

TEST REPORT

FCC ID. :	2BBDNWNP296	
Test Report No..... :	TCT250227E006	
Date of issue..... :	Mar. 13, 2025	
Testing laboratory	SHENZHEN TONGCE TESTING LAB	
Testing location/ address:	2101 & 2201, Zhenchang Factory, Renshan Industrial Zone, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, 518103, People's Republic of China	
Applicant's name..... :	Flaircomm Microelectronics, Inc.	
Address..... :	7F, Guomai Building, Guomai Science and Technology Park, 116 JiangBin East Avenue, Mawei District, Fuzhou, Fujian, 350015 China	
Manufacturer's name ... :	Flaircomm Microelectronics, Inc.	
Address..... :	7F, Guomai Building, Guomai Science and Technology Park, 116 JiangBin East Avenue, Mawei District, Fuzhou, Fujian, 350015 China	
Standard(s)	FCC CFR Title 47 Part 15 Subpart C Section 15.247 FCC KDB 558074 D01 15.247 Meas Guidance v05r02 ANSI C63.10:2020	
Product Name..... :	Telematics Control Unit	
Trade Mark	N/A	
Model/Type reference..... :	FLC-WNP296, FLC-WNP296X, FLC-STU296X	
Rating(s)..... :	DC 9V-16V	
Date of receipt of test item	Feb. 26, 2025	
Date (s) of performance of test..... :	Feb. 26, 2025 ~ Mar. 13, 2025	
Tested by (+signature) ... :	Rleo LIU	
Check by (+signature).... :	Beryl ZHAO	
Approved by (+signature):	Tomsin	

General disclaimer:

This report shall not be reproduced except in full, without the written approval of SHENZHEN TONGCE TESTING LAB. This document may be altered or revised by SHENZHEN TONGCE TESTING LAB personnel only, and shall be noted in the revision section of the document. The test results in the report only apply to the tested sample.

Table of Contents

1. General Product Information	3
1.1. EUT description	3
1.2. Model(s) list.....	3
1.3. Operation Frequency	4
2. Test Result Summary	5
3. General Information.....	6
3.1. Test environment and mode.....	6
3.2. Description of Support Units.....	6
4. Facilities and Accreditations	7
4.1. Facilities	7
4.2. Location	7
5. Measurement Uncertainty	7
6. Test Results and Measurement Data	8
6.1. Antenna requirement	8
6.2. Conducted Emission.....	9
6.3. Conducted Output Power	10
6.4. Emission Bandwidth	11
6.5. Power Spectral Density.....	12
6.6. Conducted Band Edge and Spurious Emission Measurement	13
6.7. Radiated Spurious Emission Measurement.....	15
Appendix A: Test Result of Conducted Test	
Appendix B: Photographs of Test Setup	
Appendix C: Photographs of EUT	

1. General Product Information

1.1. EUT description

Product Name.....:	Telematics Control Unit
Model/Type reference.....:	FLC-WNP296
Sample Number.....:	TCT250227E006-0101
Bluetooth Version	V5.1
Operation Frequency	2402MHz~2480MHz
Channel Separation	2MHz
Data Rate.....:	LE 1M PHY, LE 2M PHY, Coded PHY(code2, code8)
Number of Channel	40
Modulation Type.....:	GFSK
Antenna Type.....:	Chip Antenna
Antenna Gain.....:	1.60dBi
Rating(s).....:	DC 9V-16V

Note: The antenna gain listed in this report is provided by applicant, and the test laboratory is not responsible for this parameter.

1.2. Model(s) list

No.	Model No.	Tested with
1	FLC-WNP296	☒
Other models	FLC-WNP296X, FLC-STU296X	☐

Note: FLC-WNP296 is tested model, other models are derivative models. The models are identical in circuit and PCB layout, only different on the model names. So the test data of FLC-WNP296 can represent the remaining models.

1.3. Operation Frequency

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2402MHz	10	2422MHz	20	2442MHz	30	2462MHz
1	2404MHz	11	2424MHz	21	2444MHz	31	2464MHz
...	...	...	...	...	...	...	...
8	2418MHz	18	2438MHz	28	2458MHz	38	2478MHz
9	2420MHz	19	2440MHz	29	2460MHz	39	2480MHz

Remark: Channel 0, 19 & 39 have been tested.

2. Test Result Summary

Requirement	CFR 47 Section	Result
Antenna requirement	§15.203/§15.247 (b)(4)	PASS
AC Power Line Conducted Emission	§15.207	N/A
Conducted Peak Output Power	§15.247 (b)(3)	PASS
6dB Emission Bandwidth	§15.247 (a)(2)	PASS
Power Spectral Density	§15.247 (e)	PASS
Band Edge	§15.247(d)	PASS
Spurious Emission	§15.205/§15.209	PASS

Note:

1. PASS: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.

3. General Information

3.1. Test environment and mode

Operating Environment:	
Condition	Radiated Emission
Temperature:	22.7 °C
Humidity:	57 % RH
Atmospheric Pressure:	1010 mbar
Test Mode:	
Engineer mode:	Keep the EUT in continuous transmitting by select channel and modulations.
The sample was placed 0.8m & 1.5m for the measurement below & above 1GHz above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case(Z axis) are shown in Test Results of the following pages.	

3.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
/	/	/	/	/

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
3. For conducted measurements (Output Power, 6dB Emission Bandwidth, Power Spectral Density, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

4. Facilities and Accreditations

4.1. Facilities

The test facility is recognized, certified, or accredited by the following organizations:

- FCC - Registration No.: 645098

SHENZHEN TONGCE TESTING LAB

Designation Number: CN1205

The testing lab has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- A2LA-No.: 4320.01

SHENZHEN TONGCE TESTING LAB

The testing lab has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories.

4.2. Location

SHENZHEN TONGCE TESTING LAB

Address: 2101 & 2201, Zhenchang Factory, Renshan Industrial Zone, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, 518103, People's Republic of China

TEL: +86-755-27673339

5. 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	MU
1	Conducted Emission	± 3.10 dB
2	RF power, conducted	± 0.12 dB
3	Spurious emissions, conducted	± 0.11 dB
4	Duty Cycle	± 0.62 dB
5	Power Spectral Density	± 1.46 dB
6	All emissions, radiated(<1 GHz)	± 4.56 dB
7	All emissions, radiated(1 GHz - 18 GHz)	± 4.22 dB
8	All emissions, radiated(18 GHz- 40 GHz)	± 4.36 dB

6. Test Results and Measurement Data

6.1. Antenna requirement

Standard requirement:

FCC Part15 C Section 15.203 /247(b)(4)

15.203 requirement:

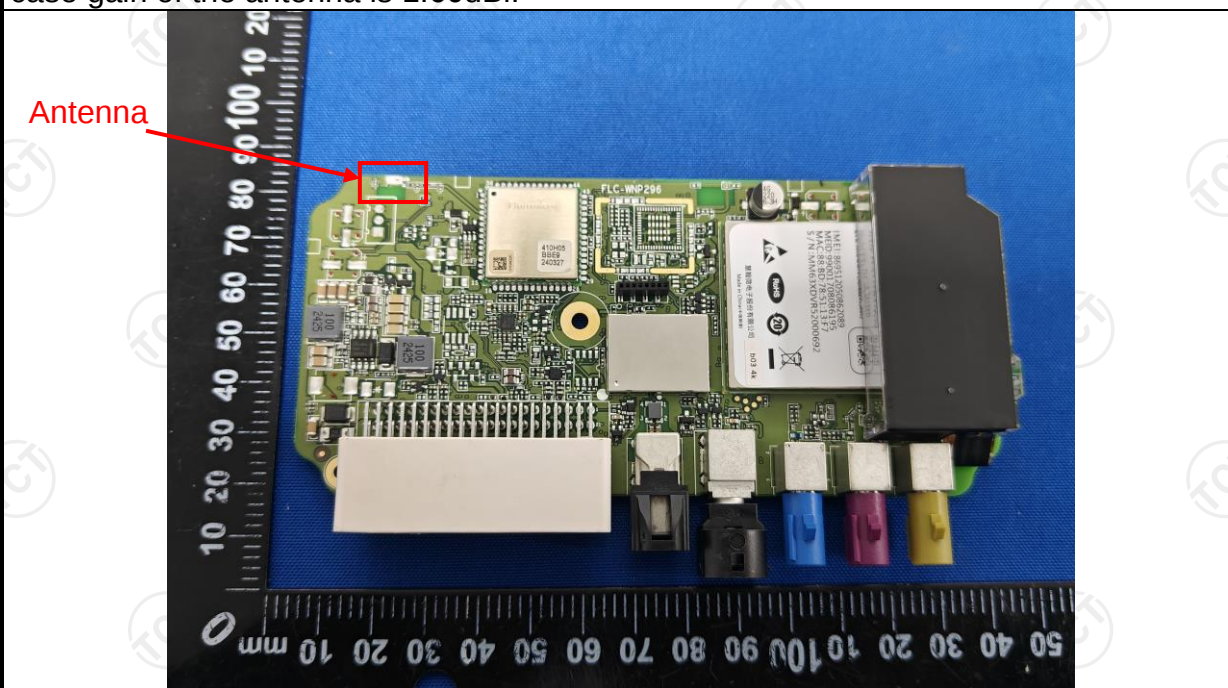
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

(The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

E.U.T Antenna:

The Bluetooth antenna is Chip antenna which permanently attached, and the best case gain of the antenna is 1.60dBi.



6.2. Conducted Emission

6.2.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.207														
Test Method:	ANSI C63.10:2020														
Frequency Range:	150 kHz to 30 MHz														
Receiver setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto														
Limits:	<table><tr><th rowspan="2">Frequency range (MHz)</th><th colspan="2">Limit (dBuV)</th></tr><tr><th>Quasi-peak</th><th>Average</th></tr><tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr><tr><td>0.5-5</td><td>56</td><td>46</td></tr><tr><td>5-30</td><td>60</td><td>50</td></tr></table>	Frequency range (MHz)	Limit (dBuV)		Quasi-peak	Average	0.15-0.5	66 to 56*	56 to 46*	0.5-5	56	46	5-30	60	50
Frequency range (MHz)	Limit (dBuV)														
	Quasi-peak	Average													
0.15-0.5	66 to 56*	56 to 46*													
0.5-5	56	46													
5-30	60	50													
Test Setup:	Reference Plane 40cm E.U.T AC power 80cm LISN Filter AC power EMI Receiver Test table/Insulation plane Remark E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m														
Test Mode:	Transmitting Mode														
Test Procedure:	1. The E.U.T is connected to an adapter through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2020 on conducted measurement.														
Test Result:	N/A														

6.3. Conducted Output Power

6.3.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	KDB 558074 D01 v05r02
Limit:	30dBm
Test Setup:	 Spectrum Analyzer EUT
Test Mode:	Refer to item 3.1
Test Procedure:	Set spectrum analyzer as following: a) Set the RBW $\geq$ DTS bandwidth. b) Set VBW $\geq 3 \times$ RBW. c) Set span $\geq 3 \times$ RBW d) Sweep time = auto couple. e) Detector = peak. f) Trace mode = max hold. g) Allow trace to fully stabilize. h) Use peak marker function to determine the peak amplitude level.
Test Result:	PASS

6.3.2. Test Instruments

Name	Manufacturer	Model No.	Serial Number	Date of Cal.	Due Date
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jun. 27, 2024	Jun. 26, 2025
Power detector box	MWRFtest	MW100-RFCB	MW210531TCT	Jan.21, 2025	Jan. 20, 2026

6.4. Emission Bandwidth

6.4.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	KDB 558074 D01 v05r02
Limit:	>500kHz
Test Setup:	 The diagram shows a green Spectrum Analyzer connected by a cable to a yellow EUT (Equipment Under Test).
Test Mode:	Refer to item 3.1
Test Procedure:	1. Set to the maximum power setting and enable the EUT transmit continuously. 2. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6dB bandwidth must be greater than 500 kHz. 3. Measure and record the results in the test report.
Test Result:	PASS

6.4.2. Test Instruments

Name	Manufacturer	Model No.	Serial Number	Date of Cal.	Due Date
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jun. 27, 2024	Jun. 26, 2025
Power detector box	MWRFtest	MW100-RFCB	MW210531TCT	Jan.21, 2025	Jan. 20, 2026

6.5. Power Spectral Density

6.5.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (e)
Test Method:	KDB 558074 D01 v05r02
Limit:	The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.
Test Setup:	 Spectrum Analyzer EUT
Test Mode:	Refer to item 3.1
Test Procedure:	1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement. 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW): $3\text{ kHz} \leq \text{RBW} \leq 100\text{ kHz}$. Video bandwidth VBW $\geq 3 \times \text{RBW}$. In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW) 4. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level. 5. Measure and record the results in the test report.
Test Result:	PASS

6.5.2. Test Instruments

Name	Manufacturer	Model No.	Serial Number	Date of Cal.	Due Date
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jun. 27, 2024	Jun. 26, 2025
Power detector box	MWRFTest	MW100-RFCB	MW210531TCT	Jan.21, 2025	Jan. 20, 2026

6.6. Conducted Band Edge and Spurious Emission Measurement

6.6.1. Test Specification

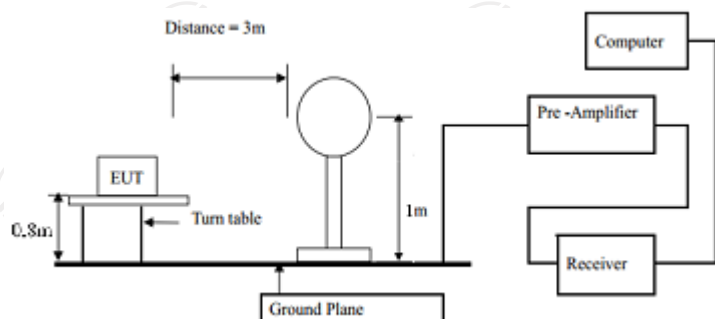
Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	KDB 558074 D01 v05r02
Limit:	In any 100 kHz bandwidth outside of the authorized frequency band, the emissions which fall in the non-restricted bands shall be attenuated at least 20 dB / 30dB relative to the maximum PSD level in 100 kHz by RF conducted measurement and radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).
Test Setup:	 The diagram illustrates the test setup. On the left is a green rectangular box labeled 'Spectrum Analyzer'. A black line representing an RF cable connects it to a yellow rectangular box on the right labeled 'EUT'.
Test Mode:	Refer to item 3.1
Test Procedure:	1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement. 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d). 4. Measure and record the results in the test report. 5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
Test Result:	PASS

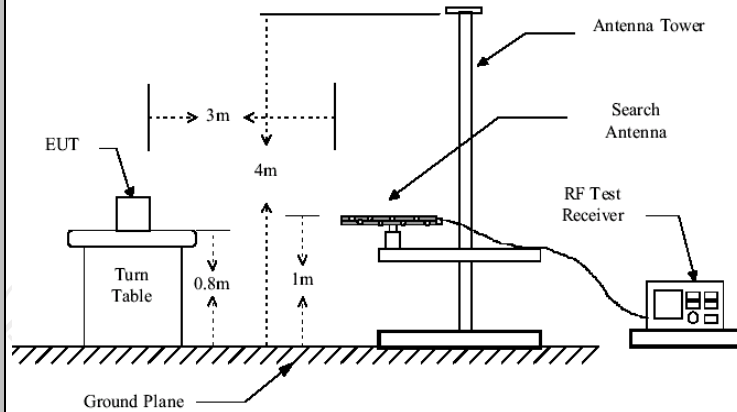
6.6.2. Test Instruments

Name	Manufacturer	Model No.	Serial Number	Date of Cal.	Due Date
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jun. 27, 2024	Jun. 26, 2025
Power detector box	MWRFTest	MW100-RFCB	MW210531TCT	Jan.21, 2025	Jan. 20, 2026

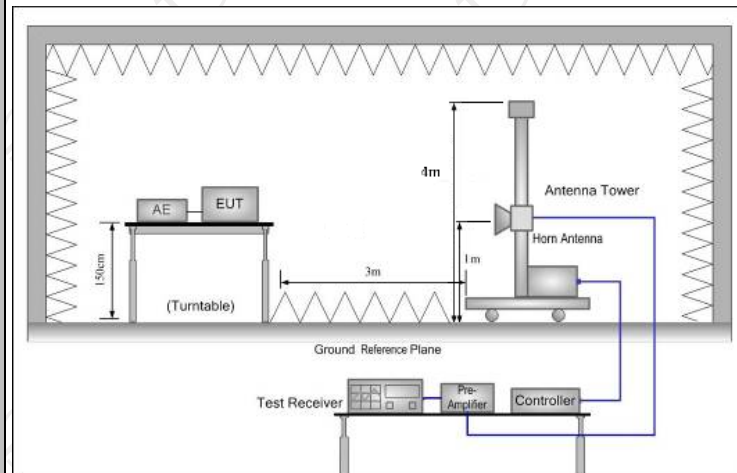
6.7. Radiated Spurious Emission Measurement

6.7.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10:2020				
Frequency Range:	9 kHz to 25 GHz				
Measurement Distance:	3 m				
Antenna Polarization:	Horizontal & Vertical				
Operation mode:	Refer to item 3.1				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value
	150kHz- 30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		Peak	1MHz	10Hz	Average Value
Limit:	Frequency		Field Strength (microvolts/meter)		Measurement Distance (meters)
	0.009-0.490		2400/F(KHz)		300
	0.490-1.705		24000/F(KHz)		30
	1.705-30		30		30
	30-88		100		3
	88-216		150		3
	216-960		200		3
	Above 960		500		3
	Frequency		Field Strength (microvolts/meter)		Measurement Distance (meters)
	Above 1GHz		500		3
		5000		3	
Test setup:	For radiated emissions below 30MHz				
					
30MHz to 1GHz					



Above 1GHz



Test Procedure:

1. For the radiated emission test below 1GHz:
The EUT was placed on a turntable with 0.8 meter above ground. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high PASS filter are used for the test in order to get better signal level.
For the radiated emission test above 1GHz:
Place the measurement antenna on a turntable with 1.5 meter above ground, which is away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final

	measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. 2. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level 3. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported. 4. Use the following spectrum analyzer settings: (1) Span shall wide enough to fully capture the emission being measured; (2) Set RBW=120 kHz for $f < 1$ GHz; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold; (3) Set RBW = 1 MHz, VBW= 3MHz for $f > 1$ GHz for peak measurement. For average measurement: VBW = 10 Hz, when duty cycle is no less than 98 percent. VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
Test mode:	Refer to section 3.1 for details
Test results:	PASS

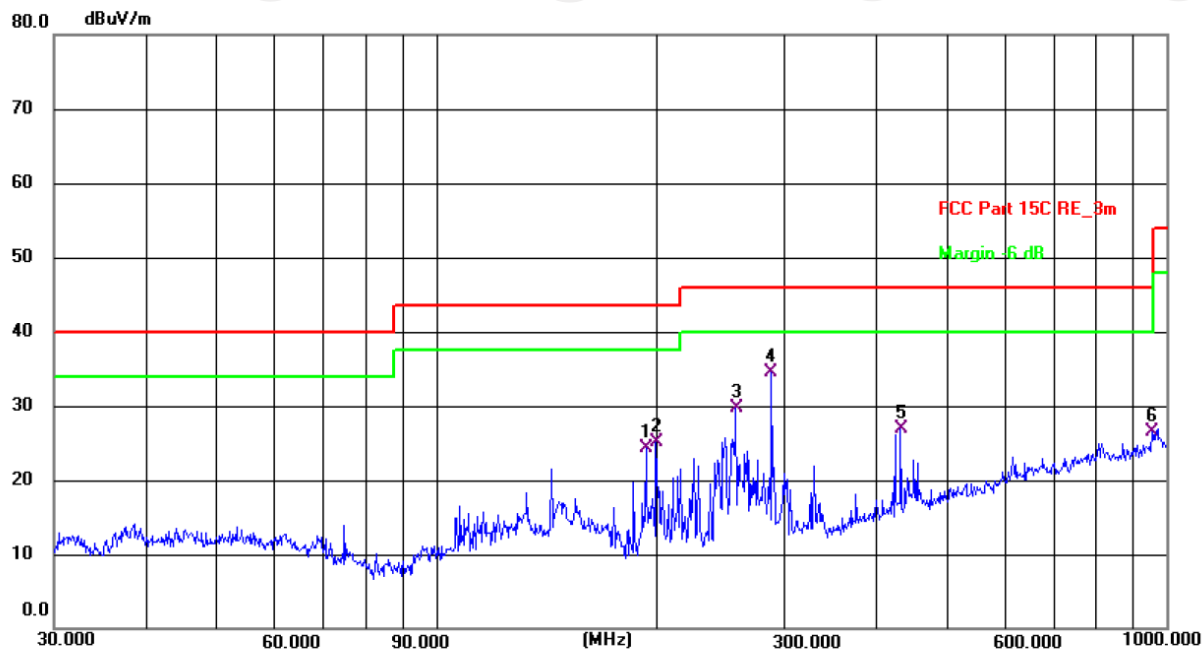
6.7.2. Test Instruments

Radiated Emission Test Site (966)					
Equipment	Manufacturer	Model	Serial Number	Date of Cal.	Due Date
EMI Test Receiver	R&S	ESCI7	100529	Jan. 21, 2025	Jan. 20, 2026
Spectrum Analyzer	R&S	FSQ40	200061	Jun. 27, 2024	Jun. 26, 2025
Pre-amplifier	SKET	LNPA_0118G-45	SK2021012102	Jan. 21, 2025	Jan. 20, 2026
Pre-amplifier	SKET	LNPA_1840G-50	SK202109203500	Jan. 21, 2025	Jan. 20, 2026
Pre-amplifier	HP	8447D	2727A05017	Jun. 27, 2024	Jun. 26, 2025
Loop antenna	Schwarzbeck	FMZB1519B	00191	Jun. 27, 2024	Jun. 26, 2025
Broadband Antenna	Schwarzbeck	VULB9163	340	Jun. 29, 2024	Jun. 28, 2025
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Jun. 29, 2024	Jun. 28, 2025
Horn Antenna	Schwarzbeck	BBHA 9170	00956	Jan. 23, 2025	Jan. 22, 2026
Coaxial cable	SKET	RE-03-D	/	Jun. 27, 2024	Jun. 26, 2025
Coaxial cable	SKET	RE-03-M	/	Jun. 27, 2024	Jun. 26, 2025
Coaxial cable	SKET	RE-03-L	/	Jun. 27, 2024	Jun. 26, 2025
Coaxial cable	SKET	RE-04-D	/	Jun. 27, 2024	Jun. 26, 2025
Coaxial cable	SKET	RE-04-M	/	Jun. 27, 2024	Jun. 26, 2025
Coaxial cable	SKET	RE-04-L	/	Jun. 27, 2024	Jun. 26, 2025
Antenna Mast	Keleto	RE-AM	/	/	/
EMI Test Software	EZ EMC	FA-03A2 RE+	1.1.4.2	/	/

6.7.3. Test Data

Please refer to following diagram for individual
Below 1GHz

Horizontal:



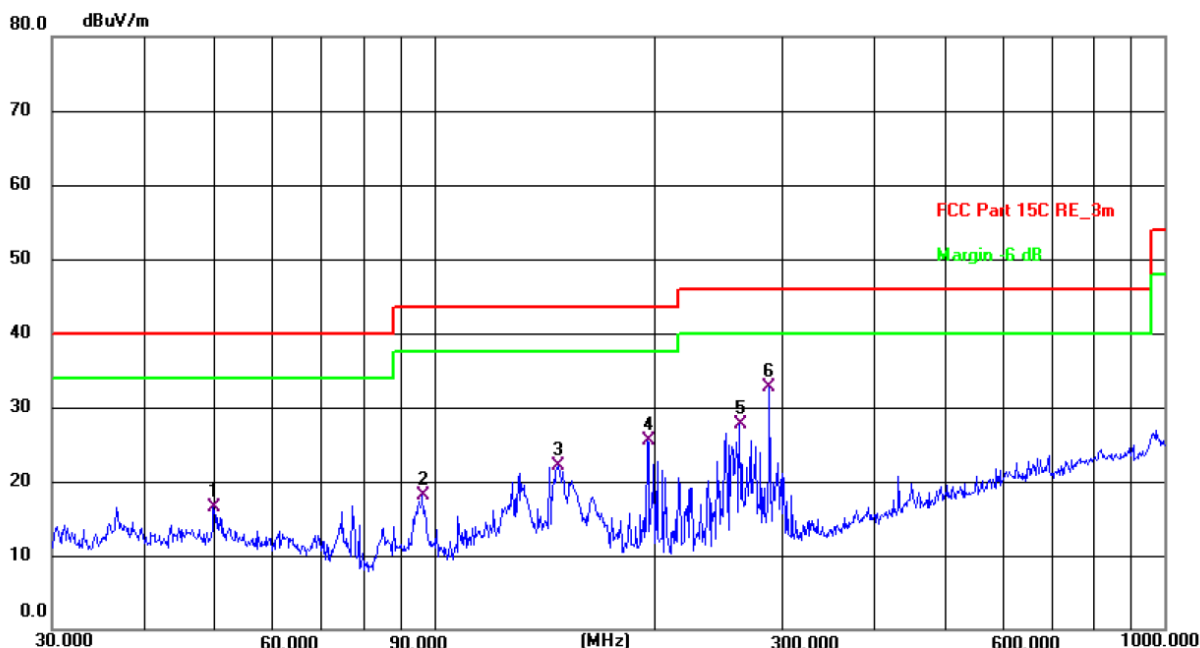
Site: 3m Anechoic Chamber2 Polarization: **Horizontal** Temperature: 22.7(C) Humidity: 57 %

Limit: FCC Part 15C RE_3m

Power: DC 12 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	193.7728	45.13	-20.80	24.33	43.50	-19.17	QP	P	
2	199.9856	46.48	-21.32	25.16	43.50	-18.34	QP	P	
3	257.4222	48.90	-19.11	29.79	46.00	-16.21	QP	P	
4 *	287.9904	52.17	-17.74	34.43	46.00	-11.57	QP	P	
5	432.5457	40.78	-13.95	26.83	46.00	-19.17	QP	P	
6	955.4381	31.54	-4.95	26.59	46.00	-19.41	QP	P	

Vertical:



Site 3m Anechoic Chamber2

Polarization: **Vertical**

Temperature: 22.7(C) Humidity: 57 %

Limit: FCC Part 15C RE_3m

Power: DC 12 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	49.8814	35.30	-18.80	16.50	40.00	-23.50	QP	P	
2	96.4361	39.84	-21.78	18.06	43.50	-25.44	QP	P	
3	147.9214	39.61	-17.42	22.19	43.50	-21.31	QP	P	
4	195.8219	46.64	-21.09	25.55	43.50	-17.95	QP	P	
5	261.9752	46.57	-18.96	27.61	46.00	-18.39	QP	P	
6 *	287.9904	50.43	-17.74	32.69	46.00	-13.31	QP	P	

Note: 1. The low frequency, which started from 9KHz~30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

2. Speed for 1M, 2M, code2 and code8 modulations of EUT have been tested, but the test data only show the worst case in this report, and we found the worst case is 1M speed modulation. Measurements were conducted in all three channels (high, middle, low), and the worst case Mode (Highest channel) was submitted only.

