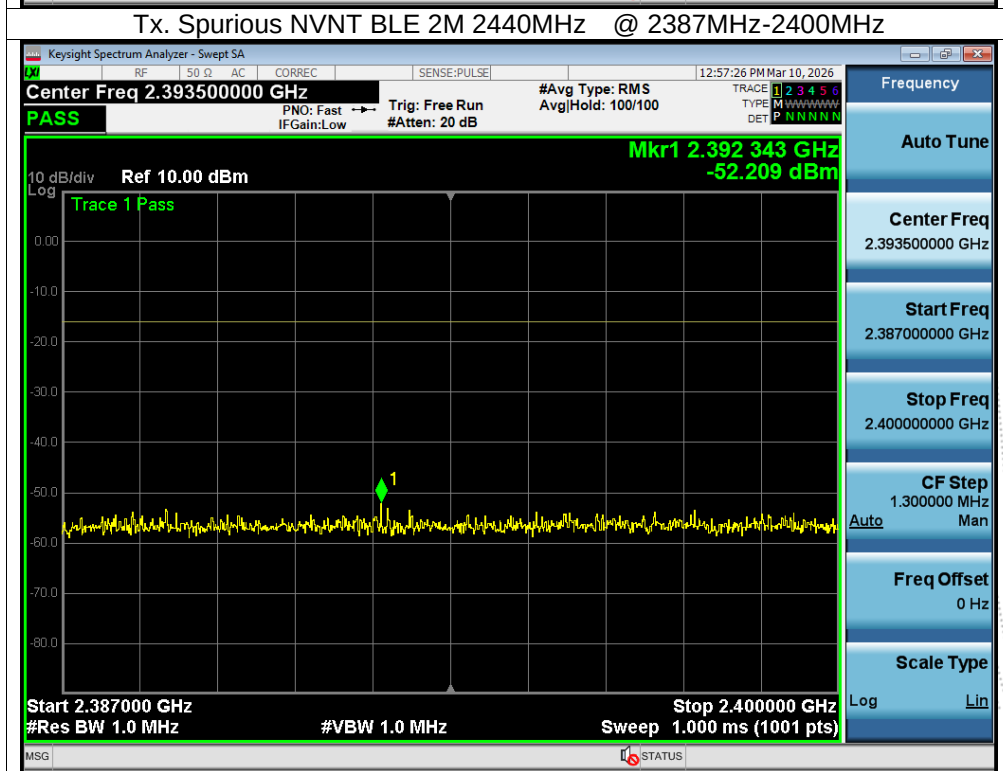
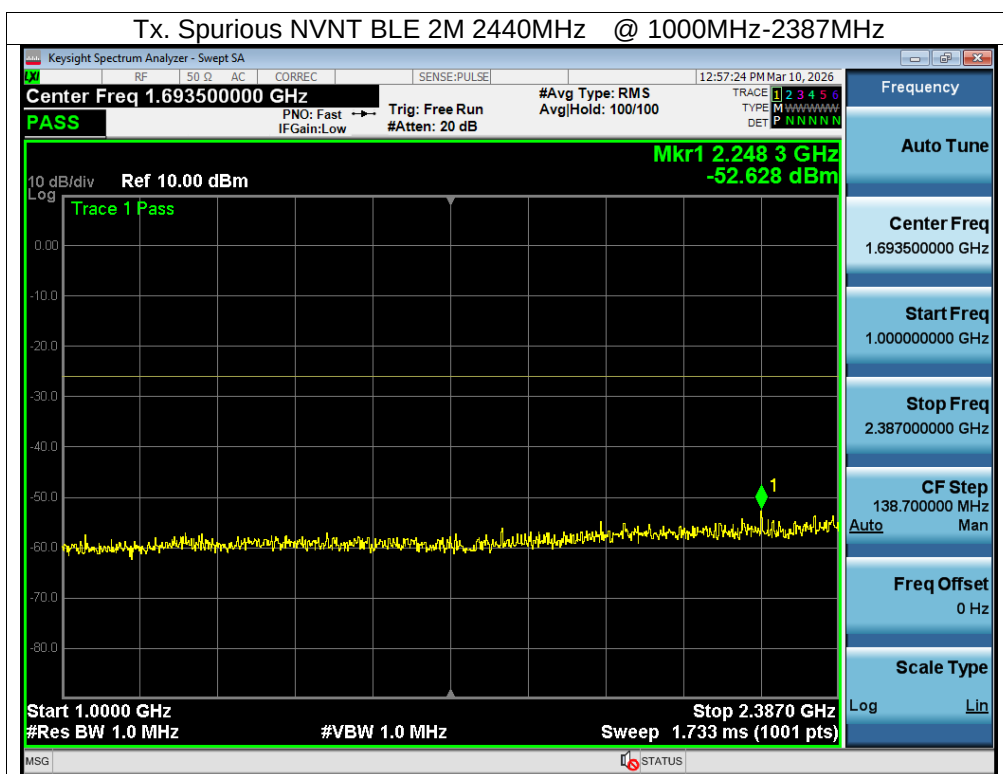


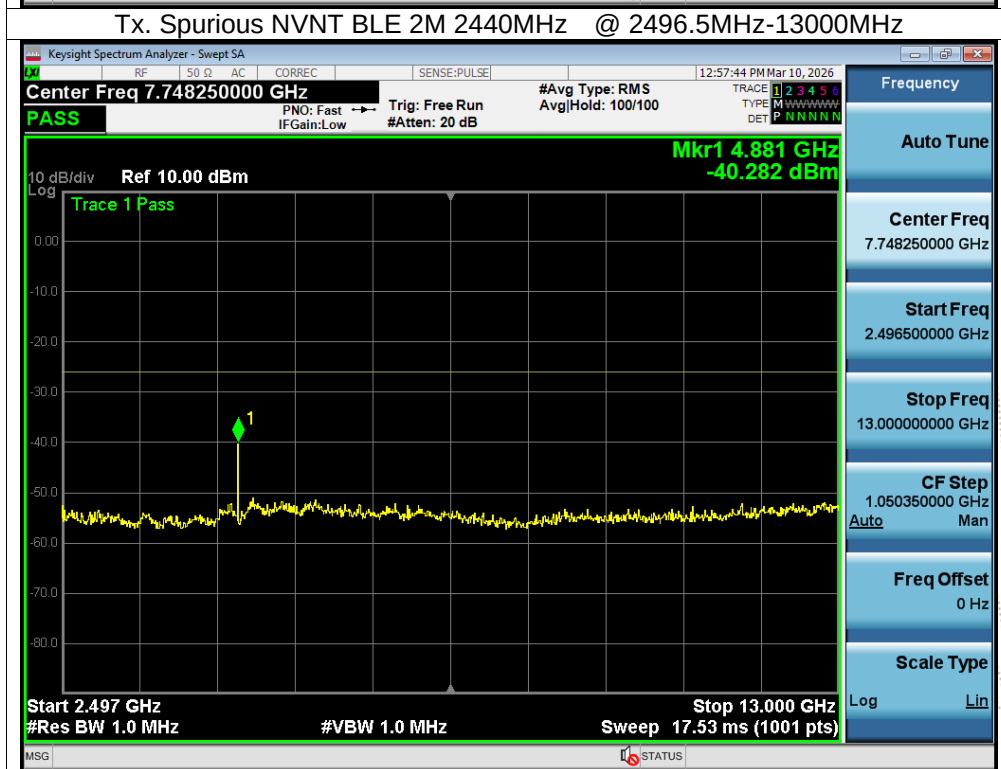
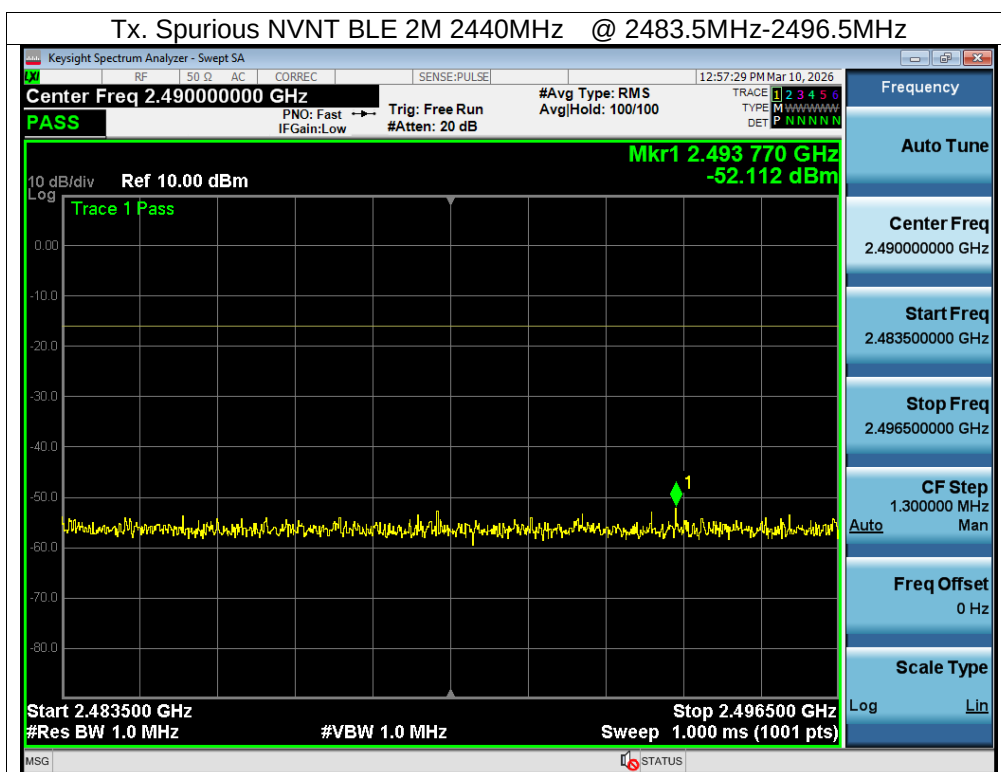


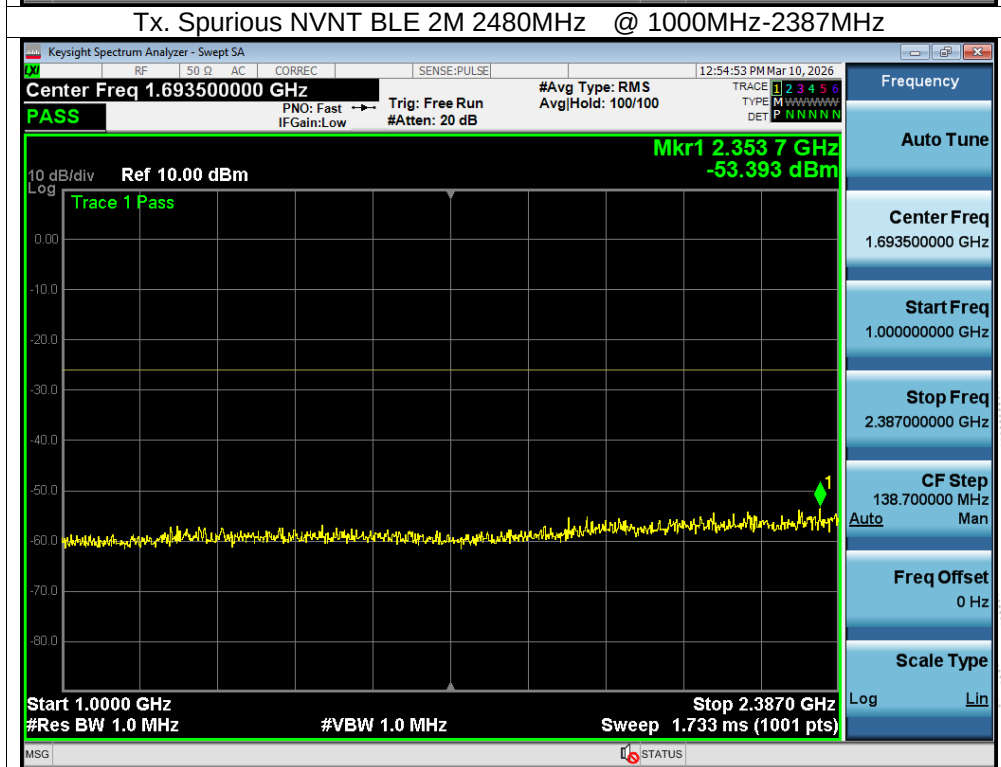
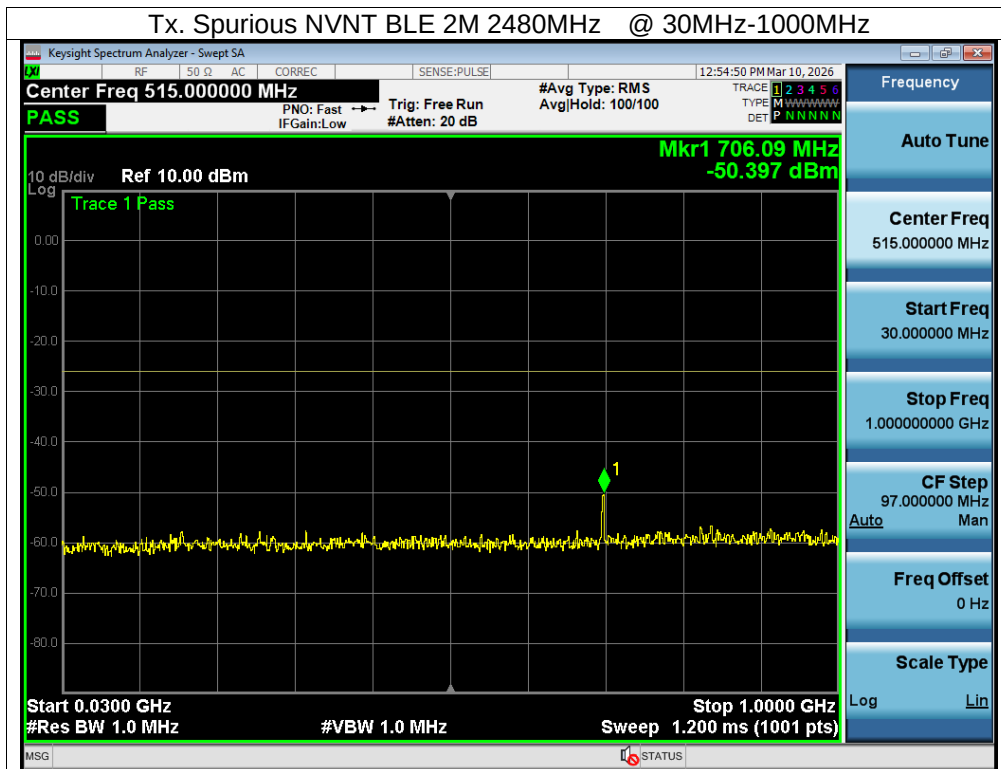