3. Freq. = Emission frequency in MHz

Measurement (dBuV/m) = Reading level (dBuV) + Corr. Factor (dB)

Correction Factor = Antenna Factor + Cable loss – Pre-amplifier

Limit (dBuV/m) = Limit stated in standard

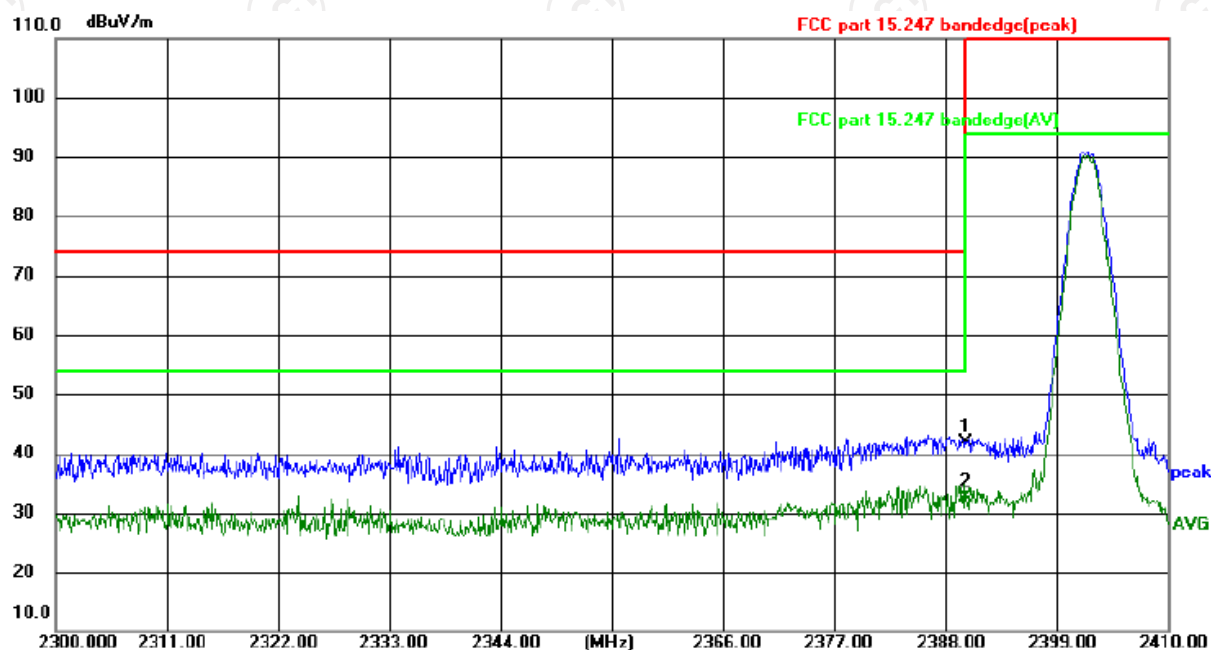
Margin (dB) = Measurement (dBuV/m) – Limits (dBuV/m)

* is meaning the worst frequency has been tested in the test frequency range

Test Result of Radiated Spurious at Band edges

Lowest channel 2402:

Horizontal:



Site: 3m Anechoic Chamber

Polarization: **Horizontal**

Temperature: 23.1(°C)

Humidity: 44 %

Limit: FCC part 15.247 bandedge(peak)

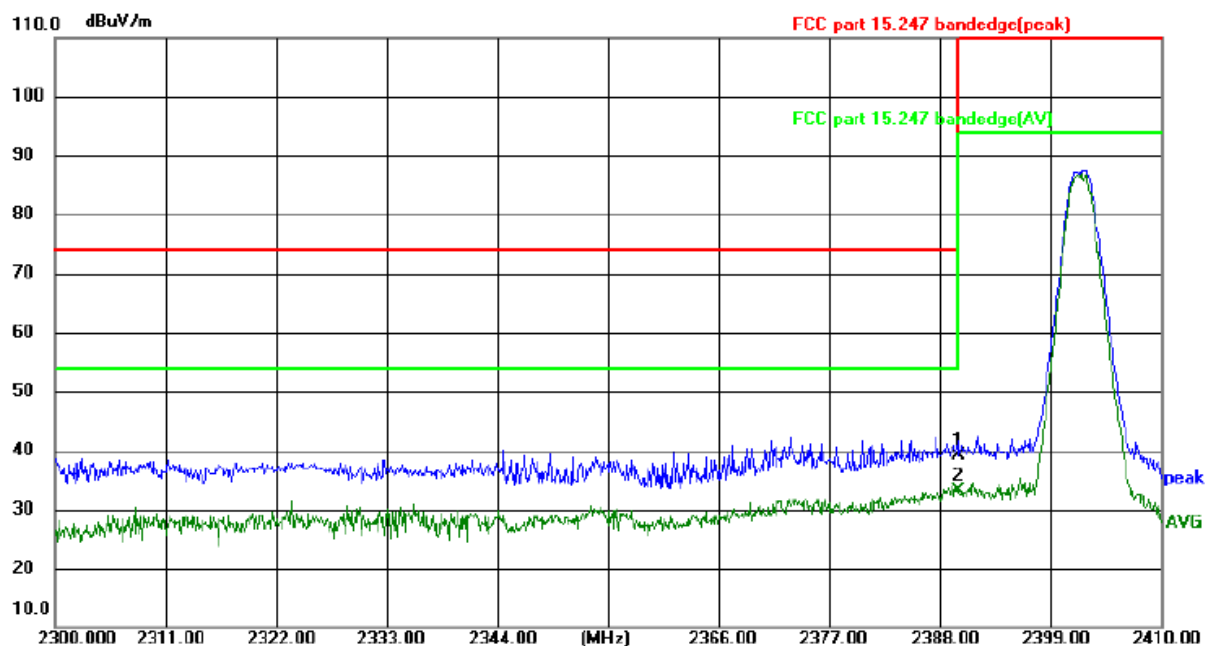
Power:DC 12V

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBuV)	AV reading (dBuV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBuV/m)	AV limit (dBuV/m)	Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)			
2390.000	H	58.60	---	-16.70	41.90	---	74	54	-32.10
2390.000	H	---	49.30	-16.70	---	32.60	74	54	-21.40

Note:

- 1.Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier
- 2.Margin (dB) = Emission Level (Peak/AVG) (dBuV/m)- limit (Peak/AVG) (dBuV/m)

Vertical:



Site: 3m Anechoic Chamber

Polarization: **Vertical**

Temperature: 23.1(°C)

Humidity: 44 %

Limit: FCC part 15.247 bandedge(peak)

Power:DC 12V

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBuV)	AV reading (dBuV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBuV/m)	AV limit (dBuV/m)	Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)			
2390.000	V	55.89	---	-16.70	39.19	---	74	54	-34.81
2390.000	V	---	49.83	-16.70	---	33.13	74	54	-20.87

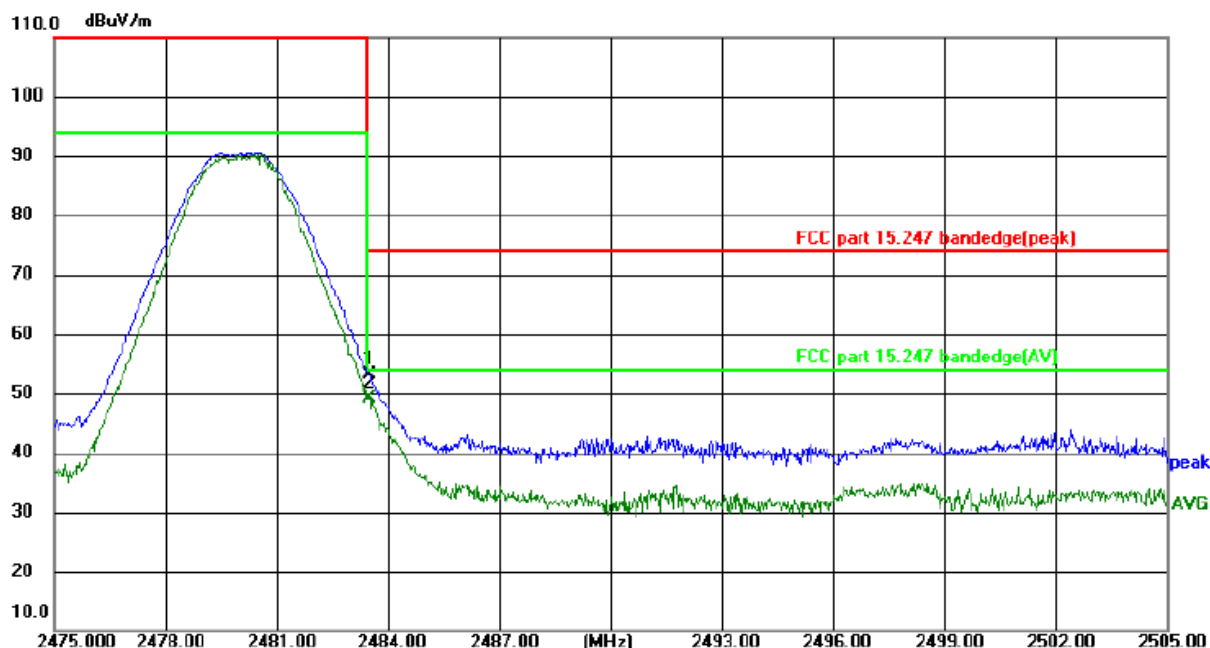
Note:

1.Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier

2.Margin (dB) = Emission Level (Peak/AVG) (dBuV/m)- limit (Peak/AVG) (dBuV/m)

Highest channel 2480:

Horizontal:



Site: 3m Anechoic Chamber

Polarization: **Horizontal**

Temperature: 23.1(°C)

Humidity: 44 %

Limit: FCC part 15.247 bandedge(peak)

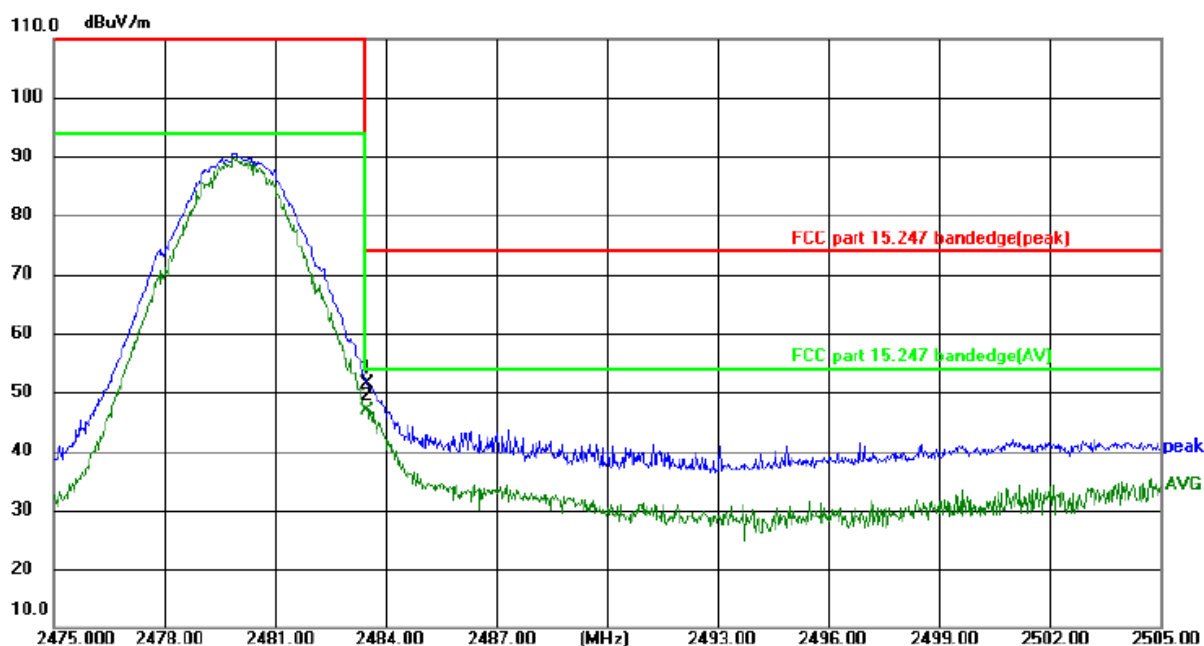
Power:DC 12V

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBuV)	AV reading (dBuV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBuV/m)	AV limit (dBuV/m)	Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)			
2483.500	H	69.82	---	-16.65	53.17	---	74	54	-20.83
2483.500	H	---	65.69	-16.65	---	49.04	74	54	-4.96

Note:

- 1.Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier
- 2.Margin (dB) = Emission Level (Peak/AVG) (dBuV/m)- limit (Peak/AVG) (dBuV/m)

Vertical:



Site: 3m Anechoic Chamber

Polarization: **Vertical**

Temperature: 23.1(°C)

Humidity: 44 %

Limit: FCC part 15.247 bandedge(peak)

Power:DC 12V

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBuV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
2483.500	V	69.07	---	-16.65	51.42	---	74	54	-22.58
2483.500	V	---	63.65	-16.65	---	47.00	74	54	-7.00

Note:

- 1.Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier
- 2.Margin (dB) = Emission Level (Peak/AVG) (dBμV/m)- limit (Peak/AVG) (dBμV/m)
- 3.Speed for 1M, 2M, code2 and code8 modulations of EUT have been tested, but the test data only show the worst case in this report, and we found the worst case is 1M speed modulation.

Above 1GHz

Low channel: 2402 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4804	H	56.29	---	-9.51	46.78	---	74	54	-7.22
7206	H	46.33	---	-1.41	44.92	---	74	54	-9.08
---	H	---	---	---	---	---	---	---	---
4804	V	56.56	---	-9.51	47.05	---	74	54	-6.95
7206	V	46.04	---	-1.41	44.63	---	74	54	-9.37
---	V	---	---	---	---	---	---	---	---

Middle channel: 2440 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4880	H	56.99	---	-9.36	47.63	---	74	54	-6.37
7320	H	46.62	---	-1.15	45.47	---	74	54	-8.53
---	H	---	---	---	---	---	---	---	---
4880	V	55.57	---	-9.36	46.21	---	74	54	-7.79
7320	V	45.03	---	-1.15	43.88	---	74	54	-10.12
---	V	---	---	---	---	---	---	---	---

High channel: 2480 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4960	H	55.64	---	-9.20	46.44	---	74	54	-7.56
7440	H	44.02	---	-0.96	43.06	---	74	54	-10.94
---	H	---	---	---	---	---	---	---	---
4960	V	54.38	---	-9.20	45.18	---	74	54	-8.82
7440	V	45.01	---	-0.96	44.05	---	74	54	-9.95
---	V	---	---	---	---	---	---	---	---

Note:

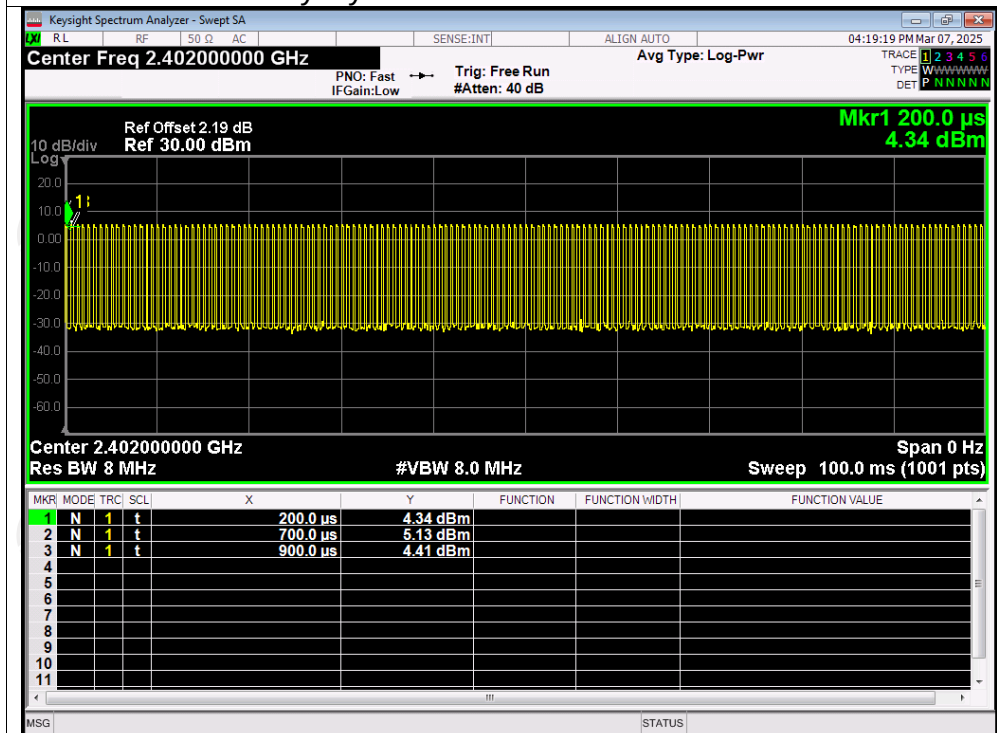
1. Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier
2. Margin (dB) = Emission Level (Peak) (dBμV/m)-Average limit (dBμV/m)
3. The emission levels of other frequencies are very lower than the limit and not show in test report.
4. Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.
5. Data of measurement shown “---”in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.
6. Speed for 1M, 2M, code2 and code8 modulations of EUT have been tested, but the test data only show the worst case in this report, and we found the worst case is 2M speed modulation.
7. All the restriction bands are compliance with the limit of 15.209.

Appendix A: Test Result of Conducted Test

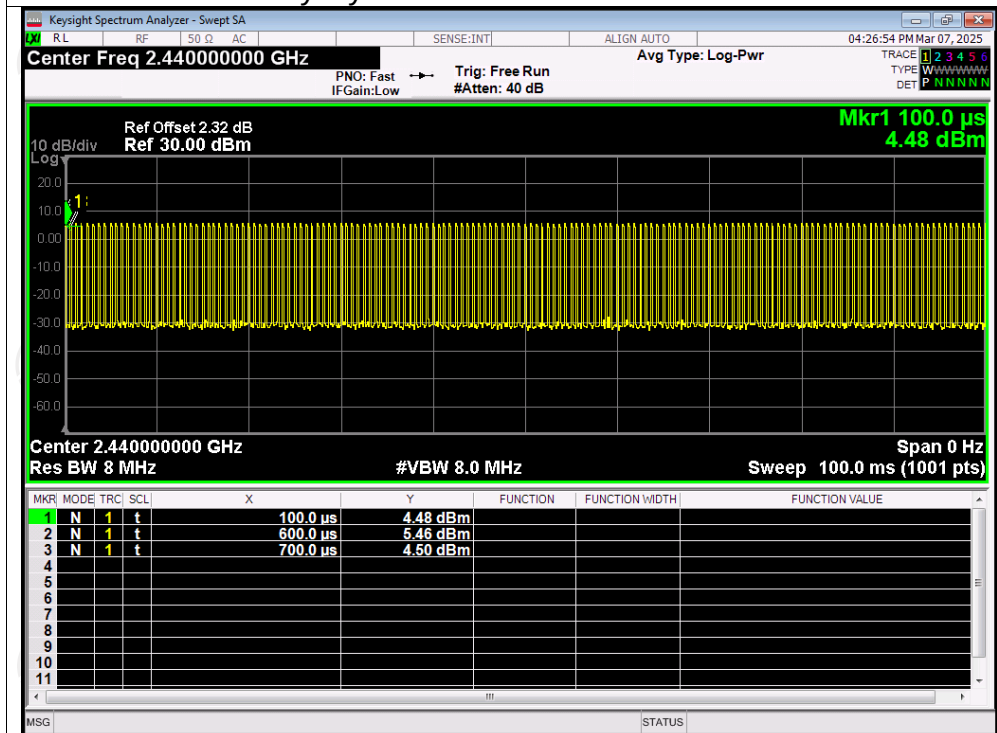
Duty Cycle				
Condition	Mode	Frequency (MHz)	Duty Cycle (%)	Correction Factor (dB)
NVNT	BLE 1M	2402	35.96	4.44
NVNT	BLE 1M	2440	32.07	4.94
NVNT	BLE 1M	2480	31.97	4.95
NVNT	BLE 2M	2402	27.97	5.53
NVNT	BLE 2M	2440	27.97	5.53
NVNT	BLE 2M	2480	27.97	5.53
NVNT	BLE (code2)	2402	39.96	3.98
NVNT	BLE (code2)	2440	40.06	3.97
NVNT	BLE (code2)	2480	43.96	3.57
NVNT	BLE (code8)	2402	39.96	3.98
NVNT	BLE (code8)	2440	39.96	3.98
NVNT	BLE (code8)	2480	44.06	3.56

Test Graphs

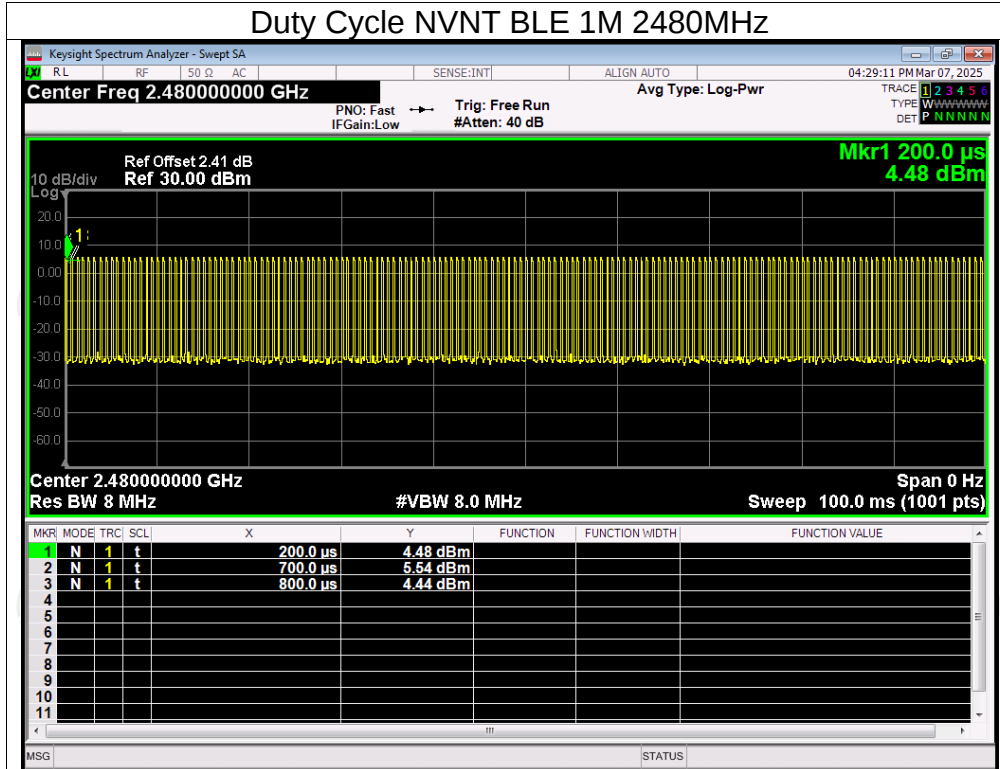
Duty Cycle NVNT BLE 1M 2402MHz



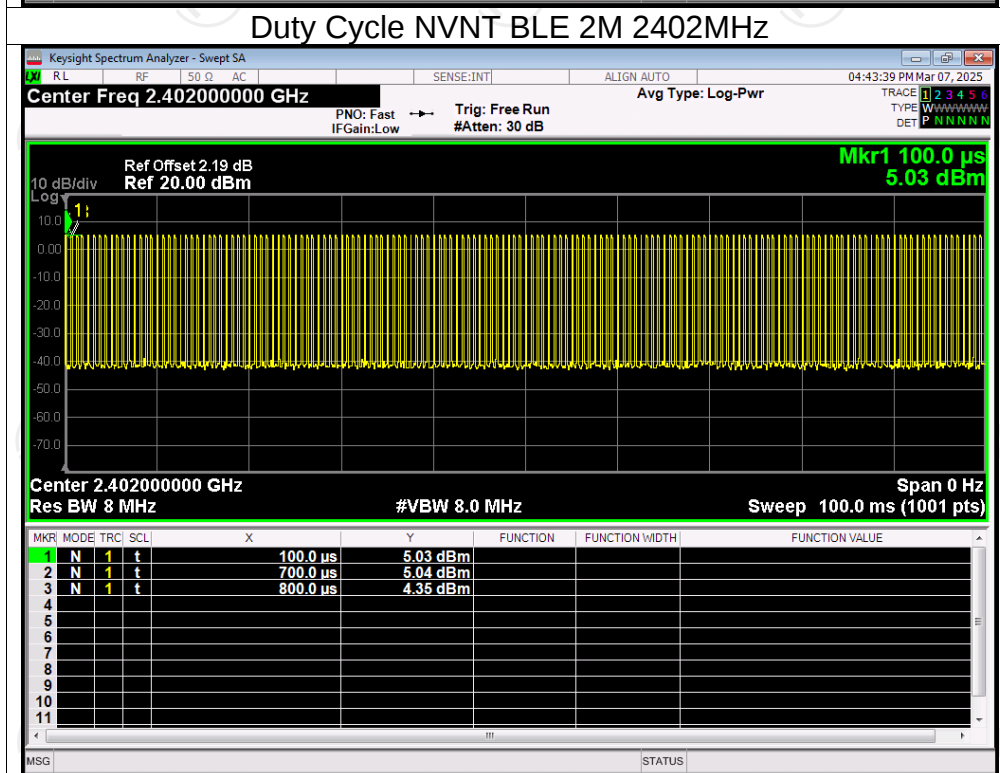
Duty Cycle NVNT BLE 1M 2440MHz



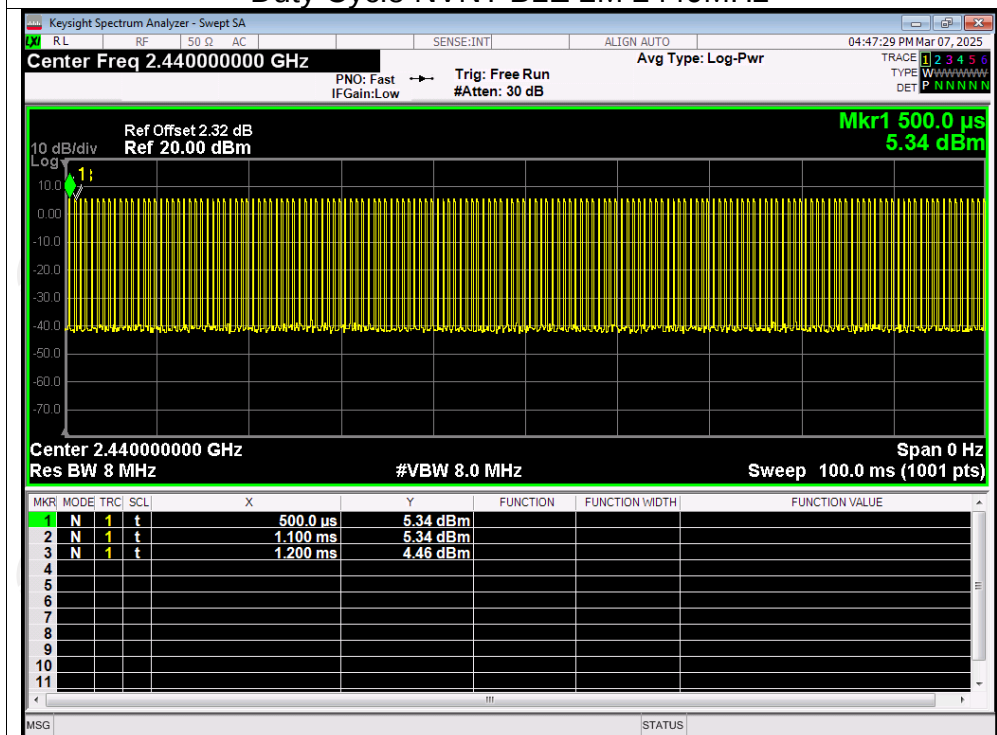
Duty Cycle NVNT BLE 1M 2480MHz



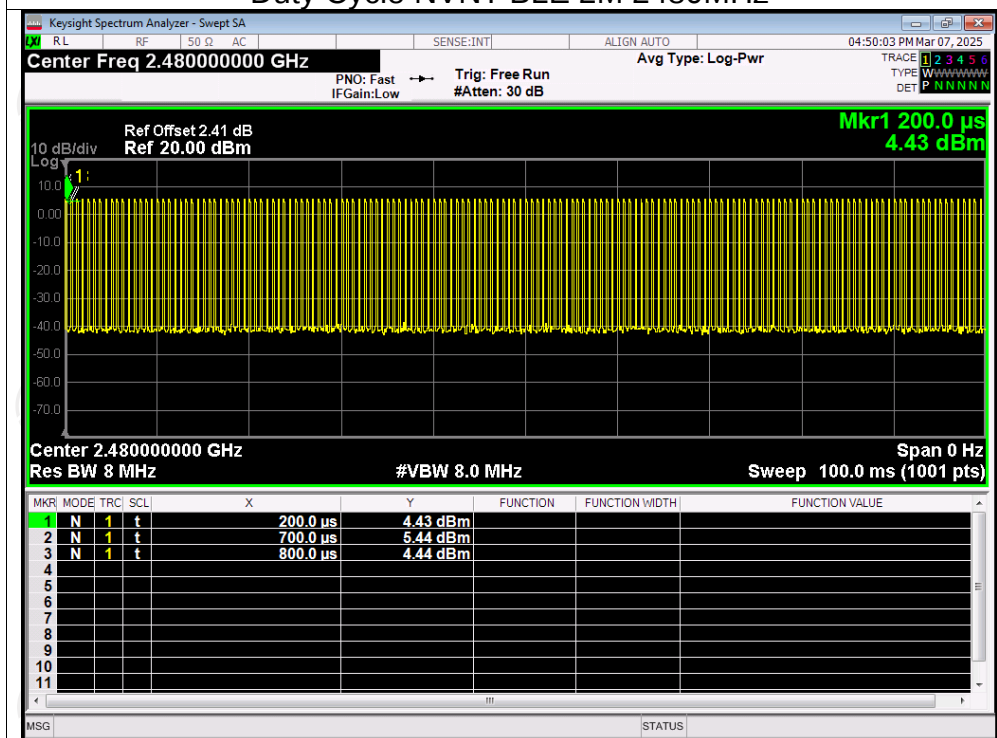
Duty Cycle NVNT BLE 2M 2402MHz



Duty Cycle NVNT BLE 2M 2440MHz

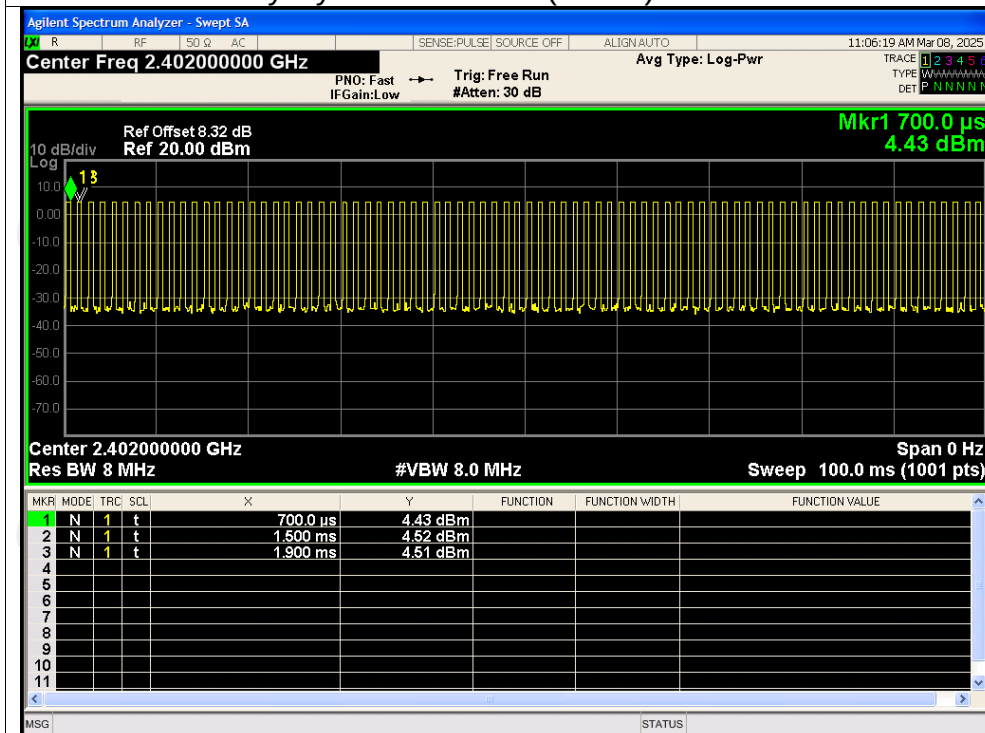


Duty Cycle NVNT BLE 2M 2480MHz

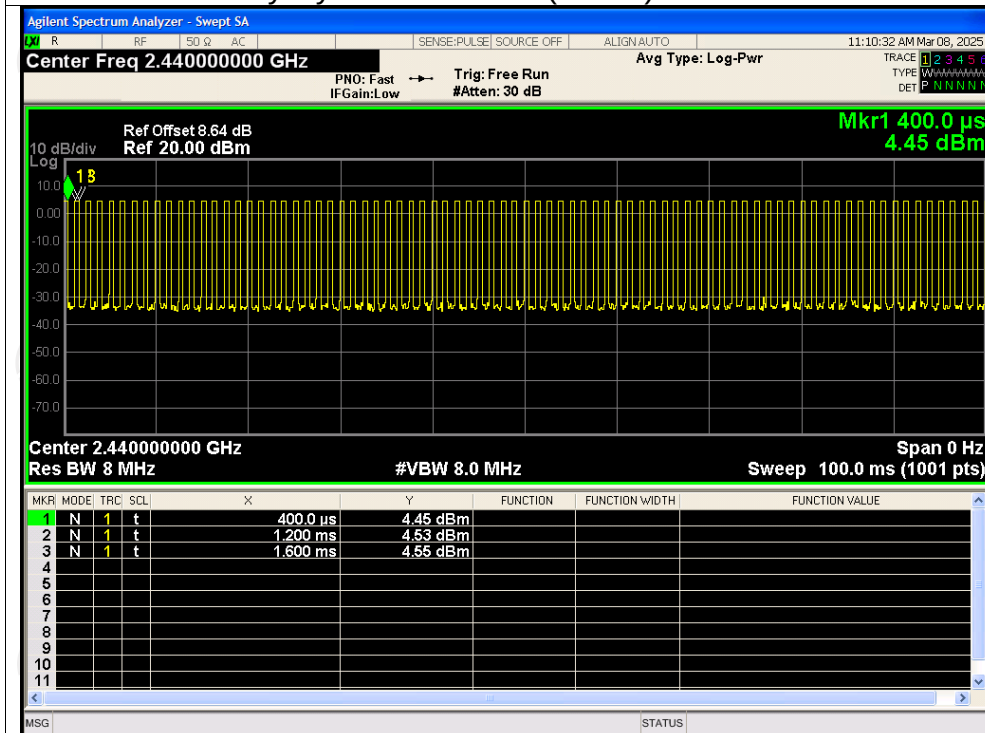


Test Graphs

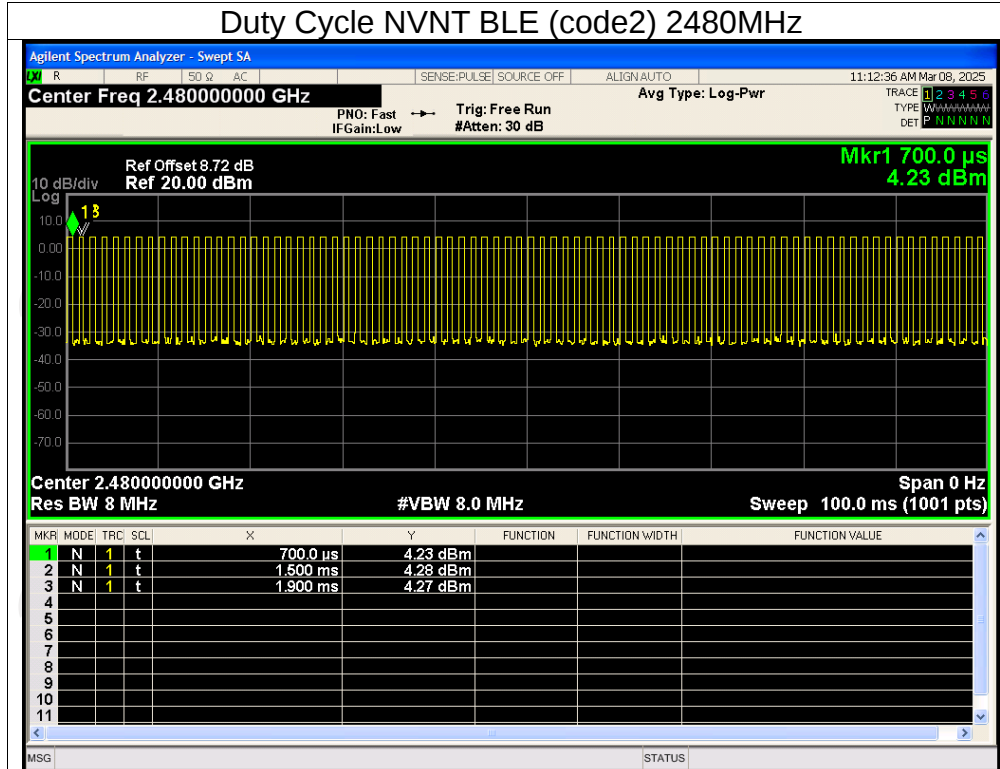
Duty Cycle NVNT BLE (code2) 2402MHz



Duty Cycle NVNT BLE (code2) 2440MHz

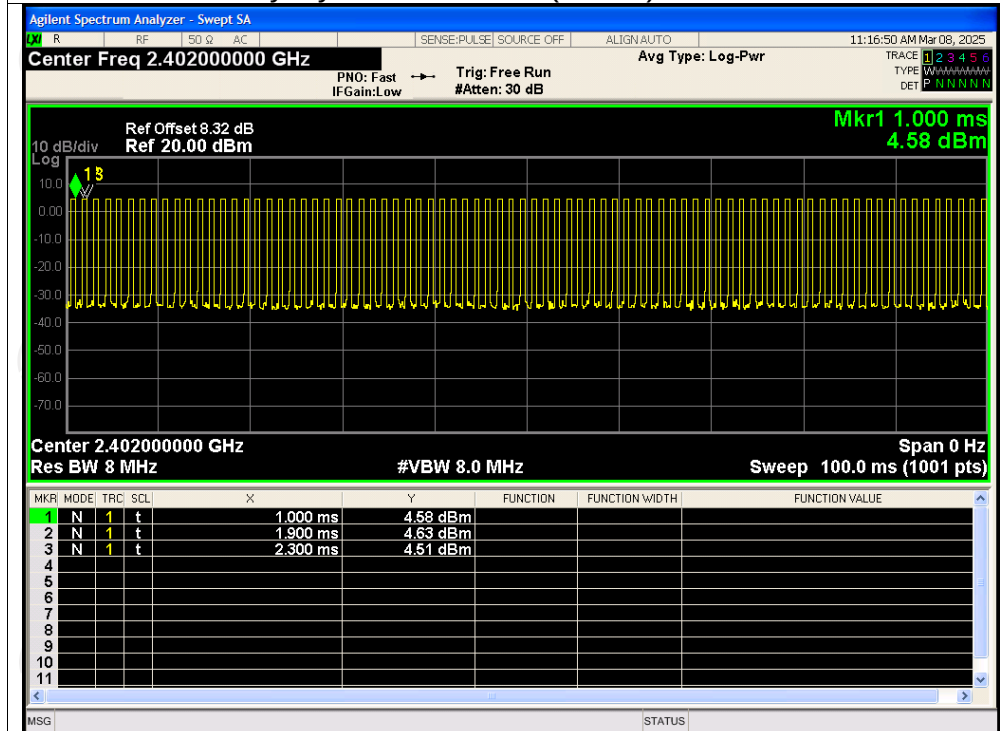


Duty Cycle NVNT BLE (code2) 2480MHz

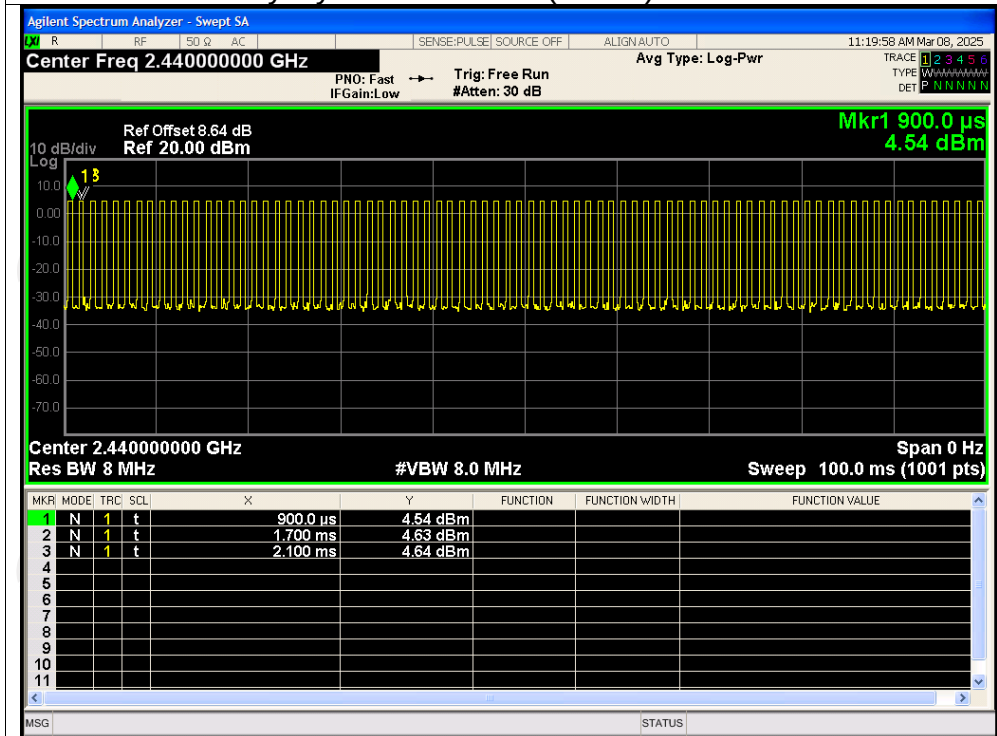


Test Graphs

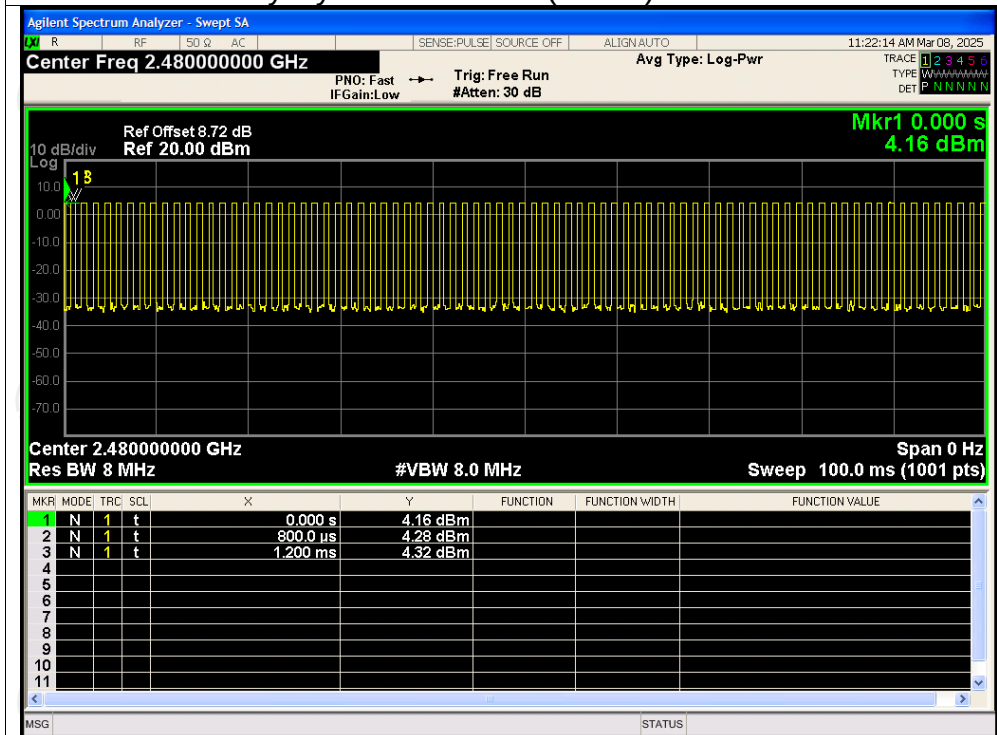
Duty Cycle NVNT BLE (code8) 2402MHz



Duty Cycle NVNT BLE (code8) 2440MHz



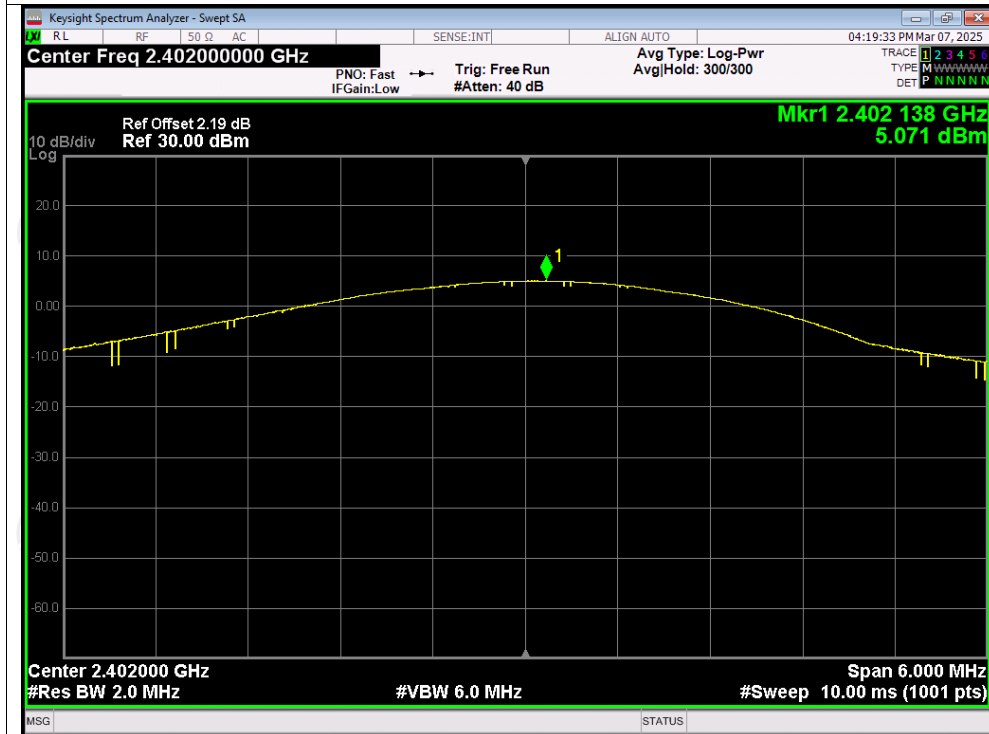
Duty Cycle NVNT BLE (code8) 2480MHz



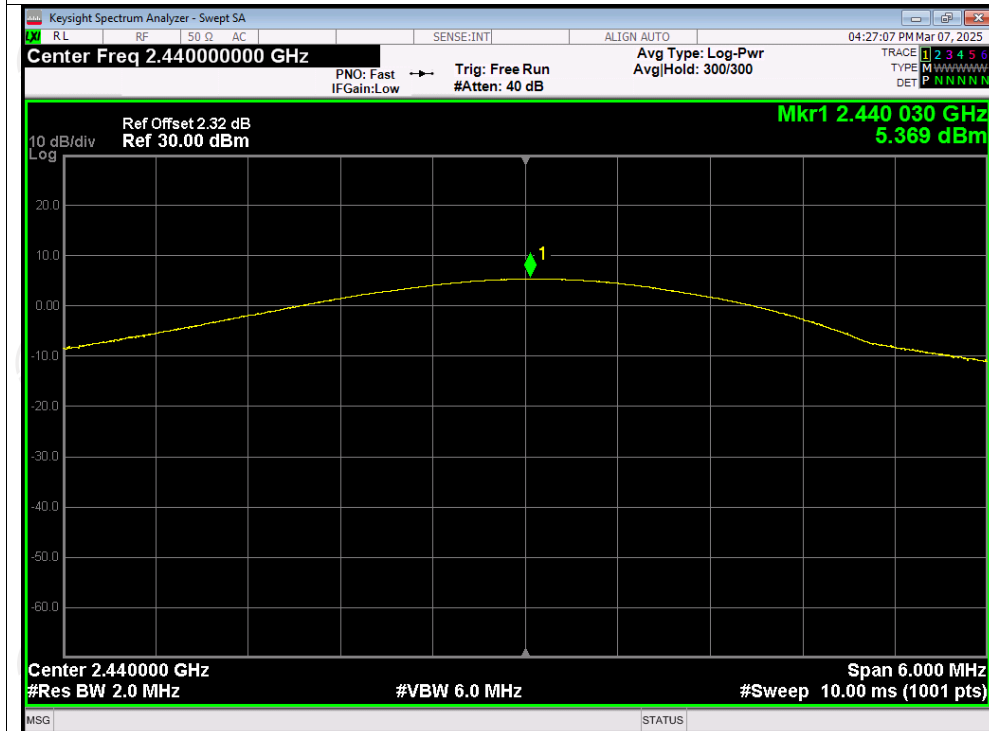
Maximum Conducted Output Power

Condition	Mode	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	BLE 1M	2402	5.07	30	Pass
NVNT	BLE 1M	2440	5.37	30	Pass
NVNT	BLE 1M	2480	5.42	30	Pass
NVNT	BLE 2M	2402	5.01	30	Pass
NVNT	BLE 2M	2440	5.24	30	Pass
NVNT	BLE 2M	2480	5.35	30	Pass
NVNT	BLE (code2)	2402	4.46	30	Pass
NVNT	BLE (code2)	2440	4.49	30	Pass
NVNT	BLE (code2)	2480	4.18	30	Pass
NVNT	BLE (code8)	2402	4.54	30	Pass
NVNT	BLE (code8)	2440	4.57	30	Pass
NVNT	BLE (code8)	2480	4.21	30	Pass