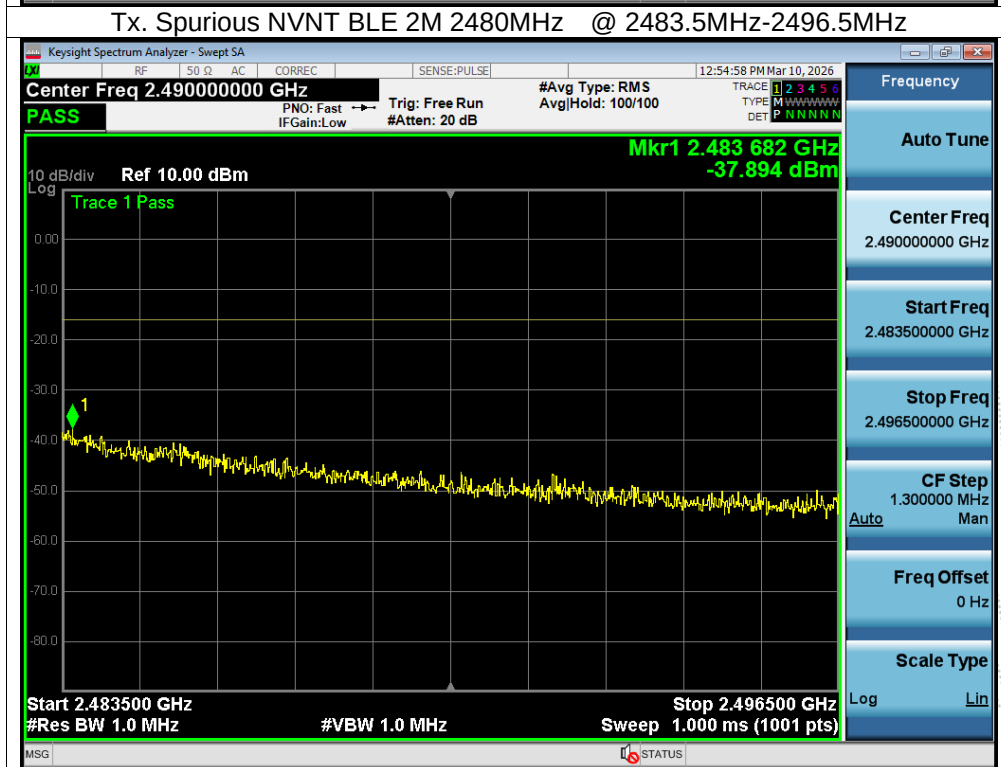
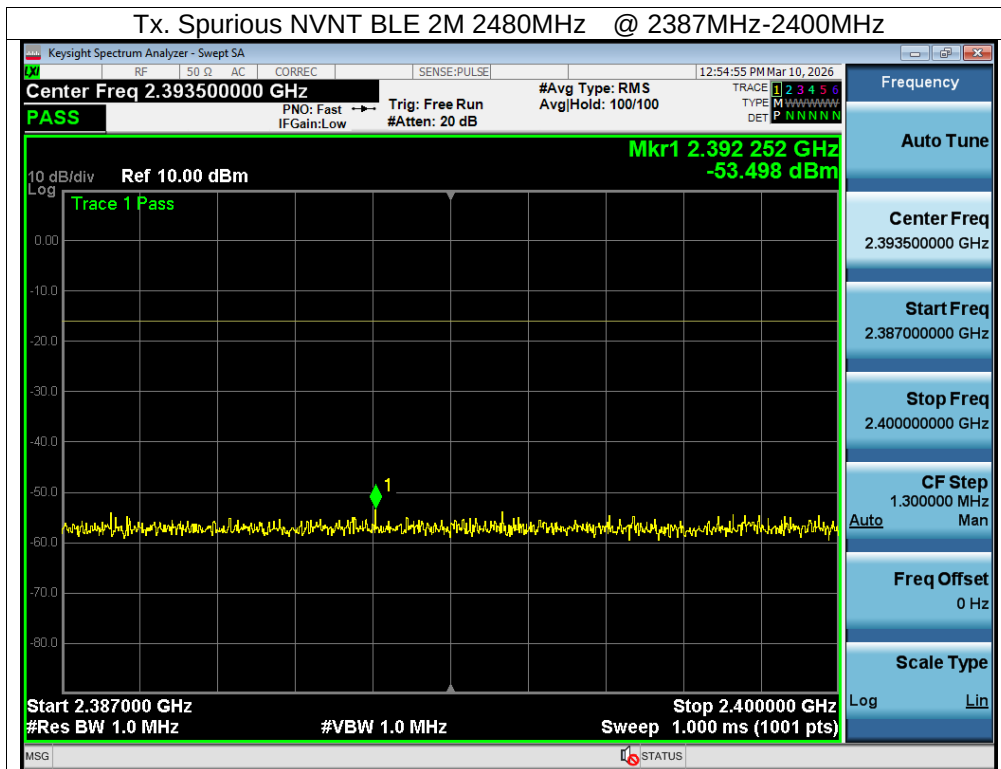


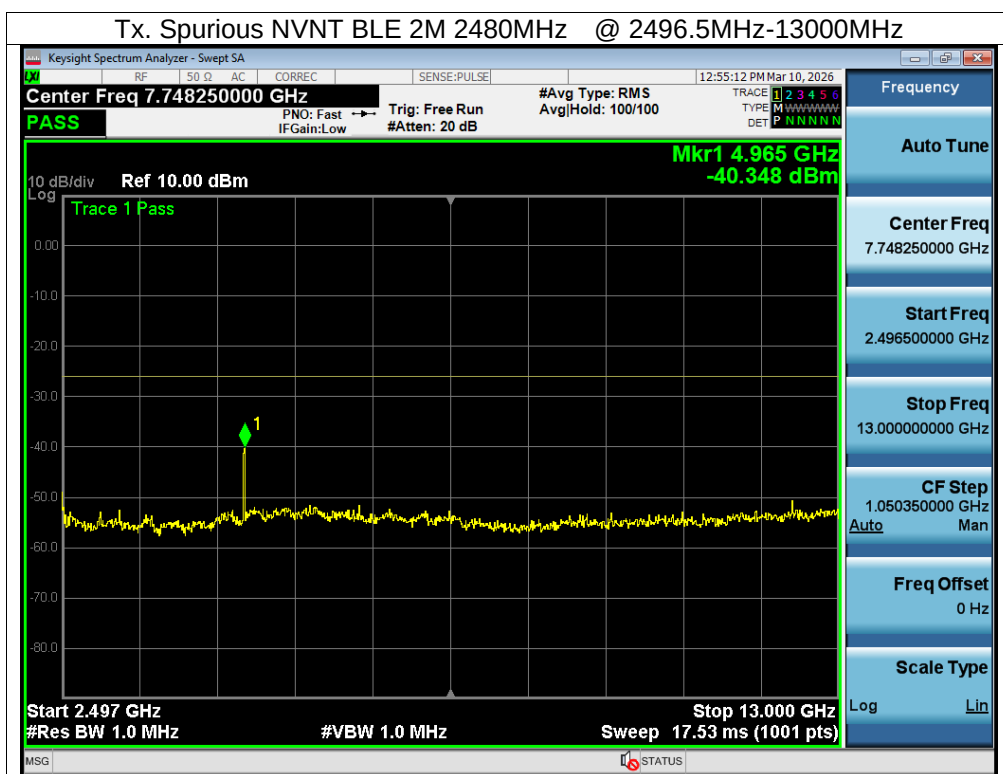






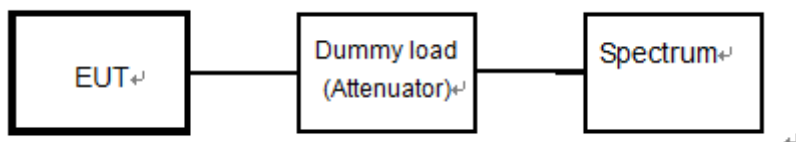






11. Imitation Of Collateral Emission Of Receiver Measurement

11.1 Block Diagram Of Test Setup



11.2 Limit

Item	Limits
RX Spurious Emission:	$\leq 4\text{nW}$ ($f < 1\text{GHz}$)
	$\leq 20\text{nW}$ ($1\text{GHz} \leq f$)

11.3 Measuring Instruments And Setting

Please refer to section 5 in this report. The following table is the setting of Spectrum Analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
RB	100 kHz (below 1GHz emissions) 1 MHz (above 1GHz emissions)
VB	100 kHz (below 1GHz emissions) 1 MHz (above 1GHz emissions)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