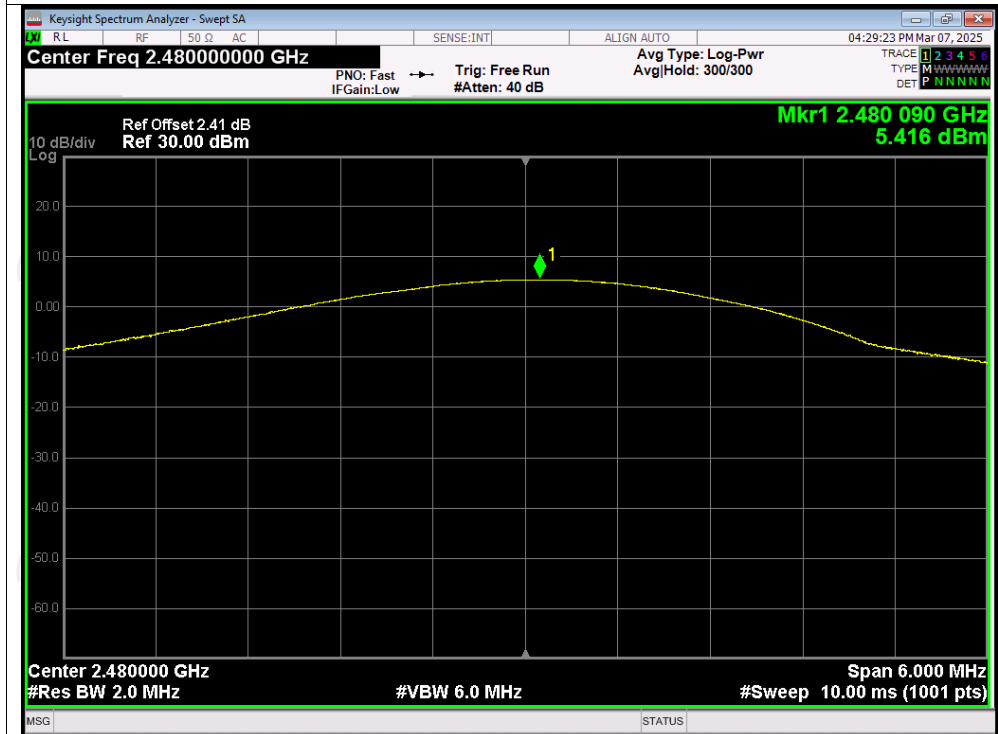
Test Graphs Power NVNT BLE 1M 2402MHz



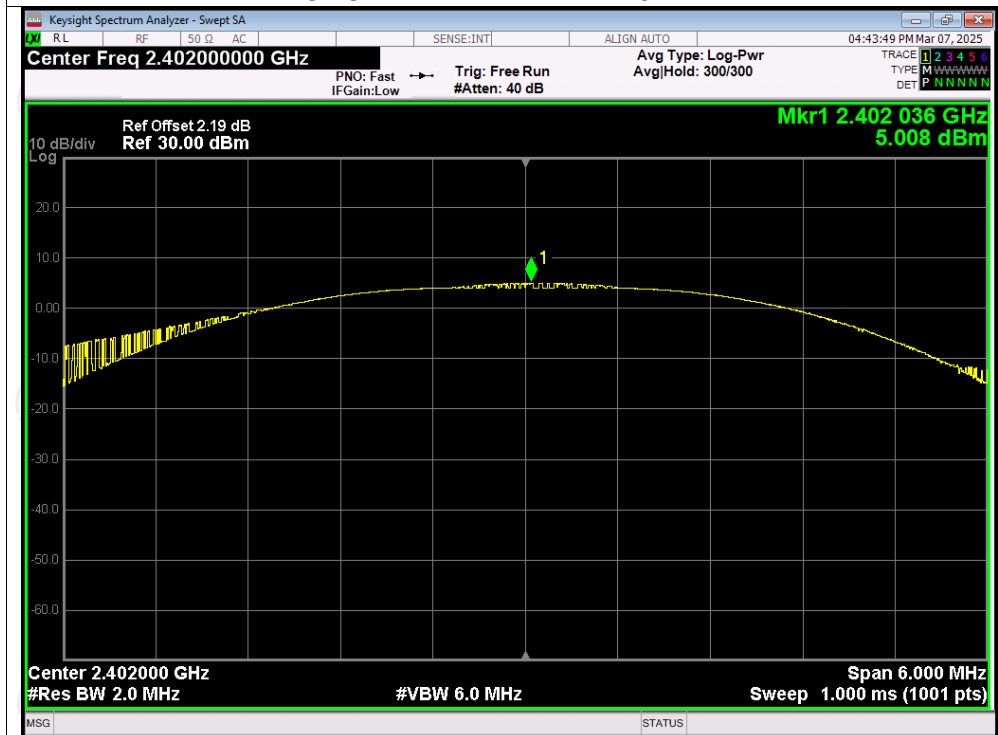
Power NVNT BLE 1M 2440MHz



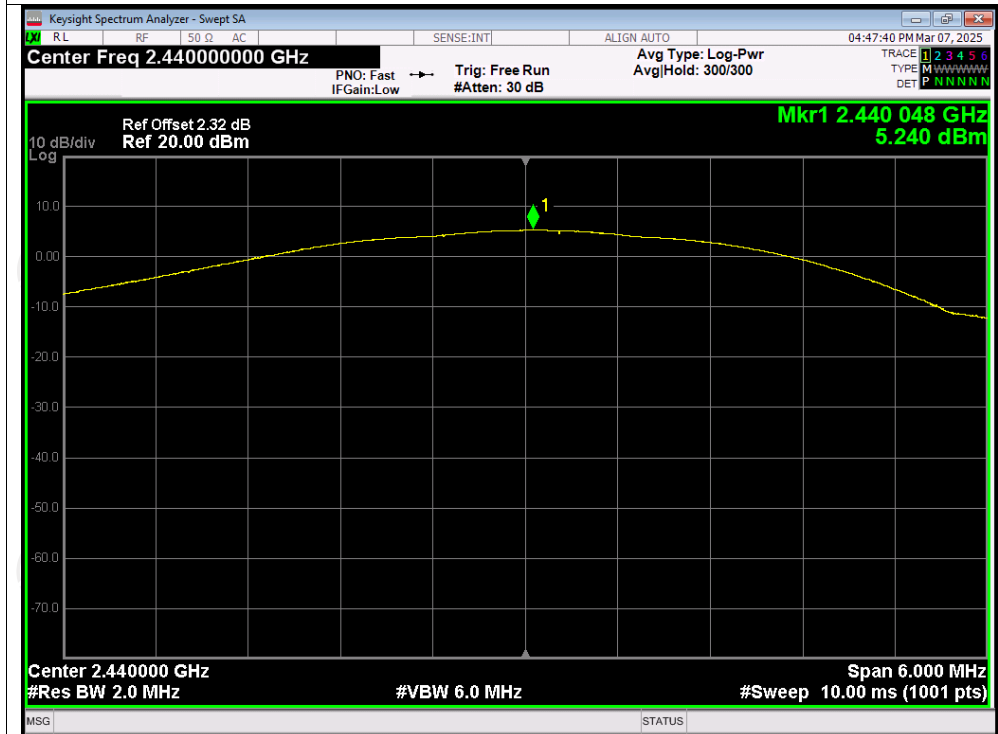
Power NVNT BLE 1M 2480MHz



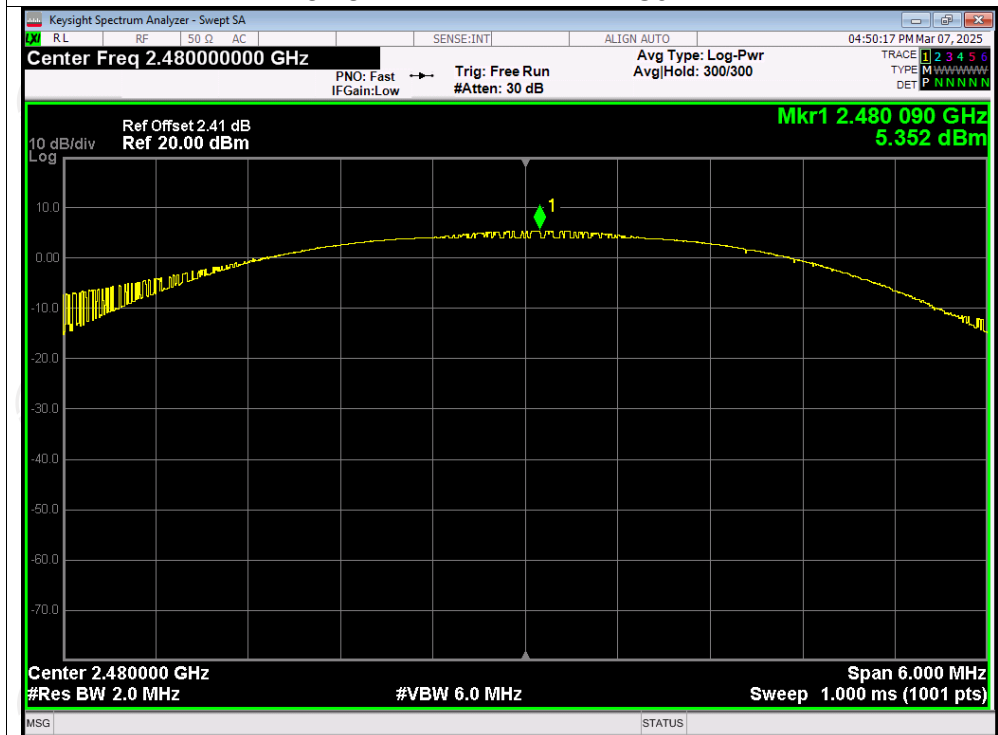
Power NVNT BLE 2M 2402MHz



Power NVNT BLE 2M 2440MHz

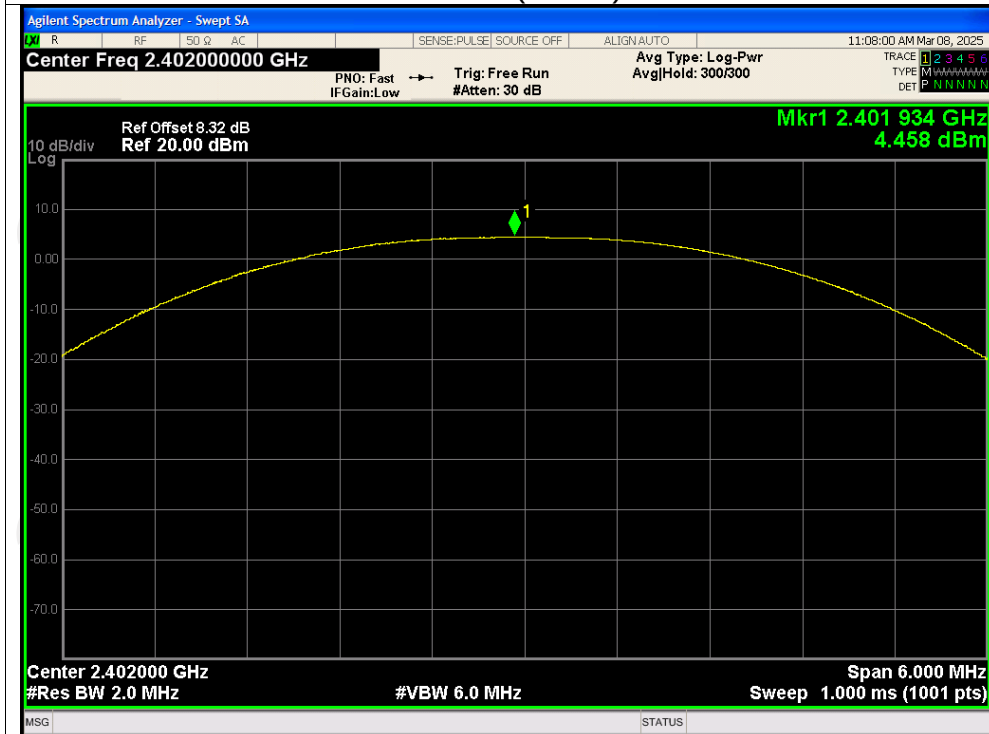


Power NVNT BLE 2M 2480MHz

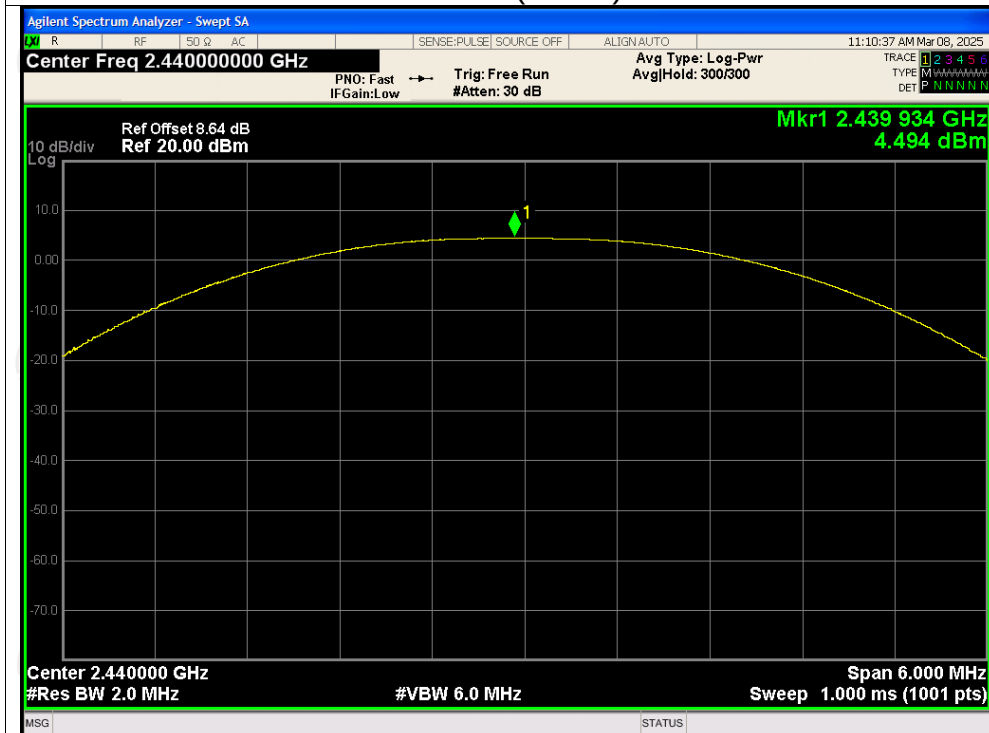


Test Graphs

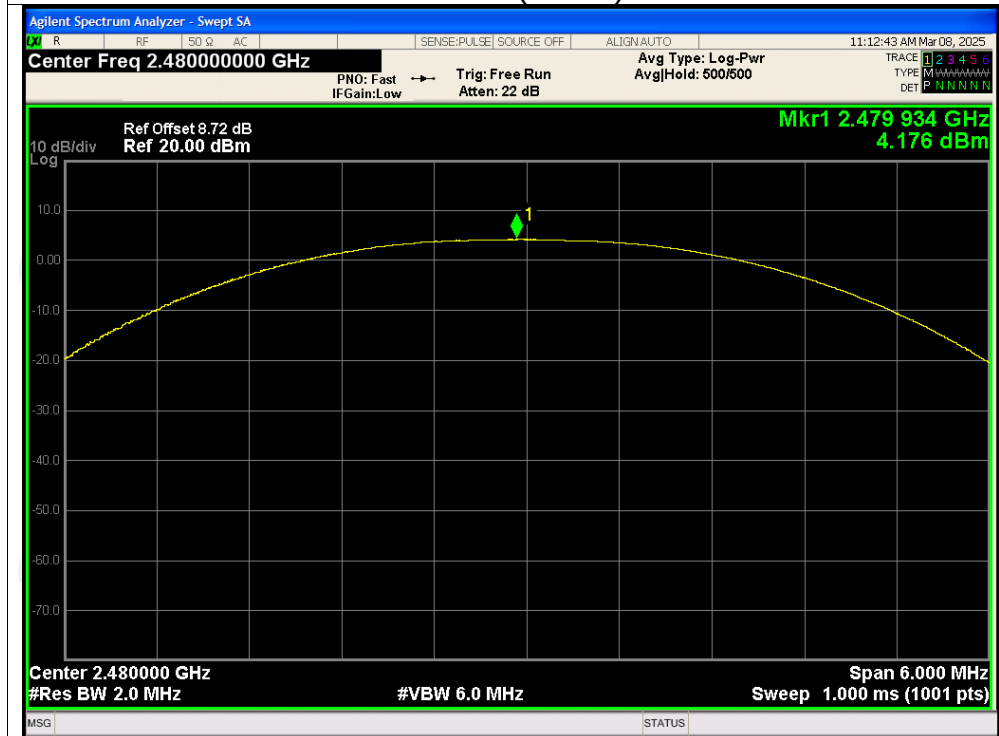
Power NVNT BLE (code2) 2402MHz



Power NVNT BLE (code2) 2440MHz

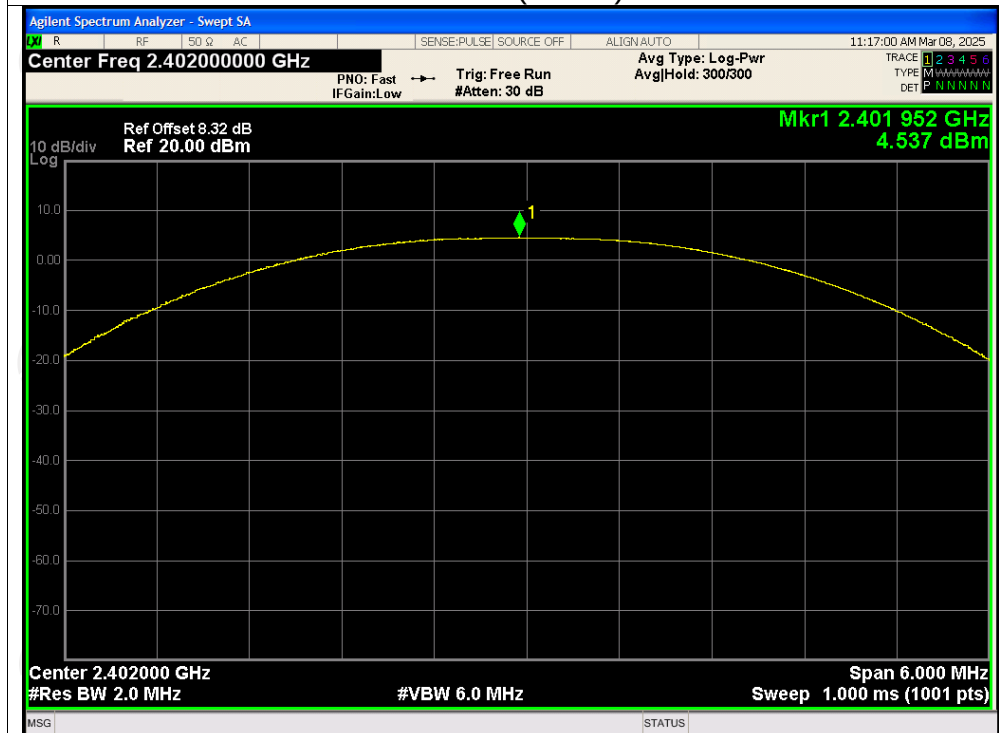


Power NVNT BLE (code2) 2480MHz

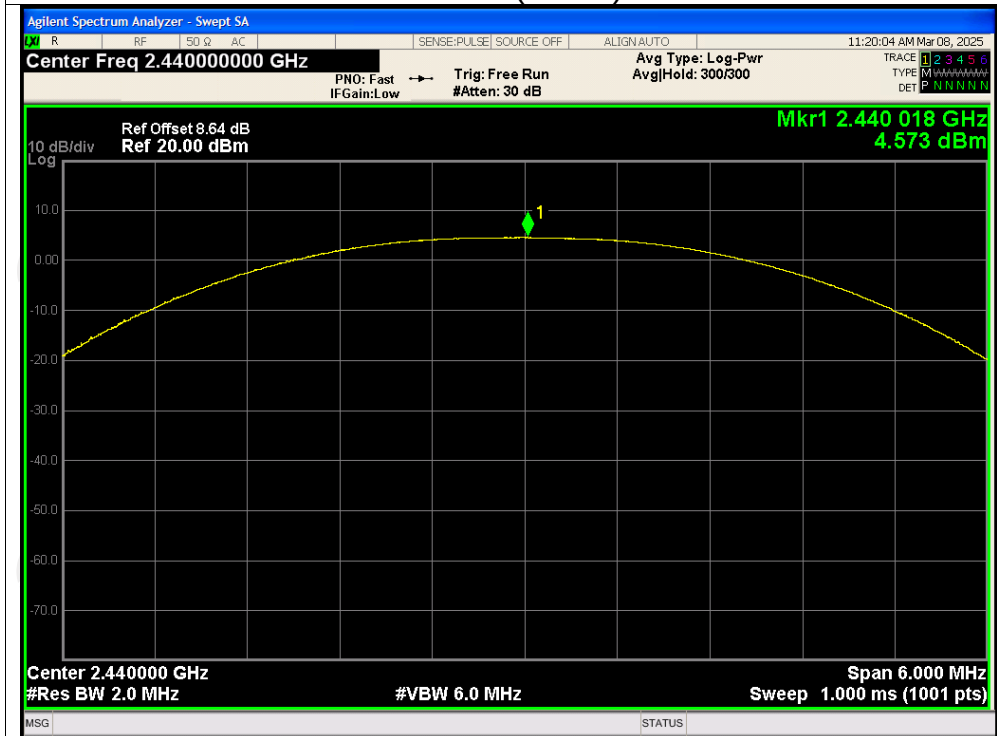


Test Graphs

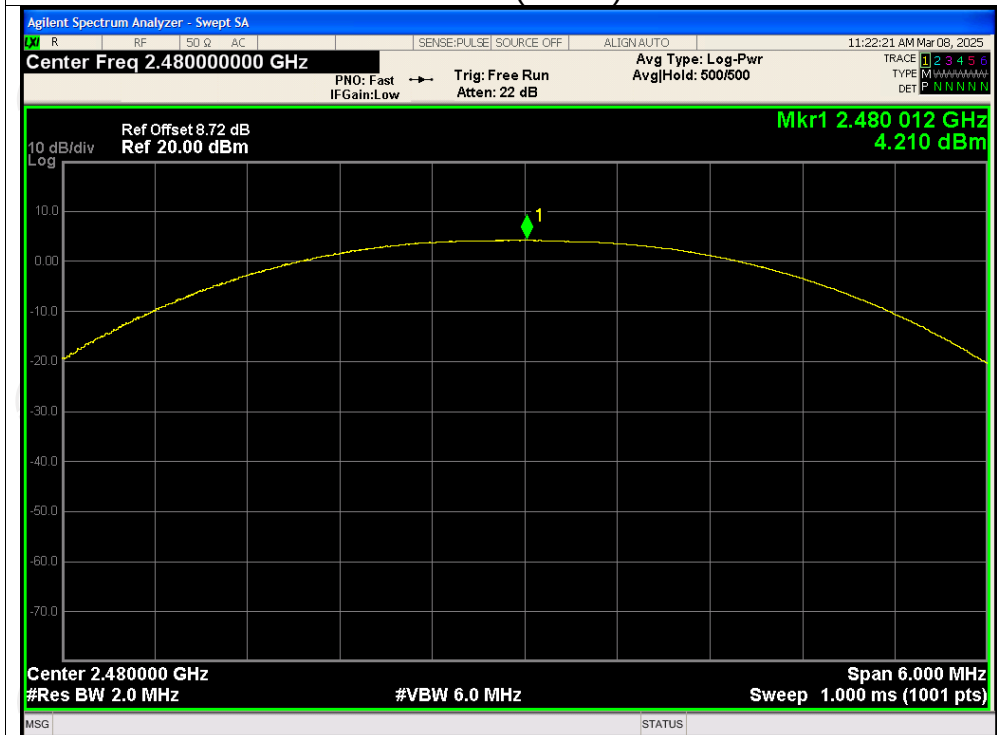
Power NVNT BLE (code8) 2402MHz



Power NVNT BLE (code8) 2440MHz



Power NVNT BLE (code8) 2480MHz

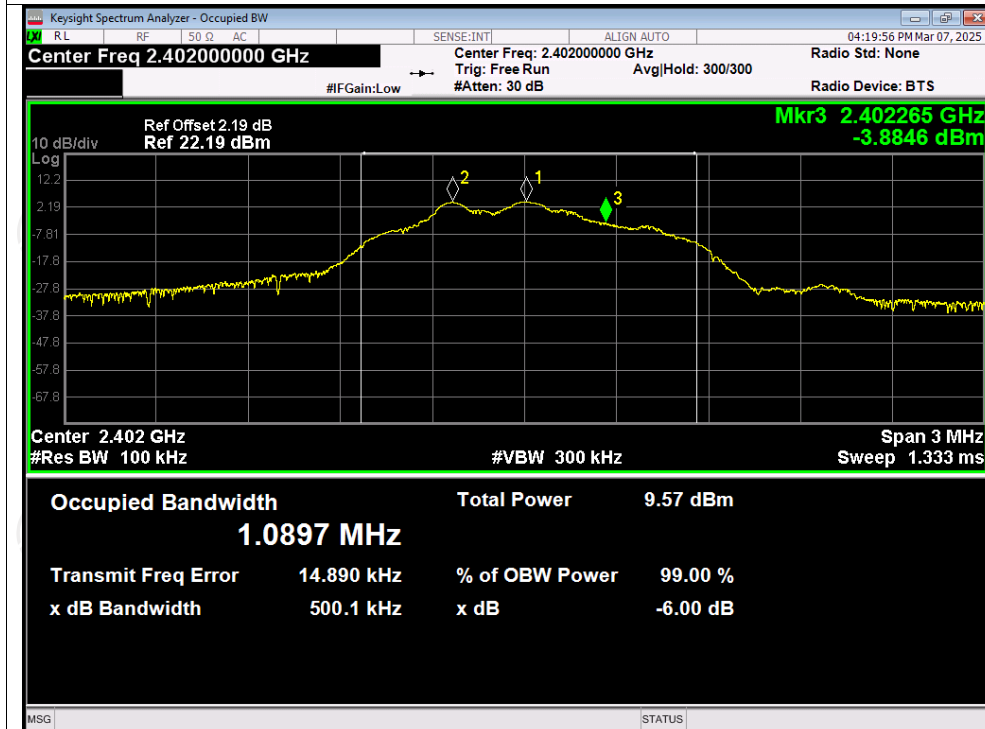


-6dB Bandwidth

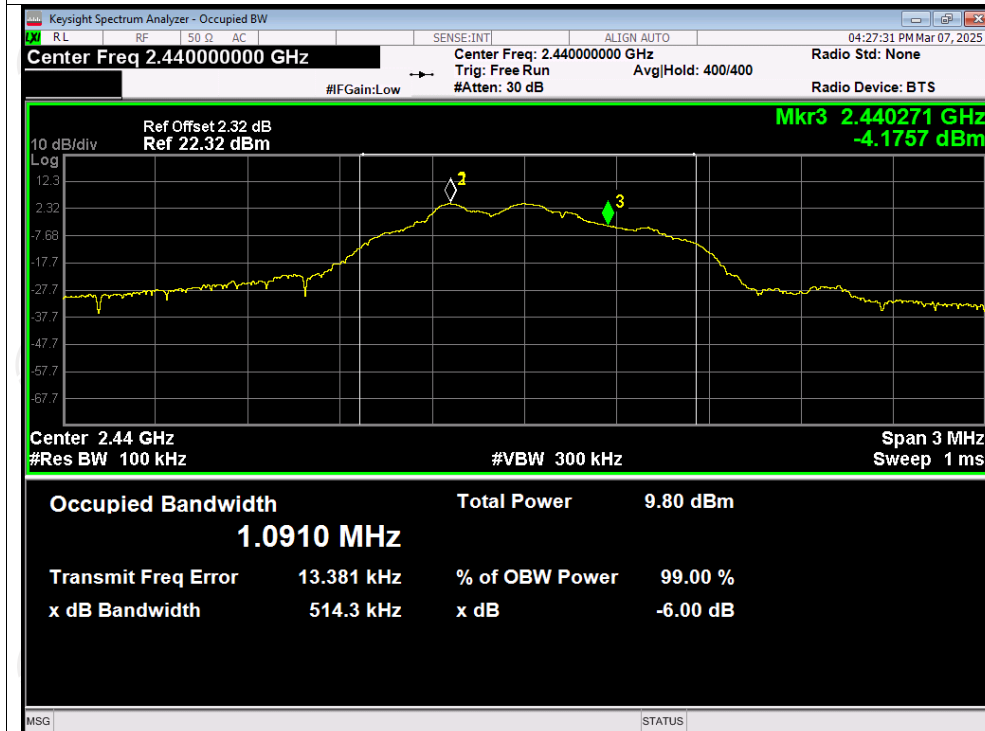
Condition	Mode	Frequency (MHz)	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	BLE 1M	2402	0.500	0.5	Pass
NVNT	BLE 1M	2440	0.514	0.5	Pass
NVNT	BLE 1M	2480	0.523	0.5	Pass
NVNT	BLE 2M	2402	0.825	0.5	Pass
NVNT	BLE 2M	2440	0.866	0.5	Pass
NVNT	BLE 2M	2480	0.861	0.5	Pass
NVNT	BLE (code2)	2402	0.662	0.5	Pass
NVNT	BLE (code2)	2440	0.659	0.5	Pass
NVNT	BLE (code2)	2480	0.659	0.5	Pass
NVNT	BLE (code8)	2402	0.663	0.5	Pass
NVNT	BLE (code8)	2440	0.660	0.5	Pass
NVNT	BLE (code8)	2480	0.651	0.5	Pass

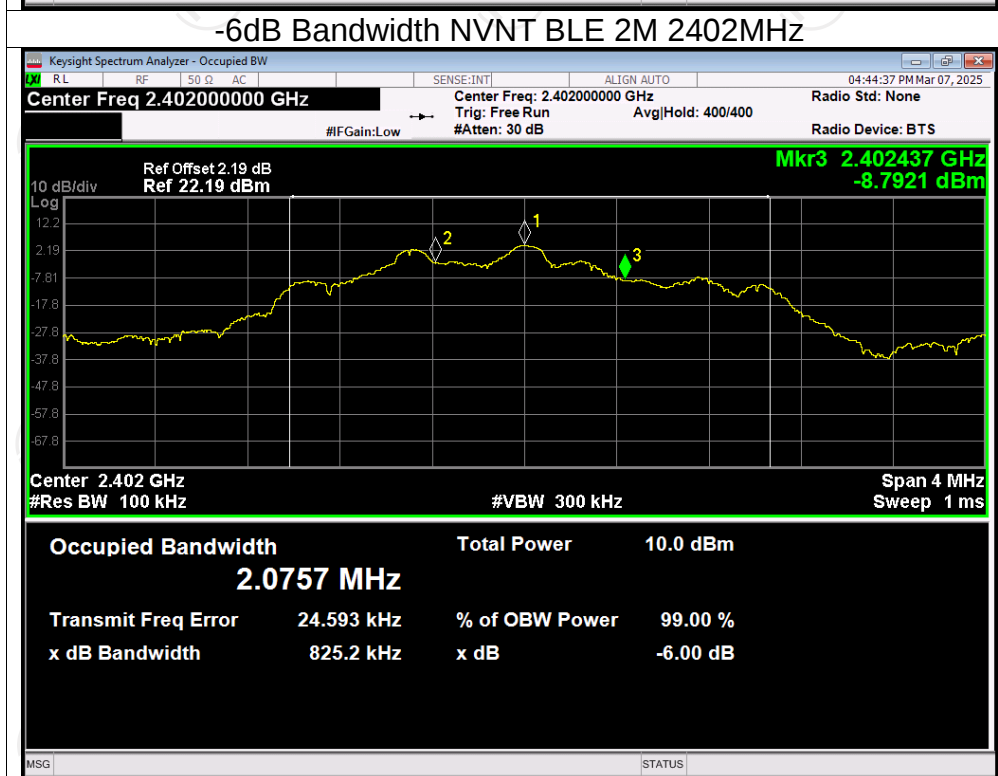
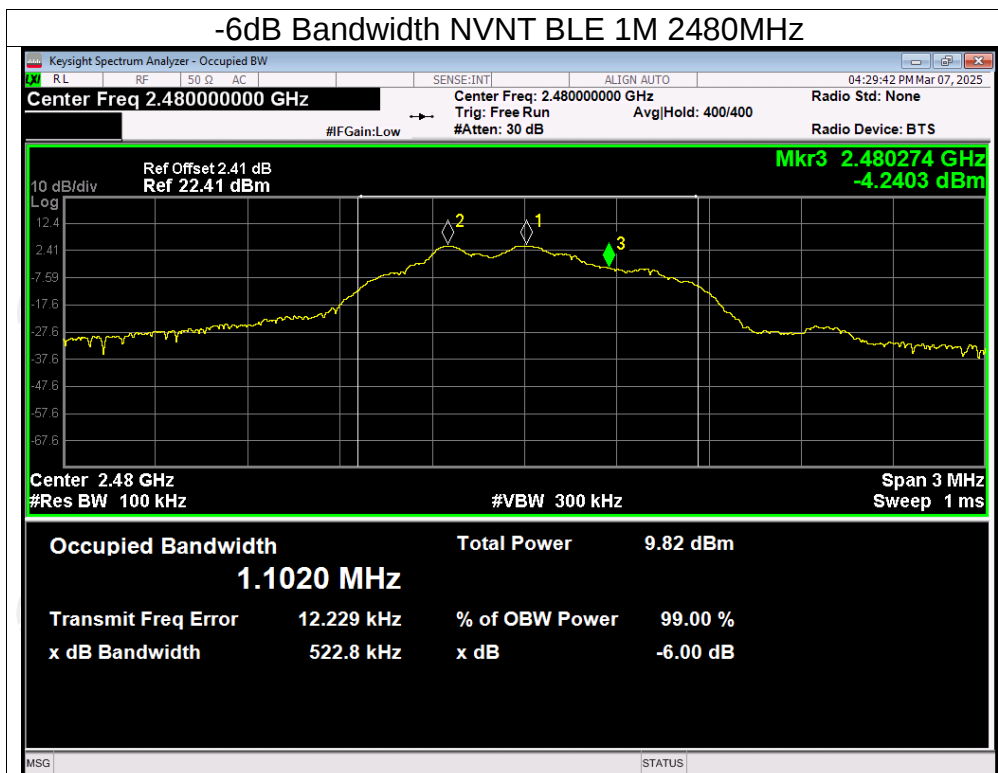
Test Graphs