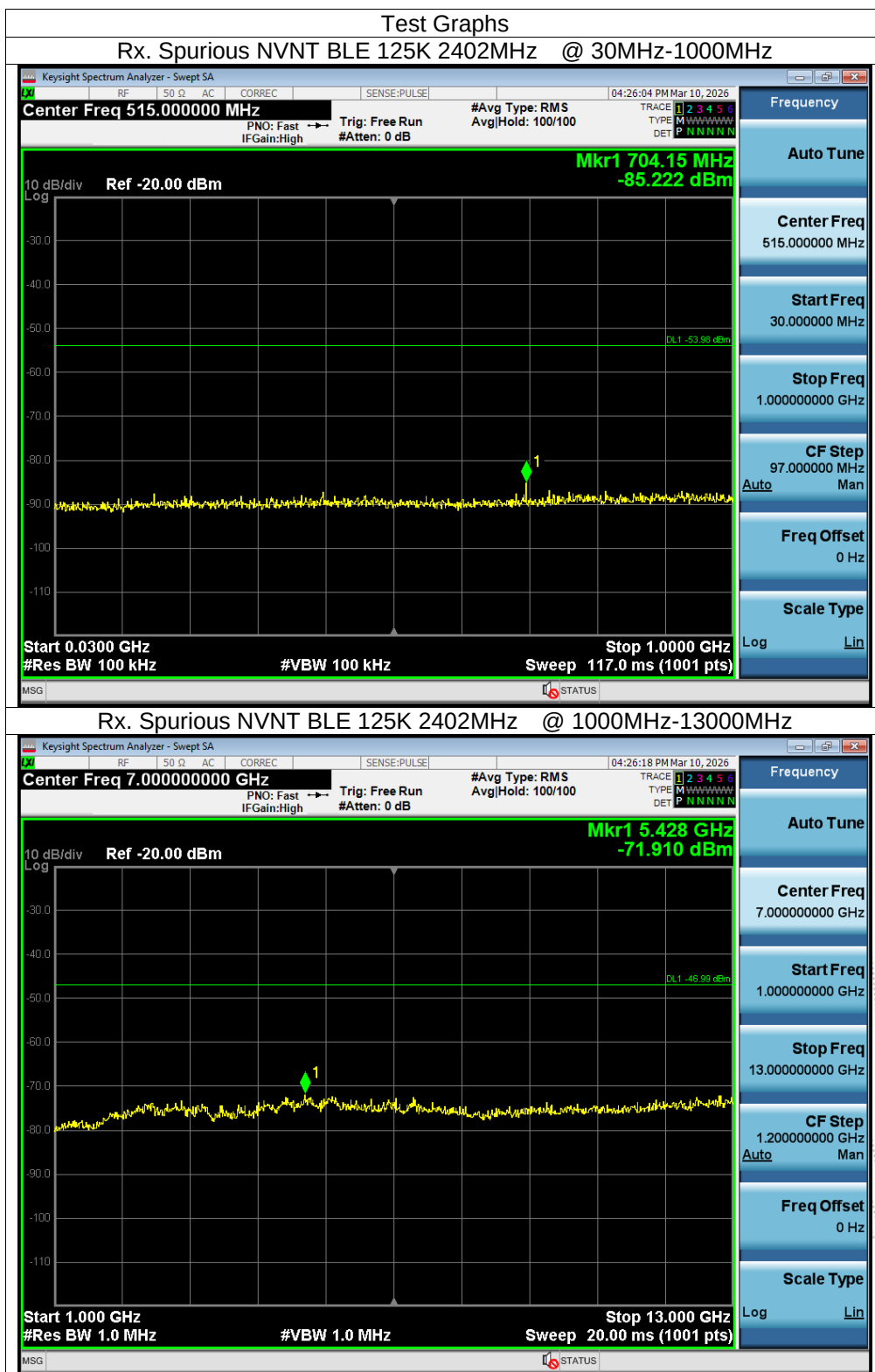
11.4 Test procedure

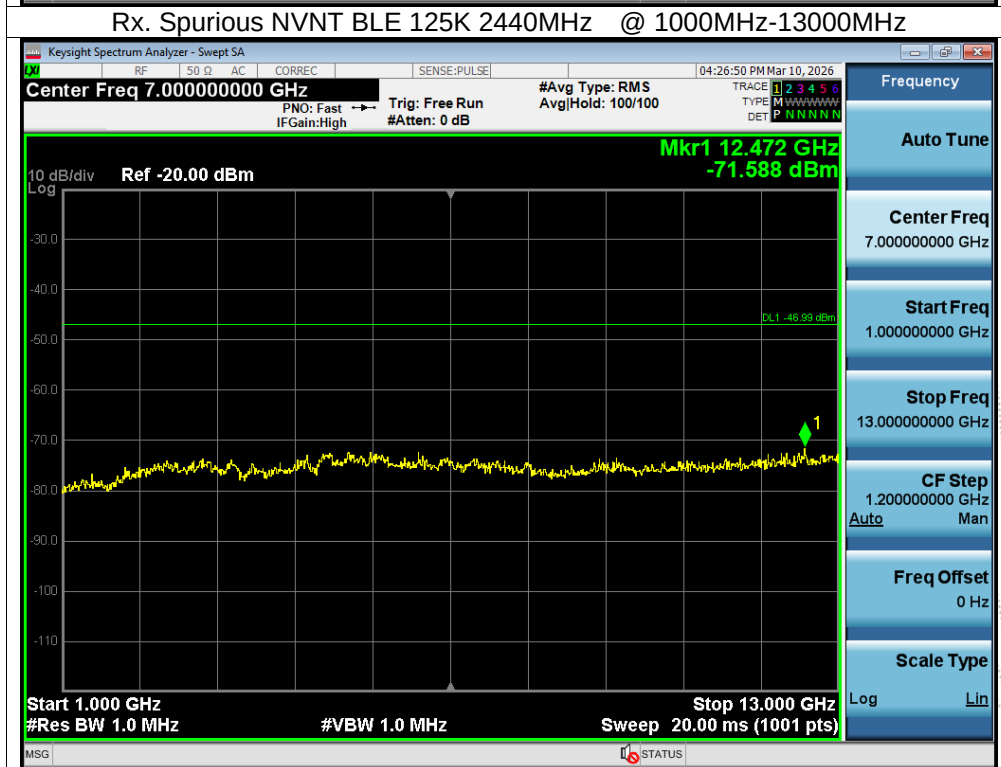
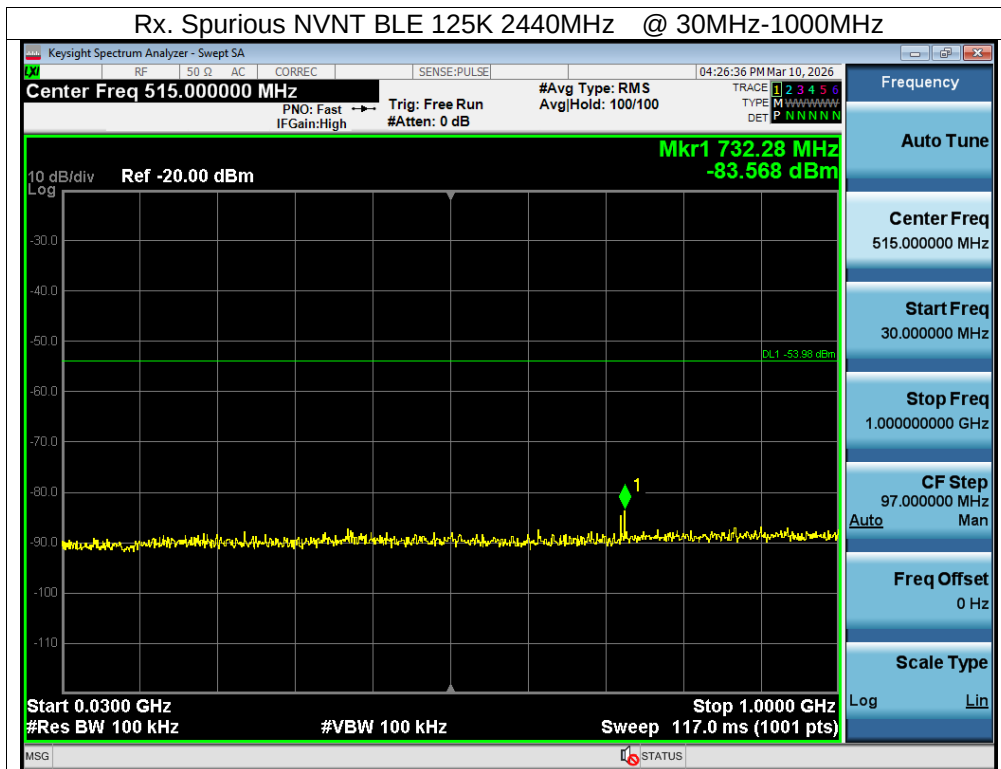
1. EUT have the continuous reception mode and fixed only one channelize.
2. Setting of SA is following as RB / VB: 100 kHz (below 1GHz emissions) / 1 MHz (above 1GHz emissions) / AT: 6dB / Ref: -20dBm / Sweep time: Auto / Sweep Mode: Continuous sweep / Detect mode: Positive peak / Trace mode: Max hold
3. SA set RB: 100kHz and VB: 100kHz. Then adjust to start frequency 30MHz and stop frequency 1000MHz. Search to mark peak reading value + cable loss shall be less than 4nW
4. SA set RB: 1MHz and VB: 1MHz. Then adjust to start frequency 1000MHz and stop frequency 12500MHz. Search to mark peak reading value + cable loss shall be less than 20nW
5. If power level of lower emissions are more than 1/10 of limit (0.4nW for $f < 1\text{GHz}$, 2nW for $f \geq 1\text{GHz}$), all those are to be indicated in the 2nd and 3rd lines. If others are 1/10 or less more of the limit, no necessary to be indicated.

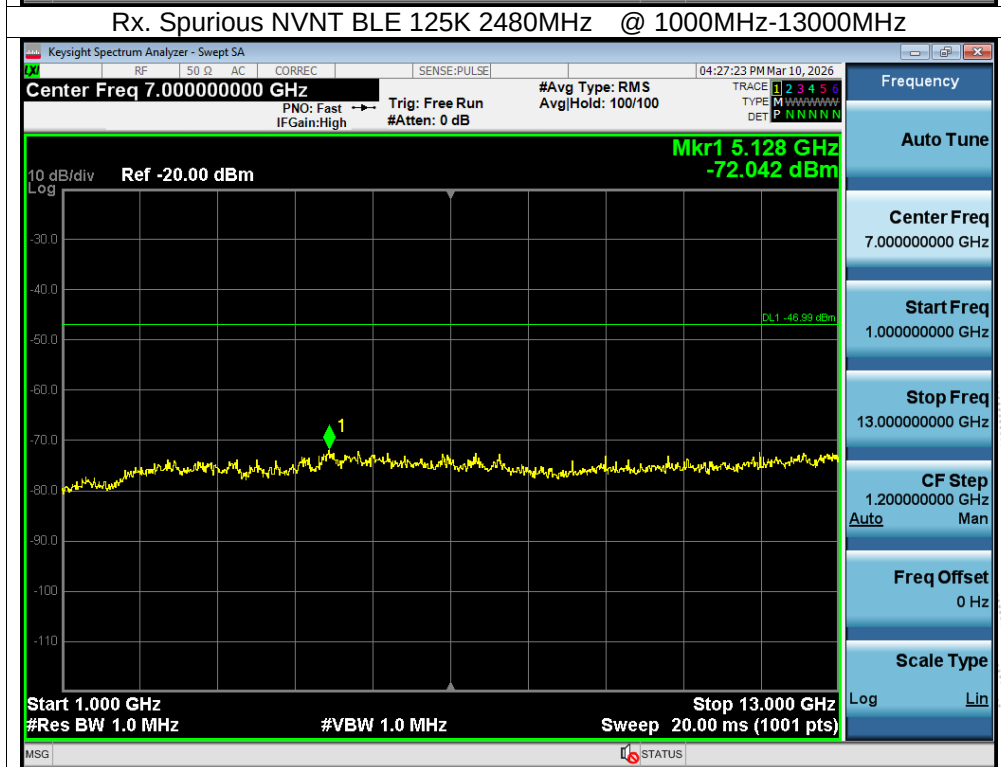
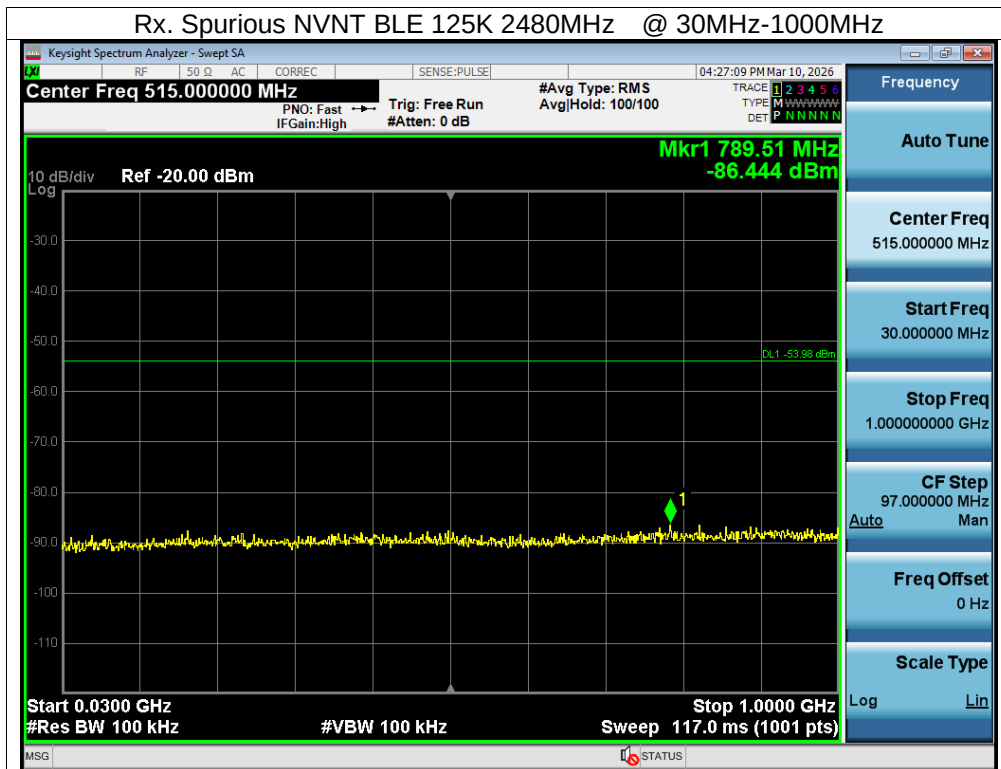
11.5 Test Result