-6dB Bandwidth NVNT BLE 1M 2402MHz

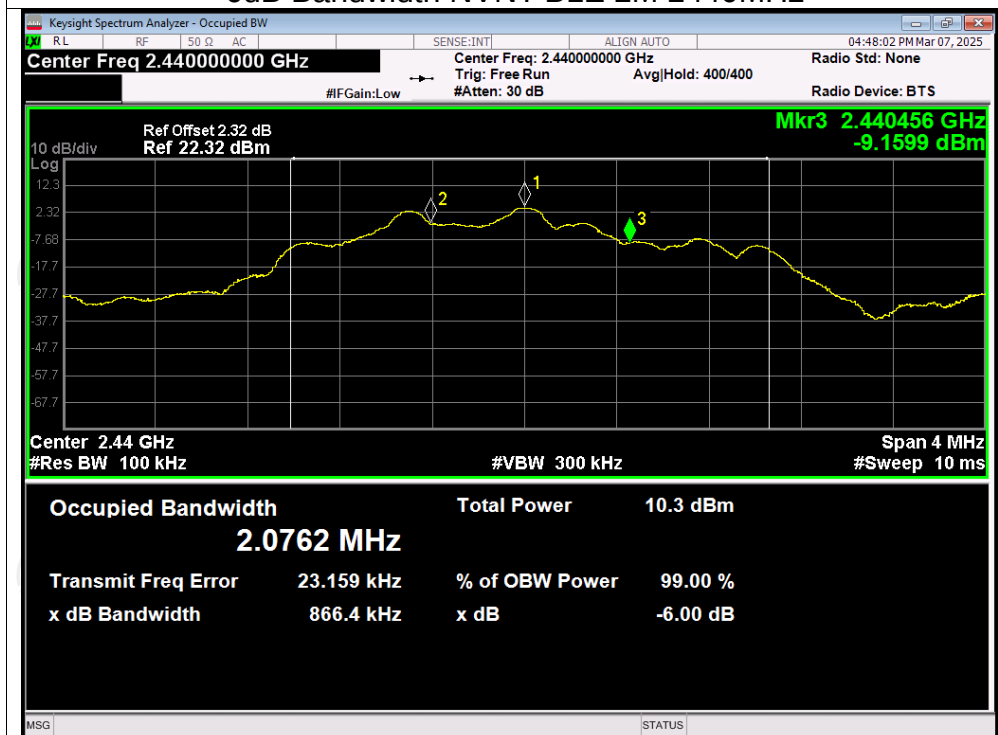


-6dB Bandwidth NVNT BLE 1M 2440MHz

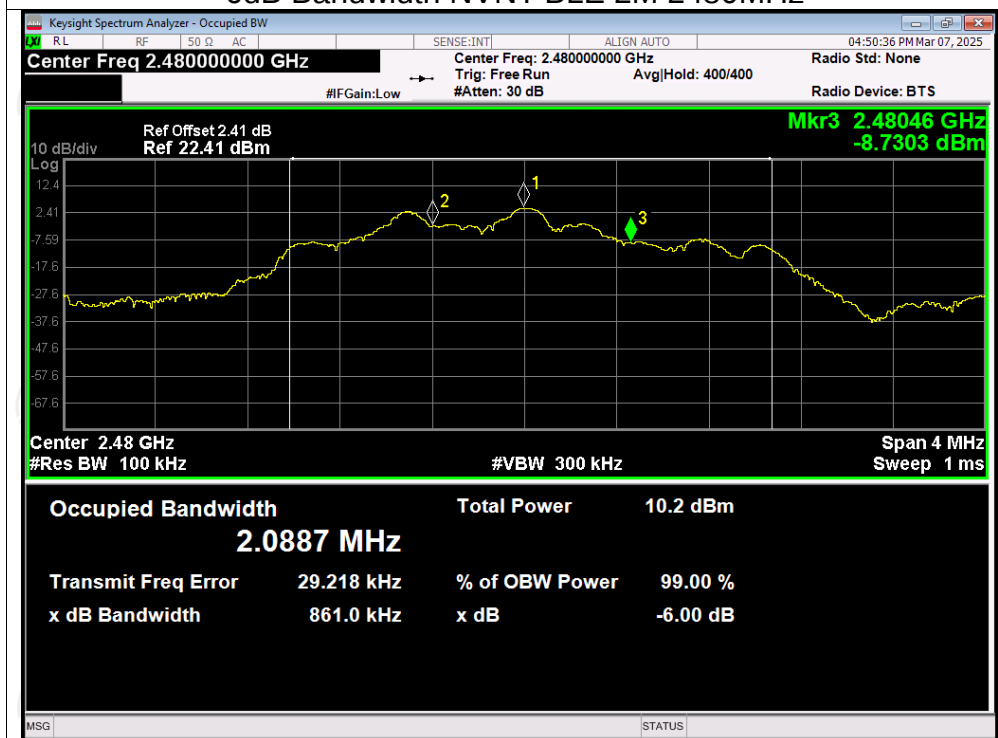




-6dB Bandwidth NVNT BLE 2M 2440MHz

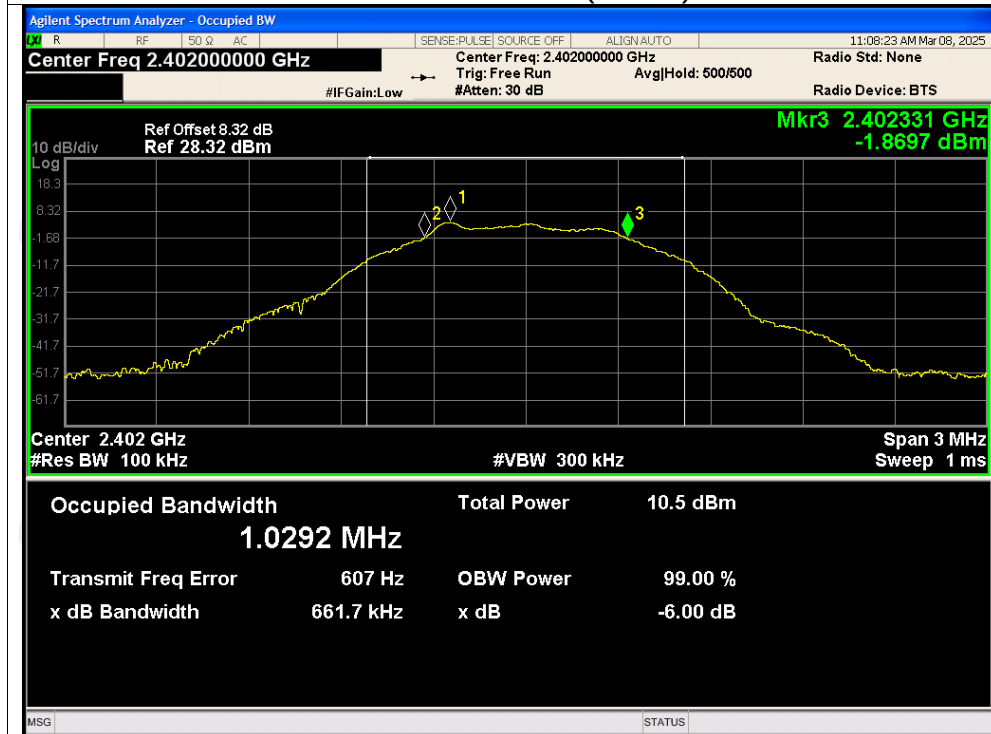


-6dB Bandwidth NVNT BLE 2M 2480MHz

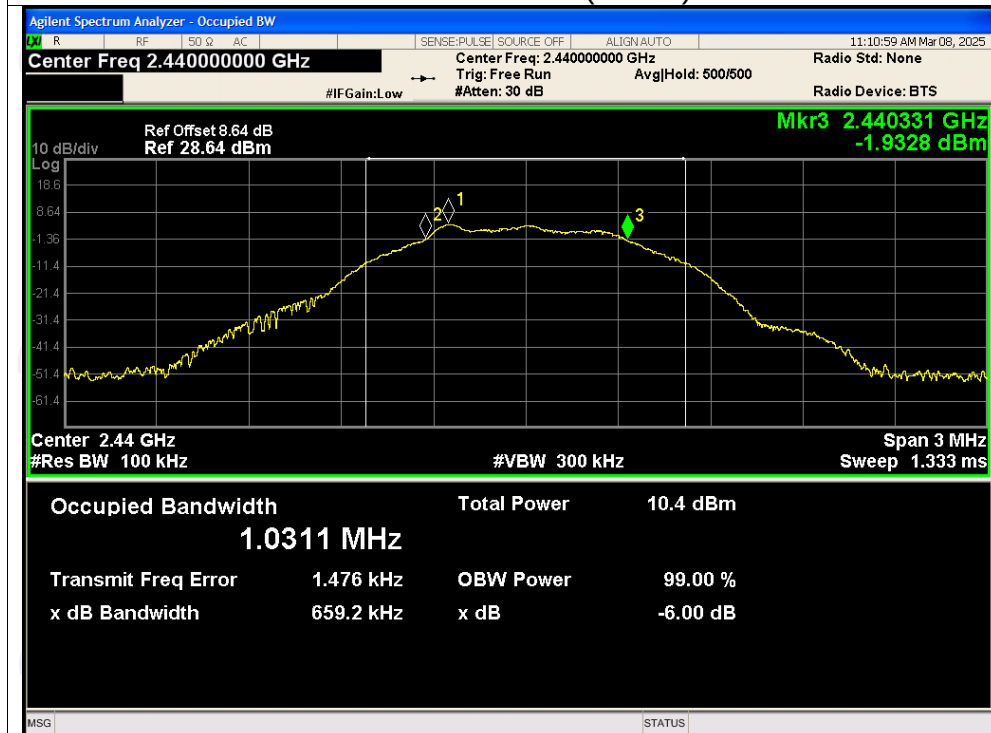


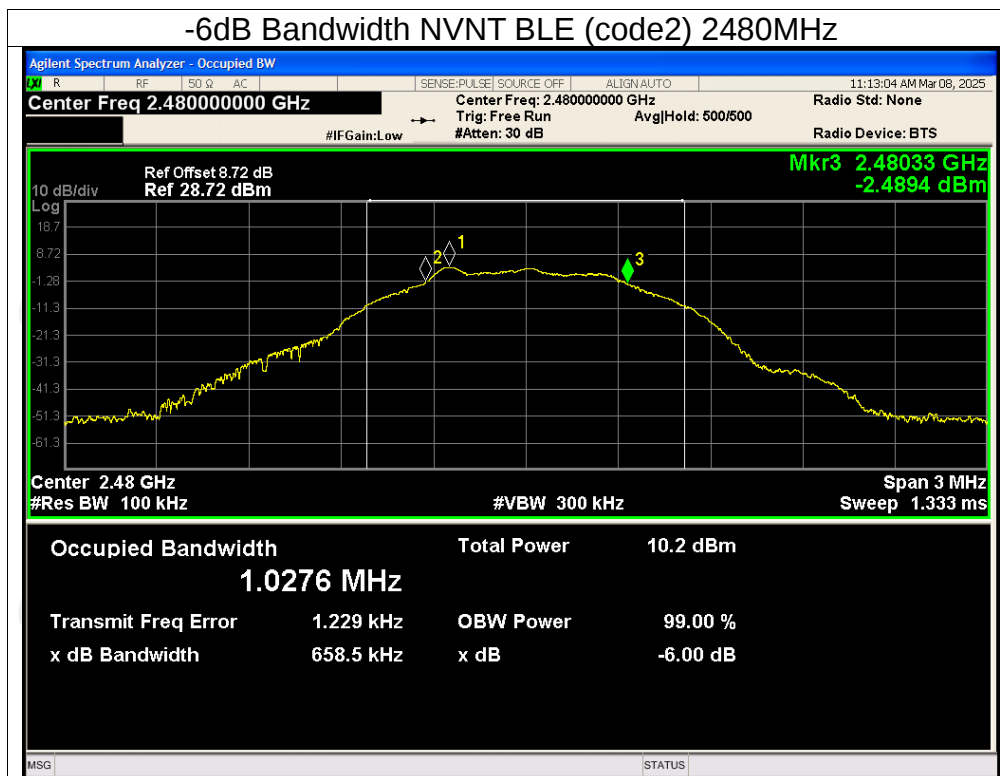
Test Graphs

-6dB Bandwidth NVNT BLE (code2) 2402MHz

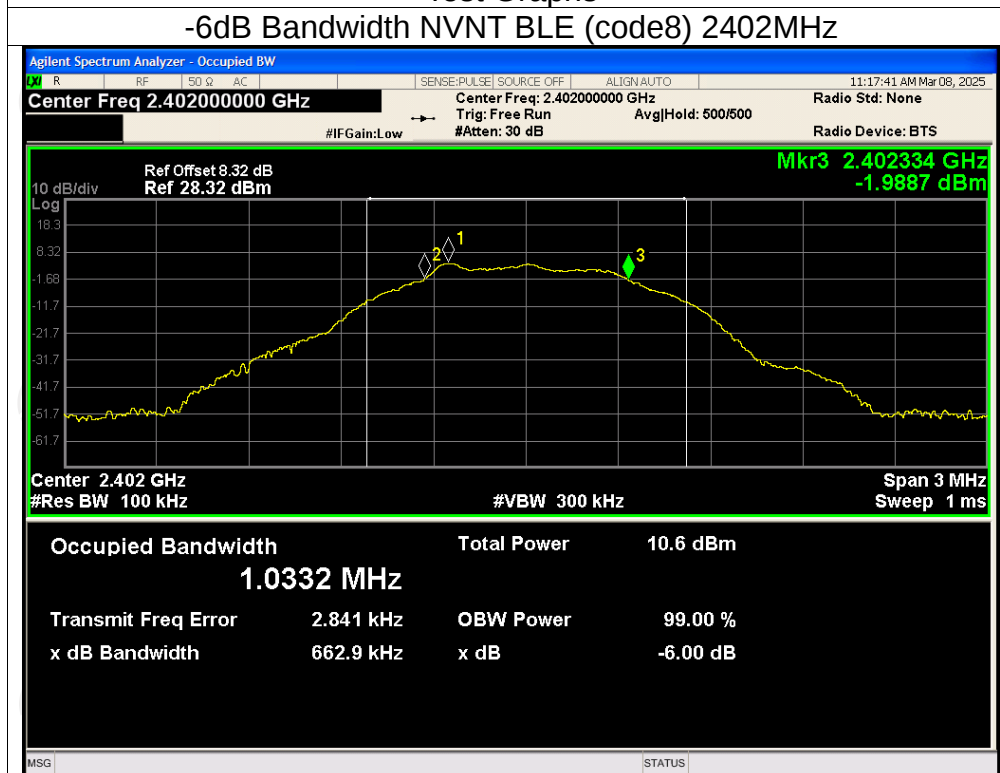


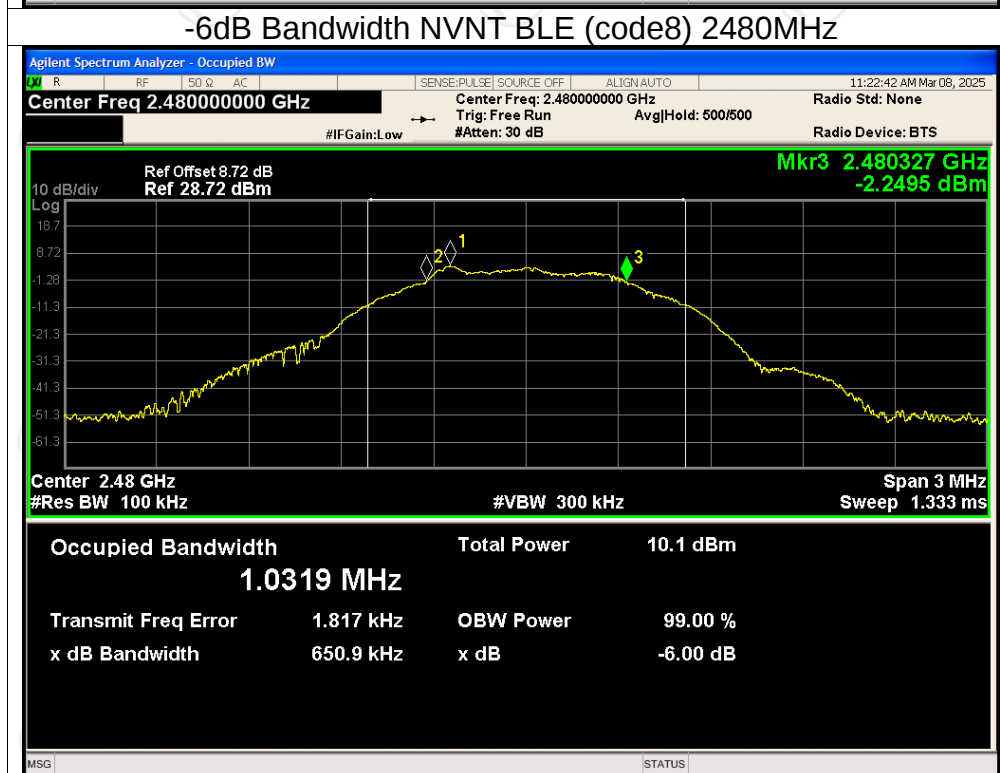
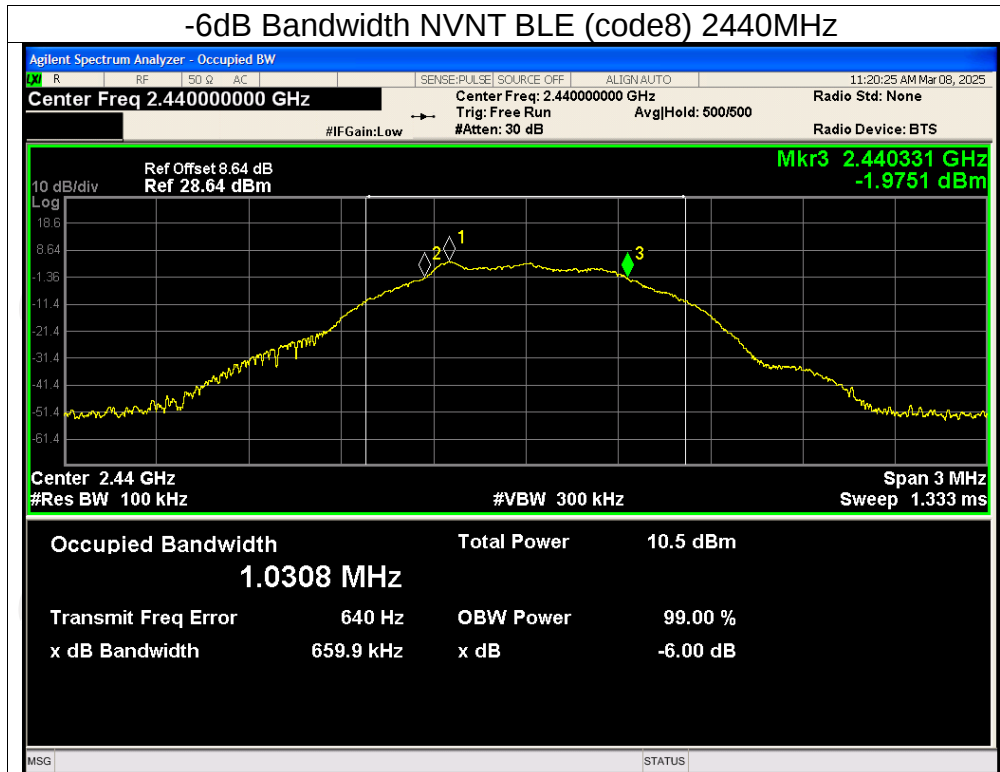
-6dB Bandwidth NVNT BLE (code2) 2440MHz





Test Graphs



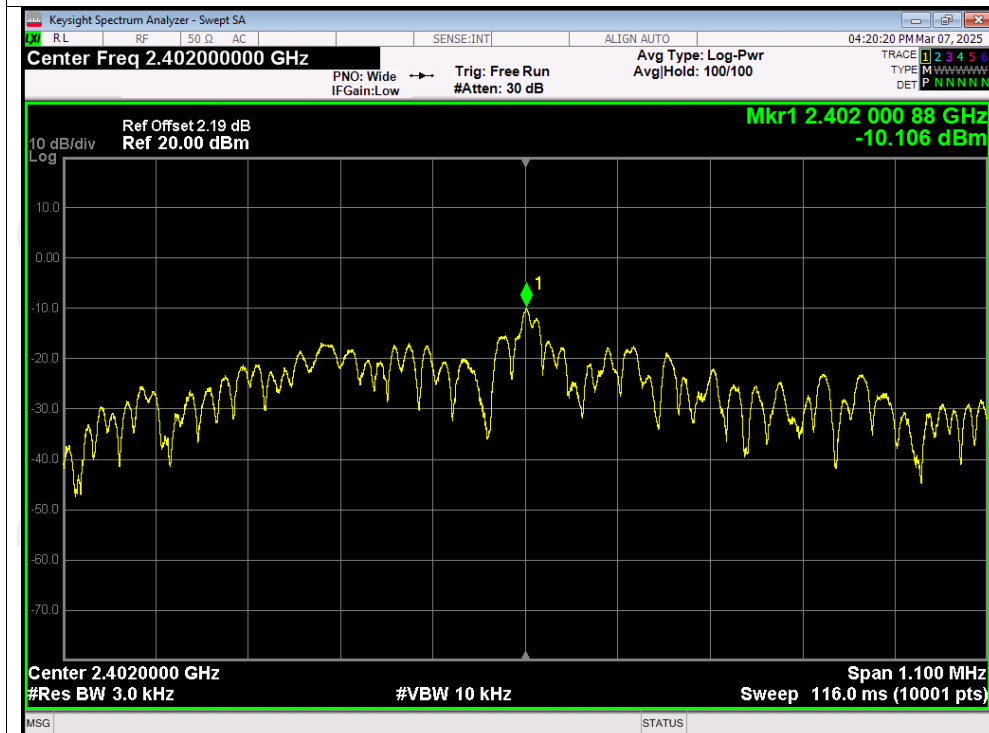


Maximum Power Spectral Density Level

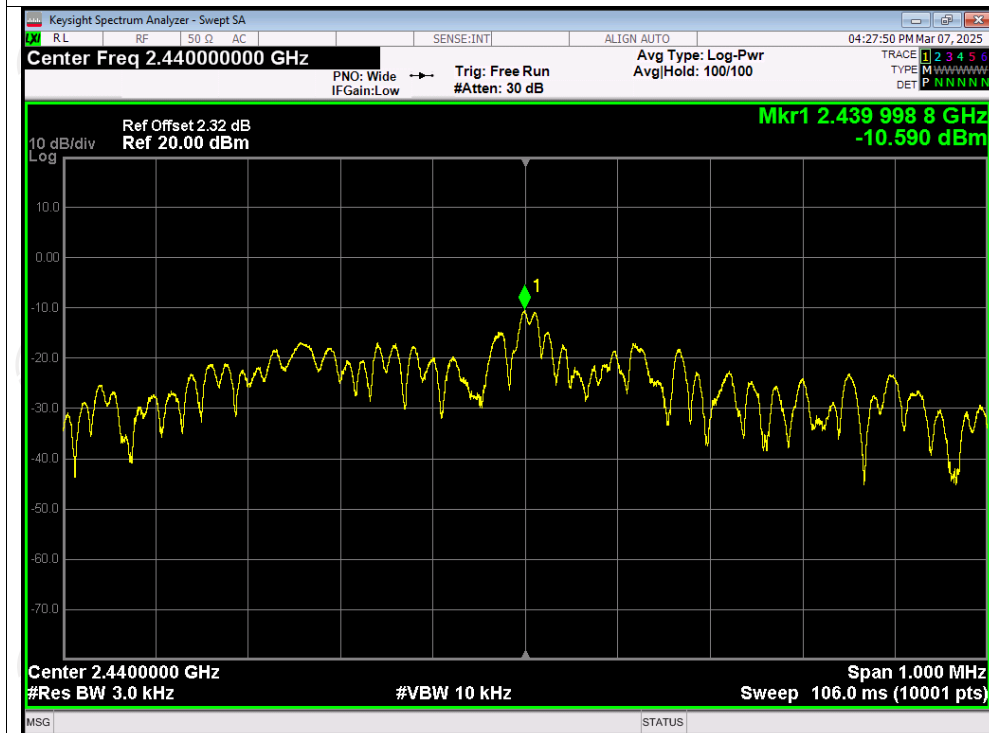
Condition	Mode	Frequency (MHz)	Conducted PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
NVNT	BLE 1M	2402	-10.11	8	Pass
NVNT	BLE 1M	2440	-10.59	8	Pass
NVNT	BLE 1M	2480	-10.77	8	Pass
NVNT	BLE 2M	2402	-12.72	8	Pass
NVNT	BLE 2M	2440	-11.93	8	Pass
NVNT	BLE 2M	2480	-11.76	8	Pass
NVNT	BLE (code2)	2402	-11.84	8	Pass
NVNT	BLE (code2)	2440	-11.77	8	Pass
NVNT	BLE (code2)	2480	-12.04	8	Pass
NVNT	BLE (code8)	2402	-11.47	8	Pass
NVNT	BLE (code8)	2440	-11.37	8	Pass
NVNT	BLE (code8)	2480	-11.68	8	Pass

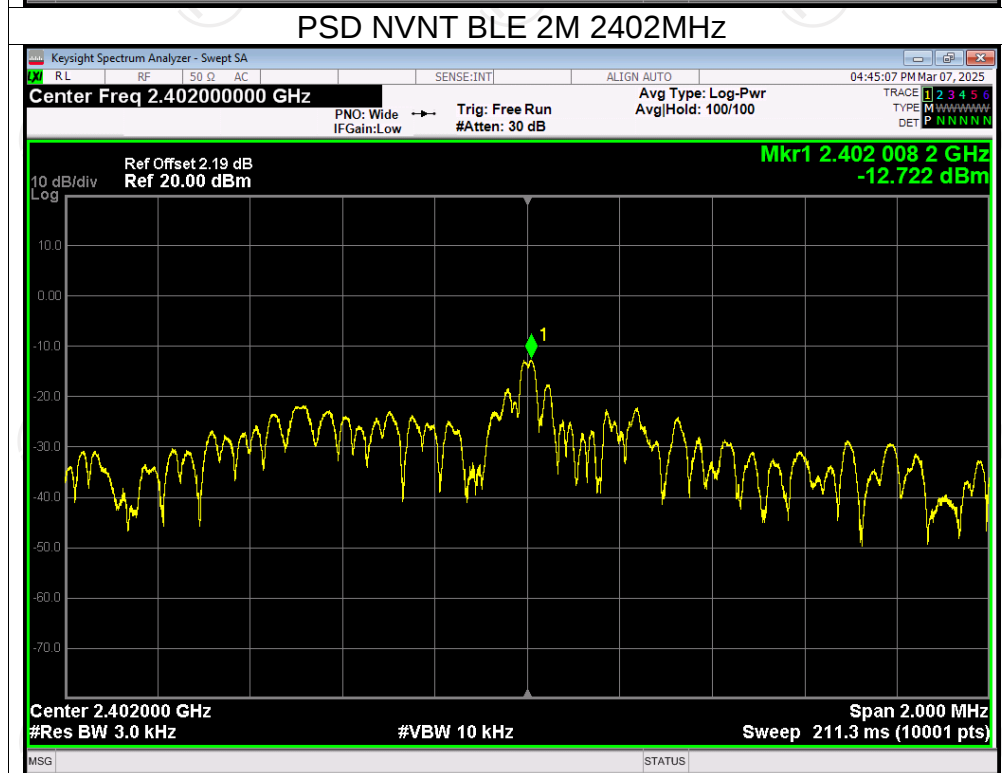
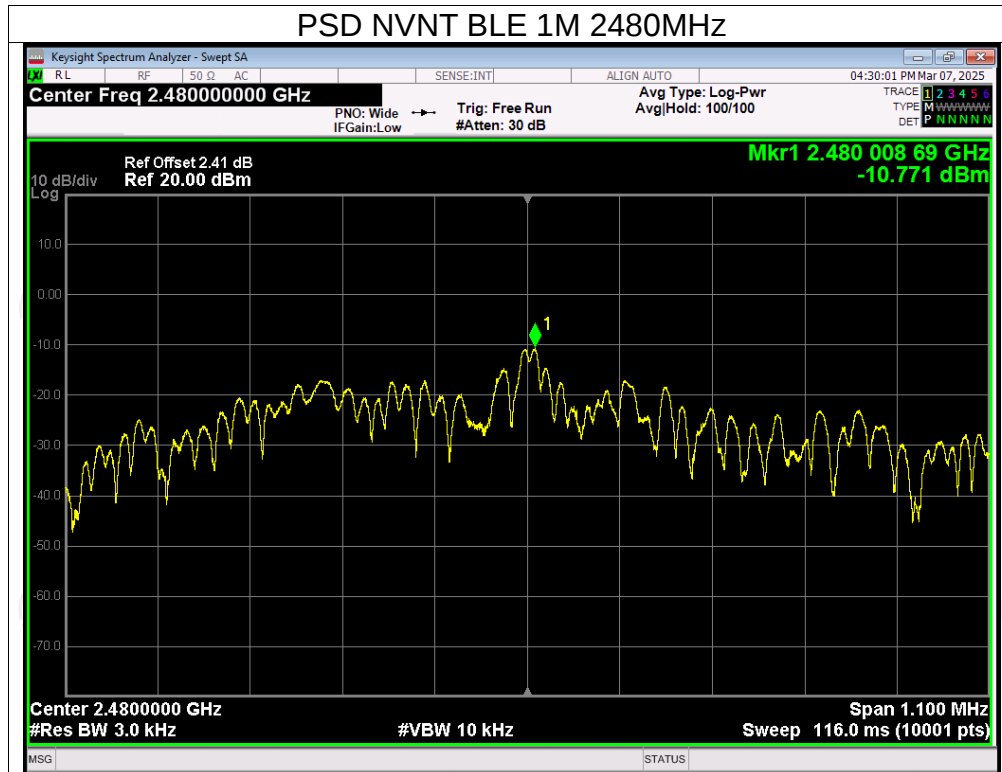
Test Graphs

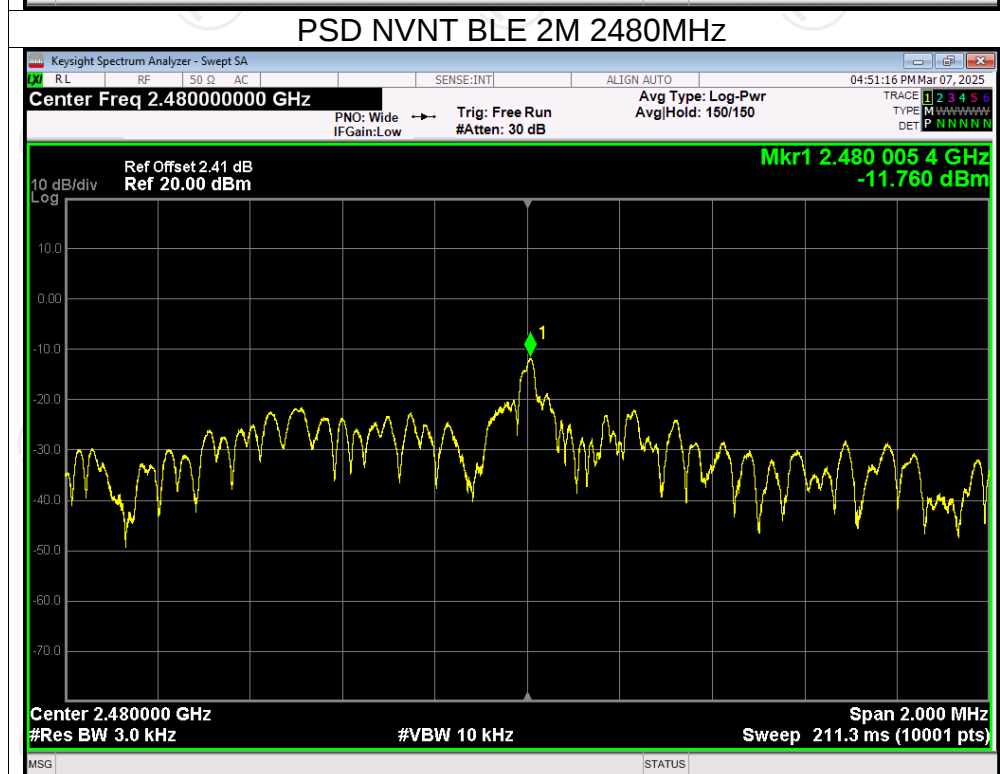
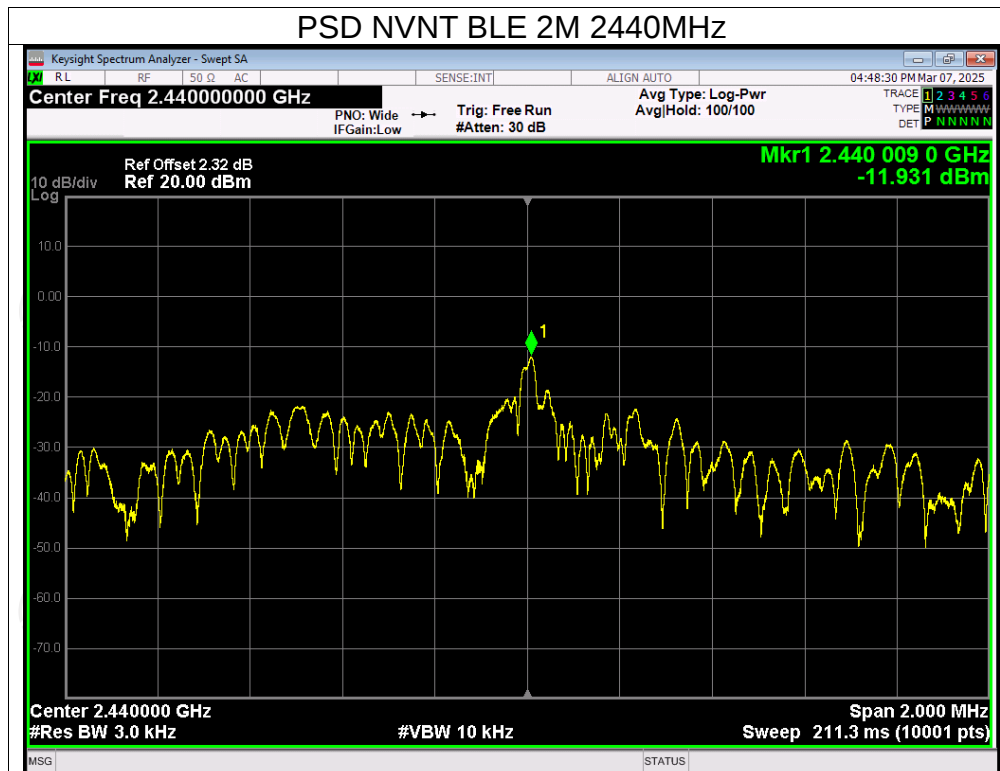
PSD NVNT BLE 1M 2402MHz