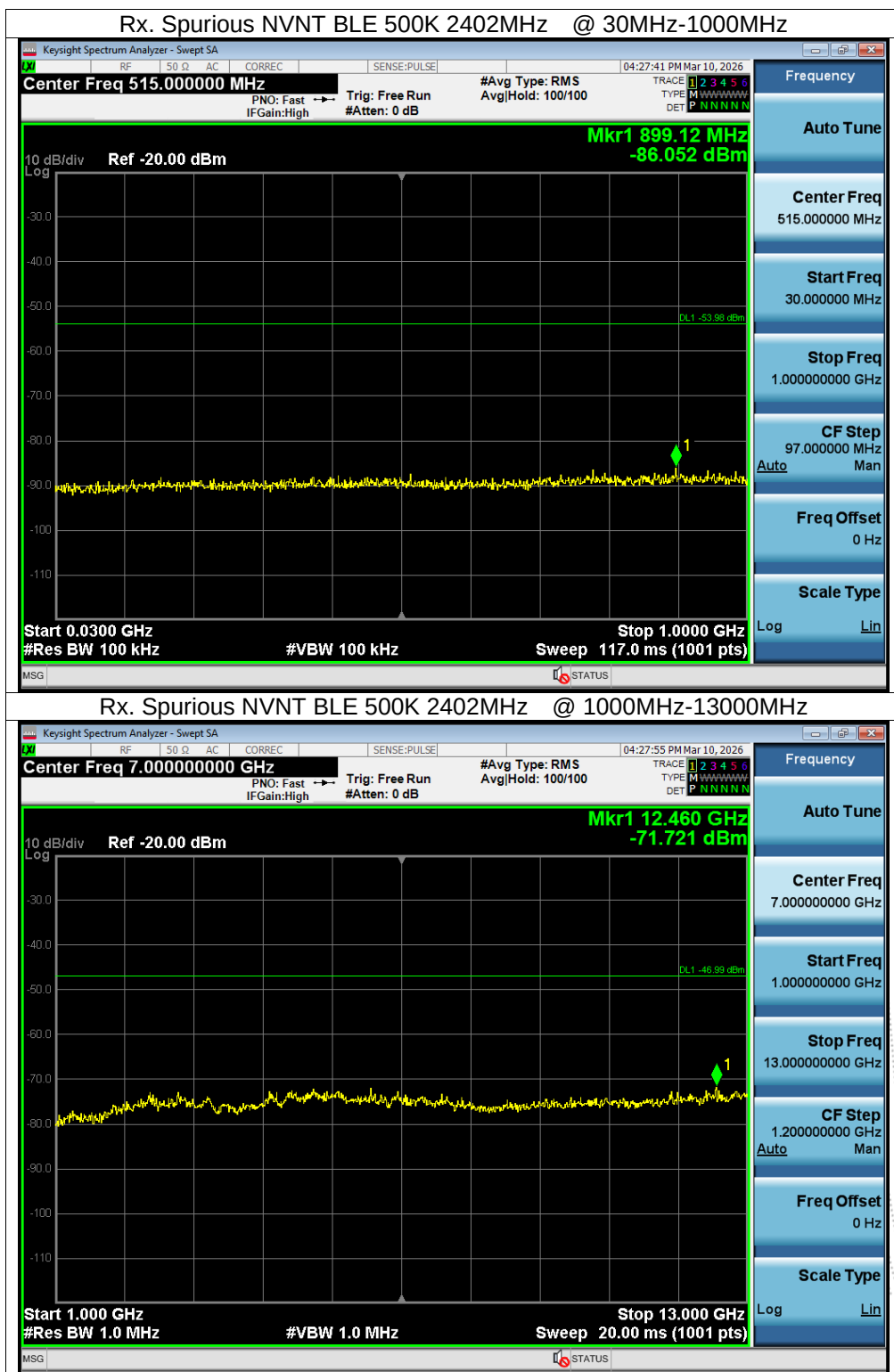
Temperature:	26°C		
Humidity:	54% RH	Test Voltage	DC 3.3V
Operation Mode:	GFSK Normal Voltage		

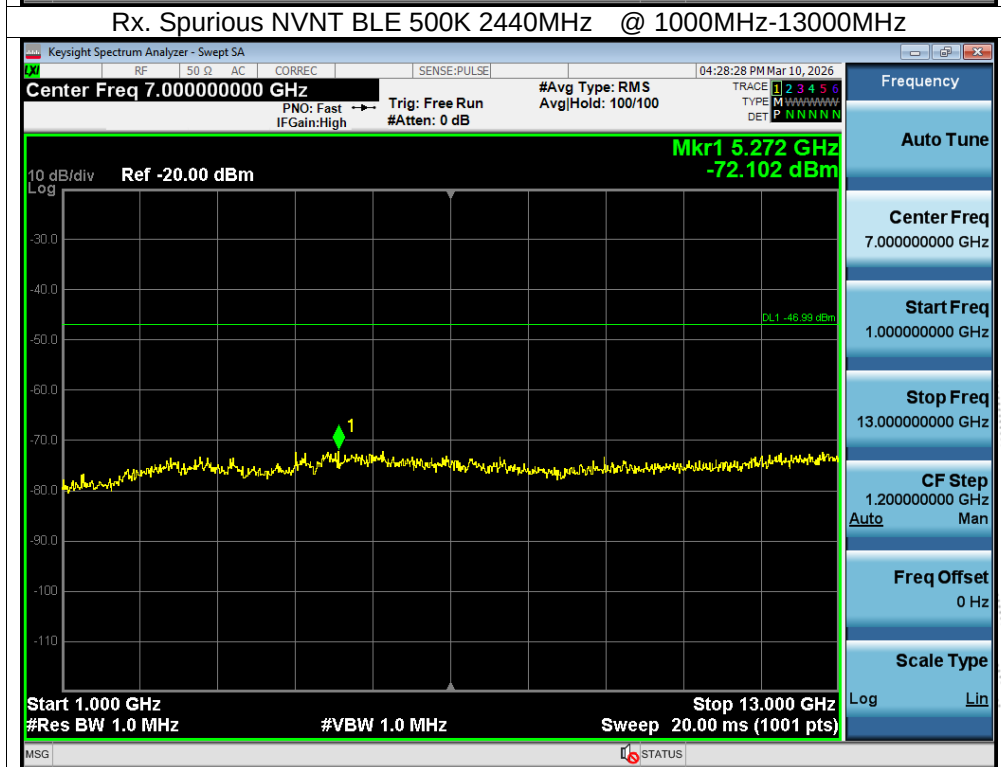
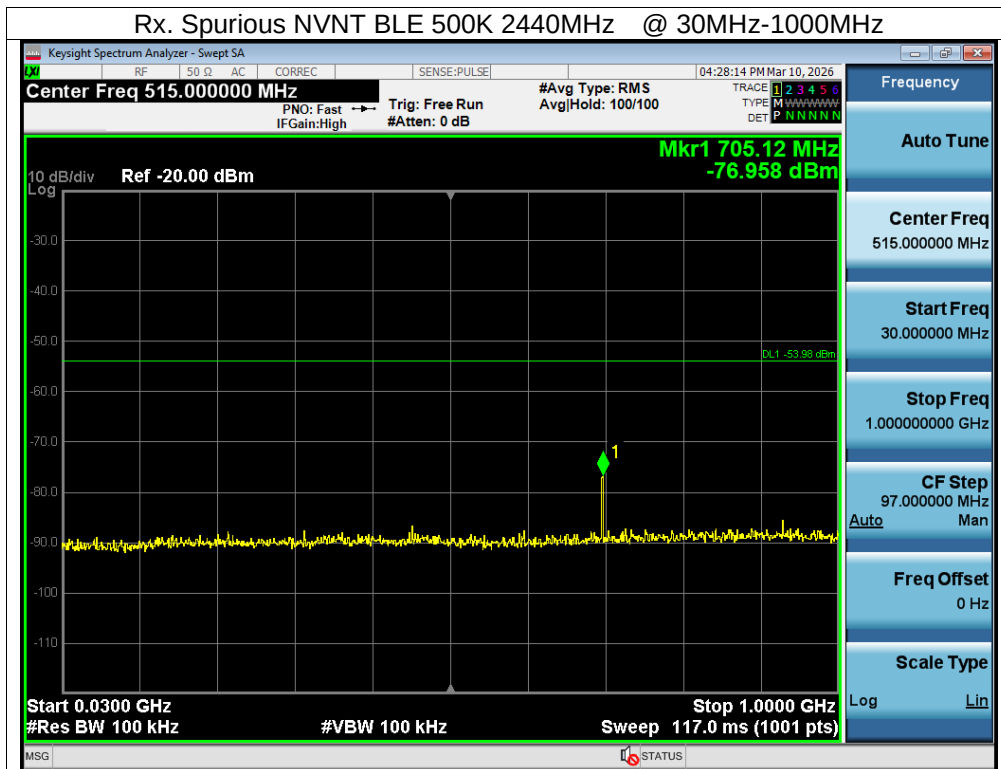
Mode	Frequency (MHz)	Range (MHz)	Emission Frequency (MHz)	Max Peak Value (dBm)	Max RMS Value (dBm)	Max Peak Value (nW)	Max RMS Value (nW)	Limit (nW)	Verdict
BLE 125K	2402	30-1000	704.15	-85.22	NA	0.003	NA	4	Pass
BLE 125K	2402	1000-13000	5428.00	-71.91	NA	0.0644	NA	20	Pass
BLE 125K	2440	30-1000	732.28	-83.57	NA	0.0044	NA	4	Pass
BLE 125K	2440	1000-13000	12472.00	-71.59	NA	0.0693	NA	20	Pass
BLE 125K	2480	30-1000	789.51	-86.44	NA	0.0023	NA	4	Pass
BLE 125K	2480	1000-13000	5128.00	-72.04	NA	0.0625	NA	20	Pass
BLE 500K	2402	30-1000	899.12	-86.05	NA	0.0025	NA	4	Pass
BLE 500K	2402	1000-13000	12460.00	-71.72	NA	0.0673	NA	20	Pass
BLE 500K	2440	30-1000	705.12	-76.96	NA	0.0201	NA	4	Pass
BLE 500K	2440	1000-13000	5272.00	-72.10	NA	0.0617	NA	20	Pass
BLE 500K	2480	30-1000	887.48	-86.17	NA	0.0024	NA	4	Pass
BLE 500K	2480	1000-13000	5440.00	-72.04	NA	0.0625	NA	20	Pass

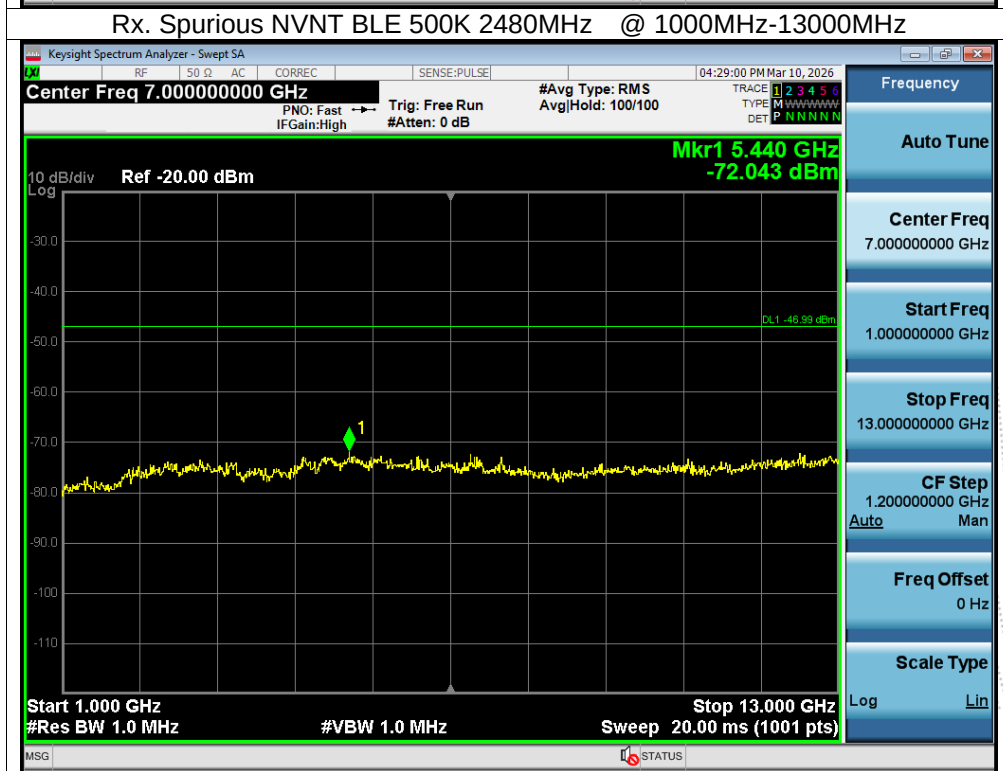
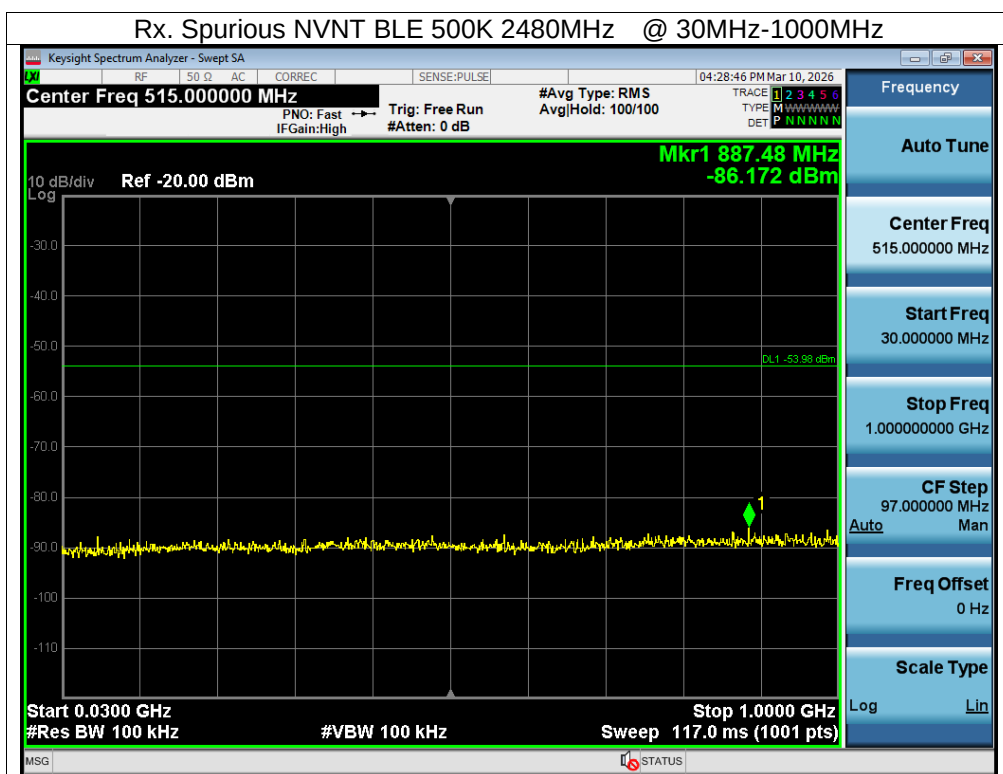