PSD NVNT BLE 1M 2440MHz

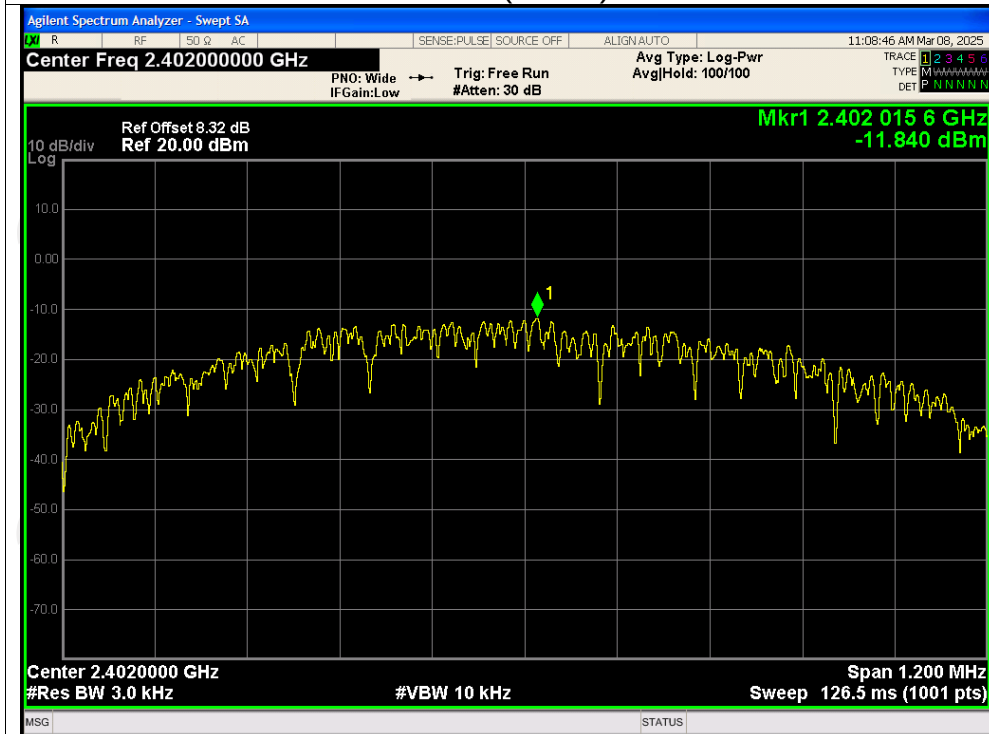




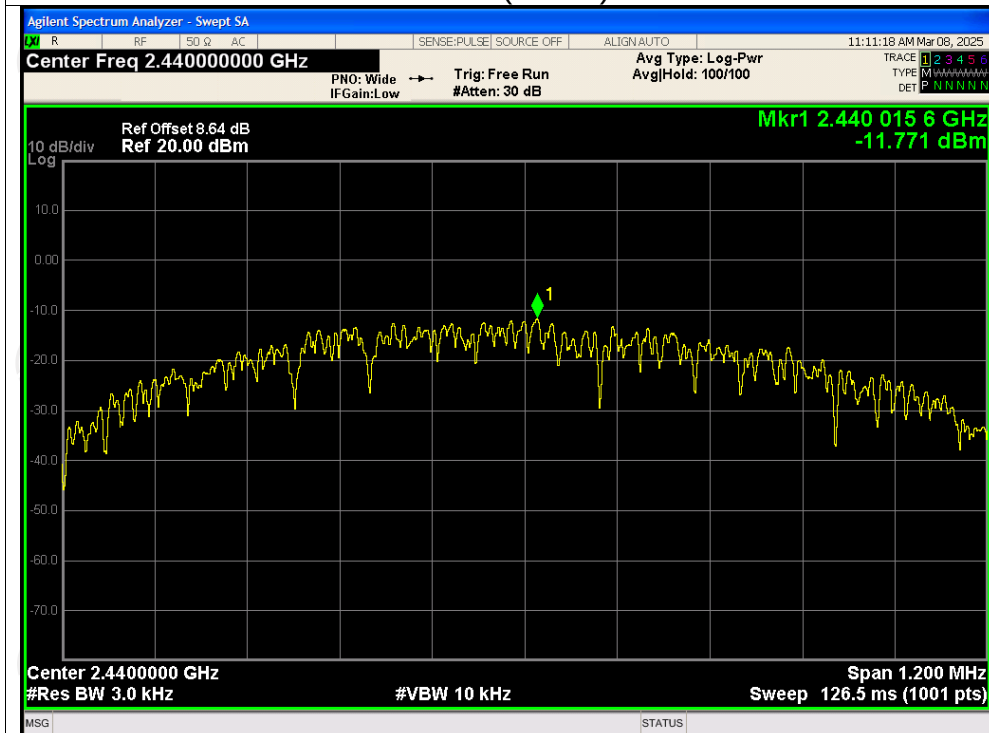


Test Graphs

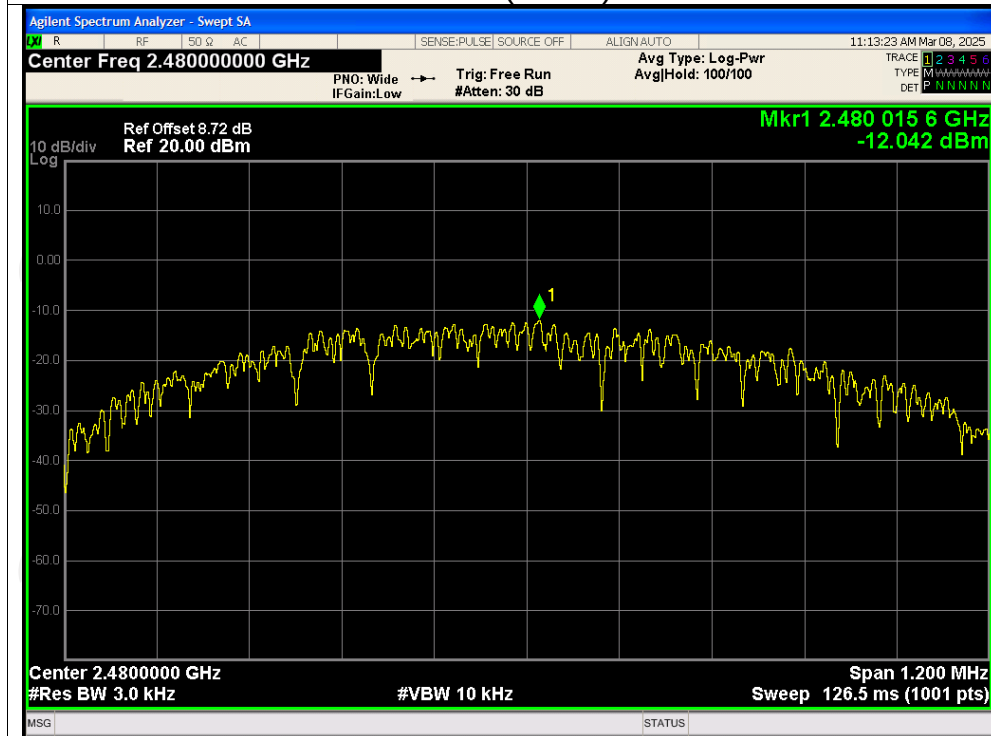
PSD NVNT BLE (code2) 2402MHz



PSD NVNT BLE (code2) 2440MHz

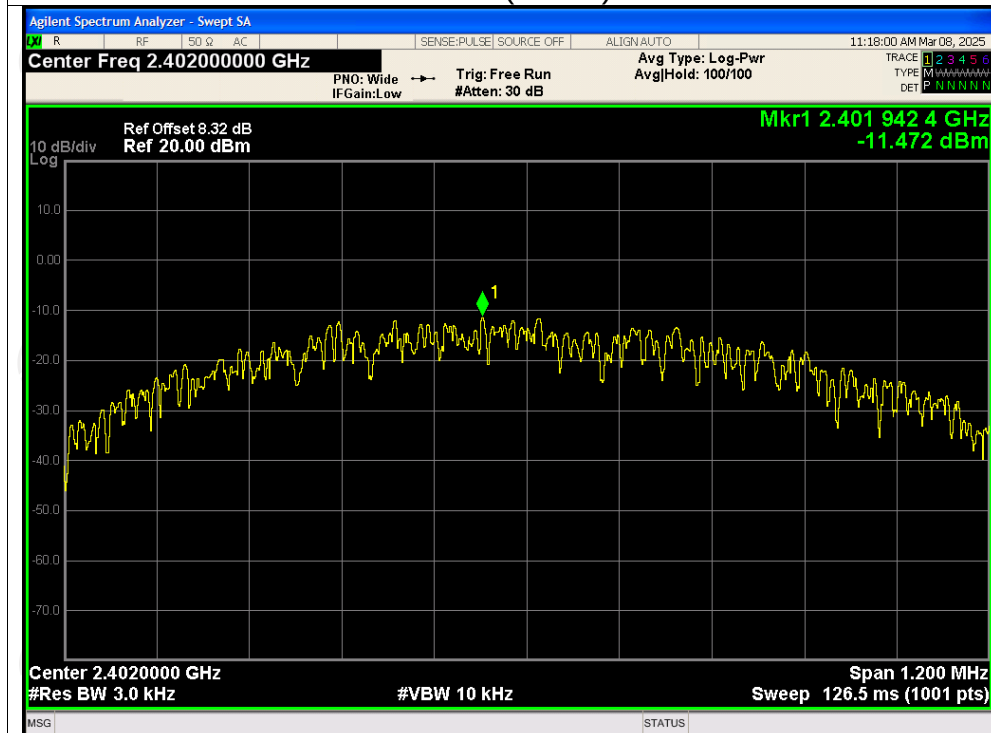


PSD NVNT BLE (code2) 2480MHz

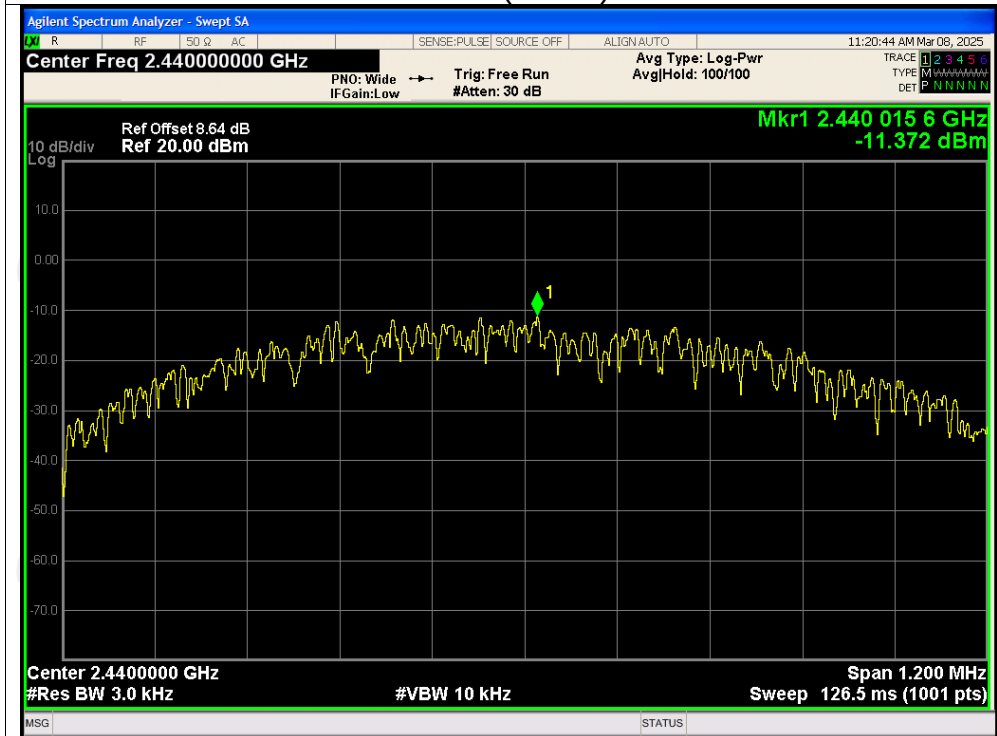


Test Graphs

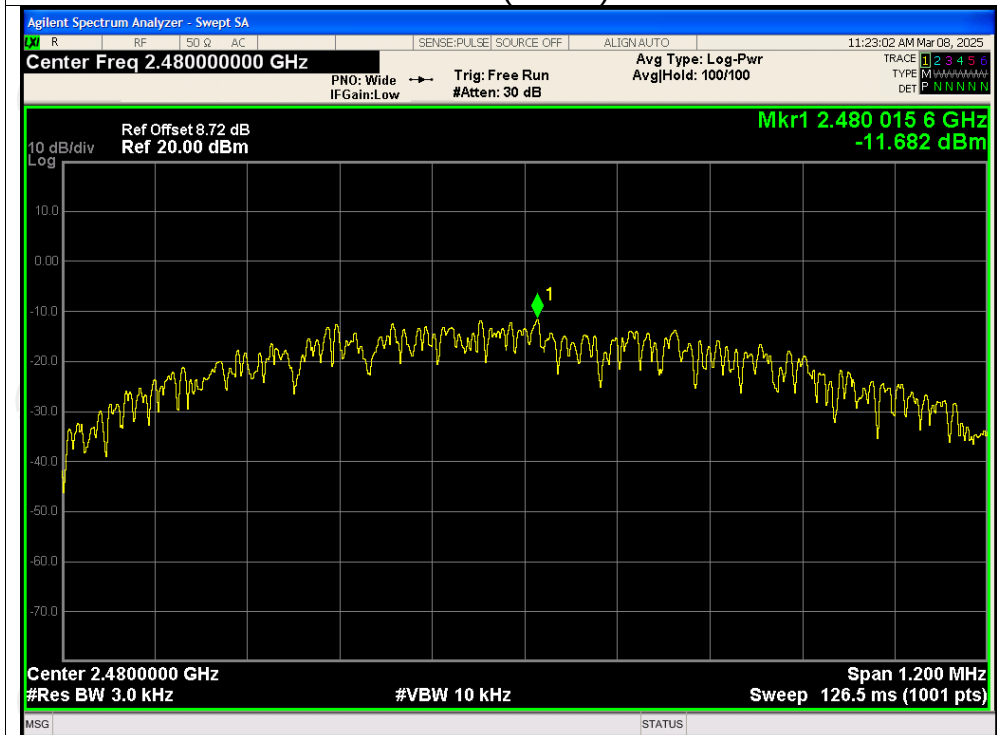
PSD NVNT BLE (code8) 2402MHz



PSD NVNT BLE (code8) 2440MHz



PSD NVNT BLE (code8) 2480MHz

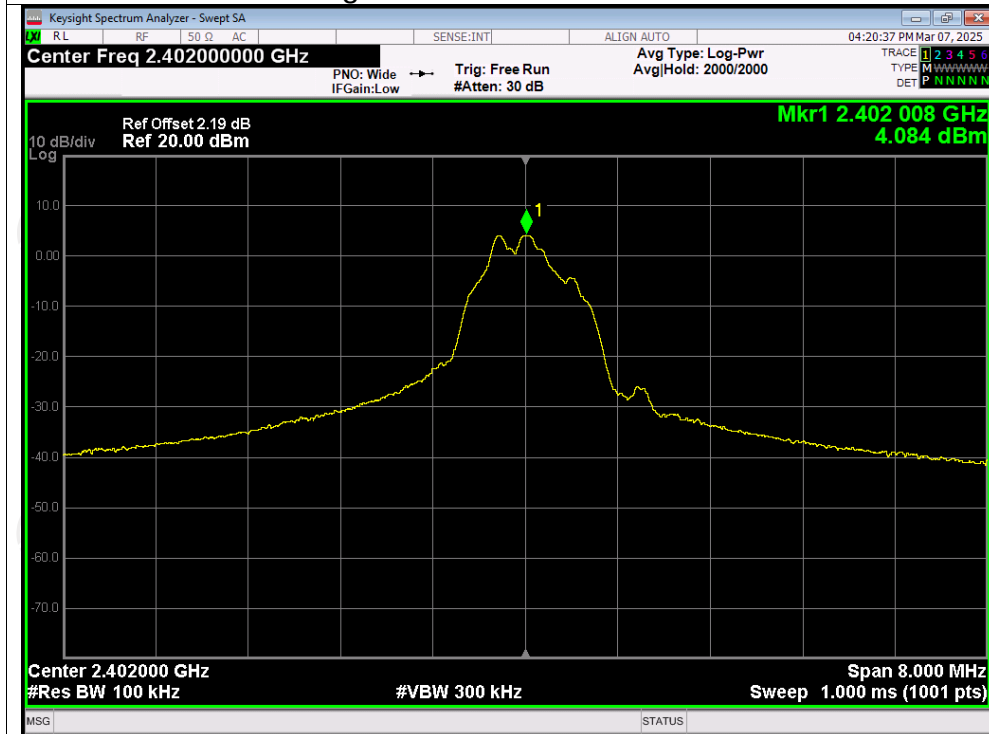


Band Edge

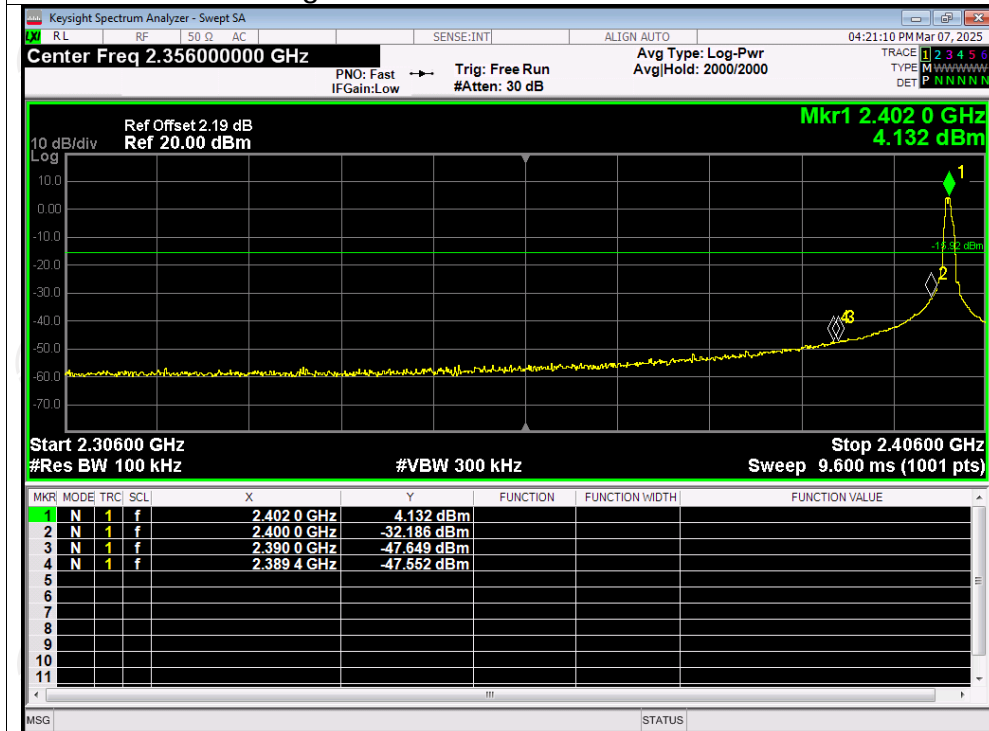
Condition	Mode	Frequency (MHz)	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	BLE 1M	2402	-51.63	-20	Pass
NVNT	BLE 1M	2480	-43.73	-20	Pass
NVNT	BLE 2M	2402	-51.79	-20	Pass
NVNT	BLE 2M	2480	-44.22	-20	Pass
NVNT	BLE (code2)	2402	-53.73	-20	Pass
NVNT	BLE (code2)	2480	-53.17	-20	Pass
NVNT	BLE (code8)	2402	-53.43	-20	Pass
NVNT	BLE (code8)	2480	-53.36	-20	Pass

Test Graphs

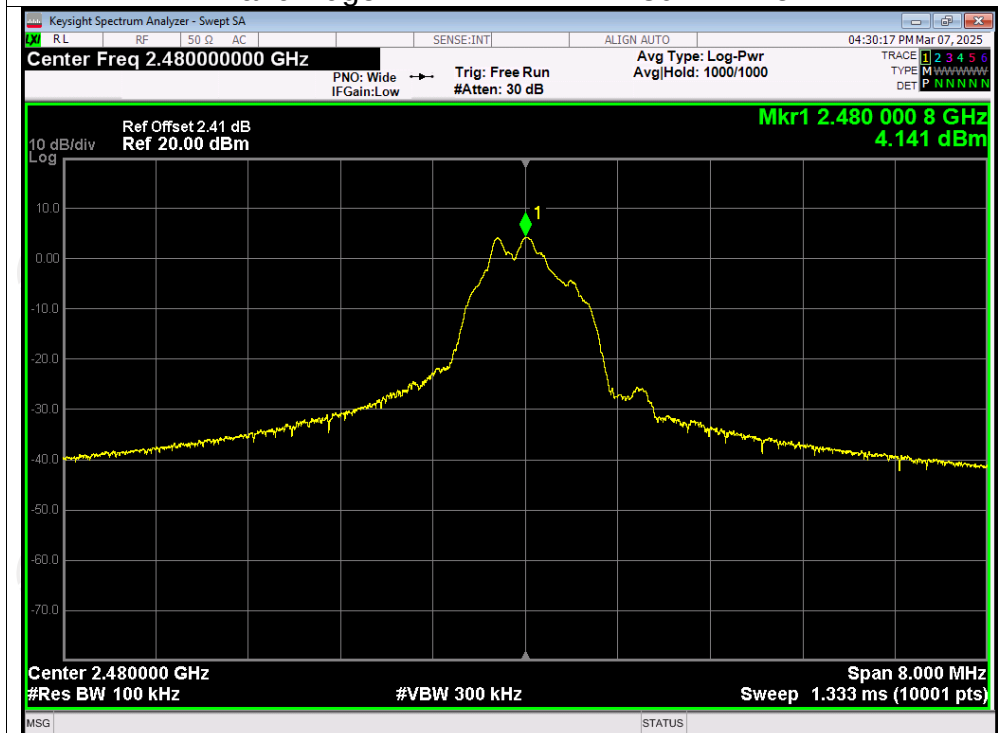
Band Edge NVNT BLE 1M 2402MHz Ref



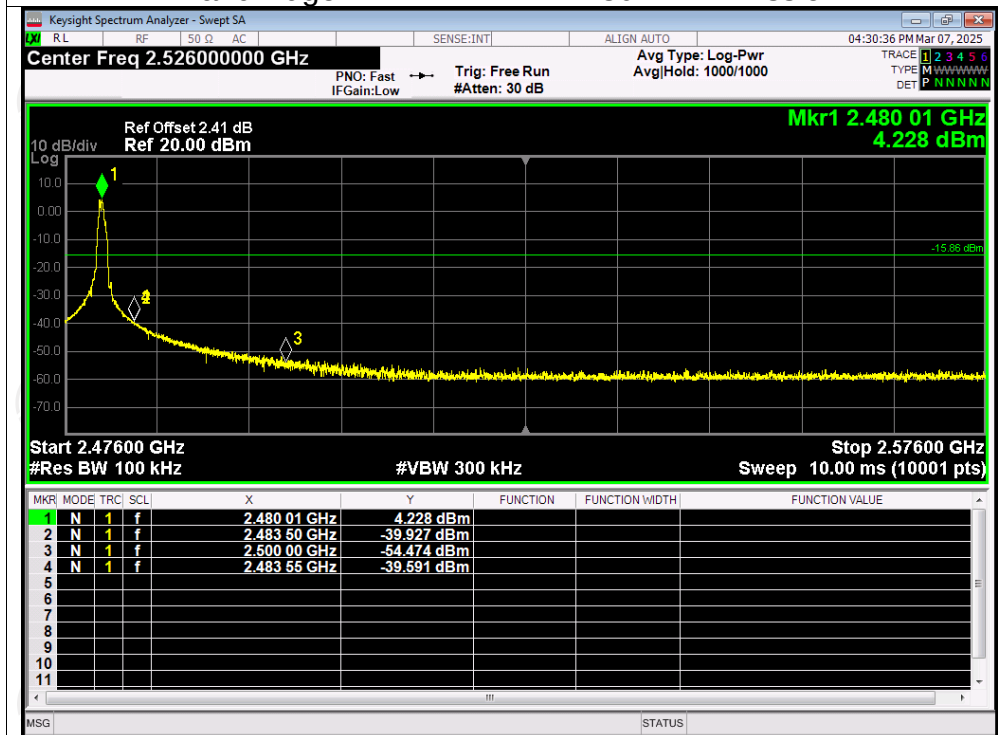
Band Edge NVNT BLE 1M 2402MHz Emission



Band Edge NVNT BLE 1M 2480MHz Ref



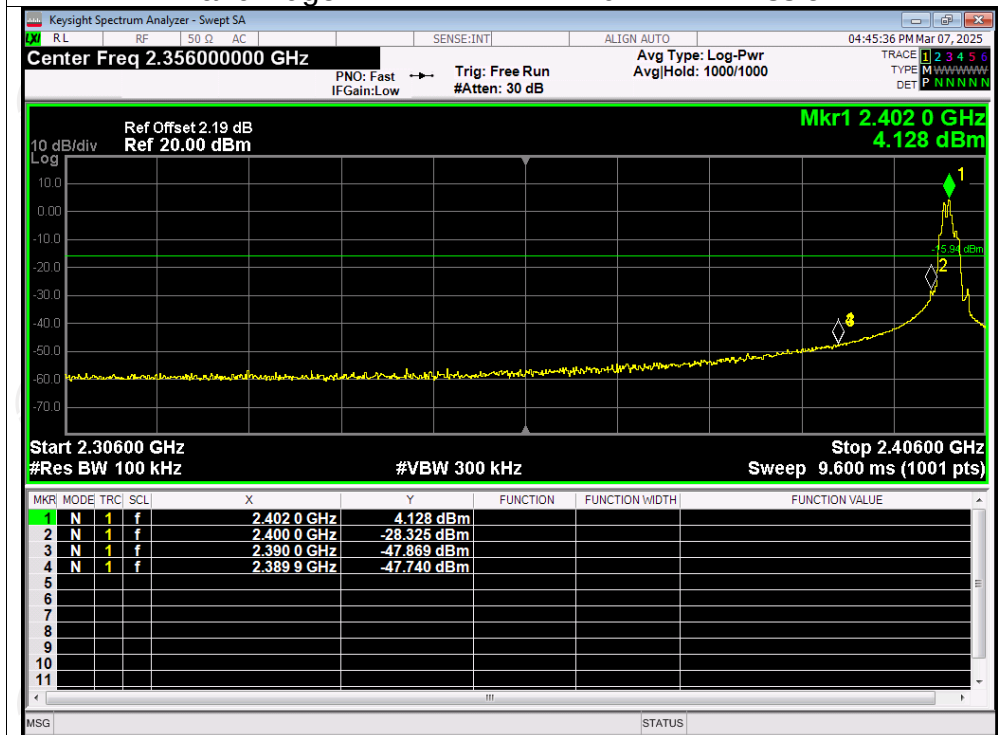
Band Edge NVNT BLE 1M 2480MHz Emission



Band Edge NVNT BLE 2M 2402MHz Ref



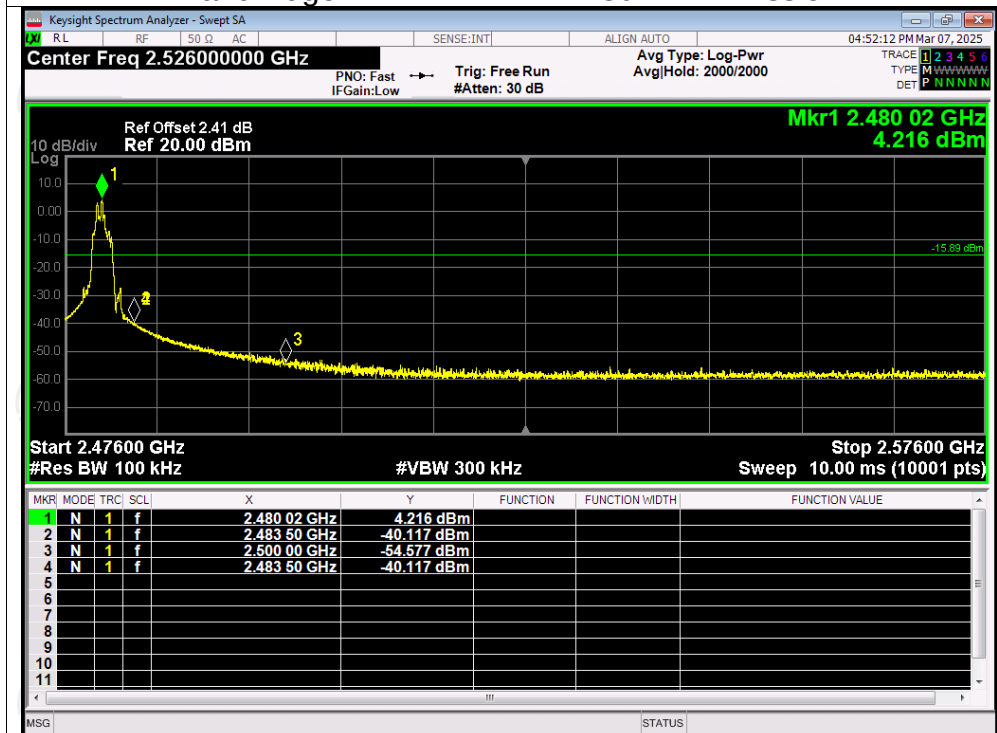
Band Edge NVNT BLE 2M 2402MHz Emission



Band Edge NVNT BLE 2M 2480MHz Ref

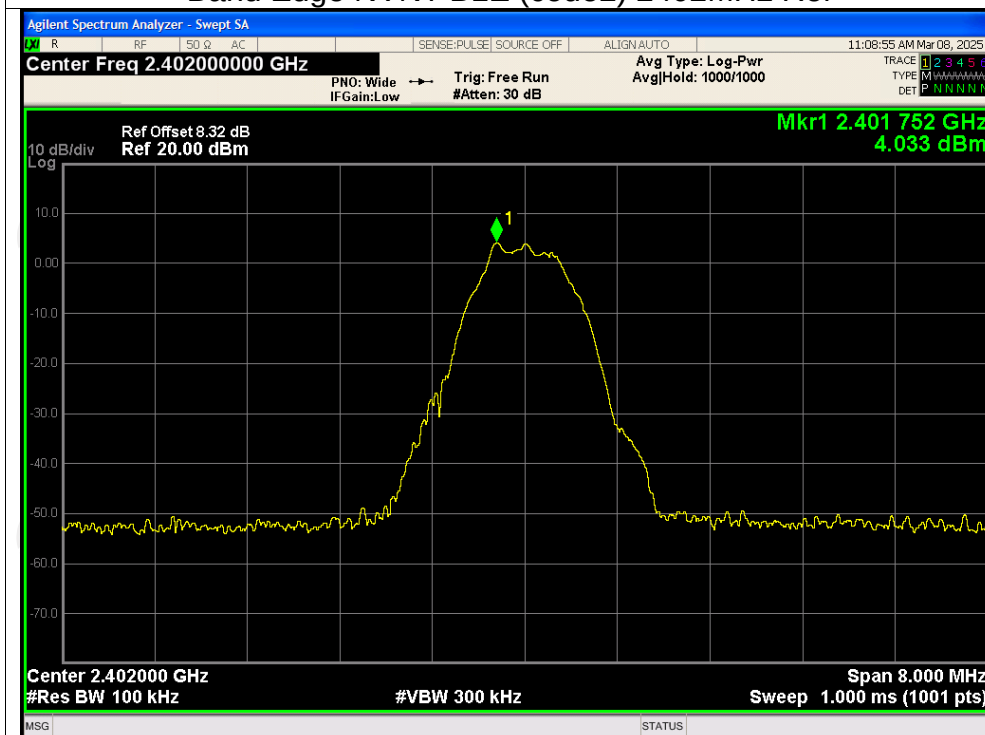


Band Edge NVNT BLE 2M 2480MHz Emission

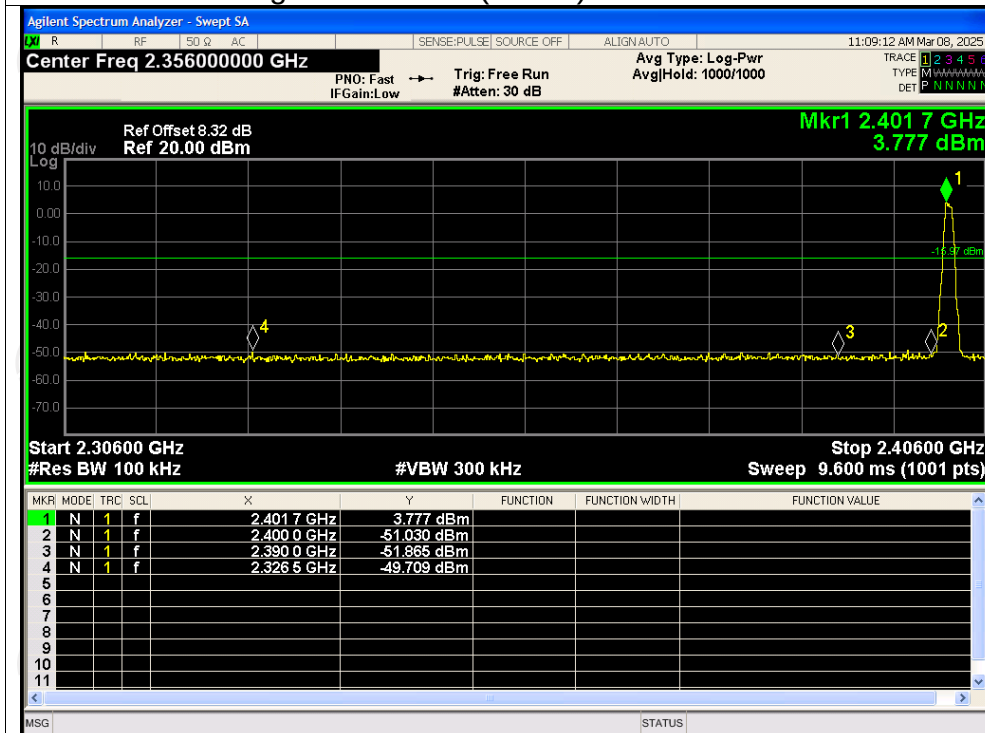


Test Graphs

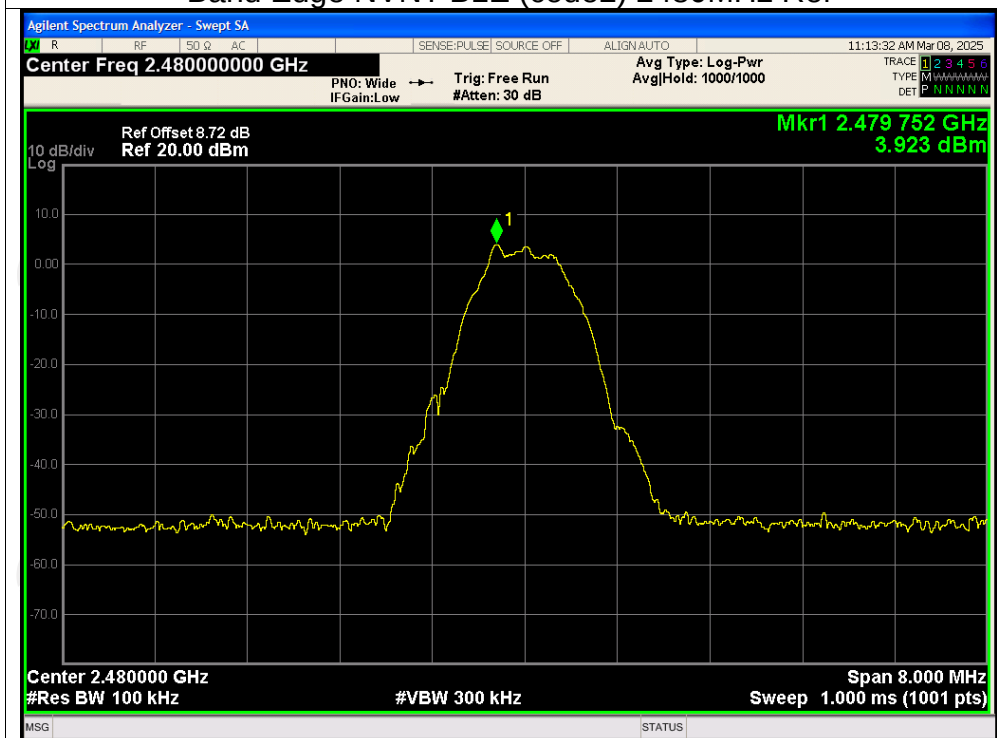
Band Edge NVNT BLE (code2) 2402MHz Ref



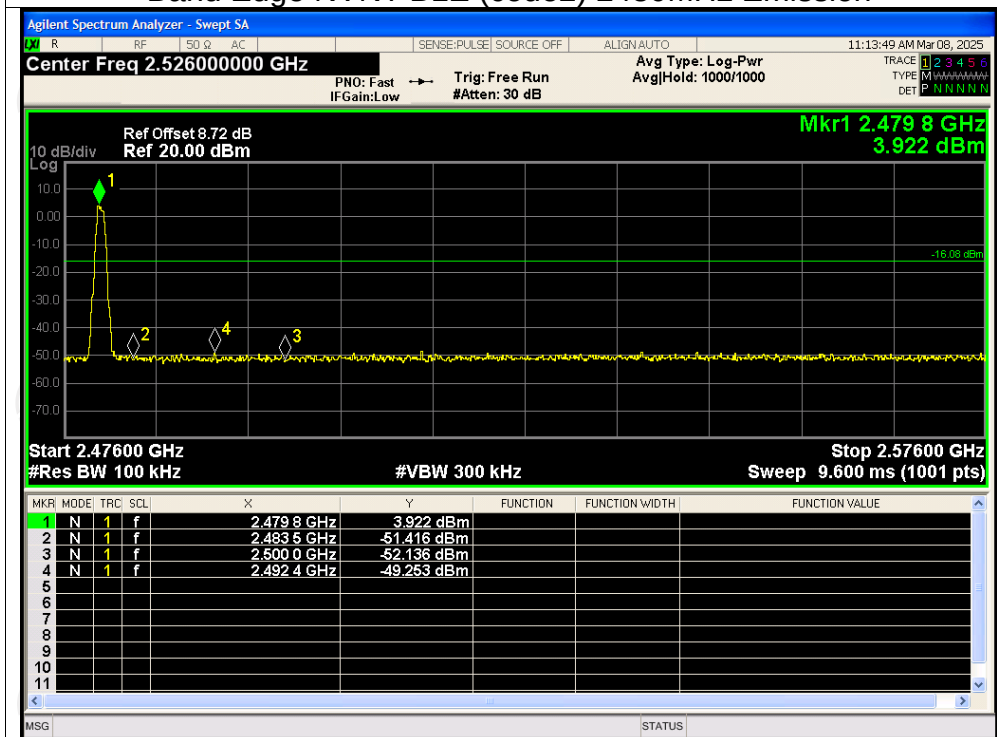
Band Edge NVNT BLE (code2) 2402MHz Emission



Band Edge NVNT BLE (code2) 2480MHz Ref

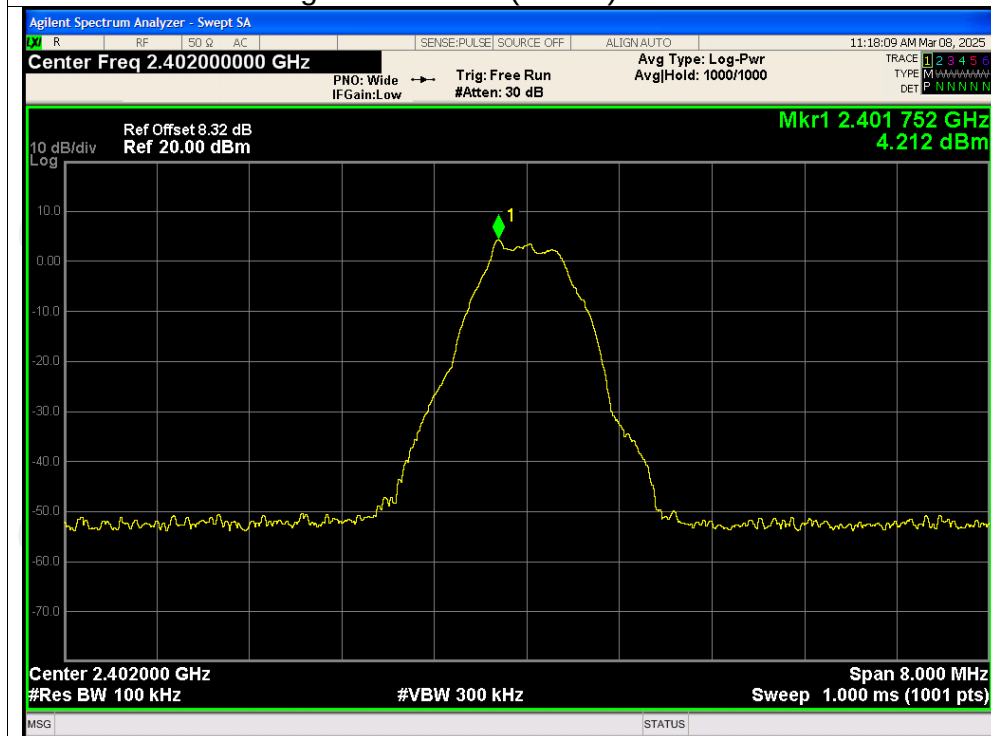


Band Edge NVNT BLE (code2) 2480MHz Emission

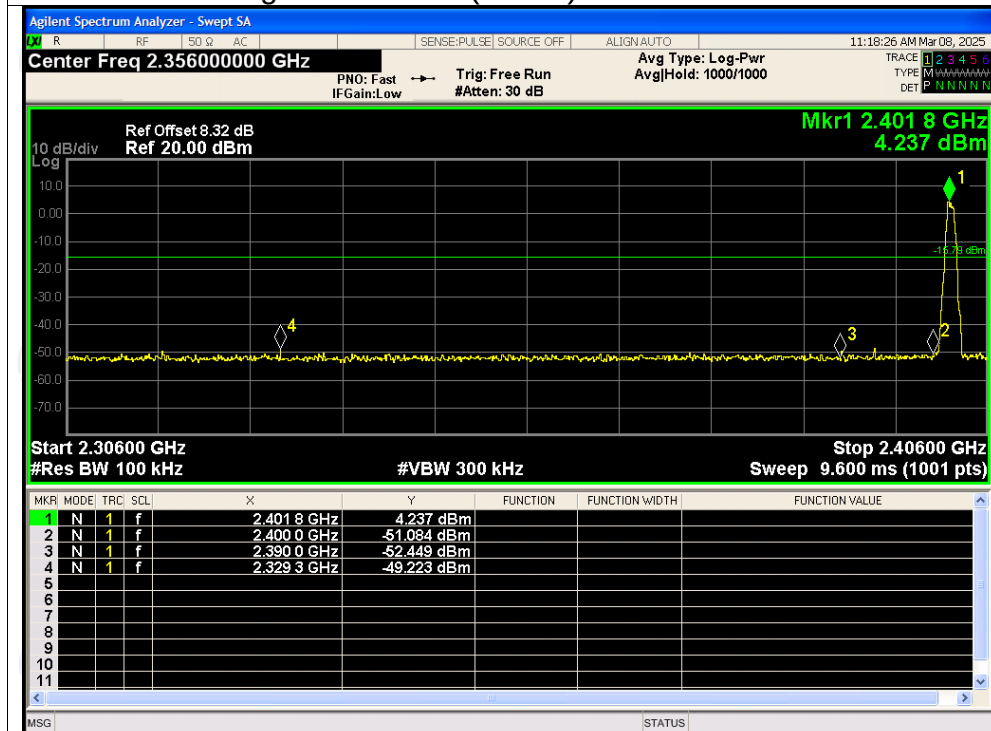


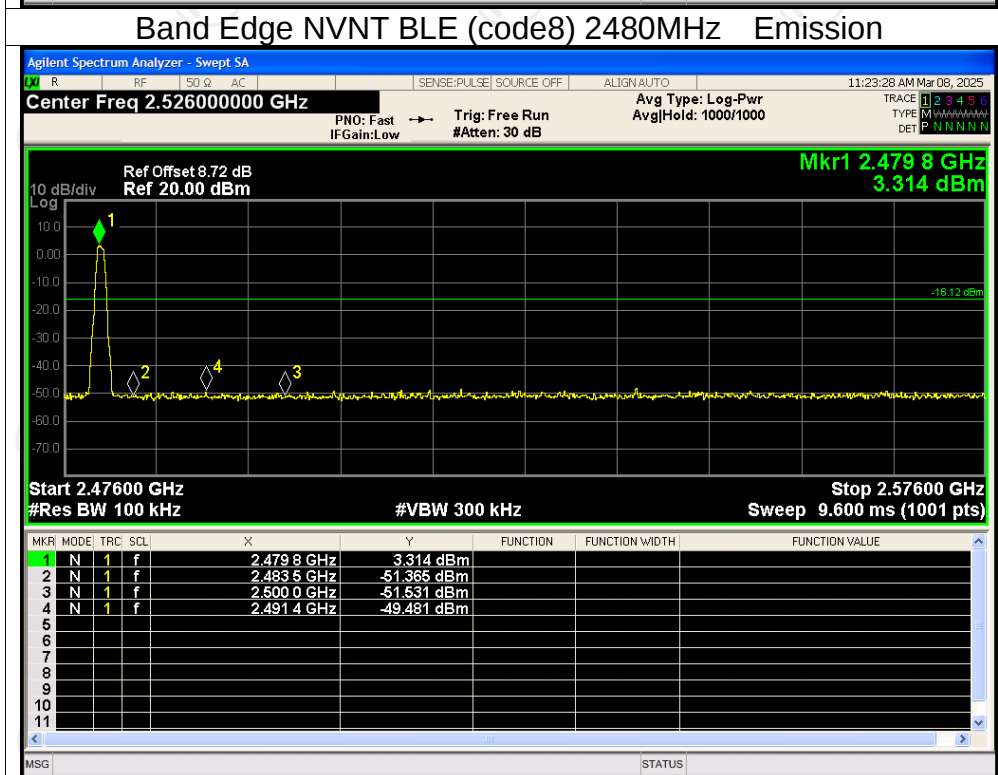
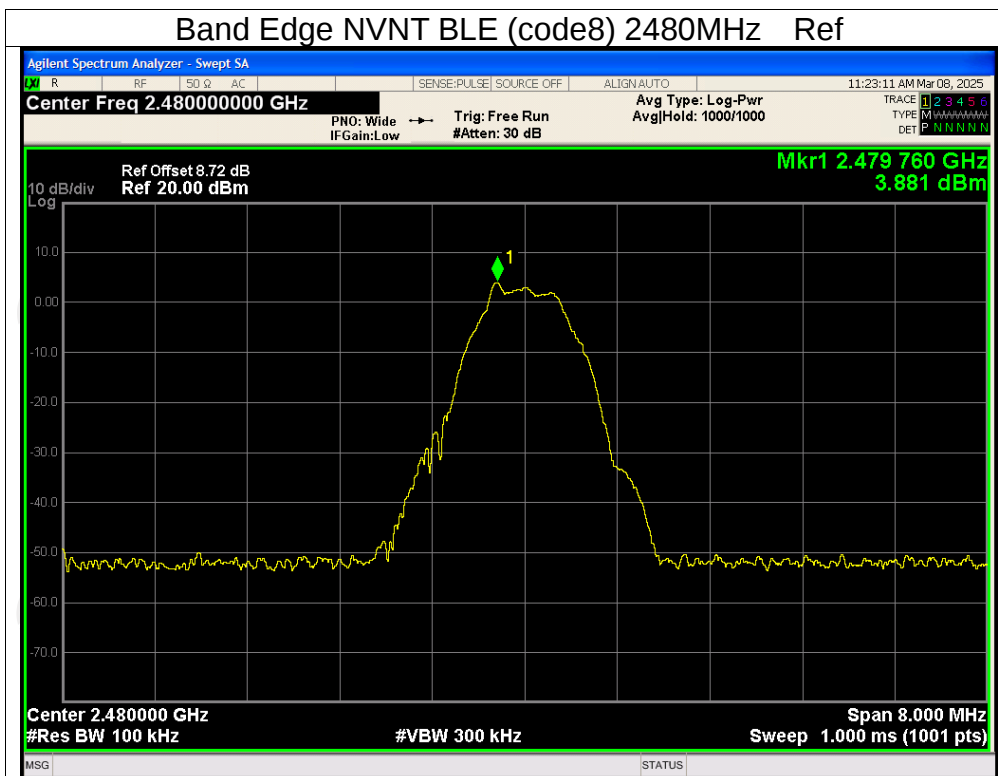
Test Graphs

Band Edge NVNT BLE (code8) 2402MHz Ref



Band Edge NVNT BLE (code8) 2402MHz Emission



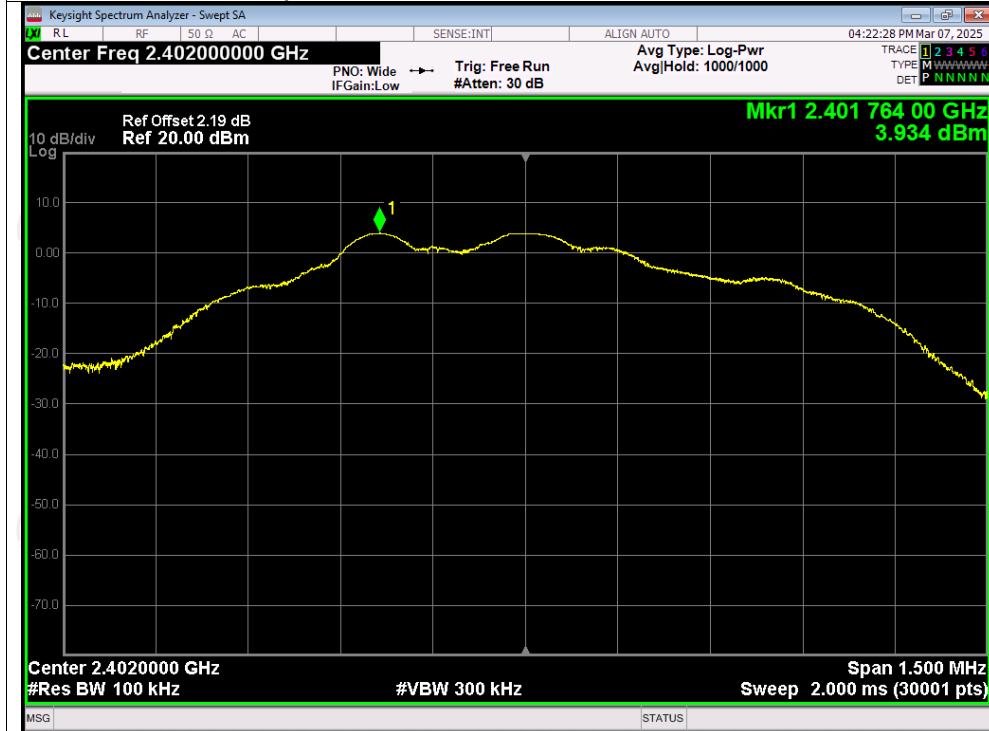


Conducted RF Spurious Emission

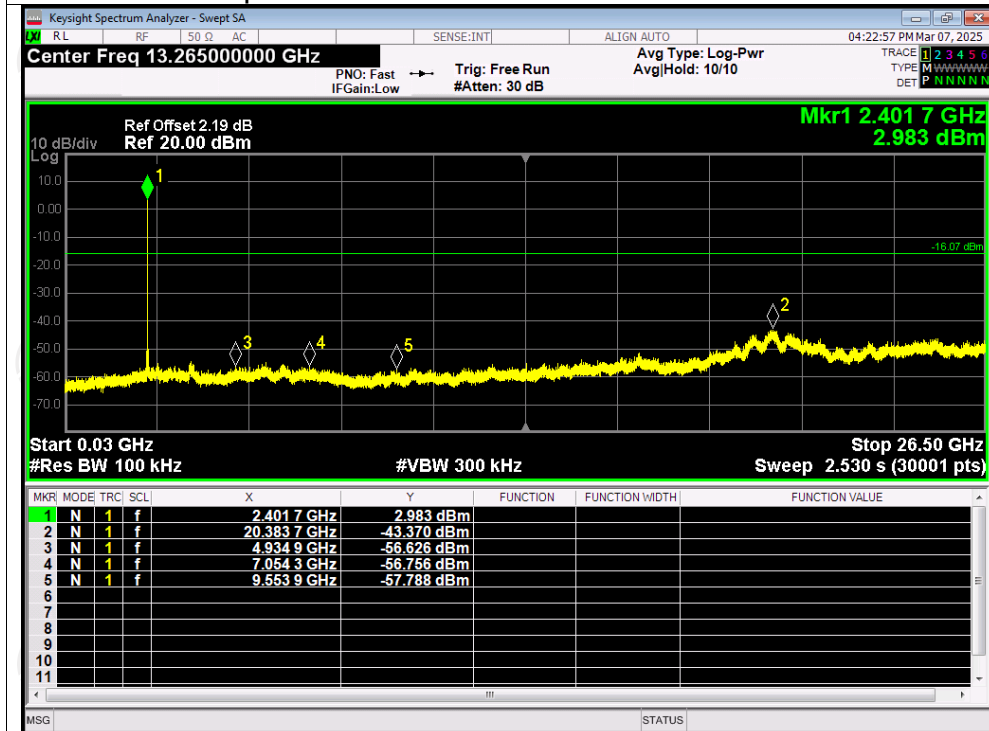
Condition	Mode	Frequency (MHz)	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	BLE 1M	2402	-47.29	-20	Pass
NVNT	BLE 1M	2440	-46.60	-20	Pass
NVNT	BLE 1M	2480	-46.28	-20	Pass
NVNT	BLE 2M	2402	-45.97	-20	Pass
NVNT	BLE 2M	2440	-46.37	-20	Pass
NVNT	BLE 2M	2480	-47.01	-20	Pass
NVNT	BLE (code2)	2402	-41.55	-20	Pass
NVNT	BLE (code2)	2440	-41.88	-20	Pass
NVNT	BLE (code2)	2480	-41.84	-20	Pass
NVNT	BLE (code8)	2402	-42.23	-20	Pass
NVNT	BLE (code8)	2440	-41.98	-20	Pass
NVNT	BLE (code8)	2480	-41.00	-20	Pass

Test Graphs

Tx. Spurious NVNT BLE 1M 2402MHz Ref



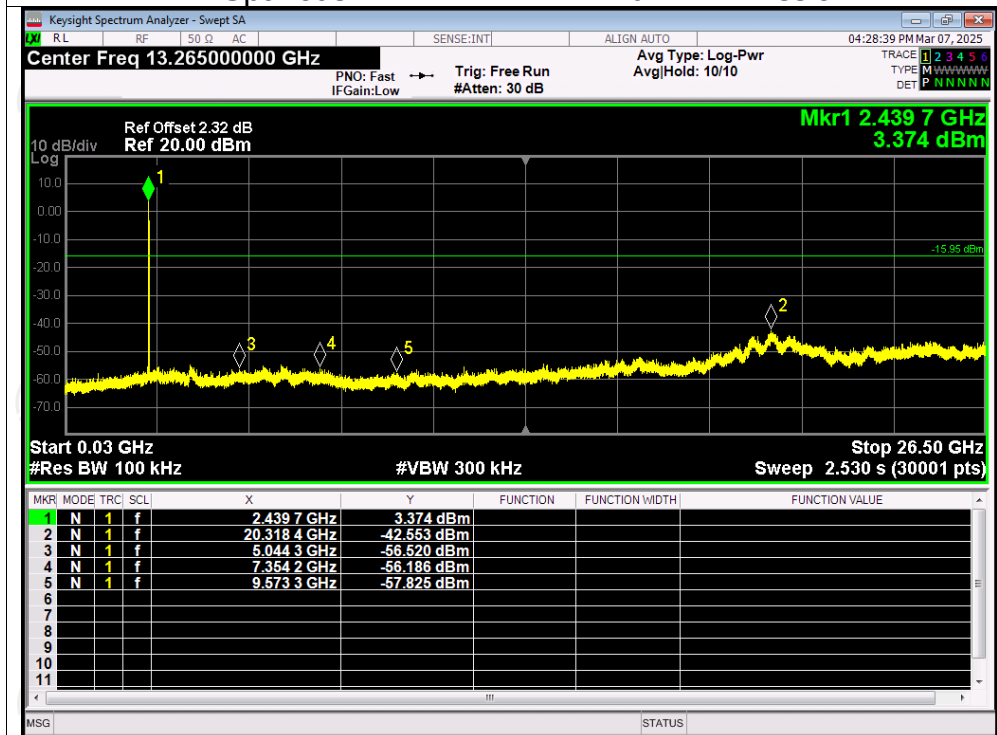
Tx. Spurious NVNT BLE 1M 2402MHz Emission



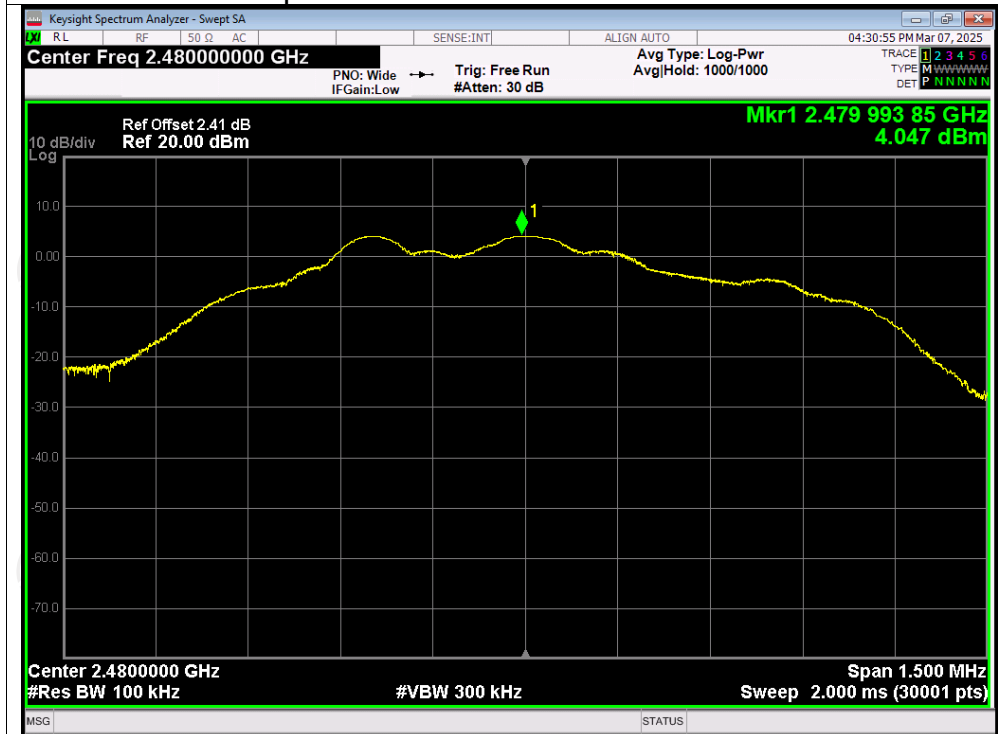
Tx. Spurious NVNT BLE 1M 2440MHz Ref



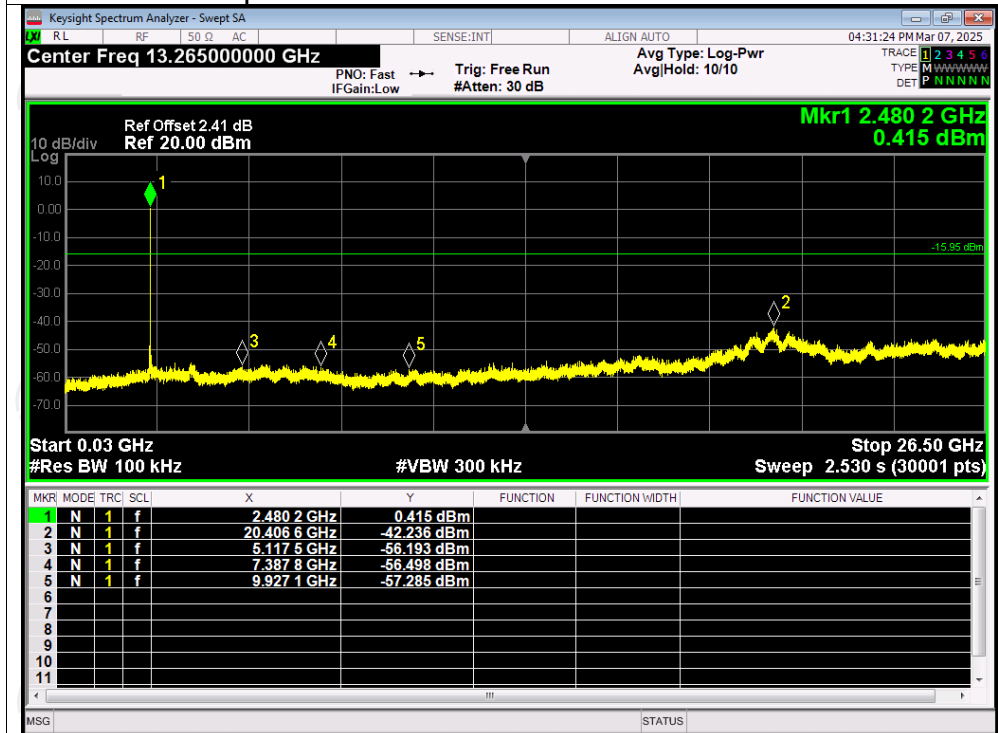
Tx. Spurious NVNT BLE 1M 2440MHz Emission



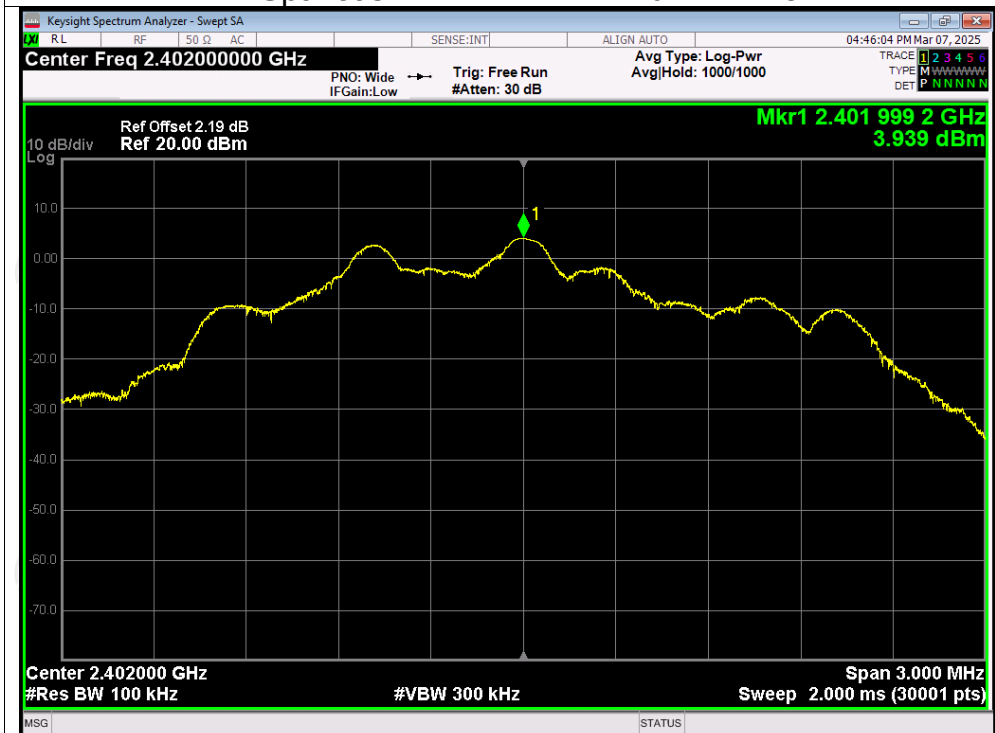
Tx. Spurious NVNT BLE 1M 2480MHz Ref



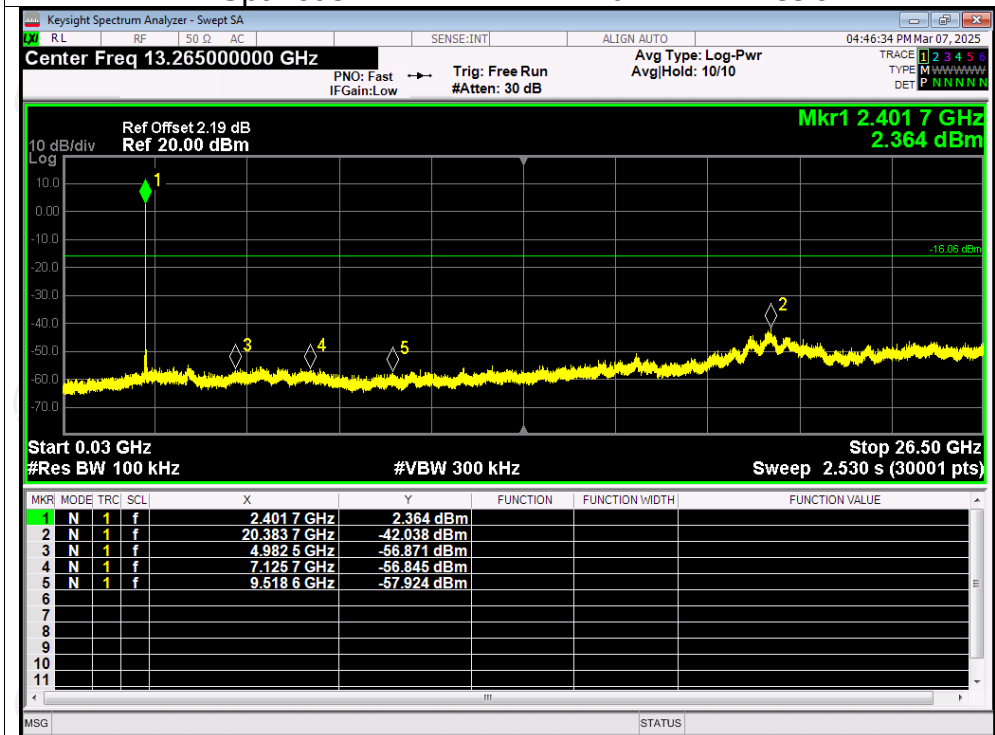
Tx. Spurious NVNT BLE 1M 2480MHz Emission



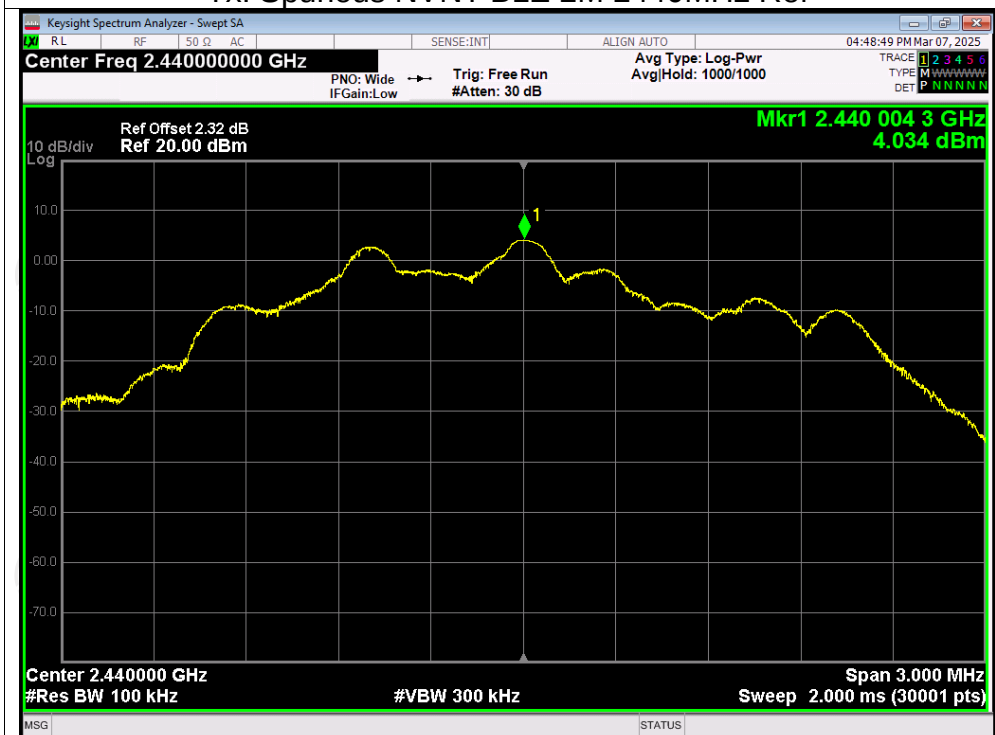
Tx. Spurious NVNT BLE 2M 2402MHz Ref



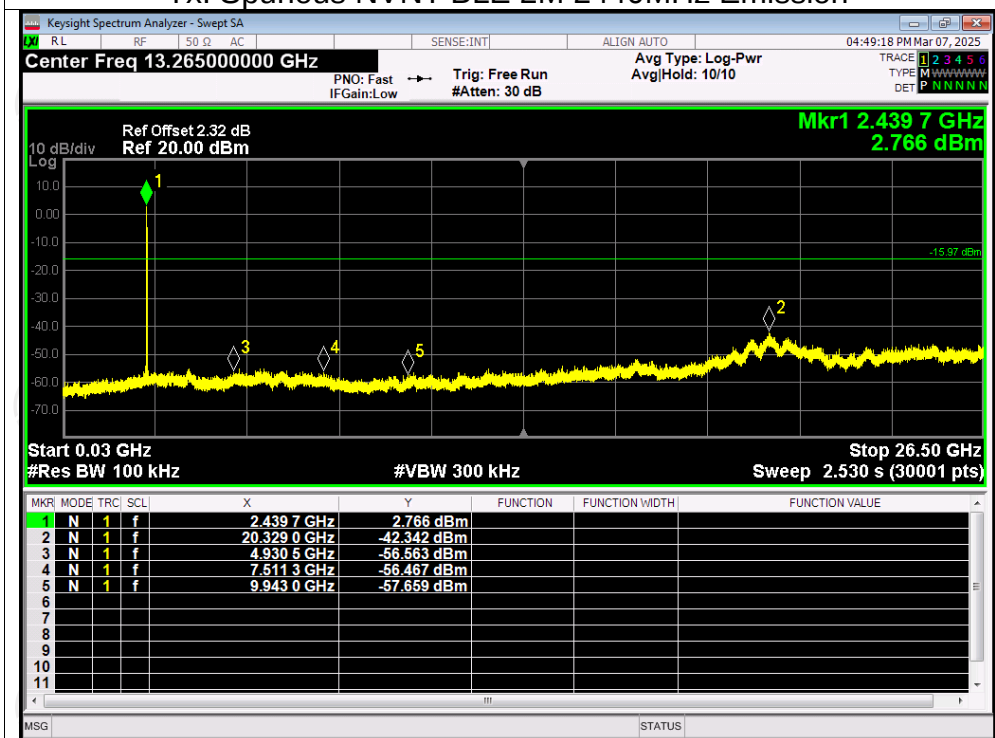
Tx. Spurious NVNT BLE 2M 2402MHz Emission