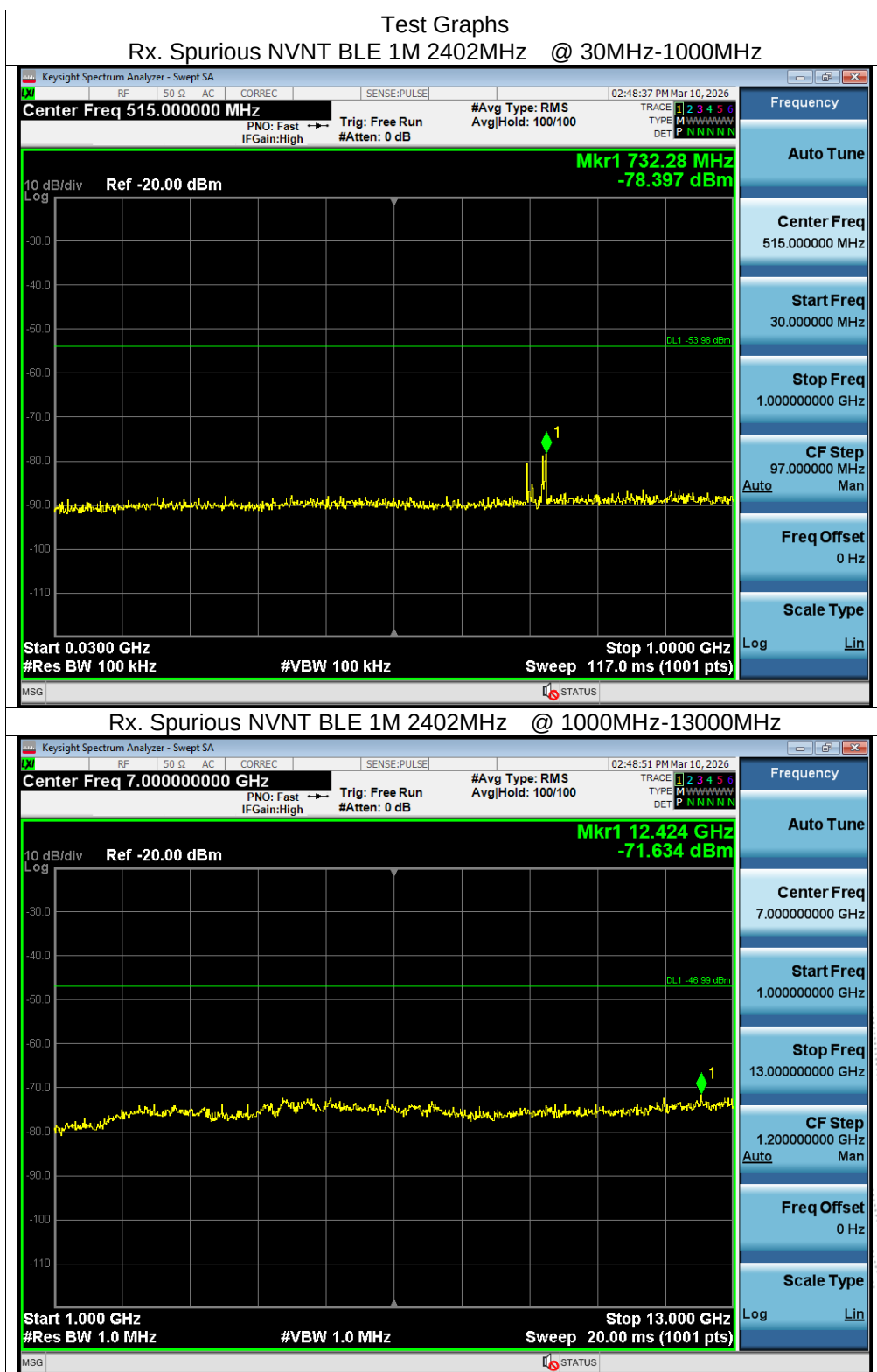


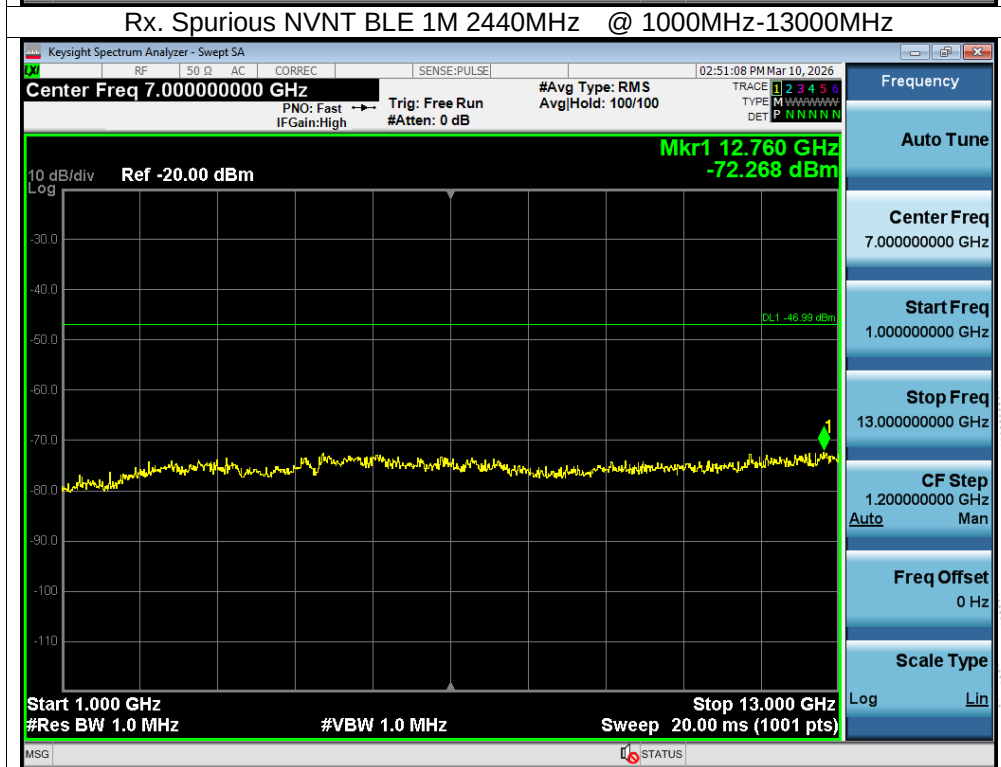
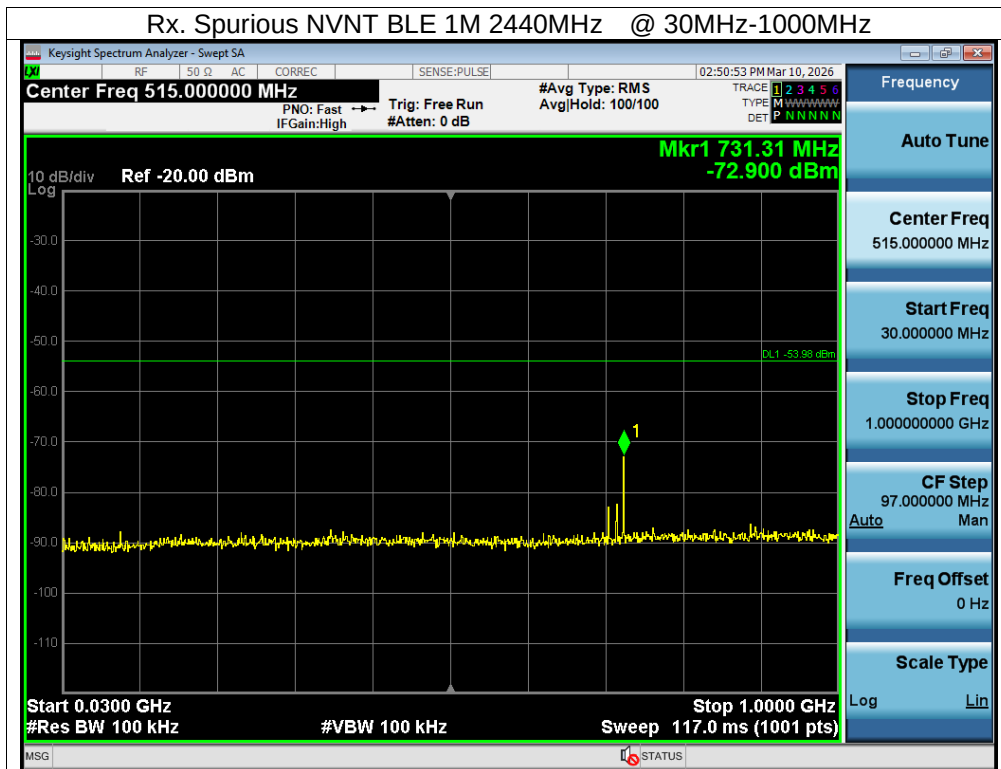


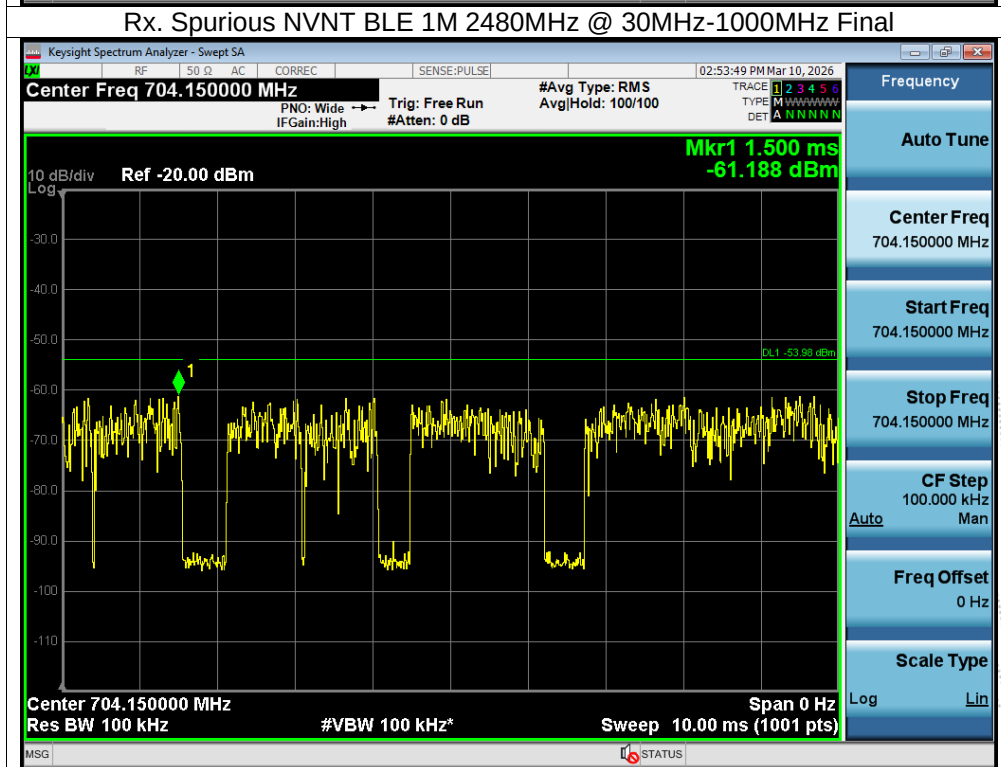
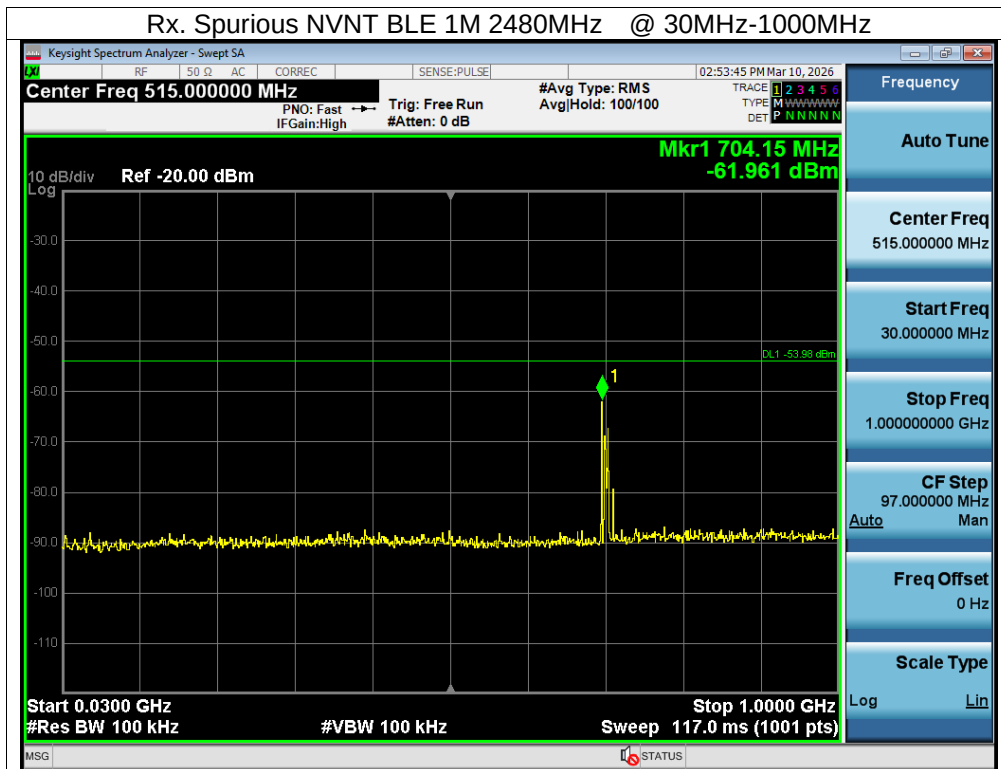


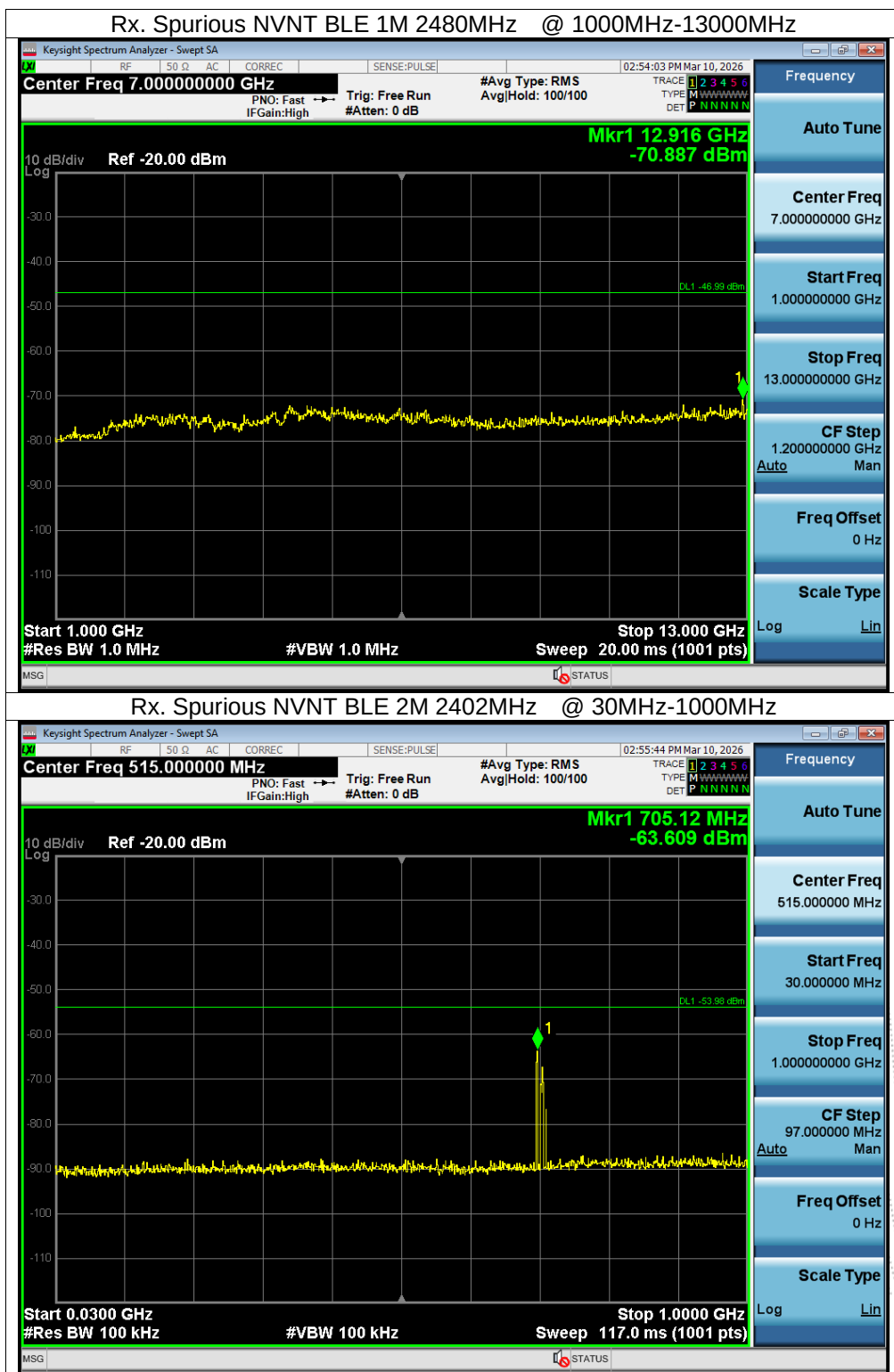


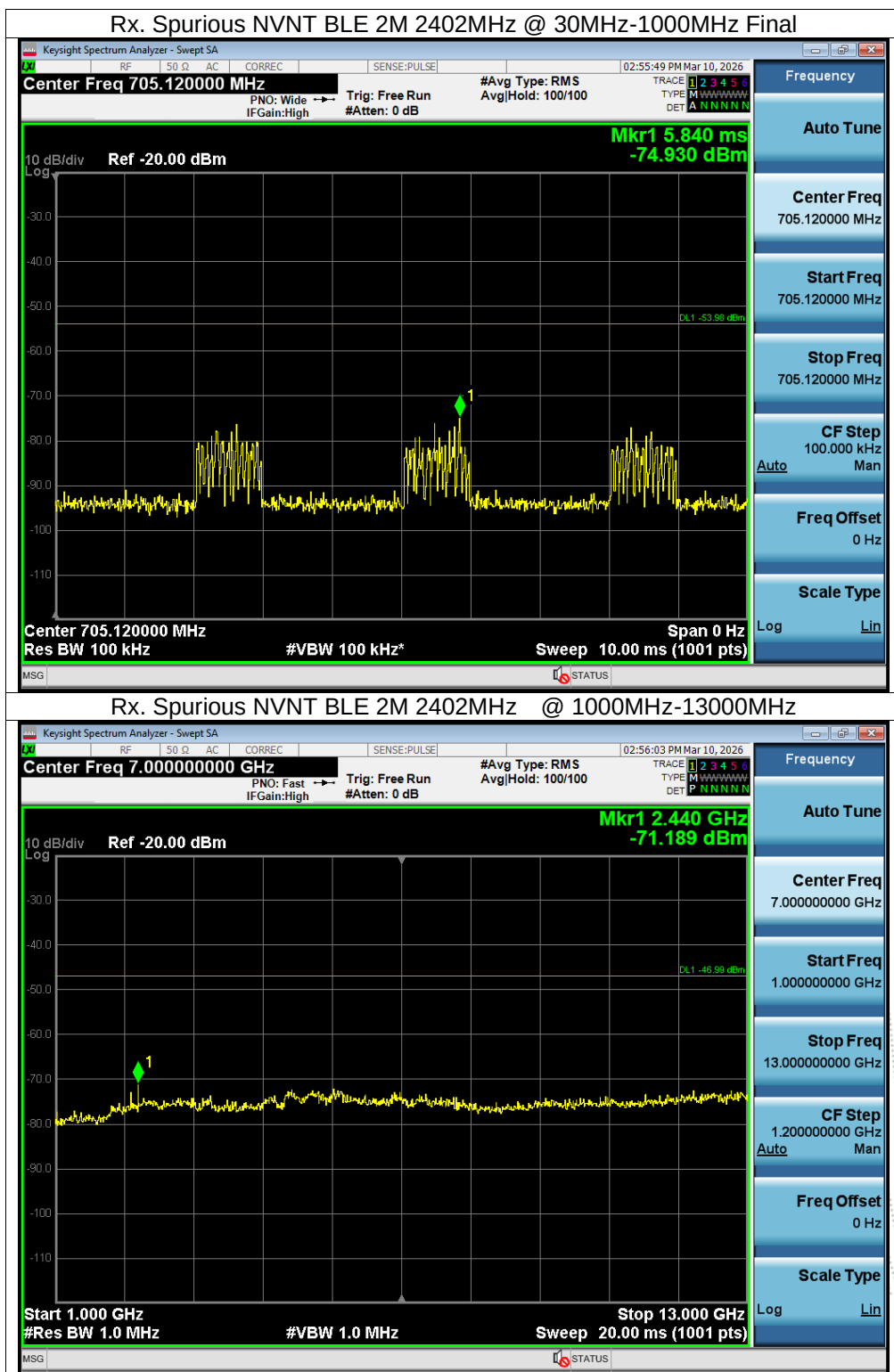
Mode	Frequency (MHz)	Range (MHz)	Emission Frequency (MHz)	Max Peak Value (dBm)	Max RMS Value (dBm)	Max Peak Value (nW)	Max RMS Value (nW)	Limit (nW)	Verdict
BLE 1M	2402	30-1000	732.28	-78.40	NA	0.0145	NA	4	Pass
BLE 1M	2402	1000-13000	12424.00	-71.63	NA	0.0687	NA	20	Pass
BLE 1M	2440	30-1000	731.31	-72.90	NA	0.0513	NA	4	Pass
BLE 1M	2440	1000-13000	12760.00	-72.27	NA	0.0593	NA	20	Pass
BLE 1M	2480	30-1000	704.15	-61.96	-61.19	0.6368	0.7603	4	Pass
BLE 1M	2480	1000-13000	12916.00	-70.89	NA	0.0815	NA	20	Pass
BLE 2M	2402	30-1000	705.12	-63.61	-74.93	0.4355	0.0321	4	Pass
BLE 2M	2402	1000-13000	2440.00	-71.19	NA	0.076	NA	20	Pass
BLE 2M	2440	30-1000	704.15	-58.48	-91.31	1.4191	0.0007	4	Pass
BLE 2M	2440	1000-13000	2452.00	-58.08	NA	1.556	NA	20	Pass
BLE 2M	2480	30-1000	704.15	-61.89	-62.34	0.6471	0.5834	4	Pass
BLE 2M	2480	1000-13000	2524.00	-57.08	NA	1.9588	NA	20	Pass

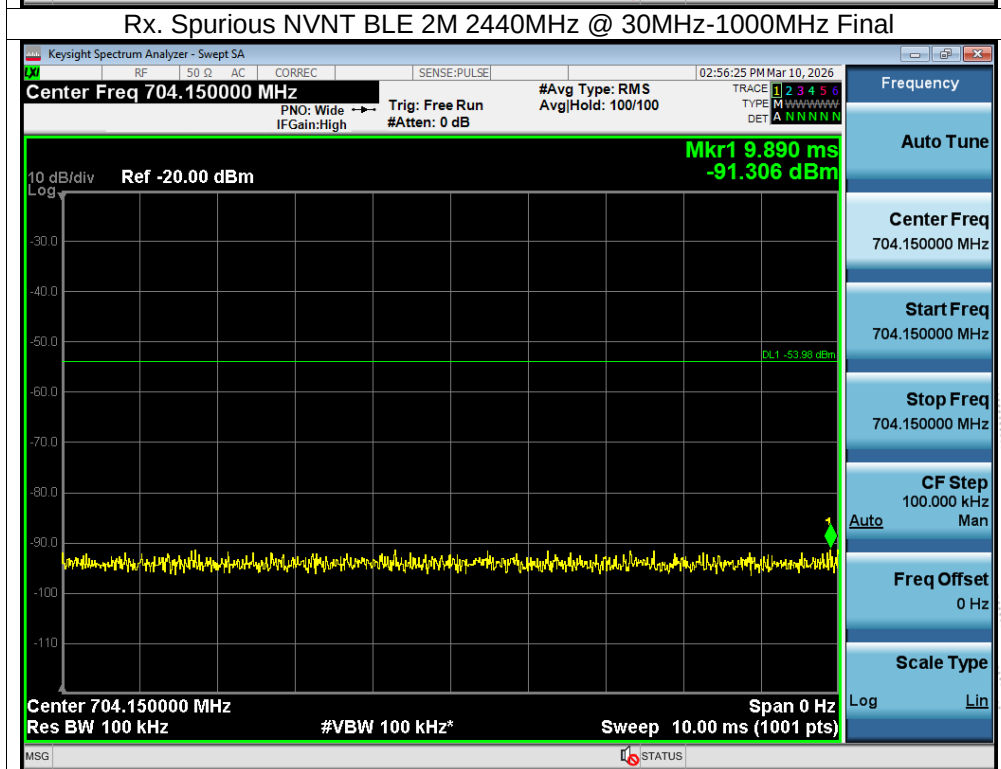
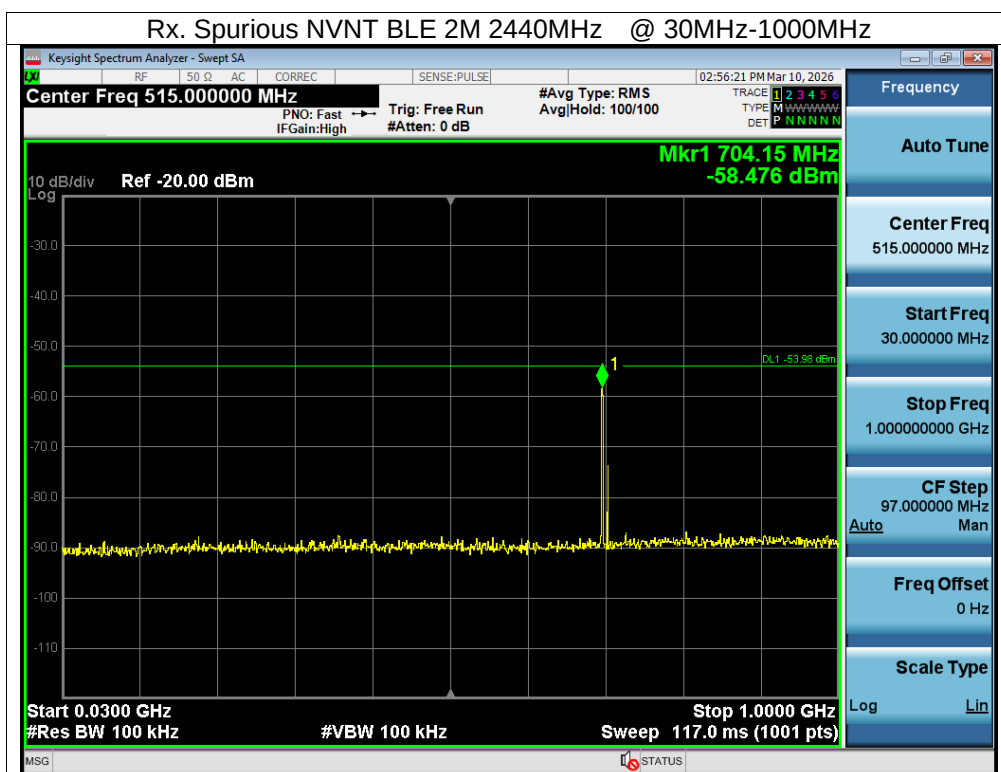