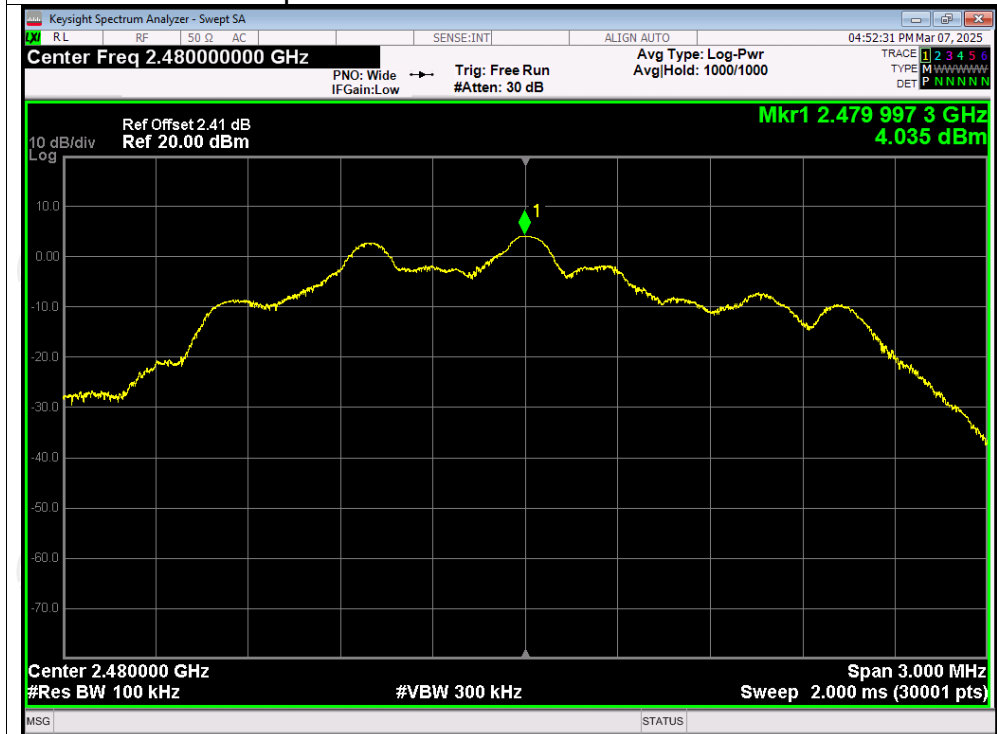
Tx. Spurious NVNT BLE 2M 2440MHz Ref



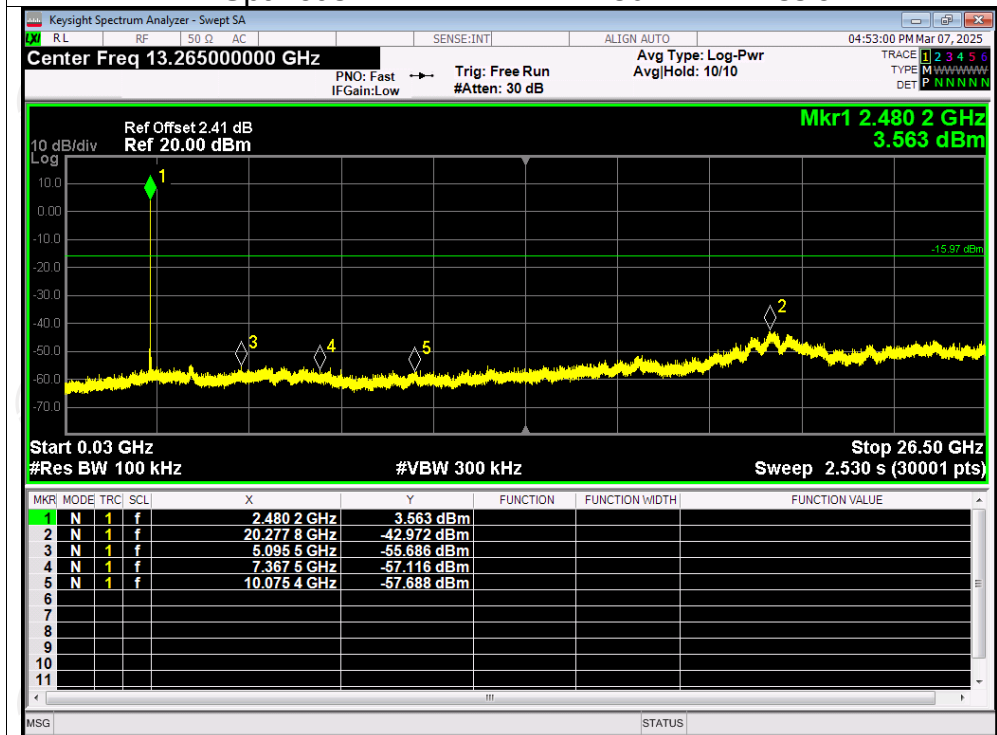
Tx. Spurious NVNT BLE 2M 2440MHz Emission



Tx. Spurious NVNT BLE 2M 2480MHz Ref

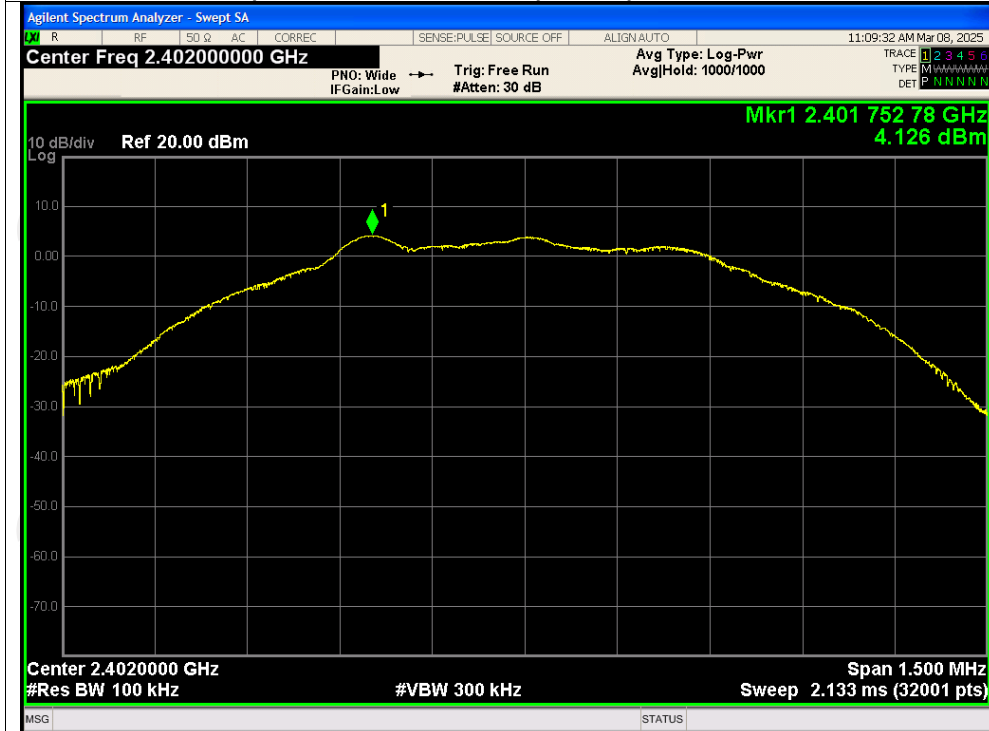


Tx. Spurious NVNT BLE 2M 2480MHz Emission

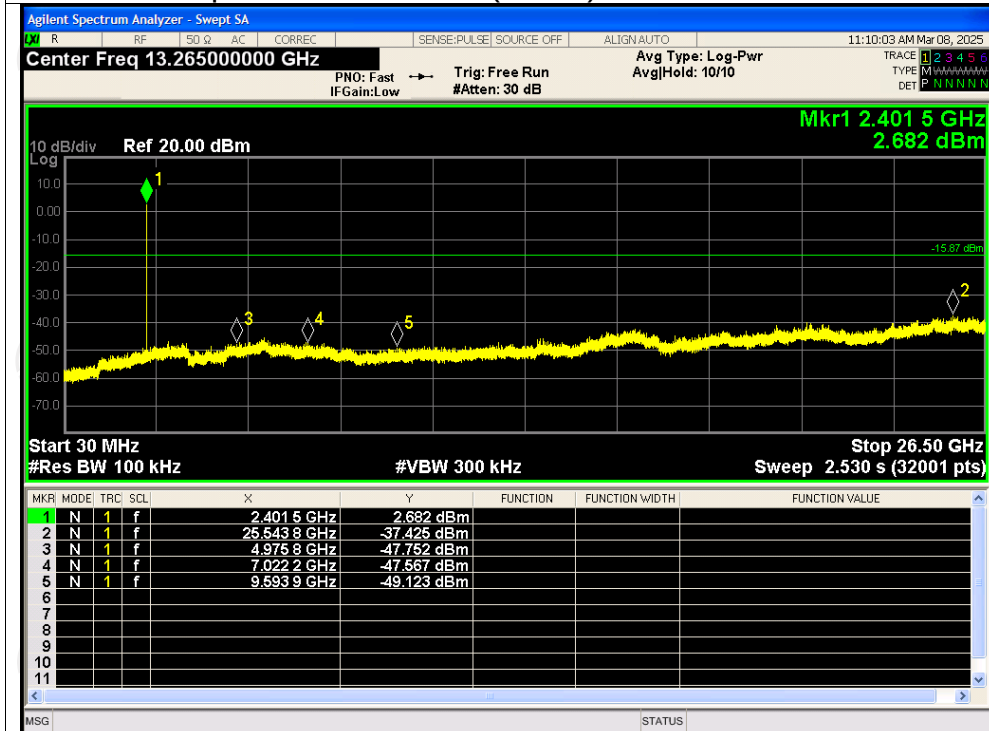


Test Graphs

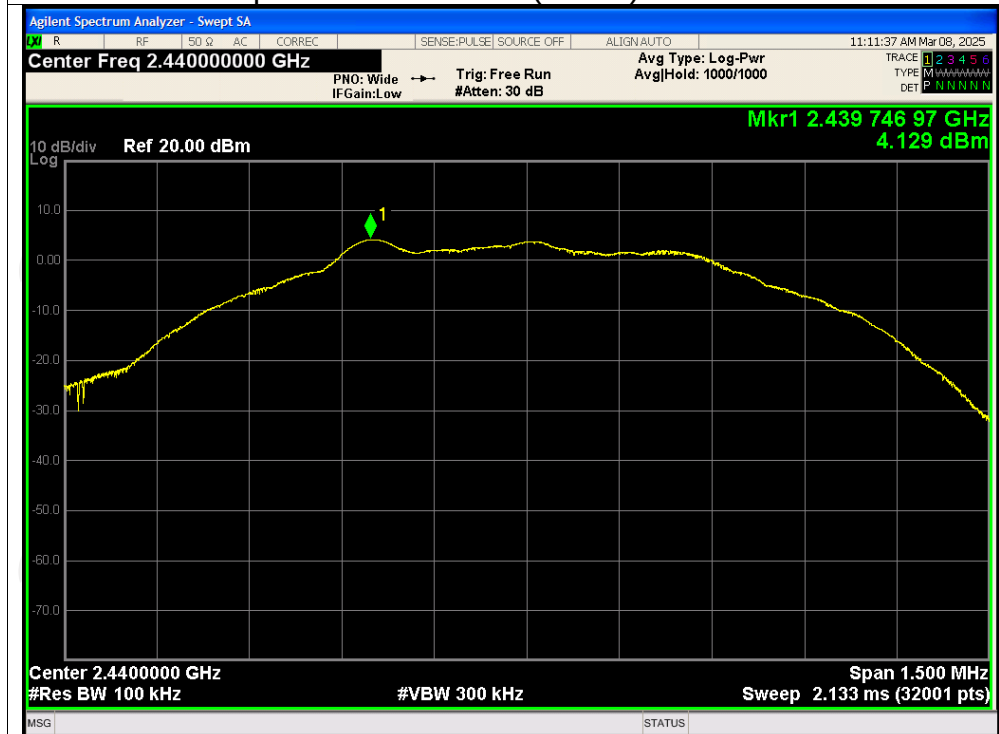
Tx. Spurious NVNT BLE (code2) 2402MHz Ref



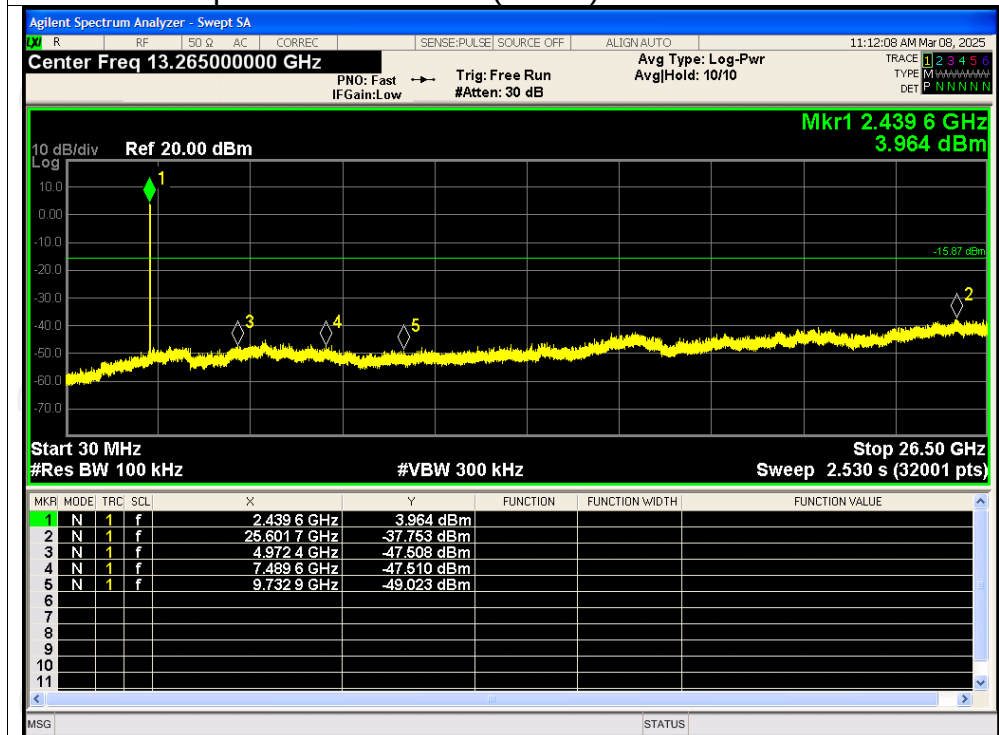
Tx. Spurious NVNT BLE (code2) 2402MHz Emission



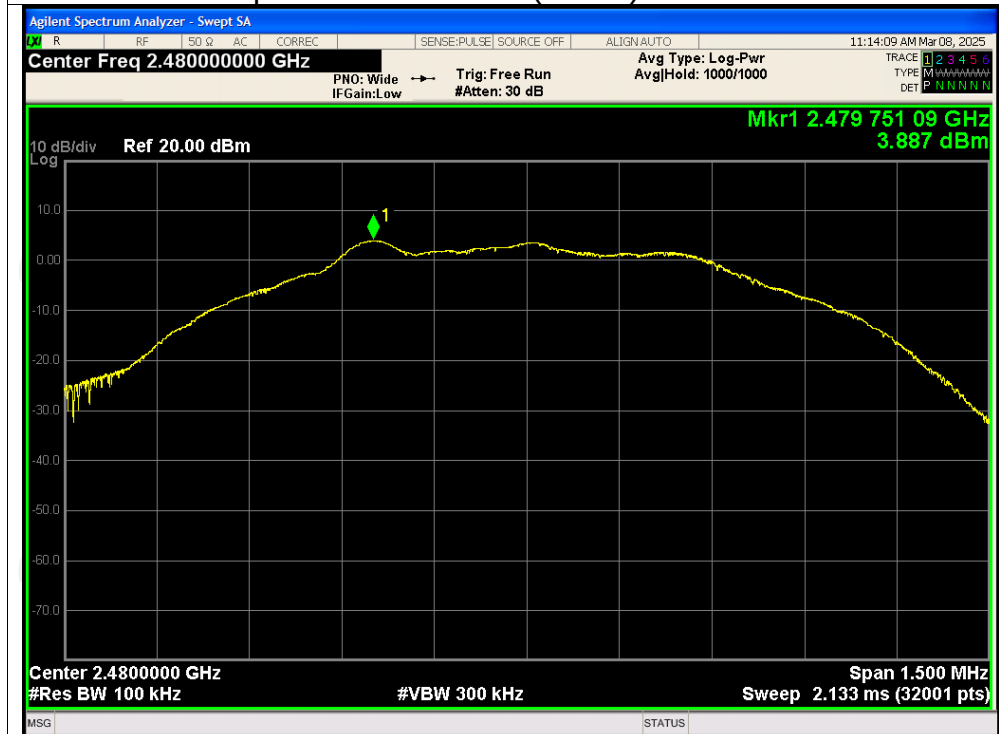
Tx. Spurious NVNT BLE (code2) 2440MHz Ref



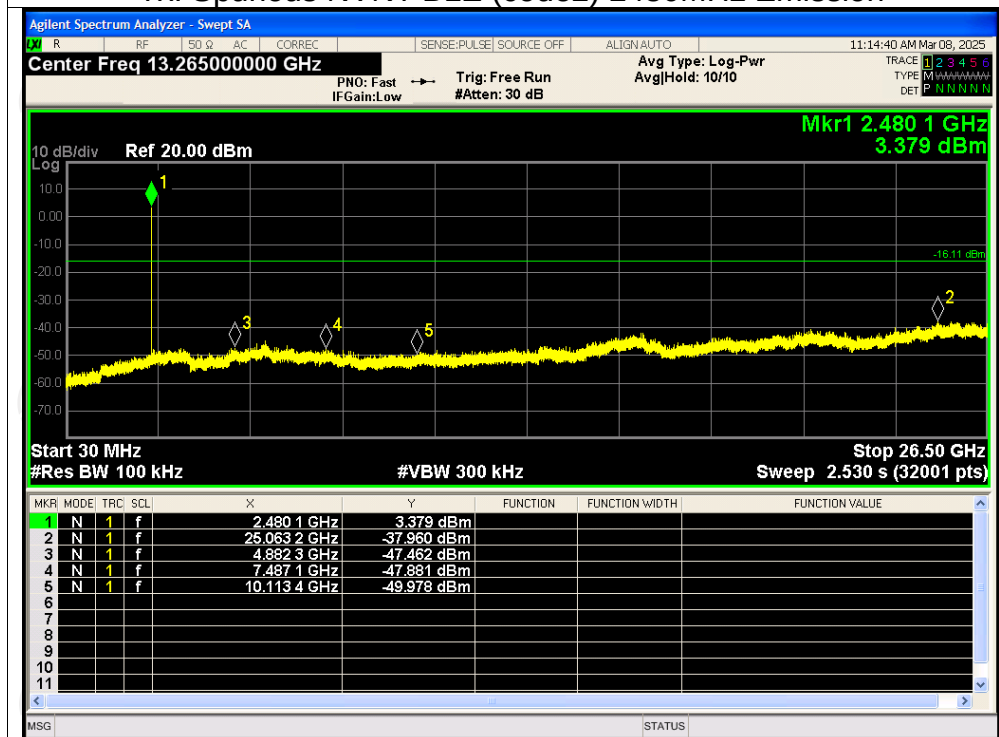
Tx. Spurious NVNT BLE (code2) 2440MHz Emission



Tx. Spurious NVNT BLE (code2) 2480MHz Ref

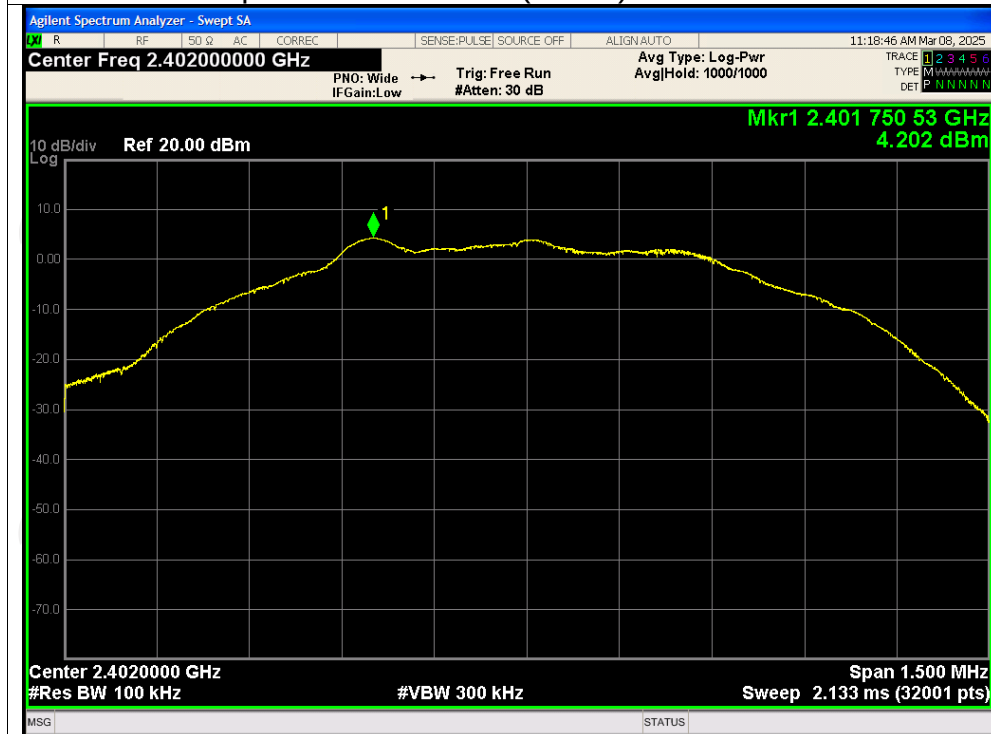


Tx. Spurious NVNT BLE (code2) 2480MHz Emission

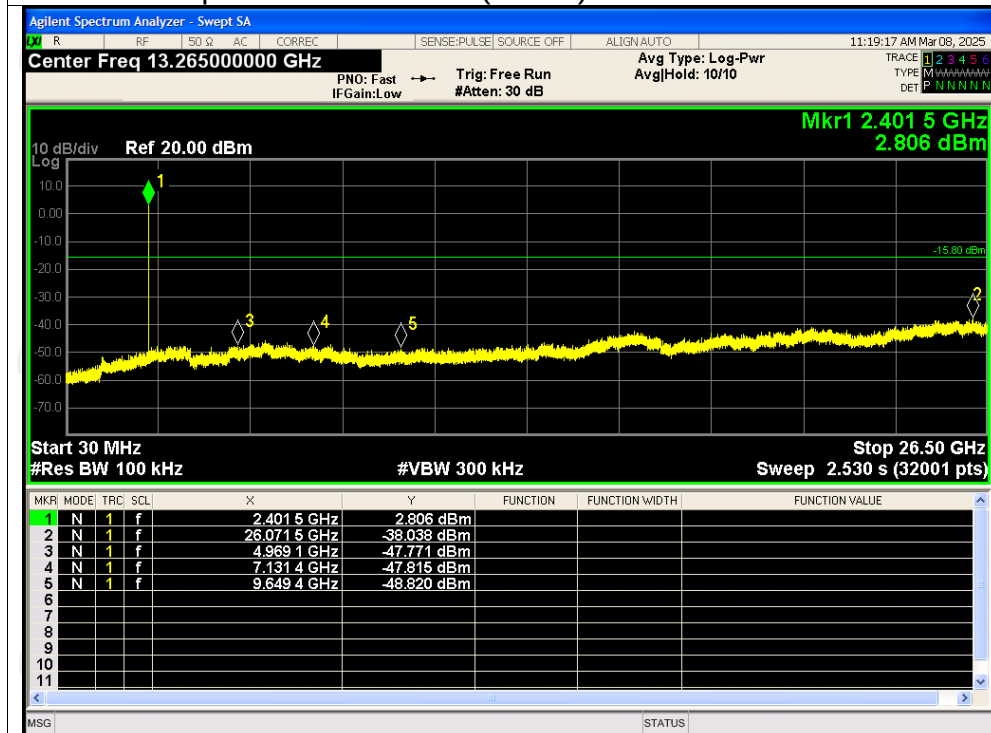


Test Graphs

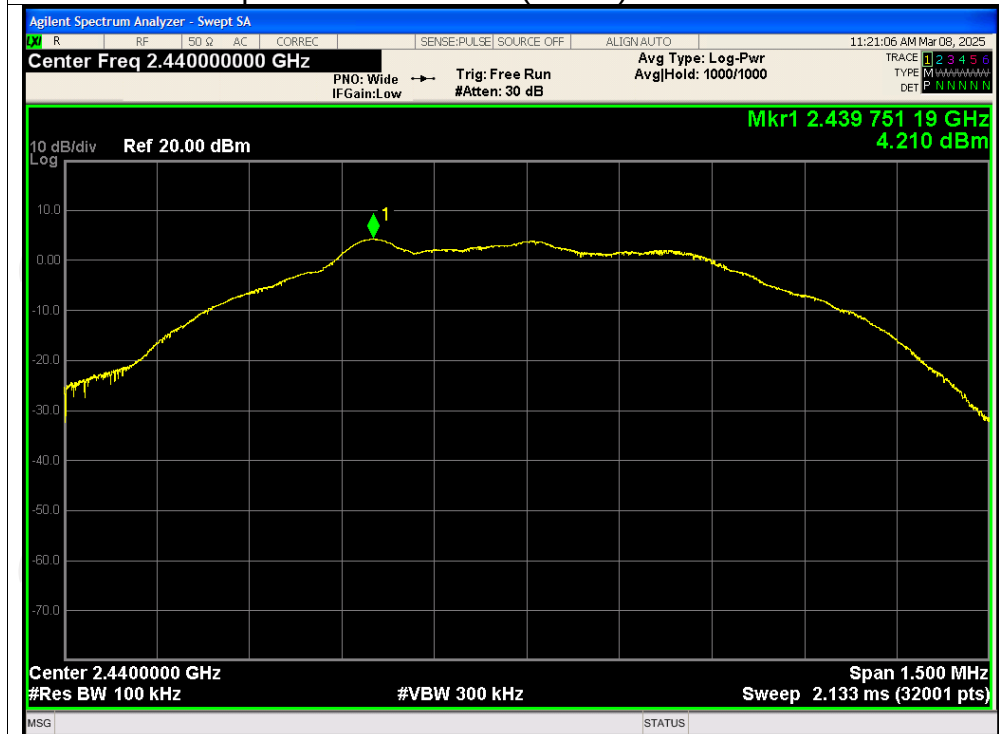
Tx. Spurious NVNT BLE (code8) 2402MHz Ref



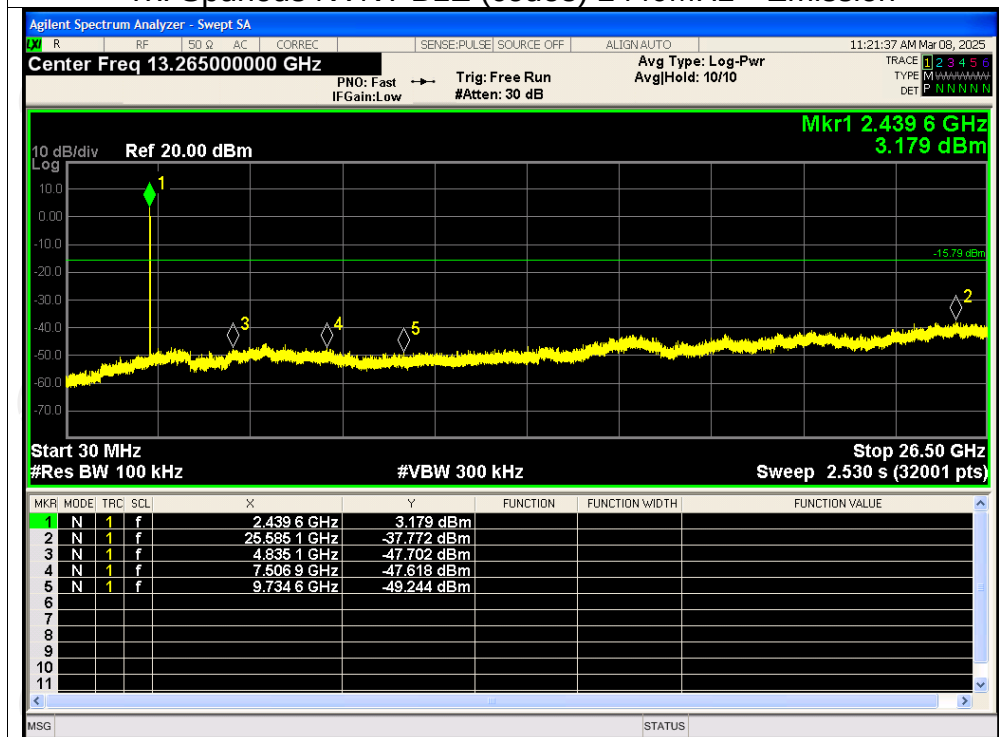
Tx. Spurious NVNT BLE (code8) 2402MHz Emission

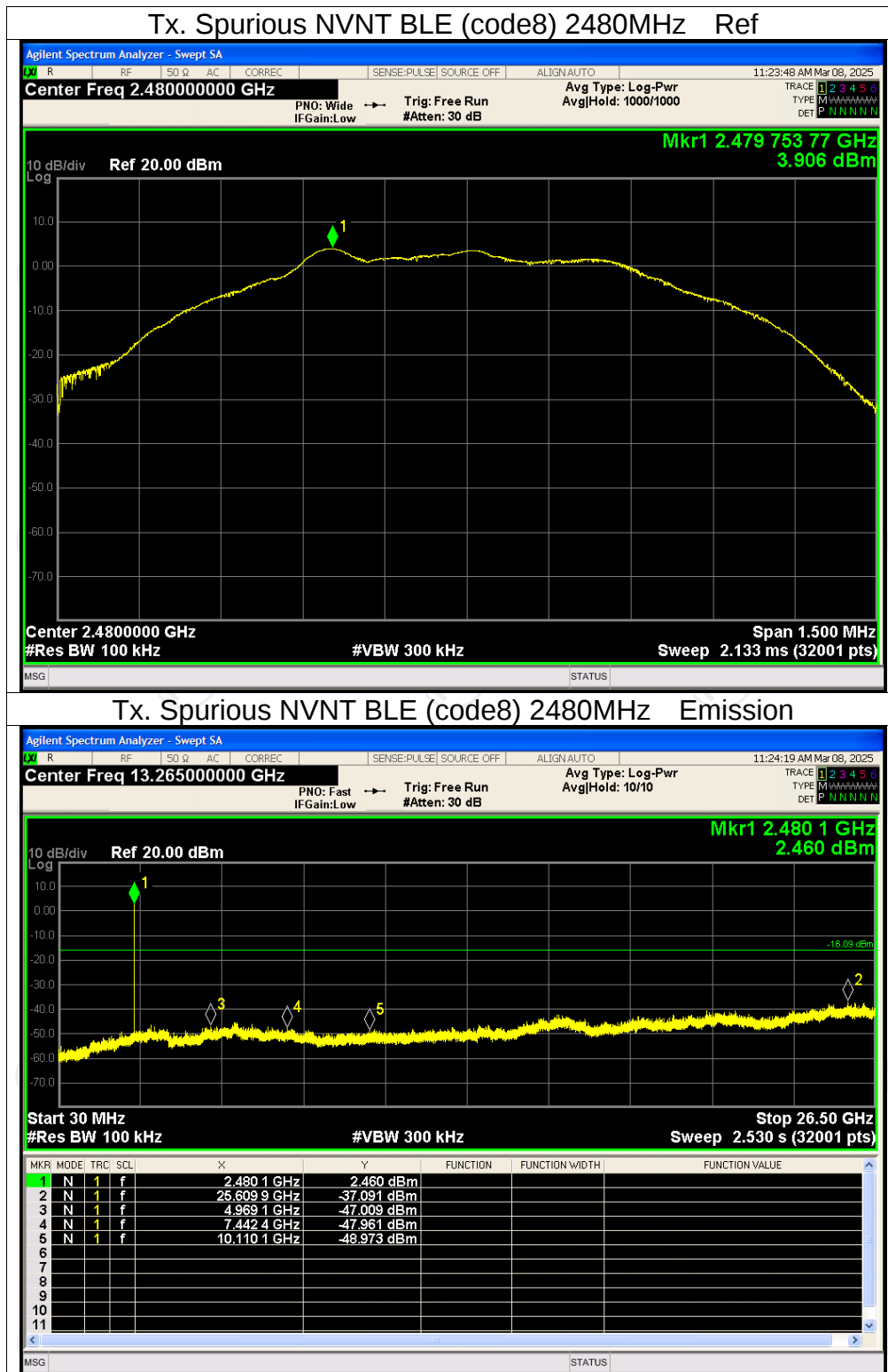


Tx. Spurious NVNT BLE (code8) 2440MHz Ref



Tx. Spurious NVNT BLE (code8) 2440MHz Emission





Appendix B: Photographs of Test Setup

Please refer to document Appendix No.: TCT250227E006-A

Appendix C: Photographs of EUT

Please refer to document Appendix No.: TCT250227E006-B & TCT250227E006-C

*******END OF REPORT*******