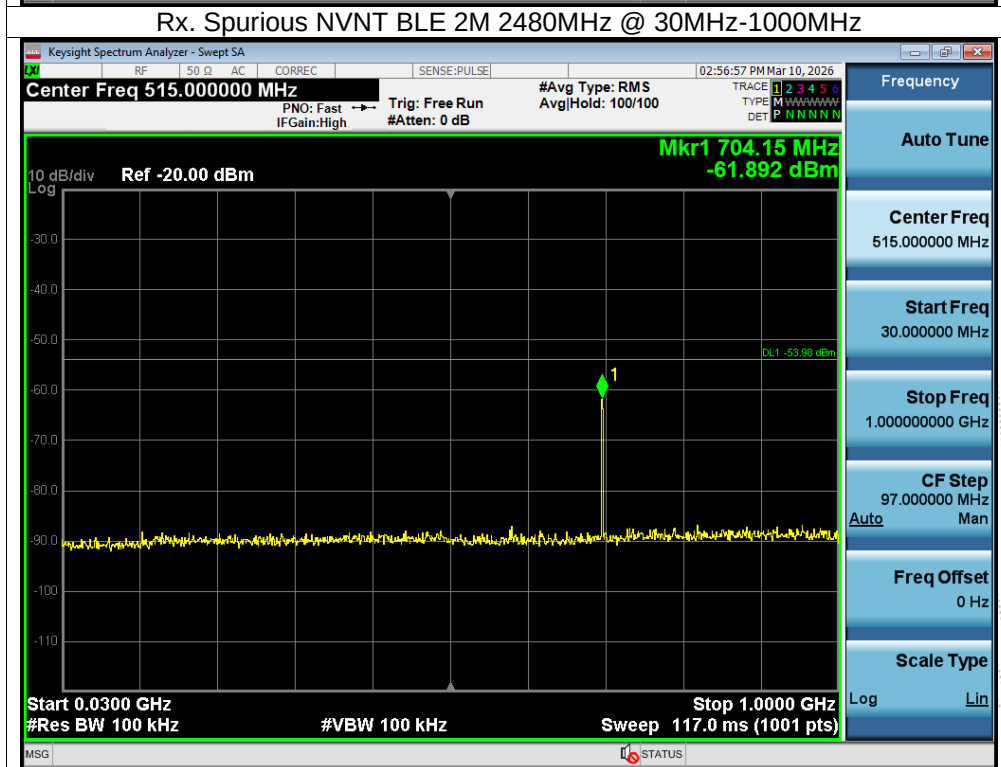
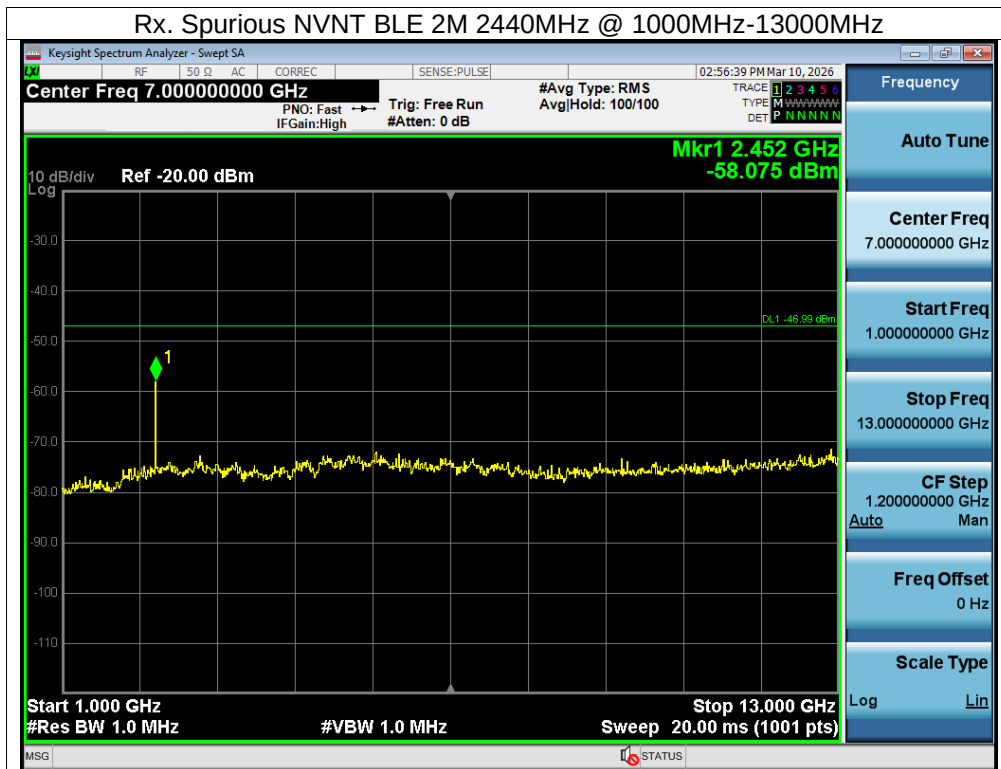


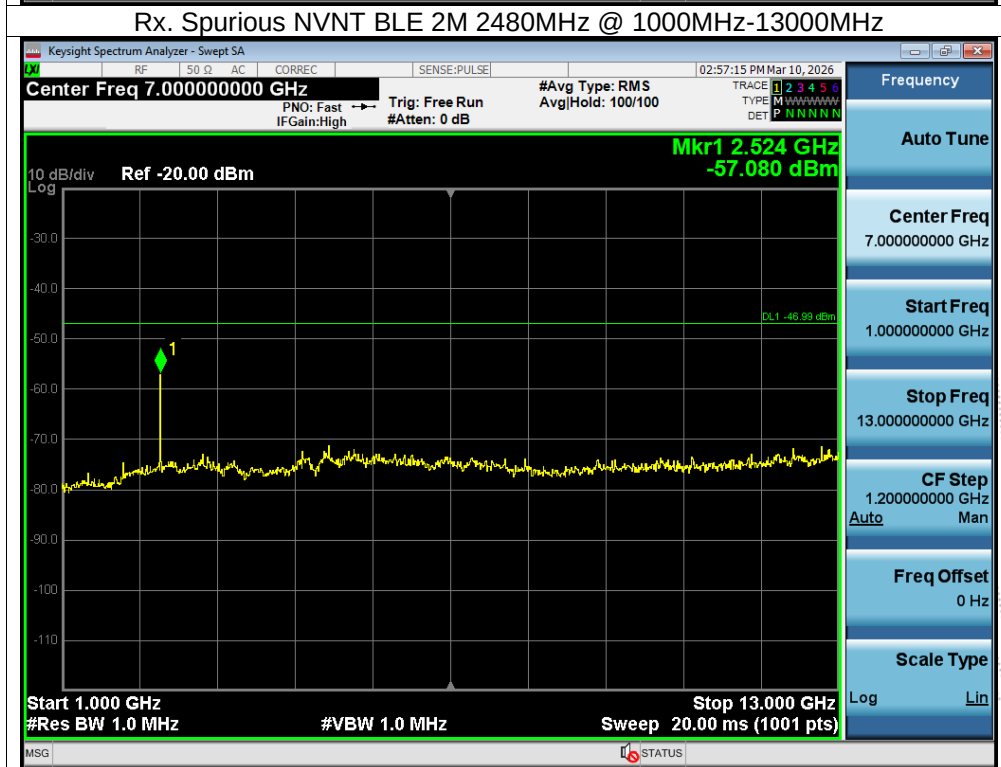
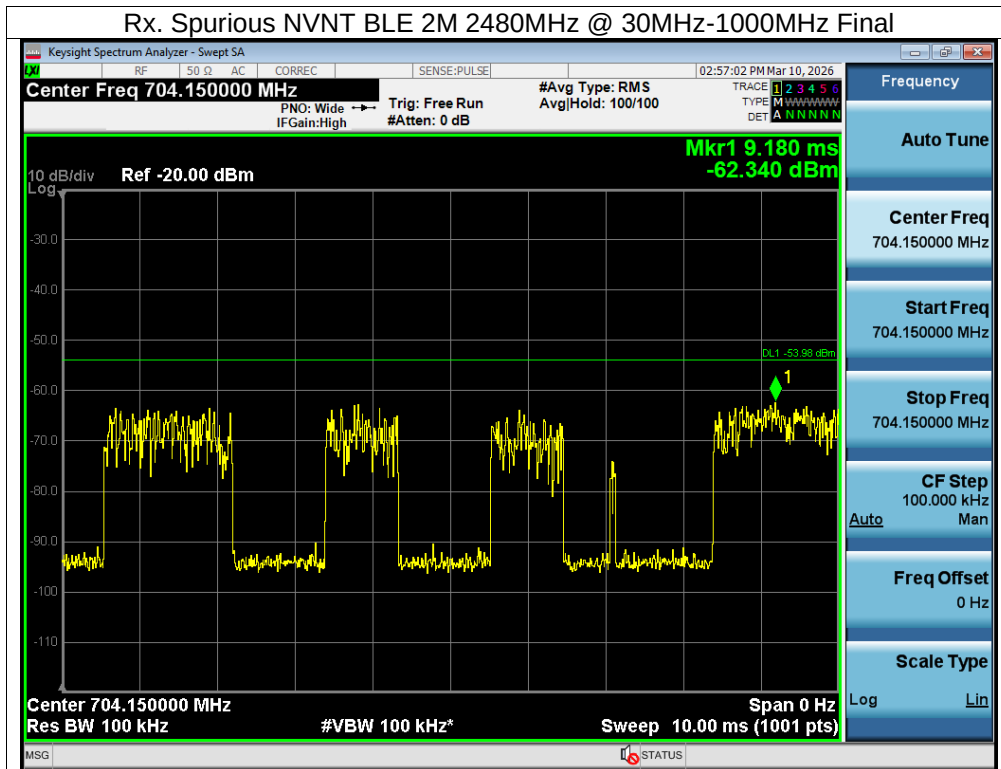








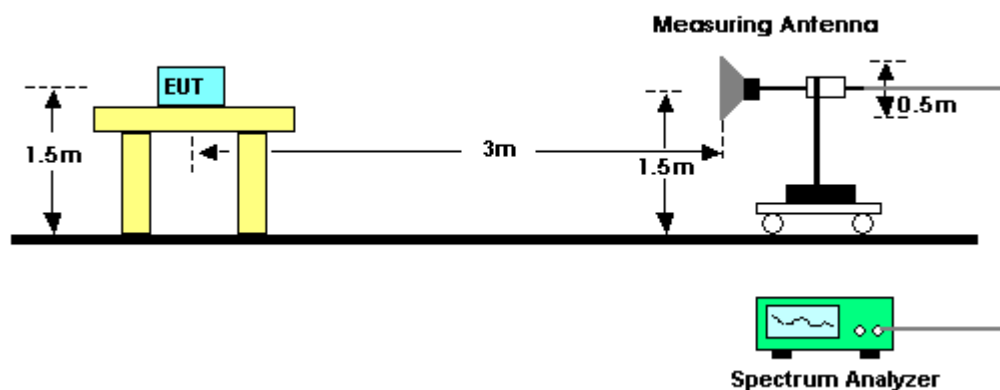




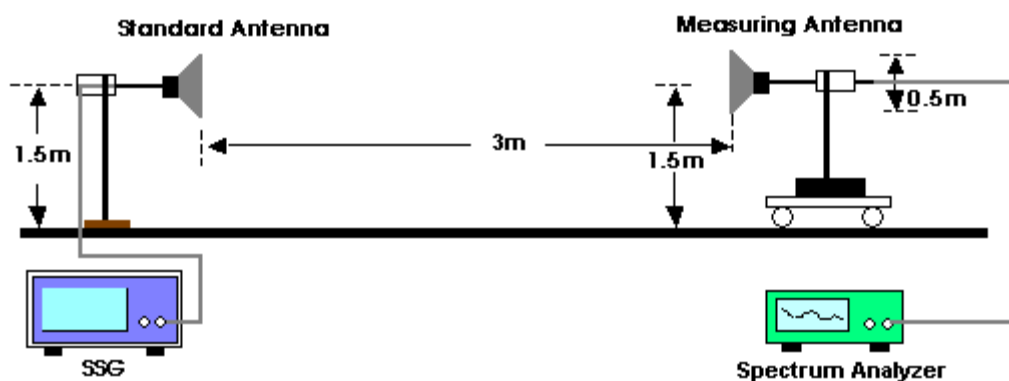
12. Transmission Antenna Gain (Eirp Antenna Power) Measurement

12.1 Block Diagram Of Test Setup

For EUT radiation measurement



For standard antenna measurement



12.2 Limit

Item	Limits
EIRP Power Density	$\leq 16.91 \text{ dBm/MHz}$ (FH form 2427 - 2470.75 MHz) $\leq 22.14 \text{ dBm/MHz}$ (OFDM, DS from 2400~2483.5MHz) $\leq 22.14 \text{ dBm}$ (Other from 2400~2483.5MHz)
Note: This test item is not applied for radio equipment with equivalent isotropic radiation power lower than 12.14dBm/MHz, but Antenna Power(Conducted) limit is 10 mW/MHz (10 dBm/MHz), So the test item will not be applied to the transmission antenna which has a gain of 2.14dBi or less	

12.3 Measuring Instruments And Setting

Please refer to section 5 in this report. The following table is the setting of spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
RB/VB	1 MHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

12.4 Test procedure

1. Set EUT ad measuring antenna at the same height and roughly facing each other.
2. Move the measuring antenna height up and down within $\pm 50\text{cm}$ of EUT height and swing it to find the maximum output of the measuring antenna. The output level at the spectrum analyzer is read sa "E".
3. Remove the EUT from the turn table and put the replacing antenna facing to measuring antenna at same height. Set the standard signal generator (SSG) at same frequency and transmit on then receive the signal
4. Swing the replacing antenna give a maximum receiving level.
5. Move the measuring antenna height up and down within $\pm 50\text{cm}$ of replacing antenna height and swing it to find the maximum receiving level.
6. Set SSG output power at Pt to give the equivalent output level of "E" or caluate Pt with SSG output which gives the nearest of "E" and difference ($\pm 1\text{dB}$). Record the Pt.
7. Calculate EIRP by the formula below $\text{EIRP} = \text{Gt} - \text{L} + \text{Pt}$.
Gt: gain of replacing antenna (dBi)
L: feeder loss between SSG and replacing antenna
Pt: Output power of the SSG
8. If the antenna for the EUT has circular polarization, sum of V-field and H-field will be result if measuring antenna is linear polarization.

12.5 Test Result

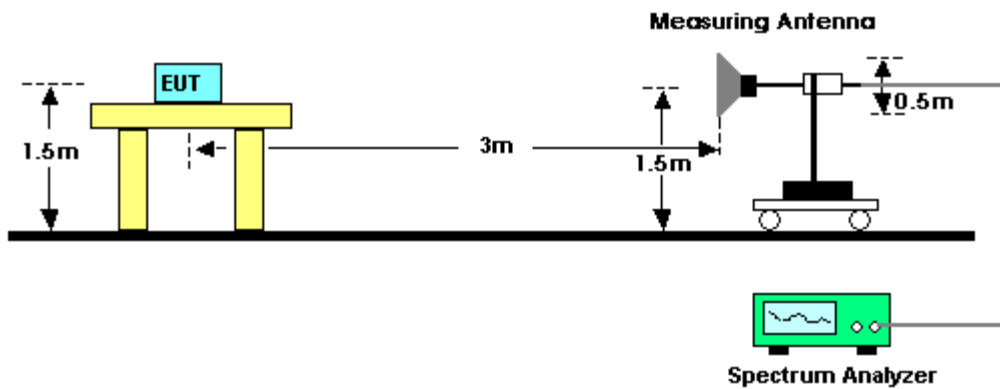
Temperature:	26°C		
Humidity:	54 % RH	Test Voltage	DC 3.3V

Mode	Frequency (MHz)	Power (dBm/MHz)	Gain (dBi)	EIRP (dBm/MHz)	Limit (dBm/MHz)	Verdict
BLE 125K	2402	3.26	3.06	6.32	12.14	Pass
BLE 125K	2440	3.59	3.06	6.65		
BLE 125K	2480	3.56	3.06	6.62		
BLE 500K	2402	3.06	3.06	6.12		
BLE 500K	2440	3.55	3.06	6.61		
BLE 500K	2480	3.47	3.06	6.53		
BLE 1M	2402	3.26	3.06	6.32		
BLE 1M	2440	3.47	3.06	6.53		
BLE 1M	2480	3.44	3.06	6.5		
BLE 2M	2402	1.3	3.06	4.36		
BLE 2M	2440	1.73	3.06	4.79		
BLE 2M	2480	1.52	3.06	4.58		

Note:EIRP=Power+Gain

13. Transmission Radiation Angle Width (3db Beamwidth) Measurement

13.1 Block Diagram Of Test Setup



13.2 Limit

Item	Limits
3dB antenna beam width	360/A (If A<1; then A=1)
Note: A = E.I.R.P. / (2.14dBi + "Antenna Power (limit)" of each modulation method (*3mW/MHz, 10mW/MHz, etc.))	

13.3 Measuring Instruments And Setting

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	0 MHz
RB	1 MHz
VB	1 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

13.4 Test procedure

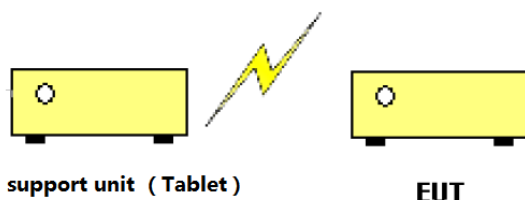
1. Set EUT and measuring antenna at the same height and roughly facing each other.
2. Set spectrum analyzer with condition in section 4.7.2 and tune reference level to observe receiving signal position.
3. Rotate directions of the EUT horizontally and vertically to find the maximum receiving power.
4. Move the measuring antenna height up and down within $\pm 50\text{cm}$ of EUT height and swing it to find the maximum output of measuring antenna. The output level at the spectrum analyzer is read as "E"
5. Calculate permitted radiation angle in horizontal and vertical using EIRP measured in another test method.
6. Calculate 3dB antenna beam width by the formula below $360/A$ (If $A < 1$; then $A=1$).

13.5 Test Result

N/A

14. Radio Interference Prevention Capability Measurement

14.1 Block Diagram Of Test Setup



14.2 Limit

Item	Limits
Identification code	≥ 48 bits

14.3 Measuring Instruments And Setting

Item	Limits
MAC IP List	MAC Scan

14.4 Test procedure

- In the case that the EUT has the function of automatically transmitting the identification code: a. Transmit the predetermined identification codes from EUT. b. Check the transmitted identification codes with the demodulator.
- In the case of receiving the identification code:
 - Transmit the predetermined identification codes from the counterpart.
 - Check if communication is normal.
 - Transmit the signals other than predetermined ID codes from the counterpart.
 - check if the EUT stops the transmission, or if it displays that identification codes are different from the predetermined ones.

14.5 Test Result

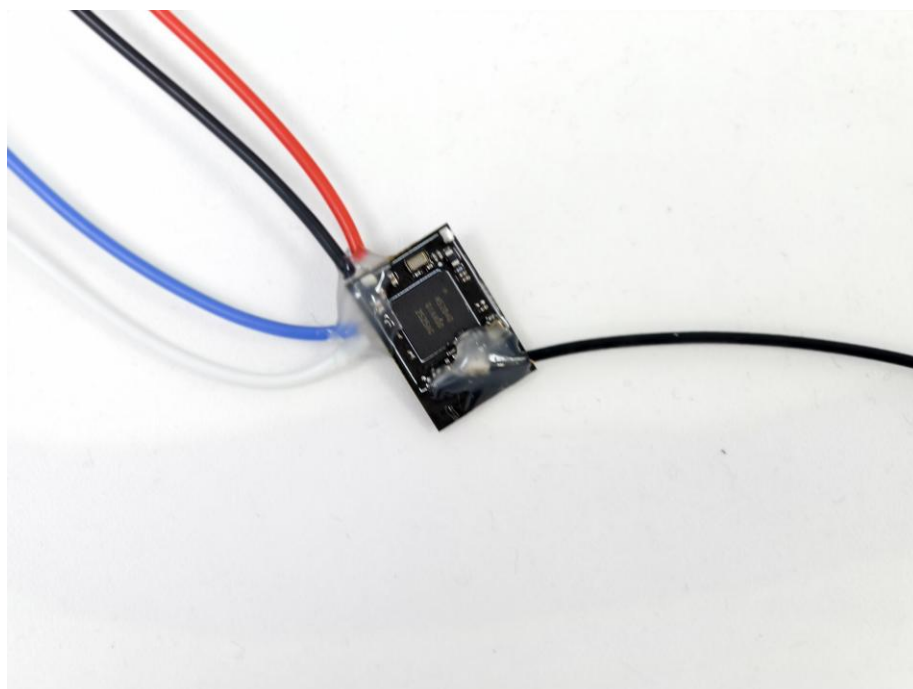
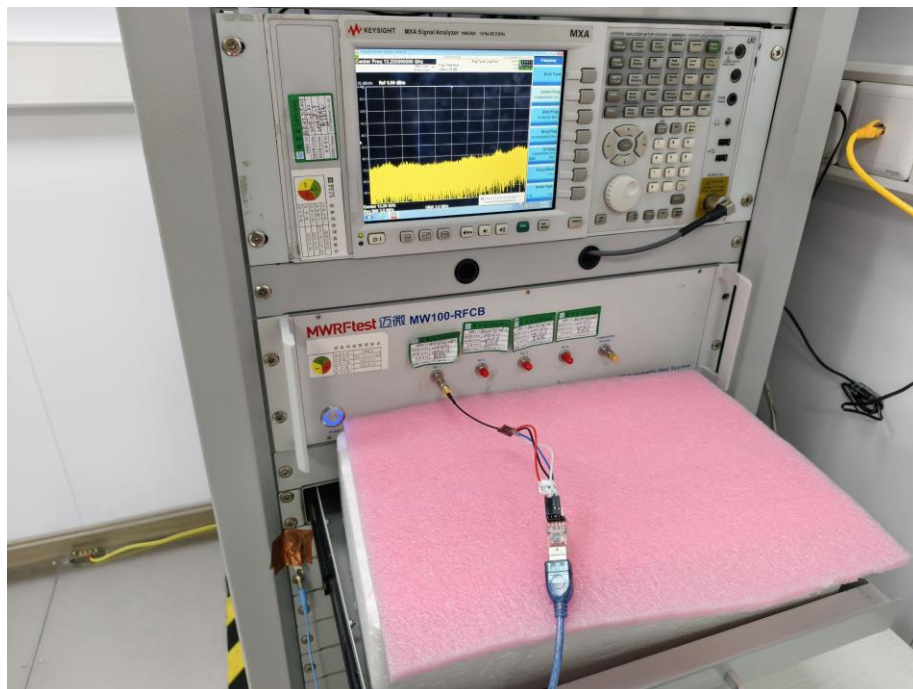
Temperature:	26°C		
Humidity:	54 % RH	Test Voltage	DC 3.3V
Operation Mode:	GFSK		

Bluetooth Device Address: 52-54-96-BD-C6-87

PASS

15. EUT Test Setup Photographs

Measurement Photos



STATEMENT

1. The equipment lists are traceable to the national reference standards.
2. The test report can not be partially copied unless prior written approval is issued from our lab.
3. The test report is invalid without the "special seal for inspection and testing".
4. The test report is invalid without the signature of the approver.
5. The test process and test result is only related to the Unit Under Test.
6. Sample information is provided by the client and the laboratory is not responsible for its authenticity.
7. The quality system of our laboratory is in accordance with ISO/IEC17025.
8. If there is any objection to this test report, the client should inform issuing laboratory within 15 days from the date of receiving test report.

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***** END *****